

Date: April 8, 2008
Re: Exhibit A to the Engineering Design Contracts
Prepared by: Mark A. McClure, P.E., Director of Engineering and Planning
City of Tomball

EXHIBIT A
(To Professional Engineering Agreement)

SCOPE OF SERVICES AND DELIVERABLE DOCUMENTS
CITY OF TOMBALL CONTRACT FOR ENGINEERING SERVICES

«PROJNAME»

File No. «filenum»

1.0 GENERAL

The Engineer shall provide professional engineering services as described in the Contract, and as further defined by this Exhibit A, Scope of Services. Reference to Director throughout Exhibit A refers to the Director of Engineering & Planning.

1.1 Description of Project

The Project generally is described as follows:

«exhibitA»

1.2 Reference Standards and Criteria

- A. "City of Tomball Engineering & Planning Department, Infrastructure Design Manual," hereinafter referred to as "City Design Manual." If manual has not been published at the time of contracting, the Engineer shall identify applicable standards and criteria to be utilized for City concurrence.
- B. Technical Paper No. 100 – "Storm Sewer Design Applications for the City of Houston, Texas, Capital Improvement Plan Projects" is encouraged by the City of Tomball for storm projects.

1.3 Review of Existing Information

- A. Existing utility information, existing record drawings of previous contracts, and existing survey information are readily available to the Engineer and the public. The Director shall provide access to such information. It is the responsibility of the Engineer to physically gather this information from all available sources.

- B. The Engineer shall review applicable existing information and develop independent recommendations based on the information. It is expected that the investigative work involved in these previous engineering efforts will not be duplicated, except as included in this Scope of Services.

2.0 BASIC SERVICES

2.1 General

- A. The Engineer shall reference the City's Project Title and City's Project File Numbers on all correspondence and submittals.
- B. The Engineer shall manage the efforts of the Project team members and Consultants, assign manpower, delegate responsibilities, review work progress, monitor conformance to the scope regarding the budget and schedule, and otherwise direct the progress of the work.
- C. Periodic meetings shall be held to review the progress of the engineering effort, or to address other issues which may arise. The Director shall initiate meetings that include the Engineer and his Consultants, and if necessary, the Director and other applicable parties. The Engineer shall prepare and deliver meeting record memorandum of decisions and action items to the City within 3 working days after each meeting.
- D. The Engineer shall notify the Director immediately of any deviation from the Scope of Engineering Services and Fee agreed to in this Scope of Services. The Engineer shall not perform services outside of the Contract scope without an Amendment to this Contract.
- E. Route all written communication with regulatory agencies, neighborhood associations, and City Council through the Director.
- F. Submit invoices on City's standard form to document and present the current status of each milestone noted within attached Exhibit "B" (Project Schedule), to record activities and deliverables completed within the month, and to note activities planned for next month.

2.2 Phase I – Preliminary Design

During the Phase I – Preliminary Design, and after written authorization from the Director of Engineering & Planning shall perform the following Phase I services during the Project:

- A. Prepare a Preliminary Engineering Report (PER) which contains the findings and recommendations resulting from this Phase of work. Include the following minimum items:

1. EXECUTIVE SUMMARY

- a. Project Location – Describe project boundaries and locations within City of Tomball limits with Key Map reference. Include location and lay-out maps.
- b. Statement of Problem – Describe deficiencies of the system.
- c. Project Base Solution – Describe the base solution if offered in the City’s Project Description/Scope of Services.
- d. Evaluation of Alternative Solutions – Provide summary of principal findings and conclusions from the evaluation of alternatives, based on specific cost and non-cost criteria
- e. Findings from Phase I Design Activities – Summarize the findings that may impact the alternative solutions. Also, summarize other issues associated with:
 - 1) Geotechnical Investigation (not required)
 - 2) Environmental Site Assessment (not required)
 - 3) Real Estate Acquisition
 - 4) Traffic Control Analysis/Requirements
 - 5) Permits
 - 6) Other items constructed in Right of Way including sidewalks, driveways, encroachments, additions or replacements.
 - 7) Other potential conflicts and special issues, such as inter-agency coordination and tree impacts.
- f. Recommended Project – Describe the recommended alternative, how it solves the described system deficiencies, and tabulate the design criteria.
- g. Estimated Construction Costs – Include Construction Costs for each alternative evaluated.

2. INTRODUCTION

- a. Project Location- Describe generally the Project boundaries and locations within City of Tomball limits with Key Map references. Include project location and vicinity maps.
- b. Statement of Problem- Describe deficiencies of the system. Include history of the problem, if available.
- c. Existing Conditions –

- 1) Existing Utilities – Indicate location, size, condition, and capacity of all public utilities. Indicate location and size of private utilities. Summarize coordination efforts with each utility. Indicate substandard or problem locations and describe deficiencies.
- 2) Existing Right-of-way – Describe width of right-of-way. Indicate if right-of-way is adequate for proposed Project and if encroachments exist.
- 3) Redline the available maps showing the proposed connections to existing utilities, upgrades/replacements of existing utilities or construction of new utilities.
- 4) For paving and storm sewer projects include the following:
 - a) Existing pavement – Describe pavement widths, lane use, pavement type and condition, composition thickness and age of pavement and presence of curb and gutter or drainage ditches. Indicate substandard or problem locations and describe deficiencies.
 - b) Existing Roadway Geometrics – Describe vertical and horizontal geometrics, corner radii, esplanade widths and openings, and intersection and driveway locations. Indicate substandard or problem locations and describe deficiencies.
 - c) Existing Traffic Control – Describe existing traffic control measures. Indicate locations of traffic signals and discuss operation. Indicate substandard or problem locations and describe deficiencies.
 - d) Traffic Volumes – Discuss volumes, composition, and forecast of traffic. Indicate existing speed limits.
 - e) Existing Drainage – Indicate watershed and describe existing drainage system noting location, size, condition, and capacity. Indicate substandard or problem locations and describe deficiencies.
- 5) For Wastewater Facility Project, include the following:
 - a) Existing Condition Assessment – Perform existing conditions assessments and summarize the findings for the components of the project under consideration. The summary shall include but not be limited to structural, mechanical, and electrical components. Also summarize the existing facilities operation conditions.
 - b) Record Drawings – Compare record drawings with actual conditions of the project facility.

- c) Interviews – Perform interviews with the facility operators to further identify changes not shown on the record drawings or previously identified.
 - d. Project Base Solution – Describe the base solution if offered in the City’s Project description/scope of services.
3. FINDINGS FROM PHASE I DESIGN ACTIVITIES

a. Utilities Research

- 1) The Engineer shall research all available information and show on schematic layouts of the project all existing water mains and appurtenances, well collection lines, sanitary sewer and storm water lines and facilities (house services lines, manholes, etc.), and lot lines from subdivision plats, telephone, power, gas, cable TV, and other private utilities.
 - 2) On major transmission pipelines, the Engineer shall contact the various pipeline companies for their assistance to determine the product material, type of pipe material, depth, and routing of pipelines.
 - 3) Summarize coordination efforts with other utilities. Indicate problem locations, describe deficiencies/conflicts and program for resolution.
- b. Proposed Right-of-way or Real Estate Acquisitions - Indicate right-of-way and easement needs, and/or other required real estate acquisitions (identification of number, location and sizes of necessary parcels based upon readily available information).
- c. Phase I Environmental Site Assessment – Summarize findings and recommendations, when authorized.
- d. Geotechnical Investigation – Summarize findings and recommendations, when authorized.
- e. Inter-agency Coordination – Identify potential conflicts in time and space with projects from other City departments and other agencies; and offer recommended solutions.
- f. Floodplain/Floodway Analysis- Findings and recommendations, if applicable.
- g. Permits and Licenses – Describe permits or licenses required from governmental agencies, public or private utilities, railroads, HC, HCFCD, TXDOT, NPDES, wetlands, etc.

- h. Tree/Landscaping Impacts – Describe the potential impact on existing trees/landscaping. Delineate between protected and non-protected trees under the City’s ordinance and measure to protect those trees covered by the ordinance.

4. EVALUATIONS AND RECOMMENDATIONS

- a. Evaluation of Alternatives – Provide a summary of principal findings and conclusions from the evaluation of alternatives, based on specific cost and non-cost criteria.
- b. Recommended Project – Describe the recommended alternative, how it solves the described system deficiencies, and tabulate the design criteria. Also, provide the following:
 - 1) Recommended Utility Improvements – Discuss the recommended improvements to public utilities and indicate locations of potential conflict with other utilities.
 - 2) Construction Traffic Control Plan – Provide traffic control concept, noting detours, phases, sequencing, construction zones, temporary pavement requirements and temporary signalization. Identify potential disruptions to local businesses and measures to address access during construction.
 - 3) Storm Water Pollution Prevention Plan – Describe the basic approach to storm water pollution prevention and what measures will be implemented.
 - 4) Tree Protection/Mitigation and Landscaping – Describe the general approach to landscaping, tree protection, and tree mitigation, as required.
 - 5) For paving and storm sewer projects, include the following:
 - a) Recommended Pavement – Describe recommended pavement widths, lane use, and structure.
 - b) Recommended Improvements to Roadway Geometrics – Describe recommended corner radii, esplanade widths and openings, intersection improvements, and measures taken to correct deficiencies. Indicate proposed speed limits.
 - c) Recommended Traffic Control – Describe the recommended improvements to existing traffic control measures. Discuss recommended improvements to traffic signals, and locations and configurations or proposed signals.
 - d) Recommended drainage improvements – Discuss findings of the hydraulic analysis. Describe recommended improvements to the

drainage system. Include drainage area maps and hydraulic analysis calculations.

6) For Wastewater Facilities include the following:

- a) Recommended Project – Discuss the recommended base project including but not limited to the structural, equipment, piping and pumping components. Provide contrast and comparison for the recommendation to replace or rehabilitate the facility components.

5. EXHIBITS:

- a. Project location maps – Prepare a color map of Project Area(s). Include a separate vicinity map of general Project Area(s)
- b. Typical cross-sections – Show horizontal dimensions, pavement structure makeup and thickness, typical locations of existing and proposed buried utilities right-of-way and easements, sidewalks, shoulders, and drainage ditches.
- c. Plan Sheets – Show proposed water mains, sanitary sewers, storm sewers and pavement footprint with alternate(s), where applicable, in plan view.
- d. Right-of-way maps – Show dimensions and locations of existing and proposed right-of-way and easement locations.

6. ESTIMATED CONSTRUCTION COST

- a. Provide the estimated Construction Cost of the recommended Project and all viable alternatives or options.

7. APPEDICES

- a. For Wastewater Facilities – Plants and Lift Stations (as applicable) include:
 - 1) Supporting Calculations
 - 2) Hydraulic Profile and Hydraulic Analysis
 - 3) Process Flow Diagram and Process Operation Analysis
 - 4) Pump curves
 - 5) Wet Well Sizing
 - 6) Force Main Sizing
 - 7) Electrical One-Line Diagram
 - 8) Instrumentation Diagram
 - 9) Historical & Future Flow Rate Calculations

- B. Deliver to Director of Engineering & Planning a Preliminary Engineering Report including applicable exhibits and recommended construction packaging for the Project.
- C. Prepare and participate in the Technical Review Committee (TRC) meeting. The purpose of the TRC meeting is for the Engineer to present the recommended projects to the TRC for approval. As part of the TRC, the Engineer shall prepare a Microsoft Power Point presentation, a TRC agenda, and an executive summary of the project showing the alternative, recommendations, and estimated construction costs. The Engineer will provide equipment for preparation and presentation of the TRC meeting. Prepare minutes of the TRC meeting and record of decision and action items.
- D. At the conclusion of the TRC, submit a revised estimate of probable construction cost, based on the outcome of the TRC. Revise the PER in response to the Technical Review Committee's record of decisions and action items and furnish 3 final copies of the PER. Submit final PER in pdf Format on a CD in a single file with Table of Contents.
- E. Upon acceptance by the TRC of the need to acquire additional right-of-way or easements for the project, the Director shall issue to the Engineer a notice to proceed for the preparation of right-of-way and easement documents. These documents shall be delivered to the Director within the time specified in the notice to proceed.
- F. Schedule of Design Activities:
The Engineer shall submit a schedule that contains actual dates, based on the date of the notice to proceed and the number of calendar days from Exhibit "B" milestones.

2.3 Phase II - Final Design

- A. Estimate of Construction Cost
 - 1. Refer to the City Design Manual.
 - 2. The Engineer shall submit an estimate of Construction Cost at the 50 percent, 70 percent, and Final Drawings stages.
- B. Agency Approvals and Signatures
 - 1. Refer to the City Design Manual.
 - 2. The Engineer shall obtain required signatures from other governmental agencies, public utilities, and private utilities, which may impact the Project prior to final approval by the Engineering & Planning Department. Governmental agencies include, but are not limited to, Harris County and Harris County Flood Control District. Utility signatures include, but are not limited to, SBC, Reliant Energy Entex, Inc., Reliant Energy HL&P Company, AT&T, and cable TV.

3. Obtain necessary approvals (permits, license agreements, etc.) from TXDOT, HCFCD, Harris County, railroad and pipeline companies prior to final approval by the Engineering & Planning Department.

C. Engineering

1. The Engineer is responsible for quality of the final design.
2. The Engineer shall specify the minimum acceptable performance and/or material standards associated with temporary facilities and structures that are determined necessary to implement the Project, that are potentially cause for significant disruption to local communities or businesses, and that are not solely for the convenience of the contractor.
3. The Engineer shall review results from additional services prior to submittal to the City and where applicable, incorporate this information into the Final Design documents. Such additional services may include, but not be limited to, survey, geotechnical, environmental, traffic control, storm water pollution prevention plans, street lighting plans, tree mitigation/planting plans and special studies.
4. The Engineer shall incorporate the City Standard Details as applicable. The Engineer shall review each Standard Details and edit as necessary to suit Project-specific requirements and to meet the design intent of the Project. Revisions to the Standard Details shall not be incorporated based solely on Engineer's preference, but are subject to review and acceptance by the Director. The Engineer shall notify the Director of all proposed changes to Standard Details and provide reasons for such proposed changes. The Engineer shall prepare additional nonstandard details necessary for bidding and construction of the Project.
5. The Engineer shall prepare specifications in accordance with the Construction Specification Institute (CSI) standard format adopted by the City. The Engineer shall use the City Standard Specifications Table of Contents for Construction Documents as a guide for organization of the Contract Documents. The City Standard Specifications are prepared to include the requirements, features, construction materials, and related items desired by the City based on the City's experience and needs. The Engineer shall review each Standard Specification and supplement as necessary to suit Project-specific requirements and to meet the design intent of the Project. Supplements to the Standard Specifications shall not be incorporated based solely on the Engineer's preference. Supplements are subject to review and acceptance by the Director. The Engineer shall prepare additional nonstandard specifications necessary for bidding and construction of the Project. Incorporate Guide Specifications necessary for bidding and construction of the Project.

6. The Engineer shall incorporate the front-end documents provided by the City into the Project specifications and will complete those front-end documents as necessary to complete the specification.
7. The Engineer shall verify findings from Utility Plan Review with the results of the Route and Site Topographical Survey Services (see Additional Services) and identify potential conflicts during construction. Proposed designs shall strive to avoid conflicts where physically and financially feasible. Relocations of private utilities shall be coordinated with the City of Tomball as early in design process as possible.
8. The Engineer shall perform the following work associated with the water plants projects.
 - a. Review existing pipe lay schedule and as-builts. Identify special issues which affect the proposed connection(s), and incorporate findings into final design. Also, determine the joint configuration for the existing piping and design accordingly.
 - b. Design water plant piping as welded joint steel pipe. Flange joints shall be used for connection to meters, valves, and other couplings, as per Engineer's design. Avoid direct bury of couplings or other similar types of connections. Provide appropriate detail views and sections.
 - c. Identify proposed connections as "Critical Locations." The Contract documents, as a minimum, should address the procedures described in item 3.13 of supplementary specification Section 02317 - Excavation and Backfill for Utilities, and 3.05 of supplementary specification Section 02511 - Water Mains. Identified "Critical Locations" shall be paid separately and listed in Document 00410 - Schedule of Unit Price Work, per each location shown on the Drawings.
 - d. Develop valve and water plant shut-down sequences for situations in which construction could necessitate a partial or entire shut-down. Plan sequences in coordination with the assigned Director of Public Works. Include sequences in Bid Documents. Prepare a plan view showing locations of existing valves, and required working condition status to operate during Construction.
 - e. During design, conduct a coordination meeting between the Engineer, Construction Manager, Engineering and Construction (E&C), and Water Production personnel to discuss potential problems with proposed construction. Incorporate particular needs into the design such as time of outages, etc.

- f. Identify in Bid Documents “critical stages of work” requiring shut-down of the facility. Written notification of minimum of 72 hours is required before beginning construction. Construction is to be performed in the presence of the assigned City Water Production project manager.

D. Application and Approval of Building Permit

1. The Engineer shall secure approval for the Building Permit Application, which provides the Director with documents necessary for obtaining a City Building Permit.
2. The Engineer shall secure the Floodplain permits from the Floodplain Administrator of the City of Tomball necessary for the construction of the project.

E. Bidding Services

1. The Engineer shall assist the City in conducting the pre-bid conference, and submit meeting minutes within 3 working days.
2. The Engineer shall prepare necessary addenda to address issues or clarifications necessary for completion of the bidding process.
3. The Engineer shall furnish a tabulation of bids received with a written recommendation for the award of a construction contract, and submit within 24-hours after the bid opening.

2.4 Phase III - Construction Phase Services

- A. The Engineer shall make site visits during times when the contractor is actively performing major construction activities. The site visits should be one visit per site location monthly, after the contractor has mobilized and is working. These visits may be combined with any site visits made to resolve field problems relating to the construction.
- B. Upon the completion of a site visit by the Engineer, a “Construction Site Observation/Status Report” shall be submitted to the City. Unless instructed otherwise by the Director, this report shall include, as a minimum, the following:
 1. Introduction and project description;
 2. Status of Submittals (shop drawings, RFIs, and RFPs);
 3. Site observation - to include discussion on whether the work observed was in general conformance with the contract documents;

4. Closing remarks;
 5. Location maps;
 6. Site photos.
- C. Requests for Information (RFI) will normally be generated by the Construction Contractor when a situation or condition is anticipated or encountered in the field that may not be fully addressed in the Construction Contract Documents. RFIs are to be reviewed and a complete and fully responsive written answer provided to the City within 48 hours, or as otherwise directed.
- D. The Engineer shall submit the as-built record drawings within 30 days after receipt of contractor red-lined as-builts.

3.0 ADDITIONAL SERVICES

Unless otherwise authorized or modified by the Director, the Engineer shall perform Additional Services in accordance with the following:

3.1 Survey

- A. Perform in accordance with the City Design Manual, if not available at the time of contracting the Engineer will propose design guidelines to be utilized.
- B. All projects must be tied to the Texas State Plane Coordinate System; all coordinates shown or displayed on any drawings must be true State plane coordinates.
- C. Route Topographical Survey - Record all topographic features and improvements within the public right-of-way, permanent right-of-way, any contiguous easements to the right-of-way, and any construction right-of-way of the Project, and on all intersecting streets for a distance of 20 feet beyond the intersection of the right-of-way lines. For paving projects, extend the topographic survey at intersecting streets to 150 feet beyond the end of new pavement. Locate sufficient monumentation to determine lot lines, lot street address (unless instructed otherwise by the City), tract lines, and rights-of-way. Identify visible underground structures (by type, type of service, size, invert elevations, and depth) including manholes, inlets, and junction boxes. In general, do not open SWBT, HL&P, and other private utility manholes and junction boxes.”
- D. Deliverables shall be submitted no later than when the 70% drawings are submitted for review. Deliverables for route topographical survey services to the City include the following:
 1. Original survey field books and electronic file.

2. Survey Control Map - A survey control map sheet drawn to scale of 1 inch = 100 feet shall show location and give a description of the vertical and horizontal City of Tomball survey control monuments used for the Project. The sheet shall show both the survey base line and the Project alignment and give bearings and distances of all control lines. The beginning point, all P.I. points, and end point of both the Project alignment and the survey base line shall list the City of Tomball survey control system coordinates and be tied into existing topography. The map shall contain the following: street names, centerline bearings, street intersection station equations, P.C.'s, P.T.'s, P.I.'s and curve data. All found property monuments shall be shown on the map with station-offset references made to the Project alignment. Those property monuments used as control monuments in setting the Project alignment shall be indicated. Project benchmarks, swing-tie (three-point tie) sketches, benchmark loops, and traverse shall be provided. The survey control map sheet shall be signed, sealed, and dated by the registered surveyor responsible for the survey.
3. Survey Drawing - Shows results of field survey work, topography, and improvements.

E. Survey services for acquisition of right-of-way, easement, or property shall include:

1. Right-of-way surveys and maps which show and describe the right-of-way, easement, or property to be acquired.
 - a. Overall project layout with acquisition parcels identified should be prepared.
 - b. Each acquisition parcel will have a mylar drawing (no smaller than 11" x17") to be signed and ink stamped.
 - c. Parcel maps should include NAD 83 State Plane Coordinates.
 - d. Each mylar drawing will include a City of Tomball signature block (available from the City of Tomball website), the Key Map page and section in title block.
 - e. For encroachments only, enlarged details of the encroachment(s) will be shown on the mylar drawing for encroachments into street right of way, show the right of way, right of way dimension and the street/avenue name.
 - f. Projects requiring TxDOT approvals should include a set of TxDOT approved, signed and sealed mylars and metes and bounds descriptions.
2. Deed research.
3. Metes and bounds descriptions.

F. Deliverables for Site Topographical Survey to the City, to be submitted no later than when 70% drawings are due, shall include original survey field books and electronic files, survey control map, and survey drawing.

G. In compliance with the geotechnical requirements of the City Design Manual, all geotechnical boring locations shall be surveyed upon completion of the geotechnical investigation. Provide station and offset including true State plane coordinates with an

accuracy of plus or minus one foot. The Engineer shall deliver the electronic files of this work to the City.

H. Channel Crossings:

1. Channel cross-sections shall be surveyed at street right-of-way and center of the right-of-way where feasible. At minimum, the survey shall include points at channel right-of-way, flowline of swales, channel high-bank, toe at channel side slope, apparent grade breaks, channel water level and channel flowline invert elevation.
2. Channel cross-sections shall be shown clearly on the design profile with all points surveyed including channel bottom flowline invert elevation.
3. The design engineer shall provide the location of the proposed utility crossing alignment to the surveyor. Channel cross-section at the proposed utility crossing location shall be surveyed once the alignment is determined. Any portion of the channel submerged under water shall be surveyed at points no further than 10 feet interval.
4. Complete channel cross-sections (as noted in Item 1 above) shall also be surveyed 20 feet upstream and downstream of proposed pipeline crossing location.

3.2 Geotechnical Investigation

- A. Perform in accordance with the City Design Manual.
- B. Provide geotechnical engineering report, signed and sealed by Professional Engineer, registered in the State of Texas along with executed Geotechnical Investigative Report Checklist.
- C. A boring location map and individual boring logs shall be incorporated into the geotechnical engineering report. All boring locations shall be clearly identified in the field to permit compliance with the Survey Requirements of the City Design Manual.
- D. Boring logs shall include as a minimum the following information:
 1. City Project File Number.
 2. Boring number.
 3. Boring location-station and either offset or distance from curb, and one other semi-permanent feature and boring elevation.
 4. Date of field work.
 5. Depth to groundwater (both at end of drilling and at 24-hour readings).
 6. Depth to caving.
 7. Completion depth.

8. Soil and sample symbology.
 9. Soil description - soil type identifications in accordance with the Unified Soil Classification System.
 10. Geotechnical analytical data.
- E. Provide a soil type report, in compliance with the City Design Manual, signed and sealed by a Professional Engineer, registered in the State of Texas. This should consist of a letter report addressing the OSHA soil types and required trench safety system to be included in the construction specifications.
- F. The Engineer shall obtain and review boring logs by others. While the Engineer is not responsible for the accuracy of these borings, this information, along with boring logs gathered during the records review, are to be included in the Geotechnical Engineering Recommendations section of the geotechnical report. Include these logs in the appendix.
- G. At each boring location take surface and subsurface roadway core within the existing pavement area to determine the existing pavement section, including the thickness of the pavement, base and sub grade, and material types.
- H. If the potential for contamination exists, or if contamination is encountered at a bore hole location, the Engineer shall immediately notify the Director before proceeding. Comply with all applicable local, state, and federal environmental guidelines.
- I. The Engineer shall obtain permits and arrange for access to boring locations on private property.
- J. The Engineer shall provide for the safety of boring sites, including traffic control commensurate with the traffic and road conditions while working in street right-of-way.
- K. Critical locations (i.e., bayou crossings, railroads, etc.) which occur along the alignment may require site specific geotechnical information. Where the initial alignment borings cannot be positioned so that they provide part or all of this site specific information, additional borings (to depths in excess of the alignment borings) may be in order. Such cases will be handled on an individual basis.
- L. If no water-bearing layer is encountered, one piezometer shall be installed at the deepest boring location.
- M. For tunnel construction:
1. Piezometers shall be installed, in water-bearing layer, at every other boring location.
 2. Perform continuous sampling through the tunnel zone (typically 6 feet above and below the tunnel). Sampling outside the tunnel zone should be in accordance with the requirements of the City Design Manual.

3. Extend borings for tunnels typically one tunnel diameter below the tunnel invert, but not less than 15 feet.
 4. Extend borings for tunnel shafts typically 1.5 shaft diameters below the bottom of the shaft, but not less than 30 feet. Increase boring depths if necessary to determine the location of water-bearing layers and piezometric levels potentially affecting bottom stability. Use borings of less depth if ground water conditions are not of concern at the particular location.
- N. Obtain a minimum of two borings at each bridge site. Their depth shall be sufficient to develop pile curves, bearing and structural recommendations for the design and construction of the bridge structure.
- O. For bridge and retaining structure designs, in conjunction with TXDOT, perform TXDOT Cone Penetrometer test. Design procedures should be in accordance with TxDOT Bridge Design Manual, latest version.
- P. Perform Slope Stability Analysis for projects that are adjacent to the bank of a bayou or creek where the slope stability is of concern.
- Q. Perform Running Soil and Ground Water Aggressivity tests for projects where metallic pipes are used.
- R. In Projects where sandstone is encountered (also known as cemented soil or cemented sand), the Standard Penetration Test (SPT) shall be done continuously throughout the sandstone layer. Verify the length of the sandstone with additional borings.

3.3 Environmental Site Assessment

- A. Refer to Engineering & Planning Department Standard Practice for Environmental Site Assessments, latest edition.
- B. Provide environmental site assessment reports along with executed Environmental Site Assessment Investigation Checklist. Provide asbestos and lead survey reports, when applicable.

3.4 Special Licenses and Permits (Payment)

- A. The actual cost of special licenses and permits, including required inspection fees, shall be reimbursed by the City.
- B. This additional service does not include Engineering work associated with Basic Services.

3.5 Traffic Control Plan (TCP)

- A. General

1. The specific traffic control work consists of the completed TCP, appropriate specifications and general notes, and traffic control construction cost estimates.
2. The TCP shall show detailed construction sequences and the necessary traffic control phases, complete with all barricades, signing, striping, delineation, detours, temporary traffic signals and any other devices, to protect the traveling public and provide safety to the construction forces.
3. The TCP should be accomplished with the least inconvenience to the traveling public consistent with expeditious completion of the Project in time and costs.

B. Standards and Guidelines:

Construction Sequencing and TCP shall be in accordance with general traffic engineering principles and practices governing traffic control during construction as prescribed by the guidelines of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD), and City of Tomball requirements.

1. The construction of the Project should be scheduled or sequenced to minimize the down time for the contractor and to maximize the utilization of space for the travelways. Sequencing is accomplished by partitioning the Project into construction phases, which may be further segmented into steps. A "*phase*" is a major portion of the construction, scheduled in a logical progression toward Project completion. A "*step*" is a minor portion of the construction, subordinate to a particular phase.
2. The TCP should clearly distinguish areas of construction with areas of traffic for each phase. The work zone is also to be distinguished from the actual construction limits.
3. Maintain minimum emergency travel lane width of 10 feet at all times. If space is not available within the existing roadway, temporary widening of the pavement section may be necessary to provide a minimum 10-foot emergency travel lane.
4. The TCP should contain the following basic elements:
 - a. Project approach signing.
 - b. Phasing overview (as applicable).
 - c. Detailed plans for each phase of construction and any designated steps.
 - d. Necessary TCP details, including appropriate City standards (Barricade & Construction, etc.), typical lane closures, and intersection details.

C. Drawings:

1. Engineer shall verify and show existing field conditions of roadways and access to adjacent properties.
2. Engineer shall show traffic control devices and location of traffic flow, indicated by direction arrows, for each phase of the Project.
3. Engineer shall define construction areas by appropriate identifications, such as cross-hatching. Show all barricades, traffic signing, traffic signal changes, detour routing, and special intersection treatment details.
4. Engineer shall show only roadways that are existing or to be constructed under the Project. Do not show roadways that have been removed or that will be constructed in future contracts.
5. Engineer shall prepare cross sections for major thoroughfares and for each roadway variation showing the traffic lanes, construction pavement markings, delineators, barriers, buffer zone for barrels and concrete traffic barriers (CTBs), pavement drop-off, and construction details.
6. Engineer shall pictorially represent all construction signing and label with appropriate identification number as shown in TMUTCD. Show and identify all other traffic control devices in the plans and cross sections.
7. Engineer shall use a "typical" TCP detail for portions of the Project wherever possible.

D. General Notes and Specifications:

1. Engineer shall add general notes to the drawings or to the City's Standard General Note Drawing, as required for clarity.
2. Engineer shall include The City of Tomball Standard Specifications for Traffic Control, and supplement as required.

E. Graphical Standards:

1. Engineer shall use no smaller scales than 1 inch equals 50 feet for details and 1 inch equals 100 feet for overall signage or detour routing. Smaller scales shall require prior approval of the Director.
2. Engineer shall prepare traffic control construction quantities and estimate of Construction Cost.

F. For paving projects, include the following:

1. Engineer shall show temporary traffic control measures required during construction, such as temporary adjustments to traffic signals, installations of contractor-supplied equipment and conduit to provide for proper signal operation, and parking restriction signs in areas where parking is not currently restricted but added roadway capacity is required.
2. Where substantial roadway capacity is being lost during construction, the Engineer shall show placement of contractor-supplied changeable message signs with proposed messages to encourage use of alternative routes by the traveling public

3.6 Storm Water Pollution Prevention Plan (SWPPP)

- A. Refer to City of Tomball Standard Details and Standard Specifications.
- B. Refer to City of Tomball “Storm Water Management Handbook for Construction Activities.” If the City hasn’t adopted a plan at contracting point in time, Consultant to identify alternative guideline for approval.
- C. The Engineer shall prepare the following documents in accordance with the above referenced standards and as described below:
 1. Pollution Prevention Plan Report, as required.
 2. Pollution Prevention Plan drawings having a minimum scale of 1 inch equals to 100 feet and showing all existing and proposed streets, Project alignments, applicable notes, proposed storm water conveyance systems, overland flow arrows, and pollution prevention measures.
 3. Pollution Prevention Plan specifications.
 4. Pollution Prevention Plan construction quantities and estimate of Construction Cost.
 5. The EPA Notice of Intent form (if required).

3.7 Existing Conditions Survey and Analysis

- A. The Engineer shall perform a survey and analyses of the existing conditions at designated locations. The Engineer shall submit the results of this work in a separate report.
- B. This special service is used where a separate deliverable is desired, and where the survey/analysis is not directly related to the scope of the new work, thus the engineering cost would not be included in the Basic Services.

Example - Consider a project that includes the mechanical and electrical rehabilitation of an existing pump station at a treatment plant site. Surveying and analyzing the existing conditions of the pump station would not be included under Additional Services, since it is covered under Basic Services with associated enhancement factors (if fee curves are used). However, if on the same project the Public Utilities also desired a survey and analysis of the electrical/mechanical systems of the aeration blowers, but no new work to the existing aeration blowers was included, then this would be an example of Additional Services.

3.8 Street Lighting Plans

- A. For new roadway construction or complete roadway reconstruction, It is the City of Tomball's practice to upgrade street lighting along all roadways to current recommended levels as part of the Capital Improvement Projects.
- B. Street Lighting plans shall be provided at 1"=40' scale (minimum) consistent with project overall layouts.
- C. Design consultant will prepare the lighting layout, spacing the streetlights at a distance of approximately 200 feet \pm 10% for driveway/utility conflicts. For roadway sections less than four lanes, stagger the streetlights along both sides of the roadway, maintaining the 200 foot \pm 10% spacing. The design should include any existing street lighting and generally begin layouts at intersections working away from them..
- D. Street Lighting plans shall show the proposed street lighting locations, electrical conduits, pull boxes and power feed locations prepared in accordance with published CenterPoint Energy specifications.
- E. The lighting layout will be submitted to the City for review and approval. Upon approval, the approved layout will be submitted to CenterPoint Energy for review and cost estimate preparation for temporary or new fixtures. Conduit and pull box costs shall be included in the Engineers Project Construction Cost Estimate.
- F. Street Lighting Plans shall include a table showing the locations of the existing and proposed streetlights by station number.

3.85 Tree Protection, Mitigation and Planting Plan

The following requirements are minimum for projects where tree inventory, protection, mitigation is required.

- A. All tree protection, mitigation and planting plans shall be prepared for compliance with Article _____ of Chapter ____ of the City of Tomball Code of Ordinances.
- B. Consultant will conduct and inventory of trees within and immediately adjacent to the street right-of-way including as a minimum: tree number, caliper, species, condition and physical address (where feasible).

- C. Tree Protection Plans will include a project layout sheet with each tree location graphically identified by tree number and the appropriate protection measures to be utilized. Details of protection measures shall be provided as necessary.
- D. The Tree Protection Plan will include a treatment schedule (tabular form) for all trees impacted by the project that shall include the tree number, physical address, species, caliper, condition and recommended treatment schedule.
- E. Tree Mitigation Plan will identify all trees to be removed from the project by tree number, physical address, species, caliper, condition and replacement conditions under the ordinance (tabular form).
- F. Trees identified to be replacements per the Tree Mitigation Plan shall be shown on a Tree Planting Plan of suitable scale and detail along with technical specifications and construction quantities. The Tree Planting Plan shall represent requirements necessary for compliance under the Ordinance.
- G. Tree inventories and treatment schedules are to be provided by a Certified Arborist. Plan and document preparation shall be provided by industry professionals in accordance with State Guidelines.

3.9 Technical Review Committee (TRC) Meeting

- A. The Engineer shall attend a Pre-TRC meeting, as scheduled by the Director. The purpose of the Pre-TRC is to allow the Director to review the preliminary design, presentation materials, and recommendations. The Engineer shall have completed and submitted the Preliminary Engineering Report (PER) prior to the Pre-TRC meeting. As part of the pre-TRC, the Engineer shall prepare a Microsoft Powerpoint presentation, a TRC agenda and an executive summary showing the alternatives, recommendations and estimated construction and project costs.
- B. Upon successful completion of the Pre-TRC meeting, the Engineer shall attend a TRC Meeting. The purpose of the TRC meeting is to present the preliminary engineering recommendations to the City's Technical Review Committee for approval to proceed to Final Design. The Engineer will provide equipment for preparation and presentation of the TRC meeting. Members of the TRC are City staff and may include senior managers representing engineering, operations, maintenance, and construction divisions. The TRC will evaluate the Engineer's recommendations and approve or modify as appropriate.
- C. Within 3 days following the TRC Meeting, the Engineer shall submit a summary of the decisions and action items from the meeting, and a revised Construction Cost estimate.

4.0 DEFINITION OF PHASE II MILESTONES FOR PAYMENT (Refer to Article 3.2.3 of Contract)

4.1 Research Utilities

- A. Engineer obtains and completes review of available record drawings.
- B. Engineer completes the utility plan review, as defined in this Scope of Services.
- C. Engineer completes coordination with other agencies, as defined in this Scope of Services.
- D. Engineer verifies information obtained in steps A, B, and C above against findings from Survey.
- E. Engineer obtains maps and correspondence from applicable private utilities, showing and verifying location of existing private utilities.

4.2 Plot of Topographical Surveys and Utilities

- A. Engineer submits set of plan drawings showing results of topographic survey and location of existing public and private utilities.

4.3 50% Drawings

- A. Engineer submits sets of construction drawings including, as a minimum:
 - 1. Cover Sheet
 - 2. Overall Layout Sheet
 - 3. Survey Control Map
 - 4. Plan and profile drawings of existing conditions and existing utilities
 - 5. Plan drawings of proposed improvements
 - 6. Profile drawings of proposed improvements at critical locations and potential conflicts
 - 7. Locations of crossings (RR, HCFCD, TXDOT, etc.), potentially contaminated areas, and proposed real estate acquisitions
 - 8. For Facilities Projects – process flow diagrams; piping and instrumentation diagrams, as applicable
 - 9. For Water & Wastewater Projects – design calculations for the proposed improvements and system head curves for pumps
- B. Engineer submits table of contents for construction specifications.
- C. Engineer submits design review checklists (as available).
- D. Engineer makes initial coordination effort with private utilities regarding potential conflicts for the project.

4.4 70% Drawings and Draft Specifications

A. Engineer submits sets of completed construction drawings including as a minimum:

1. Cover Sheet
2. Index Sheet (list of drawings)
3. Overall Layout Sheet
4. Survey Control Map
5. General Notes Sheets (as required)
6. Plan and profile drawings of existing conditions, existing utilities and proposed improvements
7. Details of crossings (RR, HCFCD, TXDOT, etc.), potentially contaminated areas, and proposed real estate acquisitions
8. Standard Details
9. Traffic Control Plan and Detour Plans (if required)
10. Storm Water Pollution Prevention Plan (if required)
11. Tree and plant protection plan (if required)
12. For Paving Projects, also include:
 - a. Typical roadway section/cross section
 - b. Traffic Signal Plans (temporary and permanent)
 - c. Permanent Paving Marking and Signage Plans
 - d. Street Lighting Plans
 - e. Drainage Area Maps
 - f. Houstorm Storm Sewer Computations
13. For Facilities Projects – process flow diagrams; piping and instrumentation diagrams, as applicable
14. For Water & Wastewater Projects – design calculations for the proposed improvements and system head curves for pumps

B. Engineer submits sets of draft construction specifications including as a minimum:

1. Table of Contents
2. Document 00410 (Bid Form) with all bid items, but excluding quantities
3. Section 01110 (Summary of Work)
4. Completed technical specifications (Division 0 through 16, as required)
5. All supplemental and non-standard technical specifications included in Divisions 2 through 16 identified.
6. A detailed construction cost estimate.

C. Engineer submits documentation that drawings were submitted to private utilities for final review.

D. Engineer submits design review checklist (as available).

4.5 Final Drawings and Specifications (100% Design)

- A. Engineer submits completed sets of construction drawings, with all review comments resolved.
- B. Engineer submits completed construction specifications.
- C. Engineer submits sheet-by-sheet quantity takeoff, flagman hour calculation, and documentation to support the construction duration specified.
- D. Engineer provides permit approval, as applicable, from TXDOT, HCFCD, Railroads, U.S. Army Corps of Engineers, and Harris County Public Infrastructure Department.
- E. Engineer documents submittals of plans to City for Building Permit Application and to Texas Department of Licensing and Regulations for ADA requirements, if applicable.
- F. For wastewater projects, Engineer submits Final Engineering Design Report (FEDR) in conformance with TNRCC requirements.

4.6 Bid-ready Drawings and Specifications

- A. Engineer submits bid-ready construction documents (signed and sealed construction drawings with all required signatures; and completed construction specifications).
- B. Engineer documents that application for City Building Permit is approved, if applicable.

4.7 Bidding Services

- A. Engineer completes services as per requirements of the Contract and the Scope of Services.