

## **RFRP # 11/12-011 – ADDENDUM #1**

### Exhibit A - Scope of Service

Coordinated Pre-Preemption of Traffic Signals to Enhance Railroad Grade Crossing Safety in Urban Areas and Estimation of Train Impacts to Arterial Travel Time Delay

*The maximum amount of funding for this project is \$150,000.00.*

*The anticipated timeframe for this project 18 months.*

### **Background Statement**

According to statistics compiled by the Federal Railroad Administration (FRA), Florida has experienced a high number of train/vehicular crashes during the period from 2006 to 2008 in comparison with other states. The FRA required Florida to submit a [Highway-Rail Grade Crossing Safety Action Plan](http://www.dot.state.fl.us/rail/FCSAP0811.pdf) (<http://www.dot.state.fl.us/rail/FCSAP0811.pdf>) for reducing crashes at railroad crossings by increasing public awareness, constructing roadway overpasses, increasing the number of lights and gates at crossings throughout the state, and through other means.

In South Florida, two (2) major rail lines (South Florida Rail Corridor and Florida East Coast Railway) stretch across the region impacting every minor and major east west arterial. The South Florida Rail Corridor includes three (3) types of rail traffic – commuter rail (Tri-Rail), intercity passenger rail (AMTRAK), and freight rail operations (CSX), while the Florida East Coast Railway is exclusively freight rail operations. Although the safety impacts are somewhat known, the mobility impacts are not measured and tracked regularly. FDOT District Four's Transportation System Management and Operation (TSM&O) pilot network (initial deployments in Ft. Lauderdale and in Southern Broward County) will take advantage of technology to measure, report and use network performance measures to enhance mobility on the TSM&O network. For more information, please visit the TSM&O website:

<http://www.dot.state.fl.us/TrafficOperations/TSMO/TSMO-d4.shtm#Components> In order to understand and develop solutions that enhance the network's performance, the TSM&O operators must understand the causes of delay and develop strategies that include operational improvements and information dissemination to the users that allows the users to make better decisions on which route or mode to take on the network. Reliable and real time performance measures relating to train crossing delays will give the TMC operators opportunities to develop and implement strategies that minimize congestion resulting from grade crossings.

The proposed research project will investigate the potential for using advanced features of traffic signal system software platforms, prevalent in Florida, to help resolve these safety and mobility problems.

First, this research will investigate the potential to implement 'pre-preemption' phasing in a coordinated manner at intersections along a given rail corridor. This phasing would be triggered

by detection (by the signal system software) of a train entering the corridor and would provide additional time for clearance of vehicles away from grade crossings downstream from the approaching train. The additional clearance will reduce potential for vehicle/train conflicts, especially during periods of congested arterial traffic. The concept to be considered in this research project would not require any physical or other interface with railroad signaling or control systems; it would reside in and be implemented entirely through traffic signal system software. The research will take into consideration the impacts of the diverse rail operations in the South Florida Rail Corridor. The presence of commuter rail, intercity passenger rail, and freight rail operations mean that train lengths and speeds will vary considerably. In addition, there are several passenger stations located within the study area that will impact phasing. Stops at these stations will vary by time of day and overall commuter rail system usage. Also, freight rail operations within both corridors may not always result in complete trips through the study area as trains may stop for deliveries, switching, and rail yard activities.

Second, this research will investigate the use of the signal system software to estimate the location of trains, train speed and impacts to travel time or the predicted delay an incoming train will have on the intersecting arterials. Additionally, this research will provide guidance on how to safely disseminate this information to the users and how the TSM&O operators should use this information to develop signal timing patterns that optimize travel times on parallel routes or potential detour routes the users may take to avoid the train delay.

### **Objective Statement**

The Objective of this research is to develop and implement a method for using existing signal equipment/software to improve safety at grade crossings, estimate the travel time impacts trains have on the network and provide recommendations for how Traffic Management Center operators can use this information to minimize these impacts. This research will focus on how Naztec's ATMS.now will be used to accomplish the objectives, however, consideration to how this strategy is transferable to other software packages used in Florida should be given.

Activities include the following:

1. Research the types of Railroad pre-emption in use within the corridor and around Florida today. Both Advanced Railroad Pre-emption and Simultaneous Railroad Pre-emption strategies are to be considered. A timeline showing the pre-emption events, the equipment/software used and the agency roles.
2. Review of ATMS.Now manual and software functions as it relates to train pre-emption and key software functions that could be used to complete this research. Broward County utilizes ATMS.now version 1.5.45.102 .
3. Review of the Department's Highway-Rail Grade Crossing Safety Action Plan. The link to the Action plan provided in the Background Statement section of this document.

4. Develop a plan that describes the process through which coordinated pre-preemption is implemented through Broward County's ATMS.now platform given the 'trigger' or preemption detection at a control section 'entry point'.

Coordinated pre-preemption via the ATMS.now platform is defined as follows: ATMS.now initiated phasing/timing that occurs prior to formal preemption of traffic signal operations triggered by an approaching train that serves as an opportunity to clear traffic away from a grade crossing prior to the preemption; coordinated means in the sense that the pre-preemption operation is initiated at one grade crossing after another in advance of the approaching train)

A control section is considered for the purpose of this project as a series of signalized grade crossings along the CSX rail corridor).

The plan should include any infrastructure, hardware/software, staffing, protocols, etc. needed to establish and maintain the process. The plan should include a flow chart depicting key activities associated with the process. The plan should be based on a control section selected by the proposer, but be applicable throughout the CSX corridor in Broward County. The control section on which the plan is based should consist of at least three adjacent signalized grade crossings.

5. Develop and implement a method for using the ATMS.Now software (and any other existing FDOT resources) to report and archive train delay performance measures, such as length of train, train speed, and estimated impact to the surrounding arterial network. Describe the ATMS.now inputs, analysis, outputs and any modifications to ATMS.now necessary to produce estimates of train-related delay within the ATMS.now network.
6. Define strategies for optimizing signal operations during and after a train crossing for intersecting and parallel arterials that maximize network performance. Criteria for when to implement a new strategy (timing pattern, DMS message, etc.) will also be developed. These strategies will be calibrated through simulation.
7. Develop a methodology for estimating the strategy-related mobility and safety impacts within the identified control section, including at signalized intersections adjacent to the signalized intersections at the control section's grade crossings. Adjacent intersections should include at least the first two signalized intersections to the east and west of each of the grade crossings in the control section. The methodology should allow comparison of

different strategies on the basis of their effect on overall delay within the network consisting of the grade crossing and adjacent signalized intersections. Using this methodology, report the estimated mobility and safety impacts to the adjacent intersections.