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2016 MOBILITY BOND

SPICEWOOD SPRINGS ROAD

REGIONAL MOBILITY IMPROVEMENTS

PRELIMINARY ENGINEERING REPORT

December 2018

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SPICEWOOD SPRINGS ROAD

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PRELIMINARY ENGINEERING REPORT

Loop 360 to 0.2 Miles West of Mesa Drive
Austin, TX 78759

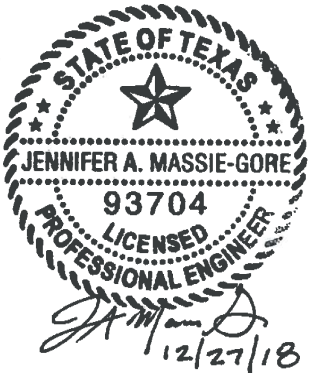
PREPARED FOR:

CITY OF AUSTIN
AUSTIN TRANSPORTATION DEPARTMENT
901 South MoPac Expressway
Plaza 5, Suite 300
AUSTIN, TX 78746

PREPARED BY:

CITY OF AUSTIN
ENGINEERING SERVICES DIVISION
PUBLIC WORKS DEPARTMENT
505 BARTON SPRINGS RD.
AUSTIN, TEXAS 78704

December 2018



Subproject ID Number: 11880.001

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EXECUTIVE SUMMARY

Background and Funding

The 2016 Mobility Bond dedicates $101 million to regional mobility projects to address congestion and enhance safety. These projects are focused on major roadways and their intersections. Improvements may include roadway expansion, signal modification, changes to the design of medians, driveway reconstruction, and improved bicycle and pedestrian facilities. Approximately $17 million in 2016 Mobility Bond funds will go towards design and construction of improvements on Spicewood Springs Road east of Loop 360.

Program and Project Goals

The stated goal of the 2016 Mobility Bond is to address congestion and enhance safety. Primary methods of addressing congestion include improving vehicular traffic flow and reducing delays at intersections or driveways. Other approaches to reducing congestion include improving facilities for alternate modes of transportation, such as transit, bicycles and walking. Metrics for enhanced safety focus on reducing the potential for all types of crashes. Proposed safety improvement options are analyzed for their ability to ensure the safety of all roadway users. This report analyzes existing and future conditions for all modes of travel and provides options and recommendations that achieve reduced congestion and enhanced safety.

The primary goal of this preliminary engineering report is to present recommendations for improvements along Spicewood Springs Road that address congestion, enhance safety and improve mobility for all roadway users. The project area is Spicewood Springs Road and right-of-way from Loop 360 to 0.2 miles west of Mesa Drive.

Process

The first step in determining the appropriate design options is developing an understanding of context and purpose of the roadway. This is accomplished by reviewing applicable guiding plans and policies and through public outreach. The recommended improvements should bring the project into compliance with design standards for the roadway classification and align with the City Council adopted governing plans. Public input is a key element for ensuring that the project team has a true understanding of the priorities and concerns of the community that the project serves. Input from stakeholders provides an understanding of local context and can be utilized to help prioritize improvements in case of conflicting goals and/or limited resources.

The Spicewood Springs Road project began with an outreach process, initiated by a public meeting and public comment period. Design survey and existing traffic movement counts were collected, crash patterns were analyzed, and mitigation methods in traffic patterns

were examined. Existing infrastructure conditions were also documented, and future area development and planned improvements were considered. Environmental investigations were completed as well as a cultural resources inventory regarding possible historical sites near Spicewood Springs Road.

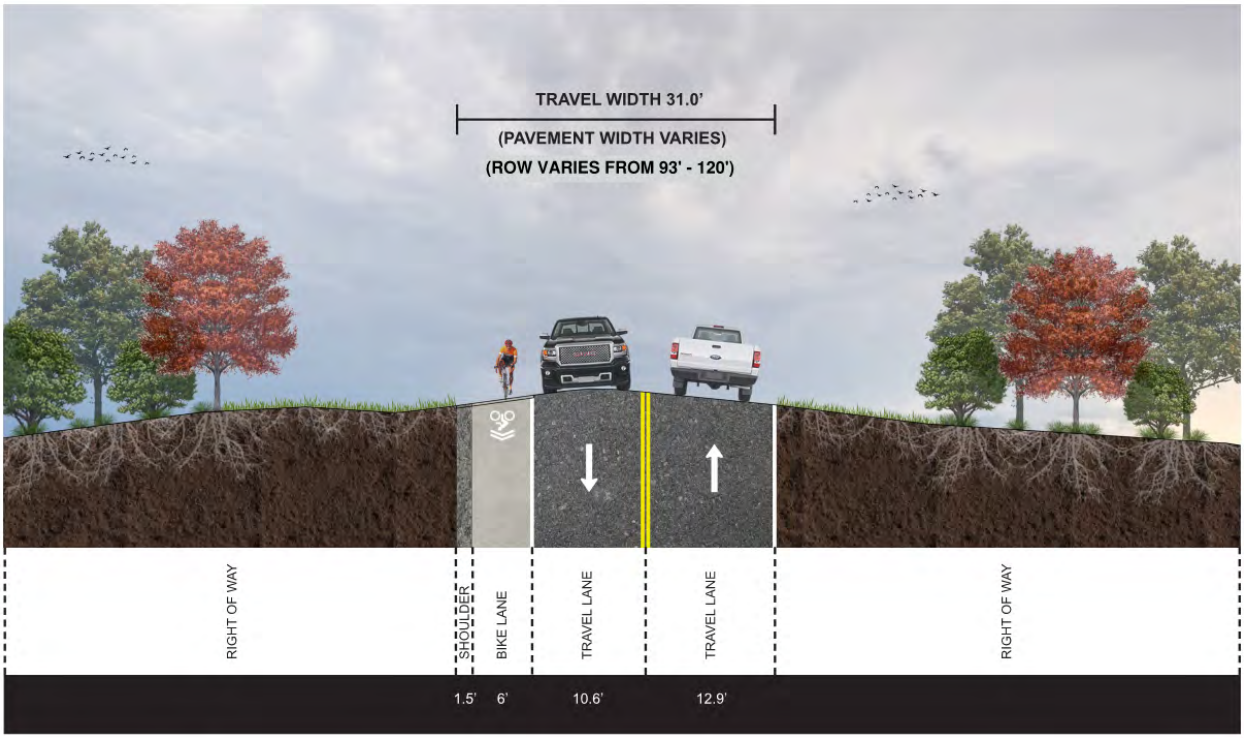
Roadway improvement options were developed into three design alternatives after investigating existing conditions, reviewing public feedback and identifying project specific constraints. Next, the three design alternatives as well as a "no build" scenario were evaluated based on metrics that identify the best options for addressing congestion and enhancing safety. A public meeting to present the three design alternatives and "no build" option was held in August 2018. Public comments from the meeting and an interactive online map were collected and analyzed. Cost estimates prepared for each design alternative allowed for development of a final design recommendation that best meets community visions and program goals while staying within the allocated budget.

Existing Characteristics

Spicewood Springs Road within the project area is primarily an undivided road with one vehicular travel lane in each direction and a bicycle lane in the eastbound direction only. One public road intersects Spicewood Springs Road within the project area and nineteen private driveways function as two-way stop-controlled intersections. A short section of roadway in front of the Austin Board of Realtors building at 4800 Spicewood Springs Road includes center turn lane and sidewalk. The turn lane and sidewalk were constructed by the Austin Board of Realtors as part of their site development in 2015. Neither side of the road has curb and gutter or continuous sidewalk facilities. The existing typical road section is shown in Figure ES-1. Access to and from businesses and residences along Spicewood Springs Road can be challenging due to the lack of a continuous center turn lane. Vehicles waiting to turn left from Spicewood Springs Road into a driveway can cause traffic to back up since there is no space to wait except in the main travel lane. East of the project limits, Spicewood Springs Road includes four vehicular lanes with raised medians, a center turn lane with sidewalk and bicycle lanes on both sides.

The existing road was analyzed with current and projected future traffic volumes using traffic modeling simulations. The results indicate extremely low speeds or gridlock for future traffic volumes, most notably in the westbound direction.

Figure ES-1 Existing roadway typical section, looking toward Loop 360



Project Goals and Design Considerations

The goal of this project is to construct improvements that address congestion and enhance safety within the project limits. Additional vehicular capacity and improved safety can be provided through modifying the roadway layout to revise or expand the number of lanes and/or add missing components such as medians, sidewalk and bicycle lanes.

This preliminary engineering report evaluates three main roadway design options:

- Alternative A – One Lane in Each Direction with Center Median Turn Lane
- Alternative B – Two Lanes in Each Direction, no center lane
- Alternative C – Two Lanes in Each Direction with Center Median Turn Lane

All design alternatives include pedestrian and bicycle facilities. Preliminary engineering phase analysis considers the public's input, environmental factors, drainage and water quality requirements, available right-of-way, existing utilities, proposed utilities and project budget.

Recommended Improvements

Alternative C is recommended for the 2016 Mobility Bond project at Spicewood Springs Road. Alternative C meets the goals of addressing congestion and enhancing safety to a greater degree than Alternatives A and B. Alternative C received the most support from the community during the second public comment period.

Alternative C includes two vehicle lanes in each direction, raised median with left turn bays at limited locations and shared use path on both sides, as shown in Figure ES-2. A total of four vehicle lanes in combination with a raised median provide added capacity and improved traffic management. The result is improved traffic flow and mobility, as measured by the Level of Service ratings. Raised center medians also improve safety by limiting the left turn locations, which reduces the number of potential vehicle conflict point. Alternative C reduces conflict points by 45% as compared to existing conditions. The shared use path, buffer zone and curb provide a safer scenario for bicyclists and pedestrians. The center median and buffer widths vary as allowed by the project budget and existing right-of-way. Water quality and detention features are proposed in the medians. Right-of-way acquisition is not anticipated based on preliminary engineering phase investigation, however, additional right-of-way needs could be identified in design phase. Table ES-1 presents a summary of preliminary engineering phase evaluation.

Figure ES-2 Alternative C – Design Recommendation

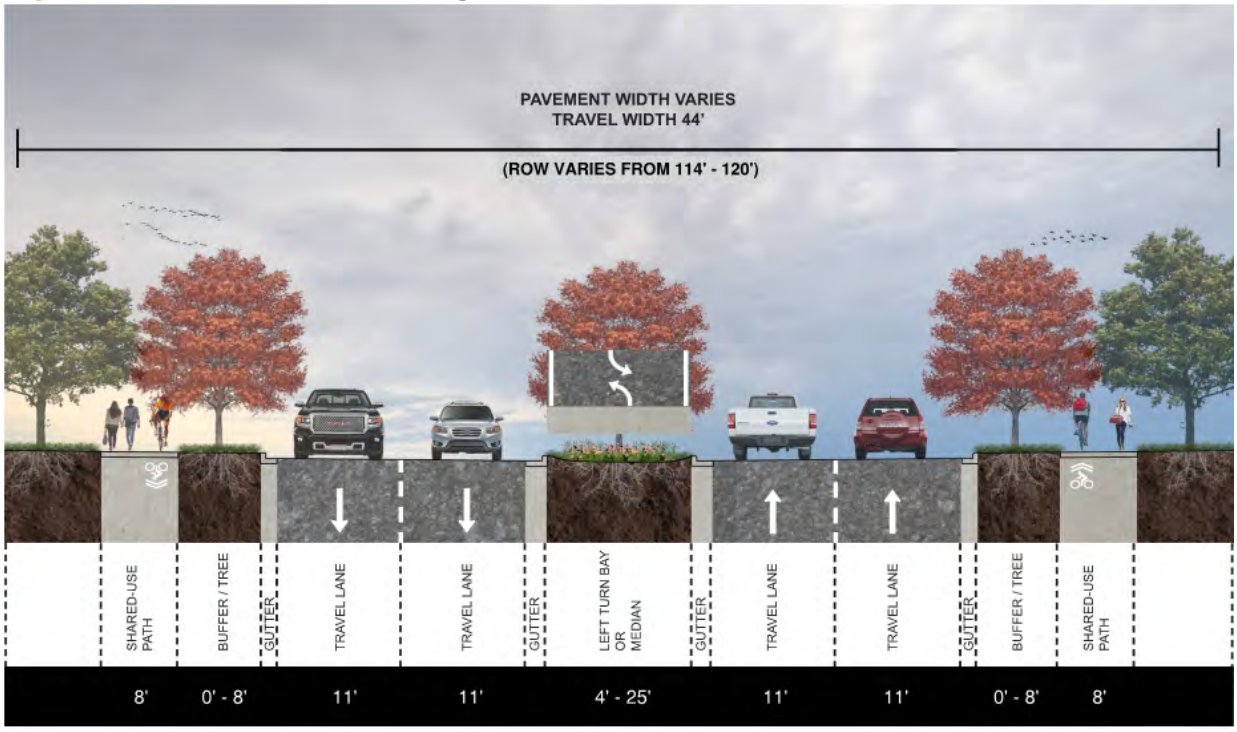


Table ES-1 Preliminary Engineering Phase Evaluation Summary

Evaluation Criteria	Basis of Evaluation	No Build	Alt A	Alt B	Alt C
Ped/Bike Safety	Includes buffer zone or raised path				
Vehicle Safety	Reduces vehicle conflict points				
Driveway Access	Acceptable driveway Level of Service				
Regional Mobility	Acceptable arterial Level of Service				
City Policies	Follows City policies, plans and design guides				
Public Feedback	Preference from 2nd public comment period				
	Evaluation Results				★

Legend

Meets criteria the most

Mostly meets criteria

Somewhat meets criteria

Does not meet criteria

Recommendation ★

The Texas Department of Transportation (TxDOT) recently started design of improvements at the Loop 360 and Spicewood Springs Road intersection. The Alternative C roadway design was modeled with and without an overpass at Loop 360 using traffic simulation software. Alternative C is the preferred option for improved traffic flow with and without TxDOT improvements at Loop 360.

Closing Old Spicewood Springs Road to vehicular traffic should be considered after TxDOT and Mobility Bond improvements are complete. Old Spicewood Springs Road serves as an alternative to passing through the congested Spicewood Springs and Loop 360 intersection. The section of road includes three low water crossings and is ranked first on the City's list of roadways with high risk of flooding. It is anticipated that an improved Loop 360 intersection would reduce vehicular traffic on Old Spicewood Springs Road. Old Spicewood Springs Road could remain open to bicycles and pedestrians. Another option is to install monitoring cameras to assist City staff with road condition monitoring and provide the public with close-to-real time information about water levels at each crossing.

Preliminary engineering investigation identified several locations outside the project area that need infill sidewalk or improved bicycle facilities. The locations are along Spicewood Springs Road east of the project limits and along Old Spicewood Springs Road. The construction of these facilities would complete continuous sidewalk and bicycle infrastructure along Spicewood Springs Road from Mopac/Loop 1 to Loop 360 and from

Spicewood Springs Road to the Lower Bull Creek Greenbelt. These improvements would require a separate funding source.

Project Cost

A summary of the engineer's opinion of probable project cost for the design recommendation is included in Table ES-2. The construction cost estimate is based on historical City of Austin construction bid tabs. The total project budget estimate includes 30% contingency. There are no anticipated additional right-of-way or easement needs for Alternative C, however, additional requirements may be identified during the design phase.

The construction cost estimate for infill sidewalk and bicycle facilities is $1,231,000. There are a number of challenging site conditions at these locations including the need for retaining walls and relocation of power poles.

Water system upgrades will be included with roadway construction, but will be funded by Austin Water, not the mobility bond. The water system upgrade cost estimate is $3.9 million; this amount is not included in the Alternative C cost estimates shown in Table ES-2.

Table ES-2 Opinion of Probable Cost for Design Recommendation

Alternative C – Design Recommendation	
Roadway Construction Cost Estimate	$ 9.6 million
Project management, design, testing and inspection	$ 7.1 million
Total Project Budget Estimate for Alternative C	**$ 16.7 million**
2016 Mobility Bond Allocation for Spicewood Springs Road	**$ 17.0 million**

Next Steps

The next project phase is design and permitting followed by contract bidding and construction phase. Preliminary engineering analysis identified the need for a light study and traffic signage study. These additional studies should be initiated at the beginning of the design phase. A noise study, which can be triggered on larger scale federal projects, is not planned as part of Spicewood Springs Road project. The project is locally funded by the 2016 Mobility Bond. TxDOT is planning a noise analysis as part of improvements at Loop 360.

1.0 INTRODUCTION

1.1 Project Purpose and Goal

The primary goals of the Spicewood Springs Road project are to address congestion and enhance safety. The following report presents preliminary engineering analysis of existing and proposed roadway cross sections, proposed infrastructure improvements, environmental concerns and historical resource investigation. The project limits are Spicewood Springs Road and right-of-way from Loop 360 to 0.2 miles west of Mesa Drive. Proposed improvements reflect the public's priorities and support needed rehabilitation of the City's existing infrastructure and facilities, while making investments in new initiatives that are consistent with the City of Austin's guiding plans and policies. Evaluation criteria were developed and applied as metrics to evaluate three design alternatives and a "no build" option.

1.2 Project Background and Funding

In March 2015, Austin City Council's Mobility Committee announced a Transportation Congestion Action Plan. The plan identifies Spicewood Springs Road from Mopac/Loop 1 to Loop 360 as a key citywide mobility corridor and recommends roadway reconstruction in order to provide additional transportation capacity. The Transportation Congestion Action Plan is included in ***Appendix E***.

The City of Austin's current transportation plan, the 2025 Austin Metropolitan Area Transportation Plan (AMATP), recommends upgrading Spicewood Springs Road from Mesa Drive to Loop 360 to include two vehicular lanes in each direction with a center turn lane or raised median. Implementing the AMATP strategic plan, through recommendations in this report, will provide two vehicular lanes in each direction, center turn lane or median, sidewalk and bicycle lanes along Spicewood Springs Road from Mopac/Loop 1 to Loop 360. The AMATP map is included in ***Appendix E***.

In November 2016, Spicewood Springs Road was included in the Regional Mobility Bond and was approved by Austin voters. The election allocated $720 million in bonds for transportation and mobility improvements throughout the City including $17 million for improvements to Spicewood Springs Road east of Loop 360 (Resolution No. 20160818-074). Preliminary engineering phase recommendations are primarily fulfilled through the 2016 Mobility Bond. Infill sidewalk along the south side of Spicewood Springs Road near Mopac/Loop 1 and along Old Spicewood Springs Road is outside the bond project limits and would be funded separately.

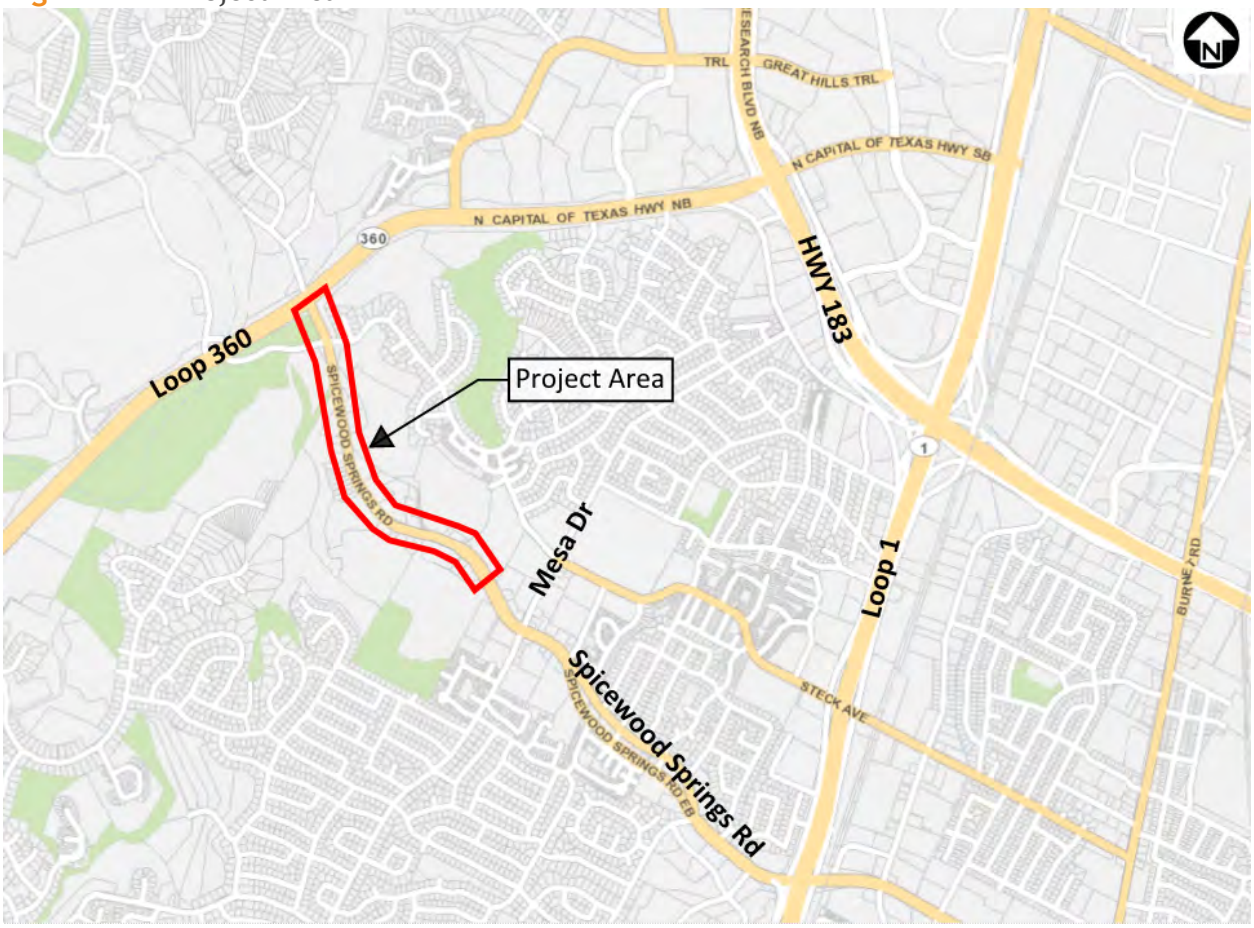
The bond resolution directs the City Manager to present recommendations that are supported by identifiable metrics and that prioritize "a) reduction in congestion; b) improved level of service and reduced delay at intersections for all modes of travel; c)

connectivity, and improved effectiveness of transit operations within these corridors and throughout the system". The full bond resolution text is included in ***Appendix E.***

1.3 Project Area

Spicewood Springs Road provides connectivity between Loop 360 and Mopac/Loop 1, two of Austin's main north-south highways. The project area limits are approximately 4,000 feet of Spicewood Springs Road from Loop 360 to 0.2 miles west of Mesa Drive. The project area is located within the Austin city limits and is shown in Figure 1-1. A standard convention used throughout this report assumes that Spicewood Springs Road is oriented east-west since it intersects with highways that generally run north-south.

Figure 1-1 Project Area



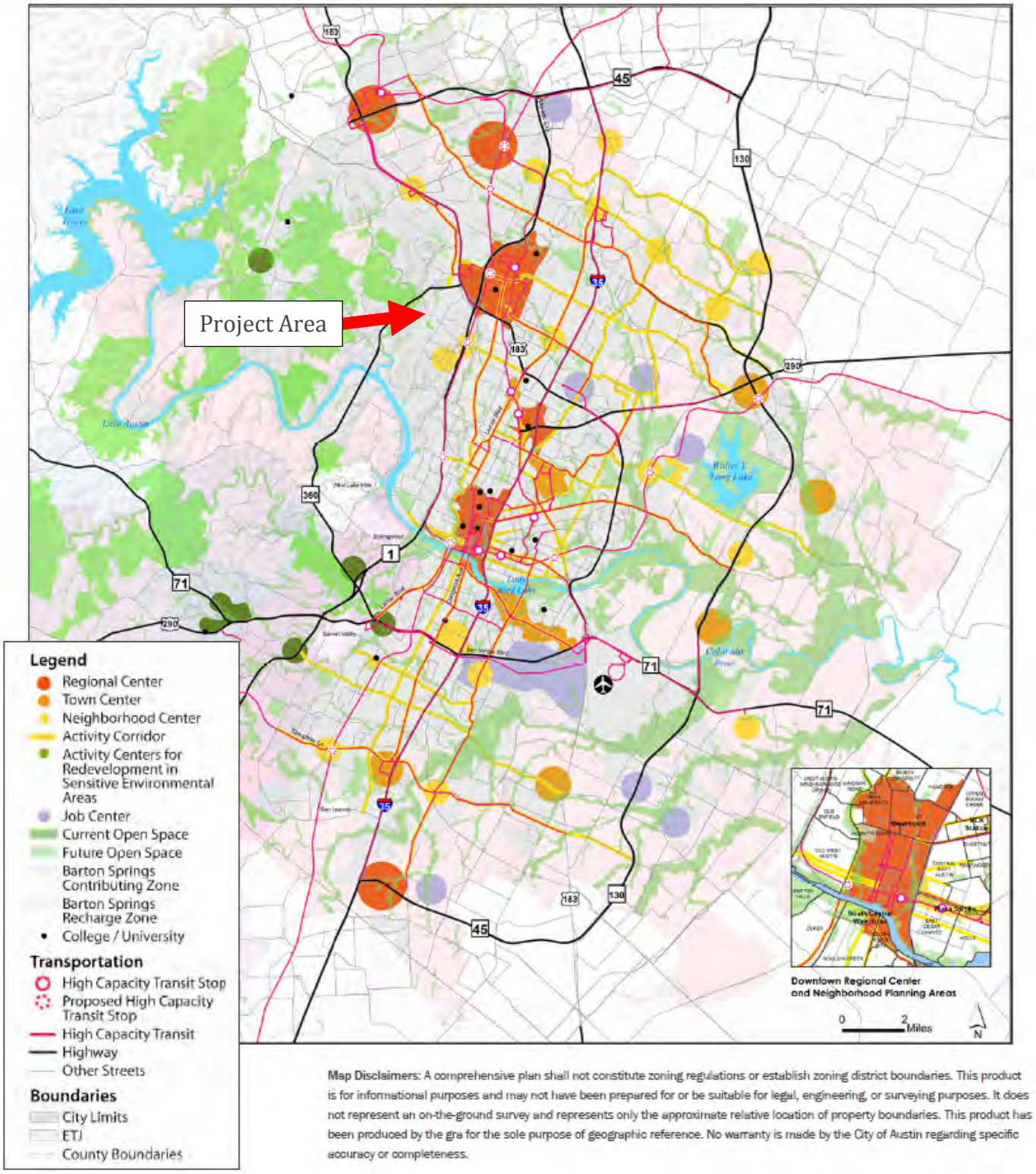
Spicewood Springs Road within the project limits is classified as a major arterial by the City's current transportation plan. Arterial roads serve through-traffic by providing connectivity between residential or commercial areas and highways. Spicewood Springs Road connects two main north-south highways and serves local residents, adjacent commercial property and through-traffic.

The project area lies within the Bull Creek watershed. The eastern end of the project coincides with the Bull Creek watershed boundary. Storm water runoff east of the boundary flows to Shoal Creek. Bull Creek watershed is classified as Water Supply Suburban by the City of Austin. Water quality features are sized based on watershed classification regulations.

Spicewood Springs Road from Mesa Drive to Loop 360 is the boundary between roads that are classified urban or suburban, as defined in Land Development Code Subchapter E. Design elements for urban and suburban roads are outlined in the Draft Austin Street Design Guide found in ***Appendix E***.

Property adjacent to Spicewood Springs Road is comprised of office buildings, multi-family housing and single-family housing. The Lower Bull Creek Greenbelt is situated immediately south of Spicewood Springs Road between Loop 360 and Old Spicewood Springs Road. A tributary to Bull Creek flows under Spicewood Springs Road just east of Loop 360 and continues south through the greenbelt. Steck Valley Greenbelt, Barrow Nature Preserve and Stillhouse Hollow Nature Preserve are located within a half mile radius of Spicewood Springs, although they are not accessed directly from Spicewood Springs Road. Numerous retail businesses, including a large grocery store, are located just outside the project area at the intersection with Mesa Drive. The larger geographic area includes neighborhood centers, a regional center and activity corridors as outlined in the Imagine Austin Comprehensive Plan (**See Figure 1-2**).

Figure 1-2 Imagine Austin Growth Concept Map



The project area is typical of the Balcones Canyon geography. General characteristics of the terrain include creeks fed by springs in steep sided canyons and deciduous woodland. Native and non-native tree species are located within the Spicewood Springs Road right-of-way. Large tracts of land remain undeveloped on both sides of Spicewood Springs Road. Deer regularly cross Spicewood Springs Road to access food resources in the undeveloped areas. The eastern two-thirds of the roadway is within the Edwards Aquifer Recharge Zone, as defined by the City of Austin. The remaining roadway is within the City of Austin's Edwards Verification Zone. However, the project area is outside of Edwards Aquifer Recharge and Transition Zones as defined by the Texas Commission on Environmental Quality (TCEQ).

Spicewood Springs Road follows a ridge formed by two steep sided ravines that eventually drain to Bull Creek. The result is significant elevation change and steep grades along the roadway. Spicewood Springs Road slopes range from nearly flat just west of Mesa Drive to 16% just east of Adirondack Trail/Old Spicewood Spring Road.

1.4 Project Process

The process of arriving at a recommendation for Spicewood Springs Road included three main components. First, a public involvement program allowed residents to provide insight about the project area and feedback on design alternatives. Second, plans and policies adopted by the City of Austin, along with public feedback, served to guide the development of design alternatives. Finally, engineering investigation and analysis efforts led to the development of a decision matrix for determining the best design alternative. Evaluation categories in the decision matrix include public support, safety, mobility and compliance with City policies. The best alternative from the decision matrix was subsequently evaluated in terms of cost and schedule feasibility.

The City of Austin began the project by developing a public involvement program and reaching out to community stakeholders and neighborhood associations. Community engagement continued throughout the project and included two formal public comment periods. A public meeting held in September 2017 initiated the first public comment period. City staff collected comments at the meeting and opened an interactive online map where residents could enter comments. Community feedback was critical to understanding existing conditions on Spicewood Springs Road including safety concerns, access challenges and traffic patterns. Comments are available in ***Appendix D.***

A number of plans and policies adopted by the City of Austin, produced by City staff or published by other local entities, served to guide the development of design alternatives. Imagine Austin, the comprehensive regional planning effort, adopted by City Council in 2012, is the foundation for many of the policies.

The following plans and policies were reviewed and incorporated into the development of potential improvements, as outlined by the 2016 Mobility Bond (Resolution No. 20160818-074):

- Capital Metro Connections 2025
- Capital Metro Service Guidelines and Standards
- Project Connect Regional High Capacity Transit Plan
- City of Austin Strategic Housing Plan
- City of Austin Transit Priority Policy
- City of Austin Strategic Mobility Plan
- City of Austin Complete Streets Policy
- City of Austin Sidewalk Master Plan (adopted June 16, 2016)
- City of Austin Urban Trails Master Plan (adopted September 25, 2014)
- City of Austin Bicycle Master Plan (adopted November 6, 2014)
- Vision Zero Plan
- applicable National Association of City Transportation Officials standards
- Imagine Austin Comprehensive Plan

Several additional documents guided preliminary engineering phase efforts:

- 2025 Austin Metropolitan Area Transportation Plan
- City of Austin Land Development Code and Criteria Manuals
- City of Austin Street Design Guide (June 2017 draft)
- Parks and Recreation Department Long Range Plan
- Watershed Protection Master Plan (dated FY 2015-2016)
- Texas Department of Transportation's schematic map of Loop 360 improvements

The project team also coordinated with the Texas Department of Transportation (TxDOT) regarding the intersection with Loop 360. TxDOT is currently in the preliminary engineering phase for grade separation improvements at the Loop 360 and Spicewood Springs Road intersection. TxDOT's current schematic plan for the intersection is shown in ***Appendix E***. TxDOT currently anticipates accepting bids for the construction project in 2022.

Engineering investigation and analysis efforts provided additional information for developing design alternatives. Field investigation, topographic survey, record drawings, traffic studies, environmental studies and a historical review helped identify project constraints. Existing right-of-way boundaries were established and used as the basis for proposed improvements.

City staff presented three design alternatives and a "no build" option at a second public meeting in August 2018. Again, City staff collected comments and opened an interactive online map where residents could enter comments. Feedback received at the meeting, via emails and through the online map was reviewed and analyzed. Comment analysis results are included in the decision matrix used to arrive at a design recommendation. Comments are available in ***Appendix D***.

Finally, a decision matrix was developed in order to evaluate design alternatives. Nationally recognized standards for evaluating roadway configurations were used to rank design alternatives in terms of their ability to address congestion and enhance safety. Design alternatives were also evaluated based on the extent to which they comply with recommendations in current City plans and policies. Results from the public feedback analysis provided the final decision matrix component. The matrix is shown in Table 8-1.

2.0 PROJECT SCOPE

2.1 Design Alternatives

City staff proposed, refined and evaluated four alternatives during preliminary engineering. The design alternatives are summarized below.

No Build – No improvements made to current roadway.

Alternative A – One Lane in Each Direction with Center Median Turn Lane

Alternative A includes one vehicular travel lane in each direction plus a center median. Gaps in the median allow left turns at certain locations. Vehicles wanting to turn left onto Spicewood Springs Road from adjacent property first turn right onto Spicewood Springs Road, then U-turn at the next left turn bay located in the median. A shared use path is located along both sides of Spicewood Springs Road for pedestrians and bicyclists. Water quality features are located in the medians. Figure 2-1 shows a typical section for Alternative A and Figure 2-2 shows the location of median cuts allowing left turns.

Alternative B – Two Lanes in Each Direction

Alternative B consists of two vehicular travel lanes in each direction without a center turn lane or median. The ability to turn left or right onto Spicewood Springs Road from adjacent property remains the same as in the existing conditions. A shared use path is located along both sides of Spicewood Springs Road for pedestrians and bicyclists. The buffer width between road curb and shared use path is minimized in order to provide area for water quality features and to minimize tree mitigation. Figure 2-3 shows a typical section for Alternative B.

Alternative C – Two Lanes in Each Direction with Center Median Turn Lane

Alternative C is similar to Alternative A with an additional vehicular travel lane added in each direction. The resulting typical section has five lanes – two lanes in each direction and a center median that also functions as a left turn bay at certain locations. Vehicles wanting to turn left onto Spicewood Springs Road from adjacent property first turn right onto Spicewood Springs Road, then U-turn at the next left turn bay located in the median. Median cuts for left turns are the same as in Alternative A and are shown in Figure 2-2 and in greater detail in the preliminary roadway plans in ***Appendix A***. A shared use path is located along

both sides of Spicewood Springs Road for pedestrians and bicyclists. Water quality features are located in the medians. The buffer width varies based on site conditions in order to minimize tree mitigation. The typical section for Alternative C is shown in Figure 2-4.

Figure 2-1 Alternative A Typical Section

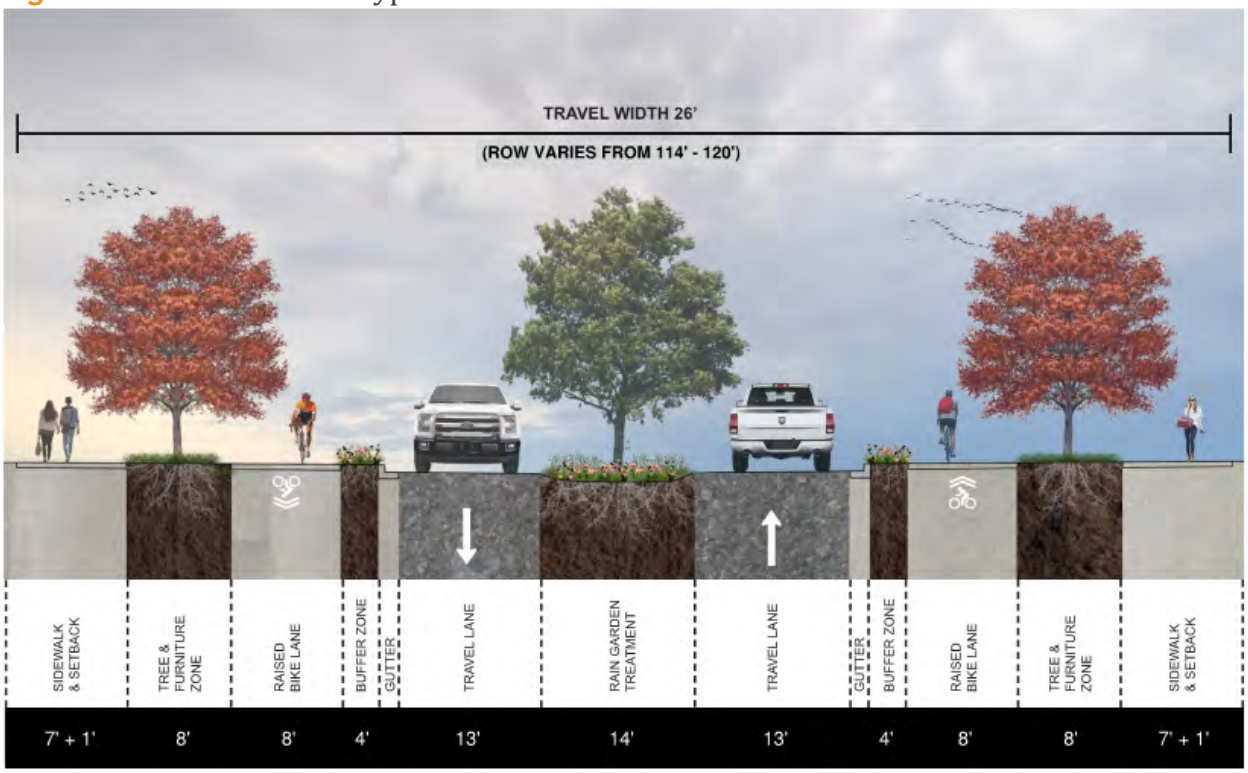


Figure 2-2 Median Cut Locations for Alternatives A and C

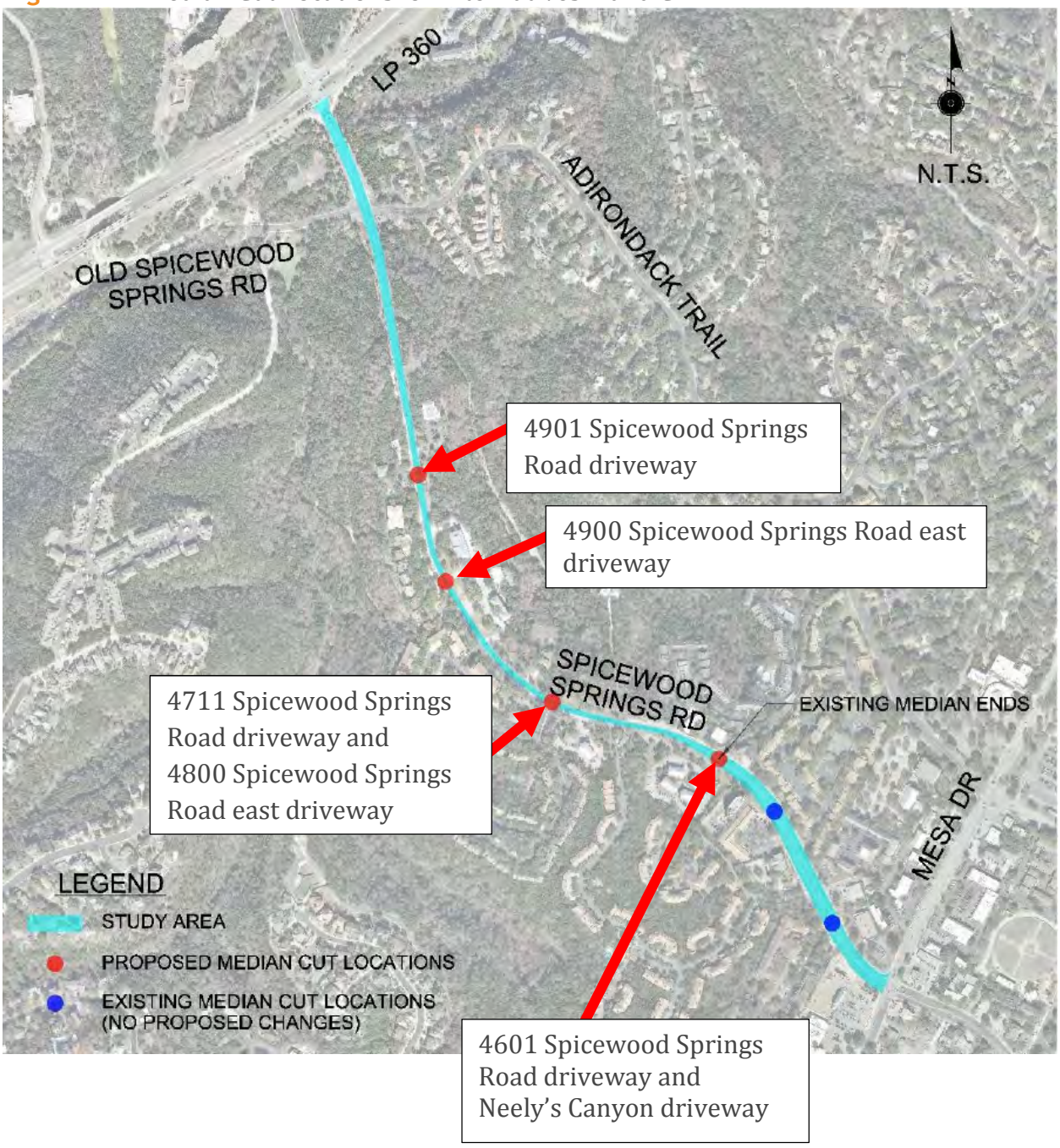


Figure 2-3 Alternative B Typical Section

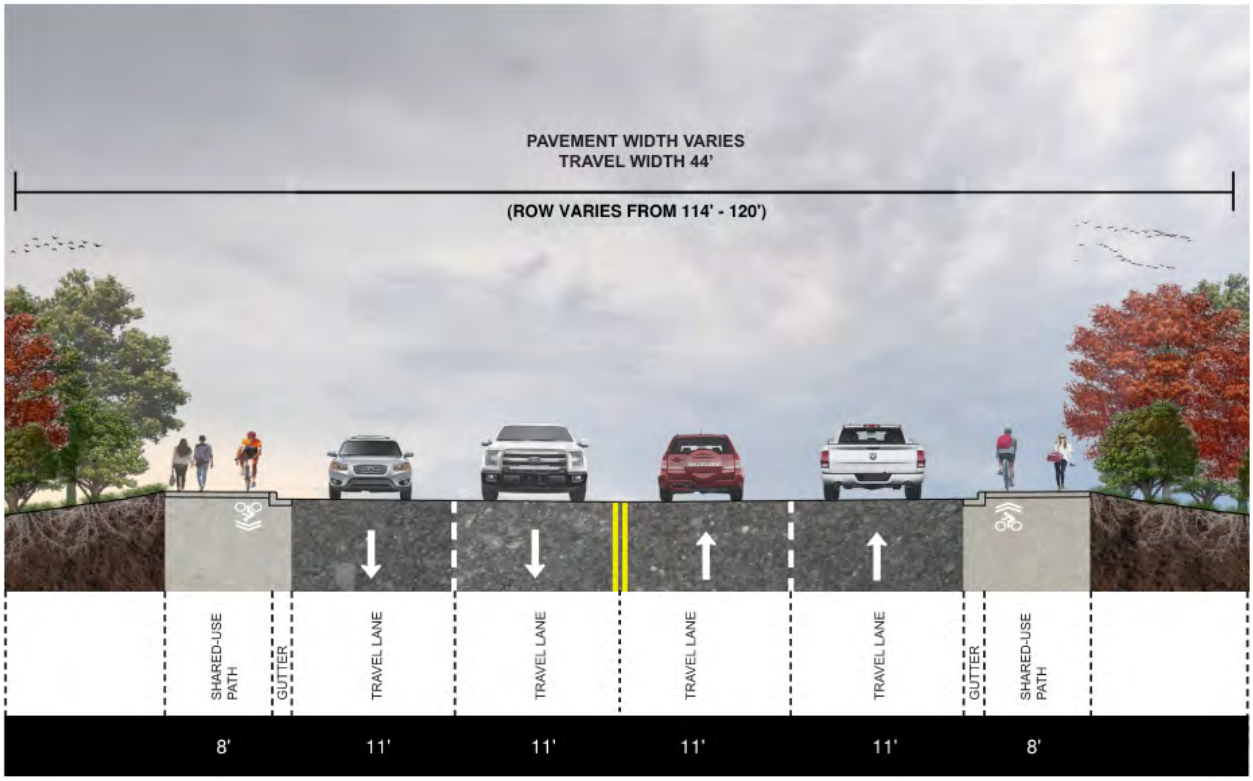
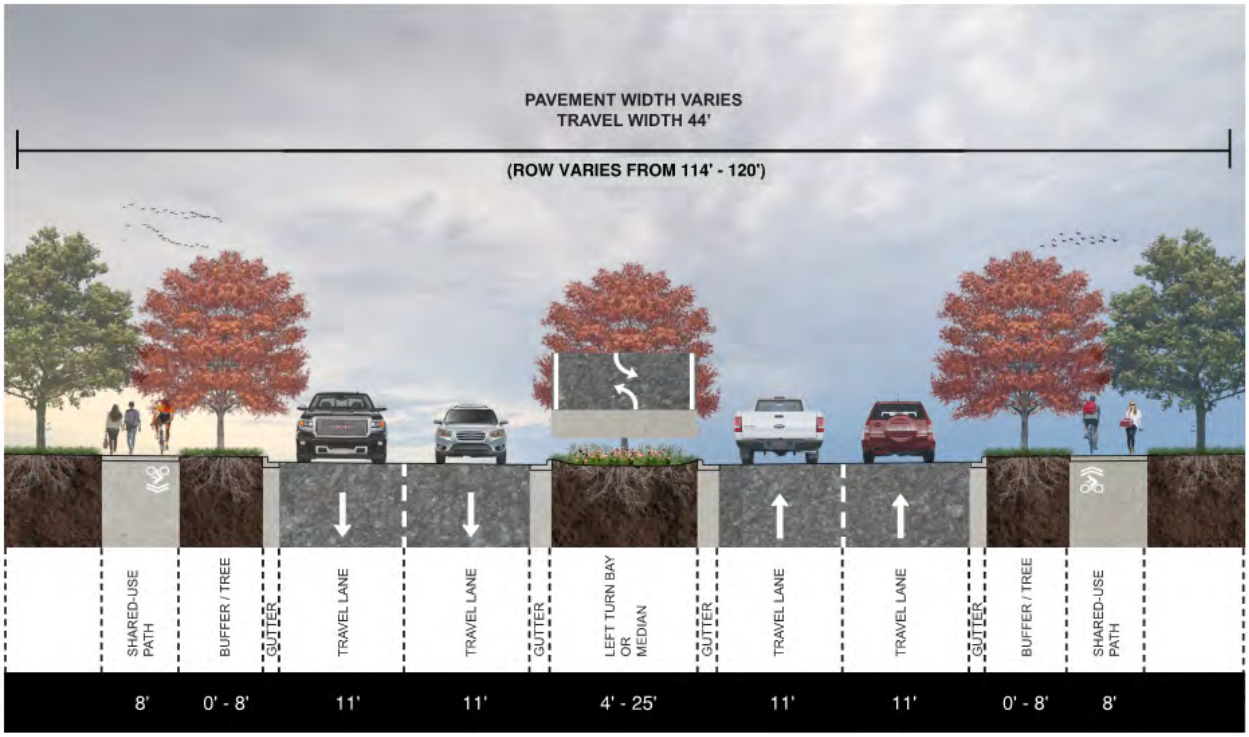


Figure 2-4 Alternative C Typical Section



2.2 Assumptions and Limitations

All recommendations presented in this report are preliminary and will be further refined during design phase. Analysis and recommendations are based on the following assumptions.

- The speed limit on Spicewood Springs Road will remain 30 mph.
- The vehicle traffic growth rate is 3.2% as described in the **traffic analysis**.
- Austin Fire Department requires a minimum 11-foot wide lane if there are two lanes in one direction and a minimum 15-ft wide lane if there is one lane in each direction. These dimensions provide adequate turning radii for fire trucks and are based on Land Development Code (LDC) Article 7.
- Drainage Criteria Manual (DCM) rainfall depths used to size storm drain and detention facilities will increase after new rainfall data is published by the National Oceanic and Atmospheric Administration (NOAA).
- Design phase coordination will occur between the City of Austin and TxDOT regarding the Spicewood Springs approach to Loop 360.
- Geotechnical and sub-surface utility engineering services will be obtained during design phase.

3.0 PUBLIC INVOLVEMENT

City of Austin staff initiated the Spicewood Springs Road Preliminary Engineering effort in September 2017. The **Spicewood Spring project website** was launched with an overview of scope and funding, anticipated schedule and information about ways for citizens to share feedback and receive project updates. The website also provided contact information for neighborhood associations and interest groups to request a small group presentation.

City staff hosted and presented project information and collected feedback from the community at a public meeting on Tuesday, September 26, 2017. At this meeting, staff gave a presentation explaining that the project would evaluate existing conditions based on community input and transportation metrics, including vehicle, pedestrian and bicycle observations, speed, driveway analysis, crash pattern analysis, right-of-way width and availability, drainage, sidewalk condition, utilities, etc. The presentation also included information about the anticipated timeline and project constraints, as well as the project team and budget. Meeting attendees were invited to share feedback on their experiences using Spicewood Springs Road via comment cards and written feedback on large printed aerial maps of the area. City staff also met with the Stillhouse Canyon Condominium Homeowners Association on October 30, 2017 to present project information, collect comments and answer questions.

In addition to the September 26 and October 30 project meetings, an **online mapping tool** was launched, inviting residents to share feedback on their experiences living, driving, walking and biking in the project area. Using the mapping tool, residents could pin comments to a specific location on Spicewood Springs Road. Both comments shared using the online mapping tool and feedback received in person at project meetings shaped the development of the draft alternatives.

Staff received a total of 237 comments and/or questions via the public meeting, the Stillhouse Canyon Condominium Homeowners Association, emails to City staff and the interactive online map. Citizens shared feedback and expressed concern about a range of issues, including vehicles driving over the speed limit on Spicewood Springs Road, safety of bicyclists and pedestrians and increased traffic and wildlife, including deer crossing the road. The majority of comments received on widening Spicewood Springs Road were in opposition to two vehicular travel lanes in each direction. The majority of comments received regarding bicycle facilities expressed support for new bicycle infrastructure. For a full list of all citizen comments received during the public comment period, view ***Appendix D***.

On August 29, 2018, City staff held a second public meeting to present the four alternatives developed and evaluated by City staff in the months following the initial project outreach:

No Build – No improvements made to current roadway

Alternative A – One travel lane in each direction; center median with median gaps to allow left turns and U-turns at certain locations; raised bike lane and sidewalk facility; new water quality and detention elements in the median

Alternative B – Two travel lanes in each direction without a center turn lane or median; left and right turn access remain the same as present-day conditions; shared use path on both sides of the road for people walking, biking or using a wheelchair; new water quality and detention elements

Alternative C – Two travel lanes in each direction; center median with median gaps to allow left turns and U-turns at certain locations; shared use path on both sides of the road for people walking, biking and using a wheelchair; new water quality and detention elements in the median

The August 29 public meeting was open house-style event, with project boards presenting safety and mobility information about the four different alternatives. Information presented included the roadway geometry and cross section of each alternative, 2027 level of service for each alternative, 2027 level of peak hour delay for each alternative, crash data, anticipated crash reduction information and more. Project boards are included in ***Appendix D***.

A comment card was available at the public meeting and asked attendees three questions:

1. What do you like about the draft alternatives for safety and mobility improvements to Spicewood Springs Road?
2. What concerns do you have about the draft alternatives for safety and mobility improvements to Spicewood Springs Road?
3. Is there one draft alternative that you prefer? Why?

The boards presented at the public meeting were posted on the project website alongside an online survey that asked the same three questions featured on the comment card. The survey was open August 30 - September 14.

431 responses were received at the public meeting, via the online survey and through email during the comment period. Overall, concerns were expressed about increased regional traffic, area deer, driver speeds, wildlife, cyclist safety and traffic impacts during construction. Of the respondents who shared feedback on an alternative preference, 26.2% supported Alternative A, 16.5% supported Alternative B, 48.3% supported Alternative C and 6.7% preferred the No Build. (2.3% of respondents indicated that none of the options presented reflected their preference for the roadway.)

Of the respondents who preferred Alternative A, many preferred the separated bike and pedestrian facilities, and expressed concern that the additional travel lanes included in Alternative B and Alternative C would increase traffic. Many supporters of Alterative A also expressed a preference for a reduced environmental footprint and a desire to maintain the existing character of Spicewood Springs Road.

Of the respondents who preferred Alternative B, many expressed support for maintaining the existing left-turn access to and from driveways, and some also expressed concern about which businesses would lose left-turn access if medians are built, as proposed in Alternative A and Alternative C.

Of the respondents who preferred Alternative C, some expressed a preference for matching the existing section at Spicewood Springs/Mesa Drive, as well as preference for two lanes in each direction to accommodate future growth. Many respondents mentioned support for Alternative C's lower 2027 peak hour delay.

Of the respondents who preferred the No Build, some expressed the opinion that the Spicewood Springs Road project is unnecessary and that any improvements would attract more traffic to the area. Many respondents who supported the No Build were also in opposition to bicycle facilities on Spicewood Springs Road.

A number of the comments expressed concern for a potential noise increase after roadway improvements are completed. Residents report that vehicle engines produce the most noise

as they accelerate up the steep hill. A noise study, which can be triggered on larger federal projects, is not planned as part of Spicewood Springs Road project.

All public comments received at the open house and as part of the second public comment period can viewed in ***Appendix D.***

4.0 EXISTING CONDITIONS

4.1 Roadway Characteristics

Spicewood Springs Road is classified by the City of Austin as a major arterial. Arterial roads are primarily intended to serve through-traffic by providing connectivity between residential or commercial areas and freeways. Spicewood Springs Road connects Loop 360 and Mopac/Loop 1 highways. Approximately 4,000 linear feet of existing roadway, with a posted speed of 30 miles per hour, are proposed for roadway improvements. Figures 4-1, 4-2 and 4-3 demonstrate existing roadway conditions.

Through most of the project area, Spicewood Springs Road has one vehicular travel lane in each direction. A short section of Spicewood Springs Road was widened to add a center turn lane in front of the Austin Board of Realtors and Canyon View Event Center building at 4800 Spicewood Springs Road. The turn lane was constructed by the Austin Board of Realtors as part of their site development in 2015. The center turn lane allows easier access to the Board of Realty as well as easier access to offices and condominiums on the opposite side of the road (4701, 4705, 4711, 4801 and 4807 Spicewood Springs Road). City staff met with the Austin Board of Realtors on September 11, 2018 to discuss the design alternatives and how proposed improvements could affect access to their property.

Pedestrian and bicycle facilities are incomplete within the Spicewood Spring Road project area. Existing 4 to 6 foot wide sidewalk runs along the north side of Spicewood Springs beginning at Mesa Drive and extending west for approximately 1,720 linear feet. The sidewalk does not connect to existing pedestrian facilities at the west end. A worn pedestrian path is visible along the south side of Spicewood Springs beginning near Mesa Drive, where existing sidewalk ends, and continuing west to the end of commercial development at 4901 Spicewood Springs Road. Approximately 730 linear feet of sidewalk were recently added in front of the Board of Realty building, but neither end connects to existing sidewalk. An eastbound bicycle lane extends from Loop 360 to 0.2 miles west of Mesa Drive. There is no westbound bicycle lane.

The Spicewood Springs typical road section changes approximately 0.2 miles west of Mesa Drive at which point Spicewood Springs widens to two lanes in each direction with center median, left turn bays and sidewalk and bicycle lanes on both sides. The wider road configuration continues east to Mopac/Loop 1 with two exceptions: 1) missing bicycle lane

for approximately 0.2 miles east and west of Mesa Drive and, 2) missing infill sidewalk on the south side of Spicewood Springs Road between Greenslope Drive and Hart Lane.

Figure 4-1 Spicewood Springs Road Picture
Looking uphill from the intersection with Old Spicewood Springs Road

Figure 4-2 Spicewood Springs Road Picture
Looking east toward the Animal Hospital at 4606 Spicewood Springs Road

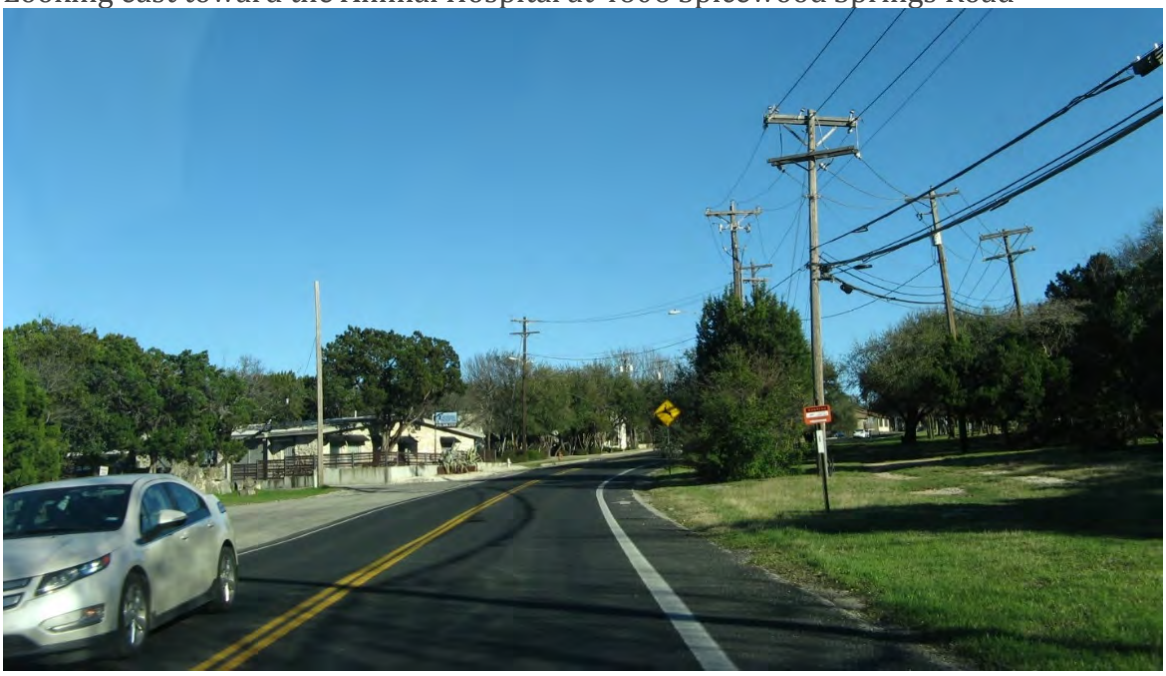
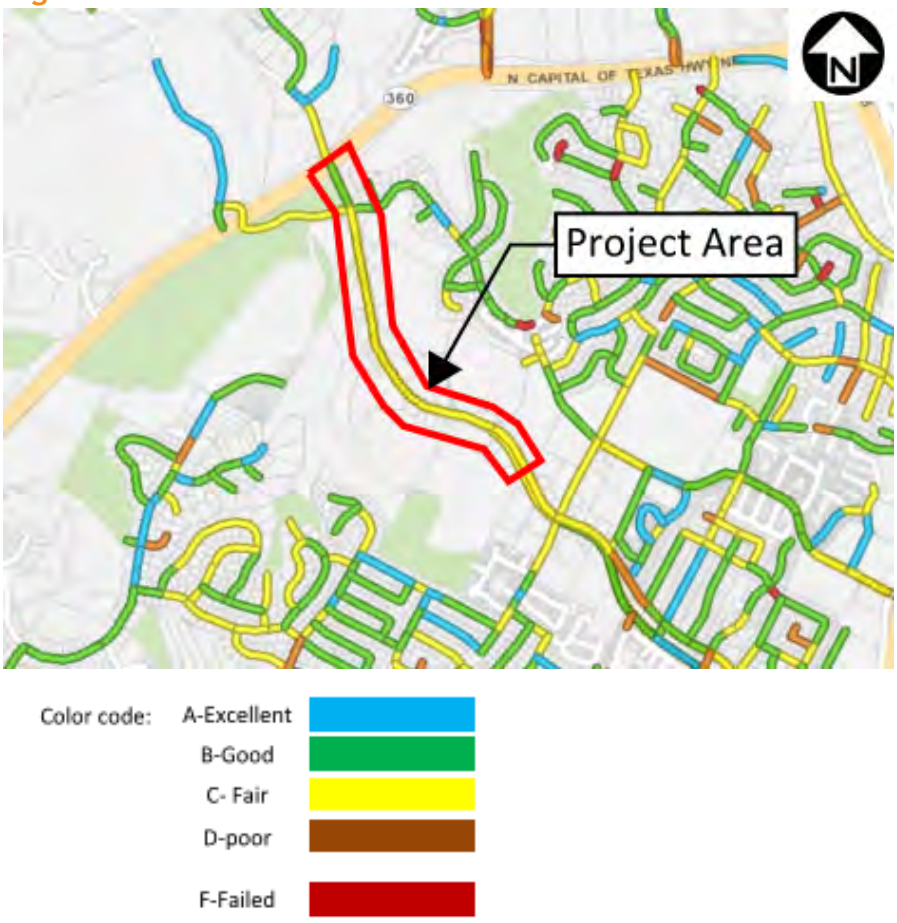


Figure 4-3 Spicewood Springs Road Picture
Looking west from the top of the steep hill near 4926 Spicewood Springs Road

The Spicewood Springs Road cross section within the project area does not comply with current design guidelines. New guidelines in the Austin Street Design Guide (June 2017 draft) list roadway features that should be included in a roadway cross section based on the land use context (urban, suburban, etc.) and Annual Average Daily Traffic (AADT). Spicewood Springs Road falls into the Urban or Suburban Level 3 roadway classification based on a current ADT of 16,435 vehicles. AADT calculations and methodology for Spicewood Springs Road are found in the **traffic analysis**. The design guide recommendations for Level 3 roads include raised bicycle lanes, sidewalk with safety buffer and either one vehicle lane in each direction with center turn lane or two lanes in each direction with center median.

The City of Austin evaluates roadway pavement conditions and assigns an A to F score to existing roads. Spicewood Springs Road between Mesa Drive and Old Spicewood Springs Road/Adirondack Trail has a pavement condition score of C-Fair and the section between Old Spicewood Springs Road/Adirondack Trail and Loop 360 is scored B-Good, as shown in Figure 4-4 below. Pavement condition grades are from the City of Austin's internal IMMPACT map tool.

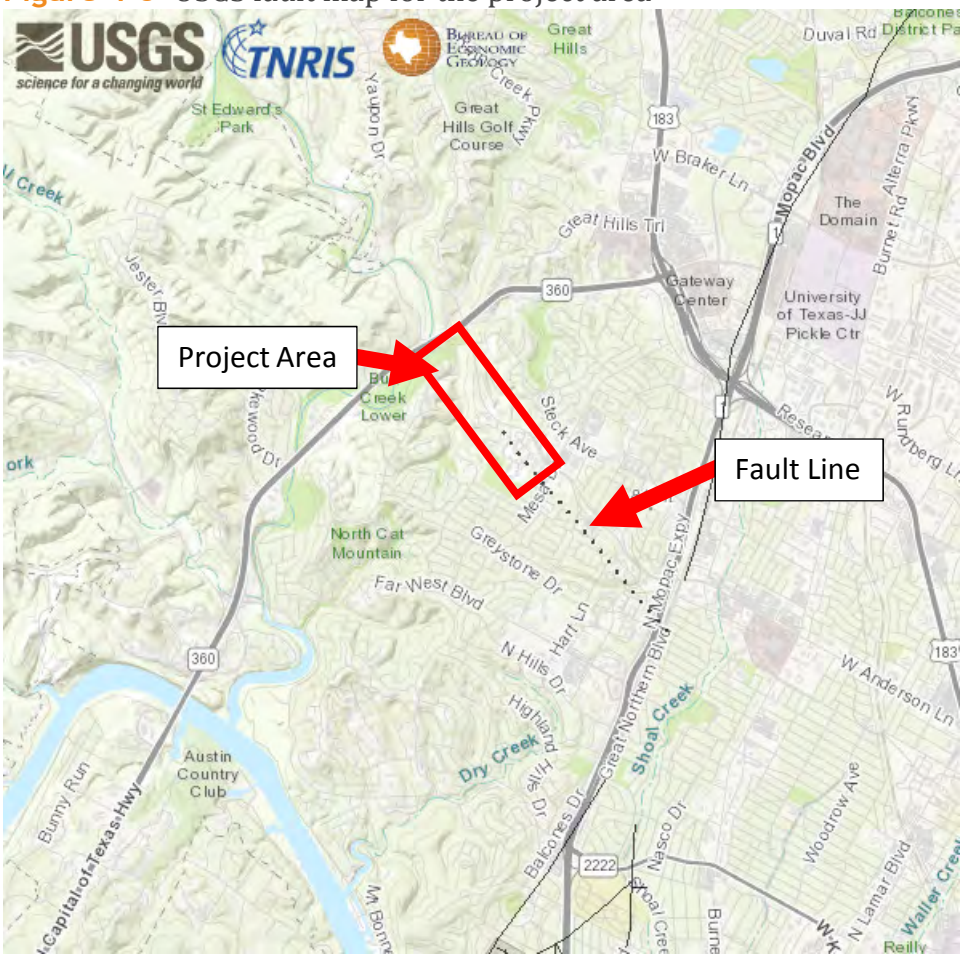
Figure 4-4 Pavement Condition Grades



Part of Spicewood Springs Road is within the bounds of a Hill Country Roadway. Loop 360 from US 290 West to US 183 is designated a Hill Country Roadway by the City of Austin. The limits of the roadway designation extend 1000 feet from Loop 360's right-of-way line. As a result, approximately 600 feet of Spicewood Springs Road to the east of Old Spicewood Springs Road/Adirondack Trail falls within the Hill Country Road corridor. There are additional survey and tree mitigation requirements in Hill Country Road corridors. The corridor limits are shown on the plan sheets in ***Appendix A***.

The Texas Geology map, available from the United States Geological Survey (USGS), shows a fault running approximately along Spicewood Springs Road from Mopac/Loop 1 to approximately 2,500 feet west of Mesa Drive. The fault could be located within the limits of Spicewood Springs Road construction. Faults are inferred based on a USGS map from the 1970s and older. City staff recommends adding fault location verification to the scope of design phase geotechnical services. A map of the fault is included in Figure 4-5.

Figure 4-5 USGS fault map for the project area



4.2 Existing Survey and Right-of-Way

A preliminary survey of the existing right-of-way was conducted in December 2017 and serves as the basis for preliminary engineering phase analysis. The survey includes the following elements:

- Existing right-of-way and property lines
- Roadway features and elevations
- Elevations for right-of-way and utility features
- Edge of pavement
- Tree types and sizes
- Overhead utilities
- Bar ditches along the road
- Existing detention ponds and sidewalk
- Connectivity of overhead and underground utilities between surveyed ground features (where possible)

City staff conducted field visits in January and February 2018 to verify survey information. Survey data was supplemented with 2012 elevation data and 2013 ground feature line work. The supplemental data was derived from geospatial information collected by a remote sensing method that uses laser light to measure distances. The method is termed LIDAR, which stands for Light Detection and Ranging. A composite base map of the greater project area was created that includes survey data within the right-of-way and LIDAR elevation or ground feature line work outside the right-of-way. The base map forms the basis for drainage calculations discussed in ***Appendix F*** as well as preliminary plans and typical sections found in ***Appendix A***.

Retaining walls and erosion protection will be necessary if the roadway width is increased from existing at the west end of the project. Spicewood Springs Road experiences a dramatic elevation change east of Loop 360 with roadway slopes up to 16%. The maximum sustained running slope allowed by the Transportation Criteria Manual (Section 1.4.2) for major arterials is 9%. There is one existing driveway on the steep slope at 5003 Spicewood Springs Road. The steep slope follows the top of a ridge formed by steep sloped ravines. The ravine on the north side of Spicewood Springs Road forms the banks of a tributary to Bull Creek. The erosion hazard review zone for this tributary extends into the project area between Loop 360 and Old Spicewood Springs Road/Adirondack Trail.

Right-of-way throughout most of the project limits varies from 114 to 120 feet wide. The first exception is right-of-way in front of an undeveloped lot (Travis Central Appraisal District No. 0147050206) at the top of the steep hill where right-of-way narrows to 96 feet wide for a distance of 280 feet. The second area is at the intersection of Spicewood Springs Road and Old Spicewood Springs Road/Adirondack Trail where the right-of-way flares to

340 feet wide and continues at 320 feet wide to the intersection with Loop 360. There is an irregular right-of-way width at 4807 Spicewood Springs Road. At this location, the City acquired an additional triangular shaped area outside the standard 120-foot wide right-of-way that is approximately 1,300 square feet. The area is approximately 10 feet from an existing office building. There is also one parcel adjacent to the north side of Spicewood Springs Road that is owned by the City of Austin (Travis Central Appraisal District No. 0147050207). The lot is adjacent to 4926 Spicewood Springs Road and is approximately 0.23 acres.

4.3 Access Management

The most significant access challenge is turning left onto or off Spicewood Springs Road during peak commute hours. Breaks in east and west bound traffic must occur simultaneously in order for drivers to turn left onto Spicewood Springs Road since most of Spicewood Springs Road is undivided. Turning left from Spicewood Springs Road into a driveway can cause traffic to back up since there is no path around the turning vehicle as the driver waits for a break in opposing traffic. The short section of center turn lane in front of the Austin Board of Realtors building was installed in 2015 through a cost sharing agreement between the Board of Realtors and the City of Austin. The agreement recognizes that both parties benefit from improved safety, mobility and access provided by the center turn lane.

4.4 Historical and Cultural Resources

City staff investigated historical structures in the project area after a resident contacted the project team with information regarding a potentially historically significant house located in the Lower Bull Creek Greenbelt. As shown in Figure 4-6, aerial imagery indicates that the Thurm house was located south of Spicewood Springs Road between Loop 360 and Old Spicewood Springs Road. The house was roughly across the road from the Marquis at Tree Tops driveway (5217 Old Spicewood Springs Road). Although the Thurm house site is outside the Spicewood Springs Road project area, staff noted that there are other archeologically significant sites along Spicewood Springs Road that could fall under the oversight of the Texas Historical Commission (THC). City staff contacted the THC's Archaeology Division and received a response on February 27, 2018 recommending that the City hire an archeological firm to document historical resources and provide recommendations since some historical resources in the project area have not been formally mapped or recorded.

A consultant conducted a **historic resources survey** for Spicewood Springs Road in order to determine if resources exist which may be eligible for inclusion on the National Register of Historic Places (NRHP). The investigation area included 150 feet beyond the edge of existing right-of-way as well as the Thurm house site.

Field investigation of the ground surface yielded evidence of a former residence in the Lower Bull Creek Greenbelt that may have been the Thurm house. Evidence includes the remnant of a former driveway and rock lined flower beds. Although these surface resources lack historical context and integrity, the area was recommended NRHP eligible due to the potential for subsurface artifacts. The area for potential subsurface artifacts is defined as parcel No. 141853, which is outside the Spicewood Springs Road right-of-way, as shown in Figure 4-6.

The cultural resource survey also identified a house and stone wall at 4615 Spicewood Springs Road that could be NRHP eligible. The house is representative of a 1930s residence and is associated with descendants of one of the area's early settlers. The house is outside the existing right-of-way and therefore, was not surveyed, but appears to be situated very close to the right-of-way line. The stone wall lies approximately 20 feet inside the existing right-of-way. Proposed construction on Spicewood Springs Road should take into consideration the presence of this wall and provide adequate protection or mitigation. City staff should coordinate with the property owner early in design phase.

Figure 4-6 Location of Thurm house site provided by City staff

5.0 TRAFFIC ANALYSIS

The City contracted with a consultant to perform a traffic study for Spicewood Springs Road from Loop 360 to Mesa Drive. The **traffic analysis report** and a subsequent **technical memo** evaluate impacts to vehicular safety, delay time at intersections or driveways and roadway travel speed for existing conditions and proposed alternatives. Analysis includes existing conditions, the design alternatives described in Section 2.1 of this report, planned improvements at the Loop 360 intersection, 2017 traffic flow rates and predicted 2027 rates. Preliminary engineering phase technical notes are included in ***Appendix F***. Readers interested in the traffic report are directed to Table 1-1 in ***Appendix F*** for a summary of how traffic study modeling scenarios relate to roadway design alternatives.

5.1 Future Characteristics

Existing traffic count data was collected in May 2017 and projected to 2027 based on a growth rate calculated specifically for Spicewood Springs Road. The traffic consultant anticipates that a 3.20% growth rate will account for future development in the project area, including the Austin Oaks Planned Unit Development (PUD) at Spicewood Springs Road and Mopac/Loop1 and the Junior League of Austin Community Impact Center at Loop 360 and Bluffstone Drive. The present and future Annual Average Daily Traffic (AADT) volumes for Spicewood Springs Road are shown in Table 5-1. The growth rate determination process is discussed in the traffic report and detailed in a memo in ***Appendix E.***

Table 5-1 Traffic volumes along Spicewood Springs Road

Average AADT	
Year	AADT
2017	16,435
2027	22,520

Growth Rate = 3.20%

5.2 Crash Analysis

The traffic analysis included review of crash data for Spicewood Springs Road and an analysis of potential conflict points for the existing and proposed roadway. The conflict point analysis provides the basis for determining which design alternatives improve safety.

City of Austin crash data for the project area was analyzed for 2012 through 2017. A map of crash locations is shown in Figure 5-1. The severity of collisions and collision types are summarized in Tables 5-2 and 5-3 below. Collisions with injury comprised 47% of the total crashes between 2012 and 2017. As noted in the traffic study, crashes involving vehicles traveling in opposite directions could be caused by unsafe left turns. Opposite direction crashes were 24% of the total for 2012 through 2017.

Figure 5-1 Crash locations 2012-2017

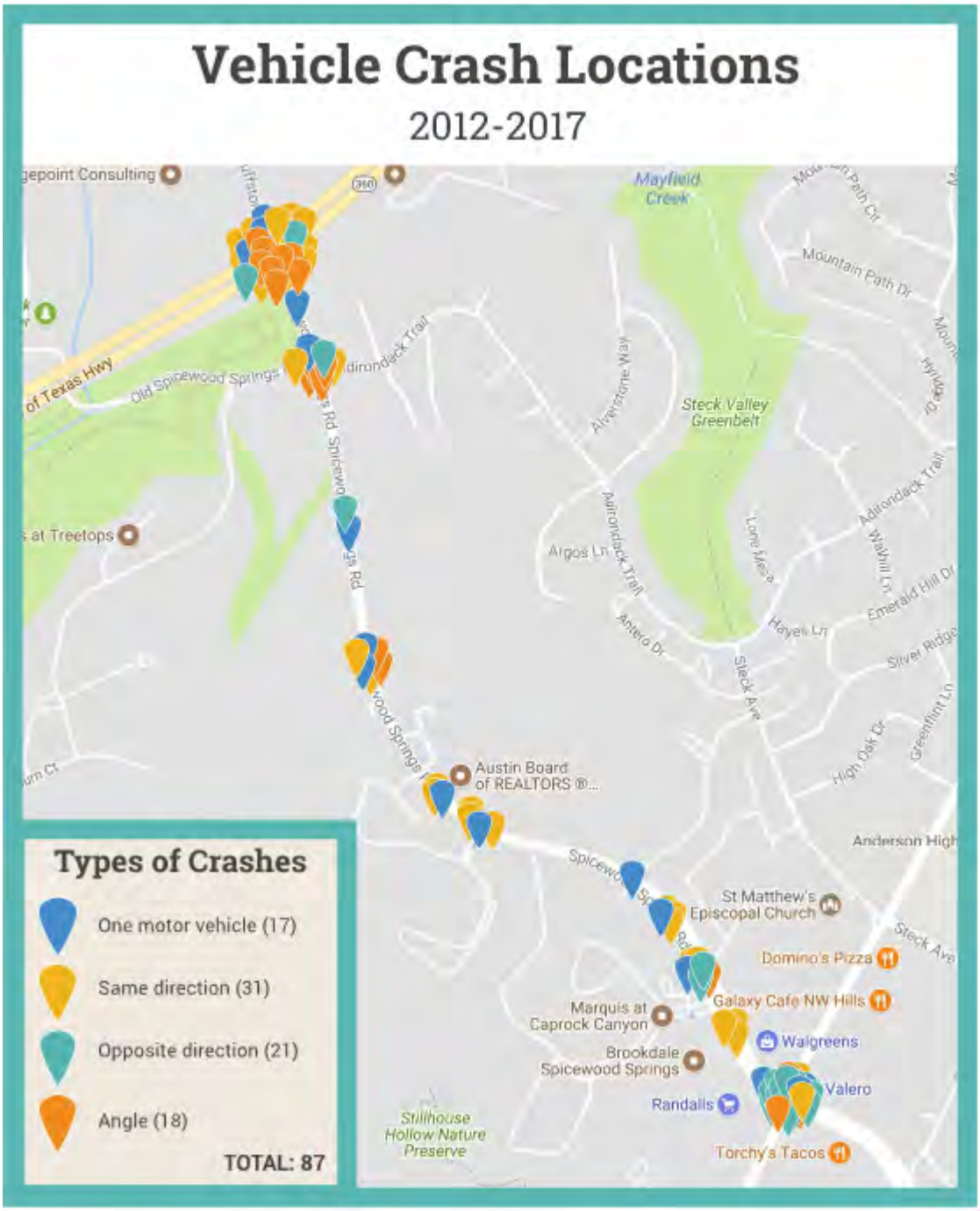


Table 5-2 Collision Severity Summary

Collision Severity		
Severity Category	**2012 - 2017 No. of Collisions**	**Percent**
Fatal	0	0%
Incapacitating	5	6%
Non-capacitating	13	15%
Possible injury	23	26%
Not injured	43	49%
Unknown	3	4%
Total Collisions	**87**	**100%**
Total Collisions with Injury	**41**	**47%**

Note: Percentages vary slightly from the traffic study due to inclusion of 2017 collision data.

Table 5-3 Collision Type Summary

Collision Type		
Type	**2012 - 2017 No. of Collisions**	**Percent**
One Motor Vehicle	17	20%
Angle	18	21%
Same Direction	31	35%
Opposite Direction	21	24%
Total Collisions	**87**	**100%**

Note: Percentages vary slightly from the traffic study to include collisions in 2017.

The analysis considered the potential conflict points along Spicewood Springs Road for the existing roadway and the three design options. Conflict points occur where vehicle travel paths intersect, such as when a left turn crosses a lane for through traffic. The presence of a raised center median reduces the number of conflict points by eliminating some turning options. The reduction in conflict points between existing and proposed conditions is a quantifiable metric that measures the improved safety benefits of proposed roadway design alternatives. A schematic diagram of the conflict points (diverging, merging or crossing) is included in Appendix I of the traffic study and a plan view of proposed median cut locations is included in ***Appendix A*** of this report.

Alternatives A and C both provide a 45% reduction in conflict points as compared to the existing roadway. The conflict point analysis is summarized in Table 5-4.

Table 5-4 Conflict Point Analysis Summary

Design Alternative	Includes median?	Total Number of Conflict Points	Percent Reduction in Conflict Points from Existing Conditions
Existing Roadway	No	323	N/A
Alternative A	Yes	178	45%
Alternative B	No	323	0%
Alternative C	Yes	178	45%

According to studies compiled by the Federal Highway Administration, adding a raised median can reduce head-on crashes by 70% and reduce all crash types by 40%. Additionally, off-street bicycle and pedestrian paths are expected to reduce the bicycle and pedestrian related crash rate by up to 25%.

One of the most effective traffic management technics is the installation of raised medians. Raised medians significantly reduce the number of conflict points and increase the through-put of the roadway. A raised median significantly reduces the crash potential on a roadway. Conflict points exist where any two vehicle paths intersect, merge, or diverge. When the number of conflict points on a roadway are reduced, the safety potential of that roadway increases. The most severe crashes occur at intersect conflict points. These are related to turning movements, specifically left-turn movements. The presence of a non-traversable median eliminates left turn movements, thereby significantly reducing the number of conflict points. These are the more severe types of potential crash, and thus the safety of the roadway is greatly improved.

5.3 Traffic Modeling Analysis

Traffic modeling results are the evaluation basis for determining which design alternatives reduce congestion and improve mobility. Computer programs were used to model traffic patterns and perform a Level of Service (LOS) analysis for Spicewood Springs Road. LOS is a quantifiable and nationally accepted metric that measures how well a given roadway configuration functions in terms of congestion and mobility. The computer programs calculated average travel speeds along Spicewood Springs Road as well as average delay for signalized intersections and driveways. LOS categories are assigned to the different design alternatives based on criteria in the 2010 *Highway Capacity Manual* (HCM). LOS categories range from A to F and are described in Table 5-5. The Arterial LOS tables from HCM 2010 is included as Tables 5-6.

Table 5-5 LOS General Description

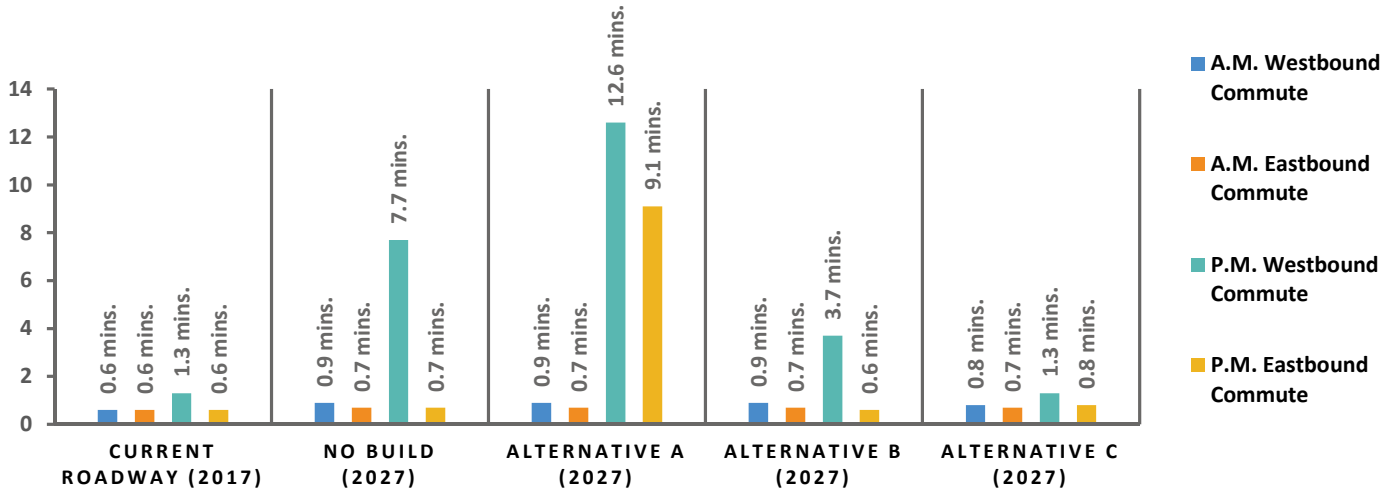
LOS	General Description
A	Free Flow
B	Reasonable Unimpeded (some delays)
C	Stable Operation (acceptable delays)
D	Approaching Unstable Operation
E	Unstable Flow (severe delays)
F	Extremely Low Speed Flow (gridlock)

Table 5-6 LOS for Arterial Segments
(HCM 2010, Exhibit 17-2)

LOS	Travel Speed as a Percentage of Base Free-Flow Speed (%)
A	> 85
B	> 67 and ≤ 85
C	> 50 and ≤ 67
D	> 40 and ≤ 50
E	> 30 and ≤ 40
F	≤ 30

Tables 5-7 and 5-8 summarize the arterial peak hour delay and level of service traffic modeling results for Spicewood Springs Road. Alternative C provides the least delay and as a result, the highest level of service. All driveways in Alternative C are rated with an "A" level of service based on intersection delay modeling results. The Old Spicewood Springs Road / Adirondack Trail intersection is rated "E" or "F" for all scenarios modeled, including existing conditions. A summary of intersection and driveway level of service is provided in ***Appendix F.***

Table 5-7 Arterial Peak Hour Delay



Note: No Build, Alternative A and Alternative C include intersection improvements at Spicewood Springs Road and Loop 360. Data is from the Traffic Study Appendix K (p. 416) and Alternative 8 Technical Memo (Table 1).

Table 5-8 Arterial Peak Hour Level of Service

Alternative	AM Westbound Commute	AM Eastbound Commute	PM Westbound Commute	PM Eastbound Commute
Current Roadway (2017)	C	C	D	C
No Build (2027)	F	C	F	C
Alternative A (2027)	C	C	F	F
Alternative B (2027)	C	C	F	C
Alternative C (2027)	C	C	D	C

Note: No Build, Alternative A and Alternative C include intersection improvements at Spicewood Springs Road and Loop 360.
Data is from the Traffic Study Appendix K (p. 416) and Alternative 8 Technical Memo (Table 1).

The method of managing traffic flow and turn patterns on a roadway is a main component of the roadway's ability (or inability) to move traffic efficiently. In addition to safety benefits, raised medians provide operational benefits and efficiencies. Raised medians prohibit left turns long most of the corridor, concentrating them as direct left-turns and U-turns at specific locations with deceleration and storage space. This results in the slower turning vehicle being moved out of the flow of thru-traffic while awaiting a turn opportunity. With

the slower vehicles removed and stored at concentrated turn locations, the thru-put capacity increases. The traffic flow benefit of medians on Spicewood Springs Road is demonstrated by the higher evening LOS for Alternative C as compared to Alternative B. Alternative A lacks the overall lane capacity to realized flow efficiency benefits from medians, as demonstrated by the low evening LOS ratings.

5.4 Traffic Study Recommendation

The traffic study recommends Alternative C based on the traffic safety and congestion analysis results. Alternatives A and C are the design options that include raised medians and meet the project goal of improving safety. Of these two, Alternative C provides a higher level of service in terms of traffic flow and intersection delay. ***Appendix F*** includes technical notes from preliminary engineering phase.

Information gathered during preliminary engineering phase will be used during design to refine proposed median and U-turn geometry and locations.

6.0 ENVIRONMENTAL CONSIDERATIONS

6.1 Environmental Concerns

The City of Austin contracted with an environmental consultant to provide a **Phase 1 Environmental Site Assessment** (ESA) and **Environmental Resource Inventory** (ERI) of Spicewood Springs road and right-of-way from Loop 360 to Mesa Drive. Both documents are in the draft stage pending further field investigation during design phase.

The ESA follows guidelines accepted by the Environmental Protection Agency for identifying conditions that could pose a threat to human health or the environment. The report found no evidence of recognized environmental conditions (RECs), controlled recognized environmental conditions, historical recognized environmental conditions or vapor encroachment conditions within the Spicewood Springs Road right-of-way.

There are two *de minimis* conditions noted for the project area. *De minimis* conditions generally are not a threat to human health or the environment and generally would not be subject to enforcement action if brought to the attention of governmental agencies. A suspected underground storage tank was identified at 4615 Spicewood Springs Road and miscellaneous solid waste or trash was observed in the right-of-way during site reconnaissance. The underground tank location should be confirmed prior to construction.

The ERI is a City of Austin assessment process that identifies environmentally significant aspects of a proposed project such as watershed, proposed floodplain modifications, Critical Environmental Features (CEFs), geology and vegetation. The environmental study included

field investigation of the Spicewood Springs Road right-of-way and a 170-foot buffer surrounding the right-of-way.

The ERI identifies six potential CEFs within the buffer area – four rim rock features and two seeps. The standard 150-foot CEF buffer extends into the right-of-way for three rim rock features and one seep. Maps of potential CEFs and water quality zones are included with the ERI. Potential CEF locations are reviewed by City staff as part of the permitting process. Final determination of CEFs in the project area will be made after a design phase field investigation by a City geologist and coordination with the environmental consultant.

City staff met regarding the Critical Environmental Features (CEFs) shown in the Environmental Resource Inventory and recommend further field investigation. The springs identified in the environmental study are not in the City of Austin CEF database and one of the rim rocks (RR-1) was previously evaluated by City of Austin staff and determined to not meet the qualifications for rim rock classification. An administrative variance from the standard 150-foot CEF buffer could be granted depending on results of field investigation. As part of a possible administrative variance approval, proposed improvements would need to route storm water runoff away from rim rock and mitigate for any loss of flow to springs or seeps. A Land Use Commission review and variance approval would be necessary if an administrative variance is not granted.

Critical water quality zones for major waterways may be crossed by an arterial street identified in the Transportation Plan (LDC 25-8-262). Furtato Creek at Spicewood Springs Road is a Bull Creek tributary and classified as a major waterway since the drainage area exceeds 640 acres. Spicewood Springs Road is included in the 2025 Austin Metropolitan Area Transportation Plan as shown in a map in ***Appendix E***. The Furtato Creek Critical and Transitional Water Quality Zones cross Spicewood Springs Road between Loop 360 and Old Spicewood Springs Road. The Transitional Water Quality Zone for a tributary to Furtato Creek extends across Spicewood Springs east of Old Spicewood Springs Road.

Staff also reviewed impervious cover limits in the critical and transitional water quality zones. Variances from the following Land Development Code sections will be needed:

- 25-8-422 - (B): Limits impervious cover in areas adjacent to a creek, referred to as the water quality transition zone.
- 25-8-423 (C): Limits the percent of impervious cover allowed for projects in Austin.

A variance from the following Land Development Code section may be needed:

- 25-8-422(C): Restrictions on placing water quality features near creeks.

As described in the ERI, project area geology is characterized by steeply rolling topography with soil and bedrock dissected by erosion and solution creating springs and creeks. Edwards Limestone is present at higher elevations along Spicewood Springs Road, which

corresponds to the area designated by the City of Austin as Edwards Aquifer Recharge Zone. The City of Austin Edwards Aquifer Verification Zone extends from the recharge zone to Loop 360 as shown in a map in ***Appendix E***. The project area is outside the Edwards Aquifer Recharge or Transition Zones as defined by TCEQ. Therefore, additional water pollution abatement plan (WPAP) or sewage collection system (SCS) applications and/or permits are not required by TCEQ.

The entire project area is within the Balcones Canyon Preserve (BCP) permit area. Compliance with the Endangered Species Act (ESA) can be achieved through a Balcones Canyon Conservation Plan (BCCP) permit for the birds and cave dwelling species covered in the BCCP. Most of Spicewood Springs Road within the project are is located in Golden-cheeked Warbler – Zone 1. The BCP defines Zone 1 as confirmed songbird habitat. Removal of trees and vegetation is not allowed within the permit area between March 1 and September 1 due to bird nesting season. Removal of vegetation can continue after March 1 only if a bird survey is conducted and does not find any birds within a 300 foot buffer of the project area. Additional mitigation measures could be required for any vegetation removed as part of roadway widening. A map of the BCP permit area and zones is included in ***Appendix E***.

The City of Austin recharge zone area is classified by the USFW as Karst Zone 1, which is defined as an area known to contain endangered cave fauna. The remaining project area either does not or probably does not contain endangered cave fauna (Karst Zone 3 or 4).

The USFW online GIS map viewer delineates area on the south side of Spicewood Springs Road, approximately half way between Loop 360 and Mesa Drive, as critical surface and subsurface habitat for the Jollyville Plateau salamander. A map is included with the draft ERI. The salamander was listed as a threatened species after the BCCP was approved by USFWS. As a result, compliance with the ESA for the Jollyville Plateau salamander is not achieved through the BCCP permit. A ground survey was performed to investigate the Spicewood Springs right-of-way and 170-foot buffer for the presence of features suitable as habitat for cave fauna. The environmental study evaluated any outcropping limestone, surface depressions, or other factors that could indicate subsurface karst development. The study found no potential karst features suitable for endangered cave fauna within the project area based on a surface inspection.

There is potential to encounter subsurface voids and/or caves within the salamander critical subsurface habitat area during construction since new waterlines are proposed that could require trenching up to 12 feet deep. Jollyville Plateau salamanders are fully aquatic and could potentially live in water filled subsurface voids. However, Spicewood Springs Road is on a canyon ridge and the likelihood for encountering groundwater within expected excavation depths is low. City staff recommends hiring an environmental consultant to

conduct a Biological Assessment to document the potential for disturbing the salamander during construction. The Biological Assessment should be conducted for the potential impacts of the recommended design alternative. The assessment should be completed before coordinating with USFWS regarding the need for an ESA 10A permit. The environmental consultant should also provide design guidance and construction specifications for habitat mitigation measures.

Many of the oak trees in the project area could be susceptible to oak wilt. Certain prevention measures and restrictions on trimming apply from February 1 to June 30. The City of Austin's Oak Wilt Prevention Policy should be included in the construction contract.

Protected riparian areas are defined by the City of Austin (ECM Section 1.3.0) as areas greater than 0.5 acres with larger riparian trees and dense tree canopy. The environmental study found no protected riparian areas within the field investigation area.

6.2 Environmental Findings and Recommendations

The following list summarizes the environmental study findings:

- No evidence of recognized environmental conditions
- No evidence of controlled recognized environmental conditions
- Evidence of two historical recognized conditions at the intersection of Mesa Drive and Spicewood Springs Road. These locations are outside the limits of proposed roadway reconstruction.
- No evidence of vapor encroachment conditions
- One *de minimis* condition in an easement at 4615 Spicewood Springs Road consisting of piping and fittings that indicate an underground storage tank for propane. The tank location should be confirmed prior to construction.
- One *de minimis* condition is the presence of solid waste/trash throughout the right-of-way. Materials include empty metal containers, concrete debris, scrap tires and an abandoned vehicle.

The following list summarizes environmental recommendations:

- Coordinate with City staff and the environmental consultant to finalize CEFs and boundaries. Administrative and/or Land Use Commission variances from standard buffer distances could be necessary.
- Request variances from the impervious cover limits in the transitional and critical water quality zones.
- Include a special provision in the construction contract that stipulates tree clearing activities must begin before March 1st and proceed continuously until completed. This complies with BCCP bird nesting season restrictions. Construction can only

being between March 1st and September 1st if a bird survey is conducted and concludes that there are no nesting birds within 300 feet of the project bounds.

- Include a special provision in the construction contract that stipulates trimming or pruning of Live Oaks and Red Oaks should not occur between February 1st and June 30th, in compliance with the Oak Wilt Prevention Policy.
- Meet with the BCCP Infrastructure Coordinator early in design phase to determine mitigation measures that may be required.
- Hire an environmental consultant to conduct a Biological Assessment and coordinate with USFWS regarding the Jollyville Plateau salamander critical subsurface habitat and any necessary mitigation measures to include in construction documents.
- Route the Shared Use Path around existing trees to the greatest extent possible.
- Specify deer resistant plantings in the landscape plan.

7.0 SITE UTILITIES

7.1 Existing Utilities

City staff researched existing utilities in the project area and added utility lines to the basemap in order to supplement ground survey information. Utility companies were contacted through the Austin Utility Location Coordination Committee (AULCC) process. Public utilities within the project area include waterlines, wastewater lines and aerial electric lines. Private utilities include natural gas and overhead and underground telecommunication lines. Existing utilities are shown in the plan sheets in ***Appendix A.***

A 66" concrete steel cylinder waterline installed in 1986 runs the length of the project and is at least 80 feet deep under the existing roadway. An older 8" cast iron waterline also runs the length of the project, but record drawings are not available. A 24" ductile iron waterline installed in 1987 extends from Old Spicewood Springs Road to approximately half the proposed road distance at which point it connects to a 48" ductile iron waterline that was installed in 1988. The 48" waterline extends to the intersection with Mesa Drive. An 8" PVC waste waterline installed in 2004 extends from Mesa Drive to the approximate half-way point of proposed improvements.

Austin Energy power lines are located along the south side of Spicewood Springs Road from the top of the steep grade past the eastern project limits. Electric lines run along the north side of the road in front of several lots at the east end of the project. Electric lines also cross the road at numerous locations.

A 6-inch Texas Gas natural gas line runs along Spicewood Springs Road from Mesa Drive to the property line between 4501 and 4504 Spicewood Springs Road. Preliminary plans do

not include reconstructing this segment of Spicewood Springs Road. There is no natural gas line along the remaining length of Spicewood Springs Road in the project area.

7.2 Potential Utility Relocations and Improvements

Austin Water has requested to upgrade their system as part of Spicewood Springs Road construction. They plan to replace the existing 8" cast iron line with 12" and 16" ductile iron lines and add 48" a waterline segment to close a gap in the 48" water service. A 6" pressure reducing valve (PRV) station on the existing 8" cast iron waterline also needs to be replaced with a 12" PRV station. Preliminary plans in ***Appendix A*** include a proposed waterline exhibit. It is anticipated that Austin Water will fund water system upgrades. The cost estimate for water system upgrades is included in ***Appendix B.***

City staff considered including reclaimed waterlines on Spicewood Springs Road with the Mobility Bond improvements. The Reclaimed Water long range plan includes a line on Spicewood Springs Road, however, existing reclaimed mains are located far from the project area and a reclaimed line on Spicewood Springs Road would be one of the last reclaimed water projects constructed in the long-range plan. City staff determined that a reclaimed waterline on Spicewood Springs Road is too far into the future and it should not be included with the Mobility Bond project.

Austin Energy currently has no plans to upgrade facilities along Spicewood Springs Road. Approximately 30 existing power poles are located in the proposed roadway corridor and need to be relocated. Additional right-of-way for the relocated poles is not anticipated. The shared use path could potentially be routed around some power poles that are located within the corridor but outside the vehicle lanes. Austin Energy could choose to consolidate power poles and and/or upgrade facilities as part of relocation. Staff recommends requesting a light study from Austin Energy and installing any necessary lighting with the relocation.

AT&T was contacted regarding any plans for major infrastructure upgrades. They currently have no plans to upgrade facilities along Spicewood Springs Road.

8.0 PROPOSED IMPROVEMENTS

8.1 Methodology

City staff evaluated the four roadway alternatives for Spicewood Springs Road in terms of safety, mobility, compliance with City policies, public preference, cost and schedule. A decision matrix was developed in order to compare the four alternatives and determine the best option. The decision matrix categories are:

- Public feedback
- Bicycle and pedestrian safety

- Vehicle safety
- Driveway access
- Regional mobility
- Compliance with City policies

The highest ranked alternative from the decision matrix was subsequently evaluated in terms of cost and schedule. The final recommendation includes design components that allow improvements to fit within the available project budget and schedule, based on preliminary engineering evaluation.

Analysis of comments received during the second public comment period is the evaluation basis for the public feedback category. Design alternatives that received greater support from the community are ranked higher.

The traffic study is the evaluation basis for the safety, access and mobility categories. Raised medians are the main traffic management technique evaluated in the study. Raised medians provide both safety and mobility benefits, as discussed in Section 5.0. As a result, design alternatives that provide sufficient lane capacity and include raised medians rank higher than other alternatives. Raised and/or protected shared use path provides a safer route for bicyclists and pedestrians. Shared use path or sidewalk and raised bicycle path are included in all design alternatives.

City policies, plans and design guides are used to evaluate cross sections and determine the degree of compliance for the City policies category. Two City documents most directly apply to the Spicewood Springs Road project. First, the City's current transportation plan recommends upgrading Spicewood Springs Road from Mesa Drive to Loop 360 to include two vehicular lanes in each direction with a center turn lane or raised median. The AMATP map is included in ***Appendix E***. Second, the Austin Street Design Guide specifies elements that roadway designs should include based on roadway classification and daily traffic volumes. Alternatives that follow design guide recommendations rank higher than other alternatives. Review of City plans and policies also identified the need for infill sidewalk outside the project area. Guiding plans and policies are discussed in depth in Section 8.2.

8.2 Guiding Plans and Policies

Design alternatives and recommendations were developed and analyzed based on visions and goals presented in the following plans and design guidelines. The guiding plans and policies are summarized below along with a discussion of how specific aspects of the design alternatives support those visions and goals.

2025 Austin Metropolitan Area Transportation Plan (AMATA)

City Council adopted a regional transportation plan, titled 2025 AMATP, in 1995. The plan prioritizes objectives and proposed improvements for roads in central Texas with a primary goal of providing for the "maximum mobility for the people of the Greater Austin Metropolitan Area with the least detrimental effects." The AMATA map highlights roads that are prioritized for improvement and designates the preferred typical sections. Spicewood Springs Road within the project area is shown as a major divided arterial road with four lanes. AMATA nomenclature for this typical section is "MAD-4". Alternatives B and C meet the AMATA goal by recommending two lanes in each direction with a raised median or center turn lane, which is the MAD-4 typical section. The AMATP map is included in ***Appendix E.***

Imagine Austin Comprehensive Plan

Imagine Austin is the 30-year comprehensive vision for Austin's future that was adopted by city council in 2012 and updated in subsequent years (Ordinance No. 20120614-058). The primary vision expressed by Imagine Austin is for Austin to "become a city of complete communities" that is mobile and interconnected with respect to transportation.

The Spicewood Springs Road Mobility Bond project addresses several specific Imagine Austin Land Use and Transportation Policy (LUT P) recommendations:

- "Incorporate provisions for bicycles and pedestrians into all roads" (LUT P15). All proposed alternatives include either a raised bicycle lane or a shared use path along both sides of Spicewood Springs Road providing connectivity between commercial areas, residential areas and parkland.
- "Reduce traffic congestion, increase transit use, and encourage alternative transportation modes…" (LUT P19). Design alternatives were evaluated in terms of their ability to reduce congestion on Spicewood Springs Road during peak travel times.
- Integrate green streets "into the urban environment and the transportation network" (LUT P23). All design alternatives include rain gardens in order to improve the water quality of roadway runoff.

City of Austin Complete Streets Policy, Street Design Guide, and Transportation Criteria Manual

The City's Complete Streets Policy implements Imagine Austin's visions within the public right-of-way. The City of Austin's Street Design Guide (June 2017 Draft) serves as specific design criteria for implementing the Complete Streets Policy, which was adopted by Austin City Council in June 2014 (Ordinance No. 20140612-119). The Complete Streets concept views city streets primarily as public spaces and places priority on including streetscape features that make streets safe, comfortable and useable.

The Austin Street Design Guide (June 2017 draft) was used to develop specific cross sections for each alternative, as shown in Figures 2-1, 2-2 and 2-4. Spicewood Springs Road should follow the design guide's Urban Level 3 design criteria based on roadway classification, traffic volume and right-of-way width. The design guide recommends a raised median, raised bike lane and sidewalk for Urban Level 3 roads with 116-foot wide right-of-way. Sidewalk and bicycle facilities are combined into one shared use path for Alternatives B and C so that improvements fit within existing right-of-way. The Alternative C design for Spicewood Springs Road most closely follows the Street Design Guide. Alternatives A and B are both missing significant components of the design guide cross section: four total lanes or raised medians. The Street Design Guide is included in ***Appendix E.***

Proposed improvements must also comply with the City of Austin Transportation Criteria Manual (TCM). The TCM includes cross section, profile, speed limit and minimum sight distance and curve requirements. Proposed improvements in Alternative C comply with TCM cross section standards. Other requirements will be addressed during design phase.

Vision Zero

Vision Zero is a traffic safety initiative included in Imagine Austin that aims to eliminate death and serious injury on roadways. Austin City Council adopted the Vision Zero Action Plan in May 2016 (Resolution No. 20160519-049). The plan is a holistic effort to improve traffic safety through education, culture change, enforcement, land use planning and transportation engineering. Three key principles of the plan are: traffic deaths are preventable, transportation systems should be designed so that human errors are not fatal and, safety is the primary consideration in transportation decisions. All design alternatives include a raised shared use path or raised bicycle path and sidewalk, which are a safer scenarios for bicyclists and pedestrians. Alternatives A and C include raised medians, which improve safety by reducing the number of potential vehicle conflict points. Alternative B improve vehicular safety the least.

City of Austin Transit Priority Policy and Strategic Mobility Plan

City Council passed a resolution in April 2016 (No. 20160414-007) directing the City Manager to develop a Transit Priority Policy that improves safety as well as increasing capacity, efficiency and reliability of existing roads. City staff are currently updating the Strategic Mobility Plan to incorporate a formal transit priority policy. The Spicewood Springs Road project aligns with the council resolution since the main criteria for evaluating design alternatives is ability to address congestion and enhance safety on an existing roadway.

City of Austin Land Development Code

Requirements for streets, site drainage, utilities and water quality are outlined in the Land Development Code (LDC) Title 25 and detailed in the City of Austin design criteria manuals.

Proposed improvements comply with applicable design criteria manuals or are likely to be granted variances, based on staff assessment of the project parameters.

City of Austin Sidewalk, Bicycle, Urban Trails Plans

Alternatives A, B and C meet goals of the City of Austin bicycle, sidewalk and urban trails plans by the inclusion of pedestrian and bicycle paths along both sides of Spicewood Springs Road. Alternatives A and C have shared use path for use by pedestrians and bicyclists. Alternative B includes sidewalk and raised bicycle path.

The current City of Austin bicycle plan, adopted on November 6, 2014, follows guidance provided by the National Association of City Transportation Officials (NACTO) in the 2011 Urban Bikeway Design Guide. The bicycle plan recommends a protected bicycle lane on Spicewood Springs Road from Mopac/Loop 1 to Loop 360.

The current City of Austin sidewalk plan, adopted on June 16, 2016, prioritizes locations without sidewalk based on proximity to pedestrian attractors such as schools, transit stops or stores and based on safety considerations such as street classification and the number of reported incidents involving pedestrians and motorized vehicles. The sidewalk plan scores sidewalk throughout the project area as medium priority. However, the plan is clear that "prioritization rankings are intended as a tool to allocate limited City of Austin sidewalk resources" and that all public and private development should include Americans with Disabilities Act (ADA) compliant sidewalks. Alternative C includes shared use path along both sides of Spicewood Springs Road.

Urban trails are similar to sidewalk but place an emphasis on providing different paths for pedestrians and bicyclists and providing recreation friendly amenities such as shade and seating. The current City of Austin urban trails plan, adopted on September 25, 2014, does not recommend an urban trail along Spicewood Springs Road between Mopac/Loop 1 and Loop 360.

Infill sidewalk and bicycle facilities along Spicewood Springs Road between Mesa drive and Mopac/Loop 1 would provide connectivity for bicyclists and pedestrians. Infill sidewalk is needed along the south side of Spicewood Springs Road between Greenslope Drive and Hart Lane. Conversion of sidewalk to shared use path is needed along both sides of Spicewood Springs Road from 0.2 miles west of Mesa Drive to Spicewood Lane. See Figures 8-5 and 8-6. The sidewalk and shared use path conversion are outside the bond project scope and would need to be funded by a different source. There are a number of construction challenges that could raise the cost. Existing sidewalk along the north side of Spicewood Springs Road and east of Mesa Drive includes retaining walls. Sidewalk along the south side of Spicewood Springs Road near Greenslope Drive would need retaining wall since the existing ground slopes down behind the curb. There are also a number of existing power poles and other utility appurtenances in both locations.

Parks and Recreation Department Long Range Plan

Parks and Recreation Department's 2011-2016 Long Range Plan includes a goal of providing "safe and accessible parks and facilities to all citizens" with a specific objective of promoting "connectivity of parks and trails from existing neighborhoods". All design alternatives meet this goal by recommending shared use path along Spicewood Springs Road. Infill sidewalk along Old Spicewood Springs Road would connect residences on Spicewood Springs Road to the Lower Bull Creek Greenbelt Trail. The sidewalk is outside the bond project scope and would need to be funded by a different source. See Figure 8-7.

Watershed Protection Strategic Plan

The Watershed Protection Department's current strategic plan, dated FY 2015-2016, identifies three low water crossings at Old Spicewood Springs Road and Loop 360 as the number one priority problem area. Although this specific area is outside the scope of the Spicewood Springs Road project limits, staff included a scenario in the traffic analysis where Old Spicewood Springs Road is closed to traffic. The results of the traffic study are intended to help evaluate options for the low water crossings. From a traffic flow perspective, closing Old Spicewood Springs Road to vehicular traffic is best considered and coordinated with TxDOT's grade separation project at Loop 360 and Spicewood Springs Road. TxDOT's improvements are expected to reduce vehicular traffic on Old Spicewood Road, which is currently used as a cut-through to bypass the Loop 360 and Spicewood Springs Road signal.

In September 2018, City staff completed a feasibility evaluation for the low water crossings on Old Spicewood Springs Road. The study evaluated several options including closing Old Spicewood Springs Road to through traffic. Vehicular access to the Marquis at Treetops apartment complex would remain open as part of the road closure option. A second option is to install video monitoring cameras to assist City staff with road condition monitoring and provide the public with close-to-real time information about water levels at each crossing.

Capital Metro Connections 2025

Capital Metro proposes eliminating the existing bus stop at Mesa Drive and Spicewood Springs Road due to low ridership in their Connections 2025 long-rang plan. The area surrounding the bus stop, including part of the Spicewood Springs Road Mobility Bond project, is marked as a "mobility innovation zone". Capital Metro intends to research mobility innovation zones and develop alternative service pilot projects to meet community needs. Capital Metro's plans are not expected to impact the Spicewood Springs Road project.

8.3 Recommendations

Alternative C is recommended for the 2016 Mobility bond project at Spicewood Springs Road. Alternative C meets the goals of addressing congestion, enhancing safety and following City policies and received the most support from the community. Alternatives A

and B either do not meet the goals or only partially address the goals. Alternatives A and B received less support from the community. Preliminary cost and schedule estimates indicate that Alternative C can be constructed within the available project budget and schedule.

Alternative C includes two vehicle lanes in each direction, raised median with left turn bays at limited locations and shared use path on both sides. Staff recommends that the posted speed limit remain 30 mph. Alternative C typical roadway section is shown in Figure 2-4 and the decision matrix is summarized in Table 8-1. Figures 8-1, 8-2 and 8-3 show artist renderings of Alternative C aerial views. ***Appendix A*** includes preliminary plan sheets for the Alternative C roadway.

Table 8-1 Evaluation Summary

Evaluation Criteria	Basis of Evaluation	No Build	Alt A	Alt B	Alt C
Ped/Bike Safety	Includes buffer zone or raised path				
Vehicle Safety	Reduces vehicle conflict points				
Driveway Access	Acceptable driveway Level of Service				
Regional Mobility	Acceptable arterial Level of Service				
City Policies	Follows City policies, plans and design guides				
Public Feedback	Preference from 2nd public comment period				
	Evaluation Results				★

Legend

Meets criteria the most

Mostly meets criteria

Somewhat meets criteria

Does not meet criteria

Recommendation ★

Figure 8-1 Artist rendering of Spicewood Springs Road
Looking east near Neely's Canyon Drive

Figure 8-2 Artist rendering of Spicewood Springs Road
Looking west near Austin Board of Realtors' Building

Figure 8-3 Artist Rendering of Spicewood Springs Road
Looking west toward Loop 360

Alternative C includes specific roadway features that enhance safety. Proposed improvements can be expected to reduce vehicle crash rates by up to 40% and pedestrian/bicyclist crash rates by up to 25%. The following aspects of Alternative C enhances safety for all road users:

- The raised median has left turn bays and u-turns at limited locations. This improves safety by decreasing the potential number of conflict points between vehicles.
- The shared use path provides a safer scenario for bicyclists and pedestrians. The curb and buffer zone are safety features for pedestrians and bicyclists that are absent from the existing roadway.

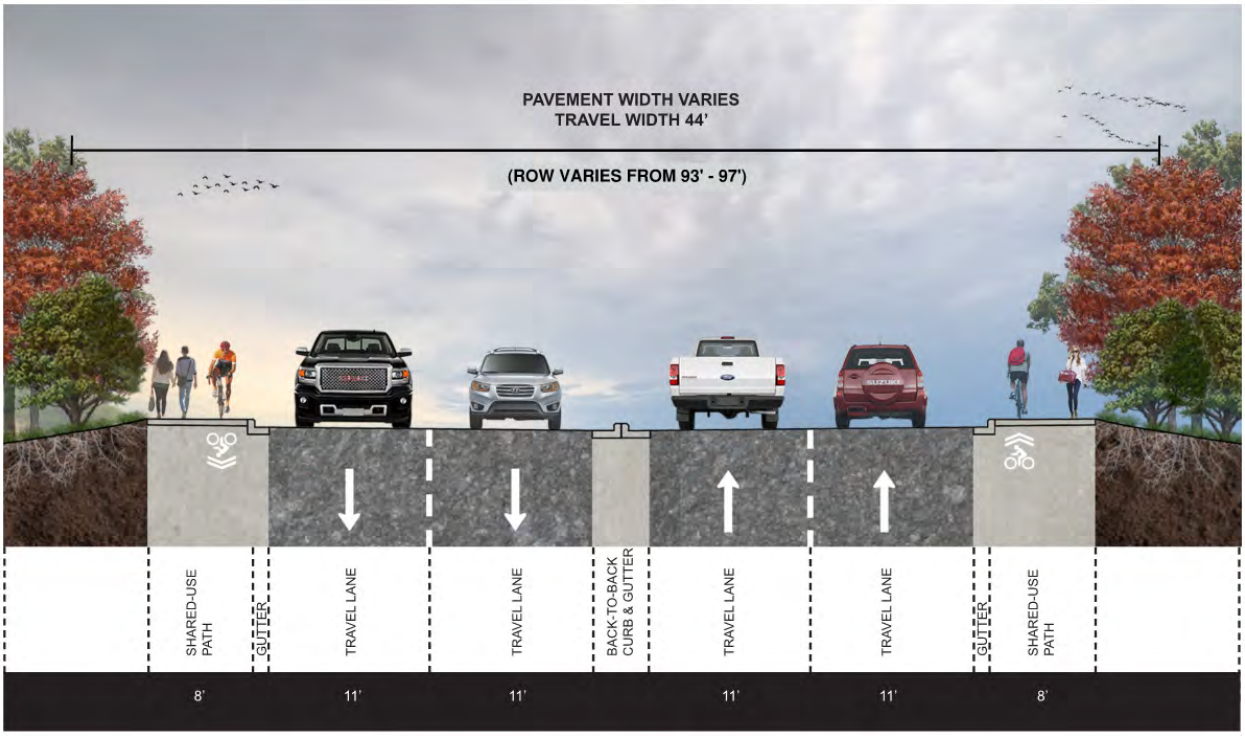
Alternative C provides the highest vehicular traffic level of service as compared to the other design alternatives and the existing roadway configuration. Alternative C is the only option that provides acceptable level of service for east and westbound evening commuters and 2027 projected traffic volumes. Tables 5-7 and 5-8 summarize level of service results from the traffic study.

City staff recommends three design standard modifications that allow proposed improvements to fit within existing right-of-way. Design standards are found in the Austin Street Design Guide in ***Appendix E.***

- Recommend a shared use path that can accommodate bicyclists and pedestrians as opposed to a raised bicycle path and a sidewalk, as shown in the Street Design Guide.
- Recommend adjusting the typical Alternative C roadway section for areas with constrained existing right-of-way. The buffer zone between the shared use path and road curb as well as the median can both be narrowed so that proposed roadway features fit within existing right-of-way. Safety is still improved for pedestrians and bicyclists by inclusion of a roadway curb even if the buffer is not present.
- Recommend narrow median on the steep hill, which is an area of constrained right-of-way. A wide median is not recommended on the steep hill since there are no proposed left turn bays. Back-to-back curb is proposed between opposing lanes of traffic, as shown in Figure 8-4.

Acquiring additional right-of-way in order to construct the entire proposed roadway length with wide median and buffer zones (Figure 2-4) is not recommended. The land cost would exceed the project budget and the real estate acquisition process would add at least 2 years to the schedule, resulting in an infeasible project. Additionally, the area of constrained median is on a ridge. Costly retaining walls would be needed in order to construct a wider roadway cross section.

Figure 8-4 Alternative C typical section with constrained right-of-way



The full roadway section with buffer zones and wide median, shown in Figure 2-4, begins 0.2 miles west of Mesa Drive and continues west to the top of the steep hill. The constrained right-of-way section, shown in Figure 8-4, begins at the top of the hill and continues west to approximately 150 feet before the intersection with Adirondack Drive/Old Spicewood Springs Road. A left turn bay is provided for westbound traffic turning left onto Old Spicewood Springs Road.

Improvements are proposed for Spicewood Springs Road between Adirondack Drive/Old Spicewood Springs Road and Loop 360 in order to transition from the Loop 360 intersection to the proposed Alternative C roadway. The section of road currently includes two westbound lanes, one wide eastbound lane and a striped center lane. Proposed improvements include adding approximately 5 feet of pavement width in order to provide two eastbound lanes. Shared use path that matches to existing curb ramps at Loop 360 is proposed on both sides of the road. Close coordination with TxDOT regarding their proposed intersection improvements is recommended.

City staff recommends including design and installation of infill pedestrian and bicycle facilities with the Spicewood Springs Mobility Bond Project. Several short sections of missing sidewalk, bicycle lane and/or shared use path are located outside the bond project area. The sections would complete connectivity of pedestrian and bicycle facilities along Spicewood Springs Road from Mopac/Loop 1 to Loop 360 and from Spicewood Springs Road to the Lower Bull Creek Greenbelt. Infill facility needs consist of 1,825 feet of sidewalk and 4,600 feet of converting existing sidewalk to shared use path. Separate funding is needed for the infill facilities, which are shown in Figures 8-5, 8-6 and 8-7.

Figure 8-5 Infill Sidewalk on Spicewood Springs Road

Figure 8-6 Sidewalk Conversion to Shared Use Path near Mesa Drive

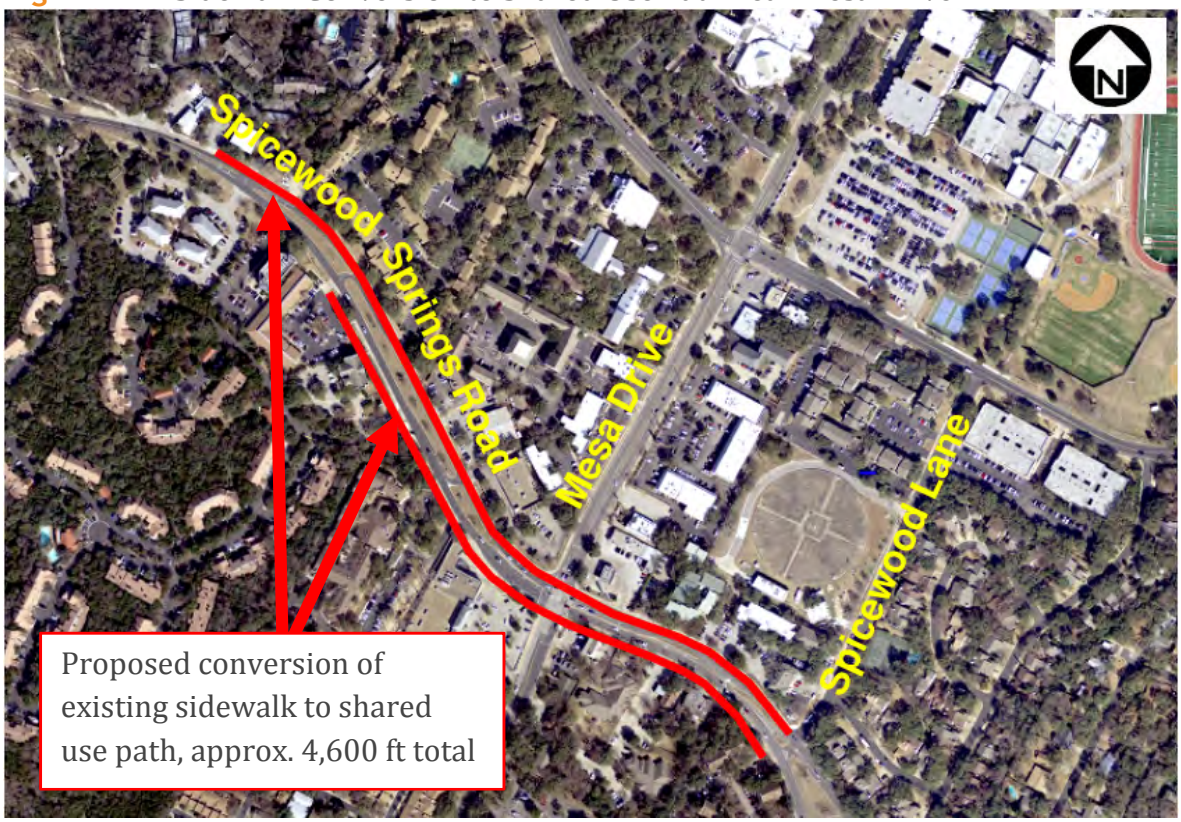
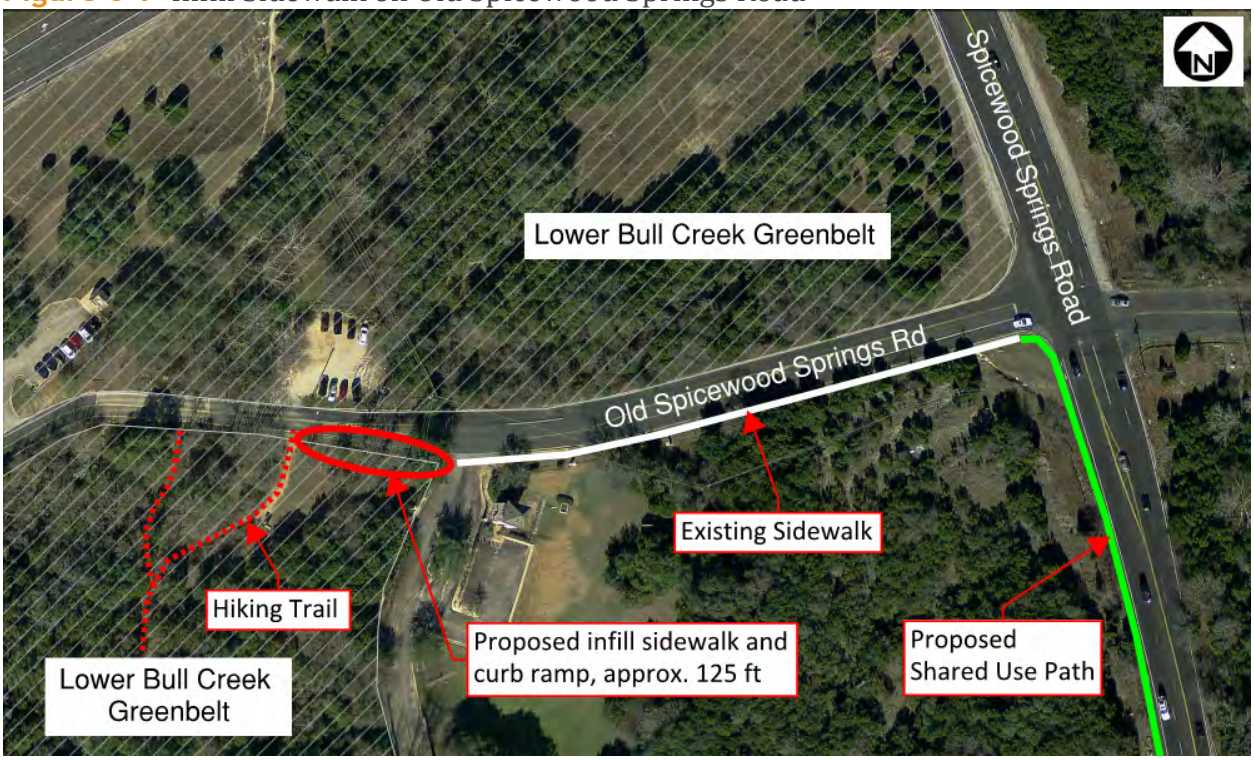


Figure 8-7 Infill Sidewalk on Old Spicewood Springs Road



City staff recommends reviewing the alignment of Old Spicewood Springs Road and Adirondack Trail during design phase. There is an offset in the existing roadway centerline at the intersection with Spicewood Springs Road. The configuration is not consistent with current design practice.

City staff recommends addressing storm water runoff requirements by placing water quality and detention facilities in the proposed medians. Cost savings are realized by placing rain gardens at the bottom of relatively shallow median detention basins. Constructing combined detention and water quality features is less expensive than building separate facilities. Additionally, a separate detention pond would require purchasing right-of-way through an expensive and lengthy right-of-way acquisition process. No additional right-of-way is anticipated at this time for the median detention option. ***Appendix F*** includes discussion of preliminary engineering drainage analysis, technical notes and detention option construction and life cycle cost estimates. ***Appendix A*** includes a schematic plan view map of proposed storm drain, detention and water quality facilities.

The likelihood of deer related vehicle crashes could potentially be reduced in several ways. Deer resistant plantings should be used in the medians and, if possible, for tree mitigation. Additional street lighting could deter deer from the roadway and/or increase deer visibility. Additional signage could help alert drivers to the presence of deer. During design phase, city staff should consult with a wildlife specialist regarding ways to reduce deer related crashes.

A light study should be conducted to identify any problem areas and recommend mitigation strategies. Additional lighting could help reduce deer related vehicle crashes by increasing sight distance in dark conditions.

A noise study, which can be triggered on larger federal projects, is not planned as part of the Spicewood Springs Road project. The project is anticipated to be entirely locally funded by the 2016 Mobility Bond. TxDOT is planning to complete a noise analysis as part of improvements at Spicewood Springs Road and Loop 360.

The Mesa Drive and Spicewood Springs Road intersection should be reviewed after completion of this project. Additional traffic flow efficiency could be realized by adjusting the signal timing and/or revising the intersection geometry.

A detailed list of preliminary phase technical recommendations that should be addressed during design phase is included in ***Appendix F***.

9.0 PROJECT IMPLEMENTATION

9.1 Cost Estimates

9.1.1 Roadway Cost Estimates

Preliminary construction cost and total project budget estimates were prepared for the design recommendation without phasing. Cost estimates for Alternative A were also prepared for the purpose of evaluating the cost to add additional lane capacity to Spicewood Springs Road. Additional vehicle capacity is provided by Alternative C through the addition of two vehicular travel lanes. Traffic analysis results summarized in Table 5-8 demonstrate that additional capacity results in acceptable levels of service for Alternative C. Traffic without the additional capacity is gridlocked during the evening commute (Alternative A). The additional two vehicular travel lanes raise the project cost by approximately 25%.

Cost estimates are summarized in Tables 9-1, 9-2 and 9-3. Construction costs are based on City of Austin historical bid tabs. Project budget estimates were calculated using standard City of Austin project management procedures. The project budget estimates include construction cost and other project costs such as design, project management, testing and inspection. A 30% contingency is also included in the project budget estimates. Itemized cost breakdowns can be found in ***Appendix B.***

Table 9-1 Alternative C – Preliminary Construction Cost Estimate

Alternative C - Design Recommendation		
Street Improvements	$	6,007,000
Austin Energy Relocation	$	600,000
Storm Water Detention	$	1,733,000
Rain Gardens for Water Quality	$	895,000
Roadway Items	**$**	**9,235,000**
Mobilization (4%)	**$**	**369,000**
Preliminary Roadway Construction Cost Estimate[1]	**$**	**9,604,000**

1. Cost estimate does not include the phasing option shown in Figure 9-1.

Table 9-2 Alternative A – Preliminary Construction Cost Estimate

Alternative A		
Street Improvements	$	4,833,000
Austin Energy Relocation	$	440,000
Storm Water Detention	$	1,493,000
Rain Gardens for Water Quality	$	575,000
Roadway Items	**$**	**7,341,000**
Mobilization (4%)	**$**	**294,000**
Preliminary Roadway Construction Cost Estimate	**$**	**7,635,000**

Table 9-3 Total Project Budget Estimates

Total Project Budget Estimate[1]	
Alternative C – design recommendation	$ 16.7 Million
Alternative A	$ 13.4 Million

1. Project budget estimate includes a 30% contingency.

9.1.2 Infill Bicycle and Pedestrian Facilities Cost Estimate

The gaps in sidewalk and bicycle facilities shown in Figures 8-5, 8-6 and 8-7 are outside the mobility bond project area and would require a separate funding source. The preliminary construction cost estimate for infill facilities is included in Table 9-4. There are number of construction challenges such as the need for retaining walls and the potential need to relocate power poles and other utility appurtenances. As a result, the cost is higher than for typical sidewalk.

Table 9-4 Construction Cost Estimate for Infill Bicycle and Pedestrian Facilities

Infill Bicycle and Pedestrian Facilities		
Sidewalk on Spicewood between Greenslope and Hart	$	250,000
Convert existing sidewalk to shared use path near Mesa Drive	$	970,000
Sidewalk on Old Spicewood Springs Road	$	11,000
Preliminary Infill Facilities Construction Cost Estimate	**$**	**1,231,000**

9.1.3 Water System Improvements Cost Estimate

A preliminary cost estimate for water system upgrades described in Section 7.2 is summarized in Table 9-5. The estimate includes cost sharing for erosion and sedimentation controls, traffic control and mobilization. Cost sharing is based on the waterline cost as a percentage of the Alternative C construction cost estimate.

Table 9-5 Cost Estimate for Water System Upgrades

Water System Upgrades		
48" DI waterline	$	1,590,000
16" DI waterline	$	460,000
12" DI waterline	$	459,000
Abandonment	$	205,000
12" PRV Station	$	60,000
Cost Sharing	$	252,000
30% Contingency	$	908,000
Preliminary Water Construction Cost Estimate (with contingency)	**$**	**3,934,000**

9.2 Permitting Requirements

The Spicewood Springs Road project requires the following permits, plans and formal notifications or acceptances. Detailed technical discussion of issues relating to each permit is included in ***Appendix F***.

- Site Plan Development Permit from the City of Austin
- Permit from and coordination with TxDOT regarding temporary traffic control. Traffic control devices may need to be placed within TxDOT right-of-way.
- Balcones Canyon Conservation Plan (BCCP) Permit (Determination Letter)
- Endangered Species Act Section 10A permit and/or coordination with the regional US Fish and Wildlife Service office regarding critical subsurface habitat for the Jollyville Plateau Salamander.
- Acceptance from the Texas Department of Licensing and Regulation acknowledging that the project is in compliance with the Texas Accessibility Standards (TAS)
- A Stormwater Pollution Prevention Plan under Texas Commission on Environmental Quality (TCEQ) Construction General Permit is needed prior to construction phase.

9.3 Project Schedule

A summary of the critical path schedule for Alternative C is provided in Table 9-6. A Gantt chart illustrating the Alternative C schedule is included in ***Appendix C***.

Table 9-6 Critical Path Schedule for Alternative C

Phase	Minimum (Months)	Maximum (Months)
Design and Permitting	24	30
Contract Procurement	6	6
Construction	24	36
TOTAL	**54 Months (4.5 Years)**	**72 Months (6.0 Years)**

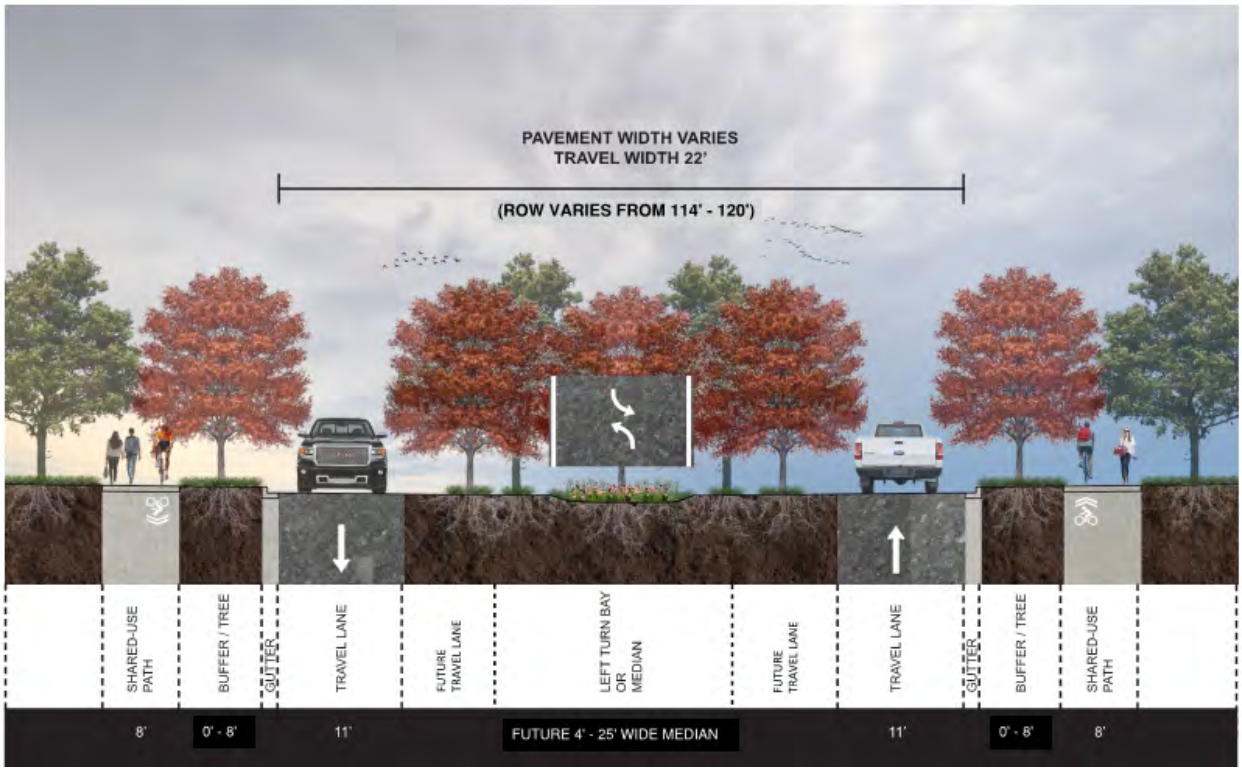
9.4 Risk Mitigation

Preliminary engineering phase identified a number of areas for further investigation during design phase. The scope of these issues is currently unknown and could impact the project schedule and/or budget. Risk factors and recommended mitigation strategies are summarized in Table 9-7.

Table 9-7 Project Risk Factors and Mitigation Strategies

Risk Factor	Category	Risk Mitigation
The extent and cost of mitigation for construction in the Balcones Canyon Preserve permit area and Jollyville Plateau salamander habitat area is difficult to assess without design phase geotechnical analysis. The extent of sub-surface voids could be large enough to require significant mitigation.	Cost	• Include City of Austin Standard Specification 658S and Standard Detail 658S (void mitigation) in the construction contract. • Ensure that an engineer experienced with cave mitigation is available during construction to provide plans and specifications for situations where the standard void mitigation detail does not apply.
Existing waterlines are located under proposed rain gardens. Austin Water currently plans to upgrade and relocate the lines. Additional funds would be needed to relocate the lines if Austin Water decides not to upgrade the waterlines.	Cost	Potential cost saving measures: • Construct a shared use path on one side of the road only • Simplify the rain garden planting design • Construct the project in phases with a first phase consisting of one lane in each direction and raised median with limited left turn bays, as shown in Figure 9-1. The second phase would include all improvements in Alternative C, as shown in Figure 2-4. The first phase would be less expensive than Alternative C. However, the total project cost for phased construction is expected to be more expensive than Alternative C.
The cost to relocate electric and other aerial dry utility lines is at the concept screening stage. The cost could increase during design phase.	Cost	
The cost for potential design accommodation for a rock wall located within the right-of-way has not been determined. The wall has been evaluated and may be eligible for registration on the National Register of Historical Places.	Cost	
The central Texas economy could impact bid prices. City staff indicate that there is currently a surplus of work available and bids are coming back higher than expected.	Cost	
Preliminary drainage analysis indicates that storm water detention and water quality fit within the proposed medians. However, the analysis will be refined during design phase and right-of-way acquisition could be needed.	Cost and Schedule	There is little potential to reduce the land acquisition schedule. The process is restricted by legally required notification and response timeframes. See above for cost saving recommendations.
The nesting season for endangered birds could impact the construction start date. Restrictions on tree clearing apply during nesting season unless a bird survey determines there are no nesting birds in the project area.	Schedule	• Award construction contract so that construction starts after nesting season. • Conduct a bird survey to verify that there are no nesting birds. However, if nesting birds are found, tree clearing cannot take place. • Clear trees under a separate permit before nesting season.

Figure 9-1 Alternative C – phased option



LIST OF ACRONYMS

ADA	Americans with Disabilities Act
AADT	Annual Average Daily Traffic
AMATP	Austin Metropolitan Area Transportation Plan
ASMP	Austin's 2014 Strategic Mobility Plan
AULCC	Austin Utility Location Coordination Committee
BCCP	Balcones Canyon Conservation Plan
BCP	Balcones Canyon Preserve
CTRMA	Central Texas Regional Mobility Authority
CEF	Critical Environmental Feature
DCM	Drainage Criteria Manual
ESD	Engineering Services Division, Public Works
ECM	Environmental Criteria Manual
ESA	Endangered Species Act
ERI	Environmental Resource Inventory
ESA	Environmental Site Assessment
HCM	Highway Capacity Manual
LUT P	Land Use and Transportation Policy
LDC	Land Development Code
LOS	Level of Service
LIDAR	Light Detection and Ranging
NOAA	National Oceanic and Atmospheric Administration
NRHP	National Register of Historic Places
PUD	Planned Unit Development
PRV	Pressure Reducing Valve
REC	Recognized Environmental Condition
SCS	Sewage Collection System
TAS	Texas Accessibility Standards
TCEQ	Texas Commission on Environmental Quality
TxDOT	Texas Department of Transportation
THC	Texas Historical Commission
TCM	Transportation Criteria Manual
TCAD	Travis Central Appraisal District
USGS	United States Geological Survey
WPAP	Water Pollution Abatement Plan
WED	Watershed Engineering Division, WPD
WPD	Watershed Protection Department

PROJECT TEAM

Program Manager (ATD):	**Paul Terranova, P.E., MBA**
Project Manager (CPO):	**Anna Martin, P.E.** **(Coordinator Program Office)**
Project Manager (PWD/PMD):	**Genest Landry, P.E., PMP**
Public Information Office (ATD):	**Cheyenne Krause** **Emily Tuttle** **Carolynn Calabrese** **Natalie Cerna**
Transportation Engineer (ATD):	**Dipti Borkar-Desai, P.E.**
Signal Review (ATD):	**Brian Craig, P.E.**
Active Transportation (ATD):	**Nathan Wilkes, P.E.** **Mike Schofield, P.E.**
Water Quality/Environmental Review (WPD):	**Tom Franke, E.I.T.** **Scott Hiers** **Sylvia R. Pope, P.G. – retired** **Glen Taffinder, P.E.**
Survey Engineering Consultant:	**Halff Associates**
Survey Reviewer:	**Istvan Voiculescu**
Traffic Study Consultant:	**Cobb Fendley & Associates**
Environmental Consultant:	**APTIM Environmental & Infrastructure, Inc.**
Pavement Life Cycle (S&B):	**Edward A. Poppitt III, P.E.**
Project Design Team (PWD/ESD):	**Jennifer Massie-Gore, P.E.** **Kiersten Dube, E.I.T.** **Micheal Singleton, P.E.** **Kimberly Gilbertson**
Quality Assurance/Quality Control:	**Thu Cao, P.E.**
Sponsor Review (ATD):	**Dipti Borkar-Desai, P.E.** **Anna Martin, P.E.** **Paul Terranova, P.E., MBA**

PROFESSIONAL ENGINEERS/CONSULTANT INFORMATION

Name	License No.	Firm	Firm's Registration No.
Dipti Borkar-Desai, P.E.	99444	City of Austin	-
David L. Boswell, P.E.	65693	City of Austin	-
Thu Cao, P.E.	93976	City of Austin	-
Brian W. Craig, P.E.	89248	City of Austin	-
Kiersten Dube, E.I.T.	54714	City of Austin	-
Daren A. Duncan, P.E.	104228	City of Austin	-
Kimberly Gilbertson	-	City of Austin	-
Genest Landry, P.E.	107482	City of Austin	-
Anna T. Martin, P.E.	96814	City of Austin	-
Jennifer Massie-Gore, P.E.	93704	City of Austin	-
Tyleah F. McGuire, P.E.	98764	City of Austin	-
Edward A. Poppitt III, P.E.	83371	City of Austin	-
Micheal Singleton, P.E.	127044	City of Austin	-
Kevin Sweat, P.E.	92023	City of Austin	-
Paul S. Terranova, P.E.	89775	City of Austin	-
Nathan James Wilkes, P.E.	116159	City of Austin	-
Patricia Frost, P.G.	2769	APTIM	5650
Krystal Heibel	-	APTIM	5650
Tonya Reese	-	APTIM	5650
Dan Clark, RPLS	6011	Halff Associates	312