

ENGINEERING SERVICES AGREEMENT

THE STATE OF TEXAS §
 §
COUNTY OF HARRIS §

THIS AGREEMENT is between **Harris County**, a body corporate and politic under the laws of the State of Texas, hereinafter called "County", acting herein for the **Harris County Toll Road Authority** (HCTRA), a division of the County, and **KIT Professionals, Inc.**, hereinafter called the "Engineer" or "Company".

W I T N E S S E T H:

WHEREAS, the County proposes to hire the Engineer to provide engineering design services for the permanent transition of Toll Road Operations to an all-electronic roadway environment for the Sam Houston Tollway Segment #4 –Southwest in Harris County, Texas, hereinafter called the "Project;"

WHEREAS, the Engineer has represented to the County that it is qualified and prepared to perform all of the services described in the Scope of Services, Appendices A-1 and A-2, attached hereto and incorporated herein by reference as if copied herein verbatim (Scope of Services), and has submitted a proposal to provide professional engineering services for the Project;

WHEREAS, the County is satisfied that the Engineer is capable of performing the necessary services required for the Project and desires to contract with the Engineer to perform the services described in the Scope of Services;

WHEREAS, the provisions of Chapter 262, Texas Local Government Code, Competitive Bidding Law do not apply to the proposed agreement because the contract is for professional engineering services;

WHEREAS, the County has determined and found that it would be in the best interest of the County to delegate to the Executive Director of HCTRA supervisory and management authority over the Engineer; and

WHEREAS, the Engineer will control the methods and means in performing the work set out in the Scope of Services;

NOW, THEREFORE, in consideration of the mutual covenants and conditions set forth below, the parties agree as follows:

1. General

- a. In performing professional engineering services under this Agreement, the Engineer will function solely and exclusively for the benefit of the County and

not for the benefit of the contractors for the Project or any other party. All services rendered by the Engineer under this Agreement shall be performed under the supervision of HCTRA. The Engineer shall render services in accordance with generally accepted professional standards and use the degree of care and skill reasonably necessary to ensure compliance with all applicable laws and regulations.

- b. The Engineer shall be responsible for the professional quality, technical accuracy and the coordination of all deliverable documents and services furnished by the Engineer under this Agreement. The Engineer shall, without additional compensation, correct or revise all errors and deficiencies in its documents.
- c. The Engineer will collaborate with the County's personnel to facilitate the implementation of a Project Database within the County's Electronic Document Management System known as "CAPTRAC". The Electronic Document Management System will provide electronic management that shall govern the distribution and file copies of all Project related correspondence, reports, plans, and technical data. The County and the Engineer will use "CAPTRAC" to facilitate the effective electronic exchange of Project information and documents with members of the design team and other interested stakeholders.
- d. The Engineer will collaborate with the County's personnel to facilitate the maintenance of the Project Database. Project files shall be entered into the database by the Engineer on a timely basis and made available by the County on "CAPTRAC" at all times for performance of daily Project activities. Other documents, including those used for legal review, audit requests/requirements, and open records request purposes, shall be entered by the County staff assisting the Engineer team. The Engineer shall also ensure that all Project files are appropriately entered into the database:
 - 1. At all critical milestones;
 - 2. At established periodic intervals; and
 - 3. Following completion of the work as a final Project record, including applicable record drawings.

2. Scope of Services

The services to be provided herein in regard to the Project are defined in Appendices A-1 and A-2 ("Scope of Services").

3. Compensation and Payment

- a. The Engineer shall be entitled to payment of the lump sum amount of **\$3,837,000.00** for services to perform the tasks delineated in Appendix A-1.

Development of the plans for the Project will be the responsibility of the Engineer. The Engineer shall submit plans for County review at 30%, 60%, 95% and 100% completion. The County shall review and provide the Engineer comments to the submittals within 20 working days of receipt. The County will pay the Engineer commensurate to the plan submittal completion based upon the County's assessment. The Engineer will not receive further payment until the County is satisfied with the Engineer's responses to the review comments. The services necessary to perform the tasks delineated in Appendix A-2 shall be paid based on hourly rates and the County shall not be obligated to pay in excess of **\$1,413,000.00** for the services described in Appendix A-2. The Engineer shall not be obligated to perform further services hereunder once the Scope of Services delineated in Appendices A-1 and A-2 have been performed.

- (1) All hourly billing for the services defined in Appendix A-2 and any additional services not included in the Scope of Services under this Agreement, including changes in the contractual scope of work and revision of work satisfactorily performed, will be performed only when approved in advance and authorized by the County, and will be reimbursed at the raw salary rates in effect at that time, times a multiplier as set forth below, to the extent that such direct salary costs and subcontracts are reasonable and necessary for the performance of such services. The reimbursable hourly raw salary rates cannot exceed those set forth in Appendix B. The Engineer shall also be entitled to expense reimbursement as set forth in Appendix B, provided that miscellaneous expenses, if any, may be reimbursed hereunder only when HCTRA determines that incurring such expenses is not required as part of the original Scope of Services and provides written approval of such expense in advance of it being incurred. Payment will be made on the basis of certified time and expense records and in accordance with those payment procedures set forth in subparagraph b., below. Billing rates will have a 3.00 multiplier on raw salary rates.
 - (2) Where subcontractors are employed by the Engineer to perform additional services not within the original Scope of Services, the Engineer will be reimbursed for subcontractors' salaries and hourly rates, including overtime rates, on the same basis as described for the Engineer's own personnel in subparagraph a. (1), of this Paragraph. Reimbursement to the Subcontractor for non-salary costs incurred by subcontractors will be on the same basis as if the costs were incurred by the Engineer. The Engineer will be paid a subcontract administrative fee equal to ten percent (10%) of all subcontractor invoiced amounts. Total contract amounts shall include subcontractor fees.
- b. It is understood and agreed that monthly payments will be made to the Engineer by the County based on the following procedures: On or about the

fifteenth day of each month during the performance of services hereunder and on or about the fifteenth day of the month following completion of all services hereunder, the Engineer shall submit to the County two (2) copies of invoices showing the amounts due for services performed during the previous month, set forth separately for work under this Agreement and for additional services (accompanied by supporting certified time and expense records of such charges in a form acceptable to the County Auditor). It is specifically understood that any requests for travel reimbursements shall comply with those procedures for travel reimbursement to County employees established by the Harris County Auditor. HCTRA shall review such invoices and approve them within ten (10) calendar days with such modifications as are consistent with this Agreement and forward same to the County Auditor. The County shall pay each such invoice as approved by the County Auditor within twenty (20) calendar days after the County Auditor's approval of same. Invoices are due and payable net 30 days from receipt.

- c. It is expressly understood and agreed that the County has available the total maximum sum of **\$5,775,000.00** as hereinafter certified available for the purpose of satisfying the County's obligations under the terms and provisions of this Agreement. The County shall not be liable under any circumstances or any interpretations hereof for any costs under the Agreement except for those certified available for this Agreement by the Harris County Auditor, as evidenced by the issuance of a purchase order by the Harris County Purchasing Agent for the certified amount. Once the funds are expended for the purpose of satisfying the County's obligations under the terms and provisions of this Agreement, the County shall have no further obligations nor shall the Engineer be required to perform further services hereunder.

4. Time of Performance

It is understood and agreed that the time for performance of the Engineer's services under this Agreement shall begin with receipt of the Notice to Proceed and end **1460** calendar days from that date, except to the extent continued performance after that date is authorized in writing by the Executive Director of HCTRA or his designee. The Engineer is responsible for notifying HCTRA thirty days prior to the end of the contract.

5. The County's Option to Terminate

- a. The County has the right to terminate this Agreement at its sole option at any time, with or without cause, by providing written notice of such intention to terminate and by stating in said notice the "Termination Date." Upon such termination, the County shall compensate the Engineer in accordance with Paragraph 3., above, for those services that were provided under this Agreement prior to its termination and that have not been previously invoiced to the County. The Engineer's final invoice for said services will be presented

to and paid by the County in the same manner set forth in Paragraph 3. b., above.

- b. Termination of this Agreement and payment in settlement as described in subparagraph a. of this Paragraph shall extinguish all rights, duties, obligations, and liabilities of the County and the Engineer under this Agreement and this Agreement shall be of no further force and effect; provided, however, such termination shall not act to release the Engineer from liability for any previous default either under this Agreement or under any standard of conduct set by law. No termination of this Agreement shall have the effect of terminating the Engineer's obligations under Sections 7 (Delays and Damages), 8 (Inspection of the Engineer's Books and Records), 12 (Appearance as Witness), or 15 (Indemnification).
- c. If the County shall terminate this Agreement as provided in this Paragraph, no fees of any type, other than fees due and payable at the Termination Date, shall thereafter be paid to the Engineer.
- d. The County's rights and options to terminate this Agreement, as provided in any provision of this Agreement shall be in addition to, and not in lieu of, any and all rights, actions and privileges otherwise available under law or equity to the County by virtue of this Agreement or otherwise. Failure of the County to exercise any of its rights, actions, options or privileges to terminate this Agreement as provided in any provision of this Agreement shall not be deemed a waiver of any rights, actions or privileges otherwise available under the law or equity with respect to any continuing or subsequent breaches of this Agreement or of any other standard of conduct set by law.
- e. Copies of all completed and partially completed documents prepared under this Agreement shall be delivered to the County upon the Engineer's receipt of termination payment when and if this Agreement is terminated.

6. Source of Fee Payments

The County intends to pay for design and construction with the proceeds from the sale and issuance of bonds and a yearly revenue fund account. It is expressly acknowledged that all payments owing for Engineering services performed under this Agreement shall be made solely from these sources of funds for financing design and construction of the Project. The County shall be under no liability under this Agreement to make payment to the Engineer from any other source. In addition, the County reserves the right, at its sole discretion, at any time prior to issuance by the County of the written notice to proceed as provided in Paragraph 4., above, to cancel this Agreement and in the event of such cancellation, the Engineer shall not be entitled to any payment, nor have any claim for compensation or damages resulting from such cancellation. In no

event shall the liability of the County under this Agreement exceed the amount hereunder certified as available by the County Auditor.

7. Delays and Damages

Except as otherwise provided herein, the Engineer agrees that no other charges or claims for damage shall be made by it against the County for any delays or hindrances occurring during the progress of the Engineer in providing to the County the services specified in this Agreement.

8. Inspection of the Engineer's Books and Records

The Engineer will permit the County, or any duly authorized agent of HCTRA, to inspect and examine the pertinent books and records of the Engineer, but only for the purpose of verifying the direct salary costs, overtime work, and out-of-pocket expenses for additional services charged to the Project described in and contemplated by Paragraph 3. a., above.

9. Personnel, Equipment, and Material

- a. The Engineer represents that it presently has, or is able to obtain, adequate qualified personnel in its employment for performance of the services required under this Agreement and that the Engineer shall furnish and maintain, at its own expense, adequate and sufficient personnel and equipment, in the opinion of HCTRA, to perform the services when and as required and without delays. It is understood that HCTRA will approve assignment and release of all key engineering personnel and that the Engineer shall submit written notification of all key engineering personnel changes monthly for HCTRA's approval prior to the implementation of such changes. Services described in this Agreement shall be performed under the direction of an engineer licensed to practice professional engineering in the State of Texas.
- b. All employees of the Engineer or subcontractors hired by the Engineer shall have such knowledge and experience as will enable them to perform the duties assigned to them. Any employee of the Engineer or subcontractor of the Engineer who, in the opinion of HCTRA, is incompetent or by his conduct becomes detrimental to the Project shall, upon request of HCTRA, immediately be removed from association with the Project.
- c. Except as otherwise specified, the Engineer shall furnish all equipment, transportation, supplies, and materials required for its operations under this Agreement.

10. Subletting

The Engineer shall not sublet, assign, or transfer all or any part of the services in this Agreement without the prior written approval of HCTRA. Responsibility to HCTRA for sublet work shall remain with the Engineer.

11. Conferences

At the request of HCTRA, the Engineer shall provide appropriate personnel for conferences at its offices, or attend conferences at the various offices of HCTRA, or at the site of the Project, and shall permit inspections of its offices by HCTRA, or others when requested by HCTRA.

12. Appearance as Witness

If requested by the County, or on its behalf, the Engineer shall prepare such engineering exhibits and plats as may be requested for all hearings and trials related to the Project and, further, it shall prepare for and appear at conferences and shall furnish competent expert engineering witnesses to provide such oral testimony and to introduce such demonstrative evidence as may be needed throughout all trials and hearings with reference to any litigation relating to the Project. Compensation for trial preparation and appearance by the Engineer in courts regarding litigation matters will be made in accordance with the provisions of Paragraph 3. a. (1), above.

13. Compliance with Laws

The Engineer shall comply with all federal, state, and local laws, statutes, ordinances, rules and regulations, and the orders and decrees of any courts or administrative bodies or tribunals in any matter affecting the performance of this Agreement, including, without limitation, Worker's Compensation laws, minimum and maximum salary and wage statutes and regulations, licensing laws and regulations. When required, the Engineer shall furnish the County with certification of compliance with said laws, statutes, ordinances, rules, regulations, orders, and decrees specified above.

The Engineer shall strictly comply with Section 2251.022 Texas Government Code, and shall require that its subcontractors fully comply with Section 2251.023 Texas Government Code.

14. Insurance

The Engineer shall obtain, keep and maintain any and all insurance that may be required by law or that may be required by any agreement the County has with any other party concerning the Project. The Engineer's insurance policies shall be the primary policies. Under no circumstances will the County be liable for any

policy premiums or deductibles. The Minimum Insurance Requirements are attached hereto as Appendix C.

15. Indemnification

TO THE EXTENT ALLOWED BY LAW, THE ENGINEER AGREES TO INDEMNIFY AND HOLD HARMLESS THE COUNTY, ITS OFFICERS, EMPLOYEES, AND AGENTS FROM LIABILITY, LOSSES, EXPENSES, DEMANDS, REASONABLE ATTORNEYS' FEES, AND CLAIMS FOR BODILY INJURY (INCLUDING DEATH) AND PROPERTY DAMAGE TO THE EXTENT CAUSED BY THE NEGLIGENCE, INTENTIONAL TORT, INTELLECTUAL PROPERTY INFRINGEMENT OF THE ENGINEER (INCLUDING THE ENGINEER'S AGENTS, EMPLOYEES, VOLUNTEERS, AND SUBCONTRACTORS/CONSULTANTS UNDER CONTRACT, OR ANY OTHER ENTITY OVER WHICH THE ENGINEER EXERCISES CONTROL) IN THE PERFORMANCE OF THE SERVICES DEFINED IN THIS AGREEMENT. THE ENGINEER SHALL ALSO SAVE THE COUNTY HARMLESS FROM AND AGAINST ANY AND ALL EXPENSES, INCLUDING REASONABLE ATTORNEYS' FEES, IN PROPORTION TO THE ENGINEER'S LIABILITY, THAT MIGHT BE INCURRED BY THE COUNTY, IN LITIGATION OR OTHERWISE RESISTING SUCH CLAIMS OR LIABILITIES.

16. Delivery of Notices, Etc.

- a. All routine written notices, invoices, change orders, etc. are to be delivered to the Deputy Director, Tolling Operations at the Harris County Toll Road Authority, 7701 Wilshire Place Drive, Houston, Texas 77040, or at such other place or places as the County may designate by written notice delivered to the Engineer.

All formal notices and demands under this Agreement shall be delivered to the Harris County Toll Road Authority, 7701 Wilshire Place Drive, Houston, Texas 77040, Attention: Executive Director.

- b. All written notices, demands, and other papers or documents to be delivered to the Engineer under this Agreement shall be delivered to KIT Professionals, Inc., 200 W. Sam Houston Parkway S., Suite 1400, Houston, Texas, 77042, Attn: Chetan M. Vyas, PE, or at such other place or places as the Engineer may designate by written notice delivered to the County.

17. Reports of Accidents, Etc.

Within 24 hours after the occurrence of any accident or other event which results in, or might result in, injury to the person or property of any third person (other than an employee of the Engineer), whether or not it results from or involves any action or failure to act by the Engineer or any employee or agent of the Engineer

and which arises in any manner from the performance of this Agreement, the Engineer shall send a written report of such accident or other event to the County, setting forth a full and concise statement of the facts pertaining thereto. The Engineer shall also immediately send the County a copy of any summons, subpoena, notice, or other documents served upon the Engineer, its agents, employees, or representatives, or received by it or them, in connection with any matter before any court arising in any manner from the Engineer's performance of work under this Agreement.

18. The County's Acts

Anything to be done under this Agreement by the County may be done by such persons, corporations, or firms as the County may designate.

19. Limitations

Notwithstanding anything herein to the contrary, all covenants and obligations of the County under this Agreement shall be deemed to be valid covenants and obligations only to the extent authorized by the Act creating the County and permitted by the laws and the Constitution of the State of Texas.

20. Captions Not a Part Hereof

The captions or subtitles of the several sections and divisions of this Agreement constitute no part of the content hereof, but are only labels to assist in locating and reading the provisions hereof.

21. Controlling Law, Venue

This Agreement shall be governed and construed in accordance with the laws of the State of Texas. This Agreement shall be performed entirely in Harris County, Texas and the parties hereto acknowledge that venue is proper in Harris County, Texas, for all disputes arising hereunder and waive the right to sue or be sued elsewhere.

22. Successors and Assigns

The County and the Engineer bind themselves and their successors, executors, administrators and assigns to the other party of this Agreement and to the successors, executors, administrators and assigns of the other party, in respect to all covenants of this Agreement.

23. Independent Contractor

Notwithstanding any provision of this Agreement, the Engineer shall at all times act as an independent contractor, and not as an employee of the County, and the

Engineer shall be responsible for the means and methods employed in performing services hereunder.

24. Certificate of Interested Parties (Form 1295)

Texas law requires all parties who enter into any contract with the County that must be approved by Commissioners Court to disclose all Interested Parties. Texas Ethics Commission Form 1295 must be completed in its entirety. If changes to this Form are necessary during this Agreement, the Engineer will notify and send the County an updated and complete version.

25. Additional Statutory Requirements

Company represents and certifies that, at the time of execution of this Agreement, Company (including any wholly owned subsidiary, majority-owned subsidiary, parent company or affiliate of the same) is not listed by the Texas Comptroller of Public Accounts pursuant to Chapters 2252 or 2270 of the Texas Government Code, nor will Company engage in scrutinized business operations or other business practices that would cause it to be listed during the term of this Agreement.

26. Historically Underutilized Business Requirements

The State of Texas maintains a Historically Underutilized Business Program, which identifies any business at least 51 percent owned by an Asian Pacific American, African American, Hispanic American, Native American, woman and/or Service Disabled Veteran, who reside in Texas and actively participate in the control, operations and management of the entity's affairs as a Historically Underutilized Business.

In accordance with Section 284.007 of the Texas Transportation Code, the County shall make a good faith effort to meet or exceed goals provided under Section 284.007(b) for awarding contracts and subcontracts associated with a project it operates, maintains, or constructs to historically underutilized businesses. For purposes of this section, the term "historically underutilized business" has the meaning given to such term in subsection (d) of Section 284.007, Transportation Code.

The Contractor agrees to reasonably assist the County in its efforts to meet or exceed the goals provided under Section 284.007(b) for awarding contracts or subcontracts to historically underutilized businesses.

The Contractor will take affirmative steps to assure that minority firms and specifically women's business enterprises are used when possible and will not be discriminated against on the grounds of race, color, religious creed, sex, or national origin in consideration for an award.

Affirmative steps shall include:

1. Placing qualified small and minority businesses and women's business enterprises on solicitation lists;
2. Assuring that small and minority businesses, and women's business enterprises are solicited whenever they are potential sources;
3. Dividing total requirements, when economically feasible, into smaller tasks or quantities to permit maximum participation by small and minority business, and women's business enterprises; and
4. Establishing delivery schedules, where the requirement permits, which encourage participation by small and minority business, and women's business enterprises.

The Contractor shall submit evidence of compliance to Appendix X when requested by County.

[SIGNATURE PAGE FOLLOWS]

APPROVED AS TO FORM:

CHRISTIAN D. MENELEE
County Attorney

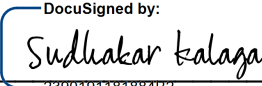
HARRIS COUNTY

By: 
MARCY LINEBARGER
Assistant County Attorney

By: _____
LINA HIDALGO
County Judge

Date: _____

KIT PROFESSIONALS, INC.

By: 
Name: Sudhakar Kalaga
Title: President
Date: 7/21/2022

APPENDIX A-1

SCOPE OF SERVICES

Design Services in Support of Conversion to All Electronic Tolling for the Sam Houston Toll Road SEGMENT 4 – SAM SOUTHWEST

PROJECT LOCATION / DESCRIPTION

The proposed Project is located in Harris County along the Sam Houston Tollway (SHTR) from approximately 0.7 miles east of IH 69 to 0.7 miles west of SH 288.

Design services to provide an All-Electronic Toll Conversion (“AET”) of the Sam Houston Tollway’s Southwest Segment, consisting of Plans, Specifications and Estimates (PS&E) packages described under the Project Scope.

A. The following Tolloed ramps will be included for AET conversion:

1. US 90A Exit Ramp - SEB
2. US 90A Entrance Ramp - NWB
3. Hillcroft Ave Exit Ramp - SEB
4. Hillcroft Ave Entrance Ramp - NWB
5. Fuqua St Exit Ramp - SEB
6. Fuqua St Entrance Ramp - NWB
7. Almeda Rd Exit Ramp - EB
8. Almeda Rd Entrance Ramp - WB

B. The following non-Toll ramps will not be included in the AET conversion.

1. W Bellfort Ave Entrance Ramp - SEB
2. W Bellfort Ave Exit Ramp - NWB
3. W Airport Blvd Entrance Ramp - SEB
4. W Airport Blvd Exit Ramp - NWB
5. S Gessner Rd Entrance Ramp - SEB
6. S Gessner Rd Exit ramp - NWB
7. US 90A Entrance Ramp - SEB
8. US 90A Exit Ramp - NWB
9. Fondren Rd Exit Ramp - NWB
10. Fondren Rd Entrance Ramp – SEB
11. Hillcroft Ave Entrance Ramp - SEB
12. Hillcroft Ave Exit Ramp – NWB
13. W Fuqua St Entrance Ramp – SEB
14. W Fuqua St Exit Ramp – NWB
15. S. Post Oak Rd Entrance Ramp – EB
16. S Post Oak Rd Exit Ramp – WB

C. The following non-Toll ramps will be included in the AET conversion.

1. SH 288 Entrance Ramp - WB

PROJECT SCOPE

A. PS&E Package 1: Safety / Maintenance Improvements at Ramps and Southwest Toll Plaza

1. The Engineer shall prepare a PS&E package to address immediate safety improvements at the toll plaza and ramp gantries and improvements needed to open one additional electronic toll lane from the former cash lanes. at the Southwest Toll Plaza. Improvements include, but are not limited to, partial demolition of existing toll booths, protection of remaining fixed structures with barrier, crash cushion attenuators, pavement restoration due to demolition, etc. Pavement markings and delineators may also be included.
2. PS&E Package 1 will also provide for converting traffic configuration to single-lane AET operation the tolled ramps identified above which includes Cash lanes only.
3. Conversion of the tolled ramps will provide for isolating existing toll booths with barrier but will not provide for new or modified overhead toll gantry structures at the converted ramps.
4. PS&E Package 1 is expected to be submitted for letting prior to the end of 2022.

C. PS&E Package 2: Convert Southwest Toll Plaza to Ultimate AET Configuration widening mainlanes to 5 lanes, WB Entrance Ramp, ITS and relocated fiber duct bank, illumination relocation required due to revised AET configuration and provide for pedestrian/bicycle improvements.

1. The Engineer shall prepare a PS&E package for improvements identified in Schematic Design 1 as described in Appendix A-2.
2. PS&E Package 2 is expected to be submitted for letting prior to the end of 2023.

SERVICES TO BE PROVIDED BY HCTRA THROUGH THE PMC

Program Management Consultant (PMC) HCTRA has designated Entech Civil Engineers, Inc. (ECE) as its Program Management Consultant (PMC). ECE shall be the prime point of contact for the Engineer. In general, Engineering design and procedures will follow the usual design practices of HCTRA.

The PMC shall provide the following items, if available, to the Engineer.

- A. Copies of as-built or existing plans for the roadway, toll plaza, etc.
- B. Contact information for each Project consultant.
- C. Latest version of TxDOT Project Specifications Book (Standard Specifications for Construction and Maintenance of Highways, Streets and Bridges).
- D. The latest version of electronic MicroStation V8i files for each of the above-mentioned plans, including topographic mapping, proposed planimetrics, profiles, drainage, signing and markings, traffic control plans, cross-sections, and utilities, if available.
- E. All available survey information including survey control information, mapping, point files, and field notes.
- F. All available geotechnical information and reports.
- G. Traffic information, including number and width of toll lanes for each toll location.
- H. Drainage Impact Study
- I. Tolling equipment layout.
- J. Toll system Integrator's design criteria and requirements.
- K. Existing and proposed traffic volumes.
- L. HCTRA All Electronic Tolling (AET) Design Guidelines and Criteria
- M. HCTRA CADD Standards
- N. AET CADD Manual

SERVICES TO BE PROVIDED BY THE ENGINEER

The Engineer shall provide engineering and design services required for the preparation of Plans Specifications, Estimates (PS&E) package(s), and bidding for the Project. The Engineer's responsibility includes inserting plans prepared by other consultants into the PS&E package.

The Engineer shall prepare all work in accordance with the latest version of applicable HCTRA and/or TxDOT procedures, specifications, manuals, guidelines, standard drawings, standard specifications or previously approved special provisions and special specifications to include *HCTRA Standard Specifications for Construction and Maintenance of Highways, Streets and Bridges, the 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, and other TxDOT approved manuals. When design criteria are not identified in TxDOT's manuals, the Engineer shall notify HCTRA and refer to the *American Association of TxDOT Highway and Transportation Officials (AASHTO), A Policy on Geometric Design of Highways and Street, Latest Edition*. All tolling design work will comply with HCTRA's latest guidelines.

The Engineer shall submit and follow their QA/QC Plan and shall resolve or make the revisions to the contract documents during the PS&E reviews (30%, 60%, 95% and final). The Engineer shall provide evidence that all comments provided have been addressed. This evidence will be in the form of a written response (e.g., Excel spreadsheet with comment and response) and, if applicable, corrected plan sheets with indications where comments were addressed.

In general, Engineering design and procedures will follow the usual design practices of HCTRA. The following are general requirements for the Project:

- A. Produce roadway plans (including cross-sections), specifications, and estimates (PS&E) and prepare construction bid documents.
- B. Produce bridge widening design plans including bridge layouts, details and detailed typical sections to be incorporated in the PS&E.
- C. Produce drainage design plans including drainage area maps, roadway inlet and storm sewer calculations, temporary drainage facilities, and SWPPP to be incorporated in the PS&E. Drainage Impact and H&H Analysis and Study to be performed by others. Engineer shall rely upon information provided by PMC/HCTRA for design of drainage infrastructure.
- D. All designs for the Project shall be in accordance with the established PMC CADD Standards.
- E. Furnish computer media and computer graphics files as described herein.
- F. Submit 30%, 60%, 95%, and final PS&E packages for review by the PMC.
- G. Bridge designs and details will be designed to accommodate required clearances associated with widening of the mainlanes, as depicted on the schematic as described in Appendix A-2.
- H. The entrance and exit ramps connecting the frontage roads to the mainlane tollway shall be designed and constructed to provide for a functional, safe transition to the proposed roadway pavement configuration to and from the existing TxDOT frontage roads.
- I. Coordinate contract document preparation with the PMC.

- J. Provide project planning and control to include quality management.
- K. Provide an accurate, complete, and constructible set of contract documents.
- L. HCTRA will have the ultimate authority for determining what constitutes an accurate, complete, and constructible set of contract documents.
- M. If so, directed by HCTRA and/or the PMC, make the revisions to the contract documents, as reported during the design review process.
- N. All plan sheets including Harris County Flood Control District (HCFCD) channels shall indicate the HCFCD unit number and right of way width.
- O. Pedestrian and bicycle improvements to be included in the PS&E Package #2 for those improvements found feasible within the existing ROW. Pedestrian and bicycle improvements inside and outside the existing ROW to be incorporated in the long-term (2045 horizon) schematic (Schematic #2), if authorized, approved, and funded.
- P. Design work will be consistent with the 6 main pillars of the overall program:
 - 1. Safety for the end users and operations,
 - 2. Reliability of the system,
 - 3. Resilience and Sustainability of the assets,
 - 4. Equity and Accessibility of the system,
 - 5. Innovation and Evolution
 - 6. Stewardship and Accountability
- Q. Preparation and submittal of Resiliency and Sustainability Reports and Risk Register with monthly follow up meetings.

(Function Code 102 - Feasibility Studies)

I. DATA COLLECTION

- A. The purpose of this task is to obtain the available data provided in support of the design of the Project.
 - 1. Review the data obtained from the PMC listed above and coordinate with the PMC for additional data requests.
 - 2. Coordinate with the PMC regarding its proposed design and the accommodations for the proposed electronic toll collection system infrastructure design.
 - 3. Review and coordinate System Integrator's design criteria for electronic toll collection system infrastructure design including, but not limited to, loop locations, distance between gantry structures, number and size of conduit

requirements, equipment building requirements, special pavement requirements, electrical and power requirements, etc.

- B. The Engineer shall conduct field reconnaissance of the Project site, noting existing conditions and special design considerations. The Engineer shall photograph the Project site at all points of interest and collect data as necessary to aid in the Design. The Engineer shall make these photos and data available to the PMC.
- C. The data collected shall include the following information (Items “1” to “7” will be obtained from the PMC, if available, while items “8” to “12” will 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. Roadway inventory information, including the number of lanes, speed limits, pavement widths and rating, bridge widths and ratings, and ROW widths
 - 5. Existing and available aerial photos, planimetric mapping, and DTM
 - 6. Environmental Data
 - 7. Previously prepared toll plaza conversion concepts and drainage studies
 - 8. Adopted land use maps and plans as available
 - 9. Federal Emergency Management Agency (FEMA) Flood Boundary Maps and Flood Insurance Studies and Models
 - 10. Public and private utility information
 - 11. Plat research for adjacent properties as available.
 - 12. Local Major Thoroughfare Plan.

II. UTILITY LOCATIONS AND COORDINATION

- A. The Engineer shall coordinate with the PMC and utility companies to address conflicts with the proposed improvements and for all necessary private and public utility connections required for the functionality of the toll locations.
- B. As required, the Engineer shall facilitate in coordination with the PMC, utility conflict identification and resolution.
- C. The Engineer shall identify conflicts that may impact the improvements and provide to the PMC a recommendation for relocation and/or adjustments for such utilities.

The Engineer shall evaluate alternatives in the adjustment of utilities balancing the needs of HCTRA and the Utility. However, the Engineer is not responsible to prepare Utility relocation / adjustment designs.

III. GEOTECHNICAL ENGINEERING

Geotechnical Engineering Services provided in Appendix A-2.

(Function Code 145 – Project Management)

I. PROJECT MANAGEMENT

The purpose of this task is to provide the overall management of the contract. The Engineer will set up Project files, and overall coordination and contact with the Project Team Members (PTM), HCTRA, and the PMC will be maintained.

- A. Provide general coordination with the PTMs and the PMC concerning administrative and technical issues.
- B. Quality Assurance/Quality Control Plan
 - 1. The Engineer shall submit their Quality Assurance / Quality Control (QA/QC) Plan to document the Engineer's quality control program. The Engineer shall conduct Quality Control procedures under respective work tasks and sub-tasks.
 - 2. The Engineer shall submit the QA/QC check print with each PS&E submittal.
- C. Prepare and submit monthly progress reports and invoices to HCTRA through the PMC for review and approval. The invoices will include the progress report, invoice, and schedule, and will be confirmed by the PMC based on in-progress deliverables received. The Engineer's written progress report shall describe activities performed during the reporting period by scope task; activities planned for the following period, problems encountered and actions taken to remedy them, a list of meetings attended, a list of deliverables submitted in the reporting period, a list outstanding issues that need resolution, overall status including a physical percent complete, and a financial percent complete by scope task, and estimated completion dates for the work.
- D. Invoices are to be submitted on a monthly basis. The Engineer will prepare each invoice in the format provided by the PMC. When directed by the PMC and/or HCTRA, the Engineer shall modify the information and/or format. Hard copies of the invoice shall be delivered to the PMC and/or emailed. For contracts with Time and Materials and/or contingency work, certified timesheets shall be submitted with the invoice.
- E. The Engineer will be responsible for internal documentation and administration of the Project files.

- F. The Engineer will provide Bid Phase Services as described in Section II Meetings and Conferences.

II. MEETINGS AND CONFERENCES

- A. Attend Project “kick-off” meeting held by the PMC and HCTRA. The Engineer shall also attend coordination and interim progress review meetings which will be scheduled on an as-needed basis. At a minimum we anticipate monthly progress meetings, and at certain points the meetings may be more frequent due to design progress. Prepare and distribute meeting minutes within five working days after the meeting.
- B. Attend Pre-Bid Conference and assist HCTRA and the PMC in conducting conferences.
- C. Prepare Pre-Bid Conference meeting minutes, including written responses to oral and written inquiries received before and during the conference, within two working days after the conference.
- D. Assist in the preparation of Addenda to interpret, clarify, and amend the Contract Documents.
- E. Prepare a set of Conformed Documents-Contract Drawings and Specifications, revised to incorporate all Addenda changes made during the Bidding Phase.
- F. Prepare the bid tabulation and submit a bid analysis summary to the PMC with recommendations within 3 days of letting.
- G. Assist the PMC and HCTRA in pre-qualifying manufacturers/suppliers for alternative products.

(Function Code 150 – Design Survey)

Design Surveying Services provided in Appendix A-2.

(Function Code 160 – Roadway Design Controls)

I. ROADWAY / SITE PLANS

- A. The Engineer shall prepare the roadway design and develop the final drawings, using the CADD standards as required by the PMC, which will be included in the bid document. The following tasks describe the work to be performed.
- B. Typical section sheets will be developed for all existing and proposed roadways, structures, and tolling locations. Typical section sheets shall include width of travel lanes, shoulders, outer separations, border widths, curb offsets, sidewalks, and

right-of-way (ROW) width. The typical section shall also include profile grade level (PGL), centerline, pavement composition, longitudinal joints, side slopes, mow strips, sodding/seeding limits, concrete traffic barriers (CTB), station limits, common proposed/existing structures including retaining walls, riprap, limits of embankment excavation, etc.

- C. Plan and profile sheets and plan view layouts for each ramp and mainlane location will be prepared to a scale of 1" =100' or as appropriate to depict all elements of the roadway as well as toll plaza area on 11"x17" format sheets.
- D. Pavement Plan for the mainlane approaches and gantry location will be prepared to a scale of 1" =40' or as appropriate to depict all pavement elements within the toll zone area on 11"x17" format sheet.
- E. Pavement details shall depict location of longitudinal and transverse joints.
- F. Plan and Profile Sheets shall include:
 - 1. Calculated roadway centerlines/base.
 - 2. Pavement edges for all improvements.
 - 3. Lane and pavement width dimensions.
 - 4. Proposed structure locations, lengths, and widths.
 - 5. Direction of traffic flow on all roadways. Lane lines and/or arrows indicating the number of lanes shall also be shown.
 - 6. Drawing scale shall be (1" =100').
 - 7. Control of access line, ROW lines and easements, if required and available.
 - 8. Limits of riprap, block sod, and seeding.
 - 9. Existing utilities and structures.
 - 10. Radii callouts, curb location, concrete traffic barrier (CTB), guard fence, crash safety items, as required.
 - 11. Retaining wall callouts.
 - 12. Calculated profile grade including grade, vertical curve data, elevations and "K" values shall be shown as appropriate.
 - 13. Superelevation callouts and tables.
 - 14. Calculated vertical clearances incorporating the appropriate superelevation rate, superstructure depth, and required clearance.

15. The location of interchanges, mainlanes, grade separations and ramps (shall include cross sections of any existing or proposed roadway, structure, or utility crossing).
 16. Culvert cross sections in plan and profile.
 17. Railroad crossings, as applicable.
- G. The Engineer shall provide plan sheets of removal items at a scale of 1" =100'. Removal sheets shall indicate pavement and other pertinent items to be removed with sufficient details.
- H. Miscellaneous roadway detail sheets will be developed for special features that may be needed to define construction items.
- I. The Engineer shall prepare cross-sections using ORD within project limits as well as maintenance parking.
- J. The Engineer shall prepare site grading layouts for mainlane and ramps as well as maintenance areas and building sites.

(Function Code 161 – Drainage Design)

I. DRAINAGE DESIGN

- A. The purpose of this task is to prepare drainage plans and details as necessary for the construction of storm sewer systems and/or bridge deck drains. Drawings prepared by others (H&H Modelers) to be signed and sealed and incorporated into the Engineer plan set.
- B. The drainage calculations should be provided for the direct connectors, mainlanes, ramps and frontage road modifications. At a minimum the drainage items to be provided shall include an overall project drainage area map, detailed drainage area maps showing the final drainage areas and inlet and storm sewer calculations for proposed and revised storm sewer flow elements incorporating Atlas-14 rainfall. All drainage designs shall be prepared in accordance with the findings presented in the project *Drainage Impact Study*.
- C. 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. Specific sources of data collected must include, but are not limited to, the State, County, and Federal Emergency Management Agency (FEMA).

3. Collect available Flood Insurance Rate Maps (FIRMs), Flood Insurance Study (FIS) data, and models.
4. Review survey data and coordinate any additional surveying needs with the PMC.
5. Meet with local government officials to obtain historical flood records. Interview local residents or local government employees to obtain additional high-water information if available. Obtain frequency of road closure and any additional high-water information from the TxDOT Houston District Maintenance office and the PMC.
6. Submit a letter report to the PMC detailing completion of data collection.

II. STORM DRAIN DESIGN

A. The Engineer shall provide the following services:

1. Review previous plans and drainage reports prepared by others which relate to drainage in the project area (to be provided by the PMC).
2. Prepare overall drainage areas and detailed drainage areas for proposed project improvements.
3. Determine proposed peak flows for sub-components of the drainage system (mainlanes, deck drains, and retaining walls).
4. Design drainage features for the mainlanes (as applicable) and Direct Connectors, including open ditch drainage, storm sewers, inlets, deck drains, manholes, and subsurface drainage at retaining walls. Internal drainage piping on structures will not be designed by the Engineer, but the Engineer will coordinate with the bridge designer(s) and provide bridge inlet information.
5. Design and analyze proposed storm sewer systems using the GEOPAK Drainage program and incorporate output into plan set. Intensity-Duration-Frequency (IDF) coefficients for Atlas-14 rainfall data shall be incorporated in the drainage model.
6. Assess the impact of additional impervious cover and in-line detention as mitigation for the increased storm water volumes.
7. Analyze the existing storm sewer systems at the proposed storm sewer systems tie-in to identify downstream capacities and any additional storm sewer improvements.
8. Design and analyze storm sewer conveyance to outfalls from proposed detention ponds.

9. Design and analyze proposed ditches and incorporate results on the storm sewer plan and profile sheets or prepare special profile sheets.
10. Existing drainage elements including, but not limited to, pipes, inlets, manholes, junction boxes, culverts, wingwalls, and headwalls to be removed, plugged, or abandoned in place shall be noted on markups and provided to the Project Team Member (PTM) responsible for preparing removal plans.

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

A. The Engineer shall provide the following services:

1. Prepare the PS&E package in accordance with the applicable requirements of HCTRA's and TxDOT's specifications, standards, and manuals, including the PS&E Preparation Manual. Include the following sheets and documents, as appropriate:
 - a. Drainage Area Maps
 - b. Hydrologic Data Sheets
 - c. Hydraulic Data Sheets
 - d. Scour Data Sheets (if applicable)
 - e. Culvert Layout Sheets
 - f. Storm Drain Plan & Profile Sheets
 - g. Drainage Plan & Profile Sheets including profile grade line of parallel ditches, if applicable
 - h. All other relevant sheets
2. Overall drainage area maps showing overall system drainage boundaries. Drawings will be prepared on 11"x17" sheets with applicable scale to show sufficient details, drainage boundaries, outfalls, and flow patterns.
3. Drainage area maps showing the drainage areas for inlets and deck drains, storm sewers and culverts. The hydrologic data for each drainage area will be provided in a summary table on each individual sheet. Drawings will be prepared on 11"x17" sheets with a 1" =100' scale. For consistency, the PMC will provide a "Go-by" plan set.
4. Hydraulic Data Sheets with the GEOPAK Drainage hydraulic model output will be prepared for each drainage system. The output will provide the peak flow calculations, storm sewer system configuration data (including inlet and storm sewer configuration), and storm sewer hydraulic calculations. For consistency, the PMC will provide a "Go-by" plan set.
5. Storm sewer plan & profile drawings and special plan details for storm sewer systems, laterals, junction boxes, etc. Identify potential utility conflicts during

- project design and add those to the sheets. Drawings will be prepared on 11" X 17" sheet at horizontal scale of 1" =100' and vertical scale of 1" =10'.
6. Detail sheets for required special drainage structures and non-standard drainage structures.
 7. Culvert layouts and Bridge Class Culvert cross sections.
 8. Areas requiring trench protection, excavation, shoring and de-watering.
 9. Plan & profile sheets for storm drain systems and outfall ditches, if applicable.
 10. Standard details from TxDOT's and HCTRA's lists of standards for drainage.
 11. Drainage details for outlet protection, outlet structures and utility accommodation structures.
 12. Identify pipe strength requirements.
 13. Drainage quantity summaries.
 14. Potential utility conflicts and, if feasible, design to mitigate or avoid those identified conflicts.
 15. Consider pedestrian facilities, utility impacts, driveway grades, retaining wall and concrete traffic barrier drainage impacts.
 16. Identify existing ground elevation profiles at the ROW lines on storm sewer plan and profile sheets.
 17. Hydraulic Data Sheets for any bridge or cross drainage structures at the outfall channel and indicate site location (e.g., station and name of creek or bayou), if applicable.
 18. Layouts for the outfall channels and analysis using HEC-RAS within existing ROW, if applicable. Prepare summary tables of the output.

IV. STORM WATER POLLUTION PREVENTION PLANS (SW3P)

- A. The Engineer shall develop SW3P for the project to minimize potential impacts to receiving waterways. The SW3P shall include plan sheets, details, and text describing the methods, quantities, type, phase/stage and locations of erosion/sedimentation control devices and any required permanent erosion control measures.

(Function Code 162 – Signing, Pavement Markings and Signalization)

I. SIGNING, PAVEMENT MARKINGS, AND DELINEATION

This work includes temporary, interim, and permanent signing, pavement markings, and roadway delineation, both within and outside of the section limits, as required.

- A. Signing.

1. The Engineer shall prepare drawings, specifications, and details for all signs. The Engineer shall coordinate with the PMC (and other Engineers as required) for overall temporary, interim, and final signing strategies and placement of signs outside contract limits. Sign detail sheets shall be prepared for large guide signs showing dimensions, lettering, shields, borders, corner radii, etc., and shall provide a summary of large and small signs. The Engineer shall also designate the shields to be attached to guide signs. The proposed signs shall be illustrated and numbered on plan sheets. Sign foundation shall be selected from TxDOT and HCTRA Standards. Sign poles, attachments, and details shall be designed per the Green Ribbon Report's recommendations and standards, unless directed otherwise by the PMC.

B. Pavement Markings

1. The Engineer shall detail permanent and interim pavement markings and channelization devices on plan sheets. The Engineer shall coordinate with the PMC (and other Engineers as required) for overall temporary, interim, and final pavement marking strategies. Pavement markings shall be selected from the latest TxDOT and HCTRA standards.

C. Plan Sheets. The Engineer shall provide the following information on signing / pavement marking layouts in 1" =100' scale:

1. Roadway layout.
2. Center line with station numbering.
3. ROW lines.
4. Designation of arrow used on exit direction signs.
5. Delineators at culverts.
6. Location of utilities.
7. Existing signs to remain, to be removed, or to be relocated.
8. Proposed signs (illustrated and numbered).
9. Existing overhead sign bridges to remain, to be revised, removed, or relocated.
10. Proposed overhead sign bridges, indicating location by plan.
11. Proposed markings (illustrated and quantified) which include pavement markings, object markings and delineation.
12. Quantities of existing pavement markings to be removed.
13. Proposed delineators and object markers.

14. The location of interchanges, mainlanes, grade separations, frontage roads and ramps.
 15. The number of lanes in each section of proposed highway and the location of changes in numbers of lanes.
 16. ROW limits
 17. Direction of traffic flow on all roadways.
- D. The Engineer shall prepare drawings, specifications, and details for all signs. The Engineer shall coordinate with the PMC for overall temporary, interim and final signing strategies and placement of signs within contract limits. The Engineer shall:
1. 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.
 2. Prepare Large Sign Structure Elevation Sheets
 3. Designate the shields to be attached to guide signs.
 4. Illustrate and number the proposed signs on plan sheets.
 5. Select each sign foundation from State Standards.
 6. The ENGINEER shall provide the following information in the Signing Plans:
 - a. Summary of Quantities
 - 1) Small signs tabulation
 - 2) Large signs tabulation including all guide signs
 - b. Sign Detail Sheets
 - 1) All signs except route markers
 - 2) Design details for large guide signs
 - 3) Dimensioning (letters, shields, borders, etc.)
 - 4) Designation of shields attached to guide signs

(Function Code 163 – Miscellaneous)**I. TRAFFIC CONTROL PLANS**

The Engineer shall provide construction phasing design. The design shall consist of developing the plans, specifications and estimates for the Traffic Control Plan (TCP).

A. General.

1. The TCP shall show the construction sequence and phases with barricades, signing, striping, delineation, detours, temporary drainage, and any other devices used for control of traffic during construction. The TCP shall be based on the latest Texas Department of Transportation (TxDOT) and Texas Manual on Uniform Traffic Control Devices (TMUTCD) manuals and standards. Prepare TCP typical sections for each stage of the construction sequence to delineate the position of the existing traffic with respect to the proposed construction. Prepare traffic control based on the sequence of construction narrative describing the phasing of construction and traffic maintenance during construction. The sequence of construction and construction narrative will be developed by the TCP/Tolling Impact corridor consultant. Incorporate recommendations from the TCP/Tolling Impact corridor consultant in the TCP, as directed by the PMC. Provide general notes and bid items for the respective design.
2. 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 PMC and HCTRA in the event existing access must be eliminated and must receive approval from HCTRA prior to any elimination of existing access.
3. 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.
4. Prepare each TCP in coordination with the PMC and HCTRA. 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.
5. Maintain continuous access to abutting properties during all phases of the TCP.
6. 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 PMC and HCTRA in writing of the need and justification for such action. The Engineer shall identify and coordinate with all utility companies for relocations required.

7. 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.
8. Delineate areas of wetlands on traffic control plans.
9. The traffic control plan shall be to a scale of 1" = 100' or as appropriate and as approved by the PMC.

II. RETAINING WALL LAYOUTS

A. The Engineer shall provide retaining wall layouts, if necessary, to include the following:

1. Plan View.
 - a. Beginning and ending wall points by station, offset, and roadway alignment and total length of wall.
 - b. Additional points as necessary to describe the relationship of wall alignment to roadway alignment(s).
 - c. Typical section showing retaining wall control point.
 - d. Indicate which side is the "Face of Wall".
 - e. Horizontal curve information, if applicable for wall alignment.
 - f. Location of soil borings.
 - g. Drainage, signing, lighting, etc. that is mounted on or passing through wall.
 - h. Subsurface drainage structures or utilities which could be impacted by wall construction.
 - i. Total length of wall.
 - j. Retaining wall quantity tables.
2. Elevation View.
 - a. Existing ground line along wall alignment.
 - b. Finished grade line at face of wall.
 - c. Top of retaining wall grade line.
 - d. Soil boring information shown at the correct elevation and scale.
 - e. Drainage, signing, lighting, etc. as noted above.
 - f. Drainage structures and utilities as noted above.

- g. Limits of additional soil/subgrade improvement and temporary shoring, if needed, as recommended in the geotechnical investigation.
 - h. Vertical limits of measurement for pavement
 - i. Underdrains, as applicable, and underdrain outfall locations.
- 3. Section View
 - a. Reinforced volume
 - b. Underdrain location
 - c. Soil improvements, if applicable

III. TRAFFIC SIGNALS (NOT PART OF THE INITIAL WORK AUTHORIZATION)

- A. If authorized, approved, and funded, the Engineer shall identify and prepare traffic signal plans/improvements to include pedestrian facilities and intersection pavement markings for the locations impacted by the Project improvements.
- B. The Engineer shall prepare the Traffic Signal layouts at a scale of 1" = 40' and develop all quantities, general notes, specifications, and incorporate all appropriate standards. The Engineer shall prepare design for the following locations:
 - 1. South Gessner Drive
 - 2. US 90A
 - 3. Fondren Road
 - 4. Hillcroft Avenue
 - 5. Rockwell Boulevard
 - 6. West Fuqua Street
 - 7. South Post Oak Road
 - 8. Antioch Drive
 - 9. South Alameda Road
 - 10. Kirby Drive
- C. The Engineer shall be responsible for coordinating with the agency responsible for maintaining and operating the traffic signal. The plans shall be prepared in according to the agency design guidelines. At a minimum the Engineer shall prepare plan sheets, which are to include:
 - 1. Estimate and quantity sheet
 - a. List of all bid items

- b. Bid item quantities
 - c. Specification item number
 - d. Paid item description and unit of measure
2. General notes and specification data.
3. Condition diagram
 - a. Highway and intersection design features
 - b. Roadside development
 - c. Traffic control including illumination
4. Plan sheet(s)
 - a. Existing traffic control that will remain (signs and markings)
 - b. Existing utilities
 - c. Proposed highway improvements
 - d. Proposed pedestrian facilities
 - e. Proposed intersection pavement marking layouts
 - f. Proposed installation
 - g. Proposed additional traffic controls
 - h. Proposed illumination attached to signal poles.
 - i. Proposed power pole source
5. Notes for plan layout
6. Low and High Voltage diagrams, as applicable
7. Phase sequence diagram(s)
 - a. Signal locations
 - b. Signal indications
 - c. Phase diagram
 - d. Signal sequence table
 - e. Flashing operation (normal and emergency)
 - f. Preemption operation (when applicable)
 - g. Contact responsible Agency to obtain interval timing, cycle length and offset
8. Construction detail sheets(s)
 - a. Poles
 - b. Detectors
 - c. Pull Box and conduit layout

- d. Vehicle and signal head schedule
 - e. Sign Schedule
 - f. Controller Foundation standard sheet
 - g. Electrical chart (Conduit and Conductor Electrical Schedule)
 - h. Marking details (when applicable)
 - i. Aerial or underground interconnect details (when applicable)
- D. The Engineer shall prepare traffic signal improvement plans, proposed signal, proposed pedestrian facilities, intersection pavement markings, and sign details to support the roadway widening. Signal poles, signals, foundations, and appurtenances shall be based on City of Houston, TxDOT, and/or HCTRA standards.
- E. The Engineer shall calculate quantities for all items related to the traffic signal improvements.
- F. The Engineer shall review the proposed roadway plans for conflicts and coordinate the removal of conflicts with the PMC.
- G. The Engineer shall verify that all proposed traffic signal work meets the requirements of ADA and the National Electrical Code (NEC).

IV. ILLUMINATION

- A. The Engineer shall refer to TxDOT's *Highway Illumination Manual* and other deemed necessary TxDOT approved manuals for design of continuous lighting and safety lighting for all conventional, high-mast, and underpass lighting, as applicable. The Engineer shall include safety lighting as part of each design on each flashing beacon and traffic signal. The Engineer shall provide a preliminary layout for initial review and approval by the PMC and HCTRA. 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 PMC to determine the location of proposed high-mast, conventional, and underpass lighting.
- B. The Engineer shall design roadway lighting over the toll lanes at the proposed mainlane toll gantries and ramp toll plazas.
- C. The design services for Illumination are limited to the relocation of existing facility impacted by PS&E 2 AET Configuration.

V. TOLLING

- A. The Engineer shall provide plans, specifications, quantities and estimate for plan layouts of the electronic toll collection (ETC), communication, and electrical system. The Engineer shall coordinate with the PMC for the toll collection design criteria and requirements prior to preparing the ETC Sub-System. The Engineer shall begin the Tolling Design once the gantry structure locations and appurtenances (i.e., Equipment Building, columns, etc.) have been finalized and CADD files provided to the Engineer.
- B. The Engineer shall prepare the ETC System design and develop the final drawings using the CADD standards as required by the PMC. The drawing and specification packages shall include all ETC Systems, communications, and electrical systems required to construct the Project. The deliverables will include electronic copies that shall include the following elements for each Mainlane Toll Gantry, Mainlane Toll Plaza, and Ramp Toll Plaza:
 - C. Communication and Tolling (CT Sheets)
 - 1. Development of CTMS base files
 - 2. Provide conduit alignment (plan view only) drawings for the segments of CTMS fiber optic cable trunk lines.
 - a. Provide plan view layouts of CCTV for the entire segment providing continuity of camera coverage. Camera locations to be provided by the PMC.
 - 3. Provide fiber, electrical, and CTMS HUB Building layouts for the new and relocated camera poles, cameras, Dynamic Message Sign (DMS), and associated conduit on plan sheets.
 - 4. Provide DMS and CCTV camera foundation and elevation layout.
 - 5. Provide loop and conduit layouts for each proposed Mainlane Toll Gantry / Plaza and Ramp Toll Gantry.
 - 6. Provide conduit stub-up plans.
 - 7. Provide overhead conduit details.
 - 8. Provide toll equipment layouts.
 - 9. Provide fiber optic cable layouts (plan view only) for fiber connectivity to the proposed Mainlane Toll Gantry / Plaza and Ramp Toll Gantry.

10. Provide fiber optic cable construction sequence, schematics, and splice diagrams for fiber connectivity to the proposed Mainlane Toll Gantry / Plaza and Ramp Toll Gantry, DMS, and CCTV cameras, as applicable.
11. Coordinate with the PMC on the electrical and toll equipment requirements for the equipment building and toll equipment structures.
12. Miscellaneous Standards Details – Electronic Toll Collection System and ITS Installation Details

D. Structural- (S Sheets)

1. Provide DMS and CCTV camera foundation and elevation layout.
2. Provide Mainlane Toll Gantry foundation layouts. Ramp Toll Plaza structural layouts limited to full depth repair of pavement.

E. Electrical- (E Sheets)

1. Coordinate with utility owners for power and point of service locations.
2. Mainlane Toll Plaza electrical modification layouts and details.
3. Mainlane Toll Gantry / Plaza and Ramp Toll Gantry electrical site, power, and conduit plan.
4. DMS and CCTV camera electrical site, power, and conduit plan.
5. Point-of-service electrical riser diagrams.
6. Mainlane Toll Gantry / Plaza and Ramp Toll Gantry prefabricated equipment building lighting (exterior and interior)
7. Coordinate the location of the tolling and electrical equipment to include the generator equipment (transfer switch, etc.) within the Equipment Buildings and confirm the design meets the local building codes, ordinances, and NEC requirements.
8. Equipment building power, lighting, and conduit plan.
9. Coordinate selection of lighting fixtures and illumination levels with PMC.
10. Light fixture schedule
11. Design roadway lighting over the toll lanes at the proposed Mainlane Toll Gantry / Plaza and Ramp Toll Gantry.
12. Lightning and grounding plans and details

- 13. Electrical panel schedules and lighting control diagram.
- 14. Electrical load analysis.
- 15. Specifications for electrical equipment at building.
- 16. Access control security plan and details.
- 17. Electrical details

VI. GENERAL NOTES, SPECIFICATIONS AND STANDARD DRAWINGS

- A. The Engineer shall prepare General Notes, for inclusion in the plans and bidding documents. The PMC will provide base General Notes for editing by the Engineer. The general notes will be edited using track changes to address Project specific issues and requirements.
- B. The Engineer shall identify necessary Standard Specifications and the appropriate reference items. HCTRA Specifications will be provided by the PMC for use on the Project by the Engineer.
- C. Special specifications will be included, if necessary, for non-standard items or procedures included in this Project.
- D. General notes, specification data and plans estimate will be prepared in accordance with HCTRA's requirements.
- E. Standard TxDOT/HCTRA drawings applicable to the Project, will be selected, and any title blocks completed that might be required.
- F. The Engineer shall provide the General Notes and Specifications in Microsoft Word format with track changes.

VII. QUANTITY TAKE-OFFS AND SUMMARY SHEETS

- A. Quantities will be determined and included on summary sheets. The quantities will be included in tables and organized according to the bid item codes that will be used for construction. The PMC will provide a "Go-By" of the quantity tables.

VIII. CONSTRUCTION COST ESTIMATE

- A. An estimate of the construction costs will be prepared with quantities in standard HCTRA unit bid format at each of the PS&E reviews (30%, 60%, 95% and final). All estimates will use HCTRA's and TxDOT's historical price data for similar projects.

- B. The Engineer shall estimate the construction cost for its responsible plans and include cost information provided from other Project team members.
- C. The Engineer shall provide a Contract Time Determination (CTD), similar to that required by TxDOT, to identify a total number of working days and a calendar showing commencement and completion of construction.

IX. MISCELLANEOUS DRAWINGS

- A. Title Sheet - include a vicinity map of the Project limits, Project title and signature blocks.
- B. Index Sheet(s) - List the sheets and standard drawings to be used on this Project. All the sheets in the plan set will be numbered continuously including standard drawings.
- C. Project Layout Sheets – Prepare a small-scale plan view plot (1" = 200', double stacked) of the Project showing/summarizing the alignment data, horizontal control, and the vertical control. Benchmark and bore-hole locations will be provided by others for incorporation onto the layouts.
- D. Express Review Sheets – Provide and/or review completed Harris County Express Review Sheet as applicable.

X. PREPARATION OF PS&E

The drawing and specification packages shall include civil, electrical, mechanical, structural, plumbing, architectural, communication infrastructure, and appurtenances (as applicable) required to construct the Project. The deliverables for the PS&E design packages will include electronic design drawings in PDF format and technical specifications, and are detailed as follows:

- A. Preparation of quantities and construction cost estimates for the Project.
- B. Preparation of General Notes and Specification Data Sheets.
- C. The Engineer shall assemble and provide contract documents into the milestone submittals for interim progress reviews by the PMC and HCTRA including each of the PS&E reviews (30%, 60%, 95% and final) as summarized below:
 - 1. Draft and final copies of roll plots and/or 11"x17" sheets as determined by the PMC and HCTRA.
 - 2. The 30% and 60% submittals shall include legible 11"x17" construction drawings in a PDF format. The Engineer shall organize all PDF's from the PTMs' into a comprehensive reproducible package. Also include, applicable

standard drawings shown on the index of sheets, a listing of “Governing Specifications and Special Provisions” and a construction cost estimate.

3. The 90% submittal shall include legible 11”x17” construction drawings in a PDF format. The Engineer shall organize all PDF’s from the PTMs’ into a comprehensive reproducible package. Also include all 60% submittal comments addressed, all applicable standard drawings shown on the index of sheets, a complete set of Engineer-prepared Special Specifications, Special Provisions and Reference Specifications, a listing of “Governing Specifications and Special Provisions”, an edited “Bid Proposal Form” and a construction cost estimate as a PDF.
 4. The final review submittal shall include legible 11”x17” construction drawings in a PDF format. The Engineer will organize all PDF’s from the PTMs’ into a comprehensive reproducible package. Also include all 95% submittal comments addressed, all applicable standard drawings shown on the index of sheets, a complete set of Engineer-prepared Special Specifications, Special Provisions and Reference Specifications, a listing of “Governing Specifications and Special Provisions”, an edited “Bid Proposal Form” a construction cost estimate as a PDF.
 5. When requested provide five (5) sets of 11” x 17” drawings and/or roll plots for review to the PMC for each submittal.
- D. Upon award of construction contract, provide electronic files of the conformed set of the Contract Drawings (with addenda from Bidding process) in the latest MicroStation format approved by the PMC, and the Specifications in Microsoft Word to the PMC and HCTRA.

(Function Code 170 – Bridge Design)

Prepare final bridge design plans and detailing, if necessary for up to 1 bridge widening (Kirby Drive) WB for the mainlanes of the Sam Houston Tollway. If additional bridge widening required, a separate supplemental to be authorized, approved, and funded prior to beginning work.

I. PREPARATION OF BRIDGE LAYOUTS

A. Bridge Layouts.

1. The Engineer shall prepare bridge layouts at a scale of 1” = 40 feet. The scale for the plan view shall be the same for the elevation view. The bridge layouts will include beginning and ending stations, stations of bridge joints, offset data, curve data, cross slope, bridge deck drains, span lengths, approach slab dimensions, total bridge length, bridge dimensions, and soil core hole locations. The bridge layouts shall be prepared in accordance with the Texas Department of Transportation (TxDOT) Bridge Division Manuals.

2. The Engineer shall evaluate and prepare bridge typical sections showing existing and proposed sections.

B. Bridge Elevations.

1. The Engineer shall prepare bridge elevations at a scale of 1"=40 feet. The elevation view will include beginning and ending stations, existing and proposed ground line, height of bents, bent dimensions, top of footing and bridge elevations, and soil core hole data. The bridge elevations shall be in accordance with TxDOT's Bridge Division Manuals.

II. BRIDGE STRUCTURAL DETAILS

- A. The Engineer shall prepare each structural design and develop detailed structural drawings of all required details in compliance with the latest edition of TxDOT's Bridge Design Manual - LFRD, Bridge Project Development Manual, Bridge Detailing Manual, Bridge Railing Manual, and AASHTO LRFD Bridge Design Specifications.

B. Additionally, the Engineer shall perform the following tasks:

1. Perform calculations for design of bridge abutments.
2. Perform calculations for bridge slab design.
3. Perform calculations to determine elevations of bridge substructure and super structure elements.
4. Perform calculations for bridge beam design.
5. Prepare necessary foundation details and plan sheets.
6. Prepare plan sheets for abutment design.
7. Prepare plan sheets for additional abutment detail.
8. Prepare framing plan and slab plan sheets.
9. Prepare typical sections.
10. Compute and prepare tables for slab and bearing seat elevations, dead load deflections, etc.
11. Design beams and prepare beam design tables.
12. Prepare Bridge Summary Sheet.

III. FOUNDATION DESIGN

- A. The Engineer shall provide all structural foundation design and details.

IV. BRIDGE QUANTITIES SUMMARY

- A. Quantities for each bridge will be provided. These quantities will be incorporated onto summary sheets to be included in the plan set as part of the individual bridge plans.

(Function Code ARC and Str) – Bridge Design)

I. ARCHITECTURAL AND STRUCTURAL DESIGN

- A. The architectural and structural scope is as follows:
 - 1. Architectural Design will be provided by HCTRA through the PMC.
 - 2. Structural Design
 - a. Provide review of the truss design that will be used at the MLTP locations. This design will cross one direction of traffic and is being design by others. The review shall be limited to adoptability of proposed structure and not for structural integrity of such.
 - b. Review and evaluate the column and foundation details corresponding to the selected option for preparation of foundation design only.
 - c. The gantry design will require the following analysis / design for the recommended alternative:
 - i. Analyze the selected/recommended alternative for each MLTP and provide comments.
 - d. Detailed Design Drawings by others may include:
 - i. Base Plans for referencing background from the design survey.
 - ii. Overall Structural Plan and Elevation.
 - iii. Structural details for the architectural cladding, solar panels, and tolling equipment's support and connection to the toll gantry for adaptation.

(Function Code 200 – Reporting)**I. RESILIENCY AND SUSTAINABILITY (R&S) REPORTING**

- A. The Engineer will participate in the Envision Verification process currently pursued by HCTRA. The Engineer is to actively look for sustainable design elements and innovative ideas for the AET. There will be a kickoff/training meeting to discuss the concepts and goals of the process, and the Engineer will document their work towards these goals and be prepared to meet with PMC staff once per month to discuss progress of these design elements and ideas.
- B. The Engineer will review operations and work products and provide information towards developing and updating the Resiliency and Sustainability Report monthly in conjunction with PMC staff.

II. RISK REGISTER CREATION, MAINTENANCE AND REPORTING

- A. The Risk Register is a tracking of various design and implementation issues encountered in the development of the PS&E. The Engineer shall create and maintain a Risk Register specific to the section. The format of the register shall be as prescribed by the PMC.
- B. The Risk Register shall be updated at least once a month to reflect the current status of the risks identified.
- C. Workshops shall be conducted at least once a month with the required participants, to update the register.
- D. Any changes to the register, in terms of new risk events or change in risk scores, shall be clearly identified and reported as part of the monthly report.

III. SCHEDULE AND SCHEDULE UPDATES REPORTING

- A. The Engineer shall prepare an overall Project schedule detailing the progression of the work. This schedule will include review dates by HCTRA and the PMC, submittal dates for deliverables, and an estimated time frame to complete the work. Changes or adjustments in the schedule caused by delays in tasks or reviews will be discussed by the PMC with HCTRA.
- B. The Engineer shall maintain this detailed schedule of design activities in Primavera P6 format.
- C. The activity coding shall follow the WBS structure prescribed by the PMC. Appropriate milestones for design delivery shall be maintained.
- D. A baseline schedule shall be created and submitted for approval. The subsequent progress schedules shall be updated monthly and any updates shall

be reported against the baseline. Any variance from the baseline shall be accompanied with an explanation in the monthly report along with a recovery schedule. Changes to the schedule, including changes in logic and addition or deletion of activities, shall be clearly identified as part of the monthly update/submission.

- E. The baseline schedules and subsequent updates shall be submitted to the PMC as part of the Engineer's monthly report in PDF format (11x17) and also as a file in its P6 native format (.XER).
- F. Schedules shall be cost loaded to allow the PMC to generate cash flow curves for the Program.

ADDITIONAL SERVICES INCLUDE:

(Function Code 300 – Construction Phase Services)

I. CONSTRUCTION PHASE SERVICES

- A. Construction Phase Services include review of shop drawings, provide responses to contractor's RFIs, attend meetings, and perform site visits as required by the PMC. This effort will be compensated on a specified rate basis. A supplemental work authorization will be developed at the Final design completion level to establish a budget for these services.

APPENDIX A-2

SCOPE OF SERVICES

Design Services in Support of Conversion to All Electronic Tolling for the Sam Houston Tollway SEGMENT 4 – SAM SOUTHWEST

PROJECT: Schematic Development for the Sam Houston Tollway SEGMENT 4 – SAM SOUTHWEST

LIMITS: From Approximately 0.7 Miles east of IH 69 to 0.7 miles west of SH 288

GENERAL DESCRIPTION

The work to be performed by the Engineer shall involve the development of conceptual schematic layouts for recommended improvements for the above referenced project. The Engineer shall also provide geotechnical engineering, surveying, and Subsurface Utility Engineering (SUE) services to support the engineering design services described in Appendix A-1 and to support the development of the conceptual schematic design described herein.

Schematic Design 1: Convert Sam Southwest Toll Plaza to Ultimate AET Configuration and widen Sam Houston Tollway mainlanes.

- A. The Engineer shall prepare a conceptual schematic design for the ultimate AET configuration of toll gantries and tolled main lanes at the Southwest Toll Plaza. The ultimate toll plaza configuration is assumed to consist of two (2) spans of tolling equipment, one over each of the EB and WB mainlanes, to be located in the vicinity of the existing toll plaza. HCTRA and the PMC will provide the aesthetic and design concepts for the ultimate toll plaza configuration.
- B. The conceptual schematic design will also provide for widening the SHTR to provide five (5) main lanes (or auxiliary lanes), full-width inside and outside shoulders in each direction (EB and WB), and a WB entrance ramp west of SH 288. Limits of the EB widening will be from east of the Almeda Overpass to west of the Kirby Drive Overpass. Limits of the WB widening will be from SH 288 DC to east of the Almeda Overpass.
- C. Widening of the mainlanes will require widening of at grade pavement section, overpass bridges, retaining walls, and modifications to illumination, ITS and parallel fiber duct bank, and tolling systems as well as other improvements. All improvements are to be inside the existing TxDOT right-of-way (ROW) as the project will not include any ROW acquisition.
- D. The schematic will also address pedestrian and bicycle improvements as a Shared Use Path needed between the frontage road and the existing TxDOT ROW. This

task shall be limited to provide connectivity and bicycle/pedestrian facility improvements and not intended to cover entire segment length.

- E. The conceptual schematic design will represent an approximate 30% design and is expected to be complete approximately three (3) months after submittal of PS&E Package 1.

Schematic Design 2: Ultimate Configuration of SHTR

- A. If authorized, approved, and funded by HCTRA, the Engineer shall prepare a schematic design for ultimate configuration of tolled mainlanes, ramps, frontage roads, intersections, and bicycle and pedestrian improvements. Ultimate configuration of the facility corridor will be developed to provide AET operations and "B" level of service improvements for 2045 year estimated traffic volumes. Improvements developed in Schematic Design 2 may require acquisition of right-of-way (ROW).
- B. Schematic Design 2 is expected to be complete prior to the end of 2023.

GENERAL REQUIREMENTS

Program Management Consultant (PMC) HCTRA has designated Entech Civil Engineers, Inc. (ECE) as its Program Management Consultant (PMC). ECE shall be the prime point of contact for the Engineer. In general, Engineering design and procedures will follow the usual design practices of HCTRA.

The Engineer shall prepare all work in accordance with the latest version of applicable HCTRA and/or TxDOT procedures, specifications, manuals, guidelines, standard drawings, standard specifications or previously approved special provisions and special specifications to include *HCTRA Standard Specifications for Construction and Maintenance of Highways, Streets and Bridges*, the *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*, and other TxDOT approved manuals. When design criteria are not identified in TxDOT's manuals, the Engineer shall notify HCTRA and refer to the *American Association of State Highway and Transportation Officials (AASHTO)*, *A Policy on Geometric Design of Highways and Street, Latest Edition*. All tolling design work will comply with HCTRA's latest guidelines. In general, and except as may be modified herein or directed by the Harris County Toll Road Authority (HCTRA), engineering design and procedures will follow the usual practices of the Texas Department of Transportation (TxDOT) and will conform to HCTRA's policies and procedures.

The Engineer shall submit their QA/QC Plan for the Project and shall resolve or make the revisions to the contract documents during the schematic refinement milestone reviews. The Engineer shall provide evidence that all comments provided have been addressed. This evidence will be in the form of a written response (e.g., Excel spreadsheet with comment and response) and, if applicable, corrected plan sheets with indications where

comments were addressed.

The following are general requirements for the Project:

- A. The work will consist of data collection and analysis, development of geometric alternatives and utility investigation.
- B. The Engineer shall complete the services described herein in accordance with the milestone schedule established for the Project which includes the engineering services described in Appendix A-1.
- C. The Engineer shall assemble and provide contract documents into the milestone submittals for interim progress reviews by the PMC and HCTRA including each of the schematic submittal reviews.
- D. The Engineer shall direct and coordinate the various elements and activities associated with developing the detailed schematic.
- E. The Engineer shall prepare the project schedule indicating tasks, critical dates, milestones, deliverables and HCTRA review requirements. The schedule will depict the order of the various tasks, milestones, and deliverables.
- F. The Engineer shall provide ongoing quality assurance and quality control to ensure completeness of product and compliance with HCTRA procedures.
- G. The Engineer shall prepare and submit to HCTRA, monthly invoices to be accompanied with written Progress Reports.

SERVICES TO BE PROVIDED BY HCTRA THROUGH THE PMC

The PMC shall provide the following items, if available, to the Engineer.

- A. Copies of as-built or existing plans for the roadway, toll plaza, etc.
- B. Contact information for each Project consultant.
- C. Latest version of TxDOT Project Specifications Book (Standard Specifications for Construction and Maintenance of Highways, Streets and Bridges).
- D. The latest version of electronic MicroStation V8i files for each of the above-mentioned plans, including topographic mapping, proposed planimetrics, profiles, drainage, signing and markings, traffic control plans, cross-sections, and utilities.
- E. All available survey information including survey control information, mapping, point files, and field notes.

- F. All available geotechnical information and reports.
- G. Traffic information, including number and width of toll lanes for each toll location.
- H. Toll Gantry design (all elements) except foundation to be design by the Engineer.
- I. Tolling equipment layout with load and cable requirements
- J. Toll system Integrator's design criteria and requirements.
- K. Existing and proposed traffic volumes.
- L. Stormwater Modeling and/or Drainage Report applicable to project limits (as needed).
- M. HCTRA All Electronic Tolling (AET) Design Guidelines and Criteria
- N. HCTRA CADD Standards
- O. AET CADD Manual

SERVICES TO BE PROVIDED BY THE ENGINEER

SCOPE OF SERVICES

The Engineer shall prepare a conceptual schematic design to convert the Sam Southwest Toll Plaza to Ultimate AET Configuration, add Collector Distributor lanes, ramp reversals, and pedestrian and bike improvements within the existing right of way. If approved and funded by HCTRA, the Engineer shall prepare a schematic design for ultimate configuration of tolled mainlanes, ramps, frontage roads, intersections, and bicycle and pedestrian improvements. Ultimate configuration of the facility corridor will be developed to provide AET operations and "B" level of service improvements for 2045 year estimated traffic volumes. The Engineer shall also provide engineering design services required to support the scope of services described in Appendix A-1 and herein. The engineering work under this contract is detailed below.

(Function Code 102 - Feasibility Studies)

I. DATA COLLECTION

- A. The purpose of this task is to obtain the available data provided in support of the design of the Project.
 - 1. The Engineer shall collect, review, and evaluate data for schematic development. The data may include but not limited to aerial photos and planimetric, as-built plans, existing utilities, previous schematics, right-of-way maps, existing aerial planimetric mapping, existing traffic counts, accident data,

FEMA studies and models, current unit bid price information, and standard drawings.

2. The Engineer shall have discussions/meet with all government transportation planning agencies such as TxDOT, Harris County Transportation and Planning, City of Houston Transportation and Drainage, as well as, adjacent land development planners that may have current and future street projects in the area that may impact the conclusions of this study. The Engineer shall notify HCTRA in writing whenever the Engineer finds disagreement with the information or documents collected.
- B. Using collected data and base maps, the Engineer shall develop overall analyses of the existing conditions to develop the various schematic designs. The analyses shall include, but not be limited to the following:
1. ROW determination
 2. Horizontal alignment
 3. Vertical alignment
 4. Pavement cross slopes and pavement type
 5. Intersection design and analysis, including traffic signalization
 6. Sight distance
 7. Large Guide Signs and Roadside signing
 8. Level-of-service
 9. Locations of critical constraints
 10. Construction of projects along the corridor for proper tie in
- C. The Engineer shall conduct an initial Kick-Off Meeting to establish and agree on fundamental aspects and concepts and to establish the basic features and design criteria for the project.
- D. The Engineer shall develop, review, and update preliminary cost estimates for the alternatives and the recommended schematic using preliminary cost basis.
- E. During the schematic alternative analyses and upon request by HCTRA, the Engineer shall provide up to three (3) alternatives. The purpose of the alternatives shall be to improve safety, decrease congestion/improve traffic operations and improve access to the adjacent communities.

- F. The Engineer shall prepare a technical memorandum to make a recommendation of the preferred alternative. The report includes geometric layouts, preliminary construction cost estimates, traffic analyses, tolling impacts, and benefits/disadvantages for the various alternatives identified.
- G. Existing and projected traffic data will be provided by HCTRA. The Engineer shall coordinate with HCTRA and other consultants providing traffic analysis services for operational and safety analysis of all alternatives. The results of these analyses shall be considered by the Engineer in identifying recommended improvements.
- H. The Engineer shall prepare a report to summarize the design criteria, existing condition analysis, field observation report, concept development and comparison, traffic analysis, drainage, preliminary cost estimate and basis of estimate, construction sequence description, pavement design, and utility conflict summary.
- I. A detailed construction sequence plan for this work is not necessary at this stage of this project; such work will be included in any selected design and future construction project. The Engineer shall consider the requirements for construction staging and traffic control throughout the development of schematic designs to ensure that the proposed design can be constructed.
- J. The Engineer shall identify design exceptions and waivers and shall document the necessity for each design exception or waiver for approval. The Engineer shall perform all necessary design, cost estimates, and crash analysis and predictability to justify each design exception. The Engineer shall perform any additional changes, updates, or modifications to draft design exception requests until final design exception approval is achieved.

II. SCHEMATIC CONCEPT DEVELOPMENT

The Engineer shall prepare preliminary schematic layouts for the proposed improvements. Preliminary schematics will include proposed alignments and typical sections (existing and proposed). Additional elements to be shown include toll gantry locations and ramp relocations as needed.

A. Develop Base Maps

The base maps to be used for the analysis and proposed concepts layout shall be developed by the Engineer from existing construction and right of way (ROW) plans as available. The Engineer shall re-establish the existing centerline horizontal alignments for all roadways, identify existing ROW, existing easements, property owners and the approximate location of major utilities based on a SUE, if applicable in the preparation of base maps.

B. Planimetrics and Aerial Mapping

Planimetrics, Digital Terrain Modeling (DTM), and aerial photographs will be furnished to the Engineer by the PMC, if available.

C. Analyze Existing Conditions

Using collected data and base maps, the Engineer shall develop an overall analysis of the existing conditions to develop the schematic design. The analysis shall include, but not be limited to the following:

1. Existing geometric features, ROW width, and typical sections
2. Existing ROW
3. Horizontal alignment
4. Vertical alignment
5. Identify existing design deficiencies
6. Existing vertical clearances at overpasses
7. Adequacy of intersection radii
8. Ramp weaving distances
9. Sight distance
10. Locations of critical constraints
11. Existing vertical clearances at Railroad (RR) locations
12. Construction of projects along the corridor for proper tie in
13. Review and analyze BRINSAP report
14. Review and analyze proposed projects along SHTR / Beltway 8.
15. Pavement Cross Slopes and pavement type

D. Concept Layouts

The Engineer shall identify and analyze design alternatives to optimize traffic operations and provide toll collection compatible with HCTRA's AET requirements. Alternatives may include but are not limited to ramp relocation, ramp reversals, addition of auxiliary lanes to mainlanes and/or frontage roads, and improvements to intersections. The Engineer shall consider 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 geometry
4. Cross Sections
5. Bicycle and Pedestrian design
6. Drainage and Hydraulic design
7. Stopping Sight distance
8. Level-of-service
9. Construction, ROW, easement, and utility costs
10. Construction sequencing
11. Traffic control during construction
12. Roadside safety appurtenances
13. Large guide signage
14. Environmental mitigation (For example: Storm Water Best Management Practices (BMP's), etc.)
15. Bridge Layouts and Clearance
16. Accommodation of ultimate corridor configuration.
17. Avoidance of utility lines, if feasible.
18. Impact of construction delays due to utility relocation delays.
19. Location of gantries, ITS, solar panels, and tolling equipment.

E. Roadway Design Criteria

The Engineer shall review the roadway design criteria provided by the PMC and based on the TxDOT Roadway Design Manual and American Association of State Highway and Transportation Officials (AASHTO) Policy on Geometric Design of Highways and Streets guidelines and shall apply the criteria to all elements of design. The Engineer may recommend updates or revisions to the criteria where appropriate.

F. ROW / Property Base Map

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

G. Typical Sections

The Engineer shall 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.

H. Bicycle and Pedestrian Accommodations (limited to the Shared Use Path along the frontage roads only for connectivity and bike/pedestrian sidewalk improvements. This task shall be limited to provide connectivity and bicycle/pedestrian facility improvements and not intended to cover entire segment length.)

The Engineer shall comply with the federal policy statement on Bicycle and Pedestrian Accommodations Regulations and Recommendations by United States Department of Transportation (USDOT) and the TxDOT Roadway Design Manual. This policy and design manual encourages the incorporation of safe and convenient walking and bicycling facilities into transportation projects. The inclusion of bicycle and pedestrian facilities shall be considered when the project is scoped. Public input when applicable, as well as local city and metropolitan planning organization for bicycle and pedestrian plans shall be considered.

I. ROW Requirements

The Engineer shall determine the ROW requirements based on the proposed alignment, typical sections, design cross sections, access control, terrain, construction requirements, drainage, clear zone, maintenance, gantry locations, Intelligent Transportation System (ITS) and environmental mitigation requirements.

J. Construction Sequence

The Engineer shall consider the requirements for construction staging and traffic control throughout the development of schematic design to ensure that the proposed design can be constructed. The Engineer shall provide construction phasing assumptions to the PMC as requested and provide preliminary Traffic Control Plan (TCP) layouts.

K. Preliminary Cost Estimates

The Engineer shall prepare a preliminary cost estimate for each concept, including the costs of construction, required ROW and associated improvements, and eligible utility adjustments. The Engineer shall prepare preliminary cost estimates for the corridor using current State and industry cost data. The Engineer shall break down preliminary cost estimates by major cost elements and use a HCTRA-approved template provided by the PMC, including breakdowns for a construction cost subtotal, inflation to let year, right-of-way cost, utilities cost, tolling cost, and total project cost. Appropriate contingencies shall be defined along with applicable back-up supporting recommended value of contingency for a specified cost element as appropriate. Potential cost increase based upon anticipated construction year shall also be considered and noted.

L. Engineering Summary Report

The Engineer shall prepare a report to summarize the design criteria, existing condition analysis, field observation report, concept development and comparison, traffic analysis, drainage, preliminary cost estimate and basis of estimate, construction sequence description, pavement design, public involvement summary, and utility conflict summary.

M. Agency Coordination and Public Involvement

1. The Engineer shall assist the PMC and HCTRA in conducting meetings with TxDOT and other agencies to discuss and review the schematic design by providing exhibits and other supporting materials; any meetings required will be conducted by the PMC and HCTRA.
2. The Engineer shall prepare revisions to the schematic as needed to address any issues identified in the Public Involvement process.

N. Design Exceptions and Waivers

The Engineer shall identify design exceptions and waivers and shall document the necessity for each design exception or waiver for approval. The Engineer shall perform all necessary design, cost estimates, and crash analysis and predictability to justify each design exception. The Engineer shall perform any additional changes, updates, or modifications to draft design exception requests until final design exception approval is achieved.

O. Conceptual Design Layout

The Engineer shall develop conceptual design schematics in MicroStation / OpenRoads Designer format to evaluate various methods of handling traffic while providing access in key areas. It is anticipated that a single design alternative that optimizes traffic flow and access shall be produced. The conceptual schematics

will be plan view only. Profile work will be done only to the extent necessary to lay out the proper horizontal geometry.

The schematics shall contain the following design elements:

1. Mainlane roadway alignment
2. Pavement edges, face of curbs and shoulder lines
3. Typical sections of existing and proposed roadways
4. Proposed structure locations (including major drainage elements, wildlife crossings and fencing structures)
5. Proposed retaining wall locations
6. Anticipated conveyance of major drainage elements.
7. Preliminary ROW requirements and control-of-access locations
8. Direction of traffic flow, lane lines and the number of lanes on all roadways
9. Existing and projected traffic volumes
10. Existing utilities

III. GEOTECHNICAL ENGINEERING

- A. The work to be performed by the Engineer consists of providing various Geotechnical Engineering Services for the Project that is described in Appendix A-1 and herein. Unless otherwise noted, all geotechnical work shall be performed in accordance with the latest edition of the TxDOT Geotechnical Manual. All testing shall be performed in accordance with the latest version of the TxDOT Manual of Test Procedures. ASTM test procedures can be used only in the absence of TxDOT procedures. All soil classification shall be done in accordance with the Unified Soil Classification System.
- B. The Engineer shall provide a signed, sealed and dated geotechnical report for the Project that contains:
 1. Soil boring locations (including site vicinity and geological maps).
 2. Boring logs compiled with TxDOT Wincore program depicting soil stratigraphy and groundwater depths, summary of existing pavement and stabilized subgrade thicknesses.
 3. Field and laboratory test results.
 4. Description of surface, subsurface conditions, and ground water conditions.

5. Feasible foundation type for toll gantries such as drilled shafts, allowable capacity curves, and design soil parameters for lateral load analysis for the foundations.
 6. Feasible bridge foundation, such as drilled shafts, allowable capacity curves, and design soil parameters for lateral load analysis for the bridge foundations.
 7. Foundation design for other structures, such as overhead sign structures, ITS devices, embankments, and other structures to support a resilient and sustainable Project.
 8. Allowable bearing capacities, design soil parameters for lateral earth pressure, and allowable skin friction for soil nails for temporary shoring (if required) for the MSE walls design soil parameters for lateral earth pressure, and LPile parameters for the drilled shaft walls (if any).
 9. Settlement and slope stability analyses on selected cross-section for the retaining walls, if required.
 10. Recommendations and dewatering guidelines for the drilled shaft and retaining wall construction.
 11. Provide borings in plan sheets using TxDOT's Wincore software.
 12. Provide foundation recommendations for overhead sign bridges (OSB).
- C. Soil borings will be taken at each location. The Engineer shall prepare a Boring Layout Plan of proposed soil borings for the retaining wall, toll gantry and toll plaza foundations, bridge foundations (if any), and other structures (if any), for the Project. Locations of the proposed soil borings shall be determined using TxDOT criteria. The Engineer shall determine the number of geotechnical borings and the total drilling footage (see Geotechnical Boring Summary). The Engineer shall prepare a Plan of Borings for the proposed boring locations. Upon review and approval of the proposed locations by the PMC, the Engineer shall perform soil borings, soil testing, and prepare the boring logs. The Engineer shall perform analysis of foundation design recommendations.
- D. For the bridges, retaining walls, toll gantry, and other structures foundation design, the Engineer shall perform soil borings and prepare the boring logs.
1. The Engineer shall clear the boring locations for underground and overhead utilities.
 2. The Engineer shall provide traffic control for work in the roadway. Traffic control plans shall be developed in accordance with the latest edition of the TxDOT Manual on Uniform Traffic Control Devices. All traffic control plans will be submitted to and approved by the PMC, HCTRA and/or TxDOT prior to commencing activities.

3. The Engineer shall take soil borings at intervals per TxDOT's Geotechnical Manual. Texas Cone penetration tests will be performed at intervals of 5 feet beginning at 5-foot depth.
4. The borings will be drilled with a truck-mounted drilling rig. Samples will be obtained continuously between Texas Cone Penetrometer testing. Undisturbed samples will be obtained of cohesive soils by pushing a Shelby tube (ASTM D-1587); granular soils will be obtained by flight auger or Standard Penetration Test (ASTM D-1586) if possible. Suitable representative portions of all soil samples will be sealed, packaged, and transported to the Engineer's laboratory. Water level readings will be noted during drilling and obtained upon completion of drilled each boring. Obtain 24-hour and approximately 30-day water level readings in the piezometers (if any), then the piezometers will be plugged.
5. The Engineer shall backfill borings with bentonite pellets or cement-bentonite grout for the borehole and then patch the hole with non-shrink grout to the top of pavement.
6. The boring samples to include any contaminated soils collected shall be properly disposed of and site cleaned up by the Engineer.
7. Laboratory testing may consist of moisture contents, Atterberg limits, and percent passing No. 200 sieve, sieve analyses, hydrometer tests, unconfined compression and unconsolidated-undrained triaxial tests depending on the soil types encountered. Additional testing includes consolidation tests and consolidated-undrained (CU) triaxial tests will also be performed for retaining wall structures (if any).

GEOTECHNICAL BORING SUMMARY			
BORING NUMBER	LOCATION	PURPOSE	DEPTH (FT)
B-01 through B-04	EBML and WBML near existing Toll Plaza	New Gantry Foundations	70
B-05 through B-15	TBD		40

(Function Code 130 – Utility Investigation)

I. UTILITY BASE MAP

- A. The work to be performed by the Engineer consists of providing Subsurface Utility Engineering Services for the Project that is described in Appendix A-1 and herein.
- B. The Engineer shall obtain information on existing utilities from utility owners and shall conduct investigations to identify and evaluate all known existing

and proposed public and private utilities. The Engineer shall identify potential conflicts and attempt to minimize the potential adverse utility impacts in the preparation of the schematic design. The Engineer shall prepare a base map depicting the utility locations. The engineer shall create and maintain a utility conflict table (UCT) through the duration of the contract identifying potential known conflicts. The format of the UCT shall be consistent with the latest version of the Harris County UCT.

- C. Utility Engineering Investigation (currently Subsurface Utility Engineering) shall include utility investigations subsurface and above ground prepared in accordance with AASHTO standards [ASCE C-1 38-02 (<http://www.fhwa.dot.gov/programadmin/asce.cfm>)] and Utility Quality Levels defined in cumulative order as follows:
1. **Quality Level D – Existing Records:** Utilities are plotted from review of available existing records.
 2. **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 then a new schematic or plan layout, if needed, is required showing the limits of the proposed project and 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 down existing intersecting roadways.
 3. **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 then a new schematic or plan layout, if needed, is required showing the limits of the proposed project and 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 down existing intersecting roadways.
 4. **Quality Level A – Locate (Test Holes):** 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.
- D. The Engineer shall comply with all applicable HCTRA policy and procedural manuals and shall 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, the PMC 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 (TCEQ). 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 the costs involved in the repair or replacement of the utility facility.

- E. The Engineer shall assist the PMC in conducting utility coordination meetings with utility companies, as required, to facilitate utility conflict identification and resolution.
 - 1. The Engineer shall 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 should also be extended to utilities that plan to install facilities within the project limits after the project has been initiated.
 - 2. The Engineer shall establish and conduct workshop meetings, both individually with each utility and with all utilities that incorporate the PMC's project team to review and resolve conflicts.
 - 3. The Engineer shall create agenda and exhibits for all coordination meetings as directed by the PMC.
 - 4. The Engineer shall schedule and conduct a utility kick-off meeting to obtain more information on existing facilities within the project limits. Major utility facilities shall be discussed and analyzed to avoid relocation, if possible.
 - 5. The Engineer shall schedule and conduct milestone meetings (or as needed) with the PMC to coordinate the work effort and resolve problems and prepare a written report of such meetings. The meetings shall review:
 - a. Existing facilities including major facilities to be avoided with the project, if possible
 - b. Utility Conflict Table
 - c. Long lead items that could potentially impact the schedule during PS&E

II. DELIVERABLES:

- A. Utility Conflict Table along with the Utility Conflicts identified in the CADD file.
- B. Utility Contacts list in excel and pdf format.
- C. Utility Contact Log

(Function Code 145 – Project Management)**I. PROJECT MANAGEMENT**

The purpose of this task is to provide the overall management of the contract. The Engineer will set up Project files, and overall coordination and contact with the Project Team Members (PTM), HCTRA, and the PMC will be maintained.

- A. Provide general coordination with the PTMs and the PMC concerning administrative and technical issues.
- B. Quality Assurance/Quality Control Plan
 - 1. The Engineer shall submit their Quality Assurance / Quality Control (QA/QC) Plan to document the Engineer's quality control program. The Engineer shall conduct Quality Control procedures under respective work tasks and sub-tasks.
 - 2. The Engineer shall submit the QA/QC check print with each submittal.
- C. Prepare and submit monthly progress reports and invoices to HCTRA through the PMC for review and approval. The invoices will include the progress report, invoice, and schedule, and will be confirmed by the PMC based on in-progress deliverables received. The Engineer's written progress report shall describe activities performed during the reporting period by scope task; activities planned for the following period, problems encountered and actions taken to remedy them, a list of meetings attended, a list of deliverables submitted in the reporting period, a list outstanding issues that need resolution, overall status including a physical percent complete, and a financial percent complete by scope task, and estimated completion dates for the work.
- D. Invoices are to be submitted on a monthly basis. The Engineer will prepare each invoice in the format provided by the PMC. When directed by the PMC and/or HCTRA, the Engineer shall modify the information and/or format. Hard copies of the invoice shall be delivered to the PMC and/or emailed. For contracts with Time and Materials and/or contingency work, certified timesheets shall be submitted with the invoice.
- E. The Engineer will be responsible for internal documentation and administration of the Project files.
- F. The Engineer shall prepare an overall Project schedule on Primavera detailing the progression of the work. This schedule will include review dates by HCTRA and the PMC, submittal dates for deliverables, and an estimated time frame to complete the work. Changes or adjustments in the schedule caused by delays in tasks or reviews will be discussed by the PMC with HCTRA.

II. MEETINGS AND CONFERENCES

- A. Attend Project “kick-off” meeting held by the PMC and HCTRA. The Engineer shall also attend coordination and interim progress review meetings which will be scheduled on an as-needed basis. At a minimum we anticipate monthly progress meetings, and at certain points the meetings may be more frequent due to design progress. Prepare and distribute meeting minutes within five working days after the meeting.
- B. Assist the PMC and HCTRA in pre-qualifying manufacturers/suppliers for alternative products.

(Function Code 150 – Design Survey)

I. DESIGN SURVEYS

- A. The work to be performed by the Engineer consists of providing surveying services for the Project that is described in Appendix A-1 and herein.
- B. Design Surveys include performance of surveys associated with the gathering of survey data for topography, cross-sections, and other related work to design a project.
- C. The purpose of a design survey is to provide field data in support of transportation systems design.
- D. 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.
- E. The PMC will request design surveys on an as needed basis. The Surveyor shall perform tasks including, but not limited to the following:
 - 1. Obtain or collect data to create cross-sections and digital terrain models.
 - 2. Locate existing utilities.
 - 3. Locate topographical features and existing improvements.
 - 4. Provide details of existing bridge structures.
 - 5. Provide details of existing drainage features (e.g., culverts, manholes, etc.).
 - 6. Locate wetlands.

7. 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 entities as directed by the PMC.
 8. Locate existing right-of-way and depict on the survey.
 9. Review right-of-way maps.
 10. Locate boreholes.
 11. Perform hydrographic surveys.
 12. Update existing control data and prepare survey control data sheets, as directed by the PMC for inclusion into a construction plan set.
- F. The Surveyor 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.
1. The following information shall be shown on the *Survey Control Index Sheet*:
 - a. Overall view of the project and primary control monuments set for control of the project
 - b. Identification of the control points
 - c. Baseline or centerline
 - d. Graphic (Bar) Scale
 - e. North Arrow
 - f. 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.
 - g. RPLS signature, seal, and date

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

- a. Location for each control point, showing baseline or centerline alignment and North arrow.
- b. Station and offset (with respect to the baseline or centerline alignments) of each identified control point.
- c. Basis of Datum for horizontal control (base control monument/benchmark name, number, datum).
- d. Basis of Datum for the vertical control (base control monument, benchmark name, number, datum).
- e. Date of current adjustment of the datum.
- f. Monumentation set for Control (Description, District name/number and Location ties).
- g. Surface Adjustment Factor and unit of measurement.
- h. Coordinates (State Plan Coordinates [SPC] Zone and surface or grid).
- i. Relevant metadata.
- j. Graphic (Bar) Scale.
- k. 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.
- l. RPLS signature, seal, and date.

G. TECHNICAL REQUIREMENTS

1. Design surveys 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 the PMC or based on acceptable methods conducted by the Surveyor, must meet the standards of accuracy required by the State.
3. 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. Vertical ground control used for design surveys, furnished to the Surveyor or based on acceptable methods conducted by the Surveyor, must meet the standards of accuracy required by the State.
5. 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.
6. Side shots or short traverse procedures used to determine horizontal and vertical locations must meet the following criteria:
 - a. Side shots or short traverses must begin and end on horizontal and vertical ground control as described above.
 - b. 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:
 - i. Bridges and other roadway structures: less than 0.1 of one foot.
 - ii. Utilities and improvements: less than 0.2 of one foot.
 - iii. Cross-sections and profiles: less than 1 foot.
 - iv. Bore holes: less than 3 feet.
 - c. 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:
 - ii. Bridges and other roadway structures: less than 0.02 of one foot.
 - iii. Utilities and improvements: less than 0.1 of one foot.
 - iv. Cross-sections and profiles: less than 0.2 of one foot.
 - v. Bore holes: less than 0.5 of one foot.

H. AUTOMATION REQUIREMENTS

1. Planimetric design files (DGN) must be fully compatible with the State's *MicroStation V8i* graphics program and Bentley's *OpenRoads Designer* system without further modification or conversion.
2. Electronically collected and processed field survey data files must be fully compatible with HCTRA's and the PMC's computer systems without further modification or conversion. All files must incorporate only those feature codes currently being used by HCTRA and the PMC.

3. DTM must be fully compatible with Bentley's *OpenRoads Designer* 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.

I. DELIVERABLES

1. The Surveyor shall prepare and submit the deliverables as specified in individual work authorizations for design surveys. The deliverables shall be any combination of the following:
 - a. Digital Terrain Models (DTM) and the Triangular Irregular Network (TIN) files in a format acceptable by the PMC.
 - b. Maps, plans, or sketches prepared by the Surveyor showing the results of field surveys.
 - c. Computer printouts or other tabulations summarizing the results of field surveys.
 - d. Digital files or media acceptable by the PMC containing field survey data (ASCII Data files).
 - e. 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.
 - f. Field survey notes, as electronic and hard copies.
 - g. 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 pre-formatted survey control data sheet form in Microsoft Office Word 2010 format will be provided by the PMC.
 - h. A digital and hard copy of all computer printouts of horizontal and vertical conventional traverses, GPS analysis and results, and survey control data sheets.
 - i. All OpenRoads DGN files.
 - j. Survey reports in a format requested by the PMC.

(Function Code 163 – Miscellaneous)

I. PREPARATION AND SUBMITTAL OF SCHEMATICS

A. The Engineer shall provide the following deliverables:

1. Project photographic record of the existing project
2. Design Criteria Concepts
3. Conceptual Alternative Roll Plots
4. Existing Conditions Report
5. Engineering Summary Report
6. Final Recommended Schematic Layout and Estimate

B. The Engineer shall assemble and provide contract documents into the milestone submittals for interim progress reviews by the PMC and HCTRA which includes each of the schematic submittal reviews as summarized below:

1. Draft and final copies of the conceptual design schematics roll plots and/or 11"x17" sheets as determined by the PMC and HCTRA.
2. When requested provide five (5) sets of 11" x 17" drawings and/or schematic roll plots for review to the PMC for each submittal.
3. Upon completion of the Project, provide electronic files of all deliverables in the latest MicroStation format approved by the PMC, and the Specifications in Microsoft Word to the PMC and HCTRA.

APPENDIX B

Maximum Raw Salary Rates KIT Professionals, Inc.

<u>JOB CLASSIFICATION</u>	Maximum Raw Salary Rate
Principal	\$135.00
Senior Project Manager	\$120.00
Deputy Project Manager	\$100.00
Support Manager	\$95.00
Senior Tolling Advisor	\$110.00
Quality Manager	\$110.00
Senior Project Engineer	\$90.00
Project Engineer	\$75.00
Design Engineer	\$65.00
Senior Traffic Engineer	\$90.00
Traffic Engineer	\$75.00
Senior Structural Engineer	\$90.00
Structural Engineer	\$75.00
Senior Electrical Engineer	\$95.00
Electrical Engineer	\$65.00
Engineer-In-Training II	\$65.00
Engineer-In-Training I	\$55.00
Senior CADD Technician	\$50.00
CADD Technician	\$45.00
Junior CADD Technician	\$40.00
Senior Engineering Technician	\$65.00
Engineering Technician	\$55.00
Junior Engineering Technician	\$45.00
Senior Scheduler	\$60.00
GIS Specialist	\$60.00
GIS Technician	\$45.00
Survey Project Manager (TX RPLS)	\$70.00
Project Manager (TX RPLS)	\$65.00
Project Assistant (TX RPLS)	\$45.00
Survey Technician	\$50.00
2-Person Survey Crew	\$60.00
3-Person Survey Crew	\$200.00
4-Person Survey Crew	\$185.00
SUE Project Manager	\$63.00
SUE Senior Engineer	\$58.00

SUE Engineer-In Training	\$38.00
SUE Engineering Technician	\$32.00
SUE CADD Technician	\$27.00
1-Person SUE Crew	\$51.00
Utility Coordinator	\$60.00
Admin/Clerical	\$35.00
Note: Maximum Raw Salary Rates shown above are effective for the first year of the approved contract and are subject to an annual escalation rate of 4% effective on the contract anniversary date.	

Maximum Reimbursable Expense		
Mileage	Per mile	IRS Approved Rate
Parking	Per day	\$20.00
Lodging/Hotel (Taxes/Fees not included)	Day/person	\$167.00
Lodging/Hotel – Taxes and Fees	Day/person	\$50.00
Meals	Day/person	\$55.00
Delivery (Local)	Each	At cost
Reproduction	Each	At cost
City of Houston Utility Records	Each	At cost
CenterPoint Energy Utility Records	Set	At cost
Terrestrial Scanner	Hour	\$150.00
Mobile LiDAR Vehicle	Day	\$9,000.00
Document Scanning	Each	At cost
SUE Quality Level D - Records Research	LF	\$0.55
SUE Quality Level C- Pole Inventory Survey	LF	\$0.90
SUE Quality Level B - Designation	LF	\$1.90
SUE Quality Level A- Test Holes		
0 to 5 Feet	Each	\$1,400.00
> 5 to 8 Feet	Each	\$1,650.00
> 8 to 13 Feet	Each	\$2,075.00
> 13 to 20 Feet	Each	\$2,600.00
Mobilization / De-Mobilization	Mile	\$6.00
Street Coring	Each	\$265.00
Traffic Control (Minimal)	Day	\$5,150.00

APPENDIX C

MINIMUM INSURANCE REQUIREMENTS

During the term of the Contract, the Contractor at its sole cost and expense shall provide primary commercial insurance of such type and with such terms and limits as may be reasonably associated with the Contract. As a minimum, the Contractor shall provide and maintain the following coverage and limits:

- A. Workers Compensation**, as required by the laws of Texas, **and Employers' Liability**, as well as All States, USL&H (United States Longshore & Harbor Workers Compensation Act) and other endorsements if applicable to the project, and in accordance with state law.

Employers' Liability

- Each Accident: \$1,000,000
- Disease—Each Employee: \$1,000,000
- Policy Limit: \$1,000,000

- B. Commercial General Liability**, including but not limited to the coverage indicated below. Coverage shall not exclude or limit Products/Completed Operations, Contractual Liability, or Cross Liability. Where exposure exists, the County may require coverage for watercraft, blasting, collapse, explosions, blowout, cratering, underground damage, pollution, or other coverage. *Harris County shall be named Additional Insured on primary/non-contributory basis.*

- Each Occurrence: \$1,000,000
- Personal and Advertising Injury: \$1,000,000
- Products/Completed Operations: \$1,000,000
- General Aggregate (per project): \$2,000,000

- C. Automobile Liability**, including coverage for all owned, hired, and non-owned vehicles used in connection with the contract. *Harris County shall be named Additional Insured on primary/non-contributory basis.*

- Combined Single Limit-Each Accident: \$1,000,000

- D. Umbrella/Excess Liability** (*Harris County shall be named Additional Insured on primary/non-contributory basis*).

- Each Occurrence/Aggregate: \$1,000,000

- E. Professional/Errors & Omissions Liability**

- Per Claim/Aggregate: \$1,000,000

The County reserves the right to require additional insurance if necessary. Coverage shall be issued by companies licensed by the Texas Department of Insurance (TDI) to do business in Texas and who have an A.M. Best rating of at least A-. Contractor shall furnish evidence of such insurance to the County in the form of unaltered insurance certificates. If any part of the contract is sublet, insurance shall be provided by or on behalf of any subcontractor, and shall be sufficient to cover their portion of the contract. Contractor shall furnish evidence of such insurance to the County as well.

Policies of insurance required by the contract shall waive all rights of subrogation against the County, its officers, employees and agents. If any applicable insurance policies are cancelled, materially changed, or non-renewed, contractor shall give written notice to the County at least 30 days prior to such effective date and within 30 days thereafter, shall provide evidence of suitable replacement policies. Failure to keep in force the required insurance coverage may result in termination of the contract. Upon request, certified copies of original insurance policies shall be furnished to the County.

The requirements stipulated in this attachment do not establish limits of contractor liability.

APPENDIX X

Disclosure of M/WBE Participation

Name of MBE/WBE Certified Firm	KIT Professionals, Inc.
Certified by:	City of Houston
Address / City / State / Zip:	2000 W Sam Houston Parkway S, Suite 1400 Houston, Texas 77042
Name of Contact Person:	Sudhakar Kalaga, PE
Email address for Contact Person:	skalaga@kitprofs.com
Telephone number for Contact Person:	713-972-6649
Percent of Subcontract:	71.47%
Description of services:	Project Management and Civil Engineering
6-digit NAICS code for work to be performed:	237310, 237990, 541330, 541511

Name of MBE/WBE Certified Firm	Traf-IQ, Inc.
Certified by:	City of Houston
Address / City / State / Zip:	14811 St. Mary's Lane, Suite 180, Houston, TX 770779
Name of Contact Person:	Sriram Natarajan, PE, PTOE
Email address for Contact Person:	sn@traf-iq.com
Telephone number for Contact Person:	832.399.1100
Percent of Subcontract:	5.20%
Description of services:	Traffic Engineering & ITS Services
6-digit NAICS code for work to be performed:	541330

Name of MBE/WBE Certified Firm	Aviles Engineering Corporation
Certified by:	City of Houston
Address / City / State / Zip:	5790 Windfern Road, Houston, TX 77041
Name of Contact Person:	Shou Ting Hu, P.E.
Email address for Contact Person:	sth@avilesengineering.com
Telephone number for Contact Person:	713-895-7645
Percent of Subcontract:	4.42%
Description of services:	Engineering Consulting Services, and Geotechnical Testing Laboratories
6-digit NAICS code for work to be performed:	541330 and 541380

Name of MBE/WBE Certified Firm	Ally General Solutions, LLC
Certified by:	City of Houston
Address / City / State / Zip:	7070 W. 43rd St., Ste 203 Houston, TX 77092
Name of Contact Person:	Rolando Castañeda, P.E.
Email address for Contact Person:	rcastaneda@allygeneralsolutions.com
Telephone number for Contact Person:	713-459-7230
Percent of Subcontract:	7.81%
Description of services:	Surveying and Mapping (except Geophysical) Services
6-digit NAICS code for work to be performed:	541370

**ORDER OF COMMISSIONERS COURT
Authorizing an Agreement KIT Professionals, Inc.**

The Commissioners Court of Harris County, Texas, met in regular session at its regular term at the Harris County Administration Building in the City of Houston, Texas, on _____, with all members present except _____.

A quorum was present. Among other business, the following was transacted:

**ORDER AUTHORIZING AN AGREEMENT WITH
KIT PROFESSIONALS, INC. TO PROVIDE ENGINEERING
DESIGN SERVICES FOR THE PERMANENT TRANSITION OF TOLL ROAD
OPERATIONS TO AN ALL-ELECTRONIC ROADWAY ENVIRONMENT
FOR THE SAM HOUSTON TOLLWAY SEGMENT #4 – SOUTHWEST**

Commissioner _____ introduced an order and moved that Commissioners Court adopt the order. Commissioner _____ seconded the motion for adoption of the order. The motion, carrying with it the adoption of the order, prevailed by the following vote:

	Yes	No	Abstain
Judge Lina Hidalgo	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Comm. Rodney Ellis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Comm. Adrian Garcia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Comm. Tom S. Ramsey, P.E.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Comm. R. Jack Cagle	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

The County Judge thereupon announced that the motion had duly and lawfully carried and that the order had been duly and lawfully adopted. The order adopted follows:

IT IS ORDERED that:

1. The Harris County Judge is authorized to execute on behalf of Harris County an agreement in an amount not to exceed \$5,775,000.00 with KIT Professionals, Inc. to provide engineering design services for the permanent transition of Toll Road Operations to an all-electronic roadway environment for the Sam Houston Tollway Segment #4 – Southwest. The Agreement is incorporated by reference and made a part of this order for all intents and purposes as though set out in full word for word.

2. All Harris County officials and employees are authorized to do any and all things necessary or convenient to accomplish the purposes of this order.