

## **PROFESSIONAL SERVICES AGREEMENT**

This Professional Services Agreement (“Agreement”) by and between Tarrant County (County) and Freese and Nichols, Inc. (Consultant), located at 801 Cherry Street, Suite 2800, Fort Worth, Texas becomes effective on the date of approval in Tarrant County Commissioners Court.

### **SCOPE OF SERVICES**

Consultant agrees to perform the services set forth in the Scope of Services attached as Attachment SC in a timely and professional manner, consistent with industry and professional standards, and in accordance with all applicable laws and the terms of this Agreement. Consultant warrants that all engineering services to be performed under this contract will be performed by a licensed engineer or licensed engineers with the professional skill and care ordinarily provided by competent engineers practicing in Texas and under the same or similar circumstances and professional license and that such services will be performed as expeditiously as is prudent considering the ordinary professional skill and care of said engineer or engineers. If any services, functions or responsibilities not specifically described in this Attachment SC are required for the proper performance and provision of these services, they shall be deemed to be included with the Attachment SC.

### **ACCESSIBILITY OF DOCUMENTS**

Consultant agrees that documents prepared by Consultant in the performance of the Scope of Services shown in Attachment SC may be made available to the public, including land developers, upon request.

### **TERM AND RENEWAL OPTIONS**

Upon approval of this contract by the Tarrant County Commissioners Court, Consultant is authorized to begin the provision of services as described in the attached Attachment SC. Consultant agrees to complete the services requested by the County in accordance with the attached schedule.

### **PAYMENT AND INVOICING**

Compensation to Consultant for the services described in the attached Exhibit A shall not exceed \$5,725,000 in the hourly rates as shown on Attachment CO for the services under this Agreement, upon approval by the County.

Consultant is to advise the County of additional services that may be required to complete any services requested under this Agreement prior to those additional services being performed that are not part of this Agreement, and must obtain prior approval, in writing, by the County before those additional services are performed and invoiced.

- a. If in the execution of services, the County may request Consultant to remove a service, prior to Consultant’s performance of that service. Consultant agrees that the County will not be held responsible for costs associated with those services that were removed.

- b. Payments will be made monthly in arrears, on a net 30-day basis. The fee is to be inclusive of all travel costs.
- c. Invoices are to be detailed and reference the fees as shown in Attachment CO. A summary of the work performed during the invoiced period should accompany the invoice submittal.
- d. Submit invoices to: Tarrant County Auditor's Office, Attention: Accounts Payable, 100 E. Weatherford St., Suite 506, Fort Worth, Texas 76196, phone: 817-884-1205, or email to: [SAP-Invoices@tarrantcountytx.gov](mailto:SAP-Invoices@tarrantcountytx.gov) and [jijackson@tarrantcountytx.gov](mailto:jijackson@tarrantcountytx.gov). Invoices should reference the Purchase Order number.

## COMPLIANCE WITH LAWS

1. In providing the services required by this Agreement, Consultant must observe and comply with all applicable federal, state, and local statutes, ordinances, rules, and regulations, including, without limitation, workers' compensation laws, minimum and maximum salary and wage statutes and regulations, and non-discrimination laws and regulations. Consultant shall be responsible for ensuring its compliance with any laws and regulations applicable to its business, including maintaining any necessary licenses and permits.

### 2. **Chapters 2271, 2252, and 2274 Texas Government Code Verification.**

(a) *Boycott of Israel Prohibited.* In compliance with Section [2271.001](#) et seq. of the Texas Government Code, Consultant verifies that neither it nor any of its affiliates currently boycott Israel and neither it nor any of its affiliates will boycott Israel during the term of this Agreement. "Boycott Israel" is defined in Section [808.001\(1\)](#) of the Texas Government Code.

(b) *Scrutinized Business Operations Prohibited.* In compliance with Section [2252.151](#) et seq. of the Texas Government Code, Consultant warrants and represents that: (1) neither Consultant nor any of its affiliates engages in scrutinized business operations in Sudan; (2) neither Consultant nor any of its affiliates engages in scrutinized business operations in Iran; and (3) neither Consultant nor any of its affiliates engages in scrutinized business operations with designated foreign terrorist organizations. "Scrutinized business operations in Sudan" is defined in Section [2270.0052](#) of the Texas Government Code. "Scrutinized business operations in Iran" is defined in Section [2270.0102](#) of the Texas Government Code. "Scrutinized business operations with designated foreign terrorist organizations" is defined in Section [2270.0152](#) of the Texas Government Code. Consultant further represents and warrants that neither Consultant nor any of its affiliates appears on any of the Texas Comptroller's [Scrutinized Companies Lists](#).

(c) *Boycott of Certain Energy Companies Prohibited.* In compliance with Section [2276.002](#) of the Texas Government Code (added by 87th Legislature, S.B. 13), Consultant verifies that neither it nor any of its affiliates currently boycott energy companies and neither it nor any of its affiliates will boycott energy companies during the term of this Agreement. "Boycott energy company" is defined in Section [809.001\(1\)](#) (added by 87th Legislature, S.B. 13) and means, without an ordinary business purpose, refusing to deal with, terminating business activities with, or otherwise taking any action that is intended to penalize, inflict economic harm on, or limit commercial relations with a company because the company: (A) engages in the exploration, production, utilization, transportation, sale, or manufacturing of fossil fuel-based energy and does

not commit or pledge to meet environmental standards beyond applicable federal and state law; or (B) does business with a company described by subsection (A).

(d) *Discrimination against Firearm Entities or Firearm Trade Associations Prohibited.* In compliance with Section [2274.002](#) of the Texas Government Code (added by 87th Legislature, S.B. 19), Consultant verifies that neither it nor any of its affiliates have a practice, policy, guidance, or directive that discriminates against a firearm entity or firearm trade association; and neither it nor any of its affiliates will discriminate during the term of the Agreement against a firearm entity or firearm trade association. “Discriminate against a firearm entity or firearm trade association” is defined in Section [2274.001\(3\)](#) (added by 87th Legislature, S.B. 19) and means, with respect to the entity or association, to: (i) refuse to engage in the trade of any goods or services with the entity or association based solely on its status as a firearm entity or firearm trade association; (ii) refrain from continuing an existing business relationship with the entity or association based solely on its status as a firearm entity or firearm trade association; or (iii) terminate an existing business relationship with the entity or association based solely on its status as a firearm entity or firearm trade association; the term *does not include*: (i) the established policies of a merchant, retail seller, or platform that restrict or prohibit the listing or selling of ammunition, firearms, or firearm accessories; and (ii) a company’s refusal to engage in the trade of any goods or services, decision to refrain from continuing an existing business relationship, or decision to terminate an existing business relationship: (aa) to comply with federal, state, or local law, policy, or regulations or a directive by a regulatory agency; or (bb) for any traditional business reason that is specific to the customer or potential customer and not based solely on an entity’s or association’s status as a firearm entity or firearm trade association.

3. **Legal Compliance.** Each party shall comply with the provisions of all applicable laws relating to the performance of its obligations under this Agreement. Each party is responsible for obtaining its own legal advice concerning its compliance with applicable laws.

4. **Prohibition of Political Activity.** None of the funds provided under this Agreement shall be used for influencing the outcome of any election, or the passage or defeat of any legislative measure. This prohibition shall not be construed to prevent the Parties’ compliance with the Texas Public Information Act. No funds provided under this Agreement may be used directly or indirectly to hire employees or in any other way fund or support candidates for the legislative, executive, or judicial branches of government, the State of Texas, or the government of the United States. None of the funds provided under this Agreement shall be paid to any official or employee who violates any of the provisions of this Section.

5. **Form 1295 Certificate of Interested Parties.** Consultant acknowledges and agrees that it has fully, accurately, and completely disclosed all interested parties in the Form 1295 electronically filed with the Texas Ethics Commission, at <https://www.ethics.state.tx.us/filinginfo/1295/>, as required by law, and that the attached signed copy attached as **Exhibit G** is a full and true copy of said filed form.

6. **Conflict of Interest.** Consultant assures that it is in compliance with the requirements of [Chapter 176](#) of the Texas Local Government Code and has filed or will promptly file the Conflict of Interest Questionnaire (CIQ Form) with the Tarrant County Clerk no later than

the 7th business day after the date Consultant becomes aware of facts that require the form to be filed. Completed forms are to be sent to:

Tarrant County Transportation Services  
Attn: Joseph Jackson, County Engineer  
100 East Weatherford Street, Room 401  
Fort Worth, Texas 76196

## INSURANCE REQUIREMENTS

Consultant shall take out, pay for and maintain always during the prosecution of the work under the contract, the following forms of insurance, in carriers acceptable to and approved by Tarrant County:

- a. Worker's Compensation/Employer's Liability
  - 1. Worker's Compensation – statutory
  - 2. Employer's Liability - \$500,000
- b. Commercial General Liability:
  - 1. Bodily injury/Personal injury/Property damage - \$1,000,000 per occurrence/\$2,000,000 aggregate
- c. Auto Liability:
  - 1. Combined Single Limit (CSL) - \$500,000 per occurrence
- d. Contractual Liability – same limits as above
- e. Professional Liability Insurance - \$1,000,000 each claim with minimum \$2,000,000 aggregate

## FINANCIAL RESPONSIBILITY

Consultant is responsible for its incurred expenses in performing this contract unless otherwise noted. To the extent permitted by the Constitution and the laws of the State of Texas, Consultant indemnifies and holds harmless the County against any and all claims, lawsuits, settlements, judgments, costs, penalties and expenses, including attorney's fees, for damage caused by or resulting from an act of negligence, intentional tort, intellectual property infringement, or failure to pay a subcontractor or supplier committed by the Consultant, its agent, or another entity over which the Consultant exercises control.

## AGENCY-INDEPENDENT CONTRACTOR

Neither Consultant nor any employee thereof is an agent of the County and neither the County nor any employee thereof is an agent of Consultant. This agreement does not and shall not be construed to entitle either party or any of their representative employees, if applicable, to any benefits, privilege, or other amenities of employment of the other part.

## ASSIGNMENT

Neither party may assign this contract.

### THIRD PARTY BENEFICIARY EXCLUDED

This party does not incur to the benefit of any specific third party. The parties to this contract do not consent to the waiver of sovereign or government immunity under Texas state or federal law to the extent either party may have that immunity under law.

### ENTIRE AGREEMENT

The Contract documents consist of the following:

- This Agreement
- Request for Qualifications 2022-044 Bid Documents and Consultant Response
- Consultant Proposal
- Any exhibits attached hereto, conditions of the contract (special, supplementary and other conditions), all addenda issued prior to execution of this Agreement and all modifications issued subsequent thereto.

To the extent of an ambiguity among the various documents, the Request for Qualifications 2022-044 will prevail. These documents collectively form the Contract, and all are fully a part of the Contract as if attached to this Agreement or repeated herein.

This Agreement may not be modified, altered, changed or amended in any respect, unless in writing and signed by both parties. For avoidance of doubt, this Agreement may not be modified orally.

The law of the State of Texas governs this contract. Venue for any action regarding this contract must be in the district courts of Tarrant County, Texas.

This agreement is effective upon the date of approval in Tarrant County Commissioners Court.

### TERMINATION

Either party may terminate this contract by:

- a. Providing written notice to the other party at least thirty (30) days prior to the date of termination;
- b. Providing in the written notice the date of termination; and
- c. Sending the written notice by certified mail return receipt requested to the party at its address.

NOTICES

**Tarrant County**

Joseph Jackson, P.E., CFM  
Tarrant County Transportation Services  
100 E. Weatherford, Suite 401  
Fort Worth, Texas 76196

**Freese and Nichols, Inc.**


Chris Bosco, P.E.  
801 Cherry Street, Suite 2800  
Fort Worth, Texas 76102

**TARRANT COUNTY**

**FREESE AND NICHOLS, INC.**

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Timothy O'Hare  
County Judge



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Chris Bosco, P.E.  
Principal-in-Charge

**REVIEWED AS TO FORM:**

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Criminal District Attorney's Office\*

\*By law, the Criminal District Attorney's Office may only advise or approve contracts or legal documents on behalf of its clients. It may not advise or approve a contract or legal document on behalf of other parties. Our review of this document was conducted solely from the legal perspective of our client. Our approval of this document was offered solely for the benefit of our client. Other parties should not rely on this approval, and should seek review and approval by their own respective attorney(s).

**CERTIFICATION OF AVAILABLE FUNDS IN THE AMOUNT OF \$5,725,000:**

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Auditor's Office

February 20, 2024

Randall Skinner  
Director, Transportation Services  
100 E. Weatherford, Room 401  
Fort Worth, Texas 76196

Re: Boat Club Road (FM 1220) Schematic Design Proposal

Dear Mr. Skinner:

Freese and Nichols, Inc. (FNI) is pleased to submit our scope and fee proposal for Schematic Design of the Boat Club Road Project (FM 1220). We propose to complete the scope of services for a fee of **\$5,725,000** as detailed in Attachment "B". We appreciate the opportunity to provide professional engineering and environmental services for TxDOT schematic design development. We are available at your convenience to meet to discuss this scope and fee proposal, please do not hesitate to contact me at 817-881-9132 if you have any questions.

Sincerely,

**FREESE AND NICHOLS, INC.**



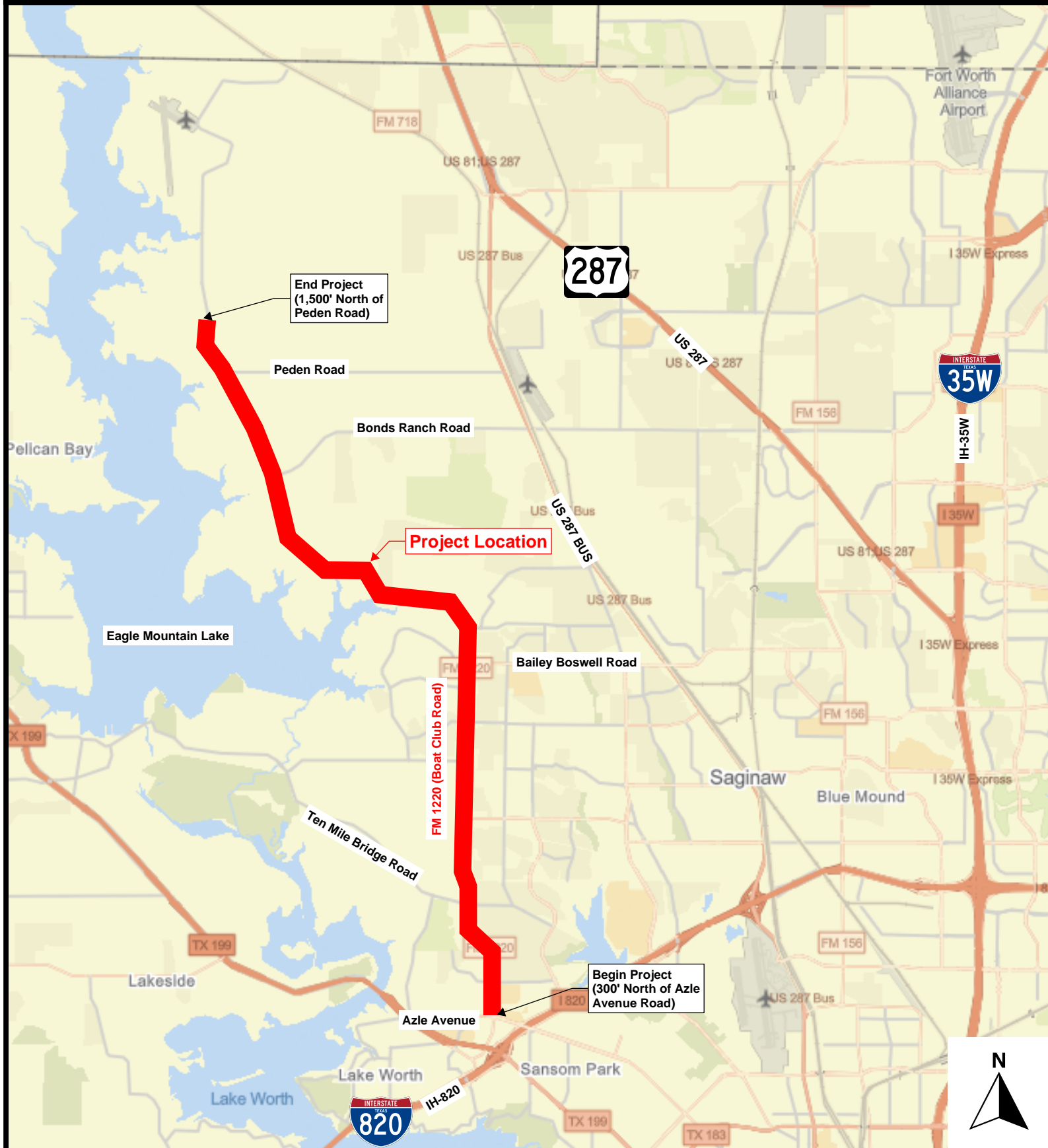
Chris Bosco, P.E.  
Principal

Attachments:

Attachment A - Project Location Map  
Attachment B – Fee Proposal Summary  
Attachment CO – Compensation  
Attachment SC – Scope of Services

# FM 1220 (Boat Club Road)

## Attachment A - Project Location Map





**FM 1220 (Boat Club Road) Improvements**  
**Attachment B - Fee Summary**

<b><u>Task</u></b>	<b><u>Fee</u></b>
<b><u>SECTION 110 - ROUTE AND DESIGN STUDIES</u></b>	
110.1 Schematic Design Work Outline	\$ 893,156
110.2 Schematic Design - General Tasks	\$ 680,654
110.3 Conceptual Design Schematics	\$ 561,041
110.4 Geometric Design Schematics	\$ 925,286
110.5 Cross Sections	\$ 197,447
110.6 Retaining Walls	\$ 44,162
110.7 Prelim Construction Sequence	\$ 30,938
110.8 Preliminary Cost Estimate	\$ 59,623
110.9 Engineering Summary Report	\$ 14,902
110.10 Agency Coordination and Public Involvement	\$ 167,769
<b>SECTION 110 TOTAL</b>	<b>\$ 3,574,977</b>
<b><u>SECTION 120 - SOCIAL, ECONOMIC, AND ENVIRONMENTAL STUDIES</u></b>	
120.2 Environmental Assessment (EA) Content	\$ 113,784
120.3 Environmental Technical Reports and Documentation	\$ 553,553
<b>SECTION 120 TOTAL</b>	<b>\$ 667,337</b>
<b><u>SECTION 130 - RIGHT-OF-WAY (ROW) DATA AND UTILITY ENGINEERING INVESTIGATION</u></b>	
130.1 Right-of-Way Surveys	\$ 285,474
130.2 Utility Engineering Investigation	\$ 832,150
<b>SECTION 130 TOTAL</b>	<b>\$ 1,117,624</b>
<b><u>SECTION 150 - DESIGN SURVEYS AND CONSTRUCTION SURVEYS</u></b>	
150.2 Design Survey	\$ 259,995
<b>SECTION 150 TOTAL</b>	<b>\$ 259,995</b>
<b><u>SECTION 160 - MISCELLANEOUS ROADWAY</u></b>	
163.1 Utility Coordination	\$ 105,067
<b>SECTION 160 TOTAL</b>	<b>\$ 105,067</b>
<b>Project Total</b>	<b>\$ 5,725,000</b>

# COMPENSATION

ATTACHMENT CO

Compensation to FNI for Basic Services in Attachment SC shall be computed on the basis of the following Schedule of Charges, but shall not exceed Five Million Seven Hundred Twenty Five Thousand Dollars (\$5,725,000).

If FNI sees the Scope of Services changing so that Additional Services are needed, including but not limited to those services described as Additional Services in Attachment SC, FNI will notify OWNER for OWNER's approval before proceeding. Additional Services shall be computed based on the following Schedule of Charges.

<b>Position</b>	<b>Hourly Rate</b>	
	<b>Min</b>	<b>Max</b>
Professional 1	98	172
Professional 2	126	196
Professional 3	140	308
Professional 4	161	354
Professional 5	228	396
Professional 6	249	466
Construction Manager 1	116	158
Construction Manager 2	123	196
Construction Manager 3	147	200
Construction Manager 4	175	249
Construction Manager 5	210	294
Construction Manager 6	280	347
Construction Representative 1	81	88
Construction Representative 2	102	116
Construction Representative 3	130	186
Construction Representative 4	130	186
CAD Technician/Designer 1	88	119
CAD Technician/Designer 2	105	193
CAD Technician/Designer 3	151	245
Corporate Project Support 1	74	154
Corporate Project Support 2	84	217
Corporate Project Support 3	105	319
Intern / Coop	56	95

## Rates for In-House Services and Equipment

<b>Mileage</b>	<b>Bulk Printing and Reproduction</b>		<b>Equipment</b>	
Standard IRS Rates		<u>B&amp;W</u>	<u>Color</u>	Valve Crew Vehicle (hour) \$75
	Small Format (per copy)	\$0.10	\$0.25	Pressure Data Logger (each) \$200
	Large Format (per sq. ft.)			Water Quality Meter (per day) \$100
<b>Technology Charge</b>	Bond	\$0.25	\$0.75	Microscope (each) \$150
\$8.50 per hour	Glossy / Mylar	\$0.75	\$1.25	Pressure Recorder (per day) \$100
	Vinyl / Adhesive	\$1.50	\$2.00	Ultrasonic Thickness Guage (per day) \$275
				Coating Inspection Kit (per day) \$275
	Mounting (per sq. ft.)	\$2.00		Flushing / Cfactor (each) \$500
	Binding (per binding)	\$0.25		Backpack Electrofisher (each) \$1,000
				<u>Survey Grade</u> <u>Standard</u>
				Drone (per day) \$200 \$100
				GPS (per day) \$150 \$50

## OTHER DIRECT EXPENSES:

Other direct expenses are reimbursed at actual cost times a multiplier of 1.10. They include outside printing and reproduction expense, communication expense, travel, transportation and subsistence away from the FNI office. For other miscellaneous expenses directly related to the work, including costs of laboratory analysis, test, and other work required to be done by independent persons other than staff members, these services will be billed at a cost times a multiplier of 1.10. For Resident Representative services performed by non-FNI employees and CAD services performed In-house by non-FNI employees where FNI provides workspace and equipment to perform such services, these services will be billed at cost times a multiplier of 2.0. This markup approximates the cost to FNI if an FNI employee was performing the same or similar services.

**These ranges and/or rates will be adjusted annually in February. Last updated 2023.**

## **ATTACHMENT SC - SCOPE OF SERVICES**

### **PROJECT UNDERSTANDING**

Tarrant County (COUNTY) has asked Freese and Nichols, Inc. (ENGINEER) to provide professional transportation design services required to develop improvements along FM 1220 (Boat Club Road) in Tarrant County, Texas from approximately 300 feet north of Azle Avenue to approximately 1,500 feet north of Peden Road between, approximately 9.9 miles (see Attachment A – Project Location Map). The FM 1220 roadway and right-of-way is currently owned and maintained by Texas Department of Transportation (TxDOT) and is considered an on-system facility. The purpose of the project is to design roadway safety and capacity improvements along FM 1220 to occur generally along the existing alignment with the anticipation that the roadway expansion will require additional right-of-way.

The ENGINEER anticipates the following two (2) phases of project development: (1) Schematic Design and Environmental and (2) Final Plans, Specifications and Estimates (PS&E). This description of services includes the Schematic Design and Environmental phase only and will be used to inform additional scope services and level of effort for the subsequent PS&E phase.

The ENGINEER will provide preliminary engineering services for development of a design schematic, environmental documents, and studies in support of the schematic work, public involvement, permit procurement, data collection and analysis, drainage, conceptual traffic control, traffic projections, traffic engineering and operations including capacity analysis, traffic simulations, safety analysis, and 3-D modeling, surveying and mapping, utility engineering investigation, and utility coordination for safety and capacity improvements along FM 1220. Improvements will include side street improvements as necessary to increase intersection safety and capacity and/or accommodate future cross street expansion.

### **GENERAL REQUIREMENTS**

#### **1.1. Coordination.**

The ENGINEER will coordinate issues and communications with COUNTY's internal resource areas through the COUNTY's Project Manager. The COUNTY will communicate the resolution of issues and provide the ENGINEER direction through the COUNTY's Project Manager.

The ENGINEER will notify the COUNTY and coordinate with adjacent engineers on all controls at project interfaces. The ENGINEER will document the coordination effort, and each engineer must provide written concurrence regarding the agreed project controls and interfaces. In the event the ENGINEER and the other adjacent engineers are unable to agree, the ENGINEER will meet jointly with the COUNTY and each adjacent engineer to resolve disagreements. If the engineers are unable to resolve an issue with the COUNTY as mediator, the COUNTY may decide the issue and the decision will be final.

The ENGINEER will prepare each exhibit necessary for approval by each railroad, utility, and other governmental or regulatory agency in compliance with the applicable format and guidelines required by each entity and as approved by the COUNTY. The ENGINEER will notify the COUNTY in writing prior to beginning any work on any outside agency's exhibit.

#### **1.2. Progress Reporting and Invoicing.**

The ENGINEER will invoice according to breakdowns shown in Exhibit D – Fee Schedule and in accordance with the Terms and Conditions of the Agreement.

#### **1.3. Traffic Control.**

The ENGINEER will provide all planning, labor, and equipment to develop and to execute each traffic control plan (TCP) needed by the ENGINEER to perform services under each work

authorization. The ENGINEER will comply with the requirements of the most recent edition of the *Texas Manual on Uniform Traffic Control Devices (TMUTCD)*. The ENGINEER will submit a copy of each TCP to TxDOT for approval prior commencing any work on any State roadway. The ENGINEER will provide all signs, flags, and safety equipment needed to execute the approved TCP. The ENGINEER will notify TxDOT in writing 24 hours in advance of executing each TCP requiring a lane closure and will not begin lane closure without having obtained TxDOT's written approval. The ENGINEER will ensure that it's field crew possess a copy of the approved TCP on the job site at all times. Upon request by TxDOT, the field crew must make the TCP available to TxDOT for inspection. The ENGINEER will assign charges for any required traffic control to the applicable function code.

**1.4. Right of Entry.**

Prior to performing any work outside of existing right of way, the ENGINEER will request right of entry from public and private land owners to allow services (e.g. environmental services, surveying services, geotechnical services) to be performed. The ENGINEER will prepare right of entry permissions, which must be signed by the landowner. Letters or other materials seeking right of entry must contain explicit reference to the kinds of activities for which right of entry is requested and an indication of the impacts (if any) that will result from performance of these services. The ENGINEER will not commit acts which will result in damages to private property and will make every effort to comply with the wishes and address the concerns of private property owners.

## **TASK DESCRIPTIONS**

### **FEASIBILITY STUDIES**

#### **ROUTE AND DESIGN STUDIES**

The ENGINEER will prepare an alignment and proposed roadway schematic layout that includes projected traffic volumes and existing and proposed typical sections. The ENGINEER will furnish Microsoft Office and MicroStation and OpenRoads computer generated media containing the roadway schematic layout to TxDOT. All supporting attachments and exhibits must accompany the schematic layout. All MicroStation and OpenRoads computer generated files containing the roadway design schematic must be fully compatible with the software used by TxDOT without further modification or conversion.

The ENGINEER will produce, obtain, review, and evaluate existing and twenty-year projected traffic data for use in the preparation of the schematic design layout. The data must be utilized in accordance with the requirements for schematic development and consistent with the policies of the TxDOT.

The ENGINEER will prepare preliminary drawings to identify any potential impacts and constraints within the project corridor, including impacts to the nature, cultural, and human environment. The potential impacts and constraints identified must include all existing and proposed utilities (both public and private), structures, burial grounds, neighborhood communities, historical landmarks, and undeveloped areas. Any potential utility conflicts and structural impediments must be identified as such. The ENGINEER will propose alternative alignments that avoid or minimize displacements and damages and prepare any additional attachments or exhibits required to illustrate a preferred alternative alignment. The ENGINEER will assist the COUNTY with agency meetings during the development of the schematic design as requested by the COUNTY. If requested by TxDOT, the ENGINEER will prepare a Notice and Opportunity to Comment and assist the COUNTY with stakeholder meetings, public meetings, and a public hearing, if requested.

An itemization of the schematic design and engineering work activity to be performed under this contract is detailed below. The ENGINEER will prepare all designs in accordance with the latest version of:

- A. *Roadway Design Manual*, published by TxDOT
- B. *TxDOT Project Development Process Manual*, published by TxDOT;
- C. *Policy on Geometric Design of Highways and Streets*, published by the American Association of State Highway and Transportation Officials' (AASHTO);
- D. *Standard Specifications for Construction of Highways, Streets, and Bridges*, published by TxDOT;
- E. *Texas Manual on Uniform Traffic Control Devices (TMUTCD)*, published by TxDOT;
- F. *Highway Capacity Manual (HCM)*, published by the Transportation Research Board (TRB);
- G. *Highway Safety Manual (HSM)*, published by AASHTO;
- H. *Hydraulic Design Manual*, published by TxDOT;
- I. *Access Management Manual*, published by TxDOT; and
- J. other State approved manuals and guides.

When design criteria are not identified in these manuals, the ENGINEER will notify the COUNTY and TxDOT and request direction.

The design schematic horizontal layout must adhere to a design scale of 1 inch = 100 foot (or 1 inch = 200 foot) The ENGINEER will develop the schematic layout, exhibits, and attachments in English units. All Microsoft Office, MicroStation, Keyhole Markup Language (KML), Keyhole Markup Language Zipped (KMZ), and Bentley OpenRoads computer graphic files furnished to the COUNTY and TxDOT must be submitted on

USB flash drive in their native format, which must be fully compatible with the programs currently used by TxDOT. Schematics must follow TxDOT and Federal Highway Administration (FHWA) standards. The schematic must follow TxDOT's computer-aided design and drafting (CADD) standards. The ENGINEER will submit the schematic as an original document, accompanied with an original MicroStation formatted graphics file. Final copies of the schematic design must be signed and sealed by a professional engineer licensed in the state of Texas.

**110.1. Schematic Design Work Outline.**

**A. Develop Base Maps**

The ENGINEER will develop the base maps to be used for the analysis and proposed schematic layout from existing construction and right of way (ROW) plans as available. The ENGINEER will re-establish the existing centerline horizontal alignments for all roadways, identify existing ROW and easements, property owners, and the approximate location of major utilities based on a utility engineering investigation in the preparation of base maps.

**B. Planimetrics and Aerial Mapping**

The ENGINEER will obtain planimetrics, digital terrain modeling (DTM), and aerial photographs from TxDOT, if available.

**C. Analyze Existing Conditions**

Using collected data and base maps, the ENGINEER will develop an overall analysis of the existing conditions to develop the schematic design. The analysis must include the following:

1. ROW and easement determination
2. Horizontal alignment
3. Vertical alignment
4. Pavement cross slopes and pavement type
5. Existing available soils information
6. Intersection design and analysis
7. Sight distance
8. Large guide signs and roadside signing
9. Level of service
10. Safety (i.e., crash data)
11. Locations of critical constraints
12. Drainage
13. Traffic control and construction phasing sequence

**D. Schematic Alternatives**

The ENGINEER will identify and analyze up to three (3) schematic alternatives to minimize potential adverse operational impacts, crash impacts, ROW impacts, environmental impacts, major utility conflicts, structural impediments, or exceptions to TxDOT and FHWA design criteria.

**E. Deliverable Schematic**

The ENGINEER will evaluate and document the following in the analysis to optimize the design:

1. Efficient use of the allocated ROW

2. Control of access (COA) and driveway locations
3. Roadway and intersection geometry
4. Cross sections
5. Bicycle and pedestrian design
6. Drainage and hydraulic design
7. Stopping sight distance
8. Level of service
9. Safety
10. Traffic and signal operations
11. Construction, ROW, easement, and utility costs
12. Construction sequencing
13. Traffic control during construction
14. Roadside safety appurtenances
15. Large guide signage
16. Environmental mitigation (e.g., noise walls, storm water best management practices (BMPs))
17. Bridge layouts and clearance
18. Railroads (if applicable)
19. Accommodation of ultimate corridor configuration.
20. Accommodation of future cross street expansion as described in local thoroughfare plan (if applicable)
21. Avoidance of utility lines (if feasible)
22. Impact of construction delays from utility relocations

F. Project Management and Coordination

1. The ENGINEER will direct and coordinate the various elements and activities associated with developing the design schematic.
2. The ENGINEER will prepare the detailed graphic project work schedule indicating tasks, critical dates, milestones, deliverables, and COUNTY and TxDOT review requirements. The project work schedule must depict the order of the various tasks, milestones, and deliverables. The ENGINEER will review the schedule monthly and provide updates regarding its progress on the schedule to the COUNTY.
3. The ENGINEER will submit written monthly progress reports to the COUNTY.
4. The ENGINEER will provide ongoing quality assurance and quality control to ensure completeness of product and compliance with COUNTY and TxDOT procedures.
5. The ENGINEER will prepare for and conduct up to nine (9) bi-monthly coordination meetings with Tarrant County staff and the Commissioners Office.

G. Data Collection

The ENGINEER will conduct field reconnaissance and collect data as necessary to complete the schematic design. The ENGINEER will conduct site visits in both the AM and PM peak hour and develop a technical report that includes photographs outlining the

findings and observations.

Data must include the following information. Items 1 through 8 must be obtained from the TxDOT, if available. Items 9 through 13 must be obtained from other agencies as required.

1. Available corridor major investment studies
2. Design data from record drawings of existing and proposed facilities
3. Existing and future design year traffic data
4. Historical crash data
5. Roadway inventory information, including the number of lanes, speed limits, pavement widths and rating, bridge widths and ratings, and ROW widths
6. Aerial photos, planimetric mapping, and DTM
7. Environmental data
8. Previously prepared drainage studies
9. Adopted land use maps and plans (if available)
10. Federal Emergency Management Agency (FEMA) flood boundary maps and flood insurance studies and models
11. Public and private utility information
12. Plat research for adjacent properties (if available)
13. Local master thoroughfare plan

H. Roadway Design Criteria

The ENGINEER will develop the roadway design criteria based on the TxDOT *Roadway Design Manual* and AASHTO *Policy on Geometric Design of Highways and Streets* guidelines. The design criteria must include the following roadway design elements: design speed, lane and shoulder widths, pavement structure and slopes, horizontal curvatures, horizontal and vertical clearances, range of vertical profile grades, and side slopes. If there is a discrepancy between the two sources, the TxDOT *Roadway Design Manual* will govern unless otherwise directed by TxDOT.

I. Preliminary Design Conference

The ENGINEER will prepare and submit a preliminary Design Summary Report (DSR) to the COUNTY and TxDOT for review and approval and will attend an initial kick-off meeting to establish and agree on fundamental aspects, basic features, concepts, and design criteria. This meeting will be coordinated with any adjacent roadway projects to ensure continuity with the design of the adjacent roadway projects. Up to three (3) design conference-related meetings are anticipated.

**110.2. Schematic Design – General Tasks.**

A. ROW Property Base Map

The ENGINEER will obtain information on existing ROW, easements, and property information from as-built plans, ROW maps, and tax records. The ENGINEER will prepare a base map depicting the information.

B. Typical Sections

The ENGINEER will develop both existing and proposed typical sections that depict the number and type of lanes, shoulders, median width, curb offsets, cross slope, border width, clear zone widths, and ROW limits.



C. Environmental Constraints

The ENGINEER will evaluate and document impacts to environmentally sensitive sites (as identified by the ENGINEER and verified by the COUNTY and TxDOT) during the schematic design process. Environmentally sensitive sites include natural, cultural, and the human environment. This effort is described in Section 120.

Examples are historic and archeological resources, burial grounds, neighborhood communities and residential areas, farmland, floodplains, wetlands, endangered species, rare habitats, wildlife corridors, wildlife crossings, parks and nature preserves, geologic features, undeveloped areas, and significant trees.

D. Drainage

1. The ENGINEER will use data from as-built plans and FEMA maps to locate drainage out falls and to determine existing storm sewer and culvert sizes, design flows, and water surface elevations for use in the design of roadway geometry.
2. The ENGINEER will conduct a preliminary drainage study to determine and evaluate the adequacy of the ROW needed to accommodate the proposed roadway and drainage system. The drainage study must:
  - a. identify the impacts to abutting properties and the 100-year floodplain due to proposed highway improvements
  - b. identify the water surface elevations for the 2, 5, 10, 25, 50, and 100-year storm events
  - c. identify and locate outfalls
  - d. provide drainage outfall descriptions
  - e. provide overall drainage area map, sub-drainage area map, and storm water detention facilities
  - f. provide a drainage study report identifying the results of the study.
3. The drainage report, which must be signed and sealed by a professional engineer licensed in Texas, must include applicable hydrologic and hydraulic models (e.g., HEC-1 and HEC-2, HEC-RAS, HEC-HMS, XP-SWMM). The models must be approved by the local TxDOT district hydraulic engineer prior to generating any reports. If requested, the ENGINEER will prepare a final drainage study in accordance with one or more of the following: TxDOT *Hydraulic Design Manual*, local TxDOT district criteria, and any other specific guidance provided by TxDOT. If requested by the COUNTY or TxDOT, the ENGINEER will evaluate the adequacy of the existing drainage structures; otherwise, the ENGINEER will not evaluate the adequacy of the existing drainage structures.

E. ROW Requirements

The ENGINEER will determine the ROW requirements based on the proposed alignment, typical sections, design cross sections, access control, terrain, construction requirements, drainage, clear zone, maintenance, intelligent transportation system (ITS), and environmental constraints and mitigation requirements.

F. Construction Sequence

The ENGINEER will evaluate and document the requirements for construction sequencing and throughout the development of schematic design . The ENGINEER will provide construction phasing assumptions to COUNTY and TxDOT. The purpose of the construction sequence layouts will be to demonstrate constructability and number of traffic phases. No work zone signage will be required or shown on the layouts. The scale will used for the layouts will be the same as the Geometric Design Schematics.

G. Design Exceptions

The ENGINEER will identify design exceptions and waivers. The ENGINEER will determine the necessity for each design exception or waiver for approval. If TxDOT agrees that design exception or waiver is necessary, the ENGINEER will prepare TxDOT's required design exception or design waiver documentation. The ENGINEER will document the operational and safety analysis for comparison of the no-build, build with standard design, and build with proposed design alternatives. For interstate facilities, the safety analysis must include the following:

1. Expected change in crashes from existing conditions to standard design conditions
2. Expected change in crashes from existing conditions to the proposed design

H. Traffic Data and Projections

Meetings/Teleconferences - The ENGINEER will participate in working meetings or teleconferences with the COUNTY, TxDOT, and other pertinent agencies to verify the project schedule, points of contact, study methodology including definition of required analysis scenarios and/or analysis to be conducted, data sources, traffic factors, development of design traffic volumes, and documentation required to address project-specific criteria required by the COUNTY and TxDOT. Up to four (4) meetings are assumed.

Existing Traffic Counts and Data Review - The ENGINEER will review necessary project-related traffic data provided by COUNTY, and TxDOT. This data will consist of traffic volume counts, corridor or study area historical count year data from permanent count stations, vehicle classification data and historical truck data. The ENGINEER will collect existing 24-hour Intersection Turning Movement Counts including bicycle and pedestrian crosswalk counts at the following study area intersections:

- 1) FM 1220 at Azle Avenue
- 2) FM 1220 at Rocky Point Trail
- 3) FM 1220 at Shadydell Drive
- 4) FM 1220 at Lea Crest Lane
- 5) FM 1220 at Ten Mile Bridge Road
- 6) FM 1220 at Granite Creek Drive
- 7) FM 1220 at Cromwell-Marine Creek Road
- 8) FM 1220 at Robertson Road
- 9) FM 1220 at Eagle Pier Way
- 10) FM 1220 at Eagle Ranch Road
- 11) FM 1220 at Dalhart Drive
- 12) FM 1220 at Golf Club Drive
- 13) FM 1220 at Lake Country Drive
- 14) FM 1220 at W. Bailey Boswell Road
- 15) FM 1220 at Park Drive
- 16) FM 1220 at Harbour View Lane
- 17) FM 1220 at Landing Way
- 18) FM 1220 at LaFrontera Drive

- 19) FM 1220 at Live Oak Lane
- 20) FM 1220 at Dickson Road
- 21) FM 1220 at Bonds Ranch Road
- 22) FM 1220 at Peden Road (East)
- 23) FM 1220 at Peden Road (West)

Field Observations - Visit the project corridor and make observations regarding traffic patterns, existing areas of congestion, existing developments in the corridor, and geometric conditions.

Methodology Memorandum - The ENGINEER will develop a proposed methodology for estimating traffic projections for each component of the project corridor. The ENGINEER will prepare a Draft Traffic Projections Methodology memorandum, based on the information provided in the TxDOT's Transportation and Programming Division (TPP) traffic analysis package and regional Travel Demand Forecasts provided by the North Central Texas Council of Governments (NCTCOG). The ENGINEER will review the proposed methodology with the COUNTY and TxDOT and address comments and incorporate revisions, as necessary, to develop the final methodology memorandum.

Traffic Volume Projections - The ENGINEER will develop the Average Daily Traffic (ADT) forecasts for the opening-year, design-year (opening year + 20 years) and pavement design year (opening year + 30 years), in coordination with the COUNTY and TxDOT. The developed traffic projections will be utilized for design and environmental analysis. The ENGINEER will develop traffic forecasts for the main lanes, and major intersections identified along FM 1220.

Straight Line Diagram Graphics and Traffic Analysis for Highway Design Tables - The ENGINEER will develop graphic representations of the anticipated daily movements along the corridor (suitable for inclusion in the design schematic and environmental document) and the Traffic Analysis for Highway Design table.

Traffic volumes developed by the ENGINEER will be submitted to the COUNTY and TxDOT-TPP for review and approval, and the ENGINEER will revise the traffic volumes based on TPP's comments (assume one (1) set of comments).

I. Traffic and Operational Analysis

- 1. The ENGINEER will review and analyze traffic data (including percent trucks, bicycle and pedestrians, design hourly volume, and directional distribution), existing roadway features (number of lanes, offset to obstructions, lane widths, intersection operation and geometry, speed limits), traffic flow patterns, and transit and traffic operations.
- 2. The ENGINEER will review and analyze historical crash data obtained from TxDOT's Crash Records Information System (CRIS) for latest 3 full calendar years (January 1st to December 31st) with respect to crash characteristics such as severity, crash types, frequency, rates, patterns, clusters, and their relationship to crash contributing factors. The purpose of the historical crash analyses is to determine safety performance of the existing conditions to understand any safety issues within the study area.
- 3. The ENGINEER will analyze the vehicular and pedestrian count data as well as crash data at the following existing unsignalized intersections to determine if the intersections meet the applicable warrants for installation of a traffic signal as set forth in the latest edition of the Texas Manual on Uniform Traffic Control Devices (TMUTCD). Warrant analysis would be based on the existing traffic and geometry conditions at the intersections:

- 1) FM 1220 at Granite Creek Drive

- 2) FM 1220 at Golf Club Drive
  - 3) FM 1220 at Bonds Ranch Road
  - 4) FM 1220 at Peden Road (East)
  - 5) FM 1220 at Peden Rd (West)
  - 6) FM 1220 at Eagle Pier Way
  - 7) FM 1220 at Dalhart Drive
  - 8) FM 1220 at Harbour View Land
  - 9) FM 1220 at Landing Way
  - 10) FM 1220 at LaFrontera Drive
  - 11) FM 1220 at Live Oak Lane
  - 12) FM 1220 at Dickson Road
4. The ENGINEER will prepare the AM and PM peak hour traffic volume forecasts necessary to conduct the intersection traffic operations analysis for the opening year and design year (opening year + 20 years) No-Build and Build alternatives.
  5. The ENGINEER will perform traffic analyses to evaluate the proposed operation of intersections utilizing traffic projections for the opening year and design year (opening + 20 years) utilizing the traffic projections developed by the ENGINEER. The ENGINEER will analyze each alternative using delay and volume to capacity ratios to determine the corridors operational Levels of Service in accordance with the methodologies of Highway Capacity Manual.
  6. The traffic analysis will be conducted for the 23 major intersections identified under Traffic Data and Projections, including a detailed level of service analysis using SYNCHRO, HCS and/or another acceptable model. The traffic analysis will be performed for the following scenarios to compare different alternatives:
    - a. Existing conditions (existing geometry + existing traffic volumes)
    - b. Opening year No-Build Alternative (No-Build geometry + opening year traffic volumes)
    - c. Opening year Build Alternative (Build geometry + opening year traffic volumes)
    - d. Design year No-Build Alternative (No-Build geometry + design year traffic volumes)
    - e. Design year Build Alternative (Build geometry + design year traffic volumes)
  7. Summary of Operational Analysis: The assumptions, methodology, and results of the traffic operations analysis will be summarized in a Draft Technical Memorandum including a table listing the intersection LOS for the corresponding opening year and design year No-Build and Build scenarios within the project limits. A Final Technical Memorandum will be prepared addressing TXDOT review comments. Results of this analysis will be incorporated into the schematic design.
- J. Bicycle and Pedestrian Accommodations
- The ENGINEER will comply with the *United States Department of Transportation Policy Statement on Bicycle and Pedestrian Accommodation Regulations and Recommendations*. The inclusion of bicycle and pedestrian facilities must be evaluated. Public input when applicable, as well as local city and metropolitan planning organization for bicycle and pedestrian plans must be considered in this evaluation.

K. Project Implementation Plan

The ENGINEER will develop an implementation plan for prioritizing improvements along the corridor and identify a sequence of improvements to manage future traffic operations and available funding. The implementation plan must consider traffic operation, the ultimate preferred alternative, and potential funding levels and sources to identify a timeline for short and mid-term improvements that accommodate corridor growth while minimizing future throwaway construction. The ENGINEER will provide the recommendations for the implementation plan in a project implementation report deliverable and incorporate the recommendations into the engineering summary report.

L. Funding Coordination

The ENGINEER will prepare project exhibits, project phasing alternatives, cost estimates and meeting agendas; and schedule, attend and facilitate up to six (6) meetings with the COUNTY, TxDOT, and NCTCOG with the objective of facilitating Advance Funding Agreements and obtaining state and federal funds for right-of-way and construction.

The ENGINEER will prepare for and attend a cost estimate review (CER) workshop with TxDOT and the FHWA to develop and review information such as cost estimation procedures and tools, identifying funding sources and revenues, and project implementation schedules. In preparation for the CER, the ENGINEER will conduct a risk analysis assessment, provide cost spreadsheets and information for input into the FHWA's probability modeling software, review and provide comments on the CER summary report, and update cost information to reflect confidence limits established during the CER.

**110.3. Conceptual Design Schematics.**

The ENGINEER will develop conceptual design schematics in MicroStation format to evaluate various methods of balancing roadway safety and capacity while providing necessary access to key areas. After considering up to three (3) alternative concepts, The ENGINEER will develop a single recommended design alternative that optimizes traffic flow and access. A single recommended design alternative will be completed after other alternatives have been reviewed by the COUNTY and TxDOT and the recommended design concept has been approved. The conceptual schematics are to be plan view only. Profile work must be done only to the extent necessary to lay out the proper horizontal geometry.

The schematics must contain the following design elements:

- A. Mainlane roadway alignment
- B. Pavement edges, face of curbs, and shoulder lines of mainlanes, intersections, and connecting highways or streets
- C. Typical sections of existing and proposed roadways
- D. Anticipated structure locations (including wildlife crossings and fencing structures)
- E. Anticipated retaining wall and sound wall locations
- F. Anticipated conveyance of major drainage elements
- G. Preliminary ROW and easement requirements and control-of-access locations
- H. Direction of traffic flow and the number of lanes on all roadways
- I. Existing and projected traffic volumes
- J. Existing utilities
- K. Waters of the United States (WOTUS)

**110.4. Geometric Design Schematics.**

The ENGINEER will develop one (1) geometric design schematic after the layout, lane arrangement, and anticipated ROW and easement impacts depicted on the single recommended design alternative is approved. The ENGINEER will use Bentley OpenRoads tools in performing this task. The geometric design schematic will include both a plan view and profile view.

- A. The geometric schematic plan view must contain the following design elements:
1. Bentley OpenRoads calculated roadway alignments for mainlanes, general purpose lanes, ramps, direct connectors, bridges, HOV lanes, managed lanes, express lanes, collector distributor roads, frontage roads and cross streets at major intersections and grade separation
  2. Horizontal curve data shown in tabular format
  3. Pavement edges, curb lines, and sidewalks for all roadway improvements
  4. Typical sections of existing and proposed roadways
  5. Proposed bridge structures, including bridge deck, abutment, bent, and rail locations
  6. Proposed retaining walls and sound walls
  7. Proposed cross-drainage structures with outfall flow arrows and significant drainage features or waterways identified
  8. Existing utilities and proposed utilities
  9. Existing property lines and respective property ownership information
  10. Existing ROW and easements
  11. Proposed ROW and easements adequate for preparation of ROW maps
  12. Waters of the US (WOTUS)
  13. Control-of-access limits
  14. Existing and projected traffic volumes
  15. Location and text of the existing and proposed guide signs and the preliminary locations for changeable message signs
  16. Lane lines, shoulder lines, and direction of traffic flow arrows indicating the number of lanes on all roadways
- B. The geometric schematic profile view must contain the following design elements:
1. Calculated profile grade and vertical curve data including "K" values for all curves and sight distance values for crest vertical curves on the mainlanes
  2. Existing ground line profiles along the mainlanes
  3. Grade separations and overpasses including preliminary abutment and bent locations, girder type, and span lengths
  4. Calculated vertical clearances at grade separations and overpasses
  5. Anticipated cross-drainage structures with approximate inlet and outfall elevations
  6. Proposed ditch grading (special grading), if it does not follow the typical section.
  7. Approximate locations of existing and proposed major utility crossings
  8. The calculated profile grade for frontage roads, connectors, ramps, and cross streets will be shown on separate Supplemental Profile rolls

**110.5. Cross-Sections.**

The ENGINEER will use a Bentley 3D OpenRoads model to generate preliminary cross-sections at 50-foot intervals and at culvert locations in conjunction with the geometric design schematic. The ENGINEER will determine earthwork volumes for use in the cost estimate. The ENGINEER will prepare 11-inch x 17-inch or roll plots of the cross-sections.

**110.6. Retaining Walls.**

The ENGINEER will prepare preliminary retaining wall concepts to be shown on schematics, typical sections, and cross sections.

- A. The ENGINEER will determine if any additional walls are required and verify the need for and length of the retaining wall as shown on the geometric design schematic.
- B. The ENGINEER will compute and tabulate retaining wall quantities for geometric design schematic submittal.

**110.7. Preliminary Construction Sequence.**

The ENGINEER will prepare preliminary construction sequence layouts in conjunction with the geometric design schematic depicting the phasing and traffic detours anticipated to safely convey traffic. The layouts must demonstrate that adequate horizontal and vertical alignments are maintained, sufficient lane widths and shoulder widths or barrier offsets are feasible, and construction zones are adequate for constructability of all proposed features. Proposed construction detours must ensure that adequate superelevation is provided. The layouts must indicate how existing pedestrian and bicycle facilities are accommodated for each phase.

**110.8. Preliminary Cost Estimate.**

The ENGINEER will prepare a preliminary cost estimate for the project, including the costs of construction, required ROW and associated improvements, and eligible utility adjustments. Current TXDOT unit bid prices must be used in preparation of the estimate.

**110.9. Engineering Summary Report.**

The ENGINEER will prepare an engineering summary report to summarize the design criteria (TxDOT Design Summary Report (DSR)), traffic analysis, preliminary cost estimate and basis of estimate, construction sequence description, and utility conflict issues.

**110.10. Agency Coordination and Public Involvement.**

- A. The ENGINEER will assist the COUNTY and TxDOT in conducting up to four (4) stakeholder meetings with property owners, stakeholders, and various agencies to discuss and review the schematic design. The ENGINEER will document and respond to issues related to the schematic design. This will involve facilitating the creation of a steering committee to include elected officials from the city of Fort Worth, the City of Lake Worth, and Tarrant County, as well as local business owners (identified by COUNTY).
- B. The ENGINEER will prepare a Notice and Opportunity to Comment as needed and assist in conducting public meetings and public hearing during the project development process. The ENGINEER will prepare schematic exhibits, constraints maps, and other necessary exhibits, and assist TxDOT with all presentations.
- C. The ENGINEER will coordinate, schedule, reserve, and pay for all meeting locations and facilities.
- D. For all public involvement activities, the ENGINEER will prepare the adjacent property owner list; mail out and pay for notices; draft letters to public officials; prepare, publish and pay for notices to major and local newspaper; hire court reporter and law enforcement for public meetings and hearing; and provide audio and visual rental equipment and changeable message boards.
- E. The ENGINEER will attend pre-meetings at the local TxDOT district in preparation for

every meeting and hearing, as directed by TxDOT.

- F. The ENGINEER will compile public comments received and responses to comments and prepare the required documentation for all public involvement activities. The ENGINEER will comply with the environmental compliance toolkits related to public involvement.

**110.11. Schematic Design Project Deliverables.**

In conjunction with the performance of the services included under Section 110 of this attachment, the ENGINEER will provide the following draft and final documents and associated electronic files as applicable

- A. Draft and final copies of the engineering summary report
- B. Draft copies of the preliminary drainage study
- C. Draft and final copies of the geometric schematic layouts 24-inch wide x 8-feet long roll plots.
- D. Draft and final copies of the conceptual design schematics roll plots
- E. Draft and final copies of the geometric design schematic layouts (1 inch = 100 feet)
- F. Draft and final copies of the geometric design schematic profiles roll plots
- G. Draft and final copies of the geometric design schematic cross-sections on 11-inch x 17-inch sheets.
- H. Electronic 3D model copy of the preliminary cross-sections created using OpenRoads tools
- I. Six final copies of the preliminary drainage study
- J. Electronic submittal of the hydrologic and hydraulic model digital files from the drainage study
- K. Copies of the preliminary construction sequence layouts in a roll plot.
- L. sequence typical sections in 11-inch x 17-inch format
- M. Electronic files will be furnished to COUNTY and TxDOT on a USB flash drive
- N. Traffic data schematics
- O. Traffic projections methodology memorandum
- P. Average daily corridor traffic projections report
- Q. Risk management plan
- R. Participation in CER
- S. Draft project management plan
- T. Final project management plan
- U. Line schematics with traffic data shown
- V. Documentation of public involvement activities
- W. Utility plan – electronic file in latest version of MicroStation fully compatible with OpenRoads civil design system
- X. Design exception and design waiver documents.
- Y. Hard copy of a draft hydraulic report.
- Z. Culvert hydraulic data sheets and preliminary culvert layouts.
- AA. Drainage report – one hard copy of final drainage report, one electronic copy of the entire drainage report in PDF format, and computer files of hydrologic and hydraulic modeling with



appropriate labeling of location, CSJ, and submittal date

- BB. Retaining wall layouts
- CC. Cost estimates for each milestone submittal
- DD. KMZ or KML file of conceptual design schematic created from applicable DGN files for reviewing in Google Earth
- EE. Final schematic 3D model created using OpenRoads software GG. Draft and final copies of traffic analysis report

## **SOCIAL, ECONOMIC, AND ENVIRONMENTAL STUDIES**

### **SOCIAL, ECONOMIC, AND ENVIRONMENTAL STUDIES AND PUBLIC INVOLVEMENT**

#### **120.1. Environmental Documentation Standards.**

Each environmental service provided by the ENGINEER must have a deliverable. Deliverables must summarize the methods used for the environmental services and the results achieved. The summary of results must be sufficiently detailed to provide satisfactory basis for thorough review by TxDOT, FHWA, and (where applicable) other agencies with regulatory oversight. All deliverables must meet regulatory requirements for legal sufficiency and adhere to the requirements for reports enumerated in TxDOT's National Environmental Policy Act of 1969 (NEPA) Memorandum of Understanding (MOU).

##### **A. Quality Assurance/Quality Control Review**

For each deliverable, the ENGINEER will perform quality assurance quality control (QA/QC) reviews of environmental documents and on all supporting environmental documentation to determine whether documents conform with:

1. Current Environmental Compliance Toolkit guidance, documentation requirements, and templates published by TxDOT's Environmental Affairs Division (ENV) and in effect as of the date of receipt of the documents or documentation to be reviewed;
2. Current state and federal laws, regulations, policies, guidance, agreements, and memoranda of understanding between TxDOT and other state or federal agencies; and
3. Guidelines contained in *Improving the Quality of Environmental Documents, A Report of the Joint AASHTO/ACEC Committee in Cooperation with the Federal Highway Administration* (May 2006) for:
  - a. Readability, and
  - b. Use of evidence and data in documents to support conclusions.

Upon request by TxDOT, the ENGINEER will provide documentation that the QA/QC reviews were performed by qualified staff.

- B. The ENGINEER will maintain the project environmental record in TxDOT's Environmental Compliance Oversight System (ECOS), including project review, completing the work development plan screens, uploading documents, and completing activities as assigned by the TxDOT.
- C. Deliverables must contain all data acquired during the environmental service and be written to be understood by the public in accordance with the TxDOT's Environmental Toolkit guidance, documentation standards, and current guidelines, policies, and procedures.
- D. Electronic versions of each deliverable must be written in software that is fully compatible with the software currently used by TxDOT and provided in the native format of the document for

future use by TxDOT. The ENGINEER will supplement all hard copy deliverables with electronic copies in searchable Adobe Acrobat (.pdf) format unless another format is specified. Each deliverable must be a single, searchable .pdf file that mirrors the layout and appearance of the physical deliverable. The ENGINEER will deliver the electronic files on USB flash drive in both the document's native format and the PDF format.

- E. When the environmental service is to apply for a permit (e.g., United States Coast Guard (USCG) permit or USACE permit), the ENGINEER will provide the permit and all supporting documentation to TxDOT as the deliverable.
- F. Submission of Deliverables
  - 1. Deliverables must consist of documentation to support a Categorical Exclusion (CE) determination, or the preparation of an Environmental Assessment (EA), as applicable. Technical reports and documentation must be prepared to support the applicable environmental classification (e.g. CE or EA). Additionally, an Open Ended (d) list Categorical Exclusion Request Form must be prepared to classify the project as an Open Ended (d) list CE, if needed.
  - 2. All deliverables must comply with all applicable state and federal environmental laws, regulations, procedures, and TxDOT's Environmental Compliance Toolkits, documentation requirements, and templates.
  - 3. On the cover page of any environmental documentation, the ENGINEER will insert the following language in a way that is conspicuous to the reader or include it in a CE project record:

"The environmental review, consultation, and other actions required by applicable Federal environmental laws for this project are being, or have been, carried-out by TxDOT pursuant to 23 U.S.C. 327 and a Memorandum of Understanding dated December 9, 2019, and executed by FHWA and TxDOT."
- G. TxDOT will provide TxDOT's and other agency comments on draft deliverables to the ENGINEER. The ENGINEER will revise the deliverable:
  - 1. To include any TxDOT commitments, findings, agreements, or determinations (e.g., wetlands, endangered species consultation, Section 106, or Section 4(f)), required for the transportation activity as specified by TxDOT;
  - 2. To incorporate the results of public involvement and agency coordination;
  - 3. To reflect mitigation measures resulting from comments received or changes in the transportation activity; and
  - 4. To include with the revised document a comment response form (matrix) in the format provided by TxDOT.
- H. The ENGINEER will provide photographs and graphics that clearly depict details relevant to an evaluation of the project area. Comparable quality electronic photograph presentations must be at least 1200 x 1600-pixel resolution. TxDOT can request images/graphics be provided in another format or quality.

## **120.2. Environmental Assessment (EA) Content and Format.**

- A. The ENGINEER will provide an EA and ensure that:
  - 1. The EA meets the requirements of 23 CFR §771.119 and TAC, Title 43, Part 1, Chapter 2 and the EA content is sufficiently detailed to meet regulatory requirements for legal sufficiency and current (at the time of creation) TxDOT ENV guidance and Environmental Compliance Toolkits.
  - 2. Exhibits to be included in reports or EAs must not exceed 11-inches x 17-inches and

must be in color. Text pages must be 8.5-inches x 11-inches. Exhibits and text in reports or EAs must be reproducible via photocopying without loss of legibility. The EA documents must be reproduced on plain white paper unless otherwise approved in advance in writing by TxDOT.

3. The EA must use quality maps and exhibits and must incorporate by reference and summarized background data and technical analyses to support the concise discussions of the alternatives and their impacts.
- B. Minimum Deliverables: (Additional deliverables to be identified in a work authorization based on work assigned.)
  1. Draft EA
  2. Revised Draft EA
  3. Draft EA for Public Hearing
  4. Final EA with Finding of No Significant Impact (FONSI) document.

**120.3. Environmental Technical Analyses and Documentation.**

- A. Definition of technical analyses and documentation for environmental services.

In general, technical analyses and documentation for environmental services might include a report, checklist, form, or analysis detailing resource-specific studies identified during the process of gathering data to make an environmental decision.

TxDOT may determine what technical reports and documentation are necessary for any given project. The ENGINEER will prepare all technical reports and documentation for TxDOT with sufficient detail and clarity to support environmental determinations. All technical reports must be compliant with TxDOT's Environmental Compliance Toolkits, documentation requirements, and templates. The environmental document must reference the technical reports.

Environmental technical reports and documentation must include appropriate NEPA or federal regulatory language in addition to the purpose and methodology used in delivering the service. Technical reports and forms must use templates and documentation standards as applicable and include sufficient information to determine the significance of impacts.

- B. Minimum Deliverables:
  1. Draft technical analyses and documentation
  2. Final technical analyses documentation
- C. The exact environmental technical analyses and documentation must be determined at the work authorization level, but can include:

1. Section 4(f) Evaluations

The ENGINEER will provide Section 4(f) Evaluations. The Section 4(f) Evaluation must conform to the appropriate TxDOT Section 4(f) checklist for exceptions, de minimus, and programmatic evaluations. For individual Section 4(f) Evaluations, the format and outline must be approved by TxDOT beforehand. All Section 4(f) Evaluations must meet the requirements set forth in TxDOT's Environmental Compliance Toolkits. The 4(f) Section of the environmental document states the reason a Section 4(f) evaluation is being completed. The 4(f) Section of the environmental document discusses the presence of all Section 4(f) properties located in the project area.

2. Section 6(f) Evaluation

The ENGINEER will determine if Land and Water Conservation Fund Act funds were used for the Section 4(f) property in accordance with the regulatory requirements and TPWD guidelines and document.

3. Environmental Public Involvement (23 CFR §771.111)

It is anticipated that the project will require two (2) public meetings and one (1) public hearing. The ENGINEER will provide public involvement activities, which might include:

- a. Developing a plan for public involvement activities, public involvement plan. The plan must specify all activities to be performed and alternatives to be discussed during public involvement activities. Public involvement activities must be carried out in compliance with Attachment A, Article 38, sections J and K of the contract. The plan must also discuss outreach strategies for both the general public and targeted strategies for environmental justice and limited English proficiency populations
- b. Compiling, maintaining, and updating a mailing list of people, agencies, and organizations interested in the transportation activity
- c. Making all arrangements for public meetings and hearings, including the site of the meetings, mailing and publishing notices, preparation of exhibits, provision for taping or transcription of proceedings, security, and any other arrangements as directed by TxDOT. The ENGINEER will not hold public meetings or hearings in the absence of TxDOT personnel
- d. Submitting all legal notices to TxDOT for review no less than six weeks prior to publication
- e. Arranging a meeting with TxDOT to review all exhibits and other materials to be used prior to public meetings or hearings
- f. Obtaining TxDOT's approval for all legal notices, exhibits, and other materials
- g. Providing personnel to staff meetings and hearings; including, people to perform registration, make presentations, and answer questions. Staffing levels of personnel to be provided must be identified in the work authorization
- h. Developing and submitting to TxDOT a meeting or hearing documentation packet
- i. Developing and sending acknowledgement or response letters to commenters at public meetings or hearings. The ENGINEER will not distribute acknowledgement or response letters without prior approval by TxDOT
- j. Developing, publishing, and distributing a newsletter on the transportation activity, including compiling and maintaining a mailing list. The ENGINEER will not distribute the newsletter without prior approval by TxDOT
- k. Submitting to TxDOT a request for development and maintenance of a website to disseminate information on the transportation activity and to gather comments from the public.
- l. Providing materials and information regarding the transportation activity to TxDOT to be posted on TxDOT-developed website.
- m. Ensuring the website conforms to state law, Texas Department of Information Resources requirements, TxDOT policies and procedures, and TxDOT Brand Guidelines.

4. Community Impacts Analysis

The ENGINEER will provide community impact analyses. Community impacts includes environmental justice, limited English proficiency, and other issues as addressed in TxDOT environmental guidance. The ENGINEER will perform community impact assessments including environmental justice analysis in accordance with Attachment A, Article 38, Sections J and K of the contract. Community impact analyses might include:

- a. Community Impacts Assessment Technical Report Form; or
  - b. Community Technical Report. The report must follow guidance provided in TxDOT's Community Impacts Assessment Toolkit. The assessment may include:
    - (1) Identification of environmental justice communities within the study area;
    - (2) A community profile;
    - (3) A displacement analysis;
    - (4) An access and travel pattern analysis;
    - (5) A community cohesion analysis;
    - (6) Determination if the project would have disproportionately high and adverse impacts on environmental justice communities. All impacts identified in the Community Impact Assessment and other relevant studies (i.e. noise analysis) must be considered to determine if the impacts disproportionately affect environmental justice communities;
    - (7) Identification of possible mitigation measures to avoid or minimize any adverse impacts to the environmental justice population within the project area;
    - (8) Summary of public involvement process including methods used to accommodate persons with limited English proficiency; and
    - (9) Identification of possible mitigation measures including those to avoid and minimize any adverse impacts to the environmental justice population within the project area.
5. Induced Growth Impact Analysis and Cumulative Impacts Analysis
- The ENGINEER will perform analysis to fulfill the requirements of NEPA and the most current version of the TxDOT *Guidance on Preparing Impact Analyses and Cumulative Impacts Analysis Guidelines* in TxDOT's Environmental Compliance Toolkits. The extent of the analyses must be determined in the work authorization.
6. Air Quality Studies
- The ENGINEER will prepare all required technical reports and the air quality section of all environmental documents in accordance with the current version of the TxDOT *Environmental Handbook for Air Quality* and Air Quality Toolkit. TxDOT may determine what technical reports and documentation are required for any given project. The required technical reports and documentation might include:
- a. Transportation Conformity Report Form and applicable coordination
  - b. Hot-Spot Analysis Technical Report and applicable coordination,
  - c. Carbon Monoxide Traffic Air Quality Analysis technical report,
  - d. Qualitative mobile source air toxics (MSAT) analysis,
  - e. Congestion management process analysis,
  - f. Applicable disclosure statements in the environmental document as prescribed in the TxDOT *Guidance for Preparing Air Quality Statements*,
  - g. Air quality cumulative and induced growth impacts analysis as specified above in paragraph 120.5, C, 5-Induced Growth Impact Analysis and Cumulative Impacts Analysis of this Attachment and included in the environmental document, and
  - h. Response to public comments received on air quality issues.

7. Noise Analysis Technical Reporting

The ENGINEER will prepare all necessary noise analyses and technical reporting.

- a. Noise Analysis Technical Reporting Requirements. At the work authorization level, the noise analysis technical reporting might include:
  - (1) Computer modeling of existing and predicted noise levels;
  - (2) Field measurements of existing noise levels and validation of existing model;
  - (3) Determining predicted noise impact contours for undeveloped property;
  - (4) Barrier analysis for impacted receivers.
- b. Noise Analysis General Requirements.
  - (1) The ENGINEER will use TxDOT's .DGN file coordinate system for all traffic noise modeling, so that all design files and traffic noise modeling software coordinate systems are the same.
  - (2) The ENGINEER will provide TxDOT with all .DXF files used for the traffic noise model.
  - (3) The ENGINEER will review all proposed noise barrier locations as part of the traffic noise modeling process.
  - (4) The ENGINEER will not begin identification of noise sensitive land uses unless TxDOT's Environmental Affairs Division's Historical Studies Branch (ENV-Historical Studies) has approved a Project Coordination Request (PCR).

8. Water Resources Analysis and Documentation

The ENGINEER will provide environmental documentation, conduct field surveys, and provide analysis of water resources for compliance with state and federal regulations as described in the *Environmental Guide: Volume 2 Activity Instructions*, <http://ftp.dot.state.tx.us/pub/txdot-info/env/toolkit/060-06-gui.pdf>, and the associated forms, templates, and guidance found in the Water Resources section of the Natural Resources Toolkit, <https://www.txdot.gov/inside-txdot/division/environmental/compliance-toolkits/natural-resources.html>. The applicable water resource studies must be determined at the work authorization level. In the case that field surveys are required, then the ENGINEER will contact TxDOT's Environmental Affairs Division's Natural Resource Management Section (ENV-NRM) for clearance prior to starting fieldwork. ENV-NRM will verify that approved methods and appropriately permitted and experienced staff will be used.

At the request of TxDOT, the ENGINEER will provide the following water analysis:

- a. Surface Water Analysis Form, including analysis of:
  - (1) Section 404 of the Clean Water Act
  - (2) Section 303(d) of the Clean Water Act
  - (3) General Bridge Act/Section 9 of the Rivers and Harbors Act
  - (4) Section 10 of the Rivers and Harbors Act
  - (5) Section 401 of the Clean Water Act
  - (6) Executive Order 11990, Protection of Wetlands
- b. WOTUS Delineation report prepared in accordance with ENV's Documentation Standard for Waters of the U.S. Delineation Report using ENV's Template: Water

- Features Delineation Report including all supporting forms and exhibits
- c. Section 404/10 Impacts Table prepared in accordance with TxDOT ENV's Section 404/10 *Impacts Table and Instructions – Preparing a Section 404/10 Impacts Table*
  - d. Section 404/10/9 Permitting Package, including:
    - (1) USACE PCN Permitting Application prepared in accordance with TxDOT ENV's *Documentation Standard for PCN*
    - (2) Conditional/Functional Assessment
    - (3) 401 Certification
  - e. For all WOTUS surveys, the ENGINEER will:
    - (1) Provide the results of the land survey in electronic DGN file format to be incorporated into the schematic and plans. GIS and KMZ files of the land survey must also be provided.
    - (2) Determine the acres of permanent and temporary impacts and linear feet of impacts at each WOTUS and provide figures of the WOTUS and associated impacts overlaying the schematic and plan sheets.
9. Biological/Natural Resources Management Analysis and Documentation
- The ENGINEER will provide environmental documentation, conduct field surveys, and provide analysis of biological natural resources for compliance with state and federal regulations as described in the TxDOT *Environmental Guide: Volume 2 Activity Instructions*, <http://ftp.dot.state.tx.us/pub/txdot-info/env/toolkit/060-06-gui.pdf>, and the associated forms, templates, and guidance found in the Natural Resources Toolkit, <https://www.txdot.gov/inside-txdot/division/environmental/compliance-toolkits/natural-resources.html>. The applicable natural resource studies must be determined at the work authorization level. In the case that field surveys are required, then the ENGINEER must contact ENV-NRM for clearance prior to starting work. ENV-NRM will verify that approved methods and appropriately permitted and experienced staff will be used. At the request of TxDOT, the ENGINEER will provide the following biological/natural resource analysis:
- a. Species Analysis Form, including:
    - (1) Species Analysis Spreadsheet, which can include a habitat analysis for the entire project area, field surveys for protected species.
    - (2) Species Analysis Form, which can include early coordination or administrative coordination with TPWD.
    - (3) Bald and Golden Eagle Protection Act (BGEPA) analysis and coordination assistance.
  - b. Farmland Protection Policy Act (FPPA) analysis
  - c. Preparation of USFWS species consultation, including section 7 informal and formal consultation for USFWS/NMFS
10. Initial Site Assessment (ISA) with Hazardous Materials Project Impact Evaluation Report
- The ENGINEER will provide an ISA with Hazardous Materials Project Impact Evaluation Report for the limits of the proposed project in accordance with Statement of Work for Hazardous Materials Processes related to NEPA in the TxDOT Hazardous Materials Management Toolkit (<http://www.txdot.gov/inside-txdot/division/environmental/compliance-toolkits/haz-mat.html>).
11. Archeological Documentation Services

The ENGINEER will provide archeological studies and documentation. All archeological studies must be sufficient to satisfy the current TxDOT Archeological Sites and Cemeteries Toolkit. An archeological background study must be performed prior to field work. If the ENGINEER was provided with a background study by TxDOT, a new background study is not required.

The ENGINEER will provide archeological resource identification, evaluation, and documentation services. In compliance with TxDOT's Environmental Compliance Toolkits, the ENGINEER will provide the following archeological services/deliverables:

- a. Archeological background study
- b. Archeological reconnaissance survey
- c. Archeological intensive survey

An archeological survey (reconnaissance or intensive) must be sufficient to satisfy state and federal regulations. The applicable archeological survey must be determined at the work authorization level. The ENGINEER will contact TxDOT's Environmental Affairs Division's Archeological Studies Branch (ENV-ARCH) for approval prior to starting field and survey work. ENV-ARCH will verify that approved methods and appropriately permitted and experienced staff will be used.

#### 12. Historic Resource Identification, Evaluation, and Documentation Services

The ENGINEER will provide historic resource identification, evaluation, and documentation services. In compliance with TxDOT's Environmental Compliance Toolkits, the ENGINEER will provide the following historic resource services/deliverables:

- a. Historic Resources PCR,
- b. Historic Resources Research Design, and
- c. Historic Resource Survey Report, including windshield, reconnaissance, or intensive level documentation.

All services, except the historic resource PCR, must have prior approval by TxDOT's Environmental Affairs Division's Historical Studies Branch (ENV-HIST) to be performed. The historic resource PCR must be accepted by ENV-HIST prior to survey field work.

#### 13. Floodplain Impacts

The ENGINEER will determine whether the transportation activity has the potential to affect floodplains. The ENGINEER will document Trinity River Corridor Development Certificate Regulatory Zone requirements (Dallas and Fort Worth Districts) if the project is within the area covered by these regulations. Studies for floodplain impacts must fulfill the requirements of Executive Order 11988 and 23 CFR 650, Subpart A. Documentation must:

- a. Briefly describe the watershed characteristics of the study area in terms of land uses and changes in land use that may affect stream discharge.
- b. Briefly describe the streams in the study area, including evidence of stream migration, down cutting, or aggradations.
- c. Identify the presence and nature (e.g., zone A, zone AE, zone AE with floodway) of any FEMA mapped floodplains; including the panel number.
- d. Indicate the existence of any significant development associated with the mapped area and identify the jurisdiction responsible for the floodplain.



- e. Identify the locations where an alternative might encroach on the base (100-year) floodplain (encroachments), where an alternative might support incompatible floodplain development, and the potential impacts of encroachments and floodplain development. This identification must be included in the text and on a map.
  - f. Include a list of all jurisdictions having control over floodplains for each alternative.
  - g. Where an encroachment or support of incompatible floodplain development results in impacts, provide more detailed information on the location, impacts, and appropriate mitigation measures. In addition, if any alternative (1) results in a floodplain encroachment or supports incompatible floodplain development having significant impacts, or (2) requires a commitment to a particular structure size or type, the report must include an evaluation and discussion of practicable alternatives to the structure or to the significant encroachment. The report must include exhibits that display the alternatives, the base floodplains and, where applicable, the regulatory floodplains.
  - h. For each alternative encroaching on a designated or regulatory floodplain, provide a preliminary indication of whether the encroachment is consistent with or requires a revision to the regulatory floodplain. If the preferred alternative encroaches on a regulatory floodplain, the report must discuss the consistency of the action with the regulatory floodplain. In addition, the report must document coordination with FEMA and local or state agencies with jurisdiction indicating that a revision is acceptable or that a revision is not required.
  - i. If the preferred alternative includes a floodplain encroachment having significant impacts, the report must include a finding that it is the only practicable alternative as required by 23 CFR 650, Subpart A. The finding must refer to Executive Order 11988 and 23 CFR 650, Subpart A. In such cases the report must document compliance with the Executive Order 11988 requirements and must be supported by the following information:
    - (1) The reasons why the proposed action must be located in the floodplain;
    - (2) The alternatives considered and why they were not practicable; and
    - (3) A statement indicating whether the action conforms to applicable state or local floodplain protection standards
14. Stormwater Permits (Section 402 of the Clean Water Act)
- The ENGINEER will:
- a. describe the need to use the TPDES General Permit, TX 150000. The text must describe how the project will comply with the terms of the TPDES, including the Stormwater Pollution Prevention Plan; and
  - b. describe the need for Municipal Separate Storm Sewer System (MS4) notification and list the MS4 participating municipalities.

## **RIGHT-OF-WAY DATA**

### **RIGHT-OF-WAY (ROW) DATA AND UTILITY ENGINEERING INVESTIGATION**

The term Surveyor means the firm (prime provider or subprovider) that is providing the surveying services shown in this scope.

The ENGINEER will ensure that the following general standards for survey work are followed.

Unless otherwise indicated, any reference in this attachment to a manual, specification, policy, rule or

regulation, or law means the version in effect at the time the work is performed. TxDOT manuals are available at: <http://onlinemanuals.txdot.gov/manuals/>.

All surveys must meet or exceed all applicable requirements and standards provided by: (1) Professional Land Surveying Practices Act, (2) General Rules of Procedures and Practices promulgated by the Texas Board of Professional Engineer's and Land Surveyors (TBPELS), and (3) *TxDOT Survey Manual*. The Surveyor will perform all work in an organized and professional manner. All surveys are subject to the approval of TxDOT.

The Surveyor will use the *TxDOT ROW Preliminary Procedures for Authority to Proceed Manual* and *TxDOT Survey Manual* as the basis for the format and preparation of all right of way (ROW) documents produced, including ROW maps, written parcel descriptions, parcel plats, and other ROW work products, unless otherwise specified by TxDOT.

Unless otherwise directed by TxDOT, the Surveyor will use (1) the North American Datum of 1983 (NAD83), Texas Coordinate System of 1983 (State Plane Coordinates) applicable to the zone or zones in which the work is performed, with values in U.S. survey feet, as the basis for all horizontal coordinates derived and (2) the datum adjustment currently in use by TxDOT.

Project or surface coordinates must be calculated by applying a combined adjustment factor (CAF) to State Plane Coordinate values. If provided by TxDOT, the Surveyor will use a project specific CAF.

Elevations must be based on the North American Vertical Datum 88 (NAVD88), unless otherwise specified by TxDOT.

All work using the Global Positioning System (GPS), whether primary control surveys or other, must meet or exceed the requirements provided by the *TxDOT Survey Manual* to the order of accuracy specified in the categories listed below or in a work authorization. If the order of accuracy is not specified in this attachment or in a work authorization, the work must meet or exceed the order of accuracy specified in the publication listed in this paragraph.

All conventional horizontal and vertical control surveys must meet or exceed the order of accuracy specified in the *TxDOT Survey Manual* unless specified otherwise in the contract.

All boundary determination surveys, whether for ROW acquisition, ROW re-establishment, or other boundary needs, must meet or exceed the accuracy specified in the *TxDOT Survey Manual* unless specified otherwise in the contract.

TxDOT may authorize the Surveyor to use an Unmanned Aircraft System (UAS) to perform services under this contract. The use of UAS is regulated by the Federal Aviation Administration (FAA). All UAS operators must comply with Federal Aviation Administration (FAA) regulations and the *TxDOT Unmanned Aircraft System (UAS) Flight Operations and User's Manual*.

The survey data must be fully compatible with TxDOT's computer system and with programs in use by TxDOT at the time of the submission, without further modification or conversion. The current programs used by TxDOT are: Microsoft Word, Bentley MicroStation, Bentley OpenRoads civil design system, Bentley GEOPAK Survey, Excel, and ESRI ArcGIS. Data collection programs must be compatible with the current import formats allowed by GEOPAK Survey and be attributed with current feature codes. These programs may be replaced at the discretion of TxDOT.

Drawing sizes are defined, based on American National Standards Institute (ANSI) standard paper sizes, as follows: A-size means 8.5-inches x 11-inches, B-size means 11-inches x 17-inches, C-size means 17-inches x 22-inches, and D-size means 22-inches x 34-inches.

Variations from these software applications or other requirements listed above will only be allowed if requested in writing by the Surveyor and approved by TxDOT.

The Surveyor will perform quality control/quality assurance on all procedures, field surveys, data, and products prior to delivery to TxDOT. TxDOT may also require the Surveyor to review the survey work performed by others. If, at any time, during the course of reviewing a submittal of any item it becomes apparent to TxDOT

that the submittal contains a substantial number of errors, omissions, and inconsistencies, TxDOT may cease its review and return the submittal to the Surveyor immediately for appropriate corrective action. A submittal returned to the Surveyor for this reason is not a submittal for purposes of the submission schedule.

The standards for services that are not boundary-related but that relate to surveying for Engineering projects may be determined by the construction specifications, design specifications, or as specified by TxDOT:

**130.1. Right-Of-Way Surveys (15.1.1).**

This includes the performance of surveys to establish land boundaries, preparation of parcel descriptions and parcel plats, and the preparation of right-of-way (ROW) maps.

The Surveyor will prepare:

- A. boundary surveys and create Property Descriptions (metes and bounds plus plats);
- B. create GIS files for ROWD/ Real Property Asset Map system; and
- C. traditional ROW map as requested by a TxDOT district.

The standards and deliverables are detailed in Chapter 4, Section 8 of the *TxDOT ROW Preliminary Procedures for the Authority to Proceed Manual*, and the checklist provided by TxDOT.

**130.2. Utility Engineering Investigation.**

Utility engineering investigation includes utility investigations subsurface and above ground prepared in accordance with ASCE/CI Standard 38-02

[(<http://www.fhwa.dot.gov/programadmin/asce.cfm>)] and Utility Quality Levels.

A. Utility Quality Levels (QL)

Utility Quality Levels are defined in cumulative order (least to greatest) as follows:

- 1. Quality Level D - Quality level value assigned to a utility segment or utility feature after a review and compilation of data sources such as existing records, oral recollections, locations marked by DIGTESS, and data repositories.
- 2. Quality Level C - Quality level value assigned to a utility segment or utility feature after surveying aboveground (i.e., visible) utility features and using professional judgement to correlate the surveyed locations of these features with those from existing utility records.
- 3. Quality Level B - Designate: Quality level value assigned to a utility segment or subsurface utility feature whose existence and position is based upon appropriate surface geophysical methods combined with professional judgment and whose location is tied to the project survey datum. Horizontal accuracy of Designated Utilities is 18" (including survey tolerances) unless otherwise indicated for a specific segment of the deliverable. Quality Level B incorporates quality levels C and D information. A composite plot is created.
- 4. Quality Level A – Quality level value assigned to a portion (x, y, and z geometry) of a point of a subsurface utility feature that is directly exposed, measured, and whose location and dimensions are tied to the project survey datum. Other measurable, observable, and judged utility attributes are also recorded (per District Best Practices). The utility location must be tied to the project survey datum with an accuracy of 0.1 feet (30-mm) vertical and to 0.2 feet (60-mm) horizontal. As test holes may be requested up front or during the project, test holes done prior to completion of QL D, C, or B deliverables must be symbolized on the QL B deliverable with a call out indicating test holes number. This is in addition to and not in lieu of the test hole.

B. Utility Investigations Methodology

1. Utility Investigation Quality Lvl D

The ENGINEER will:

- a. Perform records research from all available resources. Sources include: Texas811, Railroad Commission of Texas (Texas RRC), verbal recollection, as-built information from plans, plats, permits and any other applicable information provided by the utility owners or other stakeholders.
- b. Document utility owners and contact information.
- c. Create a utility drawing of information gathered.

2. Utility Investigation Quality Lvl C

The ENGINEER will:

- a. In combination with existing Quality Level D information, utilize surveyed above-ground utility features and professional judgement to upgrade Quality Level D information to Quality Level C. For those utilities unable to be upgraded, retain as Quality Level D.
- b. Overhead utilities information must be gathered and depicted. Sag elevations of lowest utility must be documented at road crossings, per best practices document.
- c. Storm and sanitary sewer information must be gathered from Level D and upgraded to Level C as possible, unless otherwise directed by TxDOT.
- d. Mapping of underground vaults may be requested by TxDOT.
- e. Create composite utility drawing of information gathered.

3. Designate (Quality Level B)

Designate means to indicate the horizontal location of underground utilities by the application and interpretation of appropriate non-destructive surface geophysical techniques and reference to established survey control. Designating (Quality Level B) services are inclusive of Quality Levels C and D.

The ENGINEER must:

- a. As requested by TxDOT, compile "as-built" information from plans, plats and other location data as provided by the utility owners.
- b. Coordinate with utility owner when utility owner's policy is to designate their own facilities at no cost for preliminary survey purposes. The ENGINEER will examine utility owner's work to ensure accuracy and completeness.
- c. Designate, record, and mark the horizontal location of the existing utility facilities using non-destructive surface geophysical techniques.
- d. Using both active and passive scans to attempt to locate any additional utilities, including unrecorded and abandoned storm and sanitary sewer facilities, at the direction of TxDOT, may be investigated using additional methods such as rodding that would then classify them as Quality Level B. A non-water based pink paint or pink pin flags must be used on all surface markings of underground utilities.
- e. Correlate utility owner records with designating data and resolve discrepancies using professional judgment. The ENGINEER must prepare and deliver to TxDOT a color-coded composite utility facility plan with utility owner names, quality levels, line sizes and subsurface utility locate (test hole) locations. The ENGINEER and TxDOT acknowledge that the line sizes of designated utility facilities detailed on the deliverable will be from the best available records and that an actual line size is

normally determined from a test hole vacuum excavation. A note must be placed on the designate deliverable only that states "lines sizes are from best available records". All above-ground utility feature locations must be included in the deliverable to TxDOT. This information must be provided in the latest version of OpenRoads civil design system used by TxDOT. The ENGINEER will deliver the electronic file on USB flash drive, as requested by TxDOT. A hard copy is required and must be signed, sealed, and dated by the registered ENGINEER overseeing the utility engineering investigation. When requested by TxDOT, the designated utility information must be over laid on TxDOT's design plans.

- f. Determine and inform TxDOT of the approximate electronic utility depths at critical locations as determined by TxDOT. The limits of this additional information should be determined prior to the commencement of work. This depth indication is understood by both the ENGINEER and TxDOT to be approximate only and is not intended to be used preparing the ROW and construction plans.
  - g. Provide a monthly summary, with weekly updates, of work completed and in process with adequate detail to verify compliance with agreed work schedule.
  - h. Close-out permits as required.
  - i. Clearly identify all utilities that were discovered from Quality Levels C and D investigation but cannot be depicted in Quality Level B standards. These utilities must have a unique line style and symbology in the designate (Quality Level B) deliverable.
  - j. Comply with all applicable TxDOT policy and procedural manuals.
4. Subsurface Utility Locate (Test Hole) Service (Quality Level A)
- Up to 50 test holes will be performed.

Locate is the process used to obtain precise horizontal and vertical position, material type, condition, size, and other data that may be obtainable about the utility facility and its surrounding environment through exposure by non-destructive excavation techniques that ensures the integrity of the utility facility. Subsurface Utility Locate (Test Hole) Services (Quality Level A) are inclusive of Quality Levels B, C, and D.

The ENGINEER must:

- a. Review requested test hole locations and advise TxDOT in the development of an appropriate locate (test hole) work plan relative to the existing utility infrastructure and proposed highway design elements.
- b. Coordinate with utility owner inspectors as may be required by law or utility owner policy.
- c. Place Texas 811 ticket 48 hours prior to excavation.
- d. Neatly cut and remove existing pavement material, such that the cut does not exceed 0.10 square meters (1.076 square feet) unless unusual circumstances exist.
- e. Measure and record the following data on an appropriately formatted test hole data sheet that has been sealed and dated by the ENGINEER:
  - (1) Elevation of top of utility tied to the datum of the furnished plan.
  - (2) Minimum of two benchmarks utilized. Elevations must be within an accuracy of 15mm (.591 inches) of utilized benchmarks.
  - (3) Elevation of existing grade over utility at test hole location.

- (4) Horizontal location referenced to project coordinate datum.
  - (5) Outside diameter of pipe or width of duct banks and configuration of non-encased multi-conduit systems.
  - (6) Utility facility materials.
  - (7) Utility facility condition.
  - (8) Pavement thickness and type.
  - (9) Coating/wrapping information and condition.
  - (10) Unusual circumstances or field conditions.
- f. Excavate test holes in such a manner as to prevent any damage to wrappings, coatings, cathodic protection, and other protective coverings and features. Water excavation can only be utilized with written approval from the appropriate TxDOT district office.
  - g. Be responsible for any damage to the utility during the locating process. In the event of damage, the ENGINEER must stop work, notify the appropriate utility facility owner, TxDOT, and appropriate regulatory agencies. The regulatory agencies include: the Railroad Commission of Texas and the Texas Commission on Environmental Quality. The ENGINEER will not resume work until the utility facility owner has determined the corrective action to be taken. The ENGINEER is liable for all costs involved in the repair or replacement of the utility facility.
  - h. Back fill all excavations with appropriate material, compact backfill by appropriate mechanical means, and restore pavement and surface material. The ENGINEER is responsible for the integrity of the backfill and surface restoration for a period of three years.
  - i. Furnish and install a permanent above-ground marker (as specified by TxDOT, directly above center line of the utility facility).
  - j. Provide complete restoration of work site and landscape to equal or better condition than before excavation. If a work site and landscape is not appropriately restored, the ENGINEER will return to correct the condition at no extra charge to TxDOT.
  - k. Plot utility location position information to scale and provide a comprehensive utility plan signed and sealed by the responsible professional ENGINEER. This information must be provided in the latest version of MicroStation and be fully compatible with the OpenRoads civil design system used by TxDOT. The electronic file will be delivered on USB flash drive as requested. When requested by TxDOT, the locate information must be over laid on TxDOT's design plans.
  - l. Return plans, profiles, and test hole data sheets to TxDOT. If requested, conduct a review of the findings with TxDOT.
  - m. Close-out permits as required.

## **CONTRACT MANAGEMENT AND ADMINISTRATION**

### **145.1. Contract Management and Administration.**

The ENGINEER will:

- A. Produce a complete and acceptable deliverable for each environmental service performed for environmental documentation.

- B. Incorporate environmental data into identification of alternatives.
- C. Notify the COUNTY as soon as practical, by phone and in writing, if performance of environmental services discloses the presence or likely presence of significant impacts (in accordance with 40 Code of Federal Regulations (CFR) 1500-1508). Inform TxDOT of the basis for concluding there are significant impacts and the basis for concluding that the impacts might require mitigation.
- D. Notify the COUNTY as soon as practical, by phone and in writing, if performance of environmental services results in identification of impacts or a level of controversy that might elevate the transportation activity's status from a categorical exclusion or environmental assessment. TxDOT will reassess the appropriate level of documentation.

## **DESIGN SURVEYS AND CONSTRUCTION SURVEYS**

### **150.1. Design Survey.**

- A. Definitions
  - 1. Design Survey (15.2.1)

A design survey gathers data in support of transportation systems design. A design survey includes the research, field work, analysis, computation, and documentation necessary to provide detailed topographic (3-dimensional) mapping of a project site (e.g. locating existing ROW, surveying cross-sections or developing data to create cross-sections and digital terrain models, horizontal and vertical location of utilities and improvements, collecting details of bridges and other structures, review of ROW maps, establishing control points).
- B. Technical Requirements for Design and Construction Surveys
  - 1. Design surveys and construction surveys must be performed under the supervision of a RPLS currently registered with the TBPELS.
  - 2. All control must meet the of accuracy requirements of TxDOT.

The Surveyor will comply with the standards of accuracy for control traverses provided in the *TxDOT Survey Manual* or the *TSPS Manual of Practice for Land Surveying in TxDOT of Texas*, as may be applicable.
  - 3. Short traverse procedures used to determine horizontal and vertical locations must meet the following criteria:
    - a. Short traverses must begin and end on horizontal and vertical ground control as described above.
    - b. Required horizontal accuracy (unless otherwise stated):
      - (1) Bridges and other roadway structures: less than 0.1 feet.
      - (2) Utilities and improvements: less than 0.2 feet.
      - (3) Cross-sections and profiles: less than 1 foot.
      - (4) Bore holes: less than 3 feet.
    - c. Required vertical accuracy:
      - (1) Bridges and other roadway structures: less than 0.02 feet.
      - (2) Utilities and improvements: less than 0.1 feet.

- (3) Cross-sections and profiles: less than 0.2 feet.
- (4) Bore holes: less than 0.5 feet.

**150.2. Design Survey (15.2.1).**

**A. Tasks to be Completed – Design Surveys**

If requested by TxDOT, the Surveyor will perform one or more Design Surveys. Design Survey tasks include the following:

1. Collect data to create cross-sections and DTMs.
2. Locate existing utilities.
3. Locate existing improvements.
4. Provide details of existing bridge structures, including bridge limits, bents, columns, retaining walls, and natural ground elevations.
5. Locate details of existing drainage features including culverts, manholes, retention and detention ponds, flowlines, and associated features.
6. Locate all waters of the United States (WOTUS), including wetlands.
7. Review existing ROW maps and locate the existing ROW.
  - a. Review existing ROW maps  
The Surveyor will review ROW maps prepared by others for completeness using the current schematic and the checklist provided by the TxDOT district.
  - b. Locate existing ROW  
The Surveyor will resurvey the existing ROW where it is necessary to update or redefine ROW lines. All standard surveying procedures must be adhered to including record research, recovering existing monuments, and replacing monuments as appropriate. The Surveyor will prepare an abstract map, preliminary map, final map, GIS graphics file, and a Surveyor's report. The final map must also include a monument table showing the property monuments that were found and set, and certified by the Surveyor. The Surveyor will prepare maps either in standard map sheets format or roll map format as requested by the TxDOT district.
8. Perform hydrographic surveys, according to details requested by the TxDOT district.
9. Verify the condition and usefulness of existing control points including verification of the values. Establish additional control as needed. Tie to other control points in the project vicinity including points established by the National Geodetic Survey (NGS), the Federal Emergency Management Agency (FEMA), and any other local entities as directed by TxDOT.
10. Update existing control information and prepare new survey control data sheets, as directed by TxDOT to be included in the construction plan set as described below:
  - a. The Surveyor will prepare, sign, seal, and date a survey control index sheet and horizontal and vertical control sheet(s) to be inserted into the plan set.
  - b. The survey control index sheet provides an overview of the primary project control and must include:
    - (1) An unscaled vicinity map showing the general location of the project in relation to nearby towns or other significant cultural features.



- (2) A scaled project map showing the extents of the project and the location of the primary control points. The map must show street networks, selected street names, control point identification, and significant cultural features necessary to provide a general location of the primary control.
  - (3) A table containing the primary control point values including the point number, northing, easting, elevation, stationing, and stationing offset values.
  - (4) Map annotation including a graphic scale bar, north arrow, and standard TxDOT title block. The title block will contain a section for the district name, COUNTY, highway, and CSJ number. The title block will also contain a section for a Texas registered ENGINEER to sign, seal and date the sheet to include the following statement, "The survey control information has been accepted and incorporated into this PS&E." The required format of the survey control index sheet can be downloaded from the TxDOT website.
  - (5) In the title block under the heading "Notes", identification of the horizontal and vertical datum on which the primary control is based with the date of the current adjustment, the surface adjustment factor used, and unit of measure. The Surveyor will include a note stating that the coordinates are State Plane and a notation specifying either grid or surface adjusted coordinates.
- c. The Surveyor will prepare horizontal and vertical control sheets providing detailed information about the construction, location, and monumentation of the primary control, which must include:
- (1) An unscaled location map for each primary control point showing the location of the monument in relation to physical features located in the vicinity. The location map must include a north arrow, the monument designation, the monument northing, easting, and elevation.
  - (2) Directly below the location map a text description of the monument including size, material, and construction followed by a description of the location of the monument starting with the COUNTY and TxDOT followed by a description suitable to locate the monument on the ground.
  - (3) Map annotation including a graphic scale bar, north arrow, and a standard TxDOT title block. The title block must contain a section for the district name, COUNTY, highway, and CSJ number and contain a section for a Texas registered ENGINEER to sign, seal and date the sheet to include the following statement, "The survey control information has been accepted and incorporated into this PS&E." The required format of the survey control index sheet can be downloaded from the TxDOT website.
  - (4) In the title block under the heading "Notes", identification of the horizontal and vertical datum on which the primary control is based with the date of the current adjustment, the surface adjustment factor used, and unit of measure. The Surveyor will include a note stating that the coordinates are either grid or surface adjusted coordinates.

### **150.3. Mapping (15.3).**

Mapping includes the geospatial data collection and mapping by means of aerial photogrammetry, terrestrial (close range) photogrammetry, terrestrial LiDAR, mobile LiDAR, and other remote sensing technologies.

#### **A. Purpose**

The purpose of mapping is to provide map and related data to support transportation projects

including project design and other uses.

**B. Definitions**

1. Aerial Photogrammetry (15.3.1) – Aerial Photogrammetry means the collection and processing of photography acquired from an airborne platform to develop DGN and DTM files.
2. Terrestrial Photogrammetry (15.1.2) – Terrestrial Photogrammetry means the collection and processing of photography acquired at or near ground level to develop DGN and DTM files.
3. Airborne LiDAR (15.3.4) – Airborne LiDAR means laser scanning equipment mounted on a helicopter or other airborne platform to collect data to process for DGN and DTM files.
4. Terrestrial LiDAR (15.3.3) – Terrestrial LiDAR means laser scanning equipment operated from a stationary base on the earth's surface to collect data to process for DGN and DTM files.
5. Mobile LiDAR (15.3.4) – Mobile LiDAR means laser scanning equipment mounted on a moving vehicle operating on the earth's surface to collect data to process for DGN and DTM files.
6. UAS means Unmanned Aircraft Systems (e.g., drones).
7. UAS LiDAR means laser scanning equipment on an unmanned aerial vehicle (e.g., drones) to collect data to process for DGN and DTM files.

**150.4. Mapping Services to be Provided.**

The Surveyor will provide the following mapping services as requested:

**A. Terrestrial Lidar**

The Surveyor will prepare planimetric design (DGN), digital terrain model (DTM), and triangulated irregular network (TIN) MicroStation graphics files covering the specific work location, meeting standards and specifications as required.

**B. Mobile and Aerial Lidar**

The Surveyor will prepare planimetric design (DGN), digital terrain model (DTM), and triangulated irregular network (TIN) MicroStation graphics files covering the specific work location, meeting standards and specifications as required.

**C. Mapping Tasks to be Completed**

The Surveyor will perform the following tasks as requested for each mapping service.

1. Horizontal and Vertical Control for Aerial Mapping
  - a. The Surveyor will prepare and submit an aerial ground control layout showing the proposed aerial ground control points, for approval by TxDOT.
  - b. The Surveyor will establish and determine the coordinates of the aerial ground control points.
  - c. The Surveyor will establish and determine the elevations of the aerial control points.
  - d. The Surveyor will place aerial ground control target material at the established points and maintain until the photographs from the flight are approved.
  - e. The Surveyor will prepare, to scale, a survey control index sheet for the aerial control points.

- f. The Surveyor will be prepared to locate additional points, as determined by the American Society for Photogrammetry and Remote Sensing (ASPRS) certified Photogrammetrist, if any panel points are not visible from the air.
  2. Deliverables for Horizontal and Vertical Control for Aerial Mapping  
The Surveyor will provide the following deliverables:
    - a. A final aerial control point layout showing the location of the points and labeled with their respective alpha-numeric designations.
    - b. A plot and computer graphics of an B-size index map showing an overall view of the project and the relationship of primary monumentation and control used in the preparation of the project, signed and sealed by a RPLS, and as directed by TxDOT.
    - c. An A-size data sheet for each aerial ground control point, which must include a location sketch, a physical description of the point, surface coordinates, the elevation, and datums used.
    - d. A USB flash drive containing the graphics files and scanned images of the control data sheets.
    - e. A written statement describing the datum used along with copies of all relevant NGS and data sheets.
    - f. A written tabulation of all aerial control points with their respective alpha-numeric designations, surface coordinates (for center panel points only), and elevations.
  3. Prepare Planimetric and DTM Data  
The Surveyor will perform the following tasks for each requested mapping service:
    - a. The Surveyor will provide low altitude aerial mapping to cover an area 1,200 feet wide centered on the roadway unless otherwise specified, with cross flights as directed by TxDOT.  
  
The Surveyor will follow all standards and specifications in accordance with established guidelines and recommended or approved by TxDOT.
    - b. The Surveyor will prepare planimetric design (DGN), digital terrain model (DTM), and triangulated irregular network (TIN) Bentley MicroStation graphics files and orthophotography files covering the specific work location, meeting standards and specifications as required.
      - (1) The Surveyor will collect supplemental planimetric and DTM survey data.
      - (2) The Surveyor will update aerial 2D and 3D mapping with ground surveys.
      - (3) The Surveyor will maintain the current DGN level structure and legend used by TxDOT.
      - (4) The Surveyor will maintain the current DTM level structure and legend used by TxDOT.
      - (5) The Surveyor will use file features and level structures in compliance with TxDOT's current photogrammetry mapping legend.
      - (6) The Surveyor will locate, and field check random points.
    - c. The Surveyor will conduct quality assurance and quality control (QA/QC) for each task performed and prepare a Surveyor's Report.
  4. Deliverables for Planimetric and DTMs

The Surveyor will provide the following:

- a. Certification that the photographs or LiDAR imagery were taken on the date indicated, signed by the airplane pilot or aerial photographer.
- b. The DGN, DTM, and TIN files on a medium and in a format acceptable to TxDOT, delivered on USB flash-drive or hard-drive.
  - (1) Orthophotography (created using the DTM) delivered on USB flash drive, or hard-drive in tiff format (3 banded) with world files.
  - (2) TxDOT's photogrammetry mapping legend and supplements.
- c. A tabulation showing the field-check points.
- d. Quality Assurance and Quality Control (QA/QC) and Statement of Map Accuracy.
  - (1) Statement of map accuracy.
  - (2) A surveyor's report signed and sealed by an RPLS.

**150.5. Horizontal And Vertical Control (15.3.5).**

This includes the establishment of horizontal and vertical control for survey projects.

**A. Overview of Horizontal and Vertical Control**

A horizontal control survey is performed for the purpose of placing geographic coordinates of latitude and longitude on permanent monuments for referencing lower levels of surveys. A projection is used to place the coordinates on a plane of northing and easting values for simplified measurements. Scale and elevation factors are applied to make the distance measurements applicable to the exact location on the working surface and the type of projection chosen is an "equal angle" type.

A vertical control survey is performed for accurately determining the orthometric height (elevation) of permanent monuments to be used as bench marks for lower quality leveling. Spirit leveling is the usual method of carrying elevations across country from "sea level" tidal gauges. However, Global Positioning System (GPS) can be used indirectly but with less accuracy. Height measurements from the ellipsoid (as opposed to the "sea level" geoid) can be determined very accurately with GPS and only GPS. Trigonometric leveling, with a total station, is not acceptable for vertical control work.

**B. Definitions**

1. BM means bench mark, which is a relatively permanent object whose elevation above or below an adopted datum is known.
2. CORS means continuously operating reference station, which is a network of the highest quality horizontal stations, forming the National Spatial Reference System (NSRS).
3. Control Survey means a survey providing positions (horizontal or vertical) of points to which supplemental surveys are adjusted.
4. Datum means a mathematical model of the earth designed to fit part or all of the geoid.
5. Datum Point Rod or Deep Rod Monument means a monument driven to refusal by a power driver, used for major project control.
6. GPS means the Global Positioning System, which is based on a constellation of 24 satellites orbiting the earth at a very high altitude.
7. Horizontal Control Survey means placing geographic coordinates of latitude and longitude on permanent monuments.
8. Level 1 survey means RRP, CORS or major control densification.

9. Level 2 Survey means primary project control.
10. Level 3 Survey means secondary project control.
11. NGS means National Geodetic Survey
12. RRP means Regional Reference Point, which is a TxDOT Continuously Operating Reference Point.
13. Type II Monument means a disk driven onto a length of 5/8-inch rebar with the hole filled flush with concrete.
14. Vertical Control Surveys means a survey performed for accurately determining the orthometric height (elevation) of permanent monuments to be used as bench marks for lower quality leveling.

C. Procedure for Horizontal and Vertical Control

1. The Surveyor will establish horizontal and vertical control points, including offsite points. The Surveyor will prepare signed survey control data sheets, a survey control index sheet, and a composite layout of the horizontal and vertical controls, and as directed by TxDOT.
2. The Surveyor will update existing control information and prepare new survey control data sheets, as directed by TxDOT, to be included in the construction plan set as described in Item 150.11, D.

D. Technical Requirements for Horizontal and Vertical Control

The Surveyor will adhere to the following technical requirements.

1. Horizontal and vertical controls must be performed under the supervision of a RPLS currently registered with the TBPELS.
2. Horizontal ground control used for design surveys and construction surveys, furnished to the Surveyor by TxDOT or based on acceptable methods conducted by the Surveyor, must meet the standards of accuracy required by TxDOT.

The Surveyor will comply with the standards of accuracy for horizontal control traverses, as described in the *TxDOT Survey Manual* or the *TSPS Manual of Practice for Land Surveying in TxDOT of Texas*, as may be applicable.

3. Vertical ground control used for design surveys and construction surveys, furnished to the Surveyor by TxDOT or based on acceptable methods conducted by the Surveyor, must meet the standards of accuracy required by TxDOT.

The Surveyor will comply with the standards of accuracy for vertical control traverses, as described in the *TxDOT Survey Manual* or the *TSPS Manual of Practice for Land Surveying in the State of Texas*, as may be applicable.

4. Monuments

The Surveyor will install survey monuments for a horizontal and vertical control survey that are reasonably permanent and substantial. The monuments will be easily identified and afforded reasonable protection against damage and or destruction.

- a. Offsite primary control points whether set by GPS or conventional survey methods must be set in pairs approximately 2000 feet apart outside of the project on side roads. Offsite points must be constructed approximately every 2 miles and set approximately 6 inches below natural ground and must be inter-visible between each pair of points.
- b. Secondary control points must be set approximately 6 inches below ground at a

maximum distance of 1,500 feet apart.

5. Side shots or short traverse procedures for total stations used to determine horizontal and vertical locations must meet the following criteria:
  - a. Short traverses and instrument setups for side shots must begin and end on horizontal and vertical ground control as described above.
  - b. Standards, procedures, and equipment (e.g., GPS Equipment, LiDAR, Total Stations) used must be such that horizontal locations relative to the control can be reported within the specification to allow the ENGINEER to accurately create the design to the following limits:
    - (1) Bridges and other roadway structures: less than 0.02 feet.
    - (2) Utilities and improvements: less than 0.2 feet.
    - (3) Cross-sections and profiles: less than 0.2 feet.
    - (4) Bore holes: less than 0.5 feet.
  - c. Standards, procedures, and equipment (e.g., GPS Equipment, LiDAR, Total Stations) used must be such that vertical locations relative to the control may be reported to within 0.02 feet.
6. The Surveyor will update existing control information and prepare new survey control data sheets, as directed by TxDOT, to be included in the construction plan set as described below:
  - a. The Surveyor will prepare, sign, seal, and date a survey control index sheet and horizontal and vertical control sheets to be inserted into the plan set.
  - b. The Surveyor will prepare a survey control index sheet that provides an overview of the primary project control and must include:
    - (1) An unscaled vicinity map showing the general location of the project in relation to nearby towns or other significant cultural features.
    - (2) A scaled project map showing the extents of the project and the location of the primary control points. The map must show street networks, selected street names, control point identification, and significant culture features necessary to provide a general location of the primary control.
    - (3) A table containing the primary control point values including the point number, northing, easting, elevation, stationing, and stationing offset values.
    - (4) Map annotation including a graphic scale bar, north arrow, and standard TxDOT title block. The title block must contain a section for the district name, COUNTY, highway, and CSJ number. The title block must also contain a section for a Texas registered ENGINEER to sign, seal, and date the sheet to include the following statement, "The survey control information has been accepted and incorporated into this PS&E".

The Surveyor will download the required format of the survey control index sheet from the TxDOT website.
    - (5) In the title block under the heading "Notes", identification of the horizontal and vertical datum on which the primary control is based with the date of the current adjustment, the surface adjustment factor used, and unit of measure. The surveyor will include a note stating that the coordinates are State Plane and a notation specifying either grid or surface adjusted coordinates.

E. Data Requirement

The Surveyor will perform post processing of field data, which will be reviewed by TxDOT. Data processed by standard calculators, computers, and other business hardware and software normally maintained and used by the Surveyor will be considered acceptable.

F. Tasks to be Completed

The Surveyor will perform the following tasks:

1. The Surveyor will establish horizontal and vertical control points, including offsite points. The Surveyor will prepare signed survey control data sheets, a survey control index sheet, and a composite layout of the horizontal and vertical controls, and as directed by TxDOT.
2. The Surveyor will set primary offsite control points in pairs, approximately 2 miles apart outside of the project area.
3. The Surveyor will set secondary control points approximately 6 inches below ground at a maximum distance of 1,500 feet apart.
4. The Surveyor will establish horizontal and vertical control from the TxDOT Virtual Reference Station (VRS) Network, and as directed by TxDOT.
5. The Surveyor will tie and tabulate horizontal and vertical control to other control points and datums in the vicinity established by other sources such as the National Geodetic Survey (NGS), the Federal Emergency Management Agency (FEMA), TxDOT VRS Network, and as directed by TxDOT.

G. Deliverables

The Surveyor will provide the following:

1. A B-size plot and MicroStation graphics files of the index map showing an overall view of the project and the relationship of the primary monuments and control points established for the project, signed and sealed by a registered professional land surveyor (RPLS), and as directed by TxDOT.
2. One A-size data sheet for each control point which will include, but need not be limited to, a location sketch, a physical description of the point, surface coordinates, the elevation, and the datum used.
3. A USB flash-drive containing the graphics files and scanned images of the control data sheets.
4. A written statement describing the datum used, signed and sealed by a RPLS, along with copies of all relevant NGS and TxDOT data sheets.

## **MISCELLANEOUS ROADWAY**

### **163.1. Utility Coordination.**

A. Utility Base Map

The ENGINEER will obtain information on existing utilities from utility owners and will conduct investigations to identify and evaluate all known existing and proposed public and private utilities. The ENGINEER will identify potential conflicts and attempt to minimize the potential adverse utility impacts in the preparation of the schematic design. The ENGINEER will prepare a base map depicting the utility locations. The ENGINEER will create and maintain a utility conflict matrix along with a utility conflict exhibit through the duration of the contract identifying potential known conflicts. The format of the matrix and exhibit must be consistent

with the latest version of the San Antonio District Utility Conflict Matrix and Utility Conflict Exhibit or other examples provided by TxDOT.

**B. Utility Coordination**

The ENGINEER will assist TxDOT in conducting utility coordination meetings with utility companies, as required, to facilitate utility conflict identification and resolution.

1. The ENGINEER will establish contact with all existing utilities within and adjacent to the project limits and set up utility coordination meetings to discuss concepts and options for design and construction. This process must also be extended to utilities that approach TxDOT, regarding plans to install facilities within the project limits after the project has been initiated.
2. The ENGINEER will schedule and conduct a utility kick-off meeting to obtain more information on existing facilities within the project limits. Major utility facilities must be discussed and analyzed to avoid relocation, if possible.
3. The ENGINEER will establish and conduct up to four (4) workshop meetings, both individually with each utility and with all utilities that incorporate TxDOT's project team to review and resolve conflicts.
4. The ENGINEER will create agenda and exhibits for all coordination meetings as directed by TxDOT.
5. The ENGINEER will establish and promote the desired agenda and methodologies for utility construction within the project limits. This will consist primarily of promoting the construction of utilities as a part of the highway contract.
6. The ENGINEER will schedule and conduct milestone meetings (or as-needed meetings) with TxDOT to coordinate the work effort and resolve problems. The ENGINEER will prepare a written report of these meetings. The meetings must include review of the following:
  - a. Existing facilities including major facilities to be avoided with the project, if possible
  - b. Utility Conflict Matrix
  - c. Utility Conflict Exhibit
  - d. Long lead items that could potentially impact the schedule during PS&E

**C. Deliverables**

1. Utility Conflict Matrix along with Utility Conflict Exhibit. The Utility Conflict Exhibit must be on 11x17 sheets and include callouts to indicate the conflict ID#, utility owner, type of line (water, sewer, high pressure gas, etc.), material (if it is an AC pipe line), and size (if known).
2. Utility Contacts list in excel and pdf format
3. Utility Summary to indicate major utility facilities or time sensitive items pertaining to utilities that need to be addressed in PS&E.

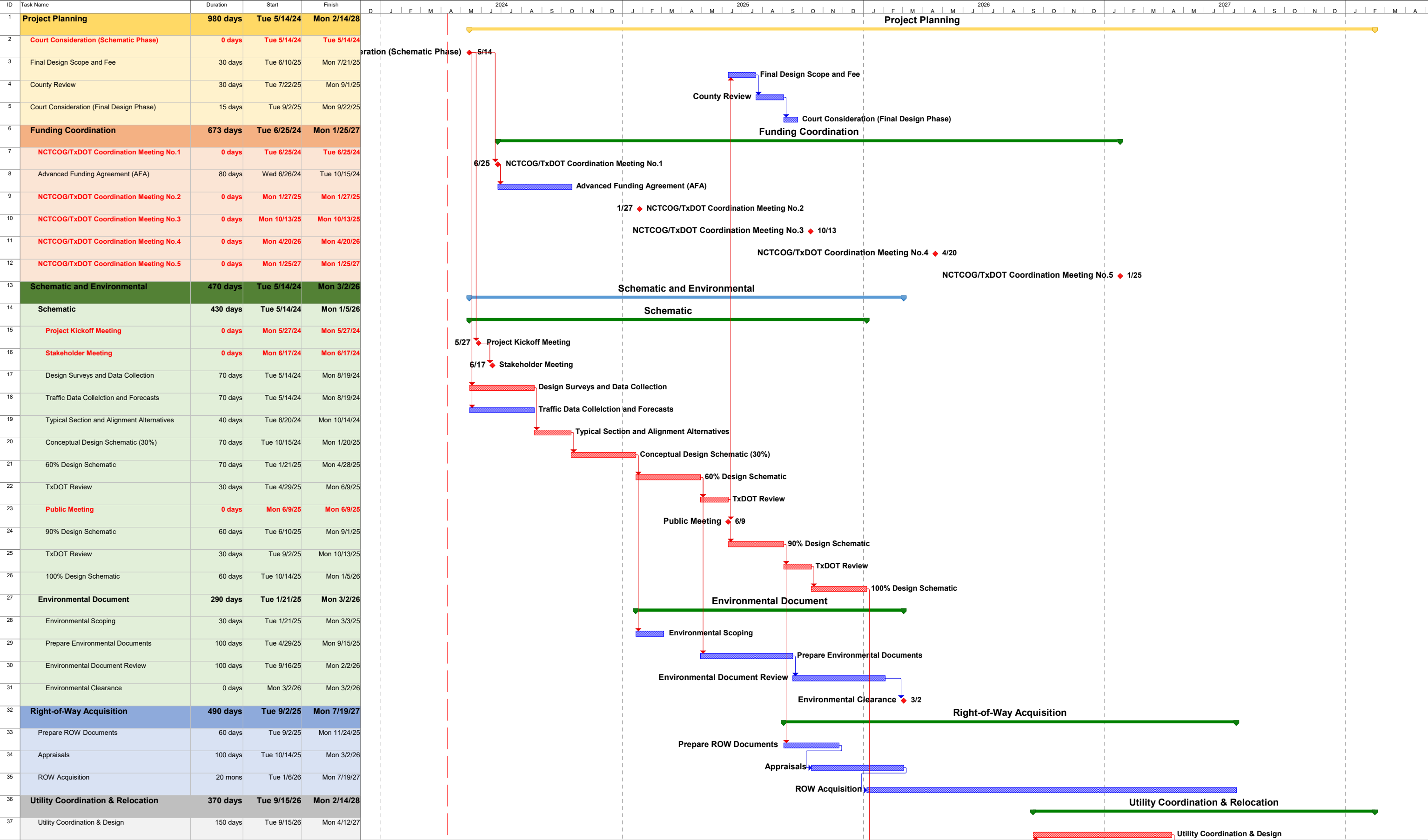


**ADDITIONAL SERVICES**

Additional Services to be performed by ENGINEER, if authorized by COUNTY, which are not included in the above-described scope of services, are described as follows:

- A. Land acquisition services.
- B. Construction materials testing.
- C. Field layouts or the furnishing of construction line and grade surveys (to be provided by the Contractor).
- D. Water and sanitary sewer design other than adjustment of surface appurtenances.
- E. Assisting COUNTY in claims disputes with Contractor(s).
- F. Assisting COUNTY in the defense or prosecution of litigation in connection with or in addition to those services contemplated by this agreement. Such services, if any, will be furnished by ENGINEER on a fee basis negotiated by the respective parties outside of and in addition to this agreement.
- G. Performing investigations, studies, and analysis of work proposed by construction contractors to correct defective work.
- H. Design, contract modifications, studies or analysis required to comply with local, State, Federal or other regulatory agencies that become effective after the date of this agreement.
- I. Services required to resolve bid protests or to rebid the projects for any reason.
- J. Providing services to review or evaluate construction contractor(s) claim(s), provided said claims are supported by causes not within the control of ENGINEER.
- K. GIS mapping services or assistance with these services.
- L. Providing services on an accelerated time schedule. The scope of this service include cost for overtime wages of employees and consultants, inefficiencies in work sequence and plotting or reproduction costs directly attributable to an accelerated time schedule directed by the ENGINEER.
- M. Quality Level "A, B, C, D" subsurface utility engineering outside of the quantity outlined in the scope of services.
- N. Development of Final Plans, Specifications and Estimates (PS&E).
- O. Property Value Market Study
- P. Funding Applications

Tarrant County - Boat Club Road



## Tarrant County - Boat Club Road

ID	Task Name	Duration	Start	Finish
38	Utility Agreement	60 days	Tue 4/13/27	Mon 7/5/27
39	Utility Relocation	8 mons	Tue 7/6/27	Mon 2/14/28
40	<b>Final Plans (PS&amp;E)</b>	<b>520 days</b>	<b>Tue 1/6/26</b>	<b>Mon 1/3/28</b>
41	60% PS&E Development	180 days	Tue 1/6/26	Mon 9/14/26
42	County & TxDOT Review	40 days	Tue 9/15/26	Mon 11/9/26
43	90% PS&E Development	80 days	Tue 11/10/26	Mon 3/1/27
44	County & TxDOT Review	40 days	Tue 3/2/27	Mon 4/26/27
45	Final Signed and Sealed Plans	80 days	Tue 4/27/27	Mon 8/16/27
46	Final TxDOT Reivew and Approval	5 mons	Tue 8/17/27	Mon 1/3/28
47	<b>Shovel Ready For Construction</b>	<b>0 days</b>	<b>Mon 2/14/28</b>	<b>Mon 2/14/28</b>

The Gantt chart displays the project schedule from 2024 to 2028. The tasks are represented by horizontal bars, with their duration and start/finish dates indicated. The chart shows a sequential flow of tasks over time, with some tasks overlapping or occurring simultaneously. The tasks are: Utility Agreement (60 days, Tue 4/13/27 to Mon 7/5/27), Utility Relocation (8 mons, Tue 7/6/27 to Mon 2/14/28), Final Plans (PS&E) (520 days, Tue 1/6/26 to Mon 1/3/28), 60% PS&E Development (180 days, Tue 1/6/26 to Mon 9/14/26), County & TxDOT Review (40 days, Tue 9/15/26 to Mon 11/9/26), 90% PS&E Development (80 days, Tue 11/10/26 to Mon 3/1/27), County & TxDOT Review (40 days, Tue 3/2/27 to Mon 4/26/27), Final Signed and Sealed Plans (80 days, Tue 4/27/27 to Mon 8/16/27), Final TxDOT Reivew and Approval (5 mons, Tue 8/17/27 to Mon 1/3/28), and Shovel Ready For Construction (0 days, Mon 2/14/28 to Mon 2/14/28). The chart also includes a timeline with months and years (2024, 2025, 2026, 2027, 2028) and a legend for task types (Utility, PS&E, Review, Construction).