General Requirements

The purpose of this task is to provide the DEPARTMENT with professional services for conducting traffic operational retiming and affiliated duties within Brevard, Flagler, Lake, Marion, Orange, Osceola, Seminole, Sumter and Volusia Counties upon request.

The CONSULTANT shall ensure that all tasks and required field activities are conducted professionally and in a manner that utilizes accepted safety methods and practices. The safety of the traveling public and the CONSULTANT’s field staff shall be an essential goal of each field activity.

For all tasks without a defined period of performance, the CONSULTANT shall return a task schedule and/or fee estimate within one (1) week from the receipt of the DEPARTMENT’s request.

Acronyms:

**AADT** - Annual Average Daily Traffic

**CADD** - Computer Aided Design and Drafting

**DTOE** - District Traffic Operations Engineer

**FDOT** - Florida Department Of Transportation

**FHWA** - Federal Highway Administration

**MUTCD** - Manual of Uniform Traffic Control Devices

**MUTS** - Manual of Uniform Traffic Studies

**PM** - Project Manager

**TMC** - Turning Movement Counts

Definitions

A traffic control timing pattern is a set of cycle length(s), splits and offsets for a section.

A section is a portion of a traffic control system which can be controlled by a single set of timing parameters.

Personnel

The CONSULTANT’s work shall be performed by the key personnel agreed upon by the CONSULTANT and the DEPARTMENT at the onset of the contract. The DEPARTMENT shall be notified immediately of any changes in the CONSULTANT’s key personnel which shall be subject to review and approval by the DEPARTMENT.

Preliminary Report

All tasks requiring a report shall have a preliminary report submitted to the PM prior to the submittal of the Final Report. The PM along with other District Traffic Operations staff shall review and comment on the preliminary report. The CONSULTANT will address and/or incorporate all the comments of the PM and the District Traffic Operations staff.

Final Report

All final reports submitted to the PM shall be signed, sealed, and dated by a Florida Registered Professional Engineer of the CONSULTANT (including all subcontracted work). The front/cover page may include the funding agencies’ logos but should not include the firm’s logo(s). The CONSULTANT shall provide one (1) original of the final report to the PM (electronic files in Adobe Acrobat PDF format and any associated CADD files in DGN format).

SYSTEM OPERATION REVIEW AND TRAFFIC SIGNAL EQUIPMENT INVENTORY

Review and document the type, age, condition, capability of the equipment, and existing timing plan at each intersection within the arterial, existing phasing, laneage and lane assignments, and the coordinating medium on an agency of FDOT inspection form. Report to the Project Manager and Maintaining Agency any deficiencies noted upon discovery.

ANALYSIS, IMPLEMENTATION AND DOCUMENTATION

The CONSULTANT shall identify each intersection including current operation and the maintaining agency. If needed, the CONSULTANT will organize a kick-off meeting with all stakeholders.

The CONSULTANT shall collect existing descriptive and volume demand data, as well as prepare a System Overview Map and Link/Node Diagrams. The diagrams shall include the condition diagram, phasing sequence diagrams for all plans, existing detector locations, link data such as length and speeds and inventory. As part of the existing collection process, the CONSULTANT will verify that existing information is accurate and collect additional data as needed. The CONSULTANT will visit the intersection(s) during the AM peak period, Mid-Day peak period, PM peak period and during low-volume period(s). The CONSULTANT should drive, walk and ride to experience the different modes of traffic.

The CONSULTANT shall determine the optimum system timing pattern(s) for the optimum cycle length during different times of the day/week. When a system analysis is performed, the necessary settings to be developed will include but are not limited to:

* Cycle Length
* Basic Signal Timings (Yellow Change, Red Clearance, Minimum Green, Maximum Green, Passage Time, Pedestrian Intervals, Dual Entry, Recalls and Memory Modes)
* Splits
* Offsets
* Force-offs
* Permissives
* TOD Plan
* Day-of-Week Plan

These parameters will be developed for the following timing plan periods if data is not available:

* Day Plan: Inbound & Outbound Peak Hour(s) and Off-Peak Hour
* Week Plan: Day plan to be implemented for each day of the week

An analysis shall consist of at least the following steps:

* Identify and justify each zone in each corridor.
* Analyze and design isolated intersection timings for each intersection.
* Analyze and design coordinated intersection (system) timings with Synchro (or a similar design tool/software that is approved by DEPARTMENT and the Maintaining Agency with Existing Phasing.
* Document existing and proposed phase sequence and lagging phase settings for each timing plan. The preferred performance measures are increased throughput, reduced traffic delays, improved travel time reliability and reduced crashes.

The CONSULTANT is responsible for selecting all input values required for the analysis. The CONSULTANT must use their own computer for all analyses to be performed under this study (the software used must be approved by the Project Manager). Electronically submit all preliminary input/output timing development runs and data files (i.e., initial and final runs); along with any link/node diagrams. The format of the timing charts will be approved by the DEPARTMENT.

The CONSULTANT will obtain from the Maintaining Agency existing controller timings.

The CONSULTANT shall provide the Project Manager and Maintaining Agency an electronic copy of the documentation for each of the timing patterns in an acceptable format. The PM along with other District Traffic Operations staff shall review and comment on the preliminary report. The CONSULTANT will address and/or incorporate all the comments of the PM and the District Traffic Operations staff. Resubmissions of the preliminary report should include comments with responses and identify any signal timing changes using a highlighter on the proposed signal timing sheets. The preliminary report shall contain, but is not limited to the following information:

* Executive Summary
* Optimum controller and coordination timing that can be implemented on existing hardware
* Master Clock Chart (Hardwire, TBC, UTCS, CLS)
* Link/node diagrams
* Electronic Data Files
* Arterial analysis and documentation
* Note for the proposed implementation date

Note for proposed field evaluation and fine-tuning end date

After acceptance of the initial timings and patterns by the Project Manager and Maintaining Agency this task includes entering the intersection system timings, developed by the CONSULTANT, into the controller units, coordination units and master units. The CONSULTANT shall notify the Maintaining Agency prior to implementation and request their authorization during the implementation.

Fine tuning of implemented timing(s) for each arterial must be performed based on field observation of the traffic operation during all developed pattern peak hours. The traffic engineer will observe the operation of the arterial for each timing pattern. The traffic engineer shall be available to investigate and fine-tune any adjustments for a period of 30 days after the submittal of the final report.

Should an existing controller, coordination unit, or master unit be inoperative or additional hardware or cabinet modifications be required at an intersection, the CONSULTANT will give verbal notification of the problem to the Project Manager and the Maintaining Agency within the same day. The CONSULTANT will also document in the report the nature, extent and probable solution(s) to the problem(s) within one week.

The CONSULTANT shall provide the Project Manager and Maintaining Agency electronic copies of the final documentation for each of the timing patterns in an acceptable format. Hard copies of the timing plans must also be placed in each cabinet in the field upon implementation. The Final Report must be signed, sealed and dated by a Florida Registered Professional Engineer. The front/cover page may include the funding agencies’ logos but should not include the firm’s logo(s). It shall contain, but is not limited to the following information:

1. Cover Page
2. Executive Summary
3. Study Summary (MOEs, Changes, Recommendations)
4. Signal Timing Implementation Date
5. 30-Day Adjustment Period Start and End Dates
6. Table of Contents
7. System Overview Map
8. Link/node Diagrams
9. Equipment Inventory
10. Arterial Analysis and Documentation
11. Final Implemented Intersection and System Timings.
12. Master Clock Chart (Hardwire, TBC, UTCS, CLS)
13. Day Plans
14. Week Plan
15. Time-Space diagrams.
16. 24-hour, 7-day counts arrayed in an acceptable format.
17. 8-hour turning movement count arrayed in an acceptable format.
18. Appendix (Count data, field sheets, Y&R/Ped calculations, Synchro Input/Output Reports, etc.)
19. Data files through electronic document submission

8-HOUR TURNING MOVEMENT COUNT/PEDESTRIANS

An 8-Hour TMC shall be taken for those hours encompassing the morning, midday peak and afternoon traffic periods and/or peak periods during which warranting volumes exist and an off-peak period.

Each period shall normally consist of a minimum of eight (8) consecutive 15-minute intervals (2 hours) during each period which yields the highest total volume of vehicles entering the intersection. Note that the 2-hour period could begin on any quarter hour. For example, the afternoon peak could be from 4:45 PM to 6:45 PM. Vehicles must be counted by personnel or other approved automated equipment. They may use tally sheets or turning movement counter boards (mechanical/electronic) and must separately record the number of pedestrians. The need for additional personnel to count traffic may be authorized as a supplemental.

Another alternative methodology that may be used to collect 8-Hour TMC, with approval from the Project Manager, is by Intersection Movement Count (IMC) devices located at the intersections, such as Gridsmart. Provided the devices at specific locations have been verified as reliable, the traffic volume information may be used.

A sketch of sufficient detail shall be made to show the approach lanes, left and right turn lanes, and whether there is a median or other type of separation. The traffic signal head arrangement and pedestrian features should be shown. The sketch should show whether the intersection is a "T" or a "Plus" type intersection, any offset, and the approximate skew if one exists. North shall be to the top of the page.

* 8-hour TMC providing hourly volume summaries.
* 8-hour TMC providing 15-minute volume summaries.
* 8-hour truck volume summaries.
* 8-hour pedestrian movement counts providing hourly summaries.
* Sketch of lane configurations.

If this data is provided as a separate document, it should include a title page, location map, the data presented on standard FDOT forms or as approved by the Project Manager, and any narrative necessary for the understanding or interpretation of the data.

4-HOUR TURNING MOVEMENT COUNT/PEDESTRIANS

A 4-Hour TMC shall be taken for a period of 4 hours encompassing the peak periods as determined by the Project Manager, which warranting volumes exist. Each period shall normally consist of a minimum of eight (8) consecutive 15-minute intervals (2 hours) during each period which yields the highest total volume of vehicles entering the intersection. Note that the 2-hour period could begin on any quarter hour. For example, the afternoon peak could be from 4:45 PM to 6:45 PM. Vehicles must be counted by personnel or other approved automated equipment. They may use tally sheets or turning movement counter boards (mechanical/electronic) and must separately record the number of pedestrians. The need for additional personnel to count traffic may be authorized as a supplemental.

Another alternative methodology that may be used to collect 4-Hour TMC, with approval from the Project Manager, is by Intersection Movement Count (IMC) devices located at the intersections, such as Gridsmart. Provided the devices at specific locations have been verified as reliable, the traffic volume information may be used.

A sketch of sufficient detail shall be made to show the approach lanes, left and right turn lanes, and whether there is a median or other type of separation. The traffic signal head arrangement and pedestrian features should be shown. The sketch should show whether the intersection is a "T" or a "Plus" type intersection, any offset, and the approximate skew if one exists. North shall be to the top of the page.

* 4-hour TMC providing hourly volume summaries.
* 4-hour TMC providing 15-minute volume summaries.
* 4-hour truck volume summaries.
* 4-hour pedestrian movement counts providing hourly summaries.
* Sketch of lane configurations.

If this data is provided as a separate document, it should include a title page, location map, the data presented on standard FDOT forms or as approved by the Project Manager, and any narrative necessary for the understanding or interpretation of the data.

24-HOUR TRAFFIC COUNT

The CONSULTANT shall collect traffic count data on each approach to the intersection for a minimum period of 24 hours during typical weekday traffic conditions. In conducting the counts, the CONSULTANT shall utilize an automatic traffic counter which produces a written record of the traffic volumes and the time of day, either directly or through subsequent interconnection and processing with external electronic hardware. The count data shall be presented in an acceptable tabular form showing 15-minute interval volumes and hourly summaries.

If this data is provided as a separate document it should include a title page, location map, the data presented on standard FDOT forms or as approved by the Project Manager, and any narrative necessary for the understanding or interpretation of the data.

7-DAY CONTINUOUS TRAFFIC COUNT

A count station is 1 location, 2 directions, or in the case of one-way pairs, 1 count for each direction.

To determine the volume of traffic utilizing a road, the Project Manager may authorize the collection of seven-day continuous traffic counts at select stations. In conducting the counts, the CONSULTANT shall utilize an automatic traffic counter which produces a written record of the traffic volume and the time of day, either directly or through subsequent interconnection and processing with external electronic hardware. From the count data, an acceptable tabular presentation of directional traffic volumes shall be developed showing 15-minute interval volumes and hourly summaries over the 7 consecutive day period. A graphical presentation shall be developed showing hourly interval volumes over the 7 consecutive day period. The 7-day period shall not include a holiday unless otherwise directed by the Project Manager.

If this data is provided as a separate document it should include a title page, location map, the data presented on standard FDOT forms or as approved by the Project Manager, and any narrative necessary for the understanding or interpretation of the data.

PUBLIC PRESENTATION

The CONSULTANT shall prepare and present a PowerPoint (or approved alternative) presentation to summarize the scope of the project and steps taken to perform the retiming effort. The presentation shall summarize the improvements and show benefits in forms of reduced delay to the corridor.

BEFORE AND AFTER TRAVEL TIME AND DELAY STUDIES

The Consultant shall use the latest approved version of Tru-Traffic to perform travel time runs for existing and implemented signal timings. The trip logs should be saved for each run in Tru-Traffic. The data will be collected to fine tune implemented signal timings, as well as to provide a field measured metric by which existing and implemented signal timings can be compared.

Each arterial has two (2) directions of travel. The travel time runs for each direction shall be made for AM Peak, Mid-Day Peak and PM Peak. The times of each peak will be determined by the CONSULTANT based on volume counts and approved by the DEPARTMENT. Six (6) runs shall be made for each time period for each direction. There will be a total of 36 directional travel time runs on each arterial. The weekday travel time runs may be made on Tuesday, Wednesday or Thursday during normal conditions. The travel time runs shall not be conducted on holidays or during special events. The runs shall also be made in similar weather conditions. The dates for travel time studies shall be approved in advance by the DEPARTMENT.

The DEPARTMENT representatives may also join the CONSULTANT for the Before and After travel time and delay runs. At least one week prior to the runs, the CONSULTANT shall inform the DEPARTMENT of the day(s) to conduct runs for the System. The CONSULTANT shall obtain DEPARTMENT approval for the directions, extent and routes of the runs before conducting the runs. The CONSULTANT shall provide the DEPARTMENT with a copy of the Tru-Traffic file(s) runs at the end of each day.

RAILROAD PREEMPTION

The CONSULTANT will conduct a Railroad preemption study using DEPARTMENT approved procedures. The Yellow and All Red intervals should be updated based on the latest District 5 guidelines. All field measurements and observations necessary for the study/timing updates should be collected. Coordination with the Railroad authorities through the District's Railroad Coordinator will be necessary to collect the required information and documents needed for the study.

MODELING

The Consultant will be required to update and maintain a comprehensive Synchro network, which includes corridors throughout District 5.

The Consultant may be required to provide and update existing Synchro models, which could include developing Peak (AM, Midday and PM), Off-Peak and Weekend Patterns for State Roads.

The Consultant will be required to make any necessary file, structure or data changes to ensure retiming efforts are captured. The Synchro model must be an accurate representation of existing conditions. Coordination with the Maintaining Agency is necessary to ensure that correct node numbers are used which reflect the ATMS ID’s.

Transit Signal Priority

Transit Signal Priority (TSP) settings will be developed for deployment in controllers with existing TSP modules. The settings will be developed in accordance with industry practice, guided by policies developed by the Florida Department of Transportation, Maintaining Agencies and the Central Florida Regional Transportation Authority (LYNX).

* For each intersection included in this project, identify phases to have Enable Transit Priority selected and define the associated operating parameters. This element includes project oversight and coordination with the appropriate agencies.
* Estimate the Time of Service Desired (TSD) and Time of Estimated Departure (TED) by movement for each intersection approach with TSP. This includes field observations during the AM and PM peak periods to estimate transit vehicle approach speed, conducted by riding the transit vehicle while running Tru-Traffic for the selected pattern; the transit vehicle speeds will be measurable from the vehicle traces.
* Determine the Maximum Reduction and Maximum Extension time values by phase and by each affected pattern, for each intersection. By policy, the maximum amount of added green time for transit vehicles will be 10 seconds but will likely be less based on practicality and coordination pattern constraints. At the conclusion of this element, a Technical Memorandum will be prepared to document the three initial elements and submitted to the appropriate agencies for review and approval.
* Develop a programming sheet to allow data entry and provide for quality checks and code data for included intersections.
* Implement the TSP parameters in a test controller in the office and run diagnostics, then download to the individual field controllers.
* Work with LYNX, or other transit agency, through the FDOT for fine tuning after transit service is initiated. This effort would be limited to the staff hours included in the fee proposal.