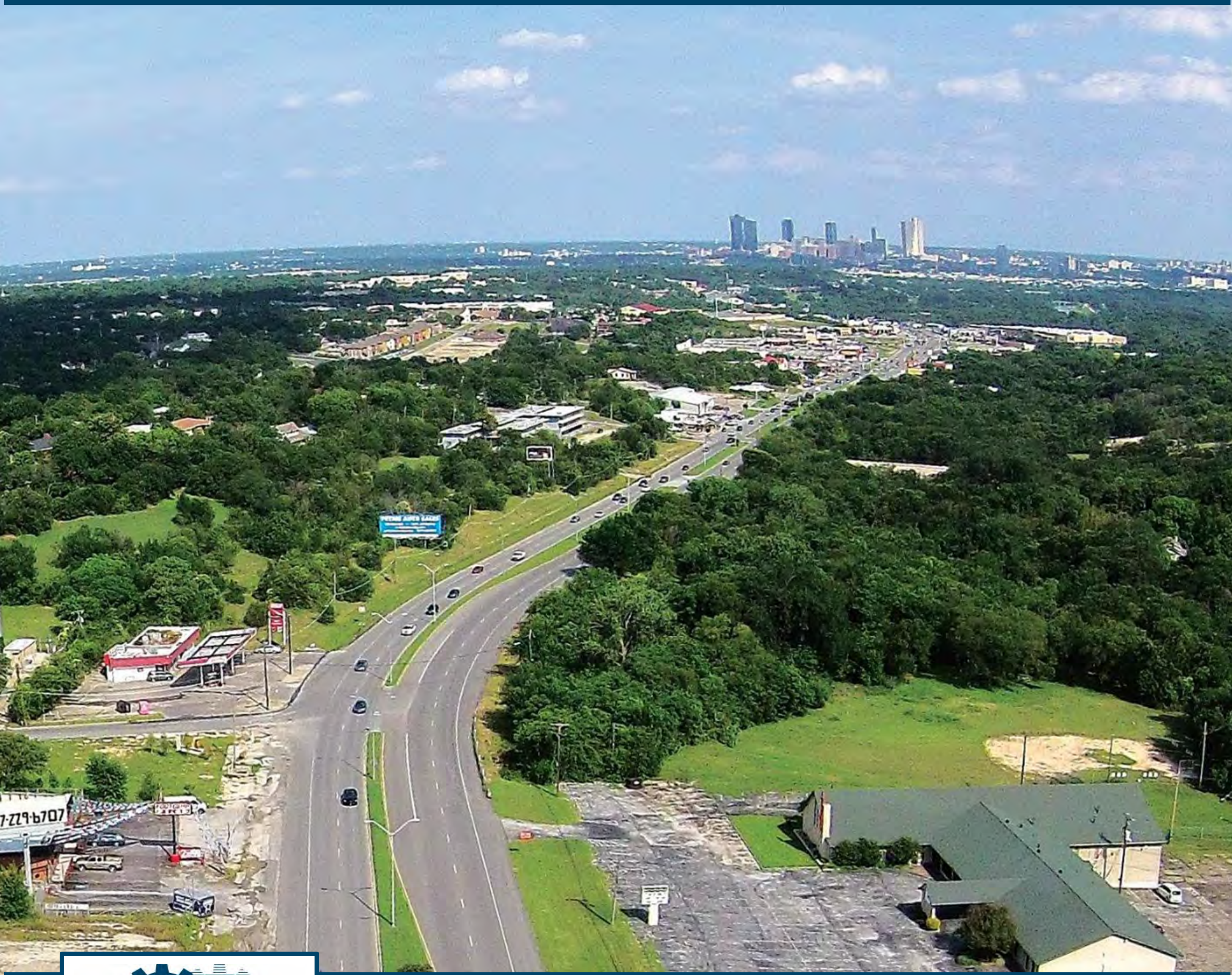
SH 199 Corridor Master Plan
Volume IV – Technical Memorandums



North Central Texas
Council of Governments

September 2017

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What is NCTCOG?

The North Central Texas Council of Governments is a voluntary association of cities, counties, school districts, and special districts which was established in January 1966 to assist local governments in **planning** for common needs, **cooperating** for mutual benefit, and **coordinating** for sound regional development.

It serves a 16-county metropolitan region centered around the two urban centers of Dallas and Fort Worth. Currently the Council has **236 members**, including 16 counties, 168 cities, 24 independent school districts, and 28 special districts. The area of the region is approximately **12,800 square miles**, which is larger than nine states, and the population of the region is over **6.5 million**, which is larger than 38 states.

NCTCOG's structure is relatively simple; each member government appoints a voting representative from the governing body. These voting representatives make up the **General Assembly** which annually elects a 15-member Executive Board. The **Executive Board** is supported by policy development, technical advisory, and study committees, as well as a professional staff of 362.

NCTCOG's offices are located in Arlington in the Centerpoint Two Building at 616 Six Flags Drive (approximately one-half mile south of the main entrance to Six Flags Over Texas).

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NCTCOG's Department of Transportation

Since 1974 NCTCOG has served as the Metropolitan Planning Organization (MPO) for transportation for the Dallas-Fort Worth area. NCTCOG's Department of Transportation is responsible for the regional planning process for all modes of transportation. The department provides technical support and staff assistance to the Regional Transportation Council and its technical committees, which compose the MPO policy-making structure. In addition, the department provides technical assistance to the local governments of North Central Texas in planning, coordinating, and implementing transportation decisions.

Prepared in cooperation with the Texas Department of Transportation and the US Department of Transportation, Federal Highway Administration, and Federal Transit Administration.

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FOREWORD

This report for the SH 199 Corridor Master Plan has been prepared in accordance with current regulations and best planning practices. The structure of this document includes four volumes.

- Volume I – Final Report includes an executive summary and seven sections documenting the study analyses and technical memorandums.
- Volume II – Mapping includes the mapping of the social, economic, natural environment, and other physical conditions within the study area.
- Volume III – Public and Stakeholder Involvement documents the meetings and coordination efforts associated with the study along with comments received from the public and stakeholders.
- Volume IV – Technical Memorandums includes a compilation of the 18 technical memorandums developed during the SH 199 Corridor Master Plan.

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Appendix A – Previous and Related Studies Technical Memorandum

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State Highway 199 Corridor Master Plan

From IH 820 to Belknap Street

Previous and Related Studies Technical Memorandum

Submittal Date:
August 10, 2017

Prepared For:
North Central Texas Council of Governments

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1.0 PREVIOUS AND RELATED STUDIES

Numerous previous planning studies have been conducted in the area. The following have been found most relevant to the State Highway (SH) 199 Corridor Master Plan. The previous planning efforts also includes seven related plans concerning the corridor from a regional, land use, or mode-specific aspect. The following sections summarize these studies.

1.1 Joint Land Use Study

The 2008 Joint Land Use Study (JLUS) was conducted by surrounding cities and Tarrant County in partnership with the US Department of Defense and the US Office of Economic Adjustment regarding the Naval Air Station Joint Reserve Base (NAS JRB). The purpose of the JLUS was to improve local land use decisions that affect the mission of NAS JRB. The North Central Texas Council of Governments (NCTCOG) was the sponsor for the study. The final report can be found at http://www.nctcog.org/trans/aviation/jlus/FinalJLUSReportMarch2008.pdf.

The goal of the JLUS was to promote compatible community growth that supports military training and operational missions. The JLUS sought to mitigate issues related to development in aircraft safety zones and near high noise areas by developing solutions to conflicts and improving communication between NAS JRB and the neighboring communities on land use. The JLUS developed immediate strategies and recommendations for:

- Establishing an oversight committee to monitor and coordinate with the base on land use and encroachment issues
- Revising and continuing enforcement of regulatory requirements such as zoning and building codes to minimize encroachment and noise issues
- Instituting noise level reduction measures and a sound attenuation program for incompatible structures located in high noise contour zones
- Establishing a real estate advisory service for the noise affected area
- Initiating land protection and/or acquisition in the designated clear zone closest to runway operations

High noise contour zones and clear zones from the study are located to the southwest of the immediate SH 199 study area. The JLUS will be updated in 2017.

1.2 Planning for Livable Military Communities Vision Report

Building on the JLUS study and the partnership developed with local governments, the Planning for Livable Military Communities Vision Report (PLMC) study conducted five focused planning activities. These included analyses of the economic markets, housing and retail sectors, enhanced transportation options, ordinances compatibility review, and comprehensive plan visions for five cities (Lake Worth, River Oaks, Sansom Park, Westworth Village, and White Settlement). The final report, completed in 2013 (http://www.nctcog.org/trans/aviation/jlus/hud.asp), identified strategies related to transportation, housing, land use, and economic development to enhance livability in several communities surrounding the NAS Fort Worth, JRB. As it applies to the SH 199 Corridor Master Plan, the PLMC suggests the following regional priorities:

- Economic development
- Coordinated planning along corridors
- Enhanced roadway design and functionality for all users and emphasis on transportation infrastructure investments
- Bicycle and pedestrian connectivity

- Mixed uses

For the SH 199 corridor, the PLMC recommended a corridor assessment study be conducted to determine the feasibility, timeframe, and cost of potential solutions to alleviate congestion along the corridor from Lake Worth to Azle. PLMC principles that relate to SH 199 corridor include:

- Strengthen the overall identity of the area and improve quality of life for existing residents and attract new families
- Revitalize prominent roadways and create mixed use centers to spark new investment and enhance the physical image of the area
- Refine and modernize the network of roads, paths, trails, and sidewalks in the area to encourage more connectivity and expand mobility choices through roadway design
- Pursue opportunities for cooperation among the cities to achieve mutual goals through coordinated planning

Transforming the aging strip centers into mixed use developments that combine housing, retail, and work space with an attractive public realm was emphasized in the PLMC vision framework. Based on this vision framework, SH 199 is intended to be lined with mixed use town centers and mixed use villages at strategic locations along the corridor (see Figure 1).

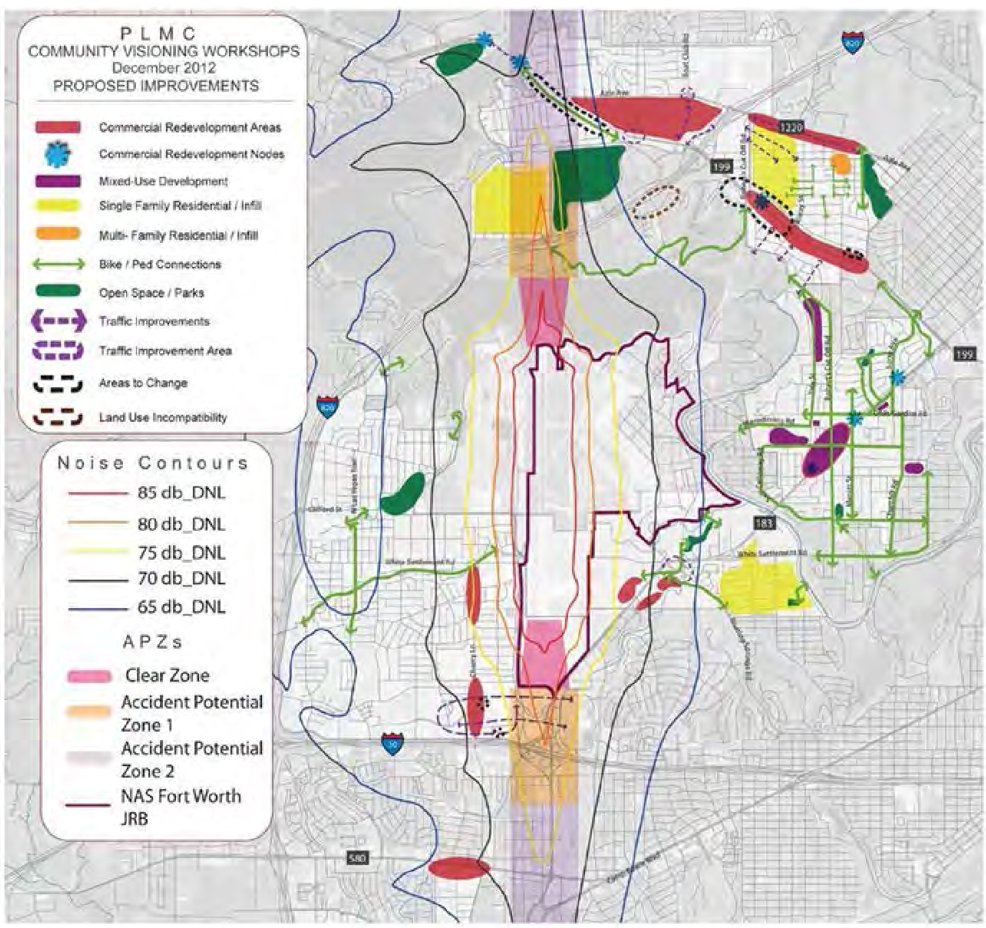


Figure 1. Community Visioning Workshop – Proposed Improvements
Source: Planning Livable Military Communities Regional Vision Plan, 2013

Mixed use town centers are designed to:

- Accommodate mixed use buildings with regional and neighborhood-serving retail and services
- Be pedestrian-oriented with storefront-style shopping streets and shared parking behind buildings with coordinated ingress/egress and on-street parking
- Have buildings oriented and built to the street
- Provide incentives to develop larger parcels at higher densities and in a coordinated, planned environment

Mixed use villages are defined as:

- Smaller and more compact in scale than Mixed Use Town Centers
- Oriented around connected street networks and intersections
- Accommodating mixed use buildings with neighborhood-serving retail, office, service, and other uses
- Building upon the historic development patterns in existing village centers to create attractive and walkable places
- Encouraging adaptive reuse of abandoned, vacant, or underutilized buildings or parcels
- Maintaining a consistently high level of design quality through the district
- Outlining open space requirements and encouraging civic uses

The PLMC highlights two key areas along SH 199 as catalyst sites for redevelopment:

- For the intersection of SH 199 and Interstate Highway (IH) 820, the plan recommends replacing the existing 32,573 square feet of current retail and office space with 80,000 square feet of retail and service uses in a neighborhood shopping center format, 15,000 square feet of limited service restaurant use, and 80,000 square feet of professional office use, resulting in potentially over 300 new jobs and new tax revenue for the City of Lake Worth.
- For the intersection of SH 199 and SH 183, the redevelopment vision includes a mix of uses in a town center format with approximately 300 apartments, 50 townhomes, and 310,000 square feet of retail, restaurant, and service space to replace the existing warehouse, retail, entertainment, and restaurant space, resulting in a net increase of 250 jobs and additional tax revenue for the cities of Fort Worth and River Oaks.

Because the corridor crosses multiple jurisdictions, the PLMC classified SH 199 as a ‘Main Street A’ to promote livability, access/mobility, and safety. Buildings within this Main Street A road type are encouraged to be oriented to the street with a mix of uses. Sidewalks should be landscaped and lined with street furniture. Curb cuts should be structured for shared parking as much as possible and turn lanes should be implemented where driveway consolidation/access management lanes have not been implemented. Additionally, crosswalks, traffic control markings, and bike facilities should be clearly marked for safe multi-modal transportation.

The report also found that 75 percent of the vehicle trips using SH 199 between Roberts Cut-Off Road and Northside Drive are passing through the corridor rather than stopping or turning onto a different road. This high percentage of through traffic presents a unique challenge. Traffic growth will likely be driven by development along the SH 199 corridor northwest of the study area and few alternate routes exist that will be able to relieve this increase in traffic. Traffic projections in the study recognized the challenge of providing a mix of uses fronting the roadway while also accommodating growth from the wanted redevelopment and regional traffic projections, and thus recommended a SH 199 Corridor Master Plan be developed to determine the appropriate mobility solutions given these challenges.

1.3 SH 183 River Oaks Boulevard Corridor Master Plan (SH 199 to West Fork of Trinity River) and SH 183 Corridor Master Plan (West Fork of Trinity River to IH 30)

The River Oaks Boulevard Corridor Master Plan was published in July 2016 as a planning effort to help guide development along River Oaks Boulevard (SH 183) from SH 199 to the West Fork of the Trinity River. The plan balances mobility and accessibility improvements with economic development. The corridor master plan (http://www.nctcog.org/trans/sustdev/landuse/funding/plan/RiverOaks.pdf) is anticipated to be the basis for preliminary design and engineering and will be the first step in a phased approach to making improvements to the corridor. The corridor master plan addressed the feasibility of numerous strategies including:

- Develop the built environment to support multimodal transportation options (bicycle, pedestrian, transit, and automobile)
- Encourage economic development along SH 183
- Support mixed use development and modern urban design
- Improve access
- Incorporate context sensitive design principles

The master plan divided River Oaks Boulevard into three zones. SH 199 intersects River Oaks Boulevard in Zone Three. The recommendations for Zone Three include retaining US 183 as a 4-lane divided roadway but maximizing the use of the wide, available right-of-way to incorporate as many modal mobility options as possible (see Figures 2 and 3). The preliminary recommendations include utilizing a contra-flow frontage road centered on the service road right-of-way configuration. The plan did not include a design of the SH 199 intersection with the intention of leaving this design for the SH 199 study.

Figure 2. SH 183 Context Zone 3 Location Map
Source: River Oaks Boulevard Corridor Master Plan, 2016

Figure 3. SH 183 Context Zone 3 Proposed Street Section
Source: River Oaks Boulevard Corridor Master Plan, 2016

As a next step, NCTCOG began development of a second corridor master plan from the West Fork of the Trinity River to IH 30. The overall focus of the study is to evaluate bicycle/pedestrian options, determine desired streetscape amenities, and conduct a safety and access management review. This study should be completed by fall 2017. Based on the both SH 183 corridor master plans, the Texas Department of Transportation (TxDOT) will be moving forward with preliminary design and environmental analysis for the roadway.

1.4 Mobility 2040

Mobility 2040: The Metropolitan Transportation Plan (MTP) for North Central Texas (Mobility 2040) is the defining vision for the multimodal transportation system in the Dallas-Fort Worth metropolitan planning area. The primary purpose of Mobility 2040 is to prioritize and guide the implementation of multimodal mobility improvements in a growing region within fiscal constraints (see Figure 4). The four goals of Mobility 2040 are focused on: 1) mobility, 2) quality of life, 3) system sustainability, and 4) implementation.

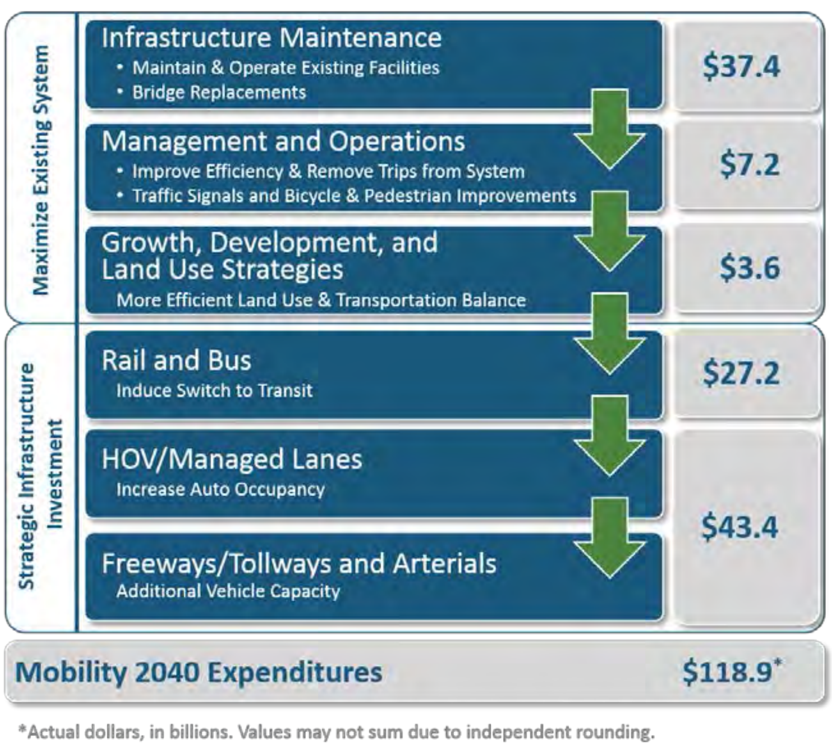


Figure 4. Mobility 2040 Prioritization and Expenditures
Source: NCTCOG, 2016

Mobility 2040 reflects an increase in projected development for central Tarrant County, which the corridor directly serves. This forecast trend is reflected in both the demographic projections used for the 2040 regional travel demand model, as well as the need for renewed infrastructure to support increasing multimodal demands in redeveloping corridors. The MTP notes SH 199 as one of several select corridors funded for future evaluation, including the following references:

- The SH 199 corridor is noted as a regionally significant arterial in need of improvement (see Figure 5), recognizing that it serves both local and regional transportation needs, provides service to regional activity centers, connects communities, and maintains access to and from areas outside of the region.
- The MTP includes guidance for positive trends in health indicators and reductions in both vehicle crashes and bike and pedestrian crashes, which are supported by safe and connected multimodal networks. To support this goal, the corridor is designated as an active transportation corridor with planned bicycle facilities.
- The MTP also notes SH 199 as a secondary route on the regionally significant commercial vehicle network.
- The SH 199 corridor is in the lowest-rated zone for consideration of regional ecosystem framework (REF) valuation, meaning the area holds opportunity for avoiding and minimizing impacts at the ecosystem level.
- The MTP also denotes the SH 199 corridor as a candidate for complete streets principle application of urban thoroughfare revitalization - with the supporting call to integrate land-use context, and supporting reinvestment through adding alternative modes of transportation, needed repairs and maintenance, and coordination with local governments.

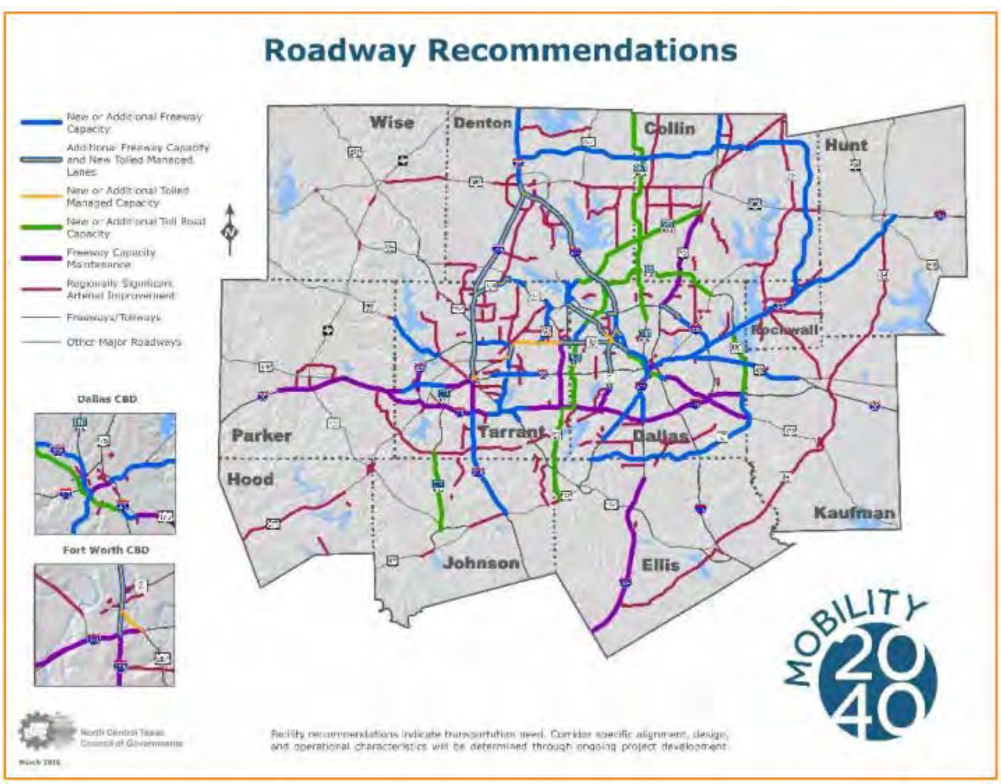


Figure 5. Mobility 2040 Roadway Recommendations
Source: NCTCOG, 2016

1.5 2013 City of Lake Worth Comprehensive Plan Vision Report

The City of Lake Worth Comprehensive Plan Vision Report, developed in 2013, is part of the PLMC Vision Report, which is intended to guide the future development of the City of Lake Worth. SH 199 enters Lake Worth on the southeast corner of the city and exits on the northwest side. The report identifies the north side of SH 199 from IH 820 to Azle Avenue as a future mixed use, commercial redevelopment area. The land on the south side of the corridor from Charbonneau Road to Edgemere Place is identified as an area to change with proposed bike and pedestrian connections. Based on the existing land use plan, a majority of the land along SH 199 is designated as commercial (see Figure 6). There are a few parcels designated as residential, institutional, education, and parks. The future land use plan (see Figure 7) nearly mirrors the existing land use plan with commercial, residential, parks/open space, and public/semi-public land uses.

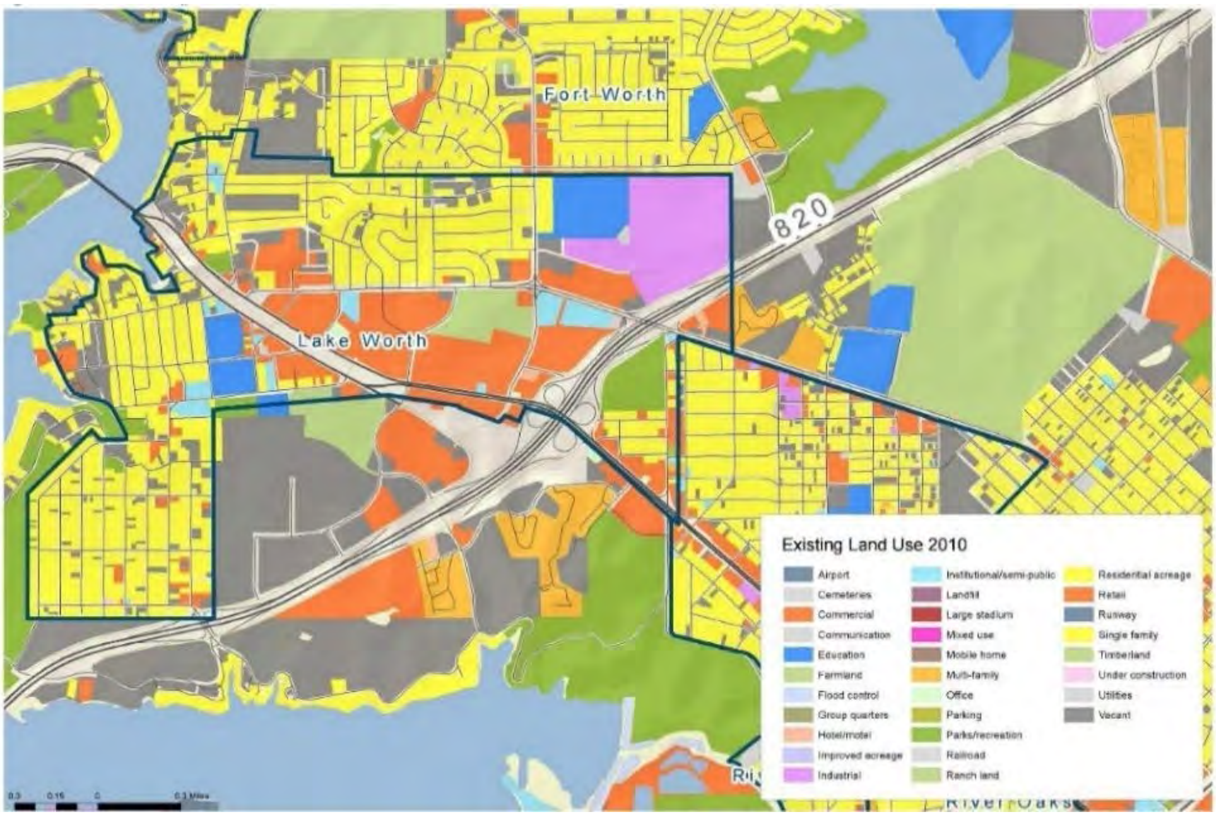


Figure 6. City of Lake Worth Existing Land Use
Source: City of Lake Worth Comprehensive Plan Vision Report, 2013

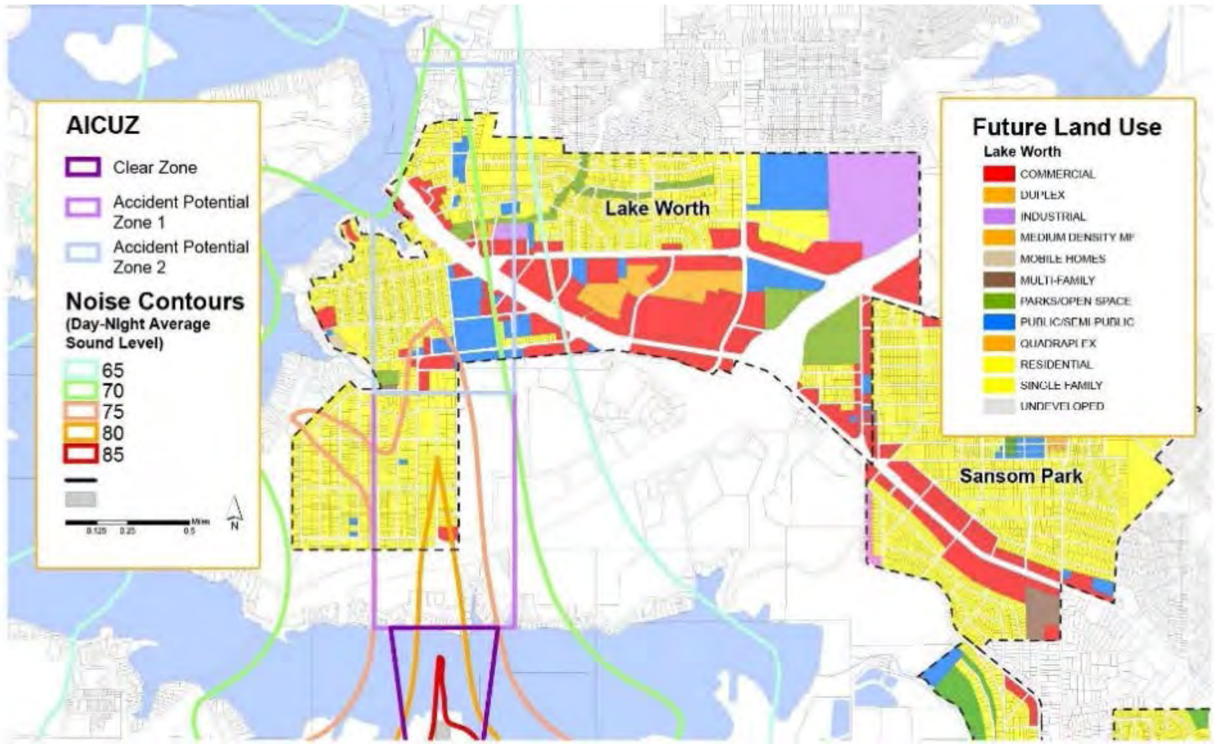


Figure 7. City of Lake Worth Future Land Use Plan
Source: City of Lake Worth Comprehensive Plan Vision Report, 2013

The proposed improvements, recommended as a result of the Community Vision Workshops (see Figure 8), include recommendations for bicycle and pedestrian connections south of the Roberts Cut Off Road and SH 199 intersection to the Marion Sansom Park, Inspiration Point, and along the perimeter of Lake Worth. In addition to bicycle and pedestrian connections, a commercial redevelopment area is recommended along SH 199 between the intersections of Roberts Cut Off Road and Skyline Drive.

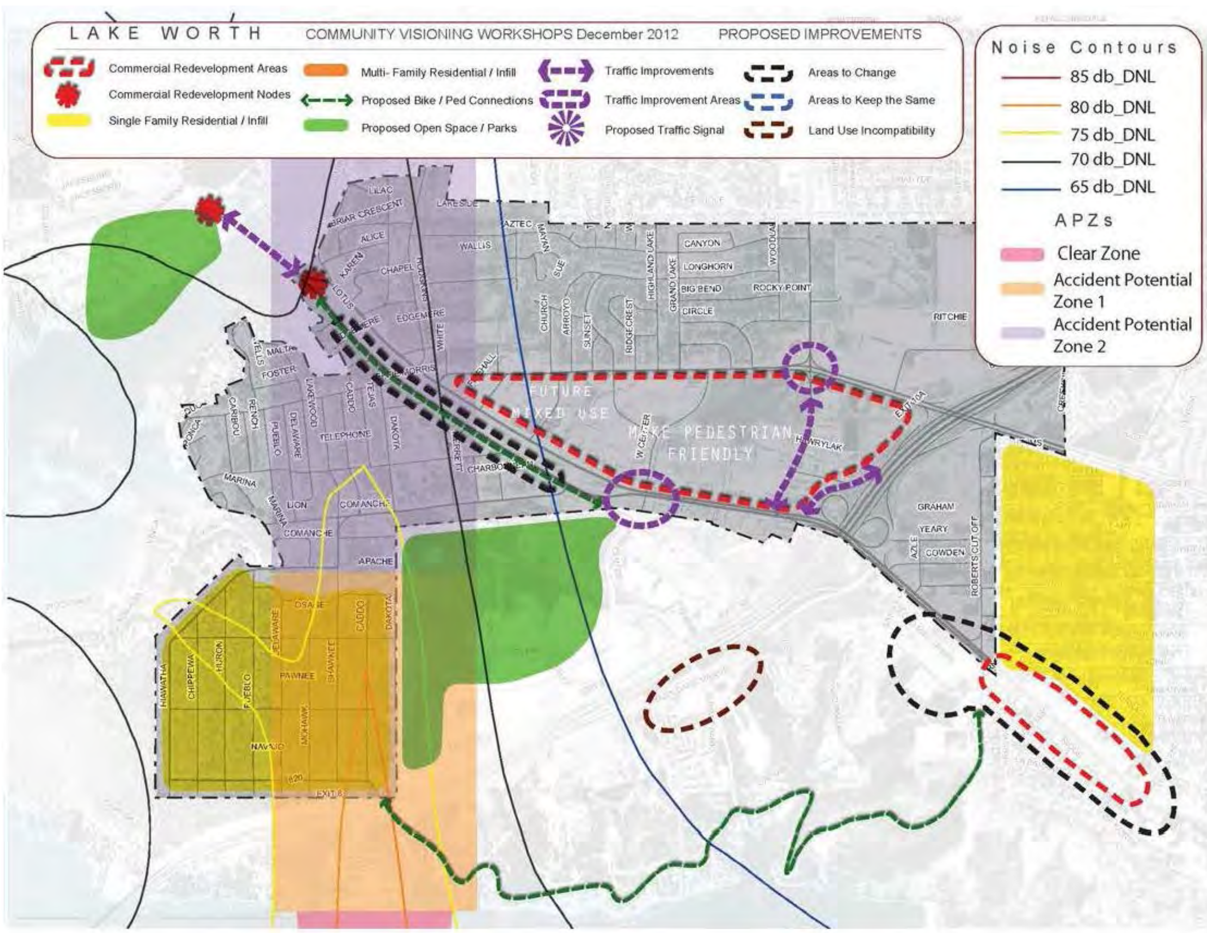


Figure 8. City of Lake Worth Oaks Community Visioning Workshop – Proposed Improvements

Source: City of Lake Worth Comprehensive Plan Vision Report, 2013

1.6 City of Sansom Park Comprehensive Plan Vision Report

The City of Sansom Park Comprehensive Plan Vision Report, developed in 2013, is part of the PLMC Vision Report, which is intended to guide the future development of the City of Sansom Park. Within the comprehensive plan, SH 199 is identified as a key commercial redevelopment area with a commercial redevelopment node located at the intersection of SH 199 and Corner Lane. Based on the existing land use plan, most of the SH 199 corridor is designated as commercial, with a few locations of residential, hotel/motel, industrial, and vacant land (see Figure 9). The future land use plan designates all the land along the SH 199 corridor as commercial (see Figure 10).

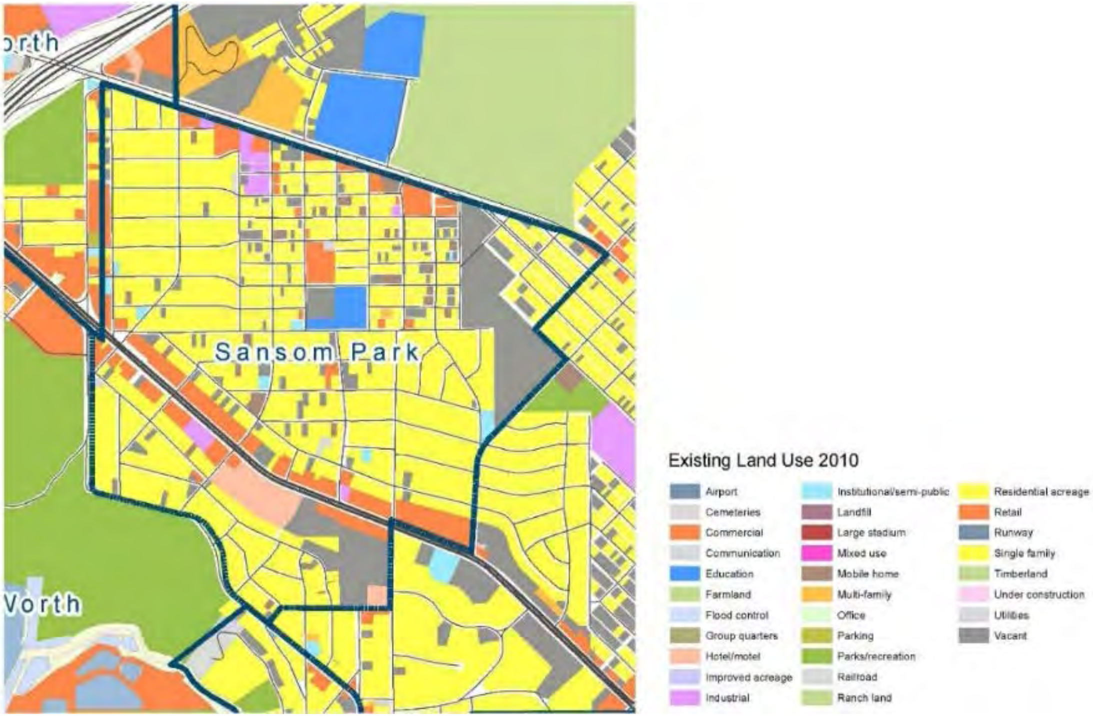
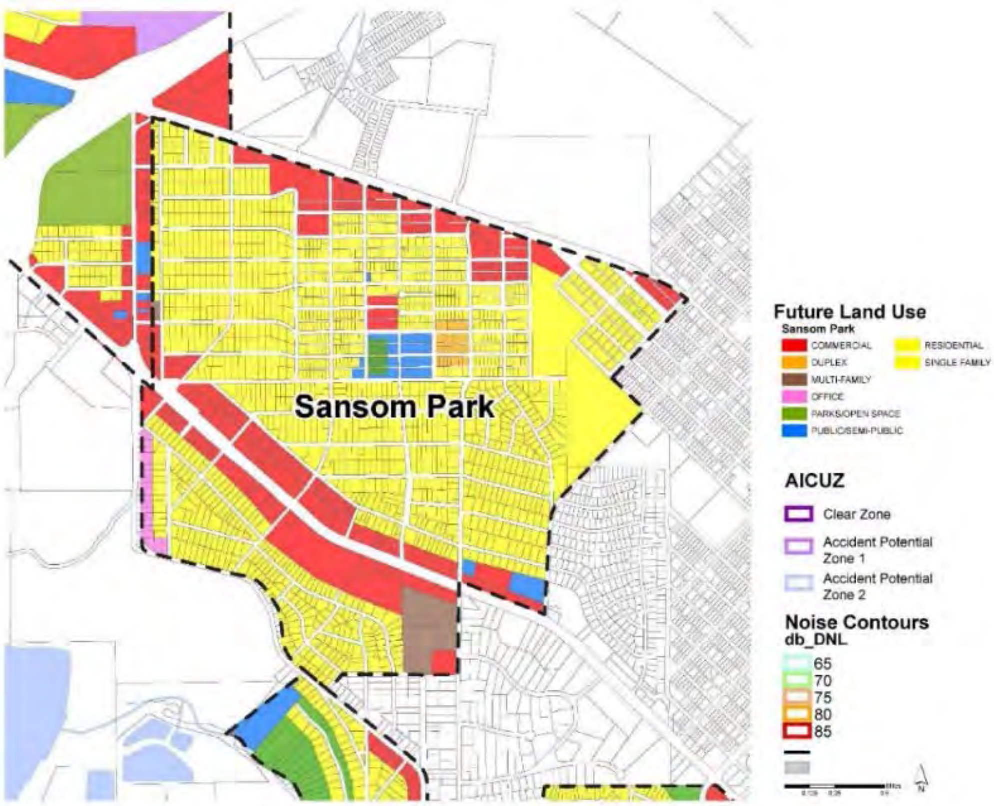


Figure 9. City of Sansom Park Existing Land Use
Source: City of Sansom Park Comprehensive Plan Vision Report, 2013



Source: Sansom Park Comprehensive Plan, 2005
*The future land use map was last updated in 2005 and may not accurately reflect existing land uses today.

Figure 10. City of Sansom Park Future Land Use Plan
Source: City of Sansom Park Comprehensive Plan Vision Report, 2013

The proposed improvements, recommended as a result of the Community Vision Workshops (see Figure 11), include recommendations for a commercial redevelopment area along SH 199 between the intersections of Broadway Drive and Beverly Hills Drive, with a commercial redevelopment node at the intersection of Broadway Drive and SH 199. The proposed improvement recommendations also include traffic improvements to and from SH 199 and Marion Sansom Park in proximity to Norfleet Street and Biway Street with a new park connection between the intersection of SH 199 and Cheyenne Street and Roberts Cut Off Road and Yale Street.

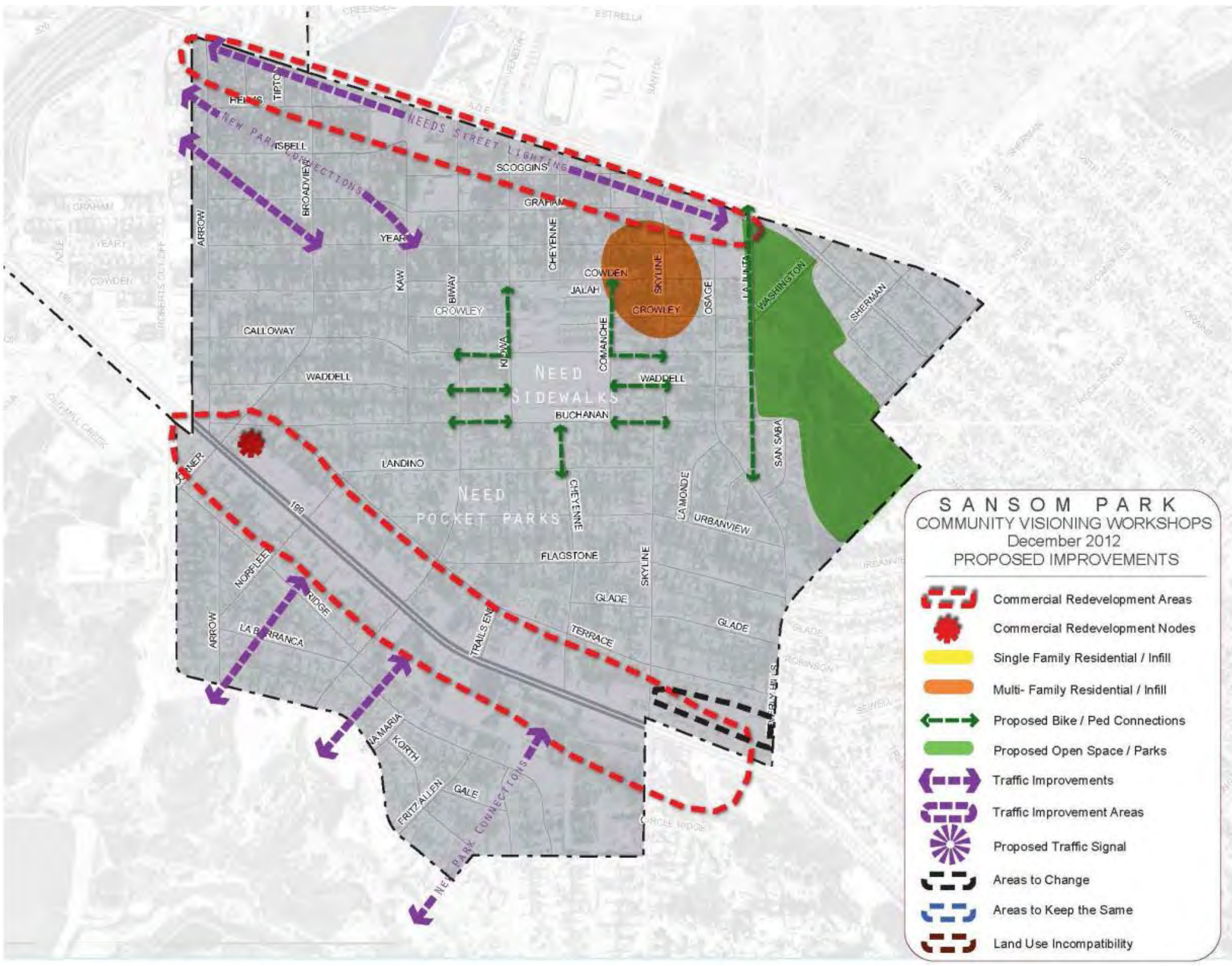


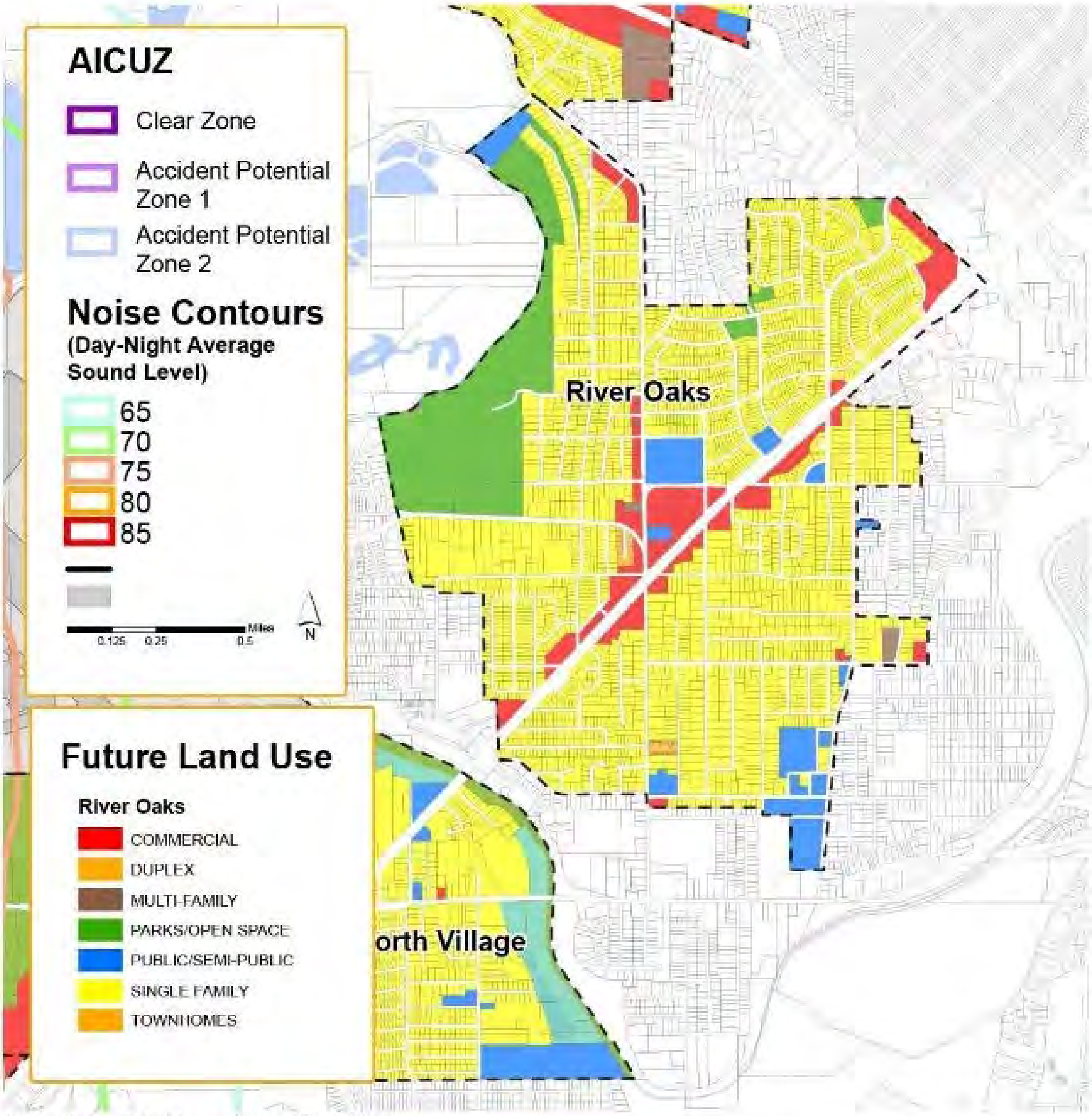
Figure 11. City of Sansom Park Community Visioning Workshop – Proposed Improvements

Source: City of Sansom Park Comprehensive Plan Vision Report, 2013

1.7 City of River Oaks Comprehensive Plan Vision Report

The City of River Oaks Comprehensive Plan Vision Report, developed in 2013, is part of the PLMC Vision Report, which is intended to guide the future development of the City of River Oaks. SH 199 is located along the northeastern edge of River Oaks, where the city has designated the area to be a commercial redevelopment area. This area includes Site 3 of the PLMC economic development building program sites, which has been redeveloped with a big-box development, intended to anchor mixed use development to improve the image of the area and to attract young singles and families. The existing land use plan for the SH 199 corridor in River Oaks acknowledges this area as retail and hotel/motel, while the future land use plan designates this land for commercial use.

Figure 12. City of River Oaks Existing Land Use
Source: City of River Oaks Comprehensive Plan Vision Report, 2013



Source: River Oaks Comprehensive Plan, 2006
* The future land use map was last updated in 2006 and may not accurately reflect existing land uses today.

Figure 13. City of River Oaks Future Land Use Plan
Source: City of River Oaks Comprehensive Plan Vision Report, 2013

The proposed improvements, recommended as a result of the Community Vision Workshops (see Figure 14), include recommendations for bicycle and pedestrian connections south of and parallel to SH 199 from Beverly Hills Drive to SH 183 and south of SH 199 along Long Avenue. In addition to bicycle and pedestrian connections, a commercial redevelopment area is recommended south of SH 199 between Long Avenue and SH 183.

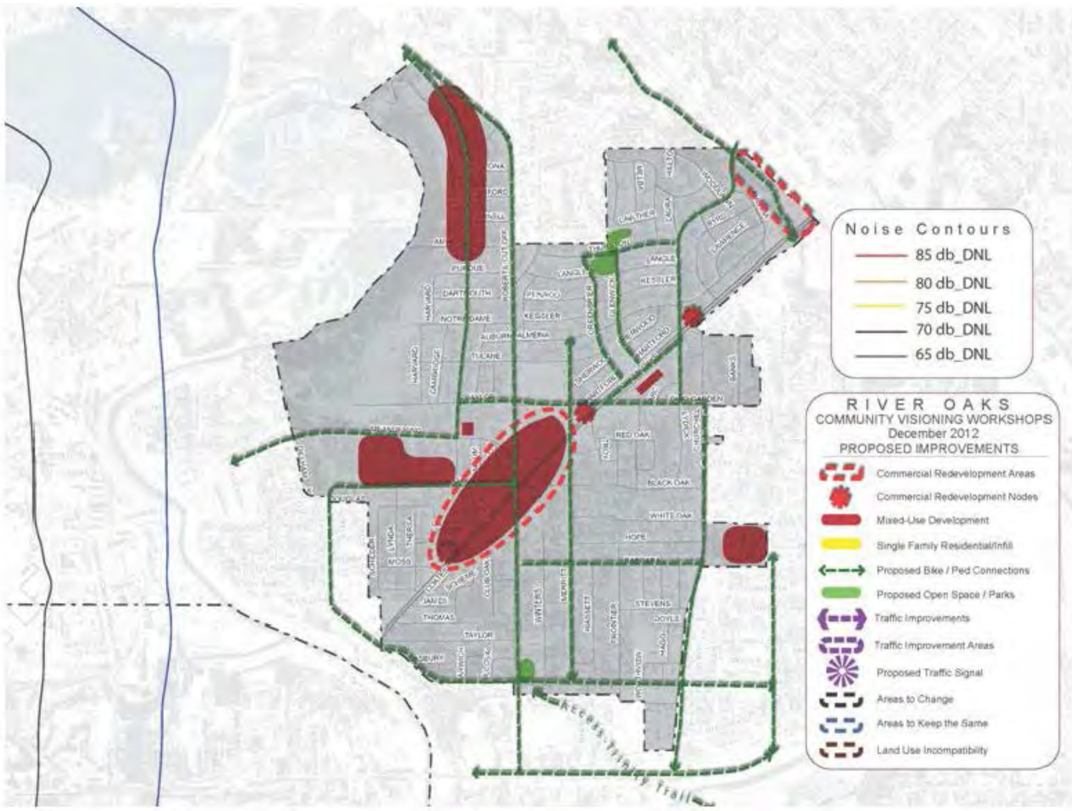


Figure 14. City of River Oaks Community Visioning Workshop – Proposed Improvements

Source: City of River Oaks Comprehensive Plan Vision Report, 2013

1.8 Fort Worth Master Thoroughfare Plan

The Fort Worth Master Thoroughfare Plan, adopted in May 2016 (http://fortworthtexas.gov/planninganddevelopment/master-thoroughfare-plan/mtp.pdf?v=160503) is the long-range plan for major roadways in the City of Fort Worth, intended to accommodate the ultimate development of the thoroughfare network. The Fort Worth Master Thoroughfare Plan is based in a complete streets philosophy, with street design supporting all transportation users and roads appropriately sized to reflect and support the surrounding land uses. The city concurrently adopted a Complete Streets Policy in April 2016 (http://fortworthtexas.gov/planninganddevelopment/complete-streets/complete-streets.pdf?v=20160511).

The Fort Worth Master Thoroughfare Plan was created from future land use maps and the application of street types, which applies land use based street designs on arterials. Street types are aspirational categories giving guidance to preferred design components within the right-of-way, with the goal to transform the thoroughfare network into a world-class complete streets system. The plan also designates established thoroughfares – roadways with transportation infrastructure already built and, in many cases, constrained by existing surrounding development with little to no ability to expand the right-of-way. SH 199 is classified as an established thoroughfare with a commercial collector street type in the plan (see Figure 15).

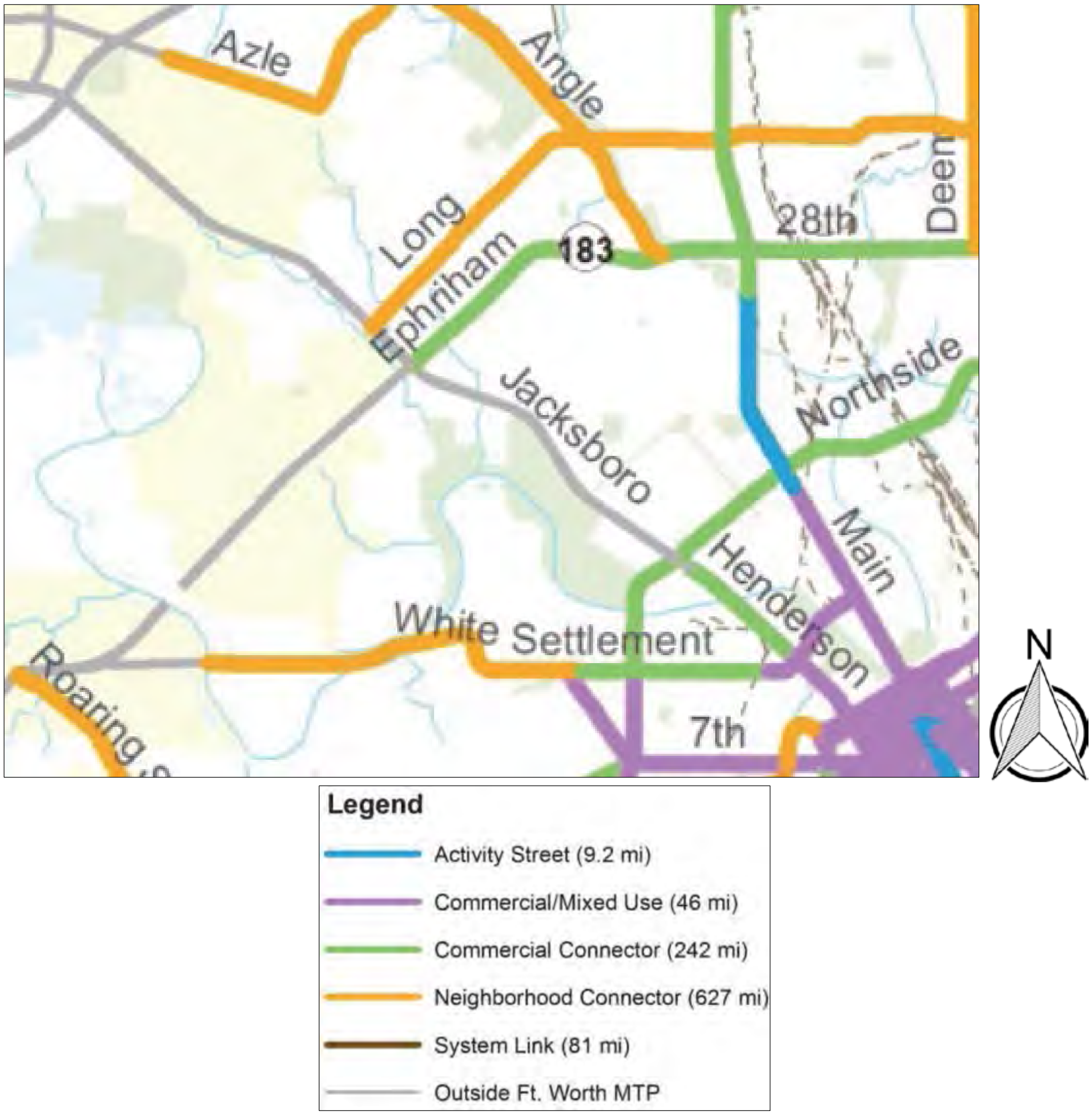


Figure 15. Recommended Street Types Within SH 199 Study Area
Source: Fort Worth Master Thoroughfare Plan, 2016

The Fort Worth Master Thoroughfare Plan was developed with regional partners such as TxDOT and Tarrant County, with a robust public involvement plan. Stakeholders were involved in developing and reviewing the plan details and supported its adoption. The plan incorporated concurrent regional and local transportation plan elements, including the Bike Fort Worth plan (see Section 1.9), the Walk Fort Worth plan (see Section 1.10), and the Fort Worth Transportation Authority plan (see Section 1.12).

1.9 Bike Fort Worth Plan

The 2009 Bike Fort Worth Plan, BikeFW, is the City of Fort Worth plan for promoting bicycling as a safe and attractive transportation alternative by working toward goals to increase the number of bicycle commuters, decrease bicyclist-related crashes, and attain designation as a bicycle friendly community (http://fortworthtexas.gov/bikefw/). BikeFW outlines preferred routes and treatments to promote safe and comfortable cycling, such as shared use paths and sidepaths.

The segment of SH 199 between Ohio Garden Road and 21st Street is also designated as an on-street bike route, connecting routes on the two roadways. The segment of SH 199 continuing into downtown after White Settlement Road includes on-street bicycle lanes.

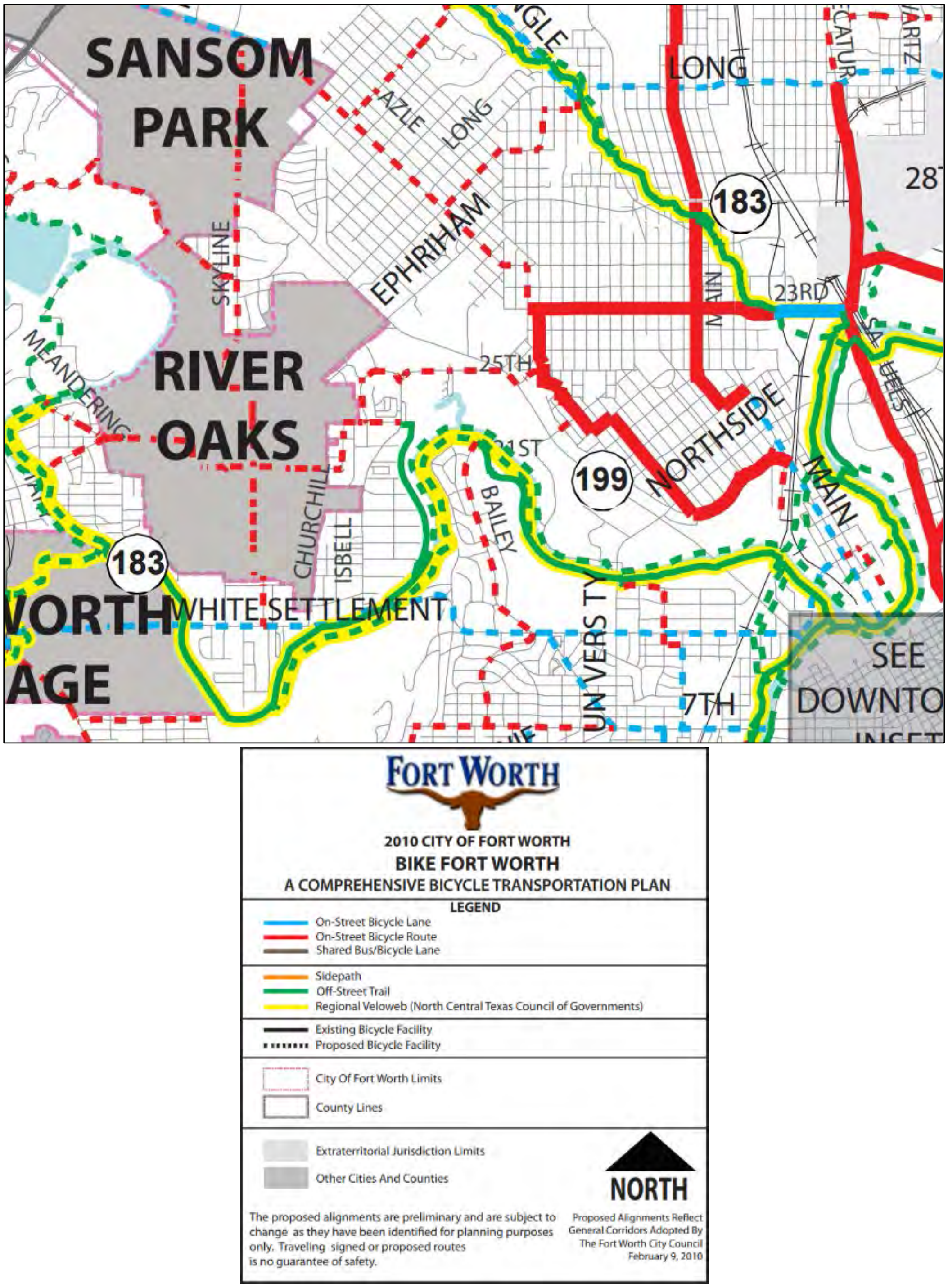


Figure 16. Bike Fort Worth Plan
Source: Bike Fort Worth, 2009

The Trinity Trail system, crossing the SH 199 corridor in its southern portion, is also listed as an existing facility in the NCTCOG Regional Veloweb section of the Mobility 2040.

1.10 Walk Fort Worth Plan

The 2014 Walk Fort Worth Plan (http://fortworthtexas.gov/walkfw/), is the City of Fort Worth plan for promoting a safe and convenient pedestrian environment for those who travel by foot, wheelchair, or other mobility aid. The Walk Fort Worth Plan recommends minimum and desirable sidewalk widths of six feet and 10 feet, respectively, along high speed arterial streets, near schools, transit stops, in downtown, and in mixed-use areas. SH 199 includes many of these characteristics and is noted in the plan as a high priority corridor for sidewalk improvements.

1.11 Trinity River Vision

Bordering the project to the south is Trinity River Vision Plan and Panther Island. Previously known as Trinity Uptown, Panther Island is a vital segment in the adopted Trinity River Vision Plan (see Figure 17). A key feature of this effort is a bypass channel that will carry flood waters around a redeveloping area north of downtown Fort Worth creating an island. Plans include developing a publicly accessible waterfront and a mix of uses, including 10,000 households and 3,000,000 square feet of commercial, educational, office, and civic spaces. The Trinity River Vision has six main objectives:

- Reconnect urban Fort Worth to the Trinity River by eliminating the barrier created by the levees. Encourage activity on the water and along waterfront areas.
- Create a vital and sustainable Panther Island that links downtown, the Cultural District Area, and the Near Northside/Stockyards Districts.
- Provide flood protection for redevelopment areas. Ensure ecosystem restoration and water quality management are integrated into a sustainable urban environment for the enjoyment of all residents.
- Attract over 10,000 new households to the Panther Island site. Create compact mixed use neighborhoods populated by the diverse demographic make-up reflective of Tarrant County.
- Create a regional inter-governmental financing strategy that includes the Tarrant Regional Water District, the City of Fort Worth, and Tarrant County. This financing would be matched by federal and state funds.
- Conserve, respect, and interpret the rich history of the confluence of the Trinity River, the birthplace of Fort Worth and Tarrant County.

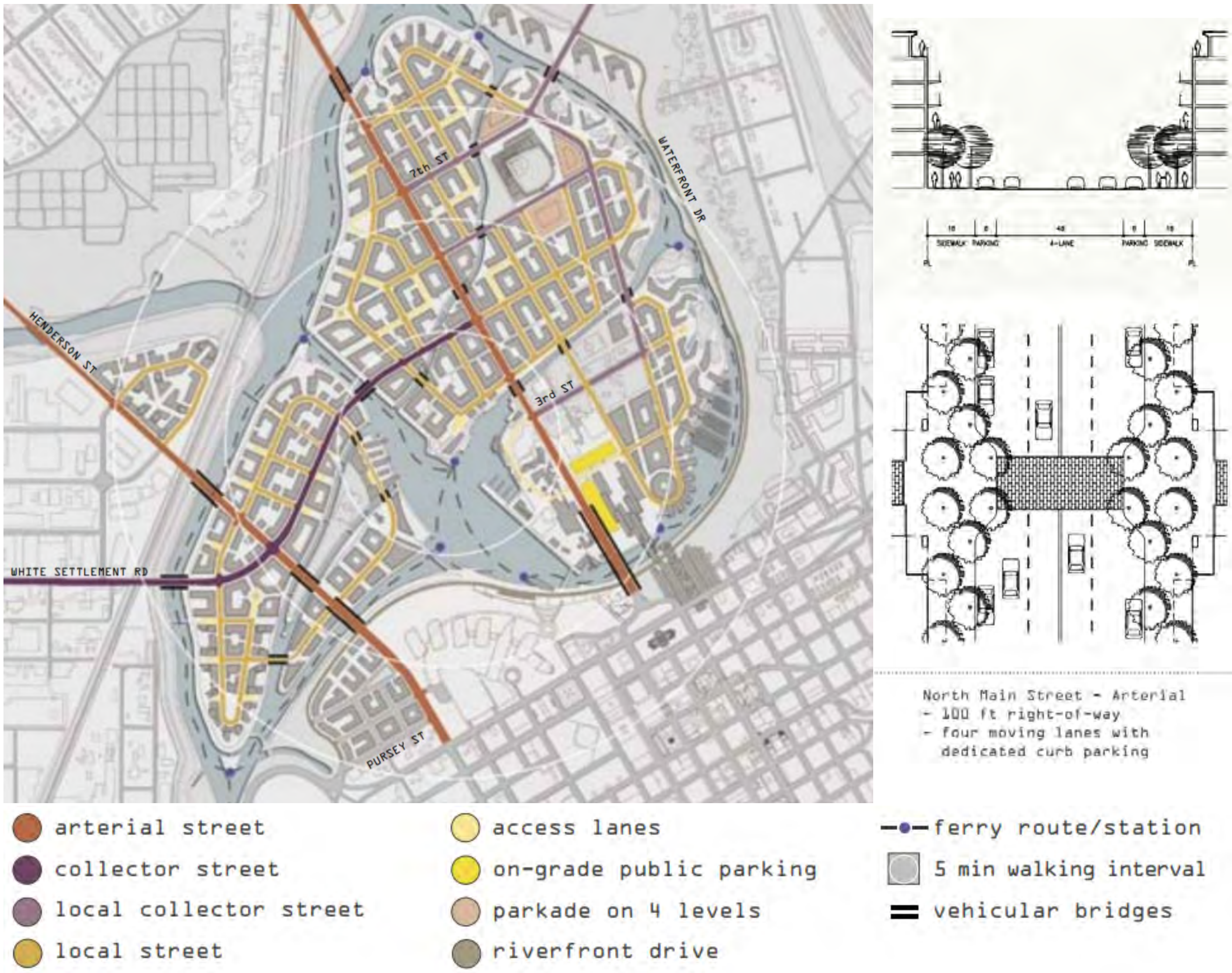


Figure 17. Panther Island Concept Plan View
Source: Trinity Uptown Plan, 2004

As part of the analysis, the Trinity River Vision examined the linkages and view corridors within the study area. The study defines Henderson Street (SH 199) as providing strong north-south connections, linking Northside Drive to the west side of downtown as well as providing connections from the site to beyond the immediate context.

SH 199 falls within the southwest neighborhood. This area is intended to be predominantly residential with a range of housing types. A central park is a key feature of this neighborhood that will be urban in nature and surrounded by four- to six-story buildings (see Figure 18).

Figure 18. Panther Island Perspective View (Looking Northeast)
Source: Trinity Uptown Plan, 2004

1.12 Fort Worth Transportation Authority Master Plan

The Fort Worth Transportation Authority adopted a master plan in 2015 with the goals to connect people and places, make transit an attractive choice, and create a sustainable system over the long term. The plan contains network recommendations with a stated five-year horizon, which include improvements along the SH 199 corridor anchored by the Fort Worth central business district and a new transit center at the intersection of SH 199 and IH 820.

- SH 199 is currently served by local, fixed route bus service, primarily Route 46, that runs the length of the corridor (see Figure 19).
- Service is planned to be expanded with an express route, and rapid bus route featuring 10-minute intervals between busses during peak periods.

Figure 19. Vision Map of Planned Services
Source: FWTA 2015 Master Plan, 2015

The plan lists the Fort Worth central business district, Panther Island, the commercial cluster at SH 199/SH 183, Town and Country Center, and Landmark Lakes Center as key destinations in the corridor. Recommendations specific to the SH 199 corridor include:

- Making convenient first-mile/last-mile connections – citing poor pedestrian conditions as one of the largest barriers to transit service outside of the urban core.
- Rapid bus service should include transit signal priority, including queue jump lanes and signal priority to speed busses through intersections. It should also include dedicated, level boarding stations, real time passenger information, and intelligent transportation system technologies, such as automatic vehicle location.
- Potential park-and-ride or kiss-and-ride lots in convenient locations to connect with FWTA services in lower ridership-dense areas. Increased ridership means more efficiency for the travel corridor.
- A transit center planned for the intersection with SH 199 and IH 820 to offer the best opportunity to branch services to serve lower rider-dense areas.

1.13 Fort Worth 2017 Comprehensive Plan

Based on the 2017 Comprehensive Plan of Fort Worth, there are five major themes that will help realize the future vision for the city. These themes include promoting economic growth, meeting the needs of an expanding population, revitalizing the central city, developing multiple growth centers, and celebrating the Trinity River. One of the key values of the city focuses on mobility. Fort Worth desires to have streets and public transportation systems that allow convenient travel throughout the city and region. The city would like for these streets to have safe sidewalks to allow pedestrian movement throughout neighborhoods, commercial districts, and greenways.

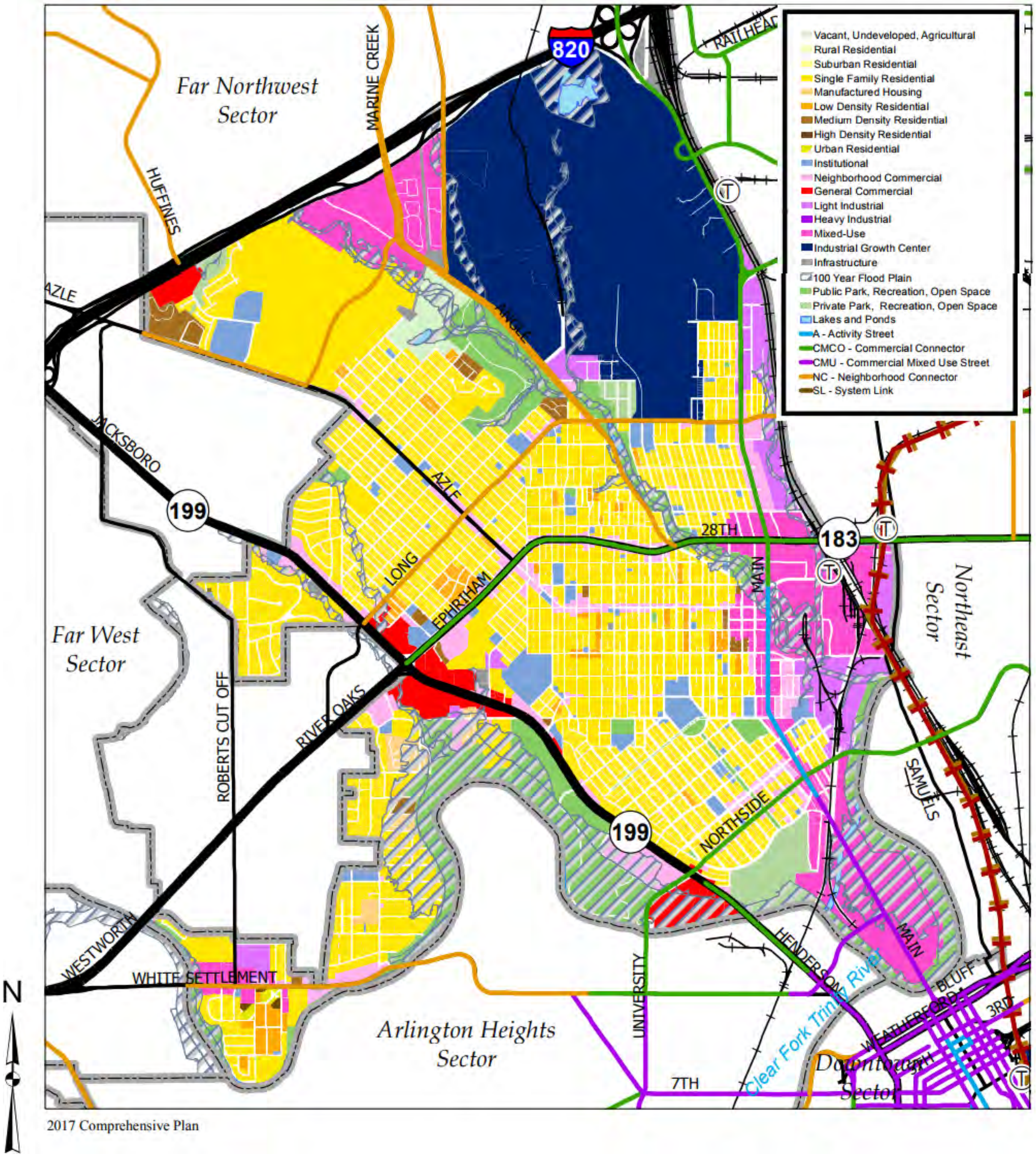


Figure 20. City of Fort Worth Future Land Use
Source: Fort Worth Comprehensive Plan, 2017

The 2017 Comprehensive Plan breaks up the city into sectors and examines the future land use policies within each sector. The SH 199 corridor falls within the Northside Sector and the Far West Sector (see Figure 20). The main policies in the Northside Sector that affect the SH 199 corridor are:

- Promote a desirable combination of compatible urban residential, office, retail, commercial, and selected light industrial uses in Panther Island.
- Encourage urban residential development in appropriate locations to create more walkable, pedestrian-oriented neighborhoods.

The main policies in the Far West Sector that affect the SH 199 corridor include:

- Promote fiscally sustainable growth on the periphery of the city by encouraging development adjacent to existing adequate infrastructure and discouraging leapfrog development.
- Consult the adopted City of Lake Worth Comprehensive Plan Vision Report (see Section 1.5) for guidance on all land use, environmental, transportation, development, and infrastructure investment decisions for all areas within the Lake Worth Vision Plan Implementation Area.
- Within the Lake Worth watershed, promote the clustering of new residential development to preserve as common open space or dedicated parkland the following types of land features: floodplains, riparian buffers, steep slopes, wooded areas, special habitat areas, and unique views.
- Support innovative development projects that implement the City of Lake Worth Comprehensive Plan Vision Report and showcase low impact development practices, conserve riparian buffers, and extend greenway networks with hike and bike trails.

Appendix B – Existing Character Zones Technical Memorandum

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State Highway 199 Corridor Master Plan

From IH 820 to Belknap Street

Existing Character Zones Technical Memorandum

Submittal Date:
June 22, 2017

Prepared For:
North Central Texas Council of Governments

Prepared By:
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817-735-7300
Texas Registered Engineering Firm F-2144

1.0 CHARACTER ZONES

Within the State Highway (SH) 199 corridor, between Interstate Highway (IH) 820 and Belknap Street, five distinct areas, referred to as character zones, have been observed. These character zones are not absolute but are observed character areas that were determined through site visits, geographic information system (GIS) analysis, existing studies, and local input. Approximate zone boundaries include:

- Character Zone 1 - IH 820 to Roberts Cut Off Road
- Character Zone 2 - Roberts Cut Off Road to Long Avenue
- Character Zone 3 - Long Avenue to Ohio Garden Road
- Character Zone 4 - Ohio Garden Road to the West Fork of the Trinity River
- Character Zone 5 - West Fork of the Trinity River to Belknap Street

Exhibit 1 includes a graphical representation of the five character zones and their boundaries.

1.1 CHARACTER ZONE 1

1.1.1 Existing Land Use Character

The land use types that line SH 199 in Character Zone 1 include commercial, retail, and office (see Exhibit 2). Behind these parcels is single-family residential to the north and multi-family and parks to the south. Along Roberts Cut Off Road are commercial, public, and multi-family structures. The structures adjacent to SH 199 include a variety of fast-food chains, restaurants, gas stations, pawn shops, and other commercial uses. Overall this zone is auto-oriented, with parking lots in front of single-use structures. A majority of the architecture is dated or typical of most auto-oriented environments across the country. A few newer structures have added architectural elements such as stone facades and a standing-seam metal roof. Figures 1 through 3 are current representative photos of Character Zone 1.

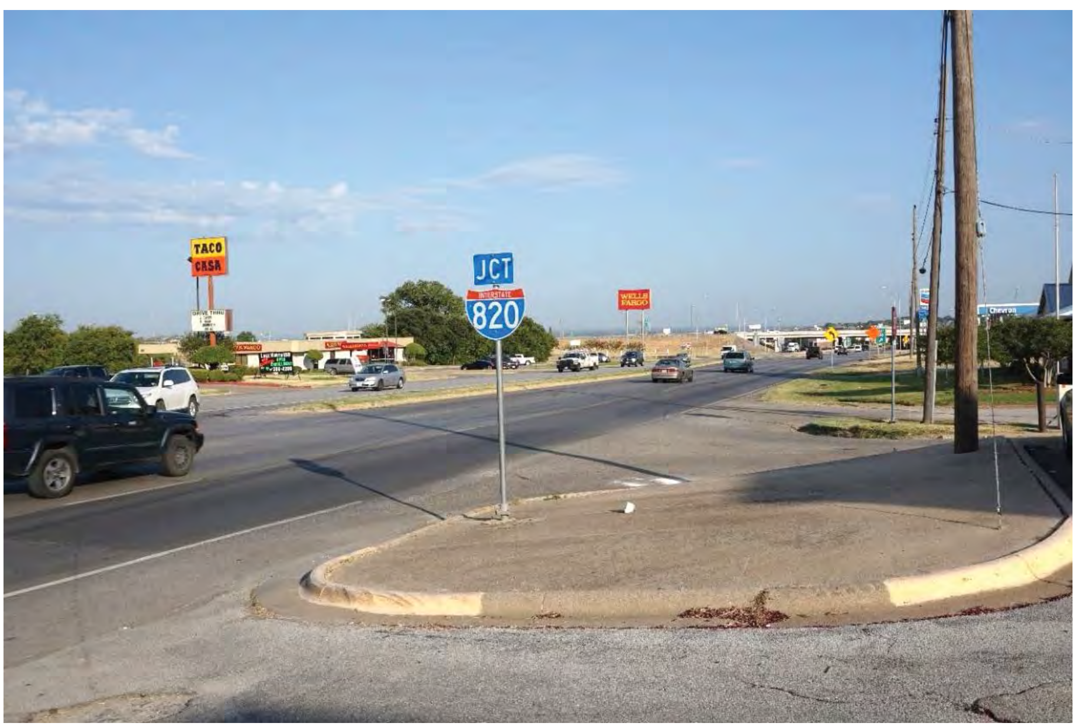


Figure 1. Typical Character Zone 1 Commercial Frontage

Source: Freese and Nichols, Inc., 2016

Figure 2. Recently Constructed Commercial Development at SH 199 and Roberts Cut Off Road Intersection

Source: Freese and Nichols, Inc., 2016; Atwoods Ranch and Home Store (http://www.atwoods.com), 2017

Figure 3. Vacant or Underutilized Area East of SH 199 and Roberts Cut Off Road Intersection

Source: Freese and Nichols, Inc., 2016

1.1.2 Current Zoning

Current zoning for Character Zone 1 includes primarily commercial uses adjacent to SH 199. Limited single-family and multi-family designations are identified behind the SH 199 commercial zoning frontage (see Exhibit 3).

1.1.3 Strongest Identity Points

The strongest existing identity in Character Zone 1 is linked to the recently constructed convenience store and renovated retail space near the Roberts Cut Off Road intersection of SH 199. In addition, more recently improved office and retail buildings near Cowden Street and Azle Way are significate façade investments.

1.2 CHARACTER ZONE 2

1.2.1 Existing Land Use Character

There are a wide variety of land uses lining SH 199 in Character Zone 2. These uses include commercial, light industrial, single-family, public, park, and vacant land (see Exhibit 2). Behind the properties along SH 199, uses primarily include single-family, multi-family, vacant land, and public land. Like Character Zone 1, the commercial uses in Character Zone 2 mostly include single-use, auto-oriented structures with parking in the front. Some of the specific uses include bars, liquor stores, motels, feed and supply stores, gas stations, auto repair shops, hardware stores, restaurants, and discount stores.

East of Skyline Drive, the parcels south of SH 199 become deeper and are predominantly made up of single-family residential and vacant land. Despite the increased parcel depth, the development potential of these parcels is affected by a stream that runs through this area. The general architecture in Character Zone 2 does not possess significant character and is typical for older, commercial-style buildings. Many buildings are one story and have flat roofs. Building materials range from metal siding to brick and stucco. Business signage is designed to catch the attention of high-speed traffic, with large lettering and high placement. Of the five zones, Character Zone 2 has the most undeveloped land that could potentially attract new development but, the stream running parallel to SH 199 may affect future site designs. There are also a handful of infill sites throughout the zone. Figures 4 and 5 are current representative photos of Character Zone 2.

Figure 4. East Perspective Near SH 199 and Beverly Hills Drive Intersection

Source: Freese and Nichols, Inc., 2016

Figure 5. Typical Character Zone 2 Commercial Frontage
Source: Freese and Nichols, Inc., 2016

1.2.2 Current Zoning
Current zoning for Character Zone 2 includes primarily commercial uses adjacent to SH 199, with some planned developments in place. Single-family designations are identified behind the SH 199 commercial zoning frontage (see Exhibit 3).

1.2.3 Strongest Identity Points
From an existing development viewpoint, Character Zone 2 lacks a strong single identity. This is often the case with old commercial corridors. The existing CVS pharmacy and El Paseo restaurant are two of the more identifiable locations. While a limited building environment is noted, a character change is experienced in Character Zone 2 associated with wide grass medians and natural vegetation along much of the SH 199 edges.

1.3 CHARACTER ZONE 3

1.3.1 Existing Land Use Character
Character Zone 3 is marked with larger parcels than the zones 1 and 2. These parcels range from commercial, to industrial, to multi-family, to vacant land (see Exhibit 2). There are a handful of single-family residential lots behind the parcels lining SH 199; however most of the lots located off SH 199 include uses for commercial, light industrial, multi-family, vacant, or public. The development typology in Character Zone 3 continues to be auto-oriented with buildings set back on the property and large parking lots lining the front. Uses include gas stations, auto-repair shops, thrift stores, single-story strip retail, fast-food restaurants, drug stores, and big-box retail stores.

The architectural character of Character Zone 3 is generally single-story buildings with flat roofs and metal siding. Most of the construction was likely built prior to the 21st century; however, there are a few newer developments, particularly around the intersection of SH 199 and SH 183. These newer uses include a big-box retail store, a drug store, and an auto parts store. These newer structures have some enhanced architectural features such as stone façades and façade articulations. More recent developments have maintained landscape elements. Figures 6 and 7 are current representative photos of Character Zone 3.

Figure 6. Typical Character Zone 3 Commercial Frontage West of SH 199 and SH 183 Intersection

Source: Freese and Nichols, Inc., 2016

Figure 7. Typical Character Zone 3 Commercial Frontage East of SH 199 and SH 183 Intersection

Source: Freese and Nichols, Inc., 2016

1.3.2 Current Zoning

Current zoning for this character zone includes primarily commercial uses adjacent to SH 199, with some industrial designations near the Ohio Garden Road area. Mostly single-family designations are identified behind the SH 199 commercial zoning frontage with a few public sites associated with existing school or community facilities (see Exhibit 3).

1.3.3 Strongest Identity Points

Zone 3 has a significant amount of commercial and retail investment when compared to other areas of the corridor. Development surrounding the intersection with SH 183 includes retail strip centers, a new convenience store, Wal-Mart, and several new fast-food establishments.

1.4 CHARACTER ZONE 4

1.4.1 Existing Land Use Character

While there are multiple commercial parcels on SH 199 in Character Zone 4, a majority of this corridor zone is lined with park uses (Rockwood Golf Course and Rockwood Park) on the south and single-family uses on the north (see Exhibit 2). Several of the existing commercial developments have been more recently constructed and offer enhanced façade materials and landscaping features. The remaining commercial properties are dated, single-story structures with large, non-landscaped parking lots, many of which are classified as car dealerships. The single-family uses adjacent to the north side of SH 199 are set back and mostly not visible from the road. There is a retaining wall lining SH 199 along these residential parcels. There are very few vacant parcels within the zone. Existing vacant parcels are tucked between single-family uses. Figures 8 through 10 are current representative photos of Character Zone 4.

Figure 8. Recently Constructed Commercial Development Near SH 199 and 21st Street Intersection
Source: Freese and Nichols, Inc., 2016

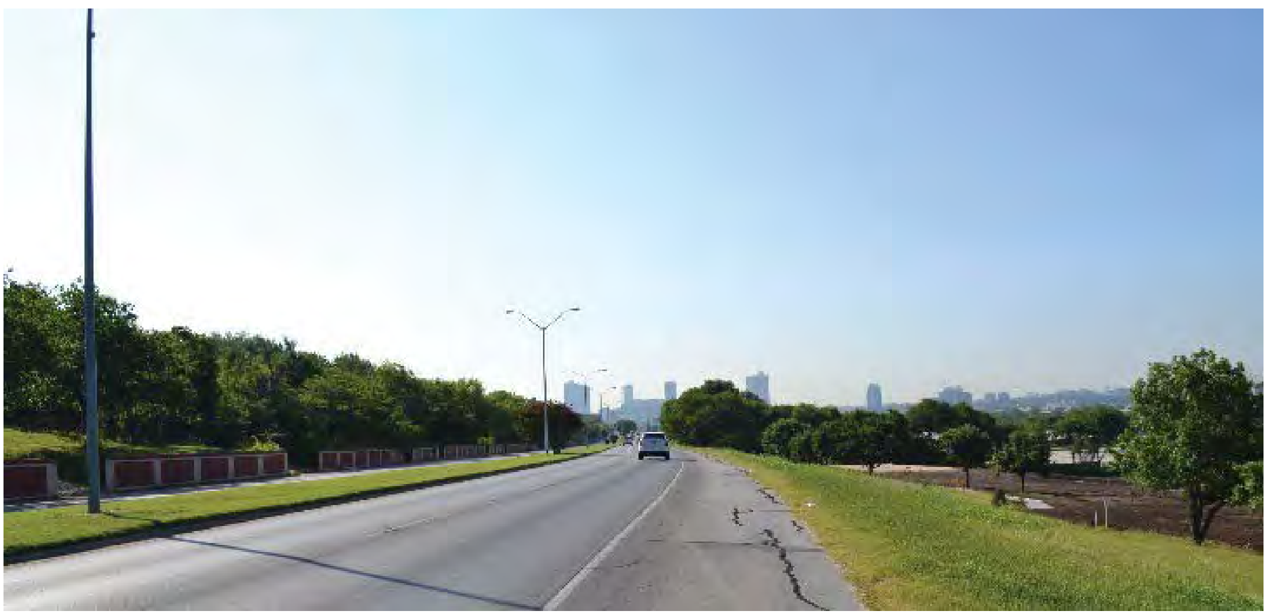


Figure 9. East Perspective Near SH 199 and 21st Street Intersection and Rockwood Golf Course
Source: Freese and Nichols, Inc., 2016

Figure 10. Typical Zone 4 Commercial Frontage Near SH 199 and University Drive Intersection
Source: Freese and Nichols, Inc., 2016

1.4.2 Current Zoning
Current zoning for this zone is primarily single-family uses adjacent to and within neighborhoods near SH 199. Concentrated areas of commercial zoning are located throughout Character Zone 4. Industrial designations are located along the south side of SH 199 near University Drive and continue toward the West Fork of the Trinity River (see Exhibit 3).

1.4.3 Strongest Identity Points
Currently under renovation, Ben Hogan Learning Center and Rockwood Golf Course possess the strongest identity points for Character Zone 4.

1.5 CHARACTER ZONE 5

1.5.1 Existing Land Use Character
Character Zone 5 is primarily made up of existing commercial and industrial land uses with a few parcels of park land associated with the Trinity River and public land (see Exhibit 2). The commercial and industrial properties house single-story buildings, most of which are metal structures. A majority of these parcels are very large and include warehousing. They have large loading docks and wide parking lots to cater to trucks moving in and out of the site. Small commercial use parcel sizes are located near White Settlement Road. The design of these businesses is auto-oriented with parking lots in the front and undesirable walking conditions for pedestrians. More recent multi-family uses are located near the far southeast end of Character Zone 5. Areas closer to downtown Fort Worth include urban forms with buildings near the street

edge; the sidewalks are wide and offer both street trees and lighting. Character Zone 5 includes the planned Panther Island redevelopment. Figures 11 through 13 are current representative photos of Character Zone 4.

Figure 11. Typical Industrial Frontage Near SH 199 and West Fork of the Trinity River Bridge

Source: Freese and Nichols, Inc., 2017

Figure 12. Typical Industrial Frontage Near SH 199 and West Fork of the Trinity River Bridge
Source: Freese and Nichols, Inc., 2017

Figure 13. Typical Commercial and Residential Frontage Near SH 199 and Belknap Street Intersection
Source: Freese and Nichols, Inc., 2017

1.5.2 Current Zoning

Current zoning for this zone primarily includes mixed-use associated with the future Panther Island project. In addition, industrial zoning is designated in portions of Character Zone 5 (see Exhibit 3).

1.5.3 Strongest Identity Points

The future Panther Island redevelopment plans would hold the strongest identity for the future of Character Zone 5. Currently, the Trinity River, Tarrant County College Trinity River Campus, and townhomes near Peach Street have the strongest existing identity in Zone 5.

2.0 EXHIBITS

1. Existing Character Zones Map
2. Existing Land Use Map
3. Current Zoning Map

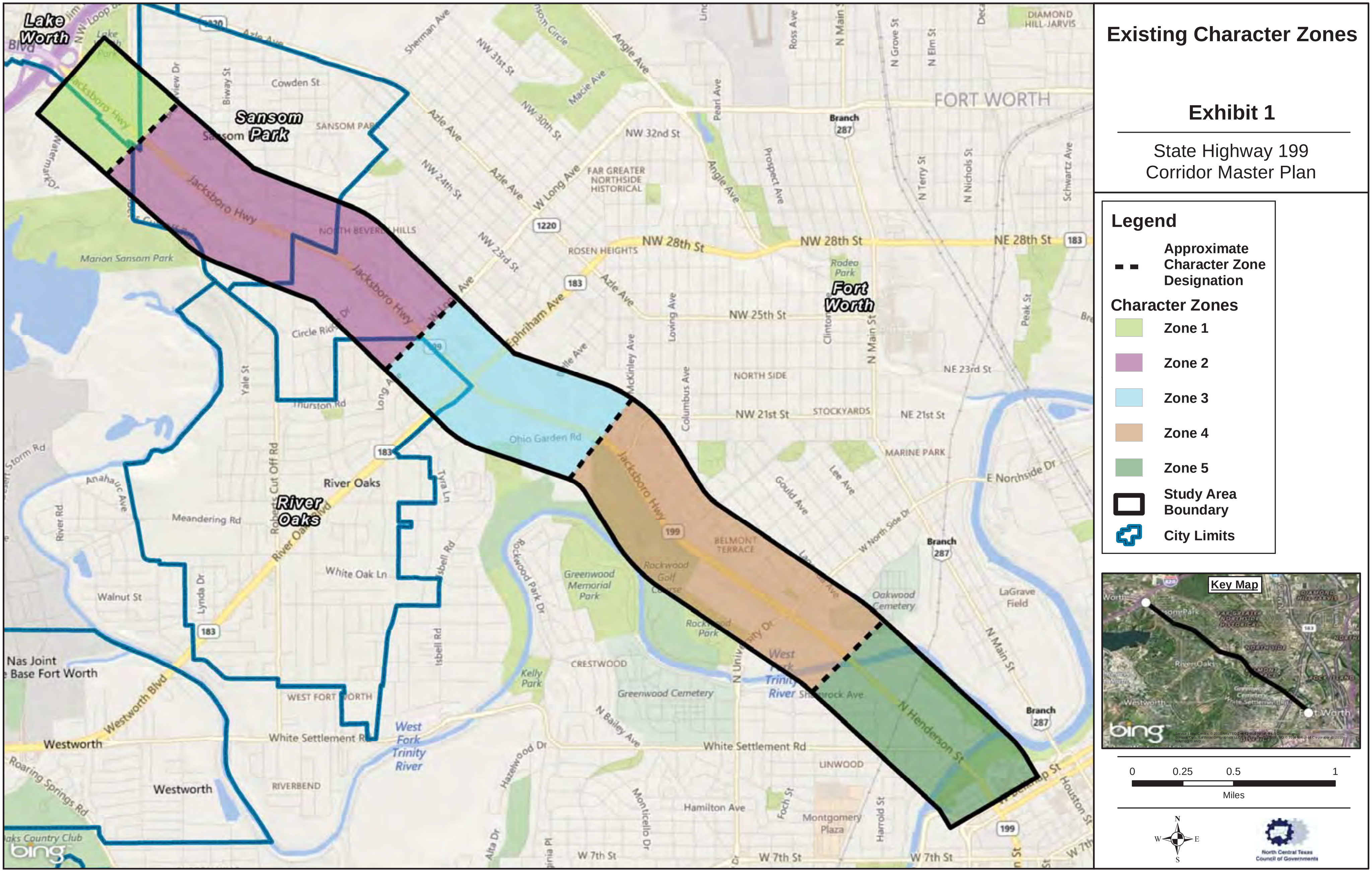
Exhibit 1

Existing Character Zone Map

Existing Character Zones

Exhibit 1

State Highway 199
Corridor Master Plan



Date: 9/15/2016

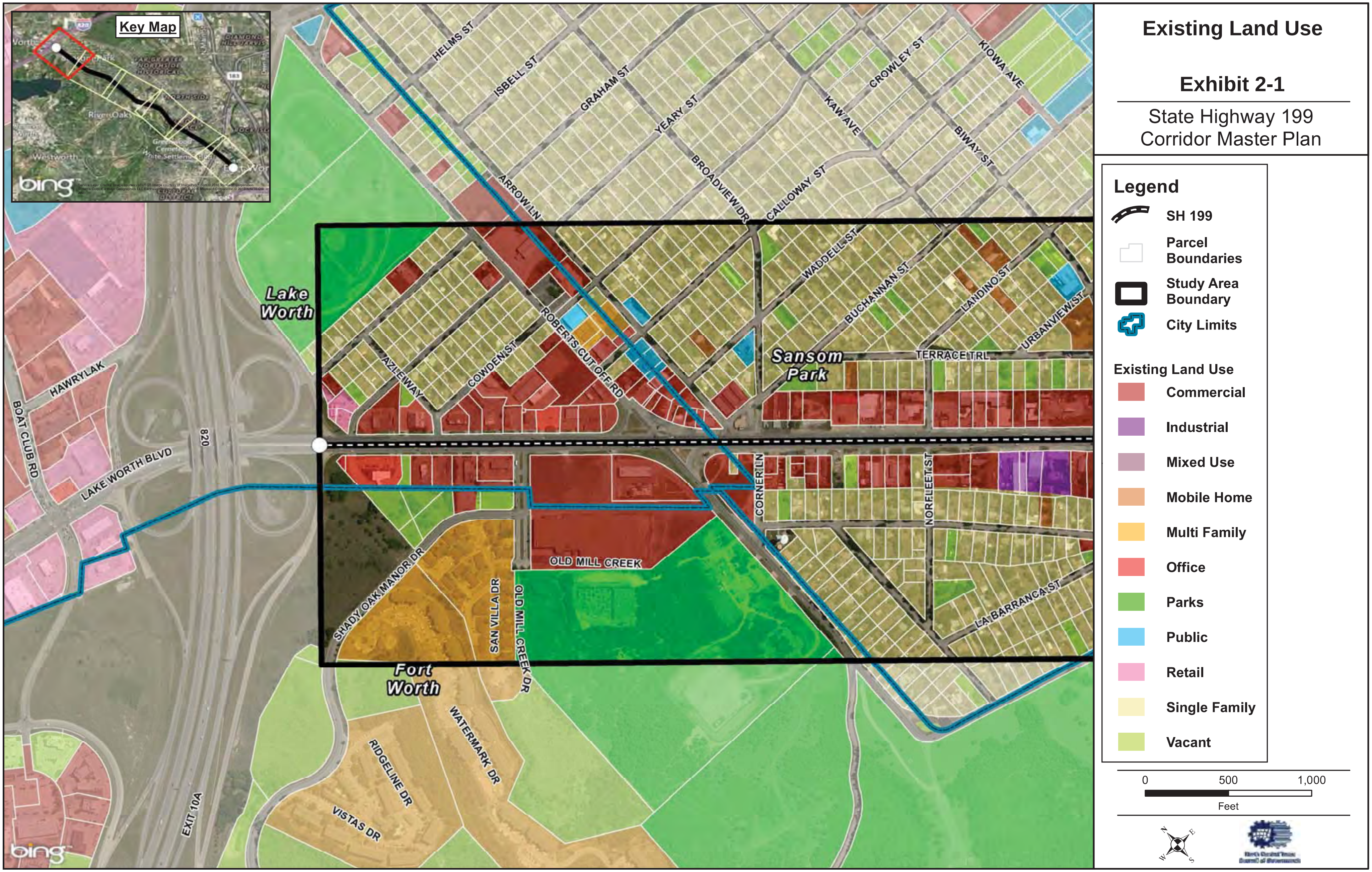
Exhibit 2

Existing Land Use Map

Existing Land Use

Exhibit 2-1

State Highway 199
Corridor Master Plan

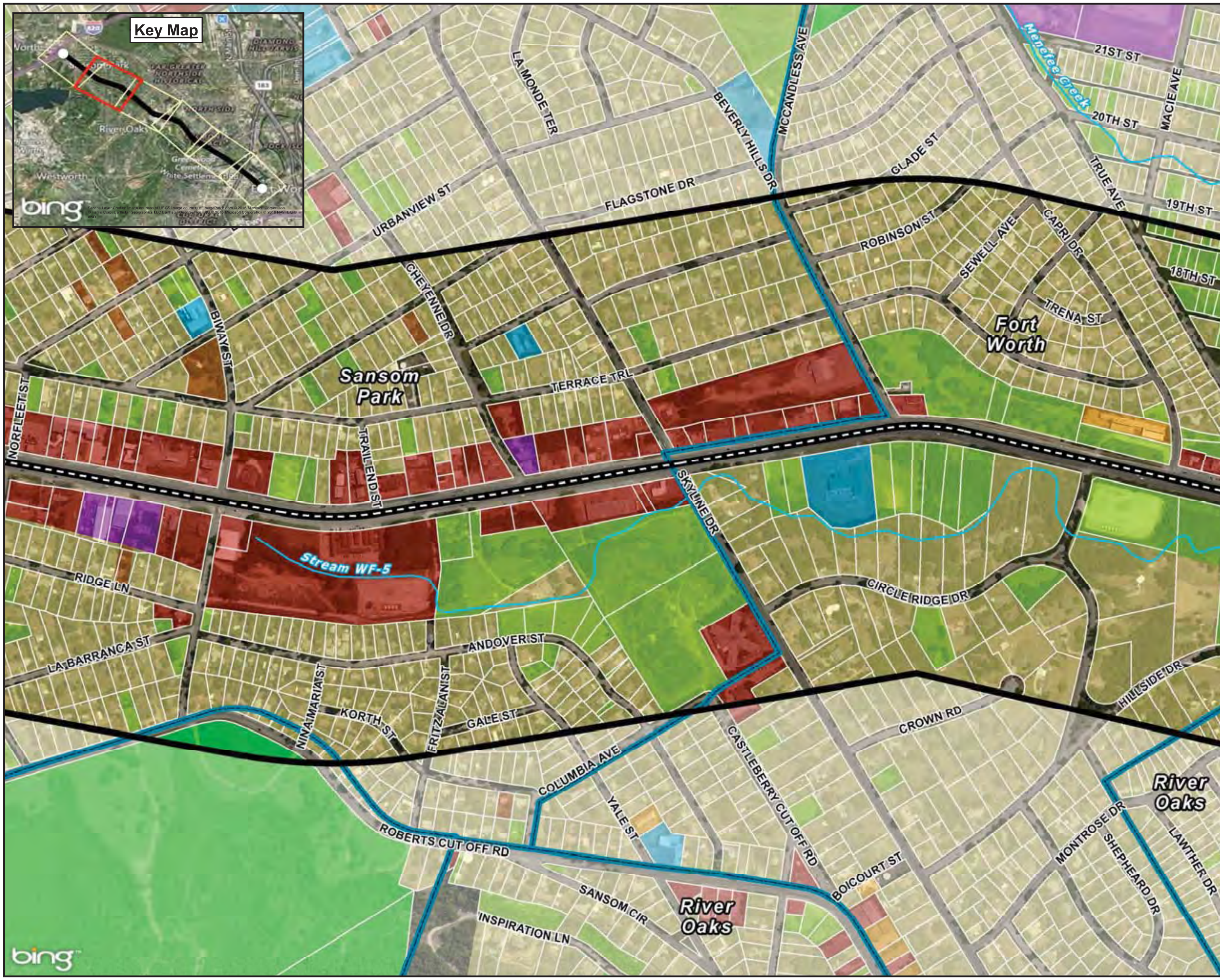


Parcel Data Source: Tarrant Appraisal District Parcels 2015 Land Use Data Source: NCTCOG 2010 Land Use Date: 8/08/2016

Existing Land Use

Exhibit 2-2

State Highway 199
Corridor Master Plan



Legend

- SH 199
- Parcel Boundaries
- Study Area Boundary
- City Limits

Existing Land Use

- Commercial
- Industrial
- Mixed Use
- Mobile Home
- Multi Family
- Office
- Parks
- Public
- Retail
- Single Family
- Vacant

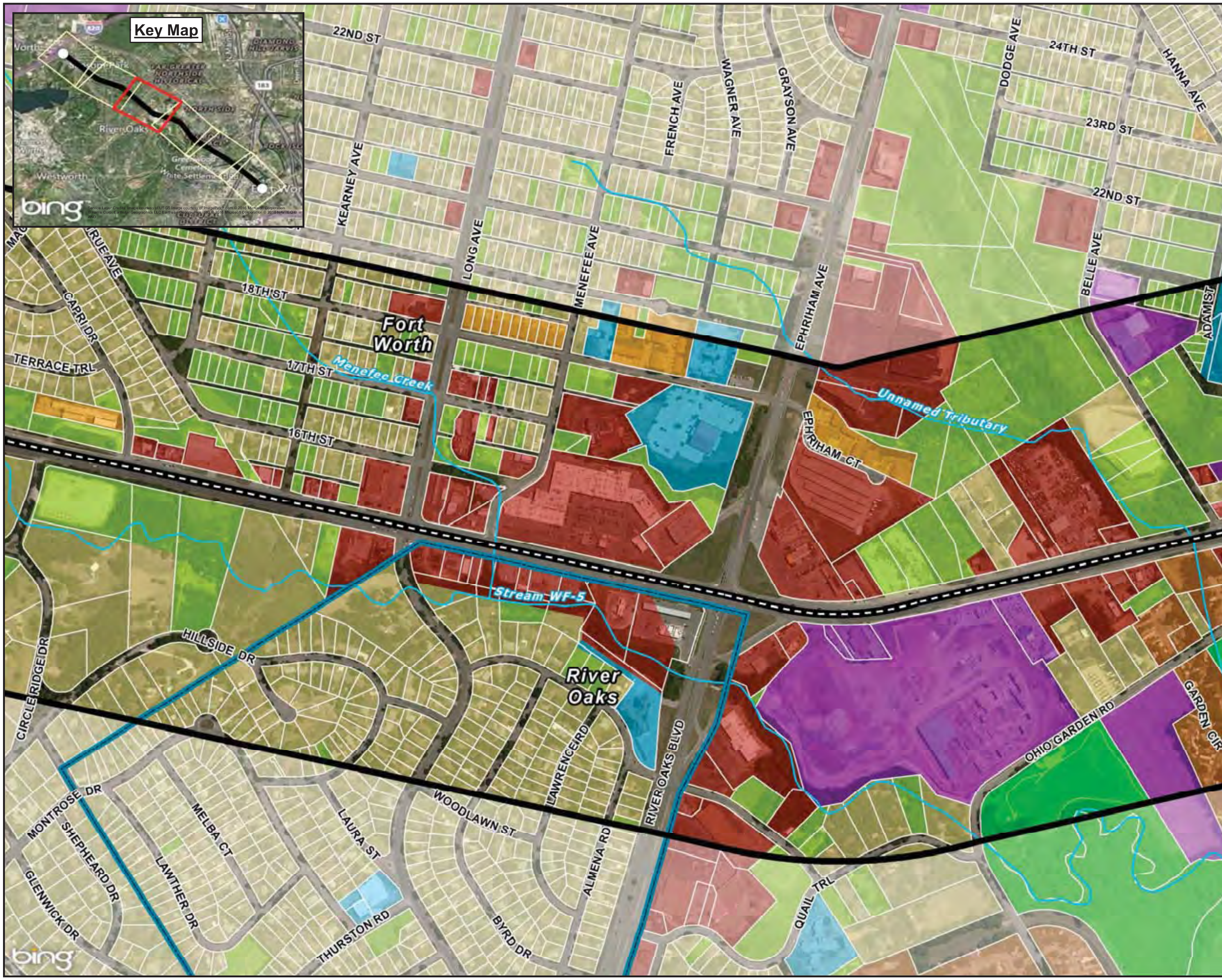
0 500 1,000
Feet

Parcel Data Source: Tarrant Appraisal District Parcels 2015 Land Use Data Source: NCTCOG 2010 Land Use Date: 8/08/2016

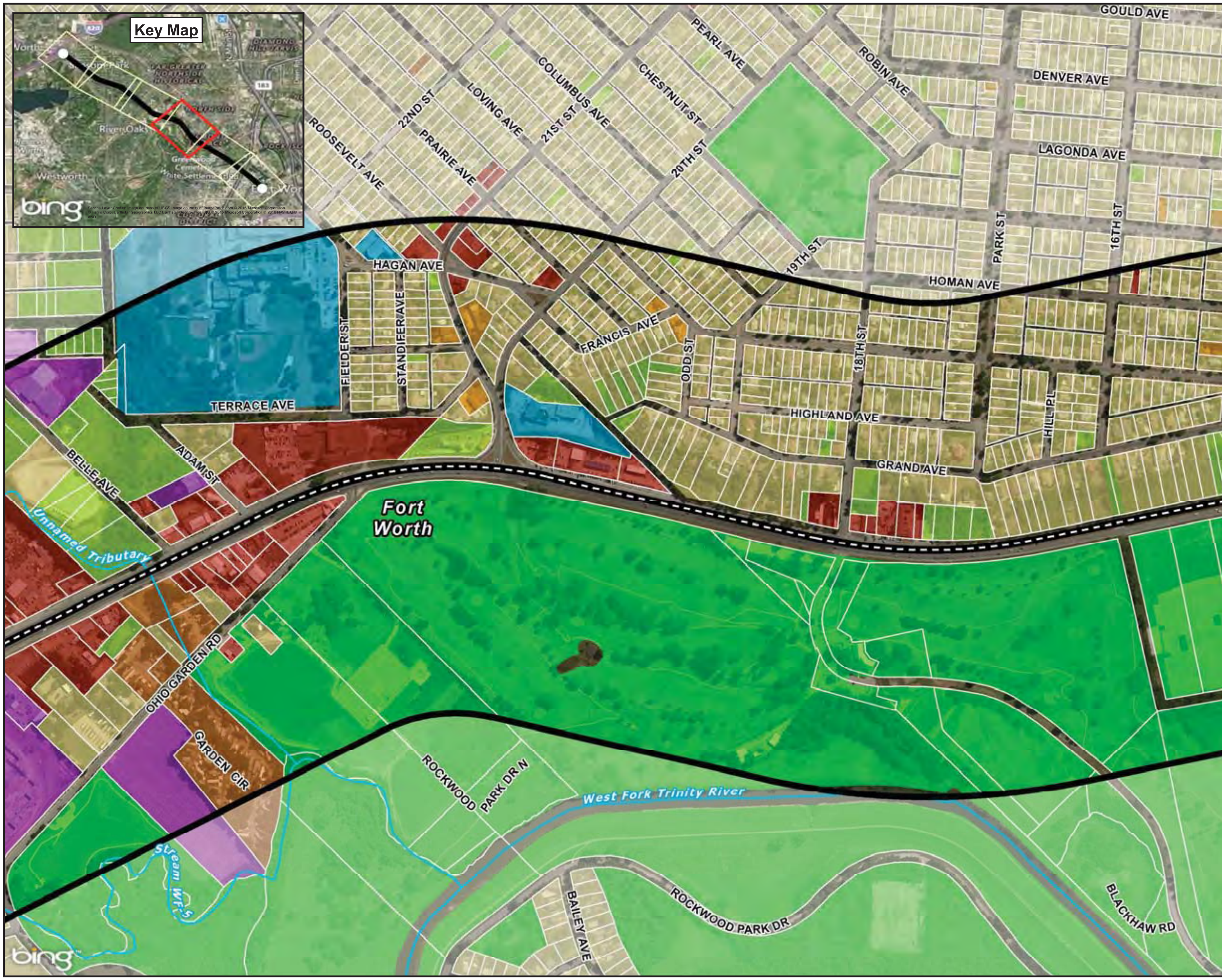
Existing Land Use

Exhibit 2-3

State Highway 199
Corridor Master Plan



Parcel Data Source: Tarrant Appraisal District Parcels 2015 Land Use Data Source: NCTCOG 2010 Land Use Date: 8/08/2016



Existing Land Use

Exhibit 2-4

State Highway 199
Corridor Master Plan

Legend

- SH 199
- Parcel Boundaries
- Study Area Boundary
- City Limits

Existing Land Use

- Commercial
- Industrial
- Mixed Use
- Mobile Home
- Multi Family
- Office
- Parks
- Public
- Retail
- Single Family
- Vacant

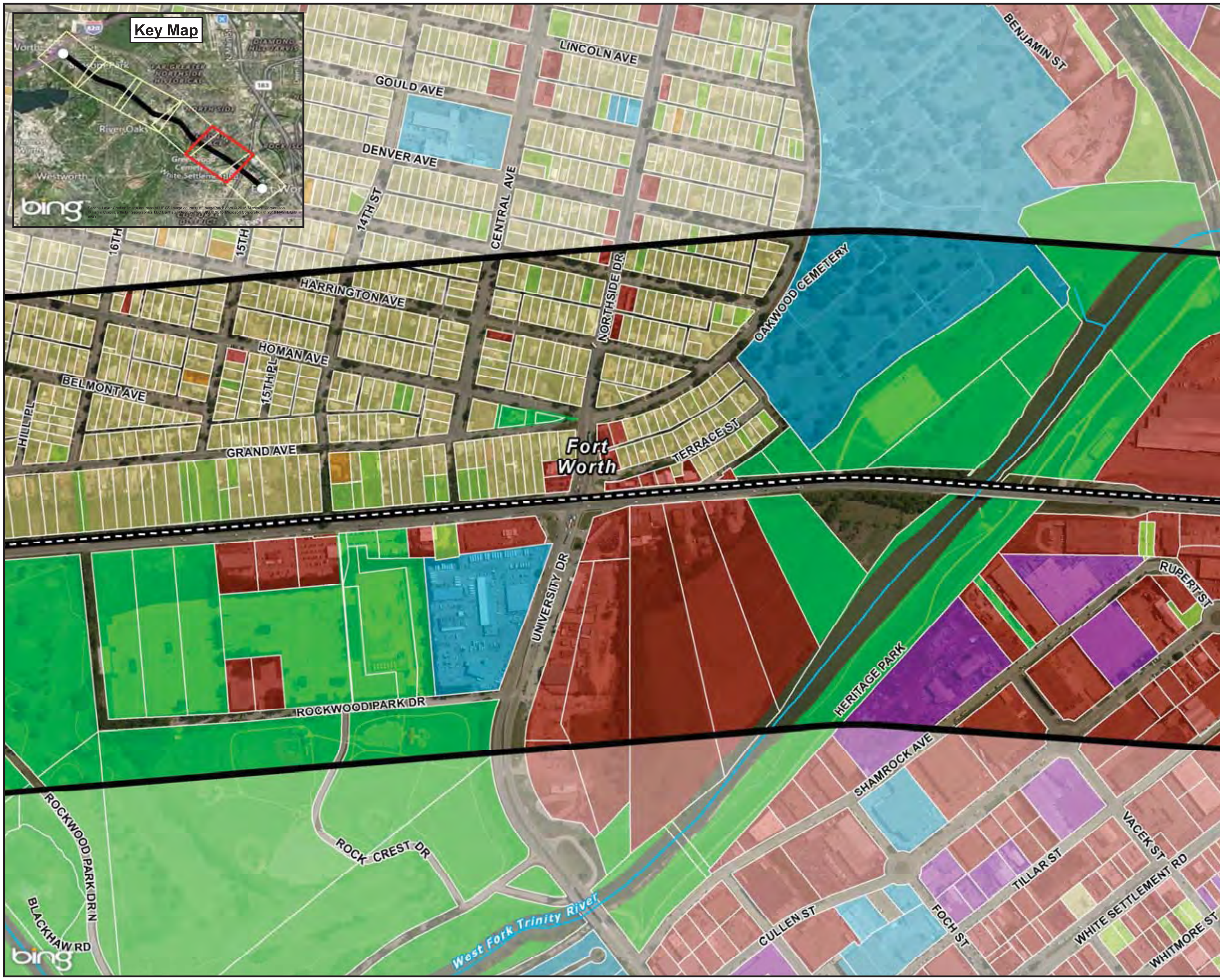
0 500 1,000
Feet

Parcel Data Source: Tarrant Appraisal District Parcels 2015 Land Use Data Source: NCTCOG 2010 Land Use Date: 8/08/2016

Existing Land Use

Exhibit 2-5

State Highway 199
Corridor Master Plan



Legend

- SH 199
- Parcel Boundaries
- Study Area Boundary
- City Limits

Existing Land Use

- Commercial
- Industrial
- Mixed Use
- Mobile Home
- Multi Family
- Office
- Parks
- Public
- Retail
- Single Family
- Vacant

0 500 1,000
Feet

Parcel Data Source: Tarrant Appraisal District Parcels 2015 Land Use Data Source: NCTCOG 2010 Land Use Date: 8/08/2016

Existing Land Use

Exhibit 2-6

State Highway 199 Corridor Master Plan

Legend

- SH 199
- Parcel Boundaries
- Study Area Boundary
- City Limits

Existing Land Use

- Commercial
- Industrial
- Mixed Use
- Mobile Home
- Multi Family
- Office
- Parks
- Public
- Retail
- Single Family
- Vacant

0 500 1,000
Feet

Parcel Data Source: Tarrant Appraisal District Parcels 2015 Land Use Data Source: NCTCOG 2010 Land Use Date: 8/08/2016

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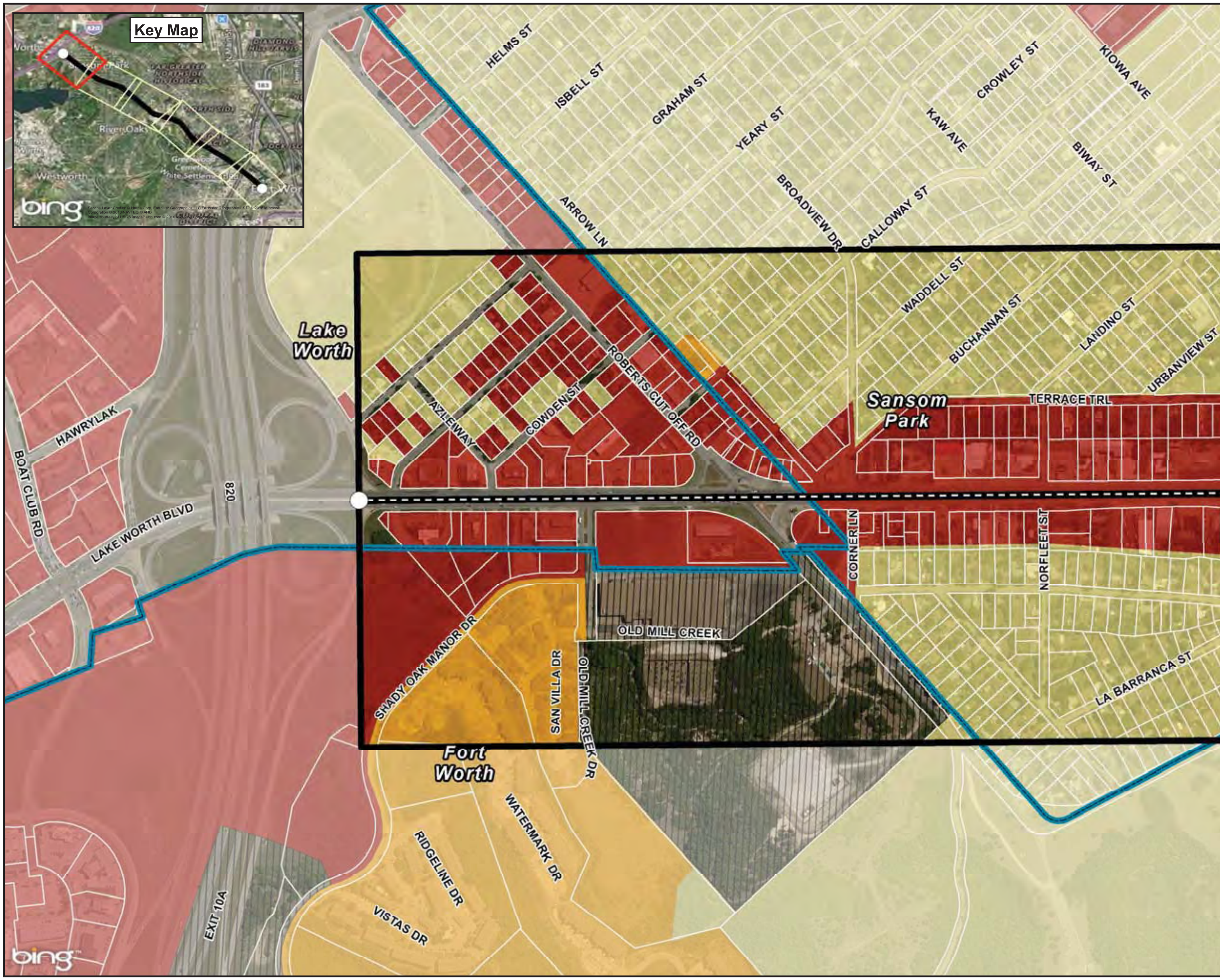
Exhibit 3

Current Zoning Map

Current Zoning

Exhibit 3-1

State Highway 199
Corridor Master Plan



Legend

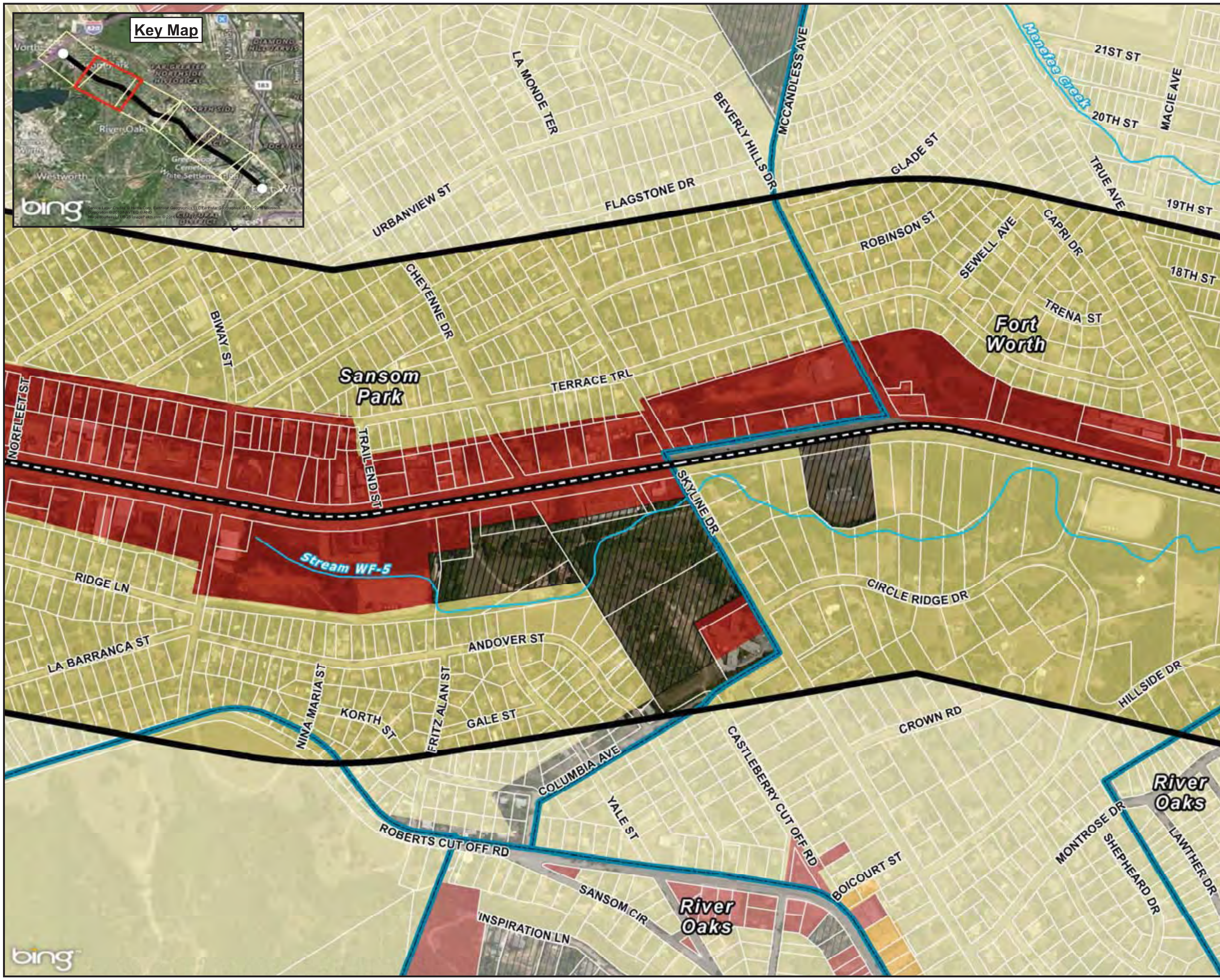
- SH 199
- Parcel Boundaries
- Study Area Boundary
- City Limits

Current Zoning

- Commercial
- Industrial
- Mixed Use
- Mobile Home
- Multi Family
- Parks
- Planned Development
- Public
- Single Family

0 500 1,000
Feet

Parcel Data Source: Tarrant Appraisal District Parcels 2015 Zoning Data Sources: Fort Worth - 2016, Lake Worth - 2013, River Oaks - 2014 , Sansom Park - 2005 Date: 8/08/2016



Current Zoning

Exhibit 3-2

State Highway 199
Corridor Master Plan

Legend

- SH 199
- Parcel Boundaries
- Study Area Boundary
- City Limits

Current Zoning

- Commercial
- Industrial
- Mixed Use
- Mobile Home
- Multi Family
- Parks
- Planned Development
- Public
- Single Family

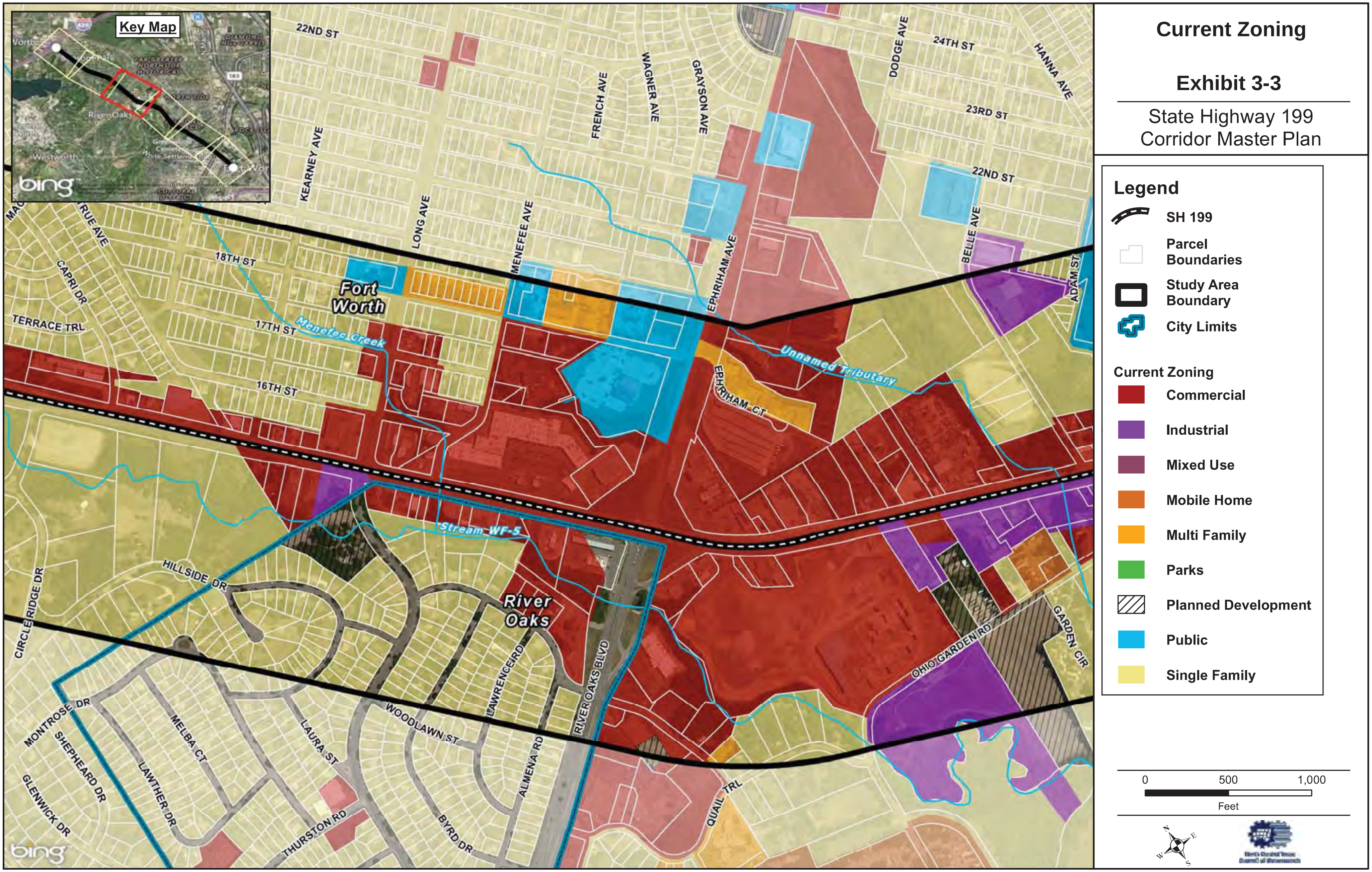
0 500 1,000
Feet

Parcel Data Source: Tarrant Appraisal District Parcels 2015 Zoning Data Sources: Fort Worth - 2016, Lake Worth - 2013, River Oaks - 2014 , Sansom Park - 2005 Date: 8/08/2016

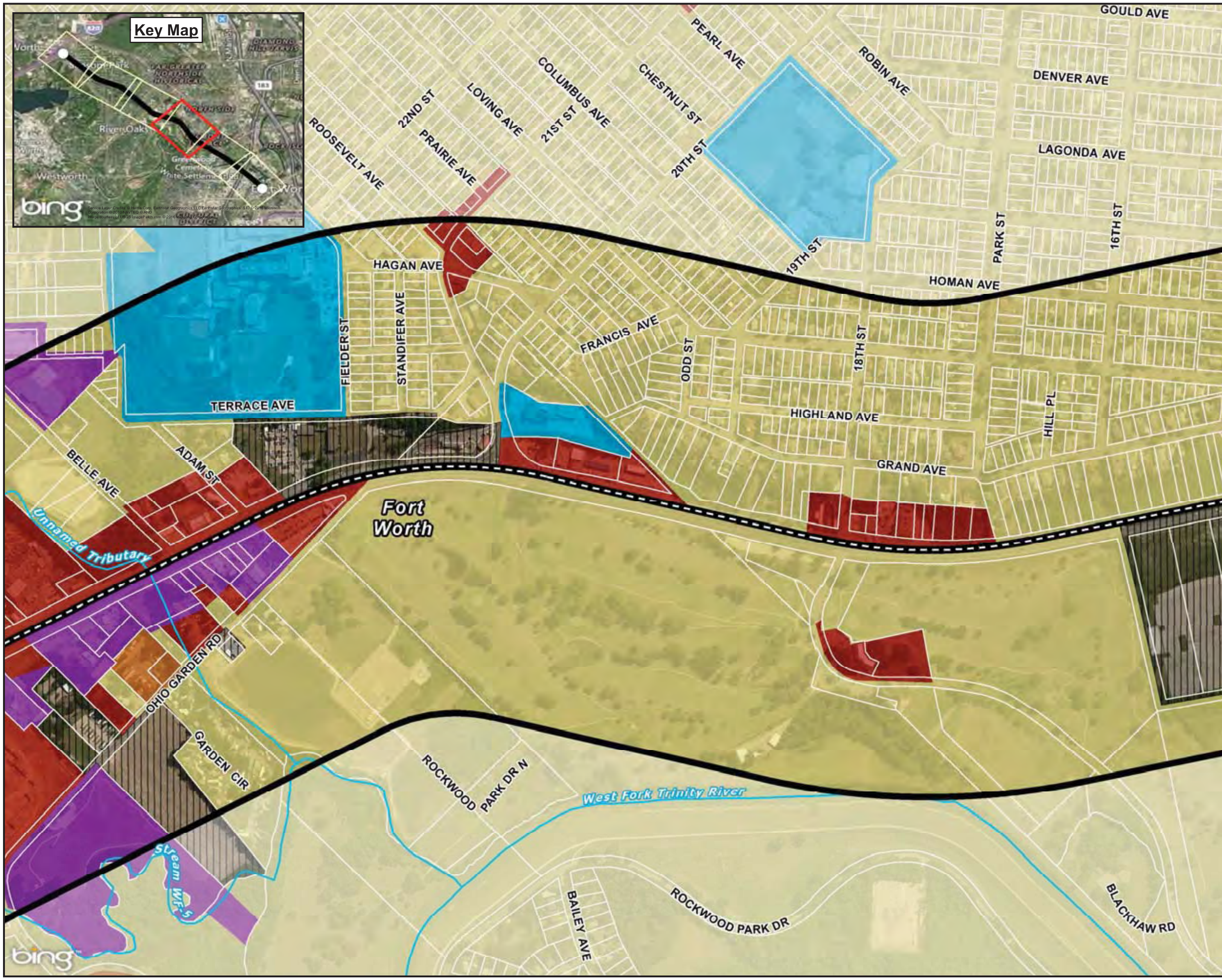
Current Zoning

Exhibit 3-3

State Highway 199
Corridor Master Plan



Parcel Data Source: Tarrant Appraisal District Parcels 2015
Zoning Data Sources: Fort Worth - 2016, Lake Worth - 2013, River Oaks - 2014 , Sansom Park - 2005
Date: 8/08/2016



Current Zoning

Exhibit 3-4

State Highway 199
Corridor Master Plan

Legend

- SH 199
- Parcel Boundaries
- Study Area Boundary
- City Limits

Current Zoning

- Commercial
- Industrial
- Mixed Use
- Mobile Home
- Multi Family
- Parks
- Planned Development
- Public
- Single Family

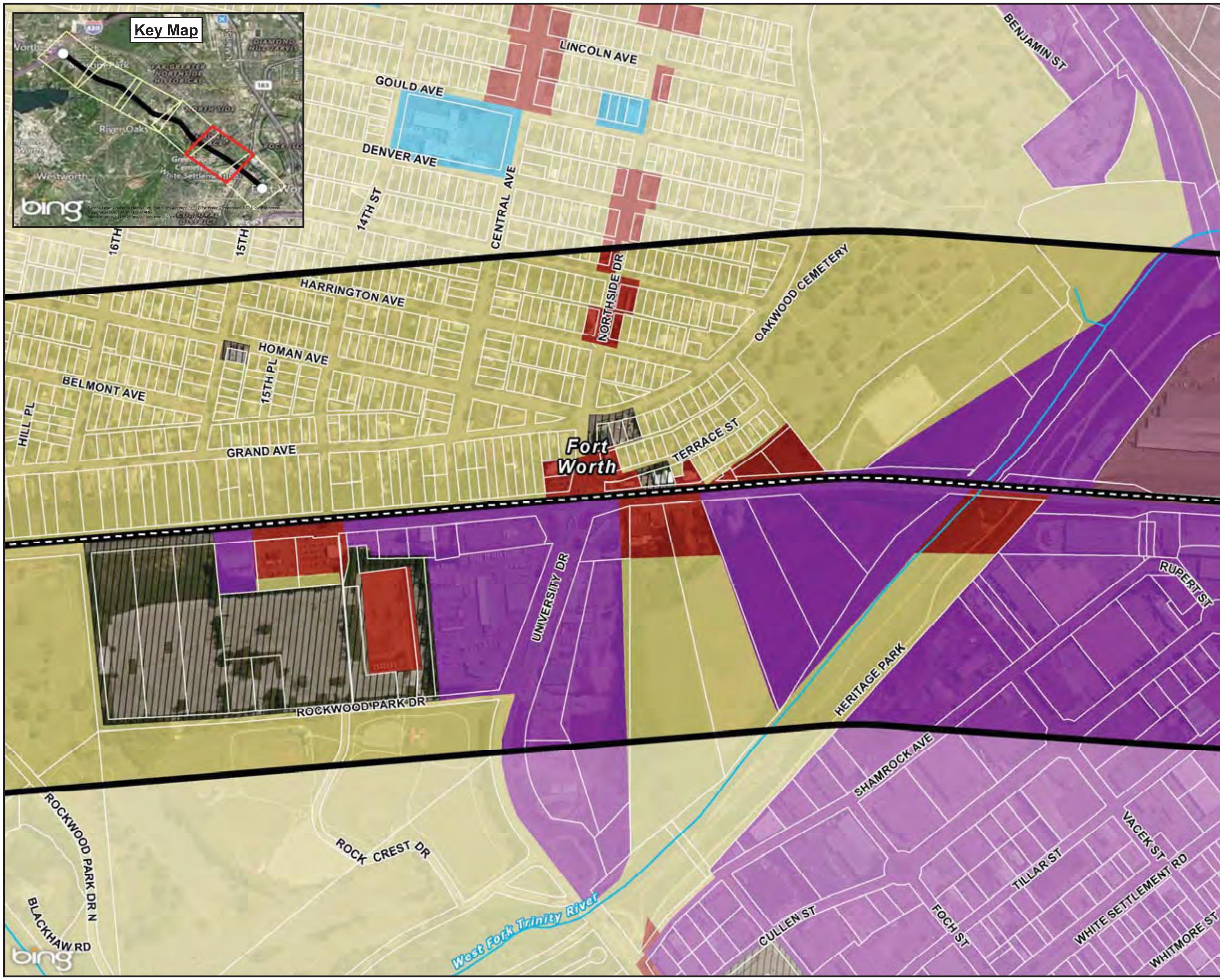
0 500 1,000
Feet

Parcel Data Source: Tarrant Appraisal District Parcels 2015   Zoning Data Sources: Fort Worth - 2016, Lake Worth - 2013, River Oaks - 2014 , Sansom Park - 2005   Date: 8/08/2016

Current Zoning

Exhibit 3-5

State Highway 199
Corridor Master Plan



Legend

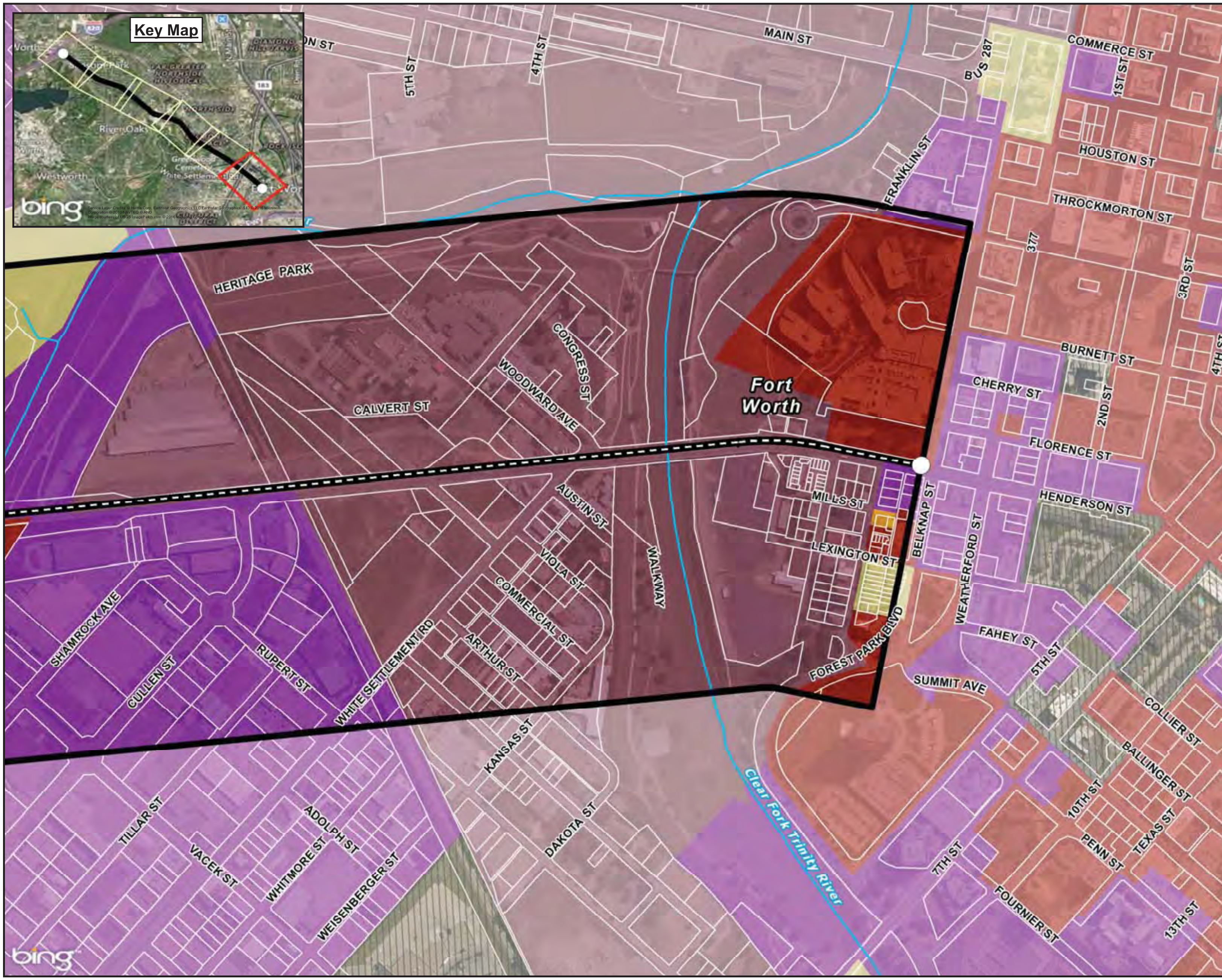
- SH 199
- Parcel Boundaries
- Study Area Boundary
- City Limits

Current Zoning

- Commercial
- Industrial
- Mixed Use
- Mobile Home
- Multi Family
- Parks
- Planned Development
- Public
- Single Family

0 500 1,000
Feet

Parcel Data Source: Tarrant Appraisal District Parcels 2015 Zoning Data Sources: Fort Worth - 2016, Lake Worth - 2013, River Oaks - 2014 , Sansom Park - 2005 Date: 8/08/2016



Current Zoning

Exhibit 3-6

State Highway 199
Corridor Master Plan

Legend

- SH 199
- Parcel Boundaries
- Study Area Boundary
- City Limits

Current Zoning

- Commercial
- Industrial
- Mixed Use
- Mobile Home
- Multi Family
- Parks
- Planned Development
- Public
- Single Family

0 500 1,000
Feet

Parcel Data Source: Tarrant Appraisal District Parcels 2015 Zoning Data Sources: Fort Worth - 2016, Lake Worth - 2013, River Oaks - 2014 , Sansom Park - 2005 Date: 8/08/2016

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Appendix C – Demographics Technical Memorandum

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State Highway 199
Corridor Master Plan

From IH 820 to Belknap Street

Demographics
Technical Memorandum

Submittal Date:
May 15, 2017

Prepared For:
North Central Texas Council of Governments

Prepared By:
Freese and Nichols, Inc.
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Fort Worth, Texas 76109
817-735-7300
Texas Registered Engineering Firm F-2144

FREESE AND NICHOLS

1.0 DEMOGRAPHICS

According to the North Central Texas Council of Governments (NCTCOG), the communities along SH 199 are experiencing the following demographic data:

Table 1. Current Study Area Demographics

City/Town	2010 Population	2016 Population	Percent Change	Daytime Population (2014)	Median Household Income (2014)	Percent of People in Poverty (2014)
Fort Worth	741,206	806,380	8.79%	880,002	$52,273	19.4%
Sansom Park	4,686	4,670	-0.34%	3,366	$38,368	30.5%
River Oaks	7,427	7,290	-1.84%	5,569	$42,622	14.5%
Lake Worth	4,584	4,710	2.75%	6,345	$47,004	7.1%
Lakeside	1,307	1,690	29.30%	838	$78,750	3.6%
Azle	10,947	11,410	4.23%	10,370	$54,171	11.8%
Springtown	2,658	2,670	0.45%	3,374	$52,500	15.8%

Source: 2016 Population Estimates, North Central Texas Council of Governments (NCTCOG), April 2016

Most of the communities along the study corridor have experienced an increase in population from 2010 to 2016. Lakeside had the largest percent change at 29.30 percent, and other cities also experienced high percentages of growth such as Fort Worth at 8.79 percent and Azle at 4.23 percent. Sansom Park and River Oaks both experienced slight decreases in population changes at -0.34 percent and -1.84 percent, respectively. The municipalities of Fort Worth, Lake Worth and Springtown all have higher daytime populations, a trend that supports SH 199 as an important commuter corridor.

The Town of Lakeside has the highest median income at $78,750. According to the US Census, the 2015 median household income for Tarrant County was $58,711. The municipalities of Fort Worth, Azle and Springtown are slightly below the Tarrant County average. The municipalities of Sansom Park, River Oaks, and Lake Worth are further below the average. Sansom Park has the highest percentage of people in poverty at 30.5 percent. The Tarrant County average is 13.1 percent for persons in poverty according to the US Census Bureau data for 2015.

2.0 ATTACHMENTS

A. 2016 Population Estimates - NCTCOG
B. 2015 United States Census Bureau Data

Attachment A

2016 Population Estimates - NCTCOG

2016 Population Estimates

North Central Texas Council of Governments | April 2016

Population Estimates

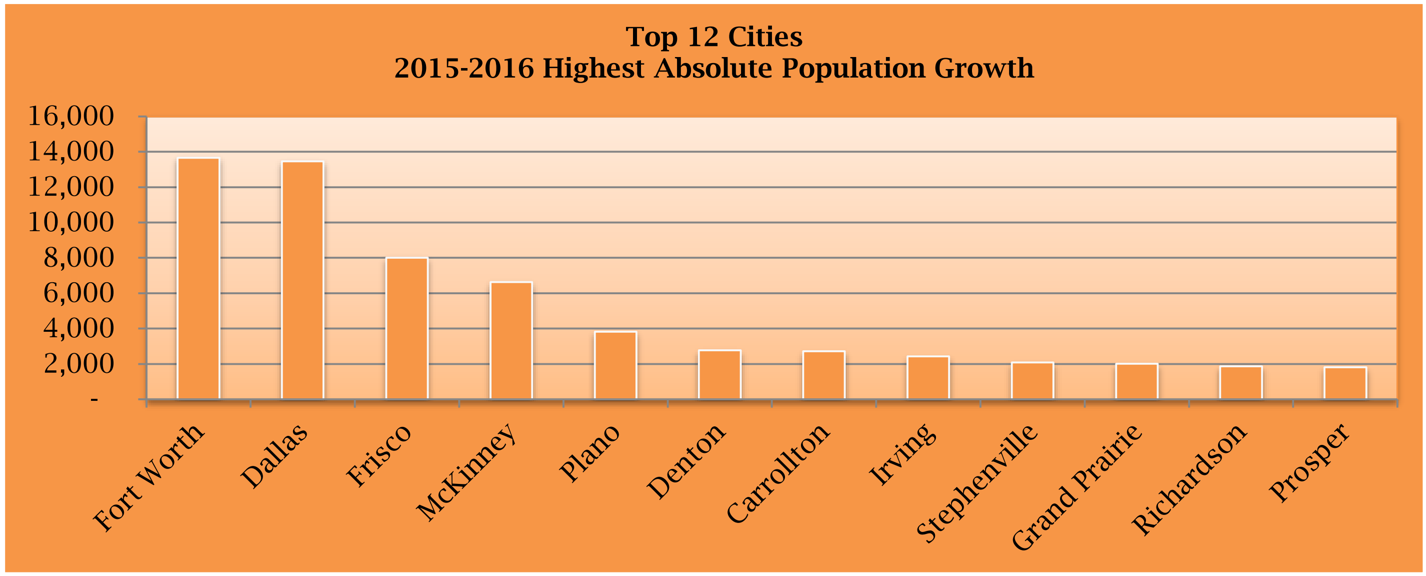
Population estimates are based on current housing inventories for cities in the NCTCOG Region with populations of 1,000 or more. Cities are listed in the county that contains the majority of the city's population.

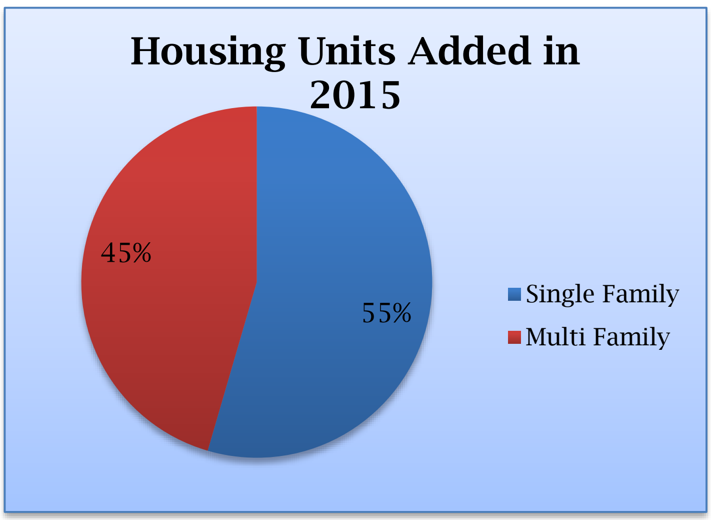
Executive Summary

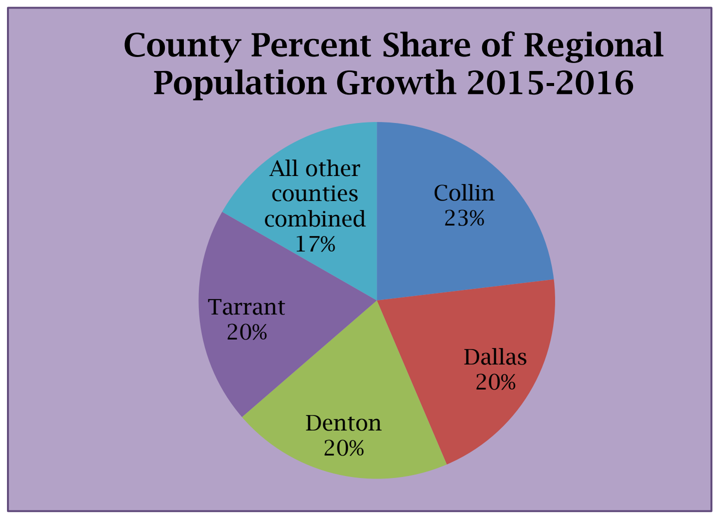
The estimated January 1, 2016 population for the NCTCOG Region is 7,058,290. From January 1, 2015 to January 1, 2016, the region experienced growth of 116,580. Forty-one cities experienced estimated population growth of 3% or more. The populations of Lakeside, Northlake, McLendon-Chisholm, and Celina each grew by more than 15% from 2015 to 2016. The city of Fort Worth had the highest absolute growth with 13,660 and Dallas had the second highest with 13,460. Collin, Dallas, Denton, and Tarrant Counties added more than 20,000 residents each.

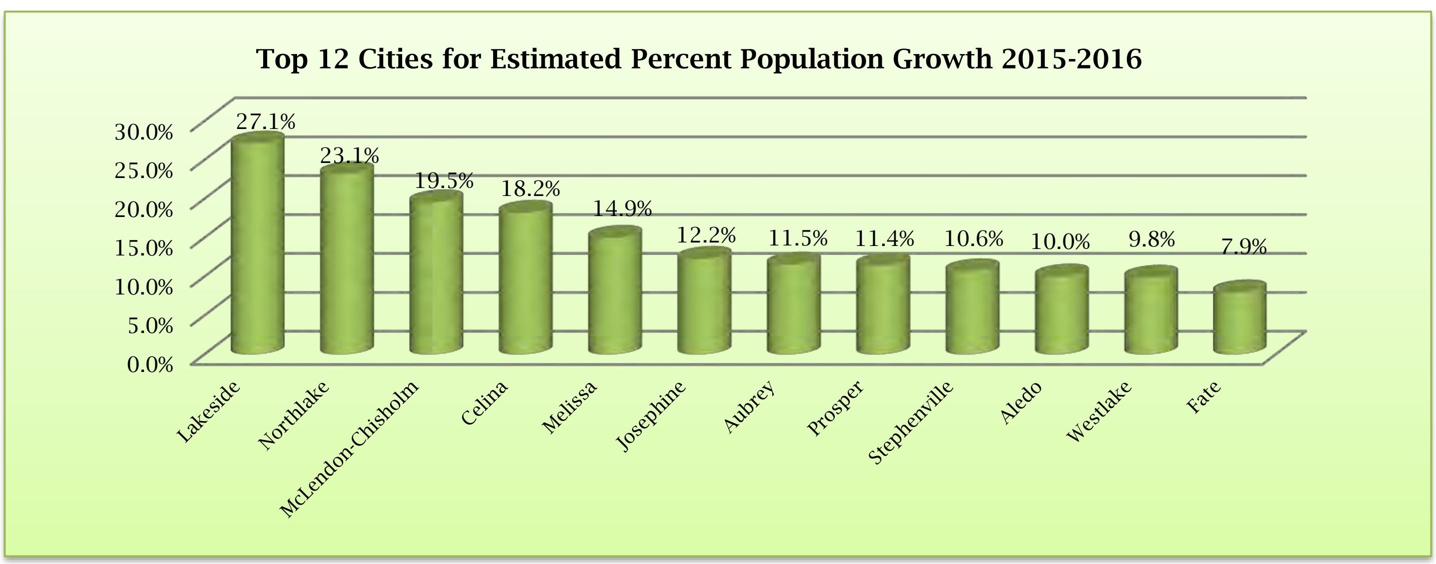
There were more new residential housing units added to the NCTCOG region last year than any other year since 2008. The continued resurgence in the housing market added 39,500 new housing units to the region last year; of this total, there were 21,500 single-family completions and 18,000 multi-family units added. Once again, the city of Dallas built more multi-family units than any other city with 7,500 new units, accounting for 40% of all multi-family units added to the region. Over 40,000 multi-family units are still under construction throughout the region, as the local economy will continue to have the biggest impact on future housing construction.

Highlights


Top 12 Cities
2015-2016 Highest Absolute Population Growth
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
-
Fort Worth
Dallas
Frisco
McKinney
Plano
Denton
Carrollton
Irving
Stephenville
Grand Prairie
Richardson
Prosper


Housing Units Added in 2015
45%
55%
Single Family
Multi Family


County Percent Share of Regional Population Growth 2015-2016
All other counties combined 17%
Collin 23%
Tarrant 20%
Dallas 20%
Denton 20%


Top 12 Cities for Estimated Percent Population Growth 2015-2016
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
27.1%
23.1%
19.5%
18.2%
14.9%
12.2%
11.5%
11.4%
10.6%
10.0%
9.8%
7.9%
Lakeside
Northlake
McLendon-Chisholm
Celina
Melissa
Josephine
Aubrey
Prosper
Stephenville
Aledo
Westlake
Fate

2016 Population Estimates, City by County

	2010 Census Population April 1	2015 Estimate January 1	2016 Estimate January 1	2015-2016 Absolute Change	2015-2016 Percent Change
Collin County	**782,341**	**870,560**	**897,510**	**26,950**	**3.1%**
Allen	84,246	91,390	91,800	410	0.4%
Anna	8,249	10,980	11,320	340	3.1%
Celina	6,028	7,320	8,650	1,330	18.2%
Fairview	7,248	8,420	8,490	70	0.8%
Farmersville	3,301	3,310	3,330	20	0.6%
Frisco	116,989	145,510	153,520	8,010	5.5%
Josephine	812	980	1,100	120	12.2%
Lavon	2,219	2,970	3,080	110	3.7%
Lowry Crossing	1,711	1,710	1,710	0	0.0%
Lucas	5,166	6,400	6,680	280	4.4%
McKinney	131,117	154,840	161,470	6,630	4.3%
Melissa	4,695	6,890	7,920	1,030	14.9%
Murphy	17,708	19,170	19,330	160	0.8%
Parker	3,811	4,200	4,290	90	2.1%
Plano	259,841	271,140	274,960	3,820	1.4%
Princeton	6,807	7,910	8,480	570	7.2%
Prosper	9,423	15,970	17,790	1,820	11.4%
St. Paul	1,066	1,080	1,080	0	0.0%
Wylie	41,427	45,000	46,100	1,100	2.4%
Split Cities Adjustment	31,426	20,030	16,900		
Remainder of County	39,051	45,340	49,510	4,170	9.2%

	2010 Census Population April 1	2015 Estimate January 1	2016 Estimate January 1	2015-2016 Absolute Change	2015-2016 Percent Change
Dallas County	**2,368,139**	**2,454,880**	**2,478,740**	**23,860**	**1.0%**
Addison	13,056	15,530	15,530	0	0.0%
Balch Springs	23,728	24,280	24,310	30	0.1%
Cedar Hill	45,028	46,350	47,090	740	1.6%
Cockrell Hill	4,193	4,160	4,160	0	0.0%
Coppell	38,659	39,880	40,310	430	1.1%
Dallas	1,197,816	1,244,270	1,257,730	13,460	1.1%
DeSoto	49,047	50,970	51,770	800	1.6%
Duncanville	38,524	39,220	39,230	10	0.0%
Farmers Branch	28,616	30,350	30,480	130	0.4%
Garland	226,876	232,960	234,300	1,340	0.6%
Glenn Heights	11,278	11,440	11,680	240	2.1%
Grand Prairie	175,396	182,610	184,620	2,010	1.1%
Highland Park	8,564	8,440	8,430	(10)	(0.1%)
Hutchins	5,338	5,350	5,350	0	0.0%
Irving	216,290	228,610	231,040	2,430	1.1%

	2010 Census Population April 1	2015 Estimate January 1	2016 Estimate January 1	2015-2016 Absolute Change	2015-2016 Percent Change
Lancaster	36,361	37,360	37,550	190	0.5%
Mesquite	139,824	142,230	142,950	720	0.5%
Richardson	99,223	102,430	104,300	1,870	1.8%
Rowlett	56,199	56,910	57,220	310	0.5%
Sachse	20,329	22,460	23,130	670	3.0%
Seagoville	14,835	15,390	15,580	190	1.2%
Sunnyvale	5,130	5,420	5,410	(10)	(0.2%)
University Park	23,068	22,840	22,720	(120)	(0.5%)
Wilmer	3,682	4,170	4,190	20	0.5%
Split Cities Adjustment	(120,096)	(126,150)	(127,770)		
Remainder of County	7,175	7,400	7,430	30	0.4%

	2010 Census Population April 1	2015 Estimate January 1	2016 Estimate January 1	2015-2016 Absolute Change	2015-2016 Percent Change
Denton County	**662,614**	**734,970**	**758,370**	**23,400**	**3.2%**
Argyle	3,282	3,690	3,820	130	3.5%
Aubrey	2,595	2,780	3,100	320	11.5%
Bartonville	1,469	1,640	1,650	10	0.6%
Carrollton	119,097	125,250	127,980	2,730	2.2%
Copper Canyon	1,334	1,370	1,380	10	0.7%
Corinth	19,935	20,620	20,740	120	0.6%
Cross Roads	1,563	1,840	1,910	70	3.8%
Denton	113,383	123,200	125,980	2,780	2.3%
Double Oak	2,867	2,930	2,950	20	0.7%
Flower Mound	64,669	66,820	68,050	1,230	1.8%
Hickory Creek	3,247	3,620	3,730	110	3.0%
Highland Village	15,056	15,290	15,370	80	0.5%
Justin	3,246	3,260	3,370	110	3.4%
Krugerville	1,662	1,670	1,680	10	0.6%
Krum	4,157	4,790	4,880	90	1.9%
Lake Dallas	7,105	7,240	7,250	10	0.1%
Lewisville	95,290	99,480	100,400	920	0.9%
Little Elm	25,898	33,710	34,400	690	2.0%
Northlake	1,724	2,160	2,660	500	23.1%
Oak Point	2,786	3,180	3,180	0	0.0%
Pilot Point	3,856	3,890	4,050	160	4.1%
Ponder	1,395	1,520	1,560	40	2.6%
Providence	4,786	5,750	6,170	420	7.3%
Roanoke	5,962	7,200	7,650	450	6.3%
Sanger	6,916	7,590	7,820	230	3.0%
Shady Shores	2,612	2,640	2,660	20	0.8%
The Colony	36,328	39,310	39,810	500	1.3%
Trophy Club	8,024	10,690	10,860	170	1.6%
Split Cities Adjustment	35,292	51,140	55,320		
Remainder of County	67,078	80,700	87,990	7,290	9.0%

	2010 Census Population April 1	2015 Estimate January 1	2016 Estimate January 1	2015-2016 Absolute Change	2015-2016 Percent Change
Ellis County	**149,610**	**161,290**	**164,960**	**3,670**	**2.3%**
Ennis	18,513	18,600	18,590	(10)	(0.1%)
Ferris	2,436	2,450	2,450	0	0.0%
Italy	1,863	1,860	1,850	(10)	(0.5%)
Midlothian	18,037	21,610	22,620	1,010	4.7%
Oak Leaf	1,298	1,340	1,350	10	0.7%
Ovilla	3,492	3,690	3,820	130	3.5%
Palmer	2,000	2,020	2,030	10	0.5%
Red Oak	10,769	11,980	12,260	280	2.3%
Waxahachie	29,621	32,670	33,480	810	2.5%
Split Cities Adjustment	3,154	3,210	3,250		
Remainder of County	58,427	61,860	63,260	1,400	2.3%

	2010 Census Population April 1	2015 Estimate January 1	2016 Estimate January 1	2015-2016 Absolute Change	2015-2016 Percent Change
Erath County	**37,890**	**41,460**	**43,540**	**2,080**	**5.0%**
Dublin	3,654	3,770	3,770	0	0.0%
Stephenville	17,123	19,560	21,640	2,080	10.6%
Remainder of County	17,113	18,130	18,130	0	0.0%

	2010 Census Population April 1	2015 Estimate January 1	2016 Estimate January 1	2015-2016 Absolute Change	2015-2016 Percent Change
Hood County	**51,182**	**56,020**	**56,240**	**220**	**0.4%**
DeCordova	2,683	2,730	2,750	20	0.7%
Granbury	7,978	8,940	9,140	200	2.2%
Split Cities Adjustment	(18)	(20)	(20)		
Remainder of County	40,539	44,370	44,370	0	0.0%

	2010 Census Population April 1	2015 Estimate January 1	2016 Estimate January 1	2015-2016 Absolute Change	2015-2016 Percent Change
Hunt County	**86,129**	**89,090**	**89,310**	**220**	**0.2%**
Caddo Mills	1,338	1,430	1,460	30	2.1%
Commerce	8,078	8,130	8,090	(40)	(0.5%)
Greenville	25,557	26,180	26,300	120	0.5%
Quinlan	1,394	1,400	1,410	10	0.7%
West Tawakoni*	1,576	1,600	1,600	0	0.0%
Wolfe City	1,412	1,420	1,420	0	0.0%
Split Cities Adjustment	356	760	1,090		
Remainder of County	46,418	48,170	47,940	(230)	(0.5%)

*city did not participate in data call

	2010 Census Population April 1	2015 Estimate January 1	2016 Estimate January 1	2015-2016 Absolute Change	2015-2016 Percent Change
Johnson County	**150,934**	**158,350**	**161,120**	**2,770**	**1.7%**
Alvarado	3,785	4,080	4,170	90	2.2%
Burleson	36,690	41,280	42,560	1,280	3.1%
Cleburne	29,337	29,170	29,140	(30)	(0.1%)
Godley	1,009	1,030	1,040	10	1.0%
Grandview	1,561	1,580	1,610	30	1.9%
Joshua	5,910	6,090	6,350	260	4.3%
Keene	6,106	6,160	6,230	70	1.1%
Venus	2,960	3,110	3,220	110	3.5%
Split Cities Adjustment	(5,608)	(6,260)	(6,290)		
Remainder of County	69,184	72,110	73,090	980	1.4%

	2010 Census Population April 1	2015 Estimate January 1	2016 Estimate January 1	2015-2016 Absolute Change	2015-2016 Percent Change
Kaufman County	**103,350**	**109,300**	**113,530**	**4,230**	**3.9%**
Combine	1,942	1,960	1,970	10	0.5%
Crandall	2,858	3,050	3,100	50	1.6%
Forney	14,661	17,480	17,990	510	2.9%
Kaufman	6,703	6,610	6,620	10	0.2%
Kemp	1,154	1,170	1,170	0	0.0%
Mabank	3,035	3,140	3,180	40	1.3%
Talty	1,535	2,010	2,120	110	5.5%
Terrell	15,816	16,220	16,320	100	0.6%
Split Cities Adjustment	(1,281)	(1,310)	(1,310)		
Remainder of County	56,927	58,970	62,370	3,400	5.8%

	2010 Census Population April 1	2015 Estimate January 1	2016 Estimate January 1	2015-2016 Absolute Change	2015-2016 Percent Change
Navarro County	**47,735**	**48,810**	**48,900**	**90**	**0.2%**
Corsicana	23,770	23,850	23,840	(10)	0.0%
Kerens	1,573	1,620	1,700	80	4.9%
Remainder of County	22,392	23,340	23,360	20	0.1%

	2010 Census Population April 1	2015 Estimate January 1	2016 Estimate January 1	2015-2016 Absolute Change	2015-2016 Percent Change
Palo Pinto County	**28,111**	**28,710**	**28,660**	**(50)**	**(0.2%)**
Mineral Wells	16,788	16,790	16,740	(50)	(0.3%)
Split Cities Adjustment	(2,144)	(2,140)	(2,140)		
Remainder of County	13,467	14,060	14,060	0	0.0%

	2010 Census Population April 1	2015 Estimate January 1	2016 Estimate January 1	2015-2016 Absolute Change	2015-2016 Percent Change
Parker County	**116,927**	**124,630**	**127,980**	**3,350**	**2.7%**
Aledo	2,716	3,210	3,530	320	10.0%
Annetta	1,288	2,670	2,720	50	1.9%
Hudson Oaks	1,662	1,940	2,050	110	5.7%
Reno	2,494	2,560	2,590	30	1.2%
Springtown	2,658	2,660	2,670	10	0.4%
Weatherford	25,250	26,600	27,080	480	1.8%
Willow Park	3,982	4,590	4,640	50	1.1%
Split Cities Adjustment	4,339	4,360	4,380		
Remainder of County	72,538	76,040	78,320	2,280	3.0%

	2010 Census Population April 1	2015 Estimate January 1	2016 Estimate January 1	2015-2016 Absolute Change	2015-2016 Percent Change
Rockwall County	**78,337**	**87,290**	**89,660**	**2,370**	**2.7%**
Fate	6,434	9,700	10,470	770	7.9%
Heath	6,921	7,430	7,690	260	3.5%
McLendon-Chisholm	1,373	2,050	2,450	400	19.5%
Rockwall	37,490	40,620	41,370	750	1.8%
Royse City	9,349	10,220	11,010	790	7.7%
Split Cities Adjustment	6,775	6,220	5,620		
Remainder of County	9,995	11,050	11,050	0	0.0%

	2010 Census Population April 1	2015 Estimate January 1	2016 Estimate January 1	2015-2016 Absolute Change	2015-2016 Percent Change
Somervell County	**8,490**	**8,950**	**9,230**	**280**	**3.1%**
Glen Rose	2,444	2,480	2,490	10	0.4%
Remainder of County	6,046	6,470	6,740	270	4.2%

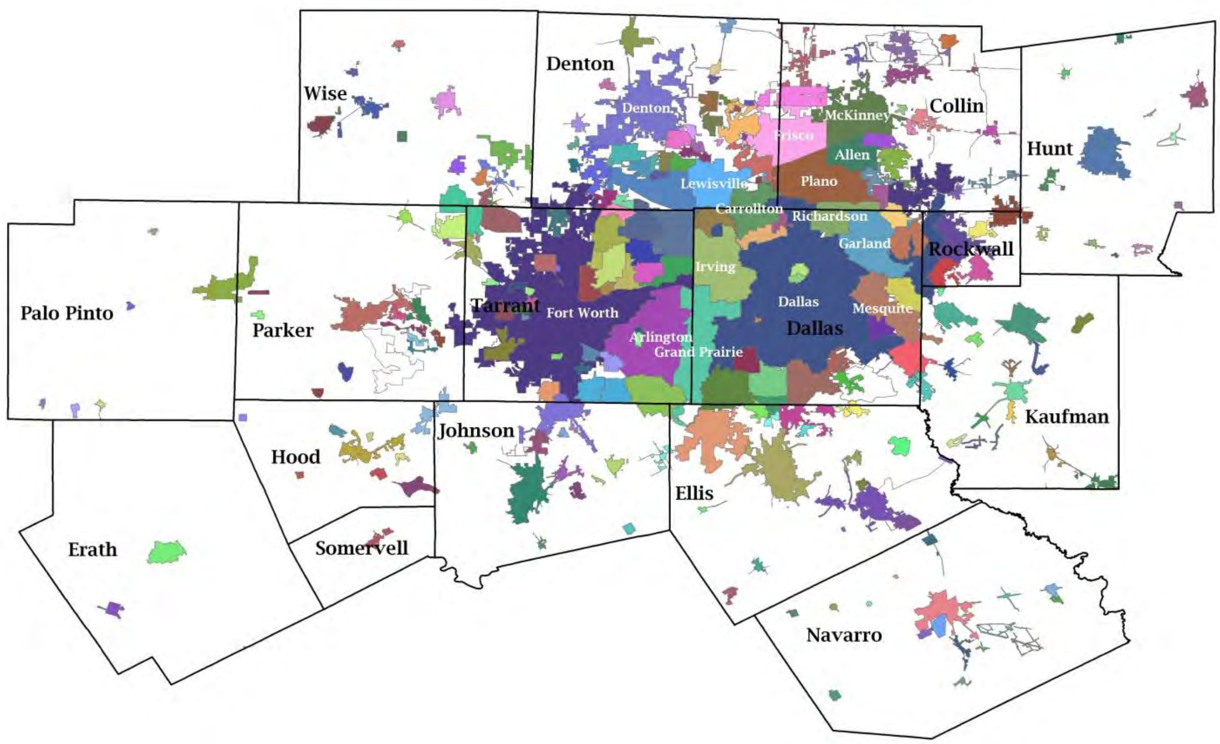
	2010 Census Population April 1	2015 Estimate January 1	2016 Estimate January 1	2015-2016 Absolute Change	2015-2016 Percent Change
Tarrant County	**1,809,034**	**1,905,430**	**1,928,300**	**22,870**	**1.2%**
Arlington	365,438	379,370	380,740	1,370	0.4%
Azle	10,947	11,140	11,410	270	2.4%
Bedford	46,979	48,060	48,550	490	1.0%
Benbrook	21,234	21,910	22,040	130	0.6%
Blue Mound	2,394	2,390	2,390	0	0.0%
Colleyville	22,807	23,760	24,230	470	2.0%
Crowley	12,838	14,130	14,140	10	0.1%
Dalworthington Gardens	2,259	2,320	2,320	0	0.0%
Edgecliff Village	2,776	2,870	3,030	160	5.6%
Euless	51,277	54,050	54,250	200	0.4%
Everman	6,108	6,110	6,110	0	0.0%
Forest Hill	12,355	12,380	12,390	10	0.1%

	2010 Census Population April 1	2015 Estimate January 1	2016 Estimate January 1	2015-2016 Absolute Change	2015-2016 Percent Change
Fort Worth	741,206	792,720	806,380	13,660	1.7%
Grapevine	46,334	48,520	48,920	400	0.8%
Haltom City	42,409	42,640	42,730	90	0.2%
Haslet	1,517	1,660	1,710	50	3.0%
Hurst	37,337	38,340	38,380	40	0.1%
Keller	39,627	42,890	44,050	1,160	2.7%
Kennedale	6,763	7,130	7,290	160	2.2%
Lake Worth	4,584	4,680	4,710	30	0.6%
Lakeside	1,307	1,330	1,690	360	27.1%
Mansfield	56,368	60,400	61,460	1,060	1.8%
North Richland Hills	63,343	66,300	66,530	230	0.3%
Pantego	2,394	2,460	2,460	0	0.0%
Pelican Bay	1,547	1,580	1,620	40	2.5%
Richland Hills	7,801	7,920	7,920	0	0.0%
River Oaks	7,427	7,270	7,290	20	0.3%
Saginaw	19,806	20,480	20,740	260	1.3%
Sansom Park	4,686	4,680	4,670	(10)	(0.2%)
Southlake	26,575	27,710	28,290	580	2.1%
Watauga	23,497	23,590	23,600	10	0.0%
Westlake	992	1,120	1,230	110	9.8%
Westworth Village	2,472	2,570	2,570	0	0.0%
White Settlement	16,116	16,740	16,830	90	0.5%
Split Cities Adjustment	43,504	45,850	46,650		
Remainder of County	54,010	58,360	58,980	620	1.1%

	2010 Census Population April 1	2015 Estimate January 1	2016 Estimate January 1	2015-2016 Absolute Change	2015-2016 Percent Change
Wise County	**59,127**	**61,970**	**62,240**	**270**	**0.4%**
Alvord	1,334	1,340	1,340	0	0.0%
Aurora	1,220	1,340	1,380	40	3.0%
Boyd	1,207	1,300	1,350	50	3.8%
Bridgeport	5,976	6,080	6,100	20	0.3%
Chico	1,002	1,010	1,010	0	0.0%
Decatur	6,042	6,390	6,490	100	1.6%
New Fairview	1,258	1,410	1,440	30	2.1%
Newark	1,005	1,010	1,020	10	1.0%
Rhome	1,522	1,590	1,590	0	0.0%
Runaway Bay	1,286	1,340	1,360	20	1.5%
Split Cities Adjustment	3,597	3,600	3,600		
Remainder of County	33,678	35,560	35,560	0	0.0%

Population by Planning Area				
	2000 U.S. Census April 1	2010 U.S. Census April 1	2015 NCTCOG Estimate January 1	2016 NCTCOG Estimate January 1
*12 County MPA**	5,197,317	6,417,724	6,813,780	6,927,960
16 County NCTCOG Region	5,309,277	6,539,950	6,941,710	7,058,290
*The 12 county Dallas-Fort Worth Metropolitan Planning Area (MPA) consists of the following counties:				
	Collin	Ellis	Johnson	Rockwall
	Dallas	Hood	Kaufman	Tarrant
	Denton	Hunt	Parker	Wise
Source: U.S. Census Bureau, NCTCOG Population Estimates				

NCTCOG Region Map



2016 Population Estimates Methodology

NCTCOG uses the housing unit method for estimating current year population:

> Estimated household population = estimated units * estimated occupancy rate * estimated persons per occupied unit

The calculation is performed for each unit type (single family, multi-family, other). The results are summed along with an estimate of group quarters population to arrive at a total population estimate. Every year, cities are asked to provide information about changes in housing stock and population in group quarters housing. Cities are also given the opportunity to review figures prior to release. The 2015 estimates for some cities have been revised. The estimates included herein supersede any prior estimates.

Split Cities

County totals are adjusted for cities that have boundaries in more than one county. Cities that extend outside the NCTCOG Region show the city total. However, the portion of the city's population that is not in the region is not included in the county or regional totals. Cities whose boundaries extend into the NCTCOG Region, but do not have a majority of their population within the region are not included in the city listings.

Split Cities			
Azle	Flower Mound	Mabank	Rowlett
Burleson	Fort Worth	Mansfield	Royse City
Carrollton	Frisco	Mesquite	Sachse
Cedar Hill	Garland	Mineral Wells	Seagoville
Celina	Glenn Heights	Newark	Seven Points
Combine	Grand Prairie	Ovilla	Southlake
Coppell	Grapevine	Plano	Springtown
Cresson	Haslet	Prosper	Trophy Club
Crowley	Heath	Reno	Venus
Dallas	Josephine	Richardson	Westlake
Ferris	Lewisville	Roanoke	Wylie

Disclaimer: There are a variety of ways to estimate population for a given area. The North Central Texas Council of Governments has selected a method that accommodates the varying level of data available for local communities while focusing on consistency. These estimates were developed for regional planning activities and have not been evaluated for other uses. They are provided as an informational item and are likely to differ from estimates produced by others, including the cities and counties listed herein. The North Central Texas Council of Governments makes no warranty, express or implied, including warranties of merchantability and fitness for a particular purpose. Responsibility for the use of these data lies solely with the user.

Research and Information Services (RIS)

NCTCOG's Research & Information Services Department performs demographic research on such topics as population, housing, and employment estimates; population, household, and employment projections; development monitoring; major employers; land use; and tabulation/analysis of Census data. The department also provides support to a regional Geographic Information System (GIS) and NCTCOG's internal computer network. Custom maps, data analysis, and special products are provided on a fee-for-service basis. To learn more about RIS at NCTCOG, visit: www.nctcog.org/ris.

North Central Texas Council of Governments

The North Central Texas Council of Governments (NCTCOG) is a voluntary association of, by, and for local governments, and was established to assist local governments in planning for common needs, cooperating for mutual benefit, and coordinating for sound regional development. NCTCOG's purpose is to strengthen both the individual and collective power of local governments and to help them recognize regional opportunities, eliminate unnecessary duplication, and make joint decisions. To learn more about NCTCOG, please visit www.nctcog.org.

North Central Texas COG
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Arlington, TX 76005
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Attachment B

2015 US Census Bureau Data

U.S. Census Quick Facts

QuickFacts

Tarrant County, Texas

QuickFacts provides statistics for all states and counties, and for cities and towns with a ***population of 5,000 or more***.

ALL TOPICS	TARRANT COUNTY, TEXAS
People	
Population	
Population estimates, July 1, 2016, (V2016)	2,016,872
Population estimates, July 1, 2015, (V2015)	1,982,498
Population estimates base, April 1, 2010, (V2016)	1,810,614
Population estimates base, April 1, 2010, (V2015)	1,809,531
Population, percent change - April 1, 2010 (estimates base) to July 1, 2016, (V2016)	11.4%
Population, percent change - April 1, 2010 (estimates base) to July 1, 2015, (V2015)	9.6%
Population, Census, April 1, 2010	1,809,034
Age and Sex	
Persons under 5 years, percent, July 1, 2015, (V2015)	7.2%
Persons under 5 years, percent, April 1, 2010	7.9%
Persons under 18 years, percent, July 1, 2015, (V2015)	26.9%
Persons under 18 years, percent, April 1, 2010	28.0%
Persons 65 years and over, percent, July 1, 2015, (V2015)	10.5%
Persons 65 years and over, percent, April 1, 2010	8.9%
Female persons, percent, July 1, 2015, (V2015)	51.1%
Female persons, percent, April 1, 2010	51.0%
Race and Hispanic Origin	
White alone, percent, July 1, 2015, (V2015) (a)	74.7%
White alone, percent, April 1, 2010 (a)	66.6%
Black or African American alone, percent, July 1, 2015, (V2015) (a)	16.4%
Black or African American alone, percent, April 1, 2010 (a)	14.9%
American Indian and Alaska Native alone, percent, July 1, 2015, (V2015) (a)	0.9%
American Indian and Alaska Native alone, percent, April 1, 2010 (a)	0.7%
Asian alone, percent, July 1, 2015, (V2015) (a)	5.4%
Asian alone, percent, April 1, 2010 (a)	4.7%
Native Hawaiian and Other Pacific Islander alone, percent, July 1, 2015, (V2015) (a)	0.2%
Native Hawaiian and Other Pacific Islander alone, percent, April 1, 2010 (a)	0.2%
Two or More Races, percent, July 1, 2015, (V2015)	2.3%
Two or More Races, percent, April 1, 2010	3.0%
Hispanic or Latino, percent, July 1, 2015, (V2015) (b)	28.2%
Hispanic or Latino, percent, April 1, 2010 (b)	26.7%
White alone, not Hispanic or Latino, percent, July 1, 2015, (V2015)	48.6%
White alone, not Hispanic or Latino, percent, April 1, 2010	51.8%
Population Characteristics	
Veterans, 2011-2015	112,758
Foreign born persons, percent, 2011-2015	15.8%
Housing	
Housing units, July 1, 2015, (V2015)	747,684
Housing units, April 1, 2010	714,803
Owner-occupied housing unit rate, 2011-2015	60.9%
Median value of owner-occupied housing units, 2011-2015	$141,000
Median selected monthly owner costs -with a mortgage, 2011-2015	$1,478
Median selected monthly owner costs -without a mortgage, 2011-2015	$541
Median gross rent, 2011-2015	$913
Building permits, 2015	8,984
Families and Living Arrangements	
Households, 2011-2015	673,737
Persons per household, 2011-2015	2.81
Living in same house 1 year ago, percent of persons age 1 year+, 2011-2015	82.7%
Language other than English spoken at home, percent of persons age 5 years+, 2011-2015	28.0%
Education	
High school graduate or higher, percent of persons age 25 years+, 2011-2015	85.1%
Bachelor's degree or higher, percent of persons age 25 years+, 2011-2015	30.3%
Health	
With a disability, under age 65 years, percent, 2011-2015	7.4%
Persons without health insurance, under age 65 years, percent	⚠ 17.7%
Economy	
In civilian labor force, total, percent of population age 16 years+, 2011-2015	68.6%

In civilian labor force, female, percent of population age 16 years+, 2011-2015	61.3%
Total accommodation and food services sales, 2012 ($1,000) (c)	4,483,569
Total health care and social assistance receipts/revenue, 2012 ($1,000) (c)	11,276,184
Total manufacturers shipments, 2012 ($1,000) (c)	45,771,009
Total merchant wholesaler sales, 2012 ($1,000) (c)	30,173,253
Total retail sales, 2012 ($1,000) (c)	28,908,781
Total retail sales per capita, 2012 (c)	$15,376
Transportation	
Mean travel time to work (minutes), workers age 16 years+, 2011-2015	26.5
Income and Poverty	
Median household income (in 2015 dollars), 2011-2015	$58,711
Per capita income in past 12 months (in 2015 dollars), 2011-2015	$29,058
Persons in poverty, percent	13.1%
Businesses	
Total employer establishments, 2015	40,484
Total employment, 2015	752,869
Total annual payroll, 2015 ($1,000)	36,162,421
Total employment, percent change, 2014-2015	-0.5%
Total nonemployer establishments, 2014	158,872
All firms, 2012	173,389
Men-owned firms, 2012	89,352
Women-owned firms, 2012	66,250
Minority-owned firms, 2012	71,133
Nonminority-owned firms, 2012	96,361
Veteran-owned firms, 2012	16,470
Nonveteran-owned firms, 2012	149,220
Geography	
Population per square mile, 2010	2,094.7
Land area in square miles, 2010	863.61
FIPS Code	48439

This geographic level of poverty and health estimates are not comparable to other geographic levels of these estimates

Some estimates presented here come from sample data, and thus have sampling errors that may render some apparent differences between geographies statistically indistinguishable. Click the Quick Info icon to the left of each row in TABLE view to learn about sampling error.

The vintage year (e.g., V2015) refers to the final year of the series (2010 thru 2015).
Different vintage years of estimates are not comparable.

(a) Includes persons reporting only one race
(b) Hispanics may be of any race, so also are included in applicable race categories
(c) Economic Census - Puerto Rico data are not comparable to U.S. Economic Census data

D Suppressed to avoid disclosure of confidential information
F Fewer than 25 firms
FN Footnote on this item in place of data
NA Not available
S Suppressed; does not meet publication standards
X Not applicable
Z Value greater than zero but less than half unit of measure shown

QuickFacts data are derived from: Population Estimates, American Community Survey, Census of Population and Housing, Current Population Survey, Small Area Health Insurance Estimates, Small Area Income and Poverty Estimates, State and County Housing Unit Estimates, County Business Patterns, Nonemployer Statistics, Economic Census, Survey of Business Owners, Building Permits.

Appendix D – Environmental Considerations Technical Memorandum

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State Highway 199 Corridor Master Plan

From IH 820 to Belknap Street

Environmental Considerations Technical Memorandum

Submittal Date:
July 17, 2017

Prepared For:
North Central Texas Council of Governments

Prepared By:
Freese and Nichols, Inc.
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Fort Worth, Texas 76109
817-735-7300
Texas Registered Engineering Firm F-2144

FREESE AND NICHOLS

1.0 ENVIRONMENTAL CONSIDERATIONS

The State Highway (SH) 199 corridor alignment, between Interstate Highway (IH) 820 and Belknap Street, travels through multiple cities and site conditions. The environmental site conditions within and around the SH 199 corridor study area are important to identify to assist the project team in the decision-making process.

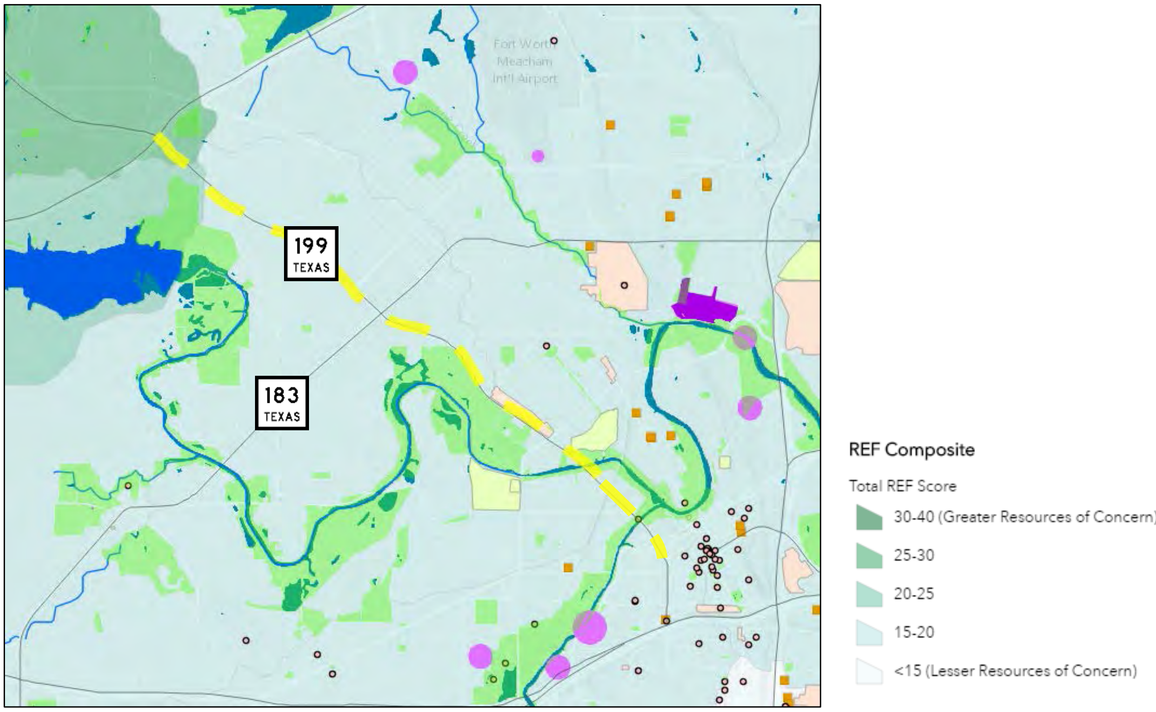


Figure 1. SH 199 Within NCTCOG REF Tool
Source: NCTCOG Regional Ecosystem Framework Tool, 2017

The corridor master plan team identified environmental conditions through field observation and consideration of compiled environmental geospatial databases. The team used a pair of web-based tools, The Regional Environmental Framework (REF) tool (http://www.nctcog.org/traces/Ref.asp) published by North Central Texas Council of Governments (NCTCOG) and the National Environmental Policy Act Assist (NEPAssist) tool (https://www.epa.gov/nepa/nepassist).

The NCTCOG REF tool was used to assess overall environmental consideration in the project consideration process. The study area is predominantly in the 15-20 REF range, representing an ecological framework zone of less concern, relative to the other aggregated zones of the REF framework. The composite scoring and aggregated sensitive resources of the study area is illustrated in Figure 1 (http://www.nctcog.org/traces/ref/REF-Update-Doc-12.4.15.pdf).

NEPAssist is published by the United States Environmental Protection Agency (USEPA). To verify the accuracy of the information, aerial photography of the study area was also reviewed. During the review process, it was determined that portions of the information gathered from the NEPAssist tool were either not included or inaccurate. To supplement the data retrieved from the NEPAssist tool, further review of information in the field and internet research and verification was used to supplement that available from the online geospatial database tools.

1.1 HISTORICAL SITES

The SH 199 corridor contains and is adjacent to multiple sites listed on the National Register of Historical Places, published by the United States Department of the Interior National Park Service. The National Register of Historic Places is a list of historic places (public and private) worthy of preservation. Typically, the identified sites contain historic and archeological resources.

The first site along SH 199 that is listed on the National Register of Historic Places is the Grand Avenue Historic District. This historic district is parallel and adjacent to the northside of SH 199 between the extension of Park Street and University Drive, which includes approximately seven blocks (see Figure 2). The Grand Avenue Historic District was a platted community in 1888 and is within two miles of the Tarrant County Courthouse. Within the district, there are 57 contributing buildings, 31 non-contributing buildings, and one contributing structure. The contributing structure is a concrete retaining wall along the face of the bluff between SH 199 and the core of the historic district (see Figures 3 and 4). This contributing structure appears to be within the existing Texas Department of Transportation (TxDOT) right-of-way for SH 199 and may need to be reconstructed based on the recommended roadway improvements and existing stability and drainage conditions. The National Park Service entered the Grand Avenue Historic District into the National Register of Historic Places on March 1, 1990.

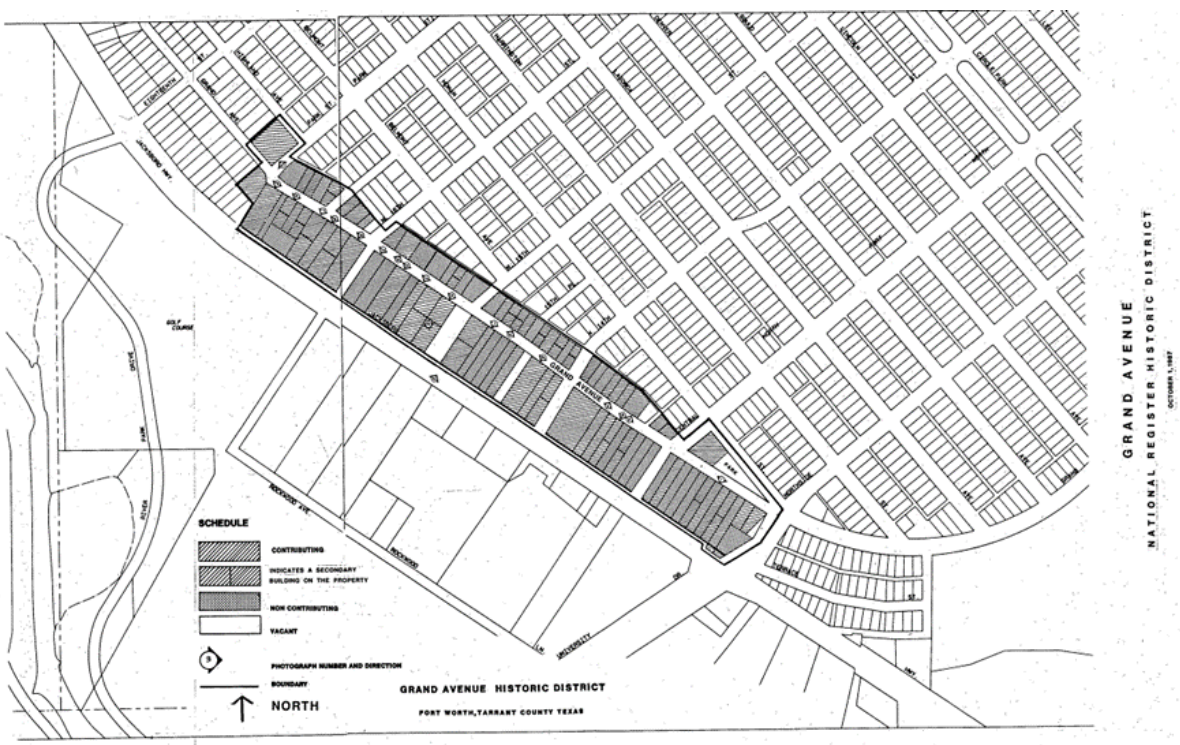


Figure 2. Grand Avenue Historic District Location Map
Source: National Register of Historic Places, 1987

Figure 3. Photograph of SH 199 Looking North at Concrete Retaining Wall
Source: National Register of Historic Places, 1987

Figure 4. Photograph of SH 199 Looking East Along Concrete Retaining Wall
Source: Freese and Nichols, Inc., 2016

The second site along SH 199 that is listed on the National Register of Historic Places is the Henderson Street Bridge at the Clear Fork of the Trinity River. This bridge was constructed in 1930 and is an 836 foot long, 73 foot wide reinforced concrete structure (see Figure 5). The four-lane undivided bridge includes seven foot sidewalks on either side of the exterior travel lanes. Multiple open arch spans, curved girders, and decorative handrails (see Figures 6 and 7). Physically, the Henderson Street Bridge is located three-eighths of a mile west of the confluence of the Clear Fork and the West Fort of the Trinity River. Currently, paved walking and bicycling trails, elements of the Trinity River Trails System, parallel the Trinity River and traverse under the historic bridge. The National Park Service entered the Henderson Street Bridge at the Clear Fork of the Trinity River into the National Register of Historic Places on March 21, 2011.

Figure 5. Henderson Street Bridge Plaque
Source: National Register of Historic Places, 2010

Figure 6. Photograph at White Settlement and Henderson Street Looking Southeast Toward Downtown Fort Worth
Source: National Register of Historic Places, 2010

Figure 7. Photograph of Henderson Street Bridge Looking East Along Trinity River
Source: Freese and Nichols, Inc., 2016

A third site along SH 199, the Rockwood Golf Course, has not been nominated and is currently not listed on the National Register of Historic Places, but may be considered an eligible site for historic designation. The Rockwood Golf Course is parallel and adjacent to the southside of SH 199 between Ohio Garden Road and the extension of 16th Street (see Figures 8 and 9). The 18-hole Rockwood Golf Course originally opened for play in 1938 and was originally designed by John Bredemus. In November 2015, a reconstruction and reconfiguration of the golf course began. The reconstruction included new greens, fairways, bunkers, and cart paths and is estimated to be completed in June 2017. Confirmation has been made that no Land and Water

Conservation Funds were used for the original construction or site updates to the Rockwood Golf Course or Rockwood Park.

Figure 8. Rockwood Golf Course Entrance Sign at SH 199 and 18th Street Intersection
Source: Freese and Nichols, Inc., 2016

Figure 9. Photograph of SH 199 Looking East with Rockwood Golf Course to the Right
Source: Freese and Nichols, Inc., 2016

1.2 PLACES OF WORSHIP

The following two places of worship are located along the SH 199 corridor (see Figure 10):

- Northwest Bible Church at 5025 Jacksboro Hwy, Fort Worth, TX 76114
- St. Demetrios Greek Orthodox Church at 2020 NW 21st St, Fort Worth, TX 76164

Figure 10. Location Map of Places of Worship in Proximity to SH 199
Source: Freese and Nichols, Inc., 2017

Additionally, the following places of worship are within one-mile of SH 199 (see Figure 10) and listed from northwest to southeast:

- Merge Community Church, 3503 NW Loop 820, Fort Worth, TX 76106
- Temple Precious Faith, 3204 Roberts Cut Off Road, Fort Worth, TX 76114
- Steadfast Baptist Church, 5840 Jacksboro Hwy A, Fort Worth, TX 76114
- Northwest Fort Worth Seventh, 2705 Biway Street, Fort Worth, TX 76114
- Beverly Hills Baptist Church, 2606 Beverly Hills Drive, Fort Worth, TX 76114
- Panther City Church, 2104 Roberts Cut Off Road, Fort Worth, TX 76114
- St Thomas the Apostle Church, 2920 Azle Avenue, Fort Worth, TX 76106
- One Faith Church, 1200 Roberts Cut Off Road, River Oaks, TX 76114
- Castleberry Church of Christ, 1025 Merritt St, River Oaks, TX 76114
- Christian Worship Center, 2520 NW 18th Street, Fort Worth, TX 76106
- Iglesia Templo Jerusalem, 2421 NW 18th Street, Fort Worth, TX 76106
- River Oaks United Methodist, 4800 Ohio Garden Road, River Oaks, TX 76114
- Faith Family Church, 1932 Ephriham Avenue, Fort Worth, TX 76164
- The Rosen Heights Baptist Church, 2524 Roosevelt Avenue, Fort Worth, TX 76164
- Victory Church, 2517 Loving Avenue, Fort Worth, TX 76164

- Victory Outreach Church, 2526 Columbus Avenue, Fort Worth, TX 76164
- New Rose Baptist Church, 1301 NW 25th Street, Fort Worth, TX 76164
- Iglesia Evangelica Roca Fuerte, 1900 Gould Avenue, Fort Worth, TX 76164
- Northside Church of Christ, 2001 Lincoln Avenue, Fort Worth, TX 76164
- La Trinidad Iglesia, 1300 Gould Avenue, Fort Worth, TX 76164

1.3 EDUCATION AND SCHOOLS

Fort Worth Independent School District (ISD) busing policy includes serving students who live more than two miles away from the schools. However, they will also serve students within that distance if they are separated by a road considered to have high vehicular volumes. SH 199 is considered such a road by their current policy. Therefore, students who live within two miles of the school but are separated by SH 199 would be eligible for school bus service. Castleberry ISD also has elementary school zones delineated by streets with high vehicular volumes within the study area, including SH 199, though middle school and high school zones extend across SH 199. The following schools are within a half-mile of the SH 199 corridor study area (see Figure 11):

- Joy James Elementary School (Castleberry ISD, lists 14 bus routes serving the school), 5300 Buchanan St, Fort Worth, TX 76114
- Northside High School (Fort Worth ISD, lists 17 bus routes), 2211 Mckinley Ave, Fort Worth, TX 76164. There is not currently a sidewalk from SH 199 to Northside High School, which is located 1,500 feet from SH 199 and the closest Route 46 FW Metro bus stop at Jacksboro and Fielder Street. However, SH 199 is also the boundary for the service area of the school, with the area south of the corridor considered River Oaks School district. Therefore, limited students are currently accessing the school from the corridor, according to school administration. A school administrator did note that the increase in commercial redevelopment along the corridor within a half mile, including the Walmart and Whataburger, is an increasingly attractive destination for after school, and expected to draw more students as pedestrians.
- Rufino Mendoza Elementary School (Fort Worth ISD) (also referred to as the Denver Avenue School in the USEPA list of places), 1412 Denver Ave, Fort Worth, TX 76164. All students attending this school live within two miles and therefore no bus service is provided.
- The Metro Opportunity High School, near downtown Fort Worth (2720 Cullen St, Fort Worth, TX 76107), currently draws students in from all over the Fort Worth area, and nearly all of them arrive by school bus. Currently, no known students walk or bike to the school.

Within the project study area, no known school bus routes currently include stops along SH 199.

Figure 11. Location Map of Education and Schools in Proximity to SH 199
Source: Freese and Nichols, Inc., 2017

The following schools are between half-mile and one-mile from the SH 199 corridor (also see Figure 11) and listed from northwest to southeast:

- Lucyle Collins Middle School, 3651 Santos Drive, Fort Worth, TX 76106
- W.J. Turner Elementary School, 3000 NW 26th Street, Fort Worth, TX 76106
- Castleberry Elementary, 1100 Roberts Cut Off Road, Fort Worth, TX 76114
- Reach High School, 1101 Merritt Street, Fort Worth, TX 76114
- Sam Rosen Elementary School, 2613 Roosevelt Avenue, Fort Worth, TX 76164
- Manual Jara Elementary School, 2100 Lincoln Avenue, Fort Worth, TX 76164
- North Fort Worth High School/J.P. Elder Middle School, 709 NW 21st Street, Fort Worth, TX 76164
- All Saints Catholic School, 2006 N Houston Street, Fort Worth, TX 76164
- Fort Worth Independent School District Administration Building, 100 N University Drive, Fort Worth, TX 76107

1.4 TOPOGRAPY AND SOILS

The SH 199 study area contains diverse natural conditions in topography and soil type. From the United States Department of Agriculture (USDA) Natural Resources Conservation Service Web Soil Survey, the soil within the study area is classified mainly as Aledo-Urban Land Complex (three to 20 percent slopes) and Aledo-Bolar-Urban Land Complex (one to eight percent slopes). These two types of soils are variations in clay loam which is found in many parts of North Texas. The topography within the study area typically includes a slopped terrain from the north to the south. This sloped terrain allows for unique vistas and vantage points along the corridor. On the contrary, the topography introduces challenges and costs to site development and corridor widening.

1.5 NATURAL HABITATS, WETLANDS, AND FLOODPLAIN

A review of the USEPA resource material yielded no critical habitat, limited wetlands, and multiple segments of the corridor within or near flood hazard zones delineated by the Flood Insurance Rate Map (FIRM) published by Federal Emergency Management Agency (FEMA) and as noted in the *Existing Conditions Drainage Assessment* technical memorandum. The 1-percent annual change flood hazard zone is on the southside and parallel to SH 199 from Cheyenne Street to the West Fork of the Trinity River. The 1-percent annual change flood hazard zone crosses SH 199 at Menefee Avenue, Belle Avenue, the West Fork of the Trinity River and the Clear Fork of the Trinity River. Flood control levees exist on the southside of the West Fork of the Trinity River at the SH 199 crossing and on the west and the east sides of the Clear Fork of the Trinity River at the SH 199 crossing.

1.6 PARK, RECREATION, AND PUBLIC RESOURCE SITE

The following are noted park, recreation, and public resource sites located within the study area in order from being northwest to southeast (see Figure 12). The *Bicycle and Pedestrian Accommodations and Linkages* technical memorandum includes additional notes of the features and alignments of the trail systems within the study area.

- Lake Worth Park, 3501 Roberts Cut Off Road, Fort Worth, TX 76114
- Texas Department of Public Safety Driver License Center, 5816 Azle Avenue, Fort Worth, TX 76114
- Marion Sansom Park and Inspiration Point, 2401 Roberts Cut Off Road, Fort Worth, TX 76114
- YMCA of Fort Worth, Camp Carter, 6200 Sand Springs Road, Fort Worth, TX 76114
- Rosen Park, 2300 McCandless Street, Fort Worth, TX 76106
- Heartland Healthcare Center - Fort Worth, 2129 Skyline Drive, Fort Worth, TX 76114
- McGee Park, 1500 Greenbrier Drive, River Oaks, TX 76114
- Rockwood Golf Course, 1851 Jacksboro Highway, Fort Worth, TX 76114
- Northside Community Center, 1801 Harrington Avenue, Fort Worth, TX 76164
- Northside Library and Circle Park, 601 Park Street, Fort Worth, TX 76164
- Marine Park, 303 NW 20th Street, Fort Worth, TX 76164
- Rockwood Park, 1400 Rockwood Park Drive N, Fort Worth, TX 76114
- The Tarrant Area Food Bank, 2600 Cullen Street, Fort Worth, TX 76107
- The Fort Worth Haws Athletic Center, 600 Congress Street, Fort Worth, TX 76107
- The Fort Worth Branch - Trinity River Trail System

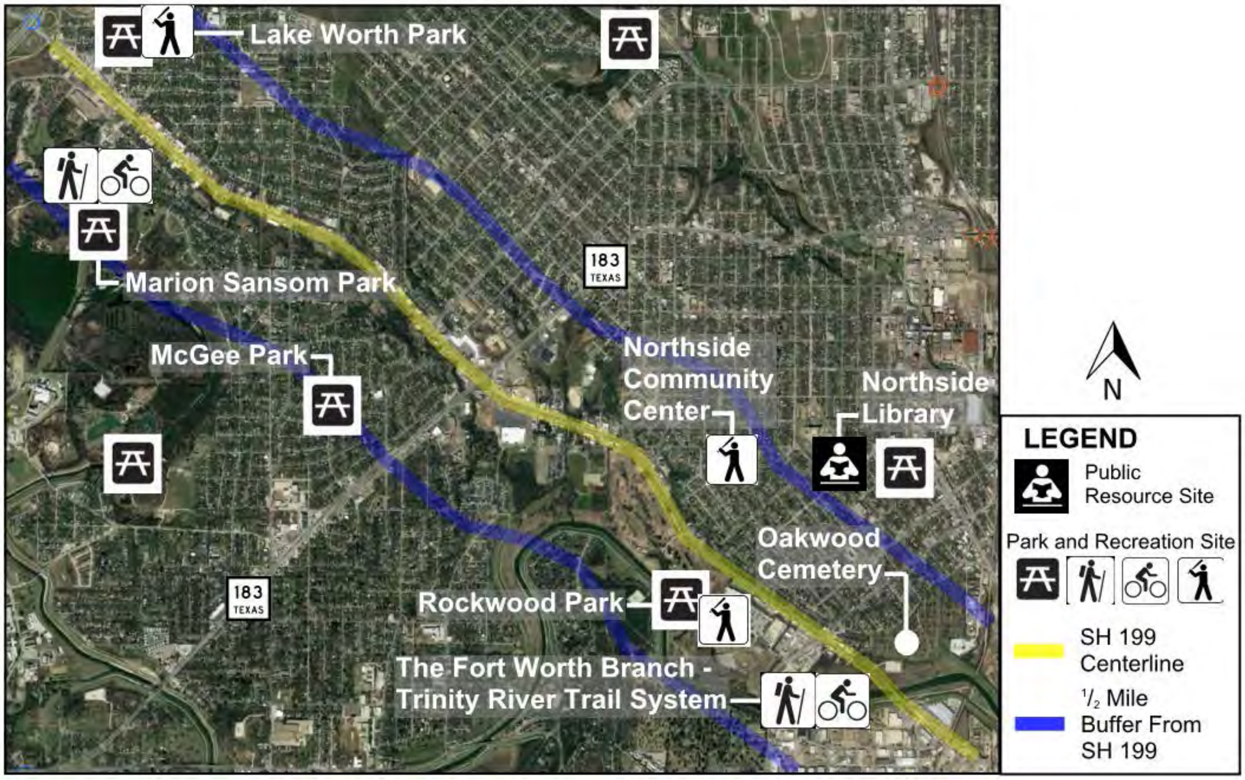


Figure 12. Location Map of Park, Recreation, and Public Resource Sites Near SH 199
Source: Freese and Nichols, Inc., 2017

In addition, though not a publicly owned facility, the Henderson Street Bazaar (1000 N. Henderson Street) is a noteworthy, regularly scheduled flea market occurring adjacent to the study area on Saturdays in a large, weather protected and paved area. The Oakwood Cemetery is also located approximately 110 feet from the edge of the SH 199 right-of-way just north of the West Fork of the Trinity River (http://oakwoodcemetery.net/). Fort Worth pioneer John Smith donated 20 acres for the cemetery on December 26, 1879. The NCTCOG REF site notes the Oakwood Cemetery Complex as currently covering approximately 65 acres.

1.7 AIR QUALITY

Tarrant County is listed as a moderate non-attainment area for eight-hour ozone level. Much of the Dallas/Fort Worth is an air quality control region, meaning that pollutant levels in the air are higher than the 'threshold' for a particular type or air pollutant – ozone. This is a federal air quality standard designed to protect human health, including those vulnerable to respiratory sensitivity, such as children and the elderly. Areas in non-attainment status are required to submit a state implementation plan (SIP) to designate an approach to reducing the pollutant levels in the air, including abiding by transportation conformity rules within those plans. Contributing factors can include cars, fuels, consumer/commercial products and activities. Power plants, factories, and other pollution sources are also typically identified for mitigation efforts. The SIP for the DFW region designates NCTCOG as responsible for on-road and some non-road source control measures. NCTCOG has implemented two categories of emission reduction strategies: Transportation Control Measures (TCMs) and Voluntary Mobile Emission Reduction Programs (VMEPs). Projects in the TCM category include but are not limited to high occupancy vehicle travel lane projects, intersection Improvements, park and ride, and bicycle/pedestrian pathway projects. Projects in the VMEP category include but are not limited to the clean vehicle program, the employee trip reduction program, and a locally enforced idling restriction. More information regarding SIP implementation strategies can be found through both the Texas Commission on Environmental Quality website (https://www.tceq.texas.gov/airquality/sip/dfw/dfw-latest-ozone) and the NCTCOG website (http://www.nctcog.org/trans/air/sip/future/strategies.asp).

1.8 REGULATED MATERIAL SITES

There are several sites noted by the USEPA for various characteristics along the corridor, including regulated material sites. The USEPA notes commercial sites that use and potentially dispose of flammable substances or hazardous chemicals, such as gas stations, cleaners, manufacturing, paint stores, etc. The following sites are listed as potential regulated material sites along the corridor: Comet One-Hour Cleaners, Smooth Cars, Walmart Supercenter 4165, Tyson Buick, Tuneup Masters, CVS Pharmacy, Family Dollar, Chevron, Star Enterprises, Inc., Intesys Technologies, and Sherwin Williams.

1.8.1 Brownfield Site

One brownfield site (0.31 acres) is listed on the USEPA registry along the SH 199 corridor – for a former gas station located on the northwest corner of the SH 199 and Beverly Hill Drive intersection (5000 SH 199, Fort Worth, TX 76114) (see Figure 13). The site currently includes tree and shrub plantings and an entrance monument for the City of Sansom Park for westbound travelers on SH 199 (see Figure 14). The current right-of-way in this area appears to be 150-feet wide.

Figure 13. Location Map of Brownfield Site at Intersection of SH 199 and Beverly Hills Drive
Source: NEPAssist Online Tool, 2017

Figure 14. Photograph Looking West of Brownfield Site at Intersection of SH 199 and Beverly Hills Drive

Source: Freese and Nichols, Inc., 2016

1.8.2 Toxic Release Site

The study area does not contain toxic release sites, Permit Compliance System and Integrated Compliance Information System release sites, or other sites registered with the Toxic Substances Control Act.

2.0 EXHIBITS

1. Environmental Considerations

3.0 ATTACHMENTS

A. Grand Avenue Historic District National Register of Historic Places Registration Form
B. Henderson Street Bridge National Register of Historic Places Registration Form
C. Rockwood Golf Course Land and Water Conservation Funds Letter
D. USDA Web Soil Survey – Soil Map

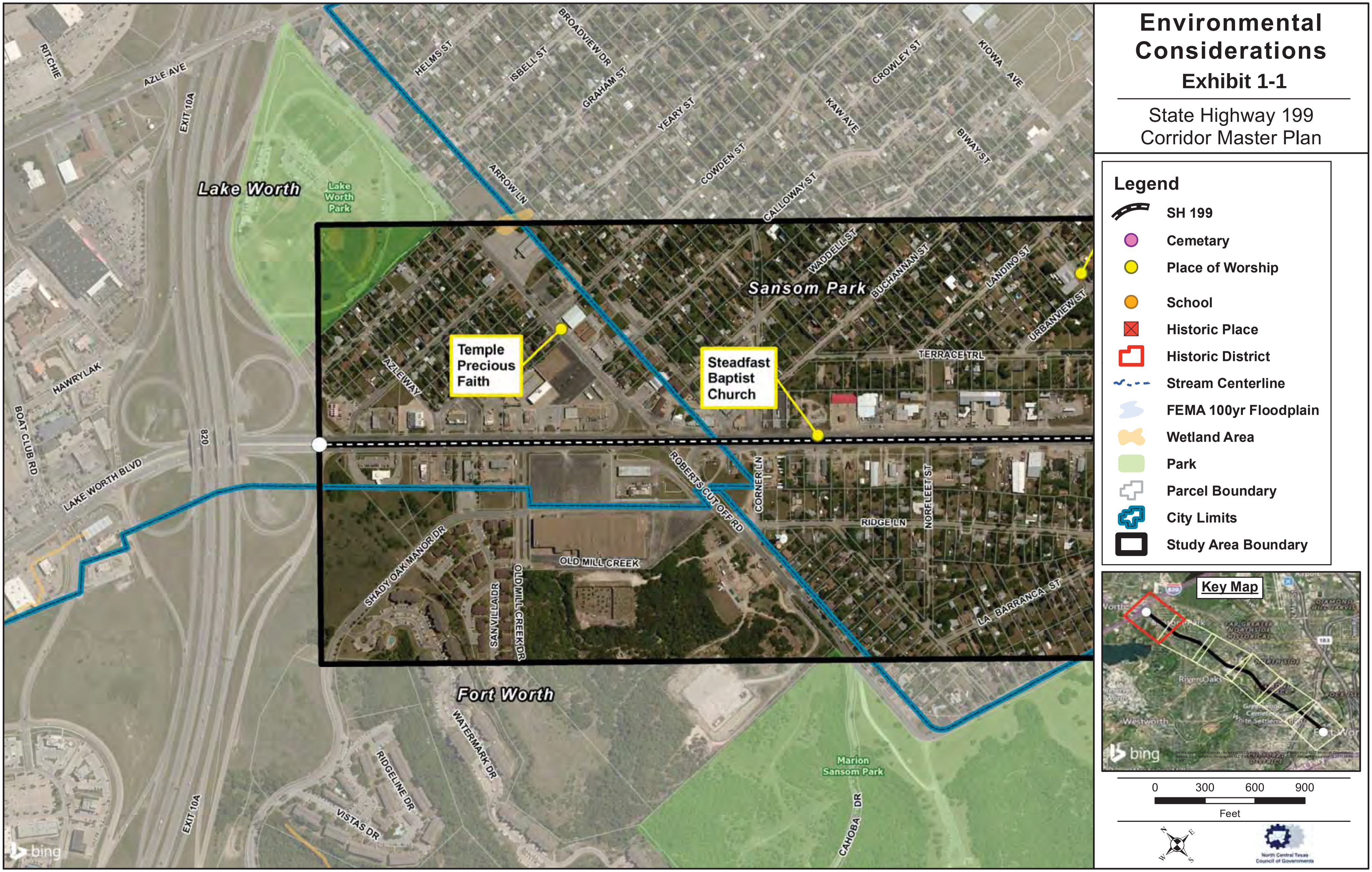
Exhibit 1

Environmental Considerations

Environmental Considerations

Exhibit 1-1

State Highway 199
Corridor Master Plan

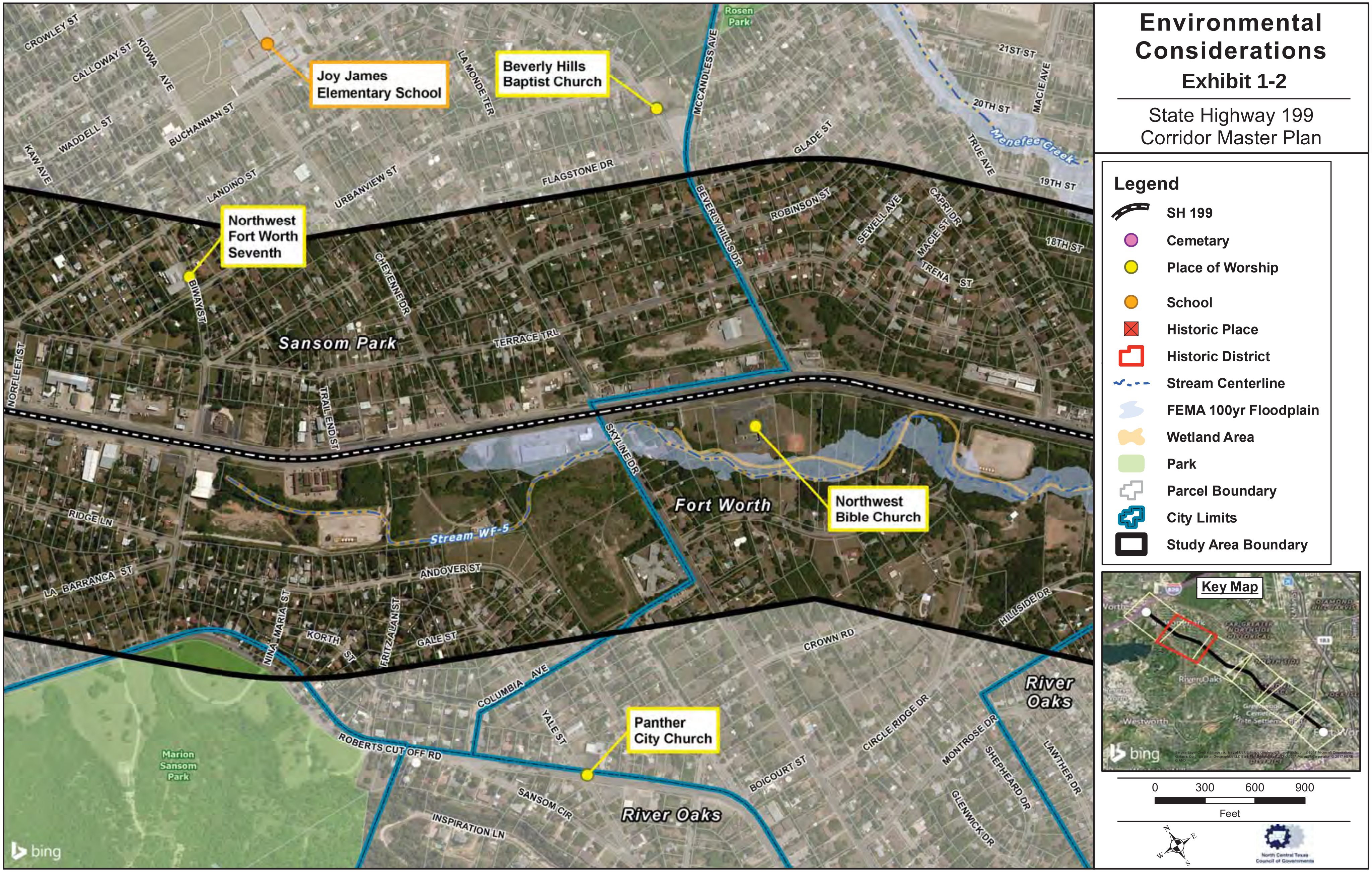


Wetland Area Data Source: U.S. Fish & Wildlife Service, National Wetlands Inventory, 2017 Historic District Data Source: National Register of Historic Places, 2017 Parcel Data Source: Tarrant Appraisal District Parcels 2015 Date: 07/15/2017

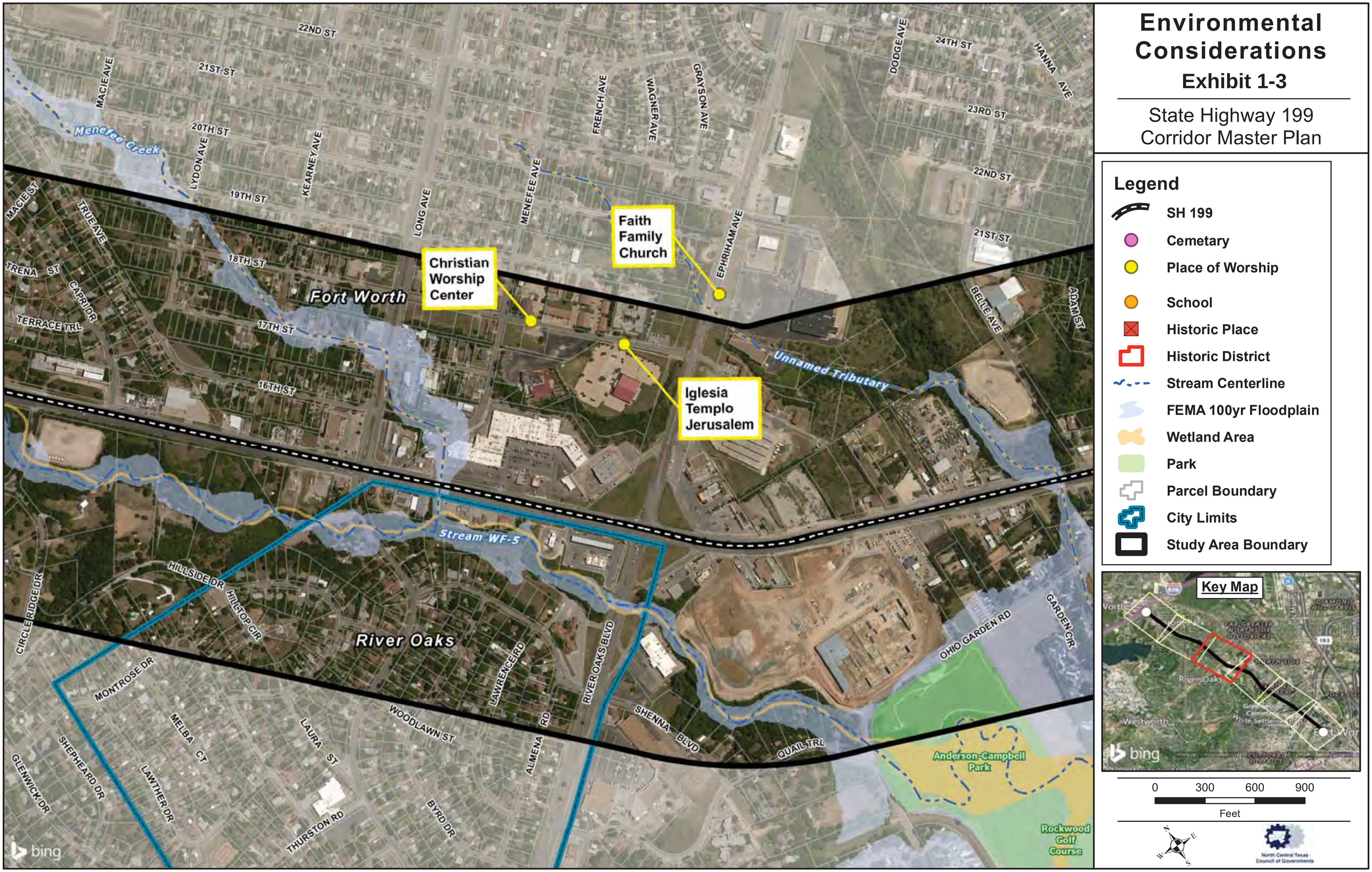
Environmental Considerations

Exhibit 1-2

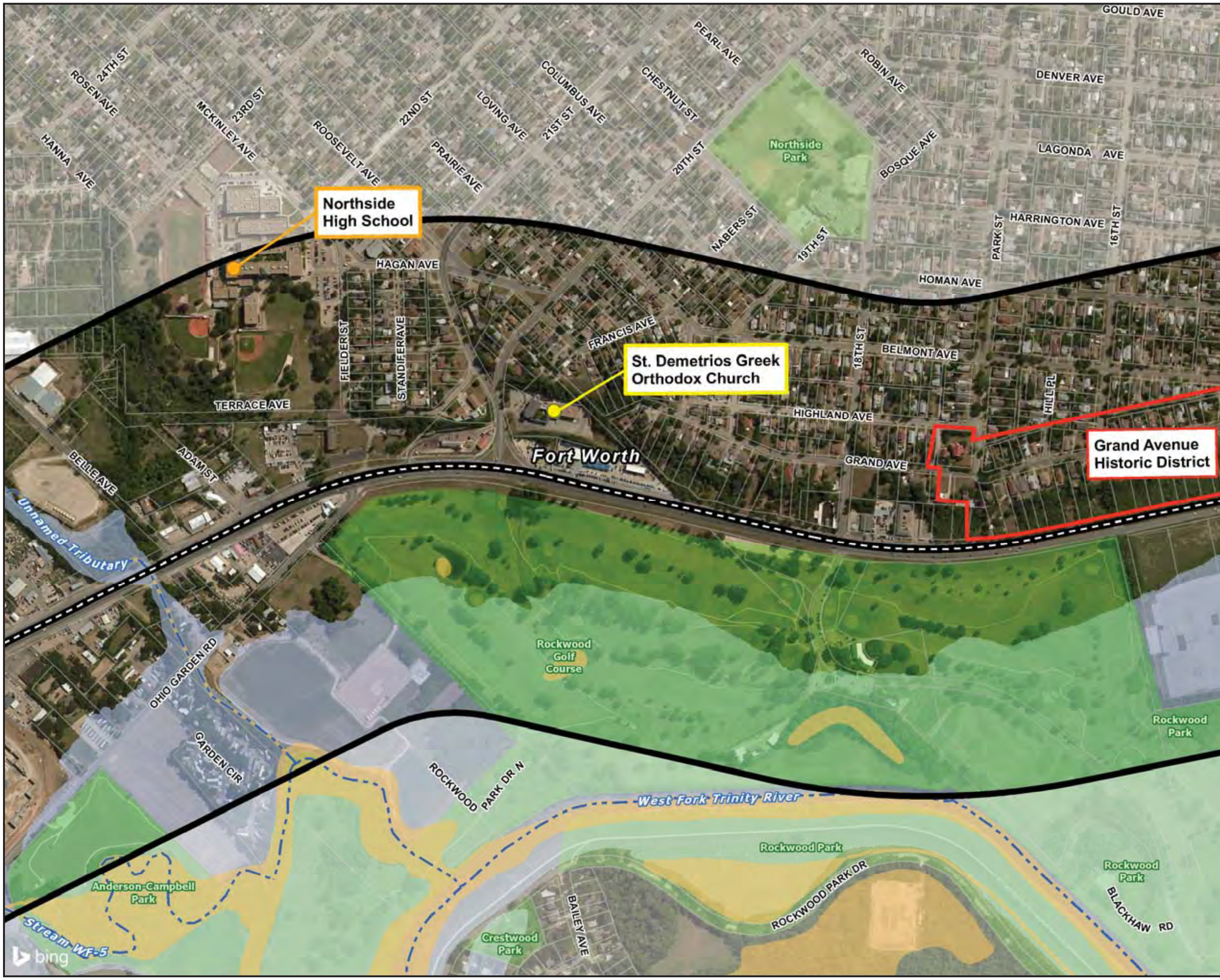
State Highway 199 Corridor Master Plan



Wetland Area Data Source: U.S. Fish & Wildlife Service, National Wetlands Inventory, 2017 Historic District Data Source: National Register of Historic Places, 2017 Parcel Data Source: Tarrant Appraisal District Parcels 2015 Date: 07/15/2017



Wetland Area Data Source: U.S. Fish & Wildlife Service, National Wetlands Inventory, 2017 Historic District Data Source: National Register of Historic Places, 2017 Parcel Data Source: Tarrant Appraisal District Parcels 2015 Date: 07/15/2017

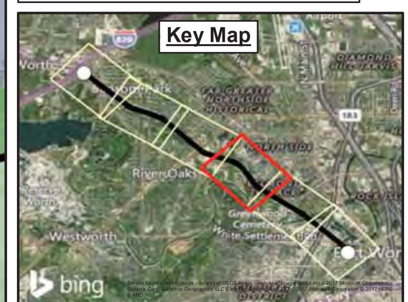


Environmental Considerations
Exhibit 1-4

State Highway 199
Corridor Master Plan

Legend

- SH 199
- Cemetary
- Place of Worship
- School
- Historic Place
- Historic District
- Stream Centerline
- FEMA 100yr Floodplain
- Wetland Area
- Park
- Parcel Boundary
- City Limits
- Study Area Boundary



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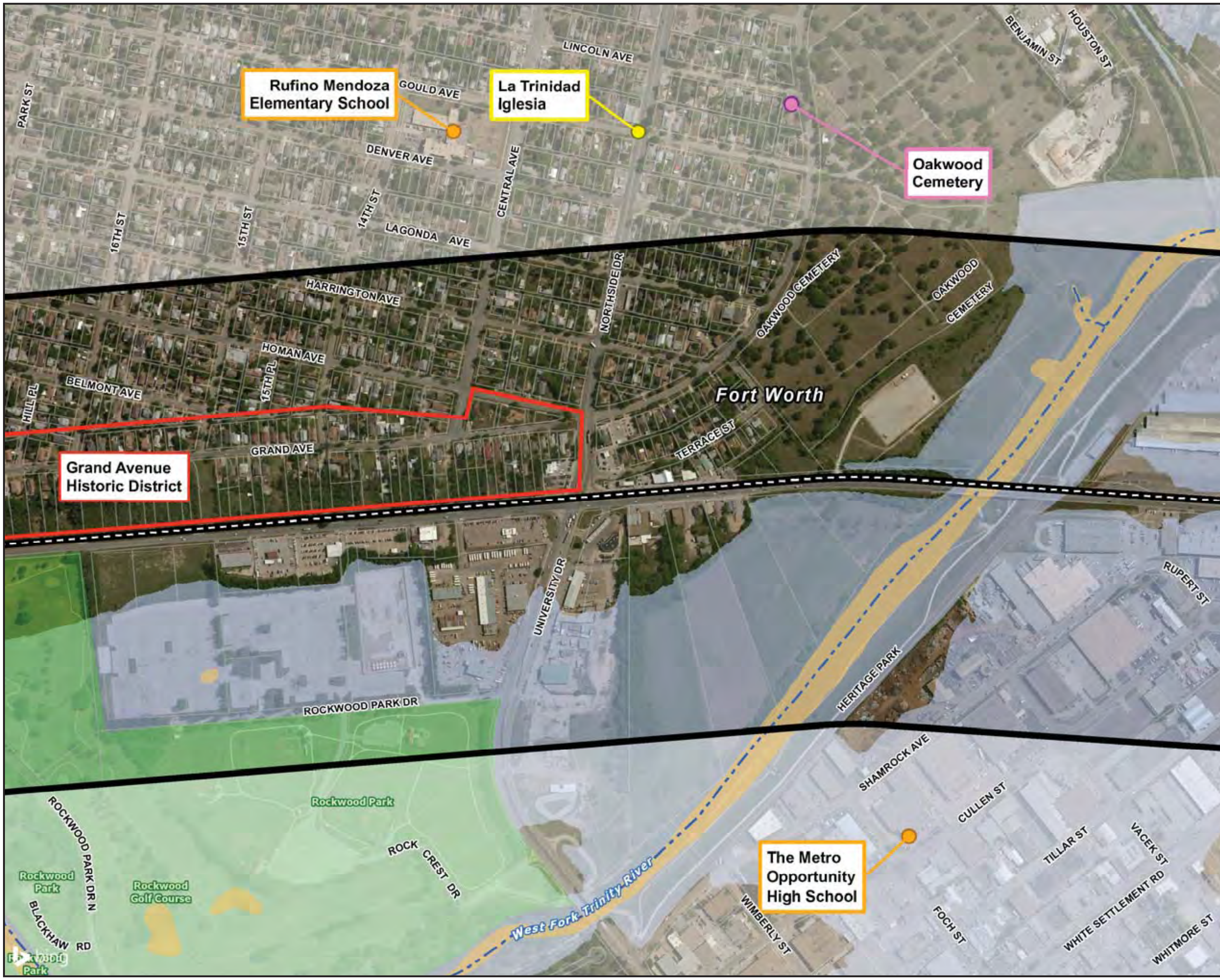
Feet

Wetland Area Data Source: U.S. Fish & Wildlife Service, National Wetlands Inventory, 2017 Historic District Data Source: National Register of Historic Places, 2017 Parcel Data Source: Tarrant Appraisal District Parcels 2015 Date: 07/15/2017

Environmental Considerations

Exhibit 1-5

State Highway 199
Corridor Master Plan



Legend

- SH 199
- Cemetary
- Place of Worship
- School
- Historic Place
- Historic District
- Stream Centerline
- FEMA 100yr Floodplain
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- Park
- Parcel Boundary
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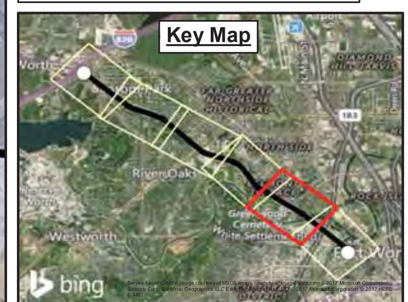


0 300 600 900
Feet

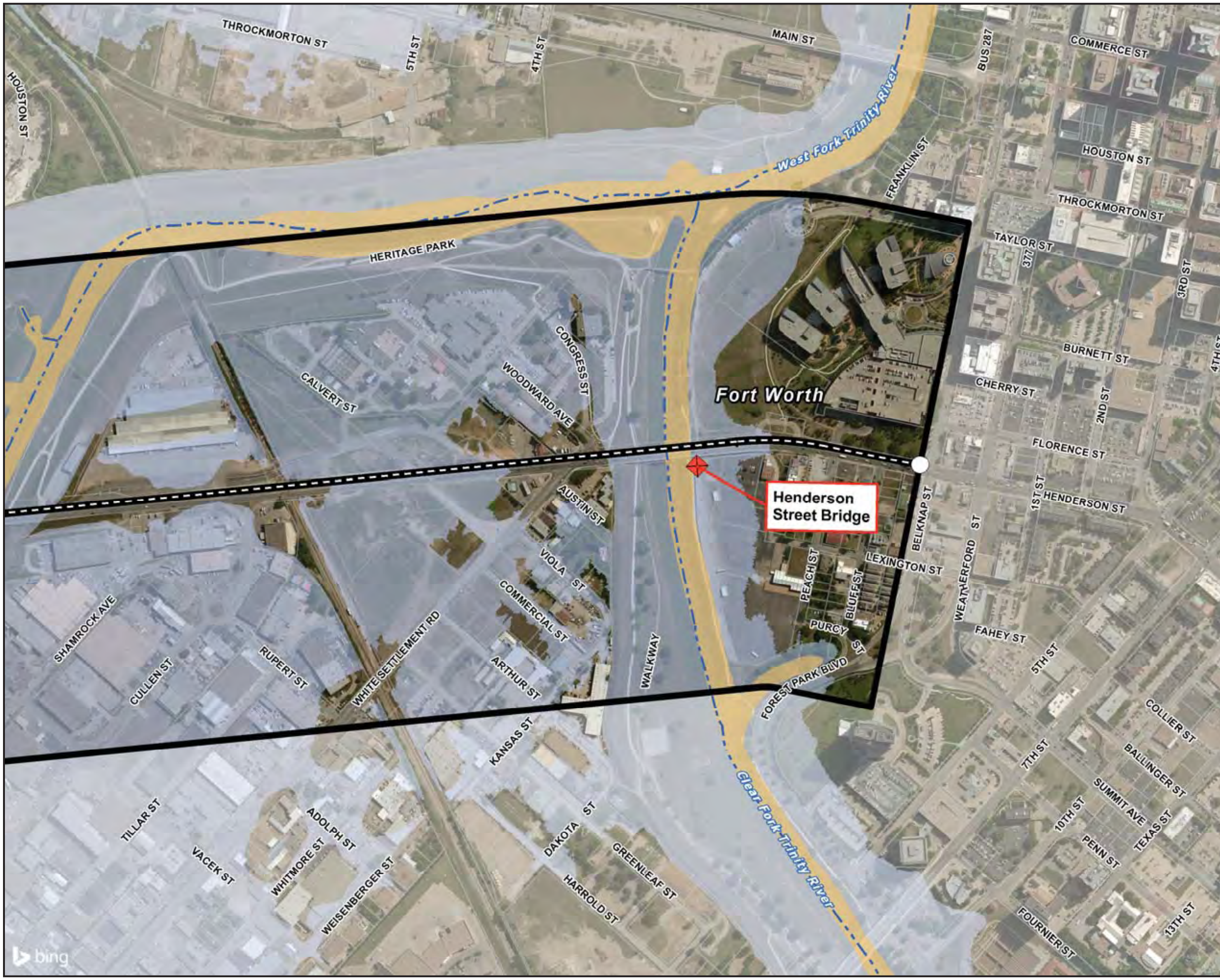
North Central Texas Council of Governments

Wetland Area Data Source: U.S. Fish & Wildlife Service, National Wetlands Inventory, 2017 Historic District Data Source: National Register of Historic Places, 2017 Parcel Data Source: Tarrant Appraisal District Parcels 2015 Date: 07/15/2017

Environmental Considerations

Exhibit 1-6

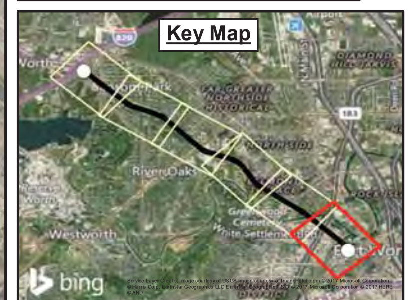
State Highway 199
Corridor Master Plan



Legend

- SH 199
- Cemetary
- Place of Worship
- School
- Historic Place
- Historic District
- Stream Centerline
- FEMA 100yr Floodplain
- Wetland Area
- Park
- Parcel Boundary
- City Limits
- Study Area Boundary

Key Map



0 300 600 900
Feet

North Central Texas Council of Governments

Wetland Area Data Source: U.S. Fish & Wildlife Service, National Wetlands Inventory, 2017 Historic District Data Source: National Register of Historic Places, 2017 Parcel Data Source: Tarrant Appraisal District Parcels 2015 Date: 07/15/2017

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Attachment A

Grand Avenue Historic District National Register of Historic Places Registration Form

NPS Form 10-900
(Rev. 8-86)

OMB No. 1024-0018

337

RECEIVED

JAN 29 1990

NATIONAL REGISTER

United States Department of the Interior
National Park Service

National Register of Historic Places Registration Form

This form is for use in nominating or requesting determinations of eligibility for individual properties or districts. See instructions in *Guidelines for Completing National Register Forms* (National Register Bulletin 16). Complete each item by marking "x" in the appropriate box or by entering the requested information. If an item does not apply to the property being documented, enter "N/A" for "not applicable." For functions, styles, materials, and areas of significance, enter only the categories and subcategories listed in the instructions. For additional space use continuation sheets (Form 10-900a). Type all entries.

1. Name of Property

historic name: Grand Avenue Historic District
other names/site number:

2. Location

street & number: 1206 Central, 1301-1801 Grand Ave., 1352 Park — [ ] not for publication N/A
city, town: Fort Worth — [ ] vicinity N/A
state: TX — code: 048 — county: Tarrant — code: 439 — zip code: 76106

3. Classification

Ownership of Property	Category of Property	Number of Resources within Property		
		Contributing	Noncontributing	
[X] private	[ ] building(s)	57	31	buildings
[ ] public-local	[X] district			sites
[ ] public-State	[ ] site	1		structures
[ ] public-Federal	[ ] structure			objects
	[ ] object	58	31	Total

Name of related multiple property listing: N/A

Number of contributing resources previously listed in the National Register: 0

4. State/Federal Agency Certification

As the designated authority under the National Historic Preservation Act of 1966, as amended, I hereby certify that this [X] nomination [ ] request for determination of eligibility meets the documentation standards for registering properties in the National Register of Historic Places and meets the procedural and professional requirements set forth in 36 CFR Part 60. In my opinion, the property [X] meets [ ] does not meet the National Register criteria. [ ] See continuation sheet.

Curtis Tunnell — 23 Jan. 1990
Signature of certifying official — Date

Texas Historical Commission
State or Federal agency and bureau

In my opinion, the property [ ] meets [ ] does not meet the National Register criteria. [ ] See continuation sheet.

Signature of commenting or other official — Date

State or Federal agency and bureau

5. National Park Service Certification

I, hereby, certify that this property is:

[X] entered in the National Register. [ ] See continuation sheet. — Entered in the National Register — Delores Byers — 3/1/90

[ ] determined eligible for the National Register. [ ] See continuation sheet.

[ ] determined not eligible for the National Register.

[ ] removed from the National Register.

[ ] other, (explain:) ____

for Signature of the Keeper — Date of Action

6. Function or Use

Historic Functions (enter categories from instructions)	Current Functions (enter categories from instructions)
Domestic - Single Dwelling	Domestic - Single Dwelling
- Secondary Structure	- Secondary Structure
- Multiple Dwelling	- Multiple Dwelling

7. Description

Architectural Classification
(enter categories from instructions)

Bungalow/Craftsman
Tudor Revival
Prairie School

Materials (enter categories from instructions)

foundation wood, concrete
walls wood-weatherboard ; brick
-shingle
roof asphalt, wood-shingle
other

Describe present and historic physical appearance.

Text begins on Continuation Sheet 7-1.

[X] See continuation sheet

The Grand Avenue Historic District is a part of North Fort Worth, a community platted in 1888 as a suburb to Fort Worth, Tarrant County, Texas. The area, now incorporated into Fort Worth and known as the "near north side," sits two miles northwest of the Tarrant County Courthouse (N.R. 1970), across the Trinity river from downtown Fort Worth. Grand Avenue comprises the western edge of the original subdivision of North Fort Worth where the street curves along the bluffs above the West Fork of the Trinity River. The district encompasses the properties on both sides of Grand Avenue for approximately seven blocks, from its intersection with Northside Drive north to a line approximately 200 feet beyond Park Street. The south end of the district is anchored by the triangular Arneson Park. At its north end the district culminates with the prominent Ross House set on Park Street and facing south onto the nominated district. The western boundary of the district is the Jacksboro Highway at the base of the bluff, thus incorporating the long, sloped lots of the western Grand Avenue properties. With few exceptions, the buildings in the district are single-family houses built in the early 20th century using bungalow or four-square form with Arts and Crafts, Prairie School and historical revival stylistic influences. There are 88 primary buildings in the district (excluding outbuildings): 57 are designated as Contributing and 31 as Non-contributing, which equates to 65 percent Contributing buildings in the district. There is one Contributing structure bringing the total Contributing resources to 89.

Grand Avenue's siting and layout along a western ridge overlooking Fort Worth are the district's most distinctive features. The broad street, intermittently shaded by sycamore and pecan trees, gently curves to follow the countours of the ridge. While lot widths vary, Grand Avenue houses are built with a consistent setback, providing modest front yards. Many of the lots have a driveway which runs beside the house to a garage set at the rear of the property. On the west side of the street the back yards of the properties slope away, opening up commanding views westward over the Trinity River bottom lands. Some of the more substantial properties on the bluff have a garage set down the slope away from the house, incorporating second story living quarters. Originally the homes on the west side of Grand Avenue could be accessed directly from the Jacksboro Highway via long, steep drives, but now the hillside is largely overgrown with mixed vegetation. The district ends at the Jacksboro Highway with an intermittent concrete retaining wall of rough finish with an incised pattern of rectangular panels.

In contrast with the grandeur of the district's siting, the homes are relatively modest. The dominant house type is the wood frame bungalow. The bungalow form, as used herein, refers to a small one or 1 1/2-story house with a modified rectangular plan, a spreading hipped or gabled roof, generally punctuated with dormers or cross gables, and a porch sheltered beneath the roof mass. The Grand Avenue district contains many variations of the bungalow form with certain patterns recurring. Typical is the side gable bungalow with a full width, inset porch and one or two dormers punctuating the main facade. This configuration is illustrated by the Butler House at 1311 Grand (photo #1), the Vinson House at 1406 Grand (photo #2),1605 Grand (photo #8), 1619 Grand (photo # 12), and 1718 Grand (photo #18). Grand Avenue houses most commonly have narrow clapboard siding or shingled walls and show variety in the details of dormers and porches. A more distinctive example within this category is the house at 1701 Grand (photo #15) showing Shingle Style influence. The side-gable roof flares over the full width gallery. Shingles sheath the entire house including the squared porch columns, although the original wood shingle roof has unfortunately been replaced with asphalt shingles. A large central dormer is bowed to create a second-floor, sheltered balcony flanked by two dormers. The house is set off from its neighbors by its distinctive siting at a 45% angle to the street.

The second typical bungalow form is the cross gabled or end gabled house with a prominent, broad gable sheltering the porch. Illustrations of this are the McCain House at 1417 Grand (photo # 4), the grouping at 1410 through 1418 Grand (photo #6), the Rumph House at 1521 Grand (photo # 7), and the Hunnicutt House at 1707 Grand (photo #16). The McCain and Hunnicutt houses are fine examples of the Arts and Crafts style with their fieldstone and clinker-brick porches, paired columns, and deep eaves with knee- brace brackets. The Rumph House uses the bungalow form, but a full second story rises behind the cross-gabled porch wing. This house is also distinguished by its clipped gables with mock half-timbering, and the wraparound porch with porte-cochere.

The third pattern of bungalow exhibits a broad, hipped roof, exemplified by the Thomas House at 1711 Grand (photo # 17) and by the house at 1622 Grand (photo #13.) Both have inset porches, extended eaves and shallow, hipped-roof dormers. The Thomas House has shaped brackets used in triplicate under the deep roof eaves. This house, along with 1718 Grand Avenue (photo #18), has the stocky Doric columns which are a distinctive feature used throughout Fort Worth in bungalows of the early 20th century.

Several Tudor Revival structures, including a small apartment building, are included in the district and reflect changing tastes and the increased use of brick in residential work following World War I. The house at 1413 Grand (photo #3) with its steep intersecting gables, half timbering, prominent front chimney, and leaded-glass windows, demonstrates the popularity of this style in the 1920s.

One of the earliest houses in the district, the Armstrong House of 1904 at 1725 Grand (photo #19), shows the continued influence into the 20th century of a subdued Queen Anne style for grander homes. Although without the freneticism of the 19th-century Queen Anne style, this home still displays the assymetry and verticality of the style and the characteristic forms such as a hip-and-gable roof, an extended bay, and a curved, wraparound porch.

Visually terminating the district on its northern edge is the Waddy R. Ross House, 1352 Park Street (photo #20), a grand, 2 1/2-story brick-clad home built in 1917. The Ross House is a good illustration of the eclecticism of stylistic influences of the time, often promoted in Prairie School literature, and is the finest of the district's houses. The intersecting gable and dormer roofs are finished with red tile and have broad eaves with elegant brackets, while the gable ends are half timbered. The facade combines seemingly disparate stylistic elements. It is dominated by a two-level porch with massive brick corner piers and a cast stone, Renaissance balustrade at the second level. A porte-cochere extends from the west elevation with a side-gabled sunroom on its second floor.

The Grand Avenue Historic District has retained its architectural integrity and cohesiveness to a significant degree. While much of the adjacent subdivision shows the neglect of years of economic disfavor, Grand Avenue properties are relatively well-kept. Inappropriate alterations to the structures, such as the addition of asbestos-shingle siding, composition shingle roofs, fabricated metal porch supports or the replacement of windows, may in many cases be reversible. Enclosure of porches, the "Victorianization" of bungalows and the addition of modern brick veneers have ruined the integrity of some structures. Despite these intrusions and the occasional construction of post-World War II homes in the neighborhood, 65% of the structures in the district are classified as Contributing elements as of 1989.

GRAND AVENUE HISTORIC DISTRICT
Fort Worth, Tarrant County, Texas

List of Contributing Properties

1201 N. Central
1206 N. Central
1301 Grand
1303 Grand
1305 Grand
1307 Grand
1309 Grand
1311 Grand
1315 Grand
1323 Grand
1400 Grand
1406 Grand
1408 Grand
1409 Grand
1412 Grand
1413 Grand
1414 Grand
1415 Grand
1417 Grand
1420 Grand
1421 Grand
1500 Grand
1501 Grand
1503 Grand
1504 Grand
1505 Grand
1506 Grand
1508 Grand
1511 Grand
1512 Grand
1514 Grand
1516 Grand
1518 Grand
1521 Grand
1523 Grand
1605 Grand
1607 Grand
1608 Grand
1611 Grand
1619 Grand
1622 Grand
1626 Grand
1701 Grand
1704 Grand
1705 Grand
1707 Grand
1710 Grand
1711 Grand
1712 Grand
1713 Grand
1715 Grand
1716 Grand
1717 Grand
1718 Grand
1725 Grand
1801 Grand
1352 Park St.

Concrete retaining wall along face of bluff

GRAND AVENUE HISTORIC DISTRICT
Fort Worth, Tarrant County, Texas

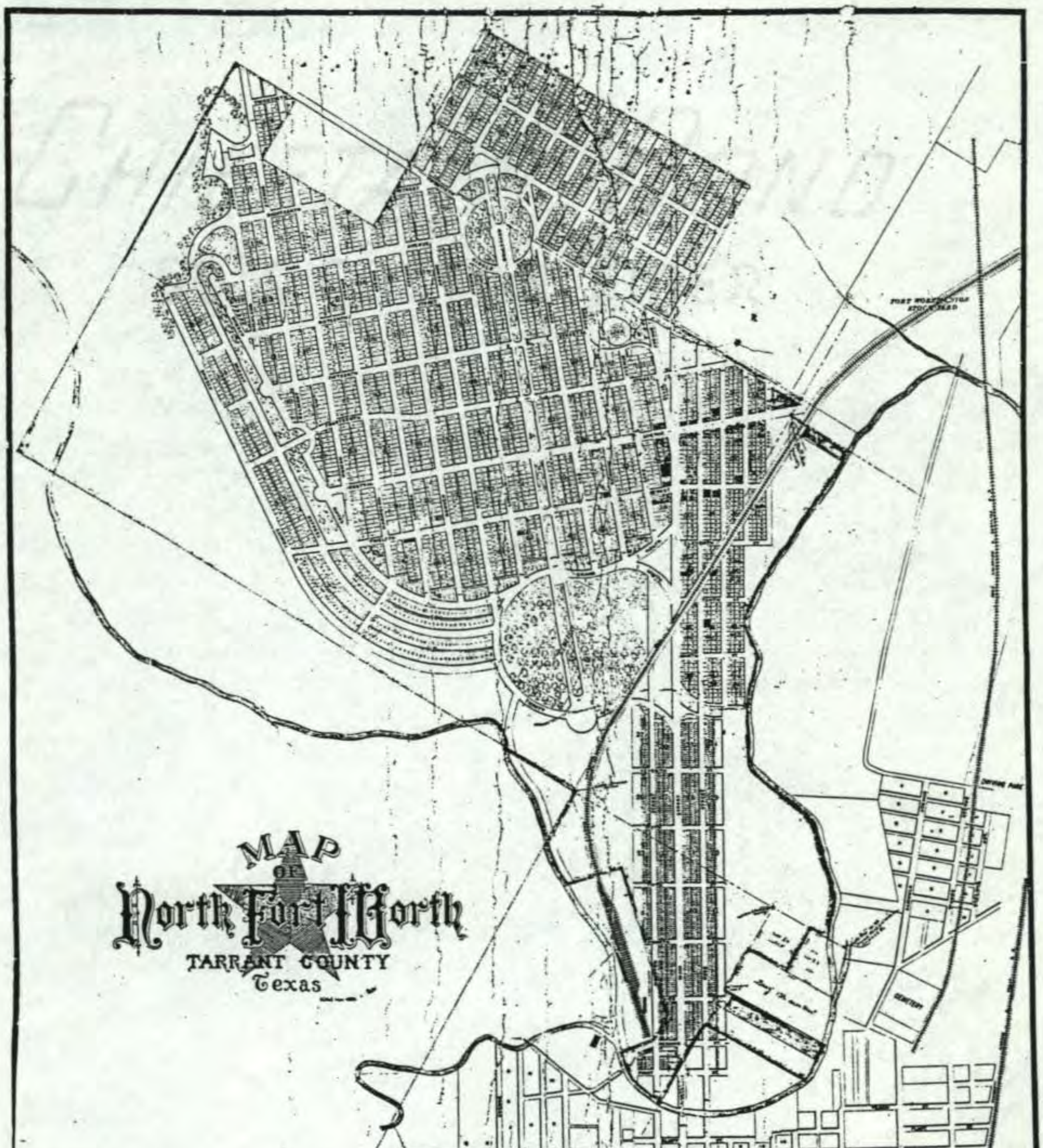
List of NonContributing Properties

1317 Grand	1519 Grand
1319 Grand	1522 Grand
1321 Grand	1604 Grand
1325 Grand	1606 Grand
1401 Grand	1610 Grand
1405 Grand	1614 Grand
1407 Grand	1615 Grand
1411 Grand	1618 Grand
1416 Grand	1623 Grand
1418 Grand	1627 Grand
1419 Grand	1702 Grand
1502 Grand	1714 Grand
1510 Grand	1720 Grand
1513 Grand	1723 Grand
1515 Grand	
Jacksboro Service Station	
Jacksboro Stables	

United States Department of the Interior
National Park Service

National Register of Historic Places
Continuation Sheet

Section number 7 Page 6



DESIGN for TOWN of NORTH FORT WORTH
NATHAN BARRETT 1888

NPS Form 10-900-a
(8-86)

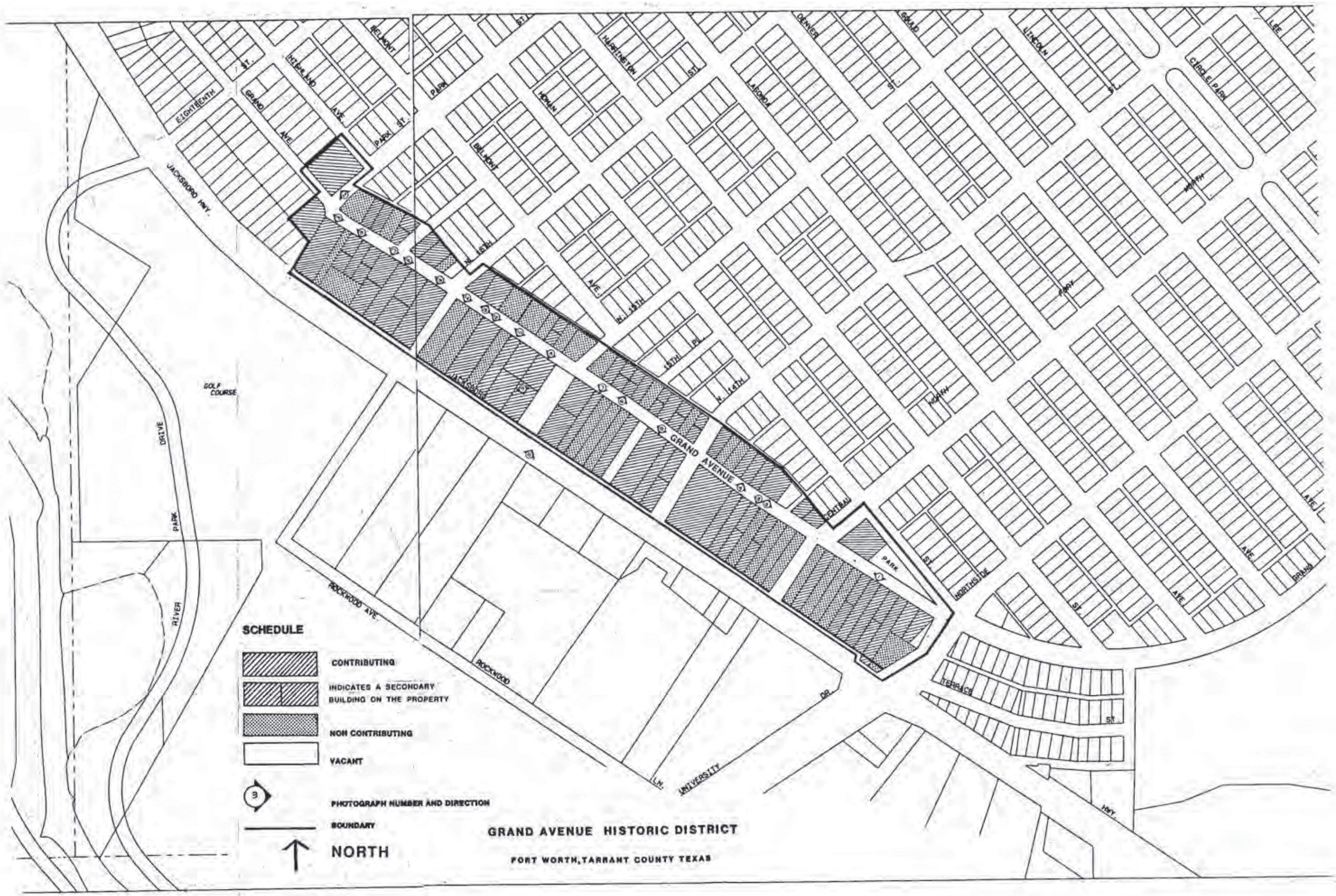
OMB Approval No. 1024-0018

United States Department of the Interior
National Park Service

National Register of Historic Places Continuation Sheet

Section number 7 Page 7

"OVERLAY of PLAN for NORTH FORT WORTH of 1888 ON MAP of FORT WORTH



GRAND AVENUE

NATIONAL REGISTER HISTORIC DISTRICT

OCTOBER 1, 1987

8. Statement of Significance

Certifying official has considered the significance of this property in relation to other properties:

☐ nationally ☐ statewide ☒ locally

Applicable National Register Criteria ☒ A ☐ B ☒ C ☐ D

Criteria Considerations (Exceptions) ☐ A ☐ B ☐ C ☐ D ☐ E ☐ F ☐ G N/A

Areas of Significance (enter categories from instructions)	Period of Significance	Significant Dates
Architecture	1902-1925	N/A
Community Planning & Development		

Cultural Affiliation
N/A

Significant Person
N/A

Architect/Builder
N/A

State significance of property, and justify criteria, criteria considerations, and areas and periods of significance noted above.

Text begins on Continuation Sheet 8-1.

☒ See continuation sheet

9. Major Bibliographical References

Fort Worth Stockyards Historic District, National Register Nomination, 1975,
Tarrant County Clerk and Recorder: Book 63, p. 149; Book 106, p. 91.
Fort Worth City Directories: 1906-1925.
Map of North Fort Worth, 1888, Tarrant County, Texas.
Page, Anderson, Turnbull, Historical Overview, North Fort Worth survey, Historic Preservation Council of Tarrant County, 1987, pp. 4-74.

☐ See continuation sheet

Previous documentation on file (NPS): N/A

☐ preliminary determination of individual listing (36 CFR 67) has been requested
☐ previously listed in the National Register
☐ previously determined eligible by the National Register
☐ designated a National Historic Landmark
☐ recorded by Historic American Buildings Survey # ______
☐ recorded by Historic American Engineering Record # ______

Primary location of additional data:

☒ State historic preservation office
☐ Other State agency
☐ Federal agency
☐ Local government
☐ University
☐ Other

Specify repository:
Texas Historical Commission, Austin, TX

10. Geographical Data

Acreage of property approx. 42 acres

UTM References

	Zone	Easting	Northing
A	1 4	6 5 3 0 0 0	3 6 2 7 2 8 0
B	1 4	6 5 3 2 0 0	3 6 2 7 4 2 0
C	1 4	6 5 3 9 8 0	3 6 2 6 6 4 0
D	1 4	6 5 4 1 2 0	3 6 2 6 7 8 0

☐ See continuation sheet

Verbal Boundary Description

☒ XX See continuation sheet

Boundary Justification

The boundary includes the visually coherent collection of early 20th century houses that have retained their basic integrity, as well as the dramatic natural bluff and retaining structure along the district's southwest edge.

☐ See continuation sheet

11. Form Prepared By

name/title Ron Emrich, Urban Prospects/Tom Niederauer & Associates
organization (with Tory Laughlin-Taylor, THC) date February, 1989
street & number 400 South Zang, Suite 925 telephone 214/942-4470
city or town Dallas state TX zip code 75208

The Grand Avenue Historic District is a remnant of the 19th-century design for the planned suburb of North Fort Worth, and a product of the early 20th-century growth of the city around its burgeoning northside stockyards and meatpacking industry. Although platted as a township in 1888, the grand plan for North Fort Worth was never fully realized. Grand Avenue, which curves along the crest of the bluff, reflects Nathan Barrett's romantic design for the area, and, as such, is significant in the area of Community Planning and Development. Annexed by Fort Worth in 1909, North Fort Worth proved an attractive area for the growing middle class to build their homes during the city's prosperous years in the early 20th century. Due to its proximity to the Stockyards district (N.R. 1975) and its beautiful vistas, Grand Avenue attracted the newly affluent middle management connected with the meatpacking industry. The opening of a streetcar route in 1889 from downtown Fort Worth along Main Street about a mile east of Grand Avenue, made North Fort Worth an accessible residential neighborhood for workers and professionals in the city as well. Built between 1906 and 1925, the houses in the district offer a good representation of the popular styles of the period, most predominantly the Bungalow. The historic integrity of the collection makes the district significant in the area of Architecture. The Grand Avenue Historic District meets National Register Criterion A for the period of affluence and growth which it represents in the history of Fort Worth, and Criterion C for its planning aspects and the collective quality of its architecture.

The north side of Fort Worth, across the Trinity River from the courthouse and downtown, developed slowly after the city's incorporation in 1873. The natural barrier of river bottoms and high bluffs effectively hemmed in northward development. The original town of Fort Worth roughly formed a square, bounded on the north by the river and on the south by the Texas and Pacific Railroad tracks. When the T&P Railroad arrived in 1876 the focus of the town shifted to the south where industrial, commercial and residential development occured close to the tracks. Across the river to the north and west, farms and ranches continued to thrive until the early 1890's because the area was perceived as less accessible and, therefore, less desirable for development.

The Grand Avenue Historic District is within the original Robert Reeves Survey of 1859. In 1887 more than 2,000 acres of land north and west of the confluence of the Clear and West Forks of the Trinity River were purchased by Fort Worth businessmen W.A. Huffman and A.T. Byers. Huffman and Byers served as President and Treasurer of the Fort Worth City Company and North Side Railway Company. Along with several other partners, they intended to create a new suburban community linked to Fort Worth by viaducts and street railways. The Fort Worth City Company engaged landscape architect Nathan Barrett to plan the new suburb, to be named North Fort Worth. Barrett had earned a national reputation as designer of the company town plan for Pullman, Illinois, in 1880.

Barrett's scheme for North Fort Worth combined elements of romantic and formal design (see illustration #2). The land of North Fort Worth rises gently from the riverbed directly north of downtown but includes steep bluffs to the west and a crest on the north. Barrett took advantage of the topography, designing concentric curving streets that followed the hillside on the west and south boundaries of his plan. The avenues were crossed with thoroughfares, creating a grid system for the interior of the plan. A circular park was proposed at the highest point to the north, terminating the cross streets and allowing a shift of the grid 45 degrees to the northeast. The park was connected by the 200-foot-wide Circle Park Boulevard to an existing circular cemetery at the south end, forming the spine of the plan. An extension of Main Street from downtown Fort Worth provided a vehicular and streetcar crossing of the river from downtown, entering North Fort Worth along the eastern edge of the subdivision, 10 blocks east of Grand Avenue.

The subdivision was platted in 1888 according to the Barrett plan, and the viaduct across the river was constructed in 1889. More than 10 miles of streetcar lines were opened in North Fort Worth that same year, becoming Fort Worth's first electric street railway. Unfortunately the suburb saw little growth in its first decade and Barrett's design was never fully realized. Today only Grand Avenue and Circle Park Boulevard remain as distinctive remnants of the original plan. At the end of the 19th century, most middle-class Fort Worth residents settled in the Southside, near the railroad yards and factories, and closer to downtown businesses. Wealthier residents built homes in the established areas near downtown or in the new development of Arlington Heights. With few homes being built in North Fort Worth, financial problems forced the Forth Worth City Company into receivership in 1897.

The subdivision changed hands several times until it was acquired in 1902 by the North Fort Worth Townsite Company. The company's directors included Louville Veranus Niles, the Boston meatpacking magnate who in 1899 had reorganized the major Fort Worth packing companies, forming the Fort Worth Packing and Provision Company. The extensive stockyards and industrial area to the northeast of North Fort Worth had recently been incorporated as Niles City. In 1902 the Swift and Armour Companies both constructed packing plants there. The resulting surge in commercial activity finally touched off the growth of North Fort Worth, causing an influx of stockyard and packing plant employees and their families to the area. The Townsite Company incorporated the town of North Fort Worth in 1902 and portions of the subdivision were replatted. The area along the western bluffs where Grand Avenue sits was resubdivided and named "Belmont Terrace." In Barrett's original plan three concentric avenues were platted following the edge of the bluffs, but only Grand Avenue survived as an element of the new plat.

The architecture of the Grand Avenue Historic District is significant within the context of the early 20th-century development of the Northside of Fort Worth. While the city's most fashionable neighborhoods in the early 20th century were located in southern and western sectors, northern Fort Worth was strongly working class. Grand Avenue, on the other hand, attracted the middle class. As a result the houses tend to be more substantial and better-detailed than is typically found in North Fort Worth. While few appear to have been architect designed, they represent strong examples of the bungalow and four square forms, reflecting Arts and Crafts, Prairie School and historical revival styles popular in the early 20th century.

Grand Avenue attracted the middle management of the meatpacking industry, small businessmen and many professionals. The area's location and commanding views made it desirable, although it never gained the prestige of the "established" Fort Worth neighborhoods. This was an area for the new middle class which was enjoying its modest properity in the midst of Fort Worth's economic boom. The cattle industry dominated the economic base of the Northside, consequently a large number of residents on Grand Avenue were involved in various aspects of the cattle industry, from trade and slaughtering to such peripheral functions as federal regulation of the industry. Typical of the early residents on Grand Avenue was Winfield S. Vinson, a cattle salesman with Casidy Southwestern Commission Company, who owned 1406 Grand Avenue (photo #2) built in 1907. J. Paul Henderson, a purchasing agent for Armour & Company first inhabited 1618 Grand (photo #11,) built in 1906. Armour clerk Norman S. Wood lived in the 1906 house at 1622 Grand (photo #13) and Allen D. Thomas, a cattle salesman for the North Texas Livestock Comission Company, purchased the 1907 house at 1711 Grand (photo #17). Representative of the professionals who moved to the Northside was Dr. Gause W. Covington, owner of the house at 1701 Grand (photo #15). A fellow physician, Dr. Demetrius Rumph had his home at 1521 Grand (photo #7) in 1919. Many of the Grand Avenue lots were developed by the Townsite Company and those houses were initially rented, before being sold in the 1910s.

A prominent resident of the district commissioned its grandest house: Waddy R. Ross had the large brick home at 1352 Park Street (photo #20) built in 1917. Ross, with his brothers Sam and R.E., had founded the Ross Brothers Horse and Mule Company and located their business in the Stockyards area. The enterprise was extremely successful and it provided horses and mules to ranchers, farmers, rodeos and the U.S. Army well into the 20th century. Among other civic accomplishments, Ross was a founder of what ultimately became the Southwestern Exposition and Fat Stock Show, which is still an important annual event for the ranching industry.

In 1909, with the North Fort Worth area booming, the town was annexed by the city of Fort Worth. Grand Avenue continued to grow into the 1920s. The population of Fort Worth as a whole grew in that decade from 106,000 to 163,000 residents. The 1930s saw a slowdown in the growth of the city, including the North Fort Worth neighborhoods. During the 1920s and 1930s the occupations of the residents of Grand Avenue reflected growing economic diversity of the area, but the cattle industry was still dominant. While Fort Worth as a whole rebounded in the 1940s, Grand Avenue and the residential areas farther east began to lose favor and did not match the residential growth of other sectors of the city. The decline of the Northside began in the 1950s, continuing through the 1960s and 1970s. In the 1950s, as the Fort Worth packing plants decreased their operations and eventually closed, the cattle industry decentralized and reduced its dependence on the stockyards. Without the packing plants to create an ongoing market, the stockyards no longer had to operate full time. Further decline occurred on Grand Avenue and the near Northside, long time residents left the area and neglect began to change the face of the street.

The 1980s have seen a new generation of Grand Avenue residents beginning the rehabilitation of homes within the District. The remarkable siting of the street, its location near downtown, and its quality architecture have led to a heightened appreciation of the neighborhood. In 1986 the "Tarrant County Historic Resources Survey, Phase V" recommended the creation of a Grand Avenue Conservation District. The City of Fort Worth applied, under the Certified Local Government program, for funds to produce a Grand Avenue Historic District nomination to the National Register, now submitted for consideration. Members of the neighborhood association and city staff hope that National Register listing will encourage still greater pride and rehabilitation work in the area.

Verbal Boundary Description:

Beginning at the northeast property line of Central Avenue, proceed northwest along the rear property lines of parcels facing southwest along Grand Avenue, to Park Street. Then proceed along the west curbline of Highland Avenue, to the rear property line of 1352 Park Street, following that property line to the east curbline of Grand Avenue, then along the north and then rear property lines of 1801 Grand Avenue, to the north property line of 1725 Grand Avenue, then along the northeast curbline of Jacksboro Highway to the southeast curbline of Northside, then along the centerline of Grand Avenue, to the north curbline of Central Avenue to the point of origin.

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

NATIONAL REGISTER OF HISTORIC PLACES
EVALUATION/RETURN SHEET

REQUESTED ACTION: NOMINATION

PROPERTY NAME: Grand Avenue Historic District

MULTIPLE NAME:

STATE & COUNTY: TEXAS, Tarrant

DATE RECEIVED: 1/29/90 DATE OF PENDING LIST: 2/13/90
DATE OF 16TH DAY: 3/01/90 DATE OF 45TH DAY: 3/15/90
DATE OF WEEKLY LIST:

REFERENCE NUMBER: 90000337

NOMINATOR: STATE

REASONS FOR REVIEW:

APPEAL:	N	DATA PROBLEM:	N	LANDSCAPE:	N	LESS THAN 50 YEARS:	N
OTHER:	N	PDIL:	N	PERIOD:	N	PROGRAM UNAPPROVED:	N
REQUEST:	N	SAMPLE:	N	SLR DRAFT:	N	NATIONAL:	N

COMMENT WAIVER: N

✓ ACCEPT ___RETURN ___REJECT 3/1/90 DATE Entered in the National Register

ABSTRACT/SUMMARY COMMENTS: Tape on photo's

RECOM./CRITERIA________________
REVIEWER________________
DISCIPLINE________________
DATE________________

DOCUMENTATION see attached comments Y/N see attached SLR Y/N

CLASSIFICATION

___count ___resource type

STATE/FEDERAL AGENCY CERTIFICATION

FUNCTION

___historic ___current

DESCRIPTION

___architectural classification
___materials
___descriptive text

SIGNIFICANCE

Period Areas of Significance--Check and justify below

Specific dates Builder/Architect
Statement of Significance (in one paragraph)

___summary paragraph
___completeness
___clarity
___applicable criteria
___justification of areas checked
___relating significance to the resource
___context
___relationship of integrity to significance
___justification of exception
___other

BIBLIOGRAPHY

GEOGRAPHICAL DATA

___acreage ___verbal boundary description
___UTMs ___boundary justification

ACCOMPANYING DOCUMENTATION/PRESENTATION

___sketch maps ___USGS maps ___photographs ___presentation

OTHER COMMENTS

Questions concerning this nomination may be directed to

______________________________ Phone ____________

Signed ____________________ Date __________

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1311 GRAND AVE., GRAND AVENUE HISTORIC DISTRICT
FORT WORTH, TEXAS
TED WATSON
9/87
TEXAS HISTORICAL COMMISSION
LOOKING SOUTHWEST
NO. 1 OF 21

1406 GRAND AVE., GRAND AVENUE HISTORIC DISTRICT 2
FORT WORTH, TEXAS
TED WATSON
9/87
NEG. TEXAS HISTORICAL COMMISSION
LOOKING SOUTHWEST
NO. 2 of 21

1406 Grand Ave.

1413 GRAND AVE, GRAND AVENUE HISTORIC DISTRICT
FORT WORTH, TEXAS
TED WATSON
9/87
NEG. TEXAS HISTORICAL COMMISSION
LOOKING SOUTHWEST
NO. 3 of 21

1413 Grand Ave.


562-FQS

4

1417 GRAND AVE., GRAND AVENUE HISTORIC DISTRICT
FORT WORTH, TEXAS
TED WATSON
9/87
NEG. TEXAS HISTORICAL COMMISSION
LOOKING SOUTHWEST
NO. 4 of 21

1417 Grand Ave.

1505 GRAND AVE., GRAND AVENUE HISTORIC DISTRICT
FORT WORTH, TEXAS
TED WATSON
9/87
NEG. TEXAS HISTORICAL COMMISSION
LOOKING SOUTHWEST
NO. 5 of 21

5

1505 Grand Ave.

1510-1518 GRAND AVE.
FORT WORTH, TEXAS
TED WATSON
9/87
NEG. TEXAS HISTORICAL COMMISSION
LOOKING NORTHEAST
NO. 6 of 21

6

1510-1518 Grand Ave.
Streetscape

1521 GRAND AVE., GRAND AVENUE HISTORIC DISTRICT
FORT WORTH, TEXAS
TED WATSON
9/87
NEG. TEXAS HISTORICAL COMMISSION
LOOKING SOUTHWEST
NO. 7 of 21

1521 Grand Ave.

1605 GRAND AVE., GRAND AVENUE HISTORIC DISTRICT 8
FORT WORTH, TEXAS
TED WATSON
9/87
NEG. TEXAS HISTORICAL COMMISSION
LOOKING SOUTHWEST
NO. 8 of 21

1605 Grand Ave.

1605 GRAND AVE., REAR, GRAND AVENUE HISTORIC DISTRICT
FORT WORTH, TEXAS
TED WATSON
9/87
NEG. TEXAS HISTORICAL COMMISSION
LOOKING SOUTHWEST
NO. 9 of 21

1605 Grand Ave.
Garage Quarters

1611 GRAND AVE., GRAND AVENUE HISTORIC DISTRICT

FORT WORTH, TEXAS

TED WATSON

9/87

NEG. TEXAS HISTORICAL COMMISSION

LOOKING SOUTHWEST

NO. 10 of 21

10

1611 Grand Ave.

1618 GRAND AVE., GRAND AVENUE HISTORIC DISTRICT
FORT WORTH, TEXAS
TED WATSON
9/87
NEG. TEXAS HISTORICAL COMMISSION
NO. 11 of 21

1618 Grand Ave.

1619 GRAND AVENUE, GRAND AVENUE HISTORIC DISTRICT 12

FORT WORTH, TEXAS

TED WATSON

9/87

NEG. TEXAS HISTORICAL COMMISSION

NO. 12 of 21

1619 Grand Ave.

1622 GRAND AVE., GRAND AVENUE HISTORIC DISTRICT 13
FORT WORTH, TEXAS
TED WATSON
9/87
NEG. TEXAS HISTORICAL COMMISSION
LOOKING NORTHEAST
NO. 13 of 21

1622 Grand Ave.

1627 GRAND AVE, GRAND AVENUE HISTORIC DISTRICT
FORT WORTH, TEXAS
9/87
NEG. TEXAS HISTORICAL COMMISSION
LOOKING SOUTHWEST
NO. 14 of 21

1627 Grand Ave.

1701 GRAND AVE., GRAND AVENUE HISTORIC DISTRICT 15
FORT WORTH, TEXAS
TED WATSON
9/87
NEG. TEXAS HISTORICAL COMMISSION
LOOKING SOUTHWEST
NO. 15 of 21

1701 Grand Ave.

1707 GRAND AVE., GRAND AVENUE HISTORIC DISTRICT 16
FORT WORTH, TEXAS
TED WATSON
9/87
NEG. TEXAS HISTORICAL COMMISSION
LOOKING SOUTHWEST
NO. 16 of 21

1707 Grand Ave.

1711 GRAND AVE., GRAND AVENUE HISTORIC DISTRICT 17
FORT WORTH, TEXAS
TED WATSON
9/87
NEG. TEXAS HISTORICAL COMMISSION
LOOKING SOUTHWEST
NO. 17 of 21

1711 Grand Ave.

1718 GRAND AVE., GRAND AVENUE HISTORIC DISTRICT 18
FORT WORTH, TEXAS
TED WATSON
9/87
NEG. TEXAS HISTORICAL COMMISSION
LOOKING NORTHEAST
No. 18 of 21

or 1728

1718 Grand Ave.

1725 GRAND AVENUE, GRAND AVENUE HISTORIC DISTRICT
FORT WORTH, TEXAS
TED WATSON
9/87
NEG. TEXAS HISTORICAL COMMISSION
LOOKING SOUTHWEST
NO. 19 of 21

1725 Grand Ave.


1352
PARK

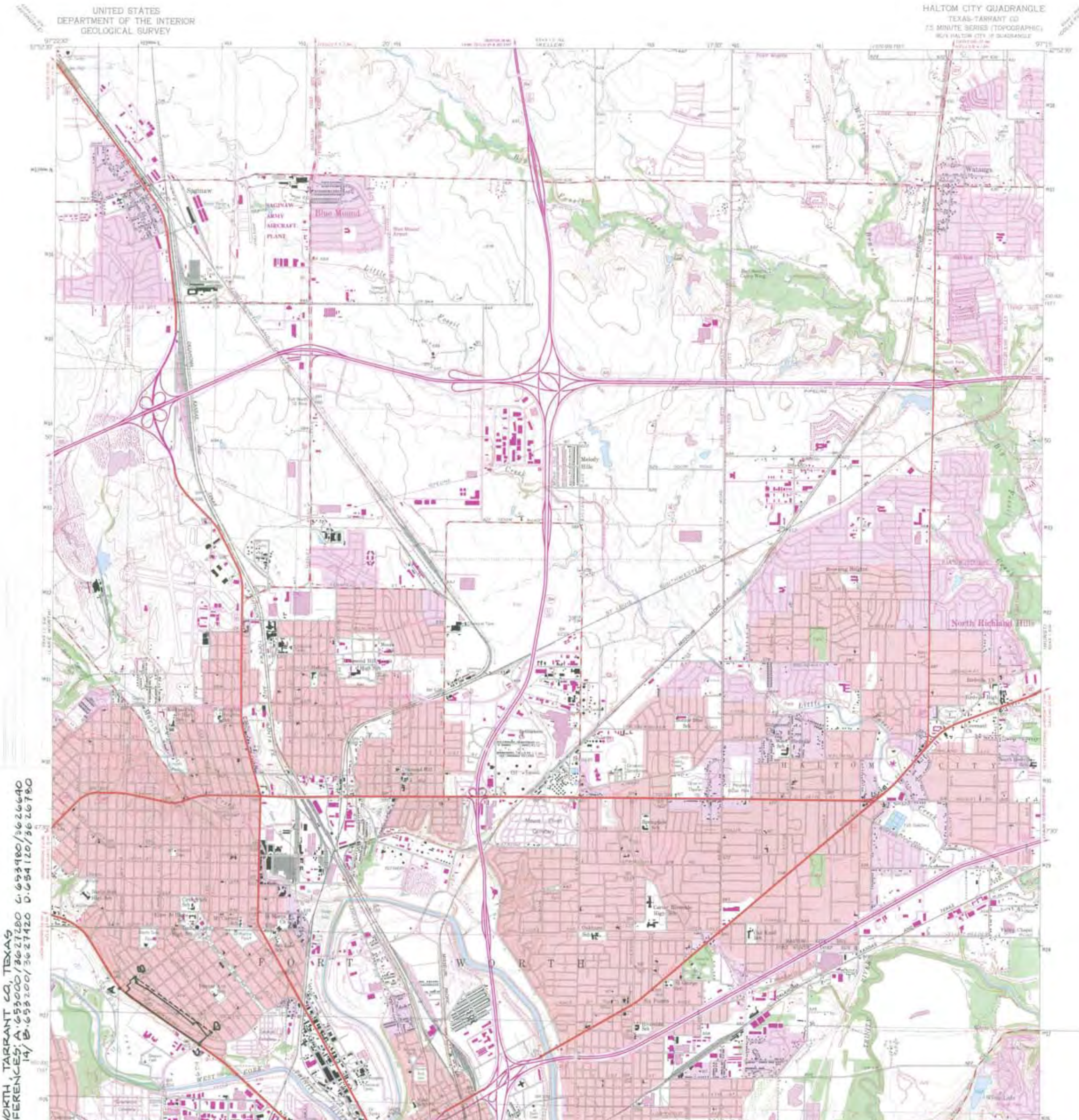
1352 GRAND AVE., GRAND AVENUE HISTORIC DISTRICT
FORT WORTH, TEXAS
TED WATSON
9/87
NEG. TEXAS HISTORICAL COMMISSION
LOOKING NORTH
NO. 20 of 21

1352 Park Street

JACKSBORO HWY. RETAINING WALL
GRAND AVENUE HISTORIC DISTRICT
FORT WORTH, TEXAS
9/87
NEG. TEXAS HISTORICAL COMMISSION
LOOKING DUE NORTH
NO. 21 of 21

21

Jacksboro Highway
Retaining Wall



UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
HALTOM CITY QUADRANGLE
TEXAS-TARRANT CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
GRAND AVENUE HISTORIC DISTRICT
FORT WORTH, TARRANT CO, TEXAS
UTM REFERENCES: A.653000/3627280 C.653980/3626690
14/ B.653200/3627420 D.654120/3626780
Saginaw
SAGINAW ARMY AIRCRAFT PLANT
Blue Mound
Watauga
Melody Hills
North Richland Hills
HALTOM CITY
FORT WORTH
Mapped, edited, and published by the Geological Survey
Control by USGS and NOS/NOAA
Topography by photogrammetric methods from aerial photographs taken 1952–1954. Field checked 1955
Polyconic projection. 10,000-foot grid ticks based on Texas coordinate system, north central zone. 1000-meter Universal Transverse Mercator grid ticks, zone 14, shown in blue. 1927 North American Datum. To place on the predicted North American Datum 1983 move the projection lines 10 meters south and 28 meters east as shown by dashed corner ticks
Red tint indicates areas in which only landmark buildings are shown
There may be private inholdings within the boundaries of the National or State reservations shown on this map
SCALE 1:24000
CONTOUR INTERVAL 10 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929
THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225, OR RESTON, VIRGINIA 22092
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST
ROAD CLASSIFICATION
Heavy-duty
Light-duty
Medium-duty
Unimproved dirt
U.S. Route
State Route
HALTOM CITY, TEX.
3297-431
1955
PHOTOREVISED 1981

Attachment B

Henderson Street Bridge National Register of Historic Places Registration Form

United States Department of the Interior

NATIONAL PARK SERVICE
1849 C Street, N.W.
Washington, D.C. 20240

March 21, 2011

Notice to file:

This property has been automatically entered in the National Register of Historic Places. This is due to the fact that the publication of our Federal Register Notice: "National Register of Historic Places: Pending Nominations and Other Actions" was delayed beyond our control to the point where the mandated 15 day public comment period ended after our required 45 day time frame to act on the nomination. If the 45th day falls on a weekend or Federal holiday, the property will be automatically listed the next business day. The nomination is technically adequate and meets the National Register criteria for evaluation, and thus, automatically listed in the National Register of Historic Places.

EB

Edson Beall
Historian
National Register of Historic Places
Phone: 202-354-2255
E-mail: Edson_Beall@nps.gov
Web: www.nps.gov/history/nr

NPS Form 10-900 OMB No. 1024-0018 128 (Expires 5/31/2012)

RECEIVED 2280

FEB 03 2011

NAT. REGISTER OF HISTORIC PLACES NATIONAL PARK SERVICE

United States Department of the Interior
National Park Service

NATIONAL REGISTER OF HISTORIC PLACES
REGISTRATION FORM

1. NAME OF PROPERTY

HISTORIC NAME: Henderson Street Bridge
OTHER NAME/SITE NUMBER: Royal Street Bridge

2. LOCATION

STREET & NUMBER: Henderson Street at the Clear Fork of the Trinity River
CITY OR TOWN: Fort Worth **VICINITY:** N/A **NOT FOR PUBLICATION:** N/A
STATE: Texas **CODE:** TX **COUNTY:** Tarrant **CODE:** 439 **ZIP CODE:** 76102

3. STATE/FEDERAL AGENCY CERTIFICATION

As the designated authority under the National Historic Preservation Act, as amended, I hereby certify that this _x_ nomination ___ request for determination of eligibility meets the documentation standards for registering properties in the National Register of Historic Places and meets the procedural and professional requirements set forth in 36 CFR Part 60. In my opinion, the property _x_ meets ___ does not meet the National Register criteria. I recommend that this property be considered significant ___ nationally _x_ statewide _x_ locally. (___ See continuation sheet for additional comments.)

Mark Wolfe 1/28/11

Signature of certifying official Date

State Historic Preservation Officer, Texas Historical Commission

State or Federal agency and bureau

In my opinion, the property ___ meets ___ does not meet the National Register criteria.
(___ See continuation sheet for additional comments.)

Signature of commenting or other official Date

State or Federal agency and bureau

4. NATIONAL PARK SERVICE CERTIFICATION

I hereby certify that this property is: Signature of the Keeper Date of Action

_✓_ entered in the National Register for Edson H. Beall 3.21.11
___ See continuation sheet.
___ determined eligible for the National Register
___ See continuation sheet.
___ determined not eligible for the National Register

___ removed from the National Register

___ other (explain):

5. CLASSIFICATION

OWNERSHIP OF PROPERTY: Public: State

CATEGORY OF PROPERTY: Structure

NUMBER OF RESOURCES WITHIN PROPERTY:	**CONTRIBUTING**	**NONCONTRIBUTING**
	0	0 **BUILDINGS**
	0	0 **SITES**
	1	0 **STRUCTURES**
	0	0 **OBJECTS**
	1	0 **TOTAL**

NUMBER OF CONTRIBUTING RESOURCES PREVIOUSLY LISTED IN THE NATIONAL REGISTER: 0

NAME OF RELATED MULTIPLE PROPERTY LISTING: Historic Bridges of Texas, 1866-1945

6. FUNCTION OR USE

HISTORIC FUNCTIONS: Transportation/road-related (vehicular) = bridge

CURRENT FUNCTIONS: Transportation/road-related (vehicular) = bridge

7. DESCRIPTION

ARCHITECTURAL CLASSIFICATION: Other: Open Spandrel Concrete Arch Bridge

MATERIALS: **FOUNDATION** Concrete
WALLS N/A
ROOF N/A
OTHER Superstructure: Concrete; Roadwearing surface: Asphalt; Railing: Concrete

NARRATIVE DESCRIPTION (see continuation sheets 7-5 through 7-7)

Summary Description

The Henderson Street Bridge (originally known as the Royal Street Bridge) spans the Clear Fork of the Trinity River in Fort Worth, Texas. Constructed in 1930, the reinforced concrete structure is 796' long between abutments and 836' in total length. It consists of a 124' long open spandrel concrete arch and 14 variable depth concrete girder approach spans. The bridge is 73' wide carrying a 56' wide four-lane roadbed and 7' wide sidewalks on either side. The roadbed of the bridge is paved with asphaltic concrete pavement. The graceful open spandrel arch, cantilevered brackets, curved girder fascias and the decorative handrails add an architectural quality and contribute to the aesthetically pleasing design. The handrails feature round arch concrete panels divided into sections by concrete posts. These posts are detailed with classical plinth, dado and coping. Original concrete light standards surmounting approximately every other post have been removed. The bridge is located one-tenth of a mile south of White Settlement Road and approximately three-eights of a mile west of the confluence of the Clear and West forks of the Trinity River. Henderson Street is a major north-south arterial near the western edge of the Central Business District and becomes part of SH 199 at Interstate 30 (south of the bridge). To the southeast of the bridge is the modern campus of RadioShack Corporation (2004-05). Beneath the southern girder spans of the bridge and extending further west are the remnants of a parking lot. The north bank of the river is edged with a paved walking/bike trail. The Henderson Street Bridge retains a high degree of integrity.

Description

With its open spandrel concrete arch, the Henderson Street Bridge provides a fitting gateway into downtown Fort Worth, Texas. Spanning the Clear Fork of the Trinity River on SH 199, also known as the Jacksboro Highway, the bridge is an important link between the Central Business District and points northwest of the city. The overall length of the bridge is 836'. It is 796' long between the abutments. It was designed by C. Milo Thelin, an engineer with the City of Fort Worth, and Ira G. Hedrick, a noted bridge consultant from Hot Springs, Arkansas. It was constructed in 1930 by Frank Parrott of Dallas, Texas. The bridge consists of a 124' long open spandrel concrete arch and 14 variable depth reinforced concrete beam and girder approach spans of 48' each. The bridge is 73' wide which includes a four-lane asphalt-topped roadbed that is 56' wide with 7' wide concrete sidewalks on both sides. The design of the bridge is notable for its graceful open spandrel concrete arch, curved fascia girders, cantilevered brackets beneath the sidewalks, and handrails along the sidewalks that consist of rounded arched concrete panels divided by concrete posts. The posts are classically detailed with plinth, dado and coping.

The substructure of the bridge is divided into three sections. The southern section consists of eleven girder spans and the northern section has three girder spans (see Figure 3). The girder spans are placed 48' apart. Each span is supported by chamfered piers between curved fascia girders. A horizontal curve towards the west begins with the second girder span from the south end of the bridge (see Figure 6). Extending perpendicular from the fascia girders are cantilevered brackets that support the sidewalk above. Between the southern and northern sections is an open spandrel four-rib concrete arch having a 124' span (see Figure 1). This is the most distinctive design element of the bridge. Four chamfered piers of varying lengths connect the tops of the ribs with the superstructure. A notable feature of the design of the arch span is the 7' slab between the two interior ribs used to carry two 20" water mains across the river (only one is now present, see Figure 8).

With the exception of the arch abutments, the entire structure rests on concrete piers varying in length from 15' to 35' driven into rock. The arch abutments are embedded at least 3' in solid rock 30' below ground surface. Expansion joints are placed every two girder spans (96' apart). Another provision for allowing expansion is the placement of two bronze plates ½" thick under each girder.[1]

On each of the four end handrail posts, a bronze plaque is attached to the dido facing the roadbed (see Figure 5). The plaques read:

1930
HENDERSON STREET BRIDGE
BUILT BY
CITY OF FORT WORTH, TEX.

O. E. CARR D. L. LEWIS IRA G. HEDRICK
CITY MANAGER CITY ENGINEER CONSULTING
ENGINEERING

COUNCILMEN
W. BURTON J. R. PENN
J. B. DAVIS WM. BRYCE E. T. RENFRO
VAN ZANDT JARVIS MAYOR DR. W. R. THOMPSON
WM. MONNING A. E. THOMAS
CONTRACTOR FRANK PARROTT

Several other bronze plaques are also located on the dados of posts on the west side of the bridge. One was erected by the Frances Cooke Van Zandt Chapter of the Daughters of the Republic of Texas dedicating the bridge to James Pinckney Henderson, first governor of Texas. Another was erected by the Tarrant County Historical Society commemorating the location of Fort Worth's first mill, originally located west of the bridge.

[1] C. Milo Thelin, "High-Strength Concrete Used in New Fort Worth, Tex., Bridge," *Engineering News-Record* (October 1, 1931): 527.

Alterations/Current Condition

The Henderson Street Bridge retains a high degree of integrity. The most noticeable alteration is the removal of the original concrete light standards that formerly surmounted the posts of the handrails. Currently, lights hang from underneath the southern girder spans and formerly illuminated the parking lot in this area. As originally constructed, the roadbed was considered to be wide enough for six lanes; four 9' and two 10' wide traffic lanes. It retains its original width but now carries four lanes. According to a Texas Department of Transportation Bridge Inspection Report from June 13, 1996 (reinspected August 1, 1997), the bridge's overall condition is satisfactory, displaying signs of aging and wear as might be expected on a heavily used bridge that is over 75 years old. The handrails have a few areas of collision damage, scaling, delamination and spalling with exposed rebar at various locations. At the time of the inspection the roadbed was noted as having patched area as well as cracking and spalling at joints. It appears that the deck has been resurfaced since that report. The super- and substructures display some cracking and spalling with exposed rebar. These conditions are still present. Although the bridge has suffered slight deterioration, it retains its integrity of design, materials, workmanship, location, feeling and association.[2]

The setting of the bridge has changed somewhat with improvements to the levee system along the Trinity River and its tributaries. Following the Great Flood of 1949, significant measures were undertaken by the U.S. Corps of Engineers, Fort Worth District, to control flooding. One aspect of this project included the rechanneling of the Clear Fork which straightened portions of its meandering course in the immediate vicinity of the bridge. Grassy banks now line the river and a walking/bike trail follows the north bank of the Clear Fork, running under the north end of the bridge. As mentioned earlier, a paved parking lot is located beneath the south end of the bridge. Over the next several years, the City of Fort Worth will construct a new channel for the Trinity River, straightening the course of the river through town as part of their project to develop the "Central City" area north of downtown (see Figure 9). The Clear Fork of the Trinity will retain its current water level at the location of the Henderson Street Bridge. The levees along the Clear Fork, however, will be decommissioned and eventually removed. The area around the bridge is already very developed, the levees have been constantly altered throughout the history of the bridge, and therefore no loss of integrity of setting is anticipated based on these changes.

[2] Texas Department of Transportation. Bridge Inspection Report, Henderson Street Bridge, June 13, 1996, reinspected August 1, 1997.

8. STATEMENT OF SIGNIFICANCE

APPLICABLE NATIONAL REGISTER CRITERIA

_x_ **A** PROPERTY IS ASSOCIATED WITH EVENTS THAT HAVE MADE A SIGNIFICANT CONTRIBUTION TO THE BROAD PATTERNS OF OUR HISTORY.
___ **B** PROPERTY IS ASSOCIATED WITH THE LIVES OF PERSONS SIGNIFICANT IN OUR PAST.
_x_ **C** PROPERTY EMBODIES THE DISTINCTIVE CHARACTERISTICS OF A TYPE, PERIOD, OR METHOD OF CONSTRUCTION OR REPRESENTS THE WORK OF A MASTER, OR POSSESSES HIGH ARTISTIC VALUE, OR REPRESENTS A SIGNIFICANT AND DISTINGUISHABLE ENTITY WHOSE COMPONENTS LACK INDIVIDUAL DISTINCTION.
___ **D** PROPERTY HAS YIELDED, OR IS LIKELY TO YIELD, INFORMATION IMPORTANT IN PREHISTORY OR HISTORY.

CRITERIA CONSIDERATIONS: N/A

AREAS OF SIGNIFICANCE: Engineering; Transportation

PERIOD OF SIGNIFICANCE: 1930-1961

SIGNIFICANT DATES: 1930, 1931

SIGNIFICANT PERSON: N/A

CULTURAL AFFILIATION: N/A

ARCHITECT/BUILDER: Hedrick, Ira G., Consulting Engineer
Thelin, C. Milo, Engineer [designer]
Lewis, Dudley, City Engineer [supervisor]
Parrott, Frank, Contractor

NARRATIVE STATEMENT OF SIGNIFICANCE (see continuation sheets 8-8 through 8-16).

9. MAJOR BIBLIOGRAPHIC REFERENCES

BIBLIOGRAPHY (see continuation sheets 9-17 through 9-18).

PREVIOUS DOCUMENTATION ON FILE (NPS): N/A

_ preliminary determination of individual listing (36 CFR 67) has been requested.
_ previously listed in the National Register
_previously determined eligible by the National Register
_ designated a National Historic Landmark
_ recorded by Historic American Buildings Survey #
_ recorded by Historic American Engineering Record #

PRIMARY LOCATION OF ADDITIONAL DATA:

x State historic preservation office *(Texas Historical Commission)*
x Other state agency *(Texas Department of Transportation, Environmental Affairs Division)*
_ Federal agency
_Local government
_ University
_ Other -- Specify Repository:

Statement of Significance

The Henderson Street Bridge, originally called the Royal Street Bridge, is an excellent example of a reinforced concrete, open spandrel arch bridge. Spanning the Clear Fork of the Trinity River in Fort Worth, Texas, it is one of a small number of intact examples of the type in Texas. Built in 1930, it was designed by C. Milo Thelin of the City's Engineering Department and Ira G. Hedrick, noted bridge consultant from Hot Springs, Arkansas. Its 124' arch spans the river and creates a graceful gateway to the west side of downtown Fort Worth. Its arcaded concrete handrails, cantilevered brackets beneath the sidewalks and curved fascia girders also add to its architectural sophistication. Because of its design qualities, it is eligible for listing in the National Register of Historic Places under Criterion C at the state level of significance in the area of Engineering. Constructed during an era of City and County efforts to improve mobility, the bridge became a vital link on the Jacksboro Highway (originally SH34, now SH199), connecting the Central Business District to points northwest of the downtown and beyond the city. It remains an important link over a significant crossing on the Jacksboro Highway and is also eligible for the National Register under Criterion A at the local level of significance for its importance to the Transportation history of Fort Worth and Tarrant County. The period of significance is from 1930, representing the year the bridge was constructed, to 1961. The latter year corresponds with the National Register's 50-year criterion.

Narrative History

The Trinity River and its tributaries, the Clear Fork and the West Fork, have played an important role in the settlement and growth of Fort Worth, Texas. The city's origins began in 1849 as a military outpost on the bluffs above the confluence of the two forks of the river. By 1853, the military had abandoned the fort but the settlement that had grown up around it survived and eventually flourished. Fort Worth became the seat of Tarrant County in 1860 and the city was incorporated in 1873. In 1876, the Texas & Pacific Railway reached the town and it soon became a major railroad hub in North Central Texas. By 1900, it had a population of 26,688. With the arrival of the Armour and Swift meat packing plants in 1902, the population of Fort Worth grew at an incredible rate and by 1910, had grown to 73,312. As the central core of the city was surrounded by the river on three sides, it became imperative to construct adequate bridges to connect the city with the Stock Yards to the north and the areas developing on its fringes, as well as to facilitate travel beyond Fort Worth.

Early Fort Worth bridges were constructed of wood or a combination of wood and steel (some being noted as wire bridges). With the Trinity River's untamed nature and tendency to flood, a concerted effort was made to build bridges that could survive such events. Tarrant County residents passed a bond issue to construct four bridges—the Main Street, West Seventh Street, Samuels Avenue and East Fourth Street viaducts—across the Trinity River in December 1911. S. W. Bowen of Brenneke and Fay, Consulting Engineers, of St. Louis was the designer. All were of reinforced concrete. For two of the structures, the West Seventh Street (or Van Zandt) Viaduct and the Main Street Viaduct, Bowen chose open spandrel arched designs. Both of these structures were important links to the Central Business District (CBD) and the Seventh Street Viaduct was adjacent to a large public park and "in a high-class residential district." The arched designs were not only beautiful, but for Bowen, they were logical choices as such designs were well suited for the particular geological conditions at both sites and were ideal for withstanding major flooding. Spanning a distance of 1,745' 3", the Main Street Viaduct, constructed between December 1912 and March 1914 and officially named the Paddock Viaduct in 1913, was the first reinforced concrete arch bridge in the nation to use self-supporting reinforced steel. Thus the precedence of using open spandrel concrete bridges to span the Trinity River in Fort Worth was set early in the 20th century. Since then, the Paddock Viaduct has become an important landmark in Fort Worth. It was listed on the National Register of Historic Places in 1979 at the national level of significance for its innovative design and has been designated a Texas Civil Engineering Landmark.[3]

With its rapid growth during the early 20th century, finding an adequate supply of water for Fort Worth became a source of concern for city leaders. In 1911, a recommendation was made to impound the water of the West Fork of the Trinity River. The construction of a dam began that year and the reservoir was completed in 1914. Known as Lake Worth, it soon became a recreational destination. The City of Fort Worth constructed a meandering road around its forty-mile shoreline and one-year campsite leases were issued by the Park and Recreation Department.[4]

But the Lake Worth dam was over five miles northwest of the CBD and a convenient way of getting there by automobile did not exist. By 1928, the residents of Tarrant County had passed a bond issue for the construction of a highway from Fort Worth that would extend from the city limits in a northwest direction to Lake Worth and then beyond to Azle at the Tarrant County-Parker County line. From there, the highway would continue on to Jacksboro in Jacks County. Formerly, to get to Jacksboro from Fort Worth, one had to travel through Decatur, Texas, for a distance of 82 miles. The new highway would provide a more direct route at a distance of 60 miles. When the bond issue was passed, the plan called for the highway to connect with a bridge the City planned to build at the north end of Royal Street. Royal Street ran at a northwest angle from West Fifth Street and the north end of Henderson Street, a north-south street on the western edge of the CBD, and terminated at the south bank of the Clear Fork (see Map 1). This plan met with opposition from business interests on North Main Street who preferred that the highway traverse their district, but the Royal Street proposition prevailed. By March 1929, the final route of the Jacksboro Highway within the city limits had been approved. From the proposed Royal Street Bridge, the highway would run in a northwesterly direction across the Trinity River bottoms, an area largely used for truck farming, for approximately three-quarters of a mile where it would cross the West Fork over a bridge to be constructed by the State. From there it would connect

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[3] S. W. Bowen, "The Design and Construction of Four Reinforced Concrete Viaducts at Fort Worth, Texas," *American Society of Civil Engineers Transactions,* Paper no. 1329, 1914; Historic American Engineering Record (HAER), National Park Service, U.S. Department of the Interior, "Main Street Viaduct (Paddock Viaduct)," HAER No. TX-50 [TEX 220-FOWOR, 7-], Prints and Photographs Division, Library of Congress. The West Seventh Street Viaduct still exists but received an addition on the west end in the early 1950s. In addition, the river was rechanneled to the west so that it no longer flows under the historic arch. The Texas Department of Transportation is developing plans to replace this structure.

[4] Tarrant County Historic Resources Survey, *Selected Tarrant County Communities* (Fort Worth: Historic Preservation Council for Tarrant County, Texas, 1990), 101.

with Terrace Avenue at Northwest Twelfth Street and then follow Terrace out of the city limits to the new bridge the City was building at the nine-mile road at Lake Worth (see Map 2).[5]

The construction of the Royal Street Bridge was part of a $1,000,000 plan adopted by the City Council in April 1928 that also called for the widening of Henderson Street in order to make it a north-south traffic arterial. Henderson Street was chosen for development as the arterial because it was the one street in the CBD that ran most continuous in a north and south line. It afforded the most suitable location for a grade separation at the Texas & Pacific (the traditional separation of the downtown and South Fort Worth) and the Frisco railways. The name of Royal Street was to be changed to Henderson Street, thus giving the street its northern extension. But the "Royal Street" name continued in use for several years and during and after construction, the bridge over the Clear Fork was often referred to as the Royal Street Bridge. The designer of the bridge, C. Milo Thelin, even referred to it as the Royal Street Bridge in an article about its construction that was published in the October 1, 1931 issue of *Engineering News-Record*.[6]

Preparation of plans and specifications for the bridge began in late August 1929. The design of the structure was a collaboration of the city's designing engineer, C. Milo Thelin, and consulting engineer, Ira G. Hedrick of Hot Springs, Arkansas, under the supervision of D. L. Lewis, city engineer. A newspaper account reported that the bridge was to be 650' long and 73' wide. This width would accommodate six lanes of traffic and seven foot wide concrete sidewalks on either side. The bridge was to be built above high water levels and without upgrade approaches. The south approach would begin at a point on Royal Street about 50' north of Valley Street and veer 17° westward. The north approach would begin on Franklin Street about 140' west of Woodward Street.[7]

When it was finally announced that the plans would be made available for bid, the *Fort Worth Star-Telegram* reported that the bridge would be 836' long and include ornamental light standards. The 14 girder spans would be 48' in length and the arch spanning the river would be 124' long. In March 1930, the contract for the construction of the bridge was awarded to Frank Parrott of Dallas for $235,639.58. Parrott's bid specified that the project would be completed in 250 working days. The contract stipulated that Parrott use local labor and materials. The funding for the project came from the recent sale of bonds that had been approved in 1925.[8]

Construction had begun on the bridge by April 1930. By November of that year, the work had progressed enough that installation of the bridge's lighting system was underway. Local electricians filed an injunction with the Seventeenth District Court asserting that Parrott had violated a local ordinance which stated that electrical work had to be done by qualified licensed and bonded contractors. Parrott countered that all of the work was

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[5] *Fort Worth Press,* September 6, 1928; *Fort Worth Record-Telegram*, January 18, 1929; *Fort Worth Star-Telegram*, March 20, 1929.
[6] *Fort Worth Star-Telegram*, April 17, 1928; *Fort Worth Record-Telegram,* march 31, 1931; Thelin, "High-Strength Concrete Used in New Fort Worth, Tex., Bridge."
[7] *Fort Worth Record-Telegram*, August 22, 1929.
[8] *Fort Worth Star-Telegram,* February 23, 1930 and March 11, 1930.

being done under the supervision of the city electrician. City Engineer D. L. Lewis told the City Council that the bridge lighting was not subject to the city electrical code. Around this same time, a Councilman opposed awarding Parrott a contract for relocating a sanitary sewer line at the city filtration plant on the grounds that Parrott had not kept his word regarding employment of local men during the construction of the Henderson Street Bridge. Finding employment for residents was an important issue for leaders during these early years of the Great Depression. Parrott insisted that the laborers were local men with the exception of a few specialists. The bridge was completed within nine months with the exception of the asphalt road surface which was not a part of Parrott's contract.[9]

Built nearly simultaneously as the Henderson Street Bridge and located approximately three-quarters of a mile to the northwest was the West Fork Bridge (or the Northwest Highway/Jacksboro Highway Bridge), a reinforced concrete cantilever span bridge supported by five concrete piers, each with triple rounded arches, and two solid concrete piers. It was 486' long and 4 lanes wide. Unlike the Royal Street Bridge, the construction of this bridge was a County project designed by state highway department engineers Gib Gilchrist (highway engineer) and George G. Wickline (bridge engineer). This bridge, also erected by Frank Parrott of Dallas, was constructed for approximately $200,000.[10]

The construction of the Henderson Street Bridge and the Northwest Highway/Jacksboro Highway Bridge coincided with the implementation of a five-year improvement plan fostered by the City of Fort Worth, Tarrant County and the Fort Worth Chamber of Commerce. From 1928 to 1932, numerous streets and boulevards, under- and overpasses, viaducts and bridges were constructed as either City or County sponsored projects. Besides the Henderson Street Bridge, another bridge constructed by the City during this era was the Lake Worth Bridge (Nine-Mile Bridge) at a cost of $200,000. County bridges, many of which received State aid, included the Purvis Road Bridge over the West Fork ($52,000), Stove Foundry Road (West Vickery Boulevard) Bridge over the Clear Fork ($80,000), East Belknap Street Bridge over the Trinity ($150,000), Frey Avenue Bridge over the Trinity ($50,000) and Cold Springs Road Bridge over the Trinity ($17,000).[11]

The Jacksboro Highway (initially designated as Highway 34), was also considered a part of this five-year plan (see Map 2). Local officials saw it as an important gateway to West Texas and wanted the highway to be constructed as a "dignified parkway," one which would provide a fitting entrance into the city. The landscape architecture firm of Hare and Hare of Kansas City, Missouri, was involved in the design of features along the divided highway which included concrete retaining walls on its east side at the base of the Grand Street bluff. As envisioned by the firm, the wall was to have been constructed with stone but instead was constructed of

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[9] *Fort Worth Star-Telegram*, November 19, 1930.

[10] Tarrant County Historic Resources Survey, *Fort Worth Near North Side and West Side, Westover Hills (*Fort Worth, Texas: Historic Preservation Council for Tarrant County, 1988): 91. This bridge is still extant.

[11] Fort Worth (Texas) Chamber of Commerce, *Five Years of Progress* (50th Anniversary Commemorative Re-Issue, Graphic History Limited, 1982): 19.

concrete. The firm gave recommendations for covering the wall with ivy and planting the slopes above with shrubs or ground cover. Portions of this wall are still extant along the highway.[12]

The Jacksboro Highway between Fort Worth and Lake Worth was formally opened for traffic on Tuesday, August 11, 1931. Following a band concert at 6:30 p.m., a ribbon cutting with speeches by local dignitaries was held at 7:00 p.m. at the newly completed bridge over the West Fork. At 8:00 p.m., a car caravan to Lake Worth began. As noted in a local paper, "From West Seventh Street [south of the Henderson and West Fork bridges] to the end of the paved portion of the new highway beyond Lake Worth, the parade of automobiles resembled a huge serpent of light when viewed from high points along the parkway type highway of reinforced concrete."[13]

As a main artery for transportation in the 1940s and 1950s, the Jacksboro Highway had several businesses along its length associated with automobile travel, including restaurants, night clubs, and tourist courts. Nicknamed "Thunder Road," the businesses catering to entertainment featured musicians such as Bob Wills and the Texas Playboys and Willie Nelson.[14] Despite the Jacksboro Highway's sordid reputation as a haven for criminal activity, including the illegal sale of liquor, gambling, and illegal prostitution, it remained one of the major arterials in Fort Worth leading to outlying communities (see Maps 3 and 4). The 1995 USGS Haltom City 7.5' quadrangle still identifies the contemporary route as a primary highway. The Jacksboro Highway and consequently, the Henderson Street Bridge, remain important connections to Lake Worth and the communities along its route in Tarrant County, as well as a link to West and Northwest Texas.

Designers and Builders of the Henderson Street Bridge

C. Milo Thelin designed the Henderson Street Bridge. He received a degree in Civil Engineering from South Dakota A & M College (South Dakota State University). Prior to his employment with the City, he worked for three years as a bridge designer and engineer for the Indiana Highway Department and a year in the engineering department of Standard Oil of Indiana. He began his employment with the City of Fort Work in 1928 as a designing engineering. His first project was designing the Lake Worth Bridge (D. L. Lewis is the engineer of record and Ira G. Hedrick was the consulting engineer). Other projects with which he was associated included the lighting systems at the municipal airport and for the underpasses built by the Texas & Pacific Railway, the East Rosedale Street Bridge, as well as other bridges and paving projects. In 1941, he became

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[12] Texas Department of Transportation, *Connecting History: The Bridges of Fort Worth* [video], (Fort Worth, Texas: Fort Worth District, Texas Department of Transportation, 2001); S. Herbert Hare to Mrs. Will F. [Mary Daggett] Lake, September 23, 1931, Mary Daggett Lake Papers, Fort Worth Public Library Archives, Series V, Box 5-1:16.

[13] *Fort Worth Star-Telegram*, morning edition, August 12, 1931.

[14] Arnold, Ann. *Gamblers and Gangsters: Fort Worth's Jacksboro Highway in the 1940s and 1950s*. Eakin Press, Austin: 1998: 10, 16.

Assistant City Engineer in Fort Worth. In 1946 he served as the acting public works director and was made the permanent director of that department in 1947. Thelin was a member of the American Society of Civil Engineers, the Texas Society of Professional Engineers, the American Public Works Association and served as president of the Texas Public Works Association later in his career.[15]

Ira G. Hedrick, the consulting engineer for the Henderson Street Bridge, received a bachelor's degree in Civil Engineering from the University of Arkansas in 1892. He obtained a Bachelor of Applied Science in 1899, a Master of Science in 1901 and Doctor of Science in 1905, all from McGill University in Montreal. From 1899-1907, he was a junior partner in the firm of Waddell & Hedrick in Kansas City with the noted bridge engineer Dr. J. A. L. Waddell, with whom he had worked previously. From 1907-1915, he partnered with Victor Hugo Cochrane in the firm of Hedrick & Cochrane and then was a partner in the firm of Hedrick & Hedrick, all of Kansas City, Missouri. At the time of the construction of the Henderson Street Bridge, Hedrick was based in Hot Springs, Arkansas. Notable projects with which he was associated included the Houston Street Viaduct, an open spandrel reinforced concrete arched viaduct in Dallas, (1911, designed while with Hedrick & Cochrane, NR 1984), the Sellwood Bridge, a Warren deck truss bridge spanning the Willamette River in Portland, Oregon (1925), several bridges in Arkansas constructed in the late 1920s and early 1930s including the Newport Bridge, a cantilevered steel truss bridge in Newport, Arkansas (1929-30, NR 1990), and the Lake Worth Bridge (Nine-Mile Bridge), a concrete girder bridge in Fort Worth (1929, demolished 1987).[16]

D. (Dudley) L. Lewis served as the supervising engineer for the design of the Henderson Street Bridge. He was born in 1885 and attended Millsaps College, a preparatory school in Jackson, Mississippi, before entering Mississippi A & M College in Starksville and graduating from there in 1906 with a degree in Civil Engineering. He obtained a Bachelor of Science in Civil Engineering from Cornell University in 1908. He became resident engineer for a construction firm building the White Rock Reservoir in Dallas in 1910. Two years later he came to Fort Worth as a draftsman in the city's engineering department. Within two months he was appointed assistant engineer in charge of sidewalk and storm sewer projects. He was made assistant engineer in charge of construction and maintenance of sanitary sewers two years later. Lewis then became assistant city engineer and in 1919 was named head of the city's engineering department. In 1937 he was named acting city manager and was named the permanent city manager in August 1938. After only 11 months, he was removed from that position because of a personnel dispute. In 1940, he began work for Wyatt C. Hedrick on various defense-related projects in Texas and Arizona. In 1943, Lewis was named executive director of the State Department of Public Works in Austin. He died January 6, 1965.[17]

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[15] Fort Worth Star-Telegram Clippings Files, *s.v.* "Thelin, C. Milo," AR406-7-171, also AR406-7-56-13, Special Collections Division, University of Texas at Arlington Libraries, Arlington, Texas [hereafter cited as SCDUTA].

[16] *Who's Who in Engineering, 1922*-23 (New York, John W. Leonard Corporation, 1922): 276, 581, 1314; Online database of the Historic American Buildings Survey/Historic American Engineering Record (HABS/HAER) Collection at the Library of Congress, available at http://memory.loc.gov/cgi-bin/query, accessed June 26, 2007;Tarrant County Historic Resources Survey, *Selected Tarrant County Communities* (Fort Worth: Historic Preservation Council for Tarrant County, 1990): 133.

[17] Fort Worth Star-Telegram Clippings file, *s.v.* "Lewis, Dudley L," AR406-7-97-71, SCDUTA.

Frank Parrott of Dallas erected the bridge. His construction firm had several projects in the Dallas area subsequent to building the Henderson Street and Jacksboro Highway bridges in Fort Worth. These included an underground reservoir in southwest Oak Cliff in Dallas (1929) and a reinforced concrete bridge on Corinth Street for Dallas County (1929). W. O. Jones, assistant engineer for the City of Fort Worth, supervised the construction of the Henderson Street Bridge. W. W. O'Farrell was the resident engineer.[18]

Open Spandrel Concrete Arch Bridges

The first open spandrel concrete arch bridge in the United States was constructed ca. 1906 and one of the earliest in Texas was the 1910 Medina River Bridge in Bexar County. This type of bridge was an evolutionary step from the closed-spandrel arch bridge, using less material and giving open spandrel arch bridges a lightness and aesthetic appeal.[19] As a result, this kind of bridge was more appealing for prominent locations and made it an ideal choice for the State Highway Department to create entry bridges for their highways leading into cities, such as the Henderson Street Bridge in Fort Worth.[20]

According to the Texas Historic Bridge Inventory, the Henderson Street Bridge "gains its significance for its type, design, and architectural treatment. The bridge is a good example of a reinforced concrete, open-spandrel arch bridge. The bridge is one of a small number of intact examples of this bridge type in Texas, and is noteworthy for its graceful design and architectural treatment of its structural members. The bridge has retained its integrity of design, materials, workmanship, location, and sufficient integrity of setting, feeling and association, to meet National Register eligibility under Criterion C, Engineering, at the state level of significance."[21]

The Texas Department of Transportation's database indicates that there are only nineteen extant open-spandrel arch concrete bridges in Texas (see Table 1). Of these, one is not historic-age and three have been altered to the point that they no longer retain sufficient integrity for listing in the National Register of Historic Places; leaving fifteen that meet the criteria for eligibility. A small number of these are listed in the National Register of Historic Places. Most bridges of this type are located in urban areas and those that have been listed fall into this category. As mentioned previously, the Paddock Viaduct in Fort Worth is listed on the National Register at the national level of significance as the first reinforced concrete arch bridge in the country to use self-supporting reinforced steel. In addition, the following open spandrel concrete arch bridges are listed on the

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[18] *Dallas Morning News*, June 18 and June 25, 1929; Thelin, "High-Strength Concrete Used in New Fort Worth, Tex., Bridge."

[19] Parsons Brinckerhoff and Engineering and Industrial Heritage, *A Context for Common Historic Bridge Types: NCHRP Project 25-25, Task 15*. October 2005: 3-67. Texas Department of Transportation (TxDOT). "Texas Historic Bridge Inventory, Survey of Non-Truss Structures."

[20] Texas Department of Transportation (TxDOT). "Texas Historic Bridge Inventory, Survey of Non-Truss Structures:" 27-8.

[21] Texas Department of Transportation, Texas Historic Bridge Inventory, Structure ID 022200171-05-018, August 31, 1999.

National Register of Historic Places at the state level of significance: the Lamar Boulevard Bridge and the Barton Springs Bridge (as a contributing resource in the Zilker Park Historic District), both in Austin; the Houston Street Viaduct in Dallas; and the Iturbide Street Bridge and the Zacate Creek Bridge (both contributing resources in the Barrio Azteca Historic District) in Laredo.[22] In addition, the Lamar Boulevard Bridge in Austin and the Houston Street Viaduct in Dallas are both listed at the local level of significance for their importance to the history of Transportation in their locales.

Conclusion

The Henderson Street Bridge is an excellent example of a reinforced concrete, open spandrel arch bridge. Based on the criteria outlined in the statewide historic bridge context ("Historic Bridges of Texas, 1866-1945"), the Henderson Street Bridge is eligible for listing in the National Register of Historic Places under Criterion C, at the state level of significance because as one of nineteen extant reinforced concrete, open spandrel arch bridge in Texas, and it embodies the defining characteristics of its type. This bridge is also significant under Criterion A, at the local level, because it played a critical role in the development of a regional transportation system, as a critical crossing of the Jacksboro Highway over the Clear Fork of the Trinity River. The period of significance is from 1930, representing the year the bridge was constructed, to 1961. The latter year corresponds with the National Register's 50-year criterion. It retains its historic integrity through the retention of its character-defining features, including arch ribs, spandrel, spandrel columns, railing, piers, abutments, and wingwalls.

[22] Mark Brown, Texas Department of Transportation, e-mail correspondence with Susan Allen Kline, July 11, 2007; Warren Grannis, Texas Department of Transportation, e-mail correspondence with Susan Allen Kline, July 12, 2007.

Table 1. Open spandrel concrete arch bridges in Texas.

Road or facility	Feature crossed	County	Year built	Significance	Structure length (ft)	Number of Spans	Length of main span (ft)
Henderson Street (SH 199)	Clear Fork Trinity River	Tarrant	1930	eligible	796	15	124
N Main Street (BU 287P)	Trinity River	Tarrant	1914	NR listed	1319	16	225
E Vickery Boulevard	Sycamore Creek	Tarrant	1930	not eligible	116	1	60
Business 287/ Loop 370	Wichita River	Wichita	1929	eligible	276	3	95
5th Street	Waco Creek	McLennan	1930	not eligible	46	1	45
South 15th Street	Waco Creek	McLennan	1922	eligible	42	1	38
Main Street	Buffalo Bayou	Harris	1914	NR listed	1275	31	170
San Jacinto Street	Buffalo Bayou	Harris	1914	NR listed	325	8	110
Lamar Street (Loop 343)	Colorado River	Travis	1943	NR listed	659	6	105
West 24th Street	Shoal Creek	Travis	1928	NR listed	138	3	55
Barton Springs Road	Barton Creek	Travis	1925	NR listed	212	3	70
South Congress Avenue	Ladybird Lake	Travis	1909	not eligible	946	8	119
Canyon Ridge	Branch of Walnut Creek	Travis	2003	not historic age	1311	5	47
Business 35	Guadalupe River	Comal	1934	eligible	818	10	120
San Antonio Street	Comal River	Comal	1923	eligible	410	7	70
Houston Viaduct	IH 30 & Trinity River	Dallas	1911	NR listed	4785	65	103
Blackburn Street	Turtle Creek	Dallas	1928	eligible	33	1	30
Iturbe-Market Street	Zacate Creek	Webb	1928	NR listed	112	1	96
Parking lot	Zacate Creek	Webb	1928	NR listed	98	1	90

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__________. "Trinity River Bridge (East Belknap Street Bridge)," HAER No. TX-88 [TEX 220-FOWOR, 11-], Prints and Photographs Division, Library of Congress.

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_________. *Selected Tarrant County Communities*, Fort Worth: Historic Preservation Council for Tarrant County, 1990.

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Texas Department of Transportation. "Texas Historic Bridge Inventory, Survey of Non-Truss Structures."

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10. GEOGRAPHICAL DATA

ACREAGE OF PROPERTY: approximately 1.4 acres

UTM REFERENCES		Zone	Easting	Northing
	1.	14	655422.5	3625551.5
	2.	14	655240	3625724

VERBAL BOUNDARY DESCRIPTION The nomination encompasses the structure, the Henderson Street Bridge at the Clear Fork of the Trinity River, from the extreme south end of the structure (beginning at the southernmost end posts of the handrails) to the extreme north end of the structure (ending at the northernmost end posts of the handrails) on the north side of the river and the extreme edges of concrete construction to include the sidewalks and concrete handrails on the east and west sides of the bridge.

BOUNDARY JUSTIFICATION The boundaries include all of the components historically associated with the nominated structure.

11. FORM PREPARED BY (with assistance from Adrienne Campbell, THC Historian)

NAME/TITLE: Susan Allen Kline, Subcontractor

ORGANIZATION: Geo-Marine, Inc. **DATE**: July 2007

STREET & NUMBER: 2201 K Avenue, Suite A2 **TELEPHONE**: 972-423-5480

CITY OR TOWN: Plano **STATE:** Texas **ZIP CODE:** 75074

ADDITIONAL DOCUMENTATION

CONTINUATION SHEETS

MAPS (see continuation sheet MAPS-19 through MAPS-22)

PHOTOGRAPHS (see continuation sheet PHOTO-30 through PHOTO-31)

ADDITIONAL ITEMS (see continuation sheet FIGURES-23 through FIGURES-29)

PROPERTY OWNER

NAME: Office of the Governor, State of Texas

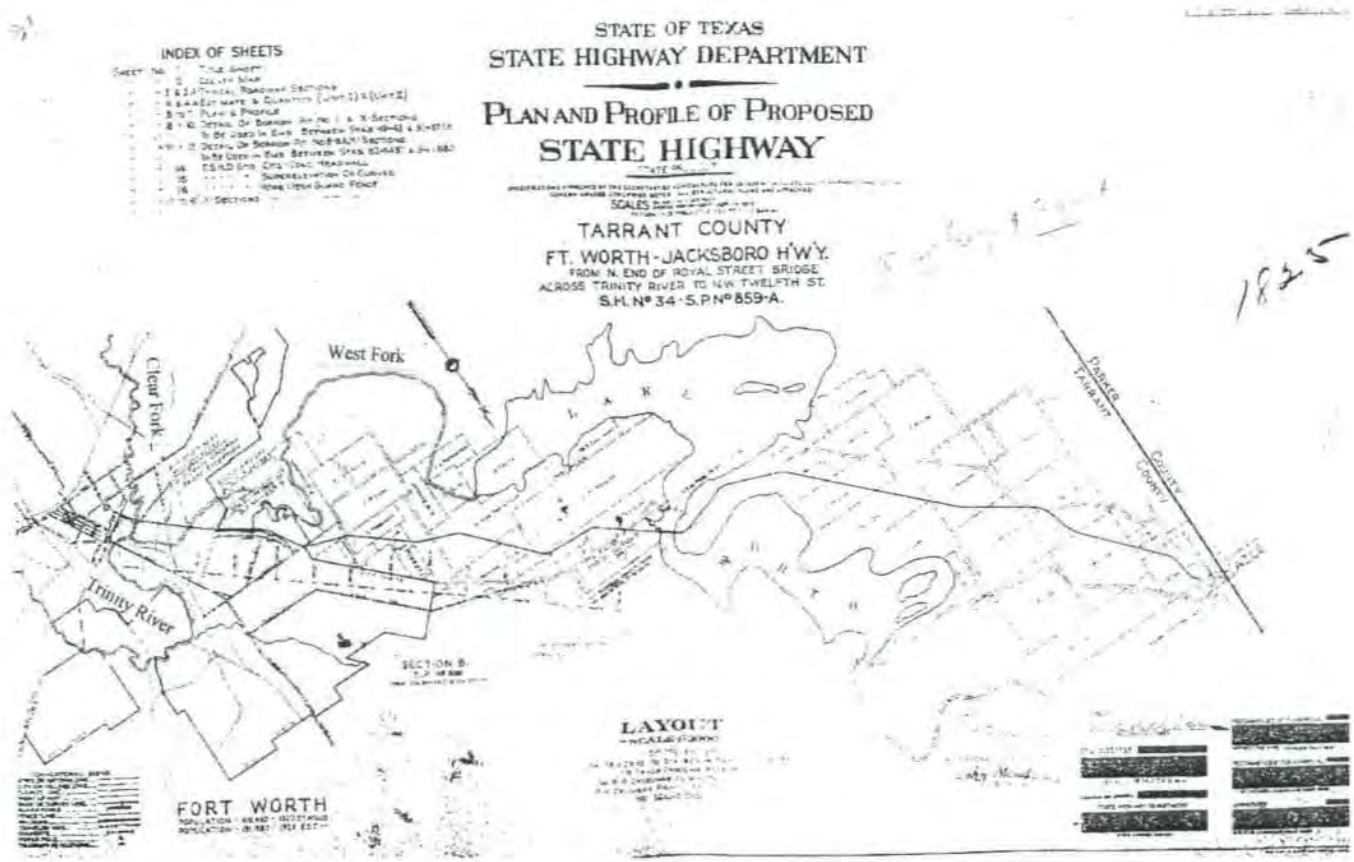
STREET & NUMBER PO Box 12428 **TELEPHONE:** (512) 463-1782

CITY OR TOWN Austin **STATE** Texas **ZIP CODE** 78711-2428

National Register of Historic Places Continuation Sheet

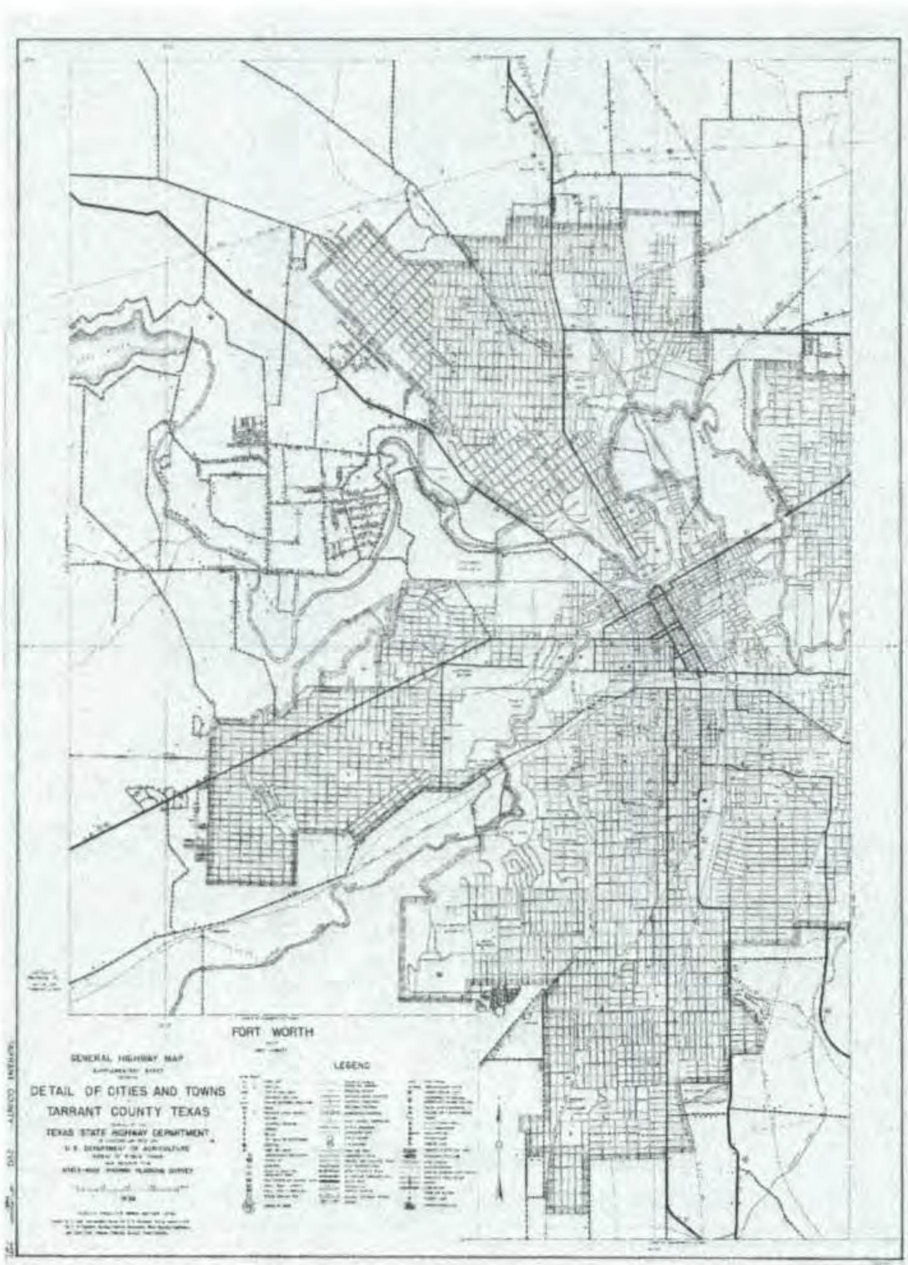
Map 1: Location of proposed Royal Street/Henderson Street Bridge over the Clear Fork of the Trinity River, *Courtesy Texas Department of Transportation.*

Map 2: Route of the Jacksboro Highway (SH34) from Fort Worth to the Tarrant County-Parker County Line, *Courtesy Texas Department of Transportation.*



National Register of Historic Places Continuation Sheet

Map 3: General Highway Map. Detail of Cities and Towns in Tarrant County, Texas [Fort Worth and vicinity]/ 1940. The Jacksboro Highway (SH 199) is visible as the major thoroughfare that heads northwest from downtown. *Image courtesy Texas State Library and Archives.*



Map 4: General Highway Map. Detail of Cities and Towns in Tarrant County, Texas. City Map, Fort Worth and vicinity, Tarrant County, Texas / 1961. Interstate highways 20, 820, and 35 are partially constructed, but the Jacksboro Highway (SH 199) is still the major thoroughfare to Lake Worth, Eagle Mountain Lake, and outlying communities northwest of downtown. *Image courtesy Texas State Library and Archives.*

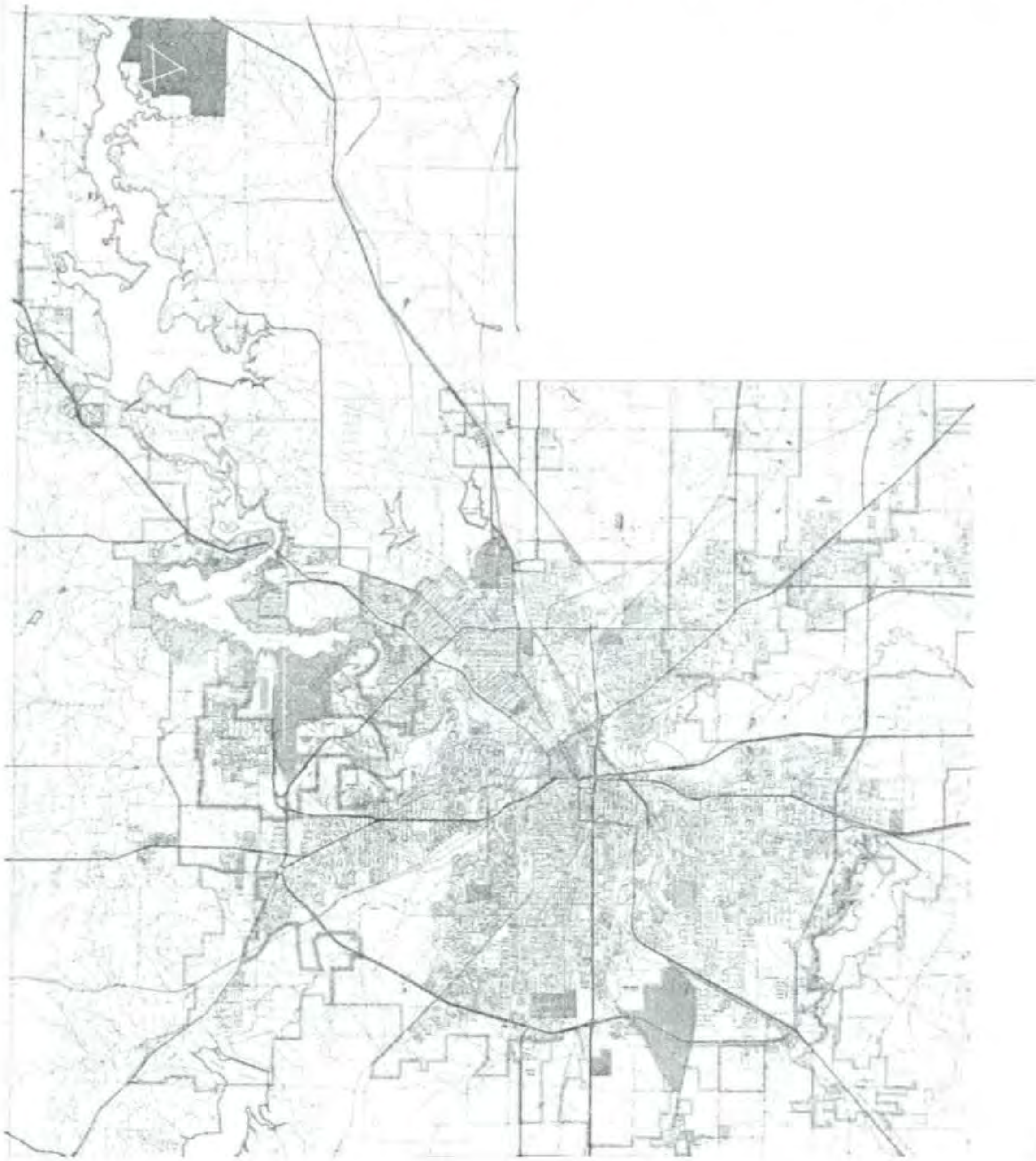


Figure 1: General Plan and Profile, *Courtesy Texas Department of Transportation.*

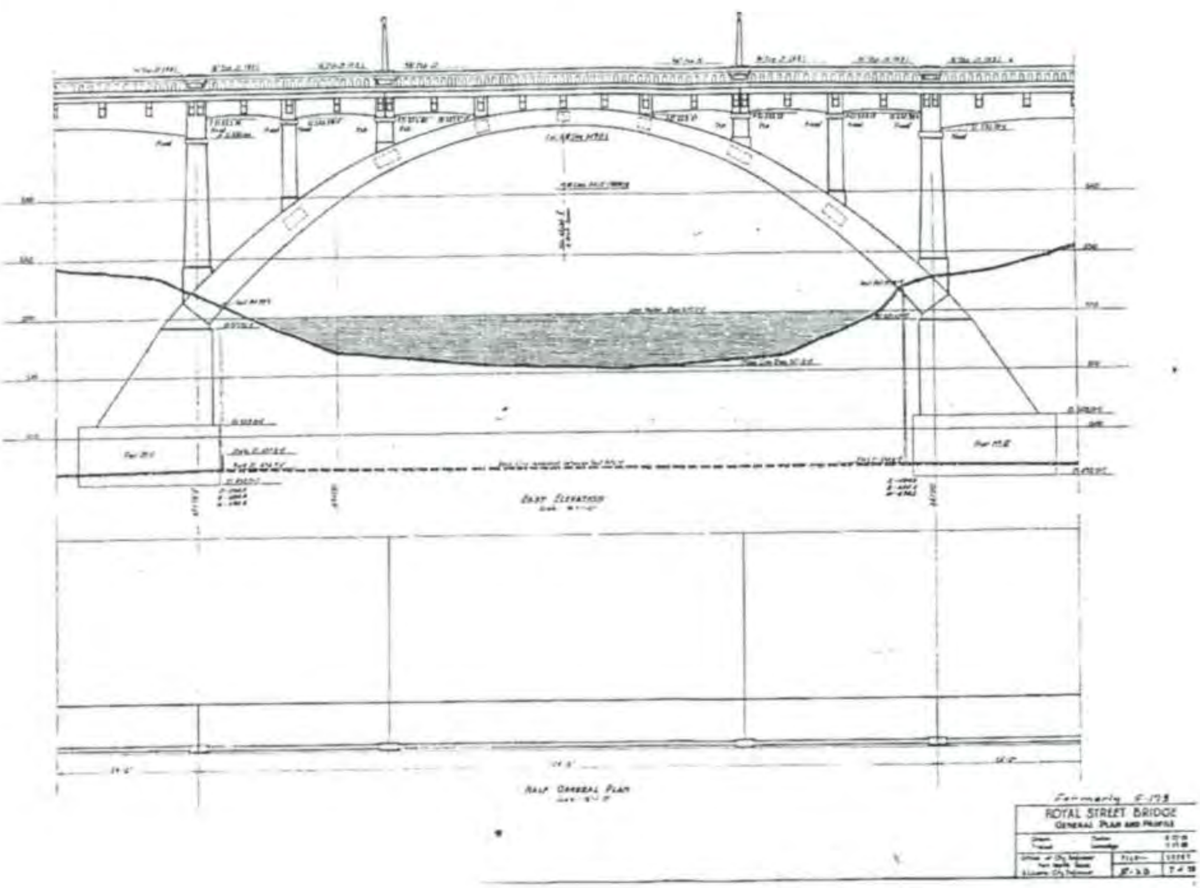


Figure 2: Half Section of Arch, Girder Shank and Column Detail, *Courtesy Texas Department of Transportation.*

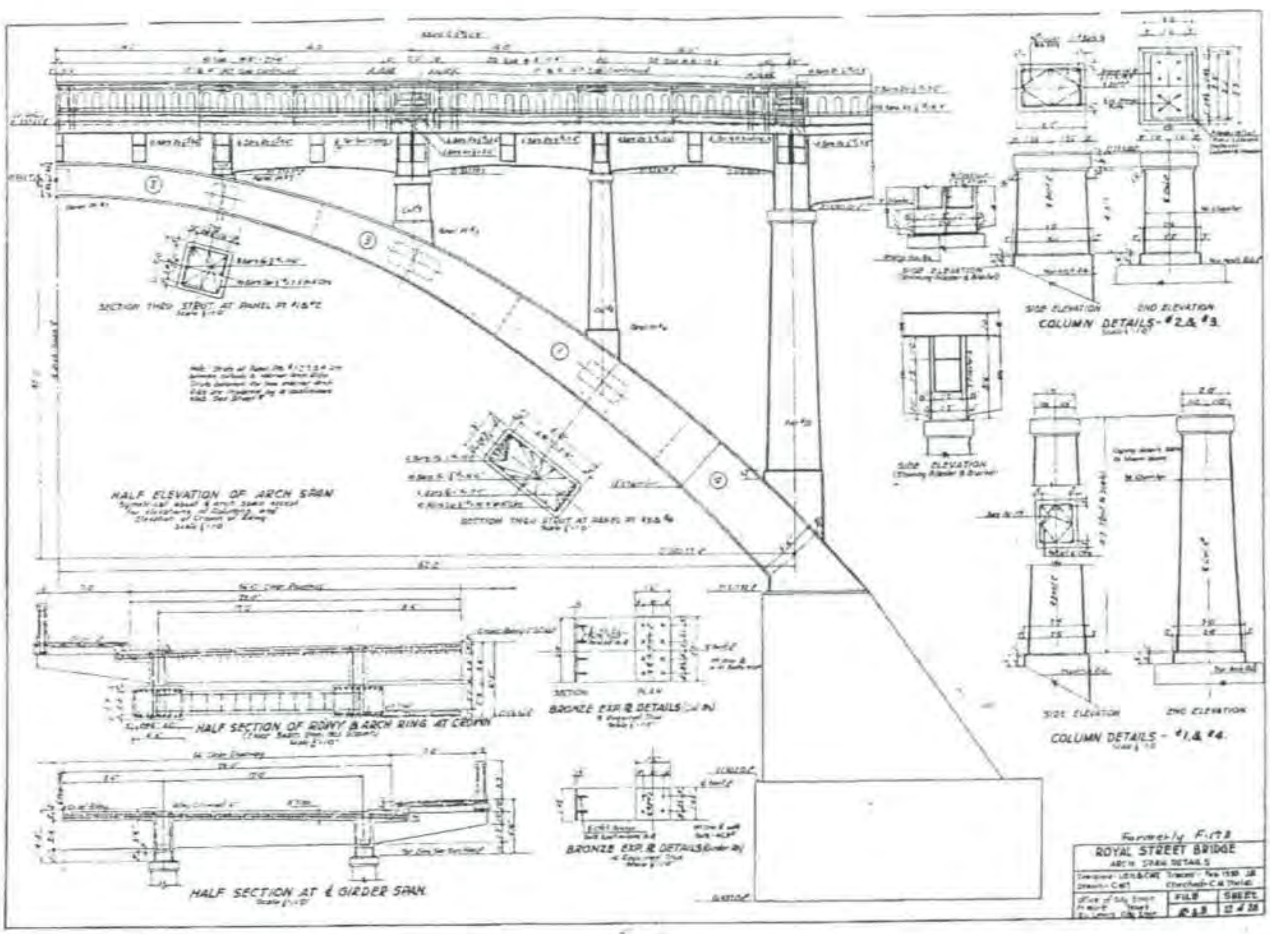


Figure 3: East elevation (south end) and General Plan, *Courtesy Texas Department of Transportation.*

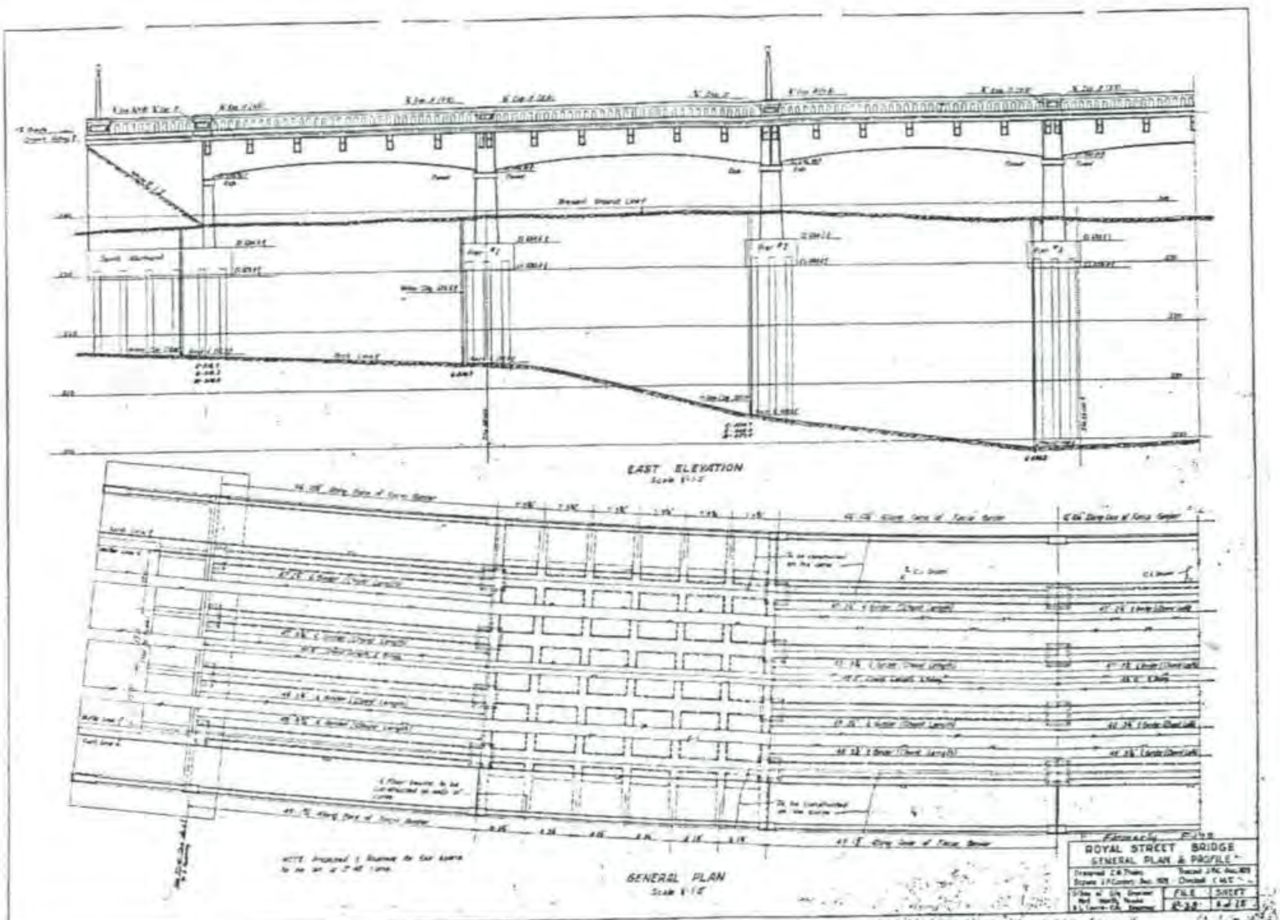


Figure 4: photo of Henderson Street Bridge from the August 1937 edition of Fort Worth's *Municipal Life*.

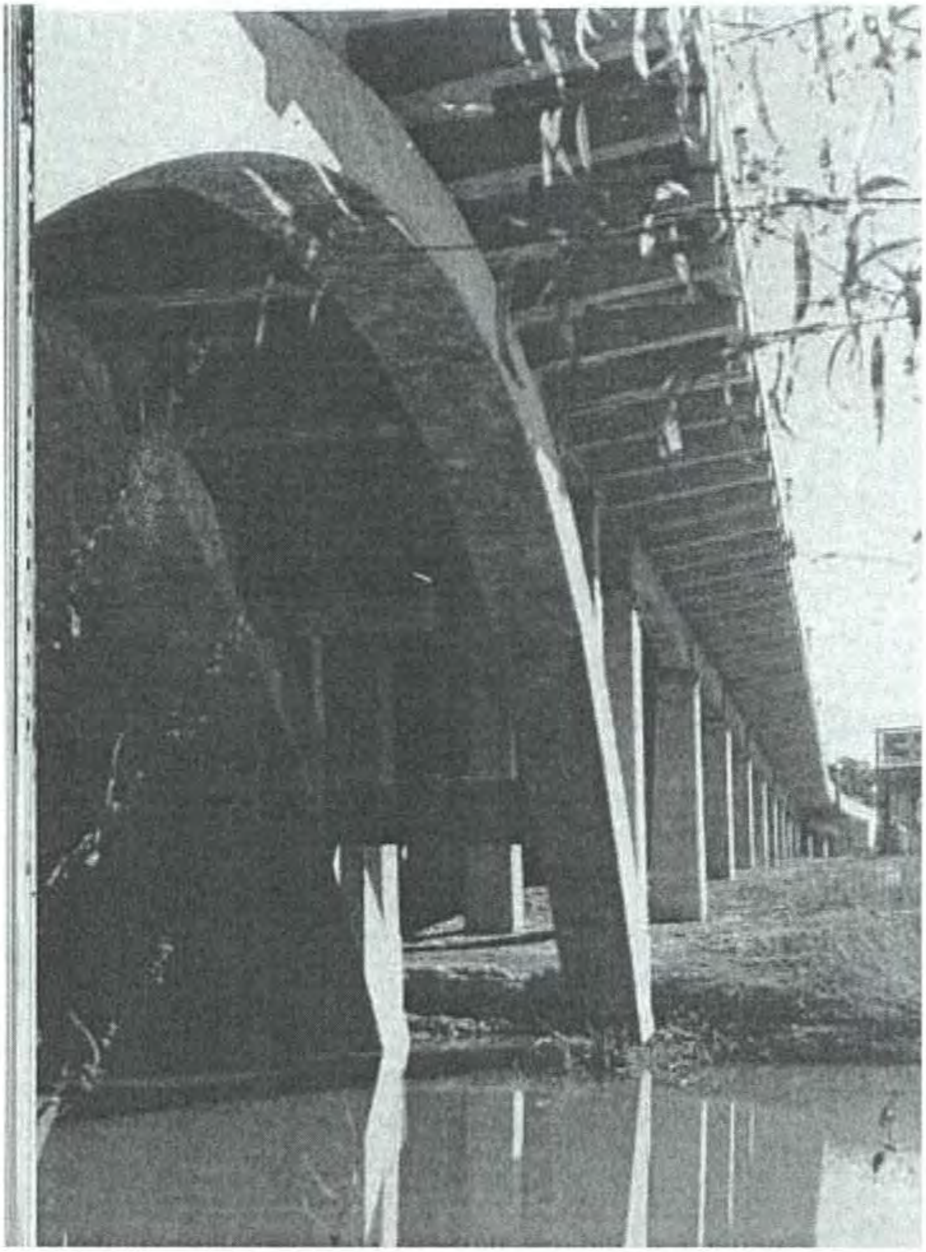


Figure 5: Dedication plaque on Southwest handrail post, looking west.

Figure 6: From deck looking north at horizontal curve

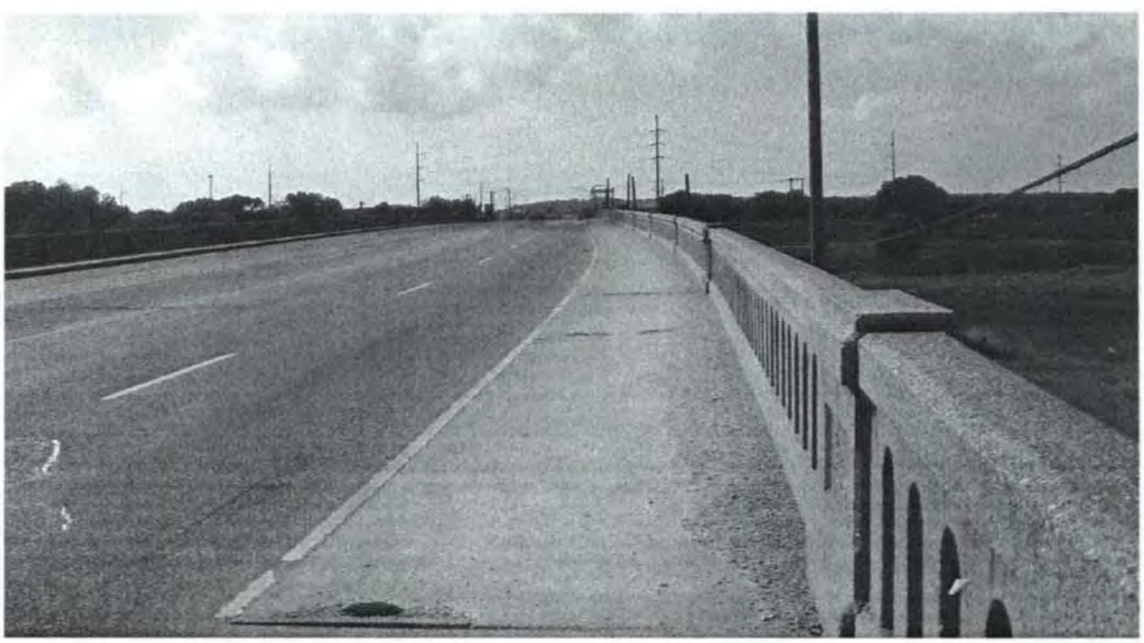


Figure 7: Looking southeast toward downtown Fort Worth

Figure 8: Conduit slab between the ribs of the arch, looking south

Figure 9: Trinity River Vision Central City Project, changes to setting of bridge.

Photograph Log

All photographs are credited as follows:

Name of Property:	Henderson Street Bridge
City:	Fort Worth
County:	Tarrant County
State:	Texas
Photographer:	Susan Allen Kline
Date:	September 12, 2010
Location of digital files:	Texas Historical Commission, Austin

Printed on HP Premium Plus Photo Paper with HP Vivera ink

Photo 1 (TX_Tarrant County_Henderson Street Bridge_0001.tif)
Plaque on southeast plinth
Camera facing: Northeast

Photo 2 (TX_Tarrant County_Henderson Street Bridge_0002.tif)
Deck of Bridge; south end of east side
Camera facing: Northwest

Photo 3 (TX_Tarrant County_Henderson Street Bridge_0003.tif)
Deck of Bridge; north end of west side
Camera facing: Southeast

Photo 4 (TX_Tarrant County_Henderson Street Bridge_0004.tif)
East side of Bridge from south end
Camera facing: Northwest

Photo 5 (TX_Tarrant County_Henderson Street Bridge_0005.tif)
East side of Bridge from north bank
Camera facing: Southwest

Photo 6 (TX_Tarrant County_Henderson Street Bridge_0006.tif)
Arch from west side of Bridge
Camera facing: Southeast

Photo 7 (TX_Tarrant County_Henderson Street Bridge_0007.tif)
West side of Bridge from north end
Camera facing: Southeast

Photo 8 (TX_Tarrant County_Henderson Street Bridge_0008.tif)
Beneath west side of Bridge on north bank
Camera facing: Southeast

Photo 9 (TX_Tarrant County_Henderson Street Bridge_0009.tif)
Beneath Bridge on north bank
Camera facing: Southeast

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

NATIONAL REGISTER OF HISTORIC PLACES
EVALUATION/RETURN SHEET

REQUESTED ACTION: NOMINATION

PROPERTY NAME: Henderson Street Bridge

MULTIPLE NAME: Historic Bridges of Texas MPS

STATE & COUNTY: TEXAS, Tarrant

DATE RECEIVED: 2/03/11 DATE OF PENDING LIST: 3/09/11
DATE OF 16TH DAY: 3/24/11 DATE OF 45TH DAY: 3/21/11
DATE OF WEEKLY LIST:

REFERENCE NUMBER: 11000128

REASONS FOR REVIEW:

APPEAL:	N	DATA PROBLEM:	N	LANDSCAPE:	N	LESS THAN 50 YEARS:	N
OTHER:	N	PDIL:	N	PERIOD:	N	PROGRAM UNAPPROVED:	N
REQUEST:	N	SAMPLE:	N	SLR DRAFT:	N	NATIONAL:	N

COMMENT WAIVER: N

✓ ACCEPT ___RETURN ___REJECT 3·21·11 DATE

ABSTRACT/SUMMARY COMMENTS:

Entered in
The National Register
of
Historic Places

RECOM./CRITERIA ________________

REVIEWER ______________________ DISCIPLINE __________________

TELEPHONE _____________________ DATE ________________________

DOCUMENTATION see attached comments Y/N see attached SLR Y/N

If a nomination is returned to the nominating authority, the nomination is no longer under consideration by the NPS.

1930
HENDERSON STREET BRIDGE
BUILT BY
CITY OF FORT WORTH, TEX.
O. E. CARR
CITY MANAGER
D. L. LEWIS
CITY ENGINEER
IRA G. HEDRICK
CONSULTING ENGINEER
·COUNCILMEN·
W. BURTON
J. B. DAVIS
VAN ZANDT JARVIS
Wm. MONNIG
Wm. BRYCE
MAYOR
J. R. PENN
E. T. RENFRO
Dr. W. R. THOMPSON
A.E. THOMAS
CONTRACTOR
FRANK PARROTT

TX_TarrantCounty-Henderson Street Bridge_0001.tif

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TX_Tarrant County_Henderson Street Bridge_0003.tif

TX_Tarrant County - Henderson Street Bridge_0004.tif

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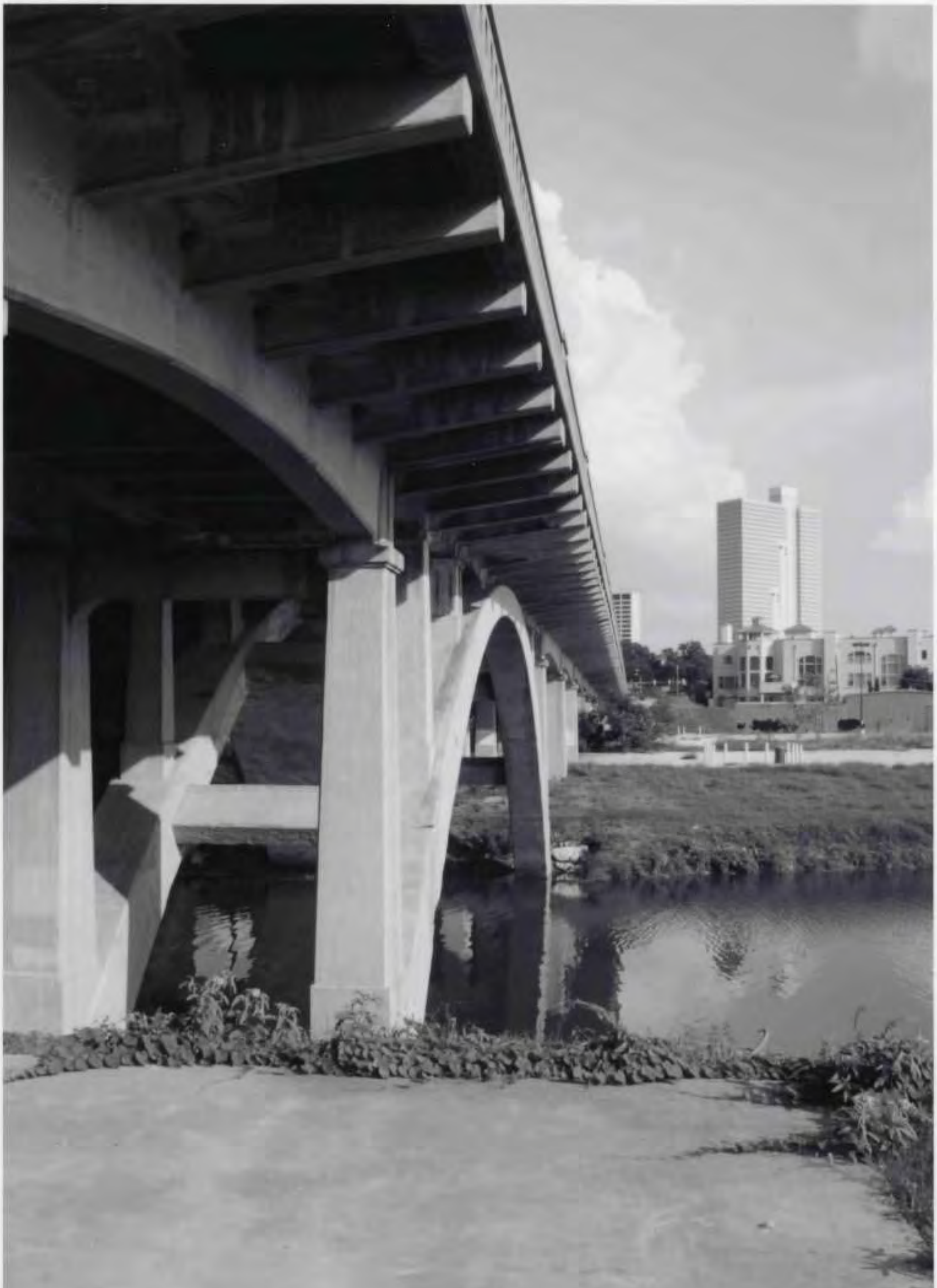

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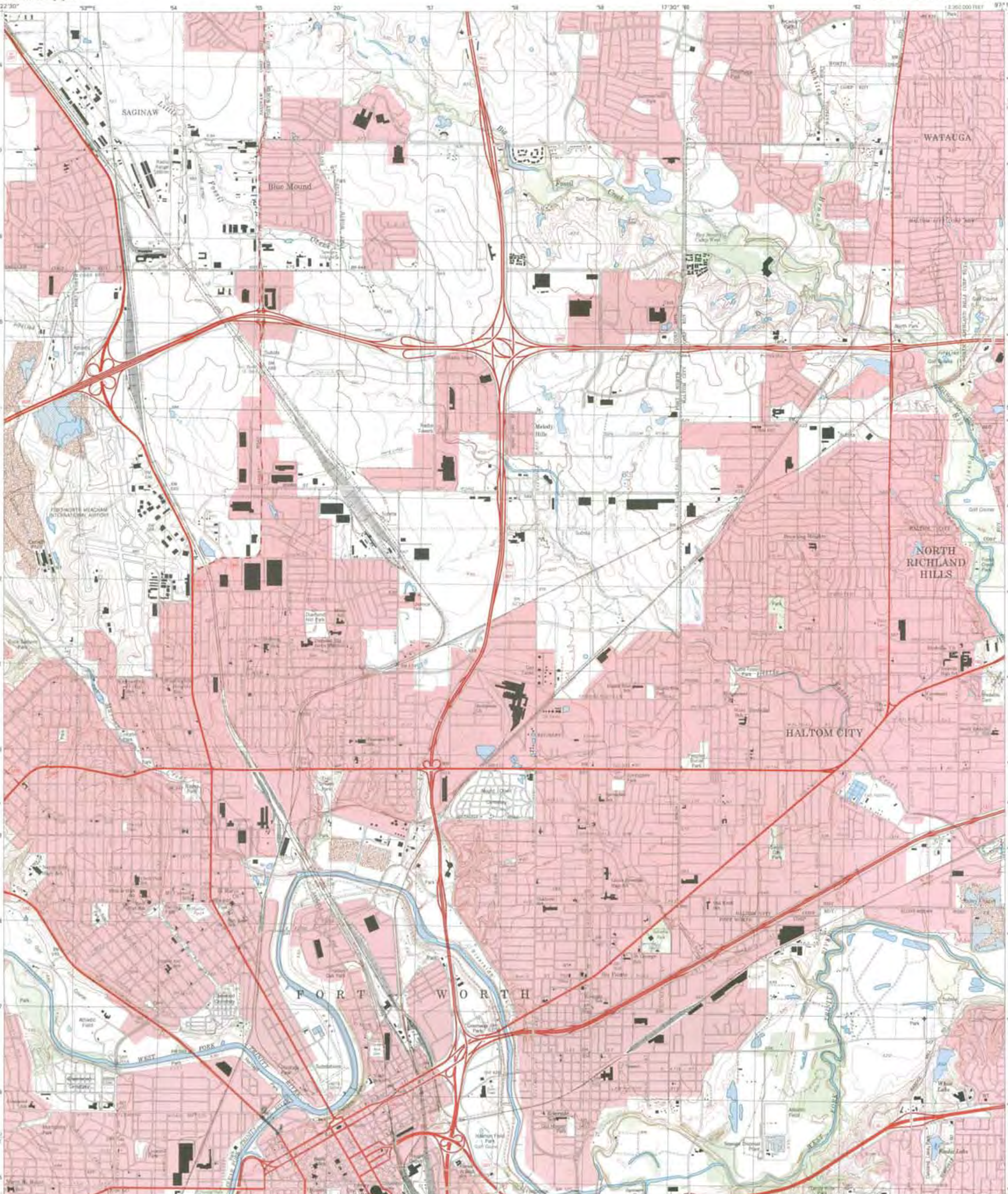
TX_Tarrant County_Henderson Street Bridge_0009.tif

USGS
science for a changing world

U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

HALTOM CITY QUADRANGLE
TEXAS-TARRANT CO.
7.5-MINUTE SERIES (TOPOGRAPHIC)



Produced by the United States Geological Survey

Topography compiled 1952. Planimetry derived from imagery taken 1995 and other sources. Survey control current as of 1955. Boundaries current as of 2000

North American Datum of 1983 (NAD 83). Projection and 1 000-meter grid: Universal Transverse Mercator, zone 14. 10 000-foot ticks: Texas Coordinate System of 1983 (north central zone)

North American Datum of 1927 (NAD 27) is shown by dashed corner ticks. The values of the shift between NAD 83 and NAD 27 are obtainable from National Geodetic Survey NADCON software

Areas covered by dashed light-blue pattern are subject to controlled inundation

Houses of worship, schools, and other labeled buildings verified 1955

UTM GRID AND 2001 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SCALE 1:24 000

CONTOUR INTERVAL 10 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929
TO CONVERT FROM FEET TO METERS, MULTIPLY BY 0.3048

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U.S. GEOLOGICAL SURVEY, P.O. BOX 25286, DENVER, COLORADO 80225
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

QUADRANGLE LOCATION

1	2	3
4		5
6	7	8

1 Avondale
2 Keller
3 Colleyville
4 Lake Worth
5 Hurst
6 Benbrook
7 Fort Worth
8 Kennedale

ADJOINING 7.5' QUADRANGLE NAMES

ROAD CLASSIFICATION

Primary highway, hard surface
Secondary highway, hard surface
Light-duty road, hard or improved surface
Unimproved road
Interstate Route
U.S. Route
State Route

HALTOM CITY, TX
1995

NIMA 6549 IV SE-SERIES V882

HENDERSON STREET BRIDGE
FORT WORTH, TARRANT COUNTY, TEXAS
UTM 1. 14 655422.5 E 3625551.5 N
2. 14 655240 E 3625724 N

TEXAS HISTORICAL COMMISSION
real places telling real stories

MEMORANDUM

FEB 03

TO: Linda McClelland, National Register of Historic Places

FROM: Adrienne Campbell, Texas Historical Commission

CC:

DATE: January 31, 2011

RE: Henderson Street Bridge, Fort Worth, Tarrant County, Texas

The following materials are submitted regarding the Park Road 4 Historic District:

1 Original National Register of Historic Places form
__ Resubmitted nomination
Multiple Property nomination form
9 Photographs
4 USGS map
Correspondence
1 Other: Archival Gold compact disc with digital photos

COMMENTS:

___ SHPO requests substantive review
___ The enclosed owner objections (do__) (do not__) constitute a majority of property owners
Other:

Attachment C

Rockwood Golf Course Land and Water Conservation Funds Letter

Rockwood Golf Course

CITY OF FORT WORTH, TEXAS

PARK AND RECREATION DEPARTMENT
2222 W. ROSEDALE
FORT WORTH, TEXAS 76110
870-7000 / AREA CODE 817

March 7, 1989

Mr. Billy Hardie
District Design Engineer
State Department of Highways
and Public Transportation
P. O. Box 6868
Fort Worth, Texas 76115

Dear Mr. Hardie:

This letter is your confirmation that no Land and Water Conservation Funds (L&WC) have been used for Fort Worth parks and lakes within the proposed State Highway 199 corridor. The Fort Worth parks and lakes within this corridor, as indicated on the aerial map, include Casino Park, Fort Worth Nature Center, Rosen Park, Marina Park, Marion Sansom Park, Rockwood Park, Marine Creek Lake Park, Lake Worth, and Marine Creek Lake. Marine Creek Lake and Marine Creek Lake Park are not indicated on the aerial (on Route 2N) but have not received any L&WC funds.

If there are any questions, contact Steve Thompson at 870-7089.

Sincerely,

Ralph Emerson

Ralph W. Emerson
Park and Recreation Director

RWE:g

cc: Mr. Steve Thompson, Acting Assistant Director/Park Planning
Ms. Jean Karlik, State Department of Highways and Public Transportation


Fort Worth Nature Center
Marina Park
Casino Park
White Park
ROUTE 2 B
ROUTE 2 N
Marion Sansom Park
N
Rockwood Park

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Attachment D

USDA Web Soil Survey – Soil Map

Soil Map—Tarrant County, Texas
(SH 199 Corridor Master Plan)

Map Scale: 1:51,400 if printed on A landscape (11" x 8.5") sheet.

N

0 500 1000 2000 3000 Meters

0 2000 4000 8000 12000 Feet

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 14N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Tarrant County, Texas
Survey Area Data: Version 13, Sep 19, 2016

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Apr 22, 2014—Jul 13, 2014

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Tarrant County, Texas (TX439)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
1	Aledo gravelly clay loam, 1 to 8 percent slopes	8.6	1.0%
3	Aledo-Bolar-Urban land complex, 3 to 20 percent slopes	277.7	31.3%
4	Aledo-Urban land complex, 1 to 8 percent slopes	126.8	14.3%
10	Bastsil-Urban land complex, 0 to 5 percent slopes	19.3	2.2%
26	Frio silty clay, 0 to 1 percent slopes, occasionally flooded	7.4	0.8%
28	Frio-Urban land complex, occasionally flooded	39.8	4.5%
44	Luckenbach-Urban land complex, 1 to 3 percent slopes	0.1	0.0%
47	Medlin clay, 5 to 15 percent slopes	9.0	1.0%
55	Ovan-Urban land complex, occasionally flooded	17.2	1.9%
62	Purves-Urban land complex, 0 to 5 percent slopes	1.2	0.1%
67	Sanger-Urban land complex, 1 to 5 percent slopes	38.2	4.3%
79	Sunev-Urban land complex, 2 to 8 percent slopes	115.3	13.0%
81	Urban land	217.7	24.6%
W	Water	8.0	0.9%
Totals for Area of Interest		**886.3**	**100.0%**

Appendix E – Franchise and City-Owned Utilities Technical Memorandum

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State Highway 199 Corridor Master Plan

From IH 820 to Belknap Street

Franchise and City-Owned Utilities Technical Memorandum

Submittal Date:
August 1, 2017

Prepared For:
North Central Texas Council of Governments

Prepared By:
Freese and Nichols, Inc.
4055 International Plaza, Suite 200
Fort Worth, Texas 76109
817-735-7300
Texas Registered Engineering Firm F-2144

FREESE AND NICHOLS

1.0 FRANCHISE AND CITY-OWNED UTILITIES

The State Highway 199 (SH 199) corridor, between Interstate Highway 820 (IH 820) and Belknap Street, includes multiple aboveground and underground utilities whose purpose is to serve customers along SH 199 and within Tarrant County. The SH 199 Corridor Master Plan and the reconstruction of SH 199 should make allowances for the existing and planned utility infrastructure within the corridor to continue the current and future services to the community. These utilities within the SH 199 corridor will be critical to maintain service points and promote growth within the region.

When reconstructing the SH 199 corridor, it should be expected that all utilities that are in direct conflict with planned construction, are non-compliant with the Utility Accommodation Rules (UAR), do not meet local ordinance or industry standards, or include other safety issues will be adjusted, realigned, or replaced. These utilities will need to be planned and constructed per the Texas Department of Transportation (TxDOT) Utility Manual and in accordance with the Texas Administrative Code (TAC) Rule §21.40 (see Attachment A). A summary of the horizontal location, depth, and encasement expectations of the franchise and city-owned utilities within the corridor can be seen in Attachment B.

2.0 FRANCHISE UTILITES

The franchise utility companies that have been identified and are expected within the corridor limits include electric providers, cable and telephone providers, and oil and gas providers. Table 1 includes a summary of these franchise utility companies.

Table 1. Franchise Utility Summary

Owner	Utility Type	Location
Oncor Electric	Electric Lines (Distribution)	Aboveground on Utility Pole
AT&T	Fiber Optic Cable and Copper Lines	Varies (Aboveground on Utility Pole and Underground)
Charter Communications	Fiber Optic Cable	Aboveground on Utility Pole
Atmos Energy	Gas Pipeline (Distribution)	Underground
Multiple Owners	Oil / Gas Pipelines (Midstream and Transmission)	Underground

Based on site observations and available data, it appears that the utility poles owned by the franchise utility companies are within the first three feet of the existing roadway right-of-way. The franchise utility lines on these utility poles include companies such as Oncor Electric, AT&T, and Charter Communications. Throughout the corridor, the electric and telecommunication services appear to service the existing properties through overhead lines from SH 199, side right-of-way, property easements, or alley service points. These overhead service points vary depending on the property location and the roadway network around the property site (see Figures 1 through 3). For example, there are no utility poles along the north and the south side of SH 199 between Roberts Cut Off Road and Biway Street because service points are located along the property edge furthest from the SH 199 right-of-way.

Figure 1. East Perspective of Overhead Utilities West of Roberts Cut Off Road
Source: Freese and Nichols, 2017

Figure 2. East Perspective of Overhead Utilities East of Skyline Drive
Source: Freese and Nichols, 2017

Figure 3. East Perspective of Overhead Utilities East of University Drive
Source: Freese and Nichols, 2017

In addition to overhead franchise utility lines, there is evidence that underground telecommunications lines exist within a segment of the SH 199 corridor. Based on site investigation, it has been noted that between Roberts Cut Off Road and Biway Street underground telecommunication lines owned by AT&T are located within the roadway median.

According to the Railroad Commission of Texas (RRC) Public GIS Viewer (http://www.rrc.state.tx.us/about-us/resource-center/research/gis-viewers/), there are multiple oil and gas midstream and transmission pipeline utilities varying from 6 inches in diameter to 24 inches in diameter within the corridor (see Exhibit 1). The available data shows that there are oil and gas pipeline crossings at the intersections of Skyline Drive, Belle Avenue, and West Fork of the Trinity River and SH 199. In addition to crossings, there are segments of the SH 199 corridor that have oil and gas pipelines traveling parallel to the roadway, on the southside of the roadway. A 10-inch diameter pipeline is currently parallel to SH 199 outside of the existing right-of-way from Biway Street to Belle Avenue. A 24-inch diameter pipeline is currently parallel to SH 199 from Belle Avenue to the West Fork of the Trinity River. On the southside of SH 199 between Ohio Garden Road and the extension of 16th Street, the 24-inch diameter pipeline appears to be in a utility easement adjacent to the existing SH 199 right-of-way. At the West Fork of the Trinity River intersection of SH 199, this 24-inch pipeline is on the westside of the Trinity River and runs north and south at the crossing. The condition and location of the existing oil and gas utilities within the project corridor should be considered when designing the location of retaining walls and storm drain outfalls.

Atmos Energy is known to be within the SH 199 corridor; however, detailed locations have not been determined at this phase of the project.

3.0 CITY-OWNED UTILITES

The cities of Lake Worth, Sansom Park, and Fort Worth have been identified as agencies that have water and waste water utilities within the SH 199 corridor. Exhibit 2 through Exhibit 8 include maps of both the existing and planned utility infrastructure within or adjacent to the SH 199 corridor.

Between IH 820 and Roberts Cut Off Road, both the City of Lake Worth and the City of Fort Worth own water and waste water utilities. The City of Lake Worth owns a 16-inch force main on the south side of SH 199, and six-inch gravity waste water lines on the north and the south sides of SH 199. The City of Lake Worth also owns an existing 6-inch diameter cast iron water line that is located on the north and the south sides of the roadway and crosses SH 199 at Azle Way. The City of Fort Worth owns a 16-inch water line that crosses SH 199 at Old Mill Creek Road and at Azle Way. The City of Fort Worth also owns a varying diameter (18-inch to 24-inch) gravity waste water line between Old Mill Creek Drive and Roberts Cut Off Road. Currently, there are no planned improvements to the water and the waste water infrastructure in this area.

Between Roberts Cut Off Road and Beverly Hills Drive, both the City of Sansom Park and the City of Fort Worth own water and waste water utilities. The City of Sansom Park owns a varying diameter (10-inch to 6-inch) water line on the south side of SH 199 from Broadway Drive to Skyline Drive. There are existing water lines crossing SH 199 at Broadway Drive (2-inch), Norfleet Street (6-inch), Biway Street (10-inch) and Skyline Drive (10-inch). The City of Sansom Park also owns 8-inch gravity sanitary sewer lines on the north and south sides of SH 199 from Broadway Drive to Skyline Drive. The City of Fort Worth owns an 8-inch water line that crosses SH 199 at Skyline Drive. The City of Fort Worth also owns a 24-inch gravity waste water line between Roberts Cut Off Road and Beverly Hills Drive. Currently, only the City of Fort Worth is planning to upsize the 24-inch gravity waste water line between Biway Street and Beverly Hills Drive to a 30-inch gravity waste water line through a sewer line improvements effort in the year 2030.

Between Beverly Hills Drive and Belknap Street, the City of Fort Worth owns water and waste water utilities. The City owns 6-inch, 8-inch, or 12-inch water lines on the north side or south side of SH 199 from Capri Drive to 21st Street. Adjacent to the Rockwood Golf Course, between 21st Street and the extension of 15th Street, there are no existing or planned water lines. The City owns a 6-inch water line on the south side of SH 199 to service the commercial properties near the University Drive intersection. In proximity to the West Fork of the Trinity River, the City owns an 8-inch, 24-inch, and 30-inch water line. The City of Fort Worth also owns a 6-inch, 8-inch, 10-inch, or 24-inch waste water line on the north side or south side of SH 199 from Beverly Hills Drive to Ohio Garden Road. Adjacent to the Rockwood Golf Course, between Ohio Garden Road and University Drive, there are no existing or planned water lines parallel to SH 199; however, an 8-inch waste water line crosses SH 199 at 21st Street and 18th Street. In proximity to the West Fork of the Trinity River, the City owns a 15-inch, 54-inch, and 66-inch waste water line. Currently, only the City of Fort Worth is planning to upsize the 24-inch gravity waste water line between Beverly Hills Drive and SH 183 to a 30-inch and 33-inch gravity waste water line through a sewer line improvements effort in the year 2030.

4.0 RECOMMENDATIONS

During the next design phase, it is recommended that a licensed land surveyor provide field investigation and subsurface utility engineering (SUE) services to aid in the identification of the horizontal and vertical location of overhead and underground franchise and city-owned utilities within the corridor. After the existing utilities have been properly identified, it is recommended that the design team conduct utility coordination meetings with the franchise utility companies and the necessary cities to further understand the anticipated improvements within the roadway improvements limits of the SH 199 corridor. In addition to the location of the existing utilities within the project limits, it is recommended that a licensed land surveyor research and locate all existing utility easement limits.

Converting the SH 199 corridor from a rural roadway section to an urban roadway section may lower the centerline roadway profile between two and three feet. The lowering of the roadway and the construction of multiple retaining wall segments within the corridor improvement limits have the potential to cause conflicts with the existing underground utilities and the existing overhead utility poles. It is recommended that the next design phase evaluate the anticipated cut, fill, and construction activities in proximity to existing utilities within the project reconstruction limits. The SH 199 reconstruction project may potentially require the relocations or adjustments of multiple franchise-owned utilities.

Once the utilities within the corridor have been properly identified and located, it is recommended that the utilities consider being placed in the border width (between the back of curb and the right-of-way line) of the roadway typical section. A depiction of the recommended location for utilities on the north or the south side of SH 199 can be seen in Figure 4. In this typical section, it is recommended that the electric utility be placed adjacent to the right-of-way, the water and waste water utilities be placed in the next available space from the right-of-way, and the copper and fiber optic lines be placed along the back of curb, when applicable.

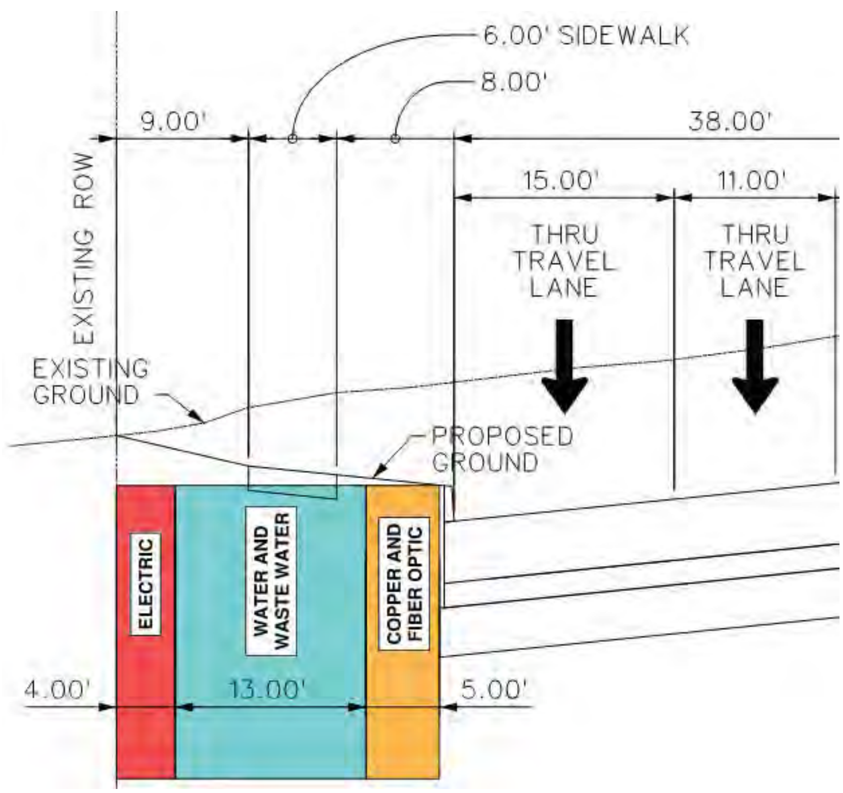

Figure 4. Proposed Typical Franchise and City Utility Location Within SH 199 Right-of-Way

Source: Freese and Nichols, 2017

If development interest is shown around the economic development sites identified in the Economic Market Analysis Technical Memorandum, aboveground franchise utilities should be considered for underground relocation at these sites. These site locations are found between IH 820 and Roberts Cut Off Road, between Biway Street and Skyline Drive, and at the SH 183 and the SH 199 intersection.

5.0 EXHIBITS

1. RRC Public GIS Viewer Data
2. City of Lake Worth – Existing - Water Utilities
3. City of Lake Worth – Existing – Waste Water Utilities
4. City of Lake Worth – Existing – Water and Waste Water Details
5. City of Sansom Park – Existing - Water Utilities
6. City of Sansom Park – Existing – Waste Water Utilities
7. City of Fort Worth – Existing and Planned - Water Utilities
8. City of Fort Worth – Existing and Planned - Waste Water Utilities

6.0 ATTACHMENTS

A. TAC Rule §21.40
B. Utility Minimum Depth of Cover and Distance Off the Right-of-Way

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Exhibit 1

RRC Public GIS Viewer Data

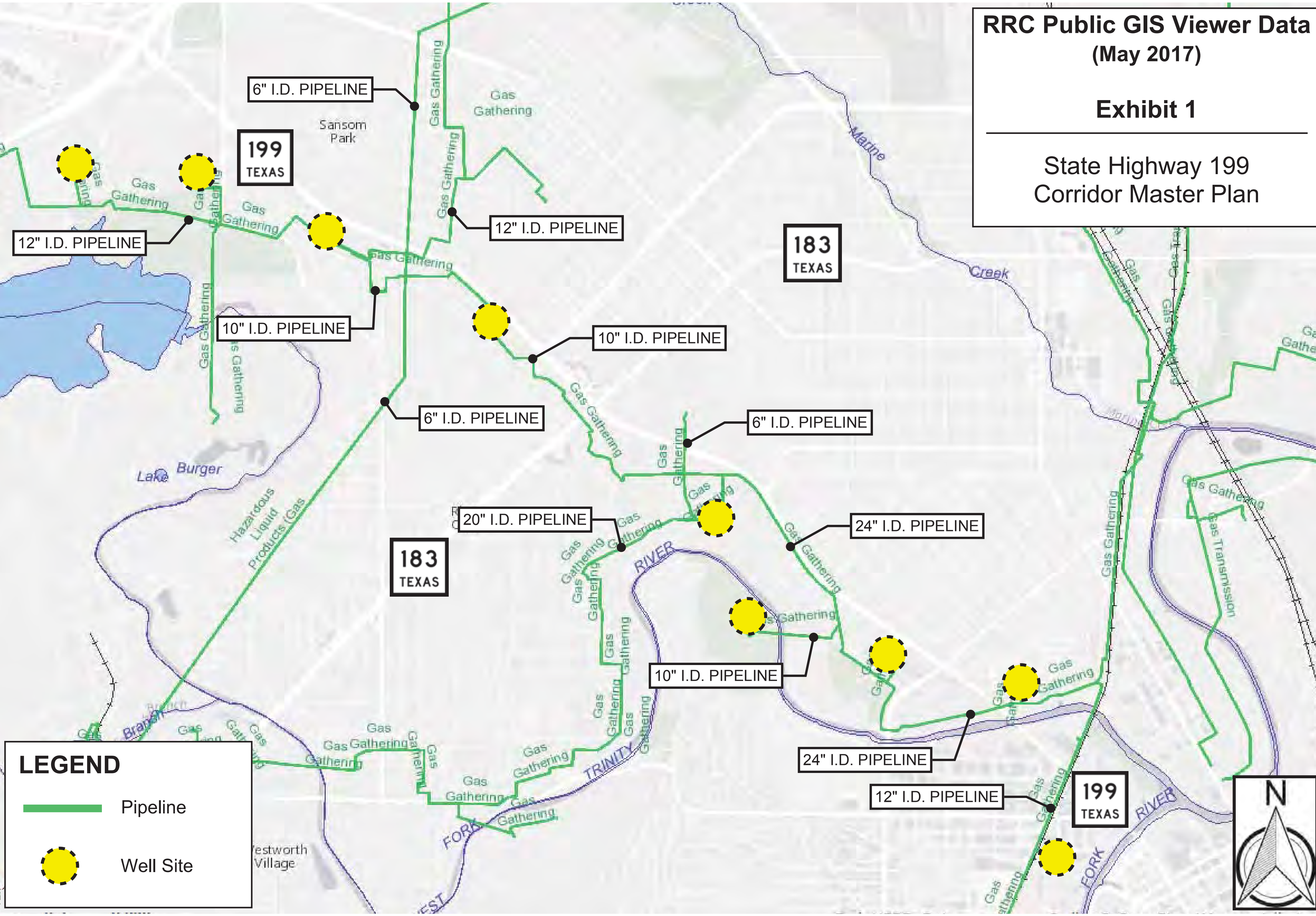
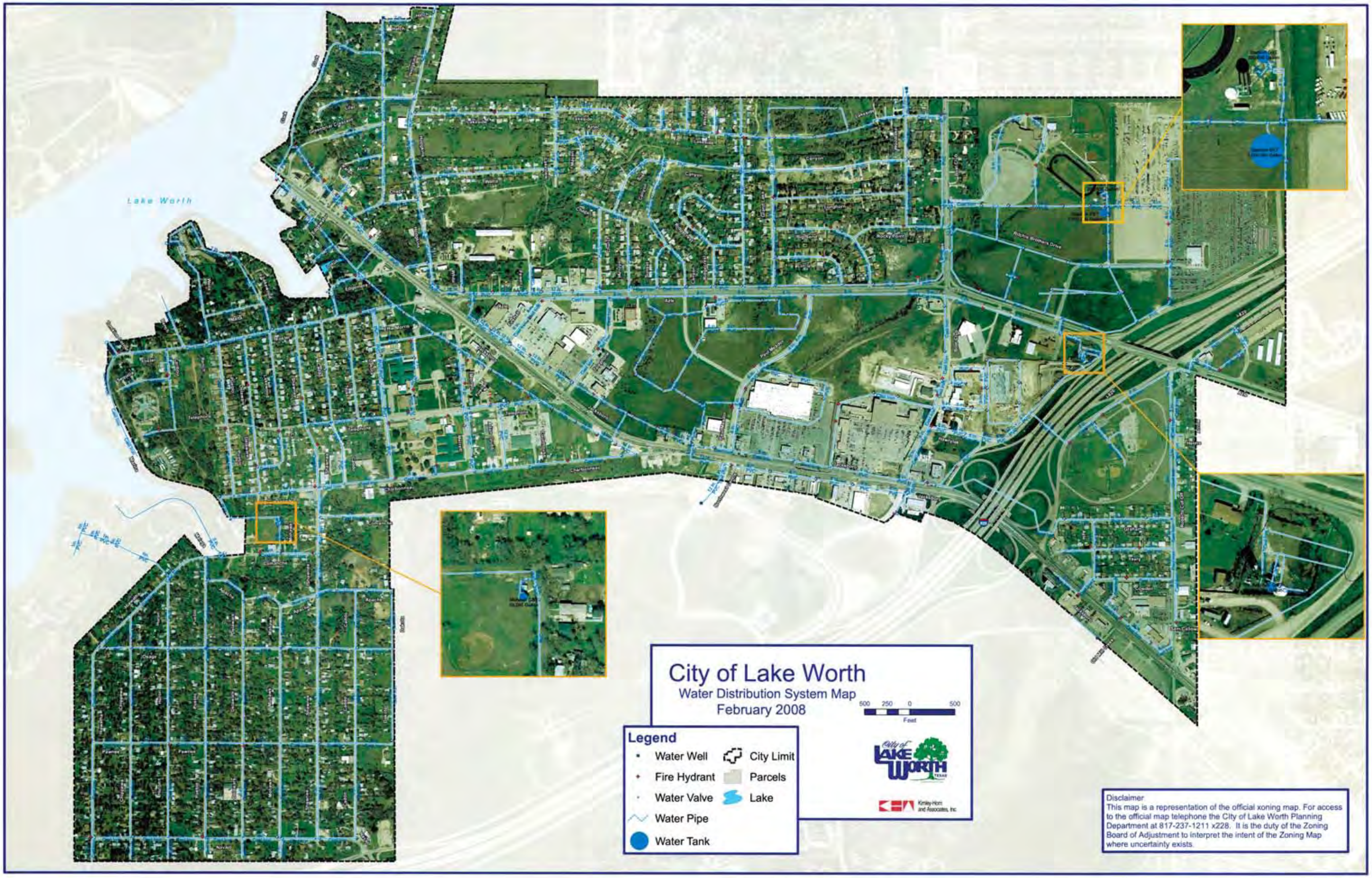

RRC Public GIS Viewer Data
(May 2017)
Exhibit 1
State Highway 199
Corridor Master Plan
6" I.D. PIPELINE
12" I.D. PIPELINE
10" I.D. PIPELINE
12" I.D. PIPELINE
10" I.D. PIPELINE
6" I.D. PIPELINE
6" I.D. PIPELINE
20" I.D. PIPELINE
24" I.D. PIPELINE
10" I.D. PIPELINE
24" I.D. PIPELINE
12" I.D. PIPELINE
199 TEXAS
183 TEXAS
Sansom Park
Lake Burger
Hazardous Liquid Products (Gas
Gas Gathering
Gas Transmission
Marine Creek
TRINITY RIVER
FORK
Westworth Village
N
LEGEND
Pipeline
Well Site

Exhibit 2

City of Lake Worth – Existing - Water Utilities



Lake Worth
City of Lake Worth
Water Distribution System Map
February 2008
500 250 0 500
Feet
Legend
Water Well
Fire Hydrant
Water Valve
Water Pipe
Water Tank
City Limit
Parcels
Lake
Disclaimer
This map is a representation of the official xoning map. For access to the official map telephone the City of Lake Worth Planning Department at 817-237-1211 x228. It is the duty of the Zoning Board of Adjustment to interpret the intent of the Zoning Map where uncertainty exists.

Exhibit 3

City of Lake Worth – Existing – Waste Water Utilities

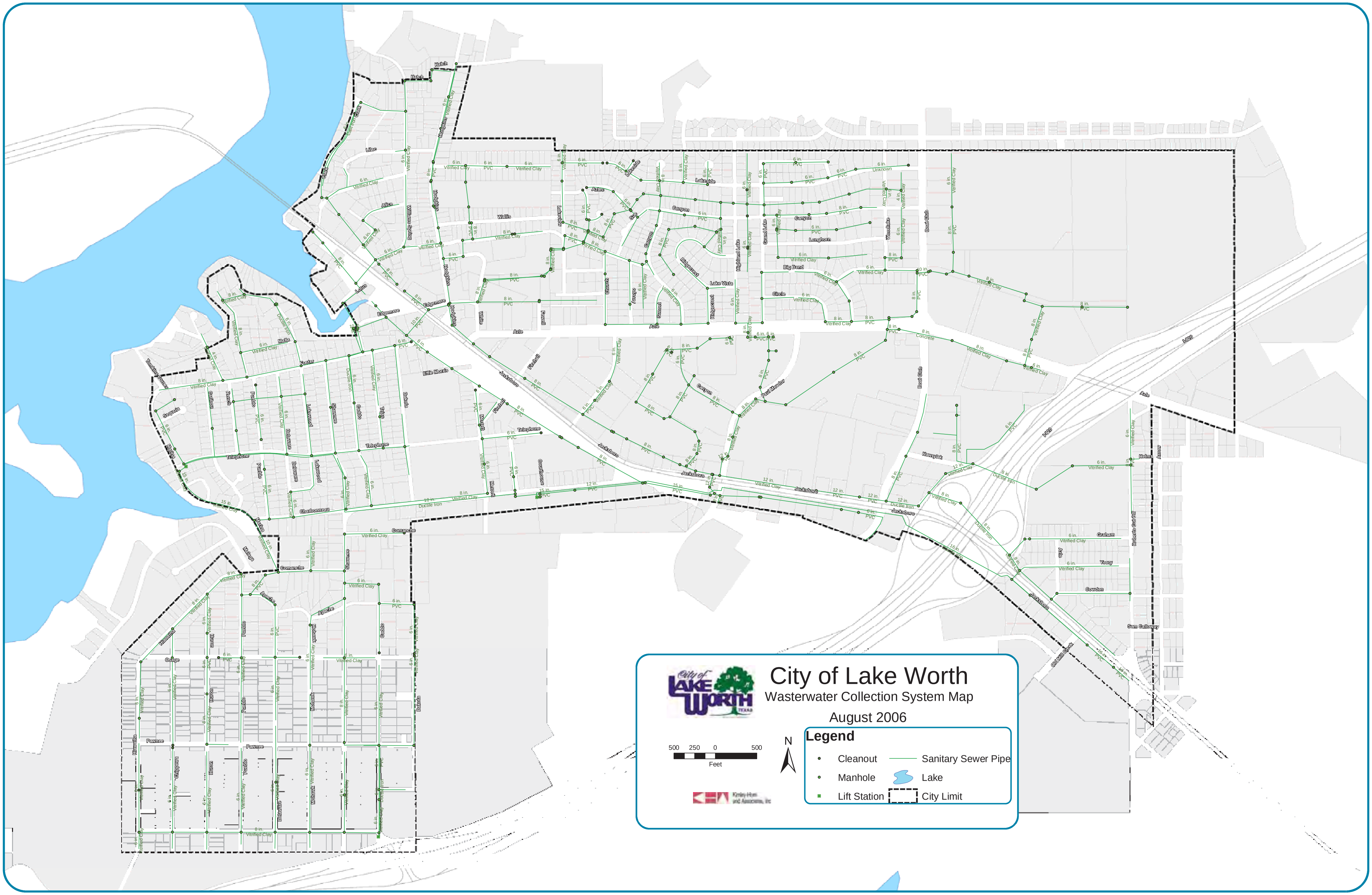
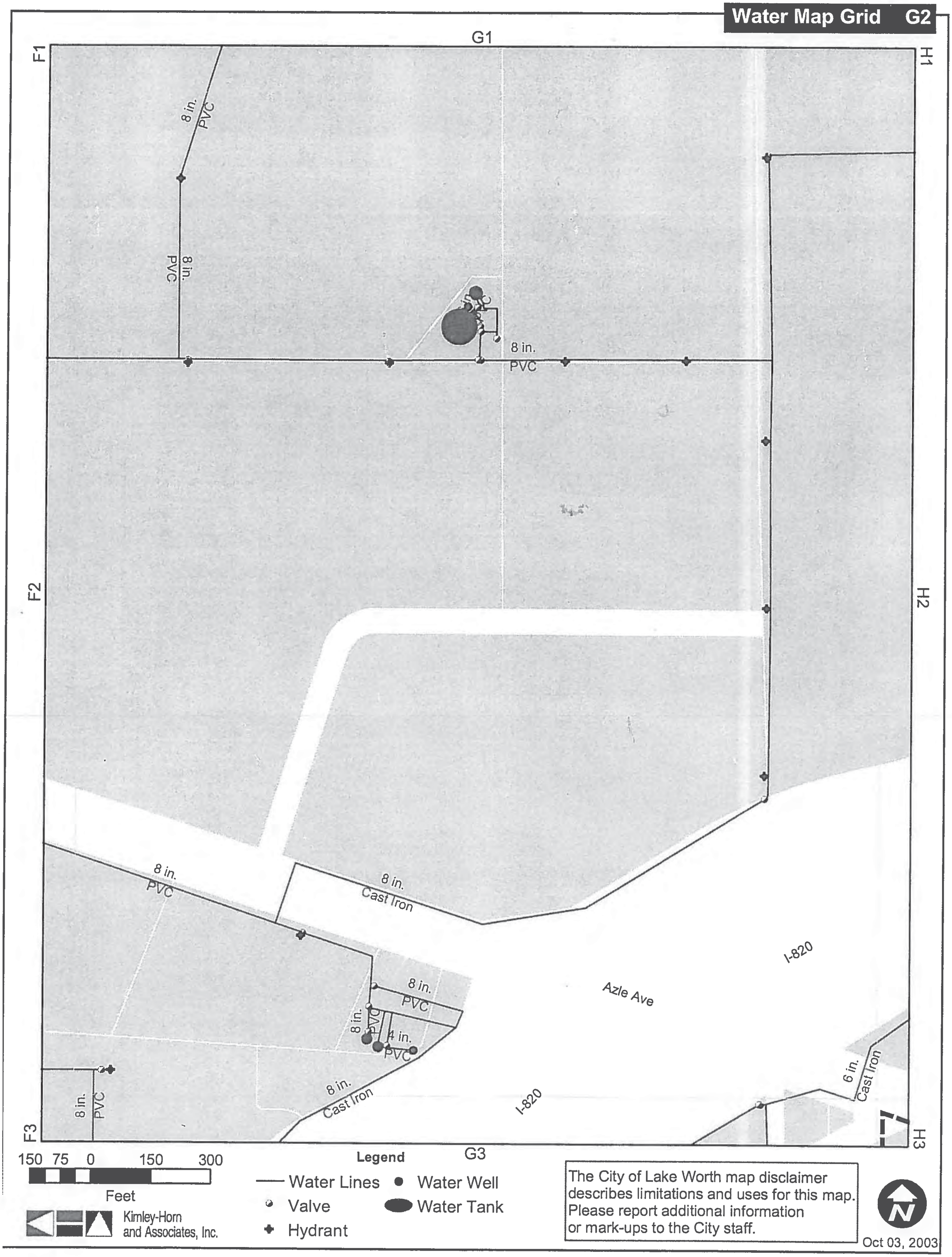
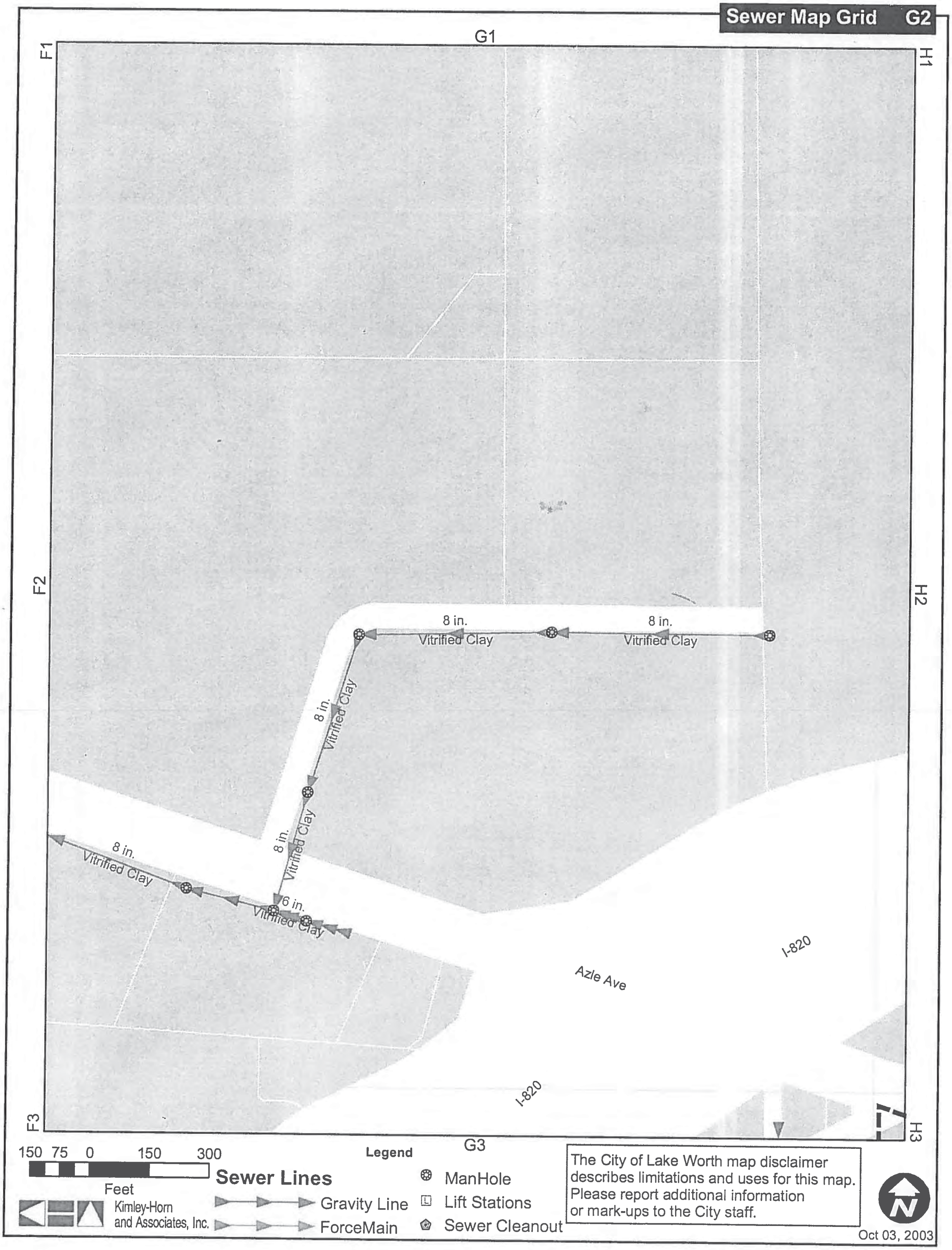

City of Lake Worth
Wasterwater Collection System Map
August 2006
Legend
Cleanout
Manhole
Lift Station
Sanitary Sewer Pipe
Lake
City Limit
N
500 250 0 500
Feet

Exhibit 4

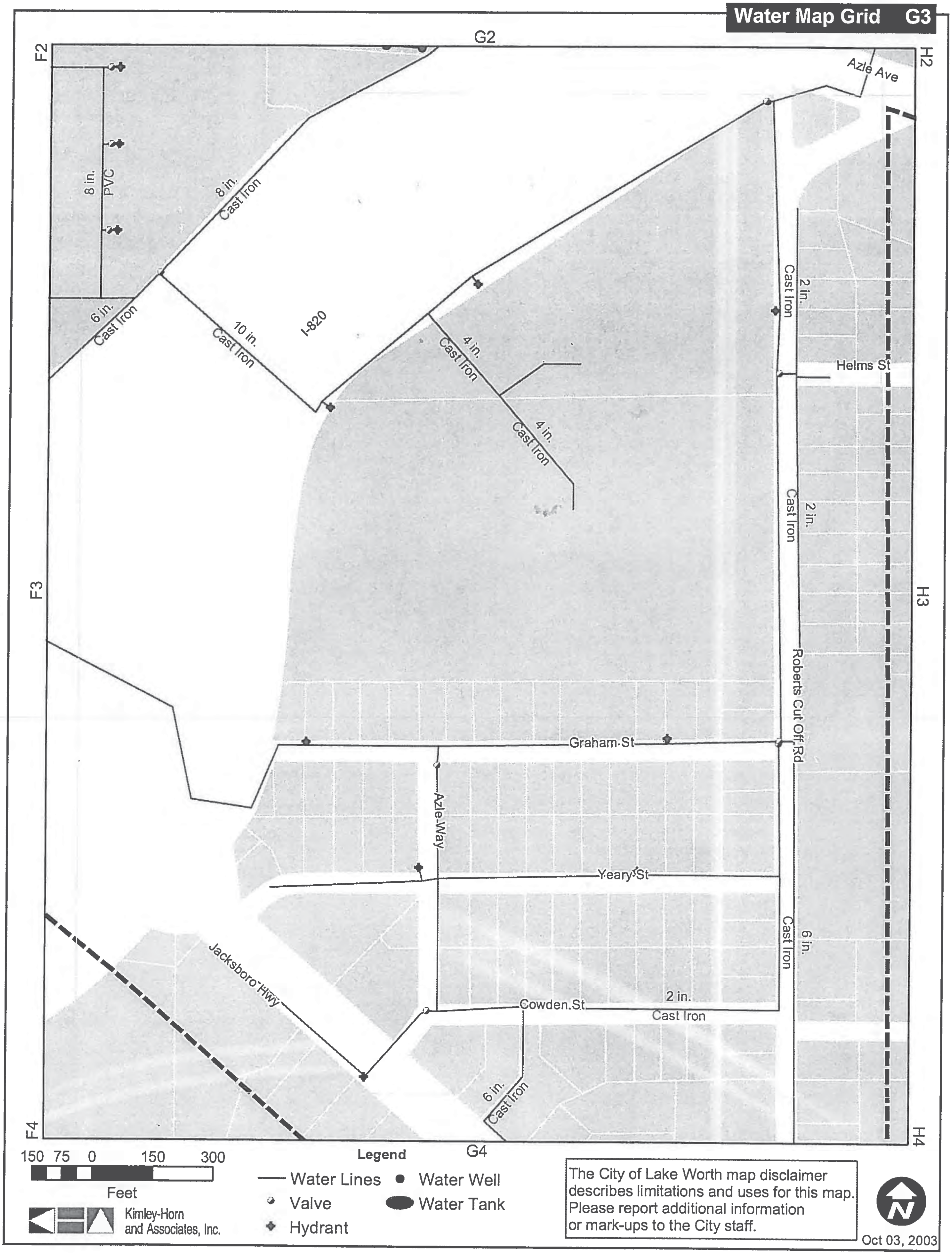
City of Lake Worth – Existing – Water and Waste Water – Detailed Maps


Water Map Grid G2
G1
F1
H1
F2
H2
F3
H3
G3
8 in. PVC
8 in. PVC
8 in. PVC
8 in. PVC
8 in. Cast Iron
8 in. PVC
8 in. PVC
4 in. PVC
8 in. PVC
8 in. Cast Iron
6 in. Cast Iron
I-820
Azle Ave
I-820
150 75 0 150 300
Feet
Kimley-Horn and Associates, Inc.
Legend
Water Lines
Water Well
Valve
Water Tank
Hydrant
The City of Lake Worth map disclaimer describes limitations and uses for this map. Please report additional information or mark-ups to the City staff.
N
Oct 03, 2003



Sewer Map Grid G2
G1
F1
H1
F2
H2
F3
G3
H3
8 in.
Vitrified Clay
8 in.
Vitrified Clay
8 in.
Vitrified Clay
8 in.
Vitrified Clay
8 in.
Vitrified Clay
6 in.
Vitrified Clay
Azle Ave
I-820
I-820
150 75 0 150 300
Feet
Kimley-Horn and Associates, Inc.
Legend
Sewer Lines
Gravity Line
ForceMain
ManHole
Lift Stations
Sewer Cleanout
The City of Lake Worth map disclaimer describes limitations and uses for this map. Please report additional information or mark-ups to the City staff.
N
Oct 03, 2003

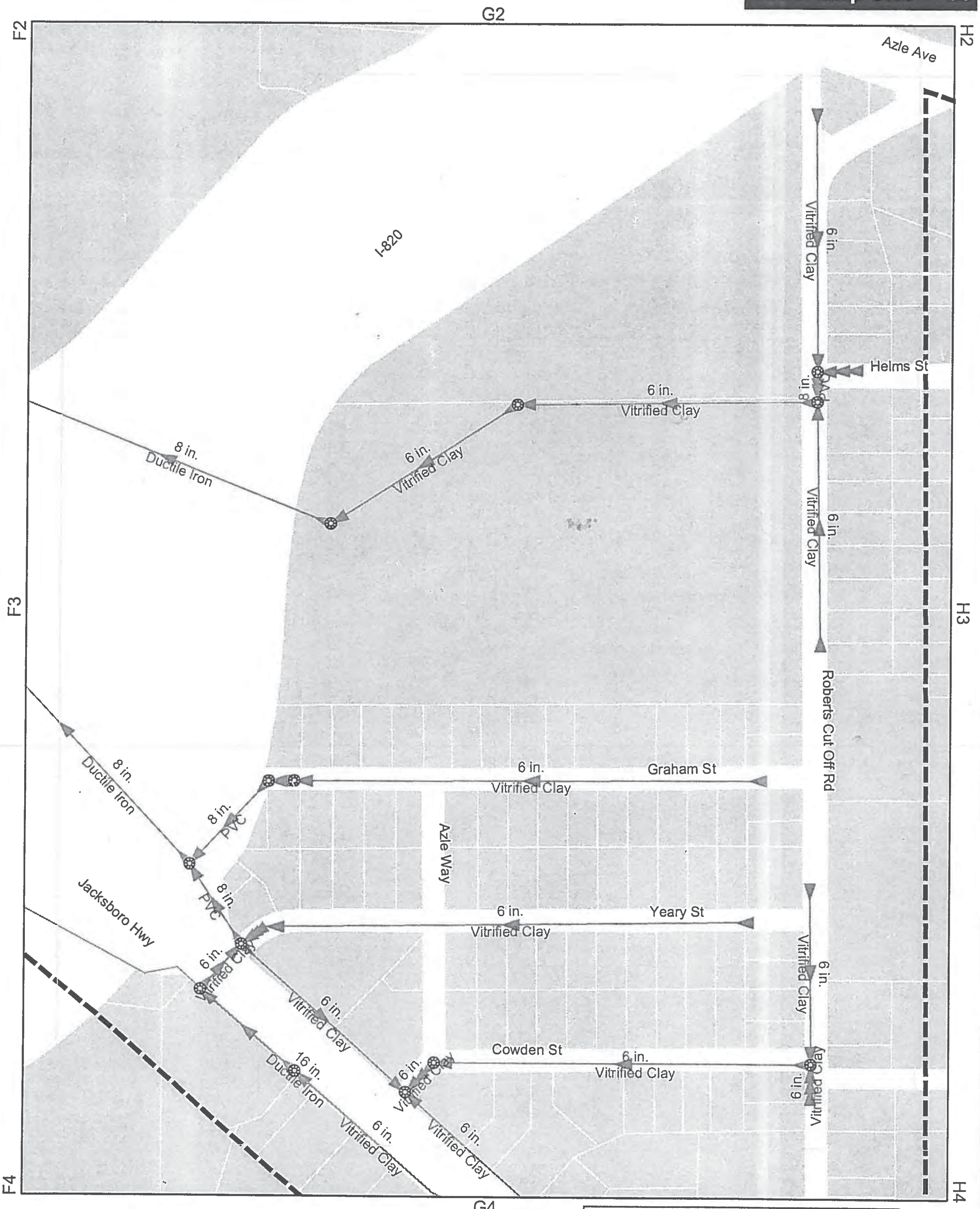
Water Map Grid G3



The City of Lake Worth map disclaimer describes limitations and uses for this map. Please report additional information or mark-ups to the City staff.

Oct 03, 2003

Sewer Map Grid G3



150 75 0 150 300

Feet

Legend

Sewer Lines

Gravity Line

ForceMain

ManHole

Lift Stations

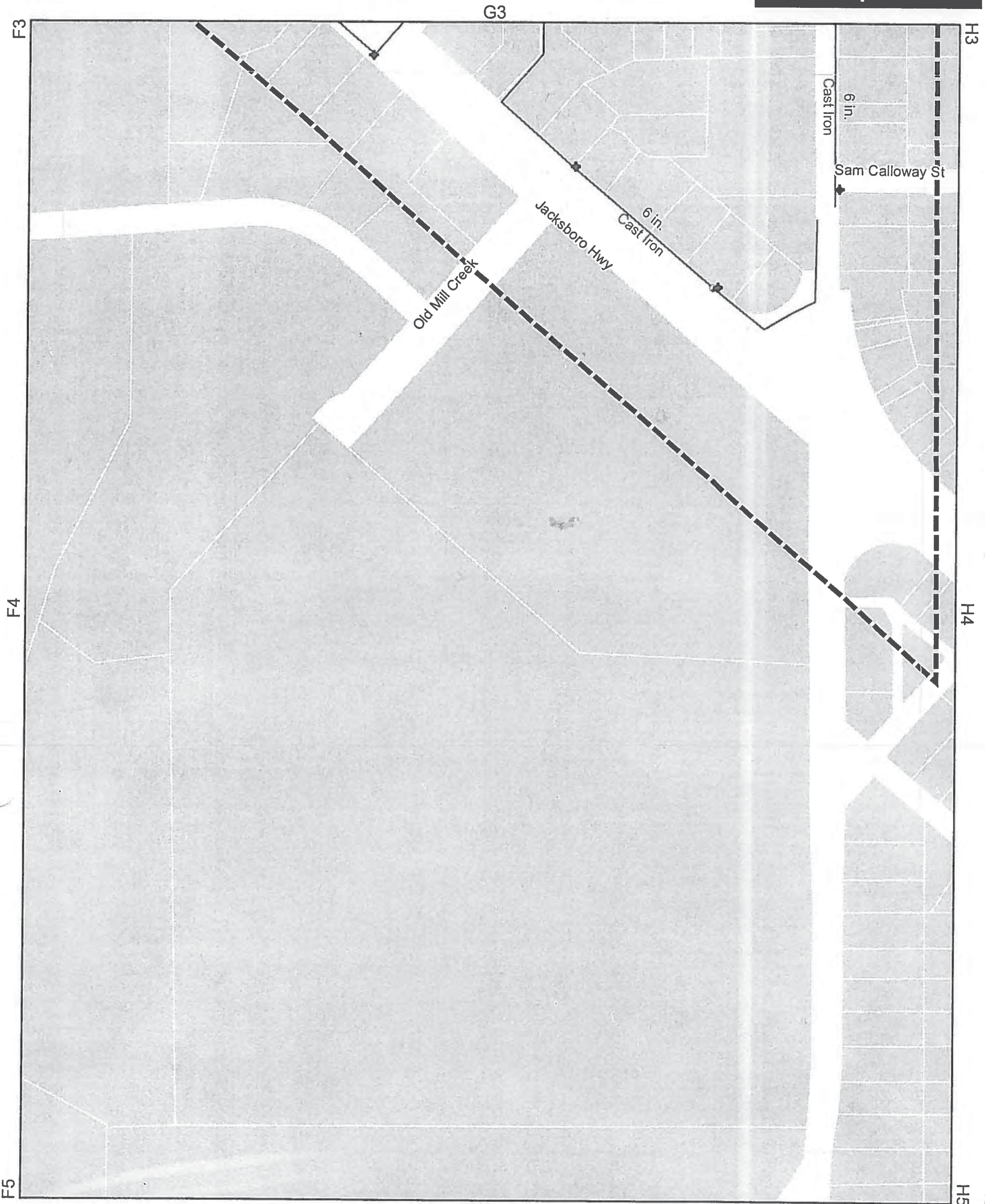
Sewer Cleanout

Kimley-Horn and Associates, Inc.

The City of Lake Worth map disclaimer describes limitations and uses for this map. Please report additional information or mark-ups to the City staff.

Oct 03, 2003

Water Map Grid G4



150 75 0 150 300

Feet

Kimley-Horn and Associates, Inc.

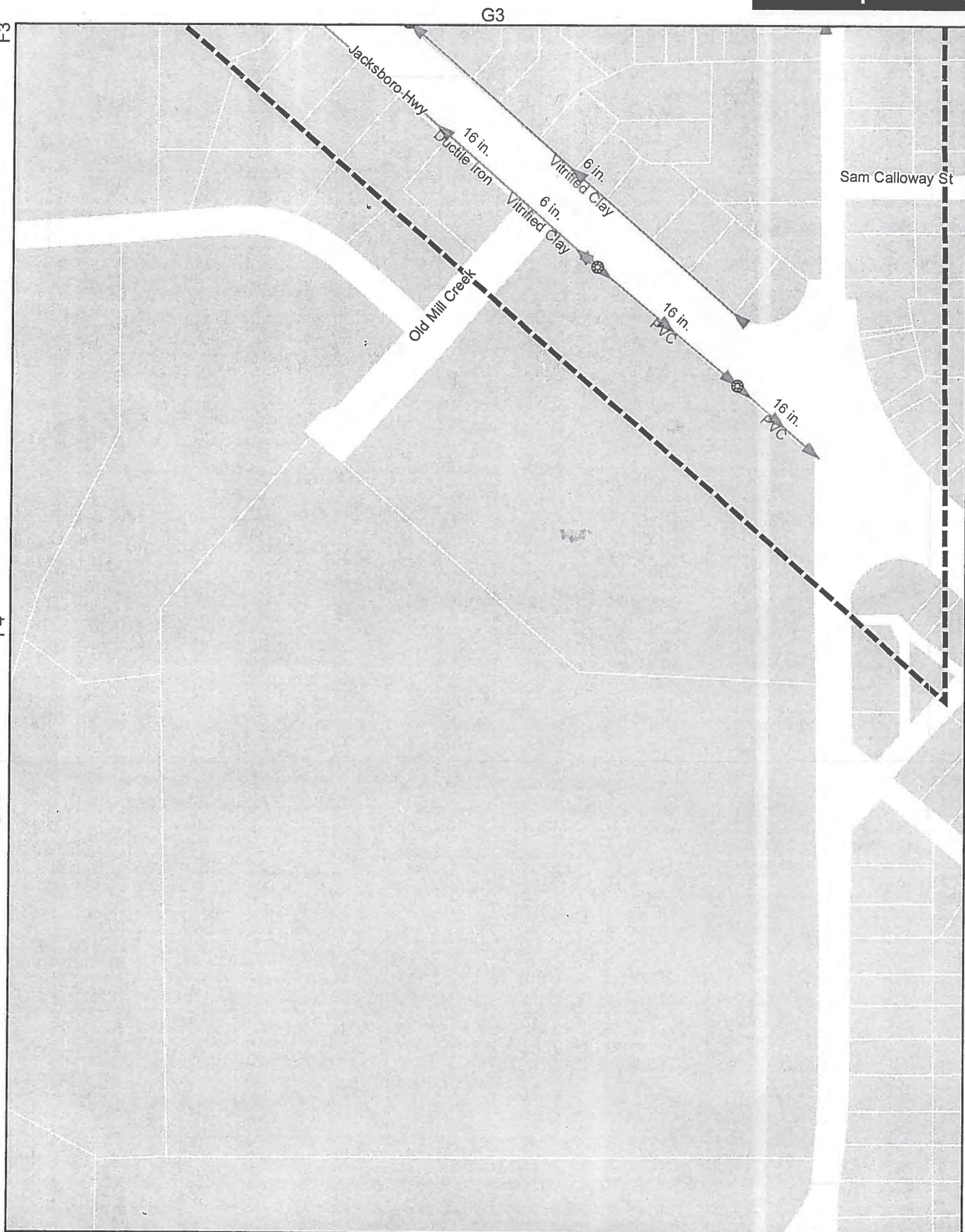
Legend

- Water Lines
- Water Well
- Valve
- Water Tank
- Hydrant

The City of Lake Worth map disclaimer describes limitations and uses for this map. Please report additional information or mark-ups to the City staff.

Oct 03, 2003

Sewer Map Grid G4



150 75 0 150 300

Feet

Kimley-Horn and Associates, Inc.

Legend

Sewer Lines

Gravity Line

ForceMain

ManHole

Lift Stations

Sewer Cleanout

The City of Lake Worth map disclaimer describes limitations and uses for this map. Please report additional information or mark-ups to the City staff.

Oct 03, 2003

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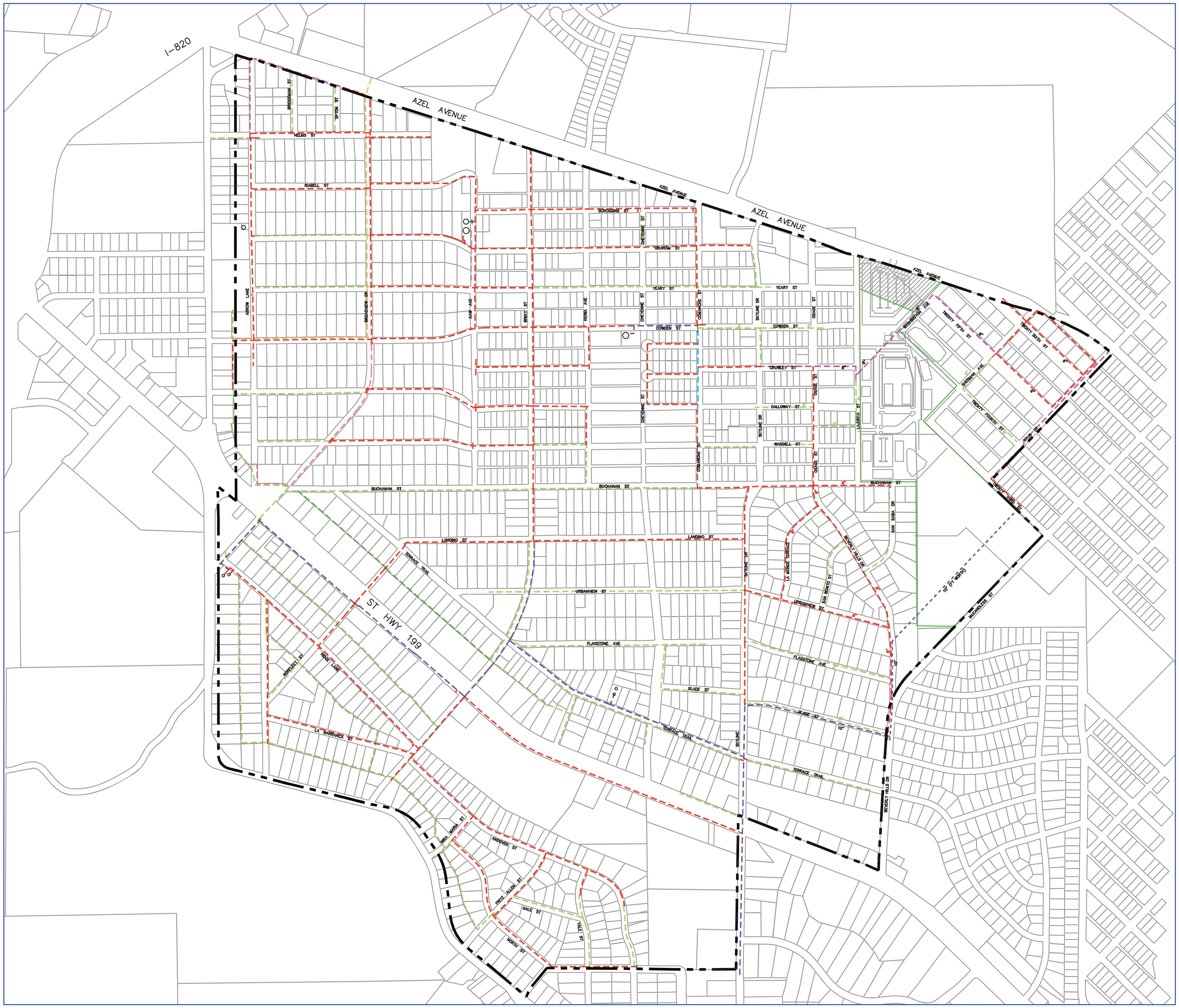
Exhibit 5

City of Sansom Park – Existing - Water Utilities



CITY OF SANSOM PARK

WATER MAP

WATER LEGEND

- 2" Water Lines
- 4" Water Lines
- 6" Water Lines
- 8" Water Lines
- 10" Water Lines
- 12" Water Lines
- Fort Worth Lines

N

400 0 200 400

GRAPHIC SCALE

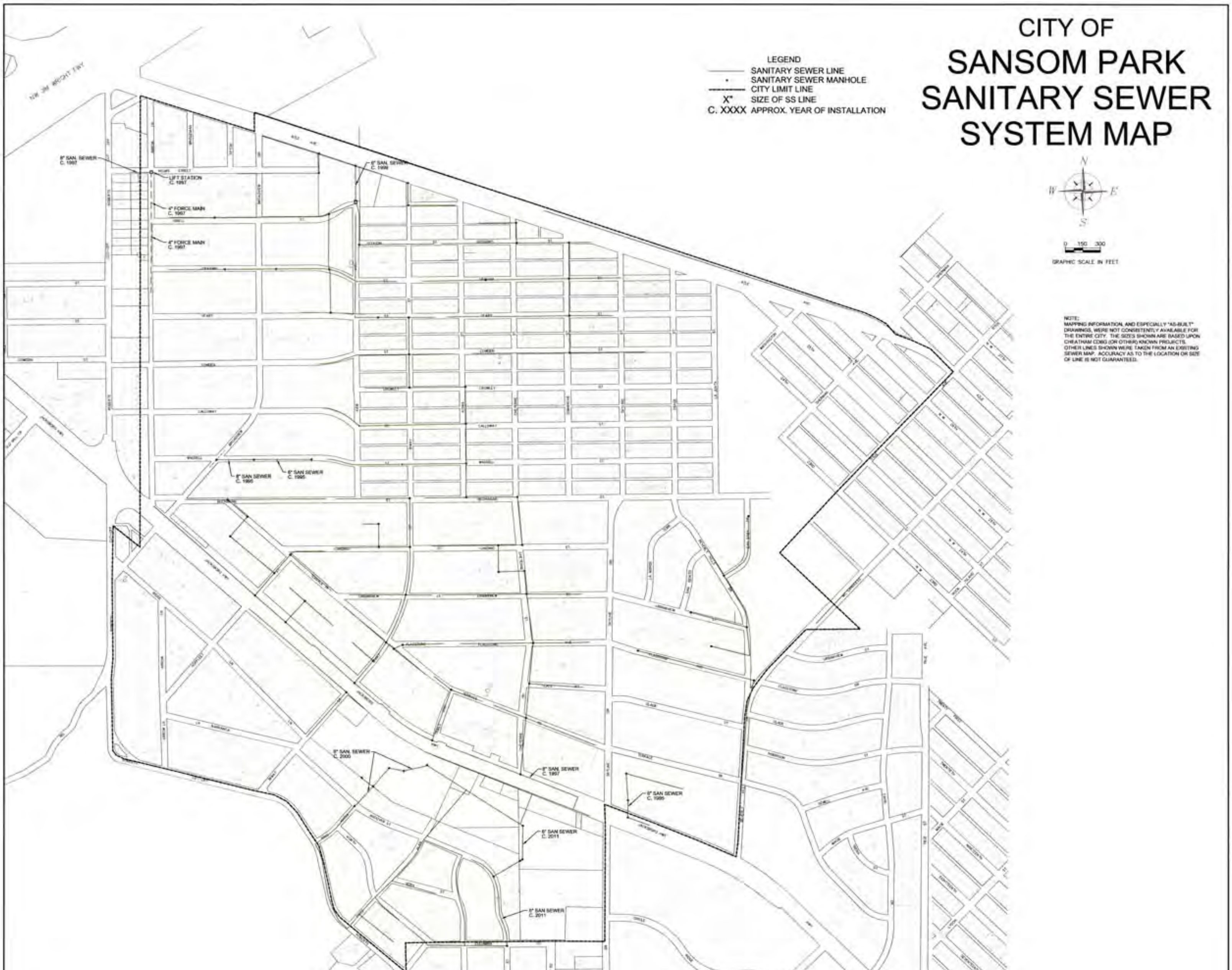
MARCH 2016

tnp teague nall & perkins

Drawing: I:\FTW\SANSOM PARK\BASE.dwg at Mar 16, 2016-3:22pm by Carol_Sh
Layout: water map Xrefs:

Exhibit 6

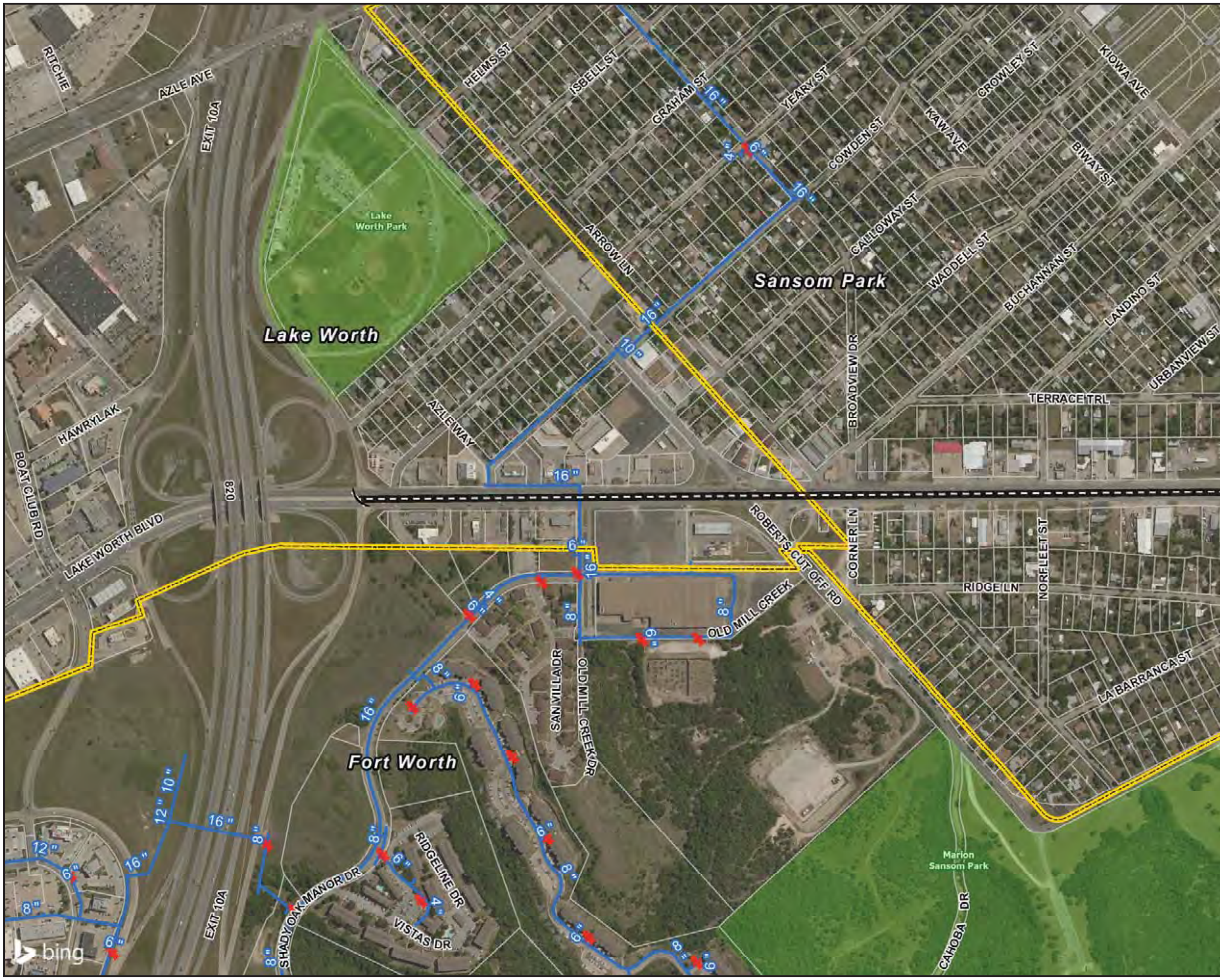
City of Sansom Park – Existing – Waste Water Utilities



CITY OF
SANSOM PARK
SANITARY SEWER
SYSTEM MAP
LEGEND
SANITARY SEWER LINE
SANITARY SEWER MANHOLE
CITY LIMIT LINE
X" SIZE OF SS LINE
C. XXXX APPROX. YEAR OF INSTALLATION
N
W
E
S
0 150 300
GRAPHIC SCALE IN FEET
NOTE:
MAPPING INFORMATION, AND ESPECIALLY "AS-BUILT" DRAWINGS, WERE NOT CONSISTENTLY AVAILABLE FOR THE ENTIRE CITY. THE SIZES SHOWN ARE BASED UPON CHEATHAM CDBG (OR OTHER) KNOWN PROJECTS. OTHER LINES SHOWN WERE TAKEN FROM AN EXISTING SEWER MAP. ACCURACY AS TO THE LOCATION OR SIZE OF LINE IS NOT GUARANTEED.
LIFT STATION
C. 1997
4" FORCE MAIN
C. 1997
NEEL-SCHAFFER
Solutions you can build upon
+
CHEATHAM & ASSOCIATES
CONSULTING ENGINEERS
TEXAS REG. No. F-2697

Exhibit 7

City of Fort Worth – Existing and Planned - Water Utilities



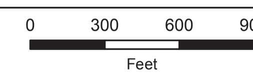
City of Fort Worth Existing and Planned Water Utilities

Exhibit 7-1

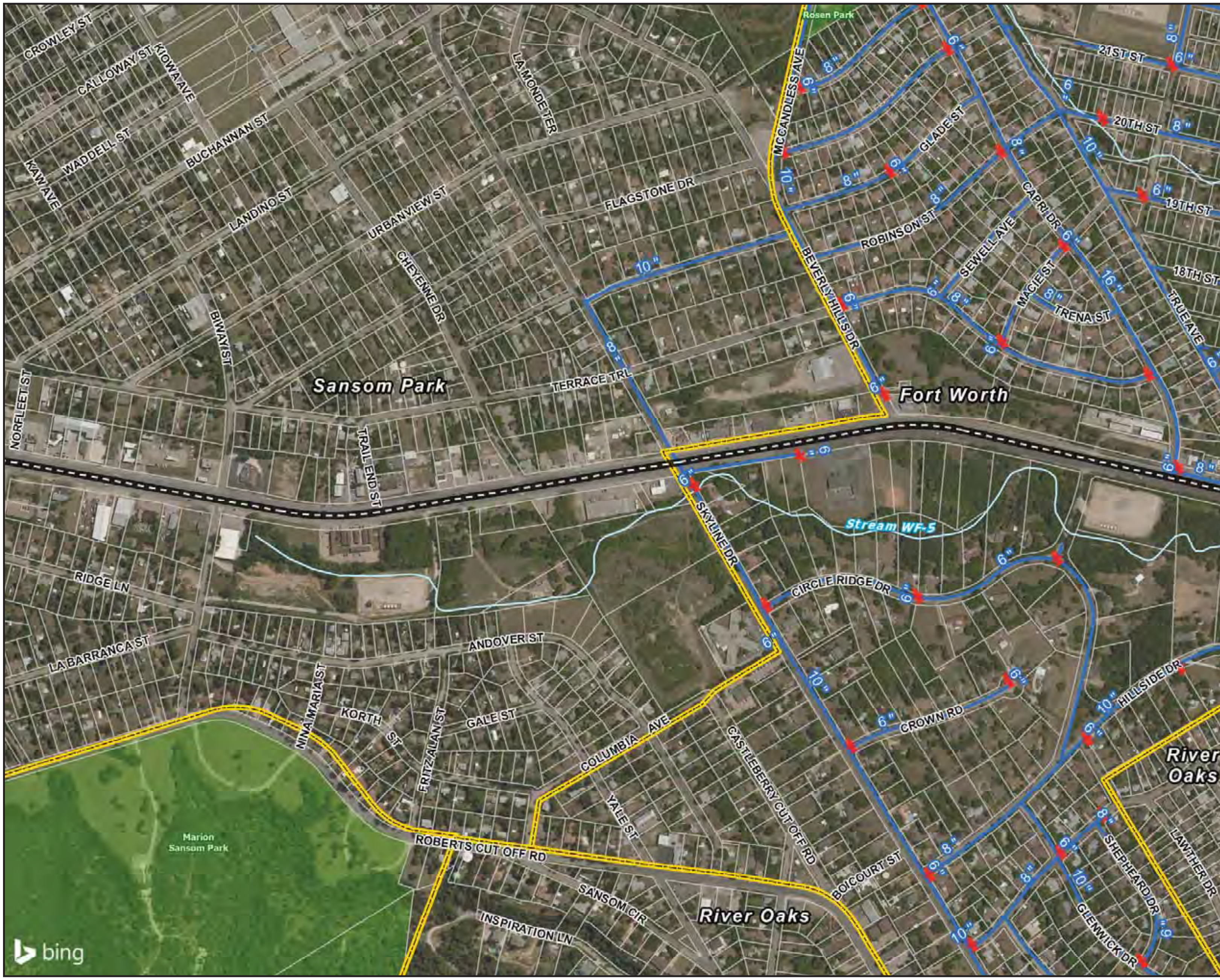
State Highway 199 Corridor Master Plan

Legend

- **SH 199**
- **Stream Centerline**
- **Parks**
- **Parcel Boundaries**
- **City Limits**
- Existing Fire Hydrant
- **Existing Water Lines**
- **2023 Water Line Improvement**



Parcel Data Source: Tarrant Appraisal District Parcels 2015   Date: 7/25/2017



City of Fort Worth Existing and Planned Water Utilities

Exhibit 7-2

State Highway 199 Corridor Master Plan

Legend

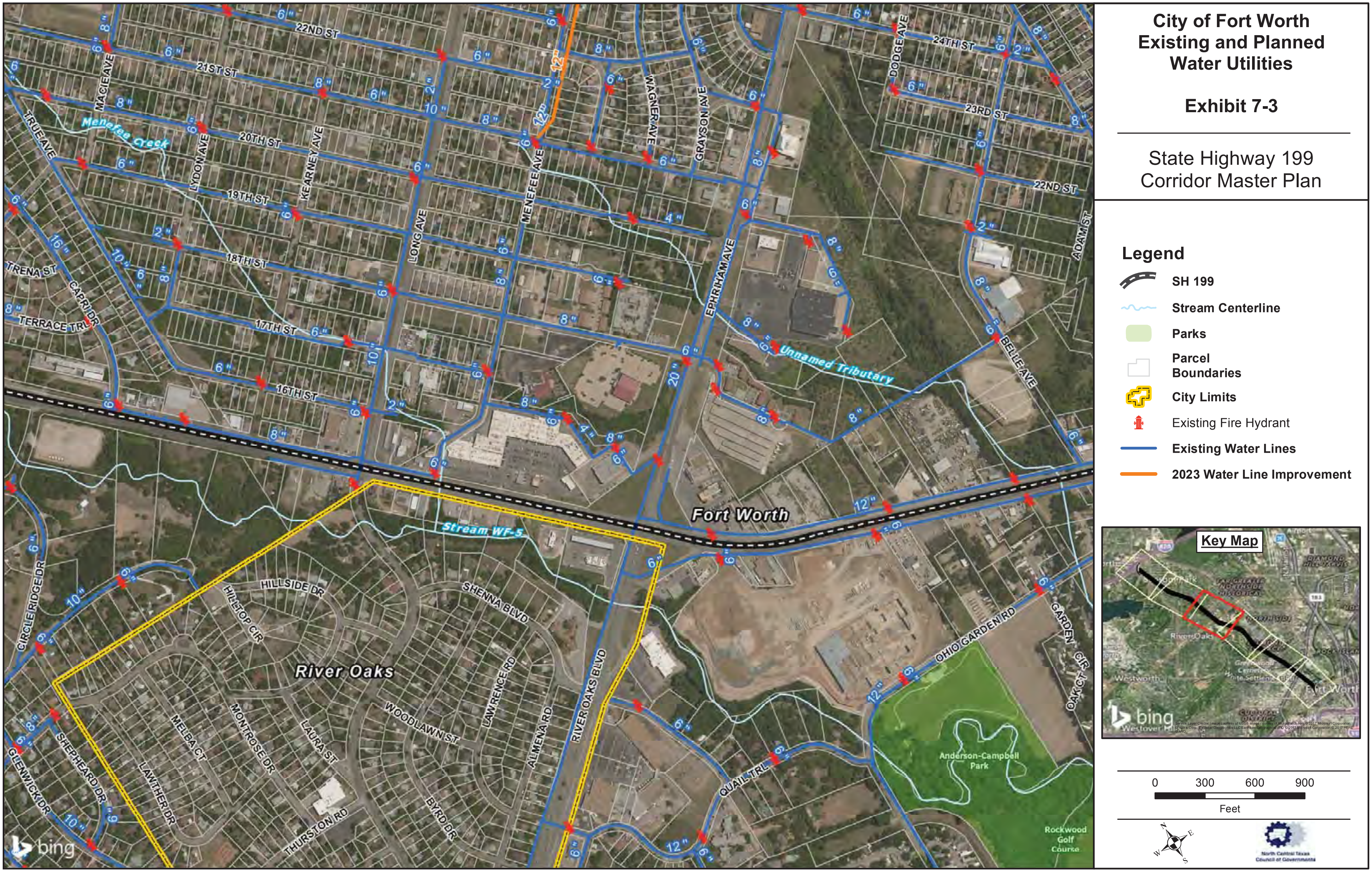
- SH 199
- Stream Centerline
- Parks
- Parcel Boundaries
- City Limits
- Existing Fire Hydrant
- Existing Water Lines
- 2023 Water Line Improvement

0 300 600 900

Feet

Parcel Data Source: Tarrant Appraisal District Parcels 2015

Date: 7/25/2017



City of Fort Worth Existing and Planned Water Utilities

Exhibit 7-3

State Highway 199 Corridor Master Plan

Parcel Data Source: Tarrant Appraisal District Parcels 2015

Date: 7/25/2017

City of Fort Worth Existing and Planned Water Utilities

Exhibit 7-4

State Highway 199 Corridor Master Plan

Legend

- SH 199
- Stream Centerline
- Parks
- Parcel Boundaries
- City Limits
- Existing Fire Hydrant
- Existing Water Lines
- 2023 Water Line Improvement

0 300 600 900

Feet

Parcel Data Source: Tarrant Appraisal District Parcels 2015   Date: 7/25/2017

City of Fort Worth Existing and Planned Water Utilities

Exhibit 7-5

State Highway 199 Corridor Master Plan

Legend

- SH 199
- Stream Centerline
- Parks
- Parcel Boundaries
- City Limits
- Existing Fire Hydrant
- Existing Water Lines
- 2023 Water Line Improvement

0 300 600 900

Feet

North Central Texas Council of Governments

Parcel Data Source: Tarrant Appraisal District Parcels 2015

Date: 7/25/2017

City of Fort Worth Existing and Planned Water Utilities

Exhibit 7-6

State Highway 199 Corridor Master Plan

Legend

- SH 199
- Stream Centerline
- Parks
- Parcel Boundaries
- City Limits
- Existing Fire Hydrant
- Existing Water Lines
- 2023 Water Line Improvement

0 300 600 900
Feet

Parcel Data Source: Tarrant Appraisal District Parcels 2015

Date: 7/25/2017

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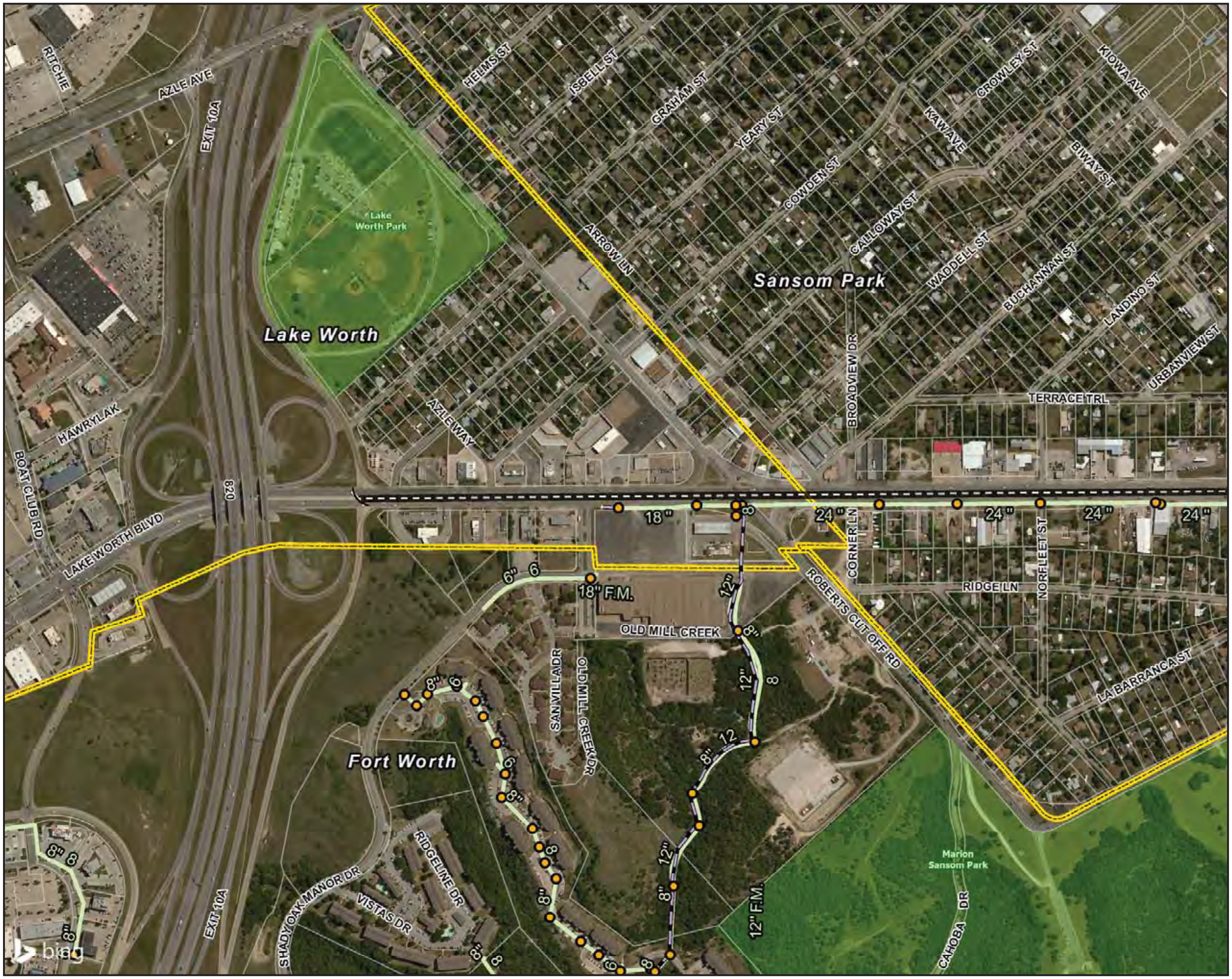
Exhibit 8

City of Fort Worth – Existing and Planned - Waste Water Utilities

City of Fort Worth Existing and Planned Waste Water Utilities

Exhibit 8-1

State Highway 199 Corridor Master Plan



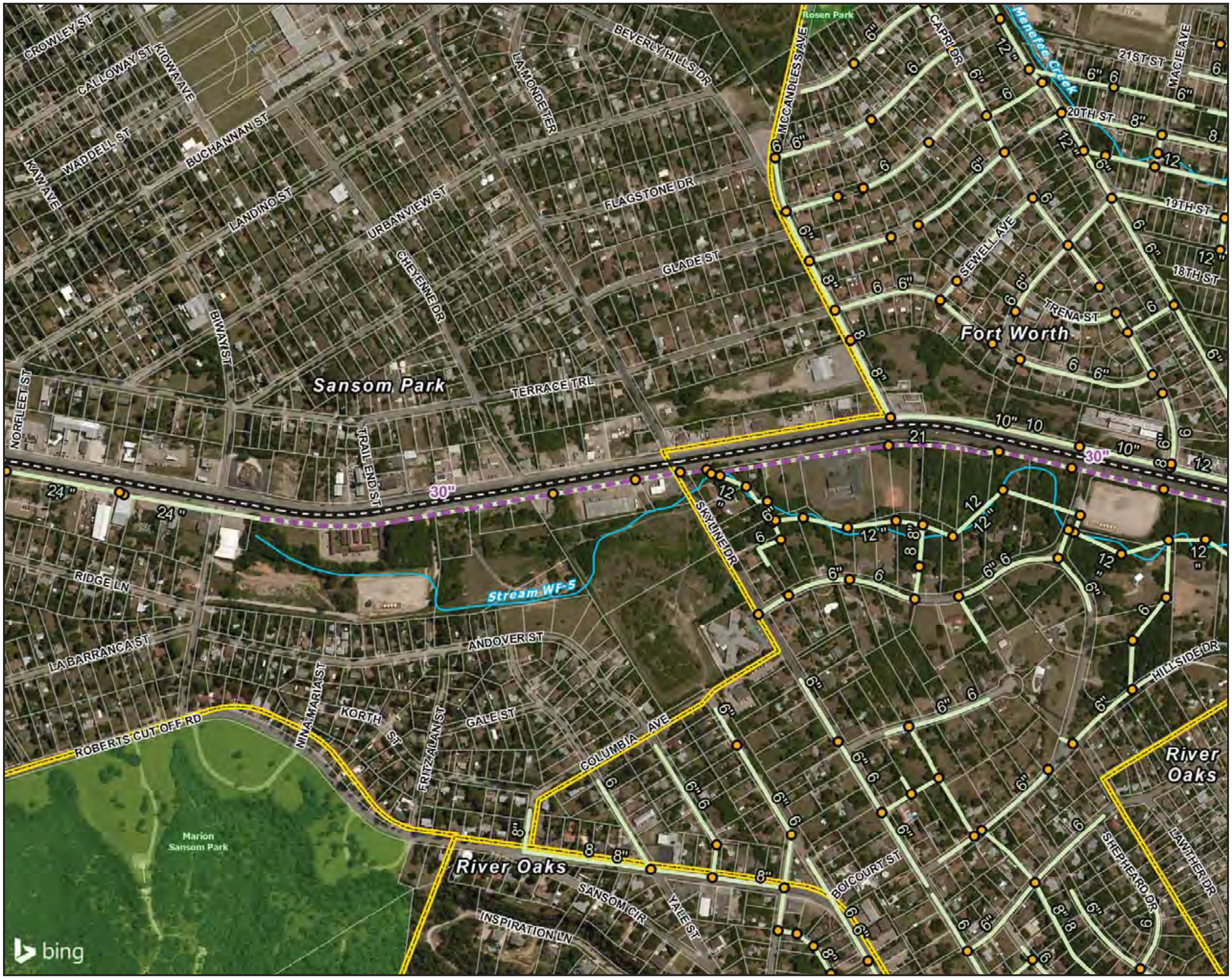
Parcel Data Source: Tarrant Appraisal District Parcels 2015

Date: 7/25/2017

City of Fort Worth Existing and Planned Waste Water Utilities

Exhibit 8-2

State Highway 199 Corridor Master Plan



Legend

- SH 199
- Streams
- Parks
- Parcel Boundaries
- City Limits
- Existing Manhole
- Existing Sewer Line
- Existing Model Force Main
- 2015 Sewer Line Parallel Improvement
- 2015 Sewer Line Improvement
- 2015 Force Main Improvement
- 2020 Sewer Line Improvement
- 2030 Sewer Line Improvement

0 300 600 900

Feet

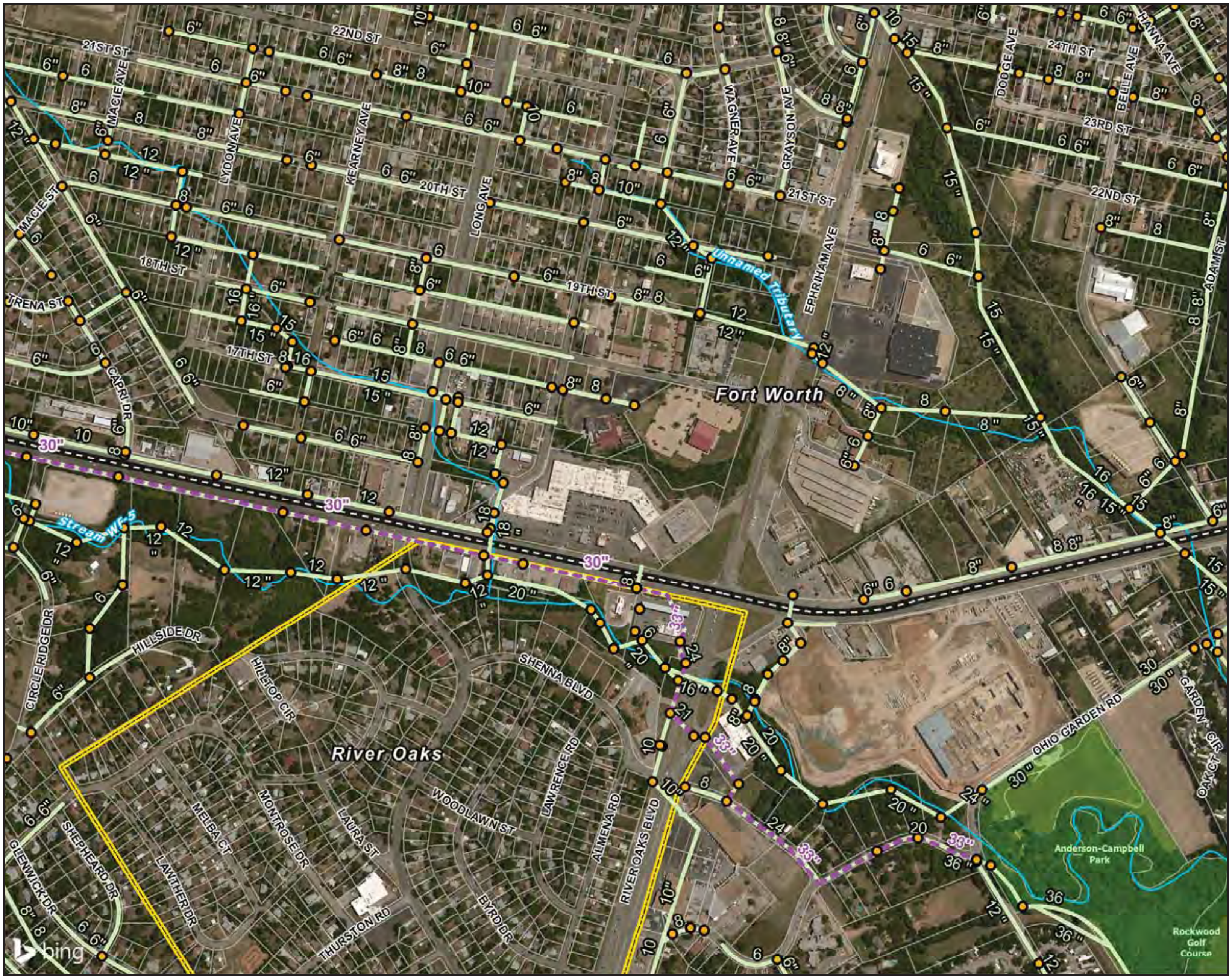
North Central Texas Council of Governments

Parcel Data Source: Tarrant Appraisal District Parcels 2015 Date: 7/25/2017

City of Fort Worth Existing and Planned Waste Water Utilities

Exhibit 8-3

State Highway 199 Corridor Master Plan



Legend

- SH 199
- Streams
- Parks
- Parcel Boundaries
- City Limits
- Existing Manhole
- Existing Sewer Line
- Existing Model Force Main
- 2015 Sewer Line Parallel Improvement
- 2015 Sewer Line Improvement
- 2015 Force Main Improvement
- 2020 Sewer Line Improvement
- 2030 Sewer Line Improvement

Key Map

0 300 600 900

Feet

Parcel Data Source: Tarrant Appraisal District Parcels 2015

Date: 7/25/2017

City of Fort Worth Existing and Planned Waste Water Utilities

Exhibit 8-4

State Highway 199 Corridor Master Plan

Legend

- SH 199
- Streams
- Parks
- Parcel Boundaries
- City Limits
- Existing Manhole
- Existing Sewer Line
- Existing Model Force Main
- 2015 Sewer Line Parallel Improvement
- 2015 Sewer Line Improvement
- 2015 Force Main Improvement
- 2020 Sewer Line Improvement
- 2030 Sewer Line Improvement

0 300 600 900
Feet

North Central Texas Council of Governments

Parcel Data Source: Tarrant Appraisal District Parcels 2015 Date: 7/25/2017

City of Fort Worth
Existing and Planned Waste Water Utilities

Exhibit 8-5

State Highway 199
Corridor Master Plan

Legend
- SH 199
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- Parcel Boundaries
- City Limits
- Existing Manhole
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- 2015 Sewer Line Parallel Improvement
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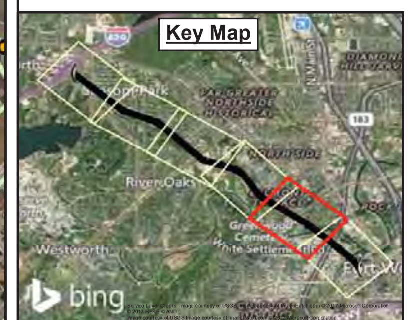
- 2015 Force Main Improvement
- 2020 Sewer Line Improvement
- 2030 Sewer Line Improvement

Key Map



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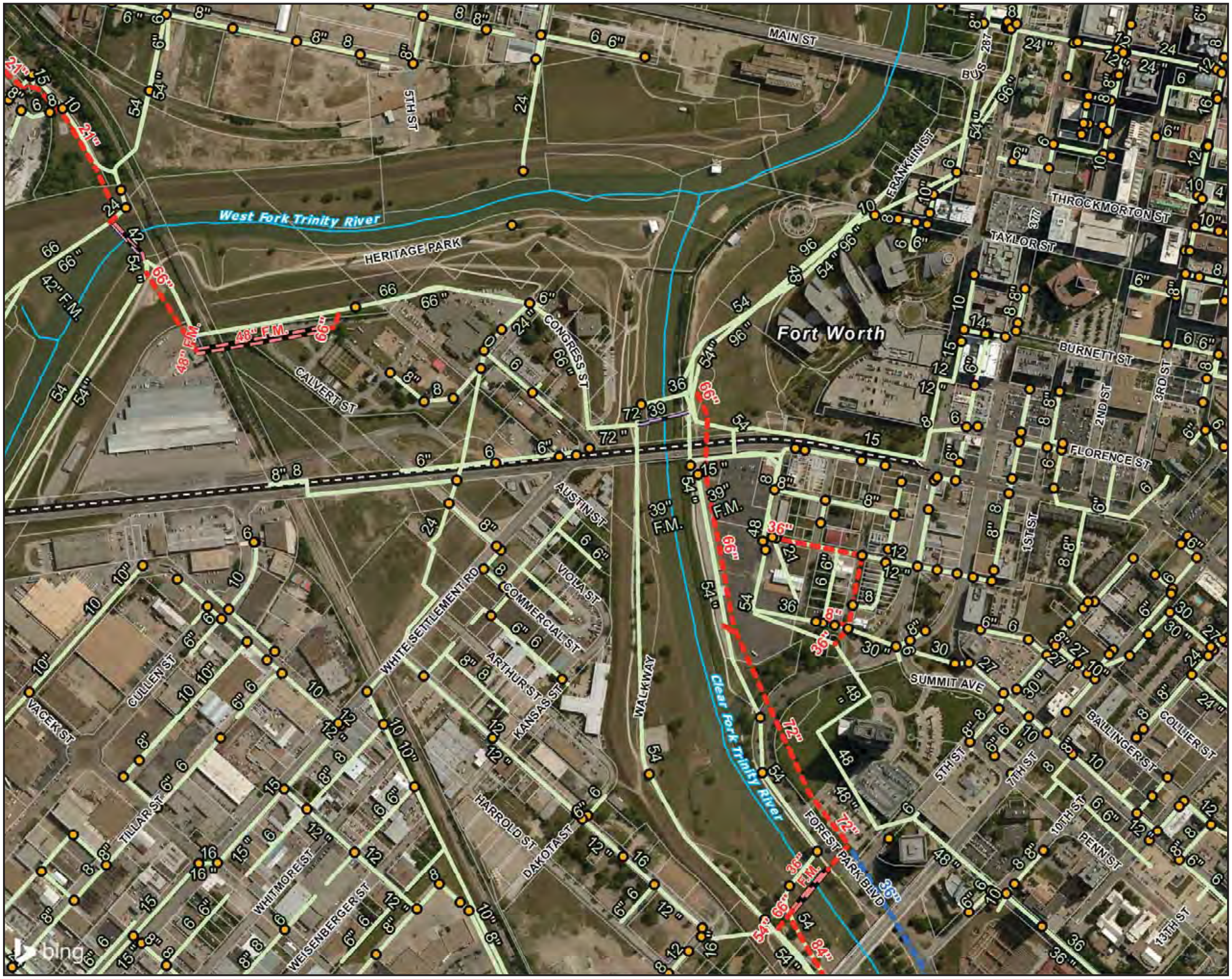
North Central Texas Council of Governments

Parcel Data Source: Tarrant Appraisal District Parcels 2015
Date: 7/25/2017



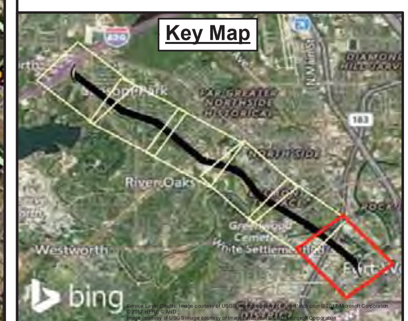
City of Fort Worth Existing and Planned Waste Water Utilities

Exhibit 8-6

State Highway 199
Corridor Master Plan

Legend

- SH 199
- Streams
- Parks
- Parcel Boundaries
- City Limits
- Existing Manhole
- Existing Sewer Line
- Existing Model Force Main
- 2015 Sewer Line Parallel Improvement
- 2015 Sewer Line Improvement
- 2015 Force Main Improvement
- 2020 Sewer Line Improvement
- 2030 Sewer Line Improvement



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North Central Texas Council of Governments

Parcel Data Source: Tarrant Appraisal District Parcels 2015 Date: 7/25/2017

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Attachment A

TAC Rule §21.40

Texas Administrative Code

TITLE 43	TRANSPORTATION
PART 1	TEXAS DEPARTMENT OF TRANSPORTATION
CHAPTER 21	RIGHT OF WAY
SUBCHAPTER C	UTILITY ACCOMMODATION
RULE §21.40	Underground Utilities

(a) General.

(1) Encasement.

(A) Underground utility facilities crossing the highway shall be encased in the interest of safety, protection of the utility, protection of the highway, and for access to the utility facility. Casing shall consist of a pipe or other separate structure around and outside the carrier line. The utility must demonstrate that the casing will be adequate for the expected loads and stresses.

(B) Casing pipe shall be steel, concrete, or plastic pipe as approved by the district, except that if horizontal directional drilling is used to place the casing, high-density polyethylene (HDPE) pipe must be used in place of plastic pipe.

(C) Encasement may be of metallic or non-metallic material. Encasement material shall be designed to support the load of the highway and superimposed loads thereon, including that of construction machinery. The strength of the encasement material shall equal or exceed structural requirements for drainage culverts and it shall be composed of material of satisfactory durability for conditions to which it may be subjected. The length of any encasement under the roadway shall be provided from top of backslope to top of backslope for cut sections, five feet beyond the toe of slope for fill sections, and five feet beyond the face of the curb for curb sections. These lengths of encasement include areas under center medians and outer separations, unless otherwise specifically addressed in subsections (b) - (f) of this section.

(D) The department will provide an example graphic upon request of a typical section showing encasement lengths.

(2) Depth. Where placements at the depths in this section are impractical or where unusual conditions exist, the department may allow installations at a lesser depth, but will require other means of protection, including encasement or the placement of a reinforced concrete slab. Reinforced concrete slabs or caps shall meet the following standards:

(A) width--five feet, or three times the diameter of the pipe, whichever is greater;

(B) thickness--six inches, at minimum;

(C) reinforcement--#4 bars at 12 inch centers each way or equivalent reinforcement; and

(D) cover--no less than six inches of sand or equivalent cushion between the bottom of the slab/cap and the top of the pipe.

(3) Manholes.

(A) Manholes shall not be installed unless necessary for installation and maintenance of underground lines. In no case shall a manhole be placed or permitted to remain in the pavement or shoulder of a highway. However, on noncontrolled access highways in urban areas, the district may, in its discretion, allow existing lines to remain in place under existing or proposed highways. In these cases, manholes may remain in place or be installed under traffic lanes of low volume highways in municipalities only if measures are taken to minimize the installations and to avoid locating them at intersections or in wheel paths.

(B) To conserve space, a manhole's dimensions shall be the minimum acceptable by appropriate engineering and safety standards. The only equipment that may be installed in manholes located on the right of way is that essential to the normal flow of the utility, such as circuit reclosers, cable splices, relays, valves, and regulators. Other equipment, such as substation equipment, large transformers, and pumps, shall be located outside the right of way.

(C) Inline manholes are the only type permitted within the right of way. The width dimensions shall be no larger than necessary to hold equipment involved and to meet safety standards for maintenance personnel. Outside width, the dimension of the manhole perpendicular to the highway, shall not exceed ten feet, with the length to be held to a reasonable minimum. The outside diameter of the manhole chimney at the ground level shall not exceed 36 inches, except that if the utility demonstrates necessity, the district may, at its discretion, allow an outside diameter of up to 50 inches. The top of the roof of the manhole shall be five feet or more below ground level.

(D) All manhole covers shall be installed flush with the ground or pavement structure. In order to minimize vandalism, manhole covers must weigh at least 175 pounds. Manhole rings and covers must be designed for HS-20 loading.

(E) Manholes shall be straight, inline installations with a minimum overall width necessary to operate and maintain the enclosed equipment. The utility is responsible for any adjustment of the manhole rim that may be needed to meet grade changes.

(4) Installation.

(A) Utility facilities placed beneath any existing highway shall be installed by boring or tunneling. Jacking may not be used unless approved in writing by the district. The district may require encasement of lines installed by boring or jacking. The use of explosives is prohibited. Pipe bursting or fluid/mist jetting may be allowed at the discretion of the department.

(B) For rural, uncurbed highway crossings, all borings shall extend beneath all travel lanes. Unless precluded by right of way limitations, the following clearances are required for rural highway crossings:

(i) 30 feet from all freeway mainlanes and other high-speed (exceeding 40 mph) highways except as indicated in clauses (ii) - (iv) of this subparagraph;

(ii) 16 feet for high-speed highways with current average daily traffic volumes of 750 vehicles per day or fewer;

(iii) 16 feet for ramps; or

(iv) ten feet for low-speed (40 mph or less) highways.

(C) Annular voids greater than one inch between the bore hole and carrier line (or casing, if used) shall be filled with a slurry grout or other flowable fill acceptable to the department to prevent settlement of any part of the highway facility over the line or casing.

(D) For curbed highway crossings, all borings shall extend beneath travel and parking lanes and extend beyond the back of curb, plus:

(i) 30 feet from facilities with speed limits of 40 mph or greater; or

(ii) five feet from facilities with speed limits of less than 40 mph or less, plus any additional width necessary to clear an existing sidewalk.

(E) Where circumstances necessitate the excavation of a bore pit or the presence of directional boring equipment closer to the edge of pavement than set forth in paragraphs (2) or (3) of this subsection, approved protective devices shall be installed for protection of the traveling public in accordance with §21.38 of this subchapter (relating to Construction and Maintenance). Bore pits shall be located and constructed in such a manner as not to interfere with the highway structure or traffic operations. If necessary, shoring shall be utilized for the protection of the highway, and must be approved by the district.

(F) All traffic control devices, including signs, markings, or barricades used to warn motorists and pedestrians of the construction activity must conform to the TMUTCD.

(G) When trenching longitudinally, backfill or stabilized sand shall be compacted to densities equal to that of the surrounding soil.

(5) Nonmetallic pipe detection. Where nonmetallic pipe is installed, whether longitudinally or at a crossing, a durable metal wire or other district-approved means of detection shall be concurrently installed.

(6) Unsuitable conditions. The following conditions are generally unsuitable or undesirable for pipeline crossings and shall be avoided:

(A) deep cuts;

(B) locations near footings or bridges and retaining walls;

(C) crossing intersections at-grade or ramp terminals;

(D) locations at cross-drains where the flow of water may be obstructed;

(E) locations within basins or underpasses drained by pump if the pipeline carries a liquid or liquefied gas; or

(F) terrain where minimum depth of cover would be difficult to attain.

(7) Clearances. Except as specified in this subchapter, there shall be a minimum of 12 inches vertical and horizontal clearance between a new utility facility and an existing utility facility, unless a greater clearance is required by the district. However, if an installation of another utility facility or

highway feature cannot take place without disturbing an existing utility facility, the minimum clearance will be 24 inches.

(8) Crossings. A district may require crossings with no longitudinal connections to be encased within the right of way.

(9) Drainage easements. Where it is necessary for pipelines to cross department drainage easements outside of the right of way, the depth of cover shall be as specified for each type of utility facility. In cases where soil conditions are such that erosion might occur, or where it is not feasible to obtain specified depth, it shall be the responsibility of the utility to install retards, energy dissipators, encasement, or concrete or equivalent slabs/caps over the pipe, as approved by the department. Where grades on the pipelines must be maintained, such as gravity flow sewer lines, each case will be reviewed on an individual basis, keeping in mind that the main purpose of the channel is to carry drainage water and that this flow must not be obstructed. The utility is responsible for obtaining any other approvals to occupy the drainage easement.

(10) Existing installations in a highway or transportation project. At the district's discretion, existing longitudinal utility facilities in a highway or transportation project that otherwise meet the requirements of this subchapter may remain in place if the utility facilities:

(A) can be maintained in accordance with §21.37(b)(2) of this subchapter (relating to Design); and

(B) are not located under the pavement structure or shoulder of any proposed or existing highway.

(11) Markers. If a high pressure pipeline crosses a highway, the utility shall place a readily identifiable, durable, and weatherproof marker over the centerline of the pipe at each right of way line. Readily identifiable, durable, and weatherproof markers shall be placed at a minimum distance of 500 feet or line of sight at the right of way line for pipelines installed longitudinally within the right of way. All markers shall indicate the name, address, emergency telephone number of the utility, and offset from the right of way line. For gas, petroleum, or saltwater pipelines, the pipeline product, operating pressure, and depth of pipe below grade shall also be indicated on the markers. At locations where underground utility facilities have been allowed to cross at an angle other than 90 degrees to centerline, the district may require additional markers in the medians and outer separations of the highway.

(12) Backfilling. Underground utility facility installations shall be backfilled with pervious material and outlets for underdrainage.

(13) Underdrainage. Underdrains shall be provided where necessary. No puddling beneath the highway will be permitted.

(b) Gas and liquid petroleum pipelines and saltwater pipelines.

(1) Low-pressure pipelines.

(A) Depth of cover for crossings. Depth of cover is the depth to the top of the carrier pipe or casing, as applicable. Where materials and other conditions justify, such as on existing pipelines remaining in place, the district may require a minimum depth of cover under the pavement structure of 12 inches or one-half the diameter of the pipe, whichever is greater.

(i) For encased low-pressure gas pipelines, the minimum depth of cover shall be:

(I) 18 inches or one-half the diameter of the pipe, whichever is greater, under pavement structure;

(II) 24 inches outside pavement structure and under ditches (original unsilted flowline); or

(III) 30 inches for unencased sections of encased pipelines outside of pavement structure.

(ii) For unencased low-pressure gas pipelines, the minimum depth of cover shall be:

(I) 60 inches under the pavement surface or 18 inches under the pavement structure for paved areas;

(II) 48 inches outside paved areas and under ditches (original unsilted flowline); or

(III) a lesser depth if authorized by the district where a reinforced concrete slab is used to protect the pipeline.

(B) Depth of cover for longitudinal placement. The minimum depth of cover for longitudinal installations shall be 36 inches.

(C) Encasement. Low-pressure gas pipelines crossing the pavement shall be placed in a steel encasement. The district may waive this encasement requirement if the pipeline is of welded steel construction and is protected from corrosion by cathodic protective measures or cold tar epoxy wrapping, and the utility signs a written agreement that the pavement will not be cut for pipeline repairs at any time in the future.

(D) Vents. One or more vents shall be provided for each casing or series of casings. For casings longer than 150 feet, vents shall be provided at both ends. On shorter casings, a vent shall be located at the high end with a marker placed at the low end. Vents shall be placed at the right of way line immediately above the pipeline, situated so as not to interfere with highway maintenance or be concealed by vegetation, and shall be no greater than six inches in diameter. The owner's name, address, and emergency telephone number shall be shown on each Cont'd...

Attachment B

Utility Minimum Depth of Cover and Distance Off the Right-of-Way

UTILITY MINIMUM DEPTH OF COVER AND DISTANCE OFF THE RIGHT-OF-WAY

UTILITY TYPE	AERIAL	BURIED	OFF ROW	ROADWAY CROSSINGS	PARALLEL TO ROADWAY	MATERIAL TYPE	NOTES
WATER (W)	N / A	36" MIN.	4 - FEET	STEEL ENCASEMENT	PUBLIC UTILITY ONLY	SS-PVC (BLUE)	ENCASEMENT SHALL EXTEND FROM ROW TO ROW LINE.
SANITARY SEWER (SS)	N / A	36" MIN.	4 - FEET	STEEL ENCASEMENT	STEEL OR PVC	SS-PVC (GREEN)	ENCASEMENT SHALL EXTEND FROM ROW TO ROW LINE.
OIL / GAS (LPG) - 60 PSIG AND LESS.	N / A	30 - INCHES LOWER THAN OPEN CHANNEL	4 - FEET	60" MIN. UNDER THE PAVEMENT SURFACE / 48" MIN. UNDER THE BAR DITCHES	ENCASED 36" / UNENCASED 48" MIN. DEPTH IS TO BE FROM THE BOTTOM OF THE BAR DITCH'S ELEVATION.	STEEL AND OR HDPE	ENCASEMENT SHALL EXTEND FROM ROW TO ROW LINE.
OIL / GAS (HPG) - GREATER THAN 60 PSIG.	N / A	48 - INCHES LOWER THAN OPEN CHANNEL	4 - FEET	STEEL ENCASED,60" MIN. UNDER THE PAVEMENT SURFACE / 48" MIN. UNDER THE BAR DITCH ELEVATION	STEEL ENCASED, 48" / UNENCASED 48" MIN. DEPTH IS TO BE FROM THE BOTTOM OF THE BAR DITCH ELEVATION.	STEEL AND OR HDPE	ENCASEMENT SHALL EXTEND FROM ROW TO ROW LINE.
COMMUNICATIONS (COPPER)	18' MIN. FROM THE DRIVING SURFACE	24" MIN. DEPTH OF COVER	4 - FEET	60" MINIMUM DEPTH OF COVER ENCASSED IN STEEL OR HDPE	24" MINIMUM DEPTH OF COVER BELOW BAR DITCH ELEVATION.	STEEL AND OR HDPE	ENCASEMENT FROM TOP OF BACK SLOPE TO TOP OF BACK SLOPE.
COMMUNICATIONS (FIBER OPTIC)	18' MIN. FROM THE DRIVING SURFACE	42" MIN. DEPTH OF COVER	4 - FEET	60" MINIMUM DEPTH OF COVER ENCASED IN STEEL OR HDPE	42" MINIMUM DEPTH OF COVER BELOW BAR DITCH ELEVATION.	STEEL AND OR HDPE	ENCASEMENT FROM TOP OF BACK SLOPE TO TOP OF BACK SLOPE.
ELECTRIC	22' MIN. FROM THE DRIVING SURFACE	36" MIN. DEPTH OF COVER	ALIGNMENT IS TO BE IN THE FIRST 3-FEET NEXT TO ROW	ENCASED IN STEEL AND MINIMUM DEPTH OF COVER OF 60"	36" MINIMUM DEPTH OF COVER, ENCASED IN STEEL OR HDPE.	STEEL AND OR HDPE	ENCASEMENT FROM TOP OF BACK SLOPE TO TOP OF BACK SLOPE.

NOTES:
1. PRIVATE UTILITIES MAY CROSS TXDOT ROADWAYS AT A 90-DEGREE ANGLE WITHOUT AN EXCEPTION LETTER.
2. PUBLIC UTILITIES MAY CROSS A TXDOT ROADWAY AND RUN PARRALLELL TO THE ROADWAY.

Appendix F – Existing Right-of-Way and Corridor Configuration Technical Memorandum

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State Highway 199
Corridor Master Plan

From IH 820 to Belknap Street

Existing Right-of-Way and Corridor Configuration
Technical Memorandum

Submittal Date:
June 28, 2017

Prepared For:
North Central Texas Council of Governments

Prepared By:
Freese and Nichols, Inc.
4055 International Plaza, Suite 200
Fort Worth, Texas 76109
817-735-7300
Texas Registered Engineering Firm F-2144

1.0 EXISTING RIGHT-OF-WAY

The State Highway (SH) 199 corridor, between Interstate Highway (IH) 820 and Belknap Street, consists of a varying width right-of-way owned by the Texas Department of Transportation (TxDOT). The existing right-of-way spans between approximately 80 feet and approximately 150 feet. The study corridor can be generalized into six different configurations based on the number of travel lanes and right-of-way width.

- 150-foot right-of-way width and six travel lanes
- 150-foot right-of-way width and four travel lanes
- 140-foot right-of-way width and four travel lanes
- 120-foot right-of-way width and four travel lanes
- 100-foot right-of-way width and four travel lanes
- 80-foot right-of-way width and four travel lanes

Beginning at the western end of the corridor, the 150-foot right-of-way width and six travel lanes configuration spans the length between IH 820 and Roberts Cut Off Road, a distance of 2,050 feet (0.39 miles). This is the only section of the corridor with six travel lanes. In addition, this section includes a center landscape median and paved shoulders of varying widths.

Continuing east along the corridor, the right-of-way width continues as 150-feet with a reduction of the number of travel lanes from six to four between Roberts Cut Off Road and 21st Street, a distance of 15,950 feet (3.02 miles). This section includes a center median and paved shoulders of varying width. The landscape median between Roberts Cut Off Road and Skyline Drive differs from the typical grass median with the inclusion of a variety of shrubs and a higher density of planted trees.

Figure 1. Landscape Median Between Roberts Cut Off Road and Skyline Drive
Source: Freese and Nichols, 2016

In the next section of the corridor, from 21st Street to the extension of Park Street, the right-of-way is typically 120-feet wide with four travel lanes. This 2,650 foot (0.50 miles) section also includes a center landscape median and paved shoulders of varying width.

Continuing eastward toward downtown Fort Worth, the 3,100-foot (0.59 miles) section between the extension of Park Street and University Drive has a right-of-way width of 140 feet with four travel lanes. Through this segment of the corridor, the TxDOT right-of-way maps (CCSJ-0171-05-001&004) depict a 120-foot right-of-way while the Plan and Profile of Proposed SH 34 / SH 199 (CCSJ-0171-05-001&004) files depict a 140-foot right-of-way. In addition, multiple developments, such as property fences and utility poles, appear to be at a 120-foot right-of-way location versus a 140-foot right-of-way location. This section of the SH 199 corridor includes a center landscaped median and paved shoulders of varying width.

Figure 2. Median Tree and Lighting East of SH 199 and 18th Street Intersection
Source: Freese and Nichols, 2016

The right-of-way reduces in width three separate times in the 7,350 feet (1.39 miles) between University Drive and Belknap Street, but continues to include four travel lanes. The first right-of-way section, between University Drive and the West Fork of the Trinity River, is 120-feet wide, the next section, between the West Fork of the Trinity River to Peach Street, is 100-feet wide, and final section, between Peach Street and Belknap Street, is 80-feet wide. These sections of SH 199 do not include a center median but do include paved shoulders of varying width.

Within the SH 199 corridor, the right-of-way at the intersections of side streets to SH 199 typically follow the alignment of the existing intersection. The layout of the existing right-of-way at the SH 199 and SH 183 intersection is unique in that the right-of-way was planned and acquired for a larger, highway interchange. Three of the four quadrants at the intersection remain as undeveloped TxDOT right-of-way; however, the southwest quadrant has been purchased and developed by a private developer. Figure 3 shows the existing right-of-way at the SH 199 and SH 183 intersection.

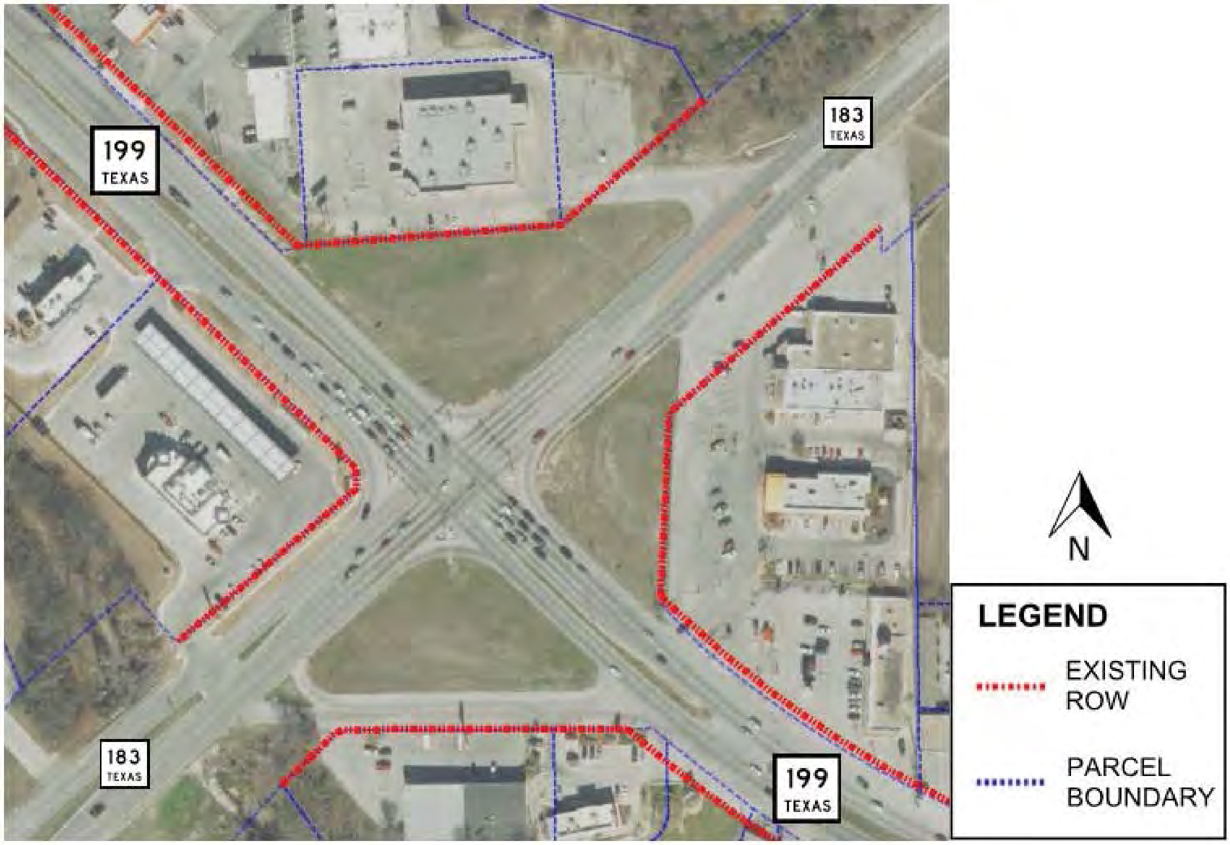

Figure 3. Existing Right-of-Way at SH 199 and SH 183 Intersection
Source: Existing Right-of-Way - TxDOT Record Drawings, Parcel Boundary - 2015 Tarrant Appraisal District Data

<u>Recommendations</u>
During the next design phase, it is recommended that a licensed land surveyor research and locate property boundaries and right-of-way limits. After locating and documenting these limits, it is recommended that the land surveyor provide a map to the design team for future development of the roadway improvements within the study area.

2.0 ROADWAY MEDIAN

In the segments of the corridor between IH 820 and University Drive where a center raised median exists, roadway illumination can be found. The center median varies in width between 18 and 20 feet and typically includes a 12-foot wide left turn lane at signalized intersections. Outside of signalized intersections, the center median openings typically do not include deceleration, taper, or storage lengths. Within the SH 199 corridor, there are 10 median openings at signalized intersections and 26 median openings at non-signalized intersections. Figures 4 and 5 shows representative median openings along SH 199.

Figure 4. Median Opening and Left Turn Lane West of SH 199 and Beverly Hills Drive Intersection
Source: Freese and Nichols, 2016

Figure 5. Center Median Opening East of SH 199 and 21st Street Intersection
Source: Freese and Nichols, 2016

3.0 POSTED SPEED LIMITS

Within the SH 199 corridor, there are three different posted speed limits, according to the TxDOT Statewide Planning Map (http://www.txdot.gov/apps/statewide_mapping/StatewidePlanningMap.html) and on-site investigation. For three-quarters of the study corridor, between IH 820 and University Drive, the posted speed limit is 45 miles per hour (mph). As SH 199 approaches downtown Fort Worth, from University Drive to 400 feet west of the West Fork of the Trinity River, the posted speed limit transitions to 40 MPH. Continuing to the east, toward downtown Fort Worth, the posted speed limit transitions from 40 mph to 35 mph. The posted speed limit of SH 199 is 35 mph from 40 feet west of the West Fork of the Trinity River to Belknap Street. The lowest posted speed limit for the SH 199 corridor resides within the Panther Island planned development. Figure 6 shows the three posted speed limits within the project study area.

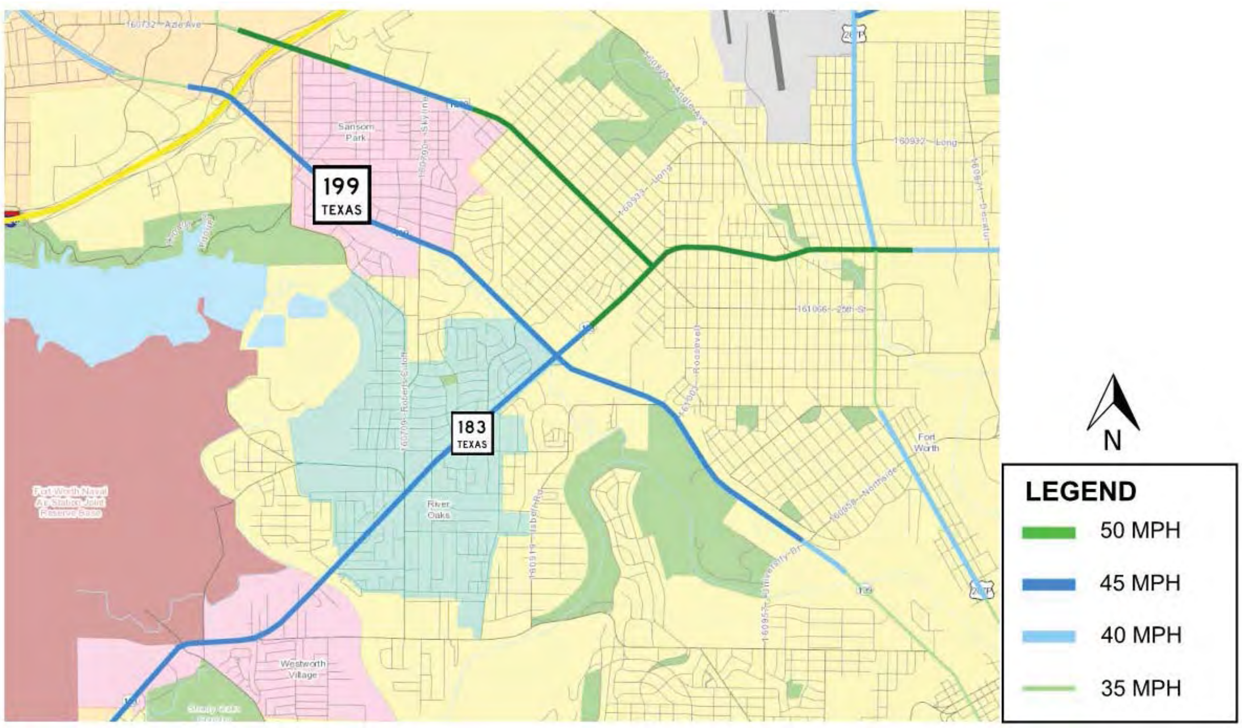

Figure 6. SH 199 Posted Speed Limits
Source: TxDOT Statewide Planning Map, 2017

4.0 EXISTING PAVEMENT SECTION

Based on available TxDOT record drawing data, the roadway pavement section within the SH 199 corridor was established during three major TxDOT projects. The first project (TxDOT CCSJ - 0171-05-001&004), was the initial construction of the SH 199 roadway, which was named SH 34 at the time. The construction began at Belknap Street and ended at Nine Mile Bridge Road and started in 1930. During this project, a 20-foot wide travel lane was constructed for eastbound and westbound vehicular traffic. The project included a six-inch reinforced concrete pavement over compacted subgrade on a four-inch parabolic crown (see Figure 7). The roadway improvements also included seven-inch concrete curbs along the center median and drainage improvements consisting of roadside drainage channels and drainage culverts crossing underneath SH 199, from the northside to the southside.

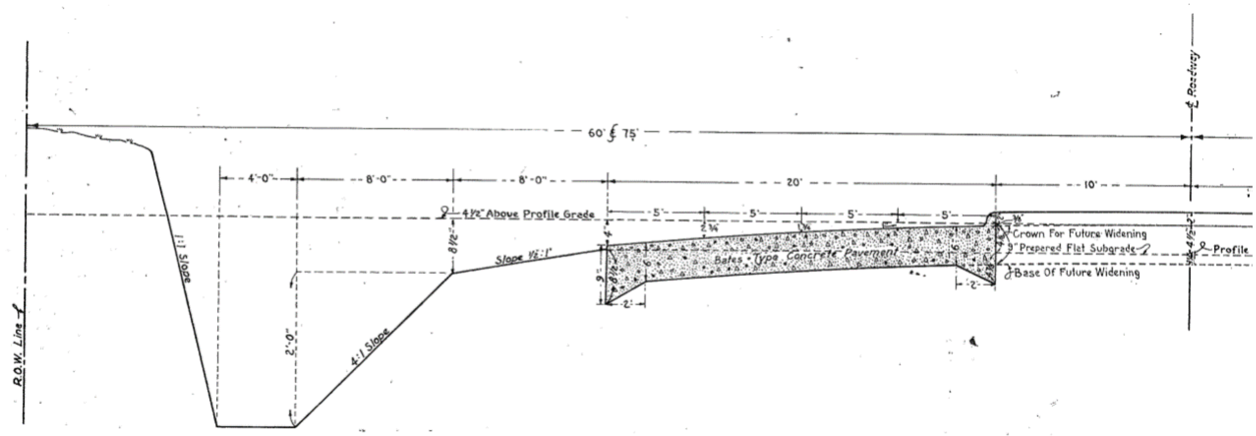

Figure 7. SH 199 CCSJ - 0171-05-001&004 Improvements – Typical Section
Source: TxDOT, 1930

The second project (TxDOT CCSJ - 0171-05-013) included the widening of SH 199 from University Drive to the Lake Worth bridge in 1956. During this project, a four-foot wide and nine-inch thick hot mix asphalt concrete (HMAC) travel lane expansion and a ten-foot wide and six-inch thick flexible base shoulder were constructed on the north and south side of SH 199 (see Figure 8). In addition to improvements to the outer edge of the roadway, median openings and left turn lanes were constructed within the project limits. The project included a two-inch HMAC overlay of the existing reinforced concrete pavement (see Figure 9).

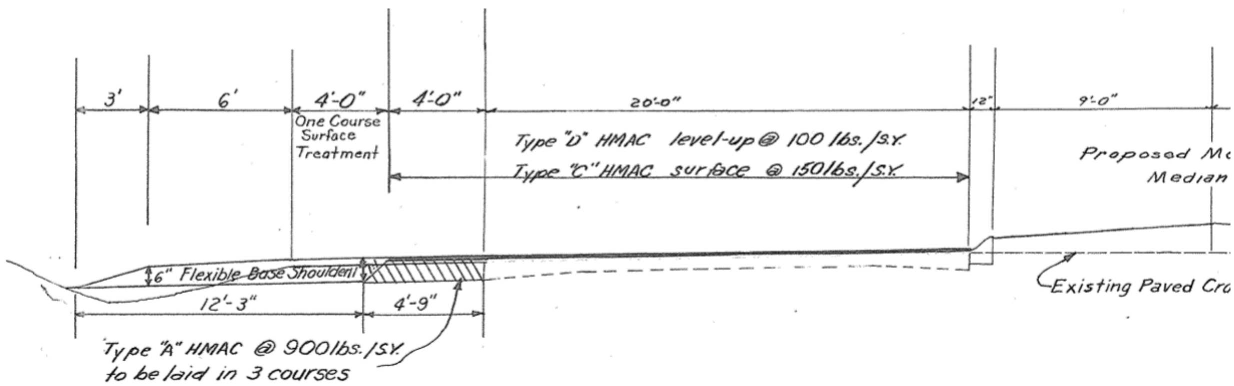

Figure 8. SH 199 CCSJ - 0171-05-013 Improvements – Typical Section
Source: TxDOT, 1956

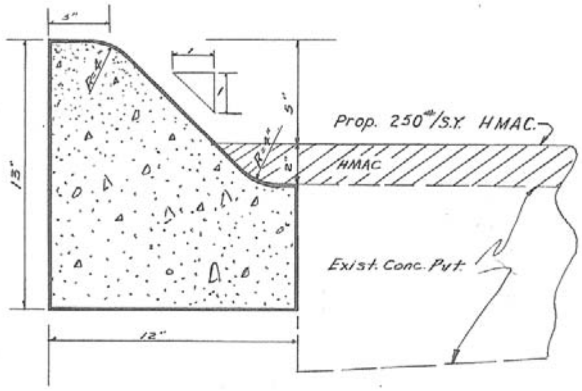

Figure 9. SH 199 CCSJ - 0171-05-013 Improvements – Curb and HMAC Overlay Detail
Source: TxDOT, 1956

The third project (TxDOT CCSJ - 0171-05-033) included the widening of SH 199 from White Settlement Road to University Drive in 1969. During this project, a variable width and eight-inch thick reinforced concrete and 6.5-foot wide and eight-inch thick flexible base pavement section were constructed on the north and south side of SH 199 (see Figure 10). Similar to previous projects, a two-inch HMAC overlay of the existing reinforced concrete pavement was constructed. This project also included the construction of concrete curb, concrete driveway, and drainage improvements in proximity to the University Drive intersection.

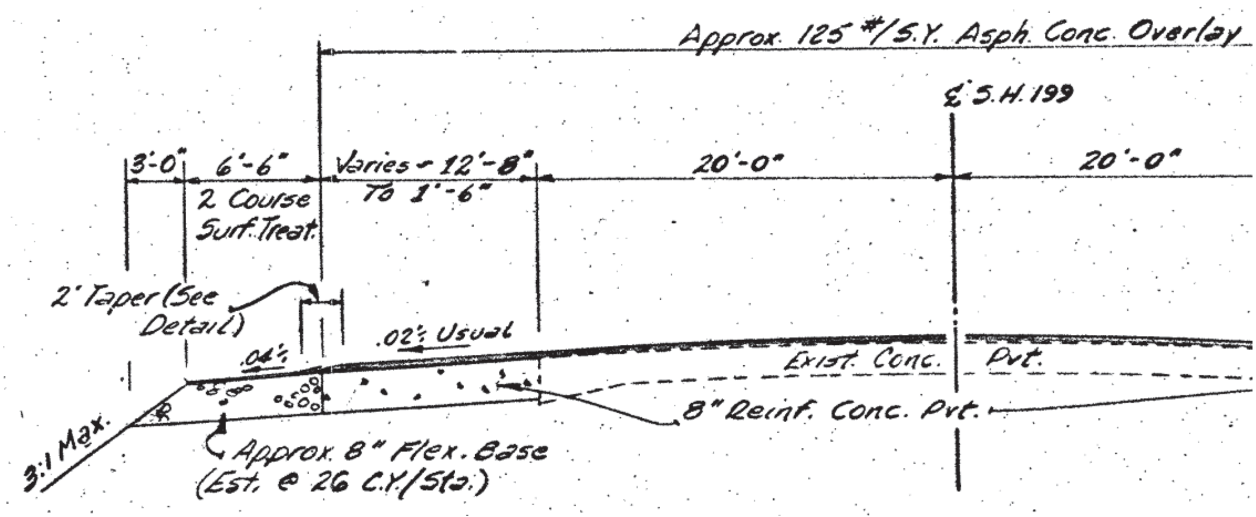

Figure 10. SH 199 CCSJ - 0171-05-033 Improvements – Typical Section
Source: TxDOT, 1969

The conditions that can be currently observed along SH 199 match the project descriptions of the CCSJ - 0171-05-001&004, CCSJ - 0171-05-013, and CCSJ - 0171-05-033 projects. Generally, the existing driving surface is an HMAC overlay with concrete curbs along the center median and drainage channels to convey stormwater between the edge of the road and the right-of-way (see Figure 11).

Figure 11. Existing Pavement Conditions Along SH 199
Source: Freese and Nichols, 2016

5.0 EXHIBITS

1. Existing Right-of-Way and Site Access

6.0 ATTACHMENTS

A. Right-of-Way Maps and Plan and Profile of Proposed SH 34 / SH 199 (CCSJ-0171-05-001&004)

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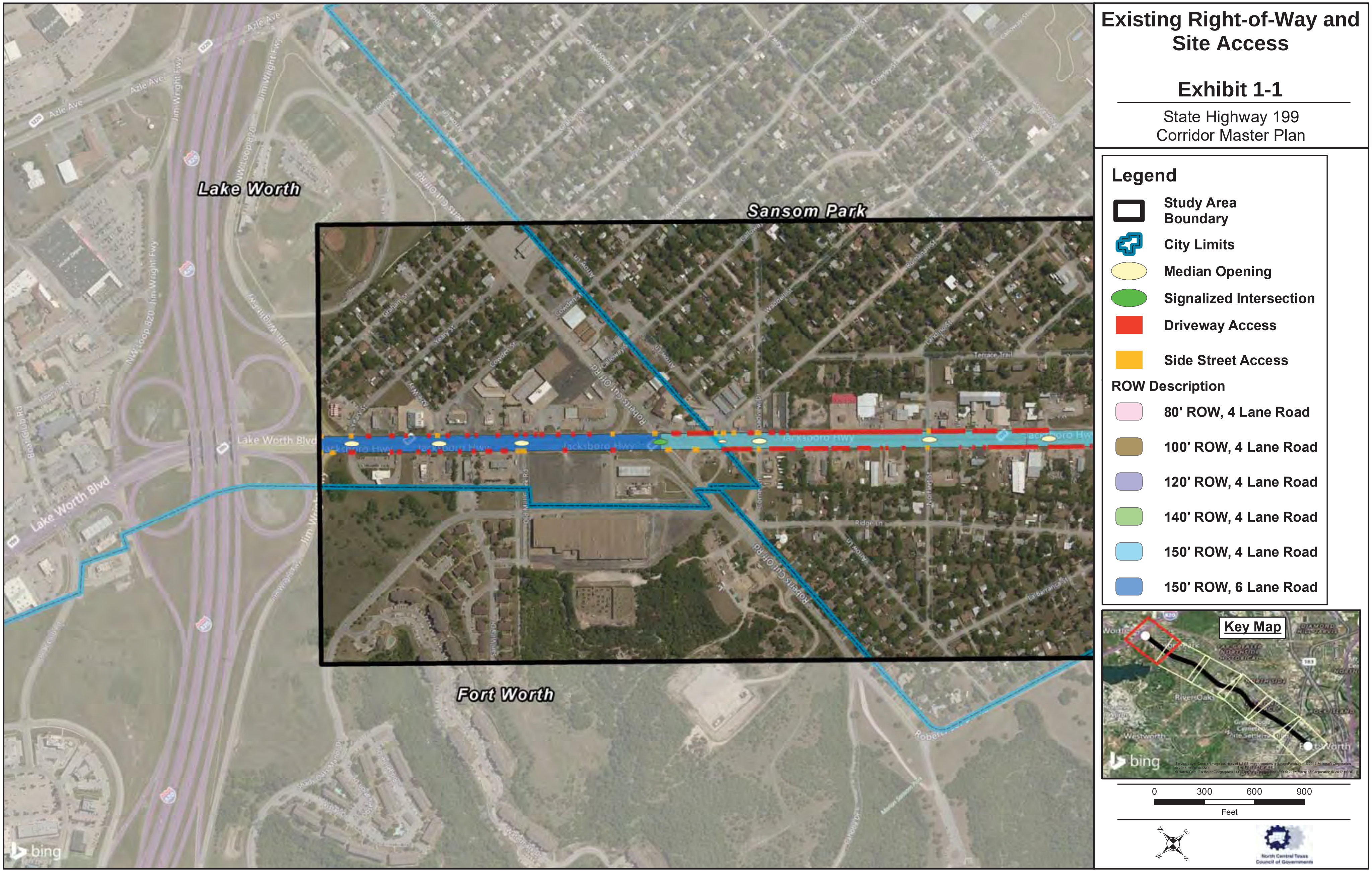
Exhibit 1

Existing Right-of-Way and Site Access

Existing Right-of-Way and Site Access

Exhibit 1-1

State Highway 199
Corridor Master Plan



Parcel Data Source: Tarrant Appraisal District Parcels 2015

Date: 06/01/2017

Existing Right-of-Way and Site Access

Exhibit 1-2

State Highway 199
Corridor Master Plan

Legend

- Study Area Boundary
- City Limits
- Median Opening
- Signalized Intersection
- Driveway Access
- Side Street Access

ROW Description

- 80' ROW, 4 Lane Road
- 100' ROW, 4 Lane Road
- 120' ROW, 4 Lane Road
- 140' ROW, 4 Lane Road
- 150' ROW, 4 Lane Road
- 150' ROW, 6 Lane Road

0 300 600 900
Feet

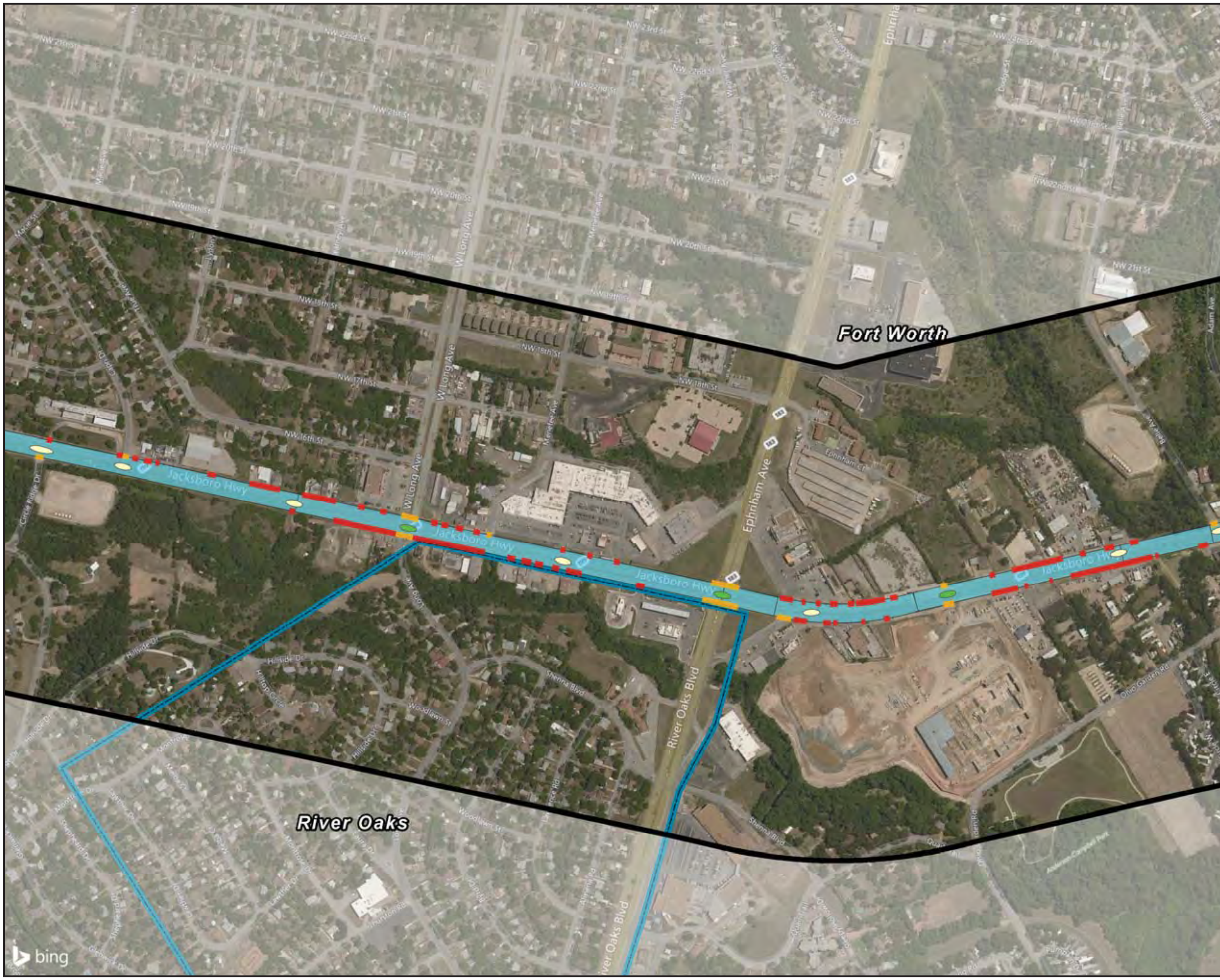
North Central Texas Council of Governments

Parcel Data Source: Tarrant Appraisal District Parcels 2015 Date: 06/01/2017

Existing Right-of-Way and Site Access

Exhibit 1-3

State Highway 199
Corridor Master Plan



Legend

- Study Area Boundary
- City Limits
- Median Opening
- Signalized Intersection
- Driveway Access
- Side Street Access

ROW Description

- 80' ROW, 4 Lane Road
- 100' ROW, 4 Lane Road
- 120' ROW, 4 Lane Road
- 140' ROW, 4 Lane Road
- 150' ROW, 4 Lane Road
- 150' ROW, 6 Lane Road

0 300 600 900
Feet

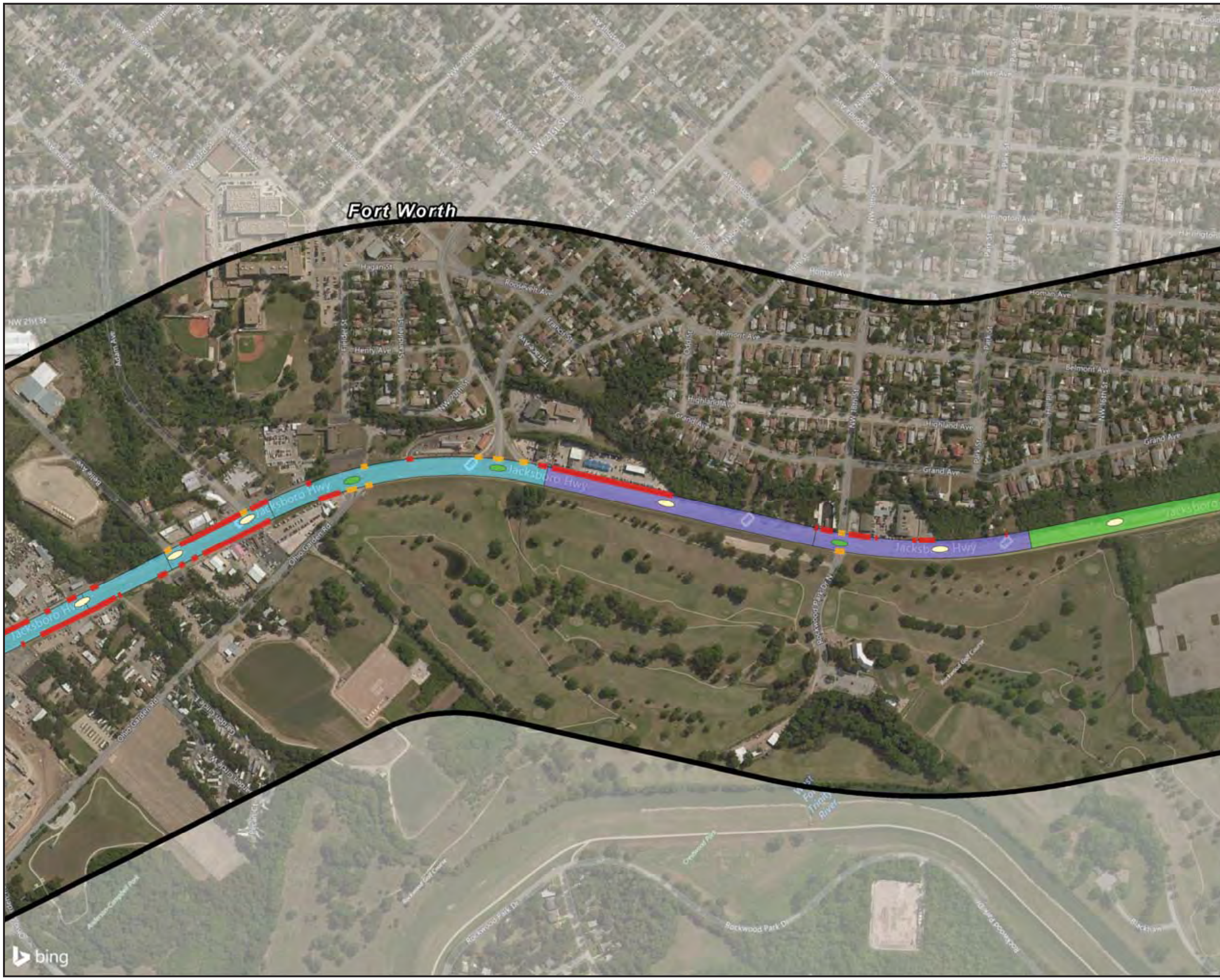
North Central Texas Council of Governments

Parcel Data Source: Tarrant Appraisal District Parcels 2015 Date: 06/01/2017

Existing Right-of-Way and Site Access

Exhibit 1-4

State Highway 199
Corridor Master Plan



Legend

- Study Area Boundary
- City Limits
- Median Opening
- Signalized Intersection
- Driveway Access
- Side Street Access

ROW Description

- 80' ROW, 4 Lane Road
- 100' ROW, 4 Lane Road
- 120' ROW, 4 Lane Road
- 140' ROW, 4 Lane Road
- 150' ROW, 4 Lane Road
- 150' ROW, 6 Lane Road

Key Map

0 300 600 900
Feet

North Central Texas Council of Governments

Parcel Data Source: Tarrant Appraisal District Parcels 2015

Date: 06/01/2017

Existing Right-of-Way and Site Access

Exhibit 1-5

State Highway 199
Corridor Master Plan

Legend

- Study Area Boundary
- City Limits
- Median Opening
- Signalized Intersection
- Driveway Access
- Side Street Access

ROW Description

- 80' ROW, 4 Lane Road
- 100' ROW, 4 Lane Road
- 120' ROW, 4 Lane Road
- 140' ROW, 4 Lane Road
- 150' ROW, 4 Lane Road
- 150' ROW, 6 Lane Road

0 300 600 900
Feet

Parcel Data Source: Tarrant Appraisal District Parcels 2015

Date: 06/01/2017

Existing Right-of-Way and Site Access

Exhibit 1-6

State Highway 199
Corridor Master Plan

Legend

- Study Area Boundary
- City Limits
- Median Opening
- Signalized Intersection
- Driveway Access
- Side Street Access

ROW Description

- 80' ROW, 4 Lane Road
- 100' ROW, 4 Lane Road
- 120' ROW, 4 Lane Road
- 140' ROW, 4 Lane Road
- 150' ROW, 4 Lane Road
- 150' ROW, 6 Lane Road

0 300 600 900
Feet

North Central Texas Council of Governments

Parcel Data Source: Tarrant Appraisal District Parcels 2015 Date: 06/01/2017

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Attachment A

Right-of-Way Maps and Plan and Profile of SH 34 / SH 199 (CCSJ-0171-05-001&004)

STATE OF TEXAS
COUNTY OF TARRANT

I, Chester Hollis County Clerk, Tarrant County, Texas do hereby certify that I have examined this right-of-way map as prepared by the County Engineer of Tarrant County, Texas and find the conveyences for the right-of-way as shown are on record as indicated in the deed records of Tarrant County

Chester Hollis
COUNTY CLERK, TARRANT COUNTY

SP 859 C -- Control 171-4-2
SP 859 C -- Control 171-5-2
SP 859 B - Control 171-5-1

Section 1 of 2 Sections

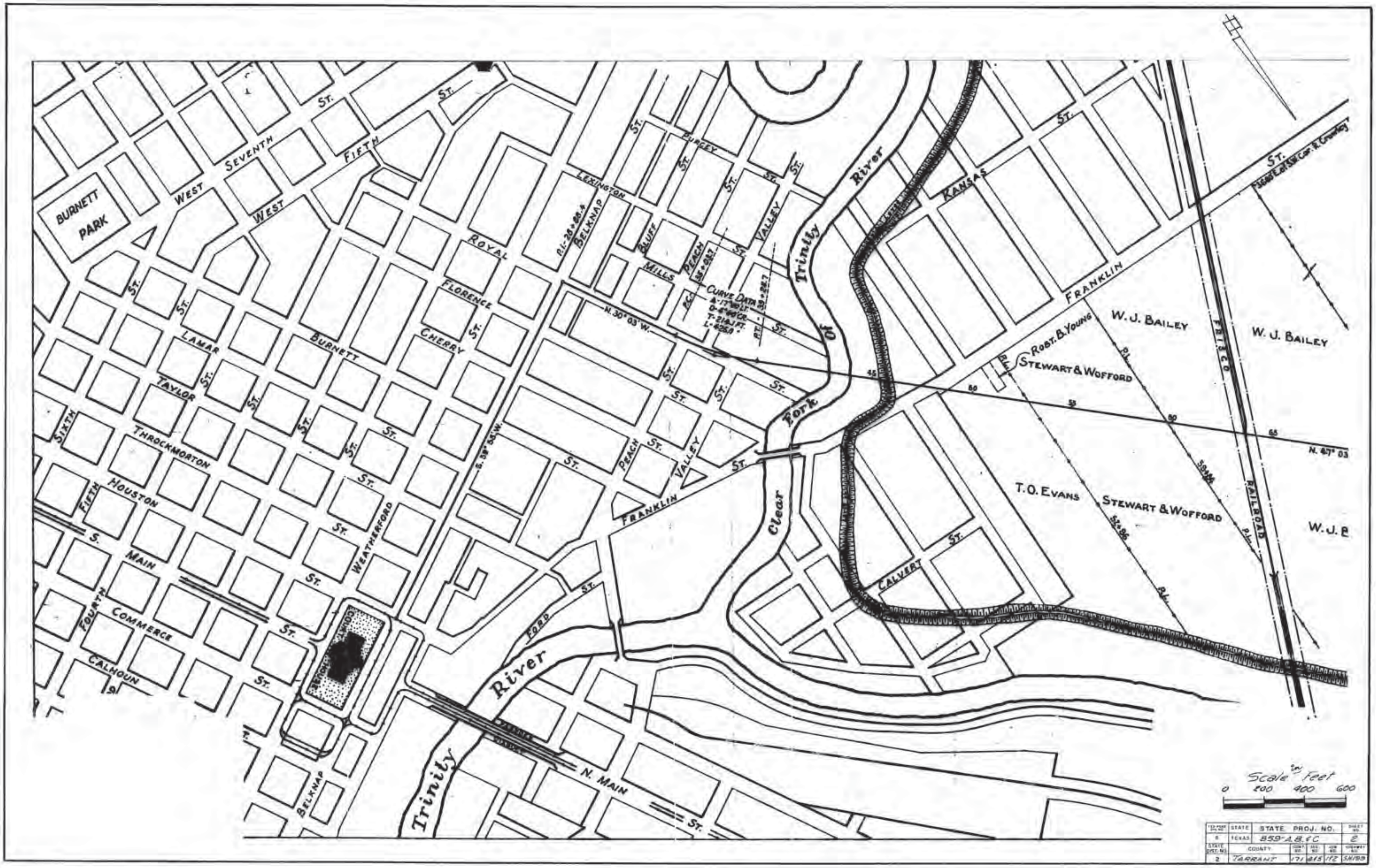
TEXAS STATE
HIGHWAY DEPARTMENT
RIGHT OF WAY MAP OF STATE HIGHWAY Nº(34) 199
FROM FORT WORTH TO LAKE WORTH
FORT WORTH - JACKSBORO HIGHWAY
STATE PROJECT Nº 859-A,B&C.

Scale 1" = 400'

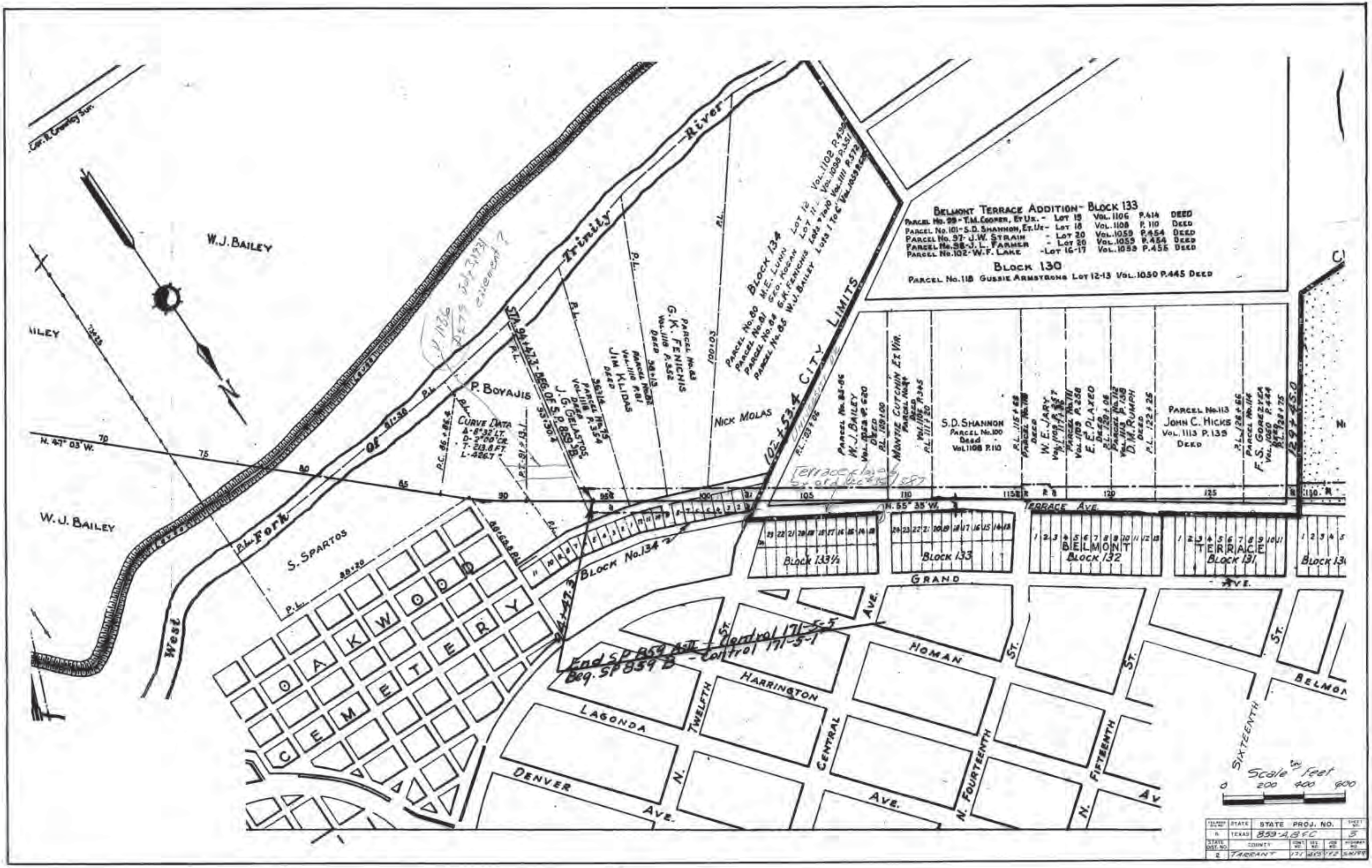
County Engr's. Office
Tarrant County.

Fort Worth, Texas.
December, 1929.

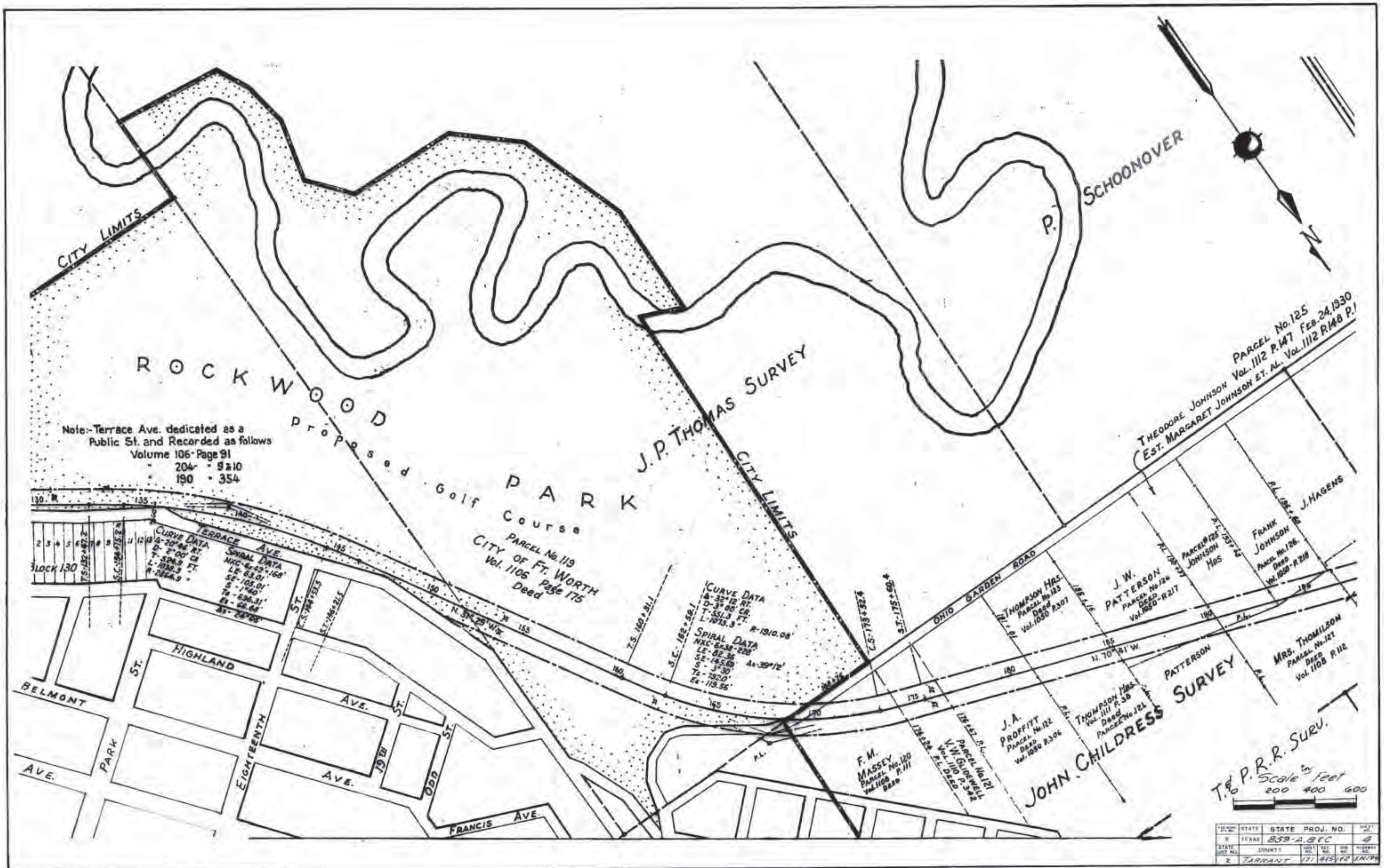
	STATE	STATE PROJ. NO.			SHEET NO.
5	TEXAS	859-A, B & C			1
STATE DIST. NO.	COUNTY	CONT. NO.	SEC. NO.	JOB NO.	HIGHWAY NO.
2	TARRANT	171	4 & 5	1 & 2	SH 199



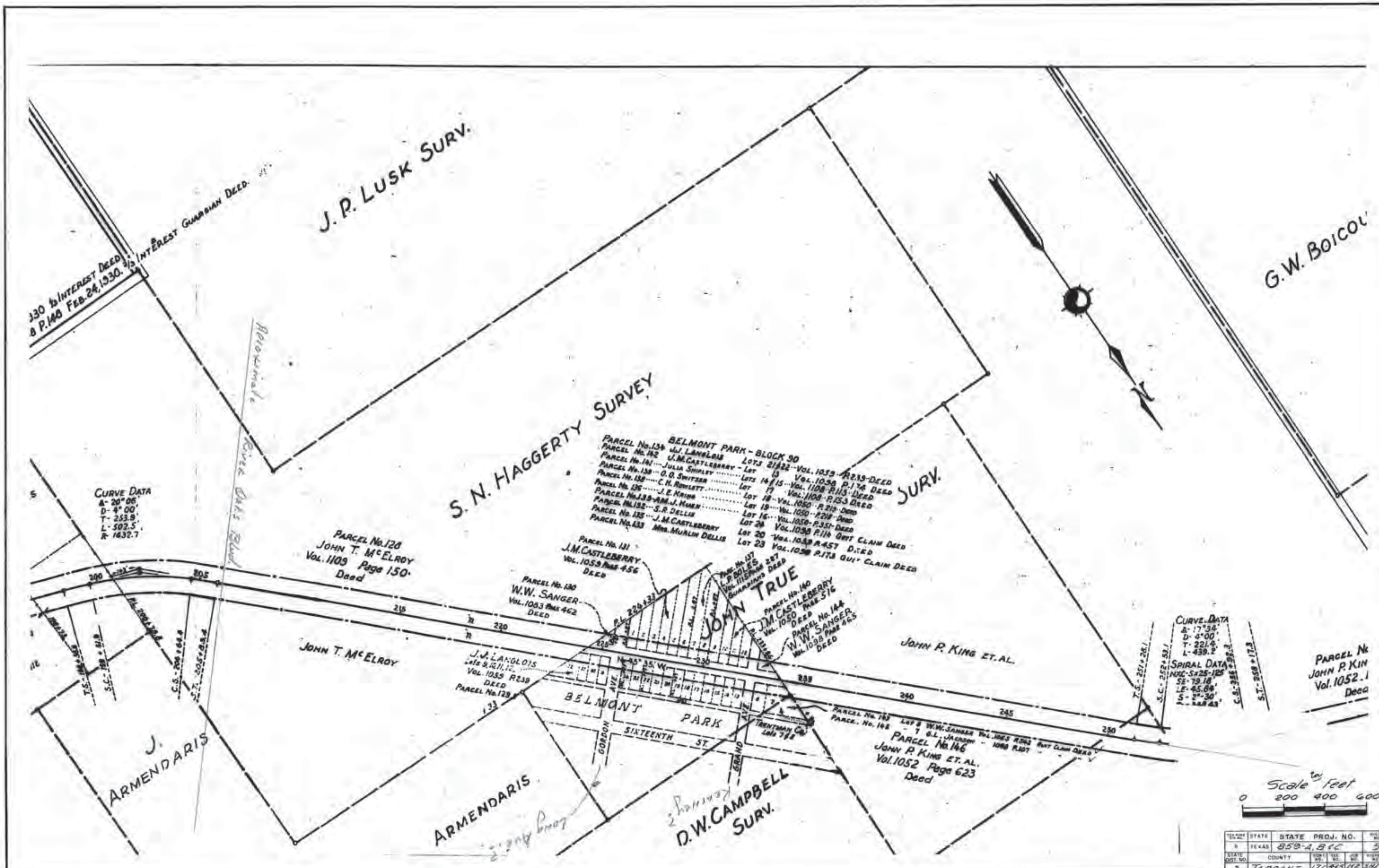
BURNETT PARK
WEST SEVENTH
WEST FIFTH
ROYAL
FLORENCE
CHERRY
BURNETT
LAMAR
TAYLOR
THROCKMORTON
HOUSTON
SIXTH
FIFTH
S. MAIN
COMMERCE
FOURTH
CALHOUN
WEATHERFORD
BELKNAP
LEXINGTON
BLUFF
MILLS
PEACH
PURCEY
VALLEY
FRANKLIN
FORD
CALVERT
KANSAS
N. MAIN
ST.
COURT HOUSE
Trinity River
Clear Fork of Trinity River
CURVE DATA
N. 30° 03' W.
S. 59° 56' W.
N. 67° 03
W. J. BAILEY
W. J. BAILEY
ROBT. B. YOUNG
STEWART & WOFFORD
T. O. EVANS
STEWART & WOFFORD
W. J. B
FRISCO RAILROAD
Scale in Feet
0 200 400 600
STATE | STATE PROJ. NO. | SHEET NO.
TEXAS | 859-A,B,&C | 2
COUNTY
TARRANT | 171 | 815 | 172 | SH199

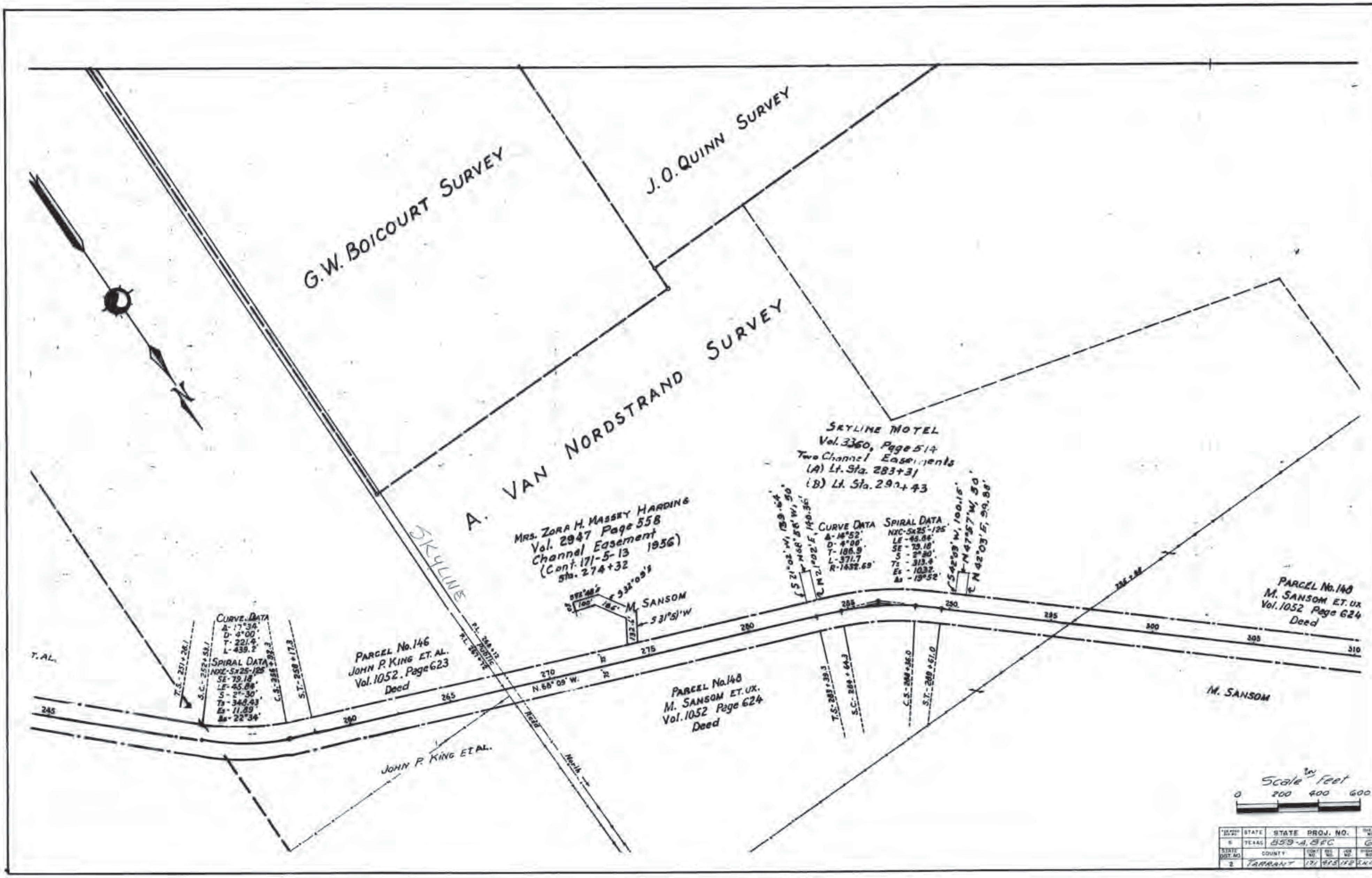


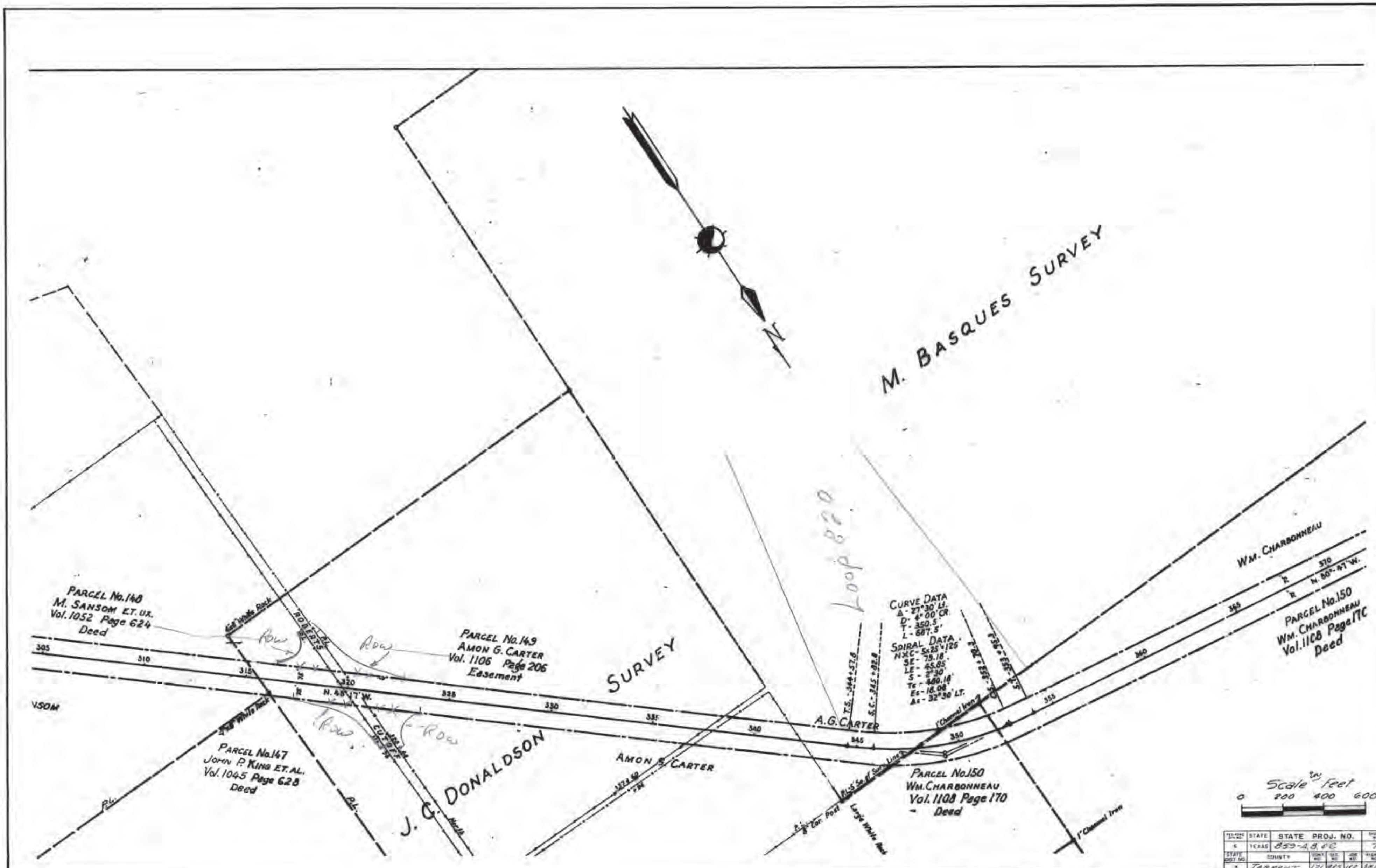
BELMONT TERRACE ADDITION - BLOCK 133
PARCEL No. 99 - T.M. COOPER, ET UX. - LOT 19 VOL. 1106 P.414 DEED
PARCEL No. 101 - S.D. SHANNON, ET. UX - LOT 18 VOL. 1108 P.110 DEED
PARCEL No. 97 - J.W. STRAIN - LOT 20 VOL. 1059 P.454 DEED
PARCEL No. 98 - J.L. FARMER - LOT 20 VOL. 1059 P.454 DEED
PARCEL No. 102 - W.F. LAKE - LOT 16-17 VOL. 1059 P.456 DEED
BLOCK 130
PARCEL No. 118 GUSSIE ARMSTRONG LOT 12-13 VOL. 1050 P.445 DEED
BLOCK 134
PARCEL No. 80 M.E. LUNN LOT 12 VOL. 1102 P.498
PARCEL No. 81 GEO. KOGAN LOT 11 VOL. 1098 P.551
PARCEL No. 84 G.K. FENICHIS LOTS 9 & 10 VOL. 1111 P.572
PARCEL No. 85 W.J. BAILEY LOTS 1 TO 6
CITY LIMITS
102+53.4
NICK MOLAS
PARCEL No. 83
G.K. FENICHIS
VOL. 1118 P.352
DEED
PARCEL No. 82
VOL. 1110 P.81
JIM KLIDAS
DEED
PARCEL No. 75
VOL. 1118 P.354
DEED
J.G. GELASTOS
STA. 94+47.3 - BEG. OF S.P. 859 B
P. BOYAJIS
CURVE DATA
Δ - 8°32' LT.
D - 2°00' CR.
T - 213.8 FT.
L - 426.7
W.J. BAILEY
W.J. BAILEY
S. SPARTOS
N. 47° 03' W.
N. 55° 35' W.
PARCEL No. 83-86
W.J. BAILEY
VOL. 1052 P.620
DEED
MONTIE CUTCHIN ET VIR.
S.D. SHANNON
PARCEL No. 100
Deed
VOL. 1108 P.110
W.E. JARY
E.E. PLAXEO
D.M. RUMPH
PARCEL No. 113
JOHN C. HICKS
VOL. 1113 P.135
DEED
F.S. GOREZYEA
PARCEL No. 114
VOL. 1050 P.444
129+45.0
TERRACE AVE.
BLOCK 133½
BLOCK 133
BELMONT
BLOCK 132
TERRACE
BLOCK 131
BLOCK 134
GRAND AVE.
OAKWOOD CEMETERY
End S.P. 859 A-I - Control 171-5-5
Beg. S.P. 859 B - Control 171-5-1
West Fork of Trinity River
HOMAN AVE.
HARRINGTON
LAGONDA
DENVER AVE.
TWELFTH ST.
CENTRAL AVE.
N. FOURTEENTH ST.
N. FIFTEENTH
SIXTEENTH ST.
BELMONT
Scale in Feet
0 200 400 800
STATE PROJ. NO.
TEXAS 859-A,B&C
SHEET 5
COUNTY TARRANT



CITY LIMITS
ROCKWOOD PARK
Proposed Golf Course
PARCEL No. 119
CITY OF FT. WORTH
Vol. 1106 Page 175
Deed
Note:-Terrace Ave. dedicated as a Public St. and Recorded as follows
Volume 106-Page 91
" 204- " 9 & 10
" 190 - 354
J. P. THOMAS SURVEY
P. SCHOONOVER
N
PARCEL No. 125
THEODORE JOHNSON VOL. 1112 P.147 FEB. 24, 1930
EST. MARGARET JOHNSON ET. AL. VOL. 1112 P.148 P.
OHIO GARDEN ROAD
J. HAGENS
FRANK JOHNSON
J. W. PATTERSON
THOMPSON HRS.
PATTERSON
SURVEY
MRS. THOMILSON
JOHN CHILDRESS SURVEY
J. A. PROFFITT
PARCEL No. 122
F. M. MASSEY
PARCEL No. 120
PARCEL No. 121
V. W. GLIDEWELL
Vol. 1110 P. 342
CURVE DATA
SPIRAL DATA
TERRACE AVE.
HIGHLAND
BELMONT
PARK
AVE.
EIGHTEENTH
19th
ODD
FRANCIS AVE.
BLOCK 130
N. 70° 41' W.
T. & P. R. R. SURV.
Scale in Feet
200 400 600
STATE
TEXAS
STATE PROJ. NO.
859-A.BFC
COUNTY
TARRANT


J. P. LUSK SURV.
S. N. HAGGERTY SURVEY
SURV.
G.W. BOICOU
JOHN TRUE
BELMONT PARK
SIXTEENTH ST.
GORDON AVE.
GRAND AVE.
J. ARMENDARIS
ARMENDARIS
D.W. CAMPBELL SURV.
JOHN T. McELROY
JOHN P. KING ET. AL.
PARCEL No. 128 JOHN T. McELROY Vol. 1109 Page 150 Deed
PARCEL No. 146 JOHN P. KING ET. AL. Vol. 1052 Page 623 Deed
PARCEL No. 130 W.W. SANGER Vol. 1053 Page 462 DEED
PARCEL No. 131 J.M. CASTLEBERRY Vol. 1059 Page 456 DEED
BELMONT PARK - BLOCK 30
CURVE DATA Δ-20°05' D-4°00' T-253.9' L-502.5' R-1432.7
CURVE DATA Δ-17°34' D-4°00' T-221.4' L-439.2
Approximate River Oaks Blvd.
Scale Feet 0 200 400 600
STATE PROJ. NO. TEXAS 859-4, B&C 5
COUNTY TARRANT


G.W. BOICOURT SURVEY
J.O. QUINN SURVEY
A. VAN NORDSTRAND SURVEY
SKYLINE MOTEL
Vol. 3360, Page 514
Two Channel Easements
(A) Lt. Sta. 283+31
(B) Lt. Sta. 290+43
MRS. ZORA H. MASSEY HARDING
Vol. 2947 Page 558
Channel Easement 1956)
(Cont. 171-5-13
Sta. 274+32
M. SANSON
CURVE DATA
SPIRAL DATA
PARCEL No. 146
JOHN P. KING ET. AL.
Vol. 1052, Page 623
Deed
PARCEL No. 148
M. SANSOM ET. UX.
Vol. 1052 Page 624
Deed
M. SANSOM
JOHN P. KING ET AL.
T. AL.
SKYLINE
N. 68° 09' W.
Scale in Feet
0 200 400 600
STATE
STATE PROJ. NO.
TEXAS
859-4, 8FC
6
COUNTY
2
TARRANT



FEDERAL DIV. NO.	STATE	STATE PROJ. NO.			SHEET NO.
6	TEXAS	859-4,8,&C			7
STATE DIST. NO.	COUNTY	CONT. NO.	SEC. NO.	JOB NO.	HIGHWAY NO.
2	TARRANT	171	815	112	SH 199

STATE OF TEXAS
COUNTY OF TARRANT

I, Chester Hollis, County Clerk of Tarrant County do hereby certify that I have examined this Right-of-way map as prepared by the County Engineer of Tarrant County Texas and find the conveyaneces for the Right of-way as shown are on record as indicated in the deed records of Tarrant County.

Chester Hollis
COUNTY CLERK OF TARRANT COUNTY

REVISIONS

Added:
1. Inset Frisco R.R. & S. Hwy. Nº 199
2. Note: 1949
3. Types of R.O.W. Markers as per Note 1949
4. Bailey's Industrial Add'n.

Special Note:
This Map covers Right-of-Way from vicinity of Clear Fork of Trinity River to vicinity of N. 12th St.
April 5, 1949

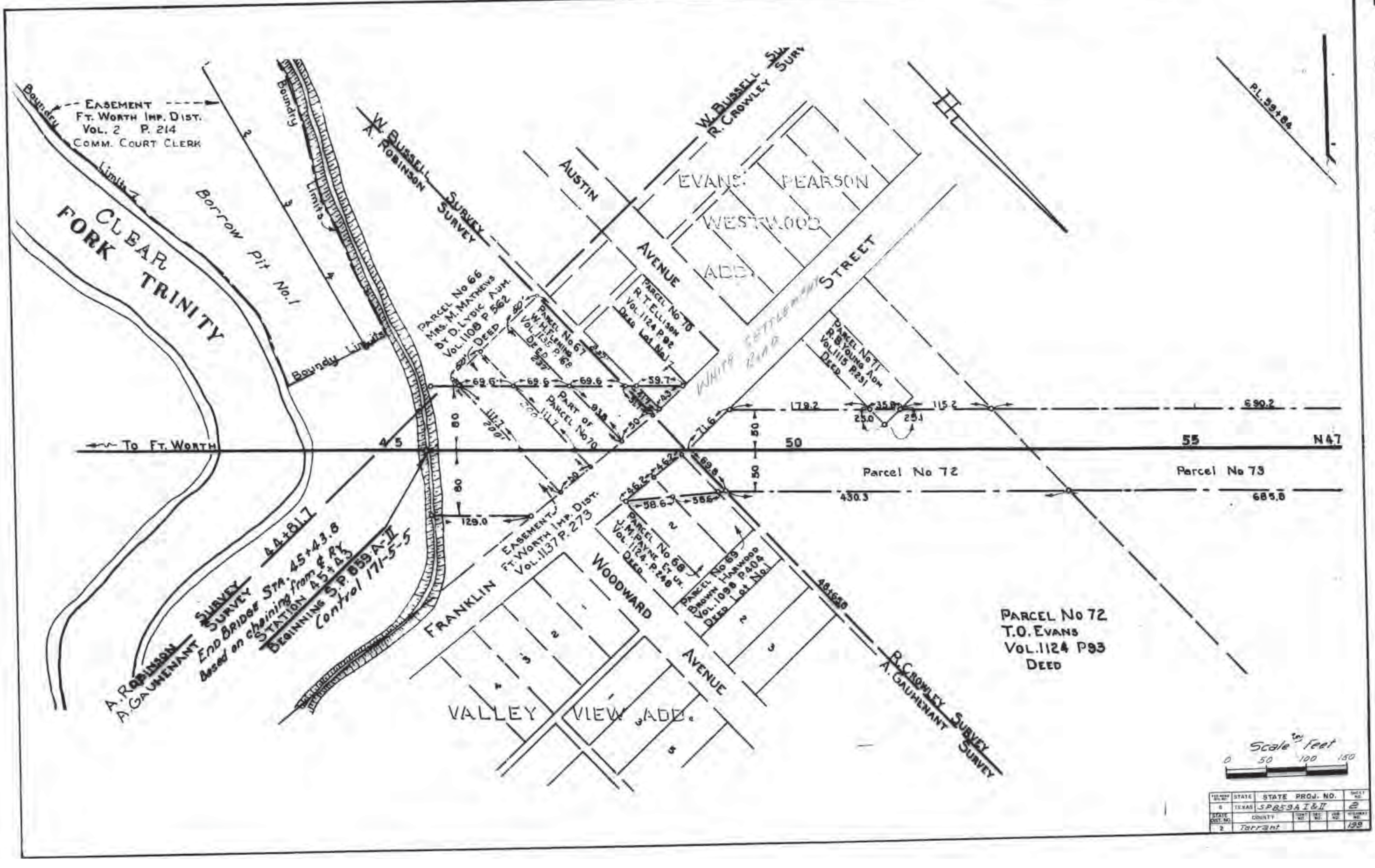
TEXAS STATE
HIGHWAY DEPARTMENT
RIGHT OF WAY MAP OF STATE HIGHWAY Nº (34) 199
FROM FORT WORTH TO LAKE WORTH
FORT WORTH - JACKSBORO HIGHWAY
STATE PROJECT Nº 859-A

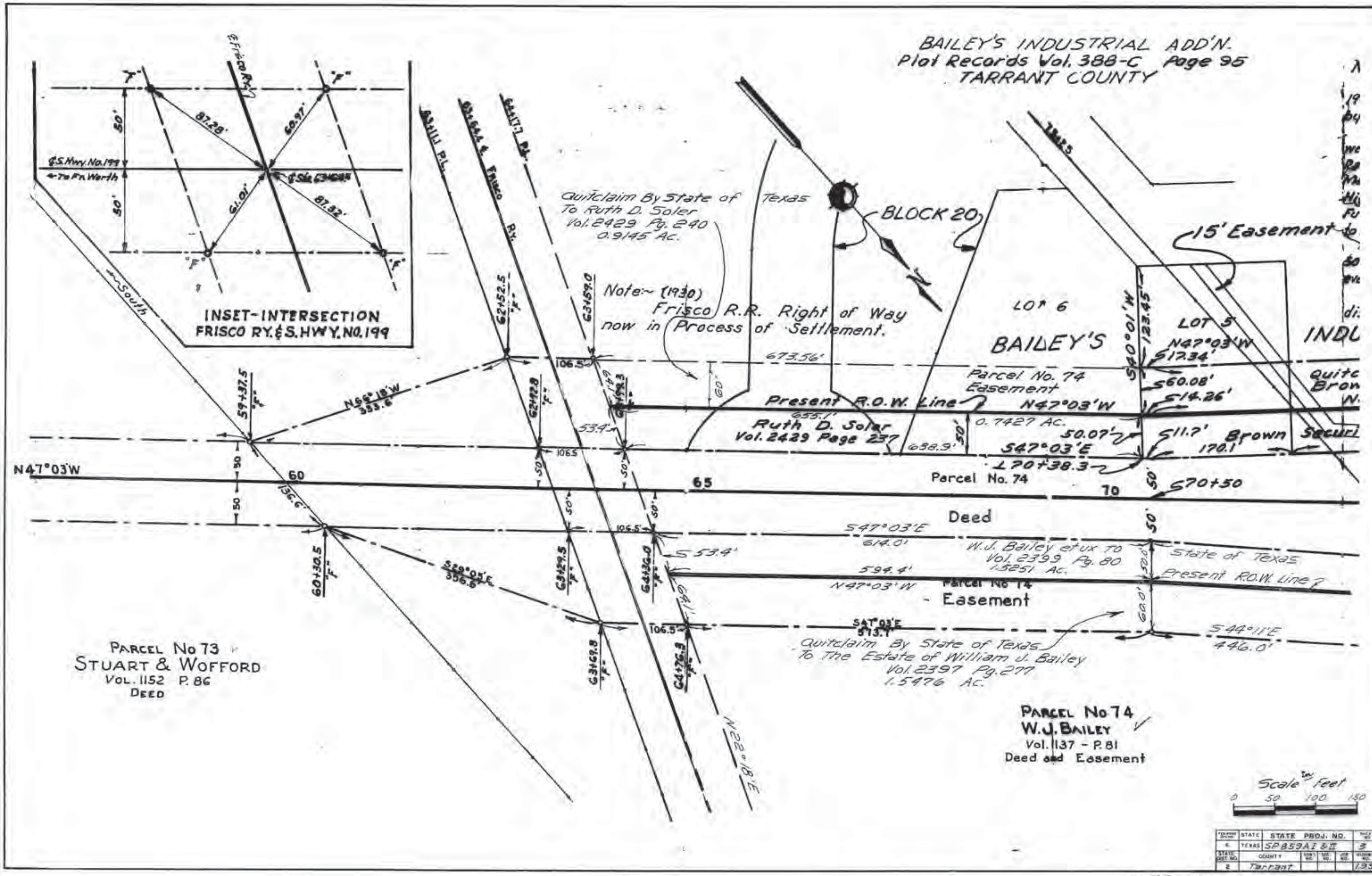
Scale 1" = 100'

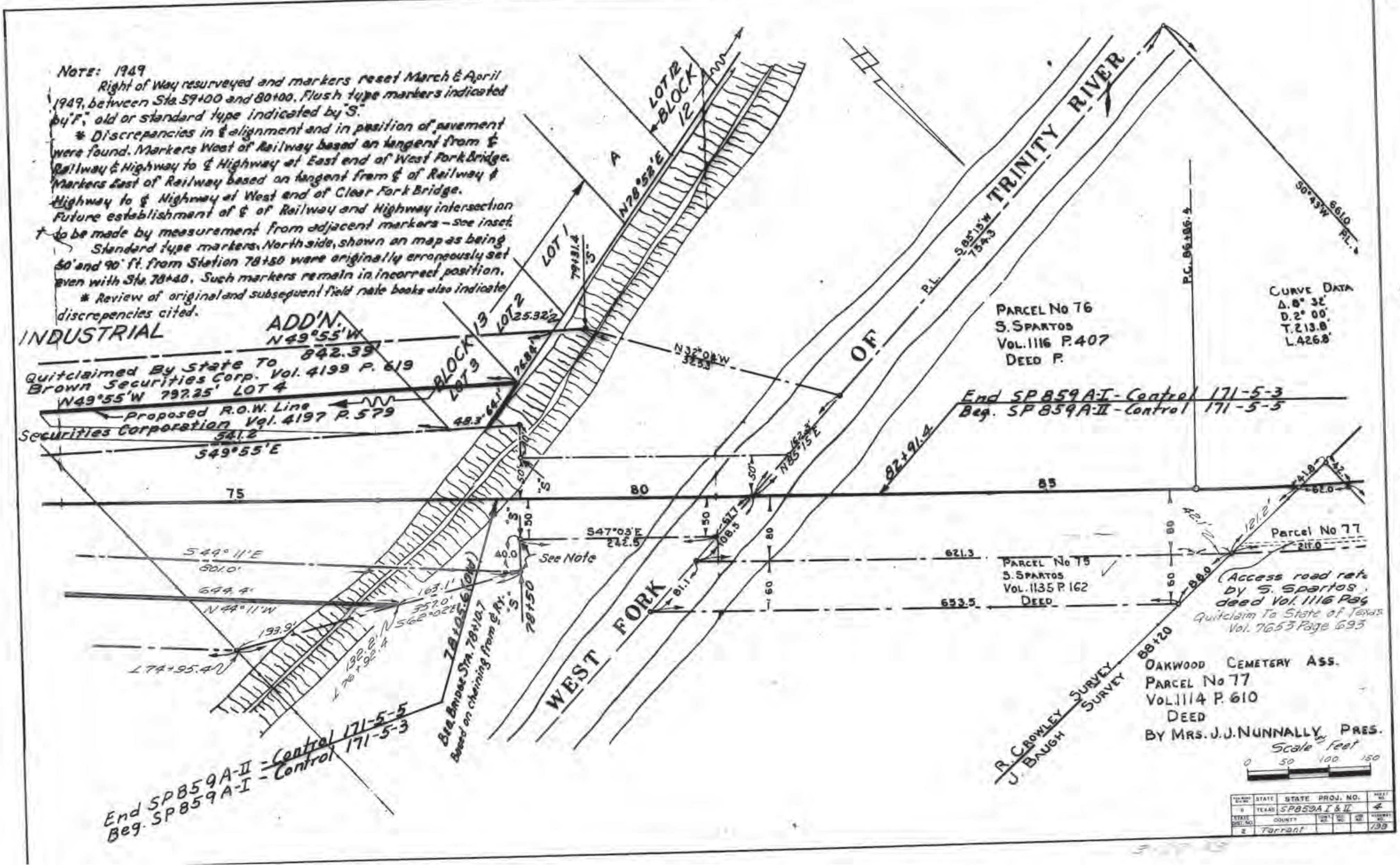
COUNTY ENGINEER OFFICE
TARRANT COUNTY

FORT WORTH, TEXAS
DEC. 1930

FEDERAL DIV. NO.	STATE	STATE PROJ. NO.			SHEET NO.
6	TEXAS	SP 859 A I & II			1
STATE DIST. NO.	COUNTY	CONT. NO.	SEC. NO.	JOB NO.	HIGHWAY NO.
2	Tarrant				199


EASEMENT
FT. WORTH IMP. DIST.
VOL. 2 P. 214
COMM. COURT CLERK
Boundry
Limits
CLEAR FORK TRINITY
Borrow Pit No. 1
To Ft. Worth
W. BUSSELL SURVEY
A. ROBINSON SURVEY
R. CROWLEY SURV
AUSTIN AVENUE
EVANS PEARSON WESTWOOD ADD
STREET
WHITE SETTLEMENT ROAD
PARCEL No 66
MRS. M. MATHEWS
BY D. LYDIC ADM.
VOL. 1108 P 562
DEED
PARCEL No 67
VOL. 1135 P. 168
DEED
PARCEL No 70
R.T. ELLISON
VOL. 1124 P. 92
DEED LOT NO. 1
PART OF PARCEL No 70
PARCEL No 71
R.B. YOUNG ADM.
VOL. 1115 P 231
DEED
PARCEL No 68
J.M. PAYNE ET UX.
VOL. 1124 P. 248
DEED
PARCEL No 69
BROWN HARWOOD
VOL. 1098 P 404
DEED LOT No. 1
EASEMENT
FT. WORTH IMP. DIST.
VOL. 1137 P. 273
FRANKLIN
WOODWARD AVENUE
VALLEY VIEW ADD.
A. ROBINSON SURVEY
A. GAUNENANT SURVEY
END BRIDGE STA. 45+43.8
Based on chaining from ¢ RY.
STATION 45+43
BEGINNING S.P. 859 A-II
Control 171-5-5
44+81.7
R. CROWLEY SURVEY
A. GAUNENANT SURVEY
Parcel No 72
Parcel No 73
PARCEL No 72
T.O. EVANS
VOL. 1124 P93
DEED
P.L. 59+84
50
55
N47
179.2
690.2
430.3
685.8
Scale in Feet
0 50 100 150
STATE PROJ. NO.
TEXAS SP859A I&II
COUNTY
Tarrant
2

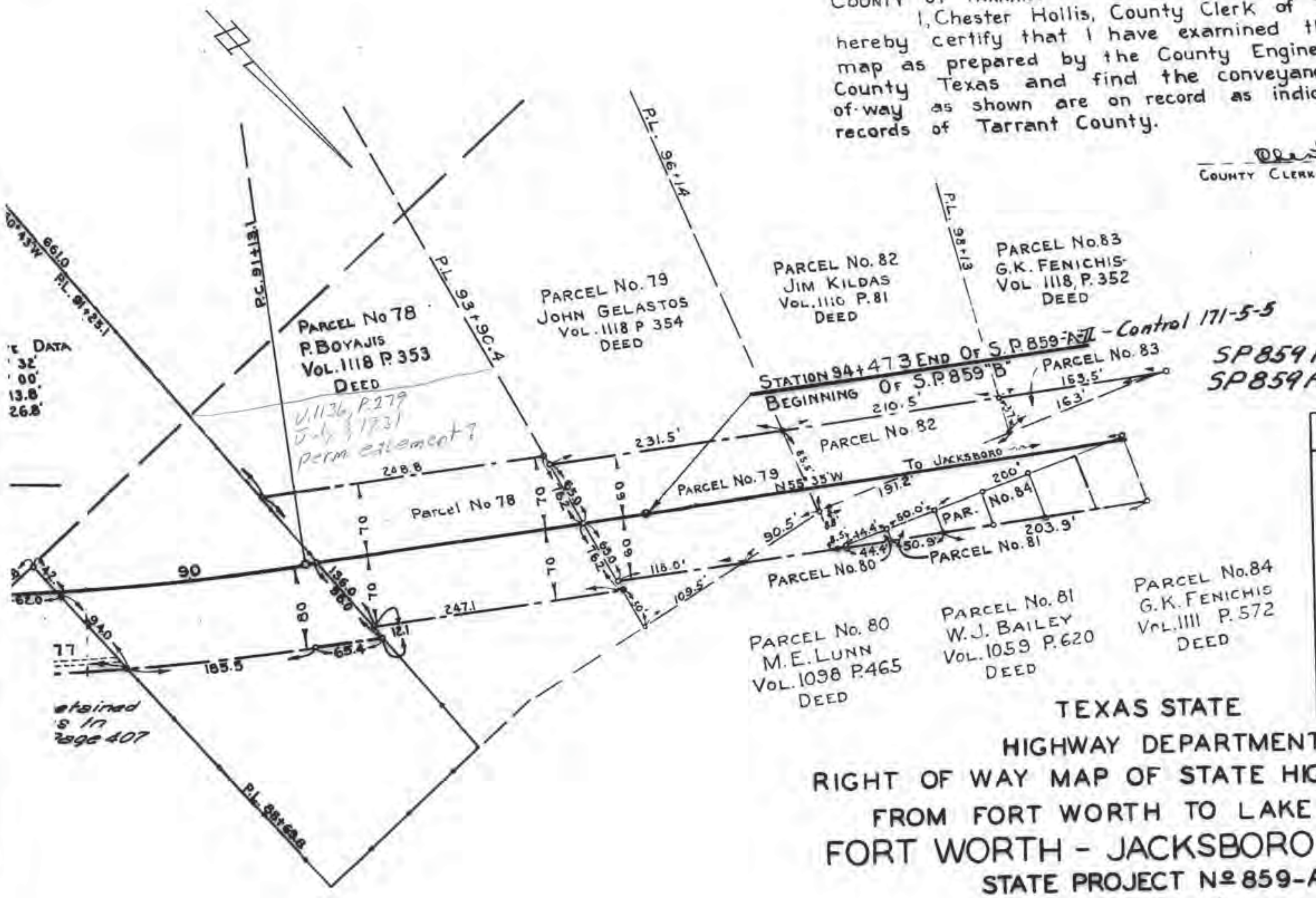

BAILEY'S INDUSTRIAL ADD'N.
Plat Records Vol. 388-C Page 95
TARRANT COUNTY
INSET-INTERSECTION
FRISCO RY. & S. HWY. NO. 199
South
Quitclaim By State of Texas
To Ruth D. Soler
Vol. 2429 Pg. 240
0.9145 Ac.
Note:~ (1930)
Frisco R.R. Right of Way
now in Process of Settlement.
BLOCK 20
LOT 6
LOT 5
BAILEY'S
15' Easement
Parcel No. 74
Easement
Present R.O.W. Line
N47°03'W
Ruth D. Soler
Vol. 2429 Page 237
0.7427 Ac.
S47°03'E
70+38.3
Brown
170.1
Parcel No. 74
70+50
N47°03W
60
65
70
Deed
S47°03'E
614.0'
W.J. Bailey et ux To
Vol. 2399 Pg. 80
1.5251 Ac.
State of Texas
Present R.O.W. Line
594.4'
N47°03'W
Parcel No 74
Easement
N66°18'W
353.6
S29°05'E
356.8
S44°11'E
446.0'
N22°18'E
Quitclaim By State of Texas
To The Estate of William J. Bailey
Vol. 2397 Pg. 277
1.5476 Ac.
PARCEL No 73
STUART & WOFFORD
VOL. 1152 P. 86
DEED
PARCEL No 74
W.J. BAILEY
Vol. 1137 - P. 81
Deed and Easement
Scale in Feet
0 50 100 150
STATE PROJ. NO.
TEXAS SP 859 AI & II
Tarrant
199


NOTE: 1949
Right of Way resurveyed and markers reset March & April 1949, between Sta. 59+00 and 80+00. Flush type markers indicated by "F," old or standard type indicated by "S."
* Discrepancies in ℄ alignment and in position of pavement were found. Markers West of Railway based on tangent from ℄ Railway & Highway to ℄ Highway at East end of West Fork Bridge. Markers East of Railway based on tangent from ℄ of Railway ℄ Highway to ℄ Highway at West end of Clear Fork Bridge. Future establishment of ℄ of Railway and Highway intersection to be made by measurement from adjacent markers – See inset.
Standard type markers, North side, shown on map as being 50' and 90' ft. from Station 78+50 were originally erroneously set even with Sta. 78+40. Such markers remain in incorrect position.
* Review of original and subsequent field note books also indicate discrepencies cited.
INDUSTRIAL ADD'N.
N49°55'W 842.39'
Quitclaimed By State To Brown Securities Corp. Vol. 4199 P. 619
W49°55'W 797.25' LOT 4
Proposed R.O.W. Line
Securities Corporation Vol. 4197 P. 579
541.2
S49°55'E
BLOCK 13
LOT 3
LOT 2
LOT 1
LOT 12
BLOCK 12
A
N78°58'E
TRINITY RIVER
OF
WEST FORK
S85°15'W 754.3
P.L.
N32°08'W 325.3
S0°43'W 661.0
P.L.
P.C. 86+86.4
CURVE DATA
Δ.8° 32'
D.2° 00'
T.213.8'
L.426.8'
PARCEL No 76
S. SPARTOS
VOL. 1116 P. 407
DEED P.
End SP 859 A-I - Control 171-5-3
Beg. SP 859 A-II - Control 171-5-5
82+91.4
N85°15'E
75
80
85
S47°03'E 242.5
See Note
78+50
Beg. Bridge Sta. 78+10.7
Based on chaining from ℄ Ry.
621.3
653.5
PARCEL No 75
S. SPARTOS
VOL. 1135 P. 162
DEED
S44°11'E 801.0'
644.4'
N44°11'W
193.9'
∠74+95.4
End SP859A-II - Control 171-5-5
Beg. SP859A-I - Control 171-5-3
Parcel No 77
Access road rets by S. Spartos, deed Vol. 1116 Pag
Quitclaim To State of Texas Vol. 7653 Page 693
88+20
R. CROWLEY SURVEY
J. BAUGH SURVEY
OAKWOOD CEMETERY ASS.
PARCEL No 77
VOL. 1114 P. 610
DEED
BY MRS. J. J. NUNNALLY PRES.
Scale Feet
0 50 100 150
STATE TEXAS
STATE PROJ. NO. SP859A I & II
SHEET NO. 4
COUNTY Tarrant
2
139

STATE OF TEXAS
COUNTY OF TARRANT

I, Chester Hollis, County Clerk of Tarrant County do hereby certify that I have examined this Right-of-way map as prepared by the County Engineer of Tarrant County Texas and find the conveyaneces for the Right of-way as shown are on record as indicated in the deed records of Tarrant County.

COUNTY CLERK OF TARRANT COUNTY



SP859A II - Control 171-5-5
SP859A I - Control 171-5-3

REVISIONS

Added:
1. Inset Frisco R.R. & S. Hwy. Nº199
2. Note: 1949
3. Types of R.O.W Markers as per Note 1949
4. Eatley's Industrial Add'n.

Special Note:
This Map covers Right-of-Way from vicinity of Clear Fork of Trinity River to vicinity of N. 12th St.
April 5, 1949

TEXAS STATE
HIGHWAY DEPARTMENT
RIGHT OF WAY MAP OF STATE HIGHWAY Nº(34) 199
FROM FORT WORTH TO LAKE WORTH
FORT WORTH - JACKSBORO HIGHWAY
STATE PROJECT Nº 859-A
Scale 1" = 100'

COUNTY ENGINEER OFFICE
TARRANT COUNTY

FORT WORTH, TEXAS
DEC. 1930

Scale in Feet
0 50 100 150

	STATE	STATE PROJ. NO.	SHEET NO.
6	TEXAS	SP 1859-A I & II	5
STATE DIST. NO.	COUNTY		HIGHWAY NO.
2	Tarrant		199

35

SP 859 B I

171-5-1

171-5-4

STATE OF TEXAS
STATE HIGHWAY DEPARTMENT

PLAN AND PROFILE OF PROPOSED
STATE HIGHWAY

STATE PROJECT

SPECIFICATIONS APPROVED BY THE SECRETARY OF AGRICULTURE FEB. 26, 1926 WITH SUBSEQUENT APPROVED REVISIONS COVERN UNLESS OTHERWISE NOTED. ALL STRUCTURAL PLANS ARE ATTACHED

SCALES PLAN 1 IN. = 100 FEET; PROFILE HOR. 1 IN. = 100 FT. VERT. 1 IN. = 10 FT.

TARRANT COUNTY

STATE HIGHWAY NO. 34
SECTION "B"
FROM N.W. TWELFTH ST.
TO
NINE MILE BRIDGE ROAD
S.P. 859-B

INDEX OF SHEETS

SHEET NO.	
1	TITLE SHEET
2	COUNTY MAP
3-3A-3B	TYPICAL CROSS SECTIONS
4	ESTIMATE AND QUANTITY SHEET
5 TO 15	PLAN AND PROFILE
16-16a & 16b	TRANSITION CURVES DETAIL
17	T.S.H.D.-UC-2 CULVERT
18 & 18	" " " C-3 (New Design)
19	" " " CH-2 (Concrete Headwalls)
20	" " GUARD FENCE
21 TO 127	CROSS SECTIONS
128 TO 131	" " -CHANNEL CHANGE
132 TO 133	" " -JUNCTION CURVES STA. 412+00

Box #76 & 114

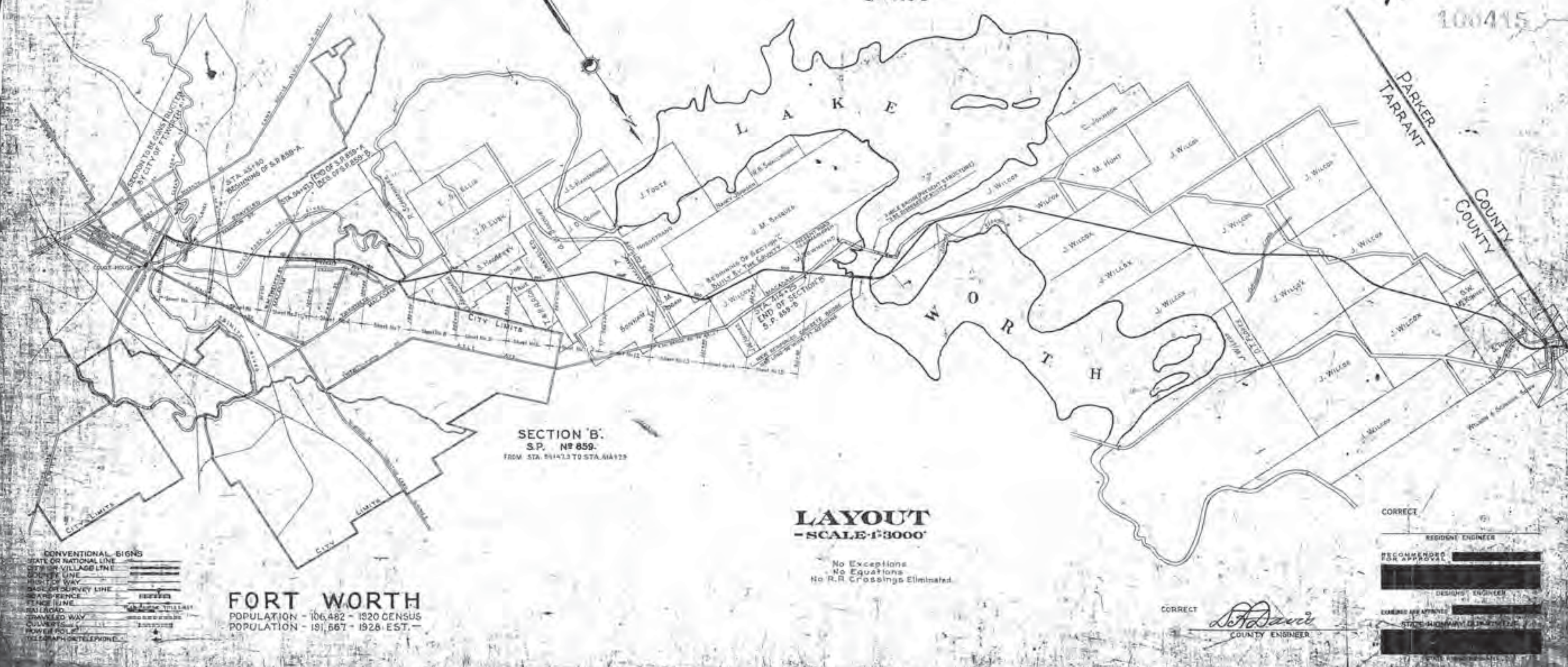
Note:- 31-146 of 157 To Comp Box #75

Note: Embankments on this project are to be constructed in accordance with specifications, Special Item 15, accompanying proposals.

Note: Machine excavated material may be cast directly into the embankment by the excavating machine.

T-35

100415



LAYOUT
-SCALE-1"=3000'

No Exceptions
No Equations
No R.R. Crossings Eliminated

FORT WORTH
POPULATION - 106,482 - 1920 CENSUS
POPULATION - 191,667 - 1928 EST.

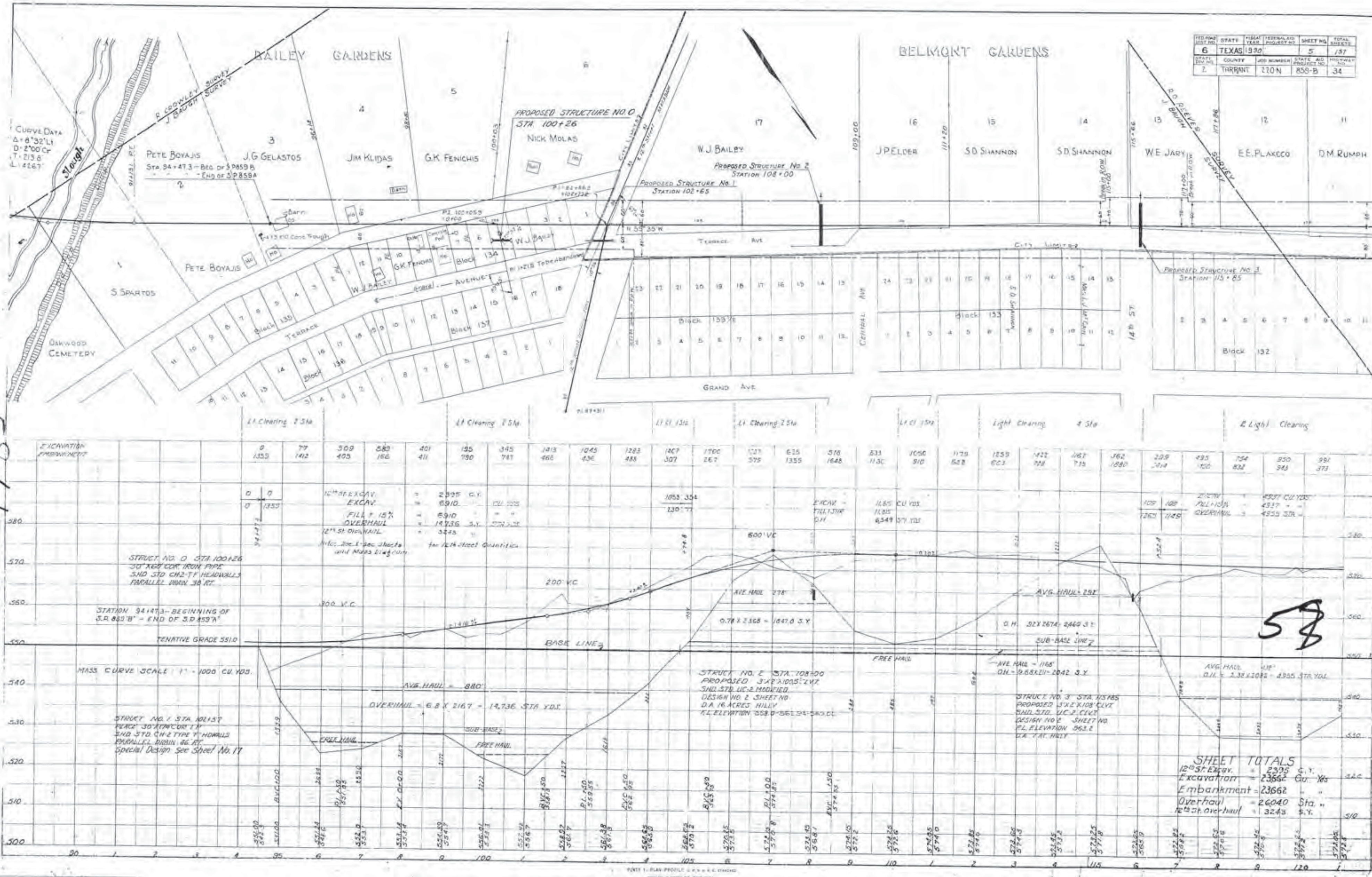
CONVENTIONAL SIGNS

CORRECT
RESIDENT ENGINEER
RECOMMENDED FOR APPROVAL [redacted]
DESIGNING ENGINEER
STATE HIGHWAY ENGINEER [redacted]

CORRECT
COUNTY ENGINEER

1779

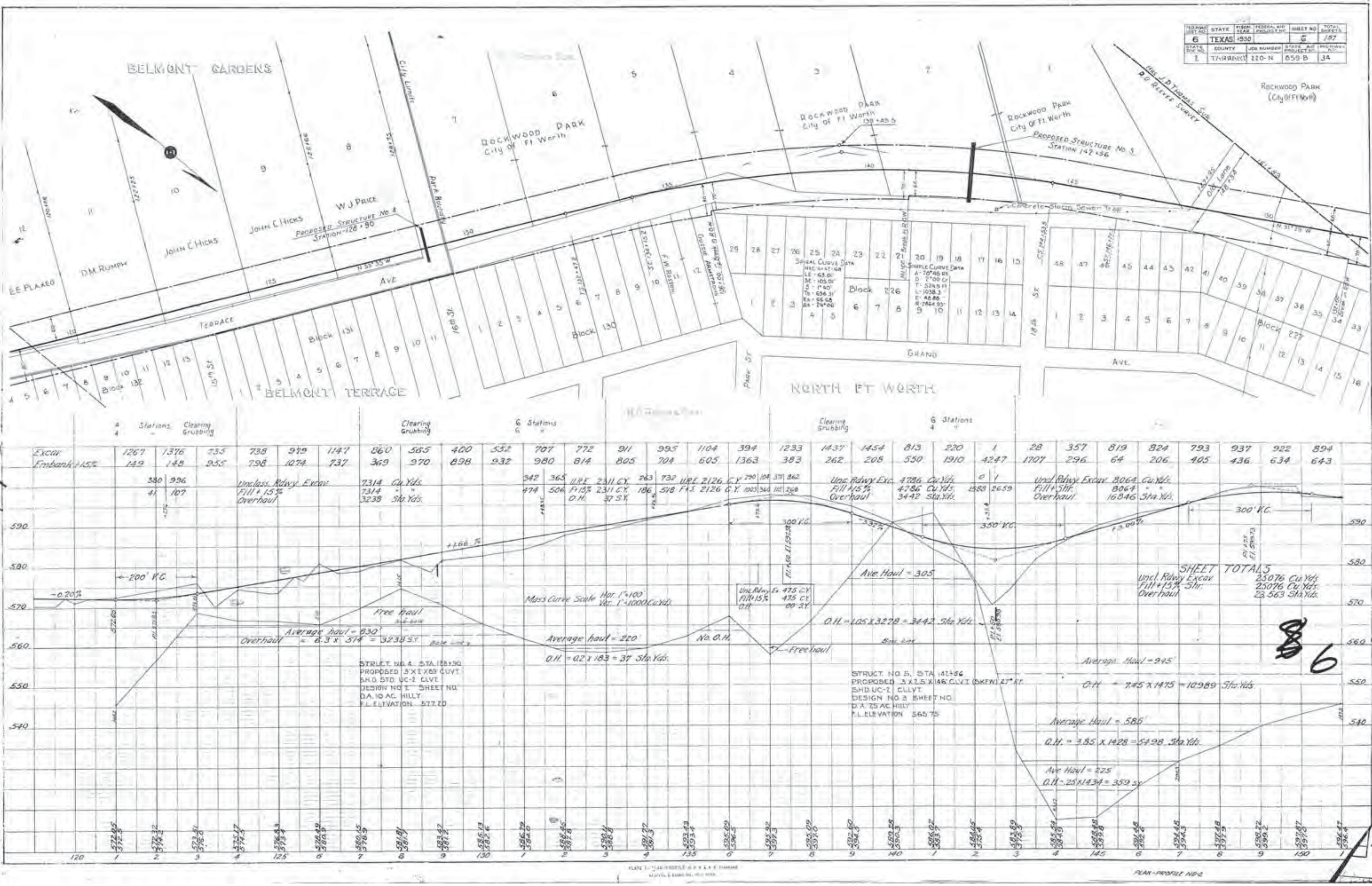
1783

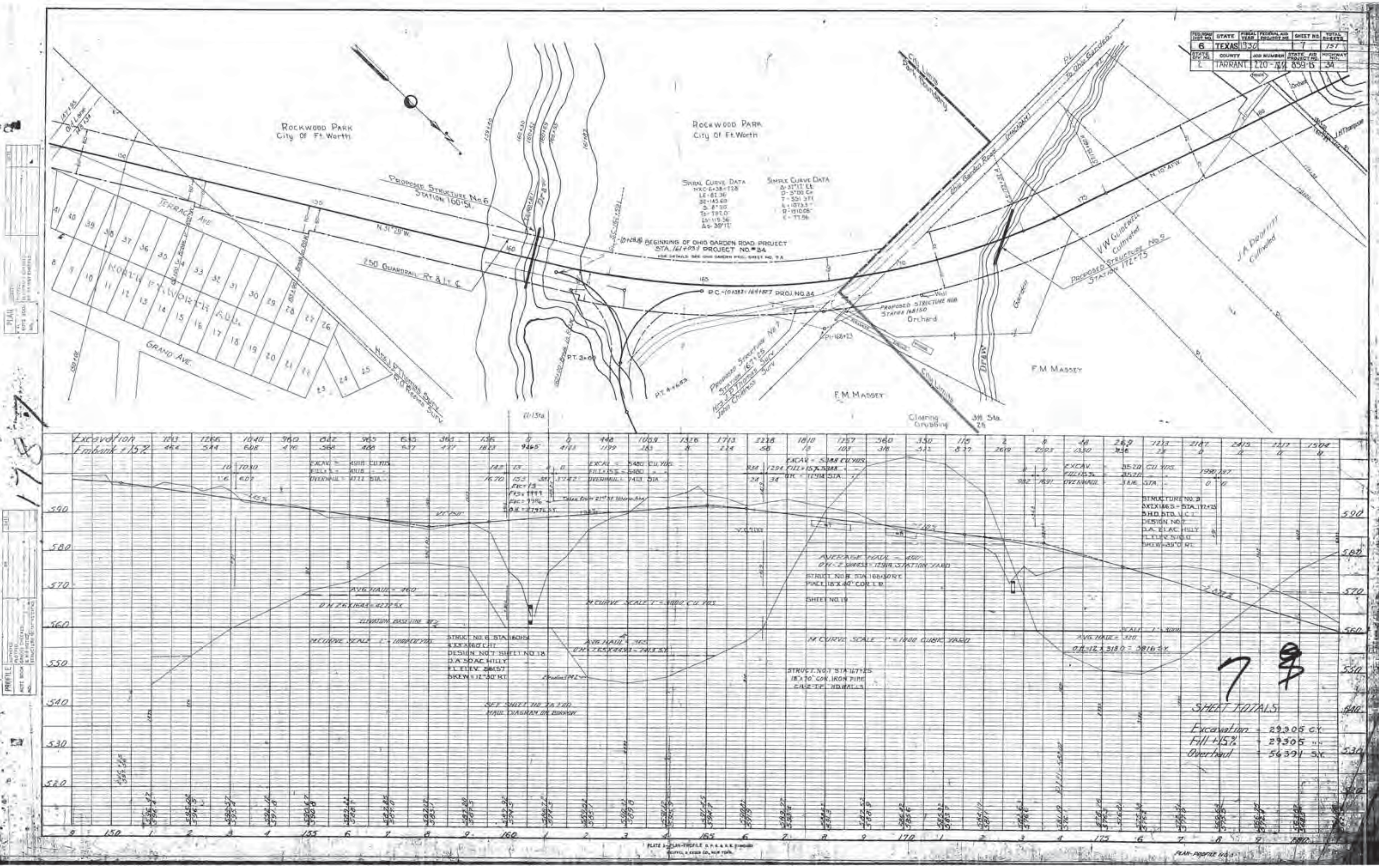


FED. ROAD DIST. NO.	STATE	FISCAL YEAR	FEDERAL AID PROJECT NO.	SHEET NO.	TOTAL SHEETS
6	TEXAS	1930		5	157
STATE DIV. NO.	COUNTY	JOB NUMBER	STATE AID PROJECT NO.	HIGHWAY NO.	
2	TARRANT	220N	859-B	34	

BAILEY GARDENS
BELMONT GARDENS
CURVE DATA
Δ = 8°32' Lt
D = 2°00' Cr
T = 213.8'
L = 426.7'
Slough
R. CROWLEY SURVEY
J. BAUGH SURVEY
PETE BOYAJIS
STA. 94+47.3 – BEG. OF S.P. 859 B – END OF S.P. 859 A
J.G. GELASTOS
JIM KLIDAS
G.K. FENICHIS
PROPOSED STRUCTURE NO. 0
STA. 100+26
NICK MOLAS
W.J. BAILEY
PROPOSED STRUCTURE No. 1
STATION 102+65
PROPOSED STRUCTURE No. 2
STATION 108+00
J.P. ELDER
S.D. SHANNON
W.E. JARY
E.E. PLAKECO
D.M. RUMPH
R.O. REEVES SURVEY
PROPOSED STRUCTURE No. 3
STATION 115+85
S. SPARTOS
OAKWOOD CEMETERY
TERRACE
AVENUE
Block 134
Block 135
Block 136
Block 137
Block 153
Block 132
CENTRAL AVE.
GRAND AVE.
14th ST.
Lt. Clearing 2 Sta.
Light Clearing 4 Sta.
2 Light Clearing
EXCAVATION
EMBANKMENT
12th St. EXCAV. = 2325 C.Y.
EXCAV. = 6910 CU. YDS.
FILL + 15% = 6910
OVERHAUL = 14,736 STA. YDS.
12th St. OVERHAUL = 3243
Note: See X-Sec. Sheets and Mass Diagram for 12th Street Quantities
STRUCT. NO. 0 STA. 100+26
30" X 60' COR. IRON PIPE
SHD. STD. CH-2-TF HEADWALLS
PARALLEL DRAIN 38' RT.
STATION 94+47.3 – BEGINNING OF S.P. 859 "B" – END OF S.P. 859 "A"
TENATIVE GRADE 551.0
MASS CURVE SCALE 1" = 1000 CU. YDS.
STRUCT. NO. 1 STA. 102+57
PLACE 30" X 74' COR. I.P.
SHD. STD. CH-2 TYPE "F" HDWALLS
PARALLEL DRAIN 46' RT.
Special Design See Sheet No. 17
200' V.C.
600' V.C.
BASE LINE
AVG. HAUL = 880'
OVERHAUL = 6.8 X 2167 = 14,736 STA. YDS.
FREE HAUL
SUB-BASE
AVE. HAUL 278'
0.78 X 2368 = 1847.0 S.Y.
STRUCT. NO. 2 STA. 108+00
AVG. HAUL 258'
SUB-BASE LINE
AVE. HAUL = 1168'
STRUCT. NO. 3 STA. 115+85
AVG. HAUL
SHEET TOTALS
12th St. Excav. = 2325 C.Y.
Excavation = 23662 Cu. Yds.
Embankment = 23662
Overhaul = 26040 Sta. "
12th St. Overhaul = 3243 S.Y.
58

1786


6 TEXAS 1930 6 157
1 TARRANT 220-N 859 B 34
BELMONT GARDENS
ROCKWOOD PARK City of Ft Worth
Rockwood Park (City of Ft Worth)
Proposed Structure No 4 Station 128+90
Proposed Structure No 5 Station 142+56
W J PRICE
JOHN C HICKS
D.M. RUMPH
E.E. PLAARD
City Limits
Park Boundary
Concrete Storm Sewer
TERRACE AVE
BELMONT TERRACE
NORTH FT WORTH
GRAND AVE
Block 132
Block 131
Block 130
Block 226
Block 227
Gussie Armstrong
F.W. Rossen
Spiral Curve Data
Simple Curve Data
Excav
Embank +15%
Stations
Clearing Grubbing
Unclass. Rdwy Excav
Fill + 15%
Overhaul
7314 Cu.Yds.
3238 Sta.Yds.
Unc. Rdwy Exc. 4786 Cu.Yds.
4786 Cu.Yds.
3442 Sta.Yds.
Uncl. Rdwy Excav 8064 Cu.Yds.
16846 Sta.Yds.
+1.66 %
-0.20%
200' V.C.
300' V.C.
330' V.C.
Mass Curve Scale Hor. 1"=100' Ver. 1"=1000 Cu.Yds.
Free haul
Average haul = 830'
Overhaul = 6.3 x 514 = 3238 S.Y.
Average haul = 220'
O.H. = 0.2 x 183 = 37 Sta.Yds.
No O.H.
Free haul
Ave. Haul = 305'
O.H. = 1.05 x 3278 = 3442 Sta.Yds.
Average Haul = 945'
O.H. = 7.45 x 1475 = 10989 Sta.Yds.
Average Haul = 585'
O.H. = 3.85 x 1428 = 5498 Sta.Yds.
Ave Haul = 225
O.H. = .25 x 1434 = 359 S.Y.
STRUCT. NO. 4 STA. 128+90
PROPOSED 3' x 2' x 69' CULVT.
SHD STD UC-2 CULVT.
DESIGN NO 2 SHEET NO
D.A. 10 AC. HILLY
F.L. ELEVATION 577.20
STRUCT. NO. 5 STA. 142+56
PROPOSED 3 x 1.5 x 146' CULVT (SKEW) 27° RT.
SHD. UC-2 CULVT.
DESIGN NO 3 SHEET NO
D.A. 25 AC. HILLY
F.L. ELEVATION 565.75
SHEET TOTALS
Uncl. Rdwy Excav 25076 Cu.Yds.
Fill + 15% Shr. 25076 Cu.Yds.
Overhaul 23 563 Sta.Yds.
86
PLAN-PROFILE NO-2


6 TEXAS 1930 7 157
2 TARRANT 220-M 859-B 34
ROCKWOOD PARK
City Of Ft. Worth
ROCKWOOD PARK
City Of Ft. Worth
PROPOSED STRUCTURE No. 6
STATION 160+51
N. 31° 29' W.
250 GUARDRAIL - Rt. & Lt. ℄
TERRACE AVE.
GRAND AVE.
NORTH FT. WORTH ADD.
SPIRAL CURVE DATA
SIMPLE CURVE DATA
BEGINNING OF OHIO GARDEN ROAD PROJECT
STA. 161+93.7 PROJECT No. 84
P.C. PROJ. NO. 34
PROPOSED STRUCTURE NO. 8
Orchard
Proposed Structure No. 7
John Childress Surv.
F.M. MASSEY
F.M. MASSEY
City Limits
Park Boundary
Ohio Garden Road
Draw
Garden
V.W. GILDEWELL
Cultivated
PROPOSED STRUCTURE No. 9
STATION 172+75
J.A. DROFFITT
Cultivated
N. 10° 41' W.
Clearing Grubbing
Excavation
Embank +15%
AVG. HAUL = 460
M-CURVE SCALE 1" = 1000 CU. YDS.
STRUCT. NO. 6 STA. 160+51
DESIGN NO. 7 SHEET NO. 18
SEE SHEET NO. 22 FOR HAUL DIAGRAM ON BORROW
AVG. HAUL = 365
AVERAGE HAUL = 480
STRUCT. NO. 8 STA. 168+50 R.T.
SHEET NO. 19
M CURVE SCALE 1" = 1000 CUBIC YARD
STRUCT. NO. 7 STA. 167+25
18"x70' COR. IRON PIPE
AVG. HAUL = 320
STRUCTURE NO. 9
SHEET TOTALS
Excavation = 29305 C.Y.
Fill +15% = 29305
Overhaul = 56391 S.Y.
590
580
570
560
550
540
530
520
150
155
160
165
170
175
180
PLAN-PROFILE NO. 3
1787
7

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Appendix G – Existing Conditions Traffic Analysis Technical Memorandum

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State Highway 199 Corridor Master Plan

From IH 820 to Belknap Street

Existing Conditions Traffic Analysis Technical Memorandum

Submittal Date:
June 5, 2017

Prepared For:
North Central Texas Council of Governments

Prepared By:
AECOM Technical Services, Inc.
801 Cherry Street, Suite 1050
Fort Worth, Texas 76102
682-316-7651
Texas Registered Engineering Firm F-3580

AECOM

1.0 INTRODUCTION

The existing State Highway (SH) 199 corridor, from Interstate Highway (IH) 820 to Belknap Street is generally a four-lane divided arterial with shoulders, with posted speed limits varying between 35 and 45 mph. The traffic study analyzed the overall corridor operations and focused on the ten existing signalized intersections between Roberts Cut Off Road and University Drive / Northside Drive, as shown in Figure 1.

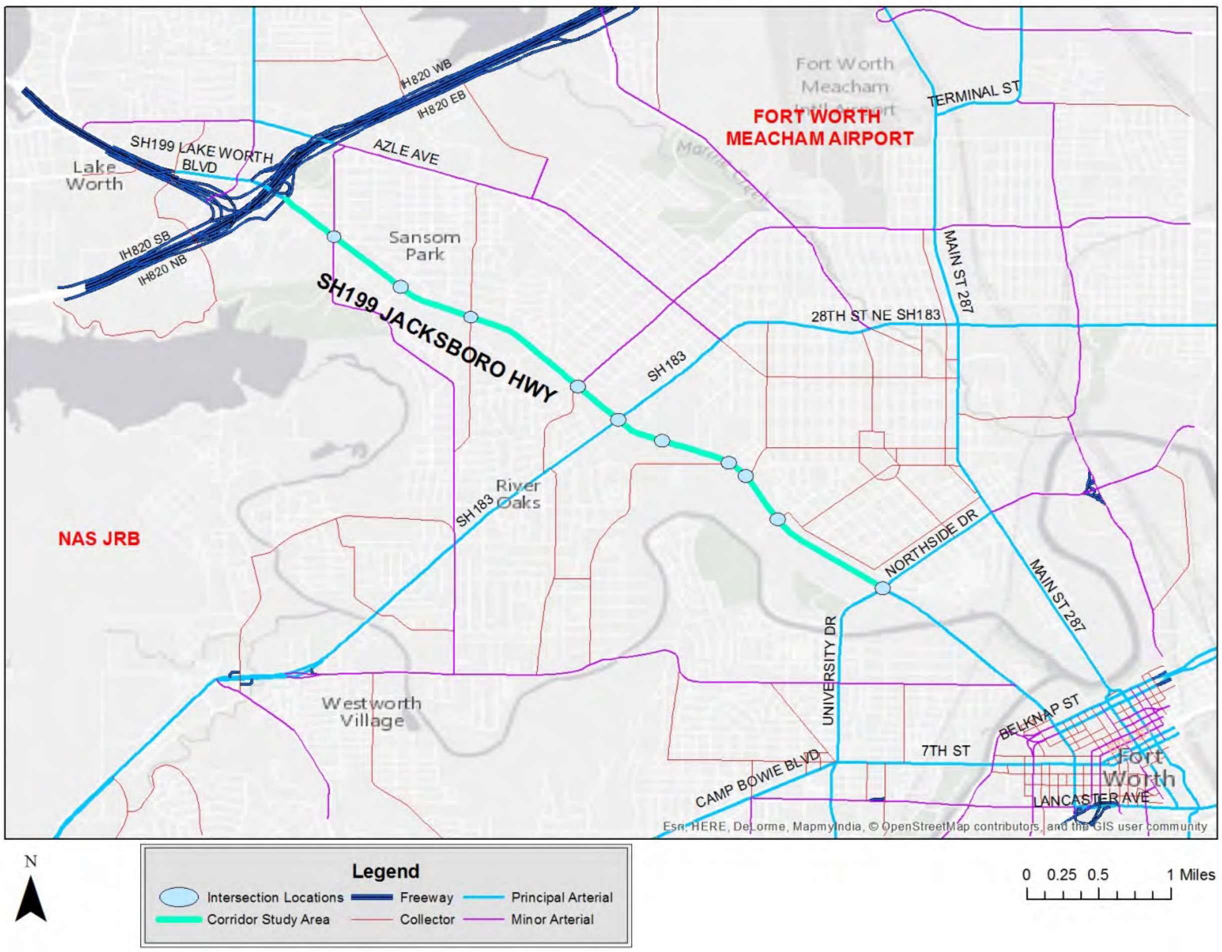

Figure 1. SH 199 Corridor Map

This traffic analysis includes technical terms and information related to traffic signal equipment and operations. For further information and definitions of the terms used, refer to the Federal Highway Administration (FHWA) Publication FHWA-HOP-08-024: *Traffic Signal Timing Manual* (https://ops.fhwa.dot.gov/publications/fhwahop08024/) or FHWA-SA-13-027: *Signalized Intersections Informational Guide* (https://www.fhwa.dot.gov/publications/research/safety/04091/).

2.0 EXISTING CONDITIONS ANALYSIS

2.1 Existing Geometry and Signal Operations

The overall operations of the SH 199 corridor are hindered by aging signal equipment, poor geometric configurations, and a lack of pedestrian facilities. Vehicle detection is provided at all signalized intersections via loops, video image vehicle detection system (VIVDS) cameras, or radar. The signals currently utilize time-of-day coordination plans focused on maximizing throughput on SH 199. Key geometric and operational characteristics at the study intersections are described in the following sections. Because the direction of SH 199 is skewed, SH 199 is designated as the east-west corridor, while all intersecting cross streets are north-south.

- **Roberts Cut Off Road**
  - ***Geometric***: Roberts Cut Off Road, is a minor arterial consisting of a single lane on both the northbound and southbound approaches, as shown in Figure 2. Channelized right turns are also provided for both approaches. Eastbound SH 199 continues three lanes from IH 820 but drops the right lane at the intersection and two through lanes continue east. The westbound approach consists of two through lanes, and the southbound channelized free right adds a third lane to IH 820. The speed limit on SH 199 west of the intersection is 40 mph, but it increases to 45 mph on the east side.

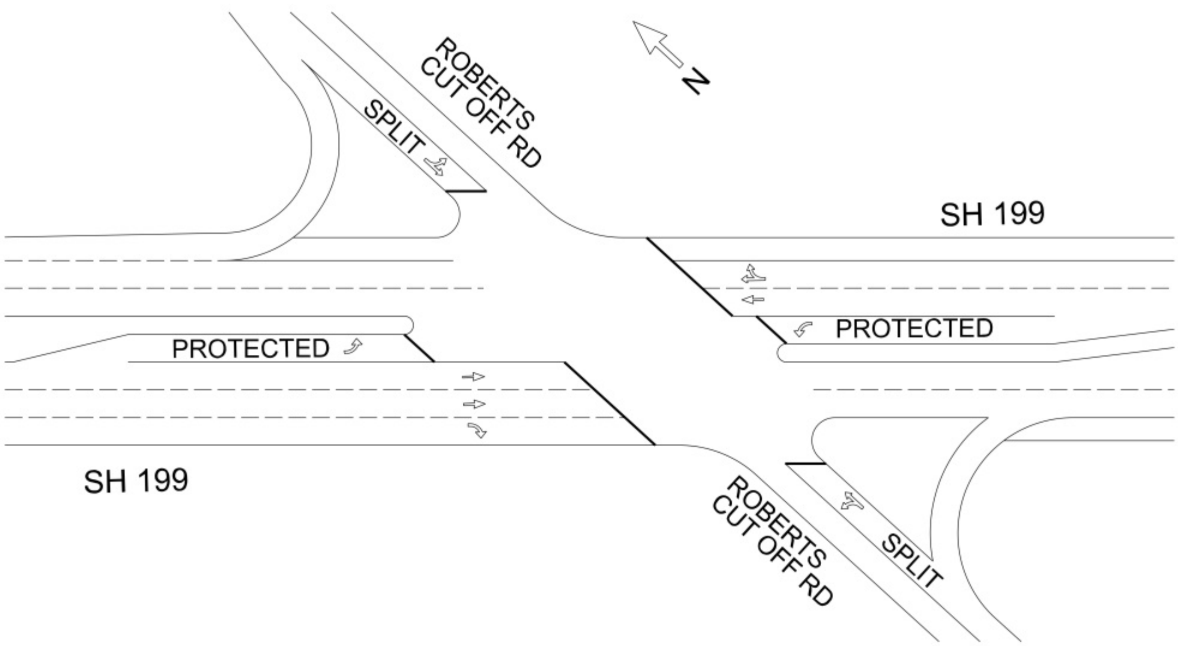

Figure 2. Roberts Cut Off Road – Existing Conditions Layout

  - ***Signal Operations***: Left turns from SH 199 are allowed only under a protected turn arrow, while the Roberts Cut Off approaches utilize split phasing. The timing of this intersection is coordinated with a network of other signals located further to the west along SH 199, and with Biway Street to the east. The intersection does not currently provide pedestrian heads or detection.

- **Biway Street**:
  - o ***Geometric***: Biway Street is a minor collector road with a single lane in each direction. Channelized right turns are provided on the northbound approach of Biway Street and the eastbound and westbound approaches on SH 199.
  - o ***Signal Operations***: The northbound through and southbound through phases operate simultaneously with permissive lefts (left turns are made through gaps in the oncoming traffic). Left turns from SH 199 are protected only. This intersection is the last one in series that is currently coordinated with the other signals to the west. A pedestrian crossing is provided on the east side of the intersection.

- **Skyline Drive**:
  - o ***Geometric****:* Skyline Drive is a minor arterial consisting of a single lane on both the northbound and southbound approaches, as shown in Figure 3.

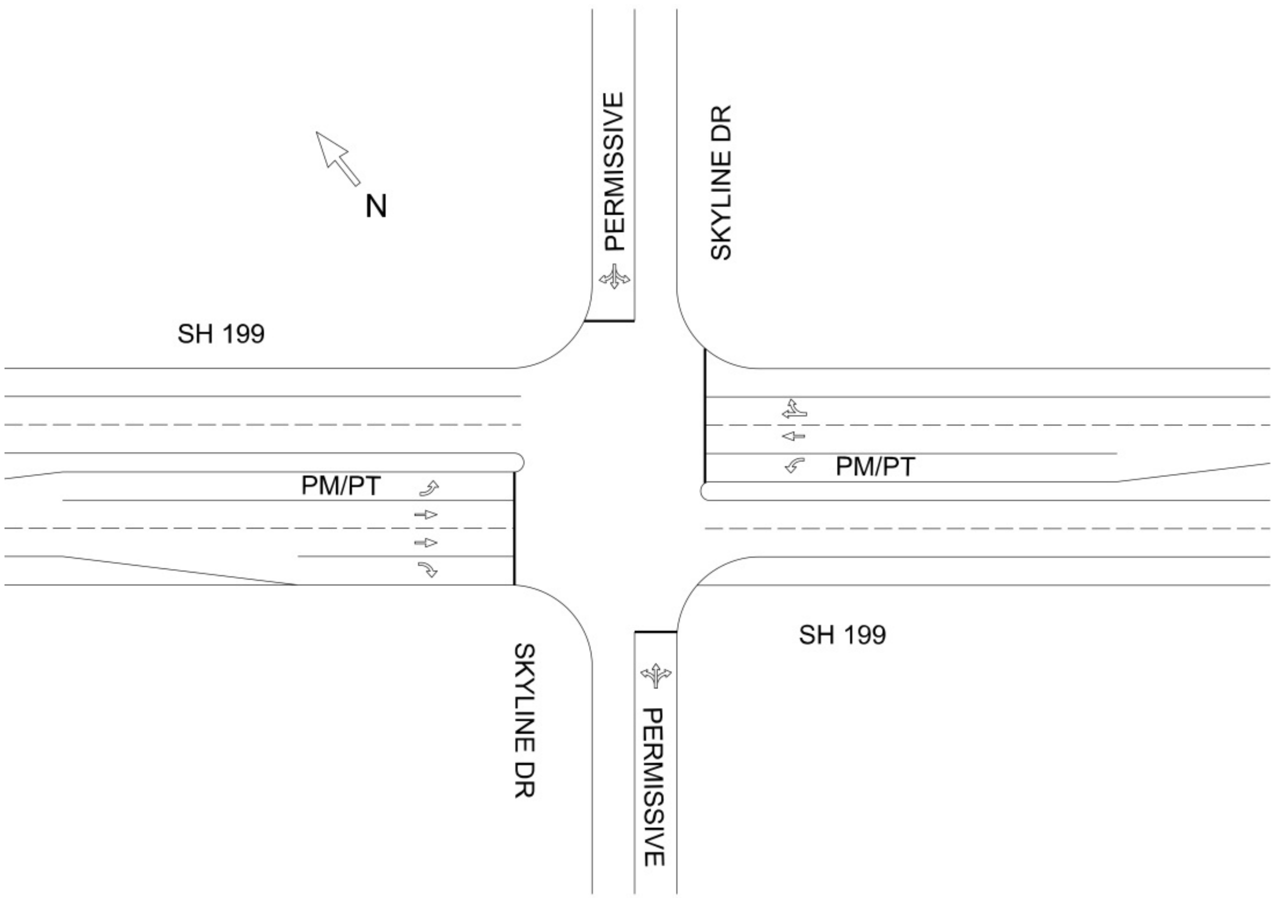

Figure 3. Skyline Drive – Existing Conditions Layout

  - o ***Signal Operations:*** The eastbound and westbound movements on SH 199 have protected/permissive lefts while the left turns from Skyline Drive are permissive only. The signal timing for Skyline Drive uses a different cycle length than the other intersections further to the west and is coordinated with the remainder of the SH 199 system to the east. No pedestrian heads or detection is provided at this location.

- **Long Avenue:**
  - ***Geometric***: Long Avenue is classified as a four-lane divided minor arterial north of SH 199 and a two-lane collector road to the south, as shown in Figure 4. The northbound approach on Long Avenue is directly across from the southbound left turn bays. The southbound approach consists of a left turn bay adjacent to a shared left and through lane. The right lane drops as a right turn bay.

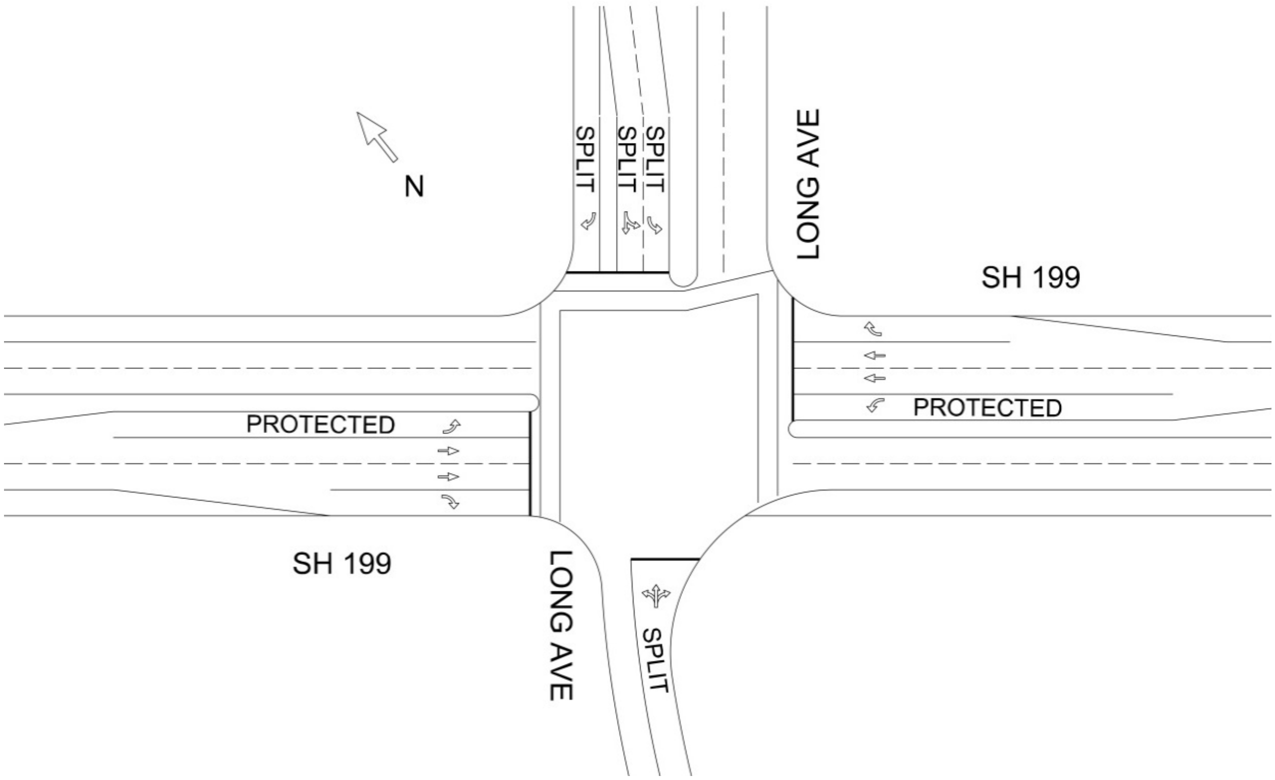

Figure 4. Long Avenue – Existing Conditions Layout

  - ***Signal Operations***: Left turns from SH 199 are protected only. The northbound approach does not align with the two departure lanes north of SH 199, so the two approaches use split phasing. No pedestrian heads or detection are provided at this location.

- **SH 183 (River Oaks Boulevard / Ephriham Avenue)**:
  - ***Geometric***: SH 183 is a principal four-lane divided arterial that crosses SH 199. Currently the intersection is built out with dual left turn bays and a right turn bay at all approaches except southbound Ephriham Avenue.
  - ***Signal Operations***: All left turns are protected only. The intersection provides pedestrian heads and detection on all four sides.

- **Walmart Drive**:
  - ***Geometric***: This intersection is not coordinated with signals further east or west on SH 199. It provides signalized access to the Walmart shopping center to the south and Advance Autoparts to the north.
  - ***Signal Operations***: The left turns for all approaches operate as protected/ permissive with flashing yellow arrows to indicate the permissive movement. The intersection provides pedestrian heads and detection on all four sides.

- **Ohio Garden Road:**
  - ***Geometric*****:** Ohio Garden Road is a two-lane undivided collector road that tees into SH 199, as shown in Figure 5. Northbound Ohio Garden Road approaches SH 199 at an acute angle, with the through lane continuing as the channelized right turn and introducing a short left turn bay that intersects SH 199 perpendicularly.
  - ***Signal Operations:*** The left turn utilizes the main through phase for Ohio Garden. The pedestrian crossing across SH 199 is on the west side of the intersection, so an independent pedestrian phase is required to protect pedestrians from the vehicles turning left. Pedestrian heads and detection are also provided on the south side of the intersection.

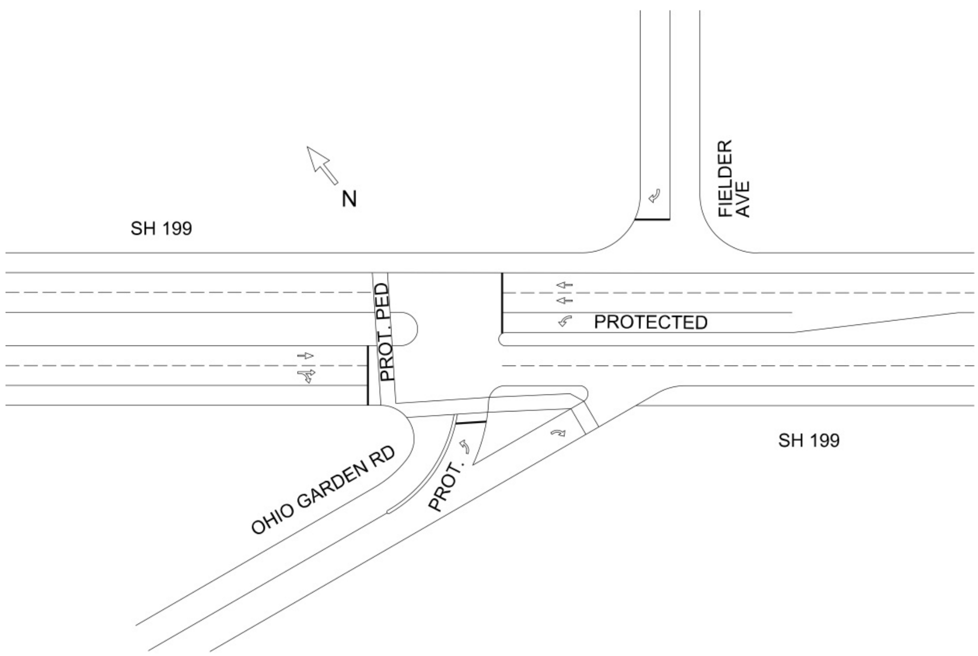

Figure 5. Ohio Garden Road – Existing Conditions Layout

- **NW 21st Street:**
  - ***Geometric*****:** NW 21St Street is a two-lane undivided collector road that tees into SH 199. It widens on the approach to provide two southbound left turn lanes and one channelized southbound right. Another large channelized right turn is provided for the westbound SH 199 right turn movement.
  - ***Signal Operations:*** The eastbound left turns from SH 199 are protected / permissive. No pedestrian heads or detection is provided at this location.

- **NW 18th Street**:
  - ***Geometric***: NW 18th Street is a two-lane undivided collector road that approaches SH 199 from the north. South of SH 199 is the driveway access to Rockwood Park Golf Course.
  - ***Signal Operations***: The cross street approaches provide permissive lefts. The left turns off of SH 199 are protected / permissive. No pedestrian heads or detection is provided at this location.

- **University Drive / Northside Drive:**
  - ***Geometric:*** University Drive to the south of SH 199 and Northside Drive to the north are both principal arterial roads, though University Drive provides six divided lanes while only Northside Drive provides four. There is a single left turn bay for each approach except for the northbound University Drive approach which provides two left turn bays, as shown in Figure 6. Eastbound and westbound SH 199 have channelized right turn movements with the eastbound right adding a lane to the southbound University departure so that three lanes continue southbound. Three northbound through lanes approach SH 199, but the outside lane drops as a right only leaving only two through lanes to continue north onto Northside Drive.

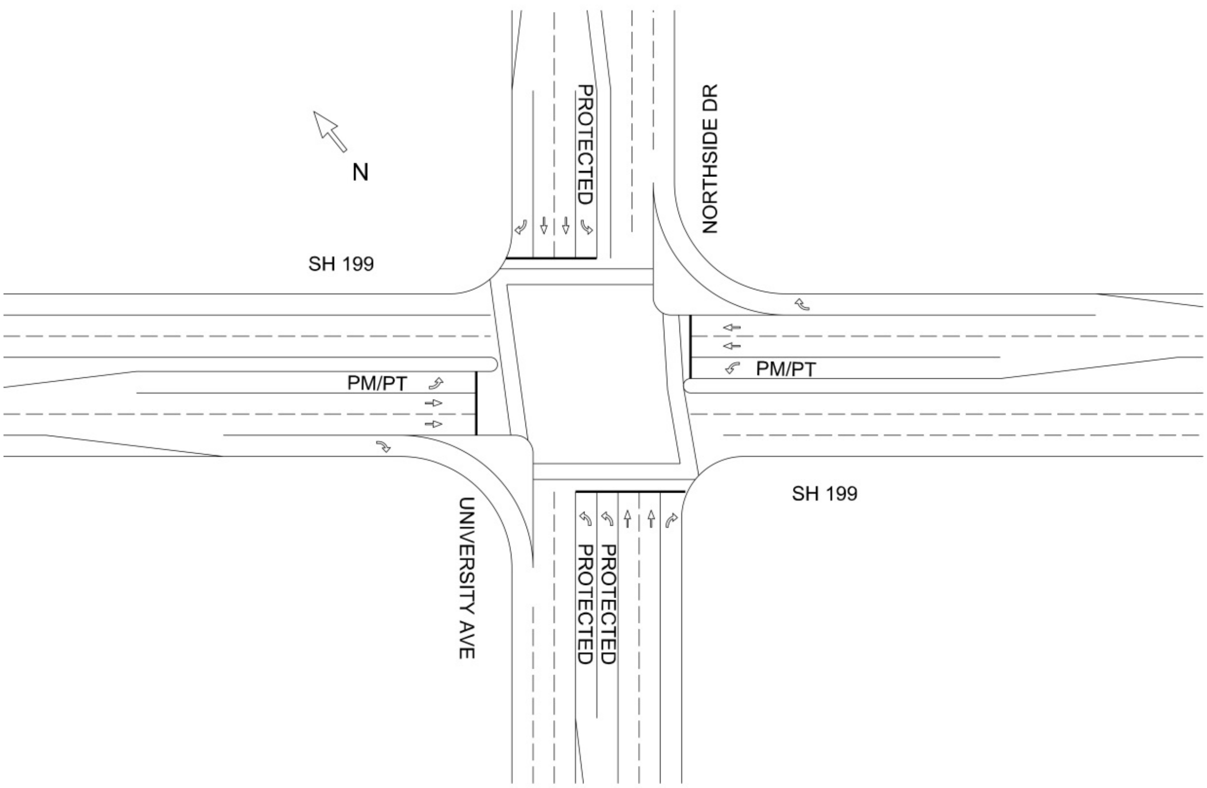

Figure 6. University Drive / Northside Drive – Existing Conditions Layout

  - ***Signal Operations:*** Left turns from SH 199 are protected/permissive, while the turns from the cross street are protected only. The intersection provides pedestrian heads and detection on all four sides.

2.2 Traffic Volumes

2.2.1 Data Collection

Weekday 24-hour classified and intersection turning movement counts were recorded April 13, 2016, and April 19, 2016. The locations of the turning movement counts and 24-hour classified counts are shown in Table 1**.**

Table 1. TMC and 24 Hour Classified Count Locations

Study Intersections	Turning Movement Counts	24 Hour Counts							
		North Side		South Side		East Side		West Side	
		SB	NB	NB	SB	EB	WB	EB	WB
SH 199 and IH 820 Northbound Frontage Road	X	X	X	X	X	X	X	X	X
SH 199 and Old Mill Creek Road	X								
SH 199 and Roberts Cut Off Road	X	X	X	X	X	X	X	X	X
SH 199 and Biway Street	X	X	X	X	X	X	X	X	X
SH 199 and Skyline Drive	X	X	X	X	X	X	X	X	X
SH 199 and Long Avenue	X	X	X	X	X	X	X	X	X
SH 199 and SH 183	X	X	X	X	X	X	X	X	X
SH 199 and Ohio Garden Road	X	X	X	X	X	X	X	X	X
SH 199 and NW 21st Street	X								
SH 199 and NW 18th Street	X	X	X	X	X	X	X	X	X
SH 199 and University Drive	X	X	X	X	X	X	X	X	X

SB=southbound, NB=northbound, EB=eastbound, WB=westbound

The morning and evening peak hours for the entire corridor were calculated from the turning movement counts and determined to be from 7:15 to 8:15 a.m. and from 5:00 to 6:00 p.m. No traffic counts were conducted at the Walmart driveway; peak hour traffic volumes were estimated using the ITE Trip Generation Manual for an 180,000 square foot free-standing discount store (Land Use 815). The existing counts were balanced to ensure that the outflow from the upstream intersection would be similar to the inflow at the downstream intersection. The balancing was capped by limiting the change in through volume to five percent of the original counts volume. The resulting peak hour turning movement volumes are shown in Figure 7. All traffic count data is provided in Attachment A.

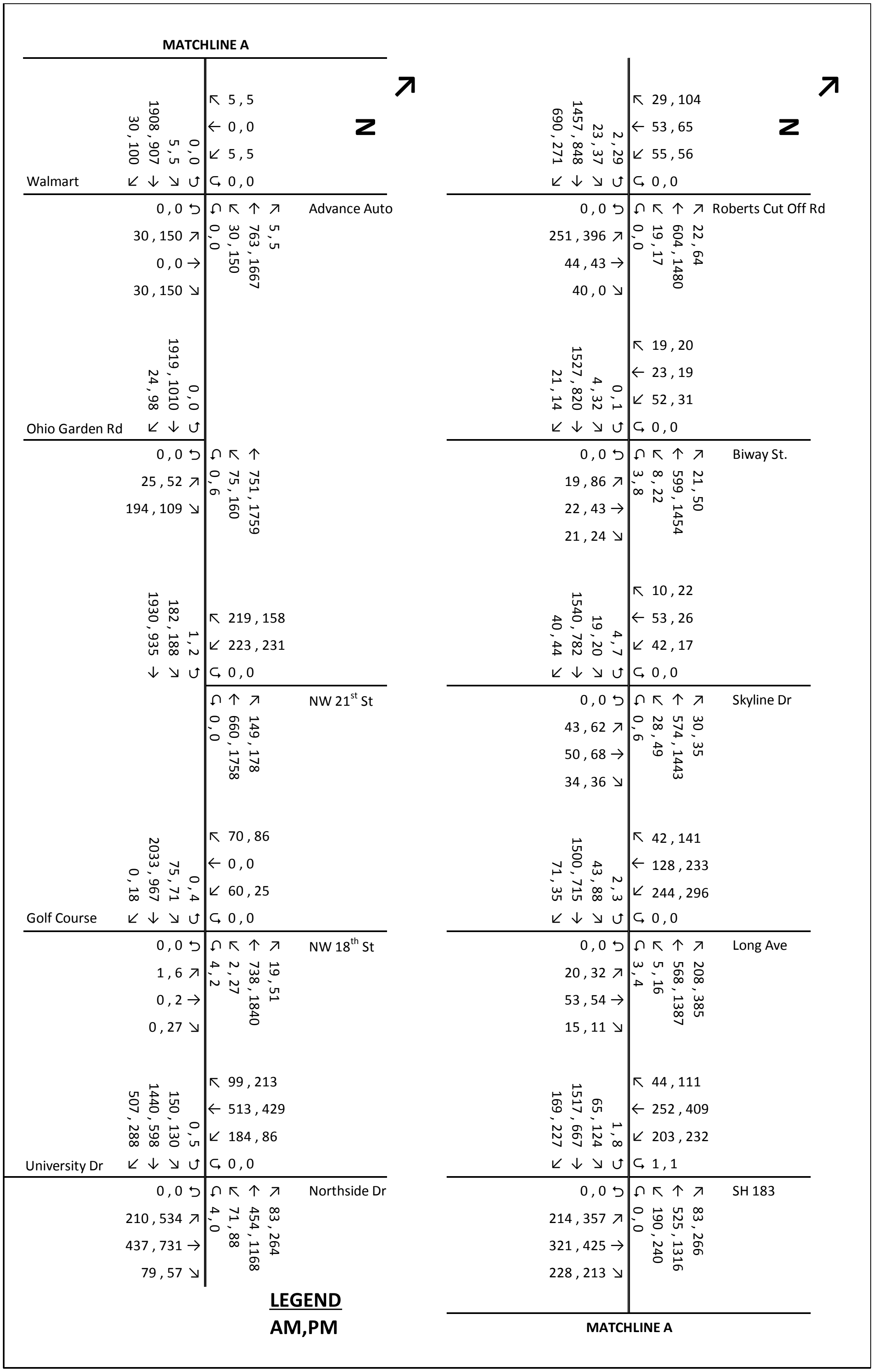

Figure 7. Morning and Evening Existing Peak Hour Traffic Counts

2.2.2 Historical Counts

The traffic counts collected in 2016 were compared to historical traffic count data acquired from the Texas Department of Transportation (TxDOT) and traffic volumes used in developing the Planning for Livable Military Communities (PLMC) study, which focused on both the SH 183 and SH 199 corridors, and was completed in 2013 for North Central Texas Council of Governments (NCTCOG). A comparison of this traffic data is presented in Table 2.

Table 2. Traffic Data Comparison

SH 199 Segment		TxDOT Historical Counts						PLMC	Count
From	**To**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2012**	**2016**
IH 820	Roberts Cut Off Road							40,300	40,533
Roberts Cut Off Road	Skyline Drive							32,500	28,674
Skyline Drive	Long Avenue	23,000	24,000	25,000	21,856	23,453	25,531	32,000	28,414
Long Avenue	SH 183							35,000	34,572
SH 183	Ohio Garden Road	27,000	29,000	29,000	27,043	28,160	37,989	36,200	36,501

TxDOT historical average annual daily traffic counts from 2010 to 2015 were available on two sections of SH 199. The counts from 2010 to 2014 were all lower than the 2016 counts by a significant margin. This is because the TxDOT daily traffic counts are calculated by dividing the overall yearly traffic volume by 365 days. Therefore, the counts include traffic volumes from the weekend, holidays, or other days when traffic volumes are lower than the typical weekday that was used for the actual counts. The 2015 counts showed an increase in traffic levels comparable to the 2016 counts, particularly between SH 183 and Ohio Garden. The traffic pattern in this area changed with the introduction of large retailers such as the Walmart in late 2014, which likely explains the increase in counts from 2014 to 2015.

The 2012 PLMC numbers are higher in the segments between Roberts Cut Off Road and Long Avenue, but are close to the 2016 counts in the other locations. Based on this data comparison, the traffic counts from 2016 were assumed to provide a reasonable baseline to use in analyzing the existing condition.

2.2.3 Existing Traffic Patterns

Based on the 2016 traffic counts, SH 199 is highly directional, with approximately 70 percent of the traffic heading eastbound towards downtown during the morning peak hour and 63 percent heading westbound during the evening peak hour. The morning peak hour constitutes 8.4 percent of the daily traffic volume while the evening peak hour constitutes 9.5 percent. Heavy vehicles comprise approximately 3 percent of the traffic volumes for the corridor.

During the morning peak hour, much of the inbound traffic originates from north of IH 820 and enters the corridor as background through traffic on SH 199. However, the northern side of Long Avenue, SH 183, NW 21st Street, and University/Northside Drives are all significant feeders for the corridor during the morning peak hour. The eastbound right turn volume at Roberts Cut Off is high (690 vehicles per hour) due to the relatively large number of vehicles that use Roberts Cut Off as an alternate route to the Naval Air Station / Joint Reserve Base (NAS/JRB). The eastbound right turn at University Drive is also high (507 vehicles per hour) because the cross street provides access to several major traffic generators.

During the evening peak hour, approximately 60 percent of the outbound traffic originates from downtown, while the remaining enters the corridor from University / Northside Drives. Most of the traffic continues on SH 199 to the western end of the project limits, though significant turning movements away from the corridor are present at NW 21st Street, SH 183 and Long Avenue. The northbound left turn from Roberts Cut Off Road is also high (396 vehicles per hour). As was the case in the morning peak hour, a significant number of vehicles use Roberts Cut Off Road as an alternate route from the NAS/JRB.

2.2.4 Existing Transit Service

Currently SH 199 is served by Bus Route 46 which runs from the Downtown Fort Worth Intermodal Transit Center to the Landmark Lakes Shopping Center near IH 820. This route is scheduled every half hour on weekdays and every hour on Saturdays, and makes 12 stops from Old Mill Creek to University Drive. The Fort Worth Transportation Authority provided ridership data from 2012 for this corridor:

- Morning Peak Hour
  - Inbound: approximately 100 riders
  - Outbound: approximately 50 riders
- Evening Peak Hour
  - Inbound: approximately 100 riders
  - Outbound: approximately 75 riders

2.3 Traffic Analysis

The traffic simulation software Synchro 9 was utilized to analyze the existing condition and measure the current operations. The traffic data, existing geometry, and timing plans provided by the City of Fort Worth were input into the Synchro software to create a realistic baseline of the existing condition.

2.3.1 Measures of Effectiveness

Analysts use level of service (LOS), a qualitative measure which ranges from A to F, to help determine how well a particular facility operates. The scale, in which LOS A represents the best operating conditions while LOS F the worst, uses numeric values of speed, flow, and density to describe the perceived quality of flow as viewed by drivers. The 2000 *Highway Capacity Manual* (HCM) provides measures of effectiveness used to determine LOS for signalized intersections, which is presented in Table 3**.** LOS is determined using the average delay (in seconds per vehicle) for the intersections. Figure 8 presents a visual representation of LOS.

Table 3. Signalized Intersection LOS Criteria

LOS	Signalized Average Delay (seconds/vehicle)
A	≤ 10
B	> 10 to ≤ 20
C	> 20 to ≤ 35
D	> 35 to ≤ 55
E	> 55 to ≤ 80
F	> 80

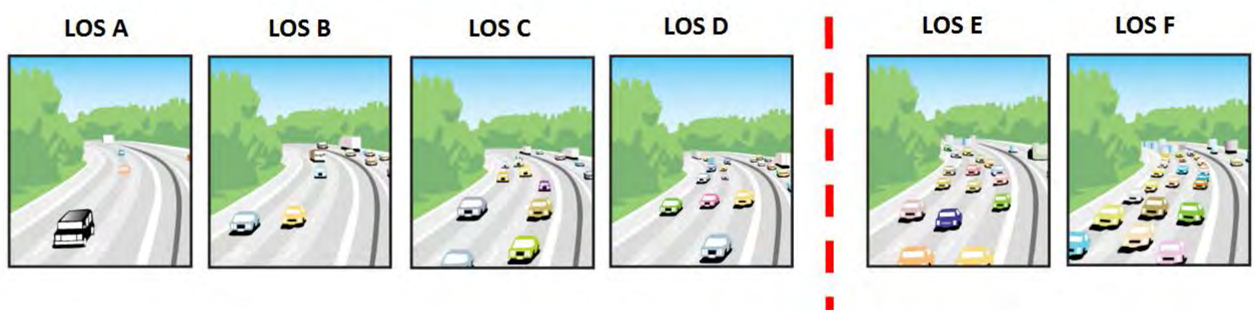

Figure 8. Corridor Level of Service

2.3.2 Level of Service Analysis

Table 4 presents the LOS results for the existing morning and evening peak hours based on HCM 2000 analysis procedures. Attachment B includes the Synchro reports.

Table 4. Existing LOS Analysis

Study Intersections	Morning		Evening	
	Delay (seconds/ vehicle)	LOS	Delay (seconds/ vehicle)	LOS
SH 199 and Roberts Cut Off Road	43.5	D	70.8	E
SH 199 and Biway Street	9.1	A	15.1	B
SH 199 and Skyline Drive	26.1	C	10.4	B
SH 199 and Long Avenue	28.6	C	33.3	C
SH 199 and SH 183	44.9	D	43.9	D
SH 199 and Walmart Driveway	15.7	B	22.3	C
SH 199 and Ohio Garden Road	16.4	B	13.8	B
SH 199 and NW 21st Street	10.8	B	22.6	C
SH 199 and NW 18th Street	12.1	B	14.7	B
SH 199 and University Drive	46.7	D	50.5	D

The analysis shows that while most of the intersections are currently operating at an acceptable LOS, three intersections are nearing capacity or are already at capacity:

- **Roberts Cut Off Road**: The northbound and southbound approaches utilize split phasing due to the lack of an independent turn bay to serve the high turning volume for the northbound left movement. While the split phasing allows the northbound left to turn unopposed, it is inefficient for overall intersection operations. Because the signal operates with split phasing, the northbound and southbound Roberts Cut Off approaches do not share green time and instead go through the intersection one after the other. Thus, the side street receives a greater share of the overall cycle than it would otherwise, and delays are increased for all approaches. Operations on SH 199 are adversely affected due to a lower split than is normally warranted.

  Problematic Movements (LOS E or F): Northbound left turn, southbound left turn, eastbound through, and westbound through

- **SH 183**: This is a principal arterial road with heavy traffic volumes on all four approaches. Left turns are also significant at this intersection which currently has dual lefts on each approach. While the intersection timing plan favors through traffic on SH 199, the other phases are adversely impacted. At this point additional through lanes are required on either SH 199 or SH 183 to significantly improve the intersection operations.

  Problematic Movements (LOS E or F): Northbound through and left, southbound through and left, westbound left, and eastbound left

- **University Drive/Northside Drive**: Similar to SH 183, University Drive is a principal arterial with heavy traffic volumes on all four approaches. Several mitigation measures are already in place: the heavy northbound left turn is already served with dual turn bays and the heavy eastbound right turn is served by a lane addition on southbound University Drive. Like SH 183, additional through lanes on either SH 199 or the cross street are required to provide any noticeable improvement to the intersection operations.

  Problematic Movements (LOS E or F): Northbound through and left, southbound through and left

3.0 ATTACHMENTS

A. Traffic Count Data
B. Synchro Output

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Attachment A

Traffic Count Data

Study Name SH 199 @ LOOP 820 NBFR
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

	SH 199 Southbound						LOOP 820 NBFR Southwestbound						YEARY ST Westbound						SH 199 Northbound						YEARY ST Eastbound						LOOP 820 NBFR Southeastbound					
Start Time	Hard Left	Left	Thru	Right	Hard Right	U-Turn	Hard Left	Bear Left	Bear Right	Right	Hard Right	U-Turn	Left	Thru	Bear Right	Right	Hard Right	U-Turn	Left	Bear Left	Thru	Bear Right	Right	U-Turn	Hard Left	Left	Bear Left	Thru	Right	U-Turn	Hard Left	Left	Bear Left	Bear Right	Hard Right	U-Turn
12:00 AM	0	0	26	1	0	0	0	0	0	0	0	0	1	0	0	4	0	0	0	0	29	9	4	2	0	0	0	0	0	0	0	0	0	6	0	0
12:15 AM	0	1	29	0	0	0	0	0	0	0	0	0	1	0	0	2	0	0	1	0	30	9	2	0	0	0	0	0	0	0	0	0	0	13	0	0
12:30 AM	0	0	22	0	0	0	0	0	0	0	0	0	1	0	0	2	0	0	0	0	16	11	1	0	0	0	0	0	0	0	0	0	0	4	0	0
12:45 AM	0	0	17	0	0	0	0	0	0	0	0	0	2	0	0	1	0	0	0	0	12	14	0	0	0	0	0	0	0	0	0	1	1	7	0	0
1:00 AM	0	0	15	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	19	7	2	0	0	0	0	0	0	0	0	0	0	3	0	0
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1:30 AM	0	0	14	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	14	3	1	0	0	0	0	0	0	0	0	0	0	2	0	0
1:45 AM	0	1	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	3	2	0	0	0	0	0	0	0	0	0	0	3	0	0
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2:30 AM	0	0	12	0	0	0	0	0	0	0	0	0	1	0	0	3	0	0	0	0	14	15	5	0	0	0	0	0	0	0	0	0	0	5	0	0
2:45 AM	0	0	16	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	10	3	2	0	0	0	0	0	0	0	0	0	0	5	0	0
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9:00 AM	0	0	244	7	0	0	0	0	0	0	0	0	3	0	0	5	1	0	3	0	113	48	7	0	0	0	0	0	0	0	0	0	0	28	3	0
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9:30 AM	0	0	242	8	0	0	0	0	0	0	0	0	0	0	0	9	3	0	4	0	150	47	5	0	0	0	0	0	0	0	0	0	0	36	0	0
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Study Name SH 199 @ LOOP 820 NBFR
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

	SH 199 Southbound						LOOP 820 NBFR Southwestbound						YEARY ST Westbound						SH 199 Northbound						YEARY ST Eastbound						LOOP 820 NBFR Southeastbound					
Start Time	Hard Left	Left	Thru	Right	Hard Right	U-Turn	Hard Left	Bear Left	Bear Right	Right	Hard Right	U-Turn	Left	Thru	Bear Right	Right	Hard Right	U-Turn	Left	Bear Left	Thru	Bear Right	Right	U-Turn	Hard Left	Left	Bear Left	Thru	Right	U-Turn	Hard Left	Left	Bear Left	Bear Right	Hard Right	U-Turn
12:00 PM	0	1	259	10	0	0	0	0	0	0	0	0	1	0	0	10	5	0	2	0	244	88	12	13	0	0	0	0	0	0	0	0	0	45	2	0
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7:00 PM	0	0	258	4	0	0	0	0	0	0	0	0	1	0	0	7	4	0	1	0	228	93	12	1	0	0	0	0	0	0	0	0	0	50	0	0
7:15 PM	1	0	208	4	0	0	0	0	0	0	0	0	3	0	0	6	5	0	0	0	222	71	7	2	0	0	0	0	0	0	0	0	0	40	0	0
7:30 PM	0	0	209	1	0	0	0	0	0	0	0	0	0	1	0	4	5	0	1	0	213	65	9	1	0	0	0	0	0	0	0	0	0	52	0	0
7:45 PM	0	0	129	3	0	0	0	0	0	0	0	0	0	0	0	8	2	0	2	0	196	39	5	1	0	0	0	0	0	0	0	0	0	40	0	0
8:00 PM	0	0	149	0	0	0	0	0	0	0	0	0	0	0	0	3	2	0	0	0	170	63	9	0	0	0	0	0	0	0	0	0	0	25	1	0
8:15 PM	0	0	132	1	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	181	57	6	1	0	0	0	0	0	0	0	0	0	36	0	0
8:30 PM	0	0	148	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	154	65	6	0	0	0	0	0	1	0	1	0	0	36	0	0
8:45 PM	0	0	135	1	0	0	0	0	0	0	0	0	1	0	0	8	1	0	0	0	157	55	0	1	0	0	0	0	0	0	1	0	0	24	0	0
9:00 PM	0	0	135	0	0	0	0	0	0	0	0	0	1	0	0	10	3	0	0	0	175	53	4	2	0	0	0	0	0	0	1	0	0	30	0	0
9:15 PM	0	0	115	2	0	0	0	0	0	0	0	0	0	0	0	3	1	0	0	0	126	55	9	2	0	1	0	0	0	0	0	0	0	17	0	0
9:30 PM	0	0	106	2	0	0	0	0	0	0	0	0	0	0	0	9	1	0	0	0	109	47	5	2	0	0	0	0	0	0	0	0	0	23	0	0
9:45 PM	0	0	94	2	0	0	0	0	0	0	0	0	1	0	0	3	1	0	1	0	145	42	3	2	0	0	0	0	0	0	0	0	0	13	0	0
10:00 PM	0	0	90	0	0	0	0	0	0	0	0	0	2	0	0	1	1	0	0	0	66	30	8	0	0	0	0	0	0	0	0	0	0	13	0	0
10:15 PM	0	0	70	0	0	0	0	0	0	0	0	0	2	0	0	4	4	0	2	0	67	36	5	0	0	0	0	0	0	0	0	0	0	20	0	0
10:30 PM	1	0	65	0	0	0	0	0	0	0	0	0	0	0	0	2	3	0	3	0	60	21	4	0	0	0	0	0	0	0	1	0	0	9	0	0
10:45 PM	0	0	61	0	0	0	0	0	0	0	0	0	2	0	0	4	1	0	0	0	62	19	4	1	0	0	0	0	0	0	0	0	0	9	0	0
11:00 PM	0	0	66	1	0	0	0	0	0	0	0	0	1	1	0	1	1	0	1	0	54	18	6	0	0	0	0	0	0	0	0	0	0	7	0	0
11:15 PM	0	0	31	1	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	53	18	5	0	0	0	0	0	0	0	0	0	0	9	0	0
11:30 PM	0	0	30	0	0	0	0	0	0	0	0	0	1	1	0	4	0	0	0	0	35	9	2	0	0	0	0	0	0	0	0	1	0	4	0	0
11:45 PM	0	0	28	0	0	1	0	0	0	0	0	0	0	0	0	4	1	0	0	0	45	13	6	1	0	0	0	0	0	0	0	0	0	10	0	0

Study Name SH 199 @ OLD MILL CREEK RD
Start Date 04/13/2016
Start Time 7:00 AM
Site Code

	SH 199 Southbound				Westbound St. Westbound				SH 199 Northbound				OLD MILL CREEK RD Eastbound			
Start Time	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn
7:00 AM	0	510	3	7	0	0	0	0	6	152	0	0	1	0	4	0
7:15 AM	0	557	1	6	0	0	0	0	3	196	0	0	1	0	13	0
7:30 AM	0	598	1	4	0	0	0	0	3	233	0	0	0	0	19	0
7:45 AM	0	525	2	6	0	0	0	0	3	209	0	0	1	0	9	0
8:00 AM	0	441	5	7	0	0	0	0	3	209	0	0	1	0	10	0
8:15 AM	0	386	5	6	0	0	0	0	10	182	0	1	0	0	15	0
8:30 AM	0	395	4	4	0	0	0	0	4	148	0	0	3	0	12	0
8:45 AM	0	326	5	4	0	0	0	0	7	176	0	0	1	0	12	0
9:00 AM	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0
4:00 PM	0	329	5	12	0	0	0	0	8	428	0	5	2	0	11	0
4:15 PM	0	298	6	7	0	0	0	0	8	489	0	1	0	0	11	0
4:30 PM	0	276	3	13	0	0	0	0	15	451	0	1	1	0	15	0
4:45 PM	0	286	7	17	0	0	0	0	14	445	0	1	3	0	9	0
5:00 PM	0	288	6	17	0	0	0	0	16	504	0	1	1	0	10	0
5:15 PM	0	271	8	11	0	0	0	0	15	457	0	0	3	0	15	0
5:30 PM	0	305	5	6	0	0	0	0	18	496	0	0	2	0	6	0
5:45 PM	0	306	8	11	0	0	0	0	19	452	0	0	0	0	13	0
6:00 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0

Study Name SH 199 @ ROBERTS CUT OFF RD
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

	SH 199 Southbound				ROBERTS CUT OFF RD Westbound				SH 199 Northbound				ROBERTS CUT OFF RD Eastbound			
Start Time	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn
12:00 AM	0	17	13	2	1	1	2	0	2	32	0	0	7	0	0	0
12:15 AM	0	35	9	3	0	1	1	0	2	28	0	0	9	0	0	0
12:30 AM	0	18	7	0	0	0	0	0	1	14	2	0	15	0	0	0
12:45 AM	0	14	8	0	0	1	0	0	1	24	2	0	5	0	2	0
1:00 AM	2	9	3	0	0	1	0	0	0	18	1	0	6	0	0	0
1:15 AM	0	15	6	1	0	0	0	0	0	19	0	0	2	0	0	0
1:30 AM	0	10	2	1	0	0	1	0	0	16	0	0	2	1	0	0
1:45 AM	0	12	5	0	0	0	0	0	0	13	0	0	2	0	0	0
2:00 AM	1	6	4	1	2	1	0	0	2	16	0	0	2	0	1	0
2:15 AM	1	7	4	1	0	0	0	0	1	22	0	0	4	2	0	0
2:30 AM	3	11	2	1	1	0	2	0	0	14	0	0	11	0	0	0
2:45 AM	1	14	4	1	0	0	0	0	0	10	0	0	6	0	0	0
3:00 AM	1	6	5	2	0	0	1	0	1	14	0	0	2	0	0	0
3:15 AM	0	8	1	0	1	1	0	0	0	14	0	0	2	0	0	0
3:30 AM	0	9	1	0	0	1	2	0	0	7	0	0	2	0	0	0
3:45 AM	1	4	5	2	0	0	1	0	1	10	0	0	9	0	0	0
4:00 AM	2	16	3	0	0	0	1	0	0	12	0	0	10	0	0	0
4:15 AM	1	20	6	1	0	1	2	0	0	18	0	0	10	0	0	0
4:30 AM	1	35	10	0	0	0	1	0	0	21	1	0	13	0	0	0
4:45 AM	0	39	7	2	2	2	1	0	0	32	1	0	14	1	0	0
5:00 AM	1	56	17	1	0	1	2	0	0	32	0	0	16	1	1	0
5:15 AM	0	64	28	3	3	2	1	0	0	34	3	0	16	1	2	0
5:30 AM	0	115	41	3	3	3	2	0	1	55	3	0	48	2	1	0
5:45 AM	2	133	60	2	6	3	6	0	1	84	4	0	37	3	1	0
6:00 AM	0	184	112	2	6	4	5	0	1	66	1	0	45	0	3	0
6:15 AM	2	193	114	3	4	6	7	0	2	89	3	0	66	4	6	0
6:30 AM	2	270	110	4	11	5	4	0	2	93	1	0	50	4	2	0
6:45 AM	7	285	133	1	8	10	9	0	2	106	3	0	49	8	6	0
7:00 AM	4	315	168	2	5	9	10	0	0	109	2	0	48	0	7	0
7:15 AM	4	359	190	0	12	12	7	0	4	139	3	0	58	6	9	0
7:30 AM	2	380	196	1	23	12	4	0	5	157	4	0	68	7	13	0
7:45 AM	9	387	174	1	11	14	9	0	5	156	8	0	61	19	13	0
8:00 AM	8	305	115	0	9	15	8	0	5	129	7	0	60	12	5	0
8:15 AM	4	311	89	0	12	11	6	0	5	140	13	0	57	8	11	0
8:30 AM	8	277	94	0	10	7	7	0	4	86	7	0	57	4	4	0
8:45 AM	3	258	91	3	11	6	7	0	4	139	4	0	44	5	2	0
9:00 AM	1	173	60	0	5	4	4	0	1	110	7	0	43	8	5	0
9:15 AM	1	209	74	4	14	6	6	0	3	141	5	0	38	5	5	0
9:30 AM	5	186	70	4	9	8	10	0	0	139	3	0	43	9	3	0
9:45 AM	5	186	59	5	13	13	14	0	3	132	10	0	43	10	3	0
10:00 AM	3	175	57	5	5	8	11	0	3	176	10	0	48	1	2	0
10:15 AM	7	187	62	6	6	6	15	0	5	154	5	0	47	3	4	0
10:30 AM	2	157	50	6	13	8	11	0	2	156	10	0	52	3	2	0
10:45 AM	10	174	49	3	8	5	16	0	3	160	7	1	63	8	2	0
11:00 AM	11	192	50	8	8	7	10	0	9	150	6	0	48	4	1	0
11:15 AM	14	218	43	5	17	8	10	0	3	161	8	0	58	9	5	0
11:30 AM	5	174	56	5	4	15	12	0	2	196	9	0	68	4	4	0
11:45 AM	17	197	59	4	13	7	20	0	2	197	13	0	57	6	3	0

Study Name SH 199 @ ROBERTS CUT OFF RD
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

	SH 199 Southbound				ROBERTS CUT OFF RD Westbound				SH 199 Northbound				ROBERTS CUT OFF RD Eastbound			
Start Time	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn
12:00 PM	11	189	60	4	14	9	25	0	4	240	10	0	66	12	1	0
12:15 PM	13	232	61	8	17	4	22	0	3	194	11	0	67	8	2	0
12:30 PM	4	192	74	4	9	10	11	0	6	217	15	0	69	6	3	0
12:45 PM	16	201	73	12	13	6	17	0	5	196	18	0	65	12	5	0
1:00 PM	10	208	82	4	12	12	23	0	8	183	12	1	52	9	5	0
1:15 PM	12	190	60	12	12	15	15	0	4	210	12	0	69	9	6	0
1:30 PM	9	205	76	5	9	8	14	0	3	252	12	0	73	12	5	0
1:45 PM	14	194	59	4	11	13	18	0	2	158	10	0	58	7	2	0
2:00 PM	10	188	61	3	5	12	10	0	1	204	8	0	50	8	4	0
2:15 PM	13	204	56	8	10	11	13	0	5	225	14	0	75	9	6	0
2:30 PM	15	169	82	6	6	12	12	0	2	244	12	0	80	15	4	0
2:45 PM	14	208	71	4	12	11	16	0	5	230	10	2	69	11	0	0
3:00 PM	12	194	80	1	10	9	13	0	4	234	13	0	94	16	1	0
3:15 PM	8	178	80	5	14	11	8	0	7	266	8	0	94	6	4	0
3:30 PM	12	188	78	11	12	11	20	0	1	266	14	0	102	8	0	0
3:45 PM	15	154	83	5	14	13	10	0	4	273	19	0	102	8	4	0
4:00 PM	11	253	75	6	8	18	13	0	6	326	21	1	102	9	0	0
4:15 PM	16	189	75	3	14	12	15	0	4	371	16	0	114	15	1	0
4:30 PM	17	200	97	11	10	15	20	0	6	331	17	0	98	13	2	0
4:45 PM	14	197	69	6	9	9	15	0	2	348	24	0	109	12	0	0
5:00 PM	11	205	68	12	13	16	30	0	2	349	14	0	106	9	0	0
5:15 PM	8	215	57	6	10	17	21	0	3	379	19	0	88	11	0	0
5:30 PM	13	189	63	6	22	19	32	0	7	319	16	0	104	16	0	0
5:45 PM	5	239	83	5	13	13	21	0	5	368	15	0	98	7	0	0
6:00 PM	13	216	59	3	14	14	24	0	1	308	16	2	90	13	1	0
6:15 PM	7	221	74	12	8	6	17	0	4	308	13	0	79	14	0	0
6:30 PM	5	191	60	4	8	10	10	0	3	234	14	0	99	17	2	0
6:45 PM	22	209	65	5	10	8	10	0	2	222	15	0	76	13	2	0
7:00 PM	18	161	72	5	9	12	16	0	3	228	9	0	69	9	1	0
7:15 PM	12	148	80	2	8	6	13	0	2	206	18	0	75	9	6	0
7:30 PM	6	155	52	1	4	7	10	0	3	196	6	0	77	13	2	0
7:45 PM	5	112	47	4	3	5	9	0	3	181	13	0	45	6	3	0
8:00 PM	4	84	42	2	1	6	6	0	2	163	8	0	52	10	3	0
8:15 PM	4	109	44	2	1	13	11	0	4	180	6	0	44	7	6	0
8:30 PM	6	112	44	1	5	5	13	0	2	149	6	0	52	6	2	0
8:45 PM	6	92	42	3	3	2	19	0	3	153	5	0	44	6	2	0
9:00 PM	5	97	35	4	2	7	13	0	1	152	6	0	49	6	1	0
9:15 PM	4	71	33	2	4	3	7	0	5	129	4	0	42	0	1	0
9:30 PM	6	87	22	5	5	3	5	0	2	92	5	0	53	0	0	0
9:45 PM	5	67	26	2	5	5	5	0	1	109	2	1	49	2	2	0
10:00 PM	3	51	29	1	3	3	5	0	3	81	3	0	15	2	2	0
10:15 PM	5	63	19	4	2	4	2	0	4	82	4	0	23	2	0	0
10:30 PM	2	41	16	2	3	3	0	0	2	68	2	0	13	4	0	0
10:45 PM	4	37	17	1	1	2	5	0	1	50	2	0	24	6	1	0
11:00 PM	2	37	24	2	0	2	4	0	2	58	0	0	10	0	1	0
11:15 PM	0	18	10	2	3	1	2	0	1	57	1	0	14	1	2	0
11:30 PM	0	25	9	1	0	2	0	0	2	40	0	1	8	0	0	0
11:45 PM	3	24	9	0	0	3	2	0	2	48	0	0	11	2	0	0

Study Name SH 199 @ BIWAY ST
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

	SH 199 Southbound				BIWAY ST Westbound				SH 199 Northbound				BIWAY ST Eastbound			
Start Time	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn
12:00 AM	0	14	0	1	0	0	1	0	0	28	1	0	0	0	0	0
12:15 AM	0	31	0	0	1	0	1	0	0	31	0	0	0	0	0	0
12:30 AM	0	12	0	0	0	0	0	0	1	14	0	0	0	1	2	0
12:45 AM	0	15	1	0	0	1	1	0	1	26	0	0	1	0	1	0
1:00 AM	0	8	0	0	0	0	0	0	0	19	0	0	1	0	0	0
1:15 AM	1	14	0	0	1	0	1	0	0	16	0	0	0	1	0	0
1:30 AM	0	13	0	0	0	0	0	0	0	16	0	0	1	0	0	0
1:45 AM	0	10	1	0	0	0	0	0	1	12	0	0	0	0	0	0
2:00 AM	0	8	0	0	0	0	0	0	0	10	1	0	0	0	0	0
2:15 AM	0	10	0	0	0	0	1	0	0	17	0	0	0	1	0	0
2:30 AM	0	10	0	0	0	0	0	0	0	15	0	0	0	0	2	0
2:45 AM	2	11	0	0	0	1	0	0	0	6	0	0	0	0	0	0
3:00 AM	0	5	0	0	0	0	0	0	0	11	2	0	0	0	0	0
3:15 AM	0	11	0	0	1	0	0	0	1	14	0	0	0	1	0	0
3:30 AM	0	7	2	0	1	0	0	0	0	7	0	0	0	0	0	0
3:45 AM	0	3	0	0	0	0	1	0	0	9	0	0	0	0	0	0
4:00 AM	0	17	0	0	0	0	0	0	0	12	0	0	0	0	1	0
4:15 AM	0	17	0	0	0	0	0	0	1	16	0	0	0	0	0	0
4:30 AM	0	34	0	0	3	0	1	0	0	21	1	0	1	0	0	0
4:45 AM	0	43	0	0	0	0	1	0	1	29	1	0	0	0	1	0
5:00 AM	0	57	0	0	3	0	1	0	0	27	0	0	2	0	0	0
5:15 AM	1	67	0	0	2	0	0	0	0	30	1	0	0	0	0	0
5:30 AM	0	118	0	0	4	0	3	0	0	58	0	0	3	0	4	0
5:45 AM	0	128	0	0	3	0	2	0	0	70	2	0	2	0	2	0
6:00 AM	0	185	0	1	6	1	2	0	0	60	1	0	1	0	5	0
6:15 AM	0	210	1	0	2	1	2	0	3	91	0	0	0	2	3	0
6:30 AM	1	258	3	0	1	0	2	0	0	83	0	0	1	2	4	0
6:45 AM	0	322	0	0	3	1	2	0	4	98	8	0	4	0	4	0
7:00 AM	0	294	0	0	6	1	3	0	1	92	5	0	2	3	4	0
7:15 AM	2	378	7	0	17	2	7	0	0	125	7	0	4	6	7	0
7:30 AM	0	413	7	0	17	8	6	0	3	152	3	0	5	3	6	0
7:45 AM	1	374	4	0	8	5	6	0	3	143	5	2	4	3	6	0
8:00 AM	1	335	3	0	10	8	0	0	2	143	6	1	6	10	2	0
8:15 AM	1	286	3	0	10	3	3	0	5	132	6	1	5	5	9	0
8:30 AM	1	326	4	0	7	5	1	0	1	99	3	2	2	3	3	0
8:45 AM	1	232	3	0	3	3	5	0	2	124	0	2	2	6	7	0
9:00 AM	1	195	5	0	6	1	4	0	6	124	2	1	4	2	4	0
9:15 AM	1	203	2	1	5	2	4	0	1	127	3	0	1	2	3	0
9:30 AM	1	183	7	2	8	0	6	0	3	147	3	0	2	3	5	0
9:45 AM	5	163	5	0	5	4	2	0	1	135	1	5	4	2	1	0
10:00 AM	4	181	5	0	3	2	3	0	2	157	3	2	3	2	5	0
10:15 AM	2	175	3	2	8	1	4	0	4	144	4	3	6	4	4	0
10:30 AM	4	175	1	1	3	2	5	0	2	165	6	1	4	2	6	0
10:45 AM	2	166	4	0	4	3	1	0	3	155	6	2	4	1	4	0
11:00 AM	4	201	2	1	11	1	2	0	3	162	7	3	3	1	2	0
11:15 AM	7	205	3	0	6	4	3	0	3	158	4	0	8	1	3	0
11:30 AM	3	188	6	1	4	3	3	0	8	194	7	4	2	4	2	0
11:45 AM	5	202	2	0	12	6	12	0	2	197	2	1	4	2	3	0

Study Name SH 199 @ BIWAY ST
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

	SH 199 Southbound				BIWAY ST Westbound				SH 199 Northbound				BIWAY ST Eastbound			
Start Time	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn
12:00 PM	3	190	3	0	4	2	5	0	6	222	6	4	9	1	0	0
12:15 PM	10	214	5	1	4	3	7	0	6	195	5	1	6	6	4	0
12:30 PM	10	197	8	1	7	7	8	0	10	223	3	3	5	6	4	0
12:45 PM	3	191	3	2	7	4	7	0	6	201	2	0	6	6	2	0
1:00 PM	5	229	7	0	5	3	10	0	2	209	4	3	7	5	5	0
1:15 PM	9	170	7	1	9	1	6	0	1	209	4	3	6	2	5	0
1:30 PM	2	219	3	1	5	5	7	0	2	230	5	2	7	3	0	0
1:45 PM	7	177	8	0	3	0	5	0	3	160	3	6	8	2	3	0
2:00 PM	3	186	3	1	7	0	3	0	6	192	5	2	3	1	6	0
2:15 PM	1	180	8	1	5	2	3	0	1	244	6	2	5	4	9	0
2:30 PM	2	182	5	3	6	4	2	0	6	237	8	4	9	5	3	0
2:45 PM	6	176	5	1	4	1	11	0	5	203	10	3	11	6	2	0
3:00 PM	3	208	6	0	7	9	3	0	6	218	9	1	13	5	4	0
3:15 PM	3	160	6	0	11	5	14	0	5	274	4	4	13	5	6	0
3:30 PM	4	190	8	1	5	4	6	0	5	239	10	4	15	9	8	0
3:45 PM	5	154	8	0	14	5	5	0	7	291	11	8	16	14	4	0
4:00 PM	6	210	7	0	7	6	2	0	4	282	8	5	40	9	7	0
4:15 PM	8	224	6	1	11	10	7	0	3	368	8	2	29	10	4	0
4:30 PM	2	166	6	2	8	9	2	0	5	297	16	6	31	19	4	0
4:45 PM	3	211	8	2	8	2	6	0	3	344	20	3	24	9	2	0
5:00 PM	4	198	2	0	9	5	9	0	9	320	13	2	23	15	2	0
5:15 PM	11	203	5	0	8	7	4	0	3	353	15	3	26	10	11	0
5:30 PM	7	204	2	0	5	1	4	0	6	349	10	3	18	11	8	0
5:45 PM	10	215	5	1	9	6	2	0	4	315	12	0	15	7	3	0
6:00 PM	10	222	3	2	11	7	3	0	2	338	12	3	6	12	2	0
6:15 PM	9	182	8	0	7	4	4	0	4	283	14	4	7	6	4	0
6:30 PM	6	208	3	1	5	3	5	0	7	240	8	2	7	6	6	0
6:45 PM	3	183	2	0	2	10	6	0	0	202	11	6	8	8	2	0
7:00 PM	7	174	8	2	2	2	8	0	1	226	9	4	7	5	4	0
7:15 PM	7	140	3	1	10	2	9	0	8	215	7	2	8	2	1	0
7:30 PM	4	139	3	0	9	3	2	0	8	189	5	3	3	4	4	0
7:45 PM	2	106	4	0	4	6	6	0	2	176	5	0	5	1	4	0
8:00 PM	5	87	5	0	1	3	7	0	3	151	5	1	5	9	4	0
8:15 PM	4	96	0	1	3	3	4	0	1	183	5	0	2	6	1	0
8:30 PM	5	113	4	0	7	4	4	0	0	148	9	0	2	4	8	0
8:45 PM	3	76	1	0	3	5	4	0	2	145	5	1	3	6	4	0
9:00 PM	0	102	3	1	4	6	5	0	1	135	13	0	1	5	4	0
9:15 PM	1	65	1	1	2	2	5	0	3	119	2	0	1	0	3	0
9:30 PM	2	81	2	0	2	4	3	0	5	91	3	0	1	1	0	0
9:45 PM	3	58	0	0	1	1	3	0	3	95	4	0	2	4	4	0
10:00 PM	0	42	3	0	5	2	2	0	3	84	5	1	1	4	5	0
10:15 PM	3	59	0	0	0	1	2	0	2	83	0	0	0	0	1	0
10:30 PM	3	41	1	0	2	3	1	0	0	66	3	0	2	0	1	0
10:45 PM	2	36	1	0	4	2	3	0	1	51	4	0	0	2	0	0
11:00 PM	2	32	0	0	0	0	0	0	0	54	6	0	1	0	0	0
11:15 PM	0	23	0	0	2	0	0	0	1	47	0	1	1	1	0	0
11:30 PM	0	24	0	0	0	0	0	0	0	44	1	0	0	0	0	0
11:45 PM	0	15	2	0	1	0	0	0	0	32	3	0	0	0	0	0

Study Name SH 199 @ SKYLINE DR
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

	SH 199 Southbound				SKYLINE DR Westbound				SH 199 Northbound				SKYLINE DR Eastbound			
Start Time	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn
12:00 AM	0	14	3	0	1	0	0	0	1	24	1	0	2	0	2	0
12:15 AM	0	27	2	0	0	0	0	0	1	33	0	0	0	1	0	0
12:30 AM	1	12	1	0	0	0	0	0	1	16	0	0	2	1	1	0
12:45 AM	0	13	1	0	0	0	0	0	0	23	0	0	0	0	1	0
1:00 AM	0	7	1	0	0	0	0	0	0	14	0	0	0	0	0	0
1:15 AM	0	14	2	0	0	1	1	0	1	14	0	0	2	1	1	0
1:30 AM	0	11	0	0	0	0	0	0	0	13	1	0	2	0	1	0
1:45 AM	0	9	1	0	0	1	0	0	1	12	1	0	0	0	0	0
2:00 AM	0	8	0	0	0	0	0	0	0	14	0	0	0	0	3	0
2:15 AM	0	8	2	0	0	0	0	0	0	17	0	0	0	0	0	0
2:30 AM	0	11	1	0	1	0	0	0	2	17	2	0	0	1	0	0
2:45 AM	0	8	1	0	0	0	0	0	1	5	0	0	0	0	0	0
3:00 AM	0	5	0	1	1	1	0	0	0	10	0	0	3	0	1	0
3:15 AM	0	12	0	0	2	0	0	0	0	15	0	0	1	0	0	0
3:30 AM	0	8	0	0	0	0	0	0	0	5	0	0	1	0	0	0
3:45 AM	0	3	0	0	0	1	0	0	1	9	1	0	0	0	0	0
4:00 AM	0	19	0	0	1	0	1	0	0	12	0	0	2	0	0	0
4:15 AM	0	17	0	0	1	1	0	0	0	16	0	0	2	0	1	0
4:30 AM	0	32	5	0	0	0	2	0	1	18	1	0	4	0	1	0
4:45 AM	0	39	4	0	0	0	0	0	1	27	2	0	6	0	0	0
5:00 AM	0	60	4	0	1	0	1	0	0	23	0	0	5	0	3	0
5:15 AM	0	72	3	0	1	1	0	0	1	30	0	0	3	0	1	0
5:30 AM	1	106	10	0	0	0	0	0	2	50	0	0	6	0	8	0
5:45 AM	0	138	6	0	2	1	2	0	5	64	1	0	7	1	2	0
6:00 AM	0	185	11	0	3	3	3	0	1	60	1	0	6	0	8	0
6:15 AM	1	185	8	0	2	3	2	0	5	76	0	0	14	1	7	0
6:30 AM	3	260	7	0	4	3	2	0	1	84	0	0	7	0	6	0
6:45 AM	0	278	8	1	2	2	1	0	6	95	2	1	11	4	8	0
7:00 AM	2	319	10	0	2	7	1	0	5	103	6	0	7	7	8	0
7:15 AM	7	366	11	1	12	16	1	0	1	128	6	0	10	12	13	0
7:30 AM	2	446	12	2	9	15	1	0	9	141	8	0	11	18	4	0
7:45 AM	6	363	11	1	7	17	5	0	12	133	10	0	13	10	12	0
8:00 AM	4	350	6	0	14	5	3	0	6	141	6	0	7	10	5	0
8:15 AM	3	298	13	1	5	11	1	0	3	133	2	0	7	1	5	0
8:30 AM	1	293	11	0	7	6	3	0	5	94	5	0	6	4	7	0
8:45 AM	1	247	18	0	6	10	2	0	11	126	4	1	5	5	5	0
9:00 AM	2	189	8	1	3	4	2	0	9	122	2	0	6	1	5	0
9:15 AM	0	214	9	1	3	2	3	0	1	139	3	0	5	5	9	0
9:30 AM	3	183	9	2	5	8	1	0	4	134	5	0	6	6	4	0
9:45 AM	6	167	6	0	5	6	1	0	5	136	9	0	14	2	10	0
10:00 AM	4	174	12	3	3	2	1	0	5	156	3	0	10	4	3	0
10:15 AM	0	181	6	2	4	1	2	0	7	162	3	1	8	2	2	0
10:30 AM	4	162	6	3	1	4	1	0	4	141	3	1	9	6	3	0
10:45 AM	2	161	8	1	2	6	2	0	9	175	7	0	11	9	1	0
11:00 AM	6	187	13	3	3	0	3	0	4	155	8	1	9	2	2	0
11:15 AM	6	184	10	5	5	7	5	0	4	170	3	1	14	5	6	0
11:30 AM	2	172	11	3	12	6	5	0	3	172	3	0	15	4	2	0
11:45 AM	6	190	11	5	5	2	5	0	8	186	6	0	17	4	6	0

Study Name SH 199 @ SKYLINE DR
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

	SH 199 Southbound				SKYLINE DR Westbound				SH 199 Northbound				SKYLINE DR Eastbound			
Start Time	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn
12:00 PM	3	169	13	3	3	2	7	0	5	209	4	2	18	13	5	0
12:15 PM	2	212	10	3	9	11	2	0	3	205	6	0	4	6	7	0
12:30 PM	5	191	8	5	6	2	3	0	7	215	7	1	7	2	8	0
12:45 PM	7	188	7	5	1	3	1	0	8	182	5	0	6	4	6	0
1:00 PM	7	208	18	7	2	3	7	0	6	176	6	1	12	7	5	0
1:15 PM	3	175	7	3	2	7	4	0	8	196	4	5	11	8	6	0
1:30 PM	7	216	9	2	4	7	4	0	7	194	4	1	5	3	12	0
1:45 PM	6	171	10	3	4	3	6	0	11	144	6	0	15	5	4	0
2:00 PM	1	200	6	4	6	3	5	0	4	185	1	0	14	1	8	0
2:15 PM	6	174	11	7	5	4	2	0	8	235	7	0	17	6	7	0
2:30 PM	2	186	10	5	3	2	7	0	4	214	5	1	12	13	9	0
2:45 PM	9	157	7	4	6	6	3	0	5	215	7	1	6	11	11	0
3:00 PM	6	201	17	2	3	11	5	0	7	225	9	3	15	9	9	0
3:15 PM	5	205	6	2	6	14	5	0	7	257	6	0	18	7	6	0
3:30 PM	4	185	15	2	6	10	0	0	11	245	6	2	15	7	7	0
3:45 PM	10	180	7	1	5	8	4	0	2	285	6	1	16	9	6	0
4:00 PM	4	216	23	5	8	7	2	0	5	300	7	0	27	14	8	0
4:15 PM	4	202	16	1	8	11	4	0	6	361	11	1	33	10	8	0
4:30 PM	9	170	14	4	5	6	6	0	3	290	11	1	20	13	5	0
4:45 PM	5	178	12	1	7	9	6	0	11	338	5	2	23	19	3	0
5:00 PM	3	200	8	0	4	3	2	0	14	339	12	2	21	18	7	0
5:15 PM	5	191	10	3	4	11	8	0	6	334	6	4	13	17	10	0
5:30 PM	7	197	12	2	6	4	7	0	15	351	9	0	17	20	6	0
5:45 PM	5	192	14	2	3	8	5	0	14	340	8	0	14	13	13	0
6:00 PM	4	201	16	4	4	6	4	0	10	306	4	0	16	4	12	0
6:15 PM	4	170	20	3	3	2	7	0	11	287	7	2	14	7	6	0
6:30 PM	10	191	10	5	4	3	4	0	12	243	4	0	13	4	8	0
6:45 PM	3	161	12	2	2	1	3	0	11	199	4	3	9	10	11	0
7:00 PM	7	136	22	4	1	6	5	0	6	227	4	1	14	2	7	0
7:15 PM	5	126	20	3	3	3	4	0	7	208	10	0	8	3	13	0
7:30 PM	7	144	10	3	2	4	4	0	15	183	1	0	12	3	8	0
7:45 PM	4	110	4	0	2	2	5	0	7	167	6	1	0	2	7	0
8:00 PM	2	82	5	4	1	2	2	0	6	147	8	0	4	7	2	0
8:15 PM	8	94	6	2	3	5	0	0	4	147	4	1	16	2	4	0
8:30 PM	5	100	9	3	4	4	6	0	10	152	2	0	4	5	10	0
8:45 PM	2	74	4	4	1	2	3	0	7	137	3	2	6	9	4	0
9:00 PM	6	88	9	2	0	2	0	0	3	142	3	0	3	4	3	0
9:15 PM	0	63	7	1	1	1	0	0	11	101	4	0	9	4	6	0
9:30 PM	1	79	11	4	0	3	2	0	6	100	7	1	7	4	5	0
9:45 PM	2	47	8	2	2	0	3	0	5	86	3	0	6	1	3	0
10:00 PM	3	46	3	0	0	2	0	0	3	88	3	0	8	4	7	0
10:15 PM	1	54	6	1	0	1	1	0	3	75	2	1	4	2	5	0
10:30 PM	1	37	5	0	1	0	4	0	2	68	0	0	1	4	2	0
10:45 PM	1	39	0	0	0	0	0	0	2	56	1	0	1	1	4	0
11:00 PM	2	32	3	2	1	1	0	0	2	64	1	0	1	1	1	0
11:15 PM	0	22	2	0	1	0	0	0	3	41	2	2	1	0	1	0
11:30 PM	0	23	1	0	1	0	2	0	3	46	3	1	0	0	0	0
11:45 PM	1	13	1	0	1	2	0	0	1	39	0	0	1	0	1	0

Study Name SH 199 @ LONG AVE
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

	SH 199 Southbound				LONG AVE Westbound				SH 199 Northbound				LONG AVE Eastbound			
Start Time	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn
12:00 AM	2	10	2	0	7	1	1	0	1	29	17	0	0	1	1	0
12:15 AM	5	18	0	0	6	2	2	0	1	35	8	1	0	0	0	0
12:30 AM	0	14	1	0	8	5	1	0	0	17	7	0	0	3	0	0
12:45 AM	0	11	2	0	9	1	1	0	0	24	5	0	0	1	0	0
1:00 AM	0	8	1	0	1	2	2	0	0	17	7	0	0	0	1	0
1:15 AM	1	13	1	0	3	0	1	0	0	15	7	0	0	0	2	0
1:30 AM	0	10	0	0	3	2	4	0	1	10	3	0	0	0	0	0
1:45 AM	2	8	0	0	1	2	2	0	0	12	3	0	0	1	1	0
2:00 AM	0	11	1	0	2	1	0	0	0	13	6	0	2	0	0	0
2:15 AM	0	8	0	0	2	2	0	0	0	14	3	0	2	0	0	0
2:30 AM	0	11	0	0	5	2	0	0	0	21	2	0	0	0	0	0
2:45 AM	0	10	0	0	3	0	0	0	0	5	3	1	1	0	0	0
3:00 AM	1	7	1	0	3	1	1	0	1	9	2	0	0	0	0	0
3:15 AM	0	16	1	0	4	2	0	0	0	12	6	0	2	0	0	0
3:30 AM	0	8	0	0	1	0	0	0	0	2	2	0	1	2	0	0
3:45 AM	0	5	2	0	4	0	0	0	0	10	5	0	0	1	1	0
4:00 AM	1	18	0	1	1	3	0	0	0	8	2	0	1	2	0	0
4:15 AM	3	17	0	0	8	1	1	0	0	13	4	0	0	0	3	0
4:30 AM	1	39	0	0	11	1	0	0	0	15	10	0	1	1	0	0
4:45 AM	0	48	1	0	10	0	2	0	0	26	2	0	2	2	1	0
5:00 AM	0	69	3	0	22	1	3	0	0	15	9	0	1	3	2	0
5:15 AM	1	75	1	0	17	2	3	0	1	28	13	0	0	7	4	0
5:30 AM	6	129	1	0	32	5	6	0	0	40	16	0	1	8	3	0
5:45 AM	2	137	1	0	25	3	4	0	0	62	23	0	3	4	1	0
6:00 AM	4	204	1	0	34	7	4	0	0	47	33	0	5	8	3	0
6:15 AM	4	226	3	0	42	10	6	0	0	65	28	1	2	8	2	0
6:30 AM	8	300	2	0	51	12	9	0	1	73	43	0	4	9	1	0
6:45 AM	12	295	7	0	53	20	7	0	0	91	35	0	3	7	4	0
7:00 AM	4	337	2	1	56	12	10	1	1	104	43	0	6	1	6	0
7:15 AM	13	386	9	0	51	26	5	0	0	108	41	1	4	11	2	0
7:30 AM	7	389	30	0	67	40	12	0	0	149	46	1	6	14	5	0
7:45 AM	16	408	20	2	64	33	15	0	2	134	52	1	6	11	4	0
8:00 AM	7	344	12	0	62	29	10	0	3	146	59	0	4	17	4	0
8:15 AM	10	338	5	0	57	19	8	0	3	117	46	1	5	8	2	0
8:30 AM	8	297	6	0	50	20	14	0	3	114	32	1	1	7	4	0
8:45 AM	8	242	6	1	58	24	16	0	2	99	39	1	2	6	2	0
9:00 AM	9	223	2	0	50	14	9	0	0	117	45	1	4	3	3	0
9:15 AM	9	217	7	4	44	13	10	0	2	124	36	3	6	8	2	0
9:30 AM	4	186	9	0	34	17	15	0	0	134	29	1	2	5	0	0
9:45 AM	9	185	5	0	46	15	10	0	1	133	31	5	1	4	4	0
10:00 AM	20	181	3	2	33	13	8	1	3	156	44	4	4	4	4	0
10:15 AM	9	173	6	0	37	18	12	1	2	154	30	3	1	4	5	0
10:30 AM	7	176	5	1	30	13	9	0	2	169	36	4	2	7	2	0
10:45 AM	11	153	3	3	48	17	12	0	4	165	35	2	3	9	6	0
11:00 AM	14	195	3	1	39	13	15	0	3	178	46	8	6	3	0	0
11:15 AM	15	168	6	1	59	19	14	0	4	142	43	2	4	4	3	0
11:30 AM	15	175	8	2	44	21	18	1	1	192	52	4	7	8	2	0
11:45 AM	11	191	7	0	51	18	13	1	3	171	41	5	6	7	3	0

Study Name SH 199 @ LONG AVE
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

	SH 199 Southbound				LONG AVE Westbound				SH 199 Northbound				LONG AVE Eastbound			
Start Time	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn
12:00 PM	14	165	4	0	42	27	21	0	2	222	48	6	6	8	3	0
12:15 PM	13	196	12	1	54	21	17	0	2	179	35	4	4	7	0	0
12:30 PM	11	194	6	0	34	14	13	0	2	218	58	3	3	6	6	0
12:45 PM	10	174	8	0	46	24	9	0	2	176	60	4	4	3	0	0
1:00 PM	15	220	8	2	38	18	13	0	1	206	49	2	2	2	6	0
1:15 PM	23	152	6	0	43	13	22	0	3	175	57	1	7	10	1	0
1:30 PM	13	227	6	1	53	24	11	0	2	215	50	2	8	8	5	0
1:45 PM	15	167	9	0	35	9	16	0	3	149	49	5	5	8	2	0
2:00 PM	15	188	10	3	40	5	15	0	2	199	65	1	6	5	2	0
2:15 PM	15	167	8	0	56	23	15	0	0	218	61	4	6	5	1	0
2:30 PM	12	180	7	1	33	17	16	0	3	233	66	3	10	5	4	0
2:45 PM	12	163	8	1	47	27	19	0	2	211	57	2	8	6	1	0
3:00 PM	18	175	13	0	59	26	15	0	3	235	48	1	6	7	2	0
3:15 PM	12	191	11	2	76	33	17	0	7	275	52	2	5	9	3	0
3:30 PM	14	167	9	1	59	35	14	0	4	270	87	3	5	10	2	0
3:45 PM	15	161	18	0	56	27	17	1	6	302	88	2	4	8	5	0
4:00 PM	17	188	10	2	55	21	23	1	5	304	88	0	8	10	0	0
4:15 PM	18	199	5	2	57	38	23	0	3	351	98	4	7	7	4	0
4:30 PM	21	174	7	2	67	40	21	0	4	312	82	3	10	15	1	0
4:45 PM	16	155	7	3	70	43	29	0	3	339	81	1	7	13	6	0
5:00 PM	21	183	6	0	71	44	25	0	5	356	98	2	11	12	0	0
5:15 PM	21	166	10	3	72	64	30	0	4	339	99	1	9	15	3	0
5:30 PM	28	193	8	0	76	72	48	0	3	349	93	0	9	12	5	0
5:45 PM	18	173	11	0	77	53	38	0	4	344	85	1	3	15	3	0
6:00 PM	19	180	5	0	76	49	30	0	9	306	91	0	7	8	5	0
6:15 PM	14	163	9	2	58	31	26	0	8	282	60	2	8	14	4	0
6:30 PM	29	173	6	0	65	41	24	1	4	246	92	1	5	10	5	0
6:45 PM	21	140	5	1	69	25	15	0	5	215	77	1	2	9	3	0
7:00 PM	19	139	7	2	53	27	15	0	7	219	76	1	6	8	3	0
7:15 PM	23	121	5	0	52	25	19	1	2	222	64	0	5	5	4	0
7:30 PM	21	136	7	0	39	22	16	0	4	187	50	2	9	8	5	0
7:45 PM	14	96	7	2	65	23	11	0	3	160	55	4	3	8	2	0
8:00 PM	12	82	5	0	55	11	7	1	2	186	66	1	4	13	1	0
8:15 PM	13	73	6	2	54	20	6	0	1	150	73	1	3	5	2	0
8:30 PM	10	95	2	1	39	14	9	0	7	178	66	0	2	7	2	0
8:45 PM	3	69	7	3	44	10	17	0	4	130	46	0	3	6	4	0
9:00 PM	4	83	8	1	34	8	11	0	2	148	71	0	5	4	1	0
9:15 PM	10	64	6	0	36	15	3	0	5	116	49	0	4	11	5	0
9:30 PM	6	65	5	1	35	9	9	0	2	115	53	0	1	7	1	0
9:45 PM	5	57	5	1	25	16	7	0	5	93	50	1	2	4	0	0
10:00 PM	8	54	3	0	21	6	5	0	4	85	36	0	1	1	2	0
10:15 PM	9	52	2	0	22	8	5	1	3	79	36	0	1	2	3	0
10:30 PM	3	38	2	0	13	2	4	0	4	75	35	0	1	0	1	0
10:45 PM	5	34	1	0	14	8	2	0	3	66	27	2	1	2	4	1
11:00 PM	5	27	2	0	12	1	7	0	0	63	19	0	1	3	2	0
11:15 PM	3	24	2	0	12	3	4	0	2	49	16	0	0	3	2	0
11:30 PM	3	25	2	0	6	1	1	0	2	49	17	1	0	0	0	0
11:45 PM	1	17	1	0	12	1	3	0	0	42	15	0	0	1	1	0

Study Name SH 199 @ SH 183
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

	SH 199 Southbound				SH 183 Westbound				SH 199 Northbound				SH 183 Eastbound			
Start Time	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn
12:00 AM	2	11	6	5	5	12	4	0	5	31	3	0	11	11	14	0
12:15 AM	2	18	3	0	3	9	1	0	8	39	7	0	9	2	7	0
12:30 AM	5	17	4	1	2	13	3	0	8	14	5	0	7	8	3	0
12:45 AM	5	12	3	1	2	4	1	0	8	22	7	0	4	6	3	0
1:00 AM	2	7	3	0	3	4	2	0	3	20	3	0	3	3	0	0
1:15 AM	3	11	4	3	3	6	0	0	3	12	3	0	6	1	4	0
1:30 AM	2	13	1	0	1	6	1	0	1	11	3	0	3	4	1	0
1:45 AM	1	7	1	0	5	8	2	0	4	14	2	0	0	4	4	0
2:00 AM	1	13	2	0	0	2	0	0	4	15	5	0	4	2	0	0
2:15 AM	5	5	1	1	3	2	1	0	4	11	9	0	4	2	0	0
2:30 AM	0	12	4	1	3	3	1	0	3	16	4	0	5	2	1	0
2:45 AM	0	9	6	1	2	7	1	0	6	7	2	0	1	4	6	0
3:00 AM	0	8	5	0	2	5	3	0	2	7	2	0	5	2	3	0
3:15 AM	2	10	5	1	1	7	0	0	3	13	2	0	4	2	1	0
3:30 AM	1	7	1	0	0	2	0	0	2	4	1	0	1	9	2	0
3:45 AM	2	5	2	2	3	2	0	0	4	4	3	0	8	0	3	0
4:00 AM	1	16	3	0	2	4	0	0	2	9	2	0	5	6	5	0
4:15 AM	3	18	2	0	5	6	1	0	0	8	1	0	5	4	4	0
4:30 AM	2	41	5	1	4	8	3	0	0	12	4	0	11	9	9	0
4:45 AM	3	36	10	2	7	7	3	0	3	17	6	0	7	9	9	0
5:00 AM	7	70	6	0	5	12	4	0	5	11	5	0	10	10	21	0
5:15 AM	10	75	8	0	9	11	5	0	7	19	10	0	24	23	23	0
5:30 AM	9	111	16	2	24	21	4	0	11	26	8	1	27	29	34	0
5:45 AM	8	149	11	2	16	20	6	0	10	47	8	0	32	29	32	0
6:00 AM	10	183	22	0	15	21	1	1	13	43	11	0	39	36	39	0
6:15 AM	11	239	17	0	19	26	4	0	17	69	14	0	29	35	48	0
6:30 AM	8	265	20	3	28	37	10	0	14	59	11	0	31	67	45	0
6:45 AM	10	314	29	0	37	25	7	0	24	97	14	0	31	36	32	0
7:00 AM	18	326	32	0	29	29	4	0	36	101	24	0	46	42	43	0
7:15 AM	19	369	37	1	51	52	12	0	38	108	23	0	46	61	52	0
7:30 AM	11	388	39	0	56	75	9	0	47	133	16	0	58	113	53	0
7:45 AM	13	380	45	0	51	68	10	0	47	136	21	0	50	71	55	0
8:00 AM	22	345	40	0	45	57	13	1	58	135	23	0	60	76	68	0
8:15 AM	17	332	56	1	35	53	6	1	47	127	25	1	40	49	43	0
8:30 AM	17	297	27	4	40	42	13	0	43	103	31	0	48	49	48	0
8:45 AM	15	235	32	1	39	48	17	1	34	111	42	0	35	69	35	0
9:00 AM	16	208	27	2	30	50	6	0	34	99	40	0	47	56	47	0
9:15 AM	26	198	34	0	37	47	14	0	45	122	35	0	43	45	32	0
9:30 AM	27	163	35	5	36	52	13	0	25	117	40	0	30	55	32	0
9:45 AM	17	177	40	1	35	42	8	0	40	147	32	0	42	67	32	0
10:00 AM	17	153	26	3	43	39	13	0	33	130	28	0	44	52	39	0
10:15 AM	27	143	33	3	34	41	20	0	54	154	37	0	49	55	33	0
10:30 AM	31	149	35	1	43	62	20	0	34	121	39	0	44	70	36	0
10:45 AM	23	145	29	3	39	50	28	0	54	144	37	0	53	32	37	0
11:00 AM	34	155	35	4	34	65	26	0	54	135	35	0	56	66	32	0
11:15 AM	28	160	48	2	30	50	21	0	59	123	53	0	64	57	46	0
11:30 AM	26	153	37	3	44	50	17	0	48	157	51	0	55	50	53	0
11:45 AM	29	158	53	2	51	63	22	0	53	150	37	0	62	75	37	0

Study Name SH 199 @ SH 183
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

	SH 199 Southbound				SH 183 Westbound				SH 199 Northbound				SH 183 Eastbound			
Start Time	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn
12:00 PM	34	143	39	3	45	70	23	0	61	170	56	1	64	62	66	0
12:15 PM	30	174	42	5	39	74	16	0	57	138	47	2	73	64	38	0
12:30 PM	41	134	52	4	57	58	17	1	65	189	61	0	65	64	58	0
12:45 PM	35	164	30	2	46	65	23	0	72	176	40	0	66	82	58	0
1:00 PM	31	178	38	7	55	66	23	0	51	159	54	1	52	53	38	0
1:15 PM	19	154	34	2	44	59	25	1	58	175	49	1	85	73	51	0
1:30 PM	25	205	53	3	53	70	19	0	53	165	51	1	57	65	44	0
1:45 PM	32	156	40	1	37	46	16	0	45	153	52	0	67	69	58	0
2:00 PM	39	156	43	2	45	73	15	0	38	151	60	1	78	65	47	0
2:15 PM	35	139	47	4	43	52	18	1	52	216	36	0	73	70	48	0
2:30 PM	33	169	34	4	53	67	21	0	49	190	52	0	66	64	41	0
2:45 PM	18	149	49	5	56	56	15	0	62	197	63	0	78	63	51	0
3:00 PM	23	145	54	4	47	76	10	0	59	216	44	0	71	76	46	0
3:15 PM	30	168	70	4	42	119	13	0	55	247	59	0	82	91	49	0
3:30 PM	24	141	53	4	57	71	26	0	63	234	45	0	84	89	56	0
3:45 PM	33	146	54	8	49	106	23	0	58	276	65	0	92	110	70	0
4:00 PM	32	146	60	2	59	70	14	0	53	282	58	0	94	117	59	0
4:15 PM	38	190	63	6	45	68	18	0	60	342	55	0	93	89	61	0
4:30 PM	29	163	59	1	54	88	26	0	61	294	53	0	82	81	54	0
4:45 PM	28	162	60	4	53	91	19	0	57	313	54	0	99	119	49	0
5:00 PM	31	183	47	3	53	87	24	0	52	337	51	0	103	118	60	0
5:15 PM	33	170	64	1	50	103	19	0	60	341	64	0	96	118	45	0
5:30 PM	28	179	67	3	70	123	36	1	64	328	76	0	86	94	40	0
5:45 PM	32	168	49	1	59	96	32	0	64	317	75	0	72	95	68	0
6:00 PM	29	174	59	4	59	94	24	1	68	302	57	1	91	83	58	0
6:15 PM	33	144	53	2	51	85	20	1	67	262	53	0	73	76	70	0
6:30 PM	31	160	43	2	57	75	19	0	66	252	59	1	76	81	58	1
6:45 PM	20	155	45	2	49	66	22	2	82	204	62	0	64	69	55	0
7:00 PM	28	122	41	3	48	61	25	0	50	203	69	0	66	61	56	0
7:15 PM	32	123	37	4	47	64	21	0	61	219	50	1	52	74	48	0
7:30 PM	25	101	34	2	37	67	16	0	49	173	49	0	39	54	42	0
7:45 PM	28	114	35	5	45	53	18	0	40	172	43	0	55	64	61	0
8:00 PM	20	93	37	2	62	61	14	0	44	157	50	1	46	54	22	0
8:15 PM	13	84	24	1	31	39	12	0	66	166	50	0	69	55	27	0
8:30 PM	22	93	29	2	30	55	15	0	50	157	46	1	45	61	27	0
8:45 PM	21	82	27	1	41	31	19	0	37	140	44	0	49	37	39	0
9:00 PM	24	71	29	4	40	50	13	0	50	139	40	0	50	52	49	0
9:15 PM	20	67	22	2	26	40	7	0	35	128	33	0	41	44	46	0
9:30 PM	10	67	21	2	30	36	8	0	40	113	34	0	39	44	44	0
9:45 PM	11	59	24	3	25	24	10	0	39	118	36	0	24	22	30	0
10:00 PM	5	59	10	0	31	25	12	0	38	72	29	0	32	24	14	0
10:15 PM	10	44	24	2	22	27	7	0	35	87	21	0	20	24	17	0
10:30 PM	14	37	20	1	16	23	4	0	22	62	17	0	25	16	13	0
10:45 PM	7	45	4	4	15	15	6	0	14	72	17	0	14	5	15	0
11:00 PM	9	26	12	1	8	15	5	0	14	72	18	0	13	14	8	0
11:15 PM	6	22	13	1	14	9	4	0	14	53	15	0	8	9	8	0
11:30 PM	6	16	11	3	7	9	5	0	15	51	12	0	17	7	7	0
11:45 PM	6	21	7	3	2	14	1	0	12	40	9	0	15	7	7	0

Study Name SH 199 @ OHIO GARDEN RD
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

	SH 199 Southbound				FIELDER ST Westbound				SH 199 Northbound				OHIO GARDEN RD Eastbound			
Start Time	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn
12:00 AM	0	26	6	0	0	0	0	0	2	37	0	0	4	0	2	0
12:15 AM	0	26	2	0	0	0	0	0	6	35	0	0	0	0	2	0
12:30 AM	0	16	2	0	0	0	0	0	3	32	0	0	0	0	1	0
12:45 AM	0	13	4	0	0	0	0	0	1	29	0	0	5	0	1	0
1:00 AM	0	12	2	0	0	0	0	0	3	18	0	0	0	0	1	0
1:15 AM	0	11	1	0	0	0	0	0	1	13	0	0	1	0	0	0
1:30 AM	0	12	3	0	0	0	0	0	1	13	0	0	0	0	1	0
1:45 AM	0	10	0	0	0	0	0	0	2	22	0	0	1	0	3	0
2:00 AM	0	13	2	0	0	0	0	0	1	14	0	0	4	0	0	0
2:15 AM	0	0	3	0	0	0	0	0	0	19	0	0	1	0	2	0
2:30 AM	0	14	2	0	0	0	0	0	0	16	0	0	2	0	3	0
2:45 AM	0	6	1	0	0	0	0	0	1	11	0	0	1	0	0	0
3:00 AM	0	11	1	0	0	0	0	0	2	12	0	0	1	0	0	0
3:15 AM	0	8	0	0	0	0	0	0	1	10	0	0	0	0	1	0
3:30 AM	0	12	1	0	0	1	0	0	2	10	0	0	0	0	1	0
3:45 AM	0	8	1	0	0	0	0	0	2	8	0	0	2	0	1	0
4:00 AM	0	18	0	0	0	0	0	0	2	13	0	0	0	0	1	0
4:15 AM	0	26	0	0	0	0	0	0	1	9	0	0	2	0	2	0
4:30 AM	0	55	1	0	0	0	0	0	2	15	0	0	1	0	9	0
4:45 AM	0	55	0	0	0	0	0	0	1	22	0	0	3	0	7	0
5:00 AM	0	76	1	0	0	0	0	0	2	21	0	0	2	0	13	0
5:15 AM	0	123	0	0	0	0	0	0	2	31	0	0	5	0	11	0
5:30 AM	0	155	2	0	0	0	0	0	2	50	0	0	4	0	25	0
5:45 AM	0	196	1	0	0	0	0	0	3	56	0	0	5	0	19	0
6:00 AM	0	234	1	0	0	0	0	0	5	63	0	0	3	0	29	0
6:15 AM	0	262	0	0	0	0	0	0	6	86	0	0	1	0	27	0
6:30 AM	0	322	4	0	0	0	0	0	10	97	0	0	5	0	18	0
6:45 AM	0	387	5	0	0	0	3	0	10	119	0	0	7	0	26	0
7:00 AM	0	410	4	0	0	0	1	0	19	153	0	0	4	0	22	0
7:15 AM	0	422	2	0	0	0	0	0	18	177	0	0	5	0	44	0
7:30 AM	0	518	7	0	0	0	2	0	17	182	0	0	6	0	49	0
7:45 AM	0	481	7	0	0	0	2	0	22	202	0	0	4	0	62	0
8:00 AM	0	464	8	0	0	0	18	0	18	190	0	0	10	0	39	0
8:15 AM	0	413	10	0	1	0	13	0	14	182	1	1	6	0	22	0
8:30 AM	0	395	8	1	0	0	2	0	14	168	0	0	9	0	26	0
8:45 AM	0	302	9	0	0	0	2	0	14	187	0	0	5	0	18	0
9:00 AM	0	265	5	0	0	0	3	0	9	180	0	0	7	0	21	0
9:15 AM	0	271	4	0	0	0	2	0	15	188	1	0	6	0	19	0
9:30 AM	0	200	8	0	0	0	0	0	12	189	0	0	6	0	13	0
9:45 AM	0	237	7	0	0	0	2	0	10	205	0	0	6	0	13	0
10:00 AM	0	225	5	0	0	0	0	0	12	214	0	1	6	0	13	0
10:15 AM	0	207	16	0	0	0	0	0	12	212	0	0	2	0	19	0
10:30 AM	0	187	8	0	0	0	1	0	8	201	0	1	3	0	13	0
10:45 AM	0	186	11	0	0	0	2	0	11	226	0	0	8	0	18	0
11:00 AM	0	180	14	0	0	0	3	0	13	214	0	1	8	0	19	0
11:15 AM	0	230	7	0	0	0	1	0	11	197	0	1	7	0	11	0
11:30 AM	0	203	7	0	0	0	5	0	5	244	1	2	4	0	14	0
11:45 AM	0	211	15	0	0	1	4	0	11	241	1	0	5	0	14	0

Study Name SH 199 @ OHIO GARDEN RD
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

	SH 199 Southbound				FIELDER ST Westbound				SH 199 Northbound				OHIO GARDEN RD Eastbound			
Start Time	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn
12:00 PM	0	209	13	0	0	0	2	0	18	240	1	2	6	0	25	0
12:15 PM	0	234	18	0	0	0	0	0	15	273	0	2	10	0	27	0
12:30 PM	0	242	11	0	0	0	11	0	13	274	1	2	7	0	18	0
12:45 PM	0	271	15	0	0	0	5	0	16	249	0	2	9	0	15	0
1:00 PM	0	216	15	0	0	0	4	0	20	231	1	0	14	0	15	0
1:15 PM	0	242	17	0	0	0	2	0	17	263	0	1	3	0	19	0
1:30 PM	0	274	9	0	0	0	0	0	29	226	0	2	8	0	24	0
1:45 PM	0	245	7	0	0	0	1	0	18	207	0	2	8	0	19	0
2:00 PM	0	220	17	0	0	0	1	0	17	266	1	2	8	0	27	0
2:15 PM	0	231	13	0	1	0	1	0	10	264	0	0	4	0	19	0
2:30 PM	0	213	11	1	0	0	0	0	18	264	1	2	8	0	31	0
2:45 PM	0	242	18	0	0	0	6	0	19	279	0	2	4	0	28	0
3:00 PM	0	220	22	1	0	0	1	0	32	322	1	0	6	0	30	0
3:15 PM	0	247	10	0	0	0	2	0	41	345	0	1	4	0	28	0
3:30 PM	0	203	14	0	0	0	12	0	30	352	0	1	12	0	31	0
3:45 PM	0	252	18	1	0	0	3	0	36	369	0	0	11	0	28	0
4:00 PM	0	216	26	0	0	0	2	0	42	405	0	0	14	0	32	0
4:15 PM	0	251	15	0	0	0	2	0	44	411	1	1	13	0	33	0
4:30 PM	0	236	19	0	0	0	3	0	52	418	2	0	11	0	28	0
4:45 PM	0	228	24	0	0	0	5	0	48	436	0	1	11	0	26	0
5:00 PM	0	286	19	0	0	0	1	0	28	458	0	3	14	0	17	0
5:15 PM	0	217	26	0	0	0	3	0	40	461	2	1	14	0	30	0
5:30 PM	0	263	28	0	0	0	2	0	47	449	0	1	12	0	36	0
5:45 PM	0	266	25	0	0	1	5	0	45	408	0	1	12	0	26	0
6:00 PM	0	262	27	0	0	0	4	0	45	375	0	1	11	0	29	0
6:15 PM	0	229	28	0	0	0	1	0	45	346	1	2	7	0	34	0
6:30 PM	1	230	13	0	0	0	1	0	31	320	0	2	7	0	31	0
6:45 PM	0	233	13	0	0	1	3	0	39	305	0	1	11	0	17	0
7:00 PM	0	176	12	0	0	0	0	0	42	312	0	1	13	0	29	0
7:15 PM	0	205	17	0	0	0	2	0	37	275	1	0	12	0	25	0
7:30 PM	0	161	13	0	0	0	1	0	25	218	0	1	5	0	26	0
7:45 PM	0	193	9	0	0	0	2	0	21	201	0	0	9	0	22	0
8:00 PM	0	158	19	0	0	0	4	0	25	238	1	0	5	0	22	0
8:15 PM	0	130	17	0	0	0	2	0	21	228	0	0	12	0	26	0
8:30 PM	0	117	5	0	0	0	1	0	22	223	0	0	15	0	10	0
8:45 PM	0	145	16	0	0	1	1	0	32	182	0	1	6	0	11	0
9:00 PM	0	135	2	1	0	0	0	0	10	218	0	0	4	0	18	0
9:15 PM	0	122	6	0	0	0	0	0	14	144	0	0	3	0	4	0
9:30 PM	0	97	10	0	0	0	0	0	17	149	0	0	5	0	17	0
9:45 PM	0	78	6	0	0	0	2	0	14	145	0	0	9	0	7	0
10:00 PM	0	89	4	0	0	0	2	0	12	117	0	0	2	1	7	0
10:15 PM	0	76	6	0	0	0	0	0	5	99	0	0	8	0	10	0
10:30 PM	0	66	8	0	0	0	1	0	11	87	0	0	1	0	6	0
10:45 PM	0	50	6	0	0	0	0	0	12	100	0	0	3	0	8	0
11:00 PM	0	44	9	0	0	0	0	0	4	83	0	0	2	0	6	0
11:15 PM	0	35	8	0	0	0	0	0	4	58	0	0	5	0	2	0
11:30 PM	0	27	5	0	0	0	0	0	6	69	1	0	1	0	4	0
11:45 PM	0	26	3	0	0	0	0	0	4	46	0	0	2	0	1	0

Study Name SH 199 @ NW 20TH ST
Start Date 04/13/2016
Start Time 7:00 AM
Site Code

	SH 199 Southbound				NW 20TH ST Westbound				SH 199 Northbound				Eastbound St. Eastbound			
Start Time	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn
7:00 AM	19	393	0	0	25	0	16	0	0	155	16	0	0	0	0	0
7:15 AM	36	466	0	0	34	0	31	0	0	161	17	0	0	0	0	0
7:30 AM	45	504	0	1	51	0	34	0	0	167	31	0	0	0	0	0
7:45 AM	44	518	0	0	45	0	45	0	0	173	48	0	0	0	0	0
8:00 AM	57	442	0	0	48	0	47	0	0	158	53	0	0	0	0	0
8:15 AM	30	415	0	0	49	0	42	0	0	150	25	0	0	0	0	0
8:30 AM	31	378	0	0	29	0	42	1	0	145	29	0	0	0	0	0
8:45 AM	42	296	0	0	39	0	31	0	0	160	25	0	0	0	0	0
9:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 PM	42	190	0	1	27	0	45	0	0	403	37	0	0	0	0	0
4:15 PM	44	251	0	2	36	0	53	0	0	396	36	0	0	0	0	0
4:30 PM	42	219	0	1	35	0	71	0	0	398	37	0	0	0	0	0
4:45 PM	45	194	0	2	33	0	54	0	0	437	54	0	0	0	0	0
5:00 PM	37	243	0	1	35	0	37	0	0	450	51	0	0	0	0	0
5:15 PM	49	212	0	0	35	0	34	0	0	449	40	0	0	0	0	0
5:30 PM	45	226	0	0	31	0	55	0	0	417	46	0	0	0	0	0
5:45 PM	57	254	0	1	24	0	41	0	0	415	41	0	0	0	0	0
6:00 PM	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0

Study Name SH 199 @ NW 18TH ST
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

	SH 199 Southbound				NW 18TH ST Westbound				SH 199 Northbound				NW 18TH ST Eastbound			
Start Time	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn
12:00 AM	2	28	0	0	0	0	1	0	0	36	0	0	0	0	0	0
12:15 AM	2	24	0	0	1	0	1	0	0	40	2	0	0	0	0	0
12:30 AM	3	10	0	0	1	0	2	0	0	35	0	0	0	0	0	0
12:45 AM	0	13	0	0	1	0	2	0	0	29	1	1	0	0	0	0
1:00 AM	0	13	0	0	0	0	2	0	0	23	0	0	0	0	0	0
1:15 AM	0	15	0	0	0	0	1	0	0	18	1	0	0	0	0	0
1:30 AM	0	13	0	0	0	0	1	0	0	16	0	0	0	0	0	0
1:45 AM	0	13	0	0	1	0	0	0	0	25	0	0	0	0	0	0
2:00 AM	2	10	0	0	1	0	0	0	0	16	0	0	0	0	0	0
2:15 AM	0	3	0	0	1	0	0	0	0	19	2	0	0	0	0	0
2:30 AM	1	13	0	0	0	0	2	0	0	19	0	0	0	0	0	0
2:45 AM	0	11	0	0	0	0	0	0	0	17	0	0	0	0	0	0
3:00 AM	0	9	0	0	0	0	0	0	0	13	1	0	0	0	0	0
3:15 AM	0	11	0	0	0	0	0	0	0	11	0	0	0	0	0	0
3:30 AM	0	8	0	0	0	0	0	0	0	7	0	0	0	0	0	0
3:45 AM	0	13	0	0	0	0	2	0	0	7	1	0	0	0	0	0
4:00 AM	0	21	0	0	0	0	0	0	0	16	1	0	0	0	0	0
4:15 AM	2	24	0	0	1	0	1	0	0	9	0	0	0	0	0	0
4:30 AM	0	66	0	1	0	0	1	0	0	17	0	0	0	0	0	0
4:45 AM	1	64	0	0	1	0	3	0	0	19	0	0	0	0	0	0
5:00 AM	3	103	0	0	0	0	2	0	0	20	0	0	0	0	0	0
5:15 AM	0	127	0	0	3	0	6	0	0	24	1	1	0	0	0	0
5:30 AM	5	208	0	0	1	0	7	0	0	33	0	1	0	0	0	0
5:45 AM	5	212	2	0	4	0	3	0	2	39	0	0	0	0	0	0
6:00 AM	2	266	1	0	7	0	3	0	0	61	0	0	0	0	0	0
6:15 AM	5	300	2	0	3	0	7	0	3	81	4	0	0	1	0	0
6:30 AM	1	400	1	0	3	0	2	0	9	96	1	1	0	0	1	0
6:45 AM	5	391	0	0	6	0	6	0	10	121	2	0	0	0	1	0
7:00 AM	2	419	0	0	6	0	9	0	0	167	0	0	0	0	0	0
7:15 AM	13	484	0	0	13	0	15	0	2	163	1	1	0	0	0	0
7:30 AM	25	539	0	0	18	0	18	0	0	180	3	1	0	0	0	0
7:45 AM	23	542	0	0	15	0	15	0	0	207	9	0	1	0	0	0
8:00 AM	14	467	0	0	14	0	22	0	0	188	6	2	0	0	0	0
8:15 AM	6	487	1	0	12	0	18	0	2	160	5	0	0	0	0	0
8:30 AM	13	387	0	0	8	0	7	0	1	162	6	0	1	0	3	0
8:45 AM	10	335	2	0	4	0	16	0	1	168	4	1	0	0	1	0
9:00 AM	7	256	0	0	7	0	10	0	3	174	11	0	0	0	0	0
9:15 AM	5	285	2	0	8	0	21	0	0	153	6	0	0	0	0	0
9:30 AM	10	206	1	0	6	0	11	0	0	170	8	0	2	0	0	0
9:45 AM	9	229	0	0	6	0	9	0	2	195	4	0	0	0	1	0
10:00 AM	5	233	0	0	4	0	13	0	1	198	6	0	1	0	0	0
10:15 AM	10	214	0	0	2	0	13	0	2	185	3	0	0	0	3	0
10:30 AM	7	210	3	0	1	0	16	0	1	181	5	0	0	0	1	0
10:45 AM	5	202	1	1	3	2	13	0	0	220	6	1	2	1	1	0
11:00 AM	8	184	0	0	1	0	10	0	1	201	5	0	0	0	1	0
11:15 AM	8	210	2	1	2	0	12	0	2	192	2	2	0	0	2	0
11:30 AM	15	205	2	1	3	0	15	0	2	225	3	0	0	0	3	0
11:45 AM	15	218	0	0	5	0	13	0	2	221	2	0	3	0	5	0

Study Name SH 199 @ NW 18TH ST
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

	SH 199 Southbound				NW 18TH ST Westbound				SH 199 Northbound				NW 18TH ST Eastbound			
Start Time	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn
12:00 PM	17	189	0	0	5	1	21	0	3	241	10	1	0	4	4	0
12:15 PM	17	239	3	0	3	0	16	0	3	269	7	0	0	0	1	0
12:30 PM	16	238	1	0	6	0	21	0	1	244	7	0	2	0	1	0
12:45 PM	9	274	3	0	6	1	16	0	2	229	4	0	1	0	1	0
1:00 PM	17	191	1	1	7	0	18	0	0	236	9	1	0	1	5	0
1:15 PM	13	241	1	1	6	0	13	0	2	244	8	2	0	1	0	0
1:30 PM	19	264	1	1	5	0	20	0	1	222	4	0	1	0	0	0
1:45 PM	18	248	0	1	6	0	10	0	0	193	3	1	1	1	1	0
2:00 PM	12	212	1	0	7	0	19	0	0	255	7	0	0	0	1	0
2:15 PM	18	231	0	0	5	0	14	0	0	275	4	0	1	0	1	0
2:30 PM	14	219	0	0	3	0	16	0	2	271	5	0	1	0	0	0
2:45 PM	20	237	1	0	9	0	13	0	0	270	7	0	2	0	1	0
3:00 PM	23	210	0	0	4	0	21	0	1	325	8	1	1	0	1	0
3:15 PM	15	229	1	1	4	1	20	0	0	368	12	1	0	0	1	0
3:30 PM	14	240	0	0	6	1	18	0	3	364	10	2	0	0	0	0
3:45 PM	18	237	1	0	6	0	13	0	2	337	8	0	0	0	1	0
4:00 PM	17	194	0	1	2	0	14	0	2	434	21	1	1	0	1	0
4:15 PM	10	244	0	1	9	0	25	0	1	403	13	2	2	0	1	0
4:30 PM	24	215	0	1	3	0	31	0	2	409	15	0	0	0	1	0
4:45 PM	19	207	0	1	5	0	22	0	2	485	9	0	0	0	0	0
5:00 PM	15	249	1	1	5	0	18	0	4	471	17	1	0	1	1	0
5:15 PM	18	228	7	2	8	0	21	0	15	467	17	0	1	0	2	0
5:30 PM	12	243	8	1	4	0	18	0	5	417	8	1	3	1	18	0
5:45 PM	26	247	3	0	8	0	25	0	3	390	9	0	2	0	6	0
6:00 PM	24	220	0	1	10	0	24	0	1	376	9	1	1	0	1	0
6:15 PM	20	198	3	0	12	0	20	0	2	379	8	0	0	1	5	0
6:30 PM	34	218	1	0	4	0	22	0	3	325	4	2	0	0	0	0
6:45 PM	20	184	1	1	6	0	23	0	0	288	11	2	3	1	7	0
7:00 PM	16	167	1	0	1	0	19	0	0	257	5	0	13	0	21	0
7:15 PM	23	164	1	1	4	0	18	0	0	229	12	1	3	0	7	0
7:30 PM	20	127	0	0	3	0	17	0	0	216	4	0	1	1	0	0
7:45 PM	20	147	0	0	1	0	16	0	0	174	7	1	0	0	0	0
8:00 PM	27	148	0	0	5	0	10	0	0	206	2	0	0	0	0	0
8:15 PM	14	113	0	0	5	0	11	0	0	208	8	0	0	0	0	0
8:30 PM	10	110	0	0	1	0	16	0	0	202	4	1	0	0	0	0
8:45 PM	17	109	0	0	3	0	17	0	0	194	7	1	0	0	0	0
9:00 PM	19	117	0	0	3	0	15	0	0	204	7	0	0	0	0	0
9:15 PM	13	107	0	0	6	0	11	0	0	128	6	0	0	0	0	0
9:30 PM	15	102	0	1	1	0	9	0	0	151	3	0	0	0	0	0
9:45 PM	6	77	0	1	5	0	12	0	0	156	6	0	0	0	0	0
10:00 PM	6	77	0	2	1	0	10	0	0	108	7	0	0	0	0	0
10:15 PM	8	74	0	0	0	0	4	0	0	118	5	0	0	0	0	0
10:30 PM	5	55	0	0	0	0	1	0	0	90	1	0	0	0	0	0
10:45 PM	5	59	0	2	2	0	7	0	0	98	2	0	0	0	0	0
11:00 PM	3	43	0	0	0	0	7	0	0	85	2	0	0	0	0	0
11:15 PM	2	27	0	1	0	0	2	0	0	61	1	1	0	0	0	0
11:30 PM	3	23	0	0	1	0	3	0	0	79	1	0	0	0	0	0
11:45 PM	3	24	0	0	0	0	3	0	0	49	1	0	0	0	0	0

Study Name SH 199 @ UNIVERSITY DR
Start Date 04/19/2016
Start Time 12:00 AM
Site Code

	SH 199 Southbound				NORTHSIDE DR Westbound				SH 199 Northbound				UNIVERSITY DR Eastbound			
Start Time	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn
12:00 AM	2	15	6	0	1	6	8	0	1	33	2	0	11	8	1	0
12:15 AM	3	12	6	0	1	4	4	0	1	39	1	1	19	14	0	0
12:30 AM	0	7	7	0	0	3	5	0	1	21	4	0	9	10	1	0
12:45 AM	0	12	4	0	0	7	4	0	0	12	3	0	11	7	0	0
1:00 AM	1	6	2	0	1	7	2	0	0	15	4	0	10	6	3	0
1:15 AM	4	6	3	1	0	2	2	0	0	18	1	0	7	6	0	0
1:30 AM	3	8	5	0	0	2	2	0	0	8	2	0	4	4	0	0
1:45 AM	4	13	6	0	5	4	4	0	0	10	1	0	9	3	0	0
2:00 AM	3	3	2	0	1	3	2	0	1	10	1	0	2	4	0	0
2:15 AM	2	4	1	0	3	3	3	1	0	13	3	0	3	4	0	0
2:30 AM	3	8	2	0	0	2	3	0	1	14	0	0	0	4	0	0
2:45 AM	4	11	1	0	1	3	2	0	0	10	0	0	4	1	0	0
3:00 AM	5	9	2	0	0	1	1	0	0	9	0	0	7	3	0	0
3:15 AM	3	7	2	0	1	2	1	0	0	5	1	0	2	6	0	0
3:30 AM	6	7	2	0	0	1	1	0	0	6	1	0	2	3	0	0
3:45 AM	5	13	3	0	2	2	1	0	0	4	1	0	1	5	0	0
4:00 AM	2	9	2	0	0	3	3	0	0	8	1	0	3	2	0	0
4:15 AM	2	20	14	0	2	4	1	0	2	9	3	0	4	5	0	0
4:30 AM	5	32	16	0	2	7	1	0	0	20	2	2	3	9	1	0
4:45 AM	4	45	8	0	3	13	2	0	0	16	1	0	5	10	0	0
5:00 AM	6	58	10	0	6	5	2	0	4	8	2	0	4	8	3	0
5:15 AM	13	103	15	0	6	13	2	0	2	19	2	0	6	5	1	0
5:30 AM	18	145	15	0	9	22	8	0	4	32	7	0	5	21	2	0
5:45 AM	29	174	25	0	11	15	9	0	5	47	6	1	10	14	7	0
6:00 AM	21	226	29	0	6	18	10	0	8	38	4	0	14	21	9	0
6:15 AM	31	223	38	0	10	37	14	0	5	58	14	0	10	45	7	0
6:30 AM	30	261	64	0	13	37	12	0	13	91	5	0	12	39	4	0
6:45 AM	38	332	75	0	39	84	15	0	18	91	10	0	23	66	7	0
7:00 AM	37	290	67	0	22	83	19	0	22	104	9	2	31	59	10	0
7:15 AM	44	350	125	0	28	106	22	0	15	92	16	1	45	85	16	0
7:30 AM	36	370	116	0	39	131	23	0	19	115	24	1	52	109	17	0
7:45 AM	27	349	133	0	59	152	27	0	22	96	24	2	46	122	23	0
8:00 AM	43	354	133	0	58	124	19	0	15	129	19	0	51	121	23	0
8:15 AM	34	369	138	0	33	133	24	0	17	104	19	1	45	96	16	0
8:30 AM	41	265	97	0	27	112	30	0	30	118	32	3	41	83	14	0
8:45 AM	24	235	94	0	28	88	26	0	31	108	26	0	39	99	11	0
9:00 AM	18	190	65	0	22	62	30	0	24	114	22	1	34	71	13	0
9:15 AM	21	144	94	1	25	82	23	0	23	125	23	0	51	81	17	0
9:30 AM	36	187	71	0	18	65	21	0	31	119	13	1	42	64	19	0
9:45 AM	24	167	77	0	15	55	33	0	19	117	19	4	52	59	7	0
10:00 AM	29	150	56	1	10	64	25	0	33	126	17	2	44	69	21	0
10:15 AM	26	120	62	2	16	63	31	0	29	119	11	0	48	63	19	0
10:30 AM	25	129	67	0	14	57	18	0	13	123	28	2	33	70	19	0
10:45 AM	22	137	68	2	24	72	24	0	18	88	30	1	44	59	13	0
11:00 AM	23	138	57	2	10	62	37	0	24	163	45	4	63	71	12	0
11:15 AM	23	104	59	0	22	75	35	0	20	135	22	0	66	87	12	0
11:30 AM	24	139	76	1	22	74	28	0	37	156	30	2	62	113	18	0
11:45 AM	30	133	77	0	26	100	26	0	32	146	40	1	74	112	21	0

Study Name SH 199 @ UNIVERSITY DR
Start Date 04/19/2016
Start Time 12:00 AM
Site Code

	SH 199 Southbound				NORTHSIDE DR Westbound				SH 199 Northbound				UNIVERSITY DR Eastbound			
Start Time	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn
12:00 PM	27	142	58	1	22	69	35	0	27	178	36	1	73	72	17	0
12:15 PM	40	138	80	0	27	69	45	0	27	119	35	2	74	112	13	0
12:30 PM	33	196	63	1	17	72	30	0	34	147	33	1	71	86	19	0
12:45 PM	9	141	75	0	28	119	43	0	30	127	27	0	80	94	16	0
1:00 PM	37	138	75	2	24	86	44	0	29	138	33	2	54	92	8	0
1:15 PM	27	141	65	1	29	68	31	0	30	168	35	1	68	104	21	0
1:30 PM	34	169	70	0	23	76	48	0	24	182	35	2	59	87	27	0
1:45 PM	22	132	67	3	27	71	30	0	28	159	29	1	88	86	20	0
2:00 PM	31	158	67	1	24	63	39	0	34	178	28	5	81	109	18	0
2:15 PM	34	145	60	0	15	71	36	0	30	164	25	0	64	119	21	0
2:30 PM	30	174	62	3	18	72	29	0	31	197	38	0	61	84	15	0
2:45 PM	39	150	60	1	18	60	37	0	29	162	46	2	76	90	14	0
3:00 PM	25	138	57	1	20	65	41	0	32	200	44	2	89	118	13	0
3:15 PM	26	130	61	3	18	100	47	0	19	244	45	1	88	92	13	0
3:30 PM	37	160	78	1	22	97	62	0	26	240	42	1	90	103	24	0
3:45 PM	31	134	95	2	34	95	50	0	20	284	45	0	56	102	12	0
4:00 PM	35	137	60	0	19	90	50	0	20	263	57	1	116	151	32	0
4:15 PM	33	126	60	0	18	108	41	0	17	304	51	2	82	109	23	0
4:30 PM	34	145	94	1	26	95	67	0	20	251	55	1	127	144	16	0
4:45 PM	28	135	73	2	23	77	44	0	21	302	62	0	125	136	20	0
5:00 PM	28	133	58	2	21	94	48	0	22	297	71	0	166	234	28	0
5:15 PM	33	144	80	0	29	125	60	0	23	300	73	0	144	210	12	0
5:30 PM	33	156	68	1	17	105	45	0	19	283	64	0	133	168	10	0
5:45 PM	31	135	67	2	19	105	60	0	24	300	56	0	91	119	7	0
6:00 PM	23	127	55	3	18	67	32	0	25	229	25	0	99	103	19	0
6:15 PM	44	118	45	3	15	72	54	0	21	210	30	0	81	91	11	0
6:30 PM	25	117	60	0	5	83	35	0	11	171	25	0	79	87	10	0
6:45 PM	22	94	46	2	13	53	39	0	12	136	24	1	59	76	8	0
7:00 PM	31	125	61	0	12	50	31	1	11	151	15	0	73	79	11	0
7:15 PM	25	69	45	1	6	30	24	0	7	148	24	0	50	68	6	0
7:30 PM	21	68	34	1	6	39	27	0	16	126	22	0	59	70	8	0
7:45 PM	28	80	39	1	6	47	33	0	14	90	11	0	57	57	6	0
8:00 PM	24	69	39	0	11	37	24	0	8	121	14	2	45	49	2	0
8:15 PM	22	74	32	0	7	40	24	0	4	109	12	0	48	59	5	0
8:30 PM	21	64	36	1	8	40	25	0	9	125	14	0	38	58	2	0
8:45 PM	25	60	30	0	5	47	23	0	3	100	17	0	53	47	3	0
9:00 PM	17	41	31	0	3	25	14	0	15	90	8	0	39	37	3	0
9:15 PM	13	56	21	0	3	44	24	0	2	81	5	0	54	34	5	0
9:30 PM	14	41	18	0	5	34	15	0	3	83	5	0	41	30	6	0
9:45 PM	11	47	18	0	6	29	23	0	2	64	13	0	28	25	1	0
10:00 PM	13	51	22	0	4	10	13	0	5	65	6	2	31	39	1	0
10:15 PM	12	41	11	0	3	27	20	0	1	59	10	0	20	28	2	0
10:30 PM	10	32	11	0	2	16	12	0	2	54	6	0	25	19	2	0
10:45 PM	6	28	15	0	3	12	11	0	1	54	11	1	22	14	1	0
11:00 PM	9	21	12	0	5	14	10	0	0	61	10	0	23	15	1	0
11:15 PM	4	20	5	0	5	9	7	0	0	49	7	1	15	16	2	0
11:30 PM	2	16	5	0	0	7	10	0	2	43	5	0	10	19	1	0
11:45 PM	6	15	8	0	2	4	2	0	2	32	3	0	15	18	0	0

Study Name SH 199 NORTH OF BIWAY ST
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	SH 199	SH 199	
Direction	Southbound	Northbound	TOTAL
12:00 AM	15	30	45
12:15 AM	31	32	63
12:30 AM	12	14	26
12:45 AM	16	28	44
1:00 AM	8	20	28
1:15 AM	15	17	32
1:30 AM	13	17	30
1:45 AM	11	12	23
2:00 AM	8	10	18
2:15 AM	10	18	28
2:30 AM	10	15	25
2:45 AM	13	6	19
3:00 AM	5	11	16
3:15 AM	11	14	25
3:30 AM	9	7	16
3:45 AM	3	10	13
4:00 AM	17	12	29
4:15 AM	17	16	33
4:30 AM	34	23	57
4:45 AM	43	30	73
5:00 AM	57	30	87
5:15 AM	68	30	98
5:30 AM	118	64	182
5:45 AM	128	74	202
6:00 AM	186	64	250
6:15 AM	211	93	304
6:30 AM	262	86	348
6:45 AM	322	104	426
7:00 AM	294	97	391
7:15 AM	387	136	523
7:30 AM	420	163	583
7:45 AM	379	153	532
8:00 AM	339	149	488
8:15 AM	290	140	430
8:30 AM	331	102	433
8:45 AM	236	131	367
9:00 AM	201	132	333
9:15 AM	207	133	340
9:30 AM	193	157	350
9:45 AM	173	141	314
10:00 AM	190	163	353
10:15 AM	182	156	338
10:30 AM	181	175	356
10:45 AM	172	160	332
11:00 AM	208	168	376
11:15 AM	215	169	384
11:30 AM	198	200	398
11:45 AM	209	213	422

Study Name SH 199 NORTH OF BIWAY ST
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	SH 199	SH 199	
Direction	Southbound	Northbound	TOTAL
12:00 PM	196	236	432
12:15 PM	230	209	439
12:30 PM	216	237	453
12:45 PM	199	216	415
1:00 PM	241	226	467
1:15 PM	187	222	409
1:30 PM	225	245	470
1:45 PM	192	173	365
2:00 PM	193	199	392
2:15 PM	190	253	443
2:30 PM	192	251	443
2:45 PM	188	226	414
3:00 PM	217	234	451
3:15 PM	169	301	470
3:30 PM	203	261	464
3:45 PM	167	312	479
4:00 PM	223	324	547
4:15 PM	239	405	644
4:30 PM	176	332	508
4:45 PM	224	376	600
5:00 PM	204	352	556
5:15 PM	219	383	602
5:30 PM	213	371	584
5:45 PM	231	333	564
6:00 PM	237	349	586
6:15 PM	199	294	493
6:30 PM	218	253	471
6:45 PM	188	216	404
7:00 PM	191	243	434
7:15 PM	151	233	384
7:30 PM	146	194	340
7:45 PM	112	187	299
8:00 PM	97	163	260
8:15 PM	101	190	291
8:30 PM	122	154	276
8:45 PM	80	152	232
9:00 PM	106	142	248
9:15 PM	68	126	194
9:30 PM	85	95	180
9:45 PM	61	100	161
10:00 PM	45	87	132
10:15 PM	62	85	147
10:30 PM	45	69	114
10:45 PM	39	54	93
11:00 PM	34	55	89
11:15 PM	23	48	71
11:30 PM	24	44	68
11:45 PM	17	32	49
	14043	14167	28210

Study Name SH 199 SOUTH OF BIWAY ST
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	SH 199	SH 199	
Direction	Northbound	Southbound	TOTAL
12:00 AM	29	14	43
12:15 AM	31	32	63
12:30 AM	15	14	29
12:45 AM	27	16	43
1:00 AM	19	8	27
1:15 AM	16	15	31
1:30 AM	16	13	29
1:45 AM	13	10	23
2:00 AM	11	8	19
2:15 AM	17	10	27
2:30 AM	15	12	27
2:45 AM	6	11	17
3:00 AM	13	5	18
3:15 AM	15	12	27
3:30 AM	7	8	15
3:45 AM	9	3	12
4:00 AM	12	18	30
4:15 AM	17	17	34
4:30 AM	22	37	59
4:45 AM	31	44	75
5:00 AM	27	60	87
5:15 AM	31	69	100
5:30 AM	58	126	184
5:45 AM	72	133	205
6:00 AM	61	196	257
6:15 AM	94	215	309
6:30 AM	83	263	346
6:45 AM	110	329	439
7:00 AM	98	304	402
7:15 AM	132	402	534
7:30 AM	158	436	594
7:45 AM	153	390	543
8:00 AM	152	348	500
8:15 AM	144	306	450
8:30 AM	105	338	443
8:45 AM	128	244	372
9:00 AM	133	206	339
9:15 AM	131	211	342
9:30 AM	153	196	349
9:45 AM	142	174	316
10:00 AM	164	191	355
10:15 AM	155	190	345
10:30 AM	174	185	359
10:45 AM	166	176	342
11:00 AM	175	217	392
11:15 AM	165	214	379
11:30 AM	213	198	411
11:45 AM	202	218	420

Study Name SH 199 SOUTH OF BIWAY ST
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	SH 199	SH 199	
Direction	Northbound	Southbound	TOTAL
12:00 PM	238	198	436
12:15 PM	207	223	430
12:30 PM	239	211	450
12:45 PM	209	200	409
1:00 PM	218	242	460
1:15 PM	217	187	404
1:30 PM	239	226	465
1:45 PM	172	189	361
2:00 PM	205	201	406
2:15 PM	253	196	449
2:30 PM	255	195	450
2:45 PM	221	185	406
3:00 PM	234	220	454
3:15 PM	287	181	468
3:30 PM	258	207	465
3:45 PM	317	180	497
4:00 PM	299	229	528
4:15 PM	381	241	622
4:30 PM	324	184	508
4:45 PM	370	224	594
5:00 PM	344	211	555
5:15 PM	374	225	599
5:30 PM	368	220	588
5:45 PM	331	227	558
6:00 PM	355	238	593
6:15 PM	305	197	502
6:30 PM	257	221	478
6:45 PM	219	193	412
7:00 PM	240	184	424
7:15 PM	232	153	385
7:30 PM	205	155	360
7:45 PM	183	114	297
8:00 PM	160	93	253
8:15 PM	189	100	289
8:30 PM	157	128	285
8:45 PM	153	84	237
9:00 PM	149	110	259
9:15 PM	124	70	194
9:30 PM	99	83	182
9:45 PM	102	63	165
10:00 PM	93	53	146
10:15 PM	85	60	145
10:30 PM	69	44	113
10:45 PM	56	40	96
11:00 PM	60	32	92
11:15 PM	49	26	75
11:30 PM	45	24	69
11:45 PM	35	16	51
	14101	14325	28426

Study Name SH 199 NORTH OF LONG AVE
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	SH 199	SH 199	
Direction	Southbound	Northbound	TOTAL
12:00 AM	14	30	44
12:15 AM	23	37	60
12:30 AM	15	18	33
12:45 AM	13	25	38
1:00 AM	9	19	28
1:15 AM	15	16	31
1:30 AM	10	14	24
1:45 AM	10	14	24
2:00 AM	12	15	27
2:15 AM	8	16	24
2:30 AM	11	21	32
2:45 AM	10	6	16
3:00 AM	9	10	19
3:15 AM	17	14	31
3:30 AM	8	3	11
3:45 AM	7	10	17
4:00 AM	20	10	30
4:15 AM	20	14	34
4:30 AM	40	16	56
4:45 AM	49	30	79
5:00 AM	72	19	91
5:15 AM	77	31	108
5:30 AM	136	47	183
5:45 AM	140	69	209
6:00 AM	209	56	265
6:15 AM	233	73	306
6:30 AM	310	86	396
6:45 AM	314	101	415
7:00 AM	344	121	465
7:15 AM	408	117	525
7:30 AM	426	167	593
7:45 AM	446	157	603
8:00 AM	363	160	523
8:15 AM	353	130	483
8:30 AM	311	129	440
8:45 AM	257	118	375
9:00 AM	234	130	364
9:15 AM	237	144	381
9:30 AM	199	151	350
9:45 AM	199	144	343
10:00 AM	206	170	376
10:15 AM	188	167	355
10:30 AM	189	181	370
10:45 AM	170	183	353
11:00 AM	213	200	413
11:15 AM	190	161	351
11:30 AM	200	219	419
11:45 AM	209	190	399

Study Name SH 199 NORTH OF LONG AVE
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	SH 199	SH 199	
Direction	Southbound	Northbound	TOTAL
12:00 PM	183	249	432
12:15 PM	222	201	423
12:30 PM	211	234	445
12:45 PM	192	189	381
1:00 PM	245	223	468
1:15 PM	181	204	385
1:30 PM	247	235	482
1:45 PM	191	170	361
2:00 PM	216	223	439
2:15 PM	190	239	429
2:30 PM	200	260	460
2:45 PM	184	239	423
3:00 PM	206	256	462
3:15 PM	216	299	515
3:30 PM	191	290	481
3:45 PM	194	323	517
4:00 PM	217	337	554
4:15 PM	224	383	607
4:30 PM	204	345	549
4:45 PM	181	378	559
5:00 PM	210	392	602
5:15 PM	200	381	581
5:30 PM	229	406	635
5:45 PM	202	385	587
6:00 PM	204	343	547
6:15 PM	188	318	506
6:30 PM	208	275	483
6:45 PM	167	233	400
7:00 PM	167	242	409
7:15 PM	149	246	395
7:30 PM	164	212	376
7:45 PM	119	176	295
8:00 PM	99	197	296
8:15 PM	94	161	255
8:30 PM	108	190	298
8:45 PM	82	153	235
9:00 PM	96	165	261
9:15 PM	80	123	203
9:30 PM	77	126	203
9:45 PM	68	103	171
10:00 PM	65	91	156
10:15 PM	63	85	148
10:30 PM	43	80	123
10:45 PM	40	69	109
11:00 PM	34	71	105
11:15 PM	29	53	82
11:30 PM	30	50	80
11:45 PM	19	45	64
	14482	14607	29089

Study Name SH 199 SOUTH OF LONG AVE
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	SH 199	SH 199	
Direction	Northbound	Southbound	TOTAL
12:00 AM	47	18	65
12:15 AM	45	25	70
12:30 AM	24	22	46
12:45 AM	29	20	49
1:00 AM	24	10	34
1:15 AM	22	18	40
1:30 AM	14	13	27
1:45 AM	15	10	25
2:00 AM	19	13	32
2:15 AM	17	10	27
2:30 AM	23	16	39
2:45 AM	9	14	23
3:00 AM	12	10	22
3:15 AM	18	20	38
3:30 AM	4	9	13
3:45 AM	15	10	25
4:00 AM	10	19	29
4:15 AM	17	28	45
4:30 AM	25	50	75
4:45 AM	28	59	87
5:00 AM	24	93	117
5:15 AM	42	96	138
5:30 AM	56	164	220
5:45 AM	85	163	248
6:00 AM	80	241	321
6:15 AM	94	271	365
6:30 AM	117	352	469
6:45 AM	126	352	478
7:00 AM	148	399	547
7:15 AM	150	440	590
7:30 AM	196	462	658
7:45 AM	189	477	666
8:00 AM	208	410	618
8:15 AM	167	398	565
8:30 AM	150	352	502
8:45 AM	141	303	444
9:00 AM	163	277	440
9:15 AM	165	266	431
9:30 AM	164	221	385
9:45 AM	170	240	410
10:00 AM	207	222	429
10:15 AM	189	218	407
10:30 AM	211	212	423
10:45 AM	206	209	415
11:00 AM	235	242	477
11:15 AM	191	232	423
11:30 AM	249	225	474
11:45 AM	220	250	470

Study Name SH 199 SOUTH OF LONG AVE
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	SH 199	SH 199	
Direction	Northbound	Southbound	TOTAL
12:00 PM	278	216	494
12:15 PM	220	254	474
12:30 PM	281	237	518
12:45 PM	242	224	466
1:00 PM	258	266	524
1:15 PM	236	197	433
1:30 PM	269	287	556
1:45 PM	206	209	415
2:00 PM	267	231	498
2:15 PM	283	228	511
2:30 PM	305	220	525
2:45 PM	272	213	485
3:00 PM	287	237	524
3:15 PM	336	272	608
3:30 PM	364	231	595
3:45 PM	398	224	622
4:00 PM	397	243	640
4:15 PM	456	264	720
4:30 PM	401	245	646
4:45 PM	424	232	656
5:00 PM	461	256	717
5:15 PM	443	242	685
5:30 PM	445	274	719
5:45 PM	434	254	688
6:00 PM	406	261	667
6:15 PM	352	227	579
6:30 PM	343	244	587
6:45 PM	298	213	511
7:00 PM	303	196	499
7:15 PM	288	177	465
7:30 PM	243	182	425
7:45 PM	222	167	389
8:00 PM	255	139	394
8:15 PM	225	130	355
8:30 PM	251	136	387
8:45 PM	180	117	297
9:00 PM	221	118	339
9:15 PM	170	105	275
9:30 PM	170	101	271
9:45 PM	149	83	232
10:00 PM	125	77	202
10:15 PM	118	77	195
10:30 PM	114	52	166
10:45 PM	98	54	152
11:00 PM	82	41	123
11:15 PM	67	38	105
11:30 PM	69	32	101
11:45 PM	57	30	87
	17529	16934	34463

Study Name SH 199 NORTH OF LOOP 820 NBFR
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	SH 199	SH 199	
Direction	Southbound	Northbound	TOTAL
12:00 AM	27	33	60
12:15 AM	30	32	62
12:30 AM	22	18	40
12:45 AM	17	13	30
1:00 AM	15	19	34
1:15 AM	18	19	37
1:30 AM	14	15	29
1:45 AM	15	11	26
2:00 AM	11	16	27
2:15 AM	13	13	26
2:30 AM	12	17	29
2:45 AM	16	11	27
3:00 AM	18	15	33
3:15 AM	8	9	17
3:30 AM	11	6	17
3:45 AM	16	13	29
4:00 AM	20	8	28
4:15 AM	22	13	35
4:30 AM	46	14	60
4:45 AM	48	20	68
5:00 AM	75	20	95
5:15 AM	78	27	105
5:30 AM	147	41	188
5:45 AM	206	54	260
6:00 AM	301	52	353
6:15 AM	327	78	405
6:30 AM	354	92	446
6:45 AM	414	110	524
7:00 AM	508	110	618
7:15 AM	540	139	679
7:30 AM	565	169	734
7:45 AM	504	173	677
8:00 AM	437	128	565
8:15 AM	375	138	513
8:30 AM	383	103	486
8:45 AM	302	141	443
9:00 AM	251	118	369
9:15 AM	272	137	409
9:30 AM	250	159	409
9:45 AM	237	169	406
10:00 AM	222	168	390
10:15 AM	234	178	412
10:30 AM	218	172	390
10:45 AM	226	175	401
11:00 AM	240	183	423
11:15 AM	258	205	463
11:30 AM	245	213	458
11:45 AM	272	229	501

Study Name SH 199 NORTH OF LOOP 820 NBFR
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	SH 199	SH 199	
Direction	Southbound	Northbound	TOTAL
12:00 PM	270	254	524
12:15 PM	287	223	510
12:30 PM	273	254	527
12:45 PM	289	234	523
1:00 PM	300	212	512
1:15 PM	226	235	461
1:30 PM	272	247	519
1:45 PM	227	188	415
2:00 PM	252	205	457
2:15 PM	250	252	502
2:30 PM	252	253	505
2:45 PM	268	241	509
3:00 PM	282	252	534
3:15 PM	246	284	530
3:30 PM	254	280	534
3:45 PM	240	281	521
4:00 PM	299	324	623
4:15 PM	272	370	642
4:30 PM	262	336	598
4:45 PM	267	350	617
5:00 PM	246	382	628
5:15 PM	234	374	608
5:30 PM	242	388	630
5:45 PM	261	368	629
6:00 PM	283	344	627
6:15 PM	246	350	596
6:30 PM	275	286	561
6:45 PM	236	252	488
7:00 PM	262	235	497
7:15 PM	213	228	441
7:30 PM	210	217	427
7:45 PM	132	204	336
8:00 PM	149	173	322
8:15 PM	133	186	319
8:30 PM	148	159	307
8:45 PM	136	166	302
9:00 PM	135	186	321
9:15 PM	117	130	247
9:30 PM	108	118	226
9:45 PM	96	148	244
10:00 PM	90	67	157
10:15 PM	70	71	141
10:30 PM	66	63	129
10:45 PM	61	66	127
11:00 PM	67	55	122
11:15 PM	32	58	90
11:30 PM	30	39	69
11:45 PM	29	50	79
	18435	14634	33069

Study Name SH 199 SOUTH OF LOOP 820 NBFR
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	SH 199	SH 199	
Direction	Northbound	Southbound	TOTAL
12:00 AM	44	35	79
12:15 AM	42	43	85
12:30 AM	28	27	55
12:45 AM	26	26	52
1:00 AM	28	19	47
1:15 AM	23	19	42
1:30 AM	18	17	35
1:45 AM	16	17	33
2:00 AM	20	12	32
2:15 AM	22	14	36
2:30 AM	34	18	52
2:45 AM	15	21	36
3:00 AM	21	20	41
3:15 AM	17	7	24
3:30 AM	14	13	27
3:45 AM	26	16	42
4:00 AM	23	23	46
4:15 AM	31	26	57
4:30 AM	35	48	83
4:45 AM	54	55	109
5:00 AM	54	78	132
5:15 AM	54	90	144
5:30 AM	120	155	275
5:45 AM	130	216	346
6:00 AM	128	310	438
6:15 AM	177	341	518
6:30 AM	158	366	524
6:45 AM	175	457	632
7:00 AM	172	534	706
7:15 AM	210	583	793
7:30 AM	246	628	874
7:45 AM	236	559	795
8:00 AM	208	483	691
8:15 AM	202	419	621
8:30 AM	161	422	583
8:45 AM	204	343	547
9:00 AM	171	275	446
9:15 AM	204	294	498
9:30 AM	206	278	484
9:45 AM	213	262	475
10:00 AM	232	242	474
10:15 AM	237	259	496
10:30 AM	235	241	476
10:45 AM	238	259	497
11:00 AM	249	284	533
11:15 AM	266	298	564
11:30 AM	304	294	598
11:45 AM	313	306	619

Study Name SH 199 SOUTH OF LOOP 820 NBFR
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	SH 199	SH 199	
Direction	Northbound	Southbound	TOTAL
12:00 PM	359	318	677
12:15 PM	308	319	627
12:30 PM	356	305	661
12:45 PM	325	336	661
1:00 PM	288	339	627
1:15 PM	332	270	602
1:30 PM	347	310	657
1:45 PM	258	268	526
2:00 PM	290	276	566
2:15 PM	351	280	631
2:30 PM	367	288	655
2:45 PM	331	292	623
3:00 PM	364	321	685
3:15 PM	395	276	671
3:30 PM	411	308	719
3:45 PM	407	289	696
4:00 PM	463	351	814
4:15 PM	519	310	829
4:30 PM	481	305	786
4:45 PM	487	321	808
5:00 PM	523	313	836
5:15 PM	488	303	791
5:30 PM	485	332	817
5:45 PM	495	339	834
6:00 PM	473	359	832
6:15 PM	454	311	765
6:30 PM	380	334	714
6:45 PM	330	286	616
7:00 PM	335	310	645
7:15 PM	302	253	555
7:30 PM	289	262	551
7:45 PM	243	170	413
8:00 PM	242	174	416
8:15 PM	245	169	414
8:30 PM	225	185	410
8:45 PM	213	161	374
9:00 PM	234	168	402
9:15 PM	192	134	326
9:30 PM	163	131	294
9:45 PM	193	110	303
10:00 PM	104	105	209
10:15 PM	110	92	202
10:30 PM	88	74	162
10:45 PM	86	73	159
11:00 PM	79	74	153
11:15 PM	76	40	116
11:30 PM	46	35	81
11:45 PM	65	39	104
	20637	21170	41807

Study Name SH 199 NORTH OF NW 18TH ST
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	SH 199	SH 199	
Direction	Southbound	Northbound	TOTAL
12:00 AM	30	37	67
12:15 AM	26	41	67
12:30 AM	13	37	50
12:45 AM	13	31	44
1:00 AM	13	25	38
1:15 AM	15	19	34
1:30 AM	13	17	30
1:45 AM	13	25	38
2:00 AM	12	16	28
2:15 AM	3	19	22
2:30 AM	14	21	35
2:45 AM	11	17	28
3:00 AM	9	13	22
3:15 AM	11	11	22
3:30 AM	8	7	15
3:45 AM	13	9	22
4:00 AM	21	16	37
4:15 AM	26	10	36
4:30 AM	67	19	86
4:45 AM	65	22	87
5:00 AM	106	22	128
5:15 AM	127	30	157
5:30 AM	213	40	253
5:45 AM	219	42	261
6:00 AM	269	64	333
6:15 AM	307	88	395
6:30 AM	402	98	500
6:45 AM	396	127	523
7:00 AM	421	176	597
7:15 AM	497	178	675
7:30 AM	564	198	762
7:45 AM	565	223	788
8:00 AM	481	210	691
8:15 AM	494	178	672
8:30 AM	400	170	570
8:45 AM	347	184	531
9:00 AM	263	184	447
9:15 AM	292	174	466
9:30 AM	217	183	400
9:45 AM	238	204	442
10:00 AM	238	212	450
10:15 AM	224	198	422
10:30 AM	220	197	417
10:45 AM	209	236	445
11:00 AM	192	211	403
11:15 AM	221	205	426
11:30 AM	223	241	464
11:45 AM	233	237	470

Study Name SH 199 NORTH OF NW 18TH ST
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	SH 199	SH 199	
Direction	Southbound	Northbound	TOTAL
12:00 PM	206	262	468
12:15 PM	259	285	544
12:30 PM	255	267	522
12:45 PM	286	246	532
1:00 PM	210	255	465
1:15 PM	256	258	514
1:30 PM	285	244	529
1:45 PM	267	205	472
2:00 PM	225	274	499
2:15 PM	249	290	539
2:30 PM	233	288	521
2:45 PM	258	285	543
3:00 PM	233	347	580
3:15 PM	246	389	635
3:30 PM	254	382	636
3:45 PM	256	350	606
4:00 PM	212	450	662
4:15 PM	255	431	686
4:30 PM	240	441	681
4:45 PM	227	508	735
5:00 PM	266	490	756
5:15 PM	255	491	746
5:30 PM	264	439	703
5:45 PM	276	417	693
6:00 PM	245	402	647
6:15 PM	221	399	620
6:30 PM	253	347	600
6:45 PM	206	315	521
7:00 PM	184	289	473
7:15 PM	189	251	440
7:30 PM	147	234	381
7:45 PM	167	190	357
8:00 PM	175	216	391
8:15 PM	127	219	346
8:30 PM	120	218	338
8:45 PM	126	211	337
9:00 PM	136	219	355
9:15 PM	120	139	259
9:30 PM	118	161	279
9:45 PM	84	169	253
10:00 PM	85	120	205
10:15 PM	82	122	204
10:30 PM	60	91	151
10:45 PM	66	107	173
11:00 PM	46	92	138
11:15 PM	30	64	94
11:30 PM	26	82	108
11:45 PM	27	52	79
	17987	17925	35912

Study Name SH 199 SOUTH OF NW 18TH ST
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	SH 199	SH 199	
Direction	Northbound	Southbound	TOTAL
12:00 AM	36	28	64
12:15 AM	42	25	67
12:30 AM	35	11	46
12:45 AM	31	15	46
1:00 AM	23	13	36
1:15 AM	19	15	34
1:30 AM	16	13	29
1:45 AM	25	14	39
2:00 AM	16	11	27
2:15 AM	21	4	25
2:30 AM	19	13	32
2:45 AM	17	11	28
3:00 AM	14	9	23
3:15 AM	11	11	22
3:30 AM	7	8	15
3:45 AM	8	13	21
4:00 AM	17	21	38
4:15 AM	9	25	34
4:30 AM	17	66	83
4:45 AM	19	65	84
5:00 AM	20	103	123
5:15 AM	26	131	157
5:30 AM	34	210	244
5:45 AM	41	216	257
6:00 AM	61	273	334
6:15 AM	88	303	391
6:30 AM	107	405	512
6:45 AM	133	398	531
7:00 AM	167	425	592
7:15 AM	167	498	665
7:30 AM	184	558	742
7:45 AM	216	557	773
8:00 AM	196	483	679
8:15 AM	167	499	666
8:30 AM	169	398	567
8:45 AM	174	341	515
9:00 AM	188	263	451
9:15 AM	159	293	452
9:30 AM	178	212	390
9:45 AM	201	236	437
10:00 AM	205	237	442
10:15 AM	190	219	409
10:30 AM	187	212	399
10:45 AM	227	207	434
11:00 AM	207	186	393
11:15 AM	198	216	414
11:30 AM	230	211	441
11:45 AM	225	228	453

Study Name SH 199 SOUTH OF NW 18TH ST
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	SH 199	SH 199	
Direction	Northbound	Southbound	TOTAL
12:00 PM	255	199	454
12:15 PM	279	243	522
12:30 PM	252	245	497
12:45 PM	235	281	516
1:00 PM	246	204	450
1:15 PM	256	249	505
1:30 PM	227	269	496
1:45 PM	197	256	453
2:00 PM	262	220	482
2:15 PM	279	237	516
2:30 PM	278	222	500
2:45 PM	277	247	524
3:00 PM	335	216	551
3:15 PM	381	235	616
3:30 PM	379	248	627
3:45 PM	347	244	591
4:00 PM	458	198	656
4:15 PM	419	256	675
4:30 PM	426	219	645
4:45 PM	496	212	708
5:00 PM	493	256	749
5:15 PM	499	238	737
5:30 PM	431	266	697
5:45 PM	402	261	663
6:00 PM	387	232	619
6:15 PM	389	215	604
6:30 PM	334	224	558
6:45 PM	301	199	500
7:00 PM	262	189	451
7:15 PM	242	176	418
7:30 PM	220	130	350
7:45 PM	182	149	331
8:00 PM	208	153	361
8:15 PM	216	118	334
8:30 PM	207	112	319
8:45 PM	202	113	315
9:00 PM	211	120	331
9:15 PM	134	113	247
9:30 PM	154	103	257
9:45 PM	162	82	244
10:00 PM	115	78	193
10:15 PM	123	74	197
10:30 PM	91	55	146
10:45 PM	100	61	161
11:00 PM	87	43	130
11:15 PM	63	28	91
11:30 PM	80	24	104
11:45 PM	50	24	74
	17376	17445	34821

Study Name SH 199 NORTH OF OHIO GARDEN RD
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	SH 199	SH 199	
Direction	Southbound	Northbound	TOTAL
12:00 AM	32	41	73
12:15 AM	28	35	63
12:30 AM	18	32	50
12:45 AM	17	34	51
1:00 AM	14	18	32
1:15 AM	12	14	26
1:30 AM	15	13	28
1:45 AM	10	23	33
2:00 AM	15	18	33
2:15 AM	3	20	23
2:30 AM	16	18	34
2:45 AM	7	12	19
3:00 AM	12	13	25
3:15 AM	8	10	18
3:30 AM	13	10	23
3:45 AM	9	10	19
4:00 AM	18	13	31
4:15 AM	26	11	37
4:30 AM	56	16	72
4:45 AM	55	25	80
5:00 AM	77	23	100
5:15 AM	123	36	159
5:30 AM	157	54	211
5:45 AM	197	61	258
6:00 AM	235	66	301
6:15 AM	262	87	349
6:30 AM	326	102	428
6:45 AM	392	129	521
7:00 AM	414	158	572
7:15 AM	424	182	606
7:30 AM	525	190	715
7:45 AM	488	208	696
8:00 AM	472	218	690
8:15 AM	423	201	624
8:30 AM	404	180	584
8:45 AM	311	194	505
9:00 AM	270	190	460
9:15 AM	275	196	471
9:30 AM	208	195	403
9:45 AM	244	213	457
10:00 AM	230	220	450
10:15 AM	223	214	437
10:30 AM	195	205	400
10:45 AM	197	236	433
11:00 AM	194	225	419
11:15 AM	237	205	442
11:30 AM	210	253	463
11:45 AM	226	250	476

Study Name SH 199 NORTH OF OHIO GARDEN RD
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	SH 199	SH 199	
Direction	Southbound	Northbound	TOTAL
12:00 PM	222	248	470
12:15 PM	252	283	535
12:30 PM	253	292	545
12:45 PM	286	263	549
1:00 PM	231	249	480
1:15 PM	259	268	527
1:30 PM	283	234	517
1:45 PM	252	216	468
2:00 PM	237	275	512
2:15 PM	244	269	513
2:30 PM	225	273	498
2:45 PM	260	289	549
3:00 PM	243	330	573
3:15 PM	257	351	608
3:30 PM	217	376	593
3:45 PM	271	384	655
4:00 PM	242	421	663
4:15 PM	266	426	692
4:30 PM	255	432	687
4:45 PM	252	452	704
5:00 PM	305	473	778
5:15 PM	243	478	721
5:30 PM	291	463	754
5:45 PM	291	425	716
6:00 PM	289	390	679
6:15 PM	257	354	611
6:30 PM	244	328	572
6:45 PM	246	319	565
7:00 PM	188	325	513
7:15 PM	222	289	511
7:30 PM	174	224	398
7:45 PM	202	212	414
8:00 PM	177	247	424
8:15 PM	147	242	389
8:30 PM	122	239	361
8:45 PM	161	189	350
9:00 PM	138	223	361
9:15 PM	128	147	275
9:30 PM	107	154	261
9:45 PM	84	156	240
10:00 PM	93	121	214
10:15 PM	82	107	189
10:30 PM	74	89	163
10:45 PM	56	103	159
11:00 PM	53	85	138
11:15 PM	43	63	106
11:30 PM	32	70	102
11:45 PM	29	48	77
	17808	17971	35779

Study Name SH 199 SOUTH OF OHIO GARDEN RD
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	SH 199	SH 199	
Direction	Northbound	Southbound	TOTAL
12:00 AM	39	28	67
12:15 AM	41	28	69
12:30 AM	35	17	52
12:45 AM	30	14	44
1:00 AM	21	13	34
1:15 AM	14	11	25
1:30 AM	14	13	27
1:45 AM	24	13	37
2:00 AM	15	13	28
2:15 AM	19	2	21
2:30 AM	16	17	33
2:45 AM	12	6	18
3:00 AM	14	11	25
3:15 AM	11	9	20
3:30 AM	12	13	25
3:45 AM	10	9	19
4:00 AM	15	19	34
4:15 AM	10	28	38
4:30 AM	17	64	81
4:45 AM	23	62	85
5:00 AM	23	89	112
5:15 AM	33	134	167
5:30 AM	52	180	232
5:45 AM	59	215	274
6:00 AM	68	263	331
6:15 AM	92	289	381
6:30 AM	107	340	447
6:45 AM	129	413	542
7:00 AM	172	432	604
7:15 AM	195	466	661
7:30 AM	199	567	766
7:45 AM	224	543	767
8:00 AM	208	503	711
8:15 AM	198	437	635
8:30 AM	182	421	603
8:45 AM	201	320	521
9:00 AM	189	286	475
9:15 AM	204	290	494
9:30 AM	201	213	414
9:45 AM	215	250	465
10:00 AM	227	239	466
10:15 AM	224	226	450
10:30 AM	210	201	411
10:45 AM	237	204	441
11:00 AM	228	200	428
11:15 AM	209	242	451
11:30 AM	252	219	471
11:45 AM	253	225	478

Study Name SH 199 SOUTH OF OHIO GARDEN RD
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	SH 199	SH 199	
Direction	Northbound	Southbound	TOTAL
12:00 PM	261	236	497
12:15 PM	290	263	553
12:30 PM	290	262	552
12:45 PM	267	288	555
1:00 PM	252	231	483
1:15 PM	281	262	543
1:30 PM	257	300	557
1:45 PM	227	266	493
2:00 PM	286	249	535
2:15 PM	274	251	525
2:30 PM	285	246	531
2:45 PM	300	272	572
3:00 PM	355	250	605
3:15 PM	387	276	663
3:30 PM	383	235	618
3:45 PM	405	280	685
4:00 PM	447	248	695
4:15 PM	457	285	742
4:30 PM	472	264	736
4:45 PM	485	255	740
5:00 PM	489	306	795
5:15 PM	504	248	752
5:30 PM	497	300	797
5:45 PM	454	293	747
6:00 PM	421	292	713
6:15 PM	394	265	659
6:30 PM	353	263	616
6:45 PM	345	251	596
7:00 PM	355	206	561
7:15 PM	313	230	543
7:30 PM	244	188	432
7:45 PM	222	215	437
8:00 PM	264	180	444
8:15 PM	249	156	405
8:30 PM	245	127	372
8:45 PM	215	157	372
9:00 PM	228	153	381
9:15 PM	158	126	284
9:30 PM	166	114	280
9:45 PM	159	85	244
10:00 PM	129	96	225
10:15 PM	104	86	190
10:30 PM	98	72	170
10:45 PM	112	58	170
11:00 PM	87	50	137
11:15 PM	62	37	99
11:30 PM	76	31	107
11:45 PM	50	27	77
	18837	18628	37465

Study Name SH 199 NORTH OF ROBERTS CUT OFF RD
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	SH 199	SH 199	
Direction	Southbound	Northbound	TOTAL
12:00 AM	32	43	75
12:15 AM	47	41	88
12:30 AM	25	29	54
12:45 AM	22	29	51
1:00 AM	14	24	38
1:15 AM	22	22	44
1:30 AM	13	20	33
1:45 AM	17	15	32
2:00 AM	12	19	31
2:15 AM	13	27	40
2:30 AM	17	28	45
2:45 AM	20	17	37
3:00 AM	14	19	33
3:15 AM	9	16	25
3:30 AM	10	11	21
3:45 AM	12	22	34
4:00 AM	21	23	44
4:15 AM	28	31	59
4:30 AM	46	35	81
4:45 AM	48	49	97
5:00 AM	75	51	126
5:15 AM	95	54	149
5:30 AM	159	108	267
5:45 AM	197	129	326
6:00 AM	298	118	416
6:15 AM	312	165	477
6:30 AM	386	151	537
6:45 AM	426	165	591
7:00 AM	489	169	658
7:15 AM	553	204	757
7:30 AM	579	230	809
7:45 AM	571	227	798
8:00 AM	428	197	625
8:15 AM	404	203	607
8:30 AM	379	150	529
8:45 AM	355	193	548
9:00 AM	234	157	391
9:15 AM	288	189	477
9:30 AM	265	196	461
9:45 AM	255	194	449
10:00 AM	240	240	480
10:15 AM	262	222	484
10:30 AM	215	225	440
10:45 AM	236	242	478
11:00 AM	261	216	477
11:15 AM	280	234	514
11:30 AM	240	281	521
11:45 AM	277	278	555

Study Name SH 199 NORTH OF ROBERTS CUT OFF RD
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	SH 199	SH 199	
Direction	Southbound	Northbound	TOTAL
12:00 PM	264	335	599
12:15 PM	314	291	605
12:30 PM	274	301	575
12:45 PM	302	290	592
1:00 PM	304	262	566
1:15 PM	274	306	580
1:30 PM	295	344	639
1:45 PM	271	238	509
2:00 PM	262	267	529
2:15 PM	281	321	602
2:30 PM	272	342	614
2:45 PM	297	319	616
3:00 PM	287	342	629
3:15 PM	271	373	644
3:30 PM	289	399	688
3:45 PM	257	390	647
4:00 PM	345	447	792
4:15 PM	283	503	786
4:30 PM	325	460	785
4:45 PM	286	478	764
5:00 PM	296	497	793
5:15 PM	286	494	780
5:30 PM	271	461	732
5:45 PM	332	492	824
6:00 PM	291	425	716
6:15 PM	314	416	730
6:30 PM	260	347	607
6:45 PM	301	313	614
7:00 PM	256	318	574
7:15 PM	242	296	538
7:30 PM	214	284	498
7:45 PM	168	239	407
8:00 PM	132	223	355
8:15 PM	159	237	396
8:30 PM	163	215	378
8:45 PM	143	219	362
9:00 PM	141	218	359
9:15 PM	110	180	290
9:30 PM	120	155	275
9:45 PM	100	165	265
10:00 PM	84	102	186
10:15 PM	91	111	202
10:30 PM	61	83	144
10:45 PM	59	80	139
11:00 PM	65	74	139
11:15 PM	30	75	105
11:30 PM	35	49	84
11:45 PM	36	61	97
	19714	19545	39259

Study Name SH 199 SOUTH OF ROBERTS CUT OFF RD
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	SH 199	SH 199	
Direction	Northbound	Southbound	TOTAL
12:00 AM	34	18	52
12:15 AM	30	35	65
12:30 AM	17	18	35
12:45 AM	27	16	43
1:00 AM	19	9	28
1:15 AM	19	15	34
1:30 AM	16	10	26
1:45 AM	13	12	25
2:00 AM	18	9	27
2:15 AM	23	7	30
2:30 AM	14	12	26
2:45 AM	10	14	24
3:00 AM	15	6	21
3:15 AM	14	9	23
3:30 AM	7	9	16
3:45 AM	11	4	15
4:00 AM	12	16	28
4:15 AM	18	20	38
4:30 AM	22	35	57
4:45 AM	33	41	74
5:00 AM	32	57	89
5:15 AM	37	69	106
5:30 AM	59	119	178
5:45 AM	89	140	229
6:00 AM	68	193	261
6:15 AM	94	203	297
6:30 AM	96	283	379
6:45 AM	111	299	410
7:00 AM	111	327	438
7:15 AM	146	380	526
7:30 AM	166	416	582
7:45 AM	169	411	580
8:00 AM	141	319	460
8:15 AM	158	334	492
8:30 AM	97	291	388
8:45 AM	147	271	418
9:00 AM	118	183	301
9:15 AM	149	228	377
9:30 AM	142	198	340
9:45 AM	145	202	347
10:00 AM	189	182	371
10:15 AM	164	197	361
10:30 AM	168	172	340
10:45 AM	171	185	356
11:00 AM	165	201	366
11:15 AM	172	240	412
11:30 AM	207	182	389
11:45 AM	212	213	425

Study Name SH 199 SOUTH OF ROBERTS CUT OFF RD
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	SH 199	SH 199	
Direction	Northbound	Southbound	TOTAL
12:00 PM	254	204	458
12:15 PM	208	251	459
12:30 PM	238	204	442
12:45 PM	219	219	438
1:00 PM	204	226	430
1:15 PM	226	208	434
1:30 PM	267	219	486
1:45 PM	170	207	377
2:00 PM	213	197	410
2:15 PM	244	220	464
2:30 PM	258	179	437
2:45 PM	247	222	469
3:00 PM	251	205	456
3:15 PM	281	196	477
3:30 PM	281	200	481
3:45 PM	296	172	468
4:00 PM	354	262	616
4:15 PM	391	204	595
4:30 PM	354	212	566
4:45 PM	374	206	580
5:00 PM	365	218	583
5:15 PM	401	225	626
5:30 PM	342	211	553
5:45 PM	388	252	640
6:00 PM	327	233	560
6:15 PM	325	229	554
6:30 PM	251	201	452
6:45 PM	239	221	460
7:00 PM	240	171	411
7:15 PM	226	162	388
7:30 PM	205	161	366
7:45 PM	197	118	315
8:00 PM	173	88	261
8:15 PM	190	116	306
8:30 PM	157	119	276
8:45 PM	161	97	258
9:00 PM	159	100	259
9:15 PM	138	76	214
9:30 PM	99	92	191
9:45 PM	113	75	188
10:00 PM	87	56	143
10:15 PM	90	65	155
10:30 PM	72	44	116
10:45 PM	53	39	92
11:00 PM	60	38	98
11:15 PM	59	23	82
11:30 PM	43	26	69
11:45 PM	50	24	74
	14635	14503	29138

Study Name SH 199 NORTH OF SH 183
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	SH 199	SH 199	
Direction	Southbound	Northbound	TOTAL
12:00 AM	24	51	75
12:15 AM	23	49	72
12:30 AM	27	25	52
12:45 AM	21	28	49
1:00 AM	12	25	37
1:15 AM	21	21	42
1:30 AM	16	15	31
1:45 AM	9	16	25
2:00 AM	16	19	35
2:15 AM	12	17	29
2:30 AM	17	23	40
2:45 AM	16	10	26
3:00 AM	13	15	28
3:15 AM	18	18	36
3:30 AM	9	5	14
3:45 AM	11	14	25
4:00 AM	20	14	34
4:15 AM	23	14	37
4:30 AM	49	27	76
4:45 AM	51	29	80
5:00 AM	83	25	108
5:15 AM	93	48	141
5:30 AM	138	59	197
5:45 AM	170	87	257
6:00 AM	215	83	298
6:15 AM	267	102	369
6:30 AM	296	103	399
6:45 AM	353	135	488
7:00 AM	376	151	527
7:15 AM	426	167	593
7:30 AM	438	200	638
7:45 AM	438	196	634
8:00 AM	407	208	615
8:15 AM	406	174	580
8:30 AM	345	168	513
8:45 AM	283	164	447
9:00 AM	253	154	407
9:15 AM	258	179	437
9:30 AM	230	165	395
9:45 AM	235	198	433
10:00 AM	199	190	389
10:15 AM	206	226	432
10:30 AM	216	186	402
10:45 AM	200	228	428
11:00 AM	228	221	449
11:15 AM	238	210	448
11:30 AM	219	232	451
11:45 AM	242	236	478

Study Name SH 199 NORTH OF SH 183
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	SH 199	SH 199	
Direction	Southbound	Northbound	TOTAL
12:00 PM	219	260	479
12:15 PM	251	232	483
12:30 PM	231	275	506
12:45 PM	231	267	498
1:00 PM	254	241	495
1:15 PM	209	287	496
1:30 PM	286	244	530
1:45 PM	229	237	466
2:00 PM	240	246	486
2:15 PM	225	311	536
2:30 PM	240	281	521
2:45 PM	221	295	516
3:00 PM	226	301	527
3:15 PM	272	346	618
3:30 PM	222	348	570
3:45 PM	241	399	640
4:00 PM	240	392	632
4:15 PM	297	459	756
4:30 PM	252	403	655
4:45 PM	254	435	689
5:00 PM	264	467	731
5:15 PM	268	457	725
5:30 PM	277	453	730
5:45 PM	250	422	672
6:00 PM	266	421	687
6:15 PM	232	357	589
6:30 PM	236	349	585
6:45 PM	222	292	514
7:00 PM	194	297	491
7:15 PM	196	296	492
7:30 PM	162	230	392
7:45 PM	182	250	432
8:00 PM	152	219	371
8:15 PM	122	248	370
8:30 PM	146	219	365
8:45 PM	131	209	340
9:00 PM	128	206	334
9:15 PM	111	178	289
9:30 PM	100	162	262
9:45 PM	97	155	252
10:00 PM	74	116	190
10:15 PM	80	116	196
10:30 PM	72	92	164
10:45 PM	60	96	156
11:00 PM	48	91	139
11:15 PM	42	66	108
11:30 PM	36	76	112
11:45 PM	37	59	96
	16891	17788	34679

Study Name SH 199 SOUTH OF SH 183
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	SH 199	SH 199	
Direction	Northbound	Southbound	TOTAL
12:00 AM	39	30	69
12:15 AM	54	28	82
12:30 AM	27	22	49
12:45 AM	37	17	54
1:00 AM	26	10	36
1:15 AM	18	18	36
1:30 AM	15	15	30
1:45 AM	20	16	36
2:00 AM	24	13	37
2:15 AM	24	8	32
2:30 AM	23	16	39
2:45 AM	15	17	32
3:00 AM	11	13	24
3:15 AM	18	12	30
3:30 AM	7	9	16
3:45 AM	11	11	22
4:00 AM	13	23	36
4:15 AM	9	27	36
4:30 AM	16	54	70
4:45 AM	26	52	78
5:00 AM	21	96	117
5:15 AM	36	107	143
5:30 AM	46	170	216
5:45 AM	65	197	262
6:00 AM	67	237	304
6:15 AM	100	306	406
6:30 AM	84	338	422
6:45 AM	135	383	518
7:00 AM	161	398	559
7:15 AM	169	472	641
7:30 AM	196	497	693
7:45 AM	204	486	690
8:00 AM	216	458	674
8:15 AM	200	411	611
8:30 AM	177	385	562
8:45 AM	187	309	496
9:00 AM	173	285	458
9:15 AM	202	267	469
9:30 AM	182	231	413
9:45 AM	219	244	463
10:00 AM	191	235	426
10:15 AM	245	210	455
10:30 AM	194	228	422
10:45 AM	235	221	456
11:00 AM	224	221	445
11:15 AM	235	236	471
11:30 AM	256	250	506
11:45 AM	240	246	486

Study Name SH 199 SOUTH OF SH 183
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	SH 199	SH 199	
Direction	Northbound	Southbound	TOTAL
12:00 PM	288	255	543
12:15 PM	244	253	497
12:30 PM	315	249	564
12:45 PM	288	268	556
1:00 PM	265	272	537
1:15 PM	283	250	533
1:30 PM	270	303	573
1:45 PM	250	251	501
2:00 PM	250	249	499
2:15 PM	304	230	534
2:30 PM	291	263	554
2:45 PM	322	256	578
3:00 PM	319	238	557
3:15 PM	361	259	620
3:30 PM	342	254	596
3:45 PM	399	265	664
4:00 PM	393	264	657
4:15 PM	457	296	753
4:30 PM	408	271	679
4:45 PM	424	264	688
5:00 PM	440	296	736
5:15 PM	465	265	730
5:30 PM	468	289	757
5:45 PM	456	295	751
6:00 PM	428	292	720
6:15 PM	382	265	647
6:30 PM	378	276	654
6:45 PM	348	259	607
7:00 PM	322	226	548
7:15 PM	331	219	550
7:30 PM	271	180	451
7:45 PM	255	220	475
8:00 PM	252	178	430
8:15 PM	282	142	424
8:30 PM	254	151	405
8:45 PM	221	162	383
9:00 PM	229	160	389
9:15 PM	196	139	335
9:30 PM	187	141	328
9:45 PM	193	114	307
10:00 PM	139	104	243
10:15 PM	143	83	226
10:30 PM	101	66	167
10:45 PM	103	75	178
11:00 PM	104	42	146
11:15 PM	82	44	126
11:30 PM	78	30	108
11:45 PM	61	30	91
	18735	18488	37223

Study Name SH 199 NORTH OF SKYLINE DR
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	SH 199	SH 199	
Direction	Southbound	Northbound	TOTAL
12:00 AM	17	26	43
12:15 AM	29	33	62
12:30 AM	14	18	32
12:45 AM	14	23	37
1:00 AM	8	14	22
1:15 AM	16	17	33
1:30 AM	11	15	26
1:45 AM	10	12	22
2:00 AM	8	14	22
2:15 AM	10	17	27
2:30 AM	12	17	29
2:45 AM	9	5	14
3:00 AM	6	14	20
3:15 AM	12	16	28
3:30 AM	8	6	14
3:45 AM	3	9	12
4:00 AM	19	15	34
4:15 AM	17	18	35
4:30 AM	37	24	61
4:45 AM	43	33	76
5:00 AM	64	29	93
5:15 AM	75	33	108
5:30 AM	117	56	173
5:45 AM	144	73	217
6:00 AM	196	69	265
6:15 AM	194	92	286
6:30 AM	270	93	363
6:45 AM	287	108	395
7:00 AM	331	111	442
7:15 AM	385	140	525
7:30 AM	462	155	617
7:45 AM	381	152	533
8:00 AM	360	151	511
8:15 AM	315	142	457
8:30 AM	305	103	408
8:45 AM	266	133	399
9:00 AM	200	131	331
9:15 AM	224	148	372
9:30 AM	197	143	340
9:45 AM	179	151	330
10:00 AM	193	170	363
10:15 AM	189	174	363
10:30 AM	175	154	329
10:45 AM	172	189	361
11:00 AM	209	170	379
11:15 AM	205	194	399
11:30 AM	188	195	383
11:45 AM	212	213	425

Study Name SH 199 NORTH OF SKYLINE DR
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	SH 199	SH 199	
Direction	Southbound	Northbound	TOTAL
12:00 PM	188	237	425
12:15 PM	227	214	441
12:30 PM	209	230	439
12:45 PM	207	194	401
1:00 PM	240	202	442
1:15 PM	188	214	402
1:30 PM	234	205	439
1:45 PM	190	168	358
2:00 PM	211	208	419
2:15 PM	198	261	459
2:30 PM	203	238	441
2:45 PM	177	228	405
3:00 PM	226	247	473
3:15 PM	218	282	500
3:30 PM	206	262	468
3:45 PM	198	306	504
4:00 PM	248	334	582
4:15 PM	223	399	622
4:30 PM	197	320	517
4:45 PM	196	368	564
5:00 PM	211	362	573
5:15 PM	209	358	567
5:30 PM	218	377	595
5:45 PM	213	361	574
6:00 PM	225	330	555
6:15 PM	197	311	508
6:30 PM	216	265	481
6:45 PM	178	213	391
7:00 PM	169	250	419
7:15 PM	154	223	377
7:30 PM	164	202	366
7:45 PM	118	172	290
8:00 PM	93	157	250
8:15 PM	110	165	275
8:30 PM	117	165	282
8:45 PM	84	150	234
9:00 PM	105	147	252
9:15 PM	71	111	182
9:30 PM	95	113	208
9:45 PM	59	97	156
10:00 PM	52	96	148
10:15 PM	62	81	143
10:30 PM	43	73	116
10:45 PM	40	57	97
11:00 PM	39	67	106
11:15 PM	24	42	66
11:30 PM	24	48	72
11:45 PM	15	40	55
	14287	14168	28455

Study Name SH 199 SOUTH OF SKYLINE DR
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	SH 199	SH 199	
Direction	Northbound	Southbound	TOTAL
12:00 AM	26	17	43
12:15 AM	34	27	61
12:30 AM	17	13	30
12:45 AM	23	14	37
1:00 AM	14	7	21
1:15 AM	15	15	30
1:30 AM	14	12	26
1:45 AM	14	9	23
2:00 AM	14	11	25
2:15 AM	17	8	25
2:30 AM	21	12	33
2:45 AM	6	8	14
3:00 AM	10	7	17
3:15 AM	15	14	29
3:30 AM	5	8	13
3:45 AM	11	3	14
4:00 AM	12	20	32
4:15 AM	16	19	35
4:30 AM	20	33	53
4:45 AM	30	39	69
5:00 AM	23	64	87
5:15 AM	31	74	105
5:30 AM	52	114	166
5:45 AM	70	142	212
6:00 AM	62	196	258
6:15 AM	81	194	275
6:30 AM	85	270	355
6:45 AM	104	289	393
7:00 AM	114	329	443
7:15 AM	135	391	526
7:30 AM	158	459	617
7:45 AM	155	382	537
8:00 AM	153	369	522
8:15 AM	138	308	446
8:30 AM	104	307	411
8:45 AM	142	259	401
9:00 AM	133	197	330
9:15 AM	143	226	369
9:30 AM	143	192	335
9:45 AM	150	182	332
10:00 AM	164	180	344
10:15 AM	173	188	361
10:30 AM	149	167	316
10:45 AM	191	164	355
11:00 AM	168	193	361
11:15 AM	178	196	374
11:30 AM	178	186	364
11:45 AM	200	201	401

Study Name SH 199 SOUTH OF SKYLINE DR
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	SH 199	SH 199	
Direction	Northbound	Southbound	TOTAL
12:00 PM	220	179	399
12:15 PM	214	228	442
12:30 PM	230	206	436
12:45 PM	195	195	390
1:00 PM	189	216	405
1:15 PM	213	188	401
1:30 PM	206	233	439
1:45 PM	161	179	340
2:00 PM	190	214	404
2:15 PM	250	186	436
2:30 PM	224	199	423
2:45 PM	228	175	403
3:00 PM	244	216	460
3:15 PM	270	217	487
3:30 PM	264	200	464
3:45 PM	294	192	486
4:00 PM	312	232	544
4:15 PM	379	219	598
4:30 PM	305	181	486
4:45 PM	356	190	546
5:00 PM	367	213	580
5:15 PM	350	209	559
5:30 PM	375	209	584
5:45 PM	362	208	570
6:00 PM	320	217	537
6:15 PM	307	181	488
6:30 PM	259	203	462
6:45 PM	217	177	394
7:00 PM	238	145	383
7:15 PM	225	142	367
7:30 PM	199	154	353
7:45 PM	181	120	301
8:00 PM	161	85	246
8:15 PM	156	102	258
8:30 PM	164	114	278
8:45 PM	149	81	230
9:00 PM	148	91	239
9:15 PM	116	70	186
9:30 PM	114	85	199
9:45 PM	94	52	146
10:00 PM	94	53	147
10:15 PM	81	60	141
10:30 PM	70	40	110
10:45 PM	59	43	102
11:00 PM	67	34	101
11:15 PM	48	26	74
11:30 PM	53	25	78
11:45 PM	40	15	55
	13869	13914	27783

Study Name SH 199 NORTH OF UNIVERSITY DR
Start Date 04/19/2016
Start Time 12:00 AM
Site Code

Channel	SH 199	SH 199	
Direction	Southbound	Northbound	TOTAL
12:00 AM	23	52	75
12:15 AM	21	62	83
12:30 AM	14	35	49
12:45 AM	16	27	43
1:00 AM	9	27	36
1:15 AM	14	28	42
1:30 AM	16	14	30
1:45 AM	23	23	46
2:00 AM	8	14	22
2:15 AM	7	19	26
2:30 AM	13	17	30
2:45 AM	16	16	32
3:00 AM	16	17	33
3:15 AM	12	8	20
3:30 AM	15	9	24
3:45 AM	21	6	27
4:00 AM	13	14	27
4:15 AM	36	14	50
4:30 AM	53	24	77
4:45 AM	57	23	80
5:00 AM	74	14	88
5:15 AM	131	27	158
5:30 AM	178	45	223
5:45 AM	228	66	294
6:00 AM	276	62	338
6:15 AM	292	82	374
6:30 AM	355	115	470
6:45 AM	445	129	574
7:00 AM	394	154	548
7:15 AM	519	159	678
7:30 AM	522	190	712
7:45 AM	509	169	678
8:00 AM	530	199	729
8:15 AM	541	173	714
8:30 AM	403	189	592
8:45 AM	353	173	526
9:00 AM	273	178	451
9:15 AM	260	200	460
9:30 AM	294	182	476
9:45 AM	268	202	470
10:00 AM	236	196	432
10:15 AM	210	200	410
10:30 AM	221	174	395
10:45 AM	229	158	387
11:00 AM	220	265	485
11:15 AM	186	236	422
11:30 AM	240	247	487
11:45 AM	240	246	486

Study Name SH 199 NORTH OF UNIVERSITY DR
Start Date 04/19/2016
Start Time 12:00 AM
Site Code

Channel	SH 199	SH 199	
Direction	Southbound	Northbound	TOTAL
12:00 PM	228	287	515
12:15 PM	258	238	496
12:30 PM	293	249	542
12:45 PM	225	250	475
1:00 PM	252	238	490
1:15 PM	234	268	502
1:30 PM	273	289	562
1:45 PM	224	280	504
2:00 PM	257	299	556
2:15 PM	239	264	503
2:30 PM	269	290	559
2:45 PM	250	276	526
3:00 PM	221	331	552
3:15 PM	220	382	602
3:30 PM	276	393	669
3:45 PM	262	392	654
4:00 PM	232	429	661
4:15 PM	219	427	646
4:30 PM	274	446	720
4:45 PM	238	473	711
5:00 PM	221	513	734
5:15 PM	257	504	761
5:30 PM	258	462	720
5:45 PM	235	453	688
6:00 PM	208	363	571
6:15 PM	210	348	558
6:30 PM	202	285	487
6:45 PM	164	236	400
7:00 PM	217	255	472
7:15 PM	140	223	363
7:30 PM	124	213	337
7:45 PM	148	181	329
8:00 PM	132	190	322
8:15 PM	128	181	309
8:30 PM	122	189	311
8:45 PM	115	176	291
9:00 PM	89	143	232
9:15 PM	90	159	249
9:30 PM	73	139	212
9:45 PM	76	115	191
10:00 PM	86	109	195
10:15 PM	64	99	163
10:30 PM	53	91	144
10:45 PM	49	87	136
11:00 PM	42	94	136
11:15 PM	29	71	100
11:30 PM	23	63	86
11:45 PM	29	49	78
	17558	17371	34929

Study Name SH 199 SOUTH OF UNIVERSITY DR
Start Date 04/19/2016
Start Time 12:00 AM
Site Code

Channel	SH 199	SH 199	
Direction	Northbound	Southbound	TOTAL
12:00 AM	36	17	53
12:15 AM	42	14	56
12:30 AM	26	8	34
12:45 AM	15	12	27
1:00 AM	19	10	29
1:15 AM	19	6	25
1:30 AM	10	8	18
1:45 AM	11	18	29
2:00 AM	12	4	16
2:15 AM	16	7	23
2:30 AM	15	8	23
2:45 AM	10	12	22
3:00 AM	9	9	18
3:15 AM	6	8	14
3:30 AM	7	7	14
3:45 AM	5	15	20
4:00 AM	9	9	18
4:15 AM	14	22	36
4:30 AM	24	37	61
4:45 AM	17	48	65
5:00 AM	14	67	81
5:15 AM	23	110	133
5:30 AM	43	156	199
5:45 AM	59	193	252
6:00 AM	50	241	291
6:15 AM	77	240	317
6:30 AM	109	278	387
6:45 AM	119	378	497
7:00 AM	137	324	461
7:15 AM	124	395	519
7:30 AM	159	427	586
7:45 AM	144	433	577
8:00 AM	163	435	598
8:15 AM	141	419	560
8:30 AM	183	309	492
8:45 AM	165	274	439
9:00 AM	161	226	387
9:15 AM	171	186	357
9:30 AM	164	225	389
9:45 AM	159	193	352
10:00 AM	178	183	361
10:15 AM	159	155	314
10:30 AM	166	164	330
10:45 AM	137	175	312
11:00 AM	236	164	400
11:15 AM	177	138	315
11:30 AM	225	181	406
11:45 AM	219	181	400

Study Name SH 199 SOUTH OF UNIVERSITY DR
Start Date 04/19/2016
Start Time 12:00 AM
Site Code

Channel	SH 199	SH 199	
Direction	Northbound	Southbound	TOTAL
12:00 PM	242	182	424
12:15 PM	183	180	363
12:30 PM	215	233	448
12:45 PM	184	185	369
1:00 PM	202	172	374
1:15 PM	234	192	426
1:30 PM	243	221	464
1:45 PM	217	180	397
2:00 PM	245	205	450
2:15 PM	219	181	400
2:30 PM	266	207	473
2:45 PM	239	184	423
3:00 PM	278	173	451
3:15 PM	309	162	471
3:30 PM	309	207	516
3:45 PM	349	180	529
4:00 PM	341	189	530
4:15 PM	374	169	543
4:30 PM	327	188	515
4:45 PM	385	178	563
5:00 PM	390	182	572
5:15 PM	396	185	581
5:30 PM	366	183	549
5:45 PM	380	161	541
6:00 PM	279	164	443
6:15 PM	261	144	405
6:30 PM	207	132	339
6:45 PM	173	116	289
7:00 PM	177	148	325
7:15 PM	179	81	260
7:30 PM	164	82	246
7:45 PM	115	92	207
8:00 PM	145	84	229
8:15 PM	125	86	211
8:30 PM	148	74	222
8:45 PM	120	68	188
9:00 PM	113	47	160
9:15 PM	88	64	152
9:30 PM	91	52	143
9:45 PM	79	54	133
10:00 PM	78	58	136
10:15 PM	70	46	116
10:30 PM	62	36	98
10:45 PM	67	33	100
11:00 PM	71	27	98
11:15 PM	57	28	85
11:30 PM	50	17	67
11:45 PM	37	17	54
	14033	13358	27391

Study Name UNIVERSITY DR EAST OF SH 199
Start Date 04/19/2016
Start Time 12:00 AM
Site Code

Channel	NORTHSIDE DR	NORTHSIDE DR	
Direction	Westbound	Eastbound	TOTAL
12:00 AM	15	12	27
12:15 AM	9	18	27
12:30 AM	8	14	22
12:45 AM	11	10	21
1:00 AM	10	11	21
1:15 AM	4	11	15
1:30 AM	4	9	13
1:45 AM	13	8	21
2:00 AM	6	8	14
2:15 AM	10	10	20
2:30 AM	5	7	12
2:45 AM	6	5	11
3:00 AM	2	8	10
3:15 AM	4	10	14
3:30 AM	2	10	12
3:45 AM	5	11	16
4:00 AM	6	5	11
4:15 AM	7	10	17
4:30 AM	10	16	26
4:45 AM	18	15	33
5:00 AM	13	16	29
5:15 AM	21	20	41
5:30 AM	39	46	85
5:45 AM	35	49	84
6:00 AM	34	46	80
6:15 AM	61	90	151
6:30 AM	62	74	136
6:45 AM	138	114	252
7:00 AM	124	105	229
7:15 AM	156	145	301
7:30 AM	193	169	362
7:45 AM	238	173	411
8:00 AM	201	183	384
8:15 AM	190	149	339
8:30 AM	169	156	325
8:45 AM	142	149	291
9:00 AM	114	111	225
9:15 AM	130	125	255
9:30 AM	104	113	217
9:45 AM	103	102	205
10:00 AM	99	115	214
10:15 AM	110	100	210
10:30 AM	89	123	212
10:45 AM	120	111	231
11:00 AM	109	139	248
11:15 AM	132	132	264
11:30 AM	124	167	291
11:45 AM	152	182	334

Study Name UNIVERSITY DR EAST OF SH 199
Start Date 04/19/2016
Start Time 12:00 AM
Site Code

Channel	NORTHSIDE DR	NORTHSIDE DR	
Direction	Westbound	Eastbound	TOTAL
12:00 PM	126	135	261
12:15 PM	141	187	328
12:30 PM	119	152	271
12:45 PM	190	130	320
1:00 PM	154	162	316
1:15 PM	128	166	294
1:30 PM	147	156	303
1:45 PM	128	137	265
2:00 PM	126	168	294
2:15 PM	122	178	300
2:30 PM	119	152	271
2:45 PM	115	175	290
3:00 PM	126	187	313
3:15 PM	165	163	328
3:30 PM	181	182	363
3:45 PM	179	178	357
4:00 PM	159	243	402
4:15 PM	167	193	360
4:30 PM	188	233	421
4:45 PM	144	226	370
5:00 PM	163	333	496
5:15 PM	214	316	530
5:30 PM	167	265	432
5:45 PM	184	206	390
6:00 PM	117	151	268
6:15 PM	141	165	306
6:30 PM	123	137	260
6:45 PM	105	122	227
7:00 PM	94	126	220
7:15 PM	60	117	177
7:30 PM	72	113	185
7:45 PM	86	96	182
8:00 PM	72	87	159
8:15 PM	71	93	164
8:30 PM	73	93	166
8:45 PM	75	89	164
9:00 PM	42	62	104
9:15 PM	71	52	123
9:30 PM	54	49	103
9:45 PM	58	49	107
10:00 PM	27	58	85
10:15 PM	50	50	100
10:30 PM	30	35	65
10:45 PM	26	31	57
11:00 PM	29	34	63
11:15 PM	21	27	48
11:30 PM	17	26	43
11:45 PM	8	27	35
	8531	9924	18455

Study Name UNIVERSITY DR WEST OF SH 199
Start Date 04/19/2016
Start Time 12:00 AM
Site Code

Channel	UNIVERSITY DR	UNIVERSITY DR	
Direction	Eastbound	Westbound	TOTAL
12:00 AM	20	13	33
12:15 AM	33	11	44
12:30 AM	20	11	31
12:45 AM	18	11	29
1:00 AM	19	9	28
1:15 AM	13	5	18
1:30 AM	8	7	15
1:45 AM	12	10	22
2:00 AM	6	6	12
2:15 AM	7	4	11
2:30 AM	4	5	9
2:45 AM	5	4	9
3:00 AM	10	3	13
3:15 AM	8	4	12
3:30 AM	5	3	8
3:45 AM	6	5	11
4:00 AM	5	5	10
4:15 AM	9	20	29
4:30 AM	13	23	36
4:45 AM	15	21	36
5:00 AM	15	19	34
5:15 AM	12	30	42
5:30 AM	28	41	69
5:45 AM	31	45	76
6:00 AM	44	55	99
6:15 AM	62	80	142
6:30 AM	55	114	169
6:45 AM	96	177	273
7:00 AM	100	172	272
7:15 AM	146	246	392
7:30 AM	178	266	444
7:45 AM	191	307	498
8:00 AM	195	272	467
8:15 AM	157	288	445
8:30 AM	138	239	377
8:45 AM	149	213	362
9:00 AM	118	151	269
9:15 AM	149	199	348
9:30 AM	125	167	292
9:45 AM	118	151	269
10:00 AM	134	153	287
10:15 AM	130	154	284
10:30 AM	122	137	259
10:45 AM	116	158	274
11:00 AM	146	143	289
11:15 AM	165	154	319
11:30 AM	193	187	380
11:45 AM	207	209	416

Study Name UNIVERSITY DR WEST OF SH 199
Start Date 04/19/2016
Start Time 12:00 AM
Site Code

Channel	UNIVERSITY DR	UNIVERSITY DR	
Direction	Eastbound	Westbound	TOTAL
12:00 PM	162	154	316
12:15 PM	199	176	375
12:30 PM	176	169	345
12:45 PM	190	224	414
1:00 PM	154	190	344
1:15 PM	193	163	356
1:30 PM	173	170	343
1:45 PM	194	166	360
2:00 PM	208	164	372
2:15 PM	204	161	365
2:30 PM	160	165	325
2:45 PM	180	149	329
3:00 PM	220	154	374
3:15 PM	193	180	373
3:30 PM	217	201	418
3:45 PM	170	210	380
4:00 PM	299	170	469
4:15 PM	214	185	399
4:30 PM	287	209	496
4:45 PM	281	171	452
5:00 PM	428	174	602
5:15 PM	366	228	594
5:30 PM	311	192	503
5:45 PM	217	196	413
6:00 PM	221	147	368
6:15 PM	183	138	321
6:30 PM	176	154	330
6:45 PM	143	111	254
7:00 PM	163	122	285
7:15 PM	124	82	206
7:30 PM	137	89	226
7:45 PM	120	100	220
8:00 PM	96	84	180
8:15 PM	112	76	188
8:30 PM	98	85	183
8:45 PM	103	80	183
9:00 PM	79	71	150
9:15 PM	93	67	160
9:30 PM	77	55	132
9:45 PM	54	49	103
10:00 PM	71	37	108
10:15 PM	50	39	89
10:30 PM	46	29	75
10:45 PM	37	28	65
11:00 PM	39	26	65
11:15 PM	33	14	47
11:30 PM	30	14	44
11:45 PM	33	14	47
	11270	10739	22009

Study Name BIWAY ST EAST OF SH 199
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	BIWAY ST	BIWAY ST	
Direction	Westbound	Eastbound	TOTAL
12:00 AM	1	1	2
12:15 AM	2	0	2
12:30 AM	0	1	1
12:45 AM	2	0	2
1:00 AM	0	0	0
1:15 AM	2	2	4
1:30 AM	0	0	0
1:45 AM	0	0	0
2:00 AM	0	1	1
2:15 AM	1	1	2
2:30 AM	0	0	0
2:45 AM	1	2	3
3:00 AM	0	2	2
3:15 AM	1	1	2
3:30 AM	1	0	1
3:45 AM	1	0	1
4:00 AM	0	0	0
4:15 AM	0	0	0
4:30 AM	4	1	5
4:45 AM	1	1	2
5:00 AM	4	0	4
5:15 AM	2	2	4
5:30 AM	7	0	7
5:45 AM	5	2	7
6:00 AM	9	1	10
6:15 AM	5	2	7
6:30 AM	3	3	6
6:45 AM	6	8	14
7:00 AM	10	8	18
7:15 AM	26	15	41
7:30 AM	31	6	37
7:45 AM	19	9	28
8:00 AM	18	17	35
8:15 AM	16	12	28
8:30 AM	13	7	20
8:45 AM	11	7	18
9:00 AM	11	5	16
9:15 AM	11	6	17
9:30 AM	14	7	21
9:45 AM	11	8	19
10:00 AM	8	9	17
10:15 AM	13	10	23
10:30 AM	10	12	22
10:45 AM	8	9	17
11:00 AM	14	12	26
11:15 AM	13	12	25
11:30 AM	10	14	24
11:45 AM	30	9	39

Study Name BIWAY ST EAST OF SH 199
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	BIWAY ST	BIWAY ST	
Direction	Westbound	Eastbound	TOTAL
12:00 PM	11	10	21
12:15 PM	14	21	35
12:30 PM	22	19	41
12:45 PM	18	11	29
1:00 PM	18	14	32
1:15 PM	16	15	31
1:30 PM	17	10	27
1:45 PM	8	12	20
2:00 PM	10	9	19
2:15 PM	10	11	21
2:30 PM	12	15	27
2:45 PM	16	22	38
3:00 PM	19	17	36
3:15 PM	30	12	42
3:30 PM	15	23	38
3:45 PM	24	30	54
4:00 PM	15	23	38
4:15 PM	28	26	54
4:30 PM	19	37	56
4:45 PM	16	32	48
5:00 PM	23	32	55
5:15 PM	19	36	55
5:30 PM	10	28	38
5:45 PM	17	29	46
6:00 PM	21	34	55
6:15 PM	15	29	44
6:30 PM	13	20	33
6:45 PM	18	22	40
7:00 PM	12	21	33
7:15 PM	21	16	37
7:30 PM	14	13	27
7:45 PM	16	8	24
8:00 PM	11	19	30
8:15 PM	10	15	25
8:30 PM	15	18	33
8:45 PM	12	14	26
9:00 PM	15	18	33
9:15 PM	9	3	12
9:30 PM	9	6	15
9:45 PM	5	11	16
10:00 PM	9	9	18
10:15 PM	3	3	6
10:30 PM	6	6	12
10:45 PM	9	8	17
11:00 PM	0	8	8
11:15 PM	2	1	3
11:30 PM	0	1	1
11:45 PM	1	3	4
	1008	1025	2033

Study Name BIWAY ST WEST OF SH 199
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	BIWAY ST	BIWAY ST	
Direction	Eastbound	Westbound	TOTAL
12:00 AM	0	0	0
12:15 AM	0	0	0
12:30 AM	3	1	4
12:45 AM	2	3	5
1:00 AM	1	0	1
1:15 AM	1	0	1
1:30 AM	1	0	1
1:45 AM	0	2	2
2:00 AM	0	0	0
2:15 AM	1	0	1
2:30 AM	2	0	2
2:45 AM	0	1	1
3:00 AM	0	0	0
3:15 AM	1	1	2
3:30 AM	0	2	2
3:45 AM	0	0	0
4:00 AM	1	0	1
4:15 AM	0	1	1
4:30 AM	1	0	1
4:45 AM	1	1	2
5:00 AM	2	0	2
5:15 AM	0	0	0
5:30 AM	7	0	7
5:45 AM	4	0	4
6:00 AM	6	1	7
6:15 AM	5	5	10
6:30 AM	7	3	10
6:45 AM	8	5	13
7:00 AM	9	2	11
7:15 AM	17	9	26
7:30 AM	14	18	32
7:45 AM	13	12	25
8:00 AM	18	13	31
8:15 AM	19	11	30
8:30 AM	8	10	18
8:45 AM	15	8	23
9:00 AM	10	12	22
9:15 AM	6	5	11
9:30 AM	10	10	20
9:45 AM	7	10	17
10:00 AM	10	9	19
10:15 AM	14	8	22
10:30 AM	12	5	17
10:45 AM	9	10	19
11:00 AM	6	6	12
11:15 AM	12	10	22
11:30 AM	8	17	25
11:45 AM	9	10	19

Study Name BIWAY ST WEST OF SH 199
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	BIWAY ST	BIWAY ST	
Direction	Eastbound	Westbound	TOTAL
12:00 PM	10	11	21
12:15 PM	16	14	30
12:30 PM	15	25	40
12:45 PM	14	13	27
1:00 PM	17	12	29
1:15 PM	13	9	22
1:30 PM	10	10	20
1:45 PM	13	11	24
2:00 PM	10	9	19
2:15 PM	18	11	29
2:30 PM	17	15	32
2:45 PM	19	11	30
3:00 PM	22	21	43
3:15 PM	24	16	40
3:30 PM	32	17	49
3:45 PM	34	20	54
4:00 PM	56	17	73
4:15 PM	43	19	62
4:30 PM	54	20	74
4:45 PM	35	13	48
5:00 PM	40	16	56
5:15 PM	47	15	62
5:30 PM	37	9	46
5:45 PM	25	15	40
6:00 PM	20	12	32
6:15 PM	17	16	33
6:30 PM	19	13	32
6:45 PM	18	12	30
7:00 PM	16	11	27
7:15 PM	11	13	24
7:30 PM	11	14	25
7:45 PM	10	12	22
8:00 PM	18	11	29
8:15 PM	9	4	13
8:30 PM	14	8	22
8:45 PM	13	8	21
9:00 PM	10	10	20
9:15 PM	4	6	10
9:30 PM	2	11	13
9:45 PM	10	4	14
10:00 PM	10	8	18
10:15 PM	1	3	4
10:30 PM	3	4	7
10:45 PM	2	4	6
11:00 PM	1	0	1
11:15 PM	2	1	3
11:30 PM	0	0	0
11:45 PM	0	2	2
	1122	757	1879

Study Name LONG AVE EAST OF SH 199
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	LONG AVE	LONG AVE	
Direction	Westbound	Eastbound	TOTAL
12:00 AM	9	20	29
12:15 AM	10	13	23
12:30 AM	14	10	24
12:45 AM	11	6	17
1:00 AM	5	7	12
1:15 AM	4	8	12
1:30 AM	9	3	12
1:45 AM	5	6	11
2:00 AM	3	6	9
2:15 AM	4	3	7
2:30 AM	7	2	9
2:45 AM	3	3	6
3:00 AM	5	3	8
3:15 AM	6	6	12
3:30 AM	1	4	5
3:45 AM	4	6	10
4:00 AM	4	5	9
4:15 AM	10	7	17
4:30 AM	12	12	24
4:45 AM	12	4	16
5:00 AM	26	12	38
5:15 AM	22	21	43
5:30 AM	43	30	73
5:45 AM	32	29	61
6:00 AM	45	45	90
6:15 AM	58	40	98
6:30 AM	72	60	132
6:45 AM	80	54	134
7:00 AM	79	49	128
7:15 AM	82	65	147
7:30 AM	119	67	186
7:45 AM	112	79	191
8:00 AM	101	83	184
8:15 AM	84	64	148
8:30 AM	84	47	131
8:45 AM	98	53	151
9:00 AM	73	57	130
9:15 AM	67	53	120
9:30 AM	66	38	104
9:45 AM	71	44	115
10:00 AM	55	69	124
10:15 AM	68	44	112
10:30 AM	52	50	102
10:45 AM	77	55	132
11:00 AM	67	63	130
11:15 AM	92	62	154
11:30 AM	84	76	160
11:45 AM	83	60	143

Study Name LONG AVE EAST OF SH 199
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	LONG AVE	LONG AVE	
Direction	Westbound	Eastbound	TOTAL
12:00 PM	90	70	160
12:15 PM	92	55	147
12:30 PM	61	75	136
12:45 PM	79	73	152
1:00 PM	69	66	135
1:15 PM	78	90	168
1:30 PM	88	71	159
1:45 PM	60	72	132
2:00 PM	60	85	145
2:15 PM	94	81	175
2:30 PM	66	83	149
2:45 PM	93	75	168
3:00 PM	100	73	173
3:15 PM	126	73	199
3:30 PM	108	111	219
3:45 PM	101	112	213
4:00 PM	100	116	216
4:15 PM	118	123	241
4:30 PM	128	118	246
4:45 PM	142	110	252
5:00 PM	140	131	271
5:15 PM	166	135	301
5:30 PM	196	133	329
5:45 PM	168	118	286
6:00 PM	155	118	273
6:15 PM	115	88	203
6:30 PM	131	132	263
6:45 PM	109	107	216
7:00 PM	95	103	198
7:15 PM	97	93	190
7:30 PM	77	79	156
7:45 PM	99	77	176
8:00 PM	74	92	166
8:15 PM	80	91	171
8:30 PM	62	83	145
8:45 PM	71	55	126
9:00 PM	53	79	132
9:15 PM	54	70	124
9:30 PM	53	66	119
9:45 PM	48	59	107
10:00 PM	32	45	77
10:15 PM	36	48	84
10:30 PM	19	38	57
10:45 PM	24	34	58
11:00 PM	20	27	47
11:15 PM	19	22	41
11:30 PM	8	20	28
11:45 PM	16	17	33
	6200	5495	11695

Study Name LONG AVE WEST OF SH 199
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	LONG AVE	LONG AVE	
Direction	Eastbound	Westbound	TOTAL
12:00 AM	2	4	6
12:15 AM	0	3	3
12:30 AM	3	6	9
12:45 AM	1	3	4
1:00 AM	1	3	4
1:15 AM	2	1	3
1:30 AM	0	3	3
1:45 AM	2	2	4
2:00 AM	2	2	4
2:15 AM	2	2	4
2:30 AM	0	2	2
2:45 AM	1	0	1
3:00 AM	0	3	3
3:15 AM	2	3	5
3:30 AM	3	0	3
3:45 AM	2	2	4
4:00 AM	3	3	6
4:15 AM	3	1	4
4:30 AM	2	1	3
4:45 AM	5	1	6
5:00 AM	6	4	10
5:15 AM	11	4	15
5:30 AM	12	6	18
5:45 AM	8	4	12
6:00 AM	16	8	24
6:15 AM	12	13	25
6:30 AM	14	15	29
6:45 AM	14	27	41
7:00 AM	13	15	28
7:15 AM	17	35	52
7:30 AM	25	70	95
7:45 AM	21	55	76
8:00 AM	25	44	69
8:15 AM	15	27	42
8:30 AM	12	29	41
8:45 AM	10	32	42
9:00 AM	10	16	26
9:15 AM	16	22	38
9:30 AM	7	26	33
9:45 AM	9	21	30
10:00 AM	12	19	31
10:15 AM	10	26	36
10:30 AM	11	20	31
10:45 AM	18	24	42
11:00 AM	9	19	28
11:15 AM	11	29	40
11:30 AM	17	30	47
11:45 AM	16	28	44

Study Name LONG AVE WEST OF SH 199
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	LONG AVE	LONG AVE	
Direction	Eastbound	Westbound	TOTAL
12:00 PM	17	33	50
12:15 PM	11	35	46
12:30 PM	15	22	37
12:45 PM	7	34	41
1:00 PM	10	27	37
1:15 PM	18	22	40
1:30 PM	21	32	53
1:45 PM	15	21	36
2:00 PM	13	17	30
2:15 PM	12	31	43
2:30 PM	19	27	46
2:45 PM	15	37	52
3:00 PM	15	42	57
3:15 PM	17	51	68
3:30 PM	17	48	65
3:45 PM	17	51	68
4:00 PM	18	36	54
4:15 PM	18	46	64
4:30 PM	26	51	77
4:45 PM	26	53	79
5:00 PM	23	55	78
5:15 PM	27	78	105
5:30 PM	26	83	109
5:45 PM	21	68	89
6:00 PM	20	63	83
6:15 PM	26	48	74
6:30 PM	20	51	71
6:45 PM	14	35	49
7:00 PM	17	41	58
7:15 PM	14	32	46
7:30 PM	22	33	55
7:45 PM	13	33	46
8:00 PM	18	18	36
8:15 PM	10	27	37
8:30 PM	11	23	34
8:45 PM	13	21	34
9:00 PM	10	18	28
9:15 PM	20	26	46
9:30 PM	9	16	25
9:45 PM	6	26	32
10:00 PM	4	13	17
10:15 PM	6	13	19
10:30 PM	2	8	10
10:45 PM	8	13	21
11:00 PM	6	3	9
11:15 PM	5	7	12
11:30 PM	0	5	5
11:45 PM	2	2	4
	1113	2288	3401

Study Name LOOP 820 NBFR NORTHEAST OF SH 199
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	LOOP 820 NBFR
Direction	Northeastbound
12:00 AM	9
12:15 AM	9
12:30 AM	11
12:45 AM	15
1:00 AM	7
1:15 AM	5
1:30 AM	3
1:45 AM	3
2:00 AM	4
2:15 AM	9
2:30 AM	15
2:45 AM	3
3:00 AM	5
3:15 AM	10
3:30 AM	10
3:45 AM	11
4:00 AM	15
4:15 AM	19
4:30 AM	21
4:45 AM	31
5:00 AM	34
5:15 AM	25
5:30 AM	76
5:45 AM	74
6:00 AM	80
6:15 AM	94
6:30 AM	74
6:45 AM	62
7:00 AM	60
7:15 AM	71
7:30 AM	70
7:45 AM	66
8:00 AM	71
8:15 AM	71
8:30 AM	54
8:45 AM	55
9:00 AM	49
9:15 AM	62
9:30 AM	50
9:45 AM	48
10:00 AM	60
10:15 AM	56
10:30 AM	57
10:45 AM	58
11:00 AM	61
11:15 AM	57
11:30 AM	85
11:45 AM	74

Study Name LOOP 820 NBFR NORTHEAST OF SH 199
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	LOOP 820 NBFR
Direction	Northeastbound
12:00 PM	93
12:15 PM	79
12:30 PM	88
12:45 PM	83
1:00 PM	76
1:15 PM	90
1:30 PM	92
1:45 PM	73
2:00 PM	82
2:15 PM	88
2:30 PM	108
2:45 PM	85
3:00 PM	102
3:15 PM	108
3:30 PM	127
3:45 PM	119
4:00 PM	140
4:15 PM	143
4:30 PM	141
4:45 PM	129
5:00 PM	139
5:15 PM	119
5:30 PM	94
5:45 PM	125
6:00 PM	119
6:15 PM	103
6:30 PM	94
6:45 PM	76
7:00 PM	97
7:15 PM	77
7:30 PM	70
7:45 PM	41
8:00 PM	65
8:15 PM	57
8:30 PM	65
8:45 PM	56
9:00 PM	56
9:15 PM	56
9:30 PM	48
9:45 PM	43
10:00 PM	31
10:15 PM	40
10:30 PM	25
10:45 PM	20
11:00 PM	19
11:15 PM	18
11:30 PM	10
11:45 PM	14
	5792

Study Name LOOP 820 NBFR NORTHWEST OF SH 199
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	LOOP 820 NBFR
Direction	Southeastbound
12:00 AM	6
12:15 AM	13
12:30 AM	4
12:45 AM	9
1:00 AM	3
1:15 AM	1
1:30 AM	2
1:45 AM	3
2:00 AM	1
2:15 AM	1
2:30 AM	5
2:45 AM	5
3:00 AM	3
3:15 AM	0
3:30 AM	2
3:45 AM	0
4:00 AM	2
4:15 AM	3
4:30 AM	2
4:45 AM	6
5:00 AM	2
5:15 AM	11
5:30 AM	9
5:45 AM	11
6:00 AM	9
6:15 AM	13
6:30 AM	15
6:45 AM	42
7:00 AM	24
7:15 AM	46
7:30 AM	60
7:45 AM	56
8:00 AM	54
8:15 AM	49
8:30 AM	43
8:45 AM	45
9:00 AM	31
9:15 AM	29
9:30 AM	36
9:45 AM	32
10:00 AM	29
10:15 AM	27
10:30 AM	29
10:45 AM	36
11:00 AM	47
11:15 AM	50
11:30 AM	48
11:45 AM	44

Study Name LOOP 820 NBFR NORTHWEST OF SH 199
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	LOOP 820 NBFR
Direction	Southeastbound
12:00 PM	47
12:15 PM	39
12:30 PM	37
12:45 PM	45
1:00 PM	40
1:15 PM	49
1:30 PM	46
1:45 PM	45
2:00 PM	31
2:15 PM	38
2:30 PM	38
2:45 PM	23
3:00 PM	42
3:15 PM	44
3:30 PM	53
3:45 PM	51
4:00 PM	59
4:15 PM	47
4:30 PM	50
4:45 PM	64
5:00 PM	66
5:15 PM	71
5:30 PM	92
5:45 PM	80
6:00 PM	75
6:15 PM	62
6:30 PM	61
6:45 PM	53
7:00 PM	50
7:15 PM	40
7:30 PM	52
7:45 PM	40
8:00 PM	26
8:15 PM	36
8:30 PM	37
8:45 PM	25
9:00 PM	31
9:15 PM	17
9:30 PM	23
9:45 PM	13
10:00 PM	13
10:15 PM	20
10:30 PM	10
10:45 PM	9
11:00 PM	7
11:15 PM	9
11:30 PM	5
11:45 PM	10
	2919

Study Name NW 18TH ST EAST OF SH 199
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	NW 18TH ST	NW 18TH ST	
Direction	Westbound	Eastbound	TOTAL
12:00 AM	1	2	3
12:15 AM	2	4	6
12:30 AM	3	3	6
12:45 AM	3	1	4
1:00 AM	2	0	2
1:15 AM	1	1	2
1:30 AM	1	0	1
1:45 AM	1	0	1
2:00 AM	1	2	3
2:15 AM	1	2	3
2:30 AM	2	1	3
2:45 AM	0	0	0
3:00 AM	0	1	1
3:15 AM	0	0	0
3:30 AM	0	0	0
3:45 AM	2	1	3
4:00 AM	0	1	1
4:15 AM	2	2	4
4:30 AM	1	0	1
4:45 AM	4	1	5
5:00 AM	2	3	5
5:15 AM	9	1	10
5:30 AM	8	5	13
5:45 AM	7	5	12
6:00 AM	10	2	12
6:15 AM	10	10	20
6:30 AM	5	2	7
6:45 AM	12	7	19
7:00 AM	15	2	17
7:15 AM	28	14	42
7:30 AM	36	28	64
7:45 AM	30	32	62
8:00 AM	36	20	56
8:15 AM	30	11	41
8:30 AM	15	19	34
8:45 AM	20	14	34
9:00 AM	17	18	35
9:15 AM	29	11	40
9:30 AM	17	18	35
9:45 AM	15	13	28
10:00 AM	17	11	28
10:15 AM	15	13	28
10:30 AM	17	12	29
10:45 AM	18	12	30
11:00 AM	11	13	24
11:15 AM	14	10	24
11:30 AM	18	18	36
11:45 AM	18	17	35

Study Name NW 18TH ST EAST OF SH 199
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	NW 18TH ST	NW 18TH ST	
Direction	Westbound	Eastbound	TOTAL
12:00 PM	27	31	58
12:15 PM	19	24	43
12:30 PM	27	23	50
12:45 PM	23	13	36
1:00 PM	25	27	52
1:15 PM	19	22	41
1:30 PM	25	23	48
1:45 PM	16	22	38
2:00 PM	26	19	45
2:15 PM	19	22	41
2:30 PM	19	19	38
2:45 PM	22	27	49
3:00 PM	25	31	56
3:15 PM	25	27	52
3:30 PM	25	24	49
3:45 PM	19	26	45
4:00 PM	16	38	54
4:15 PM	34	23	57
4:30 PM	34	39	73
4:45 PM	27	28	55
5:00 PM	23	33	56
5:15 PM	29	35	64
5:30 PM	22	21	43
5:45 PM	33	35	68
6:00 PM	34	33	67
6:15 PM	32	29	61
6:30 PM	26	38	64
6:45 PM	29	32	61
7:00 PM	20	21	41
7:15 PM	22	35	57
7:30 PM	20	25	45
7:45 PM	17	27	44
8:00 PM	15	29	44
8:15 PM	16	22	38
8:30 PM	17	14	31
8:45 PM	20	24	44
9:00 PM	18	26	44
9:15 PM	17	19	36
9:30 PM	10	18	28
9:45 PM	17	12	29
10:00 PM	11	13	24
10:15 PM	4	13	17
10:30 PM	1	6	7
10:45 PM	9	7	16
11:00 PM	7	5	12
11:15 PM	2	3	5
11:30 PM	4	4	8
11:45 PM	3	4	7
	1456	1454	2910

Study Name NW 18TH ST WEST OF SH 199
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	NW 18TH ST	NW 18TH ST	
Direction	Eastbound	Westbound	TOTAL
12:00 AM	0	0	0
12:15 AM	0	0	0
12:30 AM	0	0	0
12:45 AM	0	0	0
1:00 AM	0	0	0
1:15 AM	0	0	0
1:30 AM	0	0	0
1:45 AM	0	0	0
2:00 AM	0	0	0
2:15 AM	0	0	0
2:30 AM	0	0	0
2:45 AM	0	0	0
3:00 AM	0	0	0
3:15 AM	0	0	0
3:30 AM	0	0	0
3:45 AM	0	0	0
4:00 AM	0	0	0
4:15 AM	0	0	0
4:30 AM	0	0	0
4:45 AM	0	0	0
5:00 AM	0	0	0
5:15 AM	0	0	0
5:30 AM	0	0	0
5:45 AM	0	4	4
6:00 AM	0	1	1
6:15 AM	1	5	6
6:30 AM	1	10	11
6:45 AM	1	10	11
7:00 AM	0	0	0
7:15 AM	0	2	2
7:30 AM	0	0	0
7:45 AM	1	0	1
8:00 AM	0	0	0
8:15 AM	0	3	3
8:30 AM	4	1	5
8:45 AM	1	3	4
9:00 AM	0	3	3
9:15 AM	0	2	2
9:30 AM	2	1	3
9:45 AM	1	2	3
10:00 AM	1	1	2
10:15 AM	3	2	5
10:30 AM	1	4	5
10:45 AM	4	3	7
11:00 AM	1	1	2
11:15 AM	2	4	6
11:30 AM	3	4	7
11:45 AM	8	2	10

Study Name NW 18TH ST WEST OF SH 199
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	NW 18TH ST	NW 18TH ST	
Direction	Eastbound	Westbound	TOTAL
12:00 PM	8	4	12
12:15 PM	1	6	7
12:30 PM	3	2	5
12:45 PM	2	6	8
1:00 PM	6	1	7
1:15 PM	1	3	4
1:30 PM	1	2	3
1:45 PM	3	0	3
2:00 PM	1	1	2
2:15 PM	2	0	2
2:30 PM	1	2	3
2:45 PM	3	1	4
3:00 PM	2	1	3
3:15 PM	1	2	3
3:30 PM	0	4	4
3:45 PM	1	3	4
4:00 PM	2	2	4
4:15 PM	3	1	4
4:30 PM	1	2	3
4:45 PM	0	2	2
5:00 PM	2	5	7
5:15 PM	3	22	25
5:30 PM	22	13	35
5:45 PM	8	6	14
6:00 PM	2	1	3
6:15 PM	6	5	11
6:30 PM	0	4	4
6:45 PM	11	1	12
7:00 PM	34	1	35
7:15 PM	10	1	11
7:30 PM	2	0	2
7:45 PM	0	0	0
8:00 PM	0	0	0
8:15 PM	0	0	0
8:30 PM	0	0	0
8:45 PM	0	0	0
9:00 PM	0	0	0
9:15 PM	0	0	0
9:30 PM	0	0	0
9:45 PM	0	0	0
10:00 PM	0	0	0
10:15 PM	0	0	0
10:30 PM	0	0	0
10:45 PM	0	0	0
11:00 PM	0	0	0
11:15 PM	0	0	0
11:30 PM	0	0	0
11:45 PM	0	0	0
	177	172	349

Study Name OHIO GARDEN RD EAST OF SH 199
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	FIELDER ST	FIELDER ST	
Direction	Westbound	Eastbound	TOTAL
12:00 AM	0	0	0
12:15 AM	0	0	0
12:30 AM	0	0	0
12:45 AM	0	0	0
1:00 AM	0	0	0
1:15 AM	0	0	0
1:30 AM	0	0	0
1:45 AM	0	0	0
2:00 AM	0	0	0
2:15 AM	0	0	0
2:30 AM	0	0	0
2:45 AM	0	0	0
3:00 AM	0	0	0
3:15 AM	0	0	0
3:30 AM	1	0	1
3:45 AM	0	0	0
4:00 AM	0	0	0
4:15 AM	0	0	0
4:30 AM	0	0	0
4:45 AM	0	0	0
5:00 AM	0	0	0
5:15 AM	0	0	0
5:30 AM	0	0	0
5:45 AM	0	0	0
6:00 AM	0	0	0
6:15 AM	0	0	0
6:30 AM	0	0	0
6:45 AM	3	0	3
7:00 AM	1	0	1
7:15 AM	0	0	0
7:30 AM	2	0	2
7:45 AM	2	0	2
8:00 AM	18	0	18
8:15 AM	14	1	15
8:30 AM	2	0	2
8:45 AM	2	0	2
9:00 AM	3	0	3
9:15 AM	2	1	3
9:30 AM	0	0	0
9:45 AM	2	0	2
10:00 AM	0	0	0
10:15 AM	0	0	0
10:30 AM	1	0	1
10:45 AM	2	0	2
11:00 AM	3	0	3
11:15 AM	1	0	1
11:30 AM	5	1	6
11:45 AM	5	1	6

Study Name OHIO GARDEN RD EAST OF SH 199
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	FIELDER ST	FIELDER ST	
Direction	Westbound	Eastbound	TOTAL
12:00 PM	2	1	3
12:15 PM	0	0	0
12:30 PM	11	1	12
12:45 PM	5	0	5
1:00 PM	4	1	5
1:15 PM	2	0	2
1:30 PM	0	0	0
1:45 PM	1	0	1
2:00 PM	1	1	2
2:15 PM	2	0	2
2:30 PM	0	1	1
2:45 PM	6	0	6
3:00 PM	1	1	2
3:15 PM	2	0	2
3:30 PM	12	0	12
3:45 PM	3	0	3
4:00 PM	2	0	2
4:15 PM	2	1	3
4:30 PM	3	2	5
4:45 PM	5	0	5
5:00 PM	1	0	1
5:15 PM	3	2	5
5:30 PM	2	0	2
5:45 PM	6	0	6
6:00 PM	4	0	4
6:15 PM	1	1	2
6:30 PM	1	1	2
6:45 PM	4	0	4
7:00 PM	0	0	0
7:15 PM	2	1	3
7:30 PM	1	0	1
7:45 PM	2	0	2
8:00 PM	4	1	5
8:15 PM	2	0	2
8:30 PM	1	0	1
8:45 PM	2	0	2
9:00 PM	0	0	0
9:15 PM	0	0	0
9:30 PM	0	0	0
9:45 PM	2	0	2
10:00 PM	2	1	3
10:15 PM	0	0	0
10:30 PM	1	0	1
10:45 PM	0	0	0
11:00 PM	0	0	0
11:15 PM	0	0	0
11:30 PM	0	1	1
11:45 PM	0	0	0
	174	21	195

Study Name OHIO GARDEN RD WEST OF SH 199
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	OHIO GARDEN RD	OHIO GARDEN RD	
Direction	Eastbound	Westbound	TOTAL
12:00 AM	6	8	14
12:15 AM	2	8	10
12:30 AM	1	5	6
12:45 AM	6	5	11
1:00 AM	1	5	6
1:15 AM	1	2	3
1:30 AM	1	4	5
1:45 AM	4	2	6
2:00 AM	4	3	7
2:15 AM	3	3	6
2:30 AM	5	2	7
2:45 AM	1	2	3
3:00 AM	1	3	4
3:15 AM	1	1	2
3:30 AM	1	4	5
3:45 AM	3	3	6
4:00 AM	1	2	3
4:15 AM	4	1	5
4:30 AM	10	3	13
4:45 AM	10	1	11
5:00 AM	15	3	18
5:15 AM	16	2	18
5:30 AM	29	4	33
5:45 AM	24	4	28
6:00 AM	32	6	38
6:15 AM	28	6	34
6:30 AM	23	14	37
6:45 AM	33	15	48
7:00 AM	26	23	49
7:15 AM	49	20	69
7:30 AM	55	24	79
7:45 AM	66	29	95
8:00 AM	49	26	75
8:15 AM	28	24	52
8:30 AM	35	22	57
8:45 AM	23	23	46
9:00 AM	28	14	42
9:15 AM	25	19	44
9:30 AM	19	20	39
9:45 AM	19	17	36
10:00 AM	19	17	36
10:15 AM	21	28	49
10:30 AM	16	16	32
10:45 AM	26	22	48
11:00 AM	27	27	54
11:15 AM	18	18	36
11:30 AM	18	12	30
11:45 AM	19	27	46

Study Name OHIO GARDEN RD WEST OF SH 199
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	OHIO GARDEN RD	OHIO GARDEN RD	
Direction	Eastbound	Westbound	TOTAL
12:00 PM	31	31	62
12:15 PM	37	33	70
12:30 PM	25	24	49
12:45 PM	24	31	55
1:00 PM	29	35	64
1:15 PM	22	34	56
1:30 PM	32	38	70
1:45 PM	27	25	52
2:00 PM	35	34	69
2:15 PM	23	23	46
2:30 PM	39	29	68
2:45 PM	32	37	69
3:00 PM	36	54	90
3:15 PM	32	51	83
3:30 PM	43	44	87
3:45 PM	39	54	93
4:00 PM	46	68	114
4:15 PM	46	59	105
4:30 PM	39	71	110
4:45 PM	37	72	109
5:00 PM	31	47	78
5:15 PM	44	66	110
5:30 PM	48	75	123
5:45 PM	38	71	109
6:00 PM	40	72	112
6:15 PM	41	73	114
6:30 PM	38	44	82
6:45 PM	28	53	81
7:00 PM	42	54	96
7:15 PM	37	54	91
7:30 PM	31	38	69
7:45 PM	31	30	61
8:00 PM	27	44	71
8:15 PM	38	38	76
8:30 PM	25	27	52
8:45 PM	17	49	66
9:00 PM	22	12	34
9:15 PM	7	20	27
9:30 PM	22	27	49
9:45 PM	16	20	36
10:00 PM	10	16	26
10:15 PM	18	11	29
10:30 PM	7	19	26
10:45 PM	11	18	29
11:00 PM	8	13	21
11:15 PM	7	12	19
11:30 PM	5	11	16
11:45 PM	3	7	10
	2218	2417	4635

Study Name ROBERTS CUT OFF RD EAST OF SH 199
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	ROBERTS CUT OFF RD	ROBERTS CUT OFF RD	
Direction	Westbound	Eastbound	TOTAL
12:00 AM	4	0	4
12:15 AM	2	0	2
12:30 AM	0	2	2
12:45 AM	1	2	3
1:00 AM	1	3	4
1:15 AM	0	0	0
1:30 AM	1	1	2
1:45 AM	0	0	0
2:00 AM	3	1	4
2:15 AM	0	3	3
2:30 AM	3	3	6
2:45 AM	0	1	1
3:00 AM	1	1	2
3:15 AM	2	0	2
3:30 AM	3	0	3
3:45 AM	1	1	2
4:00 AM	1	2	3
4:15 AM	3	1	4
4:30 AM	1	2	3
4:45 AM	5	2	7
5:00 AM	3	2	5
5:15 AM	6	4	10
5:30 AM	8	5	13
5:45 AM	15	9	24
6:00 AM	15	1	16
6:15 AM	17	9	26
6:30 AM	20	7	27
6:45 AM	27	18	45
7:00 AM	24	6	30
7:15 AM	31	13	44
7:30 AM	39	13	52
7:45 AM	34	36	70
8:00 AM	32	27	59
8:15 AM	29	25	54
8:30 AM	24	19	43
8:45 AM	24	12	36
9:00 AM	13	16	29
9:15 AM	26	11	37
9:30 AM	27	17	44
9:45 AM	40	25	65
10:00 AM	24	14	38
10:15 AM	27	15	42
10:30 AM	32	15	47
10:45 AM	29	25	54
11:00 AM	25	21	46
11:15 AM	35	31	66
11:30 AM	31	18	49
11:45 AM	40	36	76

Study Name ROBERTS CUT OFF RD EAST OF SH 199
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	ROBERTS CUT OFF RD	ROBERTS CUT OFF RD	
Direction	Westbound	Eastbound	TOTAL
12:00 PM	48	33	81
12:15 PM	43	32	75
12:30 PM	30	25	55
12:45 PM	36	46	82
1:00 PM	47	31	78
1:15 PM	42	33	75
1:30 PM	31	33	64
1:45 PM	42	31	73
2:00 PM	27	26	53
2:15 PM	34	36	70
2:30 PM	30	42	72
2:45 PM	39	35	74
3:00 PM	32	41	73
3:15 PM	33	22	55
3:30 PM	43	34	77
3:45 PM	37	42	79
4:00 PM	39	41	80
4:15 PM	41	47	88
4:30 PM	45	47	92
4:45 PM	33	50	83
5:00 PM	59	34	93
5:15 PM	48	38	86
5:30 PM	73	45	118
5:45 PM	47	27	74
6:00 PM	52	42	94
6:15 PM	31	34	65
6:30 PM	28	36	64
6:45 PM	28	50	78
7:00 PM	37	36	73
7:15 PM	27	39	66
7:30 PM	21	25	46
7:45 PM	17	24	41
8:00 PM	13	22	35
8:15 PM	25	17	42
8:30 PM	23	18	41
8:45 PM	24	17	41
9:00 PM	22	17	39
9:15 PM	14	8	22
9:30 PM	13	11	24
9:45 PM	15	9	24
10:00 PM	11	8	19
10:15 PM	8	11	19
10:30 PM	6	8	14
10:45 PM	8	12	20
11:00 PM	6	2	8
11:15 PM	6	2	8
11:30 PM	2	0	2
11:45 PM	5	5	10
	2150	1799	3949

Study Name ROBERTS CUT OFF RD WEST OF SH 199
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	ROBERTS CUT OFF RD	ROBERTS CUT OFF RD	
Direction	Eastbound	Westbound	TOTAL
12:00 AM	7	16	23
12:15 AM	9	12	21
12:30 AM	15	8	23
12:45 AM	7	10	17
1:00 AM	6	4	10
1:15 AM	2	6	8
1:30 AM	3	2	5
1:45 AM	2	5	7
2:00 AM	3	7	10
2:15 AM	6	5	11
2:30 AM	11	2	13
2:45 AM	6	4	10
3:00 AM	2	6	8
3:15 AM	2	2	4
3:30 AM	2	2	4
3:45 AM	9	6	15
4:00 AM	10	3	13
4:15 AM	10	7	17
4:30 AM	13	10	23
4:45 AM	15	9	24
5:00 AM	18	18	36
5:15 AM	19	30	49
5:30 AM	51	45	96
5:45 AM	41	64	105
6:00 AM	48	117	165
6:15 AM	76	122	198
6:30 AM	56	117	173
6:45 AM	63	145	208
7:00 AM	55	177	232
7:15 AM	73	206	279
7:30 AM	88	213	301
7:45 AM	93	193	286
8:00 AM	77	135	212
8:15 AM	76	105	181
8:30 AM	65	105	170
8:45 AM	51	101	152
9:00 AM	56	65	121
9:15 AM	48	83	131
9:30 AM	55	78	133
9:45 AM	56	75	131
10:00 AM	51	68	119
10:15 AM	54	73	127
10:30 AM	57	60	117
10:45 AM	73	57	130
11:00 AM	53	66	119
11:15 AM	72	54	126
11:30 AM	76	73	149
11:45 AM	66	68	134

Study Name ROBERTS CUT OFF RD WEST OF SH 199
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	ROBERTS CUT OFF RD	ROBERTS CUT OFF RD	
Direction	Eastbound	Westbound	TOTAL
12:00 PM	79	73	152
12:15 PM	77	68	145
12:30 PM	78	90	168
12:45 PM	82	84	166
1:00 PM	66	102	168
1:15 PM	84	79	163
1:30 PM	90	87	177
1:45 PM	67	74	141
2:00 PM	62	74	136
2:15 PM	90	72	162
2:30 PM	99	96	195
2:45 PM	80	87	167
3:00 PM	111	93	204
3:15 PM	104	98	202
3:30 PM	110	90	200
3:45 PM	114	100	214
4:00 PM	111	99	210
4:15 PM	130	91	221
4:30 PM	113	118	231
4:45 PM	121	80	201
5:00 PM	115	86	201
5:15 PM	99	77	176
5:30 PM	120	89	209
5:45 PM	105	101	206
6:00 PM	104	74	178
6:15 PM	93	84	177
6:30 PM	118	73	191
6:45 PM	91	75	166
7:00 PM	79	87	166
7:15 PM	90	88	178
7:30 PM	92	62	154
7:45 PM	54	55	109
8:00 PM	65	50	115
8:15 PM	57	61	118
8:30 PM	60	51	111
8:45 PM	52	47	99
9:00 PM	56	43	99
9:15 PM	43	41	84
9:30 PM	53	27	80
9:45 PM	53	32	85
10:00 PM	19	35	54
10:15 PM	25	27	52
10:30 PM	17	21	38
10:45 PM	31	20	51
11:00 PM	11	28	39
11:15 PM	17	12	29
11:30 PM	8	13	21
11:45 PM	13	14	27
	5415	6067	11482

Study Name SH 183 EAST OF SH 199
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	SH 183	SH 183	
Direction	Westbound	Eastbound	TOTAL
12:00 AM	21	16	37
12:15 AM	13	11	24
12:30 AM	18	18	36
12:45 AM	7	18	25
1:00 AM	9	8	17
1:15 AM	9	7	16
1:30 AM	8	9	17
1:45 AM	15	7	22
2:00 AM	2	8	10
2:15 AM	6	16	22
2:30 AM	7	6	13
2:45 AM	10	6	16
3:00 AM	10	4	14
3:15 AM	8	6	14
3:30 AM	2	11	13
3:45 AM	5	5	10
4:00 AM	6	9	15
4:15 AM	12	8	20
4:30 AM	15	15	30
4:45 AM	17	18	35
5:00 AM	21	22	43
5:15 AM	25	43	68
5:30 AM	49	46	95
5:45 AM	42	45	87
6:00 AM	38	58	96
6:15 AM	49	60	109
6:30 AM	75	86	161
6:45 AM	69	60	129
7:00 AM	62	84	146
7:15 AM	115	103	218
7:30 AM	140	140	280
7:45 AM	129	105	234
8:00 AM	116	122	238
8:15 AM	95	92	187
8:30 AM	95	97	192
8:45 AM	105	127	232
9:00 AM	86	112	198
9:15 AM	98	106	204
9:30 AM	101	122	223
9:45 AM	85	116	201
10:00 AM	95	97	192
10:15 AM	95	119	214
10:30 AM	125	140	265
10:45 AM	117	92	209
11:00 AM	125	135	260
11:15 AM	101	138	239
11:30 AM	111	127	238
11:45 AM	136	141	277

Study Name SH 183 EAST OF SH 199
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	SH 183	SH 183	
Direction	Westbound	Eastbound	TOTAL
12:00 PM	138	152	290
12:15 PM	129	141	270
12:30 PM	133	167	300
12:45 PM	134	157	291
1:00 PM	144	138	282
1:15 PM	129	142	271
1:30 PM	142	141	283
1:45 PM	99	153	252
2:00 PM	133	164	297
2:15 PM	114	142	256
2:30 PM	141	149	290
2:45 PM	127	144	271
3:00 PM	133	143	276
3:15 PM	174	180	354
3:30 PM	154	158	312
3:45 PM	178	208	386
4:00 PM	143	207	350
4:15 PM	131	182	313
4:30 PM	168	163	331
4:45 PM	163	201	364
5:00 PM	164	200	364
5:15 PM	172	215	387
5:30 PM	230	199	429
5:45 PM	187	202	389
6:00 PM	178	170	348
6:15 PM	157	163	320
6:30 PM	151	171	322
6:45 PM	139	153	292
7:00 PM	134	158	292
7:15 PM	132	156	288
7:30 PM	120	128	248
7:45 PM	116	135	251
8:00 PM	137	124	261
8:15 PM	82	118	200
8:30 PM	100	129	229
8:45 PM	91	102	193
9:00 PM	103	116	219
9:15 PM	73	97	170
9:30 PM	74	88	162
9:45 PM	59	69	128
10:00 PM	68	58	126
10:15 PM	56	55	111
10:30 PM	43	47	90
10:45 PM	36	29	65
11:00 PM	28	41	69
11:15 PM	27	30	57
11:30 PM	21	25	46
11:45 PM	17	22	39
	8402	9373	17775

Study Name SH 183 WEST OF SH 199
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	SH 183	SH 183	
Direction	Eastbound	Westbound	TOTAL
12:00 AM	36	23	59
12:15 AM	18	20	38
12:30 AM	18	25	43
12:45 AM	13	15	28
1:00 AM	6	10	16
1:15 AM	11	13	24
1:30 AM	8	8	16
1:45 AM	8	13	21
2:00 AM	6	8	14
2:15 AM	6	7	13
2:30 AM	8	10	18
2:45 AM	11	19	30
3:00 AM	10	12	22
3:15 AM	7	15	22
3:30 AM	12	5	17
3:45 AM	11	8	19
4:00 AM	16	9	25
4:15 AM	13	8	21
4:30 AM	29	13	42
4:45 AM	25	20	45
5:00 AM	41	23	64
5:15 AM	70	26	96
5:30 AM	90	48	138
5:45 AM	93	41	134
6:00 AM	114	56	170
6:15 AM	112	60	172
6:30 AM	143	71	214
6:45 AM	99	78	177
7:00 AM	131	97	228
7:15 AM	159	127	286
7:30 AM	224	161	385
7:45 AM	176	160	336
8:00 AM	204	155	359
8:15 AM	132	156	288
8:30 AM	145	112	257
8:45 AM	139	114	253
9:00 AM	150	111	261
9:15 AM	120	126	246
9:30 AM	117	112	229
9:45 AM	141	122	263
10:00 AM	135	98	233
10:15 AM	137	128	265
10:30 AM	150	131	281
10:45 AM	122	133	255
11:00 AM	154	154	308
11:15 AM	167	157	324
11:30 AM	158	135	293
11:45 AM	174	169	343

Study Name SH 183 WEST OF SH 199
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	SH 183	SH 183	
Direction	Eastbound	Westbound	TOTAL
12:00 PM	192	170	362
12:15 PM	175	173	348
12:30 PM	187	175	362
12:45 PM	206	167	373
1:00 PM	143	155	298
1:15 PM	209	151	360
1:30 PM	166	176	342
1:45 PM	194	131	325
2:00 PM	190	154	344
2:15 PM	191	151	342
2:30 PM	171	150	321
2:45 PM	192	167	359
3:00 PM	193	189	382
3:15 PM	222	244	466
3:30 PM	229	187	416
3:45 PM	272	218	490
4:00 PM	270	183	453
4:15 PM	243	191	434
4:30 PM	217	208	425
4:45 PM	267	208	475
5:00 PM	281	186	467
5:15 PM	259	227	486
5:30 PM	220	254	474
5:45 PM	235	209	444
6:00 PM	232	221	453
6:15 PM	219	205	424
6:30 PM	216	185	401
6:45 PM	188	193	381
7:00 PM	183	152	335
7:15 PM	174	162	336
7:30 PM	135	150	285
7:45 PM	180	128	308
8:00 PM	122	142	264
8:15 PM	151	129	280
8:30 PM	133	134	267
8:45 PM	125	95	220
9:00 PM	151	129	280
9:15 PM	131	97	228
9:30 PM	127	97	224
9:45 PM	76	87	163
10:00 PM	70	73	143
10:15 PM	61	86	147
10:30 PM	54	65	119
10:45 PM	34	33	67
11:00 PM	35	41	76
11:15 PM	25	36	61
11:30 PM	31	35	66
11:45 PM	29	33	62
	12075	10454	22529

Study Name SKYLINE DR EAST OF SH 199
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	SKYLINE DR	SKYLINE DR	
Direction	Westbound	Eastbound	TOTAL
12:00 AM	1	1	2
12:15 AM	0	1	1
12:30 AM	0	2	2
12:45 AM	0	0	0
1:00 AM	0	0	0
1:15 AM	2	1	3
1:30 AM	0	1	1
1:45 AM	1	1	2
2:00 AM	0	0	0
2:15 AM	0	0	0
2:30 AM	1	3	4
2:45 AM	0	0	0
3:00 AM	2	0	2
3:15 AM	2	0	2
3:30 AM	0	0	0
3:45 AM	1	1	2
4:00 AM	2	0	2
4:15 AM	2	0	2
4:30 AM	2	1	3
4:45 AM	0	2	2
5:00 AM	2	0	2
5:15 AM	2	0	2
5:30 AM	0	1	1
5:45 AM	5	2	7
6:00 AM	9	1	10
6:15 AM	7	2	9
6:30 AM	9	3	12
6:45 AM	5	6	11
7:00 AM	10	15	25
7:15 AM	29	25	54
7:30 AM	25	28	53
7:45 AM	29	26	55
8:00 AM	22	20	42
8:15 AM	17	6	23
8:30 AM	16	10	26
8:45 AM	18	10	28
9:00 AM	9	5	14
9:15 AM	8	8	16
9:30 AM	14	14	28
9:45 AM	12	17	29
10:00 AM	6	11	17
10:15 AM	7	5	12
10:30 AM	6	13	19
10:45 AM	10	18	28
11:00 AM	6	16	22
11:15 AM	17	14	31
11:30 AM	23	9	32
11:45 AM	12	16	28

Study Name SKYLINE DR EAST OF SH 199
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	SKYLINE DR	SKYLINE DR	
Direction	Westbound	Eastbound	TOTAL
12:00 PM	12	20	32
12:15 PM	22	14	36
12:30 PM	11	14	25
12:45 PM	5	16	21
1:00 PM	12	20	32
1:15 PM	13	15	28
1:30 PM	15	14	29
1:45 PM	13	17	30
2:00 PM	14	3	17
2:15 PM	11	19	30
2:30 PM	12	20	32
2:45 PM	15	27	42
3:00 PM	19	24	43
3:15 PM	25	18	43
3:30 PM	16	17	33
3:45 PM	17	25	42
4:00 PM	17	25	42
4:15 PM	23	25	48
4:30 PM	17	33	50
4:45 PM	22	29	51
5:00 PM	9	33	42
5:15 PM	23	28	51
5:30 PM	17	36	53
5:45 PM	16	26	42
6:00 PM	14	12	26
6:15 PM	12	18	30
6:30 PM	11	18	29
6:45 PM	6	17	23
7:00 PM	12	13	25
7:15 PM	10	18	28
7:30 PM	10	11	21
7:45 PM	9	12	21
8:00 PM	5	17	22
8:15 PM	8	14	22
8:30 PM	14	12	26
8:45 PM	6	14	20
9:00 PM	2	13	15
9:15 PM	2	8	10
9:30 PM	5	12	17
9:45 PM	5	6	11
10:00 PM	2	10	12
10:15 PM	2	5	7
10:30 PM	5	5	10
10:45 PM	0	3	3
11:00 PM	2	4	6
11:15 PM	1	2	3
11:30 PM	3	3	6
11:45 PM	3	1	4
	876	1081	1957

Study Name SKYLINE DR WEST OF SH 199
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	SKYLINE DR	SKYLINE DR	
Direction	Eastbound	Westbound	TOTAL
12:00 AM	4	4	8
12:15 AM	1	3	4
12:30 AM	4	2	6
12:45 AM	1	1	2
1:00 AM	0	1	1
1:15 AM	4	4	8
1:30 AM	3	0	3
1:45 AM	0	3	3
2:00 AM	3	0	3
2:15 AM	0	2	2
2:30 AM	1	3	4
2:45 AM	0	2	2
3:00 AM	4	1	5
3:15 AM	1	0	1
3:30 AM	1	0	1
3:45 AM	0	2	2
4:00 AM	2	0	2
4:15 AM	3	1	4
4:30 AM	5	6	11
4:45 AM	6	5	11
5:00 AM	8	4	12
5:15 AM	4	5	9
5:30 AM	14	12	26
5:45 AM	10	12	22
6:00 AM	14	15	29
6:15 AM	22	16	38
6:30 AM	13	11	24
6:45 AM	23	16	39
7:00 AM	22	22	44
7:15 AM	35	28	63
7:30 AM	33	36	69
7:45 AM	35	40	75
8:00 AM	22	17	39
8:15 AM	13	27	40
8:30 AM	17	22	39
8:45 AM	15	39	54
9:00 AM	12	21	33
9:15 AM	19	12	31
9:30 AM	16	21	37
9:45 AM	26	17	43
10:00 AM	17	19	36
10:15 AM	12	14	26
10:30 AM	18	14	32
10:45 AM	21	23	44
11:00 AM	13	17	30
11:15 AM	25	21	46
11:30 AM	21	20	41
11:45 AM	27	21	48

Study Name SKYLINE DR WEST OF SH 199
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	SKYLINE DR	SKYLINE DR	
Direction	Eastbound	Westbound	TOTAL
12:00 PM	36	20	56
12:15 PM	17	24	41
12:30 PM	17	17	34
12:45 PM	16	18	34
1:00 PM	24	27	51
1:15 PM	25	22	47
1:30 PM	20	23	43
1:45 PM	24	24	48
2:00 PM	23	13	36
2:15 PM	30	23	53
2:30 PM	34	16	50
2:45 PM	28	18	46
3:00 PM	33	35	68
3:15 PM	31	27	58
3:30 PM	29	36	65
3:45 PM	31	17	48
4:00 PM	49	35	84
4:15 PM	51	33	84
4:30 PM	38	23	61
4:45 PM	45	32	77
5:00 PM	46	25	71
5:15 PM	40	27	67
5:30 PM	43	31	74
5:45 PM	40	36	76
6:00 PM	32	32	64
6:15 PM	27	33	60
6:30 PM	25	25	50
6:45 PM	30	24	54
7:00 PM	23	34	57
7:15 PM	24	30	54
7:30 PM	23	29	52
7:45 PM	9	13	22
8:00 PM	13	13	26
8:15 PM	22	15	37
8:30 PM	19	23	42
8:45 PM	19	13	32
9:00 PM	10	14	24
9:15 PM	19	19	38
9:30 PM	16	20	36
9:45 PM	10	13	23
10:00 PM	19	8	27
10:15 PM	11	10	21
10:30 PM	7	7	14
10:45 PM	6	2	8
11:00 PM	3	6	9
11:15 PM	2	5	7
11:30 PM	0	4	4
11:45 PM	2	4	6
	1711	1580	3291

Study Name SKYLINE DR WEST OF SH 199
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	SKYLINE DR	SKYLINE DR	
Direction	Eastbound	Westbound	TOTAL
12:00 AM	4	4	8
12:15 AM	1	3	4
12:30 AM	4	2	6
12:45 AM	1	1	2
1:00 AM	0	1	1
1:15 AM	4	4	8
1:30 AM	3	0	3
1:45 AM	0	3	3
2:00 AM	3	0	3
2:15 AM	0	2	2
2:30 AM	1	3	4
2:45 AM	0	2	2
3:00 AM	4	1	5
3:15 AM	1	0	1
3:30 AM	1	0	1
3:45 AM	0	2	2
4:00 AM	2	0	2
4:15 AM	3	1	4
4:30 AM	5	6	11
4:45 AM	6	5	11
5:00 AM	8	4	12
5:15 AM	4	5	9
5:30 AM	14	12	26
5:45 AM	10	12	22
6:00 AM	14	15	29
6:15 AM	22	16	38
6:30 AM	13	11	24
6:45 AM	23	16	39
7:00 AM	22	22	44
7:15 AM	35	28	63
7:30 AM	33	36	69
7:45 AM	35	40	75
8:00 AM	22	17	39
8:15 AM	13	27	40
8:30 AM	17	22	39
8:45 AM	15	39	54
9:00 AM	12	21	33
9:15 AM	19	12	31
9:30 AM	16	21	37
9:45 AM	26	17	43
10:00 AM	17	19	36
10:15 AM	12	14	26
10:30 AM	18	14	32
10:45 AM	21	23	44
11:00 AM	13	17	30
11:15 AM	25	21	46
11:30 AM	21	20	41
11:45 AM	27	21	48

Study Name SKYLINE DR WEST OF SH 199
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	SKYLINE DR	SKYLINE DR	
Direction	Eastbound	Westbound	TOTAL
12:00 PM	36	20	56
12:15 PM	17	24	41
12:30 PM	17	17	34
12:45 PM	16	18	34
1:00 PM	24	27	51
1:15 PM	25	22	47
1:30 PM	20	23	43
1:45 PM	24	24	48
2:00 PM	23	13	36
2:15 PM	30	23	53
2:30 PM	34	16	50
2:45 PM	28	18	46
3:00 PM	33	35	68
3:15 PM	31	27	58
3:30 PM	29	36	65
3:45 PM	31	17	48
4:00 PM	49	35	84
4:15 PM	51	33	84
4:30 PM	38	23	61
4:45 PM	45	32	77
5:00 PM	46	25	71
5:15 PM	40	27	67
5:30 PM	43	31	74
5:45 PM	40	36	76
6:00 PM	32	32	64
6:15 PM	27	33	60
6:30 PM	25	25	50
6:45 PM	30	24	54
7:00 PM	23	34	57
7:15 PM	24	30	54
7:30 PM	23	29	52
7:45 PM	9	13	22
8:00 PM	13	13	26
8:15 PM	22	15	37
8:30 PM	19	23	42
8:45 PM	19	13	32
9:00 PM	10	14	24
9:15 PM	19	19	38
9:30 PM	16	20	36
9:45 PM	10	13	23
10:00 PM	19	8	27
10:15 PM	11	10	21
10:30 PM	7	7	14
10:45 PM	6	2	8
11:00 PM	3	6	9
11:15 PM	2	5	7
11:30 PM	0	4	4
11:45 PM	2	4	6
	1711	1580	3291

Study Name YEARY ST EAST OF SH 199
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	YEARY ST	YEARY ST	
Direction	Westbound	Eastbound	TOTAL
12:00 AM	5	4	9
12:15 AM	3	3	6
12:30 AM	3	1	4
12:45 AM	3	1	4
1:00 AM	1	2	3
1:15 AM	1	0	1
1:30 AM	2	1	3
1:45 AM	0	3	3
2:00 AM	2	2	4
2:15 AM	0	0	0
2:30 AM	4	5	9
2:45 AM	1	2	3
3:00 AM	1	2	3
3:15 AM	4	2	6
3:30 AM	2	0	2
3:45 AM	0	2	2
4:00 AM	2	1	3
4:15 AM	3	1	4
4:30 AM	0	0	0
4:45 AM	2	4	6
5:00 AM	4	3	7
5:15 AM	1	2	3
5:30 AM	5	8	13
5:45 AM	4	6	10
6:00 AM	8	4	12
6:15 AM	7	10	17
6:30 AM	8	1	9
6:45 AM	6	8	14
7:00 AM	7	7	14
7:15 AM	10	11	21
7:30 AM	8	12	20
7:45 AM	16	11	27
8:00 AM	7	12	19
8:15 AM	15	6	21
8:30 AM	5	9	14
8:45 AM	6	10	16
9:00 AM	9	7	16
9:15 AM	11	11	22
9:30 AM	12	5	17
9:45 AM	9	3	12
10:00 AM	4	6	10
10:15 AM	11	8	19
10:30 AM	5	5	10
10:45 AM	8	4	12
11:00 AM	10	10	20
11:15 AM	7	7	14
11:30 AM	6	4	10
11:45 AM	8	14	22

Study Name YEARY ST EAST OF SH 199
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	YEARY ST	YEARY ST	
Direction	Westbound	Eastbound	TOTAL
12:00 PM	16	13	29
12:15 PM	17	10	27
12:30 PM	10	12	22
12:45 PM	12	8	20
1:00 PM	14	5	19
1:15 PM	8	9	17
1:30 PM	9	9	18
1:45 PM	12	5	17
2:00 PM	7	4	11
2:15 PM	5	4	9
2:30 PM	9	7	16
2:45 PM	5	4	9
3:00 PM	5	9	14
3:15 PM	7	6	13
3:30 PM	10	4	14
3:45 PM	5	5	10
4:00 PM	10	3	13
4:15 PM	1	5	6
4:30 PM	6	3	9
4:45 PM	5	7	12
5:00 PM	12	8	20
5:15 PM	10	4	14
5:30 PM	8	9	17
5:45 PM	12	7	19
6:00 PM	9	12	21
6:15 PM	13	10	23
6:30 PM	6	4	10
6:45 PM	5	7	12
7:00 PM	12	12	24
7:15 PM	14	7	21
7:30 PM	10	9	19
7:45 PM	10	5	15
8:00 PM	5	9	14
8:15 PM	5	6	11
8:30 PM	4	6	10
8:45 PM	10	0	10
9:00 PM	14	4	18
9:15 PM	4	9	13
9:30 PM	10	5	15
9:45 PM	5	3	8
10:00 PM	4	8	12
10:15 PM	10	5	15
10:30 PM	5	4	9
10:45 PM	7	4	11
11:00 PM	4	6	10
11:15 PM	5	5	10
11:30 PM	6	2	8
11:45 PM	5	6	11
	653	548	1201

Study Name YEARY ST WEST OF SH 199
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	YEARY ST	YEARY ST	
Direction	Eastbound	Westbound	TOTAL
12:00 AM	0	1	1
12:15 AM	0	1	1
12:30 AM	0	0	0
12:45 AM	0	0	0
1:00 AM	0	0	0
1:15 AM	0	0	0
1:30 AM	0	0	0
1:45 AM	0	0	0
2:00 AM	0	0	0
2:15 AM	0	0	0
2:30 AM	0	0	0
2:45 AM	0	0	0
3:00 AM	0	1	1
3:15 AM	0	1	1
3:30 AM	0	0	0
3:45 AM	0	0	0
4:00 AM	0	0	0
4:15 AM	0	0	0
4:30 AM	0	0	0
4:45 AM	0	0	0
5:00 AM	0	0	0
5:15 AM	0	0	0
5:30 AM	0	1	1
5:45 AM	0	1	1
6:00 AM	0	0	0
6:15 AM	0	1	1
6:30 AM	0	2	2
6:45 AM	0	0	0
7:00 AM	0	0	0
7:15 AM	1	3	4
7:30 AM	0	0	0
7:45 AM	0	3	3
8:00 AM	0	12	12
8:15 AM	0	7	7
8:30 AM	0	4	4
8:45 AM	0	8	8
9:00 AM	0	13	13
9:15 AM	1	13	14
9:30 AM	0	12	12
9:45 AM	1	10	11
10:00 AM	1	12	13
10:15 AM	1	9	10
10:30 AM	0	12	12
10:45 AM	0	12	12
11:00 AM	0	8	8
11:15 AM	0	14	14
11:30 AM	0	7	7
11:45 AM	0	14	14

Study Name YEARY ST WEST OF SH 199
Start Date 04/13/2016
Start Time 12:00 AM
Site Code

Channel	YEARY ST	YEARY ST	
Direction	Eastbound	Westbound	TOTAL
12:00 PM	0	14	14
12:15 PM	0	20	20
12:30 PM	0	17	17
12:45 PM	0	10	10
1:00 PM	0	10	10
1:15 PM	0	11	11
1:30 PM	0	16	16
1:45 PM	0	8	8
2:00 PM	0	13	13
2:15 PM	0	20	20
2:30 PM	0	10	10
2:45 PM	0	5	5
3:00 PM	0	9	9
3:15 PM	0	18	18
3:30 PM	0	9	9
3:45 PM	0	9	9
4:00 PM	0	13	13
4:15 PM	0	11	11
4:30 PM	0	14	14
4:45 PM	0	16	16
5:00 PM	3	8	11
5:15 PM	0	3	3
5:30 PM	1	5	6
5:45 PM	0	9	9
6:00 PM	0	6	6
6:15 PM	1	2	3
6:30 PM	0	4	4
6:45 PM	0	3	3
7:00 PM	0	5	5
7:15 PM	0	4	4
7:30 PM	0	3	3
7:45 PM	0	5	5
8:00 PM	0	1	1
8:15 PM	0	1	1
8:30 PM	1	0	1
8:45 PM	0	1	1
9:00 PM	0	0	0
9:15 PM	1	2	3
9:30 PM	0	2	2
9:45 PM	0	3	3
10:00 PM	0	0	0
10:15 PM	0	2	2
10:30 PM	0	3	3
10:45 PM	0	0	0
11:00 PM	0	3	3
11:15 PM	0	1	1
11:30 PM	0	1	1
11:45 PM	0	0	0
	12	512	524

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Attachment B

Synchro Output

Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Traffic Volume (vph)	2	23	1457	690	19	604	22	251	44	40	55	53	29
Future Volume (vph)	2	23	1457	690	19	604	22	251	44	40	55	53	29
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.0	6.0	6.0	7.0	6.0	6.0		7.5	7.5		7.5	7.5
Lane Util. Factor		1.00	0.95	1.00	1.00	0.95	1.00		1.00	1.00		1.00	1.00
Frt		1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85		1.00	0.85
Flt Protected		0.95	1.00	1.00	0.95	1.00	1.00		0.96	1.00		0.98	1.00
Satd. Flow (prot)		1787	3574	1599	1719	3438	1538		1804	1599		1835	1599
Flt Permitted		0.95	1.00	1.00	0.95	1.00	1.00		0.96	1.00		0.98	1.00
Satd. Flow (perm)		1787	3574	1599	1719	3438	1538		1804	1599		1835	1599
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2	25	1584	750	21	657	24	273	48	43	60	58	32
RTOR Reduction (vph)	0	0	0	229	0	0	13	0	0	34	0	0	29
Lane Group Flow (vph)	0	27	1584	521	21	657	11	0	321	9	0	118	3
Heavy Vehicles (%)	1%	1%	1%	1%	5%	5%	5%	1%	1%	1%	1%	1%	1%
Turn Type	Prot	Prot	NA	Perm	Prot	NA	Perm	Split	NA	Perm	Split	NA	Perm
Protected Phases	5	5	2		1	6		3	3		4	4	
Permitted Phases				2			6			3			4
Actuated Green, G (s)		4.4	67.2	67.2	4.2	67.0	67.0		28.2	28.2		12.4	12.4
Effective Green, g (s)		4.4	67.2	67.2	4.2	67.0	67.0		28.2	28.2		12.4	12.4
Actuated g/C Ratio		0.03	0.48	0.48	0.03	0.48	0.48		0.20	0.20		0.09	0.09
Clearance Time (s)		7.0	6.0	6.0	7.0	6.0	6.0		7.5	7.5		7.5	7.5
Vehicle Extension (s)		2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0		3.0	3.0
Lane Grp Cap (vph)		56	1715	767	51	1645	736		363	322		162	141
v/s Ratio Prot		c0.02	c0.44		0.01	0.19			c0.18			c0.06	
v/s Ratio Perm				0.33			0.01			0.01			0.00
v/c Ratio		0.48	0.92	0.68	0.41	0.40	0.02		0.88	0.03		0.73	0.02
Uniform Delay, d1		66.7	34.0	28.1	66.7	23.5	19.2		54.3	44.9		62.2	58.3
Progression Factor		1.00	1.00	1.00	0.94	1.30	1.00		1.00	1.00		1.00	1.00
Incremental Delay, d2		2.4	9.9	4.8	1.9	0.7	0.0		21.1	0.0		15.1	0.1
Delay (s)		69.0	43.9	32.9	64.7	31.2	19.2		75.4	44.9		77.2	58.3
Level of Service		E	D	C	E	C	B		E	D		E	E
Approach Delay (s)			40.7			31.8			71.8			73.2	
Approach LOS			D			C			E			E	

Intersection Summary			
HCM 2000 Control Delay	43.5	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	28.0
Intersection Capacity Utilization	74.4%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Traffic Volume (vph)	4	1527	21	3	8	599	21	19	22	21	52	23	19
Future Volume (vph)	4	1527	21	3	8	599	21	19	22	21	52	23	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	5.5	5.5		6.0	5.5	5.5		6.0	6.0		6.0	
Lane Util. Factor	1.00	0.95	1.00		1.00	0.95	1.00		1.00	1.00		1.00	
Frt	1.00	1.00	0.85		1.00	1.00	0.85		1.00	0.85		0.97	
Flt Protected	0.95	1.00	1.00		0.95	1.00	1.00		0.98	1.00		0.97	
Satd. Flow (prot)	1787	3574	1599		1752	3505	1568		1688	1468		1696	
Flt Permitted	0.95	1.00	1.00		0.95	1.00	1.00		0.79	1.00		0.80	
Satd. Flow (perm)	1787	3574	1599		1752	3505	1568		1368	1468		1400	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	4	1660	23	3	9	651	23	21	24	23	57	25	21
RTOR Reduction (vph)	0	0	6	0	0	0	5	0	0	21	0	7	0
Lane Group Flow (vph)	4	1660	17	0	12	651	18	0	45	2	0	96	0
Heavy Vehicles (%)	1%	1%	1%	3%	3%	3%	3%	10%	10%	10%	6%	6%	6%
Turn Type	Prot	NA	Perm	Prot	Prot	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases	5	2		1	1	6			8			4	
Permitted Phases			2				6	8		8	4		
Actuated Green, G (s)	1.2	103.8	103.8		4.8	107.4	107.4		13.9	13.9		13.9	
Effective Green, g (s)	1.2	103.8	103.8		4.8	107.4	107.4		13.9	13.9		13.9	
Actuated g/C Ratio	0.01	0.74	0.74		0.03	0.77	0.77		0.10	0.10		0.10	
Clearance Time (s)	6.0	5.5	5.5		6.0	5.5	5.5		6.0	6.0		6.0	
Vehicle Extension (s)	2.0	2.0	2.0		2.0	2.0	2.0		2.0	2.0		2.0	
Lane Grp Cap (vph)	15	2649	1185		60	2688	1202		135	145		139	
v/s Ratio Prot	0.00	c0.46			0.01	c0.19							
v/s Ratio Perm			0.01				0.01		0.03	0.00		c0.07	
v/c Ratio	0.27	0.63	0.01		0.20	0.24	0.01		0.33	0.02		0.69	
Uniform Delay, d1	69.0	8.7	4.7		65.7	4.7	3.8		58.7	56.9		61.0	
Progression Factor	1.54	0.43	1.00		1.00	1.00	1.00		1.00	1.00		1.00	
Incremental Delay, d2	1.7	0.5	0.0		0.6	0.2	0.0		0.5	0.0		10.8	
Delay (s)	108.2	4.3	4.7		66.3	4.9	3.9		59.3	56.9		71.7	
Level of Service	F	A	A		E	A	A		E	E		E	
Approach Delay (s)		4.5				5.9			58.5			71.7	
Approach LOS		A				A			E			E	

Intersection Summary			
HCM 2000 Control Delay	9.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	17.5
Intersection Capacity Utilization	66.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Traffic Volume (vph)	4	19	1540	40	28	574	30	43	50	34	42	53	10
Future Volume (vph)	4	19	1540	40	28	574	30	43	50	34	42	53	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.8	5.8	5.8	5.8	5.8	5.8		6.6			6.6	
Lane Util. Factor		1.00	0.95	1.00	1.00	0.95	1.00		1.00			1.00	
Frt		1.00	1.00	0.85	1.00	1.00	0.85		0.96			0.99	
Flt Protected		0.95	1.00	1.00	0.95	1.00	1.00		0.98			0.98	
Satd. Flow (prot)		1770	3539	1583	1770	3539	1583		1765			1803	
Flt Permitted		0.40	1.00	1.00	0.09	1.00	1.00		0.81			0.75	
Satd. Flow (perm)		739	3539	1583	168	3539	1583		1461			1379	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	4	21	1674	43	30	624	33	47	54	37	46	58	11
RTOR Reduction (vph)	0	0	0	13	0	0	10	0	10	0	0	3	0
Lane Group Flow (vph)	0	25	1674	30	30	624	23	0	128	0	0	113	0
Turn Type	pm+pt	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	5	2		1	6			8			4	
Permitted Phases	2	2		2	6		6	8			4		
Actuated Green, G (s)		106.8	103.2	103.2	106.8	103.2	103.2		25.0			25.0	
Effective Green, g (s)		106.8	103.2	103.2	106.8	103.2	103.2		25.0			25.0	
Actuated g/C Ratio		0.71	0.69	0.69	0.71	0.69	0.69		0.17			0.17	
Clearance Time (s)		5.8	5.8	5.8	5.8	5.8	5.8		6.6			6.6	
Vehicle Extension (s)		2.0	4.5	4.5	2.0	4.5	4.5		2.0			2.0	
Lane Grp Cap (vph)		550	2434	1089	158	2434	1089		243			229	
v/s Ratio Prot		0.00	c0.47		c0.00	0.18							
v/s Ratio Perm		0.03		0.02	0.13		0.01		c0.09			0.08	
v/c Ratio		0.05	0.69	0.03	0.19	0.26	0.02		0.53			0.49	
Uniform Delay, d1		6.4	13.9	7.4	12.1	8.9	7.4		57.1			56.7	
Progression Factor		1.00	1.00	1.00	1.24	1.66	78.91		1.00			1.00	
Incremental Delay, d2		0.0	1.6	0.0	0.2	0.2	0.0		1.0			0.6	
Delay (s)		6.4	15.5	7.5	15.1	14.9	584.5		58.0			57.3	
Level of Service		A	B	A	B	B	F		E			E	
Approach Delay (s)			15.1			42.3			58.0			57.3	
Approach LOS			B			D			E			E	

Intersection Summary			
HCM 2000 Control Delay	26.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	18.2
Intersection Capacity Utilization	73.7%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations														
Traffic Volume (vph)	2	43	1500	71	3	5	566	208	20	53	15	244	128	42
Future Volume (vph)	2	43	1500	71	3	5	566	208	20	53	15	244	128	42
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.1	6.1	6.1		6.1	6.1	6.1	5.9	5.9		5.9	5.9	5.9
Lane Util. Factor		1.00	0.95	1.00		1.00	0.95	1.00	1.00	1.00		1.00	1.00	1.00
Frt		1.00	1.00	0.85		1.00	1.00	0.85	1.00	0.97		1.00	1.00	0.85
Flt Protected		0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1770	3539	1583		1770	3539	1583	1770	1802		1770	1863	1583
Flt Permitted		0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)		1770	3539	1583		1770	3539	1583	1770	1802		1770	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2	47	1630	77	3	5	615	226	22	58	16	265	139	46
RTOR Reduction (vph)	0	0	0	33	0	0	0	105	0	6	0	0	0	38
Lane Group Flow (vph)	0	49	1630	44	0	8	615	121	22	68	0	265	139	8
Turn Type	Prot	Prot	NA	Perm	Prot	Prot	NA	Perm	Split	NA		Split	NA	Perm
Protected Phases	1	1	6		5	5	2		4	4		8	8	
Permitted Phases				6				2						8
Actuated Green, G (s)		7.7	86.6	86.6		1.6	80.5	80.5	11.3	11.3		26.5	26.5	26.5
Effective Green, g (s)		7.7	86.6	86.6		1.6	80.5	80.5	11.3	11.3		26.5	26.5	26.5
Actuated g/C Ratio		0.05	0.58	0.58		0.01	0.54	0.54	0.08	0.08		0.18	0.18	0.18
Clearance Time (s)		6.1	6.1	6.1		6.1	6.1	6.1	5.9	5.9		5.9	5.9	5.9
Vehicle Extension (s)		2.0	5.0	5.0		2.0	5.0	5.0	3.0	3.0		2.0	2.0	2.0
Lane Grp Cap (vph)		90	2043	913		18	1899	849	133	135		312	329	279
v/s Ratio Prot		0.03	c0.46			0.00	c0.17		0.01	c0.04		c0.15	0.07	
v/s Ratio Perm				0.03				0.08						0.01
v/c Ratio		0.54	0.80	0.05		0.44	0.32	0.14	0.17	0.50		0.85	0.42	0.03
Uniform Delay, d1		69.4	24.8	13.8		73.8	19.5	17.4	64.9	66.6		59.8	54.9	51.1
Progression Factor		1.37	0.52	0.22		1.24	0.96	2.55	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2		2.7	2.5	0.1		5.8	0.4	0.3	0.6	2.9		18.2	0.3	0.0
Delay (s)		97.5	15.5	3.2		97.6	19.1	44.8	65.5	69.5		78.1	55.3	51.1
Level of Service		F	B	A		F	B	D	E	E		E	E	D
Approach Delay (s)			17.2				26.7			68.6			68.3	
Approach LOS			B				C			E			E	

Intersection Summary			
HCM 2000 Control Delay	28.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	24.0
Intersection Capacity Utilization	71.6%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Lane Configurations														
Traffic Volume (vph)	1	65	1517	169	190	525	83	214	321	228	1	203	252	44
Future Volume (vph)	1	65	1517	169	190	525	83	214	321	228	1	203	252	44
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.7	6.7	6.7	6.7	6.7	6.7	6.3	6.3	6.3		6.3	6.3	6.3
Lane Util. Factor		0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00		0.97	0.95	1.00
Frt		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85		1.00	1.00	0.85
Flt Protected		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00		0.95	1.00	1.00
Satd. Flow (prot)		3467	3574	1599	3367	3471	1553	3433	3539	1583		3433	3539	1583
Flt Permitted		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00		0.95	1.00	1.00
Satd. Flow (perm)		3467	3574	1599	3367	3471	1553	3433	3539	1583		3433	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1	71	1649	184	207	571	90	233	349	248	1	221	274	48
RTOR Reduction (vph)	0	0	0	81	0	0	59	0	0	148	0	0	0	42
Lane Group Flow (vph)	0	72	1649	103	207	571	31	233	349	100	0	222	274	6
Heavy Vehicles (%)	1%	1%	1%	1%	4%	4%	4%	2%	2%	2%	2%	2%	2%	2%
Turn Type	Prot	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	Prot	NA	Perm
Protected Phases	1	1	6		5	2		7	4		3	3	8	
Permitted Phases				6			2			4				8
Actuated Green, G (s)		39.4	76.3	76.3	14.1	51.0	51.0	13.4	19.5	19.5		14.1	20.2	20.2
Effective Green, g (s)		39.4	76.3	76.3	14.1	51.0	51.0	13.4	19.5	19.5		14.1	20.2	20.2
Actuated g/C Ratio		0.26	0.51	0.51	0.09	0.34	0.34	0.09	0.13	0.13		0.09	0.13	0.13
Clearance Time (s)		6.7	6.7	6.7	6.7	6.7	6.7	6.3	6.3	6.3		6.3	6.3	6.3
Vehicle Extension (s)		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	2.0
Lane Grp Cap (vph)		910	1817	813	316	1180	528	306	460	205		322	476	213
v/s Ratio Prot		0.02	c0.46		c0.06	0.16		0.07	c0.10			c0.06	c0.08	
v/s Ratio Perm				0.06			0.02			0.06				0.00
v/c Ratio		0.08	0.91	0.13	0.66	0.48	0.06	0.76	0.76	0.49		0.69	0.58	0.03
Uniform Delay, d1		41.6	33.6	19.4	65.6	39.1	33.3	66.7	63.0	60.6		65.8	60.9	56.4
Progression Factor		0.83	0.67	1.13	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2		0.0	5.6	0.2	3.7	1.4	0.2	9.6	6.3	0.7		4.8	1.1	0.0
Delay (s)		34.8	28.3	22.0	69.3	40.5	33.5	76.4	69.3	61.3		70.7	61.9	56.4
Level of Service		C	C	C	E	D	C	E	E	E		E	E	E
Approach Delay (s)			28.0			46.7			68.9				65.0	
Approach LOS			C			D			E				E	

Intersection Summary			
HCM 2000 Control Delay	44.9	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	26.0
Intersection Capacity Utilization	83.7%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	1908	30	30	763	5	30	0	30	5	0	5
Future Volume (vph)	5	1908	30	30	763	5	30	0	30	5	0	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.3	6.3	6.3	6.3	6.3	6.3		5.5	5.5	5.5	5.5	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00		1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85	1.00	0.85	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.95	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583		1770	1583	1770	1583	
Flt Permitted	0.32	1.00	1.00	0.06	1.00	1.00		0.75	1.00	0.74	1.00	
Satd. Flow (perm)	598	3539	1583	118	3539	1583		1405	1583	1370	1583	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	5	2074	33	33	829	5	33	0	33	5	0	5
RTOR Reduction (vph)	0	0	11	0	0	2	0	0	31	0	4	0
Lane Group Flow (vph)	5	2074	22	33	829	3	0	33	2	5	1	0
Turn Type	D.P+P	NA	Perm	D.P+P	NA	Perm	D.P+P	NA	Perm	D.P+P	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	2		6	6		2	8		4	4		
Actuated Green, G (s)	66.0	63.0	63.0	66.0	65.2	65.2		5.6	5.6	6.5	12.0	
Effective Green, g (s)	66.0	63.0	63.0	66.0	65.2	65.2		5.6	5.6	6.5	12.0	
Actuated g/C Ratio	0.69	0.66	0.66	0.69	0.68	0.68		0.06	0.06	0.07	0.12	
Clearance Time (s)	6.3	6.3	6.3	6.3	6.3	6.3		5.5	5.5	5.5	5.5	
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	2.0	2.0	
Lane Grp Cap (vph)	420	2320	1037	132	2401	1074		81	92	96	197	
v/s Ratio Prot	0.00	c0.59		c0.01	0.23					c0.00	0.00	
v/s Ratio Perm	0.01		0.01	0.16		0.00		c0.02	0.00	0.00		
v/c Ratio	0.01	0.89	0.02	0.25	0.35	0.00		0.41	0.02	0.05	0.00	
Uniform Delay, d1	4.8	13.8	5.8	16.1	6.5	5.0		43.6	42.7	41.9	36.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.0	4.8	0.0	0.4	0.0	0.0		1.2	0.0	0.1	0.0	
Delay (s)	4.8	18.5	5.8	16.5	6.5	5.0		44.9	42.7	42.0	36.8	
Level of Service	A	B	A	B	A	A		D	D	D	D	
Approach Delay (s)		18.3			6.9			43.8			39.4	
Approach LOS		B			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	15.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	96.1	Sum of lost time (s)	23.6
Intersection Capacity Utilization	77.2%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1919	24	75	751	25	194
Future Volume (vph)	1919	24	75	751	25	194
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.2	6.2	6.2	6.2	5.2	5.2
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3539	1583	1770	3539	1770	1583
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	3539	1583	1770	3539	1770	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2086	26	82	816	27	211
RTOR Reduction (vph)	0	3	0	0	0	198
Lane Group Flow (vph)	2086	23	82	816	27	13
Turn Type	NA	Perm	Prot	NA	Prot	Perm
Protected Phases	6		5	2	4	
Permitted Phases		6				4
Actuated Green, G (s)	111.9	111.9	11.2	129.3	9.3	9.3
Effective Green, g (s)	111.9	111.9	11.2	129.3	9.3	9.3
Actuated g/C Ratio	0.75	0.75	0.07	0.86	0.06	0.06
Clearance Time (s)	6.2	6.2	6.2	6.2	5.2	5.2
Vehicle Extension (s)	0.2	0.2	2.0	0.2	2.0	2.0
Lane Grp Cap (vph)	2640	1180	132	3050	109	98
v/s Ratio Prot	c0.59		c0.05	0.23	c0.02	
v/s Ratio Perm		0.01				0.01
v/c Ratio	0.79	0.02	0.62	0.27	0.25	0.13
Uniform Delay, d1	11.8	4.9	67.3	1.9	67.0	66.5
Progression Factor	1.00	1.00	0.85	1.29	1.00	1.00
Incremental Delay, d2	2.5	0.0	6.2	0.2	0.4	0.2
Delay (s)	14.3	4.9	63.3	2.6	67.5	66.8
Level of Service	B	A	E	A	E	E
Approach Delay (s)	14.2			8.2	66.8	
Approach LOS	B			A	E	

Intersection Summary			
HCM 2000 Control Delay	16.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	21.6
Intersection Capacity Utilization	83.8%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBU	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations							
Traffic Volume (vph)	1	182	1930	660	149	178	165
Future Volume (vph)	1	182	1930	660	149	178	165
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0	6.0	6.0	5.2	5.2
Lane Util. Factor		1.00	0.95	0.95	1.00	0.97	1.00
Frt		1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected		0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)		1770	3539	3539	1583	3433	1583
Flt Permitted		0.35	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)		643	3539	3539	1583	3433	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1	198	2098	717	162	193	179
RTOR Reduction (vph)	0	0	0	0	42	0	163
Lane Group Flow (vph)	0	199	2098	717	120	193	16
Turn Type	pm+pt	pm+pt	NA	NA	Perm	Prot	Perm
Protected Phases	1	1	6	2		4	
Permitted Phases	6	6			2		4
Actuated Green, G (s)		125.4	125.4	110.7	110.7	13.4	13.4
Effective Green, g (s)		125.4	125.4	110.7	110.7	13.4	13.4
Actuated g/C Ratio		0.84	0.84	0.74	0.74	0.09	0.09
Clearance Time (s)		6.0	6.0	6.0	6.0	5.2	5.2
Vehicle Extension (s)		2.5	2.5	2.5	2.5	2.5	2.5
Lane Grp Cap (vph)		602	2958	2611	1168	306	141
v/s Ratio Prot		0.02	c0.59	0.20		c0.06	
v/s Ratio Perm		0.26			0.08		0.01
v/c Ratio		0.33	0.71	0.27	0.10	0.63	0.11
Uniform Delay, d1		2.8	5.0	6.5	5.6	65.9	62.8
Progression Factor		0.40	0.86	0.50	0.02	1.00	1.00
Incremental Delay, d2		0.1	0.9	0.3	0.2	3.7	0.3
Delay (s)		1.3	5.1	3.5	0.3	69.6	63.1
Level of Service		A	A	A	A	E	E
Approach Delay (s)			4.8	2.9		66.5	
Approach LOS			A	A		E	

Intersection Summary			
HCM 2000 Control Delay	10.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	17.2
Intersection Capacity Utilization	71.0%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Traffic Volume (vph)	75	2033	0	4	2	738	19	1	0	0	60	0	70
Future Volume (vph)	75	2033	0	4	2	738	19	1	0	0	60	0	70
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0			6.0	6.0	6.0		5.2			5.2	
Lane Util. Factor	1.00	0.95			1.00	0.95	1.00		1.00			1.00	
Frt	1.00	1.00			1.00	1.00	0.85		1.00			0.93	
Flt Protected	0.95	1.00			0.95	1.00	1.00		0.95			0.98	
Satd. Flow (prot)	1787	3574			1736	3471	1553		1787			1722	
Flt Permitted	0.31	1.00			0.05	1.00	1.00		0.50			0.85	
Satd. Flow (perm)	589	3574			88	3471	1553		934			1501	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	82	2210	0	4	2	802	21	1	0	0	65	0	76
RTOR Reduction (vph)	0	0	0	0	0	0	5	0	0	0	0	59	0
Lane Group Flow (vph)	82	2210	0	0	6	802	16	0	1	0	0	82	0
Heavy Vehicles (%)	1%	1%	1%	4%	4%	4%	4%	1%	1%	1%	0%	0%	0%
Turn Type	pm+pt	NA	Perm	pm+pt	pm+pt	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	1	6		5	5	2			4			8	
Permitted Phases	6		6	2	2		2	4			8		
Actuated Green, G (s)	125.1	117.5			112.7	111.1	111.1		13.7			13.7	
Effective Green, g (s)	125.1	117.5			112.7	111.1	111.1		13.7			13.7	
Actuated g/C Ratio	0.83	0.78			0.75	0.74	0.74		0.09			0.09	
Clearance Time (s)	6.0	6.0			6.0	6.0	6.0		5.2			5.2	
Vehicle Extension (s)	2.5	2.5			2.5	2.5	2.5		2.5			2.5	
Lane Grp Cap (vph)	555	2799			83	2570	1150		85			137	
v/s Ratio Prot	c0.01	c0.62			0.00	0.23							
v/s Ratio Perm	0.12				0.05		0.01		0.00			c0.05	
v/c Ratio	0.15	0.79			0.07	0.31	0.01		0.01			0.60	
Uniform Delay, d1	2.7	9.2			12.3	6.6	5.1		62.0			65.5	
Progression Factor	0.62	0.98			0.79	0.93	1.00		1.00			1.00	
Incremental Delay, d2	0.1	1.7			0.2	0.3	0.0		0.0			5.8	
Delay (s)	1.7	10.8			10.0	6.4	5.1		62.0			71.3	
Level of Service	A	B			A	A	A		E			E	
Approach Delay (s)		10.5				6.4			62.0			71.3	
Approach LOS		B				A			E			E	

Intersection Summary			
HCM 2000 Control Delay	12.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	17.2
Intersection Capacity Utilization	80.0%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Traffic Volume (vph)	150	1440	507	4	71	454	83	210	437	79	184	513	99
Future Volume (vph)	150	1440	507	4	71	454	83	210	437	79	184	513	99
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.3	6.3	6.3		6.3	6.3	6.3	6.2	6.2	6.2	6.2	6.2	6.2
Lane Util. Factor	1.00	0.95	1.00		1.00	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1787	3574	1599		1736	3471	1553	3367	3471	1553	1752	3505	1568
Flt Permitted	0.42	1.00	1.00		0.06	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	791	3574	1599		105	3471	1553	3367	3471	1553	1752	3505	1568
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	163	1565	551	4	77	493	90	228	475	86	200	558	108
RTOR Reduction (vph)	0	0	175	0	0	0	49	0	0	72	0	0	83
Lane Group Flow (vph)	163	1565	376	0	81	493	41	228	475	14	200	558	25
Heavy Vehicles (%)	1%	1%	1%	4%	4%	4%	4%	4%	4%	4%	3%	3%	3%
Turn Type	D.P+P	NA	Perm	D.P+P	D.P+P	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	1	6		5	5	2		7	4		3	8	
Permitted Phases	2		6	6	6		2			4			8
Actuated Green, G (s)	77.1	69.5	69.5		77.1	68.4	68.4	13.0	25.0	25.0	22.9	34.9	34.9
Effective Green, g (s)	77.1	69.5	69.5		77.1	68.4	68.4	13.0	25.0	25.0	22.9	34.9	34.9
Actuated g/C Ratio	0.51	0.46	0.46		0.51	0.46	0.46	0.09	0.17	0.17	0.15	0.23	0.23
Clearance Time (s)	6.3	6.3	6.3		6.3	6.3	6.3	6.2	6.2	6.2	6.2	6.2	6.2
Vehicle Extension (s)	2.0	2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lane Grp Cap (vph)	464	1655	740		136	1582	708	291	578	258	267	815	364
v/s Ratio Prot	0.02	c0.44			c0.03	0.14		0.07	c0.14		0.11	c0.16	
v/s Ratio Perm	0.16		0.24		0.27		0.03			0.01			0.02
v/c Ratio	0.35	0.95	0.51		0.60	0.31	0.06	0.78	0.82	0.06	0.75	0.68	0.07
Uniform Delay, d1	19.7	38.4	28.3		32.4	25.9	22.8	67.1	60.3	52.6	60.8	52.5	44.9
Progression Factor	0.80	0.92	1.04		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.1	8.9	1.6		4.6	0.5	0.2	12.0	8.8	0.0	17.4	4.6	0.4
Delay (s)	15.8	44.2	30.9		37.0	26.4	23.0	79.1	69.1	52.6	78.2	57.2	45.2
Level of Service	B	D	C		D	C	C	E	E	D	E	E	D
Approach Delay (s)		39.0				27.2			70.2			60.5	
Approach LOS		D				C			E			E	

Intersection Summary			
HCM 2000 Control Delay	46.7	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	25.0
Intersection Capacity Utilization	87.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Traffic Volume (vph)	29	37	833	271	17	1480	64	396	43	0	56	65	104
Future Volume (vph)	29	37	833	271	17	1480	64	396	43	0	56	65	104
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.0	6.0	6.0	7.0	6.0	6.0		7.5			7.5	4.0
Lane Util. Factor		1.00	0.95	1.00	1.00	0.95	1.00		1.00			1.00	1.00
Frt		1.00	1.00	0.85	1.00	1.00	0.85		1.00			1.00	0.85
Flt Protected		0.95	1.00	1.00	0.95	1.00	1.00		0.96			0.98	1.00
Satd. Flow (prot)		1787	3574	1599	1787	3574	1599		1818			1857	1615
Flt Permitted		0.95	1.00	1.00	0.95	1.00	1.00		0.96			0.98	1.00
Satd. Flow (perm)		1787	3574	1599	1787	3574	1599		1818			1857	1615
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	32	40	905	295	18	1609	70	430	47	0	61	71	113
RTOR Reduction (vph)	0	0	0	155	0	0	41	0	0	0	0	0	0
Lane Group Flow (vph)	0	72	905	140	18	1609	29	0	477	0	0	132	113
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	Prot	NA	Perm	Prot	NA	Perm	Split	NA	Perm	Split	NA	Free
Protected Phases	5	5	2		1	6		3	3		4	4	
Permitted Phases				2			6			3			Free
Actuated Green, G (s)		8.3	63.1	63.1	2.9	57.7	57.7		35.5			10.5	140.0
Effective Green, g (s)		8.3	63.1	63.1	2.9	57.7	57.7		35.5			10.5	140.0
Actuated g/C Ratio		0.06	0.45	0.45	0.02	0.41	0.41		0.25			0.08	1.00
Clearance Time (s)		7.0	6.0	6.0	7.0	6.0	6.0		7.5			7.5	
Vehicle Extension (s)		2.0	2.0	2.0	2.0	2.0	2.0		2.0			3.0	
Lane Grp Cap (vph)		105	1610	720	37	1472	659		460			139	1615
v/s Ratio Prot		c0.04	c0.25		0.01	c0.45			c0.26			c0.07	
v/s Ratio Perm				0.09			0.02						0.07
v/c Ratio		0.69	0.56	0.19	0.49	1.09	0.04		1.04			0.95	0.07
Uniform Delay, d1		64.6	28.3	23.2	67.8	41.1	24.6		52.2			64.5	0.0
Progression Factor		1.00	1.00	1.00	0.89	1.05	1.00		1.00			1.00	1.00
Incremental Delay, d2		13.8	1.4	0.6	3.0	51.6	0.1		51.8			60.3	0.1
Delay (s)		78.3	29.7	23.8	63.6	94.8	24.7		104.1			124.8	0.1
Level of Service		E	C	C	E	F	C		F			F	A
Approach Delay (s)			31.1			91.6			104.1			67.3	
Approach LOS			C			F			F			E	

Intersection Summary			
HCM 2000 Control Delay	70.8	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	28.0
Intersection Capacity Utilization	93.0%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations														
Traffic Volume (vph)	1	32	820	14	8	22	1407	50	86	43	24	31	19	20
Future Volume (vph)	1	32	820	14	8	22	1407	50	86	43	24	31	19	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	5.5	5.5		6.0	5.5	5.5		6.0	6.0		6.0	
Lane Util. Factor		1.00	0.95	1.00		1.00	0.95	1.00		1.00	1.00		1.00	
Frt		1.00	1.00	0.85		1.00	1.00	0.85		1.00	0.85		0.96	
Flt Protected		0.95	1.00	1.00		0.95	1.00	1.00		0.97	1.00		0.98	
Satd. Flow (prot)		1787	3574	1599		1787	3574	1599		1839	1615		1770	
Flt Permitted		0.95	1.00	1.00		0.95	1.00	1.00		0.75	1.00		0.63	
Satd. Flow (perm)		1787	3574	1599		1787	3574	1599		1426	1615		1137	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1	35	891	15	9	24	1529	54	93	47	26	34	21	22
RTOR Reduction (vph)	0	0	0	5	0	0	0	16	0	0	23	0	12	0
Lane Group Flow (vph)	0	36	891	10	0	33	1529	38	0	140	3	0	65	0
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	0%	0%	0%	1%	1%	1%
Turn Type	Prot	Prot	NA	Perm	Prot	Prot	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases	5	5	2		1	1	6			8			4	
Permitted Phases				2				6	8		8	4		
Actuated Green, G (s)		6.4	96.1	96.1		8.4	98.1	98.1		18.0	18.0		18.0	
Effective Green, g (s)		6.4	96.1	96.1		8.4	98.1	98.1		18.0	18.0		18.0	
Actuated g/C Ratio		0.05	0.69	0.69		0.06	0.70	0.70		0.13	0.13		0.13	
Clearance Time (s)		6.0	5.5	5.5		6.0	5.5	5.5		6.0	6.0		6.0	
Vehicle Extension (s)		2.0	2.0	2.0		2.0	2.0	2.0		2.0	2.0		2.0	
Lane Grp Cap (vph)		81	2453	1097		107	2504	1120		183	207		146	
v/s Ratio Prot		0.02	c0.25			0.02	c0.43							
v/s Ratio Perm				0.01				0.02		c0.10	0.00		0.06	
v/c Ratio		0.44	0.36	0.01		0.31	0.61	0.03		0.77	0.02		0.44	
Uniform Delay, d1		65.1	9.2	6.9		63.0	11.0	6.4		59.0	53.3		56.4	
Progression Factor		1.49	0.16	1.00		1.00	1.00	1.00		1.00	1.00		1.00	
Incremental Delay, d2		1.2	0.4	0.0		0.6	1.1	0.1		15.6	0.0		0.8	
Delay (s)		97.8	1.8	6.9		63.6	12.1	6.5		74.6	53.3		57.2	
Level of Service		F	A	A		E	B	A		E	D		E	
Approach Delay (s)			5.6				12.9			71.2			57.2	
Approach LOS			A				B			E			E	

Intersection Summary			
HCM 2000 Control Delay	15.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	17.5
Intersection Capacity Utilization	59.3%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations														
Traffic Volume (vph)	7	20	782	44	6	49	1443	35	62	68	36	17	26	22
Future Volume (vph)	7	20	782	44	6	49	1443	35	62	68	36	17	26	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.8	5.8	5.8		5.8	5.8	5.8		6.6			6.6	
Lane Util. Factor		1.00	0.95	1.00		1.00	0.95	1.00		1.00			1.00	
Frt		1.00	1.00	0.85		1.00	1.00	0.85		0.97			0.95	
Flt Protected		0.95	1.00	1.00		0.95	1.00	1.00		0.98			0.99	
Satd. Flow (prot)		1770	3539	1583		1770	3539	1583		1775			1754	
Flt Permitted		0.10	1.00	1.00		0.29	1.00	1.00		0.86			0.90	
Satd. Flow (perm)		181	3539	1583		531	3539	1583		1560			1595	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	8	22	850	48	7	53	1568	38	67	74	39	18	28	24
RTOR Reduction (vph)	0	0	0	18	0	0	0	14	0	9	0	0	16	0
Lane Group Flow (vph)	0	30	850	30	0	60	1568	24	0	171	0	0	54	0
Turn Type	pm+pt	pm+pt	NA	Perm	pm+pt	pm+pt	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	5	2		1	1	6			8			4	
Permitted Phases	2	2		2	6	6		6	8			4		
Actuated Green, G (s)		85.0	81.4	81.4		88.0	82.9	82.9		25.3			25.3	
Effective Green, g (s)		85.0	81.4	81.4		88.0	82.9	82.9		25.3			25.3	
Actuated g/C Ratio		0.65	0.63	0.63		0.68	0.64	0.64		0.19			0.19	
Clearance Time (s)		5.8	5.8	5.8		5.8	5.8	5.8		6.6			6.6	
Vehicle Extension (s)		2.0	4.5	4.5		2.0	4.5	4.5		2.0			2.0	
Lane Grp Cap (vph)		162	2215	991		408	2256	1009		303			310	
v/s Ratio Prot		0.01	0.24			c0.01	c0.44							
v/s Ratio Perm		0.12		0.02		0.09		0.02		c0.11			0.03	
v/c Ratio		0.19	0.38	0.03		0.15	0.70	0.02		0.56			0.17	
Uniform Delay, d1		12.5	12.0	9.3		7.6	15.3	8.7		47.4			43.6	
Progression Factor		1.00	1.00	1.00		0.18	0.19	0.41		1.00			1.00	
Incremental Delay, d2		0.2	0.5	0.1		0.0	1.0	0.0		1.4			0.1	
Delay (s)		12.7	12.5	9.3		1.4	3.9	3.5		48.8			43.7	
Level of Service		B	B	A		A	A	A		D			D	
Approach Delay (s)			12.3				3.8			48.8			43.7	
Approach LOS			B				A			D			D	

Intersection Summary			
HCM 2000 Control Delay	10.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	18.2
Intersection Capacity Utilization	76.9%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations														
Traffic Volume (vph)	3	88	715	35	4	16	1378	208	32	54	11	296	233	141
Future Volume (vph)	3	88	715	35	4	16	1378	208	32	54	11	296	233	141
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.1	6.1	6.1		6.1	6.1	6.1	5.9	5.9		5.9	5.9	5.9
Lane Util. Factor		1.00	0.95	1.00		1.00	0.95	1.00	1.00	1.00		1.00	1.00	1.00
Frpb, ped/bikes		1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Flpb, ped/bikes		1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt		1.00	1.00	0.85		1.00	1.00	0.85	1.00	0.97		1.00	1.00	0.85
Flt Protected		0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1770	3539	1583		1770	3539	1583	1770	1816		1770	1863	1583
Flt Permitted		0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)		1770	3539	1583		1770	3539	1583	1770	1816		1770	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	3	96	777	38	4	17	1498	226	35	59	12	322	253	153
RTOR Reduction (vph)	0	0	0	20	0	0	0	71	0	6	0	0	0	124
Lane Group Flow (vph)	0	99	777	18	0	21	1498	155	35	65	0	322	253	29
Confl. Peds. (#/hr)									11					
Turn Type	Prot	Prot	NA	Perm	Prot	Prot	NA	Perm	Split	NA		Split	NA	Perm
Protected Phases	1	1	6		5	5	2		4	4		8	8	
Permitted Phases				6				2						8
Actuated Green, G (s)		9.5	61.1	61.1		11.5	63.1	63.1	8.4	8.4		25.0	25.0	25.0
Effective Green, g (s)		9.5	61.1	61.1		11.5	63.1	63.1	8.4	8.4		25.0	25.0	25.0
Actuated g/C Ratio		0.07	0.47	0.47		0.09	0.49	0.49	0.06	0.06		0.19	0.19	0.19
Clearance Time (s)		6.1	6.1	6.1		6.1	6.1	6.1	5.9	5.9		5.9	5.9	5.9
Vehicle Extension (s)		2.0	5.0	5.0		2.0	5.0	5.0	3.0	3.0		2.0	2.0	2.0
Lane Grp Cap (vph)		129	1663	744		156	1717	768	114	117		340	358	304
v/s Ratio Prot		c0.06	0.22			0.01	c0.42		0.02	c0.04		c0.18	0.14	
v/s Ratio Perm				0.01				0.10						0.02
v/c Ratio		0.77	0.47	0.02		0.13	0.87	0.20	0.31	0.56		0.95	0.71	0.10
Uniform Delay, d1		59.2	23.4	18.5		54.7	29.9	19.1	58.0	59.0		51.8	49.1	43.2
Progression Factor		1.29	0.63	1.00		0.95	0.65	0.87	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2		20.4	0.9	0.1		0.1	3.3	0.3	1.5	5.7		34.5	5.1	0.1
Delay (s)		96.6	15.7	18.5		51.8	22.8	16.8	59.6	64.7		86.4	54.2	43.3
Level of Service		F	B	B		D	C	B	E	E		F	D	D
Approach Delay (s)			24.6				22.3			63.0			66.1	
Approach LOS			C				C			E			E	

Intersection Summary			
HCM 2000 Control Delay	33.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	24.0
Intersection Capacity Utilization	86.4%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Lane Configurations														
Traffic Volume (vph)	8	124	667	227	240	1316	266	357	425	213	1	232	409	111
Future Volume (vph)	8	124	667	227	240	1316	266	357	425	213	1	232	409	111
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.7	6.7	6.7	6.7	6.7	6.7	6.3	6.3	6.3		6.3	6.3	6.3
Lane Util. Factor		0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00		0.97	0.95	1.00
Frt		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85		1.00	1.00	0.85
Flt Protected		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00		0.95	1.00	1.00
Satd. Flow (prot)		3467	3574	1599	3467	3574	1599	3467	3574	1599		3502	3610	1615
Flt Permitted		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00		0.95	1.00	1.00
Satd. Flow (perm)		3467	3574	1599	3467	3574	1599	3467	3574	1599		3502	3610	1615
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	9	135	725	247	261	1430	289	388	462	232	1	252	445	121
RTOR Reduction (vph)	0	0	0	146	0	0	89	0	0	158	0	0	0	102
Lane Group Flow (vph)	0	144	725	101	261	1430	200	388	462	74	0	253	445	19
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	0%	0%	0%	0%
Turn Type	Prot	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	Prot	NA	Perm
Protected Phases	1	1	6		5	2		7	4		3	3	8	
Permitted Phases				6			2			4				8
Actuated Green, G (s)		9.2	52.8	52.8	15.2	58.8	58.8	15.5	23.9	23.9		12.1	20.5	20.5
Effective Green, g (s)		9.2	52.8	52.8	15.2	58.8	58.8	15.5	23.9	23.9		12.1	20.5	20.5
Actuated g/C Ratio		0.07	0.41	0.41	0.12	0.45	0.45	0.12	0.18	0.18		0.09	0.16	0.16
Clearance Time (s)		6.7	6.7	6.7	6.7	6.7	6.7	6.3	6.3	6.3		6.3	6.3	6.3
Vehicle Extension (s)		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	2.0
Lane Grp Cap (vph)		245	1451	649	405	1616	723	413	657	293		325	569	254
v/s Ratio Prot		0.04	0.20		c0.08	c0.40		c0.11	c0.13			0.07	0.12	
v/s Ratio Perm				0.06			0.13			0.05				0.01
v/c Ratio		0.59	0.50	0.16	0.64	0.88	0.28	0.94	0.70	0.25		0.78	0.78	0.08
Uniform Delay, d1		58.6	28.8	24.5	54.8	32.5	22.3	56.8	49.7	45.4		57.6	52.6	46.7
Progression Factor		1.37	0.46	0.22	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2		2.0	1.0	0.4	2.6	7.5	1.0	28.8	2.8	0.2		10.2	6.4	0.0
Delay (s)		82.1	14.2	5.9	57.5	40.0	23.2	85.5	52.5	45.6		67.9	59.0	46.7
Level of Service		F	B	A	E	D	C	F	D	D		E	E	D
Approach Delay (s)			21.2			39.8			62.9				59.9	
Approach LOS			C			D			E				E	

Intersection Summary			
HCM 2000 Control Delay	43.9	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	26.0
Intersection Capacity Utilization	84.5%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	907	100	150	1667	5	150	0	150	5	0	5
Future Volume (vph)	5	907	100	150	1667	5	150	0	150	5	0	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.3	6.3	6.3	6.3	6.3	6.3		5.5	5.5	5.5	5.5	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00		1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85	1.00	0.85	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.95	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583		1770	1583	1770	1583	
Flt Permitted	0.07	1.00	1.00	0.21	1.00	1.00		0.75	1.00	0.55	1.00	
Satd. Flow (perm)	136	3539	1583	383	3539	1583		1405	1583	1028	1583	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	5	986	109	163	1812	5	163	0	163	5	0	5
RTOR Reduction (vph)	0	0	50	0	0	2	0	0	136	0	4	0
Lane Group Flow (vph)	5	986	59	163	1812	3	0	163	27	5	1	0
Turn Type	D.P+P	NA	Perm	D.P+P	NA	Perm	D.P+P	NA	Perm	D.P+P	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	2		6	6		2	8		4	4		
Actuated Green, G (s)	55.6	46.6	46.6	55.6	54.9	54.9		15.8	15.8	16.6	22.1	
Effective Green, g (s)	55.6	46.6	46.6	55.6	54.9	54.9		15.8	15.8	16.6	22.1	
Actuated g/C Ratio	0.58	0.49	0.49	0.58	0.57	0.57		0.16	0.16	0.17	0.23	
Clearance Time (s)	6.3	6.3	6.3	6.3	6.3	6.3		5.5	5.5	5.5	5.5	
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	2.0	2.0	
Lane Grp Cap (vph)	90	1721	770	352	2028	907		231	261	184	365	
v/s Ratio Prot	0.00	0.28		c0.04	c0.51					c0.00	0.00	
v/s Ratio Perm	0.03		0.04	0.22		0.00		c0.12	0.02	0.00		
v/c Ratio	0.06	0.57	0.08	0.46	0.89	0.00		0.71	0.10	0.03	0.00	
Uniform Delay, d1	16.8	17.5	13.1	10.7	17.9	8.7		37.8	34.0	32.9	28.4	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.1	0.3	0.0	0.4	5.4	0.0		7.8	0.1	0.0	0.0	
Delay (s)	16.9	17.8	13.1	11.0	23.3	8.7		45.6	34.0	32.9	28.4	
Level of Service	B	B	B	B	C	A		D	C	C	C	
Approach Delay (s)		17.3			22.2			39.8			30.6	
Approach LOS		B			C			D			C	

Intersection Summary			
HCM 2000 Control Delay	22.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	95.8	Sum of lost time (s)	23.6
Intersection Capacity Utilization	79.5%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBU	WBL	WBT	NBL	NBR
Lane Configurations							
Traffic Volume (vph)	1010	98	6	160	1759	52	109
Future Volume (vph)	1010	98	6	160	1759	52	109
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.2	6.2		6.2	6.2	5.2	5.2
Lane Util. Factor	0.95	1.00		1.00	0.95	1.00	1.00
Frt	1.00	0.85		1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	3539	1583		1770	3539	1770	1583
Flt Permitted	1.00	1.00		0.95	1.00	0.95	1.00
Satd. Flow (perm)	3539	1583		1770	3539	1770	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1098	107	7	174	1912	57	118
RTOR Reduction (vph)	0	29	0	0	0	0	109
Lane Group Flow (vph)	1098	78	0	181	1912	57	9
Turn Type	NA	Perm	Prot	Prot	NA	Prot	Perm
Protected Phases	6		5	5	2	4	
Permitted Phases		6					4
Actuated Green, G (s)	82.9	82.9		20.1	109.2	9.4	9.4
Effective Green, g (s)	82.9	82.9		20.1	109.2	9.4	9.4
Actuated g/C Ratio	0.64	0.64		0.15	0.84	0.07	0.07
Clearance Time (s)	6.2	6.2		6.2	6.2	5.2	5.2
Vehicle Extension (s)	0.2	0.2		2.0	0.2	2.0	2.0
Lane Grp Cap (vph)	2256	1009		273	2972	127	114
v/s Ratio Prot	0.31			0.10	c0.54	c0.03	
v/s Ratio Perm		0.05					0.01
v/c Ratio	0.49	0.08		0.66	0.64	0.45	0.07
Uniform Delay, d1	12.4	9.0		51.8	3.6	57.8	56.2
Progression Factor	1.00	1.00		0.68	2.05	1.00	1.00
Incremental Delay, d2	0.8	0.2		3.0	0.7	0.9	0.1
Delay (s)	13.1	9.1		38.4	8.1	58.7	56.3
Level of Service	B	A		D	A	E	E
Approach Delay (s)	12.8				10.7	57.1	
Approach LOS	B				B	E	

Intersection Summary			
HCM 2000 Control Delay	13.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	21.6
Intersection Capacity Utilization	64.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBU	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations							
Traffic Volume (vph)	2	188	935	1758	178	125	167
Future Volume (vph)	2	188	935	1758	178	125	167
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0	6.0	6.0	5.2	5.2
Lane Util. Factor		1.00	0.95	0.95	1.00	0.97	1.00
Frt		1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected		0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)		1770	3539	3539	1583	3433	1583
Flt Permitted		0.06	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)		110	3539	3539	1583	3433	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2	204	1016	1911	193	136	182
RTOR Reduction (vph)	0	0	0	0	49	0	167
Lane Group Flow (vph)	0	206	1016	1911	144	136	15
Turn Type	pm+pt	pm+pt	NA	NA	Perm	Prot	Perm
Protected Phases	1	1	6	2		4	
Permitted Phases	6	6			2		4
Actuated Green, G (s)		107.9	107.9	89.2	89.2	10.9	10.9
Effective Green, g (s)		107.9	107.9	89.2	89.2	10.9	10.9
Actuated g/C Ratio		0.83	0.83	0.69	0.69	0.08	0.08
Clearance Time (s)		6.0	6.0	6.0	6.0	5.2	5.2
Vehicle Extension (s)		2.5	2.5	2.5	2.5	2.5	2.5
Lane Grp Cap (vph)		253	2937	2428	1086	287	132
v/s Ratio Prot		c0.08	0.29	0.54		c0.04	
v/s Ratio Perm		c0.59			0.09		0.01
v/c Ratio		0.81	0.35	0.79	0.13	0.47	0.12
Uniform Delay, d1		33.0	2.6	13.9	7.0	56.8	55.1
Progression Factor		1.58	3.02	1.38	1.35	1.00	1.00
Incremental Delay, d2		15.8	0.3	1.8	0.2	0.9	0.3
Delay (s)		67.9	8.3	21.0	9.6	57.7	55.4
Level of Service		E	A	C	A	E	E
Approach Delay (s)			18.3	19.9		56.4	
Approach LOS			B	B		E	

Intersection Summary			
HCM 2000 Control Delay	22.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	17.2
Intersection Capacity Utilization	83.8%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations														
Traffic Volume (vph)	4	71	967	18	2	27	1840	51	6	2	27	25	0	86
Future Volume (vph)	4	71	967	18	2	27	1840	51	6	2	27	25	0	86
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0	6.0		6.0	6.0	6.0		5.2			5.2	
Lane Util. Factor		1.00	0.95	1.00		1.00	0.95	1.00		1.00			1.00	
Frt		1.00	1.00	0.85		1.00	1.00	0.85		0.90			0.90	
Flt Protected		0.95	1.00	1.00		0.95	1.00	1.00		0.99			0.99	
Satd. Flow (prot)		1770	3539	1583		1787	3574	1599		1640			1682	
Flt Permitted		0.06	1.00	1.00		0.25	1.00	1.00		0.86			0.93	
Satd. Flow (perm)		103	3539	1583		479	3574	1599		1416			1574	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	4	77	1051	20	2	29	2000	55	7	2	29	27	0	93
RTOR Reduction (vph)	0	0	0	5	0	0	0	15	0	27	0	0	85	0
Lane Group Flow (vph)	0	81	1051	15	0	31	2000	40	0	11	0	0	35	0
Heavy Vehicles (%)	2%	2%	2%	2%	1%	1%	1%	1%	3%	3%	3%	0%	0%	0%
Turn Type	pm+pt	pm+pt	NA	Perm	pm+pt	pm+pt	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	1	1	6		5	5	2			4			8	
Permitted Phases	6	6		6	2	2		2	4			8		
Actuated Green, G (s)		104.4	97.3	97.3		99.8	95.0	95.0		10.7			10.7	
Effective Green, g (s)		104.4	97.3	97.3		99.8	95.0	95.0		10.7			10.7	
Actuated g/C Ratio		0.80	0.75	0.75		0.77	0.73	0.73		0.08			0.08	
Clearance Time (s)		6.0	6.0	6.0		6.0	6.0	6.0		5.2			5.2	
Vehicle Extension (s)		2.5	2.5	2.5		2.5	2.5	2.5		2.5			2.5	
Lane Grp Cap (vph)		173	2648	1184		416	2611	1168		116			129	
v/s Ratio Prot		c0.03	0.30			0.00	c0.56							
v/s Ratio Perm		0.35		0.01		0.05		0.03		0.01			c0.02	
v/c Ratio		0.47	0.40	0.01		0.07	0.77	0.03		0.10			0.27	
Uniform Delay, d1		16.4	5.9	4.2		3.7	10.7	4.8		55.2			56.0	
Progression Factor		1.25	2.30	1.00		1.07	1.03	0.77		1.00			1.00	
Incremental Delay, d2		1.4	0.4	0.0		0.0	1.2	0.0		0.3			0.8	
Delay (s)		21.9	13.9	4.2		4.0	12.2	3.7		55.5			56.8	
Level of Service		C	B	A		A	B	A		E			E	
Approach Delay (s)			14.3				11.8			55.5			56.8	
Approach LOS			B				B			E			E	

Intersection Summary			
HCM 2000 Control Delay	14.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	17.2
Intersection Capacity Utilization	81.6%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Traffic Volume (vph)	5	130	598	288	88	1168	264	534	731	57	86	429	213
Future Volume (vph)	5	130	598	288	88	1168	264	534	731	57	86	429	213
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.3	6.3	6.3	6.3	6.3	6.3	6.2	6.2	6.2	6.2	6.2	6.2
Lane Util. Factor		1.00	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frt		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1770	3539	1583	1787	3574	1599	3467	3574	1599	1787	3574	1599
Flt Permitted		0.08	1.00	1.00	0.32	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		151	3539	1583	598	3574	1599	3467	3574	1599	1787	3574	1599
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	5	141	650	313	96	1270	287	580	795	62	93	466	232
RTOR Reduction (vph)	0	0	0	183	0	0	153	0	0	46	0	0	113
Lane Group Flow (vph)	0	146	650	130	96	1270	134	580	795	16	93	466	119
Heavy Vehicles (%)	2%	2%	2%	2%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Turn Type	D.P+P	D.P+P	NA	Perm	D.P+P	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	1	1	6		5	2		7	4		3	8	
Permitted Phases	2	2		6	6		2			4			8
Actuated Green, G (s)		59.6	53.9	53.9	59.6	49.3	49.3	26.3	34.3	34.3	11.1	19.1	19.1
Effective Green, g (s)		59.6	53.9	53.9	59.6	49.3	49.3	26.3	34.3	34.3	11.1	19.1	19.1
Actuated g/C Ratio		0.46	0.41	0.41	0.46	0.38	0.38	0.20	0.26	0.26	0.09	0.15	0.15
Clearance Time (s)		6.3	6.3	6.3	6.3	6.3	6.3	6.2	6.2	6.2	6.2	6.2	6.2
Vehicle Extension (s)		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lane Grp Cap (vph)		197	1467	656	326	1355	606	701	942	421	152	525	234
v/s Ratio Prot		c0.06	c0.18		0.01	c0.36		0.17	c0.22		0.05	c0.13	
v/s Ratio Perm		0.28		0.08	0.12		0.08			0.01			0.07
v/c Ratio		0.74	0.44	0.20	0.29	0.94	0.22	0.83	0.84	0.04	0.61	0.89	0.51
Uniform Delay, d1		28.6	27.3	24.3	20.7	38.9	27.3	49.7	45.3	35.6	57.4	54.4	51.1
Progression Factor		1.66	1.03	2.67	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		11.6	0.9	0.6	0.2	13.4	0.8	7.6	6.7	0.0	5.0	16.1	0.6
Delay (s)		59.0	28.9	65.4	20.9	52.3	28.2	57.3	52.0	35.6	62.4	70.5	51.7
Level of Service		E	C	E	C	D	C	E	D	D	E	E	D
Approach Delay (s)			43.2			46.3			53.4			64.0	
Approach LOS			D			D			D			E	

Intersection Summary			
HCM 2000 Control Delay	50.5	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	25.0
Intersection Capacity Utilization	89.0%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

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Appendix H – Pedestrian and Bicycle Safety, Accommodations, and Linkages Technical Memorandum

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State Highway 199
Corridor Master Plan

From IH 820 to Belknap Street

Bicycle and Pedestrian
Safety, Accommodations, and Linkages
Technical Memorandum

Submittal Date:
September 22, 2017

Prepared For:
North Central Texas Council of Governments

Prepared By:
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1.0 BICYCLE AND PEDESTRIAN ACCOMMODATIONS AND LINKAGES

The State Highway (SH) 199 corridor between Interstate Highway (IH) 820 and Belknap Street should accommodate and provide connections for all modes of transportation and for all users. The length of the corridor is six miles. To accomplish an inclusive design approach, the existing and planned bicycle and pedestrian accommodations along SH 199 and within the study area were analyzed. From this analysis, facility and linkage recommendations can be made to enhance bicycle and pedestrian connectivity in and around the SH 199 corridor. Access management and intersection safety are also addressed from the bicyclist and pedestrian perspective.

1.1 Existing Bicycle and Pedestrian Accommodations

There are currently no dedicated bicycle facilities along the SH 199 corridor between IH 820 and Belknap Street. Along the same segment of SH 199, there are limited sections of pedestrian accommodations totaling approximately 6,000 feet (within the six-mile project length), most of which are located in proximity to areas with recent development activity, signalized intersections, and east of University Drive connecting to downtown Fort Worth. The Fort Worth Transportation Authority Bus Route 46 travels along SH 199 and has numerous stops along the corridor (see the Bus Transit Technical Memorandum for more information). Figures 1 through 3 show the lack of pedestrian and bicycle accommodations along SH 199 and the means by which users have adapted to these conditions. Without proper accommodations, pedestrians and bicyclists use the paved shoulder or social (pedestrian-created) paths near the corridor.

Figure 1. Pedestrian Walking on SH 199 Shoulder Near SH 183 Intersection
Source: Freese and Nichols, Inc., 2016

Figure 2. Bicyclist Crossing SH 199 East of SH 183 Intersection
Source: Freese and Nichols, Inc., 2016

Figure 3. Pedestrian-Created Path along SH 199 West of Capri Drive Intersection
Source: Freese and Nichols, Inc., 2016

The lack of pedestrian facilities along the corridor is a safety concern. Based on data from the Texas Department of Transportation (TxDOT) Crash Records Information System (CRIS) (https://cris.dot.state.tx.us/public/Query/), there were 23 pedestrian crashes and four bicycle crashes within a one-quarter mile radius from the SH 199 centerline. Of these, there were three pedestrian fatalities and no bicycle fatalities. For more information, see the SH 199 Crash Data Technical Memorandum.

While there are few accommodations for people walking or bicycling along SH 199, there are numerous bicycle and pedestrian facilities in the area surrounding the SH 199 corridor. Primary bicycle and pedestrian facilities in this area include the Fort Worth Trinity Trails, Marine Creek Trail, and Marion Sansom Park. There are also various existing and planned on-street bicycle facilities in the area, including several locations where these bicycle facilities are planned to intersect with or cross SH 199 (see Section 1.2). The existing and planned bicycle and pedestrian accommodations along and near the SH 199 study area are shown in Exhibit 1.

The Fort Worth Trinity Trails are located south of the study area. These trails follow the West Fork of the Trinity River from YMCA Camp Carter near Lake Worth to downtown Fort Worth. The trail corridor connects adjacent neighborhoods to downtown, Panther Island, and the Regional Veloweb. Marine Creek Trail, to the north of the study area, follows Marine Creek from Buck Sansom Park and connects to the Fort Worth Stockyards, Panther Island, and the Fort Worth Trinity Trails. These trails make up a portion of the Mobility 2040 Regional Veloweb, comprised of off-street shared use paths serving as the regional active transportation network. Providing connections to these low-stress networks is essential for overall connectivity and ensures safe mobility for travelers in the region. In addition to these shared use facilities, supplementary pedestrian accommodations in the area include sections of sidewalks north of the study corridor within residential neighborhoods and adjacent to the study corridor along SH 183 and Long Avenue (see Exhibit 1).

1.2 Planned Bicycle and Pedestrian Facilities

Planned bicycle and pedestrian facilities near the SH 199 corridor include the Lake Worth Regional Trail and shared use paths along both sides of SH 183. The planned Lake Worth Regional Trail begins at the western end of the Fort Worth Trinity Trails and continues through YMCA Camp Carter, Marion Sansom Park, and along Cahoba Drive (see Exhibit 2). The shared use path planned for SH 183 runs from Sam Calloway Road to SH 199.

1.2.1 *City of Lake Worth Comprehensive Plan Vision Report*

The *City of Lake Worth Comprehensive Plan Vision Report* (http://www.nctcog.org/trans/aviation/jlus/documents/PLMC_LakeWorthCompPlanVision.pdf) developed in 2013, is part of the *Planning Livable Military Communities Vision Report*, which is intended to guide the future development of the City of Lake Worth. Within the SH 199 corridor, the plan recommends a bicycle route and sidewalks on Roberts Cut Off Road, and bicycle facilities (type not identified) and sidewalks along SH 199.

1.2.2 *City of Sansom Park Comprehensive Plan Vision Report*

The *City of Sansom Park Comprehensive Plan Vision Report* (http://www.nctcog.org/trans/aviation/jlus/documents/PLMC_SansomParkCompPlanVision.pdf), developed in 2013, is part of the *Planning Livable Military Communities Vision Report*, which is intended to guide the future development of the City of Sansom Park. Within the SH 199 corridor, the plan recommendations for signed bicycle routes on Roberts Cut Off Road, Buchanan Street, and Skyline Drive, and on-street bike lanes on Biway Street. The plan also recommends for bicycle accommodations along SH 199 but does not specify the type of facility.

Sidewalks are recommended along SH 199 and the intersecting streets of Roberts Cut Off Road, Buchanan Street, Biway Street, and Skyline Drive. An off-street trail is recommended along Terrace Trail and Beverly Hills Drive north of SH 199.

1.2.3 *City of River Oaks Comprehensive Plan Vision Report*

The *City of River Oaks Comprehensive Plan Vision Report* (http://riveroakstx.com/doc/2013_riveroakscompplanvision.pdf), developed in 2013, is part of the *Planning Livable Military Communities Vision Report*, which is intended to guide the future development of the City of River Oaks. The plan includes pedestrian and bicycle recommendations within the study area including the Regional Veloweb and on-street bike lanes along Roberts Cut Off, and on-street bike lanes and sidewalks along SH 183 and SH 199. The plan also recommends an off-street trail south of SH 199 between Long Avenue and the Upper West Fork Trinity Trail.

1.2.4 *Bike Fort Worth* Comprehensive Bicycle Transportation Plan

The *Bike Fort Worth* plan (http://fortworthtexas.gov/bikefw/), a bicycle transportation plan approved in 2010, does not recommend bicycle facilities along SH 199. On cross streets within the study area, the plan recommends the inclusion of an on-street bicycle route on Skyline Drive, Ohio Garden Road, and 18th Street.

1.2.5 *Walk Fort Worth* Pedestrian Transportation Plan

Fort Worth's pedestrian transportation plan, *Walk Fort Worth* (http://fortworthtexas.gov/walkfw/), was approved in 2014. This plan, recommends minimum and desirable sidewalk widths of six feet and 10 feet, respectively, on arterial streets such as SH 199. This plan also identifies SH 199 as a high-priority corridor for sidewalk installation.

1.2.6 *Trinity River Strategic Master Plan*

The *Trinity River Strategic Master Plan* from Streams and Valleys, a nonprofit organization that supports the Trinity River in Fort Worth and Tarrant County, recommends a trail along SH 199 between Beverly Hills Drive and Biway Street.

1.3 Recommendations for Non-Motorized Network Connectivity

A number of factors used to identify and evaluate appropriate bicycle and pedestrian facilities within the SH 199 corridor. This process began with high-level planning and design that provides comfortable connections to destinations such as schools, parks, retail centers, and public transportation.

As a minimum, TxDOT design standards for urban streets require the inclusion of five-foot sidewalks on both sides of the roadway with the sidewalks set at least four feet behind the curb. These sidewalks must meet (ADA) design standards. Additionally, a March 2011 TxDOT memorandum titled "Guidelines Emphasizing Bicycle and Pedestrian Accommodations," established a policy to provide 14-foot outside shared use lanes or a five-foot bike lane on state roads.

However, national research shows that most of the population fits into the "interested but concerned" category with regard to bicycle travel. Therefore, providing low-stress bicycle facilities could increase ridership and create a more comfortable experience for both bicyclists and motorists (see Figure 4). For SH 199, the posted speed limit ranges from 35 miles per hour to 45 miles per hour. The upper value of 45 miles per hour suggests that providing off-street accommodations for both pedestrians and cyclists is necessary (see Figure 5). These facilities could be in the form of an enhanced sidewalk. An enhanced sidewalk, which will function similarly to a shared use path or sidepath, can accommodate pedestrians as well as all types of bicyclists and could enhance the level of comfort for bicyclists who fall into the "interested but concerned" category and do not feel comfortable riding in traffic conditions.

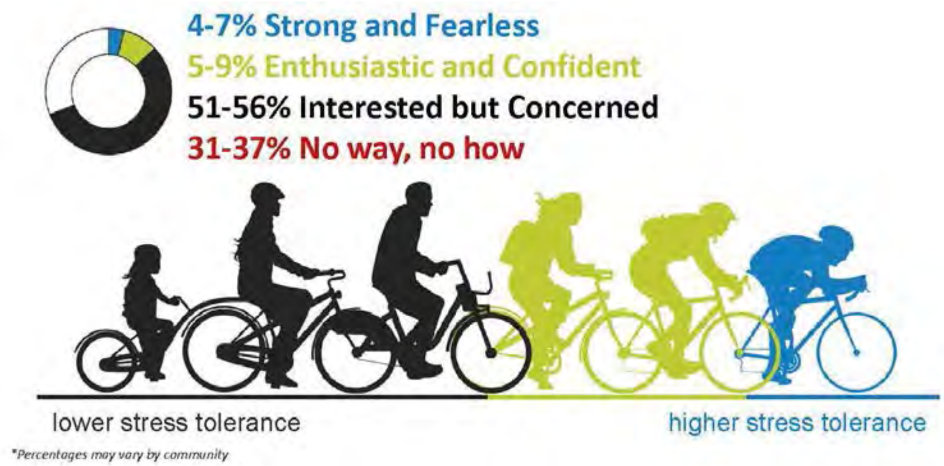

Figure 4. Design Users
Source: Toole Design Group, 2017

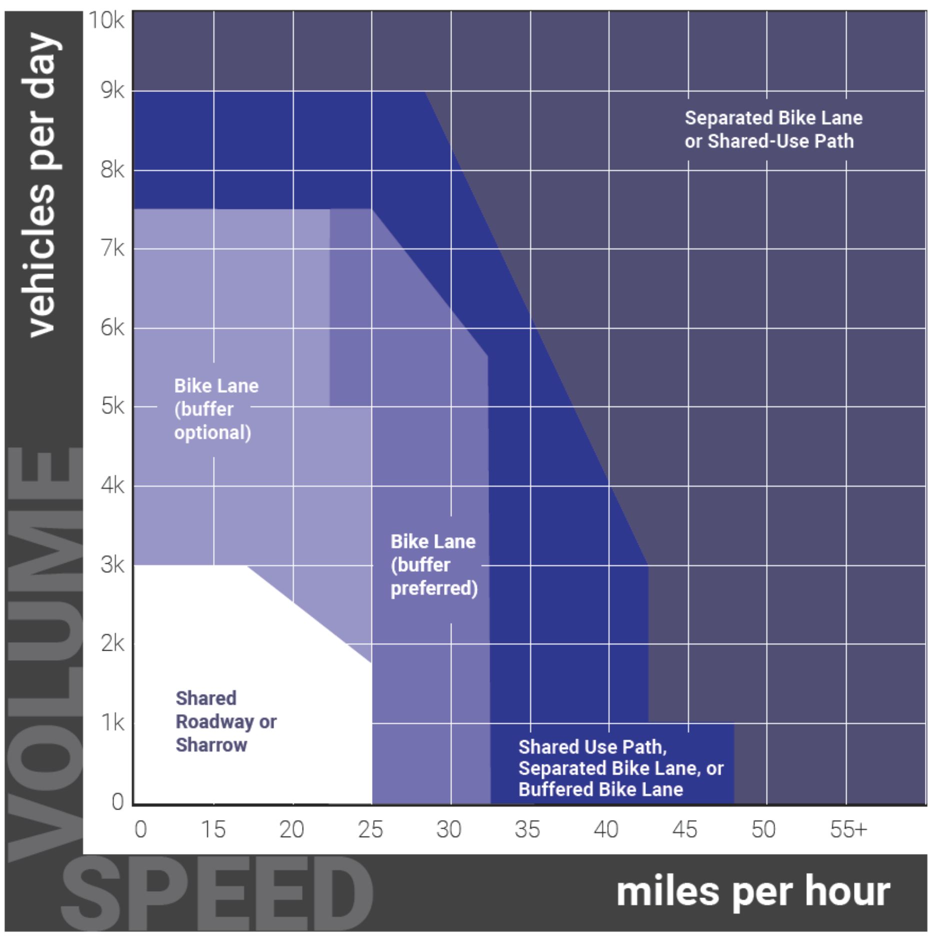

Figure 5. Bicycle Facility Selection Guidelines Based on Prevailing Motorist Speeds and Volumes
Source: Toole Design Group, 2017

Along SH 199, the presence of numerous driveways and cross streets creates conflict points between turning motorists and people walking or bicycling. Techniques to adequately address these conflict points should be considered in the design and operation of the corridor. Enhanced sidewalks that are spatially separated from vehicular traffic can improve the visibility between bicyclists, pedestrians, and motorists at intersections and driveways if the facility is recessed from the roadway and provides sufficient space for motorists to detect and yield to vulnerable road users in the conflict area. Rather than situating the bicyclist in an area outside a motorist's normal field of vision as an on-street conventional bike lane does, an enhanced sidewalk places bicyclists within the area that a motorist would see in their peripheral vision.

From IH 820 to west of University Drive, the corridor should include an enhanced sidewalk with a minimum width of 10 feet on the south side of the street and a sidewalk with a width of six feet on the north side (see Figure 6). From east of University Drive to the Trinity River Vision Bridge, 10-foot enhanced sidewalks are recommended for both sides of SH 199 (see Figure 6). In this section of SH 199, only four vehicular travel lanes are recommended, and with the available right-of-way width, it is recommended that 10-foot enhanced sidewalks be placed on both sides of SH 199 to connect to the 10-foot sidewalks on the north and the south sides of the Trinity River Vision Bridge within the Panther Island development. The 10-foot enhanced sidewalks should accommodate pedestrians as well as bicyclists who are not comfortable sharing a lane with vehicular traffic on SH 199. The TxDOT standard sidewalk widths are five feet when sidewalks are detached from the curb and six feet when sidewalks are attached to the curb. However, the wider widths are recommended to meet the preferred facility widths outlined in the approved local transportation plans, increase comfort and safety in the corridor, and address project stakeholder requests for improved walkability along SH 199.

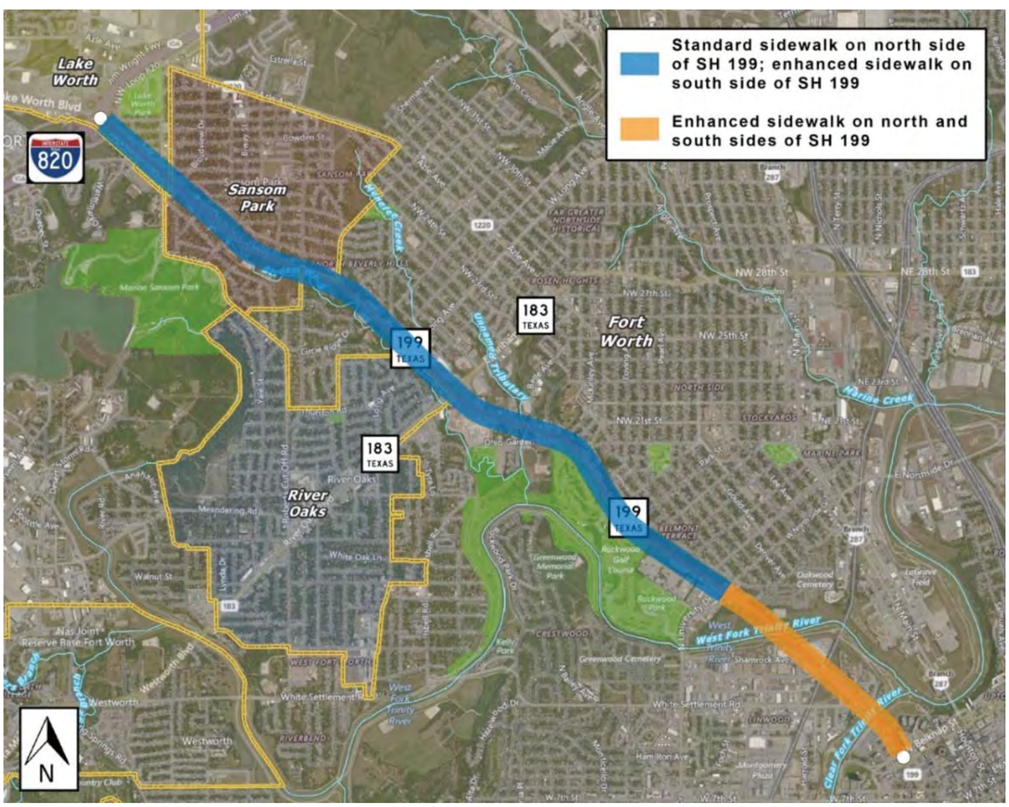

Figure 6. Sidewalk Treatment Limits
Source: Toole Design Group, 2017

Additionally, it is recommended that sidewalks be separated from the roadway with a buffer (horizontal clearance). TxDOT minimum horizontal clearance width is four feet for a standard sidewalk. However, where right-of-way allows, an additional horizontal clearance width is recommended to increase user comfort. If pedestrian and bicyclist volumes are high, a striped centerline separating eastbound and westbound pedestrian and bicycle traffic could be added for increased safety using a four-inch-wide yellow retroreflective pavement marking material (see Figure 7).

Figure 7. Enhanced Sidewalk with Centerline Striping

Source: Toole Design Group, 2012

With a properly planned buffer width, the 10-foot sidewalk (see Figure 8) could be widened to 16 feet in the future, if warranted, based on the volumes of pedestrians and bicyclists using the corridor. This 16-foot width could accommodate a 10-foot wide two-way separated bike lane with an additional six feet of width for exclusive pedestrian use (see Figure 9). Additionally, if a future release of the TxDOT *Roadway Design Manual* includes flexibility in the geometric design criteria for urban streets, as it is anticipated to include, it is recommended that the outside travel lane width be reduced from 14-feet to 11-feet and the additional space be repurposed for a separated bicycle facility within the border area.

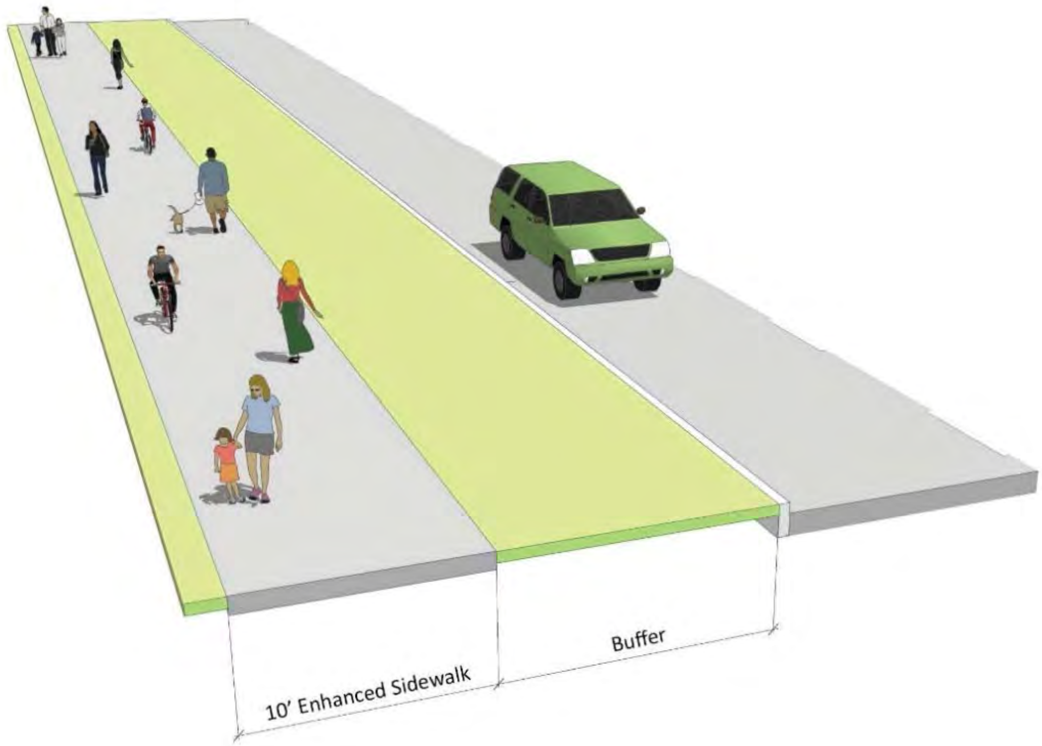

Figure 8. Initial Accommodation: Enhanced Sidewalk – West Perspective
Source: Toole Design Group, 2017

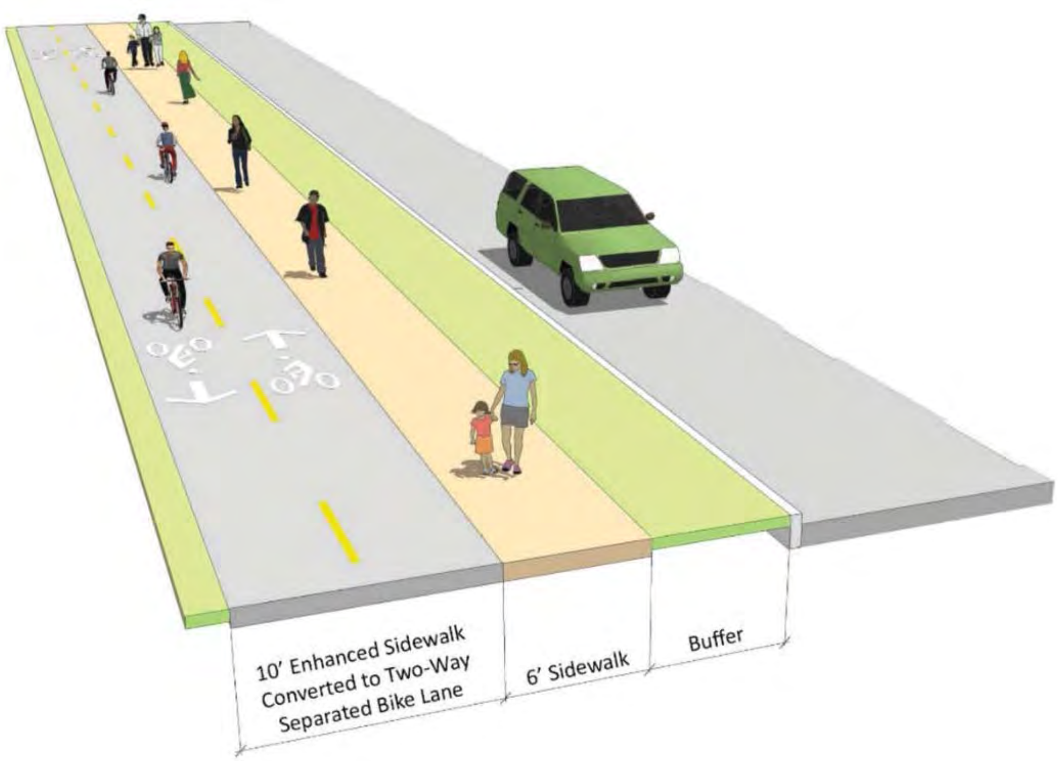

Figure 9. Future Accommodation: Two-Way Separated Bike Lane and Sidewalk – West Perspective
Source: Toole Design Group, 2017

1.4 Connections with Other Bicycle and Pedestrian Facilities

With the addition of continuous sidewalks along the project corridor, SH 199 has the potential to positively impact the overall bicycle and pedestrian network in the surrounding area. It is recommended that appropriate connections be made between the SH 199 corridor and the existing Fort Worth Trinity Trails and Marine Creek Trail, as well as the planned Lake Worth Regional Trail, shared use path along SH 183, and other bikeways planned for intersecting streets (see Section 1.2). These connections, shown in Figure 10, are especially critical for creating a cohesive network to maximize non-motorized use and increase bicycle and pedestrian trips in the area. Mapping for additional planned and existing bicycle and pedestrian accommodations within the project area can be found in Exhibit 1.

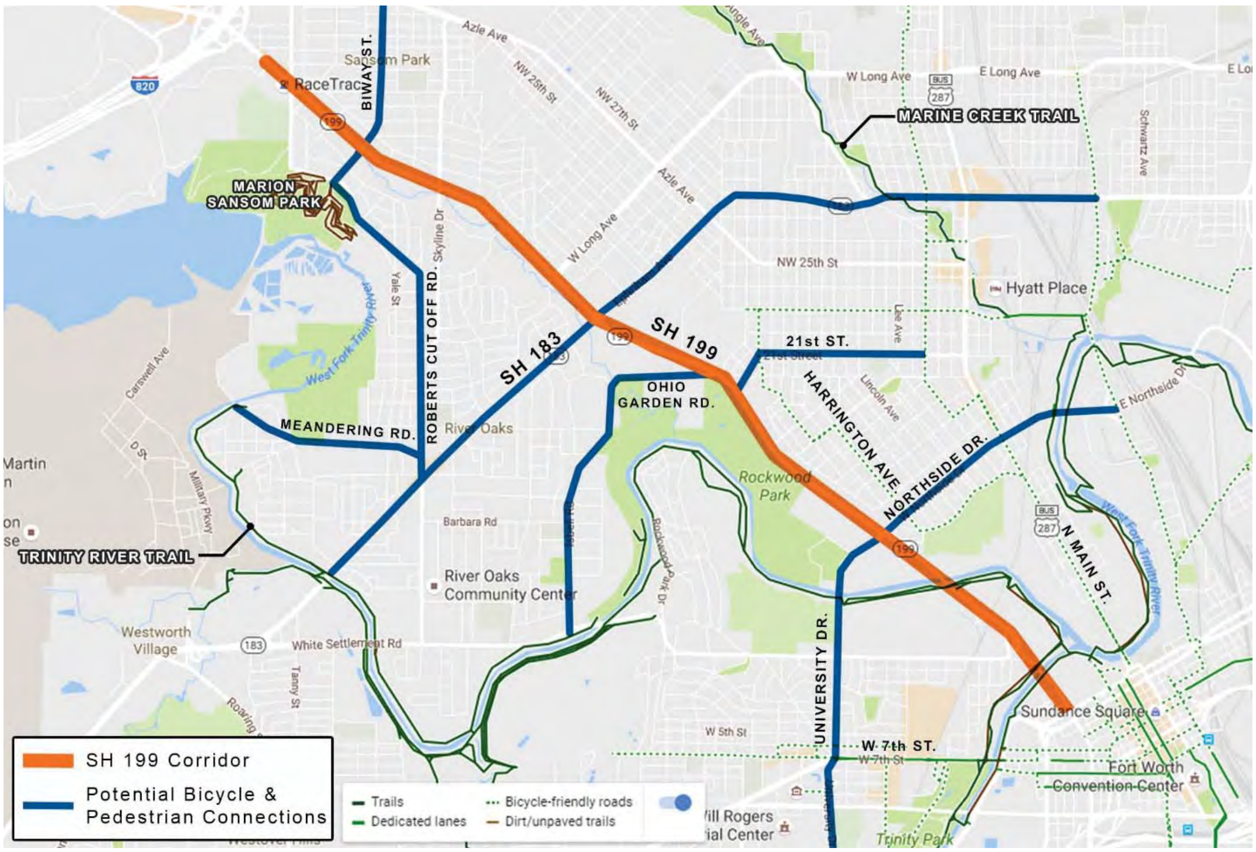

Figure 10. SH 199 Corridor and Potential Non-Motorized Connections

Source: Toole Design Group, 2017

1.4.1 Fort Worth Trinity Trails

Providing bicycle and pedestrian connections to the Fort Worth Trinity Trails south and east of the study area would help expand the bicycle and pedestrian system and improve connectivity. University Drive has the potential to act as a primary connection between SH 199 and the Fort Worth Trinity Trails. Further connections could also potentially be created to the existing bike lanes on 7th Street leading into downtown Fort Worth. Continuing bicycle facilities on Northside Drive would provide additional connections to the future Panther Island development and to existing bike routes on Harrington Avenue and North Main Street. Further to the west, Ohio Garden Road could provide an additional connection to the Ohio Garden Road trailhead of the Fort Worth Trinity Trails. At the west end of the study corridor, Biway Street and Roberts Cut Off Road could provide connections to adjacent neighborhoods and Marion Sansom Park, as well as the Fort Worth Trinity Trails via Meandering Road.

1.4.2 Marine Creek Trail

Marine Creek Trail is a facility connecting to retail and commercial areas to the north of SH 199. Off-street bicycle facilities along SH 183 should be studied to connect SH 199 to Marine Creek Trail to the north. Pedestrian and bicycle connections along SH 183 to Marine Creek Trail could further expand the non-motorized network. With a shared use path planned along SH 183 from SH 199 to the West Fork of the Trinity River, continuing bicycle facilities along SH 183 would provide a continuous connection from the Fort Worth Trinity Trails to the Marine Creek Trail. SH 183 also intersects the on-street bike route along NW 25th Street, proposed in the *Bike Fort Worth* plan.

1.4.3 Lake Worth Regional Trail and Marion Sansom Park

The Lake Worth Regional Trail (see Exhibit 2) could provide another connection and a comfortable crossing at IH 820 for pedestrians and bicyclists. To accomplish this connection, provision of bicycle and pedestrian accommodations linking SH 199 to the Lake Worth Regional Trail should be considered. The planned trail connects to the Fort Worth Trinity Trails to the south of SH 199. Additional connections to SH 199 are planned, including on-street bicycle routes along Cahoba Drive, Roberts Cut Off Road, and Skyline Drive (see Exhibit 1). These on-street routes would provide a connection from SH 199 to the planned Lake Worth Regional Trail. In addition to these planned routes, the *City of Sansom Park Comprehensive Plan Vision Report* (http://www.nctcog.org/trans/aviation/jlus/documents/PLMC_SansomParkCompPlanVision.pdf) recommends adding sidewalks and bike lanes along Biway Street from Azle Avenue to Roberts Cut Off Road. This would provide a direct route from SH 199 to Marion Sansom Park, which includes off-road bike trails maintained by Fort Worth Mountain Bikers' Association. Connections along both Biway Street and Skyline Drive could continue north of SH 199, providing connections to residential neighborhoods in the City of Sansom Park.

1.4.4 *Mobility 2040* Regional Veloweb

Connections in and around the SH 199 study area should comply with the *Mobility 2040* metropolitan transportation plan adopted by the Regional Transportation Council. With the regional network extending into the study area, the SH 199 corridor and adjacent connections should be consistent with the Community Pathways Primary Design Considerations outlined by *Mobility 2040*, including consistency with guidance set forth by American Association of State Highway Transportation Officials (AASHTO) *Guide for the Development of Bicycle Facilities* such as a minimum width of 10 to 14 feet. These planning documents recommend installation of bicycle facilities adjacent to arterial roadways with connections serving as extensions of the regional pathway network (http://www.nctcog.org/trans/sustdev/bikeped/veloweb.asp).

2.0 INTERSECTION SAFETY FOR BICYCLISTS AND PEDESTRIANS

Intersections are the most common location of crashes between motorists and vulnerable street users. The following sections highlight best practices for mitigating these crashes.

2.1 Signage and Pavement Markings

Proper signage and pavement markings are essential to communicating correct behaviors to all users. This guidance would serve to define travel paths (e.g., lane lines and turn arrows), identify conflict points (e.g., crosswalks), and provide warning and regulatory direction [e.g., Manual on Uniform Traffic Control Devices (MUTCD) signage including speed limit, stop, yield, and other signs], among other purposes. Signage can also be used for wayfinding and communicating supplementary information, such as the signage installed near accessible push buttons.

If WALK intervals will not be automatically included in the signal cycle at signalized intersections along the SH 199 corridor, signage should be included to notify pedestrians to activate the WALK interval using an accessible push button. Additionally, signage to inform bicyclists to use the pedestrian push button and cross with the pedestrian WALK indication should be posted at all signalized intersections along the enhanced sidewalk sections of the corridor (MUTCD sign R9-5, see Figures 11 and 12).

Figure 11. Bicycles Use Ped Signal Sign (R9-5)
Source: TMUTCD 2011 Edition. http://ftp.dot.state.tx.us/pub/txdot-info/trf/tmutcd/2011-rev-2/9.pdf

Figure 12. Bicycles Use Ped Signal Sign (R9-5) Installed with Pushbutton
Source: Toole Design Group, 2017

Furthermore, bicyclists would need wayfinding signage to direct them along the enhanced sidewalk route, particularly at the intersection of SH 199 and University Drive. At this location, bicyclists westbound on the enhanced sidewalk on the north side of SH 199 would need to cross SH 199 to the enhanced sidewalk on the south side of SH 199 to continue west on the enhanced sidewalk west of University Drive (see Figure 13). This wayfinding signage would be specific for bicyclist direction and should generally face eastward to be read by westbound bicyclists. Pedestrians could continue west on the 6-foot wide sidewalk on the north side of SH 199 west of University Drive; however, pedestrians who prefer to use the wider enhanced sidewalk over the standard sidewalk could also benefit from this wayfinding signage.

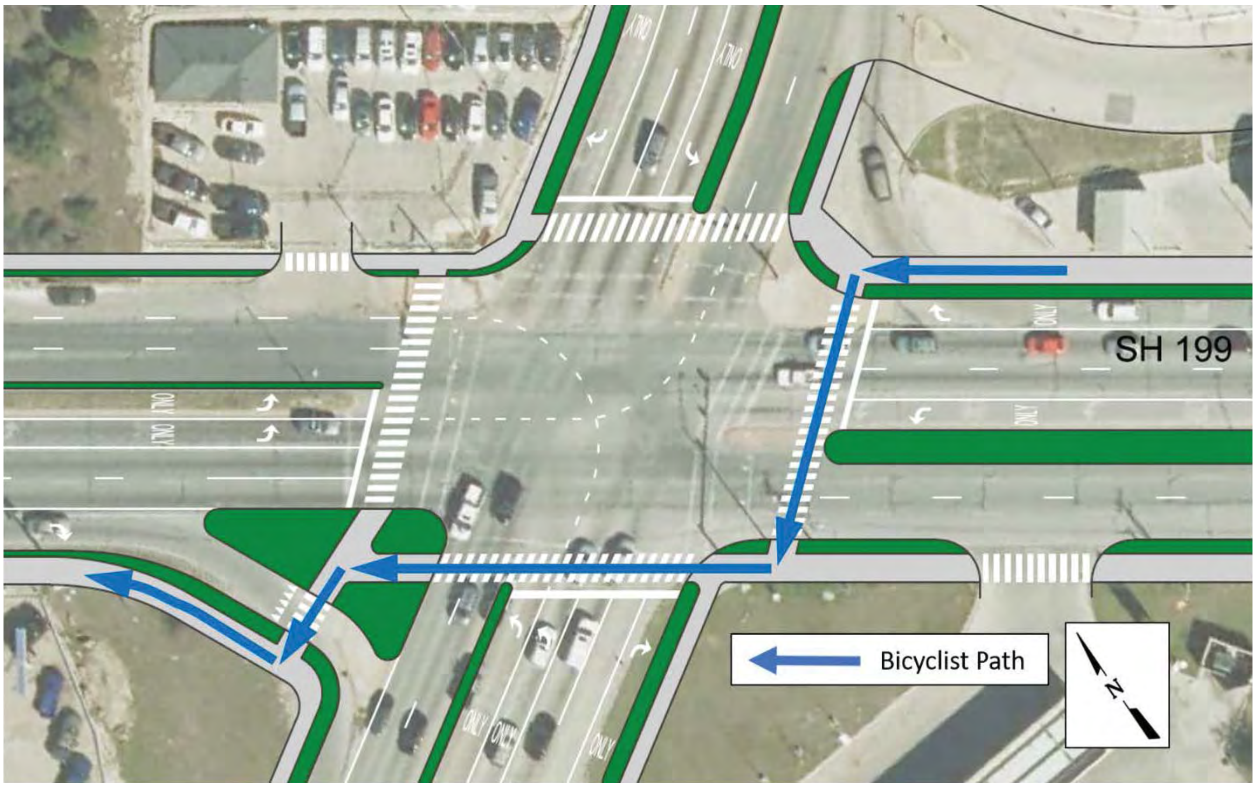

Figure 13. Westbound Bicyclist Transition from Northern Enhanced Sidewalk
Source: Toole Design Group, 2017

At signalized and unsignalized cross street intersections in sections with the enhanced sidewalk, warning signage such as W11-15 (see Figure 26) could be installed on the cross streets at the approaches to SH 199 to warn motorists of the enhanced sidewalk crossing and the potential presence of bicyclists and pedestrians. This signage should be located in alignment with the leading edge of the crossing and should have no visual obstructions. Augmented with a recessed crossing, motorists approaching the intersection on the side street would yield on the approach to the enhanced sidewalk crossing, then pull forward to the intersection without blocking the crossing. Additionally, installing high-visibility reflective pavement markings at conflict points would be a straightforward means of identifying locations where all street users should pay extra attention to their surroundings. Maintaining the sidewalk elevation and surface type at driveways, which conveys the message that motorists have not yet entered the street, would help identify these locations and encourage motorist awareness (see Figures 14 and 15).

2.2 Protected Left Turns

Pedestrians and bicyclists are vulnerable when in conflict with left-turning traffic at an intersection. Protected left turns minimize the likelihood of a left-turning motorist colliding with a pedestrian or bicyclist in the crosswalk. When left-turn movements are permissive, motorists are often looking for gaps in oncoming opposing traffic and not for the presence of pedestrians in their path (see Figure 14). Particularly at larger intersections, such as Roberts Cut Off Road, SH 183, and University Drive, left turns should have exclusive protected phases that do not overlap with pedestrian/bicycle crossing phases so that pedestrians and bicyclists are not present in the intersection when left turns are executed by conflicting traffic.

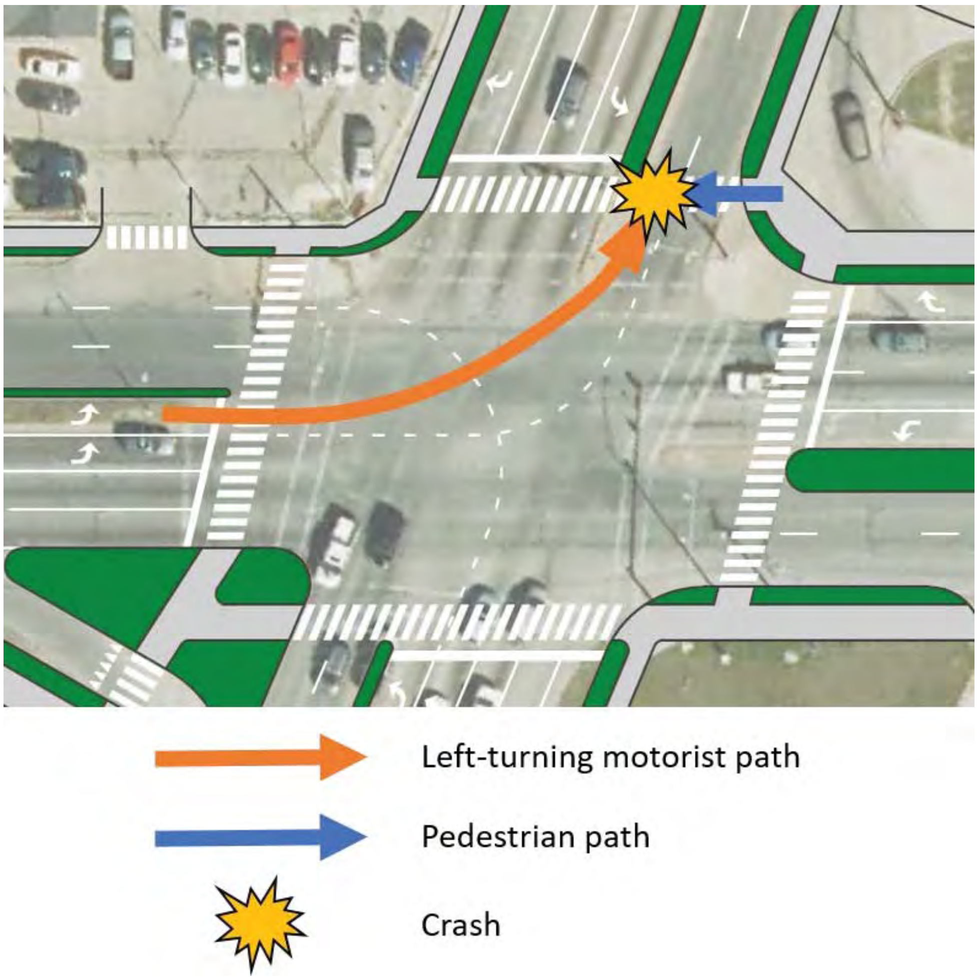

Figure 14. Left Turn Conflict with Pedestrian in Crosswalk

Source: Toole Design Group, 2017

At intersections where motorists have unobstructed views of crosswalks, use of a leading pedestrian interval might be justified. Leading pedestrian intervals are a signalization technique wherein the pedestrian phase begins three to seven seconds before the adjacent same-direction green interval begins. This strategy allows pedestrians to enter the crosswalk before motorists enter the intersection and can increase visibility of pedestrians in the crosswalk. Along SH 199, leading pedestrian interval treatments are more applicable at smaller intersections where motorists have the ability to see more of the intersection.

2.3 Accessible Pedestrian Signals

As part of the reconstruction of SH 199, new traffic signals would be installed along the corridor. All signalized locations should include accessible pedestrian signals to communicate pedestrian phase information in non-visual formats to pedestrians with visual and/or hearing impairments (see Figure 15 for an example installation).

Figure 15. Accessible Pedestrian Signal Pushbutton Assembly

Source: Rivet, Ryan. "New Campus Crosswalks Accommodate the Visually Impaired". *News from Tulane*. Tulane University. http://www2.tulane.edu/news/newwave/031716_aps_crosswalks.cfm. Accessed 22 June 2017.

2.4 Directional (Perpendicular) Curb Ramps

All crossings in the redesigned street should have directional (or perpendicular) curb ramps with adequate landing pads instead of diagonal curb ramps. This design would need to accommodate the wider ramps needed for the enhanced sidewalks. Directional curb ramps orient pedestrians and bicyclists along a straight path to be followed. The alignment of these ramps would be of special significance for visually-impaired pedestrians. Perpendicular curb ramps provide visually-impaired pedestrians with more accurate guidance on which direction to walk. All curb ramps should include detectable warning devices for ADA compliance.

2.5 Modified Turn Lane Geometry

At intersections with a large number of right-turn movements, including Roberts Cut Off/SH 199, SH 183/SH 199, and University Drive/SH 199, some or all approaches to the intersections may have channelized right-turn lanes based on turning volumes to allow motorists to avoid queues and signal-related delays.

In situations where channelized right-turn lanes are warranted by volumes, it is recommended that the lanes be designed in accordance with the latest Federal Highway Administration (FHWA) guidance, which recommends a sharper angle relative to the angle of the street being entered. This design would require motorists to slow to 14 to 28 mph, allow motorists to more easily see pedestrians or bicyclists in or near the right-turn lane crosswalk, and provide greater visibility of oncoming traffic from the left (see Figures 16 and 17). In addition, the triangle-shaped refuges should have at least 10 feet of storage space to fully accommodate a bicyclist pulling a trailer.

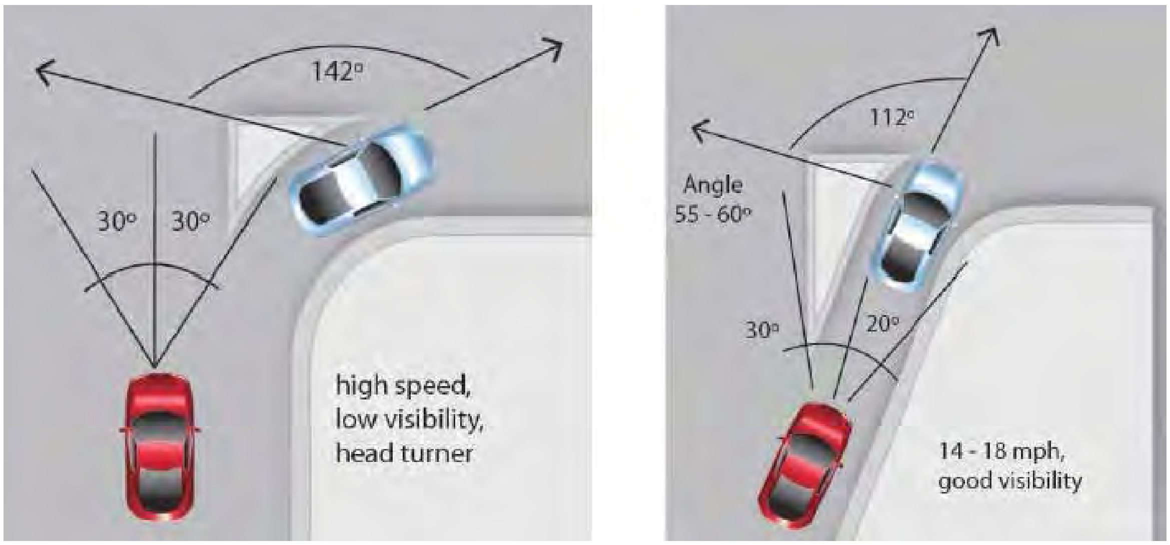

Figure 16. Recommended Right Turn Lane Angles
Source: Pedestrian Safety Guide and Countermeasure Selection System (PEDSAFE). FHWA. http://www.pedbikesafe.org/PEDSAFE/countermeasures_detail.cfm?CM_NUM=24 Accessed 28 April 2017.

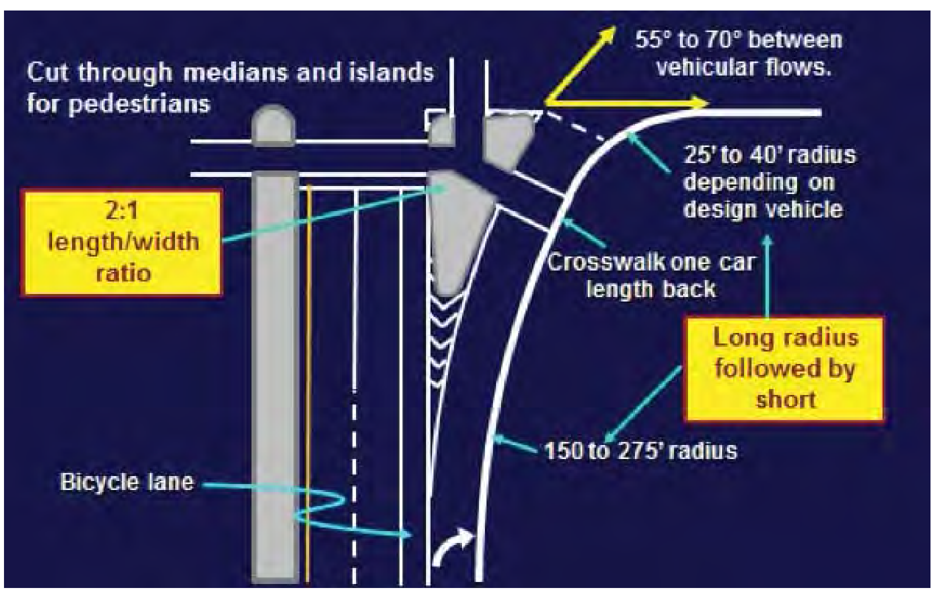

Figure 17. Right Turn Lane Crosswalk Design
Source: PEDSAFE. FHWA. http://www.pedbikesafe.org/PEDSAFE/countermeasures_detail.cfm?CM_NUM=24 Accessed 28 April 2017.

Another treatment that could reduce motorist speeds at right-turn lanes and ease pedestrian and bicyclist crossings would be the construction of raised crosswalks. Raised crosswalks would further slow motorist speeds and would increase the visibility of non-motorized street users in the crosswalk (see Figures 18 and 19). Raised crosswalks should be considered in the design of all channelized right-turn lanes in the SH 199 corridor.

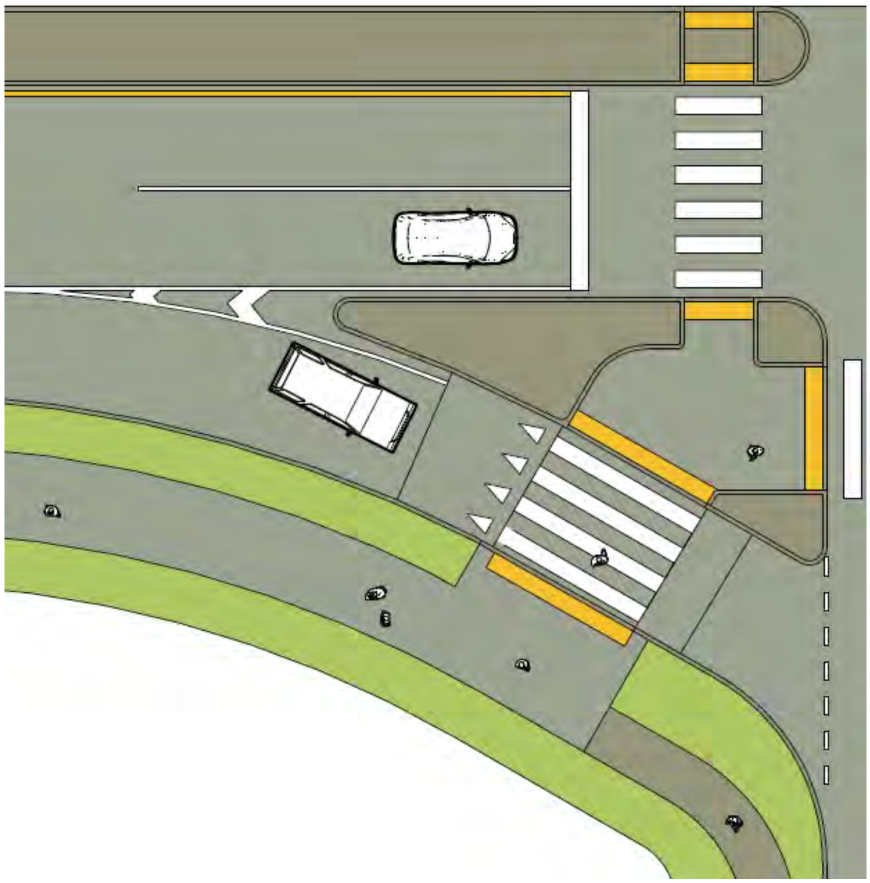

Figure 18. Plan View of Raised Crosswalk at Right Turn Lane
Source: Toole Design Group, 2017.

Figure 19. Perspective View of Raised Crosswalk at Right Turn Lane in Boulder, Colorado

Source: Toole Design Group, 2017.

2.6 Recessed Crossings

Recessed crossings at driveways could reduce the incidence of conflicts between turning vehicles and pedestrians and bicyclists crossing the driveway in the enhanced sidewalk. By setting the crossing back from the intersection, motorists have a refuge space to react and yield to crossing non-motorized users in the crosswalk (see Figure 32). Recessed crossings could also be used at unsignalized intersections and minor signalized intersections. The recommended distance between the roadway and enhanced sidewalk crossing is between six to 16.5 feet. In most locations along SH 199, the distance between the curb and right-of-way is 17 feet, allowing for setback distances on the lower end of this range. The crossing could be raised as well for added visibility and traffic calming. This greater setback to the crossing would also enhance visibility of vulnerable users as they approach and cross the driveway or cross street.

Similarly, motorists approaching the recessed crossing from the driveway or cross street could stop and look for crossing bicyclists and pedestrians upstream of the crosswalk, proceed across the crosswalk, and have adequate refuge space to look for oncoming traffic from the left before executing their right turn. Without the recessed crossing, motorists often stop in the crosswalk to gain sufficient sight distance to look for a gap in traffic.

Recessed crossings should be considered along the SH 199 corridor, particularly at major driveways where right-of-way is adequate for this design.

2.7 Median Refuges and Shorter Crossing Distances

Crossing distances at major intersections along the SH 199 study corridor currently measure between 80 to 100 feet. At a walking pace of 3.5 feet per second, these crossings could require nearly 30 seconds to traverse. With adequate signal timing, many pedestrians could cross the entire distance during the pedestrian phase, but for those who cannot, few of the crossings have medians, which strands pedestrians in the middle of the street when the pedestrian phase ends.

If possible, pedestrian refuges should be considered. These refuges should include detectable warning devices for ADA compliance.

2.8 Lighting

Appropriate lighting along the roadway, sidewalks, and at intersections would increase the comfort and safety of motorists, pedestrians, and bicyclists and should comply with the *TxDOT Highway Illumination Manual*. Lighting at intersections and crossings would make pedestrians and bicyclists more visible to motorists. Lighting is also useful to provide a greater sense of security for those using the sidewalks. It is particularly important to provide adequate lighting in commercial areas, of which large sections of SH 199 is comprised.

FHWA recommends that luminaires be located away from the intersection and positioned in a way that illuminates the approach sides of the pedestrian, provides a positive contrast between background intersection illumination and the pedestrian, and could be supplemented by vehicle headlights. Figure 20 indicates the luminaire configuration preferred by FHWA for crosswalks at wide streets, including median-located luminaires.

For the SH 199 corridor, the illumination design should illuminate the roadway and the bicycle and pedestrian facility. Illumination where a motorist is required to stop for pedestrian or traffic conflict should be steadily increased approaching the stop and correspondingly decreased leaving the conflict area.

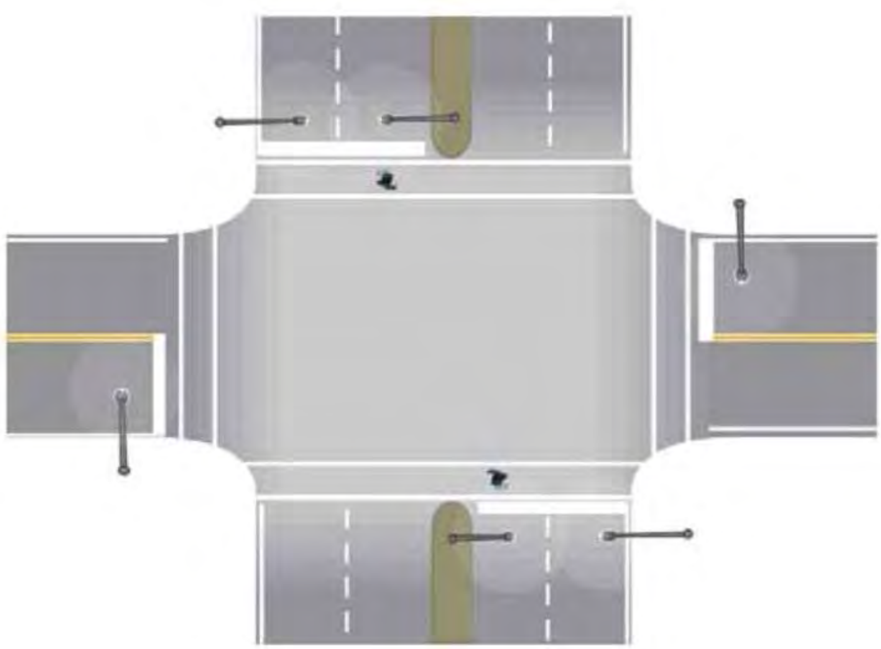

Figure 20. FHWA-Preferred Intersection Lighting Layout for Crosswalks at Wide Roadways

Source: Informational Report on Lighting Design for Midblock Crosswalks, FHWA Publication No. FHWA-HRT-08-053, https://www.fhwa.dot.gov/publications/research/safety/08053/08053.pdf

3.0 ACCESS MANAGEMENT CONSIDERATIONS FOR BICYCLE AND PEDESTRIAN SAFETY

Every location where a vehicle can enter or leave a roadway creates a potential conflict with through-moving motorists, as well as people walking or riding bicycles, and represents an opportunity for a crash to occur. For vulnerable road users, including pedestrians and bicyclists, these crashes can be particularly severe and even fatal.

The AASHTO guidelines provide a list of 14 potential design and operational complications to be anticipated in the design of shared use paths adjacent to a roadway (i.e., a sidepath, or the enhanced sidewalk planned for SH 199). Because the function of the enhanced sidewalks on SH 199 would be identical to a sidepath, these operational concerns would be the same. Some of these complications are highlighted in Figure 21.

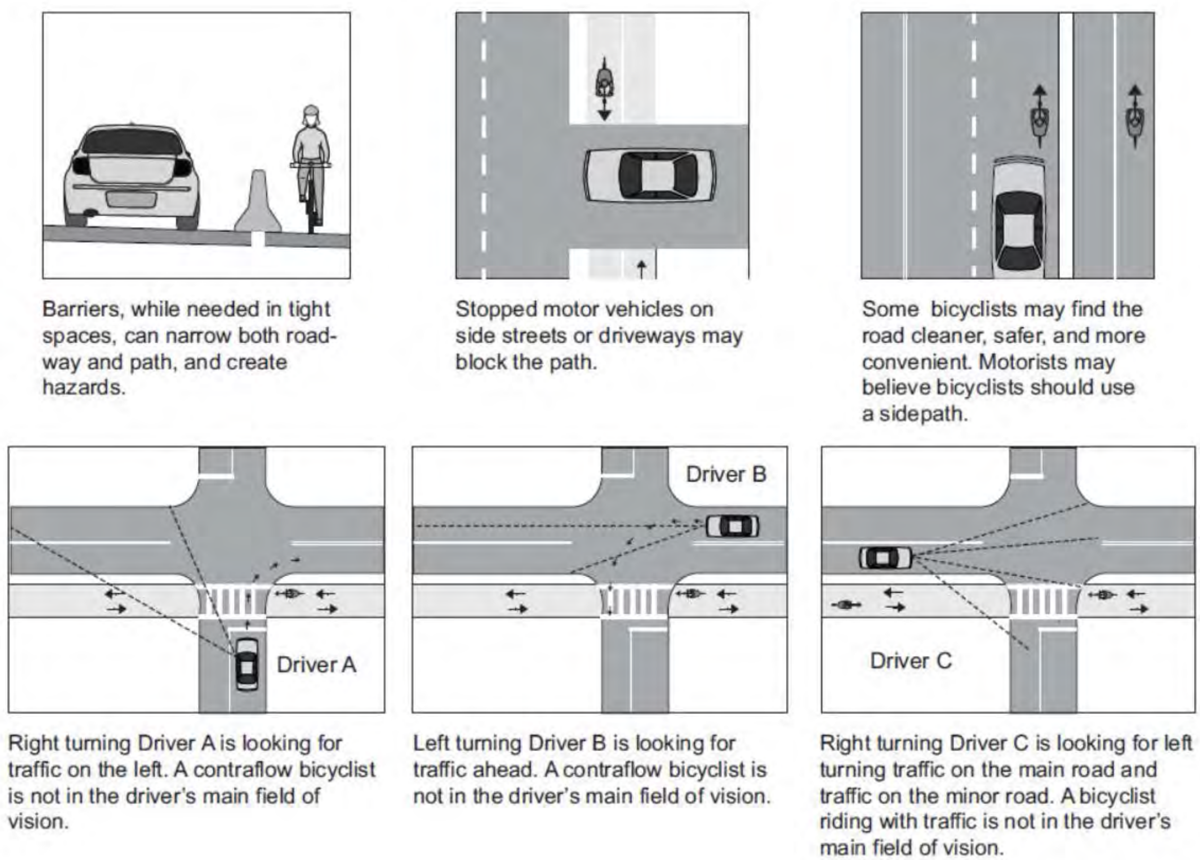

Figure 21. Sidepath Conflicts

Source: Figure 5-4, *AASHTO Guide for the Development of Bicycle Facilities*. 4th Edition

Most of the operational complications given in the AASHTO *Bike Guide* center on visibility issues and conflicts at driveways and cross streets. Proper treatments and design solutions can minimize risks to pedestrians and bicyclists created by the complications cited in the AASHTO *Bike Guide*.

The *TxDOT Access Management Manual* (http://onlinemanuals.txdot.gov/txdotmanuals/acm/acm.pdf) states that one benefit of an effective access management policy is the safety benefit created for pedestrians and bicyclists. The *TxDOT Access Management Manual* also cites research from the National Cooperative

Highway Research Program (NCHRP) which indicates that vehicle crash rates increase exponentially along a corridor as the number of access points increases. TxDOT recommends that ingress and egress points along a roadway, such as a driveway, be designed so that safety is considered for those moving along the roadway as well as for those using the driveway.

Access management is a critical design factor for bicyclist and pedestrian safety. Driveways present safety risks for bicyclists and pedestrians because every driveway along a street represents one or more conflict points where motorists could strike a vulnerable road user.

When entering or exiting a traffic stream at a driveway, motorists are often concerned primarily with avoiding conflicts with other motor vehicles and can be less attentive to potential conflicts with pedestrians and bicyclists, who typically move along the outside edges of streets either in a bike lane, sidewalk, or shared use facility. In future design phases, TxDOT would coordinate the location and width of proposed driveways based on current and future land uses, necessary vehicular access, and site circulation. TxDOT representatives would review each property on a case-by-case basis to determine access and driveway needs. All driveway locations and widths would be in accordance with the most recent version of the *TxDOT Access Management Manual* and *TxDOT Roadway Design Manual*.

There are a variety of treatments that could be applied to increase the safety of pedestrians and bicyclists crossing driveway openings. These treatments raise motorists' awareness of vulnerable road users who may be entering the crossing. The treatments also alert bicyclists and pedestrians to look for conflicting motor vehicle traffic.

3.1 Geometry and Visibility Enhancements

The view of sidewalk or bicycle facility approaches should be unobstructed for drivers preparing to turn into a driveway or cross a street. Sight distances and sight triangles based on motorist, bicyclist, and pedestrian speeds should be preserved at all locations where entering or leaving the roadway is permissible. To maintain the approach clear space upstream and downstream of the driveway or access point, trees, tall landscaping, large signs, and other visual barriers should be restricted. Keeping these areas clear of visual obstructions helps ensure that drivers can detect and react to people who may walk or bicycle across the access point. Figure 22 illustrates the influence of adequate approach clear space on a motorist's ability to see and react to bicyclists when preparing to execute a left and right turn, respectively.

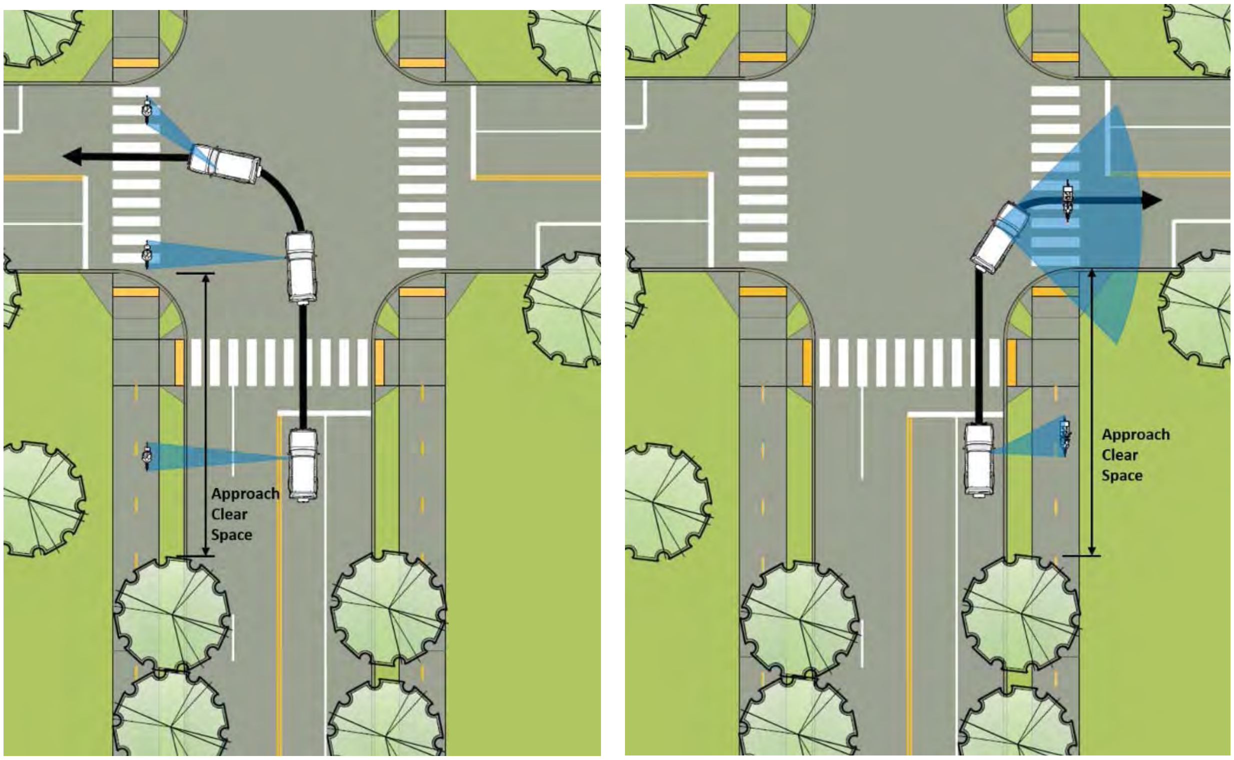

Figure 22. Approach Clear Space for Left-Turning and Right-Turning Motorists
Source: Toole Design Group, 2017

Drivers should be able to clearly see pedestrians or bicyclists approaching the driveway from either direction. The approach clear space needed depends on the speed with which motorists will negotiate the driveway entry. Table 1 provides best practices estimates of the necessary approach clear space on either side of a driveway opening for turning speeds between 10 and 20 miles per hour (mph).

Table 1. Approach Clear Space Distance by Vehicular Turning Design Speed

Vehicular Turning Design Speed	Approach Clear Space
10 mph	40 feet
15 mph	50 feet
20 mph	60 feet

Source: Exhibit 4J, *Separated Bike Lane Planning and Design Guide*. Massachusetts Department of Transportation (MassDOT). https://www.massdot.state.ma.us/highway/DoingBusinessWithUs/ManualsPublicationsForms/SeparatedBikeLanePlanningDesignGuide.aspx

In addition to providing adequate clearance on the approaches to a driveway, the sidewalk should continue across the driveway opening to draw attention to the continuity of these facilities (see Figure 23), rather than terminating the sidewalk and bicycle facility at the edge of the driveway and resuming it on the opposite side (see Figure 24). By continuing the sidewalk across the driveway, sidewalk users are prioritized and yielding behavior by motorists is reinforced.

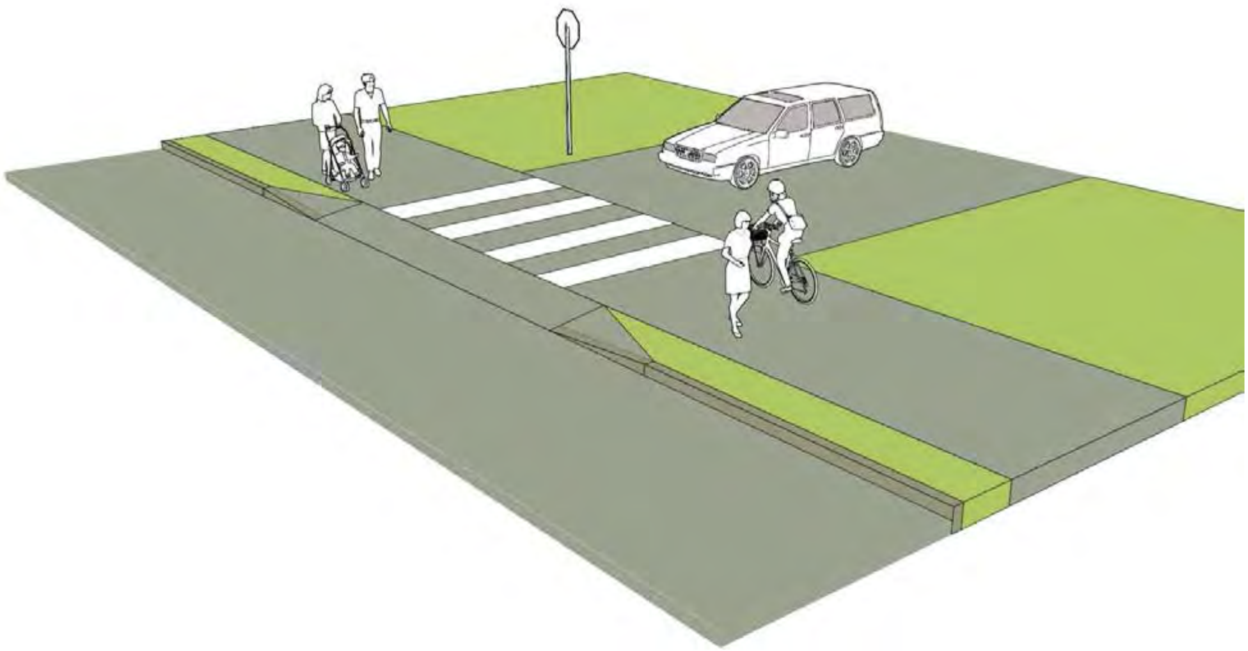

Figure 23. Continuous Enhanced Sidewalk Across Driveway
Source: Toole Design Group, 2017

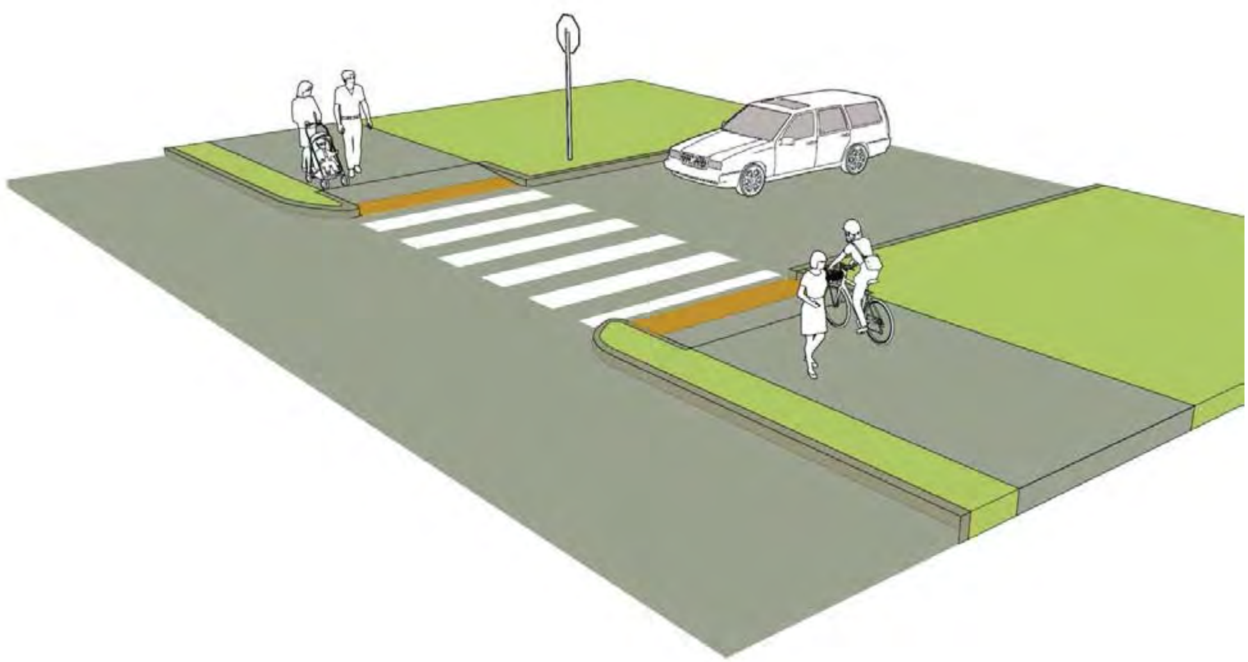

Figure 24. Discontinuous Enhanced Sidewalk Across Driveway
Source: Toole Design Group, 2017

To further encourage slower motorist turning speeds, corner radii at driveways should be reduced to appropriate dimensions for the design vehicle accessing the land use. Smaller, appropriately sized radii induce drivers to slow their vehicles to negotiate the turn. By slowing speeds, this design allows for shorter stopping distances when reacting to the presence of a pedestrian or bicyclist, should the driver fail to see these vulnerable users as they approach the crossing. Slower speeds can also reduce the severity of injuries should a crash occur. Prioritizing driveways for specific uses can ensure a higher number of safe crossings for pedestrians and bicyclists. Because most driveways will only accommodate customers and passenger vehicles, they should be designed as such while appropriate widths and curb radii should be used at entries prioritized for larger delivery vehicles.

3.2 Pavement Markings and Signage

Installing high-visibility reflective pavement markings at conflict points could be an effective means of identifying locations where all street users should pay extra attention to their surroundings. Maintaining the sidewalk elevation and surface type at driveways, which conveys the message that motorists have not yet entered the street, could help identify these locations and encourage motorist awareness.

High-visibility crosswalks should be installed and maintained at all cross streets and at all driveways if the sidewalk elevation and surface are not maintained at driveways. Continental crosswalk pavement markings 24” in width are recommended for the SH 199 corridor due to their greater visibility compared to standard crosswalk pavement markings (see Figure 25). Augmenting the crosswalk markings with pedestrian and bicyclist symbols indicating crossing non-motorized travel in both directions could heighten awareness of motorists entering the crossing.

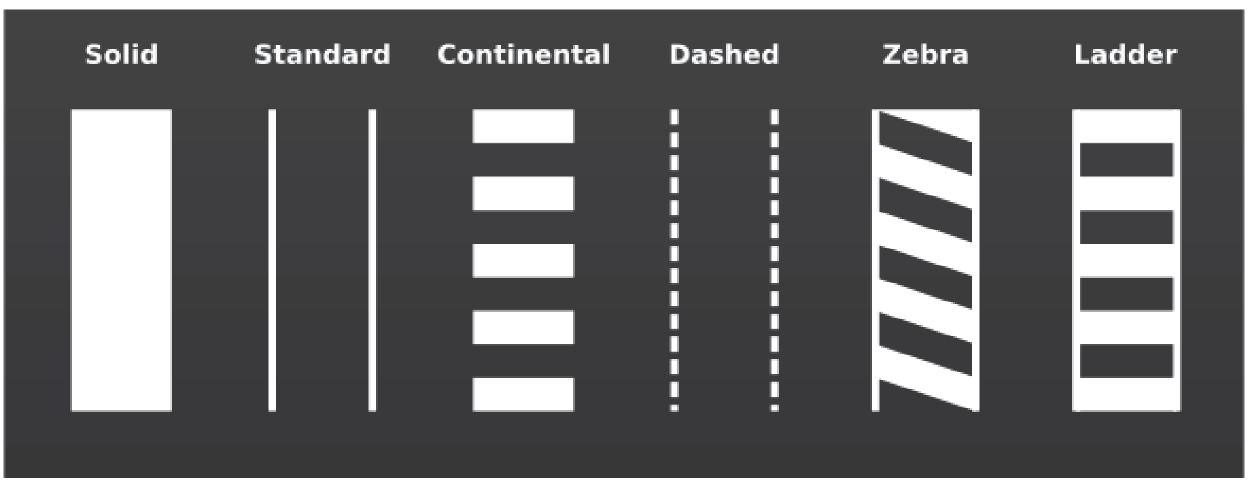

Figure 25. Types of Crosswalk Pavement Markings

Source: Crosswalks | SF Better Streets. http://www.sfbetterstreets.org/find-project-types/pedestrian-safety-and-traffic-calming/crosswalks/ Accessed: June 16, 2017.

Signage is an important component of raising motorist awareness to the presence and likely movements of vulnerable road users. Alerting motorists entering and exiting driveways to the bidirectional movements of bicyclists and pedestrians in an enhanced sidewalk could help remind motorists to look both ways for these street users and not focus solely on approaching motor vehicles. In an environment like that in the SH 199 corridor, motorists could be looking only to their left for gaps in approaching traffic and not check for bicyclist or pedestrian conflicts approaching from their right. Motorists should also be reminded to yield the right-of-way to pedestrians and bicyclists, particularly in locations when yielding compliance is poor.

3.3 Enhanced Sidewalk Signage Best Practices

Several jurisdictions across the United States have established best practices for signage in sidewalk contexts like those recommendations for SH 199. A few of these key practices for areas with potential conflicts between motorists and pedestrians or bicyclists are highlighted in this section. It should be noted that many of these signs are not included in the latest version of the *Texas Manual for Uniform Traffic Control Devices* (TMUTCD).

3.3.1 Signage for Motorists Exiting Driveways and Cross Streets

Options for signage could include customized warning signs for motorists exiting driveways and other uncontrolled crossings to notify them of the likely presence of non-motorized traffic crossing the driveway on the enhanced sidewalk. For major driveways, this signage could include assemblies with W11-15 and W16-7P signs (Figure 26). These signs should be placed on either side of the driveway to be visible to motorists as they approach the enhanced sidewalk from the property. If motorists fail to recognize the enhanced sidewalk as a non-motorized facility and attempt to drive on it, signage restricting motor vehicle usage could be added at driveways and cross streets, although this signage should be used only if an ongoing compliance problem is observed.

Figure 26. Sign Assemblies with W11-15 and W16-7P Left and W16-7P Right
Source: TMUTCD, 2011. https://ftp.dot.state.tx.us/pub/txdot-info/trf/tmutcd/2011-rev-2/revision-2.pdf

Alternatively, the W11-15 sign could be combined with a TWO-WAY supplemental plaque (W1-7) as depicted in Figure 27. This sign assembly could be located at minor driveway crossings where it would be most visible to motorists in advance of the crossing.

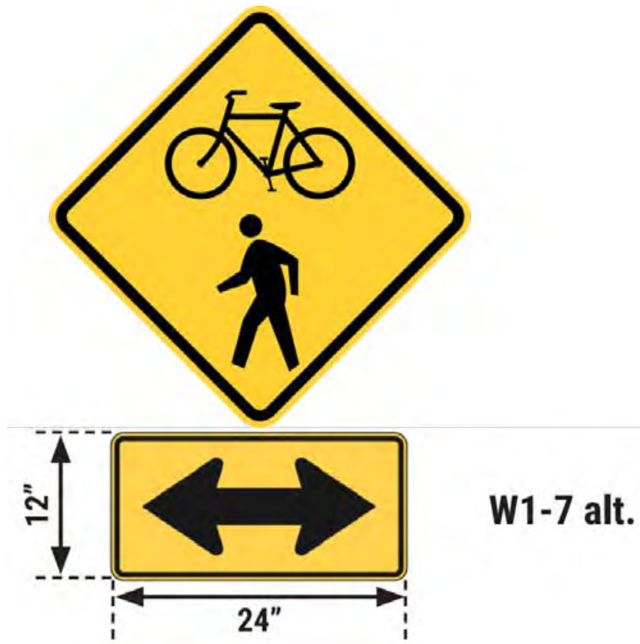

Figure 27. BICYCLE WARNING Sign (W11-15) and TWO-WAY sub-plaque (W1-7 alt.)
Source: *MassDOT Separated Bike Lane Planning and Design Guide*. https://www.massdot.state.ma.us/highway/DoingBusinessWithUs/ManualsPublicationsForms/SeparatedBikeLanePlanningDesignGuide.aspx

Some jurisdictions install signage at all major and minor driveways crossing sidepaths. The signage shown in Figure 28 is used extensively in Boulder, Colorado at locations where driveways and parking lot ingress/egress points cross sidepaths.

Figure 28. Signage for Two-Way Bicycle and Pedestrian Traffic at Driveway
Source: Toole Design Group, 2017

3.3.2 Signage for Motorists Entering Driveways and Cross Streets

At major driveways and cross streets, motorists entering driveways could be warned to yield to pedestrians and bicyclists in the enhanced sidewalk, using a modified version of R10-15, which includes symbols for both a bicyclist and a pedestrian (see Figure 29).

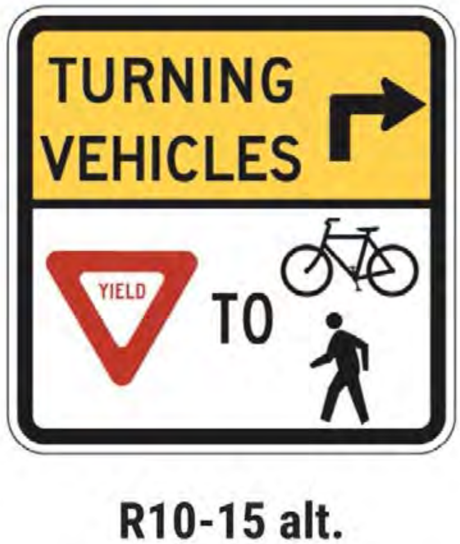

Figure 29. Turning Vehicles Yield to Bicycles and Pedestrians Sign (R10-15 alt.)
Source: *MassDOT Separated Bike Lane Planning and Design Guide*.
https://www.massdot.state.ma.us/highway/DoingBusinessWithUs/ManualsPublicationsForms/SeparatedBikeLanePlanningDesignGuide.aspx

At minor signalized and unsignalized intersections, it could be useful to install the sign pictured in Figure 30, which is used extensively by the Colorado Department of Transportation at locations where motor vehicle traffic could cross a sidepath facility.

Figure 30. Adjacent Path Sign
Source: *Colorado Department of Transportation Roadway Design Guide*.
https://www.codot.gov/business/designsupport/bulletins_manuals/roadway-design-guide/ch14

3.3.3 Signage for Pedestrians and Bicyclists on the Enhanced Sidewalk

It could also be beneficial to people walking and bicycling on the enhanced sidewalk to install signage alerting them to driveway crossings ahead and possible conflicts with motorists. Signage similar to that shown in Figure 31 could be one option.

Figure 31. Signage to Warn People Walking and Biking on Enhanced Sidewalk of Potential Cross Traffic at Driveway
Source: Toole Design Group, 2017

3.4 Raised Crossings and Recessed Crossings

At locations where a sidewalk or bicycle facility crosses driveways or intersections, special precautions should be considered. In the case of motorists attempting a left turn across oncoming traffic into the driveway, the driver might be focused on identifying a gap in the traffic stream and accelerating into the driveway when an adequate gap is found. In such a case, the driver might not observe bicyclists or pedestrians moving into or across the driveway opening. The most effective solution for this scenario is to restrict the left-turn movement with a raised median within the driveway, which eliminates the ability to make higher-speed left turns into the driveway. Similar conflicts could be encountered between right-turning motorists and bicyclists or pedestrians in the crossing. Two design solutions to help minimize the incidence of these conflicts are raised crossings and recessed crossings.

With the raised crossing, the enhanced sidewalk crossing is combined with a raised section. Motorist speeds would be reduced by the motorist's anticipation of negotiating the change in elevation between the street and the crossing. Yielding behavior by motorists would also be reinforced with slower speeds and prioritization of pedestrian and bicyclist travel. In addition, raised crossings would increase the visibility of bicyclists and pedestrians in the crossing.

Recessed crossings, which could be combined with raised crossings as in Figure 32, provide a refuge area for motorists to wait outside the conflicting traffic stream while yielding to bicyclists or pedestrians using the crossing. The greater setback to the pedestrian and bicycle facility, which typically measures between six feet and 16.5 feet from the curb face to the edge of the facility (see Section 3.6), would also enhance visibility of vulnerable users as they approach and cross the driveway or cross street. Motorists approaching the crossing to enter traffic on the main street could yield and wait for crossing pedestrians and bicyclists, then advance to a position on the opposite side of the crossing to look for gaps in traffic without obstructing pedestrians and bicyclists in the crossing.

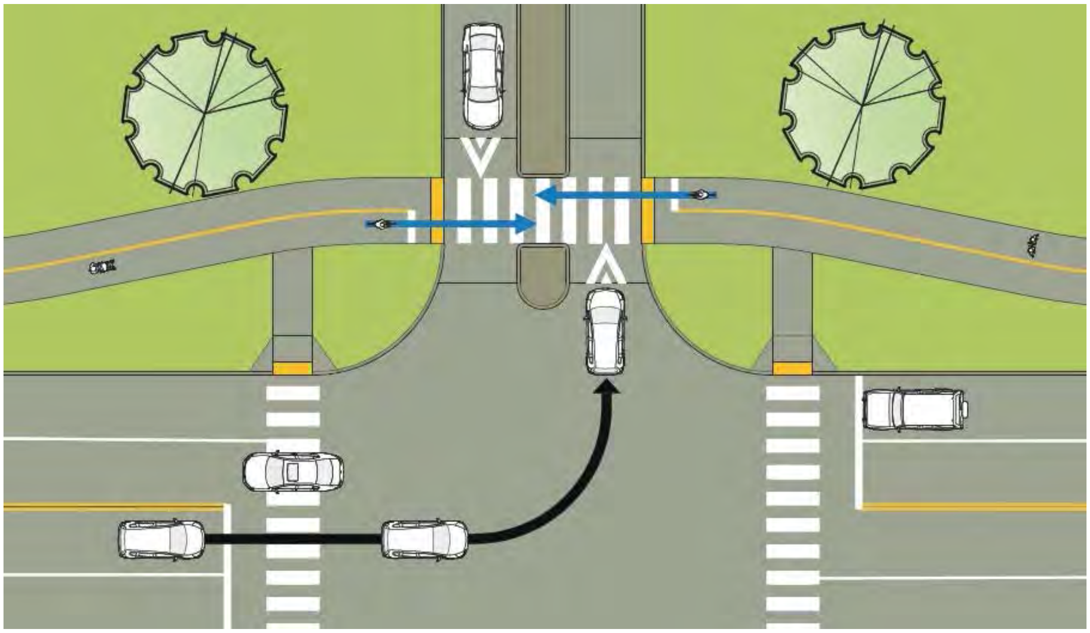

Figure 32. Recessed and Raised Crossing at Enhanced Sidewalk
Source: Toole Design Group, 2017

Along sections of the SH 199 corridor that include the enhanced sidewalk and available right-of-way, recessed crossings should be provided at all intersections and driveways, and raised crossings should be considered at all locations where geometry allows. High-visibility crosswalk markings should be implemented at all intersections and driveways, particularly if the sidewalk surface is not continued across the crossing. Warning signage to increase motorist awareness should be included at all intersections and major driveways.

4.0 COORDINATION WITH THE FORT WORTH PEDESTRIAN AND BICYCLE ADVISORY COMMISSION

The project team conducted a coordination meeting on February 23, 2017, and a workshop meeting on March 29, 2017, with the Fort Worth Pedestrian and Bicycle Advisory Commission. The Commission strongly recommended that the project team address bicycle and pedestrian connectivity along and across SH 199. Additionally, on March 31, 2017, the Fort Worth Pedestrian and Bicycle Advisory Commission provided a letter of support and the following recommendations for the SH 199 Corridor Master Plan.

- Review opportunity to connect SH 199 pedestrian and bicycle improvements to the Trinity River Trail along Ohio Garden Road to Isbell Road intersection and the bridge across the West Fork of the Trinity River
- Preference for pedestrian and bicycle accommodations to be attractive for all user types
- Include a center yellow stripe on the ten-foot enhanced sidewalk
- Include signage and/or enhanced pavements at driveway or street crossings
- Provide ten-foot enhanced sidewalks on both sides of the roadway, reduce the outside lane width from 15 feet to 12 feet, and introduce speed reduction measures
- For safety and comfort purposes, provide lighting for both the roadway and the sidewalk
- Where appropriate, provide trees on both sides of the roadway

A summary of all project recommendations stemming from these meetings can be found in the City of Fort Worth Pedestrian and Bicycle Advisory Commission Technical Memorandum.

5.0 EXHIBITS

1. Existing and Planned Bicycle and Pedestrian Accommodations Map
2. Lake Worth Regional Trail – Planned Trail Alignment
3. Map of Bikeway Network in Tarrant County
4. Fort Worth Trinity Trails Map

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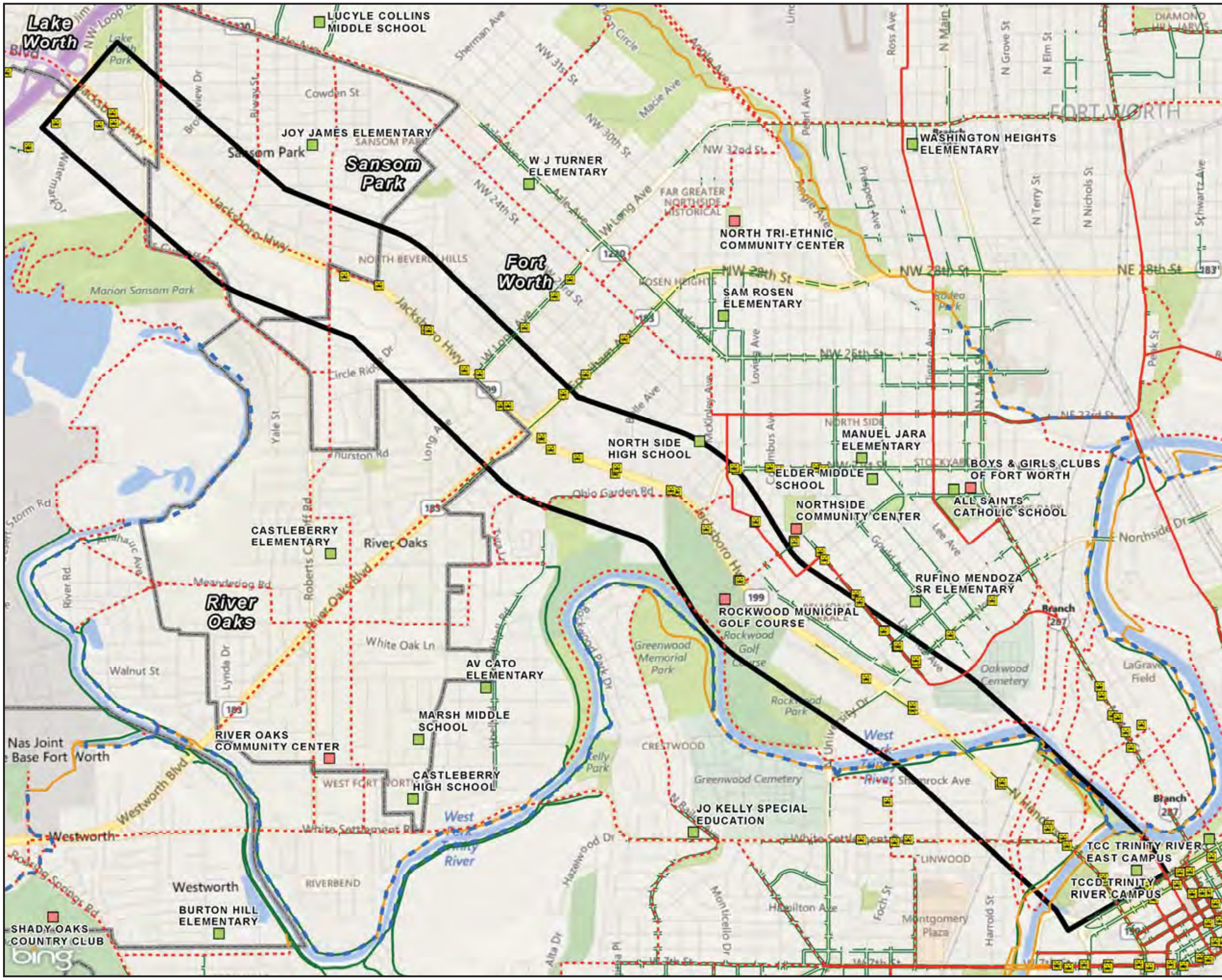
Exhibit 1

Existing Bicycle and Pedestrian Accommodations Map

Existing and Planned Bicycle and Pedestrian Accommodations Map

Exhibit 1

State Highway 199
Corridor Master Plan



Legend

- Bus Stop
- Educational Facilities
- Recreation Facilities
- Existing Pedestrian Facility
- Existing Bike Facility
- Existing Bike & Ped Facility
- Proposed Bike Facility
- Regional Veloweb
- Study Area Boundary
- City Limits

Key Map

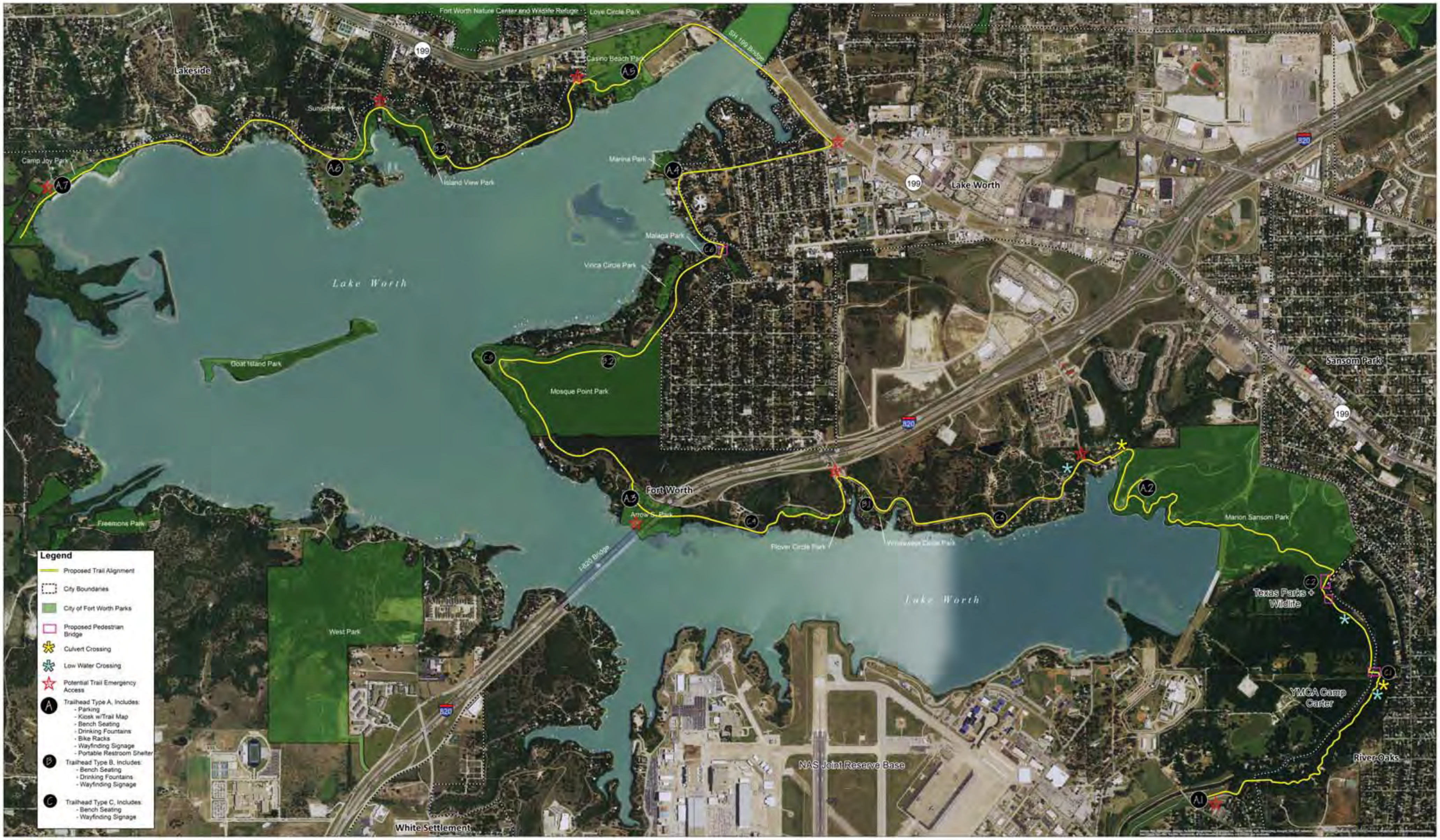
0 0.25 0.5 1
Miles

North Central Texas Council of Governments

Date: 9/23/2016

Exhibit 2

Lake Worth Regional Trail – Planned Trail Alignment



FORT WORTH. FREESE NICHOLS

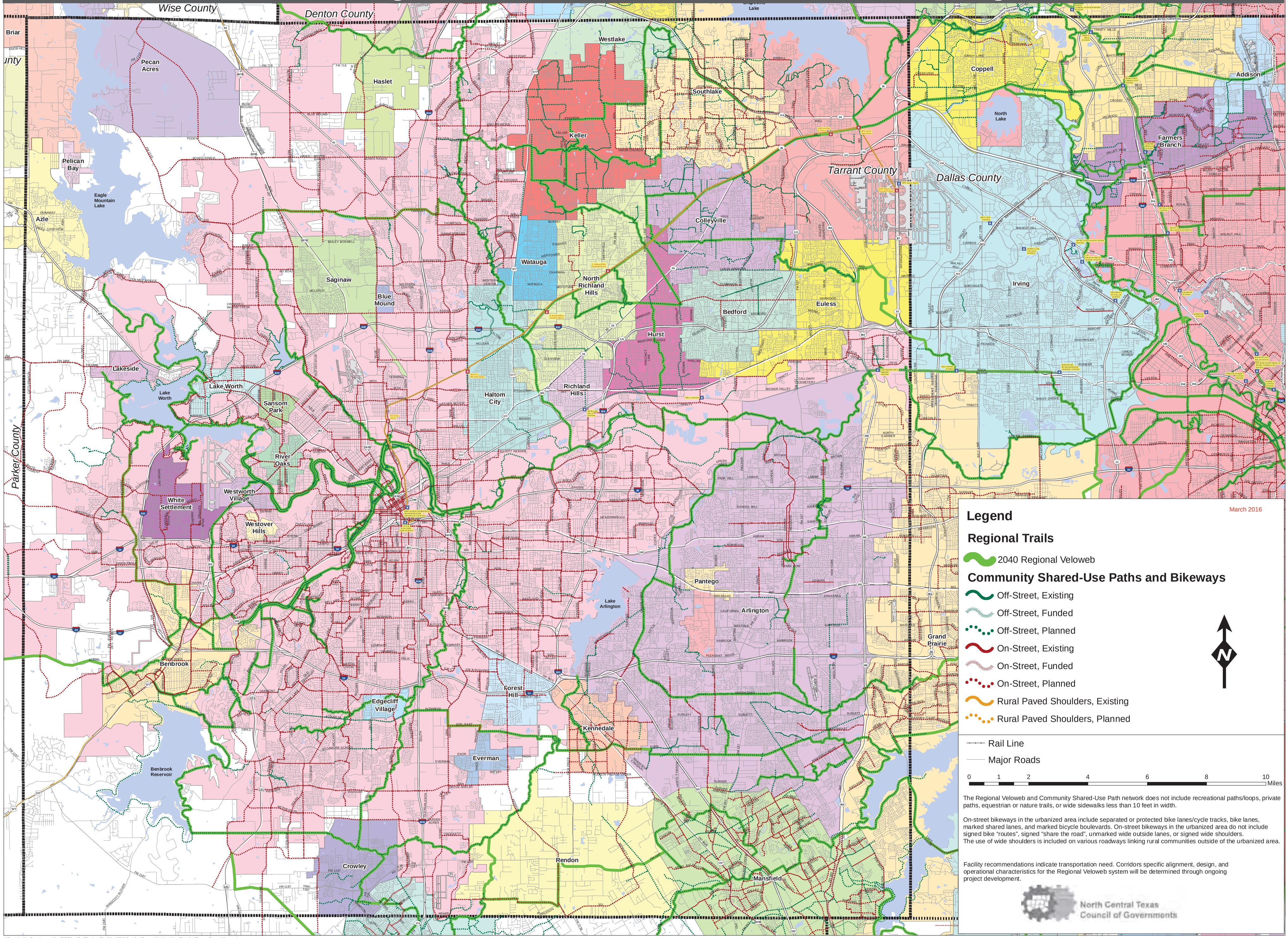
Lake Worth Regional Trail - Preliminary Trail Alignment September 16, 2015

1,000 500 0 1,000 Feet

Exhibit 3

Map of Bikeway Network in Tarrant County

Bikeway Network in Tarrant County



I:\Sustainable_Development\ArcGIS\Bike_Ped\Regional\Facilities\2040 Detailed County Working Maps\Detailed Tarrant County Map.mxd

Exhibit 4

Fort Worth Trinity Trails Map

Fort Worth Trinity Trails

Legend

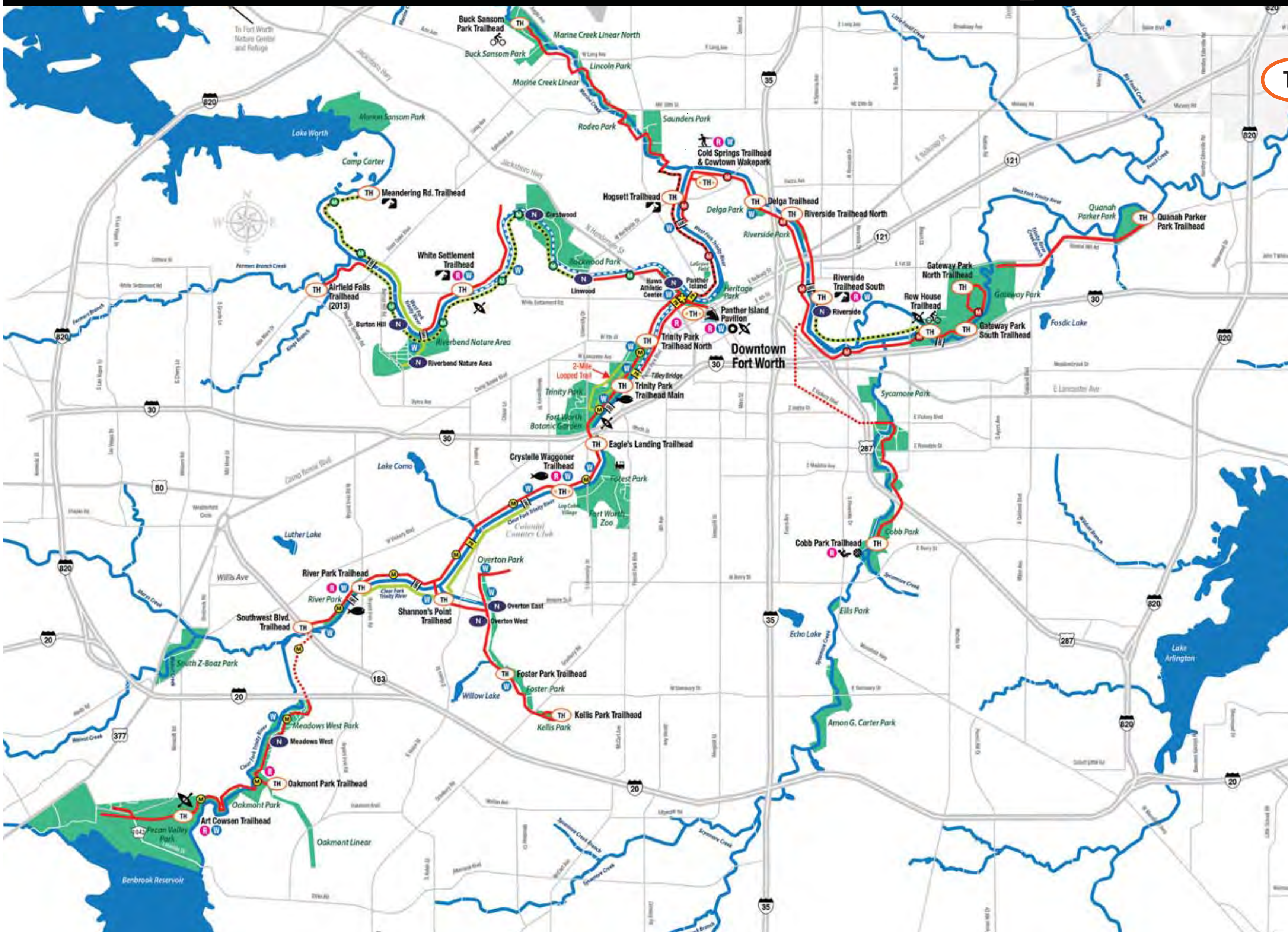
- Crushed Limestone Trails
- Paved Trails
- On-street segment of trail
- Equestrian Trails
- Paddle Routes
- LWC Low-Water Crossing
- PB Pedestrian Bridge
- N Neighborhood Access/ No Parking Area
- TH Trailhead/ Parking Area
- TH Entertainment Venue
- Mile 0
- M Mile Marker for Upper West Fork Trail
- M Mile Marker for Lower West Fork Trail
- M Mile Marker for Clear Fork Trail
- W Water Fountain
- R Restroom
- Fishing Area
- Horse Trailer Parking
- Non-Motorized Boat Launch
- Wakeboarding
- Tubing
- Mountain Biking
- Basketball
- Playground

You keep the river cool.

Support the river and enjoy special perks at **KeepTheRiverCool.org**.
See the progress we're making together at **TrinityRiverVision.org**.

We keep the river running.

trwd.com/recreation | fortworthtexas.gov | streamsandvalleys.org



Trailhead Cross Streets

Airfield Falls
Pumphrey Rd & NASJRB

Meandering Rd.
Meandering Road & Anahuac St

White Settlement
White Settlement at Isbell Rd

Heritage Park/ Panther Island Pavilion
N. Taylor St. cul-de-sac

Hogsett
600 block E. Northside Drive

Cold Spring
2289 Whirlybird Way

Delga
Nixon at Delga Street

Riverside N
Oakhurst Scenic at Embrey Place

Riverside S
E. 4th Street at S. Rayner

Row House
775 Beach Street

Gateway Park S
Riverbank Road

Gateway Park N
Streams & Valleys Circle

Quanah Parker Park
Randol Mill Rd at Woodhaven

Trinity Park N
Trinity Park Dr at W. 7th St

Trinity Park Main
Trinity Park Dr (Mayfest grounds)

Eagle's Landing
Old University Drive at Rosedale overpass

Crystelle Waggoner
4301 Riverfront Drive

Shannon's Point
Bellaire Dr. S. at Overton Woods Drive

River Park
3100 Bryant Irvin Rd

Oakmont Park
7000 Bellaire Dr. S.

Art Cowsen
7500 Memorial Oak Dr

Foster Park
South Dr at Trail Lake Dr

Kellis Park
S. Ridge Terr at Spurgeon

Appendix I – Bus Transit Technical Memorandum

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State Highway 199 Corridor Master Plan

From IH 820 to Belknap Street

Bus Transit Technical Memorandum

Submittal Date:
August 31, 2017

Prepared For:
North Central Texas Council of Governments

Prepared By:
Toole Design Group, LLC
8484 Georgia Avenue, Suite 800
Silver Spring, MD 20910
310-927-1900

TooleDesignGroup

1.0 BUS TRANSIT

The State Highway (SH) 199 Corridor Master Plan study evaluated existing conditions in the SH 199 corridor between Interstate Highway (IH) 820 and Belknap Street, including physical conditions of the corridor, traffic characteristics, and stakeholder perspectives. In addition to changes to the roadway, the study makes recommendations to improve pedestrian and bicycling conditions in the corridor. Bus transit operations and infrastructure are important components of multimodal mobility in the corridor, and necessitate analysis of connectivity and access to transit by pedestrians and bicyclists. The connectivity and access analysis resulted in a set of recommendations to enhance the experience of bus patrons in this area.

1.1 Existing Bus Service and Stop Locations

Bus stops within the study corridor are served by Fort Worth Transportation Authority (FWTA). Both River Oaks and Fort Worth are served by FWTA buses, while Lake Worth and Sansom Park are not served by FTWA bus service. The primary route serving the SH 199 corridor is Route 46, known as the Jacksboro Highway route. Figure 1 shows the route map for Route 46 and Attachment A shows the Route 46 schedule.

Figure 1. FWTA Route 46 Map

Source: Fort Worth Transportation Authority, 2017 (http://www.the-t.com/Portals/0/docs/W_tht_lft_web_Route-46_170320.pdf)

FWTA currently uses standard buses (see Figure 2) to serve Route 46. Route 46 does not have any stops along sections of SH 199 located in the non-participating jurisdictions. This service pattern creates large sections of the study corridor without bus service as seen in Exhibit 1. As a result, some bus stops are located at a greater distance from each other, which may create accessibility issues for people wishing to reach this area via transit. For instance, buses do not stop between Old Mill Creek and Beverly Hills Drive, a distance of approximately 1.25 miles. Within the FWTA service area, most bus stops are spaced within one-quarter to one-half mile along the corridor, with closer spacing near the Walmart and Town and Country Center transfer centers between SH 183 and Ohio Garden Road. Figures 3 and 4 show the existing shelter and bus pullouts at the Town and Country Center transfer center and at the Walmart transfer center along SH 199, respectively.

Figure 2. FWTA Standard Bus Traveling Westbound on SH 199 at Beverly Hills Drive Intersection

Source: Freese and Nichols, Inc., 2016

Figure 3. Existing Bus Shelter and Pull Out West of SH 199 and SH 183 Intersection at Town and Country Center

Source: Freese and Nichols, Inc., 2016

Figure 4. Existing Bus Pull Out East of SH 199 and SH 183 Intersection at Walmart
Source: Freese and Nichols, Inc., 2016

Figure 5 shows the FWTA system map in the area near the SH 199 study corridor. FWTA routes that intersect SH 199 include Routes 90 (Long Avenue) and 91 (Ridgmar Mall/Stockyards). These intersecting routes provide transfer opportunities to SH 199 at four bus stop locations east of SH 183 near Walmart (Route 90) and at the intersection with SH 183 (Route 91). Transfers to Route 90 can be made at the bus stops shared with Route 46. Transfers between Route 46 and Route 91 require walking 0.2 mile in an area with no sidewalks for bus stops on the same quadrant of the SH 199/SH 183 intersection. For transfers between bus stops in different quadrants of the intersection, bus riders must walk 0.3 mile and cross two legs of this large intersection. Crossing distances are long, measuring between 160 and 180 feet, and lack median refuges.

Figure 5. Bus Routes Serving the SH 199 Study Corridor
Source: Fort Worth Transportation Authority, 2017

With almost 14,000 riders, Route 46 had the 13th highest ridership of the 42 routes where data was collected during the month of April 2017. In the same time period, Route 91 had almost 3,000 riders (27th of 42 routes) and Route 90 had almost 1,300 riders (33rd of 42 routes). FWTA bus ridership data for the month of April 2017 can be seen in Attachment B.

On April 9, 2017, service on Route 46 was increased to run until 11:00 p.m. and Sunday service was added to the route. Headways remain at 30 minutes. Table 1 shows daily ridership on Route 46 on weekdays. Prior to the change in service, ridership averaged 550 passengers per day. After the service change, daily ridership averaged 577 passengers. While it is too soon (one month of data) to make a direct comparison between these averages due to seasonal fluctuations and other factors that affect transit ridership, it could be surmised that ridership might grow over time with the greater service levels.

Table 1. FWTA Route 46 Weekday Ridership*
(March 20, 2017 through April 28, 2017)

Date	Number of Bus Riders	Date	Number of Bus Riders
3/20/2017	618	4/10/2017	589
3/21/2017	500	4/11/2017	538
3/22/2017	465	4/12/2017	585
3/23/2017	643	4/13/2017	567
3/24/2017	521	4/14/2017	562
3/27/2017	564	4/17/2017	476
3/28/2017	526	4/18/2017	641
3/29/2017	508	4/19/2017	671
3/30/2017	542	4/20/2017	579
3/31/2017	566	4/21/2017	545
4/3/2017	573	4/24/2017	588
4/4/2017	559	4/25/2017	601
4/5/2017	559	4/26/2017	599
4/6/2017	582	4/27/2017	590
4/7/2017	526	4/28/2017	527
Total Riders	8,252	**Total Riders**	8,658

Source: Fort Worth Transportation Authority, 2017
*Route 46 improvements implemented on 4/9/2017

1.2 Bus Stop Location Impacts on Passenger Access, Operations, and Safety

The location of a bus stop can be categorized as near-side, far-side, or mid-block depending on its location relative to an intersection (see Figure 6). The location of a bus stop within a block determines a number of benefits and challenges for passenger access, operations, and safety. Attachment C provides more information regarding operational and safety considerations when siting bus stops.

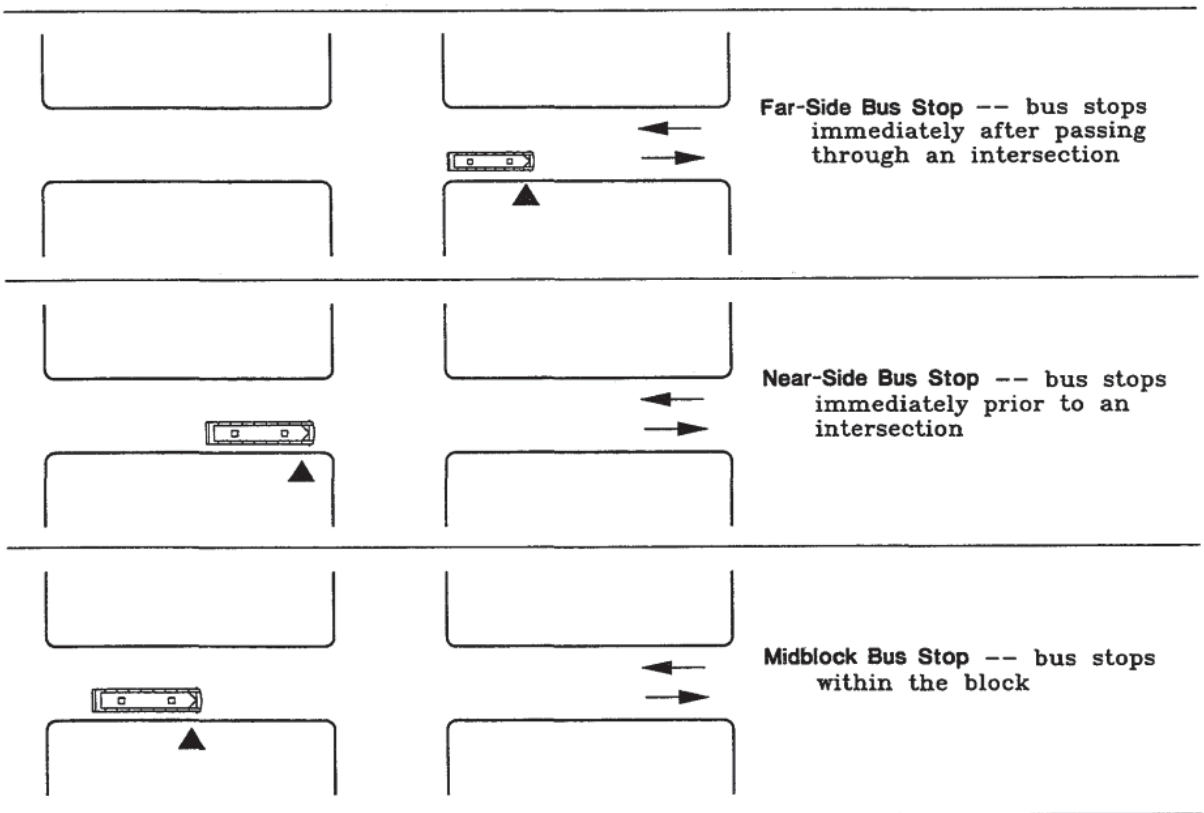


Figure 6. Examples of Far-side, Near-side, and Mid-block Transit Stops
Source: *TCRP Report 19: Guidelines for the Location and Design of Bus Stops*. Transit Cooperative Research Program (TCRP). Transportation Research Board. 1996. https://nacto.org/docs/usdg/tcrp_report_19.pdf

Bus stops along SH 199 are few and located in near-side, far-side, and mid-block configurations. For the stops located on the near- or far-side of the intersections, the distance from the intersection to the bus stop is long, 300 to 700 feet in many cases, particularly at the intersections of SH 199/SH 183 and SH 199/University Drive.

Long distances between bus stops and intersections may avoid impedance to traffic caused by stopped buses. However, this design can hamper transfer activity by bus riders and create a further disincentive to transit use, especially for those with mobility impairments. Along SH 199 in the sections that have bus service, many of the destinations are located at intersections, and pedestrian access from the bus stops is problematic because many of the connective sidewalks in these areas are missing.

1.3 Transit Plans

The FWTA adopted a master plan in 2015 that contained network recommendations with a stated five-year horizon (see Previous and Related Studies Technical Memorandum). The FWTA Master Plan indicates that Route 46 has potential to serve as a rapid bus route in the future with a park-and-ride lot near IH 820 and SH 199. If rapid bus service is implemented on this route, FWTA intends to use higher-capacity articulated buses to serve passengers. The long-range transit vision also includes improved facilities and amenities, better information provision, and enhanced pedestrian and bicycle connections.

1.4 Recommendations

The following subsections discuss changes to bus transit operations along the SH 199 study corridor that could enhance the passenger experience and make transit more appealing as a mode choice.

1.4.1 Bus Stop Location

Bus stops along SH 199 should be located in a way that allows buses to stop nearer to intersections than the current bus stop sites while not impeding traffic. This design could be achieved with near-side bus stop locations, placing bus stops in locations that allow right-turning motorists to pass around stopped buses, or bus pullouts. At a minimum, it is recommended that bus pullouts be provided at the transfer centers at SH 199 and SH 183 (Town and Country Center on the northwest corner and Walmart on the southeast corner). Aside from these two locations, bus pullouts may not be suitable along the SH 199 corridor. Some transit agencies dislike pullouts because in locations with heavy, near-continuous traffic streams, it can be difficult for bus drivers to reenter the travel lanes. In addition, pullouts may require additional right-of-way and construction costs, may collect debris that requires additional maintenance, and can conflict with driveway operations. FWTA currently plans pullouts only at transfer centers or large commercial generators.

Bus stops sited at or near intersections along SH 199 could be designed in the near- or far-side configurations. A number of factors should be considered when siting bus stops. These factors include adjacent land uses, generators of transit use, and transfer activity between routes.

Of primary importance in locating bus stops is accessibility to the stop. Connective sidewalks between bus stops and adjacent land uses, Americans with Disabilities Act (ADA)-compliant facilities, and convenient, comfortable access can improve the experience of transit users. For sidewalks outside the SH 199 right-of-way, individual cities will be responsible for the design and construction of these connections. Property owners will be responsible for providing sidewalk access points within their private property. Sidewalks should be extended into neighborhoods and to other nearby land uses to ensure ease of access for all potential bus patrons. These connections will see the highest usage by passengers at retail, commercial, and employment centers, as well as at transfer points.

1.4.2 Bus Stop Amenities

Many of the bus stops along SH 199 are located in unimproved areas and signified only with a sign (see Figure 7). Numerous improvements could be made at bus stops within the study corridor to create more appealing and comfortable experiences for transit users along SH 199. FWTA typically provides a concrete pad and sign at most stops. Additional amenities, including concrete benches or bus shelters, are based on ridership levels. FWTA should evaluate stop-level ridership trends and determine if additional amenities are justified beyond the standard concrete pad.

Figure 7. Existing Bus Stop West of SH 199 and 18th Street Intersection
Source: Freese and Nichols, Inc., 2016

1.4.3 Paved Bus Stops, Sidewalk Access, and Paved Loading Platforms

Paved concrete bus stop platforms should be provided at all bus stops for ADA compliance. Paving the bus stop area at curb level creates a loading platform which allows bus drivers to deploy bus ramps or kneel the bus to sidewalk height if needed to ease passenger boarding or alighting. The concrete platform should be contiguous with the back of the curb and connected by a paved access surface to the adjacent sidewalk. On SH 199, bus stops should be located in the buffer/parkway section and not co-located with the sidewalk unless additional width can be constructed to separate bus patrons from sidewalk users. The platform and access surface should be designed to the same reinforced concrete standard as the sidewalk. Designs for the bus stop, access way, sidewalk, and platform must be compliant with the Americans with Disabilities Act Accessibility Guidelines (https://www.access-board.gov/guidelines-and-standards/buildings-and-sites/about-the-ada-standards/background/adaag), Texas Accessibility Standards (https://www.license.state.tx.us/ab/abtas.htm), and the Proposed Guidelines for Pedestrian Facilities in the Public Right-of-Way (https://www.access-board.gov/guidelines-and-standards/streets-sidewalks/public-rights-of-way/proposed-rights-of-way-guidelines).

1.4.4 Shelters

Structured shelters at bus stops can provide shade from the sun and protection from precipitation and generally improve the experience of transit patrons while they wait for the bus. Benches can easily be incorporated into the shelter design, as can lighting, powered by a local source or by solar panels. Bus shelters in the FWTA system are typically included where ridership is high, including transfer centers and large commercial generators. At this time, FWTA has a bus shelter at the transfer point at the Town and Country Center and is planning to install a bus shelter at the Walmart transfer point by the end of 2017. The installed bus shelter along SH 199 currently comply with the FWTA standard bus shelter design (see Attachment D).

Standard FWTA dimensions for the concrete shelter pad are 10 feet by 15 feet. Because the recommended sidewalk dimension from the back of curb along SH 199 is typically eight feet and the shelter pad is typically 10 feet from the back of curb, it is recommended that sidewalks be offset an additional two feet away from the back of the curb at bus shelter locations, where possible.

Bus shelters can also be an opportunity to reflect the culture of a particular neighborhood or brand a route. For example, the FWTA bus shelters located along Lancaster Avenue in Fort Worth were enhanced and designed with unique architectural elements unique to that route. These shelter structures include solar panels to provide power for lighting and other electrical needs (see Figure 8).

Figure 8. Enhanced Bus Shelter along Lancaster Avenue Bus Route
Source: Fort Worth Transportation Authority, 2017

1.4.5 Other Passenger Amenities

Common amenities found at bus stops that increase passenger comfort include seating, trash receptacles, bicycle racks, landscaping, and lighting. Printed schedules and route maps can also help passengers plan their trip, and in areas with numerous non-English speakers, providing these guides in other languages can be helpful.

2.0 EXHIBITS

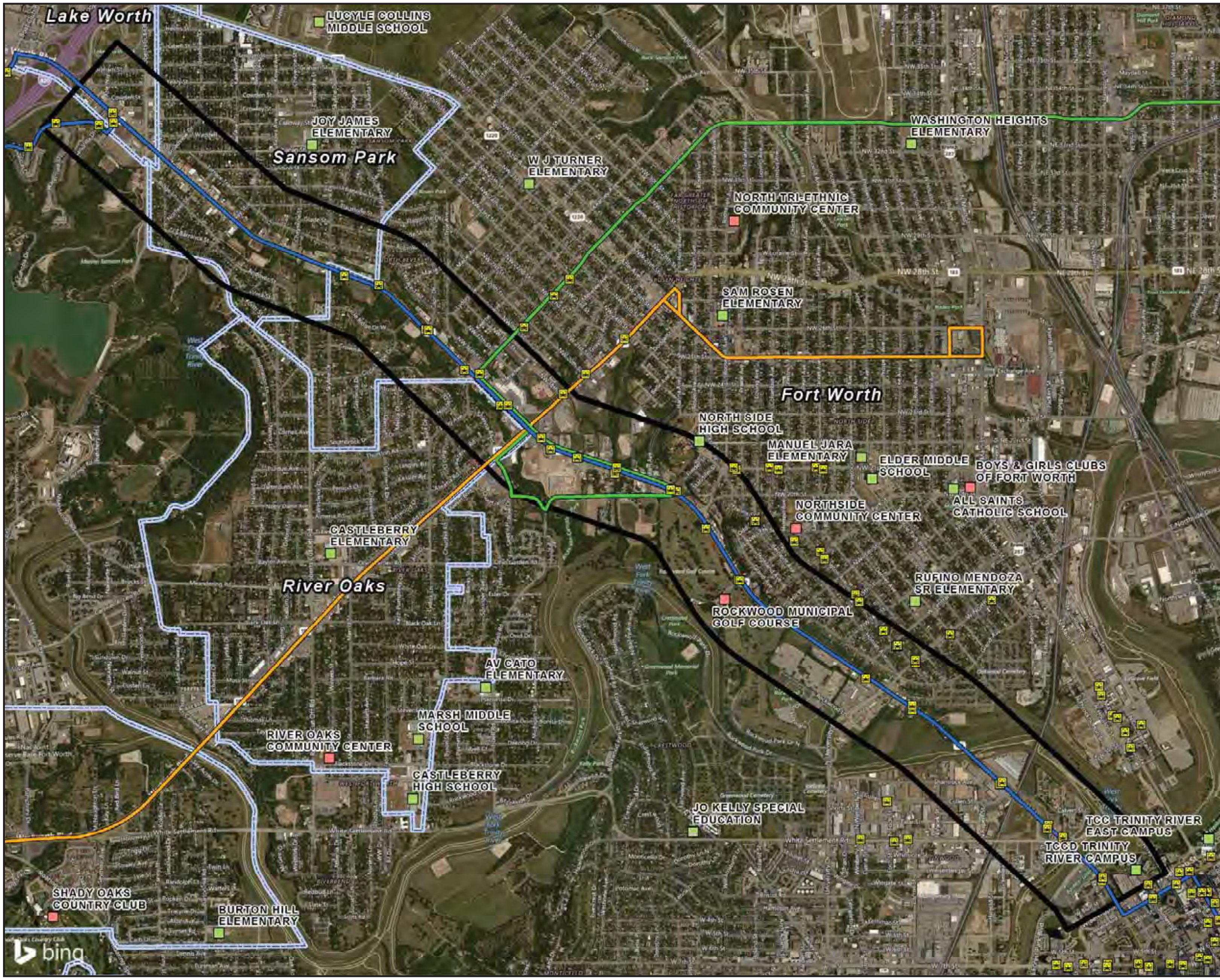
1. Existing Bus Transit Map

3.0 ATTACHMENTS

A. Route 46 Map and Schedule
B. FWTA Ridership by Route During April 2017
C. Bus Stop Location Considerations
D. Standard Detail - FWTA Bus Shelter

Exhibit 1

Existing Bus Transit Map



Existing Bus Transit Map

Exhibit 1

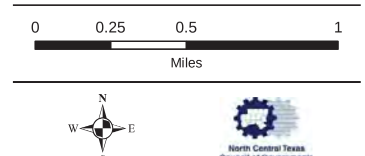
State Highway 199
Corridor Master Plan

Legend

- Bus Stop
- Educational Facilities
- Recreation Facilities

FWTA Bus Routes

- 46
- 90
- 91
- Study Area Boundary
- City Limits



Date: 8/14/2017

Attachment A

Route 46 Map and Schedule

FORT WORTH TRANSPORTATION AUTHORITY

MORE PLACES. MORE PEOPLE. **MORE POSSIBILITIES.**

Route 46
Jacksboro Hwy

Effective
April 9, 2017

FORT WORTH TRANSPORTATION AUTHORITY

GoPass

nextbus

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Suite 850 | Fort Worth, Texas 76102
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Route 46
Jacksboro Hwy

Weekdays

To Downtown

Old Mill Creek at Jacksboro (1)	Jacksboro & Ephriham (2)	ITC Station (3)
5:28	5:42	6:10
5:58	6:12	6:40
6:28	6:42	7:10
6:58	7:12	7:40
7:28	7:42	8:10
7:58	8:12	8:40
8:28	8:42	9:10
8:58	9:12	9:40
9:28	9:42	10:10
9:58	10:12	10:40
10:28	10:42	11:10
10:58	11:12	11:40
11:28	11:42	12:10
11:58	12:12	12:40
12:28	12:42	1:10
12:58	1:12	1:40
1:28	1:42	2:10
1:58	2:12	2:40
2:28	2:42	3:10
2:58	3:12	3:40
3:28	3:42	4:10
3:58	4:12	4:40
4:28	4:42	5:10
4:58	5:12	5:40
5:28	5:42	6:10
5:58	6:12	6:40
6:28	6:42	7:10
6:58	7:12	7:40
7:28	7:42	8:10
8:28	8:42	9:10
9:28	9:42	10:10
10:28	10:42	11:10

From Downtown

ITC Station (3)	Jacksboro & Ephriham (2)	Old Mill Creek at Jacksboro (1)
5:50	6:20	6:28
6:20	6:50	6:58
6:50	7:20	7:28
7:20	7:50	7:58
7:50	8:20	8:28
8:20	8:50	8:58
8:50	9:20	9:28
9:20	9:50	9:58
9:50	10:20	10:28
10:20	10:50	10:58
10:50	11:20	11:28
11:20	11:50	11:58
11:50	12:20	12:28
12:20	12:50	12:58
12:50	1:20	1:28
1:20	1:50	1:58
1:50	2:20	2:28
2:20	2:50	2:58
2:50	3:20	3:28
3:20	3:50	3:58
3:50	4:20	4:28
4:20	4:50	4:58
4:50	5:20	5:28
5:20	5:50	5:58
5:50	6:20	6:28
6:20	6:50	6:58
6:50	7:20	7:28
7:20	7:50	7:58
8:20	8:50	8:58
9:20	9:50	9:58
10:20	10:50	10:58

PM Times

Effective
April 9, 2017

Weekends & Major Holidays

To Downtown

Old Mill Creek at Jacksboro (1)	Jacksboro & Ephriham (2)	ITC Station (3)
6:28	6:42	7:10
6:58	7:12	7:40
7:28	7:42	8:10
7:58	8:12	8:40
8:28	8:42	9:10
8:58	9:12	9:40
9:28	9:42	10:10
9:58	10:12	10:40
10:28	10:42	11:10
10:58	11:12	11:40
11:28	11:42	12:10
11:58	12:12	12:40
12:28	12:42	1:10
12:58	1:12	1:40
1:28	1:42	2:10
1:58	2:12	2:40
2:28	2:42	3:10
2:58	3:12	3:40
3:28	3:42	4:10
3:58	4:12	4:40
4:28	4:42	5:10
4:58	5:12	5:40
5:28	5:42	6:10
5:58	6:12	6:40
6:28	6:42	7:10
6:58	7:12	7:40
7:28	7:42	8:10
8:28	8:42	9:10
9:28	9:42	10:10
10:28	10:42	11:10

Weekends & Major Holidays

From Downtown

ITC Station (3)	Jacksboro & Ephriham (2)	Old Mill Creek at Jacksboro (1)
6:20	6:50	6:58
6:50	7:20	7:28
7:20	7:50	7:58
7:50	8:20	8:28
8:20	8:50	8:58
8:50	9:20	9:28
9:20	9:50	9:58
9:50	10:20	10:28
10:20	10:50	10:58
10:50	11:20	11:28
11:20	11:50	11:58
11:50	12:20	12:28
12:20	12:50	12:58
12:50	1:20	1:28
1:20	1:50	1:58
1:50	2:20	2:28
2:20	2:50	2:58
2:50	3:20	3:28
3:20	3:50	3:58
3:50	4:20	4:28
4:20	4:50	4:58
4:50	5:20	5:28
5:20	5:50	5:58
5:50	6:20	6:28
6:20	6:50	6:58
6:50	7:20	7:28
7:20	7:50	7:58
8:20	8:50	8:58
9:20	9:50	9:58
10:20	10:50	10:58

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Attachment B

FWTA Ridership by Route During April 2017

Table 1. FWTA Ridership by Route During April 2017

Rank	Route Number	Route Name	Number of Bus Riders During April 2017
1	89	Spur	88,609
2	2	Camp Bowie	61,165
3	1~	Hemphill	51,823
4	25	Crosstown	43,693
5	6	8th Avenue/McCart	29,652
6	4	East Rosedale	25,154
7	3	Riverside/TCC	23,005
8	5	Evans Avenue	21,587
9	21	Boca Raton	18,755
10	26	Ridgmar Mall/Normandale	16,107
11	14	Riverside	14,852
12	15*	Stockyards/North Main	14,137
13	46^	Jacksboro Highway	13,396
14	22	Meadowbrook	12,982
15	24	Berry Street	10,975
16	19	Molly the Trolley	9,449
17	20	Handley Stop Six	8,848
18	9	Ramey/Vickery	7,070
19	11^	North Beach/Heritage Trace	6,640
20	10	Bailey	5,801
21	72	James/Hemphill	5,684
22	30	Centreport Circulator	5,266
23	7	University	5,005
24	32	Bryant Irvin	4,363
25	27	Como	4,287
26	12^	Samuels/Mercantile Center	3,385
27	91*	Ridgmar Mall/NASJRB	2,998
28	991*	Juror Shuttle	2,232
29	61	Normandale Express	2,205
30	57	Como/Downtown	1,627
31	65	South Park and Ride Express	1,530
32	8	Riverside/Evans	1,438
33	90*	Long Ave	1,267

Table 1 (continued)
FWTA Ridership by Route During April 2017

33	90*	Long Ave	1,267
34	44*	Central/Azle Ave	1,234
35	28	Mansfield Highway	1,150
36	64	North Texas Xpress	1,149
37	60	East Lancaster Express	904
38	63	North Park and Ride	881
39	66	Candleridge/Altamesa	756
40	13	Lunch Line	681
41	17"	Central	598
42	45*	TCC NW/Angle Ave	571

Source: Fort Worth Transportation Authority, 2017
* Service Started; " Service Ended; ^ Service Increased; ~ Service Reduced

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Attachment C

Bus Stop Location Considerations

1.0 BUS STOP LOCATION CONSIDERATIONS

This attachment describes some of the operational and safety advantages and disadvantages of near-side, far-side, and mid-block bus stops.

1.1 Passenger Access and Ease of Transfers

Near-side and far-side stops can provide the easiest passenger access due to their proximity to intersection corners and cross streets. Near- and far-side stops allow passengers to approach the stop from any of the intersecting streets and minimize walking distances, compared to mid-block stops. These locations are particularly advantageous when transfers between buses on intersecting routes are required because near- and far-side stops minimize walking distances between the alighting stop and subsequent boarding stop. Passenger accessibility and transfer distances can be optimized through analyses of passenger origins and transfer activity.

Mid-block bus stops can be beneficial when located near large passenger generators. Mid-block bus stops can also provide adequate berthing space for longer articulated buses, if these vehicles are used on a route. However, mid-block bus stops can require additional walking distance for passengers to access the stop and can encourage unprotected mid-block crossings. Crossing a street at an unmarked, unprotected mid-block location is unsafe because motorists do not expect such movements by pedestrians or bicyclists. In the case of SH 199, mid-block crossings would involve passengers crossing six lanes of traffic, and could lead to numerous crashes between motorists and vulnerable road users.

1.2 Operational Considerations and Schedule Adherence

Near-side stops shared with right-turn lanes minimize impacts to parking reduction and add through traffic capacity to the intersection. Where protected turn phases are provided, right-turn traffic queues may delay bus boarding and alighting, and thus impinge on schedule adherence. Through-moving buses would be required to merge back into the adjacent travel lane, which would require motorists to allow the bus to enter the traffic stream. Queue jumps can be provided to give buses an advantage to enter the through lane ahead of other traffic, but this accommodation requires a dedicated bus-only lane. On SH 199, provision of bus-only lanes would require more right-of-way than is available, eliminating this design option.

Far-side bus stops that are located on a shoulder allow a bus to have its own dedicated space for bus boarding and alighting, minimizing impacts to schedule adherence. Where separate turn lanes are needed on the near side of intersections, this design can benefit from queue jumping or operational configurations and signage that allow buses to travel straight from the turn lanes.

Mid-block bus stops can have the greatest impact on parking or other curbside activities. While near- or far-side bus stops can use intersection space to approach or depart a bus stop, mid-block locations require longer curbside restrictions for bus operations. Mid-block bus stops can have a greater impact on motor vehicle operations unless a bus pullout is provided.

1.2.1 Safety

Near-side stops can create a safety challenge where motorists turn right in front of the stopped bus. Because the stopped bus can block the view of pedestrians crossing the street, the risk of conflict between pedestrians and turning motorists is heightened. This type of behavior is most problematic at locations that do not have dedicated right-turn lanes or at locations where buses may have long dwell times, eliminating the effectiveness of the right-turn lane. This problem may occur with floating bus islands on the near side as well. Far-side stops eliminate this potential conflict.

Potential safety issues can arise with far-side stops if the bus cannot fully enter the bus stop space during the green phase of the signal. This problem may result in the bus blocking the crosswalk or the intersection. When multiple buses approach a shared bus stop simultaneously, the problem can be compounded. Pedestrians needing to use the blocked crosswalk may walk around the bus into traffic to cross the street. However, because bus service on SH 199 is provided by a single route with half-hour headways, the likelihood of buses stacking at a stop is low.

Mid-block bus stops can generate safety problems by encouraging mid-block crossings (jaywalking) by pedestrians. At mid-block stops with high ridership, implementing marked or signalized pedestrian crossings may be one solution to this safety problem.

The relative advantages and disadvantages of near-side, far-side, and mid-block bus stops can be summarized in Table 1, adapted from *TCRP Report 19 (TCRP Report 19: Guidelines for the Location and Design of Bus Stops*. Some of the operational disadvantages listed here can be minimized through the use of signal technologies, such as transit signal priority.

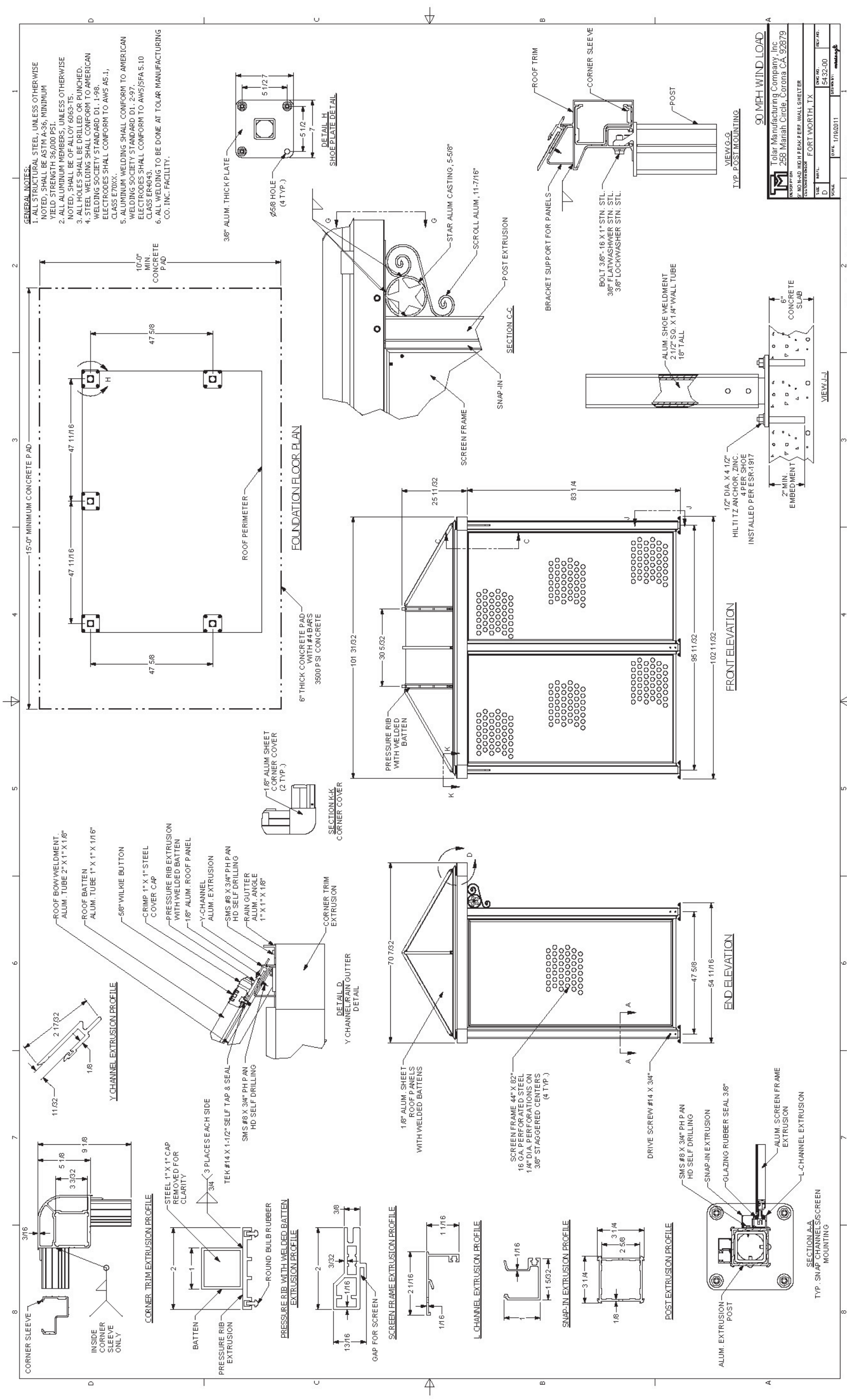
Table 1. Advantages and Disadvantages of Bus Stop Locations Relative to Intersections

	Advantages	Disadvantages
Near-side Stop	Minimizes interferences when traffic is heavy on the far side of the intersection.	Increases conflicts with right-turning vehicles.
	Allows passengers to access buses closest to crosswalk.	May result in stopped buses obscuring curbside traffic control devices and crossing pedestrians.
	Results in the width of the intersection being available for the driver to pull away from curb.	May cause sight distance to be obscured for cross vehicles stopped to the right of the bus.
	Eliminates the potential of double stopping.	May block the through lane during peak period with queuing buses.
	Allows passengers to board and slight while the bus is stopped at a red light.	Increases sight distance problems for crossing pedestrians.
	Provides the driver with the opportunity to look for oncoming traffic, including other buses with potential passengers.	
Far-side Stop	Minimizes conflicts between right-turning vehicles and buses.	May result in intersections being blocked during peak periods by stopping buses.
	Provides additional right-turn capacity by making curb lane available for traffic.	May obscure sight distance for crossing vehicles.
	Minimizes sight distance problems on approaches to intersection.	May increase sight distance problems for crossing pedestrians.
	Encourages pedestrians to cross behind the bus.	Can cause a bus to stop far side after stopping for a red light, which interferes with both bus operations and all other traffic.
	Creates shorter deceleration distances for buses since the bus can use the intersection to decelerate.	May increase number of rear-end accidents since drivers do not expect buses to stop again after stopping at a red light.
	Results in bus drivers being able to take advantage of gaps in traffic flow that are created at signalized intersections.	Could result in traffic queued into intersection when a bus is stopped in travel lane.
Mid-block Stop	Minimizes sight distance problems for vehicles and pedestrians.	Requires additional distance for no-parking restrictions.
	May result in passenger waiting areas experiencing less pedestrian congestion.	Encourages patrons to cross street at midblock (jaywalking).
		Increases walking distance for patrons crossing at intersections.

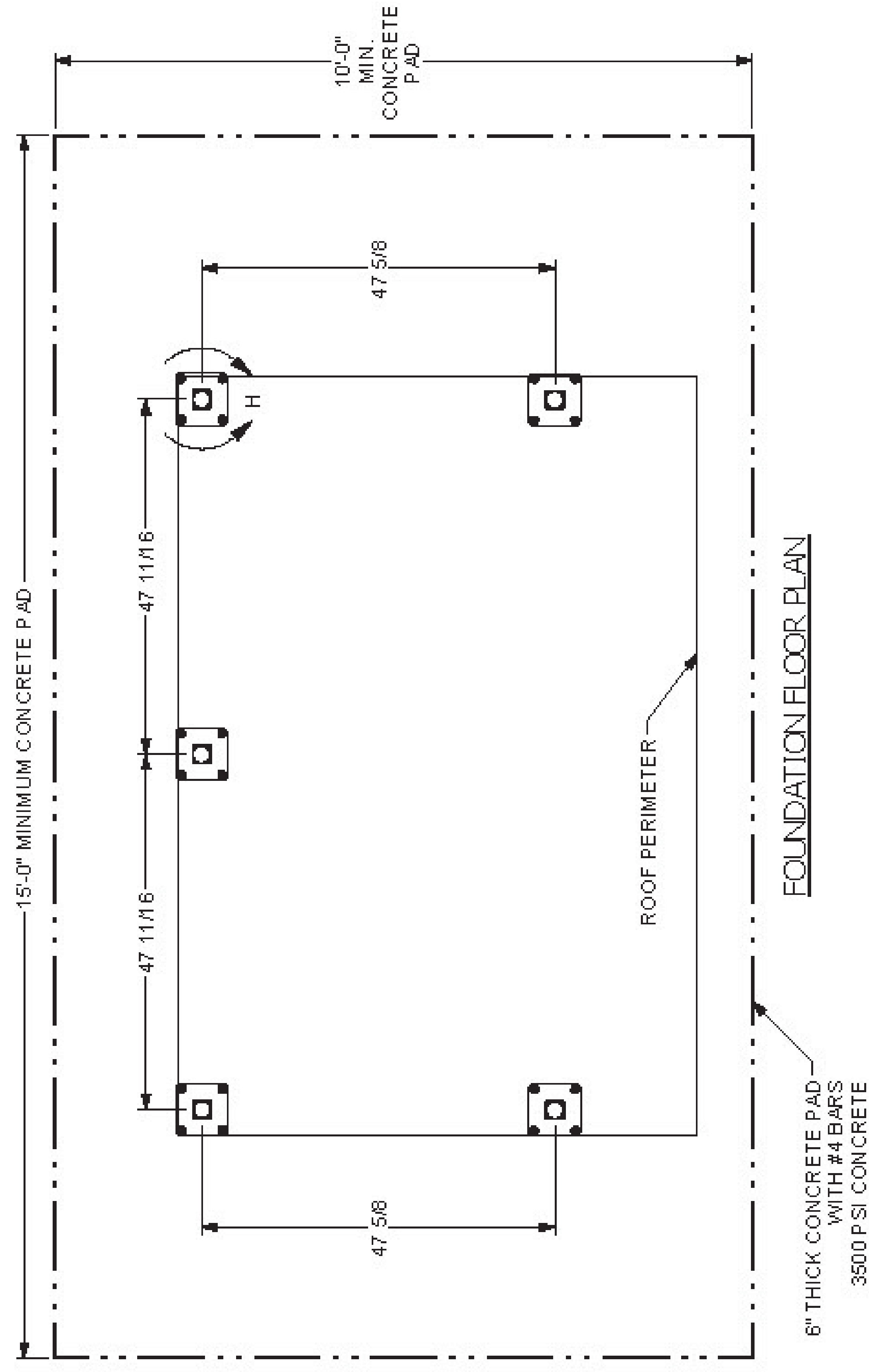
Source: Adapted from *TCRP Report 19: Guidelines for the Location and Design of Bus Stops*. Transit Cooperative Research Program (TCRP). Transportation Research Board. 1996. https://nacto.org/docs/usdg/tcrp_report_19.pdf

Attachment D

Standard Detail - FWTA Bus Shelter



GENERAL NOTES:
1. ALL STRUCTURAL STEEL, UNLESS OTHERWISE NOTED, SHALL BE ASTM A-36, MINIMUM YIELD STRENGTH 36,000 PSI.
2. ALL ALUMINUM MEMBERS, UNLESS OTHERWISE NOTED, SHALL BE OF ALLOY 6063-T5.
3. ALL HOLES SHALL BE DRILLED OR PUNCHED.
4. STEEL WELDING SHALL CONFORM TO AMERICAN WELDING SOCIETY STANDARD D1.1-98. ELECTRODES SHALL CONFORM TO AWS A5.1, CLASS E70XX.
5. ALUMINUM WELDING SHALL CONFORM TO AMERICAN WELDING SOCIETY STANDARD D1.2-97. ELECTRODES SHALL CONFORM TO AWS/SFA 5.10 CLASS ER4043.
6. ALL WELDING TO BE DONE AT TOLAR MANUFACTURING CO. INC. FACILITY.
FOUNDATION FLOOR PLAN
15'-0" MINIMUM CONCRETE PAD
10'-0" MIN. CONCRETE PAD
ROOF PERIMETER
6" THICK CONCRETE PAD WITH #4 BARS 3500 PSI CONCRETE
DETAIL H SHOE PLATE DETAIL
3/8" ALUM. THICK PLATE
Ø5/8 HOLE (4 TYP.)
SECTION C-C
STAR ALUM CASTING, 5-5/8"
SCROLL ALUM, 11-7/16"
POST EXTRUSION
SNAP-IN
SCREEN FRAME
VIEW G-G TYP. POST MOUNTING
ROOF TRIM
CORNER SLEEVE
POST
BRACKET SUPPORT FOR PANELS
BOLT 3/8"-16 X 1" STN. STL. 3/8" FLATWASHER STN. STL. 3/8" LOCKWASHER STN. STL.
ALUM. SHOE WELDMENT 2 1/2" SQ. X 1/4" WALL TUBE 18" TALL
6" CONCRETE SLAB
VIEW J-J
1/2" DIA. X 4 1/2" HILTI TZ ANCHOR, ZINC. 4 PER SHOE INSTALLED PER ESR-1917
2" MIN. EMBEDMENT
FRONT ELEVATION
PRESSURE RIB WITH WELDED BATTEN
SECTION K-K CORNER COVER
1/8" ALUM SHEET CORNER COVER (2 TYP.)
END ELEVATION
DETAIL D Y CHANNEL/RAIN GUTTER DETAIL
ROOF BOW WELDMENT, ALUM. TUBE 2" X 1" X 1/8"
ROOF BATTEN ALUM. TUBE 1" X 1" X 1/16"
5/8" WILKIE BUTTON
CRIMP 1" X 1" STEEL COVER CAP
PRESSURE RIB EXTRUSION WITH WELDED BATTEN
1/8" ALUM. ROOF PANEL
Y-CHANNEL ALUM. EXTRUSION
SMS #8 X 3/4" PH PAN HD SELF DRILLING
RAIN GUTTER ALUM. ANGLE 1" X 1" X 1/8"
CORNER TRIM EXTRUSION
TEK #14 X 1-1/2" SELF TAP & SEAL
1/8" ALUM. SHEET ROOF PANELS WITH WELDED BATTENS
SCREEN FRAME 44" X 82" 16 GA. PERFORATED STEEL 1/4" DIA. PERFORATIONS ON 3/8" STAGGERED CENTERS (4 TYP.)
DRIVE SCREW #14 X 3/4"
Y CHANNEL EXTRUSION PROFILE
CORNER TRIM EXTRUSION PROFILE
CORNER SLEEVE
INSIDE CORNER SLEEVE ONLY
STEEL 1" X 1" CAP REMOVED FOR CLARITY
3 PLACES EACH SIDE
BATTEN
PRESSURE RIB EXTRUSION
ROUND BULB RUBBER
PRESSURE RIB WITH WELDED BATTEN EXTRUSION PROFILE
GAP FOR SCREEN
SCREEN FRAME EXTRUSION PROFILE
L CHANNEL EXTRUSION PROFILE
SNAP-IN EXTRUSION PROFILE
POST EXTRUSION PROFILE
ALUM. EXTRUSION POST
SNAP-IN EXTRUSION
GLAZING RUBBER SEAL 3/8"
ALUM. SCREEN FRAME EXTRUSION
L-CHANNEL EXTRUSION
SECTION A-A TYP. SNAP CHANNELS/SCREEN MOUNTING
90 MPH WIND LOAD
Tolar Manufacturing Company, Inc
258 Mariah Circle, Corona CA 92879
2' NON-AD HIGH PEAK PERF. WALL SHELTER
FORT WORTH, TX
5432-00
1/10/2011
T:\Inventor\Eastern\Shelters\Non Ad Peak\5432-00.idw


10'-0" MIN. CONCRETE PAD
15'-0" MINIMUM CONCRETE PAD
47 5/8
47 11/16
47 11/16
H
47 5/8
ROOF PERIMETER
FOUNDATION FLOOR PLAN
6" THICK CONCRETE PAD WITH #4 BARS 3500 PSI CONCRETE

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Appendix J – Crash Data Technical Memorandum

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State Highway 199 Corridor Master Plan

From IH 820 to Belknap Street

Crash Data Technical Memorandum

Submittal Date:
June 20, 2017

Prepared For:
North Central Texas Council of Governments

Prepared By:
Freese and Nichols, Inc.
4055 International Plaza, Suite 200
Fort Worth, Texas 76109
817-735-7300
Texas Registered Engineering Firm F-2144

FREESE AND NICHOLS

1.0 CRASH DATA

Based on data from the Texas Department of Transportation (TxDOT) Crash Records Information System (CRIS) (https://cris.dot.state.tx.us/public/Query/) data between the years 2010 and 2014, the consultant team categorized and evaluated the crash data to better understand the corridor existing conditions. Within the five-year period and the study area, a one-quarter mile radius from the State Highway (SH) 199 centerline, there were 1,191 total reported crashes with 1,164 vehicular crashes, 23 pedestrian crashes, and four bicycle crashes. Of the 1,191 total crashes, there were nine vehicular fatalities, three pedestrian fatalities, and no bicycle fatalities. Knowing that a one-quarter mile radius from the SH 199 centerline would include crashes on streets with no relation to SH 199, the consultant team created a second data set of crashes that occurred within the SH 199 right-of-way and 500-feet along intersecting side streets. The crash data was assessed by year, severity, and vehicular/pedestrian/bicycle involvement. The following notes regarding the TxDOT CRIS data, raw and evaluated, were considered:

1. Data consists of locatable crashes containing latitude/longitude coordinates.
2. Bicycle and pedestrian crashes, included in the data set, also involved a motor vehicle.
3. Data is composed of TxDOT "Reportable Crashes" only.
   a. A "Reportable Motor Vehicle Traffic Crash" is defined by TxDOT as: any crash involving motor vehicle in transport that occurs or originates on a traffic way, results in injury to or death of any person, or damage to the property of any one person to the apparent extent of $1,000.
   b. A traffic way is defined as any land way open to the public as a matter of right or custom for moving persons or property from one place to another.
4. Reportable data was collected from Texas Peace Officer's Crash Reports (CR-3) received and processed by 2/13/2015.

1.1 Crash Type and Severity

The available crash data within the SH 199 corridor were categorized into crash type and severity. Table 1 shows these statistics for years 2010 through 2014. This data is also illustrated in Figure 1. Over the analysis period, the corridor experienced 766 vehicle crashes; about one percent of which were fatal crashes, whereas about 54 percent crashes did not result in any injury. In addition, there were 19 crashes involving pedestrians, and three crashes involving bicycles. Of the pedestrian crashes, three crashes resulted in a fatality. The total number of vehicle crashes increased from 121 in 2010 to 194 in 2013, followed by a decrease to 173 in 2014.

Table 1. Crash Type and Severity by Year (2010 – 2014)

Crash Type and Severity	Year					Total Crashes
	2010	2011	2012	2013	2014	
Total Vehicular Crashes	**121**	**127**	**151**	**194**	**173**	**766**
Unknown Injury Crashes	4	1	3	4	3	**15**
Incapacitating Injury Crashes	3	6	7	4	7	**27**
Non-Incapacitating Crashes	13	17	32	23	24	**109**
Possible Injury Crashes	37	35	28	56	35	**191**
Fatal Crashes	2	2	1	0	3	**8**
Non-Injury Crashes	62	66	80	107	101	**416**

Table 1. Crash Type and Severity by Year (2010 – 2014) (continued)

Crash Types and Severity	Year					Total Crashes
	2010	2011	2012	2013	2014	
Total Pedestrian Crashes	**4**	**4**	**5**	**2**	**4**	**19**
Unknown Injury Crashes	0	0	0	0	0	**0**
Incapacitating Injury Crashes	1	2	1	1	1	**6**
Non-Incapacitating Crashes	2	1	2	1	1	**7**
Possible Injury Crashes	1	0	1	0	1	**3**
Fatal Crashes	0	1	1	0	1	**3**
Non-Injury Crashes	0	0	0	0	0	**0**
Total Bicycle Crashes	**1**	**0**	**0**	**0**	**2**	**3**
Unknown Injury Crashes	0	0	0	0	0	**0**
Incapacitating Injury Crashes	1	0	0	0	1	**2**
Non-Incapacitating Crashes	0	0	0	0	1	**1**
Possible Injury Crashes	0	0	0	0	0	**0**
Fatal Crashes	0	0	0	0	0	**0**
Non-Injury Crashes	0	0	0	0	0	**0**
Total Crashes	**126**	**131**	**156**	**196**	**179**	**788**

Source: TxDOT Crash Records Information System (CRIS), 2015

Figure 1. Crash Type and Severity by Year (2010 – 2014)
Source: TxDOT Crash Records Information System (CRIS), 2015

1.2 Crashes Per Day of Week

The total crashes over the analysis period were summarized by day of the week for each year as shown in Table 2 and illustrated in Figure 2. The data indicates that during an average weekday, the highest number of crashes occurred on Tuesdays - about 15 percent higher than an average weekday. During the weekend, the number of crashes on Sundays were on average 15 percent higher than Saturdays.

Table 2. Crashes Per Day of Week (2010 – 2014)

Day of the Week	Year					Total Crashes
	2010	2011	2012	2013	2014	
Sunday	18	21	22	24	23	**108**
Monday	15	14	25	31	19	**104**
Tuesday	24	23	31	33	25	**136**
Wednesday	15	12	22	35	23	**107**
Thursday	17	25	20	27	28	**117**
Friday	16	26	18	30	32	**122**
Saturday	21	10	18	16	29	**94**
Total Crashes	**126**	**131**	**156**	**196**	**179**	**788**

Source: TxDOT Crash Records Information System (CRIS), 2015

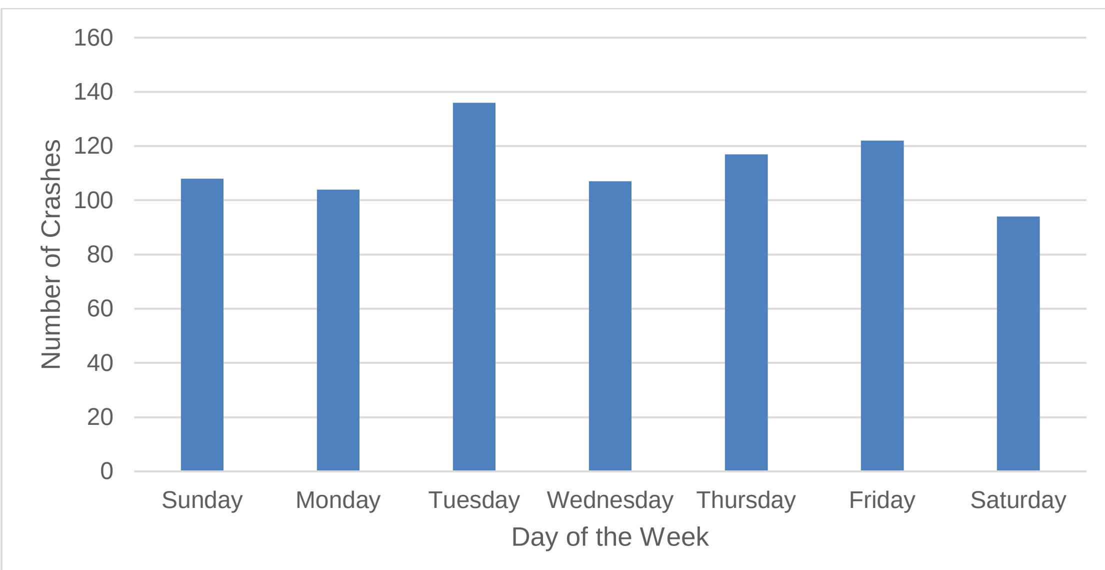


Figure 2. Crashes Per Day of Week (2010 – 2014)
Source: TxDOT Crash Records Information System (CRIS), 2015

1.3 Crashes Per Month of Year

The total crashes over the analysis period were summarized by month for each year as shown in Table 3 and illustrated in Figure 3. The data indicates that the average number of crashes per month is 65. Within the study area, the highest number of crashes occurred during the month of June with about 20 percent more crashes than the average number of crashes per month. The lowest number of crashes occurred during September, which was about 16 percent lower than the average number of crashes per month.

Table 3. Crashes Per Month of Year (2010 – 2014)

Month of Year	Year 2010	2011	2012	2013	2014	Total Crashes
January	17	10	16	11	11	**65**
February	13	8	11	17	16	**65**
March	15	12	12	13	16	**68**
April	11	11	18	23	13	**76**
May	5	9	17	21	14	**66**
June	14	19	15	15	16	**79**
July	12	15	5	15	13	**60**
August	5	13	14	14	11	**57**
September	6	7	6	21	15	**55**
October	9	9	9	19	21	**67**
November	8	7	17	16	19	**67**
December	11	11	16	11	14	**63**
Total Crashes	**126**	**131**	**156**	**196**	**179**	**788**

Source: TxDOT Crash Records Information System (CRIS), 2015

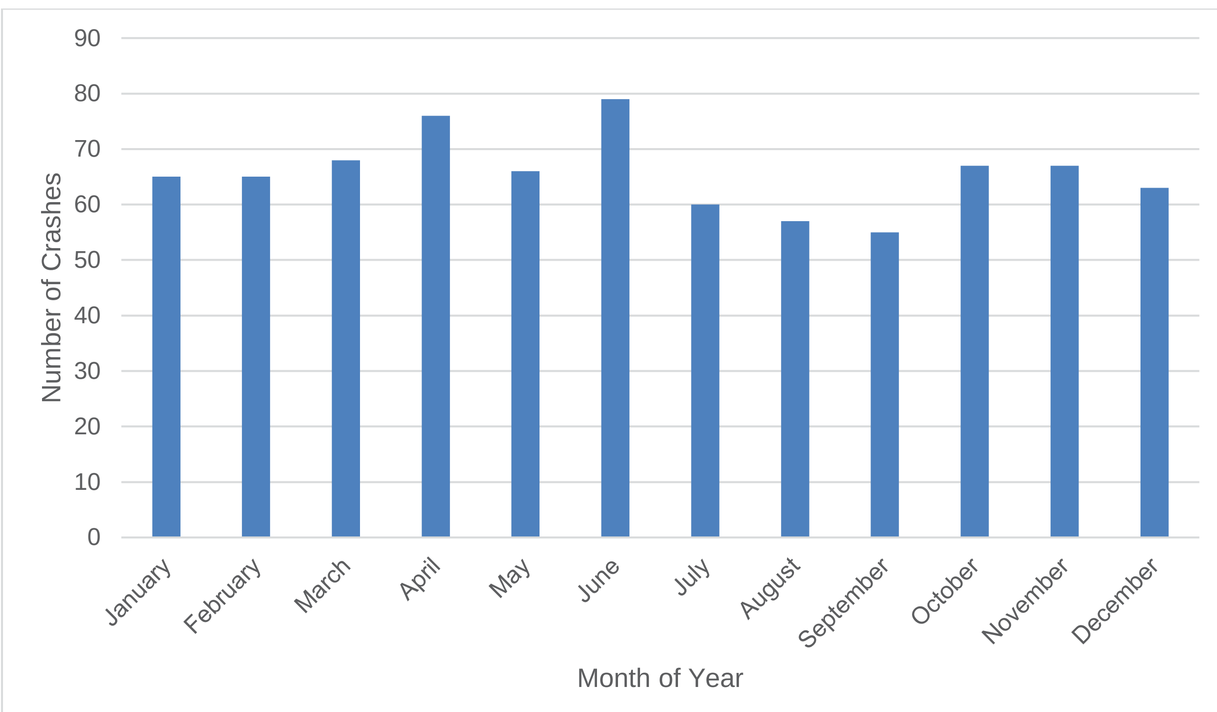


Figure 3. Crashes Per Month of Year (2010 – 2014)
Source: TxDOT Crash Records Information System (CRIS), 2015

1.4 Crashes Per Hour of Day

The crash data was summarized to determine the hourly variation in number of crashes throughout the day. The number of crashes per hour of day from 2010 through 2014 are presented in Table 4 and the time-of-day variation pattern is illustrated in Figure 4. As shown in Figure 4, the time-of-day pattern reflects the variation in traffic demand through the corridor, with higher number of crashes during the morning (7:00 a.m. to 9:00 a.m.) and evening (4:00 p.m. to 6:00 p.m.) peak hours with higher traffic demands. The spike in crashes just after 2:00 a.m. coincides with the closing time of most alcohol serving establishments.

Table 4. Crashes Per Hour of Day (2010 – 2014)

Hour of Day	Year					Total Crashes
	2010	2011	2012	2013	2014	
0	2	3	3	2	1	**11**
1	1	2	1	2	1	**7**
2	3	3	2	3	7	**18**
3	1	0	1	2	2	**6**
4	1	3	0	0	2	**6**
5	1	2	4	3	1	**11**
6	1	6	2	7	4	**20**
7	2	7	9	14	7	**39**
8	8	10	11	12	12	**53**
9	4	5	7	9	6	**31**
10	8	9	8	4	4	**33**
11	13	6	6	10	9	**44**
12	8	5	10	12	11	**46**
13	13	8	9	14	11	**55**
14	6	8	6	10	14	**44**
15	7	15	9	14	13	**58**
16	6	10	11	16	12	**55**
17	10	7	20	19	19	**75**
18	12	6	12	12	13	**55**
19	6	5	12	9	9	**41**
20	6	2	4	8	4	**24**
21	1	4	2	8	9	**24**
22	4	4	5	4	4	**21**
23	2	1	2	2	4	**11**
Total Crashes	**126**	**131**	**156**	**196**	**179**	**788**

Source: TxDOT Crash Records Information System (CRIS), 2015

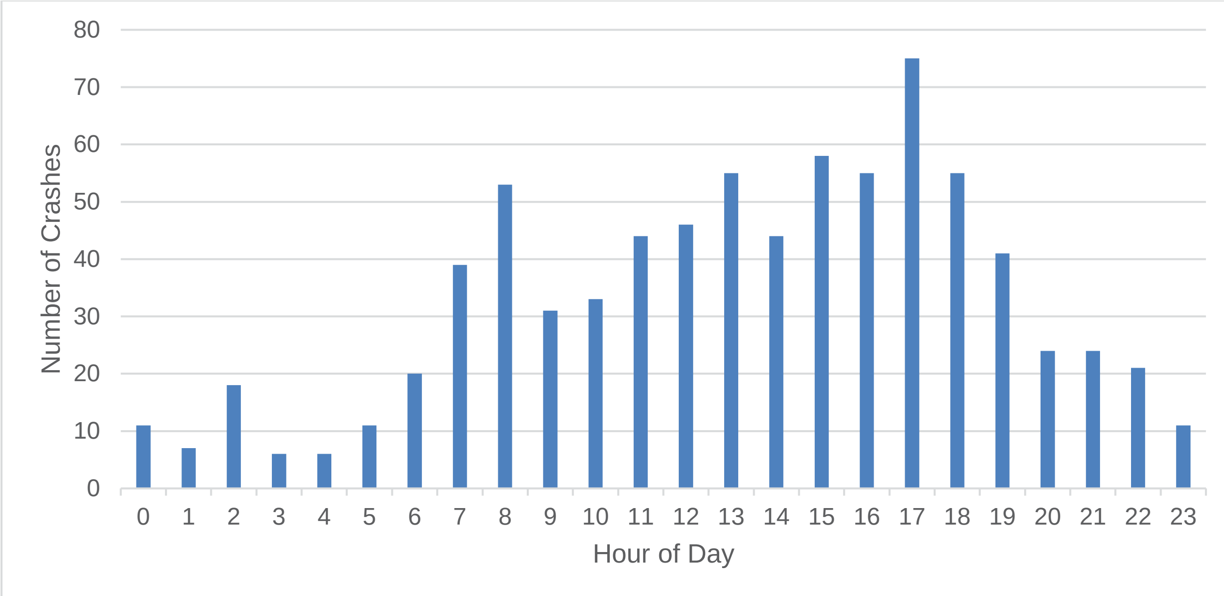


Figure 4. Crashes Per Hour of Day (2010 – 2014)
Source: TxDOT Crash Records Information System (CRIS), 2015

1.5 Crash Contributing Factor

The crashes were categorized by the crash contributing factor noted in the TxDOT CRIS database. A summary of all crashes for year 2010 through 2014 analysis period by crash contributing factor is illustrated in Figure 5. As seen in the illustration, about 57 percent of all crashes over the analysis period could be attributed to three crash contributing factors – failure to control speed, driver inattention, and failure to yield. About a quarter of all crashes occurred due to a driver's failure to control speed.

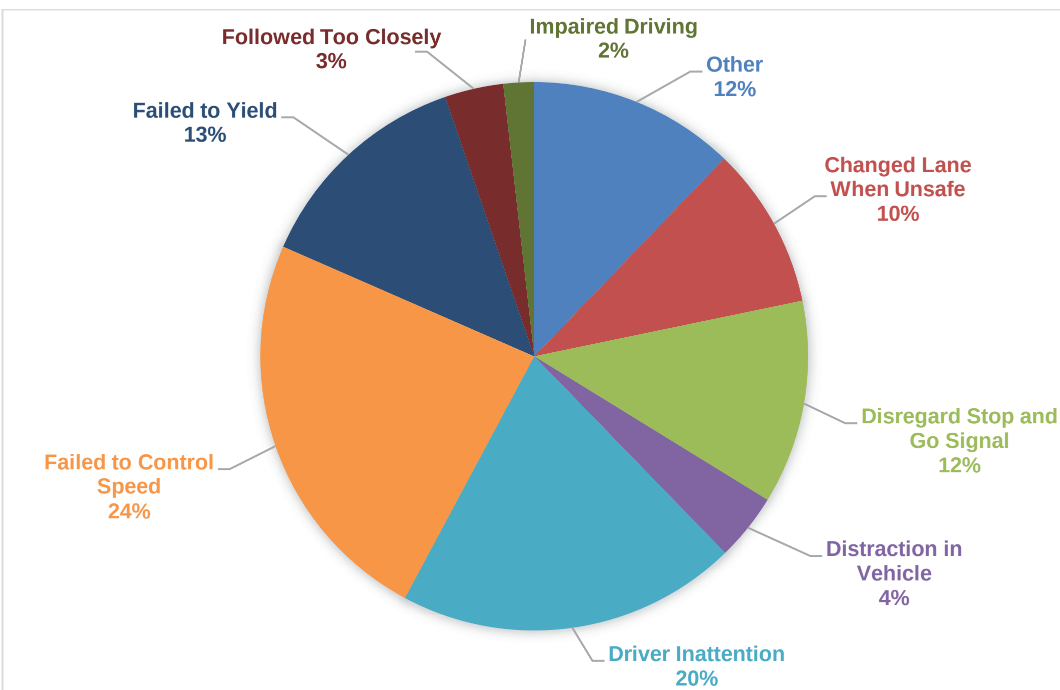


Figure 5. Crash Contributing Factor (2010 – 2014)
Source: TxDOT Crash Records Information System (CRIS), 2015

1.6 Manner of Crashes

The crashes during the analysis period were summarized by the manner of collision as shown in Table 5. The manner of collision indicates the relative direction of travel as well as the position and maneuver of the vehicles during the crash. In 53 percent of all crashes, the vehicles were traveling in the same direction. In 15 percent of all crashes, the vehicles were traveling in opposite directions. One percent of all crashes were angle crashes, while the remaining 16 percent of crashes involved only one motor vehicle. The higher proportion of crashes involving vehicles traveling in the same direction correlates to the most common crash contributing factors of failure to control speed and driver inattention as shown in Figure 5. About 28 percent of all crashes involved one vehicle going straight and another stopped, indicative of a rear end crash at an intersection.

Table 5. Manner of Crashes Per Year (2010 – 2014)

Manner of Crash	Year					Total Crashes
	2010	2011	2012	2013	2014	
Angle - Both Going Straight	6	13	15	16	22	**72**
Angle - Both Left Turn	0	1	0	0	0	**1**
Angle - One Left Turn-One Stopped	0	0	0	0	1	**1**
Angle - One Right Turn-One Left Turn	0	1	1	0	0	**2**
Angle - One Right Turn-One Stopped	0	0	1	0	0	**1**
Angle - One Straight-One Backing	0	2	0	1	0	**3**
Angle - One Straight-One Left Turn	5	6	6	10	5	**32**
Angle - One Straight-One Right Turn	4	2	4	2	2	**14**
Angle - One Straight-One Stopped	0	0	0	1	0	**1**
One Motor Vehicle - Backing	0	0	1	0	0	**1**
One Motor Vehicle - Going Straight	18	19	23	19	27	**106**
One Motor Vehicle - Turning Left	4	2	0	0	3	**9**
One Motor Vehicle - Turning Right	0	4	0	4	3	**11**
Opposite Direction - Both Going Straight	2	2	1	2	1	**8**
Opposite Direction - Both Left Turns	0	0	0	1	0	**1**
Opposite Direction - One Backing-One Stopped	1	1	0	1	0	**3**
Opposite Direction - One Right Turn-One Left Turn	0	0	0	0	1	**1**
Opposite Direction - One Straight-One Left Turn	21	11	17	27	25	**101**
Opposite Direction - One Straight-One Stopped	0	0	0	0	1	**1**
Same Direction - Both Going Straight-Rear End	18	24	13	33	22	**110**
Same Direction - Both Going Straight-Sideswipe	7	6	10	15	11	**49**
Same Direction - Both Left Turn	2	0	0	2	1	**5**
Same Direction - Both Right Turn	3	3	1	2	1	**10**
Same Direction - One Left Turn-One Stopped	0	0	0	0	1	**1**
Same Direction - One Right Turn-One Left Turn	1	0	0	0	0	**1**
Same Direction - One Straight-One Left Turn	2	0	6	4	1	**13**
Same Direction - One Straight-One Right Turn	1	0	2	3	1	**7**
Same Direction - One Straight-One Stopped	31	34	55	53	50	**223**
Total Crashes	**126**	**131**	**156**	**196**	**179**	**788**

Source: TxDOT's Crash Records Information System (CRIS), 2015

1.7 Crashes Per Roadway Segment

To identify the frequency of crashes within different segments, the corridor was divided into 11 segments separated by major intersections. The average number of crashes per year for each segment are provided in Table 6. For a comparative analysis, crash rates were calculated as number of crashes per 100 million vehicle miles traveled (VMT). The crash rates are provided in Table 6, and the variation in crash rates for different segments is illustrated in Figure 6. The three westernmost segments of the corridor between Interstate Highway (IH) 820 and Skyline Drive experienced the highest crash rates within the corridor. Further east, segments experienced lower crash rates before increasing again to the east of University Drive.

Table 6. Crash Rate Per Roadway Segment (2010 to 2014)

Segment ID **	Length (Mile)	From	To	Average No. of Crashes Per Year	2016 Average Daily Traffic (ADT)	Annual VMT (Millions)	Crash Rate (Crashes Per Million VMT)
1	0.30	IH 820	Roberts Cut Off Road	9	40,533	4.48	2.10
3	0.33	Roberts Cut Off Road	Biway Street	7	28,674	3.47	1.96
5	0.33	Biway Street	Skyline Drive	5	28,441	3.44	1.57
7	0.61	Skyline Drive	Long Avenue	5	28,436	6.29	0.79
9	0.12	Long Avenue	SH 183	1	34,571	1.55	0.39
11	0.54	SH 183	Ohio Garden Road	6	36,501	7.22	0.83
14	0.21	21st Street	18th Street	2	36,689	2.87	0.63
16	0.63	18th Street	University Drive	5	34,875	8.08	0.67
18	0.76	University Drive	White Settlement Road	10	27,391	7.57	1.32
20	0.15	White Settlement Road *	Peach Street *	1	27,391	1.48	0.95
22	0.07	Peach Street *	Belknap Street *	2	27,391	0.70	2.85

Source: TxDOT Crash Records Information System (CRIS), 2015
* Location where 2016 ADT data was unavailable. Shown ADT was interpolated from gathered traffic data.
** Segments are identified as the portion of SH 199 outside of the approaching turn lanes at signalized intersections.

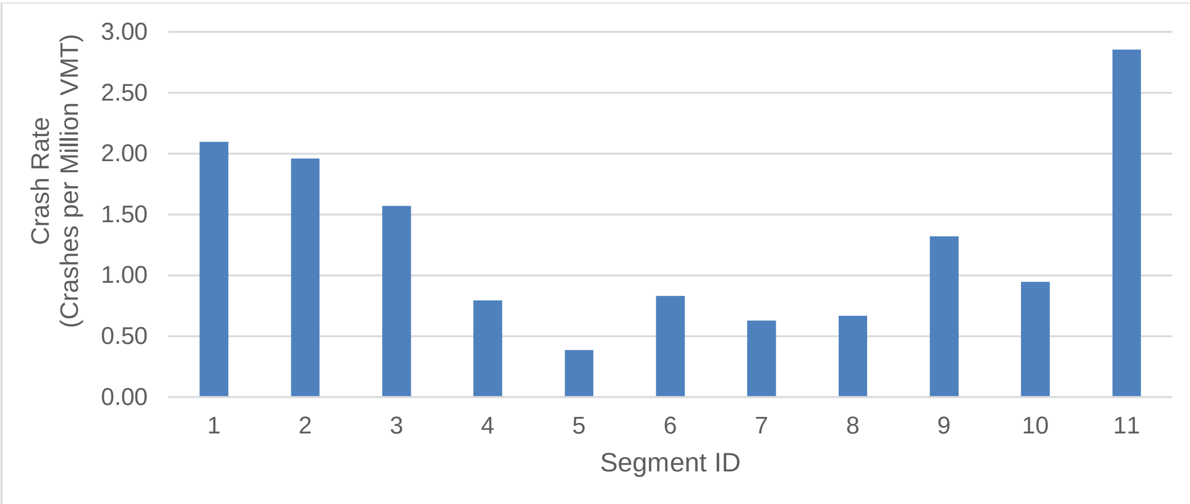


Figure 6. Crash Rate Per Segment (2010 to 2014)
Source: TxDOT Crash Records Information System (CRIS), 2015

1.8 Crashes Per Intersection

To determine relative safety of various intersections within the study corridor, intersection crash rates were calculated as the number of crashes per million entering vehicles. The average number of crashes per year over the 2010 to 2014 analysis period, and the resulting crash rates for the intersections are provided in Table 7, and the variation in crash rates is illustrated in Figure 7. The data indicates that some of the highest intersection crash rates were observed at Roberts Cut Off Road, SH 183, and University Drive. These intersections have multi-lane approaches with high turning traffic volumes to and from the corridor.

Table 7. Crash Rate Per Intersection (2010 to 2014)

Intersection ID **	Intersection with SH 199	Average No. of Crashes Per Year Between 2010 and 2014	Entering Vehicles Per Day	Annual Entering Vehicles (Millions)	Crash Rate (Crashes/ Million Entering Vehicles)
2	Roberts Cut Off Road	19	41,914	15.30	1.24
4	Biway Street	7	30,274	11.05	0.65
6	Skyline Drive	4	30,743	11.22	0.39
8	Long Avenue	8	39,324	14.35	0.53
10	SH 183	23	56,103	20.48	1.13
12	Ohio Garden Road	9	39,037	14.25	0.63
13	21st Street *	3	38,017	13.88	0.25
15	18th Street	2	36,996	13.50	0.13
17	University Drive	14	34,838	12.72	1.12
19	White Settlement Road *	11	34,838	12.72	0.88
21	Peach Street *	3	34,838	12.72	0.22

Source: TxDOT Crash Records Information System (CRIS), 2015
* Location where 2016 ADT data was unavailable. Shown ADT was interpolated from gathered traffic data.
** Intersections are identified as the portion of SH 199 between the approaching turn lanes at signalized intersections.

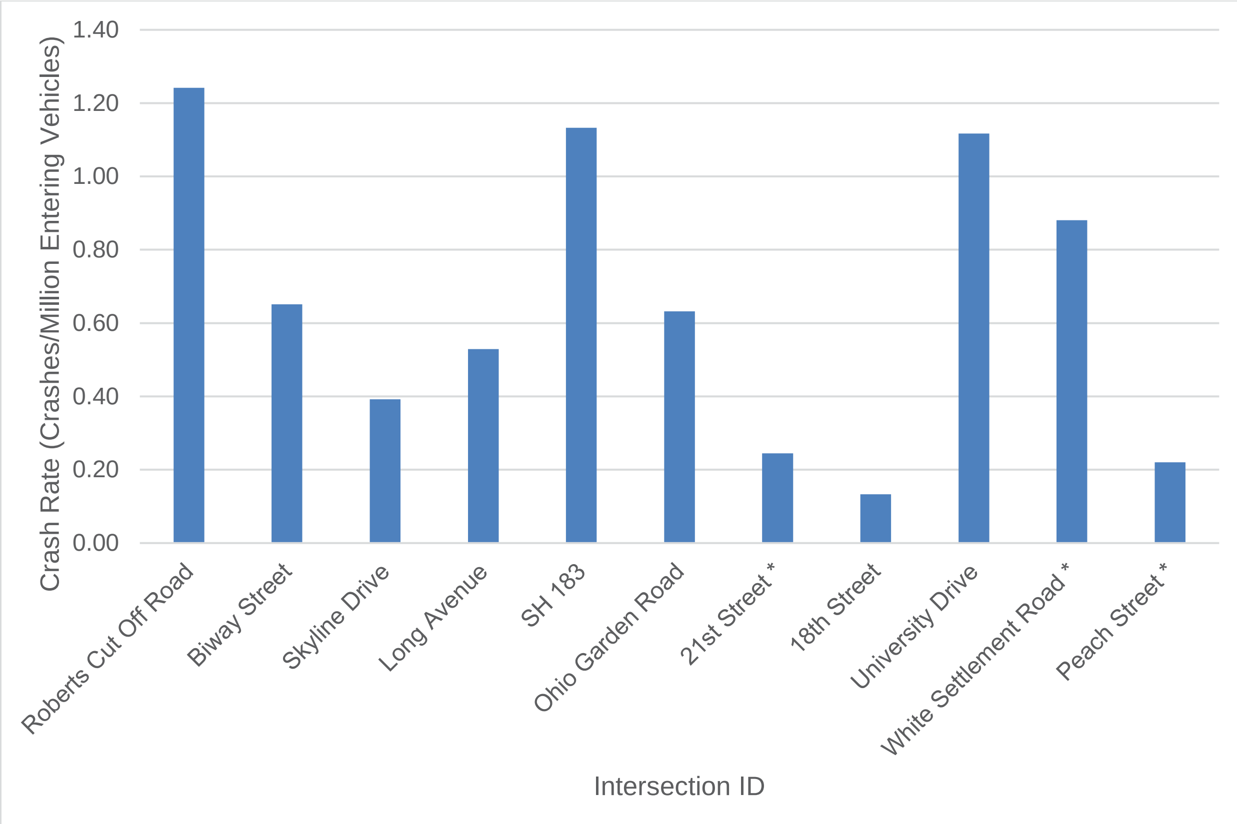


Figure 7. Crash Rate Per Intersection (2010 to 2014)
Source: TxDOT Crash Records Information System (CRIS), 2015
* Location where 2016 ADT data was unavailable. Shown ADT was interpolated from gathered traffic data.

1.9 SH 199 Crash Data Comparison to Statewide Crash Data

The overall crash rate and fatal crash rate along the study corridor was compared to similar statewide data obtained from Texas Motor Vehicle Crash Statistics (http://www.txdot.gov/inside-txdot/forms-publications/drivers-vehicles/publications/annual-summary.html), a TxDOT database, and averaged over the analysis period of 2010 through 2014. The average statewide traffic crash rate on urban state highway systems over the analysis period was 191.61 crashes per 100 million VMT, compared to 234.7 crashes per 100 million VMT for the SH 199 study corridor over the same period. The statewide average fatal crash rate was 1.24 per 100 million VMT over the five-year analysis period, compared to a fatal crash rate of 3.28 per 100 million VMT for the corridor. The higher observed crash rates on the study corridor compared to the statewide averages could be attributed to the urban nature of the corridor with multiple intersections, cross streets, and access driveways that increase the possibility of vehicle conflicts.

1.10 Site Observations

During project site visits and discussions with stakeholders, the consultant team observed and was made aware of multiple conditions that could contribute to the corridor crash statistics. These conditions are as follows:

- Lack of defined pedestrian and bicycle space along corridor and at intersections
- Private development within the TxDOT right-of-way leading to obstruction to the intersection sight distance
- Bus transit stops with difficult and challenging access points
- Lack of access management and definition between roadway edge and commercial driveways
- Lack of drainage infrastructure causing ponding within roadway ROW
- Inadequate lighting for pedestrians and cyclists

Figure 8 through Figure 11 show multiple undesirable conditions along the SH 199 corridor.

Figure 8. FWTA Bus Transit Stop East of SH 199 and Capri Drive Intersection
Source: Freese and Nichols, 2016

Figure 9. Private Development Obstructing Intersection Sight Distance Within TxDOT ROW East of SH 199 and Trails End Street Intersection
Source: Freese and Nichols, 2016

Figure 10. Paved Driveway and Shoulder East of SH 199 and 21st Street Intersection
Source: Freese and Nichols, 2016

Figure 11. Pedestrian Utilizing Roadway Shoulder West of SH 199 and SH 183 Intersection
Source: Freese and Nichols, 2016

During the time that the consultant team was developing the corridor master plan, there was one pedestrian and one bicycle related fatality with in the study area. The bicycle fatality occurred on January 25, 2017, and was in the 1100 block of SH 199 (east of University Drive intersection). The pedestrian fatality occurred on February 13, 2017, and was in the 1600 block of SH 199 (west of University Drive intersection).

2.0 EXHIBITS

1. Crash Data Map

3.0 ATTACHMENTS

A. Fort Worth Star Telegram Articles of Pedestrian and Bicycle Fatalities on SH 199

Exhibit 1

Crash Data Map

Crash Data Map
Exhibit 1-1

State Highway 199
Corridor Master Plan

Legend

- SH 199
- Parks
- Parcel Boundaries
- Study Area Boundary
- City Limits
- Signalized Intersection

Automobiles

- Fatality and Incap Injury
- Non-Incap, Pos Injury

Bicycle (B) and Pedestrian (P)

- (B) Fatality, Incap Injury
- (B) Non-Incap, Pos Injury
- (P) Fatality, Incap Injury
- (P) Non-Incap, Pos Injury

Key Map

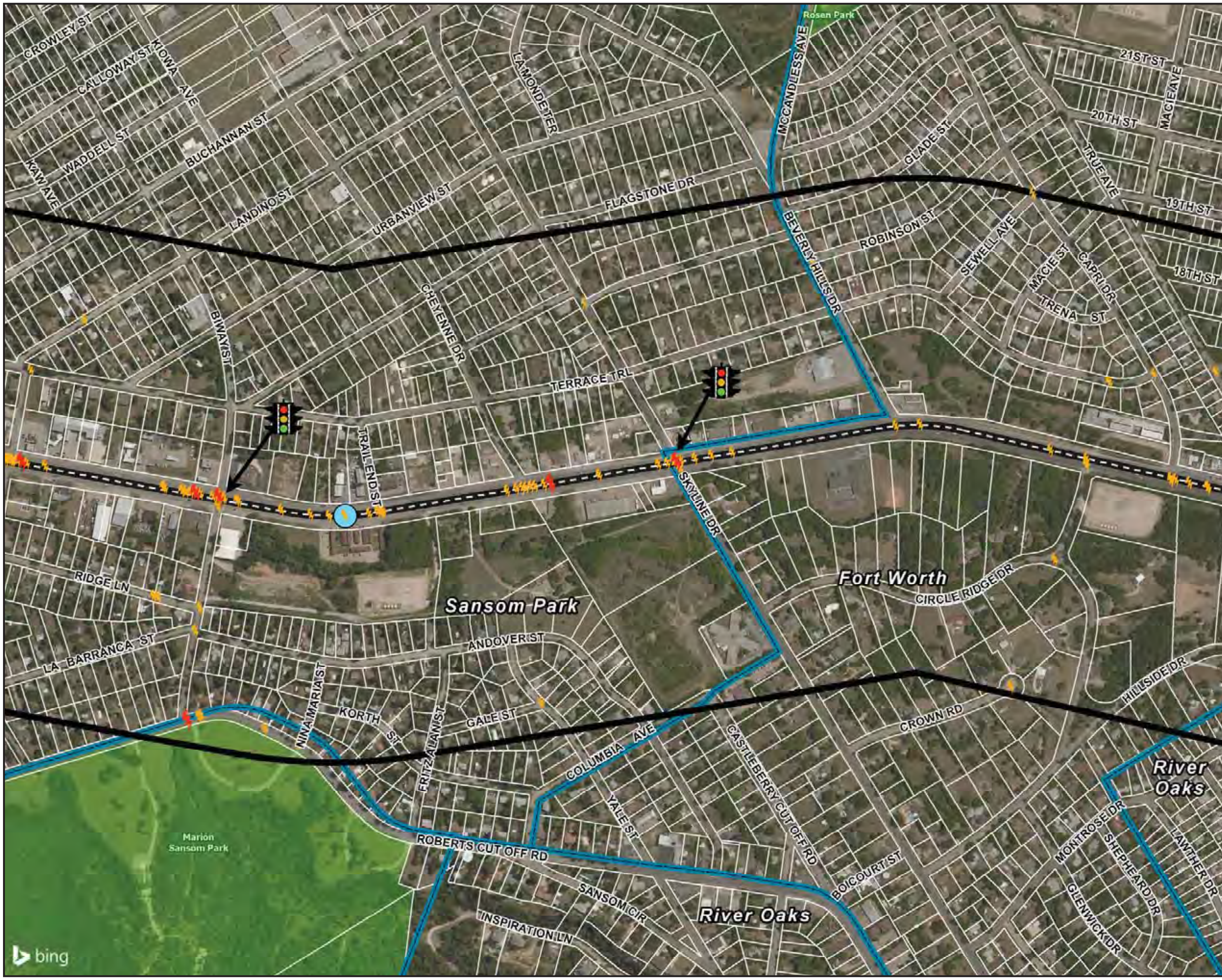
0 300 600 900
Feet

North Central Texas Council of Governments

Crash Data Source: TxDOT's Crash Records Information System (CRIS) - 2010-2014 Data
Parcel Data Source: Tarrant Appraisal District Parcels 2015
Date: 2/17/2017

Crash Data Map
Exhibit 1-2

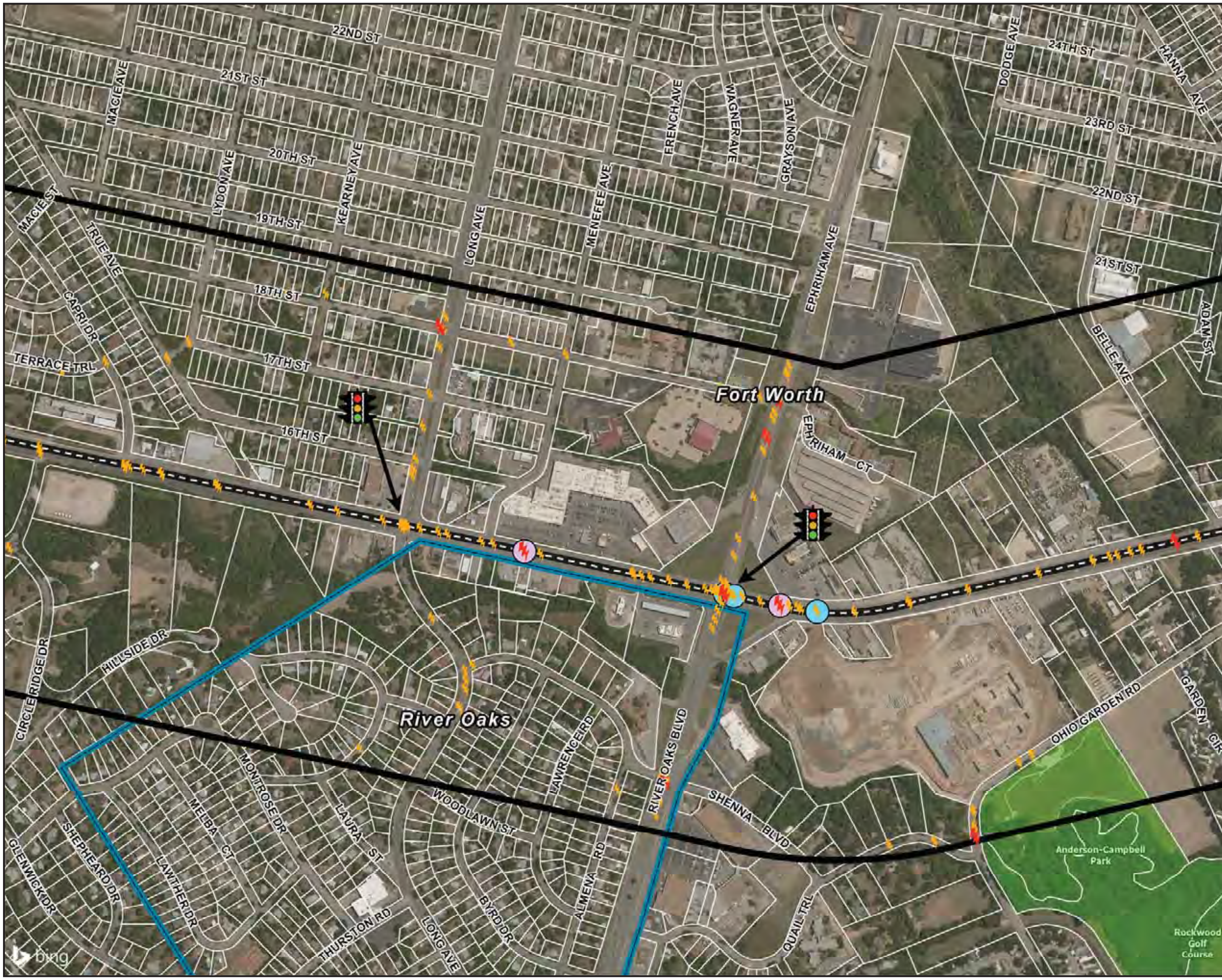
State Highway 199
Corridor Master Plan



Crash Data Source: TxDOT's Crash Records Information System (CRIS) - 2010-2014 Data
Parcel Data Source: Tarrant Appraisal District Parcels 2015
Date: 2/17/2017

Crash Data Map
Exhibit 1-3

State Highway 199
Corridor Master Plan



Legend

- SH 199
- Parks
- Parcel Boundaries
- Study Area Boundary
- City Limits
- Signalized Intersection

Automobiles

- Fatality and Incap Injury
- Non-Incap, Pos Injury

Bicycle (B) and Pedestrian (P)

- (B) Fatality, Incap Injury
- (B) Non-Incap, Pos Injury
- (P) Fatality, Incap Injury
- (P) Non-Incap, Pos Injury

Key Map

0 300 600 900
Feet

North Central Texas Council of Governments

Crash Data Source: TxDOT's Crash Records Information System (CRIS) - 2010-2014 Data Parcel Data Source: Tarrant Appraisal District Parcels 2015 Date: 2/17/2017

Crash Data Map
Exhibit 1-4

State Highway 199
Corridor Master Plan

Legend

- SH 199
- Parks
- Parcel Boundaries
- Study Area Boundary
- City Limits
- Signalized Intersection

Automobiles

- Fatality and Incap Injury
- Non-Incap, Pos Injury

Bicycle (B) and Pedestrian (P)

- (B) Fatality, Incap Injury
- (B) Non-Incap, Pos Injury
- (P) Fatality, Incap Injury
- (P) Non-Incap, Pos Injury

0 300 600 900
Feet

North Central Texas Council of Governments

Crash Data Source: TxDOT's Crash Records Information System (CRIS) - 2010-2014 Data

Parcel Data Source: Tarrant Appraisal District Parcels 2015

Date: 2/17/2017

Crash Data Map
Exhibit 1-5

State Highway 199
Corridor Master Plan

Legend

- SH 199
- Parks
- Parcel Boundaries
- Study Area Boundary
- City Limits
- Signalized Intersection

Automobiles

- Fatality and Incap Injury
- Non-Incap, Pos Injury

Bicycle (B) and Pedestrian (P)

- (B) Fatality, Incap Injury
- (B) Non-Incap, Pos Injury
- (P) Fatality, Incap Injury
- (P) Non-Incap, Pos Injury

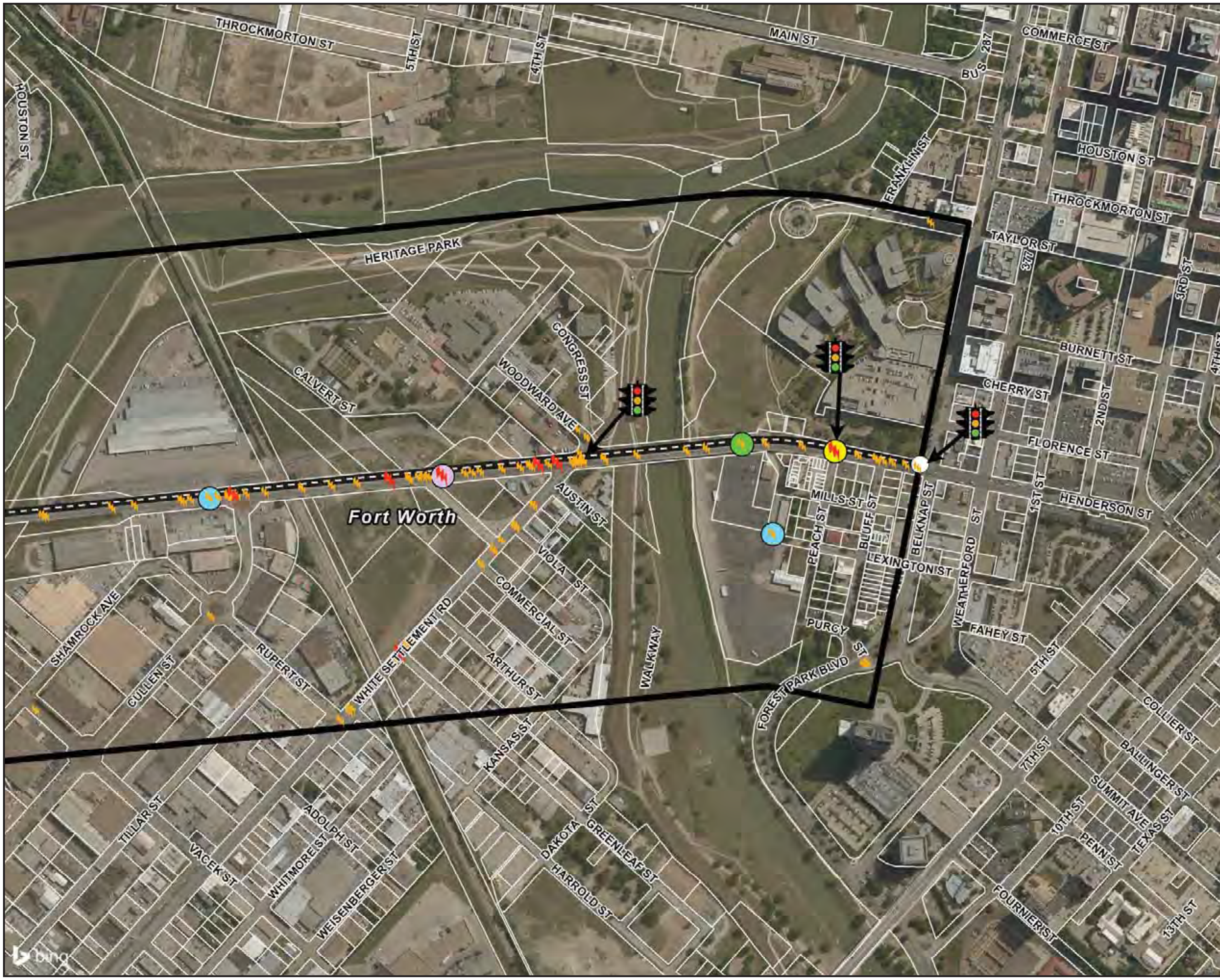
0 300 600 900
Feet

North Central Texas Council of Governments

Crash Data Source: TxDOT's Crash Records Information System (CRIS) - 2010-2014 Data
Parcel Data Source: Tarrant Appraisal District Parcels 2015
Date: 2/17/2017

Crash Data Map
Exhibit 1-6

State Highway 199
Corridor Master Plan



Legend

- SH 199
- Parks
- Parcel Boundaries
- Study Area Boundary
- City Limits
- Signalized Intersection

Automobiles

- Fatality and Incap Injury
- Non-Incap, Pos Injury

Bicycle (B) and Pedestrian (P)

- (B) Fatality, Incap Injury
- (B) Non-Incap, Pos Injury
- (P) Fatality, Incap Injury
- (P) Non-Incap, Pos Injury

0 300 600 900
Feet

Crash Data Source: TxDOT's Crash Records Information System (CRIS) - 2010-2014 Data
Parcel Data Source: Tarrant Appraisal District Parcels 2015
Date: 2/17/2017

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Attachment A

Fort Worth Star Telegram Articles of Pedestrian and Bicycle Fatalities on SH 199

FORT WORTH

JANUARY 26, 2017 12:24 PM

Homeless man killed while riding his bike 'was just a guy trying to survive'

BY DOMINGO RAMIREZ JR.
ramirez@star-telegram.com

FORT WORTH — Frank Smith was the MacGyver of the street, sometimes creating household items with just sticks and pieces of metal.

He was a familiar face at the corner of Seventh and Throckmorton streets. His home was a camp at city parks or wherever he could pitch a tent.

Buddy, his small canine companion, was always at his side, entertaining bystanders and visitors to downtown Fort Worth.

It was that bond that drove Smith, who had been in the hospital in recent days until his release on Tuesday, to ride his bicycle Wednesday morning on Jacksboro Highway to pick up Buddy from a friend.

The 58-year-old Smith didn't make it.

Smith was killed Wednesday morning when his bicycle was hit by a sport utility vehicle.

"He had lots of friends," Stacey Arbuckle of Azle said Thursday. She said she had known Smith and Buddy for almost two years when she worked in downtown Fort Worth. "He was just a guy trying to survive," she said.

Smith was pronounced dead at 7:08 a.m. Wednesday at John Peter Smith Hospital shortly after the accident, according to the Tarrant County medical examiner's website.

No hometown was listed, but public records indicated that he had lived in Kingston, N.Y., and Fort Worth.

"He wasn't a panhandler," Arbuckle said Thursday. "People would just walk up to him and give him money or food."

Friends said that Smith was hospitalized Jan. 19 for unknown medical reasons at JPS.

While in the hospital, one of Smith's friends took care of Buddy and the two were to rejoin at 7:15 a.m. Wednesday.

Patrol officers responded to the accident call about 6:30 a.m. Wednesday in the 1100 block of Jacksboro Highway.

Smith was riding his bicycle in the traffic lane southbound as was the SUV, police said. The driver did not see the bicyclist and hit him, police said.

Initially, police officials released information saying the accident was a hit-and-run. But later police revised their report, saying the driver of the vehicle was at the scene when officers arrived.

"Everyone just loved them both," Arbuckle said of man and dog. Smith "was a veteran, softspoken, and dealt with several medical issues."

Buddy was the entertainer, playing with his toys on the street corner or sitting on Smith's shoulder while his owner rode his bicycle.

“They were there every day at that street corner unless there was bad weather or he had something to do,” Arbuckle said. “They brought smiles to everyone.”

Arbuckle said that she would be taking take care of Buddy.

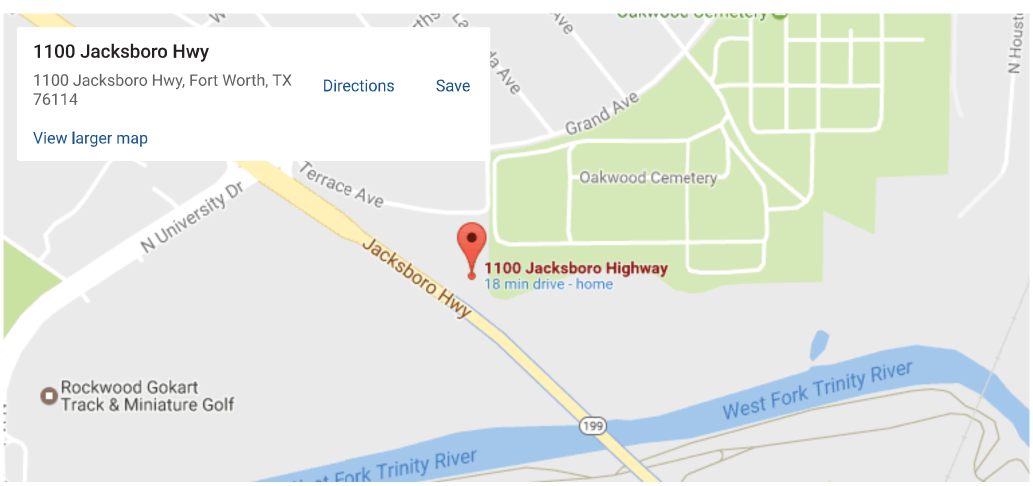
A church service to honor Smith is pending.

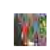
Domingo Ramirez Jr.: 817-390-7763, @mingoramirezjr

Volunteers reach out to homeless

When We Love and Compassion of Christ Ministries are among outreach groups caring for homeless

jlmarshall@star-telegram.com





Map Report a map error

This is a photography of Buddy, the traveling company of Frank Smith. Smith was killed Wednesday in a traffic accident on Jacksboro Highway in Fort Worth. Buddy was not with him at the time of the accident. **Stacey Arbuckle -** Courtesy photo

SUGGESTED FOR YOU

FORT WORTH

JANUARY 29, 2017 12:37 PM

Mass scheduled for Fort Worth homeless man killed in crash

BY DOMINGO RAMIREZ JR.
ramirez@star-telegram.com

FORT WORTH — A weekday Mass has been scheduled for a downtown homeless man familiar to many who was killed last week on Jacksboro Highway as he rode his bicycle to pick up his dog from a friend.

The Mass for Frank Smith, 58, is at 7 a.m. Feb. 8 at St. Patrick Cathedral, 1206 Throckmorton St.

A small street memorial for Smith and his little dog, Buddy, has gone up at the southeast corner of Seventh and Throckmorton streets where the two entertained downtown workers and visitors.

The memorial includes lilies and red roses and a poster with a photograph of Smith and Buddy.

One message left with flowers says, “I’ll miss you Frank. I know you’re safe now.”

Friends said Smith was hospitalized Jan. 19 at John Peter Smith Hospital. A friend took care of Buddy and the two were to rejoin at 7:15 a.m. Wednesday.

Patrol officers responded to an accident call about 6:30 a.m. in the 1100 block of Jacksboro Highway. Smith was riding his bicycle in the southbound traffic lane. The driver of an SUV also headed south did not see the bicyclist and hit him, police said.

Smith died at JPS shortly after the accident.

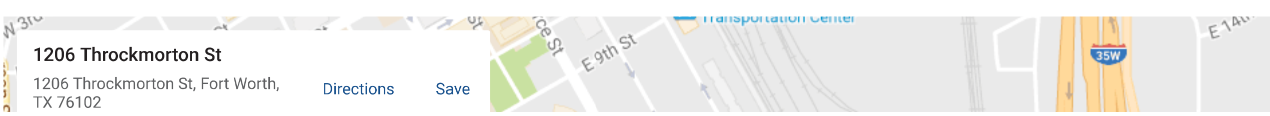
Friends of Smith are taking care of Buddy.

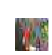
Like many homeless people, Smith’s life was not crime-free. He was convicted of sexual assault of a teen in New York in the late 1990s and served seven years in prison, according to Texas Department of Public Safety records.

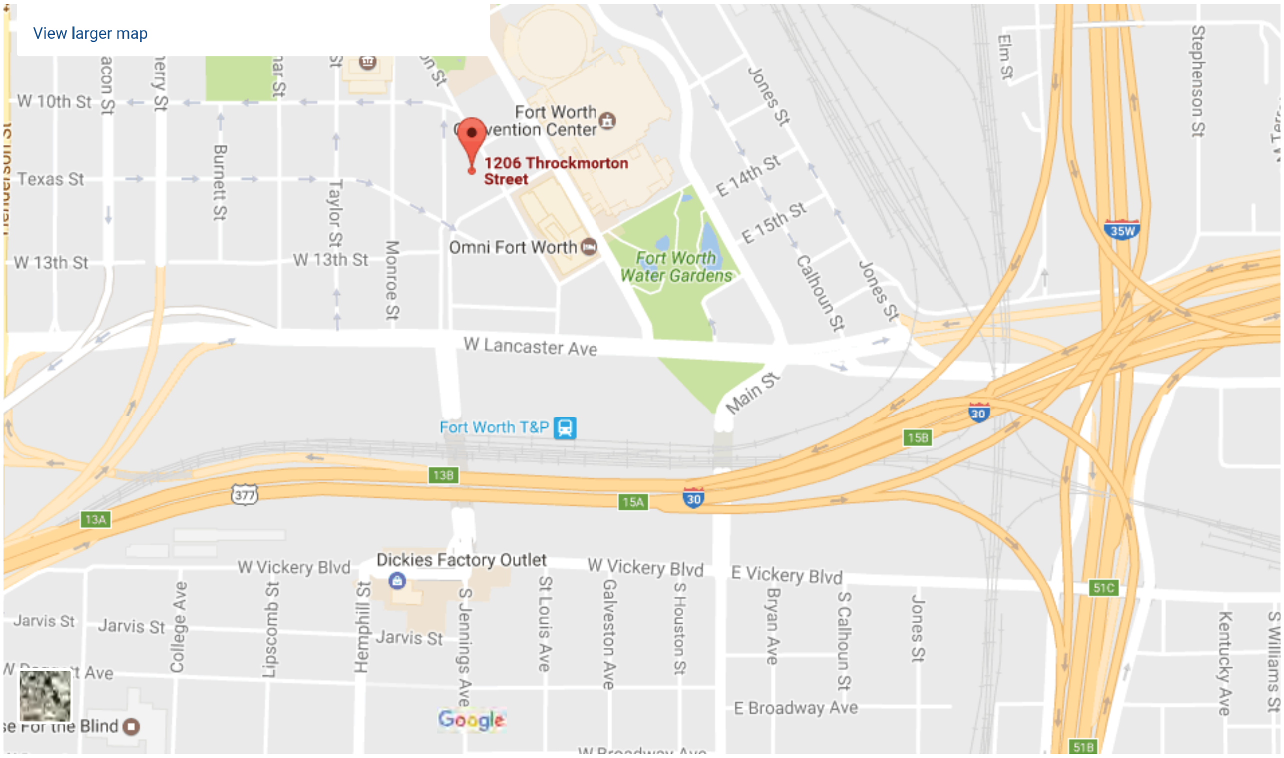
For that, Smith had to register as a sex offender in Texas.

He also was arrested in Harris County in 2010 and charged with possession of a controlled substance, according to Harris County criminal court records.

Domingo Ramirez Jr.: 817-390-7763, @mingoramirezjr







Map Report a map error

This is Buddy, the little traveling companion of Frank Smith, a well-known downtown Fort Worth homeless man who was killed in a bicycle accident. Friends of Smith are taking care of Buddy. **Stacey Arbuckle**

SUGGESTED FOR YOU

FORT WORTH

FEBRUARY 15, 2017 7:01 AM

Woman killed trying to cross Jacksboro Highway in Fort Worth

BY AZIA BRANSON
abranson@star-telegram.com

FORT WORTH — A 44-year-old woman was killed trying to cross a roadway in Fort Worth late Monday, police said.

Christeena Long attempted to cross at the 1600 block of Jacksboro Highway about 10:30 p.m. when a northbound Chevrolet struck her. The area where Long was trying to cross was not marked for pedestrian crossing, police said.

Long was taken to John Peter Smith Hospital, where she was pronounced dead at 11:07 p.m.

The driver told police visibility was reduced because of heavy rain at the time of the accident.

Frank Smith, 58, a well-known homeless man around downtown Fort Worth, was also killed when he tried to cross Jacksboro Highway on his bike last month.

Azia Branson: 817-390-7547, @aziabranson

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Appendix K – Existing Conditions – Drainage Assessment Technical Memorandum

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State Highway 199
Corridor Master Plan

From IH 820 to Belknap Street

Existing Conditions - Drainage Assessment
Technical Memorandum

Submittal Date:
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Prepared For:
North Central Texas Council of Governments

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1.0 DRAINAGE ASSESSMENT

State Highway (SH) 199 has been identified as a vital regional transportation facility in north-west Tarrant County. A study of SH 199 from east of Interstate Highway (IH) 820 to Belknap Street was initiated to produce a corridor master plan that would provide a basis for future design and construction. As part of this effort, the existing drainage conditions along the SH 199 corridor were analyzed to determine the adequacy of the existing drainage infrastructure within the study area.

1.1 EXISTING CONDITIONS

The SH 199 corridor study area is bounded by the City of Lake Worth, the City of Sansom Park, the City of River Oaks, and the City of Fort Worth. The roadway is on the state highway system and is owned and operated by the Texas Department of Transportation (TxDOT).The highway consists of a wide right-of-way and limited drainage infrastructure within the project limits. The roadway was originally built in the 1930's as a rural roadway and has never been fully reconstructed or significantly improved. The existing infrastructure of the study area is shown in Exhibits 1-1 and 1-2.

The highway drainage system consists of several culverts that drain runoff from east to west under the roadway. There are few longitudinal improvements such as roadside ditches or storm drains to collect and convey the runoff to the culverts. The minimal road drainage system varies along the length of the study area and appears to have been constructed piecemeal with development. Longitudinal drainage is generally carried by wide shallow depressions along the road shoulder. For a significant length of the project there is no depression and the runoff runs along the face of a retaining wall at the edge of the pavement. There are limited areas with curb and gutter, typically within the Fort Worth city limits, and there are a couple locations with drainage ditches.

Two creeks, Menefee Creek and an Unnamed Tributary to Stream WF-5, cross under the highway through large culverts. The creeks discharge to Stream WF-5, which runs parallel to the highway along its west side. Stream WF-5 drains to the West Fork Trinity River downstream of Ohio Garden Road. At the east end of the project area, there are bridge crossings at the West Fork Trinity River and the Clear Fork Trinity River. An additional bridge is currently under construction to cross the proposed Panther Island Bypass Channel.

Drainage areas that drain to the highway culverts are shown in Exhibit 2. Within Fort Worth, these contributing areas typically contain storm drains. These storm drains are generally not connected to the highway drainage system and discharge either to an open channel or to the road surface. Within Sansom Park and River Oaks, surface flow is carried to the highway mainly through ditches along the streets.

The study area consists mostly of residential land use, with some park and commercial lots and a central business district to the east. Land to the north of the highway consists of bluffs and steep terrain. The existing condition of the watershed is considered to be fully developed.

A site visit was conducted on July 12, 2016, to observe and record existing drainage infrastructure. During the visit, it was observed that many pipes were heavily silted. Photos from the site visit are shown in Attachment A.

Figure 1. Area with Road Side Ditches and Inlet at Low Point (SH 199, Fort Worth)
Source: Freese and Nichols, Inc., 2016

Figure 2. Silted Culvert (SH 199, Sansom Park)
Source: Freese and Nichols, Inc., 2016

1.2 KNOWN ISSUES AND PREVIOUS STUDIES

Input on existing information on the drainage issues in this area was solicited from the project partners. The following discusses these known issues, which are depicted in Exhibit 3.

The City of Fort Worth GIS flood complaints dataset was reviewed for the highway vicinity and the contributing drainage area. Only two high water entries were noted in this review. One entry noted high water at Ephriham Avenue and SH 199 near the Menefee Creek crossing in April 2015. It was noted that in this event the road was closed to traffic due to the high water. The other entry is located at Ephriham Avenue and NW 24th Street and noted police responded to high water at this location in September 2010. This location is in the watershed upstream of SH 199 along the Unnamed Tributary to WF-5.

The Menefee Creek Open Channel Study (No. SWS-020) was performed by the City of Fort Worth in 2013. The purpose of this study was to assess existing conditions of the creek and develop plans to reduce the floodplain boundaries, and protect businesses and residences from flooding. Improvement plans evaluated in this project include increasing valley storage, development of a detention pond, and a buyout of floodplain structures. Culvert improvements were not evaluated as they were considered to be cost prohibitive. A benefit-cost analysis based on the reduction in flood damages to structures determined that none of the alternatives was cost beneficial. Although structural flooding was not shown to be a major problem, there were safety concerns identified regarding overtopping culverts and flood potential along the highway. It was recommended that the City of Fort Worth give further consideration to a culvert replacement plan.

Sansom Park has been noted to experience flooding issues along the highway due to the lack of storm drain infrastructure. Runoff from Sansom Park is transported in surface ditches instead of being captured in an underground storm drain. These ditches result in flooding within Sansom Park that is then directed towards the SH 199 corridor where there are minimal drainage inlets. These inlets are overwhelmed and this excess surface flow then causes flooding of the highway during heavy rainfall.

River Oaks has indicated there is inadequate maintenance of Stream WF-5. This creek runs parallel to the highway and drains most of the contributing drainage area. It is understood that maintenance obligations of private land owners and the City of River Oaks were not properly identified as the area developed. The creek therefore does not receive proper maintenance and there are frequent issues with debris within the channel that are not addressed.

1.3 CAPACITY ANALYSIS

A high-level analysis was performed to evaluate the adequacy of the existing cross drainage structures. Data for the drainage system was obtained from various sources, including field measurements, TxDOT records, and City of Fort Worth GIS. For data that could not be obtained, reasonable assumptions were made based on TxDOT and NCTCOG iSWM Criteria.

Existing conditions of the Clear Fork and West Fork Henderson Street Bridges are provided in the Upper Trinity River Corridor Development Certificate (CDC) model developed by the USACE Fort Worth District. CDC models are hydraulic models developed by the US Army Corps of Engineers (USACE) for projects located within the Trinity River Regulatory Zone. These models are developed for the purpose of determining whether proposed projects will result in raised water levels and increased flooding. A modified version of this model was used in the hydraulic evaluation of the existing bridges and the proposed Panther Island Bypass bridge under future conditions as part of the Trinity River Vision Central City Project. These models were prepared by Camp Dresser & McKee, Inc. with coordination from USACE in 2014.

1.3.1 Hydrology

To develop peak discharges, subbasins were delineated to each drainage structure using two-foot 2001 contour data obtained from NCTCOG. Sixteen subbasins were delineated in total, as shown in Exhibit 3.

Land use and soil conditions were determined for each subbasin as part of the calculations for C-values and curve numbers. C-values are empirical coefficients that describe the fraction of rainfall that becomes runoff and are based on land use. Similarly, curve numbers are hydrologic parameters used to predict runoff based on both land use and soil type. Curve numbers do not directly represent the fraction of runoff but are inputs to more complex equations that describe this relationship. Aerial views were used to delineate the watershed into three general land use types: residential, commercial, and park. The delineations are shown in Exhibit 4. The different areas and corresponding C-values and curve numbers are shown in Table 1. C-values were obtained from iSWM criteria. Hydrologic soil types were determined and classified as A, B, C, or D. Soil Type A is sandy with high infiltration rates and Soil Type D is clayey with low infiltration rates. Soil type data was obtained from the US Department of Agriculture Soil Survey and is displayed in Exhibit 5. Most soil in the watershed is Type C.

Table 1. Hydrologic Parameters According to Land Use

Area Type	C-Value	Curve Number			
		Soil A	Soil B	Soil C	Soil D
Residential	0.60	61	75	83	87
Commercial	0.70	89	92	94	95
Park	0.25	49	69	79	84

Curve numbers for each land use and soil type were obtained from Soil Conservation Service (SCS) TR-55. Composite curve numbers were calculated based on the land use and soil conditions of each subbasin. Time of concentration was calculated for each subbasin using the TR-55 methodology. The flowpaths of each subbasin were broken into sheet, shallow concentrated, and channelized flow. The resulting curve numbers, C-values, and time of concentration for each subbasin are shown in the Attachment B.

The peak discharges of the majority of the subbasins were calculated using the rational method, which is based on rainfall intensity, C-values, and area. For these calculations, composite C-values were calculated using the delineated land uses. Rainfall intensity values were calculated using TxDOT standards from the 2016 Hydraulic Design Manual and the previously calculated time of concentration.

According to TxDOT criteria, the rational method is appropriate for watershed of less than 200 acres. Two of the delineated subbasins had areas greater than this and could not be analyzed using this method. The first of these subbasins was delineated to Menefee Creek, which crosses the highway and drains to Stream WF-5. This drainage area has been previously studied by the City of Fort Worth in the Menefee Creek Open Channel Study. The remaining subbasin drains to an Unnamed Tributary of Stream WF-5. For this subbasin, the SCS method was used to analyze existing conditions and a HEC-HMS 4.1 computer hydrologic model was developed to generate discharges.

1.3.2 Hydraulics

Hydraulic evaluation was performed using Manning's Equation. In Manning's Equation, the slope of the hydraulic grade line can be determined using discharge, pipe area, hydraulic radius, and a Manning's roughness value. The hydraulic grade represents the friction loss through the pipe over length and can be used to determine the upstream depth of water given a downstream depth. In these calculations, a Manning's roughness value of 0.013 was assumed for all pipes. Discharges were obtained from either the rational method calculations or hydrologic model discussed in the hydrology section. Pipe sizes were determined using information from record drawings provided by TxDOT and the City of Fort Worth and from GIS data provided by the City of Fort Worth. In some cases, the size of the discharging pipe was assumed to be consistent with the upstream system. Of the subbasins analyzed using this method, two contained drainage crossings with unknown sizes. In both of these cases, the crossings were not connected to pipe systems and the crossing sizes could not be estimated.

The calculated hydraulic slope was used along with the downstream tailwater to calculate the upstream headwater of the system. It was assumed that the tailwater occurs at the top of the downstream end of the pipe. The resulting headwater was then compared to the top of curb in order to determine the storm frequencies that would exceed the pipe capacity for each subbasin.

Hydraulic evaluation of the subbasins greater than 200 acres was performed in HEC-RAS computer model. The subbasin that drains to Menefee Creek has been previously studied by the City of Fort Worth in the Menefee Creek Open Channel Study. Existing hydraulic conditions for this subbasin were obtained from this model. A HEC-RAS 5.1 computer model was developed to compute water surfaces for the subbasin that drains to Unnamed Tributary of Stream WF-5. Cross sections in the model were placed directly upstream and downstream of the crossing and extend for 400 feet downstream. The starting water surface was based on the normal depth of the downstream cross section. Elevation data for the cross sections was developed from Light Detection and Ranging (LIDAR) topographic data obtained from the Texas Natural Resources Information System. The model was executed as a steady flow simulation with hydrologic flow data obtained from the HEC-HMS computer model.

The study area also includes two existing bridges on SH 199, the West Fork Trinity River Bridge and the Clear Fork Trinity River Bridge. There is also a bridge under construction at the proposed Panther Island Bypass Channel. The hydraulic performance of the existing bridges was reviewed by executing the CDC models in HEC-RAS 5.1. The proposed bridge was reviewed by executing the model prepared for the Central City project. The output of these models was checked to evaluate if the bridges caused a significant head loss or were overtopped in the 100-year and Standard Project Flood (SPF) events. The SPF represents the most severe runoff event reasonably possible in a watershed and is much more severe than a 100-year event.

The storm drain system located at the eastern end of the study area was not evaluated as part of this analysis. Analysis of this system was performed in 2014 by Freese and Nichols in the *Trinity River Vision Storm Drain Master Plan* for the City of Fort Worth as part of the TRV Central City Project. Improvements are identified throughout the area to meet City of Fort Worth criteria with future development.

1.4 RESULTS

The results of the capacity analysis are shown in Table 2 and Table 3. Many of the pipes are shown to have adequate capacity. However, based on field observations some of these pipes may be impaired by silting. Inlet capacity was not evaluated as part of this analysis. Due to the lack of inlet capacity in the upstream areas and along SH 199, it is expected the system does not perform as well as indicated by these results. It is expected that storm drain extended along SH 199 would be necessary to capture excess runoff and meet TxDOT criteria. Based on these results, many of the existing pipes within the SH 199 right-of-way may not require replacement with these future storm drain extensions.

Table 2. Pipe Crossing Capacities

Subbasin	Area (acres)	Pipe Size	Capacity
1	35.8	Unknown	Unknown
2	18.6	24"	5-year
3	9.5	36"	100-year
4	23.4	3'x3'	100-year
5	42.9	4'x3'	100-year
6	19.6	3'x2'	25-year
9	25.3	6'x6'	100-year
10	22.4	3'x2'	5-year
11	122.1	8'x7'	100-year
12	77.1	6'x6'	100-year
13	19.3	18"	Less than 2-year
14	26.0	Unknown	Unknown
15	46.8	6'x6'	50-year
16	15.0	3'x2'	10-year

Table 3. Creek Crossing Capacities

Subbasin	Crossing	Area (acres)	Culvert Size	Capacity
7	WF-5 Tributary	472.6	10'x10'	2-year
8	Menefee Creek	646.6	10'x8'	5-year

The SH 199 crossings at the two creeks are undersized and experience frequent overtopping of the roadway. The crossing at Menefee Creek has a five-year capacity, and during a 100-year storm event the highway experiences flooding at a depth of 2.1 feet and a width of 229 feet. The Unnamed Tributary to Stream WF-5 has a two-year capacity, and during a 100-year storm event experiences flooding at a depth of 1.2 feet and a width of 368 feet. HEC-RAS cross sections of these culvert crossings are included in Attachment C.

The analysis of the SH 199 bridges indicates they have adequate hydraulic function. The Clear Fork Bridge allows water to pass beneath the deck of the bridge during a 100-year storm event. The model indicates the SPF storm potentially overtops the bridge approach by approximately six inches. Although this does not cause significant headloss, it is recommended that if the bridge is replaced in the future, it be rebuilt at an elevation above the SPF water surface. It is noted however it is not anticipated that this bridge will be replaced, as it is listed in the National Register of Historic Places. The West Fork Bridge also allows water to pass beneath the deck of the bridge during a 100-year storm event. The water surface rose above the low chord of this bridge during an SPF storm event, but did not cause significant headloss.

The Central City model was used to analyze the existing bridges as well as the proposed Panther Island Bypass bridge under future conditions. It was determined that no bridges experience significant headloss under proposed conditions. For the Panther Island Bypass bridge, the water surface elevations were significantly below the deck of the bridge during all storm frequencies. The distance between the SPF water surface elevation and the low chord of the proposed bridge was approximately eight feet. HEC-RAS cross sections of the bridge crossings are included in Attachment C.

2.0 EXHIBITS

1. Existing Infrastructure
2. Drainage Area
3. Known Issues
4. Existing Land Use
5. Soil Groups

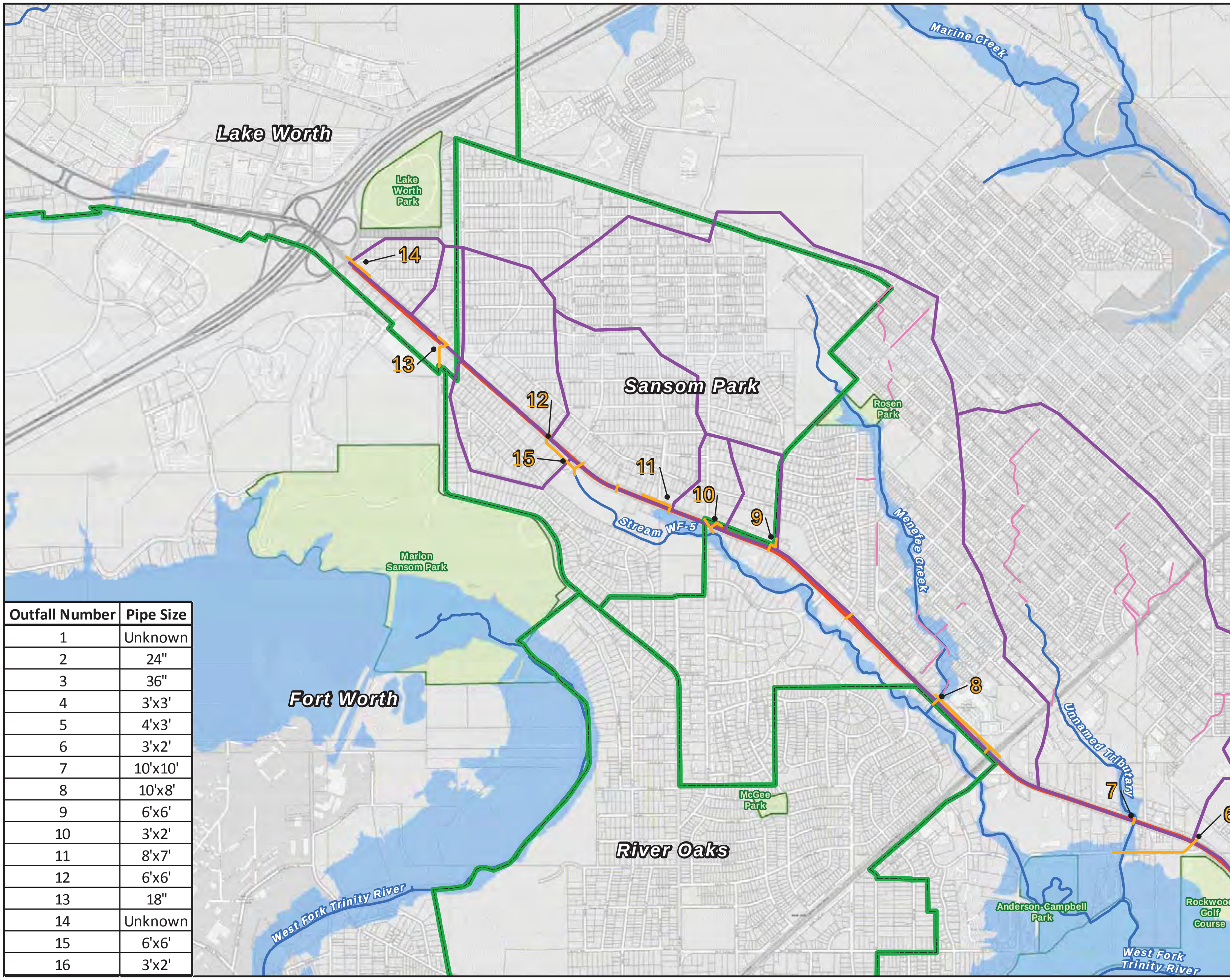
3.0 ATTACHMENTS

A. Site Visit Photos
B. Hydrologic Parameters
C. Hydraulic Cross Sections

Exhibits

Existing Infrastructure SH 199 Exhibit 1-1

State Highway 199 Corridor Master Plan



Legend

- Project Limits
- SH 199 Drainage Systems
- Off Site Drainage Systems
- Stream Centerline
- Drainage Areas
- FEMA 100yr Floodplain
- Panther Island Bypass Channel
- Parks
- Bridges
- City Limits
- 1 Outfall Location

Outfall Number	Pipe Size
1	Unknown
2	24"
3	36"
4	3'x3'
5	4'x3'
6	3'x2'
7	10'x10'
8	10'x8'
9	6'x6'
10	3'x2'
11	8'x7'
12	6'x6'
13	18"
14	Unknown
15	6'x6'
16	3'x2'

Key Map

0 1,500 3,000
Feet

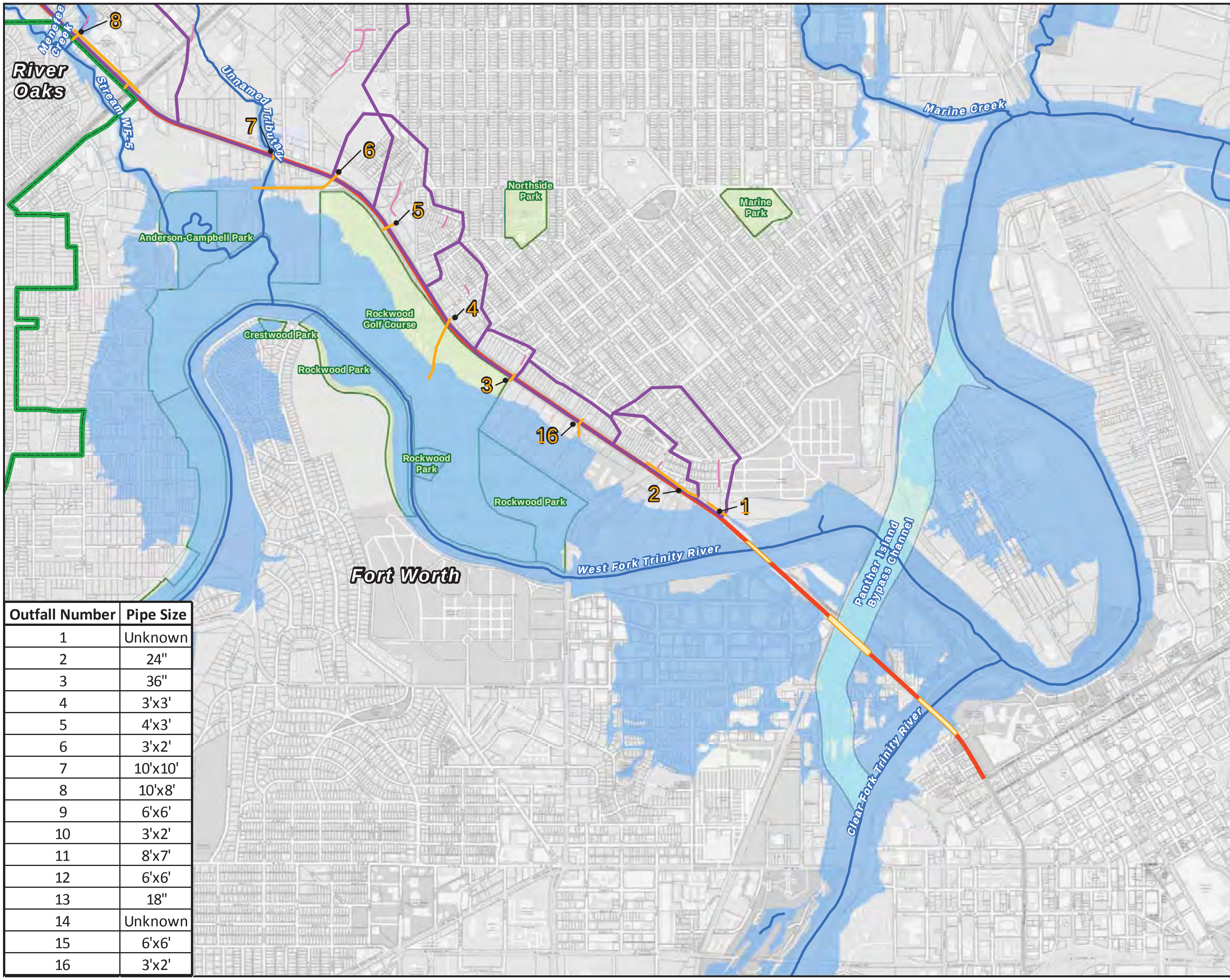
N S E W

North Central Texas Council of Governments

Parcel Data Source: Tarrant Appraisal District Parcels 2015
Floodplain Data Source: FEMA Flood Zones 2016
Date: 1/18/2017

Existing Infrastructure SH 199 Exhibit 1-2

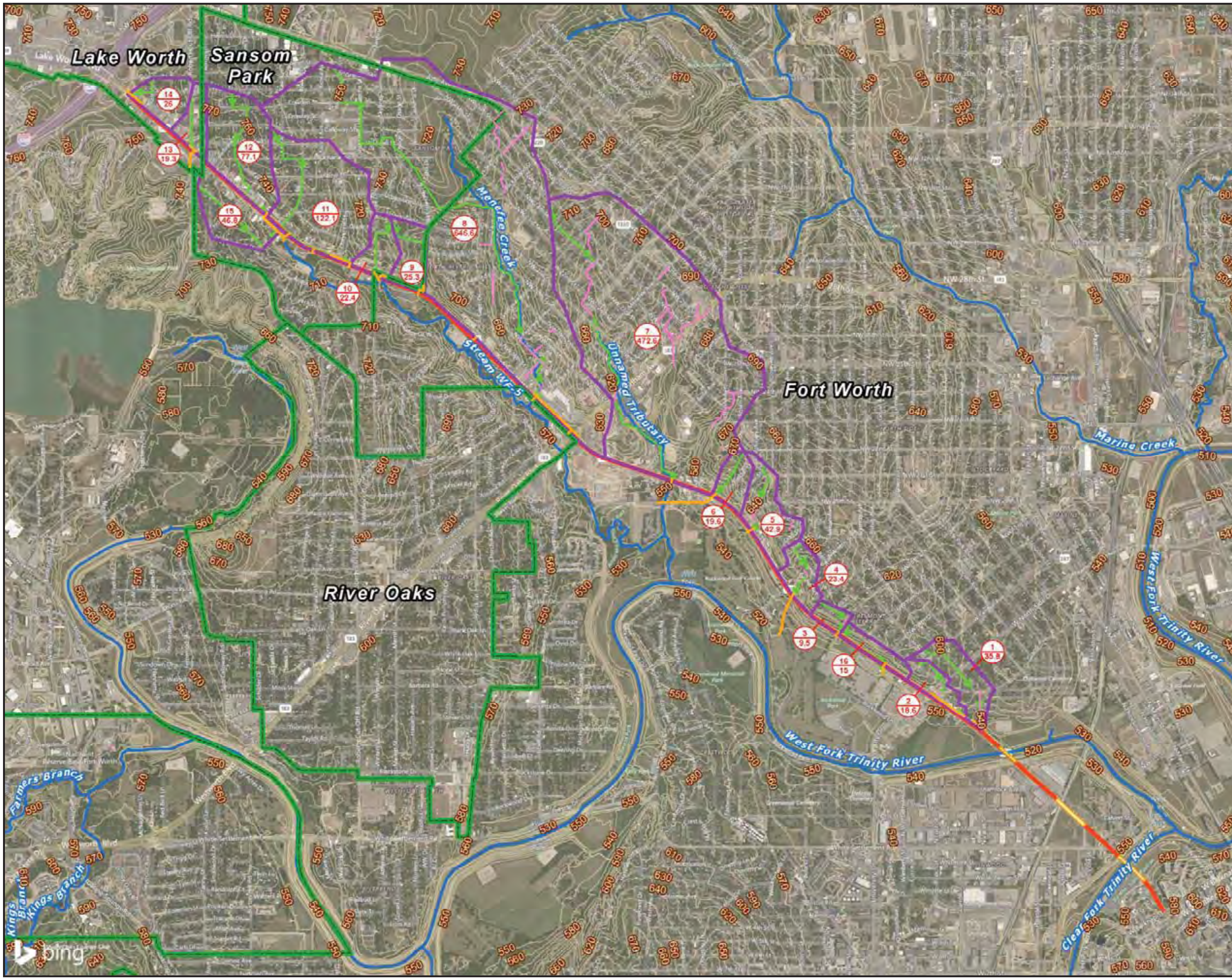
State Highway 199
Corridor Master Plan



Outfall Number	Pipe Size
1	Unknown
2	24"
3	36"
4	3'x3'
5	4'x3'
6	3'x2'
7	10'x10'
8	10'x8'
9	6'x6'
10	3'x2'
11	8'x7'
12	6'x6'
13	18"
14	Unknown
15	6'x6'
16	3'x2'

North Central Texas Council of Governments

Parcel Data Source: Tarrant Appraisal District Parcels 2015
Floodplain Data Source: FEMA Flood Zones 2016
Date: 1/18/2017



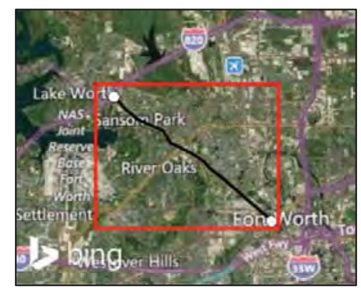
Drainage Area Map
SH 199
Exhibit 2

State Highway 199
Corridor Master Plan

Legend

- Project Limits
- SH 199 Drainage System
- Off Site Drainage Systems
- Stream Centerline
- Drainage Areas
- Bridges
- City Limits
- Flowpath
- 10-ft Contour
- 11 / 122.1 — Subbasin Name / Area (acres)

Key Map



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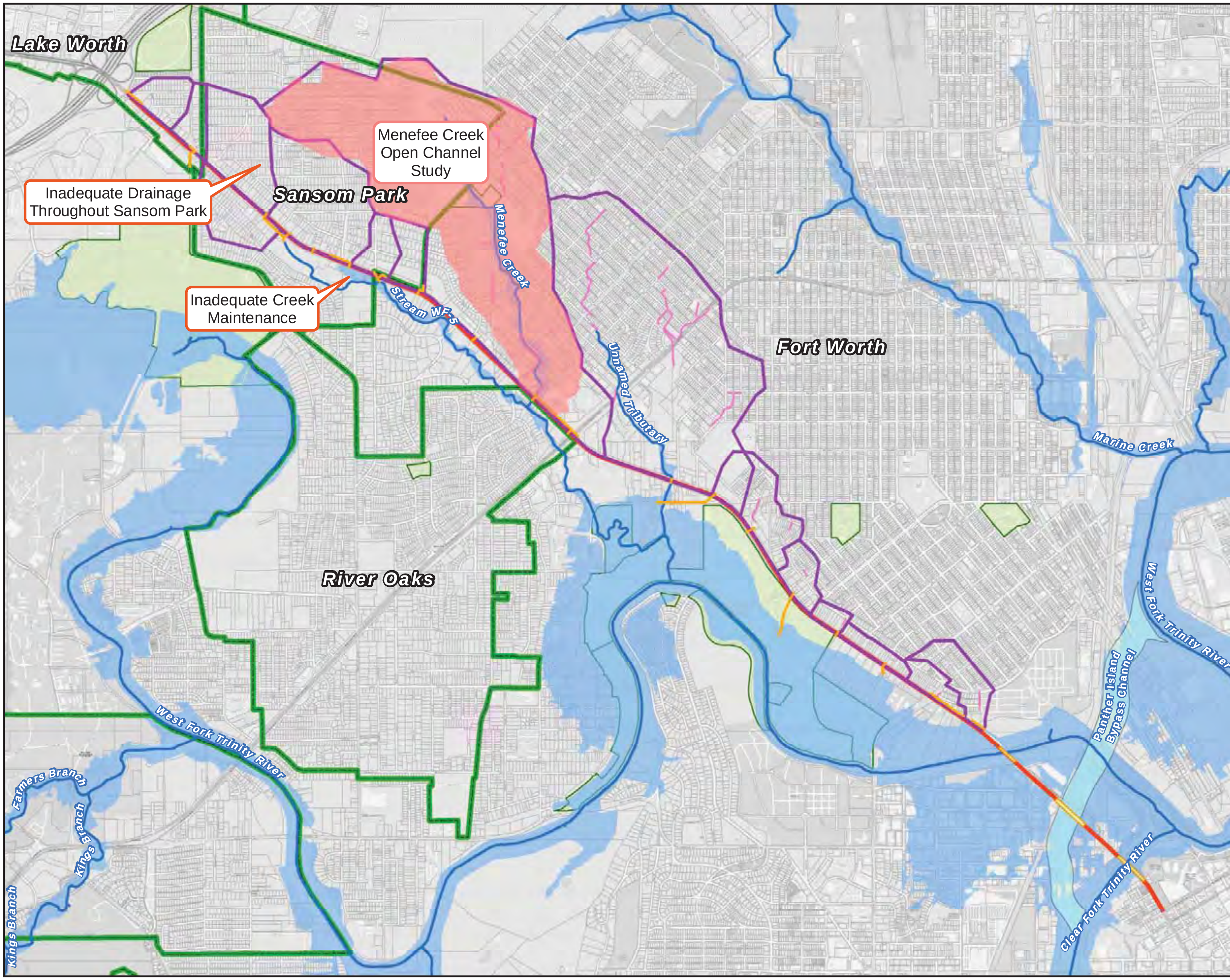
N E S W

North Central Texas Council of Governments

Date: 1/18/2017

Known Issues SH 199 Exhibit 3

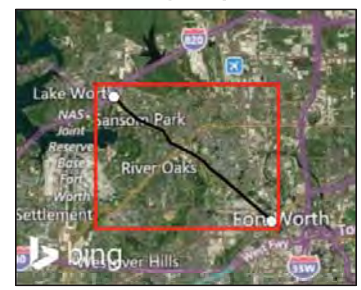
State Highway 199 Corridor Master Plan



Legend

- Project Limits
- SH 199 Drainage System
- Off Site Drainage Systems
- Stream Centerline
- Drainage Areas
- FEMA 100yr Floodplain
- Panther Island Bypass Channel
- Parks
- Bridges
- City Limits

Key Map



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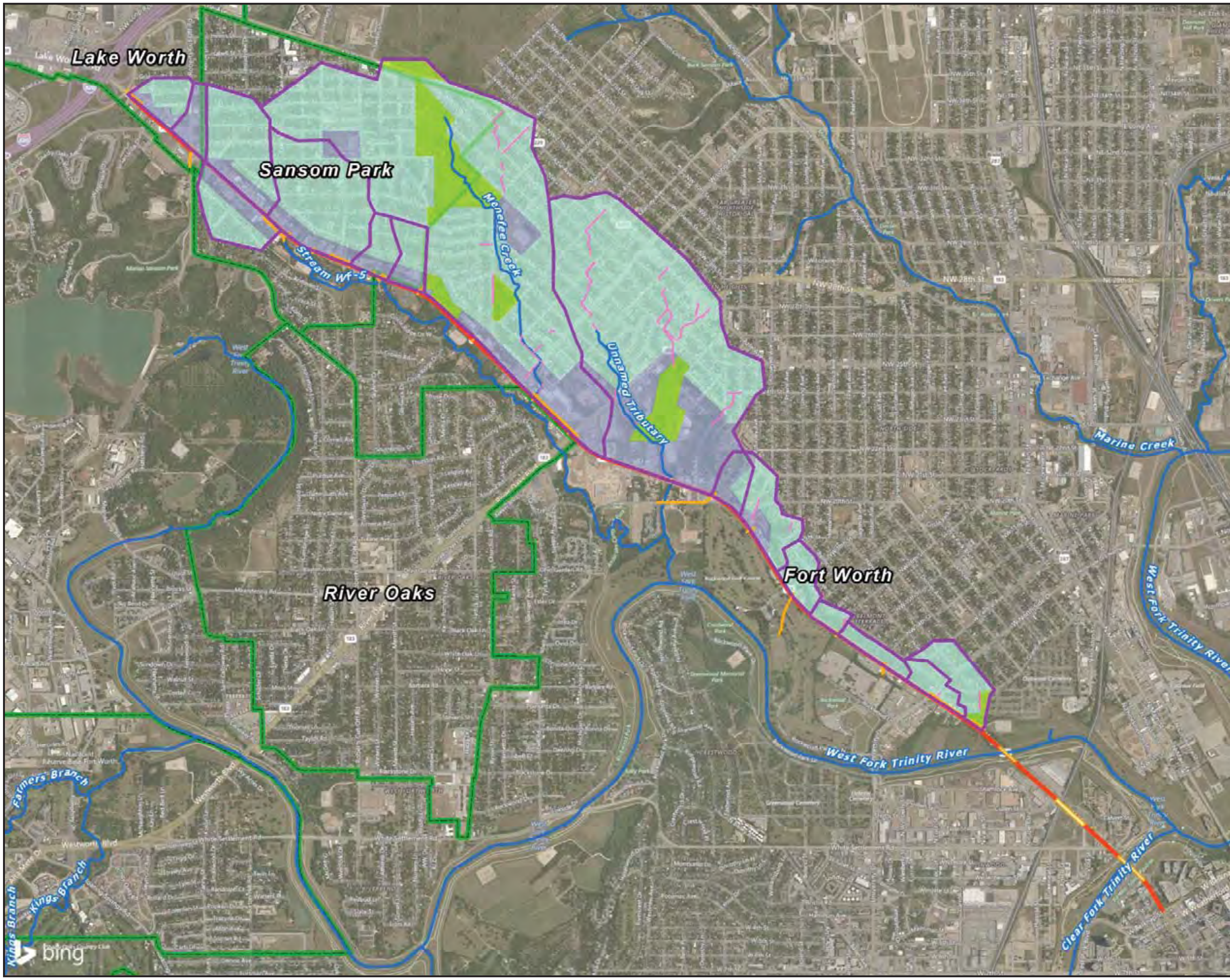
North Central Texas Council of Governments

Parcel Data Source: Tarrant Appraisal District Parcels 2015
Floodplain Data Source: FEMA Flood Zones 2016
Date: 1/18/2017



Existing Land Use SH 199 Exhibit 4

State Highway 199 Corridor Master Plan

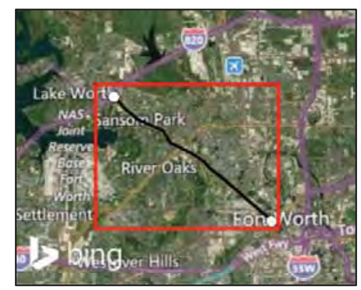
Legend

- Project Limits
- SH 199 Drainage System
- Off Site Drainage Systems
- Stream Centerline
- Drainage Areas
- Bridges
- City Limits

Land Use

- Commercial
- Medium Density Residential
- Park

Key Map



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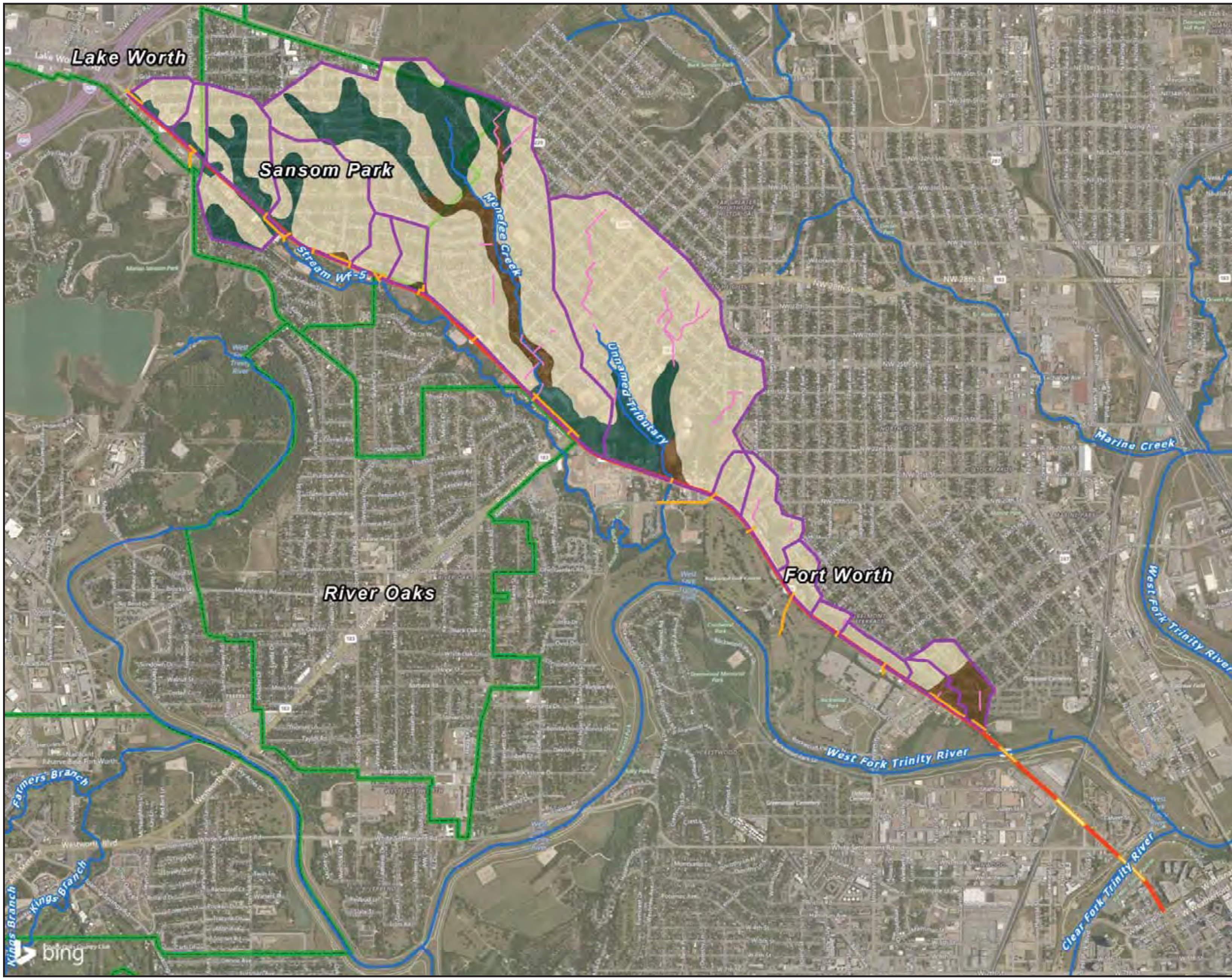
North Central Texas Council of Governments

Date: 1/18/2017

Hydrologic Soil Groups SH 199 Exhibit 5

State Highway 199
Corridor Master Plan



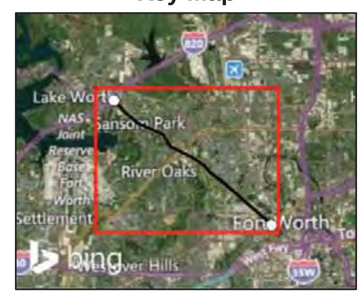
Legend

- Project Limits
- SH 199 Drainage System
- Off Site Drainage Systems
- Stream Centerline
- Drainage Areas
- Bridges
- City Limits

Hydrologic Soil Group

- B
- C
- D

Key Map



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N S E W

North Central Texas Council of Governments

Soil Data Source: USDA Soil Survey 2016

Date: 1/18/2017

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Attachment A

Site Visit Photos

Henderson Street Bridge over the Clear Fork Trinity River

Wall Blocking Drainage at Jacksboro Highway; No Curb and Gutter

Inlet at Jacksboro Highway in Fort Worth near Grand Avenue; No Curb and Gutter

Jacksboro Highway Without Curb and Gutter near 21st Street

Inlet at Jacksboro Highway near Ohio Garden Road

Culvert Outfall at Belle Avenue

Culvert at Jacksboro Highway near Belle Avenue; No Curb and Gutter

Unnamed Tributary to Stream WF-5

Jacksboro Highway with Curb and Gutter in Fort Worth near Ephriham Avenue

Inlet and Ditch at Jacksboro Highway in Fort Worth; No Curb and Gutter

Menefee Creek at Jacksboro Highway

Culvert Outfall at Circle Ridge Drive

Inlet at Jacksboro Highway Near Beverly Hills Drive in Sansom Park; No Curb and Gutter

Culvert and Ditch at Jacksboro Highway Near Skyline Drive in Sansom Park; No Curb and Gutter

Silted Culvert at Jacksboro Highway in Sansom Park; No Curb and Gutter

Inlets at Jacksboro Highway Sansom Park; No Curb and Gutter

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Attachment B

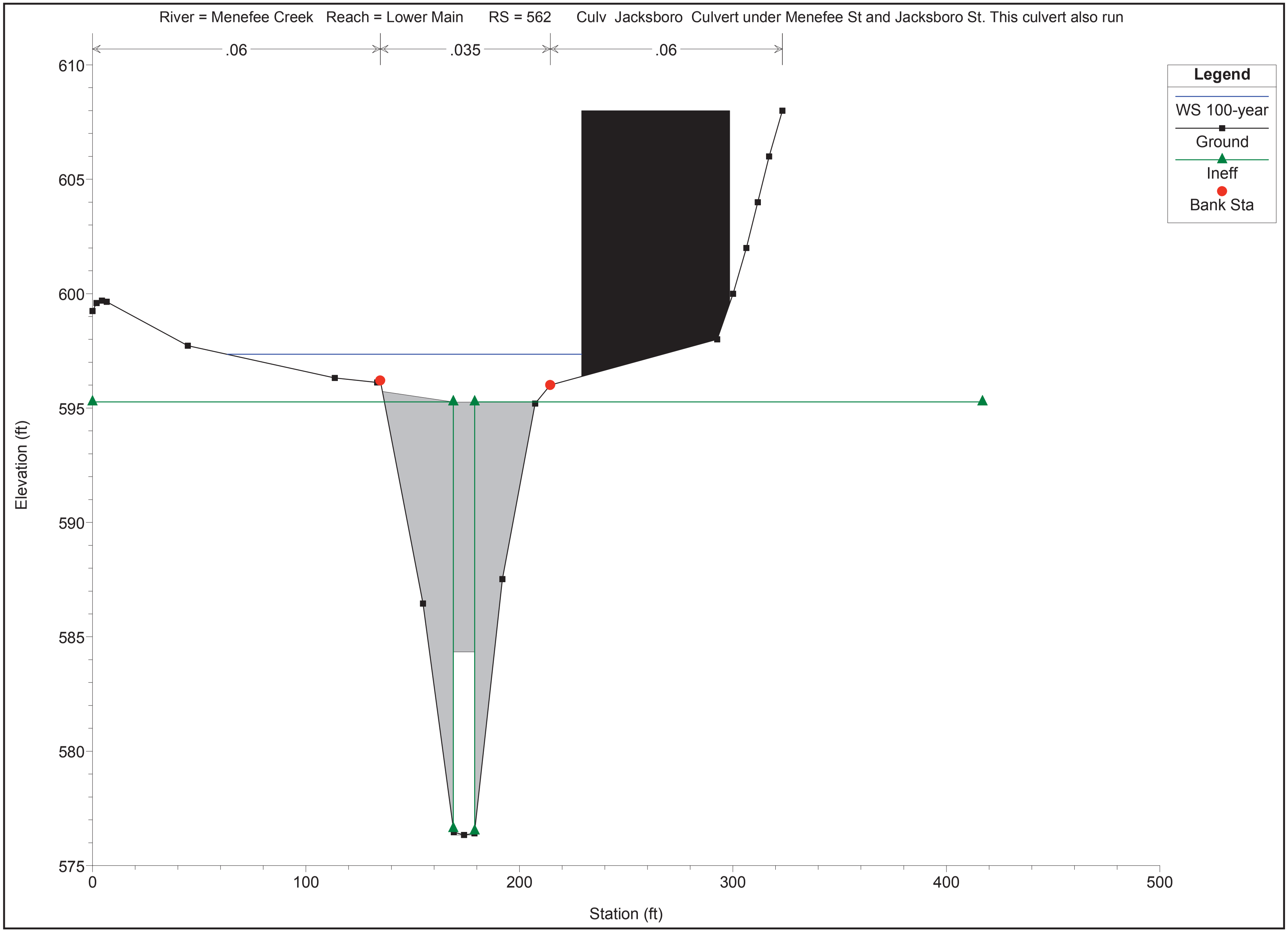
Hydrologic Parameters

Hydrologic Parameters			
Subbasin	CN	C	Tc (min)
1	77	0.55	22.50
2	80	0.60	20.18
3	83	0.60	15.15
4	83	0.60	17.36
5	86	0.62	13.53
6	91	0.67	12.15
7	86	0.60	40.93
8	84	0.57	44.41
9	86	0.63	26.49
10	87	0.64	15.49
11	85	0.62	31.13
12	86	0.62	27.29
13	94	0.70	10.31
14	87	0.64	15.59
15	89	0.64	22.49
16	83	0.60	11.72

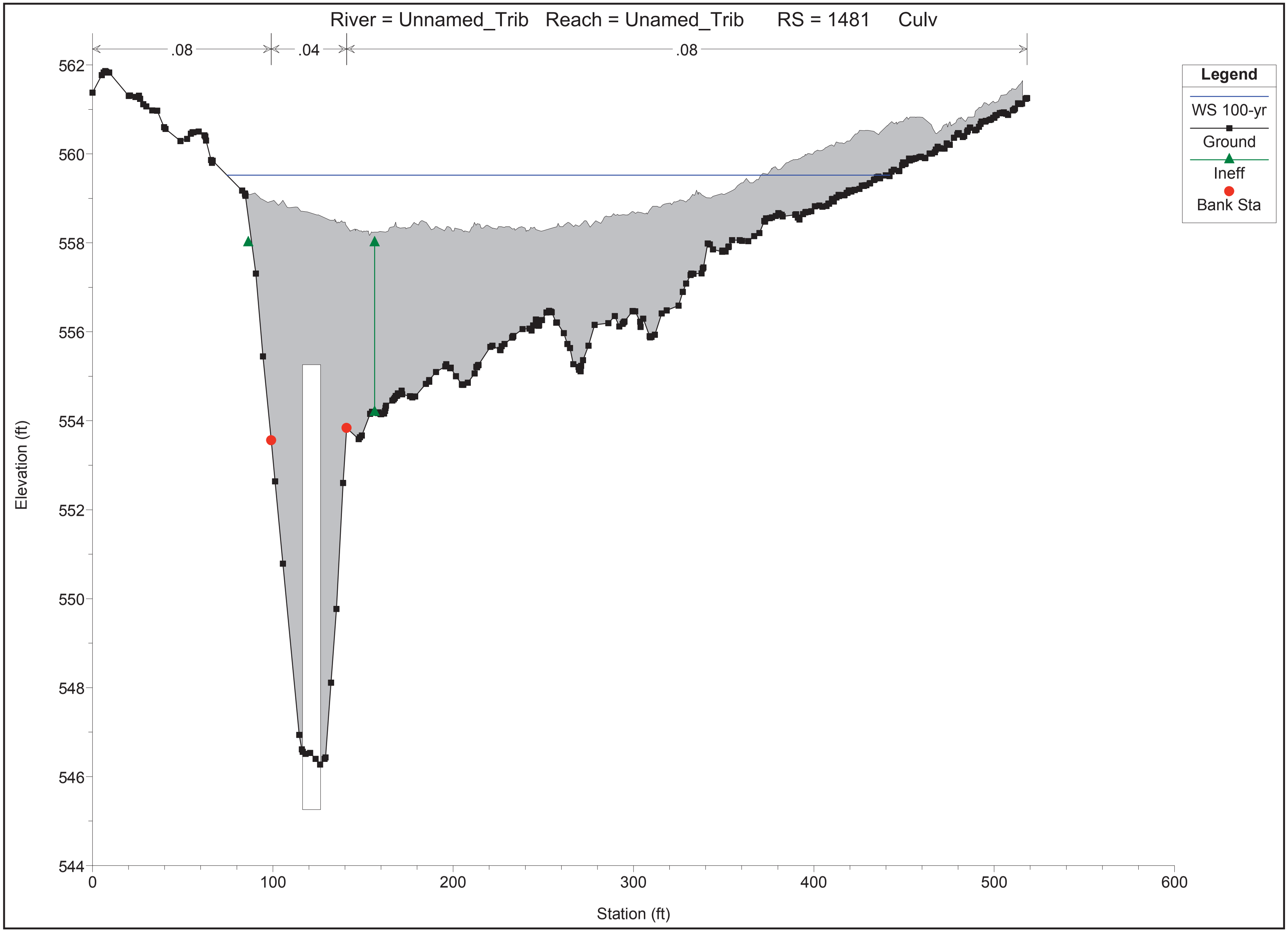
Attachment C

Hydraulic Cross Sections

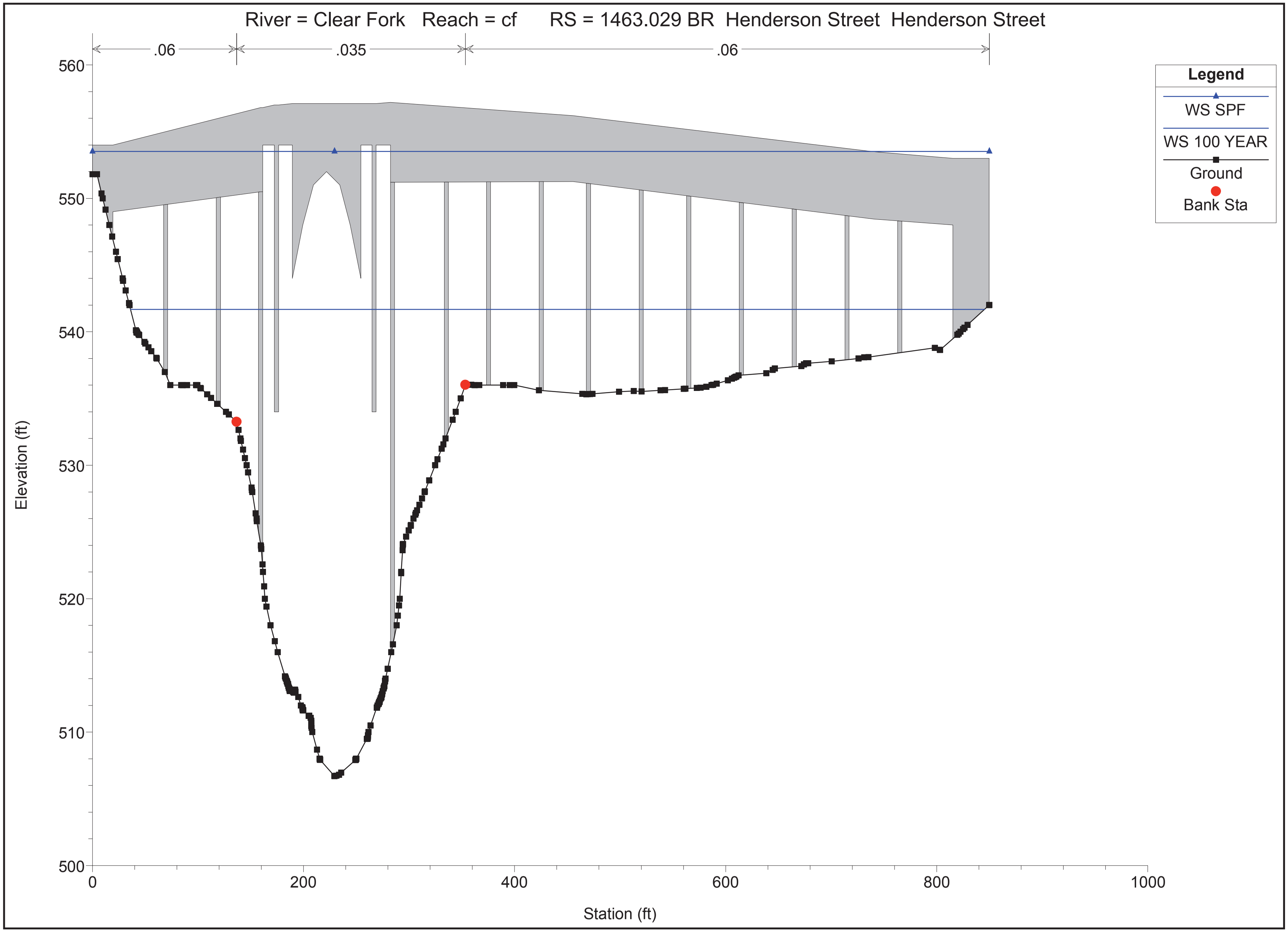
Menefee Creek Culvert Upstream Cross Section



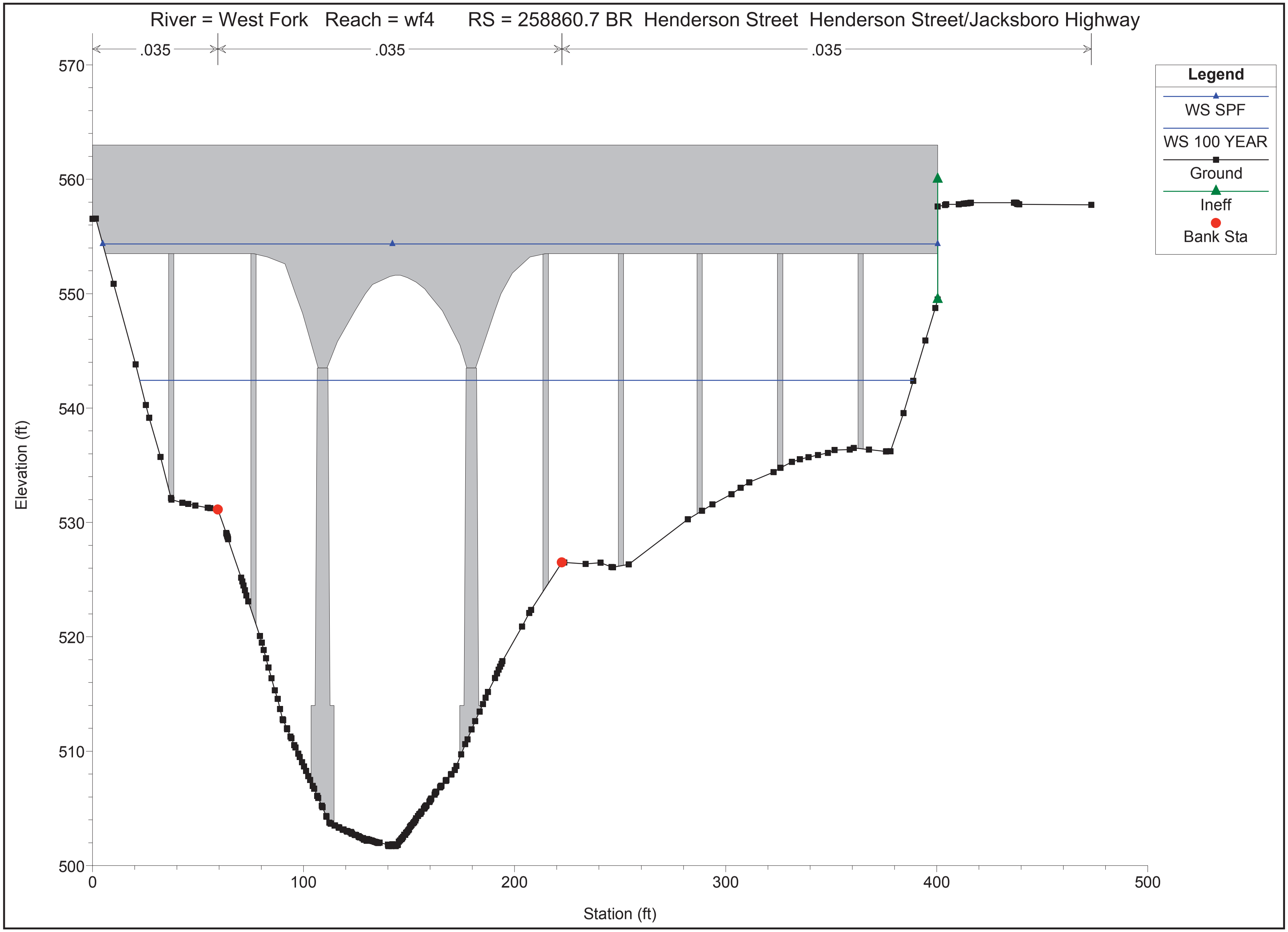
Unnamed Tributary to Stream WF-5 Upstream Cross Section



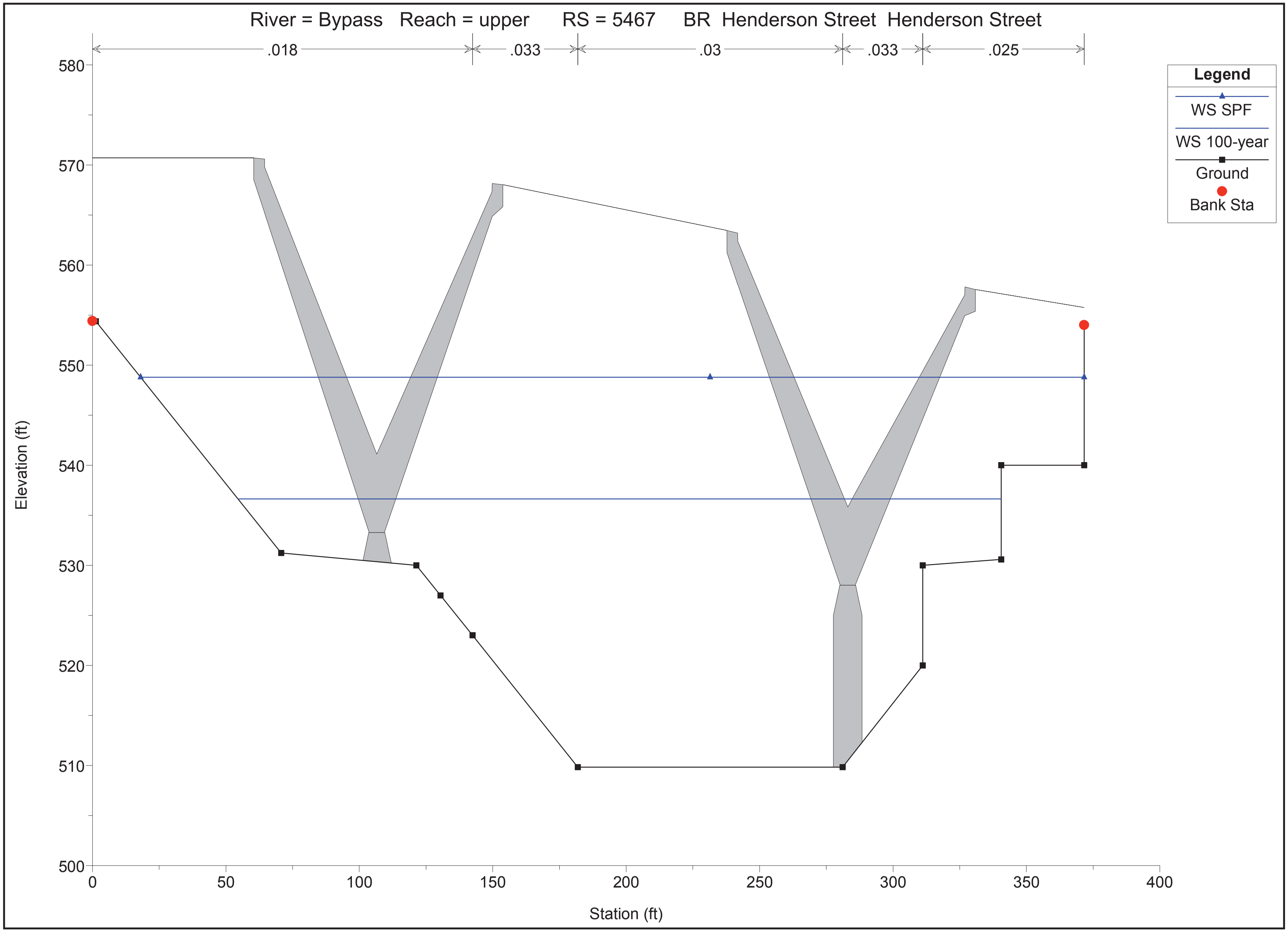
Clear Fork Upstream Cross Section



West Fork Upstream Cross Section



Proposed Panther Island Bypass Channel Upstream Cross Section



Appendix L – Economic Market Analysis Technical Memorandum

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State Highway 199
Corridor Master Plan

From IH 820 to Belknap Street

Economic Market Analysis
Technical Memorandum

Submittal Date:
July 17, 2017

Prepared For:
North Central Texas Council of Governments

Prepared By:
Catalyst Urban Development, LLC
7001 Preston Road, Suite 500
Dallas, TX 75205
214-446-3910

CATALYST
URBAN DEVELOPMENT

1.0 ECONOMIC MARKET ANALYSIS

The following analysis reflects the outcome of a market-based analysis of the State Highway (SH) 199 corridor study area to analyze the potential economic development that may be associated with the proposed improvements to the corridor. The scope of this effort includes the evaluation of the macro-economic trends and demographic patterns of the study area, definition of market "trade area" (to better understand the socio-economic condition of the area and related land use potential) for the SH 199 corridor, and the calculation of a conceptual land use program (for the primary land use drivers of office, retail, and housing) over a 10-year period for use in physical planning scenarios.

2.0 NATIONAL CONTEXT

2.1 Growth and Livability

The Fort Worth market is in a time of rapid growth and opportunity. A recent study performed by Forbes concluded that five of the 10 fastest-growing cities in the nation are in Texas, with Fort Worth being the eighth fastest-growing city. The Dallas-Fort Worth (DFW) Metroplex has been projected to have 10.68 million people by 2040, which is equivalent to the population of the City of Chicago moving to North Texas during this period. Despite this high growth however, Fort Worth is ranked 39th in a recent study by Wallet Hub (https://wallethub.com/edu/best-worst-large-cities-to-live-in/14358/) of the 60 best large cities to live in the United States (US). This lower ranking identifies opportunities for the Fort Worth marketplace to continue to improve in livability through strategic reinvestment and redevelopment strategies fueled by its strong population growth and transportation improvements such as that planned for SH 199.

2.2 Texas Job Growth

Job growth is a key driver for new investment in any trade area as it fuels new growth in all other land uses, creates daytime activity, and establishes district identity. As mentioned in Section 2.1, Texas continues its long-term trend of having strong growth across multiple market sectors. Dr. Lloyd Potter, a Texas State Demographer and collaborator with NCTCOG (North Central Texas Council of Governments), has identified the Texas job base to have grown by 2.18 million between 2004 and 2014, highlighting the on-going momentum of the state as a region center of growing employment. These statistics are significant as they show Texas has been the largest job creating state for over 25 years (see Figure 1).

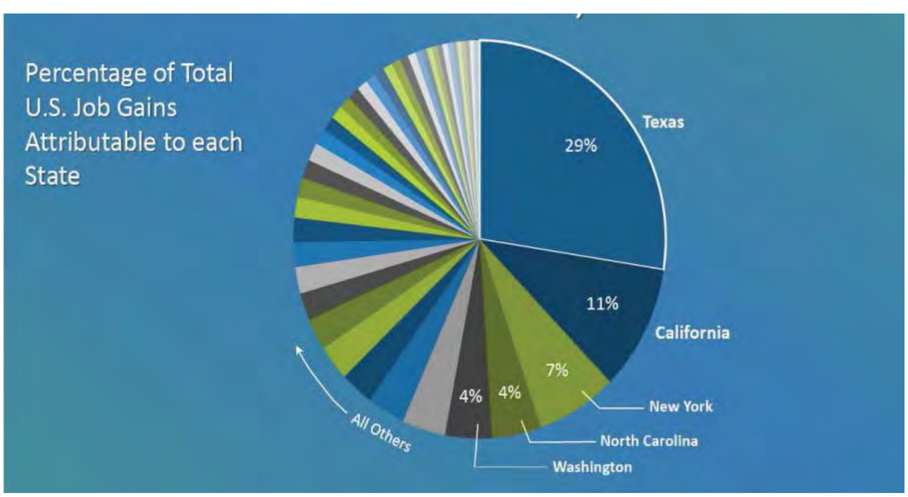


Figure 1. Job Growth (2004-2014)
Source: Dr. Lloyd Potter, Texas State Demographer, NCTCOG

2.2.1 Statewide Growth

According to another study on job growth completed by the Bureau of Labor Statistics/Federal Reserve Bank of Dallas, since 1990, Texas has had more than twice the employment growth than the rest of the country. Texas has reported a 68 percent increase in jobs over that period, whereas the US overall has experienced a 29 percent increase. The rate of other states are as follows: Florida 48 percent (also above the average for the US); California 25 percent; Illinois 12 percent; New York 10 percent; and Michigan seven percent (see Figure 2). These statistics show that Texas has been the largest job creating state for over 25 years and continues this trend without any slowing of momentum. Such growth provides real potential for the type of redevelopment possible in the corridor with proper planning strategy.

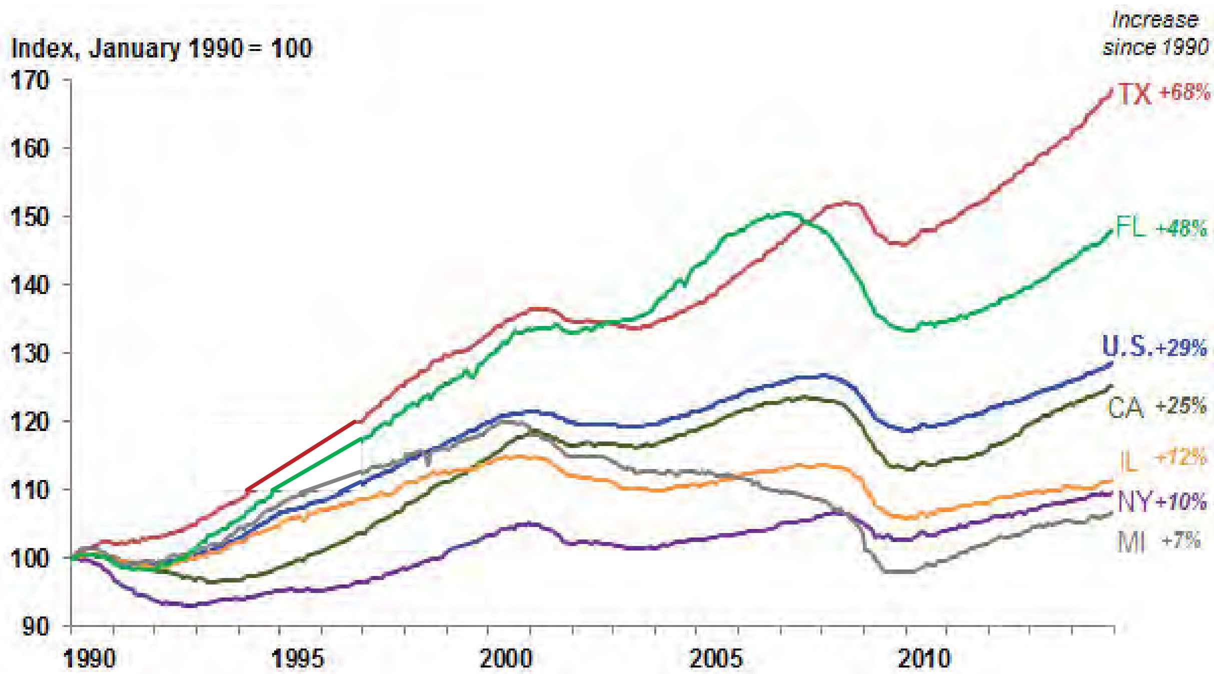


Figure 2. Employment Growth
Sources: Bureau of Labor Statistics, Federal Reserve Bank of Dallas

2.2.2 DFW Growth

Further study of the job growth market in Texas shows DFW being well positioned statewide. In a study by the Bureau of Labor Statistics/Texas A&M Real Estate Center, DFW ranked first in 2015 among all Texas Metropolitan Statistical Areas for receiving highest number of jobs. The US as a whole reported an increase of more than 2,650,000 non-farm jobs within this time period, and the state of Texas' share of national employment growth was shown to be seven percent. Figures from this particular study refer to over-the-year net employment change from first quarter 2015 to first quarter 2016. Specific job growth data for each of the eight individual Texas markets is shown in Figure 3.

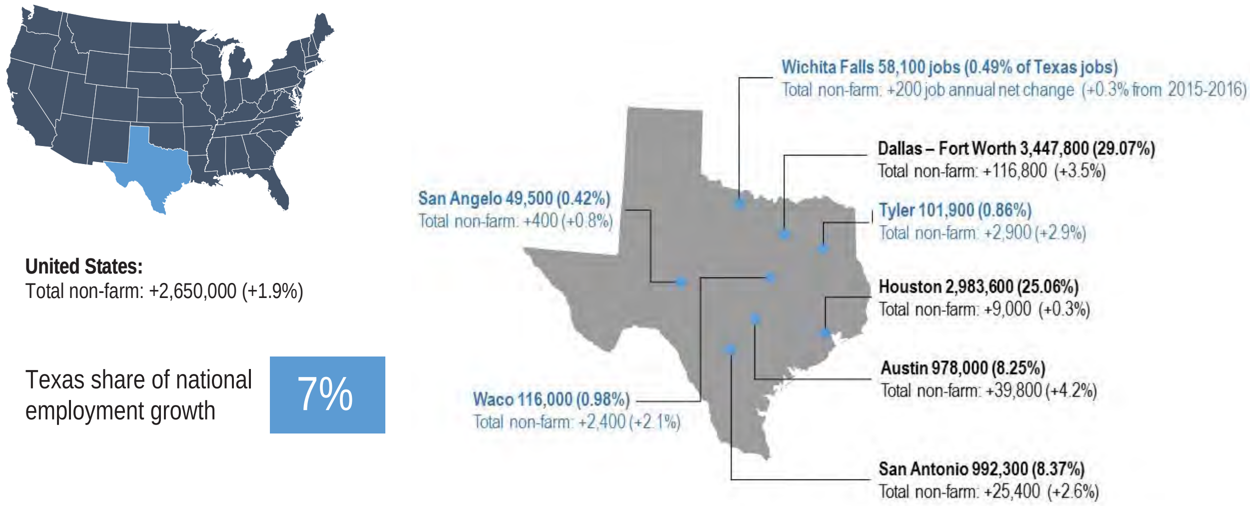


Figure 3. Housing Affordability
Source: Bureau of Labor Statistics; Texas A&M Real Estate Center
Figures refer to over-the-year net employment change, 1Q 2015 – 1Q 2016

2.3 Housing Affordability

A key factor behind the attractiveness of the DFW marketplace is the relative affordability of its housing stock when compared to other large Metropolitan Statistical Areas in the US. The chart shown in Figure 4 was prepared using data collected from Demographia (http://www.demographia.com/dhi2014.pdf), which demonstrates this comparison of housing affordability among the 10 largest markets from 2004-2014. DFW continues to be affordable when viewed nationally during this time period; only Atlanta offered more affordability. The median home value in 2016 in the SH 199 Trade Area is $95,094 with an estimation of $105,600 in 2021. This compares to a DFW median home value of $207,300 with steady growth year over year. Analysis of the SH 199 corridor trade area shows it to provide such opportunity for affordable housing (see Section 9.2) within planning frameworks such as those shown in Section 11.0 Economic Development of this technical memorandum.

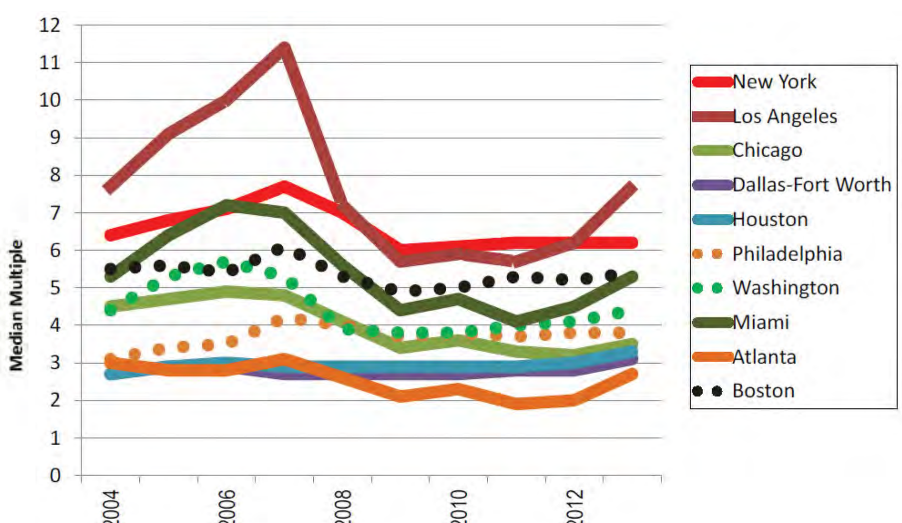


Figure 4. Middle Income Housing Affordability: 2004-2013
Source: Harvard Joint Housing Center and Demographia, 2014

2.4 Capital Centers

Access to investment capital is a key factor in the ability for redevelopment to occur within an urban area as it provides the basis for the real estate development industry to operate. The DFW market is one of the major metro areas attracting investment capital in the US today. With the fourth largest Metropolitan Statistical Area in population, DFW had the fifth largest total investment and fifth largest gross domestic product in 2015 according to an examination of data from Bureau of Economic Analysis (BEA) shown in Figure 5 (https://howmuch.net/articles/where-the-money-is-by-metro-area).

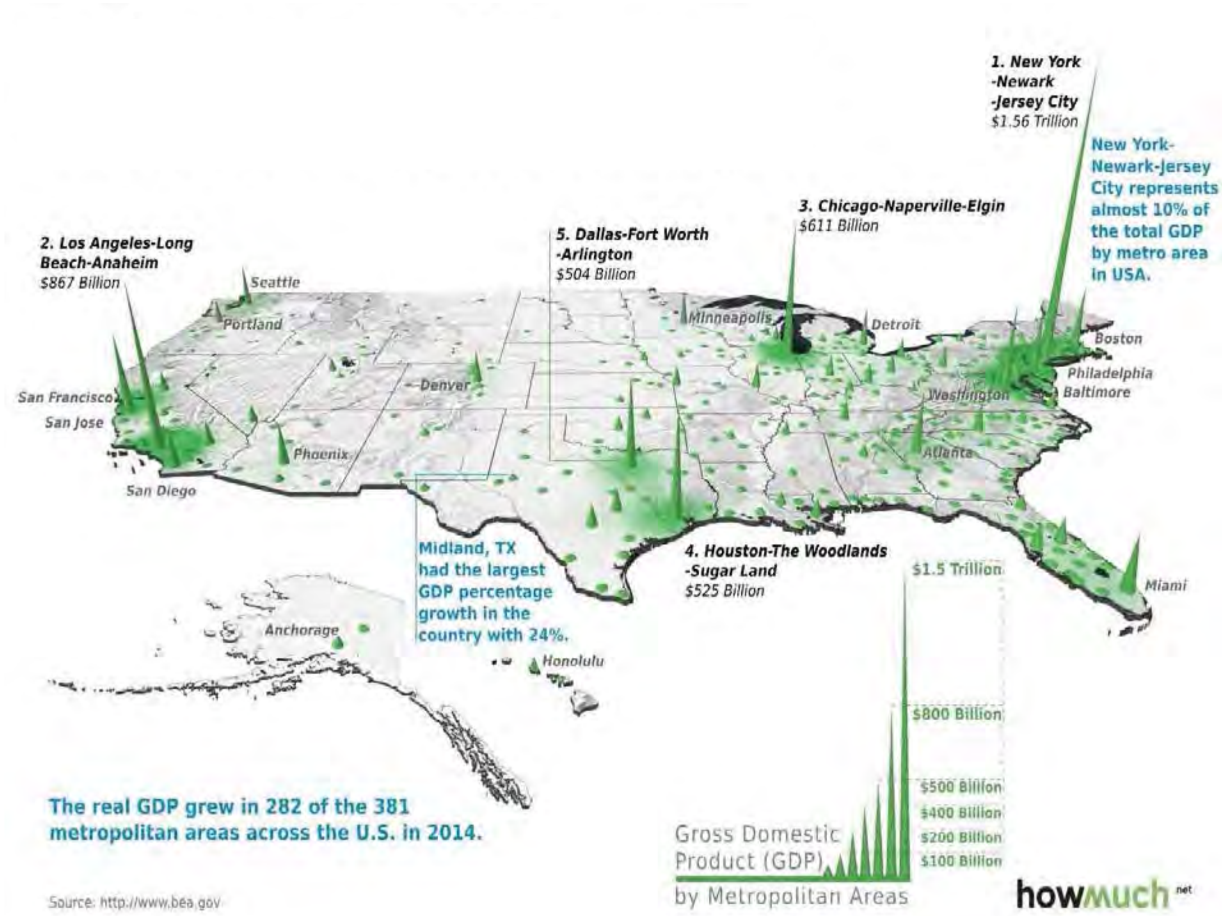


Figure 5. Capital Centers
Source: Howmuch.net, BEA, 2016

3.0 GROWTH TRENDS

The SH 199 trade (see Figure 8) area contains a large percentage of 25 to 34 year olds, and exists within a larger economy being driven (in part) by those in the knowledge-based economy. These two groups represent a large opportunity to help drive the shift towards redevelopment in an older inner-ring suburban environment as exists in the study area and is therefore described in further detail in the following sections.

3.1 Millennials

Although there are no exact birth years specified for when the Millennial generation (also known as Generation Y) starts and ends, members can have been born as early as 1980 and into the mid- to late-1990s, making them currently within the age range of approximately 16 to 36.

Advertising Age's analysis (depicted in Figure 6) identifies the 10 largest metropolitan areas with the highest average of annual net influx (arrivals minus departures) of 25 to 34 year olds between the years 2010 to 2013. Of special note is that three of those 10 metro areas were in Texas during this period. Dallas-Fort Worth-Arlington, Houston-The Woodlands-Sugar Land, and Austin-Round Rock, combine for a total of 28,500 net influx per year, which is the largest regional gain rate in the US according to the Brookings Institute.

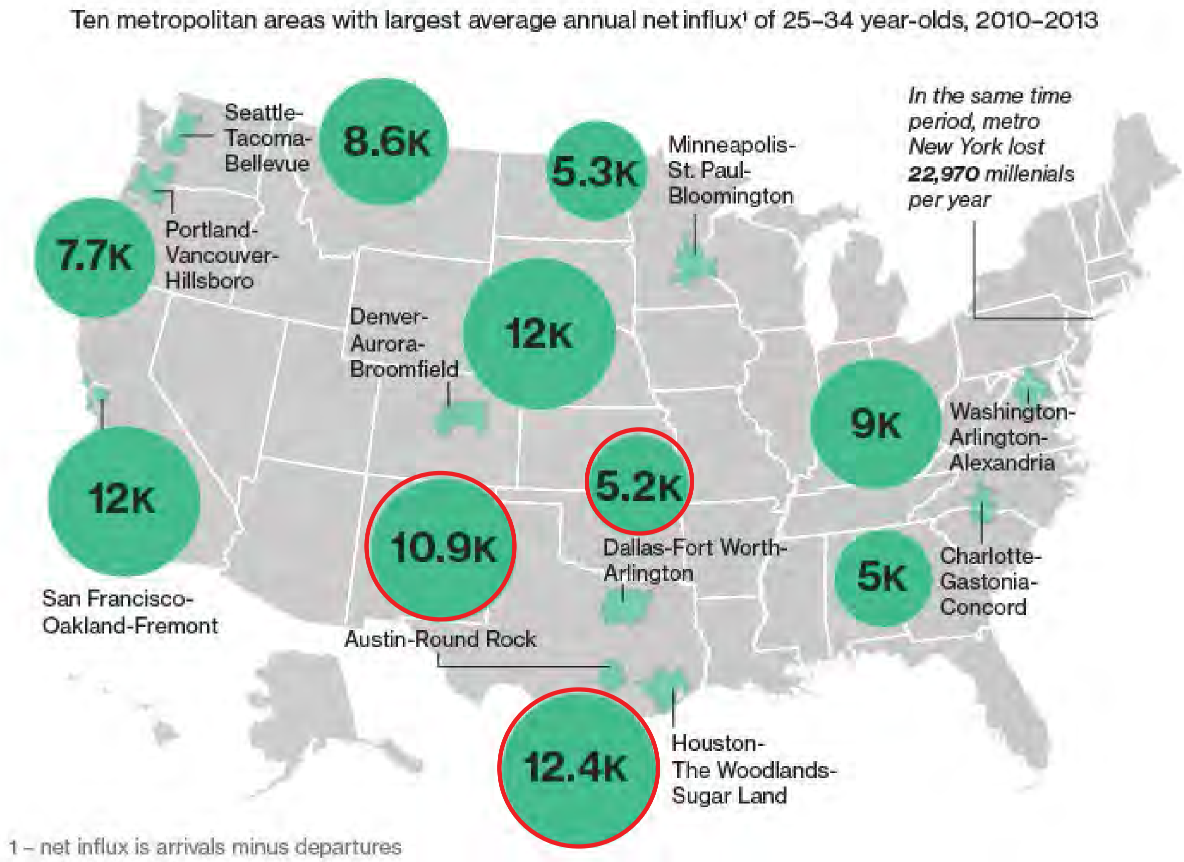


Figure 6. Millennial Population
Source: Advertising Age, The New Economy

The research group *The New Economy* has identified Millennials as the largest consumer-driven generation in history in that they are expected to spend more than $200 billion in the US annually from 2017 onward, totaling $10 trillion in their lifetimes. Given Texas is currently receiving the largest share of in-migration by this population segment, and with DFW is gaining one-third of these increases, it becomes important to plan for this age group when devising new redevelopment and reinvestment strategies. Planning for the SH 199 corridor should include a focus on attracting Millennials.

3.2 Creative Class

The Creative Class was identified by Richard Florida (an American economist, social scientist and professor) and is described as an "'ascending economic force' made up of knowledge workers, intellectuals and various types of artists." Members of this group include scientists, engineers, professors, poets, architects, and others in design, education, arts, music and entertainment. A study conducted by Martin Prosperity Institute analyzed those markets within the US that are attracting such workers. Figure 7 depicts the Creative Class Projected Absolute Growth from 2010 to 2020.

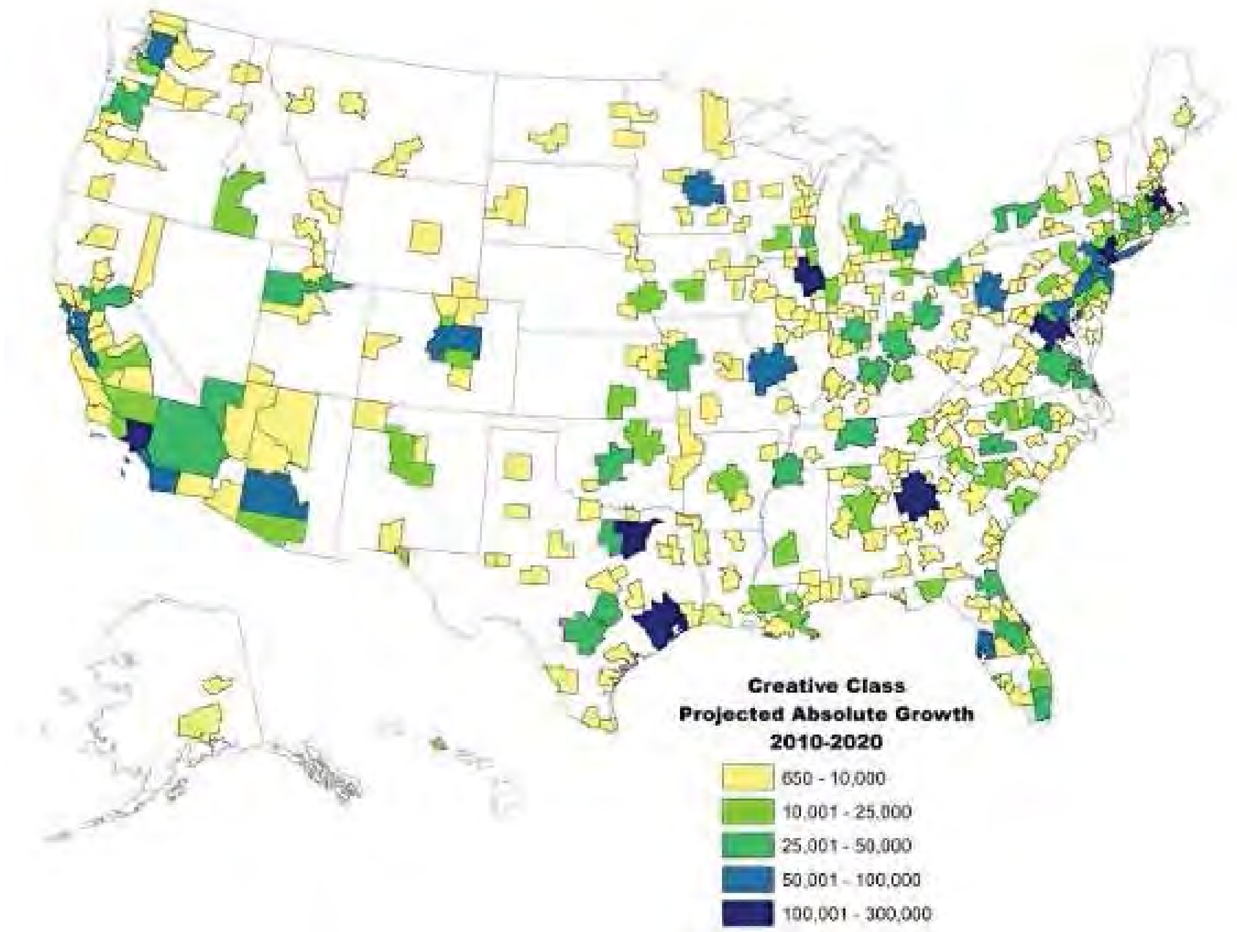


Figure 7. Creative Class Population
Source: Martin Prosperity Institute

This is important as these jobs represent the largest growth segment of the US job market, and knowledge-based and creative workers are a key driving force for economic development in post-industrial places like the Fort Worth area. Martin Prosperity Institute has widely published the trends and desires behind this workforce demographic pointing to interest in urban areas due to leisure life and community rather than actual work. They are looking for cultural, social, and technological climates in which they feel they can best "be themselves" according to Richard Florida. As such, established neighborhoods such as those along SH 199 can provide a canvas of interest for this workforce due to their proximity to downtown Fort Worth, existing community form, and potential for new investment.

4.0 TRADE AREA

4.1 Methodology

The trade area boundary for the SH 199 corridor was created through ESRI Business Analyst, a supplier of geographic information system software. The polygon feature was used to draw the trade area boundary (as defined in Section 4.2) to measure demographic statistics.

4.2 Boundary

The SH 199 corridor trade area boundary is defined by a 10-minute driving distance to the corridor that has been adjusted to accommodate impacting natural and transportation features, as well as competing centers of development. The impacting natural boundary on the northwest side of the trade area is Lake Worth. The impacting transportation boundaries include Meacham Airport, Naval Air Station Joint Reserve Base , railroads, West 7th Street and Interstate Highway (IH) 35W. The impacting competitive areas are the area south of West 7th Street and west side of IH 35W as people would not likely pass through them to go to the SH 199 corridor offering similar land uses.

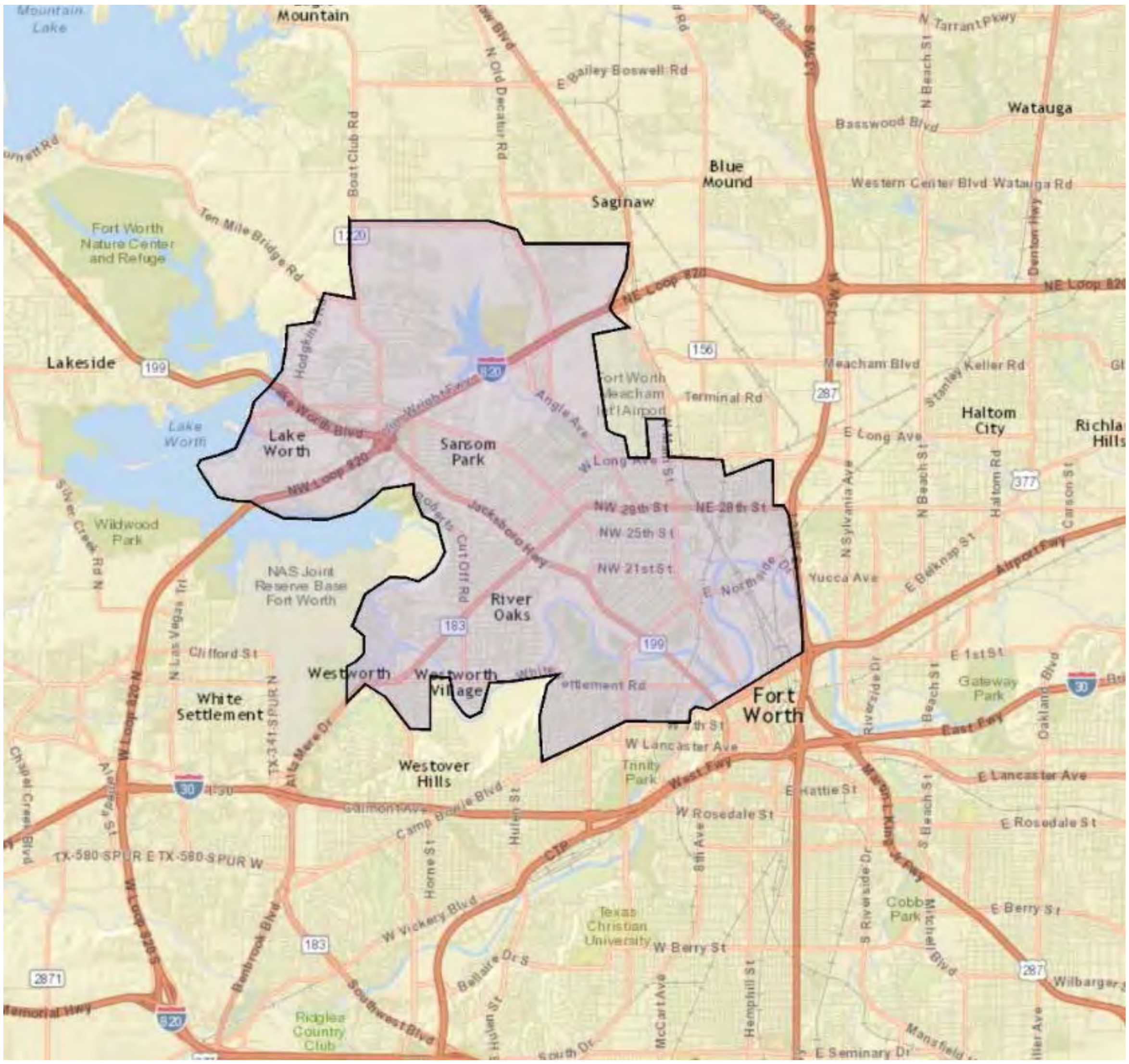


Figure 8. Trade Area Boundary
Source: ESRI, Catalyst

5.0 DEMOGRAPHIC ANALYSIS

5.1 Age Analysis Methodology

A market profile report was prepared for the trade area through ESRI Business Analyst that displayed the trade area population by age for the years 2016 and 2021. Catalyst then determined the population by age for the year 2026 by using the trend from 2016 to 2021. Next, the population was broken down by generation groups to determine the largest age group in trade area, as shown in the analysis in the following sections.

5.2 Age Analysis

Analysis of the various age groups in an area point to opportunities for market focus and land use positioning. Figure 9 (also seen in Attachment A) identifies the results of an age analysis for the SH 199 trade area. The largest age groups in the trade area are the Millennials and Gen X-ers, which is positive for the prospect of supportable urban redevelopment in the SH 199 corridor given these groups' interests as described in Section 3.0 Growth Trends. While these age groups are the largest market drivers over the next 10 years, special care should be taken to respect the needs and desires of the existing older population.

Population by Age			2016 Number	2016 Percent	2021 Number	2021 Percent	2026 Number	2026 Percent
0 - 4			9,486	9.1%	9,891	8.9%	10,313	8.7%
5 - 9	Generation Z	26% to 25%	8,977	8.6%	9,376	8.4%	9,793	8.3%
10 - 14			8,240	7.9%	8,988	8.1%	9,804	8.3%
15 - 19			7,201	6.9%	7,910	7.1%	8,689	7.4%
20 - 24	Millennials	30% to 28%	7,545	7.2%	7,496	6.8%	7,447	6.3%
25 - 34			16,611	15.9%	16,928	15.3%	17,251	14.6%
35 - 44	Gen X	25% to 25%	13,949	13.3%	15,466	13.9%	17,148	14.5%
45 - 54			12,169	11.6%	12,129	10.9%	12,089	10.2%
55 - 64	Baby Boomers	15% to 17%	9,835	9.4%	10,501	9.5%	11,212	9.5%
65 - 74			6,252	6.0%	7,365	6.6%	8,676	7.3%
75 - 84	Silent Generation	4% to 5%	3,020	2.9%	3,575	3.2%	4,232	3.6%
85+			1,254	1.2%	1,337	1.2%	1,425	1.2%

Figure 9. Age Analysis
Source: ESRI, ACS, Catalyst

5.3 Income Analysis Methodology

A market profile report was prepared for the trade area through ESRI Business Analyst that provided an income breakdown of the trade area population. The report provided household by income data for 2016 and 2021. The report also outlined the median household income, average household income, and per capita income. Catalyst used the trend from 2016 to 2021 and segmented by income and market segment to determine market movement for each group through 2026.

5.4 Income Analysis

The analysis of household incomes in the trade area is a useful tool to determine the viability of the market to support non-subsidized land use types based on the amount of household disposable and discretionary income available. Figure 10 (also seen in Attachment B), from ESRI, shows the largest grouping (50 to 55 percent of the trade area) to have incomes of $35,000 to $149,000. ESRI takes into account the census data. This is a primary urban market segment as it consists of market rate apartment dwellers, first time owners, and renters by choice; these are all strong candidates to support new development in the area. The second largest group (39 to 42 percent) are subsidized households and low income earners with an income of less than $35,000. The lower income segment has been identified to be growing, and market rate households are declining resulting in a lack of retail potential. Strategies should be prepared to stem this decline through focus on unique places and destinations as shown in Section 11.0 Economic Development.

			2016		2021		2026	
Households by Income			Number	Percent	Number	Percent	Number	Percent
<$15,000			5,162	15.3%	5,677	15.9%	5,900	16.2%
$15,000 - $24,999	Low income and	39% to 42%	4,037	11.9%	4,287	12.0%	4,299	11.8%
$25,000 - $34,999	subsidized housing		4,123	12.2%	4,795	13.4%	5,266	14.4%
$35,000 - $49,999	Market rate		5,403	16.0%	4,273	11.9%	3,191	8.8%
$50,000 - $74,999	apartment dwellers	55% to 50%	6,924	20.5%	6,965	19.5%	6,616	18.2%
$75,000 - $99,999	First time owners, move		3,524	10.4%	4,307	12.0%	4,971	13.6%
$100,000 - $149,999	up and renter by choice		2,745	8.1%	3,134	8.8%	3,379	9.3%
$150,000 - $199,999	Luxury custom	6% to 8%	990	2.9%	1,304	3.6%	1,622	4.4%
$200,000+	housing		899	2.7%	1,057	3.0%	1,174	3.2%
Median Household Income			$43,781		$45,120		$46,500	
Average Household Income			$59,286		$63,286		$67,556	
Per Capita Income			$19,765		$20,981		$22,272	

Source: ESRI, ACS, Catalyst

Figure 10. Income Analysis
Source: ESRI, ACS, Catalyst

6.0 TRAFFIC COUNTS AND MARKET EXPOSURE

6.1 Traffic Count Observations

Figure 11 identifies traffic counts in number of vehicles per day as measured by Kalibrate Technologies, a research group utilized by the national retail real estate industry. While this may vary from similar counts measured by TxDOT, it is useful to understand how the larger real estate market views the study area through industry-specific companies such as Kalibrate. The 2016 traffic counts shown in Figure 11 are equivalent traffic volumes to those experienced in other urban mixed-use areas such as West 7th Street (Fort Worth) and Knox/Henderson (Dallas). Primary intersections have counts that justify more traditional retail stores and neighborhood shopping centers. All current traffic counts are not higher than mixed-use residential areas can tolerate for livability purposes, if street design is carefully planned.

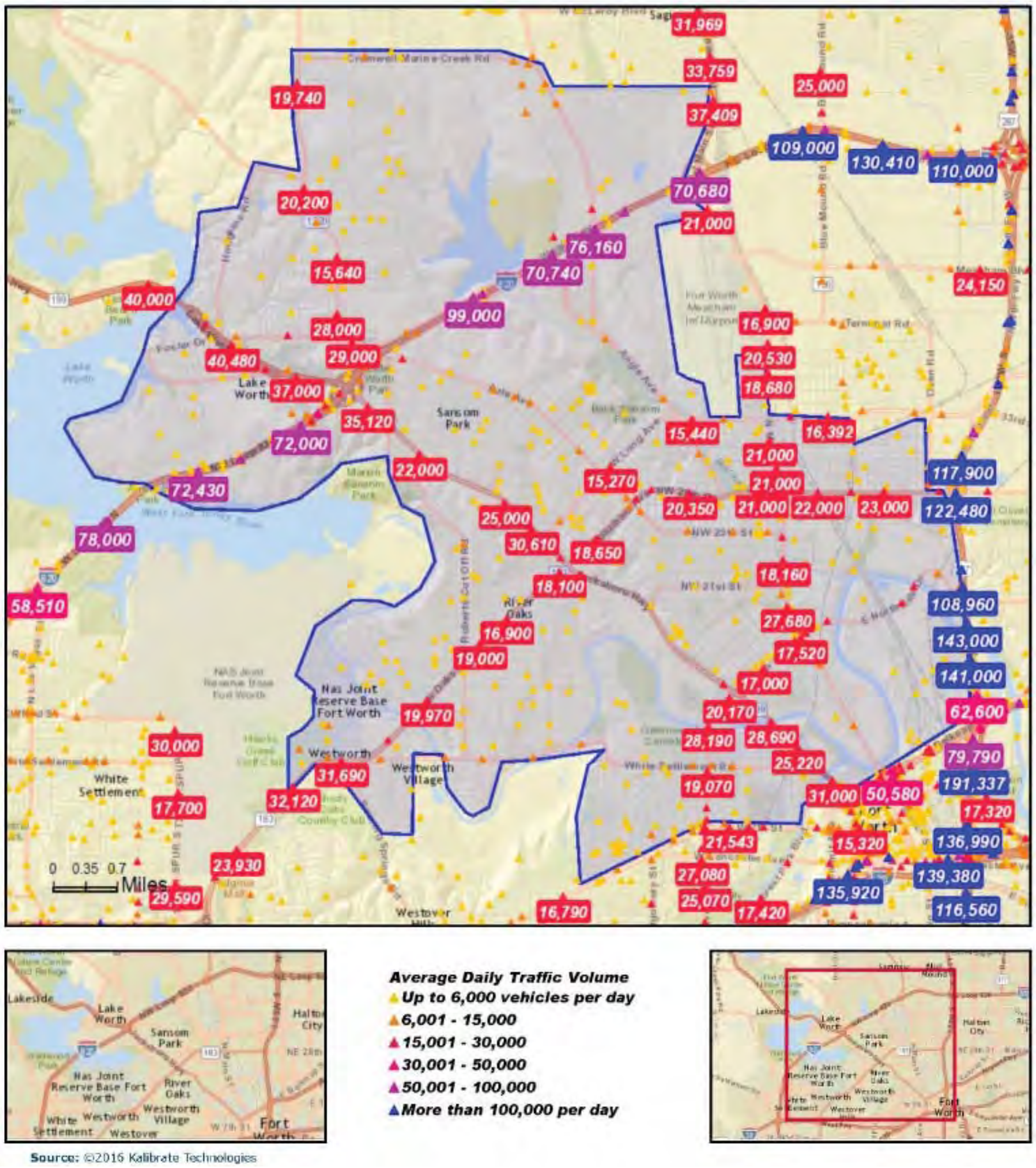


Figure 11. Traffic Count Observation
Source: 2016 Kalibrate Technologies

7.0 RETAIL AND RESTAURANT ANALYSIS

7.1 Market "Tapestry" Segments Methodology

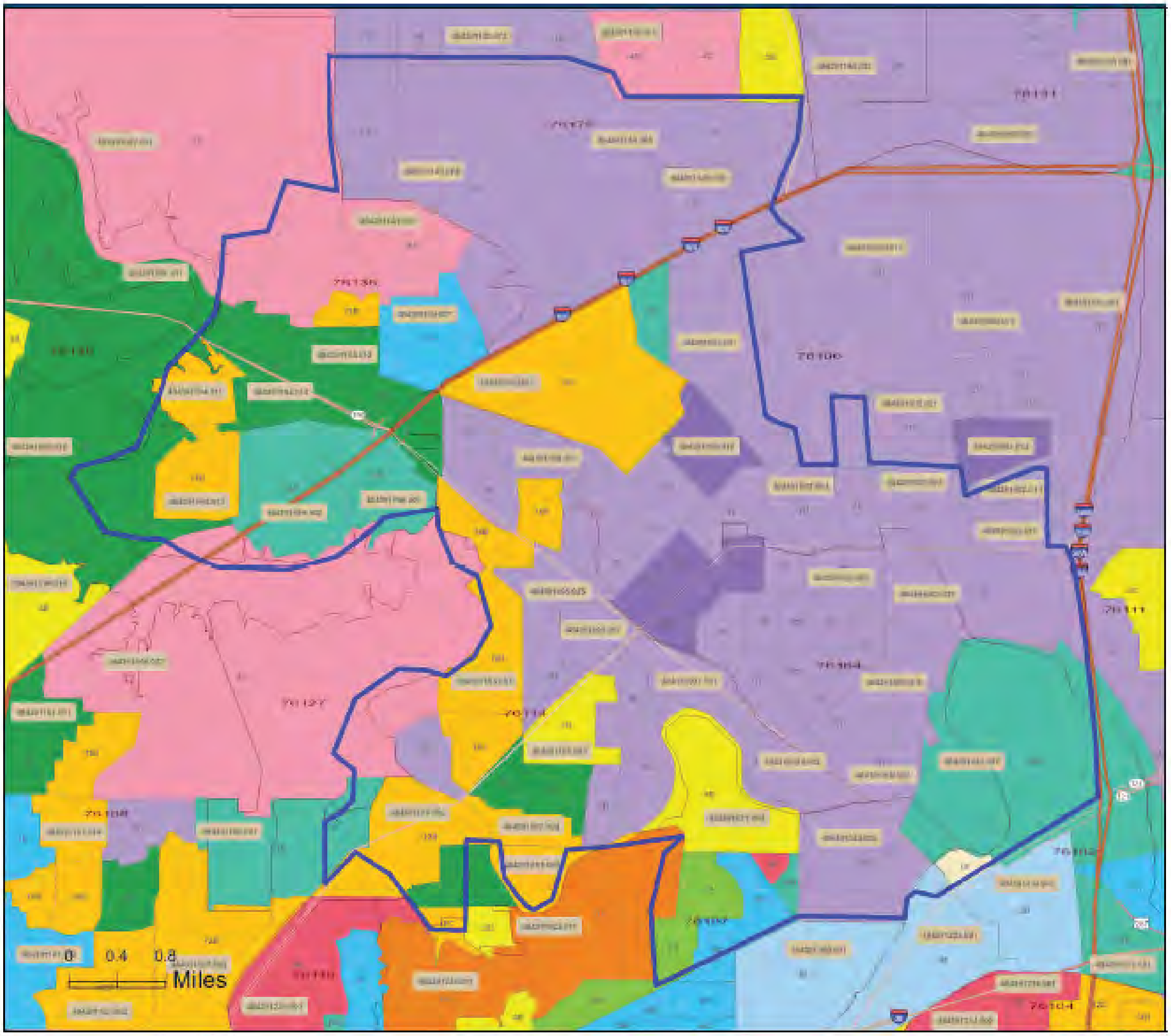
Dominate Tapestry map and the Tapestry Segmentation reports were created on ESRI Business Analyst to determine the top LifeMode groups in the trade area. The Dominate Tapestry map identifies where the LifeMode groups are located, and the Tapestry Segmentation report provided the LifeMode groups ranked largest to smallest in the trade area. After the data was collected, Catalyst analyzed the results to determine the lifestyle and retail choices inherent to the residents in the trade area.

7.2 Market "Tapestry" Segments

The trade area has been analyzed to determine the "psychographic" make-up of its residents. This is a retail industry term in which the shopping habits of a population characterize them within certain demographic groups for analysis purposes. ESRI has combined these into a series of market "tapestry" segments for each group, as shown in Figure 12. These segments are in turn examined by retail investors to determine who lives within the trade area, their lifestyle choices, and what they choose to spend their money on. The tapestry groups, as defined by ESRI, that live in the trade area are the Ethnic Enclaves, Hometown, and Cozy Country Living. The smaller demographic breakdowns within these larger segments (known as LifeModes) include Barrios Urbanos, Up and Coming Families, Traditional Living, and Small Town Simplicity as being the largest groups in the trade area.

1. The largest LifeMode in the trade area is the Ethnic Enclaves. These are multi-generational Hispanic homeowners. Within the Ethnic Enclaves, the Barrios Urbanos make up 34.1 percent of the population. They are younger diverse families with children or single-parent households with multiple generations living under the same roof. These families enjoy shopping the latest trends and purchase with an eye to brands.
2. The Up and Coming Families within the Ethnic Enclaves make up 11.9 percent of the population. The Up and Coming Families are younger, more mobile and more ethnically diverse than previous generations. This is one of the fastest-growing markets in the country.
3. The second largest LifeMode in the trade area is Hometown. Owners of old, single-family houses, young singles with children, and renters in small multi-unit buildings make up the Hometown LifeMode. The Traditional Living LifeMode group accounts for 8.4 percent of the population. The Traditional Living families are a mix of married-couple families and singles.
4. The Small Town Simplicity LifeMode group within Hometown makes up 5.4 percent of the population. These are young families and seniors that enjoy rural activities like fishing and hunting. These families keep their finances simple by paying bills in person and avoiding debt.
5. The Cozy Country Living is the last LifeMode within the trade area. The Cozy Country Living families are empty nesters and homeowners residing in single-family dwellings. The Heartland Communities within the Cozy Country Living account for 4.7 percent of the population. These families are older singles, childless couples, and retirees. They are loyal to their community and support local businesses.

A summary review of the psychographic analysis findings shows that Millennial and Gen X populations identified in Section 3.0 Growth Trends have a primarily Hispanic focus and are part of multi-generational households with a focus on family. As such, retail and restaurant programming should be tailored to meet the desires of this segment, and housing types should accommodate the diverse age ranges these multi-generational households comprise.



Market "Tapestry" Segments

ESRI Psychographic Reports

1. Ethnic Enclaves
   LifeMode: Barrios Urbanos (7D) 34.1%
   Multigenerational Hispanic families, immigrant, some dining out
2. Ethnic Enclaves
   LifeMode: Up and Coming Families (7A) 11.9%
   Young ethnically diverse families, hard working, educated, shoppers
3. Hometown
   LifeMode: Traditional Living (12B) 8.4%
   Younger families, childless couples, educated, community-loyalty
4. Hometown
   LifeMode: Small Town Simplicity (12C) 5.4%
   Young families and single older person households, community focus
5. Cozy Country Living
   LifeMode: Heartland Communities (6F) 4.7%
   Older singles & childless couples, retirees, community-loyalty

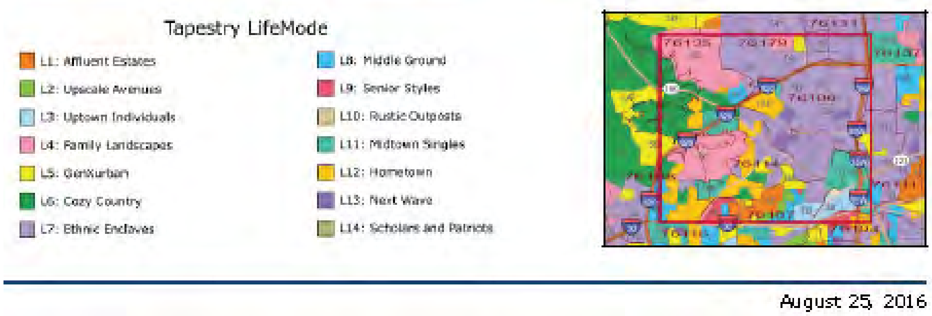


Figure 12. Market "Tapestry" Segments

Source: ESRI

7.3 Consumer Spending Methodology

A consumer spending report was developed through ESRI Business Analyst using current American Community Survey (ACS) data. The report outlined the average spend and spending potential index for 12 different retail categories. The spending potential index was then compared to the national average spending potential index by creating an excel graph to determine the products and services that are being purchased within the trade area.

7.4 Consumer Spending

Based on ESRI and ACS data, the consumer spending shown in Figure 13 (also seen in Attachment C) examines the products and services that consumers are buying within the trade area. The National Average Spending Potential index is 100 and anything above that is considered healthy. The trade area does not measure up to other successful districts when compared nationally. However, there are opportunities for some categories of restaurants and retail stores if placed with a proper planning strategy.

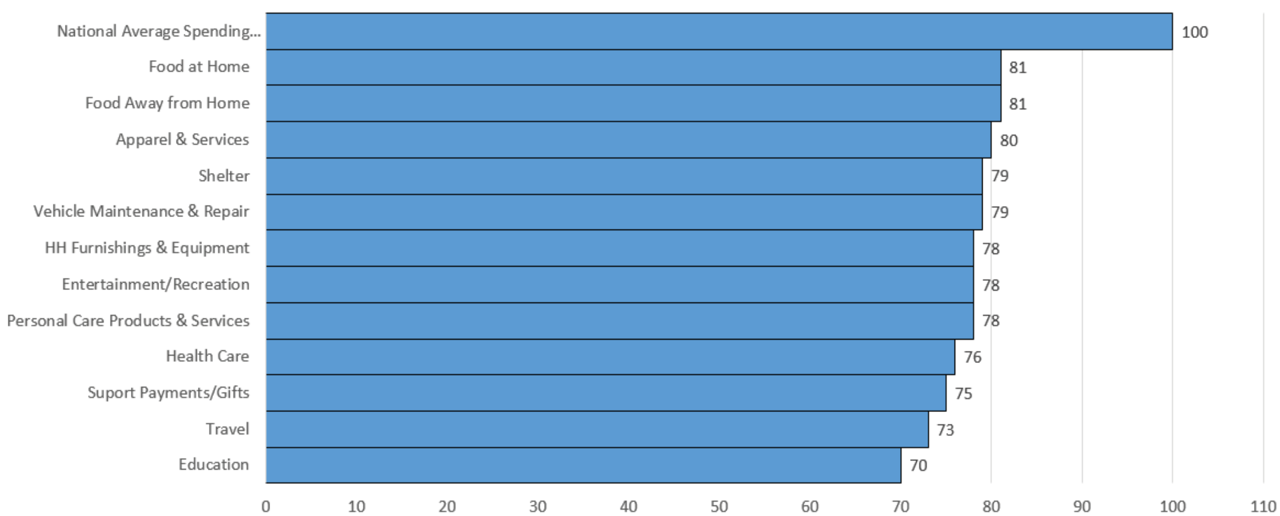


Figure 13. Consumer Spending
Source: ESRI, ACS, Catalyst

7.5 Existing Major Retail Nodes Methodology

ESRI Business Analyst gathers data form the Directory of Major Malls, Inc. to present the location of major retail areas and the gross leasable area. An existing major retail node map was generated for the trade area with the location and gross leasable area information.

7.6 Existing Major Retail Nodes

Analysis of competing retail centers shows few developments in the trade area. The competing centers that exist along and near IH 820 are more traditional/suburban in format and rely on larger store formats. The competing centers within an urban streetscape format exist along West 7th/Museum Place that provide an “eater-tainment” and mixed-use experience centered on outdoor dining and walkable streetscapes. Both of these competitive node offerings should be considered during merchandizing of SH 199 potential. Beyond these two primary nodes, there are no major competing retail centers.

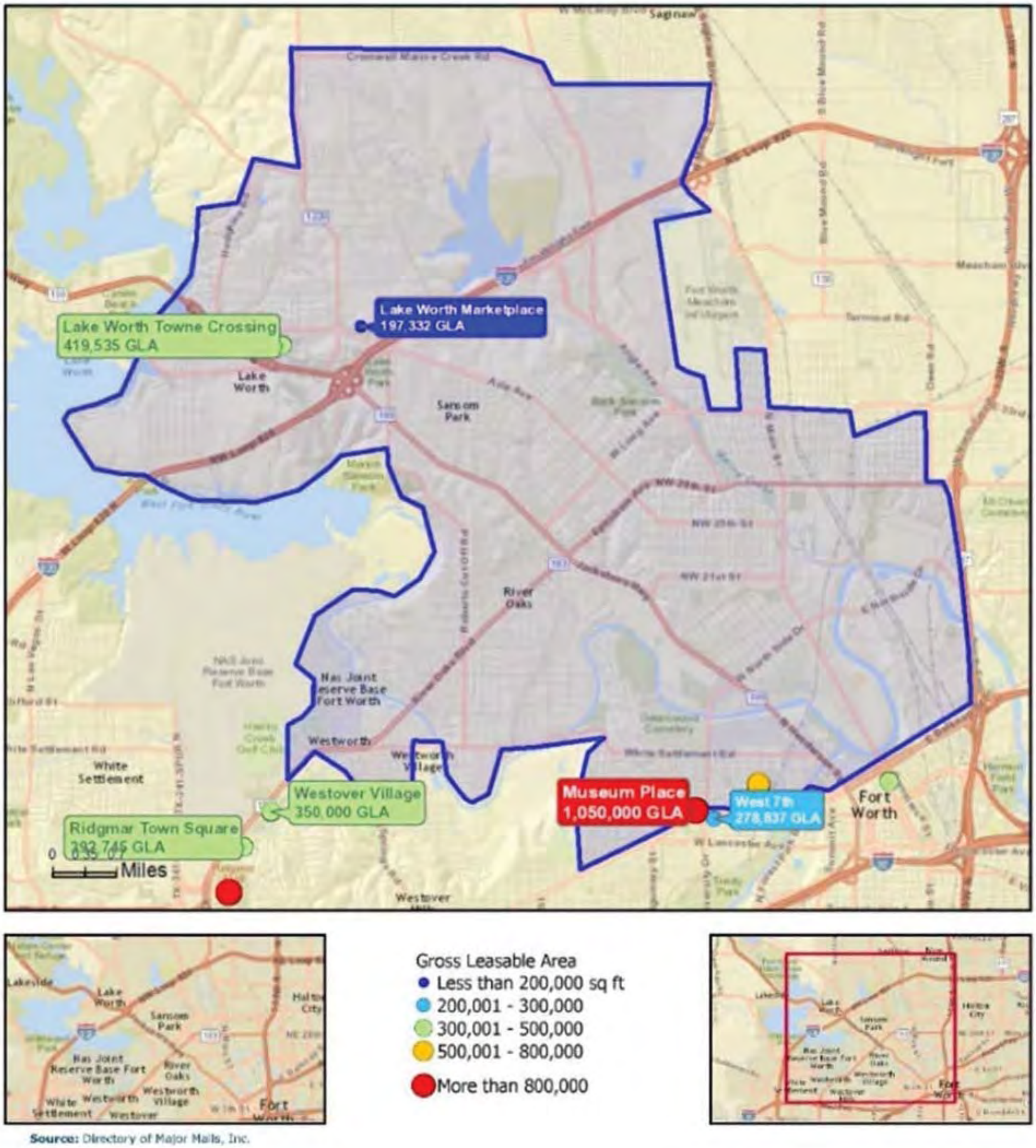


Figure 14. Existing Major Retail Nodes
Source: Directory of Major Malls, Inc.

7.7 Retail Potential Methodology

The Retail MarketPlace Profile Report from ESRI Business Analyst compares retail sales and consumer spending to measure the gap between supply and demand. Catalyst used the information provided to determine what retail groups have the potential to open a store within the trade area. Then the number of stores the retail group can open is determined by dividing the capture by the average store size.

7.8 Retail Potential

The retail leakage analysis displays what type of shopping occurs within and outside the trade area as an indicator of the retail segments that may be created within the trade area to capture such leakage in sales. As such, the analysis performed in Figure 15 (also seen in Attachment D) can assist in determining what type of retail the trade area is lacking. The numbers in green represent where money was spent outside of the trade area and the red numbers represent where money was spent within the trade area. As the analysis of the figure indicates, the primary programming opportunities implied by this figure when forecasted through 2026 include opportunities for grocery stores, clothing and accessory stores, and used merchandise stores. Restaurants would have potential when combined with other uses to create the type of synergy seen in other special districts that induce demand.

Retail Group	2016 Demand (Retail Potential)	Demand PerCapita	2026 Demand (Retail Potential)	2016 Supply (Retail Sales)	2016 Sales Leakage	2026 Forecasted Leakage	Avg Sales/sf	2016 sf Area	2026 sf Area	2016 Capture	2026 Capture	Average Store Size	2016 Stores	2026 Stores
Motor Vehicle & Parts Dealers	$213,713,101	$2,044.32	$241,391,135.00	$515,850,548	($302,138,000)	($274,460,000)								
Furniture & Home Furnishings Stores	$25,848,629	$247.26	$29,196,291.02	$31,331,940	($5,484,000)	($2,136,000)								
Bldg Materials, Garden Equip. & Supp	$41,587,521	$397.81	$46,973,530.63	$60,337,580	($18,751,000)	($13,365,000)								
Food & Beverage Stores	$170,373,541	$1,629.74	$192,438,658.39	$175,524,522	($5,151,000)	$16,915,000								
Grocery Stores	$151,719,708	$1,451.31	$171,368,963.09	$143,521,739	$8,198,000	$27,848,000	$200	40,990	139,240 sf	14,347	48,734 sf	80,000 sf	0	1
Health & Personal Care Stores	$49,005,611	$468.77	$55,352,339.21	$64,047,918	($15,043,000)	($8,696,000)								
Gasoline Stations	$65,716,297	$628.62	$74,227,230.09	$70,173,441	($4,458,000)	$4,054,000								
Gasoline Stations	$65,716,297	$628.62	$74,227,230.09	$70,173,441	($4,458,000)	$4,054,000	$1,896	(2,351)	$2,138 sf	(823)	748 sf	1,000 sf	(1)	1
Clothing & Clothing Accessories Stores	$40,324,647	$385.73	$45,547,101.52	$39,752,200	$573,000	$5,795,000								
Clothing Stores	$26,991,224	$258.19	$30,486,863.77	$23,424,254	$3,567,000	$7,063,000	$383	9,313	18,441 sf	3,260	6,454 sf	2,000 sf	2	3
Jewelry, Luggage & Leather Goods	$8,486,954	$81.18	$9,586,101.41	$3,533,125	$4,954,000	$6,053,000	$372	13,317	16,272 sf	4,661	5,695 sf	1,500 sf	3	4
Sporting Goods, Hobby, Book & Music	$26,644,580	$254.87	$30,095,325.83	$35,627,045	($8,983,000)	($5,532,000)								
Book, Periodical & Music Stores	$5,698,624	$54.51	$6,436,654.14	$2,800,103	$2,899,000	$3,637,000	$200	14,495	18,185 sf	5,073	6,365 sf	8,000 sf	1	1
General Merchandise Stores	$182,320,144	$1,744.02	$205,932,468.75	$361,417,571	($179,098,000)	($155,486,000)								
Miscellaneous Store Retailers	$40,433,756	$386.78	$45,670,341.25	$68,978,659	($28,545,000)	($23,309,000)								
Used Merchandise Stores	$7,668,382	$73.35	$8,661,515.96	$8,451,092	($783,000)	$211,000	$118	(6,636)	1,788 sf	(2,322)	626 sf	9,000 sf	(0)	0
Nonstore Retailers	$18,671,345	$178.60	$21,089,475.28	$14,177,160	$4,495,000	$6,913,000								
Electronic Shopping & Mail-Order	$12,563,379	$120.18	$14,190,465.17	$6,305,291	$6,259,000	$7,886,000								
Direct Selling Establishments	$4,733,975	$45.28	$5,347,073.22	$3,443,205	$1,291,000	$1,904,000								
Food Services & Drinking Places	$99,556,735	$952.33	$112,450,351.18	$200,898,456	($101,342,000)	($88,449,000)								

Programming Potential

2016 Retail Potential (**Full Demand**)	2016 Potential Store Count	2026 Retail Potential (**Full Demand**)	2026Potential Store Count
78,116 sf	16 stores	196,064 sf	26 stores
2016 Retail Potential (**Discounted Demand**)	2016 Potential Store Count	2026 Program Area Potential (**Discounted Demand**)	2026Potential Store Count
27,340 sf	**6 stores**	**68,622 sf**	**9 stores**

Figure 15. Retail Leakage Analysis
Source: ESRI

8.0 OFFICE AND EMPLOYMENT ANALYSIS

8.1 Employment Categories Methodology

Job employment information was provided by the Business Summary Report on ESRI Business Analyst. The report uses ACS data to breakdown the number employed by job type. Catalyst created a pie chart on excel using the data provided to display the non-farm employment breakdown.

8.2 Employment Categories

The various types of employment categories in the trade area are shown in Figure 16. This is an important analysis of the existing workforce in the trade area as it identifies the types of jobs currently being worked. In this case, the analysis shows non-farm employment broken down by categories, and white-collar jobs are among the largest types of jobs held by those in the trade area. White collar jobs are fundamental to determining office space demand as this type of work is typically housed in office space.

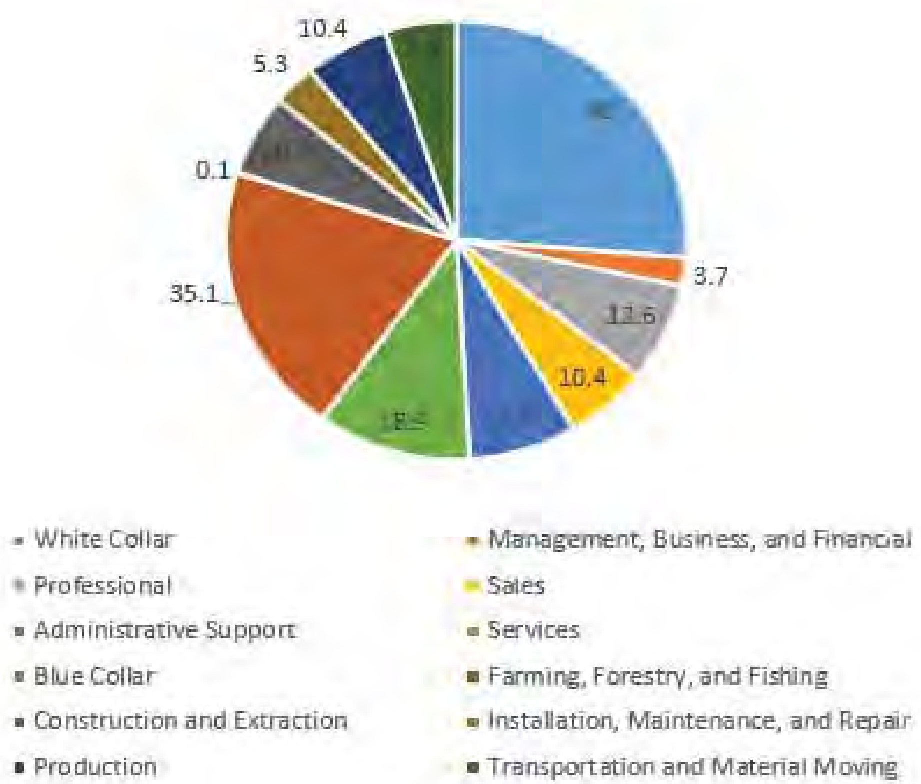


Figure 16. Non-Farm Employment
Source: ESRI, ACS, Catalyst

8.3 Office Potential Methodology

The Business Summary Report is also used to determine white collar office space potential. The Business Summary Report provides 2016 and 2020 trade area jobs and percentages. The 2026 forecasted number of jobs is calculated by using the trend of job growth/decline from 2016 to 2021. The office-oriented jobs for 2016, 2021, and 2026 is calculated by adding up the total amount of white collar jobs in that year. The 2016 total office space needed is determined by multiplying the 2016 trade area jobs by the building square feet per employee (330 square feet). To determine the forecasted 10-year net add of building square feet, the 2026 total office space needed is subtracted from the 2016 total office space needed.

8.4 Office Potential

Determining the amount of white collar office space needed in 2026 requires an employment analysis associated with a 10-year growth forecast for the trade area. The 2016 population is 104,540, and of that 13,775 people have a white collar job. The 10-year population growth is projected to have approximately 13,540 people moving into the trade area making the 2026 population almost 118,100.

After capture rates have been applied and current vacancy rates, this analysis found a forecasted demand of approximately 19,700 white collar jobs in the trade area. When applied to a building area, Figure 17 shows that this translates to almost 23,300 square feet of additional office space needed in the trade area through 2026.

Trade Area Population Forecast (1)	2016 Total Population	2020 Total Population	2026 Total Population	Employee/Population
	104,540	110,964	118,079	0.6:1
Trade Area Employment Category (SIC Codes)	**2016 Trade Area Jobs**	**Percentage of Jobs**	**Forecasted 2020 Jobs (2)**	**orecasted 2026 Jobs (2)**
Agriculture, forestry, fishing & hunting	37	0.1%	50	53
Mining	123	0.2%	166	176
Utilities	71	0.1%	96	102
Construction	1,838	3.7%	2,475	2,634
Manufacturing	2,690	5.4%	3,623	3,855
Wholesale trade	1,591	3.2%	2,143	2,280
Transportation and warehousing	685	1.4%	923	982
Retail trade	8,231	16.6%	11,085	11,796
Nonstore retailers	190	0.4%	256	272
Information	295	0.6%	397	423
Finance and Insurance "White Collar"	1,518	3.1%	2,044	2,175
Real estate, rental and leasing	1,091	2.2%	1,469	1,564
Professional, scientific and tech services	10,644	21.5%	14,335	15,254
Management	37	0.1%	50	53
Administrative, support, waste management & remediation	976	2.0%	1,314	1,399
Educational services	3,251	6.6%	4,378	4,659
Health care & social assistance	4,084	8.3%	5,500	5,853
Arts, entertainment and recreation	458	0.9%	617	656
Accommodation and food services	5,177	10.5%	6,972	7,419
Automotive repair and maintenance	757	1.5%	1,019	1,085
Other services	3,030	6.1%	4,081	4,342
Public administration	2,336	4.7%	3,146	3,348
Unclassified establishments	326	0.7%	439	467
	49,436	100.0%	66,578	70,847
Office-Oriented Jobs	**2016 Trade Area Jobs**	**Forecasted 2020 Jobs**	**Forecasted 2026 Jobs**	**Building SF/Employee**
White Collar Jobs	13,775	18,552	19,741	330
Office Space Programming	**2016 Total Office Need**	**Forecasted 10 Year Net Add**	**2065 Vacancy Rate (3**	**0 Year Programming (4)**
White Collar Office Space	4,545,750	1,968,825.79	17.6%	**23,274**

Source: ESRI, ACS, Catalyst

Figure 17. Office Potential
Source: ESRI, ACS, Catalyst

9.0 HOUSING ANALYSIS

9.1 Housing Potential Methodology

The housing potential analysis determined the total projected number of for rental housing and the total for sale housing potential. The first step was to determine the number of rental units in 2016, 2021, and 2026. The number of rental units is calculated by multiplying the percentage of total rental households by the total households for that year. Second, the number of units for market rate housing, lower income housing, and senior housing were generated for 2016, 2021, and 2026. The total number of units is calculated by multiplying the market rate/low income/senior housing percentage by the number of rental units. Next, the proposed programming was calculated for 2021 and 2026. To calculate the proposed programming for 2021, the total number of dwelling units in 2016 gets subtracted from the total number of units in 2021 then divided by the capture rate. The same step is repeated for 2026 but subtracting 2021 from 2026. The total number of units is the sum of the program for 2021 and 2026. Lastly, to determine the total rental housing potential, the total number of dwelling units for market rate, low income, and senior housing are added together. The same steps are taken to determine the total for sale housing potential projection.

9.2 Housing Potential

To determine the opportunity for residential programming in the trade area and SH 199 itself, the forecasted population growth was measured over a 10-year period and allocated to various real estate housing types. This breakdown includes applying a capture rate to be applied to the demand for each category of residential use, and analyzing the trade area incomes to determine qualifying households for both new lease and mortgage agreements. Through this analysis, a 10-year building program was prepared.

Figure 18 (also seen in Attachment E) shows a forecasted demand for 855 units across all categories over the 10-year period. This is broken down as 729 various unit categories that reflect rental households, and 126 units that reflect home ownership categories. Of the rental units, 278 units are forecasted as market rate households occurring in quality urban apartments and lofts, 303 as lower income households, and 148 as senior housing. Of the ownership units, there are 114 new constructed houses forecasted for the study area and 12 units of renovated construction.

	2016		2021		2026		10 Yr. Projected Growth		
Total Households	33,807		35,800		37,910		4,103		
Rental Units	13,557	du	14,642	du	15,815	du	2,258	du	
Percentage of Total Households	40.1%		40.9%		41.7%				
Market Rate Household Percentage	55.0%		53.0%		50.0%				
Qualifying Income Households (Market Rate)	7,456	du	7,760	du	7,907	du	451	du	
Capture Rate			60%		65%				
Proposed Market Rate Programming			183 du		96 du		**278 du**		
Lower Income Household Percentage	39.0%		41.0%		42.0%				
Qualifying Income Households (Affordable)	5,287	du	6,003	du	6,642	du	1,355	du	
Capture Rate			20%		25%				
Proposed Market Rate Programming			143 du		160 du		**303 du**		
Senior Housing Household Percentage	15.0%		16.0%		17.0%				
Qualifying Income Households (Senior Housing)	2,033	du	2,343	du	2,689	du	655	du	
Capture Rate			20%		25%				
Proposed Senior Housing Programming			62 du		86 du		**148 du**		
Total Rental Housing Potential -- All Categories							**729 du**		**32%**
Ownership Units	17,343	du	18,222	du	19,146	du	1,803	du	
Percentage of Total Households	51.3%		50.9%		50.5%				
For Sale Household Percentage	61.0%		60.0%		58.0%				
Qualifying Income Households (New Construction)	10,579	du	10,933	du	11,105	du	525	du	
Capture Rate			20%		25%				
Proposed Market Rate Programming			71 du		43 du		**114 du**		
For Sale Household Percentage	55.0%		53.0%		50.0%				
Qualifying Income Households (Renovation)	-	du	38	du	21	du	21	du	
Capture Rate			60%		65%				
Proposed Market Rate Programming			23 du		-10 du		**12 du**		

Figure 18. Housing Potential
Source: ESRI, ACS, Catalyst

10.0 FORECASTED LAND USE PROGRAM POTENTIAL

10.1 Planning Program for 10-Year Period

Based on this economic market analysis conducted for the SH 199 Corridor Master Plan Study, Table 1 summarizes the forecasted programming potential within the next 10 years. This forecasted program envisions six to eight coordinated development efforts across a 10- year period. A planning strategy should be incorporated that distributes these development programs into strategic nodes along the corridor aimed at creating a critical mass in use and activity.

Table 1. Forecasted Programming Potential within 10-Year Period

Retail, Restaurant and Office	
Retail/Restaurant	68,600 square feet (multiple projects)
Office	23,300 square feet (part of mixed-use projects)
Residential	
Market Rate Apartments	278 units (single phase)
Affordable Housing	303 units (two phases)
Senior Housing	148 units (single phase)
Townhome/Single Family	114 homes
Renovated Single Family	12 homes
Total	855 Residential Units

10.2 Conclusions for Planning Purposes

Despite regional strength, the SH 199 corridor is challenged by (a) the market identity created by the appearance of much of its current development frontage, (b) a rather meek 10-year economic development program potential based on forecasted growth, and (c) existing real estate conditions that include higher land values and complexity of land ownership that will cause more difficult land assembly for redevelopment to occur. Attachments G through N include the information used as a basis for these conclusions. As such, the involved cities should take a proactive approach to guide new interest and investment to the corridor. This strategy should be targeted around the creation of distinct development “districts” such as those shown in Section 11.0 Economic Development with emphasis on key locations where critical mass of land assembly and new development may occur. These mixed-use urban districts should be based upon strong placemaking concepts to attract a younger demographic to the corridor. The likely development types that may occur in these districts are displayed in Figures 19 through 22.

Mixed-Use Residential / Office Retail
Could provide village centers along the SH 199 corridor that offer neighborhood services, eateries, and small businesses.

Figure 19. Mixed-Use Residential/ Office Retail

Attached Townhomes
Could serve as transition from more commercial and mixed-use frontage along SH 199 to the single family community behind the corridor.

Figure 20. Attached Townhomes

Senior and Independent Living
In more passive areas along the SH 199 corridor, this type of development could also provide nodes of focus where retail is less likely.

Figure 21. Senior and Independent Living

Streetscape-Based Development
A key to the success of a new investment strategy is quality public streetscape connecting new buildings to the neighborhood.

Figure 22. Streetscape-Based Development

11.0 ECONOMIC DEVELOPMENT

11.1 Targeted Redevelopment

Due to the length of the corridor and amount of forecasted economic development potential, it is recommended that the communities along the corridor focus on core areas to target redevelopment efforts. Four such areas have been identified, that include the gateway at the IH 820 / SH 199 intersection, the primarily undeveloped area within Sansom Park near the Skyline Drive / SH 199 intersection, the commercial intersection of River Oaks Boulevard / SH 199, and the Panther Island area at the gateway to downtown Fort Worth on SH 199 and part of the Trinity River Vision area. The planning program has been used as a basis for plans in these areas, as well as a detailed analysis of real estate factors such as assessed property values, degree of land assembly challenge, natural features, etc. The master plans for these areas emphasize urban villages that provide walkable streetscapes and a mix of uses in a manner that is highly visible from SH 199 to complement and leverage its new construction.

11.2 IH 820 Gateway

11.2.1 Existing Conditions

The regional intersection of IH 820 and SH 199 is marked by a combination of both newer pad site commercial development and older retail development. The study area (shown in the dashed boundary on Figure 23) focuses on the SH 199 corridor from the IH 820 intersection to Roberts Cut Off Road as an opportunity to better define this gateway. There are geometric challenges with the Roberts Cut Off Road intersection, and potential surplus public rights-of-way along SH 199 that can be better positioned for new development potential.

Figure 23. IH 820 Gateway: Existing Conditions

11.2.2 Roadway Improvements

As shown in Figure 24, the IH 820 / SH 199 cloverleaf interchange occupies a large land footprint that may be converted into an urban diamond interchange to provide for a new development gateway to the SH 199 corridor. Similarly, the geometry of access around the Roberts Cut Off Road / SH 199 intersection may also be simplified to be a safer intersection while creating new development opportunities.

Figure 24. IH 820 Gateway: Roadway Improvements

11.2.3 Real Estate Analysis

The real estate composite land analysis shown in Figure 25 identifies those properties that have the best probability of successful land assemblage (shown in yellow). This is based on a composite of six analyses of existing zoning, land use, slope, assessed value, complexity of land assembly, and type of ownership and their degree of difficulty for development. This does not imply any of these properties are for sale; it is simply an analysis of theoretical potential.

Figure 25. IH 820 Gateway: Real Estate Analysis

11.2.4 Area Concept Plan

A series of concept plans have been prepared for the study area (Figures 26 through 28) that show various redevelopment scenarios. Figure 26 shows infill development potential around the existing retail anchor development. Figure 27 shows this same development pattern with new infill on the anchor retail parcel in the future. Figure 28 shows this larger village concept with development at the highway intersection. Through these scenarios, the various potential surplus rights-of-way including TxDOT property at the highway interchange and city right-of-way at Roberts Cut Off Road are shown as being leveraged to allow for new development. Roberts Cut Off Road has been realigned to allow for new mixed-use development node and a safer intersection with SH 199. A secondary street system allows for a more legible and scaled development pattern. The combination of these things creates a more defined mixed-use urban streetscape on SH 199 when implemented.

Figure 26. IH 820 Gateway: Area Concept Plan 1

Figure 27. IH 820 Gateway: Area Concept Plan 2

Figure 28. IH 820 Gateway: Area Concept Plan 3

11.2.5 Development Areas

For purposes of analysis and consideration, the economic development potential shown in the fully built-out redevelopment scenario (Figure 28) has been detailed in following descriptions.

Development Area 1:
Potential TxDOT surplus right-of-way allows for a new hotel along SH 199 and Senior Living on Shady Oaks Manor to form a development gateway at the IH 820 / SH 199 intersection as a "front door" for the SH 199 corridor towards Fort Worth.

I. Core Property (no interchange retrofit)

Project	Private Investment
200 units senior housing	+/-$29,000,000
120 key limited service hotel	+/- $ 7,600,000

II. Expanded Property (with interchange retrofit*)

Project	Private Investment
60,000 sf garden office	+/-$22,000,000
250 units apartments	+/-$37,400,000
*only southeast intersection quadrant quantified	
Total Potential Private Investment	**+/-$96,000,000**

Development Area 2:
The realignment of Roberts Cut Off Road allows former right-of-way to be leveraged for private mixed-use and multi-family infill development along a new grid of streets to form a neighborhood center for the surrounding area.

I. Core Property (no retail redevelopment)

Project	Private Investment
25,000 sf retail/restaurant	+/- $ 4,000,000
12 townhome units	+/- $ 3,600,000

II. Expanded Property (with retail redevelopment)

Project	Private Investment
Mixed-use development	+/- $52,000,000
350 units	
19,000 sf retail, restaurant, office	
Total Potential Private Investment	**+/-$59,600,000**

11.3 Sansom Park Village

11.3.1 Existing Conditions

The study area in Sansom Park is centered around the intersection of Skyline Drive and SH 199. This area, as shown in the dashed boundary on Figure 29, is marked by a combination of natural features / mature tree stands and older commercial development. The study area centers on the land from Biway Street to just east of Skyline Drive (Northwest Bible Church) in which the existing creek is a central connector. There are also larger tracts of undeveloped land that can be leveraged for new development and identity.

Figure 29. Sansom Park Village: Existing Conditions

11.3.2 Real Estate Analysis

The real estate composite land analysis shown in Figure 30 identifies those properties that have the best probability of successful land assemblage (shown in yellow and green). This is based on a composite of six analyses of existing zoning, land use, slope, assessed value, complexity of land assembly and type of ownership and their degree of difficulty for development. This does not imply any of these properties are for sale; it is simply an analysis of theoretical potential.

Figure 30. Sansom Park Village: Real Estate Analysis

11.3.3 Area Concept Plan

The existing neighborhoods along this area of the corridor have need for stronger frontage identity and neighborhood entrances. This concept plan shows the infill of a new retail and restaurant uses on the SH 199 corridor in a manner that amenitizes the existing creek for outdoor dining and pedestrian connection to the community behind. The existing undeveloped tracts have been positioned for new townhome and single family lots that form a distinctive urban village that provides a transition to and gateway from the SH 199 frontage. New single family lots are shown along the headlands of the existing creek corridor. A new street entry at Cheyenne Street allows for a new community gateway experience south of SH 199. The existing homestead can eventually be repurposed as a central community center. The peninsula of land around Northwest Bible Church is shown to add new residential and senior living facilities around the existing church, and a detention basin/community dog park is shown in the southern portion of the study area.

Figure 31. Sansom Park Village: Area Concept Plan

11.3.4 Development Areas

For purposes of analysis and consideration, the economic development potential of this plan has been detailed in the following descriptions.

Development Area 1:

Larger undeveloped tracts are leveraged to form a new community center defined by renovated retail / restaurant frontage between SH 199 and the creek, and townhome and single family infill within new grid of streets.

I. Core Property

Project	Private Investment
9 single family residences	+/- $ 3,000,000
25,000 sf retail/restaurant	+/- $ 4,000,000
99 townhome units	+/- $25,000,000
7,500 sf private club / school	+/- $ 2,000,000
Total Potential Private Investment	**+/-$34,000,000**

Development Area 2:

The vacant land around the existing NW Bible Church can be positioned to strengthen the church while allowing for infill of senior and other residential facilities to form a creek fronting new community experience.

I. Core Property

Project	Private Investment
Senior living facility	+/- $11,000,000
Total Potential Private Investment	**+/-$11,000,000**

11.4 SH 199/ SH 183 Intersection

11.4.1 Existing Conditions

The intersection of River Oaks Boulevard (SH 183) and SH 199 is marked by a combination of new and old retail development and natural features. The area has been developed in a fragmented and uncoordinated manner, which creates a disorganized visual appearance. The study area shown in the dashed boundary on Figure 32 centers on properties between River Oaks Boulevard and Belle Avenue, both to the north and south of SH 199. There are underutilized natural features and land parcels in the area.

Figure 32. SH 199/SH 183 Intersection: Existing Conditions

11.4.2 Real Estate Analysis

The real estate composite land analysis shows the core properties in the study area to have primarily more-difficult probability of assemblage (orange) and will require a more dense and commercial program as a result. This is based on a composite of six analyses of existing zoning, land use, slope, assessed value, complexity of land assembly and type of ownership. This does not imply any of these properties are for sale; it is simply an analysis of theoretical potential.

Figure 33. SH 199/SH 183 Intersection: Real Estate Analysis

11.4.3 Area Concept Plans

Two concept plans have been prepared for the study area (Figures 34 through 35) that show various redevelopment scenarios. Figure 34 shows new mixed-use and retail infill development north of SH 199, additional large format retail to complement the existing Walmart south of SH 199, and small commercial buildings and specialized landscaping in the potential surplus right-of-way at River Oaks Boulevard / SH 199 that form a graphic architectural gateway features when combined. Figure 35 shows this mixed-use urban village in a further redevelopment scenario once the large format retail stores outlive their market viability. All plans are based on the creation of a gridded street system that interfaces with SH 199 and that provide for a pleasant pedestrian experience.

Figure 34. SH 199/SH 183 Intersection: Area Concept Plan 1

Figure 35. SH 199/SH 183 Intersection: Area Concept Plan 2

Total Potential Investment
(All Phases)
$247,200,000

11.4.4 Development Areas

For purposes of analysis and consideration, the economic development potential of this plan has been detailed in the following descriptions.

Development Area 1:
Blighted area redeveloped to allow mixed-use apartment community on walkable street grid, and the SH 199/SH 183 intersection is defined by sculptural small office / retail buildings and landscaping with shared parking lots.

I. Core Property

Project	Private Investment
Mixed-use development	+/- $25,000,000
175 units	
10,000 sf retail, restaurant, office	
8,000 sf small retail / pad	+/- $ 1,800,000
12,000 sf small office / pad	+/- $ 2,700,000
Total Potential Private Investment	**+/-$29,500,000**

Development Area 2:
The Walmart store is positioned as a retail anchor around which new infill retail pad and in-line shop space is developed. Entrances to this area off SH 199 are more carefully defined to create a gridded street circulation pattern.

I. Core Property

Project	Private Investment
72,000 sf large format retail	+/- $ 9,000,000
29,000 sf small format retail	+/- $ 6,700,000
Total Potential Private Investment	**+/-$15,700,000**

Future Development Area 3:
The large format retail stores may likely have a shorter life span due to the changing nature of retail delivery. As such, there may be future potential to develop these properties into a more dense, mixed-use retail/residential/restaurant/small office village centered around highly designed open space and streetscape features and supported by small office and for-sale residential uses. While this demand is not evident in the 10-year programming assessment, it may be induced by the other phases noted.

I. Core Property

Project	Private Investment
3 Phases Market Mixed-Use	+/- $180,000,000
-- 1045 units	
-- 70,000 sf retail/restaurant	
-- 22,000 sf small office/retail	
1 Phase Affordable Mixed-Use	+/- $ 22,000,000
-- 155 units	
-- 14,000 sf small format retail	
Total Potential Private Investment	**+/-$202,000,000**

11.5 Panther Island

11.5.1 Existing Conditions

The study area shown dashed in Figure 36 is part of the Panther Island district of the Trinity River Vision area. As such, it is an area that is in transition due to new infrastructure being constructed associated with the river, bridge, and roadway improvements. The development in this area is currently marked by a combination of older light industrial and institutional uses. The study area centers on the existing and reclaimed land created by Trinity River Vision. There is a direct adjacency to downtown and new improvements.

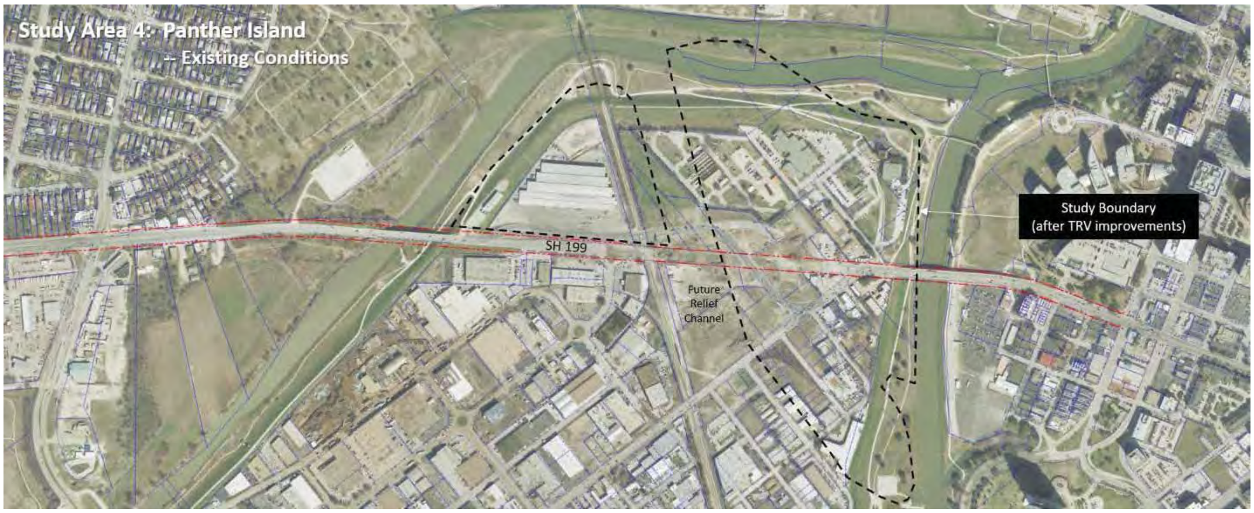


Figure 36. Panther Island: Existing Conditions

11.5.2 Real Estate Analysis

The real estate composite land analysis shows the core properties to have primarily high to medium probability of assemblage (green/yellow). This is based on a composite of six analyses of existing zoning, land use, slope, assessed value, complexity of land assembly and type of ownership. This does not imply any of these properties are for sale; it is simply an analysis of theoretical potential.

Figure 37. Panther Island: Real Estate Analysis

11.5.3 Area Concept Plan

The concept plan for this area as shown in Figure 38 reflects the exhaustive planning that has already occurred as part of the Trinity River Vision. Through this process of public input and urban design, the plan calls for a mix of uses including dense urban housing, ground level retail, and office on a series of walkable streetscapes and waterfronts. New waterfront development sites are created when the relief channels are cut all to form a dynamic neighborhood district and gateway to downtown Fort Worth.

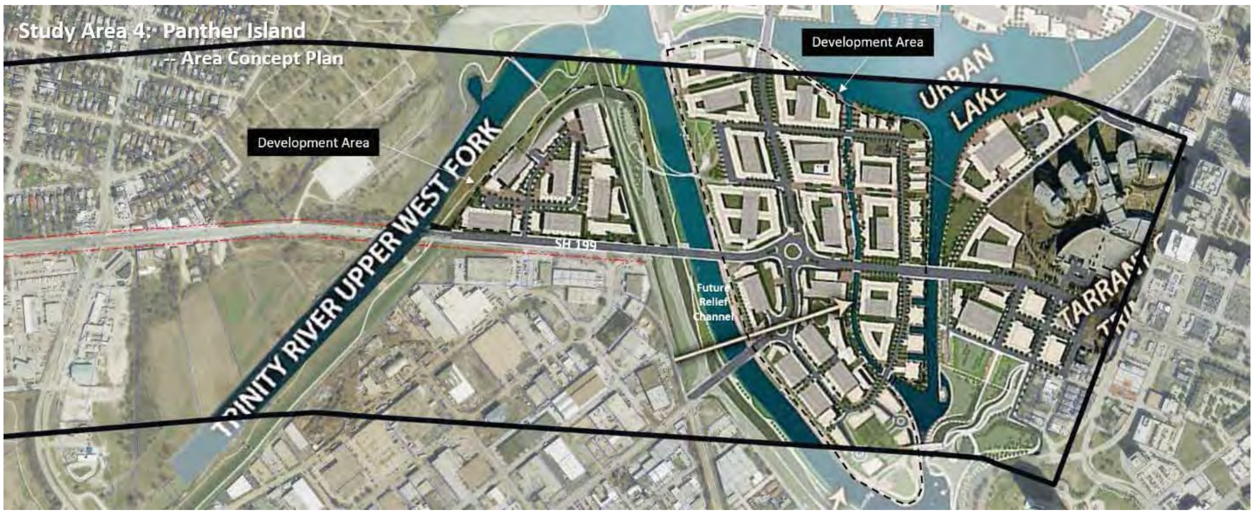


Figure 38. Panther Island: Area Concept Plan

11.5.4 Development Areas

The Trinity River Vision calls for a new series of urban mixed-use neighborhoods comprised of urban housing, retail, office, hotel, and institutional uses within a gridded street framework and urban canal system. As this area has been thoroughly planned, the SH 199 corridor plan adopts this vision and is in support of its concept as shown in Figure 39.

Figure 39. Panther Island: Development Areas

12.0 EXHIBITS

1. Existing Land Use
2. Current Zoning
3. Slope Gradient
4. Parcel Values
5. Ease of Assembly
6. Property Ownership
7. Composite Map

13.0 ATTACHMENTS

A. Age Analysis
B. Income Analysis
C. Consumer Spending
D. Retail Leakage Analysis
E. Housing Potential
F. ACS Population Summary
G. Demographic and Income Profile
H. Market Profile
I. Tapestry Segmentation Area Profile
J. 2016 Consumer Spending
K. Business Summary
L. Retail and Restaurant Programming
M. Retail Market Potential
N. Retail Marketplace Profile

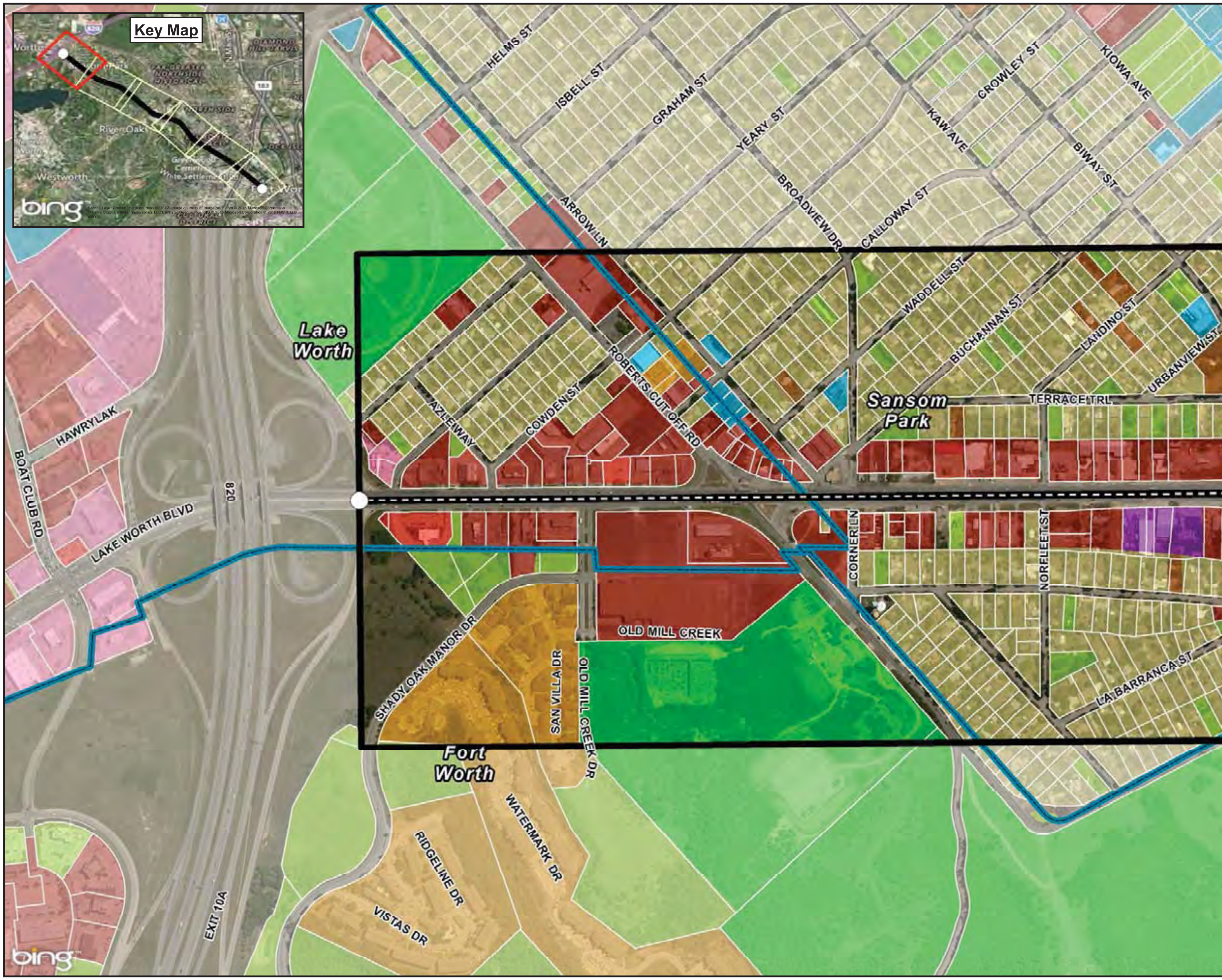
Exhibit 1

Existing Land Use

Existing Land Use

Exhibit 1-1

State Highway 199
Corridor Master Plan

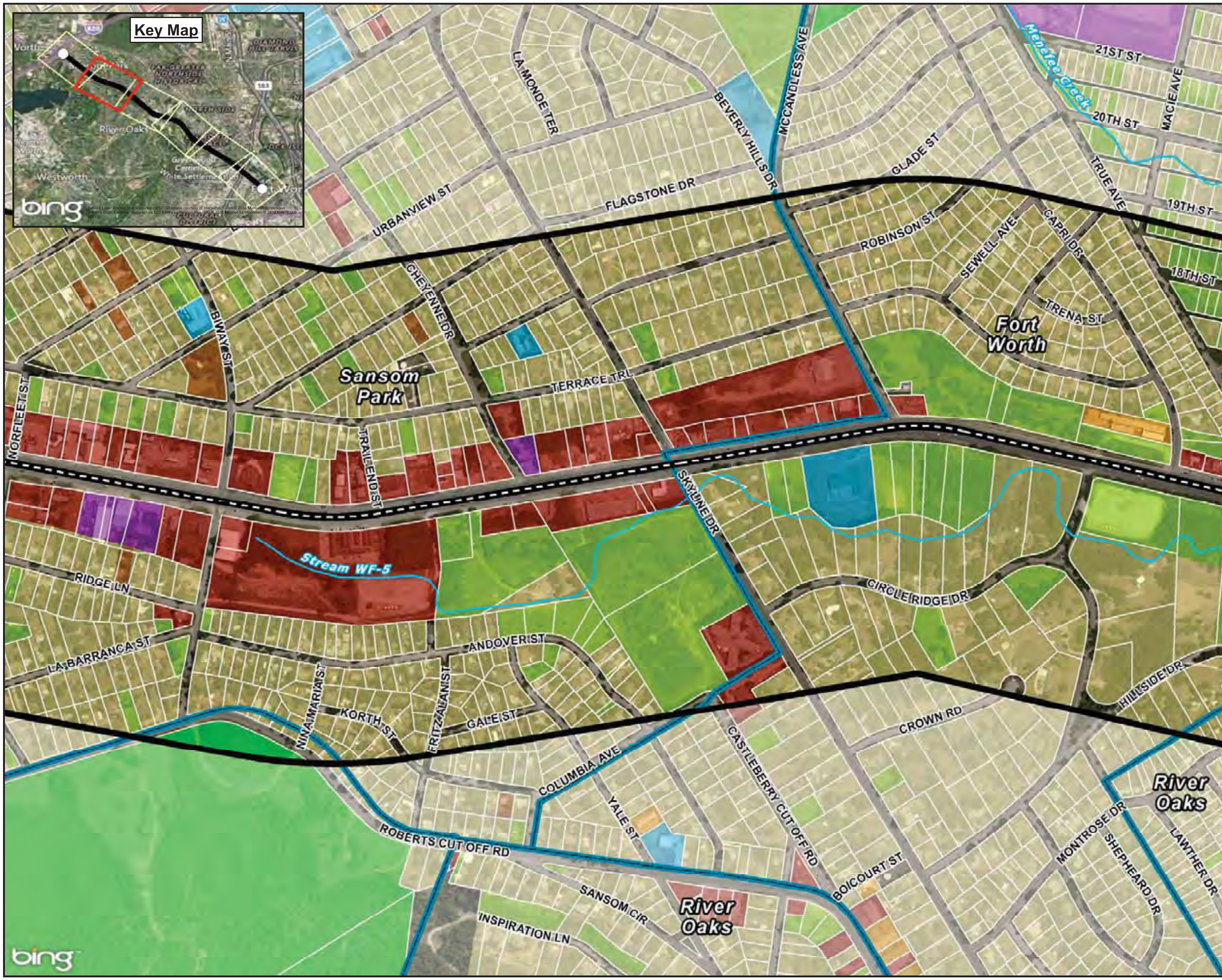


Parcel Data Source: Tarrant Appraisal District Parcels 2015 Land Use Data Source: NCTCOG 2010 Land Use Date: 8/08/2016

Existing Land Use

Exhibit 1-2

State Highway 199
Corridor Master Plan

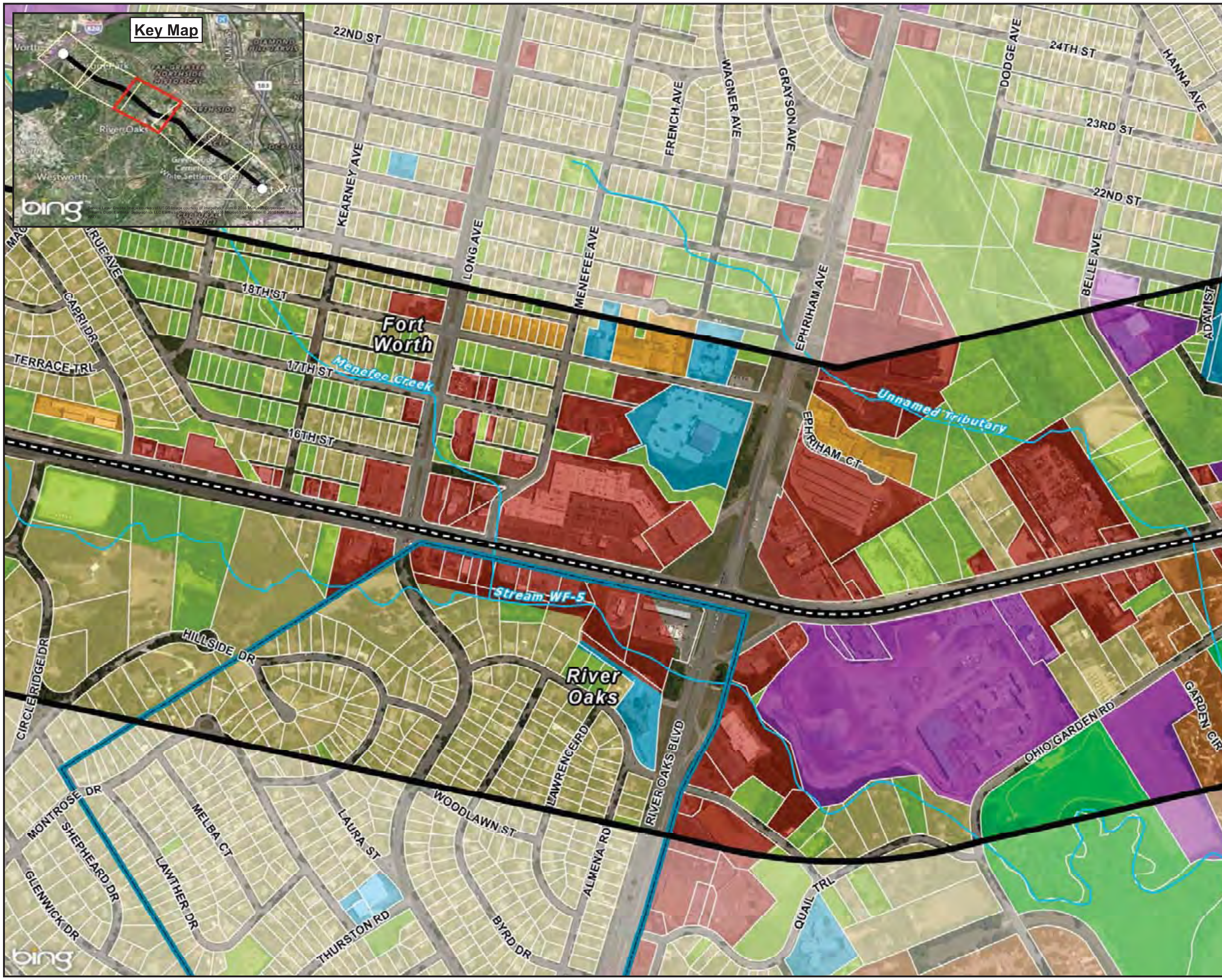


Parcel Data Source: Tarrant Appraisal District Parcels 2015 Land Use Data Source: NCTCOG 2010 Land Use Date: 8/08/2016

Existing Land Use

Exhibit 1-3

State Highway 199
Corridor Master Plan



Legend

- SH 199
- Parcel Boundaries
- Study Area Boundary
- City Limits

Existing Land Use

- Commercial
- Industrial
- Mixed Use
- Mobile Home
- Multi Family
- Office
- Parks
- Public
- Retail
- Single Family
- Vacant

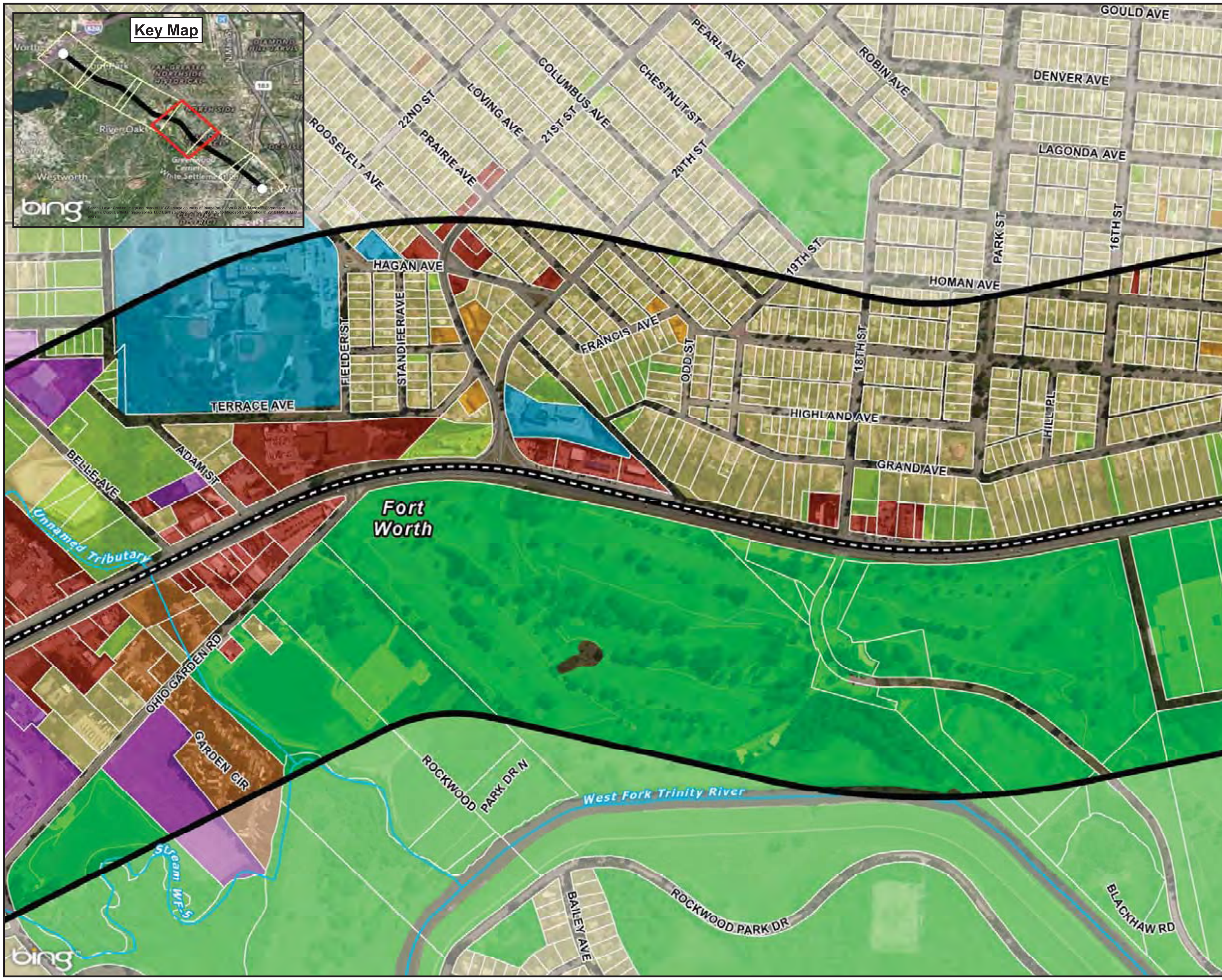
0 500 1,000
Feet

Parcel Data Source: Tarrant Appraisal District Parcels 2015 Land Use Data Source: NCTCOG 2010 Land Use Date: 8/08/2016

Existing Land Use

Exhibit 1-4

State Highway 199
Corridor Master Plan

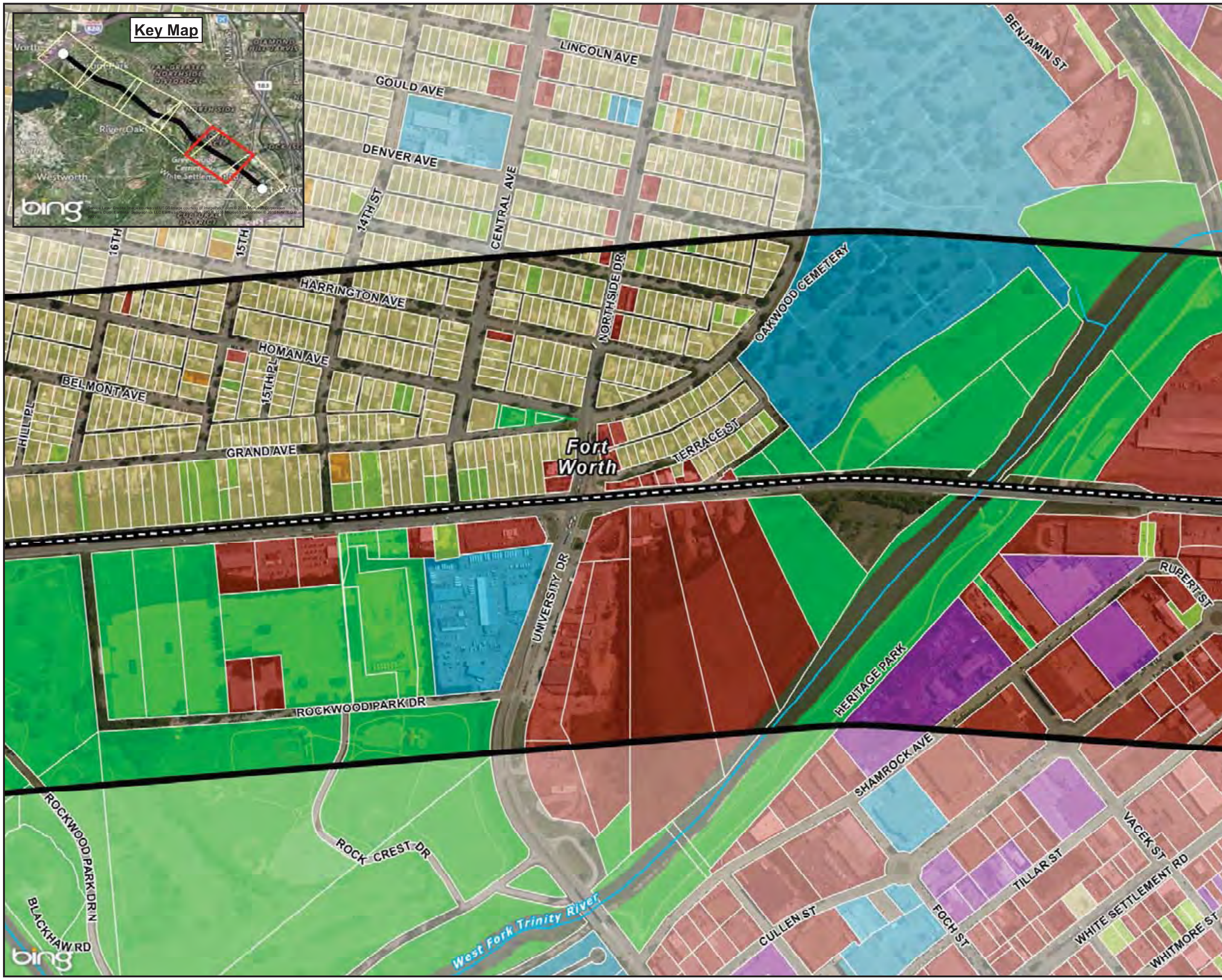


Legend
- SH 199
- Parcel Boundaries
- Study Area Boundary
- City Limits

Existing Land Use
- Commercial
- Industrial
- Mixed Use
- Mobile Home
- Multi Family
- Office
- Parks
- Public
- Retail
- Single Family
- Vacant

0 500 1,000
Feet

Parcel Data Source: Tarrant Appraisal District Parcels 2015 Land Use Data Source: NCTCOG 2010 Land Use Date: 8/08/2016



Existing Land Use

Exhibit 1-5

State Highway 199
Corridor Master Plan

Legend

- SH 199
- Parcel Boundaries
- Study Area Boundary
- City Limits

Existing Land Use

- Commercial
- Industrial
- Mixed Use
- Mobile Home
- Multi Family
- Office
- Parks
- Public
- Retail
- Single Family
- Vacant

0 500 1,000
Feet

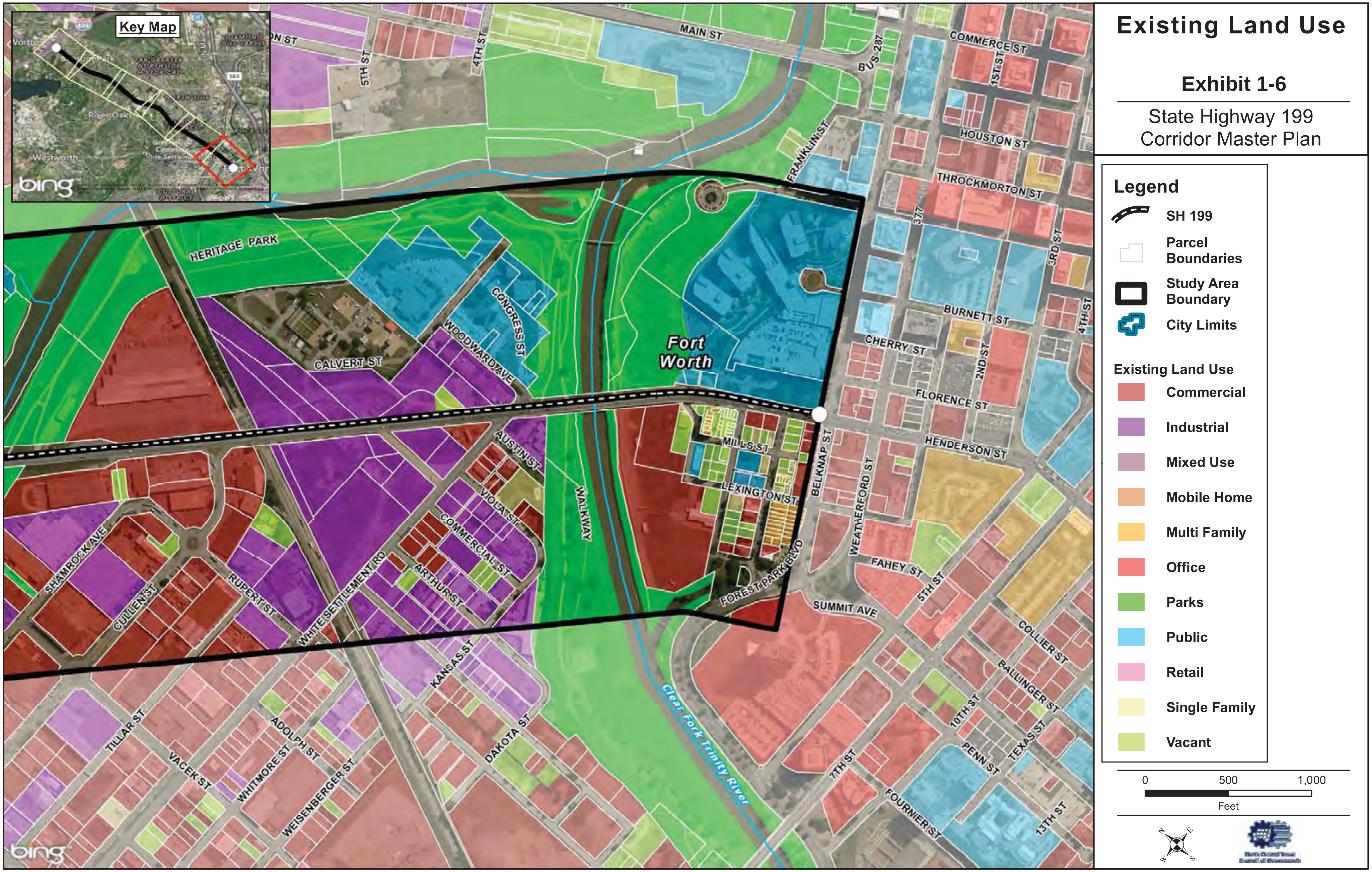
N E S W

Parcel Data Source: Tarrant Appraisal District Parcels 2015 Land Use Data Source: NCTCOG 2010 Land Use Date: 8/08/2016

Existing Land Use

Exhibit 1-6

State Highway 199
Corridor Master Plan



Parcel Data Source: Tarrant Appraisal District Parcels 2015 Land Use Data Source: NCTCOG 2010 Land Use Date: 8/08/2016

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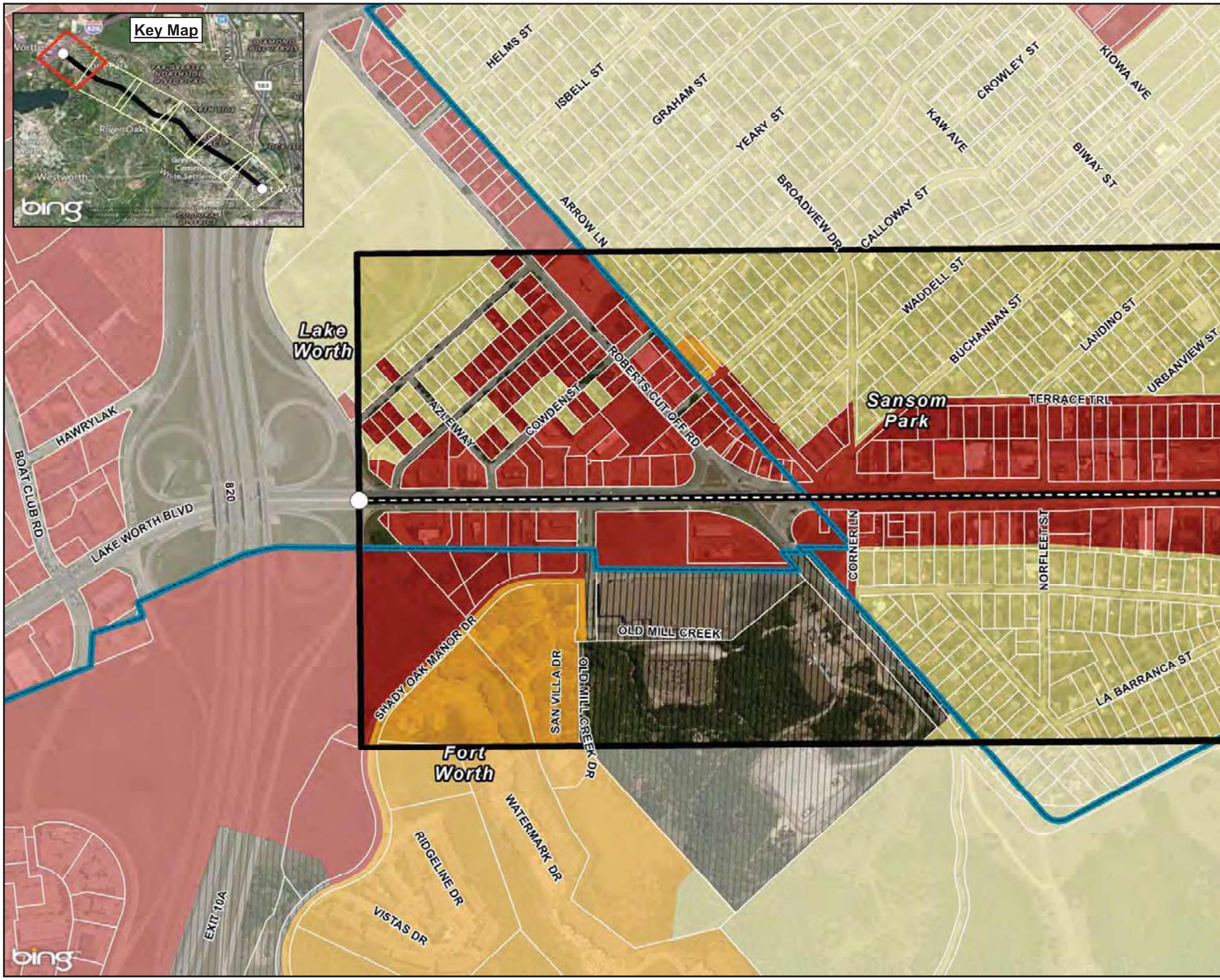
Exhibit 2

Current Zoning

Current Zoning

Exhibit 2-1

State Highway 199
Corridor Master Plan



Legend

- SH 199
- Parcel Boundaries
- Study Area Boundary
- City Limits

Current Zoning

- Commercial
- Industrial
- Mixed Use
- Mobile Home
- Multi Family
- Parks
- Planned Development
- Public
- Single Family

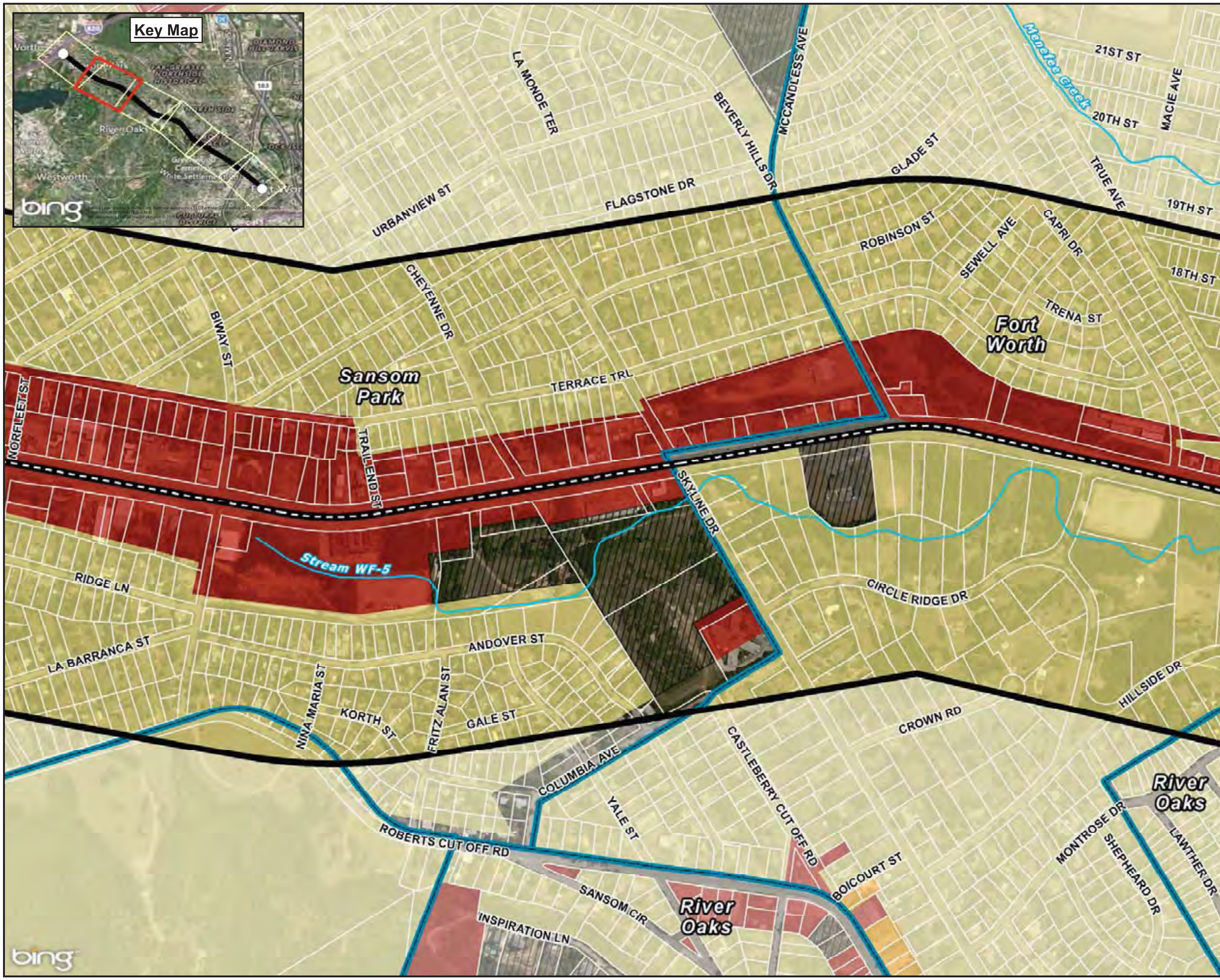
0 500 1,000
Feet

Parcel Data Source: Tarrant Appraisal District Parcels 2015 Zoning Data Sources: Fort Worth - 2016, Lake Worth - 2013, River Oaks - 2014 , Sansom Park - 2005 Date: 8/08/2016

Current Zoning

Exhibit 2-2

State Highway 199
Corridor Master Plan



Legend

- SH 199
- Parcel Boundaries
- Study Area Boundary
- City Limits

Current Zoning

- Commercial
- Industrial
- Mixed Use
- Mobile Home
- Multi Family
- Parks
- Planned Development
- Public
- Single Family

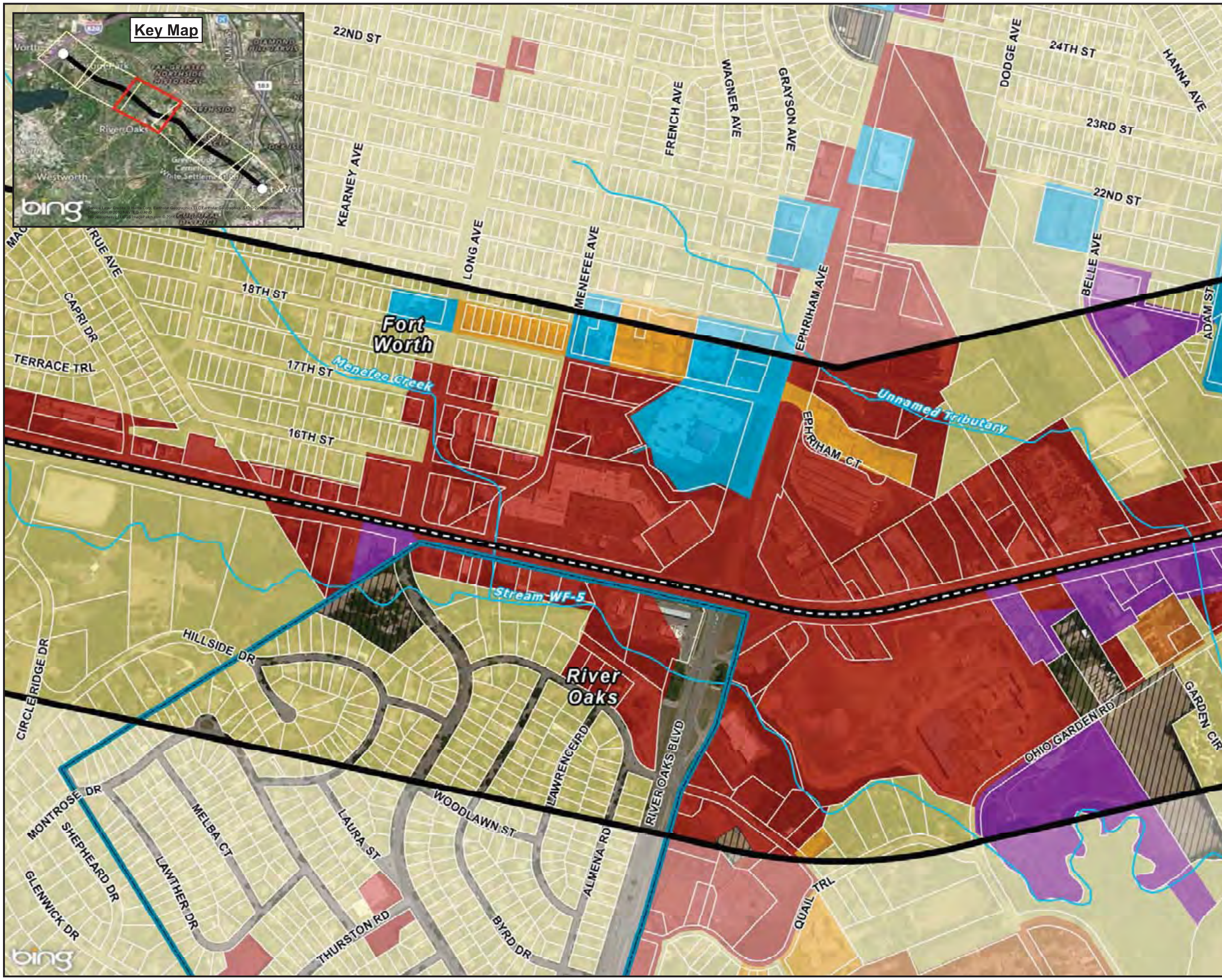
0 500 1,000
Feet

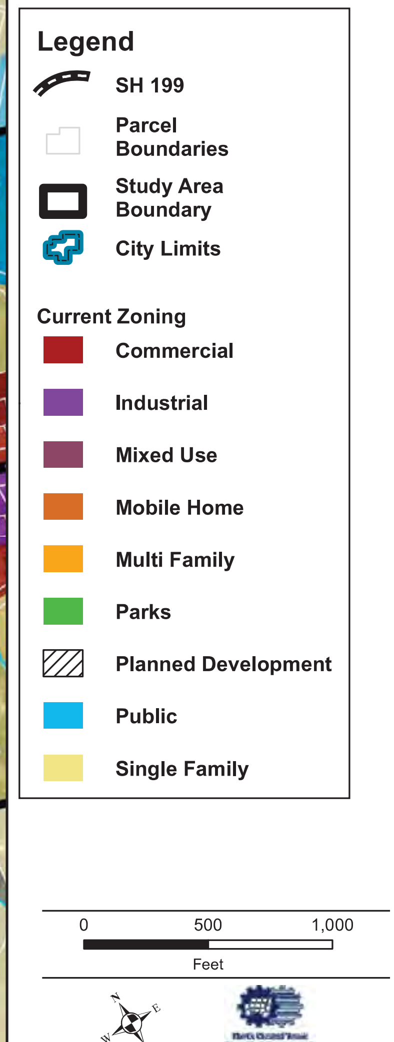
Parcel Data Source: Tarrant Appraisal District Parcels 2015 Zoning Data Sources: Fort Worth - 2016, Lake Worth - 2013, River Oaks - 2014 , Sansom Park - 2005 Date: 8/08/2016

Current Zoning

Exhibit 2-3

State Highway 199
Corridor Master Plan



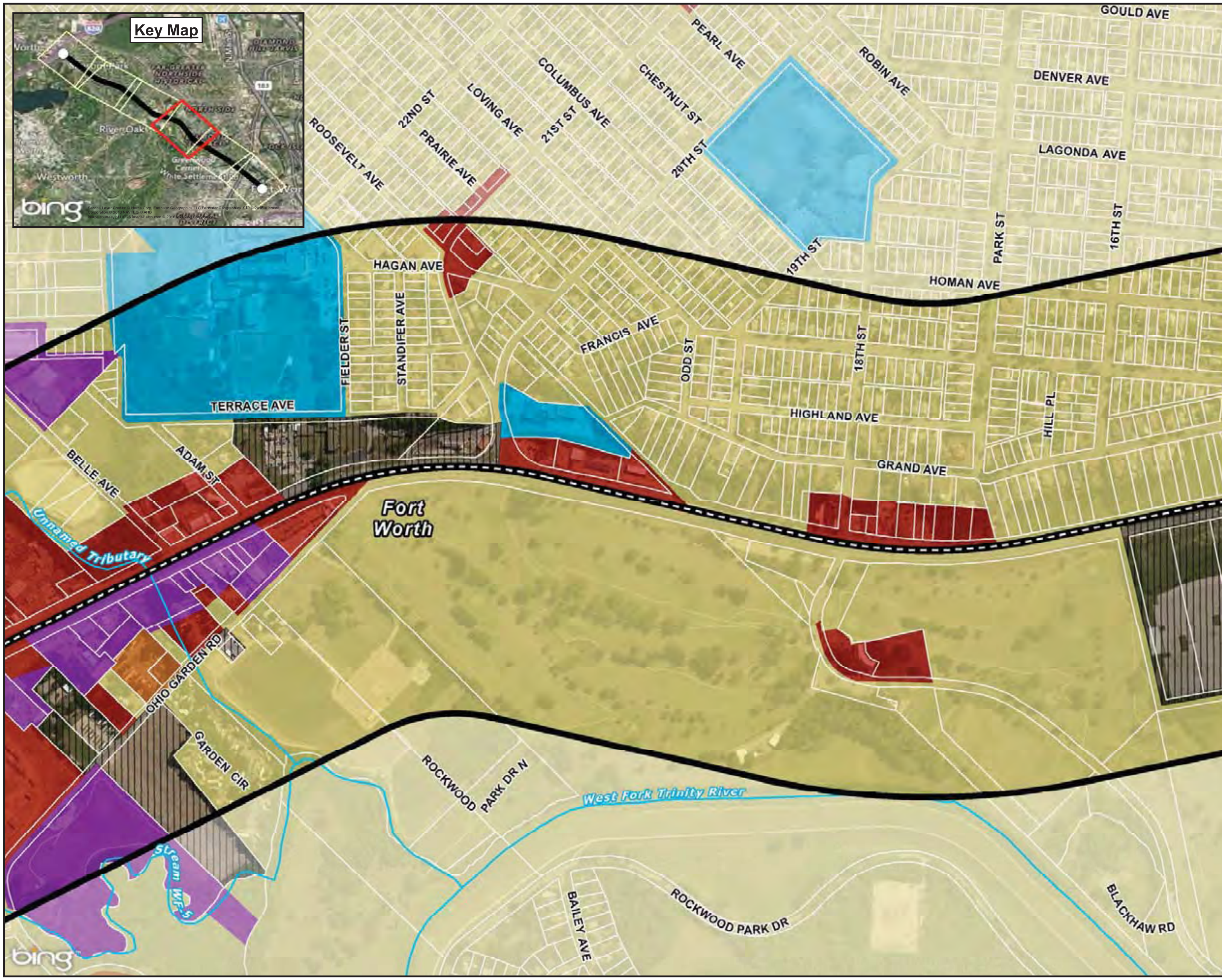


Parcel Data Source: Tarrant Appraisal District Parcels 2015 Zoning Data Sources: Fort Worth - 2016, Lake Worth - 2013, River Oaks - 2014, Sansom Park - 2005 Date: 8/08/2016

Current Zoning

Exhibit 2-4

State Highway 199
Corridor Master Plan



Legend

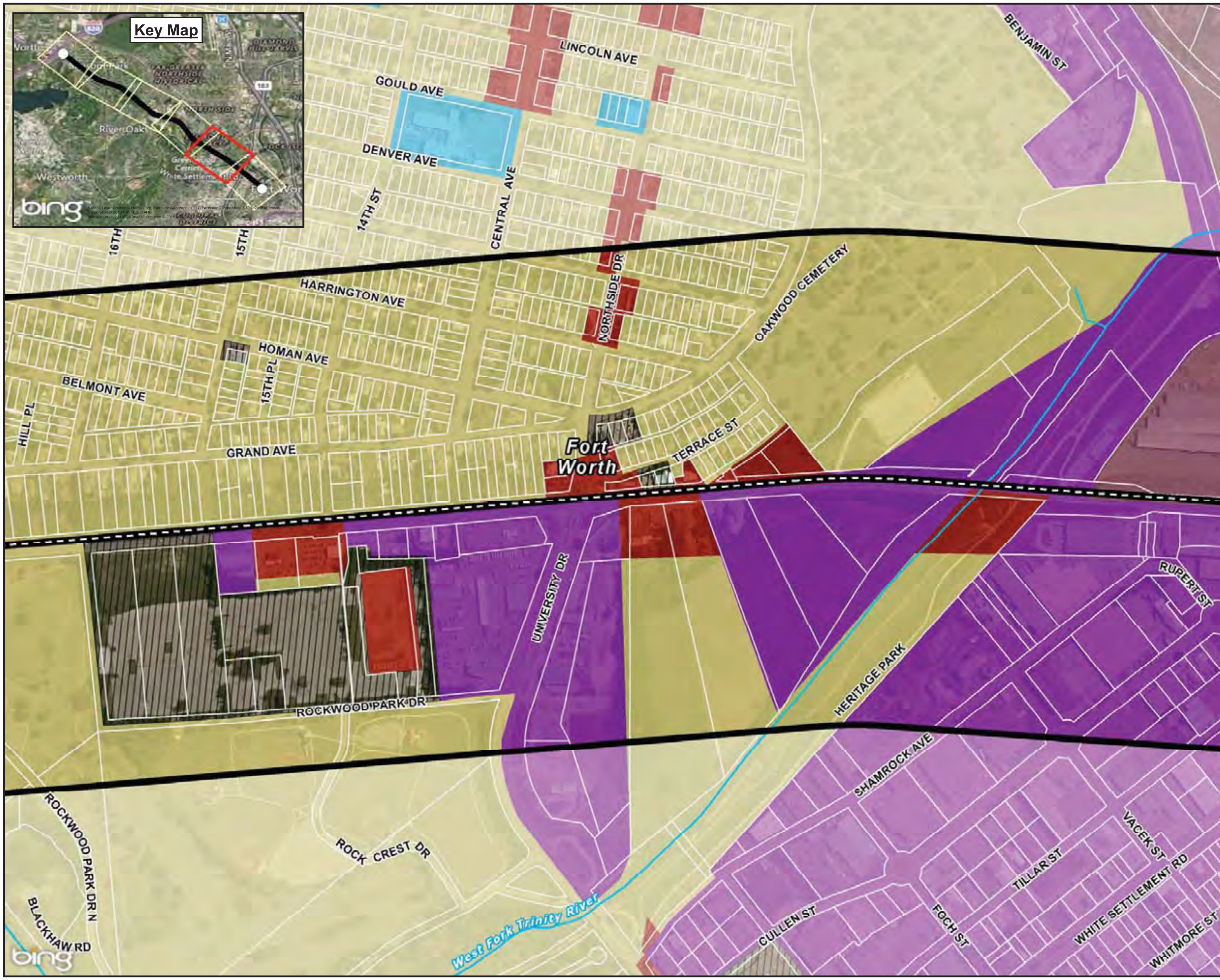
- SH 199
- Parcel Boundaries
- Study Area Boundary
- City Limits

Current Zoning

- Commercial
- Industrial
- Mixed Use
- Mobile Home
- Multi Family
- Parks
- Planned Development
- Public
- Single Family

0 500 1,000
Feet

Parcel Data Source: Tarrant Appraisal District Parcels 2015 Zoning Data Sources: Fort Worth - 2016, Lake Worth - 2013, River Oaks - 2014 , Sansom Park - 2005 Date: 8/08/2016



Current Zoning

Exhibit 2-5

State Highway 199
Corridor Master Plan

Legend

- SH 199
- Parcel Boundaries
- Study Area Boundary
- City Limits

Current Zoning

- Commercial
- Industrial
- Mixed Use
- Mobile Home
- Multi Family
- Parks
- Planned Development
- Public
- Single Family

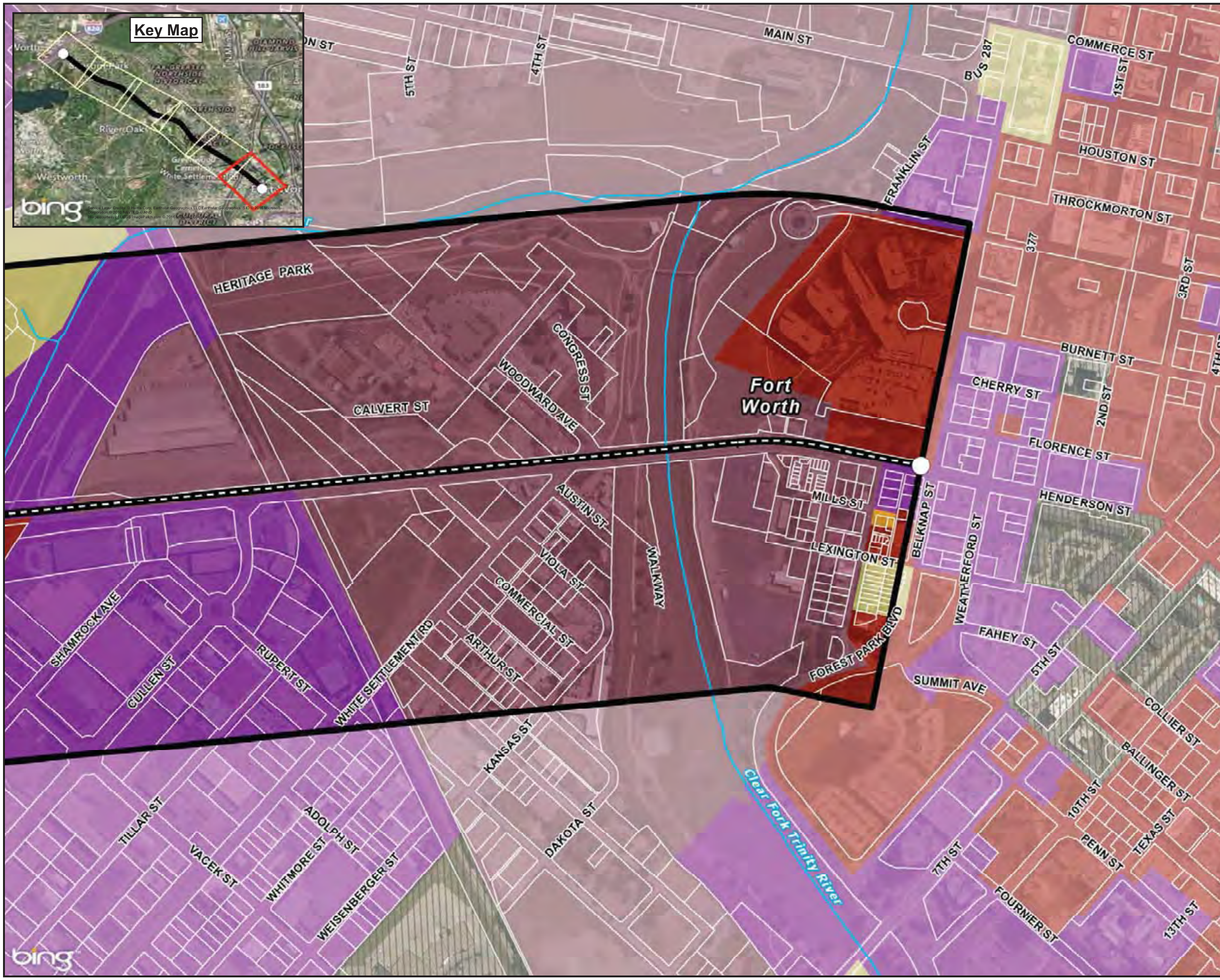
0 500 1,000
Feet

Parcel Data Source: Tarrant Appraisal District Parcels 2015 Zoning Data Sources: Fort Worth - 2016, Lake Worth - 2013, River Oaks - 2014, Sansom Park - 2005 Date: 8/08/2016

Current Zoning

Exhibit 2-6

State Highway 199
Corridor Master Plan



Legend

- SH 199
- Parcel Boundaries
- Study Area Boundary
- City Limits

Current Zoning

- Commercial
- Industrial
- Mixed Use
- Mobile Home
- Multi Family
- Parks
- Planned Development
- Public
- Single Family

0 500 1,000
Feet

Parcel Data Source: Tarrant Appraisal District Parcels 2015 Zoning Data Sources: Fort Worth - 2016, Lake Worth - 2013, River Oaks - 2014 , Sansom Park - 2005 Date: 8/08/2016

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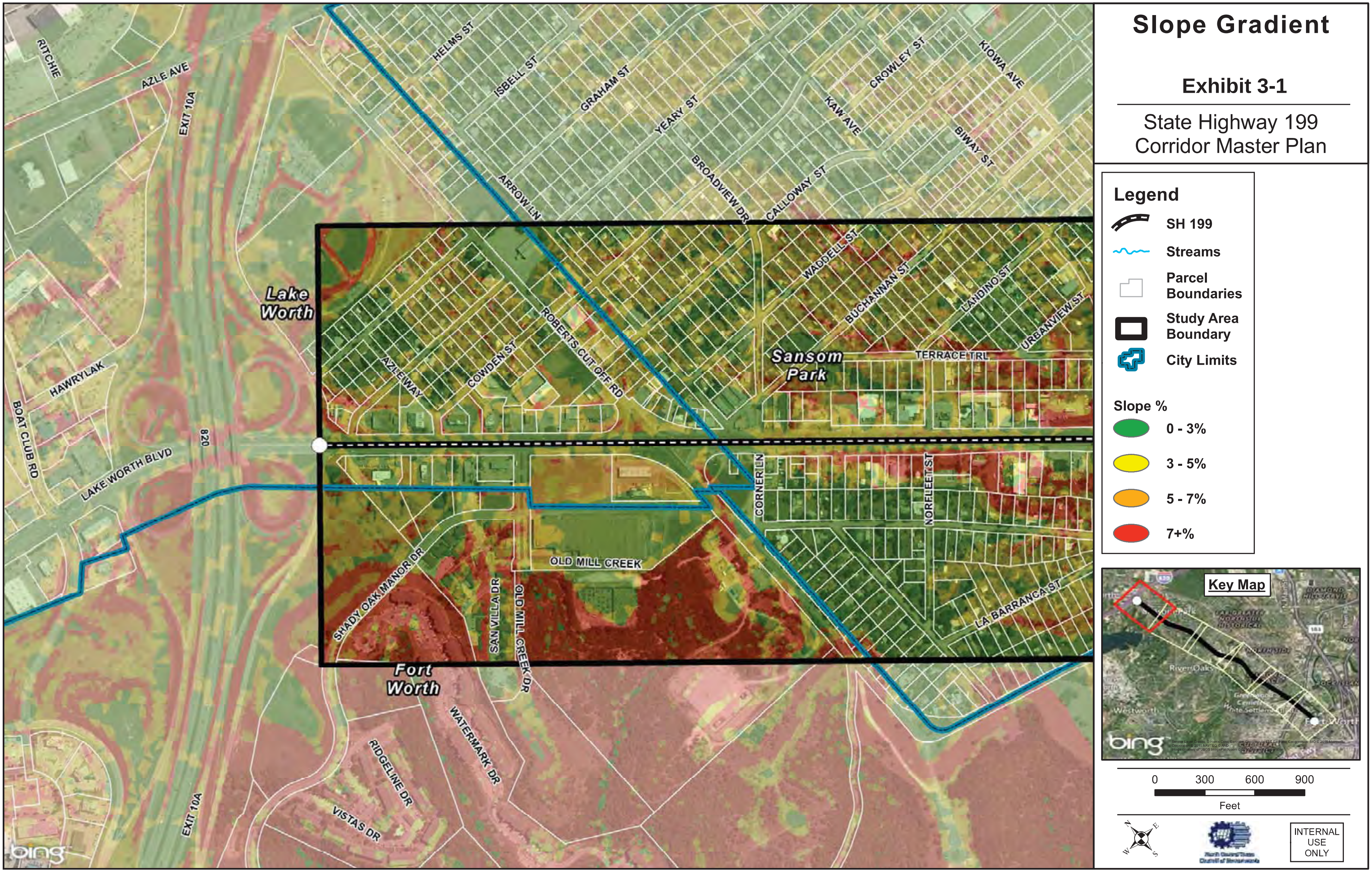
Exhibit 3

Slope Gradient

Slope Gradient

Exhibit 3-1

State Highway 199
Corridor Master Plan

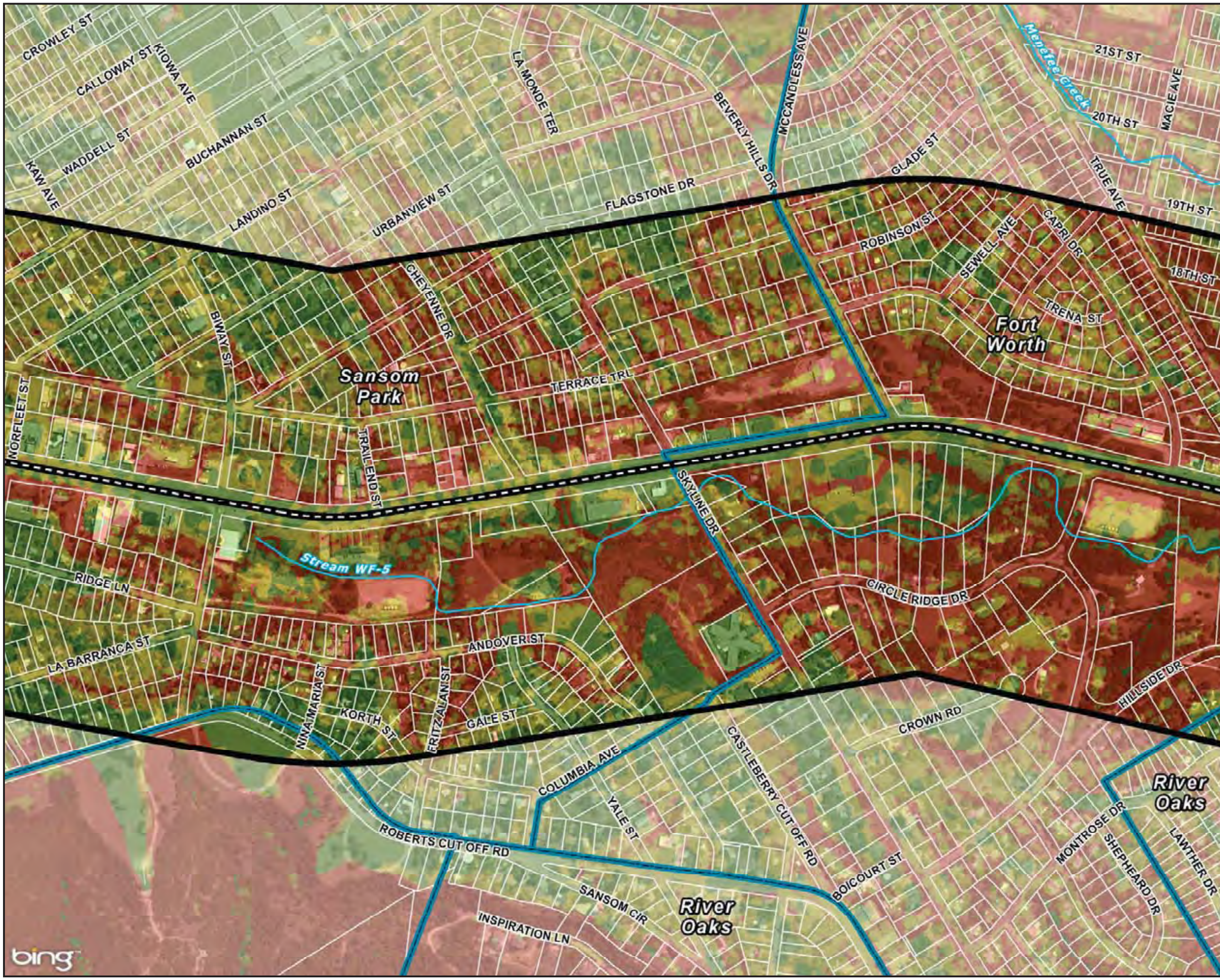


Topography Data Source: City of Fort Worth 2007 Parcel Data Source: Tarrant Appraisal District Parcels 2015 Date: 8/24/2016

Slope Gradient

Exhibit 3-2

State Highway 199
Corridor Master Plan



Legend

- SH 199
- Streams
- Parcel Boundaries
- Study Area Boundary
- City Limits

Slope %

- 0 - 3%
- 3 - 5%
- 5 - 7%
- 7+%

0 300 600 900
Feet

INTERNAL USE ONLY

Topography Data Source: City of Fort Worth 2007 Parcel Data Source: Tarrant Appraisal District Parcels 2015 Date: 8/24/2016

Slope Gradient

Exhibit 3-3

State Highway 199
Corridor Master Plan

Legend

- SH 199
- Streams
- Parcel Boundaries
- Study Area Boundary
- City Limits

Slope %

- 0 - 3%
- 3 - 5%
- 5 - 7%
- 7+%

0 300 600 900
Feet

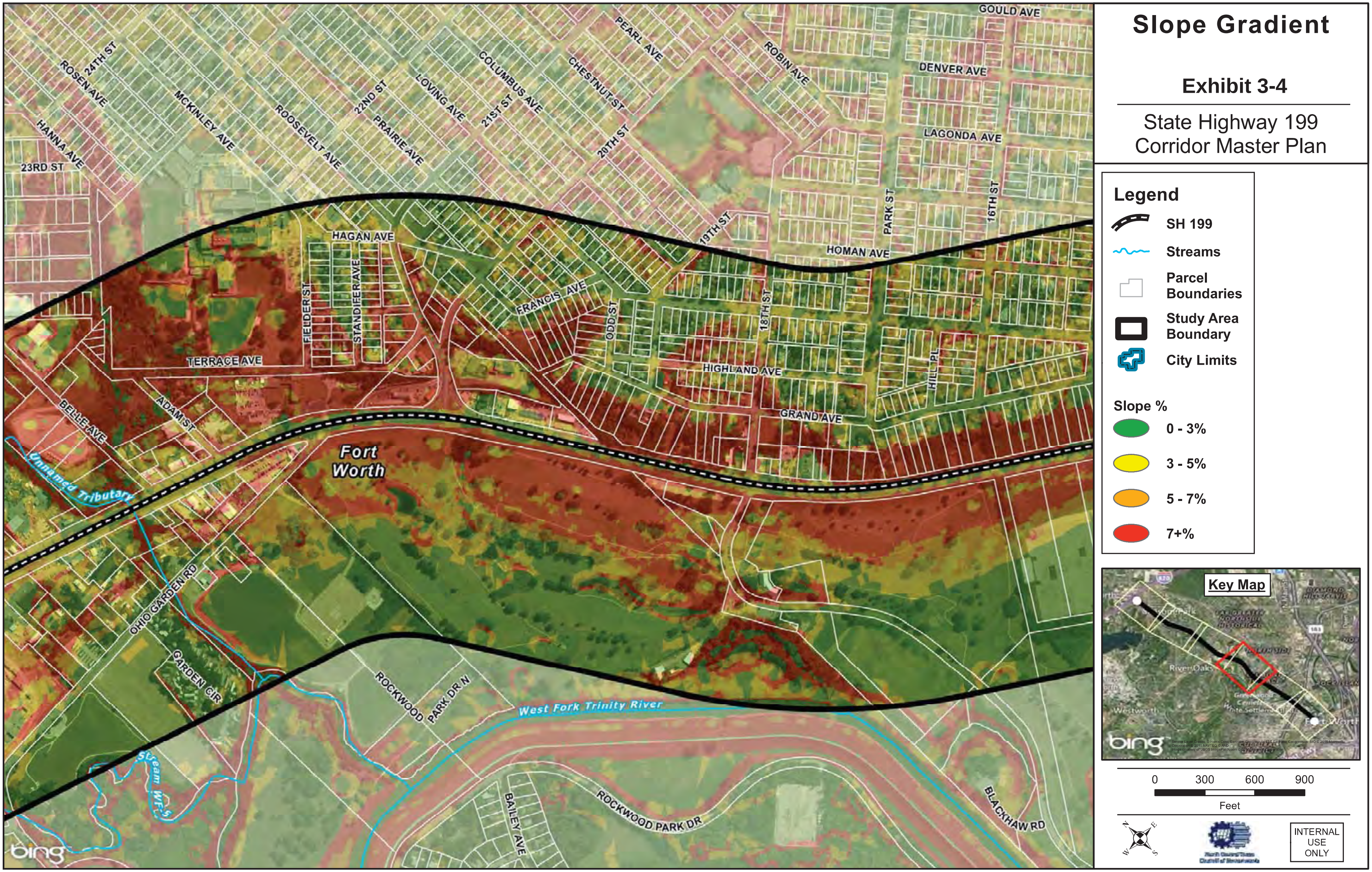
INTERNAL USE ONLY

Topography Data Source: City of Fort Worth 2007 Parcel Data Source: Tarrant Appraisal District Parcels 2015 Date: 8/24/2016

Slope Gradient

Exhibit 3-4

State Highway 199
Corridor Master Plan

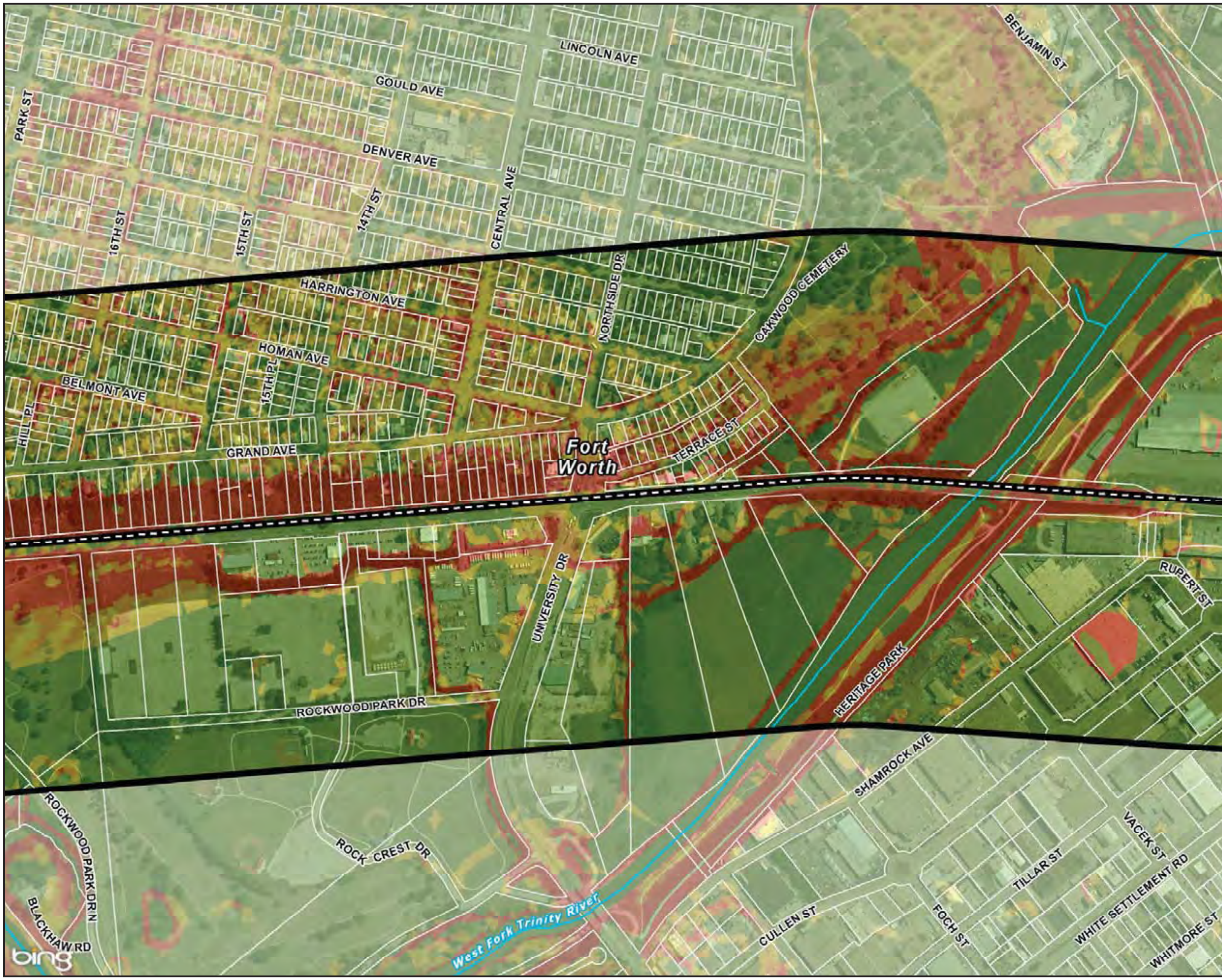


Topography Data Source: City of Fort Worth 2007 Parcel Data Source: Tarrant Appraisal District Parcels 2015 Date: 8/24/2016

Slope Gradient

Exhibit 3-5

State Highway 199
Corridor Master Plan



Legend

- SH 199
- Streams
- Parcel Boundaries
- Study Area Boundary
- City Limits

Slope %

- 0 - 3%
- 3 - 5%
- 5 - 7%
- 7+%

0 300 600 900
Feet

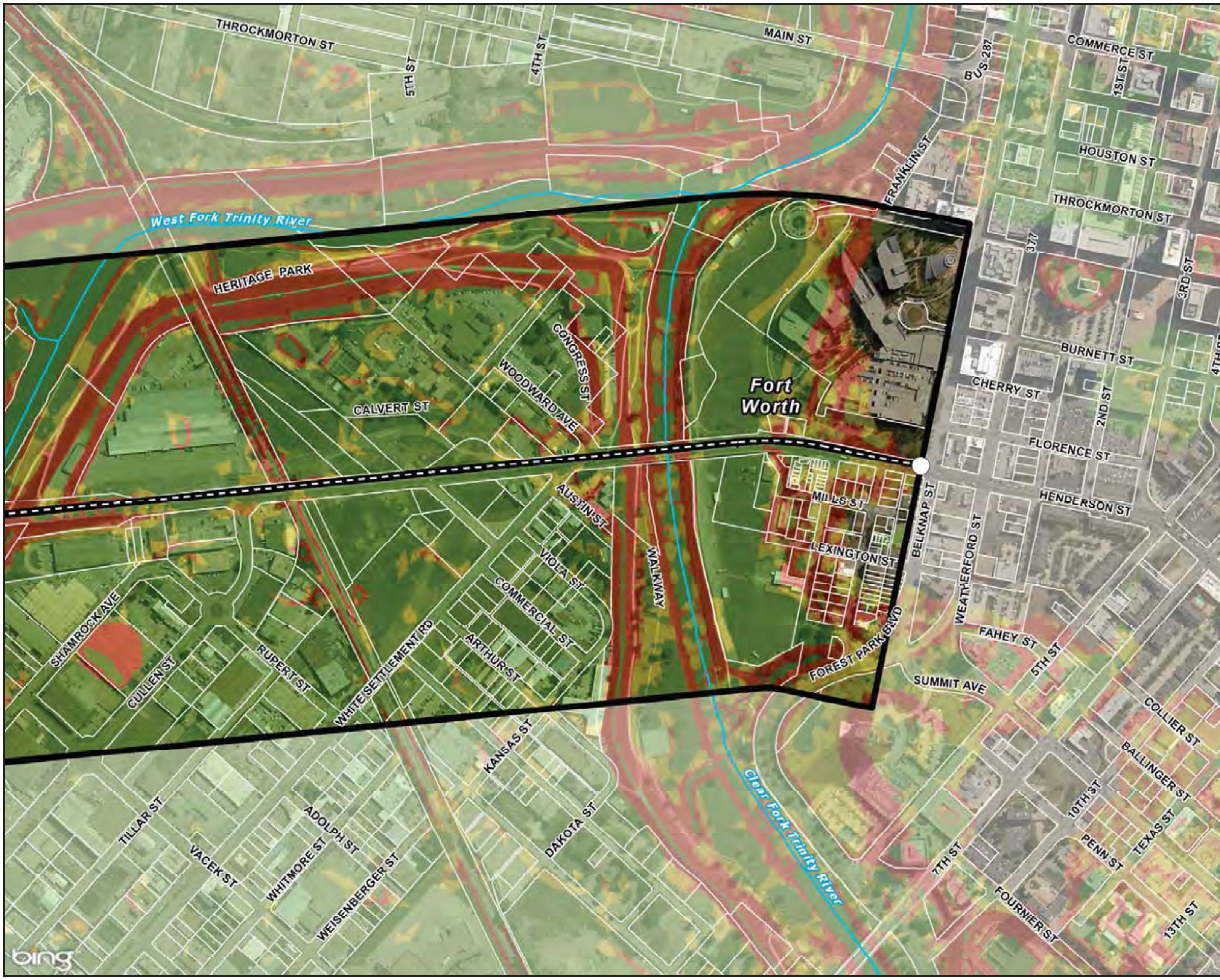
INTERNAL USE ONLY

Topography Data Source: City of Fort Worth 2007 Parcel Data Source: Tarrant Appraisal District Parcels 2015 Date: 8/24/2016

Slope Gradient

Exhibit 3-6

State Highway 199
Corridor Master Plan



Legend

- SH 199
- Streams
- Parcel Boundaries
- Study Area Boundary
- City Limits

Slope %

- 0 - 3%
- 3 - 5%
- 5 - 7%
- 7+%

0 300 600 900
Feet

INTERNAL USE ONLY

Topography Data Source: City of Fort Worth 2007 Parcel Data Source: Tarrant Appraisal District Parcels 2015 Date: 8/24/2016

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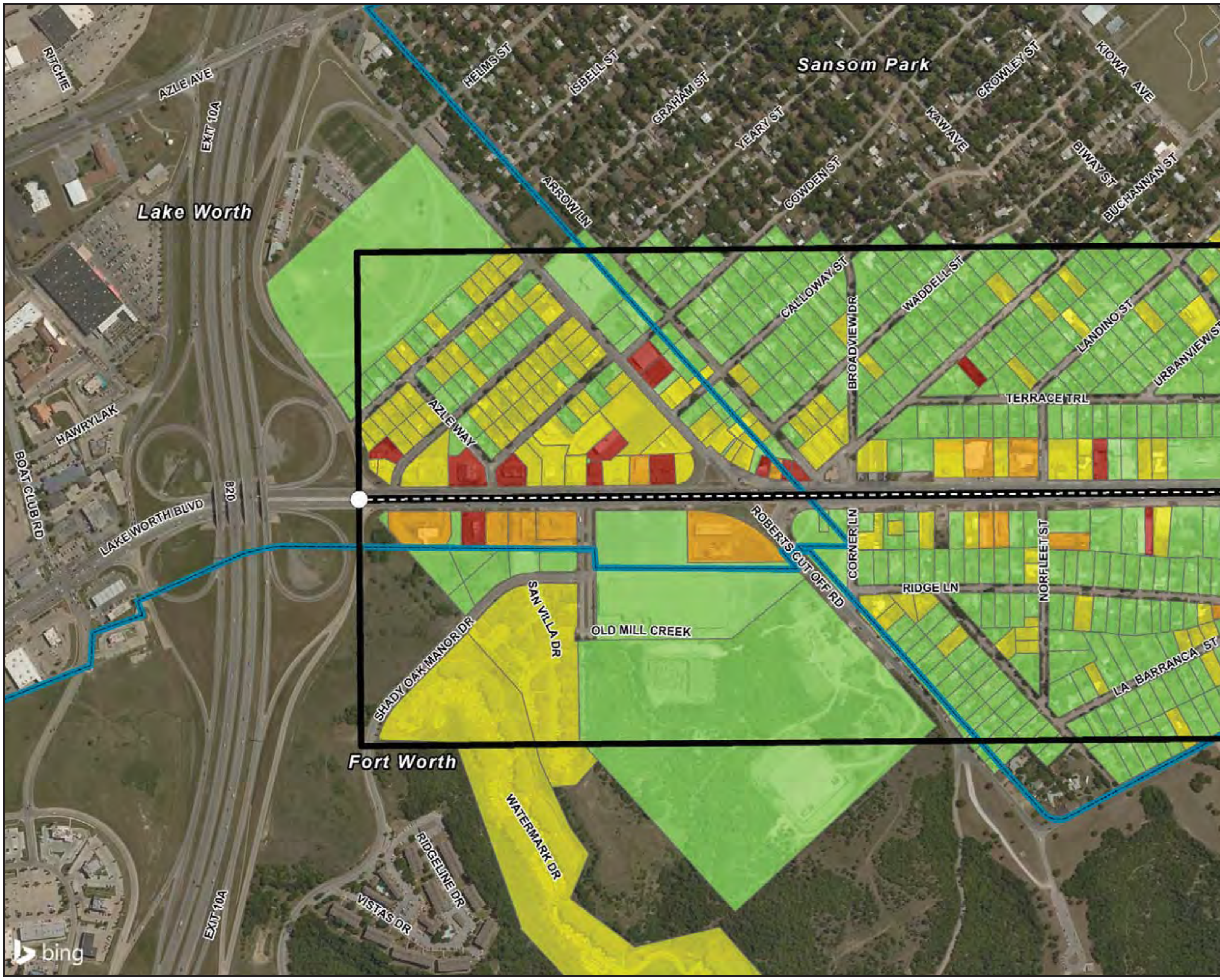
Exhibit 4

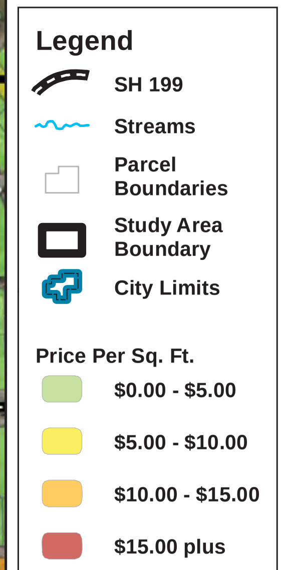
Parcel Values

Parcel Values

Exhibit 4-1

State Highway 199
Corridor Master Plan





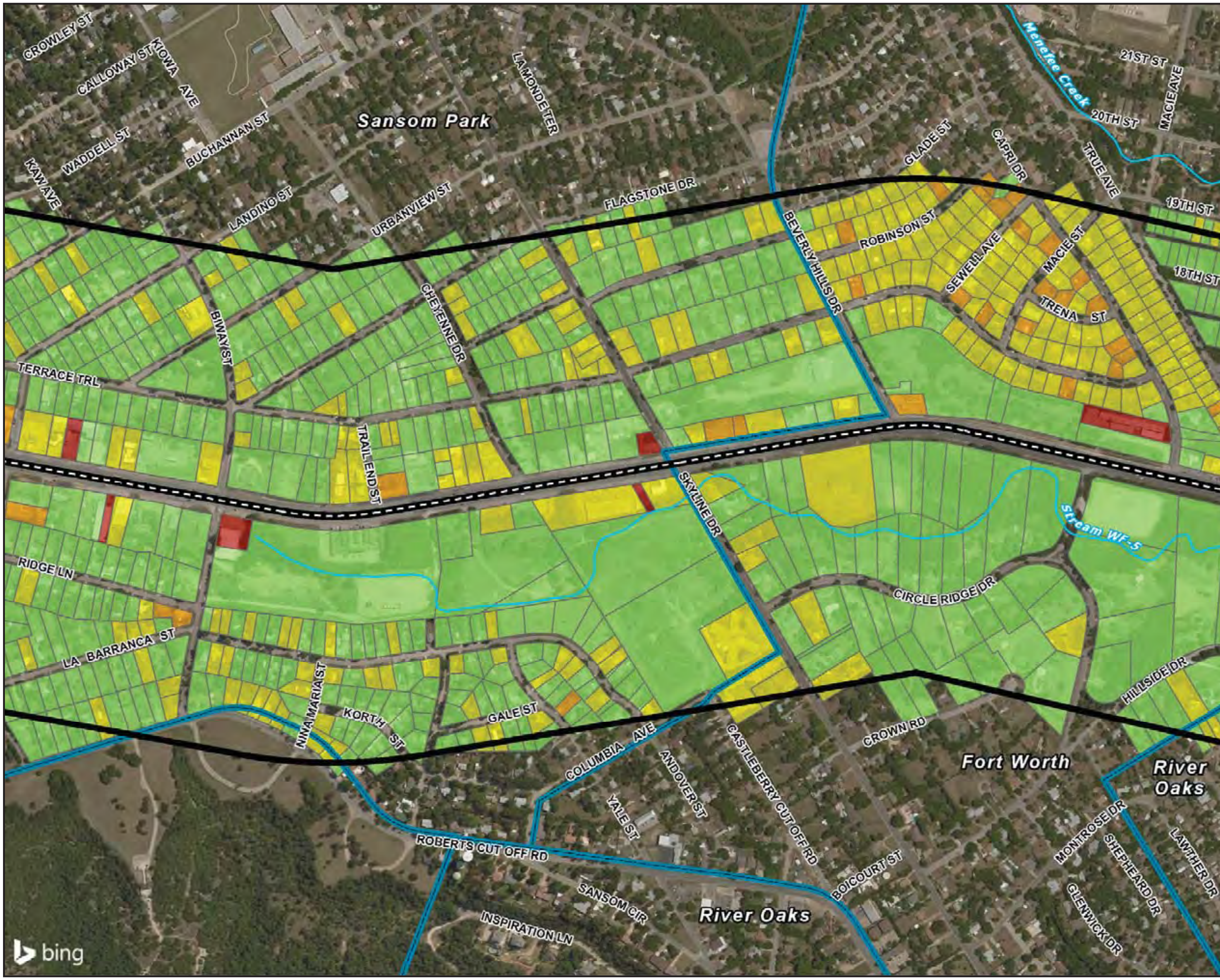
INTERNAL USE ONLY

Parcel Data Source: Tarrant Appraisal District Parcels 2015 Date: 11/28/2016

Parcel Values

Exhibit 4-2

State Highway 199
Corridor Master Plan



Legend

- SH 199
- Streams
- Parcel Boundaries
- Study Area Boundary
- City Limits

Price Per Sq. Ft.

- $0.00 - $5.00
- $5.00 - $10.00
- $10.00 - $15.00
- $15.00 plus

0 300 600 900
Feet

INTERNAL USE ONLY

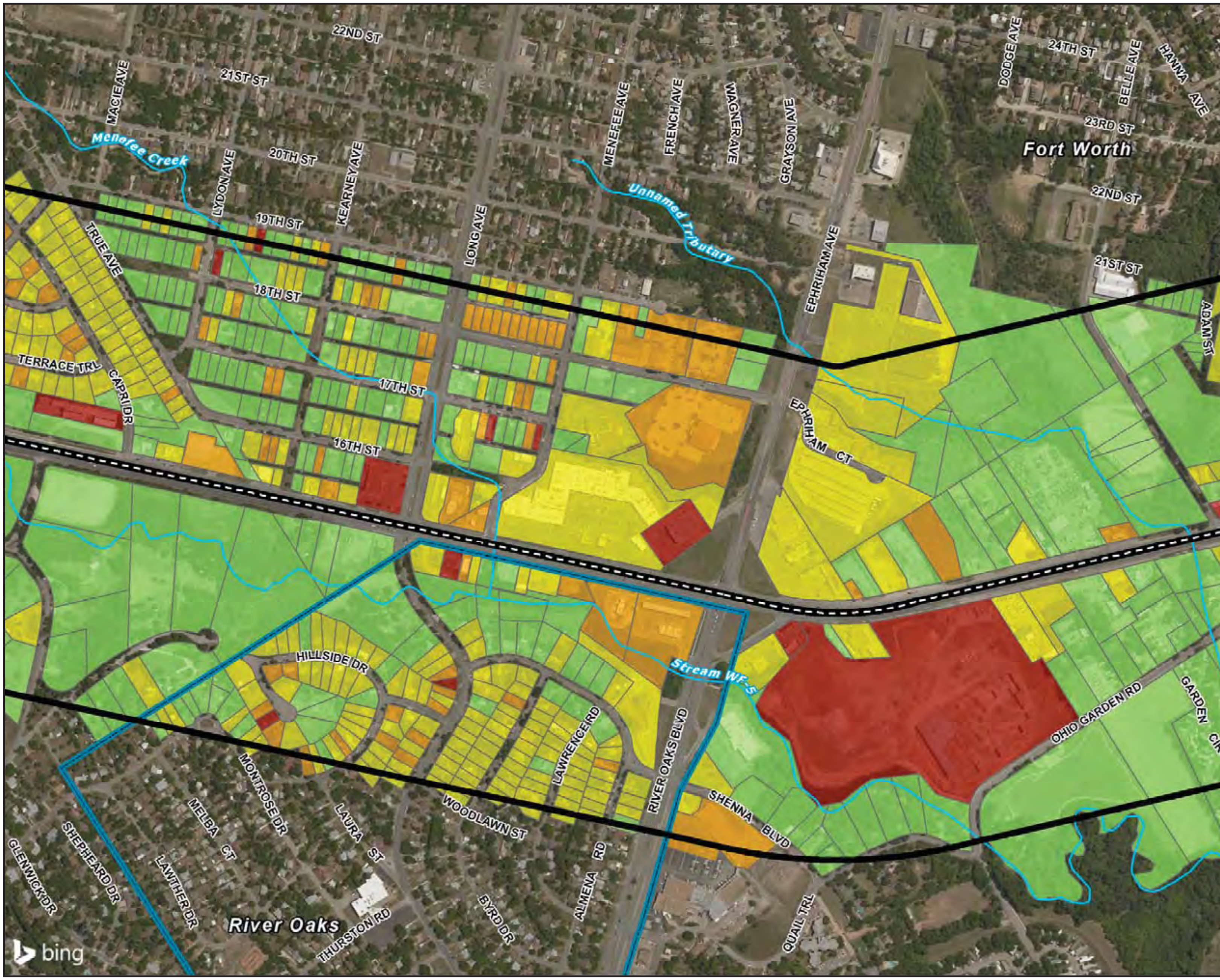
North Central Texas Council of Governments

Parcel Data Source: Tarrant Appraisal District Parcels 2015 Date: 11/28/2016

Parcel Values

Exhibit 4-3

State Highway 199
Corridor Master Plan



Legend

- SH 199
- Streams
- Parcel Boundaries
- Study Area Boundary
- City Limits

Price Per Sq. Ft.

- $0.00 - $5.00
- $5.00 - $10.00
- $10.00 - $15.00
- $15.00 plus

0 300 600 900
Feet

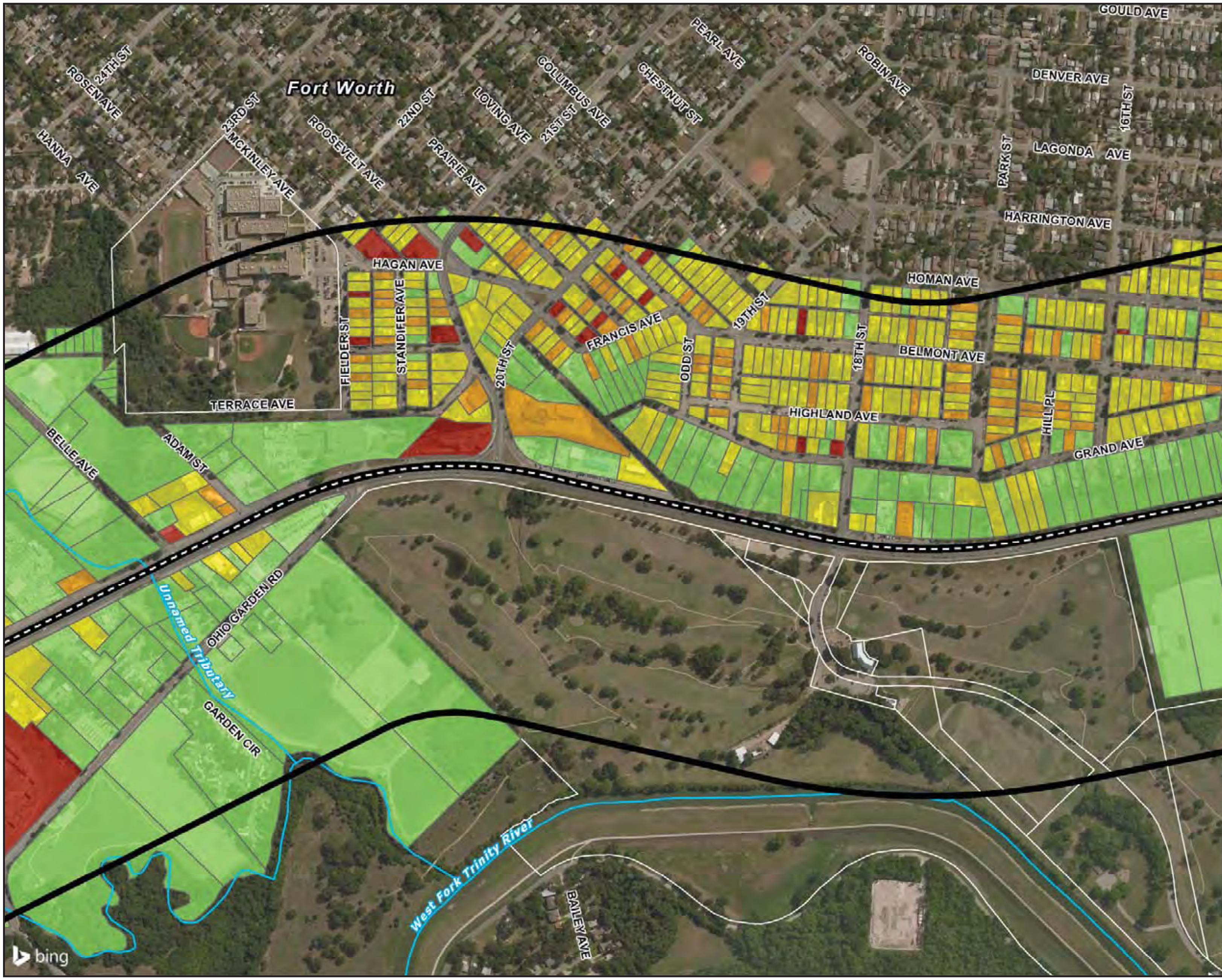
INTERNAL USE ONLY

Parcel Data Source: Tarrant Appraisal District Parcels 2015 Date: 11/28/2016

Parcel Values

Exhibit 4-4

State Highway 199
Corridor Master Plan



Legend

- SH 199
- Streams
- Parcel Boundaries
- Study Area Boundary
- City Limits

Price Per Sq. Ft.

- $0.00 - $5.00
- $5.00 - $10.00
- $10.00 - $15.00
- $15.00 plus

0 300 600 900
Feet

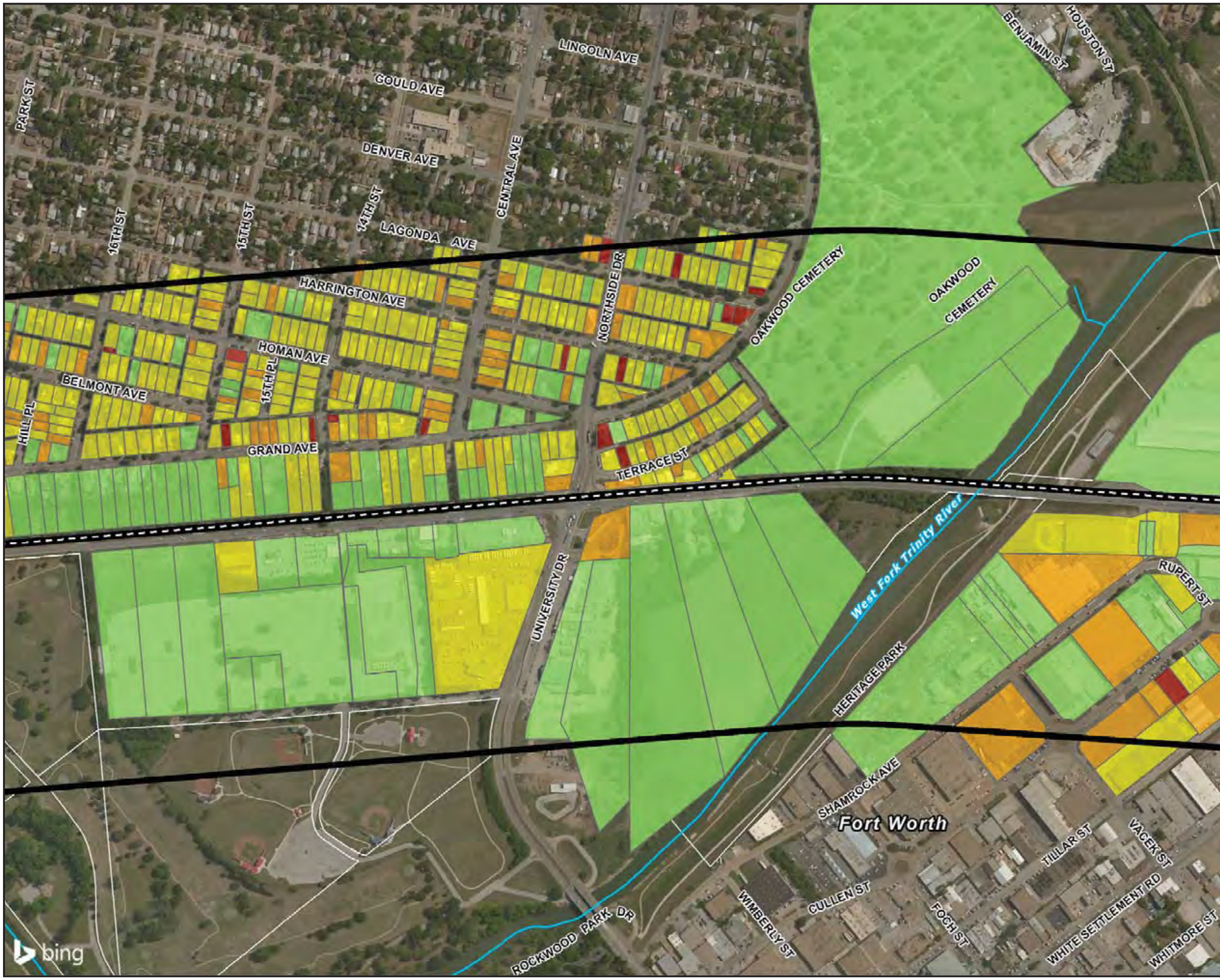
INTERNAL USE ONLY

Parcel Data Source: Tarrant Appraisal District Parcels 2015 Date: 02/17/2017

Parcel Values

Exhibit 4-5

State Highway 199
Corridor Master Plan



Legend

- SH 199
- Streams
- Parcel Boundaries
- Study Area Boundary
- City Limits

Price Per Sq. Ft.

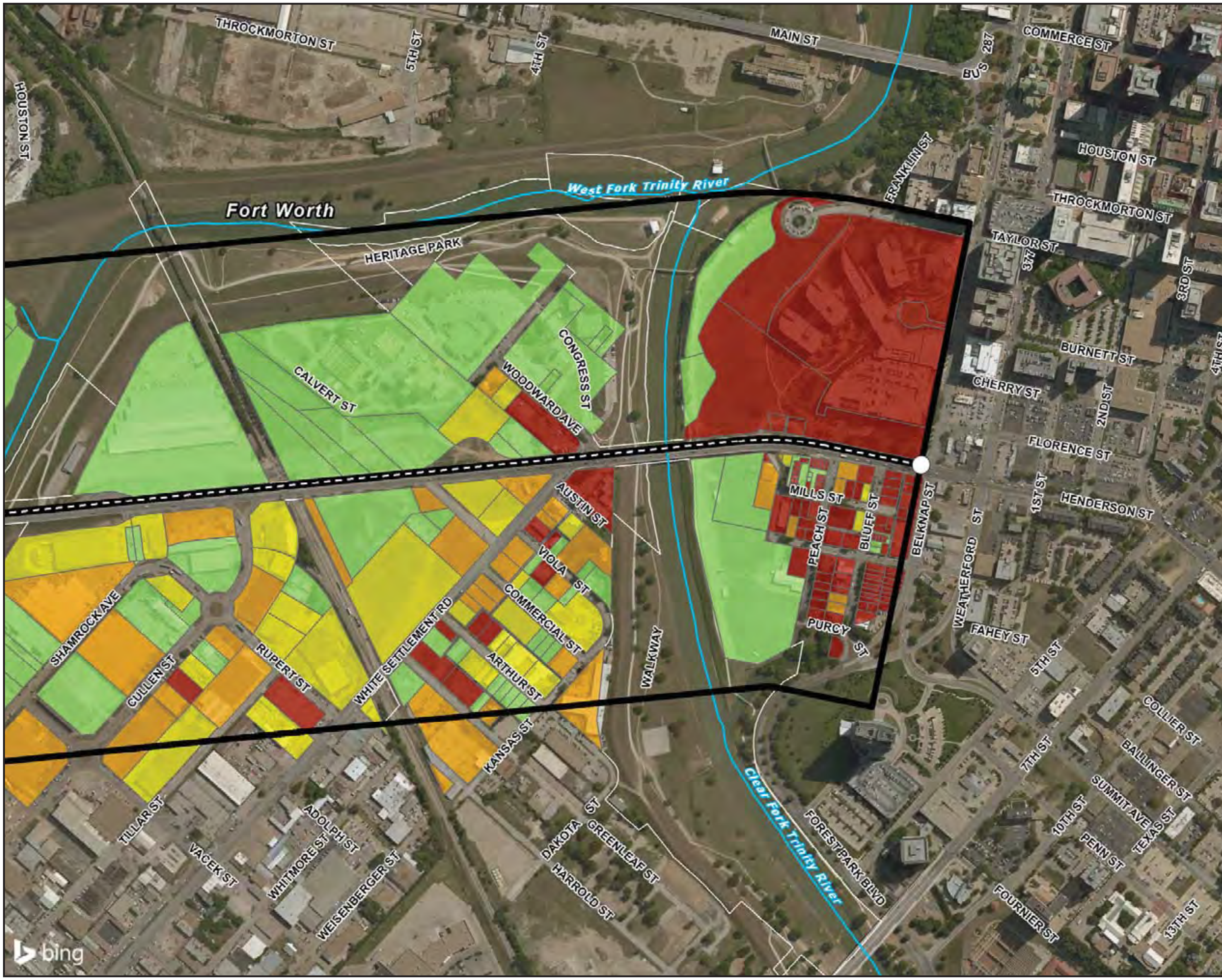
- $0.00 - $5.00
- $5.00 - $10.00
- $10.00 - $15.00
- $15.00 plus

0 300 600 900
Feet

North Central Texas Council of Governments

INTERNAL USE ONLY

Parcel Data Source: Tarrant Appraisal District Parcels 2015 Date: 11/28/2016



Parcel Values

Exhibit 4-6

State Highway 199
Corridor Master Plan

Legend

- SH 199
- Streams
- Parcel Boundaries
- Study Area Boundary
- City Limits

Price Per Sq. Ft.

- $0.00 - $5.00
- $5.00 - $10.00
- $10.00 - $15.00
- $15.00 plus

Key Map

0 300 600 900
Feet

INTERNAL USE ONLY

North Central Texas Council of Governments

Parcel Data Source: Tarrant Appraisal District Parcels 2015 Date: 11/28/2016

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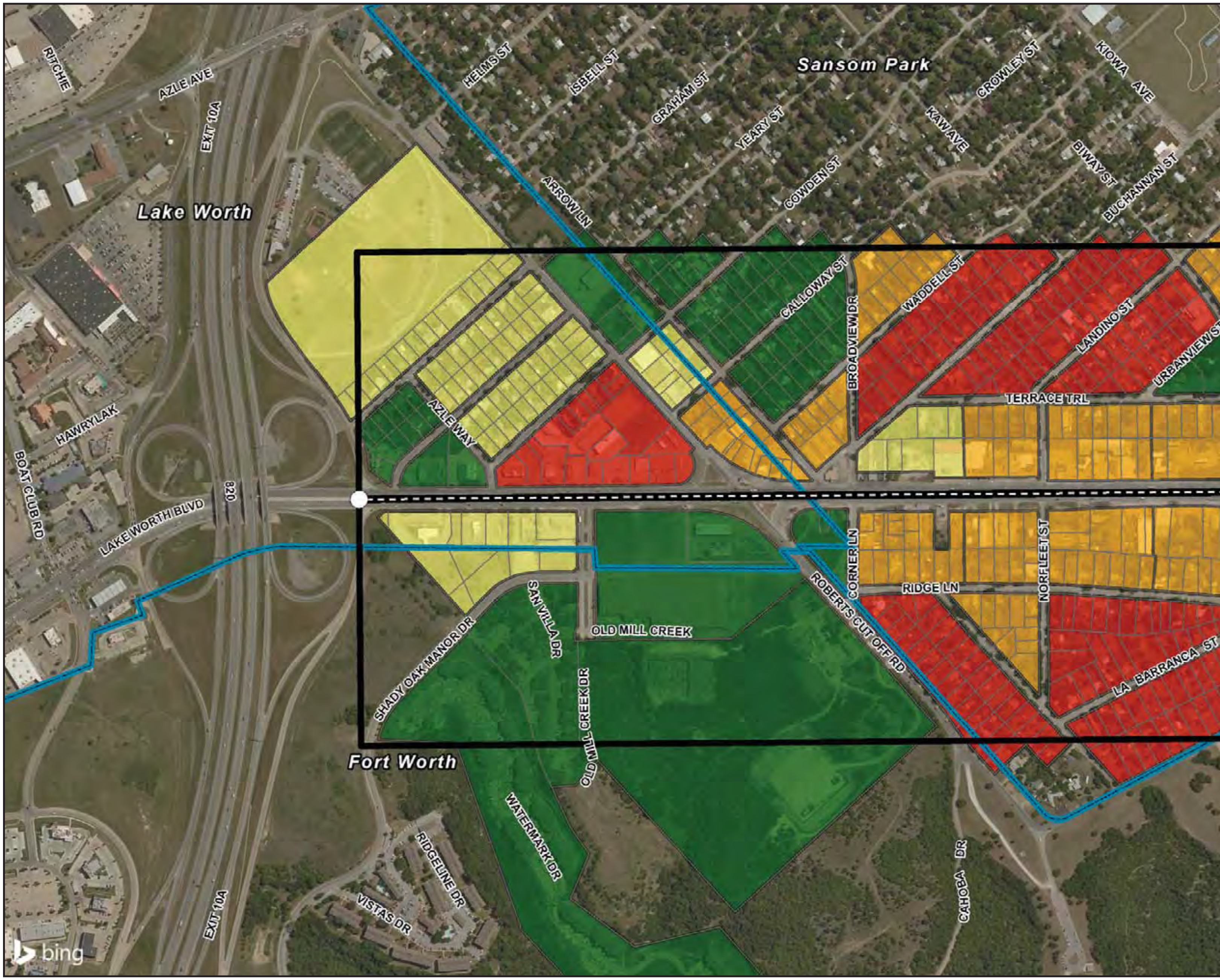
Exhibit 5

Ease of Assembly

Ease of Assembly

Exhibit 5-1

State Highway 199
Corridor Master Plan

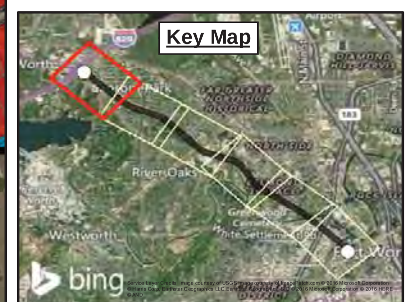


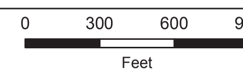
Legend

- SH 199
- Streams
- Parcel Boundaries
- Study Area Boundary
- City Limits

Owership Per Block

- 1-3
- 4-7
- 8-14
- 15+





INTERNAL USE ONLY

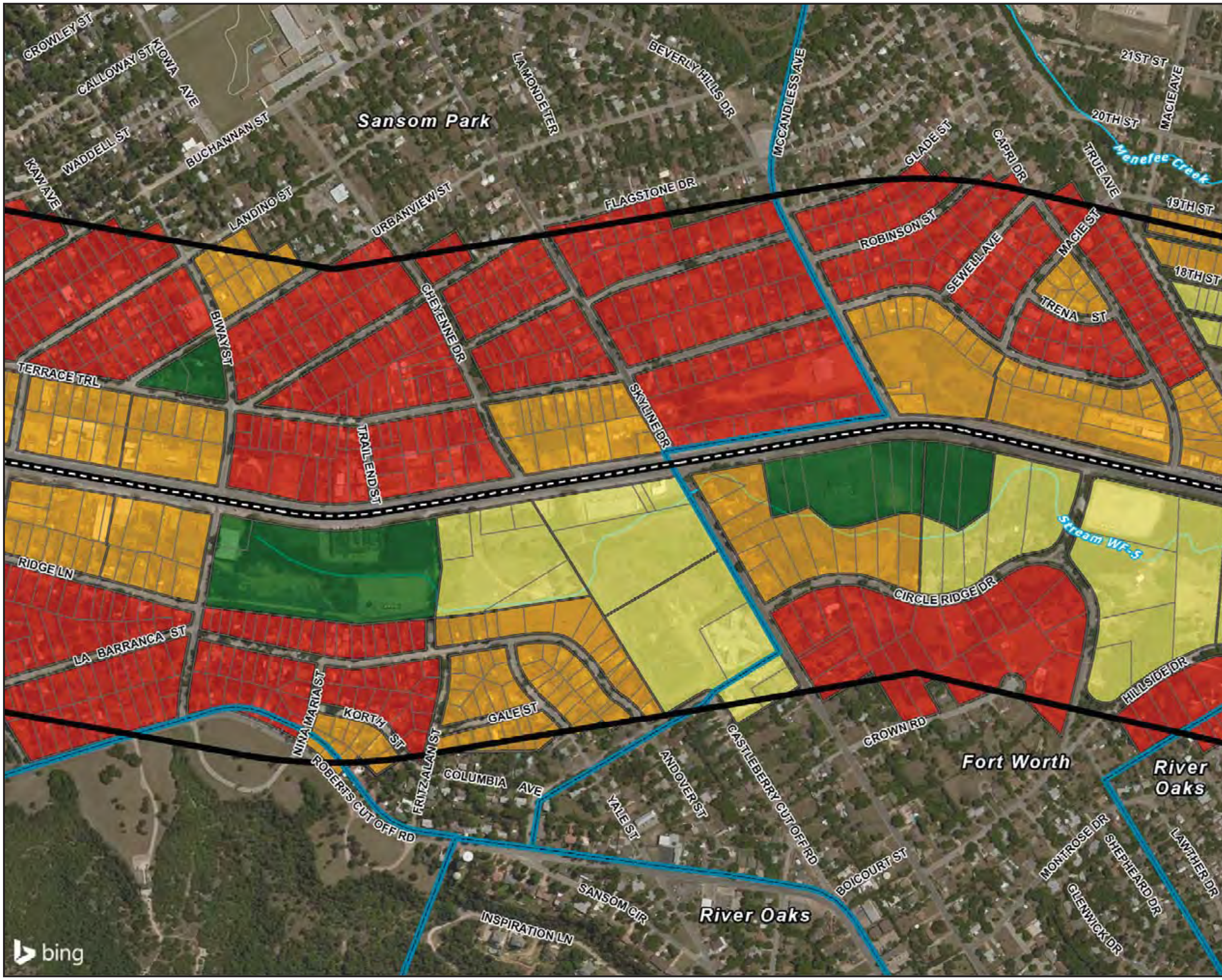
Parcel Data Source: Tarrant Appraisal District Parcels 2015

Date: 11/28/2016

Ease of Assembly

Exhibit 5-2

State Highway 199
Corridor Master Plan



Legend

- SH 199
- Streams
- Parcel Boundaries
- Study Area Boundary
- City Limits

Owership Per Block

- 1-3
- 4-7
- 8-14
- 15+

Key Map

0 300 600 900
Feet

INTERNAL USE ONLY

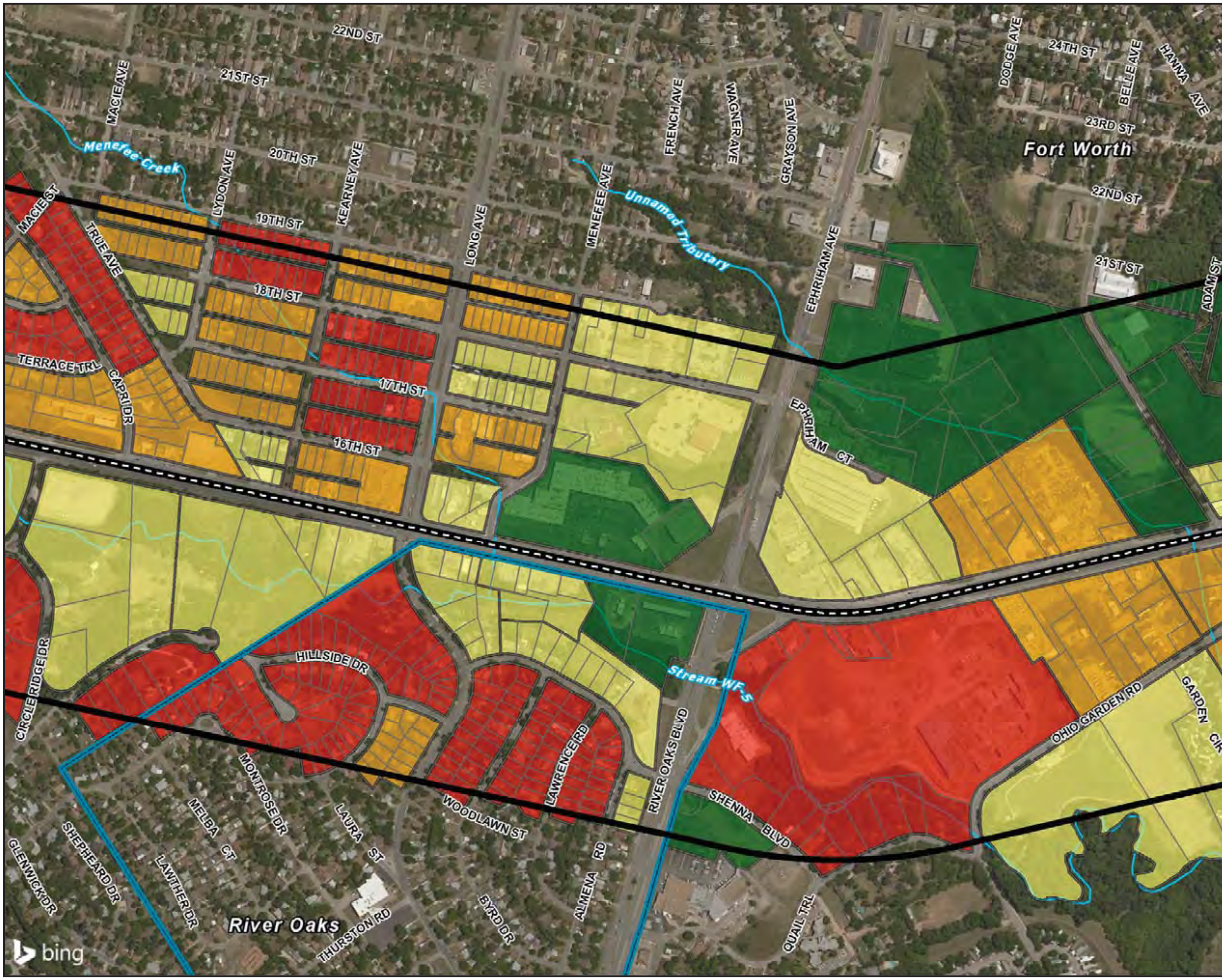
North Central Texas Council of Governments

Parcel Data Source: Tarrant Appraisal District Parcels 2015 Date: 11/28/2016

Ease of Assembly

Exhibit 5-3

State Highway 199
Corridor Master Plan



Legend

- SH 199
- Streams
- Parcel Boundaries
- Study Area Boundary
- City Limits

Owership Per Block

- 1-3
- 4-7
- 8-14
- 15+

0 300 600 900
Feet

INTERNAL USE ONLY

North Central Texas Council of Governments

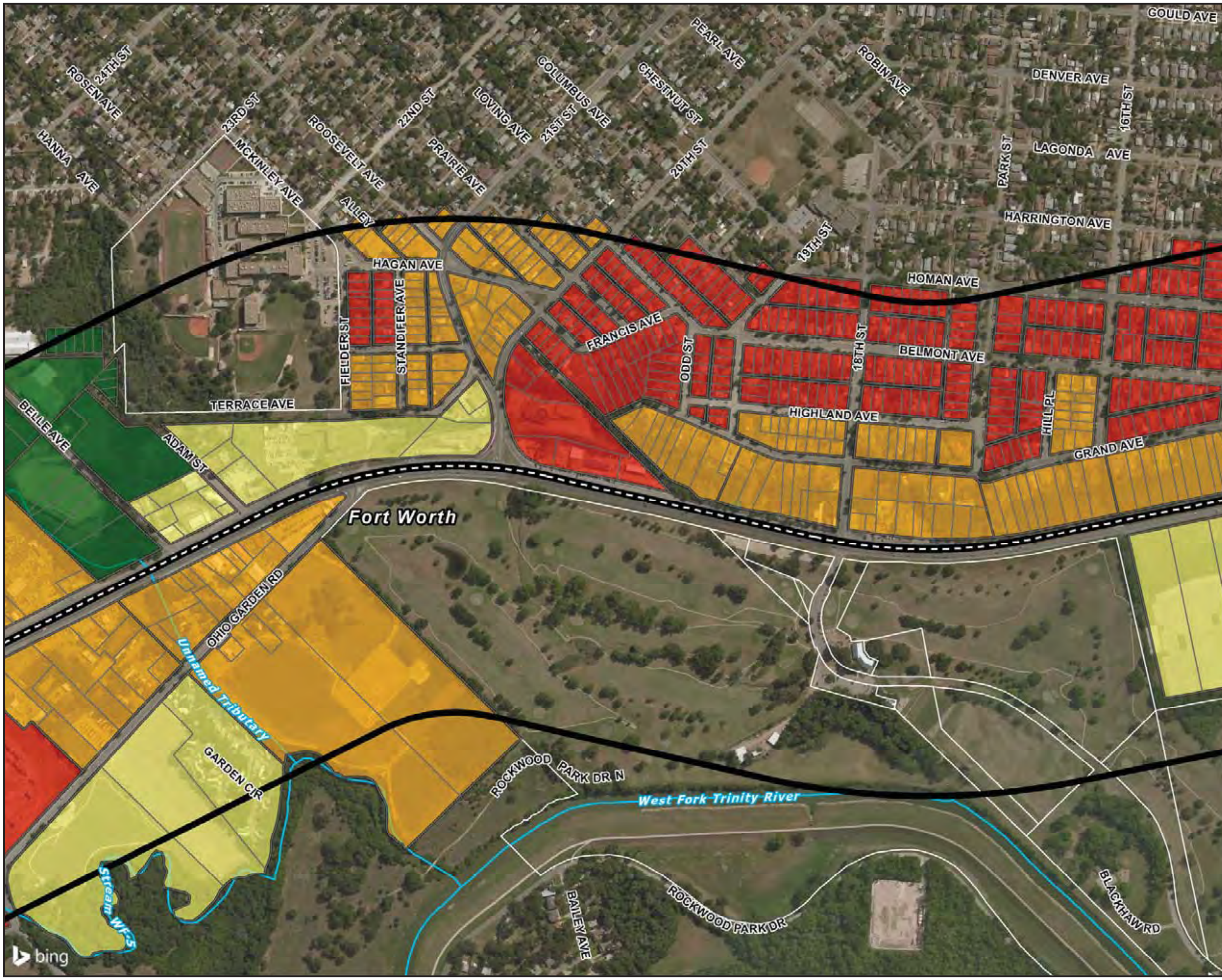
Parcel Data Source: Tarrant Appraisal District Parcels 2015

Date: 11/28/2016

Ease of Assembly

Exhibit 5-4

State Highway 199
Corridor Master Plan



Legend

- SH 199
- Streams
- Parcel Boundaries
- Study Area Boundary
- City Limits

Owership Per Block

- 1-3
- 4-7
- 8-14
- 15+

0 300 600 900
Feet

INTERNAL USE ONLY

North Central Texas Council of Governments

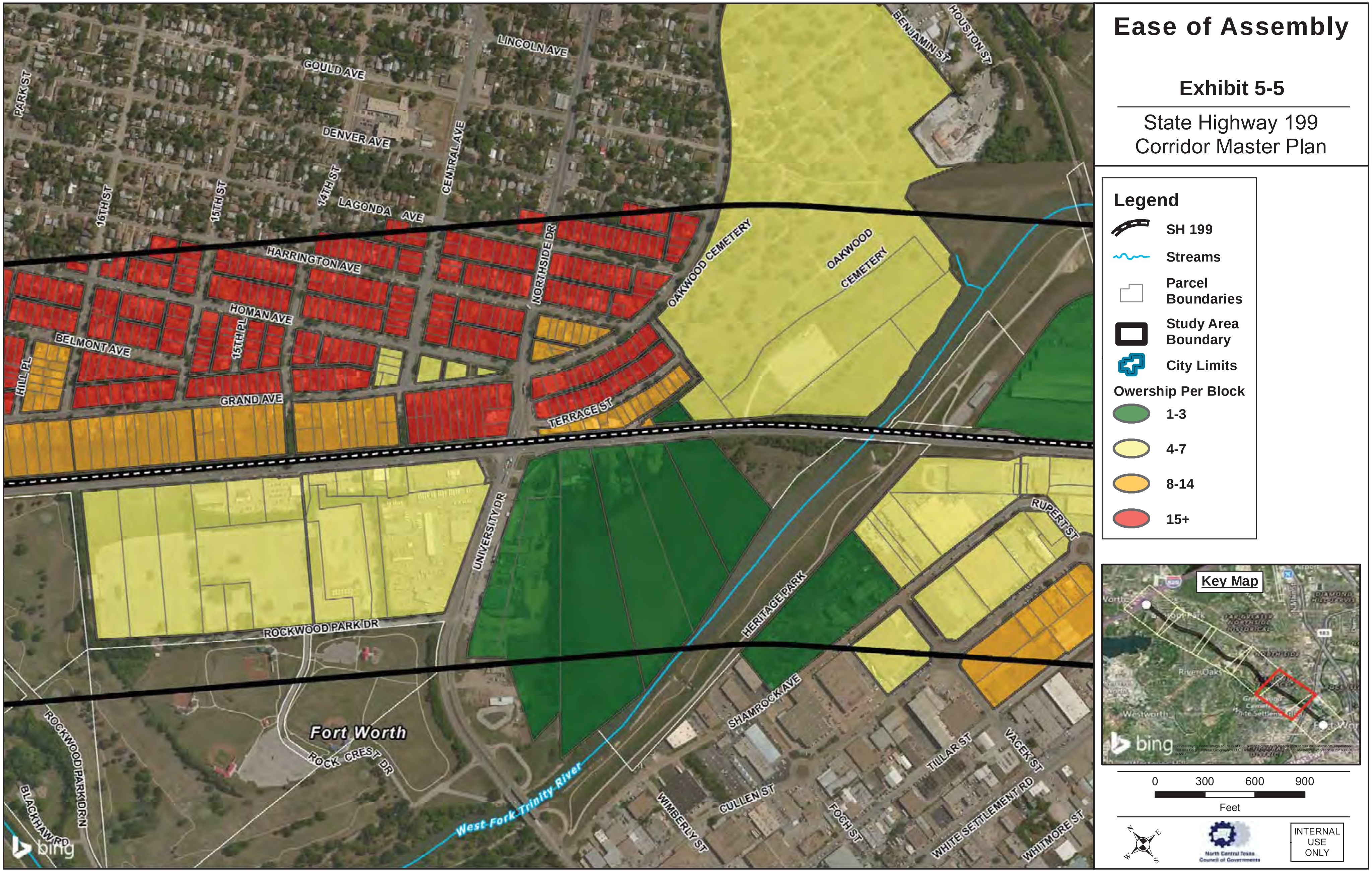
Parcel Data Source: Tarrant Appraisal District Parcels 2015

Date: 02/17/2017

Ease of Assembly

Exhibit 5-5

State Highway 199
Corridor Master Plan



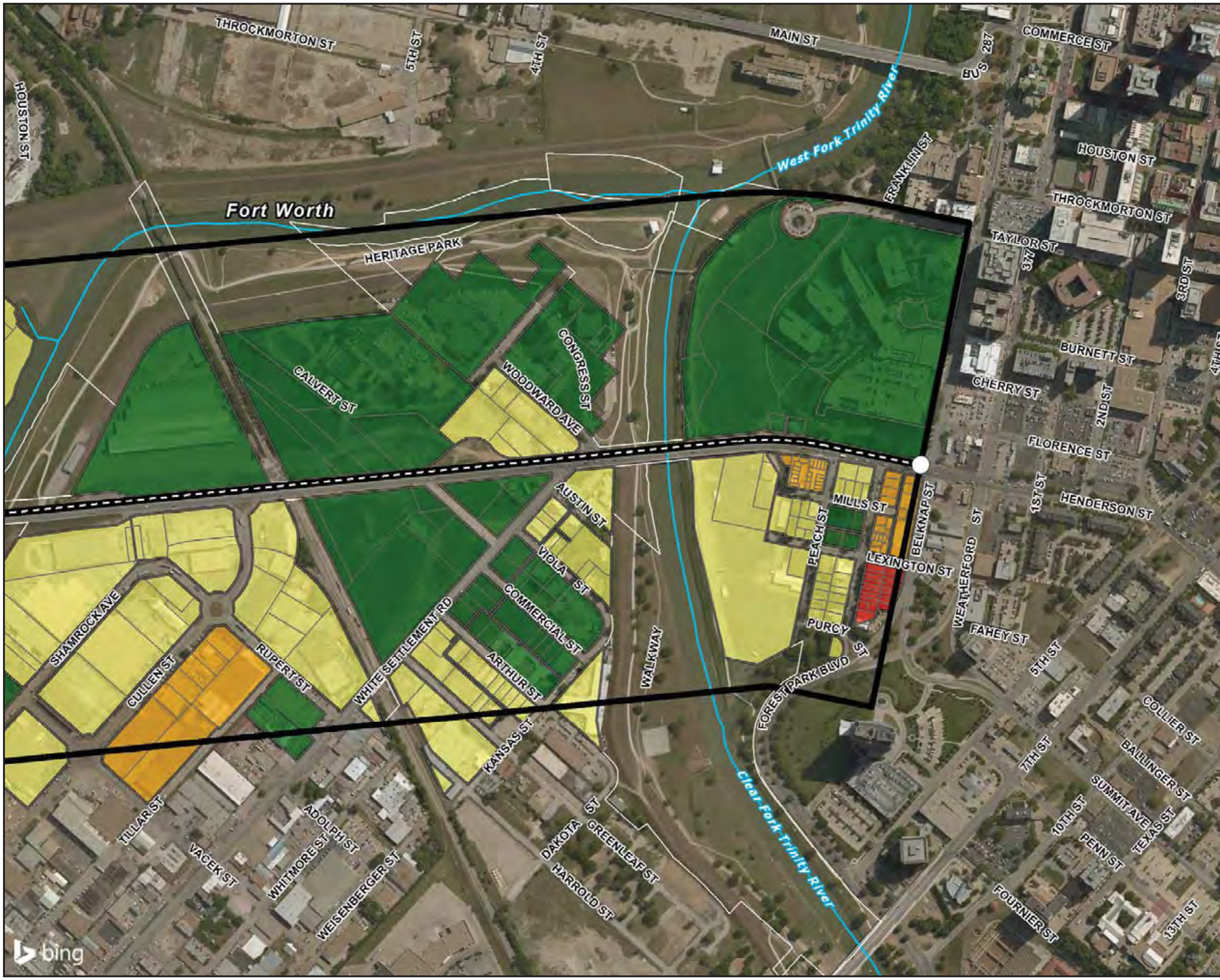
Parcel Data Source: Tarrant Appraisal District Parcels 2015

Date: 11/28/2016

Ease of Assembly

Exhibit 5-6

State Highway 199
Corridor Master Plan



Legend

- SH 199
- Streams
- Parcel Boundaries
- Study Area Boundary
- City Limits

Owership Per Block

- 1-3
- 4-7
- 8-14
- 15+

Key Map

0 300 600 900
Feet

North Central Texas Council of Governments

INTERNAL USE ONLY

Parcel Data Source: Tarrant Appraisal District Parcels 2015 Date: 11/28/2016

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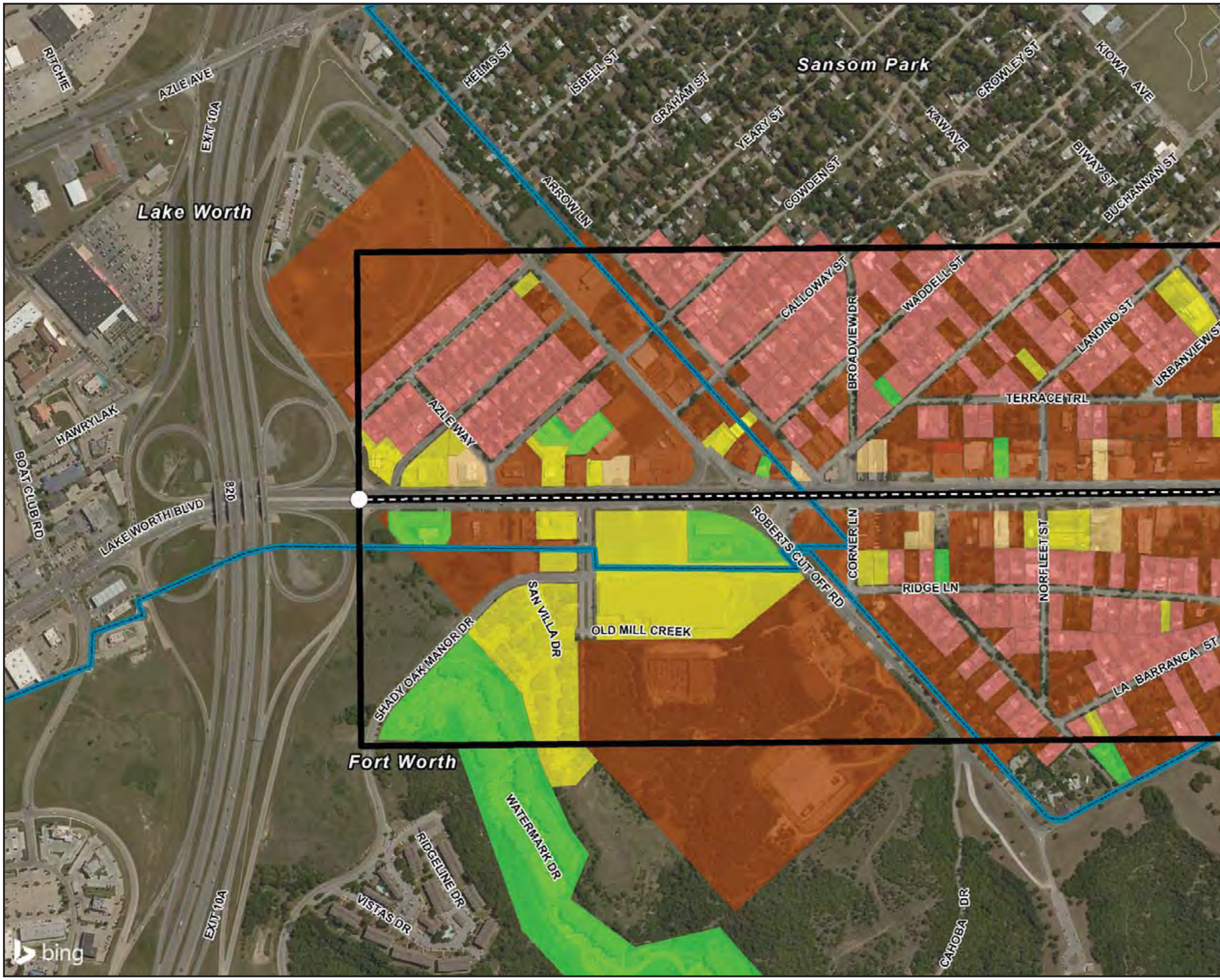
Exhibit 6

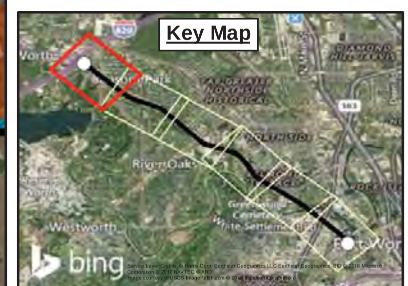
Property Ownership

Property Ownership

Exhibit 6-1

State Highway 199
Corridor Master Plan





0 300 600 900
Feet

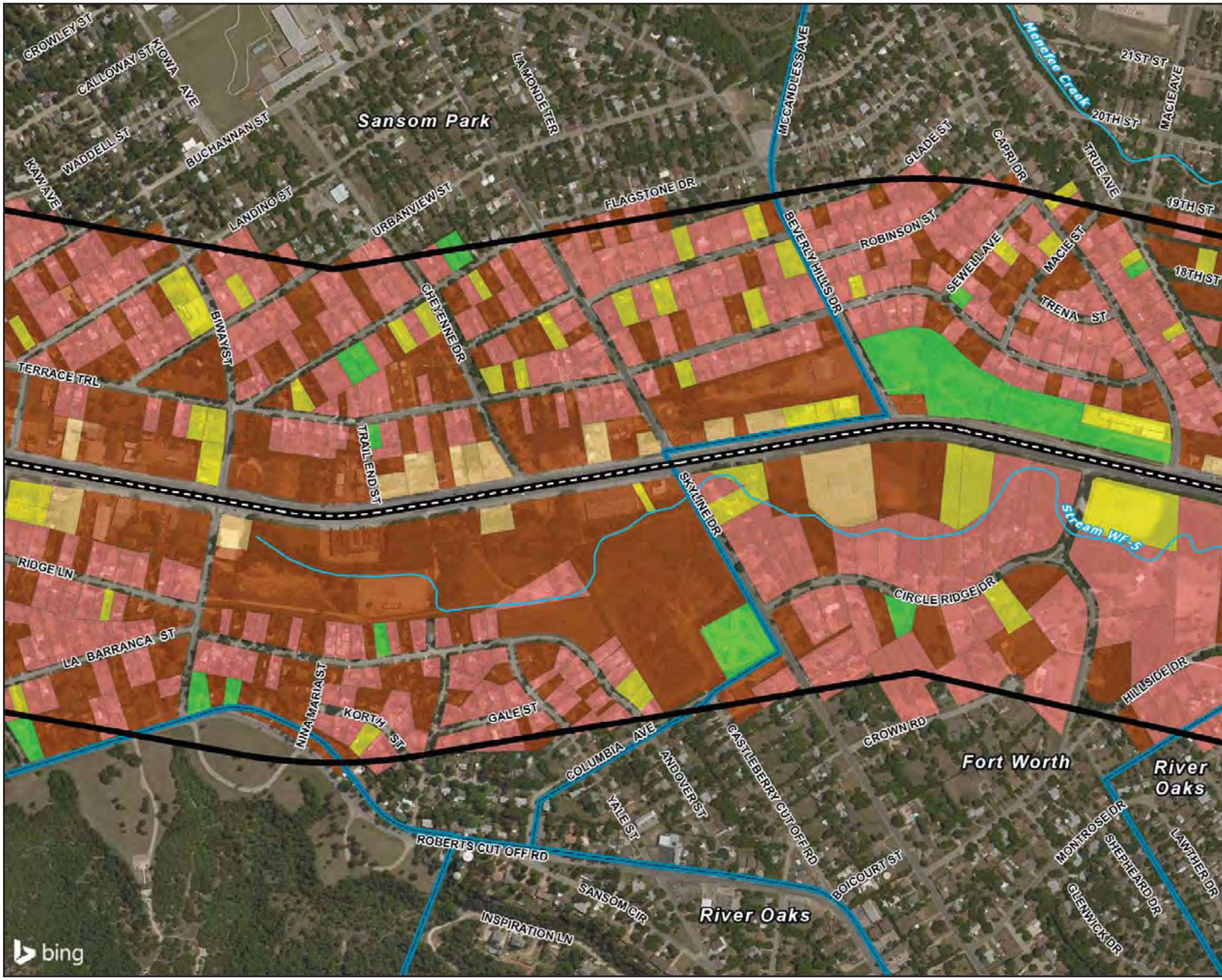
INTERNAL USE ONLY

Parcel Data Source: Tarrant Appraisal District Parcels 2015 Date: 11/28/2016

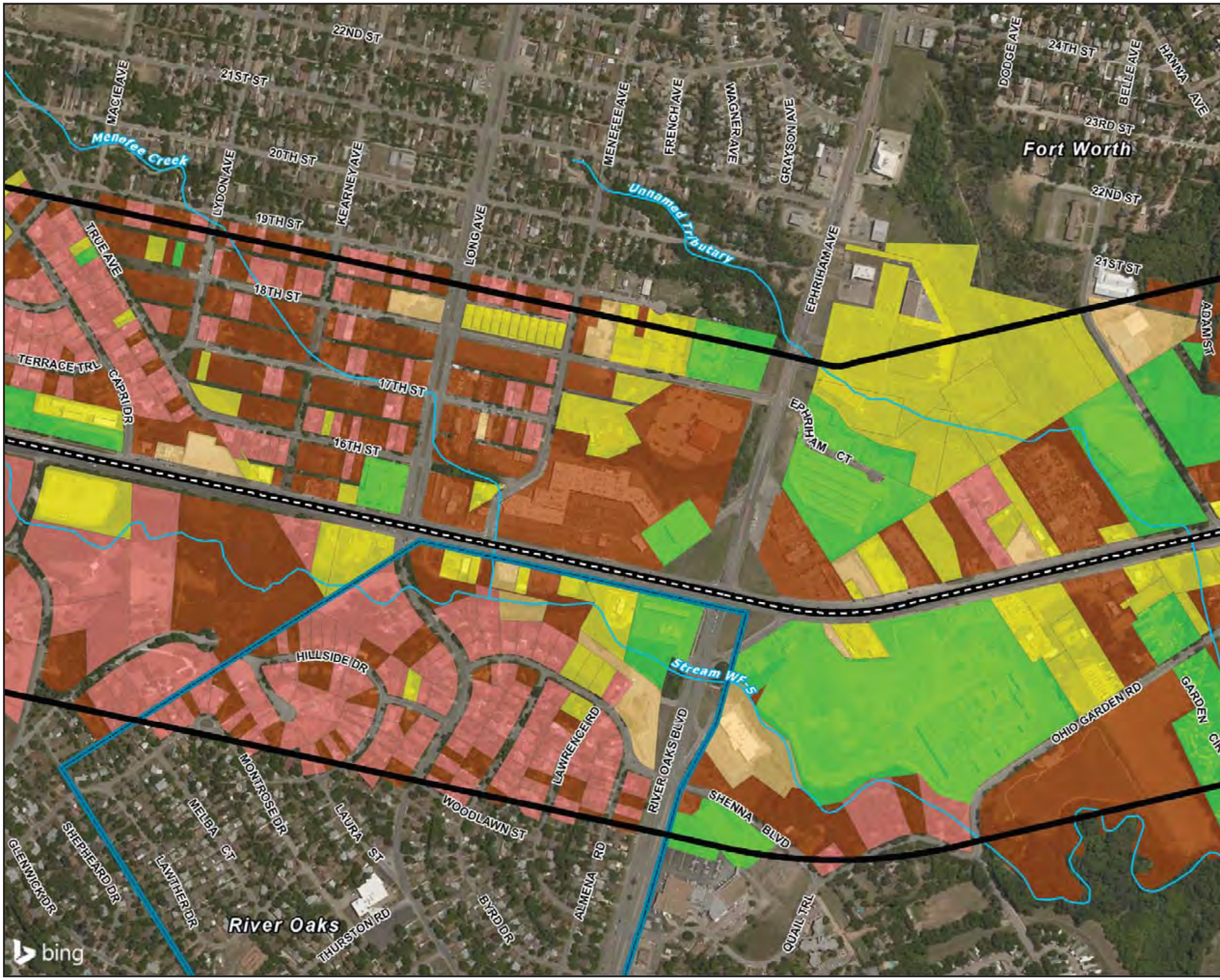
Property Ownership

Exhibit 6-2

State Highway 199
Corridor Master Plan



Parcel Data Source: Tarrant Appraisal District Parcels 2015 Date: 11/28/2016



Property Ownership

Exhibit 6-3

State Highway 199
Corridor Master Plan

Legend

- SH 199
- Streams
- Parcel Boundaries
- Study Area Boundary
- City Limits

Property Owner Type

- Com, On-Site, In County
- Res, On-Site, In County
- Not On-Site, In County
- Out of County, In State
- Out of State

0 300 600 900
Feet

N E S W

North Central Texas Council of Governments

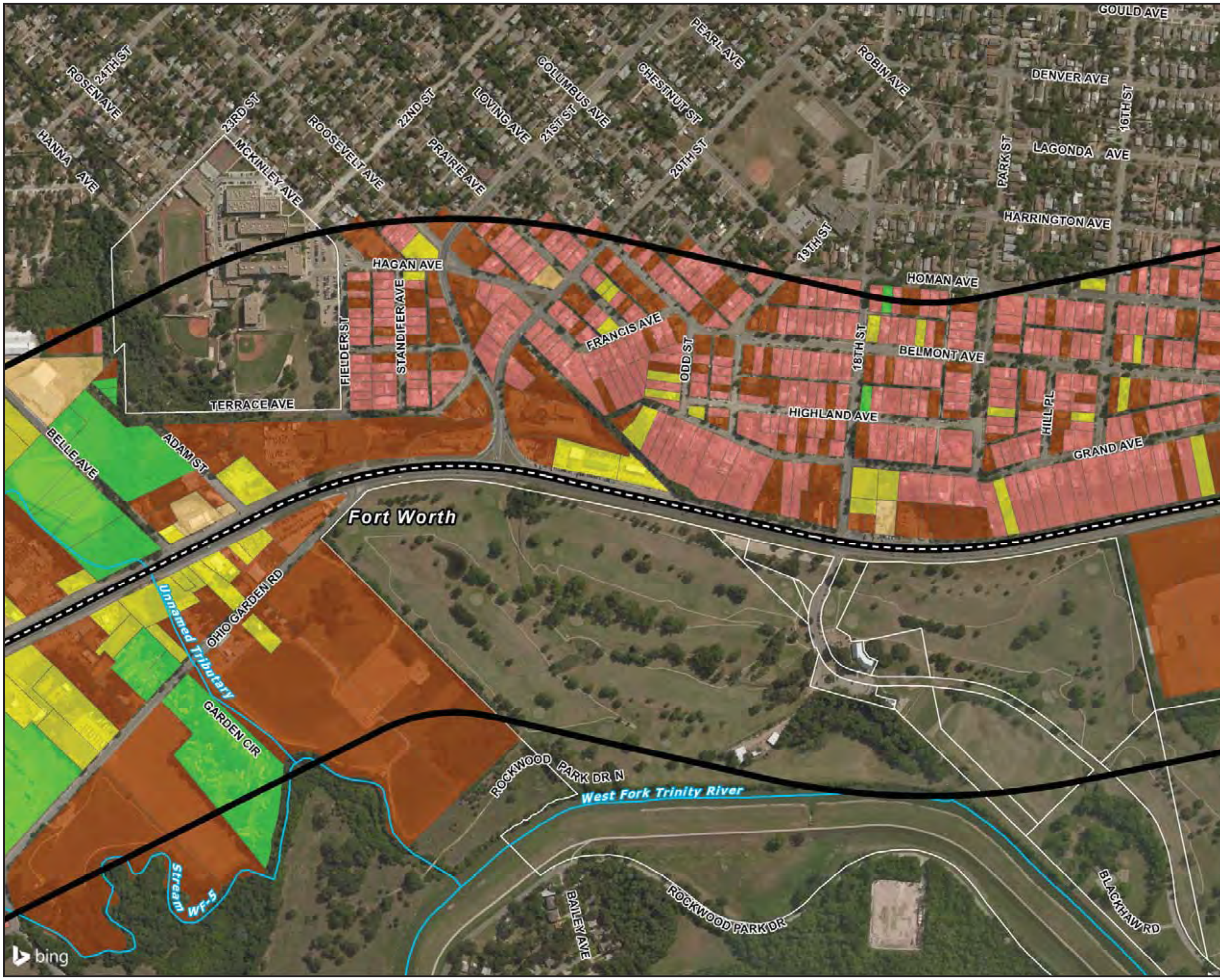
INTERNAL USE ONLY

Parcel Data Source: Tarrant Appraisal District Parcels 2015 Date: 11/28/2016

Property Ownership

Exhibit 6-4

State Highway 199
Corridor Master Plan



Legend

- SH 199
- Streams
- Parcel Boundaries
- Study Area Boundary
- City Limits

Property Owner Type

- Com, On-Site, In County
- Res, On-Site, In County
- Not On-Site, In County
- Out of County, In State
- Out of State

0 300 600 900
Feet

INTERNAL USE ONLY

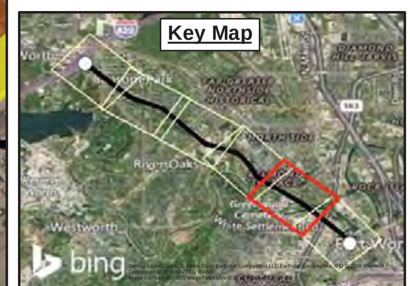
Parcel Data Source: Tarrant Appraisal District Parcels 2015

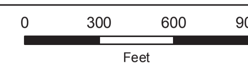
Date: 02/17/2017

Property Ownership

Exhibit 6-5

State Highway 199
Corridor Master Plan





INTERNAL USE ONLY

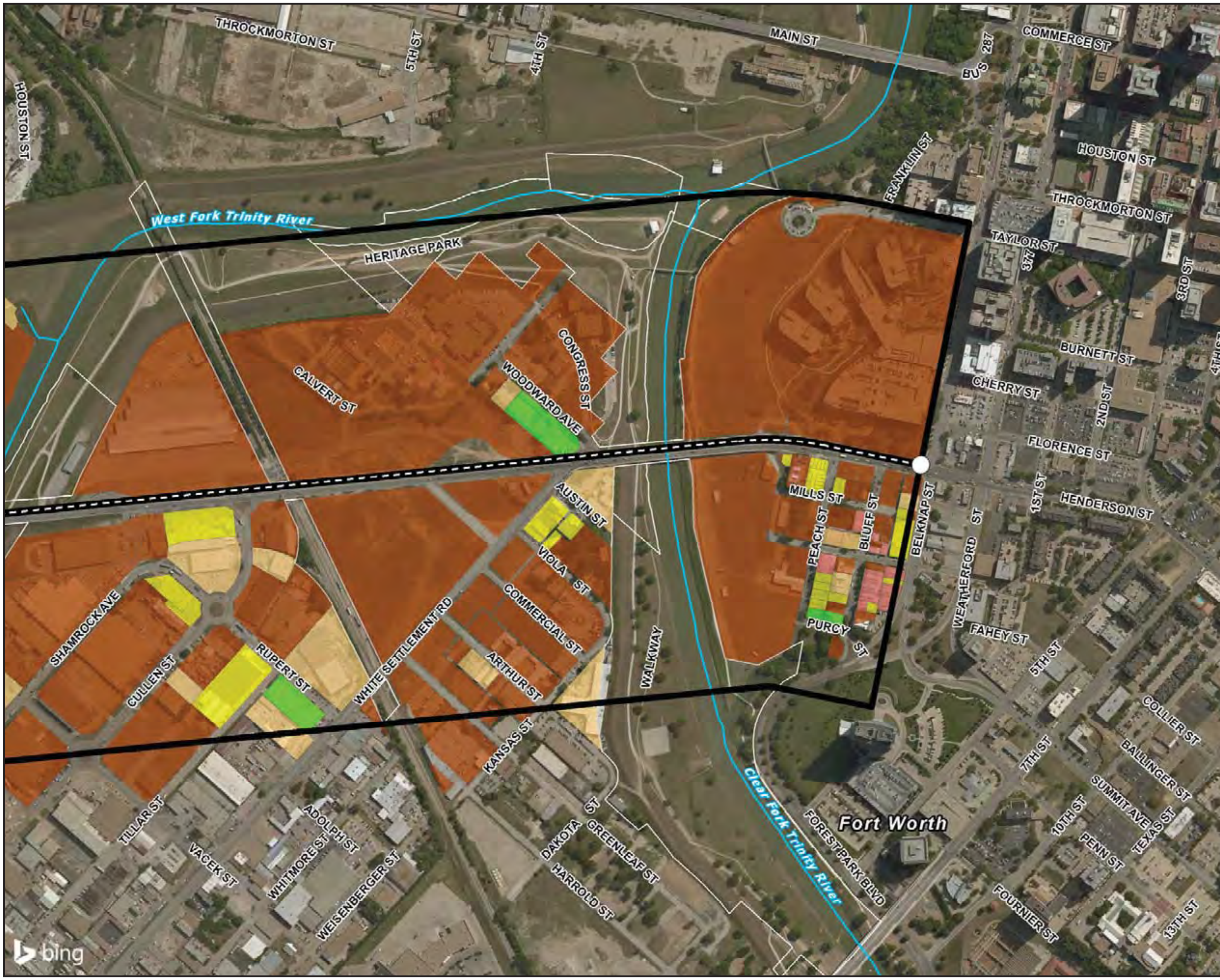
Parcel Data Source: Tarrant Appraisal District Parcels 2015

Date: 11/28/2016

Property Ownership

Exhibit 6-6

State Highway 199
Corridor Master Plan



Legend

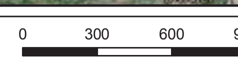
- SH 199
- Streams
- Parcel Boundaries
- Study Area Boundary
- City Limits

Property Owner Type

- Com, On-Site, In County
- Res, On-Site, In County
- Not On-Site, In County
- Out of County, In State
- Out of State

Key Map

0 300 600 900
Feet



INTERNAL USE ONLY

Parcel Data Source: Tarrant Appraisal District Parcels 2015 Date: 11/28/2016

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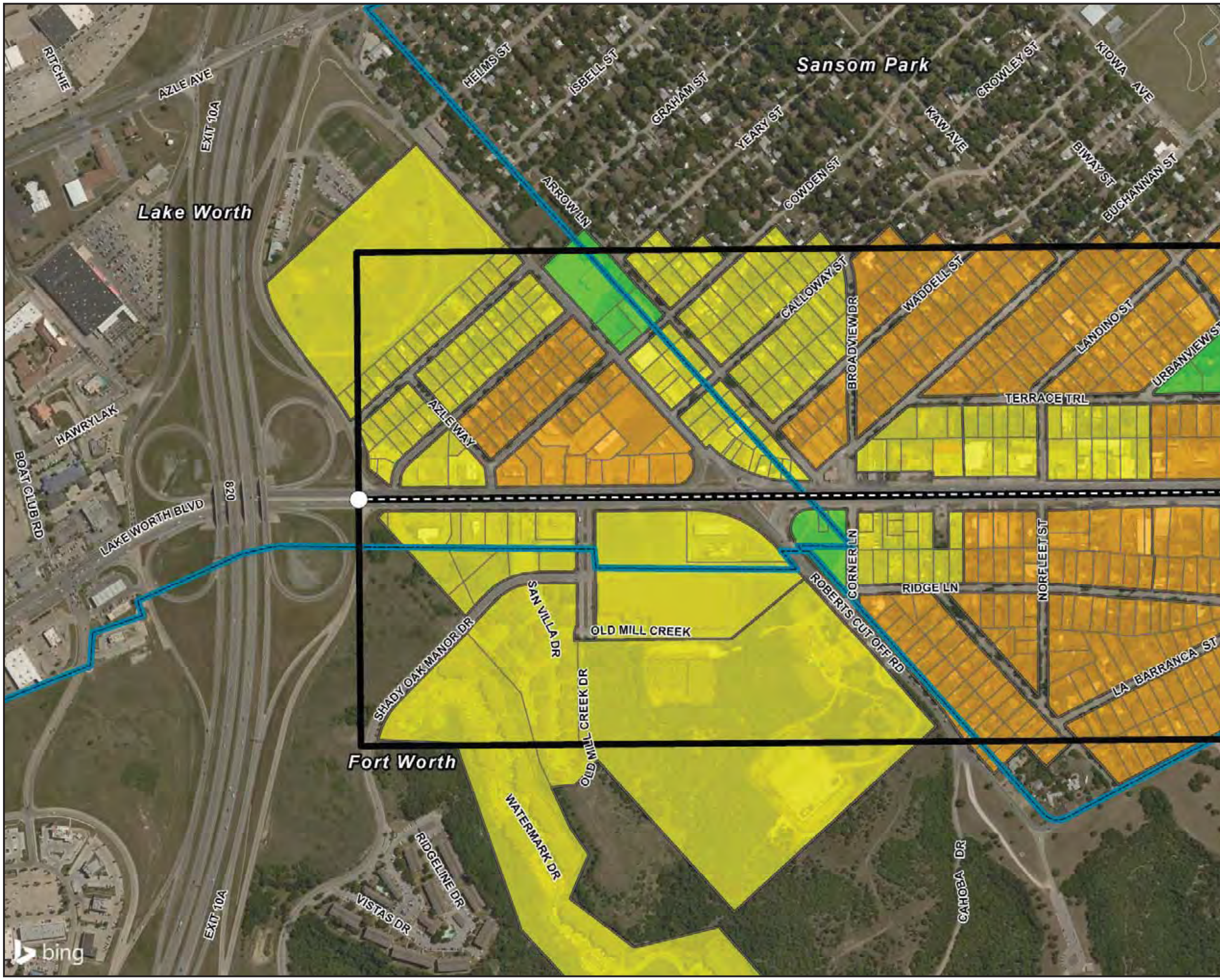
Exhibit 7

Composite Map

Composite Map

Exhibit 7-1

State Highway 199
Corridor Master Plan

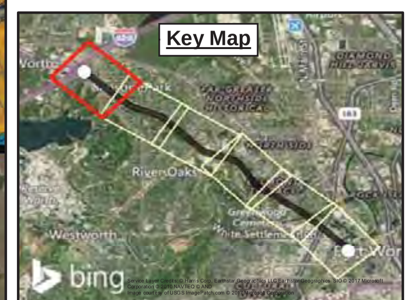


Legend

- SH 199
- Parcel Boundaries
- Study Area Boundary
- City Limits

Development Opportunity

- Easiest to Develop
- Less Easy to Develop
- Somewhat Difficult to Develop
- Most Difficult to Develop



0 300 600 900
Feet

INTERNAL USE ONLY

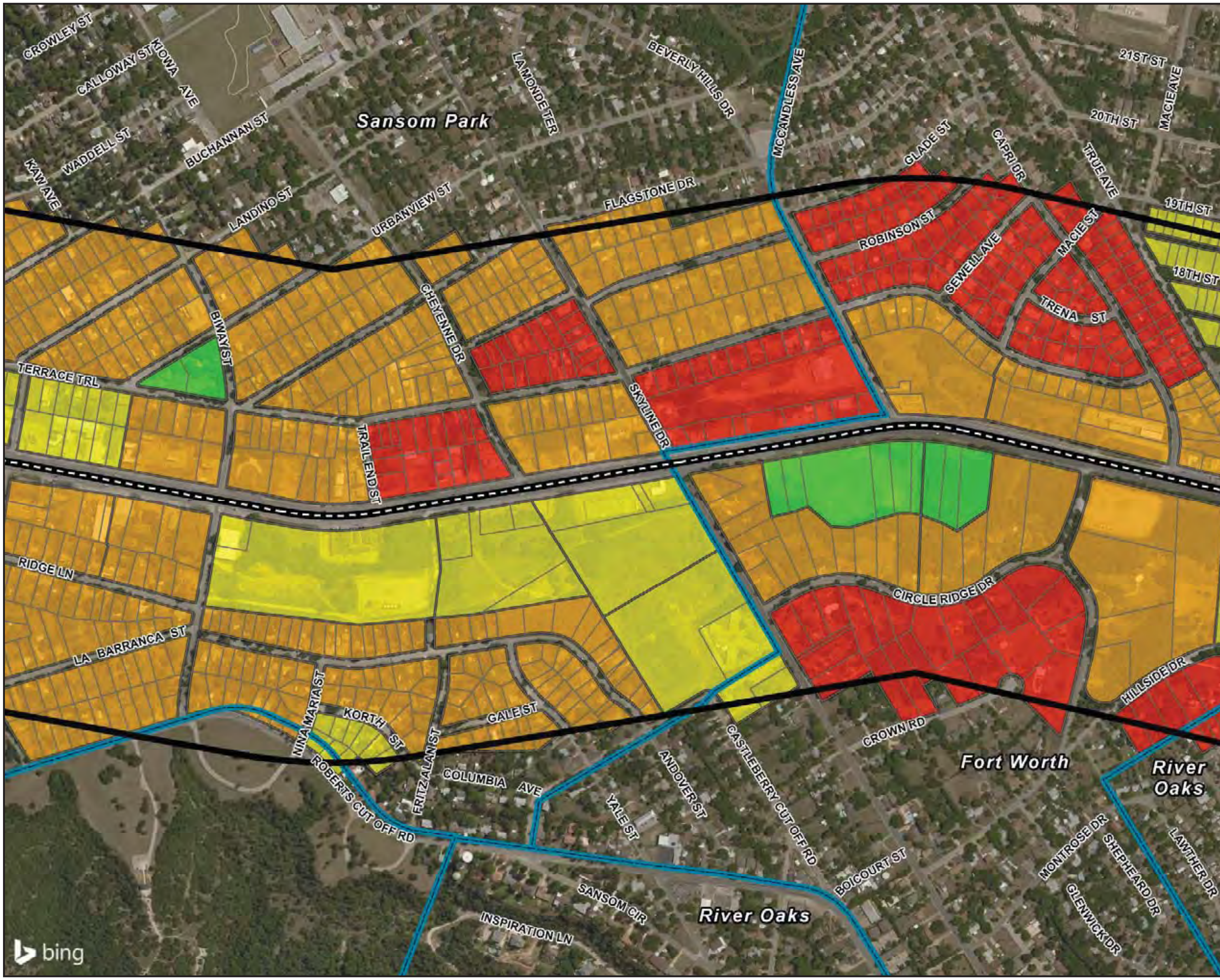
North Central Texas Council of Governments

Parcel Data Source: Tarrant Appraisal District Parcels 2015 Date: 1/3/2017

Composite Map

Exhibit 7-2

State Highway 199 Corridor Master Plan



Legend

- SH 199
- Parcel Boundaries
- Study Area Boundary
- City Limits

Development Opportunity

- Easiest to Develop
- Less Easy to Develop
- Somewhat Difficult to Develop
- Most Difficult to Develop

0 300 600 900

Feet

North Central Texas Council of Governments

INTERNAL USE ONLY

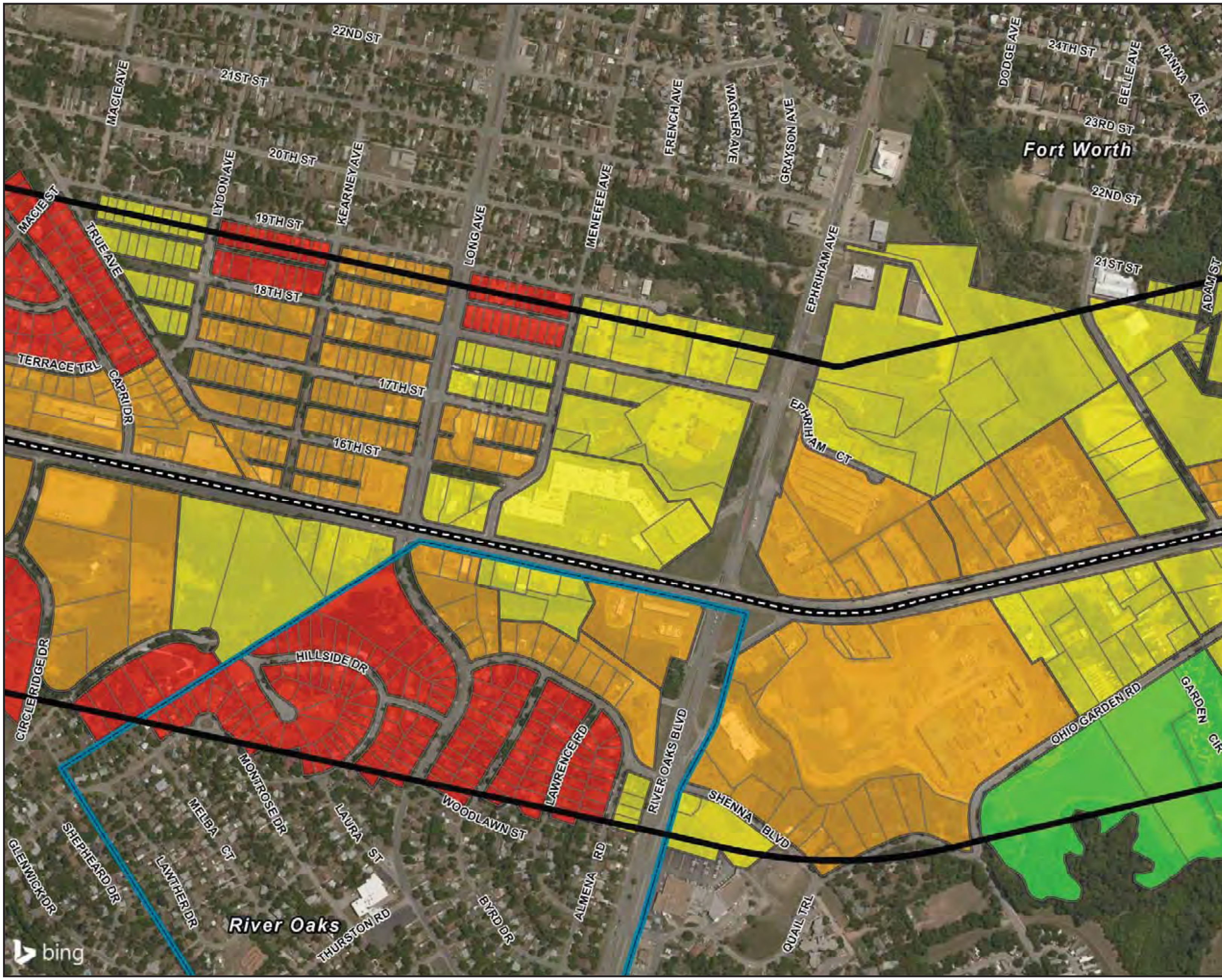
Parcel Data Source: Tarrant Appraisal District Parcels 2015

Date: 1/3/2017

Composite Map

Exhibit 7-3

State Highway 199
Corridor Master Plan



Legend

- SH 199
- Parcel Boundaries
- Study Area Boundary
- City Limits

Development Opportunity

- Easiest to Develop
- Less Easy to Develop
- Somewhat Difficult to Develop
- Most Difficult to Develop

Key Map

0 300 600 900
Feet

North Central Texas Council of Governments

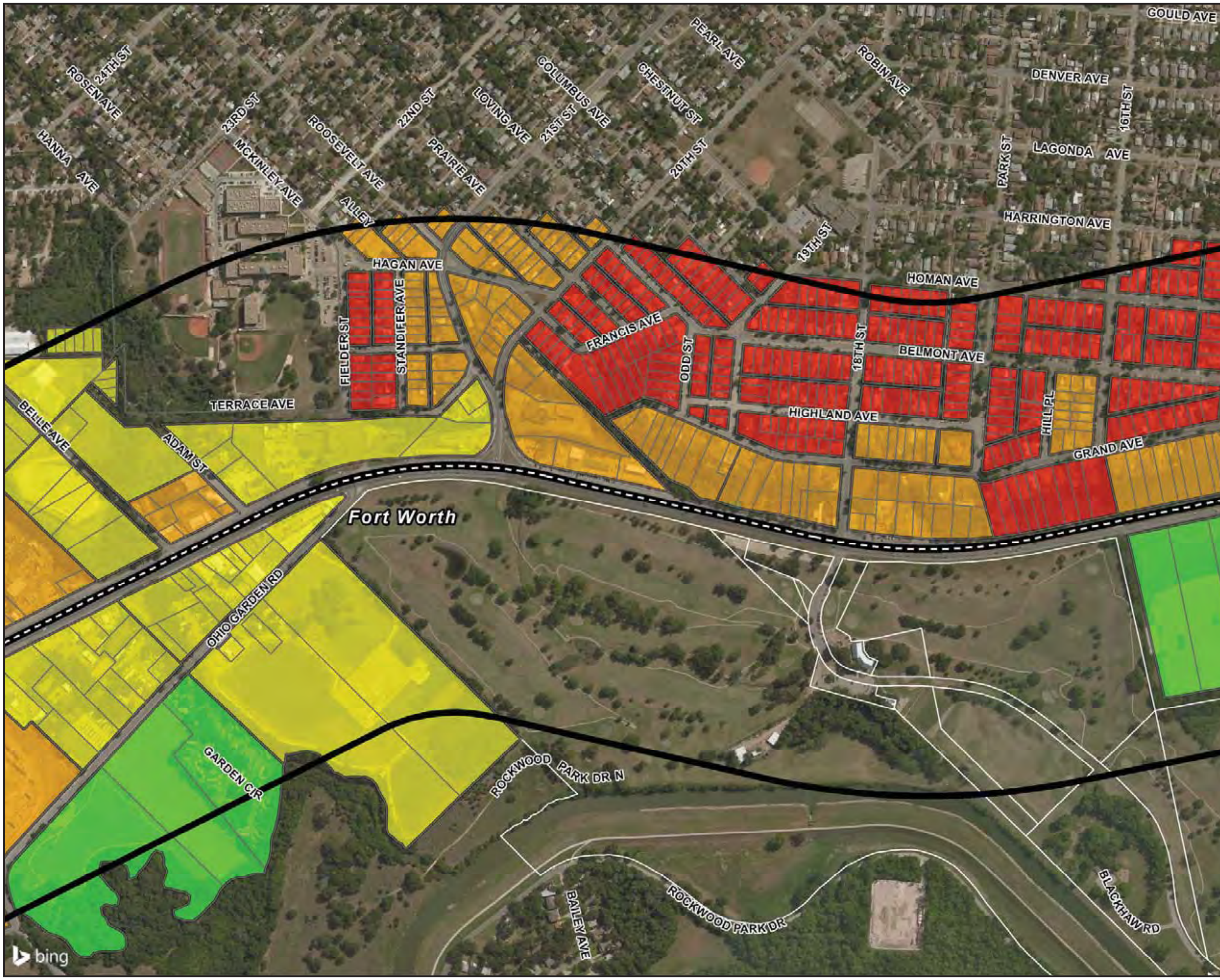
INTERNAL USE ONLY

Parcel Data Source: Tarrant Appraisal District Parcels 2015 Date: 1/3/2017

Composite Map

Exhibit 7-4

State Highway 199 Corridor Master Plan



Legend

- SH 199
- Parcel Boundaries
- Study Area Boundary
- City Limits

Development Opportunity

- Easiest to Develop
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0 300 600 900
Feet

North Central Texas Council of Governments

INTERNAL USE ONLY

Parcel Data Source: Tarrant Appraisal District Parcels 2015

Date: 02/17/2017

Composite Map

Exhibit 7-5

State Highway 199 Corridor Master Plan

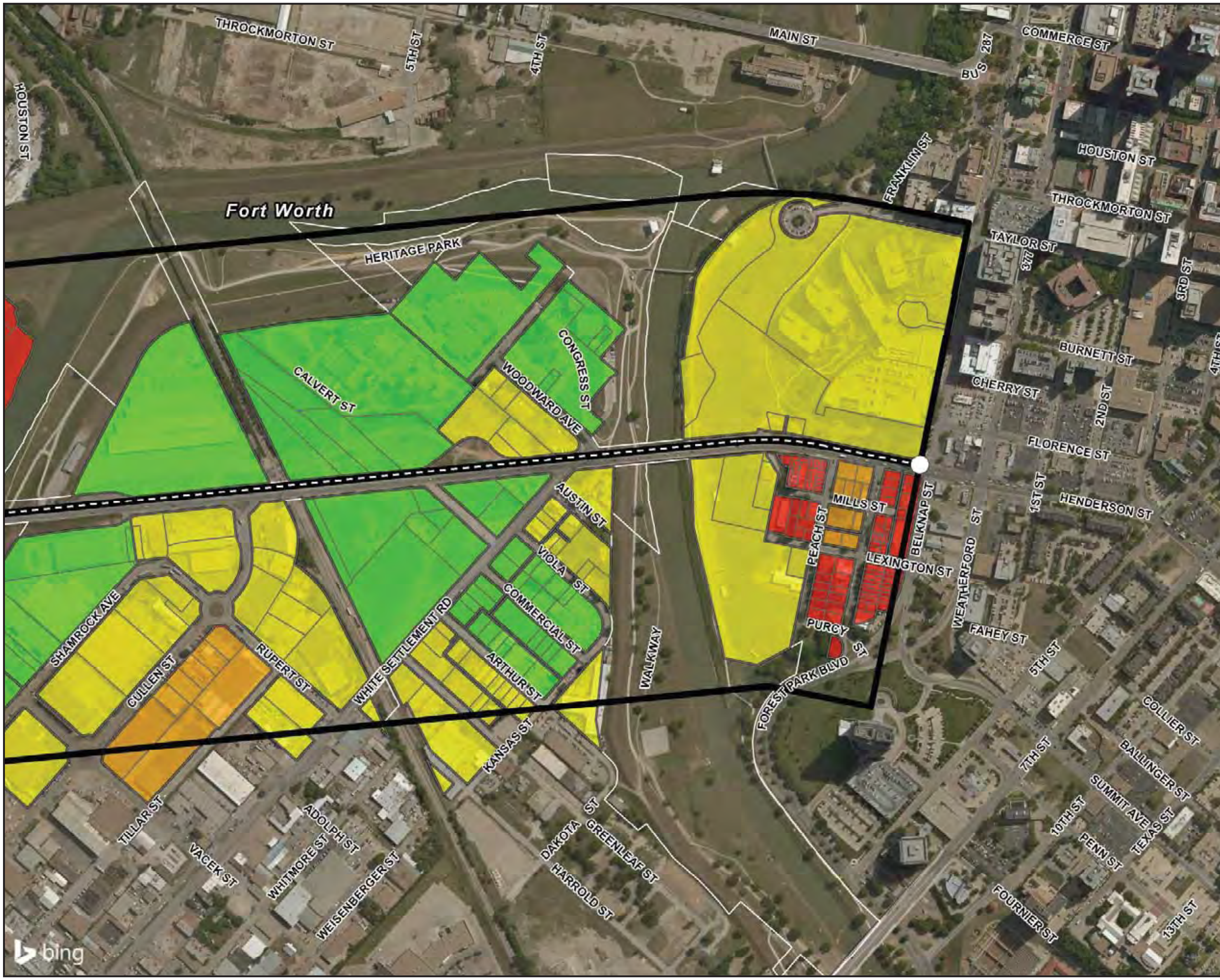
Parcel Data Source: Tarrant Appraisal District Parcels 2015

Date: 1/3/2017

Composite Map

Exhibit 7-6

State Highway 199
Corridor Master Plan

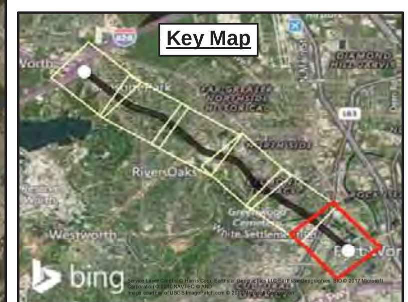


Legend

- SH 199
- Parcel Boundaries
- Study Area Boundary
- City Limits

Development Opportunity

- Easiest to Develop
- Less Easy to Develop
- Somewhat Difficult to Develop
- Most Difficult to Develop



0 300 600 900
Feet

North Central Texas Council of Governments

INTERNAL USE ONLY

Parcel Data Source: Tarrant Appraisal District Parcels 2015

Date: 1/3/2017

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Attachment A
Figure 9. Age Analysis

Population by Age	Generation	Change	2016 Number	2016 Percent	2021 Number	2021 Percent	2026 Number	2026 Percent
0 - 4	Generation Z	26% to 25%	9,486	9.1%	9,891	8.9%	10,313	8.7%
5 - 9			8,977	8.6%	9,376	8.4%	9,793	8.3%
10 - 14			8,240	7.9%	8,988	8.1%	9,804	8.3%
15 - 19	Millennials	30% to 28%	7,201	6.9%	7,910	7.1%	8,689	7.4%
20 - 24			7,545	7.2%	7,496	6.8%	7,447	6.3%
25 - 34			16,611	15.9%	16,928	15.3%	17,251	14.6%
35 - 44	Gen X	25% to 25%	13,949	13.3%	15,466	13.9%	17,148	14.5%
45 - 54			12,169	11.6%	12,129	10.9%	12,089	10.2%
55 - 64	Baby Boomers	15% to 17%	9,835	9.4%	10,501	9.5%	11,212	9.5%
65 - 74			6,252	6.0%	7,365	6.6%	8,676	7.3%
75 - 84	Silent Generation	4% to 5%	3,020	2.9%	3,575	3.2%	4,232	3.6%
85+			1,254	1.2%	1,337	1.2%	1,425	1.2%

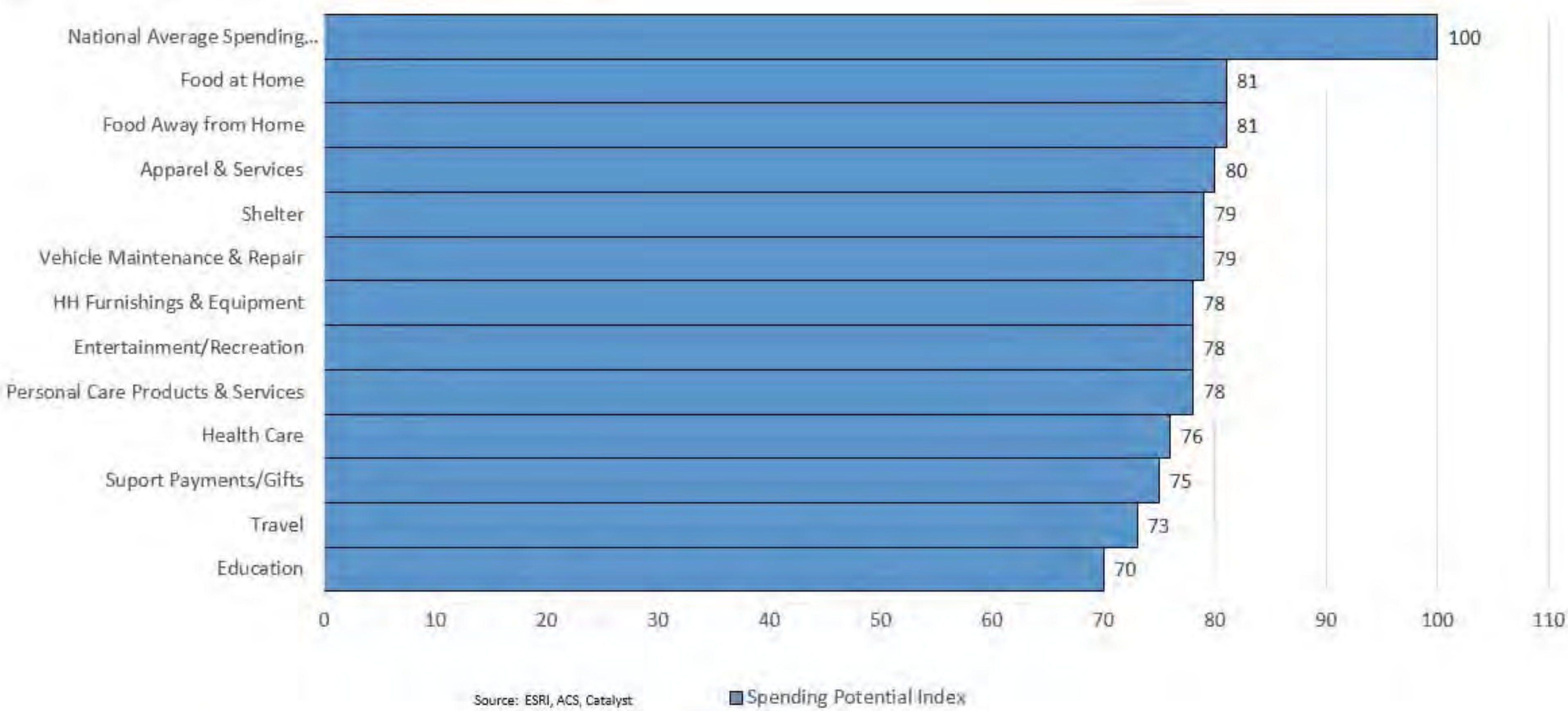
Source: ESRI, ACS, Catalyst

Attachment B
Figure 10. Income Analysis

Households by Income			2016 Number	2016 Percent	2021 Number	2021 Percent	2026 Number	2026 Percent
<$15,000	Low income and subsidized housing	39% to 42%	5,162	15.3%	5,677	15.9%	5,900	16.2%
$15,000 - $24,999			4,037	11.9%	4,287	12.0%	4,299	11.8%
$25,000 - $34,999			4,123	12.2%	4,795	13.4%	5,266	14.4%
$35,000 - $49,999	Market rate apartment dwellers	55% to 50%	5,403	16.0%	4,273	11.9%	3,191	8.8%
$50,000 - $74,999			6,924	20.5%	6,965	19.5%	6,616	18.2%
$75,000 - $99,999	First time owners, move up and renter by choice		3,524	10.4%	4,307	12.0%	4,971	13.6%
$100,000 - $149,999			2,745	8.1%	3,134	8.8%	3,379	9.3%
$150,000 - $199,999	Luxury custom housing	6% to 8%	990	2.9%	1,304	3.6%	1,622	4.4%
$200,000+			899	2.7%	1,057	3.0%	1,174	3.2%
Median Household Income			$43,781		$45,120		$46,500	
Average Household Income			$59,286		$63,286		$67,556	
Per Capita Income			$19,765		$20,981		$22,272	

Source: ESRI, ACS, Catalyst

Attachment C
Figure 13. Consumer Spending



Source: ESRI, ACS, Catalyst

Attachment D
Figure 15. Retail Leakage Analysis

Retail Group	2016 Demand (Retail Potential)	Demand PerCapita	2026 Demand (Retail Potential)	2016 Supply (Retail Sales)	2016 Sales Leakage	2026 Forecasted Leakage	Avg Sales/sf	2016 sf Area	2026 sf Area	2016 Capture	2026 Capture	Average Store Size	2016 Stores	2026 Stores
Motor Vehicle & Parts Dealers	$213,713,101	$2,044.32	$241,391,135.00	$515,850,548	($302,138,000)	($274,460,000)								
Furniture & Home Furnishings Stores	$25,848,629	$247.26	$29,196,291.02	$31,331,940	($5,484,000)	($2,136,000)								
Bldg Materials, Garden Equip. & Supp	$41,587,521	$397.81	$46,973,530.63	$60,337,580	($18,751,000)	($13,365,000)								
Food & Beverage Stores	$170,373,541	$1,629.74	$192,438,658.39	$175,524,522	($5,151,000)	$16,915,000								
Grocery Stores	$151,719,708	$1,451.31	$171,368,963.09	$143,521,739	$8,198,000	$27,848,000	$200	40,990	139,240 sf	14,347	48,734 sf	80,000 sf	0	1
Health & Personal Care Stores	$49,005,611	$468.77	$55,352,339.21	$64,047,918	($15,043,000)	($8,696,000)								
Gasoline Stations	$65,716,297	$628.62	$74,227,230.09	$70,173,441	($4,458,000)	$4,054,000								
Gasoline Stations	$65,716,297	$628.62	$74,227,230.09	$70,173,441	($4,458,000)	$4,054,000	$1,896	(2,351)	$2,138 sf	(823)	748 sf	1,000 sf	(1)	1
Clothing & Clothing Accessories Stores	$40,324,647	$385.73	$45,547,101.52	$39,752,200	$573,000	$5,795,000								
Clothing Stores	$26,991,224	$258.19	$30,486,863.77	$23,424,254	$3,567,000	$7,063,000	$383	9,313	18,441 sf	3,260	6,454 sf	2,000 sf	2	3
Jewelry, Luggage & Leather Goods	$8,486,954	$81.18	$9,586,101.41	$3,533,125	$4,954,000	$6,053,000	$372	13,317	16,272 sf	4,661	5,695 sf	1,500 sf	3	4
Sporting Goods, Hobby, Book & Music	$26,644,580	$254.87	$30,095,325.83	$35,627,045	($8,983,000)	($5,532,000)								
Book, Periodical & Music Stores	$5,698,624	$54.51	$6,436,654.14	$2,800,103	$2,899,000	$3,637,000	$200	14,495	18,185 sf	5,073	6,365 sf	8,000 sf	1	1
General Merchandise Stores	$182,320,144	$1,744.02	$205,932,468.75	$361,417,571	($179,098,000)	($155,486,000)								
Miscellaneous Store Retailers	$40,433,756	$386.78	$45,670,341.25	$68,978,659	($28,545,000)	($23,309,000)								
Used Merchandise Stores	$7,668,382	$73.35	$8,661,515.96	$8,451,092	($783,000)	$211,000	$118	(6,636)	1,788 sf	(2,322)	626 sf	9,000 sf	(0)	0
Nonstore Retailers	$18,671,345	$178.60	$21,089,475.28	$14,177,160	$4,495,000	$6,913,000								
Electronic Shopping & Mail-Order	$12,563,379	$120.18	$14,190,465.17	$6,305,291	$6,259,000	$7,886,000								
Direct Selling Establishments	$4,733,975	$45.28	$5,347,073.22	$3,443,205	$1,291,000	$1,904,000								
Food Services & Drinking Places	$99,556,735	$952.33	$112,450,351.18	$200,898,456	($101,342,000)	($88,449,000)								

Programming Potential

2016 Retail Potential (**Full Demand**)	2016 Potential Store Count	2026 Retail Potential (**Full Demand**)	2026Potential Store Count
78,116 sf	16 stores	196,064 sf	26 stores

2016 Retail Potential (**Discounted Demand**)	2016 Potential Store Count	2026 Program Area Potential (**Discounted Demand**)	2026Potential Store Count
27,340 sf	**6** stores	**68,622** sf	**9** stores

Source: ESRI

Attachment E
Figure 18. Housing Potential

	2016	2021	2026	10 Yr. Projected Growth	
Total Households	33,807	35,800	37,910	4,103	
Rental Units	13,557 du	14,642 du	15,815 du	2,258 du	
Percentage of Total Households	40.1%	40.9%	41.7%		
Market Rate Household Percentage	55.0%	53.0%	50.0%		
Qualifying Income Households (Market Rate)	7,456 du	7,760 du	7,907 du	451 du	
Capture Rate		60%	65%		
Proposed Market Rate Programming		183 du	96 du	**278 du**	
Lower Income Household Percentage	39.0%	41.0%	42.0%		
Qualifying Income Households (Affordable)	5,287 du	6,003 du	6,642 du	1,355 du	
Capture Rate		20%	25%		
Proposed Market Rate Programming		143 du	160 du	**303 du**	
Senior Housing Household Percentage	15.0%	16.0%	17.0%		
Qualifying Income Households (Senior Housing)	2,033 du	2,343 du	2,689 du	655 du	
Capture Rate		20%	25%		
Proposed Senior Housing Programming		62 du	86 du	**148 du**	
Total Rental Housing Potential – All Categories				**729 du**	**32%**
Ownership Units	17,343 du	18,222 du	19,146 du	1,803 du	
Percentage of Total Households	51.3%	50.9%	50.5%		
For Sale Household Percentage	61.0%	60.0%	58.0%		
Qualifying Income Households (New Construction)	10,579 du	10,933 du	11,105 du	525 du	
Capture Rate		20%	25%		
Proposed Market Rate Programming		71 du	43 du	**114 du**	
For Sale Household Percentage	55.0%	53.0%	50.0%		
Qualifying Income Households (Renovation)	- du	38 du	21 du	21 du	
Capture Rate		60%	65%		
Proposed Market Rate Programming		23 du	-10 du	**12 du**	
Total For Sale Housing Potential – All Categories				**126 du**	**7%**

Source: ESRI, ACS, Catalyst

Attachment F

ACS Population Summary

199 Trade Area
Area: 35.23 square miles

Prepared by Esri

	2010 - 2014 ACS Estimate	Percent	MOE(±)	Reliability
TOTALS				
Total Population	100,142		3,765	high
Total Households	32,356		919	high
Total Housing Units	35,351		942	high
POPULATION AGE 3+ YEARS BY SCHOOL ENROLLMENT				
Total	94,459	100.0%	3,497	high
Enrolled in school	26,466	28.0%	1,419	high
Enrolled in nursery school, preschool	1,651	1.7%	334	medium
Public school	1,282	1.4%	287	medium
Private school	369	0.4%	170	medium
Enrolled in kindergarten	1,750	1.9%	333	high
Public school	1,630	1.7%	319	high
Private school	121	0.1%	93	low
Enrolled in grade 1 to grade 4	7,052	7.5%	710	high
Public school	6,635	7.0%	695	high
Private school	417	0.4%	175	medium
Enrolled in grade 5 to grade 8	6,200	6.6%	599	high
Public school	5,906	6.3%	587	high
Private school	294	0.3%	118	medium
Enrolled in grade 9 to grade 12	5,531	5.9%	566	high
Public school	5,240	5.5%	560	high
Private school	292	0.3%	98	medium
Enrolled in college undergraduate years	3,727	3.9%	453	high
Public school	3,189	3.4%	413	high
Private school	538	0.6%	179	medium
Enrolled in graduate or professional school	556	0.6%	163	medium
Public school	370	0.4%	120	medium
Private school	186	0.2%	110	medium
Not enrolled in school	67,993	72.0%	2,040	high
POPULATION AGE 65+ BY RELATIONSHIP AND HOUSEHOLD				
Total	8,910	100.0%	576	high
Living in Households	8,410	94.4%	560	high
Living in Family Households	5,453	61.2%	494	high
Householder	2,657	29.8%	266	high
Spouse	1,606	18.0%	212	high
Parent	568	6.4%	169	medium
Parent-in-law	343	3.8%	156	medium
Other Relative	205	2.3%	99	medium
Nonrelative	74	0.8%	56	low
Living in Nonfamily Households	2,958	33.2%	342	high
Householder	2,861	32.1%	332	high
Nonrelative	96	1.1%	2	medium
Living in Group Quarters	500	5.6%	155	medium

Source: U.S. Census Bureau, 2010-2014 American Community Survey

Reliability: high medium low

ACS Population Summary

199 Trade Area
Area: 35.23 square miles

Prepared by Esri

	2010 - 2014 ACS Estimate	Percent	MOE(±)	Reliability
HOUSEHOLDS BY TYPE AND SIZE AND AGE				
Family Households	22,115	68.3%	864	high
2-Person	6,563	20.3%	502	high
3-Person	4,683	14.5%	515	high
4-Person	4,962	15.3%	522	high
5-Person	3,267	10.1%	436	high
6-Person	1,552	4.8%	283	high
7+ Person	1,088	3.4%	230	medium
Nonfamily Households	10,240	31.6%	646	high
1-Person	8,667	26.8%	603	high
2-Person	1,306	4.0%	217	high
3-Person	231	0.7%	115	medium
4-Person	36	0.1%	47	low
5-Person	0	0.0%	0	
6-Person	0	0.0%	0	
7+ Person	0	0.0%	0	
HOUSEHOLDS BY PRESENCE OF PEOPLE UNDER 18 YEARS BY HOUSEHOLD TYPE				
Households with one or more people under 18 years	14,196	43.9%	780	high
Family households	14,102	43.6%	779	high
Married-couple family	8,697	26.9%	641	high
Male householder, no wife present	1,514	4.7%	313	medium
Female householder, no husband present	3,891	12.0%	461	high
Nonfamily households	93	0.3%	96	low
Households with no people under 18 years	18,160	56.1%	755	high
Married-couple family	5,769	17.8%	455	high
Other family	2,244	6.9%	320	high
Nonfamily households	10,147	31.4%	645	high
HOUSEHOLDS BY PRESENCE OF PEOPLE 65 YEARS AND OVER, HOUSEHOLD SIZE AND HOUSEHOLD TYPE				
Households with Pop 65+	6,370	19.7%	424	high
1-Person	2,719	8.4%	321	high
2+ Person Family	3,509	10.8%	308	high
2+ Person Nonfamily	142	0.4%	87	medium
Households with No Pop 65+	25,985	80.3%	910	high
1-Person	5,948	18.4%	526	high
2+ Person Family	18,606	57.5%	847	high
2+ Person Nonfamily	1,432	4.4%	233	high

Source: U.S. Census Bureau, 2010-2014 American Community Survey

Reliability: high medium low

August 25, 2016

ACS Population Summary

199 Trade Area
Area: 35.23 square miles

Prepared by Esri

	2010 - 2014 ACS Estimate	Percent	MOE(±)	Reliability
POPULATION AGE 5+ YEARS BY LANGUAGE SPOKEN AT HOME AND ABILITY TO SPEAK ENGLISH				
Total	90,948	100.0%	3,331	high
5 to 17 years				
Speak only English	8,606	9.5%	917	high
Speak Spanish	11,374	12.5%	1,128	high
Speak English "very well" or "well"	10,399	11.4%	1,059	high
Speak English "not well"	827	0.9%	255	medium
Speak English "not at all"	147	0.2%	111	low
Speak other Indo-European languages	65	0.1%	47	low
Speak English "very well" or "well"	65	0.1%	47	low
Speak English "not well"	0	0.0%	0	
Speak English "not at all"	0	0.0%	0	
Speak Asian and Pacific Island languages	75	0.1%	69	low
Speak English "very well" or "well"	39	0.0%	52	low
Speak English "not well"	36	0.0%	46	low
Speak English "not at all"	0	0.0%	0	
Speak other languages	114	0.1%	114	low
Speak English "very well" or "well"	92	0.1%	109	low
Speak English "not well"	22	0.0%	35	low
Speak English "not at all"	0	0.0%	0	
18 to 64 years				
Speak only English	31,424	34.6%	1,585	high
Speak Spanish	28,845	31.7%	1,869	high
Speak English "very well" or "well"	18,455	20.3%	1,254	high
Speak English "not well"	5,509	6.1%	668	high
Speak English "not at all"	4,882	5.4%	704	high
Speak other Indo-European languages	687	0.8%	260	medium
Speak English "very well" or "well"	526	0.6%	197	medium
Speak English "not well"	145	0.2%	130	low
Speak English "not at all"	16	0.0%	25	low
Speak Asian and Pacific Island languages	613	0.7%	234	medium
Speak English "very well" or "well"	527	0.6%	200	medium
Speak English "not well"	59	0.1%	47	low
Speak English "not at all"	26	0.0%	42	low
Speak other languages	236	0.3%	127	medium
Speak English "very well" or "well"	223	0.2%	125	medium
Speak English "not well"	13	0.0%	16	low
Speak English "not at all"	0	0.0%	0	
65 years and over				
Speak only English	5,623	6.2%	448	high
Speak Spanish	3,053	3.4%	384	high
Speak English "very well" or "well"	1,462	1.6%	233	high
Speak English "not well"	469	0.5%	119	medium
Speak English "not at all"	1,122	1.2%	280	medium
Speak other Indo-European languages	213	0.2%	96	medium
Speak English "very well" or "well"	213	0.2%	96	medium
Speak English "not well"	0	0.0%	0	
Speak English "not at all"	0	0.0%	0	
Speak Asian and Pacific Island languages	21	0.0%	13	medium
Speak English "very well" or "well"	21	0.0%	13	medium
Speak English "not well"	0	0.0%	0	
Speak English "not at all"	0	0.0%	0	
Speak other languages	0	0.0%	0	
Speak English "very well" or "well"	0	0.0%	0	
Speak English "not well"	0	0.0%	0	
Speak English "not at all"	0	0.0%	0	

Source: U.S. Census Bureau, 2010-2014 American Community Survey

Reliability: high medium low

August 25, 2016

	2010 - 2014 ACS Estimate	Percent	MOE(±)	Reliability
WORKERS AGE 16+ YEARS BY PLACE OF WORK				
Total	43,250	100.0%	1,882	high
Worked in state and in county of residence	38,201	88.3%	1,701	high
Worked in state and outside county of residence	4,852	11.2%	595	high
Worked outside state of residence	197	0.5%	120	medium
WORKERS AGE 16+ YEARS BY MEANS OF TRANSPORTATION TO WORK				
Total	43,250	100.0%	1,882	high
Drove alone	34,324	79.4%	1,580	high
Carpooled	6,022	13.9%	758	high
Public transportation (excluding taxicab)	252	0.6%	105	medium
Bus or trolley bus	175	0.4%	87	medium
Streetcar or trolley car	0	0.0%	0	
Subway or elevated	11	0.0%	22	low
Railroad	66	0.2%	54	low
Ferryboat	1	0.0%	28	low
Taxicab	26	0.1%	32	low
Motorcycle	91	0.2%	56	medium
Bicycle	125	0.3%	110	low
Walked	664	1.5%	202	medium
Other means	845	2.0%	278	medium
Worked at home	901	2.1%	225	medium
WORKERS AGE 16+ YEARS (WHO DID NOT WORK FROM HOME) BY TRAVEL TIME TO WORK				
Total	42,349	100.0%	1,871	high
Less than 5 minutes	818	1.9%	210	medium
5 to 9 minutes	3,175	7.5%	445	high
10 to 14 minutes	5,992	14.1%	675	high
15 to 19 minutes	7,138	16.9%	665	high
20 to 24 minutes	7,402	17.5%	719	high
25 to 29 minutes	3,405	8.0%	517	high
30 to 34 minutes	6,399	15.1%	660	high
35 to 39 minutes	970	2.3%	220	medium
40 to 44 minutes	1,218	2.9%	320	medium
45 to 59 minutes	2,871	6.8%	473	high
60 to 89 minutes	2,352	5.6%	425	high
90 or more minutes	607	1.4%	197	medium
Average Travel Time to Work (in minutes)	N/A		N/A	
FEMALES AGE 20-64 YEARS BY AGE OF OWN CHILDREN AND EMPLOYMENT STATUS				
Total	28,841	100.0%	1,224	high
Own children under 6 years only	3,211	11.1%	444	high
In labor force	1,990	6.9%	350	high
Not in labor force	1,221	4.2%	281	medium
Own children under 6 years and 6 to 17 years	3,434	11.9%	457	high
In labor force	1,658	5.7%	354	medium
Not in labor force	1,776	6.2%	299	high
Own children 6 to 17 years only	6,249	21.7%	577	high
In labor force	4,145	14.4%	506	high
Not in labor force	2,104	7.3%	316	high
No own children under 18 years	15,948	55.3%	954	high
In labor force	10,840	37.6%	727	high
Not in labor force	5,108	17.7%	581	high

Source: U.S. Census Bureau, 2010-2014 American Community Survey

Reliability: high medium low

199 Trade Area
Area: 35.23 square miles

Prepared by Esri

	2010 - 2014 ACS Estimate	Percent	MOE(±)	Reliability
CIVILIAN NONINSTITUTIONALIZED POPULATION BY AGE & TYPES OF HEALTH INSURANCE COVERAGE				
Total	98,544	100.0%	3,743	high
Under 18 years:	29,424	29.9%	1,843	high
One Type of Health Insurance:	24,321	24.7%	1,717	high
Employer-Based Health Ins Only	8,437	8.6%	1,125	high
Direct-Purchase Health Ins Only	817	0.8%	293	medium
Medicare Coverage Only	96	0.1%	61	medium
Medicaid Coverage Only	14,460	14.7%	1,368	high
TRICARE/Military Hlth Cov Only	511	0.5%	320	medium
VA Health Care Only	0	0.0%	0	
2+ Types of Health Insurance	716	0.7%	261	medium
No Health Insurance Coverage	4,387	4.5%	659	high
18 to 34 years:	26,467	26.9%	1,515	high
One Type of Health Insurance:	13,015	13.2%	1,001	high
Employer-Based Health Ins Only	9,591	9.7%	904	high
Direct-Purchase Health Ins Only	1,065	1.1%	288	medium
Medicare Coverage Only	117	0.1%	77	low
Medicaid Coverage Only	2,079	2.1%	394	high
TRICARE/Military Hlth Cov Only	147	0.1%	118	low
VA Health Care Only	16	0.0%	17	low
2+ Types of Health Insurance	720	0.7%	253	medium
No Health Insurance Coverage	12,732	12.9%	1,091	high
35 to 64 years:	34,237	34.7%	1,510	high
One Type of Health Insurance:	20,063	20.4%	1,172	high
Employer-Based Health Ins Only	14,748	15.0%	1,032	high
Direct-Purchase Health Ins Only	1,719	1.7%	304	high
Medicare Coverage Only	769	0.8%	265	medium
Medicaid Coverage Only	2,338	2.4%	386	high
TRICARE/Military Hlth Cov Only	344	0.3%	154	medium
VA Health Care Only	145	0.1%	63	medium
2+ Types of Health Insurance	2,225	2.3%	370	high
No Health Insurance Coverage	11,949	12.1%	907	high
65+ years:	8,417	8.5%	560	high
One Type of Health Insurance:	2,944	3.0%	373	high
Employer-Based Health Ins Only	84	0.1%	42	medium
Direct-Purchase Health Ins Only	35	0.0%	47	low
Medicare Coverage Only	2,824	2.9%	369	high
TRICARE/Military Hlth Cov Only	0	0.0%	0	
VA Health Care Only	0	0.0%	0	
2+ Types of Health Insurance:	5,166	5.2%	440	high
Employer-Based & Direct-Purchase Health Insurance	22	0.0%	37	low
Employer-Based Health & Medicare Insurance	993	1.0%	207	medium
Direct-Purchase Health & Medicare Insurance	1,104	1.1%	218	medium
Medicare & Medicaid Coverage	1,377	1.4%	234	high
Other Private Health Insurance Combos	0	0.0%	0	
Other Public Health Insurance Combos	224	0.2%	91	medium
Other Health Insrance Combinations	1,446	1.5%	231	high
No Health Insurance Coverage	307	0.3%	158	medium

Source: U.S. Census Bureau, 2010-2014 American Community Survey

Reliability: high medium low

August 25, 2016

199 Trade Area
Area: 35.23 square miles

Prepared by Esri

	2010 - 2014 ACS Estimate	Percent	MOE(±)	Reliability
POPULATION BY RATIO OF INCOME TO POVERTY LEVEL				
Total	98,496	100.0%	3,752	high
Under .50	6,893	7.0%	1,040	high
.50 to .99	13,998	14.2%	1,682	high
1.00 to 1.24	7,931	8.1%	1,356	high
1.25 to 1.49	7,916	8.0%	1,291	high
1.50 to 1.84	12,724	12.9%	1,856	high
1.85 to 1.99	3,208	3.3%	1,011	medium
2.00 and over	45,827	46.5%	2,551	high
CIVILIAN POPULATION AGE 18 OR OLDER BY VETERAN STATUS				
Total	70,436	100.0%	2,434	high
Veteran	4,645	6.6%	486	high
Nonveteran	65,791	93.4%	2,365	high
Male	34,613	49.1%	1,498	high
Veteran	4,201	6.0%	433	high
Nonveteran	30,412	43.2%	1,455	high
Female	35,823	50.9%	1,314	high
Veteran	444	0.6%	162	medium
Nonveteran	35,379	50.2%	1,306	high
CIVILIAN VETERANS AGE 18 OR OLDER BY PERIOD OF MILITARY SERVICE				
Total	4,645	100.0%	486	high
Gulf War (9/01 or later), no Gulf War (8/90 to 8/01), no Vietnam Era	589	12.7%	249	medium
Gulf War (9/01 or later) and Gulf War (8/90 to 8/01), no Vietnam Era	245	5.3%	123	high
Gulf War (9/01 or later), and Gulf War (8/90 to 8/01), and Vietnam	18	0.4%	28	low
Gulf War (8/90 to 8/01), no Vietnam Era	674	14.5%	226	medium
Gulf War (8/90 to 8/01) and Vietnam Era	113	2.4%	68	medium
Vietnam Era, no Korean War, no World War II	1,345	29.0%	221	high
Vietnam Era and Korean War, no World War II	24	0.5%	18	low
Vietnam Era and Korean War and World War II	17	0.4%	18	low
Korean War, no Vietnam Era, no World War II	254	5.5%	79	medium
Korean War and World War II, no Vietnam Era	2	0.0%	9	low
World War II, no Korean War, no Vietnam Era	448	9.6%	147	medium
Between Gulf War and Vietnam Era only	674	14.5%	188	medium
Between Vietnam Era and Korean War only	221	4.8%	65	medium
Between Korean War and World War II only	17	0.4%	8	medium
Pre-World War II only	5	0.1%	9	low
HOUSEHOLDS BY POVERTY STATUS				
Total	32,356	100.0%	919	high
Income in the past 12 months below poverty level	6,504	20.1%	541	high
Married-couple family	1,648	5.1%	270	high
Other family - male householder (no wife present)	356	1.1%	126	medium
Other family - female householder (no husband present)	1,998	6.2%	326	high
Nonfamily household - male householder	1,154	3.6%	227	high
Nonfamily household - female householder	1,348	4.2%	261	high
Income in the past 12 months at or above poverty level	25,851	79.9%	873	high
Married-couple family	12,818	39.6%	711	high
Other family - male householder (no wife present)	1,940	6.0%	352	high
Other family - female householder (no husband present)	3,355	10.4%	413	high
Nonfamily household - male householder	3,938	12.2%	433	high
Nonfamily household - female householder	3,800	11.7%	389	high

Source: U.S. Census Bureau, 2010-2014 American Community Survey

Reliability: high medium low

August 25, 2016

ACS Population Summary

199 Trade Area
Area: 35.23 square miles

Prepared by Esri

	2010 - 2014 ACS Estimate	Percent	MOE(±)	Reliability
HOUSEHOLDS BY OTHER INCOME				
Social Security Income	7,473	23.1%	517	high
No Social Security Income	24,882	76.9%	890	high
Retirement Income	3,458	10.7%	347	high
No Retirement Income	28,898	89.3%	925	high
GROSS RENT AS A PERCENTAGE OF HOUSEHOLD INCOME IN THE PAST 12 MONTHS				
<10% of Income	369	2.9%	142	medium
10-14.9% of Income	1,084	8.5%	227	medium
15-19.9% of Income	1,601	12.6%	296	high
20-24.9% of Income	1,498	11.8%	287	high
25-29.9% of Income	1,426	11.2%	265	high
30-34.9% of Income	1,197	9.4%	253	medium
35-39.9% of Income	949	7.5%	259	medium
40-49.9% of Income	1,168	9.2%	282	medium
50+% of Income	2,610	20.6%	362	high
Gross Rent % Inc Not Computed	779	6.1%	210	medium
HOUSEHOLDS BY PUBLIC ASSISTANCE INCOME IN THE PAST 12 MONTHS				
Total	32,356	100.0%	919	high
With public assistance income	1,570	4.9%	296	high
No public assistance income	30,786	95.1%	911	high
HOUSEHOLDS BY FOOD STAMPS/SNAP STATUS				
Total	32,356	100.0%	919	high
With Food Stamps/SNAP	5,759	17.8%	539	high
With No Food Stamps/SNAP	26,597	82.2%	891	high
HOUSEHOLDS BY DISABILITY STATUS				
Total	32,356	100.0%	919	high
With 1+ Persons w/Disability	8,082	25.0%	593	high
With No Person w/Disability	24,274	75.0%	957	high

Data Note: N/A means not available. Population by Ratio of Income to Poverty Level represents persons for whom poverty status is determined. Household income represents income in 2014, adjusted for inflation.

2010-2014 ACS Estimate: The American Community Survey (ACS) replaces census sample data. Esri is releasing the 2010-2014 ACS estimates, five-year period data collected monthly from January 1, 2010 through December 31, 2014. Although the ACS includes many of the subjects previously covered by the decennial census sample, there are significant differences between the two surveys including fundamental differences in survey design and residency rules.

Margin of error (MOE): The MOE is a measure of the variability of the estimate due to sampling error. MOEs enable the data user to measure the range of uncertainty for each estimate with 90 percent confidence. The range of uncertainty is called the confidence interval, and it is calculated by taking the estimate +/- the MOE. For example, if the ACS reports an estimate of 100 with an MOE of +/- 20, then you can be 90 percent certain the value for the whole population falls between 80 and 120.

Reliability: These symbols represent threshold values that Esri has established from the Coefficients of Variation (CV) to designate the usability of the estimates. The CV measures the amount of sampling error relative to the size of the estimate, expressed as a percentage.

High Reliability: Small CVs (less than or equal to 12 percent) are flagged green to indicate that the sampling error is small relative to the estimate and the estimate is reasonably reliable.

Medium Reliability: Estimates with CVs between 12 and 40 are flagged yellow-use with caution.

Low Reliability: Large CVs (over 40 percent) are flagged red to indicate that the sampling error is large relative to the estimate. The estimate is considered very unreliable.

Source: U.S. Census Bureau, 2010-2014 American Community Survey

Reliability: high medium low

August 25, 2016

Attachment G

esri

Demographic and Income Profile

199 Trade Area
Area: 35.23 square miles

Prepared by Esri

Summary	Census 2010	2016	2021
Population	96,636	104,540	110,964
Households	31,519	33,807	35,800
Families	22,307	23,667	24,883
Average Household Size	3.02	3.05	3.06
Owner Occupied Housing Units	18,874	18,962	19,853
Renter Occupied Housing Units	12,645	14,845	15,947
Median Age	30.5	31.5	32.0
Trends: 2016 - 2021 Annual Rate	**Area**	**State**	**National**
Population	1.20%	1.63%	0.84%
Households	1.15%	1.58%	0.79%
Families	1.01%	1.52%	0.72%
Owner HHs	0.92%	1.52%	0.73%
Median Household Income	0.60%	1.86%	1.86%

	2016		2021		2026	
Households by Income	Number	Percent	Number	Percent	Number	Percent
<$15,000	5,162	15.3%	5,677	15.9%	5,900	16.2%
$15,000 - $24,999	4,037	11.9%	4,287	12.0%	4,299	11.8%
$25,000 - $34,999	4,123	12.2%	4,795	13.4%	5,266	14.4%
$35,000 - $49,999	5,403	16.0%	4,273	11.9%	3,191	8.8%
$50,000 - $74,999	6,924	20.5%	6,965	19.5%	6,616	18.2%
$75,000 - $99,999	3,524	10.4%	4,307	12.0%	4,971	13.6%
$100,000 - $149,999	2,745	8.1%	3,134	8.8%	3,379	9.3%
$150,000 - $199,999	990	2.9%	1,304	3.6%	1,622	4.4%
$200,000+	899	2.7%	1,057	3.0%	1,174	3.2%
Median Household Income	$43,781		$45,120		$46,500	
Average Household Income	$59,286		$63,286		$67,556	
Per Capita Income	$19,765		$20,981		$22,272	

0.982318

	Census 2010		2016		2021		2026	
Population by Age	Number	Percent	Number	Percent	Number	Percent	Number	Percent
0 - 4	9,302	9.6%	9,486	9.1%	9,891	8.9%	10,313	8.7%
5 - 9	8,488	8.8%	8,977	8.6%	9,376	8.4%	9,793	8.3%
10 - 14	7,451	7.7%	8,240	7.9%	8,988	8.1%	9,804	8.3%
15 - 19	6,957	7.2%	7,201	6.9%	7,910	7.1%	8,689	7.4%
20 - 24	7,312	7.6%	7,545	7.2%	7,496	6.8%	7,447	6.3%
25 - 34	15,376	15.9%	16,611	15.9%	16,928	15.3%	17,251	14.6%
35 - 44	13,101	13.6%	13,949	13.3%	15,466	13.9%	17,148	14.5%
45 - 54	11,797	12.2%	12,169	11.6%	12,129	10.9%	12,089	10.2%
55 - 64	8,247	8.5%	9,835	9.4%	10,501	9.5%	11,212	9.5%
65 - 74	4,709	4.9%	6,252	6.0%	7,365	6.6%	8,676	7.3%
75 - 84	2,766	2.9%	3,020	2.9%	3,575	3.2%	4,232	3.6%

85+	1,129	1.2%	1,254	1.2%	1,337	1.2%	1,425	1.2%

118,080

Race and Ethnicity	Census 2010 Number	Census 2010 Percent	2016 Number	2016 Percent	2021 Number	2021 Percent
White Alone	68,774	71.2%	72,076	68.9%	74,961	67.6%
Black Alone	4,757	4.9%	5,888	5.6%	6,782	6.1%
American Indian Alone	823	0.9%	847	0.8%	875	0.8%
Asian Alone	990	1.0%	1,300	1.2%	1,569	1.4%
Pacific Islander Alone	44	0.0%	56	0.1%	65	0.1%
Some Other Race Alone	18,278	18.9%	20,894	20.0%	22,820	20.6%
Two or More Races	2,969	3.1%	3,478	3.3%	3,892	3.5%
Hispanic Origin (Any Race)	55,878	57.8%	62,587	59.9%	68,930	62.1%

Data Note: Income is expressed in current dollars.

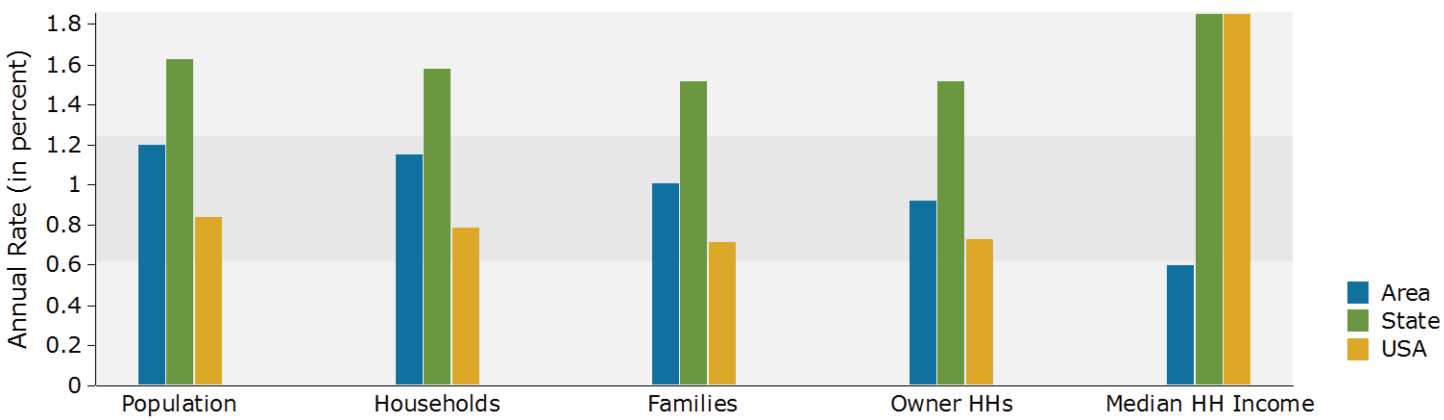
Source: U.S. Census Bureau, Census 2010 Summary File 1. Esri forecasts for 2016 and 2021.

Demographic and Income Profile

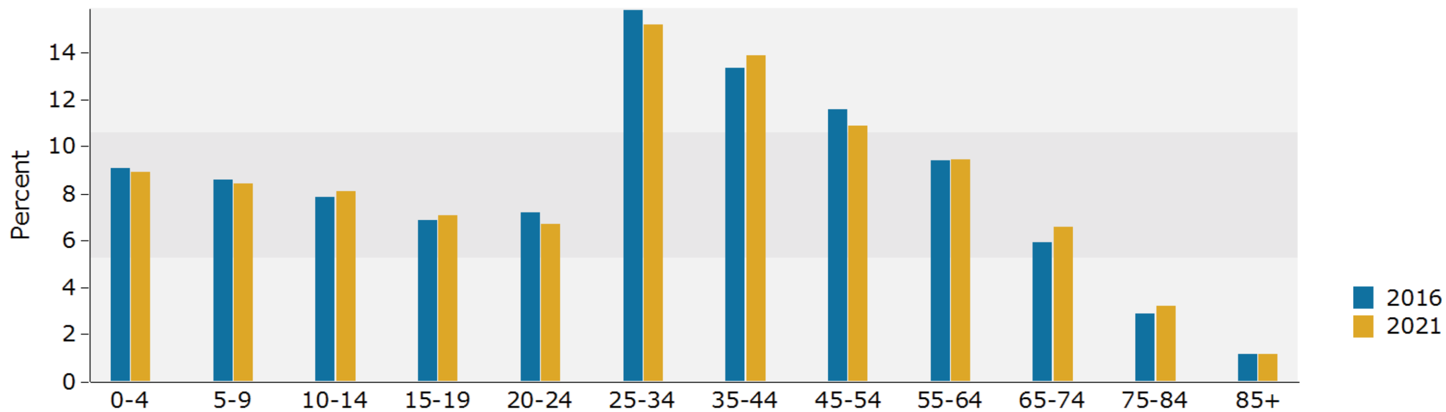
199 Trade Area
Area: 35.23 square miles

Prepared by Esri

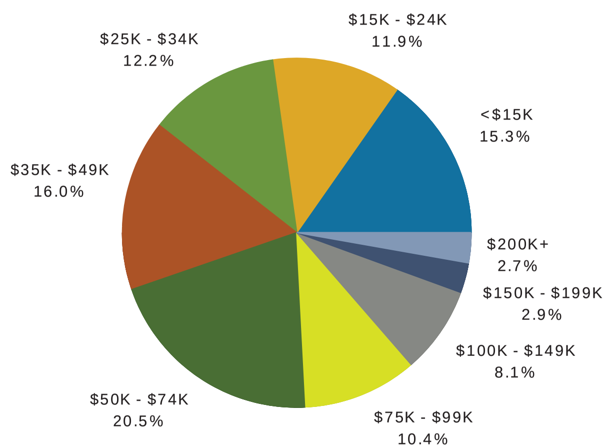
Trends 2016-2021



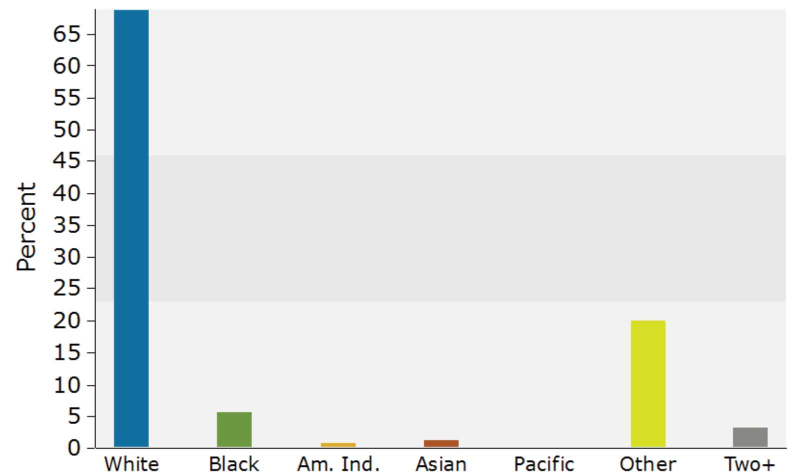
Population by Age



2016 Household Income



2016 Population by Race



2016 Percent Hispanic Origin: 59.9%

Source: U.S. Census Bureau, Census 2010 Summary File 1. Esri forecasts for 2016 and 2021.

August 25, 2016

Attachment H

Market Profile

199 Trade Area
Area: 35.23 square miles

Prepared by Esri

Population Summary	
2000 Total Population	83,828
2010 Total Population	96,636
2016 Total Population	104,540
2016 Group Quarters	1,482
2020 Total Population	110,964
2016-2021 Annual Rate	1.20%
Household Summary	
2000 Households	26,708
2000 Average Household Size	3.01
2010 Households	31,519
2010 Average Household Size	3.02
2016 Households	33,807
2016 Average Household Size	3.05
2021 Households	35,800
2021 Average Household Size	3.06
2016-2021 Annual Rate	1.15%
2010 Families	22,307
2010 Average Family Size	3.60
2016 Families	23,667
2016 Average Family Size	3.66
2021 Families	24,883
2021 Average Family Size	3.68
2016-2021 Annual Rate	1.01%
Housing Unit Summary	
2000 Housing Units	28,575
Owner Occupied Housing Units	55.6%
Renter Occupied Housing Units	37.9%
Vacant Housing Units	6.5%
2010 Housing Units	34,860
Owner Occupied Housing Units	54.1%
Renter Occupied Housing Units	36.3%
Vacant Housing Units	9.6%
2016 Housing Units	36,999
Owner Occupied Housing Units	51.3%
Renter Occupied Housing Units	40.1%
Vacant Housing Units	8.6%
2021 Housing Units	39,032
Owner Occupied Housing Units	50.9%
Renter Occupied Housing Units	40.9%
Vacant Housing Units	8.3%
Median Household Income	
2016	$43,781
2021	$45,120
Median Home Value	
2016	$95,094
2021	$105,626
Per Capita Income	
2016	$19,765
2021	$20,981
Median Age	
2010	30.5
2016	31.5
2021	32.0

Data Note: Household population includes persons not residing in group quarters. Average Household Size is the household population divided by total households. Persons in families include the householder and persons related to the householder by birth, marriage, or adoption. Per Capita Income represents the income received by all persons aged 15 years and over divided by the total population.

Source: U.S. Census Bureau, Census 2010 Summary File 1. Esri forecasts for 2016 and 2021 Esri converted Census 2000 data into 2010 geography.

Market Profile

199 Trade Area
Area: 35.23 square miles

Prepared by Esri

2016 Households by Income	
Household Income Base	33,807
<$15,000	15.3%
$15,000 - $24,999	11.9%
$25,000 - $34,999	12.2%
$35,000 - $49,999	16.0%
$50,000 - $74,999	20.5%
$75,000 - $99,999	10.4%
$100,000 - $149,999	8.1%
$150,000 - $199,999	2.9%
$200,000+	2.7%
Average Household Income	$59,286
2021 Households by Income	
Household Income Base	35,800
<$15,000	15.9%
$15,000 - $24,999	12.0%
$25,000 - $34,999	13.4%
$35,000 - $49,999	11.9%
$50,000 - $74,999	19.5%
$75,000 - $99,999	12.0%
$100,000 - $149,999	8.8%
$150,000 - $199,999	3.6%
$200,000+	3.0%
Average Household Income	$63,286
2016 Owner Occupied Housing Units by Value	
Total	18,952
<$50,000	15.2%
$50,000 - $99,999	38.6%
$100,000 - $149,999	18.2%
$150,000 - $199,999	10.7%
$200,000 - $249,999	4.9%
$250,000 - $299,999	2.4%
$300,000 - $399,999	4.0%
$400,000 - $499,999	1.1%
$500,000 - $749,999	2.3%
$750,000 - $999,999	1.4%
$1,000,000 +	1.1%
Average Home Value	$151,628
2021 Owner Occupied Housing Units by Value	
Total	19,843
<$50,000	11.6%
$50,000 - $99,999	36.8%
$100,000 - $149,999	14.1%
$150,000 - $199,999	12.9%
$200,000 - $249,999	9.3%
$250,000 - $299,999	3.2%
$300,000 - $399,999	4.5%
$400,000 - $499,999	1.3%
$500,000 - $749,999	3.3%
$750,000 - $999,999	1.7%
$1,000,000 +	1.2%
Average Home Value	$172,890

Data Note: Income represents the preceding year, expressed in current dollars. Household income includes wage and salary earnings, interest dividends, net rents, pensions, SSI and welfare payments, child support, and alimony.
Source: U.S. Census Bureau, Census 2010 Summary File 1. Esri forecasts for 2016 and 2021 Esri converted Census 2000 data into 2010 geography.

August 25, 2016

2010 Population by Age	
Total	96,634
0 - 4	9.6%
5 - 9	8.8%
10 - 14	7.7%
15 - 24	14.8%
25 - 34	15.9%
35 - 44	13.6%
45 - 54	12.2%
55 - 64	8.5%
65 - 74	4.9%
75 - 84	2.9%
85 +	1.2%
18 +	69.6%
2016 Population by Age	
Total	104,539
0 - 4	9.1%
5 - 9	8.6%
10 - 14	7.9%
15 - 24	14.1%
25 - 34	15.9%
35 - 44	13.3%
45 - 54	11.6%
55 - 64	9.4%
65 - 74	6.0%
75 - 84	2.9%
85 +	1.2%
18 +	70.4%
2021 Population by Age	
Total	110,962
0 - 4	8.9%
5 - 9	8.4%
10 - 14	8.1%
15 - 24	13.9%
25 - 34	15.3%
35 - 44	13.9%
45 - 54	10.9%
55 - 64	9.5%
65 - 74	6.6%
75 - 84	3.2%
85 +	1.2%
18 +	70.3%
2010 Population by Sex	
Males	47,994
Females	48,642
2016 Population by Sex	
Males	51,893
Females	52,647
2021 Population by Sex	
Males	55,013
Females	55,951

Source: U.S. Census Bureau, Census 2010 Summary File 1. Esri forecasts for 2016 and 2021 Esri converted Census 2000 data into 2010 geography.

2010 Population by Race/Ethnicity	
Total	96,635
White Alone	71.2%
Black Alone	4.9%
American Indian Alone	0.9%
Asian Alone	1.0%
Pacific Islander Alone	0.0%
Some Other Race Alone	18.9%
Two or More Races	3.1%
Hispanic Origin	57.8%
Diversity Index	73.9
2016 Population by Race/Ethnicity	
Total	104,539
White Alone	68.9%
Black Alone	5.6%
American Indian Alone	0.8%
Asian Alone	1.2%
Pacific Islander Alone	0.1%
Some Other Race Alone	20.0%
Two or More Races	3.3%
Hispanic Origin	59.9%
Diversity Index	75.1
2021 Population by Race/Ethnicity	
Total	110,964
White Alone	67.6%
Black Alone	6.1%
American Indian Alone	0.8%
Asian Alone	1.4%
Pacific Islander Alone	0.1%
Some Other Race Alone	20.6%
Two or More Races	3.5%
Hispanic Origin	62.1%
Diversity Index	75.6
2010 Population by Relationship and Household Type	
Total	96,636
In Households	98.5%
In Family Households	86.3%
Householder	23.1%
Spouse	15.5%
Child	38.3%
Other relative	6.3%
Nonrelative	3.1%
In Nonfamily Households	12.2%
In Group Quarters	1.5%
Institutionalized Population	1.3%
Noninstitutionalized Population	0.2%

Data Note: Persons of Hispanic Origin may be of any race. The Diversity Index measures the probability that two people from the same area will be from different race/ethnic groups.
Source: U.S. Census Bureau, Census 2010 Summary File 1. Esri forecasts for 2016 and 2021 Esri converted Census 2000 data into 2010 geography.

2016 Population 25+ by Educational Attainment	
Total	63,091
Less than 9th Grade	17.5%
9th - 12th Grade, No Diploma	14.8%
High School Graduate	22.7%
GED/Alternative Credential	5.7%
Some College, No Degree	17.9%
Associate Degree	4.9%
Bachelor's Degree	11.5%
Graduate/Professional Degree	5.1%
2016 Population 15+ by Marital Status	
Total	77,837
Never Married	35.3%
Married	46.1%
Widowed	5.3%
Divorced	13.3%
2016 Civilian Population 16+ in Labor Force	
Civilian Employed	95.4%
Civilian Unemployed	4.6%
2016 Employed Population 16+ by Industry	
Total	45,039
Agriculture/Mining	1.6%
Construction	12.2%
Manufacturing	13.5%
Wholesale Trade	4.1%
Retail Trade	11.3%
Transportation/Utilities	5.8%
Information	1.2%
Finance/Insurance/Real Estate	6.2%
Services	41.8%
Public Administration	2.4%
2016 Employed Population 16+ by Occupation	
Total	45,038
White Collar	46.0%
Management/Business/Financial	9.7%
Professional	12.6%
Sales	10.4%
Administrative Support	13.3%
Services	18.9%
Blue Collar	35.1%
Farming/Forestry/Fishing	0.1%
Construction/Extraction	10.5%
Installation/Maintenance/Repair	5.3%
Production	10.4%
Transportation/Material Moving	8.8%
2010 Population By Urban/ Rural Status	
Total Population	96,636
Population Inside Urbanized Area	99.9%
Population Inside Urbanized Cluster	0.0%
Rural Population	0.1%

Source: U.S. Census Bureau, Census 2010 Summary File 1. Esri forecasts for 2016 and 2021 Esri converted Census 2000 data into 2010 geography.

2010 Households by Type	
Total	31,518
Households with 1 Person	23.6%
Households with 2+ People	76.4%
Family Households	70.8%
Husband-wife Families	47.5%
With Related Children	28.0%
Other Family (No Spouse Present)	23.3%
Other Family with Male Householder	7.2%
With Related Children	4.4%
Other Family with Female Householder	16.1%
With Related Children	11.0%
Nonfamily Households	5.6%
All Households with Children	44.0%
Multigenerational Households	8.1%
Unmarried Partner Households	7.5%
Male-female	6.9%
Same-sex	0.6%
2010 Households by Size	
Total	31,519
1 Person Household	23.6%
2 Person Household	25.4%
3 Person Household	16.0%
4 Person Household	14.8%
5 Person Household	10.2%
6 Person Household	5.3%
7 + Person Household	4.7%
2010 Households by Tenure and Mortgage Status	
Total	31,519
Owner Occupied	59.9%
Owned with a Mortgage/Loan	37.6%
Owned Free and Clear	22.3%
Renter Occupied	40.1%
2010 Housing Units By Urban / Rural Status	
Total Housing Units	34,860
Housing Units Inside Urbanized Area	99.9%
Housing Units Inside Urbanized Cluster	0.0%
Rural Housing Units	0.1%

Data Note: Households with children include any households with people under age 18, related or not. Multigenerational households are families with 3 or more parent-child relationships. Unmarried partner households are usually classified as nonfamily households unless there is another member of the household related to the householder. Multigenerational and unmarried partner households are reported only to the tract level. Esri estimated block group data, which is used to estimate polygons or non-standard geography.

Source: U.S. Census Bureau, Census 2010 Summary File 1. Esri forecasts for 2016 and 2021 Esri converted Census 2000 data into 2010 geography.

199 Trade Area
Area: 35.23 square miles

Prepared by Esri

Top 3 Tapestry Segments		
	1.	Barrios Urbanos (7D)
	2.	Up and Coming Families
	3.	Traditional Living (12B)
2016 Consumer Spending		
Apparel & Services: Total $		$54,324,317
Average Spent		$1,606.90
Spending Potential Index		80
Education: Total $		$33,428,270
Average Spent		$988.80
Spending Potential Index		70
Entertainment/Recreation: Total $		$76,429,982
Average Spent		$2,260.77
Spending Potential Index		78
Food at Home: Total $		$136,913,302
Average Spent		$4,049.85
Spending Potential Index		81
Food Away from Home: Total $		$84,347,172
Average Spent		$2,494.96
Spending Potential Index		81
Health Care: Total $		$136,491,754
Average Spent		$4,037.38
Spending Potential Index		76
HH Furnishings & Equipment: Total $		$46,672,691
Average Spent		$1,380.56
Spending Potential Index		78
Personal Care Products & Services: Total $		$19,252,062
Average Spent		$569.47
Spending Potential Index		78
Shelter: Total $		$414,067,588
Average Spent		$12,247.98
Spending Potential Index		79
Support Payments/Cash Contributions/Gifts in Kind: Total		$58,728,864
Average Spent		$1,737.18
Spending Potential Index		75
Travel: Total $		$45,880,800
Average Spent		$1,357.14
Spending Potential Index		73
Vehicle Maintenance & Repairs: Total $		$27,621,684
Average Spent		$817.04
Spending Potential Index		79

Data Note: Consumer spending shows the amount spent on a variety of goods and services by households that reside in the area. Expenditures are shown by broad budget categories that are not mutually exclusive. Consumer spending does not equal business revenue. Total and Average Amount Spent Per Household represent annual figures. The Spending Potential Index represents the amount spent in the area relative to a national average of 100.

Source: Consumer Spending data are derived from the 2013 and 2014 Consumer Expenditure Surveys, Bureau of Labor Statistics. Esri.
Source: U.S. Census Bureau, Census 2010 Summary File 1. Esri forecasts for 2016 and 2021 Esri converted Census 2000 data into 2010 geography.

August 25, 2016

Attachment I

Tapestry Segmentation Area Profile

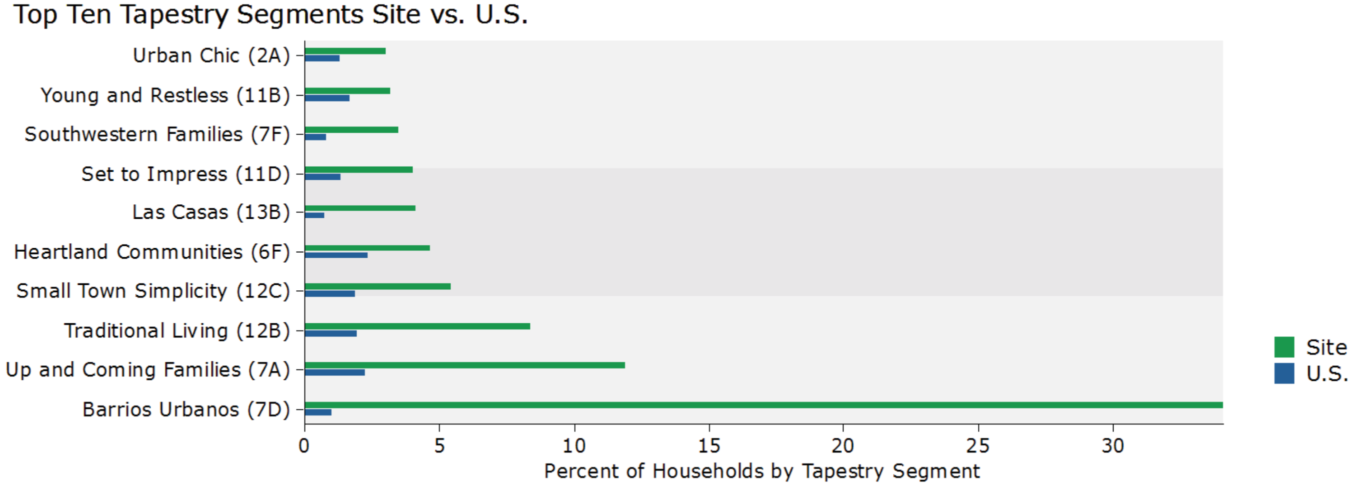
199 Trade Area
Area: 35.23 square miles

Prepared by Esri

Top Twenty Tapestry Segments

		2016 Households		2016 U.S. Households		
			Cumulativ		Cumulative	
Rank	**Tapestry Segment**	**Percent**	**Percent**	**Percent**	**Percent**	**Index**
1	Barrios Urbanos (7D)	34.1%	34.1%	1.0%	1.0%	3269
2	Up and Coming Families (7A)	11.9%	46.0%	2.3%	3.3%	522
3	Traditional Living (12B)	8.4%	54.4%	2.0%	5.3%	430
4	Small Town Simplicity (12C)	5.4%	59.8%	1.9%	7.2%	286
5	Heartland Communities (6F)	4.7%	64.5%	2.4%	9.6%	200
	Subtotal	**64.5%**		**9.6%**		
6	Las Casas (13B)	4.2%	68.7%	0.7%	10.3%	563
7	Set to Impress (11D)	4.1%	72.8%	1.4%	11.7%	292
8	Southwestern Families (7F)	3.5%	76.3%	0.8%	12.5%	423
9	Young and Restless (11B)	3.2%	79.5%	1.7%	14.2%	187
10	Urban Chic (2A)	3.0%	82.5%	1.3%	15.5%	230
	Subtotal	**18.0%**		**5.9%**		
11	Soccer Moms (4A)	2.5%	85.0%	2.8%	18.3%	90
12	Middleburg (4C)	2.4%	87.4%	2.8%	21.1%	84
13	Metro Fusion (11C)	2.3%	89.7%	1.4%	22.5%	161
14	Emerald City (8B)	2.0%	91.7%	1.4%	23.9%	141
15	In Style (5B)	2.0%	93.7%	2.3%	26.2%	88
	Subtotal	**11.2%**		**10.7%**		
16	Rustbelt Traditions (5D)	1.7%	95.4%	2.2%	28.4%	75
17	Bright Young Professionals (8C)	1.6%	97.0%	2.2%	30.6%	71
18	Social Security Set (9F)	1.5%	98.5%	0.8%	31.4%	191
19	American Dreamers (7C)	1.0%	99.5%	1.5%	32.9%	68
20	The Great Outdoors (6C)	0.2%	99.7%	1.6%	34.5%	14
	Subtotal	**6.0%**		**8.3%**		
	Total	**99.8%**		**34.6%**		**289**

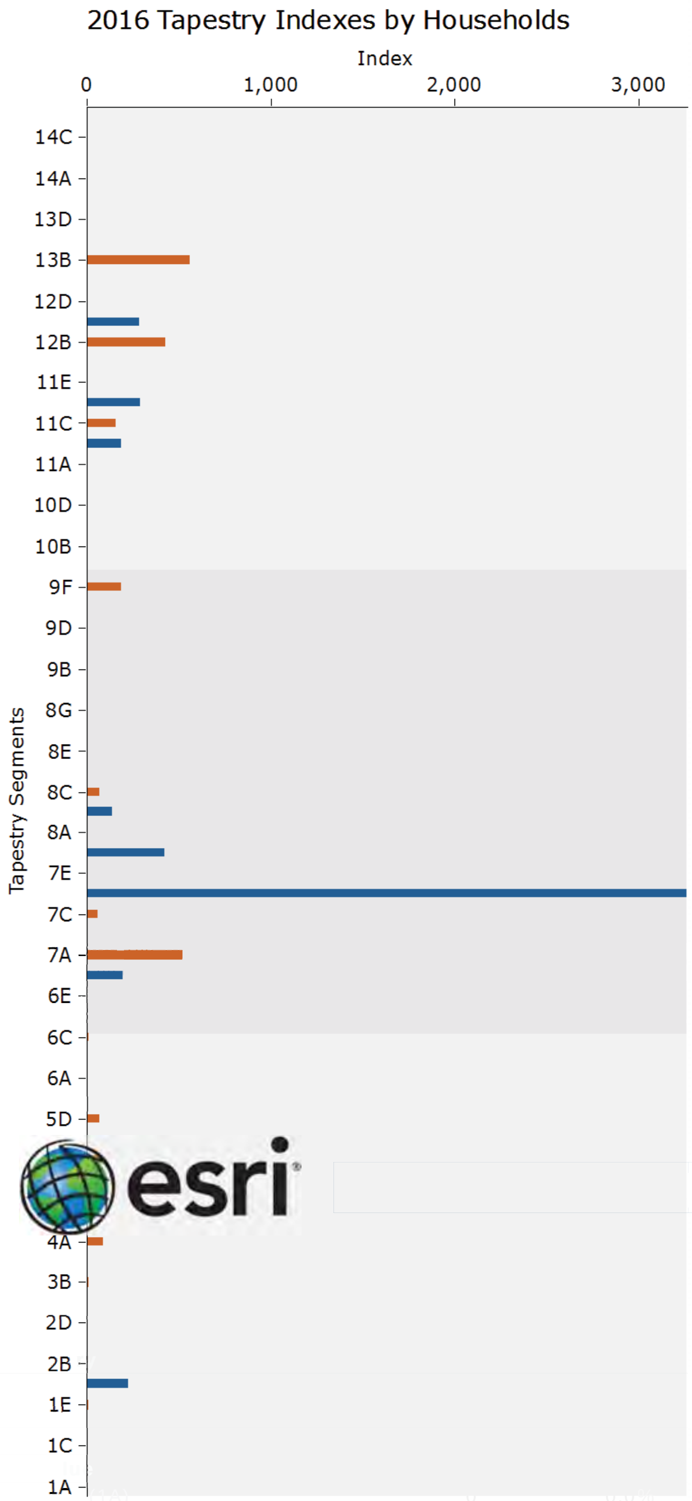
Top Ten Tapestry Segments Site vs. U.S.

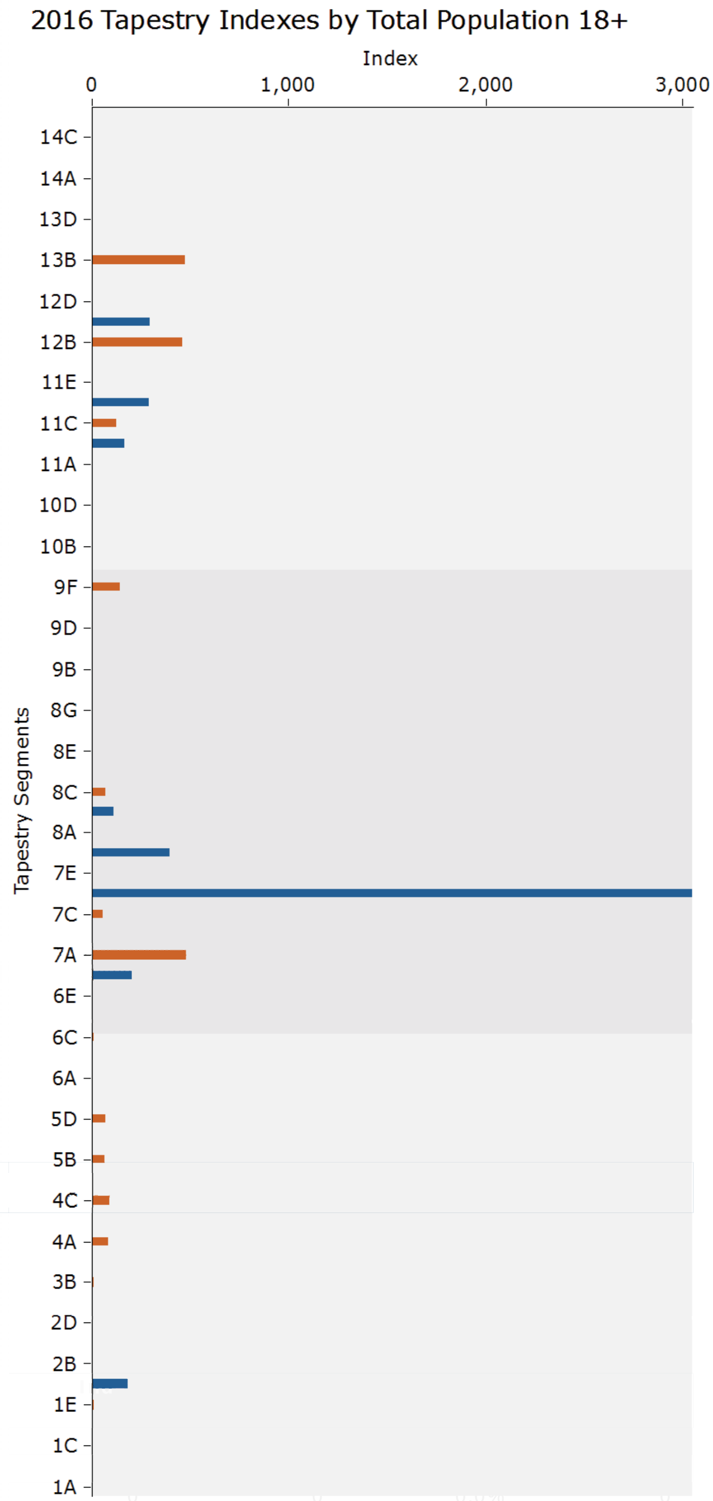


Data Note: This report identifies neighborhood segments in the area, and describes the socioeconomic quality of the immediate neighborhood. The index is a comparison of the percent of households or Total Population 18+ in the area, by Tapestry segment, to the percent of households or Total Population 18+ in the United States, by segment. An index of 100 is the US average.
Source: Esri

August 25, 2016

Tapestry Segmentation Area Profile





Savvy Suburbanites (1D)	0	0.0%	0	0	0.0%	0
Exurbanites (1E)	47	0.1%	7	101	0.1%	7
2. Upscale Avenues	**1,026**	**3.0%**	**53**	**1,692**	**2.3%**	**39**
Urban Chic (2A)	1,026	3.0%	230	1,692	2.3%	185
Pleasantville (2B)	0	0.0%	0	0	0.0%	0
Pacific Heights (2C)	0	0.0%	0	0	0.0%	0
Enterprising Professionals (2D)	0	0.0%	0	0	0.0%	0
3. Uptown Individuals	**32**	**0.1%**	**3**	**63**	**0.1%**	**3**
Laptops and Lattes (3A)	0	0.0%	0	0	0.0%	0

Metro Renters (3B)	32	0.1%	6	63	0.1%	7
Trendsetters (3C)	0	0.0%	0	0	0.0%	0
4. Family Landscapes	**1,661**	**4.9%**	**66**	**3,831**	**5.2%**	**68**
Soccer Moms (4A)	862	2.5%	90	1,897	2.6%	85
Home Improvement (4B)	0	0.0%	0	0	0.0%	0
Middleburg (4C)	799	2.4%	84	1,934	2.6%	93
5. GenXurban	**1,231**	**3.6%**	**31**	**2,231**	**3.0%**	**28**
Comfortable Empty Nesters	0	0.0%	0	0	0.0%	0
In Style (5B)	670	2.0%	88	1,087	1.5%	70
Parks and Rec (5C)	0	0.0%	0	0	0.0%	0
Rustbelt Traditions (5D)	561	1.7%	75	1,144	1.6%	74
Midlife Constants (5E)	0	0.0%	0	0	0.0%	0
6. Cozy Country Living	**1,666**	**4.9%**	**40**	**3,457**	**4.7%**	**39**
Green Acres (6A)	0	0.0%	0	0	0.0%	0
Salt of the Earth (6B)	0	0.0%	0	0	0.0%	0
The Great Outdoors (6C)	73	0.2%	14	129	0.2%	12
Prairie Living (6D)	0	0.0%	0	0	0.0%	0
Rural Resort Dwellers (6E)	0	0.0%	0	0	0.0%	0
Heartland Communities (6F)	1,593	4.7%	200	3,328	4.5%	206
7. Ethnic Enclaves	**17,090**	**50.6%**	**721**	**40,156**	**54.6%**	**676**
Up and Coming Families (7A)	4,028	11.9%	522	8,583	11.7%	484
Urban Villages (7B)	0	0.0%	0	0	0.0%	0
American Dreamers (7C)	340	1.0%	68	745	1.0%	61
Barrios Urbanos (7D)	11,529	34.1%	3,269	28,007	38.1%	3,056
Valley Growers (7E)	0	0.0%	0	0	0.0%	0
Southwestern Families (7F)	1,193	3.5%	423	2,821	3.8%	399

Data Note: This report identifies neighborhood segments in the area, and describes the socioeconomic quality of the immediate neighborhood. The index is a comparison of the percent of households or Total Population 18+ in the area, by Tapestry segment, to the percent of households or Total Population 18+ in the United States, by segment. An index of 100 is the US average.
Source: Esri

August 25, 2016

Tapestry Segmentation Area Profile

199 Trade Area
Area: 35.23 square miles

Prepared by Esri

Tapestry LifeMode Groups	**2016 Households**			2016 Adult Population		
	Number	**Percent**	**Index**	**Number**	**Percent**	**Index**
Total:	33,807	100.0%		73,562	100.0%	
8. Middle Ground	**1,207**	**3.6%**	**32**	**2,142**	**2.9%**	**29**
City Lights (8A)	0	0.0%	0	0	0.0%	0
Emerald City (8B)	675	2.0%	141	1,070	1.5%	119
Bright Young Professionals	532	1.6%	71	1,072	1.5%	73
Downtown Melting Pot (8D)	0	0.0%	0	0	0.0%	0
Front Porches (8E)	0	0.0%	0	0	0.0%	0
Old and Newcomers (8F)	0	0.0%	0	0	0.0%	0
Hardscrabble Road (8G)	0	0.0%	0	0	0.0%	0
9. Senior Styles	**522**	**1.5%**	**27**	**735**	**1.0%**	**20**
Silver & Gold (9A)	0	0.0%	0	0	0.0%	0
Golden Years (9B)	0	0.0%	0	0	0.0%	0
The Elders (9C)	0	0.0%	0	0	0.0%	0
Senior Escapes (9D)	0	0.0%	0	0	0.0%	0
Retirement Communities (9E)	0	0.0%	0	0	0.0%	0
Social Security Set (9F)	522	1.5%	191	735	1.0%	150
10. Rustic Outposts	**0**	**0.0%**	**0**	**0**	**0.0%**	**0**
Southern Satellites (10A)	0	0.0%	0	0	0.0%	0
Rooted Rural (10B)	0	0.0%	0	0	0.0%	0
Diners & Miners (10C)	0	0.0%	0	0	0.0%	0
Down the Road (10D)	0	0.0%	0	0	0.0%	0

Rural Bypasses (10E)	0	0.0%	0	0	0.0%	0
11. Midtown Singles	**3,228**	**9.5%**	**153**	**5,575**	**7.6%**	**138**
City Strivers (11A)	0	0.0%	0	0	0.0%	0
Young and Restless (11B)	1,086	3.2%	187	1,727	2.3%	171
Metro Fusion (11C)	768	2.3%	161	1,250	1.7%	130
Set to Impress (11D)	1,374	4.1%	292	2,598	3.5%	296
City Commons (11E)	0	0.0%	0	0	0.0%	0
12. Hometown	**4,686**	**13.9%**	**220**	**9,998**	**13.6%**	**230**
Family Foundations (12A)	0	0.0%	0	0	0.0%	0
Traditional Living (12B)	2,845	8.4%	430	6,239	8.5%	465
Small Town Simplicity (12C)	1,841	5.4%	286	3,759	5.1%	297
Modest Income Homes (12D)	0	0.0%	0	0	0.0%	0
13. Next Wave	**1,411**	**4.2%**	**106**	**3,581**	**4.9%**	**109**
International Marketplace	0	0.0%	0	0	0.0%	0
Las Casas (13B)	1,411	4.2%	563	3,581	4.9%	478
NeWest Residents (13C)	0	0.0%	0	0	0.0%	0
Fresh Ambitions (13D)	0	0.0%	0	0	0.0%	0
High Rise Renters (13E)	0	0.0%	0	0	0.0%	0
14. Scholars and Patriots	**0**	**0.0%**	**0**	**0**	**0.0%**	**0**
Military Proximity (14A)	0	0.0%	0	0	0.0%	0
College Towns (14B)	0	0.0%	0	0	0.0%	0
Dorms to Diplomas (14C)	0	0.0%	0	0	0.0%	0
Unclassified (15)	0	0.0%	0	0	0.0%	0

Data Note: This report identifies neighborhood segments in the area, and describes the socioeconomic quality of the immediate neighborhood. The index is a comparison of the percent of households or Total Population 18+ in the area, by Tapestry segment, to the percent of households or Total Population 18+ in the United States, by segment. An index of 100 is the US average.
Source: Esri

August 25, 2016

Tapestry Segmentation Area Profile

199 Trade Area
Area: 35.23 square miles

Prepared by Esri

Tapestry Urbanization	**2016 Households**			2016 Adult Population		
	Number	**Percent**	**Index**	**Number**	**Percent**	**Index**
Total:	33,807	100.0%		73,562	100.0%	
1. Principal Urban Center	**32**	**0.1%**	**1**	**63**	**0.1%**	**1**
Laptops and Lattes (3A)	0	0.0%	0	0	0.0%	0
Metro Renters (3B)	32	0.1%	6	63	0.1%	7
Trendsetters (3C)	0	0.0%	0	0	0.0%	0
Downtown Melting Pot (8D)	0	0.0%	0	0	0.0%	0
City Strivers (11A)	0	0.0%	0	0	0.0%	0
NeWest Residents (13C)	0	0.0%	0	0	0.0%	0
Fresh Ambitions (13D)	0	0.0%	0	0	0.0%	0
High Rise Renters (13E)	0	0.0%	0	0	0.0%	0
2. Urban Periphery	**16,334**	**48.3%**	**284**	**38,620**	**52.5%**	**293**
Pacific Heights (2C)	0	0.0%	0	0	0.0%	0
Rustbelt Traditions (5D)	561	1.7%	75	1,144	1.6%	74
Urban Villages (7B)	0	0.0%	0	0	0.0%	0
American Dreamers (7C)	340	1.0%	68	745	1.0%	61
Barrios Urbanos (7D)	11,529	34.1%	3,269	28,007	38.1%	3,056
Southwestern Families (7F)	1,193	3.5%	423	2,821	3.8%	399
City Lights (8A)	0	0.0%	0	0	0.0%	0
Bright Young Professionals (8C)	532	1.6%	71	1,072	1.5%	73
Metro Fusion (11C)	768	2.3%	161	1,250	1.7%	130
Family Foundations (12A)	0	0.0%	0	0	0.0%	0
Modest Income Homes (12D)	0	0.0%	0	0	0.0%	0
International Marketplace (13A)	0	0.0%	0	0	0.0%	0
Las Casas (13B)	1,411	4.2%	563	3,581	4.9%	478
3. Metro Cities	**7,172**	**21.2%**	**115**	**13,456**	**18.3%**	**108**
In Style (5B)	670	2.0%	88	1,087	1.5%	70

Emerald City (8B)	675	2.0%	141	1,070	1.5%	119
Front Porches (8E)	0	0.0%	0	0	0.0%	0
Old and Newcomers (8F)	0	0.0%	0	0	0.0%	0
Hardscrabble Road (8G)	0	0.0%	0	0	0.0%	0
Retirement Communities (9E)	0	0.0%	0	0	0.0%	0
Social Security Set (9F)	522	1.5%	191	735	1.0%	150
Young and Restless (11B)	1,086	3.2%	187	1,727	2.3%	171
Set to Impress (11D)	1,374	4.1%	292	2,598	3.5%	296
City Commons (11E)	0	0.0%	0	0	0.0%	0
Traditional Living (12B)	2,845	8.4%	430	6,239	8.5%	465
College Towns (14B)	0	0.0%	0	0	0.0%	0
Dorms to Diplomas (14C)	0	0.0%	0	0	0.0%	0

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Source: Esri

Tapestry Urbanization	2016 Households			2016 Adult Population		
	Number	Percent	Index	Number	Percent	Index
Total:	33,807	100.0%		73,562	100.0%	
4. Suburban Periphery	**5,963**	**17.6%**	**55**	**12,273**	**16.7%**	**52**
Top Tier (1A)	0	0.0%	0	0	0.0%	0
Professional Pride (1B)	0	0.0%	0	0	0.0%	0
Boomburbs (1C)	0	0.0%	0	0	0.0%	0
Savvy Suburbanites (1D)	0	0.0%	0	0	0.0%	0
Exurbanites (1E)	47	0.1%	7	101	0.1%	7
Urban Chic (2A)	1,026	3.0%	230	1,692	2.3%	185
Pleasantville (2B)	0	0.0%	0	0	0.0%	0
Enterprising Professionals (2D)	0	0.0%	0	0	0.0%	0
Soccer Moms (4A)	862	2.5%	90	1,897	2.6%	85
Home Improvement (4B)	0	0.0%	0	0	0.0%	0
Comfortable Empty Nesters	0	0.0%	0	0	0.0%	0
Parks and Rec (5C)	0	0.0%	0	0	0.0%	0
Midlife Constants (5E)	0	0.0%	0	0	0.0%	0
Up and Coming Families (7A)	4,028	11.9%	522	8,583	11.7%	484
Silver & Gold (9A)	0	0.0%	0	0	0.0%	0
Golden Years (9B)	0	0.0%	0	0	0.0%	0
The Elders (9C)	0	0.0%	0	0	0.0%	0
Military Proximity (14A)	0	0.0%	0	0	0.0%	0
5. Semirural	**4,233**	**12.5%**	**132**	**9,021**	**12.3%**	**135**
Middleburg (4C)	799	2.4%	84	1,934	2.6%	93
Heartland Communities (6F)	1,593	4.7%	200	3,328	4.5%	206
Valley Growers (7E)	0	0.0%	0	0	0.0%	0
Senior Escapes (9D)	0	0.0%	0	0	0.0%	0
Down the Road (10D)	0	0.0%	0	0	0.0%	0
Small Town Simplicity (12C)	1,841	5.4%	286	3,759	5.1%	297
6. Rural	**73**	**0.2%**	**1**	**129**	**0.2%**	**1**
Green Acres (6A)	0	0.0%	0	0	0.0%	0
Salt of the Earth (6B)	0	0.0%	0	0	0.0%	0
The Great Outdoors (6C)	73	0.2%	14	129	0.2%	12
Prairie Living (6D)	0	0.0%	0	0	0.0%	0
Rural Resort Dwellers (6E)	0	0.0%	0	0	0.0%	0

Southern Satellites (10A)	0	0.0%	0	0	0.0%	0
Rooted Rural (10B)	0	0.0%	0	0	0.0%	0
Diners & Miners (10C)	0	0.0%	0	0	0%	0
Rural Bypasses (10E)	0	0.0%	0	0	0.0%	0
Unclassified (15)	0	0.0%	0	0	0.0%	0

Data Note: This report identifies neighborhood segments in the area, and describes the socioeconomic quality of the immediate neighborhood. The index is a comparison of the percent of households or Total Population 18+ in the area, by Tapestry segment, to the percent of households or Total Population 18+ in the United States, by segment. An index of 100 is the US average.
Source: Esri

August 25, 2016

Attachment J

2016 Consumer Spending

National Average Spending Potential	100
Apparel & Services: Total $	$54,324,317
Average Spent	$1,606.90
Spending Potential Index	80
Education: Total $	$33,428,270
Average Spent	$988.80
Spending Potential Index	70
Entertainment/Recreation: Total $	$76,429,982
Average Spent	$2,260.77
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Food at Home: Total $	$136,913,302
Average Spent	$4,049.85
Spending Potential Index	81
Food Away from Home: Total $	$84,347,172
Average Spent	$2,494.96
Spending Potential Index	81
Health Care: Total $	$136,491,754
Average Spent	$4,037.38
Spending Potential Index	76
HH Furnishings & Equipment: Total $	$46,672,691
Average Spent	$1,380.56
Spending Potential Index	78
Personal Care Products & Services: Total $	$19,252,062
Average Spent	$569.47
Spending Potential Index	78
Shelter: Total $	$414,067,588
Average Spent	$12,247.98
Spending Potential Index	79
Support Payments/Cash Contributions/Gifts in Kind: Total	$58,728,864
Average Spent	$1,737.18
Spending Potential Index	75
Travel: Total $	$45,880,800
Average Spent	$1,357.14
Spending Potential Index	73
Vehicle Maintenance & Repairs: Total $	$27,621,684
Average Spent	$817.04
Spending Potential Index	79

budget categories that are not mutually exclusive. Consumer spending does not equal business revenue. Total and Average Amount Spent Per Household represent annual figures. The Spending Potential Index represents the amount spent in the area relative to a national average of 100.

Source: Consumer Spending data are derived from the 2013 and 2014 Consumer Expenditure Surveys, Bureau of Labor Statistics. Esri.

Source: U.S. Census Bureau, Census 2010 Summary File 1. Esri forecasts for 2016 and 2021 Esri converted Census 2000 data into 2010 geography.

Attachment K

Business Summary

199 Trade Area

Area: 35.23 square miles

Prepared by Esri

Data for all businesses in area	
Total Businesses:	3,356
Total Employees:	48,488
Total Residential Population:	104,540
Employee/Residential Population Ratio:	0.46:1

	Businesses		Employees	
by SIC Codes	Number	Percent	Number	Percent
Agriculture & Mining	58	1.7%	391	0.8%
Construction	199	5.9%	1,765	3.6%
Manufacturing	99	2.9%	2,692	5.6%
Transportation	62	1.8%	675	1.4%
Communication	29	0.9%	133	0.3%
Utility	4	0.1%	139	0.3%
Wholesale Trade	110	3.3%	1,593	3.3%
Retail Trade Summary	917	27.3%	13,203	27.2%
Home Improvement	40	1.2%	542	1.1%
General Merchandise Stores	33	1.0%	1,541	3.2%
Food Stores	103	3.1%	828	1.7%
Auto Dealers, Gas Stations, Auto Aftermarket	160	4.8%	1,160	2.4%
Apparel & Accessory Stores	44	1.3%	239	0.5%
Furniture & Home Furnishings	65	1.9%	2,650	5.5%
Eating & Drinking Places	273	8.1%	4,861	10.0%
Miscellaneous Retail	199	5.9%	1,380	2.8%
Finance, Insurance, Real Estate Summary	437	13.0%	2,612	5.4%
Banks, Savings & Lending Institutions	171	5.1%	651	1.3%
Securities Brokers	41	1.2%	190	0.4%
Insurance Carriers & Agents	99	2.9%	624	1.3%
Real Estate, Holding, Other Investment Offices	126	3.8%	1,148	2.4%
Services Summary	1,265	37.7%	22,619	46.6%
Hotels & Lodging	24	0.7%	298	0.6%
Automotive Services	158	4.7%	931	1.9%
Motion Pictures & Amusements	78	2.3%	422	0.9%
Health Services	143	4.3%	3,112	6.4%
Legal Services	79	2.4%	333	0.7%
Education Institutions & Libraries	73	2.2%	3,243	6.7%
Other Services	710	21.2%	14,280	29.5%
Government	72	2.1%	2,336	4.8%
Unclassified Establishments	103	3.1%	331	0.7%
Totals	3,356	100.0%	48,488	100.0%

August 25, 2016

Business Summary

199 Trade Area

Area: 35.23 square miles

Prepared by Esri

	Businesses		Employees	
by NAICS Codes	Number	Percent	Number	Percent
Agriculture, Forestry, Fishing & Hunting	7	0.2%	37	0.1%
Mining	16	0.5%	123	0.3%
Utilities	4	0.1%	71	0.1%
Construction	212	6.3%	1,838	3.8%
Manufacturing	105	3.1%	2,690	5.5%
Wholesale Trade	109	3.2%	1,591	3.3%
Retail Trade	620	18.5%	8,231	17.0%
Motor Vehicle & Parts Dealers	131	3.9%	1,048	2.2%
Furniture & Home Furnishings Stores	31	0.9%	214	0.4%
Electronics & Appliance Stores	31	0.9%	2,429	5.0%
Bldg Material & Garden Equipment & Supplies Dealers	40	1.2%	542	1.1%
Food & Beverage Stores	100	3.0%	833	1.7%
Health & Personal Care Stores	37	1.1%	293	0.6%
Gasoline Stations	29	0.9%	112	0.2%
Clothing & Clothing Accessories Stores	52	1.5%	255	0.5%
Sport Goods, Hobby, Book, & Music Stores	27	0.8%	257	0.5%
General Merchandise Stores	33	1.0%	1,541	3.2%
Miscellaneous Store Retailers	94	2.8%	516	1.1%
Nonstore Retailers	16	0.5%	190	0.4%
Transportation & Warehousing	53	1.6%	685	1.4%
Information	51	1.5%	295	0.6%
Finance & Insurance	318	9.5%	1,518	3.1%
Central Bank/Credit Intermediation & Related Activities	178	5.3%	705	1.5%
Securities, Commodity Contracts & Other Financial	41	1.2%	190	0.4%
Insurance Carriers & Related Activities; Funds, Trusts &	99	2.9%	624	1.3%
Real Estate, Rental & Leasing	151	4.5%	1,091	2.3%
Professional, Scientific & Tech Services	279	8.3%	10,644	22.0%

Legal Services	91	2.7%	388	0.8%
Management of Companies & Enterprises	3	0.1%	37	0.1%
Administrative & Support & Waste Management &	94	2.8%	976	2.0%
Educational Services	84	2.5%	3,251	6.7%
Health Care & Social Assistance	199	5.9%	4,084	8.4%
Arts, Entertainment & Recreation	49	1.5%	458	0.9%
Accommodation & Food Services	307	9.1%	5,177	10.7%
Accommodation	24	0.7%	298	0.6%
Food Services & Drinking Places	283	8.4%	4,879	10.1%
Other Services (except Public Administration)	521	15.5%	3,030	6.2%
Automotive Repair & Maintenance	144	4.3%	757	1.6%
Public Administration	72	2.1%	2,336	4.8%
Unclassified Establishments	102	3.0%	326	0.7%
Total	3,356	100.0%	48,488	100.0%

Source: Copyright 2016 Infogroup, Inc. All rights reserved. Esri Total Residential Population forecasts for 2016.

August 25, 2016

Attachment L

Retail and Restaurant Programming

Trade	2016 Population	104,540	**Capture Rate**	35%
Area	2026 Population	118,079		

Sales Leakage Summary

Retail Group	2016 Demand (Retail Potential)	Demand PerCapita	2026 Demand (Retail Potential)	2016 Supply (Retail Sales)	2016 Sales Leakage	2026 Forecasted Leakage	Avg Sales/sf	2016 sf Area	2026 sf Area	2016 Capture	2026 Capture	Average Store Size	2016 Stores	2026 Stores
Motor Vehicle & Parts Dealers	$213,713,101	$2,044.32	$241,391,135.00	$515,850,548	($302,137,447)	($274,459,413)								
Furniture & Home Furnishings Stores	$25,848,629	$247.26	$29,196,291.02	$31,331,940	($5,483,311)	($2,135,649)								
Bldg Materials, Garden Equip. & Supply	$41,587,521	$397.81	$46,973,530.63	$60,337,580	($18,750,059)	($13,364,049)								
Food & Beverage Stores	$170,373,541	$1,629.74	$192,438,658.39	$175,524,522	($5,150,981)	$16,914,136								
Grocery Stores	$151,719,708	$1,451.31	$171,368,963.09	$143,521,739	$8,197,969	$27,847,224	$200	40,990	139,236 sf	14,346	48,733 sf	80,000 sf	0	1
Health & Personal Care Stores	$49,005,611	$468.77	$55,352,339.21	$64,047,918	($15,042,307)	($8,695,579)								
Gasoline Stations	$65,716,297	$628.62	$74,227,230.09	$70,173,441	($4,457,144)	$4,053,789								
Gasoline Stations	$65,716,297	$628.62	$74,227,230.09	$70,173,441	($4,457,144)	$4,053,789	$1,896	(2,351)	$2,138 sf	(823)	748 sf	1,000 sf	(1)	1
Clothing & Clothing Accessories Stores	$40,324,647	$385.73	$45,547,101.52	$39,752,200	$572,447	$5,794,902								
Clothing Stores	$26,991,224	$258.19	$30,486,863.77	$23,424,254	$3,566,970	$7,062,610	$383	9,313	18,440 sf	3,260	6,454 sf	2,000 sf	2	3
Jewelry, Luggage & Leather Goods	$8,486,954	$81.18	$9,586,101.41	$3,533,125	$4,953,829	$6,052,976	$372	13,317	16,271 sf	4,661	5,695 sf	1,500 sf	3	4
Sporting Goods, Hobby, Book & Music	$26,644,580	$254.87	$30,095,325.83	$35,627,045	($8,982,465)	($5,531,719)								
Book, Periodical & Music Stores	$5,698,624	$54.51	$6,436,654.14	$2,800,103	$2,898,521	$3,636,551	$200	14,493	18,183 sf	5,072	6,364 sf	8,000 sf	1	1
General Merchandise Stores	$182,320,144	$1,744.02	$205,932,468.75	$361,417,571	($179,097,427)	($155,485,102)								
Miscellaneous Store Retailers	$40,433,756	$386.78	$45,670,341.25	$68,978,659	($28,544,903)	($23,308,318)								
Used Merchandise Stores	$7,668,382	$73.35	$8,661,515.96	$8,451,092	($782,710)	$210,424	$118	(6,633)	1,783 sf	(2,322)	624 sf	9,000 sf	(0)	0
Nonstore Retailers	$18,671,345	$178.60	$21,089,475.28	$14,177,160	$4,494,185	$6,912,315								
Electronic Shopping & Mail-Order	$12,563,379	$120.18	$14,190,465.17	$6,305,291	$6,258,088	$7,885,174								
Direct Selling Establishments	$4,733,975	$45.28	$5,347,073.22	$3,443,205	$1,290,770	$1,903,868								
Food Services & Drinking Places	$99,556,735	$952.33	$112,450,351.18	$200,898,456	($101,341,721)	($88,448,105)								

Programming Potential

2016 Retail Potential **(Full Demand)**	2016 Potential Store Count	2026 Retail Potential **(Full Demand)**	2026Potential Store Count
78,112 sf	16 stores	196,052 sf	26 stores

2016 Retail Potential **(Discounted Demand)**	2016 Potential Store Count	2026 Program Area Potential **(Discounted Demand)**	2026Potential Store Count
27,339 sf	**6 stores**	**68,618 sf**	**9 stores**

Attachment M

Retail Market Potential

199 Trade Area
Area: 35.23 square miles

Prepared by Esri

Demographic Summary	2016	2021
Population	104,540	110,964
Population 18+	73,561	77,969
Households	33,807	35,800
Median Household Income	$43,781	$45,120

Product/Consumer Behavior	Expected Number of Adults/HHs	Percent of Adults/HHs	MPI
Apparel (Adults)			
Bought any men's clothing in last 12 months	34,191	46.5%	98
Bought any women's clothing in last 12 months	30,997	42.1%	96
Bought clothing for child <13 years in last 6 months	25,389	34.5%	125
Bought any shoes in last 12 months	41,089	55.9%	104
Bought costume jewelry in last 12 months	13,649	18.6%	95
Bought any fine jewelry in last 12 months	12,990	17.7%	96
Bought a watch in last 12 months	7,749	10.5%	96
Automobiles (Households)			
HH owns/leases any vehicle	28,627	84.7%	99
HH bought/leased new vehicle last 12 mo	2,137	6.3%	67
Automotive Aftermarket (Adults)			
Bought gasoline in last 6 months	62,578	85.1%	100
Bought/changed motor oil in last 12 months	37,469	50.9%	104
Had tune-up in last 12 months	24,566	33.4%	111
Beverages (Adults)			
Drank bottled water/seltzer in last 6 months	49,162	66.8%	102
Drank regular cola in last 6 months	37,808	51.4%	115
Drank beer/ale in last 6 months	31,093	42.3%	99
Cameras (Adults)			
Own digital point & shoot camera	17,176	23.3%	80
Own digital single-lens reflex (SLR) camera	4,406	6.0%	69
Bought any camera in last 12 months	3,809	5.2%	91
Printed digital photos in last 12 months	2,044	2.8%	95
Cell Phones (Adults/Households)			
Bought cell phone in last 12 months	26,346	35.8%	99
Have a smartphone	42,255	57.4%	98
Have a smartphone: Android phone (any brand)	23,129	31.4%	117
Have a smartphone: Apple iPhone	15,056	20.5%	79
Number of cell phones in household: 1	11,239	33.2%	103
Number of cell phones in household: 2	11,988	35.5%	95
Number of cell phones in household: 3+	9,155	27.1%	106
HH has cell phone only (no landline telephone)	18,908	55.9%	133
Computers (Households)			
HH owns a computer	23,211	68.7%	89
HH owns desktop computer	13,471	39.8%	88
HH owns laptop/notebook	16,537	48.9%	90
HH owns any Apple/Mac brand computer	3,619	10.7%	71
HH owns any PC/non-Apple brand computer	21,095	62.4%	92
HH purchased most recent computer in a store	10,845	32.1%	85
HH purchased most recent computer online	3,579	10.6%	81
Spent <$500 on most recent home computer	5,137	15.2%	105
Spent $500-$999 on most recent home computer	5,465	16.2%	85
Spent $1,000-$1,499 on most recent home computer	2,121	6.3%	66
Spent $1,500-$1,999 on most recent home computer	1,348	4.0%	87
Spent $2,000+ on most recent home computer	1,076	3.2%	81

Data Note: An MPI (Market Potential Index) measures the relative likelihood of the adults or households in the specified trade area to exhibit certain consumer behavior or purchasing patterns compared to the U.S. An MPI of 100 represents the U.S. average.
Source: These data are based upon national propensities to use various products and services, applied to local demographic composition. Usage data were collected by GfK MRI in a nationally representative survey of U.S. households. Esri forecasts for 2016 and 2021.

Retail Market Potential

199 Trade Area
Area: 35.23 square miles

Prepared by Esri

Product/Consumer Behavior	Expected Number of Adults/HHs	Percent of Adults/HHs	MPI
Convenience Stores (Adults)			
Shopped at convenience store in last 6 mos	36,791	50.0%	99
Bought brewed coffee at convenience store in last 30 days	13,276	18.0%	115
Bought cigarettes at convenience store in last 30 days	10,304	14.0%	112
Bought gas at convenience store in last 30 days	25,845	35.1%	106
Spent at convenience store in last 30 days: <$20	5,296	7.2%	89
Spent at convenience store in last 30 days: $20-$39	6,637	9.0%	100
Spent at convenience store in last 30 days: $40-$50	5,046	6.9%	90
Spent at convenience store in last 30 days: $51-$99	3,808	5.2%	117
Spent at convenience store in last 30 days: $100+	18,185	24.7%	108
Entertainment (Adults)			
Attended a movie in last 6 months	42,314	57.5%	97
Went to live theater in last 12 months	6,494	8.8%	68
Went to a bar/night club in last 12 months	10,010	13.6%	81
Dined out in last 12 months	26,410	35.9%	80
Gambled at a casino in last 12 months	9,311	12.7%	92
Visited a theme park in last 12 months	13,300	18.1%	103
Viewed movie (video-on-demand) in last 30 days	9,819	13.3%	79
Viewed TV show (video-on-demand) in last 30 days	7,139	9.7%	75
Watched any pay-per-view TV in last 12 months	9,673	13.1%	100
Downloaded a movie over the Internet in last 30 days	4,705	6.4%	89
Downloaded any individual song in last 6 months	13,213	18.0%	88
Watched a movie online in the last 30 days	11,172	15.2%	95
Watched a TV program online in last 30 days	8,917	12.1%	81
Played a video/electronic game (console) in last 12 months	8,023	10.9%	104
Played a video/electronic game (portable) in last 12 months	3,833	5.2%	114
Financial (Adults)			
Have home mortgage (1st)	17,775	24.2%	78
Used ATM/cash machine in last 12 months	31,895	43.4%	88
Own any stock	3,833	5.2%	68
Own U.S. savings bond	2,900	3.9%	74
Own shares in mutual fund (stock)	3,541	4.8%	66
Own shares in mutual fund (bonds)	2,436	3.3%	68
Have interest checking account	14,787	20.1%	71
Have non-interest checking account	19,474	26.5%	94
Have savings account	33,340	45.3%	84
Have 401K retirement savings plan	8,539	11.6%	80
Own/used any credit/debit card in last 12 months	49,576	67.4%	90
Avg monthly credit card expenditures: <$111	7,210	9.8%	85
Avg monthly credit card expenditures: $111-$225	4,213	5.7%	83
Avg monthly credit card expenditures: $226-$450	4,135	5.6%	89
Avg monthly credit card expenditures: $451-$700	3,006	4.1%	77
Avg monthly credit card expenditures: $701-$1,000	2,470	3.4%	78
Avg monthly credit card expenditures: $1,001+	3,685	5.0%	55
Did banking online in last 12 months	20,780	28.2%	79
Did banking on mobile device in last 12 months	9,695	13.2%	94
Paid bills online in last 12 months	27,922	38.0%	88

Data Note: An MPI (Market Potential Index) measures the relative likelihood of the adults or households in the specified trade area to exhibit certain consumer behavior or purchasing patterns compared to the U.S. An MPI of 100 represents the U.S. average.
Source: These data are based upon national propensities to use various products and services, applied to local demographic composition. Usage data were collected by GfK MRI in a nationally representative survey of U.S. households. Esri forecasts for 2016 and 2021.

August 25, 2016

199 Trade Area
Area: 35.23 square miles

Prepared by Esri

Product/Consumer Behavior	Expected Number of Adults/HHs	Percent of Adults/HHs	MPI
Grocery (Adults)			
Used beef (fresh/frozen) in last 6 months	23,548	69.7%	100
Used bread in last 6 months	31,949	94.5%	101
Used chicken (fresh or frozen) in last 6 months	23,194	68.6%	99
Used turkey (fresh or frozen) in last 6 months	4,832	14.3%	90
Used fish/seafood (fresh or frozen) in last 6 months	18,638	55.1%	101
Used fresh fruit/vegetables in last 6 months	28,391	84.0%	98
Used fresh milk in last 6 months	29,383	86.9%	99
Used organic food in last 6 months	6,862	20.3%	103
Health (Adults)			
Exercise at home 2+ times per week	19,323	26.3%	93
Exercise at club 2+ times per week	7,774	10.6%	81
Visited a doctor in last 12 months	49,899	67.8%	89
Used vitamin/dietary supplement in last 6 months	36,761	50.0%	95
Home (Households)			
Any home improvement in last 12 months	7,753	22.9%	86
Used housekeeper/maid/professional HH cleaning service in last 12	3,823	11.3%	86
Purchased low ticket HH furnishings in last 12 months	5,193	15.4%	96
Purchased big ticket HH furnishings in last 12 months	6,525	19.3%	92
Bought any small kitchen appliance in last 12 months	7,240	21.4%	96
Bought any large kitchen appliance in last 12 months	4,274	12.6%	99
Insurance (Adults/Households)			
Currently carry life insurance	24,973	33.9%	80
Carry medical/hospital/accident insurance	43,265	58.8%	90
Carry homeowner insurance	26,023	35.4%	75
Carry renter's insurance	5,465	7.4%	91
Have auto insurance: 1 vehicle in household covered	11,165	33.0%	107
Have auto insurance: 2 vehicles in household covered	9,891	29.3%	103
Have auto insurance: 3+ vehicles in household covered	5,987	17.7%	81
Pets (Households)			
Household owns any pet	18,267	54.0%	101
Household owns any cat	6,670	19.7%	88
Household owns any dog	14,465	42.8%	105
Psychographics (Adults)			
Buying American is important to me	28,406	38.6%	91
Usually buy items on credit rather than wait	8,013	10.9%	93
Usually buy based on quality - not price	12,611	17.1%	96
Price is usually more important than brand name	20,214	27.5%	105
Usually use coupons for brands I buy often	13,606	18.5%	98
Am interested in how to help the environment	15,437	21.0%	129
Usually pay more for environ safe product	11,139	15.1%	119
Usually value green products over convenience	9,780	13.3%	126
Likely to buy a brand that supports a charity	25,352	34.5%	99
Reading (Adults)			
Bought digital book in last 12 months	8,112	11.0%	83
Bought hardcover book in last 12 months	12,210	16.6%	79
Bought paperback book in last 12 month	18,594	25.3%	81
Read any daily newspaper (paper version)	13,935	18.9%	72
Read any digital newspaper in last 30 days	21,117	28.7%	86
Read any magazine (paper/electronic version) in last 6 months	63,376	86.2%	95

Data Note: An MPI (Market Potential Index) measures the relative likelihood of the adults or households in the specified trade area to exhibit certain consumer behavior or purchasing patterns compared to the U.S. An MPI of 100 represents the U.S. average.
Source: These data are based upon national propensities to use various products and services, applied to local demographic composition. Usage data were collected by GfK MRI in a nationally representative survey of U.S. households. Esri forecasts for 2016 and 2021.

August 25, 2016

199 Trade Area
Area: 35.23 square miles

Prepared by Esri

Product/Consumer Behavior	Expected Number of Adults/HHs	Percent of Adults/HHs	MPI
Restaurants (Adults)			
Went to family restaurant/steak house in last 6 months	52,085	70.8%	95
Went to family restaurant/steak house: 4+ times a month	17,693	24.1%	88
Went to fast food/drive-in restaurant in last 6 months	66,210	90.0%	100
Went to fast food/drive-in restaurant 9+ times/mo	30,245	41.1%	104
Fast food/drive-in last 6 months: eat in	26,930	36.6%	101
Fast food/drive-in last 6 months: home delivery	6,682	9.1%	118
Fast food/drive-in last 6 months: take-out/drive-thru	33,199	45.1%	97
Fast food/drive-in last 6 months: take-out/walk-in	12,224	16.6%	85
Television & Electronics (Adults/Households)			
Own any e-reader/tablet	20,050	27.3%	86
Own e-reader/tablet: iPad	9,518	12.9%	84
Own any portable MP3 player	20,780	28.2%	92
HH owns 1 TV	7,512	22.2%	109
HH owns 2 TVs	8,905	26.3%	102
HH owns 3 TVs	7,061	20.9%	98
HH owns 4+ TVs	5,877	17.4%	92
HH subscribes to cable TV	15,329	45.3%	91
HH subscribes to fiber optic	2,032	6.0%	79
HH has satellite dish	8,139	24.1%	95
HH owns DVD/Blu-ray player	19,856	58.7%	97
HH owns camcorder	3,772	11.2%	80
HH owns portable GPS navigation device	7,119	21.1%	77
HH purchased video game system in last 12 mos	2,621	7.8%	98
HH owns Internet video device for TV	2,400	7.1%	101
Travel (Adults)			
Domestic travel in last 12 months	28,900	39.3%	78
Took 3+ domestic non-business trips in last 12 months	5,612	7.6%	69
Spent on domestic vacations in last 12 months: <$1,000	6,239	8.5%	79
Spent on domestic vacations in last 12 months: $1,000-$1,499	3,521	4.8%	82
Spent on domestic vacations in last 12 months: $1,500-$1,999	2,295	3.1%	87
Spent on domestic vacations in last 12 months: $2,000-$2,999	2,316	3.1%	81
Spent on domestic vacations in last 12 months: $3,000+	2,907	4.0%	72
Domestic travel in the 12 months: used general travel website	3,738	5.1%	75
Foreign travel in last 3 years	14,516	19.7%	82
Took 3+ foreign trips by plane in last 3 years	2,201	3.0%	66
Spent on foreign vacations in last 12 months: <$1,000	2,724	3.7%	89
Spent on foreign vacations in last 12 months: $1,000-$2,999	1,893	2.6%	79
Spent on foreign vacations in last 12 months: $3,000+	2,671	3.6%	73
Foreign travel in last 3 years: used general travel website	2,733	3.7%	67
Nights spent in hotel/motel in last 12 months: any	22,769	31.0%	76
Took cruise of more than one day in last 3 years	4,048	5.5%	66
Member of any frequent flyer program	7,576	10.3%	63
Member of any hotel rewards program	6,676	9.1%	64

Data Note: An MPI (Market Potential Index) measures the relative likelihood of the adults or households in the specified trade area to exhibit certain consumer behavior or purchasing patterns compared to the U.S. An MPI of 100 represents the U.S. average.
Source: These data are based upon national propensities to use various products and services, applied to local demographic composition. Usage data were collected by GfK MRI in a nationally representative survey of U.S. households. Esri forecasts for 2016 and 2021.

August 25, 2016

Attachment N

Retail MarketPlace Profile

199 Trade Area
Area: 35.23 square miles

Prepared by Esri

Summary Demographics						
2016 Population						104,540
2016 Households						33,807
2016 Median Disposable Income						$37,475
2016 Per Capita Income						$19,765

Industry Summary	NAICS	Demand (Retail Potential)	Supply (Retail Sales)	Retail Gap	Leakage/Surplu Factor	Number of Businesses
Total Retail Trade and Food & Drink	44-	$1,018,547,423	$1,700,964,529	-$682,417,106	-25.1	951
Total Retail Trade	44-45	$918,990,688	$1,500,066,074	-$581,075,386	-24.0	650
Total Food & Drink	722	$99,556,735	$200,898,456	-$101,341,721	-33.7	301

Industry Group	NAICS	Demand (Retail Potential)	Supply (Retail Sales)	Retail Gap	Leakage/Surplu Factor	Number of Businesses
Motor Vehicle & Parts Dealers	441	$213,713,101	$515,850,548	-$302,137,447	-41.4	149
Automobile Dealers	4411	$175,494,035	$433,873,835	-$258,379,800	-42.4	104
Other Motor Vehicle Dealers	4412	$23,879,041	$50,114,545	-$26,235,504	-35.5	13
Auto Parts, Accessories & Tire Stores	4413	$14,340,024	$31,862,167	-$17,522,143	-37.9	33
Furniture & Home Furnishings Stores	442	$25,848,629	$31,331,940	-$5,483,311	-9.6	32
Furniture Stores	4421	$17,040,277	$20,923,431	-$3,883,154	-10.2	21
Home Furnishings Stores	4422	$8,808,352	$10,408,509	-$1,600,157	-8.3	11
Electronics & Appliance Stores	443	$44,351,514	$62,847,489	-$18,495,975	-17.3	32
Bldg Materials, Garden Equip. & Supply Stores	444	$41,587,521	$60,337,580	-$18,750,059	-18.4	38
Bldg Material & Supplies Dealers	4441	$37,856,618	$55,632,005	-$17,775,387	-19.0	36
Lawn & Garden Equip & Supply Stores	4442	$3,730,903	$4,705,575	-$974,672	-11.6	3
Food & Beverage Stores	445	$170,373,541	$175,524,522	-$5,150,981	-1.5	95
Grocery Stores	4451	$151,719,708	$143,521,739	$8,197,969	2.8	62
Specialty Food Stores	4452	$10,741,384	$21,744,095	-$11,002,711	-33.9	21
Beer, Wine & Liquor Stores	4453	$7,912,450	$10,258,688	-$2,346,238	-12.9	12
Health & Personal Care Stores	446,4461	$49,005,611	$64,047,918	-$15,042,307	-13.3	30
Gasoline Stations	447,4471	$65,716,297	$70,173,441	-$4,457,144	-3.3	32
Clothing & Clothing Accessories Stores	448	$40,324,647	$39,752,200	$572,447	0.7	57
Clothing Stores	4481	$26,991,224	$23,424,254	$3,566,970	7.1	36
Shoe Stores	4482	$4,846,470	$12,794,820	-$7,948,350	-45.1	11
Jewelry, Luggage & Leather Goods Stores	4483	$8,486,954	$3,533,125	$4,953,829	41.2	10
Sporting Goods, Hobby, Book & Music Stores	451	$26,644,580	$35,627,045	-$8,982,465	-14.4	36
Sporting Goods/Hobby/Musical Instr Stores	4511	$20,945,956	$32,826,943	-$11,880,987	-22.1	28
Book, Periodical & Music Stores	4512	$5,698,624	$2,800,103	$2,898,521	34.1	8
General Merchandise Stores	452	$182,320,144	$361,417,571	-$179,097,427	-32.9	36
Department Stores Excluding Leased Depts.	4521	$136,977,240	$301,946,230	-$164,968,990	-37.6	14
Other General Merchandise Stores	4529	$45,342,904	$59,471,341	-$14,128,437	-13.5	22
Miscellaneous Store Retailers	453	$40,433,756	$68,978,659	-$28,544,903	-26.1	102
Florists	4531	$1,526,383	$1,978,355	-$451,972	-12.9	11
Office Supplies, Stationery & Gift Stores	4532	$6,946,982	$13,797,982	-$6,851,000	-33.0	24
Used Merchandise Stores	4533	$7,668,382	$8,451,092	-$782,710	-4.9	20
Other Miscellaneous Store Retailers	4539	$24,292,010	$44,751,229	-$20,459,219	-29.6	46
Nonstore Retailers	454	$18,671,345	$14,177,160	$4,494,185	13.7	11
Electronic Shopping & Mail-Order Houses	4541	$12,563,379	$6,305,291	$6,258,088	33.2	4
Vending Machine Operators	4542	$1,373,991	$4,428,664	-$3,054,673	-52.6	3
Direct Selling Establishments	4543	$4,733,975	$3,443,205	$1,290,770	15.8	3
Food Services & Drinking Places	722	$99,556,735	$200,898,456	-$101,341,721	-33.7	301
Full-Service Restaurants	7221	$53,033,228	$136,529,758	-$83,496,530	-44.0	186
Limited-Service Eating Places	7222	$41,107,658	$53,583,862	-$12,476,204	-13.2	77
Special Food Services	7223	$1,095,869	$2,785,202	-$1,689,333	-43.5	9
Drinking Places - Alcoholic Beverages	7224	$4,319,980	$7,999,634	-$3,679,654	-29.9	29

Data Note: Supply (retail sales) estimates sales to consumers by establishments. Sales to businesses are excluded. Demand (retail potential) estimates the expected amount spent by consumers at retail establishments. Supply and demand estimates are in current dollars. The Leakage/Surplus Factor presents a snapshot of retail opportunity. This is a measure of the relationship between supply and demand that ranges from +100 (total leakage) to -100 (total surplus). A positive value represents 'leakage' of retail opportunity outside the trade area. A negative value represents a surplus of retail sales, a market where customers are drawn in from outside the trade area. The Retail Gap represents the difference between Retail Potential and Retail Sales. Esri uses the North American Industry Classification System (NAICS) to classify businesses by their primary type of economic activity. Retail establishments are classified into 27 industry groups in the Retail Trade sector, as well as four industry groups within the Food Services & Drinking Establishments subsector. For more information on the Retail MarketPlace data, please click the link below to view the Methodology Statement.
http://www.esri.com/library/whitepapers/pdfs/esri-data-retail-marketplace.pdf

Source: Esri and Infogroup. Retail MarketPlace 2016 Release 1 (2015 data in 2016 geography)

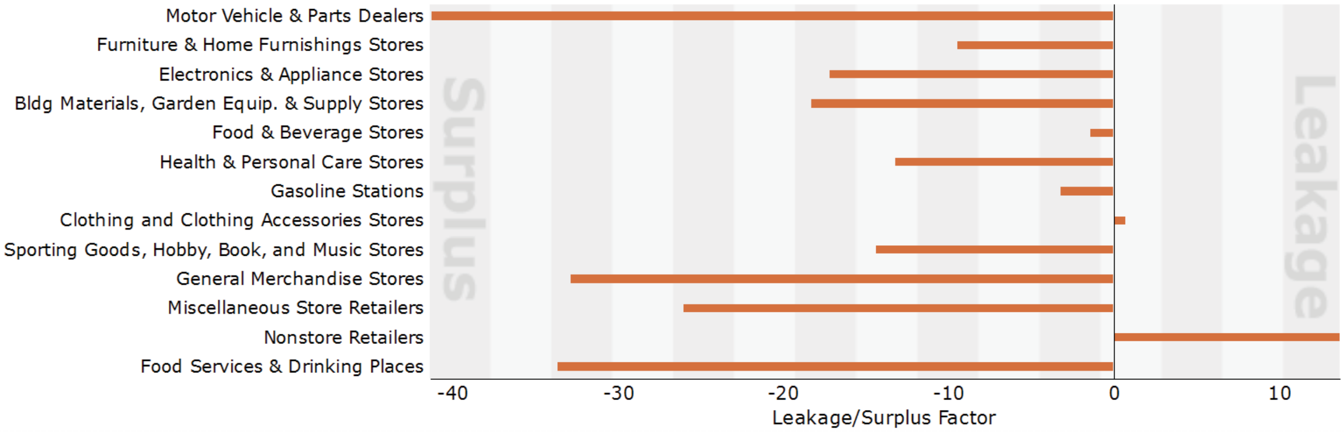
August 25, 2016

Retail MarketPlace Profile

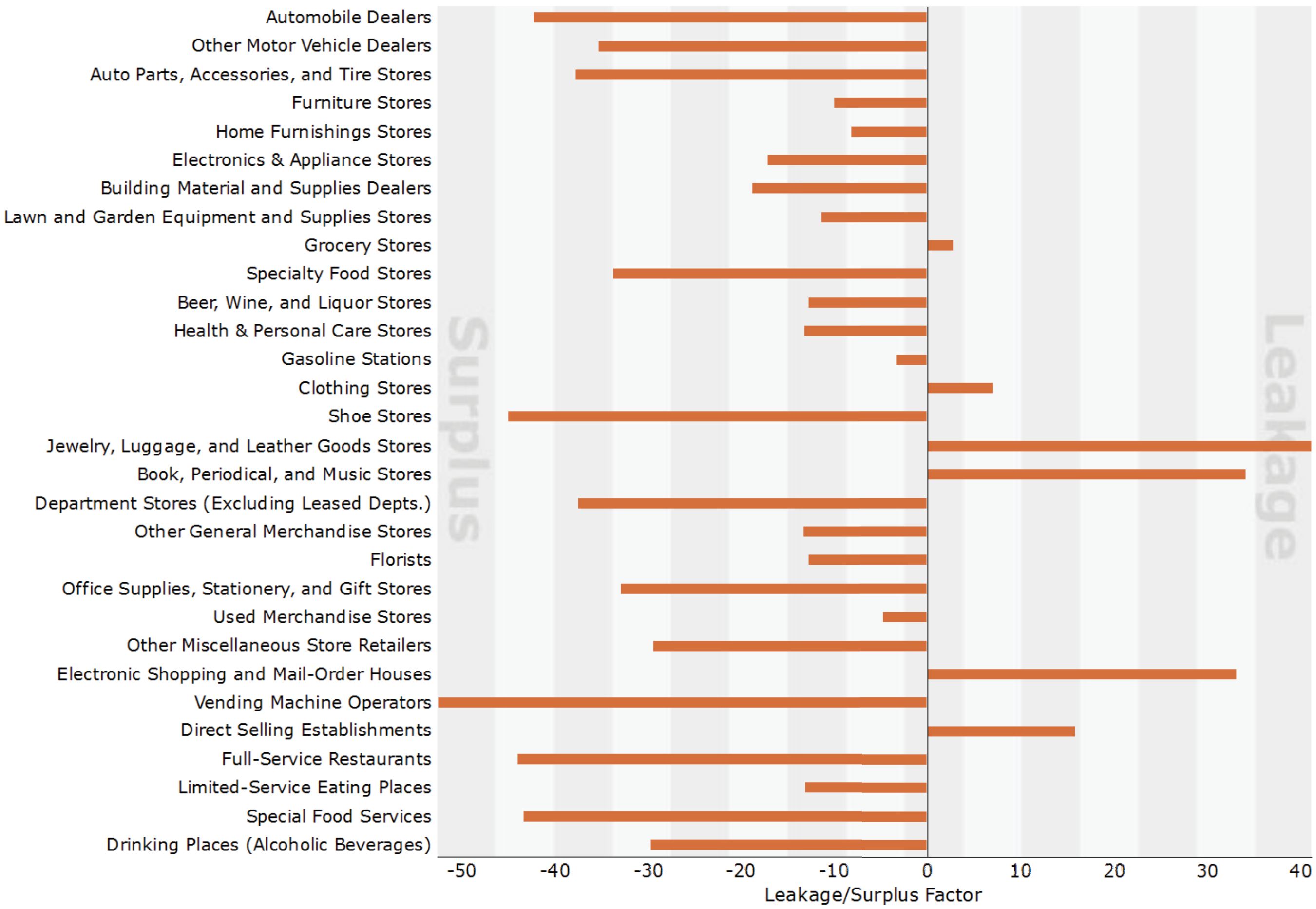
199 Trade Area
Area: 35.23 square miles

Prepared by Esri

Leakage/Surplus Factor by Industry Subsector



Leakage/Surplus Factor by Industry Group



Appendix M – Proposed Configuration Traffic Analysis Technical Memorandum

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State Highway 199
Corridor Master Plan

From IH 820 to Belknap Street

Proposed Configuration Traffic Analysis
Technical Memorandum

Submittal Date:
September 22, 2017

Prepared For:
North Central Texas Council of Governments

Prepared By:
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801 Cherry Street, Suite 1050
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AECOM

1.0 INTRODUCTION

This traffic study documents the proposed improvements of State Highway (SH) 199 from a four-lane divided rural arterial with shoulders to a six-lane urban divided facility. The traffic study analyzes the overall corridor operations and focuses on the 10 existing signalized intersections between Roberts Cut Off Road and University Drive / Northside Drive. All transportation modes (motorists, pedestrians, bicyclists, and transit users) were considered in the analysis. Additional intersection improvements are proposed to alleviate congestion on several of the cross streets. Furthermore, the analysis studied two alternative intersection designs: a split intersection at Roberts Cut Off Road and a displaced left turn intersection at SH 183. The study corridor is shown in Figure 1.

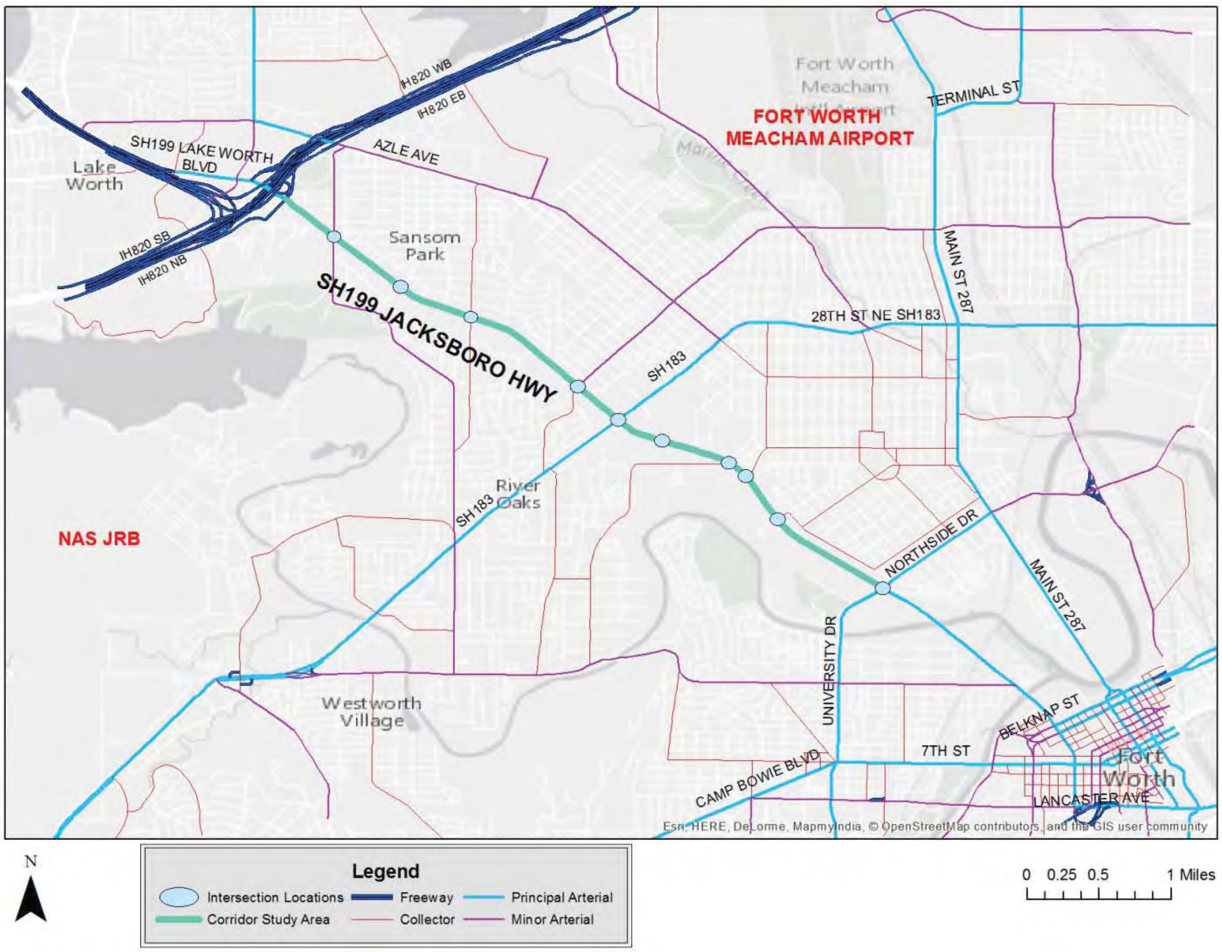


Figure 1. SH 199 Corridor

This traffic analysis includes technical terms and concepts related to traffic signal equipment and operations. For further information refer to the Federal Highway Administration (FHWA) Publication Numbers FHWA-HOP-08-024: *Traffic Signal Timing Manual*, or FHWA-SA-13-027: *Signalized Intersections Informational Guide*.

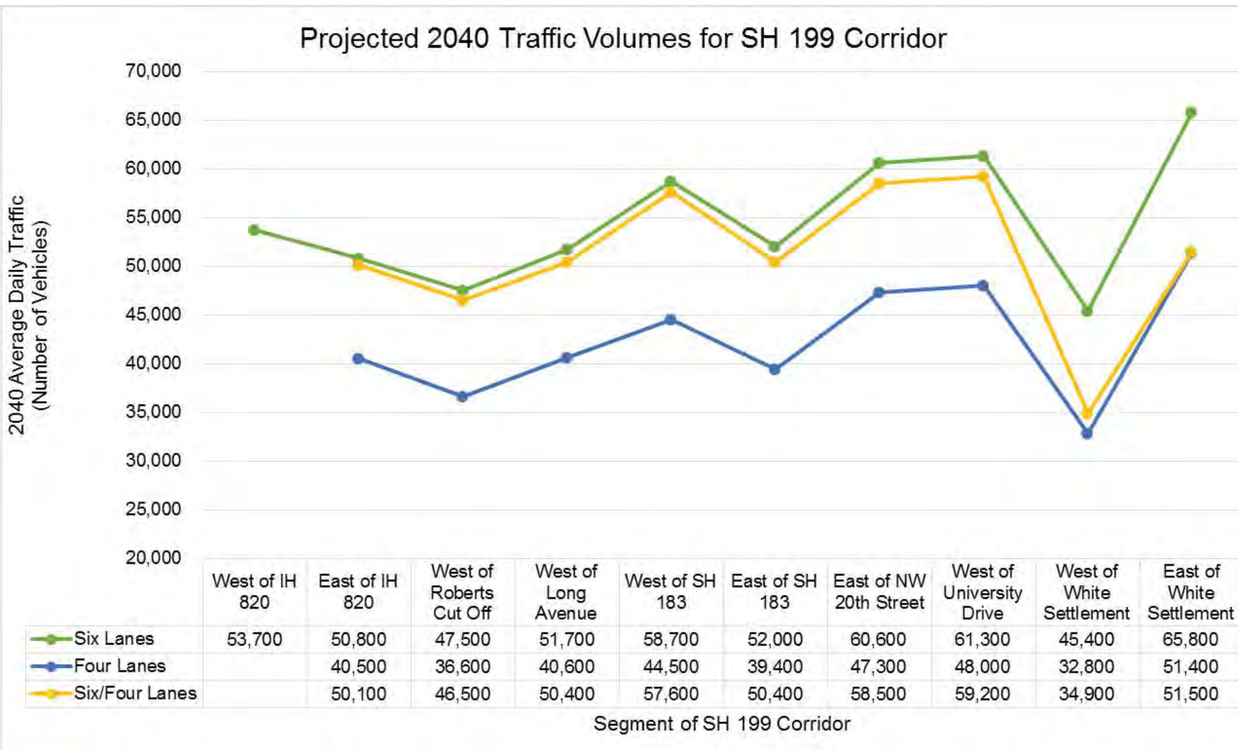
2.0 FORECASTED TRAFFIC VOLUMES

2.1 Growth Rates

The North Central Texas Council of Governments (NCTCOG) provided 2027 and 2040 link volumes from the regional travel demand TransCAD model for the proposed geometry. This model includes elements such as roadway and transit networks, population, and employment data to generate trips throughout the network, estimate the shortest and quickest path to complete a trip, and uses predicted roadway characteristics to estimate an hourly capacity per lane. Vehicles are assigned throughout the network for each link accounting for the forecasted capacity of the roadway to develop output files for directional Average Daily Traffic (ADT), morning, and evening peak hour volumes. Attachment A presents this data for SH 199 and the cross streets. The forecasted traffic volumes are dependent on the capacity of the roadway, and three potential cross sections for SH 199 were considered in the analysis:

- Four-lane section from Interstate Highway (IH) 820 to Belknap Street
- Six-lane section from IH 820 to Belknap Street
- Six-lane section from IH 820 to University Drive and a four-lane section from University Drive to Belknap Street

The forecasted Average Daily Traffic (ADT) for each cross section is shown in Figure 2.



	West of IH 820	East of IH 820	West of Roberts Cut Off	West of Long Avenue	West of SH 183	East of SH 183	East of NW 20th Street	West of University Drive	West of White Settlement	East of White Settlement
Six Lanes	53,700	50,800	47,500	51,700	58,700	52,000	60,600	61,300	45,400	65,800
Four Lanes		40,500	36,600	40,600	44,500	39,400	47,300	48,000	32,800	51,400
Six/Four Lanes		50,100	46,500	50,400	57,600	50,400	58,500	59,200	34,900	51,500

Figure 2. Forecasted ADT Based on Cross Section

The third cross section alternative (six lanes west of University Drive and / four lanes east of University Drive) is recommended for the following reasons:

- Although the NCTCOG model forecasts higher traffic volumes for the six-lane alternatives, the resultant lane density is comparatively lower than the four-lane alternative. Subsequent analyses noted that the resulting level of service (LOS) was better for the six-lane alternatives.
- A four-lane section east of University Drive / Northside Drive is more realistic than a six-lane section because of a reduction in existing right-of-way and the historical status of the Henderson Street Bridge (listed on the National Register of Historic Places). Furthermore, University Drive / Northside Drive is a major arterial that provides north and south access to major destinations, and is a natural breakpoint for the cross-section width.

Traffic counts were collected along the corridor in 2016, as discussed in the Existing Conditions report. Using those counts and the NCTCOG projections, average annual compounded growth rates were computed for the corridor. The growth rates are segmented for sections east and west of SH 183 and are shown in Table 1, Table 2 and Table 3 for the ADT, morning peak hour, and evening peak hour, respectively. Values shown are totals for both directions.

Table 1. ADT Growth Rates

Section			2027 NCTCOG		2040 NCTCOG	
From	To	2016 Counts ADT	ADT	Growth Rate (2016 – 2027)	ADT	Growth Rate (2027 – 2040)
IH 820 Northbound Frontage Road	SH 183	32,131	40,265	2.07%	50,206	1.71%
SH 183	University Drive	36,022	46,754	2.40%	56,054	1.41%

Table 2. Morning Peak Hour Growth Rates

Section		2016 Counts	2027 NCTCOG		2040 NCTCOG	
From	To	Morning Peak	Morning Volume	Growth Rate	Morning Volume	Growth Rate
IH 820 Northbound Frontage Road	SH 183	2,423	3,218	2.61%	3,909	1.51%
SH 183	University Drive	2,814	3,577	2.20%	3,981	0.83%

Table 3. Evening Peak Hour Growth Rates

Section		2016 Counts	2027 NCTCOG		2040 NCTCOG	
From	To	Evening Peak	Evening Volume	Growth Rate	Evening Volume	Growth Rate
IH 820 Northbound Frontage Road	SH 183	2,609	3,174	1.80%	3,921	1.64%
SH 183	University Drive	2,947	3,649	1.96%	4,137	0.97%

The NCTCOG model forecasts modest growth for the corridor from 2016 to 2027, and then a lower growth rate from 2027 to 2040. Most of this growth is forecasted due to anticipated residential and commercial developments northwest of the study corridor. *Mobility 2040: The Metropolitan Transportation Plan for North Central Texas* (Mobility 2040) forecasts a large increase in population density to the north and west of IH 820, as shown in Figure 3, and recommends upgrading the corridor to a freeway west of IH 820. These projections show that SH 199 is forecasted to serve as a major arterial from downtown Fort Worth to the northwest.

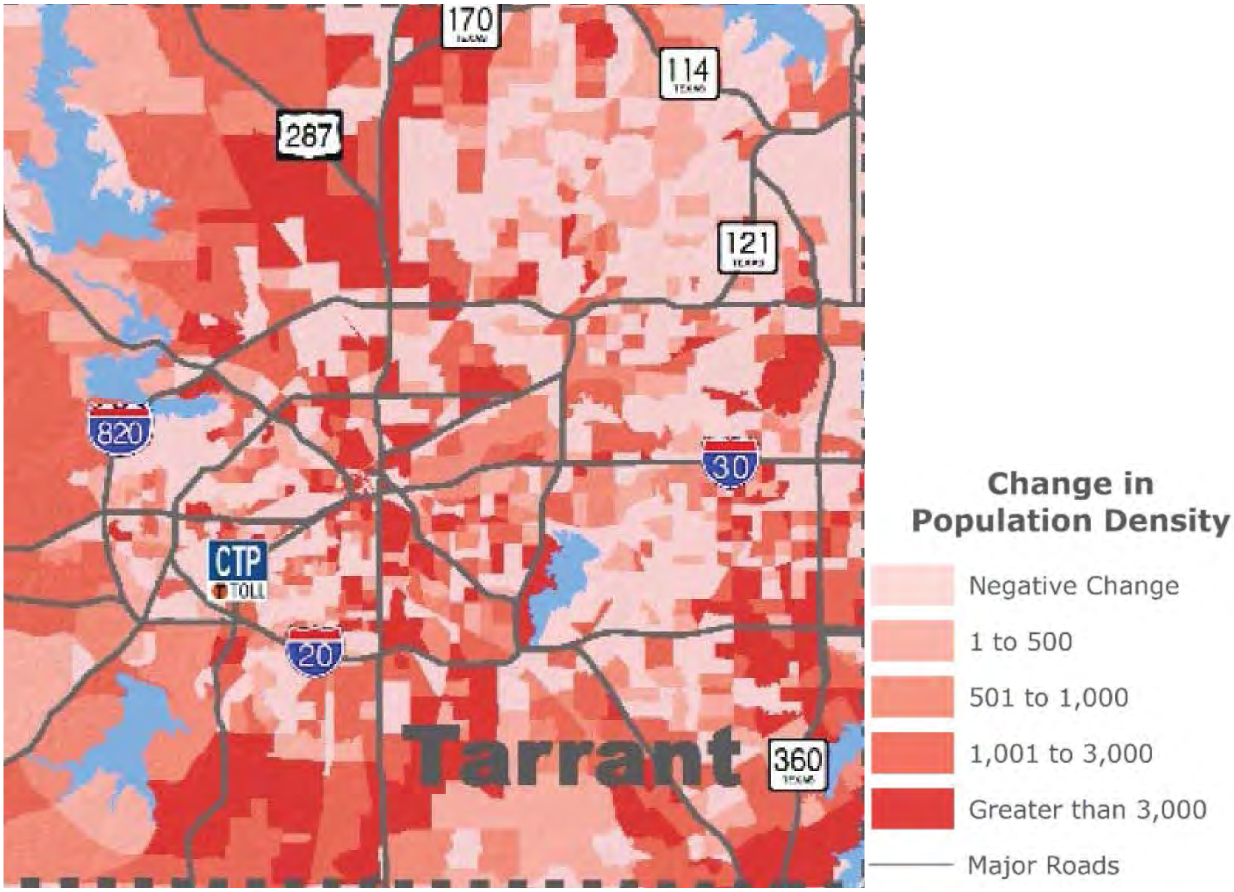


Figure 3. Change in Population Density: 2017-2040
Source: NCTCOG Mobility 2040

2.2 Turning Movement Projections

It is important to note that the NCTCOG model is a regional model, primarily focused on overall flow across the region. While it may be used as a basis for the traffic forecasts, further refinements are required to better estimate turning movements for a series of intersections. Due to the fluctuation in growth rates along SH 199 and the cross streets, applying a generalized growth rate across the corridor is not an accurate method for computing the future turning movement counts.

Future turning movement counts were projected using the forecasted volumes from the NCTCOG model and the existing turning movement counts. National Cooperative Highway Research Program (NCHRP) Report 765: *Analytical Travel Forecasting Approaches for Project-Level Planning and Design* prescribes an iterative procedure called the directional method to compute future turning movement volumes. Based on the NCHRP report, the context in which this procedure is applied matches similarly to the available data for this study. The iterative procedure is used for corridor wide areas for short range, interim and long range forecasting using existing traffic counts and traffic model link assignments. The procedure was computed using a Microsoft Excel spreadsheet.

The procedure uses the turning percentages from the existing counts and applies row and column iterations with the forecasted inflows and outflows from the model to obtain the projected turning movement counts. The calculated total inflows and outflows from the projected turning movement counts at a particular intersection are compared with the model forecasted inflows and outflows. An acceptable level of convergence was reached once these totals were within ±10 percent of the projections in the NCTCOG model. This traffic analysis required four iterations to meet the desired level of convergence. Figure 4 presents the step by step flowchart of the directional method.

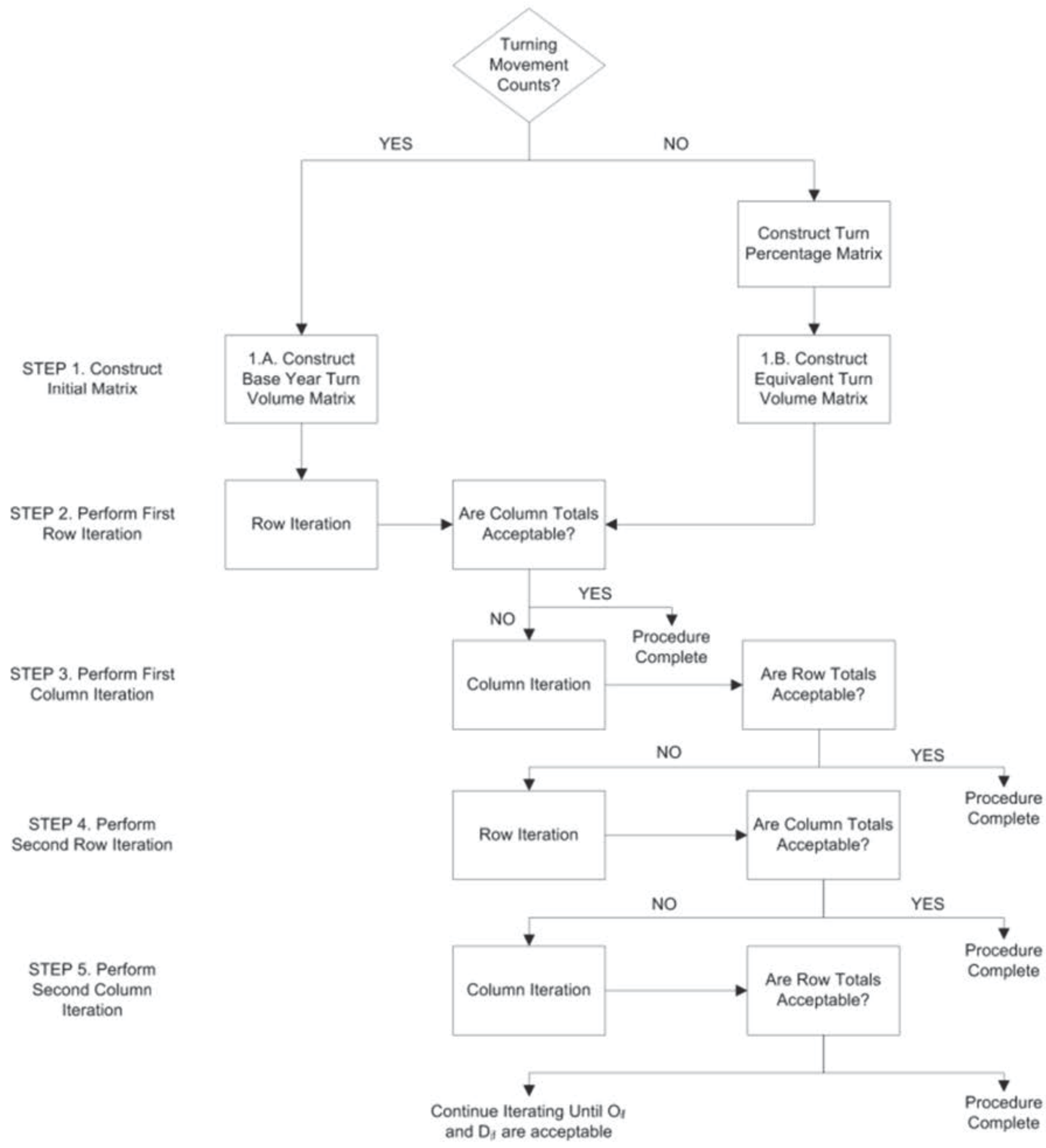


Figure 4. Directional Method Iterative Procedure

Source: *NCHRP Report 765*

2.3 Transit Plan

The NCTCOG regional model does not account for the existing bus service on the corridor. Following the implementation of the directional method, the background through traffic volumes on SH 199 were refined based on planned transit improvements provided by the Fort Worth

Transportation Authority (FWTA) to account for future growth and increased mobility. The FWTA *Master Plan 2015* discusses the recommended improvements for the corridor:

- Improvement of the existing bus route along SH 199 to a rapid bus route. This is a premium bus service which features fewer stops, frequent service, premium shelters, real-time information displayed, articulated buses, and transit signal priority. Rapid bus routes provide many elements of a Bus Rapid Transit Route without exclusive bus lanes.
- Implement an express commuter route. Express bus services are designed to transport suburban workers to downtown jobs. The commuters would use park and ride lots and ride a bus into downtown rather than drive themselves. Express bus services help reduce peak hour traffic on the congested road network.

The corridor currently operates two express buses with 30-minute headways during the morning and evening peak hours. Inbound ridership was reported as 100 passengers and outbound ridership as 50 passengers during the morning peak period. During the evening peak period, 100 passengers were reported heading inbound and 75 passengers heading outbound.

The FWTA anticipates adding more express buses in the future to reduce the headways to 15 minutes. Because ridership should increase with capacity, it was assumed that ridership would double to approximately 200 inbound passengers and approximately 100 outbound passengers during the morning peak hour. In the evening peak hour, it was estimated that ridership would increase to 200 passengers inbound and 150 passengers outbound. The background through traffic volumes was reduced by these amounts during both peak hours to account for the increased ridership. This same reduction was applied to both 2027 and 2040 traffic projections.

2.4 Forecasted Traffic Patterns

The SH 199 will remain highly directional, with approximately 70 percent of the traffic heading eastbound towards downtown during the morning peak hour, and 63 percent heading westbound during the evening peak hour in 2027. This directionality is forecasted to increase in 2040 to approximately 75 percent eastbound during the morning peak hour and 68 percent westbound during the evening peak hour.

During the 2027 morning peak hour, much of the inbound traffic originates from north of IH 820 and enters the corridor as background through traffic on SH 199. However, the northern side of Long Avenue, SH 183, NW 21st Street, and University/Northside Drive will all continue to be important feeders for the corridor during the morning peak hour. A large number of vehicles will continue to use Roberts Cut Off as an alternate route to the Naval Air Station / Joint Reserve Base (NAS/JRB). Furthermore, a large number of vehicles will leave the SH 199 corridor at University / Northside Drive.

During the 2027 evening peak hour, downtown Fort Worth and University / Northside Drive are the largest feeders of the outbound traffic volume. Most of the traffic continues on SH 199 to the western end of the project limits, though high turning movements away from the corridor are forecasted at NW 21st Street, SH 183 and Long Avenue. The northbound left turn from Roberts Cut Off will also remain high. As was the case in the morning peak hour, a high number of vehicles use Roberts Cut Off as an alternate route from the NAS/JRB.

The same general patterns are forecasted in 2040 but to a greater magnitude. The final projected turning movement volumes are shown in Figure 5 and Figure 6.

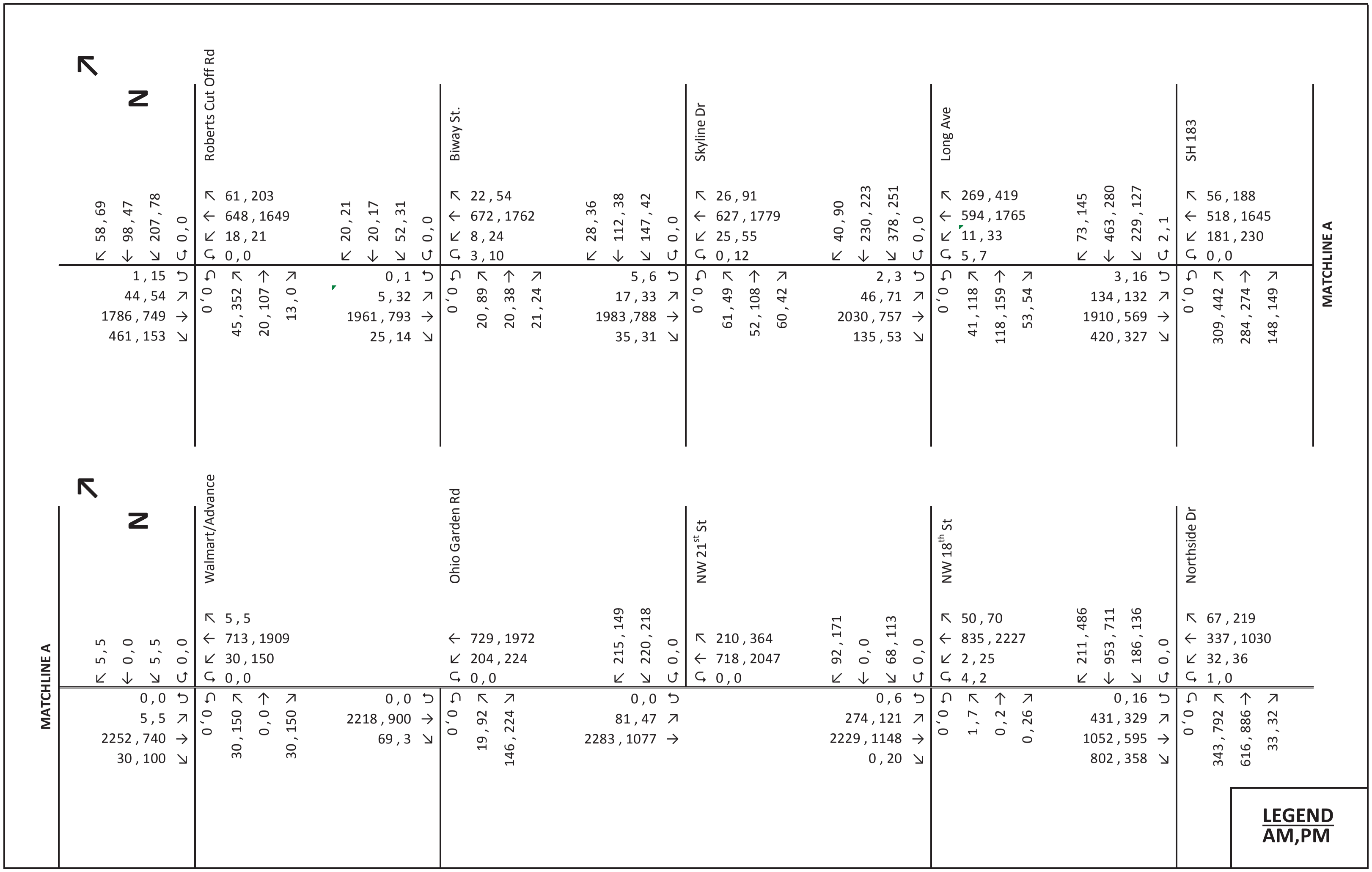


Figure 5. **2027 Projected Turning Movement Volumes**

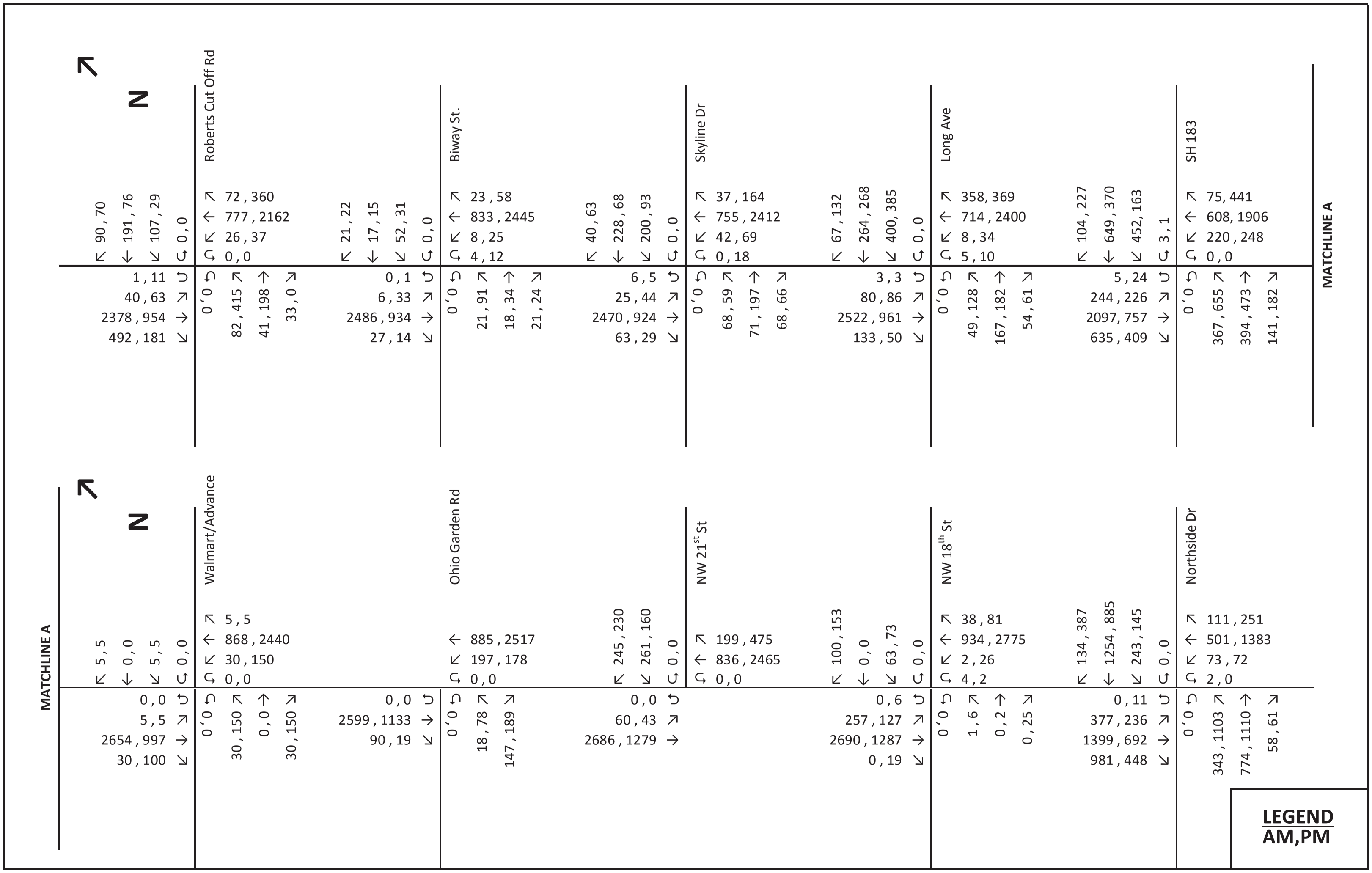


Figure 6. 2040 Projected Turning Movement Volumes

3.0 TRAFFIC ANALYSIS

Once the turning movement projections were finalized, Synchro 9 was utilized to analyze the Level of Service (LOS) at the intersections.

3.1 Proposed Geometry

The overall goal of the proposed geometric plan is to provide a context-sensitive design that accommodates all modes of traffic. Although the traffic volumes warrant three through lanes in each direction, further analysis was required to identify specific intersection improvements such as turn bays and pedestrian ramps / crosswalks. Left turn bays are required for all approaches on SH 199 and for several of the cross streets. In some cases, a second left turn bay was provided for exceptionally high turning movements (greater than 300 vehicles per hour). While the existing corridor uses the shoulders for right turn bays at intersections, the proposed configuration eliminates the shoulders. Table 2-3 of the *TxDOT Access Management Manual* provides guidelines for installing right turn bays based on factors such as the number of right turning vehicles and the posted speed limit. In some cases, however, the available right-of-way prohibits the addition of a right turn bay. Also, adding a right turn bay increases the pedestrian crossing distance resulting in a greater proportion of the overall cycle length that must be dedicated to the cross street instead of the main thoroughfare. Based on these guidelines and the actual impact to corridor operations, right turn bays are provided at locations where they are truly needed and feasible. Pedestrian crossings are provided across all sides of the intersections, and the proposed improvements also include flashing yellow arrows at all locations with protected/permissive phasing.

Attachment B presents the proposed intersection layouts for the entire corridor, including mitigation measures at several intersections to improve the forecasted LOS in 2027 and 2040:

- Additional left turn bays are provided on northbound and southbound Roberts Cut Off Road as shown in Figure 7. The northbound approach includes dual left turn bays to mitigate the heavy evening demand for this turn. The left turn bays will allow the traffic signals to utilize protected only or protected / permissive left turn treatments rather than split phasing the northbound and southbound approaches.

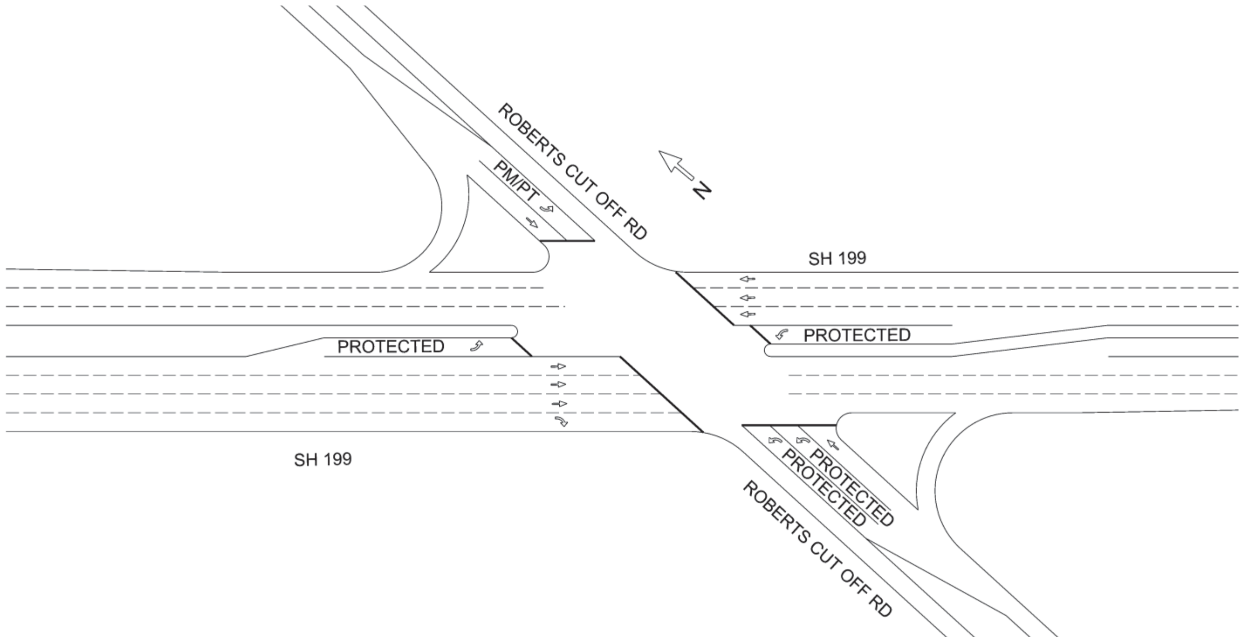


Figure 7. Proposed Improvements - Roberts Cut Off Road

- Additional left turn bays are provided on northbound and southbound Skyline Drive as shown in Figure 8 which provides additional capacity to the intersection. This also allows for protected / permissive left turn treatments at all four approaches of the intersection.

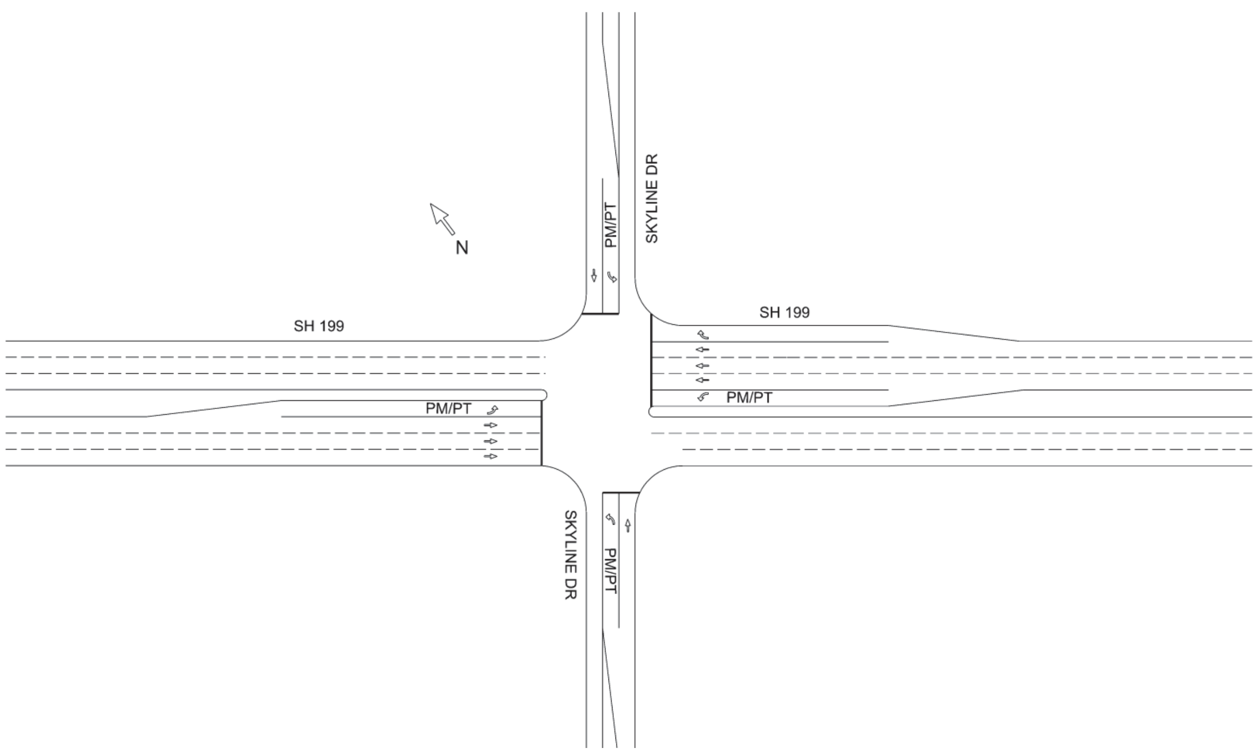


Figure 8. Proposed Improvements – Skyline Drive

- A separate left turn bay is provided for the northbound approach for Long Avenue as shown in Figure 9. Furthermore, the southbound approach is reconfigured to provide two separate left turn bays. This allows the traffic signal to utilize a more efficient timing plan for the Long Avenue approaches rather than split phasing.

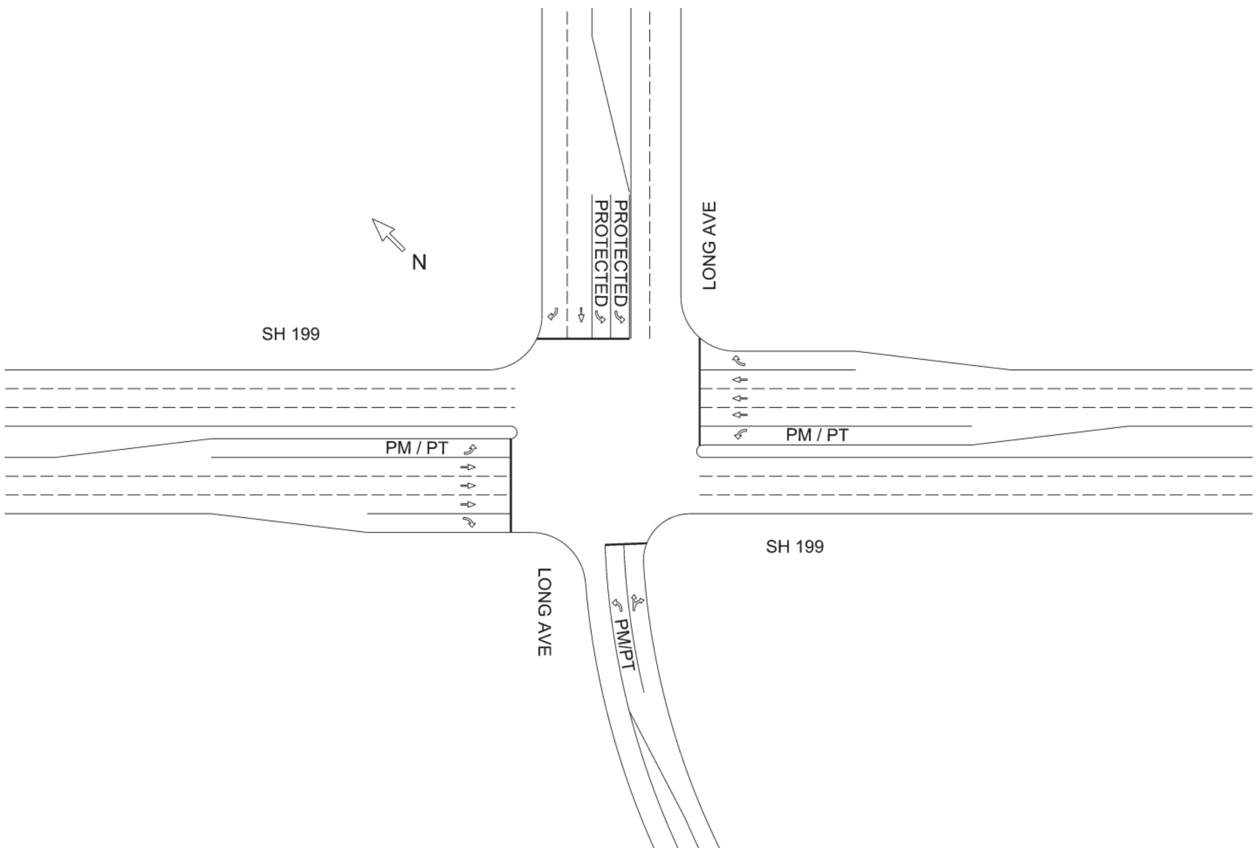


Figure 9. Proposed Improvements – Long Avenue

3.2 Level of Service Analysis

Analysts use level of service (LOS), a qualitative measure which ranges from A to F, to help determine how well a particular facility operates. The scale, in which LOS A represents the best operating conditions while LOS F the worst, uses numeric values of speed, flow and density to describe the perceived quality of flow as viewed by drivers. The 2000 *Highway Capacity Manual* (HCM) provides measures of effectiveness used to determine LOS for signalized intersections, which is presented in Table 4**.** LOS is determined using the average delay (in seconds per vehicle) for the intersections.

Table 4. Signalized Intersection LOS Criteria

LOS	Signalized Average Delay (seconds/vehicle)
A	≤ 10
B	> 10 to ≤ 20
C	> 20 to ≤ 35
D	> 35 to ≤ 55
E	> 55 to ≤ 80
F	> 80

Source: 2000 Highway Capacity Manual

Figure 10 presents a visual representation of LOS.

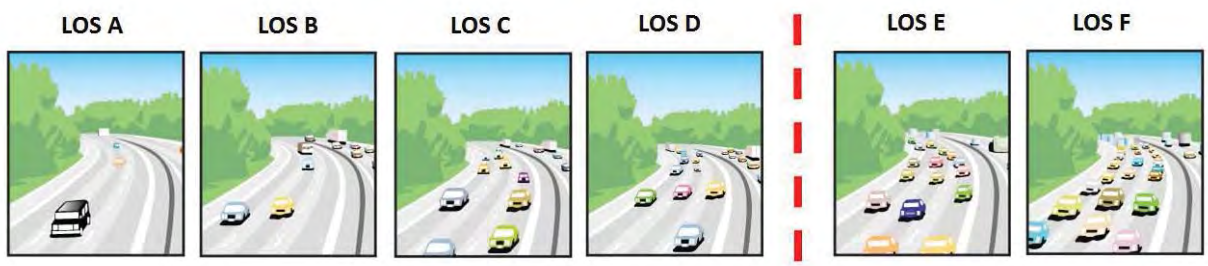


Figure 10. Corridor Level of Service

Synchro 9 models were developed for the corridor for both the no-build and proposed scenarios to analyze the morning and evening peak hours in Years 2027 and 2040. The intersections used optimized cycle lengths and splits and maintained the existing coordination on the corridor. Pedestrian clearance times based on the new crosswalk locations and crossing distances were calculated and incorporated into the model. Table 5 and Table 6 present the resulting LOS for the morning and evening peak hour, using HCM 2000 analysis procedures. The Synchro reports are included in Attachment C.

Table 5. Morning Peak Hour LOS Analysis

Morning Peak Hour	2027				2040			
	No Build		Proposed		No Build		Proposed	
Cross Street	Delay*	LOS	Delay*	LOS	Delay*	LOS	Delay*	LOS
Roberts Cut Off Road	67.3	E	21.5	C	122.0	F	30.4	C
Biway Street	9.7	A	9.1	A	26.1	C	7.4	A
Skyline Drive	47.0	D	19.3	B	155.7	F	29.2	C
Long Avenue	124.0	F	29.9	C	226.4	F	66.4	E
SH 183	72.1	E	38.1	D	104.0	F	54.3	D
Wal Mart Drive	11.3	B	4.1	A	48.5	D	7.2	A
Ohio Garden Road	23.9	C	16.4	B	56.7	E	16.1	B
NW 21st Street	15.5	B	8.5	A	29.3	C	12.4	B
NW 18th Street	12.5	B	6.4	A	37.8	D	10.0	A
University Drive	70.1	E	43.4	D	126.4	F	86.7	F

* Delay measured in seconds per vehicle.

Table 6. Evening Peak Hour LOS Analysis

Evening Peak Hour	2027				2040			
	No Build		Proposed		No Build		Proposed	
Cross Street	Delay*	LOS	Delay*	LOS	Delay*	LOS	Delay*	LOS
Roberts Cut Off Road	92.4	F	25.4	C	151.5	F	41.3	D
Biway Street	11.3	B	10.4	B	36.9	D	15.5	B
Skyline Drive	11.7	B	10.1	B	81.4	F	15.6	B
Long Avenue	60.0	E	27.1	C	153.1	F	68.9	E
SH 183	62.1	E	40.2	D	86.1	F	65.7	E
Wal Mart Drive	17.6	B	12.8	B	57.2	E	18.1	B
Ohio Garden Road	12.9	B	10.0	B	17.2	B	9.1	A
NW 21st Street	9.3	A	12.2	B	30.7	C	8.8	A
NW 18th Street	30.8	C	15.3	B	64.9	E	14.5	B
University Drive	119.3	F	84.6	F	164.1	F	146.7	F

* Delay measured in seconds per vehicle.

3.2.1 Year 2027 Results

The no-build analysis shows an operational worsening for several of the problem intersections found in the 2016 existing conditions analysis. Cycle lengths for the corridor were set at 180 seconds to minimize lost time. The following intersections will operate at an unacceptable LOS in either the morning and/or evening peak hours:

- The Roberts Cut Off Road intersection operates at LOS E in the morning and LOS F in the evening peak due to the lack of capacity along Roberts Cut Off Road and the required split phasing for the northbound and southbound approaches.
- The Long Avenue intersection operates at LOS F in the morning peak and LOS E in the evening peak. Similar to the Roberts Cut Off Road intersection, operations at this location are hindered by split phasing the northbound and southbound approaches.
- The SH 183 intersection operates at LOS E in both the morning and evening peak hours. Both the through and left turning volumes are heavy in all directions, leading to longer delays.
- The University Drive / Northside Drive intersection operates at LOS E in the morning peak hour and LOS F in the evening peak hour. Similar to SH 183, University Drive is also a major arterial with heavy turning movements for all approaches.

The proposed condition analysis reveals noticeable improvements across the corridor for the following reasons:

- The additional through lane on SH 199 increases the capacity of the corridor by nearly 50 percent. This allows for shorter cycle lengths leading to lower delays on the cross street approaches.
- The additional rapid bus routes anticipated for the corridor would reduce background vehicle demand on SH 199, as described in Section 2.3.

- The additional left turn bays at Roberts Cut Off and Long Avenue eliminate the need for split phasing, leading to more efficient operations at these two intersections.
- Dual left turn bays help reduce delays for the cross street approaches with heavy left turns (Roberts Cut Off, Long Avenue, University Drive / Northside Drive). The University Drive / Northside Drive intersection is still forecasted to be problematic but the additional eastbound left turn bay provides some relief.

3.2.2 Year 2040 Results

By 2040, nearly all of the intersections in the corridor should operate at an unacceptable LOS in the no-build scenario. Increasing traffic volumes on SH 199 could exacerbate many of the previously described problems on the corridor, and the existing geometry does not provide enough capacity to meet demand.

In the proposed scenario for SH 199, only the Long Avenue, SH 183 and University Drive / Northside Drive intersections are forecasted to operate at LOS E or F in 2040. All three cross streets have high turning volumes to and from SH 199 and, in the case of SH 183 and University Drive / Northside Drive, are major arterials with heavy background through volumes. Both intersections are essentially built out and greater intersection improvements would be needed to provide any noticeable improvement. Some possible solutions include the following; however, the first two could have significant impacts to the existing land uses and property:

- Add another through lane to the cross street
- Grade-separate the SH 199 through movement
- Innovative intersection improvements to improve efficiency. Section 4.0 evaluates alternative intersection designs at Roberts Cut Off Road and SH 183.

3.2.3 Queue Lengths and Turn Bay Length Calculations

The TxDOT *Roadway Design Manual* provides guidelines for calculating turn bay lengths, which is the sum of the required storage and deceleration lengths. The manual recommends using an acceptable traffic model such as Synchro to estimate the required storage lengths. Attachment D presents the resultant 95th percentile queue lengths for both the 2040 morning and evening peak hour analyses. These values are then compared to a minimum storage length and the larger of these two values is added to a required deceleration length dependent on the posted speed limit.

The proposed alternative presented in Attachment B uses these calculations as a starting point in designing the turn bays at each intersection. The minimum lengths were provided where possible, but factors such as available right-of-way and the distance to the next upstream intersection or driveway limited the allowable turn bay length at several locations. In these cases, the maximum practical turn bay length was provided.

4.0 ALTERNATIVE INTERSECTION ANALYSIS

Two alternative intersection designs were considered during the development of the proposed geometric configuration. The first design splits the Roberts Cut Off Road intersection into two separate intersections. The second design installs a displaced left turn intersection at SH 183.

4.1 Roberts Cut Off Road – Separate Intersections

4.1.1 Intersection Geometry

One proposed concept separates the northbound and southbound Roberts Cut Off Road approaches into two separate intersections, as shown in Figure 11. The southbound approach tees into SH 199, while the northbound approach follows the current alignment for Corner Lane and intersects SH 199 opposite Broadview Drive. The two intersections are approximately 750 feet apart and would operate with two separate traffic signal controllers.

This concept was considered due to the high crash rate at and in the proximity of the intersection, the skew angle and poor geometry for all users, and the low percentage of through traffic on Roberts Cut Off Road. Aside from potential benefits to traffic operations, the concept could also allow for adjacent properties to be better formed for development.

Because the new intersection with Corner Lane would be signalized, the analysis assumes that some vehicles on the north side currently using Roberts Cut Off Road would divert to this new signalized intersection. Traffic was re-routed between the two intersections, resulting in the year 2027 and 2040 peak hour forecasted volumes presented in Figure 12.

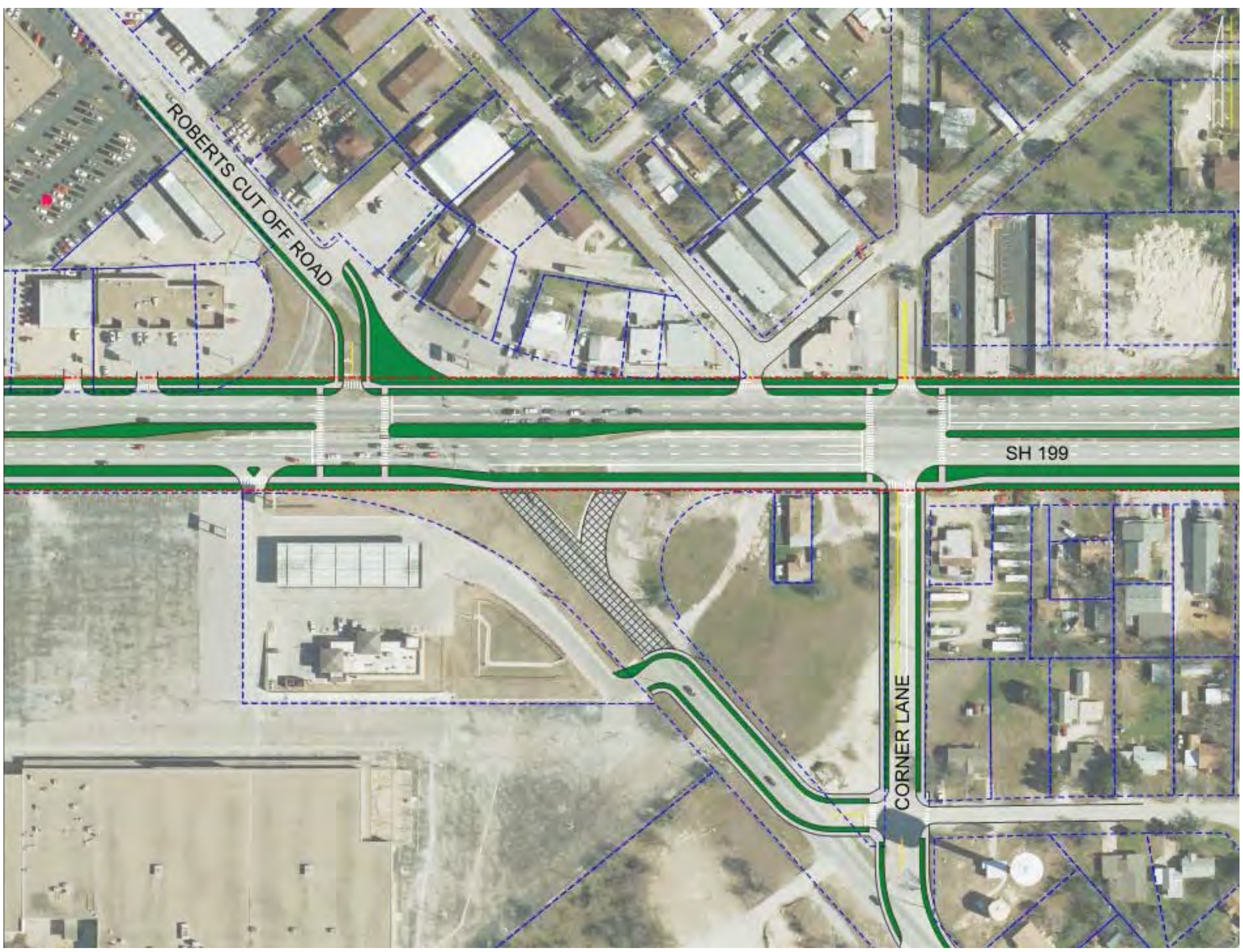


Figure 11. Alternative Intersection Geometry – Roberts Cut Off Road

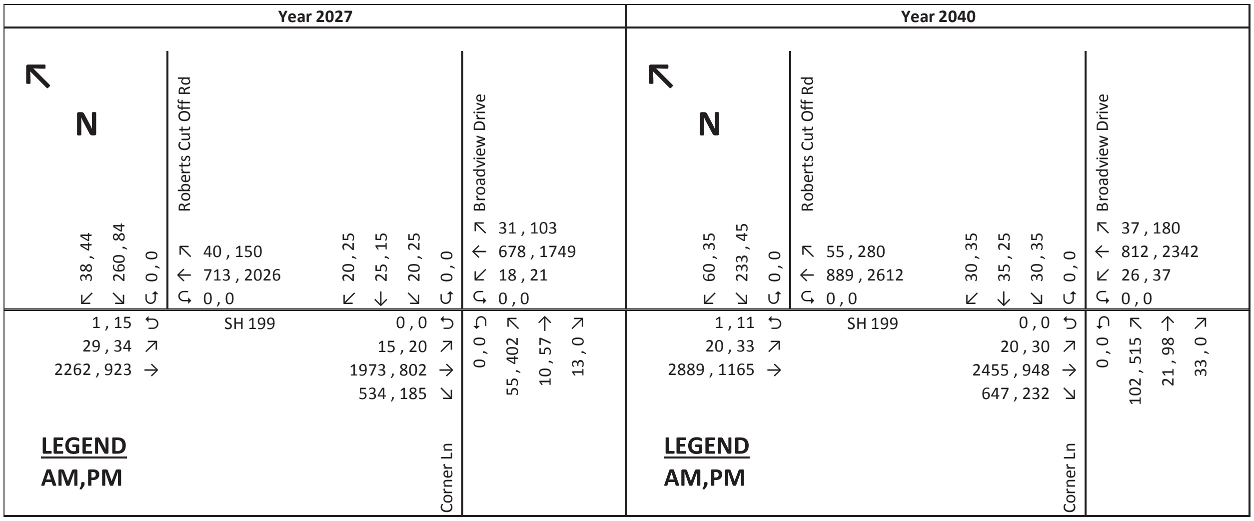


Figure 12. Alternative Intersection Traffic Volumes – Roberts Cut Off Road

4.1.2 Level of Service Analysis

Synchro 9 models were developed for the Roberts Cut Off split intersection. Biway Street was also included in the analysis with the timings from the proposed configuration locked. The cycle lengths for the two split intersections were set to match the rest of the corridor, while splits and offsets were adjusted. These steps allowed the proposed split intersection to seamlessly integrate into the rest of the corridor. Table 7 presents the resulting LOS for the morning and evening peak hour scenarios, using HCM 2000 analysis procedures. The results for the two separated intersections are also compared to the single intersection analyzed in the proposed configuration and described in Section 3.2. The Synchro reports are included in Attachment E.

Table 7. Roberts Cut Off Road Alternative Intersection LOS Analysis

Alternative	Conventional		Separate Intersections		
Analysis Period	**Delay***	**LOS**	**Cross Street**	**Delay***	**LOS**
2027					
Morning Peak Hour	21.5	C	Roberts Cut Off Road	16.2	B
			Corner Lane/ Broadview Drive	11.0	B
Evening Peak Hour	25.4	C	Roberts Cut Off Road	5.2	A
			Corner Lane/ Broadview Drive	28.1	C
2040					
Morning Peak Hour	30.4	C	Roberts Cut Off Road	21.3	C
			Corner Lane/ Broadview Drive	16.6	B
Evening Peak Hour	41.3	D	Roberts Cut Off Road	4.7	A
			Corner Lane/ Broadview Drive	47.0	D

* Delay measured in seconds per vehicle.

Separating the Roberts Cut Off Road approaches into separate intersections is forecasted to improve operations during the morning peak hour and produce similar results to the conventional single intersection approach for the evening peak hour. While this alternative provides several promising benefits, additional factors such as the loss of direct connectivity on Roberts Cut Off Road and the cost of a new signalized intersection should factor into any final decision.

4.2 SH 183 – Displaced Left Turn

4.2.1 Intersection Geometry

A second concept reconstructs the SH 183 intersection to include displaced left turn lanes for all four approaches, as shown in Figure 13. A bypass right turn lane is also provided for the heavy right turn on the eastbound approach. This concept was considered due to the high traffic volumes on both arterials, the existing right-of-way footprint, and the preference of stakeholders to evaluate non-grade separated options at this intersection.

Figure 13. Alternative Intersection Geometry – SH 183

A Displaced Left Turn intersection (DLT), also known as a continuous flow intersection, relocates the left turn movement on an approach to the other side of the opposing roadway, which consequently eliminates the left turn phase for this approach at the main intersection. This provides a greater capacity for the entire intersection and reduces the number of conflict points, rendering the DLT safer than conventional intersections. However, the intersection design requires a larger footprint, creates challenges for pedestrians, and usually requires additional traffic signals at the crossover points. *FHWA-HRT-09-060 – Alternative Intersections /Interchanges Information Report* provides further discussion on DLT intersections, their geometric requirements, signal phasing, and advantages and disadvantages.

4.2.2 Level of Service Analysis

Corridors with heavy through traffic tend to see the greatest benefit from DLT intersections as the proportion of green time is higher than for traditional timing plans. To function properly, cycle lengths for DLT intersections should be set at between 80 and 110 seconds. Ideally, after making the initial crossover the left turners should be able to arrive on a green indication at the main signal downstream. Longer cycle lengths, however, disrupt this progression and tend to increase delays for the left turn movements.

Table 8 and Table 9 present the resulting LOS for the SH 199 corridor if a DLT intersection is installed at SH 183. The results from the main analysis described in Section 3.2 are also presented again for comparison, as are the recommended cycle lengths for the corridor. The Synchro reports are included in Attachment F. For modeling purposes, the SH 183 DLT is treated as eight different signalized intersections in Synchro. The total delays for each overall turning movement were added together and a weighted average was calculated to determine the overall intersection delay.

Table 8. SH 183 Alternative Intersection – Morning Peak Hour LOS Analysis

Morning Peak Hour	2027				2040			
	Proposed 135 Second Cycle		DLT at SH 183 135 Second Cycle		Proposed 180 Second Cycle		DLT at SH 183 180 Second Cycle	
Cross Street	Delay*	LOS	Delay*	LOS	Delay*	LOS	Delay*	LOS
Roberts Cut Off Road	21.5	C	21.5	C	30.4	C	31.7	C
Biway Street	9.1	A	9.0	A	7.4	A	6.6	A
Skyline Drive	19.3	B	16.6	B	29.2	C	28.0	C
Long Avenue	29.9	C	28.6	C	66.4	E	53.7	D
SH 183	38.1	D	58.7	E	54.3	D	53.8	D
Wal Mart Drive	4.1	A	2.7	A	7.2	A	5.4	A
Ohio Garden Road	16.4	B	16.3	B	16.1	B	15.6	B
NW 21st Street	8.5	A	8.1	A	12.4	B	12.2	B
NW 18th Street	6.4	A	6.5	A	10.0	A	8.8	A
University Drive	43.4	D	43.4	D	86.7	F	87.0	F

* Delay measured in seconds per vehicle.

Table 9. SH 183 Alternative Intersection – Evening Peak Hour LOS Analysis

Evening Peak Hour	2027				2040			
	Proposed 145 Second Cycle		DLT at SH 183 145 Second Cycle		Proposed 180 Second Cycle		DLT at SH 183 180 Second Cycle	
Cross Street	**Delay***	**LOS**	**Delay***	**LOS**	**Delay***	**LOS**	**Delay***	**LOS**
Roberts Cut Off Road	25.4	C	25.1	C	41.3	D	38.4	D
Biway Street	10.4	B	10.1	B	15.5	B	13.1	B
Skyline Drive	10.1	B	10.3	B	15.6	B	17.5	B
Long Avenue	27.1	C	26.5	C	68.9	E	47.3	D
SH 183	40.2	D	52.3	D	65.7	E	66.6	E
Wal Mart Drive	12.8	B	15.1	B	18.1	B	18.3	B
Ohio Garden Road	10.0	B	9.2	A	9.1	A	9.2	A
NW 21st Street	12.2	B	9.1	A	8.8	A	8.7	A
NW 18th Street	15.3	B	13.9	B	14.5	B	13.8	B
University Drive	84.6	F	84.9	F	146.7	F	138.8	F

* Delay measured in seconds per vehicle.

The results show that the DLT intersection does not improve the LOS at the SH 183 intersection during either analysis period in 2027. The TMUTCD requires enough pedestrian clearance time to allow someone to cross at a pace of 3.5 feet per second and the required split for a particular direction increases with longer crossing distances. This is particularly evident at the SH 183 intersection, where the crosswalks across SH 199 are nearly 140 feet long. Based on the required pedestrian clearance intervals at all intersections, the lowest realistic cycle length for the corridor is 135 seconds, which is significantly higher than the 90 to 110 second splits ideal for DLT. Both alternatives matched the cycle lengths selected for the traditional intersection analysis. Thus, operations worsened at SH 183 during the evening peak hour because the added delay for the left turning traffic was greater than any benefit for the through movements.

No improvements for the DLT alternative at SH 183 were noted in the 2040 analysis. The high background traffic volumes on SH 199 required a 180 second cycle length to minimize start-up loss time for the corridor. This cycle length was selected for both alternatives. Although the high cycle length adversely affects the LOS for the left turns, the resulting benefit to the through traffic results in an overall LOS equal to the traditional intersection alternative. Some benefit was observed at Long Ave due to improved progression between this intersection and SH 183.

Based on the operational results and other factors such as the additional costs from right-of-way acquisition and four additional traffic signals, loss of access to the properties on all four corners, impacts to transit service, and impacts to bicycle and pedestrian movements, the DLT alternative is not recommended.

5.0 ATTACHMENTS

A. NCTCOG TransCAD Model Output
B. Proposed Intersection Layouts
C. Synchro Output – Traditional Intersection Design
D. Synchro Output – Queue Lengths and Turn Bay Calculations
E. Synchro Output – Roberts Cut Off Road Split Intersection Analysis
F. Synchro Output – SH 183 Displaced Left Turn Intersection Analysis

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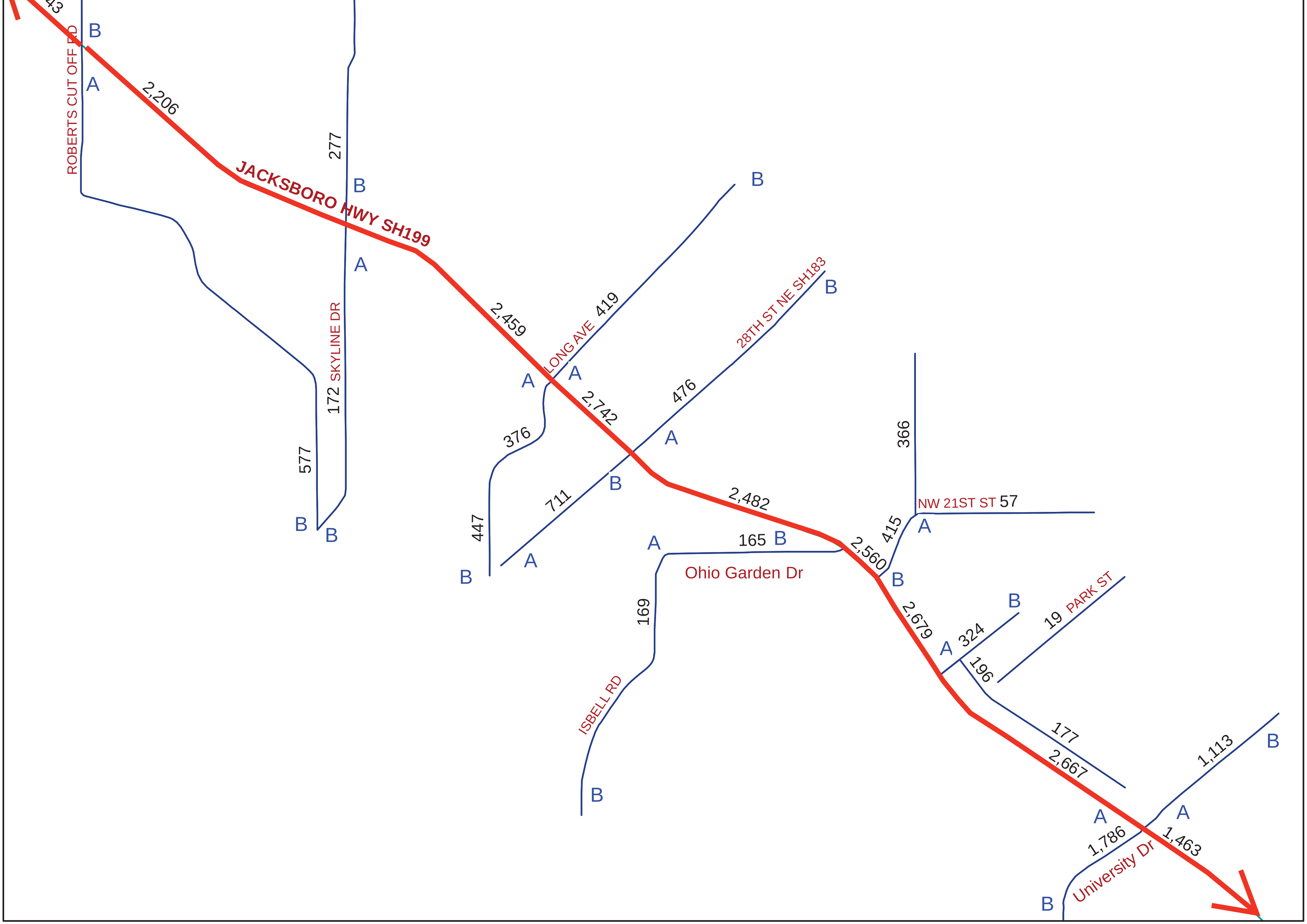
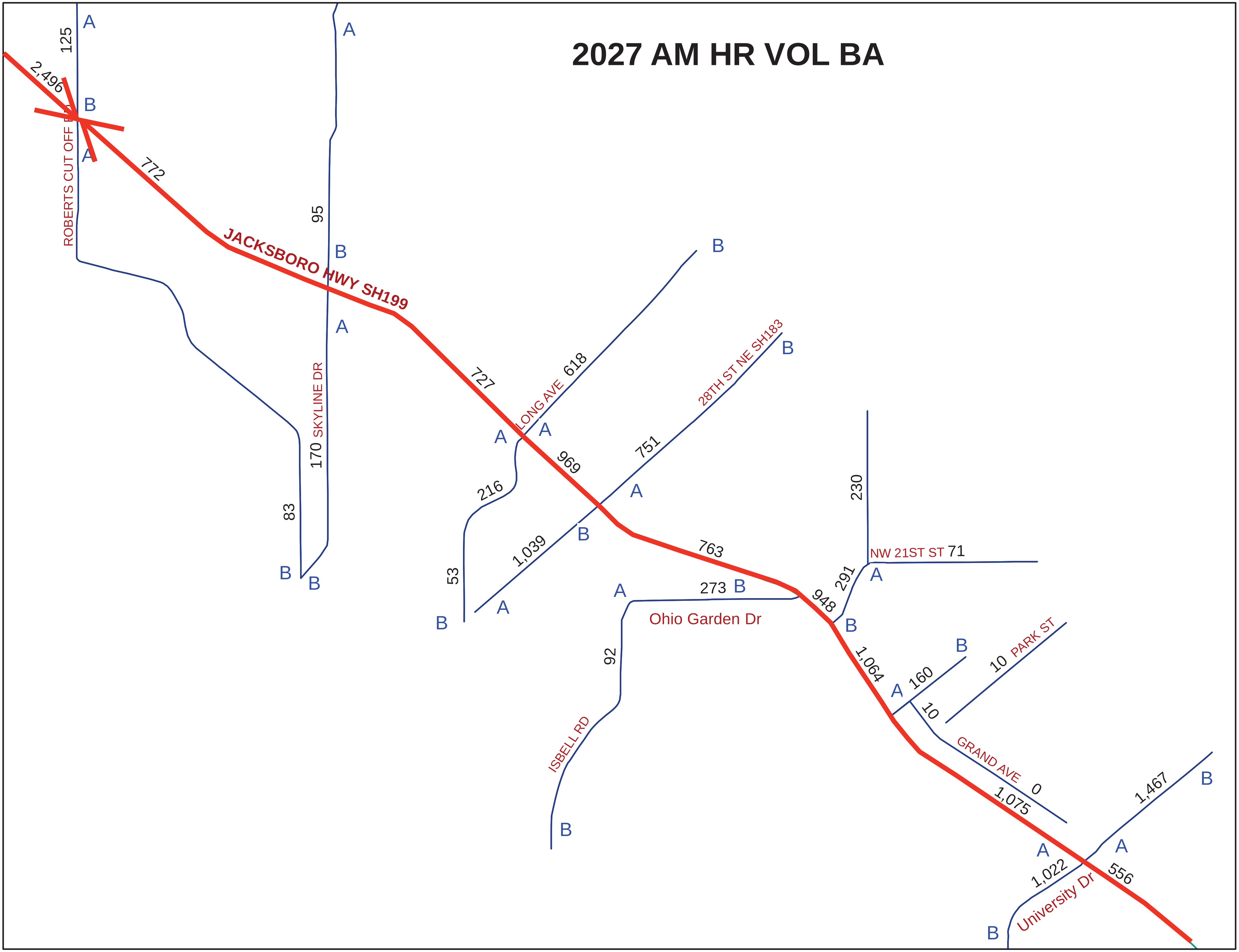
Attachment A

NCTCOG TransCAD Model Output

2027 AM HR VOL AB



2027 AM HR VOL BA



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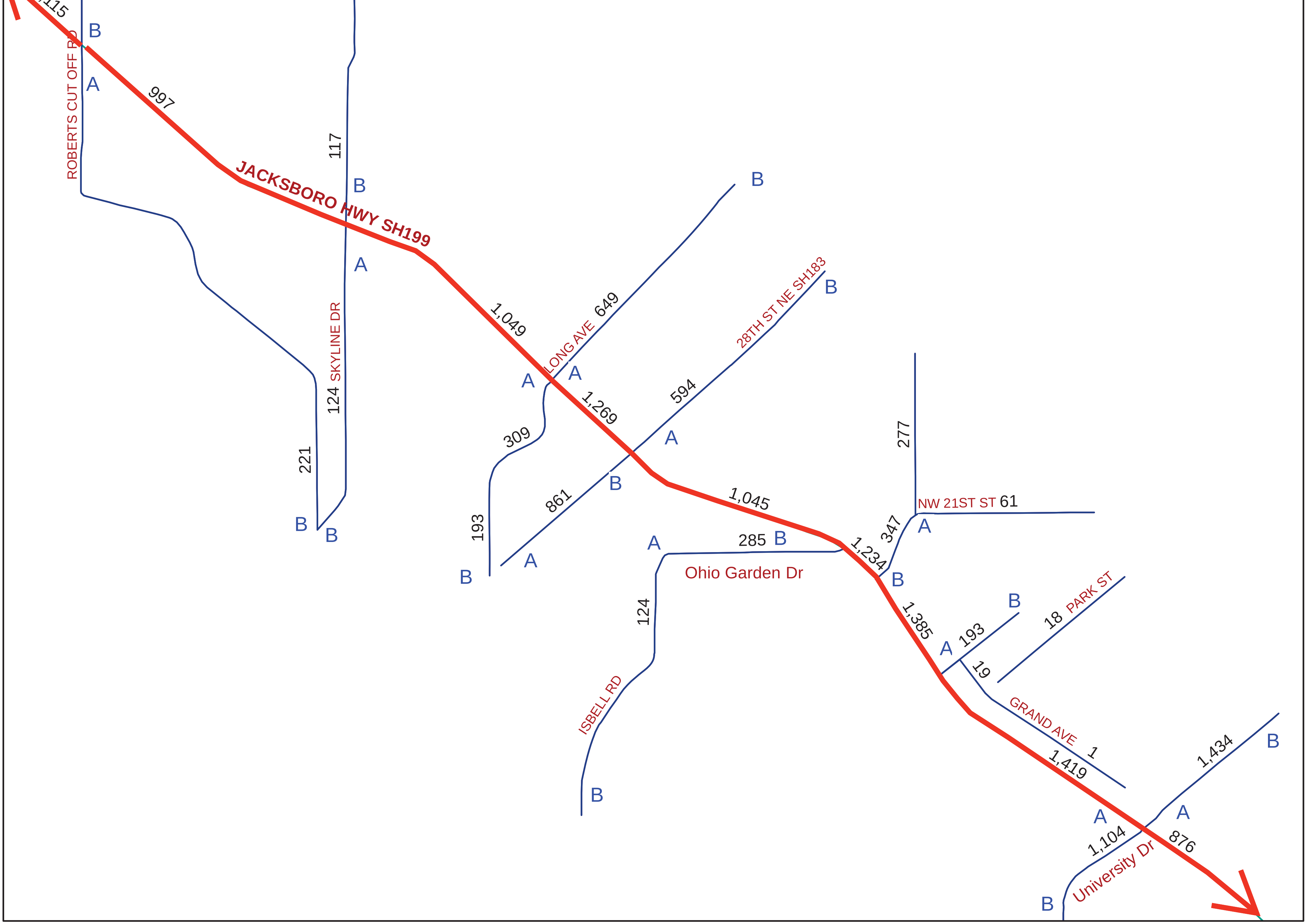

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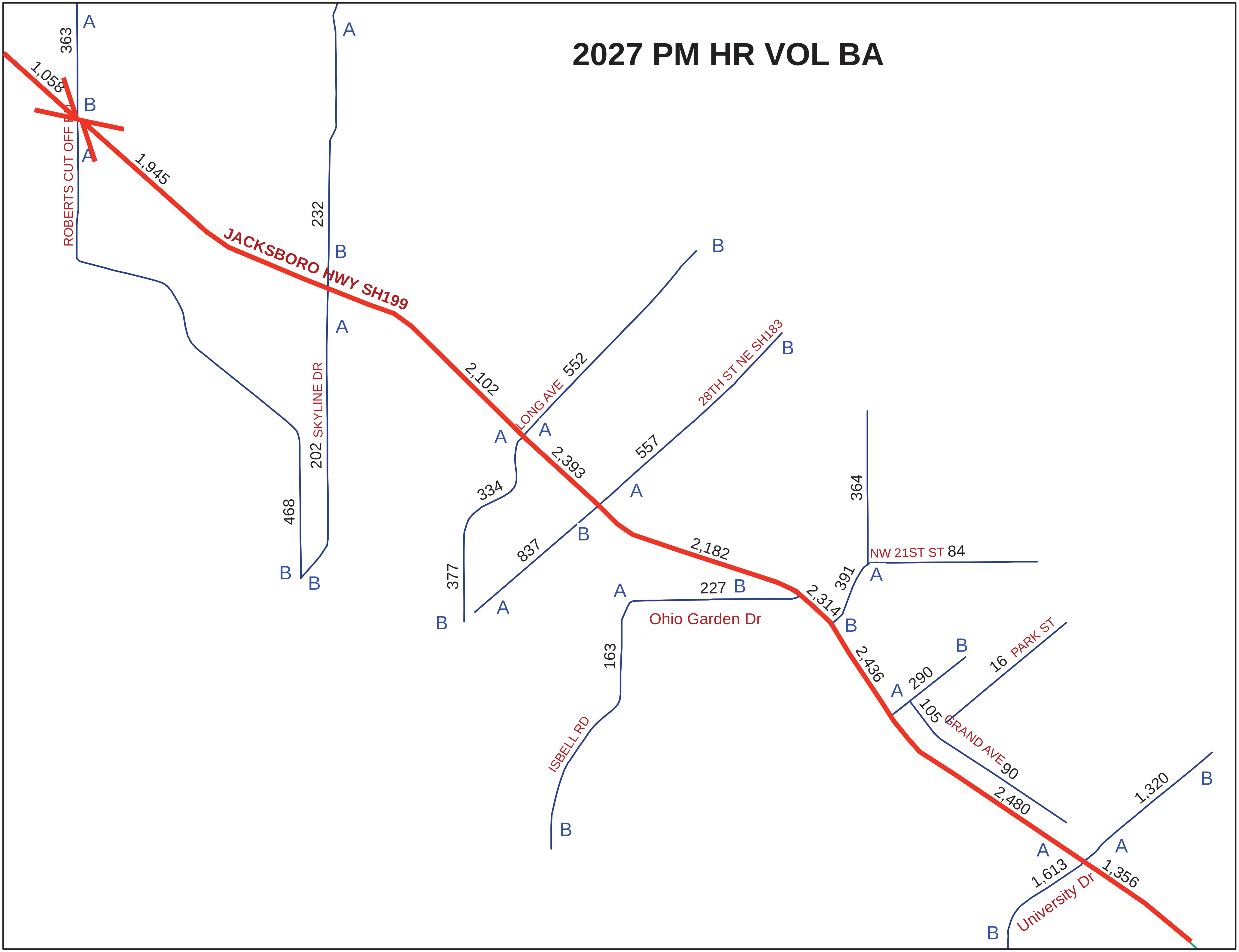

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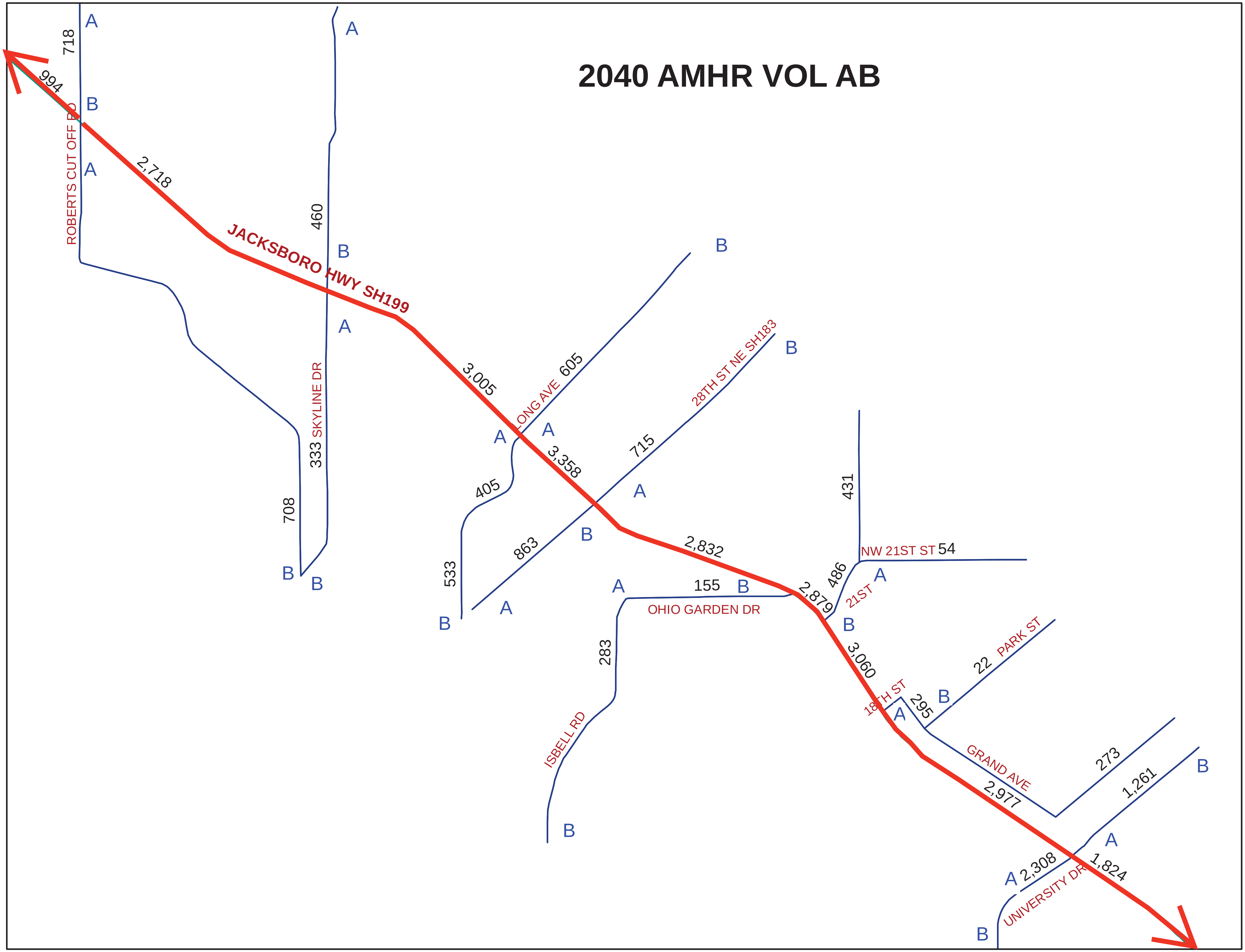

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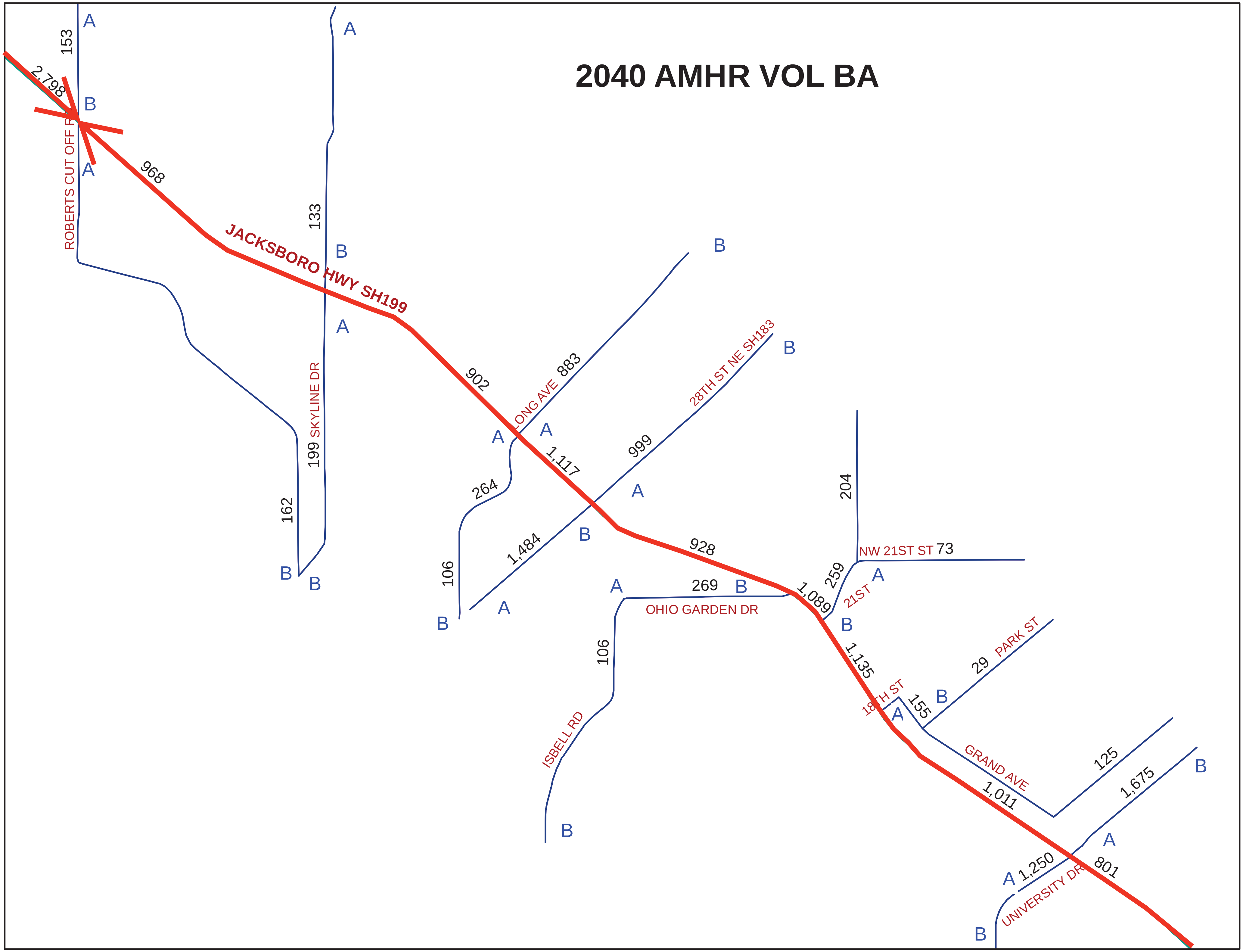

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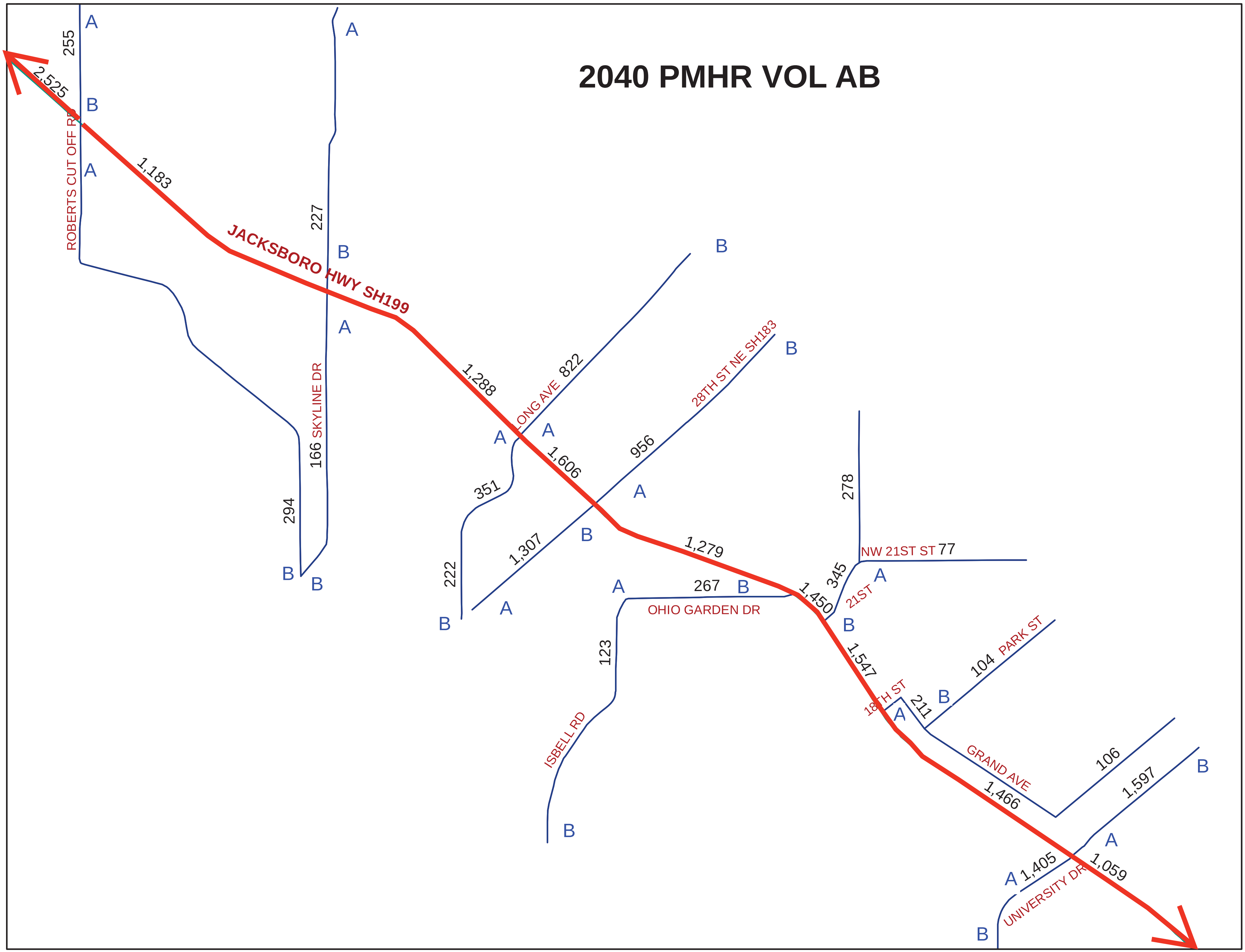

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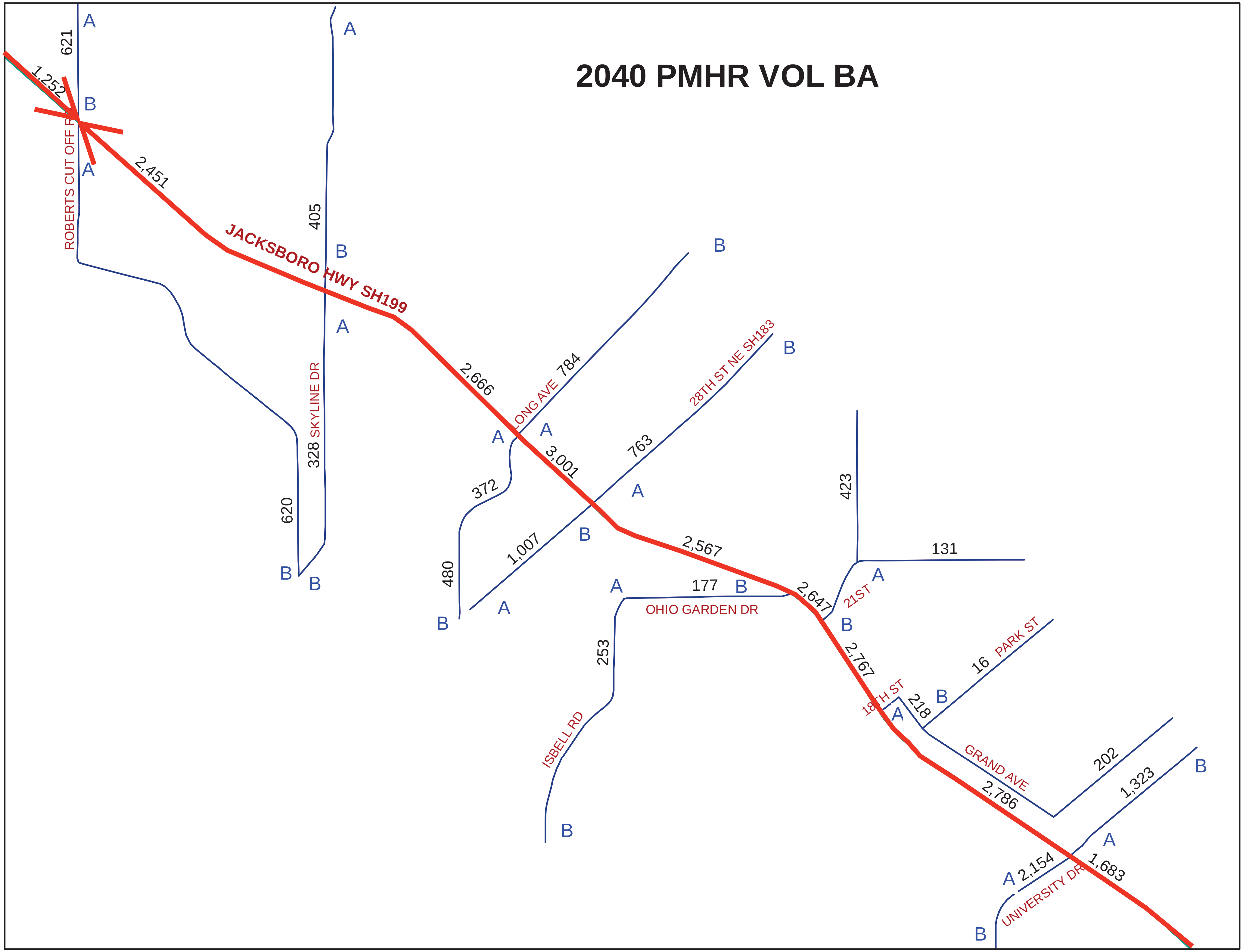

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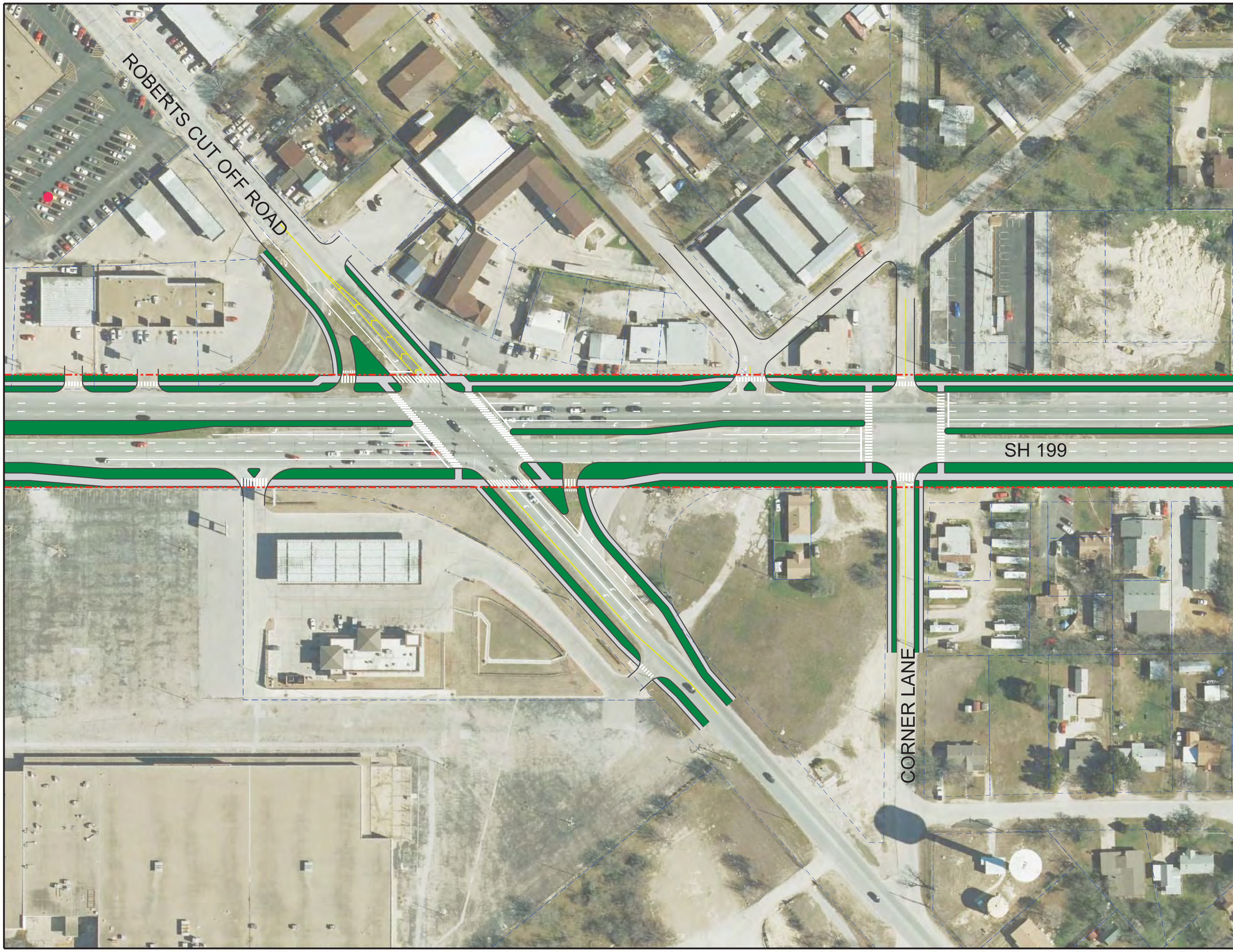
Attachment B

Proposed Intersection Layouts



North Central Texas Council of Governments

STATE HIGHWAY 199 CORRIDOR MASTER PLAN

ROBERTS CUT OFF ROAD INTERSECTION LAYOUT

LEGEND

- PROPERTY LINES (PER TXDOT RECORD DATA)
- PROPERTY LINES (PER 2015 TARRANT APPRAISAL DISTRICT DATA)
- PROPOSED SIDEWALK
- PROPOSED MEDIAN AND PARKWAY LANDSCAPING OR HARDSCAPING

NOTES:

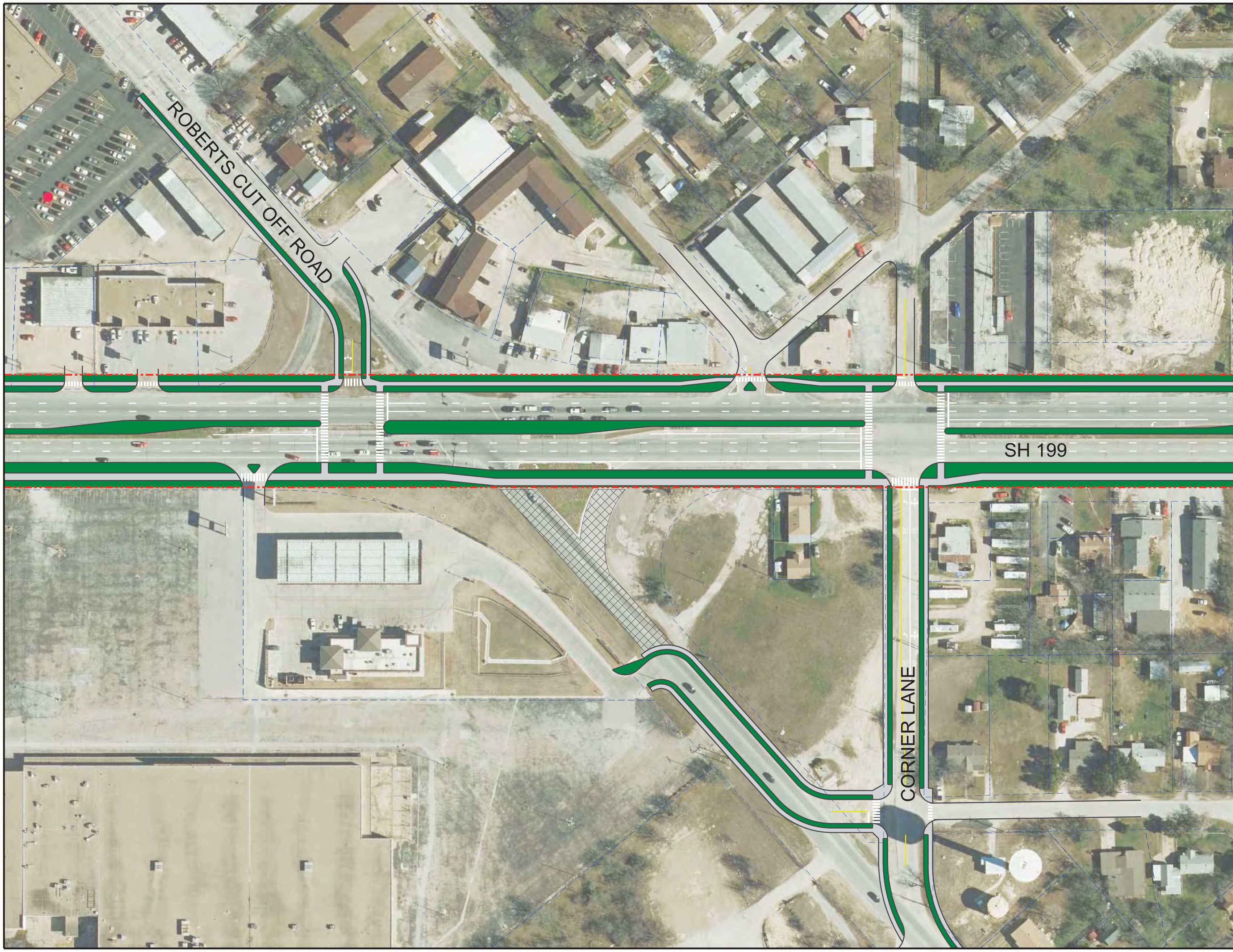
1. DURING A FUTURE DESIGN PHASE, A LICENSED LAND SURVEYOR SHALL LOCATE PROPERTY BOUNDARIES, RIGHT-OF-WAY LIMITS, AND TOPOGRAPHIC SURVEY WITHIN THE PROJECT LIMITS.
2. DRIVEWAY AND MEDIAN OPENING WIDTHS AND LOCATIONS ARE PRELIMINARY AND WILL BE DETERMINED DURING A FUTURE DESIGN PHASE.

N

0 60' 120'
SCALE IN FEET

DRAFT LAYOUT

TooleDesignGroup



North Central Texas Council of Governments

STATE HIGHWAY 199 CORRIDOR MASTER PLAN

ROBERTS CUT OFF ROAD
ALTERNATIVE INTERSECTION LAYOUT

LEGEND

- PROPERTY LINES (PER TXDOT RECORD DATA)
- PROPERTY LINES (PER 2015 TARRANT APPRAISAL DISTRICT DATA)
- PROPOSED SIDEWALK
- PROPOSED MEDIAN AND PARKWAY LANDSCAPING OR HARDSCAPING

NOTES:

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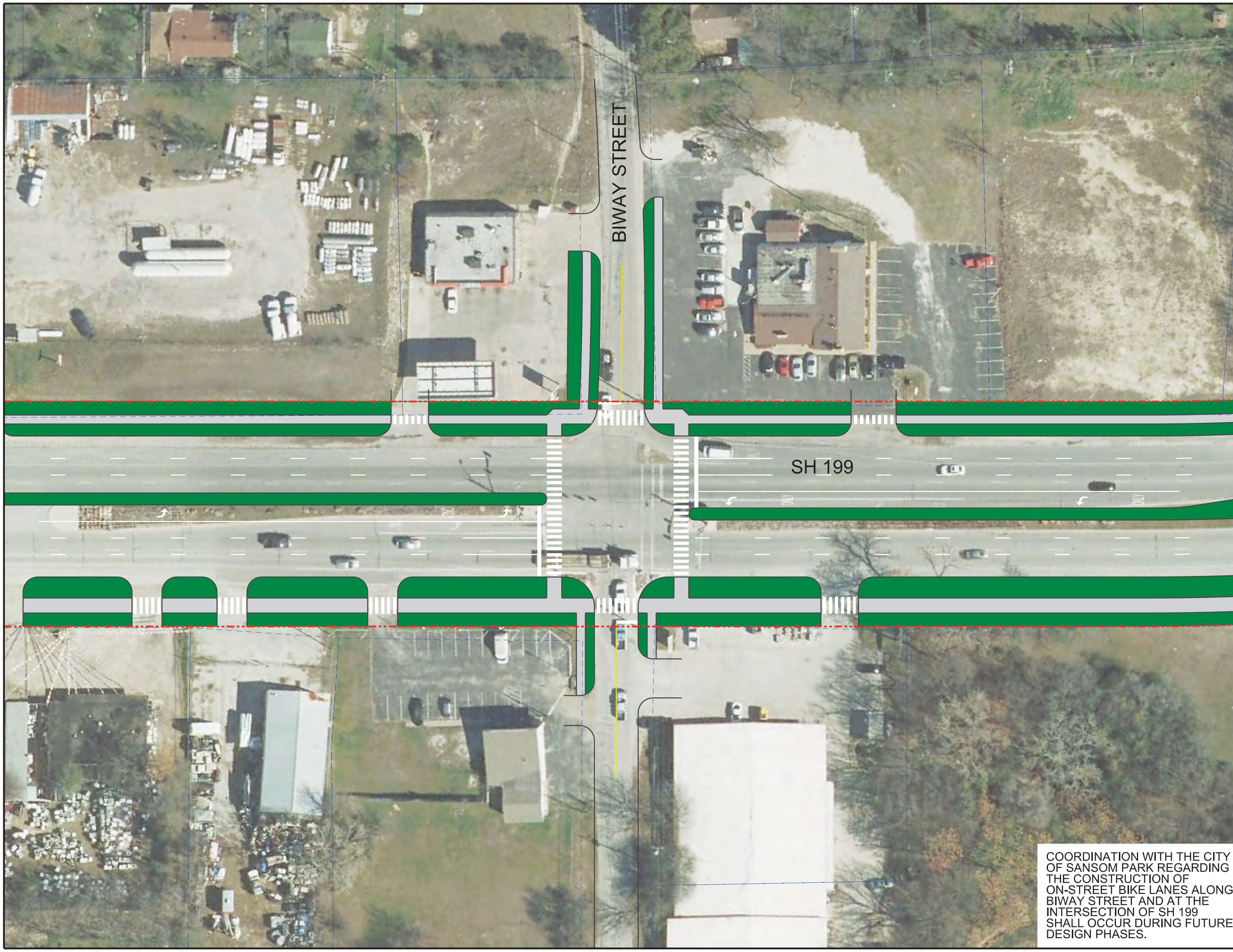

North Central Texas Council of Governments

STATE HIGHWAY 199 CORRIDOR MASTER PLAN

BIWAY STREET INTERSECTION LAYOUT

LEGEND

- PROPERTY LINES (PER TXDOT RECORD DATA)
- PROPERTY LINES (PER 2015 TARRANT APPRAISAL DISTRICT DATA)
- PROPOSED SIDEWALK
- PROPOSED MEDIAN AND PARKWAY LANDSCAPING OR HARDSCAPING

NOTES:

1. DURING A FUTURE DESIGN PHASE, A LICENSED LAND SURVEYOR SHALL LOCATE PROPERTY BOUNDARIES, RIGHT-OF-WAY LIMITS, AND TOPOGRAPHIC SURVEY WITHIN THE PROJECT LIMITS.
2. DRIVEWAY AND MEDIAN OPENING WIDTHS AND LOCATIONS ARE PRELIMINARY AND WILL BE DETERMINED DURING A FUTURE DESIGN PHASE.

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SCALE IN FEET

DRAFT LAYOUT

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North Central Texas Council of Governments

STATE HIGHWAY 199 CORRIDOR MASTER PLAN

SKYLINE DRIVE INTERSECTION LAYOUT

LEGEND

- PROPERTY LINES (PER TXDOT RECORD DATA)
- PROPERTY LINES (PER 2015 TARRANT APPRAISAL DISTRICT DATA)
- PROPOSED SIDEWALK
- PROPOSED MEDIAN AND PARKWAY LANDSCAPING OR HARDSCAPING

NOTES:

1. DURING A FUTURE DESIGN PHASE, A LICENSED LAND SURVEYOR SHALL LOCATE PROPERTY BOUNDARIES, RIGHT-OF-WAY LIMITS, AND TOPOGRAPHIC SURVEY WITHIN THE PROJECT LIMITS.
2. DRIVEWAY AND MEDIAN OPENING WIDTHS AND LOCATIONS ARE PRELIMINARY AND WILL BE DETERMINED DURING A FUTURE DESIGN PHASE.

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SCALE IN FEET

DRAFT LAYOUT

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North Central Texas Council of Governments

STATE HIGHWAY 199 CORRIDOR MASTER PLAN

LONG AVENUE INTERSECTION LAYOUT

LEGEND

- PROPERTY LINES (PER TXDOT RECORD DATA)
- PROPERTY LINES (PER 2015 TARRANT APPRAISAL DISTRICT DATA)
- PROPOSED SIDEWALK
- PROPOSED MEDIAN AND PARKWAY LANDSCAPING OR HARDSCAPING

NOTES:

1. DURING A FUTURE DESIGN PHASE, A LICENSED LAND SURVEYOR SHALL LOCATE PROPERTY BOUNDARIES, RIGHT-OF-WAY LIMITS, AND TOPOGRAPHIC SURVEY WITHIN THE PROJECT LIMITS.
2. DRIVEWAY AND MEDIAN OPENING WIDTHS AND LOCATIONS ARE PRELIMINARY AND WILL BE DETERMINED DURING A FUTURE DESIGN PHASE.

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STATE HIGHWAY 199
CORRIDOR MASTER PLAN

SH 183
INTERSECTION LAYOUT

LEGEND

- PROPERTY LINES (PER TXDOT RECORD DATA)
- PROPERTY LINES (PER 2015 TARRANT APPRAISAL DISTRICT DATA)
- PROPOSED SIDEWALK
- PROPOSED MEDIAN AND PARKWAY LANDSCAPING OR HARDSCAPING

NOTES:

1. DURING A FUTURE DESIGN PHASE, A LICENSED LAND SURVEYOR SHALL LOCATE PROPERTY BOUNDARIES, RIGHT-OF-WAY LIMITS, AND TOPOGRAPHIC SURVEY WITHIN THE PROJECT LIMITS.
2. DRIVEWAY AND MEDIAN OPENING WIDTHS AND LOCATIONS ARE PRELIMINARY AND WILL BE DETERMINED DURING A FUTURE DESIGN PHASE.

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SCALE IN FEET

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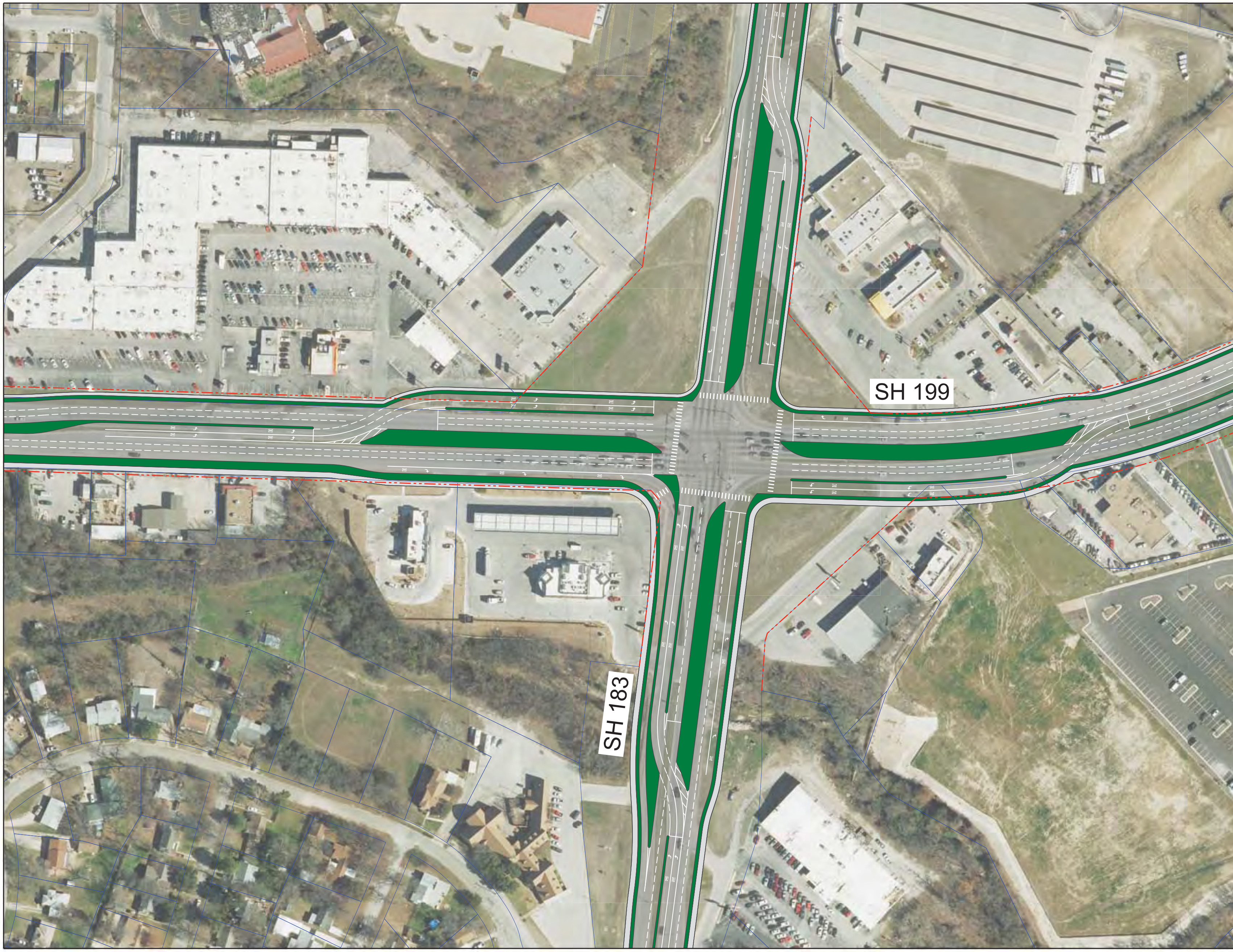
TooleDesignGroup



North Central Texas Council of Governments

STATE HIGHWAY 199 CORRIDOR MASTER PLAN

SH 183
ALTERNATIVE INTERSECTION LAYOUT

LEGEND

PROPERTY LINES (PER TXDOT RECORD DATA)

PROPERTY LINES (PER 2015 TARRANT APPRAISAL DISTRICT DATA)

PROPOSED SIDEWALK

PROPOSED MEDIAN AND PARKWAY LANDSCAPING OR HARDSCAPING

NOTES:

1. DURING A FUTURE DESIGN PHASE, A LICENSED LAND SURVEYOR SHALL LOCATE PROPERTY BOUNDARIES, RIGHT-OF-WAY LIMITS, AND TOPOGRAPHIC SURVEY WITHIN THE PROJECT LIMITS.
2. DRIVEWAY AND MEDIAN OPENING WIDTHS AND LOCATIONS ARE PRELIMINARY AND WILL BE DETERMINED DURING A FUTURE DESIGN PHASE.

N

0 80' 160'
SCALE IN FEET

DRAFT LAYOUT

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4055 International Plaza, Suite 200
Fort Worth, Texas 76109-4895
Phone - (817) 735-7300
Fax - (817) 735-7491
Web - www.freese.com

FREESE AND NICHOLS INC.
TEXAS REGISTERED ENGINEERING FIRM F-2144

North Central Texas Council of Governments

STATE HIGHWAY 199 CORRIDOR MASTER PLAN

WAL-MART ROAD INTERSECTION LAYOUT

LEGEND

- PROPERTY LINES (PER TXDOT RECORD DATA)
- PROPERTY LINES (PER 2015 TARRANT APPRAISAL DISTRICT DATA)
- PROPOSED SIDEWALK
- PROPOSED MEDIAN AND PARKWAY LANDSCAPING OR HARDSCAPING

NOTES:

1. DURING A FUTURE DESIGN PHASE, A LICENSED LAND SURVEYOR SHALL LOCATE PROPERTY BOUNDARIES, RIGHT-OF-WAY LIMITS, AND TOPOGRAPHIC SURVEY WITHIN THE PROJECT LIMITS.
2. DRIVEWAY AND MEDIAN OPENING WIDTHS AND LOCATIONS ARE PRELIMINARY AND WILL BE DETERMINED DURING A FUTURE DESIGN PHASE.

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SCALE IN FEET

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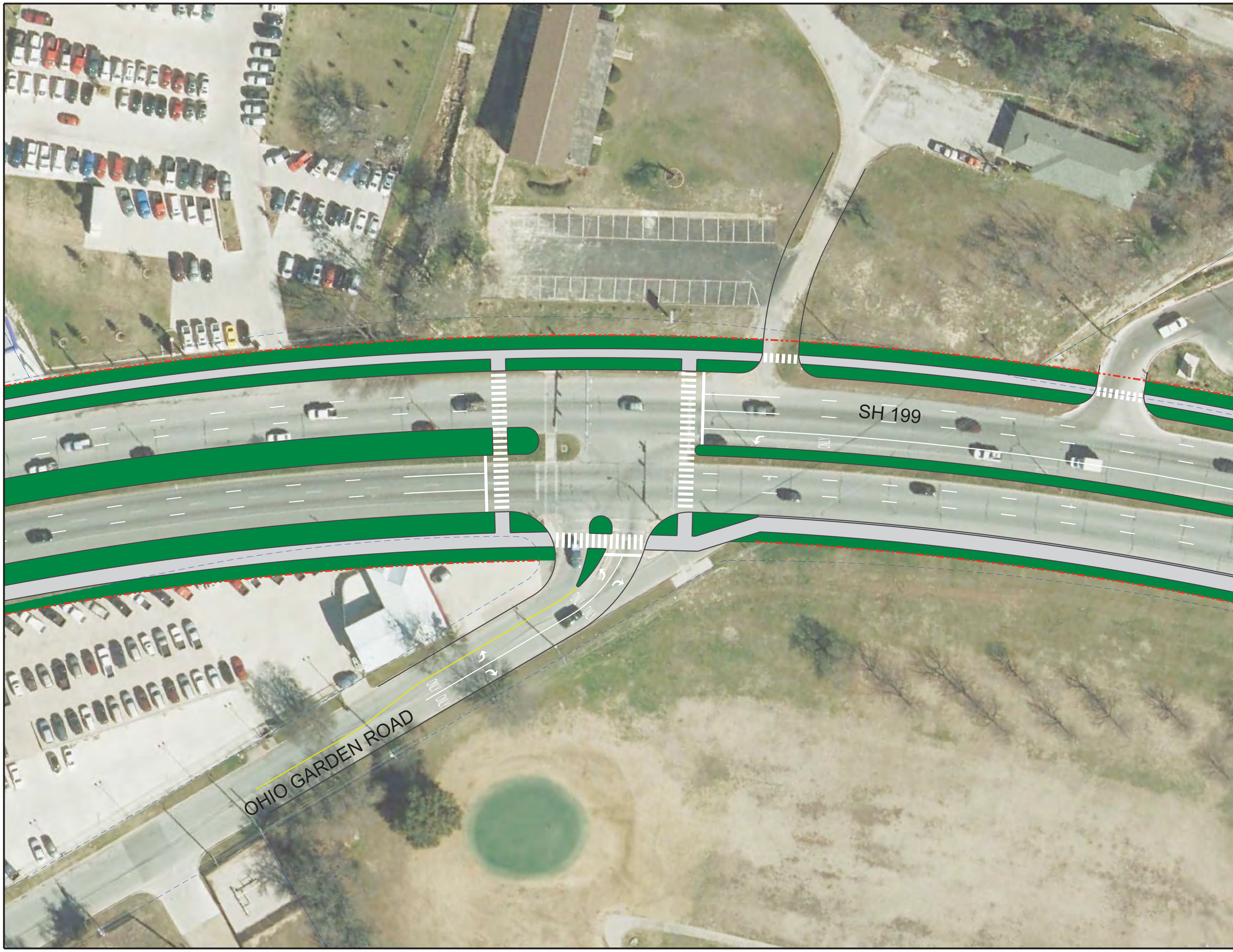
STATE HIGHWAY 199 CORRIDOR MASTER PLAN

OHIO GARDEN ROAD INTERSECTION LAYOUT



LEGEND

- PROPERTY LINES (PER TXDOT RECORD DATA)
- PROPERTY LINES (PER 2015 TARRANT APPRAISAL DISTRICT DATA)
- PROPOSED SIDEWALK
- PROPOSED MEDIAN AND PARKWAY LANDSCAPING OR HARDSCAPING

NOTES:

1. DURING A FUTURE DESIGN PHASE, A LICENSED LAND SURVEYOR SHALL LOCATE PROPERTY BOUNDARIES, RIGHT-OF-WAY LIMITS, AND TOPOGRAPHIC SURVEY WITHIN THE PROJECT LIMITS.
2. DRIVEWAY AND MEDIAN OPENING WIDTHS AND LOCATIONS ARE PRELIMINARY AND WILL BE DETERMINED DURING A FUTURE DESIGN PHASE.

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0 30' 60'
SCALE IN FEET

DRAFT LAYOUT

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North Central Texas Council of Governments

STATE HIGHWAY 199 CORRIDOR MASTER PLAN

NW 21ST STREET INTERSECTION LAYOUT

LEGEND

- PROPERTY LINES (PER TXDOT RECORD DATA)
- PROPERTY LINES (PER 2015 TARRANT APPRAISAL DISTRICT DATA)
- PROPOSED SIDEWALK
- PROPOSED MEDIAN AND PARKWAY LANDSCAPING OR HARDSCAPING

NOTES:

1. DURING A FUTURE DESIGN PHASE, A LICENSED LAND SURVEYOR SHALL LOCATE PROPERTY BOUNDARIES, RIGHT-OF-WAY LIMITS, AND TOPOGRAPHIC SURVEY WITHIN THE PROJECT LIMITS.
2. DRIVEWAY AND MEDIAN OPENING WIDTHS AND LOCATIONS ARE PRELIMINARY AND WILL BE DETERMINED DURING A FUTURE DESIGN PHASE.

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0 30' 60'
SCALE IN FEET

DRAFT LAYOUT

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North Central Texas Council of Governments

STATE HIGHWAY 199 CORRIDOR MASTER PLAN

NW 18TH STREET INTERSECTION LAYOUT

LEGEND

- PROPERTY LINES (PER TXDOT RECORD DATA)
- PROPERTY LINES (PER 2015 TARRANT APPRAISAL DISTRICT DATA)
- PROPOSED SIDEWALK
- PROPOSED MEDIAN AND PARKWAY LANDSCAPING OR HARDSCAPING

NOTES:

1. DURING A FUTURE DESIGN PHASE, A LICENSED LAND SURVEYOR SHALL LOCATE PROPERTY BOUNDARIES, RIGHT-OF-WAY LIMITS, AND TOPOGRAPHIC SURVEY WITHIN THE PROJECT LIMITS.
2. DRIVEWAY AND MEDIAN OPENING WIDTHS AND LOCATIONS ARE PRELIMINARY AND WILL BE DETERMINED DURING A FUTURE DESIGN PHASE.

N

0 30' 60'
SCALE IN FEET

DRAFT LAYOUT

Toole Design Group

North Central Texas Council of Governments

STATE HIGHWAY 199
CORRIDOR MASTER PLAN

N. UNIVERSITY DRIVE
INTERSECTION LAYOUT

LEGEND

PROPERTY LINES (PER TXDOT RECORD DATA)

PROPERTY LINES (PER 2015 TARRANT APPRAISAL DISTRICT DATA)

PROPOSED SIDEWALK

PROPOSED MEDIAN AND PARKWAY LANDSCAPING OR HARDSCAPING

NOTES:

1. DURING A FUTURE DESIGN PHASE, A LICENSED LAND SURVEYOR SHALL LOCATE PROPERTY BOUNDARIES, RIGHT-OF-WAY LIMITS, AND TOPOGRAPHIC SURVEY WITHIN THE PROJECT LIMITS.
2. DRIVEWAY AND MEDIAN OPENING WIDTHS AND LOCATIONS ARE PRELIMINARY AND WILL BE DETERMINED DURING A FUTURE DESIGN PHASE.

N

0 30' 60'
SCALE IN FEET

DRAFT LAYOUT

TooleDesignGroup

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Attachment C

Synchro Output – Traditional Intersection Design

Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Traffic Volume (vph)	1	44	1986	461	18	748	61	45	20	13	207	98	58
Future Volume (vph)	1	44	1986	461	18	748	61	45	20	13	207	98	58
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.0	6.0	6.0	7.0	6.0	6.0		7.5	7.5		7.5	7.5
Lane Util. Factor		1.00	0.95	1.00	1.00	0.95	1.00		1.00	1.00		1.00	1.00
Frt		1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85		1.00	0.85
Flt Protected		0.95	1.00	1.00	0.95	1.00	1.00		0.97	1.00		0.97	1.00
Satd. Flow (prot)		1787	3574	1599	1719	3438	1538		1818	1599		1820	1599
Flt Permitted		0.95	1.00	1.00	0.95	1.00	1.00		0.97	1.00		0.97	1.00
Satd. Flow (perm)		1787	3574	1599	1719	3438	1538		1818	1599		1820	1599
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1	48	2159	501	20	813	66	49	22	14	225	107	63
RTOR Reduction (vph)	0	0	0	103	0	0	32	0	0	13	0	0	50
Lane Group Flow (vph)	0	49	2159	398	20	813	34	0	71	1	0	332	13
Heavy Vehicles (%)	1%	1%	1%	1%	5%	5%	5%	1%	1%	1%	1%	1%	1%
Turn Type	Prot	Prot	NA	Perm	Prot	NA	Perm	Split	NA	Perm	Split	NA	Perm
Protected Phases	5	5	2		1	6		3	3		4	4	
Permitted Phases				2			6			3			4
Actuated Green, G (s)		8.9	93.2	93.2	3.0	87.3	87.3		10.9	10.9		34.9	34.9
Effective Green, g (s)		8.9	93.2	93.2	3.0	87.3	87.3		10.9	10.9		34.9	34.9
Actuated g/C Ratio		0.05	0.55	0.55	0.02	0.51	0.51		0.06	0.06		0.21	0.21
Clearance Time (s)		7.0	6.0	6.0	7.0	6.0	6.0		7.5	7.5		7.5	7.5
Vehicle Extension (s)		2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0		3.0	3.0
Lane Grp Cap (vph)		93	1959	876	30	1765	789		116	102		373	328
v/s Ratio Prot		c0.03	c0.60		0.01	0.24			c0.04			c0.18	
v/s Ratio Perm				0.25			0.02			0.00			0.01
v/c Ratio		0.53	1.10	0.45	0.67	0.46	0.04		0.61	0.01		0.89	0.04
Uniform Delay, d1		78.5	38.4	23.1	83.0	26.3	20.6		77.5	74.5		65.7	54.1
Progression Factor		1.00	1.00	1.00	0.98	0.68	1.00		1.00	1.00		1.00	1.00
Incremental Delay, d2		2.5	54.3	1.7	34.9	0.8	0.1		6.6	0.0		22.2	0.0
Delay (s)		81.0	92.7	24.8	116.1	18.8	20.7		84.1	74.5		87.9	54.2
Level of Service		F	F	C	F	B	C		F	E		F	D
Approach Delay (s)			80.0			21.1			82.5			82.5	
Approach LOS			E			C			F			F	

Intersection Summary			
HCM 2000 Control Delay	67.3	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.00		
Actuated Cycle Length (s)	170.0	Sum of lost time (s)	28.0
Intersection Capacity Utilization	93.2%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Traffic Volume (vph)	5	2161	25	3	8	772	22	20	20	21	52	20	20
Future Volume (vph)	5	2161	25	3	8	772	22	20	20	21	52	20	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	5.5	5.5		6.0	5.5	5.5		6.0	6.0		6.0	
Lane Util. Factor	1.00	0.95	1.00		1.00	0.95	1.00		1.00	1.00		1.00	
Frt	1.00	1.00	0.85		1.00	1.00	0.85		1.00	0.85		0.97	
Flt Protected	0.95	1.00	1.00		0.95	1.00	1.00		0.98	1.00		0.97	
Satd. Flow (prot)	1787	3574	1599		1752	3505	1568		1685	1468		1692	
Flt Permitted	0.95	1.00	1.00		0.95	1.00	1.00		0.77	1.00		0.80	
Satd. Flow (perm)	1787	3574	1599		1752	3505	1568		1329	1468		1393	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	5	2349	27	3	9	839	24	22	22	23	57	22	22
RTOR Reduction (vph)	0	0	6	0	0	0	5	0	0	21	0	7	0
Lane Group Flow (vph)	5	2349	21	0	12	839	19	0	44	2	0	94	0
Heavy Vehicles (%)	1%	1%	1%	3%	3%	3%	3%	10%	10%	10%	6%	6%	6%
Turn Type	Prot	NA	Perm	Prot	Prot	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases	5	2		1	1	6			8			4	
Permitted Phases			2				6	8		8	4		
Actuated Green, G (s)	1.2	134.0	134.0		2.8	135.6	135.6		15.7	15.7		15.7	
Effective Green, g (s)	1.2	134.0	134.0		2.8	135.6	135.6		15.7	15.7		15.7	
Actuated g/C Ratio	0.01	0.79	0.79		0.02	0.80	0.80		0.09	0.09		0.09	
Clearance Time (s)	6.0	5.5	5.5		6.0	5.5	5.5		6.0	6.0		6.0	
Vehicle Extension (s)	2.0	2.0	2.0		2.0	2.0	2.0		2.0	2.0		2.0	
Lane Grp Cap (vph)	12	2817	1260		28	2795	1250		122	135		128	
v/s Ratio Prot	0.00	c0.66			c0.01	0.24							
v/s Ratio Perm			0.01				0.01		0.03	0.00		c0.07	
v/c Ratio	0.42	0.83	0.02		0.43	0.30	0.02		0.36	0.02		0.73	
Uniform Delay, d1	84.1	11.1	3.9		82.8	4.6	3.5		72.4	70.1		75.1	
Progression Factor	1.20	0.50	1.00		0.88	0.87	1.00		1.00	1.00		1.00	
Incremental Delay, d2	0.8	0.3	0.0		3.6	0.3	0.0		0.7	0.0		16.9	
Delay (s)	101.7	5.9	3.9		76.7	4.2	3.5		73.1	70.1		92.0	
Level of Service	F	A	A		E	A	A		E	E		F	
Approach Delay (s)		6.1				5.2			72.1			92.0	
Approach LOS		A				A			E			F	

Intersection Summary			
HCM 2000 Control Delay	9.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	170.0	Sum of lost time (s)	17.5
Intersection Capacity Utilization	83.6%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Traffic Volume (vph)	5	17	2183	35	25	727	26	61	52	60	147	112	28
Future Volume (vph)	5	17	2183	35	25	727	26	61	52	60	147	112	28
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.8	5.8	5.8	5.8	5.8	5.8		6.6			6.6	
Lane Util. Factor		1.00	0.95	1.00	1.00	0.95	1.00		1.00			1.00	
Frt		1.00	1.00	0.85	1.00	1.00	0.85		0.95			0.99	
Flt Protected		0.95	1.00	1.00	0.95	1.00	1.00		0.98			0.97	
Satd. Flow (prot)		1770	3539	1583	1770	3539	1583		1745			1793	
Flt Permitted		0.29	1.00	1.00	0.04	1.00	1.00		0.76			0.68	
Satd. Flow (perm)		534	3539	1583	73	3539	1583		1347			1252	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	5	18	2373	38	27	790	28	66	57	65	160	122	30
RTOR Reduction (vph)	0	0	0	14	0	0	11	0	11	0	0	2	0
Lane Group Flow (vph)	0	23	2373	24	27	790	17	0	177	0	0	310	0
Turn Type	pm+pt	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	5	2		1	6			8			4	
Permitted Phases	2	2		2	6		6	8			4		
Actuated Green, G (s)		106.1	106.1	106.1	106.1	106.1	106.1		42.1			42.1	
Effective Green, g (s)		106.1	106.1	106.1	106.1	106.1	106.1		42.1			42.1	
Actuated g/C Ratio		0.62	0.62	0.62	0.62	0.62	0.62		0.25			0.25	
Clearance Time (s)		5.8	5.8	5.8	5.8	5.8	5.8		6.6			6.6	
Vehicle Extension (s)		2.0	4.5	4.5	2.0	4.5	4.5		2.0			2.0	
Lane Grp Cap (vph)		359	2208	987	81	2208	987		333			310	
v/s Ratio Prot		0.00	c0.67		0.01	c0.22							
v/s Ratio Perm		0.04		0.01	0.20		0.01		0.13			c0.25	
v/c Ratio		0.06	1.07	0.02	0.33	0.36	0.02		0.53			1.00	
Uniform Delay, d1		13.3	32.0	12.2	77.5	15.5	12.1		55.4			63.9	
Progression Factor		0.40	0.29	0.15	1.00	1.00	1.00		1.00			1.00	
Incremental Delay, d2		0.0	39.5	0.0	0.9	0.5	0.0		0.8			50.4	
Delay (s)		5.3	48.9	1.9	78.4	15.9	12.2		56.3			114.4	
Level of Service		A	D	A	E	B	B		E			F	
Approach Delay (s)			47.7			17.8			56.3			114.4	
Approach LOS			D			B			E			F	

Intersection Summary			
HCM 2000 Control Delay	47.0	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	170.0	Sum of lost time (s)	18.2
Intersection Capacity Utilization	93.1%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations														
Traffic Volume (vph)	2	46	2230	135	5	11	694	269	41	118	53	378	230	40
Future Volume (vph)	2	46	2230	135	5	11	694	269	41	118	53	378	230	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.1	6.1	6.1		6.1	6.1	6.1	5.9	5.9		5.9	5.9	5.9
Lane Util. Factor		1.00	0.95	1.00		1.00	0.95	1.00	1.00	1.00		1.00	1.00	1.00
Frt		1.00	1.00	0.85		1.00	1.00	0.85	1.00	0.95		1.00	1.00	0.85
Flt Protected		0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1770	3539	1583		1770	3539	1583	1770	1776		1770	1863	1583
Flt Permitted		0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)		1770	3539	1583		1770	3539	1583	1770	1776		1770	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2	50	2424	147	5	12	754	292	45	128	58	411	250	43
RTOR Reduction (vph)	0	0	0	42	0	0	0	134	0	9	0	0	0	35
Lane Group Flow (vph)	0	52	2424	105	0	17	754	158	45	177	0	411	250	8
Turn Type	Prot	Prot	NA	Perm	Prot	Prot	NA	Perm	Split	NA		Split	NA	Perm
Protected Phases	1	1	6		5	5	2		4	4		8	8	
Permitted Phases				6				2						8
Actuated Green, G (s)		8.4	96.3	96.3		4.8	92.7	92.7	21.4	21.4		33.5	33.5	33.5
Effective Green, g (s)		8.4	96.3	96.3		4.8	92.7	92.7	21.4	21.4		33.5	33.5	33.5
Actuated g/C Ratio		0.05	0.53	0.53		0.03	0.52	0.52	0.12	0.12		0.19	0.19	0.19
Clearance Time (s)		6.1	6.1	6.1		6.1	6.1	6.1	5.9	5.9		5.9	5.9	5.9
Vehicle Extension (s)		2.0	5.0	5.0		2.0	5.0	5.0	3.0	3.0		2.0	2.0	2.0
Lane Grp Cap (vph)		82	1893	846		47	1822	815	210	211		329	346	294
v/s Ratio Prot		0.03	c0.68			0.01	c0.21		0.03	c0.10		c0.23	0.13	
v/s Ratio Perm				0.07				0.10						0.01
v/c Ratio		0.63	1.28	0.12		0.36	0.41	0.19	0.21	0.84		1.25	0.72	0.03
Uniform Delay, d1		84.3	41.9	20.8		86.1	26.9	23.5	71.7	77.6		73.2	68.9	59.9
Progression Factor		1.00	1.00	1.00		0.85	0.58	0.65	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2		11.2	130.4	0.3		1.4	0.5	0.4	0.5	24.3		134.9	6.2	0.0
Delay (s)		95.5	172.3	21.1		74.5	16.3	15.6	72.2	102.0		208.2	75.1	59.9
Level of Service		F	F	C		E	B	B	E	F		F	E	E
Approach Delay (s)			162.3				17.0			96.2			151.9	
Approach LOS			F				B			F			F	

Intersection Summary			
HCM 2000 Control Delay	124.0	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.19		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	24.0
Intersection Capacity Utilization	106.9%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Lane Configurations														
Traffic Volume (vph)	3	134	2110	420	181	618	56	309	284	148	2	229	463	73
Future Volume (vph)	3	134	2110	420	181	618	56	309	284	148	2	229	463	73
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.7	6.7	6.7	6.7	6.7	6.7	6.3	6.3	6.3		6.3	6.3	6.3
Lane Util. Factor		0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00		0.97	0.95	1.00
Frt		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85		1.00	1.00	0.85
Flt Protected		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00		0.95	1.00	1.00
Satd. Flow (prot)		3467	3574	1599	3367	3471	1553	3433	3539	1583		3433	3539	1583
Flt Permitted		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00		0.95	1.00	1.00
Satd. Flow (perm)		3467	3574	1599	3367	3471	1553	3433	3539	1583		3433	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	3	146	2293	457	197	672	61	336	309	161	2	249	503	79
RTOR Reduction (vph)	0	0	0	60	0	0	26	0	0	126	0	0	0	68
Lane Group Flow (vph)	0	149	2293	397	197	672	35	336	309	35	0	251	503	11
Heavy Vehicles (%)	1%	1%	1%	1%	4%	4%	4%	2%	2%	2%	2%	2%	2%	2%
Turn Type	Prot	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	Prot	NA	Perm
Protected Phases	1	1	6		5	2		7	4		3	3	8	
Permitted Phases				6			2			4				8
Actuated Green, G (s)		11.3	106.0	106.0	9.3	104.0	104.0	13.7	20.0	20.0		18.7	25.0	25.0
Effective Green, g (s)		11.3	106.0	106.0	9.3	104.0	104.0	13.7	20.0	20.0		18.7	25.0	25.0
Actuated g/C Ratio		0.06	0.59	0.59	0.05	0.58	0.58	0.08	0.11	0.11		0.10	0.14	0.14
Clearance Time (s)		6.7	6.7	6.7	6.7	6.7	6.7	6.3	6.3	6.3		6.3	6.3	6.3
Vehicle Extension (s)		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	2.0
Lane Grp Cap (vph)		217	2104	941	173	2005	897	261	393	175		356	491	219
v/s Ratio Prot		0.04	c0.64		c0.06	0.19		c0.10	0.09			c0.07	c0.14	
v/s Ratio Perm				0.25			0.02			0.02				0.01
v/c Ratio		0.69	1.09	0.42	1.14	0.34	0.04	1.29	0.79	0.20		0.71	1.02	0.05
Uniform Delay, d1		82.6	37.0	20.2	85.3	19.9	16.4	83.2	77.9	72.7		78.0	77.5	67.2
Progression Factor		1.26	0.24	0.11	0.95	0.90	4.49	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2		0.7	41.3	0.1	109.8	0.4	0.1	155.1	9.2	0.2		5.1	47.0	0.0
Delay (s)		105.0	50.3	2.4	191.2	18.4	73.8	238.2	87.1	72.9		83.1	124.5	67.2
Level of Service		F	D	A	F	B	E	F	F	E		F	F	E
Approach Delay (s)			45.5			58.7			147.3				106.6	
Approach LOS			D			E			F				F	

Intersection Summary			
HCM 2000 Control Delay	72.1	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.10		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	26.0
Intersection Capacity Utilization	106.8%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑	↱	↰	↑↑	↱		↰↑	↱	↰	↳	
Traffic Volume (vph)	5	2452	30	30	813	5	30	0	30	5	0	5
Future Volume (vph)	5	2452	30	30	813	5	30	0	30	5	0	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.3	6.3	6.3	6.3	6.3	6.3		5.5	5.5	5.5	5.5	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00		1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85	1.00	0.85	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.95	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583		1770	1583	1770	1583	
Flt Permitted	0.31	1.00	1.00	0.03	1.00	1.00		0.75	1.00	0.74	1.00	
Satd. Flow (perm)	577	3539	1583	52	3539	1583		1405	1583	1370	1583	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	5	2665	33	33	884	5	33	0	33	5	0	5
RTOR Reduction (vph)	0	0	7	0	0	1	0	0	32	0	5	0
Lane Group Flow (vph)	5	2665	26	33	884	4	0	33	1	5	0	0
Turn Type	D.P+P	NA	Perm	D.P+P	NA	Perm	D.P+P	NA	Perm	D.P+P	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	2		6	6		2	8		4	4		
Actuated Green, G (s)	147.8	143.5	143.5	147.8	146.8	146.8		7.8	7.8	8.6	14.1	
Effective Green, g (s)	147.8	143.5	143.5	147.8	146.8	146.8		7.8	7.8	8.6	14.1	
Actuated g/C Ratio	0.82	0.80	0.80	0.82	0.82	0.82		0.04	0.04	0.05	0.08	
Clearance Time (s)	6.3	6.3	6.3	6.3	6.3	6.3		5.5	5.5	5.5	5.5	
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	2.0	2.0	
Lane Grp Cap (vph)	480	2821	1262	83	2886	1291		60	68	67	124	
v/s Ratio Prot	0.00	c0.75		c0.01	c0.25					c0.00	0.00	
v/s Ratio Perm	0.01		0.02	0.31		0.00		c0.02	0.00	0.00		
v/c Ratio	0.01	0.94	0.02	0.40	0.31	0.00		0.55	0.02	0.07	0.00	
Uniform Delay, d1	3.0	15.0	3.8	48.9	4.1	3.1		84.4	82.4	81.8	76.5	
Progression Factor	0.11	0.69	1.00	2.00	0.54	1.00		1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.0	0.9	0.0	1.1	0.3	0.0		6.1	0.0	0.2	0.0	
Delay (s)	0.3	11.2	3.8	98.7	2.5	3.1		90.4	82.5	82.0	76.5	
Level of Service	A	B	A	F	A	A		F	F	F	E	
Approach Delay (s)		11.1			5.9			86.5			79.2	
Approach LOS		B			A			F			E	

Intersection Summary			
HCM 2000 Control Delay	11.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	23.6
Intersection Capacity Utilization	92.2%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	2418	69	204	829	19	146
Future Volume (vph)	2418	69	204	829	19	146
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.2	6.2	6.2	6.2	5.2	5.2
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3539	1583	1770	3539	1770	1583
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	3539	1583	1770	3539	1770	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2628	75	222	901	21	159
RTOR Reduction (vph)	0	6	0	0	0	152
Lane Group Flow (vph)	2628	69	222	901	21	7
Turn Type	NA	Perm	Prot	NA	Prot	Perm
Protected Phases	6		5	2	4	
Permitted Phases		6				4
Actuated Green, G (s)	136.6	136.6	17.8	160.6	8.0	8.0
Effective Green, g (s)	136.6	136.6	17.8	160.6	8.0	8.0
Actuated g/C Ratio	0.76	0.76	0.10	0.89	0.04	0.04
Clearance Time (s)	6.2	6.2	6.2	6.2	5.2	5.2
Vehicle Extension (s)	0.2	0.2	2.0	0.2	2.0	2.0
Lane Grp Cap (vph)	2685	1201	175	3157	78	70
v/s Ratio Prot	c0.74		c0.13	0.25	c0.01	
v/s Ratio Perm		0.04				0.00
v/c Ratio	0.98	0.06	1.27	0.29	0.27	0.10
Uniform Delay, d1	20.3	5.5	81.1	1.4	83.2	82.5
Progression Factor	0.14	0.06	0.97	0.73	1.00	1.00
Incremental Delay, d2	7.6	0.0	156.1	0.2	0.7	0.2
Delay (s)	10.5	0.3	234.4	1.2	83.9	82.8
Level of Service	B	A	F	A	F	F
Approach Delay (s)	10.2			47.3	82.9	
Approach LOS	B			D	F	

Intersection Summary			
HCM 2000 Control Delay	23.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	1.00		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	21.6
Intersection Capacity Utilization	101.8%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	81	2483	818	210	220	215
Future Volume (vph)	81	2483	818	210	220	215
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	5.2	5.2
Lane Util. Factor	1.00	0.95	0.95	1.00	0.97	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	3539	3539	1583	3433	1583
Flt Permitted	0.29	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	538	3539	3539	1583	3433	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	88	2699	889	228	239	234
RTOR Reduction (vph)	0	0	0	51	0	214
Lane Group Flow (vph)	88	2699	889	177	239	20
Turn Type	pm+pt	NA	NA	Perm	Prot	Perm
Protected Phases	1	6	2		4	
Permitted Phases	6			2		4
Actuated Green, G (s)	153.5	153.5	139.5	139.5	15.3	15.3
Effective Green, g (s)	153.5	153.5	139.5	139.5	15.3	15.3
Actuated g/C Ratio	0.85	0.85	0.78	0.78	0.09	0.09
Clearance Time (s)	6.0	6.0	6.0	6.0	5.2	5.2
Vehicle Extension (s)	2.5	2.5	2.5	2.5	2.5	2.5
Lane Grp Cap (vph)	513	3017	2742	1226	291	134
v/s Ratio Prot	0.01	c0.76	0.25		c0.07	
v/s Ratio Perm	0.14			0.11		0.01
v/c Ratio	0.17	0.89	0.32	0.14	0.82	0.15
Uniform Delay, d1	2.7	8.2	6.1	5.1	81.0	76.3
Progression Factor	0.33	0.73	0.95	0.76	1.00	1.00
Incremental Delay, d2	0.0	1.5	0.3	0.2	16.4	0.4
Delay (s)	0.9	7.5	6.1	4.1	97.4	76.7
Level of Service	A	A	A	A	F	E
Approach Delay (s)		7.3	5.7		87.2	
Approach LOS		A	A		F	

Intersection Summary			
HCM 2000 Control Delay	15.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	17.2
Intersection Capacity Utilization	86.3%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Traffic Volume (vph)	274	2429	0	4	2	935	50	1	0	0	68	0	92
Future Volume (vph)	274	2429	0	4	2	935	50	1	0	0	68	0	92
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0			6.0	6.0	6.0		5.2			5.2	
Lane Util. Factor	1.00	0.95			1.00	0.95	1.00		1.00			1.00	
Frt	1.00	1.00			1.00	1.00	0.85		1.00			0.92	
Flt Protected	0.95	1.00			0.95	1.00	1.00		0.95			0.98	
Satd. Flow (prot)	1787	3574			1736	3471	1553		1787			1716	
Flt Permitted	0.24	1.00			0.03	1.00	1.00		0.43			0.86	
Satd. Flow (perm)	461	3574			54	3471	1553		812			1511	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	298	2640	0	4	2	1016	54	1	0	0	74	0	100
RTOR Reduction (vph)	0	0	0	0	0	0	13	0	0	0	0	83	0
Lane Group Flow (vph)	298	2640	0	0	6	1016	41	0	1	0	0	91	0
Heavy Vehicles (%)	1%	1%	1%	4%	4%	4%	4%	1%	1%	1%	0%	0%	0%
Turn Type	pm+pt	NA	Perm	pm+pt	pm+pt	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	1	6		5	5	2			4			8	
Permitted Phases	6		6	2	2		2	4			8		
Actuated Green, G (s)	146.1	146.1			137.6	137.6	137.6		15.1			15.1	
Effective Green, g (s)	146.1	146.1			137.6	137.6	137.6		15.1			15.1	
Actuated g/C Ratio	0.81	0.81			0.76	0.76	0.76		0.08			0.08	
Clearance Time (s)	6.0	6.0			6.0	6.0	6.0		5.2			5.2	
Vehicle Extension (s)	2.5	2.5			2.5	2.5	2.5		2.5			2.5	
Lane Grp Cap (vph)	448	2900			56	2653	1187		68			126	
v/s Ratio Prot	0.04	c0.74			0.00	c0.29							
v/s Ratio Perm	0.50				0.08		0.03		0.00			c0.06	
v/c Ratio	0.67	0.91			0.11	0.38	0.03		0.01			0.72	
Uniform Delay, d1	5.9	12.2			52.5	7.1	5.1		75.6			80.4	
Progression Factor	0.57	0.59			1.00	1.00	1.00		1.00			1.00	
Incremental Delay, d2	1.5	2.6			0.6	0.4	0.1		0.1			16.7	
Delay (s)	4.8	9.8			53.1	7.5	5.2		75.7			97.1	
Level of Service	A	A			D	A	A		E			F	
Approach Delay (s)		9.3				7.6			75.7			97.1	
Approach LOS		A				A			E			F	

Intersection Summary			
HCM 2000 Control Delay	12.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	17.2
Intersection Capacity Utilization	96.6%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Traffic Volume (vph)	431	1252	802	1	32	437	67	343	616	33	186	953	211
Future Volume (vph)	431	1252	802	1	32	437	67	343	616	33	186	953	211
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.3	6.3	6.3		6.3	6.3	6.3	6.2	6.2	6.2	6.2	6.2	6.2
Lane Util. Factor	1.00	0.95	1.00		1.00	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1787	3574	1599		1736	3471	1553	3367	3471	1553	1752	3505	1568
Flt Permitted	0.24	1.00	1.00		0.08	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	444	3574	1599		150	3471	1553	3367	3471	1553	1752	3505	1568
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	468	1361	872	1	35	475	73	373	670	36	202	1036	229
RTOR Reduction (vph)	0	0	249	0	0	0	61	0	0	27	0	0	151
Lane Group Flow (vph)	468	1361	623	0	36	475	12	373	670	9	202	1036	78
Heavy Vehicles (%)	1%	1%	1%	4%	4%	4%	4%	4%	4%	4%	3%	3%	3%
Turn Type	D.P+P	NA	Perm	D.P+P	D.P+P	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	1	6		5	5	2		7	4		3	8	
Permitted Phases	2		6	6	6		2			4			8
Actuated Green, G (s)	52.3	48.8	48.8		52.3	21.5	21.5	15.2	31.9	31.9	19.2	35.9	35.9
Effective Green, g (s)	52.3	48.8	48.8		52.3	21.5	21.5	15.2	31.9	31.9	19.2	35.9	35.9
Actuated g/C Ratio	0.41	0.38	0.38		0.41	0.17	0.17	0.12	0.25	0.25	0.15	0.28	0.28
Clearance Time (s)	6.3	6.3	6.3		6.3	6.3	6.3	6.2	6.2	6.2	6.2	6.2	6.2
Vehicle Extension (s)	2.0	2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lane Grp Cap (vph)	503	1358	607		104	581	260	398	862	385	261	979	438
v/s Ratio Prot	c0.22	0.38			0.01	0.14		c0.11	0.19		0.12	c0.30	
v/s Ratio Perm	0.16		c0.39		0.13		0.01			0.01			0.05
v/c Ratio	0.93	1.00	1.03		0.35	0.82	0.05	0.94	0.78	0.02	0.77	1.06	0.18
Uniform Delay, d1	41.4	39.8	39.8		58.1	51.6	44.9	56.1	44.9	36.5	52.5	46.2	35.1
Progression Factor	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	23.8	25.0	43.3		0.7	8.3	0.0	29.1	4.1	0.0	19.8	45.5	0.9
Delay (s)	65.1	64.8	83.1		58.8	59.9	44.9	85.2	49.0	36.5	72.3	91.7	36.0
Level of Service	E	E	F		E	E	D	F	D	D	E	F	D
Approach Delay (s)		70.7				57.9			61.1			80.3	
Approach LOS		E				E			E			F	

Intersection Summary			
HCM 2000 Control Delay	70.1	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	128.4	Sum of lost time (s)	25.0
Intersection Capacity Utilization	96.7%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Traffic Volume (vph)	1	44	1786	461	18	648	61	45	20	13	207	98	58
Future Volume (vph)	1	44	1786	461	18	648	61	45	20	13	207	98	58
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.8	5.5	5.5	6.7	5.9		6.8	7.6		6.8	7.6	7.6
Lane Util. Factor		1.00	0.91	1.00	1.00	0.91		0.97	1.00		1.00	1.00	1.00
Frt		1.00	1.00	0.85	1.00	0.99		1.00	0.94		1.00	1.00	0.85
Flt Protected		0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1787	5136	1599	1719	4876		3467	1771		1787	1881	1599
Flt Permitted		0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.73	1.00	1.00
Satd. Flow (perm)		1787	5136	1599	1719	4876		3467	1771		1380	1881	1599
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1	48	1941	501	20	704	66	49	22	14	225	107	63
RTOR Reduction (vph)	0	0	0	127	0	5	0	0	13	0	0	0	56
Lane Group Flow (vph)	0	49	1941	374	20	765	0	49	23	0	225	107	7
Heavy Vehicles (%)	1%	1%	1%	1%	5%	5%	5%	1%	1%	1%	1%	1%	1%
Turn Type	Prot	Prot	NA	Perm	Prot	NA		Prot	NA		D.P+P	NA	Perm
Protected Phases	5	5	2		1	6		7	4		3	8	
Permitted Phases				2							4		8
Actuated Green, G (s)		7.2	85.4	85.4	3.2	81.9		4.1	7.7		19.8	15.7	15.7
Effective Green, g (s)		7.2	85.4	85.4	3.2	81.9		4.1	7.7		19.8	15.7	15.7
Actuated g/C Ratio		0.05	0.63	0.63	0.02	0.61		0.03	0.06		0.15	0.12	0.12
Clearance Time (s)		5.8	5.5	5.5	6.7	5.9		6.8	7.6		6.8	7.6	7.6
Vehicle Extension (s)		2.0	2.0	2.0	2.0	2.0		2.0	3.0		2.0	3.0	3.0
Lane Grp Cap (vph)		95	3248	1011	40	2958		105	101		238	218	185
v/s Ratio Prot		0.03	c0.38		0.01	c0.16		0.01	0.01		c0.08	0.06	
v/s Ratio Perm				0.23							c0.05		0.00
v/c Ratio		0.52	0.60	0.37	0.50	0.26		0.47	0.23		0.95	0.49	0.04
Uniform Delay, d1		62.2	14.6	11.9	65.1	12.4		64.4	60.8		56.4	55.9	53.0
Progression Factor		1.00	1.00	1.00	0.69	0.29		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2		2.0	0.8	1.0	3.5	0.2		1.2	1.1		42.7	1.7	0.1
Delay (s)		64.2	15.5	12.9	48.3	3.8		65.6	61.9		99.1	57.6	53.0
Level of Service		E	B	B	D	A		E	E		F	E	D
Approach Delay (s)			15.9			5.0			64.0			80.5	
Approach LOS			B			A			E			F	

Intersection Summary			
HCM 2000 Control Delay	21.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	135.0	Sum of lost time (s)	26.6
Intersection Capacity Utilization	66.4%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Traffic Volume (vph)	5	1961	25	3	8	672	22	20	20	21	52	20	20
Future Volume (vph)	5	1961	25	3	8	672	22	20	20	21	52	20	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1	7.4			6.1	7.4			7.6			7.6	
Lane Util. Factor	1.00	0.91			1.00	0.91			1.00			1.00	
Frt	1.00	1.00			1.00	1.00			0.95			0.97	
Flt Protected	0.95	1.00			0.95	1.00			0.98			0.97	
Satd. Flow (prot)	1787	5126			1752	5012			1621			1692	
Flt Permitted	0.35	1.00			0.06	1.00			0.85			0.83	
Satd. Flow (perm)	666	5126			114	5012			1405			1441	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	5	2132	27	3	9	730	24	22	22	23	57	22	22
RTOR Reduction (vph)	0	1	0	0	0	2	0	0	17	0	0	9	0
Lane Group Flow (vph)	5	2158	0	0	12	752	0	0	50	0	0	92	0
Heavy Vehicles (%)	1%	1%	1%	3%	3%	3%	3%	10%	10%	10%	6%	6%	6%
Turn Type	D.P+P	NA		D.P+P	D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	1	6			8			4	
Permitted Phases	6			2	2			8			4		
Actuated Green, G (s)	100.5	97.3			100.5	99.5			13.4			13.4	
Effective Green, g (s)	100.5	97.3			100.5	99.5			13.4			13.4	
Actuated g/C Ratio	0.74	0.72			0.74	0.74			0.10			0.10	
Clearance Time (s)	6.1	7.4			6.1	7.4			7.6			7.6	
Vehicle Extension (s)	2.0	2.0			2.0	2.0			2.0			2.0	
Lane Grp Cap (vph)	504	3694			123	3694			139			143	
v/s Ratio Prot	0.00	c0.42			0.00	c0.15							
v/s Ratio Perm	0.01				0.07				0.04			c0.06	
v/c Ratio	0.01	0.58			0.10	0.20			0.36			0.64	
Uniform Delay, d1	4.4	9.1			12.9	5.5			56.8			58.5	
Progression Factor	0.34	0.46			1.68	1.72			1.00			1.00	
Incremental Delay, d2	0.0	0.5			0.1	0.1			0.6			7.2	
Delay (s)	1.5	4.7			21.9	9.6			57.4			65.7	
Level of Service	A	A			C	A			E			E	
Approach Delay (s)		4.7				9.7			57.4			65.7	
Approach LOS		A				A			E			E	

Intersection Summary			
HCM 2000 Control Delay	9.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	135.0	Sum of lost time (s)	21.1
Intersection Capacity Utilization	59.7%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Traffic Volume (vph)	5	17	1983	35	25	627	26	61	52	60	147	112	28
Future Volume (vph)	5	17	1983	35	25	627	26	61	52	60	147	112	28
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.1	7.4		6.1	7.4	7.4	6.8	7.6		6.8	7.6	
Lane Util. Factor		1.00	0.91		1.00	0.91	1.00	1.00	1.00		1.00	1.00	
Frt		1.00	1.00		1.00	1.00	0.85	1.00	0.92		1.00	0.97	
Flt Protected		0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1787	5122		1752	5036	1568	1770	1714		1719	1756	
Flt Permitted		0.36	1.00		0.06	1.00	1.00	0.61	1.00		0.67	1.00	
Satd. Flow (perm)		683	5122		107	5036	1568	1142	1714		1214	1756	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	5	18	2155	38	27	682	28	66	57	65	160	122	30
RTOR Reduction (vph)	0	0	1	0	0	0	14	0	34	0	0	7	0
Lane Group Flow (vph)	0	23	2192	0	27	682	14	66	88	0	160	145	0
Heavy Vehicles (%)	1%	1%	1%	1%	3%	3%	3%	2%	2%	2%	5%	5%	5%
Turn Type	D.P+P	D.P+P	NA		D.P+P	NA	Perm	D.P+P	NA		D.P+P	NA	
Protected Phases	5	5	2		1	6		3	8		7	4	
Permitted Phases	6	6			2		6	4			8		
Actuated Green, G (s)		72.8	69.2		72.8	69.2	69.2	34.3	26.3		34.3	29.6	
Effective Green, g (s)		72.8	69.2		72.8	69.2	69.2	34.3	26.3		34.3	29.6	
Actuated g/C Ratio		0.54	0.51		0.54	0.51	0.51	0.25	0.19		0.25	0.22	
Clearance Time (s)		6.1	7.4		6.1	7.4	7.4	6.8	7.6		6.8	7.6	
Vehicle Extension (s)		2.0	4.5		2.0	4.5	4.5	3.0	2.0		3.0	2.0	
Lane Grp Cap (vph)		397	2625		101	2581	803	312	333		338	385	
v/s Ratio Prot		0.00	c0.43		0.01	c0.14		0.01	0.05		c0.03	c0.08	
v/s Ratio Perm		0.03			0.14		0.01	0.05			c0.09		
v/c Ratio		0.06	0.84		0.27	0.26	0.02	0.21	0.26		0.47	0.38	
Uniform Delay, d1		14.6	28.0		47.1	18.5	16.2	39.0	46.1		41.6	44.8	
Progression Factor		0.46	0.57		0.47	0.18	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.0	2.8		0.5	0.2	0.0	0.3	0.2		1.0	0.2	
Delay (s)		6.8	18.7		22.4	3.5	16.2	39.4	46.3		42.6	45.1	
Level of Service		A	B		C	A	B	D	D		D	D	
Approach Delay (s)			18.6			4.7			43.9			43.8	
Approach LOS			B			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	19.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	135.0	Sum of lost time (s)	27.9
Intersection Capacity Utilization	86.2%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations														
Traffic Volume (vph)	2	46	2030	135	5	11	594	269	41	118	53	378	230	40
Future Volume (vph)	2	46	2030	135	5	11	594	269	41	118	53	378	230	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.4	8.7	8.7		6.9	8.7	8.7	6.8	7.9		6.8	7.9	7.9
Lane Util. Factor		1.00	0.91	1.00		1.00	0.91	1.00	1.00	1.00		0.97	1.00	1.00
Frt		1.00	1.00	0.85		1.00	1.00	0.85	1.00	0.95		1.00	1.00	0.85
Flt Protected		0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1770	5085	1583		1752	5036	1568	1805	1811		3433	1863	1583
Flt Permitted		0.37	1.00	1.00		0.07	1.00	1.00	0.47	1.00		0.95	1.00	1.00
Satd. Flow (perm)		691	5085	1583		125	5036	1568	888	1811		3433	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2	50	2207	147	5	12	646	292	45	128	58	411	250	43
RTOR Reduction (vph)	0	0	0	83	0	0	0	173	0	15	0	0	0	32
Lane Group Flow (vph)	0	52	2207	64	0	17	646	119	45	171	0	411	250	11
Heavy Vehicles (%)	2%	2%	2%	2%	3%	3%	3%	3%	0%	0%	0%	2%	2%	2%
Turn Type	D.P+P	D.P+P	NA	Perm	D.P+P	D.P+P	NA	Perm	D.P+P	NA		Prot	NA	Perm
Protected Phases	1	1	6		5	5	2		7	4		3	8	
Permitted Phases	2	2		6	6	6		2	8					8
Actuated Green, G (s)		60.4	58.9	58.9		60.9	55.1	55.1	43.8	17.2		26.6	35.8	35.8
Effective Green, g (s)		60.4	58.9	58.9		60.9	55.1	55.1	43.8	17.2		26.6	35.8	35.8
Actuated g/C Ratio		0.45	0.44	0.44		0.45	0.41	0.41	0.32	0.13		0.20	0.27	0.27
Clearance Time (s)		7.4	8.7	8.7		6.9	8.7	8.7	6.8	7.9		6.8	7.9	7.9
Vehicle Extension (s)		2.0	2.0	2.0		2.0	2.0	2.0	2.0	2.0		2.0	2.0	2.0
Lane Grp Cap (vph)		351	2218	690		80	2055	639	342	230		676	494	419
v/s Ratio Prot		0.01	c0.43			0.00	c0.13		0.01	c0.09		c0.12	c0.13	
v/s Ratio Perm		0.06		0.04		0.09		0.08	0.03					0.01
v/c Ratio		0.15	1.00	0.09		0.21	0.31	0.19	0.13	0.74		0.61	0.51	0.03
Uniform Delay, d1		21.3	37.9	22.4		60.9	27.1	25.6	31.8	56.8		49.4	42.1	36.7
Progression Factor		0.31	0.33	1.00		0.58	0.51	1.18	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2		0.0	14.2	0.2		0.4	0.3	0.5	0.1	10.8		1.1	0.3	0.0
Delay (s)		6.7	26.7	22.5		36.0	14.1	30.7	31.9	67.6		50.5	42.4	36.7
Level of Service		A	C	C		D	B	C	C	E		D	D	D
Approach Delay (s)			26.1				19.6			60.6			46.8	
Approach LOS			C				B			E			D	

Intersection Summary			
HCM 2000 Control Delay	29.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	135.0	Sum of lost time (s)	30.8
Intersection Capacity Utilization	79.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Lane Configurations														
Traffic Volume (vph)	3	134	1910	420	181	518	56	309	284	148	2	229	463	73
Future Volume (vph)	3	134	1910	420	181	518	56	309	284	148	2	229	463	73
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.4	5.9	5.9	7.4	5.9	5.9	7.0	5.4	5.4		7.0	5.4	5.4
Lane Util. Factor		0.97	0.91	1.00	0.97	0.91	1.00	0.97	0.95	1.00		0.97	0.95	1.00
Frt		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85		1.00	1.00	0.85
Flt Protected		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00		0.95	1.00	1.00
Satd. Flow (prot)		3467	5136	1599	3367	4988	1553	3433	3539	1583		3433	3539	1583
Flt Permitted		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00		0.95	1.00	1.00
Satd. Flow (perm)		3467	5136	1599	3367	4988	1553	3433	3539	1583		3433	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	3	146	2076	457	197	563	61	336	309	161	2	249	503	79
RTOR Reduction (vph)	0	0	0	108	0	0	47	0	0	123	0	0	0	65
Lane Group Flow (vph)	0	149	2076	349	197	563	14	336	309	38	0	251	503	14
Heavy Vehicles (%)	1%	1%	1%	1%	4%	4%	4%	2%	2%	2%	2%	2%	2%	2%
Turn Type	Prot	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	Prot	NA	Perm
Protected Phases	1	1	6		5	2		7	4		3	3	8	
Permitted Phases				6			2			4				8
Actuated Green, G (s)		42.1	65.2	65.2	8.2	31.3	31.3	12.0	16.3	16.3		19.6	23.9	23.9
Effective Green, g (s)		42.1	65.2	65.2	8.2	31.3	31.3	12.0	16.3	16.3		19.6	23.9	23.9
Actuated g/C Ratio		0.31	0.48	0.48	0.06	0.23	0.23	0.09	0.12	0.12		0.15	0.18	0.18
Clearance Time (s)		7.4	5.9	5.9	7.4	5.9	5.9	7.0	5.4	5.4		7.0	5.4	5.4
Vehicle Extension (s)		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	2.0
Lane Grp Cap (vph)		1081	2480	772	204	1156	360	305	427	191		498	626	280
v/s Ratio Prot		0.04	c0.40		c0.06	0.11		c0.10	0.09			0.07	c0.14	
v/s Ratio Perm				0.22			0.01			0.02				0.01
v/c Ratio		0.14	0.84	0.45	0.97	0.49	0.04	1.10	0.72	0.20		0.50	0.80	0.05
Uniform Delay, d1		33.4	30.3	23.1	63.3	44.9	40.2	61.5	57.2	53.5		53.2	53.3	46.1
Progression Factor		0.61	0.27	0.14	0.93	0.86	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2		0.0	1.8	0.9	52.2	1.5	0.2	81.6	5.1	0.2		0.3	7.0	0.0
Delay (s)		20.3	10.1	4.2	111.1	40.0	40.4	143.1	62.3	53.7		53.5	60.3	46.2
Level of Service		C	B	A	F	D	D	F	E	D		D	E	D
Approach Delay (s)			9.6			57.1			94.2				56.9	
Approach LOS			A			E			F				E	

Intersection Summary			
HCM 2000 Control Delay	38.1	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	135.0	Sum of lost time (s)	25.7
Intersection Capacity Utilization	83.8%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	2252	30	30	713	5	30	0	30	5	0	5
Future Volume (vph)	5	2252	30	30	713	5	30	0	30	5	0	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1	7.4		6.1	7.4			7.2	7.2	6.4	7.2	
Lane Util. Factor	1.00	0.91		1.00	0.91			1.00	1.00	1.00	1.00	
Frt	1.00	1.00		1.00	1.00			1.00	0.85	1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00			0.95	1.00	0.95	1.00	
Satd. Flow (prot)	1770	5075		1770	5080			1770	1583	1770	1583	
Flt Permitted	0.34	1.00		0.04	1.00			0.75	1.00	0.74	1.00	
Satd. Flow (perm)	642	5075		77	5080			1405	1583	1370	1583	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	5	2448	33	33	775	5	33	0	33	5	0	5
RTOR Reduction (vph)	0	1	0	0	0	0	0	0	31	0	4	0
Lane Group Flow (vph)	5	2480	0	33	780	0	0	33	2	5	1	0
Turn Type	D.P+P	NA		D.P+P	NA		D.P+P	NA	Perm	D.P+P	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	2			6			8		4	4		
Actuated Green, G (s)	100.3	97.1		100.3	99.3			6.8	6.8	7.6	14.0	
Effective Green, g (s)	100.3	97.1		100.3	99.3			6.8	6.8	7.6	14.0	
Actuated g/C Ratio	0.74	0.72		0.74	0.74			0.05	0.05	0.06	0.10	
Clearance Time (s)	6.1	7.4		6.1	7.4			7.2	7.2	6.4	7.2	
Vehicle Extension (s)	2.0	2.0		2.0	2.0			2.0	2.0	2.0	2.0	
Lane Grp Cap (vph)	485	3650		97	3736			70	79	79	164	
v/s Ratio Prot	0.00	c0.49		c0.01	0.15					c0.00	0.00	
v/s Ratio Perm	0.01			0.24				c0.02	0.00	0.00		
v/c Ratio	0.01	0.68		0.34	0.21			0.47	0.02	0.06	0.00	
Uniform Delay, d1	4.5	10.4		9.6	5.6			62.4	60.9	60.3	54.2	
Progression Factor	0.13	0.19		3.92	0.24			1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.0	0.6		0.8	0.1			1.8	0.0	0.1	0.0	
Delay (s)	0.6	2.7		38.6	1.5			64.2	61.0	60.4	54.2	
Level of Service	A	A		D	A			E	E	E	D	
Approach Delay (s)		2.7			3.0			62.6			57.3	
Approach LOS		A			A			E			E	

Intersection Summary			
HCM 2000 Control Delay	4.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	135.0	Sum of lost time (s)	27.1
Intersection Capacity Utilization	72.3%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	2218	69	204	729	19	146
Future Volume (vph)	2218	69	204	729	19	146
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.7		6.4	7.7	7.6	7.6
Lane Util. Factor	0.91		1.00	0.91	1.00	1.00
Frt	1.00		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	5112		1752	5036	1805	1615
Flt Permitted	1.00		0.04	1.00	0.95	1.00
Satd. Flow (perm)	5112		77	5036	1805	1615
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2411	75	222	792	21	159
RTOR Reduction (vph)	1	0	0	0	0	149
Lane Group Flow (vph)	2485	0	222	792	21	10
Heavy Vehicles (%)	1%	1%	3%	3%	0%	0%
Turn Type	NA		D.P+P	NA	Prot	Perm
Protected Phases	6		5	2	4	
Permitted Phases			6			4
Actuated Green, G (s)	95.9		104.5	110.9	8.8	8.8
Effective Green, g (s)	95.9		104.5	110.9	8.8	8.8
Actuated g/C Ratio	0.71		0.77	0.82	0.07	0.07
Clearance Time (s)	7.7		6.4	7.7	7.6	7.6
Vehicle Extension (s)	0.2		2.0	0.2	2.0	2.0
Lane Grp Cap (vph)	3631		166	4136	117	105
v/s Ratio Prot	0.49		c0.09	0.16	c0.01	
v/s Ratio Perm			c0.95			0.01
v/c Ratio	0.68		1.34	0.19	0.18	0.10
Uniform Delay, d1	11.0		32.3	2.6	59.7	59.4
Progression Factor	0.08		0.48	0.33	1.00	1.00
Incremental Delay, d2	0.9		185.9	0.1	0.3	0.2
Delay (s)	1.8		201.4	0.9	60.0	59.5
Level of Service	A		F	A	E	E
Approach Delay (s)	1.8			44.8	59.6	
Approach LOS	A			D	E	

Intersection Summary			
HCM 2000 Control Delay	16.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	1.29		
Actuated Cycle Length (s)	135.0	Sum of lost time (s)	25.7
Intersection Capacity Utilization	80.4%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	81	2283	718	210	220	215
Future Volume (vph)	81	2283	718	210	220	215
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.4	8.7	8.7	8.7	7.2	7.2
Lane Util. Factor	1.00	0.91	0.91	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1787	5136	4988	1553	1752	1568
Flt Permitted	0.34	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	634	5136	4988	1553	1752	1568
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	88	2482	780	228	239	234
RTOR Reduction (vph)	0	0	0	93	0	194
Lane Group Flow (vph)	88	2482	780	135	239	40
Heavy Vehicles (%)	1%	1%	4%	4%	3%	3%
Turn Type	D.P+P	NA	NA	Perm	Prot	Perm
Protected Phases	1	6	2		4	
Permitted Phases	2			2		4
Actuated Green, G (s)	88.4	95.8	79.9	79.9	23.3	23.3
Effective Green, g (s)	88.4	95.8	79.9	79.9	23.3	23.3
Actuated g/C Ratio	0.65	0.71	0.59	0.59	0.17	0.17
Clearance Time (s)	7.4	8.7	8.7	8.7	7.2	7.2
Vehicle Extension (s)	2.5	2.5	2.5	2.5	2.5	2.5
Lane Grp Cap (vph)	487	3644	2952	919	302	270
v/s Ratio Prot	0.01	c0.48	0.16		c0.14	
v/s Ratio Perm	0.11			0.09		0.03
v/c Ratio	0.18	0.68	0.26	0.15	0.79	0.15
Uniform Delay, d1	8.5	11.0	13.3	12.3	53.5	47.4
Progression Factor	0.18	0.14	0.11	0.06	1.00	1.00
Incremental Delay, d2	0.1	0.8	0.2	0.3	12.8	0.2
Delay (s)	1.6	2.4	1.6	1.0	66.3	47.6
Level of Service	A	A	A	A	E	D
Approach Delay (s)		2.3	1.5		57.1	
Approach LOS		A	A		E	

Intersection Summary			
HCM 2000 Control Delay	8.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	135.0	Sum of lost time (s)	27.3
Intersection Capacity Utilization	69.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Traffic Volume (vph)	274	2229	0	4	2	835	50	1	0	0	68	0	92
Future Volume (vph)	274	2229	0	4	2	835	50	1	0	0	68	0	92
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1	7.4			6.1	7.4			7.0			7.0	
Lane Util. Factor	1.00	0.91			1.00	0.91			1.00			1.00	
Frt	1.00	1.00			1.00	0.99			1.00			0.92	
Flt Protected	0.95	1.00			0.95	1.00			0.95			0.98	
Satd. Flow (prot)	1787	5136			1736	4946			1805			1699	
Flt Permitted	0.25	1.00			0.05	1.00			0.44			0.86	
Satd. Flow (perm)	468	5136			82	4946			842			1496	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	298	2423	0	4	2	908	54	1	0	0	74	0	100
RTOR Reduction (vph)	0	0	0	0	0	4	0	0	0	0	0	133	0
Lane Group Flow (vph)	298	2423	0	0	6	958	0	0	1	0	0	41	0
Heavy Vehicles (%)	1%	1%	1%	4%	4%	4%	4%	0%	0%	0%	1%	1%	1%
Turn Type	D.P+P	NA		D.P+P	D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	5	2			4			8	
Permitted Phases	2			6	6			4			8		
Actuated Green, G (s)	102.9	101.8			102.9	68.6			11.6			11.6	
Effective Green, g (s)	102.9	101.8			102.9	68.6			11.6			11.6	
Actuated g/C Ratio	0.76	0.75			0.76	0.51			0.09			0.09	
Clearance Time (s)	6.1	7.4			6.1	7.4			7.0			7.0	
Vehicle Extension (s)	2.5	2.5			2.5	2.5			2.5			2.5	
Lane Grp Cap (vph)	691	3872			75	2513			72			128	
v/s Ratio Prot	0.11	c0.47			0.00	0.19							
v/s Ratio Perm	c0.22				0.06				0.00			c0.03	
v/c Ratio	0.43	0.63			0.08	0.38			0.01			0.32	
Uniform Delay, d1	13.9	7.7			6.3	20.3			56.5			58.0	
Progression Factor	0.36	0.32			0.53	0.26			1.00			1.00	
Incremental Delay, d2	0.2	0.6			0.3	0.4			0.1			1.1	
Delay (s)	5.3	3.0			3.6	5.7			56.5			59.1	
Level of Service	A	A			A	A			E			E	
Approach Delay (s)		3.3				5.7			56.5			59.1	
Approach LOS		A				A			E			E	

Intersection Summary			
HCM 2000 Control Delay	6.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	135.0	Sum of lost time (s)	20.5
Intersection Capacity Utilization	72.7%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Traffic Volume (vph)	431	1052	802	1	32	337	67	343	616	33	186	953	211
Future Volume (vph)	431	1052	802	1	32	337	67	343	616	33	186	953	211
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	5.6	4.0		7.0	5.6	5.6	6.8	5.4	5.4	7.0	5.6	5.6
Lane Util. Factor	0.97	0.95	1.00		1.00	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3467	3574	1599		1736	3471	1553	3367	3471	1553	1752	3505	1568
Flt Permitted	0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3467	3574	1599		1736	3471	1553	3367	3471	1553	1752	3505	1568
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	468	1143	872	1	35	366	73	373	670	36	202	1036	229
RTOR Reduction (vph)	0	0	0	0	0	0	62	0	0	26	0	0	146
Lane Group Flow (vph)	468	1143	872	0	36	366	11	373	670	10	202	1036	83
Heavy Vehicles (%)	1%	1%	1%	4%	4%	4%	4%	4%	4%	4%	3%	3%	3%
Turn Type	Prot	NA	Free	Prot	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	1	6		5	5	2		7	4		3	8	
Permitted Phases			Free				2			4			8
Actuated Green, G (s)	32.9	47.8	135.0		4.8	19.7	19.7	16.1	39.2	39.2	18.2	41.3	41.3
Effective Green, g (s)	32.9	47.8	135.0		4.8	19.7	19.7	16.1	39.2	39.2	18.2	41.3	41.3
Actuated g/C Ratio	0.24	0.35	1.00		0.04	0.15	0.15	0.12	0.29	0.29	0.13	0.31	0.31
Clearance Time (s)	7.0	5.6			7.0	5.6	5.6	6.8	5.4	5.4	7.0	5.6	5.6
Vehicle Extension (s)	2.0	2.0			2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lane Grp Cap (vph)	844	1265	1599		61	506	226	401	1007	450	236	1072	479
v/s Ratio Prot	0.13	c0.32			0.02	c0.11		c0.11	0.19		0.12	c0.30	
v/s Ratio Perm			0.55				0.01			0.01			0.05
v/c Ratio	0.55	0.90	0.55		0.59	0.72	0.05	0.93	0.67	0.02	0.86	0.97	0.17
Uniform Delay, d1	44.6	41.4	0.0		64.1	55.0	49.6	58.9	42.1	34.2	57.1	46.2	34.3
Progression Factor	0.65	0.62	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.4	9.0	1.1		9.8	8.7	0.4	27.8	1.3	0.0	24.1	19.6	0.1
Delay (s)	29.5	34.5	1.1		73.9	63.7	50.0	86.6	43.4	34.2	81.2	65.7	34.4
Level of Service	C	C	A		E	E	D	F	D	C	F	E	C
Approach Delay (s)		21.8				62.4			58.1			63.0	
Approach LOS		C				E			E			E	

Intersection Summary			
HCM 2000 Control Delay	43.4	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	135.0	Sum of lost time (s)	25.0
Intersection Capacity Utilization	91.0%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Traffic Volume (vph)	1	40	2578	492	26	877	72	82	41	33	107	191	90
Future Volume (vph)	1	40	2578	492	26	877	72	82	41	33	107	191	90
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.0	6.0	6.0	7.0	6.0	6.0		7.5	7.5		7.5	7.5
Lane Util. Factor		1.00	0.95	1.00	1.00	0.95	1.00		1.00	1.00		1.00	1.00
Frt		1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85		1.00	0.85
Flt Protected		0.95	1.00	1.00	0.95	1.00	1.00		0.97	1.00		0.98	1.00
Satd. Flow (prot)		1787	3574	1599	1719	3438	1538		1821	1599		1848	1599
Flt Permitted		0.95	1.00	1.00	0.95	1.00	1.00		0.97	1.00		0.98	1.00
Satd. Flow (perm)		1787	3574	1599	1719	3438	1538		1821	1599		1848	1599
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1	43	2802	535	28	953	78	89	45	36	116	208	98
RTOR Reduction (vph)	0	0	0	78	0	0	33	0	0	33	0	0	85
Lane Group Flow (vph)	0	44	2802	457	28	953	45	0	134	3	0	324	13
Heavy Vehicles (%)	1%	1%	1%	1%	5%	5%	5%	1%	1%	1%	1%	1%	1%
Turn Type	Prot	Prot	NA	Perm	Prot	NA	Perm	Split	NA	Perm	Split	NA	Perm
Protected Phases	5	5	2		1	6		3	3		4	4	
Permitted Phases				2			6			3			4
Actuated Green, G (s)		8.0	108.9	108.9	4.0	104.9	104.9		14.6	14.6		24.5	24.5
Effective Green, g (s)		8.0	108.9	108.9	4.0	104.9	104.9		14.6	14.6		24.5	24.5
Actuated g/C Ratio		0.04	0.61	0.61	0.02	0.58	0.58		0.08	0.08		0.14	0.14
Clearance Time (s)		7.0	6.0	6.0	7.0	6.0	6.0		7.5	7.5		7.5	7.5
Vehicle Extension (s)		2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0		3.0	3.0
Lane Grp Cap (vph)		79	2162	967	38	2003	896		147	129		251	217
v/s Ratio Prot		0.02	c0.78		0.02	c0.28			c0.07			c0.18	
v/s Ratio Perm				0.29			0.03			0.00			0.01
v/c Ratio		0.56	1.30	0.47	0.74	0.48	0.05		0.91	0.02		1.29	0.06
Uniform Delay, d1		84.3	35.5	19.7	87.5	21.7	16.1		82.1	76.1		77.8	67.7
Progression Factor		1.00	1.00	1.00	1.48	0.29	0.85		1.00	1.00		1.00	1.00
Incremental Delay, d2		4.8	136.8	1.7	45.7	0.8	0.1		48.0	0.0		157.4	0.1
Delay (s)		89.0	172.3	21.3	174.9	7.1	13.9		130.0	76.2		235.1	67.9
Level of Service		F	F	C	F	A	B		F	E		F	E
Approach Delay (s)			147.3			12.1			118.6			196.3	
Approach LOS			F			B			F			F	

Intersection Summary			
HCM 2000 Control Delay	122.0	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.25		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	28.0
Intersection Capacity Utilization	111.4%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Traffic Volume (vph)	6	2686	27	4	8	933	23	21	18	21	52	17	21
Future Volume (vph)	6	2686	27	4	8	933	23	21	18	21	52	17	21
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	5.5	5.5		6.0	5.5	5.5		6.0	6.0		6.0	
Lane Util. Factor	1.00	0.95	1.00		1.00	0.95	1.00		1.00	1.00		1.00	
Frt	1.00	1.00	0.85		1.00	1.00	0.85		1.00	0.85		0.97	
Flt Protected	0.95	1.00	1.00		0.95	1.00	1.00		0.97	1.00		0.97	
Satd. Flow (prot)	1787	3574	1599		1752	3505	1568		1682	1468		1687	
Flt Permitted	0.95	1.00	1.00		0.95	1.00	1.00		0.76	1.00		0.80	
Satd. Flow (perm)	1787	3574	1599		1752	3505	1568		1310	1468		1382	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	7	2920	29	4	9	1014	25	23	20	23	57	18	23
RTOR Reduction (vph)	0	0	6	0	0	0	5	0	0	21	0	7	0
Lane Group Flow (vph)	7	2920	23	0	13	1014	20	0	43	2	0	91	0
Heavy Vehicles (%)	1%	1%	1%	3%	3%	3%	3%	10%	10%	10%	6%	6%	6%
Turn Type	Prot	NA	Perm	Prot	Prot	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases	5	2		1	1	6			8			4	
Permitted Phases			2				6	8		8	4		
Actuated Green, G (s)	1.3	143.2	143.2		3.2	145.1	145.1		16.1	16.1		16.1	
Effective Green, g (s)	1.3	143.2	143.2		3.2	145.1	145.1		16.1	16.1		16.1	
Actuated g/C Ratio	0.01	0.80	0.80		0.02	0.81	0.81		0.09	0.09		0.09	
Clearance Time (s)	6.0	5.5	5.5		6.0	5.5	5.5		6.0	6.0		6.0	
Vehicle Extension (s)	2.0	2.0	2.0		2.0	2.0	2.0		2.0	2.0		2.0	
Lane Grp Cap (vph)	12	2843	1272		31	2825	1263		117	131		123	
v/s Ratio Prot	0.00	c0.82			0.01	c0.29							
v/s Ratio Perm			0.01				0.01		0.03	0.00		c0.07	
v/c Ratio	0.58	1.03	0.02		0.42	0.36	0.02		0.37	0.02		0.74	
Uniform Delay, d1	89.1	18.4	3.8		87.5	4.8	3.4		77.2	74.7		79.9	
Progression Factor	1.42	0.89	0.00		0.59	0.71	1.00		1.00	1.00		1.00	
Incremental Delay, d2	4.1	14.1	0.0		3.0	0.3	0.0		0.7	0.0		17.9	
Delay (s)	130.3	30.4	0.0		54.9	3.7	3.4		77.9	74.7		97.7	
Level of Service	F	C	A		D	A	A		E	E		F	
Approach Delay (s)		30.4				4.3			76.8			97.7	
Approach LOS		C				A			E			F	

Intersection Summary			
HCM 2000 Control Delay	26.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	17.5
Intersection Capacity Utilization	98.1%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Traffic Volume (vph)	6	25	2670	63	42	855	37	68	71	68	200	228	40
Future Volume (vph)	6	25	2670	63	42	855	37	68	71	68	200	228	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.8	5.8	5.8	5.8	5.8	5.8		6.6			6.6	
Lane Util. Factor		1.00	0.95	1.00	1.00	0.95	1.00		1.00			1.00	
Frt		1.00	1.00	0.85	1.00	1.00	0.85		0.96			0.99	
Flt Protected		0.95	1.00	1.00	0.95	1.00	1.00		0.98			0.98	
Satd. Flow (prot)		1770	3539	1583	1770	3539	1583		1751			1803	
Flt Permitted		0.23	1.00	1.00	0.05	1.00	1.00		0.70			0.70	
Satd. Flow (perm)		432	3539	1583	94	3539	1583		1244			1285	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	7	27	2902	68	46	929	40	74	77	74	217	248	43
RTOR Reduction (vph)	0	0	0	24	0	0	21	0	10	0	0	2	0
Lane Group Flow (vph)	0	34	2902	44	46	929	19	0	215	0	0	506	0
Turn Type	pm+pt	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	5	2		1	6			8			4	
Permitted Phases	2	2		2	6		6	8			4		
Actuated Green, G (s)		105.6	105.6	105.6	83.9	83.9	83.9		51.4			51.4	
Effective Green, g (s)		105.6	105.6	105.6	83.9	83.9	83.9		51.4			51.4	
Actuated g/C Ratio		0.59	0.59	0.59	0.47	0.47	0.47		0.29			0.29	
Clearance Time (s)		5.8	5.8	5.8	5.8	5.8	5.8		6.6			6.6	
Vehicle Extension (s)		2.0	4.5	4.5	2.0	4.5	4.5		2.0			2.0	
Lane Grp Cap (vph)		450	2076	928	88	1649	737		355			366	
v/s Ratio Prot		0.01	c0.82		0.01	c0.26							
v/s Ratio Perm		0.03		0.03	0.23		0.01		0.17			c0.39	
v/c Ratio		0.08	1.40	0.05	0.52	0.56	0.03		0.61			1.38	
Uniform Delay, d1		26.0	37.2	15.8	42.4	34.8	26.0		55.5			64.3	
Progression Factor		0.38	0.60	0.33	1.34	0.23	0.03		1.00			1.00	
Incremental Delay, d2		0.0	179.9	0.0	2.2	1.2	0.1		2.0			188.2	
Delay (s)		9.8	202.2	5.2	59.1	9.1	0.8		57.5			252.5	
Level of Service		A	F	A	E	A	A		E			F	
Approach Delay (s)			195.6			11.1			57.5			252.5	
Approach LOS			F			B			E			F	

Intersection Summary			
HCM 2000 Control Delay	155.7	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.38		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	18.2
Intersection Capacity Utilization	121.5%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations														
Traffic Volume (vph)	3	80	2722	133	5	8	814	358	49	167	54	400	264	67
Future Volume (vph)	3	80	2722	133	5	8	814	358	49	167	54	400	264	67
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.1	6.1	6.1		6.1	6.1	6.1	5.9	5.9		5.9	5.9	5.9
Lane Util. Factor		1.00	0.95	1.00		1.00	0.95	1.00	1.00	1.00		1.00	1.00	1.00
Frt		1.00	1.00	0.85		1.00	1.00	0.85	1.00	0.96		1.00	1.00	0.85
Flt Protected		0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1770	3539	1583		1770	3539	1583	1770	1794		1770	1863	1583
Flt Permitted		0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)		1770	3539	1583		1770	3539	1583	1770	1794		1770	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	3	87	2959	145	5	9	885	389	53	182	59	435	287	73
RTOR Reduction (vph)	0	0	0	48	0	0	0	155	0	6	0	0	0	56
Lane Group Flow (vph)	0	90	2959	97	0	14	885	234	53	235	0	435	287	17
Turn Type	Prot	Prot	NA	Perm	Prot	Prot	NA	Perm	Split	NA		Split	NA	Perm
Protected Phases	1	1	6		5	5	2		4	4		8	8	
Permitted Phases				6				2						8
Actuated Green, G (s)		13.5	83.1	83.1		3.2	72.8	72.8	27.6	27.6		42.1	42.1	42.1
Effective Green, g (s)		13.5	83.1	83.1		3.2	72.8	72.8	27.6	27.6		42.1	42.1	42.1
Actuated g/C Ratio		0.08	0.46	0.46		0.02	0.40	0.40	0.15	0.15		0.23	0.23	0.23
Clearance Time (s)		6.1	6.1	6.1		6.1	6.1	6.1	5.9	5.9		5.9	5.9	5.9
Vehicle Extension (s)		2.0	5.0	5.0		2.0	5.0	5.0	3.0	3.0		2.0	2.0	2.0
Lane Grp Cap (vph)		132	1633	730		31	1431	640	271	275		413	435	370
v/s Ratio Prot		0.05	c0.84			0.01	c0.25		0.03	c0.13		c0.25	0.15	
v/s Ratio Perm				0.06				0.15						0.01
v/c Ratio		0.68	1.81	0.13		0.45	0.62	0.37	0.20	0.85		1.05	0.66	0.05
Uniform Delay, d1		81.2	48.5	27.8		87.5	42.6	37.5	66.5	74.2		69.0	62.5	53.4
Progression Factor		1.15	0.41	0.09		0.56	0.10	0.04	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2		1.1	365.6	0.0		2.6	1.4	1.1	0.4	21.9		59.0	2.8	0.0
Delay (s)		94.5	385.4	2.5		52.0	5.7	2.7	66.9	96.2		127.9	65.2	53.4
Level of Service		F	F	A		D	A	A	E	F		F	E	D
Approach Delay (s)			359.8				5.3			90.9			98.5	
Approach LOS			F				A			F			F	

Intersection Summary			
HCM 2000 Control Delay	226.4	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.42		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	24.0
Intersection Capacity Utilization	124.4%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Lane Configurations														
Traffic Volume (vph)	5	244	2097	635	220	708	75	367	394	141	3	452	649	104
Future Volume (vph)	5	244	2097	635	220	708	75	367	394	141	3	452	649	104
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.7	6.7	6.7	6.7	6.7	6.7	6.3	6.3	6.3		6.3	6.3	6.3
Lane Util. Factor		0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00		0.97	0.95	1.00
Frt		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85		1.00	1.00	0.85
Flt Protected		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00		0.95	1.00	1.00
Satd. Flow (prot)		3467	3574	1599	3367	3471	1553	3433	3539	1583		3433	3539	1583
Flt Permitted		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00		0.95	1.00	1.00
Satd. Flow (perm)		3467	3574	1599	3367	3471	1553	3433	3539	1583		3433	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	5	265	2279	690	239	770	82	399	428	153	3	491	705	113
RTOR Reduction (vph)	0	0	0	92	0	0	60	0	0	122	0	0	0	94
Lane Group Flow (vph)	0	270	2279	598	239	770	22	399	428	31	0	494	705	19
Heavy Vehicles (%)	1%	1%	1%	1%	4%	4%	4%	2%	2%	2%	2%	2%	2%	2%
Turn Type	Prot	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	Prot	NA	Perm
Protected Phases	1	1	6		5	2		7	4		3	3	8	
Permitted Phases				6			2			4				8
Actuated Green, G (s)		59.5	97.3	97.3	10.3	48.1	48.1	15.7	25.0	25.0		21.4	30.7	30.7
Effective Green, g (s)		59.5	97.3	97.3	10.3	48.1	48.1	15.7	25.0	25.0		21.4	30.7	30.7
Actuated g/C Ratio		0.33	0.54	0.54	0.06	0.27	0.27	0.09	0.14	0.14		0.12	0.17	0.17
Clearance Time (s)		6.7	6.7	6.7	6.7	6.7	6.7	6.3	6.3	6.3		6.3	6.3	6.3
Vehicle Extension (s)		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	2.0
Lane Grp Cap (vph)		1146	1931	864	192	927	414	299	491	219		408	603	269
v/s Ratio Prot		0.08	c0.64		c0.07	0.22		0.12	0.12			c0.14	c0.20	
v/s Ratio Perm				0.37			0.01			0.02				0.01
v/c Ratio		0.24	1.18	0.69	1.24	0.83	0.05	1.33	0.87	0.14		1.21	1.17	0.07
Uniform Delay, d1		43.7	41.4	30.4	84.8	62.1	49.0	82.2	75.9	68.1		79.3	74.7	62.7
Progression Factor		0.55	0.14	0.06	1.11	0.87	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2		0.0	81.6	0.4	144.9	8.2	0.2	171.6	15.1	0.1		115.6	93.0	0.0
Delay (s)		23.9	87.6	2.2	239.4	62.2	49.3	253.7	91.0	68.2		194.9	167.7	62.7
Level of Service		C	F	A	F	E	D	F	F	E		F	F	E
Approach Delay (s)			64.1			100.1			153.7				168.9	
Approach LOS			E			F			F				F	

Intersection Summary			
HCM 2000 Control Delay	104.0	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.21		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	26.0
Intersection Capacity Utilization	114.3%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	2854	30	30	968	5	30	0	30	5	0	5
Future Volume (vph)	5	2854	30	30	968	5	30	0	30	5	0	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.3	6.3	6.3	6.3	6.3	6.3		5.5	5.5	5.5	5.5	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00		1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85	1.00	0.85	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.95	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583		1770	1583	1770	1583	
Flt Permitted	0.26	1.00	1.00	0.03	1.00	1.00		0.75	1.00	0.74	1.00	
Satd. Flow (perm)	476	3539	1583	52	3539	1583		1405	1583	1370	1583	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	5	3102	33	33	1052	5	33	0	33	5	0	5
RTOR Reduction (vph)	0	0	7	0	0	1	0	0	31	0	5	0
Lane Group Flow (vph)	5	3102	26	33	1052	4	0	33	2	5	0	0
Turn Type	D.P+P	NA	Perm	D.P+P	NA	Perm	D.P+P	NA	Perm	D.P+P	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	2		6	6		2	8		4	4		
Actuated Green, G (s)	146.8	142.5	142.5	146.8	145.8	145.8		8.7	8.7	9.6	15.1	
Effective Green, g (s)	146.8	142.5	142.5	146.8	145.8	145.8		8.7	8.7	9.6	15.1	
Actuated g/C Ratio	0.82	0.79	0.79	0.82	0.81	0.81		0.05	0.05	0.05	0.08	
Clearance Time (s)	6.3	6.3	6.3	6.3	6.3	6.3		5.5	5.5	5.5	5.5	
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	2.0	2.0	
Lane Grp Cap (vph)	395	2801	1253	83	2866	1282		67	76	75	132	
v/s Ratio Prot	0.00	c0.88		c0.01	c0.30					c0.00	0.00	
v/s Ratio Perm	0.01		0.02	0.31		0.00		c0.02	0.00	0.00		
v/c Ratio	0.01	1.11	0.02	0.40	0.37	0.00		0.49	0.02	0.07	0.00	
Uniform Delay, d1	3.3	18.8	4.0	57.4	4.6	3.3		83.5	81.6	81.0	75.6	
Progression Factor	0.14	0.71	1.00	1.72	1.12	1.00		1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.0	48.9	0.0	1.1	0.3	0.0		2.1	0.0	0.1	0.0	
Delay (s)	0.5	62.3	4.0	99.9	5.5	3.3		85.6	81.6	81.1	75.6	
Level of Service	A	E	A	F	A	A		F	F	F	E	
Approach Delay (s)		61.6			8.4			83.6			78.3	
Approach LOS		E			A			F			E	

Intersection Summary			
HCM 2000 Control Delay	48.5	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.05		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	23.6
Intersection Capacity Utilization	103.3%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	2799	90	197	985	18	147
Future Volume (vph)	2799	90	197	985	18	147
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.2	6.2	6.2	6.2	5.2	5.2
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3539	1583	1770	3539	1770	1583
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	3539	1583	1770	3539	1770	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	3042	98	214	1071	20	160
RTOR Reduction (vph)	0	6	0	0	0	152
Lane Group Flow (vph)	3042	92	214	1071	20	8
Turn Type	NA	Perm	Prot	NA	Prot	Perm
Protected Phases	6		5	2	4	
Permitted Phases		6				4
Actuated Green, G (s)	137.4	137.4	15.8	159.4	9.2	9.2
Effective Green, g (s)	137.4	137.4	15.8	159.4	9.2	9.2
Actuated g/C Ratio	0.76	0.76	0.09	0.89	0.05	0.05
Clearance Time (s)	6.2	6.2	6.2	6.2	5.2	5.2
Vehicle Extension (s)	0.2	0.2	2.0	0.2	2.0	2.0
Lane Grp Cap (vph)	2701	1208	155	3133	90	80
v/s Ratio Prot	c0.86		c0.12	0.30	c0.01	
v/s Ratio Perm		0.06				0.01
v/c Ratio	1.13	0.08	1.38	0.34	0.22	0.10
Uniform Delay, d1	21.3	5.4	82.1	1.7	82.0	81.5
Progression Factor	0.23	0.05	0.73	0.36	1.00	1.00
Incremental Delay, d2	57.3	0.0	203.5	0.3	0.5	0.2
Delay (s)	62.2	0.3	263.6	0.9	82.4	81.7
Level of Service	E	A	F	A	F	F
Approach Delay (s)	60.3			44.6	81.7	
Approach LOS	E			D	F	

Intersection Summary			
HCM 2000 Control Delay	56.7	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.13		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	21.6
Intersection Capacity Utilization	112.1%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	60	2886	936	199	261	245
Future Volume (vph)	60	2886	936	199	261	245
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	5.2	5.2
Lane Util. Factor	1.00	0.95	0.95	1.00	0.97	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	3539	3539	1583	3433	1583
Flt Permitted	0.25	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	463	3539	3539	1583	3433	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	65	3137	1017	216	284	266
RTOR Reduction (vph)	0	0	0	48	0	223
Lane Group Flow (vph)	65	3137	1017	168	284	43
Turn Type	pm+pt	NA	NA	Perm	Prot	Perm
Protected Phases	1	6	2		4	
Permitted Phases	6			2		4
Actuated Green, G (s)	153.6	153.6	139.6	139.6	15.2	15.2
Effective Green, g (s)	153.6	153.6	139.6	139.6	15.2	15.2
Actuated g/C Ratio	0.85	0.85	0.78	0.78	0.08	0.08
Clearance Time (s)	6.0	6.0	6.0	6.0	5.2	5.2
Vehicle Extension (s)	2.5	2.5	2.5	2.5	2.5	2.5
Lane Grp Cap (vph)	453	3019	2744	1227	289	133
v/s Ratio Prot	0.01	c0.89	0.29		c0.08	
v/s Ratio Perm	0.12			0.11		0.03
v/c Ratio	0.14	1.04	0.37	0.14	0.98	0.32
Uniform Delay, d1	2.9	13.2	6.4	5.1	82.3	77.5
Progression Factor	0.08	0.66	0.17	0.00	1.00	1.00
Incremental Delay, d2	0.0	18.9	0.3	0.2	47.9	1.0
Delay (s)	0.3	27.6	1.4	0.2	130.2	78.6
Level of Service	A	C	A	A	F	E
Approach Delay (s)		27.0	1.2		105.2	
Approach LOS		C	A		F	

Intersection Summary			
HCM 2000 Control Delay	29.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	1.07		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	17.2
Intersection Capacity Utilization	97.4%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Traffic Volume (vph)	257	2890	0	4	2	1034	38	1	0	0	63	0	100
Future Volume (vph)	257	2890	0	4	2	1034	38	1	0	0	63	0	100
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0			6.0	6.0	6.0		5.2			5.2	
Lane Util. Factor	1.00	0.95			1.00	0.95	1.00		1.00			1.00	
Frt	1.00	1.00			1.00	1.00	0.85		1.00			0.92	
Flt Protected	0.95	1.00			0.95	1.00	1.00		0.95			0.98	
Satd. Flow (prot)	1787	3574			1736	3471	1553		1787			1709	
Flt Permitted	0.22	1.00			0.03	1.00	1.00		0.40			0.87	
Satd. Flow (perm)	408	3574			53	3471	1553		744			1522	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	279	3141	0	4	2	1124	41	1	0	0	68	0	109
RTOR Reduction (vph)	0	0	0	0	0	0	10	0	0	0	0	84	0
Lane Group Flow (vph)	279	3141	0	0	6	1124	31	0	1	0	0	93	0
Heavy Vehicles (%)	1%	1%	1%	4%	4%	4%	4%	1%	1%	1%	0%	0%	0%
Turn Type	pm+pt	NA	Perm	pm+pt	pm+pt	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	1	6		5	5	2			4			8	
Permitted Phases	6		6	2	2		2	4			8		
Actuated Green, G (s)	154.2	146.6			139.6	138.0	138.0		14.6			14.6	
Effective Green, g (s)	154.2	146.6			139.6	138.0	138.0		14.6			14.6	
Actuated g/C Ratio	0.86	0.81			0.78	0.77	0.77		0.08			0.08	
Clearance Time (s)	6.0	6.0			6.0	6.0	6.0		5.2			5.2	
Vehicle Extension (s)	2.5	2.5			2.5	2.5	2.5		2.5			2.5	
Lane Grp Cap (vph)	427	2910			56	2661	1190		60			123	
v/s Ratio Prot	c0.04	c0.88			0.00	0.32							
v/s Ratio Perm	0.52				0.08		0.02		0.00			c0.06	
v/c Ratio	0.65	1.08			0.11	0.42	0.03		0.02			0.76	
Uniform Delay, d1	5.0	16.7			54.6	7.2	5.0		76.1			81.0	
Progression Factor	1.10	0.83			0.36	0.18	1.00		1.00			1.00	
Incremental Delay, d2	0.3	36.5			0.3	0.3	0.0		0.1			22.2	
Delay (s)	5.8	50.3			20.2	1.6	5.0		76.2			103.2	
Level of Service	A	D			C	A	A		E			F	
Approach Delay (s)		46.7				1.8			76.2			103.2	
Approach LOS		D				A			E			F	

Intersection Summary			
HCM 2000 Control Delay	37.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.06		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	17.2
Intersection Capacity Utilization	109.5%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Traffic Volume (vph)	377	1599	981	2	73	601	111	343	774	58	243	1254	134
Future Volume (vph)	377	1599	981	2	73	601	111	343	774	58	243	1254	134
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.3	6.3	6.3		6.3	6.3	6.3	6.2	6.2	6.2	6.2	6.2	6.2
Lane Util. Factor	1.00	0.95	1.00		1.00	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1787	3574	1599		1736	3471	1553	3367	3471	1553	1752	3505	1568
Flt Permitted	0.20	1.00	1.00		0.05	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	385	3574	1599		93	3471	1553	3367	3471	1553	1752	3505	1568
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	410	1738	1066	2	79	653	121	373	841	63	264	1363	146
RTOR Reduction (vph)	0	0	147	0	0	0	88	0	0	48	0	0	93
Lane Group Flow (vph)	410	1738	919	0	81	653	33	373	841	15	264	1363	53
Heavy Vehicles (%)	1%	1%	1%	4%	4%	4%	4%	4%	4%	4%	3%	3%	3%
Turn Type	D.P+P	NA	Perm	D.P+P	D.P+P	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	1	6		5	5	2		7	4		3	8	
Permitted Phases	2		6	6	6		2			4			8
Actuated Green, G (s)	84.4	78.4	78.4		84.4	49.6	49.6	15.8	43.8	43.8	26.8	54.8	54.8
Effective Green, g (s)	84.4	78.4	78.4		84.4	49.6	49.6	15.8	43.8	43.8	26.8	54.8	54.8
Actuated g/C Ratio	0.47	0.44	0.44		0.47	0.28	0.28	0.09	0.24	0.24	0.15	0.30	0.30
Clearance Time (s)	6.3	6.3	6.3		6.3	6.3	6.3	6.2	6.2	6.2	6.2	6.2	6.2
Vehicle Extension (s)	2.0	2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lane Grp Cap (vph)	451	1556	696		98	956	427	295	844	377	260	1067	477
v/s Ratio Prot	c0.18	0.49			0.03	0.19		c0.11	0.24		0.15	c0.39	
v/s Ratio Perm	0.25		c0.57		0.36		0.02			0.01			0.03
v/c Ratio	0.91	1.12	1.32		0.83	0.68	0.08	1.26	1.00	0.04	1.02	1.28	0.11
Uniform Delay, d1	38.7	50.8	50.8		42.7	58.2	48.3	82.1	68.0	52.0	76.6	62.6	45.1
Progression Factor	0.91	0.77	0.69		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.8	53.6	144.9		39.3	3.9	0.4	143.2	29.9	0.0	59.8	132.2	0.5
Delay (s)	38.1	92.7	180.0		82.1	62.1	48.6	225.3	97.9	52.1	136.4	194.8	45.5
Level of Service	D	F	F		F	E	D	F	F	D	F	F	D
Approach Delay (s)		114.7				62.1			132.8			173.8	
Approach LOS		F				E			F			F	

Intersection Summary			
HCM 2000 Control Delay	126.4	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.30		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	25.0
Intersection Capacity Utilization	116.1%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Traffic Volume (vph)	1	40	2378	492	26	777	72	82	41	33	107	191	90
Future Volume (vph)	1	40	2378	492	26	777	72	82	41	33	107	191	90
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.8	5.5	5.5	6.7	5.9		6.8	7.6		6.8	7.6	7.6
Lane Util. Factor		1.00	0.91	1.00	1.00	0.91		0.97	1.00		1.00	1.00	1.00
Frt		1.00	1.00	0.85	1.00	0.99		1.00	0.93		1.00	1.00	0.85
Flt Protected		0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1787	5136	1599	1719	4877		3467	1756		1787	1881	1599
Flt Permitted		0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.70	1.00	1.00
Satd. Flow (perm)		1787	5136	1599	1719	4877		3467	1756		1325	1881	1599
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1	43	2585	535	28	845	78	89	45	36	116	208	98
RTOR Reduction (vph)	0	0	0	98	0	7	0	0	18	0	0	0	84
Lane Group Flow (vph)	0	44	2585	437	28	916	0	89	63	0	116	208	14
Heavy Vehicles (%)	1%	1%	1%	1%	5%	5%	5%	1%	1%	1%	1%	1%	1%
Turn Type	Prot	Prot	NA	Perm	Prot	NA		Prot	NA		D.P+P	NA	Perm
Protected Phases	5	5	2		1	6		7	4		3	8	
Permitted Phases				2							4		8
Actuated Green, G (s)		50.0	114.4	114.4	6.6	71.5		7.0	24.5		32.4	25.4	25.4
Effective Green, g (s)		50.0	114.4	114.4	6.6	71.5		7.0	24.5		32.4	25.4	25.4
Actuated g/C Ratio		0.28	0.64	0.64	0.04	0.40		0.04	0.14		0.18	0.14	0.14
Clearance Time (s)		5.8	5.5	5.5	6.7	5.9		6.8	7.6		6.8	7.6	7.6
Vehicle Extension (s)		2.0	2.0	2.0	2.0	2.0		2.0	3.0		2.0	3.0	3.0
Lane Grp Cap (vph)		496	3264	1016	63	1937		134	239		258	265	225
v/s Ratio Prot		0.02	c0.50		0.02	c0.19		c0.03	0.04		0.02	c0.11	
v/s Ratio Perm				0.27							0.06		0.01
v/c Ratio		0.09	0.79	0.43	0.44	0.47		0.66	0.26		0.45	0.78	0.06
Uniform Delay, d1		48.1	24.1	16.4	84.9	40.3		85.3	69.7		64.8	74.7	67.0
Progression Factor		1.00	1.00	1.00	1.09	0.38		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2		0.0	2.1	1.3	1.8	0.8		9.2	0.6		0.5	14.1	0.1
Delay (s)		48.2	26.1	17.8	94.7	15.9		94.6	70.3		65.3	88.8	67.1
Level of Service		D	C	B	F	B		F	E		E	F	E
Approach Delay (s)			25.0			18.3			83.0			77.3	
Approach LOS			C			B			F			E	

Intersection Summary			
HCM 2000 Control Delay	30.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	26.6
Intersection Capacity Utilization	76.7%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Traffic Volume (vph)	6	2486	27	4	8	833	23	21	18	21	52	17	21
Future Volume (vph)	6	2486	27	4	8	833	23	21	18	21	52	17	21
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1	7.4			6.1	7.4			7.6			7.6	
Lane Util. Factor	1.00	0.91			1.00	0.91			1.00			1.00	
Frt	1.00	1.00			1.00	1.00			0.95			0.97	
Flt Protected	0.95	1.00			0.95	1.00			0.98			0.97	
Satd. Flow (prot)	1787	5127			1752	5016			1618			1687	
Flt Permitted	0.29	1.00			0.03	1.00			0.83			0.78	
Satd. Flow (perm)	549	5127			54	5016			1368			1354	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	7	2702	29	4	9	905	25	23	20	23	57	18	23
RTOR Reduction (vph)	0	0	0	0	0	1	0	0	12	0	0	7	0
Lane Group Flow (vph)	7	2731	0	0	13	929	0	0	54	0	0	91	0
Heavy Vehicles (%)	1%	1%	1%	3%	3%	3%	3%	10%	10%	10%	6%	6%	6%
Turn Type	D.P+P	NA		D.P+P	D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	1	6			8			4	
Permitted Phases	6			2	2			8			4		
Actuated Green, G (s)	142.7	139.5			142.7	141.7			16.2			16.2	
Effective Green, g (s)	142.7	139.5			142.7	141.7			16.2			16.2	
Actuated g/C Ratio	0.79	0.78			0.79	0.79			0.09			0.09	
Clearance Time (s)	6.1	7.4			6.1	7.4			7.6			7.6	
Vehicle Extension (s)	2.0	2.0			2.0	2.0			2.0			2.0	
Lane Grp Cap (vph)	442	3973			72	3948			123			121	
v/s Ratio Prot	0.00	c0.53			0.00	c0.19							
v/s Ratio Perm	0.01				0.14				0.04			c0.07	
v/c Ratio	0.02	0.69			0.18	0.24			0.44			0.75	
Uniform Delay, d1	3.9	9.7			21.6	5.0			77.6			79.9	
Progression Factor	0.23	0.23			2.09	1.12			1.00			1.00	
Incremental Delay, d2	0.0	0.6			0.4	0.1			0.9			19.7	
Delay (s)	0.9	2.8			45.7	5.7			78.5			99.6	
Level of Service	A	A			D	A			E			F	
Approach Delay (s)		2.8				6.3			78.5			99.6	
Approach LOS		A				A			E			F	

Intersection Summary			
HCM 2000 Control Delay	7.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	21.1
Intersection Capacity Utilization	69.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Traffic Volume (vph)	6	25	2470	63	42	755	37	68	71	68	200	228	40
Future Volume (vph)	6	25	2470	63	42	755	37	68	71	68	200	228	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.1	7.4		6.1	7.4	7.4	6.8	7.6		6.8	7.6	
Lane Util. Factor		1.00	0.91		1.00	0.91	1.00	1.00	1.00		1.00	1.00	
Frt		1.00	1.00		1.00	1.00	0.85	1.00	0.93		1.00	0.98	
Flt Protected		0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1787	5117		1752	5036	1568	1770	1726		1719	1769	
Flt Permitted		0.31	1.00		0.04	1.00	1.00	0.25	1.00		0.52	1.00	
Satd. Flow (perm)		577	5117		70	5036	1568	465	1726		947	1769	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	7	27	2685	68	46	821	40	74	77	74	217	248	43
RTOR Reduction (vph)	0	0	1	0	0	0	16	0	20	0	0	4	0
Lane Group Flow (vph)	0	34	2752	0	46	821	24	74	131	0	217	287	0
Heavy Vehicles (%)	1%	1%	1%	1%	3%	3%	3%	2%	2%	2%	5%	5%	5%
Turn Type	D.P+P	D.P+P	NA		D.P+P	NA	Perm	D.P+P	NA		D.P+P	NA	
Protected Phases	5	5	2		1	6		3	8		7	4	
Permitted Phases	6	6			2		6	4			8		
Actuated Green, G (s)		110.7	105.8		110.7	105.8	105.8	41.4	29.6		41.4	35.5	
Effective Green, g (s)		110.7	105.8		110.7	105.8	105.8	41.4	29.6		41.4	35.5	
Actuated g/C Ratio		0.62	0.59		0.62	0.59	0.59	0.23	0.16		0.23	0.20	
Clearance Time (s)		6.1	7.4		6.1	7.4	7.4	6.8	7.6		6.8	7.6	
Vehicle Extension (s)		2.0	4.5		2.0	4.5	4.5	3.0	2.0		3.0	2.0	
Lane Grp Cap (vph)		387	3007		88	2960	921	149	283		268	348	
v/s Ratio Prot		0.00	c0.54		c0.01	0.16		0.02	0.08		c0.05	c0.16	
v/s Ratio Perm		0.05			0.31		0.01	0.10			0.13		
v/c Ratio		0.09	0.92		0.52	0.28	0.03	0.50	0.46		0.81	0.82	
Uniform Delay, d1		13.8	33.1		76.2	18.3	15.5	57.3	68.0		64.3	69.3	
Progression Factor		0.34	0.52		1.13	0.55	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.0	4.4		2.5	0.2	0.0	2.6	0.4		16.3	14.0	
Delay (s)		4.6	21.5		88.4	10.3	15.6	59.9	68.4		80.6	83.2	
Level of Service		A	C		F	B	B	E	E		F	F	
Approach Delay (s)			21.3			14.5			65.6			82.1	
Approach LOS			C			B			E			F	

Intersection Summary			
HCM 2000 Control Delay	29.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	27.9
Intersection Capacity Utilization	99.2%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations														
Traffic Volume (vph)	3	80	2522	133	5	8	714	358	49	167	54	400	264	67
Future Volume (vph)	3	80	2522	133	5	8	714	358	49	167	54	400	264	67
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.4	8.7	8.7		6.9	8.7	8.7	6.8	7.9		6.8	7.9	7.9
Lane Util. Factor		1.00	0.91	1.00		1.00	0.91	1.00	1.00	1.00		0.97	1.00	1.00
Frt		1.00	1.00	0.85		1.00	1.00	0.85	1.00	0.96		1.00	1.00	0.85
Flt Protected		0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1593	4577	1425		1577	4532	1411	1624	1647		3090	1676	1425
Flt Permitted		0.31	1.00	1.00		0.04	1.00	1.00	0.38	1.00		0.95	1.00	1.00
Satd. Flow (perm)		525	4577	1425		71	4532	1411	650	1647		3090	1676	1425
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	3	87	2741	145	5	9	776	389	53	182	59	435	287	73
RTOR Reduction (vph)	0	0	0	69	0	0	0	197	0	7	0	0	0	53
Lane Group Flow (vph)	0	90	2741	76	0	14	776	192	53	234	0	435	287	20
Heavy Vehicles (%)	2%	2%	2%	2%	3%	3%	3%	3%	0%	0%	0%	2%	2%	2%
Turn Type	D.P+P	D.P+P	NA	Perm	D.P+P	D.P+P	NA	Perm	D.P+P	NA		Prot	NA	Perm
Protected Phases	1	1	6		5	5	2		7	4		3	8	
Permitted Phases	2	2		6	6	6		2	8					8
Actuated Green, G (s)		95.6	94.1	94.1		96.1	88.8	88.8	53.6	27.9		25.7	48.7	48.7
Effective Green, g (s)		95.6	94.1	94.1		96.1	88.8	88.8	53.6	27.9		25.7	48.7	48.7
Actuated g/C Ratio		0.53	0.52	0.52		0.53	0.49	0.49	0.30	0.15		0.14	0.27	0.27
Clearance Time (s)		7.4	8.7	8.7		6.9	8.7	8.7	6.8	7.9		6.8	7.9	7.9
Vehicle Extension (s)		2.0	2.0	2.0		2.0	2.0	2.0	2.0	2.0		2.0	2.0	2.0
Lane Grp Cap (vph)		319	2392	744		54	2235	696	220	255		441	453	385
v/s Ratio Prot		c0.01	c0.60			0.00	0.17		0.01	c0.14		c0.14	0.17	
v/s Ratio Perm		0.14		0.05		0.13		0.14	0.07					0.01
v/c Ratio		0.28	1.15	0.10		0.26	0.35	0.28	0.24	0.92		0.99	0.63	0.05
Uniform Delay, d1		21.2	43.0	21.6		42.5	27.9	26.7	46.7	74.9		77.0	57.8	48.6
Progression Factor		0.25	0.40	0.03		1.02	0.11	0.95	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2		0.1	68.2	0.1		0.8	0.4	0.8	0.2	34.4		38.8	2.1	0.0
Delay (s)		5.4	85.4	0.7		44.1	3.4	26.3	46.9	109.3		115.8	59.9	48.6
Level of Service		A	F	A		D	A	C	D	F		F	E	D
Approach Delay (s)			78.8				11.4			98.1			89.5	
Approach LOS			E				B			F			F	

Intersection Summary			
HCM 2000 Control Delay	66.4	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.08		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	30.8
Intersection Capacity Utilization	109.7%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Lane Configurations														
Traffic Volume (vph)	5	244	2097	635	220	608	75	367	394	141	3	452	649	104
Future Volume (vph)	5	244	2097	635	220	608	75	367	394	141	3	452	649	104
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.4	5.9	5.9	7.4	5.9	5.9	7.0	5.4	5.4		7.0	5.4	5.4
Lane Util. Factor		0.97	0.91	1.00	0.97	0.91	1.00	0.97	0.95	1.00		0.97	0.95	1.00
Frt		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85		1.00	1.00	0.85
Flt Protected		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00		0.95	1.00	1.00
Satd. Flow (prot)		3467	5136	1599	3367	4988	1553	3433	3539	1583		3433	3539	1583
Flt Permitted		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00		0.95	1.00	1.00
Satd. Flow (perm)		3467	5136	1599	3367	4988	1553	3433	3539	1583		3433	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	5	265	2279	690	239	661	82	399	428	153	3	491	705	113
RTOR Reduction (vph)	0	0	0	131	0	0	68	0	0	120	0	0	0	89
Lane Group Flow (vph)	0	270	2279	559	239	661	14	399	428	33	0	494	705	24
Heavy Vehicles (%)	1%	1%	1%	1%	4%	4%	4%	2%	2%	2%	2%	2%	2%	2%
Turn Type	Prot	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	Prot	NA	Perm
Protected Phases	1	1	6		5	2		7	4		3	3	8	
Permitted Phases				6			2			4				8
Actuated Green, G (s)		62.9	80.0	80.0	13.1	30.2	30.2	22.3	26.3	26.3		34.9	38.9	38.9
Effective Green, g (s)		62.9	80.0	80.0	13.1	30.2	30.2	22.3	26.3	26.3		34.9	38.9	38.9
Actuated g/C Ratio		0.35	0.44	0.44	0.07	0.17	0.17	0.12	0.15	0.15		0.19	0.22	0.22
Clearance Time (s)		7.4	5.9	5.9	7.4	5.9	5.9	7.0	5.4	5.4		7.0	5.4	5.4
Vehicle Extension (s)		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	2.0
Lane Grp Cap (vph)		1211	2282	710	245	836	260	425	517	231		665	764	342
v/s Ratio Prot		0.08	c0.44		c0.07	0.13		c0.12	0.12			0.14	c0.20	
v/s Ratio Perm				0.35			0.01			0.02				0.02
v/c Ratio		0.22	1.00	0.79	0.98	0.79	0.05	0.94	0.83	0.14		0.74	0.92	0.07
Uniform Delay, d1		41.3	49.9	42.7	83.3	71.9	62.9	78.2	74.7	67.0		68.3	69.1	56.2
Progression Factor		0.66	0.44	0.33	1.20	0.78	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2		0.0	5.4	0.8	49.7	7.4	0.4	28.1	10.0	0.1		3.9	16.4	0.0
Delay (s)		27.1	27.3	15.0	149.4	63.2	63.3	106.3	84.7	67.1		72.3	85.5	56.2
Level of Service		C	C	B	F	E	E	F	F	E		E	F	E
Approach Delay (s)			24.7			84.2			90.7				78.0	
Approach LOS			C			F			F				E	

Intersection Summary			
HCM 2000 Control Delay	54.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	25.7
Intersection Capacity Utilization	95.7%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	2654	30	30	868	5	30	0	30	5	0	5
Future Volume (vph)	5	2654	30	30	868	5	30	0	30	5	0	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1	7.4		6.1	7.4			7.2	7.2	6.4	7.2	
Lane Util. Factor	1.00	0.91		1.00	0.91			1.00	1.00	1.00	1.00	
Frt	1.00	1.00		1.00	1.00			1.00	0.85	1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00			0.95	1.00	0.95	1.00	
Satd. Flow (prot)	1770	5077		1770	5081			1770	1583	1770	1583	
Flt Permitted	0.29	1.00		0.03	1.00			0.75	1.00	0.74	1.00	
Satd. Flow (perm)	534	5077		53	5081			1405	1583	1370	1583	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	5	2885	33	33	943	5	33	0	33	5	0	5
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	32	0	5	0
Lane Group Flow (vph)	5	2918	0	33	948	0	0	33	1	5	0	0
Turn Type	D.P+P	NA		D.P+P	NA		D.P+P	NA	Perm	D.P+P	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	2			6			8		4	4		
Actuated Green, G (s)	144.3	139.9		144.3	143.3			7.8	7.8	8.6	15.0	
Effective Green, g (s)	144.3	139.9		144.3	143.3			7.8	7.8	8.6	15.0	
Actuated g/C Ratio	0.80	0.78		0.80	0.80			0.04	0.04	0.05	0.08	
Clearance Time (s)	6.1	7.4		6.1	7.4			7.2	7.2	6.4	7.2	
Vehicle Extension (s)	2.0	2.0		2.0	2.0			2.0	2.0	2.0	2.0	
Lane Grp Cap (vph)	434	3945		84	4045			60	68	67	131	
v/s Ratio Prot	0.00	c0.57		c0.01	c0.19					c0.00	0.00	
v/s Ratio Perm	0.01			0.30				c0.02	0.00	0.00		
v/c Ratio	0.01	0.74		0.39	0.23			0.55	0.02	0.07	0.00	
Uniform Delay, d1	3.6	10.5		15.6	4.6			84.4	82.4	81.8	75.6	
Progression Factor	0.16	0.53		2.03	0.75			1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.0	0.5		1.1	0.1			6.1	0.0	0.2	0.0	
Delay (s)	0.6	6.0		32.8	3.6			90.4	82.5	82.0	75.6	
Level of Service	A	A		C	A			F	F	F	E	
Approach Delay (s)		6.0			4.6			86.5			78.8	
Approach LOS		A			A			F			E	

Intersection Summary			
HCM 2000 Control Delay	7.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	27.1
Intersection Capacity Utilization	80.1%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	2599	90	197	885	18	147
Future Volume (vph)	2599	90	197	885	18	147
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.7		6.4	7.7	7.6	7.6
Lane Util. Factor	0.91		1.00	0.91	1.00	1.00
Frt	0.99		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	5110		1752	5036	1805	1615
Flt Permitted	1.00		0.03	1.00	0.95	1.00
Satd. Flow (perm)	5110		54	5036	1805	1615
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2825	98	214	962	20	160
RTOR Reduction (vph)	1	0	0	0	0	152
Lane Group Flow (vph)	2922	0	214	962	20	8
Heavy Vehicles (%)	1%	1%	3%	3%	0%	0%
Turn Type	NA		D.P+P	NA	Prot	Perm
Protected Phases	6		5	2	4	
Permitted Phases			6			4
Actuated Green, G (s)	136.6		149.2	155.6	9.1	9.1
Effective Green, g (s)	136.6		149.2	155.6	9.1	9.1
Actuated g/C Ratio	0.76		0.83	0.86	0.05	0.05
Clearance Time (s)	7.7		6.4	7.7	7.6	7.6
Vehicle Extension (s)	0.2		2.0	0.2	2.0	2.0
Lane Grp Cap (vph)	3877		163	4353	91	81
v/s Ratio Prot	0.57		c0.09	0.19	c0.01	
v/s Ratio Perm			c0.99			0.01
v/c Ratio	0.75		1.31	0.22	0.22	0.10
Uniform Delay, d1	12.2		44.8	2.0	82.0	81.5
Progression Factor	0.21		0.55	0.33	1.00	1.00
Incremental Delay, d2	1.0		176.2	0.1	0.4	0.2
Delay (s)	3.5		201.1	0.8	82.5	81.7
Level of Service	A		F	A	F	F
Approach Delay (s)	3.5			37.2	81.8	
Approach LOS	A			D	F	

Intersection Summary			
HCM 2000 Control Delay	16.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	1.28		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	25.7
Intersection Capacity Utilization	87.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	60	2686	836	199	261	245
Future Volume (vph)	60	2686	836	199	261	245
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.4	8.7	8.7	8.7	7.2	7.2
Lane Util. Factor	1.00	0.91	0.91	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1787	5136	4988	1553	1752	1568
Flt Permitted	0.29	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	540	5136	4988	1553	1752	1568
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	65	2920	909	216	284	266
RTOR Reduction (vph)	0	0	0	72	0	208
Lane Group Flow (vph)	65	2920	909	144	284	58
Heavy Vehicles (%)	1%	1%	4%	4%	3%	3%
Turn Type	D.P+P	NA	NA	Perm	Prot	Perm
Protected Phases	1	6	2		4	
Permitted Phases	2			2		4
Actuated Green, G (s)	125.3	132.7	117.3	117.3	31.4	31.4
Effective Green, g (s)	125.3	132.7	117.3	117.3	31.4	31.4
Actuated g/C Ratio	0.70	0.74	0.65	0.65	0.17	0.17
Clearance Time (s)	7.4	8.7	8.7	8.7	7.2	7.2
Vehicle Extension (s)	2.5	2.5	2.5	2.5	2.5	2.5
Lane Grp Cap (vph)	431	3786	3250	1012	305	273
v/s Ratio Prot	0.01	c0.57	0.18		c0.16	
v/s Ratio Perm	0.10			0.09		0.04
v/c Ratio	0.15	0.77	0.28	0.14	0.93	0.21
Uniform Delay, d1	8.7	14.4	13.4	12.0	73.2	63.7
Progression Factor	0.10	0.08	0.26	0.15	1.00	1.00
Incremental Delay, d2	0.1	1.1	0.2	0.3	33.9	0.3
Delay (s)	0.9	2.2	3.7	2.1	107.1	64.0
Level of Service	A	A	A	A	F	E
Approach Delay (s)		2.2	3.4		86.2	
Approach LOS		A	A		F	

Intersection Summary			
HCM 2000 Control Delay	12.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	27.3
Intersection Capacity Utilization	79.6%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Traffic Volume (vph)	257	2690	0	4	2	934	38	1	0	0	63	0	100
Future Volume (vph)	257	2690	0	4	2	934	38	1	0	0	63	0	100
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1	7.4			6.1	7.4			7.0			7.0	
Lane Util. Factor	1.00	0.91			1.00	0.91			1.00			1.00	
Frt	1.00	1.00			1.00	0.99			1.00			0.92	
Flt Protected	0.95	1.00			0.95	1.00			0.95			0.98	
Satd. Flow (prot)	1787	5136			1736	4958			1805			1692	
Flt Permitted	0.24	1.00			0.03	1.00			0.39			0.87	
Satd. Flow (perm)	456	5136			51	4958			750			1507	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	279	2924	0	4	2	1015	41	1	0	0	68	0	109
RTOR Reduction (vph)	0	0	0	0	0	2	0	0	0	0	0	99	0
Lane Group Flow (vph)	279	2924	0	0	6	1054	0	0	1	0	0	78	0
Heavy Vehicles (%)	1%	1%	1%	4%	4%	4%	4%	0%	0%	0%	1%	1%	1%
Turn Type	D.P+P	NA		D.P+P	D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	5	2			4			8	
Permitted Phases	2			6	6			4			8		
Actuated Green, G (s)	144.5	142.9			144.5	124.1			15.0			15.0	
Effective Green, g (s)	144.5	142.9			144.5	124.1			15.0			15.0	
Actuated g/C Ratio	0.80	0.79			0.80	0.69			0.08			0.08	
Clearance Time (s)	6.1	7.4			6.1	7.4			7.0			7.0	
Vehicle Extension (s)	2.5	2.5			2.5	2.5			2.5			2.5	
Lane Grp Cap (vph)	516	4077			55	3418			62			125	
v/s Ratio Prot	0.06	c0.57			0.00	0.21							
v/s Ratio Perm	c0.37				0.08				0.00			c0.05	
v/c Ratio	0.54	0.72			0.11	0.31			0.02			0.62	
Uniform Delay, d1	4.6	8.9			20.6	11.0			75.7			79.8	
Progression Factor	2.05	0.76			0.38	0.34			1.00			1.00	
Incremental Delay, d2	0.5	0.7			0.4	0.2			0.1			8.1	
Delay (s)	9.9	7.4			8.2	3.9			75.8			87.9	
Level of Service	A	A			A	A			E			F	
Approach Delay (s)		7.6				3.9			75.8			87.9	
Approach LOS		A				A			E			F	

Intersection Summary			
HCM 2000 Control Delay	10.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	20.5
Intersection Capacity Utilization	84.4%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Traffic Volume (vph)	377	1399	981	2	73	501	111	343	774	58	243	1254	134
Future Volume (vph)	377	1399	981	2	73	501	111	343	774	58	243	1254	134
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	5.6	4.0		7.0	5.6	5.6	6.8	5.4	5.4	7.0	5.6	5.6
Lane Util. Factor	0.97	0.95	1.00		1.00	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3467	3574	1599		1736	3471	1553	3367	3471	1553	1752	3505	1568
Flt Permitted	0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3467	3574	1599		1736	3471	1553	3367	3471	1553	1752	3505	1568
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	410	1521	1066	2	79	545	121	373	841	63	264	1363	146
RTOR Reduction (vph)	0	0	0	0	0	0	87	0	0	45	0	0	94
Lane Group Flow (vph)	410	1521	1066	0	81	545	34	373	841	18	264	1363	52
Heavy Vehicles (%)	1%	1%	1%	4%	4%	4%	4%	4%	4%	4%	3%	3%	3%
Turn Type	Prot	NA	Free	Prot	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	1	6		5	5	2		7	4		3	8	
Permitted Phases			Free				2			4			8
Actuated Green, G (s)	25.1	70.4	180.0		6.0	51.3	51.3	17.2	50.6	50.6	28.0	61.4	61.4
Effective Green, g (s)	25.1	70.4	180.0		6.0	51.3	51.3	17.2	50.6	50.6	28.0	61.4	61.4
Actuated g/C Ratio	0.14	0.39	1.00		0.03	0.28	0.28	0.10	0.28	0.28	0.16	0.34	0.34
Clearance Time (s)	7.0	5.6			7.0	5.6	5.6	6.8	5.4	5.4	7.0	5.6	5.6
Vehicle Extension (s)	2.0	2.0			2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lane Grp Cap (vph)	483	1397	1599		57	989	442	321	975	436	272	1195	534
v/s Ratio Prot	0.12	c0.43			0.05	0.16		0.11	0.24		c0.15	c0.39	
v/s Ratio Perm			c0.67				0.02			0.01			0.03
v/c Ratio	0.85	1.09	0.67		1.42	0.55	0.08	1.16	0.86	0.04	0.97	1.14	0.10
Uniform Delay, d1	75.6	54.8	0.0		87.0	54.6	47.1	81.4	61.4	47.0	75.6	59.3	40.4
Progression Factor	1.00	0.76	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	9.4	49.1	1.6		265.5	2.2	0.3	101.7	7.7	0.0	46.1	73.7	0.0
Delay (s)	84.7	91.0	1.6		352.5	56.8	47.4	183.1	69.1	47.1	121.7	133.0	40.5
Level of Service	F	F	A		F	E	D	F	E	D	F	F	D
Approach Delay (s)		58.4				87.3			101.3			123.7	
Approach LOS		E				F			F			F	

Intersection Summary			
HCM 2000 Control Delay	86.7	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.14		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	25.0
Intersection Capacity Utilization	109.0%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Traffic Volume (vph)	15	54	949	153	21	1799	203	352	107	0	78	47	69
Future Volume (vph)	15	54	949	153	21	1799	203	352	107	0	78	47	69
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.0	6.0	6.0	7.0	6.0	6.0		7.5			7.5	4.0
Lane Util. Factor		1.00	0.95	1.00	1.00	0.95	1.00		1.00			1.00	1.00
Frt		1.00	1.00	0.85	1.00	1.00	0.85		1.00			1.00	0.85
Flt Protected		0.95	1.00	1.00	0.95	1.00	1.00		0.96			0.97	1.00
Satd. Flow (prot)		1787	3574	1599	1787	3574	1599		1830			1842	1615
Flt Permitted		0.95	1.00	1.00	0.95	1.00	1.00		0.96			0.97	1.00
Satd. Flow (perm)		1787	3574	1599	1787	3574	1599		1830			1842	1615
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	16	59	1032	166	23	1955	221	383	116	0	85	51	75
RTOR Reduction (vph)	0	0	0	78	0	0	76	0	0	0	0	0	0
Lane Group Flow (vph)	0	75	1032	88	23	1955	145	0	499	0	0	136	75
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	Prot	NA	Perm	Prot	NA	Perm	Split	NA	Perm	Split	NA	Free
Protected Phases	5	5	2		1	6		3	3		4	4	
Permitted Phases				2			6			3			Free
Actuated Green, G (s)		7.8	71.4	71.4	3.6	67.2	67.2		36.5			10.5	150.0
Effective Green, g (s)		7.8	71.4	71.4	3.6	67.2	67.2		36.5			10.5	150.0
Actuated g/C Ratio		0.05	0.48	0.48	0.02	0.45	0.45		0.24			0.07	1.00
Clearance Time (s)		7.0	6.0	6.0	7.0	6.0	6.0		7.5			7.5	
Vehicle Extension (s)		2.0	2.0	2.0	2.0	2.0	2.0		2.0			3.0	
Lane Grp Cap (vph)		92	1701	761	42	1601	716		445			128	1615
v/s Ratio Prot		0.04	c0.29		0.01	c0.55			c0.27			c0.07	
v/s Ratio Perm				0.05			0.09						0.05
v/c Ratio		0.82	0.61	0.12	0.55	1.22	0.20		1.12			1.06	0.05
Uniform Delay, d1		70.4	29.0	21.8	72.4	41.4	25.1		56.8			69.8	0.0
Progression Factor		1.00	1.00	1.00	1.16	0.58	0.25		1.00			1.00	1.00
Incremental Delay, d2		38.7	1.6	0.3	4.6	103.1	0.4		80.1			97.3	0.1
Delay (s)		109.1	30.6	22.1	88.5	127.0	6.7		136.8			167.0	0.1
Level of Service		F	C	C	F	F	A		F			F	A
Approach Delay (s)			34.1			114.5			136.8			107.7	
Approach LOS			C			F			F			F	

Intersection Summary			
HCM 2000 Control Delay	92.4	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.15		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	28.0
Intersection Capacity Utilization	100.4%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations														
Traffic Volume (vph)	1	32	993	14	10	24	1912	54	89	38	24	31	17	21
Future Volume (vph)	1	32	993	14	10	24	1912	54	89	38	24	31	17	21
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	5.5	5.5		6.0	5.5	5.5		6.0	6.0		6.0	
Lane Util. Factor		1.00	0.95	1.00		1.00	0.95	1.00		1.00	1.00		1.00	
Frt		1.00	1.00	0.85		1.00	1.00	0.85		1.00	0.85		0.96	
Flt Protected		0.95	1.00	1.00		0.95	1.00	1.00		0.97	1.00		0.98	
Satd. Flow (prot)		1787	3574	1599		1787	3574	1599		1835	1615		1763	
Flt Permitted		0.95	1.00	1.00		0.95	1.00	1.00		0.74	1.00		0.61	
Satd. Flow (perm)		1787	3574	1599		1787	3574	1599		1398	1615		1105	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1	35	1079	15	11	26	2078	59	97	41	26	34	18	23
RTOR Reduction (vph)	0	0	0	4	0	0	0	17	0	0	23	0	12	0
Lane Group Flow (vph)	0	36	1079	11	0	37	2078	42	0	138	3	0	63	0
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	0%	0%	0%	1%	1%	1%
Turn Type	Prot	Prot	NA	Perm	Prot	Prot	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases	5	5	2		1	1	6			8			4	
Permitted Phases				2				6	8		8	4		
Actuated Green, G (s)		6.7	106.6	106.6		6.9	106.8	106.8		19.0	19.0		19.0	
Effective Green, g (s)		6.7	106.6	106.6		6.9	106.8	106.8		19.0	19.0		19.0	
Actuated g/C Ratio		0.04	0.71	0.71		0.05	0.71	0.71		0.13	0.13		0.13	
Clearance Time (s)		6.0	5.5	5.5		6.0	5.5	5.5		6.0	6.0		6.0	
Vehicle Extension (s)		2.0	2.0	2.0		2.0	2.0	2.0		2.0	2.0		2.0	
Lane Grp Cap (vph)		79	2539	1136		82	2544	1138		177	204		139	
v/s Ratio Prot		0.02	c0.30			0.02	c0.58							
v/s Ratio Perm				0.01				0.03		c0.10	0.00		0.06	
v/c Ratio		0.46	0.42	0.01		0.45	0.82	0.04		0.78	0.02		0.45	
Uniform Delay, d1		69.9	9.0	6.3		69.7	14.9	6.4		63.5	57.3		60.7	
Progression Factor		1.14	0.64	1.00		0.70	0.26	0.18		1.00	1.00		1.00	
Incremental Delay, d2		1.2	0.4	0.0		0.7	1.5	0.0		17.7	0.0		0.9	
Delay (s)		81.0	6.2	6.3		49.5	5.4	1.2		81.2	57.3		61.5	
Level of Service		F	A	A		D	A	A		F	E		E	
Approach Delay (s)			8.6				6.0			77.4			61.5	
Approach LOS			A				A			E			E	

Intersection Summary			
HCM 2000 Control Delay	11.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	17.5
Intersection Capacity Utilization	73.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations														
Traffic Volume (vph)	6	33	988	31	12	55	1929	91	49	108	42	42	38	36
Future Volume (vph)	6	33	988	31	12	55	1929	91	49	108	42	42	38	36
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.8	5.8	5.8		5.8	5.8	5.8		6.6			6.6	
Lane Util. Factor		1.00	0.95	1.00		1.00	0.95	1.00		1.00			1.00	
Frt		1.00	1.00	0.85		1.00	1.00	0.85		0.97			0.96	
Flt Protected		0.95	1.00	1.00		0.95	1.00	1.00		0.99			0.98	
Satd. Flow (prot)		1770	3539	1583		1770	3539	1583		1787			1753	
Flt Permitted		0.04	1.00	1.00		0.20	1.00	1.00		0.84			0.64	
Satd. Flow (perm)		79	3539	1583		375	3539	1583		1526			1149	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	7	36	1074	34	13	60	2097	99	53	117	46	46	41	39
RTOR Reduction (vph)	0	0	0	11	0	0	0	22	0	7	0	0	11	0
Lane Group Flow (vph)	0	43	1074	23	0	73	2097	77	0	209	0	0	115	0
Turn Type	pm+pt	pm+pt	NA	Perm	pm+pt	pm+pt	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	5	2		1	1	6			8			4	
Permitted Phases	2	2		2	6	6		6	8			4		
Actuated Green, G (s)		99.6	99.6	99.6		101.0	101.0	101.0		26.0			26.0	
Effective Green, g (s)		99.6	99.6	99.6		101.0	101.0	101.0		26.0			26.0	
Actuated g/C Ratio		0.66	0.66	0.66		0.67	0.67	0.67		0.17			0.17	
Clearance Time (s)		5.8	5.8	5.8		5.8	5.8	5.8		6.6			6.6	
Vehicle Extension (s)		2.0	4.5	4.5		2.0	4.5	4.5		2.0			2.0	
Lane Grp Cap (vph)		106	2349	1051		310	2382	1065		264			199	
v/s Ratio Prot		0.01	c0.30			0.01	c0.59							
v/s Ratio Perm		0.26		0.01		0.15		0.05		c0.14			0.10	
v/c Ratio		0.41	0.46	0.02		0.24	0.88	0.07		0.79			0.58	
Uniform Delay, d1		50.8	12.2	8.6		10.4	19.7	8.4		59.4			57.0	
Progression Factor		0.56	0.39	0.11		0.30	0.30	0.03		1.00			1.00	
Incremental Delay, d2		0.9	0.6	0.0		0.0	0.5	0.0		14.1			2.5	
Delay (s)		29.3	5.4	1.0		3.2	6.3	0.2		73.5			59.5	
Level of Service		C	A	A		A	A	A		E			E	
Approach Delay (s)			6.2				5.9			73.5			59.5	
Approach LOS			A				A			E			E	

Intersection Summary			
HCM 2000 Control Delay	11.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	18.2
Intersection Capacity Utilization	86.8%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations														
Traffic Volume (vph)	3	71	957	53	7	33	1915	419	118	159	54	251	223	90
Future Volume (vph)	3	71	957	53	7	33	1915	419	118	159	54	251	223	90
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.1	6.1	6.1		6.1	6.1	6.1	5.9	5.9		5.9	5.9	5.9
Lane Util. Factor		1.00	0.95	1.00		1.00	0.95	1.00	1.00	1.00		1.00	1.00	1.00
Frpb, ped/bikes		1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Flpb, ped/bikes		1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt		1.00	1.00	0.85		1.00	1.00	0.85	1.00	0.96		1.00	1.00	0.85
Flt Protected		0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1770	3539	1583		1770	3539	1583	1770	1792		1770	1863	1583
Flt Permitted		0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)		1770	3539	1583		1770	3539	1583	1770	1792		1770	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	3	77	1040	58	8	36	2082	455	128	173	59	273	242	98
RTOR Reduction (vph)	0	0	0	33	0	0	0	91	0	8	0	0	0	84
Lane Group Flow (vph)	0	80	1040	25	0	44	2082	364	128	224	0	273	242	14
Confl. Peds. (#/hr)									11					
Turn Type	Prot	Prot	NA	Perm	Prot	Prot	NA	Perm	Split	NA		Split	NA	Perm
Protected Phases	1	1	6		5	5	2		4	4		8	8	
Permitted Phases				6				2						8
Actuated Green, G (s)		9.2	65.7	65.7		23.1	79.6	79.6	16.1	16.1		21.1	21.1	21.1
Effective Green, g (s)		9.2	65.7	65.7		23.1	79.6	79.6	16.1	16.1		21.1	21.1	21.1
Actuated g/C Ratio		0.06	0.44	0.44		0.15	0.53	0.53	0.11	0.11		0.14	0.14	0.14
Clearance Time (s)		6.1	6.1	6.1		6.1	6.1	6.1	5.9	5.9		5.9	5.9	5.9
Vehicle Extension (s)		2.0	5.0	5.0		2.0	5.0	5.0	3.0	3.0		2.0	2.0	2.0
Lane Grp Cap (vph)		108	1550	693		272	1878	840	189	192		248	262	222
v/s Ratio Prot		c0.05	0.29			0.02	c0.59		0.07	c0.13		c0.15	0.13	
v/s Ratio Perm				0.02				0.23						0.01
v/c Ratio		0.74	0.67	0.04		0.16	1.11	0.43	0.68	1.17		1.10	0.92	0.06
Uniform Delay, d1		69.2	33.5	24.1		55.1	35.2	21.5	64.4	67.0		64.5	63.7	55.9
Progression Factor		0.83	0.38	1.00		0.66	0.38	0.20	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2		19.1	2.1	0.1		0.0	51.1	0.4	9.2	117.0		86.8	35.2	0.0
Delay (s)		76.5	14.8	24.2		36.6	64.5	4.6	73.7	183.9		151.2	98.8	55.9
Level of Service		E	B	C		D	E	A	E	F		F	F	E
Approach Delay (s)			19.4				53.5			144.7			115.3	
Approach LOS			B				D			F			F	

Intersection Summary			
HCM 2000 Control Delay	60.0	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.09		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	24.0
Intersection Capacity Utilization	102.0%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Lane Configurations														
Traffic Volume (vph)	16	132	769	327	230	1795	188	442	274	149	1	127	280	145
Future Volume (vph)	16	132	769	327	230	1795	188	442	274	149	1	127	280	145
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.7	6.7	6.7	6.7	6.7	6.7	6.3	6.3	6.3		6.3	6.3	6.3
Lane Util. Factor		0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00		0.97	0.95	1.00
Frt		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85		1.00	1.00	0.85
Flt Protected		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00		0.95	1.00	1.00
Satd. Flow (prot)		3467	3574	1599	3467	3574	1599	3467	3574	1599		3502	3610	1615
Flt Permitted		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00		0.95	1.00	1.00
Satd. Flow (perm)		3467	3574	1599	3467	3574	1599	3467	3574	1599		3502	3610	1615
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	17	143	836	355	250	1951	204	480	298	162	1	138	304	158
RTOR Reduction (vph)	0	0	0	151	0	0	83	0	0	144	0	0	0	140
Lane Group Flow (vph)	0	160	836	204	250	1951	121	480	298	18	0	139	304	18
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	0%	0%	0%	0%
Turn Type	Prot	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	Prot	NA	Perm
Protected Phases	1	1	6		5	2		7	4		3	3	8	
Permitted Phases				6			2			4				8
Actuated Green, G (s)		6.3	65.6	65.6	14.7	74.0	74.0	26.7	16.9	16.9		26.8	17.0	17.0
Effective Green, g (s)		6.3	65.6	65.6	14.7	74.0	74.0	26.7	16.9	16.9		26.8	17.0	17.0
Actuated g/C Ratio		0.04	0.44	0.44	0.10	0.49	0.49	0.18	0.11	0.11		0.18	0.11	0.11
Clearance Time (s)		6.7	6.7	6.7	6.7	6.7	6.7	6.3	6.3	6.3		6.3	6.3	6.3
Vehicle Extension (s)		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	2.0
Lane Grp Cap (vph)		145	1563	699	339	1763	788	617	402	180		625	409	183
v/s Ratio Prot		c0.05	0.23		0.07	c0.55		c0.14	0.08			0.04	c0.08	
v/s Ratio Perm				0.13			0.08			0.01				0.01
v/c Ratio		1.10	0.53	0.29	0.74	1.11	0.15	0.78	0.74	0.10		0.22	0.74	0.10
Uniform Delay, d1		71.8	31.0	27.2	65.8	38.0	20.8	58.8	64.4	59.7		52.7	64.4	59.6
Progression Factor		0.66	0.42	0.34	1.18	0.85	1.05	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2		94.5	1.0	0.8	3.9	53.1	0.2	5.6	6.3	0.1		0.1	6.3	0.1
Delay (s)		141.7	14.1	9.9	81.2	85.3	22.1	64.4	70.8	59.8		52.8	70.7	59.7
Level of Service		F	B	A	F	F	C	E	E	E		D	E	E
Approach Delay (s)			28.1			79.5			65.6				63.6	
Approach LOS			C			E			E				E	

Intersection Summary			
HCM 2000 Control Delay	62.1	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	26.0
Intersection Capacity Utilization	97.9%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	940	100	150	2059	5	150	0	150	5	0	5
Future Volume (vph)	5	940	100	150	2059	5	150	0	150	5	0	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.3	6.3	6.3	6.3	6.3	6.3		5.5	5.5	5.5	5.5	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00		1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85	1.00	0.85	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.95	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583		1770	1583	1770	1583	
Flt Permitted	0.04	1.00	1.00	0.23	1.00	1.00		0.75	1.00	0.44	1.00	
Satd. Flow (perm)	73	3539	1583	428	3539	1583		1405	1583	819	1583	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	5	1022	109	163	2238	5	163	0	163	5	0	5
RTOR Reduction (vph)	0	0	40	0	0	2	0	0	139	0	4	0
Lane Group Flow (vph)	5	1022	69	163	2238	3	0	163	24	5	1	0
Turn Type	D.P+P	NA	Perm	D.P+P	NA	Perm	D.P+P	NA	Perm	D.P+P	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	2		6	6		2	8		4	4		
Actuated Green, G (s)	103.4	94.9	94.9	103.4	102.6	102.6		22.1	22.1	23.0	28.5	
Effective Green, g (s)	103.4	94.9	94.9	103.4	102.6	102.6		22.1	22.1	23.0	28.5	
Actuated g/C Ratio	0.69	0.63	0.63	0.69	0.68	0.68		0.15	0.15	0.15	0.19	
Clearance Time (s)	6.3	6.3	6.3	6.3	6.3	6.3		5.5	5.5	5.5	5.5	
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	2.0	2.0	
Lane Grp Cap (vph)	59	2239	1001	371	2420	1082		207	233	131	300	
v/s Ratio Prot	0.00	c0.29		0.02	c0.63					c0.00	0.00	
v/s Ratio Perm	0.06		0.04	0.28		0.00		c0.12	0.02	0.01		
v/c Ratio	0.08	0.46	0.07	0.44	0.92	0.00		0.79	0.10	0.04	0.00	
Uniform Delay, d1	57.1	14.2	10.6	9.4	20.4	7.5		61.7	55.4	60.3	49.2	
Progression Factor	0.42	0.43	0.33	0.60	0.59	1.00		1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.2	0.6	0.1	0.2	4.8	0.0		16.5	0.1	0.0	0.0	
Delay (s)	24.3	6.7	3.6	5.8	16.8	7.5		78.2	55.4	60.4	49.2	
Level of Service	C	A	A	A	B	A		E	E	E	D	
Approach Delay (s)		6.4			16.1			66.8			54.8	
Approach LOS		A			B			E			D	

Intersection Summary			
HCM 2000 Control Delay	17.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	23.6
Intersection Capacity Utilization	90.3%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations						
Traffic Volume (vph)	1100	3	224	2122	92	224
Future Volume (vph)	1100	3	224	2122	92	224
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.2	6.2	6.2	6.2	5.2	5.2
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3539	1583	1770	3539	1770	1583
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	3539	1583	1770	3539	1770	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1196	3	243	2307	100	243
RTOR Reduction (vph)	0	1	0	0	0	219
Lane Group Flow (vph)	1196	2	243	2307	100	24
Turn Type	NA	Perm	Prot	NA	Prot	Perm
Protected Phases	6		5	2	4	
Permitted Phases		6				4
Actuated Green, G (s)	88.2	88.2	29.2	123.6	15.0	15.0
Effective Green, g (s)	88.2	88.2	29.2	123.6	15.0	15.0
Actuated g/C Ratio	0.59	0.59	0.19	0.82	0.10	0.10
Clearance Time (s)	6.2	6.2	6.2	6.2	5.2	5.2
Vehicle Extension (s)	0.2	0.2	2.0	0.2	2.0	2.0
Lane Grp Cap (vph)	2080	930	344	2916	177	158
v/s Ratio Prot	0.34		0.14	c0.65	c0.06	
v/s Ratio Perm		0.00				0.02
v/c Ratio	0.57	0.00	0.71	0.79	0.56	0.15
Uniform Delay, d1	19.2	12.7	56.4	6.7	64.4	61.7
Progression Factor	0.59	0.34	0.77	0.18	1.00	1.00
Incremental Delay, d2	1.1	0.0	2.5	1.1	2.5	0.2
Delay (s)	12.4	4.3	45.8	2.3	66.8	61.9
Level of Service	B	A	D	A	E	E
Approach Delay (s)	12.4			6.4	63.3	
Approach LOS	B			A	E	

Intersection Summary			
HCM 2000 Control Delay	12.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	21.6
Intersection Capacity Utilization	74.8%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBU	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations							
Traffic Volume (vph)	2	47	1277	2197	364	218	149
Future Volume (vph)	2	47	1277	2197	364	218	149
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0	6.0	6.0	5.2	5.2
Lane Util. Factor		1.00	0.95	0.95	1.00	0.97	1.00
Frt		1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected		0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)		1770	3539	3539	1583	3433	1583
Flt Permitted		0.03	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)		63	3539	3539	1583	3433	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2	51	1388	2388	396	237	162
RTOR Reduction (vph)	0	0	0	0	93	0	76
Lane Group Flow (vph)	0	53	1388	2388	303	237	86
Turn Type	pm+pt	pm+pt	NA	NA	Perm	Prot	Perm
Protected Phases	1	1	6	2		4	
Permitted Phases	6	6			2		4
Actuated Green, G (s)		125.6	125.6	113.2	113.2	13.2	13.2
Effective Green, g (s)		125.6	125.6	113.2	113.2	13.2	13.2
Actuated g/C Ratio		0.84	0.84	0.75	0.75	0.09	0.09
Clearance Time (s)		6.0	6.0	6.0	6.0	5.2	5.2
Vehicle Extension (s)		2.5	2.5	2.5	2.5	2.5	2.5
Lane Grp Cap (vph)		125	2963	2670	1194	302	139
v/s Ratio Prot		0.02	c0.39	c0.67		c0.07	
v/s Ratio Perm		0.34			0.19		0.05
v/c Ratio		0.42	0.47	0.89	0.25	0.78	0.62
Uniform Delay, d1		49.7	3.3	13.9	5.6	67.0	66.0
Progression Factor		1.37	0.31	0.16	0.04	1.00	1.00
Incremental Delay, d2		1.4	0.4	0.5	0.0	12.1	7.2
Delay (s)		69.3	1.5	2.7	0.3	79.1	73.2
Level of Service		E	A	A	A	E	E
Approach Delay (s)			4.0	2.4		76.7	
Approach LOS			A	A		E	

Intersection Summary			
HCM 2000 Control Delay	9.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	17.2
Intersection Capacity Utilization	79.3%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations														
Traffic Volume (vph)	6	121	1348	20	2	25	2377	70	7	2	26	113	0	171
Future Volume (vph)	6	121	1348	20	2	25	2377	70	7	2	26	113	0	171
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0	6.0		6.0	6.0	6.0		5.2			5.2	
Lane Util. Factor		1.00	0.95	1.00		1.00	0.95	1.00		1.00			1.00	
Frt		1.00	1.00	0.85		1.00	1.00	0.85		0.90			0.92	
Flt Protected		0.95	1.00	1.00		0.95	1.00	1.00		0.99			0.98	
Satd. Flow (prot)		1770	3539	1583		1787	3574	1599		1644			1712	
Flt Permitted		0.04	1.00	1.00		0.13	1.00	1.00		0.85			0.88	
Satd. Flow (perm)		74	3539	1583		240	3574	1599		1418			1528	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	7	132	1465	22	2	27	2584	76	8	2	28	123	0	186
RTOR Reduction (vph)	0	0	0	6	0	0	0	18	0	25	0	0	97	0
Lane Group Flow (vph)	0	139	1465	16	0	29	2584	58	0	13	0	0	212	0
Heavy Vehicles (%)	2%	2%	2%	2%	1%	1%	1%	1%	3%	3%	3%	0%	0%	0%
Turn Type	pm+pt	pm+pt	NA	Perm	pm+pt	pm+pt	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	1	1	6		5	5	2			4			8	
Permitted Phases	6	6		6	2	2		2	4			8		
Actuated Green, G (s)		111.0	111.0	111.0		105.4	105.4	105.4		17.0			17.0	
Effective Green, g (s)		111.0	111.0	111.0		105.4	105.4	105.4		17.0			17.0	
Actuated g/C Ratio		0.74	0.74	0.74		0.70	0.70	0.70		0.11			0.11	
Clearance Time (s)		6.0	6.0	6.0		6.0	6.0	6.0		5.2			5.2	
Vehicle Extension (s)		2.5	2.5	2.5		2.5	2.5	2.5		2.5			2.5	
Lane Grp Cap (vph)		172	2618	1171		218	2511	1123		160			173	
v/s Ratio Prot		c0.06	0.41			0.00	c0.72							
v/s Ratio Perm		0.54		0.01		0.09		0.04		0.01			c0.14	
v/c Ratio		0.81	0.56	0.01		0.13	1.03	0.05		0.08			1.23	
Uniform Delay, d1		64.3	8.7	5.1		9.9	22.3	6.9		59.5			66.5	
Progression Factor		0.60	0.29	1.00		0.26	0.43	0.11		1.00			1.00	
Incremental Delay, d2		20.5	0.8	0.0		0.0	15.1	0.0		0.2			142.7	
Delay (s)		58.9	3.3	5.1		2.6	24.6	0.8		59.7			209.2	
Level of Service		E	A	A		A	C	A		E			F	
Approach Delay (s)			8.1				23.7			59.7			209.2	
Approach LOS			A				C			E			F	

Intersection Summary			
HCM 2000 Control Delay	30.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	17.2
Intersection Capacity Utilization	110.5%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Traffic Volume (vph)	16	329	795	358	36	1180	219	792	886	32	136	711	486
Future Volume (vph)	16	329	795	358	36	1180	219	792	886	32	136	711	486
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.3	6.3	6.3	6.3	6.3	6.3	6.2	6.2	6.2	6.2	6.2	6.2
Lane Util. Factor		1.00	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frt		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1770	3539	1583	1787	3574	1599	3467	3574	1599	1787	3574	1599
Flt Permitted		0.08	1.00	1.00	0.15	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		157	3539	1583	291	3574	1599	3467	3574	1599	1787	3574	1599
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	17	358	864	389	39	1283	238	861	963	35	148	773	528
RTOR Reduction (vph)	0	0	0	254	0	0	140	0	0	25	0	0	131
Lane Group Flow (vph)	0	375	864	135	39	1283	98	861	963	10	148	773	397
Heavy Vehicles (%)	2%	2%	2%	2%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Turn Type	D.P+P	D.P+P	NA	Perm	D.P+P	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	1	1	6		5	2		7	4		3	8	
Permitted Phases	2	2		6	6		2			4			8
Actuated Green, G (s)		68.4	51.3	51.3	68.4	47.4	47.4	28.8	43.2	43.2	13.4	27.8	27.8
Effective Green, g (s)		68.4	51.3	51.3	68.4	47.4	47.4	28.8	43.2	43.2	13.4	27.8	27.8
Actuated g/C Ratio		0.46	0.34	0.34	0.46	0.32	0.32	0.19	0.29	0.29	0.09	0.19	0.19
Clearance Time (s)		6.3	6.3	6.3	6.3	6.3	6.3	6.2	6.2	6.2	6.2	6.2	6.2
Vehicle Extension (s)		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lane Grp Cap (vph)		297	1210	541	303	1129	505	665	1029	460	159	662	296
v/s Ratio Prot		c0.18	0.24		0.01	0.36		c0.25	0.27		0.08	0.22	
v/s Ratio Perm		c0.40		0.09	0.04		0.06			0.01			c0.25
v/c Ratio		1.26	0.71	0.25	0.13	1.14	0.19	1.29	0.94	0.02	0.93	1.17	1.34
Uniform Delay, d1		61.0	43.0	35.5	42.0	51.3	37.4	60.6	52.0	38.3	67.8	61.1	61.1
Progression Factor		0.87	0.58	0.55	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		138.5	3.0	0.9	0.1	72.6	0.9	143.6	14.8	0.0	50.7	91.1	174.3
Delay (s)		191.8	28.0	20.3	42.1	123.9	38.2	204.2	66.8	38.3	118.5	152.2	235.4
Level of Service		F	C	C	D	F	D	F	E	D	F	F	F
Approach Delay (s)			63.9			108.8			129.9			179.1	
Approach LOS			E			F			F			F	

Intersection Summary			
HCM 2000 Control Delay	119.3	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.29		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	25.0
Intersection Capacity Utilization	125.3%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Traffic Volume (vph)	15	54	749	153	21	1649	203	352	107	0	78	47	69
Future Volume (vph)	15	54	749	153	21	1649	203	352	107	0	78	47	69
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.8	5.5	5.5	6.7	5.9		6.8	7.6		6.8	7.6	7.6
Lane Util. Factor		1.00	0.91	1.00	1.00	0.91		0.97	1.00		1.00	1.00	1.00
Frt		1.00	1.00	0.85	1.00	0.98		1.00	1.00		1.00	1.00	0.85
Flt Protected		0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1787	5136	1599	1787	5051		3502	1900		1805	1900	1615
Flt Permitted		0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.64	1.00	1.00
Satd. Flow (perm)		1787	5136	1599	1787	5051		3502	1900		1222	1900	1615
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	16	59	814	166	23	1792	221	383	116	0	85	51	75
RTOR Reduction (vph)	0	0	0	63	0	7	0	0	0	0	0	0	71
Lane Group Flow (vph)	0	75	814	103	23	2006	0	383	116	0	85	51	4
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	Prot	NA	Perm	Prot	NA		Prot	NA		D.P+P	NA	Perm
Protected Phases	5	5	2		1	6		7	4		3	8	
Permitted Phases				2							4		8
Actuated Green, G (s)		9.5	89.7	89.7	4.5	85.2		15.8	18.9		24.2	8.4	8.4
Effective Green, g (s)		9.5	89.7	89.7	4.5	85.2		15.8	18.9		24.2	8.4	8.4
Actuated g/C Ratio		0.07	0.62	0.62	0.03	0.59		0.11	0.13		0.17	0.06	0.06
Clearance Time (s)		5.8	5.5	5.5	6.7	5.9		6.8	7.6		6.8	7.6	7.6
Vehicle Extension (s)		2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	2.0
Lane Grp Cap (vph)		117	3177	989	55	2967		381	247		225	110	93
v/s Ratio Prot		c0.04	0.16		0.01	c0.40		c0.11	c0.06		0.01	0.03	
v/s Ratio Perm				0.06							0.05		0.00
v/c Ratio		0.64	0.26	0.10	0.42	0.68		1.01	0.47		0.38	0.46	0.05
Uniform Delay, d1		66.1	12.5	11.3	69.0	20.5		64.6	58.4		52.9	66.1	64.5
Progression Factor		1.00	1.00	1.00	1.49	0.28		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2		8.7	0.2	0.2	1.6	1.1		47.4	0.5		0.4	1.1	0.1
Delay (s)		74.7	12.7	11.5	104.2	6.9		112.0	58.9		53.3	67.2	64.6
Level of Service		E	B	B	F	A		F	E		D	E	E
Approach Delay (s)			16.9			8.0			99.7			60.7	
Approach LOS			B			A			F			E	

Intersection Summary			
HCM 2000 Control Delay	25.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	145.0	Sum of lost time (s)	26.6
Intersection Capacity Utilization	76.6%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations														
Traffic Volume (vph)	1	32	793	14	10	24	1762	54	89	38	24	31	17	21
Future Volume (vph)	1	32	793	14	10	24	1762	54	89	38	24	31	17	21
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.1	7.4			6.1	7.4			7.6			7.6	
Lane Util. Factor		1.00	0.91			1.00	0.91			1.00			1.00	
Frt		1.00	1.00			1.00	1.00			0.98			0.96	
Flt Protected		0.95	1.00			0.95	1.00			0.97			0.98	
Satd. Flow (prot)		1787	5122			1787	5113			1806			1763	
Flt Permitted		0.07	1.00			0.29	1.00			0.80			0.77	
Satd. Flow (perm)		140	5122			550	5113			1479			1391	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1	35	862	15	11	26	1915	59	97	41	26	34	18	23
RTOR Reduction (vph)	0	0	1	0	0	0	2	0	0	5	0	0	13	0
Lane Group Flow (vph)	0	36	876	0	0	37	1972	0	0	159	0	0	62	0
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	0%	0%	0%	1%	1%	1%
Turn Type	D.P+P	D.P+P	NA		D.P+P	D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases	5	5	2		1	1	6			8			4	
Permitted Phases	6	6			2	2			8			4		
Actuated Green, G (s)		103.7	86.3			103.7	99.0			20.2			20.2	
Effective Green, g (s)		103.7	86.3			103.7	99.0			20.2			20.2	
Actuated g/C Ratio		0.72	0.60			0.72	0.68			0.14			0.14	
Clearance Time (s)		6.1	7.4			6.1	7.4			7.6			7.6	
Vehicle Extension (s)		2.0	2.0			2.0	2.0			2.0			2.0	
Lane Grp Cap (vph)		153	3048			541	3490			206			193	
v/s Ratio Prot		0.01	c0.17			0.01	c0.39							
v/s Ratio Perm		0.16				0.04				c0.11			0.04	
v/c Ratio		0.24	0.29			0.07	0.57			0.77			0.32	
Uniform Delay, d1		8.4	14.3			8.0	11.9			60.2			56.2	
Progression Factor		0.99	0.67			0.35	0.26			1.00			1.00	
Incremental Delay, d2		0.3	0.2			0.0	0.5			14.9			0.4	
Delay (s)		8.6	9.8			2.8	3.7			75.1			56.6	
Level of Service		A	A			A	A			E			E	
Approach Delay (s)			9.8				3.6			75.1			56.6	
Approach LOS			A				A			E			E	

Intersection Summary			
HCM 2000 Control Delay	10.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	145.0	Sum of lost time (s)	21.1
Intersection Capacity Utilization	59.7%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations														
Traffic Volume (vph)	6	33	788	31	12	55	1779	91	49	108	42	42	38	36
Future Volume (vph)	6	33	788	31	12	55	1779	91	49	108	42	42	38	36
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.1	7.4			6.1	7.4	7.4	6.8	7.6		6.8	7.6	
Lane Util. Factor		1.00	0.91			1.00	0.91	1.00	1.00	1.00		1.00	1.00	
Frt		1.00	0.99			1.00	1.00	0.85	1.00	0.96		1.00	0.93	
Flt Protected		0.95	1.00			0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1787	5106			1787	5136	1599	1787	1802		1752	1710	
Flt Permitted		0.06	1.00			0.28	1.00	1.00	0.70	1.00		0.54	1.00	
Satd. Flow (perm)		115	5106			529	5136	1599	1326	1802		996	1710	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	7	36	857	34	13	60	1934	99	53	117	46	46	41	39
RTOR Reduction (vph)	0	0	3	0	0	0	0	43	0	11	0	0	27	0
Lane Group Flow (vph)	0	43	888	0	0	73	1934	56	53	152	0	46	53	0
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	3%	3%	3%
Turn Type	D.P+P	D.P+P	NA		D.P+P	D.P+P	NA	Perm	D.P+P	NA		D.P+P	NA	
Protected Phases	5	5	2		1	1	6		3	8		7	4	
Permitted Phases	6	6			2	2		6	4			8		
Actuated Green, G (s)		87.5	80.6			87.5	82.6	82.6	29.6	25.0		29.6	23.6	
Effective Green, g (s)		87.5	80.6			87.5	82.6	82.6	29.6	25.0		29.6	23.6	
Actuated g/C Ratio		0.60	0.56			0.60	0.57	0.57	0.20	0.17		0.20	0.16	
Clearance Time (s)		6.1	7.4			6.1	7.4	7.4	6.8	7.6		6.8	7.6	
Vehicle Extension (s)		2.0	4.5			2.0	4.5	4.5	3.0	2.0		3.0	2.0	
Lane Grp Cap (vph)		125	2838			379	2925	910	289	310		227	278	
v/s Ratio Prot		0.01	c0.17			0.01	c0.38		0.01	c0.08		0.01	c0.03	
v/s Ratio Perm		0.20				0.11		0.04	0.03			0.03		
v/c Ratio		0.34	0.31			0.19	0.66	0.06	0.18	0.49		0.20	0.19	
Uniform Delay, d1		36.5	17.3			12.1	21.5	13.9	47.3	54.2		51.4	52.5	
Progression Factor		0.67	0.36			0.28	0.15	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.6	0.3			0.1	0.8	0.1	0.3	0.4		0.4	0.1	
Delay (s)		25.2	6.5			3.5	4.0	14.0	47.6	54.7		51.9	52.6	
Level of Service		C	A			A	A	B	D	D		D	D	
Approach Delay (s)			7.4				4.4			53.0			52.3	
Approach LOS			A				A			D			D	

Intersection Summary			
HCM 2000 Control Delay	10.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	145.0	Sum of lost time (s)	27.9
Intersection Capacity Utilization	87.6%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations														
Traffic Volume (vph)	3	71	757	53	7	33	1765	419	118	159	54	251	223	90
Future Volume (vph)	3	71	757	53	7	33	1765	419	118	159	54	251	223	90
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.4	8.7	8.7		6.9	8.7	8.7	6.8	7.9		6.8	7.9	7.9
Lane Util. Factor		1.00	0.91	1.00		1.00	0.91	1.00	1.00	1.00		0.97	1.00	1.00
Frpb, ped/bikes		1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Flpb, ped/bikes		1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt		1.00	1.00	0.85		1.00	1.00	0.85	1.00	0.96		1.00	1.00	0.85
Flt Protected		0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1787	5136	1599		1787	5136	1599	1800	1828		3467	1881	1599
Flt Permitted		0.06	1.00	1.00		0.30	1.00	1.00	0.39	1.00		0.95	1.00	1.00
Satd. Flow (perm)		109	5136	1599		567	5136	1599	736	1828		3467	1881	1599
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	3	77	823	58	8	36	1918	455	128	173	59	273	242	98
RTOR Reduction (vph)	0	0	0	29	0	0	0	127	0	9	0	0	0	79
Lane Group Flow (vph)	0	80	823	29	0	44	1918	328	128	223	0	273	242	19
Confl. Peds. (#/hr)									11					
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	0%	0%	0%	1%	1%	1%
Turn Type	D.P+P	D.P+P	NA	Perm	D.P+P	D.P+P	NA	Perm	D.P+P	NA		Prot	NA	Perm
Protected Phases	1	1	6		5	5	2		7	4		3	8	
Permitted Phases	2	2		6	6	6		2	8					8
Actuated Green, G (s)		75.8	71.6	71.6		76.3	68.9	68.9	38.4	22.1		16.3	28.3	28.3
Effective Green, g (s)		75.8	71.6	71.6		76.3	68.9	68.9	38.4	22.1		16.3	28.3	28.3
Actuated g/C Ratio		0.52	0.49	0.49		0.53	0.48	0.48	0.26	0.15		0.11	0.20	0.20
Clearance Time (s)		7.4	8.7	8.7		6.9	8.7	8.7	6.8	7.9		6.8	7.9	7.9
Vehicle Extension (s)		2.0	2.0	2.0		2.0	2.0	2.0	2.0	2.0		2.0	2.0	2.0
Lane Grp Cap (vph)		136	2536	789		337	2440	759	269	278		389	367	312
v/s Ratio Prot		c0.03	0.16			0.00	c0.37		0.03	c0.12		0.08	c0.13	
v/s Ratio Perm		0.28		0.02		0.06		0.21	0.09					0.01
v/c Ratio		0.59	0.32	0.04		0.13	0.79	0.43	0.48	0.80		0.70	0.66	0.06
Uniform Delay, d1		52.4	22.1	18.9		16.8	31.9	25.1	42.6	59.3		62.0	53.9	47.5
Progression Factor		0.75	0.51	1.00		0.57	0.58	0.41	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2		4.0	0.3	0.1		0.0	1.8	1.2	0.5	14.4		4.6	3.3	0.0
Delay (s)		43.4	11.6	19.0		9.6	20.2	11.5	43.1	73.7		66.6	57.2	47.6
Level of Service		D	B	B		A	C	B	D	E		E	E	D
Approach Delay (s)			14.6				18.4			62.8			59.8	
Approach LOS			B				B			E			E	

Intersection Summary			
HCM 2000 Control Delay	27.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	145.0	Sum of lost time (s)	30.8
Intersection Capacity Utilization	84.0%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Lane Configurations														
Traffic Volume (vph)	16	132	569	327	230	1645	188	442	274	149	1	127	280	145
Future Volume (vph)	16	132	569	327	230	1645	188	442	274	149	1	127	280	145
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.4	5.9	5.9	7.4	5.9	5.9	7.0	5.4	5.4		7.0	5.4	5.4
Lane Util. Factor		0.97	0.91	1.00	0.97	0.91	1.00	0.97	0.95	1.00		0.97	0.95	1.00
Frt		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85		1.00	1.00	0.85
Flt Protected		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00		0.95	1.00	1.00
Satd. Flow (prot)		3467	5136	1599	3467	5136	1599	3467	3574	1599		3502	3610	1615
Flt Permitted		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00		0.95	1.00	1.00
Satd. Flow (perm)		3467	5136	1599	3467	5136	1599	3467	3574	1599		3502	3610	1615
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	17	143	618	355	250	1788	204	480	298	162	1	138	304	158
RTOR Reduction (vph)	0	0	0	193	0	0	90	0	0	129	0	0	0	140
Lane Group Flow (vph)	0	160	618	162	250	1788	114	480	298	33	0	139	304	18
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	0%	0%	0%	0%
Turn Type	Prot	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	Prot	NA	Perm
Protected Phases	1	1	6		5	2		7	4		3	3	8	
Permitted Phases				6			2			4				8
Actuated Green, G (s)		8.6	66.2	66.2	14.8	72.4	72.4	21.6	29.1	29.1		9.2	16.7	16.7
Effective Green, g (s)		8.6	66.2	66.2	14.8	72.4	72.4	21.6	29.1	29.1		9.2	16.7	16.7
Actuated g/C Ratio		0.06	0.46	0.46	0.10	0.50	0.50	0.15	0.20	0.20		0.06	0.12	0.12
Clearance Time (s)		7.4	5.9	5.9	7.4	5.9	5.9	7.0	5.4	5.4		7.0	5.4	5.4
Vehicle Extension (s)		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	2.0
Lane Grp Cap (vph)		205	2344	730	353	2564	798	516	717	320		222	415	186
v/s Ratio Prot		c0.05	0.12		0.07	c0.35		c0.14	0.08			0.04	c0.08	
v/s Ratio Perm				0.10			0.07			0.02				0.01
v/c Ratio		0.78	0.26	0.22	0.71	0.70	0.14	0.93	0.42	0.10		0.63	0.73	0.10
Uniform Delay, d1		67.3	24.3	23.8	63.0	27.9	19.6	61.0	50.5	47.3		66.2	62.0	57.4
Progression Factor		0.70	0.51	0.46	1.09	0.90	1.91	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2		15.1	0.3	0.7	4.4	1.3	0.3	23.3	0.1	0.1		3.9	5.7	0.1
Delay (s)		61.9	12.6	11.6	73.0	26.4	37.7	84.3	50.7	47.3		70.2	67.7	57.5
Level of Service		E	B	B	E	C	D	F	D	D		E	E	E
Approach Delay (s)			19.3			32.6			67.3				65.6	
Approach LOS			B			C			E				E	

Intersection Summary			
HCM 2000 Control Delay	40.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	145.0	Sum of lost time (s)	25.7
Intersection Capacity Utilization	78.5%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	740	100	150	1909	5	150	0	150	5	0	5
Future Volume (vph)	5	740	100	150	1909	5	150	0	150	5	0	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1	7.4		6.1	7.4			7.2	7.2	6.4	7.2	
Lane Util. Factor	1.00	0.91		1.00	0.91			1.00	1.00	1.00	1.00	
Frt	1.00	0.98		1.00	1.00			1.00	0.85	1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00			0.95	1.00	0.95	1.00	
Satd. Flow (prot)	1770	4994		1770	5083			1770	1583	1770	1583	
Flt Permitted	0.06	1.00		0.28	1.00			0.75	1.00	0.50	1.00	
Satd. Flow (perm)	111	4994		519	5083			1405	1583	931	1583	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	5	804	109	163	2075	5	163	0	163	5	0	5
RTOR Reduction (vph)	0	9	0	0	0	0	0	0	139	0	4	0
Lane Group Flow (vph)	5	904	0	163	2080	0	0	163	24	5	1	0
Turn Type	D.P+P	NA		D.P+P	NA		D.P+P	NA	Perm	D.P+P	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	2			6			8		4	4		
Actuated Green, G (s)	95.4	85.5		95.4	94.4			21.6	21.6	22.5	28.9	
Effective Green, g (s)	95.4	85.5		95.4	94.4			21.6	21.6	22.5	28.9	
Actuated g/C Ratio	0.66	0.59		0.66	0.65			0.15	0.15	0.16	0.20	
Clearance Time (s)	6.1	7.4		6.1	7.4			7.2	7.2	6.4	7.2	
Vehicle Extension (s)	2.0	2.0		2.0	2.0			2.0	2.0	2.0	2.0	
Lane Grp Cap (vph)	84	2944		426	3309			209	235	149	315	
v/s Ratio Prot	0.00	0.18		c0.03	c0.41					c0.00	0.00	
v/s Ratio Perm	0.04			0.23				c0.12	0.02	0.00		
v/c Ratio	0.06	0.31		0.38	0.63			0.78	0.10	0.03	0.00	
Uniform Delay, d1	11.7	14.9		9.5	14.9			59.4	53.3	56.4	46.5	
Progression Factor	0.47	0.43		0.32	0.48			1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.1	0.3		0.2	0.8			15.3	0.1	0.0	0.0	
Delay (s)	5.5	6.7		3.3	8.0			74.7	53.4	56.4	46.5	
Level of Service	A	A		A	A			E	D	E	D	
Approach Delay (s)		6.7			7.6			64.1			51.5	
Approach LOS		A			A			E			D	

Intersection Summary			
HCM 2000 Control Delay	12.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	145.0	Sum of lost time (s)	27.1
Intersection Capacity Utilization	72.6%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	900	3	224	1972	92	224
Future Volume (vph)	900	3	224	1972	92	224
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.7		6.4	7.7	7.6	7.6
Lane Util. Factor	0.91		1.00	0.91	1.00	1.00
Frt	1.00		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	5083		1787	5136	1787	1599
Flt Permitted	1.00		0.26	1.00	0.95	1.00
Satd. Flow (perm)	5083		489	5136	1787	1599
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	978	3	243	2143	100	243
RTOR Reduction (vph)	0	0	0	0	0	222
Lane Group Flow (vph)	981	0	243	2143	100	21
Heavy Vehicles (%)	2%	2%	1%	1%	1%	1%
Turn Type	NA		D.P+P	NA	Prot	Perm
Protected Phases	6		5	2	4	
Permitted Phases			6			4
Actuated Green, G (s)	88.7		110.7	117.1	12.6	12.6
Effective Green, g (s)	88.7		110.7	117.1	12.6	12.6
Actuated g/C Ratio	0.61		0.76	0.81	0.09	0.09
Clearance Time (s)	7.7		6.4	7.7	7.6	7.6
Vehicle Extension (s)	0.2		2.0	0.2	2.0	2.0
Lane Grp Cap (vph)	3109		570	4147	155	138
v/s Ratio Prot	0.19		0.06	c0.42	c0.06	
v/s Ratio Perm			0.26			0.01
v/c Ratio	0.32		0.43	0.52	0.65	0.15
Uniform Delay, d1	13.5		10.6	4.6	64.0	61.3
Progression Factor	0.51		0.56	0.61	1.00	1.00
Incremental Delay, d2	0.3		0.1	0.3	6.7	0.2
Delay (s)	7.2		6.0	3.1	70.8	61.5
Level of Service	A		A	A	E	E
Approach Delay (s)	7.2			3.4	64.2	
Approach LOS	A			A	E	

Intersection Summary			
HCM 2000 Control Delay	10.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	145.0	Sum of lost time (s)	25.7
Intersection Capacity Utilization	57.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBU	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations							
Traffic Volume (vph)	2	47	1077	2047	364	218	149
Future Volume (vph)	2	47	1077	2047	364	218	149
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.4	8.7	8.7	8.7	7.2	7.2
Lane Util. Factor		1.00	0.91	0.91	1.00	1.00	1.00
Frt		1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected		0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)		1787	5136	5136	1599	1787	1599
Flt Permitted		0.05	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)		94	5136	5136	1599	1787	1599
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2	51	1171	2225	396	237	162
RTOR Reduction (vph)	0	0	0	0	69	0	135
Lane Group Flow (vph)	0	53	1171	2225	327	237	27
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%
Turn Type	D.P+P	D.P+P	NA	NA	Perm	Prot	Perm
Protected Phases	1	1	6	2		4	
Permitted Phases	2	2			2		4
Actuated Green, G (s)		87.1	94.5	80.4	80.4	24.0	24.0
Effective Green, g (s)		87.1	94.5	80.4	80.4	24.0	24.0
Actuated g/C Ratio		0.60	0.65	0.55	0.55	0.17	0.17
Clearance Time (s)		7.4	8.7	8.7	8.7	7.2	7.2
Vehicle Extension (s)		2.5	2.5	2.5	2.5	2.5	2.5
Lane Grp Cap (vph)		134	3347	2847	886	295	264
v/s Ratio Prot		0.02	c0.23	c0.43		c0.13	
v/s Ratio Perm		0.22			0.20		0.02
v/c Ratio		0.40	0.35	0.78	0.37	0.80	0.10
Uniform Delay, d1		21.1	11.4	25.4	18.1	58.2	51.3
Progression Factor		1.70	0.27	0.28	0.26	1.00	1.00
Incremental Delay, d2		1.3	0.3	1.3	0.7	14.2	0.1
Delay (s)		37.3	3.3	8.3	5.5	72.4	51.5
Level of Service		D	A	A	A	E	D
Approach Delay (s)			4.8	7.9		63.9	
Approach LOS			A	A		E	

Intersection Summary			
HCM 2000 Control Delay	12.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	145.0	Sum of lost time (s)	27.3
Intersection Capacity Utilization	66.0%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations														
Traffic Volume (vph)	6	121	1148	20	2	25	2277	70	7	2	26	113	0	171
Future Volume (vph)	6	121	1148	20	2	25	2277	70	7	2	26	113	0	171
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.1	7.4			6.1	7.4			7.0			7.0	
Lane Util. Factor		1.00	0.91			1.00	0.91			1.00			1.00	
Frt		1.00	1.00			1.00	1.00			0.90			0.92	
Flt Protected		0.95	1.00			0.95	1.00			0.99			0.98	
Satd. Flow (prot)		1770	5072			1787	5113			1693			1662	
Flt Permitted		0.05	1.00			0.19	1.00			0.86			0.85	
Satd. Flow (perm)		85	5072			350	5113			1474			1446	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	7	132	1248	22	2	27	2475	76	8	2	28	123	0	186
RTOR Reduction (vph)	0	0	1	0	0	0	2	0	0	23	0	0	113	0
Lane Group Flow (vph)	0	139	1269	0	0	29	2549	0	0	15	0	0	196	0
Heavy Vehicles (%)	2%	2%	2%	2%	1%	1%	1%	1%	0%	0%	0%	3%	3%	3%
Turn Type	D.P+P	D.P+P	NA		D.P+P	D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases	1	1	6		5	5	2			4			8	
Permitted Phases	2	2			6	6			4			8		
Actuated Green, G (s)		100.9	96.1			100.9	87.4			23.6			23.6	
Effective Green, g (s)		100.9	96.1			100.9	87.4			23.6			23.6	
Actuated g/C Ratio		0.70	0.66			0.70	0.60			0.16			0.16	
Clearance Time (s)		6.1	7.4			6.1	7.4			7.0			7.0	
Vehicle Extension (s)		2.5	2.5			2.5	2.5			2.5			2.5	
Lane Grp Cap (vph)		216	3361			291	3081			239			235	
v/s Ratio Prot		c0.06	0.25			0.00	c0.50							
v/s Ratio Perm		0.39				0.07				0.01			c0.14	
v/c Ratio		0.64	0.38			0.10	0.83			0.06			0.83	
Uniform Delay, d1		46.7	11.0			7.2	22.8			51.3			58.8	
Progression Factor		0.76	0.82			0.55	0.37			1.00			1.00	
Incremental Delay, d2		5.4	0.3			0.0	0.3			0.1			21.4	
Delay (s)		40.8	9.3			3.9	8.7			51.4			80.2	
Level of Service		D	A			A	A			D			F	
Approach Delay (s)			12.4				8.7			51.4			80.2	
Approach LOS			B				A			D			F	

Intersection Summary			
HCM 2000 Control Delay	15.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	145.0	Sum of lost time (s)	20.5
Intersection Capacity Utilization	93.1%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Traffic Volume (vph)	16	329	595	358	36	1030	219	792	886	32	136	711	486
Future Volume (vph)	16	329	595	358	36	1030	219	792	886	32	136	711	486
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.0	5.6	4.0	7.0	5.6	5.6	6.8	5.4	5.4	7.0	5.6	5.6
Lane Util. Factor		0.97	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frt		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		3433	3539	1583	1787	3574	1599	3467	3574	1599	1787	3574	1599
Flt Permitted		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		3433	3539	1583	1787	3574	1599	3467	3574	1599	1787	3574	1599
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	17	358	647	389	39	1120	238	861	963	35	148	773	528
RTOR Reduction (vph)	0	0	0	0	0	0	132	0	0	23	0	0	135
Lane Group Flow (vph)	0	375	647	389	39	1120	106	861	963	12	148	773	393
Heavy Vehicles (%)	2%	2%	2%	2%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Turn Type	Prot	Prot	NA	Free	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	1	1	6		5	2		7	4		3	8	
Permitted Phases				Free			2			4			8
Actuated Green, G (s)		14.4	49.8	145.0	6.0	41.4	41.4	30.2	50.0	50.0	14.2	34.0	34.0
Effective Green, g (s)		14.4	49.8	145.0	6.0	41.4	41.4	30.2	50.0	50.0	14.2	34.0	34.0
Actuated g/C Ratio		0.10	0.34	1.00	0.04	0.29	0.29	0.21	0.34	0.34	0.10	0.23	0.23
Clearance Time (s)		7.0	5.6		7.0	5.6	5.6	6.8	5.4	5.4	7.0	5.6	5.6
Vehicle Extension (s)		2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lane Grp Cap (vph)		340	1215	1583	73	1020	456	722	1232	551	175	838	374
v/s Ratio Prot		c0.11	0.18		0.02	c0.31		c0.25	0.27		0.08	0.22	
v/s Ratio Perm				0.25			0.07			0.01			c0.25
v/c Ratio		1.10	0.53	0.25	0.53	1.10	0.23	1.19	0.78	0.02	0.85	0.92	1.05
Uniform Delay, d1		65.3	38.2	0.0	68.1	51.8	39.6	57.4	42.6	31.4	64.3	54.2	55.5
Progression Factor		0.89	0.79	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		77.9	1.6	0.3	3.7	58.9	1.2	100.0	3.0	0.0	28.5	15.2	60.7
Delay (s)		136.0	31.6	0.3	71.9	110.7	40.8	157.4	45.6	31.4	92.8	69.4	116.2
Level of Service		F	C	A	E	F	D	F	D	C	F	E	F
Approach Delay (s)			50.7			97.7			97.1			88.9	
Approach LOS			D			F			F			F	

Intersection Summary			
HCM 2000 Control Delay	84.6	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.11		
Actuated Cycle Length (s)	145.0	Sum of lost time (s)	25.0
Intersection Capacity Utilization	111.8%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Traffic Volume (vph)	11	63	1154	181	37	2312	360	415	198	0	29	76	70
Future Volume (vph)	11	63	1154	181	37	2312	360	415	198	0	29	76	70
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.0	6.0	6.0	7.0	6.0	6.0		7.5			7.5	4.0
Lane Util. Factor		1.00	0.95	1.00	1.00	0.95	1.00		1.00			1.00	1.00
Frt		1.00	1.00	0.85	1.00	1.00	0.85		1.00			1.00	0.85
Flt Protected		0.95	1.00	1.00	0.95	1.00	1.00		0.97			0.99	1.00
Satd. Flow (prot)		1787	3574	1599	1787	3574	1599		1838			1874	1615
Flt Permitted		0.95	1.00	1.00	0.95	1.00	1.00		0.97			0.99	1.00
Satd. Flow (perm)		1787	3574	1599	1787	3574	1599		1838			1874	1615
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	12	68	1254	197	40	2513	391	451	215	0	32	83	76
RTOR Reduction (vph)	0	0	0	64	0	0	58	0	0	0	0	0	0
Lane Group Flow (vph)	0	80	1254	133	40	2513	333	0	666	0	0	115	76
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	Prot	NA	Perm	Prot	NA	Perm	Split	NA	Perm	Split	NA	Free
Protected Phases	5	5	2		1	6		3	3		4	4	
Permitted Phases				2			6			3			Free
Actuated Green, G (s)		7.4	90.3	90.3	6.7	89.6	89.6		46.5			8.5	180.0
Effective Green, g (s)		7.4	90.3	90.3	6.7	89.6	89.6		46.5			8.5	180.0
Actuated g/C Ratio		0.04	0.50	0.50	0.04	0.50	0.50		0.26			0.05	1.00
Clearance Time (s)		7.0	6.0	6.0	7.0	6.0	6.0		7.5			7.5	
Vehicle Extension (s)		2.0	2.0	2.0	2.0	2.0	2.0		2.0			3.0	
Lane Grp Cap (vph)		73	1792	802	66	1779	795		474			88	1615
v/s Ratio Prot		c0.04	0.35		0.02	c0.70			c0.36			c0.06	
v/s Ratio Perm				0.08			0.21						0.05
v/c Ratio		1.10	0.70	0.17	0.61	1.41	0.42		1.41			1.31	0.05
Uniform Delay, d1		86.3	34.4	24.4	85.4	45.2	28.7		66.8			85.8	0.0
Progression Factor		1.00	1.00	1.00	1.10	0.51	0.28		1.00			1.00	1.00
Incremental Delay, d2		133.9	2.3	0.4	1.0	186.0	0.1		194.6			198.6	0.1
Delay (s)		220.2	36.7	24.8	95.3	209.1	8.2		261.4			284.4	0.1
Level of Service		F	D	C	F	F	A		F			F	A
Approach Delay (s)			44.8			180.9			261.4			171.2	
Approach LOS			D			F			F			F	

Intersection Summary			
HCM 2000 Control Delay	151.5	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.39		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	28.0
Intersection Capacity Utilization	115.2%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations														
Traffic Volume (vph)	1	33	1134	14	12	25	2595	58	91	34	24	31	15	22
Future Volume (vph)	1	33	1134	14	12	25	2595	58	91	34	24	31	15	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	5.5	5.5		6.0	5.5	5.5		6.0	6.0		6.0	
Lane Util. Factor		1.00	0.95	1.00		1.00	0.95	1.00		1.00	1.00		1.00	
Frt		1.00	1.00	0.85		1.00	1.00	0.85		1.00	0.85		0.96	
Flt Protected		0.95	1.00	1.00		0.95	1.00	1.00		0.96	1.00		0.98	
Satd. Flow (prot)		1787	3574	1599		1787	3574	1599		1833	1615		1758	
Flt Permitted		0.95	1.00	1.00		0.95	1.00	1.00		0.71	1.00		0.57	
Satd. Flow (perm)		1787	3574	1599		1787	3574	1599		1351	1615		1022	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1	36	1233	15	13	27	2821	63	99	37	26	34	16	24
RTOR Reduction (vph)	0	0	0	4	0	0	0	14	0	0	23	0	11	0
Lane Group Flow (vph)	0	37	1233	11	0	40	2821	49	0	136	3	0	63	0
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	0%	0%	0%	1%	1%	1%
Turn Type	Prot	Prot	NA	Perm	Prot	Prot	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases	5	5	2		1	1	6			8			4	
Permitted Phases				2				6	8		8	4		
Actuated Green, G (s)		7.5	132.8	132.8		7.7	133.0	133.0		22.0	22.0		22.0	
Effective Green, g (s)		7.5	132.8	132.8		7.7	133.0	133.0		22.0	22.0		22.0	
Actuated g/C Ratio		0.04	0.74	0.74		0.04	0.74	0.74		0.12	0.12		0.12	
Clearance Time (s)		6.0	5.5	5.5		6.0	5.5	5.5		6.0	6.0		6.0	
Vehicle Extension (s)		2.0	2.0	2.0		2.0	2.0	2.0		2.0	2.0		2.0	
Lane Grp Cap (vph)		74	2636	1179		76	2640	1181		165	197		124	
v/s Ratio Prot		0.02	c0.34			0.02	c0.79							
v/s Ratio Perm				0.01				0.03		c0.10	0.00		0.06	
v/c Ratio		0.50	0.47	0.01		0.53	1.07	0.04		0.82	0.02		0.51	
Uniform Delay, d1		84.4	9.4	6.2		84.4	23.5	6.3		77.1	69.5		74.0	
Progression Factor		0.88	2.19	1.00		0.68	0.33	0.00		1.00	1.00		1.00	
Incremental Delay, d2		1.3	0.4	0.0		0.3	31.8	0.0		26.0	0.0		1.5	
Delay (s)		76.0	21.1	6.2		57.5	39.4	0.0		103.1	69.5		75.5	
Level of Service		E	C	A		E	D	A		F	E		E	
Approach Delay (s)			22.5				38.8			97.7			75.5	
Approach LOS			C				D			F			E	

Intersection Summary			
HCM 2000 Control Delay	36.9	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.02		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	17.5
Intersection Capacity Utilization	92.1%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations														
Traffic Volume (vph)	5	44	1124	29	18	69	2562	164	59	197	66	93	68	63
Future Volume (vph)	5	44	1124	29	18	69	2562	164	59	197	66	93	68	63
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.8	5.8	5.8		5.8	5.8	5.8		6.6			6.6	
Lane Util. Factor		1.00	0.95	1.00		1.00	0.95	1.00		1.00			1.00	
Frt		1.00	1.00	0.85		1.00	1.00	0.85		0.97			0.96	
Flt Protected		0.95	1.00	1.00		0.95	1.00	1.00		0.99			0.98	
Satd. Flow (prot)		1770	3539	1583		1770	3539	1583		1795			1756	
Flt Permitted		0.04	1.00	1.00		0.15	1.00	1.00		0.85			0.50	
Satd. Flow (perm)		70	3539	1583		274	3539	1583		1531			901	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	5	48	1222	32	20	75	2785	178	64	214	72	101	74	68
RTOR Reduction (vph)	0	0	0	12	0	0	0	21	0	5	0	0	8	0
Lane Group Flow (vph)	0	53	1222	20	0	95	2785	157	0	345	0	0	235	0
Turn Type	pm+pt	pm+pt	NA	Perm	pm+pt	pm+pt	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	5	2		1	1	6			8			4	
Permitted Phases	2	2		2	6	6		6	8			4		
Actuated Green, G (s)		111.1	111.1	111.1		114.2	114.2	114.2		42.8			42.8	
Effective Green, g (s)		111.1	111.1	111.1		114.2	114.2	114.2		42.8			42.8	
Actuated g/C Ratio		0.62	0.62	0.62		0.63	0.63	0.63		0.24			0.24	
Clearance Time (s)		5.8	5.8	5.8		5.8	5.8	5.8		6.6			6.6	
Vehicle Extension (s)		2.0	4.5	4.5		2.0	4.5	4.5		2.0			2.0	
Lane Grp Cap (vph)		88	2184	977		239	2245	1004		364			214	
v/s Ratio Prot		0.02	c0.35			0.02	c0.79							
v/s Ratio Perm		0.35		0.01		0.23		0.10		0.23			c0.26	
v/c Ratio		0.60	0.56	0.02		0.40	1.24	0.16		0.95			1.10	
Uniform Delay, d1		82.6	20.1	13.4		17.9	32.9	13.4		67.5			68.6	
Progression Factor		0.47	0.05	0.00		0.17	0.24	0.02		1.00			1.00	
Incremental Delay, d2		7.1	0.9	0.0		0.0	108.6	0.0		33.0			90.8	
Delay (s)		46.0	1.9	0.0		3.1	116.5	0.3		100.5			159.4	
Level of Service		D	A	A		A	F	A		F			F	
Approach Delay (s)			3.6				106.2			100.5			159.4	
Approach LOS			A				F			F			F	

Intersection Summary			
HCM 2000 Control Delay	81.4	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.19		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	18.2
Intersection Capacity Utilization	107.7%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations														
Traffic Volume (vph)	3	86	1161	50	10	34	2550	369	128	182	61	385	268	132
Future Volume (vph)	3	86	1161	50	10	34	2550	369	128	182	61	385	268	132
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.1	6.1	6.1		6.1	6.1	6.1	5.9	5.9		5.9	5.9	5.9
Lane Util. Factor		1.00	0.95	1.00		1.00	0.95	1.00	1.00	1.00		1.00	1.00	1.00
Frpb, ped/bikes		1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Flpb, ped/bikes		1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt		1.00	1.00	0.85		1.00	1.00	0.85	1.00	0.96		1.00	1.00	0.85
Flt Protected		0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1770	3539	1583		1770	3539	1583	1770	1793		1770	1863	1583
Flt Permitted		0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)		1770	3539	1583		1770	3539	1583	1770	1793		1770	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	3	93	1262	54	11	37	2772	401	139	198	66	418	291	143
RTOR Reduction (vph)	0	0	0	28	0	0	0	49	0	6	0	0	0	105
Lane Group Flow (vph)	0	96	1262	26	0	48	2772	352	139	258	0	418	291	38
Confl. Peds. (#/hr)									11					
Turn Type	Prot	Prot	NA	Perm	Prot	Prot	NA	Perm	Split	NA		Split	NA	Perm
Protected Phases	1	1	6		5	5	2		4	4		8	8	
Permitted Phases				6				2						8
Actuated Green, G (s)		8.9	87.3	87.3		18.5	96.9	96.9	18.1	18.1		32.1	32.1	32.1
Effective Green, g (s)		8.9	87.3	87.3		18.5	96.9	96.9	18.1	18.1		32.1	32.1	32.1
Actuated g/C Ratio		0.05	0.48	0.48		0.10	0.54	0.54	0.10	0.10		0.18	0.18	0.18
Clearance Time (s)		6.1	6.1	6.1		6.1	6.1	6.1	5.9	5.9		5.9	5.9	5.9
Vehicle Extension (s)		2.0	5.0	5.0		2.0	5.0	5.0	3.0	3.0		2.0	2.0	2.0
Lane Grp Cap (vph)		87	1716	767		181	1905	852	177	180		315	332	282
v/s Ratio Prot		c0.05	0.36			0.03	c0.78		0.08	c0.14		c0.24	0.16	
v/s Ratio Perm				0.02				0.22						0.02
v/c Ratio		1.10	0.74	0.03		0.27	1.46	0.41	0.79	1.43		1.33	0.88	0.13
Uniform Delay, d1		85.5	37.1	24.3		74.5	41.5	24.7	79.1	81.0		74.0	72.0	62.3
Progression Factor		1.41	0.33	0.01		0.72	0.48	0.26	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2		116.7	2.3	0.1		0.0	205.1	0.1	20.1	223.1		167.5	21.3	0.1
Delay (s)		236.9	14.5	0.2		53.8	225.2	6.5	99.1	304.1		241.5	93.3	62.3
Level of Service		F	B	A		D	F	A	F	F		F	F	E
Approach Delay (s)			29.1				195.4			233.4			160.8	
Approach LOS			C				F			F			F	

Intersection Summary			
HCM 2000 Control Delay	153.1	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.40		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	24.0
Intersection Capacity Utilization	123.5%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Lane Configurations														
Traffic Volume (vph)	24	226	957	409	248	1906	441	655	473	182	1	163	370	227
Future Volume (vph)	24	226	957	409	248	1906	441	655	473	182	1	163	370	227
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.7	6.7	6.7	6.7	6.7	6.7	6.3	6.3	6.3		6.3	6.3	6.3
Lane Util. Factor		0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00		0.97	0.95	1.00
Frt		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85		1.00	1.00	0.85
Flt Protected		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00		0.95	1.00	1.00
Satd. Flow (prot)		3467	3574	1599	3467	3574	1599	3467	3574	1599		3502	3610	1615
Flt Permitted		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00		0.95	1.00	1.00
Satd. Flow (perm)		3467	3574	1599	3467	3574	1599	3467	3574	1599		3502	3610	1615
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	26	246	1040	445	270	2072	479	712	514	198	1	177	402	247
RTOR Reduction (vph)	0	0	0	126	0	0	79	0	0	164	0	0	0	157
Lane Group Flow (vph)	0	272	1040	319	270	2072	400	712	514	34	0	178	402	90
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	0%	0%	0%	0%
Turn Type	Prot	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	Prot	NA	Perm
Protected Phases	1	1	6		5	2		7	4		3	3	8	
Permitted Phases				6			2			4				8
Actuated Green, G (s)		12.3	81.4	81.4	17.9	87.0	87.0	31.6	30.8	30.8		23.9	23.1	23.1
Effective Green, g (s)		12.3	81.4	81.4	17.9	87.0	87.0	31.6	30.8	30.8		23.9	23.1	23.1
Actuated g/C Ratio		0.07	0.45	0.45	0.10	0.48	0.48	0.18	0.17	0.17		0.13	0.13	0.13
Clearance Time (s)		6.7	6.7	6.7	6.7	6.7	6.7	6.3	6.3	6.3		6.3	6.3	6.3
Vehicle Extension (s)		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	2.0
Lane Grp Cap (vph)		236	1616	723	344	1727	772	608	611	273		464	463	207
v/s Ratio Prot		c0.08	0.29		0.08	c0.58		c0.21	c0.14			0.05	0.11	
v/s Ratio Perm				0.20			0.25			0.02				0.06
v/c Ratio		1.15	0.64	0.44	0.78	1.20	0.52	1.17	0.84	0.12		0.38	0.87	0.44
Uniform Delay, d1		83.8	38.1	33.7	79.2	46.5	32.1	74.2	72.2	63.2		71.3	77.0	72.4
Progression Factor		0.68	0.34	0.21	1.06	0.72	0.48	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2		91.2	1.0	1.0	1.0	90.5	0.2	93.6	9.8	0.1		0.2	15.2	0.5
Delay (s)		148.5	14.1	8.3	85.2	123.9	15.7	167.8	82.0	63.3		71.5	92.2	73.0
Level of Service		F	B	A	F	F	B	F	F	E		E	F	E
Approach Delay (s)			33.4			101.8			122.3				82.0	
Approach LOS			C			F			F				F	

Intersection Summary			
HCM 2000 Control Delay	86.1	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.16		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	26.0
Intersection Capacity Utilization	114.2%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	1197	100	150	2590	5	150	0	150	5	0	5
Future Volume (vph)	5	1197	100	150	2590	5	150	0	150	5	0	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.3	6.3	6.3	6.3	6.3	6.3		5.5	5.5	5.5	5.5	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00		1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85	1.00	0.85	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.95	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583		1770	1583	1770	1583	
Flt Permitted	0.03	1.00	1.00	0.15	1.00	1.00		0.75	1.00	0.43	1.00	
Satd. Flow (perm)	59	3539	1583	288	3539	1583		1405	1583	805	1583	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	5	1301	109	163	2815	5	163	0	163	5	0	5
RTOR Reduction (vph)	0	0	38	0	0	1	0	0	137	0	4	0
Lane Group Flow (vph)	5	1301	71	163	2815	4	0	163	26	5	1	0
Turn Type	D.P+P	NA	Perm	D.P+P	NA	Perm	D.P+P	NA	Perm	D.P+P	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	2		6	6		2	8		4	4		
Actuated Green, G (s)	127.3	117.9	117.9	127.3	126.5	126.5		28.3	28.3	29.1	34.6	
Effective Green, g (s)	127.3	117.9	117.9	127.3	126.5	126.5		28.3	28.3	29.1	34.6	
Actuated g/C Ratio	0.71	0.66	0.66	0.71	0.70	0.70		0.16	0.16	0.16	0.19	
Clearance Time (s)	6.3	6.3	6.3	6.3	6.3	6.3		5.5	5.5	5.5	5.5	
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	2.0	2.0	
Lane Grp Cap (vph)	49	2318	1036	281	2487	1112		220	248	134	304	
v/s Ratio Prot	0.00	0.37		c0.03	c0.80					c0.00	0.00	
v/s Ratio Perm	0.07		0.05	0.38		0.00		c0.12	0.02	0.01		
v/c Ratio	0.10	0.56	0.07	0.58	1.13	0.00		0.74	0.10	0.04	0.00	
Uniform Delay, d1	49.5	16.9	11.2	13.3	26.8	8.0		72.4	65.0	71.9	58.8	
Progression Factor	1.52	1.02	7.00	0.60	0.51	1.00		1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.3	0.8	0.1	0.7	61.6	0.0		11.1	0.1	0.0	0.0	
Delay (s)	75.7	18.0	78.6	8.7	75.3	8.0		83.5	65.0	71.9	58.8	
Level of Service	E	B	E	A	E	A		F	E	E	E	
Approach Delay (s)		22.9			71.6			74.3			65.3	
Approach LOS		C			E			E			E	

Intersection Summary			
HCM 2000 Control Delay	57.2	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.07		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	23.6
Intersection Capacity Utilization	105.0%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1333	19	178	2667	78	189
Future Volume (vph)	1333	19	178	2667	78	189
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.2	6.2	6.2	6.2	5.2	5.2
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3539	1583	1770	3539	1770	1583
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	3539	1583	1770	3539	1770	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1449	21	193	2899	85	205
RTOR Reduction (vph)	0	3	0	0	0	196
Lane Group Flow (vph)	1449	18	193	2899	85	9
Turn Type	NA	Perm	Prot	NA	Prot	Perm
Protected Phases	6		5	2	4	
Permitted Phases		6				4
Actuated Green, G (s)	129.9	129.9	24.5	160.6	8.0	8.0
Effective Green, g (s)	129.9	129.9	24.5	160.6	8.0	8.0
Actuated g/C Ratio	0.72	0.72	0.14	0.89	0.04	0.04
Clearance Time (s)	6.2	6.2	6.2	6.2	5.2	5.2
Vehicle Extension (s)	0.2	0.2	2.0	0.2	2.0	2.0
Lane Grp Cap (vph)	2553	1142	240	3157	78	70
v/s Ratio Prot	0.41		0.11	c0.82	c0.05	
v/s Ratio Perm		0.01				0.01
v/c Ratio	0.57	0.02	0.80	0.92	1.09	0.13
Uniform Delay, d1	11.8	7.1	75.4	5.8	86.0	82.7
Progression Factor	0.98	0.84	1.17	0.67	1.00	1.00
Incremental Delay, d2	0.8	0.0	1.7	0.6	128.5	0.3
Delay (s)	12.3	5.9	89.6	4.4	214.5	83.0
Level of Service	B	A	F	A	F	F
Approach Delay (s)	12.2			9.7	121.5	
Approach LOS	B			A	F	

Intersection Summary			
HCM 2000 Control Delay	17.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	21.6
Intersection Capacity Utilization	89.9%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	43	1479	2615	475	160	230
Future Volume (vph)	43	1479	2615	475	160	230
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	5.2	5.2
Lane Util. Factor	1.00	0.95	0.95	1.00	0.97	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	3539	3539	1583	3433	1583
Flt Permitted	0.03	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	53	3539	3539	1583	3433	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	47	1608	2842	516	174	250
RTOR Reduction (vph)	0	0	0	92	0	58
Lane Group Flow (vph)	47	1608	2842	424	174	192
Turn Type	pm+pt	NA	NA	Perm	Prot	Perm
Protected Phases	1	6	2		4	
Permitted Phases	6			2		4
Actuated Green, G (s)	146.7	146.7	134.3	134.3	22.1	22.1
Effective Green, g (s)	146.7	146.7	134.3	134.3	22.1	22.1
Actuated g/C Ratio	0.81	0.81	0.75	0.75	0.12	0.12
Clearance Time (s)	6.0	6.0	6.0	6.0	5.2	5.2
Vehicle Extension (s)	2.5	2.5	2.5	2.5	2.5	2.5
Lane Grp Cap (vph)	104	2884	2640	1181	421	194
v/s Ratio Prot	0.02	c0.45	c0.80		0.05	
v/s Ratio Perm	0.35			0.27		c0.12
v/c Ratio	0.45	0.56	1.08	0.36	0.41	0.99
Uniform Delay, d1	80.9	5.6	22.8	7.9	73.0	78.8
Progression Factor	0.74	0.28	0.19	0.00	1.00	1.00
Incremental Delay, d2	1.8	0.6	35.3	0.1	0.5	61.6
Delay (s)	62.0	2.2	39.7	0.1	73.4	140.5
Level of Service	E	A	D	A	E	F
Approach Delay (s)		3.9	33.6		113.0	
Approach LOS		A	C		F	

Intersection Summary			
HCM 2000 Control Delay	30.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	1.05		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	17.2
Intersection Capacity Utilization	95.9%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations														
Traffic Volume (vph)	6	127	1487	19	2	26	2925	81	6	2	25	73	0	153
Future Volume (vph)	6	127	1487	19	2	26	2925	81	6	2	25	73	0	153
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0	6.0		6.0	6.0	6.0		5.2			5.2	
Lane Util. Factor		1.00	0.95	1.00		1.00	0.95	1.00		1.00			1.00	
Frt		1.00	1.00	0.85		1.00	1.00	0.85		0.90			0.91	
Flt Protected		0.95	1.00	1.00		0.95	1.00	1.00		0.99			0.98	
Satd. Flow (prot)		1770	3539	1583		1787	3574	1599		1642			1699	
Flt Permitted		0.03	1.00	1.00		0.14	1.00	1.00		0.83			0.89	
Satd. Flow (perm)		56	3539	1583		257	3574	1599		1377			1545	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	7	138	1616	21	2	28	3179	88	7	2	27	79	0	166
RTOR Reduction (vph)	0	0	0	5	0	0	0	12	0	24	0	0	82	0
Lane Group Flow (vph)	0	145	1616	16	0	30	3179	76	0	12	0	0	163	0
Heavy Vehicles (%)	2%	2%	2%	2%	1%	1%	1%	1%	3%	3%	3%	0%	0%	0%
Turn Type	pm+pt	pm+pt	NA	Perm	pm+pt	pm+pt	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	1	1	6		5	5	2			4			8	
Permitted Phases	6	6		6	2	2		2	4			8		
Actuated Green, G (s)		141.0	141.0	141.0		137.8	137.8	137.8		17.0			17.0	
Effective Green, g (s)		141.0	141.0	141.0		137.8	137.8	137.8		17.0			17.0	
Actuated g/C Ratio		0.78	0.78	0.78		0.77	0.77	0.77		0.09			0.09	
Clearance Time (s)		6.0	6.0	6.0		6.0	6.0	6.0		5.2			5.2	
Vehicle Extension (s)		2.5	2.5	2.5		2.5	2.5	2.5		2.5			2.5	
Lane Grp Cap (vph)		120	2772	1240		237	2736	1224		130			145	
v/s Ratio Prot		c0.05	0.46			0.00	c0.89							
v/s Ratio Perm		c0.89		0.01		0.09		0.05		0.01			c0.11	
v/c Ratio		1.21	0.58	0.01		0.13	1.16	0.06		0.09			1.12	
Uniform Delay, d1		70.5	7.8	4.3		10.1	21.1	5.2		74.4			81.5	
Progression Factor		1.09	0.55	1.00		0.36	0.37	0.05		1.00			1.00	
Incremental Delay, d2		142.7	0.8	0.0		0.0	73.3	0.0		0.2			111.0	
Delay (s)		219.6	5.0	4.3		3.7	81.1	0.3		74.6			192.5	
Level of Service		F	A	A		A	F	A		E			F	
Approach Delay (s)			22.5				78.3			74.6			192.5	
Approach LOS			C				E			E			F	

Intersection Summary			
HCM 2000 Control Delay	64.9	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.19		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	17.2
Intersection Capacity Utilization	122.7%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Traffic Volume (vph)	11	236	892	448	72	1533	251	1103	1110	61	145	885	387
Future Volume (vph)	11	236	892	448	72	1533	251	1103	1110	61	145	885	387
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.3	6.3	6.3	6.3	6.3	6.3	6.2	6.2	6.2	6.2	6.2	6.2
Lane Util. Factor		1.00	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frt		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1770	3539	1583	1787	3574	1599	3467	3574	1599	1787	3574	1599
Flt Permitted		0.06	1.00	1.00	0.13	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		117	3539	1583	252	3574	1599	3467	3574	1599	1787	3574	1599
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	12	257	970	487	78	1666	273	1199	1207	66	158	962	421
RTOR Reduction (vph)	0	0	0	207	0	0	86	0	0	43	0	0	106
Lane Group Flow (vph)	0	269	970	280	78	1666	187	1199	1207	23	158	962	315
Heavy Vehicles (%)	2%	2%	2%	2%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Turn Type	D.P+P	D.P+P	NA	Perm	D.P+P	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	1	1	6		5	2		7	4		3	8	
Permitted Phases	2	2		6	6		2			4			8
Actuated Green, G (s)		77.4	69.0	69.0	77.4	63.7	63.7	40.8	61.4	61.4	16.2	36.8	36.8
Effective Green, g (s)		77.4	69.0	69.0	77.4	63.7	63.7	40.8	61.4	61.4	16.2	36.8	36.8
Actuated g/C Ratio		0.43	0.38	0.38	0.43	0.35	0.35	0.23	0.34	0.34	0.09	0.20	0.20
Clearance Time (s)		6.3	6.3	6.3	6.3	6.3	6.3	6.2	6.2	6.2	6.2	6.2	6.2
Vehicle Extension (s)		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lane Grp Cap (vph)		176	1356	606	179	1264	565	785	1219	545	160	730	326
v/s Ratio Prot		c0.12	c0.27		0.02	0.47		c0.35	0.34		0.09	c0.27	
v/s Ratio Perm		c0.54		0.18	0.17		0.12			0.01			0.20
v/c Ratio		1.53	0.72	0.46	0.44	1.32	0.33	1.53	0.99	0.04	0.99	1.32	0.97
Uniform Delay, d1		56.9	47.2	41.6	35.2	58.1	42.6	69.6	59.0	39.6	81.8	71.6	71.0
Progression Factor		0.99	0.76	1.26	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		259.8	2.7	2.1	0.6	148.8	1.6	243.8	23.3	0.0	66.7	152.6	40.3
Delay (s)		316.2	38.6	54.7	35.8	206.9	44.1	313.4	82.3	39.6	148.5	224.2	111.3
Level of Service		F	D	D	D	F	D	F	F	D	F	F	F
Approach Delay (s)			86.4			178.3			193.2			185.6	
Approach LOS			F			F			F			F	

Intersection Summary			
HCM 2000 Control Delay	164.1	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.48		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	25.0
Intersection Capacity Utilization	132.8%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Traffic Volume (vph)	11	63	954	181	37	2162	360	415	198	0	29	76	70
Future Volume (vph)	11	63	954	181	37	2162	360	415	198	0	29	76	70
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.8	5.5	5.5	6.7	5.9		6.8	7.6		6.8	7.6	7.6
Lane Util. Factor		1.00	0.91	1.00	1.00	0.91		0.97	1.00		1.00	1.00	1.00
Frt		1.00	1.00	0.85	1.00	0.98		1.00	1.00		1.00	1.00	0.85
Flt Protected		0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1787	5136	1599	1719	4834		3467	1881		1787	1881	1599
Flt Permitted		0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.36	1.00	1.00
Satd. Flow (perm)		1787	5136	1599	1719	4834		3467	1881		679	1881	1599
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	12	68	1037	197	40	2350	391	451	215	0	32	83	76
RTOR Reduction (vph)	0	0	0	75	0	9	0	0	0	0	0	0	70
Lane Group Flow (vph)	0	80	1037	122	40	2732	0	451	215	0	32	83	6
Heavy Vehicles (%)	1%	1%	1%	1%	5%	5%	5%	1%	1%	1%	1%	1%	1%
Turn Type	Prot	Prot	NA	Perm	Prot	NA		Prot	NA		D.P+P	NA	Perm
Protected Phases	5	5	2		1	6		7	4		3	8	
Permitted Phases				2							4		8
Actuated Green, G (s)		8.6	111.6	111.6	7.6	111.1		19.2	30.2		34.2	15.0	15.0
Effective Green, g (s)		8.6	111.6	111.6	7.6	111.1		19.2	30.2		34.2	15.0	15.0
Actuated g/C Ratio		0.05	0.62	0.62	0.04	0.62		0.11	0.17		0.19	0.08	0.08
Clearance Time (s)		5.8	5.5	5.5	6.7	5.9		6.8	7.6		6.8	7.6	7.6
Vehicle Extension (s)		2.0	2.0	2.0	2.0	2.0		2.0	3.0		2.0	3.0	3.0
Lane Grp Cap (vph)		85	3184	991	72	2983		369	315		153	156	133
v/s Ratio Prot		c0.04	0.20		0.02	c0.57		c0.13	c0.11		0.00	0.04	
v/s Ratio Perm				0.08							0.03		0.00
v/c Ratio		0.94	0.33	0.12	0.56	0.92		1.22	0.68		0.21	0.53	0.05
Uniform Delay, d1		85.4	16.3	14.1	84.5	30.3		80.4	70.4		60.6	79.1	75.9
Progression Factor		1.00	1.00	1.00	1.33	0.41		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2		77.2	0.3	0.3	3.4	3.9		122.0	6.0		0.2	3.5	0.1
Delay (s)		162.6	16.6	14.3	115.8	16.2		202.4	76.4		60.8	82.6	76.1
Level of Service		F	B	B	F	B		F	E		E	F	E
Approach Delay (s)			25.1			17.6			161.7			76.4	
Approach LOS			C			B			F			E	

Intersection Summary			
HCM 2000 Control Delay	41.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	26.6
Intersection Capacity Utilization	91.9%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Traffic Volume (vph)	33	934	14	12	25	2445	58	91	34	24	31	15	22
Future Volume (vph)	33	934	14	12	25	2445	58	91	34	24	31	15	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1	7.4			6.1	7.4			7.6			7.6	
Lane Util. Factor	1.00	0.91			1.00	0.91			1.00			1.00	
Frt	1.00	1.00			1.00	1.00			0.98			0.96	
Flt Protected	0.95	1.00			0.95	1.00			0.97			0.98	
Satd. Flow (prot)	1787	5124			1752	5018			1640			1675	
Flt Permitted	0.03	1.00			0.25	1.00			0.77			0.78	
Satd. Flow (perm)	59	5124			466	5018			1301			1331	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	36	1015	15	13	27	2658	63	99	37	26	34	16	24
RTOR Reduction (vph)	0	1	0	0	0	1	0	0	4	0	0	10	0
Lane Group Flow (vph)	36	1029	0	0	40	2720	0	0	158	0	0	64	0
Heavy Vehicles (%)	1%	1%	1%	3%	3%	3%	3%	10%	10%	10%	6%	6%	6%
Turn Type	D.P+P	NA		D.P+P	D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	1	6			8			4	
Permitted Phases	6			2	2			8			4		
Actuated Green, G (s)	132.9	128.4			132.9	128.3			26.0			26.0	
Effective Green, g (s)	132.9	128.4			132.9	128.3			26.0			26.0	
Actuated g/C Ratio	0.74	0.71			0.74	0.71			0.14			0.14	
Clearance Time (s)	6.1	7.4			6.1	7.4			7.6			7.6	
Vehicle Extension (s)	2.0	2.0			2.0	2.0			2.0			2.0	
Lane Grp Cap (vph)	87	3655			376	3576			187			192	
v/s Ratio Prot	c0.01	0.20			0.00	c0.54							
v/s Ratio Perm	0.29				0.08				c0.12			0.05	
v/c Ratio	0.41	0.28			0.11	0.76			0.84			0.33	
Uniform Delay, d1	19.9	9.3			6.4	16.2			75.0			69.2	
Progression Factor	1.91	2.14			0.26	0.38			1.00			1.00	
Incremental Delay, d2	1.1	0.2			0.0	0.8			26.8			0.4	
Delay (s)	39.0	20.0			1.7	7.0			101.8			69.6	
Level of Service	D	C			A	A			F			E	
Approach Delay (s)		20.7				7.0			101.8			69.6	
Approach LOS		C				A			F			E	

Intersection Summary			
HCM 2000 Control Delay	15.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	21.1
Intersection Capacity Utilization	73.0%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations														
Traffic Volume (vph)	5	44	924	29	18	69	2412	164	59	197	66	93	68	63
Future Volume (vph)	5	44	924	29	18	69	2412	164	59	197	66	93	68	63
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.1	7.4			6.1	7.4	7.4	6.8	7.6		6.8	7.6	
Lane Util. Factor		1.00	0.91			1.00	0.91	1.00	1.00	1.00		1.00	1.00	
Frt		1.00	1.00			1.00	1.00	0.85	1.00	0.96		1.00	0.93	
Flt Protected		0.95	1.00			0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1787	5112			1752	5036	1568	1770	1792		1719	1680	
Flt Permitted		0.04	1.00			0.23	1.00	1.00	0.57	1.00		0.21	1.00	
Satd. Flow (perm)		70	5112			430	5036	1568	1057	1792		382	1680	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	5	48	1004	32	20	75	2622	178	64	214	72	101	74	68
RTOR Reduction (vph)	0	0	2	0	0	0	0	46	0	7	0	0	19	0
Lane Group Flow (vph)	0	53	1034	0	0	95	2622	132	64	279	0	101	123	0
Heavy Vehicles (%)	1%	1%	1%	1%	3%	3%	3%	3%	2%	2%	2%	5%	5%	5%
Turn Type	D.P+P	D.P+P	NA		D.P+P	D.P+P	NA	Perm	D.P+P	NA		D.P+P	NA	
Protected Phases	5	5	2		1	1	6		3	8		7	4	
Permitted Phases	6	6			2	2		6	4			8		
Actuated Green, G (s)		112.7	105.7			112.7	107.9	107.9	39.4	31.9		39.4	33.4	
Effective Green, g (s)		112.7	105.7			112.7	107.9	107.9	39.4	31.9		39.4	33.4	
Actuated g/C Ratio		0.63	0.59			0.63	0.60	0.60	0.22	0.18		0.22	0.19	
Clearance Time (s)		6.1	7.4			6.1	7.4	7.4	6.8	7.6		6.8	7.6	
Vehicle Extension (s)		2.0	4.5			2.0	4.5	4.5	3.0	2.0		3.0	2.0	
Lane Grp Cap (vph)		89	3001			320	3018	939	255	317		139	311	
v/s Ratio Prot		c0.02	0.20			0.01	c0.52		0.01	c0.16		c0.03	0.07	
v/s Ratio Perm		0.36				0.17		0.08	0.05			0.13		
v/c Ratio		0.60	0.34			0.30	0.87	0.14	0.25	0.88		0.73	0.40	
Uniform Delay, d1		69.5	19.2			13.8	30.1	15.8	57.0	72.2		62.2	64.4	
Progression Factor		0.55	0.22			0.29	0.19	0.02	1.00	1.00		1.00	1.00	
Incremental Delay, d2		6.8	0.3			0.0	0.4	0.0	0.5	23.1		17.2	0.3	
Delay (s)		45.0	4.5			4.1	6.0	0.3	57.6	95.3		79.4	64.7	
Level of Service		D	A			A	A	A	E	F		E	E	
Approach Delay (s)			6.4				5.6			88.4			70.8	
Approach LOS			A				A			F			E	

Intersection Summary			
HCM 2000 Control Delay	15.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	27.9
Intersection Capacity Utilization	100.8%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations														
Traffic Volume (vph)	3	86	961	50	10	34	2400	369	128	182	61	385	268	132
Future Volume (vph)	3	86	961	50	10	34	2400	369	128	182	61	385	268	132
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.4	8.7	8.7		6.9	8.7	8.7	6.8	7.9		6.8	7.9	7.9
Lane Util. Factor		1.00	0.91	1.00		1.00	0.91	1.00	1.00	1.00		0.97	1.00	1.00
Frt		1.00	1.00	0.85		1.00	1.00	0.85	1.00	0.96		1.00	1.00	0.85
Flt Protected		0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1593	4577	1425		1577	4532	1411	1624	1646		3090	1676	1425
Flt Permitted		0.04	1.00	1.00		0.22	1.00	1.00	0.29	1.00		0.95	1.00	1.00
Satd. Flow (perm)		71	4577	1425		373	4532	1411	503	1646		3090	1676	1425
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	3	93	1045	54	11	37	2609	401	139	198	66	418	291	143
RTOR Reduction (vph)	0	0	0	25	0	0	0	82	0	7	0	0	0	112
Lane Group Flow (vph)	0	96	1045	29	0	48	2609	319	139	257	0	418	291	31
Heavy Vehicles (%)	2%	2%	2%	2%	3%	3%	3%	3%	0%	0%	0%	2%	2%	2%
Turn Type	D.P+P	D.P+P	NA	Perm	D.P+P	D.P+P	NA	Perm	D.P+P	NA		Prot	NA	Perm
Protected Phases	1	1	6		5	5	2		7	4		3	8	
Permitted Phases	2	2		6	6	6		2	8					8
Actuated Green, G (s)		101.0	96.8	96.8		101.5	93.9	93.9	48.2	29.4		18.8	39.0	39.0
Effective Green, g (s)		101.0	96.8	96.8		101.5	93.9	93.9	48.2	29.4		18.8	39.0	39.0
Actuated g/C Ratio		0.56	0.54	0.54		0.56	0.52	0.52	0.27	0.16		0.10	0.22	0.22
Clearance Time (s)		7.4	8.7	8.7		6.9	8.7	8.7	6.8	7.9		6.8	7.9	7.9
Vehicle Extension (s)		2.0	2.0	2.0		2.0	2.0	2.0	2.0	2.0		2.0	2.0	2.0
Lane Grp Cap (vph)		99	2461	766		241	2364	736	191	268		322	363	308
v/s Ratio Prot		c0.04	0.23			0.01	c0.58		0.04	c0.16		c0.14	0.17	
v/s Ratio Perm		0.50		0.02		0.11		0.23	0.16					0.02
v/c Ratio		0.97	0.42	0.04		0.20	1.10	0.43	0.73	0.96		1.30	0.80	0.10
Uniform Delay, d1		82.5	24.9	19.6		18.2	43.0	26.6	58.4	74.7		80.6	66.8	56.5
Progression Factor		1.14	1.10	1.00		0.37	0.29	0.16	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2		76.3	0.5	0.1		0.0	48.9	0.6	11.1	43.7		155.2	11.4	0.1
Delay (s)		170.5	27.9	19.7		6.8	61.5	4.9	69.4	118.4		235.8	78.2	56.5
Level of Service		F	C	B		A	E	A	E	F		F	E	E
Approach Delay (s)			39.0				53.2			101.5			151.9	
Approach LOS			D				D			F			F	

Intersection Summary			
HCM 2000 Control Delay	68.9	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.09		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	30.8
Intersection Capacity Utilization	109.6%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Lane Configurations														
Traffic Volume (vph)	24	226	757	409	248	1906	441	655	473	182	1	163	370	227
Future Volume (vph)	24	226	757	409	248	1906	441	655	473	182	1	163	370	227
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.4	5.9	5.9	7.4	5.9	5.9	7.0	5.4	5.4		7.0	5.4	5.4
Lane Util. Factor		0.97	0.91	1.00	0.97	0.91	1.00	0.97	0.95	1.00		0.97	0.95	1.00
Frt		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85		1.00	1.00	0.85
Flt Protected		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00		0.95	1.00	1.00
Satd. Flow (prot)		3467	5136	1599	3367	4988	1553	3433	3539	1583		3433	3539	1583
Flt Permitted		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00		0.95	1.00	1.00
Satd. Flow (perm)		3467	5136	1599	3367	4988	1553	3433	3539	1583		3433	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	26	246	823	445	270	2072	479	712	514	198	1	177	402	247
RTOR Reduction (vph)	0	0	0	230	0	0	113	0	0	134	0	0	0	129
Lane Group Flow (vph)	0	272	823	215	270	2072	366	712	514	64	0	178	402	118
Heavy Vehicles (%)	1%	1%	1%	1%	4%	4%	4%	2%	2%	2%	2%	2%	2%	2%
Turn Type	Prot	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	Prot	NA	Perm
Protected Phases	1	1	6		5	2		7	4		3	3	8	
Permitted Phases				6			2			4				8
Actuated Green, G (s)		13.7	65.0	65.0	18.3	69.6	69.6	45.8	57.9	57.9		13.1	25.2	25.2
Effective Green, g (s)		13.7	65.0	65.0	18.3	69.6	69.6	45.8	57.9	57.9		13.1	25.2	25.2
Actuated g/C Ratio		0.08	0.36	0.36	0.10	0.39	0.39	0.25	0.32	0.32		0.07	0.14	0.14
Clearance Time (s)		7.4	5.9	5.9	7.4	5.9	5.9	7.0	5.4	5.4		7.0	5.4	5.4
Vehicle Extension (s)		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	2.0
Lane Grp Cap (vph)		263	1854	577	342	1928	600	873	1138	509		249	495	221
v/s Ratio Prot		c0.08	0.16		0.08	c0.42		c0.21	0.15			0.05	c0.11	
v/s Ratio Perm				0.13			0.24			0.04				0.07
v/c Ratio		1.03	0.44	0.37	0.79	1.07	0.61	0.82	0.45	0.13		0.71	0.81	0.53
Uniform Delay, d1		83.2	43.7	42.4	79.0	55.2	44.3	63.1	48.5	43.1		81.6	75.1	71.9
Progression Factor		0.62	0.38	0.38	0.90	0.90	0.97	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2		56.5	0.6	1.3	7.8	41.4	3.3	5.6	0.1	0.0		7.9	9.3	1.2
Delay (s)		107.8	17.1	17.4	79.0	91.3	46.3	68.7	48.6	43.2		89.5	84.4	73.2
Level of Service		F	B	B	E	F	D	E	D	D		F	F	E
Approach Delay (s)			33.2			82.5			57.9				82.2	
Approach LOS			C			F			E				F	

Intersection Summary			
HCM 2000 Control Delay	65.7	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	25.7
Intersection Capacity Utilization	96.8%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	997	100	150	2440	5	150	0	150	5	0	5
Future Volume (vph)	5	997	100	150	2440	5	150	0	150	5	0	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1	7.4		6.1	7.4			7.2	7.2	6.4	7.2	
Lane Util. Factor	1.00	0.91		1.00	0.91			1.00	1.00	1.00	1.00	
Frt	1.00	0.99		1.00	1.00			1.00	0.85	1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00			0.95	1.00	0.95	1.00	
Satd. Flow (prot)	1770	5016		1770	5084			1770	1583	1770	1583	
Flt Permitted	0.03	1.00		0.17	1.00			0.75	1.00	0.44	1.00	
Satd. Flow (perm)	59	5016		325	5084			1405	1583	825	1583	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	5	1084	109	163	2652	5	163	0	163	5	0	5
RTOR Reduction (vph)	0	7	0	0	0	0	0	0	140	0	4	0
Lane Group Flow (vph)	5	1186	0	163	2657	0	0	163	23	5	1	0
Turn Type	D.P+P	NA		D.P+P	NA		D.P+P	NA	Perm	D.P+P	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	2			6			8		4	4		
Actuated Green, G (s)	126.7	92.9		126.7	125.9			25.4	25.4	26.2	32.6	
Effective Green, g (s)	126.7	92.9		126.7	125.9			25.4	25.4	26.2	32.6	
Actuated g/C Ratio	0.70	0.52		0.70	0.70			0.14	0.14	0.15	0.18	
Clearance Time (s)	6.1	7.4		6.1	7.4			7.2	7.2	6.4	7.2	
Vehicle Extension (s)	2.0	2.0		2.0	2.0			2.0	2.0	2.0	2.0	
Lane Grp Cap (vph)	49	2588		500	3555			198	223	124	286	
v/s Ratio Prot	0.00	c0.24		0.06	c0.52					c0.00	0.00	
v/s Ratio Perm	0.07			0.17				c0.12	0.01	0.01		
v/c Ratio	0.10	0.46		0.33	0.75			0.82	0.10	0.04	0.00	
Uniform Delay, d1	17.1	27.6		24.8	17.0			75.1	67.4	73.2	60.4	
Progression Factor	1.38	0.41		0.59	0.69			1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.3	0.5		0.1	1.1			22.3	0.1	0.0	0.0	
Delay (s)	24.0	11.9		14.7	13.0			97.5	67.4	73.2	60.4	
Level of Service	C	B		B	B			F	E	E	E	
Approach Delay (s)		12.0			13.1			82.5			66.8	
Approach LOS		B			B			F			E	

Intersection Summary			
HCM 2000 Control Delay	18.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	27.1
Intersection Capacity Utilization	82.8%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1133	19	178	2517	78	189
Future Volume (vph)	1133	19	178	2517	78	189
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.7		6.4	7.7	7.6	7.6
Lane Util. Factor	0.91		1.00	0.91	1.00	1.00
Frt	1.00		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	5123		1752	5036	1805	1615
Flt Permitted	1.00		0.18	1.00	0.95	1.00
Satd. Flow (perm)	5123		334	5036	1805	1615
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1232	21	193	2736	85	205
RTOR Reduction (vph)	0	0	0	0	0	190
Lane Group Flow (vph)	1253	0	193	2736	85	15
Heavy Vehicles (%)	1%	1%	3%	3%	0%	0%
Turn Type	NA		D.P+P	NA	Prot	Perm
Protected Phases	6		5	2	4	
Permitted Phases			6			4
Actuated Green, G (s)	112.0		145.3	151.7	13.0	13.0
Effective Green, g (s)	112.0		145.3	151.7	13.0	13.0
Actuated g/C Ratio	0.62		0.81	0.84	0.07	0.07
Clearance Time (s)	7.7		6.4	7.7	7.6	7.6
Vehicle Extension (s)	0.2		2.0	0.2	2.0	2.0
Lane Grp Cap (vph)	3187		531	4244	130	116
v/s Ratio Prot	0.24		0.07	c0.54	c0.05	
v/s Ratio Perm			0.23			0.01
v/c Ratio	0.39		0.36	0.64	0.65	0.13
Uniform Delay, d1	17.0		14.0	4.9	81.3	78.2
Progression Factor	0.24		1.03	0.56	1.00	1.00
Incremental Delay, d2	0.3		0.1	0.5	8.7	0.2
Delay (s)	4.4		14.4	3.2	90.0	78.4
Level of Service	A		B	A	F	E
Approach Delay (s)	4.4			4.0	81.8	
Approach LOS	A			A	F	

Intersection Summary			
HCM 2000 Control Delay	9.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	25.7
Intersection Capacity Utilization	68.0%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	43	1279	2465	475	160	230
Future Volume (vph)	43	1279	2465	475	160	230
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.4	8.7	8.7	8.7	7.2	7.2
Lane Util. Factor	1.00	0.91	0.91	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1787	5136	4988	1553	1752	1568
Flt Permitted	0.03	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	59	5136	4988	1553	1752	1568
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	47	1390	2679	516	174	250
RTOR Reduction (vph)	0	0	0	49	0	218
Lane Group Flow (vph)	47	1390	2679	467	174	32
Heavy Vehicles (%)	1%	1%	4%	4%	3%	3%
Turn Type	D.P+P	NA	NA	Perm	Prot	Perm
Protected Phases	1	6	2		4	
Permitted Phases	2			2		4
Actuated Green, G (s)	134.0	141.4	127.6	127.6	22.7	22.7
Effective Green, g (s)	134.0	141.4	127.6	127.6	22.7	22.7
Actuated g/C Ratio	0.74	0.79	0.71	0.71	0.13	0.13
Clearance Time (s)	7.4	8.7	8.7	8.7	7.2	7.2
Vehicle Extension (s)	2.5	2.5	2.5	2.5	2.5	2.5
Lane Grp Cap (vph)	105	4034	3535	1100	220	197
v/s Ratio Prot	c0.02	0.27	c0.54		c0.10	
v/s Ratio Perm	0.32			0.30		0.02
v/c Ratio	0.45	0.34	0.76	0.42	0.79	0.16
Uniform Delay, d1	48.5	5.7	16.5	10.9	76.3	70.1
Progression Factor	0.58	0.52	0.06	0.00	1.00	1.00
Incremental Delay, d2	2.1	0.2	0.7	0.5	16.9	0.3
Delay (s)	30.4	3.2	1.6	0.5	93.2	70.4
Level of Service	C	A	A	A	F	E
Approach Delay (s)		4.0	1.4		79.8	
Approach LOS		A	A		E	

Intersection Summary			
HCM 2000 Control Delay	8.8	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	27.3
Intersection Capacity Utilization	75.1%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Traffic Volume (vph)	127	1287	19	2	26	2775	81	6	2	25	73	0	153
Future Volume (vph)	127	1287	19	2	26	2775	81	6	2	25	73	0	153
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1	7.4			6.1	7.4			7.0			7.0	
Lane Util. Factor	1.00	0.91			1.00	0.91			1.00			1.00	
Frt	1.00	1.00			1.00	1.00			0.90			0.91	
Flt Protected	0.95	1.00			0.95	1.00			0.99			0.98	
Satd. Flow (prot)	1787	5124			1736	4966			1691			1682	
Flt Permitted	0.03	1.00			0.16	1.00			0.82			0.88	
Satd. Flow (perm)	61	5124			291	4966			1403			1501	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	138	1399	21	2	28	3016	88	7	2	27	79	0	166
RTOR Reduction (vph)	0	1	0	0	0	2	0	0	24	0	0	95	0
Lane Group Flow (vph)	138	1419	0	0	30	3102	0	0	12	0	0	151	0
Heavy Vehicles (%)	1%	1%	1%	4%	4%	4%	4%	0%	0%	0%	1%	1%	1%
Turn Type	D.P+P	NA		D.P+P	D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	5	2			4			8	
Permitted Phases	2			6	6			4			8		
Actuated Green, G (s)	137.0	130.6			137.0	124.2			22.5			22.5	
Effective Green, g (s)	137.0	130.6			137.0	124.2			22.5			22.5	
Actuated g/C Ratio	0.76	0.73			0.76	0.69			0.12			0.12	
Clearance Time (s)	6.1	7.4			6.1	7.4			7.0			7.0	
Vehicle Extension (s)	2.5	2.5			2.5	2.5			2.5			2.5	
Lane Grp Cap (vph)	169	3717			272	3426			175			187	
v/s Ratio Prot	c0.06	0.28			0.00	c0.62							
v/s Ratio Perm	0.57				0.08				0.01			c0.10	
v/c Ratio	0.82	0.38			0.11	0.91			0.07			0.80	
Uniform Delay, d1	64.0	9.4			5.7	23.1			69.5			76.6	
Progression Factor	0.86	1.06			0.41	0.26			1.00			1.00	
Incremental Delay, d2	23.7	0.3			0.0	0.4			0.1			21.1	
Delay (s)	78.8	10.2			2.3	6.5			69.6			97.7	
Level of Service	E	B			A	A			E			F	
Approach Delay (s)		16.3				6.5			69.6			97.7	
Approach LOS		B				A			E			F	

Intersection Summary			
HCM 2000 Control Delay	14.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	20.5
Intersection Capacity Utilization	99.7%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Traffic Volume (vph)	11	236	692	448	72	1383	251	1103	1110	61	145	885	387
Future Volume (vph)	11	236	692	448	72	1383	251	1103	1110	61	145	885	387
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.0	5.6	4.0	7.0	5.6	5.6	6.8	5.4	5.4	7.0	5.6	5.6
Lane Util. Factor		0.97	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frt		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		3467	3574	1599	1736	3471	1553	3367	3471	1553	1752	3505	1568
Flt Permitted		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		3467	3574	1599	1736	3471	1553	3367	3471	1553	1752	3505	1568
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	12	257	752	487	78	1503	273	1199	1207	66	158	962	421
RTOR Reduction (vph)	0	0	0	0	0	0	94	0	0	41	0	0	109
Lane Group Flow (vph)	0	269	752	487	78	1503	179	1199	1207	25	158	962	312
Heavy Vehicles (%)	1%	1%	1%	1%	4%	4%	4%	4%	4%	4%	3%	3%	3%
Turn Type	Prot	Prot	NA	Free	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	1	1	6		5	2		7	4		3	8	
Permitted Phases				Free			2			4			8
Actuated Green, G (s)		10.0	58.5	180.0	11.9	60.4	60.4	43.2	67.6	67.6	17.0	41.4	41.4
Effective Green, g (s)		10.0	58.5	180.0	11.9	60.4	60.4	43.2	67.6	67.6	17.0	41.4	41.4
Actuated g/C Ratio		0.06	0.32	1.00	0.07	0.34	0.34	0.24	0.38	0.38	0.09	0.23	0.23
Clearance Time (s)		7.0	5.6		7.0	5.6	5.6	6.8	5.4	5.4	7.0	5.6	5.6
Vehicle Extension (s)		2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lane Grp Cap (vph)		192	1161	1599	114	1164	521	808	1303	583	165	806	360
v/s Ratio Prot		c0.08	0.21		0.04	c0.43		c0.36	0.35		0.09	c0.27	
v/s Ratio Perm				c0.30			0.12			0.02			0.20
v/c Ratio		1.40	0.65	0.30	0.68	1.29	0.34	1.48	0.93	0.04	0.96	1.19	0.87
Uniform Delay, d1		85.0	51.9	0.0	82.2	59.8	44.9	68.4	53.8	35.7	81.1	69.3	66.6
Progression Factor		0.97	0.86	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		207.2	2.6	0.5	12.7	137.6	1.8	224.4	11.1	0.0	56.6	99.2	18.5
Delay (s)		290.1	47.3	0.5	94.9	197.4	46.7	292.8	64.9	35.7	137.7	168.5	85.1
Level of Service		F	D	A	F	F	D	F	E	D	F	F	F
Approach Delay (s)			75.5			170.9			174.7			142.5	
Approach LOS			E			F			F			F	

Intersection Summary			
HCM 2000 Control Delay	146.7	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.33		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	25.0
Intersection Capacity Utilization	120.9%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

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Attachment D

Synchro Output – Queue Lengths and Turn Bay Calculations

				Year 2040 Synchro Results			TxDOT Roadway Design Manual, Table 3-3 and Table 3-4				
Intersection Number	Cross Street	Movement	Number of Bays	95th %ile Queue Length (ft) AM	95th %ile Queue Length (ft) PM	Posted Speed (mph)	Min. Storage Length (ft)	Req. Storage Length (ft)	Decel Length (ft)	Taper Length (ft)	Min Turn Bay Length (ft)
1	Roberts Cut Off Road	EBL	1	72	233	45	100	233	345	100	580**
		EBR	1	281	38	45	30	281	345	100	630
		WBL	1	53	63	45	100	100	345	100	445
		NBL	2	95	455	30	100	455	160	100	615
		SBL	1	171	62	30	100	171	160	50	335
		SBR	1	19	0	30	30	30	160	50	190
2	Biway Street	EBL	1	1	63	45	100	100	345	100	445
		WBL	1	19	2	45	100	100	345	100	445
3	Skyline Drive	EBL	1	5	66	45	100	100	345	100	445
		WBL	1	77	27	45	100	100	345	100	445
		WBR	1	11	8	45	30	30	345	100	375
		NBL	1	109	100	30	100	109	75*	50	185
		SBL	1	291	160	30	100	291	75*	50	370
4	Long Avenue	EBL	1	13	211	45	100	211	345	100	560
		EBR	1	0	16	45	30	30	345	100	375
		WBL	1	7	11	45	100	100	345	100	445
		WBR	1	39	43	45	30	43	345	100	390
		NBL	1	81	201	35	100	201	110*	50	315
		SBL	2	426	448	35	100	448	110*	100	560
		SBR	1	4	37	35	30	37	215	50	255
5	SH 183	EBL	2	106	229	45	100	229	345	150	575
		EBR	1	184	120	45	30	184	345	100	530
		WBL	2	251	207	45	100	251	345	150	600
		WBR	1	24	576	45	30	576	345	100	925
		NBL	2	366	555	40	100	555	275	100	830
		NBR	1	83	64	40	30	83	275	50	360
		SBL	2	396	152	40	100	396	275	100	675
		SBR	1	29	213	40	30	213	275	50	490
6	Walmart Drive	EBL	1	0	8	45	100	100	345	100	445
		WBL	1	21	20	45	100	100	345	100	445
7	Ohio Garden Road	WBL	1	458	62	45	100	458	345	100	805
		NBL	1	55	162	30	100	162	75*	50	240
8	NW 21st Street	EBL	1	3	43	45	100	100	345	100	445
		SBL	2	505	283	30	100	505	75*	100	580
9	NW 18th Street	EBL	1	55	260	45	100	260	345	100	605
		WBL	1	0	2	45	100	100	345	100	445
10	University Drive	EBL	2	292	313	45	100	313	345	150	660
		EBR	1	LANE DROP							
		WBL	1	252	154	40	100	252	275	50	530
		WBR	1	36	211	40	30	211	275	50	490
		NBL	2	381	1140	35	100	1140	110*	100	1250**
		NBR	1	LANE DROP							
		SBL	2	513	348	40	100	513	160*	100	675**
		SBR	1	57	549	40	30	549	160*	50	710**

Notes:

* *Assumes a turning vehicle speed differential of 20 MPH per TxDOT Roadway Design Manual Table 3-3A.*

** *Calculated minimum turn lane length cannot be incorporated due to site constraints.*

1 *Queue lengths are dependent on estimates of the projected turning movement volumes.*

2 *Turn lane length calculations are dependent on selected signal timing. Provided calculations reflect an optimized signal timing utilizing Synchro traffic modeling software. In practice, the timings for the left turns can be field-adjusted to help reduce queues.*

3 *Presence of, or lack of, turn bays may impact the intersection queue lengths. Vehicles in right turn bays can often turn right on red, whereas those in shared through lanes can only turn right unless they are at the front of the turn bay.*

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	44	2585	535	28	923	89	81	116	208	98
v/c Ratio	0.09	0.78	0.48	0.38	0.47	0.66	0.32	0.44	0.79	0.29
Control Delay	42.1	27.1	10.0	105.7	17.5	107.4	52.8	64.9	94.8	4.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	42.1	27.1	10.0	105.7	17.5	107.4	52.8	64.9	94.8	4.6
Queue Length 50th (ft)	34	800	150	23	292	54	64	116	242	0
Queue Length 95th (ft)	72	1002	281	53	444	#95	116	171	326	19
Internal Link Dist (ft)		744			2672		306		496	
Turn Bay Length (ft)	115			130		100		100		300
Base Capacity (vph)	515	3302	1124	73	2757	137	449	264	459	492
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.09	0.78	0.48	0.38	0.33	0.65	0.18	0.44	0.45	0.20

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Lane Group	EBL	EBT	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	7	2731	13	930	66	98
v/c Ratio	0.01	0.66	0.14	0.23	0.49	0.76
Control Delay	0.8	2.6	17.5	5.1	73.0	106.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	0.8	2.6	17.5	5.1	73.0	106.0
Queue Length 50th (ft)	1	143	1	135	60	106
Queue Length 95th (ft)	m1	20	m19	26	113	172
Internal Link Dist (ft)		2672		2397	495	325
Turn Bay Length (ft)	135		200			
Base Capacity (vph)	492	4109	96	4084	279	272
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.01	0.66	0.14	0.23	0.24	0.36

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	34	2753	46	821	40	74	151	217	291
v/c Ratio	0.08	0.90	0.46	0.27	0.04	0.49	0.50	0.80	0.82
Control Delay	4.3	21.4	61.9	10.3	1.3	62.3	62.2	80.7	87.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	4.3	21.4	61.9	10.3	1.3	62.3	62.2	80.7	87.2
Queue Length 50th (ft)	6	200	24	150	1	68	140	220	334
Queue Length 95th (ft)	m5	#847	77	278	11	109	209	291	428
Internal Link Dist (ft)		2397		4145			688		590
Turn Bay Length (ft)	150		200		150	100		100	
Base Capacity (vph)	404	3042	101	2994	975	152	375	272	419
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.08	0.90	0.46	0.27	0.04	0.49	0.40	0.80	0.69

Intersection Summary

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	90	2741	145	14	776	389	53	241	435	287	73
v/c Ratio	0.28	1.08	0.17	0.17	0.34	0.43	0.23	0.92	1.04	0.63	0.15
Control Delay	5.1	59.0	0.2	19.7	3.3	3.2	44.6	110.0	126.5	66.1	1.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	5.1	59.0	0.2	19.7	3.3	3.2	44.6	110.0	126.5	66.1	1.3
Queue Length 50th (ft)	12	~1272	0	1	18	40	43	273	~308	308	0
Queue Length 95th (ft)	m13	#1453	m0	m7	m28	m39	81	#431	#426	423	4
Internal Link Dist (ft)		4145			1653			583		1092	
Turn Bay Length (ft)	200		200	175		200	50		100		
Base Capacity (vph)	328	2533	860	82	2270	901	230	281	418	453	471
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.27	1.08	0.17	0.17	0.34	0.43	0.23	0.86	1.04	0.63	0.15

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	270	2279	690	239	661	82	399	428	153	494	705	113
v/c Ratio	0.22	1.00	0.82	0.98	0.79	0.22	0.94	0.83	0.44	0.74	0.92	0.25
Control Delay	27.9	28.4	10.4	146.7	63.0	8.1	106.9	88.3	15.4	75.8	86.9	4.5
Queue Delay	0.0	16.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	27.9	44.7	10.4	146.7	63.0	8.1	106.9	88.3	15.4	75.8	86.9	4.5
Queue Length 50th (ft)	112	~941	409	152	282	25	247	263	12	285	427	0
Queue Length 95th (ft)	m106	m672	m184	#251	197	24	#366	315	83	#396	#513	29
Internal Link Dist (ft)		1653			1123			715			901	
Turn Bay Length (ft)	150		175	185		200	200		500	200		50
Base Capacity (vph)	1210	2281	841	245	1973	697	425	727	437	666	806	469
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	108	0	0	0	0	0	0	2	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.22	1.05	0.82	0.98	0.34	0.12	0.94	0.59	0.35	0.74	0.87	0.24

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Lane Group	EBL	EBT	WBL	WBT	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	5	2918	33	948	33	33	5	5
v/c Ratio	0.01	0.69	0.34	0.22	0.47	0.19	0.06	0.02
Control Delay	0.4	5.2	30.6	2.5	103.7	2.4	74.8	0.2
Queue Delay	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	0.4	5.3	30.6	2.5	103.7	2.4	74.8	0.2
Queue Length 50th (ft)	0	95	4	50	39	0	6	0
Queue Length 95th (ft)	m0	m260	21	210	80	0	20	0
Internal Link Dist (ft)		1123		2564	195			209
Turn Bay Length (ft)	330		320					
Base Capacity (vph)	497	4203	97	4409	266	383	88	466
Starvation Cap Reductn	0	267	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.01	0.74	0.34	0.22	0.12	0.09	0.06	0.01

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	2923	214	962	20	160
v/c Ratio	0.75	1.31	0.22	0.22	0.69
Control Delay	3.6	209.0	0.8	86.9	25.8
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	3.6	209.0	0.8	86.9	25.8
Queue Length 50th (ft)	221	~267	14	23	0
Queue Length 95th (ft)	14	#458	41	55	81
Internal Link Dist (ft)	2564		616	902	
Turn Bay Length (ft)		250		50	
Base Capacity (vph)	3878	163	4353	361	451
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.75	1.31	0.22	0.06	0.35

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	65	2920	909	216	284	266
v/c Ratio	0.15	0.77	0.28	0.20	0.93	0.55
Control Delay	1.1	2.2	3.8	0.6	108.3	12.9
Queue Delay	0.0	0.1	0.0	0.0	0.0	0.0
Total Delay	1.1	2.3	3.8	0.6	108.3	12.9
Queue Length 50th (ft)	0	244	28	0	332	14
Queue Length 95th (ft)	m3	36	38	0	#505	106
Internal Link Dist (ft)		616	1775		891	
Turn Bay Length (ft)	220			200	200	
Base Capacity (vph)	435	3785	3249	1084	321	493
Starvation Cap Reductn	0	71	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.15	0.79	0.28	0.20	0.88	0.54

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Lane Group	EBL	EBT	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	279	2924	6	1056	1	177
v/c Ratio	0.54	0.69	0.05	0.31	0.02	0.79
Control Delay	9.2	6.9	2.0	4.1	71.0	55.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	9.2	6.9	2.0	4.1	71.0	55.3
Queue Length 50th (ft)	77	317	0	18	1	82
Queue Length 95th (ft)	m55	234	m0	m201	7	170
Internal Link Dist (ft)		1775		4071	463	466
Turn Bay Length (ft)	200		185			
Base Capacity (vph)	546	4216	119	3420	141	372
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.51	0.69	0.05	0.31	0.01	0.48

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	410	1521	1066	81	545	121	373	841	63	264	1363	146
v/c Ratio	0.85	1.09	0.67	1.42	0.55	0.22	1.16	0.86	0.11	0.97	1.14	0.23
Control Delay	87.9	88.9	5.1	319.7	57.7	4.8	168.4	71.6	0.4	121.0	125.6	6.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	87.9	88.9	5.1	319.7	57.7	4.8	168.4	71.6	0.4	121.0	125.6	6.9
Queue Length 50th (ft)	235	~1046	51	~127	291	0	~267	500	0	315	~984	3
Queue Length 95th (ft)	292	#1190	738	#252	366	36	#381	588	0	#513	#1125	57
Internal Link Dist (ft)		4071			2625			1000			1109	
Turn Bay Length (ft)	170			170		300	270			170		300
Base Capacity (vph)	558	1397	1599	57	990	544	321	975	568	272	1195	628
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.73	1.09	0.67	1.42	0.55	0.22	1.16	0.86	0.11	0.97	1.14	0.23

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	80	1037	197	40	2741	451	215	32	83	76
v/c Ratio	1.13	0.32	0.18	0.49	0.89	1.22	0.68	0.20	0.58	0.27
Control Delay	216.1	16.4	2.3	123.1	15.0	184.3	82.3	56.3	95.8	2.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	216.1	16.4	2.3	123.1	15.0	184.3	82.3	56.3	95.8	2.3
Queue Length 50th (ft)	~108	204	0	45	850	~335	247	30	97	0
Queue Length 95th (ft)	#233	271	38	m63	110	#455	334	62	155	0
Internal Link Dist (ft)		931			2672		306		496	
Turn Bay Length (ft)	115			130		100		100		300
Base Capacity (vph)	71	3260	1087	99	3067	369	608	162	459	523
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.13	0.32	0.18	0.40	0.89	1.22	0.35	0.20	0.18	0.15

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Lane Group	EBL	EBT	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	36	1030	40	2721	162	74
v/c Ratio	0.37	0.28	0.10	0.75	0.85	0.37
Control Delay	34.9	21.1	1.8	7.5	106.2	61.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	34.9	21.1	1.8	7.5	106.2	61.1
Queue Length 50th (ft)	25	355	2	85	184	67
Queue Length 95th (ft)	63	271	m2	1269	262	117
Internal Link Dist (ft)		2672		2397	495	325
Turn Bay Length (ft)	135		200			
Base Capacity (vph)	110	3691	392	3614	267	278
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.33	0.28	0.10	0.75	0.61	0.27

Intersection Summary
m Volume for 95th percentile queue is metered by upstream signal.

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	53	1036	95	2622	178	64	286	101	142
v/c Ratio	0.52	0.35	0.29	0.86	0.18	0.25	0.88	0.72	0.43
Control Delay	42.4	4.6	3.6	6.4	0.1	53.1	97.3	82.3	57.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	42.4	4.6	3.6	6.4	0.1	53.1	97.3	82.3	57.4
Queue Length 50th (ft)	31	21	8	83	0	58	325	94	125
Queue Length 95th (ft)	m66	213	m8	m84	m0	100	432	#160	197
Internal Link Dist (ft)		2397		4145			688		590
Turn Bay Length (ft)	150		200		150	100		100	
Base Capacity (vph)	102	3002	325	3053	995	259	374	140	376
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.52	0.35	0.29	0.86	0.18	0.25	0.76	0.72	0.38

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	96	1045	54	48	2609	401	139	264	418	291	143
v/c Ratio	1.08	0.42	0.06	0.19	1.09	0.48	0.71	0.96	1.30	0.80	0.32
Control Delay	174.7	27.6	2.2	5.8	57.1	3.0	70.9	115.9	212.9	84.0	5.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	174.7	27.6	2.2	5.8	57.1	3.0	70.9	115.9	212.9	84.0	5.4
Queue Length 50th (ft)	~85	382	7	12	~1276	66	125	304	~330	330	0
Queue Length 95th (ft)	m#211	226	m16	m11	m#1189	m43	#201	#495	#448	#471	37
Internal Link Dist (ft)		4145			1653			583		1092	
Turn Bay Length (ft)	200		200	175		200	50		100		
Base Capacity (vph)	89	2495	850	257	2399	827	195	281	322	363	441
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.08	0.42	0.06	0.19	1.09	0.48	0.71	0.94	1.30	0.80	0.32

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	272	823	445	270	2072	479	712	514	198	178	402	247
v/c Ratio	1.03	0.44	0.55	0.79	1.07	0.67	0.82	0.45	0.31	0.71	0.81	0.71
Control Delay	106.8	17.4	5.4	83.3	88.3	30.1	71.6	50.3	6.4	97.4	88.2	39.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	106.8	17.4	5.4	83.3	88.3	30.1	71.6	50.3	6.4	97.4	88.2	39.2
Queue Length 50th (ft)	~178	156	107	171	~978	304	411	256	0	107	246	112
Queue Length 95th (ft)	m#229	m154	m120	207	#1093	576	#555	320	64	152	299	213
Internal Link Dist (ft)		1653			1154			715			901	
Turn Bay Length (ft)	150		175	185		200	200		500	200		50
Base Capacity (vph)	263	1853	807	405	1928	713	873	1138	643	286	727	444
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.03	0.44	0.55	0.67	1.07	0.67	0.82	0.45	0.31	0.62	0.55	0.56

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Lane Group	EBL	EBT	WBL	WBT	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	5	1193	163	2657	163	163	5	5
v/c Ratio	0.06	0.42	0.34	0.69	0.82	0.45	0.03	0.01
Control Delay	11.2	10.8	9.7	10.3	104.7	11.9	53.6	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.2	10.8	9.7	10.3	104.7	11.9	53.6	0.0
Queue Length 50th (ft)	0	31	59	446	190	0	5	0
Queue Length 95th (ft)	m8	560	20	79	269	70	17	0
Internal Link Dist (ft)		1154		2545	227			237
Turn Bay Length (ft)	330		320					
Base Capacity (vph)	88	3084	473	3837	265	431	163	435
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.06	0.39	0.34	0.69	0.62	0.38	0.03	0.01

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	1253	193	2736	85	205
v/c Ratio	0.39	0.36	0.64	0.65	0.67
Control Delay	4.4	9.4	3.4	103.5	19.8
Queue Delay	0.0	0.0	0.5	0.0	0.0
Total Delay	4.4	9.4	3.9	103.5	19.8
Queue Length 50th (ft)	24	13	13	100	0
Queue Length 95th (ft)	55	m62	355	162	87
Internal Link Dist (ft)	2545		616	902	
Turn Bay Length (ft)		250		50	
Base Capacity (vph)	3187	540	4244	361	487
Starvation Cap Reductn	0	0	882	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.39	0.36	0.81	0.24	0.42

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	47	1390	2679	516	174	250
v/c Ratio	0.39	0.34	0.75	0.44	0.79	0.60
Control Delay	28.9	3.3	1.6	0.6	100.0	13.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	28.9	3.4	1.7	0.6	100.0	13.2
Queue Length 50th (ft)	13	22	45	0	203	0
Queue Length 95th (ft)	43	130	53	m0	283	87
Internal Link Dist (ft)		616	1775		891	
Turn Bay Length (ft)	220			200	200	
Base Capacity (vph)	121	4035	3577	1161	321	491
Starvation Cap Reductn	0	666	0	0	0	0
Spillback Cap Reductn	0	0	47	0	0	2
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.39	0.41	0.76	0.44	0.54	0.51

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Lane Group	EBL	EBT	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	138	1420	30	3104	36	245
v/c Ratio	0.88	0.38	0.10	0.90	0.18	0.87
Control Delay	94.8	11.0	2.1	7.4	28.5	70.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	94.8	11.0	2.1	7.4	28.5	70.3
Queue Length 50th (ft)	110	186	2	153	10	167
Queue Length 95th (ft)	#260	421	m2	m127	45	262
Internal Link Dist (ft)		1775		4071	476	466
Turn Bay Length (ft)	200		185			
Base Capacity (vph)	162	3753	291	3462	287	371
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.85	0.38	0.10	0.90	0.13	0.66

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	269	752	487	78	1503	273	1199	1207	66	158	962	421
v/c Ratio	1.40	0.65	0.30	0.68	1.29	0.44	1.48	0.93	0.10	0.96	1.19	0.90
Control Delay	261.4	48.0	1.0	109.9	183.9	23.9	268.6	66.4	1.6	138.0	155.9	66.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	261.4	48.0	1.0	109.9	183.9	23.9	268.6	66.4	1.6	138.0	155.9	66.5
Queue Length 50th (ft)	~223	286	3	92	~1184	118	~1002	720	0	189	~719	343
Queue Length 95th (ft)	#313	540	27	154	#1321	211	#1140	#839	9	#348	#859	#549
Internal Link Dist (ft)		4071			2625			1000			1109	
Turn Bay Length (ft)	170			170		300	270			170		300
Base Capacity (vph)	192	1160	1599	144	1164	615	808	1303	646	165	806	469
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.40	0.65	0.30	0.54	1.29	0.44	1.48	0.93	0.10	0.96	1.19	0.90

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Attachment E

Synchro Output – Roberts Cut Off Road Split Intersection Analysis

Movement	EBU	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations							
Traffic Volume (vph)	1	29	2262	713	40	260	38
Future Volume (vph)	1	29	2262	713	40	260	38
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.7	5.5	5.9		6.8	
Lane Util. Factor		1.00	0.91	0.91		1.00	
Frt		1.00	1.00	0.99		0.98	
Flt Protected		0.95	1.00	1.00		0.96	
Satd. Flow (prot)		1787	5136	4901		1772	
Flt Permitted		0.31	1.00	1.00		0.96	
Satd. Flow (perm)		591	5136	4901		1772	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1	32	2459	775	43	283	41
RTOR Reduction (vph)	0	0	0	2	0	4	0
Lane Group Flow (vph)	0	33	2459	816	0	320	0
Heavy Vehicles (%)	1%	1%	1%	5%	5%	1%	1%
Turn Type	D.P+P	D.P+P	NA	NA		Prot	
Protected Phases	5	5	2	6		4	
Permitted Phases	6	6				4	
Actuated Green, G (s)		87.1	93.2	83.6		29.5	
Effective Green, g (s)		87.1	93.2	83.6		29.5	
Actuated g/C Ratio		0.65	0.69	0.62		0.22	
Clearance Time (s)		5.7	5.5	5.9		6.8	
Vehicle Extension (s)		2.0	2.0	2.0		3.0	
Lane Grp Cap (vph)		412	3545	3034		387	
v/s Ratio Prot		0.00	c0.48	0.17		c0.18	
v/s Ratio Perm		0.05					
v/c Ratio		0.08	0.69	0.27		0.83	
Uniform Delay, d1		8.7	12.4	11.7		50.3	
Progression Factor		1.00	1.00	0.45		1.00	
Incremental Delay, d2		0.0	1.1	0.2		13.5	
Delay (s)		8.8	13.6	5.5		63.8	
Level of Service		A	B	A		E	
Approach Delay (s)			13.5	5.5		63.8	
Approach LOS			B	A		E	

Intersection Summary			
HCM 2000 Control Delay	16.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	135.0	Sum of lost time (s)	22.4
Intersection Capacity Utilization	70.7%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	1973	534	18	678	31	55	10	13	20	25	20
Future Volume (vph)	15	1973	534	18	678	31	55	10	13	20	25	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.4	7.7	7.7	6.4	7.7		7.6	7.6		7.6	7.6	
Lane Util. Factor	1.00	0.91	1.00	1.00	0.91		0.95	0.95		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	0.95		1.00	0.93	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.98		0.95	1.00	
Satd. Flow (prot)	1770	5085	1583	1770	5052		1681	1648		1770	1737	
Flt Permitted	0.34	1.00	1.00	0.05	1.00		0.95	0.98		0.95	1.00	
Satd. Flow (perm)	634	5085	1583	100	5052		1681	1648		1770	1737	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	16	2145	580	20	737	34	60	11	14	22	27	22
RTOR Reduction (vph)	0	0	83	0	2	0	0	13	0	0	21	0
Lane Group Flow (vph)	16	2145	497	20	769	0	43	29	0	22	28	0
Turn Type	D.P+P	NA	Perm	D.P+P	NA		Split	NA		Split	NA	
Protected Phases	5	2		1	6		3	3		4	4	
Permitted Phases	6		2	2								
Actuated Green, G (s)	91.2	87.4	87.4	91.2	84.3		7.8	7.8		6.7	6.7	
Effective Green, g (s)	91.2	87.4	87.4	91.2	84.3		7.8	7.8		6.7	6.7	
Actuated g/C Ratio	0.68	0.65	0.65	0.68	0.62		0.06	0.06		0.05	0.05	
Clearance Time (s)	6.4	7.7	7.7	6.4	7.7		7.6	7.6		7.6	7.6	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	486	3292	1024	114	3154		97	95		87	86	
v/s Ratio Prot	0.00	c0.42		0.00	c0.15		c0.03	0.02		0.01	c0.02	
v/s Ratio Perm	0.02		0.31	0.11								
v/c Ratio	0.03	0.65	0.49	0.18	0.24		0.44	0.30		0.25	0.33	
Uniform Delay, d1	7.9	14.5	12.2	10.8	11.2		61.5	61.0		61.7	62.0	
Progression Factor	0.57	0.47	0.21	1.86	1.36		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.0	0.7	1.2	0.7	0.2		3.2	1.8		1.5	2.2	
Delay (s)	4.5	7.5	3.7	20.9	15.5		64.7	62.8		63.3	64.2	
Level of Service	A	A	A	C	B		E	E		E	E	
Approach Delay (s)		6.7			15.6			63.8			63.9	
Approach LOS		A			B			E			E	

Intersection Summary			
HCM 2000 Control Delay	11.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	135.0	Sum of lost time (s)	29.3
Intersection Capacity Utilization	59.7%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBU	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations							
Traffic Volume (vph)	1	20	2889	889	55	233	60
Future Volume (vph)	1	20	2889	889	55	233	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.7	5.5	5.9		6.8	
Lane Util. Factor		1.00	0.91	0.91		1.00	
Frt		1.00	1.00	0.99		0.97	
Flt Protected		0.95	1.00	1.00		0.96	
Satd. Flow (prot)		1787	5136	4897		1759	
Flt Permitted		0.25	1.00	1.00		0.96	
Satd. Flow (perm)		470	5136	4897		1759	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1	22	3140	966	60	253	65
RTOR Reduction (vph)	0	0	0	2	0	5	0
Lane Group Flow (vph)	0	23	3140	1024	0	313	0
Heavy Vehicles (%)	1%	1%	1%	5%	5%	1%	1%
Turn Type	D.P+P	D.P+P	NA	NA		Prot	
Protected Phases	5	5	2	6		4	
Permitted Phases	6	6				4	
Actuated Green, G (s)		129.6	135.7	126.4		32.0	
Effective Green, g (s)		129.6	135.7	126.4		32.0	
Actuated g/C Ratio		0.72	0.75	0.70		0.18	
Clearance Time (s)		5.7	5.5	5.9		6.8	
Vehicle Extension (s)		2.0	2.0	2.0		3.0	
Lane Grp Cap (vph)		361	3871	3438		312	
v/s Ratio Prot		0.00	c0.61	0.21		c0.18	
v/s Ratio Perm		0.04					
v/c Ratio		0.06	0.81	0.30		1.00	
Uniform Delay, d1		7.3	14.0	10.1		74.0	
Progression Factor		1.00	1.00	0.50		1.00	
Incremental Delay, d2		0.0	2.0	0.2		51.8	
Delay (s)		7.4	16.0	5.3		125.8	
Level of Service		A	B	A		F	
Approach Delay (s)			15.9	5.3		125.8	
Approach LOS			B	A		F	

Intersection Summary			
HCM 2000 Control Delay	21.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	22.4
Intersection Capacity Utilization	82.6%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	20	2455	647	26	812	37	102	21	33	30	35	30
Future Volume (vph)	20	2455	647	26	812	37	102	21	33	30	35	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.4	7.7	7.7	6.4	7.7		7.6	7.6		7.6	7.6	
Lane Util. Factor	1.00	0.91	1.00	1.00	0.91		0.95	0.95		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	0.93		1.00	0.93	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.99		0.95	1.00	
Satd. Flow (prot)	1770	5085	1583	1770	5052		1681	1631		1770	1733	
Flt Permitted	0.28	1.00	1.00	0.03	1.00		0.95	0.99		0.95	1.00	
Satd. Flow (perm)	527	5085	1583	62	5052		1681	1631		1770	1733	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	22	2668	703	28	883	40	111	23	36	33	38	33
RTOR Reduction (vph)	0	0	76	0	2	0	0	17	0	0	20	0
Lane Group Flow (vph)	22	2668	627	28	921	0	87	66	0	33	51	0
Turn Type	D.P+P	NA	Perm	D.P+P	NA		Split	NA		Split	NA	
Protected Phases	5	2		1	6		3	3		4	4	
Permitted Phases	6		2	2								
Actuated Green, G (s)	125.3	120.1	120.1	125.3	121.4		14.7	14.7		10.7	10.7	
Effective Green, g (s)	125.3	120.1	120.1	125.3	121.4		14.7	14.7		10.7	10.7	
Actuated g/C Ratio	0.70	0.67	0.67	0.70	0.67		0.08	0.08		0.06	0.06	
Clearance Time (s)	6.4	7.7	7.7	6.4	7.7		7.6	7.6		7.6	7.6	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	393	3392	1056	92	3407		137	133		105	103	
v/s Ratio Prot	0.00	c0.52		0.01	c0.18		c0.05	0.04		0.02	c0.03	
v/s Ratio Perm	0.04		0.40	0.20								
v/c Ratio	0.06	0.79	0.59	0.30	0.27		0.64	0.49		0.31	0.50	
Uniform Delay, d1	8.5	21.0	16.5	49.3	11.7		80.1	79.1		81.1	82.0	
Progression Factor	0.72	0.59	0.51	0.82	0.87		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.0	1.0	1.3	1.8	0.2		9.3	2.9		1.7	3.7	
Delay (s)	6.2	13.3	9.8	42.1	10.3		89.3	81.9		82.9	85.8	
Level of Service	A	B	A	D	B		F	F		F	F	
Approach Delay (s)		12.5			11.2			85.7			84.9	
Approach LOS		B			B			F			F	

Intersection Summary			
HCM 2000 Control Delay	16.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	29.3
Intersection Capacity Utilization	71.2%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBU	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations							
Traffic Volume (vph)	15	34	923	2026	150	84	44
Future Volume (vph)	15	34	923	2026	150	84	44
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.7	5.5	5.9		6.8	
Lane Util. Factor		1.00	0.91	0.91		1.00	
Frt		1.00	1.00	0.99		0.95	
Flt Protected		0.95	1.00	1.00		0.97	
Satd. Flow (prot)		1770	5085	5033		1720	
Flt Permitted		0.05	1.00	1.00		0.97	
Satd. Flow (perm)		85	5085	5033		1720	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	16	37	1003	2202	163	91	48
RTOR Reduction (vph)	0	0	0	2	0	15	0
Lane Group Flow (vph)	0	53	1003	2363	0	124	0
Turn Type	D.P+P	D.P+P	NA	NA		Prot	
Protected Phases	5	5	2	6		4	
Permitted Phases	6	6					
Actuated Green, G (s)		110.9	117.0	106.0		15.7	
Effective Green, g (s)		110.9	117.0	106.0		15.7	
Actuated g/C Ratio		0.76	0.81	0.73		0.11	
Clearance Time (s)		5.7	5.5	5.9		6.8	
Vehicle Extension (s)		2.0	2.0	2.0		3.0	
Lane Grp Cap (vph)		121	4103	3679		186	
v/s Ratio Prot		c0.01	0.20	c0.47		c0.07	
v/s Ratio Perm		0.32					
v/c Ratio		0.44	0.24	0.64		0.67	
Uniform Delay, d1		9.9	3.4	9.9		62.1	
Progression Factor		1.00	1.00	0.13		1.00	
Incremental Delay, d2		0.9	0.1	0.6		8.7	
Delay (s)		10.8	3.5	1.9		70.8	
Level of Service		B	A	A		E	
Approach Delay (s)			3.9	1.9		70.8	
Approach LOS			A	A		E	

Intersection Summary			
HCM 2000 Control Delay	5.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	145.0	Sum of lost time (s)	22.4
Intersection Capacity Utilization	60.4%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	20	802	185	21	1749	103	402	57	0	25	15	25
Future Volume (vph)	20	802	185	21	1749	103	402	57	0	25	15	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.4	7.7	7.7	6.4	7.7		7.6	7.6		7.6	7.6	
Lane Util. Factor	1.00	0.91	1.00	1.00	0.91		0.95	0.95		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	1.00		1.00	0.91	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.96		0.95	1.00	
Satd. Flow (prot)	1770	5085	1583	1770	5043		1681	1705		1770	1687	
Flt Permitted	0.05	1.00	1.00	0.28	1.00		0.95	0.96		0.95	1.00	
Satd. Flow (perm)	95	5085	1583	516	5043		1681	1705		1770	1687	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	22	872	201	23	1901	112	437	62	0	27	16	27
RTOR Reduction (vph)	0	0	101	0	3	0	0	0	0	0	26	0
Lane Group Flow (vph)	22	872	100	23	2010	0	249	250	0	27	17	0
Turn Type	D.P+P	NA	Perm	D.P+P	NA		Split	NA		Split	NA	
Protected Phases	5	2		1	6		3	3		4	4	
Permitted Phases	6		2	2								
Actuated Green, G (s)	81.8	71.1	71.1	81.8	78.8		27.2	27.2		6.7	6.7	
Effective Green, g (s)	81.8	71.1	71.1	81.8	78.8		27.2	27.2		6.7	6.7	
Actuated g/C Ratio	0.56	0.49	0.49	0.56	0.54		0.19	0.19		0.05	0.05	
Clearance Time (s)	6.4	7.7	7.7	6.4	7.7		7.6	7.6		7.6	7.6	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	88	2493	776	383	2740		315	319		81	77	
v/s Ratio Prot	c0.01	0.17		c0.00	c0.40		c0.15	0.15		c0.02	0.01	
v/s Ratio Perm	0.14		0.06	0.03								
v/c Ratio	0.25	0.35	0.13	0.06	0.73		0.79	0.78		0.33	0.22	
Uniform Delay, d1	40.3	22.7	20.1	18.3	25.1		56.2	56.1		67.0	66.6	
Progression Factor	0.98	0.92	0.90	0.84	0.76		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.5	0.4	0.3	0.1	1.5		12.7	11.9		2.4	1.5	
Delay (s)	41.1	21.2	18.4	15.5	20.6		68.8	68.0		69.4	68.1	
Level of Service	D	C	B	B	C		E	E		E	E	
Approach Delay (s)		21.1			20.5			68.4			68.6	
Approach LOS		C			C			E			E	

Intersection Summary			
HCM 2000 Control Delay	28.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	145.0	Sum of lost time (s)	29.3
Intersection Capacity Utilization	68.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBU	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations							
Traffic Volume (vph)	11	33	1165	2612	280	45	35
Future Volume (vph)	11	33	1165	2612	280	45	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.7	5.5	5.9		6.8	
Lane Util. Factor		1.00	0.91	0.91		1.00	
Frt		1.00	1.00	0.99		0.94	
Flt Protected		0.95	1.00	1.00		0.97	
Satd. Flow (prot)		1770	5085	5012		1705	
Flt Permitted		0.03	1.00	1.00		0.97	
Satd. Flow (perm)		51	5085	5012		1705	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	12	36	1266	2839	304	49	38
RTOR Reduction (vph)	0	0	0	3	0	18	0
Lane Group Flow (vph)	0	48	1266	3140	0	69	0
Turn Type	D.P+P	D.P+P	NA	NA		Prot	
Protected Phases	5	5	2	6		4	
Permitted Phases	6	6					
Actuated Green, G (s)		149.0	155.1	145.0		12.6	
Effective Green, g (s)		149.0	155.1	145.0		12.6	
Actuated g/C Ratio		0.83	0.86	0.81		0.07	
Clearance Time (s)		5.7	5.5	5.9		6.8	
Vehicle Extension (s)		2.0	2.0	2.0		3.0	
Lane Grp Cap (vph)		80	4381	4037		119	
v/s Ratio Prot		c0.01	0.25	c0.63		c0.04	
v/s Ratio Perm		0.48					
v/c Ratio		0.60	0.29	0.78		0.58	
Uniform Delay, d1		42.9	2.3	9.1		81.2	
Progression Factor		1.00	1.00	0.23		1.00	
Incremental Delay, d2		7.8	0.2	0.5		7.1	
Delay (s)		50.7	2.5	2.5		88.2	
Level of Service		D	A	A		F	
Approach Delay (s)			4.2	2.5		88.2	
Approach LOS			A	A		F	

Intersection Summary			
HCM 2000 Control Delay	4.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	22.4
Intersection Capacity Utilization	71.9%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	30	948	232	37	2342	180	515	98	0	35	25	35
Future Volume (vph)	30	948	232	37	2342	180	515	98	0	35	25	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.4	7.7	7.7	6.4	7.7		7.6	7.6		7.6	7.6	
Lane Util. Factor	1.00	0.91	1.00	1.00	0.91		0.95	0.95		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	1.00		1.00	0.91	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.97		0.95	1.00	
Satd. Flow (prot)	1770	5085	1583	1770	5031		1681	1711		1770	1699	
Flt Permitted	0.04	1.00	1.00	0.23	1.00		0.95	0.97		0.95	1.00	
Satd. Flow (perm)	73	5085	1583	431	5031		1681	1711		1770	1699	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	33	1030	252	40	2546	196	560	107	0	38	27	38
RTOR Reduction (vph)	0	0	92	0	4	0	0	0	0	0	33	0
Lane Group Flow (vph)	33	1030	160	40	2738	0	330	337	0	38	32	0
Turn Type	D.P+P	NA	Perm	D.P+P	NA		Split	NA		Split	NA	
Protected Phases	5	2		1	6		3	3		4	4	
Permitted Phases	6		2	2								
Actuated Green, G (s)	107.2	101.3	101.3	107.2	101.6		34.0	34.0		9.5	9.5	
Effective Green, g (s)	107.2	101.3	101.3	107.2	101.6		34.0	34.0		9.5	9.5	
Actuated g/C Ratio	0.60	0.56	0.56	0.60	0.56		0.19	0.19		0.05	0.05	
Clearance Time (s)	6.4	7.7	7.7	6.4	7.7		7.6	7.6		7.6	7.6	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	96	2861	890	300	2839		317	323		93	89	
v/s Ratio Prot	c0.01	0.20		0.00	c0.54		0.20	c0.20		c0.02	0.02	
v/s Ratio Perm	0.19		0.10	0.07								
v/c Ratio	0.34	0.36	0.18	0.13	0.96		1.04	1.04		0.41	0.36	
Uniform Delay, d1	39.3	21.6	19.1	15.6	37.5		73.0	73.0		82.5	82.3	
Progression Factor	1.52	0.89	0.75	0.61	0.80		1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.1	0.3	0.4	0.1	7.9		61.6	61.8		2.9	2.5	
Delay (s)	61.8	19.6	14.7	9.7	37.9		134.6	134.8		85.4	84.8	
Level of Service	E	B	B	A	D		F	F		F	F	
Approach Delay (s)		19.7			37.5			134.7			85.0	
Approach LOS		B			D			F			F	

Intersection Summary			
HCM 2000 Control Delay	47.0	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	29.3
Intersection Capacity Utilization	85.5%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

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Attachment F

Synchro Output – SH 183 Displaced Left Turn Intersection Analysis

Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Traffic Volume (vph)	1	44	1786	461	18	648	61	45	20	13	207	98	58
Future Volume (vph)	1	44	1786	461	18	648	61	45	20	13	207	98	58
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.8	5.5	5.5	6.7	5.9		6.8	7.6	7.6	6.8	7.6	7.6
Lane Util. Factor		1.00	0.91	1.00	1.00	0.91		0.97	1.00	1.00	1.00	1.00	1.00
Frt		1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1787	5136	1599	1719	4876		3467	1881	1599	1787	1881	1599
Flt Permitted		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.74	1.00	1.00
Satd. Flow (perm)		1787	5136	1599	1719	4876		3467	1881	1599	1398	1881	1599
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1	48	1941	501	20	704	66	49	22	14	225	107	63
RTOR Reduction (vph)	0	0	0	128	0	5	0	0	0	13	0	0	56
Lane Group Flow (vph)	0	49	1941	373	20	765	0	49	22	1	225	107	7
Heavy Vehicles (%)	1%	1%	1%	1%	5%	5%	5%	1%	1%	1%	1%	1%	1%
Turn Type	Prot	Prot	NA	Perm	Prot	NA		Prot	NA	Perm	D.P+P	NA	Perm
Protected Phases	5	5	2		1	6		7	4		3	8	
Permitted Phases				2						4	4		8
Actuated Green, G (s)		7.2	85.2	85.2	3.2	81.7		4.2	6.5	6.5	20.0	15.8	15.8
Effective Green, g (s)		7.2	85.2	85.2	3.2	81.7		4.2	6.5	6.5	20.0	15.8	15.8
Actuated g/C Ratio		0.05	0.63	0.63	0.02	0.61		0.03	0.05	0.05	0.15	0.12	0.12
Clearance Time (s)		5.8	5.5	5.5	6.7	5.9		6.8	7.6	7.6	6.8	7.6	7.6
Vehicle Extension (s)		2.0	2.0	2.0	2.0	2.0		2.0	3.0	3.0	2.0	3.0	3.0
Lane Grp Cap (vph)		95	3241	1009	40	2950		107	90	76	246	220	187
v/s Ratio Prot		0.03	c0.38		0.01	c0.16		0.01	0.01		c0.09	0.06	
v/s Ratio Perm				0.23						0.00	c0.04		0.00
v/c Ratio		0.52	0.60	0.37	0.50	0.26		0.46	0.24	0.01	0.91	0.49	0.04
Uniform Delay, d1		62.2	14.8	12.0	65.1	12.5		64.3	61.9	61.2	56.1	55.8	52.9
Progression Factor		1.00	1.00	1.00	0.81	0.43		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		2.0	0.8	1.0	3.5	0.2		1.1	1.4	0.0	34.6	1.7	0.1
Delay (s)		64.2	15.6	13.0	56.6	5.6		65.4	63.3	61.2	90.7	57.5	53.0
Level of Service		E	B	B	E	A		E	E	E	F	E	D
Approach Delay (s)			16.0			6.9			64.2			75.7	
Approach LOS			B			A			E			E	

Intersection Summary			
HCM 2000 Control Delay	21.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	135.0	Sum of lost time (s)	26.6
Intersection Capacity Utilization	66.7%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Traffic Volume (vph)	5	1961	25	3	8	672	22	20	20	21	52	20	20
Future Volume (vph)	5	1961	25	3	8	672	22	20	20	21	52	20	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1	7.4			6.1	7.4			7.6	7.6		7.6	
Lane Util. Factor	1.00	0.91			1.00	0.91			1.00	1.00		1.00	
Frt	1.00	1.00			1.00	1.00			1.00	0.85		0.97	
Flt Protected	0.95	1.00			0.95	1.00			0.98	1.00		0.97	
Satd. Flow (prot)	1787	5126			1752	5012			1685	1468		1692	
Flt Permitted	0.35	1.00			0.06	1.00			0.79	1.00		0.80	
Satd. Flow (perm)	666	5126			114	5012			1368	1468		1393	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	5	2132	27	3	9	730	24	22	22	23	57	22	22
RTOR Reduction (vph)	0	1	0	0	0	2	0	0	0	21	0	9	0
Lane Group Flow (vph)	5	2158	0	0	12	752	0	0	44	2	0	92	0
Heavy Vehicles (%)	1%	1%	1%	3%	3%	3%	3%	10%	10%	10%	6%	6%	6%
Turn Type	D.P+P	NA		D.P+P	D.P+P	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	5	2		1	1	6			8			4	
Permitted Phases	6			2	2			8		8	4		
Actuated Green, G (s)	100.6	97.4			100.6	99.6			13.3	13.3		13.3	
Effective Green, g (s)	100.6	97.4			100.6	99.6			13.3	13.3		13.3	
Actuated g/C Ratio	0.75	0.72			0.75	0.74			0.10	0.10		0.10	
Clearance Time (s)	6.1	7.4			6.1	7.4			7.6	7.6		7.6	
Vehicle Extension (s)	2.0	2.0			2.0	2.0			2.0	2.0		2.0	
Lane Grp Cap (vph)	504	3698			123	3697			134	144		137	
v/s Ratio Prot	0.00	c0.42			0.00	c0.15							
v/s Ratio Perm	0.01				0.07				0.03	0.00		c0.07	
v/c Ratio	0.01	0.58			0.10	0.20			0.33	0.02		0.67	
Uniform Delay, d1	4.4	9.0			12.9	5.5			56.7	54.9		58.7	
Progression Factor	0.33	0.39			2.51	1.94			1.00	1.00		1.00	
Incremental Delay, d2	0.0	0.6			0.1	0.1			0.5	0.0		9.7	
Delay (s)	1.5	4.1			32.4	10.7			57.2	55.0		68.5	
Level of Service	A	A			C	B			E	D		E	
Approach Delay (s)		4.1				11.0			56.4			68.5	
Approach LOS		A				B			E			E	

Intersection Summary			
HCM 2000 Control Delay	9.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	135.0	Sum of lost time (s)	21.1
Intersection Capacity Utilization	66.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Traffic Volume (vph)	5	17	1983	35	25	627	26	61	52	60	147	112	28
Future Volume (vph)	5	17	1983	35	25	627	26	61	52	60	147	112	28
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.1	7.4		6.1	7.4	7.4	6.8	7.6		6.8	7.6	
Lane Util. Factor		1.00	0.91		1.00	0.91	1.00	1.00	1.00		1.00	1.00	
Frt		1.00	1.00		1.00	1.00	0.85	1.00	0.92		1.00	0.97	
Flt Protected		0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1787	5122		1752	5036	1568	1770	1714		1719	1756	
Flt Permitted		0.37	1.00		0.05	1.00	1.00	0.56	1.00		0.64	1.00	
Satd. Flow (perm)		702	5122		93	5036	1568	1041	1714		1149	1756	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	5	18	2155	38	27	682	28	66	57	65	160	122	30
RTOR Reduction (vph)	0	0	1	0	0	0	12	0	37	0	0	8	0
Lane Group Flow (vph)	0	23	2192	0	27	682	16	66	85	0	160	144	0
Heavy Vehicles (%)	1%	1%	1%	1%	3%	3%	3%	2%	2%	2%	5%	5%	5%
Turn Type	D.P+P	D.P+P	NA		D.P+P	NA	Perm	D.P+P	NA		D.P+P	NA	
Protected Phases	5	5	2		1	6		3	8		7	4	
Permitted Phases	6	6			2		6	4			8		
Actuated Green, G (s)		82.6	79.0		82.6	79.0	79.0	24.5	16.2		24.5	19.7	
Effective Green, g (s)		82.6	79.0		82.6	79.0	79.0	24.5	16.2		24.5	19.7	
Actuated g/C Ratio		0.61	0.59		0.61	0.59	0.59	0.18	0.12		0.18	0.15	
Clearance Time (s)		6.1	7.4		6.1	7.4	7.4	6.8	7.6		6.8	7.6	
Vehicle Extension (s)		2.0	4.5		2.0	4.5	4.5	3.0	2.0		3.0	2.0	
Lane Grp Cap (vph)		458	2997		101	2946	917	214	205		243	256	
v/s Ratio Prot		0.00	c0.43		0.01	c0.14		0.01	0.05		c0.04	c0.08	
v/s Ratio Perm		0.03			0.16		0.01	0.04			c0.08		
v/c Ratio		0.05	0.73		0.27	0.23	0.02	0.31	0.41		0.66	0.56	
Uniform Delay, d1		10.3	20.3		35.4	13.4	11.7	47.0	55.0		50.3	53.7	
Progression Factor		0.39	0.55		0.67	0.14	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.0	1.4		0.5	0.2	0.0	0.8	0.5		6.3	1.7	
Delay (s)		4.0	12.5		24.3	2.1	11.8	47.8	55.5		56.6	55.3	
Level of Service		A	B		C	A	B	D	E		E	E	
Approach Delay (s)			12.4			3.3			52.8			56.0	
Approach LOS			B			A			D			E	

Intersection Summary			
HCM 2000 Control Delay	16.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	135.0	Sum of lost time (s)	27.9
Intersection Capacity Utilization	73.7%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations														
Traffic Volume (vph)	2	46	2030	135	5	11	594	269	41	118	53	378	230	40
Future Volume (vph)	2	46	2030	135	5	11	594	269	41	118	53	378	230	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.4	8.7	8.7		6.9	8.7	8.7	6.8	7.9		6.8	7.9	7.9
Lane Util. Factor		1.00	0.91	1.00		1.00	0.91	1.00	1.00	1.00		0.97	1.00	1.00
Frt		1.00	1.00	0.85		1.00	1.00	0.85	1.00	0.95		1.00	1.00	0.85
Flt Protected		0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1770	5085	1583		1752	5036	1568	1805	1811		3433	1863	1583
Flt Permitted		0.37	1.00	1.00		0.07	1.00	1.00	0.45	1.00		0.95	1.00	1.00
Satd. Flow (perm)		696	5085	1583		122	5036	1568	847	1811		3433	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2	50	2207	147	5	12	646	292	45	128	58	411	250	43
RTOR Reduction (vph)	0	0	0	81	0	0	0	169	0	15	0	0	0	33
Lane Group Flow (vph)	0	52	2207	66	0	17	646	123	45	171	0	411	250	10
Heavy Vehicles (%)	2%	2%	2%	2%	3%	3%	3%	3%	0%	0%	0%	2%	2%	2%
Turn Type	D.P+P	D.P+P	NA	Perm	D.P+P	D.P+P	NA	Perm	D.P+P	NA		Prot	NA	Perm
Protected Phases	1	1	6		5	5	2		7	4		3	8	
Permitted Phases	2	2		6	6	6		2	8					8
Actuated Green, G (s)		63.4	60.7	60.7		63.9	57.0	57.0	40.8	19.7		21.1	32.8	32.8
Effective Green, g (s)		63.4	60.7	60.7		63.9	57.0	57.0	40.8	19.7		21.1	32.8	32.8
Actuated g/C Ratio		0.47	0.45	0.45		0.47	0.42	0.42	0.30	0.15		0.16	0.24	0.24
Clearance Time (s)		7.4	8.7	8.7		6.9	8.7	8.7	6.8	7.9		6.8	7.9	7.9
Vehicle Extension (s)		2.0	2.0	2.0		2.0	5.0	5.0	2.0	2.0		2.0	2.0	2.0
Lane Grp Cap (vph)		377	2286	711		96	2126	662	312	264		536	452	384
v/s Ratio Prot		0.01	c0.43			0.00	c0.13		0.01	c0.09		c0.12	0.13	
v/s Ratio Perm		0.06		0.04		0.08		0.08	0.03					0.01
v/c Ratio		0.14	0.97	0.09		0.18	0.30	0.19	0.14	0.65		0.77	0.55	0.03
Uniform Delay, d1		19.6	36.1	21.3		57.2	25.8	24.5	34.0	54.4		54.6	44.7	38.9
Progression Factor		0.26	0.43	0.03		0.65	0.59	0.70	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2		0.0	9.8	0.2		0.3	0.4	0.6	0.1	4.1		5.9	0.8	0.0
Delay (s)		5.1	25.4	0.8		37.7	15.7	17.8	34.1	58.5		60.4	45.5	39.0
Level of Service		A	C	A		D	B	B	C	E		E	D	D
Approach Delay (s)			23.5				16.7			53.7			53.8	
Approach LOS			C				B			D			D	

Intersection Summary			
HCM 2000 Control Delay	28.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	135.0	Sum of lost time (s)	30.8
Intersection Capacity Utilization	79.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	2252	30	30	713	5	30	0	30	5	0	5
Future Volume (vph)	5	2252	30	30	713	5	30	0	30	5	0	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1	7.4		6.1	7.4			7.2	7.2	6.4	7.2	
Lane Util. Factor	1.00	0.91		1.00	0.91			1.00	1.00	1.00	1.00	
Frt	1.00	1.00		1.00	1.00			1.00	0.85	1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00			0.95	1.00	0.95	1.00	
Satd. Flow (prot)	1770	5075		1770	5080			1770	1583	1770	1583	
Flt Permitted	0.34	1.00		0.04	1.00			0.75	1.00	0.74	1.00	
Satd. Flow (perm)	642	5075		77	5080			1405	1583	1370	1583	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	5	2448	33	33	775	5	33	0	33	5	0	5
RTOR Reduction (vph)	0	1	0	0	0	0	0	0	31	0	4	0
Lane Group Flow (vph)	5	2480	0	33	780	0	0	33	2	5	1	0
Turn Type	D.P+P	NA		D.P+P	NA		D.P+P	NA	Perm	D.P+P	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	2			6			8		4	4		
Actuated Green, G (s)	100.3	97.1		100.3	99.3			6.8	6.8	7.6	14.0	
Effective Green, g (s)	100.3	97.1		100.3	99.3			6.8	6.8	7.6	14.0	
Actuated g/C Ratio	0.74	0.72		0.74	0.74			0.05	0.05	0.06	0.10	
Clearance Time (s)	6.1	7.4		6.1	7.4			7.2	7.2	6.4	7.2	
Vehicle Extension (s)	2.0	2.0		2.0	2.0			2.0	2.0	2.0	2.0	
Lane Grp Cap (vph)	485	3650		97	3736			70	79	79	164	
v/s Ratio Prot	0.00	c0.49		c0.01	0.15					c0.00	0.00	
v/s Ratio Perm	0.01			0.24				c0.02	0.00	0.00		
v/c Ratio	0.01	0.68		0.34	0.21			0.47	0.02	0.06	0.00	
Uniform Delay, d1	4.5	10.4		9.6	5.6			62.4	60.9	60.3	54.2	
Progression Factor	0.00	0.04		3.85	0.21			1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.0	0.5		0.8	0.1			1.8	0.0	0.1	0.0	
Delay (s)	0.0	0.9		37.9	1.3			64.2	61.0	60.4	54.2	
Level of Service	A	A		D	A			E	E	E	D	
Approach Delay (s)		0.9			2.8			62.6			57.3	
Approach LOS		A			A			E			E	

Intersection Summary			
HCM 2000 Control Delay	2.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	135.0	Sum of lost time (s)	27.1
Intersection Capacity Utilization	72.3%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	2218	69	204	729	19	146
Future Volume (vph)	2218	69	204	729	19	146
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.7		6.4	7.7	7.6	7.6
Lane Util. Factor	0.91		1.00	0.91	1.00	1.00
Frt	1.00		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	5112		1752	5036	1805	1615
Flt Permitted	1.00		0.04	1.00	0.95	1.00
Satd. Flow (perm)	5112		77	5036	1805	1615
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2411	75	222	792	21	159
RTOR Reduction (vph)	1	0	0	0	0	149
Lane Group Flow (vph)	2485	0	222	792	21	10
Heavy Vehicles (%)	1%	1%	3%	3%	0%	0%
Turn Type	NA		D.P+P	NA	Prot	Perm
Protected Phases	6		5	2	4	
Permitted Phases			6			4
Actuated Green, G (s)	95.9		104.5	110.9	8.8	8.8
Effective Green, g (s)	95.9		104.5	110.9	8.8	8.8
Actuated g/C Ratio	0.71		0.77	0.82	0.07	0.07
Clearance Time (s)	7.7		6.4	7.7	7.6	7.6
Vehicle Extension (s)	0.2		2.0	0.2	2.0	2.0
Lane Grp Cap (vph)	3631		166	4136	117	105
v/s Ratio Prot	0.49		c0.09	0.16	c0.01	
v/s Ratio Perm			c0.95			0.01
v/c Ratio	0.68		1.34	0.19	0.18	0.10
Uniform Delay, d1	11.0		32.3	2.6	59.7	59.4
Progression Factor	0.06		0.46	0.39	1.00	1.00
Incremental Delay, d2	0.9		185.9	0.1	0.3	0.2
Delay (s)	1.5		200.8	1.1	60.0	59.5
Level of Service	A		F	A	E	E
Approach Delay (s)	1.5			44.8	59.6	
Approach LOS	A			D	E	

Intersection Summary			
HCM 2000 Control Delay	16.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	1.29		
Actuated Cycle Length (s)	135.0	Sum of lost time (s)	25.7
Intersection Capacity Utilization	80.4%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	81	2283	718	210	220	215
Future Volume (vph)	81	2283	718	210	220	215
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.4	8.7	8.7	8.7	7.2	7.2
Lane Util. Factor	1.00	0.91	0.91	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1787	5136	4988	1553	1752	1568
Flt Permitted	0.34	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	634	5136	4988	1553	1752	1568
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	88	2482	780	228	239	234
RTOR Reduction (vph)	0	0	0	93	0	194
Lane Group Flow (vph)	88	2482	780	135	239	40
Heavy Vehicles (%)	1%	1%	4%	4%	3%	3%
Turn Type	D.P+P	NA	NA	Perm	Prot	Perm
Protected Phases	1	6	2		4	
Permitted Phases	2			2		4
Actuated Green, G (s)	88.4	95.8	79.9	79.9	23.3	23.3
Effective Green, g (s)	88.4	95.8	79.9	79.9	23.3	23.3
Actuated g/C Ratio	0.65	0.71	0.59	0.59	0.17	0.17
Clearance Time (s)	7.4	8.7	8.7	8.7	7.2	7.2
Vehicle Extension (s)	2.5	2.5	2.5	2.5	2.5	2.5
Lane Grp Cap (vph)	487	3644	2952	919	302	270
v/s Ratio Prot	0.01	c0.48	0.16		c0.14	
v/s Ratio Perm	0.11			0.09		0.03
v/c Ratio	0.18	0.68	0.26	0.15	0.79	0.15
Uniform Delay, d1	8.5	11.0	13.3	12.3	53.5	47.4
Progression Factor	0.19	0.09	0.11	0.06	1.00	1.00
Incremental Delay, d2	0.1	0.8	0.2	0.3	12.8	0.2
Delay (s)	1.7	1.7	1.6	1.1	66.3	47.6
Level of Service	A	A	A	A	E	D
Approach Delay (s)		1.7	1.5		57.1	
Approach LOS		A	A		E	

Intersection Summary			
HCM 2000 Control Delay	8.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	135.0	Sum of lost time (s)	27.3
Intersection Capacity Utilization	69.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Traffic Volume (vph)	274	2229	0	4	2	835	50	1	0	0	68	0	92
Future Volume (vph)	274	2229	0	4	2	835	50	1	0	0	68	0	92
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1	7.4			6.1	7.4			7.0			7.0	
Lane Util. Factor	1.00	0.91			1.00	0.91			1.00			1.00	
Frt	1.00	1.00			1.00	0.99			1.00			0.92	
Flt Protected	0.95	1.00			0.95	1.00			0.95			0.98	
Satd. Flow (prot)	1787	5136			1736	4946			1805			1699	
Flt Permitted	0.25	1.00			0.04	1.00			0.44			0.86	
Satd. Flow (perm)	462	5136			82	4946			842			1496	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	298	2423	0	4	2	908	54	1	0	0	74	0	100
RTOR Reduction (vph)	0	0	0	0	0	4	0	0	0	0	0	133	0
Lane Group Flow (vph)	298	2423	0	0	6	958	0	0	1	0	0	41	0
Heavy Vehicles (%)	1%	1%	1%	4%	4%	4%	4%	0%	0%	0%	1%	1%	1%
Turn Type	D.P+P	NA		D.P+P	D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	5	2			4			8	
Permitted Phases	2			6	6			4			8		
Actuated Green, G (s)	102.9	101.3			102.9	66.5			11.6			11.6	
Effective Green, g (s)	102.9	101.3			102.9	66.5			11.6			11.6	
Actuated g/C Ratio	0.76	0.75			0.76	0.49			0.09			0.09	
Clearance Time (s)	6.1	7.4			6.1	7.4			7.0			7.0	
Vehicle Extension (s)	2.5	2.5			2.5	2.5			2.5			2.5	
Lane Grp Cap (vph)	709	3853			82	2436			72			128	
v/s Ratio Prot	0.11	c0.47			0.00	0.19							
v/s Ratio Perm	c0.21				0.06				0.00			c0.03	
v/c Ratio	0.42	0.63			0.07	0.39			0.01			0.32	
Uniform Delay, d1	14.3	8.0			6.4	21.6			56.5			58.0	
Progression Factor	0.42	0.32			0.44	0.25			1.00			1.00	
Incremental Delay, d2	0.2	0.6			0.2	0.4			0.1			1.1	
Delay (s)	6.2	3.1			3.0	5.8			56.5			59.1	
Level of Service	A	A			A	A			E			E	
Approach Delay (s)		3.4				5.7			56.5			59.1	
Approach LOS		A				A			E			E	

Intersection Summary			
HCM 2000 Control Delay	6.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	135.0	Sum of lost time (s)	20.5
Intersection Capacity Utilization	75.2%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Traffic Volume (vph)	431	1052	802	1	32	337	67	343	616	33	186	953	211
Future Volume (vph)	431	1052	802	1	32	337	67	343	616	33	186	953	211
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	5.6	4.0		7.0	5.6	5.6	6.8	5.4	5.4	7.0	5.6	5.6
Lane Util. Factor	0.97	0.95	1.00		1.00	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3467	3574	1599		1736	3471	1553	3367	3471	1553	1752	3505	1568
Flt Permitted	0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3467	3574	1599		1736	3471	1553	3367	3471	1553	1752	3505	1568
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	468	1143	872	1	35	366	73	373	670	36	202	1036	229
RTOR Reduction (vph)	0	0	0	0	0	0	62	0	0	26	0	0	146
Lane Group Flow (vph)	468	1143	872	0	36	366	11	373	670	10	202	1036	83
Heavy Vehicles (%)	1%	1%	1%	4%	4%	4%	4%	4%	4%	4%	3%	3%	3%
Turn Type	Prot	NA	Free	Prot	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	1	6		5	5	2		7	4		3	8	
Permitted Phases			Free				2			4			8
Actuated Green, G (s)	32.9	47.8	135.0		4.8	19.7	19.7	16.1	39.2	39.2	18.2	41.3	41.3
Effective Green, g (s)	32.9	47.8	135.0		4.8	19.7	19.7	16.1	39.2	39.2	18.2	41.3	41.3
Actuated g/C Ratio	0.24	0.35	1.00		0.04	0.15	0.15	0.12	0.29	0.29	0.13	0.31	0.31
Clearance Time (s)	7.0	5.6			7.0	5.6	5.6	6.8	5.4	5.4	7.0	5.6	5.6
Vehicle Extension (s)	2.0	2.0			2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lane Grp Cap (vph)	844	1265	1599		61	506	226	401	1007	450	236	1072	479
v/s Ratio Prot	0.13	c0.32			0.02	c0.11		c0.11	0.19		0.12	c0.30	
v/s Ratio Perm			0.55				0.01			0.01			0.05
v/c Ratio	0.55	0.90	0.55		0.59	0.72	0.05	0.93	0.67	0.02	0.86	0.97	0.17
Uniform Delay, d1	44.6	41.4	0.0		64.1	55.0	49.6	58.9	42.1	34.2	57.1	46.2	34.3
Progression Factor	0.66	0.61	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.4	8.9	1.1		9.8	8.7	0.4	27.8	1.3	0.0	24.1	19.6	0.1
Delay (s)	29.6	34.3	1.1		73.9	63.7	50.0	86.6	43.4	34.2	81.2	65.7	34.4
Level of Service	C	C	A		E	E	D	F	D	C	F	E	C
Approach Delay (s)		21.8				62.4			58.1			63.0	
Approach LOS		C				E			E			E	

Intersection Summary			
HCM 2000 Control Delay	43.4	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	135.0	Sum of lost time (s)	25.0
Intersection Capacity Utilization	91.0%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBU	EBL	EBT	WBT	WBR	SWL	SWR
Lane Configurations							
Traffic Volume (vph)	3	134	2330	900	0	0	0
Future Volume (vph)	3	134	2330	900	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.0	4.0	7.0			
Lane Util. Factor		0.97	0.91	0.91			
Frt		1.00	1.00	1.00			
Flt Protected		0.95	1.00	1.00			
Satd. Flow (prot)		3433	5085	5085			
Flt Permitted		0.95	1.00	1.00			
Satd. Flow (perm)		3433	5085	5085			
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	3	146	2533	978	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	149	2533	978	0	0	0
Turn Type	Prot	Prot	NA	NA			
Protected Phases	3	3	Free	1 2 4			
Permitted Phases							
Actuated Green, G (s)		44.0	135.0	77.0			
Effective Green, g (s)		44.0	135.0	77.0			
Actuated g/C Ratio		0.33	1.00	0.57			
Clearance Time (s)		7.0					
Vehicle Extension (s)		3.0					
Lane Grp Cap (vph)		1118	5085	2900			
v/s Ratio Prot		0.04	0.50	0.19			
v/s Ratio Perm							
v/c Ratio		0.13	0.50	0.34			
Uniform Delay, d1		32.1	0.0	15.4			
Progression Factor		1.41	1.00	0.81			
Incremental Delay, d2		0.0	0.2	0.1			
Delay (s)		45.3	0.2	12.6			
Level of Service		D	A	B			
Approach Delay (s)			2.7	12.6		0.0	
Approach LOS			A	B		A	

Intersection Summary			
HCM 2000 Control Delay	5.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	135.0	Sum of lost time (s)	28.0
Intersection Capacity Utilization	48.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	0	0	474	0	231	536
Future Volume (vph)	0	0	474	0	231	536
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)			7.0		7.0	4.0
Lane Util. Factor			0.95		0.97	0.95
Frt			1.00		1.00	1.00
Flt Protected			1.00		0.95	1.00
Satd. Flow (prot)			3539		3433	3539
Flt Permitted			1.00		0.95	1.00
Satd. Flow (perm)			3539		3433	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	515	0	251	583
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	515	0	251	583
Turn Type			NA		Prot	NA
Protected Phases			2 3 4		1	Free
Permitted Phases						
Actuated Green, G (s)			83.0		38.0	135.0
Effective Green, g (s)			83.0		38.0	135.0
Actuated g/C Ratio			0.61		0.28	1.00
Clearance Time (s)					7.0	
Vehicle Extension (s)					3.0	
Lane Grp Cap (vph)			2175		966	3539
v/s Ratio Prot			c0.15		c0.07	0.16
v/s Ratio Perm						
v/c Ratio			0.24		0.26	0.16
Uniform Delay, d1			11.7		37.6	0.0
Progression Factor			1.56		1.00	1.00
Incremental Delay, d2			0.1		0.1	0.1
Delay (s)			18.3		37.7	0.1
Level of Service			B		D	A
Approach Delay (s)	0.0		18.3			11.4
Approach LOS	A		B			B

Intersection Summary			
HCM 2000 Control Delay	14.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.28		
Actuated Cycle Length (s)	135.0	Sum of lost time (s)	28.0
Intersection Capacity Utilization	31.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations						
Traffic Volume (vph)	2289	0	181	574	0	0
Future Volume (vph)	2289	0	181	574	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0		7.0	4.0		
Lane Util. Factor	0.91		0.97	0.91		
Frt	1.00		1.00	1.00		
Flt Protected	1.00		0.95	1.00		
Satd. Flow (prot)	5085		3433	5085		
Flt Permitted	1.00		0.95	1.00		
Satd. Flow (perm)	5085		3433	5085		
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2488	0	197	624	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	2488	0	197	624	0	0
Turn Type	NA		Prot	NA		
Protected Phases	1 2 4		3	Free		
Permitted Phases						
Actuated Green, G (s)	77.0		44.0	135.0		
Effective Green, g (s)	77.0		44.0	135.0		
Actuated g/C Ratio	0.57		0.33	1.00		
Clearance Time (s)			7.0			
Vehicle Extension (s)			3.0			
Lane Grp Cap (vph)	2900		1118	5085		
v/s Ratio Prot	c0.49		c0.06	0.12		
v/s Ratio Perm						
v/c Ratio	0.86		0.18	0.12		
Uniform Delay, d1	24.4		32.5	0.0		
Progression Factor	0.35		1.52	1.00		
Incremental Delay, d2	2.3		0.1	0.0		
Delay (s)	10.7		49.5	0.0		
Level of Service	B		D	A		
Approach Delay (s)	10.7			11.9	0.0	
Approach LOS	B			B	A	

Intersection Summary			
HCM 2000 Control Delay	11.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	135.0	Sum of lost time (s)	28.0
Intersection Capacity Utilization	61.1%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	0	420	309	432	644	0
Future Volume (vph)	0	420	309	432	644	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.0	7.0	4.0	7.0	
Lane Util. Factor		1.00	0.97	0.95	0.95	
Frt		0.86	1.00	1.00	1.00	
Flt Protected		1.00	0.95	1.00	1.00	
Satd. Flow (prot)		1611	3433	3539	3539	
Flt Permitted		1.00	0.95	1.00	1.00	
Satd. Flow (perm)		1611	3433	3539	3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	457	336	470	700	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	457	336	470	700	0
Turn Type		pm+ov	Prot	NA	NA	
Protected Phases		1	1	Free	2 3 4	
Permitted Phases		2 3 4				
Actuated Green, G (s)		121.0	38.0	135.0	83.0	
Effective Green, g (s)		121.0	38.0	135.0	83.0	
Actuated g/C Ratio		0.90	0.28	1.00	0.61	
Clearance Time (s)		7.0	7.0			
Vehicle Extension (s)		3.0	3.0			
Lane Grp Cap (vph)		1611	966	3539	2175	
v/s Ratio Prot		c0.08	c0.10	0.13	c0.20	
v/s Ratio Perm		0.20				
v/c Ratio		0.28	0.35	0.13	0.32	
Uniform Delay, d1		1.0	38.6	0.0	12.5	
Progression Factor		1.00	1.00	1.00	1.12	
Incremental Delay, d2		0.1	0.2	0.1	0.1	
Delay (s)		1.1	38.8	0.1	14.1	
Level of Service		A	D	A	B	
Approach Delay (s)	1.1			16.2	14.1	
Approach LOS	A			B	B	

Intersection Summary			
HCM 2000 Control Delay	11.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.38		
Actuated Cycle Length (s)	135.0	Sum of lost time (s)	28.0
Intersection Capacity Utilization	55.5%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1910	420	0	591	309	0
Future Volume (vph)	1910	420	0	591	309	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	4.0		7.0	7.0	
Lane Util. Factor	0.91	1.00		0.91	0.97	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	1.00	1.00		1.00	0.95	
Satd. Flow (prot)	5085	1583		5085	3433	
Flt Permitted	1.00	1.00		1.00	0.95	
Satd. Flow (perm)	5085	1583		5085	3433	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2076	457	0	642	336	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	2076	457	0	642	336	0
Turn Type	NA	Free		NA	Prot	
Protected Phases	1 2			1 2 3	4	
Permitted Phases		Free				
Actuated Green, G (s)	56.0	135.0		107.0	14.0	
Effective Green, g (s)	56.0	135.0		107.0	14.0	
Actuated g/C Ratio	0.41	1.00		0.79	0.10	
Clearance Time (s)					7.0	
Vehicle Extension (s)					3.0	
Lane Grp Cap (vph)	2109	1583		4030	356	
v/s Ratio Prot	c0.41			0.13	c0.10	
v/s Ratio Perm		c0.29				
v/c Ratio	0.98	0.29		0.16	0.94	
Uniform Delay, d1	39.1	0.0		3.3	60.1	
Progression Factor	0.66	1.00		0.55	0.46	
Incremental Delay, d2	14.8	0.4		0.0	32.2	
Delay (s)	40.7	0.4		1.9	60.0	
Level of Service	D	A		A	E	
Approach Delay (s)	33.4			1.9	60.0	
Approach LOS	C			A	E	

Intersection Summary			
HCM 2000 Control Delay	30.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	135.0	Sum of lost time (s)	28.0
Intersection Capacity Utilization	57.4%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	134	0	0	340	536	0
Future Volume (vph)	134	0	0	340	536	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0			7.0	7.0	
Lane Util. Factor	0.97			0.95	0.91	
Frt	1.00			1.00	1.00	
Flt Protected	0.95			1.00	1.00	
Satd. Flow (prot)	3433			3539	5085	
Flt Permitted	0.95			1.00	1.00	
Satd. Flow (perm)	3433			3539	5085	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	146	0	0	370	583	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	146	0	0	370	583	0
Turn Type	Prot			NA	NA	
Protected Phases	2			1 3 4	3 4	
Permitted Phases						
Actuated Green, G (s)	11.0			110.0	65.0	
Effective Green, g (s)	11.0			110.0	65.0	
Actuated g/C Ratio	0.08			0.81	0.48	
Clearance Time (s)	7.0					
Vehicle Extension (s)	3.0					
Lane Grp Cap (vph)	279			2883	2448	
v/s Ratio Prot	c0.04			c0.10	c0.11	
v/s Ratio Perm						
v/c Ratio	0.52			0.13	0.24	
Uniform Delay, d1	59.5			2.6	20.5	
Progression Factor	0.58			0.72	1.00	
Incremental Delay, d2	6.8			0.0	0.1	
Delay (s)	41.5			1.9	20.5	
Level of Service	D			A	C	
Approach Delay (s)	41.5			1.9	20.5	
Approach LOS	D			A	C	

Intersection Summary			
HCM 2000 Control Delay	17.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.25		
Actuated Cycle Length (s)	135.0	Sum of lost time (s)	28.0
Intersection Capacity Utilization	26.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	2058	574	0	231	0
Future Volume (vph)	0	2058	574	0	231	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.0	7.0		7.0	
Lane Util. Factor		0.91	0.86		0.97	
Frt		1.00	1.00		1.00	
Flt Protected		1.00	1.00		0.95	
Satd. Flow (prot)		5085	6408		3433	
Flt Permitted		1.00	1.00		0.95	
Satd. Flow (perm)		5085	6408		3433	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	2237	624	0	251	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	2237	624	0	251	0
Turn Type		NA	NA		Prot	
Protected Phases		1 2 3	1 2		4	
Permitted Phases						
Actuated Green, G (s)		107.0	56.0		14.0	
Effective Green, g (s)		107.0	56.0		14.0	
Actuated g/C Ratio		0.79	0.41		0.10	
Clearance Time (s)					7.0	
Vehicle Extension (s)					3.0	
Lane Grp Cap (vph)		4030	2658		356	
v/s Ratio Prot		c0.44	0.10		c0.07	
v/s Ratio Perm						
v/c Ratio		0.56	0.23		0.71	
Uniform Delay, d1		5.2	25.6		58.5	
Progression Factor		0.72	0.61		0.45	
Incremental Delay, d2		0.1	0.0		6.1	
Delay (s)		3.8	15.6		32.4	
Level of Service		A	B		C	
Approach Delay (s)		3.8	15.6		32.4	
Approach LOS		A	B		C	

Intersection Summary			
HCM 2000 Control Delay	8.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	135.0	Sum of lost time (s)	28.0
Intersection Capacity Utilization	58.0%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	181	0	432	0	0	463
Future Volume (vph)	181	0	432	0	0	463
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0		7.0			7.0
Lane Util. Factor	0.97		0.91			0.95
Frt	1.00		1.00			1.00
Flt Protected	0.95		1.00			1.00
Satd. Flow (prot)	3433		5085			3539
Flt Permitted	0.95		1.00			1.00
Satd. Flow (perm)	3433		5085			3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	197	0	470	0	0	503
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	197	0	470	0	0	503
Turn Type	Prot		NA			NA
Protected Phases	2		3 4			1 3 4
Permitted Phases						
Actuated Green, G (s)	11.0		65.0			110.0
Effective Green, g (s)	11.0		65.0			110.0
Actuated g/C Ratio	0.08		0.48			0.81
Clearance Time (s)	7.0					
Vehicle Extension (s)	3.0					
Lane Grp Cap (vph)	279		2448			2883
v/s Ratio Prot	c0.06		c0.09			c0.14
v/s Ratio Perm						
v/c Ratio	0.71		0.19			0.17
Uniform Delay, d1	60.4		20.0			2.7
Progression Factor	0.56		1.00			0.64
Incremental Delay, d2	13.9		0.0			0.0
Delay (s)	47.6		20.0			1.8
Level of Service	D		C			A
Approach Delay (s)	47.6		20.0			1.8
Approach LOS	D		C			A

Intersection Summary			
HCM 2000 Control Delay	16.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.26		
Actuated Cycle Length (s)	135.0	Sum of lost time (s)	28.0
Intersection Capacity Utilization	29.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Traffic Volume (vph)	1	40	2378	492	26	777	72	82	41	33	107	191	90
Future Volume (vph)	1	40	2378	492	26	777	72	82	41	33	107	191	90
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.8	5.5	5.5	6.7	5.9		6.8	7.6	7.6	6.8	7.6	7.6
Lane Util. Factor		1.00	0.91	1.00	1.00	0.91		0.97	1.00	1.00	1.00	1.00	1.00
Frt		1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1787	5136	1599	1719	4877		3467	1881	1599	1787	1881	1599
Flt Permitted		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.73	1.00	1.00
Satd. Flow (perm)		1787	5136	1599	1719	4877		3467	1881	1599	1369	1881	1599
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1	43	2585	535	28	845	78	89	45	36	116	208	98
RTOR Reduction (vph)	0	0	0	101	0	7	0	0	0	32	0	0	83
Lane Group Flow (vph)	0	44	2585	434	28	916	0	89	45	4	116	208	15
Heavy Vehicles (%)	1%	1%	1%	1%	5%	5%	5%	1%	1%	1%	1%	1%	1%
Turn Type	Prot	Prot	NA	Perm	Prot	NA		Prot	NA	Perm	D.P+P	NA	Perm
Protected Phases	5	5	2		1	6		7	4		3	8	
Permitted Phases				2						4	4		8
Actuated Green, G (s)		49.0	112.9	112.9	6.6	71.0		7.0	21.5	21.5	33.9	26.9	26.9
Effective Green, g (s)		49.0	112.9	112.9	6.6	71.0		7.0	21.5	21.5	33.9	26.9	26.9
Actuated g/C Ratio		0.27	0.63	0.63	0.04	0.39		0.04	0.12	0.12	0.19	0.15	0.15
Clearance Time (s)		5.8	5.5	5.5	6.7	5.9		6.8	7.6	7.6	6.8	7.6	7.6
Vehicle Extension (s)		2.0	2.0	2.0	2.0	2.0		2.0	3.0	3.0	2.0	3.0	3.0
Lane Grp Cap (vph)		486	3221	1002	63	1923		134	224	190	286	281	238
v/s Ratio Prot		0.02	c0.50		0.02	c0.19		c0.03	0.02		0.03	c0.11	
v/s Ratio Perm				0.27						0.00	0.05		0.01
v/c Ratio		0.09	0.80	0.43	0.44	0.48		0.66	0.20	0.02	0.41	0.74	0.06
Uniform Delay, d1		48.9	25.2	17.2	84.9	40.6		85.3	71.5	70.0	63.4	73.2	65.7
Progression Factor		1.00	1.00	1.00	0.78	0.48		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		0.0	2.2	1.4	1.8	0.8		9.2	0.4	0.0	0.3	10.0	0.1
Delay (s)		48.9	27.4	18.5	68.0	20.5		94.6	71.9	70.0	63.8	83.2	65.8
Level of Service		D	C	B	E	C		F	E	E	E	F	E
Approach Delay (s)			26.2			21.9			83.4			73.8	
Approach LOS			C			C			F			E	

Intersection Summary			
HCM 2000 Control Delay	31.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	26.6
Intersection Capacity Utilization	76.7%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Traffic Volume (vph)	6	2486	27	4	8	833	23	21	18	21	52	17	21
Future Volume (vph)	6	2486	27	4	8	833	23	21	18	21	52	17	21
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1	7.4			6.1	7.4			7.6	7.6		7.6	
Lane Util. Factor	1.00	0.91			1.00	0.91			1.00	1.00		1.00	
Frt	1.00	1.00			1.00	1.00			1.00	0.85		0.97	
Flt Protected	0.95	1.00			0.95	1.00			0.97	1.00		0.97	
Satd. Flow (prot)	1787	5127			1752	5016			1682	1468		1687	
Flt Permitted	0.29	1.00			0.03	1.00			0.76	1.00		0.80	
Satd. Flow (perm)	549	5127			54	5016			1317	1468		1382	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	7	2702	29	4	9	905	25	23	20	23	57	18	23
RTOR Reduction (vph)	0	0	0	0	0	1	0	0	0	21	0	7	0
Lane Group Flow (vph)	7	2731	0	0	13	929	0	0	43	2	0	91	0
Heavy Vehicles (%)	1%	1%	1%	3%	3%	3%	3%	10%	10%	10%	6%	6%	6%
Turn Type	D.P+P	NA		D.P+P	D.P+P	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	5	2		1	1	6			8			4	
Permitted Phases	6			2	2			8		8	4		
Actuated Green, G (s)	142.7	139.5			142.7	141.7			16.2	16.2		16.2	
Effective Green, g (s)	142.7	139.5			142.7	141.7			16.2	16.2		16.2	
Actuated g/C Ratio	0.79	0.78			0.79	0.79			0.09	0.09		0.09	
Clearance Time (s)	6.1	7.4			6.1	7.4			7.6	7.6		7.6	
Vehicle Extension (s)	2.0	2.0			2.0	2.0			2.0	2.0		2.0	
Lane Grp Cap (vph)	442	3973			72	3948			118	132		124	
v/s Ratio Prot	0.00	c0.53			0.00	c0.19							
v/s Ratio Perm	0.01				0.14				0.03	0.00		c0.07	
v/c Ratio	0.02	0.69			0.18	0.24			0.36	0.02		0.73	
Uniform Delay, d1	3.9	9.7			21.6	5.0			77.1	74.6		79.8	
Progression Factor	0.23	0.21			2.15	0.57			1.00	1.00		1.00	
Incremental Delay, d2	0.0	0.6			0.4	0.1			0.7	0.0		17.3	
Delay (s)	0.9	2.7			47.0	3.0			77.8	74.7		97.1	
Level of Service	A	A			D	A			E	E		F	
Approach Delay (s)		2.7				3.6			76.7			97.1	
Approach LOS		A				A			E			F	

Intersection Summary			
HCM 2000 Control Delay	6.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	21.1
Intersection Capacity Utilization	76.7%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Traffic Volume (vph)	6	25	2470	63	42	755	37	68	71	68	200	228	40
Future Volume (vph)	6	25	2470	63	42	755	37	68	71	68	200	228	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.1	7.4		6.1	7.4	7.4	6.8	7.6		6.8	7.6	
Lane Util. Factor		1.00	0.91		1.00	0.91	1.00	1.00	1.00		1.00	1.00	
Frt		1.00	1.00		1.00	1.00	0.85	1.00	0.93		1.00	0.98	
Flt Protected		0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1787	5117		1752	5036	1568	1770	1726		1719	1769	
Flt Permitted		0.31	1.00		0.04	1.00	1.00	0.22	1.00		0.51	1.00	
Satd. Flow (perm)		581	5117		68	5036	1568	413	1726		919	1769	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	7	27	2685	68	46	821	40	74	77	74	217	248	43
RTOR Reduction (vph)	0	0	1	0	0	0	16	0	20	0	0	4	0
Lane Group Flow (vph)	0	34	2752	0	46	821	24	74	131	0	217	287	0
Heavy Vehicles (%)	1%	1%	1%	1%	3%	3%	3%	2%	2%	2%	5%	5%	5%
Turn Type	D.P+P	D.P+P	NA		D.P+P	NA	Perm	D.P+P	NA		D.P+P	NA	
Protected Phases	5	5	2		1	6		3	8		7	4	
Permitted Phases	6	6			2		6	4			8		
Actuated Green, G (s)		112.8	107.8		112.8	107.9	107.9	39.3	27.5		39.3	33.4	
Effective Green, g (s)		112.8	107.8		112.8	107.9	107.9	39.3	27.5		39.3	33.4	
Actuated g/C Ratio		0.63	0.60		0.63	0.60	0.60	0.22	0.15		0.22	0.19	
Clearance Time (s)		6.1	7.4		6.1	7.4	7.4	6.8	7.6		6.8	7.6	
Vehicle Extension (s)		2.0	4.5		2.0	4.5	4.5	3.0	2.0		3.0	2.0	
Lane Grp Cap (vph)		396	3064		89	3018	939	134	263		253	328	
v/s Ratio Prot		0.00	c0.54		c0.01	0.16		0.02	0.08		c0.06	c0.16	
v/s Ratio Perm		0.05			0.31		0.02	0.10			0.13		
v/c Ratio		0.09	0.90		0.52	0.27	0.03	0.55	0.50		0.86	0.87	
Uniform Delay, d1		12.9	31.3		36.1	17.3	14.7	59.3	69.9		66.4	71.3	
Progression Factor		0.57	0.45		1.19	0.69	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.0	3.6		2.0	0.2	0.0	4.9	0.5		23.8	21.3	
Delay (s)		7.4	17.9		45.2	12.1	14.7	64.2	70.4		90.1	92.6	
Level of Service		A	B		D	B	B	E	E		F	F	
Approach Delay (s)			17.7			13.9			68.4			91.5	
Approach LOS			B			B			E			F	

Intersection Summary			
HCM 2000 Control Delay	28.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	27.9
Intersection Capacity Utilization	86.7%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations														
Traffic Volume (vph)	3	80	2522	133	5	8	714	358	49	167	54	400	264	67
Future Volume (vph)	3	80	2522	133	5	8	714	358	49	167	54	400	264	67
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.4	8.7	8.7		6.9	8.7	8.7	6.8	7.9		6.8	7.9	7.9
Lane Util. Factor		1.00	0.91	1.00		1.00	0.91	1.00	1.00	1.00		0.97	1.00	1.00
Frt		1.00	1.00	0.85		1.00	1.00	0.85	1.00	0.96		1.00	1.00	0.85
Flt Protected		0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1770	5085	1583		1752	5036	1568	1805	1830		3433	1863	1583
Flt Permitted		0.31	1.00	1.00		0.04	1.00	1.00	0.37	1.00		0.95	1.00	1.00
Satd. Flow (perm)		578	5085	1583		81	5036	1568	699	1830		3433	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	3	87	2741	145	5	9	776	389	53	182	59	435	287	73
RTOR Reduction (vph)	0	0	0	71	0	0	0	203	0	7	0	0	0	54
Lane Group Flow (vph)	0	90	2741	74	0	14	776	186	53	234	0	435	287	19
Heavy Vehicles (%)	2%	2%	2%	2%	3%	3%	3%	3%	0%	0%	0%	2%	2%	2%
Turn Type	D.P+P	D.P+P	NA	Perm	D.P+P	D.P+P	NA	Perm	D.P+P	NA		Prot	NA	Perm
Protected Phases	1	1	6		5	5	2		7	4		3	8	
Permitted Phases	2	2		6	6	6		2	8					8
Actuated Green, G (s)		94.3	91.6	91.6		94.8	86.1	86.1	54.9	26.2		28.7	46.9	46.9
Effective Green, g (s)		94.3	91.6	91.6		94.8	86.1	86.1	54.9	26.2		28.7	46.9	46.9
Actuated g/C Ratio		0.52	0.51	0.51		0.53	0.48	0.48	0.30	0.15		0.16	0.26	0.26
Clearance Time (s)		7.4	8.7	8.7		6.9	8.7	8.7	6.8	7.9		6.8	7.9	7.9
Vehicle Extension (s)		2.0	2.0	2.0		2.0	5.0	5.0	2.0	2.0		2.0	2.0	2.0
Lane Grp Cap (vph)		357	2587	805		72	2408	750	262	266		547	485	412
v/s Ratio Prot		0.01	c0.54			0.00	c0.15		0.01	c0.13		c0.13	0.15	
v/s Ratio Perm		0.12		0.05		0.10		0.12	0.05					0.01
v/c Ratio		0.25	1.06	0.09		0.19	0.32	0.25	0.20	0.88		0.80	0.59	0.05
Uniform Delay, d1		21.8	44.2	22.8		83.6	29.0	27.8	45.7	75.4		72.8	58.2	49.8
Progression Factor		0.33	0.48	0.08		0.88	0.82	3.06	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2		0.1	31.6	0.1		0.5	0.3	0.8	0.1	26.2		7.3	1.3	0.0
Delay (s)		7.3	53.0	1.9		73.8	24.2	85.7	45.8	101.6		80.2	59.5	49.8
Level of Service		A	D	A		E	C	F	D	F		F	E	D
Approach Delay (s)			49.1				45.0			91.5			69.9	
Approach LOS			D				D			F			E	

Intersection Summary			
HCM 2000 Control Delay	53.7	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	30.8
Intersection Capacity Utilization	104.1%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	2654	30	30	868	5	30	0	30	5	0	5
Future Volume (vph)	5	2654	30	30	868	5	30	0	30	5	0	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1	7.4		6.1	7.4			7.2	7.2	6.4	7.2	
Lane Util. Factor	1.00	0.91		1.00	0.91			1.00	1.00	1.00	1.00	
Frt	1.00	1.00		1.00	1.00			1.00	0.85	1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00			0.95	1.00	0.95	1.00	
Satd. Flow (prot)	1770	5077		1770	5081			1770	1583	1770	1583	
Flt Permitted	0.29	1.00		0.03	1.00			0.75	1.00	0.74	1.00	
Satd. Flow (perm)	533	5077		54	5081			1405	1583	1370	1583	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	5	2885	33	33	943	5	33	0	33	5	0	5
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	31	0	5	0
Lane Group Flow (vph)	5	2918	0	33	948	0	0	33	2	5	0	0
Turn Type	D.P+P	NA		D.P+P	NA		D.P+P	NA	Perm	D.P+P	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	2			6			8		4	4		
Actuated Green, G (s)	143.1	138.7		143.1	142.1			8.9	8.9	9.8	16.2	
Effective Green, g (s)	143.1	138.7		143.1	142.1			8.9	8.9	9.8	16.2	
Actuated g/C Ratio	0.79	0.77		0.79	0.79			0.05	0.05	0.05	0.09	
Clearance Time (s)	6.1	7.4		6.1	7.4			7.2	7.2	6.4	7.2	
Vehicle Extension (s)	2.0	2.0		2.0	2.0			2.0	2.0	2.0	2.0	
Lane Grp Cap (vph)	430	3912		84	4011			69	78	76	142	
v/s Ratio Prot	0.00	c0.57		c0.01	c0.19					c0.00	0.00	
v/s Ratio Perm	0.01			0.30				c0.02	0.00	0.00		
v/c Ratio	0.01	0.75		0.39	0.24			0.48	0.02	0.07	0.00	
Uniform Delay, d1	3.8	11.1		16.4	4.9			83.3	81.4	80.8	74.6	
Progression Factor	0.23	0.25		1.77	0.87			1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.0	0.7		1.1	0.1			1.9	0.0	0.1	0.0	
Delay (s)	0.9	3.4		30.2	4.4			85.2	81.4	80.9	74.6	
Level of Service	A	A		C	A			F	F	F	E	
Approach Delay (s)		3.4			5.3			83.3			77.7	
Approach LOS		A			A			F			E	

Intersection Summary			
HCM 2000 Control Delay	5.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	27.1
Intersection Capacity Utilization	80.1%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑↱		↰	↑↑↑	↰	↱
Traffic Volume (vph)	2599	90	197	885	18	147
Future Volume (vph)	2599	90	197	885	18	147
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.7		6.4	7.7	7.6	7.6
Lane Util. Factor	0.91		1.00	0.91	1.00	1.00
Frt	0.99		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	5110		1752	5036	1805	1615
Flt Permitted	1.00		0.03	1.00	0.95	1.00
Satd. Flow (perm)	5110		54	5036	1805	1615
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2825	98	214	962	20	160
RTOR Reduction (vph)	1	0	0	0	0	152
Lane Group Flow (vph)	2922	0	214	962	20	8
Heavy Vehicles (%)	1%	1%	3%	3%	0%	0%
Turn Type	NA		D.P+P	NA	Prot	Perm
Protected Phases	6		5	2	4	
Permitted Phases			6			4
Actuated Green, G (s)	135.6		149.2	155.6	9.1	9.1
Effective Green, g (s)	135.6		149.2	155.6	9.1	9.1
Actuated g/C Ratio	0.75		0.83	0.86	0.05	0.05
Clearance Time (s)	7.7		6.4	7.7	7.6	7.6
Vehicle Extension (s)	0.2		2.0	0.2	2.0	2.0
Lane Grp Cap (vph)	3849		173	4353	91	81
v/s Ratio Prot	0.57		c0.09	0.19	c0.01	
v/s Ratio Perm			c0.92			0.01
v/c Ratio	0.76		1.24	0.22	0.22	0.10
Uniform Delay, d1	12.8		45.7	2.0	82.0	81.5
Progression Factor	0.32		0.50	0.48	1.00	1.00
Incremental Delay, d2	1.0		144.9	0.1	0.4	0.2
Delay (s)	5.1		167.6	1.1	82.5	81.7
Level of Service	A		F	A	F	F
Approach Delay (s)	5.1			31.4	81.8	
Approach LOS	A			C	F	

Intersection Summary			
HCM 2000 Control Delay	15.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	1.21		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	25.7
Intersection Capacity Utilization	87.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	60	2686	836	199	261	245
Future Volume (vph)	60	2686	836	199	261	245
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.4	8.7	8.7	8.7	7.2	7.2
Lane Util. Factor	1.00	0.91	0.91	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1787	5136	4988	1553	1752	1568
Flt Permitted	0.29	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	540	5136	4988	1553	1752	1568
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	65	2920	909	216	284	266
RTOR Reduction (vph)	0	0	0	72	0	208
Lane Group Flow (vph)	65	2920	909	144	284	58
Heavy Vehicles (%)	1%	1%	4%	4%	3%	3%
Turn Type	D.P+P	NA	NA	Perm	Prot	Perm
Protected Phases	1	6	2		4	
Permitted Phases	2			2		4
Actuated Green, G (s)	125.3	132.7	117.3	117.3	31.4	31.4
Effective Green, g (s)	125.3	132.7	117.3	117.3	31.4	31.4
Actuated g/C Ratio	0.70	0.74	0.65	0.65	0.17	0.17
Clearance Time (s)	7.4	8.7	8.7	8.7	7.2	7.2
Vehicle Extension (s)	2.5	2.5	2.5	2.5	2.5	2.5
Lane Grp Cap (vph)	431	3786	3250	1012	305	273
v/s Ratio Prot	0.01	c0.57	0.18		c0.16	
v/s Ratio Perm	0.10			0.09		0.04
v/c Ratio	0.15	0.77	0.28	0.14	0.93	0.21
Uniform Delay, d1	8.7	14.4	13.4	12.0	73.2	63.7
Progression Factor	0.11	0.08	0.21	0.02	1.00	1.00
Incremental Delay, d2	0.1	1.0	0.2	0.3	33.9	0.3
Delay (s)	1.0	2.2	3.0	0.5	107.1	64.0
Level of Service	A	A	A	A	F	E
Approach Delay (s)		2.2	2.6		86.2	
Approach LOS		A	A		F	

Intersection Summary			
HCM 2000 Control Delay	12.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	27.3
Intersection Capacity Utilization	79.6%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Traffic Volume (vph)	257	2690	0	4	2	934	38	1	0	0	63	0	100
Future Volume (vph)	257	2690	0	4	2	934	38	1	0	0	63	0	100
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1	7.4			6.1	7.4			7.0			7.0	
Lane Util. Factor	1.00	0.91			1.00	0.91			1.00			1.00	
Frt	1.00	1.00			1.00	0.99			1.00			0.92	
Flt Protected	0.95	1.00			0.95	1.00			0.95			0.98	
Satd. Flow (prot)	1787	5136			1736	4958			1805			1692	
Flt Permitted	0.24	1.00			0.03	1.00			0.39			0.87	
Satd. Flow (perm)	456	5136			51	4958			750			1507	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	279	2924	0	4	2	1015	41	1	0	0	68	0	109
RTOR Reduction (vph)	0	0	0	0	0	2	0	0	0	0	0	99	0
Lane Group Flow (vph)	279	2924	0	0	6	1054	0	0	1	0	0	78	0
Heavy Vehicles (%)	1%	1%	1%	4%	4%	4%	4%	0%	0%	0%	1%	1%	1%
Turn Type	D.P+P	NA		D.P+P	D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	5	2			4			8	
Permitted Phases	2			6	6			4			8		
Actuated Green, G (s)	144.5	142.9			144.5	124.1			15.0			15.0	
Effective Green, g (s)	144.5	142.9			144.5	124.1			15.0			15.0	
Actuated g/C Ratio	0.80	0.79			0.80	0.69			0.08			0.08	
Clearance Time (s)	6.1	7.4			6.1	7.4			7.0			7.0	
Vehicle Extension (s)	2.5	2.5			2.5	2.5			2.5			2.5	
Lane Grp Cap (vph)	516	4077			55	3418			62			125	
v/s Ratio Prot	0.06	c0.57			0.00	0.21							
v/s Ratio Perm	c0.37				0.08				0.00			c0.05	
v/c Ratio	0.54	0.72			0.11	0.31			0.02			0.62	
Uniform Delay, d1	4.6	8.9			20.6	11.0			75.7			79.8	
Progression Factor	1.42	0.62			0.38	0.29			1.00			1.00	
Incremental Delay, d2	0.5	0.7			0.4	0.2			0.1			8.1	
Delay (s)	7.0	6.2			8.2	3.3			75.8			87.9	
Level of Service	A	A			A	A			E			F	
Approach Delay (s)		6.3				3.3			75.8			87.9	
Approach LOS		A				A			E			F	

Intersection Summary			
HCM 2000 Control Delay	8.8	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	20.5
Intersection Capacity Utilization	84.4%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Traffic Volume (vph)	377	1399	981	2	73	501	111	343	774	58	243	1254	134
Future Volume (vph)	377	1399	981	2	73	501	111	343	774	58	243	1254	134
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	5.6	4.0		7.0	5.6	5.6	6.8	5.4	5.4	7.0	5.6	5.6
Lane Util. Factor	0.97	0.95	1.00		1.00	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3467	3574	1599		1736	3471	1553	3367	3471	1553	1752	3505	1568
Flt Permitted	0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3467	3574	1599		1736	3471	1553	3367	3471	1553	1752	3505	1568
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	410	1521	1066	2	79	545	121	373	841	63	264	1363	146
RTOR Reduction (vph)	0	0	0	0	0	0	87	0	0	45	0	0	94
Lane Group Flow (vph)	410	1521	1066	0	81	545	34	373	841	18	264	1363	52
Heavy Vehicles (%)	1%	1%	1%	4%	4%	4%	4%	4%	4%	4%	3%	3%	3%
Turn Type	Prot	NA	Free	Prot	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	1	6		5	5	2		7	4		3	8	
Permitted Phases			Free				2			4			8
Actuated Green, G (s)	25.1	70.4	180.0		6.0	51.3	51.3	17.2	50.6	50.6	28.0	61.4	61.4
Effective Green, g (s)	25.1	70.4	180.0		6.0	51.3	51.3	17.2	50.6	50.6	28.0	61.4	61.4
Actuated g/C Ratio	0.14	0.39	1.00		0.03	0.28	0.28	0.10	0.28	0.28	0.16	0.34	0.34
Clearance Time (s)	7.0	5.6			7.0	5.6	5.6	6.8	5.4	5.4	7.0	5.6	5.6
Vehicle Extension (s)	2.0	2.0			2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lane Grp Cap (vph)	483	1397	1599		57	989	442	321	975	436	272	1195	534
v/s Ratio Prot	0.12	c0.43			0.05	0.16		0.11	0.24		c0.15	c0.39	
v/s Ratio Perm			c0.67				0.02			0.01			0.03
v/c Ratio	0.85	1.09	0.67		1.42	0.55	0.08	1.16	0.86	0.04	0.97	1.14	0.10
Uniform Delay, d1	75.6	54.8	0.0		87.0	54.6	47.1	81.4	61.4	47.0	75.6	59.3	40.4
Progression Factor	0.95	0.81	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	9.4	49.1	1.6		265.5	2.2	0.3	101.7	7.7	0.0	46.1	73.7	0.0
Delay (s)	81.0	93.7	1.6		352.5	56.8	47.4	183.1	69.1	47.1	121.7	133.0	40.5
Level of Service	F	F	A		F	E	D	F	E	D	F	F	D
Approach Delay (s)		59.2				87.3			101.3			123.7	
Approach LOS		E				F			F			F	

Intersection Summary			
HCM 2000 Control Delay	87.0	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.14		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	25.0
Intersection Capacity Utilization	109.0%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBU	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations							
Traffic Volume (vph)	5	244	2732	1079	0	0	0
Future Volume (vph)	5	244	2732	1079	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.0	4.0	7.0			
Lane Util. Factor		0.97	0.91	0.91			
Frt		1.00	1.00	1.00			
Flt Protected		0.95	1.00	1.00			
Satd. Flow (prot)		3433	5085	5085			
Flt Permitted		0.95	1.00	1.00			
Satd. Flow (perm)		3433	5085	5085			
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	5	265	2970	1173	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	270	2970	1173	0	0	0
Turn Type	Prot	Prot	NA	NA			
Protected Phases	3	3	Free	1 2 4			
Permitted Phases							
Actuated Green, G (s)		44.0	180.0	122.0			
Effective Green, g (s)		44.0	180.0	122.0			
Actuated g/C Ratio		0.24	1.00	0.68			
Clearance Time (s)		7.0					
Vehicle Extension (s)		3.0					
Lane Grp Cap (vph)		839	5085	3446			
v/s Ratio Prot		0.08	0.58	0.23			
v/s Ratio Perm							
v/c Ratio		0.32	0.58	0.34			
Uniform Delay, d1		55.8	0.0	12.1			
Progression Factor		1.36	1.00	0.42			
Incremental Delay, d2		0.1	0.1	0.1			
Delay (s)		76.0	0.1	5.1			
Level of Service		E	A	A			
Approach Delay (s)			6.5	5.1		0.0	
Approach LOS			A	A		A	

Intersection Summary			
HCM 2000 Control Delay	6.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	28.0
Intersection Capacity Utilization	56.1%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBU	SBL	SBT
Lane Configurations							
Traffic Volume (vph)	0	0	713	0	3	452	753
Future Volume (vph)	0	0	713	0	3	452	753
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)			7.0			7.0	4.0
Lane Util. Factor			0.95			0.97	0.95
Frt			1.00			1.00	1.00
Flt Protected			1.00			0.95	1.00
Satd. Flow (prot)			3539			3433	3539
Flt Permitted			1.00			0.95	1.00
Satd. Flow (perm)			3539			3433	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	775	0	3	491	818
RTOR Reduction (vph)	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	775	0	0	494	818
Turn Type			NA		Prot	Prot	NA
Protected Phases			2 3 4		1	1	Free
Permitted Phases							
Actuated Green, G (s)			108.0			58.0	180.0
Effective Green, g (s)			108.0			58.0	180.0
Actuated g/C Ratio			0.60			0.32	1.00
Clearance Time (s)						7.0	
Vehicle Extension (s)						3.0	
Lane Grp Cap (vph)			2123			1106	3539
v/s Ratio Prot			c0.22			c0.14	0.23
v/s Ratio Perm							
v/c Ratio			0.37			0.45	0.23
Uniform Delay, d1			18.4			48.3	0.0
Progression Factor			0.78			1.00	1.00
Incremental Delay, d2			0.1			0.3	0.2
Delay (s)			14.4			48.6	0.2
Level of Service			B			D	A
Approach Delay (s)	0.0		14.4				18.4
Approach LOS	A		B				B

Intersection Summary			
HCM 2000 Control Delay	16.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	28.0
Intersection Capacity Utilization	44.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑		↰↰	↑↑↑		
Traffic Volume (vph)	2690	0	220	683	0	0
Future Volume (vph)	2690	0	220	683	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0		7.0	4.0		
Lane Util. Factor	0.91		0.97	0.91		
Frt	1.00		1.00	1.00		
Flt Protected	1.00		0.95	1.00		
Satd. Flow (prot)	5085		3433	5085		
Flt Permitted	1.00		0.95	1.00		
Satd. Flow (perm)	5085		3433	5085		
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2924	0	239	742	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	2924	0	239	742	0	0
Turn Type	NA		Prot	NA		
Protected Phases	1 2 4		3	Free		
Permitted Phases						
Actuated Green, G (s)	122.0		44.0	180.0		
Effective Green, g (s)	122.0		44.0	180.0		
Actuated g/C Ratio	0.68		0.24	1.00		
Clearance Time (s)			7.0			
Vehicle Extension (s)			3.0			
Lane Grp Cap (vph)	3446		839	5085		
v/s Ratio Prot	c0.57		c0.07	0.15		
v/s Ratio Perm						
v/c Ratio	0.85		0.28	0.15		
Uniform Delay, d1	22.0		55.2	0.0		
Progression Factor	0.28		0.86	1.00		
Incremental Delay, d2	1.6		0.2	0.1		
Delay (s)	7.8		47.4	0.1		
Level of Service	A		D	A		
Approach Delay (s)	7.8			11.6	0.0	
Approach LOS	A			B	A	

Intersection Summary			
HCM 2000 Control Delay	8.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	28.0
Intersection Capacity Utilization	69.9%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	0	635	367	535	869	0
Future Volume (vph)	0	635	367	535	869	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.0	7.0	4.0	7.0	
Lane Util. Factor		1.00	0.97	0.95	0.95	
Frt		0.86	1.00	1.00	1.00	
Flt Protected		1.00	0.95	1.00	1.00	
Satd. Flow (prot)		1611	3433	3539	3539	
Flt Permitted		1.00	0.95	1.00	1.00	
Satd. Flow (perm)		1611	3433	3539	3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	690	399	582	945	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	690	399	582	945	0
Turn Type		pm+ov	Prot	NA	NA	
Protected Phases		1	1	Free	2 3 4	
Permitted Phases		2 3 4				
Actuated Green, G (s)		166.0	58.0	180.0	108.0	
Effective Green, g (s)		166.0	58.0	180.0	108.0	
Actuated g/C Ratio		0.92	0.32	1.00	0.60	
Clearance Time (s)		7.0	7.0			
Vehicle Extension (s)		3.0	3.0			
Lane Grp Cap (vph)		1611	1106	3539	2123	
v/s Ratio Prot		c0.14	0.12	0.16	c0.27	
v/s Ratio Perm		0.29				
v/c Ratio		0.43	0.36	0.16	0.45	
Uniform Delay, d1		0.9	46.8	0.0	19.6	
Progression Factor		1.00	1.00	1.00	0.30	
Incremental Delay, d2		0.2	0.2	0.1	0.1	
Delay (s)		1.1	47.0	0.1	5.9	
Level of Service		A	D	A	A	
Approach Delay (s)	1.1			19.2	5.9	
Approach LOS	A			B	A	

Intersection Summary			
HCM 2000 Control Delay	9.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	28.0
Intersection Capacity Utilization	75.0%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	2097	635	0	712	367	0
Future Volume (vph)	2097	635	0	712	367	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	4.0		7.0	7.0	
Lane Util. Factor	0.91	1.00		0.91	0.97	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	1.00	1.00		1.00	0.95	
Satd. Flow (prot)	5085	1583		5085	3433	
Flt Permitted	1.00	1.00		1.00	0.95	
Satd. Flow (perm)	5085	1583		5085	3433	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2279	690	0	774	399	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	2279	690	0	774	399	0
Turn Type	NA	Free		NA	Prot	
Protected Phases	1 2			1 2 3	4	
Permitted Phases		Free				
Actuated Green, G (s)	85.0	180.0		136.0	30.0	
Effective Green, g (s)	85.0	180.0		136.0	30.0	
Actuated g/C Ratio	0.47	1.00		0.76	0.17	
Clearance Time (s)					7.0	
Vehicle Extension (s)					3.0	
Lane Grp Cap (vph)	2401	1583		3842	572	
v/s Ratio Prot	c0.45			0.15	c0.12	
v/s Ratio Perm		c0.44				
v/c Ratio	0.95	0.44		0.20	0.70	
Uniform Delay, d1	45.4	0.0		6.3	70.7	
Progression Factor	0.45	1.00		0.70	0.65	
Incremental Delay, d2	7.7	0.7		0.0	3.5	
Delay (s)	28.1	0.7		4.5	49.6	
Level of Service	C	A		A	D	
Approach Delay (s)	21.7			4.5	49.6	
Approach LOS	C			A	D	

Intersection Summary			
HCM 2000 Control Delay	21.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	28.0
Intersection Capacity Utilization	62.7%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	244	0	0	469	753	0
Future Volume (vph)	244	0	0	469	753	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0			7.0	7.0	
Lane Util. Factor	0.97			0.95	0.91	
Frt	1.00			1.00	1.00	
Flt Protected	0.95			1.00	1.00	
Satd. Flow (prot)	3433			3539	5085	
Flt Permitted	0.95			1.00	1.00	
Satd. Flow (perm)	3433			3539	5085	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	265	0	0	510	818	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	265	0	0	510	818	0
Turn Type	Prot			NA	NA	
Protected Phases	2			1 3 4	3 4	
Permitted Phases						
Actuated Green, G (s)	20.0			146.0	81.0	
Effective Green, g (s)	20.0			146.0	81.0	
Actuated g/C Ratio	0.11			0.81	0.45	
Clearance Time (s)	7.0					
Vehicle Extension (s)	3.0					
Lane Grp Cap (vph)	381			2870	2288	
v/s Ratio Prot	c0.08			c0.14	c0.16	
v/s Ratio Perm						
v/c Ratio	0.70			0.18	0.36	
Uniform Delay, d1	77.1			3.8	32.4	
Progression Factor	0.42			0.70	1.00	
Incremental Delay, d2	9.7			0.0	0.1	
Delay (s)	42.4			2.7	32.5	
Level of Service	D			A	C	
Approach Delay (s)	42.4			2.7	32.5	
Approach LOS	D			A	C	

Intersection Summary			
HCM 2000 Control Delay	24.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.35		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	28.0
Intersection Capacity Utilization	33.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑↑	↑↑↑↑		↰↰	
Traffic Volume (vph)	0	2238	683	0	452	0
Future Volume (vph)	0	2238	683	0	452	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.0	7.0		7.0	
Lane Util. Factor		0.91	0.86		0.97	
Frt		1.00	1.00		1.00	
Flt Protected		1.00	1.00		0.95	
Satd. Flow (prot)		5085	6408		3433	
Flt Permitted		1.00	1.00		0.95	
Satd. Flow (perm)		5085	6408		3433	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	2433	742	0	491	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	2433	742	0	491	0
Turn Type		NA	NA		Prot	
Protected Phases		1 2 3	1 2		4	
Permitted Phases						
Actuated Green, G (s)		136.0	85.0		30.0	
Effective Green, g (s)		136.0	85.0		30.0	
Actuated g/C Ratio		0.76	0.47		0.17	
Clearance Time (s)					7.0	
Vehicle Extension (s)					3.0	
Lane Grp Cap (vph)		3842	3026		572	
v/s Ratio Prot		c0.48	0.12		c0.14	
v/s Ratio Perm						
v/c Ratio		0.63	0.25		0.86	
Uniform Delay, d1		10.3	28.4		72.9	
Progression Factor		0.36	1.13		0.64	
Incremental Delay, d2		0.1	0.0		11.2	
Delay (s)		3.8	32.1		57.6	
Level of Service		A	C		E	
Approach Delay (s)		3.8	32.1		57.6	
Approach LOS		A	C		E	

Intersection Summary			
HCM 2000 Control Delay	16.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	28.0
Intersection Capacity Utilization	67.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	220	0	535	0	0	649
Future Volume (vph)	220	0	535	0	0	649
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0		7.0			7.0
Lane Util. Factor	0.97		0.91			0.95
Frt	1.00		1.00			1.00
Flt Protected	0.95		1.00			1.00
Satd. Flow (prot)	3433		5085			3539
Flt Permitted	0.95		1.00			1.00
Satd. Flow (perm)	3433		5085			3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	239	0	582	0	0	705
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	239	0	582	0	0	705
Turn Type	Prot		NA			NA
Protected Phases	2		3 4			1 3 4
Permitted Phases						
Actuated Green, G (s)	20.0		81.0			146.0
Effective Green, g (s)	20.0		81.0			146.0
Actuated g/C Ratio	0.11		0.45			0.81
Clearance Time (s)	7.0					
Vehicle Extension (s)	3.0					
Lane Grp Cap (vph)	381		2288			2870
v/s Ratio Prot	c0.07		c0.11			c0.20
v/s Ratio Perm						
v/c Ratio	0.63		0.25			0.25
Uniform Delay, d1	76.4		30.7			4.0
Progression Factor	0.46		1.00			0.67
Incremental Delay, d2	7.4		0.1			0.0
Delay (s)	42.5		30.8			2.7
Level of Service	D		C			A
Approach Delay (s)	42.5		30.8			2.7
Approach LOS	D		C			A

Intersection Summary			
HCM 2000 Control Delay	19.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.32		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	28.0
Intersection Capacity Utilization	35.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Traffic Volume (vph)	15	54	749	153	21	1649	203	352	107	0	78	47	69
Future Volume (vph)	15	54	749	153	21	1649	203	352	107	0	78	47	69
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.8	5.5	5.5	6.7	5.9		6.8	7.6		6.8	7.6	7.6
Lane Util. Factor		1.00	0.91	1.00	1.00	0.91		0.97	1.00		1.00	1.00	1.00
Frt		1.00	1.00	0.85	1.00	0.98		1.00	1.00		1.00	1.00	0.85
Flt Protected		0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1787	5136	1599	1787	5051		3502	1900		1805	1900	1615
Flt Permitted		0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.65	1.00	1.00
Satd. Flow (perm)		1787	5136	1599	1787	5051		3502	1900		1230	1900	1615
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	16	59	814	166	23	1792	221	383	116	0	85	51	75
RTOR Reduction (vph)	0	0	0	64	0	7	0	0	0	0	0	0	70
Lane Group Flow (vph)	0	75	814	102	23	2006	0	383	116	0	85	51	5
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	Prot	NA	Perm	Prot	NA		Prot	NA	Perm	D.P+P	NA	Perm
Protected Phases	5	5	2		1	6		7	4		3	8	
Permitted Phases				2						4	4		8
Actuated Green, G (s)		9.5	88.8	88.8	4.5	84.3		15.8	19.9		25.1	9.3	9.3
Effective Green, g (s)		9.5	88.8	88.8	4.5	84.3		15.8	19.9		25.1	9.3	9.3
Actuated g/C Ratio		0.07	0.61	0.61	0.03	0.58		0.11	0.14		0.17	0.06	0.06
Clearance Time (s)		5.8	5.5	5.5	6.7	5.9		6.8	7.6		6.8	7.6	7.6
Vehicle Extension (s)		2.0	2.0	2.0	2.0	2.0		2.0	3.0		2.0	3.0	3.0
Lane Grp Cap (vph)		117	3145	979	55	2936		381	260		233	121	103
v/s Ratio Prot		c0.04	0.16		0.01	c0.40		c0.11	c0.06		0.01	0.03	
v/s Ratio Perm				0.06							0.05		0.00
v/c Ratio		0.64	0.26	0.10	0.42	0.68		1.01	0.45		0.36	0.42	0.05
Uniform Delay, d1		66.1	12.9	11.6	69.0	21.1		64.6	57.5		52.2	65.3	63.7
Progression Factor		1.00	1.00	1.00	1.41	0.24		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2		8.7	0.2	0.2	1.6	1.1		47.4	1.2		0.4	2.4	0.2
Delay (s)		74.7	13.1	11.8	98.9	6.3		112.0	58.7		52.5	67.6	63.9
Level of Service		E	B	B	F	A		F	E		D	E	E
Approach Delay (s)			17.3			7.3			99.6			60.2	
Approach LOS			B			A			F			E	

Intersection Summary			
HCM 2000 Control Delay	25.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	145.0	Sum of lost time (s)	26.6
Intersection Capacity Utilization	76.6%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations														
Traffic Volume (vph)	1	32	793	14	10	24	1762	54	89	38	24	31	17	21
Future Volume (vph)	1	32	793	14	10	24	1762	54	89	38	24	31	17	21
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.1	7.4			6.1	7.4			7.6	7.6		7.6	
Lane Util. Factor		1.00	0.91			1.00	0.91			1.00	1.00		1.00	
Frt		1.00	1.00			1.00	1.00			1.00	0.85		0.96	
Flt Protected		0.95	1.00			0.95	1.00			0.97	1.00		0.98	
Satd. Flow (prot)		1787	5122			1787	5113			1835	1615		1763	
Flt Permitted		0.08	1.00			0.29	1.00			0.77	1.00		0.66	
Satd. Flow (perm)		143	5122			555	5113			1457	1615		1195	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1	35	862	15	11	26	1915	59	97	41	26	34	18	23
RTOR Reduction (vph)	0	0	1	0	0	0	2	0	0	0	23	0	13	0
Lane Group Flow (vph)	0	36	876	0	0	37	1972	0	0	138	3	0	62	0
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	0%	0%	0%	1%	1%	1%
Turn Type	D.P+P	D.P+P	NA		D.P+P	D.P+P	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	5	5	2		1	1	6			8			4	
Permitted Phases	6	6			2	2			8		8	4		
Actuated Green, G (s)		105.6	88.8			105.6	100.9			18.3	18.3		18.3	
Effective Green, g (s)		105.6	88.8			105.6	100.9			18.3	18.3		18.3	
Actuated g/C Ratio		0.73	0.61			0.73	0.70			0.13	0.13		0.13	
Clearance Time (s)		6.1	7.4			6.1	7.4			7.6	7.6		7.6	
Vehicle Extension (s)		2.0	2.0			2.0	2.0			2.0	2.0		2.0	
Lane Grp Cap (vph)		157	3136			546	3557			183	203		150	
v/s Ratio Prot		0.01	c0.17			0.01	c0.39							
v/s Ratio Perm		0.16				0.04				c0.09	0.00		0.05	
v/c Ratio		0.23	0.28			0.07	0.55			0.75	0.02		0.41	
Uniform Delay, d1		7.6	13.1			7.2	10.9			61.2	55.5		58.4	
Progression Factor		2.84	1.00			0.14	0.10			1.00	1.00		1.00	
Incremental Delay, d2		0.3	0.2			0.0	0.5			14.4	0.0		0.7	
Delay (s)		21.8	13.4			1.0	1.6			75.6	55.5		59.1	
Level of Service		C	B			A	A			E	E		E	
Approach Delay (s)			13.7				1.6			72.4			59.1	
Approach LOS			B				A			E			E	

Intersection Summary			
HCM 2000 Control Delay	10.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	145.0	Sum of lost time (s)	21.1
Intersection Capacity Utilization	58.6%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations														
Traffic Volume (vph)	6	33	788	31	12	55	1779	91	49	108	42	42	38	36
Future Volume (vph)	6	33	788	31	12	55	1779	91	49	108	42	42	38	36
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.1	7.4			6.1	7.4	7.4	6.8	7.6		6.8	7.6	
Lane Util. Factor		1.00	0.91			1.00	0.91	1.00	1.00	1.00		1.00	1.00	
Frt		1.00	0.99			1.00	1.00	0.85	1.00	0.96		1.00	0.93	
Flt Protected		0.95	1.00			0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1787	5106			1787	5136	1599	1787	1802		1752	1710	
Flt Permitted		0.07	1.00			0.29	1.00	1.00	0.70	1.00		0.45	1.00	
Satd. Flow (perm)		130	5106			543	5136	1599	1326	1802		829	1710	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	7	36	857	34	13	60	1934	99	53	117	46	46	41	39
RTOR Reduction (vph)	0	0	2	0	0	0	0	38	0	12	0	0	28	0
Lane Group Flow (vph)	0	43	889	0	0	73	1934	61	53	151	0	46	52	0
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	3%	3%	3%
Turn Type	D.P+P	D.P+P	NA		D.P+P	D.P+P	NA	Perm	D.P+P	NA		D.P+P	NA	
Protected Phases	5	5	2		1	1	6		3	8		7	4	
Permitted Phases	6	6			2	2		6	4			8		
Actuated Green, G (s)		94.5	87.7			94.5	89.6	89.6	22.6	16.6		22.6	16.4	
Effective Green, g (s)		94.5	87.7			94.5	89.6	89.6	22.6	16.6		22.6	16.4	
Actuated g/C Ratio		0.65	0.60			0.65	0.62	0.62	0.16	0.11		0.16	0.11	
Clearance Time (s)		6.1	7.4			6.1	7.4	7.4	6.8	7.6		6.8	7.6	
Vehicle Extension (s)		2.0	4.5			2.0	4.5	4.5	3.0	2.0		3.0	2.0	
Lane Grp Cap (vph)		140	3088			412	3173	988	226	206		167	193	
v/s Ratio Prot		0.01	c0.17			0.01	c0.38		0.01	c0.08		c0.01	0.03	
v/s Ratio Perm		0.19				0.11		0.04	0.03			0.03		
v/c Ratio		0.31	0.29			0.18	0.61	0.06	0.23	0.74		0.28	0.27	
Uniform Delay, d1		27.8	13.7			9.3	17.0	11.0	53.2	62.1		53.2	58.8	
Progression Factor		0.83	0.43			0.16	0.16	0.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.4	0.2			0.1	0.6	0.1	0.5	11.1		0.9	0.3	
Delay (s)		23.5	6.1			1.5	3.3	0.1	53.8	73.2		54.0	59.1	
Level of Service		C	A			A	A	A	D	E		D	E	
Approach Delay (s)			6.9				3.1			68.4			57.2	
Approach LOS			A				A			E			E	

Intersection Summary			
HCM 2000 Control Delay	10.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	145.0	Sum of lost time (s)	27.9
Intersection Capacity Utilization	75.1%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations														
Traffic Volume (vph)	3	71	757	53	7	33	1765	419	118	159	54	251	223	90
Future Volume (vph)	3	71	757	53	7	33	1765	419	118	159	54	251	223	90
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.4	8.7	8.7		6.9	8.7	8.7	6.8	7.9		6.8	7.9	7.9
Lane Util. Factor		1.00	0.91	1.00		1.00	0.91	1.00	1.00	1.00		0.97	1.00	1.00
Frpb, ped/bikes		1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Flpb, ped/bikes		1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt		1.00	1.00	0.85		1.00	1.00	0.85	1.00	0.96		1.00	1.00	0.85
Flt Protected		0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1787	5136	1599		1787	5136	1599	1800	1828		3467	1881	1599
Flt Permitted		0.06	1.00	1.00		0.30	1.00	1.00	0.34	1.00		0.95	1.00	1.00
Satd. Flow (perm)		106	5136	1599		572	5136	1599	644	1828		3467	1881	1599
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	3	77	823	58	8	36	1918	455	128	173	59	273	242	98
RTOR Reduction (vph)	0	0	0	29	0	0	0	122	0	9	0	0	0	81
Lane Group Flow (vph)	0	80	823	29	0	44	1918	333	128	223	0	273	242	17
Confl. Peds. (#/hr)									11					
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	0%	0%	0%	1%	1%	1%
Turn Type	D.P+P	D.P+P	NA	Perm	D.P+P	D.P+P	NA	Perm	D.P+P	NA		Prot	NA	Perm
Protected Phases	1	1	6		5	5	2		7	4		3	8	
Permitted Phases	2	2		6	6	6		2	8					8
Actuated Green, G (s)		79.6	73.7	73.7		80.1	70.9	70.9	34.6	22.1		12.5	24.5	24.5
Effective Green, g (s)		79.6	73.7	73.7		80.1	70.9	70.9	34.6	22.1		12.5	24.5	24.5
Actuated g/C Ratio		0.55	0.51	0.51		0.55	0.49	0.49	0.24	0.15		0.09	0.17	0.17
Clearance Time (s)		7.4	8.7	8.7		6.9	8.7	8.7	6.8	7.9		6.8	7.9	7.9
Vehicle Extension (s)		2.0	2.0	2.0		2.0	5.0	5.0	2.0	2.0		2.0	2.0	2.0
Lane Grp Cap (vph)		159	2610	812		369	2511	781	234	278		298	317	270
v/s Ratio Prot		c0.03	c0.16			0.01	c0.37		0.04	0.12		c0.08	c0.13	
v/s Ratio Perm		0.25		0.02		0.06		0.21	0.09					0.01
v/c Ratio		0.50	0.32	0.04		0.12	0.76	0.43	0.55	0.80		0.92	0.76	0.06
Uniform Delay, d1		23.3	20.9	17.9		15.0	30.2	23.9	45.7	59.3		65.7	57.5	50.6
Progression Factor		1.98	0.46	1.00		0.58	0.44	0.22	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2		0.9	0.3	0.1		0.0	1.5	1.1	1.4	14.4		30.6	9.4	0.0
Delay (s)		47.0	9.9	17.9		8.7	14.7	6.4	47.1	73.7		96.3	66.9	50.6
Level of Service		D	A	B		A	B	A	D	E		F	E	D
Approach Delay (s)			13.5				13.1			64.2			77.4	
Approach LOS			B				B			E			E	

Intersection Summary			
HCM 2000 Control Delay	26.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	145.0	Sum of lost time (s)	30.8
Intersection Capacity Utilization	86.5%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	740	100	150	1909	5	150	0	150	5	0	5
Future Volume (vph)	5	740	100	150	1909	5	150	0	150	5	0	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1	7.4		6.1	7.4			7.2	7.2	6.4	7.2	
Lane Util. Factor	1.00	0.91		1.00	0.91			1.00	1.00	1.00	1.00	
Frt	1.00	0.98		1.00	1.00			1.00	0.85	1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00			0.95	1.00	0.95	1.00	
Satd. Flow (prot)	1770	4994		1770	5083			1770	1583	1770	1583	
Flt Permitted	0.06	1.00		0.28	1.00			0.75	1.00	0.50	1.00	
Satd. Flow (perm)	111	4994		515	5083			1405	1583	927	1583	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	5	804	109	163	2075	5	163	0	163	5	0	5
RTOR Reduction (vph)	0	10	0	0	0	0	0	0	139	0	4	0
Lane Group Flow (vph)	5	903	0	163	2080	0	0	163	24	5	1	0
Turn Type	D.P+P	NA		D.P+P	NA		D.P+P	NA	Perm	D.P+P	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	2			6			8		4	4		
Actuated Green, G (s)	95.4	83.7		95.4	94.5			21.4	21.4	22.5	28.9	
Effective Green, g (s)	95.4	83.7		95.4	94.5			21.4	21.4	22.5	28.9	
Actuated g/C Ratio	0.66	0.58		0.66	0.65			0.15	0.15	0.16	0.20	
Clearance Time (s)	6.1	7.4		6.1	7.4			7.2	7.2	6.4	7.2	
Vehicle Extension (s)	2.0	2.0		2.0	2.0			2.0	2.0	2.0	2.0	
Lane Grp Cap (vph)	83	2882		440	3312			207	233	150	315	
v/s Ratio Prot	c0.00	0.18		0.03	c0.41					c0.00	0.00	
v/s Ratio Perm	0.04			0.21				c0.12	0.02	0.00		
v/c Ratio	0.06	0.31		0.37	0.63			0.79	0.10	0.03	0.00	
Uniform Delay, d1	22.4	15.8		9.6	14.9			59.6	53.5	52.0	46.5	
Progression Factor	0.59	0.71		0.65	0.57			1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.1	0.3		0.2	0.8			16.5	0.1	0.0	0.0	
Delay (s)	13.3	11.5		6.4	9.3			76.1	53.6	52.0	46.5	
Level of Service	B	B		A	A			E	D	D	D	
Approach Delay (s)		11.5			9.1			64.8			49.3	
Approach LOS		B			A			E			D	

Intersection Summary			
HCM 2000 Control Delay	15.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	145.0	Sum of lost time (s)	27.1
Intersection Capacity Utilization	72.6%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	900	3	224	1972	92	224
Future Volume (vph)	900	3	224	1972	92	224
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.7		6.4	7.7	7.6	7.6
Lane Util. Factor	0.91		1.00	0.91	1.00	1.00
Frt	1.00		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	5083		1787	5136	1787	1599
Flt Permitted	1.00		0.26	1.00	0.95	1.00
Satd. Flow (perm)	5083		489	5136	1787	1599
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	978	3	243	2143	100	243
RTOR Reduction (vph)	0	0	0	0	0	222
Lane Group Flow (vph)	981	0	243	2143	100	21
Heavy Vehicles (%)	2%	2%	1%	1%	1%	1%
Turn Type	NA		D.P+P	NA	Prot	Perm
Protected Phases	6		5	2	4	
Permitted Phases			6			4
Actuated Green, G (s)	88.7		110.7	117.1	12.6	12.6
Effective Green, g (s)	88.7		110.7	117.1	12.6	12.6
Actuated g/C Ratio	0.61		0.76	0.81	0.09	0.09
Clearance Time (s)	7.7		6.4	7.7	7.6	7.6
Vehicle Extension (s)	0.2		2.0	0.2	2.0	2.0
Lane Grp Cap (vph)	3109		570	4147	155	138
v/s Ratio Prot	0.19		0.06	c0.42	c0.06	
v/s Ratio Perm			0.26			0.01
v/c Ratio	0.32		0.43	0.52	0.65	0.15
Uniform Delay, d1	13.5		10.6	4.6	64.0	61.3
Progression Factor	0.69		0.42	0.07	1.00	1.00
Incremental Delay, d2	0.3		0.1	0.3	6.7	0.2
Delay (s)	9.6		4.6	0.7	70.8	61.5
Level of Service	A		A	A	E	E
Approach Delay (s)	9.6			1.1	64.2	
Approach LOS	A			A	E	

Intersection Summary			
HCM 2000 Control Delay	9.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	145.0	Sum of lost time (s)	25.7
Intersection Capacity Utilization	57.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBU	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations							
Traffic Volume (vph)	2	47	1077	2047	364	218	149
Future Volume (vph)	2	47	1077	2047	364	218	149
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.4	8.7	8.7	8.7	7.2	7.2
Lane Util. Factor		1.00	0.91	0.91	1.00	1.00	1.00
Frt		1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected		0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)		1787	5136	5136	1599	1787	1599
Flt Permitted		0.05	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)		85	5136	5136	1599	1787	1599
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2	51	1171	2225	396	237	162
RTOR Reduction (vph)	0	0	0	0	57	0	135
Lane Group Flow (vph)	0	53	1171	2225	339	237	27
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%
Turn Type	D.P+P	D.P+P	NA	NA	Perm	Prot	Perm
Protected Phases	1	1	6	2		4	
Permitted Phases	2	2			2		4
Actuated Green, G (s)		97.7	105.1	91.3	91.3	24.0	24.0
Effective Green, g (s)		97.7	105.1	91.3	91.3	24.0	24.0
Actuated g/C Ratio		0.67	0.72	0.63	0.63	0.17	0.17
Clearance Time (s)		7.4	8.7	8.7	8.7	7.2	7.2
Vehicle Extension (s)		2.5	2.5	2.5	2.5	2.5	2.5
Lane Grp Cap (vph)		132	3722	3233	1006	295	264
v/s Ratio Prot		c0.02	0.23	c0.43		c0.13	
v/s Ratio Perm		0.25			0.21		0.02
v/c Ratio		0.40	0.31	0.69	0.34	0.80	0.10
Uniform Delay, d1		38.3	7.1	17.5	12.6	58.2	51.3
Progression Factor		1.10	0.25	0.16	0.06	1.00	1.00
Incremental Delay, d2		1.4	0.2	0.7	0.5	14.2	0.1
Delay (s)		43.7	2.0	3.6	1.3	72.4	51.5
Level of Service		D	A	A	A	E	D
Approach Delay (s)			3.8	3.2		63.9	
Approach LOS			A	A		E	

Intersection Summary			
HCM 2000 Control Delay	9.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	145.0	Sum of lost time (s)	27.8
Intersection Capacity Utilization	66.0%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations														
Traffic Volume (vph)	6	121	1148	20	2	25	2277	70	7	2	26	113	0	171
Future Volume (vph)	6	121	1148	20	2	25	2277	70	7	2	26	113	0	171
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.1	7.4			6.1	7.4			7.0			7.0	
Lane Util. Factor		1.00	0.91			1.00	0.91			1.00			1.00	
Frt		1.00	1.00			1.00	1.00			0.90			0.92	
Flt Protected		0.95	1.00			0.95	1.00			0.99			0.98	
Satd. Flow (prot)		1770	5072			1787	5113			1693			1662	
Flt Permitted		0.05	1.00			0.19	1.00			0.86			0.85	
Satd. Flow (perm)		85	5072			350	5113			1474			1446	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	7	132	1248	22	2	27	2475	76	8	2	28	123	0	186
RTOR Reduction (vph)	0	0	1	0	0	0	2	0	0	23	0	0	113	0
Lane Group Flow (vph)	0	139	1269	0	0	29	2549	0	0	15	0	0	196	0
Heavy Vehicles (%)	2%	2%	2%	2%	1%	1%	1%	1%	0%	0%	0%	3%	3%	3%
Turn Type	D.P+P	D.P+P	NA		D.P+P	D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases	1	1	6		5	5	2			4			8	
Permitted Phases	2	2			6	6			4			8		
Actuated Green, G (s)		100.9	96.1			100.9	87.4			23.6			23.6	
Effective Green, g (s)		100.9	96.1			100.9	87.4			23.6			23.6	
Actuated g/C Ratio		0.70	0.66			0.70	0.60			0.16			0.16	
Clearance Time (s)		6.1	7.4			6.1	7.4			7.0			7.0	
Vehicle Extension (s)		2.5	2.5			2.5	2.5			2.5			2.5	
Lane Grp Cap (vph)		216	3361			291	3081			239			235	
v/s Ratio Prot		c0.06	0.25			0.00	c0.50							
v/s Ratio Perm		0.39				0.07				0.01			c0.14	
v/c Ratio		0.64	0.38			0.10	0.83			0.06			0.83	
Uniform Delay, d1		46.7	11.0			7.2	22.8			51.3			58.8	
Progression Factor		0.65	0.43			0.55	0.37			1.00			1.00	
Incremental Delay, d2		5.4	0.3			0.0	0.3			0.1			21.4	
Delay (s)		36.0	5.0			3.9	8.7			51.4			80.2	
Level of Service		D	A			A	A			D			F	
Approach Delay (s)			8.0				8.7			51.4			80.2	
Approach LOS			A				A			D			F	

Intersection Summary			
HCM 2000 Control Delay	13.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	145.0	Sum of lost time (s)	20.5
Intersection Capacity Utilization	93.1%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Traffic Volume (vph)	16	329	595	358	36	1030	219	792	886	32	136	711	486
Future Volume (vph)	16	329	595	358	36	1030	219	792	886	32	136	711	486
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.0	5.6	4.0	7.0	5.6	5.6	6.8	5.4	5.4	7.0	5.6	5.6
Lane Util. Factor		0.97	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frt		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		3433	3539	1583	1787	3574	1599	3467	3574	1599	1787	3574	1599
Flt Permitted		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		3433	3539	1583	1787	3574	1599	3467	3574	1599	1787	3574	1599
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	17	358	647	389	39	1120	238	861	963	35	148	773	528
RTOR Reduction (vph)	0	0	0	0	0	0	132	0	0	23	0	0	135
Lane Group Flow (vph)	0	375	647	389	39	1120	106	861	963	12	148	773	393
Heavy Vehicles (%)	2%	2%	2%	2%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Turn Type	Prot	Prot	NA	Free	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	1	1	6		5	2		7	4		3	8	
Permitted Phases				Free			2			4			8
Actuated Green, G (s)		14.4	49.8	145.0	6.0	41.4	41.4	30.2	50.0	50.0	14.2	34.0	34.0
Effective Green, g (s)		14.4	49.8	145.0	6.0	41.4	41.4	30.2	50.0	50.0	14.2	34.0	34.0
Actuated g/C Ratio		0.10	0.34	1.00	0.04	0.29	0.29	0.21	0.34	0.34	0.10	0.23	0.23
Clearance Time (s)		7.0	5.6		7.0	5.6	5.6	6.8	5.4	5.4	7.0	5.6	5.6
Vehicle Extension (s)		2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lane Grp Cap (vph)		340	1215	1583	73	1020	456	722	1232	551	175	838	374
v/s Ratio Prot		c0.11	0.18		0.02	c0.31		c0.25	0.27		0.08	0.22	
v/s Ratio Perm				0.25			0.07			0.01			c0.25
v/c Ratio		1.10	0.53	0.25	0.53	1.10	0.23	1.19	0.78	0.02	0.85	0.92	1.05
Uniform Delay, d1		65.3	38.2	0.0	68.1	51.8	39.6	57.4	42.6	31.4	64.3	54.2	55.5
Progression Factor		0.92	0.83	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		77.9	1.6	0.3	3.7	58.9	1.2	100.0	3.0	0.0	28.5	15.2	60.7
Delay (s)		137.9	33.5	0.3	71.9	110.7	40.8	157.4	45.6	31.4	92.8	69.4	116.2
Level of Service		F	C	A	E	F	D	F	D	C	F	E	F
Approach Delay (s)			52.1			97.7			97.1			88.9	
Approach LOS			D			F			F			F	

Intersection Summary			
HCM 2000 Control Delay	84.9	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.11		
Actuated Cycle Length (s)	145.0	Sum of lost time (s)	25.0
Intersection Capacity Utilization	111.8%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBU	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations							
Traffic Volume (vph)	16	132	896	2232	0	0	0
Future Volume (vph)	16	132	896	2232	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.0	4.0	7.0			
Lane Util. Factor		0.97	0.91	0.91			
Frt		1.00	1.00	1.00			
Flt Protected		0.95	1.00	1.00			
Satd. Flow (prot)		3433	5085	5085			
Flt Permitted		0.95	1.00	1.00			
Satd. Flow (perm)		3433	5085	5085			
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	17	143	974	2426	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	160	974	2426	0	0	0
Turn Type	Prot	Prot	NA	NA			
Protected Phases	3	3	Free	1 2 4			
Permitted Phases							
Actuated Green, G (s)		37.0	145.0	94.0			
Effective Green, g (s)		37.0	145.0	94.0			
Actuated g/C Ratio		0.26	1.00	0.65			
Clearance Time (s)		7.0					
Vehicle Extension (s)		3.0					
Lane Grp Cap (vph)		876	5085	3296			
v/s Ratio Prot		0.05	0.19	c0.48			
v/s Ratio Perm							
v/c Ratio		0.18	0.19	0.74			
Uniform Delay, d1		42.2	0.0	17.2			
Progression Factor		0.83	1.00	0.27			
Incremental Delay, d2		0.1	0.1	0.7			
Delay (s)		35.3	0.1	5.4			
Level of Service		D	A	A			
Approach Delay (s)			5.0	5.4		0.0	
Approach LOS			A	A		A	

Intersection Summary			
HCM 2000 Control Delay	5.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	145.0	Sum of lost time (s)	28.0
Intersection Capacity Utilization	59.0%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBU	SBL	SBT
Lane Configurations			↑↑				↑↑
Traffic Volume (vph)	0	0	594	0	1	127	425
Future Volume (vph)	0	0	594	0	1	127	425
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)			7.0			7.0	4.0
Lane Util. Factor			0.95			0.97	0.95
Frt			1.00			1.00	1.00
Flt Protected			1.00			0.95	1.00
Satd. Flow (prot)			3539			3433	3539
Flt Permitted			1.00			0.95	1.00
Satd. Flow (perm)			3539			3433	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	646	0	1	138	462
RTOR Reduction (vph)	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	646	0	0	139	462
Turn Type			NA		Prot	Prot	NA
Protected Phases			2 3 4		1	1	Free
Permitted Phases							
Actuated Green, G (s)			87.0			44.0	145.0
Effective Green, g (s)			87.0			44.0	145.0
Actuated g/C Ratio			0.60			0.30	1.00
Clearance Time (s)						7.0	
Vehicle Extension (s)						3.0	
Lane Grp Cap (vph)			2123			1041	3539
v/s Ratio Prot			c0.18			0.04	0.13
v/s Ratio Perm							
v/c Ratio			0.30			0.13	0.13
Uniform Delay, d1			14.2			36.7	0.0
Progression Factor			1.25			1.00	1.00
Incremental Delay, d2			0.1			0.1	0.1
Delay (s)			17.8			36.7	0.1
Level of Service			B			D	A
Approach Delay (s)	0.0		17.8				8.6
Approach LOS	A		B				A

Intersection Summary			
HCM 2000 Control Delay	13.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.28		
Actuated Cycle Length (s)	145.0	Sum of lost time (s)	28.0
Intersection Capacity Utilization	32.3%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑		↰↰	↑↑↑		
Traffic Volume (vph)	845	0	230	1833	0	0
Future Volume (vph)	845	0	230	1833	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0		7.0	4.0		
Lane Util. Factor	0.91		0.97	0.91		
Frt	1.00		1.00	1.00		
Flt Protected	1.00		0.95	1.00		
Satd. Flow (prot)	5085		3433	5085		
Flt Permitted	1.00		0.95	1.00		
Satd. Flow (perm)	5085		3433	5085		
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	918	0	250	1992	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	918	0	250	1992	0	0
Turn Type	NA		Prot	NA		
Protected Phases	1 2 4		3	Free		
Permitted Phases						
Actuated Green, G (s)	94.0		37.0	145.0		
Effective Green, g (s)	94.0		37.0	145.0		
Actuated g/C Ratio	0.65		0.26	1.00		
Clearance Time (s)			7.0			
Vehicle Extension (s)			3.0			
Lane Grp Cap (vph)	3296		876	5085		
v/s Ratio Prot	0.18		0.07	0.39		
v/s Ratio Perm						
v/c Ratio	0.28		0.29	0.39		
Uniform Delay, d1	10.9		43.4	0.0		
Progression Factor	0.67		1.29	1.00		
Incremental Delay, d2	0.0		0.2	0.2		
Delay (s)	7.4		55.9	0.2		
Level of Service	A		E	A		
Approach Delay (s)	7.4			6.4	0.0	
Approach LOS	A			A	A	

Intersection Summary			
HCM 2000 Control Delay	6.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	145.0	Sum of lost time (s)	28.0
Intersection Capacity Utilization	38.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	0	327	442	423	510	0
Future Volume (vph)	0	327	442	423	510	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.0	7.0	4.0	7.0	
Lane Util. Factor		1.00	0.97	0.95	0.95	
Frt		0.86	1.00	1.00	1.00	
Flt Protected		1.00	0.95	1.00	1.00	
Satd. Flow (prot)		1611	3433	3539	3539	
Flt Permitted		1.00	0.95	1.00	1.00	
Satd. Flow (perm)		1611	3433	3539	3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	355	480	460	554	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	355	480	460	554	0
Turn Type		pm+ov	Prot	NA	NA	
Protected Phases		1	1	Free	2 3 4	
Permitted Phases		2 3 4				
Actuated Green, G (s)		131.0	44.0	145.0	87.0	
Effective Green, g (s)		131.0	44.0	145.0	87.0	
Actuated g/C Ratio		0.90	0.30	1.00	0.60	
Clearance Time (s)		7.0	7.0			
Vehicle Extension (s)		3.0	3.0			
Lane Grp Cap (vph)		1611	1041	3539	2123	
v/s Ratio Prot		c0.07	c0.14	0.13	c0.16	
v/s Ratio Perm		0.15				
v/c Ratio		0.22	0.46	0.13	0.26	
Uniform Delay, d1		0.8	40.9	0.0	13.8	
Progression Factor		1.00	1.00	1.00	1.17	
Incremental Delay, d2		0.1	0.3	0.1	0.1	
Delay (s)		0.9	41.2	0.1	16.1	
Level of Service		A	D	A	B	
Approach Delay (s)	0.9			21.1	16.1	
Approach LOS	A			C	B	

Intersection Summary			
HCM 2000 Control Delay	15.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	145.0	Sum of lost time (s)	28.0
Intersection Capacity Utilization	46.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑	↱		↑↑↑	↰↰	
Traffic Volume (vph)	569	327	0	1790	442	0
Future Volume (vph)	569	327	0	1790	442	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	4.0		7.0	7.0	
Lane Util. Factor	0.91	1.00		0.91	0.97	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	1.00	1.00		1.00	0.95	
Satd. Flow (prot)	5085	1583		5085	3433	
Flt Permitted	1.00	1.00		1.00	0.95	
Satd. Flow (perm)	5085	1583		5085	3433	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	618	355	0	1946	480	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	618	355	0	1946	480	0
Turn Type	NA	Free		NA	Prot	
Protected Phases	1 2			1 2 3	4	
Permitted Phases		Free				
Actuated Green, G (s)	64.0	145.0		108.0	23.0	
Effective Green, g (s)	64.0	145.0		108.0	23.0	
Actuated g/C Ratio	0.44	1.00		0.74	0.16	
Clearance Time (s)					7.0	
Vehicle Extension (s)					3.0	
Lane Grp Cap (vph)	2244	1583		3787	544	
v/s Ratio Prot	0.12			c0.38	c0.14	
v/s Ratio Perm		0.22				
v/c Ratio	0.28	0.22		0.51	0.88	
Uniform Delay, d1	25.8	0.0		7.6	59.7	
Progression Factor	1.10	1.00		0.54	0.56	
Incremental Delay, d2	0.1	0.3		0.1	14.3	
Delay (s)	28.4	0.3		4.2	47.6	
Level of Service	C	A		A	D	
Approach Delay (s)	18.2			4.2	47.6	
Approach LOS	B			A	D	

Intersection Summary			
HCM 2000 Control Delay	14.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	145.0	Sum of lost time (s)	28.0
Intersection Capacity Utilization	58.9%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰↰			↑↑	↑↑↑	
Traffic Volume (vph)	132	0	0	462	425	0
Future Volume (vph)	132	0	0	462	425	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0			7.0	7.0	
Lane Util. Factor	0.97			0.95	0.91	
Frt	1.00			1.00	1.00	
Flt Protected	0.95			1.00	1.00	
Satd. Flow (prot)	3433			3539	5085	
Flt Permitted	0.95			1.00	1.00	
Satd. Flow (perm)	3433			3539	5085	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	143	0	0	502	462	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	143	0	0	502	462	0
Turn Type	Prot			NA	NA	
Protected Phases	2			1 3 4	3 4	
Permitted Phases						
Actuated Green, G (s)	13.0			118.0	67.0	
Effective Green, g (s)	13.0			118.0	67.0	
Actuated g/C Ratio	0.09			0.81	0.46	
Clearance Time (s)	7.0					
Vehicle Extension (s)	3.0					
Lane Grp Cap (vph)	307			2880	2349	
v/s Ratio Prot	c0.04			c0.14	c0.09	
v/s Ratio Perm						
v/c Ratio	0.47			0.17	0.20	
Uniform Delay, d1	62.7			2.9	23.1	
Progression Factor	0.41			0.55	1.00	
Incremental Delay, d2	5.0			0.0	0.0	
Delay (s)	31.0			1.7	23.1	
Level of Service	C			A	C	
Approach Delay (s)	31.0			1.7	23.1	
Approach LOS	C			A	C	

Intersection Summary			
HCM 2000 Control Delay	14.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.24		
Actuated Cycle Length (s)	145.0	Sum of lost time (s)	28.0
Intersection Capacity Utilization	28.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	718	1833	0	127	0
Future Volume (vph)	0	718	1833	0	127	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.0	7.0		7.0	
Lane Util. Factor		0.91	0.86		0.97	
Frt		1.00	1.00		1.00	
Flt Protected		1.00	1.00		0.95	
Satd. Flow (prot)		5085	6408		3433	
Flt Permitted		1.00	1.00		0.95	
Satd. Flow (perm)		5085	6408		3433	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	780	1992	0	138	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	780	1992	0	138	0
Turn Type		NA	NA		Prot	
Protected Phases		1 2 3	1 2		4	
Permitted Phases						
Actuated Green, G (s)		108.0	64.0		23.0	
Effective Green, g (s)		108.0	64.0		23.0	
Actuated g/C Ratio		0.74	0.44		0.16	
Clearance Time (s)					7.0	
Vehicle Extension (s)					3.0	
Lane Grp Cap (vph)		3787	2828		544	
v/s Ratio Prot		c0.15	c0.31		c0.04	
v/s Ratio Perm						
v/c Ratio		0.21	0.70		0.25	
Uniform Delay, d1		5.6	32.8		53.5	
Progression Factor		0.81	0.76		0.55	
Incremental Delay, d2		0.0	0.8		0.2	
Delay (s)		4.6	25.7		29.4	
Level of Service		A	C		C	
Approach Delay (s)		4.6	25.7		29.4	
Approach LOS		A	C		C	

Intersection Summary			
HCM 2000 Control Delay	20.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	145.0	Sum of lost time (s)	28.0
Intersection Capacity Utilization	42.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	230	0	423	0	0	280
Future Volume (vph)	230	0	423	0	0	280
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0		7.0			7.0
Lane Util. Factor	0.97		0.91			0.95
Frt	1.00		1.00			1.00
Flt Protected	0.95		1.00			1.00
Satd. Flow (prot)	3433		5085			3539
Flt Permitted	0.95		1.00			1.00
Satd. Flow (perm)	3433		5085			3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	250	0	460	0	0	304
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	250	0	460	0	0	304
Turn Type	Prot		NA			NA
Protected Phases	2		3 4			1 3 4
Permitted Phases						
Actuated Green, G (s)	13.0		67.0			118.0
Effective Green, g (s)	13.0		67.0			118.0
Actuated g/C Ratio	0.09		0.46			0.81
Clearance Time (s)	7.0					
Vehicle Extension (s)	3.0					
Lane Grp Cap (vph)	307		2349			2880
v/s Ratio Prot	c0.07		c0.09			c0.09
v/s Ratio Perm						
v/c Ratio	0.81		0.20			0.11
Uniform Delay, d1	64.8		23.1			2.8
Progression Factor	0.39		1.00			0.42
Incremental Delay, d2	20.2		0.0			0.0
Delay (s)	45.2		23.1			1.2
Level of Service	D		C			A
Approach Delay (s)	45.2		23.1			1.2
Approach LOS	D		C			A

Intersection Summary			
HCM 2000 Control Delay	22.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.25		
Actuated Cycle Length (s)	145.0	Sum of lost time (s)	28.0
Intersection Capacity Utilization	26.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Traffic Volume (vph)	11	63	954	181	37	2162	360	415	198	0	29	76	70
Future Volume (vph)	11	63	954	181	37	2162	360	415	198	0	29	76	70
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.8	5.5	5.5	6.7	5.9		6.8	7.6		6.8	7.6	7.6
Lane Util. Factor		1.00	0.91	1.00	1.00	0.91		0.97	1.00		1.00	1.00	1.00
Frt		1.00	1.00	0.85	1.00	0.98		1.00	1.00		1.00	1.00	0.85
Flt Protected		0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1787	5136	1599	1787	5026		3502	1900		1805	1900	1615
Flt Permitted		0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.36	1.00	1.00
Satd. Flow (perm)		1787	5136	1599	1787	5026		3502	1900		684	1900	1615
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	12	68	1037	197	40	2350	391	451	215	0	32	83	76
RTOR Reduction (vph)	0	0	0	75	0	9	0	0	0	0	0	0	70
Lane Group Flow (vph)	0	80	1037	122	40	2732	0	451	215	0	32	83	6
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	Prot	NA	Perm	Prot	NA		Prot	NA	Perm	D.P+P	NA	Perm
Protected Phases	5	5	2		1	6		7	4		3	8	
Permitted Phases				2						4	4		8
Actuated Green, G (s)		8.5	111.9	111.9	7.4	111.3		19.2	30.1		34.1	14.9	14.9
Effective Green, g (s)		8.5	111.9	111.9	7.4	111.3		19.2	30.1		34.1	14.9	14.9
Actuated g/C Ratio		0.05	0.62	0.62	0.04	0.62		0.11	0.17		0.19	0.08	0.08
Clearance Time (s)		5.8	5.5	5.5	6.7	5.9		6.8	7.6		6.8	7.6	7.6
Vehicle Extension (s)		2.0	2.0	2.0	2.0	2.0		2.0	3.0		2.0	3.0	3.0
Lane Grp Cap (vph)		84	3192	994	73	3107		373	317		154	157	133
v/s Ratio Prot		c0.04	0.20		0.02	c0.54		c0.13	c0.11		0.00	0.04	
v/s Ratio Perm				0.08							0.03		0.00
v/c Ratio		0.95	0.32	0.12	0.55	0.88		1.21	0.68		0.21	0.53	0.05
Uniform Delay, d1		85.5	16.1	14.0	84.7	28.7		80.4	70.4		60.7	79.2	76.0
Progression Factor		1.00	1.00	1.00	1.37	0.32		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2		81.3	0.3	0.3	3.1	2.8		116.6	5.7		0.2	3.2	0.1
Delay (s)		166.9	16.4	14.2	118.8	11.9		197.0	76.1		60.9	82.4	76.2
Level of Service		F	B	B	F	B		F	E		E	F	E
Approach Delay (s)			25.2			13.4			158.0			76.3	
Approach LOS			C			B			F			E	

Intersection Summary			
HCM 2000 Control Delay	38.4	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	26.6
Intersection Capacity Utilization	91.9%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations														
Traffic Volume (vph)	1	33	934	14	12	25	2445	58	91	34	24	31	15	22
Future Volume (vph)	1	33	934	14	12	25	2445	58	91	34	24	31	15	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.1	7.4			6.1	7.4			7.6	7.6		7.6	
Lane Util. Factor		1.00	0.91			1.00	0.91			1.00	1.00		1.00	
Frt		1.00	1.00			1.00	1.00			1.00	0.85		0.96	
Flt Protected		0.95	1.00			0.95	1.00			0.96	1.00		0.98	
Satd. Flow (prot)		1787	5124			1787	5118			1833	1615		1758	
Flt Permitted		0.03	1.00			0.26	1.00			0.73	1.00		0.59	
Satd. Flow (perm)		57	5124			481	5118			1392	1615		1068	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1	36	1015	15	13	27	2658	63	99	37	26	34	16	24
RTOR Reduction (vph)	0	0	1	0	0	0	1	0	0	0	23	0	11	0
Lane Group Flow (vph)	0	37	1029	0	0	40	2720	0	0	136	3	0	63	0
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	0%	0%	0%	1%	1%	1%
Turn Type	D.P+P	D.P+P	NA		D.P+P	D.P+P	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	5	5	2		1	1	6			8			4	
Permitted Phases	6	6			2	2			8		8	4		
Actuated Green, G (s)		137.2	132.7			137.2	132.4			21.7	21.7		21.7	
Effective Green, g (s)		137.2	132.7			137.2	132.4			21.7	21.7		21.7	
Actuated g/C Ratio		0.76	0.74			0.76	0.74			0.12	0.12		0.12	
Clearance Time (s)		6.1	7.4			6.1	7.4			7.6	7.6		7.6	
Vehicle Extension (s)		2.0	2.0			2.0	2.0			2.0	2.0		2.0	
Lane Grp Cap (vph)		89	3777			399	3764			167	194		128	
v/s Ratio Prot		c0.01	0.20			0.00	c0.53							
v/s Ratio Perm		0.30				0.07				c0.10	0.00		0.06	
v/c Ratio		0.42	0.27			0.10	0.72			0.81	0.02		0.50	
Uniform Delay, d1		17.5	7.8			5.3	13.4			77.2	69.7		74.0	
Progression Factor		1.62	2.15			0.23	0.31			1.00	1.00		1.00	
Incremental Delay, d2		1.1	0.2			0.0	0.7			24.1	0.0		1.1	
Delay (s)		29.5	16.9			1.3	4.9			101.3	69.8		75.1	
Level of Service		C	B			A	A			F	E		E	
Approach Delay (s)			17.3				4.9			96.3			75.1	
Approach LOS			B				A			F			E	

Intersection Summary			
HCM 2000 Control Delay	13.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	21.1
Intersection Capacity Utilization	71.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations														
Traffic Volume (vph)	5	44	924	29	18	69	2412	164	59	197	66	93	68	63
Future Volume (vph)	5	44	924	29	18	69	2412	164	59	197	66	93	68	63
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.1	7.4			6.1	7.4	7.4	6.8	7.6		6.8	7.6	
Lane Util. Factor		1.00	0.91			1.00	0.91	1.00	1.00	1.00		1.00	1.00	
Frt		1.00	1.00			1.00	1.00	0.85	1.00	0.96		1.00	0.93	
Flt Protected		0.95	1.00			0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1787	5112			1787	5136	1599	1787	1810		1752	1712	
Flt Permitted		0.04	1.00			0.23	1.00	1.00	0.56	1.00		0.20	1.00	
Satd. Flow (perm)		70	5112			439	5136	1599	1062	1810		369	1712	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	5	48	1004	32	20	75	2622	178	64	214	72	101	74	68
RTOR Reduction (vph)	0	0	2	0	0	0	0	42	0	7	0	0	19	0
Lane Group Flow (vph)	0	53	1034	0	0	95	2622	136	64	279	0	101	123	0
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	3%	3%	3%
Turn Type	D.P+P	D.P+P	NA		D.P+P	D.P+P	NA	Perm	D.P+P	NA		D.P+P	NA	
Protected Phases	5	5	2		1	1	6		3	8		7	4	
Permitted Phases	6	6			2	2		6	4			8		
Actuated Green, G (s)		113.1	106.0			113.1	108.0	108.0	39.0	31.2		39.0	32.8	
Effective Green, g (s)		113.1	106.0			113.1	108.0	108.0	39.0	31.2		39.0	32.8	
Actuated g/C Ratio		0.63	0.59			0.63	0.60	0.60	0.22	0.17		0.22	0.18	
Clearance Time (s)		6.1	7.4			6.1	7.4	7.4	6.8	7.6		6.8	7.6	
Vehicle Extension (s)		2.0	4.5			2.0	4.5	4.5	3.0	2.0		3.0	2.0	
Lane Grp Cap (vph)		92	3010			329	3081	959	255	313		139	311	
v/s Ratio Prot		c0.02	0.20			0.01	c0.51		0.01	c0.15		c0.03	0.07	
v/s Ratio Perm		0.34				0.17		0.08	0.05			0.13		
v/c Ratio		0.58	0.34			0.29	0.85	0.14	0.25	0.89		0.73	0.40	
Uniform Delay, d1		33.2	19.1			13.7	29.4	15.7	57.3	72.8		61.6	64.9	
Progression Factor		2.53	0.22			0.24	0.24	0.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		5.2	0.3			0.1	1.0	0.1	0.5	25.2		17.2	0.3	
Delay (s)		89.1	4.6			3.4	8.1	0.2	57.9	98.0		78.8	65.2	
Level of Service		F	A			A	A	A	E	F		E	E	
Approach Delay (s)			8.7				7.5			90.6			70.8	
Approach LOS			A				A			F			E	

Intersection Summary			
HCM 2000 Control Delay	17.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	27.9
Intersection Capacity Utilization	94.4%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations														
Traffic Volume (vph)	3	86	961	50	10	34	2400	369	128	182	61	385	268	132
Future Volume (vph)	3	86	961	50	10	34	2400	369	128	182	61	385	268	132
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.4	8.7	8.7		6.9	8.7	8.7	6.8	7.9		6.8	7.9	7.9
Lane Util. Factor		1.00	0.91	1.00		1.00	0.91	1.00	1.00	1.00		0.97	1.00	1.00
Frpb, ped/bikes		1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Flpb, ped/bikes		1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt		1.00	1.00	0.85		1.00	1.00	0.85	1.00	0.96		1.00	1.00	0.85
Flt Protected		0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1787	5136	1599		1787	5136	1599	1800	1829		3467	1881	1599
Flt Permitted		0.04	1.00	1.00		0.22	1.00	1.00	0.31	1.00		0.95	1.00	1.00
Satd. Flow (perm)		83	5136	1599		413	5136	1599	592	1829		3467	1881	1599
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	3	93	1045	54	11	37	2609	401	139	198	66	418	291	143
RTOR Reduction (vph)	0	0	0	26	0	0	0	80	0	7	0	0	0	91
Lane Group Flow (vph)	0	96	1045	28	0	48	2609	321	139	257	0	418	291	52
Confl. Peds. (#/hr)									11					
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	0%	0%	0%	1%	1%	1%
Turn Type	D.P+P	D.P+P	NA	Perm	D.P+P	D.P+P	NA	Perm	D.P+P	NA		Prot	NA	Perm
Protected Phases	1	1	6		5	5	2		7	4		3	8	
Permitted Phases	2	2		6	6	6		2	8					8
Actuated Green, G (s)		98.3	92.4	92.4		98.8	90.3	90.3	50.9	27.8		23.1	40.9	40.9
Effective Green, g (s)		98.3	92.4	92.4		98.8	90.3	90.3	50.9	27.8		23.1	40.9	40.9
Actuated g/C Ratio		0.55	0.51	0.51		0.55	0.50	0.50	0.28	0.15		0.13	0.23	0.23
Clearance Time (s)		7.4	8.7	8.7		6.9	8.7	8.7	6.8	7.9		6.8	7.9	7.9
Vehicle Extension (s)		2.0	2.0	2.0		2.0	5.0	5.0	2.0	2.0		2.0	2.0	2.0
Lane Grp Cap (vph)		121	2636	820		275	2576	802	234	282		444	427	363
v/s Ratio Prot		c0.04	0.20			0.01	c0.51		0.03	c0.14		c0.12	0.15	
v/s Ratio Perm		0.40		0.02		0.09		0.20	0.13					0.03
v/c Ratio		0.79	0.40	0.03		0.17	1.01	0.40	0.59	0.91		0.94	0.68	0.14
Uniform Delay, d1		47.1	26.8	21.7		19.5	44.9	28.0	52.5	74.9		77.8	63.6	55.5
Progression Factor		1.41	0.87	1.00		0.85	0.59	0.55	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2		25.9	0.4	0.1		0.1	16.3	0.8	2.7	31.1		28.1	3.6	0.1
Delay (s)		92.3	23.8	21.8		16.6	42.6	16.1	55.2	106.0		105.9	67.2	55.6
Level of Service		F	C	C		B	D	B	E	F		F	E	E
Approach Delay (s)			29.2				38.7			88.5			84.2	
Approach LOS			C				D			F			F	

Intersection Summary			
HCM 2000 Control Delay	47.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	30.8
Intersection Capacity Utilization	103.0%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	997	100	150	2440	5	150	0	150	5	0	5
Future Volume (vph)	5	997	100	150	2440	5	150	0	150	5	0	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1	7.4		6.1	7.4			7.2	7.2	6.4	7.2	
Lane Util. Factor	1.00	0.91		1.00	0.91			1.00	1.00	1.00	1.00	
Frt	1.00	0.99		1.00	1.00			1.00	0.85	1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00			0.95	1.00	0.95	1.00	
Satd. Flow (prot)	1770	5016		1770	5084			1770	1583	1770	1583	
Flt Permitted	0.03	1.00		0.20	1.00			0.75	1.00	0.48	1.00	
Satd. Flow (perm)	61	5016		363	5084			1405	1583	893	1583	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	5	1084	109	163	2652	5	163	0	163	5	0	5
RTOR Reduction (vph)	0	5	0	0	0	0	0	0	136	0	4	0
Lane Group Flow (vph)	5	1188	0	163	2657	0	0	163	27	5	1	0
Turn Type	D.P+P	NA		D.P+P	NA		D.P+P	NA	Perm	D.P+P	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	2			6			8		4	4		
Actuated Green, G (s)	122.8	111.6		122.8	122.0			29.3	29.3	30.1	36.5	
Effective Green, g (s)	122.8	111.6		122.8	122.0			29.3	29.3	30.1	36.5	
Actuated g/C Ratio	0.68	0.62		0.68	0.68			0.16	0.16	0.17	0.20	
Clearance Time (s)	6.1	7.4		6.1	7.4			7.2	7.2	6.4	7.2	
Vehicle Extension (s)	2.0	2.0		2.0	2.0			2.0	2.0	2.0	2.0	
Lane Grp Cap (vph)	49	3109		335	3445			228	257	153	320	
v/s Ratio Prot	c0.00	0.24		0.03	c0.52					c0.00	0.00	
v/s Ratio Perm	0.07			0.30				c0.12	0.02	0.01		
v/c Ratio	0.10	0.38		0.49	0.77			0.71	0.10	0.03	0.00	
Uniform Delay, d1	40.4	17.0		11.0	19.6			71.4	64.2	69.4	57.2	
Progression Factor	0.64	1.00		0.73	0.58			1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.3	0.3		0.3	1.4			8.5	0.1	0.0	0.0	
Delay (s)	26.2	17.3		8.4	12.6			79.9	64.2	69.4	57.2	
Level of Service	C	B		A	B			E	E	E	E	
Approach Delay (s)		17.4			12.4			72.1			63.3	
Approach LOS		B			B			E			E	

Intersection Summary			
HCM 2000 Control Delay	18.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	27.1
Intersection Capacity Utilization	82.8%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1133	19	178	2517	78	189
Future Volume (vph)	1133	19	178	2517	78	189
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.7		6.4	7.7	7.6	7.6
Lane Util. Factor	0.91		1.00	0.91	1.00	1.00
Frt	1.00		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	5073		1787	5136	1787	1599
Flt Permitted	1.00		0.19	1.00	0.95	1.00
Satd. Flow (perm)	5073		366	5136	1787	1599
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1232	21	193	2736	85	205
RTOR Reduction (vph)	1	0	0	0	0	190
Lane Group Flow (vph)	1252	0	193	2736	85	15
Heavy Vehicles (%)	2%	2%	1%	1%	1%	1%
Turn Type	NA		D.P+P	NA	Prot	Perm
Protected Phases	6		5	2	4	
Permitted Phases			6			4
Actuated Green, G (s)	128.7		145.2	151.6	13.1	13.1
Effective Green, g (s)	128.7		145.2	151.6	13.1	13.1
Actuated g/C Ratio	0.71		0.81	0.84	0.07	0.07
Clearance Time (s)	7.7		6.4	7.7	7.6	7.6
Vehicle Extension (s)	0.2		2.0	0.2	2.0	2.0
Lane Grp Cap (vph)	3627		425	4325	130	116
v/s Ratio Prot	0.25		0.04	c0.53	c0.05	
v/s Ratio Perm			0.32			0.01
v/c Ratio	0.35		0.45	0.63	0.65	0.13
Uniform Delay, d1	9.7		10.8	4.8	81.2	78.1
Progression Factor	0.75		0.46	0.43	1.00	1.00
Incremental Delay, d2	0.2		0.2	0.5	8.7	0.2
Delay (s)	7.5		5.2	2.5	89.9	78.3
Level of Service	A		A	A	F	E
Approach Delay (s)	7.5			2.7	81.7	
Approach LOS	A			A	F	

Intersection Summary			
HCM 2000 Control Delay	9.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	25.7
Intersection Capacity Utilization	68.0%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	43	1279	2465	475	160	230
Future Volume (vph)	43	1279	2465	475	160	230
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.4	8.7	8.7	8.7	7.2	7.2
Lane Util. Factor	1.00	0.91	0.91	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1787	5136	5136	1599	1787	1599
Flt Permitted	0.03	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	59	5136	5136	1599	1787	1599
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	47	1390	2679	516	174	250
RTOR Reduction (vph)	0	0	0	49	0	219
Lane Group Flow (vph)	47	1390	2679	467	174	31
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%
Turn Type	D.P+P	NA	NA	Perm	Prot	Perm
Protected Phases	1	6	2		4	
Permitted Phases	2			2		4
Actuated Green, G (s)	134.3	141.7	127.7	127.7	22.4	22.4
Effective Green, g (s)	134.3	141.7	127.7	127.7	22.4	22.4
Actuated g/C Ratio	0.75	0.79	0.71	0.71	0.12	0.12
Clearance Time (s)	7.4	8.7	8.7	8.7	7.2	7.2
Vehicle Extension (s)	2.5	2.5	2.5	2.5	2.5	2.5
Lane Grp Cap (vph)	107	4043	3643	1134	222	198
v/s Ratio Prot	0.02	c0.27	c0.52		c0.10	
v/s Ratio Perm	0.31			0.29		0.02
v/c Ratio	0.44	0.34	0.74	0.41	0.78	0.16
Uniform Delay, d1	21.0	5.6	15.9	10.7	76.5	70.4
Progression Factor	2.43	0.23	0.08	0.01	1.00	1.00
Incremental Delay, d2	2.0	0.2	0.7	0.5	15.9	0.3
Delay (s)	53.0	1.5	2.0	0.6	92.3	70.6
Level of Service	D	A	A	A	F	E
Approach Delay (s)		3.2	1.8		79.5	
Approach LOS		A	A		E	

Intersection Summary			
HCM 2000 Control Delay	8.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	27.3
Intersection Capacity Utilization	75.1%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations														
Traffic Volume (vph)	6	127	1287	19	2	26	2775	81	6	2	25	73	0	153
Future Volume (vph)	6	127	1287	19	2	26	2775	81	6	2	25	73	0	153
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.1	7.4			6.1	7.4			7.0			7.0	
Lane Util. Factor		1.00	0.91			1.00	0.91			1.00			1.00	
Frt		1.00	1.00			1.00	1.00			0.90			0.91	
Flt Protected		0.95	1.00			0.95	1.00			0.99			0.98	
Satd. Flow (prot)		1770	5074			1787	5114			1642			1699	
Flt Permitted		0.03	1.00			0.16	1.00			0.82			0.88	
Satd. Flow (perm)		60	5074			300	5114			1358			1516	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	7	138	1399	21	2	28	3016	88	7	2	27	79	0	166
RTOR Reduction (vph)	0	0	1	0	0	0	1	0	0	24	0	0	95	0
Lane Group Flow (vph)	0	145	1419	0	0	30	3103	0	0	12	0	0	150	0
Heavy Vehicles (%)	2%	2%	2%	2%	1%	1%	1%	1%	3%	3%	3%	0%	0%	0%
Turn Type	D.P+P	D.P+P	NA		D.P+P	D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases	1	1	6		5	5	2			4			8	
Permitted Phases	2	2			6	6			4			8		
Actuated Green, G (s)		137.2	130.8			137.2	123.4			22.3			22.3	
Effective Green, g (s)		137.2	130.8			137.2	123.4			22.3			22.3	
Actuated g/C Ratio		0.76	0.73			0.76	0.69			0.12			0.12	
Clearance Time (s)		6.1	7.4			6.1	7.4			7.0			7.0	
Vehicle Extension (s)		2.5	2.5			2.5	2.5			2.5			2.5	
Lane Grp Cap (vph)		176	3687			281	3505			168			187	
v/s Ratio Prot		c0.06	0.28			0.00	c0.61							
v/s Ratio Perm		0.56				0.08				0.01			c0.10	
v/c Ratio		0.82	0.38			0.11	0.89			0.07			0.80	
Uniform Delay, d1		64.5	9.3			5.7	22.6			69.7			76.7	
Progression Factor		0.94	0.74			0.37	0.26			1.00			1.00	
Incremental Delay, d2		24.2	0.3			0.0	0.4			0.1			21.1	
Delay (s)		84.6	7.2			2.1	6.3			69.9			97.8	
Level of Service		F	A			A	A			E			F	
Approach Delay (s)			14.4				6.3			69.9			97.8	
Approach LOS			B				A			E			F	

Intersection Summary			
HCM 2000 Control Delay	13.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	20.5
Intersection Capacity Utilization	100.0%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Traffic Volume (vph)	11	236	692	448	72	1383	251	1103	1110	61	145	885	387
Future Volume (vph)	11	236	692	448	72	1383	251	1103	1110	61	145	885	387
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.0	5.6	4.0	7.0	5.6	5.6	6.8	5.4	5.4	7.0	5.6	5.6
Lane Util. Factor		0.97	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frt		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		3433	3539	1583	1787	3574	1599	3467	3574	1599	1787	3574	1599
Flt Permitted		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		3433	3539	1583	1787	3574	1599	3467	3574	1599	1787	3574	1599
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	12	257	752	487	78	1503	273	1199	1207	66	158	962	421
RTOR Reduction (vph)	0	0	0	0	0	0	95	0	0	41	0	0	142
Lane Group Flow (vph)	0	269	752	487	78	1503	178	1199	1207	25	158	962	279
Heavy Vehicles (%)	2%	2%	2%	2%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Turn Type	Prot	Prot	NA	Free	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	1	1	6		5	2		7	4		3	8	
Permitted Phases				Free			2			4			8
Actuated Green, G (s)		11.0	43.7	180.0	26.7	59.4	59.4	43.2	68.6	68.6	16.0	41.4	41.4
Effective Green, g (s)		11.0	43.7	180.0	26.7	59.4	59.4	43.2	68.6	68.6	16.0	41.4	41.4
Actuated g/C Ratio		0.06	0.24	1.00	0.15	0.33	0.33	0.24	0.38	0.38	0.09	0.23	0.23
Clearance Time (s)		7.0	5.6		7.0	5.6	5.6	6.8	5.4	5.4	7.0	5.6	5.6
Vehicle Extension (s)		2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lane Grp Cap (vph)		209	859	1583	265	1179	527	832	1362	609	158	822	367
v/s Ratio Prot		c0.08	0.21		0.04	c0.42		c0.35	0.34		0.09	c0.27	
v/s Ratio Perm				0.31			0.11			0.02			0.17
v/c Ratio		1.29	0.88	0.31	0.29	1.27	0.34	1.44	0.89	0.04	1.00	1.17	0.76
Uniform Delay, d1		84.5	65.5	0.0	68.3	60.3	45.5	68.4	52.1	35.0	82.0	69.3	64.7
Progression Factor		0.89	0.76	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		158.7	11.5	0.5	0.2	130.4	1.7	205.3	7.1	0.0	71.6	89.5	8.1
Delay (s)		234.2	61.1	0.5	68.5	190.7	47.2	273.7	59.1	35.0	153.6	158.8	72.8
Level of Service		F	E	A	E	F	D	F	E	D	F	F	E
Approach Delay (s)			72.4			164.4			162.6			134.8	
Approach LOS			E			F			F			F	

Intersection Summary			
HCM 2000 Control Delay	138.8	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.29		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	25.0
Intersection Capacity Utilization	120.9%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBU	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations							
Traffic Volume (vph)	24	226	1166	2788	0	0	0
Future Volume (vph)	24	226	1166	2788	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.0	4.0	7.0			
Lane Util. Factor		0.97	0.91	0.91			
Frt		1.00	1.00	1.00			
Flt Protected		0.95	1.00	1.00			
Satd. Flow (prot)		3433	5085	5085			
Flt Permitted		0.95	1.00	1.00			
Satd. Flow (perm)		3433	5085	5085			
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	26	246	1267	3030	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	272	1267	3030	0	0	0
Turn Type	Prot	Prot	NA	NA			
Protected Phases	3	3	Free	1 2 4			
Permitted Phases							
Actuated Green, G (s)		37.0	180.0	129.0			
Effective Green, g (s)		37.0	180.0	129.0			
Actuated g/C Ratio		0.21	1.00	0.72			
Clearance Time (s)		7.0					
Vehicle Extension (s)		3.0					
Lane Grp Cap (vph)		705	5085	3644			
v/s Ratio Prot		c0.08	0.25	c0.60			
v/s Ratio Perm							
v/c Ratio		0.39	0.25	0.83			
Uniform Delay, d1		61.7	0.0	17.9			
Progression Factor		1.33	1.00	0.36			
Incremental Delay, d2		0.3	0.1	1.2			
Delay (s)		82.1	0.1	7.7			
Level of Service		F	A	A			
Approach Delay (s)			14.6	7.7		0.0	
Approach LOS			B	A		A	

Intersection Summary			
HCM 2000 Control Delay	10.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	28.0
Intersection Capacity Utilization	72.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBU	SBL	SBT
Lane Configurations							
Traffic Volume (vph)	0	0	1140	0	1	163	597
Future Volume (vph)	0	0	1140	0	1	163	597
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)			7.0			7.0	4.0
Lane Util. Factor			0.95			0.97	0.95
Frt			1.00			1.00	1.00
Flt Protected			1.00			0.95	1.00
Satd. Flow (prot)			3539			3433	3539
Flt Permitted			1.00			0.95	1.00
Satd. Flow (perm)			3539			3433	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	1239	0	1	177	649
RTOR Reduction (vph)	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	1239	0	0	178	649
Turn Type			NA		Prot	Prot	NA
Protected Phases			2 3 4		1	1	Free
Permitted Phases							
Actuated Green, G (s)			117.0			49.0	180.0
Effective Green, g (s)			117.0			49.0	180.0
Actuated g/C Ratio			0.65			0.27	1.00
Clearance Time (s)						7.0	
Vehicle Extension (s)						3.0	
Lane Grp Cap (vph)			2300			934	3539
v/s Ratio Prot			c0.35			0.05	0.18
v/s Ratio Perm							
v/c Ratio			0.54			0.19	0.18
Uniform Delay, d1			17.0			50.3	0.0
Progression Factor			1.21			1.00	1.00
Incremental Delay, d2			0.2			0.1	0.1
Delay (s)			20.8			50.4	0.1
Level of Service			C			D	A
Approach Delay (s)	0.0		20.8				10.9
Approach LOS	A		C				B

Intersection Summary			
HCM 2000 Control Delay	16.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	28.0
Intersection Capacity Utilization	47.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑		↰↰	↑↑↑		
Traffic Volume (vph)	1102	0	248	2347	0	0
Future Volume (vph)	1102	0	248	2347	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0		7.0	4.0		
Lane Util. Factor	0.91		0.97	0.91		
Frt	1.00		1.00	1.00		
Flt Protected	1.00		0.95	1.00		
Satd. Flow (prot)	5085		3433	5085		
Flt Permitted	1.00		0.95	1.00		
Satd. Flow (perm)	5085		3433	5085		
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1198	0	270	2551	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	1198	0	270	2551	0	0
Turn Type	NA		Prot	NA		
Protected Phases	1 2 4		3	Free		
Permitted Phases						
Actuated Green, G (s)	129.0		37.0	180.0		
Effective Green, g (s)	129.0		37.0	180.0		
Actuated g/C Ratio	0.72		0.21	1.00		
Clearance Time (s)			7.0			
Vehicle Extension (s)			3.0			
Lane Grp Cap (vph)	3644		705	5085		
v/s Ratio Prot	0.24		0.08	0.50		
v/s Ratio Perm						
v/c Ratio	0.33		0.38	0.50		
Uniform Delay, d1	9.5		61.7	0.0		
Progression Factor	0.67		1.12	1.00		
Incremental Delay, d2	0.1		0.2	0.2		
Delay (s)	6.4		69.3	0.2		
Level of Service	A		E	A		
Approach Delay (s)	6.4			6.9	0.0	
Approach LOS	A			A	A	

Intersection Summary			
HCM 2000 Control Delay	6.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	28.0
Intersection Capacity Utilization	48.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	0	409	655	655	618	0
Future Volume (vph)	0	409	655	655	618	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.0	7.0	4.0	7.0	
Lane Util. Factor		1.00	0.97	0.95	0.95	
Frt		0.86	1.00	1.00	1.00	
Flt Protected		1.00	0.95	1.00	1.00	
Satd. Flow (prot)		1611	3433	3539	3539	
Flt Permitted		1.00	0.95	1.00	1.00	
Satd. Flow (perm)		1611	3433	3539	3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	445	712	712	672	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	445	712	712	672	0
Turn Type		pm+ov	Prot	NA	NA	
Protected Phases		1	1	Free	2 3 4	
Permitted Phases		2 3 4				
Actuated Green, G (s)		166.0	49.0	180.0	117.0	
Effective Green, g (s)		166.0	49.0	180.0	117.0	
Actuated g/C Ratio		0.92	0.27	1.00	0.65	
Clearance Time (s)		7.0	7.0			
Vehicle Extension (s)		3.0	3.0			
Lane Grp Cap (vph)		1611	934	3539	2300	
v/s Ratio Prot		c0.08	c0.21	0.20	c0.19	
v/s Ratio Perm		0.20				
v/c Ratio		0.28	0.76	0.20	0.29	
Uniform Delay, d1		0.7	60.2	0.0	13.6	
Progression Factor		1.00	1.00	1.00	0.33	
Incremental Delay, d2		0.1	3.7	0.1	0.1	
Delay (s)		0.8	63.9	0.1	4.5	
Level of Service		A	E	A	A	
Approach Delay (s)	0.8			32.0	4.5	
Approach LOS	A			C	A	

Intersection Summary			
HCM 2000 Control Delay	19.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	28.0
Intersection Capacity Utilization	54.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑	↱		↑↑↑	↰↰	
Traffic Volume (vph)	757	409	0	2133	655	0
Future Volume (vph)	757	409	0	2133	655	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	4.0		7.0	7.0	
Lane Util. Factor	0.91	1.00		0.91	0.97	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	1.00	1.00		1.00	0.95	
Satd. Flow (prot)	5085	1583		5085	3433	
Flt Permitted	1.00	1.00		1.00	0.95	
Satd. Flow (perm)	5085	1583		5085	3433	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	823	445	0	2318	712	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	823	445	0	2318	712	0
Turn Type	NA	Free		NA	Prot	
Protected Phases	1 2			1 2 3	4	
Permitted Phases		Free				
Actuated Green, G (s)	79.0	180.0		123.0	43.0	
Effective Green, g (s)	79.0	180.0		123.0	43.0	
Actuated g/C Ratio	0.44	1.00		0.68	0.24	
Clearance Time (s)					7.0	
Vehicle Extension (s)					3.0	
Lane Grp Cap (vph)	2231	1583		3474	820	
v/s Ratio Prot	0.16			c0.46	c0.21	
v/s Ratio Perm		0.28				
v/c Ratio	0.37	0.28		0.67	0.87	
Uniform Delay, d1	33.8	0.0		16.6	65.8	
Progression Factor	0.37	1.00		0.37	0.59	
Incremental Delay, d2	0.1	0.4		0.3	6.3	
Delay (s)	12.8	0.4		6.5	45.1	
Level of Service	B	A		A	D	
Approach Delay (s)	8.4			6.5	45.1	
Approach LOS	A			A	D	

Intersection Summary			
HCM 2000 Control Delay	13.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	28.0
Intersection Capacity Utilization	71.6%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	226	0	0	914	597	0
Future Volume (vph)	226	0	0	914	597	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0			7.0	7.0	
Lane Util. Factor	0.97			0.95	0.91	
Frt	1.00			1.00	1.00	
Flt Protected	0.95			1.00	1.00	
Satd. Flow (prot)	3433			3539	5085	
Flt Permitted	0.95			1.00	1.00	
Satd. Flow (perm)	3433			3539	5085	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	246	0	0	993	649	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	246	0	0	993	649	0
Turn Type	Prot			NA	NA	
Protected Phases	2			1 3 4	3 4	
Permitted Phases						
Actuated Green, G (s)	23.0			143.0	87.0	
Effective Green, g (s)	23.0			143.0	87.0	
Actuated g/C Ratio	0.13			0.79	0.48	
Clearance Time (s)	7.0					
Vehicle Extension (s)	3.0					
Lane Grp Cap (vph)	438			2811	2457	
v/s Ratio Prot	c0.07			c0.28	0.13	
v/s Ratio Perm						
v/c Ratio	0.56			0.35	0.26	
Uniform Delay, d1	73.8			5.3	27.5	
Progression Factor	0.34			0.73	1.00	
Incremental Delay, d2	4.8			0.1	0.1	
Delay (s)	29.5			3.9	27.6	
Level of Service	C			A	C	
Approach Delay (s)	29.5			3.9	27.6	
Approach LOS	C			A	C	

Intersection Summary			
HCM 2000 Control Delay	15.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	28.0
Intersection Capacity Utilization	43.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑↑	↑↑↑↑		↰↰	
Traffic Volume (vph)	0	939	2347	0	163	0
Future Volume (vph)	0	939	2347	0	163	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.0	7.0		7.0	
Lane Util. Factor		0.91	0.86		0.97	
Frt		1.00	1.00		1.00	
Flt Protected		1.00	1.00		0.95	
Satd. Flow (prot)		5085	6408		3433	
Flt Permitted		1.00	1.00		0.95	
Satd. Flow (perm)		5085	6408		3433	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1021	2551	0	177	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	1021	2551	0	177	0
Turn Type		NA	NA		Prot	
Protected Phases		1 2 3	1 2		4	
Permitted Phases						
Actuated Green, G (s)		123.0	79.0		43.0	
Effective Green, g (s)		123.0	79.0		43.0	
Actuated g/C Ratio		0.68	0.44		0.24	
Clearance Time (s)					7.0	
Vehicle Extension (s)					3.0	
Lane Grp Cap (vph)		3474	2812		820	
v/s Ratio Prot		c0.20	c0.40		c0.05	
v/s Ratio Perm						
v/c Ratio		0.29	0.91		0.22	
Uniform Delay, d1		11.3	47.1		55.0	
Progression Factor		0.52	0.89		0.66	
Incremental Delay, d2		0.0	4.2		0.1	
Delay (s)		5.9	45.9		36.1	
Level of Service		A	D		D	
Approach Delay (s)		5.9	45.9		36.1	
Approach LOS		A	D		D	

Intersection Summary			
HCM 2000 Control Delay	34.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	28.0
Intersection Capacity Utilization	50.3%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	248	0	655	0	0	370
Future Volume (vph)	248	0	655	0	0	370
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0		7.0			7.0
Lane Util. Factor	0.97		0.91			0.95
Frt	1.00		1.00			1.00
Flt Protected	0.95		1.00			1.00
Satd. Flow (prot)	3433		5085			3539
Flt Permitted	0.95		1.00			1.00
Satd. Flow (perm)	3433		5085			3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	270	0	712	0	0	402
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	270	0	712	0	0	402
Turn Type	Prot		NA			NA
Protected Phases	2		3 4			1 3 4
Permitted Phases						
Actuated Green, G (s)	23.0		87.0			143.0
Effective Green, g (s)	23.0		87.0			143.0
Actuated g/C Ratio	0.13		0.48			0.79
Clearance Time (s)	7.0					
Vehicle Extension (s)	3.0					
Lane Grp Cap (vph)	438		2457			2811
v/s Ratio Prot	c0.08		c0.14			c0.11
v/s Ratio Perm						
v/c Ratio	0.62		0.29			0.14
Uniform Delay, d1	74.3		27.9			4.3
Progression Factor	0.37		1.00			0.28
Incremental Delay, d2	6.0		0.1			0.0
Delay (s)	33.6		28.0			1.2
Level of Service	C		C			A
Approach Delay (s)	33.6		28.0			1.2
Approach LOS	C		C			A

Intersection Summary			
HCM 2000 Control Delay	21.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.31		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	28.0
Intersection Capacity Utilization	31.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

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Appendix N – Recommended Corridor Configuration Technical Memorandum

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State Highway 199 Corridor Master Plan

From IH 820 to Belknap Street

Recommended Corridor Configuration Technical Memorandum

Submittal Date:
September 25, 2017

Prepared For:
North Central Texas Council of Governments

Prepared By:
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FREESE AND NICHOLS

1.0 RECOMMENDED CORRIDOR CONFIGURATION

The State Highway (SH) 199 corridor, between Interstate Highway (IH) 820 and Belknap Street, is sitting within a unique topographic region with varying elevations and vistas that are distinct within central Tarrant County. The corridor runs parallel to and across natural tributaries, streams, and rivers with distinguished floodplains. At the same time, the corridor is adjacent to communities with historic significance, a range of existing and planned developments, and sites with environmental challenges. These identified attributes of the corridor and community should be considered in the recommendations of the roadway improvements.

One of the goals of the SH 199 Corridor Master Plan is to identify and provide safe (reference Crash Data Technical Memorandum), comfortable, and attractive transportation accommodation recommendations for all users (motor vehicle, pedestrian, bicycle, and transit) within the project limits. The recommended corridor configurations within this technical memorandum are intended to align and assist in meeting this project goal.

For consistency within this technical memorandum, the SH 199 corridor will be described from west (IH 820) to east (Belknap Street) with adjacent features described as north and south of the corridor.

1.1 Geometric Design Guidelines

The SH 199 corridor is a Texas Department of Transportation (TxDOT) owned and maintained facility; therefore, the design recommendations for the corridor configuration should be in accordance with the approved and accepted practices by this agency. The published **TxDOT** *Roadway Design Manual* (http://onlinemanuals.txdot.gov/txdotmanuals/rdw/rdw.pdf) should be considered as a basis for design criteria for this corridor.

Based on published data on the TxDOT Statewide Planning Map (http://www.txdot.gov/apps/statewide_mapping/StatewidePlanningMap.html), the SH 199 corridor, from IH 820 to Belknap Street, is designated as a low speed (speed limit equal to or less than 45 miles per hour) principal arterial (functional classification) within a large urbanized area (population greater than 200,000). Therefore, the corridor should follow the design criteria outlined in Chapter 3 – New Location and Reconstruction (4R) Design Criteria, Section 2 – Urban Streets of the *TxDOT Roadway Design Manual*.

It should be noted that multiple dimensions provided in the following sections recommend the use of the minimum criteria outlined in the *TxDOT Roadway Design Manual*, in lieu of the desirable criteria. These recommendations are due to the urban context of the roadway, the necessary retaining walls, the adjacent historic and park properties, the need to provide access to adjacent properties, and the need to provide multi-modal accommodations along the corridor length. In many situations, if desirable criteria were followed, right-of-way acquisition would be required, there would be an increase in need for retaining walls, and the roadway width would increase by upwards of 10 feet which may impact the multi-modal accessibility of the corridor.

1.2 Improvement Limits

Although the limits of the SH 199 Corridor Master Plan extend from IH 820 to Belknap Street, the roadway improvement limits will be from IH 820 to Shamrock Avenue (east side of the West Fork of the Trinity River) (see Figure 1). These limits are due to the improvements outlined and being implemented by the Trinity River Vision Authority / Panther Island project as well as the listing of the Henderson Street Bridge on the National Register of Historic Places. The planned roadway improvements between Shamrock Avenue and the Clear Fork Bridge can be seen in Attachment A. The documentation for the historical designation of the Henderson Street Bridge can be seen in the Environmental Considerations Technical Memorandum. The length of the project limits from IH 820 to Shamrock Avenue is 27,000 feet, or 5.11 miles.

In addition to projects that are currently under construction, such as the Trinity River Vision Authority / Panther Island project, there are projects that are currently in the early stages of planning and design that may alter the roadway improvement limits in the future. These projects include the IH 820 and SH 199 interchange and the River Oaks Boulevard (SH 183) Corridor Master Plan. The design of the IH 820 and SH 199 interchange has been initiated by TxDOT and the project team is currently evaluating alignment and configuration alternatives. During initial project coordination meetings, it was understood that the interchange project may include the improvements of SH 199 from IH 820 to Roberts Cut Off Road. The implementation of the recommended roadway improvements within the River Oaks Boulevard (SH 183) Corridor Master Plan would not alter the roadway improvement limits along SH 199 but the SH 199 Corridor Master Plan may alter the roadway improvement limits along SH 183 near the SH 183 and SH 199 intersection.

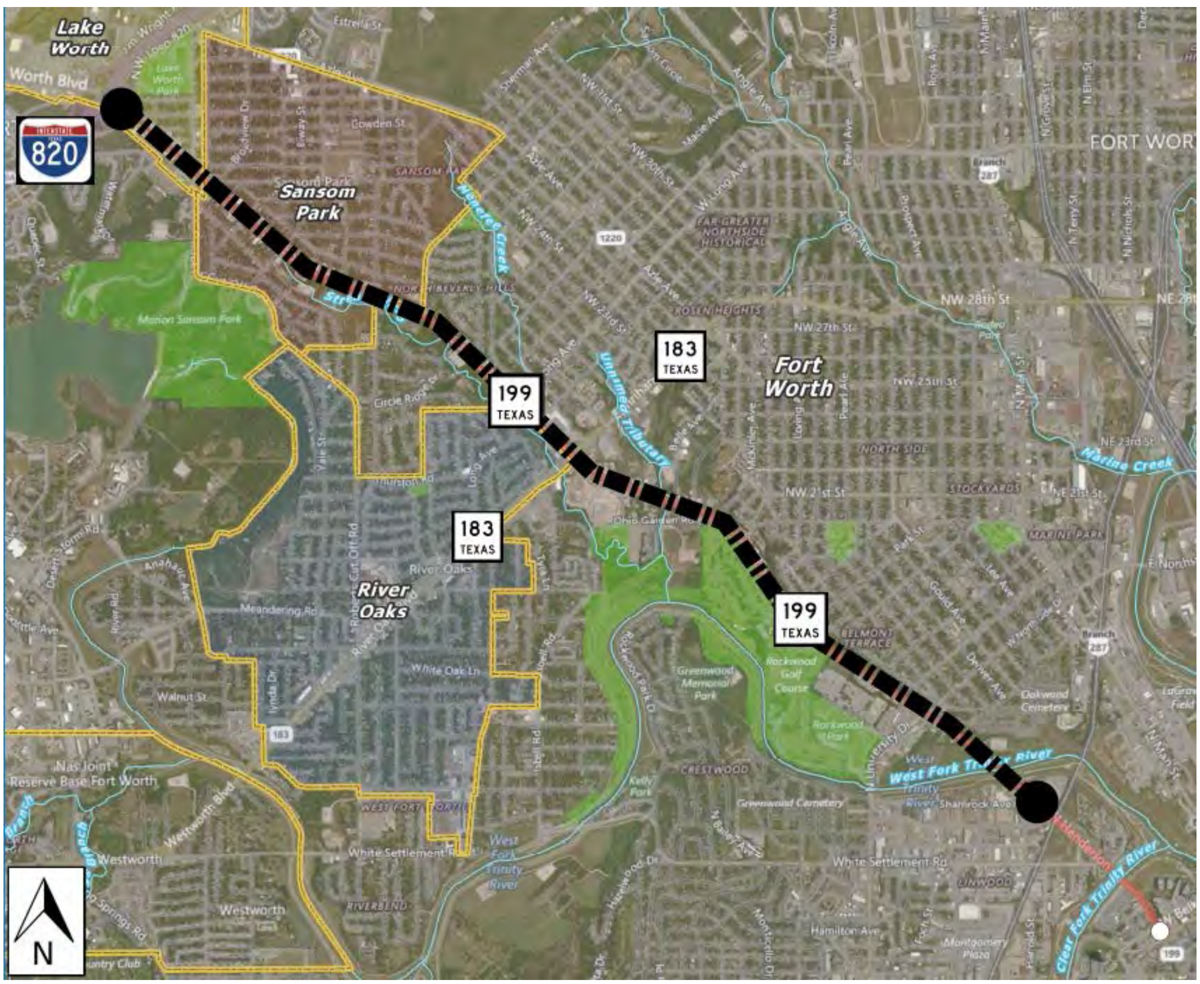

Figure 1. SH 199 Improvement Limits – Location Map
Source: Freese and Nichols, 2017

1.3 Improvement Sections

The recommended improvements within the project corridor can be divided into four sections and can be described as follows:

- Section 1 – IH 820 to Ohio Garden Road
- Section 2 – Ohio Garden Road to Extension of 16th Street
- Section 3 – Extension of 16th Street to University Drive
- Section 4 – University Drive to Shamrock Avenue

The existing right-of-way width, as described in the Existing Right-of-Way and Corridor Configuration Technical Memorandum, is generally 150-feet wide from IH 820 to Ohio Garden Road, 120-feet wide from Ohio Garden Road to University Drive, and a transition from 120-feet to 100-feet wide from University Drive to Shamrock Avenue.

Based on the traffic analysis described in the Existing Conditions Traffic Analysis Technical Memorandum, six travel lanes will be required from IH 820 to University Drive and four travel lanes will be required from University Drive to Shamrock Avenue.

Each section of SH 199 has features that make it unique and require attention to the surrounding context and character to appropriately provide the necessary transportation infrastructure.

2.0 SECTION 1 - IH 820 TO OHIO GARDEN ROAD

The first of four sections of the SH 199 corridor can be defined as the roadway between IH 820 and Ohio Garden Road (see Figure 2). This section is the longest within the corridor and spans a distance of 17,100 feet (3.24 miles). Section 1 bisects or is adjacent to the cities of Lake Worth, Sansom Park, River Oaks, and Fort Worth. A majority of Section 1 includes commercial properties adjacent to the SH 199 right-of-way and multiple intersections with side streets. Access to properties and roadway networks adjacent to SH 199 is important through the varying terrain within this section. These features were considered during the development of a recommended corridor configuration for Section 1.

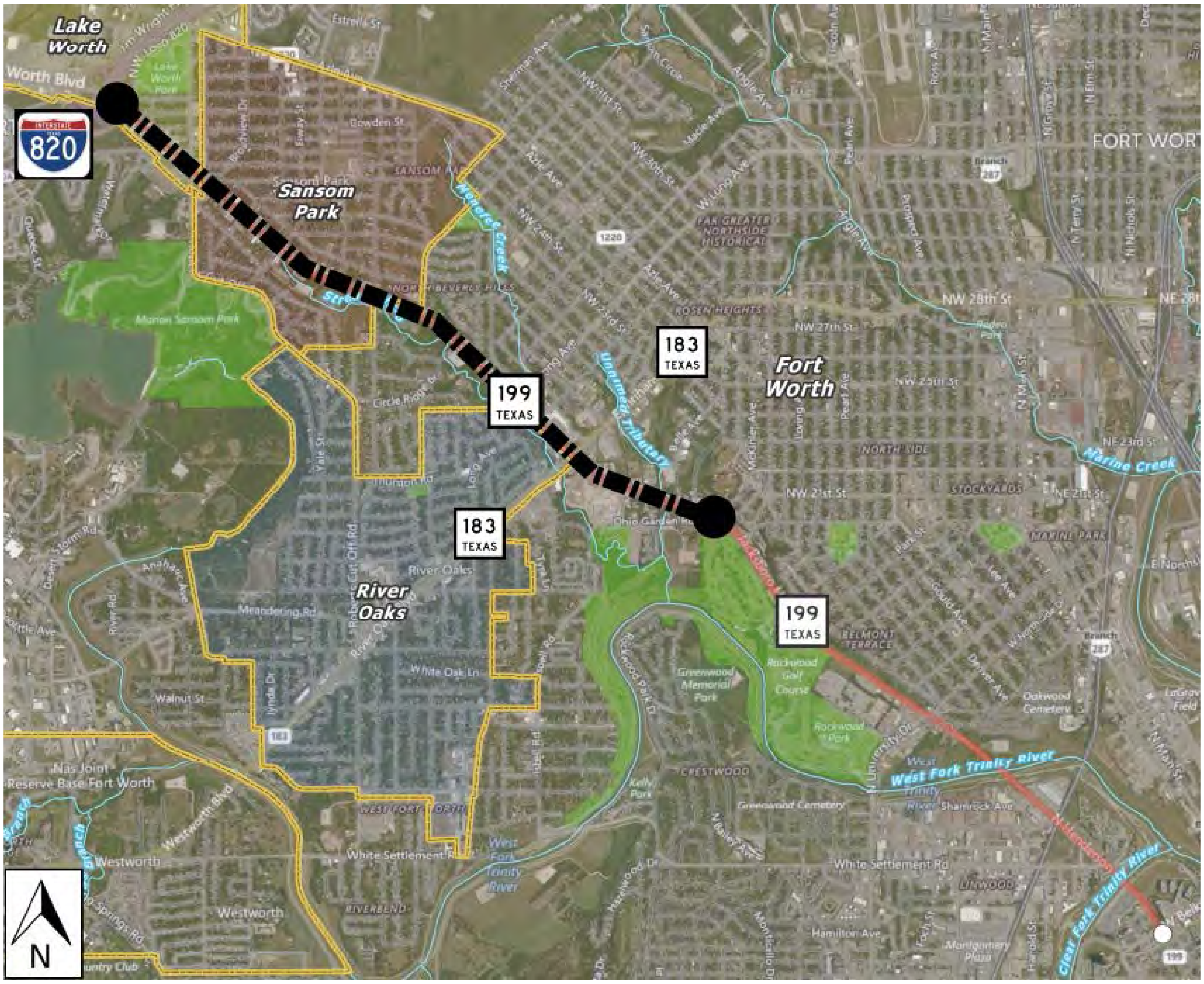

Figure 2. Section 1 – IH 820 to Ohio Garden Road – Location Map
Source: Freese and Nichols, 2017

2.1 Geometric Design Criteria Recommendations

The geometric design criteria recommendations for Section 1 of SH 199, based on the *TxDOT Roadway Design Manual*, are graphically shown in Figure 3 and listed in Table 1.

Table 1. Section 1 - Recommended Design Criteria

Right-of-way width*	150	feet
Design speed	45	miles per hour
Terrain	Rolling	
Horizontal curvature	1,039	feet (minimum)
K value (sag curve)	79	
K value (crest curve)	61	
Maximum grade	7	%
Minimum grade	0.35	%
Cross slopes	2	%
Number of travel lanes^	6	lanes

Table 1. (continued) Section 1 - Recommended Design Criteria

Width of travel lane	11 feet
Width of outside travel lane	14 feet
Width of speed change lane	10 feet
Offset to face of curb	1 foot
Raised median width	18 feet
Border width (north)	23 feet
Border width (south)	33 feet
Clear sidewalk width (north)	6 feet
Clear sidewalk width (south)	10 feet
Horizontal clearance width (minimum)	4 feet
Curb parking lanes	None
Shoulder width	None (Curbed)
Superelevation˜	None
Bridge Sections	None

* Existing Right-of-Way Width; ^ Number of Travel Lanes from Proposed Configuration Traffic Analysis Technical Memorandum
˜No Superelevation Recommended to Reduce Vehicles Traveling at High Rates of Speed and to Align Drainage Structures Along Outside Edge of Roadway

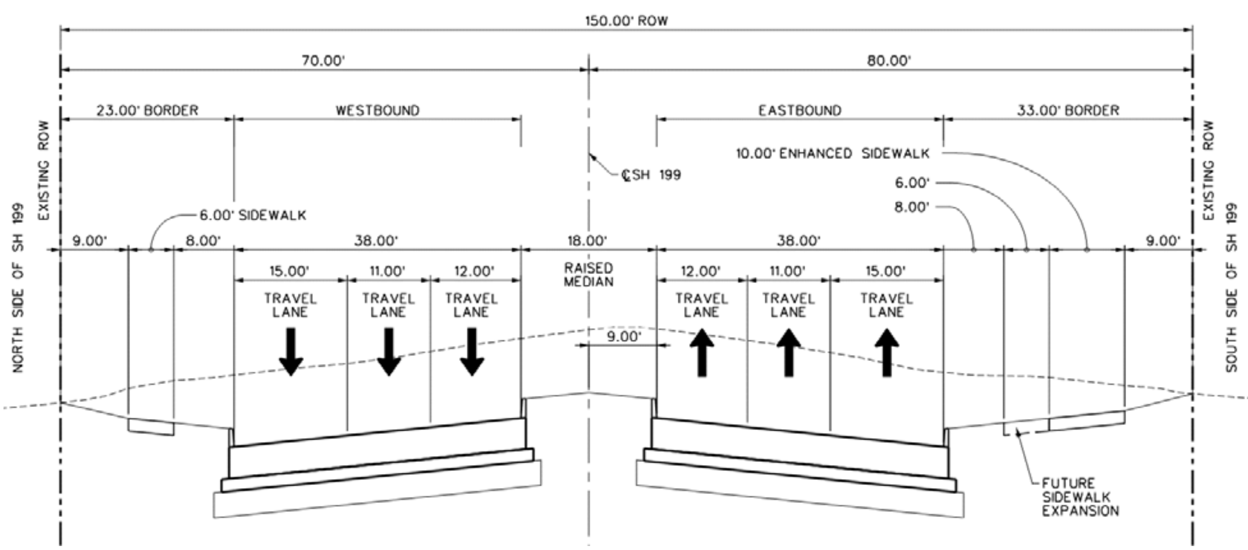

Figure 3. Section 1 – IH 820 to Ohio Garden Road Typical Section
Source: Freese and Nichols, 2017

The recommended design criteria and typical section allow for horizontal and vertical flexibility within the border widths to maintain access to the adjacent properties and allow for the introduction of turn lanes at intersections within the existing right-of-way, as necessary (see Attachment B). This recommended typical section provides space for franchise and city-owned utilities, underground drainage systems, urban design elements, bus transit, pedestrian, and bicycle accommodations. It also allows for future expansion of the enhanced sidewalk at the time that it is warranted.

2.2 Retaining Walls

While most of Section 1 is developed with commercial properties adjacent to the corridor, there are multiple areas that include varying terrain, natural vegetation, and tributaries parallel to the roadway. These features distinguish SH 199 from other corridors, and preservation of the context of the corridor is preferred. Therefore, to reduce impacts to these unique features outside of the existing right-of-way, a retaining wall (fill wall) on the south side of SH 199 between Beverly Hills Drive and Long Avenue approximately 2,200 feet in length and approximately six feet in height, would be necessary. It is recommended that the retaining wall on the south side of SH 199 include a combination railing designed for vehicular and pedestrian traffic.

2.3 Turn Lane and Intersection Typical Section

The need for single and dual left-turn lanes and single right-turn lanes throughout Section 1 is defined in the Proposed Configuration Traffic Analysis Technical Memorandum and requires variation to the typical section shown in Figure 3. The variation from the typical section for the turn lanes are generally within the raised median width and the border width. The recommended typical section for each intersection can be seen in Attachment B. It should be noted that a TxDOT design variance, as outlined in Section 2 of Chapter 1 of the *TxDOT Roadway Design Manual*, may be required at the SH 199 intersection of SH 183 for the recommended raised median width of two feet for the eastbound and westbound approaches, which is less than the minimum raised median width of six feet.

3.0 SECTION 2 – OHIO GARDEN TO EXTENSION OF 16TH STREET

The second of four sections of the SH 199 corridor can be defined as the roadway between Ohio Garden Road and the extension of 16th Street (see Figure 4). This section spans a distance of 4,100 feet (0.78 miles). Section 2 is entirely within the City of Fort Worth. A majority of Section 2 includes varying terrain with the higher elevations being on the north side of SH 199 and the lower elevations being on the south side of the SH 199. The elevations along the north right-of-way and the south right-of-way can vary as much as 15 feet in areas. In addition, properties between the extension of Park Street and the extension of 16th Street and along the north side of this section are residential properties within the Grand Avenue Historic District which is listed on the National Register of Historic Places. The property along the south side of this entire section is the Rockwood Golf Course and is a public recreational facility. These features and environmental impacts were considered during the development of a recommended corridor configuration for Section 2.

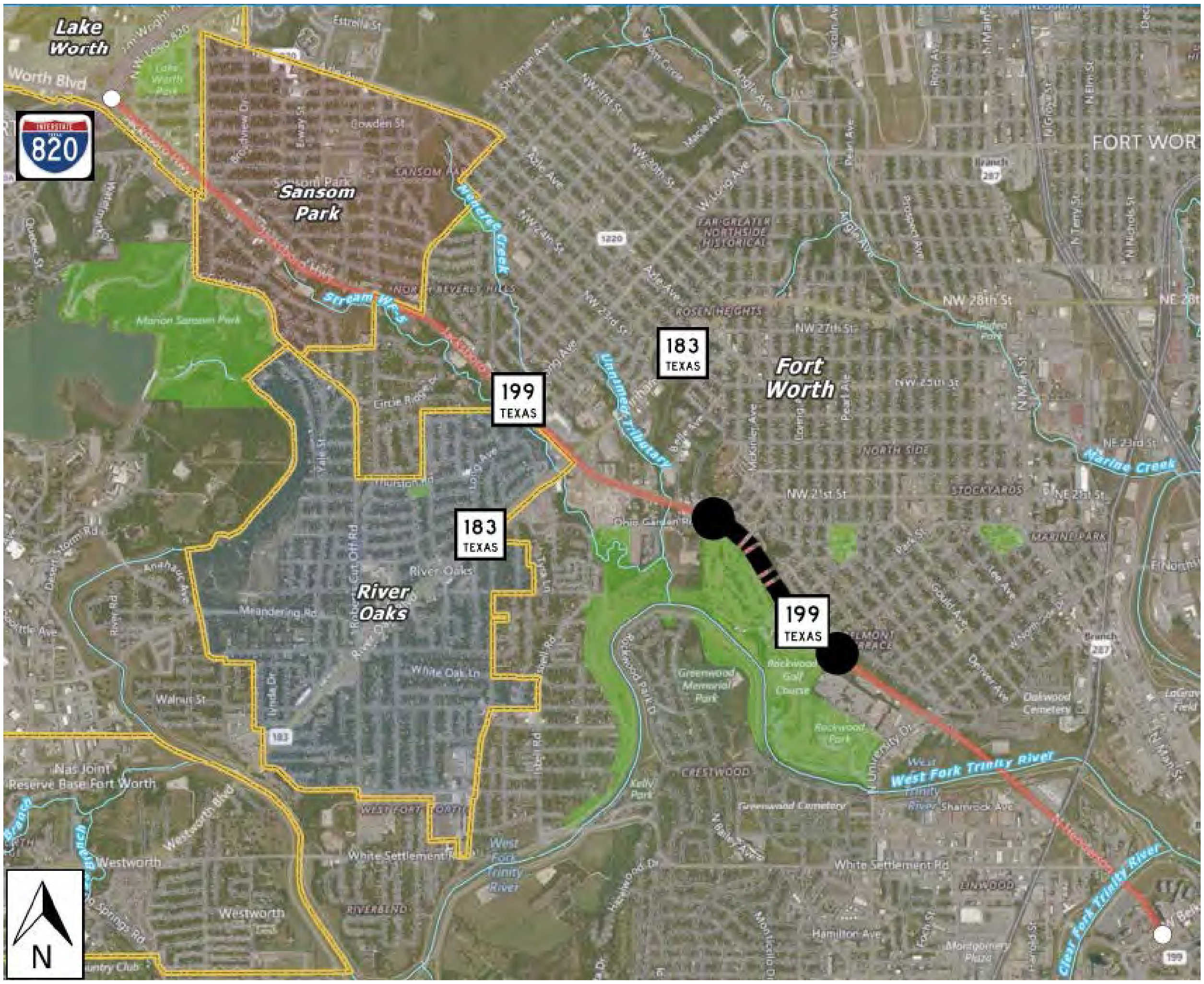

Figure 4. Section 2 – Ohio Garden Road to Extension of 16th Street – Location Map

Source: Freese and Nichols, 2017

3.1 Geometric Design Criteria Recommendations

The geometric design criteria recommendations for Section 2 of SH 199, based on the *TxDOT Roadway Design Manual*, are graphically shown in Figure 5 and listed in Table 2.

Table 2. Section 2 - Recommended Design Criteria

Right-of-way width*	120 feet
Design speed	45 miles per hour
Terrain	Rolling
Horizontal curvature	1,039 feet (minimum)
K value (sag curve)	79
K value (crest curve)	61
Maximum grade	7 %
Minimum grade	0.35 %
Cross slopes	2 %
Number of travel lanes^	6 lanes

Table 2. (continued) Section 2 - Recommended Design Criteria

Width of travel lane	11 feet
Width of outside travel lane	14 feet
Width of speed change lane	10 feet
Offset to face of curb	1 foot
Raised median width	4 feet
Border width (north)	17 feet
Border width (south)	23 feet
Clear sidewalk width (north)	6 feet
Clear sidewalk width (south)	10 feet
Horizontal clearance width (minimum)	4 feet
Curb parking lanes	None
Shoulder width	None (Curbed)
Superelevation~	None
Bridge Sections	None

* Existing Right-of-Way Width; ^ Number of Travel Lanes from Proposed Configuration Traffic Analysis Technical Memorandum
~No Superelevation Recommended to Reduce Vehicles Traveling at High Rates of Speed and to Align Drainage Structures Along Outside Edge of Roadway

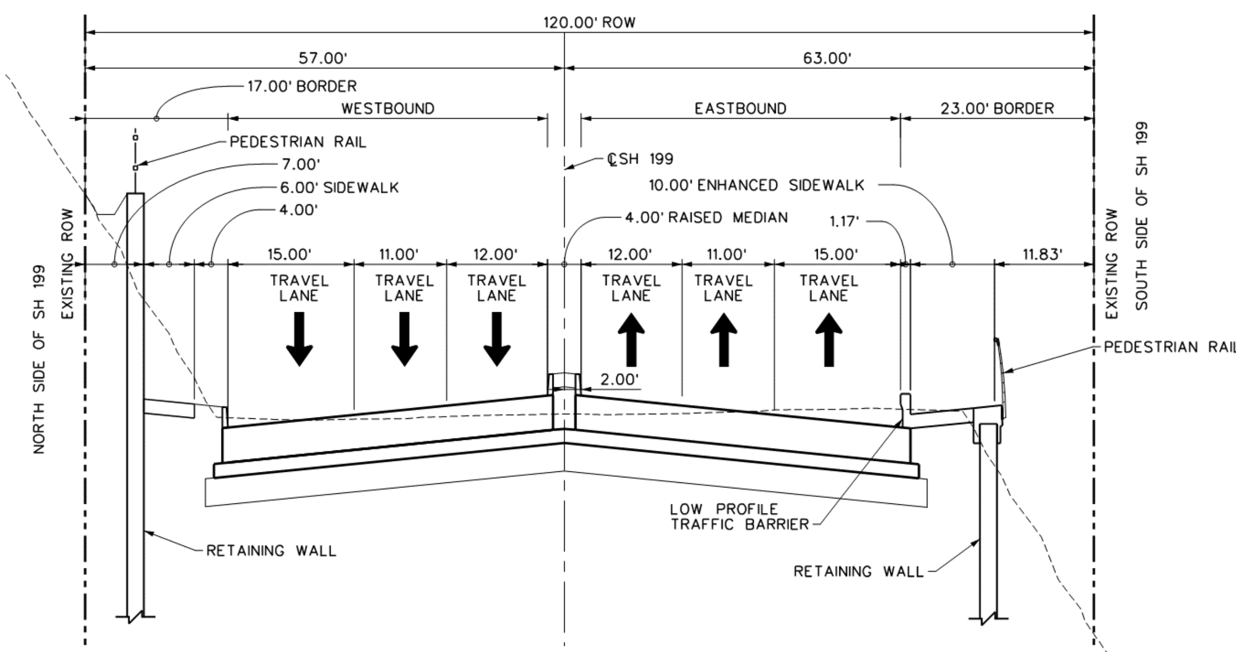

Figure 5. Section 2 – Ohio Garden Road to Extension of 16th Street Typical Section
Source: Freese and Nichols, 2017

The recommended design criteria and typical section reflect the challenges of the location of Section 2 which include Rockwood Golf Course (south of SH 199), Grand Avenue Historic District (north of SH 199), and the existing 120-foot right-of-way width. Compared to Section 1, Section 2 includes a reduced median width, reduced border width, retaining walls, and sidewalks located closer to the vehicular travel lanes. These recommendations are made to preserve the historic district on the north side of the roadway and the recreational facility on the south side of the roadway, to provide the appropriate travel lanes per the Proposed

Configuration Traffic Analysis Technical Memorandum, and to provide space for the introduction of turn lanes at intersections within the existing right-of-way, as necessary (see Attachment C). In addition, the recommended typical section provides for franchise and city-owned utilities, underground drainage systems, urban design elements, bus transit, pedestrian, and bicycle accommodations. Finally, the recommend typical section provides space for drainage structures behind the retaining walls on the north side of the roadway (cut wall) and space for the construction and maintenance of retaining walls on the north side and the south side of the roadway (cut and fill wall).

3.2 Retaining Walls

Due to the existing terrain, the Rockwood Golf Course, the Grand Avenue Historic District, and the breadth of the recommended improvements, retaining walls would be required along portions of the north side and the south side of Section 2. On the north side of SH 199 between the extension of Odd Street and 18th Street (approximately 750 feet), a retaining wall (cut wall) height of approximately eight feet would be necessary. Additionally, on the north side between the extension of Park Street and the extension of 16th Street (approximately 900 feet), a retaining wall (cut wall) height of approximately seven feet would be necessary. On the south side of SH 199 between Ohio Garden Road and the extension of 16th Street (approximately 4,100 feet), a retaining wall (fill wall) height of approximately five feet would be necessary. It is recommended that the retaining walls on the north side and south side of SH 199 include a railing for pedestrian traffic. A pedestrian railing on the north side of SH 199 is recommended for the pedestrian traffic that may occur along the edge of the residential properties and the roadway right-of-way. The retaining wall on the south side would only be required to provide a railing for pedestrian traffic because of the recommended low profile traffic barrier recommended along the outside travel lane. The intention of the combination of the low profile traffic barrier and the pedestrian rail on the outside of the enhanced sidewalk is to provide a more transparent view of Rockwood Golf Course than the typical application of a concrete curb between the outside travel lane and sidewalk and combination rail on the outside of the sidewalk.

It should be noted that a retaining wall (cut wall) currently exists along the north side of SH 199 between the extension of Park Street and the extension of 16th Street. The existing retaining wall appears to reside within the existing SH 199 right-of-way and would likely need to be removed and replaced with the recommended improvements to SH 199. It is recommended that the retaining wall along SH 199, and within the Grand Avenue Historic District, include colors and patterns that are sensitive to the context of the historic district. The design would likely require approval by the Texas Historical Commission and local historians.

3.3 Turn Lanes at Intersections

The need for single left-turn lanes and single right-turn lanes throughout Section 2 are defined in the Proposed Configuration Traffic Analysis Technical Memorandum and require variation to the typical section shown in Figure 5. The variation from the typical section for the turn lanes are generally within the raised median width and the border width. The recommended typical section for each intersection can be seen in Attachment C. It should be noted that a TxDOT design variance, as outlined in Section 2 of Chapter 1 of the *TxDOT Roadway Design Manual*, may be required at the SH 199 intersections of 21st Street and 18th Street for the recommended raised median width of two feet for the eastbound and westbound approaches, which is less than the minimum raised median width of six feet.

4.0 SECTION 3 – EXTENSION OF 16TH STREET TO UNIVERSITY DRIVE

The third section of the SH 199 corridor can be defined as the roadway between the extension of 16th Street to University Drive (see Figure 6). This section spans a distance of 2,700 feet (0.51 miles). Section 3 is entirely within the City of Fort Worth. Section 3 includes residential properties and commercial properties along the north side of SH 199, and commercial properties along the south side. The properties along the north side of SH 199, between the extension of 16th Street and University Street, are within the Grand Avenue Historic District, which is listed on the National Register of Historic Places. Access to commercial properties adjacent to this section is important. These features were considered during the development of a recommended corridor configuration for Section 3.

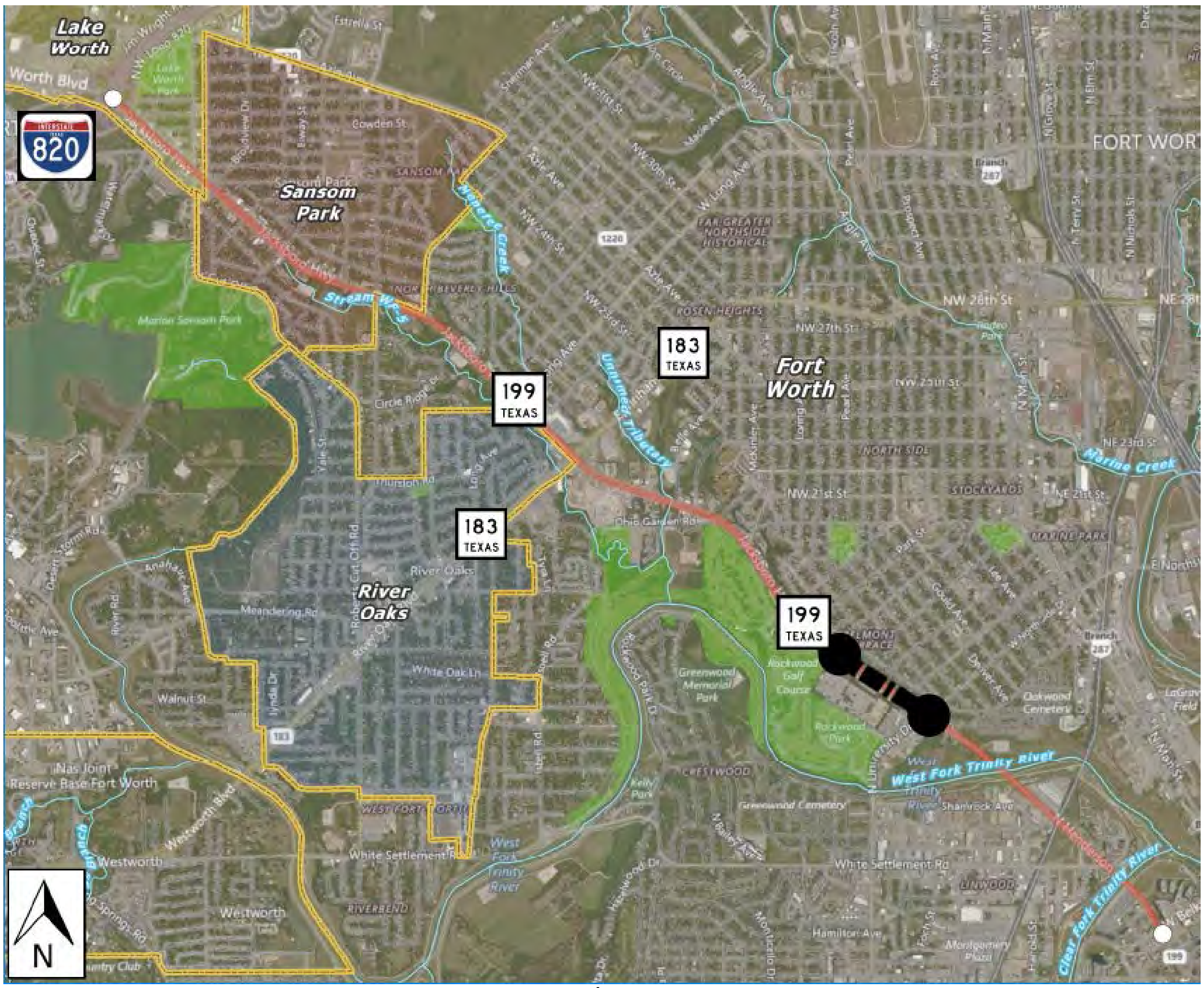

Figure 6. Section 3 – Extension of 16th Street to University Drive – Location Map
Source: Freese and Nichols, 2017

4.1 Geometric Design Criteria Recommendations

The geometric design criteria recommendations for Section 3 of SH 199, based on the *TxDOT Roadway Design Manual*, are graphically shown in Figure 7 and listed in Table 3.

Table 3. Section 3 - Recommended Design Criteria

Right-of-way width*	120	feet
Design speed	45	miles per hour
Terrain	Rolling	
Horizontal curvature	1,039	feet (minimum)
K value (sag curve)	79	
K value (crest curve)	61	
Maximum grade	7	%
Minimum grade	0.35	%
Cross slopes	2	%
Number of travel lanes^	6	lanes
Width of travel lane	11	feet
Width of outside travel lane	14	feet
Width of speed change lane	10	feet
Offset to face of curb	1	foot
Raised median width	12	feet
Border width (north)	16	feet
Border width (south)	16	feet
Clear sidewalk width (north)	6	feet
Clear sidewalk width (south)	10	feet
Horizontal clearance width (minimum)	4	feet
Curb parking lanes	None	
Shoulder width	None (Curbed)	
Superelevation~	None	
Bridge Sections	None	

* Existing Right-of-Way Width; ^ Number of Travel Lanes from Proposed Configuration Traffic Analysis Technical Memorandum
~No Superelevation Recommended to Reduce Vehicles Traveling at High Rates of Speed and to Align Drainage Structures Along Outside Edge of Roadway

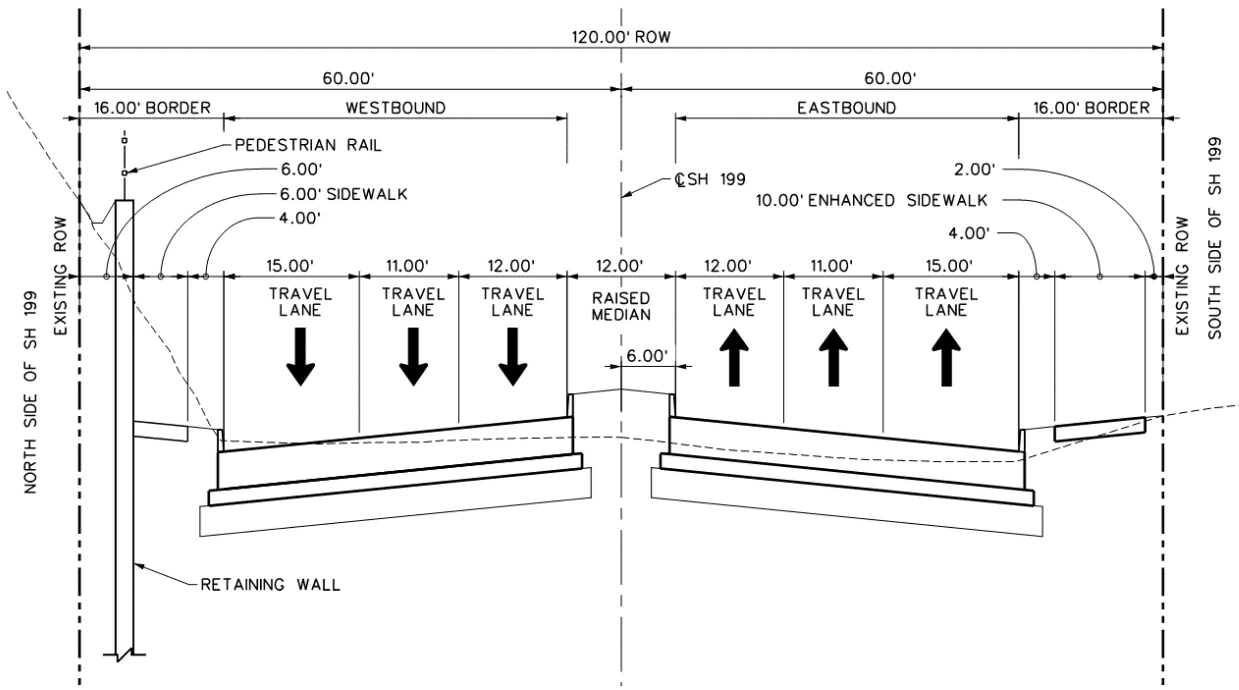

Figure 7. Section 3 – Extension of 16th Street to University Drive Typical Section
Source: Freese and Nichols, 2017

The recommended design criteria and typical section resemble the context of Section 3 which contains Grand Avenue Historic District (north of SH 199), commercial developments along the south side of the roadway, and the 120-foot right-of-way width. Section 3 includes a raised median wider than Section 2 but narrower than Section 1. Due to the right-of-way width, the adjacent historic district, and necessary retaining wall along the north side of the roadway, the horizontal clearance between the outside travel lane and the sidewalks are four feet. The recommended typical section provides space for the introduction of turn lanes at intersections within the existing right-of-way, as necessary (see Attachment D), space for franchise and city-owned utilities, underground drainage systems, urban design elements, and bus transit, pedestrian, and bicycle accommodations.

4.2 Retaining Walls

Similar to Section 2, Section 3 has varying terrain and the Grand Avenue Historic District on the north side of the roadway and would require a retaining wall to preserve these features and provide the necessary improvements. Along the north side of SH 199, between the extension of 16th Street to University Drive (approximately 2,700 feet), a retaining wall (cut wall) height of approximately eight feet would be necessary. It is recommended that the retaining wall on the north side of SH 199 include a railing for pedestrian traffic that may occur along the edge of the residential properties and the roadway right-of-way.

It should be noted that a retaining wall (cut wall) currently exists along the north side of SH 199 between the extension of 16th Street and University Drive. The existing retaining wall appears to reside within the existing SH 199 right-of-way and would likely need to be removed and replaced with the recommended improvements to SH 199. It is recommended that the retaining wall along SH 199, and within the Grand Avenue Historic District, include colors and patterns that are sensitive to the context of the historic district. The design would likely need to be approved by the Texas Historical Commission and local historians.

4.2.1 Turn Lanes at Intersections

The need for single and dual left-turn lanes and single right-turn lanes throughout Section 3 are defined in the Proposed Configuration Traffic Analysis Technical Memorandum and require variation to the typical section shown in Figure 7. The variation from the typical section for the turn lanes are generally within the raised median width and the border width. The recommended typical section for each intersection can be seen in Attachment D. It should be noted that a TxDOT design variance, as outlined in Section 2 of Chapter 1 of the *TxDOT Roadway Design Manual*, may be required at the SH 199 intersection of University Drive for the recommended raised median width of two feet for the eastbound approach, which is less than the minimum raised median width of six feet.

5.0 SECTION 4 - UNIVERSITY DRIVE TO SHAMROCK AVENUE

The fourth and final section of the SH 199 corridor can be defined as the roadway between University Drive and Shamrock Avenue (see Figure 8). This section spans a distance of 3,100 feet (0.59 miles). Section 4 is entirely within the City of Fort Worth. Section 4 includes commercial properties along the north side and the south side of SH 199 between University Drive and 900 feet east of University Drive. Section 4 also crosses the West Fork of the Trinity River and includes a bridge structure over the body of water. These natural features and property access were considered during the development of a recommended corridor configuration for Section 4.

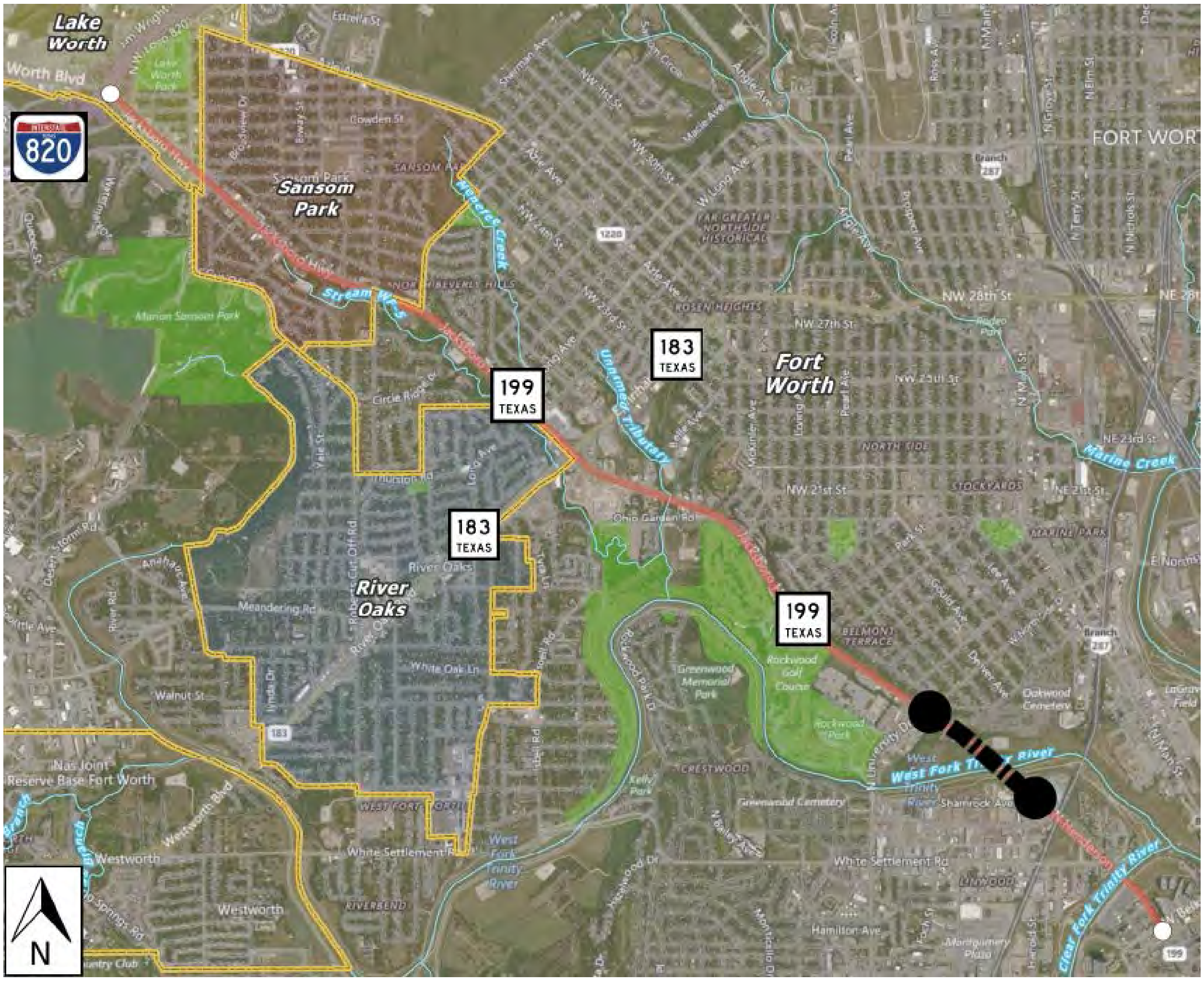

Figure 8. Section 4 – University Drive to Shamrock Avenue – Location Map
Source: Freese and Nichols, 2017

5.1 Geometric Design Criteria Recommendations

The geometric design criteria recommendations for Section 4 of SH 199, based on the *TxDOT Roadway Design Manual*, are graphically shown in Figure 9 and listed in Table 4.

Table 4. Section 4 - Recommended Design Criteria

Right-of-way width*	Varies (100 feet to 120 feet)
Design speed	40 miles per hour
Terrain	Rolling
Horizontal curvature	762 feet (minimum)
K value (sag curve)	64
K value (crest curve)	44
Maximum grade	8 %
Minimum grade	0.35 %
Cross slopes	2 %
Number of travel lanes^	4 lanes

Table 4. (continued) Section 4 - Recommended Design Criteria

Width of travel lane	11 feet (with raised median) and 12 feet (without raised median)
Width of outside travel lane	14 feet
Width of speed change lane	10 feet
Offset to face of curb	1 foot
Raised median width	Varies (0 feet to 26 feet)
Border width (north)	Varies (20 feet to 23 feet)
Border width (south)	Varies (20 feet to 23 feet)
Clear sidewalk width (north)	10 feet
Clear sidewalk width (south)	10 feet
Horizontal clearance width (minimum)	4 feet
Curb parking lanes	None
Shoulder width	None (Curbed)
Superelevation~	None
Bridge Sections	Vehicular bridge at the intersection of the West Fork of the Trinity River

* Existing Right-of-Way Width; ^ Number of Travel Lanes from Proposed Configuration Traffic Analysis Technical Memorandum
~No Superelevation Recommended to Reduce Vehicles Traveling at High Rates of Speed and to Align Drainage Structures Along Outside Edge of Roadway

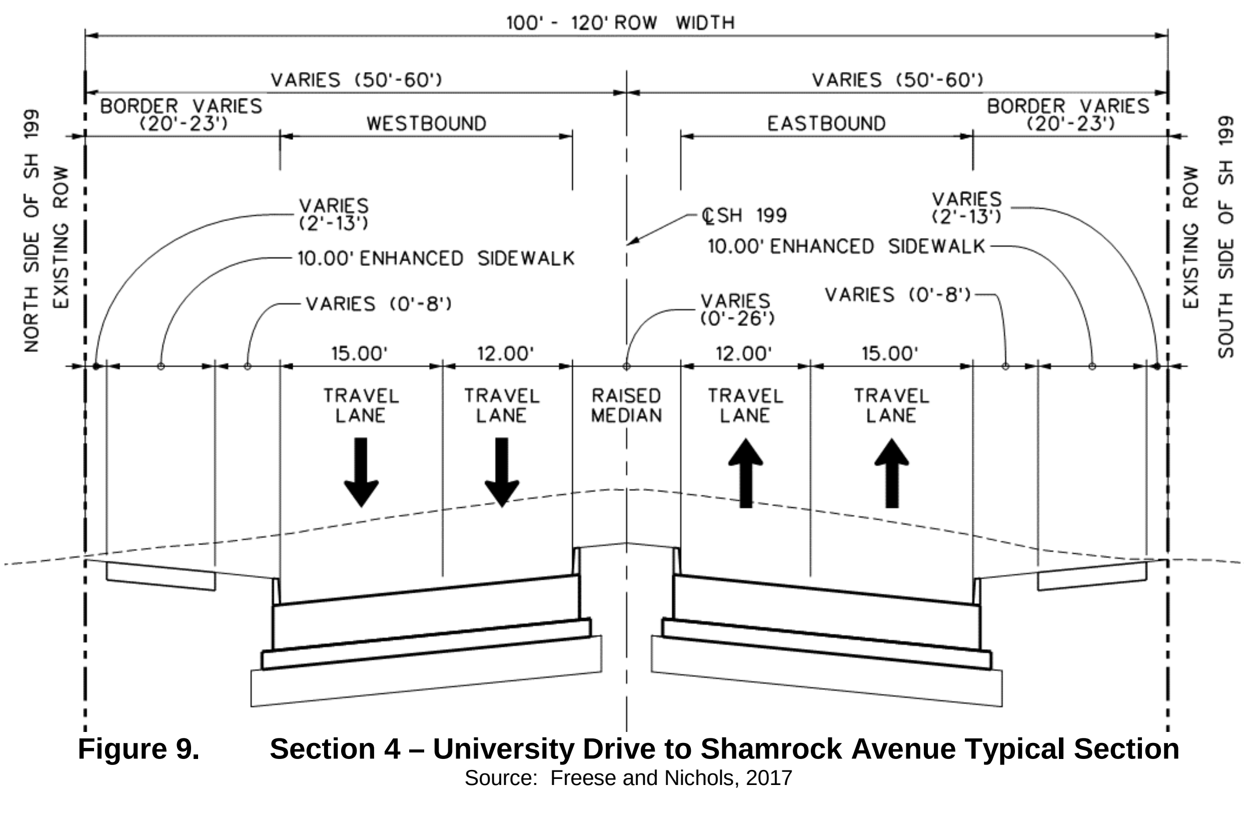

Figure 9. Section 4 – University Drive to Shamrock Avenue Typical Section
Source: Freese and Nichols, 2017

The recommended design criteria and typical section allows for the transition of the six travel lanes west of University Drive and the four travel lanes east of University Drive, as well as the transition from a 120-foot right-of-way width to a 100-foot right-of-way width as SH 199 approaches the West Fork of the Trinity River. Within Section 4 of SH 199, the roadway transitions from a raised median to no raised median (only centerline pavement markings between the eastbound and the westbound travel lanes) across the West Fork of the Trinity River and to the construction limits of the Trinity River Bridge / Panther Island project. To match and extend the improvements being constructed with the Trinity River Bridge / Panther Island project, 10-foot enhanced sidewalks are recommended on the north side and the south side of SH 199. The recommended typical section provides space for the introduction of turn lanes at intersections within the existing right-of-way, as necessary (see Attachment D), space for franchise and city-owned utilities, underground drainage systems, urban design elements, and bus transit, pedestrian, and bicycle accommodations.

5.2 Bridge at West Fork of the Trinity River

It is recommended that the existing bridge at the West Fork of the Trinity River be removed and replaced. This approximately 490-foot long bridge should be removed utilizing methods that will have minimal impact on roadway users, Trinity Trail users, and the water quality of the West Fork of the Trinity River. The West Fork of the Trinity River also includes a flood-control levee along the east side. Due to the presence of the water body and the levee, the project team met with the Tarrant Regional Water District (TRWD) and United States Army Corps of Engineers (USACE) on July 29, 2017 to review the project and understand the regulatory requirements within the vicinity of this crossing. A summary of the meeting, including meeting exhibits, can be reviewed in the TRWD and USACE Coordination Meeting Technical Memorandum. During the meeting, the teams reviewed bridge alternatives of an at-grade crossing, a seven-and-a-half-foot grade separated crossing, and a 15-foot grade separated crossing of the eastern levee of the Trinity River. Considering the impacts that a grade separated crossing would have on adjacent properties, motor vehicle driver comfort, and visualization of surrounding aesthetics, it is initially recommended that a 525-foot-long bridge with an at-grade crossing of the eastern levee of the Trinity River be considered. With an at-grade crossing of the levee, a concrete floodwall would be required to reinforce the earthen levee in proximity to the eastern bridge abutment. In addition to structural improvements, stormwater pollutant control and regional water quality should be considered when discharging stormwater into the Trinity River or related tributaries. Future design phases of SH 199 should consider coordination meetings with TRWD and USACE to ensure compliance of planned improvements with federal and local regulations.

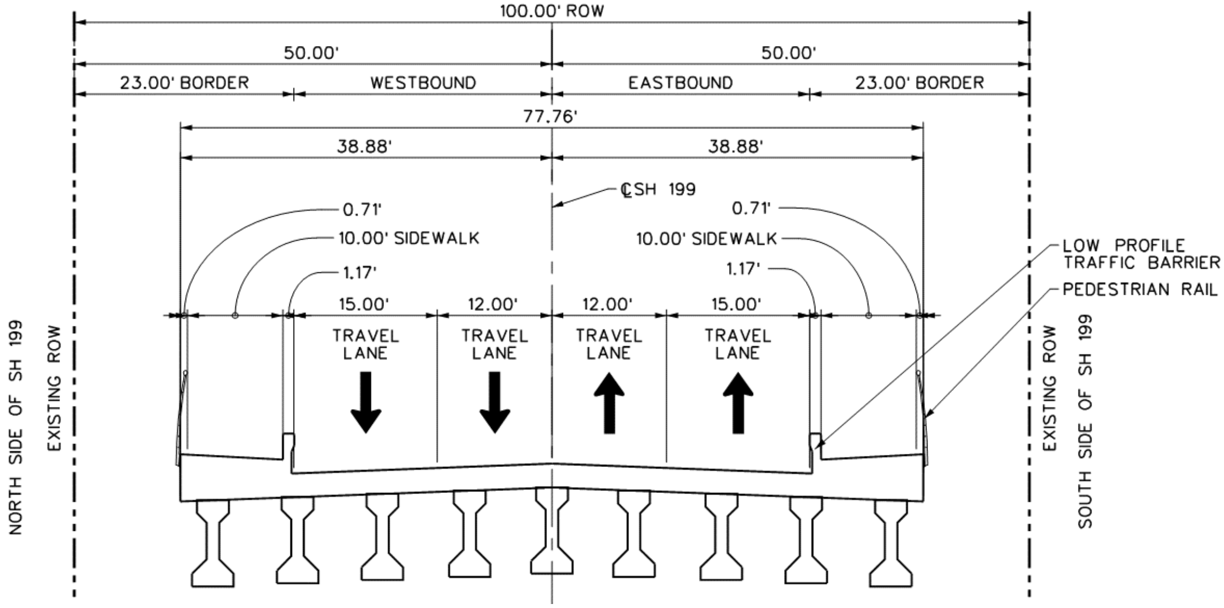

Figure 10. Bridge at West Fork of the Trinity River Typical Section
Source: Freese and Nichols, 2017

Figure 10 graphically shows the recommend typical section for the bridge at the West Fork of the Trinity River. These horizontal bridge dimensions and elements match those being constructed with the Trinity River Vision / Panther Island project to the east of the improvement limits of the SH 199 corridor. It is recommended that the bridge typical section include low profile traffic barriers between the outside travel lane and the ten-foot sidewalks with a pedestrian rail on either side of the outside of the bridge. The intention of the combination of the low profile traffic barrier and the pedestrian rail on the outside of the bridge is to provide a more transparent view of the West Fork of the Trinity River and adjacent improvements and to offer a more comfortable pedestrian environment than the typical application of a concrete curb between the outside travel lane and sidewalk and combination rail on the outside of the bridge.

6.0 CORRIDOR LENGTH RECOMMENDATIONS

6.1 Access Management

To improve the mobility, safety, and attractiveness of the SH 199 corridor, it is recommended that access management strategies be considered throughout the project limits. These strategies, outlined in the Access Management Technical Memorandum and in compliance with the *TxDOT Roadway Design Manual,* and the *TxDOT Access Management Manual*, include the design and construction of driveways to current standards, the design and construction of raised medians and median openings at appropriate locations, and the inclusion of access management plans by the local municipalities.

6.2 Bicycle, Pedestrian, and Bus Transit Accommodations

To accommodate all users of the SH 199 corridor, it is recommended that motorists, bicyclists, pedestrians, and bus transit users be considered during the next design phase of the project. It is recommended that the Bicycle and Pedestrian Safety, Accommodations, and Linkages Technical Memorandum and the Bus Transit Technical Memorandum be reviewed and understood to assist in the future design phases.

6.3 Drainage Improvements

The SH 199 corridor includes unique drainage challenges due to the local terrain and infrastructure. The current and future drainage patterns should be considered during the next design phase of the project to appropriately design the underground stormwater system and the accommodations for all users. It is recommended that the Existing Conditions – Drainage Assessment Technical Memorandum and the Proposed Improvements – Drainage Assessment Technical Memorandum be reviewed and understood to assist in the future design phases.

6.4 Urban Design Elements

A comprehensive approach to urban design enhancements and context sensitive design, as outlined in the Urban Design Technical Memorandum, should be considered throughout the SH 199 corridor. The potential for variation in horizontal geometry (median and buffer widths) of the roadway corridor is available within the existing right-of-way width to provide placemaking opportunities and the complementing of existing qualities. These urban design opportunities should be explored when available space is identified in the future design phase and once topographic conditions, property boundaries, and subsurface utilities are better defined.

6.5 Signing and Pavements Markings

To improve the SH 199 corridor safety and efficiency, the roadway should include the appropriate installation of uniform signing and pavement markings in accordance with the *Texas Manual on Uniform Traffic Control Devices* (TMUTCD) (http://www.txdot.gov/business/resources/signage/tmutcd.html). The inclusion of highly visible signing and pavement markings can assist in the delineation of the roadway, the travel lanes, and can help in the communication of a variety of information to the roadway users. For safety purposes, clear and informative signing and pavement markings are critical at points of conflict of the various users of SH 199.

6.6 Lighting

To improve safety, security, and quality of life for motorists, pedestrians, bicyclists, and bus transit users, it is recommended that the SH 199 corridor include illumination. The illumination should include appropriate lighting levels for the vehicular travel ways as well as the pedestrian and bicycle travel ways. These lighting improvements should be in compliance with the *TxDOT Highway Illumination Manual* (http://onlinemanuals.txdot.gov/txdotmanuals/hwi/hwi.pdf) and *Illuminating Engineering Society (IES) of North America Recommended Practice 8, Roadway Lighting* and should include vehicular lighting and pedestrian and bicyclist lighting. It is initially recommended that the vehicular lighting be spaced at 150 feet continuously through the corridor and mounted at a minimum height of 30 feet. It is initially recommended that lighting for the pedestrian and bicyclist environments should be spaced at 75 feet continuously throughout the corridor and mounted at a minimum height of 15 feet. The lighting should be spaced opposite from one another along the north side and the south side of the roadway (see Figure 11). With the equal spacing of lighting fixtures on a 75-foot pattern (pedestrian and bicycle) and 150-foot pattern (vehicular), the light fixtures can be mounted on the same pole when lighting locations are identical. As described in the Urban Design Technical Memorandum, it would be beneficial to the roadway users to include variation in the corridor and install vehicular lighting in the center raised median when it is feasible within the defined Parkway Concept.

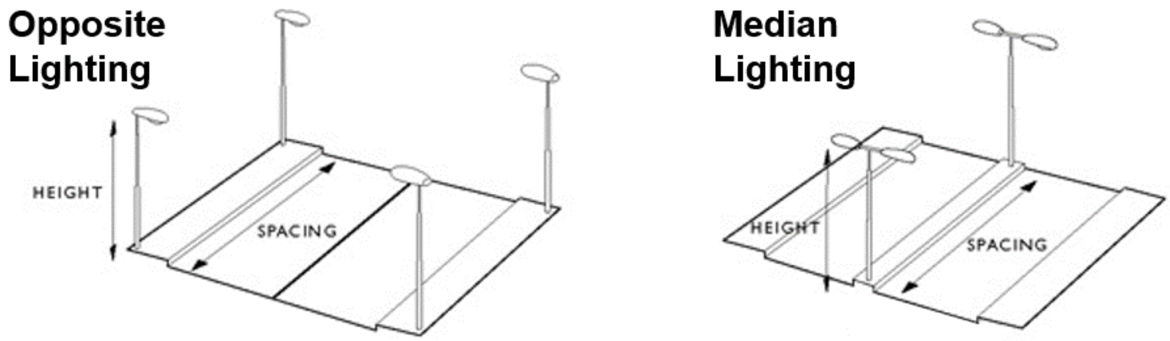

Figure 11. Street Lighting Pole Arrangement Patterns
Source: Samudra Electronic System, 2017

Based on input from the project stakeholders, it is preferred that the lighting be energy efficient through the installation of light-emitting diode (LED) lighting fixtures and that the fixtures be types that control uplighting, backlighting outside of the right-of-way, and glare for users. In addition to being beneficial within the right-of-way, many stakeholders saw the potential for economic development and the enhancement of nighttime activities through lighting of all travel ways.

When applicable, the illumination design should steadily increase the illumination levels at intersections and at pedestrian, bicycle, transit, or traffic conflicts. The lighting levels should steadily increase approaching the conflict point stop and correspondingly decrease leaving the conflict area.

During the next phase of the design process, it is recommended that calculations of lighting levels per section and at intersections of the corridor be developed to ensure that the lighting locations comply with the *TxDOT Highway Illumination Manual* and *Illuminating Engineering Society (IES) of North America Recommended Practice 8, Roadway Lighting*. The project stakeholders should also be included in the next design phase to provide input on preference topics such as non-standard lighting fixtures and banner arms.

7.0 FUTURE PROJECT RECOMMENDATIONS

As the design process continues into the next phases, it is recommended that the following opportunities be considered.

- In-field data such as topographic conditions, property boundaries, and subsurface utilities should be collected to better inform the design process and determine the limits of construction.
- When it is appropriate, design waivers for improvements within the right-of-way should be considered to allow for a reduction in the impacts to historic structures/districts, environmentally sensitive areas, and recreation facilities, and to enable a contribution to the preservation of the community character.
- Due to the varying terrain within and adjacent to the right-of-way and the extent of the corridor improvements, it is recommended that the future design phase include a detailed geotechnical investigation to provide guidance for the appropriate cut and fill retaining wall types, heights, and soil stabilization requirements.
- It is recommended that the design team consider all users of the corridor when making design decisions. There is potential for design decisions that positively affect one user group (motor vehicle users) to negatively affect another user group (pedestrians, bicyclists, and transit users).

- If a future release of the *TxDOT Roadway Design Manual* includes flexibility in the geometric design criteria for urban streets with regards to on-street bicycle accommodations, it is recommended that the outside lane width be reduced from 14-feet to 11-feet. It is recommended that the additional two to three feet from each outside travel lane be redistributed to create a separated bicycle facility within the border width of the SH 199 right-of-way.
- Due to varying terrain and necessary property access, a separate roadway profile may be necessary for the eastbound and the westbound travel lanes. A separate roadway profile may also reduce the amount of cut volume, fill volume, and retaining wall heights along multiple sections of SH 199.

8.0 ATTACHMENTS

A. Trinity River Vision / Panther Island - SH 199 (Henderson Street) Roadway Improvement Plans
B. Section 1 - Recommended Typical Sections
C. Section 2 - Recommended Typical Sections
D. Section 3 - Recommended Typical Sections
E. Section 4 - Recommended Typical Sections
F. Retaining Wall - Cut Wall and Fill Wall Example

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Attachment A

Trinity River Vision / Panther Island - SH 199 (Henderson Street) Roadway Improvement Plans

DESIGN TJS	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
GRAPHICS FNI	6	HP 2008 (345), etc.		SH 199, etc.
CHECK AIG	STATE	DISTRICT	COUNTY	SHEET NO.
	TEXAS	FTW	TARRANT	1
CHECK JFD	CONTROL	SECTION	JOB	
	0171	05	081, etc.	

FINAL PLANS

NAME OF CONTRACTOR: ____________

DATE OF LETTING: ____________

DATE WORK BEGAN: ____________

DATE WORK COMPLETED: ____________

DATE WORK ACCEPTED: ____________

SUMMARY OF CHANGE ORDERS:

THE CONTRACTOR SHALL PROVIDE AND ERECT BARRICADES AND WARNING SIGNS IN ACCORDANCE WITH BC(1)-07 THROUGH BC(12)-07 AT POINTS INDICATED AND AT OTHER POINTS AS DIRECTED BY THE ENGINEER.

STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED
STATE HIGHWAY IMPROVEMENT

HENDERSON		
DESIGN SPEED = 40 MPH		
ADT:	37,700	(2013)
	38,700	(2033)
	42,700	(2043)

NORTH MAIN		
DESIGN SPEED = 30 MPH		
ADT:	12,200	(2013)
	14,900	(2033)
	16,400	(2043)

WHITE SETTLEMENT		
DESIGN SPEED = 30 MPH		
ADT:	35,000	(2014)
	42,800	(2034)
	47,200	(2044)

ROUNDABOUTS ARE DESIGNED FOR 25 MPH

VOLUME 1

PREPARED BY:

FREESE NICHOLS
4055 International Plaza, Suite 200
Fort Worth, TX 76109-4895
Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144

JOHN F. DEMAR 80059

HENDERSON STREET (S.H. 199)
TARRANT COUNTY

FEDERAL AID PROJECT HP 2008 (345)
CSJ: 0171-05-081

LIMITS FROM: AT BYPASS CHANNEL (ON HENDERSON)
LIMITS TO: NEAR CBD & TRINITY RIVER

TOTAL LENGTH OF PROJECT =
ROADWAY = 1665.41 FT. = 0.315 MI.
BRIDGE = 806.00 FT. = 0.153 MI.
TOTAL = 2471.41 FT. = 0.468 MI.

TYPE: FOR THE CONSTRUCTION OF MISCELLANEOUS WORK

CONSISTING OF: GRADING, PAVING, DRAINAGE, BRIDGE, PAVEMENT MARKING AND SIGNING.

NORTH MAIN STREET (BU 287P)
TARRANT COUNTY

FEDERAL AID PROJECT HP 2008 (344)
CSJ: 0014-01-022

LIMITS FROM: AT BYPASS CHANNEL (ON MAIN STREET)
LIMITS TO: NEAR TRINITY RIVER

TOTAL LENGTH OF PROJECT =
ROADWAY = 1,389.56 FT. = 0.263 MI.
BRIDGE = 449.82 FT. = 0.085 MI.
TOTAL = 1,839.38 FT. = 0.348 MI.

TYPE: FOR THE RECONSTRUCTION OF EXISTING FACILITY FROM 4 LANES UNDIVIDED TO 4 LANES UNDIVIDED, INCLUDING A NEW BRIDGE.

CONSISTING OF: BRIDGE, GRADING, PAVING, DRAINAGE, PAVEMENT MARKING AND SIGNING.

WHITE SETTLEMENT ROAD
TARRANT COUNTY

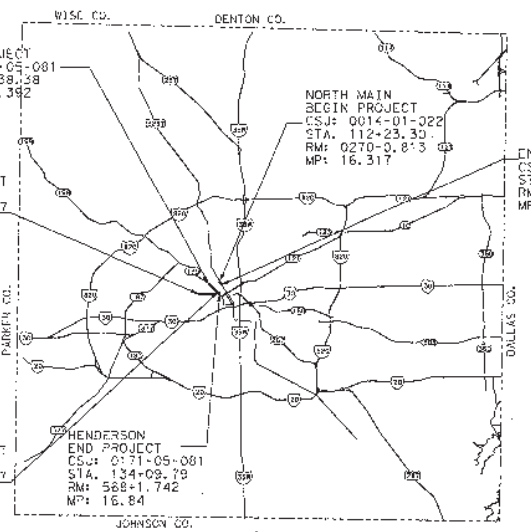
FEDERAL AID PROJECT STP 2014 (669)MM
CSJ: 0902-48-687

LIMITS FROM: AT BYPASS CHANNEL (ON WHITE SETTLEMENT ROAD)
LIMITS TO: NEAR TRINITY RIVER

TOTAL LENGTH OF PROJECT =
ROADWAY = 1439.01 FT. = 0.319 MI.
BRIDGE = 949.31 FT. = 0.180 MI.
TOTAL = 2388.32 FT. = 0.499 MI.

TYPE: FOR THE RECONSTRUCTION OF EXISTING FACILITY FROM 5 LANES UNDIVIDED TO 4 LANES UNDIVIDED.

CONSISTING OF: BRIDGE, GRADING, PAVING, DRAINAGE, PAVEMENT MARKING AND SIGNING.



HENDERSON
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RM: 568+1.392
MP: 16.49

NORTH MAIN
BEGIN PROJECT
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STA. 112+23.30
RM: 0270-0.813
MP: 16.317

END PROJECT
CSJ: 0014-01-022
STA. 130+62.68
RM: 0270-0.465
MP: 16.665

WHITE SETTLEMENT
BEGIN PROJECT
CSJ: 0902-48-687
STA. 114+66.06

WHITE SETTLEMENT
END PROJECT
CSJ: 0902-48-687
STA. 141+00.00

HENDERSON
END PROJECT
CSJ: 0171-05-081
STA. 134+09.79
RM: 568+1.742
MP: 16.84

NO EXCEPTIONS
NO EQUATIONS
HS RAILROAD CROSSING (STA. 120+17.12) SHEET 708
NMS RAILROAD CROSSING (STA. 110+61.37) SHEET 794
WSR RAILROAD CROSSING (STA. 124+15.58) SHEET 776

TARRANT COUNTY

REGISTERED ACCESSIBILITY SPECIALIST (RAS)
INSPECTION REQUIRED
TDLR NO. EABPRJ

CONCURRENCE: Jan 24, 2014
CITY OF FORT WORTH TRANSPORTATION/ PUBLIC WORKS DIRECTOR

TEXAS DEPARTMENT OF TRANSPORTATION

RECOMMENDED FOR LETTING ____________, 2014
____________, P.E.
DISTRICT DESIGN ENGINEER

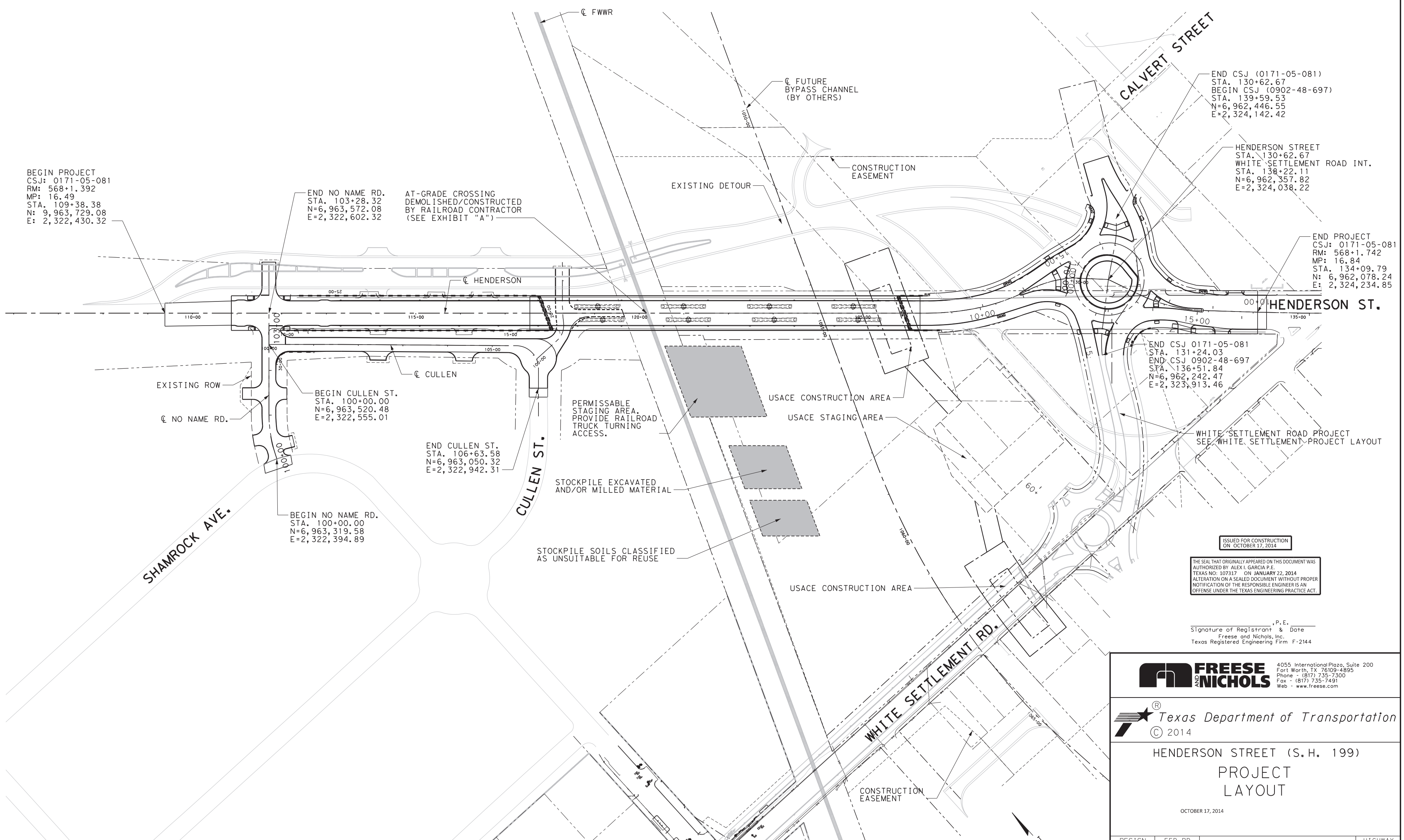
SUBMITTED FOR LETTING Feb 26th, 2014
____________, P.E.
FOR AREA ENGINEER

APPROVED FOR LETTING ____________, 2014
____________, P.E.
DIRECTOR, TRAFFIC OPERATIONS DIVISION

RECOMMENDED FOR LETTING 2-26, 2014
Brian R. Barth, P.E.
DISTRICT ENGINEER

APPROVED FOR LETTING ____________, 2014
____________, P.E.
DIRECTOR, DESIGN DIVISION

NOTE:
SPECIFICATIONS ADOPTED BY THE TEXAS DEPARTMENT OF TRANSPORTATION, JUNE 1, 2004, AND THE CONTRACT PROVISIONS LISTED AND DATED AS FOLLOWS SHALL GOVERN ON THIS PROJECT: REQUIRED CONTRACT PROVISIONS FOR ALL FEDERAL-AID CONSTRUCTION CONTRACTS (FORM FHWA 1273, MAY, 2012).



ISSUED FOR CONSTRUCTION ON OCTOBER 17, 2014

THE SEAL THAT ORIGINALLY APPEARED ON THIS DOCUMENT WAS AUTHORIZED BY ALEX I. GARCIA P.E. TEXAS NO: 107317 ON JANUARY 22, 2014 ALTERATION ON A SEALED DOCUMENT WITHOUT PROPER NOTIFICATION OF THE RESPONSIBLE ENGINEER IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE ACT.

_______________, P.E.
Signature of Registrant & Date
Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144

FREESE AND NICHOLS
4055 International Plaza, Suite 200
Fort Worth, TX 76109-4895
Phone - (817) 735-7300
Fax - (817) 735-7491
Web - www.freese.com

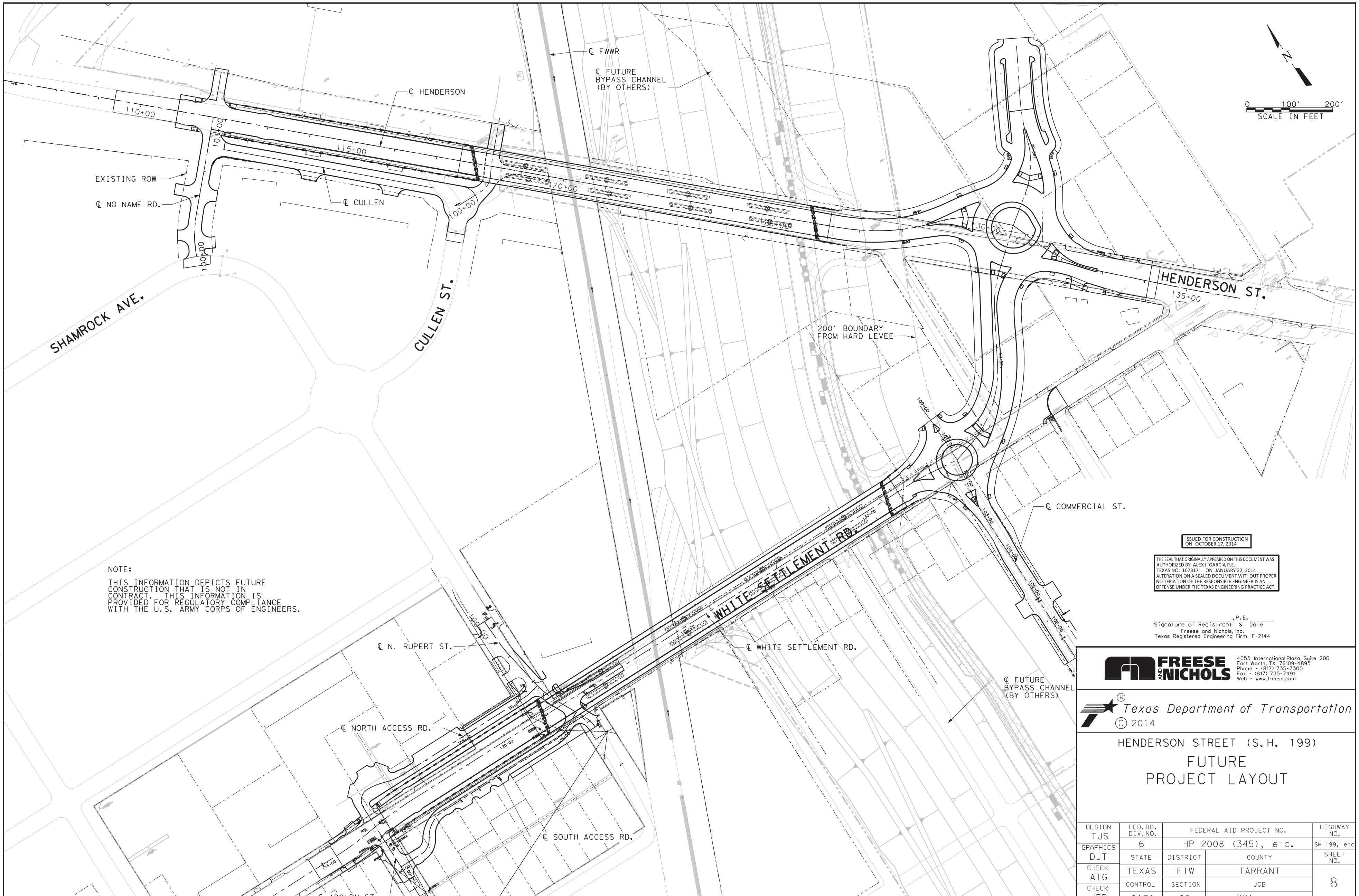
Texas Department of Transportation
© 2014

HENDERSON STREET (S.H. 199)

PROJECT LAYOUT

OCTOBER 17, 2014

DESIGN TJS	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
GRAPHICS FNI	6	HP 2008 (345), etc.		SH 199, etc
CHECK AIG	STATE	DISTRICT	COUNTY	SHEET NO.
	TEXAS	FTW	TARRANT	5
CHECK JFD	CONTROL	SECTION	JOB	
	0171	05	081, etc	



NOTE:
THIS INFORMATION DEPICTS FUTURE CONSTRUCTION THAT IS NOT IN CONTRACT. THIS INFORMATION IS PROVIDED FOR REGULATORY COMPLIANCE WITH THE U.S. ARMY CORPS OF ENGINEERS.

ISSUED FOR CONSTRUCTION ON OCTOBER 17, 2014

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__________ ,P.E.
Signature of Registrant & Date
Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144

FREESE AND NICHOLS
4055 International Plaza, Suite 200
Fort Worth, TX 76109-4895
Phone - (817) 735-7300
Fax - (817) 735-7491
Web - www.freese.com

Texas Department of Transportation
© 2014

HENDERSON STREET (S.H. 199)
FUTURE
PROJECT LAYOUT

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
TJS	6	HP 2008 (345), etc.		SH 199, etc
GRAPHICS DJT	STATE	DISTRICT	COUNTY	SHEET NO.
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CHECK JFD	CONTROL 0171	SECTION 05	JOB 081, etc	

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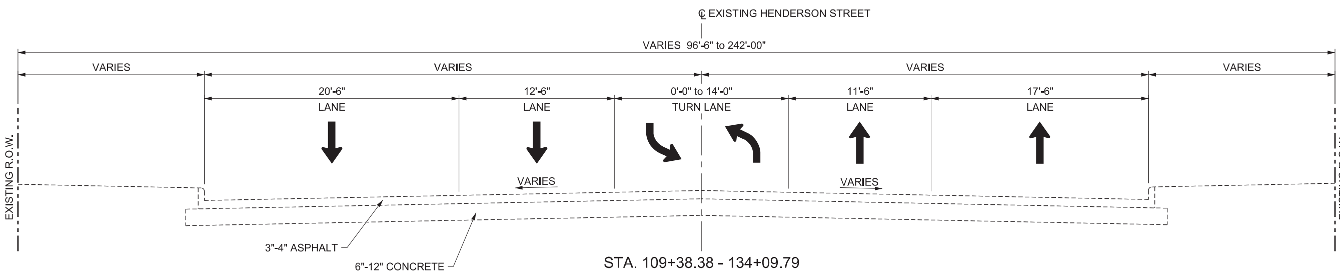

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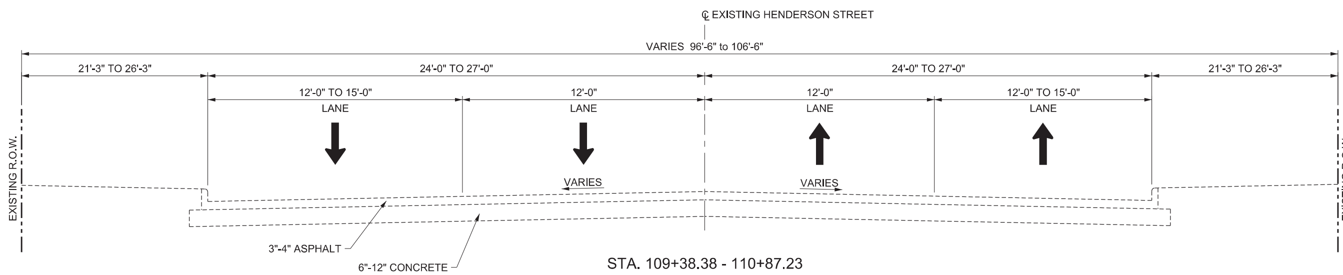
NOT TO SCALE



STA. 109+38.38 - 110+87.23

HENDERSON STREET
TRANSITION TYPICAL SECTION
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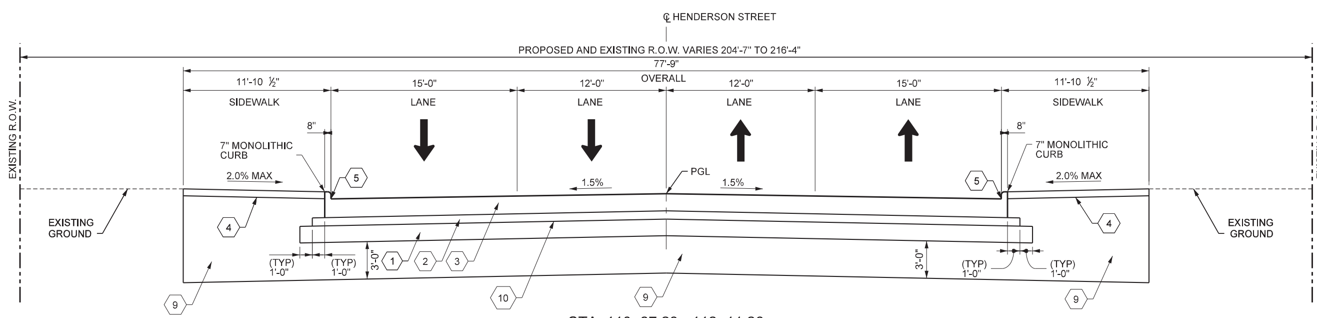

STA. 110+87.23 - 112+11.26
STA. 126+71.00 - 128+57.22

HENDERSON STREET
PAVEMENT TYPICAL SECTION
NOT TO SCALE

TYPICAL SECTION LEGEND

1. 8" FLEX BASE TY A GR 1 (247-2041)
2. 4" HMAC TY B PG 64-22 (3224-2008)
3. 12" CONCRETE PAVEMENT (*) (360-2005, 2013)
4. 4" TYPICAL CONCRETE SIDEWALK (**) (531-2015)
5. 0' CURB OFFSET
7. 6" CRCP (360-2021)
8. 6" LIME TREATED SUBGRADE (260-2006)
9. 3' LOW PI SELECT FILL (***) (247-2060)
10. PRIME COAT MC-30 OR AE-P (310-2005)

* SEE CONCRETE PAVEMENT LAYOUT, SHEET 146 .

** SEE LANDSCAPE SIDEWALK PAVING PLANS FOR LIMITS OF ALTERNATE SIDEWALK TYPE.

*** LOW PI SELECT FILL SHOULD CONSIST OF CLAYEY SAND OR SANDY CLAY HAVING A PI OF 8 TO 15, AND SHOULD BE COMPACTED IN 9 INCH LOOSE LIFTS TO 100% TEX-114E AT -2% TO 2% OF OPTIMUM.

NOTES:

1. SEE SHEET 531 FOR LOW PROFILE CONCRETE RAILING DETAILS AND SHEET 534 FOR MONOLITHIC CURB DETAILS.
2. 7" MONOLITHIC CURBS ARE TYPE II.

ISSUED FOR CONSTRUCTION ON OCTOBER 17, 2014

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__________, P.E. ______
Signature of Registrant & Date
Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144

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Fort Worth, TX 76109-4895
Phone - (817) 735-7300
Fax - (817) 735-7491
Web - www.freese.com

Texas Department of Transportation

HENDERSON STREET (S.H. 199)

TYPICAL SECTIONS

Sheet 1 of 6

DESIGN TJS	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.			HIGHWAY NO.
	6	HP 2008 (345), etc.			SH 199, etc
GRAPHICS FNI	STATE	DISTRICT	COUNTY		SHEET NO.
CHECK AIG	TEXAS	FTW	TARRANT		19
CHECK JFD	CONTROL	SECTION	JOB		
	0171	05	081, etc		

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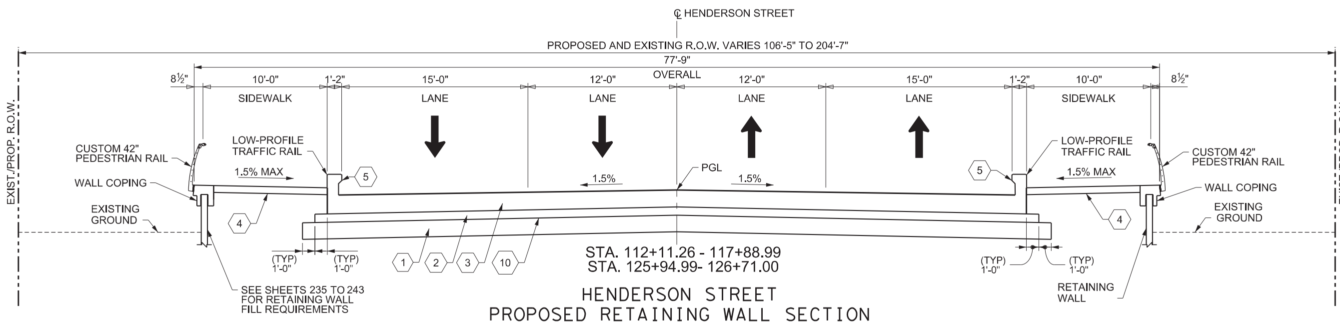
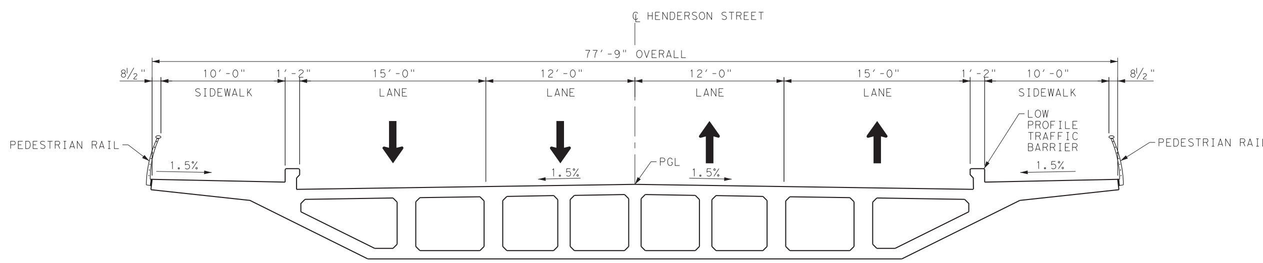


STA. 112+11.26 - 117+88.99
STA. 125+94.99- 126+71.00

HENDERSON STREET
PROPOSED RETAINING WALL SECTION

NOT TO SCALE



STA. 117+88.99 - 125+94.99

HENDERSON STREET
PROPOSED TYPICAL BRIDGE SECTION

NOT TO SCALE

TYPICAL SECTION LEGEND

1. 8" FLEX BASE TY A GR 1 (247-2041)
2. 4" HMAC TY B PG 64-22 (3224-2008)
3. 12" CONCRETE PAVEMENT (*) (360-2005, 2013)
4. 4" TYPICAL CONCRETE SIDEWALK (**) (531-2015)
5. 0' CURB OFFSET
7. 6" CRCP (360-2021)
8. 6" LIME TREATED SUBGRADE (260-2006)
9. 3' LOW PI SELECT FILL (***) (247-2060)
10. PRIME COAT MC-30 OR AE-P (310-2005)

* SEE CONCRETE PAVEMENT LAYOUT, SHEET 146.

** SEE LANDSCAPE SIDEWALK PAVING PLANS FOR LIMITS OF ALTERNATE SIDEWALK TYPE.

*** LOW PI SELECT FILL SHOULD CONSIST OF CLAYEY SAND OR SANDY CLAY HAVING A PI OF 8 TO 15, AND SHOULD BE COMPACTED IN 9 INCH LOOSE LIFTS TO 100% TEX-114E AT -2% TO 2% OF OPTIMUM.

NOTE:
SEE SHEET 531 FOR LOW PROFILE CONCRETE RAILING DETAILS AND SHEET 534 FOR MONOLITHIC CURB DETAILS.

NOTE:
7" MONOLITHIC CURBS ARE TYPE II.

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HENDERSON STREET (S.H. 199)

TYPICAL SECTIONS

Sheet 2 of 6

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
TJS	6	HP 2008 (345), etc.		SH 199, etc
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
FNI	TEXAS	FTW	TARRANT	20
CHECK	CONTROL	SECTION	JOB	
AIG	0171	05	081, etc	
CHECK				
JFD				

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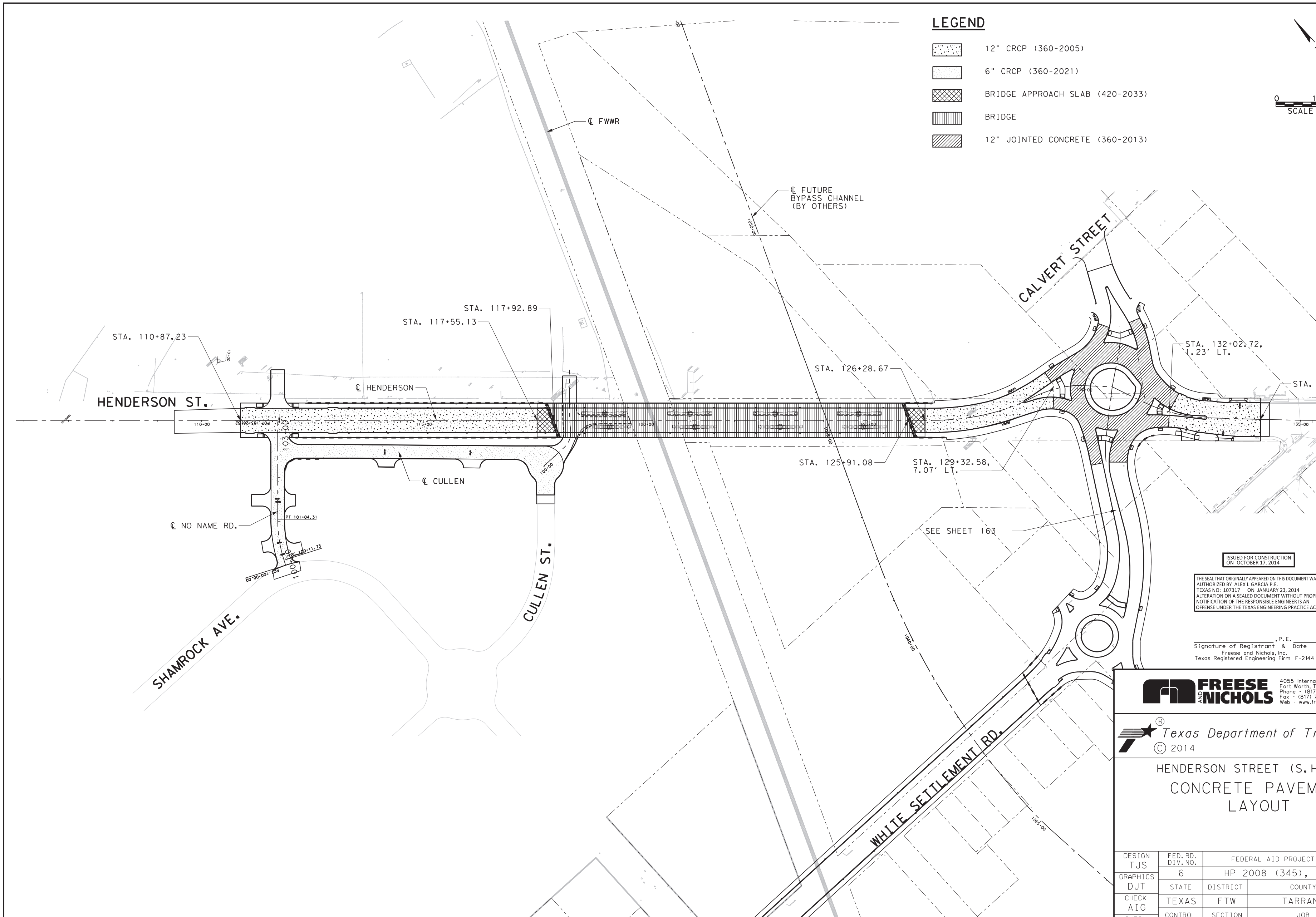

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HENDERSON STREET (S.H. 199)
CONCRETE PAVEMENT
LAYOUT

DESIGN TJS	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.			HIGHWAY NO.
	6	HP 2008 (345), etc.			SH 199, etc
GRAPHICS DJT	STATE	DISTRICT	COUNTY		SHEET NO.
CHECK AIG	TEXAS	FTW	TARRANT		146
CHECK JFD	CONTROL	SECTION	JOB		
	0171	05	081, etc		

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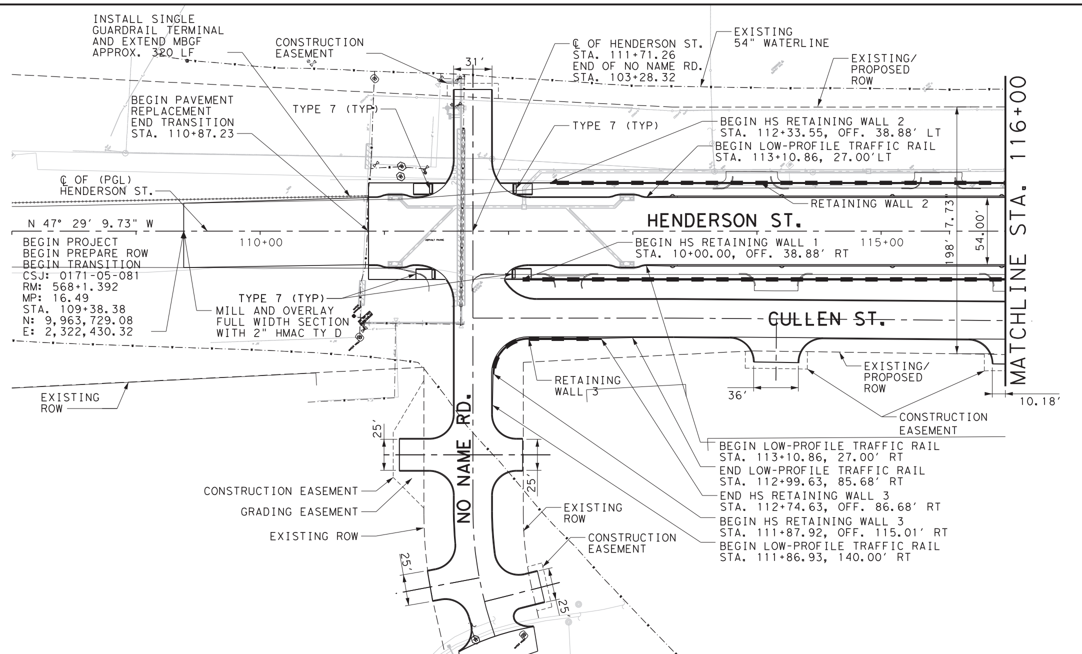
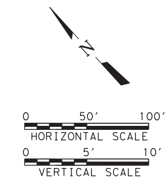


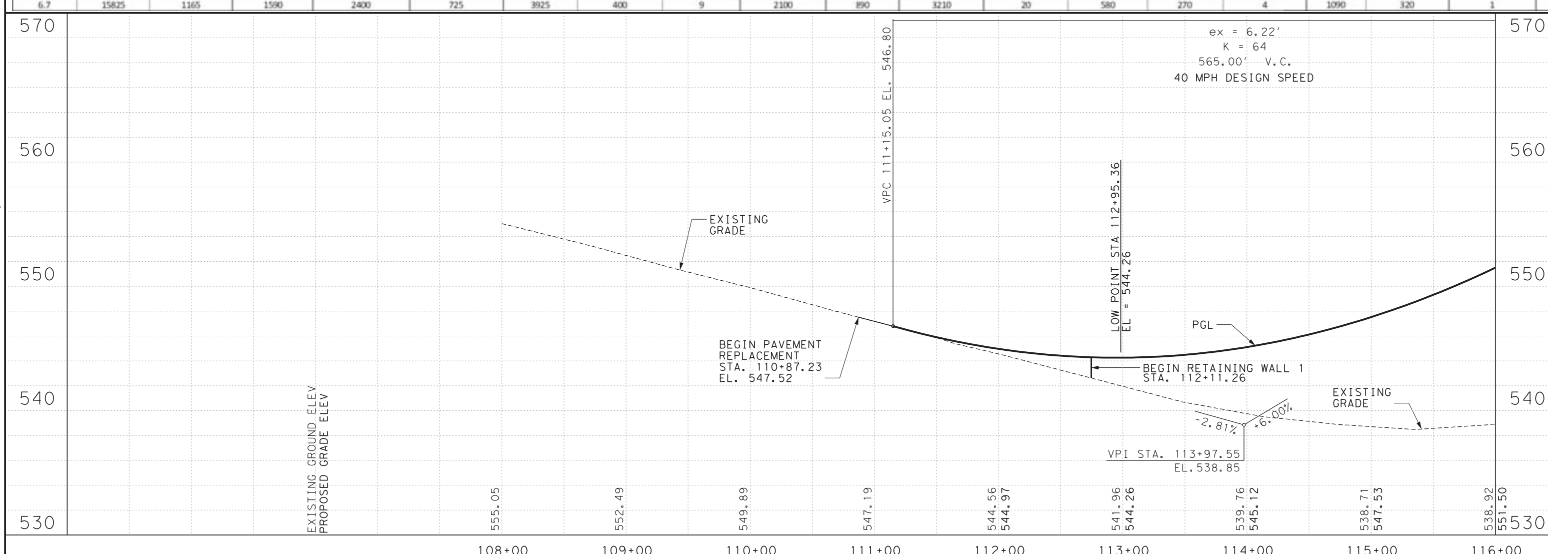


LEGEND

- EXISTING ROW
- PROPOSED ROW
- PROPOSED CONSTRUCTION EASEMENT
- PERMANENT GRADING EASEMENT
- PROPOSED ACCESS EASEMENT

NOTE:
1. DO NOT PLACE PAVEMENT ON RETAINING WALL FILL UNTIL RETAINING WALL AND BACKFILL HAVE BEEN COMPLETELY CONSTRUCTED AND ALLOWED TO SETTLE FOR SIX MONTHS.
2. SEE HENDERSON STREET PAVING LAYOUT ON SHEET 146 FOR ADDITIONAL DETAIL.

100	110	132	132	132	247	247	260	260	310	354	360	432	450	529	531	531	540	544	3268	3268
2002	2001	2004	2006	2008	2041	2060	2006	2016	2005	2045	2005	2039	2190	2006	2010	2015	2001	2001	2008	2043
PREPARING ROW	EXCAVATION (ROADWAY)	EMBANKMENT (FINAL)(DENS CONT)(TY B)	EMBANKMENT (FINAL)(DENS CONT)(TY C)	EMBANKMENT (FINAL)(DENS CONT)(TY D)	FL BS CMP IN PLC)(TY A GI 1)(FNAL POS)	FL BS (CMP IN PLC)(TY E GR 4)(FNAL POS)	LIME TRT (EXST MATL) (6")	LIME (HYD, COM, OR QK(SLURRY))	PRIME COAT (MC-30 OR AE-P)	PLANE ASPH CONC PAV (2")	CONC PVMT (CONT REINF-CRCP)(12")	RIPRAP (MOW STRIP)(4 IN)	RAIL (SPECIAL TRAFFIC) (BRIDGE)	CONC CURB (MONO) (TY II)	CURB RAMPS (TY 7)	CONC SIDEWALKS (4")	MTL W-BEAM GD FEN (TIM POST)	GUARDRAIL END TREATMENT (INSTALL)	D-GR HMA(QCQA) TY-B PG64-22	D-GR HMA(QCQA) TY-D PG70-22
STA	CY	CY	CY	CY	CY	CY	SY	TON	GAL	SY	SY	CY	LF	LF	EA	SY	LF	EA	TON	TON
6.7	15825	1165	1590	2400	725	3925	400	9	2100	890	3210	20	580	270	4	1090	320	1	770	110



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_______________, P.E.
Signature of Registrant & Date
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Texas Registered Engineering Firm F-2144

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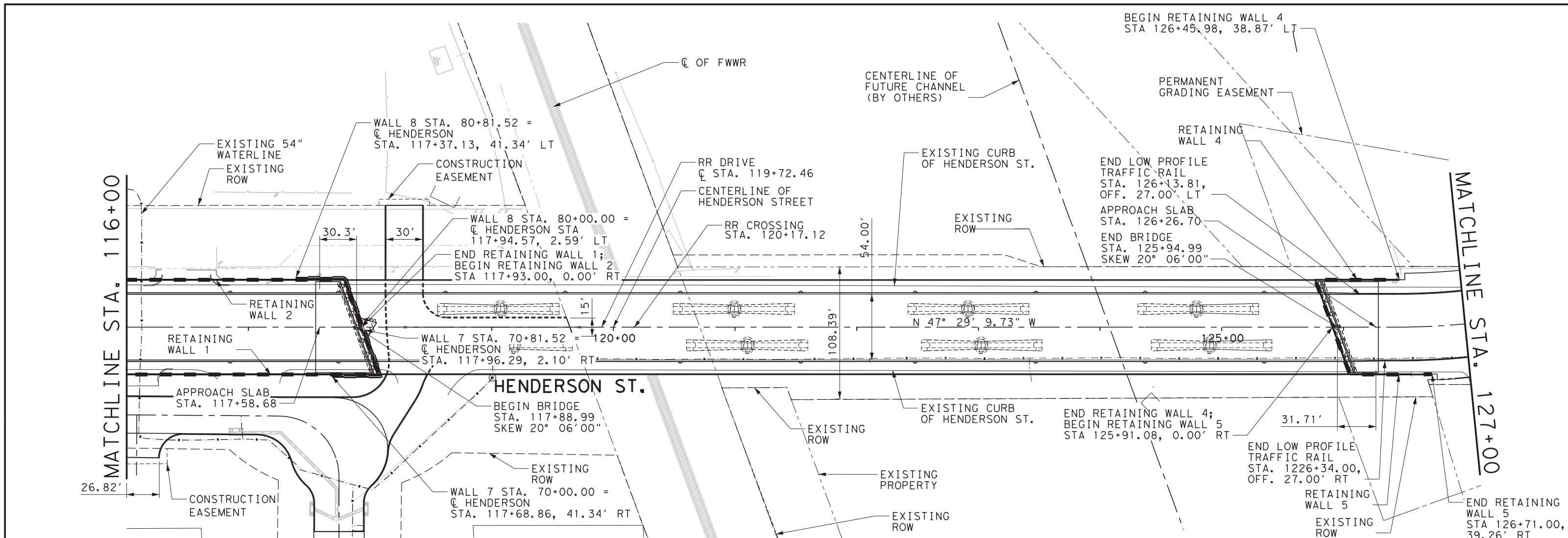
Fax - (817) 735-7491
Web - www.freese.com

Texas Department of Transportation

HENDERSON STREET (S.H. 199)
ROADWAY PLAN AND PROFILE
HENDERSON STREET
STA 108+00 TO STA 116+00

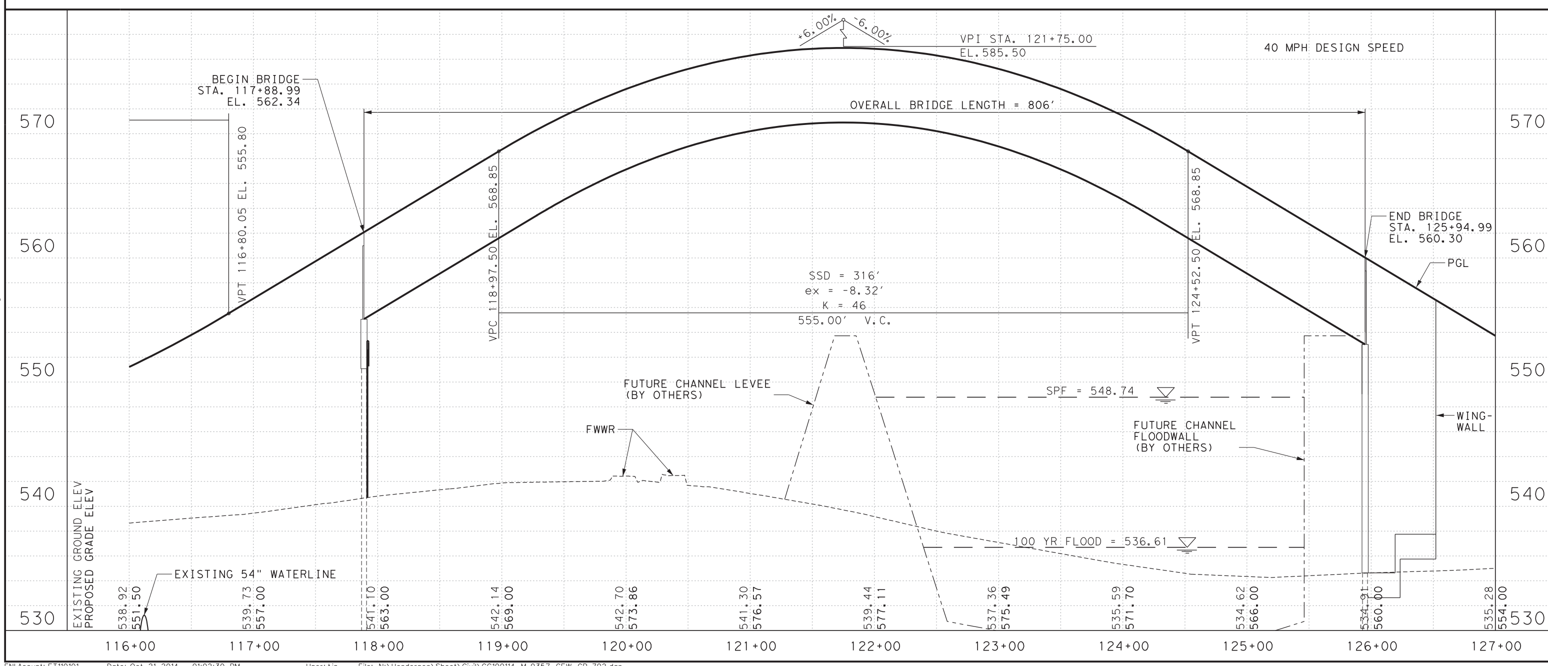
DESIGN TJS	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.			HIGHWAY NO.
GRAPHICS DJT	6	HP 2008 (345), etc.			SH 199, etc
CHECK AIG	STATE	DISTRICT	COUNTY		SHEET NO.
	TEXAS	FTW	TARRANT		147
CHECK JFD	CONTROL	SECTION	JOB		
	0171	05	081, etc		



LEGEND

- EXISTING ROW
- PROPOSED ROW
- PROPOSED CONSTRUCTION EASEMENT
- PERMANENT GRADING EASEMENT
- PROPOSED ACCESS EASEMENT
- FUTURE COFW ROW

100	110	110	132	132	132	247	247	310	360	420	450	529	531	3268
2002	2001	2002	2004	2006	2008	2041	2060	2005	2005	2033	2190	2006	2015	2008
PREPARING ROW	EXCAVATION (ROADWAY)	EXCAVATION (CHANNEL)	EMBANKMENT (FINAL)(DENS CONT)(TY B)	EMBANKMENT (FINAL)(DENS CONT)(TY C)	EMBANKMENT (FINAL)(DENS CONT)(TY D)	FL BS (CMP IN PLC)(TY A GR 1)(FNAL POS)	FL BS (CMP IN PLC)(TY E GR 4)(FNAL POS)	PRIME COAT (MC-30 OR AE-P)	CONC PVMT (CONT REINF-CRCP)(12")	CL S CONC (APPR SLAB)	RAIL (SPECIAL TRAFFIC) (BRIDGE)	CONC CURB (MONO) (TY II)	CONC SIDEWALKS (4")	D-GR HMA(QCQA) TY-B PG64-22
STA	CY	CY	CY	CY	CY	CY	CY	GAL	SY	CY	LF	LF	SY	TON
11	5233	14537	4210	1440	10600	3155	1630	800	1460	202	452	155	648	350



NOTE:
1. DO NOT PLACE PAVEMENT ON RETAINING WALL FILL UNTIL RETAINING WALL AND BACKFILL HAVE BEEN COMPLETELY CONSTRUCTED AND ALLOWED TO SETTLE FOR SIX MONTHS.
2. SEE HENDERSON STREET PAVING LAYOUT ON SHEET 146 FOR ADDITIONAL DETAIL.
3. SEE HENDERSON STREET BRIDGE LAYOUT ON SHEET 312 TO 313 FOR ADDITIONAL DETAIL.

ISSUED FOR CONSTRUCTION ON OCTOBER 17, 2014

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HENDERSON STREET (S.H. 199)

ROADWAY PLAN AND PROFILE HENDERSON STREET STA 116+00 TO STA 127+00

Sheet of

DESIGN TJS	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
GRAPHICS DJT	6	HP 2008 (345), etc.		SH 199, etc
	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK AIG	TEXAS	FTW	TARRANT	148
	CONTROL	SECTION	JOB	
CHECK JFD	0171	05	081, etc	

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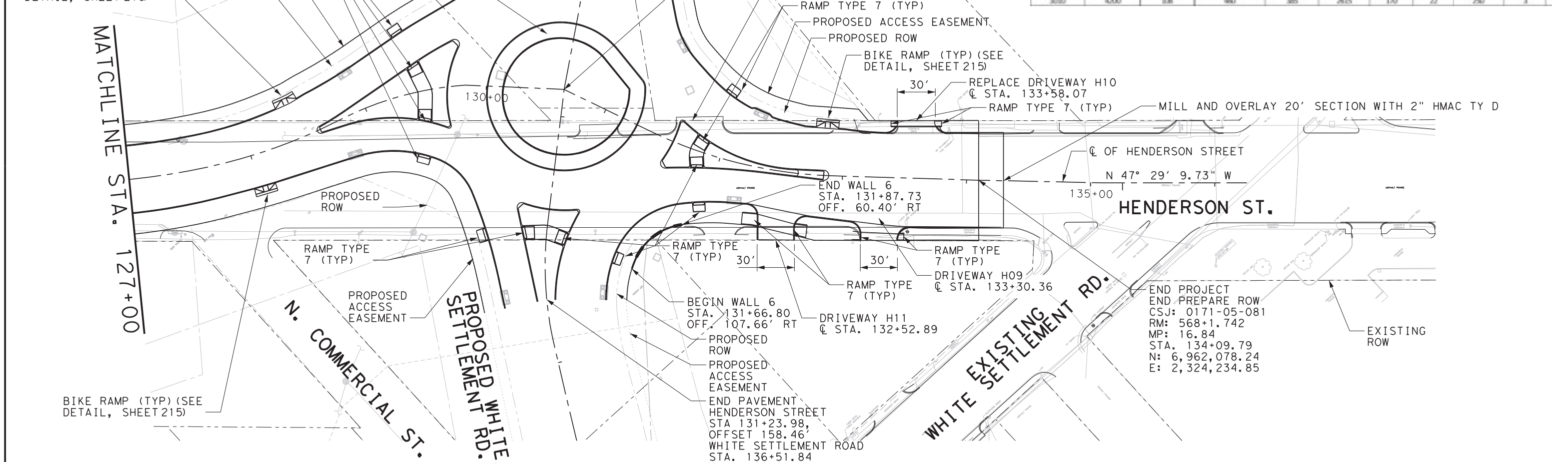
100	110	132	247	247	260	260	310	354
2002	2001	2008	2041	2060	2006	2016	2005	2045
PREPARING ROW	EXCAVATION (ROADWAY)	EMBANKMENT (FINAL)(DENS CONT)(TY D)	FL BS (CMP IN PLC)(TY A GR 1)(FNAL POS)	FL BS (CMP IN PLC)(TY E GR 4)(FNAL POS)	LIME TRT (EXST MATL) (6")	LIME (HYD, COM, OR QK(SLURRY))	PRIME COAT (MC-30 OR AE-P)	PLANE ASPH CONC PAV (2")
STA	CY	CY	CY	CY	SY	TON	GAL	SY
7.1	11100	14600	1650	13820	180	4	3700	180

360	360	368	528	529	529	530	531	531	531	3224	3224
2005	2013	2002	2002	2005	2006	2010	2010	2015	2018	2008	2043
CONC PVMT (CONT REINF-CRCP)(12")	CONC PVMT (JOINTED-CPCD)(12")	ANCHOR LUGS PAVEMENT TERMINALS	COLORED TEXTURED CONC (6")	CONC CURB (MONO) (TY I)	CONC CURB (MONO) (TY II)	DRIVEWAYS (CONC)	CURB RAMPS (TY 7)	CONC SIDEWALKS (4")	CURB RAMPS (SPECIAL)	D-GR HMA(QCQA) TY-B PG64-22	D-GR HMA(QCQA) TY-D PG70-22
SY	SY	LF	SY	LF	LF	SY	EA	SY	EA	TON	TON
3010	4200	108	460	385	2615	170	22	250	3	1340	20

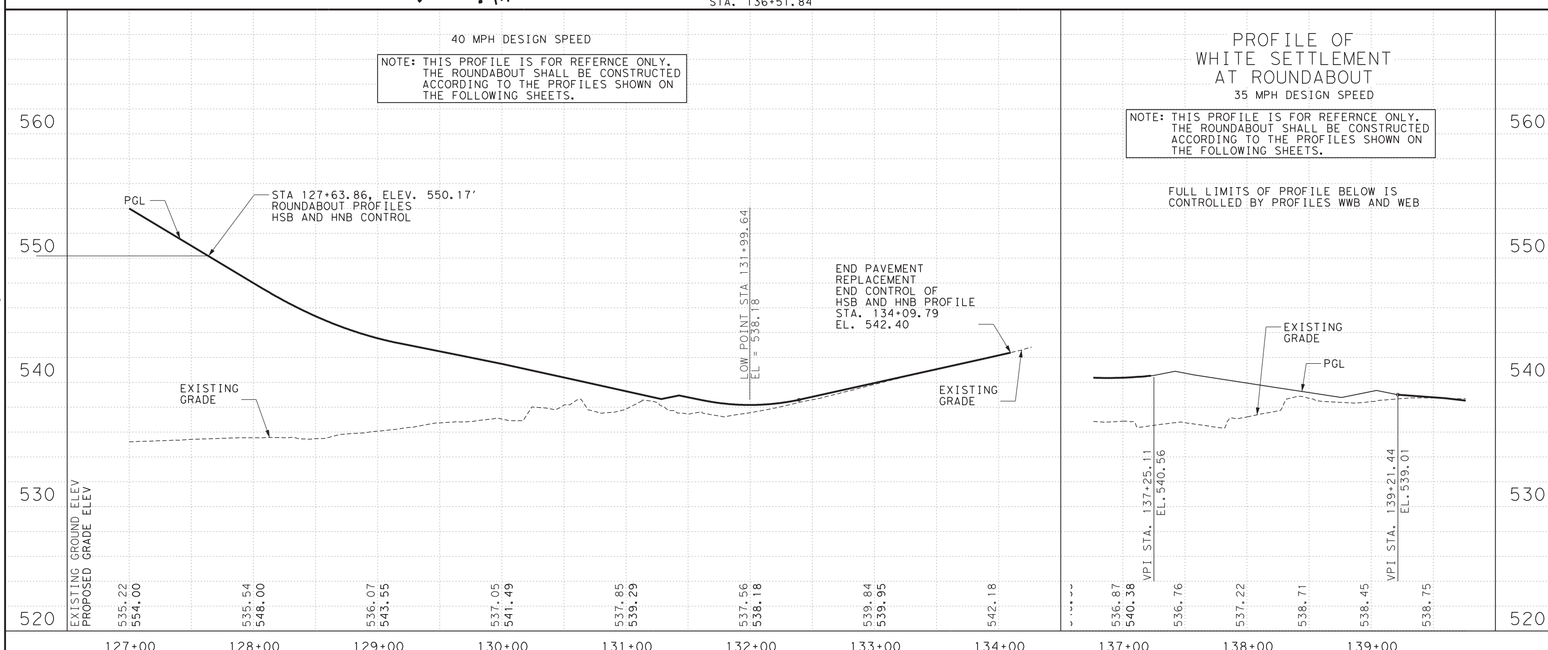


0 50' 100'
HORIZONTAL SCALE
0 5' 10'
VERTICAL SCALE

LEGEND

- EXISTING ROW
- PROPOSED ROW
- PROPOSED CONSTRUCTION EASEMENT
- PERMANENT GRADING EASEMENT
- PROPOSED ACCESS EASEMENT
- PROPOSED ACCESS/ UTILITY EASEMENT

NOTE:
1. SEE HENDERSON STREET PAVING LAYOUT ON SHEET 146 FOR ADDITIONAL DETAIL.



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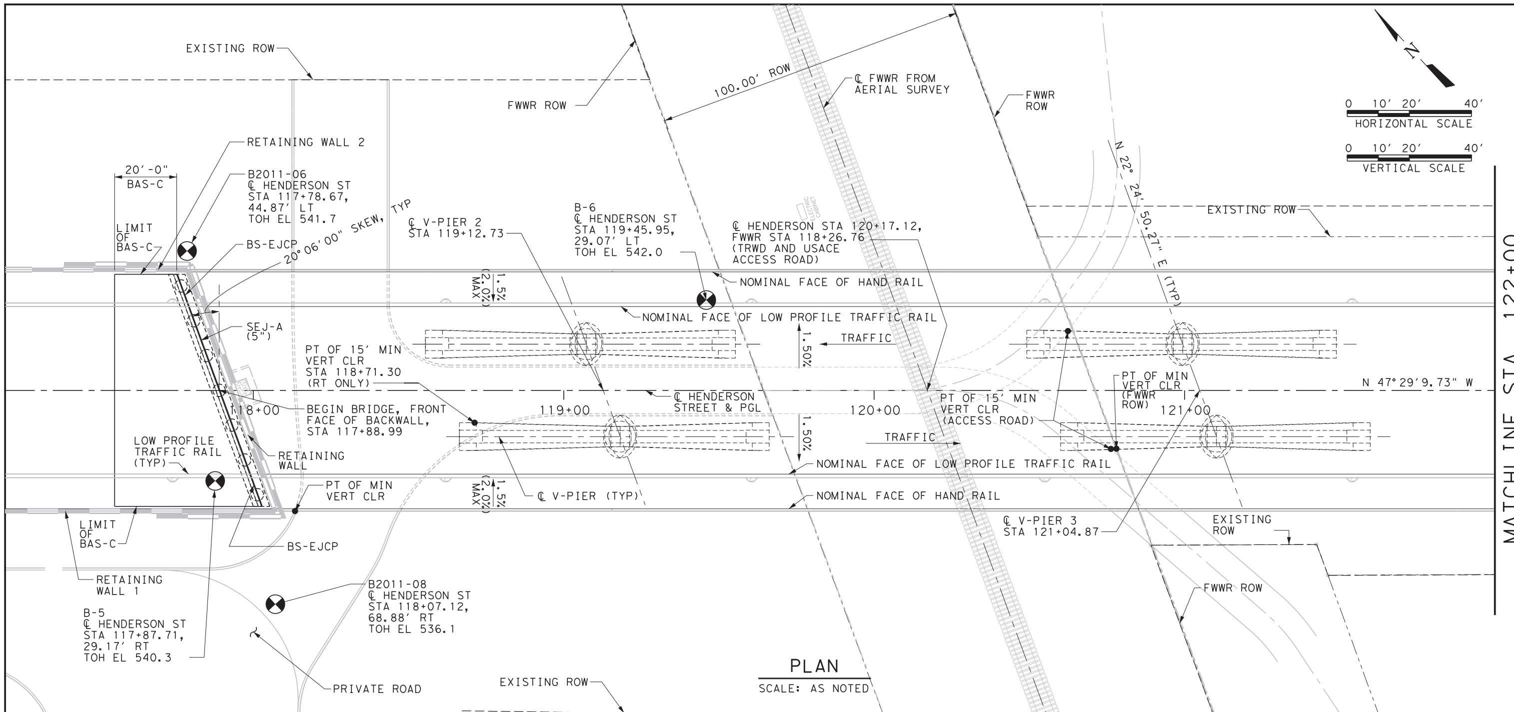
Texas Department of Transportation

HENDERSON STREET (S.H. 199)
ROADWAY PLAN AND PROFILE
HENDERSON STREET
STA 127+00 TO STA 134+09.79

Sheet of

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.			HIGHWAY NO.
TJS	6	HP 2008 (345), etc.			SH 199, etc
GRAPHICS DJT	STATE	DISTRICT	COUNTY		SHEET NO.
CHECK AIG	TEXAS	FTW	TARRANT		149
CHECK JFD	CONTROL 0171	SECTION 05	JOB 081, etc		

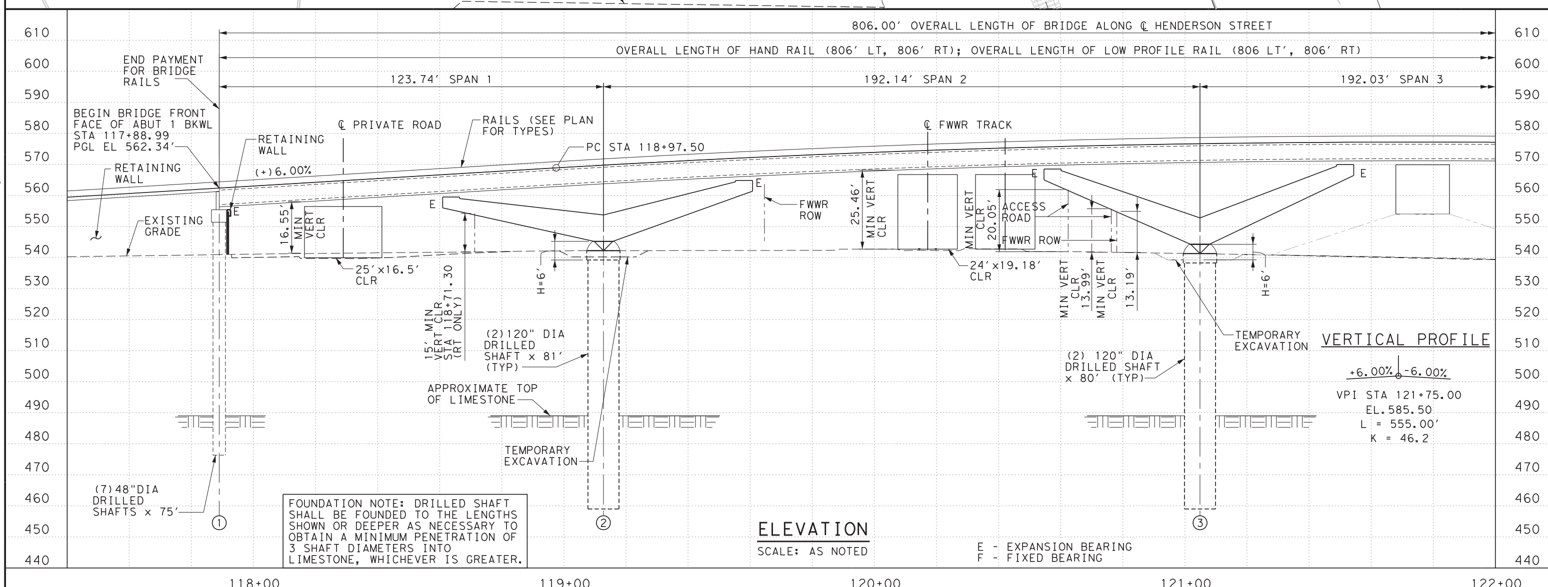


PLAN
SCALE: AS NOTED

GENERAL NOTES:

1. BRIDGE DESIGNED FOR HL93 LOADING (AND A 25 PSF FUTURE OVERLAY) IN ACCORDANCE WITH AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 4TH EDITION, AND INTERIM REVISIONS THERETO.
2. SEE ROADWAY PLANS FOR LOCATION OF BENCHMARKS FOR HORIZONTAL AND VERTICAL CONTROL.
3. "E" DENOTES EXPANSION DISC BEARING AND "F" DENOTES FIXED DISC BEARING. SEE DISC BEARING LAYOUT SHEET FOR MORE DETAILS.
4. BRIDGE PLAN AND PROFILE SHOWN AS COMPLETED STRUCTURE. SEE SEQUENCE OF CONSTRUCTION FOR TEMPORARY SUPPORTING STRUCTURES REQUIRED.
5. BRIDGE SIDEWALKS ARE NOT DESIGNED FOR ANY MOTOR VEHICLE LIVE LOAD. CONTRACTOR SHALL NOT HAVE VEHICULAR LIVE LOAD ON SIDEWALKS DURING CONSTRUCTION.
6. SEE VERTICAL CLEARANCE DIAGRAMS FOR CONSTRUCTION CLEARANCES AND REQUIREMENTS.
7. DESIGN SPEED = 40 MPH
   FUNCTIONAL CLASS = URBAN PRINCIPAL ARTERIAL
   ADT (2015) = 31,700
   ADT (2035) = 38,700
   ADT (2045) = 42,700
8. VERIFY LOCATIONS OF ALL UTILITIES PRIOR TO CONSTRUCTION.
9. THE "H" VALUES SHOWN AS ESTIMATED COLUMN HEIGHTS. THE CONTRACTOR IS RESPONSIBLE FOR CALCULATING THE ACTUAL COLUMN HEIGHTS BASED ON FIELD CONDITIONS.
10. REFER TO BORING LOGS SHEETS FOR ADDITIONAL INFORMATION.
11. EXISTING STORM DRAIN TO BE PROTECTED DURING CONSTRUCTION.
12. HORIZONTAL CLEARANCES ARE MEASURED FROM EDGE OF PAVEMENT.
13. REFER TO ILLUMINATION PLANS FOR LIGHT LOCATIONS ON BRIDGE.
12. USACE DRILLED SHAFTS TO BE CONSTRUCTED BY USACE CONTRACTOR. COORDINATE WITH USACE DRILLED SHAFT CONTRACTOR DURING BRIDGE CONSTRUCTION. ALLOW USACE DRILLED SHAFT CONTRACTOR TO CONSTRUCT USACE DRILLED SHAFTS BEFORE COMPLETION OF BRIDGE. REFER TO "EXHIBIT B" SHEETS FOR COORDINATION PURPOSES ONLY.

NBI: 02-220-0-0171-05-237



FOUNDATION NOTE: DRILLED SHAFT SHALL BE FOUNDED TO THE LENGTHS SHOWN OR DEEPER AS NECESSARY TO OBTAIN A MINIMUM PENETRATION OF 3 SHAFT DIAMETERS INTO LIMESTONE, WHICHEVER IS GREATER.

ELEVATION
SCALE: AS NOTED

E - EXPANSION BEARING
F - FIXED BEARING

ISSUED FOR CONSTRUCTION ON OCTOBER 17, 2014

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Signature of Registrant & Date
Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144

HL93 LOADING

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Fort Worth, TX 76109-4895
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Fax - (817) 735-7491
Web - www.freese.com

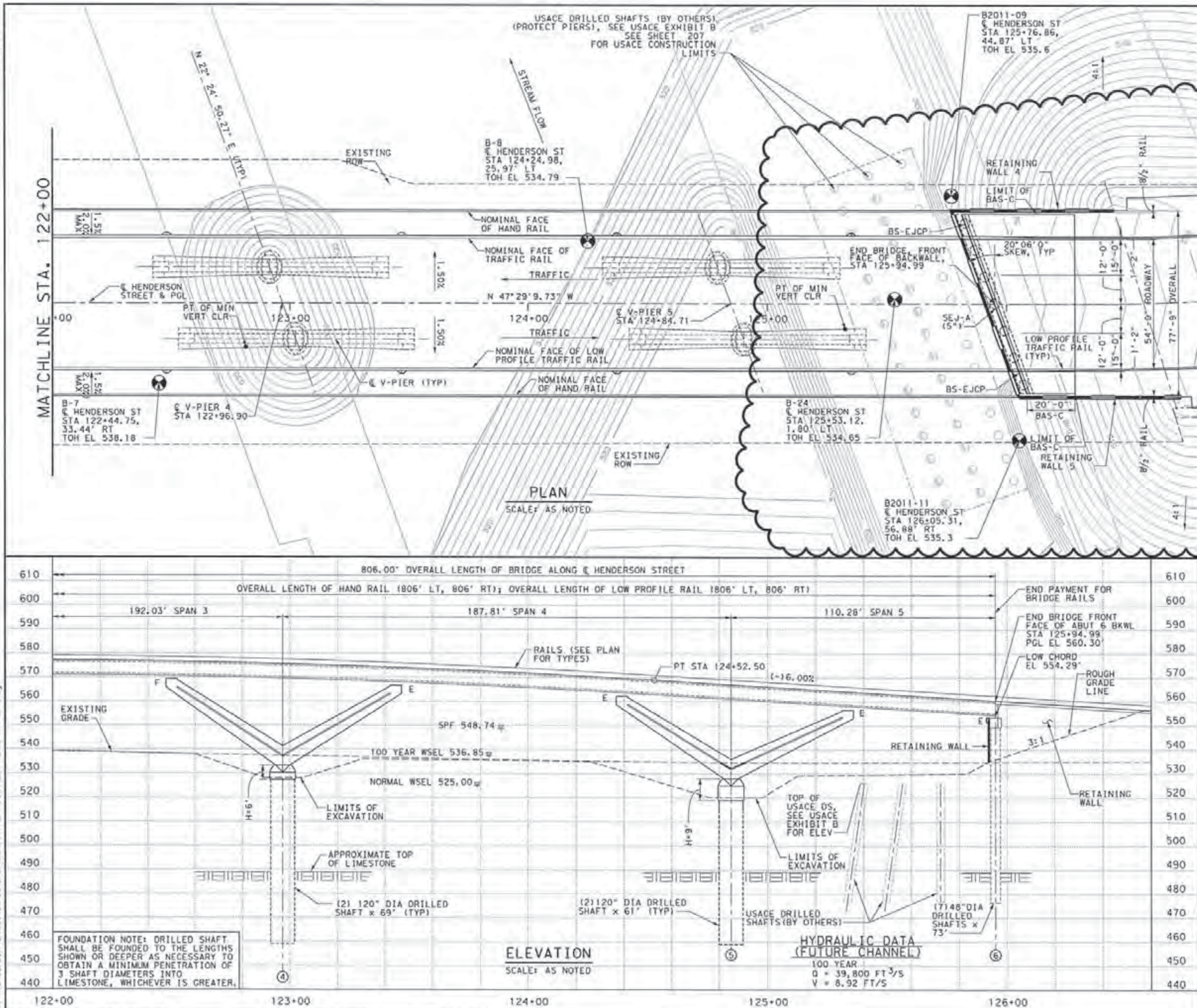
Texas Department of Transportation

HENDERSON STREET (S.H. 199)

BRIDGE LAYOUT
STA 117+88.99 TO STA 122+00.00

Sheet 1 of 2

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
HM	6	HP 2008 (345), etc.		SH 199, etc
GRAPHICS KAC	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK VBK	TEXAS	FTW	TARRANT	312
CHECK JFD	CONTROL 0171	SECTION 05	JOB 081, etc	



NO.	ISSUE	BY	DATE
1	USACE PIER REVISIONS	TJS	6-10-12

0 10' 20' 40' HORIZONTAL SCALE

0 10' 20' 40' VERTICAL SCALE

06.10.14

Signature of Registrant & Date

Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144

HL93 LOADING

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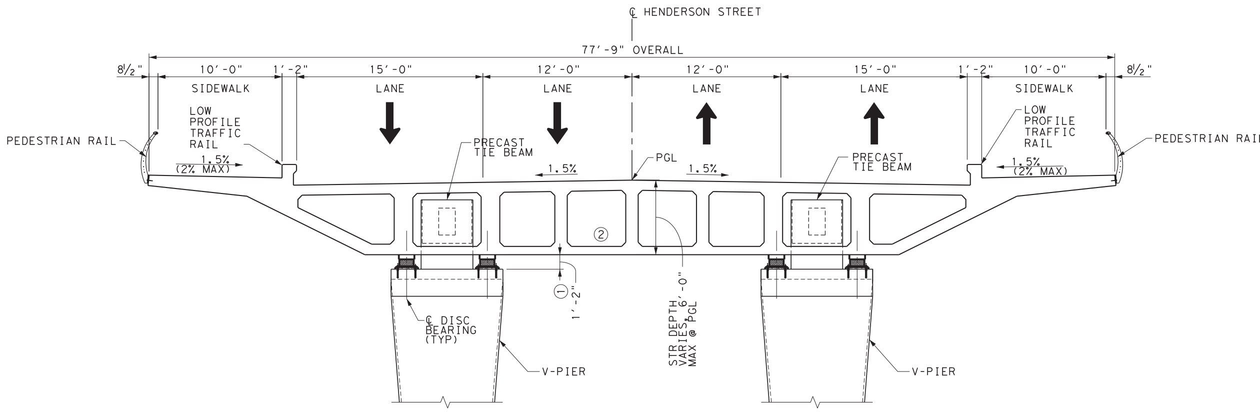
HENDERSON STREET (S.H. 199)

BRIDGE LAYOUT
STA 122+00.00 TO
STA 125+94.99

Sheet 2 of 2

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
HM	6	HP 2008 (345), etc.		SH 199, etc
GRAPHICS KAC	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK VBK	TEXAS	FTW	TARRANT	313
CHECK JFD	CONTROL 0171	SECTION 05	JOB 081, etc	



1. CONTRACTOR TO COORDINATE WITH DISC BEARING MANUFACTURER FOR ACTUAL HEIGHT.
2. SEE FIBER OPTICS SHEETS FOR CONDUIT LOCATIONS.

BRIDGE CROSS-SECTION

NOT TO SCALE

ISSUED FOR CONSTRUCTION ON OCTOBER 17, 2014

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, P.E.
Signature of Registrant & Date
Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144

HL93 LOADING

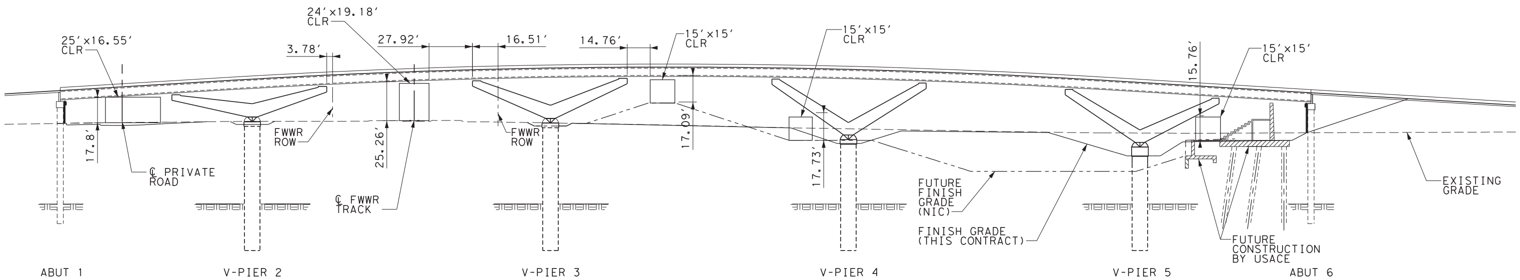
FREESE AND NICHOLS
4055 International Plaza, Suite 200
Fort Worth, TX 76109-4895
Phone - (817) 735-7300
Fax - (817) 735-7491
Web - www.freese.com

Texas Department of Transportation

HENDERSON STREET (S.H. 199)
BRIDGE TYPICAL CROSS-SECTION

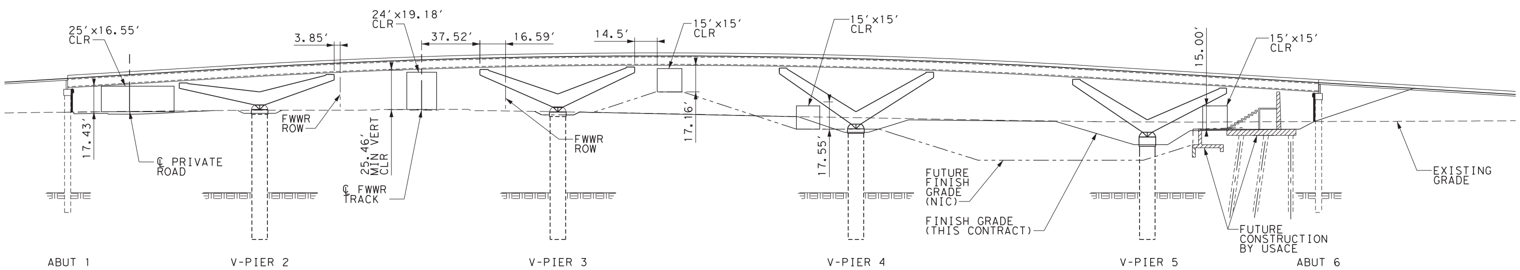
Sheet 1 of 1

DESIGN HM	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
	6	HP 2008 (345), etc.		SH 199, etc
GRAPHICS KAC	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK VBK	TEXAS	FTW	TARRANT	314
CHECK JFD	CONTROL	SECTION	JOB	
	0171	05	081, etc	



LEFT V-PIER CROSS-SECTION

NOT TO SCALE



RIGHT V-PIER CROSS-SECTION

NOT TO SCALE

NOTE:
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THIS SHEET IS FOR INFORMATIONAL PURPOSES ONLY.

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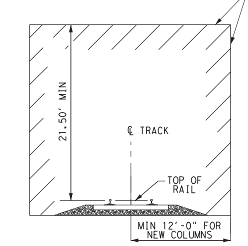

MINIMUM CONSTRUCTION CLEARANCE ENVELOPE

(NORMAL TO RAILROAD)
12'-0" FOR FWWR

ISSUED FOR CONSTRUCTION ON OCTOBER 17, 2014

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Fort Worth, TX 76109-4895
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HENDERSON STREET (S.H. 199)

VERTICAL CLEARANCE DIAGRAMS

Sheet 1 of 1

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
HM	6	HP 2008 (345), etc.		SH 199, etc
GRAPHICS KAC	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK VBK	TEXAS	FTW	TARRANT	315
CHECK JFD	CONTROL	SECTION	JOB	
	0171	05	081, etc	

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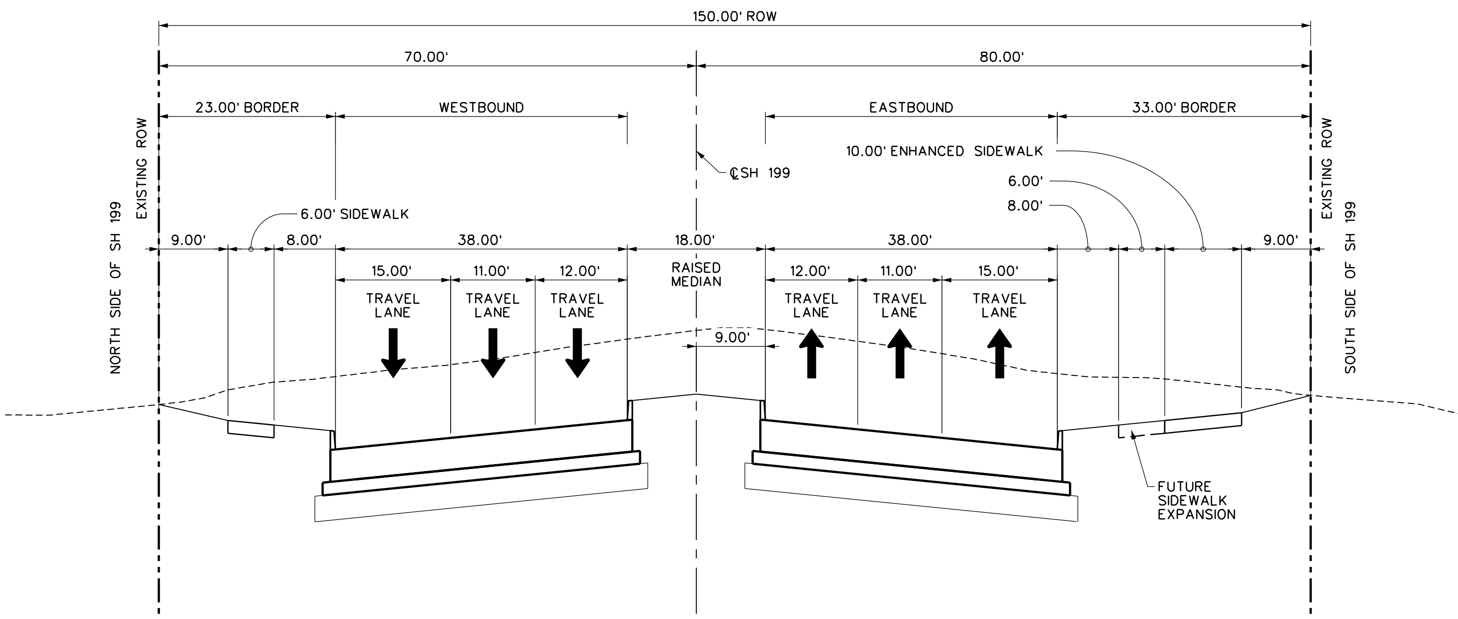
Attachment B

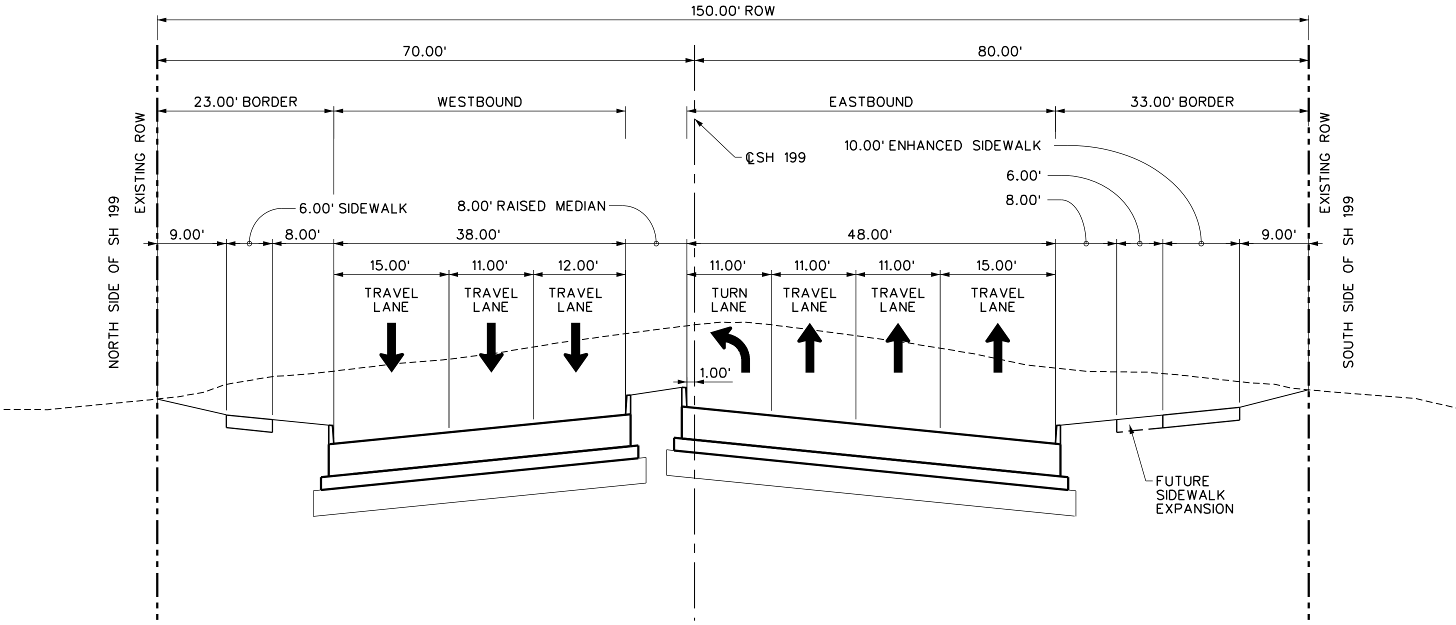
Section 1 - Recommended Typical Sections



RECOMMENDED
SH 199 TYPICAL SECTION
6 LANES
150' ROW WIDTH

NOT TO SCALE

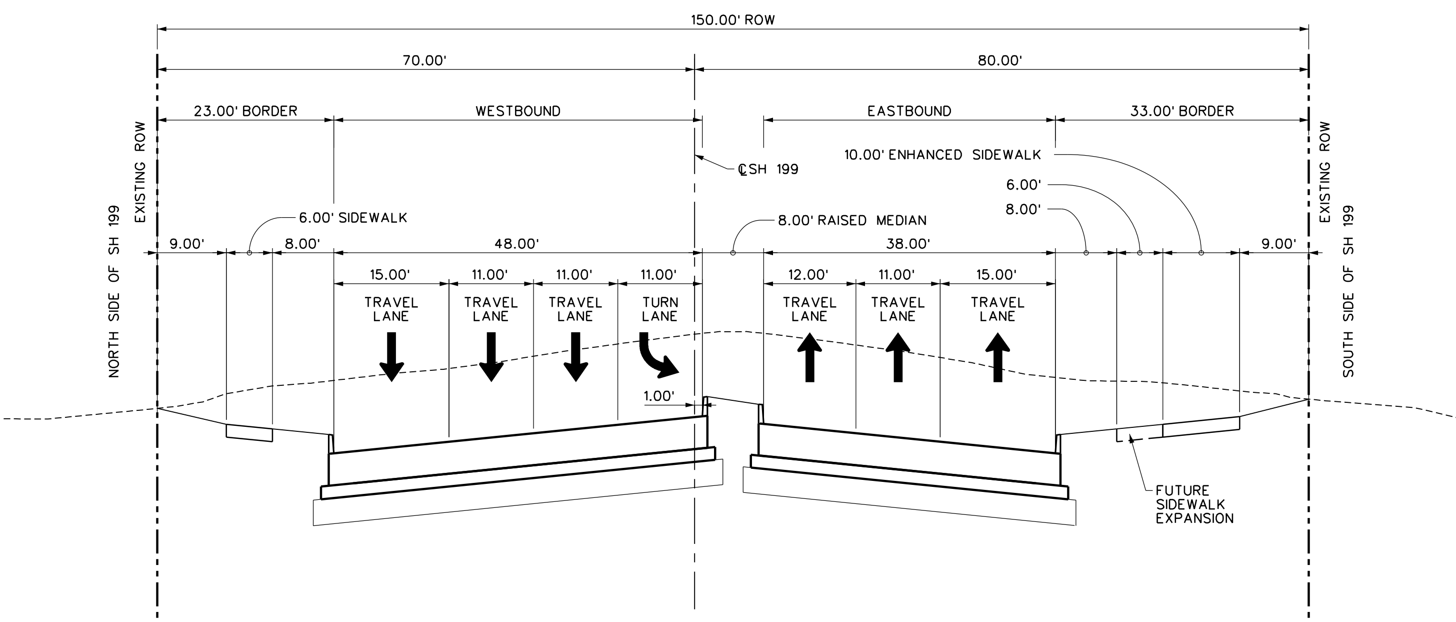
SECTION 1
FROM IH-820 TO OHIO GARDEN ROAD



RECOMMENDED
SH 199 TYPICAL SECTION
6 LANES
150' ROW WIDTH

NOT TO SCALE

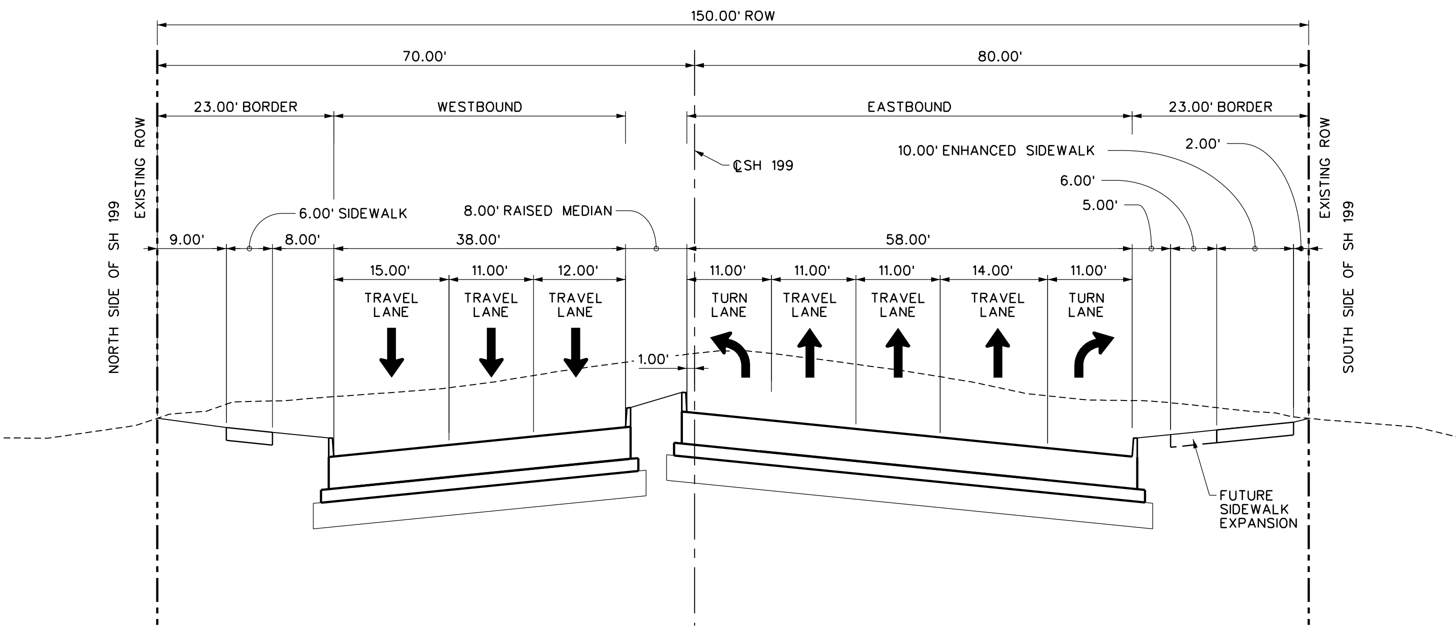
SECTION 1
FROM IH-820 TO OHIO GARDEN ROAD
EASTBOUND LEFT TURN LANE
AT AZLE WAY, CORNER LANE, NORFLEET STREET, BIWAY STREET, CHEYENNE STREET, SKYLINE DRIVE, BEVERLY HILLS DRIVE, CAPRI DRIVE, TOWN AND COUNTRY CENTER, WALMART DRIVE, AND BELLE AVENUE



RECOMMENDED
SH 199 TYPICAL SECTION
6 LANES
150' ROW WIDTH

NOT TO SCALE

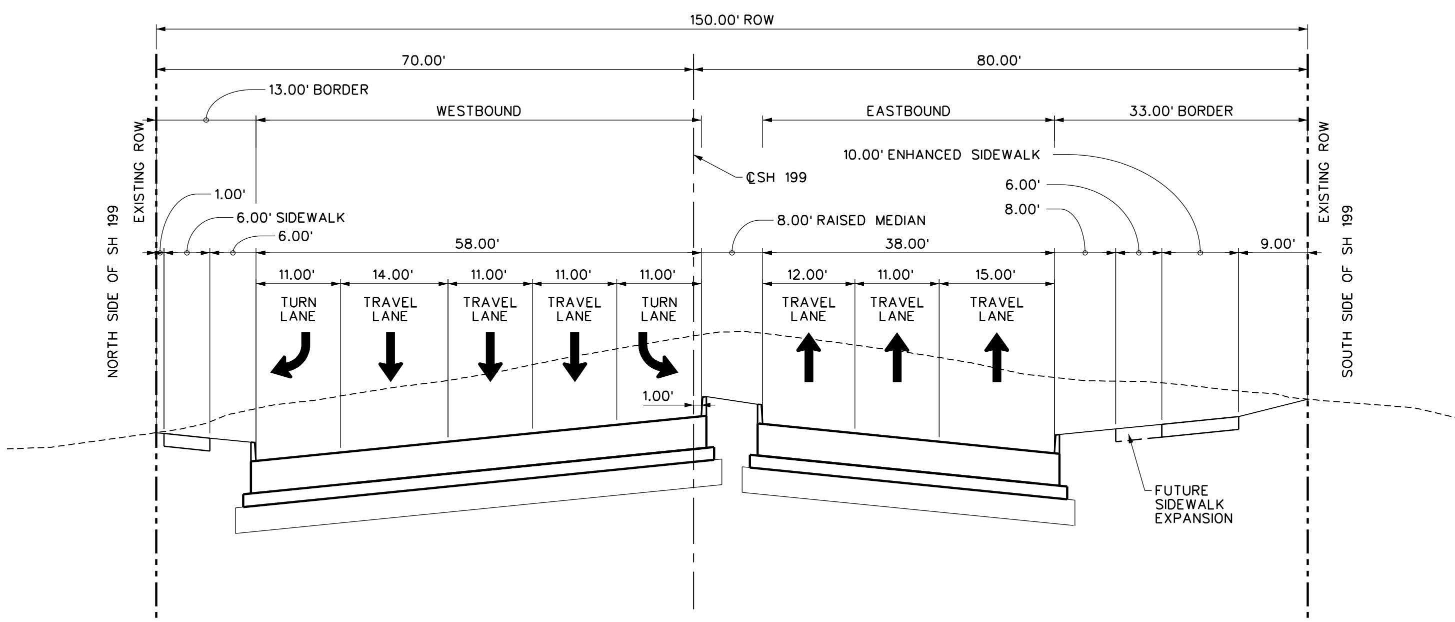
SECTION 1
FROM IH-820 TO OHIO GARDEN ROAD
WESTBOUND LEFT TURN LANE
AT OLD MILL CREEK ROAD, ROBERTS CUT OFF ROAD, CORNER LANE, NORFLEET STREET, BIWAY STREET, BEVERLY HILLS DRIVE, CAPRI DRIVE, AND WALMART DRIVE



RECOMMENDED
SH 199 TYPICAL SECTION
6 LANES
150' ROW WIDTH

NOT TO SCALE

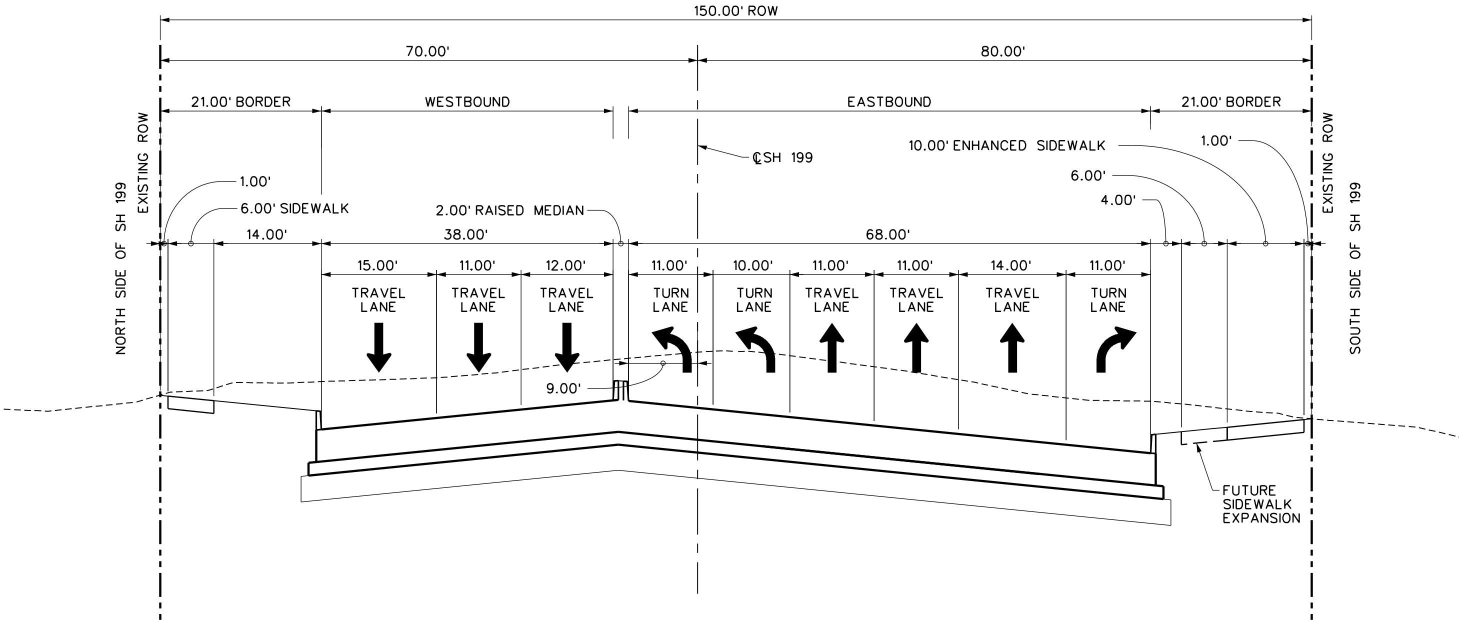
SECTION 1
FROM IH-820 TO OHIO GARDEN ROAD
EASTBOUND LEFT AND RIGHT TURN LANES
AT ROBERTS CUT OFF ROAD AND LONG AVENUE



RECOMMENDED
SH 199 TYPICAL SECTION
6 LANES
150' ROW WIDTH

NOT TO SCALE

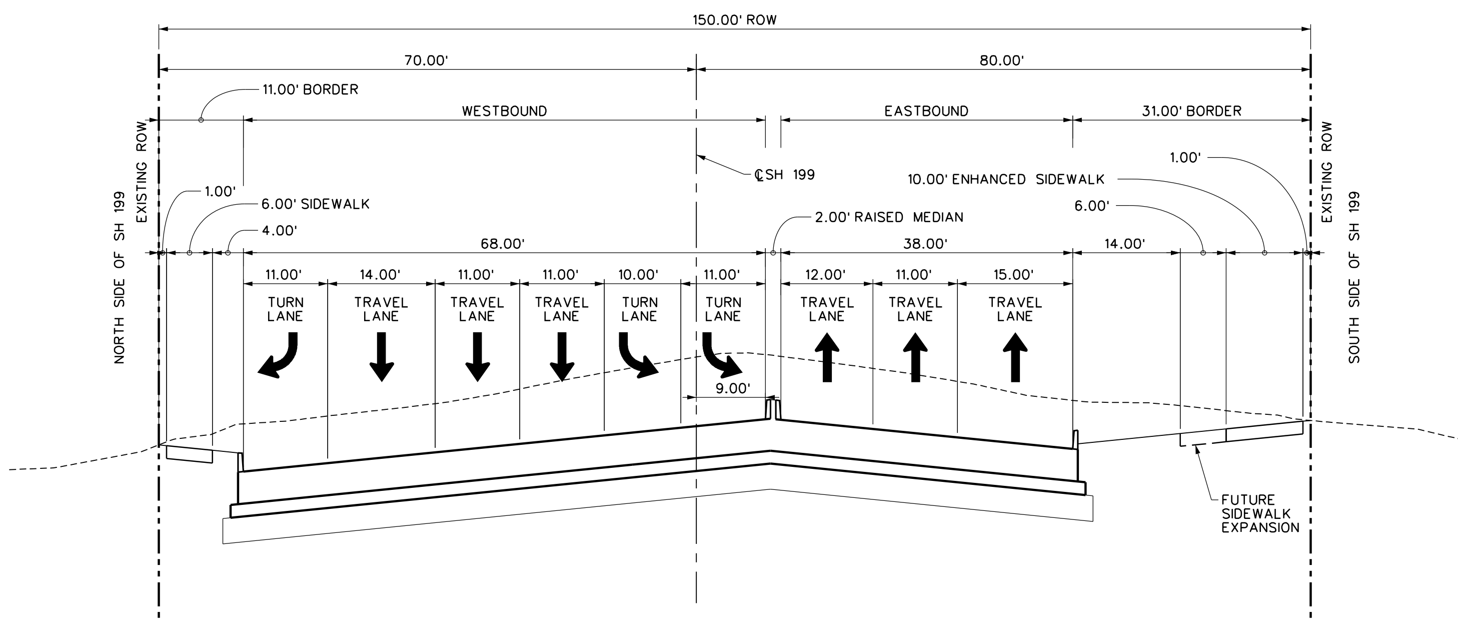
SECTION 1
FROM IH-820 TO OHIO GARDEN ROAD
WESTBOUND LEFT AND RIGHT TURN LANES
AT SKYLINE DRIVE AND LONG AVENUE



RECOMMENDED
SH 199 TYPICAL SECTION
6 LANES
150' ROW WIDTH

NOT TO SCALE

SECTION 1
FROM IH-820 TO OHIO GARDEN ROAD
EASTBOUND DUAL LEFT AND RIGHT TURN LANES
AT SH 183



RECOMMENDED
SH 199 TYPICAL SECTION
6 LANES
150' ROW WIDTH

NOT TO SCALE

SECTION 1
FROM IH-820 TO OHIO GARDEN ROAD
WESTBOUND DUAL LEFT AND RIGHT TURN LANES
AT SH 183

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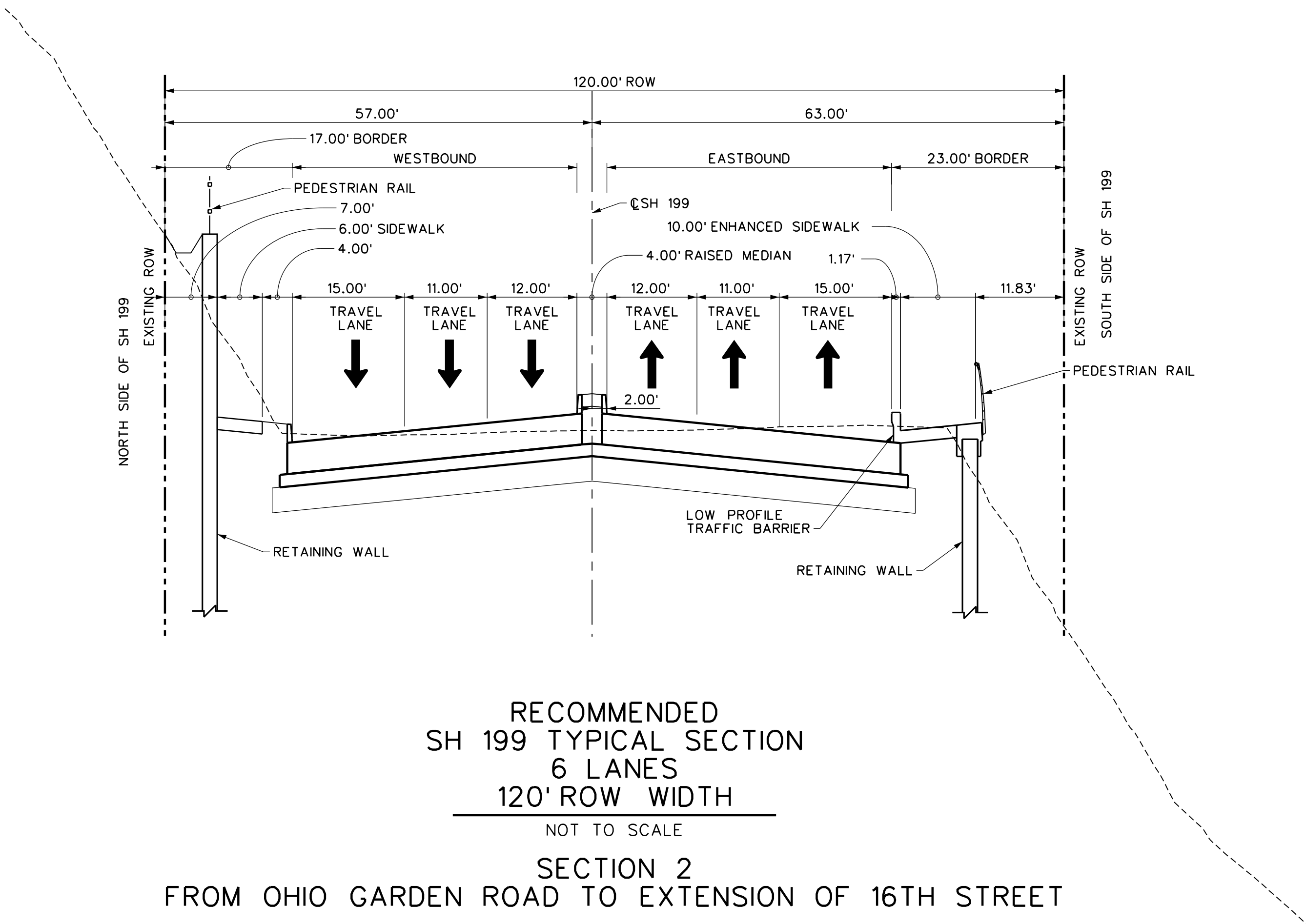
Attachment C

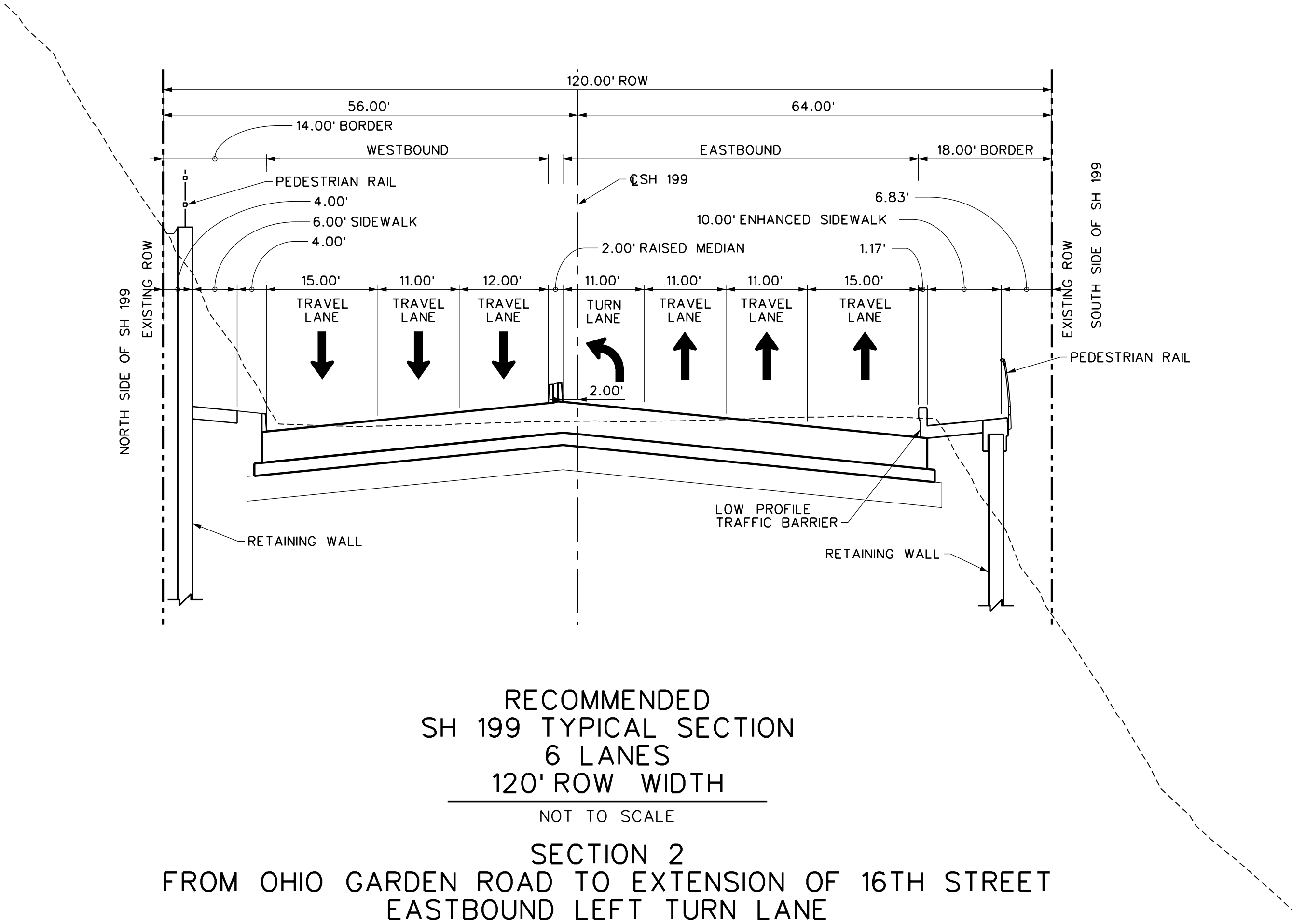
Section 2 - Recommended Typical Sections



RECOMMENDED
SH 199 TYPICAL SECTION
6 LANES
120' ROW WIDTH

NOT TO SCALE

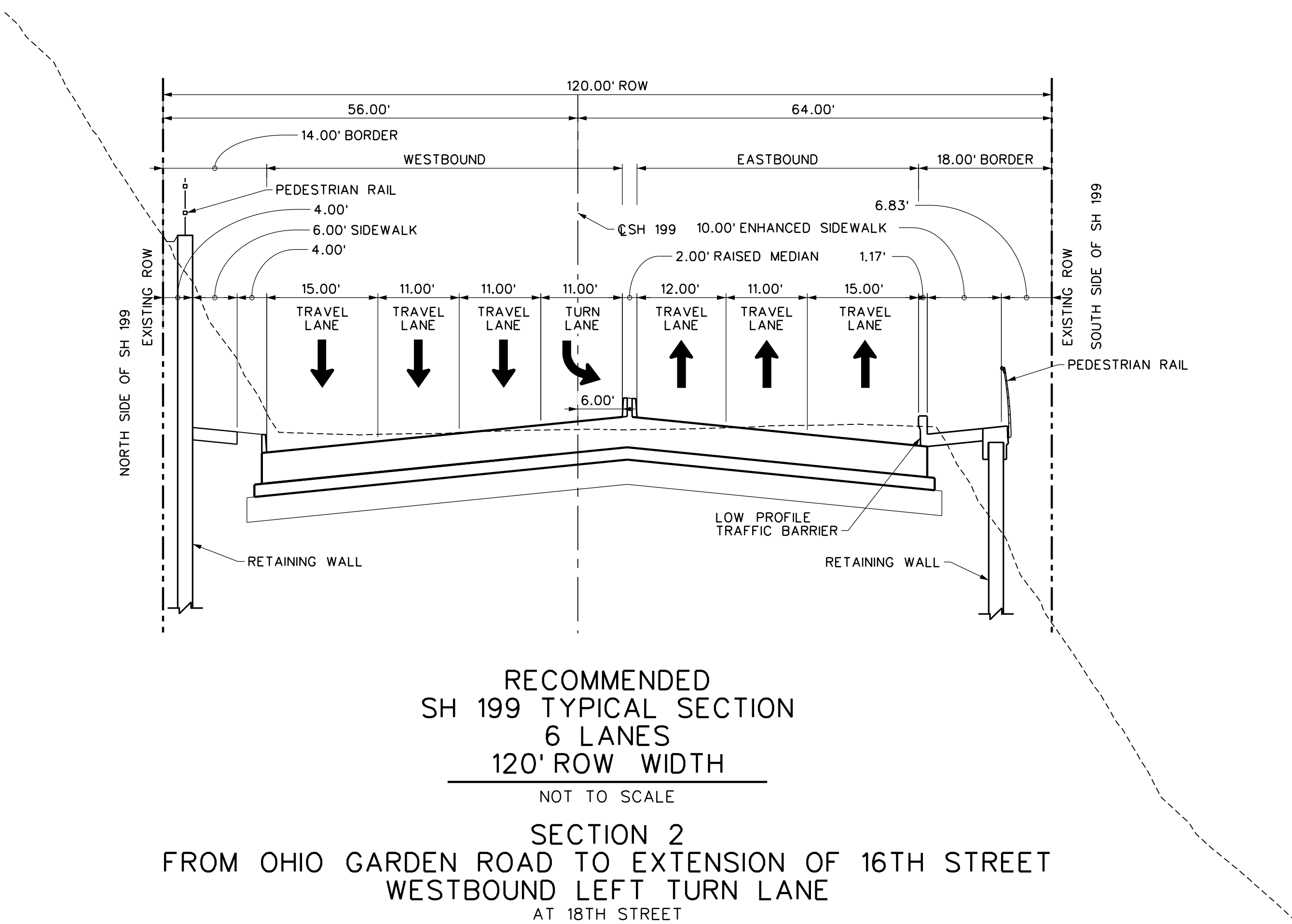
SECTION 2
FROM OHIO GARDEN ROAD TO EXTENSION OF 16TH STREET



RECOMMENDED
SH 199 TYPICAL SECTION
6 LANES
120' ROW WIDTH

NOT TO SCALE

SECTION 2
FROM OHIO GARDEN ROAD TO EXTENSION OF 16TH STREET
EASTBOUND LEFT TURN LANE
AT 21ST STREET AND 18TH STREET



RECOMMENDED
SH 199 TYPICAL SECTION
6 LANES
120' ROW WIDTH

NOT TO SCALE

SECTION 2
FROM OHIO GARDEN ROAD TO EXTENSION OF 16TH STREET
WESTBOUND LEFT TURN LANE
AT 18TH STREET

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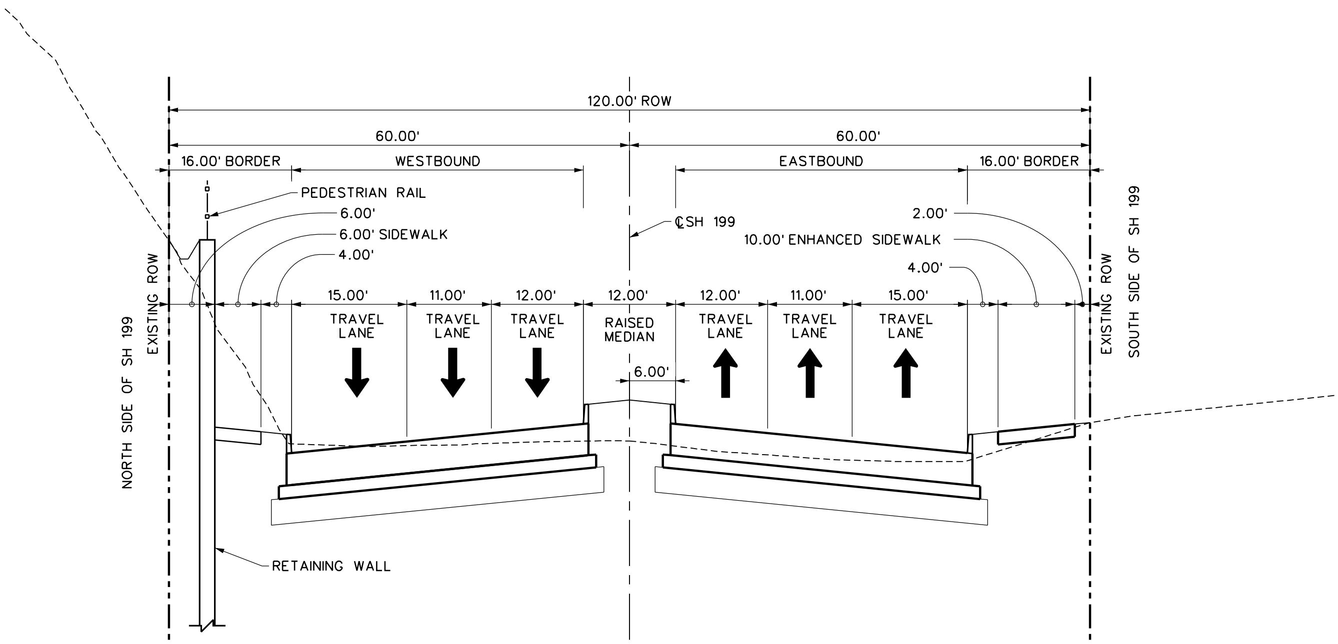
Attachment D

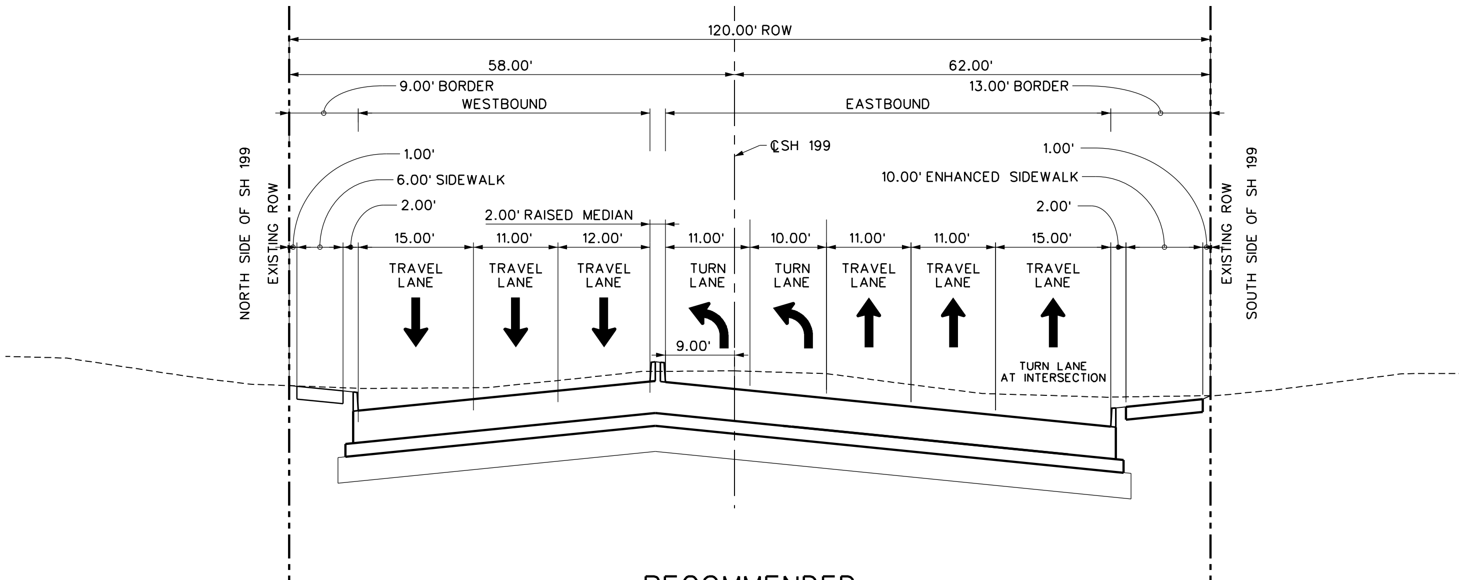
Section 3 - Recommended Typical Sections



RECOMMENDED
SH 199 TYPICAL SECTION
6 LANES
120' ROW WIDTH

NOT TO SCALE

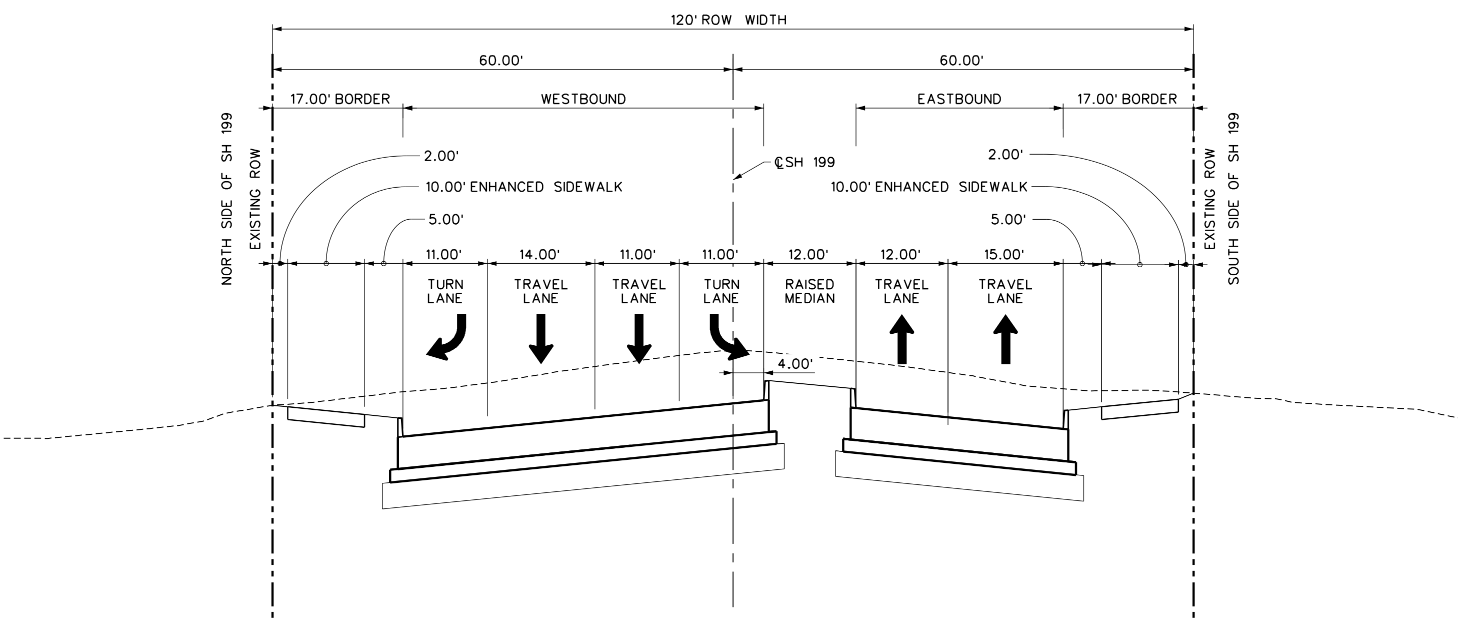
SECTION 3
FROM EXTENSION OF 16TH STREET TO UNIVERSITY DRIVE



RECOMMENDED
SH 199 TYPICAL SECTION AT TURN LANE
6 LANES
120' ROW WIDTH

NOT TO SCALE

SECTION 3
FROM EXTENSION OF 16TH STREET TO UNIVERSITY DRIVE
EASTBOUND DUAL LEFT TURN LANES
AT UNIVERSITY DRIVE



RECOMMENDED
SH 199 TYPICAL SECTION AT TURN LANE
4 LANES
100'-120' ROW WIDTH

NOT TO SCALE

SECTION 3
FROM EXTENSION OF 16TH STREET TO UNIVERSITY DRIVE
WESTBOUND LEFT AND RIGHT TURN LANES
AT UNIVERSITY DRIVE

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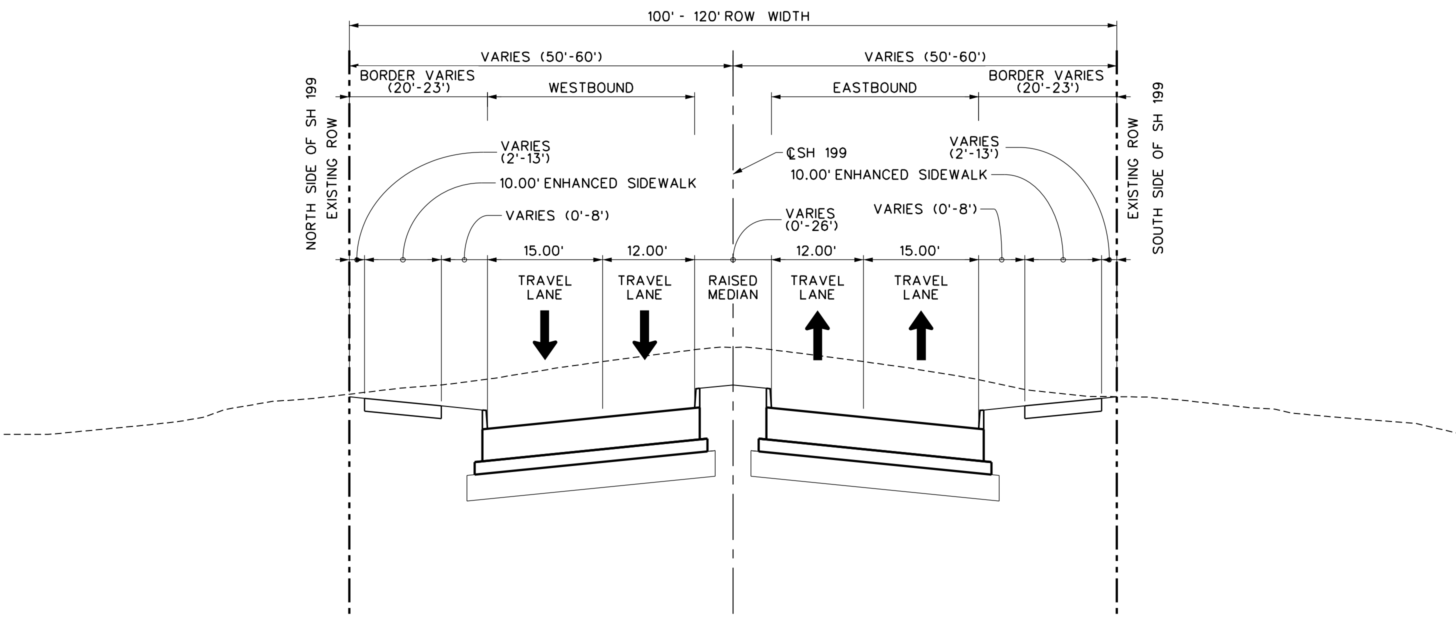
Attachment E

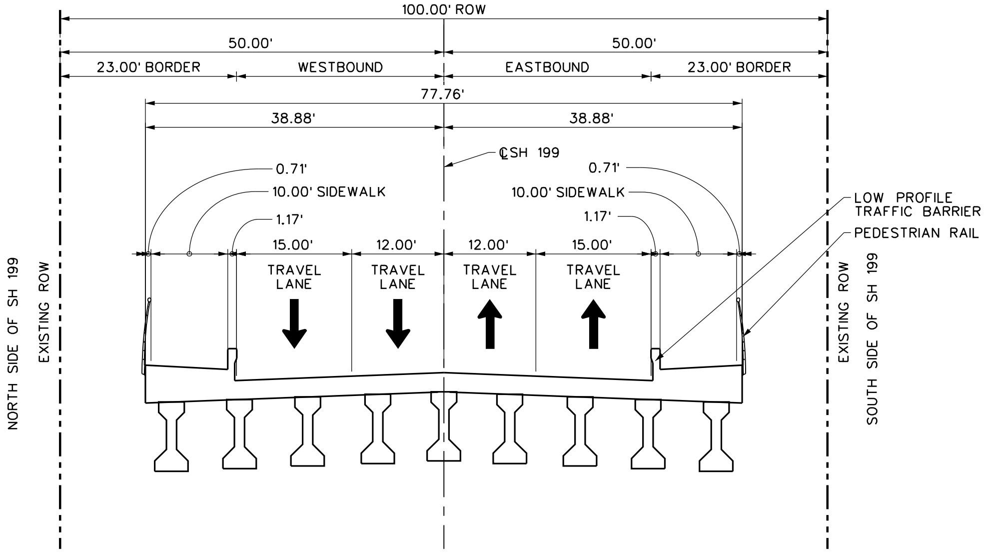
Section 4 - Recommended Typical Sections



RECOMMENDED
SH 199 TYPICAL SECTION
4 LANES
100'-120' ROW WIDTH

NOT TO SCALE

SECTION 4
FROM UNIVERSITY DRIVE TO SHAMROCK AVENUE



RECOMMENDED
SH 199 TYPICAL SECTION
4 LANES
100' ROW WIDTH

NOT TO SCALE

SECTION 4
FROM UNIVERSITY DRIVE TO SHAMROCK AVENUE
BRIDGE AT WEST FORK TRINITY RIVER

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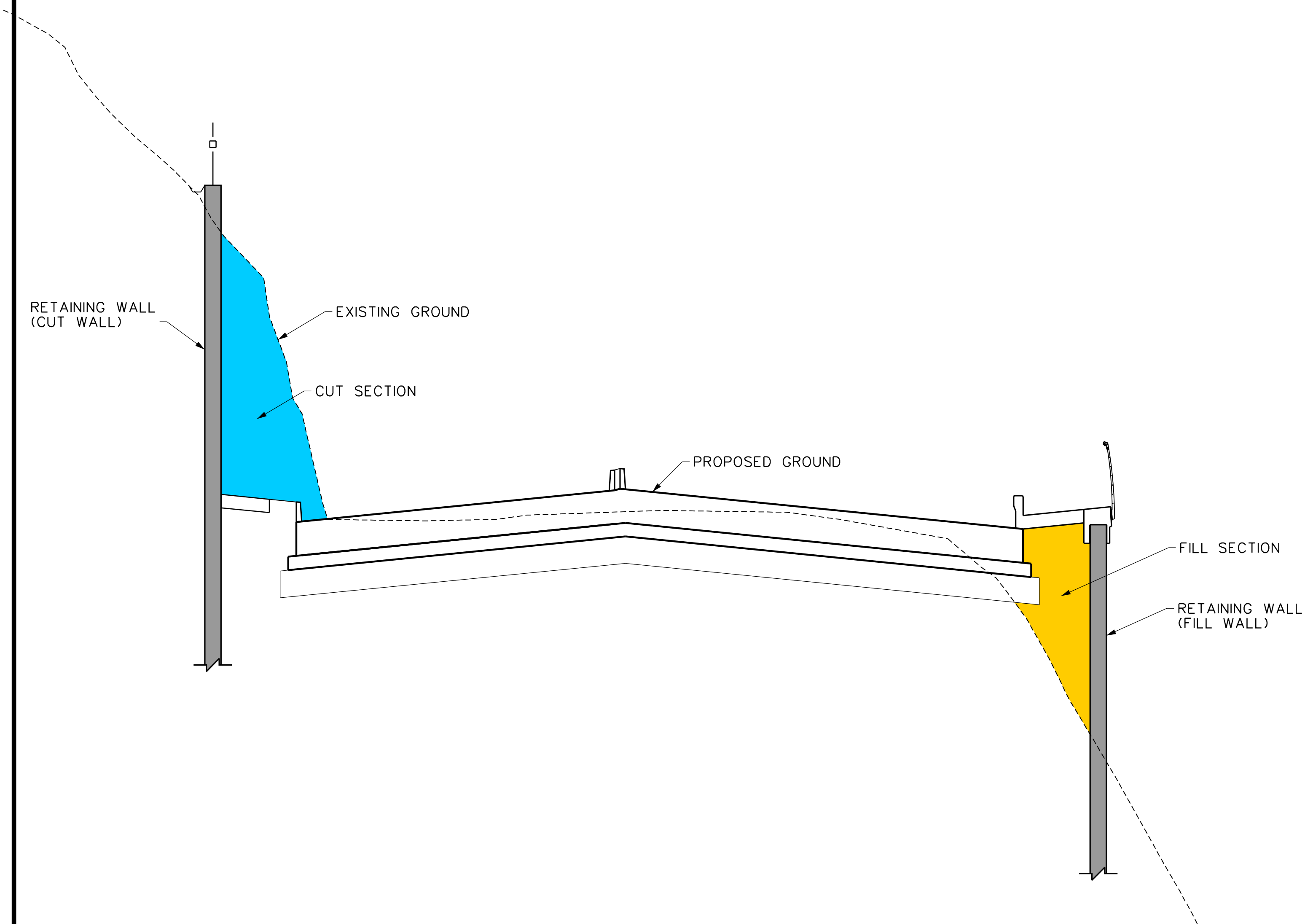
Attachment F

Retaining Wall - Cut Wall and Fill Wall Example



ATTACHMENT F

Retaining Wall - Cut Wall and Fill Wall Example

Appendix O – Access Management Technical Memorandum

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State Highway 199 Corridor Master Plan

From IH 820 to Belknap Street

Access Management Technical Memorandum

Submittal Date:
August 29, 2017

Prepared For:
North Central Texas Council of Governments

Prepared By:
Toole Design Group, LLC
8484 Georgia Avenue, Suite 800
Silver Spring, MD 20910
310-927-1900

1.0 ACCESS MANAGEMENT

The State Highway (SH) 199 Corridor Master Plan study evaluated existing conditions in the SH 199 corridor between Interstate Highway (IH) 820 and Belknap Street including physical conditions of the corridor, traffic characteristics, and stakeholder perspectives. An overview of the access management needs in the SH 199 corridor between IH 820 and Belknap Street is provided.

1.1 Access Management Purpose

Access management policies could improve the mobility, safety, and attractiveness of a corridor and may involve the application of one or more of the following strategies:

- Driveway improvements and consolidation
- Joint and cross access between adjacent properties
- Raised medians
- Dedicated left- and right-turn lanes
- Improvements to the pedestrian realm, including sidewalks and pedestrian amenities
- Traffic signal operational improvements
- Thoroughfare planning to improve the surrounding roadway network

The Texas Department of Transportation (TxDOT) provides guidelines for access management in the *TxDOT Access Management Manual* (http://onlinemanuals.txdot.gov/txdotmanuals/acm/acm.pdf). The following potential benefits of effective access management policies are listed in the manual:

- Improving roadway safety conditions (reduced crash rates)
- Reducing traffic delay and congestion, which has a positive economic effect on market areas
- Promoting properly designed access and circulation systems for development
- Improving the appearance of transportation corridors and increasing the area available for landscaping, which can help attract investment and enhance the image of an area
- Providing property owners and customers with safe access to roadways
- Reducing air pollution
- Making pedestrian and bicycle travel safer

Controlling access to adjacent land uses is important for motorist, bicyclist, and pedestrian safety. Every location where a vehicle can enter or leave a roadway presents a potential conflict with through-moving motorists, as well as people walking or riding bicycles. Each of these conflict points represents an opportunity for a crash to occur. For vulnerable road users, including pedestrians and bicyclists, these crashes can be particularly severe and even fatal. Furthermore, the community as a whole benefits from good access management practices because the transportation system is typically safer and more efficient, the roadway corridor is more attractive, and the life of transportation infrastructure investment is prolonged.

Access management refers to the practice of designing streets to coordinate, reduce, and consolidate property access points along a corridor and thus minimize the number of conflict points between all users. This objective is accomplished by considering specific design criteria for the location, spacing, design, and operation of driveways, median openings, and intersections. The goal of this practice is to safely balance access to adjacent land uses and transportation system efficiency.

1.2 Existing Conditions

Access management is particularly important along principal arterial roadways such as SH 199. Arterials are expected to provide safe and efficient movement of traffic, as well as access to adjacent property. While direct property access is allowed, driveways and other access opportunities must be carefully managed to preserve mobility and avoid creating unsafe traffic operations. The SH 199 corridor evolved over time in an unsystematic way, which has led to access management practices driven by stakeholders in the corridor, rather than by a methodical access management plan and corresponding driveway development. SH 199 currently includes duplicative and wide driveways that decrease system efficiency and endanger road users. Driveways in multiple segments lack definition, as does the edge of the roadway (see Figure 1).

Figure 1. Continuous Driveways Along SH 199 East of Roberts Cut Off Road
Source: Freese and Nichols, Inc., 2016

Many of the access points along SH 199 within the study corridor are unmanaged. Large sections of the highway have paved shoulders that are contiguous with parking lots or other adjacent paved uses. These areas present the opportunity for motorists to depart or enter the roadway at any location and create long zones of conflict between motorists and vulnerable road users. These swaths of pavement are also commonly used as parking or queuing areas for vehicles, including large trucks. Parking in the right-of-way can create obstructions to proper sight distances for motorists and obstacles to pedestrians and bicyclists traveling along the shoulders of SH 199. In locations where driveways are present, many have large corner radii and pavement treatments that show no visual or physical differentiation at non-motorized crossings. These designs encourage higher turning speeds by motorists that can be unsafe for all users. Of the 788 crashes that occurred between 2010 and 2014 within the SH 199 corridor, some may be attributable to the influence of poor access management.

1.2.1 Driveways

Driveways provide the physical transition between a site and the abutting roadway. Driveways should be located and designed to minimize impacts on traffic while providing safe entry and exit from the parcel served. The location and design of the driveway connection must take into account characteristics of the roadway, site, and potential users. The SH 199 study corridor currently includes 117 driveways on the north side of SH 199 and 93 driveways on the south side (26 percent more driveways on the north side) (see Exhibit 1 and Table 1). Driveways on the north are more closely spaced than those on the south (270 feet between driveways on the north versus 340 feet on the south).

Driveway throat widths average approximately 80 feet on each side of SH 199, with many driveway widths in excess of 100 feet. There are many locations along the SH 199 study corridor where no curbs exist and the roadway pavement abuts a paved parking area. This condition allows motorists to exit or enter the roadway at any location along these large parcel frontages, which can be unsafe and inefficient. Each driveway along the SH 199 study corridor should be reviewed as to its width, location, and necessity.

Table 1. Existing Access Conditions within SH 199 Study Corridor*

	Driveway Width (Feet)	Number of Driveways	Cross Streets (Feet)	Number of Cross Streets
North of SH 199 Centerline	9,470	117	1,125	31
South of SH 199 Centerline	7,465	93	1,190	21
Total	16,935	210	2,315	52

Source: Freese and Nichols, Inc., 2017
* Existing number of driveways and driveway widths were determined using 2015 aerial imagery

1.2.2 Raised Medians and Median Openings

Within the SH 199 corridor, a raised center median currently exists between IH 820 and University Drive. Medians on principal arterial highways are beneficial for providing improved safety and vehicular efficiency. Median openings provide for cross traffic movement, as well as left-turns and U-turns. The design and placement of medians and median openings is an integral part of an access management strategy. Between University Drive and Belknap Street, SH 199 is a four-lane undivided roadway and does not included a raised median.

Within the segment of the corridor with a raised median, there are 10 median openings at signalized intersections and 26 median openings at non-signalized intersections. At the non-signalized intersections, center median openings generally do not include deceleration, taper, or storage lengths. For signalized intersections, deceleration, taper, and storage lengths are included to accommodate turning movements.

In addition to the median openings for the street intersections, there are also several median openings at non-intersection locations. Some of these median breaks are not aligned with cross streets and appear not to be associated with a specific driveway or development. Two such locations currently exist between Rockwood Golf Course and University Drive and are shown in Figure 2.

Figure 2. Existing SH 199 Median Openings Unassociated with Cross Streets or Driveways
Source: Google Maps, 2017

1.3 Design Standards

The *TxDOT Access Management Manual* provides the diagram shown in Figure 3 and access connection spacing distances for state highways such as SH 199 (i.e., state highways that are not new highways, freeway mainlanes, or frontage roads). Posted speeds in the study section of SH 199 vary from 35 mph to 45 mph. According to Table 2-2 in the *TxDOT Access Management Manual*, the access connection spacing distance is 250 feet for state highways with a posted speed of 35 mph, 305 feet for highways with posted speeds of 40 mph, and 360 feet for those with posted speeds of 45 mph. The values in Table 2-2 of the *TxDOT Access Management Manual* provide minimum connection spacing criteria for arterial roadways such as SH 199. However, TxDOT does make exceptions for highways like SH 199 where numerous existing separate businesses are located in close proximity along the highway and for properties with established ownership. To the extent possible, the number of driveways should be minimized and the corner radii and openings should be designed for business access needs.

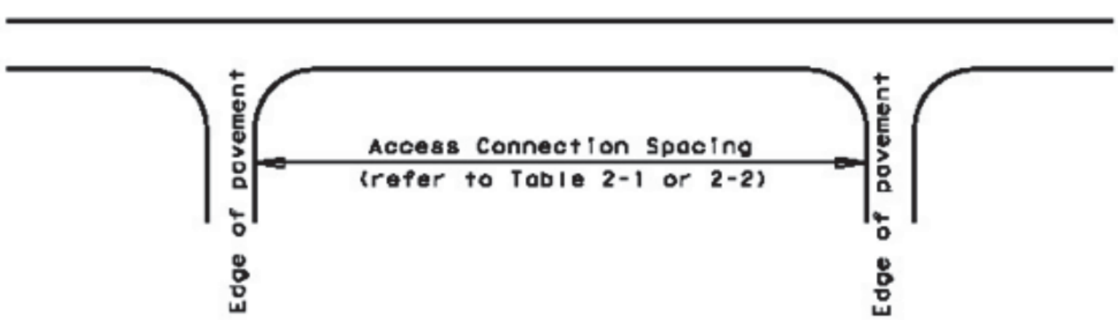


Figure 3. Figure 2-1 from the *TxDOT Access Management Manual* (Access Connection Spacing Diagram)
Source: *TxDOT Access Management Manual, 2011*

Appendix C of the TxDOT *Roadway Design Manual* (http://onlinemanuals.txdot.gov/txdotmanuals/rdw/rdw.pdf) includes driveway design standards.

Table C-2 in this manual provides standard design criteria for two-way commercial driveways used by passenger and single-unit truck design vehicles, which is the category under which most driveways on SH 199 will fall. Recommended driveway curb radii and driveway throat widths are provided, based on the expected number of large vehicles and single-unit design vehicles over a given time period (per hour or per day) and the geometry of the driveway (with or without a divider).

1.4 Recommendations

Study recommendations pertaining to access management in the form of driveway provision and the design of median openings are discussed in the following subsections.

1.4.1 Driveway Recommendations

To improve corridor safety and efficiency, it is recommended that the widths and locations of driveways within the SH 199 study corridor be designed in accordance with the guidelines outlined in the *TxDOT Roadway Design Manual* and the *TxDOT Access Management Manual*. Based on Table C-2 of Appendix C, many of the driveways along SH 199 should have curb radii of 30 feet and throat widths of 30 feet. With the application of TxDOT design standards for driveways, the sum of driveway widths on the north and south sides on SH 199 could be decreased by 63 percent (both sides). This driveway width reduction, which assumes the number of driveways remains constant, decreases the distance in which people walking and bicycling are in conflict with motorists entering or exiting the driveways (see Table 2). If the number of driveways is decreased as well (a likely outcome of the design), the reduction in total driveway width would be greater.

In the design of access management for SH 199, the number and width of driveways should be kept to a minimum. In compliance with the *TxDOT Roadway Design Manual* and the *TxDOT Access Management Manual* as noted previously, driveway widths should not exceed 30 feet, except in rare instances where large trucks may need additional width for ingress or egress. Parcels should have only a single point of access to the extent possible while observing Texas property access regulations. Shared driveways between adjacent parcels should be encouraged. A prototypical access management plan for the portion of SH 199 between Norfleet Street and Biway Street can be seen in Exhibit 2.

Table 2. Preliminary Proposed Access Management within SH 199 Study Corridor

	Driveway Width (Feet)	Number of Driveways*
North of SH 199 Centerline	3,510	117
South of SH 199 Centerline	2,790	93
Total	6,300	210

Source: Freese and Nichols, Inc., 2017

* Number of driveways assumed to be equal to existing; however, fewer total driveways are expected to be recommended in the future schematic and plan development process

In future design phases, it is recommended that TxDOT coordinate the location and width of proposed driveways based on current and future land uses, necessary vehicular access, and site circulation. In addition, it is recommended that TxDOT representatives meet with property owners and review each parcel on a case-by-case basis to determine individual access and driveway needs. Finally, all driveway locations and widths will need to comply with the most recent version of the *TxDOT Access Management Manual* and *TxDOT Roadway Design Manual*.

1.4.2 Recommendations for Raised Medians and Median Openings

The *TxDOT Roadway Design Manual* also contains guidance regarding the design of raised medians and median openings. SH 199 currently has traditional median openings, allowing the flow of traffic in all directions. Figure 3-1 of the *Roadway Design Manual* shows different types of median openings that limit the movements through the median opening. According to the *Roadway Design Manual*, median openings should be provided only for street intersections or at intervals for major developed areas. Spacing between median openings must be adequate to allow for introduction of left-turn lanes and signal detection loops to operate without false calls. A directional opening (like those shown in Figure 3-1 of the *Roadway Design Manual*) could be used to limit the number and types of conflicts.

As noted in Section 1.2.2 of this memorandum, there are 26 existing median openings at non-signalized intersections and several others at non-intersection locations. It is recommended that all of these existing locations be reviewed during the future design phases. Closing unnecessary median openings could help reduce turning movement conflicts and improve the safety and operation of the corridor. For the openings deemed necessary, the design may be reconfigured to manage movements through the opening. Based on an evaluation of the established roadway network, observed turning movements, and the crash locations identified in the Crash Data Technical Memorandum, the following 11 non-signalized locations, listed in order from west to east, are recommended for median openings. The designs of these openings should include left-turn deceleration lanes and storage lengths consistent with the design criteria outlined in Table 3-3 of the *TxDOT Roadway Design Manual*.

- Azle Way
- Old Mill Creek Road
- Corner Lane
- Norfleet Street
- Cheyenne Street
- Beverly Hills Drive
- Circle Ridge Drive
- Capri Drive
- Town and Country Center
- Belle Avenue
- Fort Worth Independent School District Service Center III

1.5 Corridor Access Management Plans

Chapter 3 of the *TxDOT Access Management Manual* provides an overview of the administrative procedures regarding access management plans. Section 1 of Chapter 3 describes an approval process for local access management guidelines. Municipalities may request that TxDOT use the municipality's access management guidelines to determine appropriate access connection locations. If a local access management plan is used on a state highway, either TxDOT or the municipality may be the permitting authority for driveways. Municipalities are not required to take over the permitting for state highways within their jurisdiction. Local access management guidelines must be based on sound engineering practices and accepted access management principles.

Section 2 of Chapter 3 discusses corridor access management plans. Any municipality or metropolitan planning organizations, in cooperation with TxDOT, may develop an access management plan for a specified state highway segment for purposes of preserving or enhancing safe and efficient operation. This practice is applicable to the SH 199 corridor study. The plan should include the following elements:

- Existing and future access locations
- All major access-related roadway design elements
- Lots or parcels currently having frontage on the highway segment
- Pedestrian and bicycle amenities and associated safety implications
- Transit facility considerations
- All supporting technical materials

Chapter 3 of the *TxDOT Access Management Manual* provides guidance on engineering analyses that should be used to evaluate access connections to state highways. Such engineering studies should be used to guide future development along the corridor. The chapter also discusses the sale of access rights and an appeals process. It is recommended that all municipalities within the SH 199 corridor review all chapters of the *TxDOT Access Management Manual* prior to moving forward with future design phases for the SH 199 corridor.

2.0 EXHIBITS

1. Existing Right-of-Way and Site Access
2. Prototypical Access Management Plan

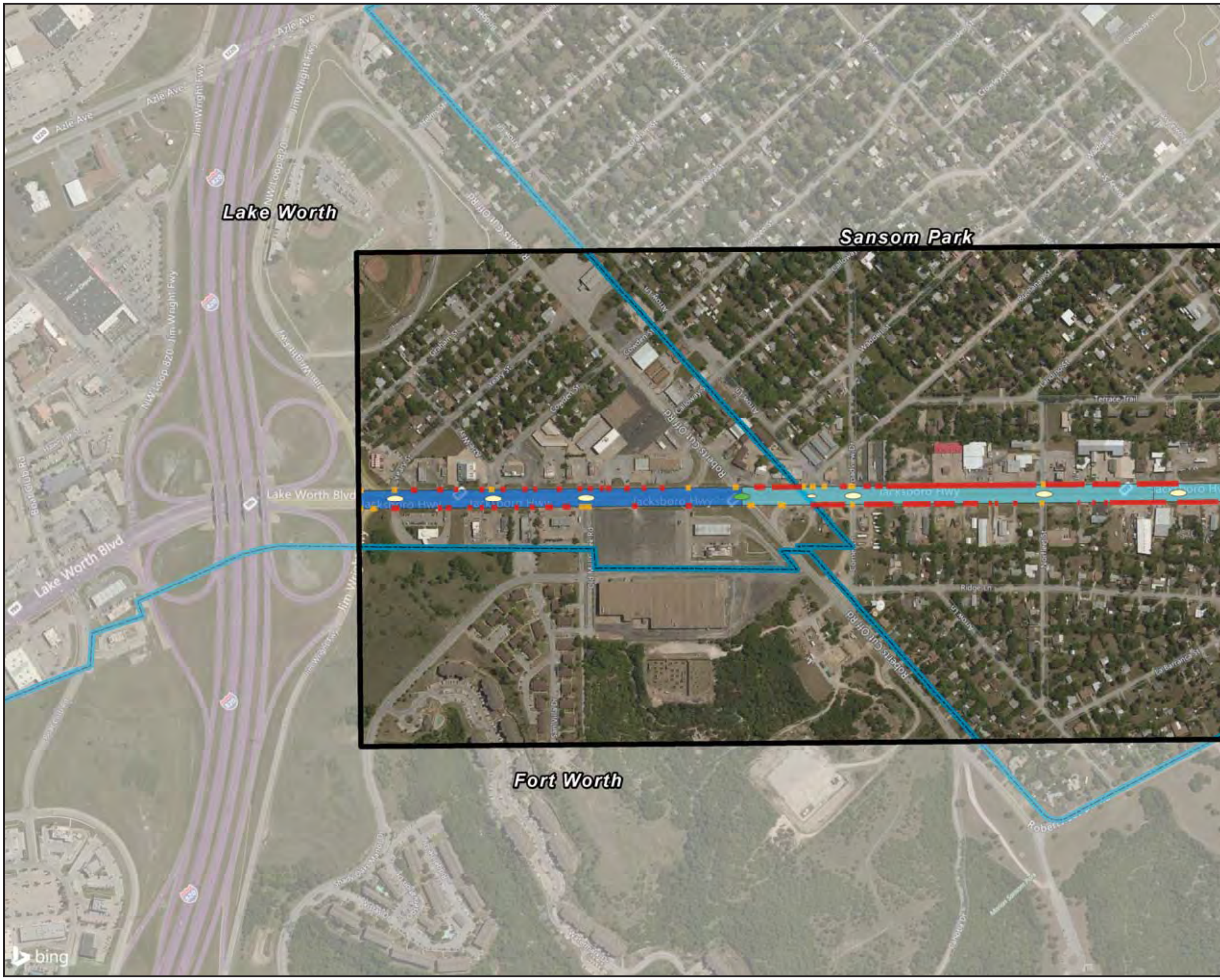
Exhibit 1

Existing Right-of-Way and Site Access

Existing Right-of-Way and Site Access

Exhibit 1-1

State Highway 199
Corridor Master Plan



Legend

- Study Area Boundary
- City Limits
- Median Opening
- Signalized Intersection
- Driveway Access
- Side Street Access

ROW Description

- 80' ROW, 4 Lane Road
- 100' ROW, 4 Lane Road
- 120' ROW, 4 Lane Road
- 140' ROW, 4 Lane Road
- 150' ROW, 4 Lane Road
- 150' ROW, 6 Lane Road

0 300 600 900
Feet

North Central Texas Council of Governments

Parcel Data Source: Tarrant Appraisal District Parcels 2015 Date: 06/01/2017

Existing Right-of-Way and Site Access

Exhibit 1-2

State Highway 199
Corridor Master Plan

Legend

- Study Area Boundary
- City Limits
- Median Opening
- Signalized Intersection
- Driveway Access
- Side Street Access

ROW Description

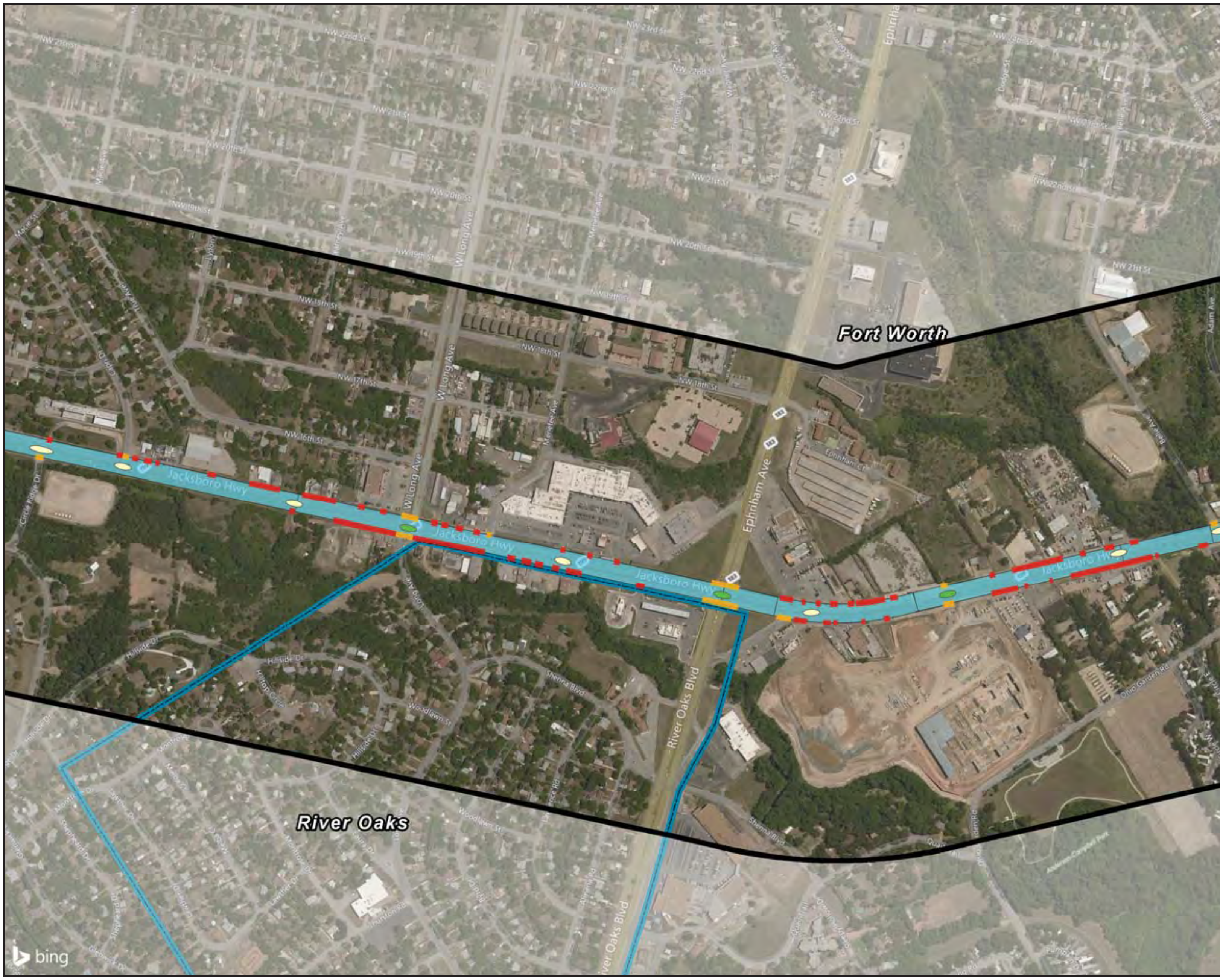
- 80' ROW, 4 Lane Road
- 100' ROW, 4 Lane Road
- 120' ROW, 4 Lane Road
- 140' ROW, 4 Lane Road
- 150' ROW, 4 Lane Road
- 150' ROW, 6 Lane Road

Parcel Data Source: Tarrant Appraisal District Parcels 2015 Date: 06/01/2017

Existing Right-of-Way and Site Access

Exhibit 1-3

State Highway 199
Corridor Master Plan



Legend

- Study Area Boundary
- City Limits
- Median Opening
- Signalized Intersection
- Driveway Access
- Side Street Access

ROW Description

- 80' ROW, 4 Lane Road
- 100' ROW, 4 Lane Road
- 120' ROW, 4 Lane Road
- 140' ROW, 4 Lane Road
- 150' ROW, 4 Lane Road
- 150' ROW, 6 Lane Road

0 300 600 900
Feet

North Central Texas Council of Governments

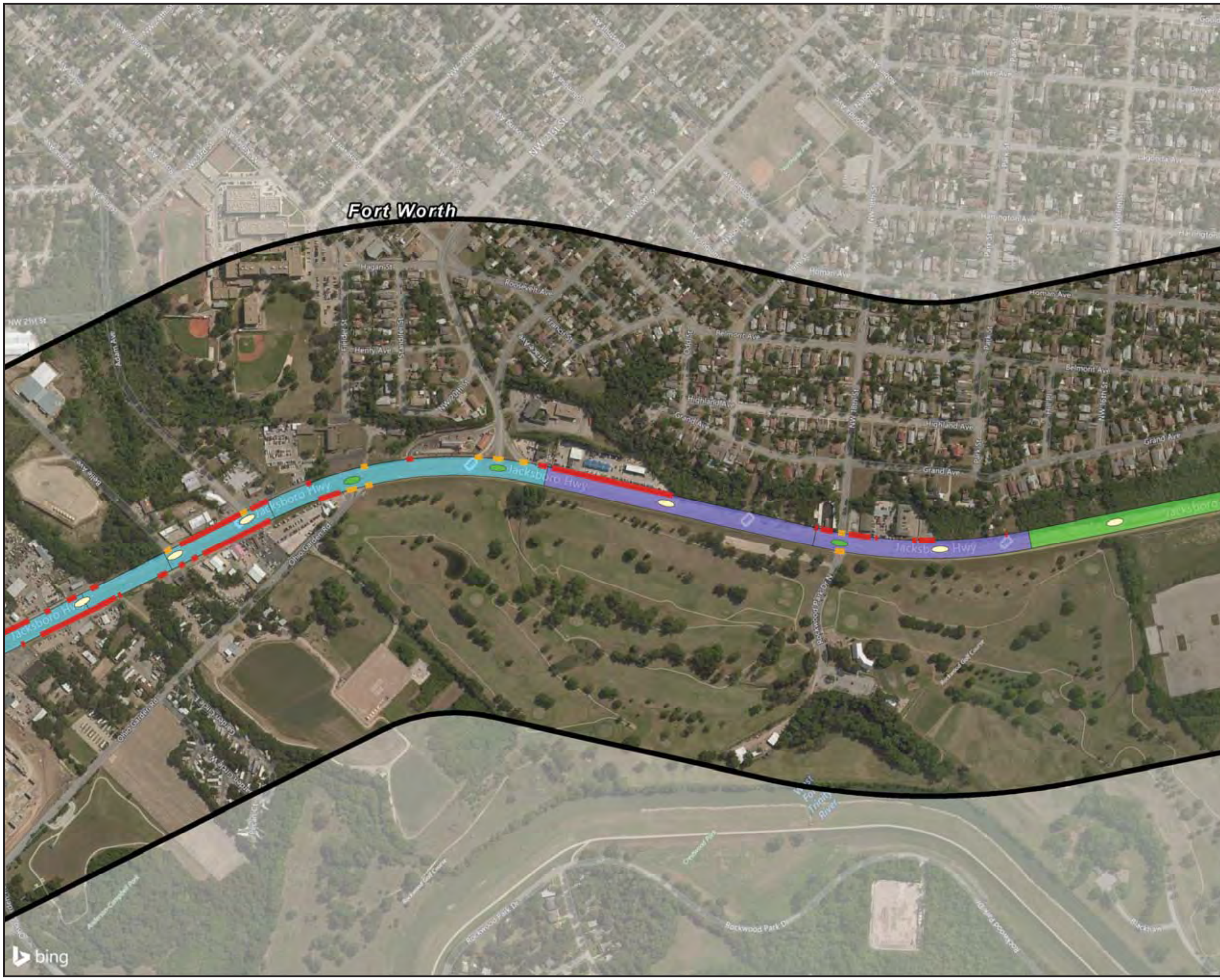
Parcel Data Source: Tarrant Appraisal District Parcels 2015

Date: 06/01/2017

Existing Right-of-Way and Site Access

Exhibit 1-4

State Highway 199
Corridor Master Plan



Legend

- Study Area Boundary
- City Limits
- Median Opening
- Signalized Intersection
- Driveway Access
- Side Street Access

ROW Description

- 80' ROW, 4 Lane Road
- 100' ROW, 4 Lane Road
- 120' ROW, 4 Lane Road
- 140' ROW, 4 Lane Road
- 150' ROW, 4 Lane Road
- 150' ROW, 6 Lane Road

0 300 600 900
Feet

Parcel Data Source: Tarrant Appraisal District Parcels 2015

Date: 06/01/2017

Existing Right-of-Way and Site Access

Exhibit 1-5

State Highway 199
Corridor Master Plan

Legend

- Study Area Boundary
- City Limits
- Median Opening
- Signalized Intersection
- Driveway Access
- Side Street Access

ROW Description

- 80' ROW, 4 Lane Road
- 100' ROW, 4 Lane Road
- 120' ROW, 4 Lane Road
- 140' ROW, 4 Lane Road
- 150' ROW, 4 Lane Road
- 150' ROW, 6 Lane Road

Key Map

0 300 600 900
Feet

North Central Texas Council of Governments

Parcel Data Source: Tarrant Appraisal District Parcels 2015

Date: 06/01/2017

Existing Right-of-Way and Site Access

Exhibit 1-6

State Highway 199
Corridor Master Plan

Legend

- Study Area Boundary
- City Limits
- Median Opening
- Signalized Intersection
- Driveway Access
- Side Street Access

ROW Description

- 80' ROW, 4 Lane Road
- 100' ROW, 4 Lane Road
- 120' ROW, 4 Lane Road
- 140' ROW, 4 Lane Road
- 150' ROW, 4 Lane Road
- 150' ROW, 6 Lane Road

0 300 600 900
Feet

Parcel Data Source: Tarrant Appraisal District Parcels 2015
Date: 06/01/2017

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Exhibit 2

Prototypical Access Management Plan

North Central Texas Council of Governments

STATE HIGHWAY 199 CORRIDOR MASTER PLAN

Prototypical Access Management Plan

Exhibit 2

LEGEND

- ROW LINES (PER TXDOT RECORD DATA)
- PROPERTY LINES (PER 2015 TARRANT APPRAISAL DISTRICT DATA)
- PROPOSED SIDEWALK
- PROPOSED MEDIAN AND PARKWAY LANDSCAPING OR HARDSCAPING
- FUTURE SIDEWALK

NOTES

1. DURING A FUTURE DESIGN PHASE, A LICENSED LAND SURVEYOR SHALL LOCATE PROPERTY BOUNDARIES, RIGHT-OF-WAY LIMITS, AND TOPOGRAPHIC SURVEY WITHIN THE PROJECT LIMITS.
2. DRIVEWAY AND MEDIAN OPENINGS WIDTHS AND LOCATIONS ARE PRELIMINARY AND WILL BE DETERMINED DURING A FUTURE DESIGN PHASE.

N

0 30' 60' 120'
SCALE IN FEET

DRAFT LAYOUT

FREESE AND NICHOLS
4055 International Plaza, Suite 200
Fort Worth, Texas 76109-4895
Phone - (817) 735-7300
Fax - (817) 735-7491
Web - www.freese.com

FREESE AND NICHOLS INC.
TEXAS REGISTERED ENGINEERING FIRM F-2144

Appendix P – Proposed Improvements – Drainage Assessment Technical Memorandum

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State Highway 199
Corridor Master Plan

From IH 820 to Belknap Street

Proposed Improvements - Drainage Assessment
Technical Memorandum

Submittal Date:
July 14, 2017

Prepared For:
North Central Texas Council of Governments

Prepared By:
Freese and Nichols, Inc.
4055 International Plaza, Suite 200
Fort Worth, Texas 76109
817-735-7300
Texas Registered Engineering Firm F-2144

1.0 PROPOSED DRAINAGE IMPROVEMENTS

Drainage improvement concepts were developed for the State Highway (SH) 199 Corridor Master Plan to consider the scope of improvements that would be necessary to resolve the numerous drainage issues identified within the project study area. The improvements consist of both the replacement of undersized culvert crossings and the implementation of an underground storm drain system. These improvements were evaluated to meet current highway standards as outlined in the Texas Department of Transportation (TxDOT) Hydraulic Design Manual. The proposed improvements limit inundation from a 10-year storm to maintain one lane open to traffic and limit the inundation of a 100-year storm to be within the right-of-way of the highway. The methodology and criteria used to develop the proposed improvements were similar to those used during storm drain design. Although the methodology is similar, the conceptual improvements will need to be evaluated in further detail during the future design phase of the project.

1.1 Methodology

1.1.1 Hydrology

Hydrology calculations for the proposed drainage system were performed with methodology consistent with that used for the existing system hydrologic calculations. The drainage areas that were delineated for the existing conditions calculations were subdivided into smaller areas for the proposed calculations. These additional drainage areas were delineated to points where it was assumed capture of runoff would be required to meet the TxDOT criteria.

Areas that drain directly to the highway were delineated into areas not to exceed 10 acres. This maximum area represents an approximation of the largest area that can provide runoff to the highway before the allowable spread of flow for a 10-year event is exceeded. This maximum area was determined by runoff from areas with characteristics typical of the watershed and by comparing it to the typical flow capacity of the proposed pavement section geometry. Inlet capacity was not evaluated as part of this assessment. During the future design phase of the project, inlets may be necessary at closer spacings than the proposed delineations based on the collection of topographic survey and the development of the roadway profile. Adjacent upstream areas, without storm drain improvements, may require inlet improvements to appropriately capture runoff prior to the SH 199 corridor.

Other inflow points were identified where assumed future storm drains or concentrated discharges may occur that should be collected in the proposed system. The watershed consists of a total of 48 delineated subbasins, as shown in Exhibit 1. The hydrologic parameters for the proposed conditions subbasins are included in Attachment A.

1.1.2 Hydraulics

The conceptual infrastructure was sized through a hydraulic analysis of the discharges through the potential improvements. Pipe hydraulic calculations were performed in a storm drain design spreadsheet using Manning’s equation. The proposed culvert crossings were evaluated in US Army Corps of Engineers Hydrologic Engineering Center's River Analysis System (HEC-RAS) computer model.

The storm drain hydraulic calculations were performed in a manner similar to the existing conditions analysis. The hydraulic calculations were performed for the total 100-year discharge without subtracting a provision for the flow in the road section above the pipe. This methodology was considered appropriate due to the relatively large subbasins being modeled.

If surface flow were considered, the capacity of the road would be surpassed before the next downstream analysis point which is contrary to the design criteria being evaluated.

In addition to the pipe friction calculation, minor headlosses were evaluated to consider the impacts of structures along the storm drain. All inflow points along the pipe were modeled as a manhole with a lateral connection using Equation 1. A loss coefficient of 0.35 was used to represent this structure. A headloss representing inlet losses was applied at the upstream end of each pipe system as well. This headloss was calculated using Equation 2 with a loss coefficient of 1.25.

Equation 1

$$H_k = \frac{V_2^2}{2g} - k_j \frac{V_1^2}{2g}$$

H_k= headloss at manhole on line
k_j= loss coefficient
V_1= velocity at upstream of structure
V_2= velocity at downstream of structure

Equation 2

$$H_k = k_j \frac{V_2^2}{2g}$$

H_k= headloss at manhole at beginning of line
k_j= loss coefficient
V_2= velocity downstream of structure

The minor losses were added to the friction losses and the tailwater elevation to determine the resulting headwater elevation. The pipe sizes were adjusted to find the most efficient system with a resulting headwater elevation six inches below the top of the curb. To make this comparison, proposed road grades were estimated from the existing ground elevation. For the purposes of these calculations, the pipes were assumed to have five feet of cover below the assumed road profile. It was assumed that the tailwater elevation occurs at the top of the downstream end of the pipe system. A copy of the final tabular calculations is included in Attachment B.

Hydraulic calculations for the culverts at the two creek crossings were performed in the hydraulic models developed for the existing conditions assessment. No changes were made to the discharge rates used in the original models. The Menefee Creek crossing was also evaluated in a Federal Highway Administration HY-8 7.50 model as the steep slope and length of the culvert produced unrealistic results in HEC-RAS. The culverts were sized to pass a 100-year event without overtopping.

1.2 Results

1.2.1 Drainage Infrastructure

The methodology outlined in the previous sections was used to develop conceptual improvements along the majority of the SH 199 corridor. The Panther Island area was excluded from this analysis as the future drainage in this vicinity is addressed under the Trinity River Vision Storm Drain Master Plan. A total of 19 storm drain lines were identified as necessary along SH 199. Proposed culvert crossings were also calculated at both crossings. The proposed sizes for these crossings are shown in Table 1. The proposed outfall sizes of the storm drain lines are shown in Table 2. The conceptual improvements proposed for this master plan are depicted in Exhibit 2.

Table 1. Culvert Sizing at Creek Crossings

Name	Barrels	Box Culvert Size *
Unnamed Tributary Culvert	2	11' x 9' RCB
Menefee Creek Culvert	2	9' x 8' RCB

* RCB = Reinforced Concrete Box

Table 2. Outfall Sizing by System Name

System Name	Drainage Area (acres)	Storm Drain Outfall Size *
Line A	62.7	72” RCP
Line B	13.0	36” RCP
Line C	8.5	24” RCP
Line D	22.2	42” RCP
Line E	41.1	60” RCP
Line F	18.9	36” RCP
Line G	29.5	42” RCP
Line H	33.4	48” RCP
Line I	8.1	24” RCP
Line J	13.6	36” RCP
Line K	44.6	60” RCP
Line L	21.2	42” RCP
Line M	69.5	66” RCP
Line N	15.7	36” RCP
Line O	33.8	60” RCP
Line P	25.2	54” RCP
Line Q	105.9	7’ x 7’ RCB
Line R	6.4	30” RCP
Line S	24.8	42” RCP

* RCP = Reinforced Concrete Pipe, RCB = Reinforced Concrete Box

As identified in the existing conditions assessment, some of the outfall pipes crossing SH 199 have adequate capacity for a 100-year storm. These existing storm drain segments are located at proposed lines D, C, E, K, and M. In these areas, the existing drainage may be usable as the downstream ends of the proposed system.

The few existing drainage lines that run along the highway were determined to have an inadequate capacity and will need to be upsized or improved with parallel systems. One of these lines consists of a large box pipe located in a parking lot parallel to SH 199 near Biway Street. This line was assumed to become the downstream end of the proposed line Q. The additional drainage directed to this point from offsite areas was assumed to be in separate parallel systems (lines O and P) so that the existing box pipe would not require upsizing.

The condition and location of existing infrastructure will need to be evaluated, and the sizes will need to be confirmed. If the pipes are functional and do not conflict with the roadway design, they can be allowed to remain rather than be replaced.

1.2.2 Design Considerations

A number of design considerations were identified during the evaluation of the conceptual improvements. Consideration of these items is beyond the scope of the master plan, but they should be addressed with the future design effort.

It is suggested that the proposed storm drain be located at the center of a traffic lane on the north side of the proposed roadway (see Figure 1). Almost the entirety of the offsite drainage comes from the north side of the highway. Locating the storm drain pipe on this side will reduce the need for long inlet laterals across the highway. Centering the storm drain in a traffic lane will reduce the possibility of multiple lanes being shut down when maintenance is required on the storm drain which minimizes disruption to traffic.

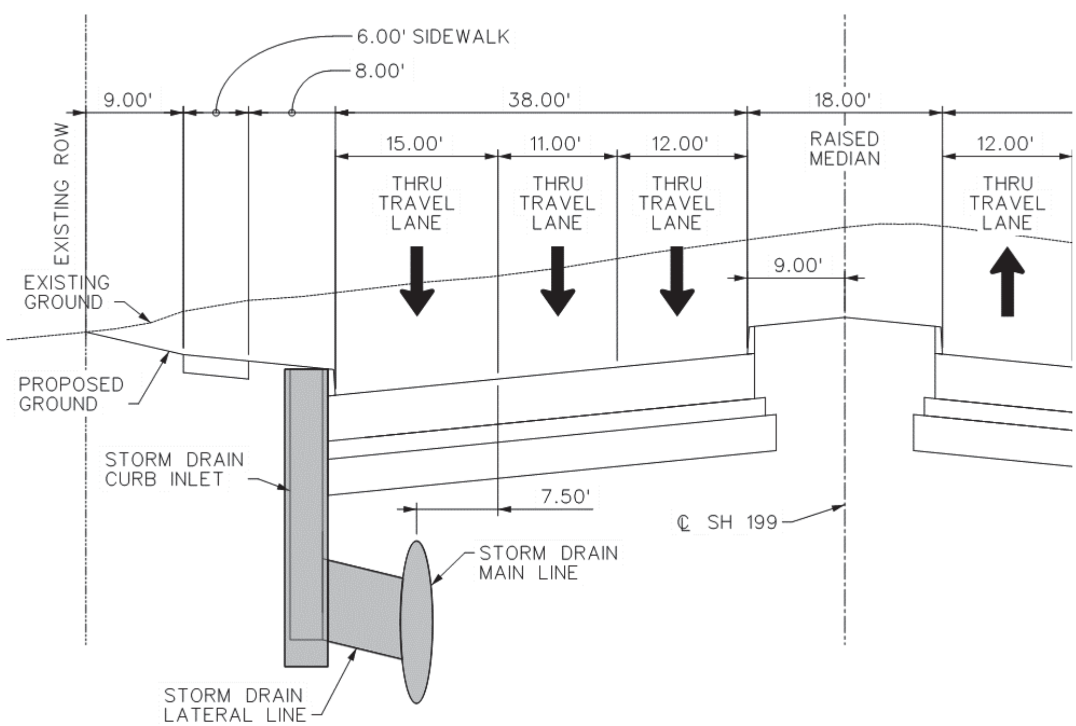


Figure 1. Proposed Storm Drain Main Line Alignment in Westbound Lane

Source: Freese and Nichols, Inc., 2017

The nearby terrain should also be considered when evaluating offsite drainage. The existing ground in some of the areas of SH 199 is steeply sloped. This could make the construction of offsite drainage lines more difficult due to an inability to traverse the slope with construction equipment. These steep areas include the area on the north side of SH 199 between 21st Street and University Drive. Drainage improvements should be considered to protect the proposed retaining wall sections from excess drainage and ponding. Alternative construction methods should be considered beyond typical pipe installation in these areas.

The impact on properties downstream of the highway should also be considered. Several of the existing outfalls drain to poorly defined receiving streams. Improving drainage along the highway or in upstream areas could cause erosion or increased flooding in these areas. Coordination with the downstream property owners and the cities they are within should be performed to evaluate the need for further improvement downstream.

Portions of the highway with significant offsite drainage without storm drain improvements should be evaluated closely for inlet capacity. The runoff from these large areas may require an unrealistic number of inlets at the highway to capture the runoff. A strategy should be considered either to extend storm drains into these offsite areas or to plan for storm drain extensions in the future. Alternatively, open culverts could be provided in addition to the closed system at these locations to provide surface capture.

1.3 Low Impact Development Opportunities

Different forms of low impact development (LID) were explored as part of the assessment of the proposed drainage improvements. LID infrastructure uses or imitates natural processes to minimize the drainage impact of a development. These practices generally decrease the quantity of runoff as well as remove pollutants to improve the quality of runoff. Multiple LID improvements are considered to have secondary social and economic benefits due to the potential of increased property values, aesthetics, or improved quality of life. The LID forms that are ideally suited for implementation along SH 199 are discussed in further detail within this section. Opportunities for LID should be evaluated during preliminary engineering and hydraulic analysis for the corridor.

LID improvements were also considered for the Panther Island developments as part of the Trinity River Vision Storm Drain Master Plan. Protecting the water quality while also preserving the aesthetics of the waterfront is an important focus of the project. The storm drain master plan contemplates various implementation levels of LID practices. The basic implementation includes bioretention within street rights-of-way, and the higher levels of implementation involve requirements for private property to implement LID improvements. The level of LID implementation is currently under consideration by the Trinity River Vision Authority (TRVA).

1.3.1 Bioretention Basins

Bioretention basins are structural stormwater controls that perform the process of filtering pollutants from stormwater runoff using soil and vegetation. The runoff captured in a bioretention basin is filtered through a highly porous media and the pollutants are removed through natural processes. Excess runoff is conveyed to the main drainage system. The basin area typically consists of a grass buffer strip to reduce runoff velocity and provide preliminary filtering, a ponding area to provide temporary storage of runoff, a mulch layer to perform filtration, and vegetation to stabilize surrounding soils and provide uptake of runoff and pollutants. Additionally, a sand bed may also be included for aeration and drainage of the planting soil. Bioretention basins are capable of removing a high percentage of the total suspended solids in typical urban runoff.

Bioretention areas can be incorporated into roadside landscaping in various ways that are considered aesthetically pleasing. Inlet planters that combine vegetation planters and stormwater inlets, for example, are a form of bioretention often used in urban areas. Because of the soil conditions of the SH 199 project area, an underdrain could be required to convey the treated runoff to the main drainage system. An example of bioretention that has been incorporated into roadside landscaping is shown in Figure 2. These types of bioretention cells could be implemented in the parkways proposed along the corridor.

Figure 2. Bioretention Basins
Source: Southwest Urban Hydrology Bio-Retention Basins, 2015

1.3.2 Bioretention Swales

Bioretention swales are channels designed to capture stormwater runoff and treat it in a manner similar to bioretention basins. The swales are designed so that the flow through them is slow and shallow, which allows particulates in the runoff to settle and limits the effects of erosion. In the SH 199 project area, dry swales could be used, which are vegetated channels with a filter bed of soil above an underdrain system. Like the bioretention basins, swales are capable of removing a high percentage of the total suspended solids in typical urban runoff.

If implemented along the length of SH 199, bioretention swales could carry a portion of the stormwater runoff and less capacity could be required in the proposed storm drain. This could reduce the storm drain costs, although the cost of maintenance for the swales could be higher. The swales can be placed in a wide parkway, on either the north or south side of the road, or within the median. An example of a bioretention swale in a highway median is shown in Figure 3.

Figure 3. Bioretention Swale
Source: Aaron Volkening, 2010

1.3.3 Floatables Capture

A common LID technique involves installing a device to capture floatables and debris. This is generally only effective for removing larger debris and may be used in combination with other LID methods.

Bars, screens, and nets can be used to prevent debris from entering the stormwater system. At SH 199, inlet screens would most likely be used. These can be installed at the opening of the inlet or inside the catch basin. These devices could be a cost-effective way to improve water quality although these methods do not provide the secondary benefits that more visible LID systems can have. This method typically requires regular maintenance to prevent the screens or nets from becoming clogged with debris. The effect of potential clogging on the hydraulic capacity of the storm drain system should be considered. An example of an inlet with a screen inside the catch basin is shown in Figure 4.

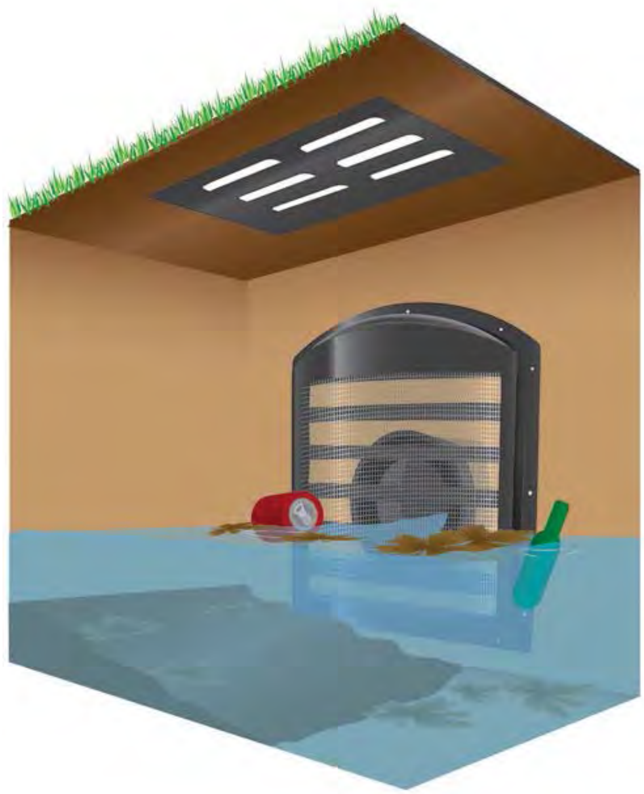


Figure 4. Inlet Screen Inside Catch Basin
Source: Ultratech International, Inc. Ultra-Debris Screen, 2017

1.3.4 Treatment Units

Treatment units are LID devices that can be installed on drainage lines and are capable of removing pollutants as well as floatables. Different types of treatment units include vortex separators and baffle separators. These types of treatment units can be highly effective at pollutant removal and do not require dedicated space within the right-of-way. Due to their lack of visibility they typically do not provide secondary social and economic benefits.

A vortex separator consists of a cylindrical vault that moves water in a circular direction, forcing debris to the center and top of the separation chamber. Vortex separators can be installed as either on-line or off-line devices and are typically located at the downstream end of a system. The required maintenance varies depending on the size of the device and the amount of debris it takes in.

Baffle separators contain catch basins with one or more chambers that promote sedimentation of coarse material and separation of oil from stormwater. These inlets also contain a screen for catching debris. Baffle separators are typically installed as in-line devices. Inspection and maintenance is required, and high loads of sediment may interfere with the baffle separator's functionality. An example of a baffle separator is shown in Figure 5.

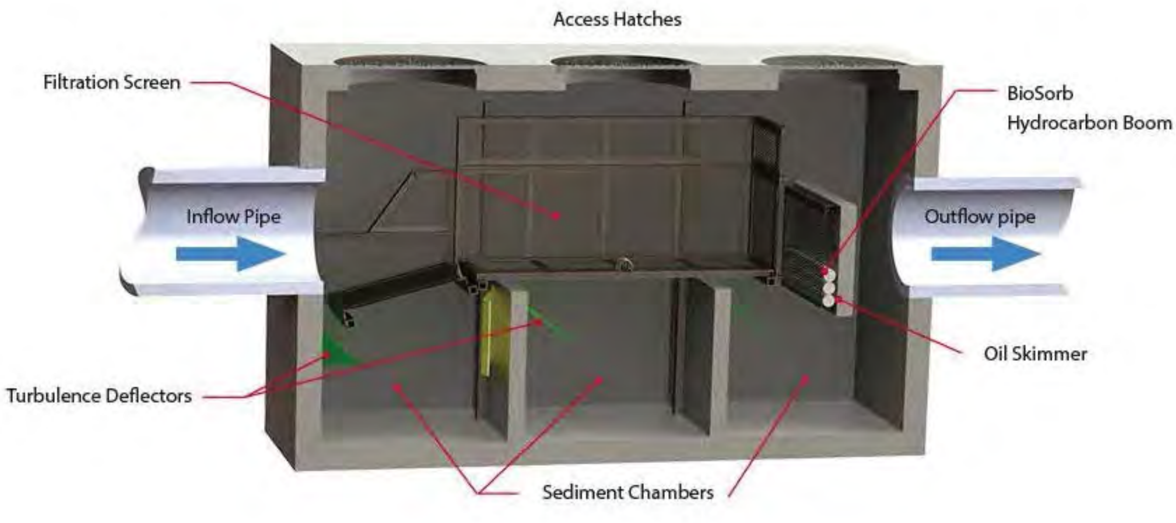


Figure 5. Baffle Separator Diagram
Source: BioClean NSBB Hydrodynamic Separator, 2017

2.0 EXHIBITS

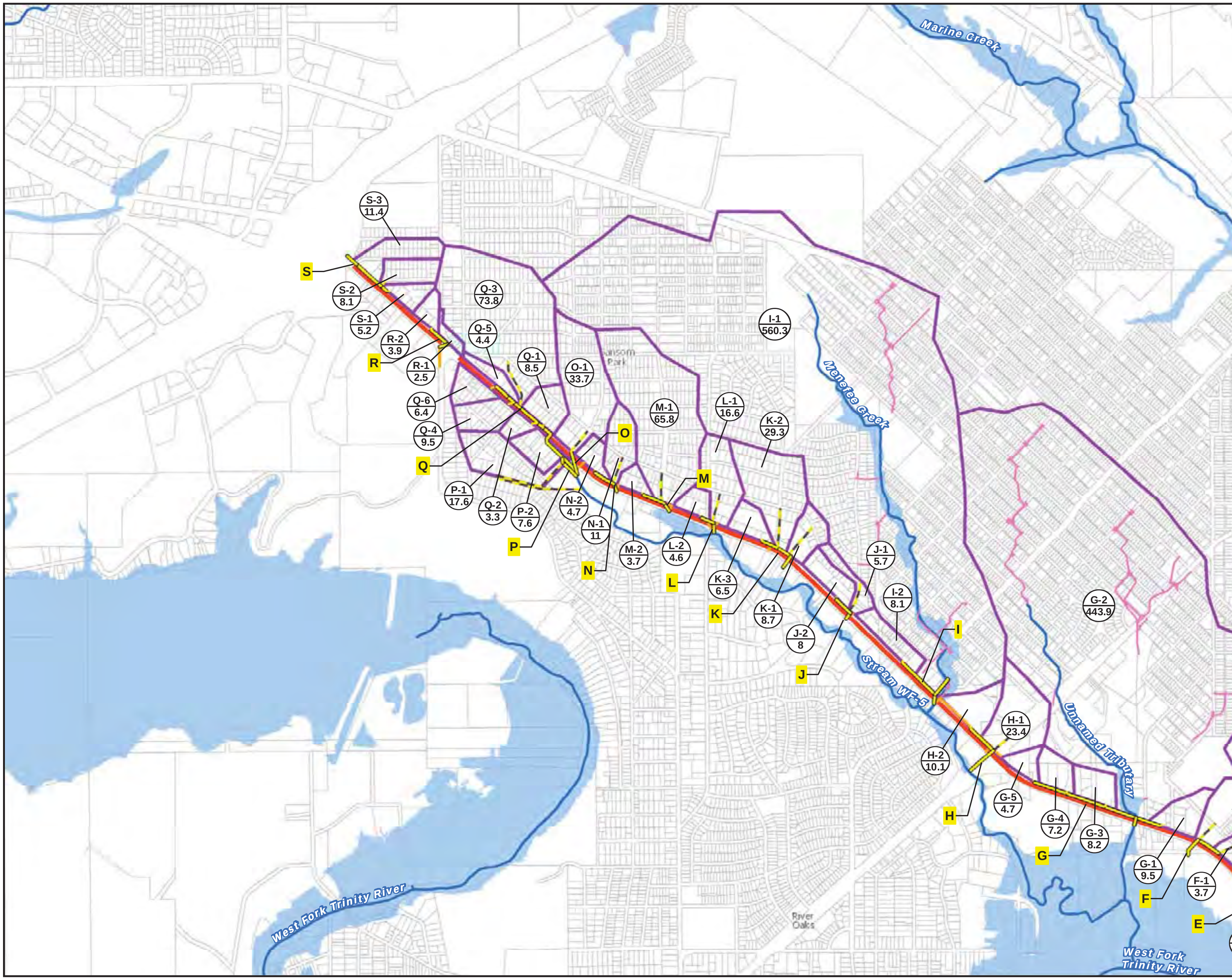
1. Proposed Drainage Area Map
2. Proposed Storm Drain System

3.0 ATTACHMENTS

A. Hydrologic Parameters
B. Hydraulic Calculations

Exhibit 1

Proposed Drainage Area Map



Proposed Drainage Area Map

Exhibit 1-1

State Highway 199
Corridor Master Plan

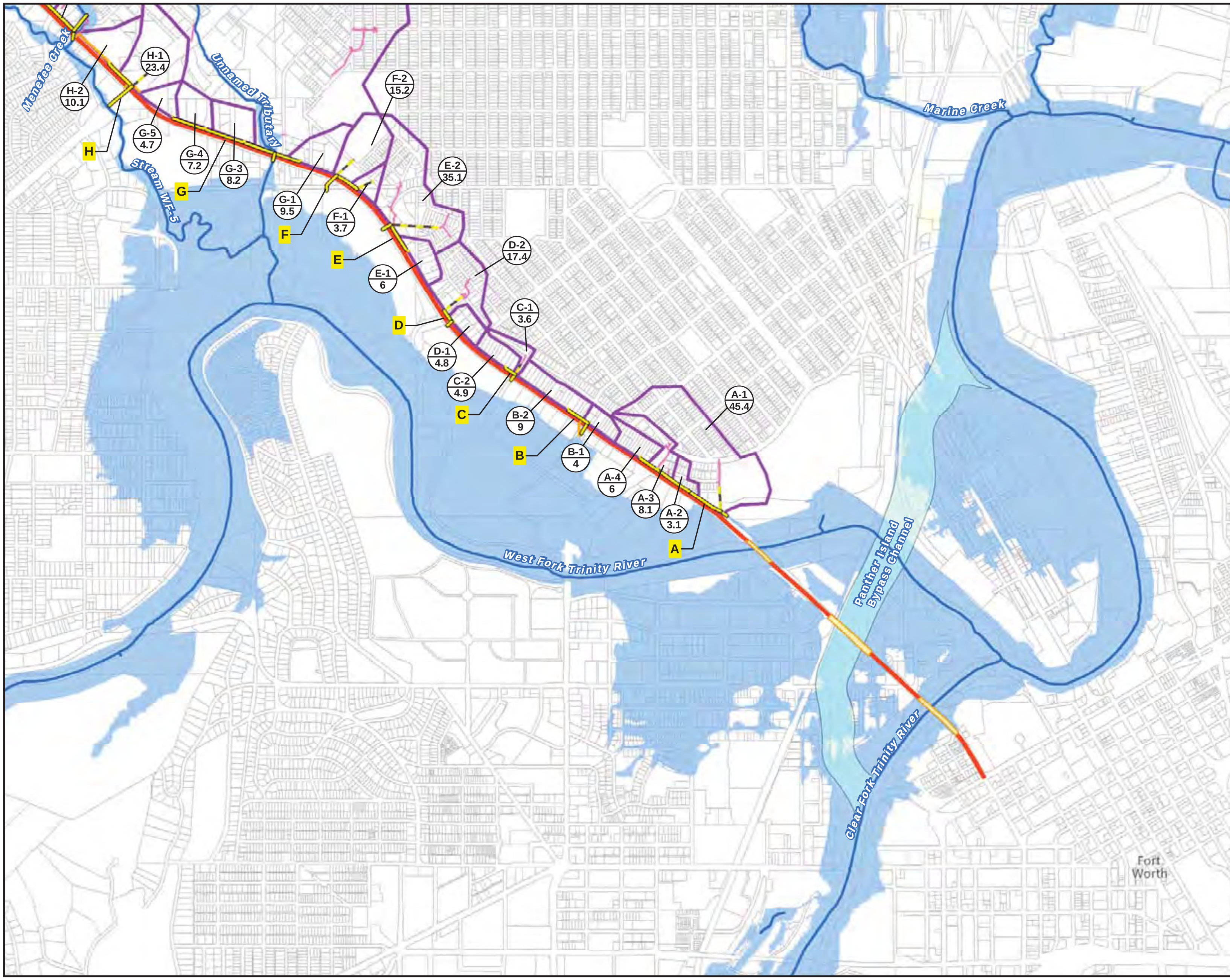
- Project Limits
- Assumed Future Storm Drain
- Proposed Storm Drain
- SH 199 Drainage System
- Off Site Drainage Systems
- Stream Centerline
- Bridges
- Drainage Areas
- Panther Island Bypass Channel
- 11 / 122.1 — Subbasin Name / Area (acres)
- A — Storm Drain System Name

0 2,000 4,000
Feet

N S E W

North Central Texas Council of Governments

Date: 5/3/2017

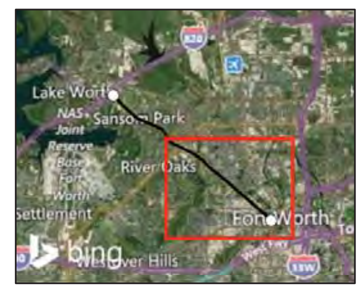


Proposed Drainage Area Map

Exhibit 1-2

State Highway 199
Corridor Master Plan

- Project Limits
- Assumed Future Storm Drain
- Proposed Storm Drain
- SH 199 Drainage System
- Off Site Drainage Systems
- Stream Centerline
- Bridges
- Drainage Areas
- Panther Island Bypass Channel
- 11 / 122.1 — Subbasin Name / Area (acres)
- A — Storm Drain System Name



0 2,000 4,000
Feet

N E S W

North Central Texas Council of Governments

Date: 5/3/2017

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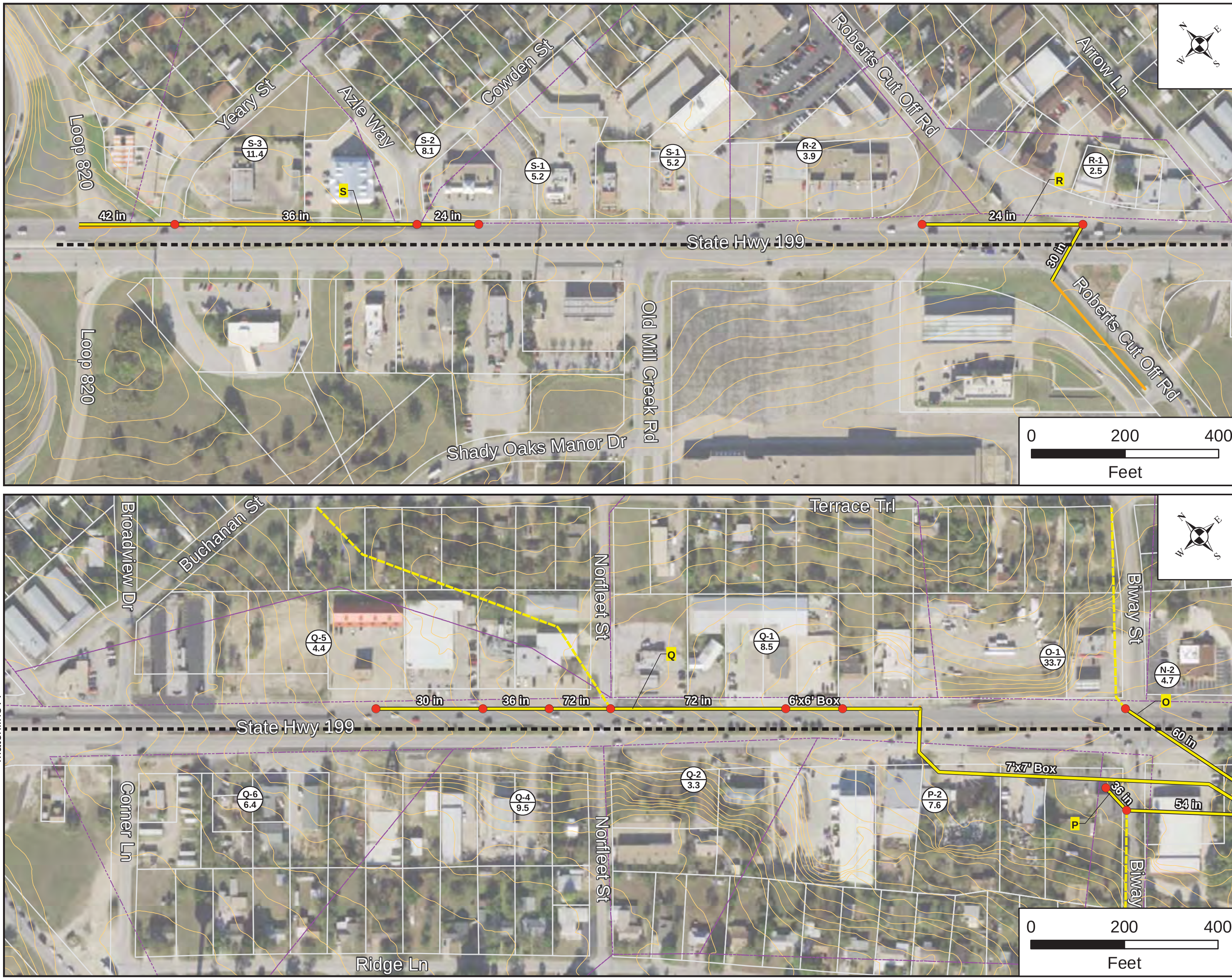
Exhibit 2

Proposed Storm Drain System

Proposed Storm Drain System

Exhibit 2-1

State Highway 199
Corridor Master Plan



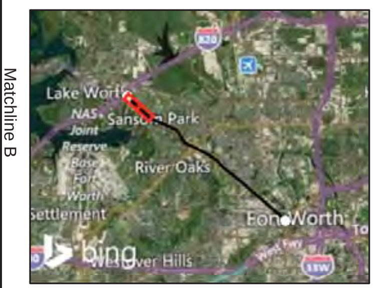
Legend

- Inflow Location
- 2-ft Contours (NCTCOG 2001)
- Proposed Centerline
- Future Storm Drain
- Proposed Storm Drain
- Existing SH 199 Drainage System
- Existing Off Site Drainage Systems
- Stream Centerline
- Drainage
- Bridges

11 / 122.1 — Subbasin Name / Area (acres)

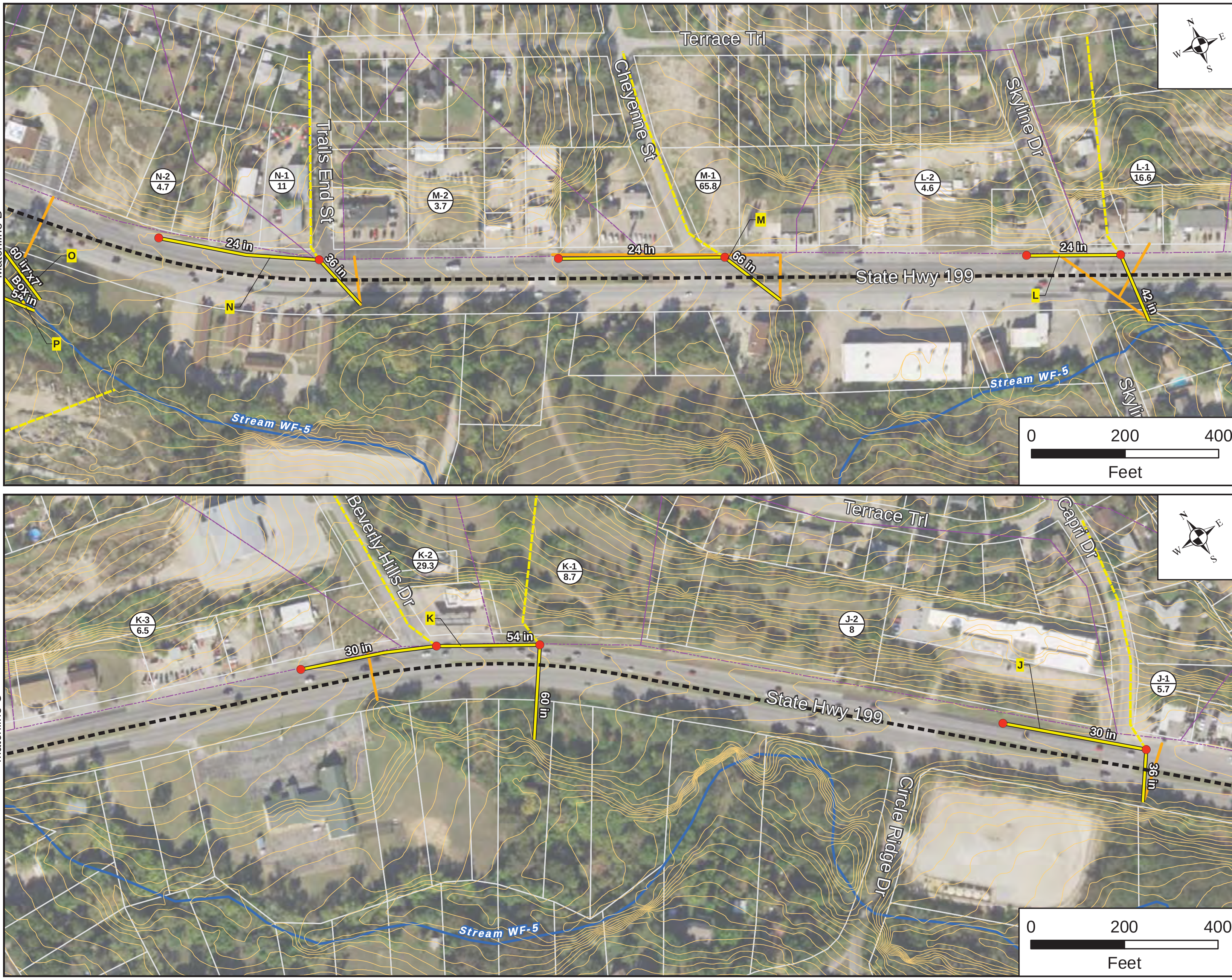
A — Storm Drain System Name

Note: Inlet and lateral capacity was not evaluated as part of the master plan. Future inlets and laterals that may be necessary within the right-of-way are not shown in these exhibits.



North Central Texas Council of Governments

Date: 7/20/2017



Proposed Storm Drain System

Exhibit 2-2

State Highway 199
Corridor Master Plan

Legend

- Inflow Location
- 2-ft Contours (NCTCOG 2001)
- Proposed Centerline
- Future Storm Drain
- Proposed Storm Drain
- Existing SH 199 Drainage System
- Existing Off Site Drainage Systems
- Stream Centerline
- Drainage
- Bridges

11 / 122.1 — Subbasin Name / Area (acres)

A — Storm Drain System Name

Note: Inlet and lateral capacity was not evaluated as part of the master plan. Future inlets and laterals that may be necessary within the right-of-way are not shown in these exhibits.

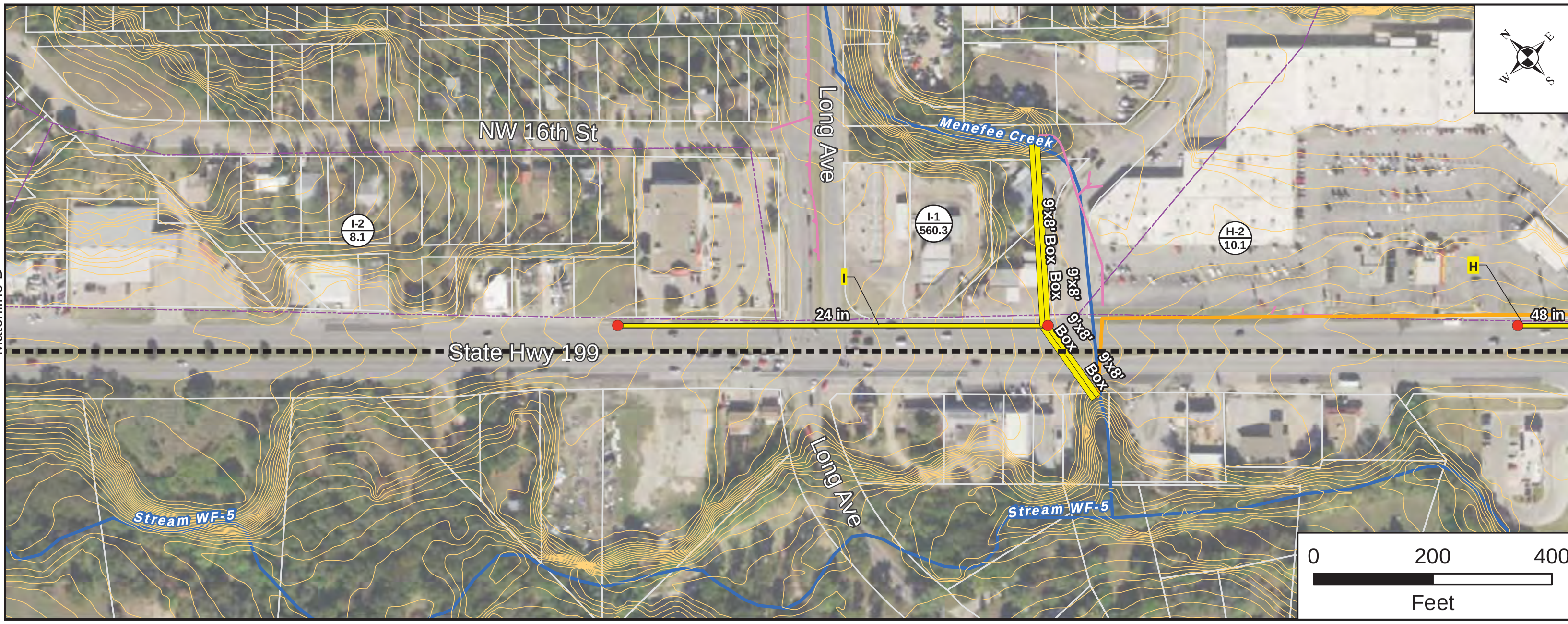
North Central Texas Council of Governments

Date: 7/20/2017

Proposed Storm Drain System

Exhibit 2-3

State Highway 199
Corridor Master Plan



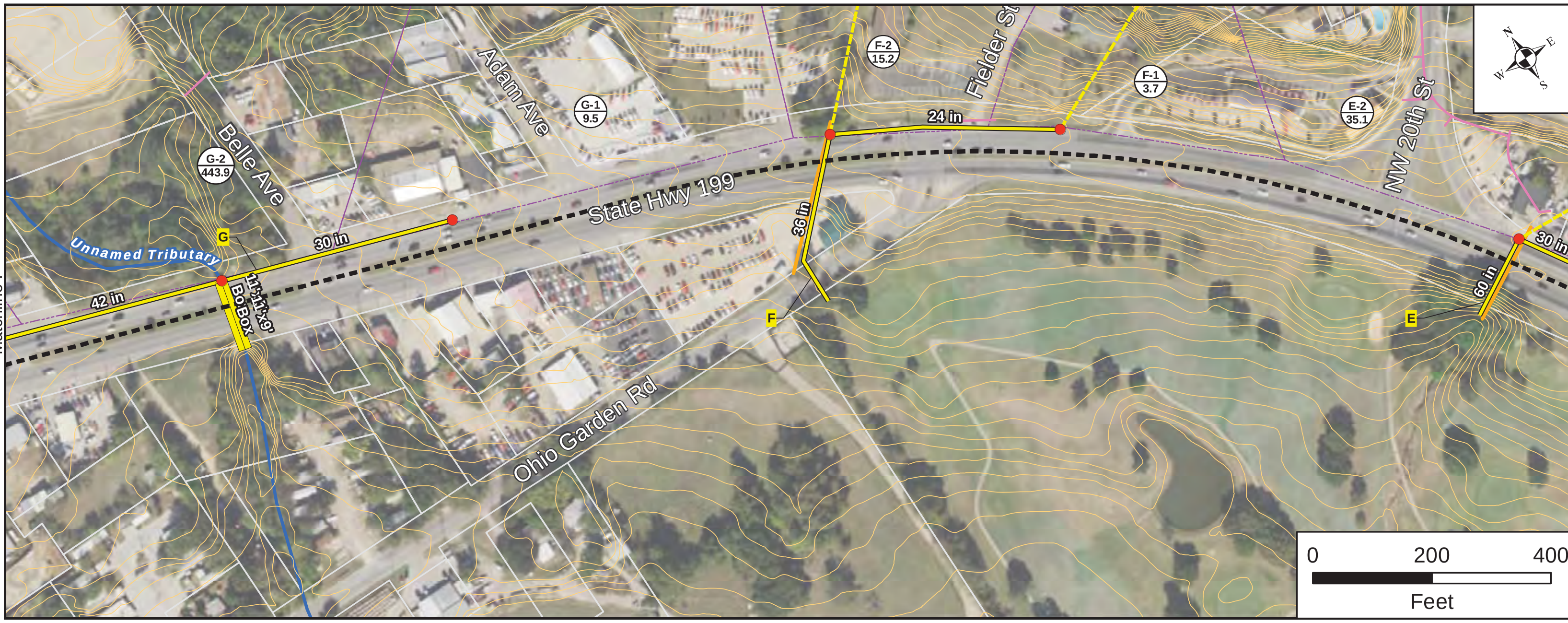
Legend

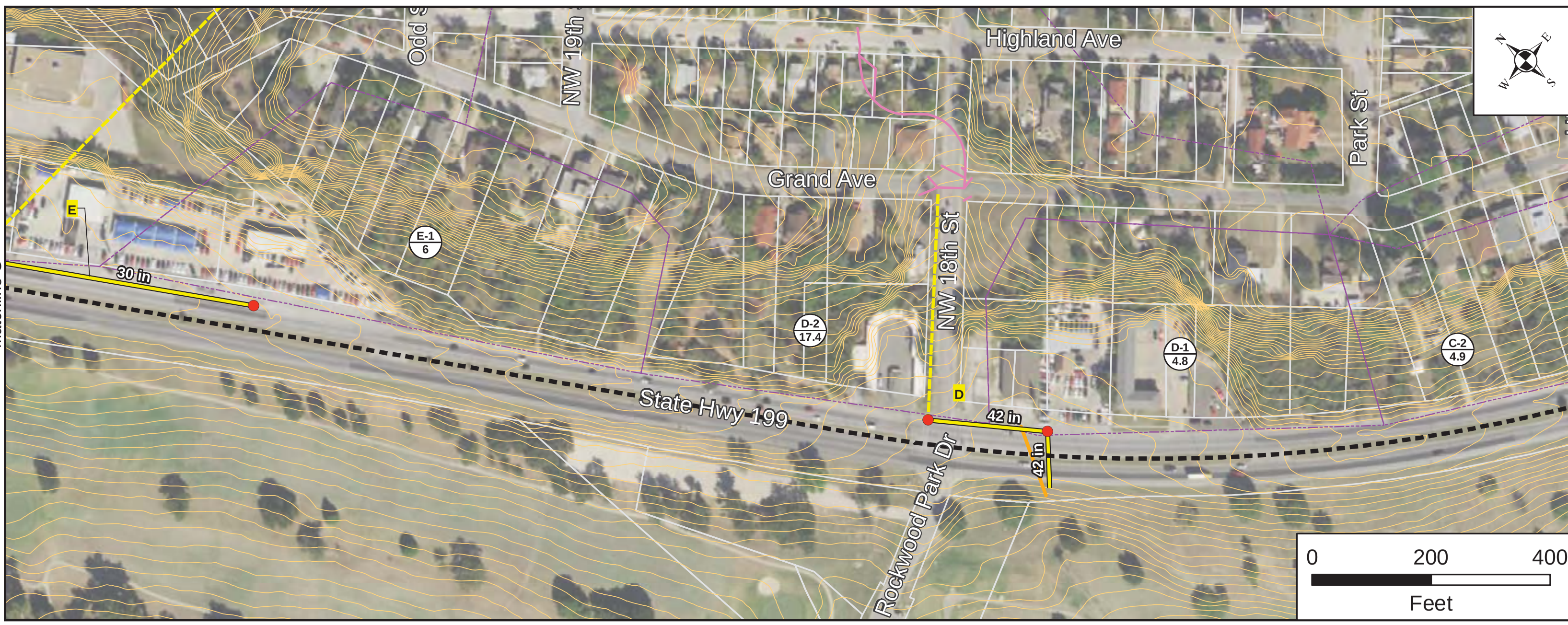
- Inflow Location
- 2-ft Contours (NCTCOG 2001)
- Proposed Centerline
- Future Storm Drain
- Proposed Storm Drain
- Existing SH 199 Drainage System
- Existing Off Site Drainage Systems
- Stream Centerline
- Drainage
- Bridges
- 11 / 122.1 — Subbasin Name / Area (acres)
- A — Storm Drain System Name

Note: Inlet and lateral capacity was not evaluated as part of the master plan. Future inlets and laterals that may be necessary within the right-of-way are not shown in these exhibits.

North Central Texas Council of Governments

Date: 7/20/2017





Proposed Storm Drain System

Exhibit 2-4

State Highway 199
Corridor Master Plan

Legend

- Inflow Location
- 2-ft Contours (NCTCOG 2001)
- Proposed Centerline
- Future Storm Drain
- Proposed Storm Drain
- Existing SH 199 Drainage System
- Existing Off Site Drainage Systems
- Stream Centerline
- Drainage
- Bridges

11 / 122.1 — Subbasin Name / Area (acres)

A — Storm Drain System Name

Note: Inlet and lateral capacity was not evaluated as part of the master plan. Future inlets and laterals that may be necessary within the right-of-way are not shown in these exhibits.

North Central Texas
Council of Governments

Date: 7/20/2017

Proposed Storm Drain System

Exhibit 2-5

State Highway 199
Corridor Master Plan

Legend

- Inflow Location
- 2-ft Contours (NCTCOG 2001)
- Proposed Centerline
- Future Storm Drain
- Proposed Storm Drain
- Existing SH 199 Drainage System
- Existing Off Site Drainage Systems
- Stream Centerline
- Drainage
- Bridges

11 — Subbasin Name
122.1 — Area (acres)

A — Storm Drain System Name

Note: Inlet and lateral capacity was not evaluated as part of the master plan. Future inlets and laterals that may be necessary within the right-of-way are not shown in these exhibits.

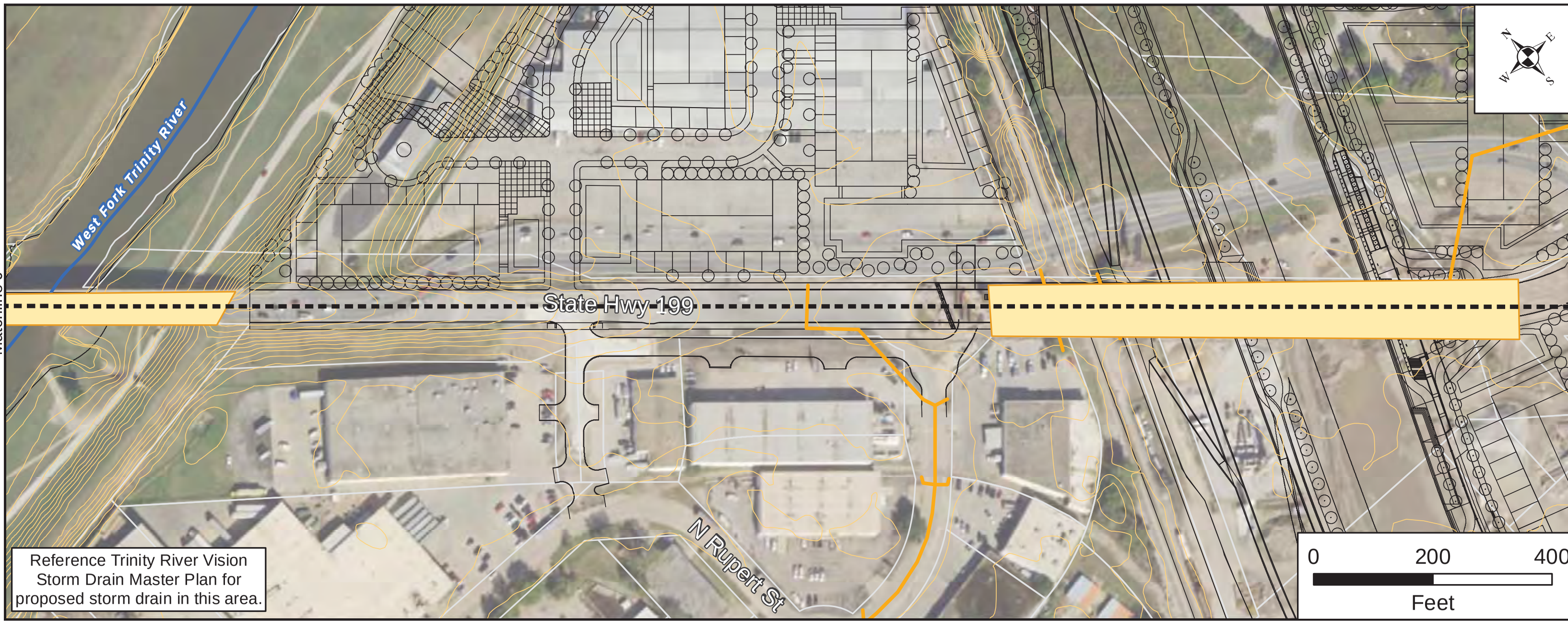
North Central Texas Council of Governments

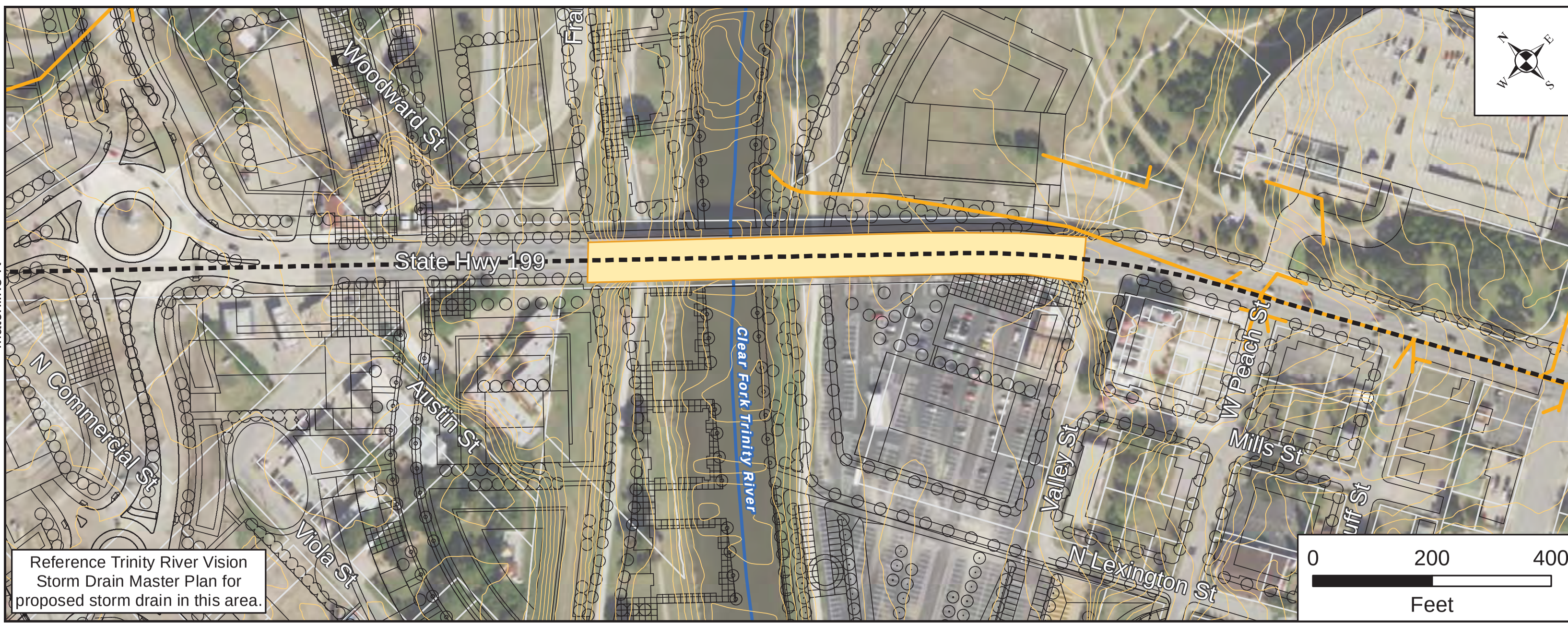
Date: 7/20/2017

Proposed Storm Drain System

Exhibit 2-6

State Highway 199
Corridor Master Plan

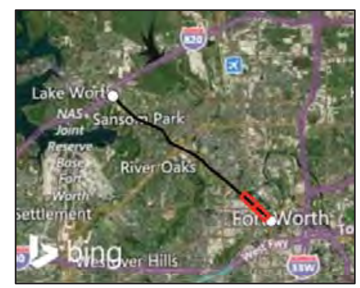




Legend

- Inflow Location
- 2-ft Contours (NCTCOG 2001)
- Proposed Centerline
- Future Storm Drain
- Proposed Storm Drain
- Existing SH 199 Drainage System
- Existing Off Site Drainage Systems
- Stream Centerline
- Drainage Areas
- Bridges
- 11 / 122.1 — Subbasin Name / Area (acres)
- A — Storm Drain System Name

Note: Inlet and lateral capacity was not evaluated as part of the master plan. Future inlets and laterals that may be necessary within the right-of-way are not shown in these exhibits.



North Central Texas Council of Governments

Date: 7/20/2017

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Attachment A

Hydrologic Parameters

Hydrologic Values					
DESIGN POINT	DRAINAGE AREA (ac)	TOTAL Tc (min)	RUNOFF COEF. "C"	100 YEAR INTENSITY I (in/hr)	100 YEAR PEAK FLOW Q (cfs)
1	2	3	4	5	6
A-1	45.42	15.00	0.55	9.20	229.93
A-2	3.11	15.00	0.60	9.20	17.18
A-3	8.12	15.00	0.60	9.20	44.84
A-4	6.05	15.00	0.60	9.20	33.41
B-1	4.02	15.00	0.60	9.20	22.20
B-2	9.00	15.00	0.60	9.20	49.70
C-1	3.55	15.00	0.60	9.20	19.60
C-2	4.91	15.00	0.60	9.20	27.12
D-1	4.79	15.00	0.60	9.20	26.45
D-2	17.39	15.00	0.60	9.20	96.04
E-1	6.02	15.00	0.62	9.20	34.35
E-2	35.11	15.00	0.62	9.20	200.36
F-1	3.69	15.00	0.67	9.20	22.76
F-2	15.17	15.00	0.67	9.20	93.55
G-1	9.47	15.00	0.60	9.20	52.30
G-3	8.16	15.00	0.60	9.20	45.06
G-4	7.18	15.00	0.60	9.20	39.65
G-5	4.69	15.00	0.60	9.20	25.90
H-1	23.35	15.00	0.60	9.20	128.95
H-2	10.05	15.00	0.60	9.20	55.50
I-2	8.10	15.00	0.57	9.20	42.50
J-1	5.68	15.00	0.60	9.20	31.37
J-2	7.95	15.00	0.60	9.20	43.90
K-1	8.74	15.00	0.60	9.20	48.27
K-2	29.31	15.00	0.60	9.20	161.87
K-3	6.51	15.00	0.60	9.20	35.95
L-1	16.58	15.00	0.63	9.20	96.14
L-2	4.60	15.00	0.63	9.20	26.67
M-1	65.84	15.00	0.62	9.20	375.72
M-2	3.67	15.00	0.62	9.20	20.94
N-1	11	15.00	0.62	9.20	62.77
N-2	4.73	15.00	0.62	9.20	26.99
O-1	33.75	15.00	0.62	9.20	192.60
P-1	17.63	15.00	0.64	9.20	103.85
P-2	7.58	15.00	0.64	9.20	44.65
Q-1	8.54	15.00	0.63	9.20	49.52
Q-2	3.32	15.00	0.63	9.20	19.25

Q-3	73.81	15.00	0.63	9.20	428.00
Q-4	9.45	15.00	0.63	9.20	54.80
Q-5	4.39	15.00	0.63	9.20	25.46
Q-6	6.38	15.00	0.63	9.20	37.00
R-1	2.45	15.00	0.70	9.20	15.79
R-2	3.94	15.00	0.70	9.20	25.39
S-1	5.18	15.00	0.64	9.20	30.51
S-2	8.13	15.00	0.64	9.20	47.89
S-3	11.44	15.00	0.64	9.20	67.39

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Attachment B

Hydraulic Calculations

STORM DRAIN HYDRAULIC CALCULATIONS TABLE

FROM	TO	PIPE LENGTH feet	Drainage Area Incremental No.	Drainage Area Incremental Area	Drainage Area Total Area	Runoff "c"	Incr. cA	Total cA	Time of Concentration Inlet min.	Time of Concentration Travel min.	Time of Concentration Total min.	5-yr Intensity in/hr.	100-yr Intensity in/hr.	Q5 Runoff cfs	Q100 Runoff cfs	100-yr Inlet Bypass cfs	Q pipe cfs	Pipe Size in.	No. of Barrels	n	Sf ft/ft	HGL D/S Elev.	HGL U/S Elev.	V1 (in) ft/sec	V2 (out) ft/sec	V12/2G ft.	V22/2G ft.	Kj	KjV12/2G ft.	Hk ft.	Design U/S HGL Elev.	Invert Elev. US ft.	Invert Elev. DS ft.	T/C ELEV. Ft.	DESCRIPTION	NOTES
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
LINE A																																				
026+64.90	23+06.70	358.20	A-4	6.05	6.05	0.60	3.63	3.63	15.00	0.56	15.00	5.12	9.20	18.60	33.41	0.00	33.41	24	1	0.013	0.0218	555.41	563.22	0.00	10.64	0.000	1.756	1.25	0.00	2.20	565.42	563.00	551.00	570.00	MH at Beg. of Line	
023+06.70	17+15.30	591.40	A-3	8.12	14.17	0.60	4.87	8.50	15.00	1.23	15.56	5.03	9.03	42.74	76.79	0.00	76.79	42	1	0.013	0.0058	551.59	555.03	10.64	7.98	1.756	0.989	0.35	0.61	0.37	555.41	549.50	543.50	558.00	MH on Line w/60º Lat	
17+15.30	11+23.00	592.30	A-2	3.11	17.28	0.60	1.87	10.37	15.00	1.06	16.80	4.83	8.68	50.08	89.96	0.00	89.96	42	1	0.013	0.0080	545.84	550.58	7.98	9.35	0.989	1.358	0.35	0.35	1.01	551.59	543.50	541.50	552.00	MH on Line w/60º Lat	
11+23.00	10+00.00	123.00	A-1	45.42	62.70	0.55	24.98	35.35	15.00	0.20	17.85	4.67	8.40	165.25	296.86	0.00	296.86	72	1	0.013	0.0049	544.00	544.60	9.35	10.50	1.358	1.712	0.35	0.48	1.24	545.84	539.00	538.00	550.00	MH on Line w/60º Lat	
LINE B																																				
15+63.60	11+91.50	372.10	B-2	9.00	9.00	0.60	5.40	5.40	15.00	0.88	15.00	5.12	9.20	27.66	49.70	0.00	49.70	36	1	0.013	0.0056	570.34	572.41	0.00	7.03	0.000	0.768	1.25	0.00	0.96	573.37	567.00	566.00	575.00	MH at Beg. of Line	
11+91.50	10+00.00	191.50	B-1	4.02	13.02	0.60	2.41	7.81	15.00	0.32	15.88	4.97	8.94	38.86	69.81	0.00	69.81	36	1	0.013	0.0110	567.00	569.10	7.03	9.88	0.768	1.515	0.35	0.27	1.25	570.34	566.00	564.00	574.00	MH on Line w/60º Lat	
LINE C																																				
12+92.10	11+15.10	177.00	C-2	4.91	4.91	0.60	2.95	2.95	15.00	0.34	15.00	5.12	9.20	15.09	27.12	0.00	27.12	24	1	0.013	0.0144	583.75	586.29	0.00	8.63	0.000	1.157	1.25	0.00	1.45	587.74	581.00	577.00	588.00	MH at Beg. of Line	
11+15.10	10+00.00	115.10	C-1	3.55	8.46	0.60	2.13	5.08	15.00	0.13	15.34	5.06	9.10	25.70	46.18	0.00	46.18	24	1	0.013	0.0417	576.00	580.80	8.63	14.70	1.157	3.356	0.35	0.40	2.95	583.75	577.00	574.00	584.00	MH on Line w/60º Lat	
LINE D																																				
12+96.60	10+94.80	201.80	D-2	17.39	17.39	0.60	10.43	10.43	15.00	0.34	15.00	5.12	9.20	53.45	96.04	0.00	96.04	42	1	0.013	0.0091	581.29	583.13	0.00	9.98	0.000	1.547	1.25	0.00	1.93	585.07	579.50	576.50	588.00	MH at Beg. of Line	
10+94.80	10+00.00	94.80	D-1	4.79	22.18	0.60	2.87	13.31	15.00	0.13	15.34	5.06	9.10	67.40	121.10	0.00	121.10	42	1	0.013	0.0145	578.00	579.37	9.98	12.59	1.547	2.460	0.35	0.54	1.92	581.29	576.50	574.50	585.00	MH on Line w/60º Lat	
LINE E																																				
16+84.90	12+04.70	480.20	E-1	6.02	6.02	0.62	3.73	3.73	15.00	1.14	15.00	5.12	9.20	19.12	34.35	0.00	34.35	30	1	0.013	0.0070	585.33	588.70	0.00	7.00	0.000	0.761	1.25	0.00	0.95	589.65	582.50	580.50	590.00	MH at Beg. of Line	
12+04.70	10+00.00	204.70	E-2	35.11	41.13	0.62	21.77	25.50	15.00	0.30	16.14	4.93	8.86	125.76	225.95	0.00	225.95	60	1	0.013	0.0075	582.00	583.54	7.00	11.51	0.761	2.056	0.35	0.27	1.79	585.33	578.00	577.00	588.00	MH on Line w/60º Lat	
LINE F																																				
16+88.50	12+93.80	394.70	F-1	3.69	3.69	0.67	2.47	2.47	15.00	0.91	15.00	5.12	9.20	12.66	22.76	0.00	22.76	24	1	0.013	0.0101	578.00	581.99	0.00	7.24	0.000	0.815	1.25	0.00	1.02	583.01	581.00	576.00	588.00	MH at Beg. of Line	
12+93.80	10+00.00	293.80	F-2	15.17	18.86	0.67	10.16	12.64	15.00	0.31	15.91	4.97	8.93	62.80	112.83	0.00	112.83	36	1	0.013	0.0286	565.00	573.41	7.24	15.96	0.815	3.956	0.35	0.29	3.67	577.08	575.00	562.00	583.00	MH on Line w/60º Lat	PARTIAL FLOW
LINE G																																				
29+09.20	23+48.90	560.30	G-5	4.69	4.69	0.60	2.81	2.81	15.00	1.13	15.00	5.12	9.20	14.41	25.90	0.00	25.90	24	1	0.013	0.0131	581.44	588.79	0.00	8.24	0.000	1.055	1.25	0.00	1.32	590.11	586.00	578.00	593.00	MH on Line w/60º Lat	
23+48.90	16+88.80	660.10	G-4	7.18	11.87	0.60	4.31	7.12	15.00	0.86	16.13	4.93	8.86	35.14	63.13	0.00	63.13	30	1	0.013	0.0237	563.61	579.25	8.24	12.86	1.055	2.568	0.35	0.37	2.20	581.44	577.50	556.50	585.00	MH on Line w/60º Lat	
16+88.80	11+99.40	489.40	G-3	8.16	20.03	0.60	4.90	12.02	15.00	0.76	16.99	4.80	8.62	57.70	103.65	0.00	103.65	42	1	0.013	0.0106	557.51	562.70	12.86	10.77	2.568	1.802	0.35	0.90	0.90	563.61	555.50	547.50	564.00	MH on Line w/60º Lat	
16+11.40	11+99.40	412.00	G-1	9.47	9.47	0.60	5.68	5.68	15.00	0.64	15.00	5.12	9.20	29.11	52.30	0.00	52.30	30	1	0.013	0.0163	557.51	564.21	0.00	10.65	0.000	1.763	1.25	0.00	2.20	566.41	559.50	548.50	567.00	MH at Beg. of Line	
LINE H																																				
19+86.70	14+79.60	507.10	H-2	10.05	10.05	0.60	6.03	6.03	15.00	1.91	15.00	5.12	9.20	30.89	55.50	0.00	55.50	48	1	0.013	0.0015	582.82	583.58	0.00	4.42	0.000	0.303	1.25	0.00	0.38	583.96	578.00	577.00	585.00	MH at Beg. of Line	
14+79.60	10+00.00	479.60	H-1	23.35	33.40	0.60	14.01	20.04	15.00	0.58	16.91	4.81	8.65	96.43	173.25	0.00	173.25	48	1	0.013	0.0145	573.00	579.98	4.42	13.79	0.303	2.951	0.35	0.11	2.85	582.82	577.00	569.00	586.00	MH on Line w/60º Lat	
LINE I																																				
18+67.34	11+45.10	722.24	I-2	8.10	8.10	0.57	4.62	4.62	15.00	0.89	15.00	5.12	9.20	23.65	42.50	0.00	42.50	24	1	0.013	0.0353	591.97	617.46	0.00	13.53	0.000	2.841	1.25	0.00	3.55	621.01	616.00	592.00	623.00	MH at Beg. of Line	
LINE J																																				
14+23.80	11+13.30	310.50	J-2	7.95	7.95	0.60	4.77	4.77	15.00	0.58	15.00	5.12	9.20	24.43	43.90	0.00	43.90	30	1	0.013	0.0115	636.65	640.20	0.00	8.94	0.000	1.242	1.25	0.00	1.55	641.76	635.50	633.50	643.00	MH at Beg. of Line	
11+13.30	10+00.00	113.30	J-1	5.68	13.63	0.60	3.41	8.18	15.00	0.18	15.58	5.02	9.03	41.09	73.82	0.00	73.82	36	1	0.013	0.0123	634.00	635.39	8.94	10.44	1.242	1.694	0.35	0.43	1.26	636.65	633.00	631.00	641.00	MH on Line w/60º Lat	
LINE K																																				
17+18.80	14+24.30	294.50	K-3	6.51	6.51	0.60	3.91	3.91	15.00	0.67	15.00	5.12	9.20	20.01	35.95	0.00	35.95	30	1	0.013	0.0077	654.33	656.59	0.00	7.32	0.000	0.833	1.25	0.00	1.04	657.63	652.50	649.50	660.00	MH at Beg. of Line	
14+24.30	12+03.40	220.90	K-2	29.31	35.82	0.60	17.59	21.49	15.00	0.30	15.67	5.01	9.00	107.65	193.41	0.00	193.41	54	1	0.013	0.0097	650.18	652.32	7.32	12.16	0.833	2.296	0.35	0.29	2.00	654.33	647.50	644.50	657.00	MH on Line w/60º Lat	
12+03.40	10+00.00	203.40	K-1	8.74	44.56	0.60	5.24	26.74	15.00	0.28	15.97	4.96	8.91	132.59	238.22	0.00	238.22	60	1	0.013	0.0084	647.00	648.70	12.16	12.13	2.296	2.286	0.35	0.80	1.48	650.18	644.00	642.00	654.00	MH on Line w/60º Lat	
LINE L																																				
13+54.50	11+53.50	201.00	L-2	4.60	4.60	0.63	2.90	2.90	15.00	0.39	15.00	5.12	9.20	14.85	26.67	0.00	26.67	24	1	0.013	0.0139	661.80	664.59	0.00	8.49	0.000	1.119	1.25	0.00	1.40	665.99	659.00	658.00	666.00	MH at Beg. of Line	
11+53.50	10+00.00	153.50	L-1	16.58	21.18	0.63	10.45	13.34	15.00	0.20	15.39	5.05	9.08	67.45	121.19	0.00	121.19	42	1	0.013	0.0145	657.50	659.73	8.49	12.60	1.119	2.464	0.35	0.39	2.07	661.80	656.50	654.00	665.00	MH on Line w/60º Lat	
LINE M																																				
15+58.20	12+02.50	355.70	M-2	3.67	3.67	0.62	2.28	2.28	15.00	0.89	15.00	5.12	9.20	11.66	20.94	0.00	20.94	24	1	0.013	0.0086	672.00	675.05	0.00	6.67	0.000	0.690	1.25	0.00	0.86	675.91	673.50	666.00	682.00	MH at Beg. of Line	
12+02.50	10+00.00	202.50	M-1	65.84	69.51	0.62	40.82	43.10	15.00	0.21	15.89	4.97	8.93	214.31	385.04	0.00	385.04	66	1	0.013	0.0131	665.50	668.16	6.67	16.21	0.690	4.078	0.35	0.24	3.84	672.00	662.50	660.00	673.00	MH on Line w/60º Lat	
LINE N																																				
14+76.80	11+30.10	346.70	N-2	4.73	4.73	0.62	2.93	2.93	15.00	0.67	15.00	5.12	9.20	15.02	26.99	0.00	26.99	24	1	0.013	0.0142	689.24	694.18	0.00	8.59	0.000	1.146	1.25	0.00	1.43	695.61	693.00	686.00	700.00	MH at Beg. of Line	
11+30.10	10+00.00	130.10	N-1	11.00	15.73	0.62	6.82	9.75	15.00	0.17	15.67	5.01	9.00	48.85	87.76	0.00	87.76	36	1	0.013	0.0173	685.00	687.25	8.59	12.42	1.146	2.393	0.35	0.40	1.99	689.24	685.00	682.00	693.00	MH on Line w/60º Lat	
LINE O																																				
13+67.40	10+00.00	367.40	O-1	33.75	33.75	0.62	20.93	20.93	15.00	0.62	15.00	5.12	9.20	107.19	192.60	0.00	192.60	60	1	0.013	0.0055	701.00	703.01	0.00	9.81	0.000	1.494	1.25	0.00	1.87	704.88	697.00	696.00	705.00	MH at Beg. of Line	
LINE P																																				
13+23.70	12+83.50	40.20	P-2	7.58	7.58	0.64	4.85	4.85	15.00	0.11	15.00	5.12	9.20	24.85	44.65	0.00	44.65	36	1	0.013	0.0045	703.23	703.41	0.00	6.32	0.000	0.620	1.25	0.00	0.77	704.19	699.00	698.00	705.00	MH at Beg. of Line	
12+83.50	10+00.00	283.50	P-1	17.63	25.21	0.64	11.28	16.13	15.00	0.51	15.11	5.10	9.17	82.35	147.97	0.00	147.97	54	1	0.013	0.0057	700.50	702.11	6.32	9.30	0.620	1.344	0.35	0.22	1.13	703.23	696.50	696.00	704.00	MH on Line w/60º Lat	
LINE Q																																				
28+97.10	26+69.00	228.10	Q-1	8.54	8.54	0.63	5.38	5.38	15.00	0.38	15.00	5.12	9.20	27.56	49.52	0.00	49.52	30	1	0.013	0.0146	729.95	733.27	0.00	10.09	0.000	1.580	1.25	0.00	1.98	735.25	730.50	724.50	738.00	MH at Beg. of Line	
26+69.00	25+27.20	141.80	Q-2	3.32	11.86	0.63	2.09	7.47	15.00	0.25	15.38	5.06	9.09	37.79	67.90	0.00	67.90	36	1	0.013	0.0104	727.60	729.07	10.09	9.61	1.580	1.433	0.35	0.55	0.88	729.95	724.00	720.00	732.00	MH on Line w/60º Lat	
25+27.20	23+96.00	131.20	Q-3	73.81	85.67	0.63	46.50	53.97	15.00	0.13	15.62	5.02	9.01	270.76	486.47	0.00	486.47	72	1	0.013	0.0132	721.77	723.50	9.61	17.21	1.433	4.597	0.35	0.50	4.10	727.60	717.00	713.00	728.00	MH on Line w/60º Lat	
23+96.00	20+22.20	373.80	Q-4	9.45	95.12	0.63	5.95	59.93	15.00	0.33	15.75	5.00	8.98	299.37	537.86	0.00	537.86	72	1	0.013	0.0161	711.73	717.76	17.21	19.02	4.597	5.619	0.35	1.61	4.01	721.77	712.00	703.00	724.00	MH on Line w/60º Lat	
20+22.20	19+00.50	121.70	Q-5	4.39	99.51	0.63	2.77	62.69	15.00	0.18	16.08	4.94	8.88	309.85	556.67	0.00	556.67	6 x 6	1	0.013	0.0107	708.69	709.98	19.02	15.46	5.619	3.713	0.35	1.97	1.75	711.73	703.00	701.00	715.00	MH on Line w/60º Lat	
19+00.50	10+00.00	900.50	Q-6	6.38	105.89	0.63	4.02	66.71	15.00	0.23	16.26	4.91	8.83	327.81	588.94	0.00	588.94	7 x 7	1	0.013	0.0053	703.00	707.74	15.46	12.04	3.713	2.250	0.35	1.30	0.95	708.69	701.00	696.00	713.00	MH on Line w/60º Lat	
LINE R																																				
14+81.40	11+37.20	344.20	R-2	3.94	3.94	0.70	2.76	2.76	15.00	0.71	15.00	5.12	9.20	14.13	25.39	0.00	25.39	24	1	0.013	0.0126	750.00	754.34	0.00	8.08	0.000	1.014	1.25	0.00	1.27	755.61	751.00	747.00	758.00	MH at Beg. of Line	
11+37.20	10+00.00	137.20	R-1	2.45	6.39	0.70	1.72	4.47	15.00	0.28	15.71	5.00	8.99	22.38	40.20	0.00	40.20	30	1	0.013	0.0096	748.00	749.32	8.08	8.19	1.014	1.041	0.35	0.35	0.69	750.00	746.50	745.50	754.00	MH on Line w/60º Lat	
LINE S																																				
18+54.40	17+22.30	132.10	S-1	5.18	5.18	0.64	3.32	3.32	15.00	0.23	15.00	5.12	9.20	16.98	30.51	0.00	30.51	24	1	0.013	0.0182	749.11	751.51	0.00	9.71	0.000	1.465	1.25	0.00	1.83	753.34	748.00	746.00	755.00	MH at Beg. of Line	
17+22.30	12+05.00	517.30	S-2	8.13	13.31	0.64	5.20	8.52	15.00	0.78	15.23	5.08	9.13	43.30	77.80	0.00	77.80	36	1	0.013	0.0136	740.70	747.74	9.71	11.01	1.465	1.881	0.35	0.51	1.37	749.11	745.00	736.00	753.00	MH on Line w/60º Lat	
12+05.00	10+00.00	205.00	S-3	11.44	24.75	0.64	7.32	15.84	15.00	0.23	16.01	4.95	8.90	78.46	140.96	0.00	140.96	42	1	0.013	0.0196	734.00	738.02	11.01	14.65	1.881	3.333	0.35	0.66	2.67	740.70	735.50	730.50	744.00	MH on Line w/60º Lat	

Appendix Q – Urban Design Considerations Technical Memorandum

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State Highway 199 Corridor Master Plan

From IH 820 to Belknap Street

Urban Design Technical Memorandum

Submittal Date:
July 28, 2017

Prepared For:
North Central Texas Council of Governments

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FREESE AND NICHOLS

1.0 URBAN DESIGN

1.1 Background

Urban design is a broad topic that encompasses all aspects of the built environment. The built environment can include private development such as the varied properties along the project corridor. It can also include the public spaces and facilities such as the State Highway (SH) 199 right-of-way. The combined consideration of public and private spaces is often described as the public realm. The public realm is the collective assemblage of private property environs and public open spaces inclusive of roadway rights-of-way. The urban design elements within the public realm can contribute to a more unified vision of land use, development character, open space design, and a more seamless boundary between the roadway right-of-way and adjacent properties (public or private). In the case of the SH 199 Corridor Master Plan, from Interstate Highway (IH) 820 to Belknap Street, urban design addresses potential open space improvements (landscape and hardscape) within the public right-of-way. Landscape improvements take into account elements such as trees, shrubs, ground covers, and turf, as well as the supporting earthwork and irrigation systems. Hardscape improvements take into account elements such as pedestrian pavements, walls, fencing, light fixtures, traffic signal hardware, and site furnishings. While all of these are functional elements, they can also be character defining features. The potential exists to incorporate landscape and hardscape elements in a manner that further defines and complements the corridor context.

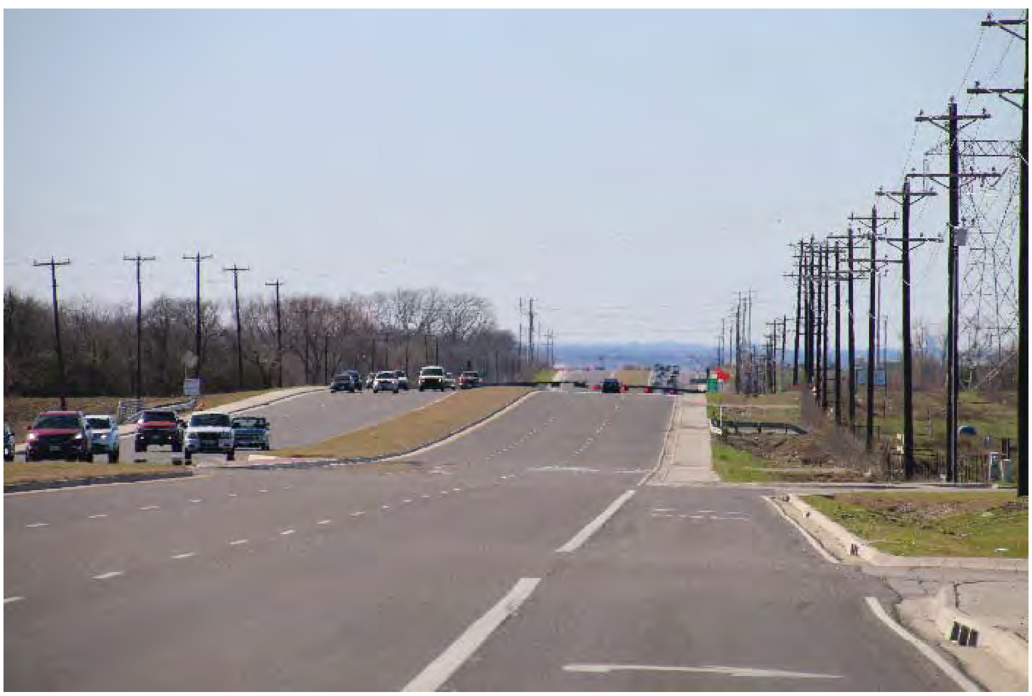

Figure 1. Typical TxDOT Corridor Without Enhancements (US 380)
Source: Freese and Nichols, 2017

Practices for major roadway improvement projects within Texas Department of Transportation (TxDOT) right-of-way or jurisdiction occasionally include a minimal level of landscape and hardscape improvements, though not included in all projects (see Figure 1). These usually take the form of treatments such as tinted concrete pedestrian and median paving finishes, retaining wall panel formliner finishes/paint coatings, and sporadic parkway or median plantings (above and beyond turf establishment), when included. While these types of improvements are part of the urban design palette, some entities elect to incorporate additive enhancements. The

SH 199 urban design considerations illustrate several alternatives for potential enhancements, some of which would likely need to be funded by partner organizations and/or agencies in concert with TxDOT. These considerations are pointed out so that entities who wish to entertain these types of programs can do so at the appropriate time. As a general guideline, it is desirable to initiate these discussions early in project planning phases so that appropriate design accommodations and coordination can be conducted in advance of the final engineering design. If considered afterward, certain design alternatives may prove difficult or unfeasible to implement.

As described in the Economic Market Analysis Technical Memorandum, catalyst redevelopments and new infill developments are being considered at four locations outside of the right-of-way, but within the SH 199 corridor study area (see Exhibit 1). The urban design of SH 199 has the ability to complement and highlight the redevelopment nodes by implementing differentiating streetscape improvements. There is a strong potential for a new aesthetic to emerge, occurring in a more integrated manner, by implementing a corridor-wide urban design scheme that reacts appropriately to the surroundings. Aside from the prospect of future transformations, the corridor currently displays a wide range of variation and localized character (see Existing Character Zones Technical Memorandum). In addition to the existing character, the breadth and regional scale of the SH 199 corridor is a dominant feature that will remain as such in the future. These unique corridor context qualities form the basis for the urban design concept alternatives. The urban design strategy intends to capitalize and expand upon existing, favorable qualities and characteristics and the identified redevelopment nodes. A strategy such as this is described as a Context Sensitive Design approach. This technical memorandum establishes preliminary design strategies which could be further developed in future phases, if implemented.

1.2 Urban Design Considerations

The planned reconstruction of the SH 199 corridor offers the opportunity to enhance the character of the corridor through forward thinking urban design strategies. Redevelopment of parcels may occur over time given the proximity to employment centers, regional attractions, and as a response to population growth projections for the region. The proposed urban design improvements are strategized to complement existing conditions, the types of catalyst redevelopment concepts defined in the Economic Market Analysis Technical Memorandum, and other new development that may occur. It would be wise for the partner municipalities to consider development policies and standards to accommodate future development in a manner that optimizes continuity with improvements within the right-of-way.

The breadth of the proposed improved corridor is very large by comparison to most urban roadways and its continuous alignment translates to six miles in length. Urban design improvements could mitigate the length and width of the facility by introducing elements that reduce the apparent scale of the roadway environment (see Figure 2), potentially lending more human scaled qualities to the corridor. This could be further developed by incorporating variability within the urban design features to complement unique identities for the communities along the route and to avoid a single application throughout the project corridor. This approach enables certain design features and motifs to express community identity within a consistent method of organization applied throughout the corridor. By applying consistent planimetric layouts with varied details and motifs, a balance can be struck between variability and continuity. Variability may be further achieved through transitions in the horizontal geometry of the roadway. This potentially introduces a degree of sinuosity that affords the opportunity to further differentiate segments of the corridor and to express the gently rolling terrain through which the roadway travels.

Figure 2. Regional Scale Corridor with Broad Footprint
Source: Freese and Nichols, 2017

Several other design considerations incorporated into the urban design strategies include the potential for community gateways and community differentiation. Community gateways provide improvements to accentuate a location of prominence such as an entry into a community or a key intersection. This could take the form of a landmark structure such as masonry features or a sculpture, a heavily landscaped portal, distinctive lighting effects and/or identity signage (see Figure 3). The listed gateway alternatives are simply representative examples; additional methods exist to distinguish these locations and could include subtle treatments to frame views that highlight vistas and adjacent natural features.

Figure 3. Example Gateway Landmark Features
Source: Freese and Nichols, 2017

1.3 Urban Design Concepts

The urban design concepts represent a starting point for design with an intent to demonstrate the enhancement potential of the corridor. They are at a conceptual level and depict prototypical conditions which would require further development in subsequent design efforts. These efforts would likely include additional refinements, confirmation of site specific conditions, and application of final design criteria to layouts throughout the corridor. Toward this, care should be taken to respect applicable sightlines and clearances. For best outcomes, the concept refinements should be addressed in advance of or concurrent with other aspects of the project design to enable appropriate coordination of urban design conditions.

The concepts consider the existing character of the corridor and capitalize on principles inherent in the catalyst development concepts to varying degrees. Conditions vary based on lane configurations and right-of-way width, lending minor nuance to how the designs translate within these zones. As a starting point for design, additional features and concepts could be added and/or subtracted from these strategies as supported by stakeholder consensus and funding resources available to the project. It is not the intent of this initial urban design effort to prescribe specific mandates rather to provide stimulus and general direction at a project planning level to subsequent design efforts. In so doing, many final design decisions and flexibilities remain.

Three concepts (base, boulevard, and parkway) were developed to pose different perspectives as described in Section 1.4, Section 1.5, and Section 1.6 and shown in Exhibits 2 through 4). All concepts anticipate interagency and/or public-private partnerships to accomplish the level of improvements depicted. The concepts were developed with an intent to make the corridor look and feel *"More Like a Street, Less Like a Highway."*

1.4 Base Concept

The base concept envisions the corridor with an eye toward consistency and continuity accomplished through a unified design repeated throughout the project. It translates the experience of rapid movement past fixed objects into a pattern of linear elements observed in the same way as one whisks past pavement markings and regularly spaced elements on a roadway. This approach is consistent with the way many transportation projects are designed with repeating patterns and standardized elements. In this regard, this design would be the most closely associated with standard transportation design practices with minimal enhancements (see Figure 4 and 5). Even with a lesser level of enhancement, it is wise to organize the urban design around a common set of themes and strategies which can vary by concept alternative. This concept can be characterized as a "C*ity in Motion, Celebrating the Roadway Experience.*"

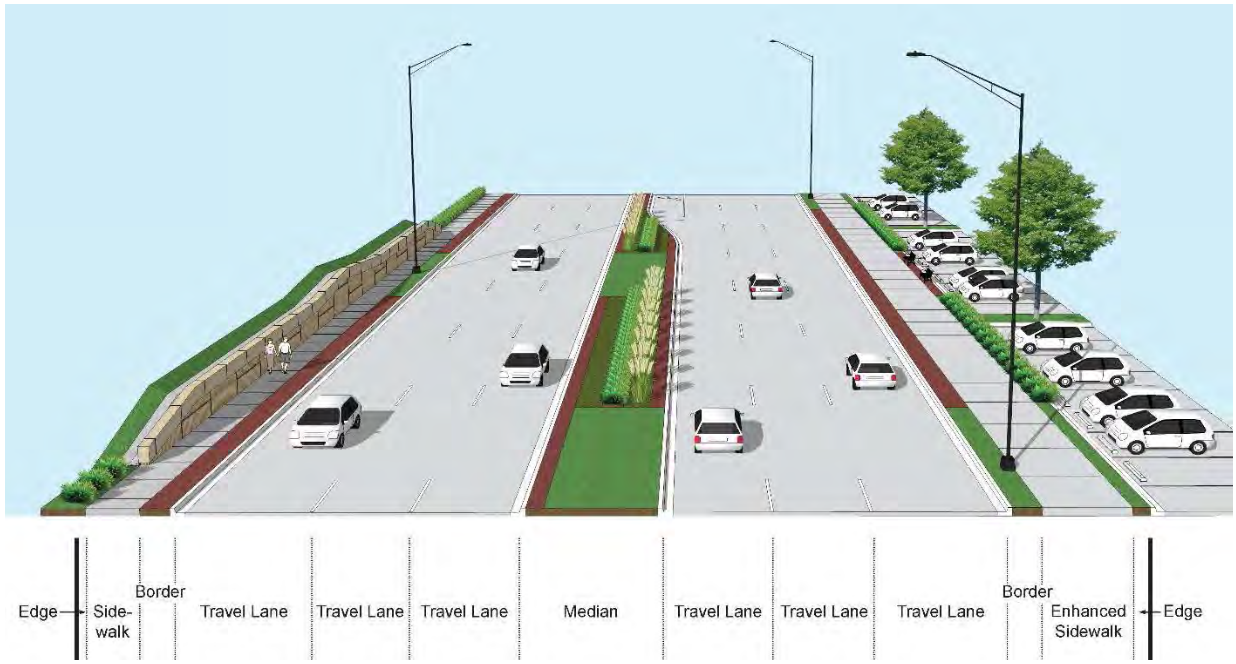

Figure 4. Base Concept – 120' Right-of-Way
Source: Freese and Nichols, 2017

Figure 5. Base Concept – 150' Right-of-Way
Source: Freese and Nichols, 2017

Design elements could include TxDOT standard roadway light fixtures placed in staggered offsets along the outer roadway edges and treated with additive paint finish applied to the poles, arms, and fixture housing. Sidewalks could be offset from curb lines by a narrow turf strip that incorporates periodic special paving panels, most likely in the form of tinted/imprinted concrete. The special paving panels could be mirrored across the sidewalk and into center medians. Where space permits, the outermost panels could accommodate site furnishings such as benches, trash receptacles, and bus stop shelters. Plantings could be organized off the special paving geometry to enable periodic shrub and ground cover beds. Where these occur, the special paving edges could function as a maintenance strip to avoid planting immediately adjacent to active traffic. Regularly spaced blocks of shade trees infill between the planting beds along the outer edges of the right-of-way whereas medians would remain open to feature the more detailed shrub and ground cover plantings. Shrubs are suggested along the outer edge of the right-of-way to aid in screening of adjacent parking lots. Retaining wall systems could utilize mechanically stabilized earth (MSE) panels common to TxDOT practices. A variety of textures and paint colors could be selected for wall finishes, including artful wall murals embossed into the surfaces.

1.5 Parkway Concept

The parkway concept creates broad outer margins along the outside edges of the roadway (see Figures 6 and 7). In doing so, it minimizes the median width. This concept emphasizes improvements in proximity to what could become catalyst redevelopment sites loosely organized based on Traditional Neighborhood Development principles such as mixed-use, buildings in proximity to roadways, block style arrangements, and other principles, if adopted. Along other properties, it could optimize landscaping as a traditional foreground to varied commercial buildings and parking lots. The outward emphasis of this concept is characterized as "*Urban Transition, Creating Walkable Development Edges.*"

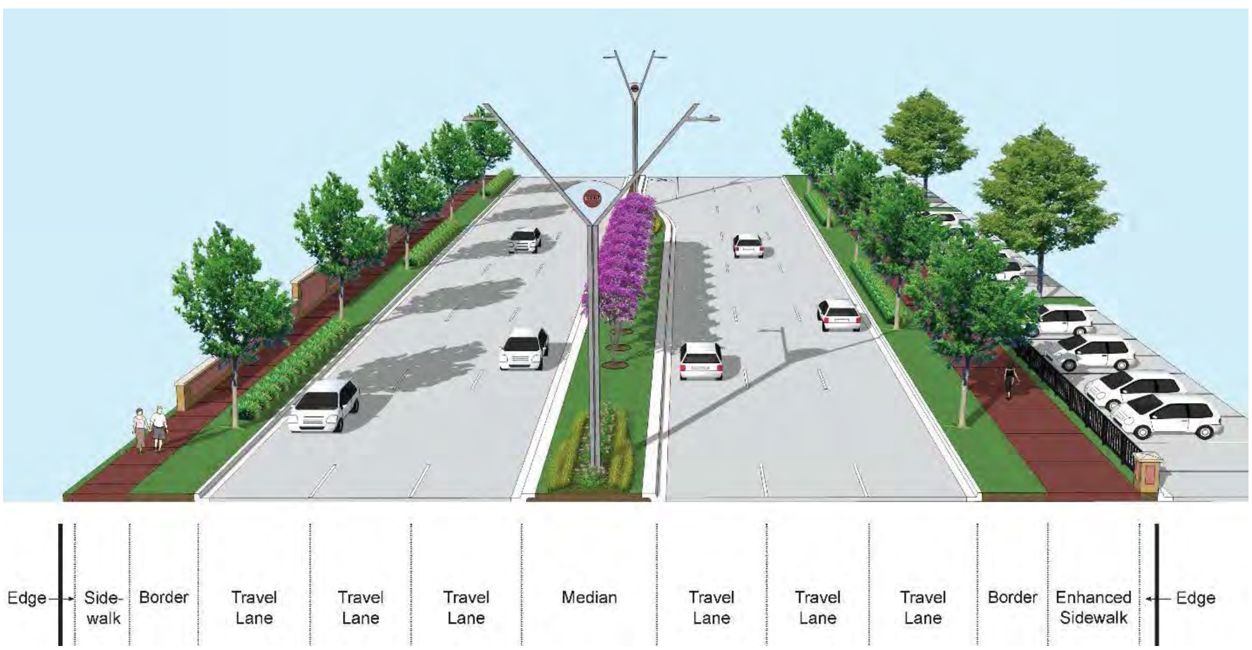

Figure 6. Parkway Concept – 120' Right-of-Way
Source: Freese and Nichols, 2017

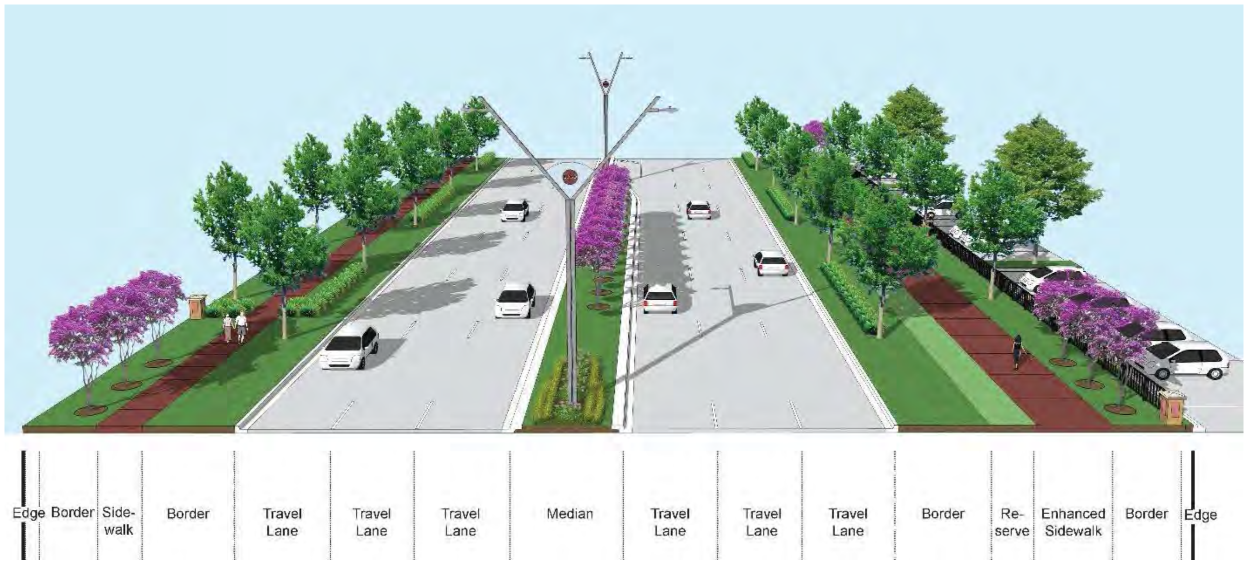

Figure 7. Parkway Concept – 150' Right-of-Way
Source: Freese and Nichols, 2017

A primary goal of this concept is to achieve shaded sidewalks via traditional, tree rows where permitted. Sidewalks enhanced with special paving materials such as brick or concrete pavers could expand upon the traditional character of the scheme. Linear bands of shrubs could be interspersed between trees as a buffer to adjacent traffic and to create varied special sequences. Rather than duplicating shrubbery along the outer right-of-way edge, this concept could use ornamental fencing as a semi-transparent visual buffer to parking behind. Fence design motifs could be standardized for the corridor, by city jurisdiction, or other sub-district limits to recognize local identities. Regularly spaced masonry columns could be incorporated into this fence line as periodic accents and to delineate driveway openings or property corners.

The reduced width median could accommodate smaller scaled plantings, potentially in traditionally shaped beds with ornamental scale trees between. The narrow width of median islands adjacent to left turn bays could necessitate continuous paving, preferably specialty materials to match outer sidewalks. A wide curb section is depicted to further delineate the median but to also afford more setback for the landscape edging and maintenance operations. To avoid shade tree canopies along outer edges, street lights would be placed within medians. This would reduce the prospect of light obstruction and enable the light standards to be of distinctive form(s) to lend further character. A generic illumination assembly is shown in Figure 6 and Figure 7, but many commercially available assembly styles exist which could lend a strong identity to this approach. City, corridor, or district logos could be incorporated into these types of pole standards as an added touch of local identity.

1.6 Boulevard Concept

The boulevard concept emphasizes an inward focus with an expanded median width enabling informally arranged plantings of variable size and type (see Figures 8 and 9). Outer margins on each side of the roadway would be reduced in width but still retain sufficient space for variable landscaping. Sidewalks could also meander as space is available in the 150-foot right-of-way areas. The high degree of variability adapts well to the varied development edges that it interfaces with. Boulevards with generous median landscapes have long been regarded as demonstrating classic qualities. Given the emphasis on naturalized landscaping, this concept can be described as "*Classic Quality, Enhancing Nature and Green Immersion.*"

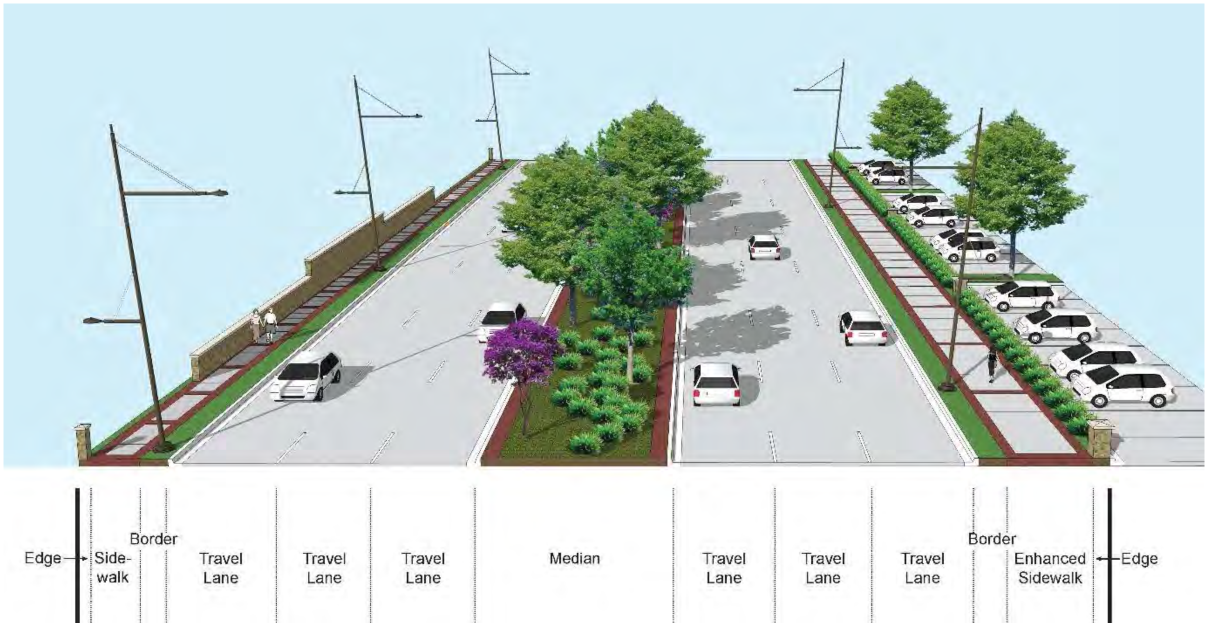

Figure 8. Boulevard Concept –120' Right of Way
Source: Freese and Nichols, 2017

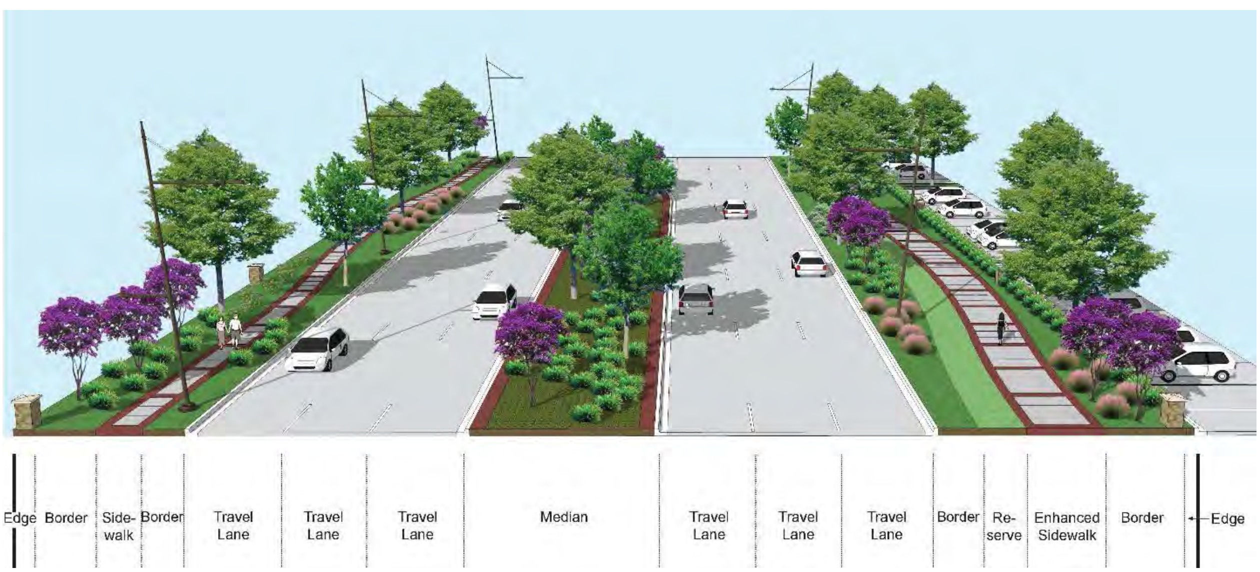

Figure 9. Boulevard Concept – 150' Right of Way
Source: Freese and Nichols, 2017

Median landscapes concentrate understory plantings in periodic pockets with turf or surface aggregate, such as rock mulch or decomposed granite, in between. To aid in maintenance access and to further accentuate the center emphasis, a continuous edger is proposed along the back of the median curb lines. This could be special paving materials ranging from tinted, imprinted concrete to stone pavers or brick unit pavers. Minor undulations of the ground surface, such as berms, could occur within the median if irrigation runoff is controlled.

Given the consolidation of plantings in the median, street lights are proposed along the outer roadway edges to minimize conflicts with tree canopies. Figure 8 and Figure 9 depict custom light poles with a slight lean away from the roadway. This is inspired by the landform of several bluffs in the area. Fixture arms would orient to the roadway as well as a lower arm oriented toward sidewalks. As with the parkway concept, the light standards shown are conceptual and could be translated into a final design through a number of market available fixtures and specialty poles/arms.

Sidewalks are shown with a regularly spaced banding and edging of special pavement set within concrete. Regularly spaced masonry columns would demark the boundary between right-of-way and adjacent properties. Where needed for visual buffering of parking lots, shrub hedges could be planted between columns. These columns are envisioned to be clad with stone veneer and topped with a precast cap. It could be possible to incorporate logos or artful plaques in the front face of these columns to reinforce an identity of the corridor or a particular district. Stone veneer or stone-like stained formliners are suggested for the facing on retaining walls.

1.7 Intersection Concept

Special paving treatments at intersections and driveways could extend bicycle and pedestrian systems by highlighting crosswalks. For durability, materials within the road beds at these crossings may be a slightly different version of the sidewalk special paving such as tinted concrete without imprinted textural patterns. At certain locations deserving additional emphasis, the interior of intersections could potentially accommodate additional pavement enhancements. These could feature medallion-like inlays centered in the intersections or artist inspired motifs unique to each location. In either event, care should be applied to avoid confusion with complex traffic patterns. Material could vary to include tinted concrete, interlocking concrete pavers, or heavy-duty brick pavers if approved by TxDOT and subject to sufficient construction budgets and maintenance funding commitments. The traffic signal poles and mast arm could be treated with additive paint finish to enhance the aesthetic of the corridor. The described intersection enhancements are shown in Figure 10 and Exhibit 5 and can be applied equally to all of the concept alternatives.

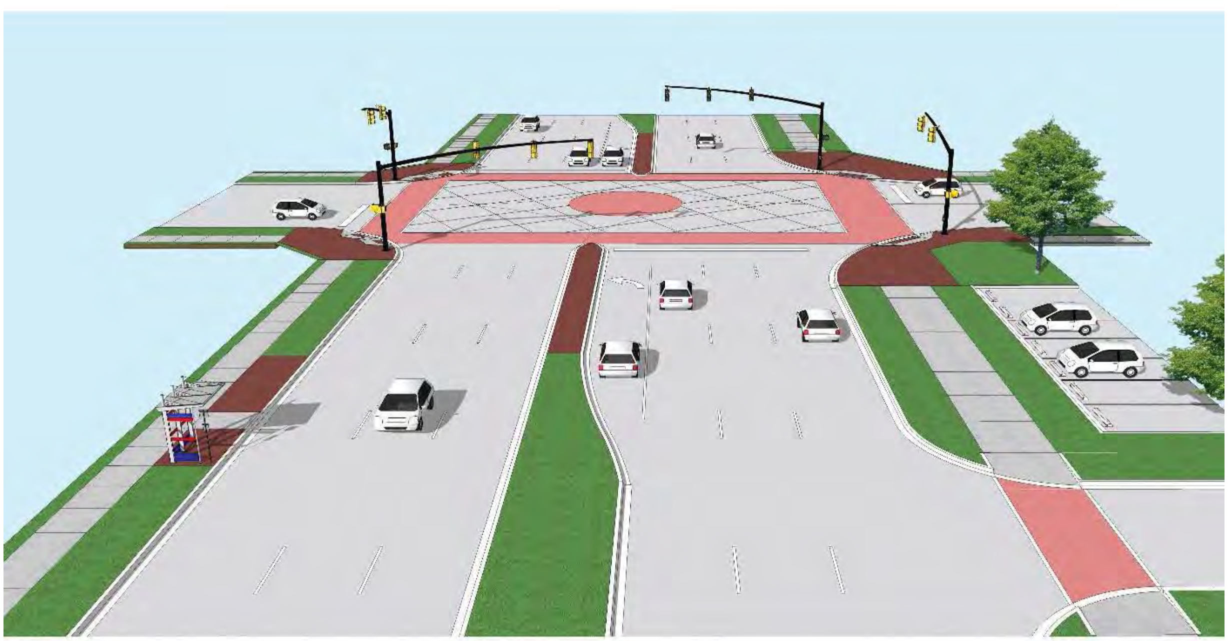

Figure 10. Enhanced Signalized Intersection Condition
Source: Freese and Nichols, 2017

1.8 Concept Plan

A combination of design strategies from the boulevard concept, the parkway concept, and the intersection concept seems most appropriate for the corridor design strategy. Exhibit 6 depicts this combination in plan form with the parkway concept sections closely aligned with the catalyst development zones and the boulevard concept sections in between. This approach lends variety to the corridor and the potential for a more sinuous roadway footprint by way of a variable median width. Transitions could be made between the two concept sections as well as several locations where lanes and right-of-way configurations change.

Gateway opportunities punctuate the concept plan to further contribute to the variability. Several of these could serve as community gateways announcing the transition from one municipality to another. Others could serve as regional landmarks noting key locations with appropriately scaled elements that lend a sense of identity and serve as place-making devices. Green nodes afford opportunity for larger scaled landscape events to identify key crossing locations. These could translate into local landscaped foregrounds which also open views to significant crossroads or natural feature corridors. As examples, a number of these opportunities have been identified in the Panther Island development near downtown Fort Worth where specialty bridge designs, modern roundabouts, and associated landscape and hardscape features would accentuate these locations as identity events.

While not part of the roadway right-of-way, two additional features warrant identification. The first feature is a tributary to the West Fork of the Trinity River that is along the south side of SH 199, from Long Avenue to Biway Street. The second feature is the escarpment, located between 21st Street and University Drive along the north side of SH 199. Both contain attributes that could add unique, complementary qualities to surrounding properties and neighborhoods. Many communities have found ways to preserve and enhance features such as terrain and waterbodies as assets for development, community quality, and identity. The urban design improvements for SH 199 should respond to these features with complementary designs to highlight their unique qualities.

2.0 EXHIBITS

1. Corridor Context Diagram
2. Base Concept - Perspective Views
3. Parkway Concept - Perspective Views
4. Boulevard Concept - Perspective Views
5. Enhanced Signalized Intersection Conditions
6. SH 199 Urban Design Concept Plan

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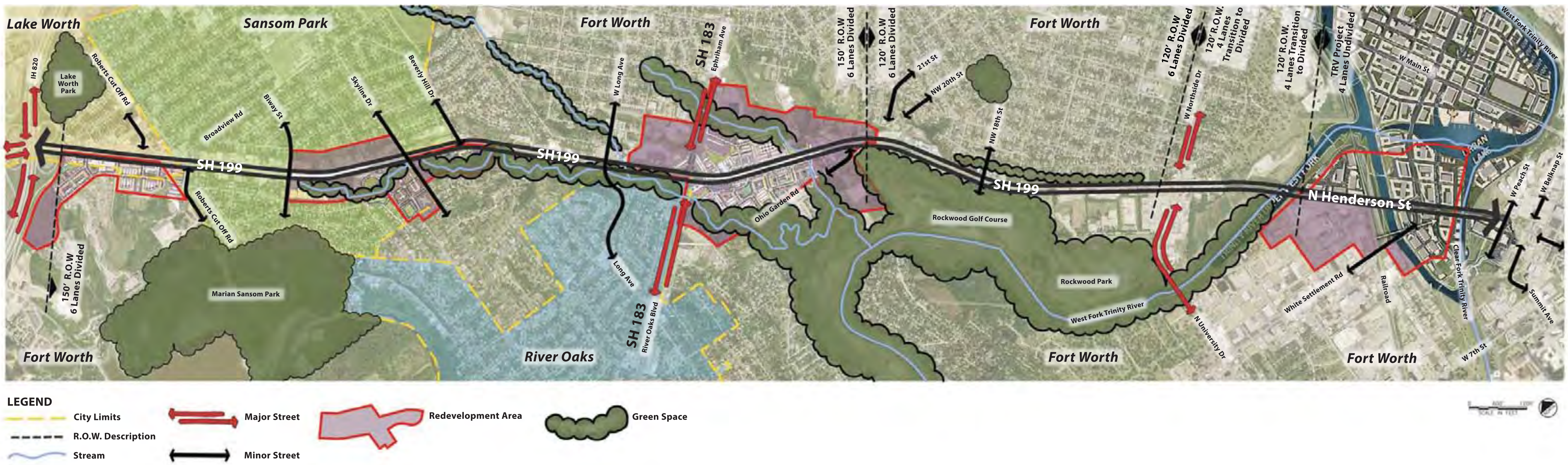
Exhibit 1

Corridor Context Diagram



State Highway 199 Corridor Master Plan - Urban Design Concept

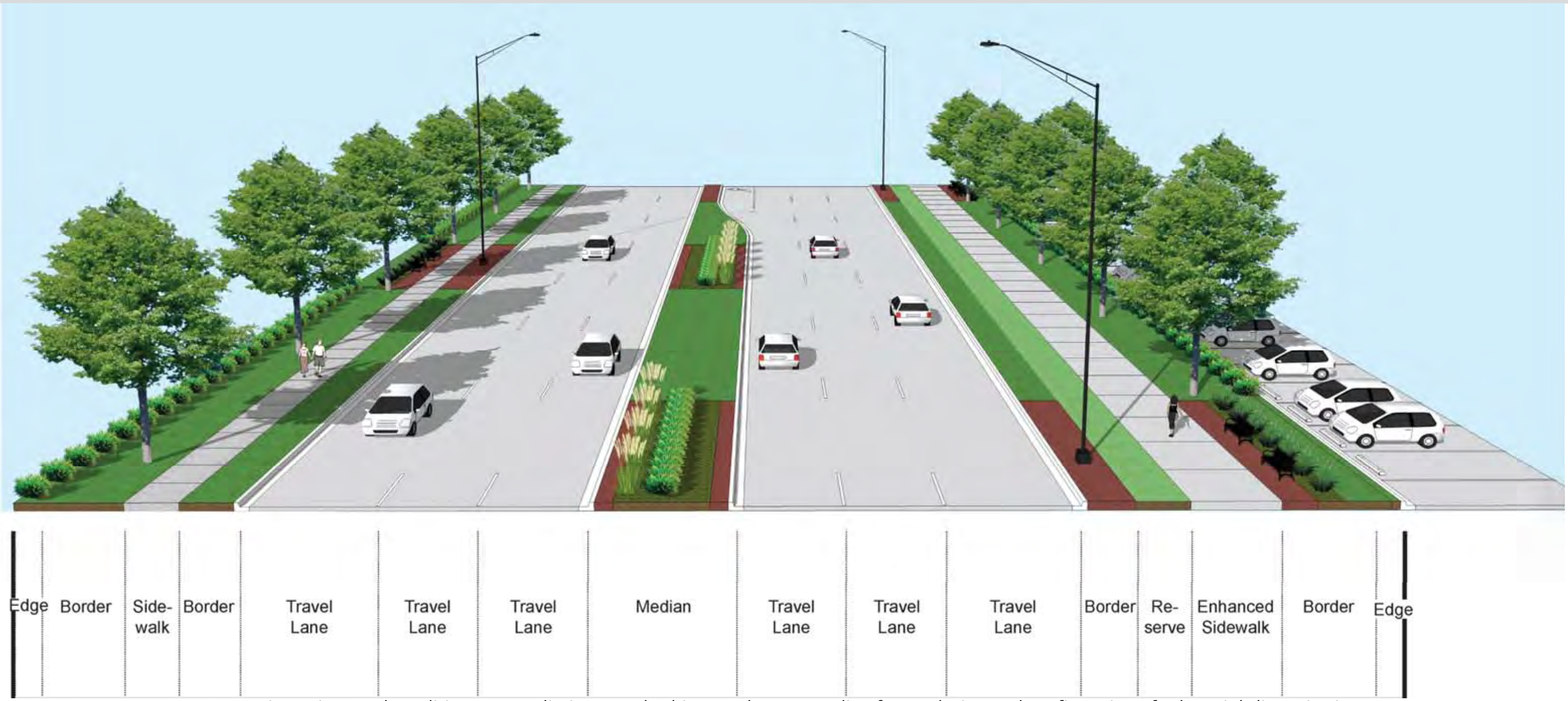
Prepared by FREESE NICHOLS

20 April 2017

Exhibit 2

Base Concept - Perspective Views

Base Concept - 150’ ROW

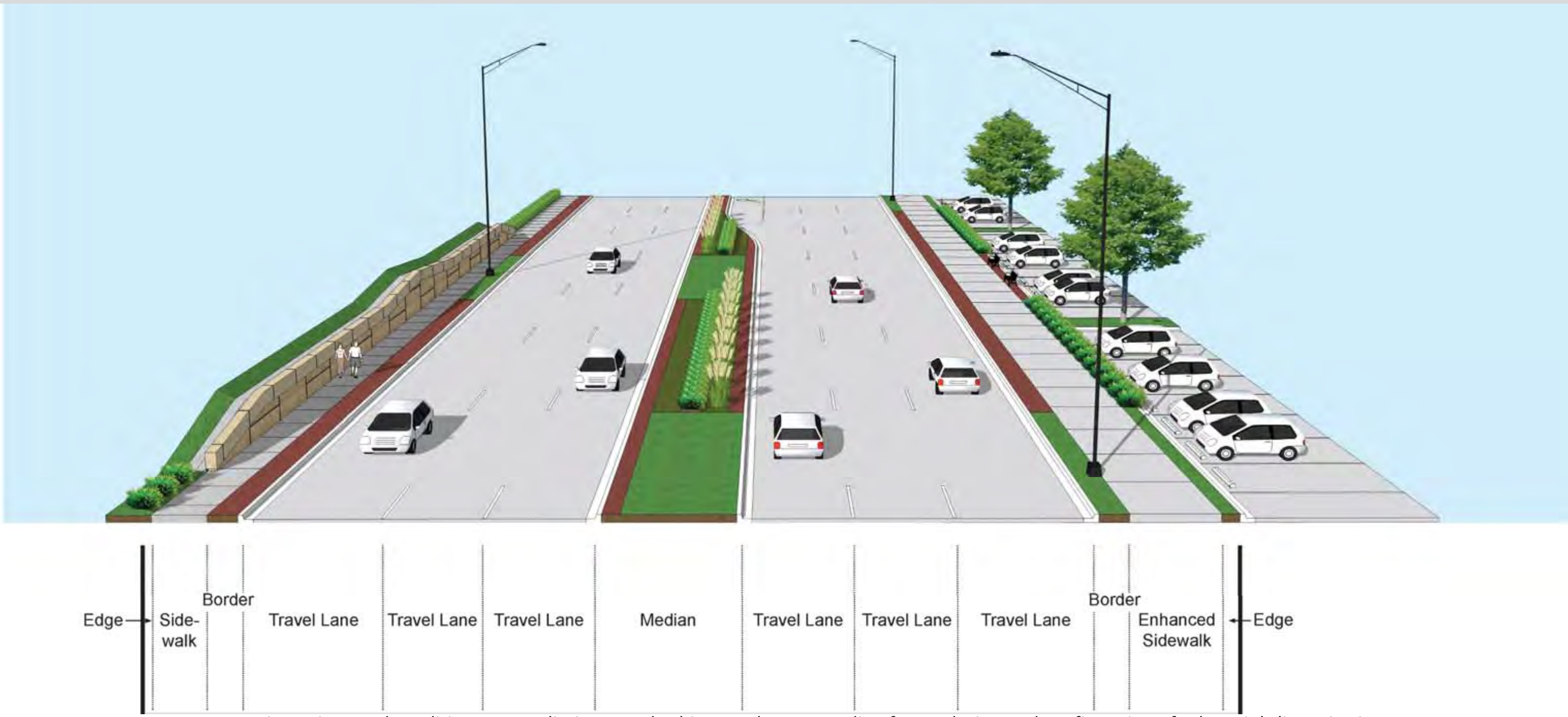


Note: Dimensions and conditions are preliminary and subject to change pending future design and confirmation of urban sightline criteria

Base Concept - 150’ ROW

Note: Dimensions and conditions are preliminary and subject to change pending future design and confirmation of urban sightline criteria

Base Concept - 120’ ROW



Note: Dimensions and conditions are preliminary and subject to change pending future design and confirmation of urban sightline criteria

North Central Texas Council of Governments

SH 199 Corridor Master Plan

Base Concept - 120’ ROW

Note: Dimensions and conditions are preliminary and subject to change pending future design and confirmation of urban sightline criteria

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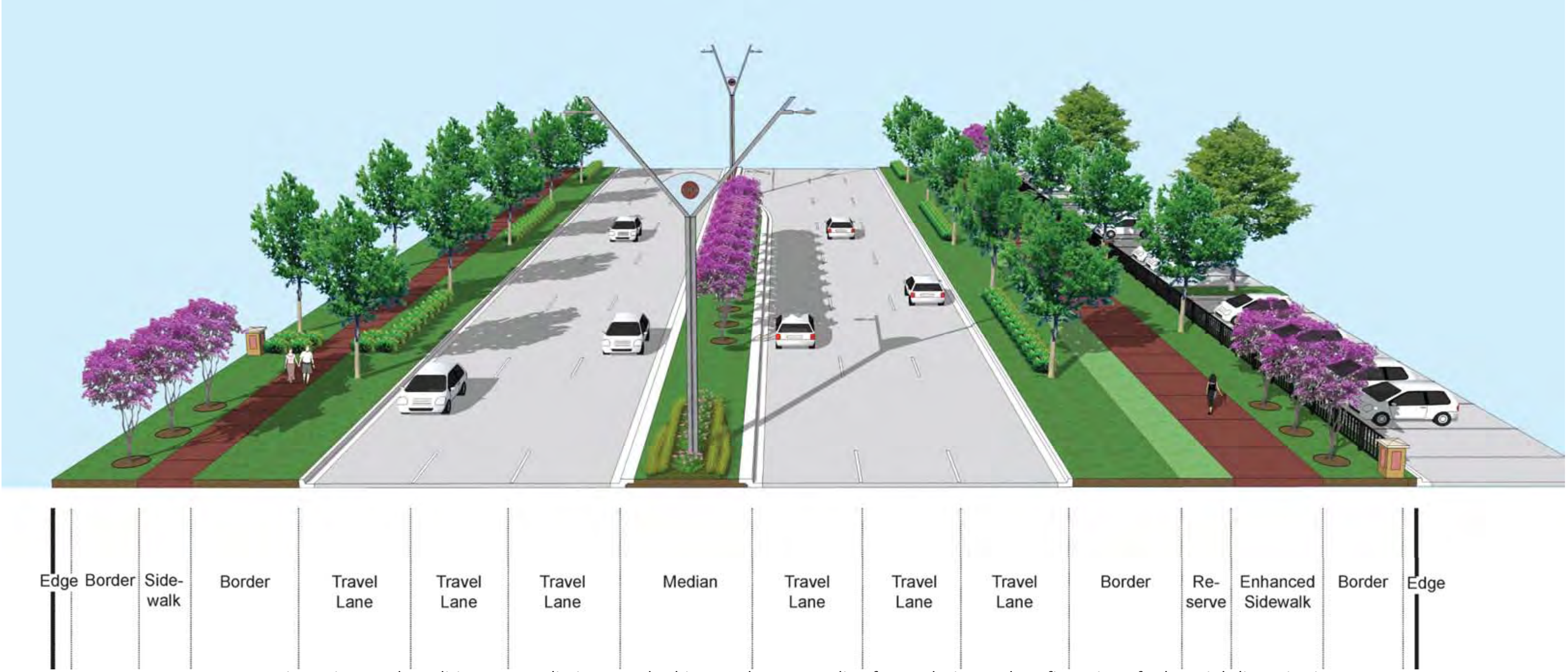
Exhibit 3

Parkway Concept - Perspective Views

Parkway Concept - 150' ROW

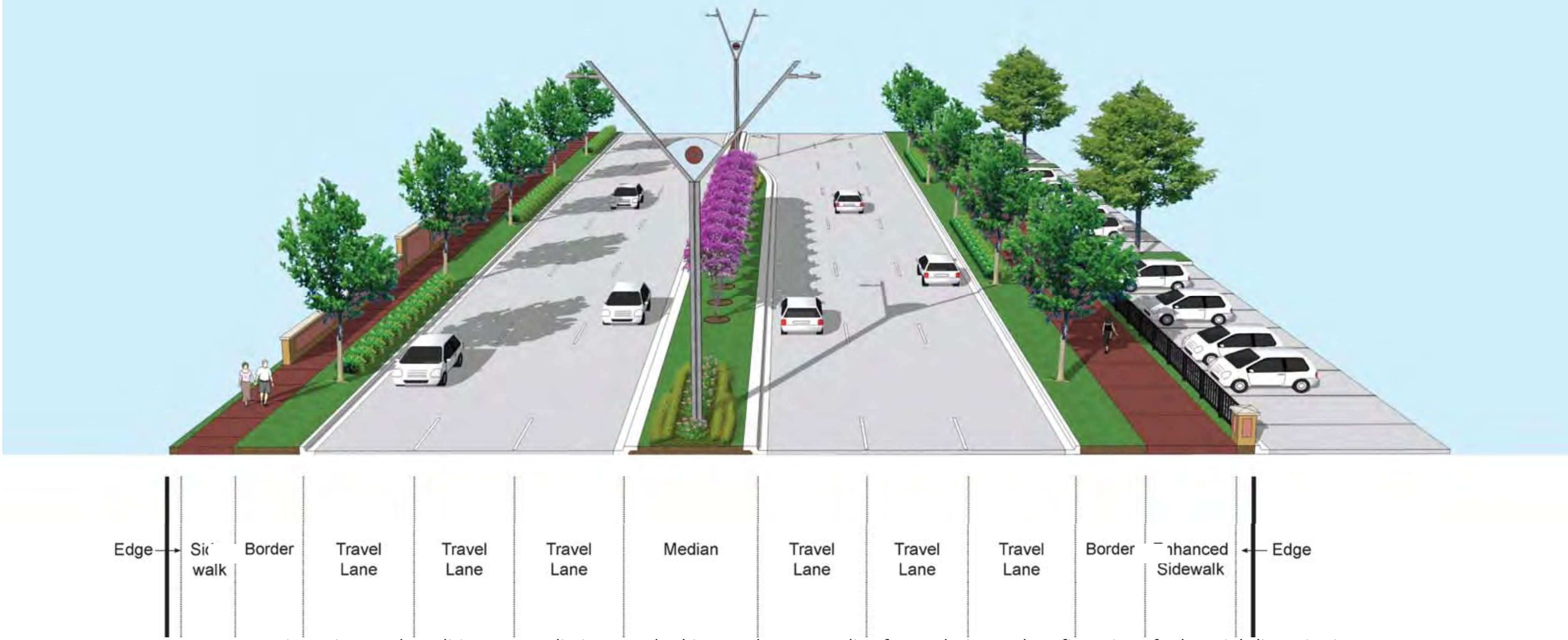


Note: Dimensions and conditions are preliminary and subject to change pending future design and confirmation of urban sightline criteria

Parkway Concept - 150’ ROW

Note: Dimensions and conditions are preliminary and subject to change pending future design and confirmation of urban sightline criteria

Parkway Concept - 120’ ROW



Note: Dimensions and conditions are preliminary and subject to change pending future design and confirmation of urban sightline criteria

North Central Texas Council of Governments

Parkway Concept - 120’ ROW

Note: Dimensions and conditions are preliminary and subject to change pending future design and confirmation of urban sightline criteria

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Exhibit 4

Boulevard Concept - Perspective Views

Boulevard Concept - 150’ ROW

Note: Dimensions and conditions are preliminary and subject to change pending future design and confirmation of urban sightline criteria

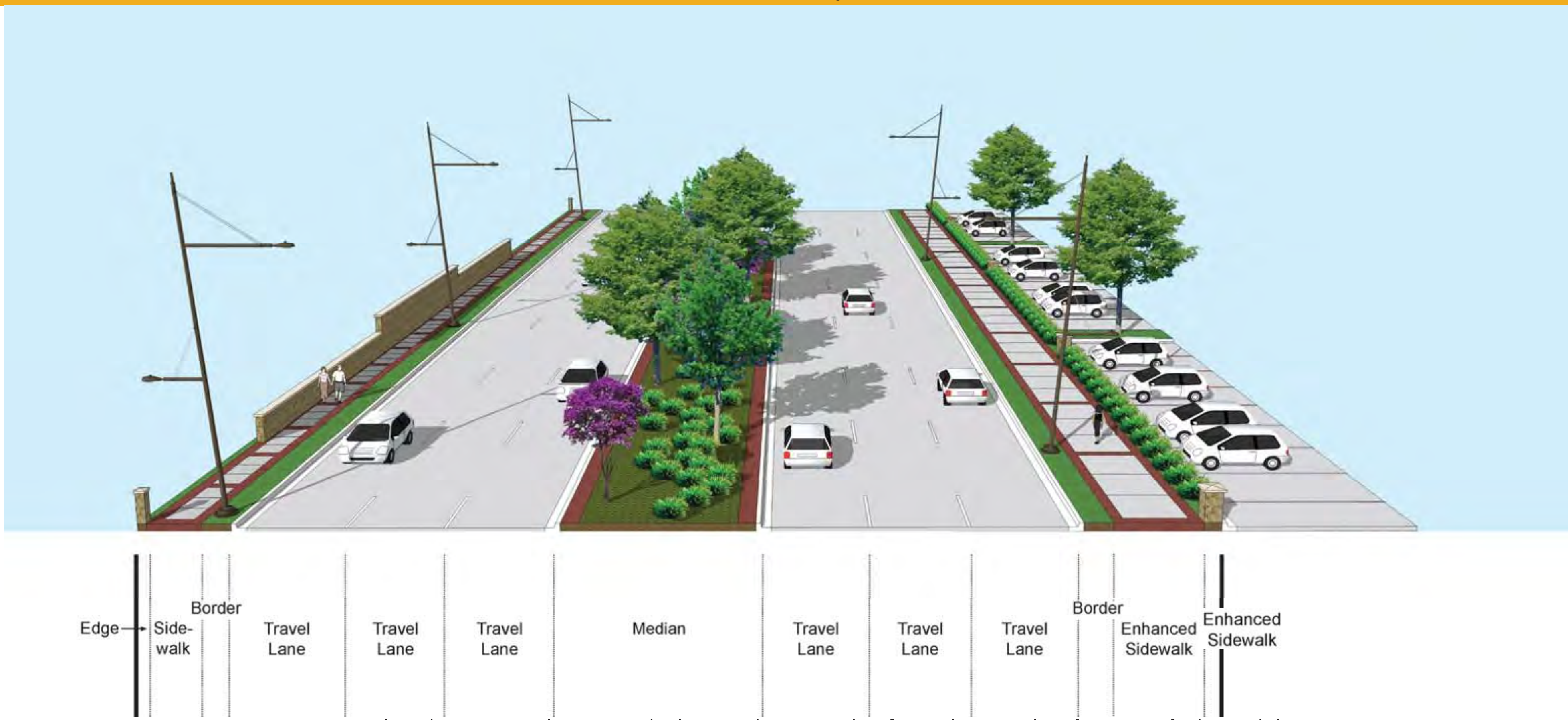
North Central Texas Council of Governments

SH 199 Corridor Master Plan

Boulevard Concept - 150' ROW

Note: Dimensions and conditions are preliminary and subject to change pending future design and confirmation of urban sightline criteria

Boulevard Concept - 120’ ROW



Note: Dimensions and conditions are preliminary and subject to change pending future design and confirmation of urban sightline criteria

Boulevard Concept - 120’ ROW

Note: Dimensions and conditions are preliminary and subject to change pending future design and confirmation of urban sightline criteria

North Central Texas Council of Governments

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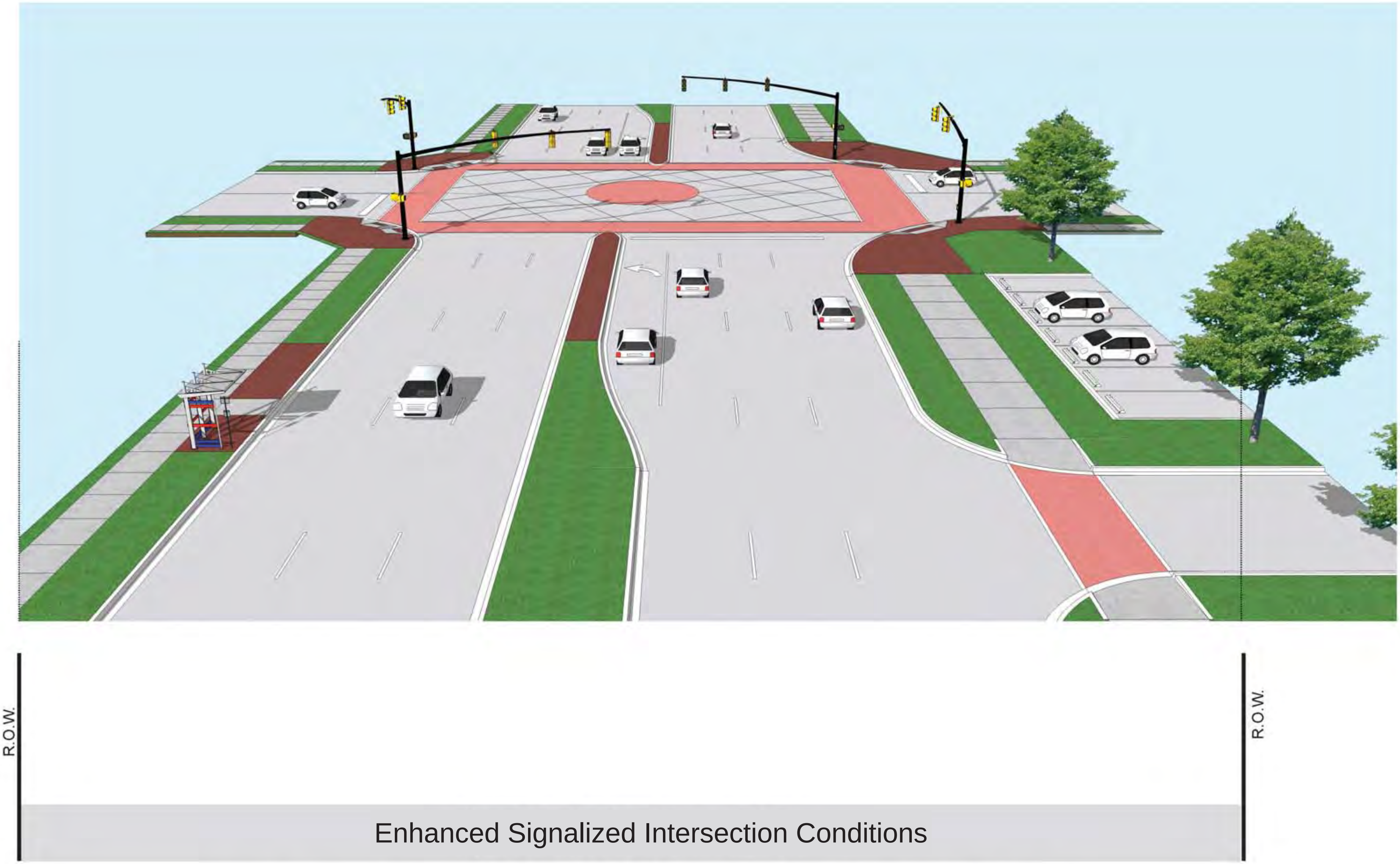
Exhibit 5

Enhanced Signalized Intersection Conditions

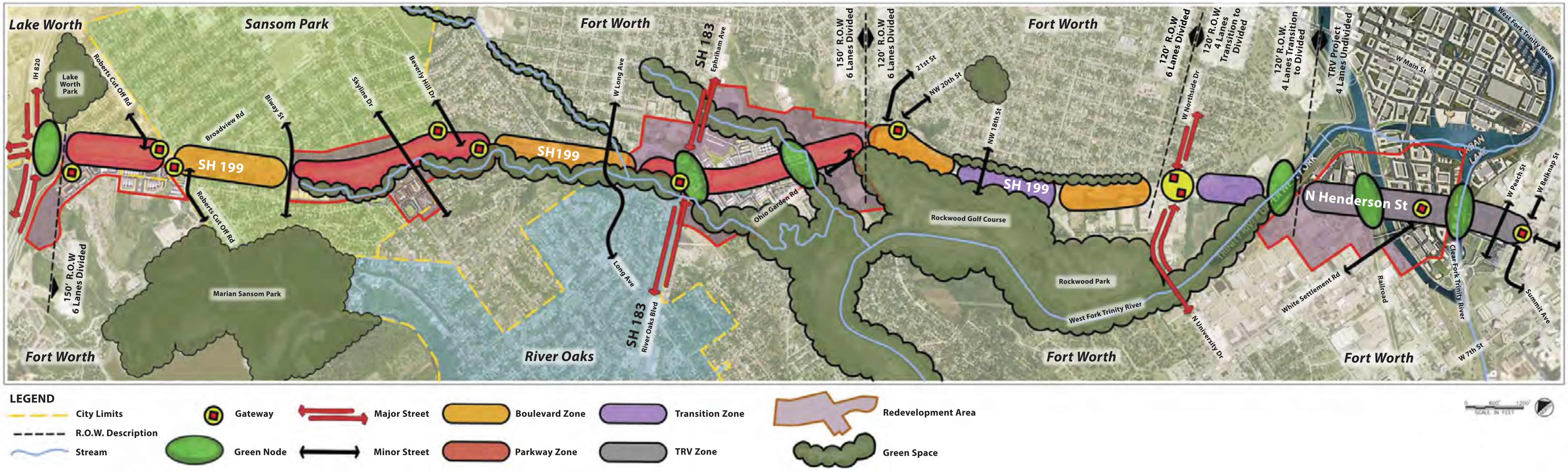


Enhanced Signalized Intersection Conditions

NOTE: View is prototypical. Dimensions/Conditions are preliminary and subject to change pending further design

Exhibit 6

SH 199 Urban Design Concept Plan



State Highway 199 Corridor Master Plan - Urban Design Concept

Prepared by FREESE NICHOLS

20 April 2017

Appendix R – Estimated Construction Cost Technical Memorandum

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State Highway 199
Corridor Master Plan

From IH 820 to Belknap Street

Estimated Construction Cost
Technical Memorandum

Submittal Date:
August 24, 2017

Prepared For:
North Central Texas Council of Governments

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Fort Worth, Texas 76109
817-735-7300
Texas Registered Engineering Firm F-2144

FREESE AND NICHOLS

ESTIMATED CONSTRUCTION COST

TYPE: FOR THE RECONTRUCTION OF SH 199
LIMITS: FROM IH 820 TO WEST FORK OF THE TRINITY RIVER
LENGTH: FEET = 27,000 / MILES = 5.11
PREPARED BY: FREESE AND NICHOLS, INC.
DATE: AUGUST_2017

ITEM NO.	DESCRIPTION	UNIT	QTY	PRICE	AMOUNT
	GENERAL				
100	PREPARING ROW	STA	27.00	$15,000.00	$405,000.00
104	REMOVE CONCRETE (CURB)	LF	60,750.00	$2.50	$151,875.00
104	REMOVE CONCRETE (ROADWAYS)	SY	180,000.00	$10.00	$1,800,000.00
104	REMOVE CONCRETE (DRIVEWAYS)	SY	12,000.00	$15.00	$180,000.00
104	REMOVE RETAINING WALL	SY	3,270.00	$35.00	$114,450.00
105	REMOVE ASPHALT PAVING	SY	300,000.00	$7.50	$2,250,000.00
496	REMOVE BRIDGE	EA	1.00	$300,000.00	$300,000.00
496	REMOVE DRAINAGE CULVERTS	LS	1.00	$250,000.00	$250,000.00
690	REMOVE TRAFFIC SIGNAL	EA	10.00	$10,000.00	$100,000.00
105	MISCELLANEOUS REMOVALS	LS	1.00	$350,000.00	$350,000.00
110	EXCAVATION (ROADWAY)	CY	330,000.00	$12.00	$3,960,000.00
132	EMBANKMENT (ON-SITE)	CY	132,000.00	$10.00	$1,320,000.00
160	TOPSOIL (4")	SY	130,500.00	$1.50	$195,750.00
164	BROADCAST SEED	SY	130,500.00	$0.75	$97,875.00
168	VEGETATIVE WATERING	MG	5,000.00	$15.00	$75,000.00
506	SWPPP AND EROSION CONTROL	LS	1.00	$250,000.00	$250,000.00
				CATEGORY TOTAL	**$11,799,950.00**
	ROADWAY				
260	LIME TREATMENT OF EXISTING MATERIAL (8")	SY	315,000.00	$3.00	$945,000.00
260	LIME (HYDRATED LIME)	TON	5,250.00	$175.00	$918,750.00
310	PRIME COAT (MULTI OPTION)	GAL	63,000.00	$4.50	$283,500.00
341	4" ASPHALT UNDERLAYMENT (TYPE B)	TON	69,000.00	$75.00	$5,175,000.00
360	CONTINUOUSLY REINFORCED CONCRETE PAVEMENT (12")	SY	285,000.00	$60.00	$17,100,000.00
360	CONCRETE CURB (TYPE II - B)	LF	135,000.00	$6.50	$877,500.00
530	CONCRETE DRIVEWAY	SY	24,000.00	$75.00	$1,800,000.00
531	CONCRETE SIDEWALK (4")	SY	57,600.00	$60.00	$3,456,000.00
531	CURB RAMP	EA	80.00	$2,000.00	$160,000.00
360	CONCRETE MEDIAN RIPRAP (4")	CY	700.00	$350.00	$245,000.00
423	RETAINING WALL	SF	83,600.00	$70.00	$5,852,000.00
450	DECORATIVE PEDESTRIAN HANDRAIL AT RETAINING WALL	LF	4,000.00	$175.00	$700,000.00
450	LOW PROFILE TRAFFIC BARRIER AT RETAINING WALL	LF	4,000.00	$75.00	$300,000.00
450	PEDESTRIAN HANDRAIL AT RETAINING WALL	LF	4,200.00	$80.00	$336,000.00
450	COMBINATION RAIL AT RETAINING WALL	LF	3,000.00	$150.00	$450,000.00
				CATEGORY TOTAL	**$38,598,750.00**
	DRAINAGE				
462	CONCRETE BOX CULVERT (6 FT X 6 FT)	LF	130.00	$520.00	$67,600.00
462	CONCRETE BOX CULVERT (7 FT X 7 FT)	LF	910.00	$575.00	$523,250.00
462	CONCRETE BOX CULVERT (9 FT X 8 FT)	LF	940.00	$635.00	$596,900.00
462	CONCRETE BOX CULVERT (11 FT X 9 FT)	LF	250.00	$690.00	$172,500.00
464	REINFORCED CONCRETE PIPE (24")	LF	3,710.00	$75.00	$278,250.00
464	REINFORCED CONCRETE PIPE (30")	LF	2,530.00	$110.00	$278,300.00
464	REINFORCED CONCRETE PIPE (36")	LF	1,860.00	$115.00	$213,900.00
464	REINFORCED CONCRETE PIPE (42")	LF	2,330.00	$135.00	$314,550.00
464	REINFORCED CONCRETE PIPE (48")	LF	990.00	$175.00	$173,250.00
464	REINFORCED CONCRETE PIPE (54")	LF	510.00	$185.00	$94,350.00
464	REINFORCED CONCRETE PIPE (60")	LF	780.00	$200.00	$156,000.00
464	REINFORCED CONCRETE PIPE (66")	LF	205.00	$250.00	$51,250.00
464	REINFORCED CONCRETE PIPE (72")	LF	630.00	$320.00	$201,600.00
465 / 466	DRAINAGE APPURTENANCES (INLETS, MANHOLES, HEADWALLS AND END TREATMENTS)	LS	1.00	$780,500.00	$780,500.00
402	TRENCH EXCAVATION PROTECTION	LF	15,775.00	$5.00	$78,875.00
				CATEGORY TOTAL	**$3,981,075.00**
	BRIDGE				
422	BRIDGE STRUCTURE	SF	26,250.00	$85.00	$2,231,250.00
422	BRIDGE APPROACH SLAB	CY	120.00	$375.00	$45,000.00
4022	ARTICULATED CONCRETE BLOCKS	SF	37,500.00	$10.00	$375,000.00
416 / 420	FLOODWALL ALONG LEVEE AT BRIDGE	EA	1.00	$800,000.00	$800,000.00
450	DECORATIVE PEDESTRIAN RAIL AT BRIDGE	LF	2,100.00	$175.00	$367,500.00
450	LOW PROFILE TRAFFIC BARRIER AT BRIDGE	LF	2,100.00	$75.00	$157,500.00
				CATEGORY TOTAL	**$3,976,250.00**

	SIGNALS				
680	HIGHWAY TRAFFIC SIGNAL	EA	10.00	$200,000.00	$2,000,000.00
				CATEGORY TOTAL	**$2,000,000.00**
	ILLUMINATION				
610	ROADWAY ILLUMINATION FIXTURE	EA	360.00	$3,500.00	$1,260,000.00
610	PEDESTRIAN ILLUMINATION FIXTURE	EA	720.00	$2,500.00	$1,800,000.00
416	30" DRILLED SHAFT FOR ILLUMINATION FIXTURE	FT	4,320.00	$150.00	$648,000.00
618	CONDUIT	LF	54,000.00	$20.00	$1,080,000.00
620	ELECTRICAL CONDUCTOR	LF	162,000.00	$2.00	$324,000.00
624	GROUND BOXES	EA	180.00	$1,500.00	$270,000.00
				CATEGORY TOTAL	**$5,382,000.00**
	SIGNING				
636 / 644	SIGNS AND SMALL ROADSIDE SIGN ASSEMBILIES	LS	1.00	$270,000.00	$270,000.00
				CATEGORY TOTAL	**$270,000.00**
	PAVEMENT MARKING				
666 / 668 / 672 / 678	PAVEMENT MARKERS AND MARKINGS	LS	1.00	$440,000.00	$440,000.00
				CATEGORY TOTAL	**$440,000.00**
	LANDSCAPE AND URBAN DESIGN ALLOWANCES				
192 / 528	LANDSCAPE AND URBAN DESIGN ALLOWANCES	LS	1.00	$2,000,000.00	$2,000,000.00
				CATEGORY TOTAL	**$2,000,000.00**
	MISCELLANEOUS				
500	MOBILIZATION (5%)	LS	1.00	$3,423,000.00	$3,423,000.00
502	BARRICADES, SIGNS, AND TRAFFIC HANDLING	MO	36.00	$15,000.00	$540,000.00
681	TEMPORARY TRAFFIC SIGNAL	EA	10.00	$50,000.00	$500,000.00
-	UTILITY MODIFICATIONS (10.0%)	LS	1.00	$6,845,000.00	$6,845,000.00
				CATEGORY TOTAL	**$11,308,000.00**
	ESTIMATED CONSTRUCTION COST SUBTOTAL (FY 2018) :				**$79,800,000.00**
	CONTINGENCY			25.0%	$20,000,000.00
	INFLATION	YR	5.00	4.0%	$21,700,000.00
	ESTIMATED CONSTRUCTION COST TOTAL (FY 2023) :				**$121,500,000.00**

NOTES:	
1	THIS ESTIMATED CONSTRUCTION COST TOTAL IS A PRELIMINARY ESTIMATE AND SHOULD BE REFINED DURING FUTURE DESIGN PHASES
2	THIS ESTIMATED CONSTRUCTION COST TOTAL DOES NOT INCLUDE RIGHT-OF-WAY COSTS OR DESIGN COSTS
3	DURING FUTURE DESIGN PHASES, THE PROJECT TEAM SHOULD COLLECT TOPOGRAPHIC DATA AND RIGHT-OF-WAY BOUNDARIES TO DETERMINE RECONSTRUCTION LIMITS OF THE CORRIDOR AND IMPACTS TO ADJACENT PROPERTIES
4	ITEM NUMBERS ARE BASED ON THE TEXAS DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR CONSTRUCTION AND MAINTENANCE
5	UNIT PRICES ARE BASED ON 12-MONTH AVERAGE UNIT PRICES FOR CONSTRUCTION ACITVITIES IN THE STATE OF TEXAS AND THE FORT WORTH DISTRICT PUBLISHED BY THE TEXAS DEPARTMENT OF TRANSPORTATION
6	VEGETATIVE WATERING IS ASSUMED TO BE AT A RATE OF 170,000 GAL/ACRE
7	PAVEMENT SECTION IS ASSUMED TO BE 12" CONTINIOUSLY REINFORCED CONCRETE PAVEMENT, 4" ASPHALT UNDERLAYMENT, AND 8" LIME STABILIZED SUBGRADE
8	LIME APPLICATION RATE IS ASSUMED TO BE 150 LB/CY
9	PRIME COAT APPLICATION RATE IS ASSUMED TO BE 0.2 GAL/SY
10	ASPHALT UNIT WEIGHT IS ASSUMED TO BE AT A RATE OF 115 LB/SY/IN
11	ILLUMINATION DRILLED SHAFTS ARE ASSUMED TO BE 6' IN DEPTH
12	LANDSCAPE AND URBAN DESIGN ALLOWANCES ARE BASED ON ADDITIVE COST DIFFERENTIALS FROM TXDOT STANDARD PRACTICE IMPROVEMENTS

UNIT LEGEND:	
CY	CUBIC YARD
EA	EACH
LF	LINEAR FEET
LS	LUMP SUM
STA	STATION (1 STA. = 100 LINEAR FEET)
MI	MILE
SY	SQUARE YARD
TON	TON (1 TON = 2,000 POUNDS)
YR	YEAR
MG	1,000 GALLONS

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