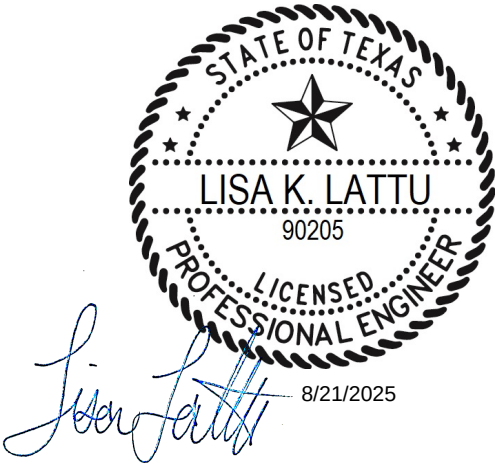
Lockwood, Andrews & Newnam, Inc.

Cibolo West Trunk Main Route Study and Analysis

Technical Memorandum



August 21, 2025

407 South Stagecoach Trail, San Marcos, TX 78666 | 210.499.5082 | www.lan-inc.com

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APPENDIX A – Preliminary Opinion of Probable Construction Cost with Easement Tables and Exhibits
APPENDIX B – Select Sheets from Schaefer Road Final Plans
APPENDIX C – Environmental & Cultural Desktop Study
APPENDIX D – Geotechnical Desktop Study

TO:	City of Schertz, Engineering
COPY:	Green Valley Special Utility District
PROJECT:	Cibolo West Trunk Main Route Study and Analysis
SUBJECT:	Technical Memorandum
ISSUED BY:	Lisa K. Lattu, PE, AICP
ISSUED DATE:	7/23/2025
REVIEWED BY:	Emmanuel De Pau, PE, LEED AP

1. Executive Summary

1.1. Background

Lockwood, Andrews & Newnam, Inc. (LAN) was contracted by the City of Schertz (Schertz) to conduct the Cibolo West Trunk Main Route Study and Analysis (Cibolo West Trunk Main) in coordination with the Green Valley Special Utility District (GVSUD) according to the 2023 Comprehensive Settlement Agreement for shared wastewater infrastructure planning. The Cibolo West Trunk Main project consisted of engineering and support services for approximately 23,000 linear feet (LF) of future wastewater trunk main. To determine a feasible alignment, the study evaluated existing infrastructure, potential alignment alternatives, environmental and geotechnical conditions, utility conflicts, proposed and future developments, and updated hydraulic modeling of the planned sewershed wastewater loading. The recommended route follows existing and proposed rights-of-way, avoiding critical conflicts such as petroleum pipelines and drainage structures.

1.2. Planning Cost

A planning alignment corridor has been identified. The trunk line will consist of 18-inch, 24-inch, and 30-inch gravity mains, with design flows reaching 2.65 MGD average daily flow and 8.3 MGD peak flow. **The preliminary opinion of probable construction cost is estimated at $22 million, including construction and easement acquisition.**

1.3. Cost Sharing

The cost sharing was based on the pro-rata share of planned wastewater flows through each pipe segment and is summarized in Table 1.1.

Table 1.1 West Cibolo Trunk Main Segment Flow Pro-Rata Share

Segment	Diameter	Total Flow (MGD)	Schertz Flow (MGD)	Schertz Share	GVSUD Flow (MGD)	GVSUD Share
A	**30-inch**	2.65	1.84	**69.4 %**	0.81	**30.6 %**
B	**24-inch**	1.85	1.74	**93.9 %**	0.11	**6.1 %**
C	**24-inch**	1.51	1.51	**100 %**	0.00	**0.0 %**
D	**18-inch**	1.23	1.12	**100 %**	0.00	**0.0 %**

The Preliminary Opinion of Probable Construction Cost (OPCC) is $22,087,640. A summary with cost sharing is in Table 1.2 with the details in Appendix A.

Table 1.2 Preliminary Opinion Of Probable Construction Cost

Segment	Segment Cost	Schertz %	Schertz $	GVSUD %	GVSUD $
General Construction	$ 1,275,000	**69.4 %**	$ 884,850	**30.6 %**	$ 390,150
A	$12,068,430	**69.4 %**	$ 8,375,500	**30.6 %**	$ 3,692,930
B	$ 3,032,390	**93.9 %**	$ 2,847,420	**6.1 %**	$ 184,970
C	$ 3,052,070	**100 %**	$ 3,052,070	**0.0 %**	$ 0
D	$ 2,659,750	**100 %**	$ 2,659,750	**0.0 %**	$ 0
Total	**$ 22,087,640**	**---**	**$ 17,819,590**	**---**	**$ 4,268,050**

1.4. Project Overview

This technical memo reviews the analysis, notes property parcels with easement requirements, an Opinion of Probable Construction Cost (OPCC), and includes the desktop environmental[1], cultural[2], and geotechnical[3] reviews. Hydraulic modeling analysis reviewed planned developments and future buildout conditions to confirm pipe sizing, capacity, and shared flows. Costs are allocated between Schertz and GVSUD based on flow contribution and pipe segment capacity, with Schertz contributing approximately 69% of the total flows. The cost sharing has been prepared for each trunk main segment from Segment A at the Cibolo Creek Municipal Authority (CCMA) South Wastewater Treatment Plant (WWTP) to the most upstream point Segment D at Schaefer Road.

1.5. Alignment Considerations

The future trunk main for the West Cibolo Creek sewershed is planned to follow the future Master Throughfare Plan arterial and meet with a newly constructed trunk main serving an adjacent sewershed at a to-be-expanded wastewater treatment facility. The continued use of the Saddlebrook Lift Station and force mains will need to be coordinated with the City of Schertz as well as future force mains to balance wastewater plant treatment loads between the CCMA North or O. J. Riedel (ORJ) wastewater treatment plant and the CCMA South Wastewater Treatment Plant (WWTP).

The topography slopes towards Cibolo Creek, and the creek and its tributaries further constrain the viable options for the Cibolo West Trunk Main with physical and permitting obstacles. Desktop environmental and geotechnical studies highlight potential intermittent streams and wetland areas, along with soil conditions requiring borings for final design. The Texas State Historical Commission concurrence with the architectural and archeological protection plans for the final construction method and corridor are also indicated.

[1] Blanton & Associates, Inc., a Wholly Owned Subsidiary of ICF Jones & Stokes, Inc.
[2] Blanton & Associates, Inc., a Wholly Owned Subsidiary of ICF Jones & Stokes, Inc.
[3] Raba Kistner Consultants Inc.

Rapid development has the biggest effect on future road right-of-way (ROW) and utility corridors available for trunk main easement and construction. The Saddlebrook Ranch development has constrained the available ROW along Redbud Canyon due to existing infrastructure and landscaping. As a result, the trunk main easements will need to be acquired from adjacent landscape and drainage lots.

Planning for the proposed Cibolo West Trunk Main must also account for future development, ensuring that connections can be made to the system. Specifically, the planned inverts for the trunk main at the northern or upstream part of the project must allow for future gravity connections that will need to be deeper than the Schaefer Road drainage culverts.

1.6. Recommendations

The project should proceed with topographic survey, design and permitting within the recommended alignment corridor. Field investigations and determinations of potential Waters of the US (WOTUS), bald eagle nests, petroleum pipelines, Texas Historical Commission (THC) concurrence of a cultural resources survey, and subsurface conditions will allow final determinations on environmental and historical permitting. Ongoing coordination with developers for easement acquisition and future wastewater connections will also provide critical information. The timing of the CCMA South WWTP projected treatment expansion will dictate the timing of the Cibolo West Trunk Main and may require operational projects and methodologies to accommodate existing and planned development flows until the trunk main can be designed, constructed, and operational.

2. Background

2.1. Comprehensive Settlement Agreement

Schertz and GVSUD entered into a Comprehensive Settlement Agreement (Agreement) on May 17, 2023, to resolve the regional provision of retail wastewater service. The Agreement included development of a master plan for the planning, design, and construction of wastewater facilities

in the corporate limits and extraterritorial jurisdiction of Schertz. The Master Plan is to include a future wastewater trunk line that would jointly provide transport of wastewater for Schertz and GVSUD within their respective Certificate of Convenience and Necessity (CCN) boundaries and send flow to the Cibolo Creek Municipal Authority (CCMA) South Wastewater Treatment Plant (WWTP). The future wastewater trunk line is known as the Cibolo West Trunk Main.

2.2. Purpose and Scope

The Schertz Cibolo West Trunk Main Route Study and Analysis (Project) consisted of engineering and support services for the approximately 23,000 linear feet (LF) future wastewater trunk main that will serve the Schertz and GVSUD between the north/south watershed break near Schaefer Road and the CCMA South WWTP. Based on the Schertz 2024 Wastewater Master Plan, a 15-inch trunk main was anticipated to serve wastewater loads for Schertz only. The final trunk main sizing was identified as part of this Project to carry wastewater loading from Schertz and GVSUD.

The Project scope includes wastewater planning and analysis, hydraulic modeling and analysis, trunk main sizing, site reconnaissance, alignment and easement evaluation, constructability review of the recommended alignment, desktop environmental, cultural, and geotechnical studies, preliminary opinion of construction cost, and cost sharing calculations. Evaluations, findings, and recommendations are provided in the following sections.

3. Alignment and Alternatives Analysis

3.1. Alternative Corridors

Three potential corridors were evaluated for the Cibolo West Trunk Main, with only one determined to be viable. The alignment along the future North–South Principal Arterial identified in the City of Schertz 2017 Master Thoroughfare Plan (MTP) was selected because it provides the most direct connection to the CCMA South WWTP, follows a planned transportation corridor that can accommodate future utility needs, and maintains favorable topography to support gravity

flow at reasonable depths. This corridor also avoids major environmental constraints and minimizes permitting complexity compared to the alternatives. The MTP is shown in Figure 3.1

Two other alternatives were evaluated. The first alternative corridor was located along the future North–South Collector to the west of the project area. This alignment would have extended the length of the trunk main, increased construction costs, and created potential conflicts with the Woman Hollering Creek Trunk Line. Additionally, moving the line westward onto higher elevation would have required significantly deeper excavations to maintain gravity flow, further escalating costs and constructability challenges.

The second alternative considered shifting the alignment east toward Weir Road. While this option shortened the distance to the roadway, it introduced far greater challenges. It would have required crossing Cibolo Creek, extended the trunk main outside the City limits, and added another creek crossing to re-enter and reach the CCMA South WWTP. Beyond the additional length and cost, this option carried substantial risks related to federal permitting (United States Army Corps of Engineers), flooding hazards, and the complexity of constructing creek crossings. For these reasons, the eastern corridor was also rejected.

In summary, the North–South Principal Arterial corridor was chosen as the most practical, cost-effective, and technically feasible alignment to meet the City's long-term wastewater service needs.

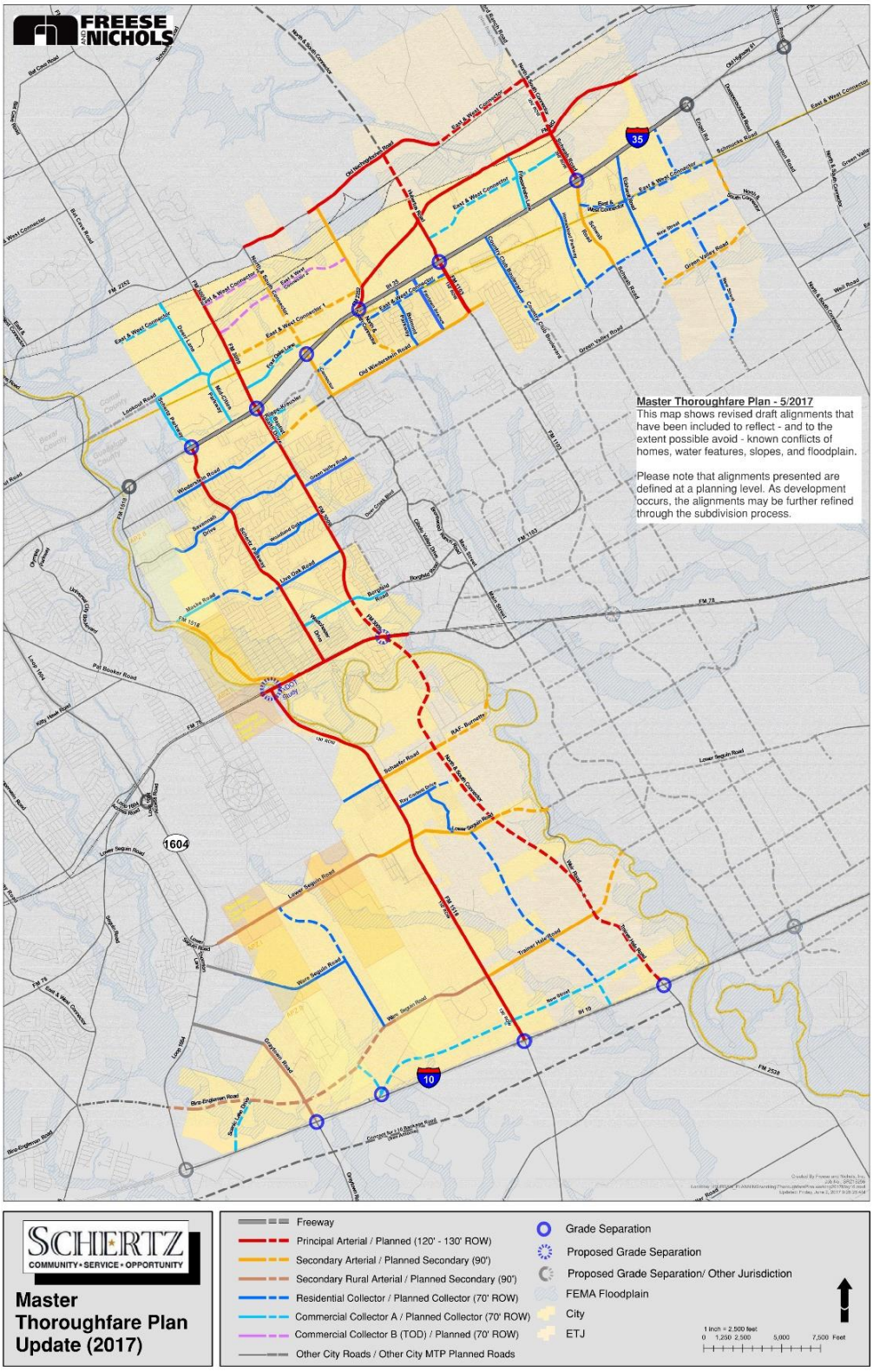


Figure 3.1 City of Schertz Master Thoroughfare Plan 2017

3.2. Selected Corridor Overview

The Cibolo West Trunk Main is planned to follow a future North-South Principal Arterial identified in the MTP. This arterial (and trunk main) would extend FM 3009 from Schaefer Road to Weir Road, west of Cibolo Creek and is part of Figure 3.1. The proposed trunk main and the recently constructed Woman Hollering Creek Trunk Main will outfall at the Cibolo Creek Municipal South Wastewater Treatment Plant.

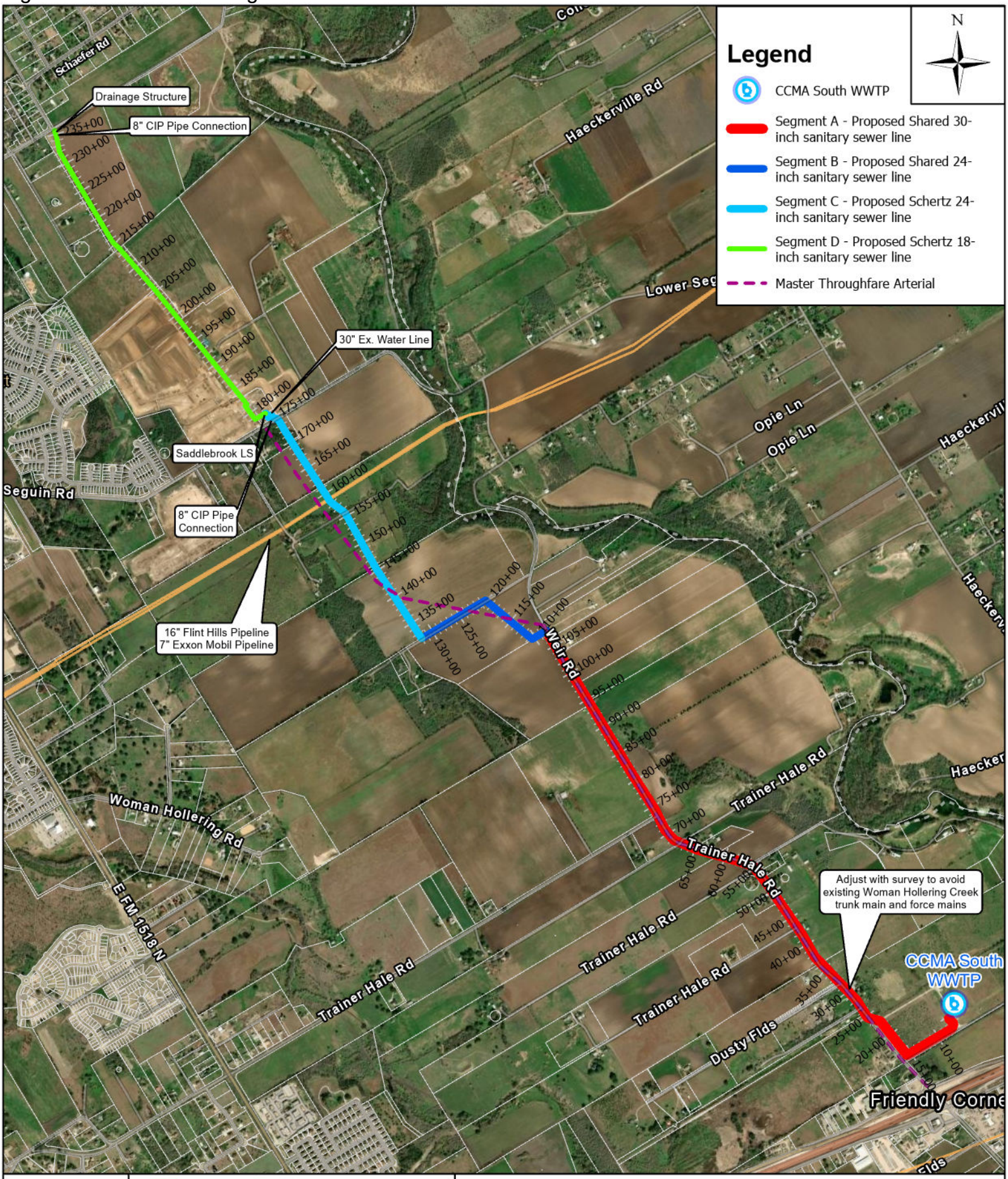
The planned Cibolo West Trunk Main alignment corridor consists of four segments: A, B, C, and D shown in Figure 3.2 and described below:

- ***Segment A*** is the 30-inch diameter segment at the downstream end of the trunk main. Segment D connects the CCMA South WWTP to Trainer Hale and then continues to Weir Road (approximately Station 5+00 to Station 110+00) where the trunk main transitions to Segment B. Note that Segment A is sized for the entire Cibolo West sewershed and accommodates the addition of parcels along Weir Road at 4 equivalent development units (EDUs) per acre.
- ***Segment B*** is the 24-inch diameter segment that crosses large agricultural and residential parcels between Weir Road and the GVSUD Krueger-Martin Tract (Station 110+00 to Station 133+00). Segment B diverges from the thoroughfare route to avoid potential creek tributaries, sloping topography, and isolating the corner of a private property parcel. Alignment can be further refined with survey and design.
- ***Segment C*** is also a 24-inch diameter segment but only carries Schertz flows. The segment connects the Krueger-Martin Tract to the Saddlebrook Lift Station at Lower Seguin Road (Station 133+00 to Station 177+00). Segment C is parallel to existing and planned roadways like Redbud Canyon.

- ***Segment D*** is an 18-inch diameter segment Schertz flows and connects the Saddlebrook Lift Station at Lower Seguin Road to Schaefer Road (Station 177+00 to Station 235+00). There are existing and future flows north of Schaefer Road that will enter the Cibolo West Trunk Main.

Depending on final alignment, the wastewater trunk main may be located in a permanent easement overlapping and/or extending beyond the future ROW, or within the ROW depending on the constraints of each segment. Figures 3.3 and 3.4 show conceptual sections of the future arterial with the future wastewater trunk main.

Figure 3.2 Trunk Main Alignment Corridor



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CHECKED:	LKL
PREPARED:	ZRJ
	8/5/2025

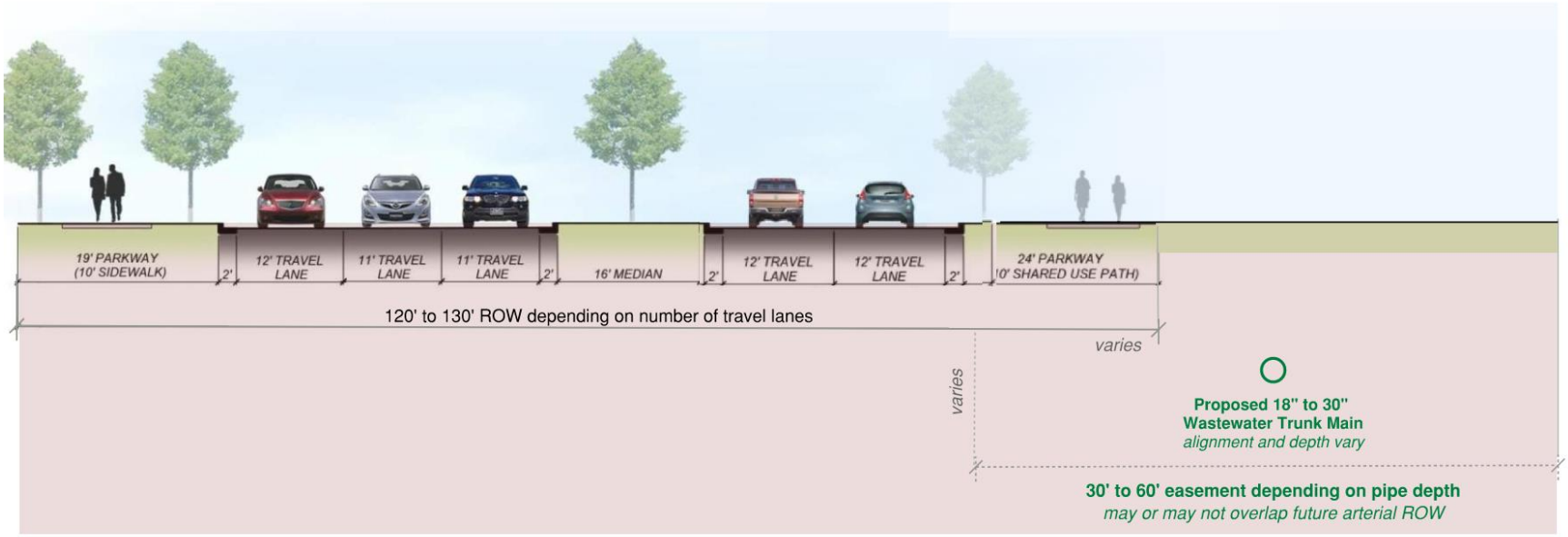
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CIBOLO WEST WASTEWATER TRUNK LINE ALIGNMENT CORRIDOR

0 1,100 2,200 4,400 Feet

N:\120\120-11816-014\4-0-Production-Working\4-9-GIS\Working Project Data and Maps\000_APRX\6_06_2025_Shertz_Cibolo_Route_Study.aprx
Date: 8/5/2025 Time: 10:21 AM

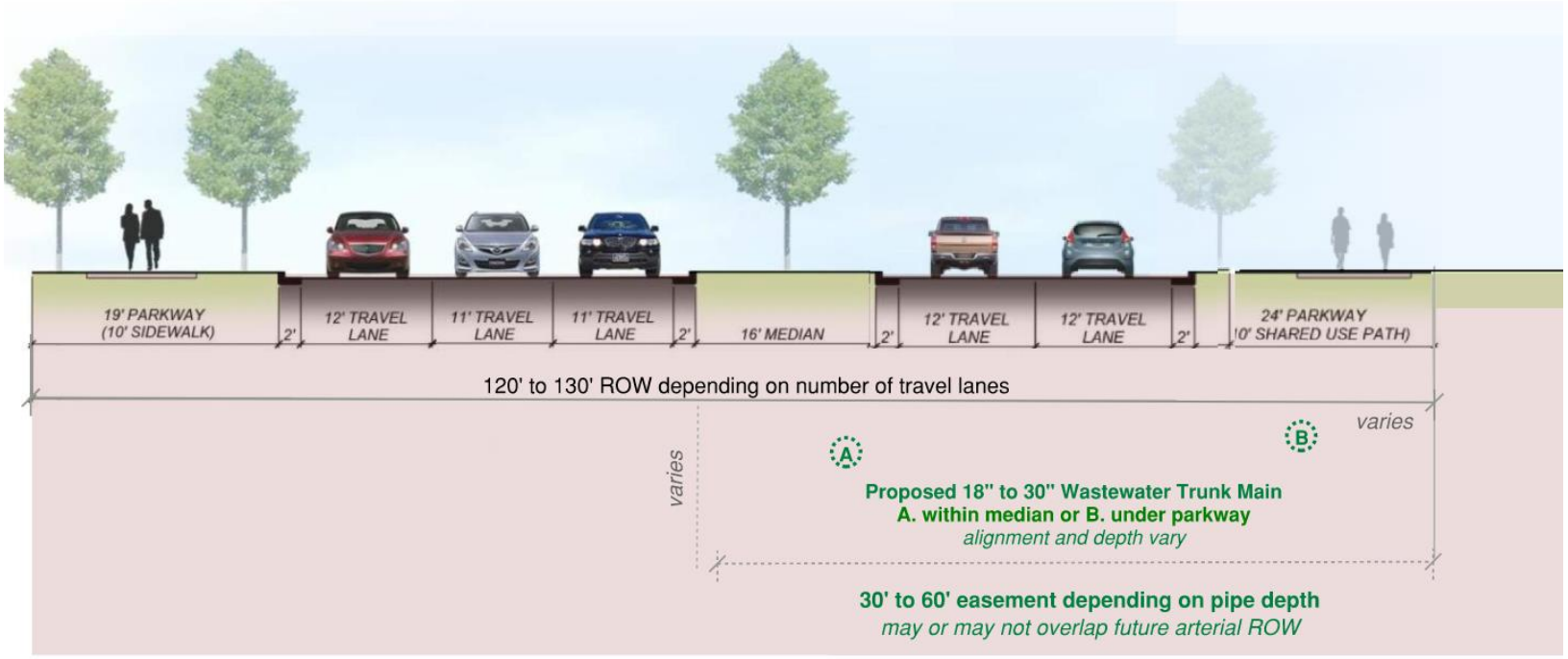
Conceptual Section: Future Arterial with Adjacent or Overlapping Future Wastewater Trunk Main Easement



Based on City of Schertz Master Thoroughfare Plan June 2017, Figures 14 and 15

Figure 3.3 Arterial Adjacent or Overlapping Wastewater Easement

Conceptual Section: Future Arterial with Future Wastewater Trunk Main Easement in ROW



Based on City of Schertz Master Thoroughfare Plan June 2017, Figures 14 and 15

Figure 3.4 Arterial with Median or ROW Wastewater Easement

3.3. Selected Alignment Corridor and Constraints

Several key constraints were identified along the selected alignment corridor. These include the Schaefer Road drainage structure, future wastewater line connections, existing wastewater line connections from the Saddlebrook Lift Station, Saddlebrook drainage structures, petroleum pipelines (crossing east–west near Lower Seguin Road), the Woman Hollering Creek Trunk Main and associated force mains, and the trunk main outfall at the CCMA South WWTP.

To minimize impacts, initial adjustments were made to the MTP arterial alignment of the trunk main to avoid potential Cibolo Creek tributaries and the associated risks of federal permitting, additional costs, and project delays. In addition, because the ground surface slopes eastward toward Cibolo Creek, shifting the alignment westward would place the trunk main at higher elevations, requiring greater excavation depths and increasing construction cost. These constraints are illustrated in Figure 3.5. The alignment will be further refined as part of the final design following completion of detailed topographic survey.

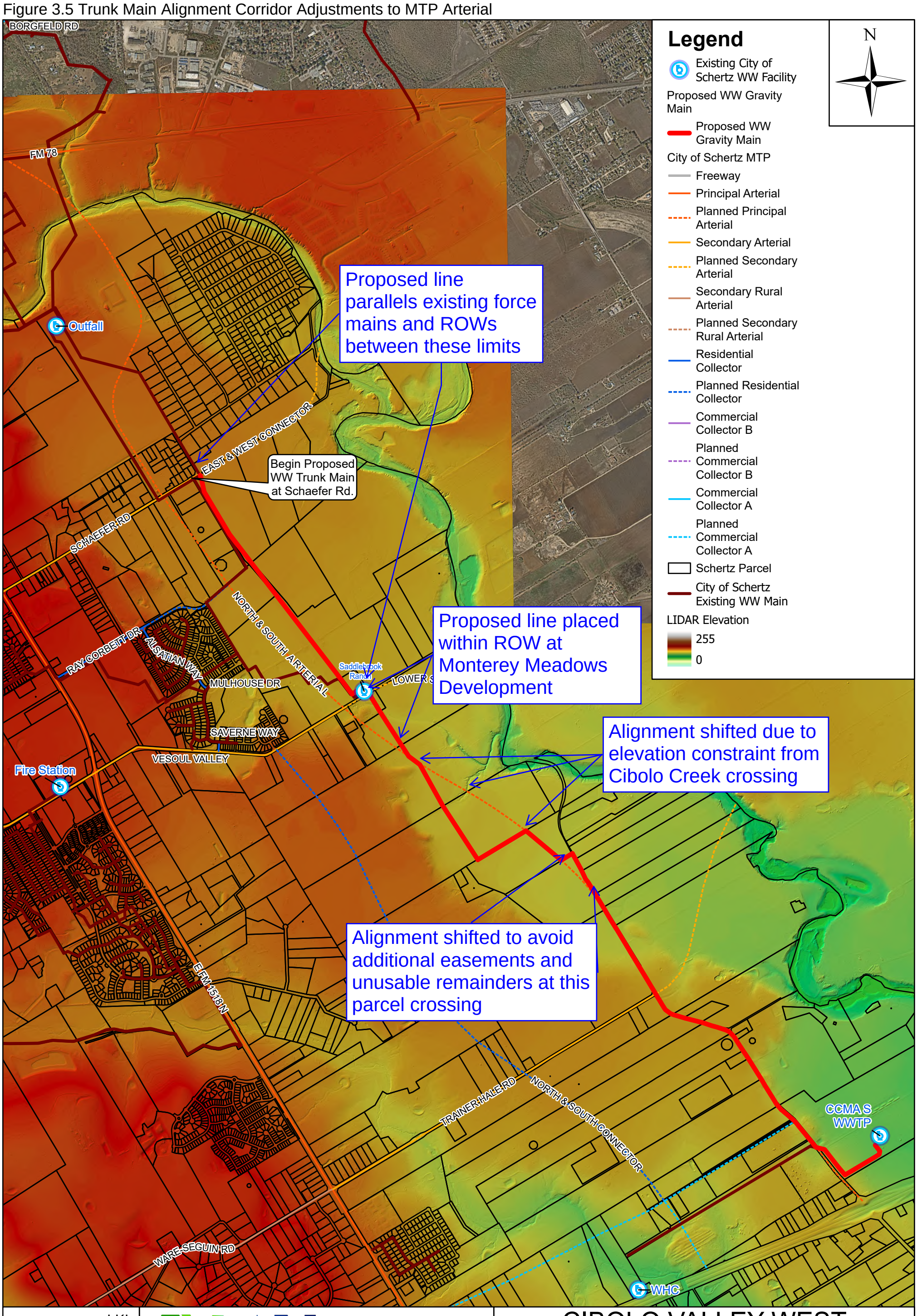
3.3.1. Schaefer Rd. Drainage Structure

The drainage structure at Schaefer Road impacts the proposed 8-inch CIP gravity sewer identified in the 2024 Wastewater Master Plan for the 2030 planning period. These sanitary sewers are anticipated to connect to the Cibolo West Trunk Main beneath the Schaefer Road drainage structure. To accommodate this future connection, the trunk main must be set at an elevation of 657 feet at this location. Select plan sheets for the drainage structure are provided in Appendix B.

3.3.2. Saddlebrook Lift Station

A large development near the alignment corridor was constructed with the Saddlebrook Lift station near Lower Seguin Road. The lift station currently sends flows north to the CCMA Odo J. Riedel Regional Water Reclamation Plant (OJR). Schertz plans to abandon the lift station once the new trunk line is completed and divert flow to the CCMA South WWTP.

Figure 3.5 Trunk Main Alignment Corridor Adjustments to MTP Arterial



APPROVED:	LKL	CIBOLO VALLEY WEST TRUNK MAIN ROUTE STUDY **PROPOSED ALIGNMENT 1**	
CHECKED:	EDP		
PREPARED:	CAG		
8/21/2025		1 IN = 1,800 FT	EXHIBIT 1

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3.3.3. Existing and Future Wastewater Collectors, Trunk Mains, and Force Mains

Existing wastewater lines will need to connect to the proposed Cibolo West Trunk Main. As the CCMA South WWTP expansion or capacity allows, force mains and lift stations will be taken off-line, and the flows will be carried by the Cibolo West Trunk Main. Future Development wastewater collectors will also need to be connected to the Cibolo West Trunk Main. The Woman Hollering Creek (WHC) Trunk Main and force mains will need to be considered in the final design of connection to the CCMA South WWTP.

3.3.4. Petroleum Pipelines

The Texas Railroad Commission pipeline database was reviewed to identify potential conflicts and future coordination. Near Lower Seguin Road, the alignment corridor crosses a 16-inch Flint Hills Pipeline located approximately 4-feet below ground and a 7-inch Exxon Mobil Pipeline with a depth to be determined. Additional coordination will be required during the design phase with the pipeline companies to avoid a utility conflict.

3.4. Easement Evaluation

When reviewing the corridor, the trunk main alignment was planned within the future road right-of-way (ROW). While the alignment corridor parallels existing roadways; the wastewater main crosses private property and parcels owned by agencies other than Schertz and GVSUD. The City of Schertz provided current planned development information (through June 2025) in addition to the 2024 Wastewater Master Plan developments including Saddlebrook, Monterey Meadows, Lindorfer Tract, Brown Ranch, Krueger-Martin Tract, and Poppy Hills. Note that not all subdivision names used are necessarily formal, but only what was indicated to the City during preliminary development meetings at the time. LAN utilized these planned developments and the proposed alignment corridor to determine the affected parcels.

Initial easement evaluations were conducted for permanent easements located outside the existing ROW, and temporary construction easements preliminarily placed. These are estimated locations of easements for planning purposes for re-evaluation during the design phase. The

ownership and land values were calculated using 2025 Bexar County Appraisal District (CAD) information. Permanent utility easements were calculated at 100% of the CAD land value. Temporary construction easements were calculated at 50% of the CAD land value. Due to changing land values, a 50% contingency was added to each trunk main easement segment.

3.4.1. Permanent Utility Easement

The City of Schertz desires to have 2 feet of permanent wastewater easement for each foot of trunk main depth. The pipelines range from 5 feet to 30 feet deep. A consistent easement width was established for each pipeline segment between 50 feet and 60-feet.

The existing Redbud Canyon ROW has a median where an existing force-main is located. Redbud Canyon has only a 20-foot open space buffer between it and new home properties. The open space buffer also accommodates drainage infrastructure so the Cibolo West Trunk Main easements should be contained in the ROW to avoid adding numerous additional easement acquisitions.

3.4.2. Temporary Construction Easement

A 30-foot temporary construction easement is recommended. Only 20 feet were identified in the Redbud Canyon open space buffers as that was their maximum width. In most cases, an additional 30 feet were available in the parcels adjacent to the route corridor used for permanent easement. In some cases, additional parcels may be required. Final determinations will be made based on potential proposed development layouts and peculiarities to each property.

3.4.3. Easement Data Tables and Exhibits

Tables of parcel ownership collected from CAD are included as Table 3.1 and Table 3.2 for permanent utility easements and temporary construction easements (24 parcels). The parcels are illustrated in Figure 3.6 and Figure 3.7.

Table 3.1 Permanent Utility Easement Table

PRELIMINARY PERMANENT UTILITY EASEMENT PLANNING COST

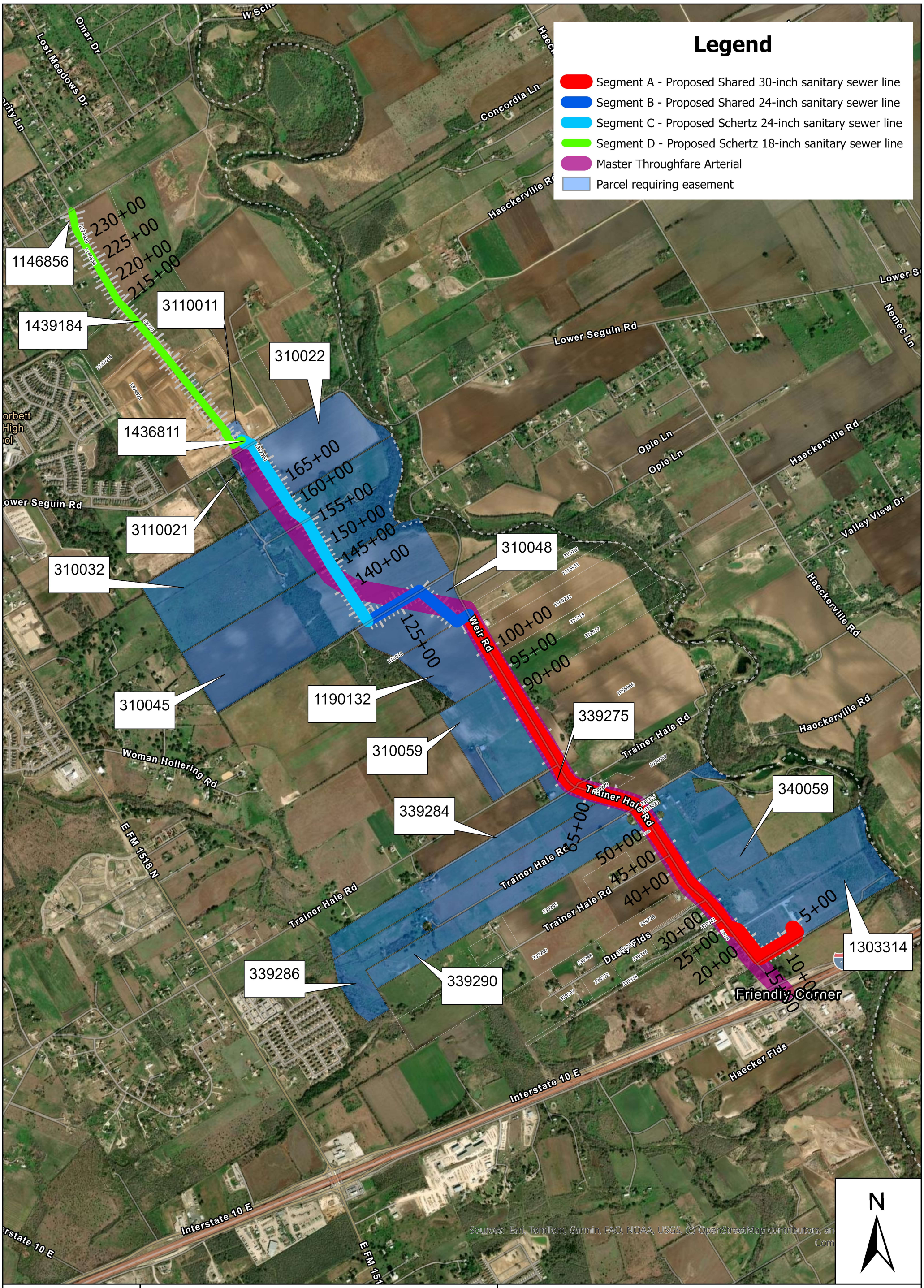
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Cibolo West Route Study Sanitary Sewer Trunk Line

Parcel Number	Parcel ID	Owner	Address	Land Value	Parcel Area (Sq ft)	Planning Land Value [1] (Per Sq Ft)	Trunk Line Segment	Easement Width (ft)	Easement Length (ft)	Easement Planning Cost [2]
1	1303314	CIBOLO CREEK MUNICIPAL AUTHORITY	TRAINER HALE RD SCHERTZ, TX 78154	$ 5,024,070	4046475.71	$1.24	A	60	2100	$ 156,450
2	339290	HAECKER RALPH & GLADYS	8205 TRAINER HALE RD SCHERTZ, TX 78154	$ 1,377,342	2,699,413	$0.51	A	60	210	$ 6,430
3	339286	HERRERA JOYLENE S	8215 TRAINER HALE RD SCHERTZ, TX 78154	$ 2,100,820	3,538,030	$0.59	A	60	560	$ 19,960
4	340059	SCHMIDT BETTY	8180 TRAINER HALE RD SCHERTZ, TX 78154	$ 1,745,770	3,281,543	$0.53	A	60	1930	$ 61,610
5	339275	LUENSMANN HENRY W FAMILY TR &	8447 Trainer Hale Rd, Schertz, TX 78154	$ 247,540	236,966	$1.04	A	60	250	$ 15,670
6	339284	REAL CHARLES E & REAL JOHN THOMAS	8321 TRAINER HALE RD SCHERTZ, TX 78154	$ 1,790,990	2,920,045	$0.61	A	60	630	$ 23,190
7	310059	LUENSMANN CHARLES O	8602 TRAINER HALE RD SCHERTZ, TX 78154	$ 2,456,780	3,012,000	$0.82	A	60	860	$ 42,090
8	1190132	MARTIN RUTH E	WEIR AVE SCHERTZ, TX 78154	$ 1,619,200	1,834,573	$0.88	A	60	540	$ 28,600
9	310048	KRUEGER MELVIN ALVIN	9263 WEIR AVE CIBOLO, TX 78108	$ 1,388,130	1,834,573	$0.76	B	50	1990	$ 75,290
10	310045	ANCIENT KK ENDEAVORS LLC &	WEIR AVE SCHERTZ, TX 78154	$ 5,461,980	7,307,190	$0.75	C	50	600	$ 22,430
11	310032	HOLTZ SEANNA FRASER	12820 LOWER SEGUIN RD SCHERTZ, TX 78108	$ 10,553,600	8,265,510	$1.28	C	50	720	$ 45,970
12	310022	FRIESENHAHN MILTON & BILLIE, BASHA ELIZABETH ANN, ZWIEKE	12840 LOWER SEGUIN RD SCHERTZ, TX 78154	$ 5,266,800	3,265,475	$1.61	C	50	360	$ 29,040
13	310021	GUAJARDO GUILLERMO J & MARTHA C	LOWER SEGUIN RD SCHERTZ, TX 78154	$ 249,150	239,580	$1.04	C	50	470	$ 24,440
14	1436811	JEN TEXAS 32 LLC	LOWER SEGUIN RD TX	$ 21,870	17,082	$1.28	C	50	100	$ 6,410
15	310011	ASHTON SAN ANTONIO RESIDENTIAL LLC	13011 LOWER SEGUIN RD SCHERTZ, TX 78154	$ 204,790	149,306	$1.37	D	55	140	$ 10,570
16	1146856	SCHERTZ-CIBOLO-UNIVERSAL CITY ISD BOARD OF TRUSTEES	RAF BURNETTE SCHERTZ, TX 78154	$ 100,120	178,596	$0.56	D	55	870	$ 26,830
17	1439184	JEN TEXAS 32 LLC	REDBUD CANYON TX	$ 397,520	69,744	$5.70	D	55	450	$ 141,070
									SubTotal	$ 736,050
									Contingency 50%	$ 368,040
									Planning Total	**$ 1,104,090**

1. Easement Planning Land Value is from the April 2025 Bexar County Appraisal Land Value.
2. Rounded up to the next $10, does not include legal, survey, or other acquisition soft costs.

Figure 3.6 Cibolo West Wastewater Trunk Main Route Study



APPROVED: LKL	LAN TBPE Firm No. 2614 407 S. Stagecoach Trail, Suite 07 * San Marcos, TX 78666 **T** 512.396.4040 • **F** 512.338.4942 www.lan-inc.com • info@lan-inc.com	CIBOLO WEST WASTEWATER TRUNK MAIN ROUTE STUDY
CHECKED: RJH		
PREPARED: RJH		0 0.25 0.5 Miles
8/8/2025		PERMANENT EASEMENT PARCELS

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Table 3.2 Temporary Construction Easement Table

PRELIMINARY TEMPORARY CONSTRUCTION EASEMENT PLANNING COST

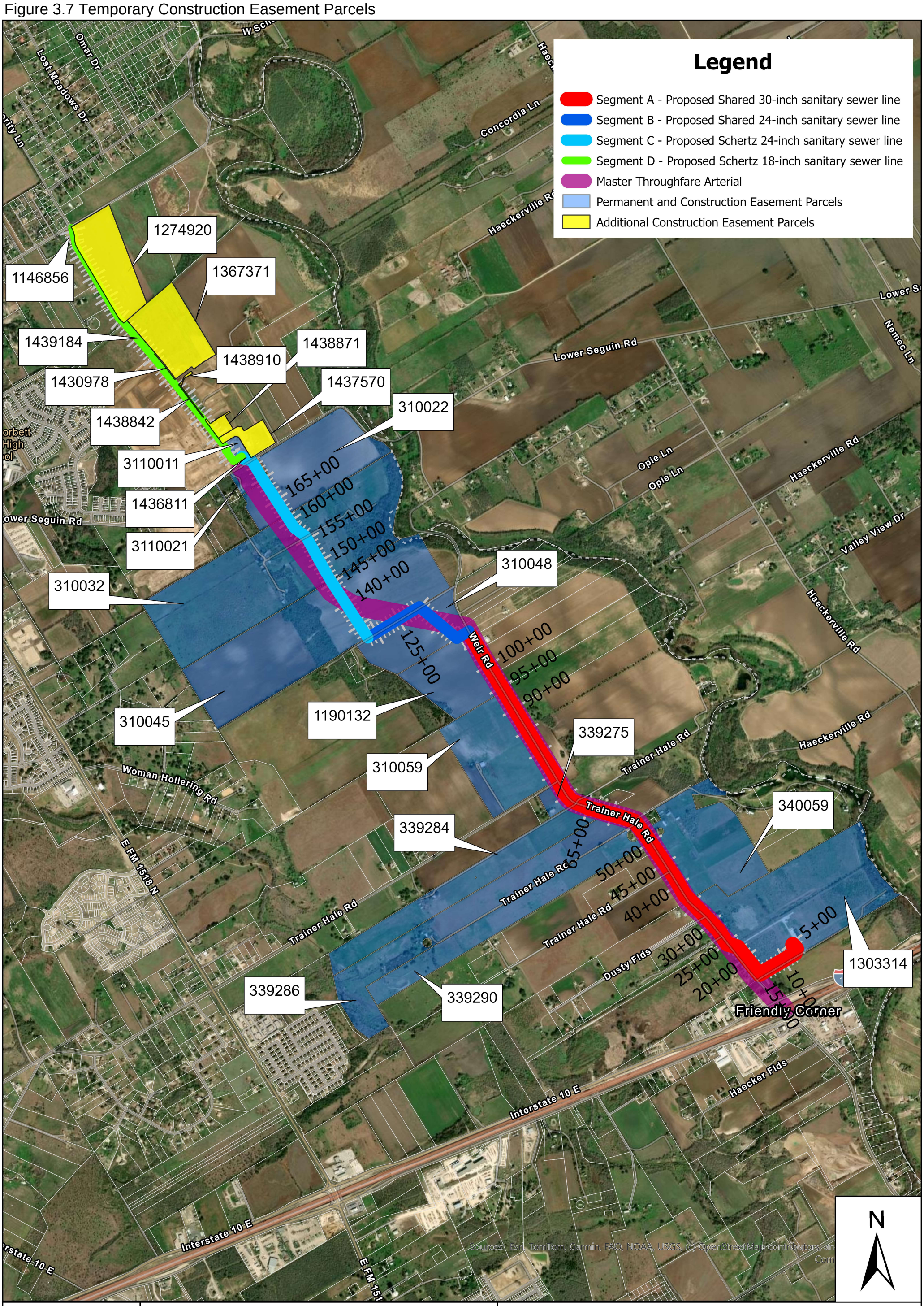
Date: 08/08/2025

Cibolo West Route Study Sanitary Sewer Trunk Line

Parcel Number	Parcel ID	Owner	Address	Planning Land Value [1] (Per Sq Ft)	Trunk Line Segment	Easement Width (ft)	Easement Length (ft)	Easement Planning Cost [2]
1	1303314	CIBOLO CREEK MUNICIPAL AUTHORITY	TRAINER HALE RD SCHERTZ, TX 78154	$0.62	A	30	2100	$ 39,120
2	339290	HAECKER RALPH & GLADYS	8205 TRAINER HALE RD SCHERTZ, TX 78154	$0.26	A	30	210	$ 1,610
3	339286	HERRERA JOYLENE S	8215 TRAINER HALE RD SCHERTZ, TX 78154	$0.30	A	30	560	$ 4,990
4	340059	SCHMIDT BETTY	8180 TRAINER HALE RD SCHERTZ, TX 78154	$0.27	A	30	1930	$ 15,410
5	339275	LUENSMANN HENRY W FAMILY TR &	8447 TRAINER HALE RD SCHERTZ, TX 78154	$0.52	A	30	250	$ 3,920
6	339284	REAL CHARLES E & REAL JOHN THOMAS	8321 TRAINER HALE RD SCHERTZ, TX 78154	$0.31	A	30	630	$ 5,800
7	310059	LUENSMANN CHARLES O	8602 TRAINER HALE RD SCHERTZ, TX 78154	$0.41	A	30	860	$ 10,530
8	1190132	MARTIN RUTH E	WEIR AVE SCHERTZ, TX 78154	$0.44	A	30	540	$ 7,150
9	310048	KRUEGER MELVIN ALVIN	9263 WEIR AVE CIBOLO, TX 78108	$0.38	B	30	1990	$ 22,590
10	310045	ANCIENT KK ENDEAVORS LLC &	WEIR AVE SCHERTZ, TX 78154	$0.37	C	30	600	$ 6,730
11	310032	HOLTZ SEANNA FRASER	12820 LOWER SEGUIN RD SCHERTZ, TX 78108	$0.64	C	30	720	$ 13,790
12	310022	FRIESENHAHN MILTON & BILLIE, BASHA ELIZABETH ANN, ZWIEKE	12840 LOWER SEGUIN RD SCHERTZ, TX 78154	$0.81	C	30	1260	$ 30,490
13	310021	GUAJARDO GUILLERMO J & MARTHA C	LOWER SEGUIN RD SCHERTZ, TX 78154	$0.52	C	30	470	$ 7,340
14	1436811	JEN TEXAS 32 LLC	LOWER SEGUIN RD TX	$0.64	C	30	100	$ 1,930
15	310011	ASHTON SAN ANTONIO RESIDENTIAL LLC	13011 LOWER SEGUIN RD SCHERTZ, TX 78154	$0.69	D	30	540	$ 11,120
16	1146856	SCHERTZ-CIBOLO-UNIVERSAL CITY ISD BOARD OF TRUSTEES	RAF BURNETTE SCHERTZ, TX 78154	$0.28	D	30	870	$ 7,320
16a	1274920	LUDWIG JANIS K	RAF BURNETTE SCHERTZ, TX 78108	$0.60	D	30	860	$ 15,380
17	1439184	JEN TEXAS 32 LLC	REDBUD CANYON TX	$2.85	D	30	450	$ 38,480
17a	1367371	ASHTON SAN ANTONIO RESIDENTIAL LLC	LOWER SEGUIN RD SCHERTZ, TX 78154	$0.69	D	30	860	$ 17,770
17b	1439078	JEN TEXAS 32 LLC	10138 REDBUD CANYON TX	$0.00	D	20	640	$ 50
17c	1438910	JEN TEXAS 32 LLC	10472 MULHOUSE DRIVE TX	$0.02	D	20	60	$ 30
17d	1438842	JEN TEXAS 32 LLC	REDBUD CANYON TX	$0.00	D	20	790	$ 50
17e	1438871	JEN TEXAS 32 LLC	9790 REDBUD CANYON TX	$0.00	D	30	440	$ 10
17f	1437570	JEN TEXAS 32 LLC	12947 LOWER SEGUIN ROAD TX	$0.00	D	30	140	$ 10
							SubTotal $	261,620
							Contingency 50% $	130,830
							Planning Total $	**392,450**

1. Construction Easement Planning Land Value is 50% of the April 2025 Bexar County Appraisal Land Value.
2. Rounded up to the next $10, does not include legal, survey, or other acquisition soft costs.

Figure 3.7 Temporary Construction Easement Parcels



APPROVED:	LKL
CHECKED:	RJH
PREPARED:	RJH
	8/8/2025

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CIBOLO WEST WASTEWATER TRUNK MAIN ROUTE STUDY

0 0.25 0.5 Miles

CONSTRUCTION EASEMENT PARCELS

N:\120\120-11816-014\4-0-Production-Working\4-9-GIS\Working Project Data and Maps\000_APRX\6_18_2025_Bob_cons.aprx
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3.5. Support Services

Desktop environmental, cultural, and geotechnical studies were completed for the selected alignment corridor to provide preliminary feedback regarding constructability of the proposed trunk sewer. The Draft Environmental and Cultural Study and Draft Geotechnical Study are provided as Appendices C and D, respectively. The following sections offer a summary of the evaluations and findings.

3.5.1. Environmental Resources Desktop Study

The environmental review was conducted by ICF through a desktop review of literature and databases and mapping of environmental resources. The following statures were consulted when finding potential constraints:

- Sections 404, 301, and 401 of the Clean Water Act (CWA)
- Section 10 of the Rivers and Harbors Act (RHA)
- Endangered Species Act (ESA)
- Bald and Golden Eagle Protection Act (BGEPA)
- Migratory Bird Treaty Act (MBTA)
- National Historic Preservation Act (NHPA)
- Antiquities Code of Texas (ACT)

The environmental report noted the potential for intermittent streams, shown in Figure 3.8, which require further investigation. The alignment intersects two database-mapped intermittent steam reaches. Therefore, a field visit to identify and map the boundaries of Waters of the U.S. (WOTUS), and wetlands is recommended to avoid federal permitting and construction considerations. Should the route enter federal jurisdictional waterways an evaluation for federally listed and proposed species would be required. It is anticipated that proposed impacted project species could include the tricolored bat and monarch butterfly. Similarly, though not expected, ICF recommended a field investigation to identify any bald eagle nest or presence within 660 feet of the project alignment.

3.5.2. Cultural Resources Desktop Study

The cultural review conducted by ICF through a desktop review of literature and databases and mapping of cultural resources stated that the known architectural sites are closer to Cibolo Creek and not expected in the alignment corridor.

To protect archaeological artifacts, the recommended Cultural Survey would require the concurrence of the Texas Historical Commission (THC). ICF has prepared a draft letter and described a cultural survey through shovel testing and mechanical trenching is recommended in greenfield or previously undeveloped regions of the project. This would be required for the open-cut installation of a wastewater trunk main. These regions are highlighted in yellow in Figure 3.9.

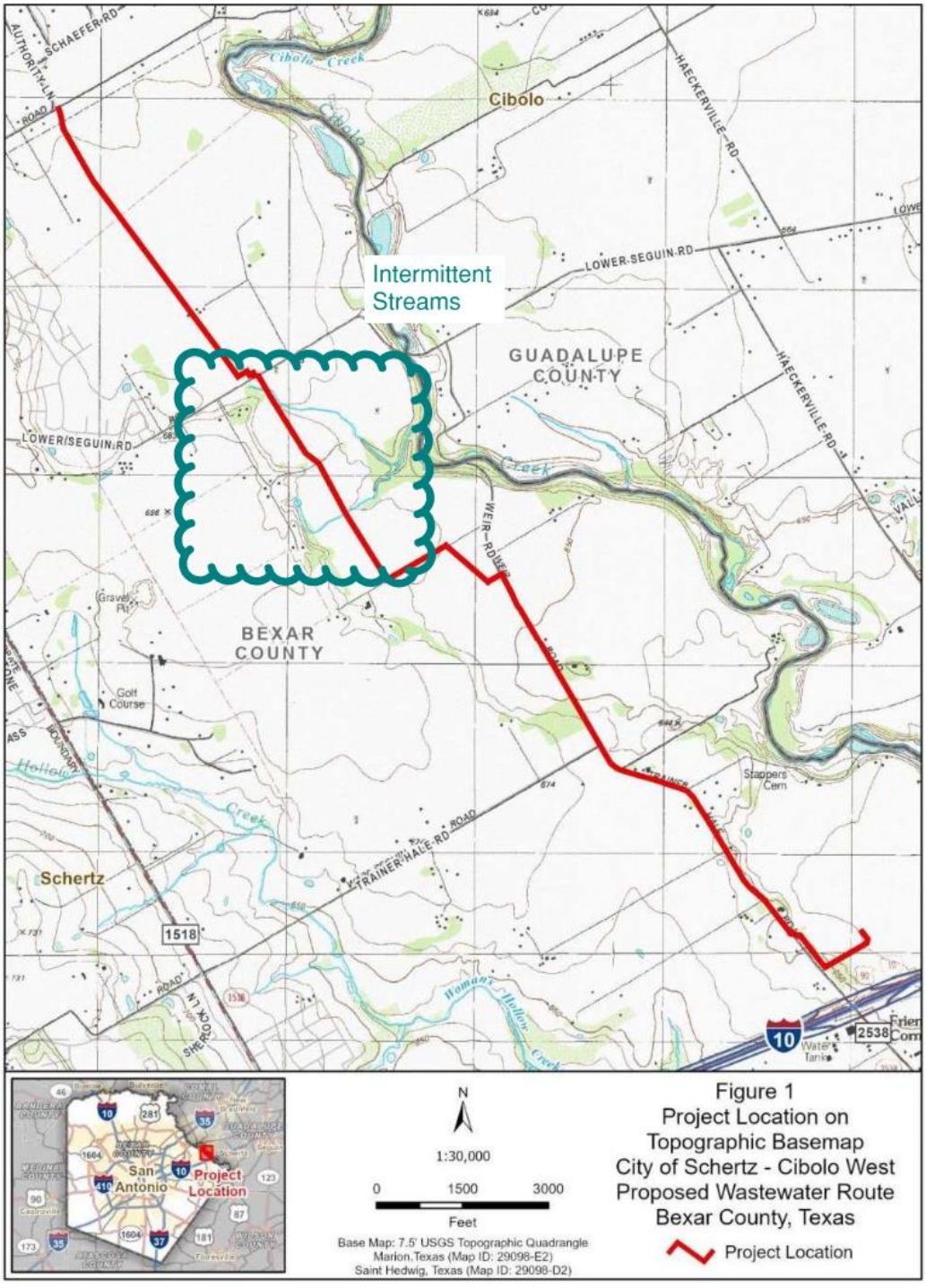
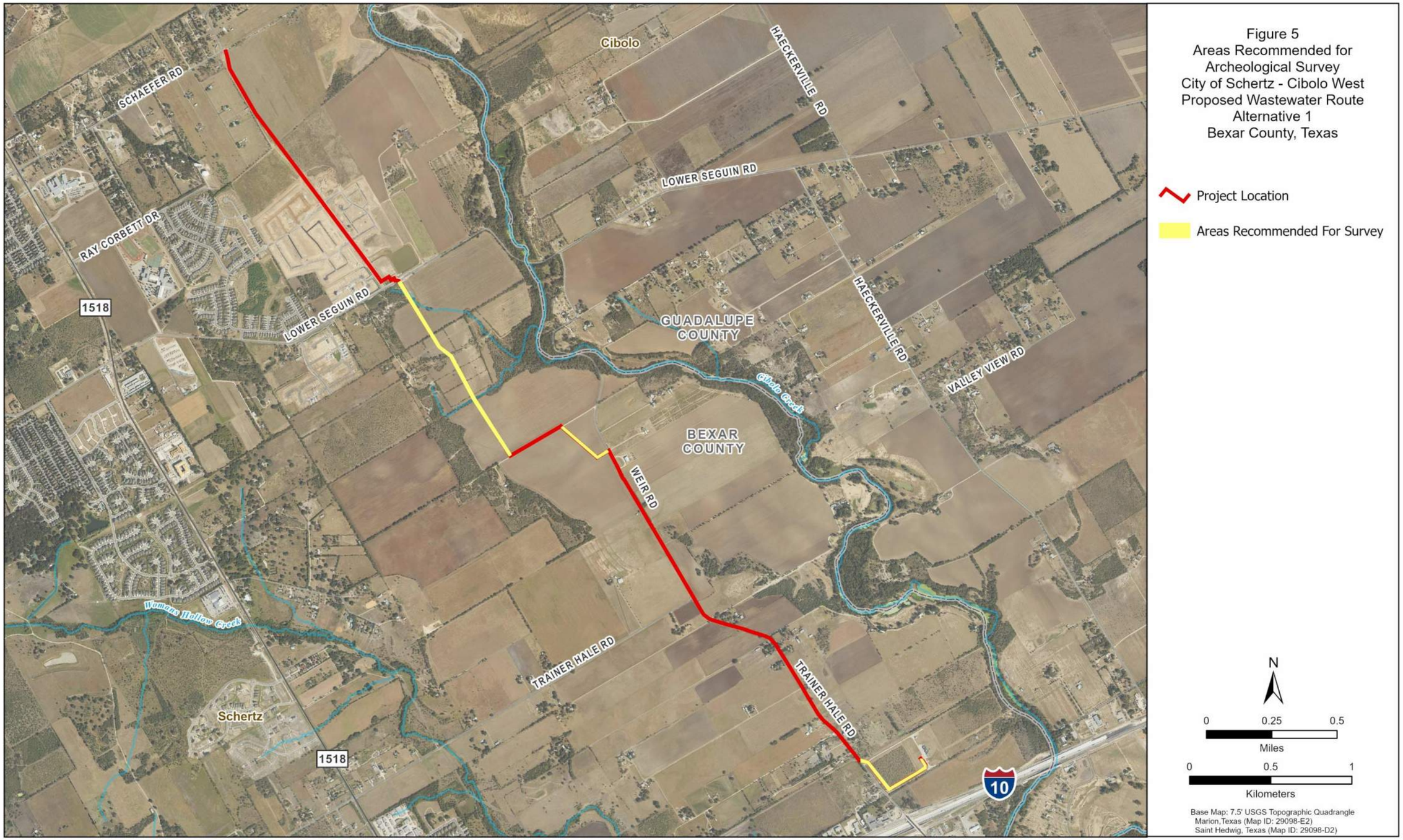


Figure 3.8 Intermittent Stream Identification[4]

[4] Environmental and Cultural Resources Report – Cibolo Valley West Trunk Main Route Study and Analysis City of Schertz, Bexar County Texas

Figure 3.9 Recommended Archeological Site Survey Locations

Request for Concurrence with Desktop Review
Proposed City of Schertz Cibolo Valley West Trunk Main Route Study and Analysis
Bexar County, Texas
May 23, 2025
Attachments



3.5.3. Geotechnical Desktop Study

Raba Kistner, Consultants Inc. (RKCI) conducted a desktop geotechnical study for the Cibolo West Trunk Main. RKCI looked at project location, geographical information from the Geologic Atlas of Texas (San Antonio Sheet), groundwater database, and historical borings. An overview of the historical borings reviewed are shown in Figure 3.10.

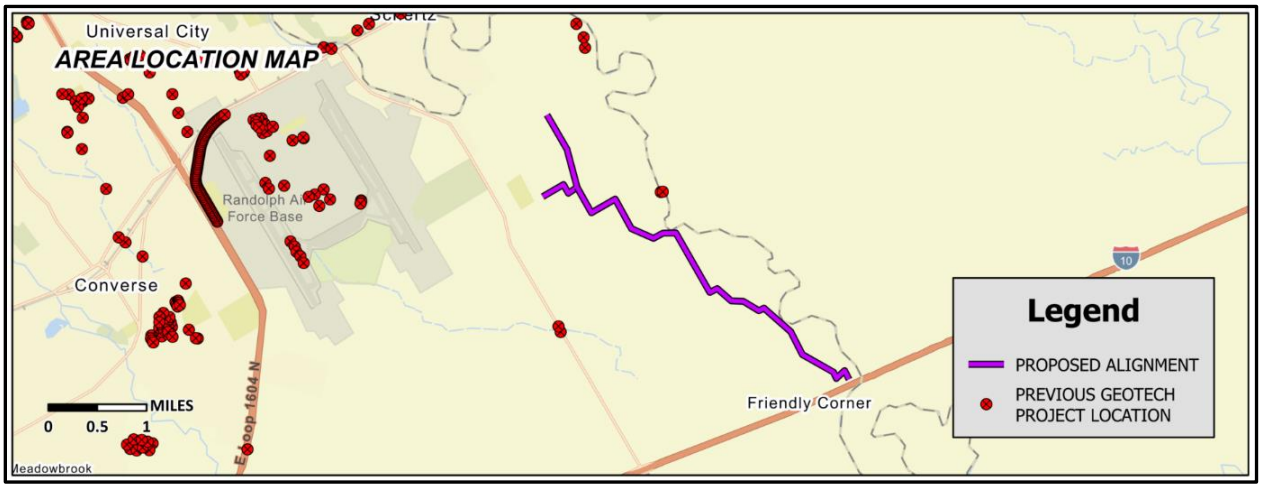


Figure 3.10 Historic Geotechnical Borings

The following were found and identified as parameters which could affect the design:

- Localized fill from previous development
- Highly plastic, dark brown clay overlying tank gravel/sand 10-13 feet below ground
- Groundwater 13-15 ft below ground

Furthermore, RKCI identified other design considerations: the presence of groundwater in granular stratums, the sloughing of excavation walls in granular soils, and the presence of expansive soil and potential soil movements. These should be evaluated with geotechnical field exploration during the design phase. The geological formations identified are shown in Figure 3.11.

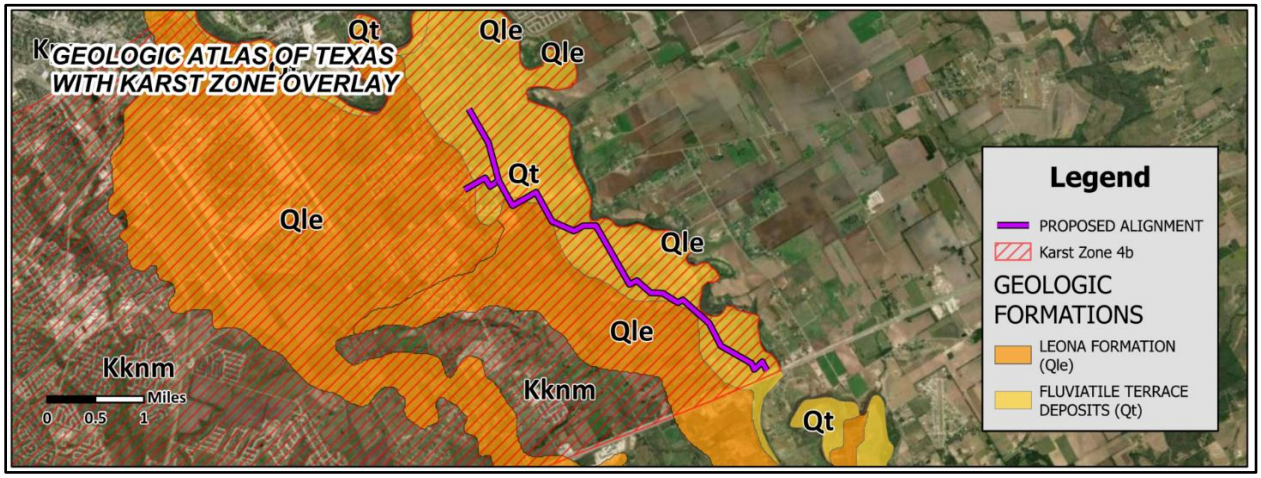


Figure 3.11 Geological Formations

4. Sewershed Evaluation

4.1. Overview

As part of the Cibolo West Trunk Main Route Study and Analysis, sewershed evaluation played a key role in sizing and evaluating the alignment corridor, and performance of the proposed wastewater trunk main. Hydraulic modeling was conducted to simulate projected wastewater flows, and support decision-making regarding trunk main sizing and alignment corridor. The hydraulic model also served as a tool to evaluate buildout conditions for both the City of Schertz (Schertz) and the Green Valley Special Utility District (GVSUD), helping to confirm the proposed trunk main can reliably convey projected flows to the Cibolo Creek Municipal Authority (CCMA) South WWTP.

4.2. Hydraulic Modeling Methodology

LAN utilized the Schertz hydraulic model developed as part of the 2024 Wastewater Master Plan (WWMP) as the foundation for this analysis. The 2050 wet weather flow scenario from Schertz's model served as the base scenario, which included sanitary flows from:

(1) the existing system (including flows currently directed to the Corbett Lift Station) and (2) future developments identified in the 2024 Wastewater Master Plan (including future flows from vacant lands north of Schaefer Road and within the Cibolo sewershed).

For the new buildout scenario, future sanitary flows were updated to reflect increased contributions from planned developments within both the City of Schertz and the GVSUD's Certificate of Convenience and Necessity (CCN). At Schertz's request, twelve specific planned developments were incorporated into the buildout scenario. The specific planned developments are included to represent realistic development patterns in the area. The planned developments identified herein are intended to represent probable development patterns within the study area.

While not all subdivisions listed in Table 4.1, Table 4.2, Table 4.3, and Figure 4.1 have been confirmed for construction, it is assumed that equivalent developments of similar scale and character will occur should these specific subdivisions not proceed. Sanitary demands for these developments were estimated using a unit flow rate of 245 gallons per day per equivalent dwelling unit (gpd/EDU). The resulting average dry weather flows (DWF) are summarized in Table 4.1.

In addition, LAN assumed that all privately owned, undeveloped properties, including parcels with existing homes not currently connected to a sewer system, as well as vacant lands within the Schertz and GVSUD CCNs and located within the Cibolo West sewershed, would be fully developed under buildout conditions. The following approach was used to estimate sanitary demands for these areas:

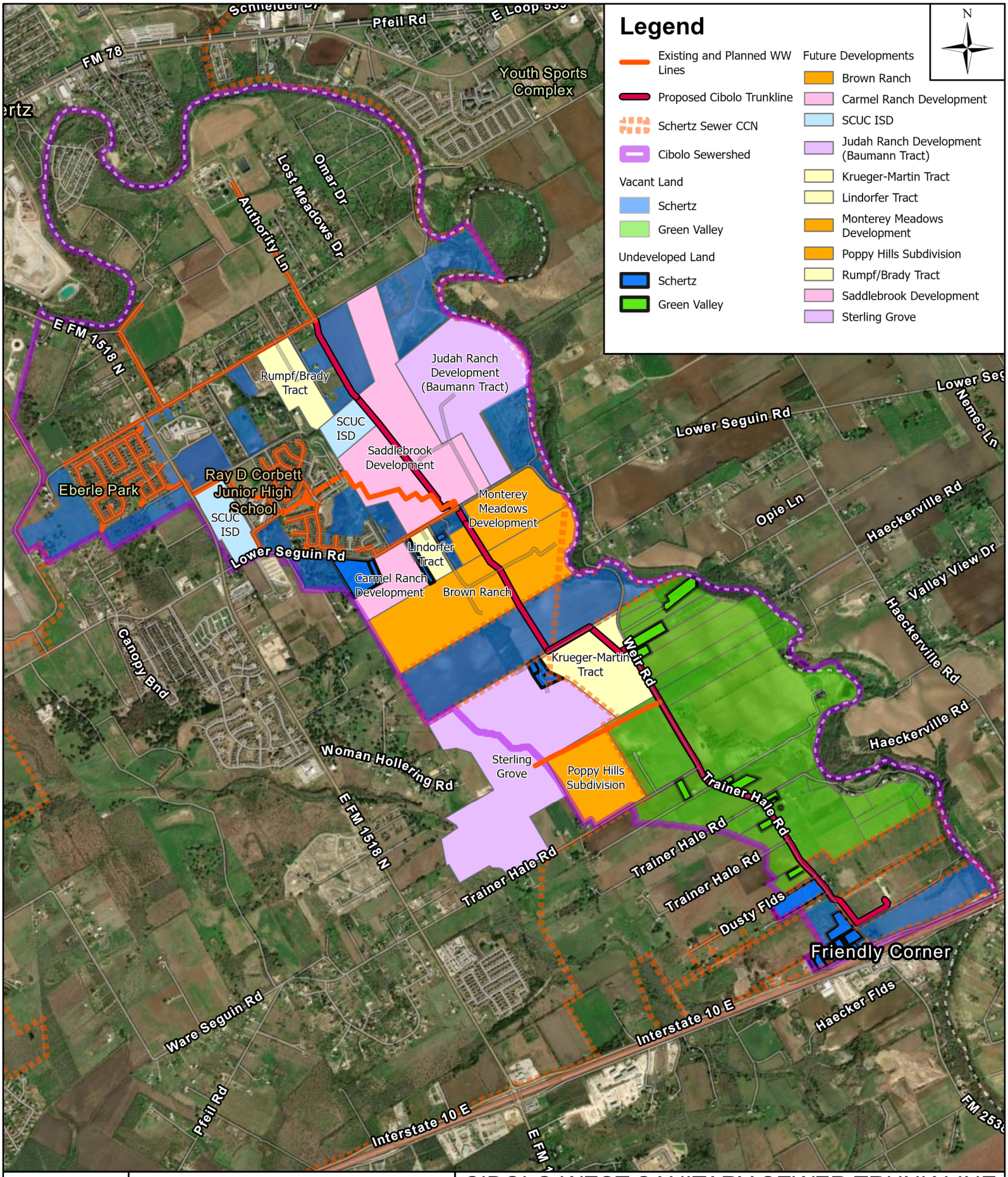
1. Undeveloped and vacant land parcels were identified using parcel data provided by Schertz.
2. A development density of four (4) EDUs per acre and a unit flow rate of 245 gpd per EDU were applied to calculate the projected sanitary loadings based on the Schertz Public Works Design Guide.

Table 4.1 Future Planned Development Summary

Future Planned Developments	CCN	Area (acre)	EDUs	Area in Cibolo Sewershed (%)	EDUs in Cibolo Sewershed	Average DWF (gpm)	Average DWF (MGD)
Rumpf/Brady Tract	Schertz	44.12	250	100	250.0	43	0.06
Saddlebrook Development	Schertz	217.07	634	100	634.0	109	0.16
Carmel Ranch Development	Schertz	39.87	127	100	127.0	22	0.03
Lindorfer Tract	Schertz	15.22	63	100	63.0	11	0.01
Monterey Meadows Development	Schertz	76.65	174	100	174.0	30	0.04
SCUC ISD Property 1	Schertz	24.88	200	100	200.0	34	0.05
Judah Ranch Development (Baumann Tract)	Schertz	163.74	420	100	420.0	72	0.10
Poppy Hills Subdivision	Schertz	78.32	204	100	204.0	35	0.05
Sterling Grove	Schertz	283.04	832	43	358.6	61	0.09
Krueger-Martin Tract	Green Valley	85.32	461	100	461.0	78	0.11
SCUC ISD Property 2	Schertz	36.94	160	100	160.0	27	0.04
Brown Ranch	Schertz	192.86	600	100	600.0	103	0.15
Total					**3,651.6**	**625**	**0.89**

Figure 4.1 shows future planned developments, undeveloped and vacant lands considered for the buildout condition.

Figure 4.1 Future Planned Development



APPROVED:	LKL
CHECKED:	BK
PREPARED:	RJH
	8/6/2025

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CIBOLO WEST SANITARY SEWER TRUNK LINE

PLANNED AND FUTURE DEVELOPMENTS IN THE SEWERSHED

0 1,500 3,000 6,000 Feet

N:\120\120-11816-014\4-0-Production-Working\4-9-GIS\Working Project Data and Maps\000_APRX\8_06_2025_Contributing Equivalent Development Units_Zane.aprx
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Table 4.2 summarizes the dry weather sanitary loadings for the Cibolo West Trunk Main.

Table 4.2 Sanitary Loadings for Cibolo West Trunk Main

Type	EDU	Average DWF (gpm)	Average DWF (MGD)
Future Planned Developments (See Table 4.1)	3,651.6	625	0.89
Undeveloped and Vacant Lands	5,736.0	979	1.41
Existing System from 2024 WWMP	517.2	880	0.13
Future Planned Developments from 2024 WWMP	911.0	155	0.22
Total	10,815.8	2,639	2.65

Table 4.3 tallies the flows and percentages for Schertz and GVSUD.

Table 4.3 Development Flows Table

WEST CIBOLO CREEK
TRUNK MAIN SIZING FLOWS
Date: 08/06/2025

West Cibolo CreekMaster Plan Trunkline Flows	gpm	EDUs	Avg MGD
Existing Flows	88	517.22	0.13
Future Developments *	155	911.0	0.22

Future Development	CCN	Area (acre)	EDUs	Acres inside Cibolo Sewershed	% Area inside Cibolo Sewershed	EDUs in Cibolo Sewershed	Avg MGD
Rumpf/Brady Tract	Schertz	44.12	250	44.12	100	250.0	0.06
Saddlebrook Development *	Schertz	217.07	634	217.07	100	634.0	0.16
Carmel Ranch Development *	Schertz	39.87	127	23.00	100	127.0	0.03
Lindorfer Tract	Schertz	15.22	63	15.22	100	63.0	0.01
Monterey Meadows Development	Schertz	76.65	174	76.65	100	174.0	0.04
Schertz-Cibolo-Universal City ISD Property 1	Schertz	24.88	200	24.88	100	200.0	0.05
Judah Ranch Development (Baumann Tract)	Schertz	163.74	420	163.74	100	420.0	0.10
Poppy Hills Subdivision	Schertz	78.32	204	43.00	100	204.0	0.05
Sterling Grove *	Schertz	283.04	832	122.00	43	358.6	0.09
Krueger-Martin Tract	Green Valley	85.32	461	85.32	100	461.0	0.11
Schertz-Cibolo-Universal City ISD Property 2	Schertz	36.94	160	36.94	100	160.0	0.04
Brown Ranch	Schertz	192.86	600	123.00	100	600.0	0.15

**** These Development EDUs were updated in June 2025.***

Green Valley	461.0	0.11
Schertz	3,190.63	0.78
Total	**3,651.6**	0.89

Undeveloped Land	Area (acre)	EDUs	Avg MGD
Schertz	721.00	2,884.0	0.71
Green valley	713.00	2,852.0	0.70
Total	**1,434.00**	**5,736.0**	**1.41**

	Percentage	EDU	Avg MGD
Sewershed Total (Schertz)	**69**	7,502.9	1.84
Sewershed Total (Green Valley)	**31**	3,313.0	0.81
Sewershed Total (Existing + Development + Vacant Lands)	**100**	**10,815.9**	2.65

Table 4.4 presents the breakdown of EDUs between the City of Schertz and GVSUD for the Cibolo West Trunk Main.

Table 4.4 Breakdown of EDUs between Schertz and GVSUD

Type	Total EDU	Schertz's EDUs	GVSUD's EDUs	Schertz Percentage	GVSUD Percentage
Future Planned Developments (See Table 4.1)	3,652	3,191	461	87	13
Undeveloped and Vacant Lands	5,736	2,884	2,852	51	49
Existing System from 2024 WWMP	517	517	0	100	0
Future Planned Developments from 2024 WWMP	911	911	0	100	0
Total	**10,816**	**7,503**	**3,313**	**69**	**31**

4.3. Design Criteria

Design criteria guide the sizing and profile of new facilities in accordance with the Texas Commission on Environmental Quality (TCEQ) requirements and established engineering best practices. Table 4.5 provides a summary of the design criteria applied to the new sewer lines. According to the criteria in Table 4.5 for maximum allowable flow depth, surcharging was not permitted in new trunk mains.

Table 4.5 Design Criteria for New Sewer Lines

Item	Recommended Value
Maximum Allowable Flow Depth	Maximum depth-to-diameter (d/D) of 1.0 (full pipe) under peak design flow
Slopes for Gravity Lines	18-inch: 0.115% to 2.83%
	24-inch: 0.08% to 1.93%
	30-inch: 0.06% to 1.43%

4.4. Design Storm

For continuity with the Schertz 2024 Wastewater Master Plan, a 5-year design storm with a 24-hour duration was applied to the model. For the City of Schertz, the rainfall depth provided in the National Oceanic and Atmospheric Association's Atlas 14 precipitation frequency estimates is 5.4 inches (NOAA Atlas 14, Precipitation-Frequency Atlas of the United States, Volume 11 Version2.0: Texas, 2018 - https://hdsc.nws.noaa.gov/pfds/).

The rainfall depth was distributed over time using the Soil Conservation Service (SCS) rainfall distribution Type III, representing the rainfall temporal distribution type for the Gulf of Mexico and Atlantic coastal areas (USDA National Engineering Handbook Part 640, Chapter 4, Storm Rainfall Depth and Distribution). Figure 4.2 shows the hyetograph of the design storm used for this evaluation.

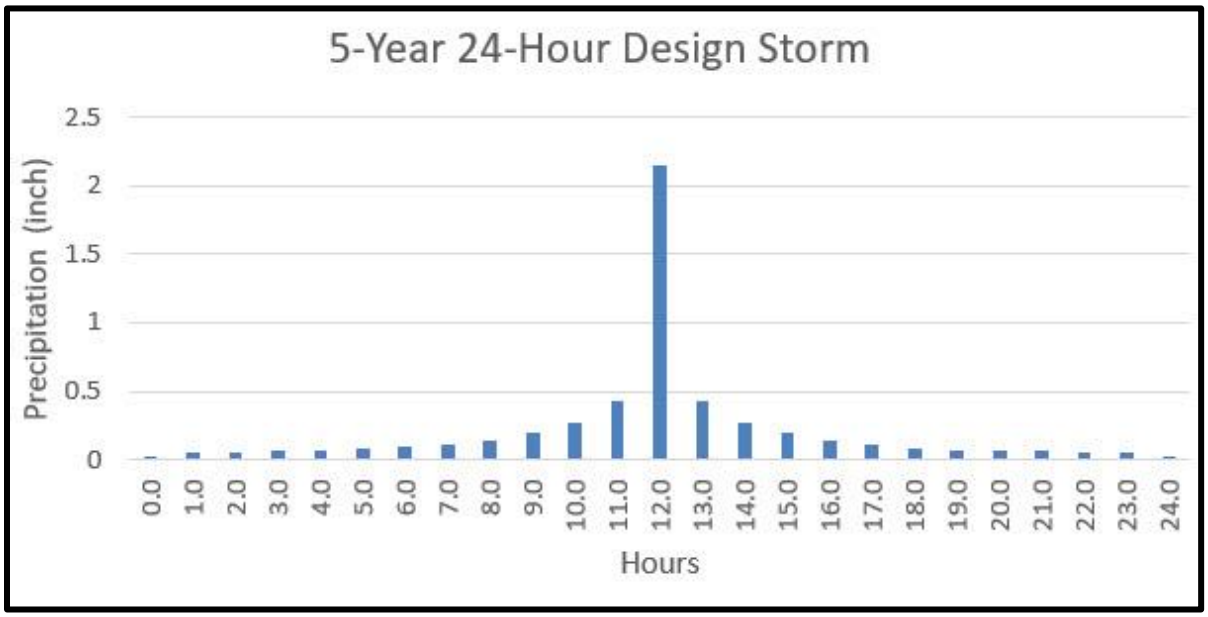


Figure 4.2 Schertz's 5-Year 24-Hour Design Storm

4.5. Inflow and Infiltration Assumptions

RTK hydrographs developed as part of the City of Schertz's 2024 Wastewater Master Plan were used to represent inflow and infiltration (I&I) in the existing system model. These hydrographs reflect I&I conditions for the current infrastructure and service areas. To account for peak dry weather flows, diurnal curves were also incorporated into the analysis.

For future development areas outside the existing service boundaries where historical I&I data is unavailable, a peaking factor of 4 was applied to account for the increase from average dry weather flow to peak dry weather flow with inflow and infiltration (I&I). This reflects a peaking factor of 3 for peak dry weather flow and an additional factor of 1 for I&I. This approach assumes that new infrastructure will be constructed to current standards and, as a result, will lower susceptibility to I&I and is consistent with the approach used in the Schertz 2024 Wastewater Master Plan.

4.6. Future System Analysis

The future system analysis considered two planning periods: (1) near-term, which included all demand categories listed in Table 4.2 except undeveloped and vacant lands, and (2) buildout. For each planning period, both dry and wet weather conditions were evaluated. To model new development areas, LAN allocated future sanitary flows to the nearest manholes along the Cibolo West Trunk Main. It was assumed that developers would be responsible for extending sewer connections from their developments to the trunk main.

The buildout wet weather condition represents the most conservative scenario for designing the Cibolo West Trunk Main and was therefore used as the basis for determining pipe sizes. Modeling results indicated that the proposed trunk main would consist of a series of 18-inch, 24-inch, and 30-inch diameter segments, progressing from upstream to downstream, and ultimately discharging to the CCMA South WWTP.

Figures 4.3 and 4.4 illustrate the plan and profile views of the proposed trunk main alignment corridor. As shown in Figure 4.3, the alignment corridor begins near Schaefer Road and extends south to the CCMA South WWTP, following existing roadways, utility corridors, and parcel boundaries.

4.6.1. Trunk Main Segments

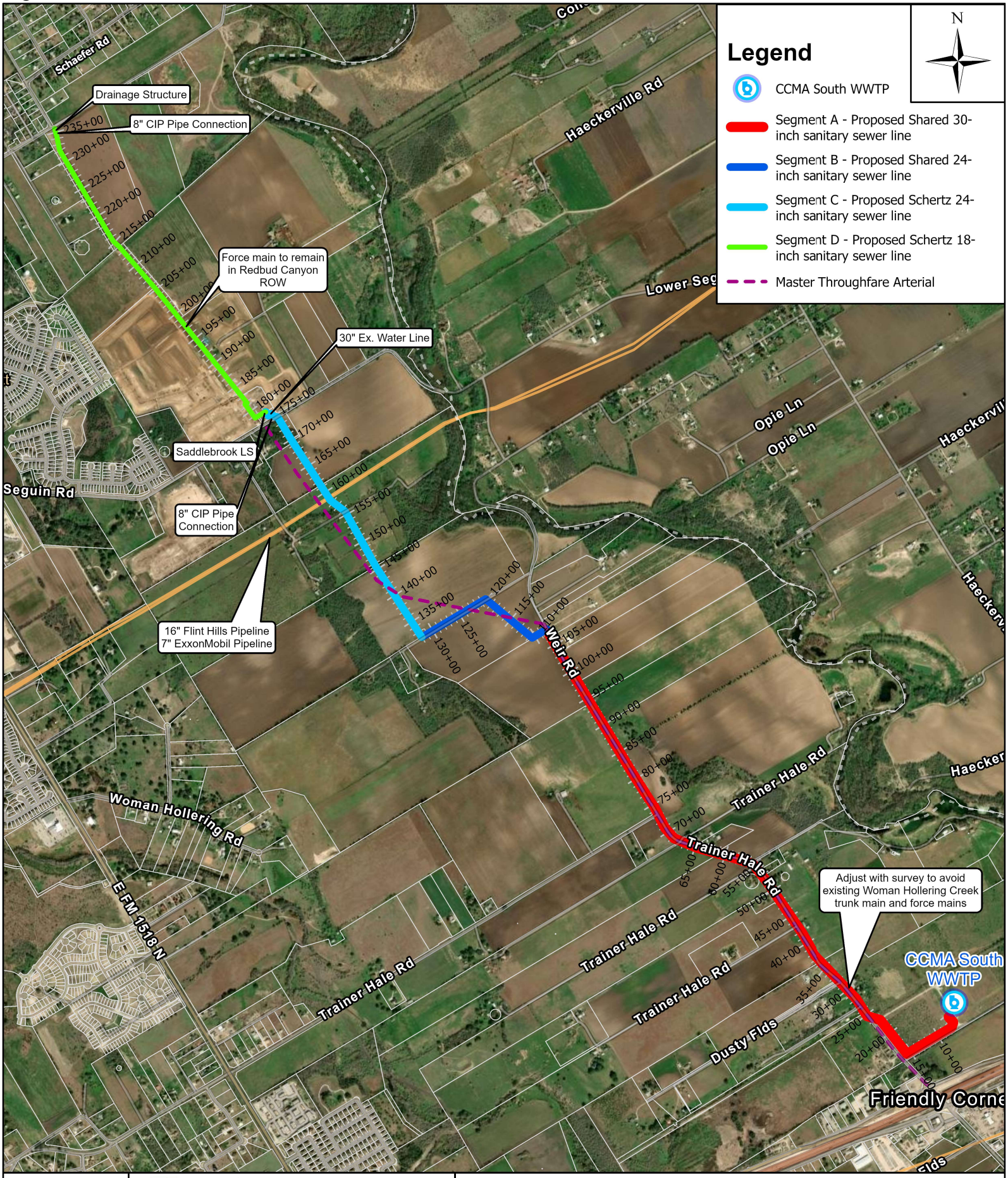
The Cibolo West Trunk Main consists of four primary segments:

- Segment A: a shared 30-inch sanitary sewer serving both the City of Schertz and GVSUD, located at the downstream end.
- Segment B: a shared 24-inch segment, serving both entities.
- Segment C: a 24-inch line serving only the City of Schertz, located upstream of Segment B.
- Segment D: The most upstream portion, a Schertz-only 18-inch sanitary line.

This configuration was selected based on projected flows and capacity requirements under ultimate buildout conditions.

Figure 4.4 shows the profile view of the proposed Cibolo West Sanitary Sewer Trunk Line, providing a detailed look at the ground elevation, pipe profile and slope, and key features and invert elevations along the route from Schaefer Road to the CCMA South WWTP.

Figure 4.3 Cibolo West Trunk Main Plan



APPROVED:	LKL
CHECKED:	LKL
PREPARED:	ZRJ
	8/21/2025

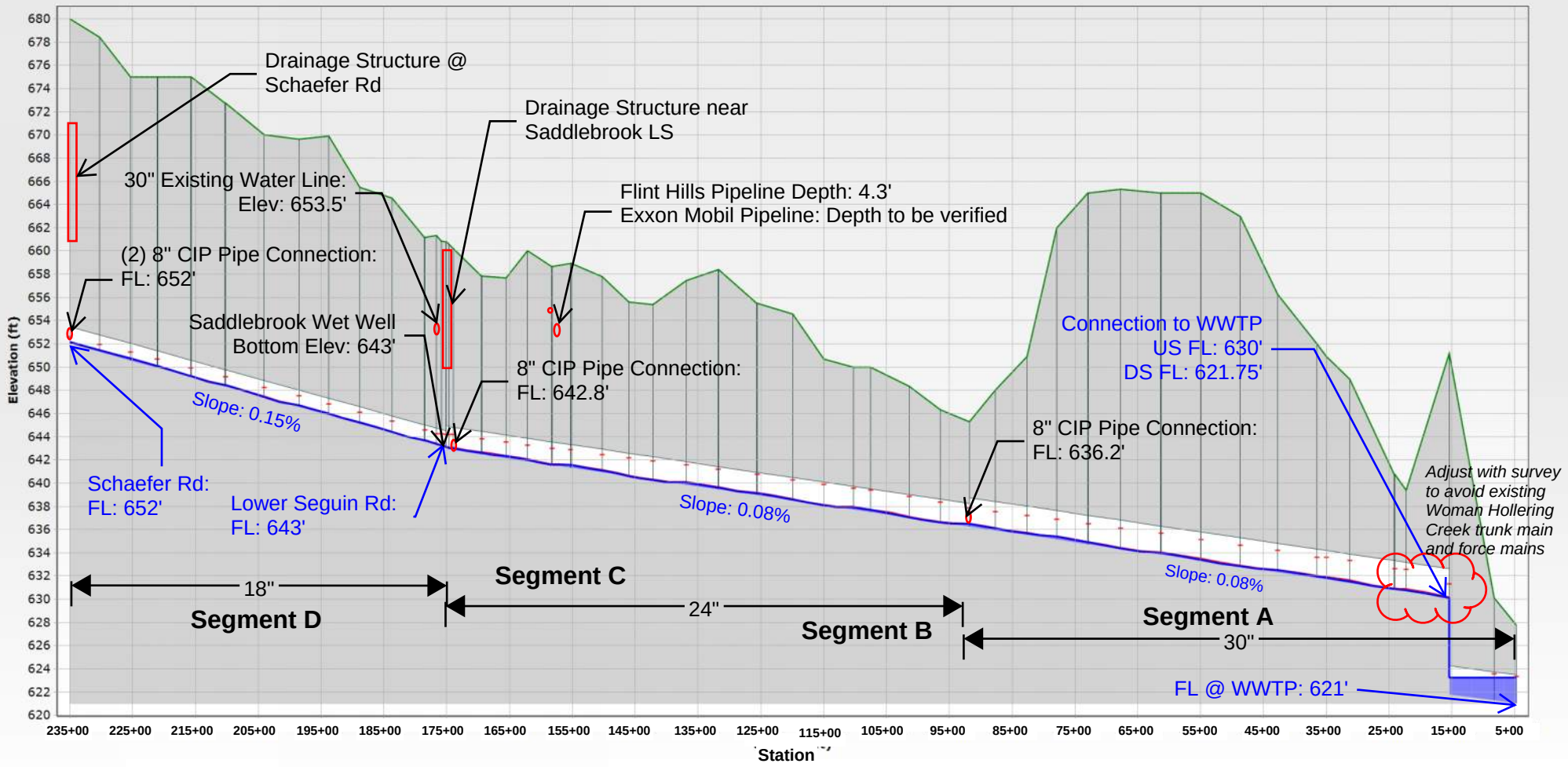
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CIBOLO WEST WASTEWATER TRUNK LINE ALIGNMENT CORRIDOR

0 1,100 2,200 4,400 Feet

N:\120\120-11816-014\4-0-Production-Working\4-9-GIS\Working Project Data and Maps\000_APRX\6_06_2025_Shertz_Cibolo_Route_Study.aprx
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Figure 4.4 Cibolo West Trunk Main Profile



APPROVED:	LKL
CHECKED:	LKL
PREPARED:	BK
	6/23/2025

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CIBOLO WEST SANITARY SEWER TRUNK PROFILE

Proposed Alignment Corridor

Not To Scale

4.7. Future System Scenarios

In this section, the results of future system scenarios are discussed.

4.7.1. Near-Term Scenarios

The near-term planning period included all demand categories listed in Table 4.2 except undeveloped and vacant lands. Dry and wet weather condition scenarios for the near-term planning period were created. The model was run under dry weather conditions. The modeling results representing the maximum depth-to-diameter (d/D) for this scenario are presented in Figure 4.5. The near-term results indicate that approximately 68% of the Cibolo West Trunk Main length experiences a maximum d/D of less than 0.5, about 30% falls between 0.5 and 0.75, and only 2% exceeds 0.75.

Then the model ran under wet weather conditions. The modeling results representing the maximum depth-to-diameter (d/D) for this scenario are presented in Figure 4.6. The results indicate that approximately 53% of the Cibolo West Trunk Main length experiences a maximum d/D of less than 0.5, about 45% falls between 0.5 and 0.75, and only 2% exceeds 0.75 in the near-term.

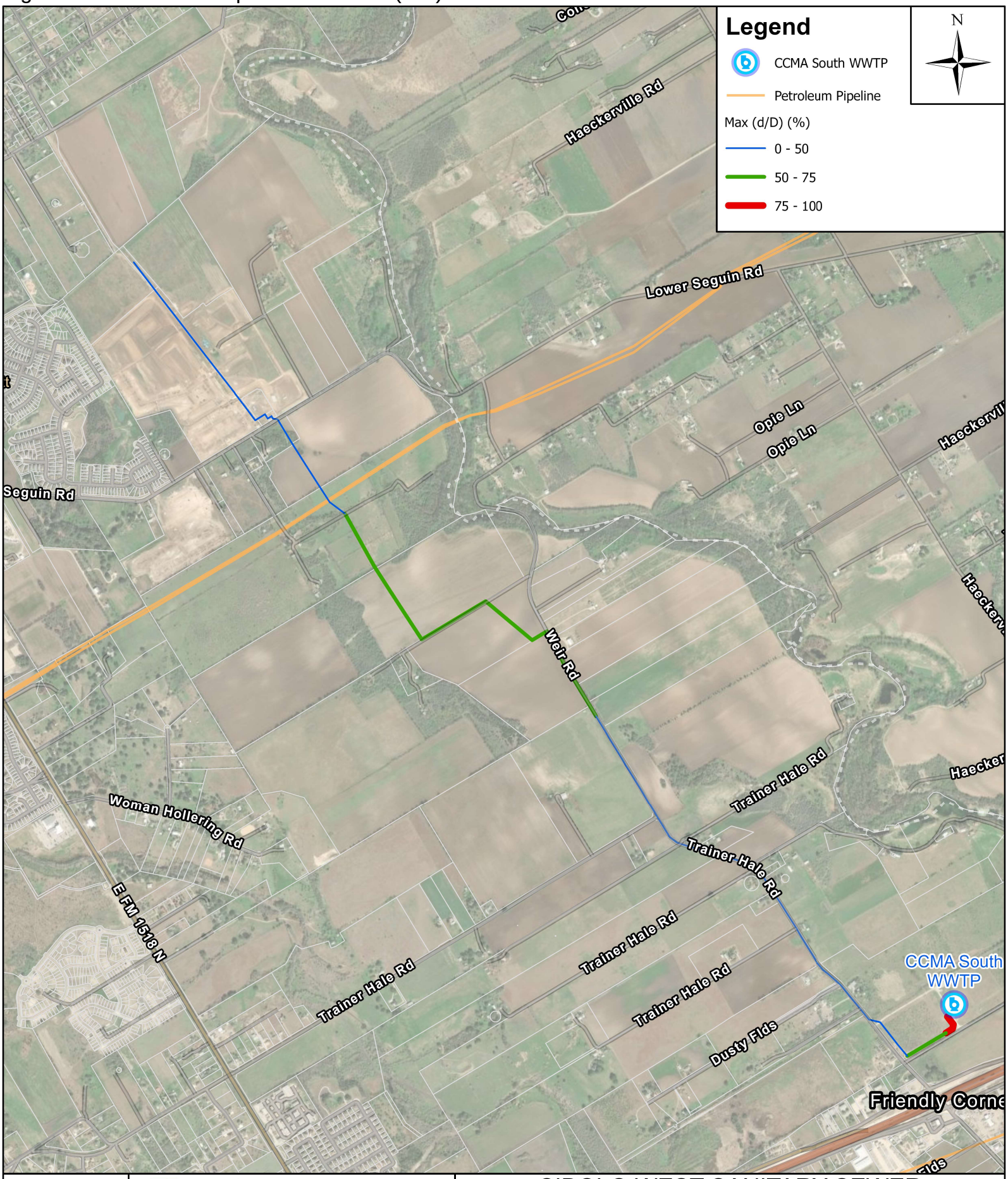
Due to rapid and unpredictable development, Schertz and GVSUD requested the trunk main be sized for the buildout planning period and examined for feasibility in the near-term. Excess capacity observed in the near-term trunk main model loading conditions will be utilized as the system grows towards buildout.

4.7.2. Build-Out Scenarios

Dry and wet weather condition scenarios for the buildout planning period were created. The model was run under dry weather conditions. The modeling results representing the maximum depth-to-diameter (d/D) for this scenario are presented in Figure 4.7. The results indicate that approximately 16% of the Cibolo West Trunk Main length experiences a maximum d/D of less than 0.5, about 79% falls between 0.5 and 0.75, and only 5% exceeds 0.75.

Then the model ran under wet weather conditions. The modeling results representing the maximum depth-to-diameter (d/D) for this scenario are presented in Figure 4.8. The results indicate that approximately 6% of the Cibolo West Trunk Main length experiences a maximum d/D of less than 0.5, about 65% falls between 0.5 and 0.75, and 29% exceeds 0.75.

Figure 4.5 Maximum Depth-to-Diameter (d/D) with Near-Term DWF



APPROVED:	
CHECKED:	LKL
PREPARED:	BK
6/19/2025	

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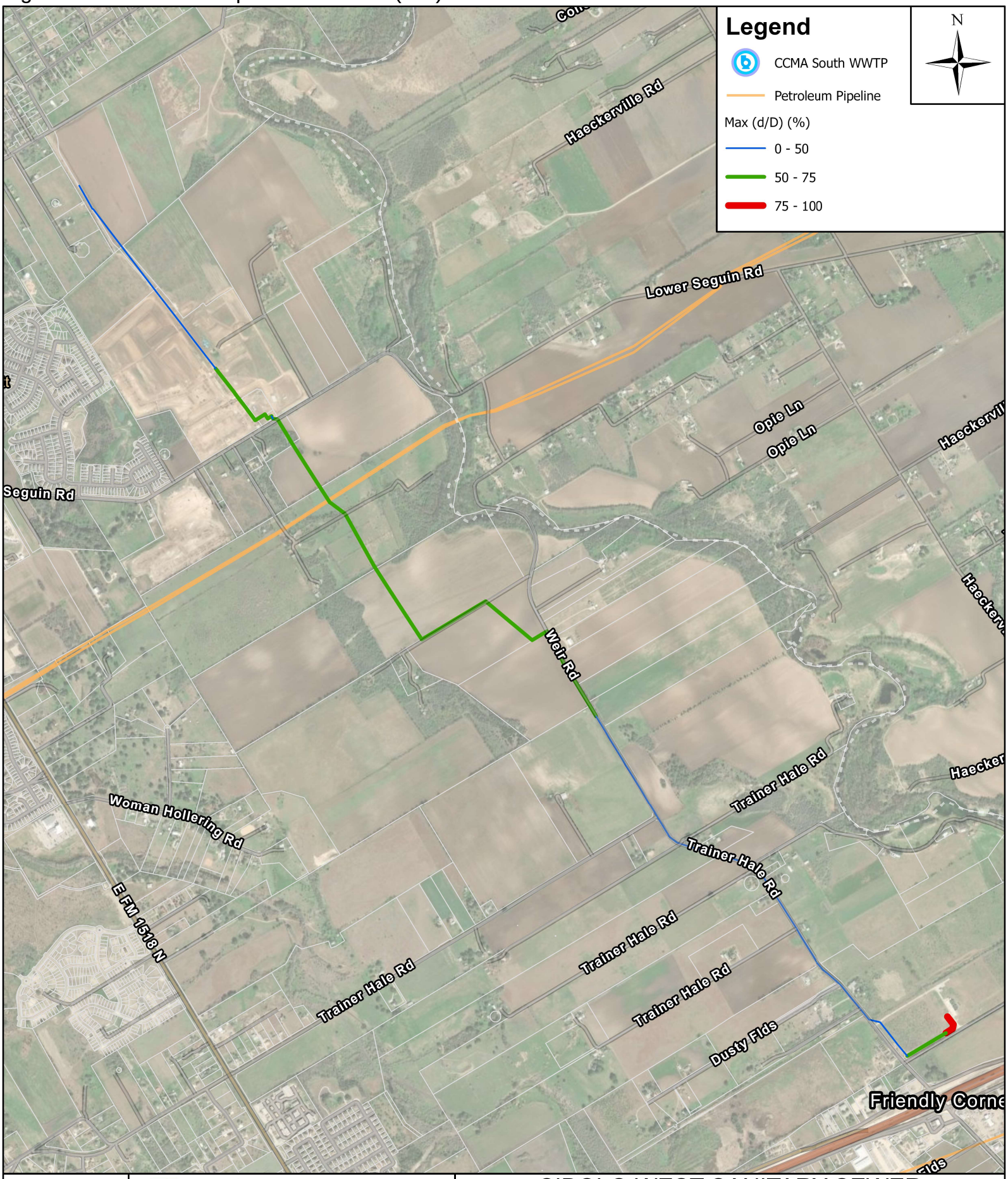
CIBOLO WEST SANITARY SEWER TRUNK LINE ALIGNMENT

Max Depth-to-Diameter (d/D) with Near Term DWF

0 1,000 2,000 4,000 Feet

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Figure 4.6 Maximum Depth-to-Diameter (d/D) with Near-Term WWF



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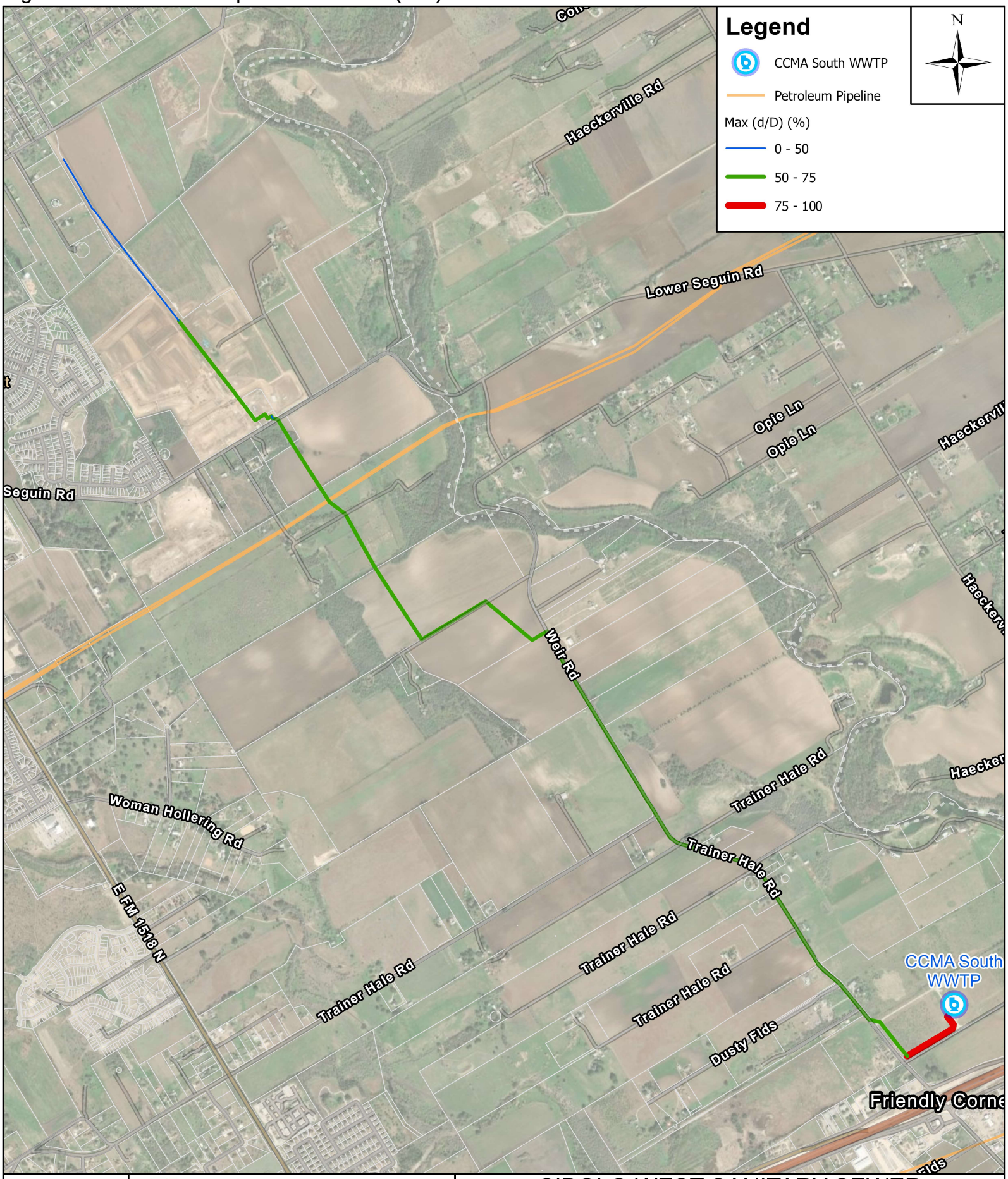
CIBOLO WEST SANITARY SEWER TRUNK LINE ALIGNMENT

Max Depth-to-Diameter (d/D) with Near Term WWF

0 1,000 2,000 4,000 Feet

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Figure 4.7 Maximum Depth-to-Diameter (d/D) with Buildout DWF



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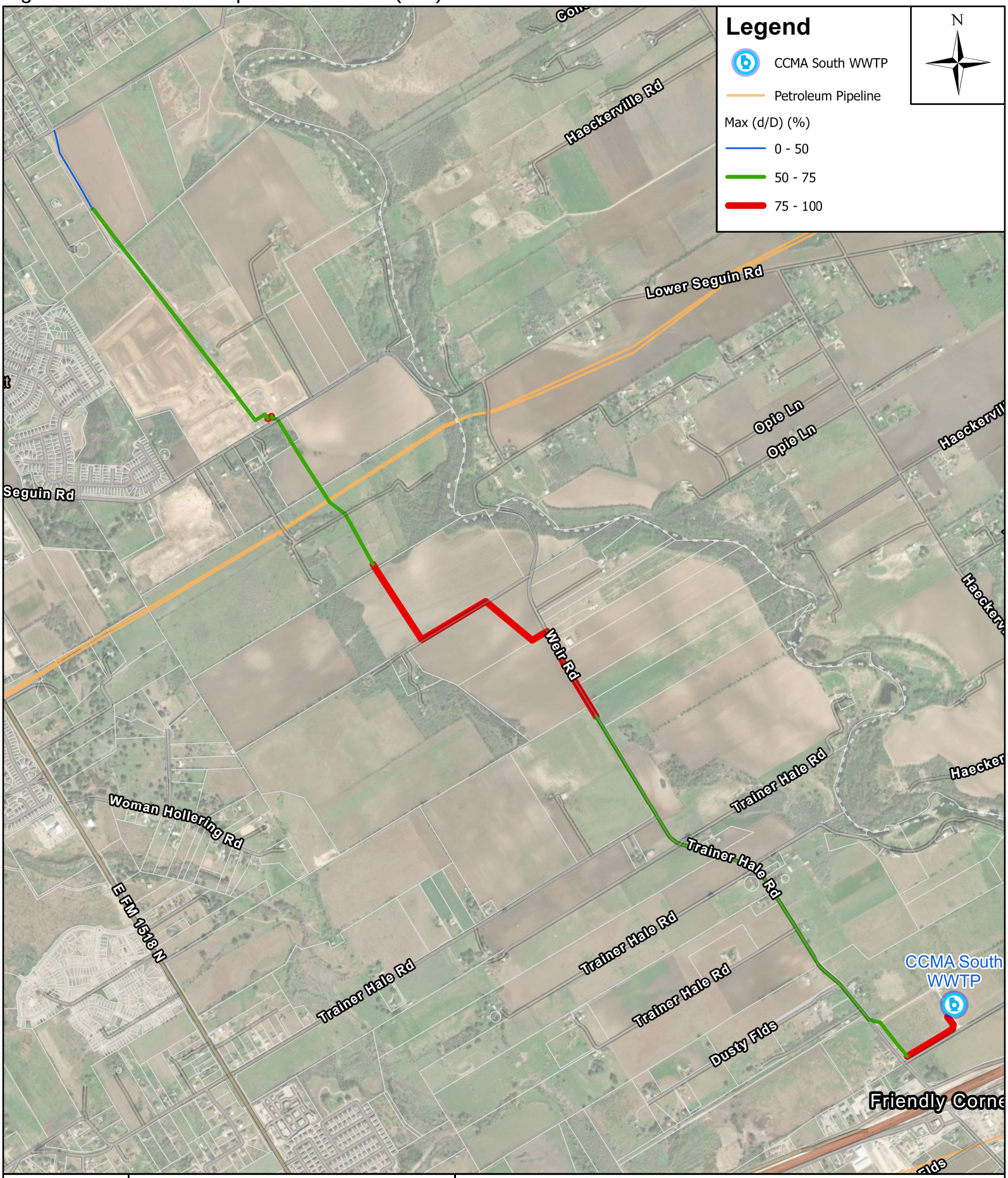
CIBOLO WEST SANITARY SEWER TRUNK LINE ALIGNMENT

Max Depth-to-Diameter (d/D) with Buildout DWF

0 1,000 2,000 4,000 Feet

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Figure 4.8 Maximum Depth-to-Diameter (d/D) with Buildout WWF



APPROVED:	
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PREPARED:	BK
6/19/2025	

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CIBOLO WEST SANITARY SEWER TRUNK LINE ALIGNMENT

Max Depth-to-Diameter (d/D) with Buildout WWF

0 1,000 2,000 4,000 Feet

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4.8. Near-Term Operations & Maintenance Considerations

4.8.1. Self-Cleansing Velocity

Sizing a trunk main for future wastewater flows can affect operations in the near-term. The design criteria specify a minimum velocity of 2 feet per second, commonly referred to as the self-cleansing velocity. This threshold is generally required to limit sediment deposition and maintain hydraulic performance at average daily flow. During very low-flow periods (such as nighttime dry weather), velocities may temporarily drop below 2 ft/s. Such occurrences are acceptable, provided that solids deposition does not impair system function. In the near term, it is recommended that routine inspection, flushing, or cleaning of the trunk main be performed to manage solids accumulation, particularly during extended drought conditions when wastewater contributions are reduced.

For the Cibolo West Trunk Main, the 18-inch, 24-inch, and 30-inch segments, the velocities for average daily flow at both near-term and buildout conditions are at or above 2 ft/s. Overnight, dry weather velocities fall below this threshold, as anticipated. Figures 4.9, 4.10, and 4.11 show the modeled dry weather velocities for both the near-term and buildout scenarios in each trunk main segment. Thus, the Cibolo West Trunk Main satisfies the minimum self-cleansing velocity requirements under average daily flow conditions.

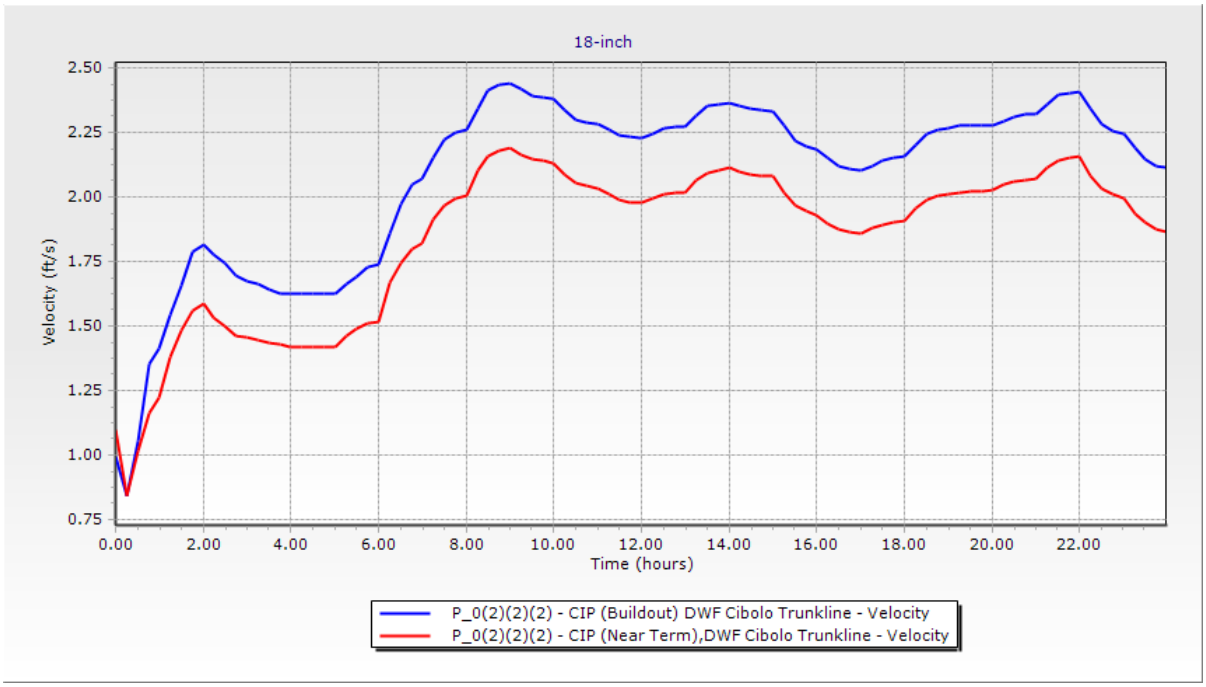


Figure 4.9 Eighteen Inch Dry Weather Velocities

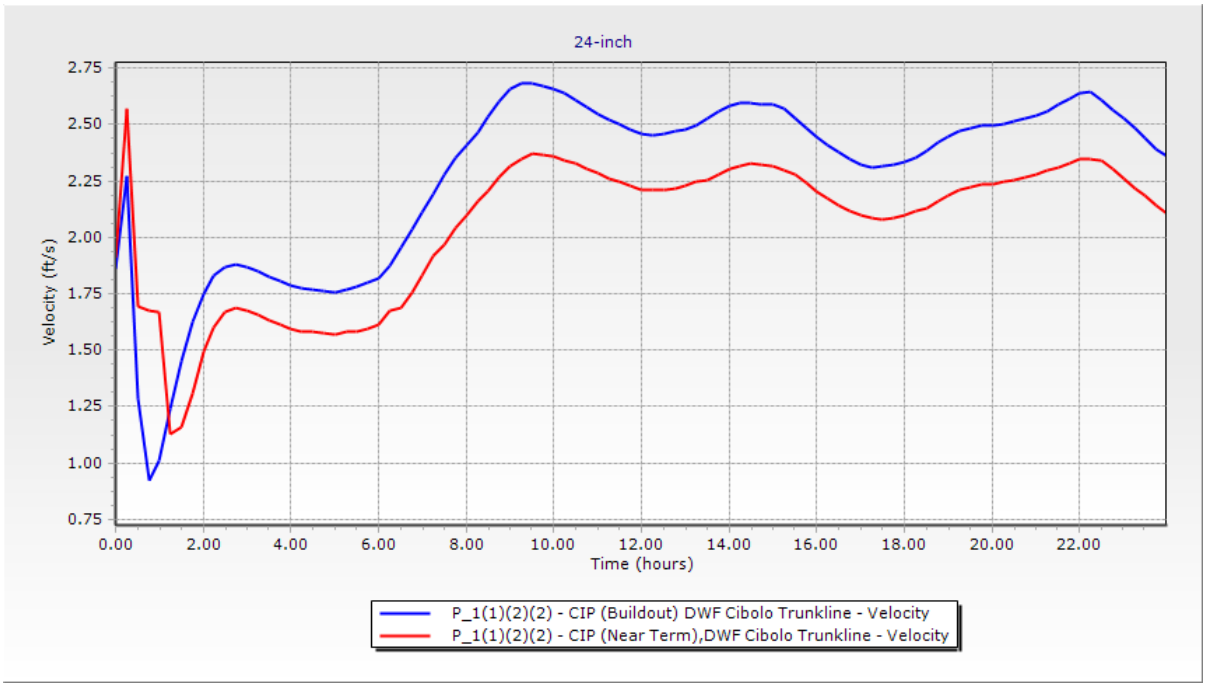


Figure 4.10 Twenty-Four Inch Dry Weather Velocities

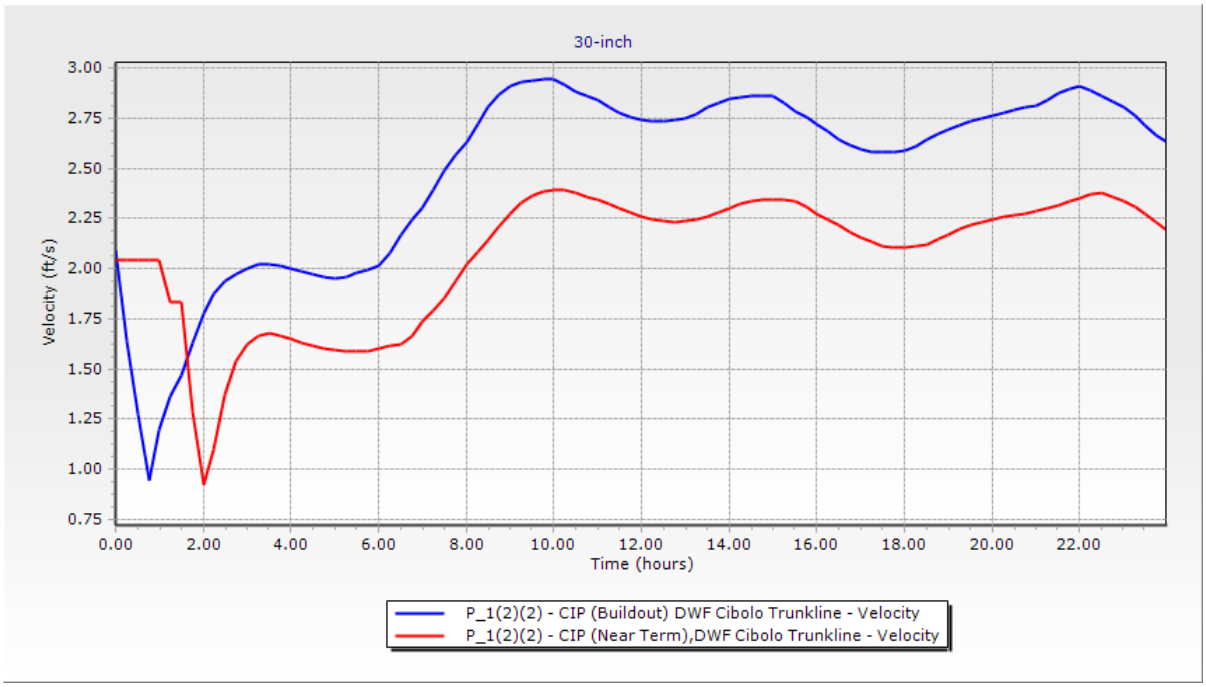


Figure 4.11 Thirty Inch Dry Weather Velocities

4.8.2. Additional Considerations

Proper slope and elevation control in both design and construction will be critical to achieving the required slope to achieve the self-cleansing velocities while avoiding conditions that exceed the pipe flow capacity causing surcharging and overflows. The final design drawings shall include details of pipe sizes, lengths between manholes, slopes, flowline elevations at manhole inverts and outlets, and rim elevations. Elevations should be rounded down during design to ensure adequate fall for gravity flow and to reduce the risk of blockages. Detailed construction as-builts should be required to confirm compliance with the design drawings and to ensure accurate records for future reference.

Management of fats, oils, and grease (FOG) shall also be incorporated as a systemwide consideration. Continued education and enforcement programs are recommended to influence customer behavior, reduce the discharge of un-flushable materials, and minimize the potential for line clogging.

4.9. Projected Sanitary Sewer Flows and Capacity

Based on the wastewater flow projections and the hydraulic modeling results for near-term and build-out conditions, the projected average daily flow and peak flow from the Cibolo West Trunk Main to the CCMA South WWTP were estimated and summarized in Table 4.6.

Table 4.6 Projected Sanitary Sewer Flows from Cibolo West Trunk Main to CCMA South WWTP

Planning Period	Flow Type	gpm	MGD
Near-Term	Average Base Flow	868	1.25
	Peak Flow	2,876	4.14
Buildout	Average Base Flow	1,840	2.65
	Peak Flow	5,764	8.30

4.9.1. Pipe Capacity

Schertz's SewerGEMS model was used to calculate the pipe capacity. The model utilizes the Hazen-Williams equation and a coefficient of 130 (for steel). Although other pipe materials with a higher coefficient are typically used for sanitary sewer pipes, this value was used to provide a more conservative analysis. The projected maximum capacity for each pipe diameter is summarized in Table 4.7. Future development outside of the plan will require modeling to predict the new maximum capacities as the values will not change linearly and are dependent on the modeled plan and actual flows.

Table 4.7 Projected Maximum Capacity for Each Pipe Diameter

Diameter	Slope	Maximum Capacity (MGD)
18-inch	0.15%	3.1
24-inch	0.08%	4.8
30-inch	0.08%	8.6

4.9.2. CCMA South WWTP Expansion

The CCMA South WWTP is anticipated to undergo a future treatment expansion to increase treatment capacity. In the interim, Schertz and GVSUD will continue to implement operational projects and management strategies to accommodate both existing and planned development flows until the Cibolo West Trunk Main is placed into service.

5. Costs and Cost Sharing

5.1. Segment Summary

General, segment, construction, and easement subtotals were calculated separately based on pipeline segments. Pipeline costs were summarized by taking the unit costs and dividing them into four segments based on diameter, depth, and flow share in the pipeline: The summary for Segment A (30-inch), Segment B (24-inch), Segment C (24-inch), and Segment D (18-inch). The flow share is discussed later in this section. Table 5.1 summarizes the construction cost of each pipe segment.

Table 5.1 Overall Opinion of Probable Construction Cost

Segment	Diameter	Construction
General Construction	All	$ 1,275,000
A	30-inch	$ 12,068,430
B	24-inch	$ 3,032,390
C	24-inch	$ 3,052,070
D	18-inch	$ 2,659,750
Grand Total		**$ 22,087,640**

5.2. Cost References

Unit costs for the preliminary opinion of probable construction cost (OPCC) were compiled from San Antonio area projects, and the City of Schertz: Woman Hollering Creek Sanitary Sewer Project. Unit costs comprise of general costs, remove and replacement costs, sanitary sewer costs, manholes cost, and steel casing costs.

5.2.1. General Construction

General construction costs included mobilization, traffic control, and trench safety. Mobilization was determined by taking approximately 5% of the total cost while traffic control was determined at approximately $10 per linear foot of sanitary sewer and trench safety costs at approximately $1 per linear foot of sanitary sewer. Table 5.2 summarizes the general costs.

Table 5.2 Proposed General Sharing Costs for Cibolo Route Study Sanitary Sewer

General Costs	WHC	Line-Item Price
Mobilization	5% of total cost	$ 1,000,000
Traffic Control	$10/LF of sanitary	$250,000
Trench Safety	$1/LF of sanitary sewer	$ 25,000
Subtotal		$ 1,275,000

5.2.2. Pipe, Casing, and Manhole Costs,

Unit costs for sewer piping, manholes (to 6-feet depth), and manhole extra depth (beyond 6-feet depth) were reviewed from San Antonio area projects, and the Woman Hollering Creek Project. The types of manholes included in the OPCC consist of sanitary sewer manholes, extra depth for manholes exceeding six vertical feet, a sanitary sewer doghouse manhole for the future lift station connection, and a drop manhole at CCMA South WWTP.

Steel casing costs were determined by the linear footage of pipe segments requiring casing, specifically those crossing Flint Hills and Exxon Mobil Pipelines, Schaefer Road, and Lower Seguin Road.

5.2.3. Pavement, Driveways, and Sidewalks

Removing and Replacing Pavement, Driveways, and Sidewalks cost values were found by measuring the area of construction at Schaefer Road, Trainer Hale Road, Lower Seguin Road, and affected driveways and sidewalks. Table 5.3 summarizes the proposed measurements and cost values for removing and replacing pavement, driveways, and sidewalks.

Table 5.3 Proposed Cost Values for Removing and Replacing Pavement, Driveways, and Sidewalks

Segment	Unit	Quantity	Unit Price	Line Price
A	SY	18,530	$150	$ 2,779,500
B	SY	2,640	$ 150	$ 396,000
C & D	SY	1,750	$ 150	$ 262,500
Subtotal				$ 3,438,000

5.2.4. Construction Contingency

A 30% construction cost contingency was included as a Class 3 feasibility estimate.

5.3. Easements

The basis of the easement evaluation aligned with existing and potential future right-of-way (ROW) throughout the route. Easements costs were calculated by combining planning land values, which comprise the price per square foot determined by land value based on the 2025 Bexar County Appraisal District (CAD) values and easement width and length. The assumption was made that permanent easement planning land value would use 100% of the 2025 CAD and Value per square foot while temporary construction easements would use 50% of the 2025 CAD Land Value.

5.3.1. Easement Contingency

Due to rapid development in the area, a 50% easement contingency was included. The total easement planning cost was approximately $1.5 M with approximately $1.1 M for permanent

easements and approximately $400,000 for temporary construction easements. Appendix A includes the permanent utility and temporary construction Easement costs and Exhibits.

5.3.2. Preliminary Opinion of Probable Construction Cost

A preliminary OPCC is provided in Appendix A detailing general construction, pipeline segments, easements, and contingencies.

5.4. Capacity Share

The Cibolo West Trunk Main was divided into four segments based on the proposed pipe diameter and shared pipe capacity. The flow from each entity into the four segments was used to calculate the capacity share. Schertz and GVSUD each have flow conveyed through Segments A and B. Flow in Segments C and D are from Schertz' CCN only. Table 5.4 provides the flow capacity in each Segment along with the flow loading from each entity used to calculate the capacity share percentage.

Table 5.4: Pipeline and Segment Capacity Share

Segment	Diameter	Total Flow (MGD)	Schertz Flow (MGD)	Schertz Share	GVSUD Flow (MGD)	GVSUD Share
A	**30-inch**	2.65	1.84	**69.4 %**	0.81	**30.6 %**
B	**24-inch**	1.85	1.74	**93.9 %**	0.11	**6.1 %**
C	**24-inch**	1.51	1.51	**100 %**	0.00	**0.0 %**
D	**18-inch**	1.23	1.23	**100 %**	0.00	**0.0 %**

5.5. Cost Share

In addition to pipe diameter, costs were also split based on contributing flows from Schertz and Green Valley Special Utility District (GVSUD). The flow-based cost was determined by first separating future development areas into Schertz and GVSUD. The percentage of area located

within the Cibolo Sewershed was then calculated for each development by dividing the area inside the sewershed by the total development was determined. The average million gallons per day (MGD) for each development was then calculated using a conversion factor of 245 gallons per EDU per day. The cost share was allocated based on the percentage of flow contribution, with MGD values separated by pipe segments. Finally, the total flow values for each segment were used to divide the MGD contribution from Schertz and GVSUD to fairly distribute costs. Table 5.5 provides a summary of the cost share between Schertz and GVSUD. The Preliminary Opinion Of Probable Construction Cost is $ 22,087,640 and detailed in Appendix A.

Table 5.5. Proposed Flow Based Cost Sharing

Segment	Segment Cost	Schertz %	Schertz $	GVSUD %	GVSUD $
General Construction	$ 1,275,000	**69.4 %**	$ 884,850	**30.6 %**	$ 309,150
A	$ 12,068,430	**69.4 %**	$ 8,375,500	**30.6 %**	$ 3,692,930
B	$ 3,032,390	**93.9 %**	$ 2,847,420	**6.1 %**	$ 184,970
C & D	$ 5,711,820	**100 %**	$ 5,711,820	**0.0 %**	$ 0
Total	**$ 22,087,640**		**$ 17,819,590**		**$ 4,268,050**

6. Conclusion

The future trunk main for the West Cibolo Creek sewershed is planned to follow the alignment of the future Master Throughfare Plan arterial and will connect to a newly constructed trunk main serving an adjacent sewershed at the expanded wastewater treatment facility.

The primary challenge of the Cibolo West Trunk Main is the rapid pace of development in the served area. Existing wastewater force mains serving existing development and must remain in service until those flows can be diverted to the proposed Cibolo West Trunk Main. Within the Saddlebrook Ranch development, an existing force main is located in the Redbud Canyon ROW,

and existing water, wastewater, and drainage infrastructure within the landscape areas and fencing hinder alignment options.

Planning and coordination must also ensure that future developments can connect to the trunk main. In particular, the sewershed is divided by drainage infrastructure at Schaefer Road, and the trunk main inverts at the northern (upstream) portion of the project must be set to accommodate future gravity connections at depths greater than the Schaefer Road drainage culverts.

The Cibolo West Trunk Main will serve as the long-term backbone of wastewater service for the sewershed, providing the capacity, connectivity, and reliability necessary to support sustained growth in the region. This technical memo reviewed preliminary alignment alternatives, updated the sewershed evaluation, and proposed cost sharing for the Cibolo West Trunk Main, a 23,000 future wastewater trunk that will serve Schertz and GVSUD. Hydraulic modeling analysis reviewed planned developments and future buildout conditions to confirm pipe sizing, capacity, and shared flows.

Costs are allocated between Schertz and GVSUD based on flow contribution and pipe segment capacity, with Schertz contributing approximately 69% of the total flows. Easement information was prepared assuming that additional permanent utility easement would be required as well as temporary construction easement. Easement planning costs were included in the Opinion of Probable Construction Cost. Desktop environmental, cultural, and geotechnical reviews were also performed.

Desktop environmental and geotechnical studies highlight potential intermittent streams and wetland areas, along with soil conditions requiring borings for final design. The Texas State Historical Commission concurrence with the architectural and archeological protection plans for the final construction method and corridor are also indicated. These will require additional consideration during the design phase of the project.

Ongoing coordination with developers for easement acquisition and future wastewater connections will also provide critical information. The continued use of the Saddlebrook Lift

Station force mains will need to be coordinated with the City of Schertz and additional future force mains to balance wastewater plant treatment loads between the CCMA North or O. J. Riedel (ORJ) wastewater treatment plant and the CCMA South WWTP. The timing of the CCMA South WWTP projected treatment expansion will impact the timing of the Cibolo West Trunk Main and may require operational projects and methodologies to accommodate existing and planned development flows until the trunk main can be designed, constructed, and operational.

The project should progress to a Design Phase including topographic survey, design and permitting within the recommended alignment corridor. In addition to the design route, the Woman Hollering Creek lines, drainage structures at Schaefer Road and Lower Seguin Road, and the petroleum pipeline crossings will need to be confirmed. Field investigations and determinations of potential Waters of the US (WOTUS), bald eagle nests, petroleum pipelines, Texas Historical Commission (THC) concurrence of a cultural resources survey, and geologic subsurface conditions will allow final determinations on environmental and historical permitting.

APPENDIX A

Preliminary Opinion of Probable Construction Cost with Easement Tables and Exhibits

PRELIMINARY TEMPORARY CONSTRUCTION EASEMENT PLANNING COST

Date: 08/08/2025

Cibolo West Route Study Sanitary Sewer Trunk Line

Parcel Number	Parcel ID	Owner	Address	Planning Land Value [1] (Per Sq Ft)	Trunk Line Segment	Easement Width (ft)	Easement Length (ft)	Easement Planning Cost [2]
1	1303314	CIBOLO CREEK MUNICIPAL AUTHORITY	TRAINER HALE RD SCHERTZ, TX 78154	$0.62	A	30	2100	$ 39,120
2	339290	HAECKER RALPH & GLADYS	8205 TRAINER HALE RD SCHERTZ, TX 78154	$0.26	A	30	210	$ 1,610
3	339286	HERRERA JOYLENE S	8215 TRAINER HALE RD SCHERTZ, TX 78154	$0.30	A	30	560	$ 4,990
4	340059	SCHMIDT BETTY	8180 TRAINER HALE RD SCHERTZ, TX 78154	$0.27	A	30	1930	$ 15,410
5	339275	LUENSMANN HENRY W FAMILY TR &	8447 TRAINER HALE RD SCHERTZ, TX 78154	$0.52	A	30	250	$ 3,920
6	339284	REAL CHARLES E & REAL JOHN THOMAS	8321 TRAINER HALE RD SCHERTZ, TX 78154	$0.31	A	30	630	$ 5,800
7	310059	LUENSMANN CHARLES O	8602 TRAINER HALE RD SCHERTZ, TX 78154	$0.41	A	30	860	$ 10,530
8	1190132	MARTIN RUTH E	WEIR AVE SCHERTZ, TX 78154	$0.44	A	30	540	$ 7,150
9	310048	KRUEGER MELVIN ALVIN	9263 WEIR AVE CIBOLO, TX 78108	$0.38	B	30	1990	$ 22,590
10	310045	ANCIENT KK ENDEAVORS LLC &	WEIR AVE SCHERTZ, TX 78154	$0.37	C	30	600	$ 6,730
11	310032	HOLTZ SEANNA FRASER	12820 LOWER SEGUIN RD SCHERTZ, TX 78108	$0.64	C	30	720	$ 13,790
12	310022	FRIESENHAHN MILTON & BILLIE, BASHA ELIZABETH ANN, ZWIEKE	12840 LOWER SEGUIN RD SCHERTZ, TX 78154	$0.81	C	30	1260	$ 30,490
13	310021	GUAJARDO GUILLERMO J & MARTHA C	LOWER SEGUIN RD SCHERTZ, TX 78154	$0.52	C	30	470	$ 7,340
14	1436811	JEN TEXAS 32 LLC	LOWER SEGUIN RD TX	$0.64	C	30	100	$ 1,930
15	310011	ASHTON SAN ANTONIO RESIDENTIAL LLC	13011 LOWER SEGUIN RD SCHERTZ, TX 78154	$0.69	D	30	540	$ 11,120
16	1146856	SCHERTZ-CIBOLO-UNIVERSAL CITY ISD BOARD OF TRUSTEES	RAF BURNETTE SCHERTZ, TX 78154	$0.28	D	30	870	$ 7,320
16a	1274920	LUDWIG JANIS K	RAF BURNETTE SCHERTZ, TX 78108	$0.60	D	30	860	$ 15,380
17	1439184	JEN TEXAS 32 LLC	REDBUD CANYON TX	$2.85	D	30	450	$ 38,480
17a	1367371	ASHTON SAN ANTONIO RESIDENTIAL LLC	LOWER SEGUIN RD SCHERTZ, TX 78154	$0.69	D	30	860	$ 17,770
17b	1439078	JEN TEXAS 32 LLC	10138 REDBUD CANYON TX	$0.00	D	20	640	$ 50
17c	1438910	JEN TEXAS 32 LLC	10472 MULHOUSE DRIVE TX	$0.02	D	20	60	$ 30
17d	1438842	JEN TEXAS 32 LLC	REDBUD CANYON TX	$0.00	D	20	790	$ 50
17e	1438871	JEN TEXAS 32 LLC	9790 REDBUD CANYON TX	$0.00	D	30	440	$ 10
17f	1437570	JEN TEXAS 32 LLC	12947 LOWER SEGUIN ROAD TX	$0.00	D	30	140	$ 10
							SubTotal	$ 261,620
							Contingency 50%	$ 130,830
							Planning Total	**$ 392,450**

1. Construction Easement Planning Land Value is 50% of the April 2025 Bexar County Appraisal Land Value.
2. Rounded up to the next $10, does not include legal, survey, or other acquisition soft costs.

PRELIMINARY PERMANENT UTILITY EASEMENT PLANNING COST

Date: 08/08/2025

Cibolo West Route Study Sanitary Sewer Trunk Line

Parcel Number	Parcel ID	Owner	Address	Land Value	Parcel Area (Sq ft)	Planning Land Value [1] (Per Sq Ft)	Trunk Line Segment	Easement Width (ft)	Easement Length (ft)	Easement Planning Cost [2]
1	1303314	CIBOLO CREEK MUNICIPAL AUTHORITY	TRAINER HALE RD SCHERTZ, TX 78154	$ 5,024,070	4046475.71	$1.24	A	60	2100	$ 156,450
2	339290	HAECKER RALPH & GLADYS	8205 TRAINER HALE RD SCHERTZ, TX 78154	$ 1,377,342	2,699,413	$0.51	A	60	210	$ 6,430
3	339286	HERRERA JOYLENE S	8215 TRAINER HALE RD SCHERTZ, TX 78154	$ 2,100,820	3,538,030	$0.59	A	60	560	$ 19,960
4	340059	SCHMIDT BETTY	8180 TRAINER HALE RD SCHERTZ, TX 78154	$ 1,745,770	3,281,543	$0.53	A	60	1930	$ 61,610
5	339275	LUENSMANN HENRY W FAMILY TR &	8447 Trainer Hale Rd, Schertz, TX 78154	$ 247,540	236,966	$1.04	A	60	250	$ 15,670
6	339284	REAL CHARLES E & REAL JOHN THOMAS	8321 TRAINER HALE RD SCHERTZ, TX 78154	$ 1,790,990	2,920,045	$0.61	A	60	630	$ 23,190
7	310059	LUENSMANN CHARLES O	8602 TRAINER HALE RD SCHERTZ, TX 78154	$ 2,456,780	3,012,000	$0.82	A	60	860	$ 42,090
8	1190132	MARTIN RUTH E	WEIR AVE SCHERTZ, TX 78154	$ 1,619,200	1,834,573	$0.88	A	60	540	$ 28,600
9	310048	KRUEGER MELVIN ALVIN	9263 WEIR AVE CIBOLO, TX 78108	$ 1,388,130	1,834,573	$0.76	B	50	1990	$ 75,290
10	310045	ANCIENT KK ENDEAVORS LLC &	WEIR AVE SCHERTZ, TX 78154	$ 5,461,980	7,307,190	$0.75	C	50	600	$ 22,430
11	310032	HOLTZ SEANNA FRASER	12820 LOWER SEGUIN RD SCHERTZ, TX 78108	$ 10,553,600	8,265,510	$1.28	C	50	720	$ 45,970
12	310022	FRIESENHAHN MILTON & BILLIE, BASHA ELIZABETH ANN, ZWIEKE	12840 LOWER SEGUIN RD SCHERTZ, TX 78154	$ 5,266,800	3,265,475	$1.61	C	50	360	$ 29,040
13	310021	GUAJARDO GUILLERMO J & MARTHA C	LOWER SEGUIN RD SCHERTZ, TX 78154	$ 249,150	239,580	$1.04	C	50	470	$ 24,440
14	1436811	JEN TEXAS 32 LLC	LOWER SEGUIN RD TX	$ 21,870	17,082	$1.28	C	50	100	$ 6,410
15	310011	ASHTON SAN ANTONIO RESIDENTIAL LLC	13011 LOWER SEGUIN RD SCHERTZ, TX 78154	$ 204,790	149,306	$1.37	D	55	140	$ 10,570
16	1146856	SCHERTZ-CIBOLO-UNIVERSAL CITY ISD BOARD OF TRUSTEES	RAF BURNETTE SCHERTZ, TX 78154	$ 100,120	178,596	$0.56	D	55	870	$ 26,830
17	1439184	JEN TEXAS 32 LLC	REDBUD CANYON TX	$ 397,520	69,744	$5.70	D	55	450	$ 141,070
									SubTotal	$ 736,050
									Contingency 50%	$ 368,040
									Planning Total	**$ 1,104,090**

1. Easement Planning Land Value is from the April 2025 Bexar County Appraisal Land Value.
2. Rounded up to the next $10, does not include legal, survey, or other acquisition soft costs.

PRELIMINARY ENGINEERING OPINION OF PROBABLE CONSTRUCTION COST

Date: 08/11/2025

Cibolo West Route Study Sanitary Sewer Trunk Line

Item No.	Description	Unit	Quantity	Unit Price	Line Item Price
General					
1	Mobilization	LS	1	$ 1,000,000	$ 1,000,000
2	Traffic Control	LS	1	$ 250,000	$ 250,000
3	Trench Safety	LS	1	$ 25,000	$ 25,000
				General Subtotal	$ 1,275,000
Segments C & D					
4	Removing and Replacing Pavement, Driveways, and Sidewalks	SY	1,750	$ 150	$ 262,500
5	18" Diameter Sanitary Sewer	LF	6,000	$ 200	$ 1,200,000
6	24" Diameter Sanitary Sewer	LF	4,000	$ 400	$ 1,600,000
7	Sanitary Sewer Manholes	EA	20	$ 13,400	$ 268,000
8	Extra Depth Manholes (> 6' Deep)	VF	370	$ 830	$ 307,100
9	Sanitary Sewer Doghouse Manhole	EA	1	$ 20,300	$ 20,300
10	Install 30" Steel Casing	LF	400	$ 520	$ 208,000
			Construction Contingency	*30%*	*$ 1,160,000*
			Construction Subtotal		*$ 5,025,900*
			Easement Land Value		$ 457,270
			Easement Contingency	*50%*	*$ 228,650*
				Segments C & D Subtotal	$ 5,711,820
Segment B					
11	Removing and Replacing Pavement, Driveways, and Sidewalks	SY	2,640	$ 150	$ 396,000
12	24" Diameter Sanitary Sewer	LF	4,100	$ 400	*$ 1,640,000*
13	Sanitary Sewer Manholes	EA	8	$ 13,400	$ 107,200
14	Extra Depth Manholes (> 6' Deep)	VF	92	$ 830	$ 76,360
			Construction Contingency	*30%*	*$ 666,000*
			Construction Subtotal		*$ 2,885,560*
			Easement Land Value		$ 97,880
			Easement Contingency	*50%*	*$ 48,950*
				Segment B Subtotal	$ 3,032,390
Segment A					
15	Removing and Replacing Pavement, Driveways, and Sidewalks	SY	18,530	$ 150	$ 2,779,500
16	Sanitary Sewer Manholes	EA	15	$ 13,400	$ 201,000
17	Sanitary Sewer Drop Manhole	EA	2	$ 14,500	$ 29,000
18	Extra Depth Manholes (> 6' Deep)	VF	311	$ 830	$ 258,130
19	30" Diameter Sanitary Sewer	LF	8,900	$ 600	$ 5,340,000
20	Install 42" Steel Casing	LF	250	$ 660	$ 165,000
			Construction Contingency	*30%*	*$ 2,632,000*
			Construction Subtotal		*$ 11,404,630*
			Easement Land Value		$ 442,530
			Easement Contingency	*50%*	*$ 221,270*
				Segment A Subtotal	$ 12,068,430
Construction and Easement Subtotals					
				Construction Subtotal	$ 20,591,090
				Easement Subtotal	$ 1,496,550
				GRAND TOTAL	**$ 22,087,640**

1. Does Not Include Survey, Acquisition, Design and other Soft Costs

2. All Values in 2025 Dollars

Legend

- Segment A - Proposed Shared 30-inch sanitary sewer line
- Segment B - Proposed Shared 24-inch sanitary sewer line
- Segment C - Proposed Schertz 24-inch sanitary sewer line
- Segment D - Proposed Schertz 18-inch sanitary sewer line
- Master Throughfare Arterial
- Parcel requiring easement

1146856
1439184
3110011
310022
1436811
3110021
310032
310048
310045
1190132
310059
339275
339284
340059
339286
339290
1303314

Omar Dr
Lost Meadows Dr
Concordia Ln
Haeckerville Rd
Lower Seguin Rd
Nemec Ln
Opie Ln
Valley View Dr
Weir Rd
Trainer Hale Rd
Woman Hollering Rd
E FM 1518 N
Dugat Flds
Haecker Flds
Friendly Corner
Interstate 10 E

230+00
225+00
220+00
215+00
165+00
160+00
155+00
150+00
145+00
140+00
125+00
100+00
95+00
90+00
65+00
50+00
45+00
40+00
30+00
25+00
20+00
15+00
10+00
5+00

Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, (c) OpenStreetMap contributors, an
Com

N

APPROVED:	LKL
CHECKED:	RJH
PREPARED:	RJH
	8/8/2025

LAN
TBPE Firm No. 2614
407 S. Stagecoach Trail, Suite 07 * San Marcos, TX 78666
T 512.396.4040 • **F** 512.338.4942
www.lan-inc.com • info@lan-inc.com

CIBOLO WEST WASTEWATER TRUNK MAIN ROUTE STUDY

0 0.25 0.5 Miles

PERMANENT EASEMENT PARCELS

N:\120\120-11816-014\4-0-Production-Working\4-9-GIS\Working Project Data and Maps\000_APRX\6_18_2025_Bob.aprx
Date: 8/8/2025 Time: 3:52 PM

Legend

- Segment A - Proposed Shared 30-inch sanitary sewer line
- Segment B - Proposed Shared 24-inch sanitary sewer line
- Segment C - Proposed Schertz 24-inch sanitary sewer line
- Segment D - Proposed Schertz 18-inch sanitary sewer line
- Master Throughfare Arterial
- Permanent and Construction Easement Parcels
- Additional Construction Easement Parcels

1274920
1146856
1367371
1439184
1438910
1438871
1430978
1437570
1438842
310022
3110011
1436811
3110021
310032
310048
310045
1190132
310059
339275
339284
340059
339286
339290
1303314

Omar Dr
Lost Meadows Dr
Concordia Ln
Haeckerville Rd
Lower Seguin Rd
Nemec Ln
Opie Ln
Valley View Dr
Weir Rd
Trainer Hale Rd
Woman Hollering Rd
E FM 1518 N
Dusty Flds
Haecker Flds
Interstate 10 E
Friendly Corner

165+00
160+00
155+00
150+00
145+00
140+00
125+00
100+00
95+00
90+00
65+00
50+00
45+00
40+00
30+00
25+00
20+00
15+00
10+00
5+00

Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, (C) OpenStreetMap contributors, an
Com

N

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	8/8/2025

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www.lan-inc.com • info@lan-inc.com

CIBOLO WEST WASTEWATER TRUNK MAIN ROUTE STUDY

0 0.25 0.5 Miles

CONSTRUCTION EASEMENT PARCELS

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PROPOSED FLOW BASED COST SHARING

Date: 08/11/2025

Cibolo West Route Study Sanitary Sewer

Segment	Segment Cost	Schertz %	Schertz $	GVSUD %	GVSUD $
General Construction	$ 1,275,000	69.4%	$ 884,850	30.6%	$ 390,150
Segments D&C (Schertz 18" and 24")	$ 5,711,820	100%	$ 5,711,820	0.0%	$ -
Segment B (Shared 24")	$ 3,032,390	93.9%	$ 2,847,420	6.1%	$ 184,970
Segment A (Shared 30")	$ 12,068,430	69.4%	$ 8,375,500	30.6%	$ 3,692,930
GRAND TOTAL	**$ 22,087,640**		**$ 17,819,590**		**$ 4,268,050**

1. Does Not Include Survey, Acquisition, Design and other Soft Costs

2. All Values in 2025 Dollars

APPENDIX B

Select Sheets

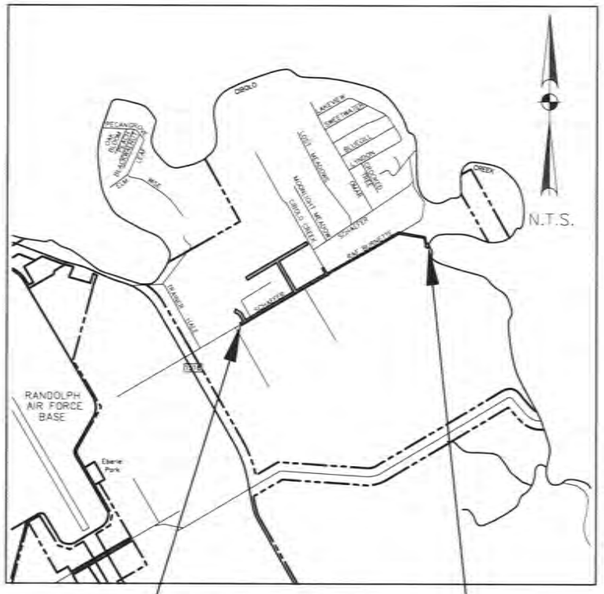
from Schaefer Road Final Plans

PUBLIC WORKS DEPARTMENT
FLOOD CONTROL DIVISION

SCHAEFER ROAD DRAINAGE PHASE I (CB-19)

PROJECT LIMITS:
ALONG SCHAEFER ROAD FROM HILBROOK DRIVE TO RAF BURNETTE; CONTINUING ALONG RAF BURNETTE (APPROX. 2400 FEET); TURNING EAST-SOUTHEAST ALONG A DRAINAGE EASEMENT ENDING AT CIBOLO CREEK (APPROX. 1000 FEET).

IFB 2012-006



LOCATION MAP

END PROJECT
STA. 77+03.73
NORTHING 13743388.0640
EASTING 2207756.7352

BEGIN PROJECT
STA. 10+73.62
NORTHING 13745775.3239
EASTING 2213382.1872

EXCEPTIONS: NONE
EQUATIONS: NONE
RAILROAD CROSSINGS: NONE

DESIGN SPEED = 30 MPH
PROJECT LENGTH = 6631 LF

THE STATE OF TEXAS
COUNTY OF BEXAR

NELSON W. WOLFF	COUNTY JUDGE
SERGIO "CHICO" RODRIGUEZ	COMMISSIONER PCT. 1
PAUL ELIZONDO	COMMISSIONER PCT. 2
KEVIN A. WOLFF	COMMISSIONER PCT. 3
TOMMY ADKISSON	COMMISSIONER PCT. 4
RENEE D. GREEN, PE	DIRECTOR OF PUBLIC WORKS/ COUNTY ENGINEER

PREPARED BY:
BAIN MEDINA BAIN, INC.
ENGINEERS & SURVEYORS
7073 SAN PEDRO AVENUE
SAN ANTONIO, TEXAS 78216
210.494.7223
TBPE Registration No. F-1712

INDEX OF SHEETS

SHEET NO.	DESCRIPTION
1	COVER SHEET AND INDEX
2-3	GENERAL NOTES AND QUANTITIES
4-5	OVERALL SITE LAYOUT
6	SURVEY CONTROL MAP
7	HORIZONTAL ALIGNMENT DATA
8	ROADWAY TYPICAL SECTIONS
9	TRAFFIC CONTROL PLAN NARRATIVE & SEQUENCE OF WORK
10-15	TRAFFIC CONTROL PLAN
16	SCHAEFER ROAD STORMWATER POLLUTION PREVENTION NOTES
17-24	SCHAEFER ROAD STORMWATER POLLUTION PREVENTION PLAN
25	ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS (EPIC)
26-34	DEMOLITION AND EXISTING UTILITIES PLAN
35-36	TREE PROTECTION DETAIL SHEET
37-43	SCHAEFER ROAD PLAN AND PROFILE (END - STA: 41+50)
44-49	OUTFALL PLAN AND PROFILE (STA:41+50 TO OUTFALL)
50	8'x8' SBC PLAN AND PROFILE
51	INTERSECTION GRADING PLAN
52	SANITARY SEWER FORCE MAIN ADJUSTMENTS
53	SCHAEFER ROAD STORM DRAIN INLET SECTIONS
54	HEADWALL DETAILS
55	OUTFALL DETAILS
56-57	CHANNEL "A" PLAN AND PROFILE
58-59	CHANNEL "B" PLAN AND PROFILE
60-61	CHANNEL "C" PLAN AND PROFILE
62	DRAINAGE AREA MAP (EXTERIOR)
63	DRAINAGE AREA MAP (INTERIOR)
64	WINSTORM LAYOUT
65	WINSTORM CALCULATIONS
66	HEC-RAS CALCULATIONS
67-69	SIGNING AND PAVEMENT MARKING PLAN
70-84	SCHAEFER ROAD CROSS SECTIONS (STA:43+74.75 TO STA:77+00)
85-86	CHANNEL A CROSS SECTIONS (STA:10+40 TO STA:20+67.90)
87-88	CHANNEL B CROSS SECTIONS (STA:10+00 TO STA:19+96.74)
89-90	CHANNEL C CROSS SECTIONS (STA:10+00 TO STA:20+21)
91	OUTFALL CROSS SECTIONS (STA: 10+47.33 TO STA: 11+50)
92-105	CIVIL DETAILS
106-117	BARRICADE AND CONSTRUCTION STANDARDS DETAILS
118-120	TRAFFIC CONTROL PLAN DETAILS
121	FENCE DETAIL
122	TRAFFIC CONTROL PLAN (ONE LANE) DETAIL

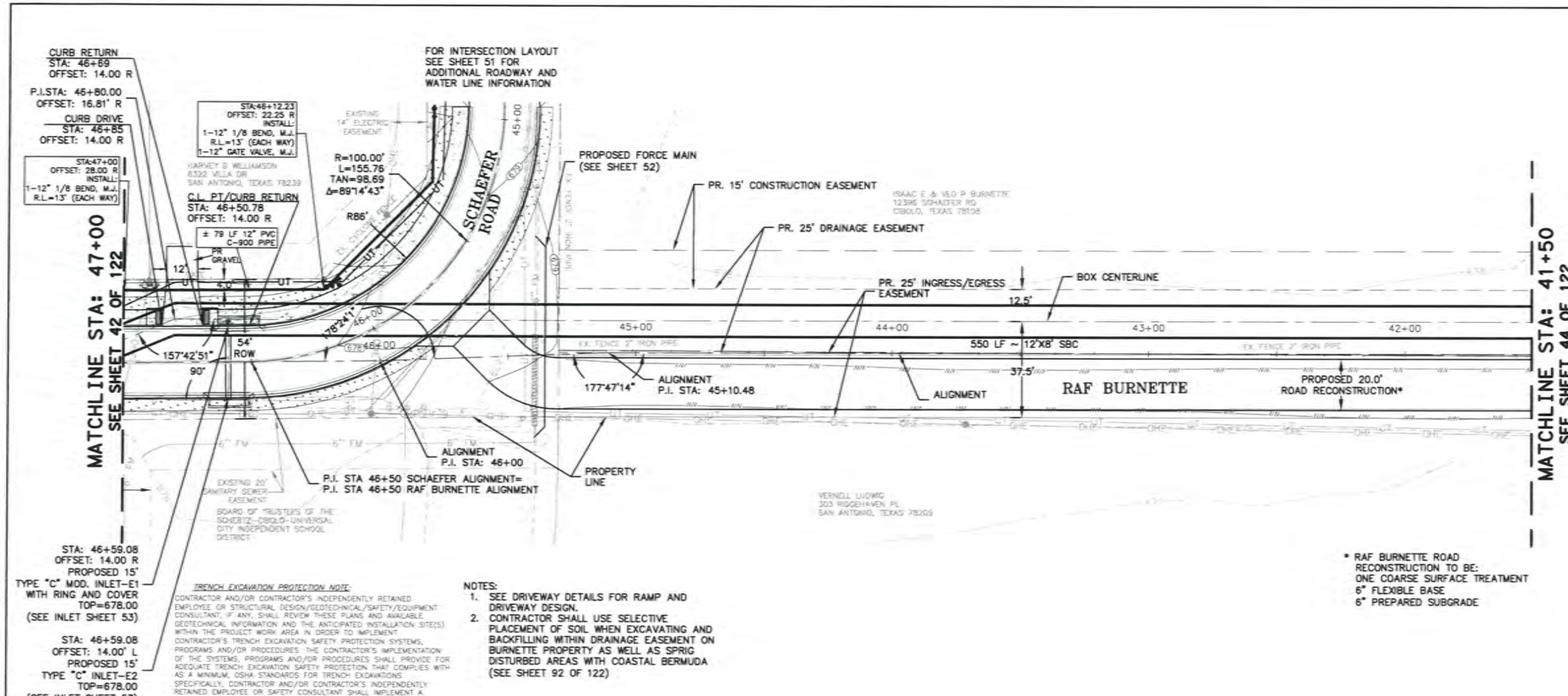
STATE OF TEXAS
CARL BAIN
56996
REGISTERED
PROFESSIONAL ENGINEER

The seal appearing on this document was authorized by Carl Bain P.E. 56996 on October 28, 2011

STATE OF TEXAS
HERNAN A. JARAMILLO
92831
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PROFESSIONAL ENGINEER

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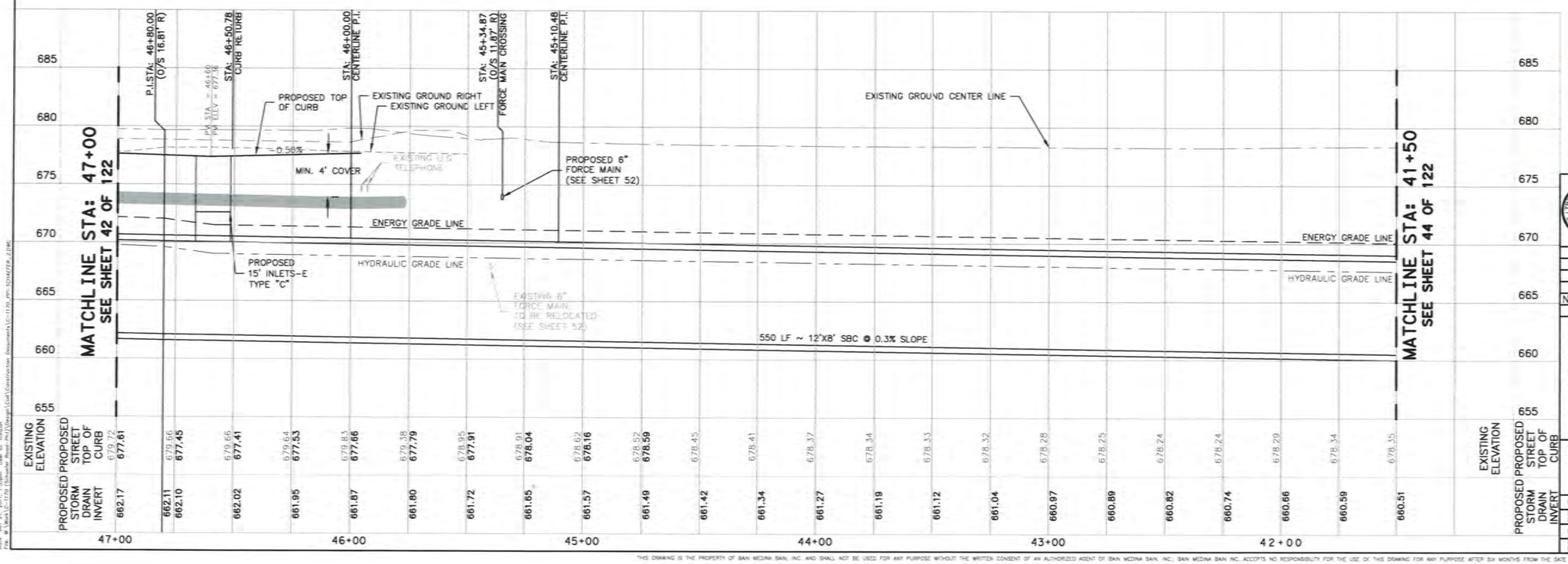


TRENCH EXCAVATION PROTECTION NOTE:

CONTRACTOR AND/OR CONTRACTOR'S INDEPENDENTLY RETAINED EMPLOYEE OR STRUCTURAL DESIGN/GEOTECHNICAL/SAFETY/EQUIPMENT CONSULTANT, IF ANY, SHALL REVIEW THESE PLANS AND AVAILABLE GEOTECHNICAL INFORMATION AND THE ANTICIPATED INSTALLATION SITE(S) WITHIN THE PROJECT WORK AREA IN ORDER TO IMPLEMENT CONTRACTOR'S TRENCH EXCAVATION SAFETY PROTECTION SYSTEMS, PROGRAMS AND/OR PROCEDURES. THE CONTRACTOR'S IMPLEMENTATION OF THE SYSTEMS, PROGRAMS AND/OR PROCEDURES SHALL PROVIDE FOR ADEQUATE TRENCH EXCAVATION SAFETY PROTECTION THAT COMPLIES WITH AS A MINIMUM, OSHA STANDARDS FOR TRENCH EXCAVATIONS. SPECIFICALLY, CONTRACTOR AND/OR CONTRACTOR'S INDEPENDENTLY RETAINED EMPLOYEE OR SAFETY CONSULTANT SHALL IMPLEMENT A TRENCH SAFETY PROGRAM IN ACCORDANCE WITH OSHA STANDARDS GOVERNING THE PRESENCE AND ACTIVITIES OF INDIVIDUALS WORKING IN AND AROUND TRENCH EXCAVATION.

NOTES:
1. SEE DRIVEWAY DETAILS FOR RAMP AND DRIVEWAY DESIGN.
2. CONTRACTOR SHALL USE SELECTIVE PLACEMENT OF SOIL WHEN EXCAVATING AND BACKFILLING WITHIN DRAINAGE EASEMENT ON BURNETTE PROPERTY AS WELL AS SPRIG DISTURBED AREAS WITH COASTAL BERMUDA (SEE SHEET 92 OF 122)

* RAF BURNETTE ROAD RECONSTRUCTION TO BE:
ONE COARSE SURFACE TREATMENT
6" FLEXIBLE BASE
6" PREPARED SUBGRADE



LEGEND

- EXISTING ASBESTOS CMT WATER PIPE
- EXISTING ELECTRIC
- EXISTING UNDERGROUND TELEPHONE
- EXISTING POWER POLE
- EXISTING GUY WIRE/ANCHOR
- EXISTING LIGHT POLE
- EXISTING MAILBOX
- EXISTING TELEPHONE PEDESTAL
- EXISTING TREE
- EXISTING TREE TO BE REMOVED
- EXISTING FIRE HYDRANT
- EXISTING WATER METER
- EXISTING SIGN
- EXISTING DOUBLE SIDED SIGN
- PROPOSED DUAL WATER SERVICE RELAY AND NEW METER BOX RELOCATION
- PROPOSED SINGLE WATER SERVICE RELAY AND NEW METER BOX RELOCATION
- PROPOSED MAIL BOX
- EXISTING EDGE OF PAVEMENT
- EXISTING RIGHT OF WAY
- PROPOSED RIGHT OF WAY
- EXISTING CONTOURS
- PROPOSED CONTOURS
- ENERGY GRADE LINE (EGL)
- HYDRAULIC GRADE LINE (HGL)
- PROPOSED UNDERGROUND TELEPHONE
- PROPOSED CONCRETE
- PROPOSED SOD/GRASS
- PROPOSED ROCK GABION

FENCING NOTE:
SEE 'DEMOLITION AND EXISTING UTILITIES' SHEETS AND FENCE DETAIL SHEET FOR FENCING REQUIREMENTS.

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Hernan Jaramillo, P.E.

BEXAR COUNTY
PUBLIC WORKS DEPARTMENT
FLOOD CONTROL DIVISION

NO	DATE	DESCRIPTION	DWG	CHK
		REVISIONS		

SCHAEFER ROAD

PLAN AND PROFILE
STA 47+00 TO STA 41+50

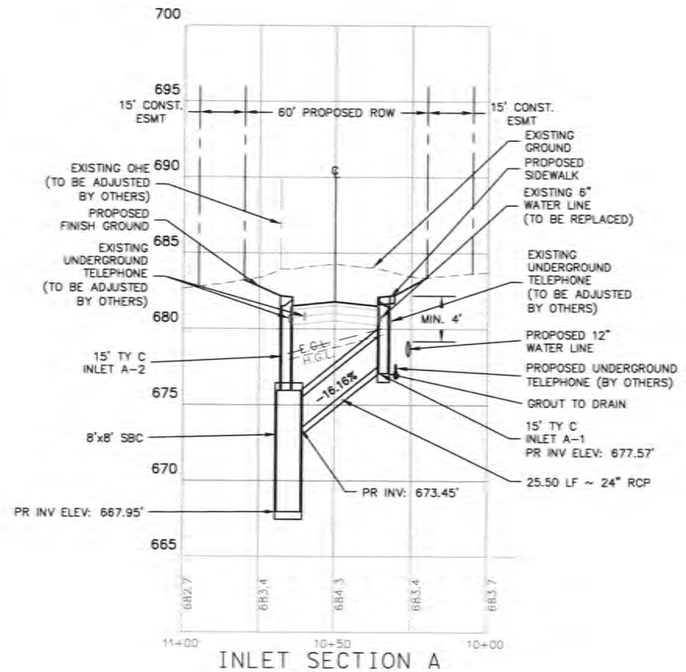
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V: 1"=10'

BAIN MEDINA BAIN
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7073 San Pedro Avenue
San Antonio, Texas 78216 210/494-7223
TBPE Registration No. F-1712

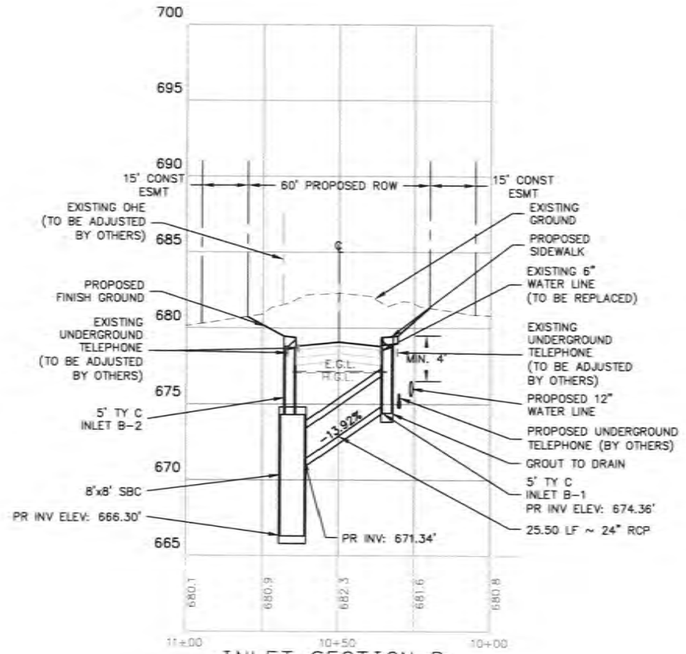
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CHK DGN:			
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CHK DWG:	TEXAS	BEXAR	43 OF 122

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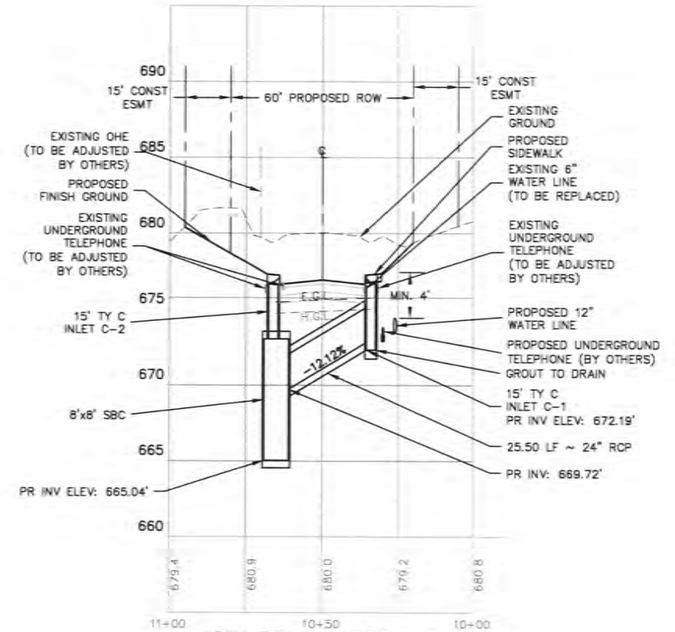
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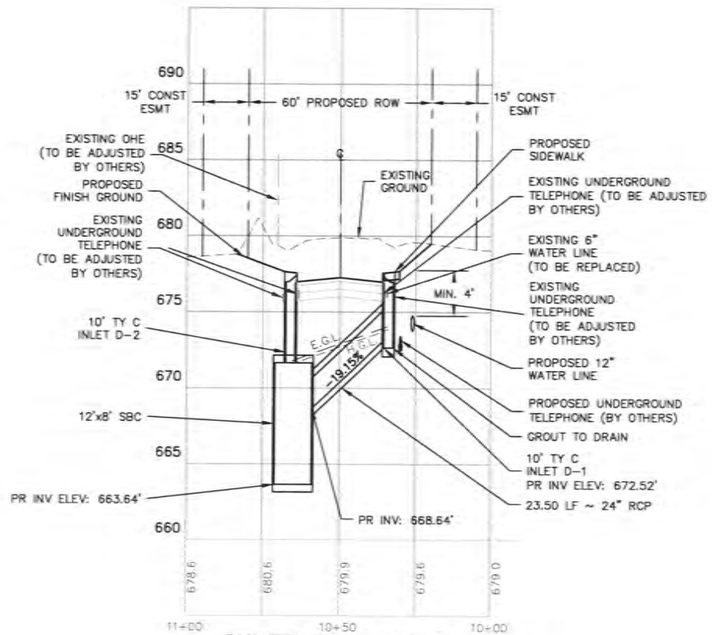
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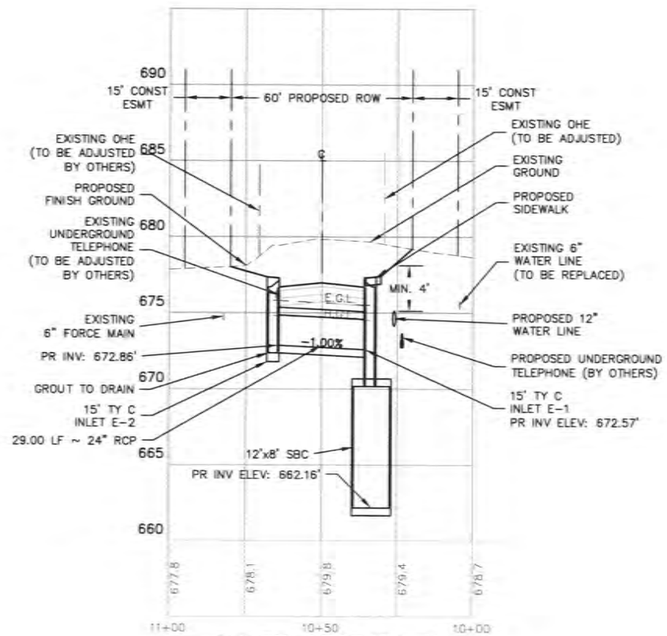
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INLET SECTION C
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TOP OF INLETS=TC=677.16



INLET SECTION D
STA. 54+00
TOP OF INLETS=TC=677.50



INLET SECTION E
STA. 46+60
TOP OF INLETS=TC=677.36



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BEXAR COUNTY
PUBLIC WORKS DEPARTMENT
FLOOD CONTROL DIVISION

NO	DATE	DESCRIPTION	DWG	CHK
		REVISIONS		

SCHAEFER ROAD

STORM DRAIN INLET SECTIONS

0 12.5 25 50
H: 1"=50'
V: 1"=10'

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San Antonio, Texas 78216 210/494-7223
TBPE Registration No. F-1712

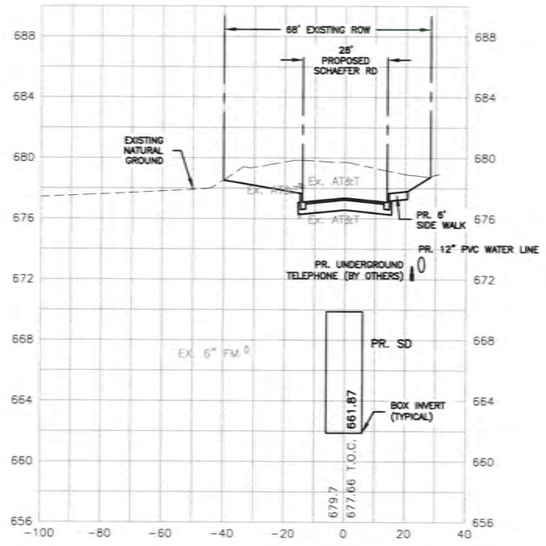
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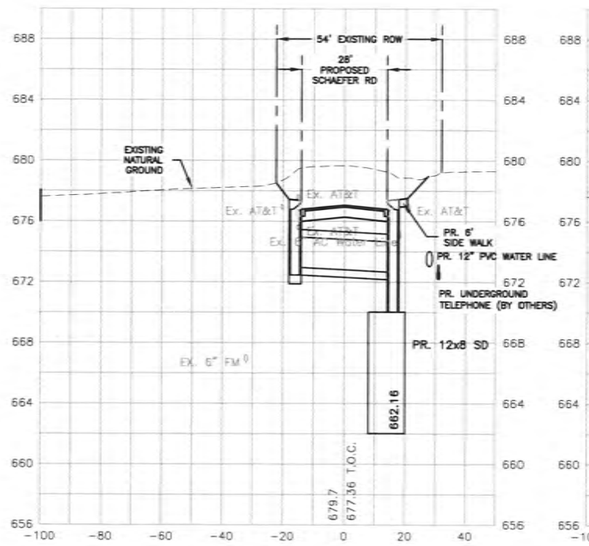
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NOTE:
PARKWAY GRADING WILL NOT EXCEED
4:1 AND WILL MATCH EXISTING GROUND
AT RIGHT-OF-WAY LINE UNLESS
OTHERWISE SHOWN ON SECTIONS.

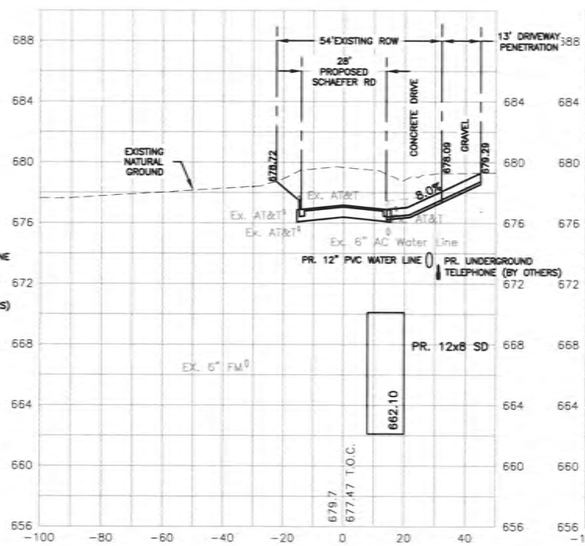
46+00



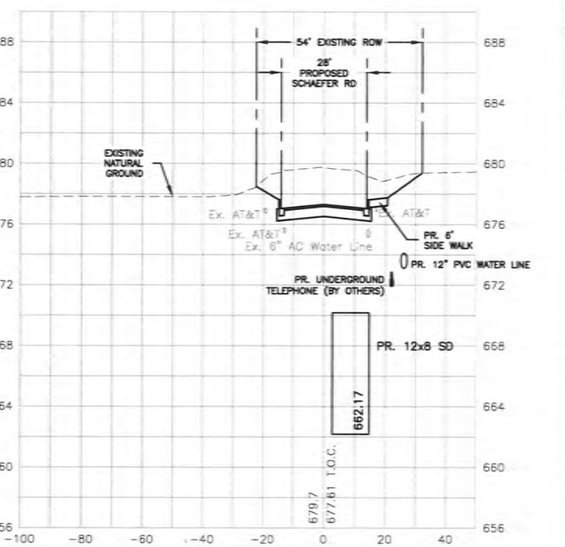
46+51 INLET



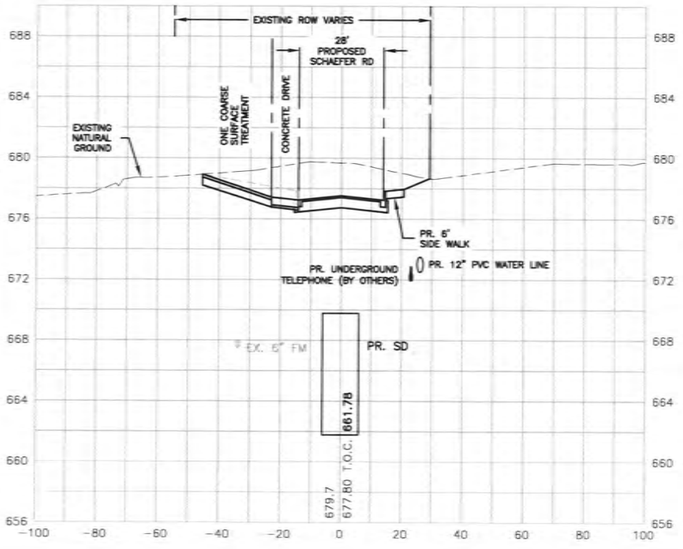
46+77 DRIVEWAY



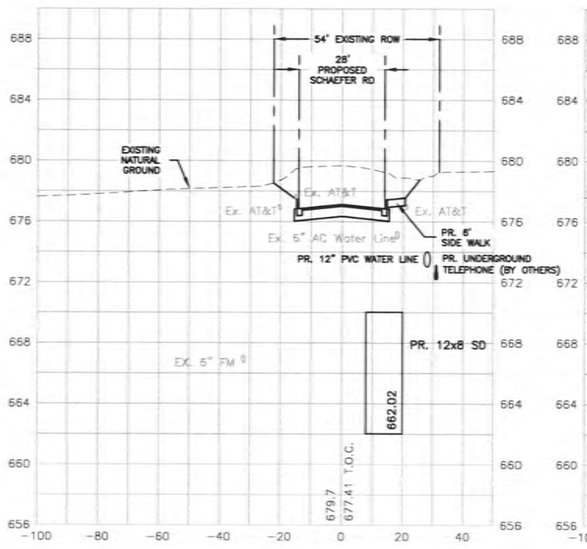
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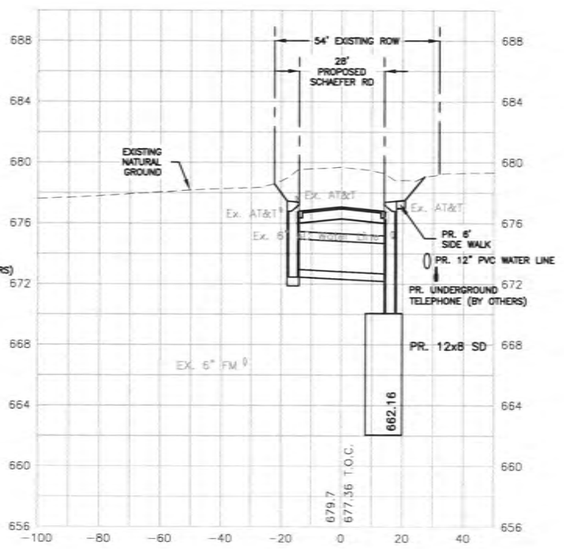
45+72.90 DRIVEWAY
RAF BURNETTE



46+50



46+59 INLET



STATE OF TEXAS
HERNAN A. JARAMILLO
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BEXAR COUNTY
PUBLIC WORKS DEPARTMENT
FLOOD CONTROL DIVISION

Flood Control

NO	DATE	DESCRIPTION	DWG	CHK
		REVISIONS		

SCHAEFER ROAD

CROSS SECTIONS
STA 45+72.90 TO STA 47+00

0 12.5 25 50
H: 1"=50'
V: 1"=10'

BAIN MEDINA BAIN
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7073 San Pedro Avenue
San Antonio, Texas 78216 210/494-7223
TBPE Registration No. F-1712

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CHK DGN:			
DWG:	STATE	COUNTY	SHEET NO.
CHK DWG:	TEXAS	BEXAR	71 OF 122

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APPENDIX C

Environmental & Cultural Desktop Study

DRAFT

ENVIRONMENTAL AND CULTURAL RESOURCES REPORT FOR THE CIBOLO VALLEY WEST TRUNK MAIN ROUTE STUDY AND ANALYSIS

BEXAR COUNTY, TEXAS

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1.0 Introduction

Blanton and Associates, Inc., a wholly owned subsidiary of ICF Jones & Stokes, Inc. (ICF), was contracted by Lockwood, Andrews, and Newman, Inc. (LAN) to conduct a desktop environmental and cultural resources review and assessment of the City of Schertz's proposed Cibolo West Wastewater Trunk Main (the "project") in eastern Bexar County, Texas near its border with Guadalupe County (**Figures 1** and **2**). The project consists of construction of approximately 23,000 linear feet (4.36 miles) of 18-inch or greater diameter wastewater sewer main. The anticipated depth of impacts for pipeline installation are 10 to 15 feet below ground surface for the northern portion of the project area and up to 31 feet below the current ground surface near Trainer Hale Road where the ground elevation is highest. The project is at the route analysis and proofing stage of development, preceding 30 percent design.

Analyses presented herein are based on a review of literature and remote sensing data, and focus on potential constraints associated with the following statutes:

- Sections 404, 401, and 402 of the Clean Water Act (CWA)
- Section 10 of the Rivers and Harbors Act
- Endangered Species Act (ESA)
- Bald and Golden Eagle Protection Act (BGEPA)
- Migratory Bird Treaty Act (MBTA)
- Section 106 of the National Historic Preservation Act (NHPA)
- Antiquities Code of Texas (ACT)

This report details ICF's environmental and cultural resources desktop evaluation. **Section 2.0** describes the methods used to evaluate environmental and cultural resources in the project area; **Section 3.0** discusses the results of the environmental and cultural resources desktop evaluation; and **Section 4.0** provides a summary and recommendations derived from the evaluation. References cited in this report are provided in **Section 5.0**. A request for concurrence by the Texas Historical Commission (THC) to the desktop cultural resources review findings and recommendations is provided in **Appendix A**.

2.0 Methods

ICF ecologists completed a literature, database, and desktop review for mapped potential environmental and cultural resources by reviewing the project layout and its vicinity in relation to available data that included, but was not limited to the following:

- U.S. Geological Survey (USGS) historical and contemporary 7.5-minute topographic maps for the Marion and Saint Hedwig, Texas quadrangles (USGS 2025a)
- Natural color aerial imagery collected for select years from 1985 through 2025 (Google Earth Pro [Google] 2025)
- U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Soil Survey Geographic Database (SSURGO) for Bexar and Guadalupe Counties, Texas (USDA-NRCS 2025a)

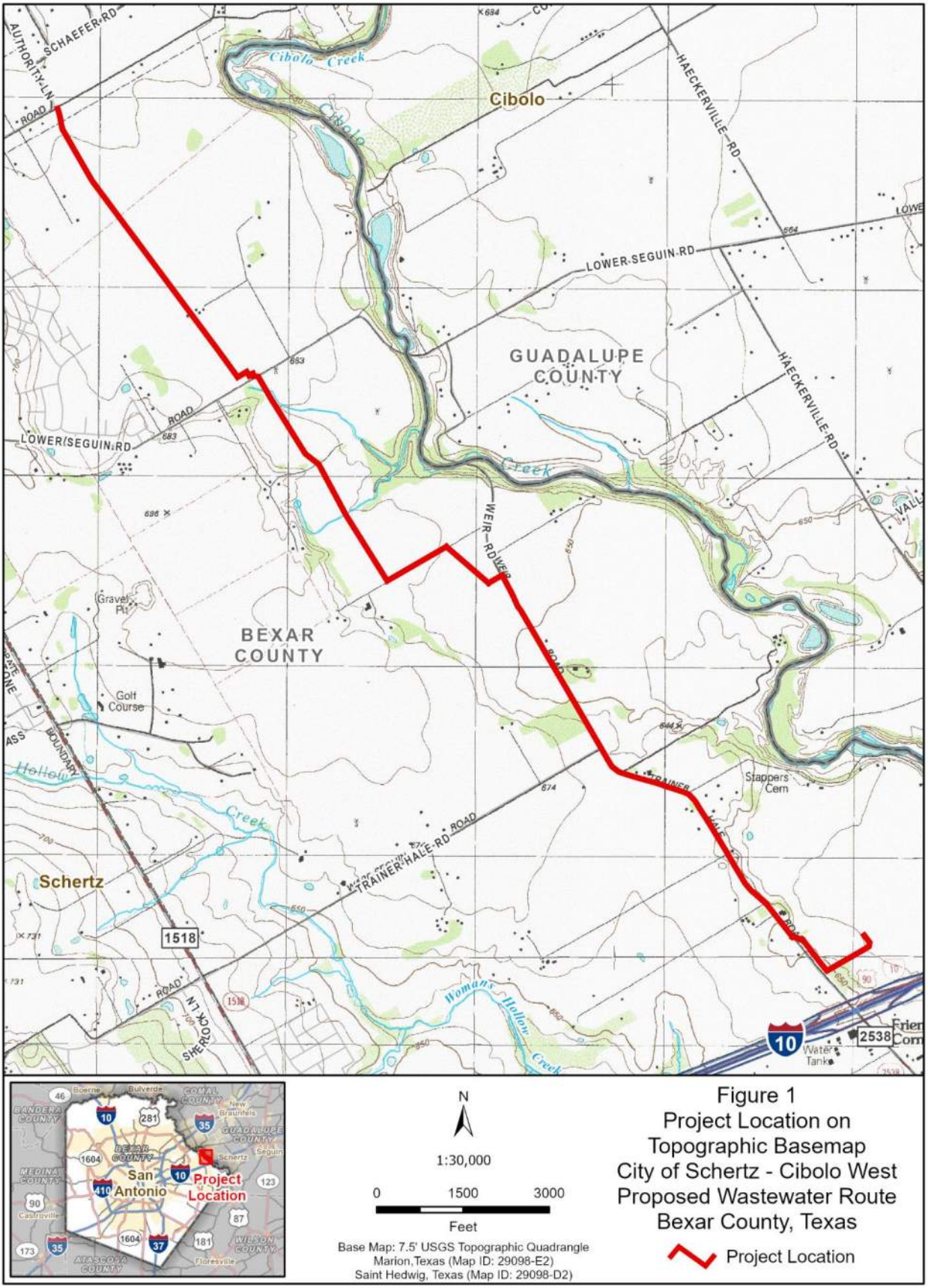


Figure 1
Project Location on
Topographic Basemap
City of Schertz - Cibolo West
Proposed Wastewater Route
Bexar County, Texas

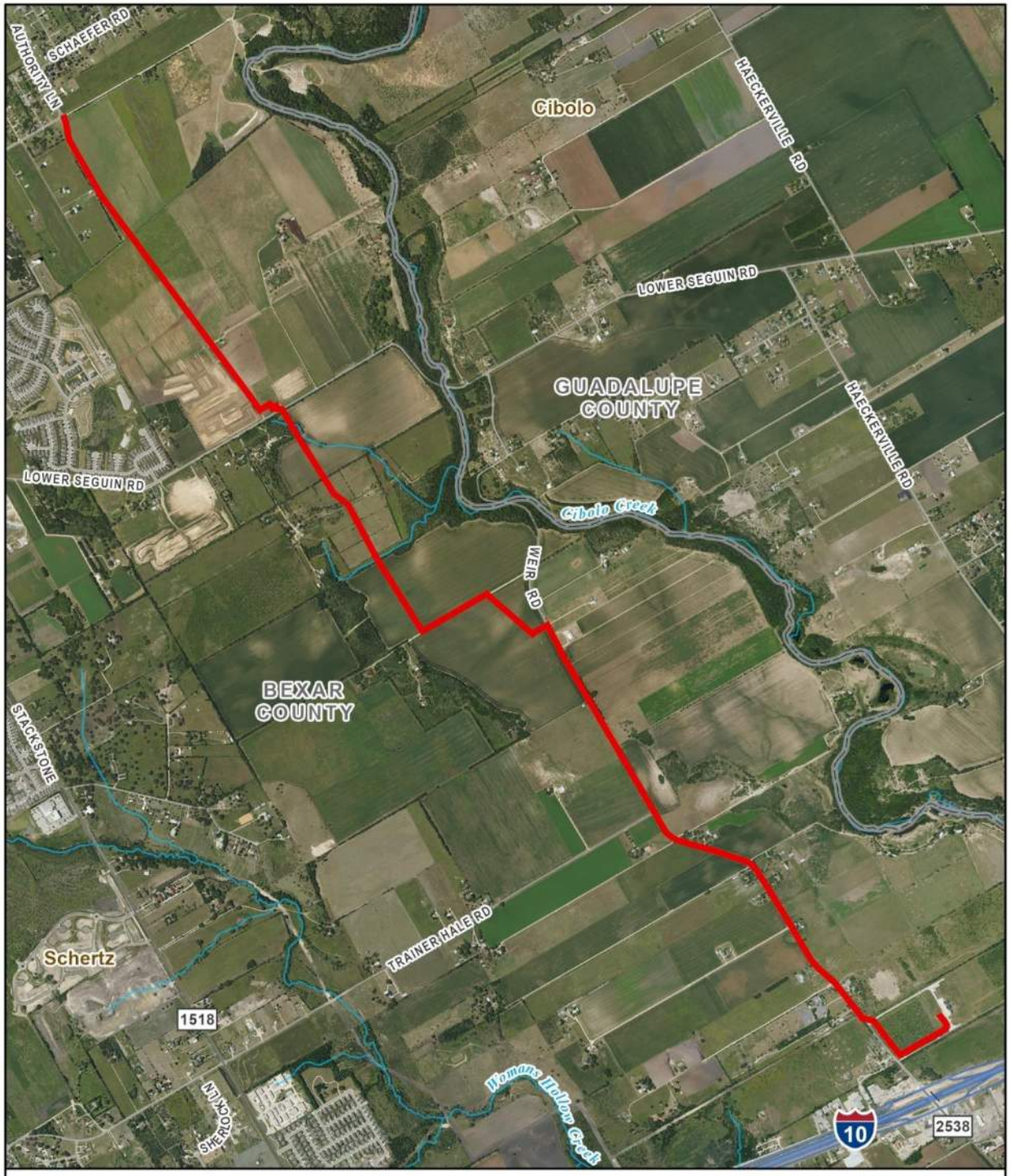


Figure 2
Project Location on
Aerial Imagery Basemap
City of Schertz - Cibolo West
Proposed Wastewater Route
Bexar County, Texas

- USDA-NRCS State Soil Data Access (SDA) Hydric Soils List for Bexar and Guadalupe counties, Texas (USDA-NRCS 2025b)
- Federal Emergency Management Agency (FEMA) floodplain data (FEMA 2025)
- USGS National Hydrography Dataset (NHD) (USGS 2025b) and Watershed Boundary Dataset (USGS 2025c)
- U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) (USFWS 2025a)
- U.S. Army Corps of Engineers (USACE) list of "Navigable Waters of the United States in the Fort Worth, Albuquerque, and Tulsa Districts within the State of Texas" (USACE 2011)
- USFWS Information for Planning and Consultation (IPaC) query for 5-mile buffer of project alignment in Bexar and Guadalupe counties, Texas (USFWS 2025b)
- USFWS Environmental Conservation Online System (ECOS) lists for Bexar and Guadalupe counties (USFWS 2025c)
- USFWS Threatened & Endangered Species Active Critical Habitat Report (USFWS 2025d)
- USFWS San Antonio Area Endangered Karst Invertebrates mapper (USFWS 2025e)
- Texas Parks and Wildlife Department (TPWD) Rare, Threatened, and Endangered Species of Texas (RTEST) Annotated County Lists for Bexar and Guadalupe counties (review included only federally listed species and those proposed or candidate for listing) (TPWD 2025a)
- TPWD Texas Natural Diversity Database (TXNDD) search (5-mile radius of project alignment) for federally listed, proposed, and candidate species occurrences (TPWD 2025b)
- The Cornell Lab of Ornithology eBird Database (eBird 2025)
- The California Academy of Sciences and National Geographic Society iNaturalist Database (iNaturalist 2025)
- Texas Historical Commission's (THC) Historic Sites Atlas (THC 2025a) and restricted-access Online Archeological Sites Atlas (THC 2025b)

An environmental and cultural resources desktop review was conducted by ICF for the project alignment and a 0.5-mile buffer. The intent was to identify any potential water resources that could be subject to regulation under Section 404 and 401 of the CWA or Section 10 of the RHA. Further, evaluated was the potential for occurrence of any federally listed, proposed, or candidate T&E species or its habitat, including review of USFWS designated and proposed critical habitats and mapped karst zones, to determine resources protected under the ESA.

Additionally, a five-mile buffer of the project alignment was defined as the search radius for review of recorded occurrences of federally listed, proposed, and candidate species in the TXNDD (TPWD 2025b) and designated and proposed critical habitat (USFWS 2025d). Of note, the eBird (2025) and iNaturalist (2025) databases include self-reported species sightings by citizens that are unverified, and as such, provide a general reference but inherently exhibit a level of uncertainty. Additionally, iNaturalist sightings for some sensitive species (e.g., federally listed species) provide obscured locations that have been randomly repositioned in the vicinity of their actual reported location.

Within the 0.5-mile project alignment buffer, cultural resources databases were reviewed to document previous archeological surveys and locations of recorded archeological sites to determine documented cultural resources and potential for such resources that may be protected under Section 106 of the NHPA or the ACT. In addition to identifying recorded archeological sites, the cultural resources review included the following types of information on the Archeological Sites Atlas: National Register of Historic Places (NRHP)-listed properties, State Antiquities Landmarks (SALs), Official Texas Historical Markers (OTHMs), Recorded Texas Historic Landmarks (RTHLs), and cemeteries.

Non-archeological historic resources designated or determined eligible for designation as SALs or for inclusion in the NRHP were reviewed through consultation of the Atlas (THC 2025b). Identified were all historic properties and districts within this search radius. The cultural resources review additionally sought to assess the potential for unrecorded cultural resources in the project area that may be impacted by the proposed project.

3.0 Results

3.1 Project Area Description

Located in eastern Bexar County, Texas, near its border with Guadalupe County, the project area is within the City of Schertz's southeastern extent, to the southwest of the City of Cibolo (**Figures 1** and **2**). The project alignment extends approximately 23,000 linear feet (4.36 miles) generally from northwest to southeast from near the intersection of Schaefer Road and Raf Burnette Road to north of Interstate Highway (IH) 10 and its frontage road. Generally, the northern half (12,754 feet [2.42 miles]) traverses primarily agricultural lands with some interspersed housing development, crossing Lower Seguin Road before reaching Weir Road. The extent of the proposed project alignment from its northmost extent to Lower Seguin Road parallels an existing pipeline. The southern extent (10,246 feet [1.94 miles]) is largely collocated within Weir Road and Trainer Hale Road, deflecting to the east near the southern terminus. The following sections further describe the project area defined herein as the proposed project alignment and a 0.5-mile buffer.

3.1.1 Biogeography, Topography, and Climate

Biogeographically, the project area is entirely located within the Northern Blackland Prairie (32a) Ecoregion of the larger Texas Blackland Prairies (Griffith et al. 2007). According to Griffith et al. (2007), the Northern Blackland Prairie Ecoregion exhibits rolling to nearly level plains that were historically vegetated by tallgrass prairie vegetation, maintained by frequent fire and American bison (*Bison bison*) grazing. Historically, dominant vegetation of the region included little bluestem (*Schizachyrium scoparium*), big bluestem (*Andropogon gerardii*), yellow Indiangrass (*Sorghastrum nutans*), and tall dropseed (*Sporobolus asper*), with more mesic lowlands vegetated by eastern gamagrass (*Tripsacum dactyloides*) and switchgrass (*Panicum virgatum*), as well as asters (*Aster* spp.), prairie bluet (*Hedyotis nigricans*), prairie clovers (*Dalea* spp.), and coneflowers (*Rudbeckia* spp.). Woodland and forested areas were occasional, often restricted to riparian areas (e.g., stream bottoms) and mesic slopes, where prevalent species included bur oak (*Quercus macrocarpa*), Shumard oak (*Q. shumardii*), sugarberry (*Celtis laevigata*), elm (*Ulmus* spp.), ash (*Fraxinus* spp.), eastern cottonwood (*Populus deltoides*), and pecan (*Carya illinoinensis*). Nearly all native vegetative communities have been removed, remaining only in small extant communities due to land use conversion from ranching to farming, the transition of

native pasture to introduced pasture grasses, such as Johnson grass (*Sorghum halepense*), Bermuda grass (*Cynodon dactylon*) and King Ranch bluestem (*Bothriochloa ischaemum*), and urban development.

Typical of the region, project area topography is generally low gradient to nearly level, with slight slope to the east towards Cibolo Creek or its tributaries. Elevations within the project area range from 600 to 700 feet above mean sea level. The steepest gradients occur in immediate proximity to Cibolo Creek and its tributaries (USGS 2022).

The climate of the project area is humid sub-tropical, with an average annual rainfall of approximately 32.38 inches. Monthly mean precipitation ranges from a high of 4.40 inches in May, and another slight peak in September (3.88 inches) and October (3.75 inches) (historically the wettest months) to a low of 1.74 inches in February, historically the driest month. Temperatures are hottest in summer months of June through September and range from a maximum monthly mean high of 96.0 °F in August to 92.4.0 °F and 90.1 °F in June and September, respectively. December and January are the coldest months, with monthly mean low temperatures of 42.4 °F and 41.0 °F, respectively (National Oceanic and Atmospheric Administration [NOAA] 2025).

3.1.2 Geology and Soils

Geologic rock formations underlying the project alignment and nearly the entirety of the project area consist of fluviatile terrace deposits (Qt) associated with Cibolo Creek and surrounding Leona Formation (Qle), both relatively recent being of the Quaternary Period (USGS 2014). Fluviatile terrace deposits consist of gravel, sand, silt, and clay, and where adjacent to the Edwards Plateau, largely consist of gravel, limestone, dolomite, and chert. Leona Formation consists of fine calcareous silt grading down into coarse gravel. A minor portion of the project area in the southwest intersects Navarro Group and Marlbrook Marl (Kknm) of the Taylor Group, characterized by an upper part of marl, clay, sandstone, and siltstone and lower part of clay.

The project area does not overlie any major or minor defined aquifers (George et al. 2011). As such, the project area does not overly the Edwards Aquifer contributing, recharge, or transition zone (Texas Commission on Environmental Quality [TCEQ] 2025). The project area is not within a karst region described by the Texas Speleological Society (TSS 2007). Further, the project area is not within a defined karst zone or fauna region (see later discussion in **Section 3.3**).

Soils within the project area include 15 soil map units with surface textures including loam, gravelly clay loam, silty clay, and clay. Drainage ranges from well drained for most soils to moderately well drained for some areas. Runoff is variable ranging from negligible to very high. None of the soil map units are ponded but several are frequently or rarely flooded. Of these soil map units, only the Bosque and Seguin soils, frequently flooded (Bo) are recognized as hydric. Soil map units within the project area including their areal extent and hydric soil designation are provided in **Table 1**.

Table 1. Soil Map Units within the Project Area

Soil Map Unit (Symbol)	Acres in Project Area	Percent of Project Area	Hydric (%)
Altoga silty clay, 5 to 12 percent slopes eroded (AlE3)	7.76	0.2	No
Bosque and Seguin soils, frequently flooded (Bo)	50.81	1.6	Yes (2%)
Gullied land-Sunev complex, 3 to 20 percent slopes (Gu)	68.2	2.2	No
Lewisville silty clay, 0 to 1 percent slopes (LvA)	1,792.84	56.7	No
Lewisville silty clay, 1 to 3 percent slopes (LvB)	34.77	1.1	No
Patrick soils, 1 to 3 percent slopes, rarely flooded (PaB)	415.77	13.2	No
Patrick soils, 3 to 5 percent slopes, rarely flooded (PaC)	176	5.6	No
Pits and Quarries, 1 to 90 percent slopes (Pt)	1.09	< 0.1	No
Sunev loam, 0 to 1 percent slopes (SuA)	65.34	2.1	No
Sunev loam, 1 to 3 percent slopes (SuB)	3.05	0.1	No
Sunev loam, 3 to 5 percent slopes, eroded (SuC3)	16.15	0.5	No
Eddy gravelly clay loam, 1 to 8 percent slopes (Tb)	5.3	0.2	No
Tinn and Frio soils, 0 to 1 percent slopes, frequently flooded (Tf)	90.19	2.8	No
Sunev loam, 0 to 1 percent slopes (VaA)	202.58	6.4	No
Sunev loam, 1 to 3 percent slopes (VaB)	231.68	7.3	No
Total	**3,161.53**	**100**	**--**

Sources: USDA-NRCS 2025a, 2025b

3.1.3 Land Use/Land Cover

Land use/land cover data provided by the 2023 Annual National Land Cover Database (NLCD) was reviewed to estimate the type and extent of cover classes within the project area (USGS 2024). According to these data, the project area is dominated by cultivated crops (40.02 percent) and shrub/scrub (20.63 percent). Other subdominant land cover types include hay/pasture (13.78 percent); developed, open space (9.18 percent); and developed, low intensity (8.31 percent). Minor components consist of open water; developed, medium intensity; developed, high intensity; barren land; deciduous forest; evergreen forest; mixed forest; herbaceous; and woody wetlands. Mapped 2023 Annual NLCD (USGS 2024) land use/land cover classes within the project area are listed in descending order of prevalence in **Table 2** below, including their areal extent and percent composition. Photointerpretation of contemporary aerial imagery (Google 2025) by ICF found the mapped land use/land cover for the project area to appear generally accurate.

Table 2. Land Use/Land Cover within the Project area

Land Cover Classification	Acres in Project Area	Percent of Project Area
Cultivated Crops	1,265.17	40.02
Shrub/Scrub	652.1	20.63
Hay/Pasture	435.69	13.78
Developed, Open Space	290.26	9.18
Developed, Low Intensity	262.74	8.31
Woody Wetlands	111.12	3.51
Developed, Medium Intensity	84.46	2.67
Herbaceuous	21.17	0.67
Deciduous Forest	13.57	0.43
Developed, High Intensity	12.90	0.41
Mixed Forest	8.31	0.26
Barren Land	2.73	0.09
Open Water	0.89	0.03
Evergreen Forest	0.42	0.01
Total	**3,161.53**	**100**

Sources: 2023 Annual NLCD (USDA 2024)

3.2 Water Resources

Hydrographically, the entirety of the project area is within the Upper Cibolo Creek Watershed (HUC 10-1210030402), with drainage in this watershed contributing to flow in the upper reaches of Cibolo Creek through infiltration and subsurface groundwater movement, surface runoff, and channelized flow along tributaries. Within this watershed, the entirety of the project alignment and most of the project area are within the Dietz Creek—Cibolo Creek Subwatershed (HUC12-121003040206). Herein, drainage is conveyed to the east towards Cibolo Creek. A minor portion of the southwestern project area extent is within the Martinez Creek—Cibolo Creek Subwatershed (HUC12-121003040302). Drainage herein is conveyed to the southeast towards Woman Hollow Creek—a tributary to Martinez Creek. Martinez Creek flows into Cibolo Creek approximately 5.58 linear miles southeast of the project alignment's southern terminus (USGS 2025b, 2025c).

Cibolo Creek is the prominent drainage feature within the project area and its general vicinity, located approximately 1,600 feet at its nearest to 3,000 feet at its farthest to the east of the project alignment and intersecting the eastern edge of the project area (**Figure 3**). Review of USGS topographic maps (USGS 2025a), the NHD (USGS 2025b), and the NWI (USFWS 2025a) identified numerous mapped water resources within the project area, including a perennial stream (Cibolo Creek), numerous impoundments (i.e., freshwater ponds) thereof, three unnamed intermittent tributaries thereto, and an upper reach of an unnamed intermittent tributary to Woman's Hollow Creek. Additionally, numerous isolated freshwater ponds, as well as on-channel features, are mapped throughout the project area. The NWI (USFWS 2025a) identifies several freshwater emergent wetlands and freshwater forested/shrub wetlands along and adjacent to Cibolo Creek in and adjacent to the project area (**Figure 3**).

Figure 3
Water Resources
on Topographic Base
City of Schertz - Cibolo West
Proposed Wastewater Route
Bexar County, Texas

Project Location

Water Resources Study Area
(0.5-mile Buffer)

National Hydrography Dataset (NHD) (USGS)

Stream

Pond

National Wetlands Inventory (NWI) Features (USFWS)

Freshwater Emergent Wetland

Freshwater Forested/Shrub Wetland

Freshwater Pond

Riverine

100-yr Floodplain (FEMA)

Freshwater Pond (Photointerpreted)

N

1:30,000

0 1500 3000

Feet

Base Map: 7.5' USGS Topographic Quadrangle
Marion,Texas (Map ID: 29098-E2)
Saint Hedwig, Texas (Map ID: 29098-D2)

Based on database review and photointerpretation of aerial imagery, the project alignment intersects two mapped unnamed intermittent stream reaches near their headwaters. Both features are tributaries to Cibolo Creek. The first crossing is within a wooded area adjacent to a cultivated field immediately south of Lower Seguin Road. The second crossing is approximately 2,500 linear feet to the south, along a wooded riparian corridor. At its southern extent, the project alignment is approximately 63 west-southwest of a mapped isolated freshwater pond near the intersection of Trainer Hale Road and Bexar Bowling Road. Database-mapped and photointerpreted water resources within the project area are depicted in **Figure 3**.

The NFHL (FEMA 2025) maps 100-year floodplains within the project area in association with Cibolo Creek and several of its tributaries (**Figure 3**). Additionally, Cibolo Creek has an associated regulated floodway along the main channel. The project alignment does not intersect mapped 100-year floodplains, with nearest designated floodplain approximately 82 feet east of the alignment, associated with the northernmost mapped intermittent stream crossing.

3.2.1 Clean Water Act

3.2.1.1 Section 404 of the Clean Water Act

Section 404 of the Clean Water Act (CWA) regulates the discharge of dredged or fill material into waters of the U.S. (WOTUS). A revised definition of WOTUS was published in the Federal Register on January 18, 2023, and became effective on March 20, 2023 (88 FR 3004). Subsequently, on May 25, 2023, the U.S. Supreme Court issued a ruling in the case of Sackett v. EPA, which concluded that the CWA's definition of "waters" refers only to those relatively permanent, standing or continuously flowing bodies of water (i.e., streams, oceans, rivers, and lakes) and to adjacent wetlands that are "indistinguishable" from those bodies of water due to a continuous surface connection (U.S. Supreme Court 2023). To assert jurisdiction over an adjacent wetland under the Sackett decision, the adjacent body of water must be a WOTUS (i.e., a relatively permanent body of water [RPW] connected to traditional navigable waters [TNWs]), and the wetland must have a continuous surface connection with that water, making it difficult to determine where the "water" ends and the "wetland" begins (U.S. Supreme Court 2023). As a result, the EPA and USACE amended the January 2023 WOTUS definition to be consistent with the Sackett decision, and the amended rule (also referred to as the "Conforming Rule"), which was published in the Federal Register and became effective on September 8, 2023 (U.S. Supreme Court 2023, U.S. EPA and USACE 2023).

However, due to ongoing litigation that affects 26 states, including Texas, the January 2023 WOTUS rule is enjoined, and the USACE and EPA are currently interpreting WOTUS in those 26 states consistent with the pre-2015 regulatory regime and the Sackett decision (U.S. EPA 2024). Under the pre-2015 regulatory regime, consistent with Sackett, the EPA and USACE assert jurisdiction over:

- TNWs
- Interstate Waters
- Other Waters
- Impoundments of Jurisdictional Waters
- Tributaries
- The Territorial Seas
- Adjacent Wetlands

Under this interpretation:

- "Other waters" are limited to relatively permanent lakes and ponds that do not meet another jurisdictional category.
- "Tributaries" include natural, man-altered, or man-made water bodies that (1) flow directly or indirection into TNWs or interstate waters and (2) meet the relatively permanent standard, meaning they have flowing or standing water year-round or continuously at least seasonally (e.g., typically three months).
- "Adjacent wetlands" include wetlands that physically abut or touch TNWs, interstate waters, impoundments of jurisdictional waters, relatively permanent tributaries, or the territorial seas, and have a continuous surface connection to those waters making it difficult to determine where the water ends and wetland begins (U.S. EPA and USACE 2024).

3.2.1.2 Section 401 of the CWA

Section 401 of the CWA regulates water quality for those projects that impact WOTUS and is administered by the Texas Commission on Environmental Quality (TCEQ). The level of TCEQ coordination and review is dependent on the USACE permit type and extent of impacts to water resources.

3.2.1.3 Section 402 of the CWA

Section 402 of the CWA requires a Storm Water Pollution Prevention Plan (SWPPP) be implemented at construction sites that are greater than 1 acre in size to control erosion and sedimentation during and following construction until the site is stabilized by revegetation. The EPA has delegated the authority to administer the Section 402 program to the State of Texas (TCEQ). The SWPPP is usually prepared by the construction contractor.

3.2.1.4 Section 10 of the RHA

Navigable waters subject to Section 10 of the RHA are based on the list of navigable waters in the Fort Worth, Albuquerque, and Tulsa Districts (USACE 2011). No navigable waters subject to Section 10 of the RHA occur in the project area.

3.2.1.5 Floodplains

Construction within a FEMA floodplain may require prior coordination with the local floodplain administrator. Although mapped 100-year floodplains are identified for Cibolo Creek within the project area, the project alignment does not intersect such designated flood zones (**Figure 3**). The nearest 100-year floodplain is approximately 82 feet east of the project alignment, immediately south of the northernmost mapped stream crossing.

3.3 Species of Concern

This section discusses the federal regulations addressing threatened and endangered species, describes the protected and rare species of potential occurrence in the project area, and provides an assessment of the potential impacts of the project on listed species and applicable regulatory implications. ICF biologists conducted background research of the project area, during which vegetation communities and aquatic resources within the project area were remotely evaluated for the presence of potential habitat

for federally listed species, as well as proposed and candidate species for such listing, with the potential to occur in or near the site.

3.3.1 Federal Regulations – USFWS

The USFWS has legislative authority to list and monitor the status of species whose populations are considered imperiled. This federal legislative authority for the protection of threatened and endangered species issues from the Endangered Species Act (ESA) of 1973 and its subsequent amendments. Regulations supporting this act are codified and regularly updated in Sections 17.11 and 17.12 of Title 50 of the Code of Federal Regulations (CFR). The federal process stratifies potential candidates for listing based upon the species' biological vulnerability. The vulnerability decision is based upon many factors affecting the species within its range and is linked to the best scientific data available to the USFWS at the present time. Species listed as endangered (E) or threatened (T) by the USFWS are provided full regulatory protection (USFWS 1976). This protection not only prohibits the direct take of a protected species but also includes a prohibition of indirect take, such as destruction of designated critical habitat. The ESA and accompanying regulations provide the necessary authority and incentive for the individual states to establish their own regulatory vehicle for the management and protection of threatened and endangered species.

3.3.2 Species Descriptions and Potential to Occur in Project Area

Federally listed endangered, threatened, proposed, and candidate species potentially occurring in Bexar and Guadalupe counties are presented below in **Table 3** (USFWS 2025b, 2025c, TPWD 2025a). Annotation further specifies ICF's assessment of the potential for the species and its habitat to occur within the project area. Additionally, the bald eagle (*Haliaeetus leucocephalus*) and golden eagle (*Aquila chrysaetos*), protected by the Bald and Golden Eagle Protection Act (BGEPA), potentially occur in these counties, and are included **Table 3** but discussed separately in **Section 3.3.2.3**. No designated or proposed critical habitat for federally listed species occurs within the project area (USFWS 2025d).

Table 3. Federally Listed Endangered, Threatened, Proposed, and Candidate Species Potentially Occurring in Bexar and Guadalupe Counties, Texas

Species		Conservation Status[1]		Potential to Occur in Project Area	
Common Name	**Scientific Name**	**Federal**	**State**	**Habitat**	**Species**
AMPHIBIANS					
San Marcos Salamander	*Eurycea nana*	T	T	None	None
Texas Blind Salamander	*Eurycea rathbuni*	E	E	None	None
ARACHNIDS					
Cokendolpher Cave Harvestman	*Texella cokendolpheri*	E	--	None	None
Government Canyon Bat Cave Meshweaver	*Cicurina vespera*	E	--	None	None
Government Canyon Bat Cave Spider	*Tayshaneta microps*	E	--	None	None
Madla Cave Meshweaver	*Cicurina madla*	E	--	None	None
Robber Baron Cave Meshweaver	*Cicurina baronia*	E	--	None	None

Table 3. Federally Listed Endangered, Threatened, Proposed, and Candidate Species Potentially Occurring in Bexar and Guadalupe Counties, Texas

Species		Conservation Status[1]		Potential to Occur in Project Area	
Common Name	**Scientific Name**	**Federal**	**State**	**Habitat**	**Species**
BIRDS					
Bald Eagle	*Haliaeetus leucocephalus*	BGEPA	--	Foraging, Breeding Unlikely	Possible
Eastern Black Rail	*Laterallus jamaicensis jamaicensis*	T	T	None	None
Golden-cheeked Warbler	*Setophaga chrysoparia*	E	E	None	Possible
Golden Eagle	*Aquila chrysaetos*	BGEPA	--	Foraging	Unlikely
Piping Plover	*Charadrius melodus*	T	T	None	Unlikely
Rufa Red Knot	*Calidris canutus rufa*	T	T	None	Unlikely
Whooping Crane	*Grus americana*	E	E	Foraging	Unlikely
CRUSTACEANS					
Peck's Cave Amphipod	*Stygobromus* (=*Stygonectes*) *pecki*	E	E	None	None
FISH					
Fountain Darter	*Etheostoma fonticola*	E	E	None	None
Toothless Blindcat	*Trogloglanis pattersoni*	PE	T	None	None
Widemouth Blindcat	*Satan eurystomus*	PE	T	None	None
INSECTS					
Comal Springs Riffle Beetle	*Heterelmis comalensis*	E	E	None	None
Comal Springs Dryopid Beetle	*Stygoparnus comalensis*	E	E	None	None
[No Common Name] Beetle	*Rhadine exilis*	E	--	None	None
[No Common Name] Beetle	*Rhadine infernalis*	E	--	None	None
Helotes Mold Beetle	*Batrisodes venyivi*	E	--	None	None
Monarch Butterfly	*Danaus plexippus*	PT	--	Potential	Possible
MAMMALS					
Tricolored Bat	*Perimyotis subflavus*	PE	--	Potential	Possible
MOLLUSKS					
False Spike	*Fusconaia mitcheli*	E	E	None	None
Guadalupe Fatmucket	*Lampsilis bergmanni*	E	E	None	None
Guadalupe Orb	*Cyclonaias necki*	E	E	None	None
PLANTS					
Black Lace Cactus	*Echinocereus reichenbachii* var. *albertii*	E	E	None	None
Bracted Twistflower	*Streptanthus bracteatus*	T	--	None	None
Texas Wild-rice	*Zizania texana*	E	E	None	None

[1] E = Endangered; T = Threatened; PE = Proposed Endangered; PT = Proposed Threatened; C = Candidate; BGEPA = Protected under the Bald and Golden Eagle Protection Act; -- = Not listed
Source: USFWS 2025b, 2025c; TPWD 2025a

Of note, numerous federally listed species of known or potential occurrence in Bexar and Gaudalupe counties exhibit highly restricted ranges associated with surficial (e.g., springs) and subsurface (e.g., caves, cavities, and voids) karst features of the Edwards Aquifer and Edwards Plateau Ecoregion. As previously discussed, the project area is within the Northern Blackland Prairie Ecoregion of the Texas Blackland Prairies and does not overlie the Edwards Aquifer. Further, the project area does not exhibit geologic formations supportive of karst feature formation. Review of the USFWS San Antonio Area Endangered Karst Invertebrates mapper (USFWS 2025e) does not locate the project area within a karst fauna region and identifies the project area as within Karst Zone 4b. Karst Zone 4b includes areas which do not contain karst invertebrate species, and for which karst feature surveys are not required if beyond a 500-foot buffer from Zones 1 through 3b (which the project area is) (USFWS 2024a, **Figure 4**).

Therefore, the following species were included in **Table 3** but are not discussed further because potentially suitable habitat is not present and the species are not anticipated to occur within the project area: San Marcos salamander (*Eurycea nana*), Texas blind salamander (*Eurycea rathbuni*), Cokendolpher Cave harvestman (*Texella cokendolpheri*), Government Canyon Bat Cave meshweaver (*Cicurina vespera*), Government Canyon Bat Cave spider (*Tayshaneta microps*), Madla Cave meshweaver (*Cicurina madla*), Robber Baron Cave meshweaver (*Cicurina baronia*), Peck's Cave amphipod (*Stygobromus pecki*), toothless blindcat (*Trogloglanis pattersoni*), widemouth blindcat (*Satan eurystomus*), Comal Springs riffle beetle (*Heterelmis comalensis*), Comal Springs dryopid beetle (*Stygoparnus comalensis*), two unnamed beetles (*Rhadine exilis* and *R. infernalis*), and Helotes mold beetle (*Batrisodes venyivi*).

Further, two federally listed bird species—piping plover (*Charadrius melodus*) and rufa red knot (*Calidris canutus rufa*)— need to be evaluated only for wind energy project, which this project is not (USFWS 2025b). Therefore, further discussion of these species is excluded.

The following paragraphs provide a brief review of the ecological requirements and known distributions of the federally listed species potentially occurring in Bexar and Guadalupe counties, Texas that were carried forward in the assessment. Thereafter, ICF's determination of potential for the species and its habitat to occur within the project area and the potential for the project to impact the species are provided.

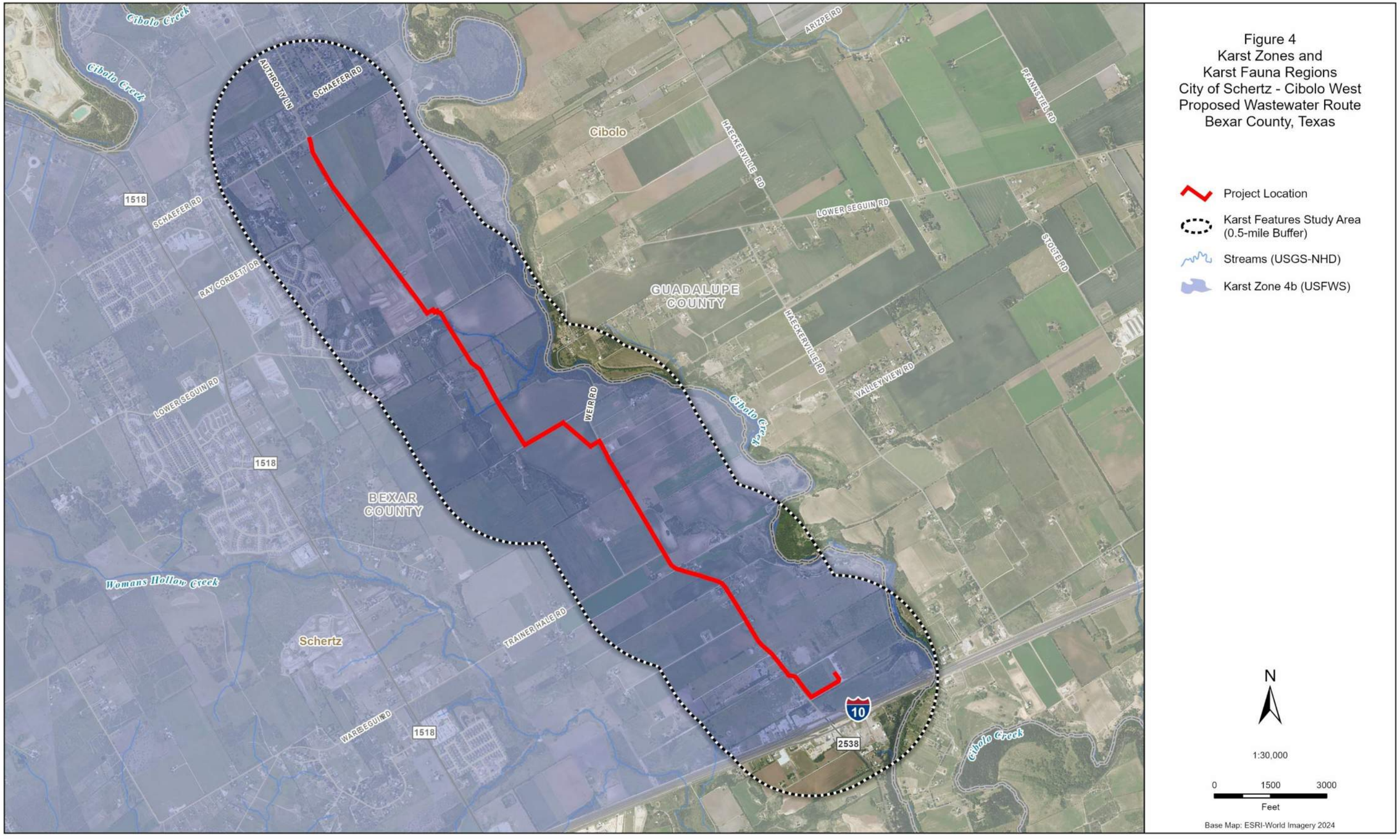
3.3.2.1 Federally Listed Species

Birds

Eastern Black Rail

The eastern black rail (*Laterallus jamaicensis jamaicensis*) is the smallest rail in North America, weighing on average just 35 grams (85 FR 63764). This small, sparrow-sized rail has red eyes, smoky to black breast and head, brown patch on the back of the neck and white spots on the tips of flight feathers on the back. It is a tropical migrant species that breeds and/or winters in Texas coastal marshes. Although primarily known from coastal areas, this rail has also been observed, periodically, in inland areas (85 FR 63764). Relatively little is known of the ecological requirements of the subspecies, but it occurs in salt, brackish, and freshwater marshes, primarily in those areas with dense herbaceous vegetation. The project area does not support large freshwater marsh complexes preferred by this subspecies.

The TPWD's TXNDD (TPWD 2025b), eBird (2025), and iNaturalist (2025) do not include observations of the eastern black rail within five miles of the project alignment. Based on the determination of no preferred habitat for the eastern black rail and lack of documented observations of the species in or near the project area, the species is not expected to occur within the project area or to be impacted by the project.


Cibolo Creek
Cibolo Creek
AUTHORITY LN
SCHAEFER RD
1518
SCHAEFER RD
RAY CORBETT DR
LOWER SEGUIN RD
1518
BEXAR COUNTY
Womans Hollow Creek
Schertz
TRAINER HALE RD
WARBEQUIM
1518
Cibolo
ARIZPE RD
HAECKERVILLE RD
LOWER SEGUIN RD
GUADALUPE COUNTY
HAECKERVILLE RD
VALLEY VIEW RD
WEIR RD
Cibolo Crk
PFANNSTIEL RD
STOLTE RD
10
2538
Cibolo Creek
Figure 4
Karst Zones and
Karst Fauna Regions
City of Schertz - Cibolo West
Proposed Wastewater Route
Bexar County, Texas
Project Location
Karst Features Study Area
(0.5-mile Buffer)
Streams (USGS-NHD)
Karst Zone 4b (USFWS)
N
1:30,000
0
1500
3000
Feet
Base Map: ESRI-World Imagery 2024

Golden-cheeked Warbler

The federally endangered golden-cheeked warbler (*Setophaga chrysoparia*, GCWA) is a small (about 5 inches long), neo-tropical songbird that nests only in the mixed Ashe juniper (*Juniperus ashei*)–oak (*Quercus* spp.) woodlands of Central Texas (TPWD 2025a). Listed on December 27, 1990 (55 FR 53153), critical habitat has been designated for the species. Adult males have black on the crown, nape, back, throat, and upper breast. The wings are black with two white wing bars. The cheeks are a bright golden-yellow with a black eyeline. The underparts are white streaked with black on the flanks. Adult females are similar but duller; the crown and back are olive-green with some black streaking (Ladd and Gass 1999). GCWAs only eat insects, including caterpillars, spiders, and beetles, typically found on foliage (Oberholser 1974, Pulich 1976).

The GCWA is the only bird in Texas that nests exclusively within the state's boundaries (Oberholser 1974). Ladd and Gass (1999) describe the breeding range of the GCWA as including portions of the Edwards Plateau, Lampasas Cut Plain, Central Mineral Region (or Llano Uplift), Comanche Plateau, Western Cross Timbers, and North Central Prairies physiographic regions, as delineated by Kier et al. (1977). The species has been recorded in 41 Texas counties, of which 25 counties (ranging from Young to Uvalde to Bexar to Johnson) had known breeding populations in 1999 (Ladd and Gass 1999).

Within GCWA habitat, Ashe juniper and various oak species are the dominant tree species throughout the breeding range. Texas oak (*Quercus buckleyi*), plateau live oak (*Q. fusiformis*), shin oak (*Quercus sinuata* var. *sinuata*), cedar elm (*Ulmus crassifolia*), walnut (*Juglans* spp.), hackberry (*Celtis* spp.), and Texas ash (*Fraxinus texensis*) are common, particularly in the central part of the GCWA's range (Pulich 1976, Ladd and Gass 1999). GCWAs are typically found in areas of steep slopes, canyon heads, draws, and adjacent ridgetops (Kroll 1974, Pulich 1976, Ladd 1985). GCWAs require some mature Ashe juniper in their nesting habitat. Bark shreds of mature Ashe juniper are used by the species for constructing nests, which are well camouflaged and located high in the nest tree, thereby making them difficult to find (Kroll 1974, Pulich 1976, Ladd 1985). Male warblers are territorial during the breeding season and defend territories that have been shown to range from approximately 4 to 10 acres (Ladd and Gass 1999).

GCWAs winter in pine–oak woodlands of mountainous regions (highlands) of southern Mexico (Chiapas) and Central America (Guatemala, Honduras, El Salvador, and Nicaragua) (Oberholser 1974, Pulich 1976, Braun et al. 1986, Groce et al. 2010). From July-August GCWAs migrate southward from Texas through eastern Mexico and southward (Oberholser 1974, Pulich 1976, Groce et al. 2010). GCWAs begin returning to Texas in late February (Vidal et al. 1994).

The project is in the Texas Blackland Prairies, which does not support breeding habitat and territories for the species. However, GCWA sightings have been documented within five miles of the project alignment (eBird 2025, TPWD 2025b, **Figure 5**). Given the proximity of the project area to the species' breeding habitat on the Edwards Plateau and its location within the migratory corridor for the species, these sightings represent observations of migrants. Occurrence of the species within the project area is likely but would include migrants passing through the area. The proposed project is not anticipated to affect the GCWA.

Figure 5
Species of Concern
City of Schertz - Cibolo West
Proposed Wastewater Route
Bexar County, Texas

Project Location

5-mile buffer

iNaturalist Occurrences

Monarch butterfly

Tricolored bat

eBird Occurrences

Bald Eagle

Golden-cheeked Warbler

Whooping Crane

There are no NDD element occurrences or federally listed, proposed, or candidate species and no designated or proposed critical habitat within five miles of the project location.

N

1:100,000

0 1 2

Miles

Base Map: ESRI-World Imagery 2024

Whooping Crane

The endangered whooping crane (*Grus americana*) is North America's tallest bird, with a standing height of five feet or more (Urbanek and Lewis 2020). The species was listed on March 11, 1967 (32 FR 4001) with critical habitat later designated (43 FR 20938). Although four geographically distinct populations of whooping cranes exist in the wild, the Aransas-Wood Buffalo Population (AWBP) is the largest and the only natural and self-sustaining population which in winter of 2022-2023 was estimated at 536 individuals (USFWS 2025f). The AWBP breeds in isolated marshy areas of Wood Buffalo National Park in Canada's Northwest Territories and overwinters on the Texas coast. Each fall, the entire AWBP population of whooping cranes migrates approximately 2,500 miles from northern Canada to the Aransas National Wildlife Refuge (ANWR) and adjacent areas of the mid-Texas coast in Aransas, Calhoun, and Refugio counties, where the species overwinters in oak savannahs, salt marshes, and bays (Campbell 2003, Canadian Wildlife Service [CWS] and USFWS 2007, USFWS 2009a).

The project area is located within the 90-percent Whooping Crane Migration Corridor (Pearse et al. 2018). The 90-percent Whooping Crane Migration Corridor is approximately 180 miles wide at the southern end and represents the area that contains 90 percent of all whooping crane sightings as determined by radio-tracking whooping cranes (2009-2018) (Pearse et al. 2020) and by mapping confirmed sightings of whooping cranes that have been reported by individuals during the period from 1950 to 2011 (Taylor et al. 2015). According to the Whooping Crane International Recovery Plan, the majority of whooping crane stopover sites are located in the central part of the U.S., along significant wetland complexes and riverine habitats (CWS and USFWS 2007).

Based on literature review and desktop analysis, the project area does not appear to support suitable stopover sites for roosting in migration or overwintering, such as large emergent wetland complexes. Further, proximity of development limits suitability of the project area for the species. However, migrating whooping cranes could stopover in the project area to forage in croplands, although such stopover would be unlikely. The closest reported whooping crane sighting to the project area is approximately 4.7 miles north of the project alignment's northern terminus (eBird 2025, **Figure 5**). The sighting is noted as incidental and may include observation of migrating individuals in flight. Occurrence of whooping cranes in the project area is highly unlikely but could include temporary stopover in migration. Nonetheless, the proposed project activities are not anticipated to affect the whooping crane.

Fish

Fountain Darter

The federally endangered fountain darter (*Etheostoma fonticola*), a member of the family Percidae, is a freshwater fish species endemic to the San Marcos and Comal rivers of Comal and Hays counties in Central Texas. The species has designated critical habitat in Hays County, Texas, at Spring Lake and downstream on the San Marcos River (USFWS 2025d). The historic range of this species on the San Marcos River extends from Spring Lake downstream to just below its confluence with the Blanco River, and in the Comal River, from the headwaters downstream to its confluence with the Guadalupe River (Schenck and Whiteside 1976). Currently the fountain darter is known to occur in the upper portions of the Comal River including Landa Lake and in the San Marcos River from Spring Lake downstream to the outfall of the San Marcos City Wastewater Treatment Plant (McKinney and Sharp 1995, Schenck and Whiteside 1976).

Between 1954 and 1973, the original population of fountain darters was extirpated from the Comal River (Linam et al. 1993, Schenck and Whiteside 1976). It is believed that a combination of a rotenone treatment by the Texas Fish, Game, and Oyster Commission in 1951 used to remove non-native Rio Grande cichlids (*Cichlasoma cyanoguttatum*), temperature variations due to the springs ceasing to flow for a six-month period in 1956, and a flood from Blieders Creek in 1971 all contributed to the die off of the fountain darter (Linam et al. 1993, Schenck and Whiteside 1976). Beginning in 1975, a total of 457 fountain darters from San Marcos were re-introduced into the Comal River, from which the present Comal River population is descended (Linam et al. 1993, Schenck and Whiteside 1976).

Fountain darters are small (usually <1.0 inch), olive-green in color, with dark markings along the lateral line, dark spots at the base of the tail, opercule, dorsal fin, and around the eye (Schenck and Whiteside 1976). Fountain darter habitat requirements include clear, clean, flowing, and thermally constant waters, adequate food supply, undisturbed sand and gravel substrates, rock outcrops, and areas of submergent vegetation (algae, moss, vascular plants) for cover (McKinney and Sharp 1995, Schenck and Whiteside 1976, USFWS 1996). Young fountain darters are found in heavily vegetated areas with low flows, while adults can be found in all suitable habitats (Schenck and Whiteside 1976). Fountain darters appear to have adapted to a relatively narrow temperature range at the downstream edges of their available habitat (Bonner et al. 1998).

Food sources for fountain darters consist of copepods, aquatic insect larvae, and amphipods (McKinney and Sharp 1995, Schenck and Whiteside 1976). Generally small aquatic invertebrates are the preferred food item; however, type and amount of food consumed changes with growth of the fish (Schenck and Whiteside 1976). Fountain darters feed based on visual cues, primarily during the day, and are stationary feeders; waiting for their prey to come to them (USFWS 1996, Schenck and Whiteside 1976).

Observations of the fountain darter have not been recorded within five miles of the project alignment (TPWD 2025b, iNaturalist 2025). Given the restricted range of the species and absence of potentially suitable habitat for the species within the project study area, the fountain darter is not anticipated to occur within the project area or to be affected by the proposed project activities.

Mollusks

Streams within Texas have been categorized by USFWS and TPWD (2023) into evaluation classes for potential mussel presence, as described and summarized in the "Texas Mussel Survey Protocol." The five stream groups defined therein are presented below:

- Group 1 Streams: Small/medium stream reaches that include designated or proposed Critical Habitat for federally listed or federally proposed mussel species or reaches known to or may be inhabited by federally listed species.
- Group 2 Streams: Large stream reaches that include designated or proposed Critical Habitat for federally listed or federally proposed mussel species or reaches known to or may be inhabited by federally listed species.
- Group 3 Streams: Small/medium stream reaches that are known to or may be inhabited by state listed freshwater mussel species, but presence of federally listed freshwater mussel species is not anticipated.

- Group 4 Streams: Large stream reaches that are known to or may be inhabited by state listed freshwater mussel species, but presence of federally listed freshwater mussel species is not anticipated.
- Group 5 Streams: Streams where no federally or state-listed freshwater mussels occur, but mussels are known to occur; or perennial streams where it is anticipated that live freshwater mussels may occur, but presence or diversity have not been confirmed.

Within the project area and project study area, several stream reaches, including Cibolo Creek, are recognized by USFWS and TPWD (2023) as Group 5 Streams. Numerous mussel records exist for the reach of Cibolo Creek within and adjacent to the project area. Species recorded do not include those that are currently federally listed, and include threeridge (*Amblema plicata*), Tampico pearly mussel (*Cyrtonaias tampicoensis*), yellow sandshell (*Lampsilis teres*), Louisiana fatmucket (*Lampsis hydiana*), washboard (*Megalonaias nervosa*), giant floater (*Pyganodon grandis*), mapleleaf (*Quadrula quadrula*), pondmussel (*Sagittunio subrostrata*), Texas lilliput (*Toxolasma texasiense*), tapered pondhorn (*Uniomerus declivis*), and paper pondshell (*Utterbackia imbecillis*) (Randklev et al. 2023).

False Spike

The false spike (*Fusconaia mitchelli*) is a medium-sized freshwater mussel that is federally listed as endangered with designated critical habitat effective July 5, 2024 (89 FR 48034). Its shell is tawny-brown to dark brown or black, oval to round in shape, and up to 5.2 inches in length (Howells 2014). Its historical range included the Brazos, Colorado, and Guadalupe river systems in Central Texas, and the Rio Grande System in New Mexico, Texas, and Mexico (Howells 2014, 74 FR 66260). Currently, only one false spike population is known, found in the lower Guadalupe River, with the species believed extirpated from the remainder of its range (89 FR 48034). Suitable habitat includes larger creeks and rivers, often in sand, gravel, or cobble substrates, in slow to moderate flows at shallow depths and not within impoundments (Randklev et al. 2023, Howells 2014). Glochidia host fish are believed to be minnows (family Cyprinidae) and have been confirmed to include blacktail shiner and red shiner (89 FR 48034, USFWS 2025b).

There are no recorded occurrences of the false spike within five miles of the project alignment (TPWD 2025b, iNaturalist 2025), and the project area is outside of the species' range (Randklev et al. 2023, USFWS 2025c). Based on the restricted current range of the species and its extirpation from its historical range, as well as the classification of Cibolo Creek as a Group 5 Stream, it is highly unlikely that the species could occur in Cibolo Creek. Other streams within the project area are classified as intermittent, are headwater drainages, and likely do not support suitable habitat for the species. Based on avoidance of Cibolo Creek by the project alignment and project location outside of the species' range, the project is not anticipated to affect the false spike.

Guadalupe Fatmucket

The Guadalupe fatmucket (*Lampsilis bergmanni*), previously believed to be the Texas fatmucket (*Lampsilis bracteata*), was recently described as a new species endemic to the Upper Guadalupe River (Inoue et al. 2019, USFWS 2022). The two species are indistinguishable by soft anatomy characteristics and shell morphology but are genetically distinct and occur within different river basins of the Edwards Plateau region. The Guadalupe fatmucket is restricted to the upstream reaches of the Guadalupe River Basin whereas the Texas fatmucket occurs only in the Colorado River Basin (Inoue et al. 2019). The species was federally listed as endangered on June 4, 2024, with designated critical habitat (89 FR 48034).

The Guadalupe fatmucket is a small to medium sized freshwater mussel with an elongated elliptical to ovate shape and offset hinge (GBRA 2022). The mussel is yellow to green or tan in color and often has green or brown growth rest lines that run from the hinge line to the margin of the shell (Guadalupe-Blanco River Authority [GBRA] 2022, Randklev et al. 2023). This mussel has different shell shapes for the males and females, with the female having a more inflated shell (Howells 2014). Guadalupe fatmucket adults are filter feeders that siphon plankton, organic matter and small organisms out of the water and sediment (GBRA 2022). The juvenile glochidia receive nourishment from the gills of a fish host. The Guadalupe fatmucket is found in headwater habitats in gravel or bedrock fissures, and its glochidial host fish are likely to be sunfish (family Centrarchidae) (89 FR 47916). It is reported to occur in slow to moderate current in sand, mud, and gravel substrates among large cobble, boulders, bedrock ledges, horizontal cracks in bedrock slabs, and macrophyte beds, as well as the roots of cypress (*Taxodium* spp.) trees and vegetation along steep banks (Randklev et al. 2023).

The project area is outside of the range of the Guadalupe fatmucket (Randklev et al. 2023, USFWS 2025c). Streams within the project area are classified as Group 5, where no federally or state-listed freshwater mussels are known to occur. Additionally, occurrence of the species has not been documented within five miles of the project area (TPWD 2025b, iNaturalist 2025). As such, the Guadalupe fatmucket is not expected to occur within the project area, and proposed project activities are not expected to affect the species.

Guadalupe Orb

The Guadalupe orb (*Cyclonaias necki*) is a recently federally listed endangered freshwater mussel species with designated critical habitat (89 FR 48034). The species is endemic to Central Texas and occurs only in the Guadalupe River Basin in two separate and isolated populations: the upper Guadalupe River and the lower Guadalupe River (86 FR 47916). This species is a small-sized mussel with a shell length that reaches up to 2.5 inches (Burlakova et al. 2018). Its shell is yellow-green, brown-green, yellow, brown, or black, and sometimes with green rays or blotches (Randklev et al. 2023). The Guadalupe orb inhabits medium-size streams to large rivers primarily in riffles and runs with substrates comprised of sand, gravel, and cobble, including mud-silt or gravel-filled cracks in bedrock slabs; it is considered intolerant of reservoirs but is known to occur in them (TPWD 2025a, Randklev et al. 2023).

The project area is outside of the range of the Guadalupe orb (Randklev et al. 2023, USFWS 2025c). Stream reaches of Cibolo Creek within the project area are classified as Group 5, where no federally or state-listed freshwater mussels are known to occur. Additionally, occurrence of the species has not been documented within five miles of the project area (TPWD 2025b, iNaturalist 2025). As such, the Guadalupe orb is not expected to occur within the project area, and proposed project activities are not expected to affect the species.

Plants

Of note, federally listed plants on private property generally do not have regulatory protection under the ESA, except for in certain circumstances (e.g., federal activities or federal nexus). Respective of the proposed project, federally listed plant occurrences have pertinence where in proximity to federally permitted activities, such as regulated stream crossings permitted under Section 404 of the CWA.

Black Lace Cactus

A federally endangered species, the black lace cactus (*Echnocereus reichenbachii* var. *albertii*) is a small, pink-flowering, columnar shaped cactus that occurs between coastal grasslands and Rio Grande plain

shrub (Emmett 1989). The species is typically found in open, unshaded areas in the vicinity of dense brush and near streams of the coastal plain in South Texas, generally at 50 meters or less in elevation (USFWS 2009b). It is often found growing with halophytes and is thought to be adapted to saline soils. The historic range of the black lace cactus based on known populations extends from east-central Jim Wells County on the most southwestern edge of the range to northeastern Kleberg County near Ricardo at the most southeastern point, and up to southern Refugio County at the most northern extent, encompassing portions of Jim Wells, Kleberg, Nueces, San Patrico, and Refugio counties (USFWS 2009b). Recent populations were discovered in northern McMullen County and southern Atascosa County (USFWS 2019). Most populations occur on private properties and the status of several populations remain uncertain. Threats to the species include conversion of its native habitat to cropland or improved pasture, the use of herbicides, encroachment of invasive species, and range improvement programs involving land cover changes via bulldozing and brush clearing (USFWS 2009b).

The project area is outside of the range of the black lace cactus, which occurs to the southeast and south (USFWS 2025c). Further, elevations in the project area are higher than anticipated for the species and most of the land cover in the project area has been converted to agriculture or urban development. Review of occurrences did not identify black lace cactus records within five miles of the project alignment (TPDWD 2025b, iNaturalist 2025). The black lace cactus is not expected to occur within the project area, and proposed project activities are not anticipated to affect the species.

Bracted Twistflower

Bracted twistflower (*Streptanthus bracteatus*) is an annual herbaceous plant in the mustard family (Brassicaceae) that is endemic to the southeastern edge of the Edwards Plateau in Central Texas (Poole et al. 2007). The species is known from Bandera (historical), Bexar, Comal (historical), Medina, Real (historical), Travis, and Uvalde counties (Poole et al. 2007, NatureServe 2025). Bracted twistflower is federally listed as threatened with a 4(d) rule and designated critical habitat (88 FR 21844). Designated critical habitat includes 1,596 acres in Uvalde, Medina, Bexar, and Travis Counties in Texas (USFWS 2025d).

Features that distinguish this species from most other congeners include leaves borne on the flower stalk that lack stems and all flower stems have a small, modified leaf, called a bract, at their bases (88 FR 21844). The plant flowers from mid-April to late May, with fruit maturing and foliage withering by early summer (Poole et al. 2007, TPWD 2025a). As an annual species, bracted twistflower populations fluctuate greatly by year, with no individuals germinating some years and abundant germination in others (USFWS 2021b). Germination is in response to fall and winter rainfall, with the species forming basal rosettes, with foliage waxy bluish-green above and often purple-tinged below, with broadly lobed margins. Flowering stalks, often unbranched and typically 18 to 24 inches in height but reaching 54 inches, emerge the following spring and bear showy lavender-purple flowers and have lower stem leaves that are elongated heart shaped (USFWS 2021b).

In the landscape, suitable bracted twistflower habitat is positioned near the boundary between the Edwards or Devils River limestone formations and the Glen Rose limestone formation (88 FR 21844). Habitat was described by Poole et al. (2007) as oak–juniper woodlands and associated tree canopy openings on steep to moderate slopes and in canyon bottoms, with shallow, well-drained gravelly clays and clay loams over limestone. Known populations of bracted twistflower are geographically associated with proximity to the Balcones Escarpment and the interface of Edwards and Glen Rose limestone formations (USFWS 2021b). Populations are known to occur on several soil types, including Tarrant, Brackett, or Speck soil series over Edwards, Glen Rose, and Walnut geologic formations (TPWD 2025a).

Species abundance has declined due to habitat destruction from urbanization and browsing pressure from introduced domestic and exotic animals and increased populations of white-tailed deer (Odocoileus virginianus) (NatureServe 2025).

Recorded occurrence of bracted twistflower is absent from within five miles of the project alignment (TPWD 2025b, iNaturalist 2025). Further, the project area is outside of the known range of the species (USFWS 2025c). Based on desktop review, the geology and land cover of the project area does not appear to support suitable habitats for the bracted twistflower. Therefore, the bracted twistflower is not anticipated to occur within the project area, and project activities are not expected to affect the species.

Texas Wild-rice

Texas wild-rice (*Zizania texana*) is an aquatic, monoecious, perennial macrophyte, 3.3 to 6.6 feet long that is endemic to the San Marcos River and federally listed as endangered (43 FR 17910). It is found growing submerged in swift moving, shallow areas (primarily ≤ 3.3 feet deep) of the San Marcos River (Poole and Bowles 1999). During times of low flow, the upper portions of the culms (stems) and leaves become emergent (Terrell et al. 1978, USFWS 1996). Texas wild-rice exhibits specific habitat requirements that include thermally constant temperatures, clear water, undisturbed stream bottom habitat, protection from floods, and protection that allows inflorescence (flower production) during reproduction (McKinney and Sharp 1995). To attach securely to substrate, it extends short spongy roots that are tightly intertwined and develop into a plant colony (Beaty 1972). The species flowers year-round, with anthesis peaking from March through June (TPWD 2025a).

Texas wild-rice has not been recorded within five miles of the project alignment (TPWD 2025b, iNaturalist 2025). Geographically restricted, the project area is outside of the species' range (USFWS 2025c), with the nearest occurrence of the species 29 miles to the northeast along the San Marcos River. Stream reaches within the project area do not appear characterized by swift moving, thermally constant waters with shallow areas and protection from flood events that could provide suitable habitat for the species based on desktop review by ICF. Texas wild-rice is not anticipated to occur within the project area, and construction of the proposed project is not expected to affect the species.

3.3.2.2 Proposed Species

The below sections describe two species with potential to occur in the project area that are proposed for federal listing: the tricolored bat (*Perimyotis subflavus*), which is proposed for listing as endangered, and the monarch butterfly (*Danaus plexippus*), which is proposed for listing as threatened. Species proposed for listing are generally not provided regulatory protection under the ESA except for federal projects or projects with a federal nexus. However, should the species be listed, they are afforded full regulatory protections at the time of listing.

Mammals

Tricolored Bat

The tricolored bat was proposed for listing as endangered by USFWS on September 14, 2022 (87 FR 56381).The tricolored bat is one of the smallest bats in eastern North America with an average body length of three inches and weighing between four and eight grams (Fujita and Kunz 1984). This insectivorous species is distinguished by its unique tricolored fur and often appears yellowish to nearly orange. A slow flier, with an erratic and "fluttery" pattern while foraging (Fujita and Kunz 1984), its flight pattern and small size lead people to sometimes mistake it for a moth (Harvey et al. 2011).

During non-hibernating seasons (i.e., spring, summer, and fall), the tricolored bat is among the earliest bat species to emerge to feed in the evening from daytime roost structures. Tricolored bats roost primarily in live and dead foliage of live or recently dead deciduous hardwood trees, such as oaks. However, roosting has also been observed in Spanish moss (*Tillandsia usneoides*), beard lichen (*Usnea trichodea*), pine needles, eastern redcedar (*Juniperus virginiana*), and artificial structures such as, bridges, culverts, barns, and open-sided shelters (e.g., porches, pavilions) (USFWS 2021a, 2024b). Tricolored bats primarily hibernate in caves, mine tunnels, and rock crevices wherever found within their range. Where caves are sparce, they may use road-associated culverts (USFWS 2021a, 2024b). In the southern portion of their range, where tricolored bats remain active year-round and exhibit shorter torpor bouts, they may roost in culverts, bridges, cavities in live trees, live and dead leaf clusters, and/or Spanish moss during the winter (USFWS 2021a, 2024b). Tricolored bats exhibit high site fidelity to hibernacula and small roosting areas (USFWS 2021a, 2024b); although, within a roosting area, tricolored bats are known to utilize different specific leaf clusters or other specific locations for shorter periods of time (Ammerman et al. 2012). Where they hibernate, tricolored bats typically disperse from winter hibernacula to summer roosting habitats in the spring, with at least some tricolored bats exhibiting latitudinal migration (more often males), with a maximum observed migration distance of 151 miles, with shorter distances more common (USFWS 2025g)

Tricolored bat foraging habitat includes a variety of forested habitats as well adjacent and interspersed non-forested habitats, such as emergent wetlands, edges of agricultural fields, old fields, and pastures. The diversity of potentially suitable roosting, foraging, and hibernating habitat makes identification of discrete tricolored bat habitat difficult (USFWS 2024b).

The species has been devastated by the novel, invasive fungal disease known as white-nose syndrome (WNS) since 2006 when the disease was first documented at hibernacula in upstate New York. As WNS has spread across the continent, numbers of the tricolored bat have plummeted. Biologists report mortality rates up to 100 percent in affected hibernacula. The tricolored bat hibernates for longer periods than other bat species within its range, although in the southern portion of its range, hibernation length may be shorter and they may continue feeding during the winter months and not move to hibernacula until December. The species' preference for hibernating sites within the optimal temperature and humidity range for the WNS fungus, may make the tricolored bat particularly susceptible to lethal infection by the disease (Langwig et al. 2012, USFWS 2021a).

The 2024 USFWS Range-wide Indiana Bat and Northern Long-eared Bat Survey Guidelines (USFWS 2024b), which also provide guidance for tricolored bats, indicate that the project area is within the tricolored bat Year-round Active Zone 2 (Zone 2). Within Zone 2, tricolored bats do not hibernate or go into winter torpor and are active year-round, roosting in the winter in similar habitats as used in other seasons. Information on spring staging and fall swarming activities is lacking for this zone. The summer occupancy in Zone 2 is from March 15 through July 15, which is the timeframe in which bats are present on their summer home range and/or roosting in colonies. Pup season in Zone 2 extends from May 1 through July 15, and demarcates the timeframe during late pregnancy and when most young are born until they can fly and forage independently (USFWS 2024b).

Roosting and foraging habitat occurs in the study area, but as previously noted, the diversity of potential habitat for the tricolored bat makes mapping discrete habitat locations difficult for the species. Therefore, suitable tricolored bat habitat was not discretely mapped by ICF; however, forests and woodlands could provide potential roosting habitat for the tricolored bat, and linear features, such as fencerows and riparian corridors, as well as open waters and wetlands, could be used as foraging areas.

Observation of the tricolored bat has been recorded within five miles of the project alignment, with a sighting 4.6 miles to the west of the southern terminus of the project alignment (iNaturalist 2025, **Figure 5**). Although the location of this record has been obfuscated and may be farther from the project area, the species has been documented elsewhere in the region (iNaturalist 2025). Bats are difficult to observe and/or identify and are not often detected without specialized equipment specifically used to determine the species. Although much of the project area extent is in cropland devoid of trees, remnant wooded areas could provide roosting habitat with foraging habitat throughout both in and outside of the project area. The proposed project may affect the tricolored habitat if removal clearing of wooded vegetation (e.g., trees and saplings generally > 4 inches diameter at breast height).

At present, the tricolored bat is proposed for federal listing (87 FR 56381) and is not afforded protection under the ESA at this time, but must be evaluated under the Section 7 process where there is a federal nexus (e.g., where CWA Section 404 permitting is required). If tree clearing for the project is required after the tricolored bat becomes federally listed, the listing and subsequent guidance should be reviewed to confirm the appropriate time for tree clearing to avoid impacts. Additionally, potential impacts to the species should be considered at locations where a Section 404 CWA permit is required (e.g., crossings of jurisdictional streams).

USFWS (2025g) has developed a voluntary review process for development projects which provides minimum conservation measures for projects that are likely to adversely affect the species. Within Zone 2, recommended minimum conservation measures include the following:

- Avoid removing known roost trees and suitable roost trees within 0.25-mile of a known tricolored bat maternity roost during the pup season.
- Avoid removing suitable roost trees within 1.5-miles of a tricolored bat capture or acoustic record during the pup season (based on completion of mist netting and acoustic surveys).
- If the project area is located outside of known buffered locations but within an area where tricolored bat may be present, conduct a voluntary presence/absence survey following the USFWS's guidelines or assume presence and avoid removing suitable roost trees during the pup season.
- Offset any remaining impacts of incidental take that were not avoided. For example, offsetting measures could include (but are not limited to) restoring or protecting known habitat for the affected species, locating and protecting new colonies, and treating tricolored bat for WNS if treatments are available.

Insects

Monarch Butterfly

The monarch butterfly was recently proposed for federal listing as threatened in December 2024 (89 FR 100662), and as such, is not currently protected by the ESA. A member of the family Nymphalidae, the monarch butterfly is a charismatic North American species known for its bright orange wings with a black border and black veins. Adult monarchs lay eggs on their obligate milkweed host plant (*Asclepias* spp.), which their larvae rely on as a food source during development (USFWS 2024c, 2025h). During the breeding season, there are multiple generations of monarchs produced, with adults living from two to five weeks on average; however, breeding adults enter diapause to overwinter, allowing them to live for six to nine months (USFWS 2024c). In migration and while breeding, adult monarchs rely on a

diversity of blooming nectar resources, which they feed on (USFWS 2024c). Monarchs migrate through Texas in the fall and spring and are generally observed in a wide variety of habitats (iNaturalist 2025). Regarding the population east of the Rocky Mountains that crosses Texas, they migrate from as far as Canada across the United States to a few forested congregation sites in the mountains of central Mexico where they overwinter (USFWS 2025h).

Numerous monarch observations have been reported within five miles of the project alignment (iNaturalist 2025, **Figure 5**). Further, it is likely that the project area supports milkweed species that could serve as suitable host plants as well as nectar producing flowering plants that could serve as foraging resources. As a candidate species for federal listing, the monarch butterfly is not currently protected under the ESA, and any activities to avoid or minimize impacts to the species would be voluntary. Best management practices recommend maintenance activities to occur from November 1st through March 1st to avoid peak monarch breeding and migration periods in this region (Monarch Joint Venture 2023).

3.3.2.3 Bald and Golden Eagles

Within the United States or anywhere within its jurisdiction, bald eagles and golden eagles are protected by the BGEPA. Provisions of the act state that, unless otherwise permitted to do so, no person "shall knowingly, or with wanton disregard for the consequences of his act take, possess, sell, purchase, barter, offer to sell, purchase or barter, transport, export or import, at any time or in any manner, any bald eagle or golden eagle, alive or dead, or any part, nest, or egg thereof." As used in the BGEPA, the definition of "take" includes pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or disturb. The act imposes criminal and civil penalties on anyone, including associations, partnerships, and corporations that violate the act.

The most likely source of eagle take in the context of the proposed project would be from bald eagle nest take or nest disturbance. The probability of either of these threats from the proposed project is dependent on (1) the amount of required tree clearing, and (2) the likelihood of occurrence of nesting bald eagles in the project area. The latter can be substantially mitigated in the planning stage by reconnaissance surveys for eagles and their nests within a nominal buffer around the project area.

Bald Eagle

The bald eagle is the second largest bird of prey in North America, with a wingspan of 5.5 to 8 feet, and exhibits a distinguishable white head and tail with dark brown body and wings, and yellow hooked beak and feet in adult plumage. In 2007, the USFWS removed the bald eagle from the list of endangered and threatened wildlife (72 FR 37346), and TPWD recently removed the species from the state list of threatened species effective March 30, 2020 (45 Texas Register 2188). However, the species continues to receive federal protection under provisions of the BGEPA and MBTA, as previously discussed.

The bald eagle is a widespread migratory species, ranging over much of the U.S. and Canada. Primarily foraging on fish and occasionally waterfowl and other prey, including carrion, bald eagles prefer habitats associated with large bodies of water where prey is readily available (USFWS 1989). In Texas, the bald eagle is present year-round and may be found when breeding, wintering, and in migration. It is a rare and local summer resident primarily in the eastern third of the state but found more widely throughout most of the state during migration and winter (Oberholser 1974, Lockwood and Freeman 2014). In the winter, bald eagles are locally common on large reservoirs in the eastern third of Texas (Lockwood and Freeman 2014). Breeding populations generally occur in the eastern half of the state along the Gulf

Coast and on major inland lakes and reservoirs, while nonbreeding birds (i.e., migrants and winter residents) can occur throughout the state (USFWS 1993, Campbell 2003).

Migrating eagles generally arrive in Texas between September and October, with nesting typically occurring from October through June (USFWS 1993, Campbell 2003). Fall migration times have remained stable despite climate change (Therrien et al. 2017). Nesting sites often include tall trees or cliffs located along river systems or within 1 to 2 miles of some other large body of water (e.g., reservoirs) where they forage. In these areas, nests are often located on ecotones in areas where forest, marsh, and water converge. Mature trees taller than the surrounding forest (approximately 40- to 120 feet tall) that provide an unobstructed flight path are typically used for nesting and roosting. Common nest tree species in Texas include loblolly pine (*Pinus taeda*), bald cypress (*Taxodium distichum*), oaks, eastern cottonwood (*Populus deltoides*), and American sycamore (*Platanus occidentalis*). Mating bald eagle pairs exhibit high site fidelity to nesting territories and often rebuild in the same location or vicinity of a fallen nest (USFWS 2007, Buehler 2022).

Database review did not identify known bald eagle nests within five miles of the project area (TPWD 2025b, eBird 2025, iNaturalist 2025). Given the absence of large waterbodies (e.g., major rivers, lakes, large ponds) that could provide suitable foraging habitats and near which bald eagles typically nest, it is unlikely that nesting bald eagles occur within the project area. Further, availability of suitable nest trees appears limited in the project area due to conversion of woodland to cropland and urban development. Nonetheless, numerous bald eagle sightings occur within five miles of the project alignment (eBird 2025, **Figure 5**). The project area likely provides suitable foraging habitat for the species. Site reconnaissance is recommended to assess whether bald eagle nests occur within 660-feet of the proposed project alignment. The project is not anticipated to impact the bald eagle assuming that bald eagle nests do not occur within the project area and should nests be discovered, nest impacts could be avoided.

Golden Eagle

The golden eagle occupies a variety of habitats in western North America ranging from Arctic to desert. It is found primarily in mountains up to 12,000 feet, canyonlands, rimrock terrain, and riverside cliffs and bluffs, but is also found in flat open spaces where it forages near cliffs that provide nesting or overwintering sites. Golden eagles nest on cliffs and steep escarpments in grassland, chaparral, shrubland, and forest. This species subsists primarily on rabbits, hares, ground squirrels, and prairie dogs, though they are capable of taking much larger prey such as cranes, wild ungulates, and domestic livestock (Farrand 1988, Kochert et al. 2002). Based on their range and habitat requirements, golden eagles have the potential to occur as transients or foragers within the project area. A search of the TXNDD (TPWD 2025b), eBird (2025), and iNaturalist (2025) found no records of a golden eagle sighting near the project site. Therefore, it is considered unlikely that a golden eagle would occur in the project area.

3.3.2.4 General Avian Species

The MBTA of 1918 established a prohibition to "pursue, hunt, take, capture, kill, attempt to take, capture or kill, possess, offer for sale, sell, offer to purchase, purchase, deliver for shipment, ship, cause to be shipped, deliver for transportation, transport, cause to be transported, carry, or cause to be carried by any means whatever, receive for shipment, transportation or carriage, or export, at any time, or in any manner, any migratory bird…or any part, nest, or egg of any such bird" (16 U.S.C § 703).

In the MBTA's long history, there have been differing interpretations of its applicability, particularly to activities that unintentionally kill migratory birds or destroy their nests. Most recently, the USFWS published a final rule on October 4, 2021, revoking a January 7, 2021, regulation that limited the scope of the MBTA (86 FR 54642). This rule became effective on December 3, 2021. As a result, the USFWS has returned to implementing the MBTA as prohibiting incidental take and applying enforcement discretion, consistent with judicial precedent and long-standing agency practice prior to 2017.

Since the project area is comprised mostly of cropland, with some shrub/scrub and hay/pasture as well as urban development, it is not anticipated to result in the loss of sensitive habitat for migratory birds. Constructing the project outside the breeding season is a potential best management practice (BMP) that could minimize risks to migratory birds.

3.4 Cultural Resources

Several state and federal laws intended to protect cultural resources may apply to the project. At the federal level, the following laws may apply to actions on federal land or private land on which federal actions (e.g., federal permitting or funding) are required:

- The Antiquities Act of 1906 established protection over any "historic ruin or monument, or any object of antiquity situated on government lands" and requires permits for their removal.
- The National Historic Preservation Act (NHPA) of 1966, as amended through 2000, authorizes the Secretary of the Interior to expand and maintain the National Register of Historic Places (NRHP), establishes and defines the responsibilities of the State and Tribal Historic Preservation Officers and the Advisory Council of Historic Preservation (ACHP), and pledges federal assistance to the preservation efforts of state and local groups.
- Section 106 of the NHPA of 1966, as amended through 2000, requires Federal agencies to take into account the effects of their activities and programs on historic properties. When a federal agency funds, licenses, or permits an activity that may affect cultural resources, the agency must consult with the State Historic Preservation Office in cooperation with the ACHP in Washington, D.C. to comply with Section 106 of the NHPA.
- The American Indian Religious Freedom Act of 1978 protects and preserves for American Indians their inherent right of freedom to believe, express, and exercise the traditional religions of the American Indian, Eskimo, Aleut, and Native Hawaiians, including but not limited to access to sites, use and possession of sacred objects, and the freedom to worship through ceremonials and traditional rites.
- The Native American Graves Protection and Repatriation Act of 1990 requires the return of Native American remains and cultural objects by federal agencies and museums to Native American groups and governs excavations and inadvertent discovery of remains and cultural items on federal and tribal lands.

Construction of the project would occur entirely on private lands and no federal nexus is anticipated; therefore, the federal regulations described above are not anticipated to apply to the project.

At the state level, applicable cultural resource regulations include the following:

- Natural Resources Code, Title 9, Chapter 191—Antiquities Code of Texas (13 TAC 26.1–27). The Antiquities Code of Texas (ACT) was enacted to protect archeological sites and historic buildings on state lands. The ACT requires state agencies and political subdivisions of the state to notify the THC of ground-disturbing activity on public land. The law also established the designation of SALs, which may be applied to historic buildings as well as archeological sites. Under Subchapter E § 191.132, the intentional defacing of American Indian or aboriginal paintings, hieroglyphics, or other marks or carvings on rock or elsewhere that pertain to early American Indian or aboriginal habitation of the country is prohibited. Additionally, §191.32 states that a person who is not the owner shall not willfully injure, disfigure, remove, or destroy a historical structure, monument, marker, medallion, or artifact without lawful authority. The project is planned to be constructed entirely on private lands, and no state lands will be impacted from project construction.
- Health and Safety Code, Title 8, Chapter 711—General Provisions Relating to Cemeteries (13 TAC 22.1–6). The owner of property on which an unknown cemetery or grave is discovered or on which an abandoned cemetery is located may not construct improvements on the property in a manner that would further disturb the cemetery or grave until the human remains interred in the cemetery are removed under a written order issued by the state registrar or the state registrar's designee under Section 711.004(f) and under an order of a district court.

An Archeological Survey Permit is required for projects undertaken on lands owned or controlled by an agency or political subdivision of the State of Texas. These permits must be approved by the THC. Because the project will be constructed by the City of Schertz, a political subdivision of the State, an Archeological Survey Permit would be required.

ICF conducted a background review of previous archeological surveys and locations of recorded archeological sites within 0.5 mile of the project alignment by consulting the THC restricted access Online Archeological Sites Atlas (Atlas) (THC 2025b). IN addition to identifying recorded archeological sites, the review included the following types of information on the Atlas: NRHP-listed properties, SALs, OTHMs, RTHLs, and cemeteries. Results of the background review indicate that portions of the project area have been previously surveyed for archeological resources during two investigations and one additional investigation occurs within 0.5 mile. No previously recorded archeological sites or cemeteries occur within the project alignment. Four archeological sites, two cemeteries, and one NRHP property have been recorded within a 0.5-mile radius of the project alignment.

Cemeteries are not typically considered eligible for inclusion in the NRHP but may be considered eligible if the cemetery derives its primary significance from graves of people who were of transcendent importance, or from age, or from distinctive design features, or from association with historic events. However, cemeteries are protected under Title 8, Subtitle C, Chapters 694–715 of the Texas Health and Safety Code and therefore, the project must be designed to avoid these sensitive resources. There is not a complete database of burial sites or cemeteries for the State of Texas.

Sacred Sites and Traditional Cultural Properties are places that Native Americans have a cultural or historic link to. These places do not necessarily have to contain any archeological remains and can be abstract. Due to this, it is impossible to inventory these sorts of places in any compressive way. There are no known Sacred Sites or Traditional Cultural Properties within the project area.

According to the project plans, some anticipated impacts from the proposed project would occur within existing roadway right-of-way (ROW) (specifically beneath existing pavement) and within an easement that is collocated with an existing wastewater pipeline (specifically the project alignment between Lower Seguin Road and Schaefer Road), which have been previously impacted. Remaining anticipated impacts from the proposed project would occur within new locations crossing agricultural fields and other undeveloped lands, which do not appear to be previously disturbed based on desktop review, are within Pleistocene to Holocene-aged terrace deposits that are high provability for the presence of archeological sites along Cibolo Creek, and have not been previously surveyed. Additionally, the presence of deep soils in this area potentially dating back to the Holocene era suggests deeply buried archeological deposits may be present. Based on this data and the project's anticipated depth of impact, it is possible that the proposed project could adversely affect intact archeological sites in a few areas, and thus, ICF recommends archaeological survey of portions of the project area where intact buried cultural deposits may be impacted. ICF composed a request to the THC for concurrence with these findings, which is provided in **Appendix A** and provides further details and mapping of recommended survey areas.

ICF historians conducted a review of the THC's Texas Historic Sites Atlas (THC 2025a) for standing structures SALs and properties and districts listed in the NRHP located within or directly adjacent to the proposed project activities. One NRHP-listed property—the SH3-A Bridge at Cibolo Creek—was identified within the 0.5-mile of the project alignment. Since there are no historic properties or districts listed in the NRHP or standing structures designated as SALs within the proposed project alignment, the project has no potential to affect historic properties, and no additional work under the ACT for the non-archeological built environment resources is recommended at this time. Further details are provided in **Appendix A**.

4.0 Summary and Recommendations

ICF completed desktop review of environmental and cultural resources located along and in the vicinity of the proposed project alignment. Regarding water resources, the project alignment intersects two database-mapped intermittent stream reaches in its northern extent. ICF recommends completion of a delineation of WOTUS following routine determination methods for the project alignment and ROW. Based on photointerpretation and the upper headwater locations of these stream reaches, it is possible that they are non-jurisdictional features. Should field delineation find these or other resources along the alignment to be potential WOTUS and discharge of dredged or fill materials into such features is necessary (e.g., cannot be avoided by re-routing or boring under), triggering required compliance with Sections 404 and 401 of the CWA, ICF anticipates that such impacts can likely be completed under Nationwide Permit 58. Utility Line Activities for Water and Other Substances (NWP 58) without Pre-construction Notification (PCN). To do so, impacts at each single and complete crossing would have to be under the threshold (< 0.1 acre) and meet all conditions of NWP 58, as well as general and regional conditions for the NWP program. These include, but are not limited to, General Condition 18. Endangered Species, General Condition 19. Migratory Birds and Bald and Golden Eagles, and General Condition 20. Historic Properties. Of note, requirements of General Condition 18 include evaluation for both federally listed and proposed species, which for the project would include tricolored bat and monarch butterfly. Therefore, clearing of potential roost trees for tricolored bats near WOTUS crossing would need to be considered.

Desktop evaluation of the potential occurrence of habitat and individuals for federally listed species, species proposed or candidate for such listing, and bald and golden eagles was completed by ICF for the project area. Project impacts to federally listed species are not anticipated; however, impacts could occur to the proposed tricolored bat and monarch butterfly. These species are not currently afforded regulatory protection under the ESA except at locations with a federal nexus (e.g., WOTUS crossings) or federal projects. Voluntary conservation measures for these species are provided in the pertinent species sections. Bald eagles may occur in the project area, where they may forage. Occurrence of bald eagle nests is unlikely and not expected, but possible. Therefore, ICF recommends completion of a field reconnaissance to identify bald eagle nest presence/absence within 660 feet of the project alignment. Other federally listed species may occur within the project area temporarily during migration or as vagrants and include golden-cheeked warbler, piping plover, rufa red knot, and whooping crane. The proposed project activities are not anticipated to affect these species.

Cultural resources survey is recommended for archeological resources along specified extents of the proposed project alignment and ROW where ICF desktop review identified potential for their occurrence. Further information is detailed in the letter requesting concurrence with these findings to the THC (**Appendix A**), which includes mapping of suggested survey locations. Suggested survey would include both shovel testing and mechanical deep trenching.

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Appendix A

THC Request for Concurrence Letter (DRAFT)

May 23, 2025

Dr. Emily Dylla
Archeology Division
Texas Historical Commission
1511 Colorado Street
Austin, Texas 78701

Subject: Proposed City of Schertz Cibolo Valley West Trunk Main Route Study and Analysis - Request for Concurrence with Desktop Review

Dear Dr. Dylla:

Blanton & Associates, Inc., a wholly owned subsidiary of ICF Jones & Stoke, Inc's. (ICF), is hereby providing a request for concurrence with the results of our desktop review under the Antiquities Code of Texas for the proposed Cibolo Valley West Trunk Main Route Study and Analysis in Bexar County, Texas, on behalf of the City of Schertz (City). The planned project would install a series of new wastewater pipelines (**Figures 1** and **2** in **Attachment**) and will be constructed within an easement that crosses privately owned lands. The City controls the easement where project activities are proposed, making the project subject to review under the Antiquities Code of Texas. No federal nexus is anticipated.

Project Description

The City is proposing to install approximately 23,000 linear feet (LF) of 18-inch to 48-inch diameter wastewater sewer main (approximately 4.36 miles). A work zone buffer of 25 feet along the proposed alignment is assumed. The project area totals approximately 13.11 acres. Anticipated depth of impacts for the pipelines are 10 to 15 feet below ground surface for the northern portion of the project area and up to 31 feet below the current ground surface near Trainer Hale Road where the ground elevation is highest.

Archeological Resources

ICF conducted a background review of previous archeological surveys and locations of recorded archeological sites within 0.5 mile of the project area by consulting the Texas Historical Commission's (THC) restricted access Online Archeological Sites Atlas (Atlas). In addition to identifying recorded archeological sites, the review included the following types of information on the Atlas: NRHP-listed properties, State Antiquities Landmarks (SALs), Official Texas Historical Markers (OTHMs), Recorded Texas Historic Landmarks (RTHLs), and cemeteries.

Results of the background review indicate that portions of the project area have been previously surveyed for archeological resources during two investigations and one additional investigation occurs within 0.5 mile (**Figures 3** and **4** in **Attachment**, **Table 1**).

Table 1. Previous Investigations within the 0.5-Mile Study Area

Project	Sponsor/Client	Site(s) Discovered or Revisited	Approximate Distance of Previous Project Area to Current Project Area	Reference
1999 Survey	Unknown	None	0.30 mile	Atlas 2025
2003 Survey	Texas Water Development Board	None	Crosses Project Area	Davis et al. 2004
2010 Survey	Bexar County Flood Control	41BX1875	Crosses Project Area	Young and Sanchez 2013

Source: Atlas 2025.

No previously recorded archeological sites or cemeteries occur within the project area. Four archeological sites, two cemeteries, and one NRHP property have been recorded within the 0.5-mile study area (**Figures 3** and **4**, **Table 2**).

Table 2. Cultural Resources within the 0.5-Mile Study Area

Site/Cemetery/NRHP Property/Marker/District	Description	SAL/NRHP Eligibility	Approximate Distance to Project Area
41BX178	Undated Native American lithic procurement locality	Undetermined	0.31 mile
41BX506	Undated Native American campsite	Undetermined	0.50 mile
41BX1719	Undated Native American campsite	Determined Ineligible within TxDOT ROW	0.38 mile
41BX1875	Undated Native American campsite	Undetermined	0.50 mile
Hector Galindo Grave	Cemetery	Undetermined	0.43 mile
Stapper Cemetery	Cemetery	Undetermined	0.32 mile
SH 3-A Bridge at Cibolo Creek NRHP Property	Historic bridge	Listed 1996	0.49 mile

Source: Atlas 2025.

According to the project plans, some anticipated impacts from the proposed project would occur within existing roadway right of way (specifically beneath existing pavement) and within an easement that is collocated with an existing wastewater pipeline (specifically the project alignment between Lower Seguin Road and Schaefer Road), which have been previously impacted. Remaining anticipated impacts from the proposed project would occur within new locations crossing agricultural fields and other undeveloped lands, which do not appear to be previously disturbed based on desktop review, are within

Pleistocene to Holocene-aged terrace deposits that are high probability for the presence of archeological sites along Cibolo Creek, and have not been previously surveyed. Additionally, the presence of deep soils in this area potentially dating back to the Holocene era suggests deeply buried archeological deposits may be present. Based on this data and the project's anticipated depth of impact, it is possible that the proposed project could adversely affect intact archeological sites in a few areas, and thus, ICF recommends archeological survey of portions of the project area where intact buried cultural deposits may be impacted (**Figures 5.1** and **5.2**). Field survey methods should consist of pedestrian survey and shovel testing supplemented by backhoe trenching or other deep testing within portions of the project that are recommended for survey (approximately 7.86 acres).

Non-Archeological Built Environment Historic Resources

ICF historians conducted a review of the THC's *Texas Historic Sites Atlas* for standing structures SALs and properties and districts listed in the NRHP located within or directly adjacent to the proposed project activities. As identified in **Table 2** above, there is one NRHP-listed property – the SH 3-A Bridge at Cibolo Creek – within the 0.5-mile study area around the proposed project area (THC 2025). Since there are no historic properties or districts listed in the NRHP or standing structures designated as SALs within the proposed project area, the proposed project has no potential to affect historic properties, and no additional work under the Antiquities Code of Texas for the non-archeological built environment resources is recommended.

Conclusion

This letter recommends that a survey to assess project impacts to archeological sites be performed for the proposed project. It also recommends no additional work for non-archeological built environment resources. ICF respectfully requests concurrence with these findings in consultation under the Antiquities Code of Texas. If you have any questions regarding this project or the information included in this letter, please contact me at andrea.burden@icf.com or John Williamson, Environmental Project Manager, at john.williamson@icf.com.

Sincerely,



Andrea Stahman Burden
Lead Archeologist
ICF

cc: Heather Goodson, Senior Historian, ICF
John Williamson, Project Manager, ICF

Attachment: Figures

References

Atlas
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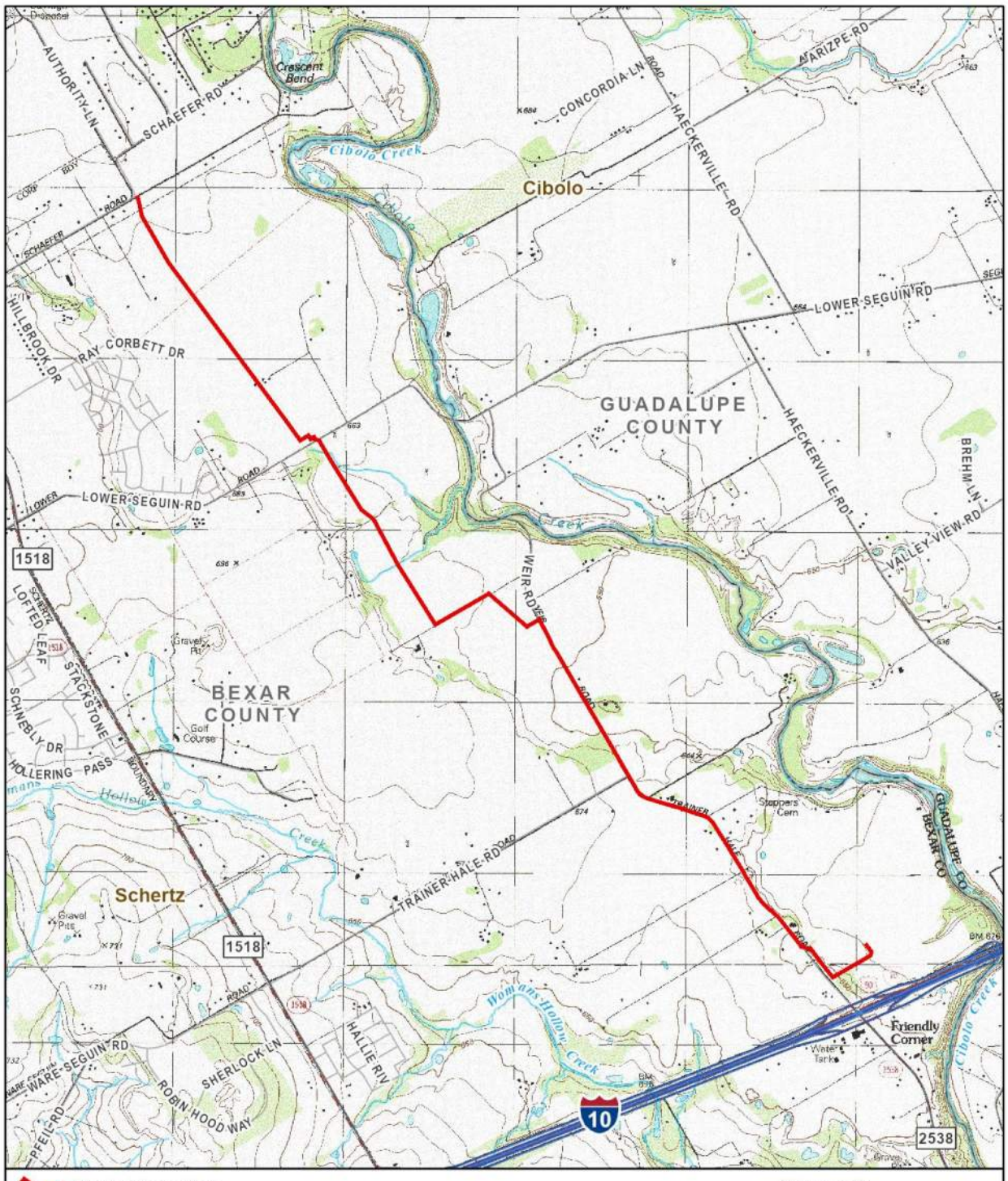
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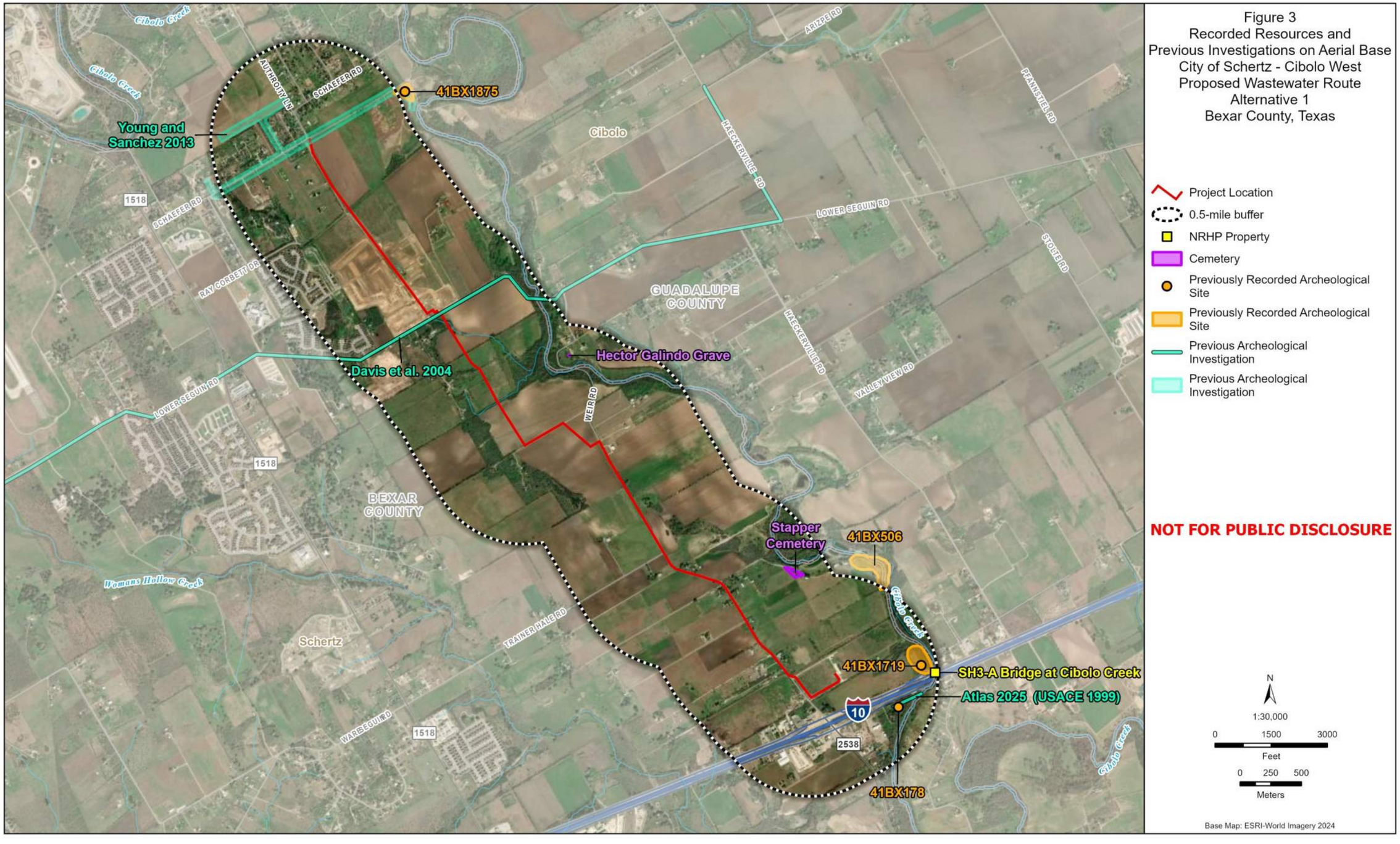
Figures

Request for Concurrence with Desktop Review
Proposed City of Schertz Cibolo Valley West Trunk Main Route Study and Analysis
Bexar County, Texas
May 23, 2025
Attachments

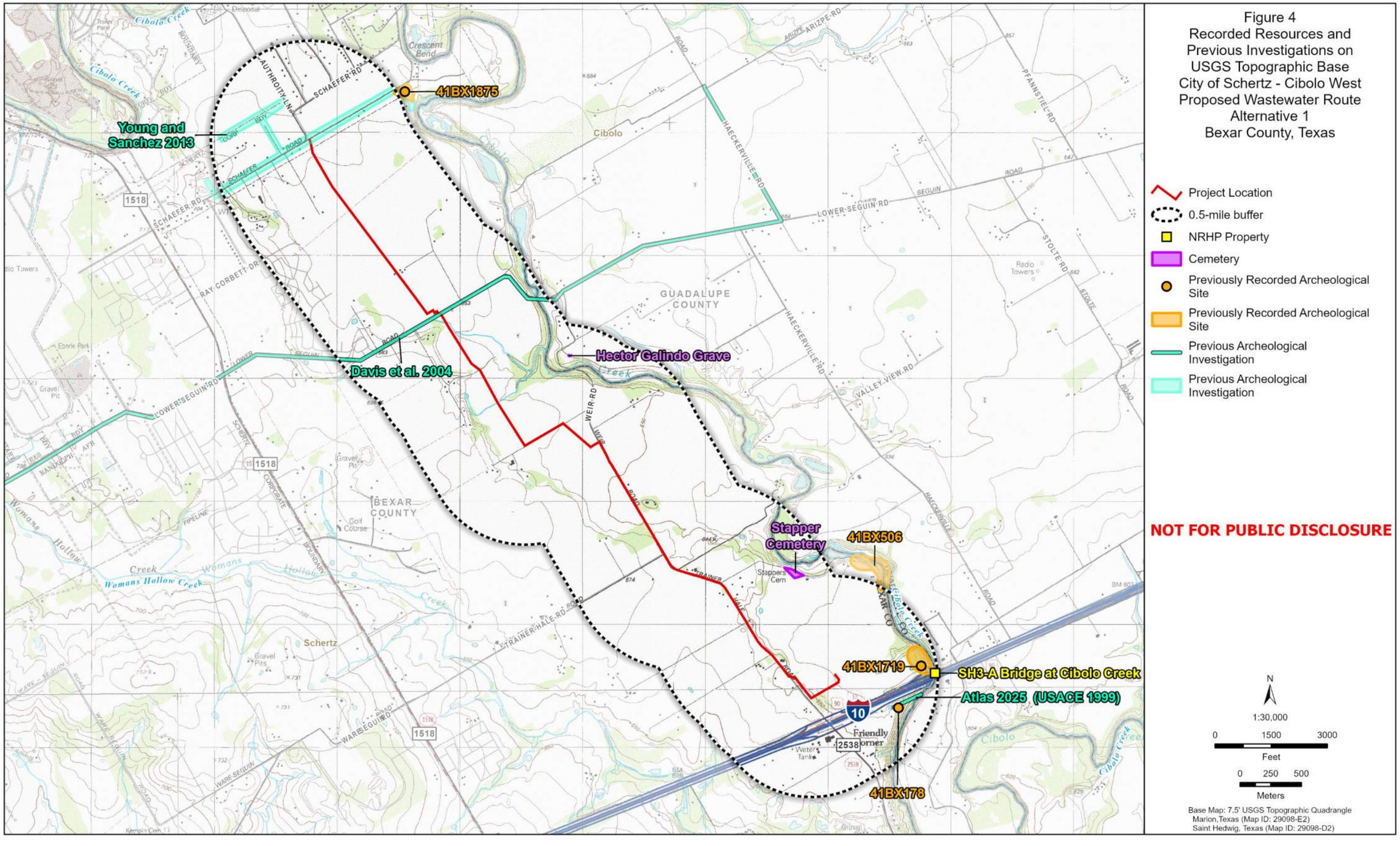


Request for Concurrence with Desktop Review
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Bexar County, Texas
May 23, 2025
Attachments

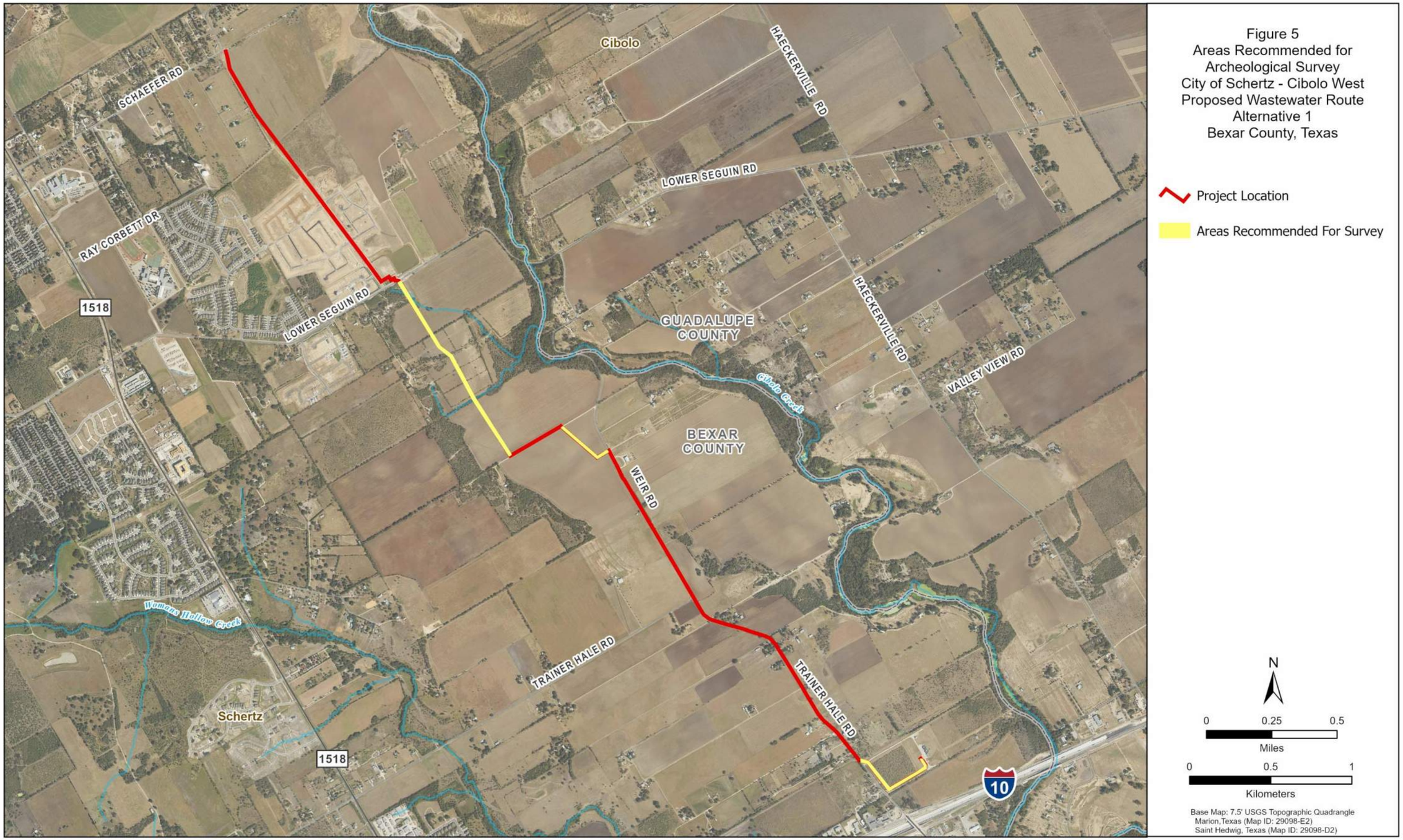



Cibolo Creek
Cibolo Creek
AUTHORITY LN
SCHAEFER RD
41BX1875
Young and Sanchez 2013
1518
SCHAEFER RD
RAY CORBETT DR
Cibolo
ARIZPE RD
HAECKERVILLE RD
PEANUT FIELD RD
LOWER SEGUIN RD
STOCKE RD
GUADALUPE COUNTY
Davis et al. 2004
Hector Galindo Grave
WEIR RD
HAECKERVILLE RD
VALLEY VIEW RD
LOWER SEGUIN RD
1518
BEXAR COUNTY
Stapper Cemetery
41BX506
Womans Hollow Creek
Schertz
TRAINER HALE RD
41BX1719
SH3-A Bridge at Cibolo Creek
Atlas 2025 (USACE 1999)
10
2538
WARBEGUIWD
1518
41BX178
Cibolo Creek
Figure 3
Recorded Resources and
Previous Investigations on Aerial Base
City of Schertz - Cibolo West
Proposed Wastewater Route
Alternative 1
Bexar County, Texas
Project Location
0.5-mile buffer
NRHP Property
Cemetery
Previously Recorded Archeological Site
Previously Recorded Archeological Site
Previous Archeological Investigation
Previous Archeological Investigation
NOT FOR PUBLIC DISCLOSURE
N
1:30,000
0 1500 3000
Feet
0 250 500
Meters
Base Map: ESRI-World Imagery 2024

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Request for Concurrence with Desktop Review
Proposed City of Schertz Cibolo Valley West Trunk Main Route Study and Analysis
Bexar County, Texas
May 23, 2025
Attachments



APPENDIX D

Geotechnical Desktop Study

RABA KISTNER
a kiwa company
Raba Kistner, Inc.
1913 Post Road, Suite 645
New Braunfels, TX 78130
www.rkci.com
P 830.214.0544
F 830.214.0627
F-3257

GEOTECHNICAL DESKTOP STUDY

TO: Ms. Lisa K. Lattu, P.E., AICP
Lockwood, Andrews & Newnam, Inc.
407 South Stagecoach Trail, Suite 207
San Marcos, Texas 78666

FROM: Mr. Eric J. Neuner, P.E.
Vice President



Mr. Santosh Shrestha, E.I.T.
Graduate Engineer
Raba Kistner, Inc.

DATE: February 21, 2025

RE: **Geotechnical Desktop Study**
Cibolo West Trunk Line
Schertz, Texas
RKI Project No. ANA25-005-00

Raba Kistner, Inc. (RKI) is pleased to present our geotechnical desktop study for the reference site. This report includes our understanding of the project, desktop study information, site development considerations, and supporting data (Figure 1). It should be noted that this effort did not include performing field work, drilling, collecting samples, nor performing laboratory testing. Once project plans become more complete, RKI should be retained to perform a geotechnical subsurface exploration for the proposed alignment. Important information regarding geotechnical engineering reports has been prepared by the Geotechnical Business Council (GBC) and is included at the end of this document for your review.

Project Description

A conceptual alignment (approximately 20,500 lineal ft) for the Cibolo West Trunk Line has been identified in the City of Schertz. Preliminarily, the trunk line may have a diameter of 15 inches +/- and may include an additional 10-inch collector line (approximately 2,500 lineal ft) that connects to the trunk line near the northern segment. The preliminary trunk line extends from Schaeffer Road and trends to the south and east towards Interstate 10. We assume that the trunk line will be near 10 to 15 ft below the existing ground surface.

Based on our review of relatively recent aerial photography that is presented in Figure 1, the portion of this site is generally covered with brush and trees but will cross or extend along previously developed areas and roadways.

Anticipated Ground Conditions

Based on our review of the *Geologic Atlas of Texas, San Antonio Sheet*, the identified alignment is naturally underlain by fluviatile terrace deposits (Qt) and Leona Formation (Qle). Fluviatile terrace deposits are stream bed deposits typically consisting of clays, silts, sands, and gravels. Such deposits can contain point bars, cutbanks, oxbows, and abandoned channel segments associated with variations in stream bed activity. As a result, soil profiles in terrace deposit areas may vary greatly over relatively short vertical and horizontal distances. Key geotechnical engineering concerns for development

supported on this formation are the expansive nature of the clays, the consistency or relative density of the deposits, and the absence/presence as well as thickness of potentially water-bearing gravels.

The Leona Formation is associated with terrace deposits of the Nueces and Leona Rivers and typically consists of clays/silts grading down into coarse gravel and cobbles. The Leona Formation can be highly variable and can therefore result in highly variable conditions over relatively short distances. Key geotechnical engineering concerns for development supported on the Leona Formation are the expansive nature of the clays, the consistency and/or relative density of the deposits, and the absence/presence as well as thickness of potentially water-bearing gravels.

On the basis of available historic borings performed by RKI near this site, as illustrated on Figure 1, the subsurface conditions along the identified alignment is anticipated to consist of localized fills (from previous development and roadway grading) that in turn is underlain by natural highly plastic dark brown clay overlying tan gravel/sand up to 10 to 13 ft below the existing ground surface which may overlay highly plastic tan and gray clay.

Anticipated Groundwater

Historic RKI borings performed in this area encountered water at approximately 5 feet below the existing ground surface at the time of drilling. A review of available nearby well information from the Groundwater Database (GWDB) of the Texas Water Development Board (TWDB)[1], indicates that groundwater was encountered at approximately 13 to 15 feet below the existing ground surface at the time of that study for State Well Number 6831805 circa 1957 and was dry in 1963.

Based on our experience in the area, the potential for localized groundwater may occur as a perched condition, and it is possible for groundwater to exist beneath this site at shallow depths on a transient basis, particularly following periods of precipitation, runoff, Cibolo Creek stage, utility backfill or other source avenues not apparent at this time. Groundwater levels may vary significantly over time due to the effects of seasonal variation in precipitation, recharge, the depth and thickness of the sand/gravel layer, or other factors not evident at this time. The construction process itself may also cause variations in the groundwater level.

Preliminary Site Considerations

As discussed previously, a geotechnical field exploration and related analysis will be required once more completed site plans are available. The comments included in this report should only be used for conceptual planning. Key geotechnical engineering considerations for the identified alignment will include:

- Presence of groundwater and perched water in granular stratums (occurring naturally or from previous developments such as existing fill or utility backfill);
- Sloughing of excavation walls in granular soil layers; and
- Presence of potentially expansive soil and potential for soil-related movements.

Final recommendations will be affected by the plan and profile of the alignment, site grading plans, and structural tolerances. Additional considerations are summarized in the following table:

[1] Groundwater Data Viewer | Texas Water Development Board

Issue	Comment
Trench Safety	Temporary slopes or retention systems may be required. In areas where back slopes are feasible and have heights less than 20 ft, excavated slopes should be consistent with safety regulations. Submerged soil or soil in which water is freely seeping are classified as OSHA Type C soils. OSHA guidelines provide for temporary slopes performed in Type C materials to be constructed at 1 Vertical: 1.5 Horizontal or flatter. Excavations extending deeper than 20 ft must be evaluated by a professional engineer. Temporary slopes left open may undergo sloughing and result in an unstable situation. The contractor should evaluate stability and failure consequences before open cut slopes are made. Minor sloughing of open face slopes may occur. If the slope is expected to remain open for an extended time, an impermeable membrane covering the slopes could be considered as a means to reduce the potential for slope degradation and instability.
Groundwater	As discussed in the *Anticipated Groundwater* section, it is possible for groundwater to exist beneath this site at shallow depths on a transient basis, particularly following periods of precipitation and within granular layers. Typically, the Contractor is responsible for designing, installing and maintaining a dewatering system for groundwater control and taking precautions to avoid distress to nearby existing structures, as a result of dewatering. We recommend the Contractor consider retaining a dewatering expert to assist in identifying, implementing and monitoring the most suitable and cost-effective method to control groundwater. The groundwater depth should be lowered to a depth of at least 3 ft below the planned excavation bottom to provide a firm working surface. Extended and/or extensive dewatering can result in settlement of existing structures in the vicinity; the Contractor is to take necessary precautions to minimize the effects on these structures.
Excavations	An excavated temporary slope may not be feasible at all locations, and a temporary retention system may be required. While many different types and configurations of retention systems can be used, the more common include trench boxes. The design of the system should be performed by the contractor that performs the work. The design should account for the possibility of overexcavating unsuitable or disturbed subgrades. The contractor should also be responsible for monitoring the performance of the retention system. OSHA regulations should be followed with respect to bracing requirements. Worker safety and classification of soil type is the responsibility of the contractor. We do recommend that a pre-construction site evaluation and survey be performed to determine the proximity and condition of existing roadways and nearby structures prior to performing excavations.
Existing fill	Filled areas are not generally anticipated, although localized fills may be present. Fills, if any, are likely to be uncontrolled and would be considered potentially compressible.
Seismic risk	The following information has been summarized for seismic considerations associated with this site per ASCE 7-16 edition: Site Class Definition: **Class C**, based on our experience in the area.
Karst or Mines	The identified alignment is located over Karst Zone 4b. Karstic features and underground mines are not expected or known to occur in this area.

Report Limitations

The comments provided in this report are based on interpretation of limited published data and RKI experience. The client must recognize that variations may occur from the research. A subsurface exploration and geotechnical evaluation must be performed for additional subsurface evaluation. RKI will not be responsible for improper use of the comments herein or failure by others to recognize conditions that may be detrimental to the successful design of the project.

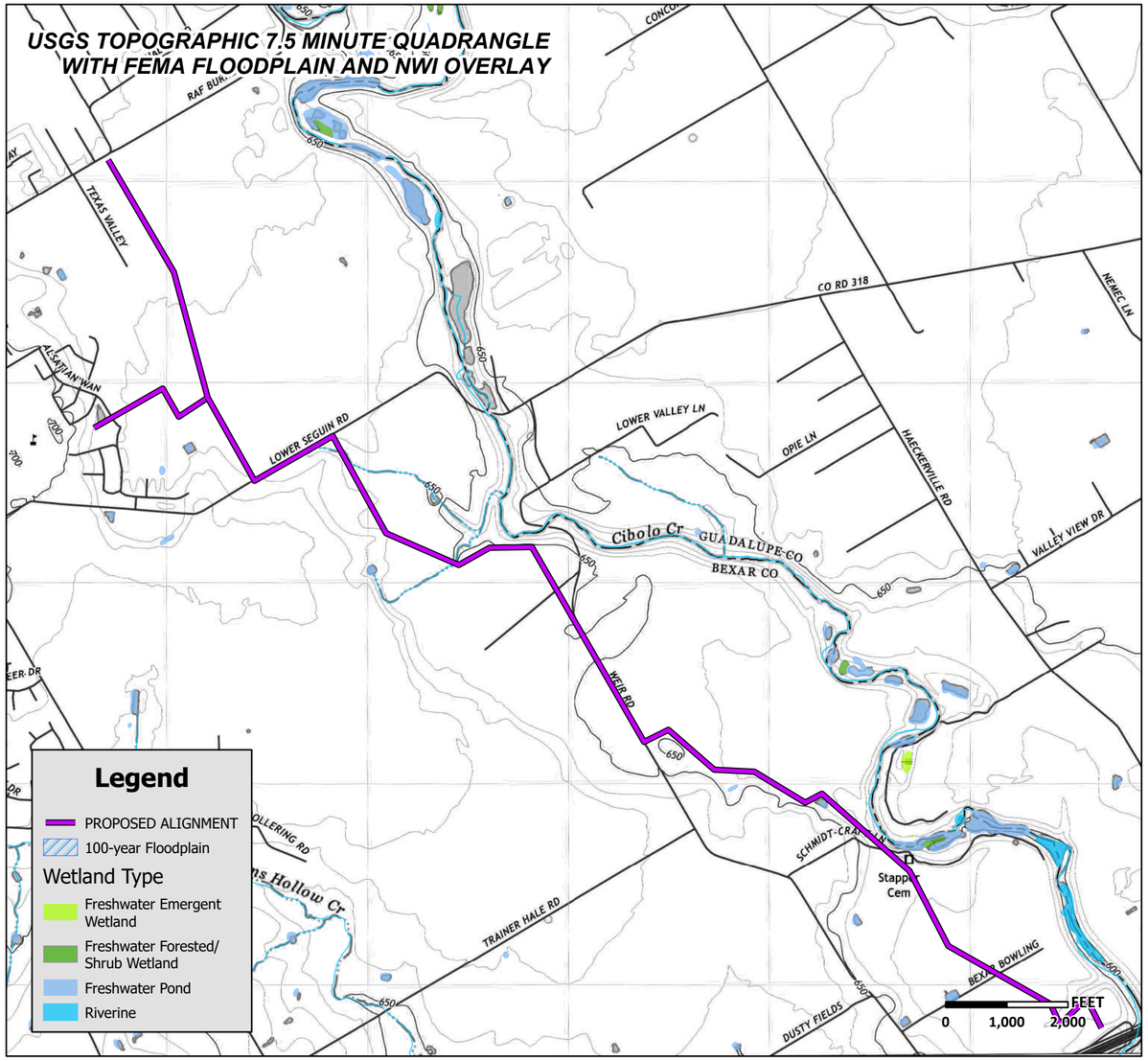
This report has been prepared on behalf of and for the exclusive use of Lockwood, Andrews & Newnam, Inc. for specific application to the named project as described herein. If this report is provided to others, Lockwood, Andrews & Newnam, Inc., it should make it clear that the information is provided for factual data only and not as a warranty of subsurface conditions included in this report.

RKI has endeavored to conduct the services described herein in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality and under similar circumstances as this project. RKI makes no other warranty, expressed or implied. The comments contained in this report are professional opinions.

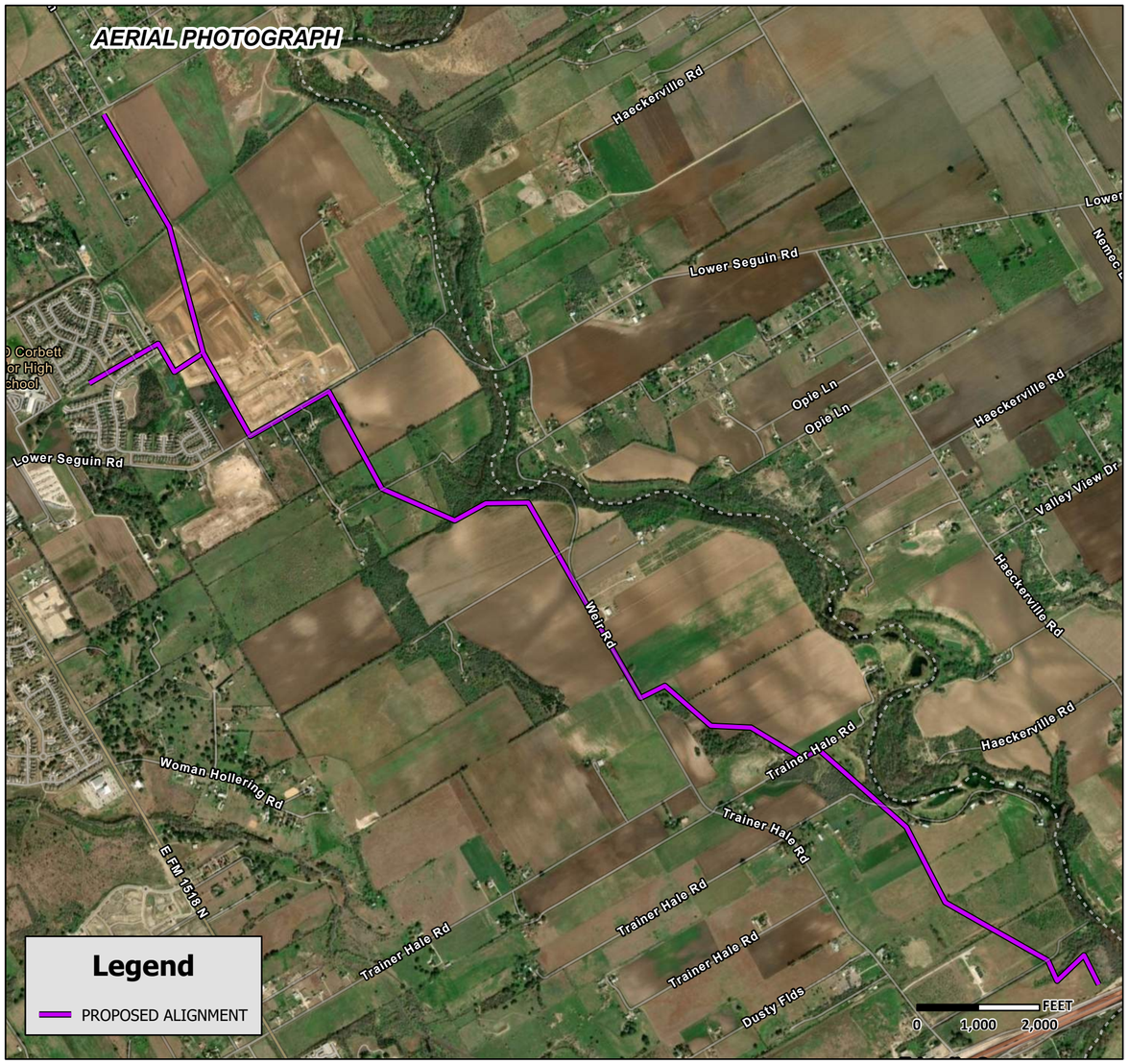
Attachments

Figure 1 – Project Planning Map
Important Information About Your Geotechnical Engineering Report

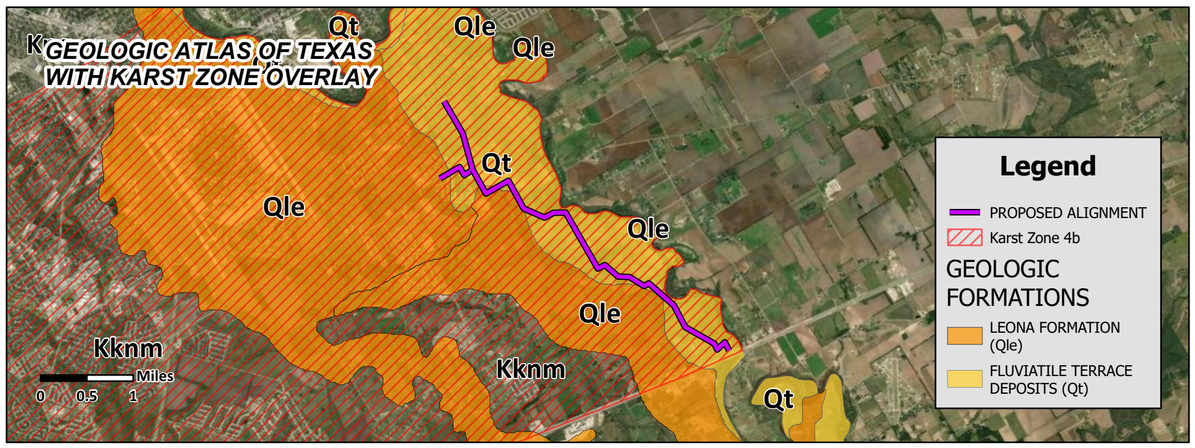
USGS TOPOGRAPHIC 7.5 MINUTE QUADRANGLE WITH FEMA FLOODPLAIN AND NWI OVERLAY



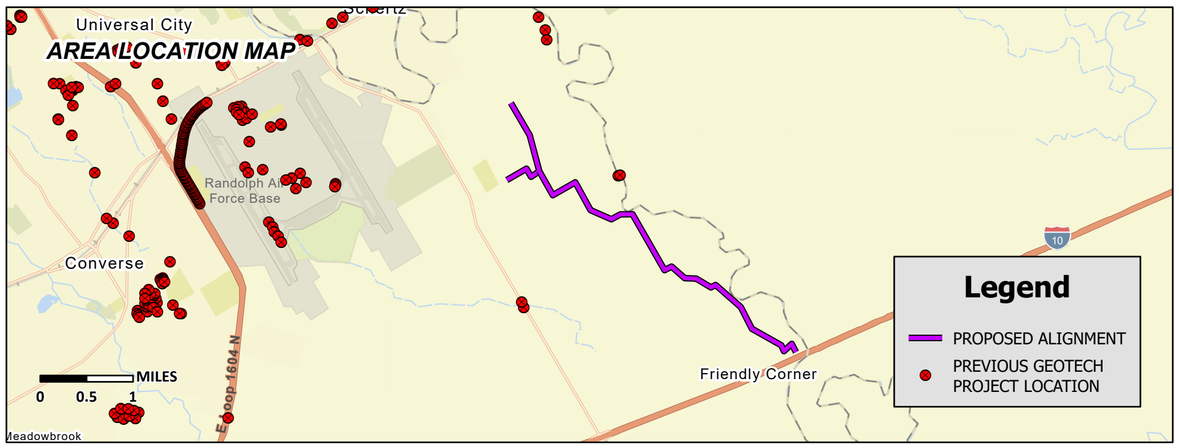
AERIAL PHOTOGRAPH



GEOLOGIC ATLAS OF TEXAS WITH KARST ZONE OVERLAY



AREA LOCATION MAP



RABA KISTNER

PROJECT PLANNING MAP

Cibolo West Trunk Line – Desktop Study
Schertz, Texas

PROJECT NUMBER:	ANA25-005-00
DRAWN BY:	BM
CHECKED BY:	SS
DATE:	02/06/2025

FIGURE 1

SOURCE: 1) USGS 7.5 Minute Topographic Quadrangle Bulverde
2) Aerial Photograph Provided by ESRI, MATRIX
3) Geology Provided by Bureau of Economic Geology (BEG) Geologic Atlas of Texas (GAT), San Antonio Sheet
4) Basemaps Provided by Environmental Systems Research Institute (ESRI)
5) Soils Data Provided by Natural Resources Conservation Service (NRCS)
6) Karst Zone Data Provided by Veni