

**SUPPLEMENTAL AGREEMENT NO. 1  
TO  
ENGINEERING SERVICES AGREEMENT OF  
AUGUST 24, 2021  
FOR  
FORT BEND GRAND PARKWAY TOLL ROAD AUTHORITY**

This Supplemental Agreement is signed in multiple counterparts to be effective on the date approved by the Fort Bend County Commissioners Court, and modifies the ENGINEERING SERVICES AGREEMENT dated August 24, 2021 (the "Agreement") between the Fort Bend Grand Parkway Toll Road Authority, a Texas Local Government Corporation (the "Authority"), and Half Associates, Inc., (the "Engineer").

The Agreement is hereby modified as follows:

1. The first sentence in Section 1 is replaced with the following sentence:

"The Engineer shall render professional services to FBGPTRA related to the Project as defined in the Scope of Services in Attachments A and. A-1"

2. Section 2.a is replaced with the following paragraphs:

"The Maximum Compensation under this Agreement is \$3,354,071.00. The amount paid under this Agreement may not exceed the Maximum Compensation without an approved supplemental agreement.

Compensation for the performance of services within the Scope of Services described in Attachment A will be paid as a lump sum amount not to exceed \$82,159.00, as shown in Attachment B.

Compensation for the performance of services within the Scope of Services described in Attachment A-1 will be paid as a lump sum amount not to exceed \$3,271,912.00, as shown in Attachment B-1.


The Engineer shall furnish satisfactory documentation of such work (e.g. timesheets, billing rates, classifications, invoices, etc.) as may be required by FBGPTRA."

This Supplemental Agreement does not alter, modify, or otherwise change any part of the Agreement, except as specifically stated in this Supplemental Agreement.


Supplemental Agreement No. 1  
To Agreement of August 24, 2021

IN WITNESS WHEREOF, this Supplemental Agreement is hereby executed as of October 17, 2022

FORT BEND GRAND PARKWAY TOLL ROAD  
AUTHORITY, a Texas local government corporation

By:   
Name: Bobbie Tallas  
Title: Vice Chairman

Halff Associates, Inc.  
ENGINEER

By:   
Name: Bobby J Adams, P.E.  
Title: Senior Vice President

**EFFECTIVE DATE**

THIS AGREEMENT IS EFFECTIVE ON THE DATE IT IS APPROVED BY THE FORT BEND  
COUNTY COMMISSIONERS COURT, AND IF NOT SO APPROVED SHALL BE NULL AND VOID.

DATE OF COMMISSIONERS COURT APPROVAL: \_\_\_\_\_

AGENDA ITEM NO.: \_\_\_\_\_

**ATTACHMENT A-1  
SCOPE OF SERVICES  
(PLANS, SPECIFICATIONS AND ESTIMATE)**

**SERVICES TO BE PROVIDED BY THE ENGINEER**

The Engineer shall provide engineering services required for refining the preliminary schematic and preparation of plans, specifications and estimates (PS&E) and related documents, for reconstructing the Fort Bend Grand Parkway Toll Road (SH 99 Segment D) Northbound and Southbound Mainlanes between FM 1464 and West Airport Blvd to a 6-lane facility. The design of the intersection, ramps and bridge at John Sharp Road will be designed to include a 90-degree intersection with a roundabout. Concept exhibits will be prepared for evaluation for final design. These engineering services may include, but are not limited to, project management and coordination with all team member consultants to provide a complete PS&E. Specific design effort will include: preparing roadway and bridge designs, drainage design, construction sequence and traffic control plan, storm water pollution prevention plan, signing and pavement marking design and traffic signal design (if required). The Engineer will provide Subsurface Utility Engineering and Utility Coordination.

**GENERAL REQUIREMENTS**

• **Design Criteria.** The Engineer shall prepare all work in accordance with the latest version of applicable TxDOT procedures, specifications, manuals, guidelines, standard drawings, and standard specifications or previously approved special provisions and special specifications, which include: the *PS&E Preparation Manual*, *Roadway Design Manual*, *Hydraulic Design Manual*, the *Texas Manual on Uniform Traffic Control Devices (TMUTCD)*, *Standard Specifications for Construction and Maintenance of Highways, Streets and Bridges (latest Edition)*, and other Fort Bend Grand Parkway Toll Road Authority (FBGPTRA) approved manuals. When design criteria are not identified in TxDOT manuals, the Engineer shall notify the FBGPTRA and refer to the American Association of State Highway and Transportation Officials (AASHTO), *A Policy on Geometric Design of Highways and Street*, (latest Edition). In addition, the Engineer shall follow TxDOT's guidelines in developing the Plan, Specification, and Estimate (PS&E) package. The Engineer shall prepare the PS&E package in a form suitable for letting through the FBGPTRA's contract bidding and awarding process.

The Engineer shall identify, prepare exhibits and complete all necessary forms for each Design Exception and Waiver required within project limits prior to the 30% project completion submittal. The Engineer shall submit each exception and waiver to the FBGPTRA for coordination and processing of approvals. If subsequent changes require additional exceptions, the Engineer shall notify the FBGPTRA in writing as soon as possible after identification of each condition that may warrant a design exception or waiver.

• **Right-of-Entry and Coordination.** The Engineer shall notify the FBGPTRA and secure permission to enter private property for any team member needing to perform any surveying, environmental, engineering or geotechnical activities needed off State right-of-way. The Engineer shall not commit acts which would result in damages to private property, and the Engineer shall make every effort to comply with the wishes and address the concerns of affected private property owners. The Engineer or representative team member shall contact each property owner prior to any entry onto the owner's property and shall request concurrence from the FBGPTRA prior to each entry.

The Engineer shall notify the FBGPTRA and coordinate with adjacent engineers on all controls at project interfaces. The Engineer shall document the coordination effort, and each engineer shall 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 and each adjacent engineer shall meet jointly with the FBGPTRA for resolution. The FBGPTRA will have authority over the Engineer's disagreements and the FBGPTRA's decision will be final.

The Engineer or team member firm shall prepare each exhibit necessary for approval by each utility, and other governmental or regulatory agency in compliance with the applicable format and guidelines required by each entity and as approved by the FBGPTRA. The Engineer shall notify the FBGPTRA in writing prior to beginning any work on any outside agency's exhibit.

• **Progress Reporting and Invoicing.** The Engineer shall invoice according to Function Code breakdowns shown in the Contract for Engineering Services. The Engineer shall submit each invoice in a format acceptable to the FBGPTRA.

The Engineer shall submit a monthly written progress report to the FBGPTRA's Project Manager regardless of whether the Engineer is invoicing for that month. The Engineer's written progress report shall describe activities during the reporting period; activities planned for the following period; problems encountered and actions taken to remedy them; list of meetings attended; and overall status, including a per cent complete by task.

The Engineer shall prepare a design time schedule and an estimated construction contract time schedule, using the latest version of Primavera software or any FBGPTRA approved programs. The schedules shall indicate tasks, subtasks, critical dates, milestones, deliverables and review requirements in a format that depicts the interdependence of the various items. The Engineer shall provide assistance to FBGPTRA personnel in interpreting the schedules. The Engineer shall schedule milestone submittals at 30%, 60%, 90% and final project completion phases. The Engineer shall advise the FBGPTRA in writing if the Engineer is not able to meet the scheduled milestone review date.

Once the project goes to letting, all electronic files shall be delivered within 30 days of written request.

Final payment is contingent upon the FBGPTRA's receipt and confirmation by the FBGPTRA's Project Manager that the electronic files run and are formatted in accordance with FBGPTRA requirements and all review comments are addressed.

The Engineer shall prepare a letter of transmittal to accompany each document submittal to the FBGPTRA. At a minimum, the letter of transmittal must include the FBGPTRA project number, the highway number, County, and project limits.

**1.4. Coordination.** The Engineer shall coordinate issues and communications with TxDOT and other agencies through the FBGPTRA's Project Manager. The FBGPTRA will communicate the resolution of issues and provide the Engineer direction through the FBGPTRA's Project Manager.

**1.5. Quality Assurance (QA) and Quality Control (QC).** The Engineer shall provide peer review at all levels. For each deliverable, the Engineer shall have some evidence of their internal review and mark-up of that deliverable as preparation for submittal. A milestone submittal is not considered complete unless the required milestone documents and associated internal red-line mark-ups are submitted. The FBGPTRA's Project Manager may require the Engineer to submit the Engineer's internal mark-up (red-lines) or comments developed as part the Engineer's quality control step. When internal mark-ups are requested by the FBGPTRA in advance, the FBGPTRA, at its sole discretion, may reject the actual deliverable should the Engineer fail to provide the evidence of quality control. The Engineer shall clearly label each document submitted for quality assurance as an internal mark-up document.

The Engineer shall review the survey previously performed by others to determine suitability for design needs. Any deficiencies discovered, will be coordinated with the surveyor of record for correction as needed to complete the proposed design.

**1.6. Use of the TxDOT's Standards.** The Engineer shall identify and insert as frequently as is feasible the applicable, current TxDOT's Standard Details, TxDOT Houston District Standard Details, or miscellaneous details that have been approved for use in the plan. The Engineer shall sign, seal, and date each Standard and miscellaneous detail if the Standard selected has not been adopted for use by TxDOT or if it has been modified. The Engineer shall obtain approval for use of these details during the early stages of design from the FBGPTRA Project Manager. In addition, these details shall be accompanied by the appropriate general notes, special specifications, special provisions, and method of payment. The Engineer shall retain the responsibility for the appropriate selection of each Standard identified for use within their design.

**1.7. Organization of Plan Sheets.** The PS&E shall be complete and organized in accordance with the latest edition of the TxDOT's PS&E Preparation Manual. The PS&E package shall be suitable for the bidding and awarding of a construction contract, and in accordance with the FBGPTRA's policies and procedures, and the TxDOT's PS&E Checklist.

**1.8. Organization of Design Project Folder and Files (Electronic Project Files).** The Engineer shall organize the electronic project files in accordance with the FBGPTRA's format requirements.

**1.9. Data Classification.** Unless otherwise clearly labeled or otherwise specifically excepted through a provision of this contract or its attachments, all data provided to or generated by the Engineer under this contract is considered public data.

## **TASK DESCRIPTIONS AND FUNCTION CODES**

The Engineer shall categorize each task performed to correspond with the Function Codes (FC) and Task Descriptions.

### **FUNCTION CODE 102(110) – FEASIBILITY STUDIES**

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

**110.1. Data Collection and Field Reconnaissance.** The Engineer shall collect, review and evaluate data described below. The Engineer shall notify the FBGPTRA in writing whenever the Engineer finds disagreement with the information or documents:

1. Data, if available, from the FBGPTRA or TxDOT, including “as-built plans”, existing schematics, right-of-way maps, Subsurface Utility Engineering (SUE) mapping, existing cross sections, existing planimetric mapping, environmental documents, existing channel and drainage easement data, Bridge Inspection records, current unit bid price information, current special provisions, special specifications, and standard drawings.
2. Utility plans and documents from appropriate municipalities and agencies.
3. Flood plain information and studies from the Federal Emergency Management Agency (FEMA), the United States Army Corps of Engineers (USACE), local municipalities, and other governmental agencies.
4. Conduct field reconnaissance and collect data including a photographic record of notable existing features.

**110.2. Design Criteria.** The Engineer shall develop the roadway design criteria based on the 4R criteria, design speed, functional classification, roadway class and any other set criteria as set forth in *PS&E Preparation Manual*, *Roadway Design Manual*, *Bridge Design Manual*, *Hydraulic Design Manual*, and other deemed necessary State approved manuals. In addition, the Engineer shall prepare the Design Summary Report (DSR) and submit it electronically. The Engineer shall obtain written concurrence from the FBGPTRA prior to proceeding with a design if any questions arise during the design process regarding the applicability of State's design criteria.

**110.4. Geotechnical Borings and Investigations:** The Engineer shall coordinate with the Geotechnical Engineer regarding the geotechnical borings and investigations performed in the Geotechnical Engineer's previous Engineering Services and include the recommendations into the project design.

1. The Engineer shall provide a signed, sealed and dated geotechnical report provided by the Geotechnical Engineer which contains, but is not limited to, soil boring locations, boring logs, laboratory test results, generalized subsurface conditions, ground water conditions, piezometer data, analyses and recommendations for settlement and slope stability of the earthen embankments, skin friction tables and design capacity curves including skin friction and point bearing. The skin friction tables, and design capacity curves must be present for piling and drilled shaft foundation.

2. Foundation Studies: The Engineer shall coordinate with the Geotechnical Engineer.

3. The Engineer shall incorporate soil boring data sheets prepared, signed, sealed, and dated by the Geotechnical Engineer. The soil boring sheets shall be in accordance with the TxDOT's WINCORE software as can be found on the Texas Department of Transportation (TxDOT) website.

#### **FUNCTION CODE 120(120) – SOCIAL/ECON/ENVIRON STUDIES**

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

**120.1. Informal Meetings.** The Engineer shall provide technical assistance, preparation of exhibits for, and minutes of informal meetings requested by the public to discuss the pending impacts to neighborhoods and businesses due to roadway shutdowns, detours and access restrictions or as deemed necessary. This is not to be confused with the formal public meetings held during the National Environmental Policy Act (NEPA) process during schematic approval for Public Involvement. Assistance (exhibits, attendance, etc.) may be required for a formal public meeting/hearing associated with schematic approval work.

**120.2. Environmental Permits Issues and Commitments (EPIC) Sheets.** The Engineer shall coordinate with other team member firms to complete the latest version of the EPIC sheets per information provided by the FBGPTRA. These sheets must be signed, sealed and dated by the Engineer as indicated in signature block.

**FUNCTION CODE 130(130) – RIGHT-OF-WAY (ROW) DATA**

All standards, procedures and equipment used by the Engineer's Surveyor shall be such that the results of the survey will be in accordance with Board Rule 663.15, as promulgated by the Texas Board of Professional Land Surveyors.

The Engineer shall locate the existing ROW within the project limits from the current project control monuments. The Engineer's Surveyor shall prepare parcel sketches for additional ROW needed as determined by design for acquisition by FBGPTRA. The Engineer's Surveyor shall prepare metes and bounds descriptions in accordance with Fort Bend County guidelines for property acquisition and add parcels to the existing right-of-way maps for new parcels to be acquired in the area of John Sharp Blvd.

**130.1. Right-of-Way Map.** The Engineer shall review and evaluate the proposed or existing right-of-way map to verify that all construction staging, and alignment considerations have been taken into account. The Engineer shall make every effort to prevent detours and utility relocations from extending beyond the proposed right-of-way lines. The Engineer shall notify the FBGPTRA in writing if it is necessary to obtain additional construction easements or rights-of-entry and shall provide justification for such action. The Engineer shall be responsible for identifying and delineating any temporary construction easements in areas outside the Right of Way. The FBGPTRA shall secure the necessary legal instruments.

**FUNCTION CODE 145(145, 164) – MANAGING CONTRACTED/DONATED PE**

**PROJECT MANAGEMENT AND ADMINISTRATION**

The Engineer, in association with the FBGPTRA's Project Manager shall be responsible for directing and coordinating all activities associated with the project to comply with FBGPTRA policies and procedures, and to deliver that work on time.

**Project Management and Coordination.** The Engineer shall coordinate all subconsultant activity to include quality of and consistency of plans. The Engineer shall coordinate with necessary local entities.

The Engineer shall:

- Prepare monthly written progress report.
- Develop and maintain a detailed project schedule to track project conformance to Exhibit C, Work Schedule. The schedule submittals shall be hard copy and electronic format.
- Meet on a scheduled basis with the FBGPTRA to review project progress.
- Prepare, distribute, and file both written and electronic correspondence.
- Prepare and distribute meeting minutes.
- Document phone calls and conference calls as required during the project to coordinate the work for various team members.

**FUNCTION CODE 160(150) – ROADWAY DESIGN**

**Design Surveys**

The Engineer shall coordinate with the Surveyor for data required for project design. The Engineer shall include the *Survey Control Index Sheet* and a *Horizontal and Vertical Control Sheet(s)*, signed, sealed and dated by the professional engineer in direct responsible charge of the surveying and the responsible RPLS, into the plan set. The Engineer's Surveyor shall supplement previous obtained survey data as needed to complete the development of the project design.

Design Surveys include performance of surveys associated with the gathering of survey data for topography, cross-sections, all easements, utilities and other related work in order to design a project, or during layout and staking of projects for construction.

1. PURPOSE

The purpose of a design survey is to provide field data in support of transportation systems design.

2. DEFINITIONS

A design survey is defined as the combined performance of research, field work, analysis, computation, and documentation necessary to provide detailed topographic (3-dimensional) mapping of a project site. A design survey may include, but need not be limited to locating existing right-of-way, cross-sections or data to create cross-sections and Digital Terrain Models (DTM), horizontal and vertical location of utilities and improvements, detailing of bridges and other structures, review of right-of-way maps, establishing control points, etc.

3. TASKS TO BE COMPLETED

3.1. Design Surveys

The Engineer's Surveyors shall perform tasks to provided additional survey needed supplement the survey previously performed including, but not limited to the following:

- i. Obtain or collect data to create cross-sections and digital terrain models.
- ii. Locate existing utilities and easements.
- iii. Locate topographical features and existing improvements.
- iv. Provide details of existing bridge structures.
- v. Provide details of existing drainage features, (e.g., culverts, manholes, etc.).

- vi. Establish additional and verify existing control points. Horizontal and Vertical control ties must be made and tabulated, to other control points in the vicinity, which were established by other sources such as, the National Geodetic Survey (NGS), and the Federal Emergency Management Agency (FEMA), and any other local.
- vii. Locate existing rights-of-way and easements.
- viii. Review right-of-way maps.
- ix. Locate boreholes.
- x. Perform hydrographic surveys.
- xi. Update existing control data and prepare survey control data sheets for inclusion into a construction plan set.

The Engineer's Surveyors shall also prepare a *Survey Control Index Sheet* and a *Horizontal and Vertical Control Sheet(s)*, signed, sealed and dated by the professional engineer in direct responsible charge of the surveying and the responsible RPLS for insertion into the plan set. The *Survey Control Index Sheet* shows an overall view of the project control and the relationship or primary monumentation and control used in the preparation of the project; whereas, the *Horizontal and Vertical Control sheet(s)* identifies the primary survey control and the survey control monumentation used in the preparation of the project. Both the *Survey Control Index Sheet* and the *Horizontal and Vertical Control Sheet(s)* must be used in conjunction with each other as a set.

The following information shall be shown on the *Survey Control Index Sheet*:

- Overall view of the project and primary control monuments set for control of the project
- Identification of the control points
- Baseline or centerline
- Graphic (Bar) Scale
- North Arrow
- Placement of note "*The survey control information has been accepted and incorporated into this PS&E*" which shall be signed, sealed and dated by a Texas Professional Engineer
- RPLS signature, seal, and date

The following information shall be shown on all *Horizontal and Vertical Control Sheets*:

- Location for each control point, showing baseline or centerline alignment and North arrow.
- Station and offset (with respect to the baseline or centerline alignments) of each identified control point.

- Basis of Datum for horizontal control (base control monument/benchmark name, number, datum).
- Basis of Datum for the vertical control (base control monument, benchmark name, number, datum).
- Date of current adjustment of the datum.
- Monumentation set for Control (Description, District name/number and Location ties).
- Surface Adjustment Factor and unit of measurement.
- Coordinates (State Plan Coordinates [SPC] Zone and surface or grid).
- Relevant metadata.
- Graphic (Bar) Scale.
- Placement of note "*The survey control information has been accepted and incorporated into this PS&E*" which shall be signed, sealed and dated by a Texas Professional Engineer
- RPLS signature, seal and date.

#### 4. TECHNICAL REQUIREMENTS

- 4.1. Design surveys must be performed under the supervision of a RPLS currently registered with the TBPLS.
- 4.2. Horizontal ground control used for design surveys, furnished to the Engineer's Surveyor based on acceptable methods conducted by the Engineer's Surveyor, must meet the standards of accuracy required by the State.

Reference may be made to standards of accuracy for horizontal control traverses, as described in the TxDOT Survey Manual, latest edition, or the TSPS Manual of Practice for Land Surveying in the State of Texas, as may be applicable.

- 4.3. Vertical ground control used for design surveys, furnished to the Engineer's Surveyor based on acceptable methods conducted by the Engineer's Surveyor, must meet the standards of accuracy required by the State.

Reference may be made to standards of accuracy for vertical control traverses, as described in the TxDOT Survey Manual, latest edition, or the TSPS Manual of Practice for Land Surveying in the State of Texas, as may be applicable.

- 4.4. Side shots or short traverse procedures used to determine horizontal and vertical locations must meet the following criteria:

- i. Side shots or short traverses must begin and end on horizontal and vertical ground control as described above.
- ii. Standards, procedures, and equipment (may be GPS Equipment, LiDAR, Total Stations, etc.) used must be such that horizontal locations relative to the control may be reported within the following limits:
  - Bridges and other roadway structures: less than 0.1 of one foot.
  - Utilities and improvements: less than 0.2 of one foot.
  - Cross-sections and profiles: less than 1 foot.
  - Bore holes: less than 3 feet.
- iii. Standards, procedures, and equipment (may be GPS Equipment, LiDAR, Total Stations, etc.) used must be such that vertical locations relative to the control may be reported within the following limits:
  - Bridges and other roadway structures: less than 0.02 of one foot.
  - Utilities and improvements: less than 0.1 of one foot.
  - Cross-sections and profiles: less than 0.2 of one foot.
  - Bore holes: less than 0.5 of one foot.

## 5. AUTOMATION REQUIREMENTS

- a. Planimetric design files (DGN) must be fully compatible with the *MicroStation* graphics program without further modification or conversion.
- b. Electronically collected and processed field survey data files must be fully compatible with the FBGPTRA's computer systems without further modification or conversion.
- c. DTM must be fully compatible with the *OpenRoads civil design* system without further modification or conversion. All DTM must be fully edited and rectified to provide a complete digital terrain model with all necessary break lines.

## DELIVERABLES

The deliverables for design surveys shall be any combination of the following:

Digital Terrain Models (DTM) and the Triangular Irregular Network (TIN) files in a format acceptable by the FBGPTRA.

Maps, plans, or sketches prepared by the Engineer's Surveyor showing the results of field surveys.

Computer printouts or other tabulations summarizing the results of field surveys.

Digital files or media acceptable by the FBGPTRA containing field survey data (ASCII Data files).

Maps, plats, plans, sketches, or other documents acquired from utility companies, private corporations, or other public agencies, the contents of which are relevant to the survey.

Field survey notes, as electronic and hard copies.

An 8 ½ inch by 11-inch survey control data sheet for each control point which must include, but need not be limited to, a location sketch, a physical description of the point including a minimum of two reference ties, surface coordinates, a surface adjustment factor, elevation, and the horizontal and vertical datums used.

A digital and hard copy of all computer printouts of horizontal and vertical conventional traverses, GPS analysis and results, and survey control data sheets.

All GEOPAK GPK files and OpenRoads files.

## **FUNCTION CODE 160(160) - ROADWAY DESIGN**

### **ROADWAY DESIGN CONTROLS**

The Engineer shall inform the FBGPTRA of changes made from previous initial meetings regarding each exception, waiver, and variance that may affect the design. The Engineer shall cease all work under this task until the exceptions, waivers, and variances have been resolved between the Engineer and the FBGPTRA unless otherwise directed to proceed. The Engineer shall identify, prepare exhibits, and complete all necessary forms for Design Exceptions and Waivers within project limits prior to the 30% Submittal. These exceptions shall be provided to the FBGPTRA for coordination and processing of approvals.

**160.1. Geometric Design.** The Engineer shall:

- A. Refine Schematic The Engineer shall review the schematic provided by the Engineer in the preliminary engineering phase and revise to reflect final approved concept. The Engineer shall refine the horizontal alignment and develop the vertical alignment in English units for main lanes, ramps, cross streets, including

grade separation structures. The Engineer shall determine vertical clearances at grade separations and overpasses, taking into account the appropriate percent grade and super-elevation rate. Minor modifications in the alignment must be considered to provide optimal design. Modifications must be coordinated with the FBGPTRA and adjacent Engineers.

- B. Preliminary Geometric Project Layout. The Engineer shall develop a preliminary geometric project layout (Layout) for the full length of the project to be reviewed and approved by the FBGPTRA prior to the Engineer proceeding with the 30% milestone submittal package.

The Layout must consist of a planimetric file of existing features and the proposed improvements within the existing and any proposed ROW. The Layout must also include the following features: existing and proposed ROW, existing and proposed horizontal and vertical alignment and profile grade line, cross culverts, lane widths, cross slopes, ditch slopes, pavement structure, clear zone, dedicated right turn lanes, corner clips, retaining walls guard rail, and water surface elevations for various rainfall frequencies, etc. Existing major subsurface and surface utilities must be shown on the Layout.

The Engineer shall develop the proposed alignment to avoid the relocation of existing utilities as much as possible. The Engineer shall consider Americans with Disabilities Act (ADA) requirements when developing the Layout. The Layout must be prepared in accordance with the current TxDOT Roadway Design Manual. The Engineer shall provide horizontal and vertical alignment of the project layout in English units for main lanes and cross streets. Minor alignment alternatives must be considered to provide for an optimal design. The project layout must be coordinated with the FBGPTRA and adjacent Engineers, if any. The Engineer shall also provide proposed and existing typical sections with the profile grade line (PGL), lane widths, cross slopes, ROW lines, ditch shapes, pavement structures and clear zones depicted, etc.

Prior to proceeding with the final preliminary geometric layout, the Engineer shall also present to the FBGPTRA for review and approval, alternatives for the design (e.g. flush or raised curb median) with recommendations and cost estimates for each alternative. The Engineer shall also attend all necessary meetings to discuss the outcome of the evaluations of the study.

## **160.2. Roadway Design.**

The Engineer shall use Bentley's OpenRoads 3D Design technology or GEOPAK in the design and preparation of the roadway plan sheets. The Engineer shall use the versions of MicroStation and GEOPAK that are implemented at TxDOT.

The Engineer shall provide roadway plan and profile drawings using CADD standards followed by TxDOT. The drawings must consist of a planimetric file of

existing features and files of the proposed improvements. The roadway base map must contain line work that depicts existing surface features obtained from the schematic drawing. Existing major subsurface and surface utilities must be shown. Existing and proposed right-of-way lines must be shown. Plan and Profile must be shown on separate or same sheets (this depends upon width of pavement) for main lanes, ramps, and cross streets.

The plan view must contain the following design elements:

1. Calculated roadway centerlines for mainlanes, ramps, cross streets and frontage roads, as applicable. Horizontal control points must be shown. The alignments must be calculated using OpenRoads or GEOPAK horizontal geometry tools.
2. Pavement edges for all improvements (mainlanes, direct connectors, ramps, cross streets, driveways and frontage roads, if applicable).
3. Lane and pavement width dimensions.
4. The geometrics of ramps, auxiliary and managed lanes.
5. Proposed structure locations, lengths, and widths.
6. Direction of traffic flow on all roadways. Lane lines and arrows indicating the number of lanes must also be shown.
7. Drawing scale shall be 1"=100'
8. Control of access line, ROW lines and easements.
9. Begin and end superelevation transitions and cross slope changes.
10. Limits of riprap, block sod, and seeding.
11. Existing utilities and structures.
12. Benchmark information.
13. Radii call outs, curb location, Concrete Traffic Barrier (CTB), guard fence, crash safety items and American with Disabilities Act Accessibility Guidelines (ADAAG) compliance items.

The profile view must contain the following design elements:

1. Calculated profile grade for proposed mainlanes (cite direction), direct connectors, ramps, cross streets and frontage roads, if applicable. Vertical curve data, including "K" values must be shown. The profiles must be calculated using OpenRoads or GEOPAK vertical geometry tools.
2. Existing and proposed profiles along the proposed centerline of the mainlanes, the outside shoulder line of ramps, and the outside gutter line of the designated (north, south, east or west) bound frontage roads.
3. Water surface elevations at major stream crossing for 2, 5, 10, 25, 50, and 100-year storms.
4. Calculated vertical clearances at grade separations and overpasses, taking into account the appropriate superelevation rate, superstructure depth and required clearance.
5. The location of interchanges, mainlanes, grade separations and ramps (shall include cross sections of any proposed or existing roadway, structure, or utility crossing).

6. Drawing vertical scale to be 1"=10'.

### **160.3. Typical Sections:**

The Engineer shall prepare typical sections for all proposed and existing roadways and structures. Typical sections must include width of travel lanes, shoulders, outer separations, border widths, curb offsets, and ROW. The typical section must also include Proposed Profile Gradeline (PGL), centerline, pavement design, longitudinal joints, side slopes, sodding or seeding limits, concrete traffic barriers and sidewalks, if required, station limits, common proposed and existing structures including retaining walls, existing pavement removal, riprap, limits of embankment and excavation, etc.

- 160.4. Mainlane Design:** The Engineer shall provide the design of mainlanes with full shoulders, entrance and exit ramps, and auxiliary lanes. The design must be consistent with the approved schematic or refined schematic and the current *TxDOT Roadway Design Manual*.

- 160.5. Cross Streets.** The Engineer shall provide an intersection layout detailing the pavement design and drainage design at the intersection of each cross street. The layout must include the horizontal and vertical alignments, curb returns, geometrics, transition length, stationing, pavement, drainage details, and American with Disabilities Act Accessibility Guidelines (ADAAG) compliance items. The Engineer shall design for full pavement width to the ROW and provide a transition to the existing roadway. John Sharp Road will be designed as a 90-degree intersection with a roundabout.

- 160.6. Cut and Fill Quantities.** The Engineer shall develop an earthwork analysis to determine cut and fill quantities and provide final design cross sections at 100 feet intervals. Cross sections must be created from GEOPAK or 3D corridor model and must be delivered in the standard TxDOT format on 11"x17" sheets or roll plots and electronic files. The Engineer shall provide templates and corridors used to generate the design cross sections. Cross sections and quantities must include existing pavement removals. Annotation shall include at a minimum existing and proposed ROW, side slopes (front & back), profiles, etc.

The Engineer shall submit 1 sets of drawings (PDF) at the 30%, 60%, and 90%, and final submittals, respectively. The Engineer shall submit the current GEOPAK files or OpenRoads 3D corridor model for each submittal.

- 160.7. Plan Preparation.** The Engineer shall prepare roadway plans, profiles and typical sections for the proposed improvements. Prior to the 30% submittal, the Engineer shall schedule a workshop to review profiles, OpenRoads 3D corridor models (if applicable) and cross-sections with the FBGPTRA. The profile and cross sections must depict the 2, 5, 10, 25, 50, 100 and 500-year (if available) water surface elevations. The drawings will provide an overall view of the roadway and existing

ground elevations with respect to the various storm design frequencies for the length of the project. This will enable the FBGPTRA to determine the most feasible proposed roadway profile. The FBGPTRA will approve the proposed profiles, 3D corridor models (if applicable), and cross sections before the Engineer continues with the subsequent submittals. This scope of services and the corresponding cost proposal are based on the Engineer preparing plans to construct freeway main lanes, ramps, and cross streets at intersections. The roadway plans must consist of the types and be organized in the sequence as described in the *PS&E Preparation manual*.

**160.8. Pavement Design.** If applicable, the Engineer shall incorporate the pavement design provided by the FBGPTRA for this project.

## **FUNCTION CODE 160(161) - ROADWAY DESIGN**

### **DRAINAGE**

161.1. Data Collection. The Engineer shall provide the following data collection services:

1. Conduct field inspections to observe current conditions and the outfall channels, the cross-drainage structures, drainage easements, the tributary channel, and land development projects that contribute flow to the tributary. Document field inspections with digital photos.
2. Collect available applicable data including GIS data and maps, site survey data, construction plans, previous reports and studies, and readily available rainfall history for the area. Particular sources of data collected must include, but are not limited to, the State, County, and Federal Emergency Management Agency (FEMA).

161.2. Complex Hydraulic Design and Documentation. The Engineer shall coordinate with the Hydrologic/Hydraulic Engineer providing the drainage analysis and report for information pertinent to the project's drainage design.

161.3. Storm Drains

The Engineer shall provide the following services:

1. Design and analyze storm drains using software as approved by the FBGPTRA.
2. Size inlets, laterals, trunk line and outfall. Develop designs that minimize the interference with the passage of traffic or incur damage to the highway and local property in accordance with the TxDOT's Hydraulic Design Manual and any specific guidance provided by the FBGPTRA.
3. Determine hydraulic grade line starting at the outfall channel for each storm drain design. Use the design water surface elevation of the outfall as the starting basis (tailwater) for the design of the proposed storm sewer system.

4. Calculate manhole head losses. Compute manhole head losses as per FHWA's HEC-22.
5. Limit discharge into existing storm drains and existing outfalls to the capacity of the existing system, which will be determined by the Engineer. Evaluate alternate flow routes or detention, if necessary, to relieve system overload. Determine the amount of the total detention storage to control storm drain runoff for the design frequency based on hydrograph routing for the full range of frequencies (50%, 20%, 10%, 4%, 2%, 1%, and 0.2% AEP), as well as a rough estimate of the available on-site volume. When oversized storm drains are used for detention, the Engineer shall evaluate the hydraulic gradeline throughout the whole system, within project limits, for the design frequency or frequencies. The Engineer shall coordinate with the FBGPTRA any proposed changes to the detention systems. The FBGPTRA will assess the effects of such changes on the comprehensive drainage studies.
6. Identify areas requiring trench protection, excavation, shoring, and de-watering.

161.4. Cross-Drainage Structures: The Engineer shall provide the following services:

1. Determine drainage areas and flows for cross culvert drainage systems.
2. Determine the sizing of the drainage crossings. The scope may include extending, adjusting or replacing non-bridge-class culvert crossing or crossings as specified in the Contract. Develop designs that minimize the interference with the passage of traffic or cause damage to the highway and local property in accordance with TxDOT's Hydraulic Design Manual and any specific guidance provided by the FBGPTRA. Cross drainage design shall be performed using HY-8 or HEC RAS.

161.5. Temporary Drainage Facilities: The Engineer shall provide the following services:

1. Develop plans for all temporary drainage facilities necessary to allow staged construction of the project and to conform with the phasing of adjacent construction projects without significant impact to the hydraulic capacity of the area. Drainage area maps are not required for temporary drainage.

161.6. Plans, Specifications and Estimates (PS&E) Development for Hydraulics:

The Engineer shall provide the following services:

1. Prepare the PS&E package in accordance with the applicable requirements of the TxDOT's specifications, standards, and manuals, including the PS&E Preparation Manual. Include the following sheets and documents, as appropriate:
  - a. Culvert Layout Sheets
  - b. Storm Drain Plan/Profile Sheets
  - c. Roadway Plan & Profile Sheets including profile grade line of parallel ditches, if applicable.

- d. All other relevant sheets
2. Prepare culvert cross sections and identify each cross-section's station location.
3. Identify areas requiring trench protection, excavation, shoring and de-watering.
4. Prepare drainage area maps.
5. If applicable, prepare plan and profile sheets for storm drain systems and outfall ditches.
6. Select any necessary standard details from TxDOT's list of standards for items such as inlets, manholes, junction boxes and end treatments.
7. Prepare details for non-standard inlets, manholes and junction boxes.
8. Prepare drainage details for outlet protection, outlet structures and utility accommodation structures
9. Identify pipe strength requirements
10. Prepare drainage facility quantity summaries
11. Identify potential utility conflicts and, if feasible, design to mitigate or avoid those identified conflicts.
12. Incorporate the Hydraulic Data Sheets for any bridge or cross drainage structures at the outfall channels prepared by others into the project plans.
13. Develop layouts for the following:
  - a. Subsurface drainage at retaining walls.
  - b. Outfall channels within existing ROW.
  - c. Bridge deck drainage systems, including internal drainage piping within the bents where required on structures.

#### **FUNCTION CODE 160(162) - ROADWAY DESIGN**

#### **SIGNING, PAVEMENT MARKINGS AND SIGNALIZATION (PERMANENT)**

**162.1. Signing.** The Engineer shall prepare drawings, specifications, and details for all signs. The Engineer shall coordinate with the FBGPTRA (and other Engineers as

required) for overall temporary, interim and final signing strategies and placement of signs outside contract limits. The Engineer shall:

- Prepare sign detail sheets for large guide signs showing dimensions, lettering, shields, borders, corner radii, etc., and shall provide a summary of large and small signs to be removed, relocated, or replaced.
- Designate the shields to be attached to guide signs.
- Illustrate and number the proposed signs on plan sheets.
- Select each sign foundation from TxDOT Standards.

**162.2. Pavement Marking.** The Engineer shall detail both permanent and temporary pavement markings and channelization devices on plan sheets. The Engineer shall coordinate with the FBGPTRA (and other Engineers as required) for overall temporary, interim, and final pavement marking strategies. The Engineer shall select Pavement markings from the latest TxDOT standards.

The Engineer shall provide the following information on signing and pavement marking layouts:

- Roadway layout.
- Center line with station numbering.
- Designation of arrow used on exit direction signs
- Culverts and other structures that present a hazard to traffic.
- Location of utilities.
- Existing signs to remain, to be removed, to be relocated or replaced.
- Proposed signs (illustrated, numbered and size).
- Proposed overhead sign bridges to remain, to be revised, removed, relocated, or replaced.
- Proposed overhead sign bridges, indicating location by plan.
- Proposed markings (illustrated and quantified) which include pavement markings, object markings and delineation.
- Quantities of existing pavement markings to be removed.
- Proposed delineators, object markers, and mailboxes.
- The location of mainlanes, grade separations, cross streets and ramps.
- The number of lanes in each section of proposed highway and the location of changes in numbers of lanes.
- Right-of-way limits.
- Direction of traffic flow on all roadways.

## **FUNCTION CODE 160(163) - ROADWAY DESIGN**

### **MISCELLANEOUS (ROADWAY)**

The Engineer shall provide the following services:

**163.1. Retaining Walls and Miscellaneous Structures.** The Engineer shall develop each retaining wall design and determine the location of each soil boring needed for the foundation design of each retaining wall in accordance with the *Geotechnical Manual*. Prior to preparation of retaining wall layouts, the Engineer shall prepare a comparative cost analysis of different types of retaining walls versus roadway embankment, pavement, soil stabilization, retaining walls type, and available ROW to determine optimum selection based on economics, construction time duration, ROW encroachments (need for construction easements) and construction feasibility. The Engineer shall submit early in the plan preparation the retaining wall layouts to obtain approval from the FBGPTRA. The Engineer shall incorporate all necessary information from above referenced manuals and respective checklists into the retaining wall layouts. For stage construction, the Engineer shall indicate limits of existing retaining walls for removal and reconstruction, and determine limits of temporary retaining walls to be shown on the TCP.

The approximate limits of each retaining wall shall be based on Station or length. The Engineer shall notify the FBGPTRA the type of retaining walls that will be used for Cut and Fill locations. Retaining wall types must include:

- Mechanically Stabilized Earth (MSE) Walls. The Engineer shall prepare the retaining wall layouts showing plan and profile or retaining walls for design by a State approved vendor. The Engineer is responsible for design of geometry and wall stability. The Engineer shall incorporate a slope of 4:1 or flatter from the existing and finished ground line elevation to the face of the retaining wall.
- Soil Nailed Walls.

The Engineer shall provide layouts (scale 1" = 100'), elevations, quantity estimate, summary of quantities, typical cross sections and structural details of all retaining walls within the project. Approximate lengths of the retaining walls as shown on the schematic are listed as below. The Engineer shall determine if any additional walls are required and verify the need for and length of the retaining walls as shown on the schematic.

If applicable, the FBGPTRA will provide architectural standard drawings. The Engineer shall incorporate architectural standard drawings into design details. The specific requirements for each item are as follows:

1. Layout Plan

- (1) Designation of reference line
- (2) Beginning and ending retaining wall stations
- (3) Offset from reference line
- (4) Horizontal curve data
- (5) Total length of wall
- (6) Indicate face of wall
- (7) All wall dimensions and alignment relations (alignment data as necessary)

- (8) Soil boring locations
  - (9) Drainage, signing, lightning, etc. that is mounted on or passing through the wall.
  - (10) Subsurface drainage structures or utilities which could be impacted by wall construction.
2. Elevation:
- (a) Top of wall elevations
  - (b) Existing and finished ground line elevations
  - (c) Vertical limits of measurement for payment
  - (d) Type, limits and anchorage details of railing (only if Traffic Railing foundation standard is not being used on this project)
  - (e) Top and bottom of wall profiles plotted at correct station & elevation.
  - (f) Underdrains
  - (g) Any soil improvement, if applicable.
  - (h) Drainage, signing, lighting etc. as noted above
  - (i) Drainage structures and utilities as noted above
3. Sectional View:
- (a) Reinforced volume
  - (b) Underdrain location
  - (c) Soil improvements, if applicable.
4. General Guidelines for Retaining Walls
- (a) The Engineer shall verify with the Geotechnical Firm that will perform design calculations to check the external stability of the walls including slope stability, bearing, sliding and overturning and detail drawings in accordance with the standard TxDOT requirements.
  - (b) For retaining wall submittals, the Engineer shall check TxDOT's Bridge Division website for current requirements.

**163.2. Traffic Control Plan, Detours, Sequence of Construction.** The Engineer shall prepare Traffic Control Plans (TCP) including TCP typical sections, for the project. A detailed TCP must be developed in accordance with the latest edition of the TMUTCD. The Engineer shall implement the current Barricade and Construction (BC) standards and TCP standards as applicable. The Engineer shall interface and coordinate phases of work, including the TCP, with adjacent Engineers. The Engineer shall:

- 1. Provide a written narrative of the construction sequencing and work activities per phase and determine the existing and proposed traffic control devices (regulatory signs, warning signs, guide signs, route markers, construction pavement markings, barricades, flag personnel, temporary traffic signals, etc.) to be used to handle traffic during each construction sequence. The Engineer shall show proposed traffic control devices at grade intersections during each construction phase (stop signs, flagperson,

- signals, etc.). The Engineer shall show temporary roadways, ramps, structures and detours required to maintain lane continuity throughout the construction phasing. If temporary shoring is required, prepare layouts and show the limits on the applicable TCP.
2. Coordinate with the FBGPTRA in scheduling a Traffic Control Workshop and submittal of the TCP for approval. The Engineer shall assist the FBGPTRA in coordinating mitigation of impacts to adjacent schools, emergency vehicles, pedestrians, bicyclists and neighborhoods.
  3. Develop each TCP to provide continuous, safe access to each adjacent property during all phases of construction and to preserve existing access. The Engineer shall notify the FBGPTRA in the event existing access must be eliminated and must receive approval prior to any elimination of existing access.
  4. Design temporary drainage to replace existing drainage disturbed by construction activities or to drain detour pavement. The Engineer shall show horizontal and vertical location of culverts and required cross sectional area of culverts.
  5. Prepare each TCP in coordination with the FBGPTRA. The TCP must include interim signing for every phase of construction. Interim signing must include regulatory, warning, construction, route, and guide signs. The Engineer shall interface and coordinate phases of work, including the TCP, with adjacent Engineers, which are responsible for the preparation of the PS&E for adjacent projects.
  6. Maintain continuous access to abutting properties during all phases of the TCP. The Engineer shall develop a list of each abutting property along its alignment. The Engineer shall prepare exhibits for and attend meetings with the public, as requested by the FBGPTRA.
  7. Make every effort to prevent detours and utility relocations from extending beyond the proposed Right-of-way lines. If it is necessary to obtain additional permanent or temporary easements and Right-of-Entry, the Engineer shall notify the FBGPTRA in writing of the need and justification for such action. The Engineer shall identify and coordinate with all utility companies for relocations required.
  8. Describe the type of work to be performed for each phase of sequence of construction and any special instructions (e.g. storm drain, culverts, bridges, railing, illumination, signals, retaining walls, signing, paving surface sequencing or concrete placement, ROW restrictions, utilities, etc.) that the contractor should be made aware to include limits of construction, obliteration, and shifting or detouring of traffic prior to the proceeding phase.
  9. Include the work limits, the location of channelizing devices, positive barrier, location and direction of traffic, work area, stations, pavement markings, and other information deemed necessary for each phase of construction.
  10. Identify and delineate any outstanding ROW parcels.
  11. Delineate areas of wetlands on traffic control plans.

- 163.3. Temporary Illumination:** The Engineer shall immediately notify the FBGPTRA if the Engineer determines that existing roadway illumination will be affected by the project.
- 163.4. Illumination.** The Engineer shall refer to TxDOT's *Highway Illumination Manual* and other deemed necessary TxDOT approved manuals for design of ramp safety lighting, roundabout lighting, and underpass lighting. The Engineer shall provide a preliminary layout for initial review and approval by the FBGPTRA. The Engineer shall prepare circuit wiring diagrams showing the number of luminaries on each circuit, electrical conductors, length of runs, service pole assemblies. Underpass lighting must be used on all structures within each project. The Engineer shall integrate existing illumination within the project limits into the proposed design. The Engineer shall coordinate with the FBGPTRA to determine the location of proposed conventional, roundabout and underpass lighting.
- 163.5. Storm Water Pollution Prevention Plans (SWP3).** The Engineer shall develop SWP3, on separate sheets from (but in conformance with) the TCP, to minimize potential impact to receiving waterways. The SWP3 must include text describing the plan, quantities, type, phase and locations of erosion control devices and any required permanent erosion control.
- 163.6. Compute and Tabulate Quantities.** The Engineer shall provide the summaries and quantities within all formal submittals.
- 163.7. Miscellaneous Structural Details.** The Engineer shall provide necessary details required to supplement standard details.
- 163.8. Estimate.** The Engineer shall independently develop and report quantities necessary to construct the contract in standard FBGPTRA bid format at the 30, 60, 90% milestone and Final PS&E submittals. The Engineer shall prepare each construction cost estimates using Estimator or any approved method.
- 163.9. Contract time determination.** The Engineer shall prepare a detailed contract time estimate to determine the approximate time required for construction of the project in calendar and working days (based on the TxDOT standard definitions of calendar and working days) at the 90% and Final PS&E milestone. The Engineer shall provide assistance to the FBGPTRA in interpreting the schedule.
- 163.10. Specifications and General Notes.** The Engineer shall identify necessary standard specifications, special specifications, special provisions and the appropriate reference items. The Engineer shall prepare General Notes from the FBGPTRA *Master List of General Notes*, Special Specifications and Special Provisions for inclusion in the plans and bidding documents. The Engineer shall provide General Notes, Special Specifications and Special Provisions in the required format.

**163.11. Constructability Review.** The Engineer shall provide Independent Quality Review of the constructability PS&E sets.

The Engineer shall perform constructability reviews at major project design milestones (e.g. 60%, 90%, and final plan) to identify potential constructability issues and options that would provide substantial time savings during construction. The constructability review must be performed for all roadway and structural elements such as Sequence of Work/Traffic Control, Drainage (Temporary and Permanent), Storm Water Pollution Prevention Plan (SWP3), Environmental Permits, Issues and Commitments (EPIC) addressed, identify Utility conflicts; ensuring accuracy and appropriate use of Items, Quantities, General Notes, Standard and Special Specifications, Special Provisions, Contract Time/Schedule, Standards; and providing detailed comments in an approved format. Reviews must be captured in a Constructability Log identifying areas of concern and potential conflict. The Engineer shall provide the results of all Constructability reviews and recommendations at major project design milestone submittals.

**163.12 Utility Adjustment Coordination.**

Utility Adjustment Coordination must include utility coordination meetings with individual utility companies, communication and coordination with utilities.

*The Engineer shall provide Utility Adjustment Coordination as described below:*

- *Coordination with FBGPTRA, PS&E design team, 10 anticipated utility owners, and project stakeholders as required to develop a Utility Conflict Matrix (UCM)*

**1. UTILITY COORDINATION**

The Utility Coordinator shall perform utility coordination and liaison activities with involved utility owners, their consultants, and FBGPTRA to achieve project notifications, concurrence letters (Letter of No Objection (LONO), formal coordination meetings, conflict analysis, and resolution.

- a. The Utility Coordinator shall coordinate all activities with FBGPTRA or their designee, to facilitate the orderly progress and completion of design phase. The Utility Coordinator shall be responsible for the following:

- i. **Work Plan.** Coordinate a work plan including a list of the proposed meetings and coordination activities, and related tasks to be performed, a schedule, and an estimate. The work plan must satisfy the requirements of the project and must be approved by FBGPTRA prior to commencing work.

- ii. **External Communications.** The Utility Coordinator shall coordinate all activities with FBGPTRA and its consultants, or other

contractors or representatives as authorized by FBGPTRA. Also, the Utility Coordinator shall provide FBGPTRA copies of diaries, correspondence, and other documentation of work-related communications between the Utility Coordinator, utility owners, and other outside entities.

iii. **Permits and rights of entry.** Obtain all necessary permits from city, county, municipality, railroad, or other jurisdiction to allow the Engineer to work within existing streets, roads, or private property for additional designating and subsurface utility locating.

- b. As required, the Utility Coordinator shall coordinate with the local utility committees to present a footprint of FBGPTRA's project with represented utility companies and owners for their markups of their locations. The Utility Coordinator shall also coordinate with any other utility committees which may include county, city, or other officials, if needed.
- c. The Utility Coordinator shall provide initial project notification letters to all affected utility companies, owners, and other concerned parties, if needed.
- d. The Utility Coordinator shall provide FBGPTRA a Utility Contact List for each project with all information such as: (a) Owner's Name; (b) Contact Person; (c) Telephone Numbers; (d) Emergency Contact Number; (e) E-mail addresses; (f) as well as pertinent information concerning their respective affected utilities and facilities, including but not limited to: size, number of poles, material, and other information which readily identifies the utilities companies' facilities.

## 2. UTILITY AGREEMENTS FOR UTILITY ADJUSTMENTS

- a. Utility Agreements are excluded from this Scope of Services.

### **DELIVERABLES:**

The Engineer shall provide the following:

- Work Plan
- NOPC Letters
- Utility Contact List
- Meeting Minutes (PDF electronic format)

### **163.13. Utility Engineering.**

Utility Engineering includes the identification of utility conflicts, coordination,

compliance with the UAR, and resolution of utility conflicts. The Engineer shall coordinate all activities with FBGPTRA, or FBGPTRA's designee, to facilitate the orderly progress and completion of FBGPTRA's design phase.

*The Engineer shall provide Utility Engineering as described below:*

- *Engineering/Coordination with FBGPTRA, PS&E design team, 10 anticipated utility owners, and project stakeholders as required to develop a Utility Conflict Matrix (UCM)*
- *Up to 4 iterations of the UCM based on 30%, 60%, 90%, and 100% design*

## 1. COORDINATION OF ENGINEERING ACTIVITIES

- a. Utility Layout: The Engineer shall maintain a utility layout in the latest version of MicroStation used by FBGPTRA. This layout must include all existing utilities which are to remain in place or be abandoned, and all adjusted utilities. This layout must be utilized to monitor the necessity and evaluate alternatives. The Utility Engineer shall utilize the layout of existing utilities as prepared, if available, and make a determination of the following:
  - i. Facilities in conflict with the proposed project that are to be relocated.
  - ii. Facilities to be abandoned in place.
  - iii. Facilities to remain in service and in place as a result of roadway design adjustments.
  - iv. The Utility Engineer shall be responsible for determining if there are additional facilities not shown in the Subsurface Utility Engineering (SUE) documents, which require relocation. The Engineer shall coordinate this information with FBGPTRA immediately upon discovery.

## 2. PUBLIC & INDIVIDUAL MEETINGS WITH UTILITY COMPANIES

As required, to facilitate utility conflict identification and resolution, the Engineer shall:

- a. Establish contact with all existing utilities within and adjacent to the project limits, and set up monthly utility coordination meetings to discuss concepts and options for construction.
- b. Schedule all utility coordination meetings and ensure compatibility with the schedule of FBGPTRA.

- c. Set agenda for all coordination meetings as directed by FBGPTRA.
  - d. Establish and promote the desired agenda and methodologies for utility construction within the project limits. The agenda and methodologies will consist primarily of promoting the construction of utilities as a part of the Highway Contract.
  - e. Work Plan: Develop a work plan including a list of the tasks to be performed, a schedule, and an estimate. The work plan must satisfy the requirements of the project and must be approved by FBGPTRA prior to commencing work.
  - f. **Progress Meetings.** The Utility Coordinator shall implement a schedule of monthly meetings (up to 12 meetings) with all utility companies and owner or owner's representatives for coordination purposes. Such meetings must commence as early as possible in the design process and shall continue until completion of the project. The Utility Coordinator shall notify FBGPTRA at least two business days in advance of each meeting to allow FBGPTRA the opportunity to participate in the meeting. The Utility Coordinator shall provide and produce meeting minutes of all meetings with said utility companies, owners, or owners' representatives within seven business days.
3. REVIEW OF UTILITY'S PROPOSED ADJUSTMENTS
- a. Evaluate Alternatives: The Utility Engineer shall evaluate alternatives in the adjustment of utilities balancing the needs of both FBGPTRA and the Utility.
  - b. Review Estimates and Schedules: The Utility Engineer shall review the Utility Adjustment Estimates for reasonableness of cost and the timely scheduling of the adjustment.
  - c. Review Plans for compliance with Utility Accommodation Rules and proposed location data. The responsibility for quality and accuracy of Utility Adjustment Plans will remain with the Utility Company.
4. The Engineer shall not provide services for the sole benefit of third parties.
5. The Engineer shall prepare a Signed and Sealed Proposed Utility Layout in the latest version of Micro Station used by FBGPTRA that can be overlaid on the base file with drainage. The Engineer shall:
- a. Ensure all facilities conflicts have been resolved.
  - b. Ensure all stakeholders have concurred with the various alignments.

- c. Establish the sequence of construction for all utility relocation work whether it is included as a part of the Highway Construction or not.
  - d. Determine which utilities will be built as part of the contract.
  - e. Determine which facilities will be relocated prior to construction.
6. The Engineer shall coordinate, develop, and review plans, specifications, and estimates (PS&E) for all utilities included in the construction contract.
  7. The Utility Coordinator shall submit the required number of executed copies of the Utility Agreement Assemblies, a copy of the recorded easement Deed, plans, and estimate to FBGPTRA by letter, recommending approval (two original signature and two copies of each). The Transmittal letter should include the following statement "The proposed utility adjustment will not conflict with proposed highway construction and will comply with applicable utility codes and regulations. The utility should be reimbursed for eligible costs incurred within their easement limits for replacement in kind." The transmittal should also provide a description of the work being done as well as the estimated cost, and schedule of work.

**DELIVERABLES:**

The Engineer shall provide the following:

- Utility Conflict Matrix
- Utility Conflict Matrix Exhibit
- Meeting Minutes (PDF electronic format)

**163.14. Utility Engineering Investigation (currently Subsurface Utility Engineering)**

Utility Engineering Investigation (currently Subsurface Utility Engineering) includes utility investigations subsurface and above ground prepared in accordance with AASHTO standards [ASCE C-1 38-22 (<http://www.fhwa.dot.gov/programadmin/asce.cfm>)] and Utility Quality Levels.

*The Engineer shall provide additional SUE Quality Levels as described below and incorporate with prior SUE data collected:*

- *SUE Quality Level B investigation for all utilities around the John Sharp Blvd intersection (Weisser)*
- *SUE Quality Level A investigation up to 12 test holes (Halff)*

**1. UTILITY QUALITY LEVELS**

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

- Quality Level D - Existing Records: Utilities are plotted from review of available existing records.

- Quality Level C - Surface Visible Feature Survey: Quality level "D" information from existing records is correlated with surveyed surface-visible features. Includes Quality Level D information. If there are variances in the designated work area of Level D, a new schematic or plan layout will be necessary to identify the limits of the proposed project and the limits of the work area required for this work authorization; including highway stations, limits within existing or proposed right of way, additional areas outside the proposed right of way, and distances or areas to be included along existing intersecting roadways.
- Quality Level B - Designate: Two-dimensional horizontal mapping. This information is obtained through the application and interpretation of appropriate non-destructive surface geophysical methods. Utility indications are referenced to established survey control. Incorporates quality levels C and D information to produce Quality Level B. If there are variances in the designated work area of Level D, a new schematic or plan layout will be necessary to identify the limits of the proposed project and the limits of the work area required for this work authorization; including highway stations, limits within existing or proposed right of way, additional areas outside the proposed right of way, and distances or areas to be included along existing intersecting roadways.
- Quality Level A - Locate (Test Hole): Three-dimensional mapping and other characterization data. This information is obtained through exposing utility facilities through test holes and measuring and recording (to appropriate survey control) utility and environment data. Incorporates quality levels B, C and D information to produce Quality Level A.

2. 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. Designate (Quality Level B) Services are inclusive of Quality levels C and D.

The Engineer shall:

- a. As requested by FBGPTRA 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 shall examine utility owner's work to ensure accuracy and completeness.
- c. Designate, record, and mark the horizontal location of the existing utility facilities and their service laterals to the apparent existing right-of-way using non-destructive surface geophysical techniques. No storm sewer facilities are to be designated unless authorized by the FBGPTRA. A non-water base paint, utilizing the APWA color code scheme, must be used on all surface markings of underground utilities.
- d. Correlate utility owner records with designating data and resolve discrepancies using professional judgment. A color-coded composite utility facility plan with utility owner names, quality levels, line sizes, and subsurface utility locate (test-hole) locations, must be prepared and delivered to FBGPTRA. It is understood by both the Engineer and FBGPTRA that the line sizes of designated utility facilities detailed on the deliverable are 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 appurtenance locations must be included in the deliverable to FBGPTRA. This information must be provided in the latest version of Micro Station or Geopak used by FBGPTRA. The electronic file will be delivered on CD or DVD, as required by FBGPTRA. A hard copy is required and must be signed, sealed, and dated by the Engineer. When requested by FBGPTRA, the designated utility information must be over laid on FBGPTRA's design plans.
- e. Determine and inform FBGPTRA of the approximate utility depths at critical locations as determined by FBGPTRA. This depth indication is understood by both the Engineer and FBGPTRA to be approximate only and is not intended to be used preparing the right of way and construction plans.
- f. Provide a monthly summary of work completed and in process with adequate detail to verify compliance with agreed work schedule.
- g. Close-out permits as required.
- h. 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.

- i. Comply with all applicable FBGPTRA policy and procedural manuals.

3. SUBSURFACE UTILITY LOCATE (TEST HOLE) SERVICE (QUALITY LEVEL A)

Locate means 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 shall:

- a. Review requested test hole locations and advise FBGPTRA 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. Neatly cut and remove existing pavement material, such that the cut does not to exceed 0.10 square meters (1.076 square feet), unless unusual circumstances exist.
- d. Measure and record the following data on an appropriately formatted test hole data sheet that has been sealed and dated by the Engineer:
  - i. Elevation of top and/or bottom of utility tied to the datum of the furnished plan.
  - ii. Identify a minimum of two benchmarks utilized. Elevations must be within an accuracy of 15mm (.591 inches) of utilized benchmarks.
  - iii. Elevation of existing grade over utility at test hole location.
  - iv. Horizontal location referenced to project coordinate datum.
  - v. Outside diameter of pipe or width of duct banks and configuration of non-encased multi-conduit systems.
  - vi. Utility facility material(s).
  - vii. Utility facility condition.
  - viii. Pavement thickness and type.
  - ix. Coating and Wrapping information, and condition.

- x. Unusual circumstances or field conditions.
- e. Excavate test holes in such a manner as to prevent any damage to wrappings, coatings, cathodic protection, or other protective coverings and features.
- f. Be responsible for any damage to the utility during the locating process. In the event of damage, the Engineer shall stop work, notify the appropriate utility facility owner, FBGPTRA, and appropriate regulatory agencies. The regulatory agencies include, but are not limited to the Railroad Commission of Texas and the Texas Commission on Environmental Quality. The Engineer shall not resume work until the utility facility owner has determined the corrective action to be taken. The Engineer shall be liable for all costs involved in the repair or replacement of the utility facility.
- g. Back fill all excavations with appropriate material, compact backfill by mechanical means, and restore pavement and surface material. The Engineer shall be responsible for the integrity of the backfill and surface restoration for a period of three years. Install a marker ribbon throughout the backfill.
- h. Furnish and install a permanent above ground marker directly above center line of the utility facility.
- i. 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 shall return to correct the condition at no extra charge to the FBGPTRA.
- j. Plot utility location position information to scale and provide a comprehensive utility plan sign and sealed by the responsible Engineer. This information shall be provided in the latest version of Micro Station or Geopak format used by the FBGPTRA. The electronic file will be delivered on C.D or DVD. When requested by FBGPTRA, the Locate information must be over laid on FBGPTRA's design plans.
- k. Return plans, profiles, and test hole data sheets to FBGPTRA. If requested, conduct a review of the findings with FBGPTRA.
- l. Close-out permits as required.

**DELIVERABLES:**

The Engineer shall provide the following:

- One set of Electronic Files (MicroStation and PDF) on USB and/or Dropbox service of Quality Level A and B (inclusive of QL-C and QL-D) SUE in MicroStation format as requested by FBGPTRA
- Two sets of signed and sealed Subsurface Utility Locate (Quality Level A) Test Hole data sheets on 11" x 17" size sheets, (as needed upon request from FBGPTRA). Provide digital PDF version as well
- A monthly summary, or at intervals as requested by FBGPTRA, with updates of work completed and in process with adequate detail to verify compliance with agreed work schedule
- KMZ of the Quality Level A and B (inclusive of QL-C and QL-D) SUE

## **FUNCTION CODE 160(170) – ROADWAY DESIGN**

### **BRIDGE DESIGN**

**170.1 Bridge Layout.** The Engineer shall prepare a bridge layout plan sheet for each bridge and bridge class culvert.

#### Bridges

1. Mainlanes SB over John Sharp  
(Approx. 500 LF, 5 Span, Prestressed Concrete TX Girders)
2. Mainlanes NB over John Sharp  
(Approx. 500 LF, 5 Span, Prestressed Concrete TX Girders)
3. Mainlanes SB over Oyster Creek  
(Approx. 260 LF, 3 Span, Prestressed Concrete TX Girders)
4. Mainlanes NB over Oyster Creek  
(Approx. 260 LF, 3 Span, Prestressed Concrete TX Girders)

#### Bridge Class Culverts

1. Bridge class culvert 4-7'x3'x177'  
(Beginning station 885+69.5, Ending station 886+00)
2. Bridge Class culvert 3-7'x3'x173'  
(Beginning station 929+55.5, Ending station 929+78.5)

The Engineer shall use the data previously obtained for foundation design in accordance with the *Geotechnical Manual*.

Prior to preparation of each bridge layout, the Engineer shall prepare a comparative cost analysis of bridge structures to determine: (1) the optimum bridge beams for vertical clearance over roadway, or waterways, (2) the optimum bridge structure versus roadway embankment, pavement, soil stabilization, and retaining walls.

The Engineer shall submit a bridge layout for each structure early in the plan preparation process to obtain approval from the FBGPTRA. The Engineer shall

comply with all relevant sections of the latest edition of *TxDOT's LRFD Bridge Design Manual, Bridge Project Development Manual, Bridge Detailing Guide, and AASHTO LRFD Bridge Design Specifications and respective checklists*. Each bridge layout sheet must include bridge typical sections, structural dimensions, abutment and bent locations, superstructure and substructure types. The Engineer shall locate and plot all soil borings and utilities, show proposed retaining walls, and, for staged construction, indicate limits of existing bridge for removal and reconstruction.

**170.2 Bridge Detail Summary.** The Engineer shall prepare total bridge quantities, estimates, and summary sheets for each bridge or bridge class culvert.

**170.3 Bridge Structural Details.** The Engineer shall prepare each structural design and develop detailed structural drawings of all required details in compliance with above-listed manuals and guidelines. The Engineer shall assemble and complete all applicable TxDOT Standard Details sheets.

Additionally, the Engineer shall:

- Perform calculations for design of bridge abutments.
- Perform calculations for bridge slab design.
- Perform calculations to determine elevations of bridge substructure and super structure elements.
- Prepare necessary foundation details and plan sheets.
- Prepare plan sheets for abutment design.
- Prepare plan sheets for additional abutment details.
- Prepare framing plan and slab plan sheets.
- Compute and prepare tables for slab and bearing seat elevations, dead load deflections, etc.
- Design beams and prepare beam design tables.
- Prepare special provisions and special specifications in accordance with the above-listed manuals and guidelines.

## **Deliverables**

### **Plans**

The Engineer shall provide the following information at each submittal:

1. 30% Plans Submittal
  - 1.1. One pdf set of 11" x 17" plan sheets for the FBGPTRA Review.
  - 1.2. Estimate of construction cost.
  - 1.3. Engineer's internal QA and QC markup set.
  - 1.4. Design Exceptions with existing and proposed typical sections, location map and design exception exhibits.
2. Between 30% Submittal and 60% Submittal:

- 2.1. One pdf set of 11" x 17" bridge and retaining wall layouts for the FBGPTRA review.
  - 2.2. External stability analysis for retaining walls.
  - 2.3. Engineer's internal QA and QC marked up set.
  - 2.4. One set of a roll format TCP phasing layouts and one .pdf of plan sheets for TCP concept.
3. 60% Plans Submittal:
- 3.1. One pdf set of 11" x 17" plan sets for the FBGPTRA review.
  - 3.2. Estimate of construction cost.
  - 3.3. Engineer's internal QA and QC marked up set.
  - 3.4. One set of a roll format TCP phasing layouts and one .pdf of plan sheets for TCP concept.
4. Review Submittal (90%)
- 4.1. 1 pdf sets of 11" x 17" plan sheets for the FBGPTRA Review.
  - 4.2. Estimate of construction cost.
  - 4.3. Marked up general notes
  - 4.4. Construction schedule.
  - 4.5. New Special Specifications and Special Provisions if applicable.
  - 4.6. Engineer's internal QA and QC marked up set.
  - 4.7. Other supporting documents.
5. Review Submittal (95%):
- 5.1. 1 pdf set of 11" x 17" plan sheets for the FBGPTRA review
  - 5.2. List of governing Specifications and Special Provisions in addition to those required.
  - 5.3. Marked up general notes.
  - 5.4. Construction Schedule.
  - 5.5. Plans estimate.
  - 5.6. New Special Specifications and Special Provisions, if applicable.
  - 5.7. Triple Zero Special Provisions to be furnished by FBGPTRA.
  - 5.8. Engineer sign, seal and date supplemental sheets (8 1/2" x 11").
  - 5.9. Contract time determination summary.
  - 5.10. Engineer's internal QA and QC marked-up set.
  - 5.11. Other supporting documents.
6. Final submittal (100%).
- 6.1. 1 pdf set of 11" x 17"
  - 6.2. Revised supporting documents from 95% review comments.
  - 6.3. Final earthwork cross-sections using GEOPAK or Bentley's OpenRoads tools. The level of detail of the surface and subsurface features will be at the direction of the FBGPTRA.

**Electronic Copies**

The Engineer shall furnish the FBGPTRA with the electronic files of the final plans in the format requested by FBGPTRA, and .pdf format.

The Engineer shall also provide separate electronic files containing cross section information (in dgn, XLR, & ASCII formats) for the FBGPTRA contractor to use.

The Engineer shall provide an electronic copy of Primavera file or the latest scheduling program used by the FBGPTRA for the construction time estimate.

### **Calculations**

The Engineer shall provide the following:

Provide all quantity and non-structural design calculations.

Provide all engineering calculations, analysis, input calculations, quantities, geometric designs (GEOPAK GPK files), etc. relating to the project's structural elements. Project structural elements include, but are not limited to: bridges, retaining walls, overhead sign foundations, non-standard culverts, custom headwalls and drainage appurtenances.

The Engineer may provide the calculations in .pdf format in lieu of the bound hard copies. The .pdf file should be submitted via email or file transfer.

Fort Bend Grand Parkway Toll Road Authority  
 Project: 126-1011  
 Prime Provider: Half Associates, Inc.  
 Sub Providers: PGAL and Weisser

Attachment B-1 - Fee Schedule  
 Method of Payment: Lump Sum

Fort Bend Grand Parkway Toll Road Authority Project No. 126-1011 SH99: From FM 1464 to West Airport Blvd. Prime Provider: Half Associates, Inc. Sub Providers: PGAL & Weisser		Total	Prime Provider Half	Sub-Provider PGAL, Inc.	Sub-Provider Weisser
FC 102 (110)	Total Labor Cost (Lump Sum)	\$66,638.00	\$41,368.00	\$25,270.00	
	Other Direct Expenses				
FC 130 (130)	Total Labor Cost	\$19,476.00	\$8,224.00	\$11,252.00	
	Other Direct Expenses				
FC 145 (164)	Total Labor Cost	\$468,288.00	\$366,880.00	\$101,408.00	
	Other Direct Expenses	\$12,972.00	\$9,094.50	\$2,977.50	
FC 160 (160)	Total Labor Cost (Lump Sum)	\$60,190.00			\$60,190.00
	Total Labor Cost (Unit Costs)	\$12,960.00			\$12,960.00
	Other Direct Expenses				
FC 160 (160)	Total Labor Cost (Lump Sum)	\$730,095.00	\$527,755.00	\$202,340.00	
	Other Direct Expenses				
FC 160 (161)	Total Labor Cost	\$504,446.00		\$504,446.00	
	Other Direct Expenses				
FC 160 (162)	Total Labor Cost	\$150,816.00		\$150,816.00	
	Other Direct Expenses				
FC 160 (163)	Total Labor Cost	\$852,007.00	\$444,359.00	\$407,648.00	
	Total Unit Costs	\$18,900.00	\$18,900.00		
	Other Direct Expenses				
FC 160 (170)	Total Labor Cost	\$376,024.00	\$348,728.00	\$27,296.00	
	Other Direct Expenses				
<b>Grand Totals</b>		<b>\$3,271,912.00</b>	<b>\$1,765,308.50</b>	<b>\$1,433,453.50</b>	<b>\$73,150.00</b>
(SUB%)		100.00%	53.95%	43.81%	2.24%

Fort Bend Grand Parkway Toll Road Authority  
 Project: 126-1011  
 Prime Provider: Half Associates, Inc.  
 Sub Providers: Weisser

Attachment B-1 - Fee Schedule  
 Method of Payment: Lump Sum

DESCRIPTION							TOTAL MH BY FC	TOTAL COSTS BY FC
ROADWAY DESIGN - FC 160 (150)							453	\$60,190.00
<b>SUBTOTAL LABOR EXPENSES</b>							453	\$60,190.00
<b>UNIT COSTS</b>	UNIT	RATE	FC 160			TOTALS		
2-man survey crew	hr	\$162.000	80			80	\$12,960.00	
<b>SUBTOTAL DIRECT EXPENSES</b>						80	\$12,960.00	
<b>OTHER DIRECT EXPENSES</b>	QUANTITY	RATE	UNIT					
Photocopies/Printing B/W (11"x17")		\$0.20	EACH					\$0.00
Photocopies/Printing B/W (8 1/2"x11")		\$0.10	EACH					\$0.00
Photocopies Color (11"x17")		\$0.74	EACH					\$0.00
Photocopies Color (8 1/2"x11")		\$0.40	EACH					\$0.00
Plots (B/W on Bond)		\$0.50	SF					\$0.00
Plots (Color on Bond)		\$1.50	SF					\$0.00
CD's		\$1.00	EACH					\$0.00
Standard Postage		\$0.47	LETTER					\$0.00
Overnight Mail - letter size		\$2.95	EACH					\$0.00
Overnight Mail - oversized box		\$30.00	EACH					\$0.00
Courier Services		\$30.00	EACH					\$0.00
Mileage		\$0.54	MILE					\$0.00
Toll Charges		\$2.00	EACH					\$0.00
<b>SUBTOTAL DIRECT EXPENSES</b>								\$0.00

SUMMARY	
TOTAL COSTS FOR PRIME ONLY	\$60,190.00
TOTAL UNIT COSTS SUB ONLY	\$12,960.00
<b>GRAND TOTAL</b>	<b>\$73,150.00</b>