South Fulton Community Improvement District

Freight Intelligent Transportation System

prepared for

South Fulton Community Improvement District

prepared by

Cambridge Systematics, Inc.

with

Volkert, Inc.

South Fulton Community Improvement District

CAMBRIDGE SYSTEMATICS

May 26, 2021

report

South Fulton CID Freight Intelligent Transportation System Concept of Operations

Draft

prepared for

South Fulton Community Improvement District

prepared by

Cambridge Systematics, Inc.
730 Peachtree Street, NE, Suite 500
Atlanta, GA 30308

Volkert, Inc.
101 Marietta Street, NW, Suite 2210
Atlanta, GA 30303

date

May 26, 2021

Table of Contents

1.0 Purpose **1-1**

2.0 Freight ITS Plan Background **2-1**

3.0 Existing ITS Assets and Facilities **3-1**

3.1 GDOT ITS Assets 3-1

3.1.1 GDOT NaviGAtor 3-1

3.1.2 GDOT Traffic Management Center 3-1

3.1.3 GDOT Field Equipment 3-1

3.2 CSX Field Equipment 3-4

4.0 Concept of Operations **4-1**

4.1 Agency Roles and Responsibilities 4-3

4.1.1 City of Fairburn 4-3

4.1.2 CSX Transportation 4-3

4.1.3 Georgia Department of Transportation 4-3

4.2 Proposed Freight and ITS Improvements 4-4

4.2.1 Phase I and II Freight ITS Improvements 4-5

4.2.2 Phase III Freight ITS Improvements 4-12

5.0 Ultimate System **5-1**

5.1 Desired Features Inclusive of Regional Goals 5-3

5.1.1 Communications and Collaboration 5-4

5.1.2 Traveler Information Dissemination 5-6

5.1.3 Observation and Detection 5-8

5.1.4 Traffic and Incident Management 5-10

5.1.5 Goods Movement Support Systems and Technology 5-12

5.2 High Level System Requirements 5-14

5.2.1 ATMS 5-14

5.2.2 CCTV 5-14

5.2.3 Detection System 5-14

5.2.4 Dynamic Message Signs 5-14

6.0 Technology Scan **6-1**

6.1 Identification of Hardware Considered 6-1

6.2 Identification of Software Solutions Considered 6-1

7.0 Benefit-Cost Analysis **7-1**

7.1 En-Route Traveler Information 7-1

7.2 Traffic Incident Management 7-4

7.3 Emissions Reduction 7-7

7.4 Summary of Benefit-Cost Analysis 7-8

8.0 Summary 8-1

Appendix A. Traffic Study A-1

A.1 Crossing Closure Impacts A-1

A.2 Traffic Patterns and Growth A-8

A.3 Impact of Traffic Patterns and Crossing Closures on the Freight ITS A-15

A.3.1 Volume Passing by the DMS Locations A-15

A.3.2 Percent Time Freight ITS Disseminates Useful Information A-19

A.3.3 Average Time Saved by Drivers Acting on the Information A-20

A.4 Summary of the Traffic Study Results A-21

Appendix B. Proposed Intersection Improvements B-1

List of Tables

Table 4.1 Alignment of South Fulton Freight ITS Goals with Regional ITS Goals ... 4-2
Table 4.2 Summary of Freight ITS Improvement Projects ... 4-5
Table 5.1 Summary of Freight ITS Improvement Projects ... 5-4
Table 6.1 Hardware Considered for the Freight ITS ... 6-1
Table 7.1 Summary of Quantitative Impacts to be Generated by the Phase II Freight ITS Improvements ... 7-1
Table 7.2 Routes to CSX Impacted by the Phase II Freight ITS ... 7-2
Table 7.3 Phase II Freight ITS Operating Characteristics and Parameters ... 7-2
Table 7.4 Value of Time and Average Vehicle Occupancy Parameters ... 7-3
Table 7.5 En-Route Traveler Information Benefits Resulting from the Phase II Freight ITS Improvements ... 7-3
Table 7.6 Crash Values ... 7-4
Table 7.7 Total VMT Impacted by the Phase II Freight ITS ... 7-5
Table 7.8 2015-2019 Average Annual Crash Rate per Million Vehicle Miles on Primary CSX Routes ... 7-5
Table 7.9 Crash Reduction Factor from Deployment of ITS ... 7-5
Table 7.10 Traffic Incident Management Benefits Resulting from the Phase II Freight ITS Improvements ... 7-6
Table 7.11 Idle Emission Rates for Urban Unrestricted Access Roadways ... 7-7
Table 7.12 Emission Damage Cost Rates for Major Pollutants ... 7-7
Table 7.13 Emissions Reduction Benefits Resulting from the Phase II Freight ITS Improvements ... 7-8
Table 7.14 Summary of Quantitative Impacts to be Generated by the Phase II Freight ITS Improvements ... 7-9
Table A.1 Summary Analysis of McLarin Road Crossing Closures ... A-2
Table A.2 Growth Rates from ARC Travel Demand Model ... A-10
Table A.3 Peak Period Westbound Approach Volumes for Crossing 901263C ... A-11
Table A.4 Estimate of Percent Time Disseminating Useful Information Given Minimum Duration Threshold ... A-20
Table A.5 Average Time Saved by Drivers Acting on Freight ITS Information ... A-21

List of Figures

Figure 1.1 South Fulton CID Area 1-1
Figure 2.1 Vehicle Queueing Along McLarin Road—8-9 a.m., January 24, 2020 2-1
Figure 2.2 Vehicle Queueing Along McLarin Road—8-9 a.m., January 24, 2020 2-2
Figure 3.1 GDOT Field Equipment—Cameras 3-2
Figure 3.2 GDOT Field Equipment—Fiber Optic Cable 3-3
Figure 3.3 GDOT Field Equipment—Conduit Bank 3-3
Figure 3.4 GDOT Field Equipment—Conduit Handholes, Pullboxes, and Splice Vaults 3-4
Figure 4.1 Phase I/II Freight ITS Decision Framework 4-7
Figure 4.2 Phase I/II Freight ITS Concept Diagram 4-8
Figure 4.3 Phase I/II Freight ITS Concept Layout 4-9
Figure 4.4 CSX Wayfinding—McLarin Road and the SR 74-McLarin Road Ramp 4-11
Figure 5.1 Freight ITS Operations Overview 5-2
Figure 5.2 Freight ITS Data Flow Diagram 5-3
Figure 5.3 Communications and Collaboration Systems Diagram 5-5
Figure 5.4 Traveler Information Dissemination Diagram 5-7
Figure 5.5 Observation and Detection Diagram 5-9
Figure 5.6 Traffic and Incident Management Diagram 5-11
Figure 5.7 Goods Movement Support Systems and Technology Diagram 5-13
Figure A.1 Queue Measurement Along McLarin Road A-1
Figure A.2 McLarin Road Looking West A-2
Figure A.3 Blockage Time and Queue Length (Vehicles)—Wednesday, 2/26/2020 .... A-3
Figure A.4 Blockage Time and Queue Length (Vehicles)—Thursday, 2/27/2020 .... A-4
Figure A.5 Blockage Time and Queue Length (Vehicles)—Monday, 3/2/2020 .... A-4
Figure A.6 Blockage Time and Queue Length (Vehicles)—Monday, 3/2/2020 .... A-5
Figure A.7 Blockage Time and Queue Length (Vehicles)—Tuesday, 3/3/2020 .... A-5
Figure A.8 Approximate Queue Length (Feet)—Wednesday, 2/26/2020 .... A-6
Figure A.9 Approximate Queue Length (Vehicles)—Thursday, 2/27/2020 .... A-6
Figure A.10 Approximate Queue Length (Vehicles)—Monday, 3/2/2020 .... A-7
Figure A.11 Approximate Queue Length (Feet)—Monday, 3/2/2020 .... A-7
Figure A.12 Approximate Queue Length (Feet)—Tuesday, 3/3/2020 .... A-8
Figure A.13 Truck Turning Movement Counts, 2018 a.m. Peak A-9
Figure A.14 Truck Turning Movement Counts, 2018 p.m. Peak A-9
Figure A.15 Truck Turning Movement Count Locations, 2/26/2020 .... A-11
Figure A.16 Truck Turning Movement Counts, 2020 a.m. and p.m. Peak Periods A-12
Figure A.17 Bohannon Road at McLarin Road Turning Movement Counts A-13

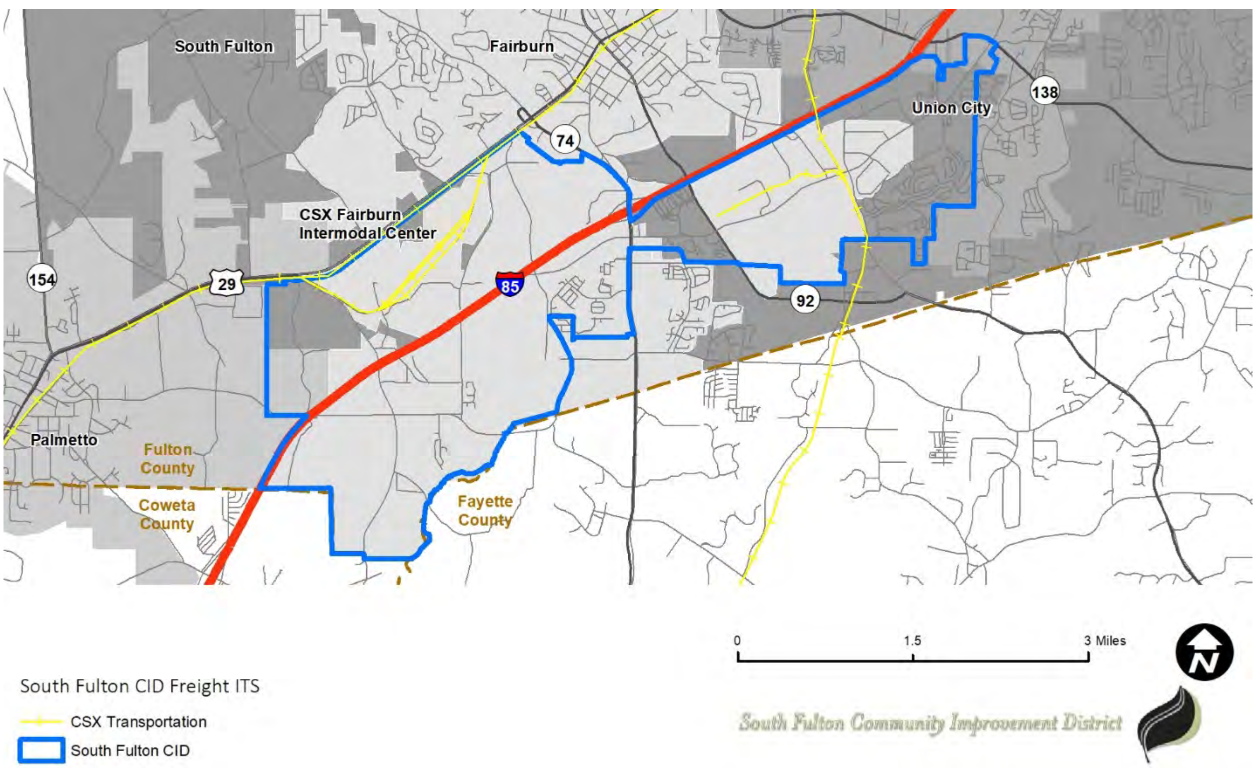
Figure A.18 Bohannon Road at McLarin Road Turning Movement Counts A-14
Figure A.19 Primary Routes to CSX........ A-16
Figure A.20 SR 74 to McLarin Road Route to CSX A-17
Figure A.21 Bohannon Road to McLarin Road Route to CSX A-18
Figure A.22 U.S. 29 to McLarin Road via Roberts Street Route to CSX A-19
Figure B.1 Proposed Improvements at SR 74-U.S. 29 Ramp at U.S. 29/Roosevelt Highway B-1
Figure B.2 Proposed Improvements on U.S. 29/Roosevelt Highway B-2
Figure B.3 Proposed Improvements at SR 74-U.S. 29 Ramp at SR 74 .... B-3
Figure B.4 Proposed Improvements at SR 74-McLarin Road Ramp at SR 74 .... B-4

1.0 Purpose

The purpose of this document is to describe the basic intelligent transportation system (ITS) architecture and communications network for near-term and long-term deployments of a Freight ITS project for the area surrounding the CSX Fairburn Intermodal Center using commercially available technologies. The South Fulton CID is shown in Figure 1.1 with CSX.

The prevalence of heavy truck traffic throughout the CID area takes a significant toll on the condition and performance of its multimodal transportation network and impacts employee commutes. A specific challenge is the impact of freight trains entering and exiting the CSX Fairburn Intermodal Center on the surrounding roadway network. Trains entering or exiting the intermodal terminal block multiple at-grade crossings which in turn blocks heavy trucks operating in the area. This is most pronounced on McLarin Road, where blocked crossings result in the roadway acting as a de facto staging area for trucks needing to access the intermodal terminal or one of the businesses along McLarin and Bohannon Roads. This is a significant source of nonrecurring congestion and negatively impacts surrounding businesses. The Freight ITS outlined in this report is part of the solution to addressing this particular challenge—as well as broader freight mobility issues—impacting the study area.

Figure 1.1 South Fulton CID Area



Source: South Fulton CID; Cambridge Systematics, Inc. analysis.

The report details the deployment of various ITS strategies into one integrated ITS system for an improved capacity for proactive and reactive management in and around the Fairburn Intermodal Terminal. The report clearly describes the various system integration and deployment requirements. It includes the following:

- Section 1—Document Purpose defines the intent of this document and an overview of the contents.
- Section 2—Plan Background contains overview information for the Project and purpose and need for the improvements contained in the Plan.
- Section 3—Existing ITS Assets and Facilities provides an overview of the relevant existing ITS equipment and facilities in the study area.
- Section 4—Concept of Operations provides recommendations of operational objectives to address the needs at the CSX Intermodal Center and the necessary roadway and ITS improvements needed to meet those operational objectives.
- Section 5—Ultimate System summarizes the functionalities of the proposed Freight ITS including desired features inclusive of regional goals, required architecture, and high-level system requirements.
- Section 6—Technology Scan identifies the technologies considered and summarizes the results of the technology scan which involved research into the types of products available for the proposed projects and recommended solutions.
- Section 7—Benefit-Cost Analysis estimates the economic benefit of the proposed Freight ITS.
- Section 8—The final section of the report summarizes the information presented in Sections 1 through 7.

2.0 Freight ITS Plan Background

The prevalence of heavy truck traffic takes a significant toll on the condition and performance of the South Fulton CID's multimodal transportation network and its businesses. A specific challenge identified in the South Fulton CID Multimodal Transportation Study was the impact of freight trains entering the CSX Intermodal Center on the surrounding roadway network. Trains entering the intermodal terminal block multiple at-grade crossings which in turn blocks heavy trucks operating in the area, especially McLarin Road. This results in McLarin Road acting as a de facto staging area for trucks needing to access the intermodal terminal or one of the businesses along McLarin and Bohannon Roads. This represents a source of significant nonrecurring congestion and negatively impacts the quality of life for surrounding residents. A freight ITS investment for the area is a potential solution as it could alert trucks to the presence of a train blocking at-grade rail crossings along McLarin Road, allowing them to avoid the area. In addition, the system could be paired with a short-term parking facility/staging area in which the ITS would direct drivers to a truck staging area where they could wait safely until a train clears the crossings.

Figure 2.1 Vehicle Queueing Along McLarin Road—8-9 a.m., January 24, 2020

Source: Cambridge Systematics, Inc.

Figure 2.2 Vehicle Queueing Along McLarin Road—8-9 a.m., January 24, 2020

Source: Cambridge Systematics, Inc.

3.0 Existing ITS Assets and Facilities

Existing ITS assets within the study area or that are physically located outside the study area but provide coverage include:

- GDOT NaviGAtor.
- GDOT Traffic Management Center (TMC).
- GDOT Field Equipment.
- CSX Field Equipment.

3.1 GDOT ITS Assets

3.1.1 GDOT NaviGAtor

GDOT ITS assets located within the study area, or that are physically outside the study area but provide coverage, include the GDOT NaviGAtor, Traffic Management Center (TMC), and various field equipment. The GDOT NaviGAtor is the State's Advanced Traffic Management System (ATMS). The NaviGAtor system was first incepted in 1996 for the Olympic Games to help handle the expected influx of roughly 2 million visitors. The NaviGAtor system provides real time speed, volume, and travel time data by using field devices like closed circuit television and detection cameras, ramp meters and dynamic message signs. Relevant hubs and field equipment from the freight ITS project may be integrated into the GDOT NaviGAtor system and this will allow the state's existing traffic management devices and equipment within and near the project area to connect to the South Fulton CID Freight ITS systems.

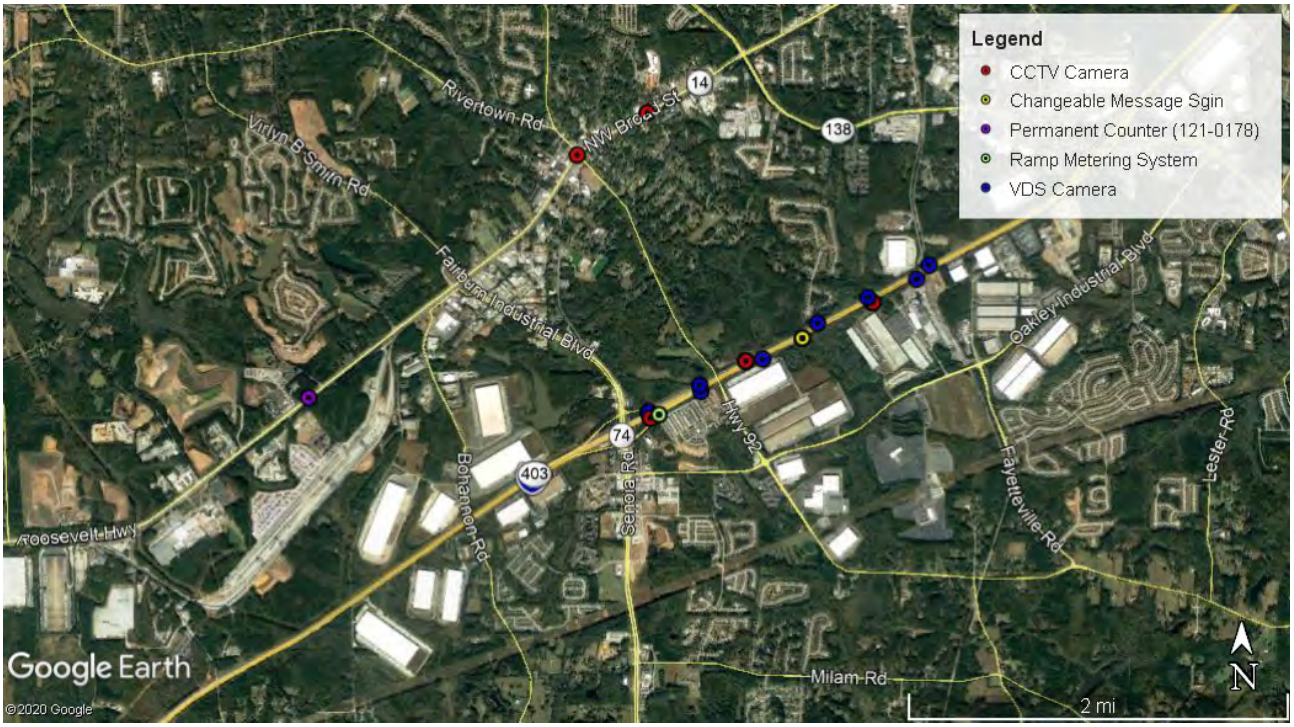
3.1.2 GDOT Traffic Management Center

GDOT has an extensive deployment of traffic operations systems and technology on the states highway network connected to their TMC. The GDOT TMC is the headquarters and information clearinghouse for NaviGAtor. It monitors travel conditions on the State's roadways and collects real-time information from video detection system cameras and other field devices. The GDOT TMC then communicates to the traveling public (i.e., via dynamic message signs, the NaviGAtor web, and other means) useful information to improve safety, improve travel time reliability, and mitigate congestion, among others. Utilizing existing fiber and wireless connections, the South Fulton CID Freight ITS components have a communications pathway to the GDOT TMC. This helps in the integration of the of the regional ITS into the GDOT ITS program.

3.1.3 GDOT Field Equipment

The existing GDOT field equipment within the study area consists of 18 video cameras along I-85 and SR 14/U.S. 29/Roosevelt Highway, a dynamic message sign and associated equipment north of SR 92/ Spence Road on I-85, a ramp metering system for SR 74/Senoia Road onto I-85 Northbound, and a permanent count station on SR 14/U.S. 29/Roosevelt Highway. Other GDOT field equipment is located along I-85 and consists of fiber optic cable, conduit duct bank, and conduit access points.

Figure 3.1 GDOT Field Equipment—Cameras



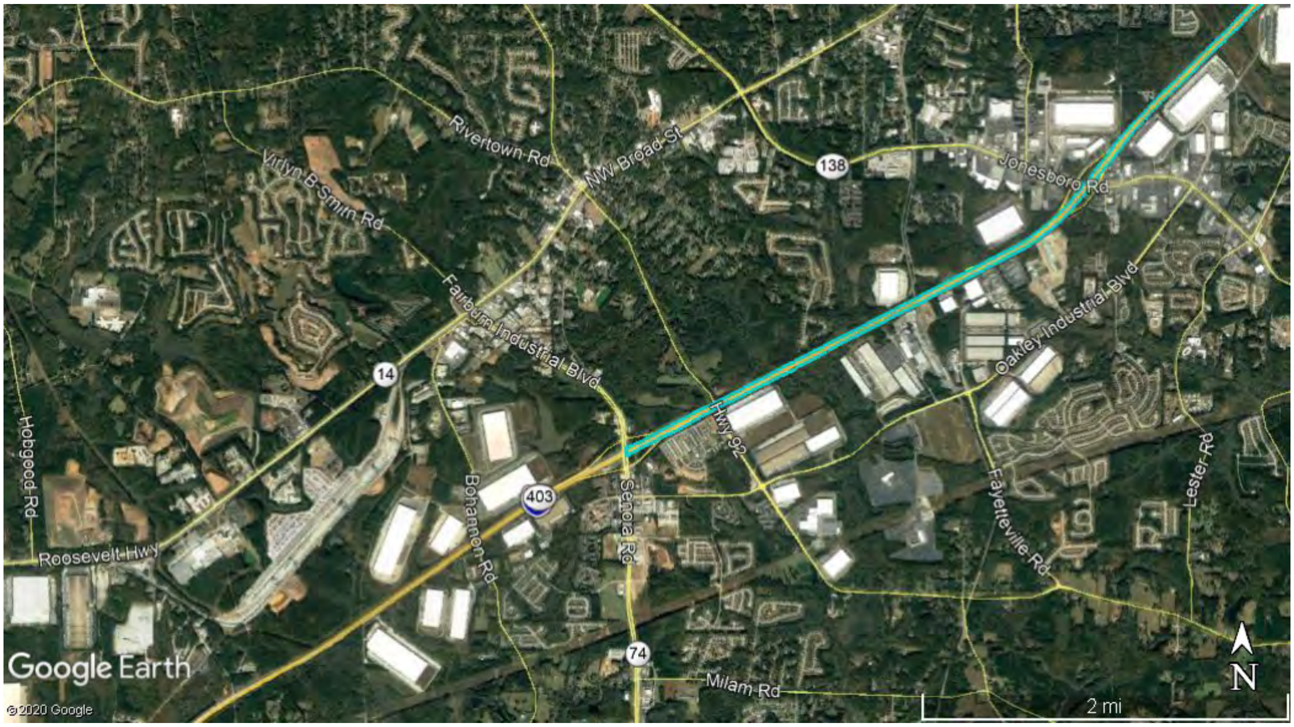
Source: Georgia Department of Transportation, Office of Traffic Operations.

The existing GDOT field equipment within the immediate vicinity of the project area was identified as follows:

- Cameras were identified at SR 14/U.S. 29/W. Broad Street at SR 92 and SR 14/U.S. 29/Main Street at Elder Street intersections, to the north and south respectively. These cameras were identified to be connected to the GDOT NaviGAtor system with 4G cellular modems. Since all these cameras are connected to the NaviGAtor system through cellular network and do not have a fiber connection, these cannot be used to establish interconnect between the proposed freight ITS system and GDOT TMC.
- Conduit banks, fiber optic cable, conduit handholes, pull boxes and splice vaults within the project area were determined. These existing GDOT field equipment end at the interchange of I-85 and SR 74 and therefore are not within the immediate vicinity of the project location.

Establishing interconnect between the existing GDOT field equipment and the proposed Freight ITS would require installation of new fiber and conduit over a distance of approximately 1.5 miles and would not be a cost-effective solution. The most cost-effective solution would be to provide a power source and cellular modem to each of the proposed ITS components to provide a direct connection to the GDOT TMC.

Figure 3.2 GDOT Field Equipment—Fiber Optic Cable

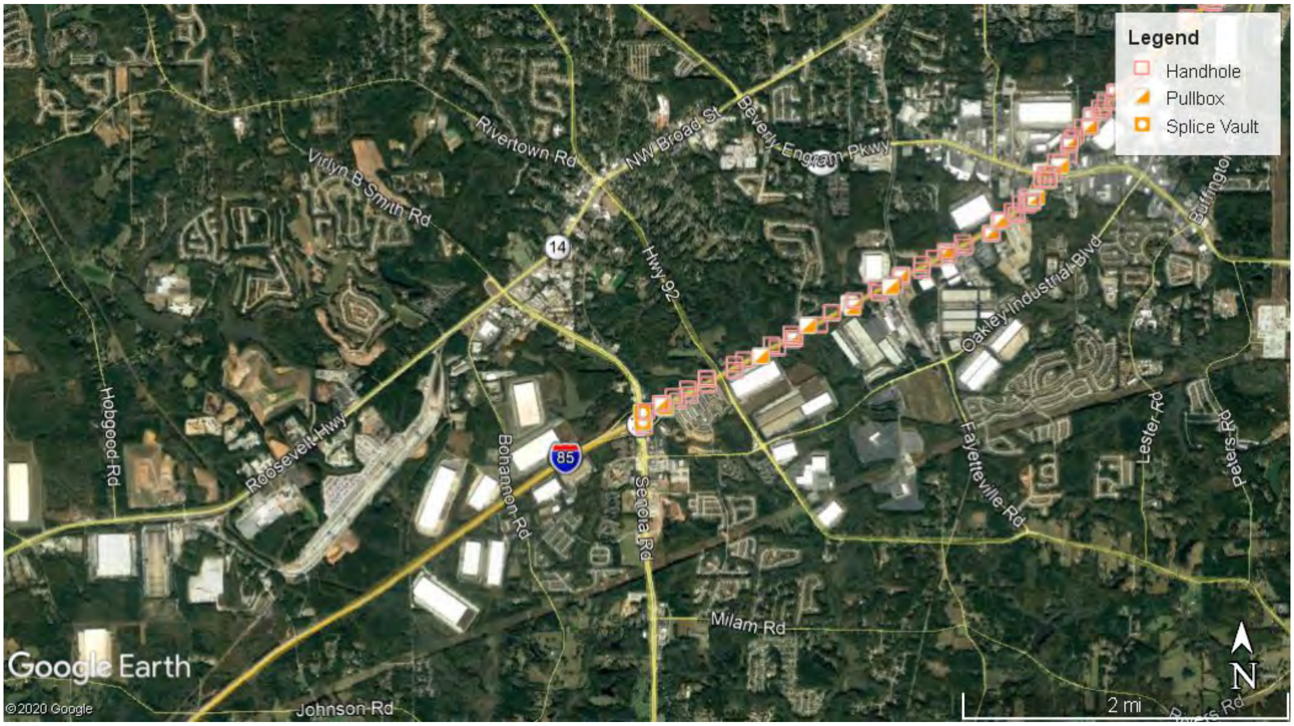


Source: Georgia Department of Transportation, Office of Traffic Operations.

Figure 3.3 GDOT Field Equipment—Conduit Bank

Source: Georgia Department of Transportation, Office of Traffic Operations.

Figure 3.4 GDOT Field Equipment—Conduit Handholes, Pullboxes, and Splice Vaults



Source: Georgia Department of Transportation, Office of Traffic Operations.

3.2 CSX Field Equipment

CSX's Active Warning System is deployed at at-grade crossings within the study area—notably at crossings with McLarin Road, Peters Street, and Gullatt Road. CSX field equipment includes crossing gates, warning lights, and controller cabinets at at-grade crossings. Information from the CSX controller such as the gate position (up or down) and railroad active warning system, can be used by the Freight ITS to determine if it needs to display a message on the dynamic message sign.

4.0 Concept of Operations

This Concept of Operations document describes the high-level consensus vision of stakeholders in the South Fulton CID regarding freight transportation management and operations in the area surrounding the CSX Fairburn Intermodal Center. It also describes the agencies involved and their roles and responsibilities for the Freight ITS. Furthermore, the Concept of Operations addresses questions of what freight transportation management systems and improvements are needed in the study area and how they can be integrated into the broader regional system.

The vision for the Freight ITS is to support sustainable economic growth and expansion within the South Fulton CID through the development of a communications network that provides direct, real time information to local, regional, and State partners; the provision of an institutional environment that implements strategies and technological tools that enhance freight operations; provides safe, viable alternative routes for freight traffic; and the development of a system that allows for the measurement and monitoring of performance to allow for future enhancements.

The goals of the Freight ITS are as follows:

- Improve multi-jurisdiction and public-private coordination and collaboration.
- Improve communications and information sharing among public sector agencies and between the public and private sectors.
- Improve traffic and incident management throughout the South Fulton CID with a focus on the area surrounding the CSX Fairburn Intermodal Center.
- Reduce non-recurring congestion throughout the South Fulton CID with a focus on the area surrounding the CSX Fairburn Intermodal Center.
- Disseminate real-time information on traffic conditions in the South Fulton CID including the Fairburn Intermodal Center.
- Mitigate impacts to the environment and the community caused by the movement of goods.

These goals are consistent with the Atlanta regional ITS Vision and goals.[1] Table 4.1 shows how the Freight ITS goals align with those of the Atlanta Region.

[1] https://cdn.atlantaregional.org/wp-content/uploads/atlanta-regional-its-architecture-2004-with-exhibit-2b-excerpt-2.pdf.

Table 4.1 Alignment of South Fulton Freight ITS Goals with Regional ITS Goals

	Multijurisdiction Coordination	Incident Management	Communications and Information Sharing	Real Time Travel Information	Traffic Management	Safety	Non-recurring congestion	Air quality
Improve multi-jurisdiction and public-private coordination and collaboration.	●		●					
Improve communications and information sharing among public sector agencies and between the public and private sectors.	●		●					
Improve traffic and incident management throughout the South Fulton CID with a focus on the area surrounding the CSX Fairburn Intermodal Center.		●		●	●	●		
Reduce non-recurring congestion throughout the South Fulton CID with a focus on the area surrounding the CSX Fairburn Intermodal Center.		●		●	●		●	
Disseminate real-time information on traffic conditions in the South Fulton CID including the Fairburn Intermodal Center.				●	●		●	
Mitigate impacts to the environment and the community caused by the movement of goods.								●

Source: Atlanta Regional Commission, Atlanta Regional ITS Architecture, 2004; Volkert, Inc; Cambridge Systematics, Inc.

4.1 Agency Roles and Responsibilities

The primary entities and agencies involved in the deployment of the Freight ITS include the City of Fairburn, CSX Transportation, and the Georgia Department of Transportation. Though not formally designated as a responsible entity, the South Fulton CID will play a critical role as a convenor of local, regional, and State stakeholders and also as a guiding hand in the evolution of the Freight ITS as the study area's needs and priorities change over time.

4.1.1 City of Fairburn

The proposed Freight ITS is primarily within the limits of the City of Fairburn. Furthermore, key first-/last-mile freight connectors included in the proposed system are locally owned and maintained roadways. These include Howell Avenue (including the planned extension), McLarin Road, Bohannon Road, Peters Street, Gullatt Road, and the SR 74-McLarin Road ramp. As a key stakeholder, the role and responsibilities of the City of Fairburn include:

- Manage and maintain local roadways included in the Freight ITS.
- Manage and maintain ITS equipment and devices.
- Disseminate information on construction and work zones that may impact the Freight ITS to other stakeholders.

4.1.2 CSX Transportation

The CSX Fairburn Intermodal Center is a freight rail terminal that serves domestic intermodal freight. It moves containers between trucks and trains (e.g., lifts) as goods are shipped to their final destinations. On average, there are about 500,000 annual lifts at the Fairburn Intermodal Center[2]. Operations at the intermodal terminal and their impacts on surrounding roadways is the primary motivating factor for the Freight ITS. As such, CSX Transportation plays a critical role in the success and operation of the Freight ITS. As discussed in greater detail in sections 4 and 5, the proposed Freight ITS includes as a component the CSX active warning system. Furthermore, as the system grows and evolves over time, greater information on operations within the intermodal terminal may be incorporated into the Freight ITS including truck turn times, loading/unloading times, and advanced warning information for long trains, among others. The roles and responsibilities of CSX Transportation include:

- Manage and maintain the active warning system.
- Disseminate information on operations at the Fairburn Intermodal Center to other stakeholders.

4.1.3 Georgia Department of Transportation

GDOT is a critical stakeholder for the Freight ITS as the proposed system will be incorporated into the broader regional ITS that GDOT owns and operates. Existing ITS assets in the study area are wholly owned by GDOT. In addition, SR 74 and U.S. 29/Roosevelt Highway are the primary arterial roadways providing access to the CSX Intermodal Center and the broader State network and National Highway Freight Network.

[2] January 16, 2020 interview with CSX.

These routes are owned and operated by GDOT. As the primary operator of the proposed Freight ITS, GDOT's roles and responsibilities include:

- Real time video control.
- Traffic signal control on state routes.
- Traffic, incident, and construction information collection and dissemination through DMS and 511.
- Manage and maintain state roadways.
- Manage and maintain the ITS including equipment and devices.

4.2 Proposed Freight and ITS Improvements

The identification and planning of the ITS and technology improvements in this report came through research and data gathering, meetings conducted with CSX Transportation, GDOT, the South Fulton CID, City of Fairburn and the Atlanta Regional Commission and interviews with key stakeholders in both the public and private sectors. The projects are intended to improve the efficiency, safety, and reliability of truck and rail access and circulation within and near the Fairburn Intermodal Terminal, as well as provide improved truck traveler information.

The Freight ITS focus is primarily aimed at traffic management and operations of the roadways that provide first-/last-mile connectivity to the Fairburn Intermodal Terminal and regional traveler information dissemination to and from the intermodal terminal. The improvements have been grouped into three categories:

- **Phase I**
  - These represent immediate roadway and operational improvements in progress intended to provide better access to the area surrounding the Fairburn Intermodal Terminal. Phase I improvements are being led by the City of Fairburn with help from the South Fulton CID and coordination with GDOT.
- **Phase II**
  - These represent near-term ITS investments primarily aimed at alleviating queueing along McLarin Road due to extended blockages of the at-grade crossing. Phase II improvements would be led by GDOT as the owner and operator of the region's ITS and by the City of Fairburn as the local sponsor and owner of roadways impacted by the proposed Freight ITS—namely Howell Avenue (including the planned extension), McLarin Road, Bohannon Road, Peters Street, Gullatt Road, and the SR 74-McLarin Road ramp. The South Fulton CID and CSX would support GDOT and the City of Fairburn with CSX providing access to the impacted controller cabinets,
- **Phase III**
  - These are longer-term investments intended to better manage truck parking and staging needs in the study area as well as provide advanced warning for very long trains that have the potential to block multiple crossings in the study area for extended periods of time. Phase III improvements would likely require a public-private partnership for the development of a truck staging lot (or the use of excess

daytime capacity at the existing travel center at SR 74 and Oakley Industrial Boulevard) and greater coordination with CSX for the information needed to support an advanced train warning system.

Table 4.2 summarizes the ITS improvement projects included in each of the three phases.

Table 4.2 Summary of Freight ITS Improvement Projects

Phase I	Phase II	Phase III
• Howell Avenue Extension	• Roadway and intersection upgrades: SR 74 at McLarin Road and SR 74 at U.S. 29 • Communications (Cellular, Wi-Fi) • Queue detection • Wayfinding • Public/private communication and collaboration	• Truck staging lot and operations • Advanced train warning

Source: Volkert, Inc; Cambridge Systematics, Inc.

4.2.1 Phase I and II Freight ITS Improvements

Figure 4.1 contains a high-level decision framework that outlines how the Phase I/II improvement projects would function to enhance freight mobility in the study area and to alleviate the queueing of trucks along McLarin Road due to extended blockages of crossing 901263C. Figure 4.2 contains a more detailed diagram of the flow of data for the proposed Freight ITS. Figure 4.3 depicts a conceptual layout of the Freight ITS including the roadway and intersection improvements proposed as part of the system. Generally, the proposed Freight ITS would function semi-autonomously and follow these high-level steps:

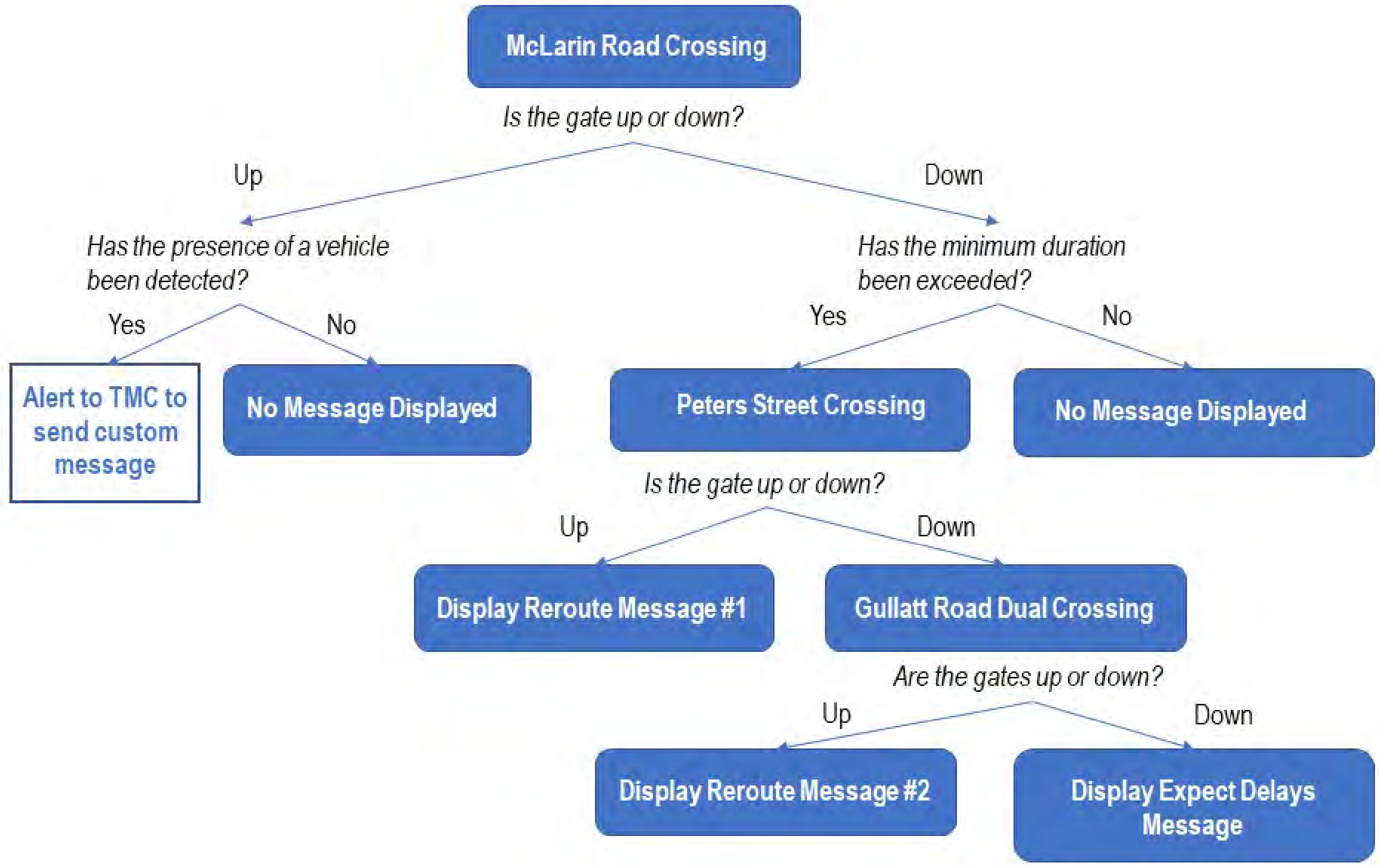
- The Freight ITS would first determine if the gates were up or down (and the active warning system activated) at crossing 901263C. This would be accomplished via a contact closure between the Freight ITS and the CSX controller cabinet and a roadside logic controller capable of sorting and distributing data to other ITS assets. If the gate is up and no queue is detected at the crossing, no message will be displayed on the dynamic message signs in the study area. However, if the gate is up but a queue is detected, the Freight ITS will alert GDOT TMC so that a custom message may be transmitted based on area conditions as informed by the Observation and Detection components of the system.

- If the Freight ITS determines that the McLarin Road crossing gate is down, it would then determine if the minimum duration threshold has been exceeded. The minimum duration threshold is a set amount of time (that may be adjusted based on observed performance) that the crossing must be closed before the Freight ITS re-routes trucks to an alternative crossing. As the results of the Traffic Study (included in Appendix A) suggest, due to activity within Fairburn Intermodal Terminal crossing 901263C experiences 1 or more closure every hour with the majority of these closures lasting only 3 to 9 minutes. To prevent freight traffic from being needlessly re-routed during a relatively brief closure, the Freight ITS proposes to re-route truck traffic only if the minimum threshold has been exceeded—a threshold of 9 minutes may serve as the suggested starting point based on the data collection. However, it should be noted that the risk of a truck being caught in an extended delay is viewed as more onerous than the risk of being unnecessarily diverted which could justify a lower starting threshold. So, if the McLarin Road crossing gate is down but the minimum threshold has not been exceeded, no message is transmitted to the dynamic message signs. Alternatively, if the McLarin Road crossing gate is down and the minimum threshold has been exceeded, the Freight ITS then checks if the queue length is met. If the queue length is not met, then a custom message is transmitted to the dynamic message sign indicating that the crossing is blocked and there will be a delay. If the queue length is met then the freight ITS checks the status of other crossings in the study area (namely, Peters Street and Gullatt Road) to determine if trucks may be re-routed to those crossings.

- If the Freight ITS determines that the McLarin Road crossing gate is down (and the active warning system activated) and the minimum duration threshold has been exceeded and the queue length is met, the Freight ITS then checks if the gates are up or down at the Peters Street at-grade crossing. If the gate is up, the Freight ITS will transmit a message to the dynamic message sign to re-route to the Peters Street at-grade crossing. If the gate is down at Peters Street, the Freight ITS will then determine the status of the Gullatt Road dual at-grade crossings. If the gate is up, the Freight ITS will transmit a message to the dynamic message signs to re-route to the Gullatt Road dual at-grade crossings. If the gate is down at the Gullatt Road dual at-grade crossings, the Freight ITS will then display a message indicating to expect delays for accessing the study area.

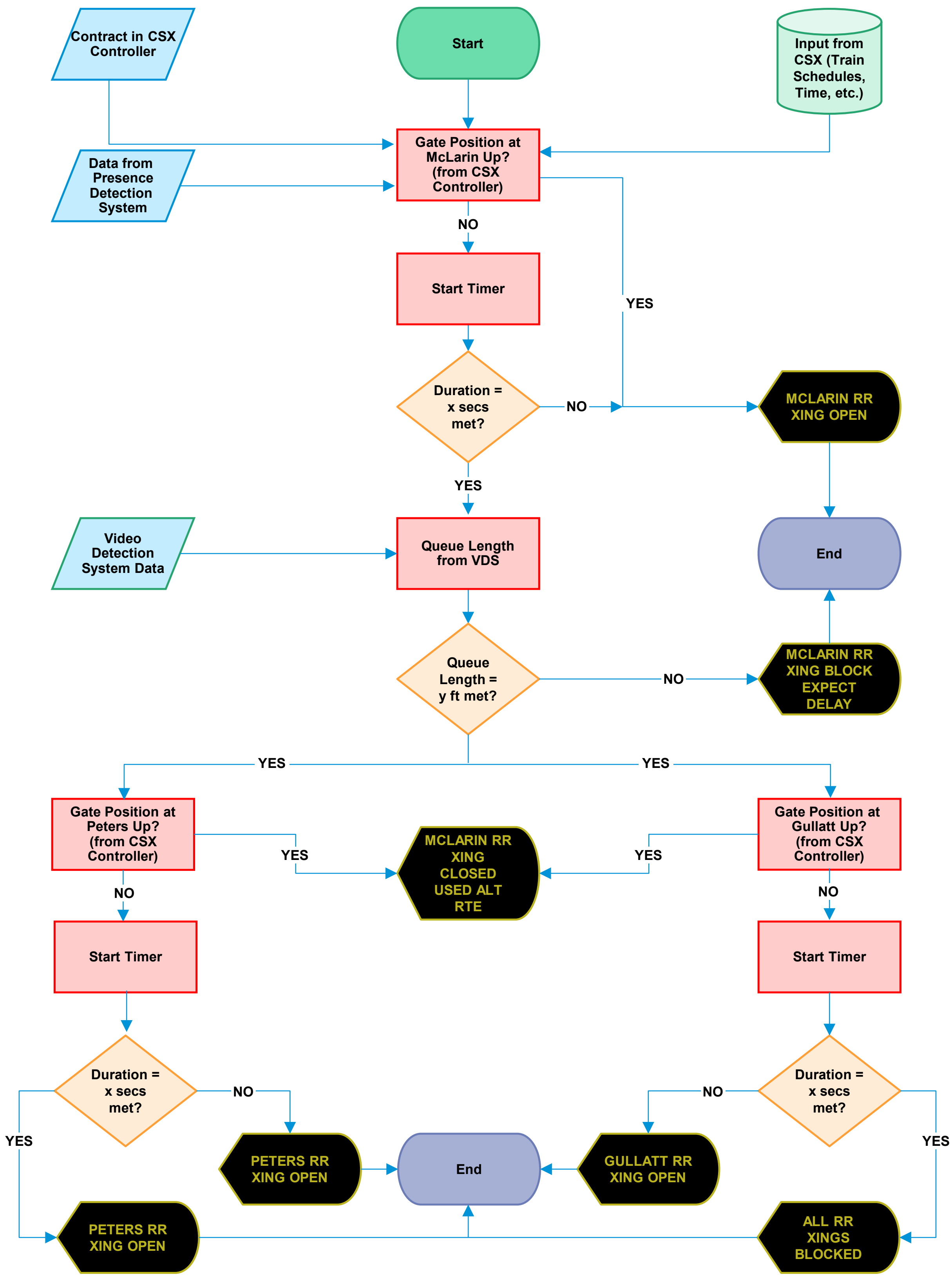
It is important to note that the diagrams in Figure 4.1 and Figure 4.2 assume that the Freight ITS will perform semi-autonomously via a roadside logic controller capable of sorting and distributing data to the State's existing network of dynamic message signs, flashing beacon systems, and in-vehicle warning systems via Dedicated Short-Range Communication (DSRC) radios and infrastructure. Thus, the Freight ITS will be capable of transmitting to the dynamic message signs, predetermined messages based on the statuses of study area at-grade crossings and the presence or absence of queues along McLarin Road without intervention by the GDOT TMC. However, the GDOT TMC will have the capability of entering custom messages if they are needed based on area conditions as informed by the Observation and Detection components of the Freight ITS.

Figure 4.1 Phase I/II Freight ITS Decision Framework



Source: Volkert, Inc; Cambridge Systematics, Inc.

Figure 4.2 Phase I/II Freight ITS Concept Diagram



Source: Volkert, Inc; Cambridge Systematics, Inc.

Figure 4.3 Phase I/II Freight ITS Concept Layout

VOLKERT

TYPICAL CMS INSTALLATION CONSISTS OF:

1. LED PIXEL CMS, NON-WALK-IN, 3X15
2. CMS CABINET
3. SHOULDER MOUNTED SIGN ASSEMBLY, TP 3
4. 4G LTE ROUTER
5. PULL BOX
6. POWER SOURCE
7. CAT6 CABLE, OUTDOOR RATED, SHIELDED
8. CONDUIT, NONMETAL
9. CCTV
10. STRAIN POLE

Source: Volkert, Inc; Cambridge Systematics, Inc.

Roadway and Intersection Upgrades

As shown in Figure 4.3 (with additional drawings included in Appendix B), intersection improvements will be made at the following locations to ensure that safe, viable alternative routes are provided:

- SR 74-U.S. 29 Ramp at U.S. 29/Roosevelt Highway.
- SR 74-U.S. 29 Ramp at SR 74.
- SR 74-McLarin Road Ramp at SR 74.

The intersection of SR 74-U.S. 29 Ramp at U.S. 29 will be improved by adding an acceleration lane to the existing roadway geometry. Since the ITS concept diverts trucks onto U.S. 29 using the SR 74-U.S. 29 Ramp, an acceleration lane will be helpful in aiding the semi-trucks to accelerate up to speed before merging onto U.S. 29. Stakeholder feedback gathered as part of the SFCID Multimodal Study suggested that stakeholders perceive this intersection as being less safe for trucks due to the need for trucks to accelerate from a complete stop into traffic traveling at a high rate of speed.

As a part of long-term plans, improvements can be made to the intersection between Oakley Industrial Boulevard and Bohannon Road. This will enable semi-trucks to make a smoother right turn from Oakley Industrial Boulevard onto Bohannon Road.

Communications

The goal is to provide communication infrastructure (cellular) that allows communication between the Traffic Management Center (TMC) and its components. Specifically, the railroad’s active warning system and three (3) dynamic message signs for the purpose of advance warning. Power service locations are needed for the proposed South Fulton CID Freight ITS components such as the Dynamic Message Signs. Coordination with utility companies is needed to meter the power service locations.

Field Devices

The proposed Freight ITS will include a variety of field devices. These field devices will include ITS cabinets and controllers, CCTV cameras with poles, power meters, dynamic message signs and detection cameras with poles. These devices will collect and transmit data to the TMC as appropriate, providing the operators a view of traffic flow within the project area. A summary of the needed field devices in included below:

- **Close Circuit Television (CCTV) Cameras—**CCTV cameras will provide coverage on McLarin Road, Bohannon Road, SR 74, and U.S. 29/Roosevelt Highway and provide feedback to the GDOT TMC, allowing for quick response times to incidents on the road network. The CCTV cameras will have the capability of being viewed and controlled from the GDOT TMC.
- **Dynamic Message Signs—**Dynamic message signs will be used to display important messages to drivers on the key corridors. They will alert trucks to the presence of a train blocking the at-grade rail crossings along McLarin Road and re-direct them to alternate routes.
- **Detection Cameras—**A detection camera is proposed for the Freight ITS and will be located at the McLarin Road at-grade crossing (Federal Railroad Administration ID 901263C). This camera will be used to detect and measure queue lengths at the crossing.

- **Roadside Logic Controller Cabinet—**The controller cabinet will establish a wireless communications pathway between the proposed ITS components and the existing regional system. Furthermore, this study proposes that the Freight ITS use a logic controller cabinet capable of sorting and distributing data to the State's existing ITS.

- **Other Field Devices—**Other field devices to deliver power and to establish a communication pathway (e.g., conduit, power meters, pull boxes, etc.) will be installed as needed.

Wayfinding

Improved wayfinding, similar to the existing wayfinding at the intersection of McLarin Road and the SR 74-McLarin Road Ramp shown in Figure 4.4, will aid motor carriers in navigating alternative routes to the CSX Fairburn Intermodal Terminal. Wayfinding is proposed at the following locations:

- SR 74-U.S. 29 Ramp at SR 74.
- SR 74-U.S. 29 Ramp at U.S. 29/Roosevelt Highway.
- U.S. 29/Roosevelt Highway at Peters Street.
- U.S. 29/Roosevelt Highway at Gullatt Road.
- Peters Street at McLarin Road.
- Gullatt Road at McLarin Road.

Figure 4.4 CSX Wayfinding—McLarin Road and the SR 74-McLarin Road Ramp

Source: Google Earth.

4.2.2 Phase III Freight ITS Improvements

Phase III improvements represent longer-term investments intended to better manage truck parking and staging needs in the study area as well as provide advanced warning for very long trains that have the potential to block multiple crossings in the study area for extended periods of time. These investments are estimated to require significantly greater financial resources than Phase I and II projects and also increased collaboration between the public and private sectors. Thus, Phase III investments are included in this report only to articulate the broader concept of the Freight ITS.

Truck Staging Lot

As part of Phase III (e.g., long-term) plans, the existing private truck parking facility at 7860 Senoia Road or a new facility within the CID area can be incorporated into the freight ITS as a truck staging area. Dynamic message signs can be used to divert trucks to the staging area in the event that the crossing is closed. The staging area can further be used to meter trucks into the CSX terminal as part of a slot-style scheduling system and as a general staging area for trucks making pick-ups or deliveries to businesses in the CID area.

A Parking Management System for managing the lot would be composed of entry control equipment and vehicle sensors that would be deployed in a parking lot, and control equipment that would be deployed at the GDOT TMC and/or at the Fairburn Intermodal Terminal. The equipment would be connected through cellular network.

Advanced Train Warning

Also, as part of Phase III plans, an advanced train warning system may also be incorporated into the Freight ITS. Stakeholder outreach with CSX revealed that the Fairburn Intermodal Center typically receives trains that are about 9,000 feet long. However, the intermodal terminal periodically receives trains that are closer to 12,000 feet long. These trains cause much more significant disruption to traffic in the study area as multiple switching movements are necessary to break these trains down so that they are short enough to enter the intermodal terminal. An advanced train warning system would alert the traveling public on the impending arrival of these trains and direct them to grade-separated crossings.

5.0 Ultimate System

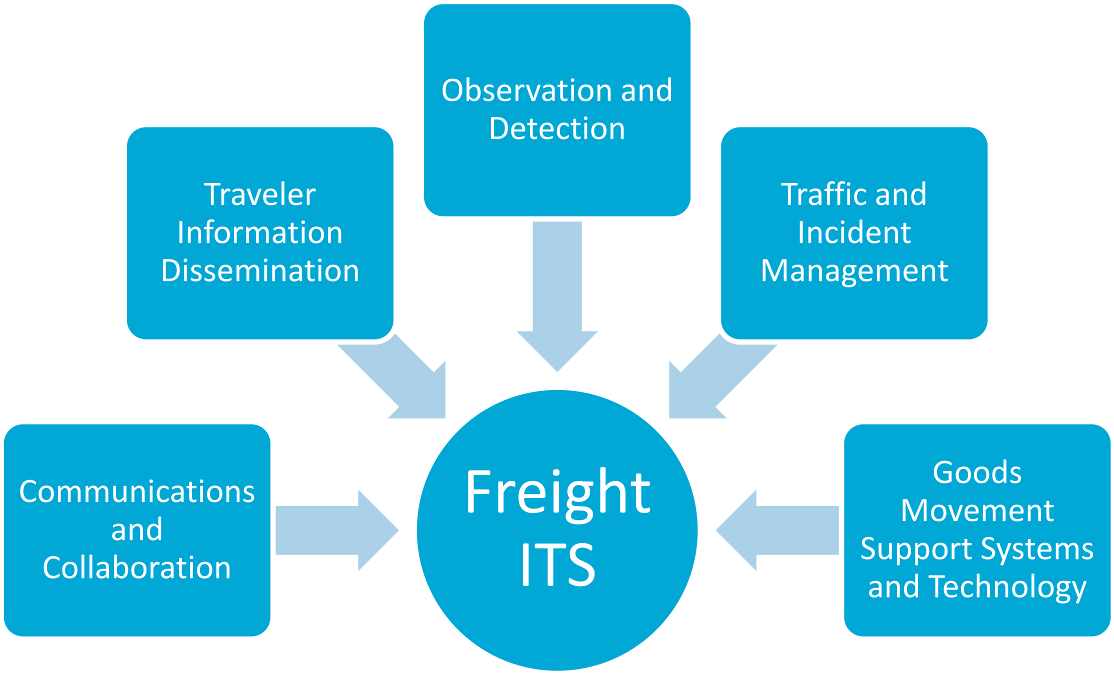
The Ultimate System is a compilation of every project from Phase I through Phase III as shown in Table 4.2. Some of the key objectives of the ITS and technology components of the Freight ITS are to:

- Improve traffic information and management along the Fairburn Intermodal Center's access routes.
- Improve traffic observation, verification, and monitoring.
- Enhance information sharing during an emergency or incident.
- Develop an ITS communication network that serves future needs.
- Reduce traffic congestion, truck idling, and related emissions.
- Minimize conflicts between transportation modes.
- Improve goods movements along major traffic routes.

This section of the report describes the proposed system and improvements that have been identified based on stakeholder desired changes and identified user needs. The descriptions are provided at a high-level, indicating the operational features and functionalities without specifying design details or technology specific solutions. There are 5 groups of interrelated project improvements, listed below and in Figure 5.1, to improve goods movement within the Fairburn Intermodal Center area and for regional freight travel to and from the intermodal terminal including:

1. Communications and Collaboration.
2. Traveler Information Dissemination.
3. Observation and Detection.
4. Traffic and Incident Management.
5. Goods Movement Support Systems & Technology.

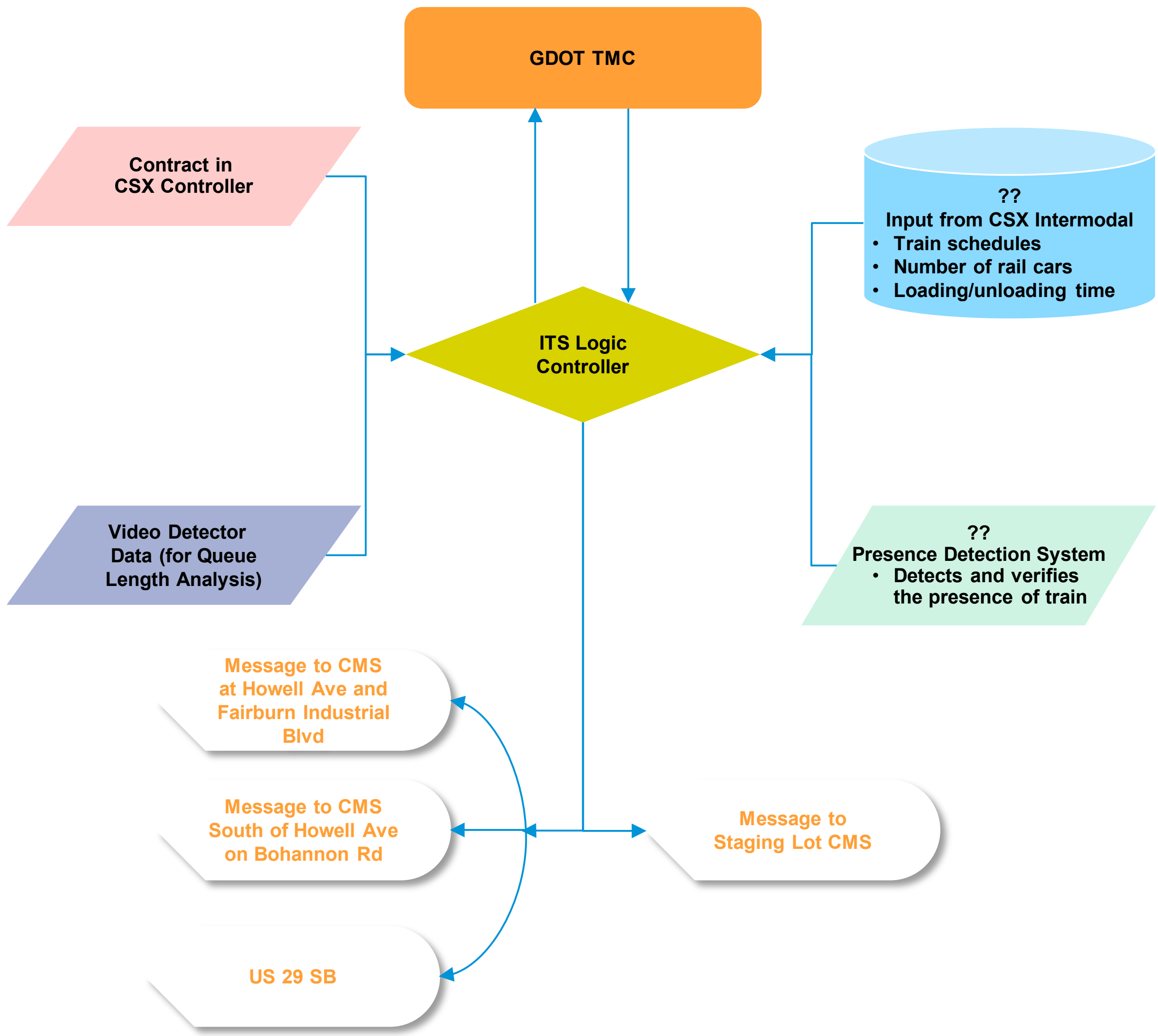
Figure 5.1 Freight ITS Operations Overview



Source: Volkert, Inc; Cambridge Systematics, Inc.

Figure 5.2 demonstrates how data will flow through the proposed Phase I/II Freight ITS. As discussed in section 4.2.1, the Freight ITS will perform semi-autonomously via a roadside logic controller capable of sorting and distributing data to the State’s existing network of dynamic message signs, flashing beacon systems, and in-vehicle warning systems (via DSRC radios and infrastructure, or through in-vehicle monitoring devices that operate through intelligent transportation system service providers as opposed to roadside units). Thus, the logic controller serves as the primary point where data is input into the Freight ITS. The proposed data inputs include information on terminal operations from CSX (loading/unloading times, approximate crossing closure times, etc.), which can be conveyed to the logic controller in the study area. Data inputs also include information from the presence detection and rail active warning system on the status of the warning system (activated/not activated) at study area at-grade crossings, the length of time the active warning system has been activated, and the presence of queued vehicles. With these data inputs, the logic controller is able to send pre-determined messages to the CMS in the area. These data will also be transmitted to the GDOT TMC for purposes of monitoring the system and in the case that custom messages must be transmitted to the dynamic message signs in the area.

Figure 5.2 Freight ITS Data Flow Diagram



Source: Volkert, Inc; Cambridge Systematics, Inc.

5.1 Desired Features Inclusive of Regional Goals

The GDOT TMC, and other regional partners, will be able to manage traffic operations in the study area based on the real-time exchange of field device status and data as well as provide additional communications means when traditional communications (e.g., landline and cellular phone) are not available. The exchange of this real-time management information would allow GDOT to maintain a near real-time dissemination of traffic and incident information that occurs within the study area and the first-/last-mile truck routes to and from the Fairburn Intermodal Center. Table 5.1 presents the 5 implementation groupings with the individual project improvements includes in each grouping. Note that some improvements could be placed into multiple groupings but are only identified in one (e.g., CCTV upgrades also support traffic and incident management and traveler information with live video feeds).

Table 5.1 Summary of Freight ITS Improvement Projects

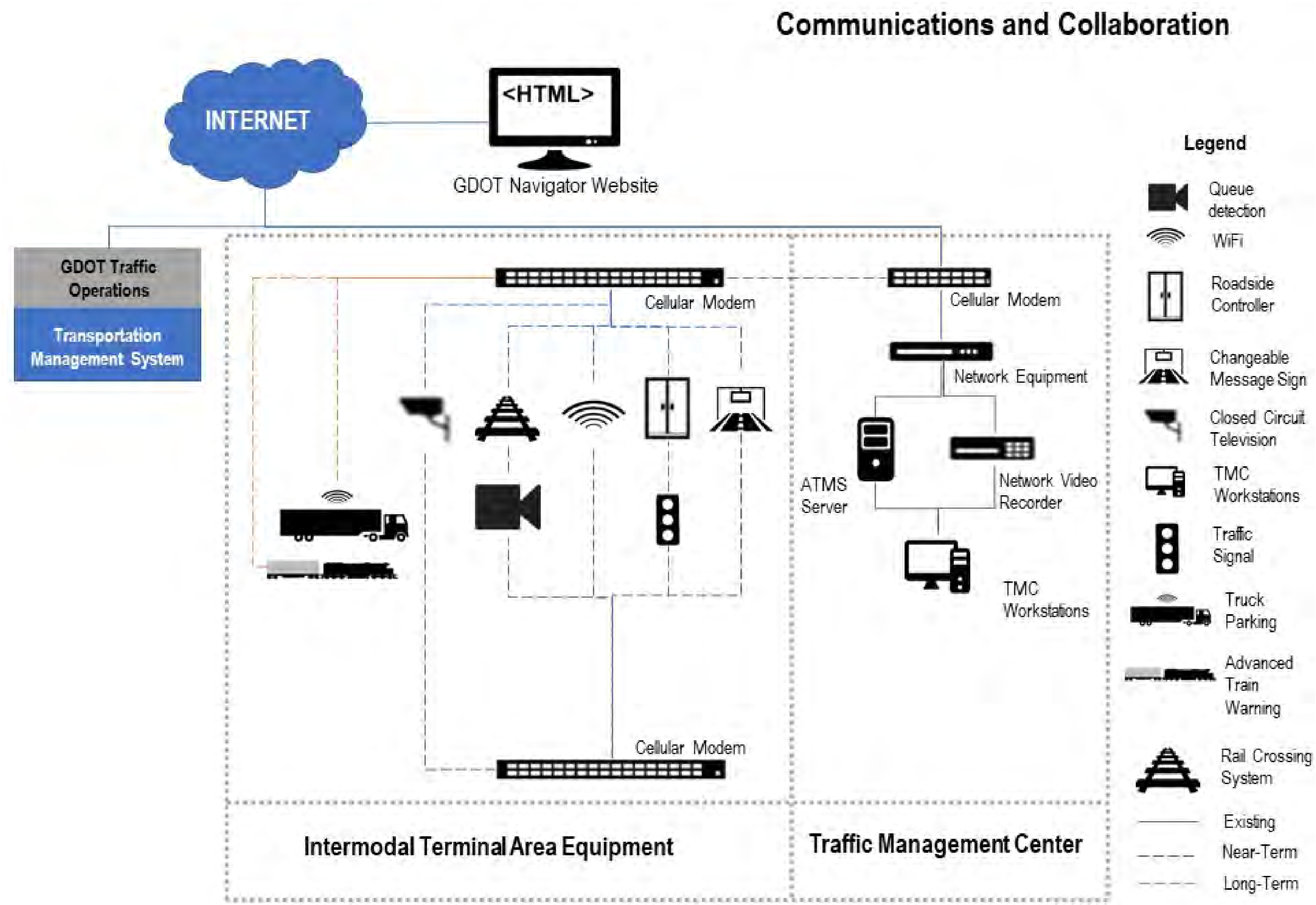
Implementation Group	ITS Deployments
Traveler Information Dissemination	• Dynamic message signs
Communications and Collaboration	• Communications (Cellular, Wi-Fi) • Public/private communications and collaboration
Observation and Detection	• CCTV • Queue detection
Traffic and Incident Management	• ATMS • Active warning rail system
Goods Movement Support Systems	• Truck parking • Advanced train warning

Source: Volkert, Inc; Cambridge Systematics, Inc.

5.1.1 Communications and Collaboration

Figure 5.3 presents the diagram for the interconnectivity of the Communications and Collaboration group, what devices will utilize the communications pathways and the type of connection, and the agencies that will be connected. A direct connection using cellular modems will connect the roadside controller to the proposed dynamic message signs and traffic signal. As shown in Figure 5.1, a cellular modem infrastructure will link the GDOT TMC and field devices (Wi-Fi, Roadside Controller Cabinet, CCTV, dynamic message signs, etc.) in the intermodal terminal area.

Figure 5.3 Communications and Collaboration Systems Diagram

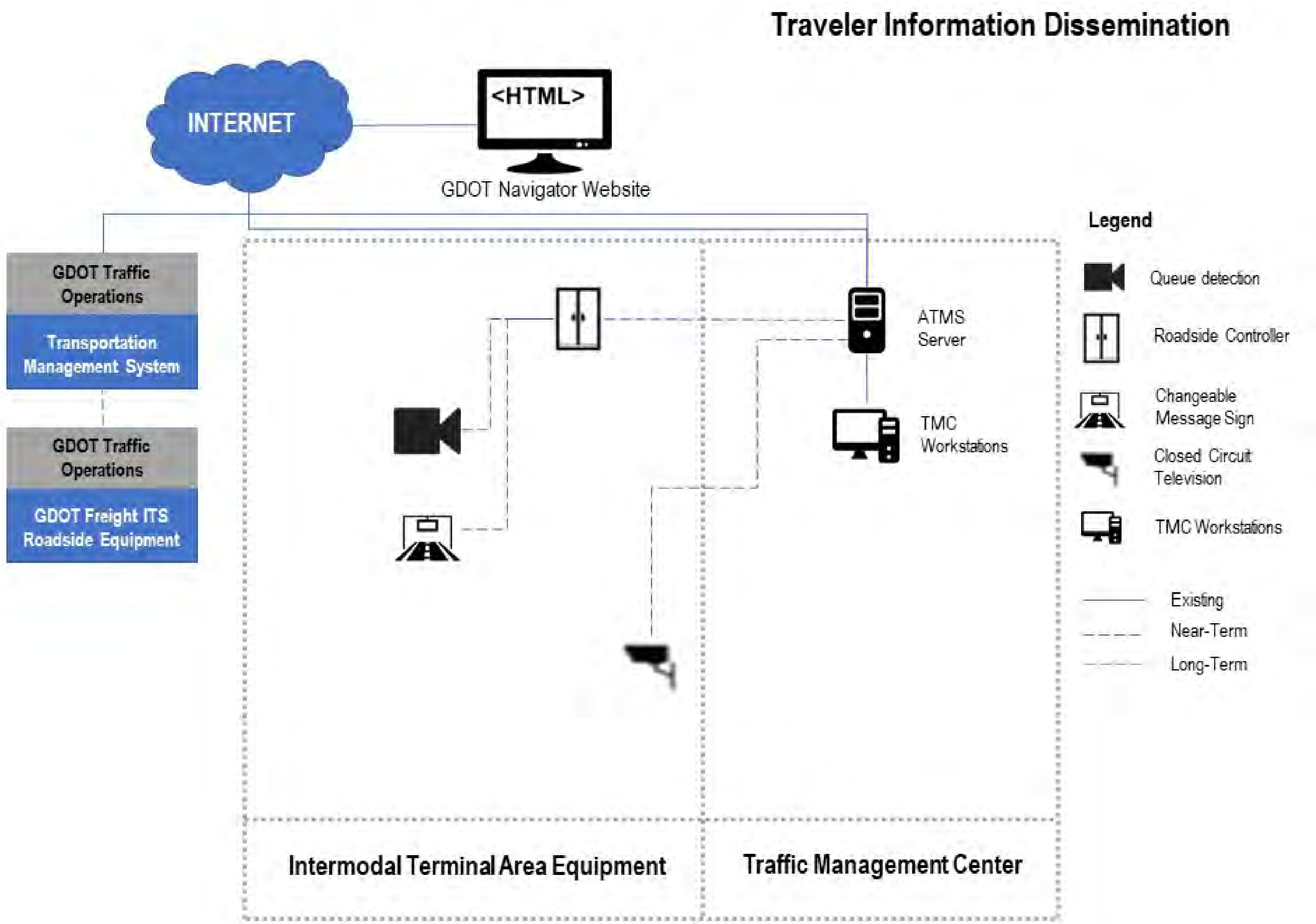


Source: Volkert, Inc; Cambridge Systematics, Inc.

5.1.2 Traveler Information Dissemination

Figure 5.4 illustrates a high-level conceptual view of the Freight ITS information and data integration approach including data sources, dissemination approaches, and potential users. Deployment of the proposed ITS technologies will allow collection and integration of data from sources in the study area. The Freight ITS information delivery services include the GDOT Navigator website and dynamic message sign notifications. Through stakeholder outreach, trucking fleet dispatchers serving the Fairburn Intermodal Terminal and freight-intensive businesses in the study area can be made aware of the Freight ITS and directed to the Navigator website so that they may monitor the messages posted on the dynamic message signs. They could then relay the information directly to truckers via in-vehicle monitoring systems or whatever technologies their companies use. The dynamic message signs would be connected to the GDOT TMC through cellular modem, so operators could disseminate messages to the signs. The dynamic message signs would provide emergency, traffic, and intermodal terminal related information to motor carriers and the traveling public.

Figure 5.4 Traveler Information Dissemination Diagram



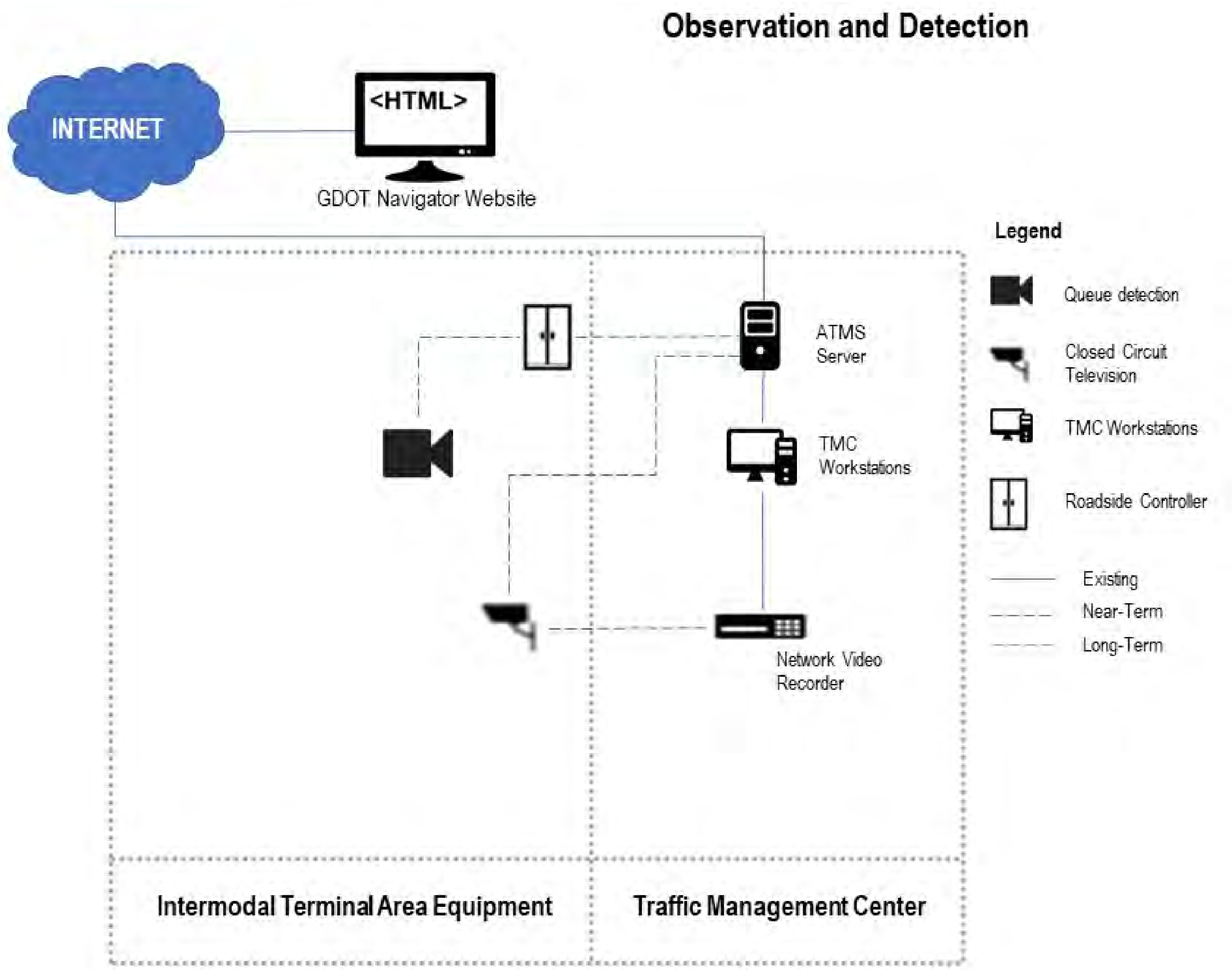
Source: Volkert, Inc; Cambridge Systematics, Inc.

5.1.3 Observation and Detection

Figure 5.5 shows the functional connections between the various pieces of equipment in the Observation and Detection group. CCTV cameras will be installed at key intersection locations where there is a potential of congestion related problems because of disruptive incidents, recurring high traffic volumes, etc. CCTV cameras would provide operators in the GDOT TMC, through the region's existing video management system (VMS) and network video recorder (NVR), surveillance of the area surrounding the Fairburn Intermodal Center. The GDOT TMC would also be able to control the CCTV cameras and monitor situations as the need arises.

Queue Detection would detect vehicles at the McLarin Road at-grade crossing. This information would be processed by the roadside logic controller. The logic controller would send pre-determined messages to the area dynamic message signs based on the operating logic presented in Figure 4.2. It would also transmit this information to the GDOT TMC.

Figure 5.5 Observation and Detection Diagram



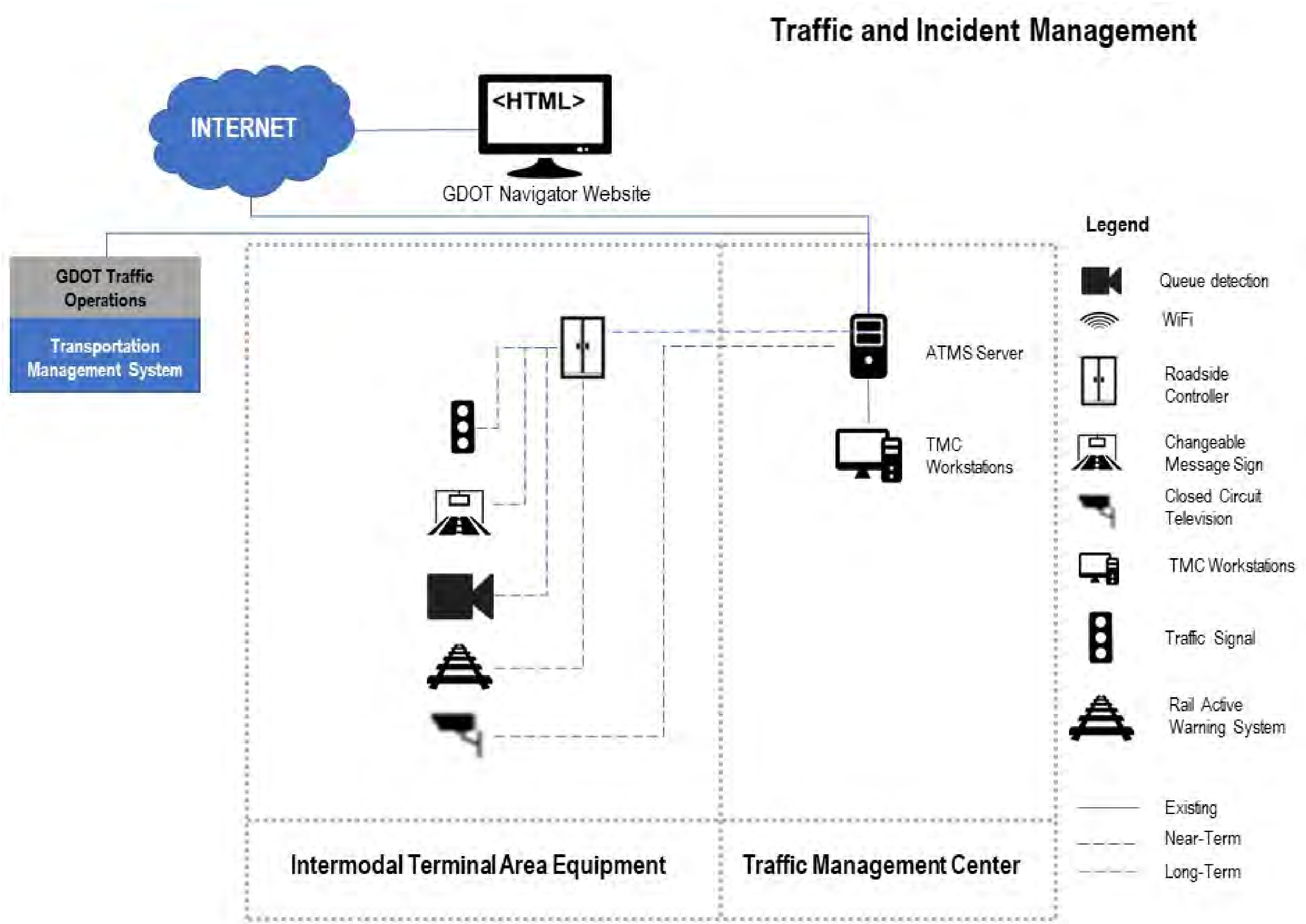
Source: Volkert, Inc; Cambridge Systematics, Inc.

5.1.4 Traffic and Incident Management

Figure 5.6 depicts the connectivity between the Traffic and Incident Management field devices and the GDOT TMC. A traffic signal at the intersection of Howell Avenue and SR 74 is under consideration by GDOT District 7. If the intersection is signal-controlled, its timing may be coordinated to facilitate trucks entering and exiting the Fairburn Intermodal Center.

The rail grade crossing active warning system and the queue detection alert the Freight ITS to the presence of a train and queued vehicles at the McLarin Road crossing. The rail active warning system is existing as there are already gates and flashing lights at the at-grade crossing. The proposed Freight ITS will link into the existing CSX infrastructure. Queue detection will be added as part of the proposed system.

Figure 5.6 Traffic and Incident Management Diagram



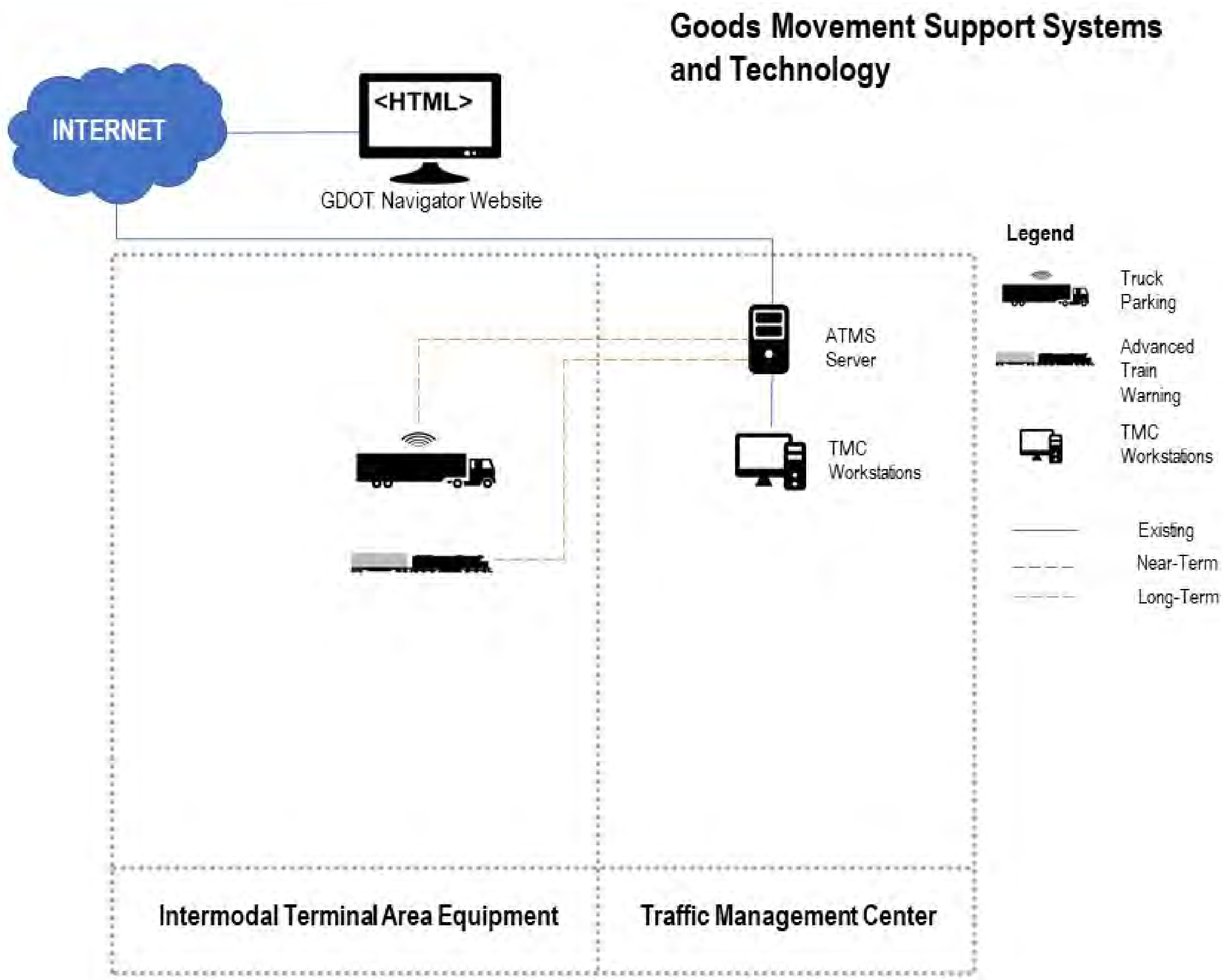
Source: Volkert, Inc; Cambridge Systematics, Inc.

5.1.5 Goods Movement Support Systems and Technology

Figure 5.7 presents the Goods Movement Support Systems and Technology field devices and the connections back to the GDOT TMC. As a long-term improvement, the truck parking system and associated staging lot will give truck drivers a designated area to park as they await entry into the Fairburn Intermodal Terminal. From the lot, drivers may be metered into the intermodal terminal, limiting their impact on area roadways. The system could also be able to monitor the availability of parking spaces for overnight and longer rest periods at the nearby Fairburn Travel Center and provide this to the public through the GDOT Navigator system. This would improve regional traffic safety as it would help to limit the number of fatigued drivers on the region's highways as well as mitigate drivers parking on Interstate highway ramps and shoulders due to lack of truck parking in the region.

Another long-term, Phase III improvement would be the implementation of an advanced train warning system. Stakeholder outreach with CSX revealed that the Fairburn Intermodal Center typically receives trains that are about 9,000 feet long. However, the intermodal terminal periodically receives trains that are closer to 12,000 feet long. These trains cause much more significant disruption to traffic in the study area as multiple switching movements are necessary to break these trains down so that they are short enough to enter the intermodal terminal. An advanced train warning system would alert the traveling public on the impending arrival of these trains and direct them to grade-separated crossings.

Figure 5.7 Goods Movement Support Systems and Technology Diagram



Source: Volkert, Inc; Cambridge Systematics, Inc.

5.2 High Level System Requirements

This section summarizes the high-level system requirements for ATMS, CCTV cameras, detection system and dynamic message signs to be implemented within South Fulton CID and the immediate vicinity of the CSX Intermodal Center.

5.2.1 ATMS

This proposed Freight ITS will look at a completely new advanced traffic management system (ATMS) that will be used to monitor traffic and improve flow of traffic. The data collected from the ATMS will have the ability to be accessed by the GDOT TMC. The anticipated benefits would include reducing congestion in the study area, reduction in the truck idle times and reduced emissions. It is anticipated that this ATMS will expand the existing GDOT ATMS capability.

5.2.2 CCTV

As a part of the Freight ITS, Closed-Circuit Television Cameras (CCTV) will be installed. CCTV cameras provide coverage on high-traffic corridors and provide feedback to the TMC, allowing for quick response times to incidents on the road network. The CCTV cameras will have the capability of being viewed and controlled from the TMC using video management software.

5.2.3 Detection System

The proposed Freight ITS will incorporate the existing CSX active warning system (AWS) for the at-grade rail crossings along McLarin Road. The efficiency of the AWS system will be a key component to the effectiveness of the dynamic message signs. In addition to the AWS, the Freight ITS will also use a video queue detector to alert the system to the presence of queued vehicles at crossing 901263C. As outlined in Figure 4.1, the AWS and video queue detection will work together to enhance the reliability of the Freight ITS.

5.2.4 Dynamic Message Signs

Dynamic message signs display important messages to drivers on key corridors This plan will consist of installing three (3) dynamic message signs that will alert trucks to the presence of a train blocking the at-grade rail crossings along McLarin Road. The dynamic message signs will be preempted from the active warning system at the at grade rail crossings along McLarin Road. Dynamic message signs promote safe and efficient traffic movement and could reduce congestion.

In addition to at-grade crossing warnings, these signs may be used to communicate additional information to drivers in the area to improve safety and mobility. Examples include travel conditions on U.S. 29 and SR 74 in the CID area using information from the CCTV cameras that are proposed as part of this study (i.e., SR 74 at Howell Avenue and U.S. 29 at Roberts Street) and those cameras already in operation in the area (i.e., SR 14/U.S. 29/W. Broad Street at SR 92 and SR 14/U.S. 29/Main Street at Elder Street intersections). Also, the dynamic message signs could also be used to alert motorists to travel conditions on I-85, potentially re-routing traffic to U.S. 29 as an alternate route. This would be especially beneficial to trucks departing the intermodal facility.

6.0 Technology Scan

The technology scan includes a review of the technology elements to be considered for deployment and a review the state of the practice and recent advancements of these technologies. Recommendations are made for each of the technology elements. Only technologies that are being considered for the immediate and near-term have been evaluated.

6.1 Identification of Hardware Considered

Research was conducted on available hardware which can be utilized for the South Fulton CID ITS project in its immediate phase. The field equipment that will be used in this project will be in accordance with the GDOT Qualified Products List QPL 48. The items identified in Table 6.1 were considered.

Table 6.1 Hardware Considered for the Freight ITS

Product	Manufacturing Company	Purpose
Cabinet Components		
Wireless Communication	Infinet Wireless	The controller cabinet will establish a wireless communications pathway between the existing ITS components and the proposed ITS components.
Wireless Radio	Encom	
Wireless Receiver/Transmitter	Proxim	
Controller	MH Corbin	
Dynamic Message Signs		
3 Line X 15-character LED Front Access	Ledstar	The dynamic message signs will be used to display messages that warn truck drivers of the blocked crossing and direct them to the alternate route along U.S. 29/Roosevelt Highway.
Permanent DMS	SES America, Inc.	

Source: Volkert, Inc; Cambridge Systematics, Inc.

6.2 Identification of Software Solutions Considered

The software solution for the Long-term phase of the project may utilize the Kapsch's DYNAC ATMS software developed by Kapsch TrafficCom to collect, disseminate, and manage transportation systems. This ATMS is customizable with an exact set of features as per requirements for small and large-scale deployments. The web-based application using a standard PC browser with web makes access very simple. [3]

[3] https://www.kapsch.net/us/ktc/downloads/brochures/Kapsch-KTC-BR-ATMS-DYNAC-EN_U.S.-WEB.pdf?lang=en-U.S.

7.0 Benefit-Cost Analysis

The proposed Phase II ITS improvements are expected to generate substantial benefits for the South Fulton area. The improvements are estimated to cost about $1.492 million in capital costs with ongoing operational and maintenance costs of nearly $11,000 per year. As shown in Table 7.1, the estimated average annual benefits and costs of the project with the 7 percent discount rate are estimated to be $95,400 and $61,305, respectively. This yields a benefit-cost ratio of 1.6 at the 7 percent discount rate. The undiscounted benefits and costs of the project are estimated to be over $234,680 and over $85,472, respectively. This yields an undiscounted benefit-cost ratio of 2.7. These results are driven by the savings in travel time due to en-route traveler information, traffic incident management, and emissions cost savings to be generated by the Phase II Freight ITS project in the South Fulton CID.

Table 7.1 Summary of Quantitative Impacts to be Generated by the Phase II Freight ITS Improvements

Benefit and Costs	Benefits and Costs ($2018)	Benefits and Costs (7%)
Total Benefits	$4,476,153	$1,820,135
Total Capital Costs	$1,492,000	$1,138,240
Average Annual Benefits	$234,680	$95,400
Average Annual Costs	$85,472	$61,305
Benefit-Cost Ratio (BCR)	2.7	1.6

Source: Cambridge Systematics, Inc.

A modified version of the Federal Highway Administration's (FHWA) Tool for Operations Benefit Cost Analysis (TOPS BC) was utilized for this effort as it is a spreadsheet-based resource that estimates annualized benefits and costs associated with various ITS and operational strategies (e.g., DMSs, traveler information, traffic incident management, advanced signal systems, etc.) based on several project parameters, which are either provided as direct inputs to the program or defaults based on national averages and existing literature. The remainder of Section 7 describes the methodology, inputs, assumptions, and BCA results for the Phase II Freight ITS project.

7.1 En-Route Traveler Information

The first category of benefits is travel time saved due to delivering drivers en-route traveler information via the DMS to be installed as part of Phase II. In the context of the Phase II Freight ITS, travel time is saved primarily by drivers being able to avoid the blocked crossing when a train is present for an extended period of time. In total, about 1,874 vehicles per day are estimated to pass the DMS locations as they head towards the CSX Transportation gate on McLarin Road. About 872 of these vehicles are trucks while the remainder (1,002 vehicles per day) are passenger vehicles. Thus, 1,874 vehicles per day represent the total amount of traffic that may be impacted by the Freight ITS. However, this is a conservative estimate as the DMS may be used to transmit messages advising motorists on travel conditions beyond the CID area. For example, the DMS may also be used to advise motorists on travel conditions on I-85 before they access the highway via SR 74. In the event of an incident on I-85, motorists could be directed to U.S. 29/Roosevelt Highway prior to entering I-85.

The daily volume of vehicles that pass the DMS locations is based on the estimated amount of vehicles that approach crossing 901263C from McLarin Road westbound. Vehicles approach from 3 primary routes as described in detail in Table 7.2:

- SR 74 Northbound to McLarin Road Westbound—about 1,605 vehicles per day.
- Bohannon Road northbound to McLarin Road westbound—about 140 vehicles per day.
- U.S. 29 southbound to McLarin Road westbound via Roberts Street—about 129 vehicles per day.

Table 7.2 Routes to CSX Impacted by the Phase II Freight ITS

Route	Distance (Miles)	Vehicles per Day
SR 74 Northbound from Howell Avenue to McLarin Road Westbound	0.8	1,605
Bohannon Road Northbound from Howell Avenue to McLarin Road Westbound	0.6	140
U.S. 29 Southbound via Roberts St. to McLarin Road Westbound	0.8	129
Total		**1,874**

Source: GDOT Traffic Analysis and Data Application, 2020; South Fulton CID Traffic Count Data, 2017-2020; Cambridge Systematics.

In order to estimate the en-route traveler information benefits associated with the Phase II Freight ITS, some important assumptions are made about the operational characteristics of the Phase II Freight ITS, the traffic characteristics of the impacted roadways, and the monetary value of time savings. Regarding the operational characteristics of the Phase II Freight ITS, as shown in Table 7.3 the BCA assumes that the ITS will be actively disseminating information to drivers and alerting them to the status of the crossings and alternate routes for about 5.5 percent of time on a daily basis (PTD). This estimate is based on the traffic study results in Appendix A including the assumed minimum duration threshold that determines when the Freight ITS would begin actively re-routing traffic (see section 4.2.1).

Table 7.3 Phase II Freight ITS Operating Characteristics and Parameters

Phase II Freight ITS Operational Characteristics	Parameter
Percent time device is disseminating useful information (PTD)	5.5%
Percent Drivers Acting on the Information (PDA)	50%
Average Time Saved (Minutes) per Day by Drivers Acting on the Information (TT)	15

Source: Cambridge Systematics, Inc.

For operational characteristics, it is also assumed that 50 percent of drivers will act on the information provided by the Freight ITS (PDA) and that each person will save about 15 minutes of travel time (TT). The analysis assumes that half of drivers will act on the information given the importance of this crossing to area stakeholders, its impact to local businesses, and its role as the primary access point for the CSX Fairburn Intermodal Center as documented in the 2017 South Fulton CID Multimodal Study. In addition, the local businesses in the study area who rely on these corridors are positioned to actively promote the use of the Freight ITS. Thus, the BCA assumes that a higher proportion of drivers will act on the information disseminated by the Freight ITS. Based on the traffic results presented in section 4.2.1, the BCA assumes that drivers that act on the information will save about 15 minutes in travel time. This includes the time spent traveling on one of the alternate routes.

The value of travel time savings from en-route traveler information is also impacted by the value of travel time (VOTT) by vehicle type (i.e., trucks and autos) and the corresponding average vehicle occupancy (AVO). Generally, the value of time for trucks is higher than passenger vehicles, while passenger vehicles are assumed to carry more occupants. The values of both parameters are based on guidance from U.S. DOT on conducting benefit-cost analyses. Using traffic count data collected for the area, it was determined that about 47 percent of traffic consists of trucks while the remainder consists of automobiles.

Table 7.4 Value of Time and Average Vehicle Occupancy Parameters

Vehicle Type	VOTT ($/Hour Person)	AVO (Persons/Vehicle)	Percent of Traffic
Trucks	$29.50	1.00	47%
Autos	$16.60	1.67	53%

Source: U.S. DOT Benefit-Cost Analysis Guidance for Discretionary Grant Programs, January 2020; Cambridge Systematics, Inc. analysis of South Fulton CID Traffic Count Data, 2017-2020.

Equation (1) was used to calculate the value of travel time savings. The proposed Build scenario is expected to have a positive impact on travel times as both automobiles and trucks are able to avoid delays due to closed crossings.

Equation (1):

$$Value\ of\ Travel\ Time\ Savings_t = \sum_k AVO_k \times VOTT_k \times PTD \times PDA \times Annual\ Volume_{k,t} \times TT_t$$

$$k = Trucks, Autos \qquad 2022 \leq t \leq 2042$$

The monetary value of reduced/additional travel time costs due to en-route traveler information are reported in 2018 dollars and are also discounted using a 7 percent discount rate. Table 7.5 presents the travel time cost savings benefits generated by en-route traveler information for the Phase II Freight ITS improvements over the 20-year analysis horizon.

Table 7.5 En-Route Traveler Information Benefits Resulting from the Phase II Freight ITS Improvements

Calendar Year	Reduced/Additional Travel Time (in Person-Hours)	Monetary Value of Travel Time Cost Saved/Wasted (in 2018$)	Present Value (7%)
2022	5,781	$121,838	$92,950
2023	5,868	$123,666	$88,172
2024	5,956	$125,521	$83,640
2025	6,045	$127,404	$79,341

Calendar Year	Reduced/Additional Travel Time (in Person-Hours)	Monetary Value of Travel Time Cost Saved/Wasted (in 2018$)	Present Value (7%)
2026	6,136	$129,315	$75,262
2027	6,228	$131,254	$71,394
2028	6,322	$133,223	$67,724
2029	6,416	$135,222	$64,243
2030	6,513	$137,250	$60,941
2031	6,610	$139,309	$57,808
2032	6,710	$141,398	$54,837
2033	6,810	$143,519	$52,018
2034	6,912	$145,672	$49,344
2035	7,016	$147,857	$46,808
2036	7,121	$150,075	$44,402
2037	7,228	$152,326	$42,119
2038	7,337	$154,611	$39,954
2039	7,447	$156,930	$37,901
2040	7,558	$159,284	$35,953
2041	7,672	$161,673	$34,104
2042	7,787	$164,098	$32,351
Total	**141,474**	**$2,981,446**	**$1,211,265**

Source: Cambridge Systematics, Inc. analysis.

7.2 Traffic Incident Management

The next category of benefits are safety improvements due to the deployment of ITS on the routes serving the CSX Fairburn Intermodal Center. Generally, the economic impact of changes in traffic safety attributable to a transportation investment depends on its potential to increase or decrease VMT and/or alter the average rate of crashes by severity. This analysis compares the change in crash outcomes by severity between the Build and No-Build scenarios. The change in crash outcomes by severity is then converted to dollars using the appropriate monetized value provided by U.S. DOT (see Table 7.6).

Table 7.6 Crash Values

Value of Reduced Crash	Parameter
Fatality Crash	$10,636,600
Injury Crash	$250,600
Property Damage Only Crash	$6,120

Source: U.S. DOT Benefit-Cost Analysis Guidance for Discretionary Grant Programs, January 2020; FHWA TOPS.

The total impacted VMT, from 3 primary routes serving the intermodal facility, is shown in Table 7.7. Using crash data from the 2015-2019 time period for the roadways that serve as primary routes to the CSX Fairburn Intermodal Center, the average annual crash rate by severity was calculated as shown in Table 7.8. Notably, no fatal crashes were observed on these routes over the 2015-2019 time period.

Table 7.7 Total VMT Impacted by the Phase II Freight ITS

Route	Distance (Miles)	Vehicles per Day	Daily Vehicle Miles Traveled
SR 74 Northbound from Howell Avenue to McLarin Road Westbound	0.8	1,605	1,284
Bohannon Road Northbound from Howell Avenue to McLarin Road Westbound	0.6	140	84
U.S. 29 Southbound via Roberts St. to McLarin Road Westbound	0.8	129	103
Total		**1,874**	**1,471**

Source: GDOT Traffic Analysis and Data Application, 2020; South Fulton CID Traffic Count Data, 2017-2020; Cambridge Systematics.

Table 7.8 2015-2019 Average Annual Crash Rate per Million Vehicle Miles on Primary CSX Routes

Crash Severity	Average Annual Crash Rate per Million Vehicle Miles
Fatality	0.00
Injury	4.1
Property Damage Only	28.7

Source: GDOT Georgia Accident Reporting System (GEARS) Database, 2015-2019; Cambridge Systematics, Inc.

The deployment of ITS on the routes serving the CSX Fairburn Intermodal Center is expected to reduce the rate of crashes in the area. A 2000 study in the San Antonio metropolitan area found that posting nearby railroad crossing delays on freeway DMS would reduce crashes by nearly 10 percent. Thus, the analysis assumes a similar crash reduction level for the roadways serving the intermodal facility (see Table 7.9).

Table 7.9 Crash Reduction Factor from Deployment of ITS

Phase II Freight ITS Operational Characteristics	Parameter
Crash Reduction Factor (CRF)	10%

Source: U.S. DOT, Intelligent Transportation Systems Joint Program Office, 2000, https://www.itskrs.its.dot.gov/its/benecost.nsf/ID/c029ae8d4f3b84bb8525733a006d57c6?OpenDocument&Query=Home.

The estimated traffic safety costs for the Build and No Build scenarios were then estimated and capitalized for the 2022 to 2042 period (see Equation 2). The monetary value of reduced/additional crash costs are reported in 2018 dollars and are discounted using a 7 percent discount rate. Table 7.10 shows the traffic safety benefits/disbenefits to be generated by the Phase II Freight ITS improvements over the 20-year analysis horizon.

Equation (2):

$$Value\ of\ Safety\ Savings_t = \sum_{Severity} Value\ of\ Crash_{Severity} \times CRF \times VMT_t$$

$$2022 \leq t \leq 2042$$

Table 7.10 Traffic Incident Management Benefits Resulting from the Phase II Freight ITS Improvements

Calendar Year	Reduced/Additional Number of Crashes	Monetary Value of Crashes Increased/ Decreased (in 2018$)	Present Value (7%)
2022	-1.9	$68,518	$52,272
2023	-1.9	$69,546	$49,585
2024	-1.9	$70,589	$47,037
2025	-2.0	$71,648	$44,619
2026	-2.0	$72,723	$42,325
2027	-2.0	$73,814	$40,150
2028	-2.0	$74,921	$38,086
2029	-2.1	$76,045	$36,128
2030	-2.1	$77,185	$34,271
2031	-2.1	$78,343	$32,510
2032	-2.2	$79,518	$30,839
2033	-2.2	$80,711	$29,253
2034	-2.2	$81,922	$27,750
2035	-2.3	$83,150	$26,323
2036	-2.3	$84,398	$24,970
2037	-2.3	$85,664	$23,687
2038	-2.4	$86,949	$22,469
2039	-2.4	$88,253	$21,314
2040	-2.4	$89,577	$20,219
2041	-2.5	$90,920	$19,179
2042	-2.5	$92,284	$18,194
Total	**-46**	**$1,676,677**	**$681,180**

Source: Cambridge Systematics, Inc. analysis.

7.3 Emissions Reduction

This portion of the analysis captures the benefits (or disbenefits) associated with savings (or additional expenditures) from emission damage costs. Vehicular major pollutants include Carbon Dioxide (CO_2), Nitrogen Oxides (NOx), Particular Matter ($PM_{2.5}$), and Volatile Organic Compounds (VOCs). Emission rates for these major pollutants are a function of vehicle type and average travel speed. This analysis applies the regional emission rates estimated using MOVES2014 from the Atlanta Regional Commission (see Table 7.11).

Table 7.11 Idle Emission Rates for Urban Unrestricted Access Roadways

Pollutant	Light Duty Vehicles (grams/hr.)	Heavy Duty Vehicles (grams/hr.)
CO_2	3,288.46	7,715.08
NO_x	0.94	28.77
$PM_{2.5}$	0.09	1.72
VOC	0.62	4.98

Source: Atlanta Regional Commission, MOVES Emission Rates.

The emissions rates (in grams per mile) of major pollutants (CO_2, VOCs, NOx, and $PM_{2.5}$) from MOVES2014 for Metro Atlanta were used to estimate the emissions totals for both the Build and No-Build scenarios. This is calculated for both passenger vehicles and trucks. The Phase II Freight ITS improvements are predicted to reduce the amount of time spent idling at the closed crossing for both passenger vehicles and trucks over the 2022-2042 forecast horizon. Thus, there is an expected decrease in emissions as vehicles typically emit greater amounts of pollutants when idling than when traveling at free flow speeds. The total change in emissions across the Build and No-Build scenarios was then calculated and converted from grams to short tons (for VOCs, NOx, and $PM_{2.5}$) or metric tons (for CO_2). That value was then converted to dollars using the emission cost shown in Table 7.12 provided by U.S. DOT.

Table 7.12 Emission Damage Cost Rates for Major Pollutants

Emission Type	Emission Damage Cost in 2018$
VOCs	$2,100 per short ton
NOx	$8,600 per short ton
$PM2_{.5}$	$387,300 per short ton
CO_2	$1 per metric ton (2022-2034) $2 per metric ton (2035-2042)

Source: U.S. DOT Benefit-Cost Analysis Guidance for Discretionary Grant Programs, January 2020.

The difference in cost between the Build and No-Build scenarios is the estimated benefit/disbenefit attributable to the Phase II Freight ITS improvements (see Equation 3). The total cost of emissions was capitalized for the 2022 to 2042 period and is reported in 2018 dollars using a 7 percent discount rate. Table 7.13 presents the emission cost benefits to be generated by the Phase II Freight ITS improvements over the 20-year analysis horizon.

Equation (3):

$$Total\ Emissions_t = \sum_{Vehicle\ Type} \sum_{Emission\ Type} Emission\ Rate_{Pollutant,\ Vehicle\ Type} \times Reduction\ in\ Idle\ Time$$

$$2022 \leq t \leq 2042, for\ all\ Idling\ Speed$$

Table 7.13 Emissions Reduction Benefits Resulting from the Phase II Freight ITS Improvements

Calendar Year	Reduced/Additional Emissions (Short Tons)	Monetary Value of Emissions Cost Saved/Wasted (in 2018$)	Present Value (7%)
2022	-7.50E-02	$1,974	$1,506
2023	-7.40E-02	$1,947	$1,388
2024	-7.30E-02	$1,920	$1,280
2025	-7.19E-02	$1,893	$1,179
2026	-7.08E-02	$1,865	$1,086
2027	-6.98E-02	$1,837	$999
2028	-6.87E-02	$1,809	$919
2029	-6.76E-02	$1,780	$846
2030	-6.64E-02	$1,750	$777
2031	-6.53E-02	$1,721	$714
2032	-6.41E-02	$1,690	$656
2033	-6.30E-02	$1,660	$601
2034	-6.18E-02	$1,628	$552
2035	-6.06E-02	$1,616	$512
2036	-5.93E-02	$1,584	$469
2037	-5.81E-02	$1,551	$429
2038	-5.68E-02	$1,518	$392
2039	-5.55E-02	$1,484	$358
2040	-5.42E-02	$1,450	$327
2041	-5.29E-02	$1,415	$298
2042	-5.16E-02	$1,380	$272
Total	**-1**	**$35,471**	**$15,559**

Source: Cambridge Systematics, Inc. analysis.

7.4 Summary of Benefit-Cost Analysis

The aggregation of all benefits expected to be generated by the Phase II Freight ITS improvements as well as the project costs are shown in Table 7.14. The estimated total benefits and costs of the project with the 7 percent discount rate are estimated to be $95,400 and $61,305, respectively. This yields a benefit-cost ratio of 1.6 at the 7 percent discount rate. The undiscounted benefits and costs of the project are estimated to be over $234,680 and over $85,472, respectively. This yields an undiscounted benefit-cost ratio of 2.7.

Table 7.14 Summary of Quantitative Impacts to be Generated by the Phase II Freight ITS Improvements

Benefit and Costs	Benefits and Costs ($2018)	Benefits and Costs (7%)
Average Annual Benefits	$234,680	$95,400
Average Annual Costs	$85,472	$61,305
Benefit-Cost Ratio (BCR)	2.7	1.6

Source: Cambridge Systematics, Inc.

8.0 Summary

This report has described the basic intelligent transportation system (ITS) architecture and communications network for near- and long-term deployment of a Freight ITS project for the area surrounding the CSX Fairburn Intermodal Center. Key groupings of the project improvements that comprise the proposed system included Communications and Collaboration, Traveler Information Dissemination, Observation and Detection, Traffic and Incident Management, and Goods Movement Support Systems and Technology. Taken together, these components of the proposed Freight ITS will help to alleviate the impacts of heavy truck traffic while enhancing freight operations as the study area's freight assets, most notably the CSX Fairburn Intermodal Center, serve as an economic engine for south Metro Atlanta and the State as a whole. The Phase II Freight ITS improvements are predicted to generate a substantial return-on-investment, approximately $1.60 for every $1 invested.

Appendix A. Traffic Study

A.1 Crossing Closure Impacts

In order to better understand the impact of crossing closures on the McLarin Road corridor, traffic data was collected over the 2/26/2020 to 3/3/2020 time period. The primary purpose of the data collection was to estimate the frequency and extent of queueing on McLarin Road between crossing 901263C and Bohannon Road. In addition, the data collection provided information on traffic patterns near the CSX Fairburn Intermodal Terminal, specifically at the two intersections adjacent to the terminal gate that must be passed in order to access the facility: (1) Bohannon Road at McLarin Road and (2) Owens Corning Driveway at McLarin Road.

So that the frequency and magnitude of vehicle queues along the westbound approach of McLarin Road due to the presence of a train at the at-grade crossing could be estimated, an eastward facing video camera was placed just west of the crossing. Over 4 separate 24-hour periods from Monday to Thursday (including one day each), video footage was recorded. The collected information included number of gate closures, length of gate closures, presence of a train, vehicle queue length, and the types of vehicles in the queue by Federal Highway Administration classification. [4]

Figure A.1 Queue Measurement Along McLarin Road

Source: Bing Maps; Volkert, Inc.; Cambridge Systematics, Inc.

[4] Federal Highway Administration, Traffic Monitoring Guide, Appendix C, October 2016, https://www.fhwa.dot.gov/policyinformation/tmguide/tmg_2013/vehicle-types.cfm, Accessed April 13, 2020.

Figure A.2 McLarin Road Looking West

Source: Google Earth.

There were 18 to 33 closures recorded over each 24-hour observation period as shown in Table A.1. On average, there is nearly at least one closure during every hour of a day. Many closures are spurred by activity within the terminal as several occur with no train present. Furthermore, most closures are relatively short with the average being 3 to 9 minutes. However, some closures exceeded 30 minutes with the longest observed closured exceeding 2 hours. The frequency and length of closures have implications for the type of ITS technology that would be most effective. For example, the frequency of relatively short closures with no train present suggests that a freight ITS activated by the CSX Active Warning System may not be effective as motorists would receive multiple messages per day with warnings to divert when it is not necessary given the duration of the closure.

Table A.1 Summary Analysis of McLarin Road Crossing Closures

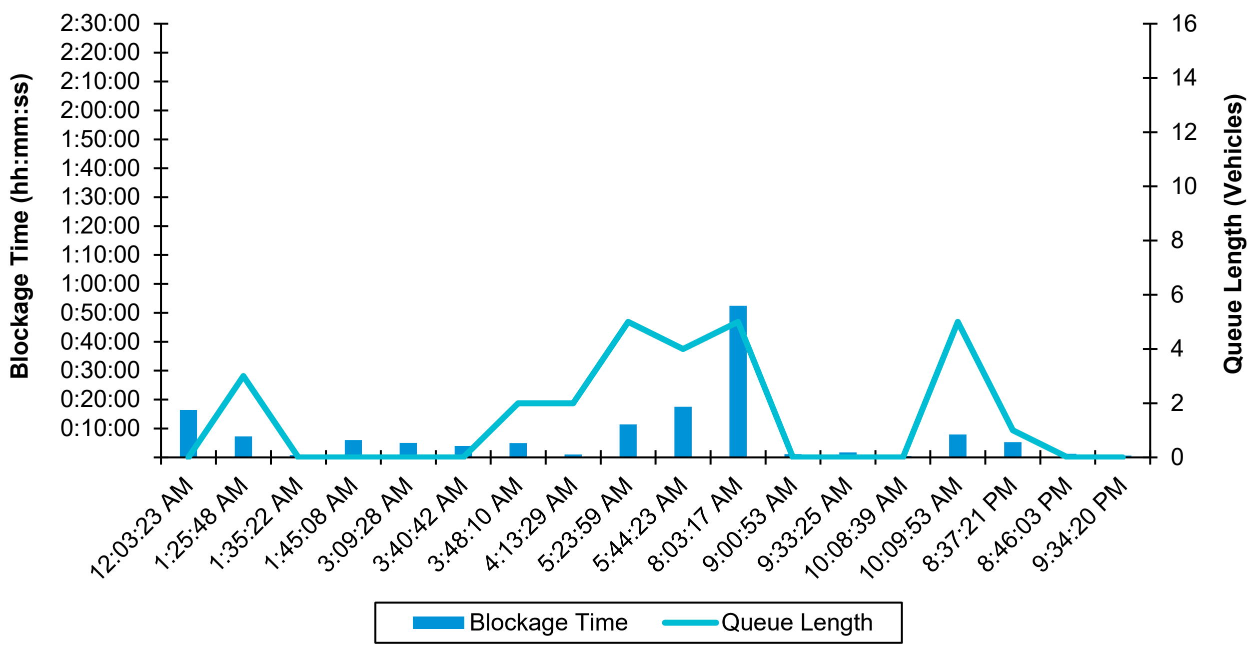
Date	No. of Closures	No. of Closures with Train Present	Average Length of Closure (00:00:00)	Minimum Length of Closure (00:00:00)	Maximum Length of Closure (00:00:00)
Wednesday, 2/26/2020	18	10	0:08:04	0:00:28	0:52:26
Thursday, 2/27/2020	32	16	0:09:43	0:00:19	2:08:17
Monday, 3/2/2020	28	16	0:04:31	0:00:22	0:37:31
Tuesday, 3/3/2020	33	15	0:02:56	0:00:36	0:11:59

Source: National Data Surveying; Cambridge Systematics, Inc.

Queue lengths were estimated by counting the number and type of vehicles that crossed the railroad upon the gate's opening. The queue was assumed to dissipate once headways exceeded 15 seconds. However, it is important to note that this methodology has its limitations and that queues may actually be longer. A driver distracted by a phone or other device while waiting in the queue could cause the headway to prematurely exceed 15 seconds. Also, the CSX driveway is located approximately 400 ft. from the McLarin Road crossing. Any existing queue at that driveway due to trucks that approached the intermodal terminal from McLarin Road eastbound would impact the observed headways and resulting estimate of queue length.

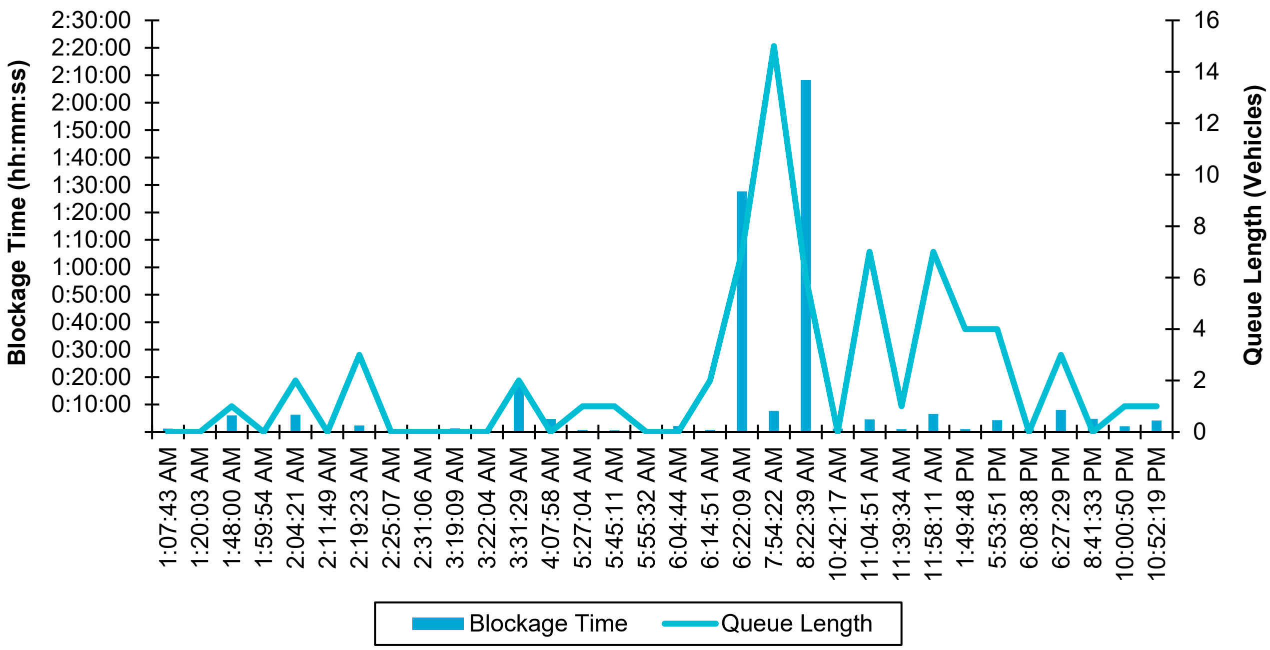
The data for Wednesday, 2/26/2020 indicates that the longest blockage lasted over 52 minutes and that 5 vehicles waited in the queue (see Figure A.3); on Thursday, 2/27/2020 the longest blockage lasted over 2 hours and approximately 6 vehicles waited in the queue (see Figure A.4); on Monday, 3/2/2020 the longest blockage lasted 37 minutes and that 11 vehicles waited in the queue (see Figure A.5); on Tuesday, 3/3/2020 the longest blockage lasted only about 12 minutes with 5 vehicles waiting in the queue.

Figure A.3 Blockage Time and Queue Length (Vehicles)—Wednesday, 2/26/2020



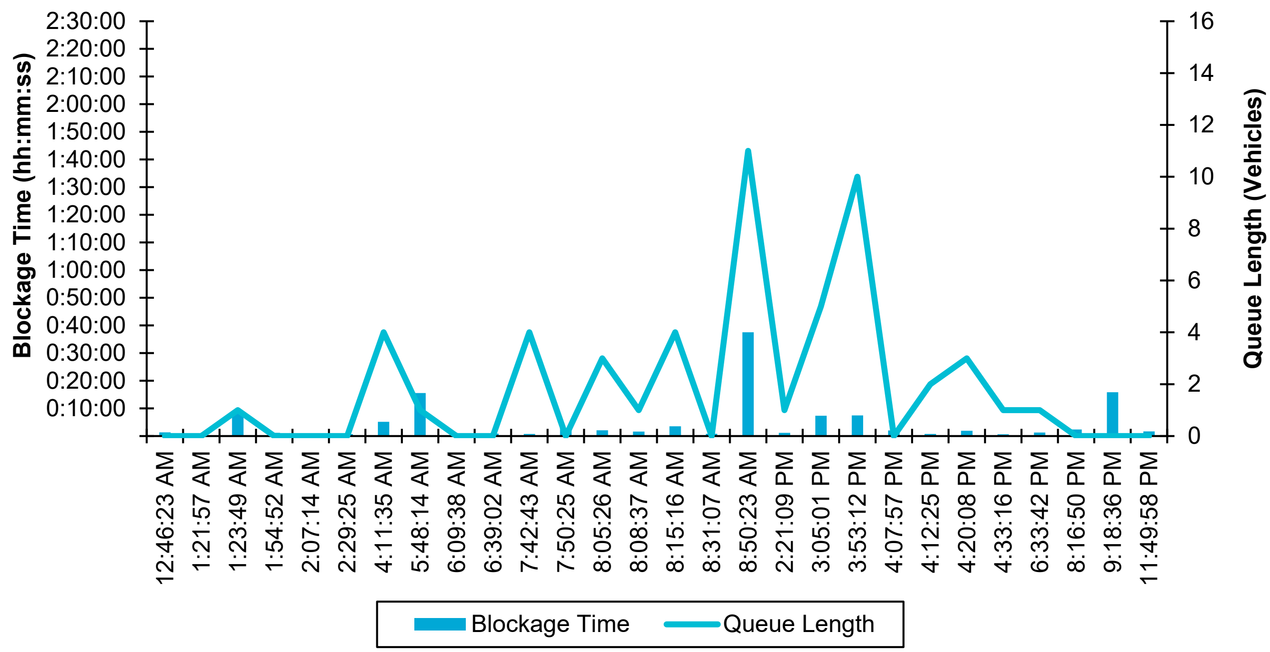
Source: National Data Surveying; Cambridge Systematics, Inc.

Figure A.4 Blockage Time and Queue Length (Vehicles)—Thursday, 2/27/2020



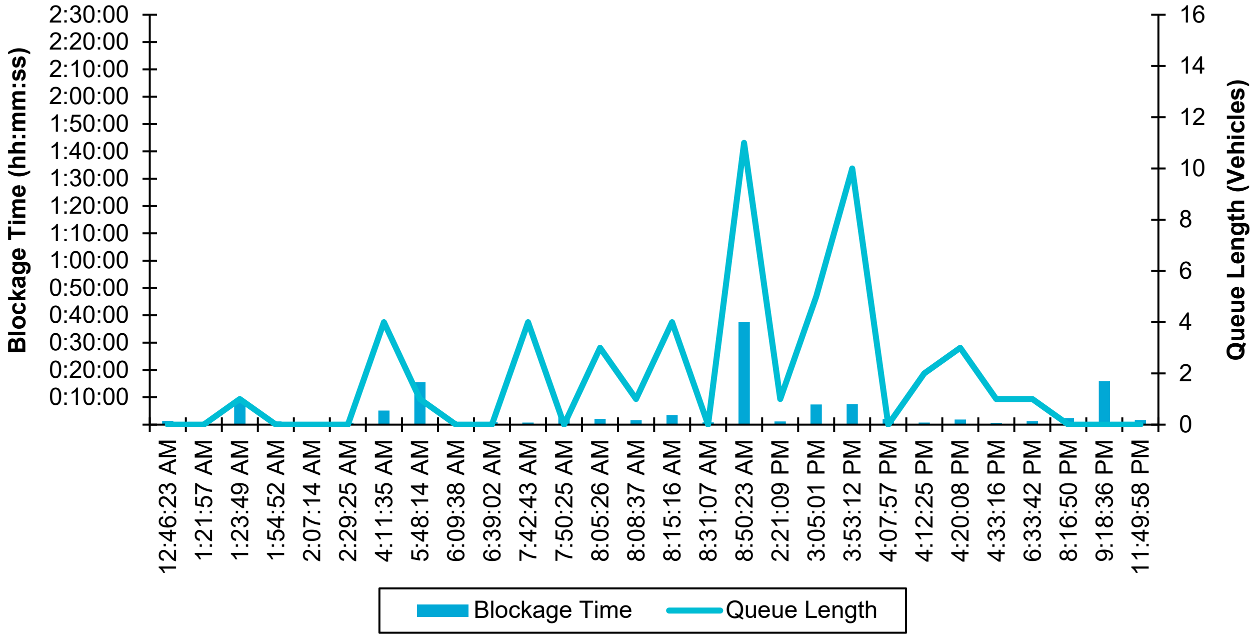
Source: National Data Surveying; Cambridge Systematics, Inc.

Figure A.5 Blockage Time and Queue Length (Vehicles)—Monday, 3/2/2020



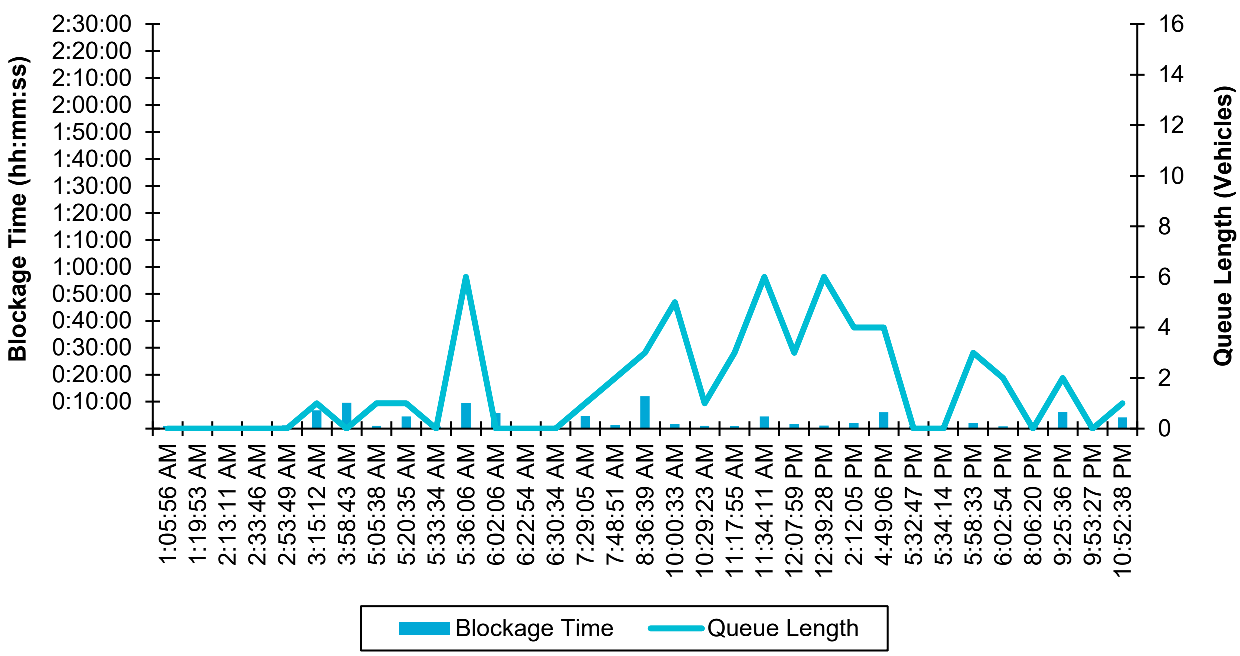
Source: National Data Surveying; Cambridge Systematics, Inc.

Figure A.6 Blockage Time and Queue Length (Vehicles)—Monday, 3/2/2020



Source: National Data Surveying; Cambridge Systematics, Inc.

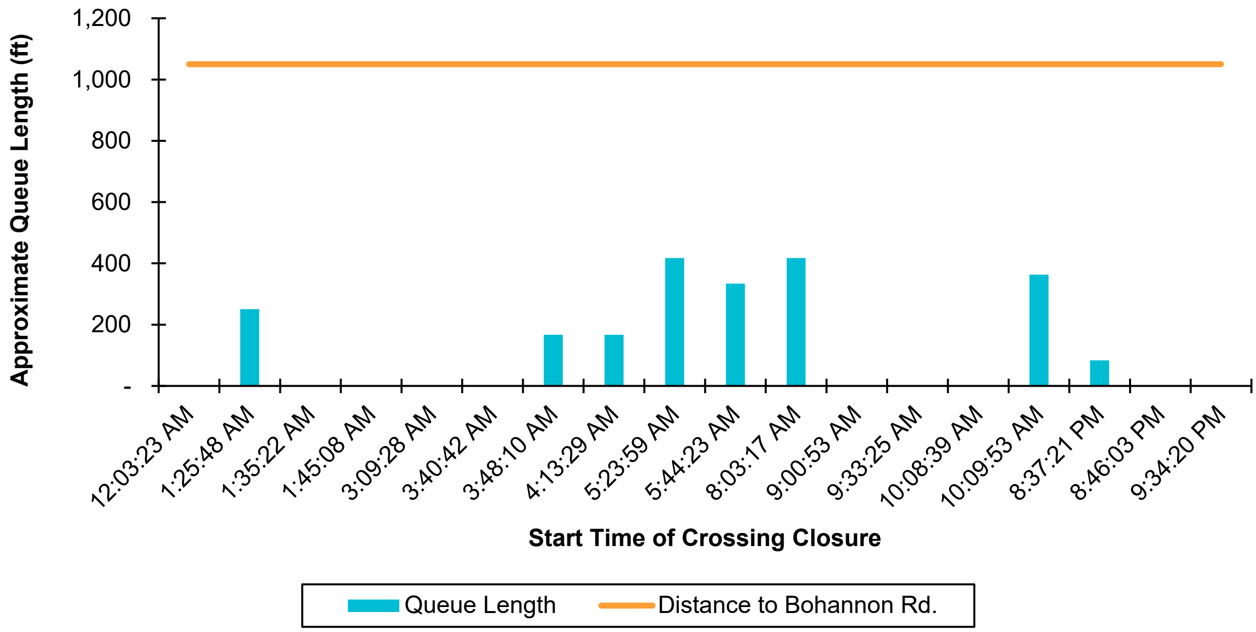
Figure A.7 Blockage Time and Queue Length (Vehicles)—Tuesday, 3/3/2020



Source: National Data Surveying; Cambridge Systematics, Inc.

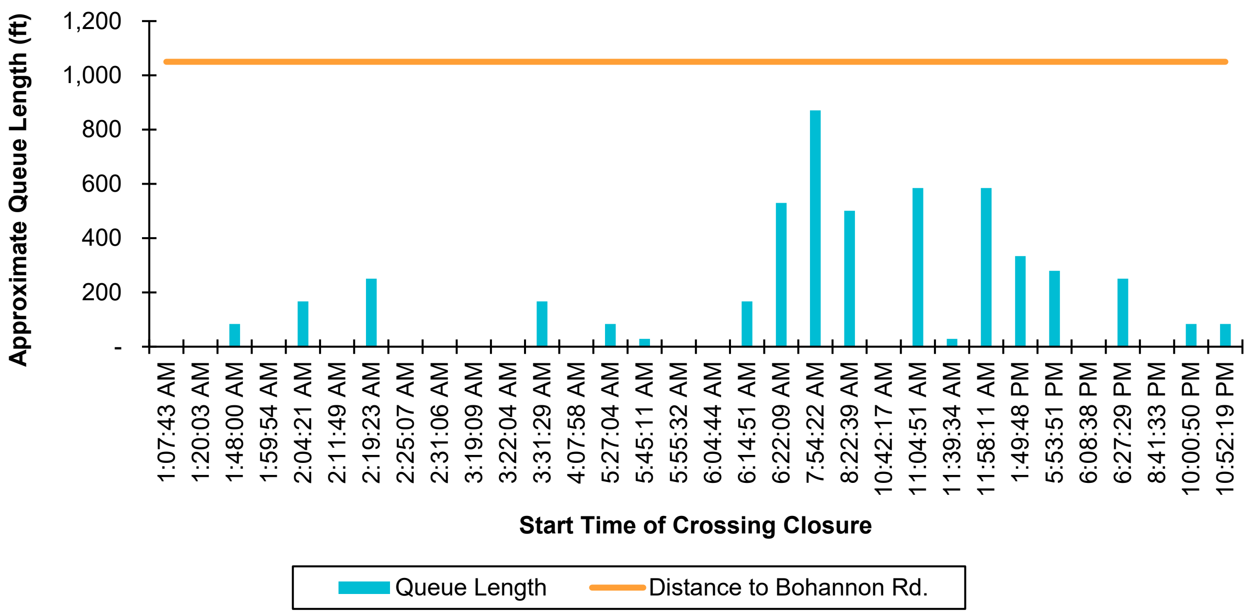
The length of queues in feet was also estimated. It was assumed that passenger vehicles measured 19 feet in length and that trucks measured 73.5 feet in length. Additionally, it was assumed that vehicles left a 10 feet buffer between vehicles and the at-grade crossing stop bar. The data for Wednesday, 2/26/2020 suggests that longest queue may have measured nearly 420 feet (see); on Thursday, 2/27/2020 the longest queue is estimated to have measured approximately 870 feet (see Figure A.9); on Monday, 3/2/2020 the queue is estimated to have measured approximately 860 feet, which is just short of the Bohannon Road intersection (see Figure A.10); on Tuesday, 3/3/2020 the queue is estimated to have measured 864 feet (see Figure A.12).

Figure A.8 Approximate Queue Length (Feet)—Wednesday, 2/26/2020



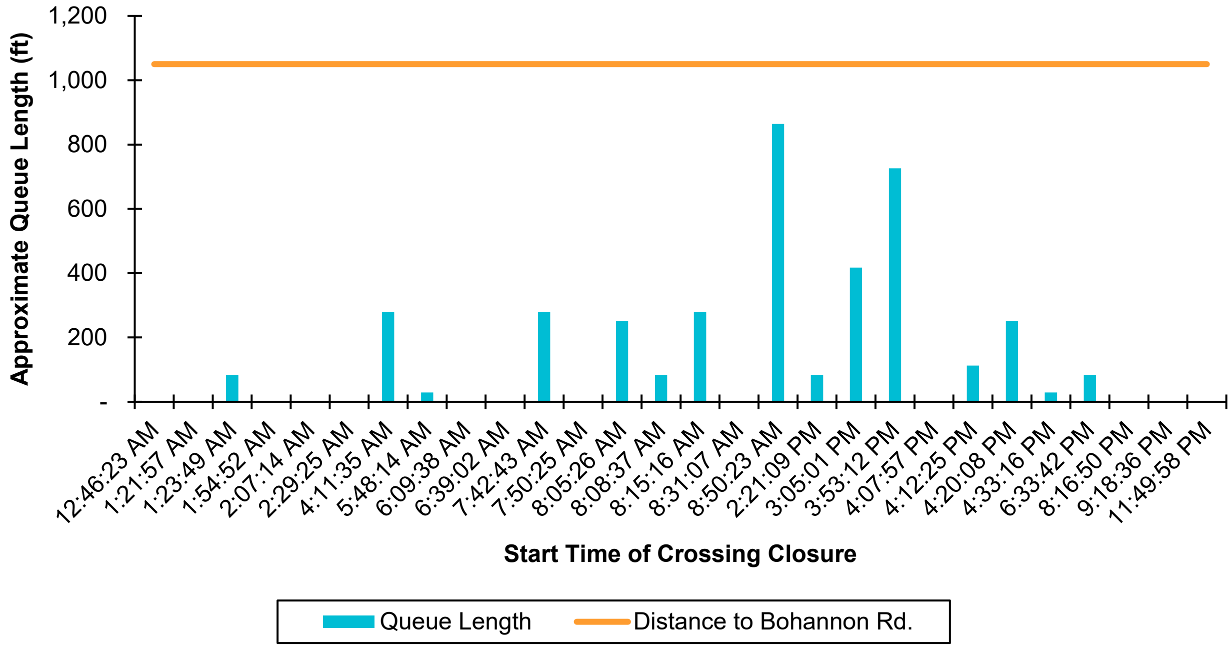
Source: National Data Surveying; Cambridge Systematics, Inc.

Figure A.9 Approximate Queue Length (Vehicles)—Thursday, 2/27/2020



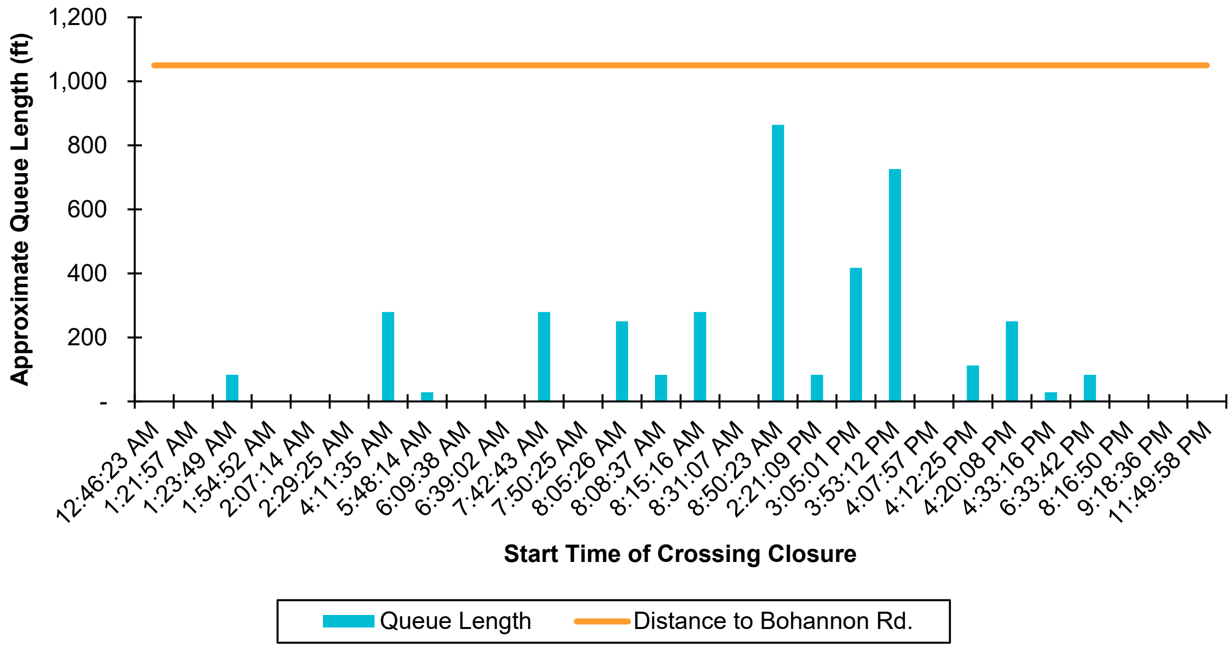
Source: National Data Surveying; Cambridge Systematics, Inc.

Figure A.10 Approximate Queue Length (Vehicles)—Monday, 3/2/2020



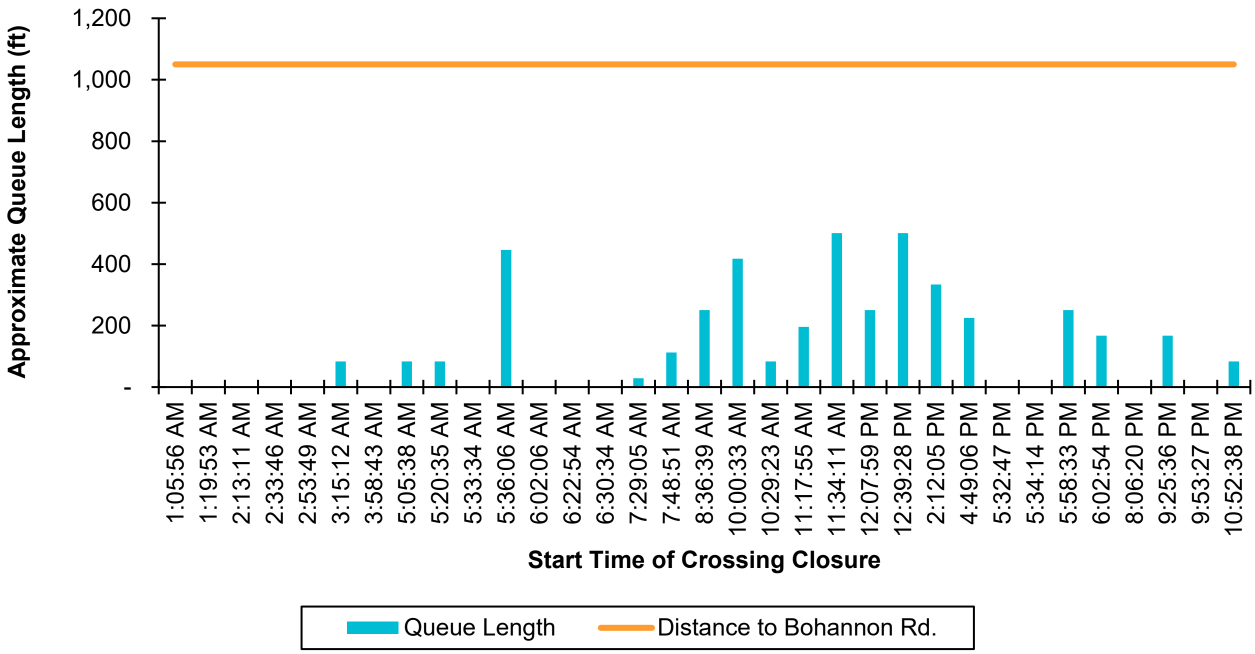
Source: National Data Surveying; Cambridge Systematics, Inc.

Figure A.11 Approximate Queue Length (Feet)—Monday, 3/2/2020



Source: National Data Surveying; Cambridge Systematics, Inc.

Figure A.12 Approximate Queue Length (Feet)—Tuesday, 3/3/2020



Source: National Data Surveying; Cambridge Systematics, Inc.; Volkert, Inc.

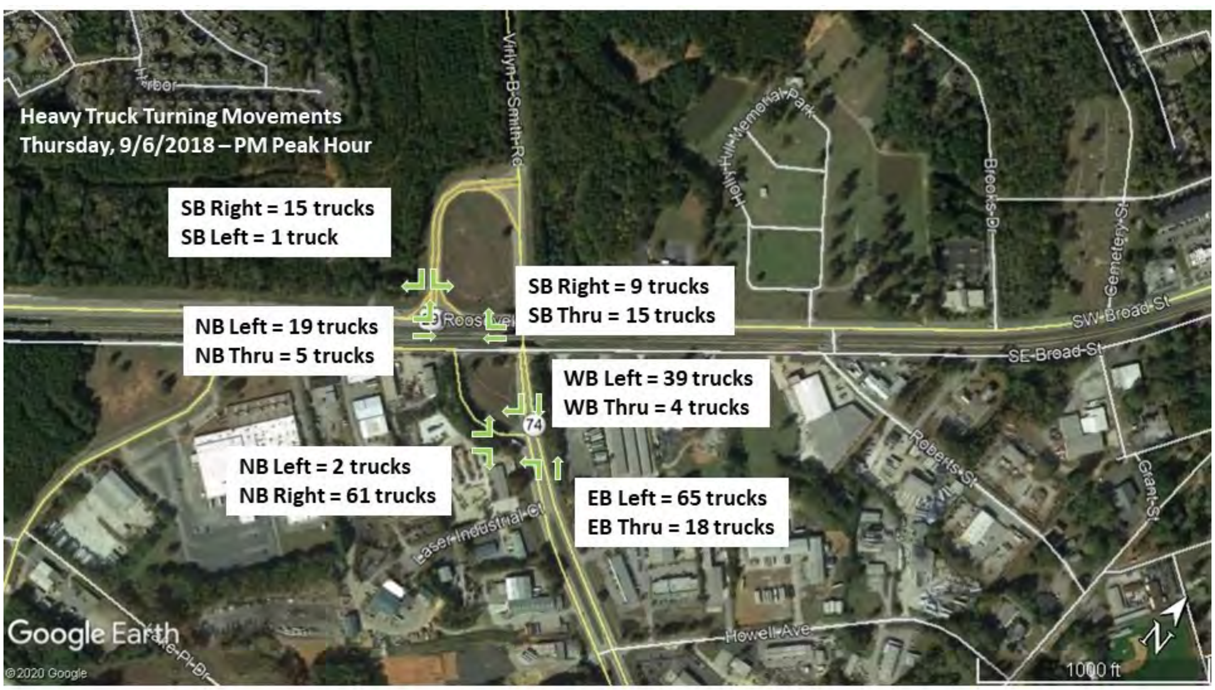
A.2 Traffic Patterns and Growth

Traffic data collected in 2018 show significant volumes of turning trucks at key intersections in the study area during the a.m. (see Figure A.13) and p.m. (see Figure A.14) peak periods. These intersections include SR 74 at SR 74-McLarin Road Ramp and U.S. 29/Roosevelt Highway at SR 74-U.S. 29/Roosevelt Highway Ramp. Over 50 turning truck movements were observed at these intersections during the morning peak. While overall truck turning movement volumes were lower during the afternoon peak period, some volumes exceeded 60 trucks per hour. In addition, data from the GDOT Traffic Analysis Data Tool indicate nearly 4,300 trucks per day travel SR 74 within the study area (i.e., Station 121-0282 at Howell Avenue).

Figure A.13 Truck Turning Movement Counts, 2018 a.m. Peak

Source: National Data and Surveying; Cambridge Systematics, Inc.

Figure A.14 Truck Turning Movement Counts, 2018 p.m. Peak



Source: National Data and Surveying; Cambridge Systematics, Inc.

More recent traffic data was collected as part of this study at the intersections of McLarin Road with Bohannon Road and at the intersection of McLarin Road with Peters Street (see Figure 8.15). The results of the traffic data collection (see Figure A.16, Figure A.17, and Figure A.18) indicate significant volumes of turning trucks during the a.m. (7-8 a.m.) and p.m. (4-5 p.m.) peak periods. During peak periods, approximately 58 to 85 westbound trucks (89 to 113 vehicles total) approach crossing 901263C at McLarin Road based on current traffic conditions. This creates the opportunity for significant queues to develop along McLarin Road towards Bohannon Road if a train is blocking the crossing, negatively impacting businesses along that corridor and contribution to congestion and emissions from truck idling. Furthermore, current turning count data indicate that some trucks approach crossing 901263C through left turns from Bohannon Road onto McLarin Road. This is important because it suggests that a Freight ITS must deliver information to motorists at points along Bohannon Road in addition to SR 74.

There is potential for the current impacts to businesses along the McLarin Road and Bohannon Road corridors to be exacerbated by future traffic growth in the study area. Table A.2 shows growth rates at various locations throughout the study area calculated from annual volume statistics from the Atlanta Regional Commission's travel demand model. On average, traffic volumes are projected to grow at a rate of about 1.7 percent annually. Using the 1.7 percent annual growth rate, and a more conservative 1 percent growth rate, Table A.3 shows estimated peak period approach volumes for crossing 901263C at McLarin Road for the year 2040. The results indicate that peak period westbound approach truck volumes may grow to 80-120 (140-160 total vehicles) during peak periods. This implies that queues may grow longer over time. Furthermore, this analysis does not account for external factors that may increase train volumes and container lifts at the Fairburn Intermodal Center, such as growth at the Port of Savannah, and thus increase the frequency and length of blockages.

Table A.2 Growth Rates from ARC Travel Demand Model

Location	Annual Growth Rate (2020 – 2040)
U.S. 29/Roosevelt Highway southwest of SR 74	1.3%
U.S. 29/Roosevelt Highway-SR 74 Ramp	1.4%
U.S. 29/Roosevelt Highway northeast of SR 74	1.4%
Virlyn B. Smith Road northwest of U.S. 29/Roosevelt Highway-SR 74 Ramp	1.2%
Bohannon Road southeast of Creekwood Road	3.5%
McLarin Road southwest of SR 74	4.0%
McLarin Road-SR 74 Ramp	1.8%
SR 74 northwest of Howell Avenue	1.5%
Senoia Road northeast of SR 74	1.4%
Senoia Road southeast of Howell Avenue	1.5%
SR 74 northwest of I-85	1.4%
I-85 SB On-Ramp	2.1%
I-85 NB Off-Ramp	1.9%
I-85 NB On-Ramp	1.4%
I-85 SB Off-Ramp	0.4%
U.S. 29/Roosevelt Highway west of SR 74	1.3%
Average	**1.7%**

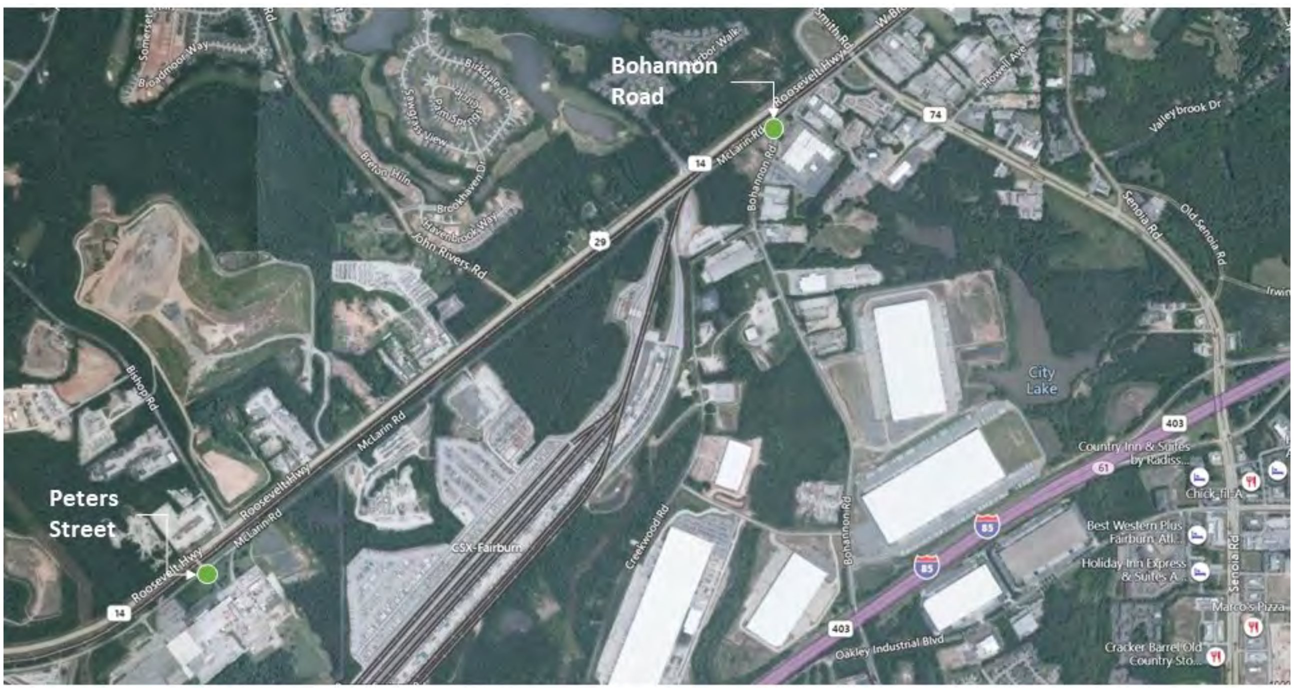
Source: Cambridge Systematics, Inc.

Table A.3 Peak Period Westbound Approach Volumes for Crossing 901263C

Traffic Type	Peak Period	Year 2020 Peak Period Westbound Approach Volumes	Year 2040 Peak Period Westbound Approach Volumes (1% Annual Growth Rate)	Year 2040 Peak Period Westbound Approach Volumes (1.7% Annual Growth Rate)
Trucks	a.m.	58	71	81
	p.m.	85	104	119
Passenger Vehicles	a.m.	31	38	43
	p.m.	28	34	39
Total Volume	**a.m.**	**89**	**109**	**125**
	p.m.	**113**	**138**	**158**

Source: Cambridge Systematics, Inc.; Volkert, Inc.

Figure A.15 Truck Turning Movement Count Locations, 2/26/2020

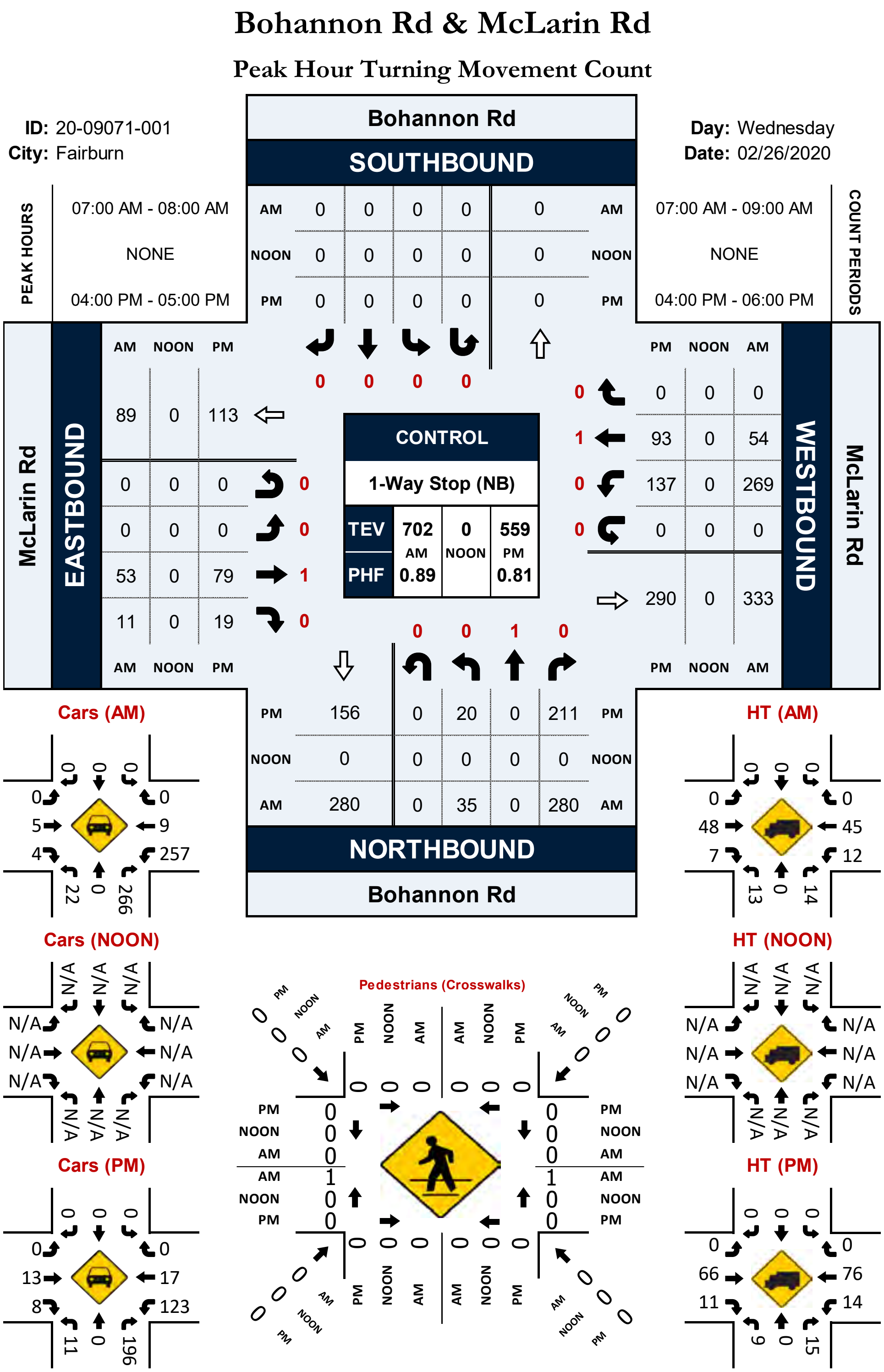


Source: Cambridge Systematics, Inc.

Figure A.16 Truck Turning Movement Counts, 2020 a.m. and p.m. Peak Periods

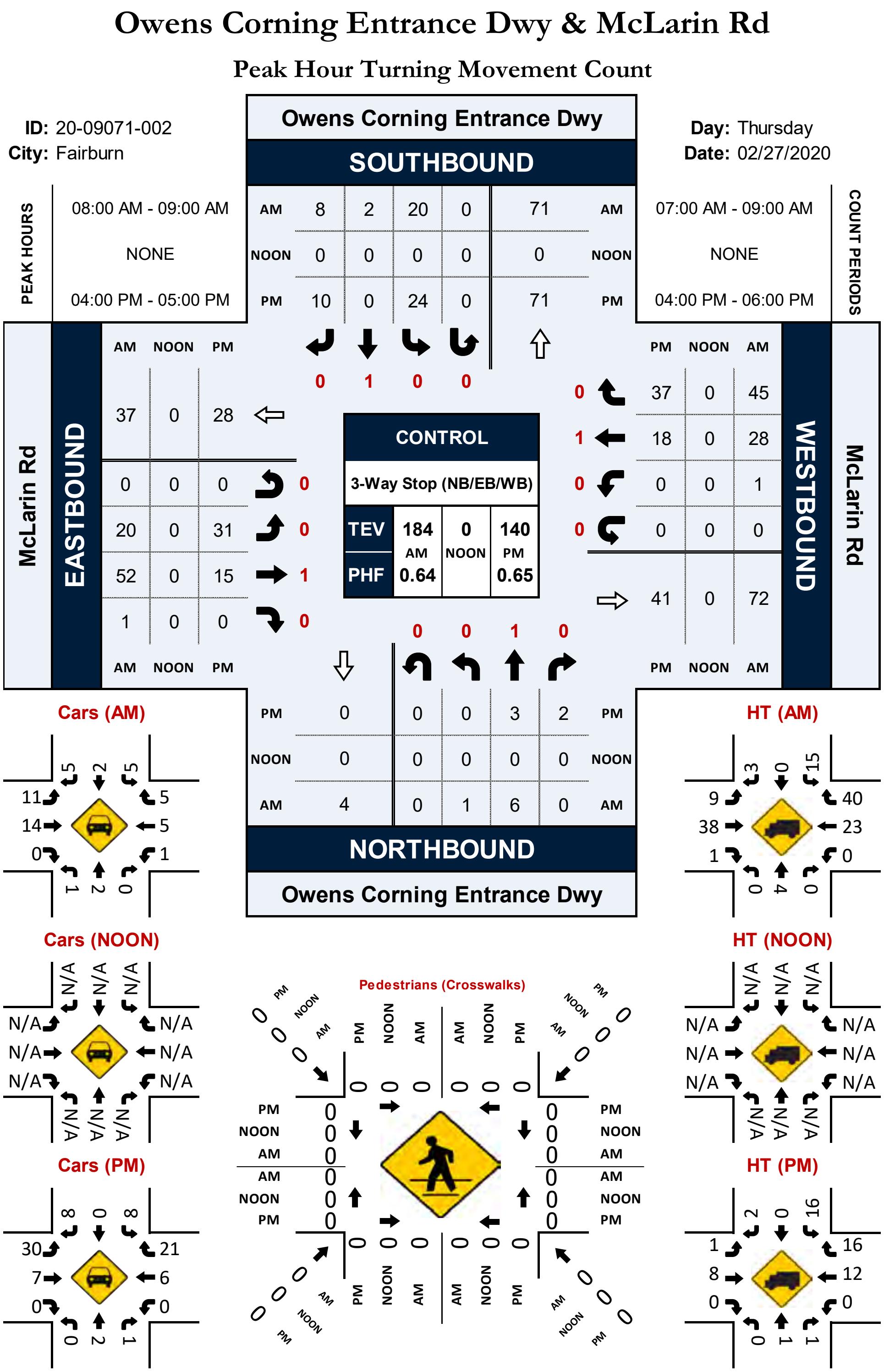
Source: National Data and Surveying; Cambridge Systematics, Inc.

Figure A.17 Bohannon Road at McLarin Road Turning Movement Counts



Source: National Data and Surveying.

Figure A.18 Bohannon Road at McLarin Road Turning Movement Counts



Source: National Data and Surveying.

A.3 Impact of Traffic Patterns and Crossing Closures on the Freight ITS

The information on traffic patterns and crossing closures impacts the design of the proposed Freight ITS as well as assumptions on its benefits and costs to area motorists. This section of the report uses traffic data and crossing closure data to estimate the volume of traffic passing the DMS locations, thus eligible to being impacted by information on the status of the crossings. It also estimates volumes on the primary routes used to access the CSX Fairburn Intermodal Center using traffic counts collected by the SFCID and also those contained in the GDOT Traffic Analysis and Data Application tool. In addition, this analysis uses information collected on train activity at the at-grade crossing to estimate the percent of time the Freight ITS would be actively disseminating information and thus impacting traffic behavior in the area.

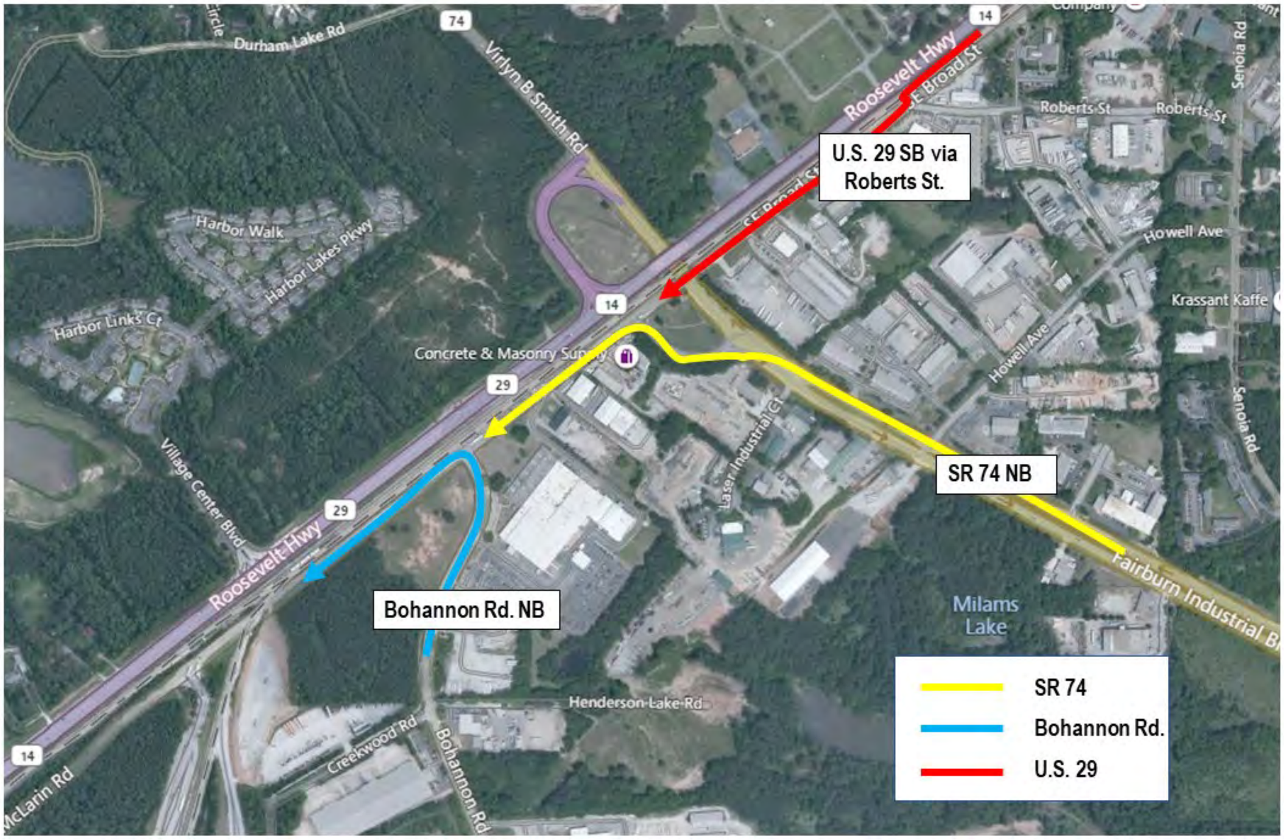
A.3.1 Volume Passing by the DMS Locations

In total, about 1,874 vehicles per day are estimated to pass the DMS locations as they head towards the CSX Transportation gate on McLarin Road. About 872 of these vehicles are trucks while the remainder (1,002 vehicles per day) are passenger vehicles. Thus, 1,874 vehicles per day represent the total amount of traffic that may be impacted by the Freight ITS. However, this is a conservative estimate as the DMS may be used to transmit messages advising motorists on travel conditions beyond the CID area. For example, the DMS may also be used to advise motorists on travel conditions on I-85 before they access the highway via SR 74. In the event of an incident on I-85, motorists could be directed to U.S. 29/Roosevelt Highway prior to entering I-85.

The daily volume of vehicles that pass the DMS locations is based on the estimated amount of vehicles that approach crossing 901263C from McLarin Road westbound. Vehicles are assumed to approach from 3 locations as shown in Figure A.19:

- SR 74 Northbound to McLarin Road Westbound—about 1,605 vehicles per day.
- Bohannon Road northbound to McLarin Road westbound—about 140 vehicles per day.
- U.S. 29 southbound to McLarin Road westbound via Roberts Street—about 129 vehicles per day.

Figure A.19 Primary Routes to CSX



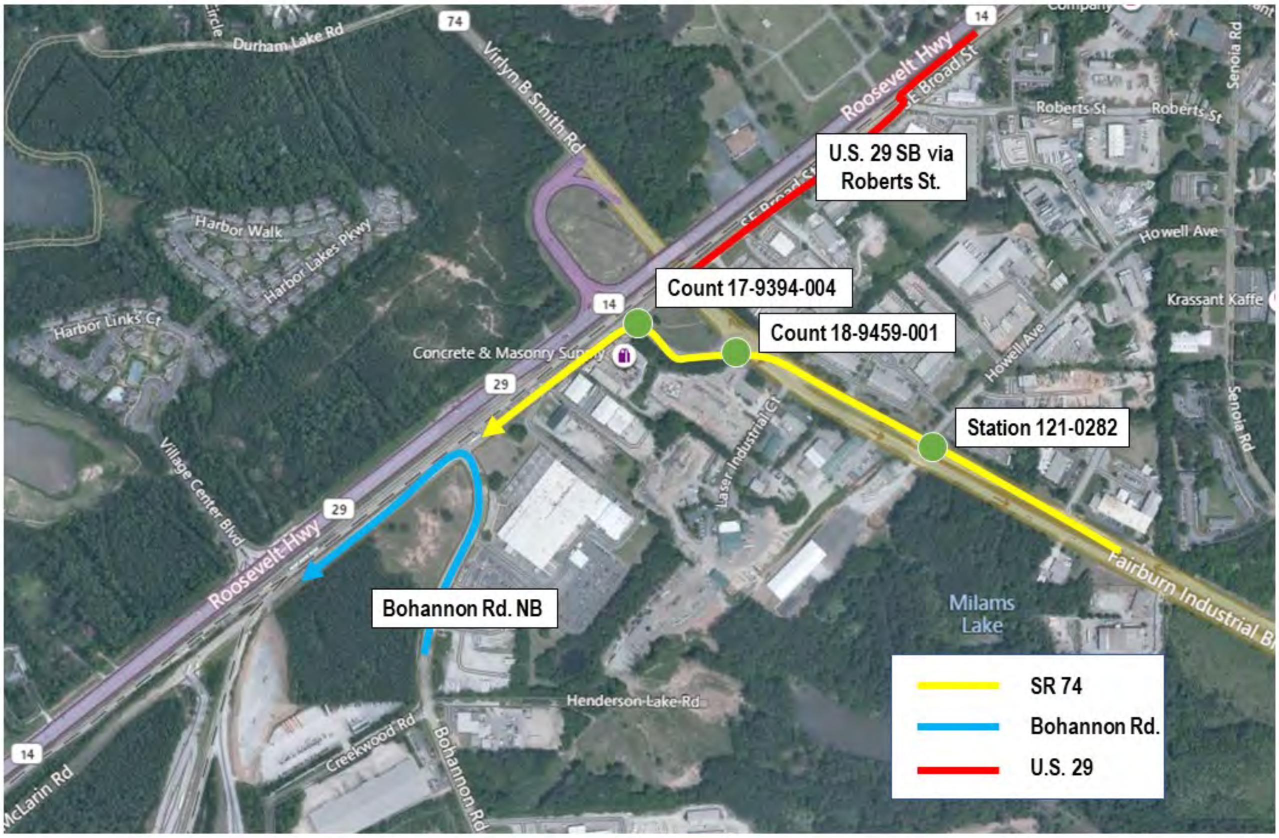
Source: Cambridge Systematics, Inc. analysis.

Vehicles Approaching from SR 74 Northbound

The daily volume of vehicles approaching crossing 901263C from SR 74 northbound was estimated as follows (see Figure A.20):

- Traffic data from GDOT station 121-0282 indicates that about 19,100 vehicles per day travel on SR 74 near its intersection with Howell Avenue Count data at that station also indicates that about 49.5 percent of traffic travels westbound (i.e., towards the SR 74-McLarin Road ramp)—about 9,493 vehicles per day.
- Intersection turning movement counts collected as part the CID's Howell Avenue Extension project (count 18-9459-001) indicated that about 19.5 percent of the estimated 9,493 vehicles per day traveling westbound on SR 74 turn left onto the SR 74-McLarin Road ramp northbound—about 1,851 vehicles per day.
- Intersection turning movement counts collected as part the CID's Howell Avenue Extension project (count 17-9394-004) indicated that about 86.7 percent of the estimated 1,851 vehicles per day traveling northbound on the SR 74-McLarin Road ramp turn left onto McLarin Road westbound towards crossing 901263C—about 1,605 vehicles per day. Of that total, 49.7 percent (or 798 vehicles) are assumed to be trucks and 50.3 percent (or 807 vehicles) are assumed to be passenger vehicles based on the data from the traffic count.

Figure A.20 SR 74 to McLarin Road Route to CSX



Source: Cambridge Systematics, Inc. analysis.

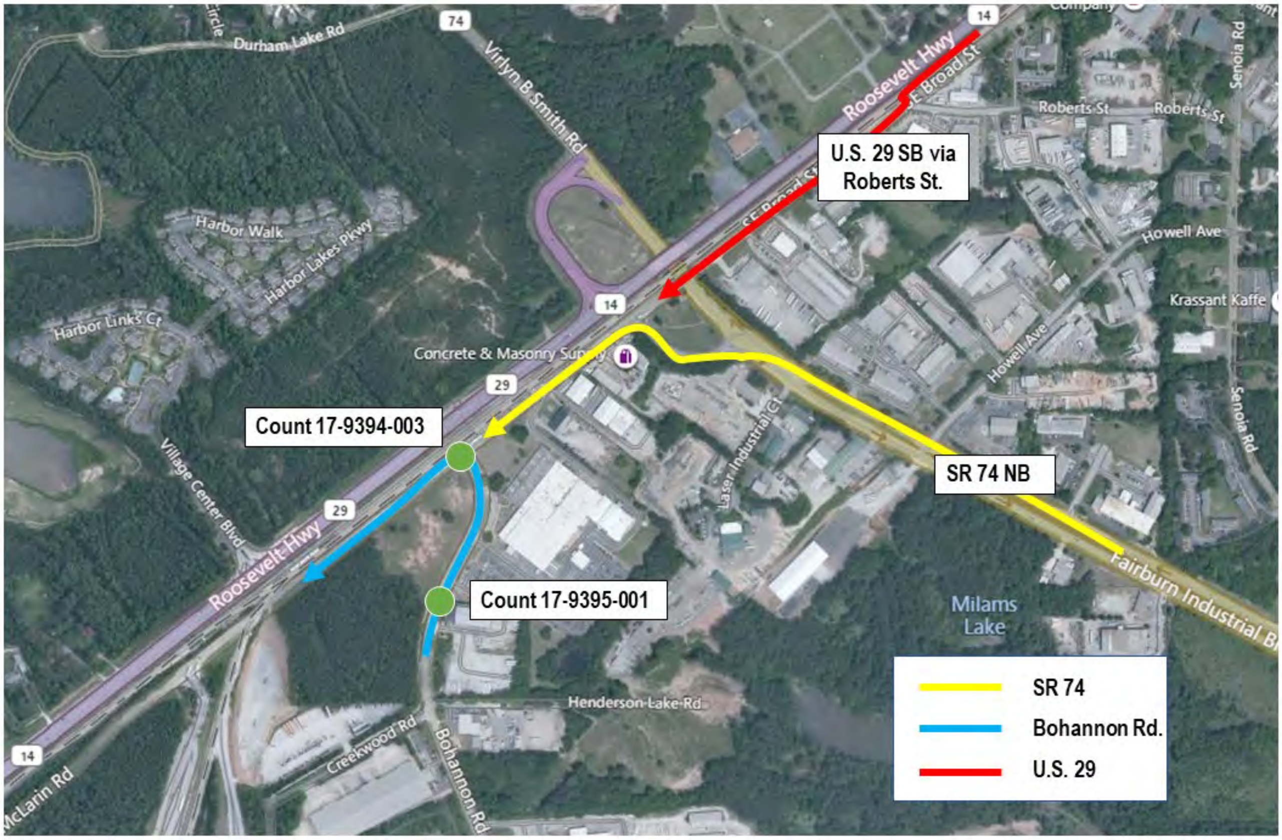
Vehicles Approaching from Bohannon Road Northbound

The daily volume of vehicles approaching crossing 901263C from Bohannon Road northbound was estimated as follows (see Figure A.21):

- Traffic data from collected as part of the Howell Avenue Extension project (count 17-9395-001) recorded an average daily traffic on Bohannon Road of 3,125 vehicles on 8/3/2017. Applying a monthly factor of 0.97 and a daily factor of 0.92, the estimated AADT is 2,789 for Bohannon Road just south of McLarin Road. Count data also indicated that about 51.9 percent of traffic travels northbound (i.e., towards the McLarin Road)—about 1,448 vehicles per day.

- Turning movement counts were collected as part the CID's Howell Avenue Extension project (count 17-9394-003) and as part of the Freight ITS project. From those counts, it was determined that the average percentage of vehicles turning left onto McLarin Road westbound from Bohannon Road northbound was about 9.7 percent—about 140 vehicles per day. Of those 140 vehicles, about 43.2 percent (or 60 vehicles) are trucks and 56.8 percent (or 80 vehicles) are passenger vehicles.

Figure A.21 Bohannon Road to McLarin Road Route to CSX



Source: Cambridge Systematics, Inc. analysis.

Vehicles Approaching from U.S. 29/Roosevelt Highway Southbound via Roberts Street

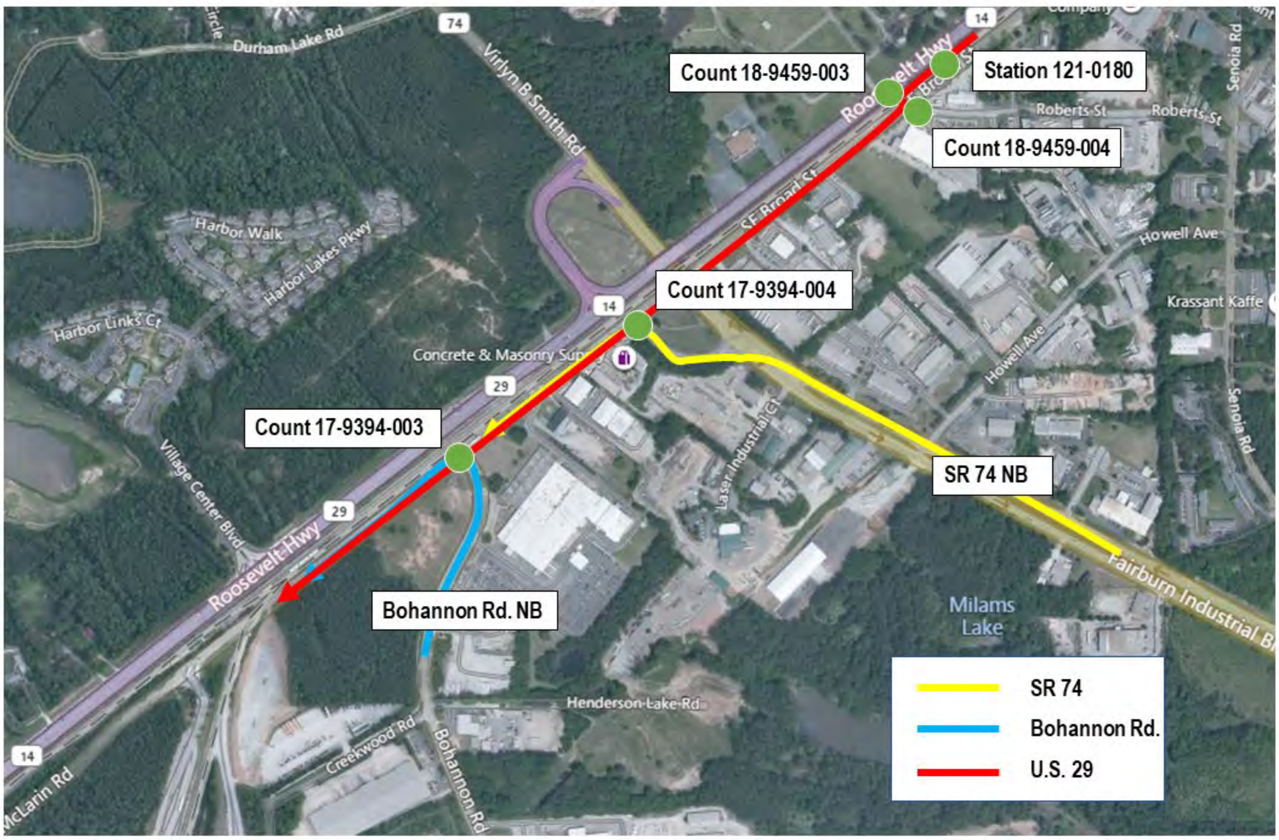
The daily volume of vehicles approaching crossing 901263C from U.S. 29/Roosevelt Highway westbound was estimated as follows (see Figure A.22):

- Traffic data from GDOT station 121-0180 indicates that about 12,600 vehicles per day travel on U.S. 29/Roosevelt Highway near its intersection with Roberts Street. Count data at that station also indicates that about 52 percent of traffic travels westbound (i.e., towards Roberts Street from downtown Fairburn)—about 6,552 vehicles per day.
- Intersection turning movement counts collected as part the CID's Howell Avenue Extension project (count 18-9459-003) indicated that about 10.5 percent of the estimated 6,552 vehicles per day traveling westbound on U.S. 29/Roosevelt Highway turn left onto Roberts Street eastbound—about 688 vehicles per day.
- Intersection turning movement counts collected as part the CID's Howell Avenue Extension project (count 18-9459-004) also indicated that about 78.4 percent of the estimated 688 vehicles per day traveling eastbound on Roberts Street turn right onto McLarin Road westbound—about 539 vehicles per day.
- Intersection turning movement counts collected as part the CID's Howell Avenue Extension project (count 17-9394-004) also indicated that about 85.4 percent of the estimated 539 vehicles per day

traveling westbound on McLarin Road continue through its intersection with the SR 74-McLarin Road ramp without turning—about 460 vehicles per day.

- Turning movement counts collected as part the CID's Howell Avenue Extension project (count 17-394-003) and as part of the Freight ITS project. From those counts, it was determined that the average percentage of vehicles continuing through on McLarin Road at its intersection with Bohannon Road northbound was about 9.7 percent—about 129 vehicles per day. Of those 129 vehicles approaching crossing 901263C from U.S. 29/Roosevelt Highway via Roberts Street, about 11 percent (or 14 vehicles) are trucks and 89 percent (or 115 vehicles) are passenger vehicles based on the distribution of vehicles from the turning movement count collected at U.S. 29/Roosevelt Highway intersection with Roberts Street (count 18-9459-003).

Figure A.22 U.S. 29 to McLarin Road via Roberts Street Route to CSX



Source: Cambridge Systematics, Inc. analysis.

A.3.2 Percent Time Freight ITS Disseminates Useful Information

Based on the results of the train observation study, if a threshold of 9 minutes is used for initiating the Freight ITS, then the time spent disseminating useful information in a day can range from 4 minutes (about 0.3 percent of a 24-hour period) to 3.5 hours (about 14.6 percent of a 24-hour period). The lower end of that range implies there will be days when the system is not needed. On average, the system would disseminate useful information about 5.5 percent of the time. This is equivalent to approximately 1 hour 20 minutes on a daily basis as shown in Table A.4.

Table A.4 Estimate of Percent Time Disseminating Useful Information Given Minimum Duration Threshold

Date	Time Disseminating Useful Information	Percent Time Disseminating Useful Information in a Day
Thursday, 2/27/2020	1:01:44	4.2%
Friday, 2/28/2020	3:26:00	14.6%
Tuesday, 3/3/2020	0:41:56	2.9%
Wednesday, 3/4/2020	0:04:00	0.3%
Average	**0:01:19**	**5.5%**

Source: National Data Surveying; Cambridge Systematics, Inc.

A.3.3 Average Time Saved by Drivers Acting on the Information

The average time saved by drivers acting on information disseminated by the Freight ITS was estimated by examining the travel time difference between the primary route used to access the CSX gate (i.e., SR 74 and McLarin Road) and the primary proposed alternate route for when the McLarin Road crossing is blocked (i.e., SR 74 to U.S. 29 to Peters Street to McLarin Road). Beginning at Howell Avenue, the distance to the CSX gate using the SR 74 to McLarin Road route is about 0.8 miles. Assuming an average speed of 35 mph, the average travel time is about 1.4 minutes.

Beginning at Howell Avenue, the distance to the CSX gate using the SR 74 to U.S. 29 to Peters Street to McLarin Road route is about 3.7 miles. Assuming an average speed of 35 mph, the average travel time is about 6.3 minutes. This amounts to an additional 4.9 minutes in travel time for the primary alternate route (i.e., Additional Alternate Route Travel Time = 4.9 minutes).

Data from the train observation study was used to estimate the amount of time saved by drivers acting on the information, while adjusting for the added travel time for the alternate route. The time saved is equal to the time the Freight ITS is actively disseminating useful information minus the added travel time from the primary alternate route. The Freight ITS is only actively disseminating information from the moment the minimum duration threshold (i.e., Minimum Duration Threshold = 9 minutes) is exceeded to the moment the active warning system for crossing 901263C ceases. Using Equation 4 and data from the train observation study, on average time saved can range from about -3.5 minutes (i.e., indicating that drivers lost 3.5 minutes in time by taking the longer alternate route versus waiting out the blocked crossing) to just over 1 hour. The average across the range of blocked crossing events is about 20 minutes in time savings as shown in Table A.5.

Equation (4):

Table A.5 Average Time Saved by Drivers Acting on Freight ITS Information

Date	Average Time Saved by Drivers Acting on Freight ITS Information
Thursday, 2/27/2020	0:10:32
Friday, 2/28/2020	1:03:46
Tuesday, 3/3/2020	0:09:05
Wednesday, 3/4/2020	-0:03:34
Average	**0:19:57**

Source: Cambridge Systematics, Inc.

The average across the range of blocked crossing events represents the maximum amount of time saved by drivers acting on the information disseminated by the Freight ITS. However, in reality vehicles will arrive at various points in time while the Freight ITS is actively disseminating information. Some will arrive just as the Freight ITS begins re-routing traffic, thereby experiencing the full travel time benefit. Others will arrive just before the Freight ITS ends re-routing traffic, thereby experiencing a fraction of the travel time benefit. For the purpose of estimating the benefits and costs of the Freight ITS, the benefit-cost analysis assumes that on average vehicles will experience a fraction of the blockage and a portion of the full-time savings potential—about 15 minutes.

A.4 Summary of the Traffic Study Results

Overall, the results of the traffic study support the need for a Freight ITS in the study area and help to inform the development of the proposed system. Some key takeaways from the traffic study that impact the proposed Freight ITS include:

- Queues consisting of trucks serving the CSX Fairburn Intermodal Center develop along McLarin Road when trains block crossing 901263C. These queues are sometimes long enough to block the intersection of McLarin Road with Bohannon Road, negatively impacting businesses along those corridors.
- In addition to through movements on McLarin Road at the intersection of Bohannon Road, there are significant truck turning movements from Bohannon Road onto McLarin Road westbound. This indicates that trucks serving the CSX Fairburn Intermodal Center and other businesses on McLarin Road, also use Bohannon Road as a primary route. These trucks are likely coming from the Oakley Industrial Boulevard corridor. This implies that the proposed Freight ITS must deliver information to motor carriers traveling on that corridor in addition to those on SR 74 and U.S. 29/Roosevelt Highway.
- Crossing 901263C is blocked multiple times a day, at least once every hour on average. There is significant variation in the duration of these blockages. Some last only a few seconds with others exceeding 1 hour in duration. The average blockage lasts 3 to 9 minutes as observed in the data.
- Crossing 901263C is impacted by activity within the intermodal terminal. The crossing's active warning system is activated multiple times a day due to activity within the terminal, with no train being present at the crossing. This occurs, on average, about 50 percent of the time based on the data.

Appendix B. Proposed Intersection Improvements

Figure B.1 Proposed Improvements at SR 74-U.S. 29 Ramp at U.S. 29/Roosevelt Highway

Source: Volkert, Inc; Cambridge Systematics, Inc.

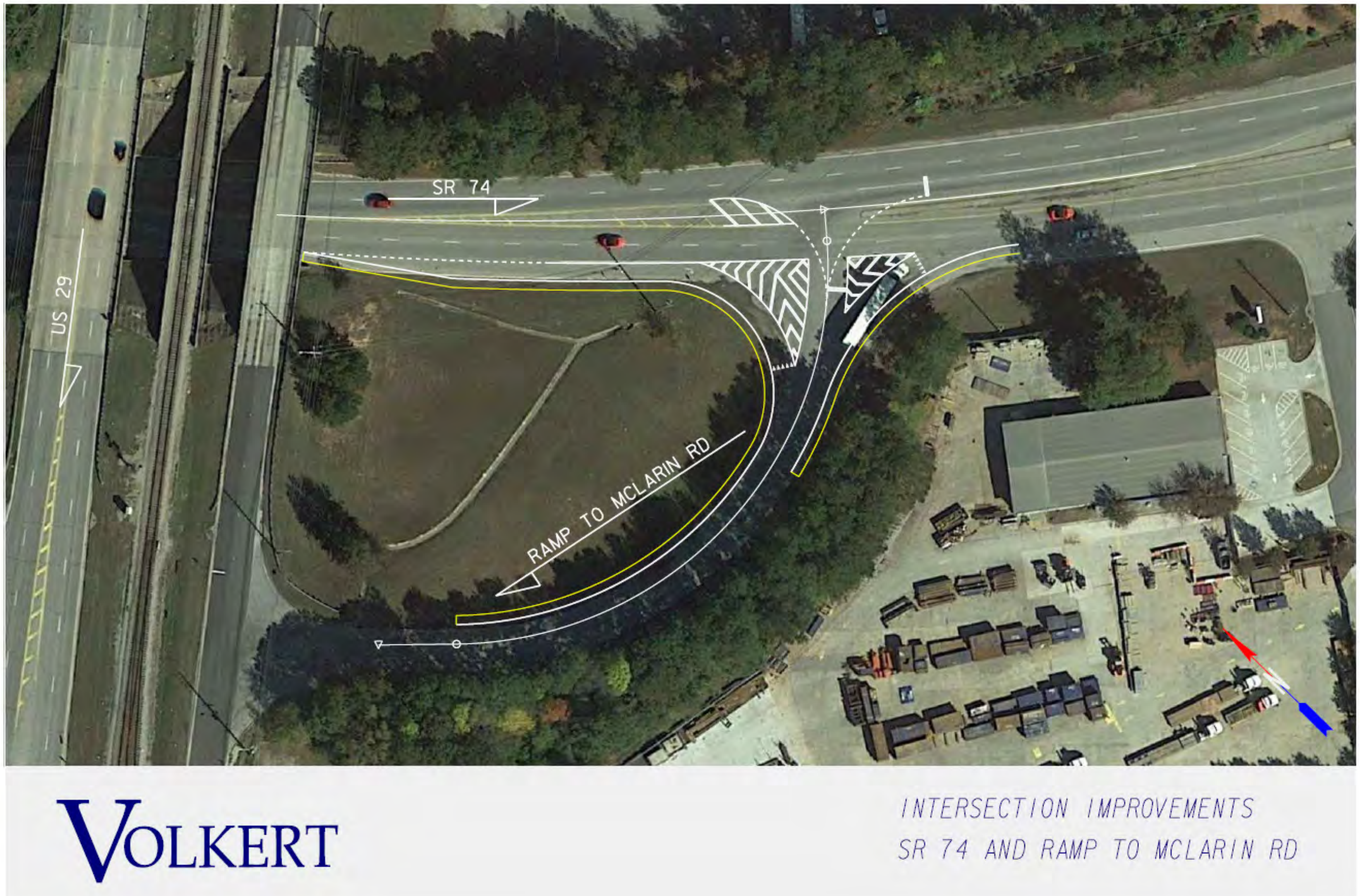
Figure B.2 Proposed Improvements on U.S. 29/Roosevelt Highway

Source: Volkert, Inc; Cambridge Systematics, Inc.

Figure B.3 Proposed Improvements at SR 74-U.S. 29 Ramp at SR 74

Source: Volkert, Inc; Cambridge Systematics, Inc.

Figure B.4 Proposed Improvements at SR 74-McLarin Road Ramp at SR 74



Source: Volkert, Inc; Cambridge Systematics, Inc.