

EXHIBIT C.1 ENGINEER'S DESIGN SERVICES SCOPE OF WORK

The work to be performed by the Engineer shall consist of providing traffic signal timing services for the **Eastlake Blvd.** corridor in El Paso County. The corridor segment to be retimed includes 11 signalized intersections, as listed below:

Eastlake Blvd. at:

1. IH-10 EB Frontage Road
2. IH-10 WN Frontage Road
3. McDonalds/Amazon driveway
4. Rojas Dr.
5. Mission Ridge Blvd.
6. Peyton Dr./ Eastlake High School
7. Emerald Sands
8. Emerald Park Dr.
9. Darrington Rd. (Horizon Heights Elementary, Ensor Middle School))
10. N. Kenazo Ave.
11. Horizon Blvd.

Design Standards. The ENGINEER shall prepare all work in accordance with the latest version of applicable STATE procedures, manuals, and guidelines to include the *Traffic Signals Manual*, *Texas Manual on Uniform Traffic Control Devices (TMUTCD)*, *Transportation Research Board (TRB) Highway Capacity Manual*, and other STATE approved manuals.

The engineering services shall include traffic count data collection, performing travel time studies, traffic signal timing development and report preparation. The Engineer shall perform the following tasks:

A. Project Coordination

The Engineer shall prepare for and attend a virtual or in person project kick-off meeting, one in-progress project meeting for the signal system to be coordinated. The Engineer shall prepare for and attend a second meeting to present the recommendations to the County. The Engineer shall prepare meeting agendas and meeting minutes for both meetings.

The Engineer shall review the existing phasing and timing sheets, the clearance intervals to be used and the pedestrian walk and don't walk times for all intersections in the specific project.

The Engineer shall prepare invoices and progress reports monthly and advise the County on any issues that may impact the project budget or schedule.

B. Data Collection

The Engineer shall collect 24-hour bi-directional, classification count data at one location in the corridor. The count will extend from Thursday to Sunday of a typical week during the school session. The Engineer shall analyze the counts for accuracy and shall prepare tabular summaries of the counts for each day and each direction of travel.

The Engineer shall collect turning movement volume data (TMCs) at each signalized intersection listed above, on a typical weekday during the morning, midday, and afternoon peak periods. The count will include pedestrian activity.

The count periods shall be as follows:

- 7-9 AM
- 11 AM -1 PM
- 2-4 PM
- 5-7 PM

The Engineer shall analyze the counts for patterns and prepare tabular summaries for each intersection TMC. The Engineer shall determine the peak hour factors for all the turning movement data collected and submitted in a tabular form. The Engineer shall also present the peak hour turning movement data in map format.

The Engineer shall perform a site visit to gather intersection and signal inventory data. The intersection data will include the number of lanes and lane use, posted speed limit on each approach, bus stop locations, and parking near the intersection. The signal inventory will include controller brand and type, software version, cabinet equipment, signal head types, left turn signal type, overlap movements, vehicle detection, pedestrian detection, pedestrian signals, communication panels if available.

C. Travel Time Runs

A travel time run study consists of a total of six (6) travel time runs in each direction on the corridor within the project limits for the 11 intersections during morning, midday, and afternoon peak periods. Three (3) of the runs are made before implementing new timings. The remaining three (3) runs are made after implementing and fine tuning the new timings. The Engineer shall analyze any travel time data collected and provide the State with before and after comparisons in the form of tables and graphs.

D. Timing Plan Generation

The Engineer shall perform capacity analysis at each intersection to evaluate the existing timings and to determine the saturation flow rates and the existing Level of Service (LOS). The Engineer shall perform Synchro optimization analysis using the existing volumes to determine the best cycle length for each peak period. The Engineer shall summarize these results in a tabular and graphical format. Determining the best cycle length may require coordination with crossing arterials that are in existing systems.

The Engineer shall generate the time-space diagrams for the morning, midday, afternoon, and off-peak periods. The Engineer shall submit the generated timing plans

and time-space diagrams to the County for review. The Engineer shall incorporate the appropriate revisions into the timing plans and time-space diagrams and shall submit the revised timing plans and time-space diagrams to the County along with the Preliminary Report. The Engineer shall submit controller timing sheets that are appropriate for each controller manufacturer.

E. Signal Communications Analysis

The Engineer shall perform a signal communications analysis to determine the options available to provide reliable interconnection of the traffic signals in the corridor. The analysis will focus on lower cost, wireless options such as GPS clocks and spread spectrum radios. The Engineer will evaluate the ability of each intersection controller to work with GPS clocks or wireless equipment. The Engineer will recommend options and prepare cost estimates for each option.

Once the County selects the preferred option, the Engineer will prepare a supplemental Task Order to prepare the appropriate plans, specifications and estimates for the signal communications installations.

F. Preliminary Report

The Engineer shall prepare a preliminary report to summarize the data collection, capacity/LOS analysis, timing plan generation, and recommendations for the retiming of the signal system. The Engineer shall submit one (1) copy of the signal timing plans – cycles, splits and offsets - in a tabular form and also one (1) set of time-space diagrams for each period of analysis. The Preliminary Report shall be submitted by e-mail in PDF format.

The Engineer shall meet with County staff for a technical review meeting. The Engineer shall discuss the timing optimization process and the recommendations, as well as the time frame for implementing the timing plans in the field by the County contractor. The Engineer shall incorporate the review comments from this meeting into the Final Report. Also included in the study will be recommendations if any of the above mentioned intersections are candidates for flashing yellow operation based on the accident information provided by the County.

G. In Field Fine-Tuning

The Engineer shall make recommendations and respond to questions in the field during the timing implementation process by the County's contractor. When the new timing plans are operational, the Engineer shall provide qualified engineers for on-site fine tuning assistance. During the course of this assistance, the Engineer shall observe the actual operation of the new timing plans and recommend field adjustments to improve traffic operations to be made by the County.

Once the final timing is established, the consultant shall update the signal timing sheets to reflect the adjustment made in the field.

H. Final Report

The Engineer shall prepare a final report to document the signal retiming work on the corridor. The report will include the travel time data collected after the fine-tuning of the new optimized signal timings. The Final Report shall consist of:

- The methodology used, the alternatives considered, recommendations of the Engineer;
- photographs of each intersection;
- a photograph of the interior of the cabinet;
- turning movement counts and 24-hour counts in tabular format;
- turning movement counts in map format;
- a Yellow-Change/Red-Clearance Interval Worksheet for each intersection;
- a signal timing sheet for each plan at each intersection (based on constant vehicle demand).

I. Deliverables

The Engineer shall submit the following deliverables:

- the Final Report
- a CD-ROM containing the final report, all technical data, and Synchro files.