

**RESOLUTION 20-199**

**A RESOLUTION TO APPROVE THE PURCHASE OF UPGRADE COMPONENTS FOR TRAFFIC SIGNAL CABINETS ON THE PORT ROYAL CORRIDOR**

**WHEREAS**, the City of Spring Hill currently has four (4) traffic signals installed on the Port Royal corridor which are maintained by certified City staff; and

**WHEREAS**, the City contracted with The Corradino Group to perform a traffic signal timing study in October 2020 to determine the optimal settings to increase traffic flow and provide safety for the citizens; and

**WHEREAS**, The Corradino Group submitted five (5) alternate recommendations, with Alternate 5 (Hybrid – Wireless Communications and GPS Time Source Module) being the City’s recommendation for implementation; and

**WHEREAS**, City staff received cost estimates from S&W Contracting for the upgrades for the traffic signal cabinet components with a total of \$15,600.00; and

**WHEREAS**, additional items not identified by The Corradino Group are needed for two of the cabinets for an additional cost of \$4,800.00; and

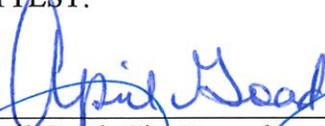
**WHEREAS**, funding for the upgrades are budgeted in the Impact Fees fund (124-43110-932) in the amount of \$28,500.

**NOW, THEREFORE BE IT RESOLVED**, that the City of Spring Hill Board of Mayor and Aldermen, approves the purchase of upgrade components for traffic signal cabinets on the Port Royal corridor in the amount of \$20,400.00.

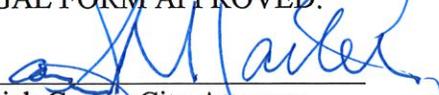
**Passed and Adopted by the Board of Mayor and Aldermen of the City of Spring Hill, Tennessee on the 21<sup>st</sup> day of December, 2020.**

  
\_\_\_\_\_  
Rick Graham, Mayor

ATTEST:

  
\_\_\_\_\_  
April Goad, City Recorder

LEGAL FORM APPROVED:

  
\_\_\_\_\_  
Patrick Carter, City Attorney



**REQUEST:** *Approval of Resolution 20-199*

**SUBMITTED BY:** Chuck Downham, Assistant City Administrator  
Missy Stahl, Senior Project Manager  
Tyler Scroggins, Public Works Supervisor

**DATE:** December 7, 2020

**RE:** To approve the purchase of upgrade components for traffic signal cabinets on the Port Royal corridor

**ATTACHMENTS:** Timing study, cost estimate

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**PURPOSE:**

The purpose of this resolution is to approve the purchase of upgrade components for the four (4) traffic signal cabinets on the Port Royal corridor.

**BACKGROUND:**

The City of Spring Hill currently has four (4) traffic signals installed on the Port Royal corridor that the City is responsible for maintaining. With the newly installed signals at the Port Royal Road/Saturn Parkway intersection, the City contracted with The Corradino Group to perform a traffic signal timing study to determine what settings and components would make the optimal traffic flow and increase safety for the citizens. Based on their study recommendations, the City recommends the implementation of Alternate 5 (Hybrid – Wireless Communications and GPS Time Source Module).

With this option, a few cabinet components will need to be upgraded. City staff requested cost estimates from S&W Contracting and received quotes back for a total of \$15,600.00. Though not identified in the study, City staff would like to add smart conflict monitors to two of the cabinets for an additional total cost of \$4,800.00. If these were also added, the total cost of the upgrades would be \$20,400.00.

**FINANCIAL IMPACT:**

The funding for the upgrades is budgeted in the Impact Fees fund (124-43110-932) with a total budget of \$28,500.00.



**STAFF RECOMMENDATION:**

Staff recommends approval of Resolution 20-199 to approve the purchase of upgrade components for traffic signal cabinets on the Port Royal corridor at total cost of \$20,400.00.



**Date:** October 27, 2020

**To:** Chuck Downham  
Assistant City Administrator  
City of Spring Hill

**From:** Gerald Bolden, PE, PTOE

**Subject:** Communications Equipment Evaluation for Corridor Connectivity

## TECHNICAL MEMORANDUM COMMUNICATIONS EQUIPMENT

This memorandum discusses the review of the existing communications equipment installed at the Saturn Parkway and Port Royal Road intersections and the evaluation to determine the best and most cost-effective strategy for interconnection of the Port Royal Road intersections from Saturn Parkway to Buckner Lane.

### 1. Background

The Tennessee Department of Transportation (TDOT) recently completed intersection improvements, including signalization, at Port Royal Road and Saturn Parkway Ramps. During project development by TDOT, the City of Spring Hill (City) coordinated with and requested TDOT to include synchronized timings between the new signals installed at the Saturn Parkway Ramps and Reserve Boulevard, located approximately 600 feet north of the westbound ramp intersection. As part of the intersection project, TDOT provided basic start-up timing plans for the Saturn Parkway Ramp intersections and communications equipment at the intersections, including an Omni antenna at westbound ramp intersection and a Yagi antenna at the eastbound ramp intersection, both with a wireless ethernet/serial/USB gateway.

According to TDOT, due to Reserve Boulevard being outside of the project scope for the Saturn Parkway intersections, any updated signal timings, field adjustments and synchronization for and/or with Reserve Boulevard would be the responsibility of the City. With Reserve Boulevard intersection in such close proximity of the Saturn Parkway ramp intersections and no installed signal timing coordination or communications equipment/media between Reserve Boulevard and Saturn Parkway Ramps, the City initiated discussions with The Corradino Group (Corradino) to provide assistance with coordinated timings between the three intersections.

During this same period, the intersection of Port Royal Road and Kroger Access (east leg)/Port Royal Road Access (west leg) was identified through the development process for planned signalization. This new traffic signal will be located approximately 1,000 feet north of Reserve Boulevard intersection.

Additionally, the existing signalized intersection of Port Royal Road and Buckner Lane is approximately 1,400 feet north of the proposed Kroger Access signalized intersection. With the addition of the Kroger Access signal and the overall operations of the corridor and Buckner Lane intersection, the City requested Corradino to review the existing communications equipment installed at the Saturn Parkway and Port Royal Road intersections and prepare an evaluation to determine the best and most cost-effective strategy for interconnection of the Port Royal Road intersections from Saturn Parkway Eastbound Ramp to Buckner Lane.

## 2. Existing Conditions

There are four signalized and one proposed signalized intersection along the corridor between the Saturn Parkway Eastbound Ramp to Buckner Lane. The two Saturn Parkway ramp intersections are part of the diamond interchange and are separated by approximately 1,300 feet. Just north of the westbound ramp intersection, approximately 600 feet, is Reserve Boulevard. The proposed signalized intersection with the main Kroger Access is located approximately 1,000 feet north of Reserve Boulevard and Buckner Lane intersection is approximately 1,400 feet north of the Kroger Access.

Currently, the only communications link, for any of the Port Royal intersections, is between the two Saturn Parkway ramp intersections. As mentioned in the previous section, TDOT installed an Omni antenna at the Saturn Parkway Westbound Ramp intersection and a Yagi antenna at the Eastbound Ramp intersection, both with a wireless ethernet/serial/USB gateway. The omni antenna will be used to receive wireless communications from the Eastbound Ramp intersection and Reserve Boulevard, when equipment is installed.

The hardware (controller and communications) installed at each intersection is as follows:

### Saturn Parkway Eastbound Ramp

- McCain ATC eX NEMA Controller
- Microhard 1W 900 MHz Wireless Ethernet/Serial/USB Gateway
- Yagi Antenna

### Saturn Parkway Westbound Ramp

- McCain ATC eX NEMA Controller
- Microhard 1W 900 MHz Wireless Ethernet/Serial/USB Gateway
- Omni Antenna

### Reserve Boulevard

- Peek Traffic Flash-Enabled 3000E Controller (TS2 Type 2)

### Buckner Lane

- Peek Traffic Flash-Enabled 3000E Controller (TS2 Type 2)



The McCain ATC eX NEMA controller has Ethernet, Serial and USB connectors. The wireless gateway used at the Saturn Parkway Ramps (Microhard 1W 900 Mhz Wireless Ethernet/Serial/USB Gateway) is connected to the McCain controller via Port 1 Ethernet. The Peek Traffic Flash-Enabled 3000E controller has RS-485 and RS-232 connectors. There is a spare port (Port 3) that can accommodate Serial/Ethernet card for connectivity.

### 3. Potential Modifications

Through continued discussions with the City staff, a primary equipment list to bring each intersection up to the same capabilities was developed and a subsequent order-of-magnitude cost was developed.

Optimal traffic signal system performance relies on efficient signal operations and corridor coordination. Signal coordination is each controller having a specific phase and amount of time, within a cycle, synced with the adjacent controllers. Consistent controller time clocks are critical to having efficient coordinated signal operations, so traffic can efficiently progress through the corridor. Unfortunately, controller time clocks often "float" or "drift", i.e. lose or gain time, which results in signal timings getting out of sync along the corridor and creating additional delays for drivers.

There are various ways to address out of sync time clocks including manual adjustments, installation of GPS Time Source Modules, or installation of interconnect between intersections. The interconnect could be wireless or wired. For the Port Royal Road corridor, the two Saturn Parkway Ramp intersections are connected wirelessly with the westbound ramp serving as the primary or master controller, making sure the time clocks are consistent and the phasing/timing remain in sync.

The primary criteria for determination of the most appropriate communications platform for maintain proper signal timing and coordination along Port Royal Road is cost and compatibility. The following are the various alternatives considered and some details about each:

- Wireless Communications (Spread-spectrum radio)
  - Consistent with the Saturn Parkway intersections;
  - Existing Peek controllers may require installation of a serial/ethernet card in Port 3 and additional programming/configuring;
  - Operation dependent on distance, line-of-sight, weather conditions, radio interference;
  - Reasonable cost.
- Wired Communications (Overhead or underground)
  - Requires significant design and/or utility make-ready;
  - Existing Peek controllers may require installation of a fiber optic port in Port 3 and additional programming/configuring;
  - Not dependent on distance, line-of-sight, weather conditions, radio interference;
  - Significant cost.
- GPS Time Source Module
  - Additional equipment to be added to the Saturn Parkway intersections;
  - Not dependent on distance, line-of-sight, weather conditions, radio interference;
  - Reasonable cost.

The following section details the primary equipment necessary at each intersection and an associated Engineer's Opinion of Probable Cost (order of magnitude).

***Alternative 1: Wireless Communications (Spread-spectrum radio)***

- Port Royal Road @ Saturn Parkway Eastbound Ramp
  - No additional equipment needed
- Port Royal Road @ Saturn Parkway Westbound Ramp
  - No additional equipment needed
- Port Royal Road @ Reserve Boulevard
  - Yagi Antenna Kit
    - Antenna; cable(s); lighting protection
  - Ethernet Serial Transceiver Kit
    - Power supply; cable
  - Modification to existing Peek Traffic Flash-Enabled 3000E Controller (TS2 Type 2) including addition of port 3 card and necessary reprogramming
- Port Royal Road @ Buckner Lane
  - Yagi Antenna Kit
    - Antenna; cable(s); lighting protection
  - Ethernet Serial Transceiver Kit
    - Power supply; cable
  - Modification to existing Peek Traffic Flash-Enabled 3000E Controller (TS2 Type 2) including addition of port 3 card and necessary reprogramming

***Alternative 2: Wired Communications (Overhead Fiber Optic Communications)***

- Port Royal Road @ Saturn Parkway Eastbound Ramp
  - No additional equipment needed as the communications between this intersection and the Saturn Parkway Westbound Ramp intersection will utilize the existing radio communications
- Port Royal Road @ Saturn Parkway Westbound Ramp
  - Fiber Optic Modem
  - Fiber-optic cable; splice enclosure
  - Pole with riser assembly
  - Conduit between pole and existing pull box
- Port Royal Road @ Reserve Boulevard
  - Fiber Optic Modem
  - Fiber-optic cable; splice enclosure
  - Modification to existing Peek Traffic Flash-Enabled 3000E Controller (TS2 Type 2) including addition of port 3 card and necessary reprogramming
- Port Royal Road @ Buckner Lane
  - Fiber Optic Modem
  - Fiber-optic cable; splice enclosure
  - Modification to existing Peek Traffic Flash-Enabled 3000E Controller (TS2 Type 2) including addition of port 3 card and necessary reprogramming

***Alternative 3: Wired Communications (Underground Fiber Optic Communications)***

- Port Royal Road @ Saturn Parkway Eastbound Ramp
  - No additional equipment needed
- Port Royal Road @ Saturn Parkway Westbound Ramp
  - Fiber Optic Modem
  - Fiber-optic cable; splice enclosure
  - Conduit and pull box(es) to connect from Reserve Boulevard
- Port Royal Road @ Reserve Boulevard
  - Fiber Optic Modem
  - Fiber-optic cable; splice enclosure
  - Conduit and pull box(es) to connect from Buckner Lane
  - Modification to existing Peek Traffic Flash-Enabled 3000E Controller (TS2 Type 2) including addition of port 3 card and necessary reprogramming
- Port Royal Road @ Buckner Lane
  - Fiber Optic Modem
  - Fiber-optic cable; splice enclosure
  - Modification to existing Peek Traffic Flash-Enabled 3000E Controller (TS2 Type 2) including addition of port 3 card and necessary reprogramming

***Alternative 4: GPS Time Source Module***

- Port Royal Road @ Saturn Parkway Eastbound Ramp
  - No additional equipment needed as the communications between this intersection and the Saturn Parkway Westbound Ramp intersection will utilize the existing radio communications
- Port Royal Road @ Saturn Parkway Westbound Ramp
  - GPS Time Source Module
- Port Royal Road @ Reserve Boulevard
  - GPS Time Source Module
  - Modification to existing Peek Traffic Flash-Enabled 3000E Controller (TS2 Type 2) including addition of port 3 card and necessary reprogramming
- Port Royal Road @ Buckner Lane
  - GPS Time Source Module
  - Modification to existing Peek Traffic Flash-Enabled 3000E Controller (TS2 Type 2) including addition of port 3 card and necessary reprogramming

After discussions with City staff, a fifth alternative was considered. This alternative provides the wireless communication components at each of the intersections to keep all clocks synced and a GPS Time Source Module at one intersection to keep the clocks synced to the correct time due to the use of Time of Day coordinated timing plans.

**Alternative 5: Hybrid - Wireless Communications (Spread-spectrum radio) and GPS Time Source Module**

- Port Royal Road @ Saturn Parkway Eastbound Ramp
  - No additional equipment needed as the communications between this intersection and the Saturn Parkway Westbound Ramp intersection will utilize the existing radio communications
- Port Royal Road @ Saturn Parkway Westbound Ramp
  - GPS Time Source Module
- Port Royal Road @ Reserve Boulevard
  - Yagi Antenna Kit
    - Antenna; cable(s); lighting protection
  - Ethernet Serial Transceiver Kit
    - Power supply; cable
  - Modification to existing Peek Traffic Flash-Enabled 3000E Controller (TS2 Type 2) including addition of port 3 card and necessary reprogramming
- Port Royal Road @ Buckner Lane
  - Yagi Antenna Kit
    - Antenna; cable(s); lighting protection
  - Ethernet Serial Transceiver Kit
    - Power supply; cable
  - Modification to existing Peek Traffic Flash-Enabled 3000E Controller (TS2 Type 2) including addition of port 3 card and necessary reprogramming

The following table shows the Engineer's Opinion of Probable Cost (order of magnitude) for the above referenced equipment and construction/installation at the intersections along Port Royal Road. These numbers were based on TDOT 2019 Average Unit Prices and City of Spring Hill supplied equipment cost. Note these do not include equipment or construction cost associated with the proposed traffic signal installation at Port Royal Road and Kroger Access/Port Royal Road Access.

ALTERNATIVE	ORDER OF MAGNITUDE COST
Alternative 1: Wireless Communications (Spread-Spectrum Radio)	\$12,500 - \$15,000
Alternative 2: Wired Communications (Overhead Fiber Optic Communications)	\$45,000 - \$55,000
Alternative 3: Wired Communications (Underground Fiber Optic Communications)	\$145,000 - \$165,000
Alternative 4: GPS Time Source Module	\$6,500 - \$8,500
Alternative 5: Hybrid of Wireless Communications and a GPS Time Source Module	\$14,000 - \$16,500

Additionally, for the intersections of Port Royal Road at Reserve Boulevard and Port Royal Road at Buckner Lane, the City may want to consider a controller change-out from the existing Peek Traffic 3000E to the McCain ATC eX NEMA Controller, which is current installed at the Saturn Parkway intersections. The order-of-magnitude cost for the new controllers, assuming minimal cabinet modifications are needed, are anticipated to be in the range of \$4,000 - \$6,000 each.

#### 4. Conclusion

Based on the review of the corridor, the existing equipment at each of the signalized intersections, the plan for future connectivity of the City's signalized intersections, and coordination with City staff, the recommendation for the Port Royal Road signalized corridor is: **Alternative 5: Hybrid of Wireless Communications and a GPS Time Source Module**. This alternative provides a communications link to all of the signalized intersections along this segment of Port Royal Road, and provides the capabilities to keep each of the controller clocks on the correct time of day through the implementation of a GPS Time Source Module at the intersection of Port Royal Road and Saturn Parkway Westbound Ramps.