UPWP Task 5.36

SMART St. Augustine

Systems Engineering Report

June 30, 2021

Relationship the Grant Application

This report addresses the full vision of SMART St. Augustine. There are systems and individual projects that are not part of the grant application. The systems engineering for the full deployment was prepared to ensure future phases will be compatible, to the maximum extent possible, to optimize investment.

Purpose of this Document

This document summarizes the systems engineering completed to date. It is compiled into a single document to reduce the need for redundancy that occurs in multiple documents, such as the project description.

The report is divided into the following sections:

- Systems Engineering Management Plan
- Concept of Operations
- Project Evaluation and Data Management Plan
- Project and Risk Management Plan
- High-level System Validation Requirements

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PROFESSIONAL ENGINEER CERTIFICATION

I hereby certify that I am a registered professional engineer in the State of Florida practicing engineering for Kimley-Horn and Associates, Inc. and that I have supervised the preparation of and approve the analysis, findings, opinions, conclusions and technical advice hereby reported for:

PROJECT: SMART St. Augustine
St. Johns County, FL

The engineering work represented by this document was performed through the following duly authorized engineering business:

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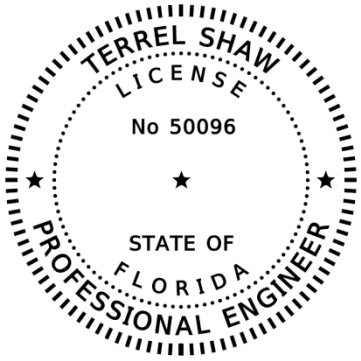
Any engineering analysis, documents, conclusions, or recommendations relied upon from other professional sources or provided by the others are referenced accordingly in the following report.

FLORIDA REGISTERED ENGINEER:



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Terrel Shaw

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Abbreviations

Abbreviation	Explanation
3GPP	3rd Generation Partnership Project
4G	4th Generation
5G	5th Generation
ADA	Americans with Disabilities
AMI	Advanced Metering Infrastructure
ATC	Advanced Traffic Controllers
ATCMTD	Advanced Transportation Congestion Management Technologies Deployment
ATSPM	Automated Traffic Signal Performance Measures
CCNA	Consultant Competitive Negotiations Act
CEI	Construction Engineering and Inspection
CIP	Capital Improvement Plans
COA	Council on Aging
CVE	Connected Vehicle Environment
DMS	Dynamic Message Sign
EAV	Electric and Autonomous Vehicle
ENI	European Union Institute
EPAMD	Electric Personal Assistance Mobility Devices
EV	Electric Vehicle
F&I	Furnishing and Installing
FAC	Florida Administrative Code
FDOT	Florida Department of Transportation
FHWA	Federal Highway Administration
FON	Fiber Optic Network
ft	feet
GbE	Gigabit Ethernet
GIS	Geographical Information System
GPS	Global Positioning Systems
HARB	Historic Architectural Review Board
IDE	Integrated Data Exchange
IEC	International Electrotechnical Commission
IEEE	Institute of Electronical and Electronics Engineers
INCOSE	International Council on Systems Engineering
IoT	Internet of Things
ISO	International Organization for Standardization
ISP	Internet Service Provider
ITS	Intelligent Transportation Systems
kWH	Kilowatt Hours
LAP	Local Agency Program
LED	Light Emitting Diode

Abbreviation	Explanation
LOS	Level of Service
LRTP	Long Range Transportation Plan
LTE	Long-term Evolution
MAP	Mesh Access Point
MPP	Mesh Access Portal
NHTSA	National Highway Traffic Safety Association
NOAA	National Oceanic and Atmospheric Administration
O&M	Operations and Maintenance
PD&E	Project Development and Environment
PERT	Project Evaluation Review Technique
RITSA	Regional ITS Architecture
RRFB	Rectangular Rapid Flashing Beacons
RSU	Roadside Unit
RTMC	Regional Transportation Management Center
RWIS	Road Weather Information Systems
SEMP	Systems Engineering Management Plan
SET-IT	the Systems Engineering Tool for Intelligent Transportation
SMART	SMART St. Augustine is a branded moniker without meeting
STA	Station
TAPS-LA	Technology Application Partnerships with Local Agencies for Deploying Connected and Automated Vehicle Technologies
TIP	Transportation Improvement Program
TNC	Transportation Network Company
TOD	Transit-Oriented Developments
TPO	Transportation Planning Organization
TSM&O	Transportation Systems Management and Operations
UPWP	Unified Planning Work Program
V2V	Vehicle to Vehicle
VMT	Vehicle-miles Traveled
WAVE	Wireless Active Vehicle

1 Overview

1.1 Project Overview

SMART St. Augustine project is a "signature" project of the Smart Region Master Plan adopted in 2017 by the North Florida Transportation Planning Organization (North Florida TPO) and partner agencies. St. Augustine has a vision to make the nation's first city one of the first fully integrated smart cities.

The SMART St. Augustine program will address the needs of its 15,000 residents and six million annual visitors. The projects will also preserve the historic and architectural resources of St. Augustine for future generations.

This document addresses the approach to fulfill the St. Augustine's vision of a smart community to address the City's needs, issues, problems, and objectives associated with mobility, safety, economic, environmental, and resiliency. This deployment continues to be refined as needs, projects, or systems are refined.

An initial phase of this project is funded for construction in fiscal year 21/22 of the Florida Department of Transportation (FDOT) Work Program for $968,000 as part of the Technology Application Partnerships with Local Agencies for Deploying Connected and Automated Vehicle Technologies (TAPS-LA).

Project Name:	SMART St. Augustine Connected Vehicle System
Financial Project Identification:	448653-1
Federal Aid Project Number:	N/A
Funding Source:	District Intelligent Transportation Systems (ITS)
Phase:	Construction: $968,000[1]

As part of this effort, concept plans for this project were prepared and are included in Appendix A.

1.2 Purpose and Intended Audience

SMART St. Augustine will use innovative and emerging technologies to collect, analyze, and disseminate data to enhance the City's mobility, safety, economy, environment concerns, and infrastructure within this unique community.

The intended audience for this document is the stakeholders involved in using, delivering, operating, and maintaining the project.

1.3 Document Overview

The summary of the project systems engineering management plan includes the items that are unique to the systems engineering process being performed as part of this project. It explains the process or how the systems engineering will be completed.

The concept of operations communicates the current situation, user needs, proposed system expectations, and the system developer's understanding of how the system will meet those needs. The

[1] *FDOT Office of Work Program Tentative Work Program Updated 3/3/21 21:11 PM)* https://fdotewp1.dot.state.fl.us/fmsupportapps/workprogram/WorkProgram.aspx

concept of operations will serve as the basis for the project's stakeholder organizations to direct the project. It identifies stakeholders' roles and responsibilities for each functional component of SMART St. Augustine. This includes the City, FDOT, North Florida TPO, and other key agency stakeholders. The roles and responsibilities of the technical project team members including the system designer, software designer, contractor, and integrator are also discussed to ensure the project team meets the needs and requirements of the project.

The project management plan outlines the costs, schedule, organization chart, risk matrix and other issues that will drive the successful delivery of this project.

A list of high-level user requirements for each of the systems is also provided.

In traditional project development, this is equivalent to a preliminary engineering report. It is not a scope of work.

1.4 High-Level System Overview

This project includes the deployment and integration of the following systems.

Foundational Activities

- Data exchange and analytics
- Integration of traffic management software into SunGuide®
- Marketing and communications
- Strategies to preserve the historic and architectural character of St. Augustine

Improve Safety

- Automated bicycle and pedestrian sensors
- Audible pedestrian count down signals
- Bicycle and pedestrian safety app
- Pedestrian crosswalk improvements
- Smart lighting
- Street flood and water level sensors

Enhance Mobility

- Arterial Dynamic Messaging Signs (DMS)
- Automated Traffic Signal Performance Measures (ATSPM) and real-time condition monitoring
- Bridge closure notification system
- Electric and Autonomous Vehicle (EAV) shuttles
- Integrated traveler information app
- Mobility hubs consisting of information kiosks, parking pay stations, bike racks, and Electric Vehicle (EV) charging stations
- Parking Management System using DMS
- Parking information signs
- Smart signals and the Connected Vehicle Environment (CVE)
- Virtual DMS

Provide Sustainable Solutions

- EV charging stations at mobility hubs

- Solar path pilot
- Street lighting replacement with Light Emitting Diode (LED)

Provide Ladders of Opportunity
- Public Wi-Fi for underserved communities
- Transportation Network Company (TNC) incentives and subsidies

Create Resilient Communities
- Stormwater sensors for resiliency risk assessments and data analytics

Manage Assets and Services
- Pavement management systems

1.5 Stakeholders

Table 1 identifies the major stakeholders who will be involved in this project and the high-level summary of their role in this project.

Table 1. Major Stakeholders

Stakeholder	Role
Residents	Experience the results of the project as end users.
Businesses	Experience the results of the project as end users. Provide parking data if they opt in.
Visitors	Experience the results of the project as end users.
City of St. Augustine	Owner and operator of the SMART St. Augustine deployment.
Boards and Commissions	Public engagement in policy, ordinance development and code enforcement.
City Commission	Elected officials who govern the City.
City Manager	Responsible for the administrative management and delivery of services for the City.
City Archeologist	St. Augustine is the only City in the nation that has a City Archeologist. The position is also the dedicated staff for the Historic Architecture Review Board ensure the City's ordinances are enforced and reviews proposed projects.
City Attorney	Provides legal advice and counsel for the management and administration of the City.
Communications Division	Responsible for the management and distribution of all public information and communications for the City of St. Augustine, including but not limited to press releases, public service videos, social media, website content, and coordinating media interviews.
Planning and Building	Provides certified professional services for the enforcement of the City's codes relating to the of land and the State of Florida regulation.
Public Safety	
Fire Department	Protects the City from fires and natural disasters, serves as first responders to emergencies and performs enforcement of codes and ordinances.
Police Department	Enforce laws to promote a positive and peaceful quality of life for citizens and visitors.
Public Works	

Stakeholder	Role
Engineering	Provides professional services for the planning, design and construction of the City's infrastructure and assets.
Stormwater	Oversees the management of drainage and stormwater treatment facilities within the City to meet federal and state requirements.
Mobility	Coordinates the multimodal mobility options within the City.
Parking	Manages, operates, and enforces the City's parking infrastructure and ordinances. Operates parking shuttles for remote parking lots when active (currently contract with Elite services).
Streets and Grounds	Performs the maintenance of streets and grounds on City property.
Solid Waste	Manages and operates the collection of garbage and solid waste in the City.
Water and Wastewater	Manages and operates the City's potable water, sanitary sewer treatment and wastewater collection systems.
Purchasing	Acquires goods and services for the City.
General Services	Manages the City's information and communications infrastructure.
State of Florida	Governs the state including the administration and enforcement of laws and rules.
Department of Emergency Management	Manages the state operations and all state resources during emergencies.
FDOT	Partners with the City to plan, design, construct and maintain state roads within the City. Manages and operates the statewide 511 system.
St. Johns County	Partner with the City in the delivery of public services. Operates the traffic signal systems within the City.
County Council on Aging	Manages paratransit services in the county, operates The Sunshine Bus Company which provides seven fixed-route transit services in the City, City of St. Augustine Beach, City of Hastings and a connection to Duval County at the Avenues Mall, and manages Coastal Transportation Services that provides private charter services.
Sherriff	Enforce laws to promote a positive and peaceful quality of life for citizens and visitors.
School Board	Operates the public-school system in St. Johns County.
Flagler College	Manages and operates a 19-acre college campus within the City that has 2,600 students and employs 500 persons.
Flagler Hospital	Flagler Health is a total a care enterprise aimed at advancing the physical, social and economic health of Northeast Florida communities. They serve as the lead agency for St. Johns County's Continuum of Care with an aim to end homelessness and bring care to health villages throughout the region.
Florida Highway Patrol	Enforce laws to promote a positive and peaceful quality of life for citizens and visitors.
Jacksonville Transportation Authority (JTA)	JTA operates express bus services, regular bus services, and on-demand services in Duval County, Clay Community Transportation Flex Service and paratransit for the disabled and elderly in Duval and Clay County. JTA also operates the St. Johns Express Select Service from the St. Johns Government Center and The Pavilion at Durbin Park. Six of The Sunshine Bus Company routes connect to the JTA services at the Avenues Mall.
North Florida TPO	Plans, funds, and coordinates federal transportation funding in Clay, Duval, Nassau, and St. Johns counties. Champion for Smart North Florida.

Stakeholder	Role
Smart North Florida, Inc.	Coordinates the deployment and operations of regional Smart City strategies as a 501(c)(3).
United Way	Operates the 211 services in northeast Florida which provides support for persons in need to connect to public and non-government organizations social services.
Press	Partners with public affairs staff to educate and inform the public.
Contractors/Vendors	Implements the projects as defined in specific scopes of work and project requirements.
Visit St. Augustine	Operates and manages the Visit St. Augustine web site and mobile app.

1.6 Referenced Documentation

This report relies on guidelines and prior studies to prepare a customized approach for this unique project, systems engineering standards, practices and principles. This is consistent with the 4th Edition of the International Council on Systems Engineering (INCOSE) *Systems Engineering Handbook: A Guide for System Life Cycle Processes and Activities* and the FDOT's *Florida's Statewide Systems Engineering Management Plan.*[2]

Other documents and standards relevant to the project are summarized in Table 2. This list is not all inclusive of the standards and specifications that will be needed at the time of deployment. Some standards may change, and new standards may be added.

[2] FDOT, Florida's Statewide ITS Systems Engineering Management Plan, 2005. https://www.fdot.gov/docs/default-source/traffic/its/projects_deploy/semp/pdf/050315_D1-10_V2.pdf

Table 2. Referenced Documents

Document Number	Title	Version	Date
–	SMART St. Augustine TAPS-LA Grant Application	Final	2020
–	City of St. Augustine Mobility Plan	Final	2020
–	City of St. Augustine Strategic Plan	Final	2020
–	SMART St. Augustine Advanced Transportation and Congestion Management Technologies Deployment Grant Application	Final	2019
–	Smart Parking Concept of Operations and Regional ITS Architecture Update	Final	2018
–	SMART St. Augustine Master Plan	Final	2018
–	North Florida Smart Regional Master Plan	Final	2017
–	St. Augustine For-hire Vehicle Study	Final	2017
–	St. Augustine Smart Parking Management Plan	Final	2015
–	Bridge of Lions Traffic Diversion Plan	Final	2014
–	St. Augustine Mobility Institute	Final	2012

Table 3. Relevant Policies and Standards (Latest Edition at Time of Procurement)

Policy and Procedure No.	Document Name
Rule 940	23 United States Code, Part 940 (Rule 940)
Procedure 750-040-003	FDOT Systems Engineering and ITS Architecture Procedure, 750-040-003.
Form 750-040-04	FDOT ITS Architecture Change Request Form (FDOT Form 750-040-04) for requesting changes to the Regional ITS Architecture (RITSA) or Statewide Intelligent Transportation System Architecture
Form 750-040-05	FDOT Project Risk Assessment and Regulatory Compliance Checklist (FDOT Form 750-040-05) used to (a) assess if the project is low risk or high risk and (b) address all regulatory systems engineering items in 23 Code of Federal Regulations, Part 940.11
Form 750-040-06	FDOT Systems Engineering Project Checklist (FDOT Form 750-040-06) for all federally funded high-risk ITS projects
	FDOT Standard Specifications for Road and Bridge Construction, latest edition
	FDOT Standard Plans, latest edition
	FDOT Approved Products List
FAC 74-1	Florida Administrative Code, Chapter 74-1 (FAC 74-1). Cybersecurity requirements and risks should be addressed to meet Florida Cybersecurity Standards under FAC 74-2 or applicable law.
INCOSE-TP- 2003-002-04 2015	International Council on Systems Engineering (INCOSE) Systems Engineering Handbook
INCOSE-TP- 2010-007-01	INCOSE Guide for the Application of Systems Engineering in Large Infrastructure Projects.

Policy and Procedure No.	Document Name
FIPS PUB 199	Federal Information Processing Standards Publication of the National Institute of Standards and Technology (NIST). Standards for Security Categorization of Federal Information and Information Systems.
ISO/IEC/IEEE 15288:2015 (E)	International Organization for Standardization (ISO)/International Electrotechnical Commission (IEC)/Institute of Electrical and Electronics Engineers (IEEE). ISO/IEC/IEEE 15288:2015 Systems and Software Engineering – System Life Cycle Processes
ISO/IEC/IEEE 15288, IEEE 15288.1, and IEEE 15288.2	Best Practices for Using Systems Engineering Standards (ISO/IEC/IEEE 15288, IEEE 15288.1, and IEEE 15288.2)
IEEE 1609	Series Wireless Access Vehicle Environment (WAVE)
IEEE 1901	Series Power Line Communications
IEEE 802.11x	Local Area Networks and Mesh Area Networks (Wi-Fi Communications)
IEEE 1512	Emergency Management System
IEEE P2413	Internet of Things (IoT) Architecture
IEEE 1588	Precision Time Stamp
IEEE 1451	Series Sensor Networks
IEEE P1451-99	Harmonization of IoT Devices and Systems
IEEE P802E	ePrivacy
IEEE 1363	Series Encryption
IEEE 1402	Physical Security
IEEE 1686	Intelligent Electronic Devices
IEEE P7002	Data Privacy Process
IEEE P7004	Child and Student Data Governance
IEEE P7006	Personal Data Artificial Intelligence Agent
ISO/TC 204	Intelligent Transportation Systems https://www.iso.org/committee/54706/x/catalogue/
Public Law 116-207	IoT Cybersecurity Improvement Act of 2020, Public Law 116-207
NHTSA	National Highway Traffic Safety Association's (NHTSA) Cybersecurity Best Practices for the Safety of Modern Vehicles
NTCIP	National Transportation Communications for ITS Protocol. There are numerous standards associated with ITS deployments that will apply https://www.ntcip.org/document-numbers-and-status/
SAE 21434	Road Vehicle Cybersecurity and Engineering
SAE J2735	DSRC Message Set standard
SAE J2945	Onboard Minimum Performance Requirements for Vehicle to Vehicle (V2V) Safety
	U.S. DOT Volpe National Transportation Systems Center. Low- Speed Automated Shuttles: State of the Practice.

2 Project Systems Engineering Management Plan

2.1 Purpose and Need for Systems Engineering

This report describes the technical activities, systems engineering processes, responsibilities, methodologies used on the projects and the relationship of these activities to other project activities. It is used to manage the scope of work, plan for critical activities, reduce risk and complete deliverables.

The benefits of having a well-defined plan include:

- Required for federal funding
- Good project management
- Better procurement
- Better outcomes
- Measurable results
- Improved stakeholder participation
- More adaptable, resilient, and interoperable systems
- Verified functionality and fewer defects
- Replicability and continuity with subsequent projects
- Improved documentation[3]

The intent of the systems engineering process is to promote innovation and then manage risk and costs over the life-cycle of delivering a project as shown in Figure 1.

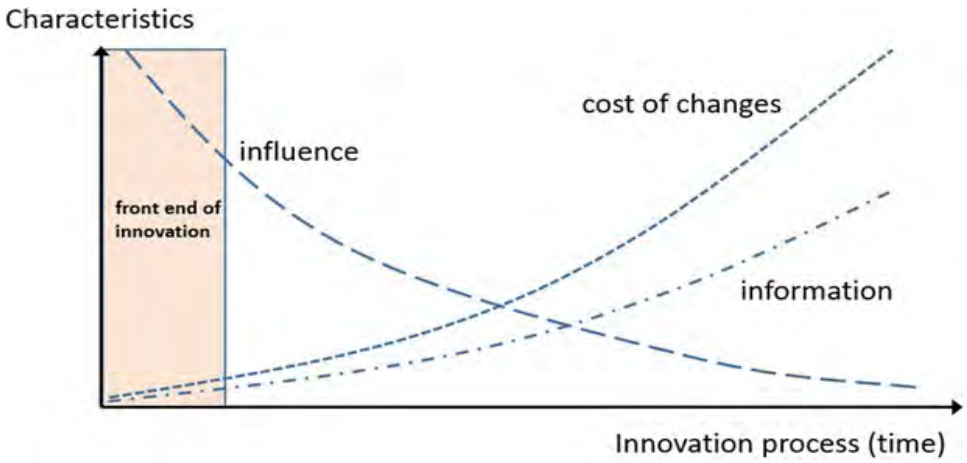

Figure 1. Benefits of Performing Systems Engineering

[3] https://ops.fhwa.dot.gov/publications/seitsguide/section2.htm#s2.1

2.2 Systems Engineering Process

The systems engineering process in this project relies on the "V-model" which is the process adopted by the Federal Highway Administration (FHWA) and FDOT. It is summarized on Figure 2.

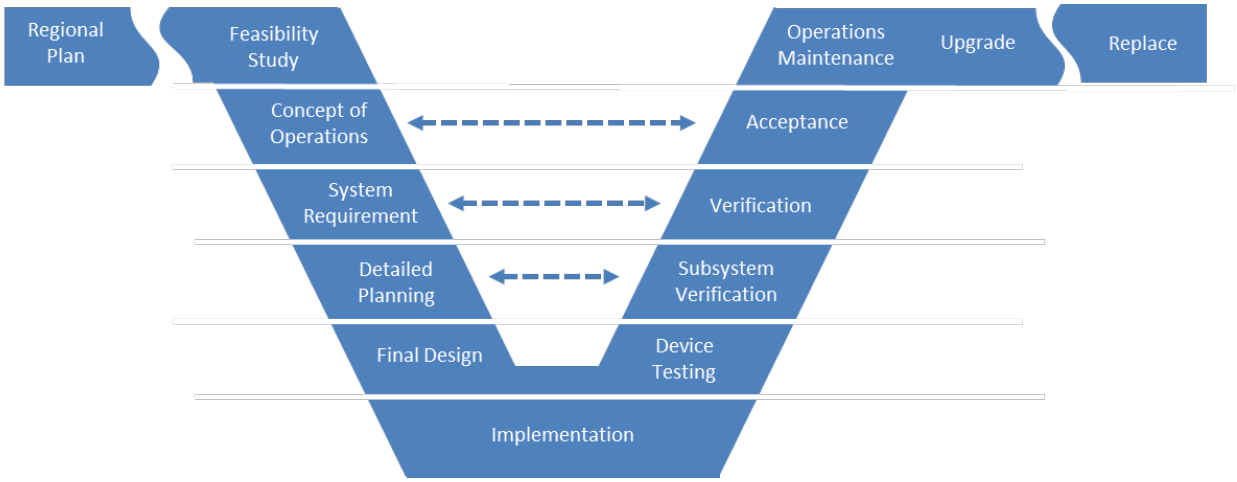

Figure 2. V-Model of Systems Engineering

The model is based on increasing level of detail design where user needs and requirements are documented and then translated to detail technical requirements and specifications. Compliance with the requirements is then checked to ensure the final deployment meets user needs.

All projects must have a well-defined process for identifying risk and a methodology for managing it. The risk management plan should cover activities for all functional disciplines. The project team should review the project risk as an integral part of normal project reviews. Because of the innovative nature of this project, program risks must be identified early in the project and their mitigation actions planned. The costs of changes to project scope, schedule and costs can be significant if not addressed early as shown in Figure 1.

FHWA oversight may occur on this project and their risk management process will be followed which requires the following to be summarized in a risk register, or matrix:

- Identification of each risk factor by project component
- Summary of risk details
- Description
- Assessment
- Affected activities
- Probability of occurrence

- Change in costs
- Change in schedule
- Mitigation strategies
- Responsible party for addressing each risk factor

The intent of including the full vision for SMART St. Augustine in the systems engineering is to ensure the systems deployed in a phased approach will be, to the extent feasible, compatible with future phases of the project.

FDOT's Florida Statewide Systems Engineering Management Plan (SEMP) structure and approach and is supplemented with other standards and guidance as outlined in Section 1 where needed.

The items unique to this project are summarized in the following sections.

2.2.1 Developing the Project Digital Architecture

Version 9 of the National ITS Architecture will be used for this project.

FDOT Form 750-040-06 Systems Engineering Project Checklist is included in Appendix A which identifies the items that will need to be completed prior to letting for this project.

Updates to the RITSA are needed to address the final scope of the TAPs-LA project and the ultimate vision for SMART St. Augustine. The FDOT ITS Architecture Change Request Form 750-040-04 is provided in Appendix B.

A project specific ITS architecture was prepared in the Systems Engineering Tool for Intelligent Transportation (SET-IT) Version 9.0 (May 2021). The architecture documentation including the change justification for each user service is provided in Appendix C.

2.2.2 Deliverables

Table 4 summarizes the documentation requirements for this project, who will prepare and the phases to be addressed. Updates for these documents may be required following each phase. As the program evolves and the team acts on the described activities and process, some elements may require refinement to ensure a quality and sustainable system is deployed. The systems engineering documentation will be updated as needed to accommodate these changes and refinements to ensure that the project team understands and continues to follow systems engineering processes that will result in successful project outcomes. This document will be reviewed to reflect the decisions made during major milestones in the concept of operations, system requirements, procurement, design, testing and deployment.

Table 4. Systems Engineering Documentation Requirements

Document	Required	In This Report	Responsible Party
Project Systems Engineering Management Plan	✓	✓	
Concept of Operations	✓	✓	
ITS Architecture Update	✓	✓	
Project Evaluation and Data Management Plan	✓	✓	
Data Management Plan	✓	✓	
Project and Risk Management Plan	✓	✓	
High-level System Validation Requirements	✓	✓	
Design Scope of Work	✓		Lead Agency
Requirements Traceability Verification Test Matrix	✓		Designer
Project Performance Management Plan	✓		Designer
Quality Management Plan	✓		Designer
Reliability and Maintainability Program Plan	✓		Designer
Security Engineering Plan	✓		Designer
Software Development Plan	✓		Designer
Subcontract Management Plan			Designer
System and Subsystem Requirements	✓		Designer
System Test Plan	✓		Designer
System Validation	✓		CEI*
System Verification	✓		CEI
Test Procedures	✓		CEI
Test Report	✓		CEI
Hardware Development Plan	N/A		
Human Factors Engineering Project Plan	N/A		
Integrated Logistics Support Plan	N/A		
Operational Development Plan	N/A		

*Construction Engineering and Inspection (CEI)

3 Project Needs

3.1 Background, Objectives and Scope

St. Augustine was founded in 1565 and is the nation's oldest continuously occupied settlement of European and African origin in the continental United States. St. Augustine is home to 15,000 people. More than six million people visit St. Augustine each year. Figure 3 shows the City limits.

Archaeological resources provide evidence of prehistoric and Native American heritage dating back more than 4,000 years. Many properties are listed in the National Register of Historic Places and several are National Historic Landmarks. The highest concentration is near the original St. Augustine Town Plan, now known as the Spanish Quarter. The plan was laid out in the late 16th century for foot traffic, walking, horses, and horse-drawn carriages. Thousands of buildings are more than 50-years old which heightens the City's unique sense of place. The Spanish Town Plan is shown on Figure 4.

Growing volumes of vehicles, pedestrians, trucks, and for-hire vehicles are overwhelming the limited parking and street infrastructure downtown. This congestion is a risk to the historic areas and endangers the City's cultural charm. Addressing overcrowding, congestion and mobility are the City's highest priorities to maintain and protect resources and livability. Strategies that can improve the lives of residents, business owners and visitors are needed. The projects will also be applied to tie the community together, providing new opportunities for the disadvantaged areas in west St. Augustine.

The City's vision was articulated in the September 2020 Vision Plan:

> *St. Augustine will be a diverse, livable, authentic waterfront city that builds upon its rich history and environment to create a distinctive community character founded on a healthy and vibrant economy, a diverse mix of people and experiences and a valuing of its natural assets.*

The vision for this project is:

> *Make the nation's first city, one of the nation's first fully integrated smart cities.*
>
> *This vision will be accomplished by deploying innovative technologies to enhance mobility, improve safety, reduce environmental impacts, reduce the costs to operate and maintain infrastructure and provide ladders of opportunity for areas with limited access to social services and jobs.*

The following sections summarize the needs to be addressed as part of this project.

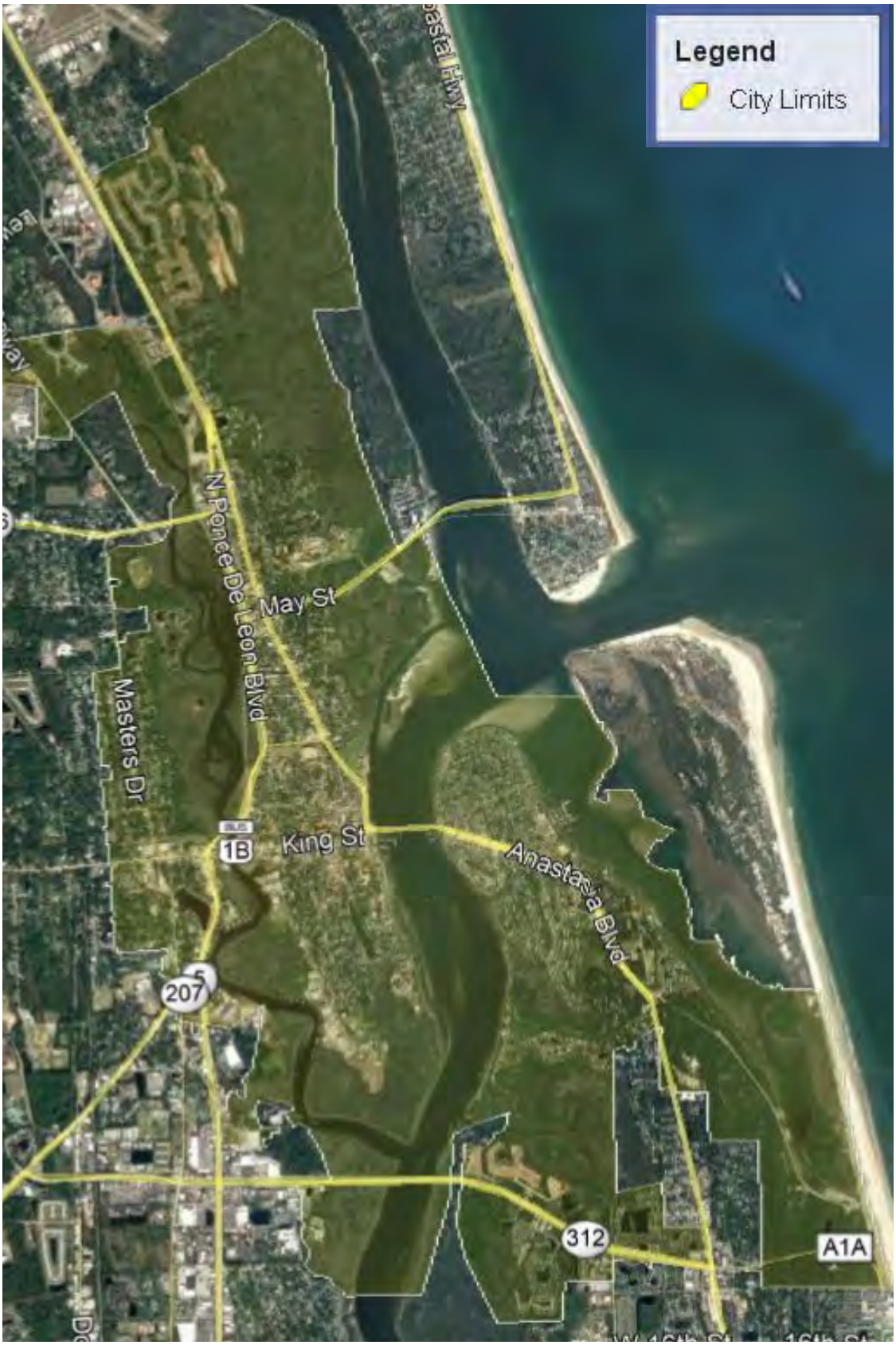

Figure 3. City of St. Augustine

Figure 4. Spanish City Plan

3.2 Improve Safety

There were 9,552 crashes and 20 fatalities within the City during the last three years (2017-2019)[4] . The economic cost of these crashes averages $148 million per year in lost incomes, medical costs, and other expenses. A summary of the crashes by severity during this period is provided in Table 5. The economic costs are summarized in Table 6.

Table 5. Summary of Crashes

Severity	Economic Cost of Crashes[5]	Total Crashes	Bicyclists or Pedestrians	Average Bicyclist or Pedestrian per Year	Vehicle Only	Average per Year
Fatal	$10,900,00	20	4	1.33	16	5
Serious Injury	$521,300	113	81	27	32	11
Moderate Injury	$142,000	508			508	169
Minor Injury	$72,000	1,088			1,088	363
Property Damage	$3,700	7,823	44	14.67	7,779	2,593
Total		**9,552**	**129**	**43**		**3,141**

Table 6. Summary of Economic Costs

Severity	Economic Cost of Crashes	Vehicle-only Crashes	Bicyclists or Pedestrians	Total
Fatal	$10,900,000.00	$54,500,000	$14,533,333	$69,033,333
Serious Injury	$521,300.00	$5,734,300	$13,832,100	$19,566,400
Moderate Injury	$142,000.00	$23,998,000		$23,998,000
Minor Injury	$72,000.00	$26,136,000		$26,136,000
Property Damage	$3,700.00	$9,594,100	$54,267	$9,648,367
Total		**$119,962,400**	**$28,419,700**	**$148,382,100**

Figure 5, Figure 6, Figure 7, and Figure 8 show the location of the crashes involving bicyclists and pedestrians, also called vulnerable road users for 2017, 2018, 2019 and 2020, respectively. A map of the vulnerable road users crash locations in 2020 was provided, although 2020 data is not included in Table 5 or Table 6 due to the influence of COVID-19.

[4] *Based on data collected by Signal4Analytics. 2020 data was excluded because of the influence of COVID-19.*

[5] *U.S. Department of Transportation. Benefit-Cost Analysis Guidance for Discretionary Grant Programs, February 2021. https://www.transportation.gov/sites/dot.gov/files/2021-02/Benefit%20Cost%20Analysis%20Guidance%202021.pdf,*

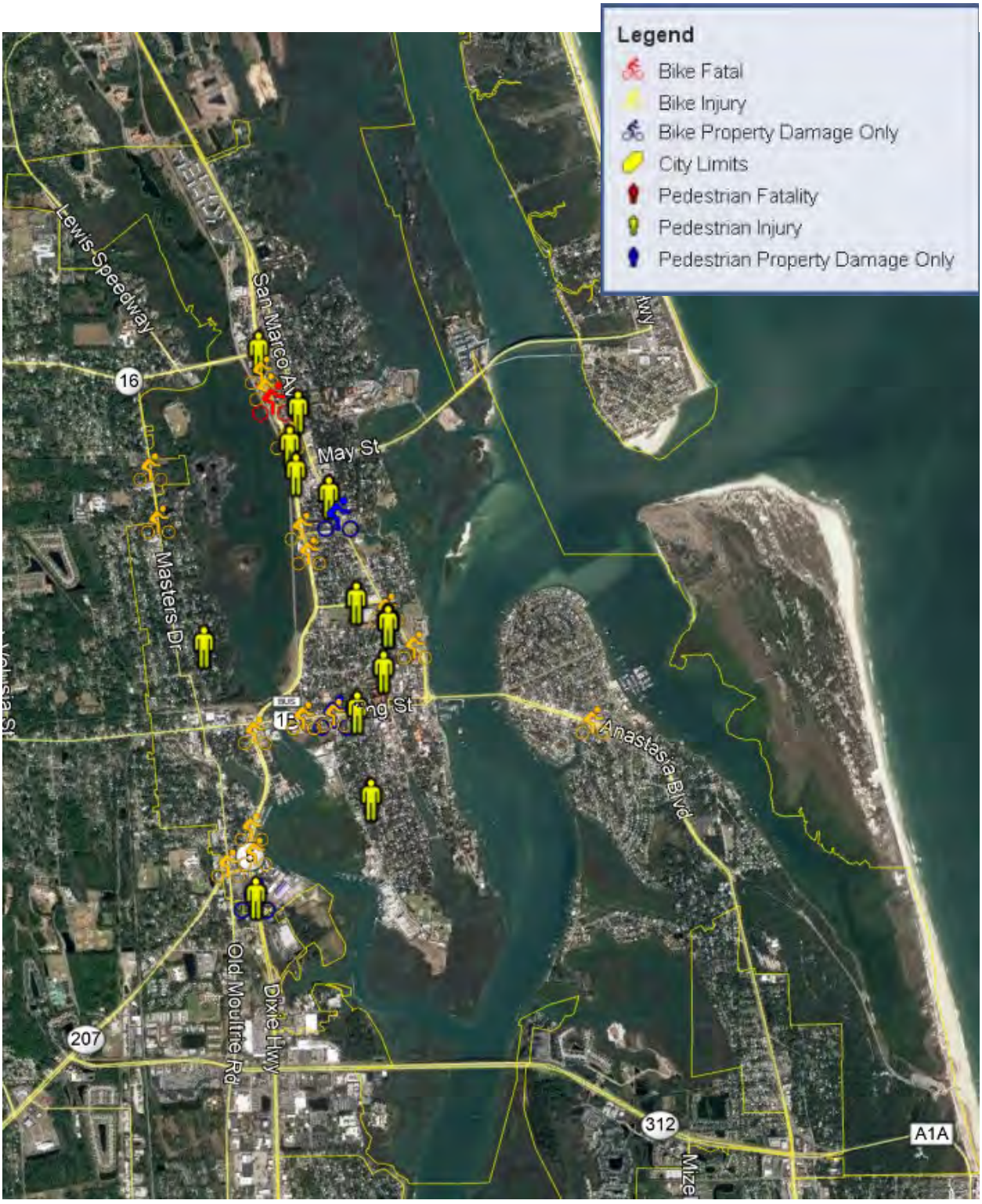

Figure 5. Vulnerable Road User Crash History (2017)

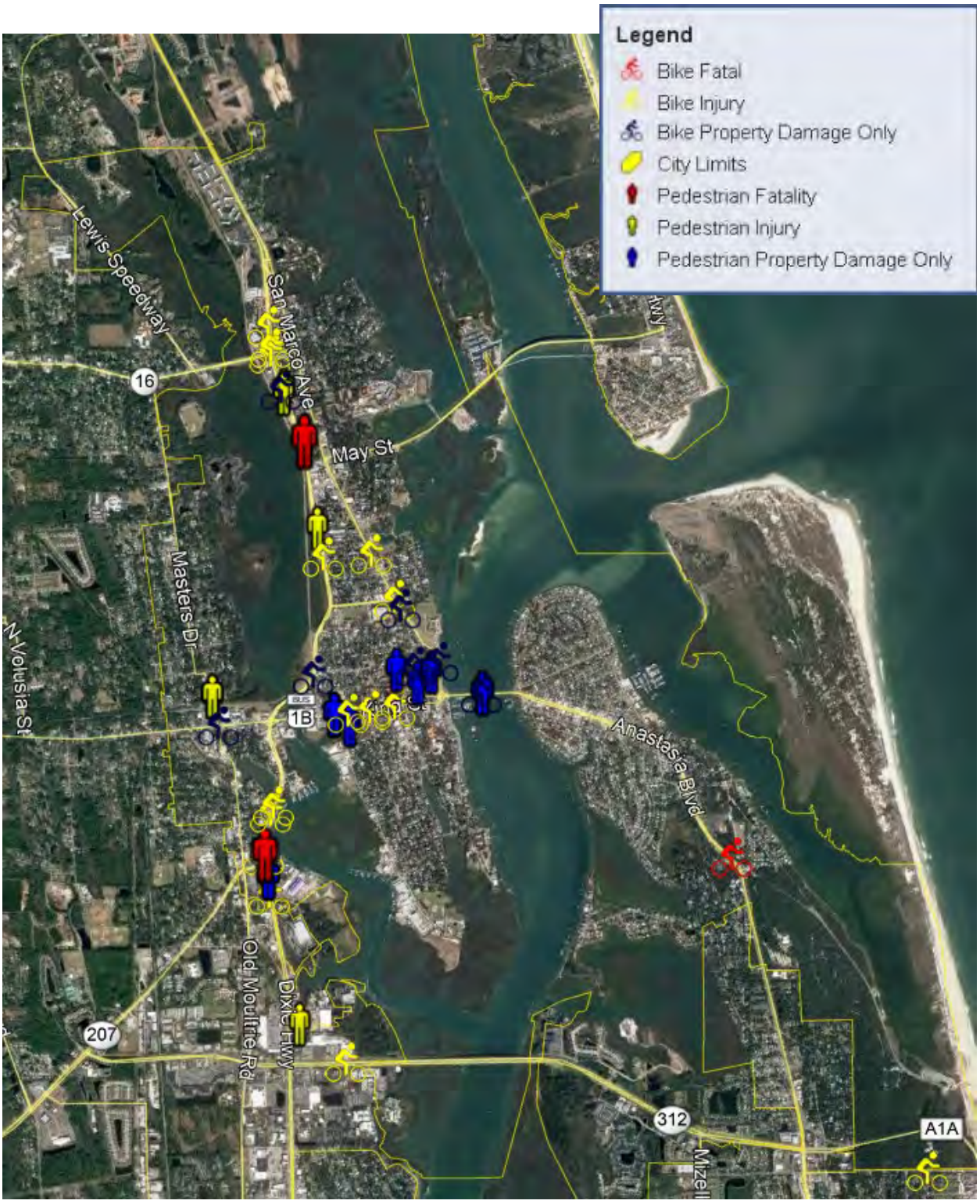

Figure 6. Vulnerable Road User Crash History (2018)

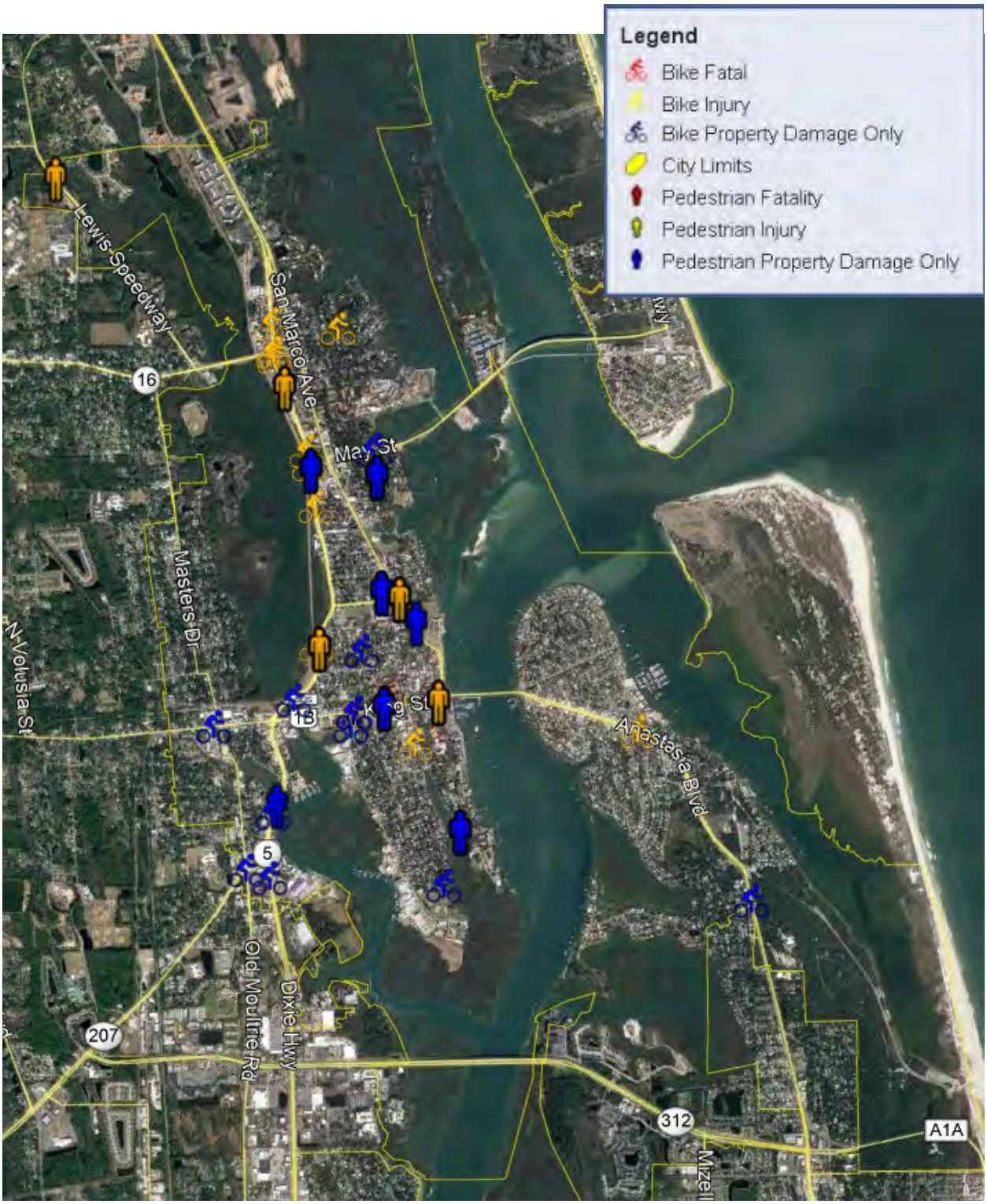

Figure 7. Vulnerable Road User Crash History (2019)

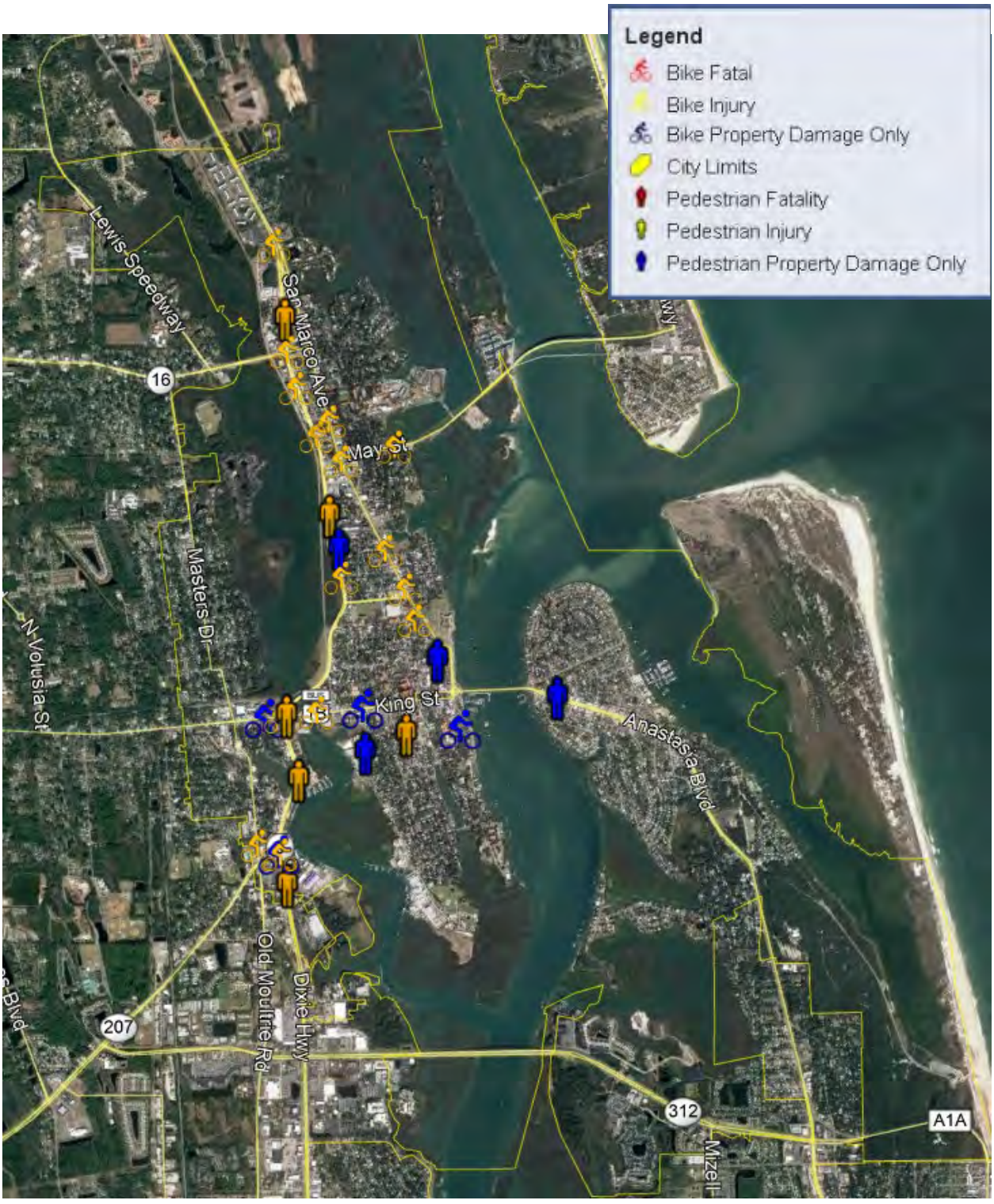

Figure 8. Vulnerable Road User Crash History (2020)

3.3 Enhance Mobility and Parking

The annual economic cost of congestion for recurring delay in the City is $88 million per year.[6]

Six million visitors arrive by vehicle and park each year. Parking is an essential need. Parking demand exceeds the capacity and when vehicles cannot find on-street parking they circulate the City increasing congestion by 30%.[7] When trucks circulate to find parking they reduce the useful life of roadways and cause damage to curbs and other infrastructure. Reducing the circulating traffic will also improve pedestrian safety by reducing the number of vehicle-pedestrian conflicts. Recurring congestion is severe with the 200th highest hourly volume being primarily Level of Service (LOS) E and F as shown on Figure 9.

Parking demand downtown and at the St. Augustine Amphitheatre (Amphitheatre) exceeds the capacity during special events and requires remote parking using shuttles which strain limited City resources. Special events such as the Nights of Lights can attract as many as 40,000 visitors per day.

The Bridge of Lions is a double-leaf bascule bridge on SR A1A that was built in the mid-1920s as a way for automobiles to connect St. Augustine to Anastasia Island. It is on the National Register of Historic Places. It was rebuilt in 2000 in a similar configuration, but to current engineering standards. The bridge opens for boat traffic and creates delays.[8] The bridge is typically closed for vehicular traffic for 8-10minutes and creates significant queues and delays, while the queues dissipate on roads until traffic returns to normal conditions.

The average and maximum queues observed when the bridge is closed to vehicle traffic is summarized in Table 7 and shown on Figure 10. The average delay is estimated to be 567 vehicle-hours per day or a cost of $3.5 million per year.

Table 7. Bridge of Lions Queues

Road	Lanes	Average Queue (ft)	Maximum Queue (ft)
US 1B King Street	2	900	6,000
SR A1A Avenida Menendez	2	2,100	6,000
Avenida Menendez South	1	350	500
Bridge to gate		800	800
Total		4,150	13,300

Strategies, tactics, and technologies are needed to meet the City's mobility needs, reduce congestion and better manage parking.

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[6] *North Florida TPO, St. Augustine For-hire Vehicle Study, 2017. Values escalated to 2020 dollars using 2.7% per year.*

[7] *North Florida TPO, St. Augustine Truck Study, 2017* http://northfloridatpo.com/images/uploads/docs/St_Augustine_Truck_Study_Final_Report.pdf

[8] *City of St. Augustine* https://www.citystaug.com/393/Bridge-of-Lions#:~:text=Hours%20of%20Operation,and%205%20p.m%2C%20if%20requested. *The bridge opens Monday through Friday, 7 a.m. to 6 p.m., on the hour and half-hour; with no openings at 8 a.m., 12 noon and 5 p.m. On Saturday, Sunday and Federal holidays, the bridge opens 7 a.m. to 6 p.m., on the hour and half-hour, including 8 a.m., 12 noon, and 5 p.m., if requested. The Bridge of Lions will open upon request, Monday through Sunday, 6 p.m. to 7 a.m., without exception to the hour and half hour.*

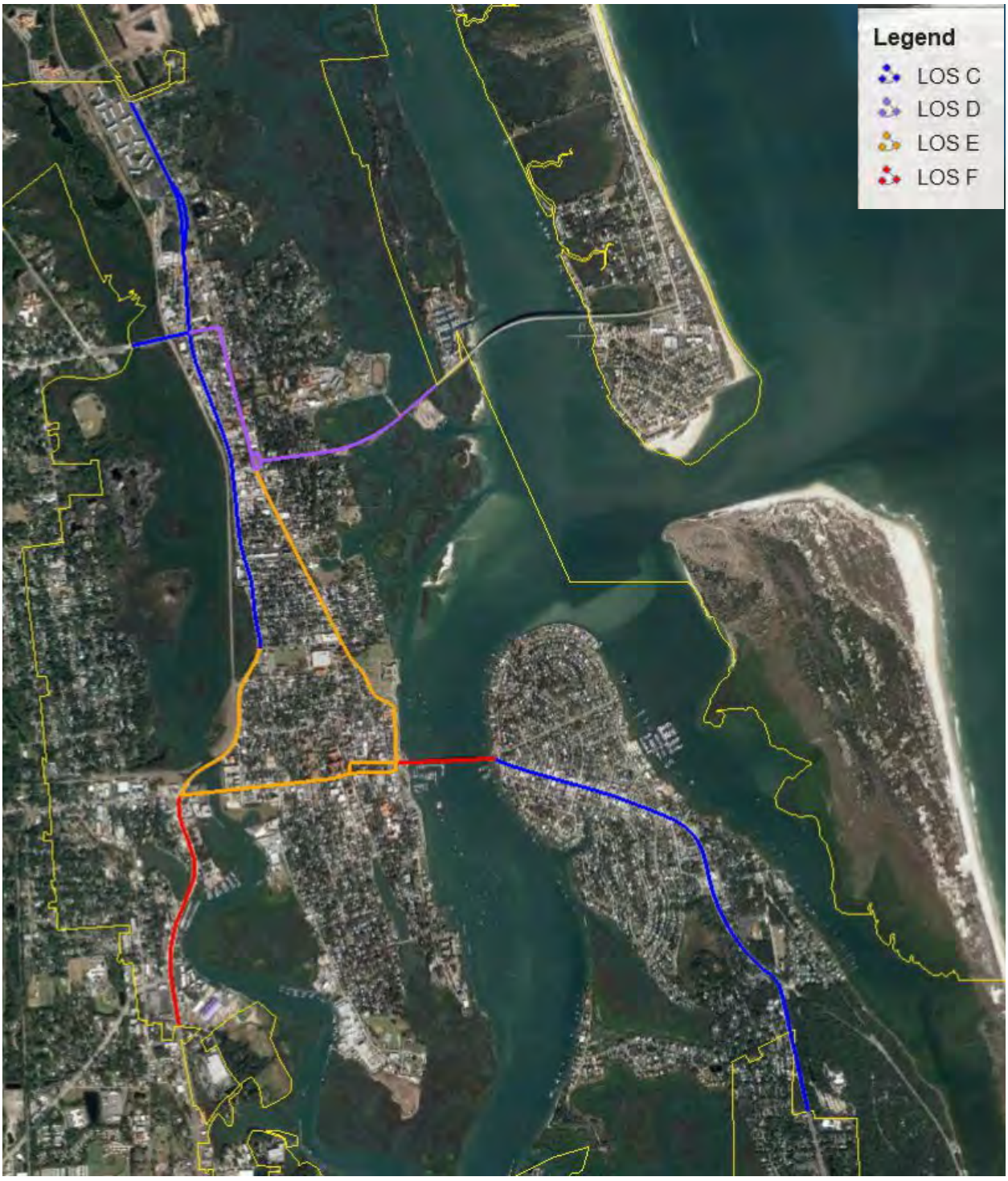

Figure 9. Existing LOS Map

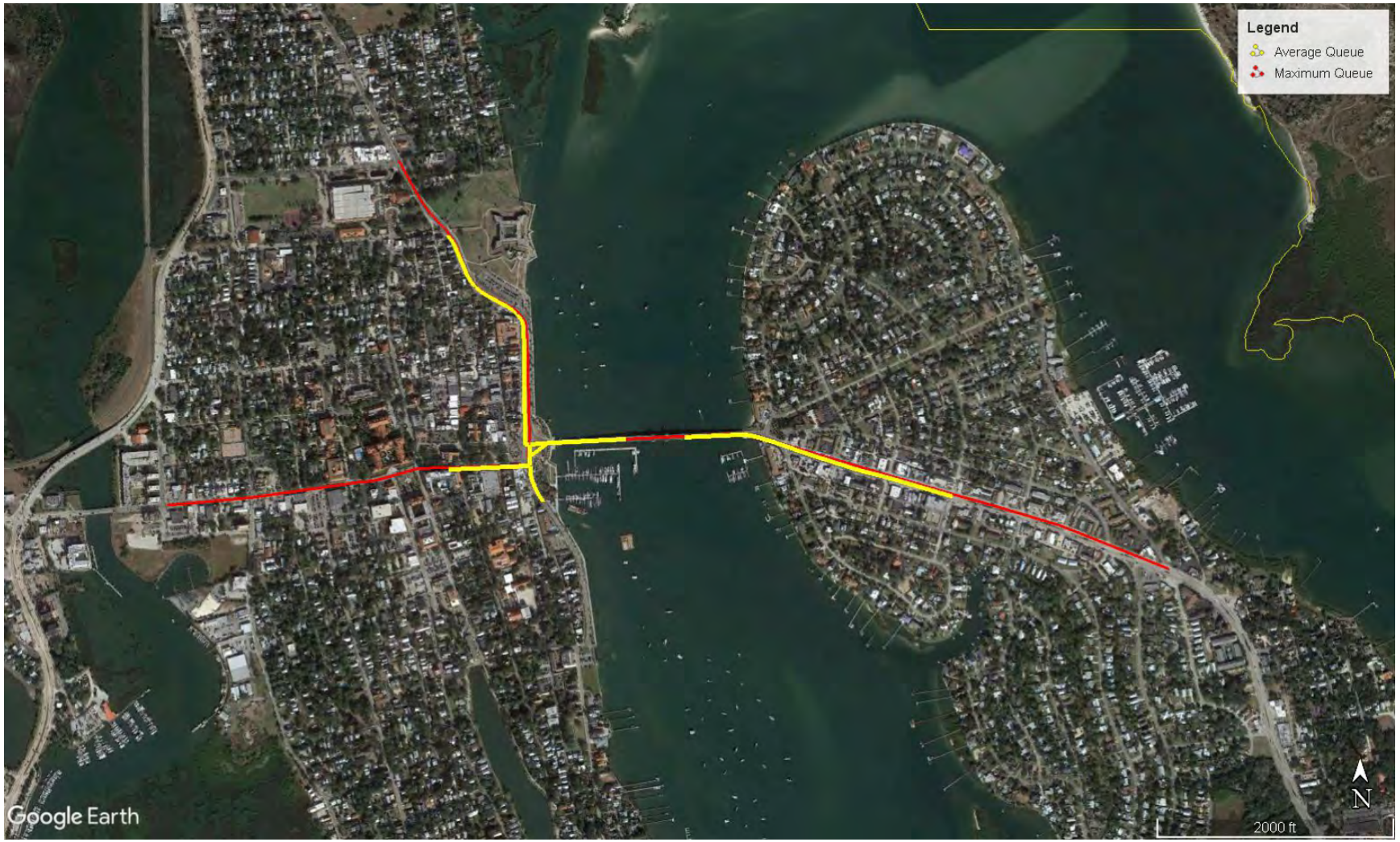

Figure 10. Extent of Queues During Bridge of Lions Closures

3.4 Provide Sustainable Solutions

Fossil fuel combustion from transportation made up approximately 35% of carbon emissions in the United States in 2015.[9]

Strategies and tactics are needed to reduce congestion and greenhouse gas emissions.

3.5 Provide Ladders of Opportunity

Several underserved communities were identified in the City by the North Florida TPO.[10]

- About 21% of the population live in poverty and 11% of residents' income is below 50% of the poverty level.
- Nearly 50% of the residents living in poverty worked at least part time and 4% worked full time.
- Nearly one-in-four, 22%, of children live in poverty.
- Only 75% of households in the City had internet subscriptions in 2018.[11] Reliable internet access is considered an essential need for economic mobility and education attainment.
- About 8% of the City's population did not graduate high school.
- About 6% of the residents are disabled. The world-renowned Florida School for the Deaf and Blind has 600 resident students and another 400 commuter students. This unique, vulnerable road user community has needs for infrastructure design and accessibility to ensure members of this community can safely navigate the City.
- The crime rate in the City is 167% of the state and national average for crimes per 100,000 in population. This rate is biased based on the resident population and does not consider the number of visitors.[12]

West St. Augustine was identified as the most vulnerable community in St. Augustine. This area is classified as an area of persistent poverty, food insecure, and medically underserved.

- West St. Augustine and the area north of CR 312 are classified as food deserts.[13] The consequences of food insecurity are profound. Children who don't have access to enough healthy food have learning difficulties, behavioral issues, depression, anxiety, and higher rates of obesity. Adults who don't have access to enough healthy foods have more mental health issues, obesity, and chronic diseases such as diabetes and heart disease.[14] This area is shown in Figure 11.

[9] *Environmental Protection Agency, DRAFT Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2019, Table ES-2: Recent Trends in U.S. Greenhouse Gas Emissions and Sinks* https://www.epa.gov/sites/production/files/2021-02/documents/us-ghg-inventory-2021-main-text.pdf

[10] *North Florida TPO, Ladders of Opportunity: Improving lives through mobility,* 2020.

[11] *US Census, Quick Facts v2019.* https://www.census.gov/quickfacts/staugustinecityflorida

[12] *Macrotrends, St. Augustine FL Crime Rate 1999-2018,* https://www.macrotrends.net/cities/us/fl/st-augustine/crime-rate-statistics#:~:text=threat%20of%20force.-,The%20St.,a%209.97%25%20decline%20from%202016

[13] *U.S. Department of Agriculture* https://www.ers.usda.gov/data-products/food-access-research-atlas/go-to-the-atlas/

[14] *University of North Florida Center for Nutrition and Food Security, Brooks College of Health* https://www.unf.edu/brooks/Center_for_Nutrition_and_Food_Security/

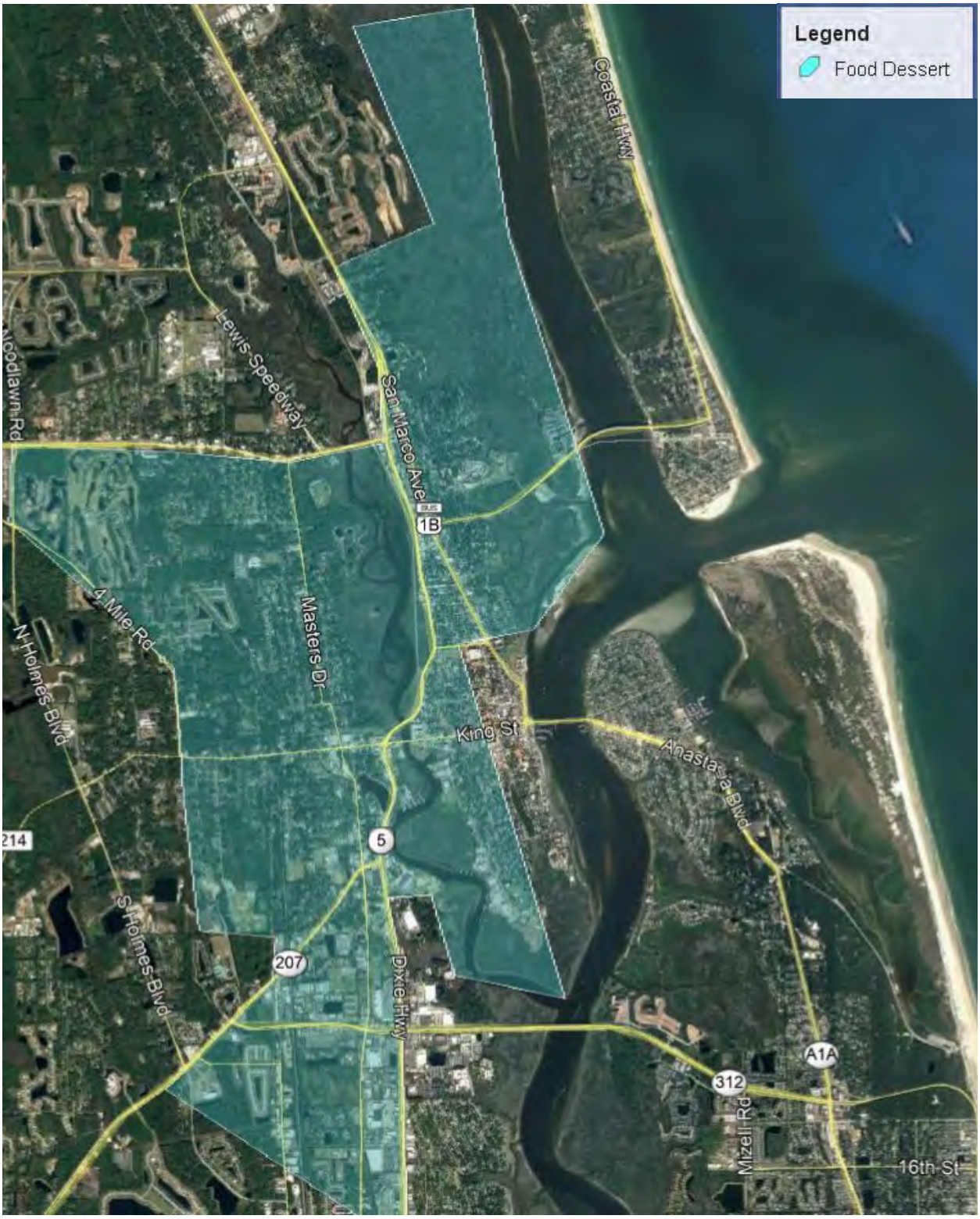

Figure 11. Food Desert

- West St. Augustine was identified as a medically underserved population by the U.S. Health Resources and Service Administration. [15] This area has shortages of primary medical care, dental or mental health providers with low income, high Medicaid eligible populations, and mortality rates are higher than statewide averages. The medically underserved area is shown on Figure 12.
- West St. Augustine is disproportionately minority compared to other areas of the City.
- This area coincides with the Crookshank Elementary School zone. Crookshank Elementary School[16]
    - Serves 848 students in Pre-kindergarten to fifth grade.
    - Placed in the bottom 50% of all schools in Florida for overall test scores (math proficiency is top 50%, and reading proficiency is bottom 50%) for the 2017-18 school year.

A priority area of underserved communities within this neighborhood is shown on Figure 13. About 26% of persons in census block group 12109.20300.2 and nearly 33% of the residents in census block group 1209.21002.2 live in poverty.

About 27% of the residents of West St. Augustine work in the Historic Downtown St. Augustine. In Historic Downtown:

- Accommodations and food services represent 19% of the City's jobs
- Retail represent 8.5% of the City's jobs.

The safe and reliable multimodal access to Historic Downtown is needed for residents in West St. Augustine to reach these job opportunities.

Strategies, tactics, and technologies are needed to serve these communities to ensure every resident has the opportunity and access to economic mobility, healthy food, a safe environment, and quality education opportunities.

[15] *U.S. Department of Health Resources and Services Administration, https://data.hrsa.gov/tools/shortage-area/mua-find*

[16] *Public School Review: Crookshank Elementary School Profile 2017-2019 Academic Year https://www.publicschoolreview.com/crookshank-elementary-school-profile#:~:text=Crookshank*

Figure 12. Medically Underserved

Figure 13. Underserved Communities

3.6 Grow North Florida

Visitors to St. Augustine and St. Johns County spent almost $712 million in 2019[17] and tourism is the major economic engine for the City and County.

- Optimized, connected, and safer street network can be attractive to businesses and residents looking to move to North Florida.
- Optimized freight networks can improve operations of existing freight business and attract new business.
- Enhanced data from innovative technologies can create a hotbed for startup technology companies who will use the data for new research and applications.

Implementing strategies and tactics to support and manage the six million visitors and 15,000 residents will provide the following opportunities to grow the economy.

3.7 Create Resilient Communities

The economic value of the City's historical resources is $2.9 billion.[18]

Part of the charm and beauty of St. Augustine is its proximity to meandering waterways and lengthy coastlines. These features put the City at risk to flooding from tides, storms, and sea level rise. These hazards threaten the historic assets that define St. Augustine. The City is located within an area that is prone to flooding during spring or king tides, northeastern fronts and tropical storms. Most of the City is located within the AE flood zone as designated by the Federal Emergency Management Agency. AE flood zones are areas that present a 1% annual chance of flooding and a 26% chance over the life of a 30-year mortgage, according to the Federal Emergency Management Agency.[19] Figure 14 shows the flood zones (blue) and drainage outfalls within the City.

The City needs technologies to operate and manage more safely, and to preserve the economic and historic resources.

3.8 Manage Assets and Services

An essential responsibility of the City is to be a steward of public funds and operate public infrastructure effectively. The City owns, manages, and operates streets, drainage, waste management, water distribution, water treatment and wastewater treatment assets. The total replacement value of these assets is $505 million.[20]

Strategies, tactics and technologies can be used to better preserve and manage the City's resources.

[17] *St. Johns County Tourist Development Council, http://www.co.st-johns.fl.us/tdc/index.aspx*

[18] *City of St. Augustine, Baseline Report 2015: A Report Card for the City's Roads, Water, Sewer, and Stormwater, 2015 https://www.citystaug.com/DocumentCenter/View/406/2015-Baseline-Assessment-PDF?bidId=*

[19] *Federal Emergency Management Administration. https://msc.fema.gov/portal/home*

[20] *City of St. Augustine, Baseline Report 2015: A Report Card for the City's Roads, Water, Sewer, and Stormwater, 2015 https://www.citystaug.com/DocumentCenter/View/406/2015-Baseline-Assessment-PDF?bidId=*

Figure 14. Flood Prone Areas and Drainage Outfalls

3.9 Preserve the Historic and Architectural Character of St. Augustine

St. Augustine, founded in 1565, ranks as the nation's oldest continuously occupied settlement of European and African American origin in the continental United States.

Strategies, tactics, and technologies are needed to support the preservation of the historic fabric.

3.10 Operational Constraints

The City Commission and City Manager have the authority to implement improvements necessary for the public good under the authority of Division 4, Section 2-149 of the City's ordinances as follows.[21]

> *The city commission may declare improvements necessary for the public good and direct the city manager to implement said improvements. The city manager will provide reasonable community notice and an opportunity for public comment prior to the commission approving any contractual obligation of city funds to construct a new building or its supporting infrastructure, to initiate a change in the comprehensive plan or a rezoning for a project expending city funds, to enter into a public-private partnership as allowed pursuant to Florida law, or to vacate roads. The community notice provision does not include expenditures of city funds pursuant to an approved capital improvement plan, routine connection to right-of-way or utilities, maintenance or repair or reconstruction of existing city buildings or public infrastructure. Community notice pursuant to this section shall include a notice mailed to the Neighborhood Council of St. Augustine, Inc. or its successor by regular U.S. mail or electronic mail, to any of its officers or registered agents. In addition, the city manager may provide additional courtesy notice and information to the community at large in person, by regular U.S. mail or electronic mail, posting on the city's website or as otherwise provided by the city clerk. Notice pursuant to this section is not intended to be a legal notice, nor should it be relied upon to provide affected party status or standing. If more specific notice is required for any government action pursuant to federal, state, or local law such notice shall preempt and supersede the general community notice provided herein.*

Operational constraints that may exist, either perceived or actual, will be coordinated between the agencies and memorandum of understanding may be developed to resolve them and to confirm the roles and responsibilities. This a living document and as individual systems and projects are implemented; the roles and responsibilities will be refined.

[21] *City of St. Augustine Code of Ordinances, codified through Ordinance No. 20-16, adopted March 9, 2020. (Supp. No. 53)* https://library.municode.com/fl/st._augustine/codes/code_of_ordinances?nodeId=PTIICOOR_CH2AD_ARTIVFI_DIV4PUIMSPAS_S2-146ADPOPRPUMAMOAPRE

4 Current Situation

The following sections summarize the current systems and related information needed to establish the baseline condition considered in this project.

4.1 Prior Investments in this Project

Table 8 summarizes the prior investments made by the stakeholders toward fulfilling the Smart St. Augustine Master Plan.

Table 8. Summary of Prior Investments in SMART St. Augustine

Project	Agency	Amount	Completed
SMART St. Augustine Master Plan	North Florida TPO	$35,000	2019
Smart Parking System	City	$416,000	2019
RRFB Crosswalks with Pedestrian Sensors - Valencia Street at Flagler College - Malaga Street at Flagler College Dorm. Riberia Street at Marina	City	$120,000	2020
SMART St. Augustine Systems Engineering	North Florida TPO	$125,000	2021
TOTAL		**$696,000**	

4.2 Historic and Architectural Character of St. Augustine

The Historic Architectural Review Board (HARB) advises property owners and government agencies concerning the maintenance, protection, enhancement, and preservation of historic resources. The board reviews applications for Certificates and Opinions of Appropriateness, Certificates of Demolition or Relocation, and may designate historic landmarks. HARB also reviews applications associated with the historic preservation property tax (ad valorem) exemption for the City of St. Augustine and St. Johns County.[22]

4.3 Software Systems

The following software are related to this deployment.

- FDOT SunGuide™ for the additional arterial dynamic message signs, parking information signs, connected vehicle roadside units, automated pedestrian detection at signals, and bridge closure notification.

- FDOT's ATMS.NOW for advanced traffic signal controller upgrades, signal management version control for connected vehicle roadside units, automated pedestrian detection at signals, and alternate signal timing plans during bridge closures.

- City's parking management software, ParkStAug, to provide parking availability information for use in traveler information systems as the system grows and evolves.

[22] *City of St. Augustine* https://www.citystaug.com/601/Historic-Architectural-Review-Board-HARB

- Visit St. Augustine's app and website provides information to visitors on things to do, places to stay, where to eat, special events and maps. The app is owned and operated by a private sector company called Visit St. Augustine and is supported through advertising.

- The City's CivicPlus software shares information between City services and the public for the effective management of the City. Several software products are available in the platform.[23]

- The Utilities Department is engaged in the development of the following software for asset management and business intelligence
    - Using Cityworks® to manage water, wastewater and solid waste assets
    - Creating a Geographical Information System (GIS) portal for internal use
    - Developing a public portal for reporting service issues and the status of the responses
    - Implementing Supervisory Control and Data Acquisition (SCADA) system for management and operations
    - Testing Microsoft BI® software and ESRI ArcGIS Utility Network® applications for performance management

- Smart North Florida's Integrated Data Exchange (IDE) is a repository for the storage information to be shared across the region.

- North Florida TPO's Congestion Management Process collects real-time information on congestion and mobility and provides a publicly available dashboard on the North Florida TPO's website.

Figure 15 provides a visual summary of the existing software systems.

[23] *Civil Plus* https://www.civicplus.com/

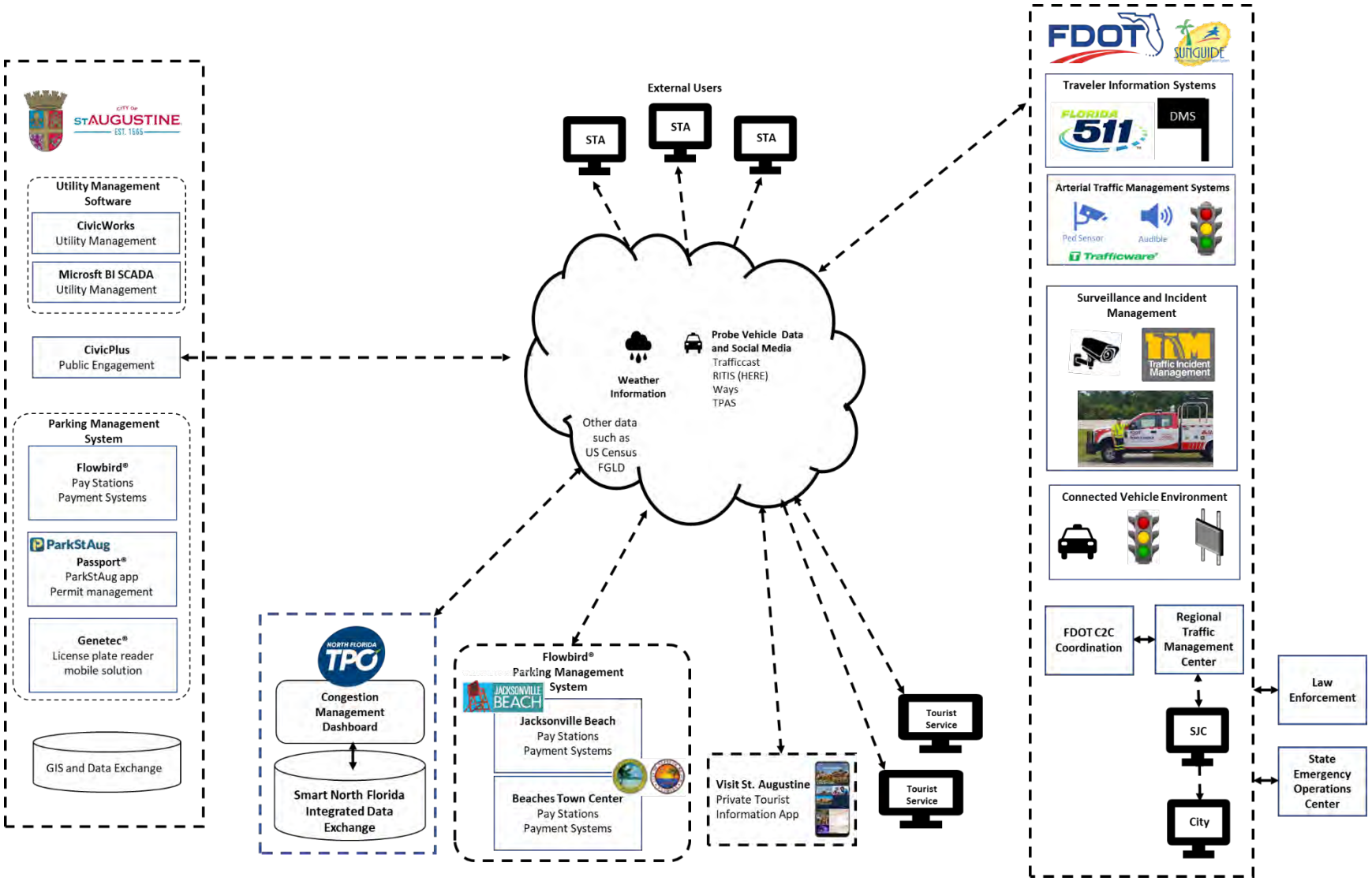

Figure 15. Existing Software Context Diagram

4.4 Communications

4.4.1 FDOT Fiber Optic Network

The FDOT maintains a fiber optic network for traffic signals and traveler information systems. The fiber optic network in the City is connected to the FDOT backbone through a conduit that runs along SR 16 to I-95. The typical fiber install is 12 strands of single mode fiber. As fiber and traffic signal upgrades are made, 48 strands of single mode fiber are being installed as a minimum.

The existing fiber network within the City is shown on Figure 16 and within downtown on Figure 17.

4.4.2 Wi-Fi

No public broadband service is currently available. The following private companies provide Wi-Fi service in the City

- Xfinity™
- ATT™
- Earthlink™
- Easy Internet Now™
- Synergy™
- Viastat™
- HughesNet™

4.5 Parking

4.5.1 Parking Capacity

The city maintains on-street parking, parking lots and two parking garages. The locations are shown on Figure 18. There are 452 on-street public parking spaces. There are 29 public parking truck loading zones. The Historic Downtown Parking Garage accommodates about 1,200 public parking spaces. Another 101 private parking spaces were identified from aerial photography inventories.

Requests for proposals are planned in 2021 to construct two new 500 space parking garages. One is located north of West King Street, west of US 1 Ponce de Leon Boulevard. The second will be located east of the Bridge of Lions on SR A1A Anastasia Boulevard at Comares Avenue. Figure 18 shows the locations of the existing parking and proposed public parking, parking meters and pay stations.

The combination of the on-street parking and garage cost about $1.5 million per year in operations. About $6 million of revenue are collected each year. Receipts from enforcement are placed in general revenue and not accounted for as part of the parking system.

4.5.2 Parking Systems

The City implemented a smart parking management system in 2019 for $416,000 that uses a combination of vendors:

- Passport® provides the mobile payment applications, permits and enforcement.
- Flowbird® provides the pay stations.
- Genetec AutoVu® provides the pay-by-plate enforcement.
- Smarking® provides operational view dashboards and performance metrics.

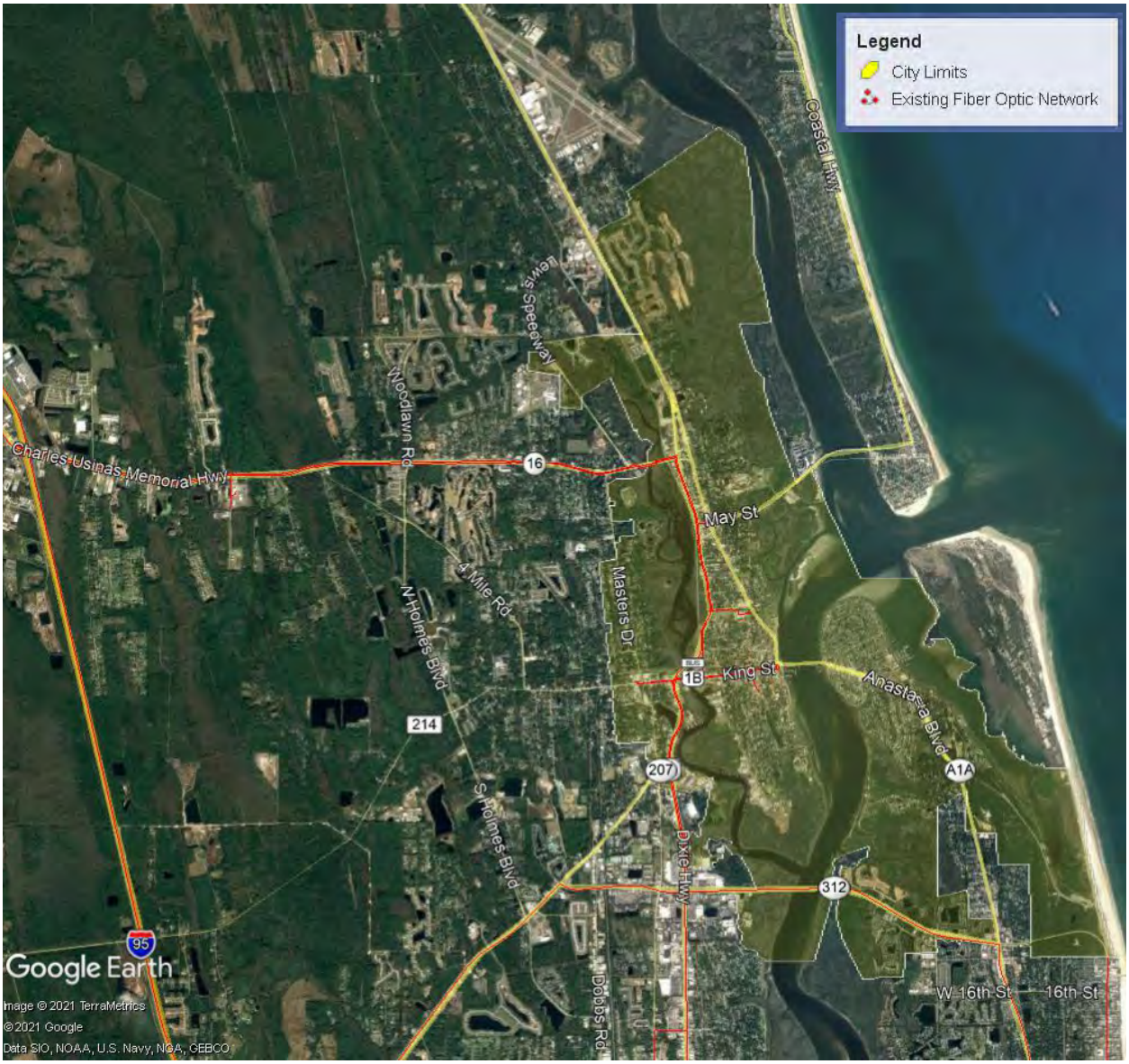

Figure 16. Existing Fiber Optic Network

Figure 17. Existing Fiber Optic Network Downtown

Figure 18. Existing and Planned Parking Lots, Garages, Meters and Pay Stations

Flowbird® provides payment systems online and in an app that support two other parking management systems in north Florida.

- The City of Atlantic Beach and the City of Neptune Beach recently contracted with Flowbird® to implement pay stations and a payment app for their 299 metered spaces.
- The City of Jacksonville Beach has 1,000 parking spaces available in their downtown area and Flowbird® provides the mobile payment system and pay stations.
- The University of North employs Flowbird® for their parking payment system.

The City of Jacksonville has 1,600 metered parking spaces and more than 43,000 public parking spaces in downtown Jacksonville. These include metered spaces, parking garages, and surface parking lots. Parking meters accept cash and credit cards.

The City of Fernandina Beach is also a tourist destination in the region. They maintain 456 parking spaces and there are no pay stations or mobile payment systems.

A single, regionally integrated parking payment system is needed to improve efficiency and provide a better user experience. The lack of this system results in congestion impacts for seeking available parking, the cost of enforcement, and loss of revenue.

4.6 Traffic Signals

Existing traffic signals are located on state roads and maintained by the City through an agreement between FDOT and the City.

St. Johns County operates the signals during normal business hours using the ATMS.NOW® traffic management systems software. Pre-timed signal plans are used.

When St. Johns County is not operating the signal system, FDOT operates and monitors the system from the Regional Transportation Management Center (RTMC) in Jacksonville through the SunGuide® software.

The existing signals, controller types, and ethernet switches are summarized in Table 9. The locations of the signals are shown on Figure 19.

Traffic signals are interconnected with a fiber optic network owned and maintained by the FDOT west of the Bridge of Lions. The fiber optic network connecting the signals is typically 12 strand single mode fiber. The network runs along SR 16 to the west where it is connected to the statewide fiber optic network backbone on I-95 at the SR 16 interchange.

The signals at the gates on the Bridge of Lions are operated by the bridge tender. They are not connected to other signals.

On Anastasia Island the traffic signals on SR A1A Anastasia Boulevard run free and are not interconnected.

There are eight Rectangular Rapid Flashing Beacons (RRFB) operating in the City at the following locations and shown in Figure 20.

- Malaga Street near Oviedo Street

A related project for the replacement of two RRFBs with signalized pedestrian crossings on SR A1A Avenida Menendez at SR A1A Avenida Menendez at Coastline and near Hypolita Street is in the FDOT's Work Program.

Project Name:	SR A1A Avenida Menendez From US 1B King St to Castillo San Marcos Pedestrian Safety Improvement	
Financial Project Identification:	443554-1	
Federal Aid Project Number:	N/A	
Phase:	Design:	$15,007 in FY 2021
	Construction:	$1,186,522 in FY 2022[1]

This project does not include any of the smart technologies discussed in the deployment.

Table 9. Existing Traffic Signals

Corridor	Intersecting Roadway	Switch Type	Controller Subtype	MMU Manufacturer
SR A1A Anastasia Boulevard	R.B Hunt Elementary School	N/A	ATC	Trafficware™
SR A1A Anastasia Boulevard	Matanzas Boulevard	N/A	Series TS2	Naztec™
SR A1A Avenida Menendez	Mid-block near Castillo de San Marcos	ITS 8040	Series TS2	Trafficware™
SR A1A Avenida Menendez	Mid-block near Castillo de San Marcos			Transyt™
SR A1A Avenida Menendez	King Street	ITS 8040	Series TS2	Naztec™
SR A1A South Castillo Drive	Forth Alley	ITS 8040	Series TS2	Naztec™
SR A1A San Marco Avenue	West Castillo Drive	ITS 8040	Series TS2	Transyt Corporation™
SR A1A San Marco Avenue	SR A1A May Street and San Carlos	ITS 8040	Series TS2	Naztec™
SR 207	South Dixie Highway	ITS 8040	Series TS2	Naztec™
SR 312	Marina Cove Drive and South Plantation Island Drive	ITS 8040	Series TS2	Naztec™
SR 312	Mizzel Road	ITS 8040		Econolite™
US 1 Dixie Highway	SR 207	ITS 8040	Series TS2	Naztec™
US 1 Dixie Highway	Rambla Street	NA	Series TS2	Naztec™
US 1 Ponce de Leon Boulevard	SR 16	ITS 8040	Series TS2	Naztec™
US 1 Ponce de Leon Boulevard	West Castillo Drive	ITS 8040	Series TS2	Naztec™
US 1B Cathedral Place	St. George Street	ITS 8040	Series TS2	Peek Traffic™
US 1B King Street	Riberia Street	ITS 8040	Series TS2	Naztec™
US 1B King Street	Cordova Street	ITS 8040	Series TS2	Peek Traffic™
US 1B King Street	Malaga Street	ITS 8040	Series TS2	Trafficware™
US 1B King Street	St. George Street	ITS 8040	Series TS2	Peek Traffic™
US 1B King Street	Dr. Martin Luther King Jr. Avenue	ITS 8040	Series TS2	Naztec™

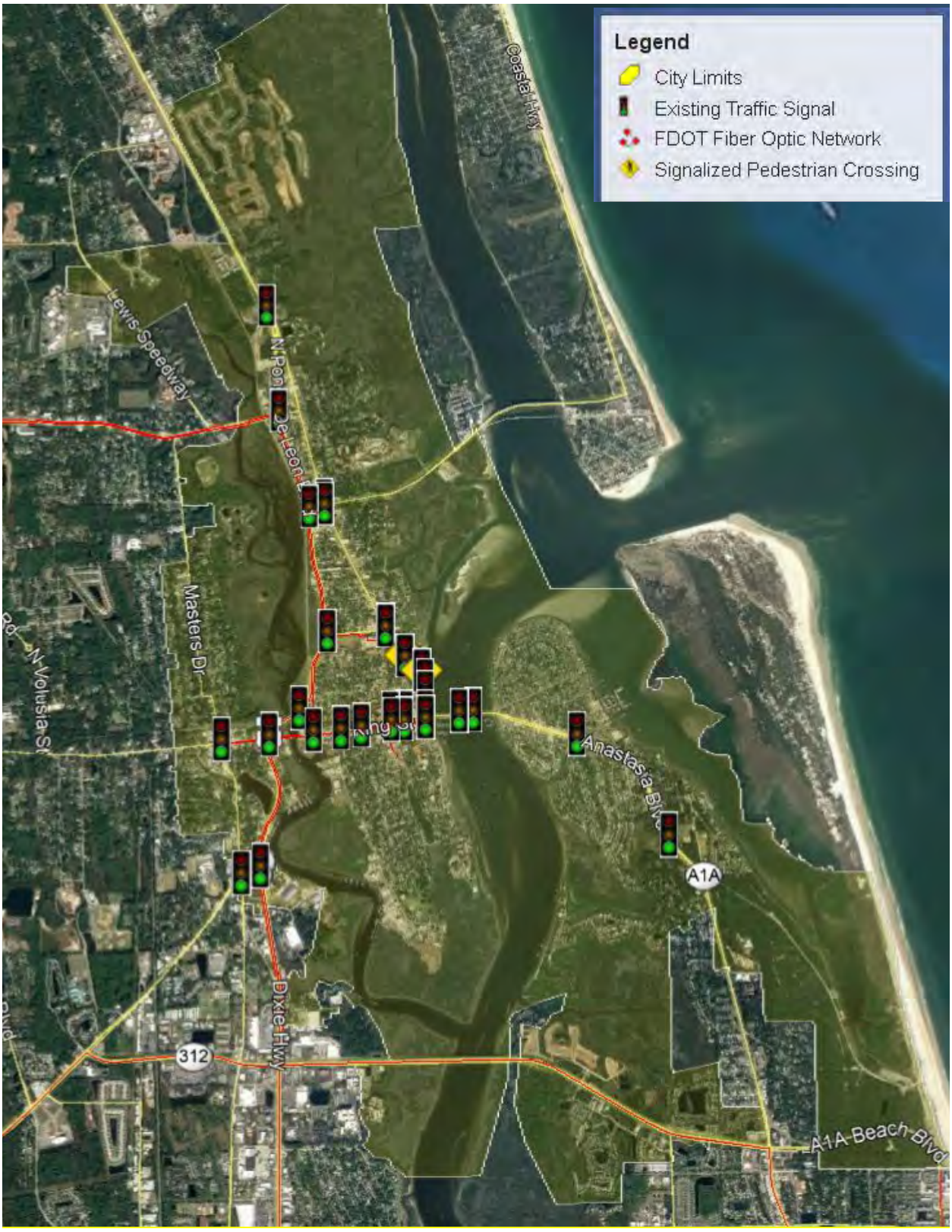

Figure 19. Existing Signals

Figure 20. Existing RRFB - include FSDB location on map?

- SR A1A San Marco Avenue near Cincinnati Avenue
- SR A1A San Marco Avenue near the Fountain of Youth
- SR A1A San Marco Avenue near Old Mission Road
- US 1B King Street near Cordova Street
- Valencia Street at Flagler College

* Design projects are underway to replace the RRFP at these two locations with pedestrian signals. Construction will begin in Summer 2022 and cost $815,000.

4.7 Transit Services

The following summarizes the transit options available in the City.

4.7.1 Sunshine Bus Company

The Sunshine Bus Company is St. Johns County's public transit system. The Sunshine Bus system is operated through the St. Johns County Council on Aging (COA) - a private not-for-profit agency partially funded by the State of Florida Department of Elder Affairs with support from the United Way of St. Johns County, St. Johns County Board of County Commissioners and private donations.[24]

The Sunshine Bus company operates seven routes as shown on Figure 21. The Sunshine Bus Company's depot is located just south of the City limits off Pope Road west of SR A1A south of SR 312 in unincorporated St. Johns County. The following routes travel in the City, or to the depot.

- Blue Line – Travels west from the depot along SR 312 over the Matanzas River to St. Augustine South and then north of US 1 Dixie Highway and Ponce de Leon Boulevard to the Flagler College Auditorium.
- Conn Express – Travels from the Christ the King Anglin Church on US 1 Dixie Highway south of SR 206 to St. Augustine Main Library near May Street.
- Green Line – Travels from Moultrie Publix, south of US 1 Dixie Highway to SR 206, across the Intracoastal Waterway on SR 206 and then north of SR A1A to the depot.
- Orange Line – Travels from the depot north on SR A1A Anastasia Boulevard across the Bridge of Lions to the St. Johns County government center off Lewis Speedway Road.
- Red Line – Travels from the depot north on SR A1A Anastasia Boulevard across the Bridge of Lions and then turns south into the Lincolnville neighborhood then north to the Historic Downtown Parking Garage and then north to the St. Johns County government center off US 1.
- Teal Line – Travels from Hastings to St. Augustine along SR 207 to US 1 Ponce de Leon Boulevard north to Flagler Hospital with a loop in St. Augustine South.
- Purple Line – Travels from the I-95 interchange with SR 16 along SR 16 into the City, turns south into Lincolnville and the north along US 1 Ponce de Leon Boulevard, Dixie Highway and Philips Highway to the Avenues Mall where it connects to the Jacksonville Transportation Authority's services.

[24] *The Sunshine Bus Company* https://sunshinebus.net/

Figure 21. The Sunshine Bus Company Transit System

4.7.2 Paratransit

The St. Johns County COA also operates paratransit service for the City. Paratransit provides transportation for people with disabilities who are unable to use the regular, fixed route transit service that serves their region. Paratransit usually provide door-to-door service for people who call to reserve a ride.

A trip planner is available from the St. Johns County COA for paratransit services. The route schedules are provided on The Sunshine Bus Company's website https://sunshinebus.net/.

Need to include JTA St. Johns Express Select - https://www.jtafla.com/schedules/regional-services/st-johns-express-select/

4.7.3 Airport Shuttles and Special Events

Elite Transportation Services

- Provides independent shuttle service to the Jacksonville International Airport.
- Provide services for the City during special events for carrying passengers from remote parking lots to downtown and between the Amphitheatre and its remote parking lots. The shuttle routes and locations are shown on Figure 22.

Island Airport Shuttle provides remote parking access service on the 4th of July along SR A1A, called Anastasia Boulevard within the city limits and the Scenic and Historic Coastal Highway in St. Augustine Beach. It stops at Alcazar Street, RB Hunt Elementary, Red Cox Road (Hamilton Upchurch Neighborhood Park), Amphitheatre, Anastasia Baptist Church.

4.7.4 For-hire Vehicles

Tours are an integral part of the City's tourism industry. The trolleys, carriages, and pedicabs mix with automobiles exacerbating congestion. The routes of these vehicles are shown on Figure 23 and Figure 24.

4.7.5 Microtransit

Other for-hire vehicles also have a significant impact on the travel speeds and congestion in the automobile travel lanes. They also operate on sidewalks conflicting with pedestrians. These for-hire vehicles include: pedicabs, taxis, low-speed vehicles Electric Personal Assistance Mobility Devices or EPAMDs (such as Segway™), rental scooters/scoot coupes, and bike rentals.

Figure 22. Special Event Parking

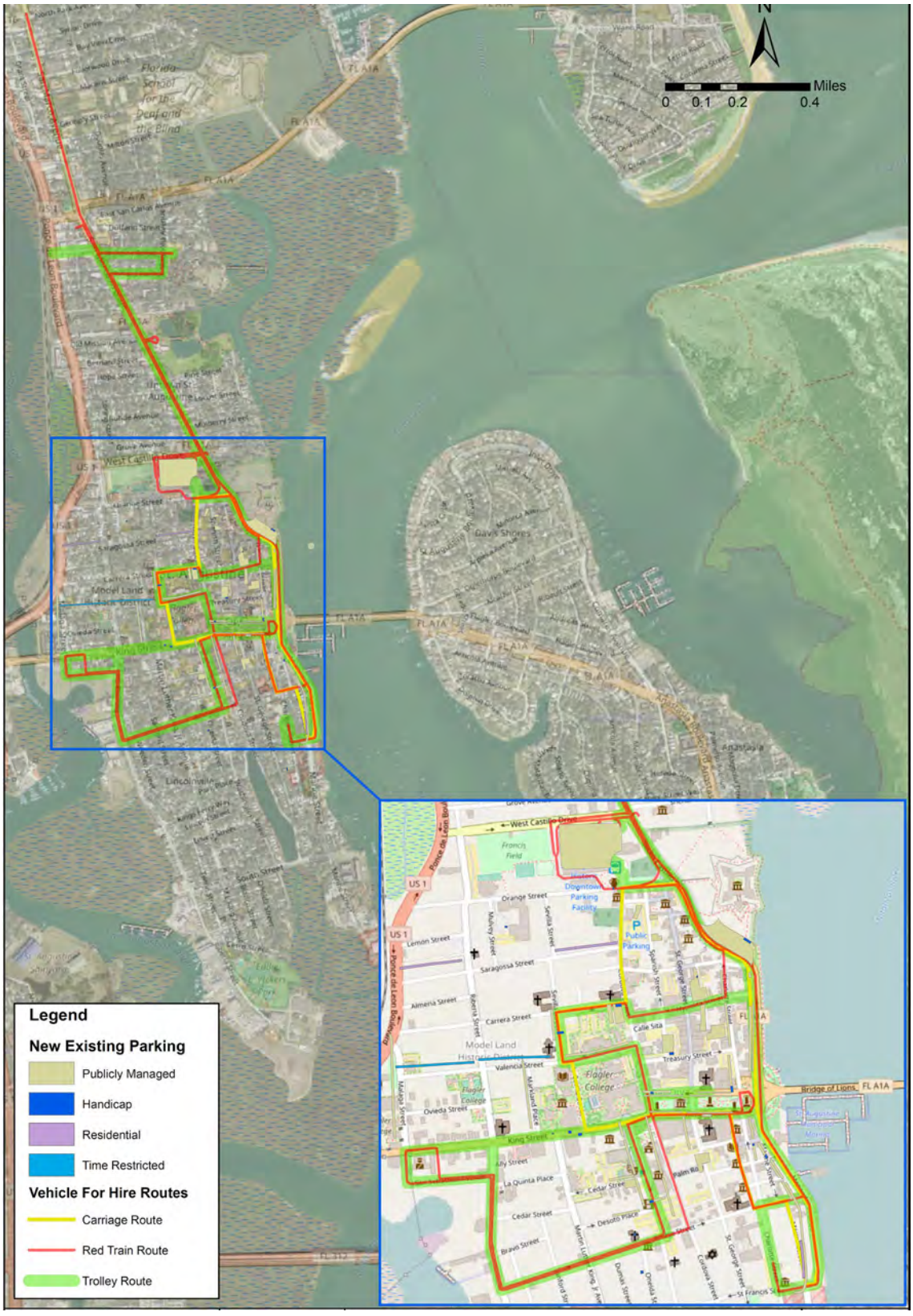

Figure 23. Trolley and Carriage Routes

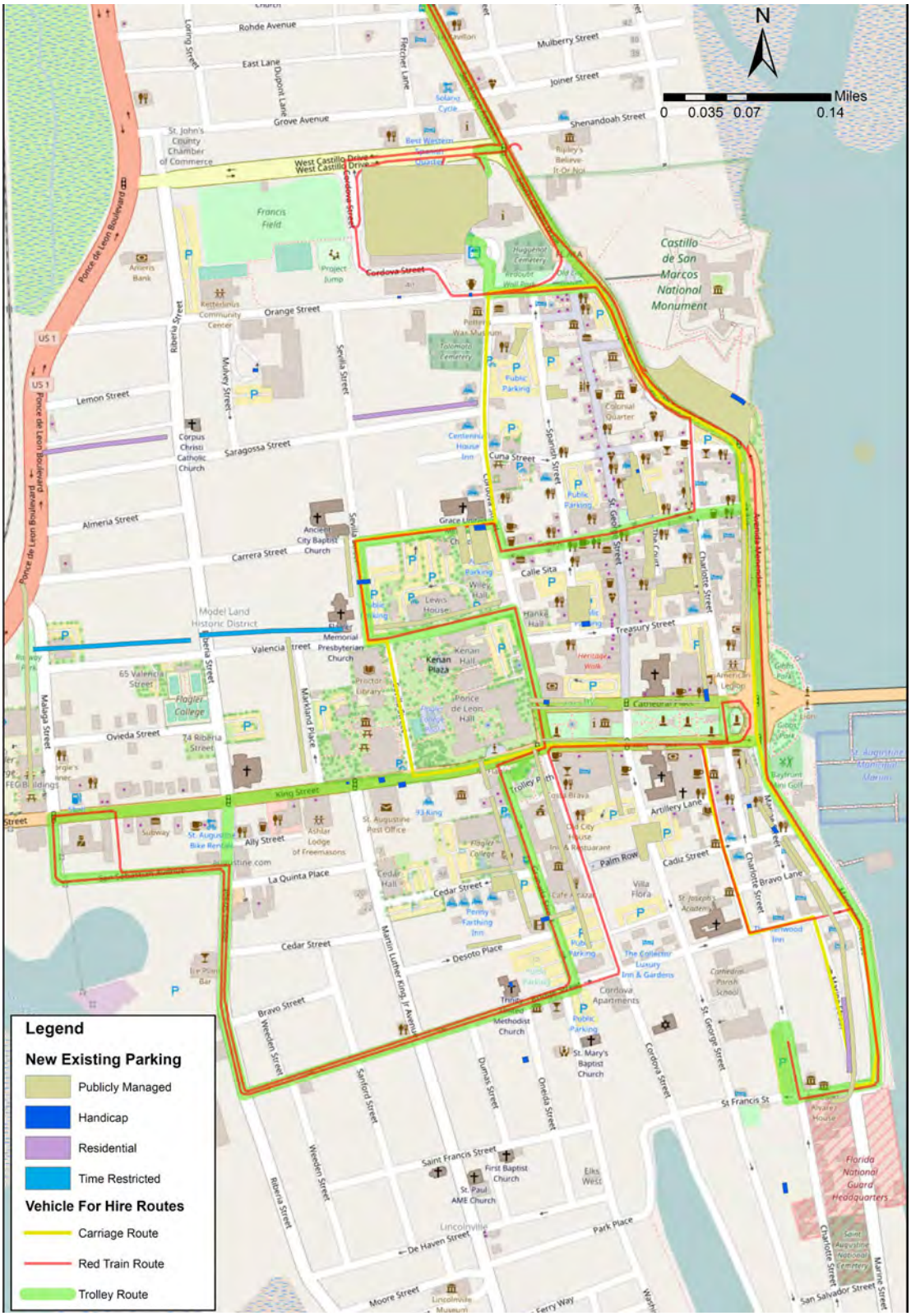

Figure 24. Trolley and Carriage Routes Downtown

4.8 Weather Information Systems

Road Weather Information Systems (RWIS) are installed at three bridges and are shown on Figure 25.

- SR A1A Vilano Bridge – The bridge is a prestressed stringer/multi-beam bridge over the Tolomato River between the City of St. Augustine and Vilano Beach
- SR A1A Bridge of Lions- The Bridge of Lions is a double-leaf bascule bridge that spans the Intracoastal Waterway.
- SR 312 Mickler-O'Connell Bridge – The bridge is a prestressed stringer/multi-beam bridge over the Tolomato River between the City and the City of St. Augustine Beach.

The Bridge of Lions may be closed for maritime traffic during normal operations.

The bridges are closed for the safety of high-profile vehicles during periods of inclement weather when sustained winds over 35 mph are observed. These conditions occur during tropical storms, hurricanes and other severe weather.

The RWIS were installed and are maintained by FDOT. Communications is provided through a partnership with the National Weather Service through satellites. The signal is then sent to the internet and the FDOT's RTMC in Jacksonville. The City is installing a weather information station at the Municipal Marina.

4.9 Evacuation Routes

Figure 20 shows the Zone A evacuation zones within the city limits and the evacuation routes when emergencies are declared. This occurs most frequency during tropical storms and hurricanes.

4.10 Tourist Information Apps

There are apps that provide information about parking and destinations. These include:

- Visit St. Augustine - https://www.visitstaugustine.com/
- Old City - https://www.oldcity.com/
- Florida's Historic Coast - https://www.floridashistoriccoast.com/

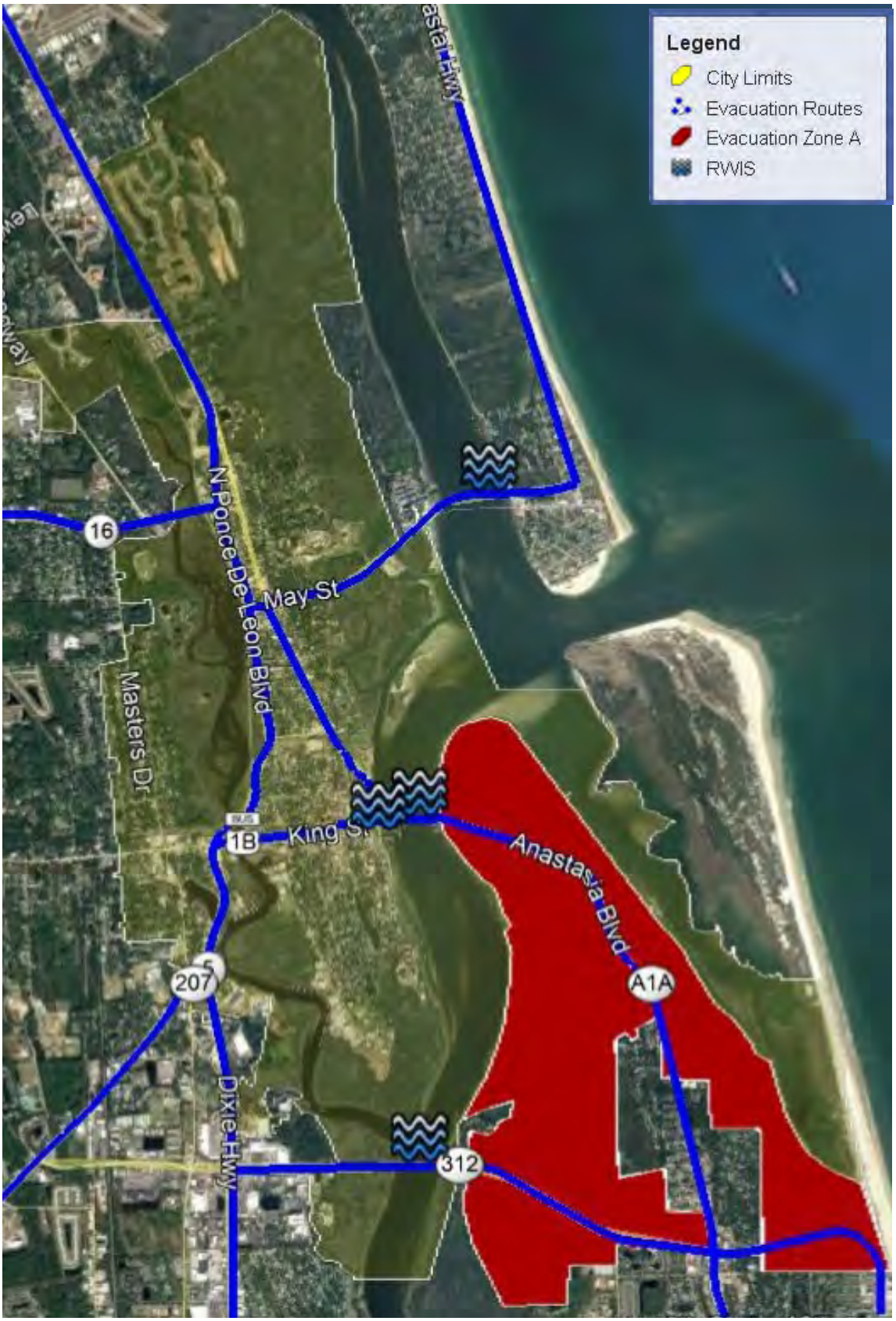

Figure 25. Evacuation Routes and Bridge RWIS

4.11 EV Charging Stations

There is only one public EV charging station in the City. It is located at the east end of Desoto Place near City Hall. The charge is free. Parking fees apply.

There are eight private EV charging stations within the city limits and four others are located near the City.

There are six million visitors to the City every year and they all arrive by vehicle. Providing charging stations is an important feature to alleviate range concerns and encourage vehicles that reduce greenhouse gas emissions. The stations located within the City are shown on Figure 26.

- TPO funded charging station or whatever you want to call it – ChargeWell™ is dead-no longer use on-street parking at 146 Malaga Street near the Flagler College dormitories
- Tesla at Wyndham Sebastian, 333 S Ponce de Leon Boulevard
- Tesla at Toques parking lot, 95 Cordova Street
- Tesla at Casa Monica Hotel, 98 St. George Street
- Tesla at Hilton Hotel, 32 Avenida Menendez
- Tesla at Holiday Inn, 1302 N Ponce de Leon Boulevard
- Tesla at 279 St. George Street
- Tesla at Best Western Hotel, 2010 N Ponce de Leon Boulevard
- Tesla at Best Western Hotel, 541 SR A1A Beach Boulevard

4.12 User Class Profiles and Support Environment

Table 1 summarizes the stakeholders engaged in this project, their profiles.

The support environment is described with each of the subsystems.

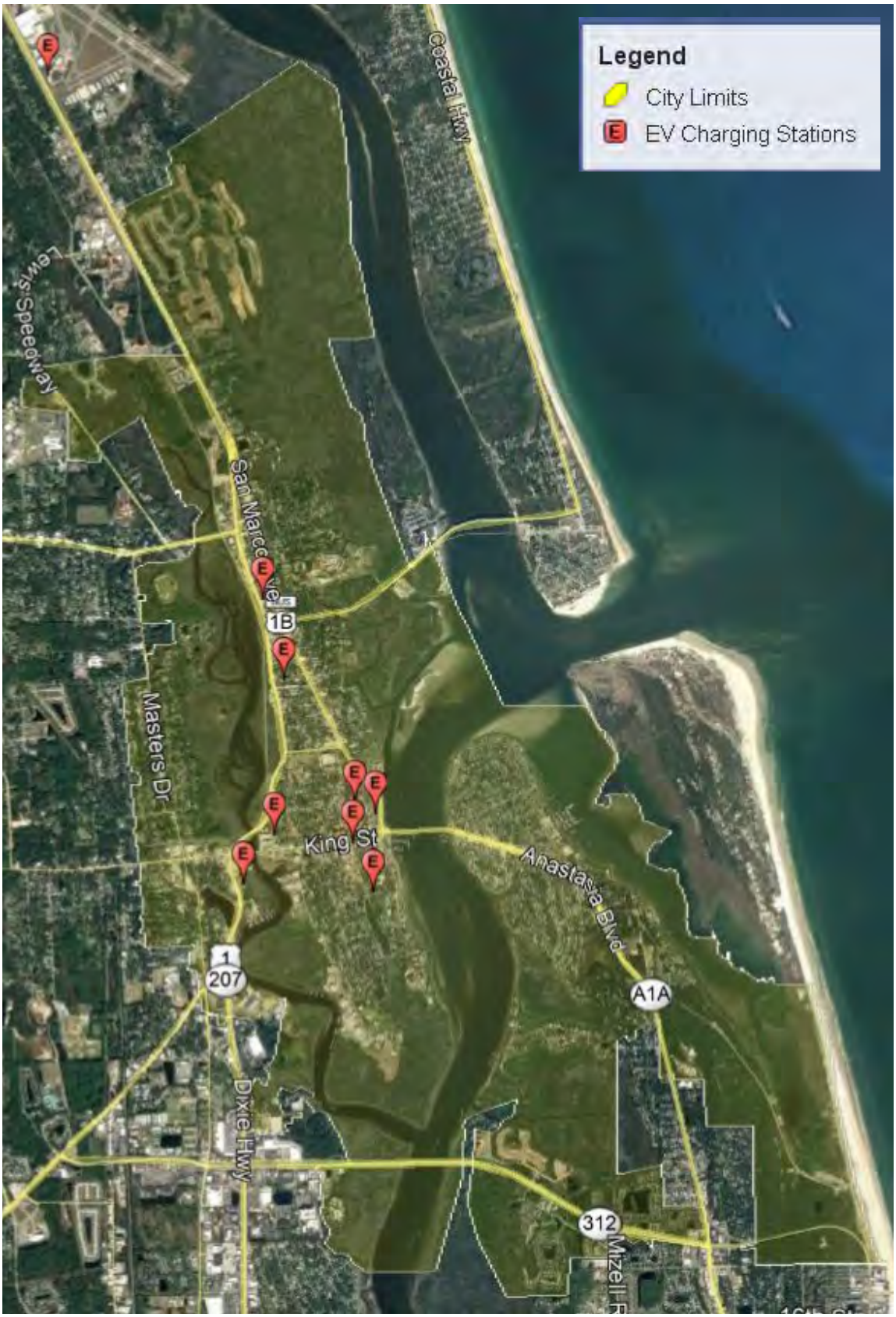

Figure 26. EV Charging Stations

5 Change Justification

The following summarizes the justification for the proposed changes.

5.1 Improve Safety

Based on a review of other projects, the number of pedestrian-vehicle conflicts due to inappropriate crossings were reduced by 81% when vehicle volumes were reduced by providing traffic information systems.[25] Autonomous emergency braking can reduce fatalities by 57%.[26]

A study completed in 2020 indicated that smart lighting at mid-block crossings in the Municipality of Rome showed a 19% reduction in vehicle speeds at similar locations where similar installations which are correlated with lower fatal crashes and serious injury risks.[27]

5.2 Enhance Mobility

SMART St. Augustine will enhance mobility by reducing traffic congestion and increasing safety for pedestrians. Parking demand currently exceeds capacity and when vehicles cannot find on-street parking they circulate the City increasing congestion by 30%.[28] Trucks circulate to find parking which reduces the pavement life. Reducing this circulation will also improve pedestrian safety by reducing the number of vehicle-pedestrian conflicts.

Based on a review of other projects, the parking information systems have benefit-cost ratios of greater than 4:1.[29] More than half of commercial truck drivers prefer to use dynamic message signs and on-line apps to obtain parking information while about one-third rely on books and maps.[30] Some smart parking systems deployed in multiple states result in benefit-cost ratios greater than 3:1.[31] Use of navigation systems and dynamic message signs can reduce traffic levels by 16%. Drivers can save up to 30% of time seeking a parking space.[32] Other studies showed that broadcasting information on the availability of on-

[25] *USDOT (2001), Evaluation of Automated Pedestrian Detection at Signalized Intersections, Report No. FHWA-RD-00-097*

[26] *Doecke, and Anderson, (2013). "Crash Reduction Potential of Connected Vehicles in South Australia.", Report No. CASR126*

[27] *Safety 2020, 6(2), 20; https://doi.org/10.3390/safety6020020*

[28] *http://northfloridatpo.com/images/uploads/docs/St_Augustine_Truck_Study_Final_Report.pdf*

[29] *Regional Truck Parking Information Management System (TPIMS) TIGER Proposal 2015. www.maasto.net/documents/TPIMS-Grant.pdf*

[30] *Sanchez-Badillo, Alejandro, et al. "Accelerating SmartPark Deployment Strategic Plan." Welcome to ROSA P, United States. Department of Transportation. Federal Motor Carrier Safety Administration. Office of Analysis, Research, and Technology, 1 June 2019, rosap.ntl.bts.gov/view/dot/40895.*

[31] *Sanchez-Badillo, Alejandro, et al. "Accelerating SmartPark Deployment Strategic Plan." Welcome to ROSA P, United States. Department of Transportation. Federal Motor Carrier Safety Administration. Office of Analysis, Research, and Technology, 1 June 2019, rosap.ntl.bts.gov/view/dot/40895.*

[32] *Kompfner, Paul, and Wolfgang Reinhardt. "The Potential Impact of in-Car Information on Urban Parking." Esafetysupport.org, Nov. 2008, www.esafetysupport.org/download/working_groups/ICT_Clean_Mobility/ICT%20for%20Clean%20%20Efficient%20Mobility_v%201.1%20final.pdf*

street parking spaces reduces delays by 5%[33] and 43%.[34] Parking facilities that provide information on parking space availability reduced traffic by 9% and delays by 4%.[35]

The use of data communicated between the roadside units and vehicle on-board units will improve travel time reliability and safety by reducing the number of vehicle-pedestrian conflicts through reduction in unnecessary circulating traffic.

Approaching the mobility needs as a system by integrating the roadside units, advanced signal performance measures, parking information systems, and traffic management data will provide benefits greater than any individual system alone by managing incidents, congestion, and parking demand.

5.3 Provide Sustainable Solutions

Reducing congestion, providing opportunities to encourage EV use, and testing new technologies will reduce carbon emissions.

The social costs of carbon emissions ranges from $6 (domestically) to $62 (global impacts) per metric-ton of emissions.[36] The social costs of carbon is a measure of the economic harm from those impacts, expressed as the dollar value of the total damages from emitting one ton of carbon dioxide into the atmosphere.

5.4 Provide Ladders of Opportunity

One of the foundational strategies for SMART St. Augustine is to provide public broadband internet access in underserved communities.

Only 75% of households in the City had internet subscriptions in 2018.[37] Reliable internet access is considered an essential need for economic mobility and education attainment. The benefits of providing internet access are proven to increase education attainment which also increase life-time earnings and the success of subsequent generations.

5.5 Grow North Florida

Every $55,000 of investment in infrastructure creates one new permanent job.[38] The investments in this project are needed to save lives, improve mobility, enhance air quality and provide ladders of opportunity that result in long-term economic benefit to the City.

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[33] *Tasseron, G., et al. The Potential Impact of in-Car Information on Urban Parking. Nov. 2014, rstrail.tudelft.nl/sites/default/files/tasseron_geert_0.pdf.*

[34] *SFMTA (2014), SFPark Pilot Project Evaluation*

[35] *USDOT (2007), Advanced parking management systems : a cross-cutting study: taking the stress out of parking, Report No. FHWA-JPO-07-011*

[36] *National Academies of Sciences, Engineering, and Medicine 2017. Valuing Climate Damages: Updating Estimation of the Social Cost of Carbon Dioxide. Washington, DC: The National Academies Press. https://doi.org/10.17226/24651.*

[37] *US Census, https://www.census.gov/quickfacts/staugustinecityflorida*

[38] *Woodard and Curran, https://www.woodardcurran.com/blog/the-economic-benefits-of-infrastructure-investment-part-i-making-the-case*

5.6 Create Resilient Communities

The National Institute of Building Sciences analyzed the result of investment from several federal agencies by the Federal Emergency Management Agency, Economic Development Agency, and the U.S. Department of Housing and Urban Development, over a 23-year period. The study found that for every $1 invested in resiliency projects there is a $6 return.[39]

5.7 Improve the Effectiveness of Government

A 2019 survey found that cities deploying smart mobility solutions are.[40]

- Bolstering customer satisfaction by 38%
- Improving productivity and delivery times for business by 32%

The same survey found that smart initiatives can expose urban areas' cybersecurity risks. About 82% of cities plan to increase their cybersecurity budgets next year to cope with rising cyber risks. The cost of cyber loss events over the last year averaged $3.4 million with the cities who participated in the survey.[41] Improving the City's cyber security through this deployment is needed to manage this risk.

[39] *National Institute of Building Sciences Multi-hazard Mitigation Council, Natural Hazard Mitigation Saves: 2018 Interim Report, 2018* https://www.nibs.org/page/mitigationsaves

[40] *Traffic Technology Today,* https://www.traffictechnologytoday.com/news/funding/measurable-roi-for-smart-city-initiatives-revealed.html

[41] *Traffic Technology Today,* https://www.traffictechnologytoday.com/news/funding/measurable-roi-for-smart-city-initiatives-revealed.html

6 Goals, Objectives, and Performance Measures

6.1 Background

Smart communities utilize innovative and emerging technologies to collect, store, and analyze data from many sources to enhance the region's livability. While many of these technologies have been deployed independently with great success, integrating them together and harnessing the power of coordinated data will provide new and innovative means to improve the quality of life for citizens throughout the region.

There are many pieces to a smart region, including, but not limited to, waste, water, energy, healthcare, and transportation. The true power of a smart community is realized when the silos between each piece are broken down.

A smart community collects information from a wide variety of internet-of-things technologies. It merges data from multiple sources into one data management system. Connections can be made that were not previously discovered. A smart community brings a hotbed of activity surrounding emerging technologies that draw in tech startups and other businesses. This can create growth in addition to providing unique and cutting-edge services to the region.

SMART St. Augustine will utilize innovative and emerging technologies to collect and analyze data from many sources to enhance the region's livability.

6.2 Goals and Objectives

SMART St. Augustine is a "signature" project and supports the SMART North Florida regional goals and the goals and objectives unique to St. Augustine. SMART St. Augustine's goals include:

- **Improve Safety**– provide a safer transportation network to work toward a goal of zero deaths.
- **Enhance Mobility**– provide mobility options that reduce travel times, improve reliability, and meet the needs of the residents and six million visitors to St. Augustine each year.
- **Provide Sustainable Solutions**– reduce greenhouse gas emissions through more effective mobility options, waste management, energy efficiency and green energy.
- **Provide Ladders of Opportunity** – provide multi-modal options that are accessible, reliable, and affordable for individuals with varied needs.
- **Grow North Florida** – leverage smart community strategies and tactics that encourage commerce and present business opportunities.
- **Create Resilient Communities** – provide strategic technologies that support resiliency strategies adopted in the City's resilience master plan: Resilient Heritage in the Nation's Oldest City[42].
- **Manage Assets and Services –** leverage technologies to construct, manage and operate the infrastructure and services for streets, drainage, water, sewer, and waste management.
- **Preserve the Historic and Architectural Character –** protect and preserve the historic and architectural heritage of this unique community.

[42] *City of St. Augustine* https://www.citystaug.com/DocumentCenter/View/4058/St-Augustine-Resilient-Heritage-Report?bidId=

- **Adapt to Changing Technology -** Technology is evolving rapidly, making it difficult for agencies to upgrade their systems with current products. A project lifespan often takes years for planning, budgeting, implementation, training, and ultimately operations. By the time a new technology is operational, it is likely that a newer version has been released. The solution to this challenge is to select modular and open-architecture systems that can be easily changed with time. This may mean regular and automatic software updates or purchasing pieces of hardware for new capabilities. The importance of this process is flexibility and compatibility with neighboring cities and communities who may use different vendors and products. Adaptation strategies include:

    - Implement innovative and interoperable technology that is adaptable and easy to maintain
    - Create redundancy for limited disruptions
    - Develop a complete and resilient communications network infrastructure
    - Create a modular and scalable system
    - Standardize technologies to limit the number of unique device types to streamline maintenance
    - Implement technology with real time performance metrics to identify and respond to events
    - Provide remote access to the system
    - Create a proactive maintenance program
    - Prepare a proactive system monitoring and response to network impacts

6.3 Plan Consistency

6.3.1 City Strategic Plan

These project objectives are consistent with the City's objectives outlined in the Strategic Plan:

Infrastructure Planning and Construction - To assess our infrastructure, update and prioritize Capital Improvement Plans (CIP), create financing strategies and move the plan into systematic construction. The primary focus has been in water, sewer, road, and stormwater systems, including water and wastewater treatment plant facilities.

Mobility Planning and Construction- To implement the mobility and growth plan developed due to the rise in congestion caused by growth of our regional population and increased tourism. Residents are increasingly frustrated by traffic congestion, lack of parking, and a decrease in "livable" quality.

Zoning and Building Code Update - To preserve the character of St. Augustine. The current effort encourages resident and business participation in new planning efforts to redefine the future of the City and its unique neighborhoods and entry corridors.

Resiliency, Sustainability, Sea-level Rise Planning, and Implementation - To develop City values that lead to resilient strategies that will help us to face the challenges of sea level rise and sustainable practices that will help to reduce our carbon footprint.

Arts, Education, and Community - To be a more integral part of the community's rich arts and cultural scene. The City would like to play a more active role in the development of art and cultural programs that will educate both our residents and our visitors.

Enhance Partnerships to Affect Change in Affordable Housing and Homelessness - To ensure that all of St. Augustine's residents have the necessities of life.

Proactive Planning to Preserve our Downtown Character - Collaboration between residents, business owners, visitors, and the City to preserve the downtown character and ensure that all can enjoy a safe, social, enjoyable, high quality atmosphere.

Event Planning and Management - To continually evaluate the City's special event policies along with mobility solutions that will facilitate the success of events held on public property in such a way that events will not place undue burden on City services, residents and businesses but rather enhance the livable nature of the City and help to move the City's other strategic objectives forward.

Diversity, Equity, and Inclusion - To promote diversity, equity and inclusion in the workplace and community. The City is committed to a productive, collaborative, supportive and respectful working environment.

6.3.2 City 2030 Comprehensive Plan

The consistency of this project with the 2030 Comprehensive Plan as summarized in Table 10.

6.3.3 City 2040 Mobility Plan

The City adopted a mobility in 2020 which is summarized in Figure 27 and is comprised of:

- A Walking and Bicycling Plan to enhance safety and connectivity for people walking and bicycling. A network of protected bike lanes and trails is proposed on City, County and state roads. A multimodal river walk is proposed along the redeveloping San Sebastian waterfront from US 1B King Street to SR 312. Several high-visibility crosswalks proposed at key intersections.
- The Streets Plan includes a mixture of complete streets and low-speed shared streets within the historic districts of St. Augustine. Improvements to SR 313 and the SR 312 Extension are shown to reduce regional cut-through traffic within downtown. Improved pedestrian access is needed along West Castillo Drive from US 1 Ponce de Leon Boulevard to the Historic Downton Parking Garage.
- The Transit Circulator Plan proposes to construct parking on the periphery of the Historic District and use shuttle services to carry visitors to downtown. A water taxi service is proposed with stops along the San Sebastian River and Matanzas River. Two Transit-Oriented Developments (TODs) are proposed along future regional rail connections to Jacksonville and Central and South Florida.

Table 10. Examples of Consistency with 2030 Comprehensive Plan

Project Goal	Element	Policy, Goal or Objective
Safety	Future Land Use Element Goal	*minimizing the threat to health, safety and welfare posed by hazards, nuisances, incompatible land uses, and environmental degradation*
Safety and Mobility	Transportation Element Policy 1.17	*development of bicycle and pedestrian routes taking into consideration roadway widths, traffic volumes and accident rates, with the safety of the cyclists being the primary concern.*
Safety, Mobility and Manage Assets	Transportation Element Policy 1.1.9	*projects which are needed to protect the public health and safety*
Safety, Mobility	Transportation Element Policy 1.5.1	*employ Transportation System Management Strategies to protect the right-of-way, improve efficiency and enhance safety*
Safety and Manage Assets	Sanitary Sewer Policy 1.2.1	*projects which serve to protect public health and safety;*
Safety and Manage Assets	Potable Water Policy 1.5.2	[place potable water] *consistent with public health and safety, potable water facilities shall be in place and available*
Safety and Manage Assets	Solid Waste Policy 1.1.4	[solid waste facilities*] provide collection services at a frequency and level of convenience to protect the health and safety of the community*
Safety and Manage Assets	Stormwater Policy 1.2.3	[place stormwater management facilities] *consistent with public health and safety, potable water facilities shall be in place and available*
Safety and Manage Assets	Capital Improvement Policy 1.2	*protect public health and safety by eliminating or reducing existing or potential public hazards*
Sustainability and Manage Assets	Future Land Use Element Objective 4	*Encourage the use of innovative and sustainable land development practices that maximize the use of existing services and facilities*
Sustainability and Resiliency	Conservation and Coastal Management Policy 1	*New development, alterations to existing structures and repairs to existing structures that sustain damage greater than 50% of their structural value located in the coastal high hazard areas*
Sustainability	Transportation Element Policy 1.5	*The City recognizes that the use of gasoline creates a large portion of the greenhouse gas emissions and shall incorporate transportation strategies to address the reduction of these greenhouse gas emissions.*

Project Goal	Element	Policy, Goal or Objective
Ladders of Opportunity	Plan Vision	*To create an environment within the City and adjacent areas in which its residents have the opportunity to maximize the potential for economic benefit, and the enjoyment of natural resources, while minimizing the threat to health, safety and welfare posed by hazards, nuisances, incompatible land uses, and environmental degradation.*
Ladders of Opportunity	Future Land Use Element Goal	*To create an environment within the City and adjacent areas in which its residents have the opportunity to maximize the potential for economic benefit, and the enjoyment of natural resources, while minimizing the threat to health, safety and welfare posed by hazards, nuisances, incompatible land uses, and environmental degradation.*
Ladders of Opportunity	Housing Element Goal	*The City will ensure that an adequate and affordable supply of housing is provided for existing and future household populations.*
Grow North Florida	Transportation Element Goal	*To maintain a coordinated multimodal transportation system which provides for the safe, efficient, and economical movement of people, goods, and services, which is consistent with the Future Land Use Plan, conserves energy, and protects the City's natural, cultural, and historical resources.*
Grow North Florida	Housing Element Objective	*The City shall implement cost effective measures to reduce energy and water consumption and promote energy conservation, carbon reduction, green building, and economic development through its Housing initiatives.*
Preserve the Historic and Architectural Character	Historic Preservation Element	*Maintain and enhance the historic integrity and ambiance within the City of St. Augustine while encouraging economic growth and the identification, preservation, continued use and adaptive reuse of existing historic structures*

Note: Items in italics were quoted directly from the 2030 Comprehensive Plan and not edited for grammar or consistency.

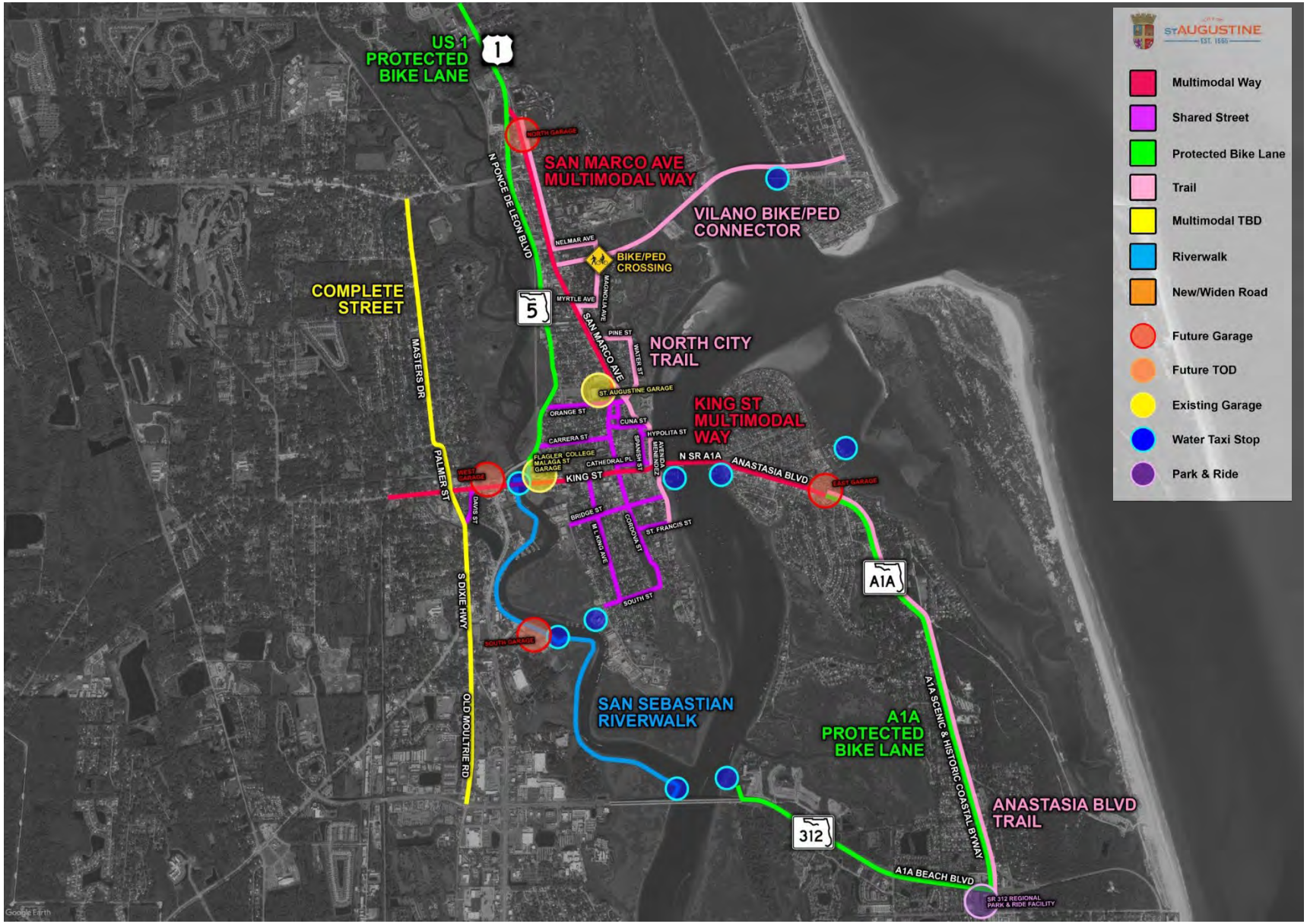


Figure 27. 2040 Mobility Plan Summary

6.3.4 State and Metropolitan Plans

This project is included in the following plans.

- Task 5.36 SMART St. Augustine for the systems engineering, preliminary plans and cost estimates in the North Florida TPO's Unified Planning Work Program (UPWP)
- The UPWP is included in the North Florida TPO's Transportation Improvement Program (TIP) by reference of the use of Federal planning program funds.
- The project is included in the North Florida TPO's 2045 Long-Range Transportation Plan (LRTP) Transportation Systems Management and Operations (TSM&O) Needs Plan
- An initial phase of this project is funded for construction in fiscal year 21/22 of the FDOT Work Program for $1 million as part of the TAPS-LA.
- No right-of-way acquisition or property agreements are required for this project.
- No environmental phases are required. The project qualifies as a programmatic categorical exclusion under the National Environmental Policy Act as implemented in the FDOT's Project Development and Environment (PD&E) Study process through assignment from the FHWA.

6.4 Performance Measures

Table 11 summarize the goals, performance metrics and benchmarks to be accomplished within the functional life of this project.

Table 11. Performance Measures

Goal	Performance Measure and Benchmark
Improve Safety – provide a safer transportation network to work toward a goal of zero deaths.	• Reduce bicycle and pedestrian fatal and serious injury crashes by 25% • Reduce property-damage only bicycle and pedestrian crashes by 25% • Reduce all vehicular crashes by 5%
Enhance Mobility – provide mobility options that reduce travel times, improve reliability, and meet the needs of the residents and six million visitors to St. Augustine each year.[43]	• Consider policies and ordinances that allow more modal choices while protecting the safety and comfort of pedestrians through integrated trip planning available from apps and at mobility hubs • Reduce congestion by 8% from smart parking and traveler information systems • Reduce congestion by 2% from signalization and CVE systems • Reduce congestion by 0.5% by implementing the bridge closure notification system and flood detection sensors • Improve reliability by 5%
Provide Sustainable Solutions – reduce greenhouse gas emissions through more effective mobility options, waste management, energy efficiency and green energy.	• Reduce the City's carbon footprint based on the delay reduction from mobility improvements[44] • Increase EV use by providing public charging stations at mobility hubs
Provide Ladders of Opportunity – provide multi-modal options that are accessible, reliable, and affordable for individuals with varied needs.	• Achieve 95% reliable internet accessibility for underserved populations in target areas • Implement subsidies for TNC use • Implement incentives for attending scheduled medical appointments at Flagler Hospital
Grow North Florida – leverage smart community strategies and tactics that encourage commerce and present business opportunities.	• Grow the cities domestic product by 5% attracting and retaining more visitors • Achieve 85% satisfaction on surveys for residents and visitors on the availability of traveler information • Monitor hits on the traveler information app inclusive of the kiosks provided at mobility hubs
Create Resilient Communities – provide strategic technologies that support resiliency strategies adopted in the City's resilience master plan: Resilient Heritage in the Nation's Oldest City .	• Use new sensors to improve risk modeling for sea-level rise • Implement management systems and strategies to minimize the impact of sea-level rise on public services in accordance with the City's reliability management approach

[43] *Since the number of visitors are likely to increase over time the benefits evaluation are based on an index of growth in visitors (%) times the baseline congestion costs.*

[44] *The cost of carbon emissions is included in the congestion reduction benefits.*

Goal	Performance Measure and Benchmark
Manage Assets and Services – leverage technologies to construct, manage and operate the infrastructure and services for streets, drainage, water, sewer, and waste management.	• Use sensor data to develop predictive analytics to reduce the life-cycle costs for infrastructure management • Achieve a 95% reliability for the operations and maintenance of all systems • Reduce life-cycle costs for projects • Result in a positive return on investment
Preserve the Historic and Architectural Character – protect and preserve the historic and architectural heritage of this unique community.	• Provide for context sensitive designs that are approved by the Historical and Architectural Board and vetted through a public involvement process

7 Description of the Proposed System

7.1 Summary

Table 12 summarizes the proposed SMART St. Augustine program. The current situation and progress toward implementing some of these technologies as pilots are also summarized in the table. Some of the proposed strategies and tactics support multiple objectives. The systems summarized in Table 12 may be grouped (such as technologies at signals) and the order changed to simplify the discussion in the subsequent sections.

7.2 Change Priorities

Table 13 summarizes the priories of each change needed within each phase of the project.

7.3 Service Packages

Table 14 provides a summary of the service packages anticipated as part of the project.

7.4 Foundational Activities

The following summarizes the proposed deployment.

7.4.1 Preserve the Historic and Architectural Character of St. Augustine

All projects must be consistent with the historic and architectural character of St. Augustine. Project reviews will be performed by the City.

7.4.2 Software Integration

Integration of new systems with existing legacy systems and the need for integration in future phases will need to be addressed. The following software are anticipated to be impacted with this deployment

- FDOT SunGuide™ for the additional arterial dynamic message signs, parking information signs, connected vehicle roadside units, automated pedestrian detection at signals, and bridge closure notification.
- FDOT's ATMS.NOW for advanced traffic signal controller upgrades, signal management version control for connected vehicle roadside units, automated pedestrian detection at signals, and alternate signal timing plans during bridge closures.
- City's parking management software –
    - Passport® and ParkStAug app
    - Flowbird®
    - Genetec AutoVu®
    - Smarking®
- Smart North Florida's integrated data exchange for the sharing of real-time information and its storage for future performance evaluation and development of predictive analytics.
- North Florida TPO's Congestion Management Process for the sharing of real-time information and its storage for future performance evaluation.

Figure 28 shows the proposed software integration envisioned as part of SMART St. Augustine.

Table 12. Summary of the Proposed Deployment, Status and Goal Supported

Proposed Deployment Strategy or Technology	Current Status	Improve Safety	Enhance Mobility	Provide Sustainable Solutions	Provide Ladders of Opportunity	Grow North Florida	Create Resilient Communities	Manage Assets	Preserve the Historic and Architectural Heritage
Foundational Activities Needed for All Other Services									
Preserve the Historic and Architectural Character of St. Augustine Foundational activity to design device enclosures consistent with the historic and archeological character of the City.	No activities.			✓	✓	✓	✓	✓	✓
Software Integration - Foundational activity for the sharing of information for all internet-of-things devices and stakeholders.	Smart North Florida is developing and making continuous improvements for an Integrated Data Exchange and Data Analytics Platform for limited use cases.	✓	✓	✓	✓	✓	✓	✓	
Broadband Wi-Fi – High speed internet connectivity. Foundational for IoT ecosystem and public Wi-Fi for digital equity.	Prior discussions with internet providers occurred before COVID-19 about providing Wi-Fi services at schools.	✓	✓	✓	✓	✓	✓	✓	
Improve Safety									
Crosswalk Improvements – Physical improvements to enhance safety and Americans with Disabilities (ADA) accessibility.	No activities.	✓	✓						
Bicycle and Pedestrian Sensors – Automated pedestrian and bicycle detection at intersections and mid-block crossings to extend green times, crossing times or other safety measures.	A pilot sensor and RRFB was installed by Flagler College at Valencia Street (mid-block crossing) and Malaga Street.	✓	✓						
Bicycle and Pedestrian Safety App – Location services embedded into Visit St. Augustine app to provide vector and prediction analytics for bicyclists and pedestrians at intersections.	No activities.	✓	✓						
Smart Lighting – Provide enhanced lighting at night and to notify drivers through connected vehicle technologies to improve safety and reduce power consumption.	No activities.	✓						✓	
Enhance Mobility									
Truck Parking Management System – System to manage timing of truck deliveries. System will provide video surveillance and enforcement by plate for loading zone management.	Phase 1 of a smart parking system was implemented in 2019 that uses apps, kiosks, and license-plate reader technology for enforcement.	✓	✓	✓					
For-Hire Vehicle Management System – Vehicle location systems including Global Positioning Systems (GPS) transponders on for-hire vehicles (pedicabs, taxis, carriages, trolleys/trains, low-speed vehicles, rental scooters/scoot coupes, bike rentals, tour buses/coaches, etc.) to manage access fees and route restriction.	This system required agreements with private sector companies on a voluntary basis and is referenced only for information in this plan.	✓	✓	✓					
Arterial DMS - Dynamic messaging signs to direct traffic to available parking and manage traffic flow during events and emergencies on state roads.	The City is partnering with FDOT on the delivery of a TAPs-LA grant. Construction funding is available July 1, 2021.	✓	✓	✓					
Parking Information Signs- Street-level dynamic messaging signs to direct traffic to available parking and manage traffic flow during events and emergencies on local roads.	Construction is funded through a FDOT TAPs-LA grant. Construction funding is available July 1, 2021.	✓	✓	✓					

Proposed Deployment Strategy or Technology	Current Status	Improve Safety	Enhance Mobility	Provide Sustainable Solutions	Provide Ladders of Opportunity	Grow North Florida	Create Resilient Communities	Manage Assets	Preserve the Historic and Architectural Heritage
Virtual DMS – Using geofencing technologies and integrating the City's parking and visitors' app, notification can be sent to users for transportation, parking, and emergency management needs.	No activities.	✓	✓	✓					
Smart and Connected Signals - Connected vehicle technologies to improve travel times, reliability and safety for vehicles and pedestrians. This project will deploy automatic pedestrian detection at mid-block crossings to improve safety. This deployment will advance the technology by transmitting messages for via connected vehicles to roadside units to vulnerable users such as pedestrians and vehicles per SAE J2735 standards.	Deployment of roadside units and traffic controller upgrades along SR 16A King Street are funded for construction through a FDOT TAPs-LA grant. Construction funding is available July 1, 2021.	✓	✓	✓					
ATSPM and Real-time Condition Monitoring – Software solutions that provide real-time traffic signal system management.	Deployment of traffic controller upgrades along SR 16A King Street are funded for construction through a FDOT TAPs-LA grant. Construction funding is available July 1, 2021.	✓	✓	✓					
Bridge Closure Notification System – Messages and notifications via traffic information systems when bridges are open for boat traffic. Allow vehicles to avoid traveling through downtown when other options such as SR 312 are available and could save travelers time.	RWIS and operational procedures are in place for notifications. Signal timing plans are being updated for implementation in 2021.	✓	✓	✓					
EAV Shuttle – Shuttle circulator service for access to and from the parking garages with destinations. This strategy can assist visitors who are mobility challenged with accessing the full experience of the City.	No activities.	✓	✓	✓					
Mobility Hubs – Mobility hubs will be in public parking lots and include EV charging stations, visitor information kiosks, bicycle racks and other amenities. Kiosk can be used for Wi-Fi broadband hot spots to encourage visitors to download traveler information apps.	No activities.	✓	✓			✓			
Integrated Trip Planning App – to provide traveler information for visitors and trip planning coordination for the mobility underserved populations.	The private sector continues to advance in the area. For example, Google Maps is now providing integrated route planning and payment systems for transit and parking.	✓	✓	✓	✓	✓		✓	
Provide Sustainable Solutions									
Solar Path Pilot – Photometric cells in pavers to test and demonstrate the potential for power generation.	No activities.			✓		✓		✓	
Street Lighting LED bulb replacement.	City pays FPL for actual use based on meters or standard rates per pole. Maintain and pay for electric service for decorative lighting on FDOT facilities. FPL maintains cobra-heads on FPL poles.	✓		✓				✓	

Proposed Deployment Strategy or Technology	Current Status	Improve Safety	Enhance Mobility	Provide Sustainable Solutions	Provide Ladders of Opportunity	Grow North Florida	Create Resilient Communities	Manage Assets	Preserve the Historic and Architectural Heritage
EV Charging Stations – See mobility hubs.	Regional Clean Fuels Coalition is providing some initial start-ups but is eliminating the program as the private sector entered the market. One station exists in the City near City Hall. Stations are planned near the City in St. Augustine Beach City Hall. Several private companies provide EV charging stations near the city. The two locations near the Spanish Quarter are in private parking areas.						✓		
Provide Ladders of Opportunity									
Shared-vehicle Incentives – Financial incentives to assist the cash-dependent for access to health care, healthy food, and other social services.	No activities.				✓				
Digital Equity - Evaluate digital equity (access to the internet) needs in underserved communities	Some coordination with schools and internet providers occurred prior to COVID-19 to offer reduced prices and availability.				✓				
Wellness Ridership Program - Partner with Transportation Network Companies and health care providers to improve access to health care and avoid appointment cancelations.	United Way currently aids travelers through their 211 service by coordinating with TNCs on free or reduced fare trips. The St. Johns Council on Aging and Sunshine Bus currently provides transportation for the disadvantaged services. JTA provides ReadiRide services in limited portions of St. Johns County				✓				
Create Resilient Communities									
Resiliency Support Systems – Leverage multi-agency sea-level, street flood and RWIS to enhance models for risk and develop a detailed utility plan identifying risks and costs for raising vulnerable utilities based on sensor data. Stormwater sensor, monitoring and predictive analytics to predict sea-level rise at locations along the Tolomato and Matanzas rivers	Recently completed a resiliency master plan that recommends advancing a SCADA and converting to AMI smart meters.						✓		✓
Manage Assets and Services									
Smart Waste Management – Sensors in trash cans to optimize resources for the handling and removing waste in the street environment.	A pilot project that installed Bigbelly trash and recycling bins on St. George Street.			✓				✓	✓
Utility Management Systems – Software integration of stormwater and wastewater asset management for event detection such as road closures and work order status in CivicPlus.	City is implementing SCADA and converting to Advanced Metering Infrastructure (AMI) smart meters.							✓	✓

Proposed Deployment Strategy or Technology	Current Status	Improve Safety	Enhance Mobility	Provide Sustainable Solutions	Provide Ladders of Opportunity	Grow North Florida	Create Resilient Communities	Manage Assets	Preserve the Historic and Architectural Heritage
Pavement Management Systems – Video-based inventory systems using machine-learning to assess needs and verification of CivicPlus work orders.	Pilot project was performed by the North Florida TPO to demonstrate the effectiveness of this technology.							✓	✓
Integrated Asset Management App – Software and data integration for the management of assets and CivicPlus work order status.	Civic Plus system was implemented in 2020.							✓	✓
Street Flood Notification System – Sensors identify locations where street flooding is eminent or occurring to route travelers around this safety hazard.	No activities.							✓	✓
Resiliency Systems – Data and software integration to leverage existing data to prepare predictive analytics and risk assessments to guide infrastructure investment decisions.	City is developing SCADA and converting to AMI smart meters.						✓	✓	✓
Smart Grid – Expand the City's renewal energy assets and manage power for sustainable energy.	FPL dashboard for City facilities for energy consumption in the grid. Smart meters advancing.								

Table 13. Change Priorities

Component	Phase 1	Priority in the Full Vision
Foundational Activities		
Preserve the Historic and Architectural Character	✓	Essential
Software integration	✓	Essential
Broadband Wi-Fi		Essential
Improve Safety		
Crosswalk Improvements	✓	Essential
Bicycle and Pedestrian Sensors		Desirable
Bicycle and Pedestrian Safety App		Desirable
Smart Lighting		Desirable
Enhance Mobility		
Truck Parking Management System		Desirable
For-Hire Vehicle Management System	✓	Desirable
Arterial Dynamic Messaging Signs	✓	
Parking Information Signs	✓	Desirable
Virtual Dynamic Message Signs		Desirable
Smart and Connected Signals	✓	Desirable
Automated Traffic Signal Performance Measures and Real-time Condition Monitoring	✓	Low
Bridge Closure Notification System	✓	Essential
EAV Shuttle		Desirable
Smart Kiosk		Desirable
Integrated Trip Planning App		Essential
Provide Sustainable Solutions		
Solar Path Pilot		Desirable
Street Lighting LED Replacement		Essential
Electric Vehicle Charging Stations		Desirable
Provide Ladders of Opportunity		
Shared-vehicle Incentives		Desirable
Digital Equity in Underserved Neighborhoods		Essential
Transportation Network Companies and Health Care Provider Partnerships		Essential
Create Resilient Communities		
Stormwater Sensors and Monitoring	✓	Essential
Street Flood Notification System	✓	Essential
Resiliency Risk Assessments and Data Analytics		Essential
Manage Assets and Services		Essential
Smart Waste Management		Desirable
Utility Management Systems		Essential
Pavement Management Systems		Desirable
Integrated Asset Management App		Desirable

Table 14. Service Packages

Service Package
DM01 ITS Data Warehouse
DM02 Performance Monitoring
MC09 Infrastructure Monitoring
MC10 Asset Tracking
PM01 Parking Space Management
PM02 Smart Park and Ride System
PM03 Parking Electronic Payment
PM04 Regional Parking Management
PM05 Parking Reservations
PM06 Loading Zone Management
PS13 Evacuation and Reentry Management
PS14 Disaster Travel Information
PT01 – PT18 (for automated vehicle shuttle in ultimate phase)
SU01 Connected Vehicle System Monitoring and Maintenance
SU02 Core Authorization
SU03 Data Distribution
SU04 Map Management
SU05 Location and Time
SU06 ITS Communications
SU08 Security Credentials Management
SU09 Device Certification and Enrollment
SU11 Field Equipment Maintenance
SU12 Vehicle Maintenance
SU13 Personnel Device Maintenance
ST04 Roadside Lighting
ST05 Electric Charging Stations Management
TM01 Infrastructure-Based Traffic Surveillance
TM02 Vehicle-Based Traffic Surveillance
TM03 Traffic Signal Control
TM04 Connected Vehicle Traffic Signal System
TM06 Traffic Information Dissemination
TM07 Regional Transportation Management
TM08 Traffic Incident Management System
TM18 Drawbridge Management
TI01 Broadcast Travel Information
TI02 Personalized Traveler Information
TI03 Dynamic Route Guidance
TI04 Infrastructure Provided Trip Planning
TI05 Travel Services Information and Reservation
TI07 In-vehicle Signage
VS01 Autonomous Vehicle Safety Systems
VS02 V2V Basic Safety
VS03 Situational Awareness

Service Package
VS04 V2V Special Vehicle Alert
VS06 Stop Sign Gap Assist
VS07 Road Weather Motorist Alert and Warning
VS08 Queue Warning
VS10 Restricted Lane Warnings
VS12 Pedestrian Cyclist Safety
VS13 Intersection Safety Warning and Collision Avoidance
VS16 Automated Vehicle Operations
VS17 Traffic Code Dissemination
Other (for IoT packages)

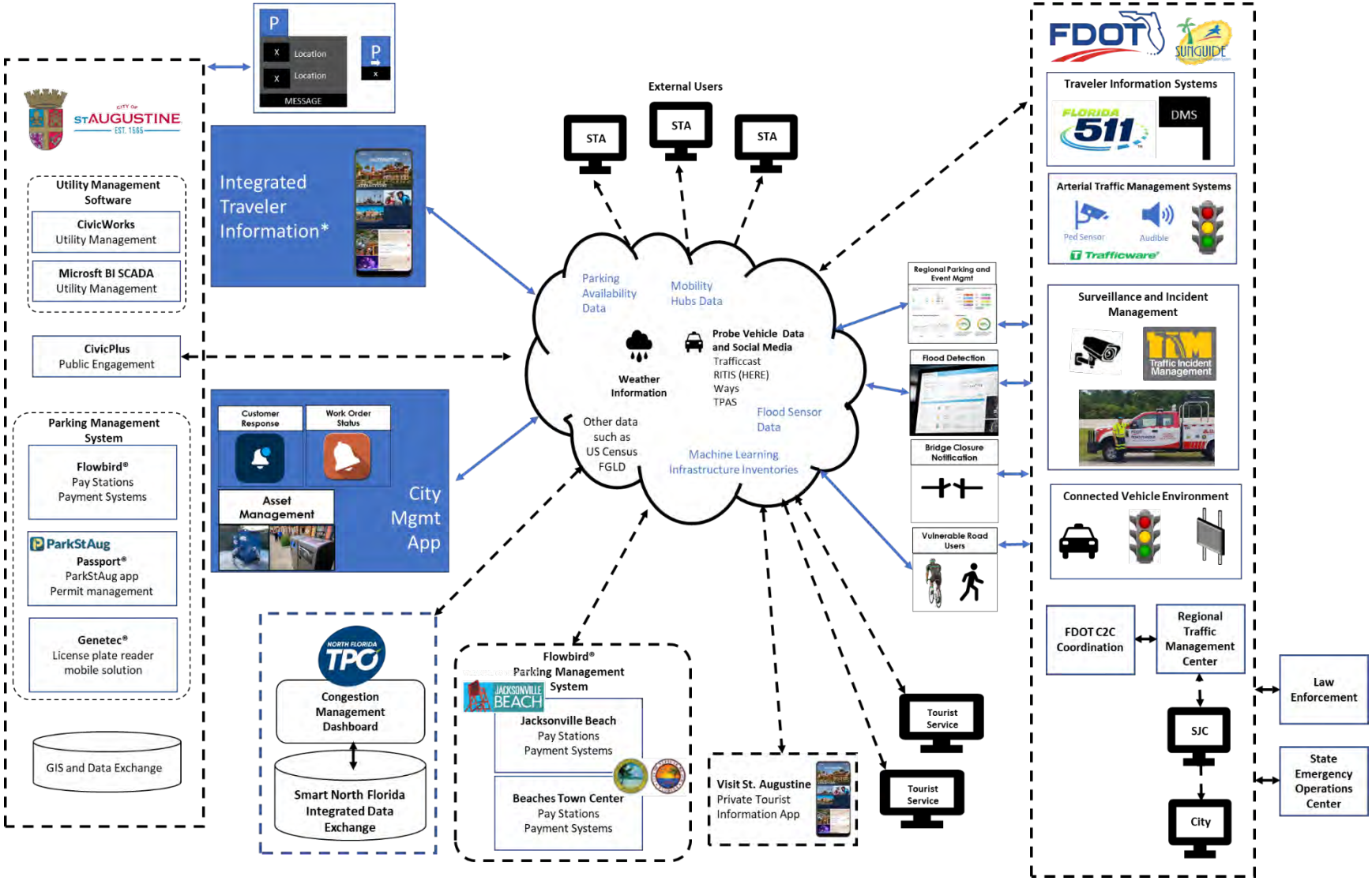


Figure 28. Proposed Software Integration and Development

7.4.3 Communications Network

The implementation of the systems and subsystems proposed in this project will require wireless and fiber optic network communications. Figure 29 shows the proposed communications architecture.

The communications architecture consists of the following standards and media

- Gigabit Ethernet (GbE) on existing and proposed Fiber Optic Networks (FON) and cabled networks.
- Cellular-Vehicle to Everything (C-V2X) uses 3rd Generation Partnership Project (3GPP) standardized 4th Generation (4G) Long Term Evolution (LTE) or 5th Generation (5G) mobile cellular connectivity to send and receive signals from a vehicle to other vehicles, pedestrians or to fixed objects such as traffic lights in its surroundings. It commonly uses the 5.9 GHz frequency band.
- Mesh Access Point (MAP) for Wi-Fi systems using the IEEE 802.11s standards
- Mesh Access Portal (MPP) for Wi-Fi systems using the IEEE 802.11s standards

Other abbreviations shown on Figure 29 include:

- Roadside Units (RSUs) are radios that operate in the CVE.
- 1000Base-CX is a shielded copper wire connection for ethernet connections.
- DMS
- Fiber Optic Network (FON)
- Regional Transportation Management Center (RTMC)
- National Oceanic and Atmospheric Administration (NOAA)
- Internet Service Provider (ISP)
- Station (STA) is a device using the Wi-Fi network

More detail on the proposed mesh Wi-Fi network is discussed under the public Wi-Fi system.

The new fiber optic network and wireless (private Wi-Fi and cellular) communications needed for the deployment is shown on Figure 30.

The public Wi-Fi networks are discussed later in this report.

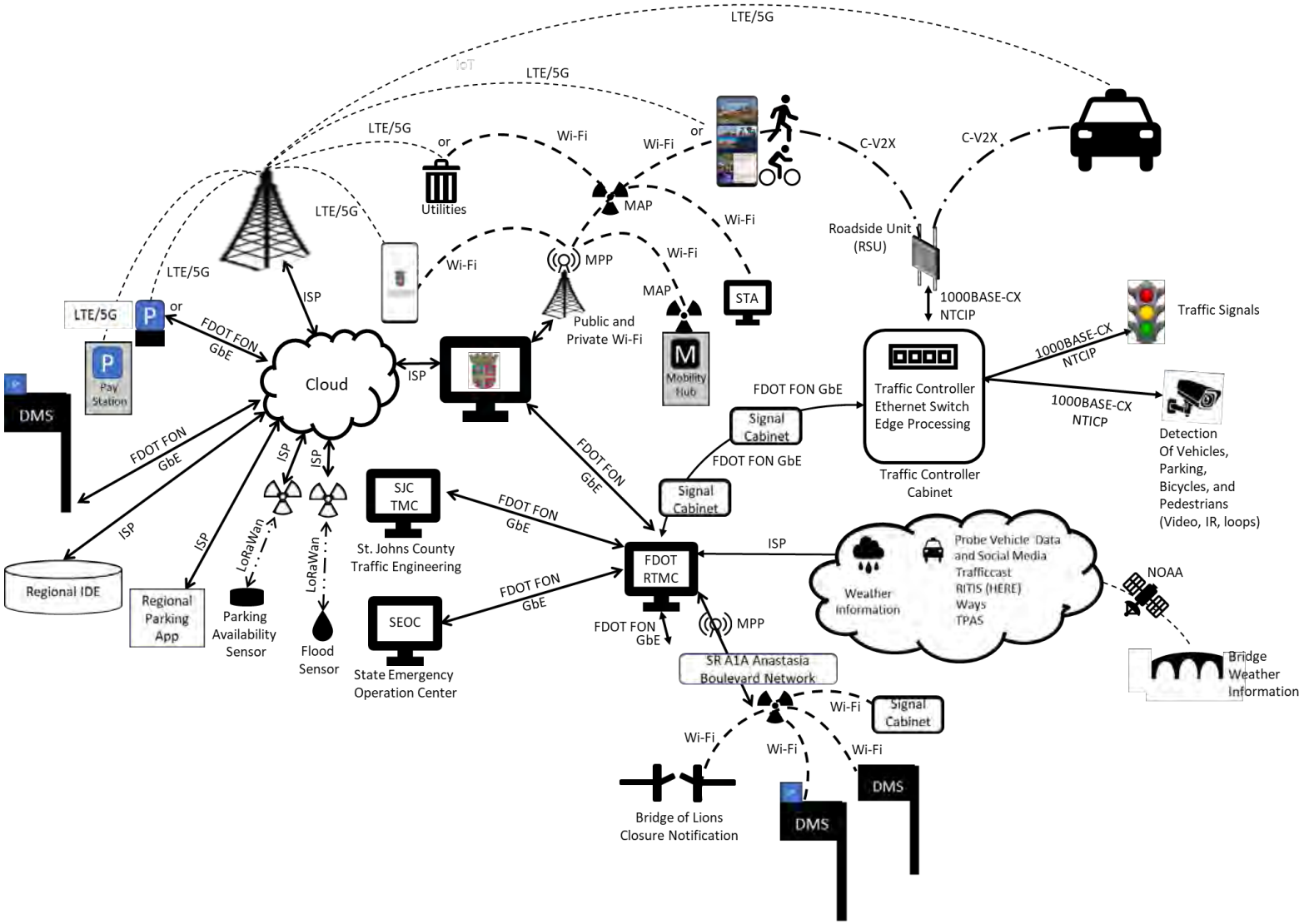


Figure 29. High Level Communications Architecture

Note: Abbreviations are discussed in the related narrative.

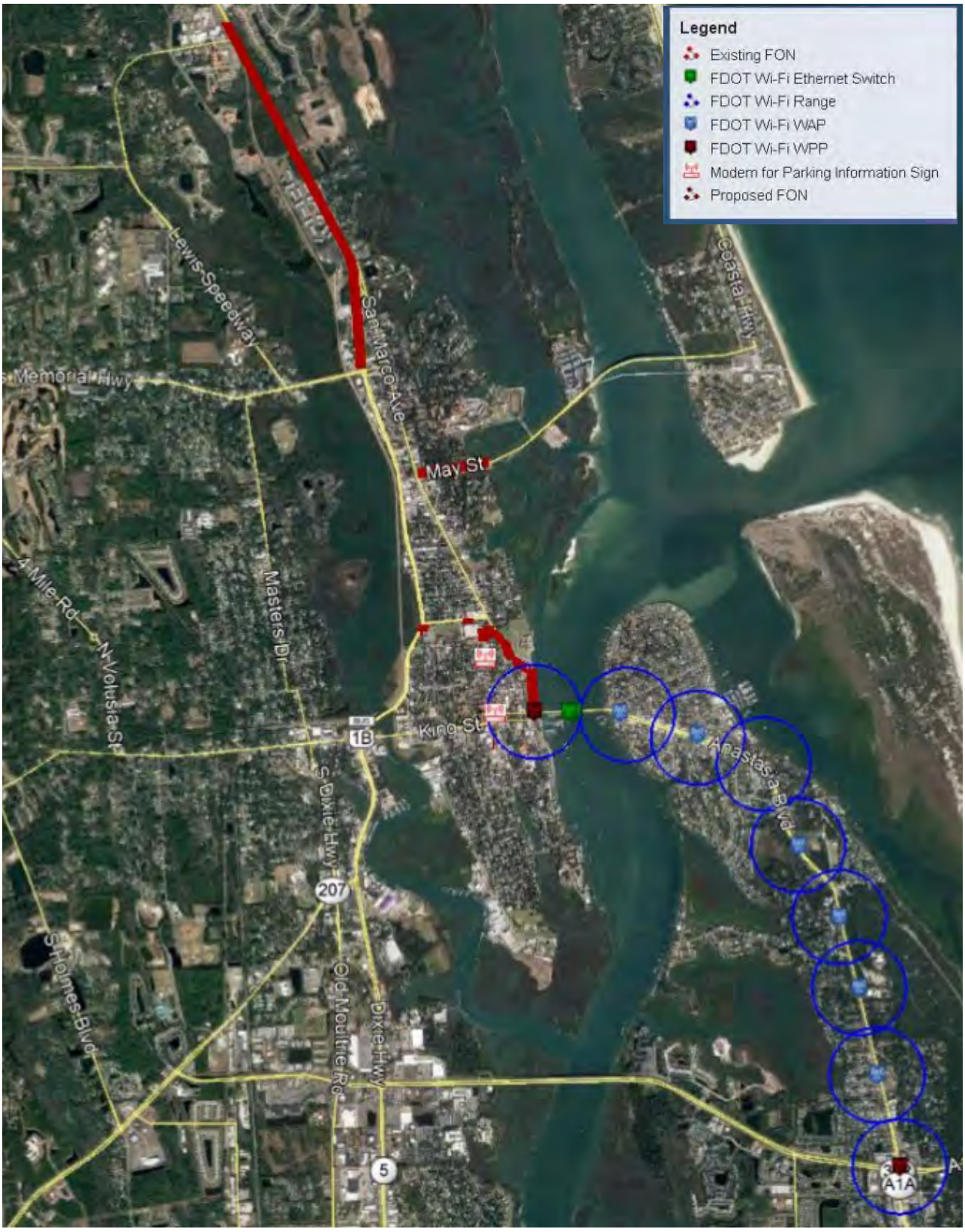


Figure 30. Proposed FDOT Private Communications Network

7.5 Safety

7.5.1 Pedestrian Crosswalk Improvements

Pedestrian crosswalk improvements are proposed at the following midblock crossings to include RRFB.

- Malaga Street near the Flagler College dorms
- Valencia Street near Flagler College
- Riberia Street at Bridge Street

These crossings are shown in Figure 31, Figure 32, and Figure 33.

Figure 31. King Street near Aviles Street

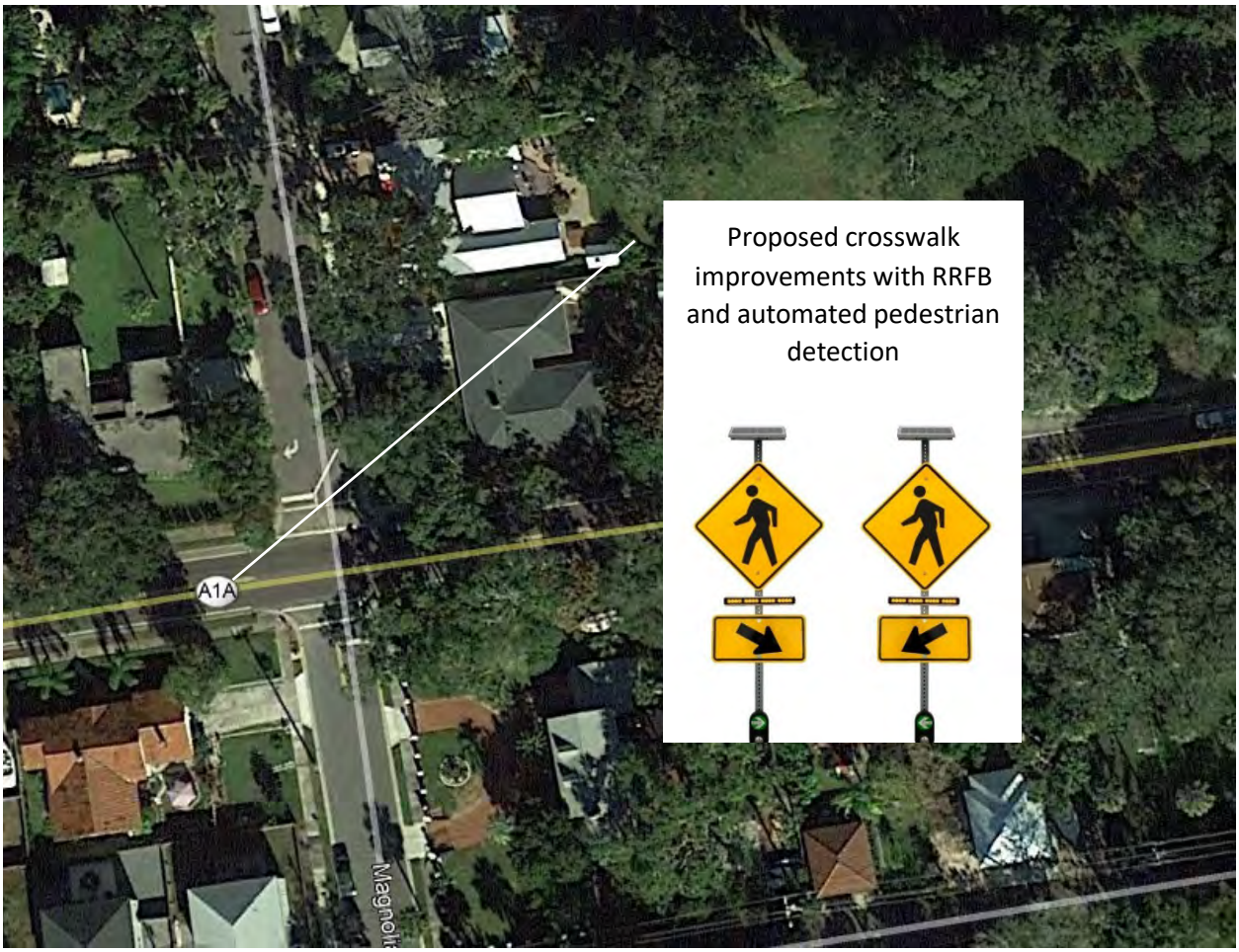


Figure 32. May Street near Magnolia Street

Figure 33. Riberia Street Pedestrian Crossing

7.5.2 Bicycle and Pedestrian

7.5.2.1 Automated Pedestrian Detection Sensors

Automatic pedestrian and bicycle detection will be deployed at signals to improve safety. Automated pedestrian and bicycle detection are proposed at the following mid-block signal or RRFB locations

1. Riberia Street near Bridge Street
2. King Street at Aviles Street
3. May Street at Magnolia Avenue
4. Malaga Street near Flagler College Dormitories
5. Valencia Street near Flagler College

Pedestrian walk signal extension for these low mobility pedestrians will also be considered in the operations based on number of pedestrians using the crossings and the presence of elderly or handicapped pedestrians.

7.5.2.2 Smart Lighting

Smart lighting sensors and luminaires will be added at the following mid-block crossings.

- Malaga Street near Flagler College Dormitories RRFB Crossing
- Valencia Street near Flagler College RRFB Crossing
- Riberia Street near Bridge Street RRFB Crossing

At these locations, automatic pedestrian detectors will be installed and lighting levels in the crosswalks will be increased when the pedestrian is crossing.

Lighting design criteria[45] recommend that a higher level of vertical illuminance may be required for crosswalks when there is a possibility of continuous glare from opposing vehicles, the crosswalk is located in an area with high ambient light levels, or the crosswalk is located at a lighted intersection.

A photometric analysis is needed during the design of the smart lighting systems locations to determine the proposed brightening that can occur. Each of the streets are currently lit and FHWA has maximum uniformity ratios that can be used to ensure drivers' vision is not impaired.[46]

7.5.2.3 Bicycle and Pedestrian Safety Apps

This system proposes a mobile-device app to help deliver accurate bicycle and pedestrian detection. The app recognizes when the cyclist is within a pre-defined detection zone and notifies the traffic controller via NTCIP or cabinet-mounted Priority Detector.

[45] *USDOT, Informational Report on Lighting Design for Midblock Crosswalks, Report Number FHWA-HRT-08-053, April 2008* https://www.fhwa.dot.gov/publications/research/safety/08053/#Toc192922524

[46] *USDOT, FHWA Lighting Handbook, August 2012* https://safety.fhwa.dot.gov/roadway_dept/night_visib/lighting_handbook/

Several options are being explored for this system deployment including custom software development, commercial off -the- shelf vendors as standalone apps or embedding the app in another app such as the Visit St. Augustine app.

Figure 34 provides an overview of the bicycle app concept.

Figure 35 provides and overview of the pedestrian app concept.

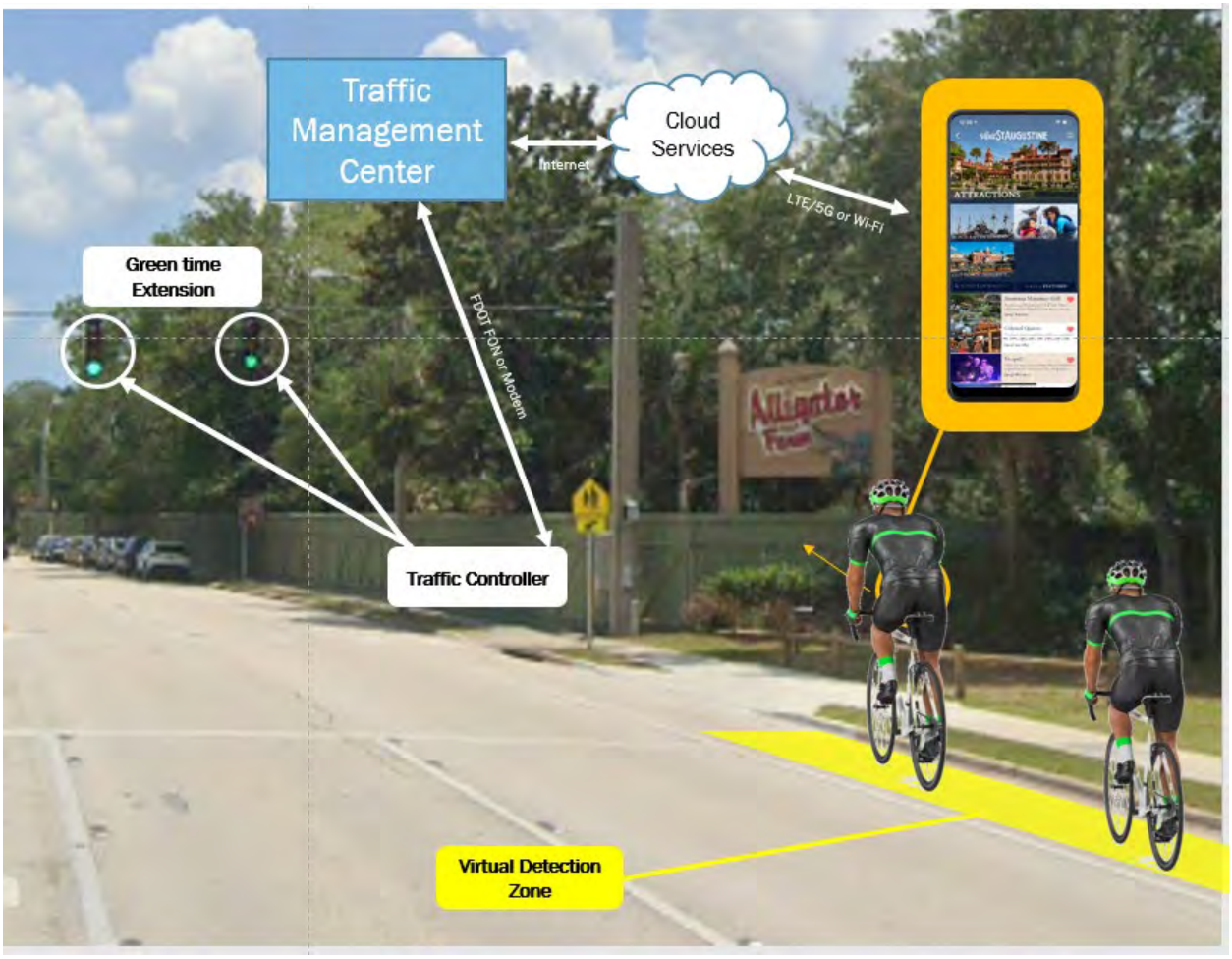


Figure 34. Bicycle Safety App Concept

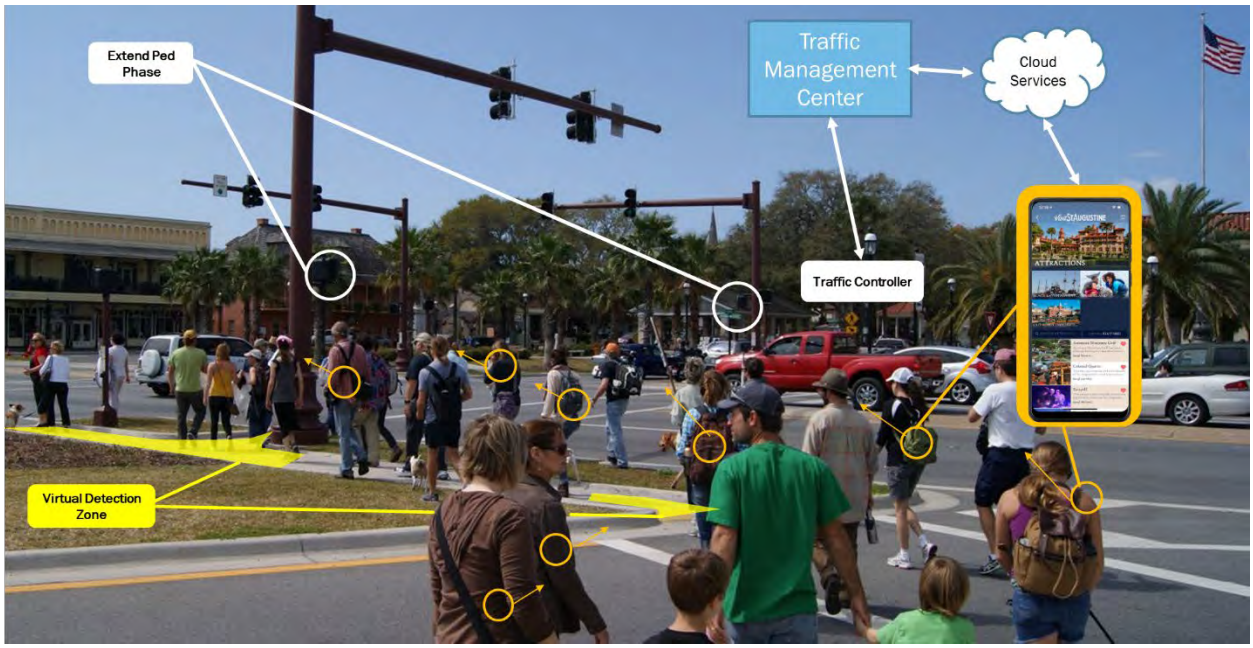


Figure 35. Pedestrian Safety App

7.5.3 Evacuations and Recovery Management

Safe and efficient emergency evacuation needs will be addressed through multiple subsystems related to traffic incident management, RWIS, bridge closure notifications and smart signals.

7.6 Mobility

7.6.1 Smart Signals

RSU for connected vehicles will be deployed at each intersection to improve safety and mobility. SAE J2735 message types will be used for the following:

- Map data
- Signal phase and timings
- Basic safety messages
- Personal safety messages

Advanced Traffic Controllers (ATCs) upgrades are needed at each intersection to accommodate the RSUs and automatic pedestrian detection sensors.

ATSPMs will be collected using the Purdue method.

- Signal condition reports such as: no data, force offs, max outs, low advance detector counts and stuck pedestrian phases
- Time space diagrams and progression performance measures such as arrival on red, red occupancy ratio, and green occupancy ratio
- Pedestrians measures such as actuations and pedestrian delay

Table 15 summarizes the subsystem elements that will be installed at each traffic signal location.

Figure 37 summarizes the connected vehicle systems high-level architecture.

Figure 36 shows the location of each signal.

Adaptive signal control for the traffic signals along US 1B King Street and Cathedral Plan and Avenida Menendez was evaluated as part of this project and is not feasible based. A summary of the analysis is provided in Appendix D.

Table 15. Proposed Signal Improvements

Intersection	ATC Upgrade	Cabinet Upgrade	RSU	Wireless Connection	Automated Pedestrian Detection and Audible Countdown Signals	Smart Lighting
SR A1A Avenida Menendez at SR 16/US 1B Cathedral Place	●		●		●	
SR A1A Avenida Menendez at SR 16/US 1B King Street	●		●		●	
US 1B Cathedral Place at St. George Street	●		●		●	
US 1B Cathedral Place at Cordova Street	●	●	●		●	
US 1B King Street at St. George Street	●	●	●		●	
US 1B King Street at Cordova Street	●	●	●		●	
US 1B King Street at MLK Avenue	●	●	●		●	
US 1B King Street at Riberia Street	●	●	●		●	
US 1B King Street at Malaga Street	●	●	●		●	
US 1 Ponce de Leon Boulevard at King Street	●		●		●	
SR A1A San Marco Avenue at W. Castillo Drive	●		●		●	
SR A1A San Marco Avenue at May Street	●		●		●	
SR A1A San Marco Avenue at San Carlos Avenue	●		●		●	
SR A1A Anastasia Boulevard at Matanzas Boulevard	●		●	●	●	
SR A1A Anastasia Boulevard at RB Hunt Elementary	●		●	●	●	
SR 207 at Old Dixie Highway	●		●		●	
US 1 Old Dixie Highway at SR 207	●		●		●	
US 1 Ponce de Leon Boulevard at Rambla Street	●		●		●	
US 1 Ponce de Leon Boulevard at W Castillo Drive	●		●		●	
US 1 Ponce de Leon Boulevard at SR 16	●		●		●	
US 1 Old Dixie Highway at West San Carlos Avenue	●		●	●	●	
W. King Street at Pellicer Lane	●	●	●	●	●	
SR A1A Avenida Menendez ped. signal at Castillo south	●	●	●	●	●	●
SR A1A Avenida Menendez ped. signal at Castillo north	●	●	●	●	●	●
SR A1A Avenida Menendez ped. signal near Hypolita Street			●	●	●	●
SR A1A Avenida Menendez ped. signal near Treasury Street			●	●	●	●

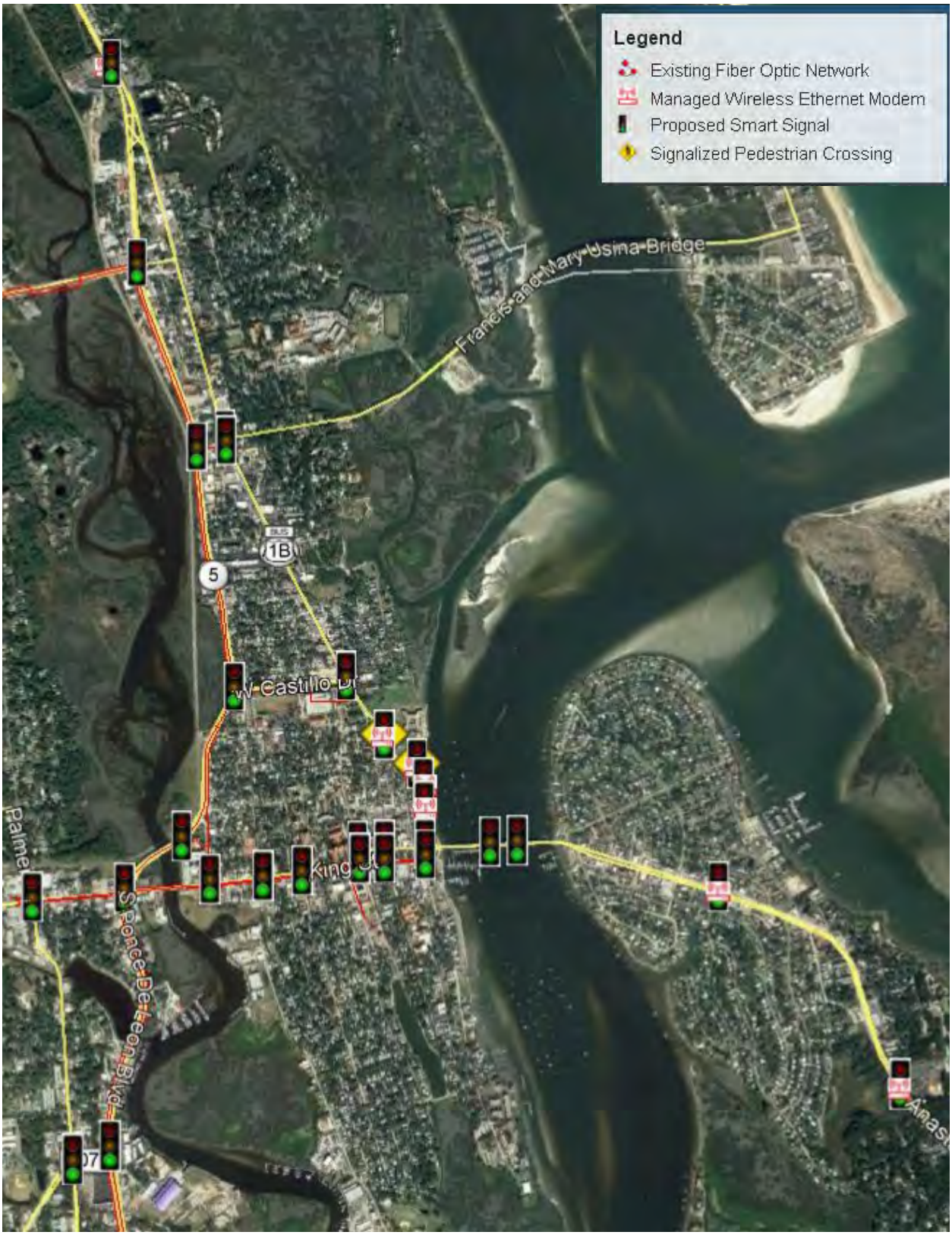


Figure 36. Proposed Smart Signal Deployments

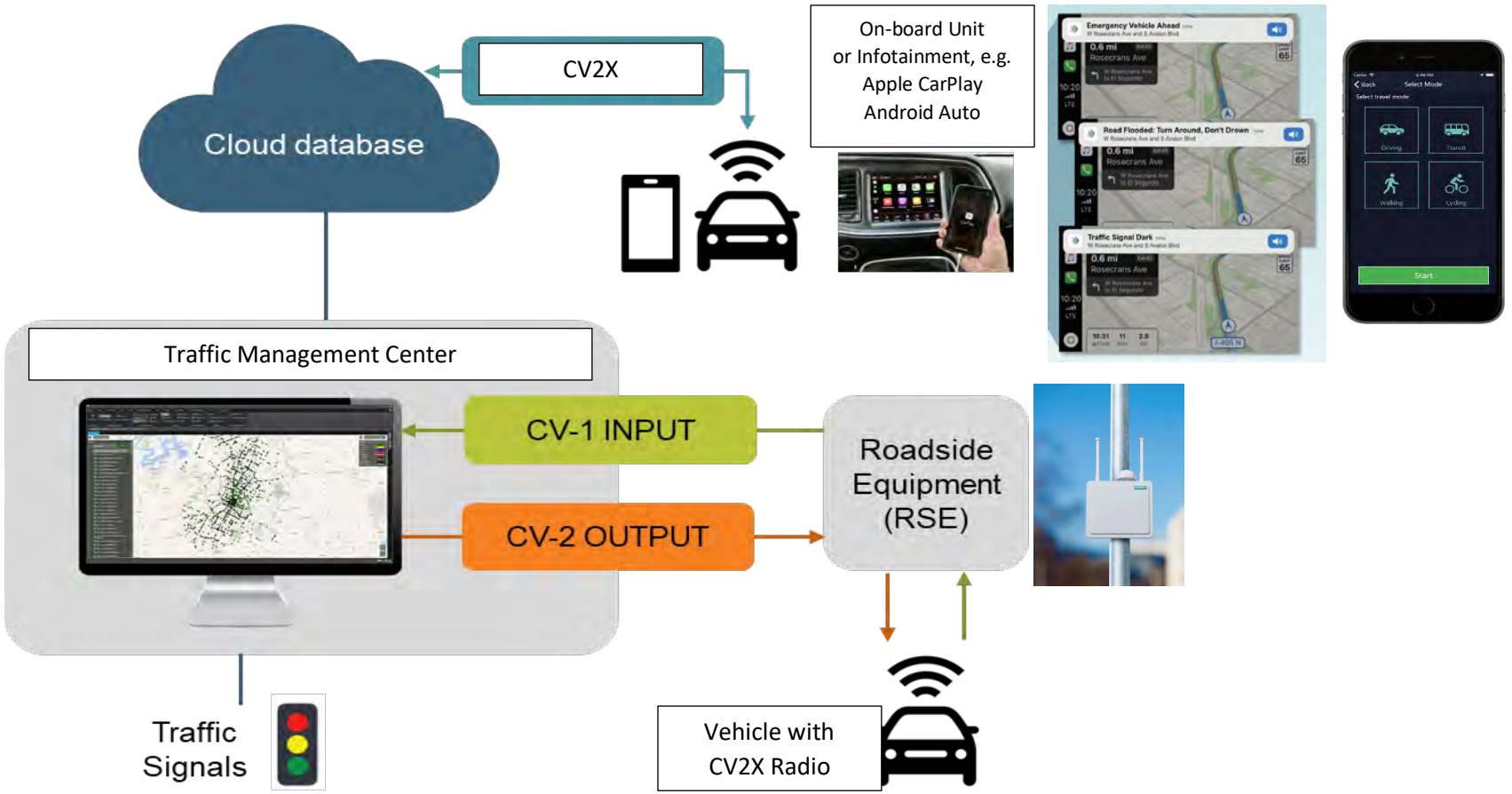


Figure 37. Connected Signals Concept

7.6.2 Roadside Traveler Information Signs

Two types of roadside traveler information signs are proposed: arterial DMS and parking information signs. The proposed locations for the DMS are shown on Figure 38.

Full-color, cantilever mounted, walk-in, arterial DMS with 12-inch character messages are proposed on the state roads. An example of a cantilever mounted DMS is shown in Figure 39. The signs will be installed at the following locations as part of this phase.

- US 1 Dixie Highway northbound, south of SR 312
- SR A1A May Street westbound, west of Hospital Creek Bridge
- US 1 Dixie Highway southbound, north of Lewis Speedway
- SR 16 eastbound, west of FEC/US 1 Dixie Highway
- SR 207 eastbound, west of SR 312
- US 1 Ponce de Leon Boulevard northbound, south of US 1B King Street
- US 1 Ponce de Leon Boulevard southbound, north of US 1B King Street

Parking information signs are proposed as shown on Figure 40. These are static mount panel signs with LED panels displaying the availability of parking spaces or other information. A schematic for the proposed parking information sign in this project is shown on Figure 41. The signs will be installed at these locations:

- US 1 Ponce de Leon Boulevard northbound, south of W. Castillo Street
- US 1 Ponce de Leon Boulevard northbound, south of W. Castillo Street
- SR A1A Avenida Menendez northbound, south of Castillo de San Marcos
- SR A1A Castillo Drive southbound, near Visitor Center
- Granada Street southbound, near City Hall Parking
- Tolomato Parking Lot entrance
- West King Street at future parking garage

Smaller single-post parking availability information signs are proposed at these locations due to the constrained rights of way.

- W. Castillo Dive, eastbound, east of US 1 Ponce de Leon Boulevard (small)
- W. Castillo Dive, westbound, west of SR A1A San Marco Avenue (small)
- Orange Street for Cordova Street northbound travelers (small)
- US 1B Cathedral Place westbound at Cordova Street (small)

Prior to installation, the City Architectural and Historic Review Board review is needed for installation of signs on city streets. Review of signs on state-maintained roadways are exempt from official approval but are still recommended. During preliminary design, removing other signs will be explored to reduce the number of signs within the street environment.

Figure 38. Arterial DMS

Figure 39. Typical Arterial DMS

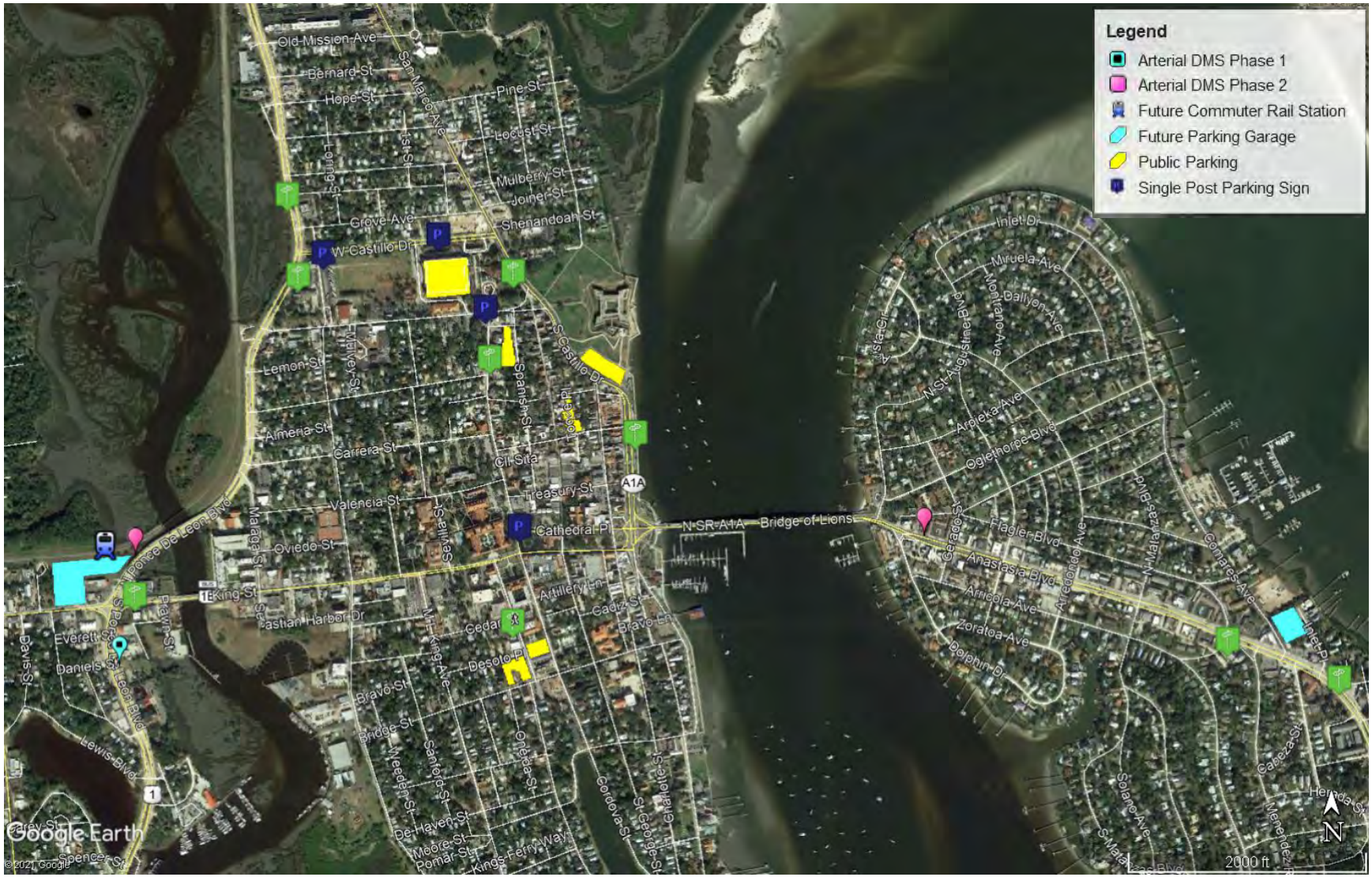


Figure 40. Proposed Parking Information Signs

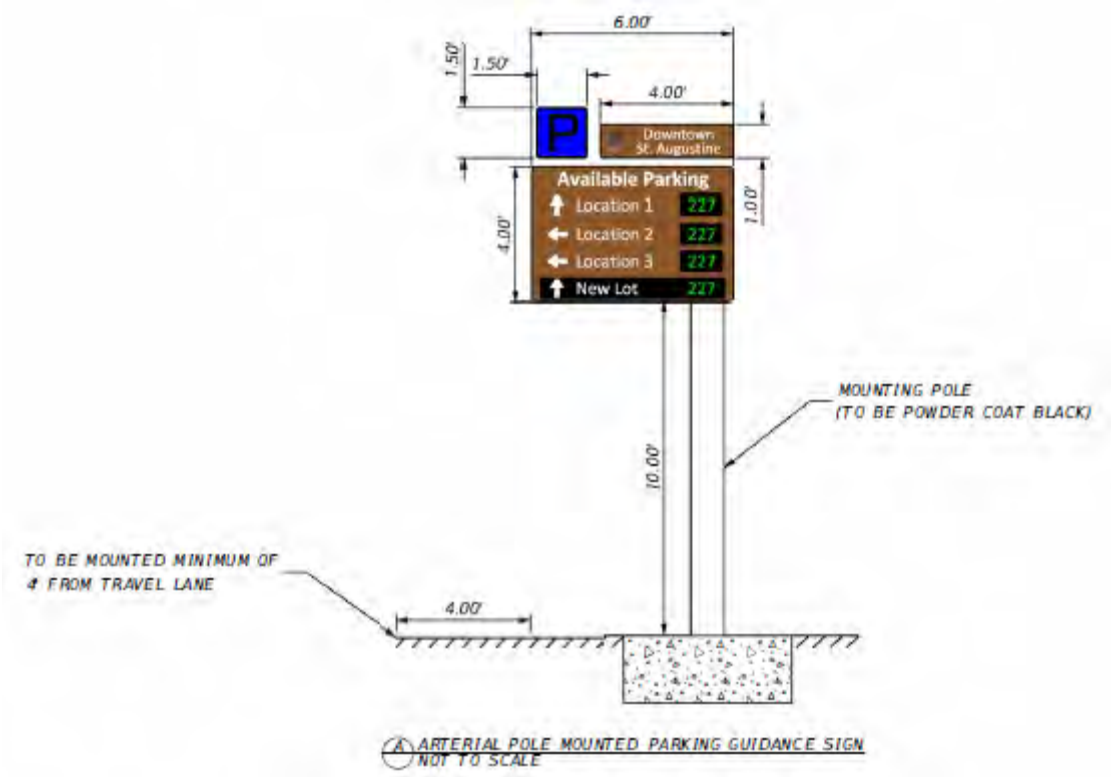


Figure 41. Parking Information Sign

Note: The clear zone requirements are based on the roadway design speed and if curb and gutter are provided. The standards are available in Chapter 215 of the FDOT Design Manual https://www.fdot.gov/roadway/fdm/default.shtm. A minimum of 4-ft is shown for curb and gutter sections with design speeds of 40-45 mph.

Source: ParkLogix™

Figure 42. Single Post Parking Availability Sign

Table 16. Proposed DMS and Parking Sign Locations

No.	Location	Arterial DMS (Traffic, Incidents and Parking)	Parking Information Signs (Space Availability)	Freeway DMS (Traffic and Incidents
1	SR A1A (May Street) westbound at Hospital Creek Bridge	X		
2	US 1 (Dixie Highway) southbound north of Lewis Speedway	X		
3	SR 16 eastbound west of the US 1 Ponce de Leon Boulevard intersection	X		
4	US 1 Ponce de Leon Boulevard northbound south of SR 16 King Street	X		
5	SR 207 eastbound south of SR 312	X		
6	SR A1A (Scenic and Historic Coastal Byway) northbound south of SR 312	X		
	I-95 northbound south of SR 207 (existing)			X
	I-95 southbound north of SR 207 (existing)			X
	I-95 northbound south of SR 16 (existing)			X
	I-95 southbound north of SR 16 (existing)			X
1	Ponce de Leon Boulevard northbound south of West Castillo Drive		X	
2	Ponce de Leon Boulevard southbound north of West Castillo Drive		X	
3	West Castillo Drive westbound west of SR A1A San Marco Avenue		X	
4	Tolomato Parking Lot entrance		X	
5	South entrance to the Castillo de San Marcos National Monument Parking Lot		X	
6	North entrance to the Castillo de San Marcos National Monument Parking Lot		X	
7	Granada Street Public/Private Parking Lots		X	
8	W. Castillo Dive, eastbound, east of US 1 Ponce de Leon Boulevard (small)		X	
9	W. Castillo Dive, westbound, west of SR A1A San Marco Avenue (small)		X	
10	Orange Street for Cordova Street northbound travelers (small)		X	
11	US 1B Cathedral Place westbound at Cordova Street (small)		X	

7.6.3 Historic Downtown Parking Garage Parking Information

This component of the advanced traffic management system will install five closed-circuit television cameras and parking space occupancy sensors for 1,200 spaces in the Historic Downtown Parking Garage.

Figure 43. Historic Downtown Parking Garage

7.6.4 Truck Parking Management System

Because of the City plan near the historic downtown many deliveries are made from on-street parking and hand trucked to restaurants and retail business. A Truck Parking Management Plan was adopted by the City in 2015 that recommended dynamic (by time of day) assignment of truck loading zones before 10 a.m. that then is reverted to vehicle parking. This will ensure the optimum use of the parking since truck parking peaks in the a.m. and vehicle demand peaks in the afternoon.

7.6.5 Parking and Traveler Information Systems App

A parking management system app will be prepared to leverage recently installed license plate reader parking enforcement to collect data on availability and provide enforcement for on-street parking and delivery services during the loading zone available periods. Integrating the parking information will support decision making for traffic management, signal management, the bridge closure notification, special event management and incident management personnel by providing real-time information in the field to direct traffic and respond to incidents.

Information on parking availability from the existing parking management system and the data collected in the Historic Downtown Parking Garage will be integrated and an app will be built with the Visit St. Augustine app to provide parking and traffic information. Figure 8 provides a schematic of the content that can be integrated into the Visit St. Augustine app to create a single portal for all traveler and visitor information. Advertising is currently used to support the costs of the development and maintenance of this app.

Several local agencies developed their own parking apps with payment systems. One of the subsystems proposed in this project is to develop an integrated parking payment app that will be vendor neutral and allow for payment across the region in a single portal. One of the requirements for this app is that it can be embedded in other apps.

Figure 44 shows a schematic of the types of information and alerts that can be provided through the integrated app.

Figure 45 shows how users can “opt-in” for their location services to enable this app.

Figure 46 illustrates a use case when the Amphitheater parking is full and remote parking is required.

This app and the DMS signs will also disseminate information on the potential street flooding using data from the flood sensors discussed in the section on resiliency.

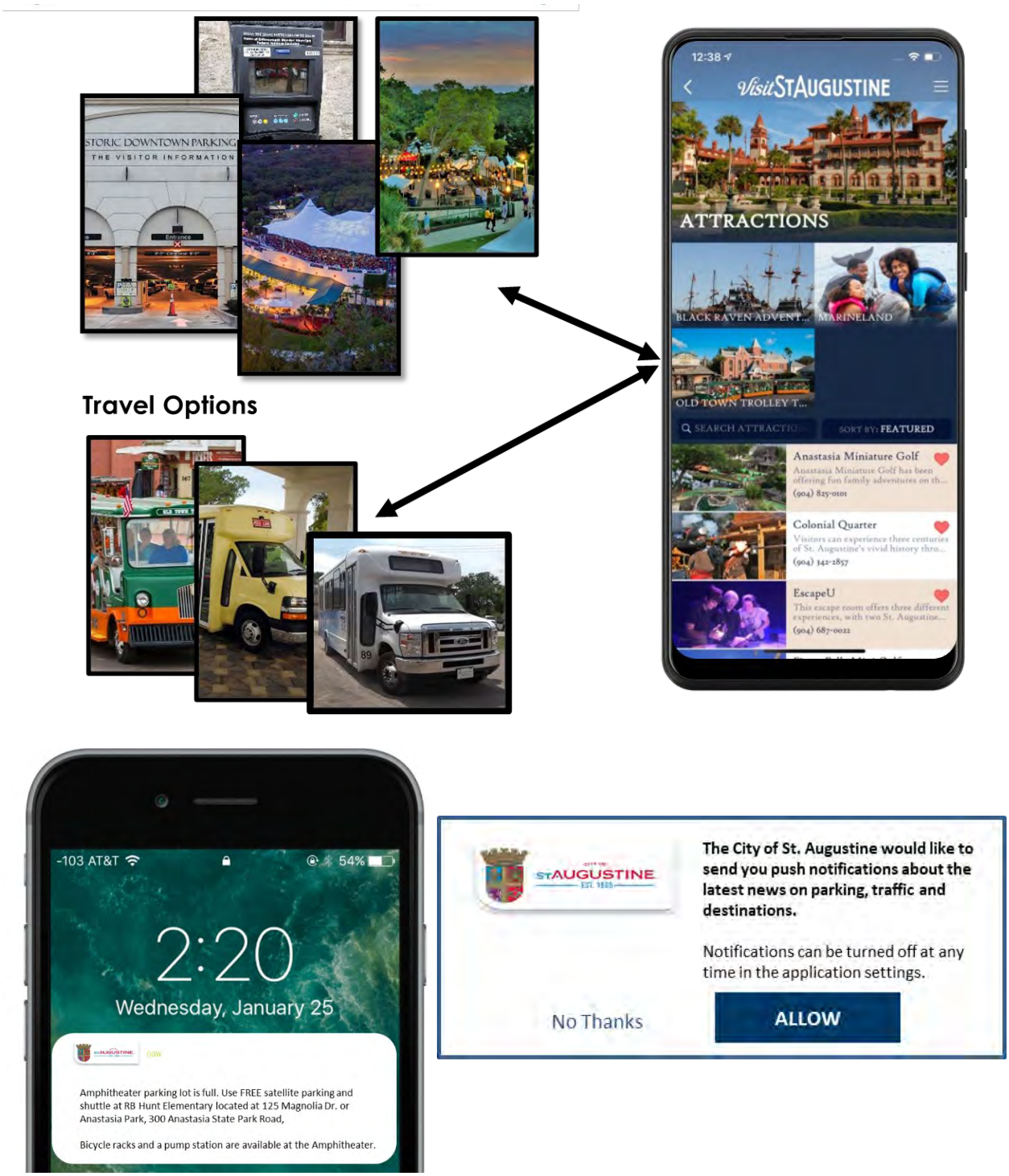


Figure 44. Parking and Traveler Information Map

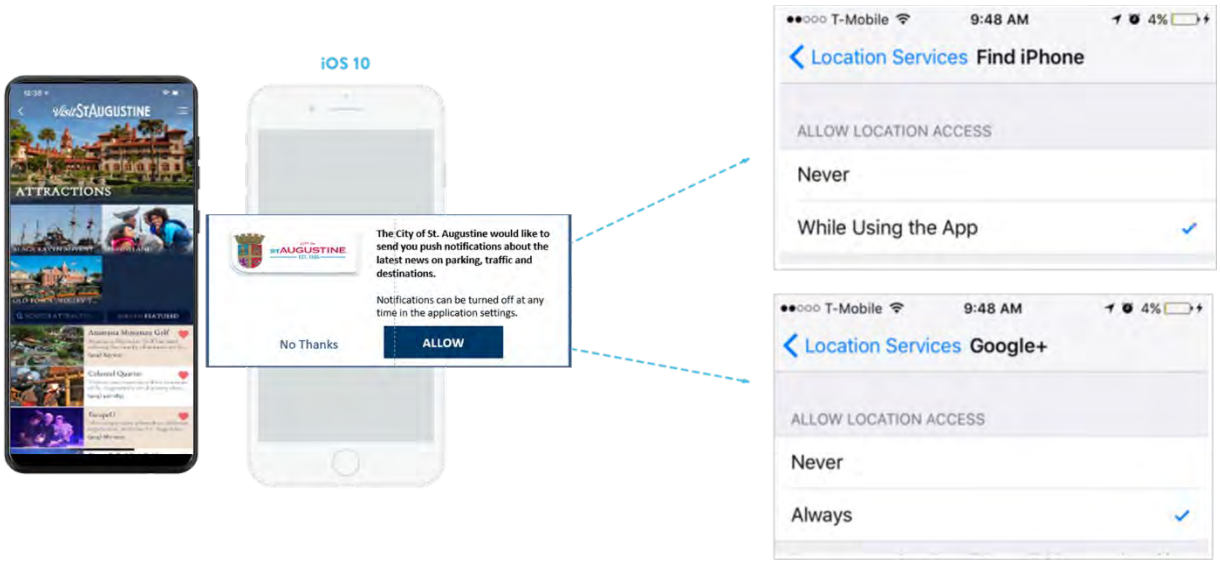


Figure 45. Virtual DMS Location Services "Opt-In"

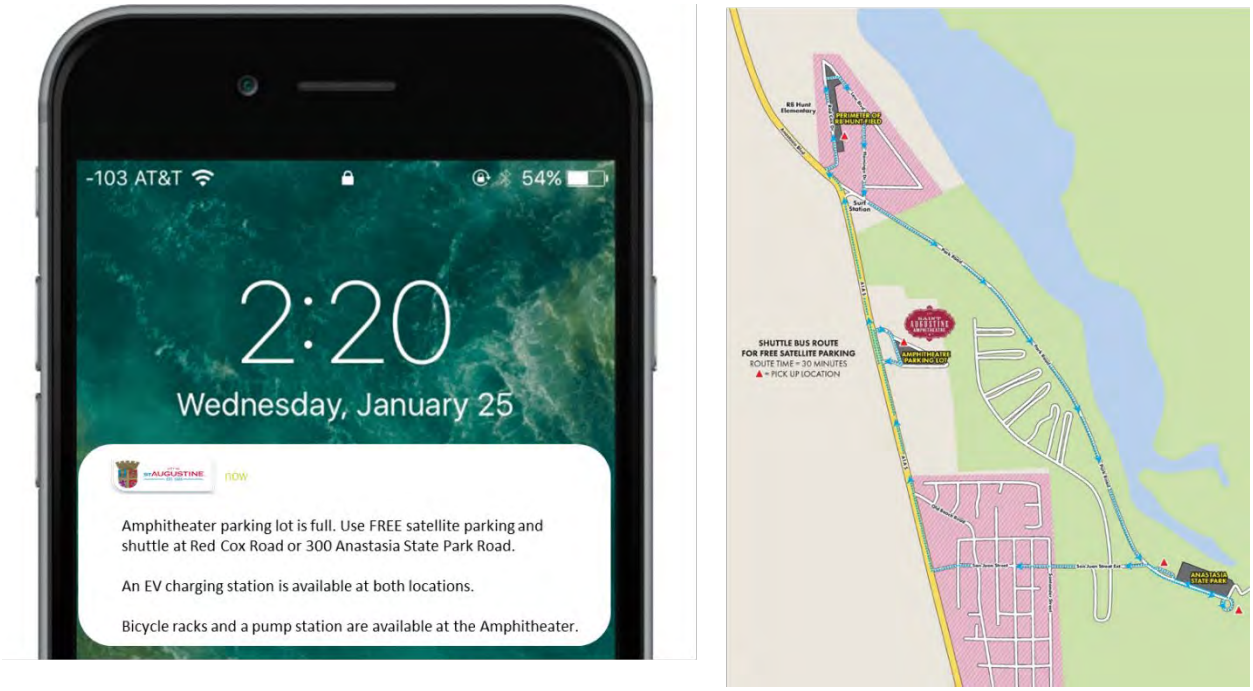


Figure 46. Virtual DMS Amphitheater Parking Use Case

7.6.6 Mobility Hubs

Mobility hubs will be provided that include:

- EV charging stations
- Information kiosks
- Bike racks

The EV charging stations near downtown are in private parking areas and were shown previously on Figure 26.

Providing EV charging stations in public lots and remote parking lots for special events will encourage more EV drivers to visit St. Augustine in lieu of their conventional vehicles by reducing range and availability anxiety.

The following locations are proposed:

- St. Johns County Government Center - Administration
- St. Johns County Government Center - Department of Health
- St. Johns County Government Center - County Courthouse
- Historic Garage
- Castillo de San Marcos Parking Lot (National Park Service coordination needed. If not a *de minimums* impact, this site may be eliminated.)
- Tolomato Lot
- Amphitheater
- Anastasia State Park (Florida Department of Environment coordination is needed. If not a *de minimums* impact, this site may be eliminated.)
- City Hall Parking Lot
- Granada Street Parking Lot
- Hypolita Street Parking Lot
- Flagler Garage

These locations are shown on Figure 47. An inset of the proposed locations near the Spanish Quarter is provided in Figure 48.

Public Wi-Fi service is proposed with access points provided at the Historic Garage, Flagler College Recreation Center, City Hall and the Hypolita Street public parking lot. These locations and the area where Wi-Fi service will be available are shown on Figure 49.

An example of a mobility hub with an EV charging station, bicycle racks and information kiosk is shown in Figure 50.

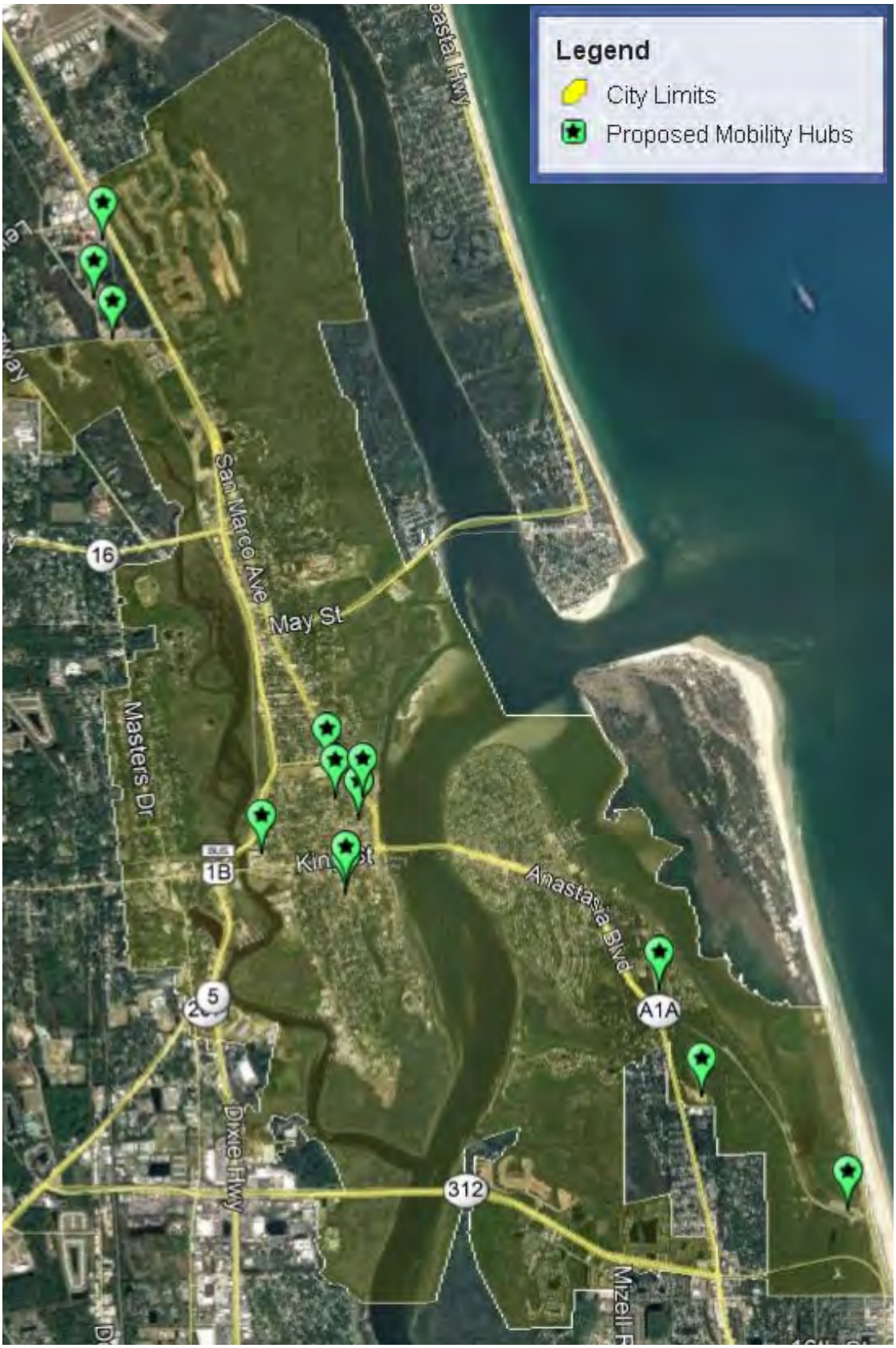


Figure 47. Mobility Hubs

Figure 48. Mobility Hubs Downtown

Figure 49. Public Wi-Fi at Mobility Hubs

Figure 50. Examples of a Mobility Hubs

7.6.7 EAV Shuttle

EAV shuttles have the potential to enhance mobility between the parking garages especially for those who have mobility challenges or are disabled. EAV shuttle vehicles are smaller than conventional paratransit vehicles and consistent with the narrower streets that exist in the City. However, the technology is not mature enough for an early implementation phase. EAV shuttles are considered to address stakeholder roles and responsibilities and to ensure any technologies evaluated may support their deployment in the future. Three alternate routes are under consideration and are shown on Figure 51, Figure 52, and Figure 53.

Table 17 summarizes the characteristics associated with each route option.

7.6.7.1 Option 1

Option 1 travels from the Historic Downtown Parking Garage to King Street and loops along King Street to Sevilla Street before returning to the Historic Downtown Parking Garage. The route is 1.1 miles long. There are five stops:

1. Historic Downtown Parking Garage
2. Spanish Quarter southbound near Hypolita Street
3. Flagler College North
4. Flagler College South
5. Spanish Quarter northbound near Hypolita Street

7.6.7.2 Option 2

Option 2 travels from the Historic Downtown Parking Garage to King Street and then along King Street westbound to Hartstom Street where a future parking garage and commuter rail station is planned. The route then returns to King Street and travels eastbound to Granada Street, eastbound on Bridge Street, then northbound on Cordova Street. It turns right on King Street to St. George Street and then westbound on Cathedral Street to Cordova Street. Once on Cordova Street it returns to the Historic Downtown Parking Garage. The route is 3.1 miles long. There are 12 stops.

1. Historic Downtown Parking Garage
2. Spanish Quarter southbound near Hypolita Street
3. Flagler College southbound
4. San Sebastian at Flagler College Dormitories
5. Hartshorn Street circle
6. San Sebastian eastbound
7. Lightner Museum
8. City Hall
9. Santa Monica
10. St. George (Spanish Quarter South)
11. Flagler College northbound
12. Spanish Quarter northbound

Figure 51. EAV Route Option 1

Figure 52. EAV Route Option 2

Figure 53. EAV Route Option 3

Table 17. AV Route Options

Variable		Option 1	Option 2	Option 3	Unit
Trip Information					
	Round Trip Distance	1.1	3.1	2.5	miles per trip
	Assumed Speed	10	10	10	miles per hour
	Trip time with no stops	6.6	18.6	15	minutes per trip (min)
	Number of Stops	5	12	12	AV stops per trip
	Time at each Stop	1	1	1	minutes per stop
	Trip time with stops (max)	11.6	30.6	27	minutes per trip (max)
	Average trip time	9.1	24.6	21	minutes per trip (avg)
Headway and Number of Running Vehicles					
	Desired Headway	10	10	10	minutes
	Number of running vehicles	2	4	3	vehicles
Actual Speed and Headway					
	Avg Speed with no stops	10.0	10.0	10.0	miles per hour
	Avg Speed with average stops	7.3	7.6	7.1	miles per hour
	Avg Speed with all stops	5.7	6.1	5.6	miles per hour
	Avg Headway with no stops	3.3	4.7	5.0	minutes
	Avg Headway with average stops	4.6	6.2	7.0	minutes
	Avg Headway with all stops	5.8	7.7	9.0	minutes
Service Span					
	Service Start Time	10:00 AM			
	Service End Time	6:00 PM			
	Operational Hours per Day	8	8	8	hours per day
	Total Vehicle Hours per Day	16	32	24	vehicle hours per day
Total Vehicles					
	Battery span for one vehicle	8	8	8	hours
	Operational Vehicles	2	4	3	vehicles

Variable		Option 1	Option 2	Option 3	Unit
	Spare Vehicles	1	1	1	vehicles
	Total Vehicles	3	5	4	vehicles
Operational Days/Hours					
	Operational Days per week	7			days per week
	Operational Days per Year	364			days per year
	Operational Hours per Year	2,912			hours per year
Vehicle-miles Traveled (VMT)					
	Trips per vehicle per day (average)	53	20	23	trips per vehicle per day
	Miles per day (average)	117	62	58	miles per day
	Total VMT per year	42,588	90,272	63,336	miles per year
Electric Consumption					
	Miles per charge	58	61	57	miles per charge per vehicle
	kWH required per charge	33	33	33	kWH per charge
	kWH required per all operation vehicles	66	34	34	kWH per day per vehicle
Concierge Hours					
	On-Board Hours per day	16	32	24	hours per day
	Overhead Hours per day	1	2	1	hours per day
	Concierge Hours per day	17	34	25	hours per day
	Concierge Hours per year	6,115	12,230	9,173	hours per year

7.6.7.3 Option 3

Option 3 travels from the Historic Downtown Parking Garage to King Street and then along King Street westbound where it turns left to Sebastian Harbor Drive and the left on Riberia Street. The route then returns to King Street and travels eastbound to Granada Street, eastbound on Bridge Street, then northbound on Cordova Street. It turns right on King Street to St. George Street and then westbound on Cathedral Street to Cordova Street. Once on Cordova Street it returns to the Historic Downtown Parking Garage. The route is 2.4 miles long. There are 10 stops.

1. Historic Downtown Parking Garage
2. Spanish Quarter southbound near Hypolita Street
3. Flagler College southbound
4. San Sebastian at Flagler College Dormitories
5. Lightner Museum
6. City Hall
7. Santa Monica
8. St. George (Spanish Quarter South)
9. Flagler College northbound
10. Spanish Quarter northbound

The infrastructure needed to support the EAV deployment will include:

- Video surveillance along the route using a private Wi-Fi or cellular services to transmit the video images to the JTA U2C operations center, FDOT Regional Transportation Management Center (and law enforcement through existing communication links), St. Johns County, and City of St. Augustine
- RSUs at each signalized intersection with CV2X communications (included as part of the safety and mobility systems)
- Charging and short-term maintenance facilities (assumes long-term maintenance will be performed at JTA's Jacksonville maintenance facilities)

Solar road panels are also being considered at these locations and are discussed in the sustainability section.

7.7 Sustainable Solutions

7.7.1 Solar Road or Path Pilot

This project proposes the demonstration and testing of a solar road or solar path. The location and type of deployment will be determined based on additional engineering studies.

Solar roads or paths are photoelectric cells imbedded in hardened glass or composite plastic materials that can be driven, cycled, or walked on. Applications being considered in this project include parking lots at mobility hubs to power EV charging stations and sidewalks at the Amphitheater. The proposed mobility hubs were shown on Figure 47. The path surrounding the Amphitheater is shown on Figure 55.

7.7.2 Street Lighting LED Replacement

The City currently maintains 782 streetlights (512 on FDOT roads) and paid $90,437 for electricity in 2020 for these streetlights. Converting to LED bulbs can save up to 50% of power costs and have a similar life span to high-pressure sodium luminaires.

Because of the more uniform spread available from LED streetlights some of the streetlights on City streets may also be removed. Photometric analysis is needed to determine the appropriate location considering the change in luminaires.

7.8 Resilient Communities

7.8.1 Flood Sensors

Flood sensors are proposed at the outfall location for each of the flood pathways identified in a Coastal Vulnerability Assessment for the City prepared by the Florida Department of Environmental Protection.[47] The flood paths are based on more detailed modeling than the Federal Emergency Management Agency "AE flood zones" that estimate the anticipated flooding during 1% events with no sea-level rise. The proposed sensors are shown on Figure 54.

7.8.2 Resiliency Risk Assessments and Data Analytics

The data collected from the flood sensors will be used to improve modeling of the potential impact of sea level rise and to make decisions on investments in infrastructure.

[47] *Florida Department of Environmental Protection, 2016 https://www.citystaug.com/DocumentCenter/View/323/Coastal-Vulnerability-Assessment-PDF?bidId=*

Figure 54. Flood Paths and Proposed Sensors

Figure 55. St. Augustine Amphitheatre

7.9 Mobility for the Underserved

7.9.1 Digital Equity in Underserved Neighborhoods

A digital inclusion initiative is proposed to support St. Augustine's underserved residents with focused Wi-Fi hotspots around schools and throughout the underserved area shown on Figure 56.

A digital architecture modeled on the OakWi-Fi network is proposed. A meshed Wi-Fi network per IEEE 802.11s protocols is proposed.

Meshed network portals where the Wi-Fi network is connected to an internet service provider are proposed at the following locations.

- Crookshank Elementary
- St. Augustine High School
- Sebastian Middle School
- Harris Tower
- Comcast Tower
- Crown Point Tower
- American Tower
- City's Water Treatment Plant

Within the mesh network, redundant connections between each network access point and the base stations are provided. Network access point radios are proposed to be mounted on electric poles within neighborhoods to provide convenient access to power and grounding.

This network will not be connected to the transportation communications network to protect the security of the transportation communication network.

The total area served is approximately 2.3 square-miles.

7.9.2 Shared-vehicle and TNC Incentives

This project includes the development of a partnership with the St. Johns County Council on Aging and Flagler Hospital to provide incentives for members of the medically underserved communities to successfully attend medical appointments.

An incentive will be provided in the form of electronic gift cards or discounts on other services when a patient attends a scheduled appointment. The benefits of this program will be to improve attendance for high-risk populations such as prenatal care, to avoid unneeded emergency room visits, and provide more reliable attendance and revenues for the medical-care provider.

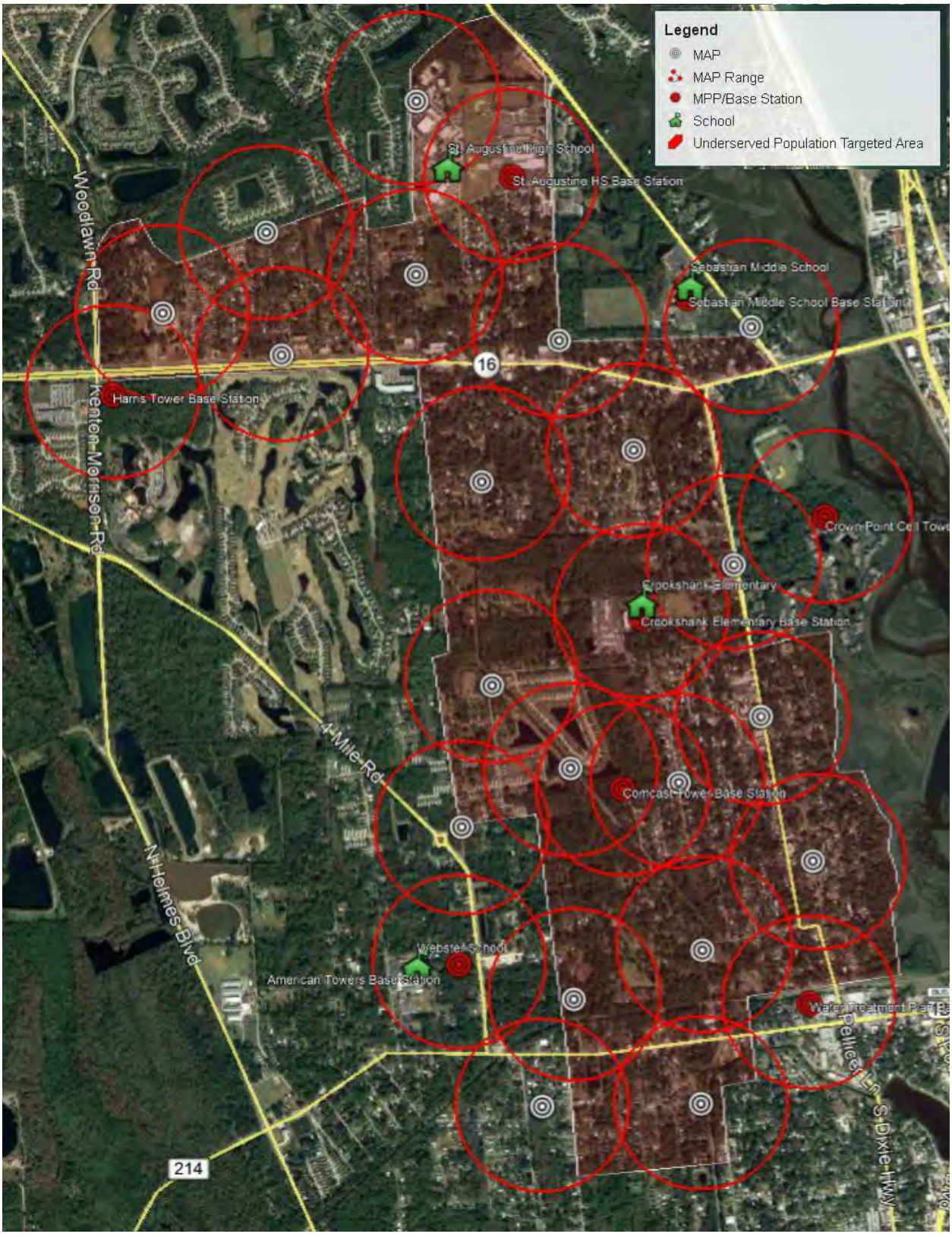


Figure 56. West St. Augustine Wi-Fi

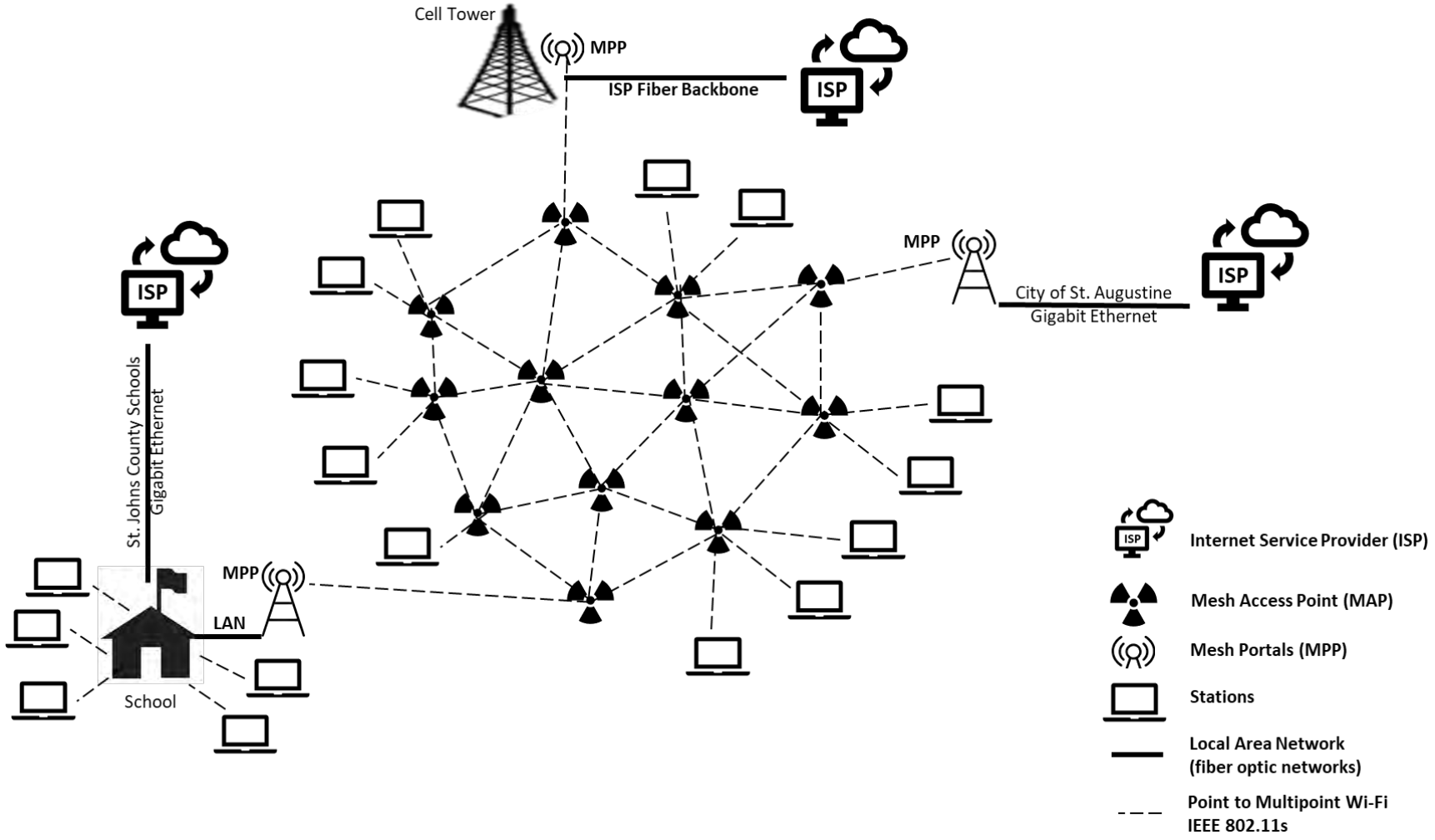


Figure 57. Mesh Wi-Fi Architecture

7.10 Asset Management

7.10.1.1 Smart Waste Management

The City recently completed a Bigbelly Modular Multi-station pilot for smart waste receptacles on St. George Street. Based on the results of the pilot the City may expand this application and service to other areas.

7.10.1.2 Utility Management Systems

This City contemplates the future integration of utility management systems being developed by the City as summarized in Table 12.

7.10.1.3 Pavement Management Systems

The North Florida TPO completed a smart pavement management pilot in 2019 that included a technology evaluation and successfully demonstrated the application of machine-learning video-based pavement condition assessments.

This project proposed to implement a system to assess the pavement condition on an annual basis and to develop predictive analytics and a decision-support system for pavement maintenance and resurfacing program.

7.10.1.4 Integrated Asset Management App

A fully integrated mobile-device enabled asset management is contemplated as part of this project. The timing and requirements for this app will be determined following the completion of utility management systems deployments being performed outside this project.

The concept is for any user to be able to identify and track the condition of all infrastructure in near real-time and for this system to be linked to the work order and customer complaint components of CivicPlus. This will allow the user to be able to coordinate work between multiple disciplines and offices and be responsive to questions for officials or the public.

A concept for this app is provided in Figure 58.

Figure 58. Integrated Asset Management App

7.11 Summary of the Proposed Deployment

Table 18. Summary of Proposed Deployment - Field Devices

Subsystem/Location
Arterial DMS
SR 16 eastbound, east of I-95
SR 16 eastbound, west of FEC/US 1 Dixie Highway
SR 16 westbound, east of I-95
SR 207 DMS to I-95 backbone
SR 207 eastbound, east of I-95
SR 207 eastbound, west of SR 312
SR 207 westbound, east of I-95
SR A1A Anastasia Boulevard from King Street to Historic Downtown Parking Garage
SR A1A Anastasia Boulevard from SR 312 to the Bridge of Lions
SR A1A Anastasia Boulevard northbound, south of Amphitheater
SR A1A Anastasia Boulevard northbound, south of Bridge of Lions
SR A1A Anastasia Boulevard southbound, north of Red Cox Drive (Hamilton Upchurch Neighborhood Park)
SR A1A May Street Arterial DMS to SR A1A San Marco Avenue
SR A1A May Street westbound, west of Hospital Creek Bridge
SR A1A Scenic Highway northbound, south of SR 312
US 1 Dixie Highway northbound, south of SR 312
US 1 Dixie Highway southbound, north of Lewis Speedway
US 1 from San Marco to Lewis Speedway DMS
US 1 Ponce de Leon between SR 16 and Rambla
US 1 Ponce de Leon Boulevard northbound, south of US 1B King Street
US 1 Ponce de Leon Boulevard southbound, north of King Street
US 1 Ponce de Leon from backbone to Parking Information Sign NB at W Castillo Drive
Audible Pedestrian Countdown Signals
SR 207 at Old Dixie Highway
SR A1A at Matanzas Boulevard
SR A1A at RB Hunt Elementary
SR A1A Avenida Menendez at Castillo de San Marco north entrance Signalized Ped Crossing
SR A1A Avenida Menendez at Castillo de San Marco south entrance Signalized Ped Crossing
SR A1A Avenida Menendez at Proposed Signal near Hypolita Street
SR A1A Avenida Menendez at Proposed Signal near Treasury Street
SR A1A Avenida Menendez at SR 16/US 1 Bus Cathedral Place
SR A1A Avenida Menendez at SR 16/US 1 Bus King Street
SR A1A San Marco Avenue at San Carlos Avenue
SR A1A San Marco Avenue at W. Castillo Drive
US 1 at Rambla Street
US 1 at SR 207
US 1 at W Castillo Drive

Subsystem/Location
US 1 Ponce de Leon Boulevard at King Street
US 1B Cathedral Place at Cordova Street
US 1B Cathedral Place at St. George Street
US 1B King Street at Cordova Street
US 1B King Street at Malaga Street
US 1B King Street at MLK Avenue
US 1B King Street at Riberia Street
US 1B King Street at St. George Street
W. King Street at Pellicer Lane
Bridge Closure Notification System
SR A1A Bridge of Lions
Connected Vehicle Controller Upgrades and RSU Installation (448653-1 is funded using TAPS-LA)
SR A1A Avenida Menendez at SR 16/US 1 Bus Cathedral Place
SR A1A Avenida Menendez at SR 16/US 1 Bus King Street
SR A1A San Marco Avenue at W. Castillo Drive
US 1 Ponce de Leon Boulevard at King Street
US 1B Cathedral Place at Cordova Street
US 1B Cathedral Place at St. George Street
US 1B King Street at Cordova Street
US 1B King Street at Malaga Street
US 1B King Street at MLK Avenue
US 1B King Street at Riberia Street
US 1B King Street at St. George Street
Connected Vehicle Controller Upgrades and RSU Installation (Phase 2)
SR 207 at Old Dixie Highway
SR A1A at Matanzas Boulevard
SR A1A at RB Hunt Elementary
SR A1A San Marco Avenue at May Street
SR A1A San Marco Avenue at San Carlos Avenue
US 1 at Rambla Street
US 1 at SR 16
US 1 at SR 207
US 1 at W Castillo Drive
US 1 at West San Carlos Avenue
W. King Street at Pellicer Lane
Flood Detection Sensors for Street Flooding and Resiliency Modeling
1 Luwanna Cir
109 Ferdinand Ave
115 Ferdinand Ave
117 Inlet Drive

Subsystem/Location
123 Ferdinand Ave
157 Inlet Drive
17 Dolphin Dr
181 Inlet Drive
19 Avista Circle
201 Coquina Ave
201 Inlet Drive
207 S. Matanzas Blvd
212 Kenan Street
22 St. Augustine Blvd.
233 S. Matanzas Blvd
35 Dolphin Dr.
36 Coquina Ave
467 Arricola Ave
51 Avista Circle
70 Coquina Ave
81 Dolphin Dr
83/103 Inlet Drive
91 Coquina Ave
Alerto Ditch Outfall
Furnish and Install Devices and Software
SR A1A Avenida Menendez Flood Path
US 1 - Orange Street Flood Path
US 1B King Street Flood Path
Historic Downtown Parking Garage
Parking Garage Sensors and Cameras
LED Street Lighting Conversion
LED Street Lighting Conversion - City
LED Street Lighting Conversion - State
Mobility Hubs
Amphitheater
City Hall Parking Lot
Flagler Garage
Historic Downtown Garage
Hypolita Street Parking Lot
Spanish Street Parking Lot
St. George Street Parking Lot
St. Johns County Government Center - Administration
St. Johns County Government Center - County Courthouse
St. Johns County Government Center - Department of Health

Subsystem/Location
Tolomato Lot
Parking Availability Sensors
Anderson Circle
Aviles Street near Artillery Lane
Carrera Street east of Cordova Street
Charlotte Street near Anderson Circle
Charlotte Street near Cuna Street
Charlotte Street north of Hypolita Street
Cordova near Palm Row
Cordova Street at Artillery Lane
Granada Street between King and Cedar Streets
Granada Street near DeSoto Place
Marine Street near Artillery Lane
Marine Street near Bridge Street
Marine Street south of Cadiz Street
Spanish Street near Tolomato lot
Spanish Street Parking Lot
SR A1A Avenida Menendez Bayfront near Cuna Street
SR A1A Avenida Menendez near Anderson Circle
SR A1A Avenida Menendez near Hypolita Street
SR A1A Avenida Menendez near Treasury Street
SR A1A Avenida Menendez north of Bravo Lane
SR A1A Avenida Menendez south of Bridge Street
SR A1A King Street Circle
The Court near Hypolita Street
Tolomato Lot
Toques Lot
US 1B Cathedral Street west of St. George Street
US 1B King Street between St. George Street and Aviles Street
US 1B King Street east of Aviles Street
US 1B King Street near Cordova Street
US 1B King Street near St. George Street
Valencia Street near Sevilla Street
Parking Information DMS
Cordova Street near Tolomato Parking Lot entrance
Granada Street southbound, near City Hall Parking
Orange Street for Cordova Street northbound travelers (small)
SR A1A Anastasia Boulevard northbound at proposed garage
SR A1A Anastasia Boulevard southbound at proposed garage
SR A1A Avenida Menendez northbound, south of Castillo de San Marcos

Subsystem/Location
SR A1A Castillo Drive southbound, near Visitor Center
US 1 Ponce de Leon Boulevard northbound, south of W. Castillo Street
US 1B Cathedral Place westbound at Cordova Street (small)
W. Castillo Dive, eastbound, east of US 1 Ponce de Leon Boulevard (small)
W. Castillo Dive, westbound, west of SR A1A San Marco Avenue (small)
West King Street at proposed parking garage
Pedestrian Crosswalk Improvements
Avenida Menendez at Marine Street
Malaga Street near Flagler College Dormitories (sensors only)
Riberia Street near Bridge Street (RRFB and sensors)
SR A1A May Street at Magnolia Street (RRFB and sensors)
US 1B King Street at Aviles Street (RRFB and sensors)
Valencia Street near Flagler College RRFB Crossing
Pedestrian Sensors for Automatic Detection at Signalized Crossings
SR A1A Avenida Menendez at Castillo de San Marco north entrance Signalized Ped Crossing
SR A1A Avenida Menendez at Castillo de San Marco south entrance Signalized Ped Crossing
SR A1A Avenida Menendez at Proposed Signal near Hypolita Street
SR A1A Avenida Menendez at Proposed Signal near Treasury Street
Smart Lighting Pilots
Malaga Street near Flagler College Dormitories RRFB Crossing
Riberia Street near Bridge Street RRFB Crossing
Valencia Street near Flagler College RRFB Crossing
Truck Parking Management Devices
Carrera Street east of Cordova Street
Charlotte Street near Anderson Circle
SR A1A Avenida Menendez Bayfront near Cuna Street
SR A1A Avenida Menendez near Anderson Circle
SR A1A Avenida Menendez near Hypolita Street
SR A1A Avenida Menendez near Treasury Street
Tolomato Lot
US 1B Cathedral Street west of St. George Street

Table 19. Summary of Software Components

Software Components
Integrated Data Exchange and Real-time CMD
Integration of Bike/Ped apps into Visit St. Augustine
Machine Learning Pavement Condition Assessments
SunGuide Software Integration
TNC Incentives for Medical Appointments
Integrated Dynamic Loading Zone Parking Management App
Virtual DMS with Geofencing

Table 20. Summary of Communications Components

Software Components
Fiber Optic Network on US 1 Ponce de Leon Boulevard from SR 16 to Lewis Speedway
Fiber Optic Network on SR A1A May Street from Hospital Creek to SR A1A San Marco Avenue
Fiber Optic Network on SR A1A Avenida Menendez from Bridge of Lions to West Castillo Drive
Private FDOT Wi-Fi from Bridge of Lions to SR A1A Avenida Menendez Fiber Optic Access Point
Private FDOT Wi-Fi from Bridge of Lions to SR 312 along SR A1A Anastasia Boulevard

7.12 Benefit Analysis

The SMART St. Augustine project is anticipated to generate $56 million in benefits over its useful life (7 years of operations) as summarized in Table 11. Other benefits could not be quantified based on available case studies and research.

Table 21. Total Benefits (2020$)

Need	Social Benefits	Total Benefits
Safety	Reduction in fatal, injury and PDO crashes for both vehicle and bicycle/pedestrian crashes	$39 million
Congestion Reduction	Reduction in costs associated with congestion including operator time, operating costs and emissions	$17 million
Emission Savings	Decrease in carbon dioxide, volatile organic compounds, particulates and nitrous oxides	$0.2 million
Public Wi-Fi	Unable to quantify costs	-
TOTAL BENEFITS		**$56.2 million**

The benefits are summarized in Appendix E.

8 Concept of Operations

8.1 Operational Policies and Constraints

The City Commission and City Manager have the authority to implement improvements necessary for the public good under the authority of Division 4, Section 2-149 of the City's ordinances.

Operational constraints that may exist, either perceived or actual, will be coordinated between the agencies and a memorandum of understanding may be developed to resolve them and to confirm the roles and responsibilities. This a living document and as individual systems and projects are implemented; the roles and responsibilities will be refined.

8.2 Modes of Operation

Table 22 summarizes the operational scenarios anticipated with each service package and mode of operation.

Table 22. Summary of Modes of Operation

Service Package	Identifier	Mode	Description
		Foundational Activity	
Software integration	SOFTP1	Data Ingestion	Gather data for inclusion in the platform
	SOFTP2	Normalize	Transform the data to meet data standards
	SOFTP3	Archive	Save data for use
	SOFTP4	Monitor	Compiles summary statistic for each mode of operations
	SOFTP5	Report	Use dashboards and other tools to report data
	SOFTP6	Analytics	Use the data analytics to prepare customized reporting for historical, real-time, and predictive analytics
	SOFTP7	Exchange	Shares data in accordance with data governance policies
	SOFTP8	Manage	Defines data governance policies, security, and integrity
Broadband Wi-Fi	BBWIF1	Normal Operations	Normal Operations
	BBWIF2	Limited Service	Reduced availability below coverage or bandwidth requirements
	BBWIF3	Failure Conditions	The system is unusable
	BBWIF4	Maintenance	Service does not meet performance requirements because maintenance is underway
	BBWIF5	Analytics	Real-time data is sent to the Software integration for use
		Improve Safety	
Crosswalk Improvements	CROSW1	Normal Operations	Operate
	CROSW2	Construction	Crossing closed due to construction or maintenance
	CROSW3	Another Event	Crossing closed due to another event such as street flooding or construction work zone
	CROSW4	Analytics	Real-time data is sent to the Software integration for use
Bicycle and Pedestrian Sensors	BPSEN1	Normal Operations - Ped Call	Automatic detection and virtual push button
	BPSEN2	Normal Operations - Green Extension for Bikes	Automatic detection and prediction to extend green time for approach to an intersection
	BPSEN3	Failure Conditions	The system is unusable
	BPSEN4	Construction	Detection zone is closed due to construction or maintenance
	BPSEN5	Another Event	Street is closed due to another event such as street flooding
	BPSEN6	Maintenance	Service does not meet performance requirements because maintenance is underway
	BPSEN6	Analytics	Real-time data is sent to the Software integration for use
Bicycle and Pedestrian Safety App	BPAPP1	Operations	Operate
	BPAPP2	Maintenance	Perform maintenance
	BPAPP3	Analytics	Use the data analytics to prepare customized reporting for historical, real-time, and predictive analytics
Smart Lighting	LIGHT1	Operations	Operate
	LIGHT2	Maintenance	Perform maintenance
	LIGHT3	Analytics	Use the data analytics to prepare customized reporting for historical, real-time, and predictive analytics

Service Package	Identifier	Mode	Description
		Enhance Mobility	
Parking Management System	PARKG1	Monitor	Parking occupancy detected
	PARKG2	Normal Truck Loading Zone Operations	Truck loading zones open before 10 a.m. and after 5 a.m. between 5 and 10 a.m.
	PARKG3	Normal Operations - Reduced Truck Parking Availability	Provide traveler information to route trucks to available loading zones
	PARKG4	Normal Operations – No Truck Parking Availability	Due to loading zones being closed or spaces full. Provide traveler information to route trucks to available loading zones
	PARKG5	Normal Operations – Special Events	Provide traveler information to route trucks to available loading zones
	PARKG6	Normal Parking Operations	Provide traveler information to vehicles to available loading zones
	PARKG7	Normal Operations - Reduced Availability	Due to parking areas being closed or spaced full. Provide traveler information to route vehicles to available parking
	PARKG8	Normal Operations – No Availability	Provide traveler information to vehicles to available parking
	PARKG9	Normal Operations – Special Events	Provide traveler information to vehicles to available parking
	PARKG10	Maintenance	Perform maintenance
	PARKG11	Enforcement	Violations detected
	PARKG12	Violation Notification	Notification of fine sent to vehicle owner
	PARKG13	Collections	Fines collected
	PARKG14	Impound	Vehicle booted or impounded from loading zone for duration or unpaid violations
	PARKG15	Vehicle Released	Vehicle released from boot or impound, and payment received
	PARKG16	Emergency	Emergency conditions where all parking is closed for evacuation or other conditions
	PARKG17	Analytics	Use the data analytics to prepare customized reporting for historical, real-time, and predictive analytics
For-hire Vehicle Management System	FHVMS1	Normal Operation	Normal operation vehicle tracking
	FHVMS2	Failure Conditions	The system is unusable.
	FHVMS5	Maintenance	Service does not meet performance requirements because maintenance is underway
	FHVMS6	Analytics	Real-time data is sent to the Software integration for use
Arterial Dynamic Messaging Signs	ARDMS1	Normal Operations - Weekday Off Peak	Operated by FDOT 8 p.m. to 6 a.m.; 7 p.m. to 6 a.m.
	ARDMS2	Normal Operations - Weekday Peak	Operated by FDOT 6 a.m. to 10 a.m. and 4 p.m. to 7 p.m.
	ARDMS3	Normal Operations - Weekend	Operated by FDOT normal operations weekend
	ARDMS4	Normal Operations - Special Events	Operated by agency other than FDOT during special events
	ARDMS5	Normal Operations - Bridge Closure	Operated by FDOT when bridge closed to traffic
	ARDMS19	Normal Operations - Lane Closure	Operated by FDOT during lane closure caused by construction or incident
	ARDMS6	Limited Service	Reduced availability because of need for maintenance or loss of communications at individual signs
	ARDMS7	Failure Conditions	The system is unusable
	ARDMS8	Maintenance	Service does not meet performance requirements because maintenance is underway
	ARDMS9	Analytics	Real-time data is sent to the Software Integration Planform for use
Virtual Dynamic Message Signs	VDMS1	Monitor	Parking occupancy detected
	VDMS2	Truck Loading Zone Only	Truck loading zones open before 10 a.m. and after 5 a.m. between 5 and 10 a.m.
	VDMS3	Reduced Availability	Provide traveler information to route trucks to available parking spaces
	VDMS4	No Availability	Due to loading zones being closed or spaces full. Provide traveler information to route trucks to available loading zones
	VDMS5	Special Event	Provide traveler information to route trucks to available loading zones

Service Package	Identifier	Mode	Description
	VDMS6	Normal Parking Operations	Provide traveler information to vehicles to available loading zones
	VDMS7	Normal Operations - Reduced Availability	Due to parking areas being closed or spaced full. Provide traveler information to route vehicles to available parking
	VDMS8	Normal Operations – No Availability	Provide traveler information to vehicles to available parking
	VDMS9	Normal Operations – Special Events	Provide traveler information to vehicles to available parking
	VDMS10	Maintenance	Perform maintenance
	VDMS11	Enforcement	Violations detected
	VDMS12	Violation Notification	Notification of fine sent to vehicle owner
	VDMS13	Collections	Fines collected
	VDMS14	Impound	Vehicle booted or impounded from loading zone for duration or unpaid violations
	VDMS15	Vehicle Released	Vehicle released from boot or impound, and payment received
	VDMS16	Emergency	Emergency conditions where all parking is closed for evacuation or other conditions
	VDMS17	Normal Operations - Weekday Off Peak	Operated by FDOT 8 p.m. to 6 a.m.; 7 p.m. to 6 a.m.
	VDMS18	Normal Operations - Weekday Peak	Operated by FDOT 6 a.m. to 10 a.m. and 4 p.m. to 7 p.m.
	VDMS19	Normal Operations - Weekend	Operated by FDOT normal operations weekend
	VDMS21	Normal Operations - Special Events	Operated by agency other than FDOT during special events
	VDMS22	Normal Operations - Bridge Closure	Operated by FDOT when bridge closed to traffic
	VDMS23	Normal Operations - Incident	Operated by FDOT during traffic incident
	VDMS24	Normal Operations - Lane Closure	Operated by FDOT during lane closure caused by construction or incident
	VDMS25	Limited Service	Reduced availability because of need for maintenance or loss of communications at individual signs
	VDMS26	Failure Conditions	The system is unusable
	VDMS27	Maintenance	Service does not meet performance requirements because maintenance is underway
	VDMS28	Analytics	Real-time data is sent to the Software Integration Planform for use
CVE	CV2XE1	Normal Operations - Roadway Obstacle	User need met in accordance with the appropriate standard
	CV2XE2	Normal Operations - Low Visibility	User need met in accordance with the appropriate standard
	CV2XE3	Normal Operations - Forward Collision Warning	User need met in accordance with the appropriate standard
	CV2XE4	Normal Operations - Permitted Left Turn	User need met in accordance with the appropriate standard
	CV2XE5	Normal Operations - Stop Controlled Intersection	User need met in accordance with the appropriate standard
	CV2XE6	Normal Operations - Right-turn on Red	User need met in accordance with the appropriate standard
	CV2XE7	Normal Operations - Blind Spot Warning	User need met in accordance with the appropriate standard
	CV2XE8	Normal Operations - Lane Change Collisions Avoidance	User need met in accordance with the appropriate standard
	CV2XE9	Normal Operations - Transit Signal Priority	User need met in accordance with the appropriate standard
	CV2XE10	Normal Operations - Platooning	User need met in accordance with the appropriate standard
	CV2XE11	Normal Operations - Collect Vehicle Data	User need met in accordance with the appropriate standard
	CV2XE12	Normal Operations - Store Data on Vehicle	User need met in accordance with the appropriate standard
	CV2XE13	Normal Operations - Approaching Yellow Signal	User need met in accordance with the appropriate standard
	CV2XE14	Normal Operations - Approaching Red Signal	User need met in accordance with the appropriate standard
	CV2XE15	Normal Operations - School Zone Warning	User need met in accordance with the appropriate standard
	CV2XE16	Normal Operations - Monitor Vehicle Performance	User need met in accordance with the appropriate standard
	CV2XE17	Normal Operations - On-schedule	User need met in accordance with the appropriate standard

Service Package	Identifier	Mode	Description
	CV2XE18	Normal Operations - Time Synchronization	User need met in accordance with the appropriate standard
	CV2XE19	Normal Operations - Position Data	User need met in accordance with the appropriate standard
	CV2XE20	Normal Operations - Vehicle Cybersecure	User need met in accordance with the appropriate standard
	CV2XE21	Normal Operations - RSU Cybersecure	User need met in accordance with the appropriate standard
	CV2XE22	Normal Operations - Provide Traveler Information	User need met in accordance with the appropriate standard
	CV2XE23	Limited Service - Communications	Reduced availability because of need for maintenance or loss of communications at individual signals
	CV2XE23	Limited Service - Data Quality	Reduced availability because of need for maintenance or loss of communications at individual signals
	CV2XE24	Failure Conditions - Communications	The system is unusable
	CV2XE25	Failure Conditions - Data Quality	The system is unusable
	CV2XE27	Failure Condition - Cybersecurity Breach	The system is unusable
	CV2XE28	Maintenance	Service does not meet performance requirements because maintenance is underway
	CV2XE29	Analytics	Real-time data is sent to the Software Integration Planform for use
ATSPM	ATSPM1	Normal Operations	Normal operations
	ATSPM2	Limited Service	Reduced availability because of need for maintenance or loss of communications at individual signals
	ATSPM3	Failure Conditions	The system is unusable
	ATSPM4	Maintenance	Service does not meet performance requirements because maintenance is underway
	ATSPM5	Analytics	Real-time data is sent to the Software Integration Planform for use
Bridge Closure Notification	BRIDG1	Normal Operations	Normal operations
	BRIDG2	Normal Operations – Bridge Closed to Traffic	Normal operation when bridge is closed to traffic and notification system is activated
	BRIDG3	Limited Service	Reduced availability because of need for maintenance or loss of communications at individual signals
	BRIDG4	Failure Conditions	The system is unusable
	BRIDG5	Maintenance	Service does not meet performance requirements because maintenance is underway
	BRIDG6	Analytics	Real-time data is sent to the Software Integration Planform for use
Smart Kiosk at Mobility Hubs	KIOSK1	Normal Operations - Wi-Fi	Normal operations
	KIOSK2	Normal Operations - Parking Availability	Availability of software described in other services for use
	KIOSK3	Normal Operations - Electric Vehicle Charging Availability	Availability of software described in other services for use
	KIOSK4	Normal Operations - Integrated Trip Planning Availability	Availability of software described in other services for use
	KIOSK5	Normal Operations - Emergency Call Box	Emergency call box with cellular notifications
	KIOSK6	Normal Operations - ADA Accessibility	Meet all ADA requirements, TTL, etc.
	KIOSK7	Normal Operations - Real-time Data Display	Availability of software described in other services
	KIOSK8	Normal Operations - USB Charging	Charging ports for electronic devices
	KIOSK9	Normal Operations - Passenger Loading Zone Locations	Interactive map
	KIOSK10	Normal Operations - Visit St. Augustine Availability	Availability of software described in other services for use
	KIOSK11	Limited Service	Reduced availability because of need for maintenance or loss of communications or partial data availability
	KIOSK12	Failure Conditions	The system is unusable
	KIOSK13	Maintenance	Service does not meet performance requirements because maintenance is underway
	KIOSK14	Analytics	Real-time data is sent to the Software integration for use

Service Package	Identifier	Mode	Description
Integrated Trip Planning App	TRIPA1	Normal Operations - Residents	Normal operations with trips selected by user
	TRIPA2	Normal Operations - Visitors	Normal operations with trips selected by user
	TRIPA3	Normal Operations - Transportation Disadvantaged	Normal operations with trips selected by user
	TRIPA4	Normal Operations - Veterans	Normal operations with trips selected by user
	TRIPA5	Normal Operations - Homeless	Normal operations with trips selected by user
	TRIPA6	Normal Operations - Mobile Users	Normal operations with trips selected by user
	TRIPA7	Normal Operations - Kiosk Users	Normal operations with trips selected by user
	TRIPA8	Normal Operations - Desktop Users	Updates to the resources and other uses
	TRIPA9	Status Changes	Baseline changes to maps, modes, or other information
	TRIPA10	Limited Service	Reduced availability because of need for maintenance or loss of communications or partial data availability
	TRIPA11	Failure Conditions	The system is unusable
	TRIPA12	Maintenance	Service does not meet performance requirements because maintenance is underway
	TRIPA13	Analytics	Real-time data is sent to the Software Integration Planform for use
EAV Shuttles	CASEE1	Normal Operations - Roadway Obstacle	User need met in accordance with the appropriate standard
	CASEE2	Normal Operations - Low Visibility	User need met in accordance with the appropriate standard
	CASEE3	Normal Operations - Forward Collision Warning	User need met in accordance with the appropriate standard
	CASEE4	Normal Operations - Permitted Left Turn	User need met in accordance with the appropriate standard
	CASEE5	Normal Operations - Stop Controlled Intersection	User need met in accordance with the appropriate standard
	CASEE6	Normal Operations - Right-turn on Red	User need met in accordance with the appropriate standard
	CASEE7	Normal Operations - Blind Spot Warning	User need met in accordance with the appropriate standard
	CASEE8	Normal Operations - Lane Change Collisions Avoidance	User need met in accordance with the appropriate standard
	CASEE9	Normal Operations - Transit Signal Priority	User need met in accordance with the appropriate standard
	CASEE10	Normal Operations - Platooning	User need met in accordance with the appropriate standard
	CASEE11	Normal Operations - Collect Vehicle Data	User need met in accordance with the appropriate standard
	CASEE12	Normal Operations - Store Data on Vehicle	User need met in accordance with the appropriate standard
	CASEE13	Normal Operations - Approaching Yellow Signal	User need met in accordance with the appropriate standard
	CASEE14	Normal Operations - Approaching Red Signal	User need met in accordance with the appropriate standard
	CASEE15	Normal Operations - School Zone Warning	User need met in accordance with the appropriate standard
	CASEE16	Normal Operations - Monitor Vehicle Performance	User need met in accordance with the appropriate standard
	CASEE17	Normal Operations - On-schedule	User need met in accordance with the appropriate standard
	CASEE18	Normal Operations - Time Synchronization	User need met in accordance with the appropriate standard
	CASEE19	Normal Operations - Position Data	User need met in accordance with the appropriate standard
	CASEE20	Normal Operations - Vehicle Cybersecure	User need met in accordance with the appropriate standard
	CASEE21	Normal Operations - RSU Cybersecure	User need met in accordance with the appropriate standard
	CASEE22	Normal Operations - Provide Traveler Information	User need met in accordance with the appropriate standard
	CASEE23	Limited Service - Communications	Reduced availability because of need for maintenance or loss of communications at individual signals
	CASEE23	Limited Service - Data Quality	Reduced availability because of need for maintenance or loss of communications at individual signals
	CASEE24	Failure Conditions - Communications	The system is unusable

Service Package	Identifier	Mode	Description
	CASEE25	Failure Conditions - Data Quality	The system is unusable
	CASEE27	Failure Condition - Cybersecurity Breach	The system is unusable
	CASEE28	Maintenance	Service does not meet performance requirements because maintenance is underway
	CASEE29	Analytics	Real-time data is sent to the Software Integration Platform for use
Provide Sustainable Solutions			
Solar Path Pilot	SOLAR1	Normal Operations	Normal operations
	SOLAR2	Limited Service	Reduced availability because of need for maintenance or loss of communications or partial data availability
	SOLAR3	Failure Conditions	The system is unusable
	SOLAR4	Maintenance	Service does not meet performance requirements because maintenance is underway
	SOLAR5	Analytics	Real-time data is sent to the Software Integration Platform for use
Street Light LED Conversion	LEDSL1	Normal Operations	Normal operations
	LEDSL2	Limited Service	Reduced availability because of need for maintenance or loss of communications or partial data availability
	LEDSL3	Failure Conditions	The system is unusable
	LEDSL4	Maintenance	Service does not meet performance requirements because maintenance is underway
	LEDSL5	Analytics	Real-time data is sent to the Software Integration Platform for use
EV Charging	ELECT1	Normal Operations	Normal operations
	ELECT2	Limited Service	Reduced availability because of need for maintenance or loss of communications or partial data availability
	ELECT3	Failure Conditions	The system is unusable
	ELECT4	Maintenance	Service does not meet performance requirements because maintenance is underway
	ELECT5	Analytics	Real-time data is sent to the Software Integration Platform for use
Mobility for the Underserved			
Shared Vehicles	EQUIT1	Normal Operations	Normal operations
	EQUIT2	Limited Service	Reduced availability because of need for maintenance or loss of communications or partial data availability
	EQUIT3	Failure Conditions	The system is unusable
	EQUIT4	Maintenance	Service does not meet performance requirements because maintenance is underway
	EQUIT5	Analytics	Real-time data is sent to the Software Integration Platform for use
TNC Incentives and Subsidies	HEALTH1	Normal Operations	Normal operations
	HEALTH2	Limited Service	Reduced availability because of need for maintenance or loss of communications or partial data availability
	HEALTH3	Failure Conditions	The system is unusable
	HEALTH4	Maintenance	Service does not meet performance requirements because maintenance is underway
	HEALTH5	Analytics	Real-time data is sent to the Software Integration Platform for use
Create Resilient Communities			

Service Package	Identifier	Mode	Description
Street Flood Notification System	FLOOD1	Normal Operations	Normal operations
	FLOOD2	Event Conditions	Flooding imminent detection
	FLOOD3	Limited Service	Reduced availability because of need for maintenance or loss of communications or partial data availability
	FLOOD4	Failure Conditions	The system is unusable
	FLOOD5	Maintenance	Service does not meet performance requirements because maintenance is underway
	FLOOD6	Analytics	Real-time data is sent to the Software Integration Platform for use
Resiliency Data Analytics	RISKA1	Normal Operations	Normal operations
	RISKA2	Limited Service	Reduced availability because of need for maintenance or loss of communications or partial data availability
	RISKA3	Failure Conditions	The system is unusable
	RISKA4	Maintenance	Service does not meet performance requirements because maintenance is underway
	RISKA5	Analytics	Real-time data is sent to the Software Integration Platform for use
Manage Assets and Services			
Smart Waste Management	WASTE1	Normal Operations	Normal operations
	WASTE2	Normal Operations - Request for Special Pickup	Request logged and ticket issued
	WASTE3	Normal Operations - Trash Removal Needed	Need identified through smart receptacle sensors
	WASTE4	Limited Service	Reduced availability because of need for maintenance or loss of communications or partial data availability
	WASTE5	Failure Conditions	The system is unusable
	WASTE6	Maintenance	Service does not meet performance requirements because maintenance is underway
	WASTE7	Analytics	Real-time data is sent to the Software Integration Platform for use
Utility Management Systems	WATER1	Normal Operations	Normal operations
	WATER2	Event Notification	An event occurs requires maintenance
	WATER3	Civic Plus Ticket Issues	A ticket is issued for a work order in Civic Plus
	WATER4	Condition Update	An update to the baseline system is performed based on completion of a project or change in operations
	WATER5	Limited Service	Reduced availability because of need for maintenance or loss of communications or partial data availability
	WATER6	Failure Conditions	The system is unusable
	WATER7	Maintenance	Service does not meet performance requirements because maintenance is underway
	WATER8	Analytics	Real-time data is sent to the Software Integration Platform for use
	SEWER1	Normal Operations	Normal operations
	SEWER2	Event Notification	An event occurs requires maintenance
	SEWER3	Civic Plus Ticket Issued	A ticket is issued for a work order in Civic Plus
	SEWER4	Condition Update	An update to the baseline system is performed based on completion of a project or change in operations
	SEWER5	Limited Service	Reduced availability because of need for maintenance or loss of communications or partial data availability
	SEWER6	Failure Conditions	The system is unusable
	SEWER7	Maintenance	Service does not meet performance requirements because maintenance is underway
	SEWER8	Analytics	Real-time data is sent to the Software Integration Platform for use

Service Package	Identifier	Mode	Description
	ELECT1	Status Change	Notification of an event received from FPL
	ELECT1	Limited Service	Reduced availability because of need for maintenance or loss of communications or partial data availability
	ELECT1	Failure Conditions	The system is unusable
	ELECT1	Maintenance	Service does not meet performance requirements because maintenance is underway
	ELECT1	Analytics	Real-time data is sent to the Software Integration Platform for use
Pavement Management Systems	PAVEM1	Normal Operations - Monitor	Normal operations
	PAVEM2	Normal Operations - Event Detected	An event occurs requires maintenance
	PAVEM3	Normal Operations - Civic Plus Ticket Issued	A ticket is issued for a work order in Civic Plus
	PAVEM3	Normal Operations - Condition Update	An update to the baseline system is performed based on completion of a project or change in operations
	PAVEM4	Limited Service	Reduced availability because of need for maintenance or loss of communications or partial data availability
	PAVEM5	Failure Conditions	The system is unusable
	PAVEM6	Maintenance	Service does not meet performance requirements because maintenance is underway
	PAVEM7	Analytics	Real-time data is sent to the Software Integration Platform for use
Integrated Asset Management App	ASSET1	Normal Operations - Waste Management	Normal Operations - Waste Management
	ASSET2	Normal Operations - Utility Management	Normal Operations - Utility Management
	ASSET3	Normal Operations - Pavement	Normal Operations - Pavement
	ASSET4	Normal Operations - Facilities	Normal Operations - Facilities
	ASSET5	Event Warning - Waste Management	Event warning generated in other subsystem analytics or by app
	ASSET6	Event Warning - Utility Management	Event warning generated in other subsystem analytics or by app
	ASSET7	Event Warning - Pavement	Event warning generated in other subsystem analytics or by app
	ASSET8	Event Warning - Facilities	Event warning generated in other subsystem analytics or by app
	ASSET9	Civic Plus Ticket - Waste Management	Internal work order generated from known need or public request
	ASSET10	Civic Plus Ticket - Utility Management	Internal work order generated from known need or public request
	ASSET11	Civic Plus Ticket - Pavement	Internal work order generated from known need or public request
	ASSET12	Civic Plus Ticket - Facilities	Internal work order generated from known need or public request
	ASSET13	Limited Service	Reduced availability because of need for maintenance or loss of communications or partial data availability
	ASSET14	Failure Conditions	The system is unusable
	ASSET15	Maintenance	Service does not meet performance requirements because maintenance is underway
	ASSET16	Analytics	Real-time data is sent to the Software Integration Platform for use

8.3 Roles and Responsibilities

Table 23 summarizes the major stakeholders' roles in SMART St. Augustine. The following summarizes the major roles and responsibilities of the major stakeholder groups.

8.3.1 Residents

- Experience the benefit of the project as end users.
- Provide input to project definition and feedback through public comment

8.3.2 Business

- Experience the benefit of the project as end users.
- Provide input to project definition and feedback through public comment (residents and businesses)

8.3.3 Visitors

- Experience the benefit of the project as end users.
- Provide input to project definition and feedback through public comment

8.3.4 City of St. Augustine

Owner and operator of the proposed SMART St. Augustine program for systems not defined as the responsibility of other agencies such as infrastructure on the state-maintained roadways.

8.3.4.1 City Commission

Elected officials who govern the City and make final approvals for all policies, ordinances, and rules for the City.

8.3.4.2 Boards and Commissions

Public engagement in policy, ordinance development and code enforcement.

8.3.4.3 City Attorney

Provides legal advice and counsel for the management and administration of the City

8.3.4.4 City Manager

Responsible for the administrative management and delivery of services for the City.

Table 23. Summary of Stakeholder Roles by Project Phase

Stakeholder and Users	User Class Profiles	Advise	Funding	Policy	Systems Engineering	Final Design	Implementation	Operations and Maintenance
Residents	Experience the results of the project as end users.	✓						
Business	Experience the results of the project as end users.	✓						
Visitors	Experience the results of the project as end users.	✓						
City of St. Augustine	Owner and operator of the SMART St. Augustine deployment	✓						
Boards and Commissions	Public engagement in policy, ordinance development and code enforcement	✓		✓	✓			
City Commission	Elected officials who govern the City	✓	✓	✓				
		✓		✓	✓	✓	✓	✓
City Attorney	Provides legal advice and counsel for the management and administration of the City	✓	✓	✓				
City Manager	Responsible for the administrative management and delivery of services for the City. The following Departments report to the City Manager.	✓		✓	✓	✓		
Fire Department	Protects the City from fires and natural disasters, serves as first responders to emergencies and performs enforcement of codes and ordinances.							
Police Department	Enforce laws to promote a positive and peaceful quality of life for citizens and visitors	✓		✓	✓			✓
Finance Department	Responsible for the management of the City financial resources and customer service.	✓		✓	✓			✓
General Services Department	Responsible for the management and operations of the City's facilities, fleets, marinas, information technology and visitor information centers including the City's purchasing office.							
Communications Department	Responsible for the management and distribution of all public information and communications for the City of St. Augustine, including but not limited to press releases, public service videos, social media, website content, and coordinating media interviews. St. Augustine is the only city in the Nation that has a City Archeologist. The position is also the dedicated staff for the Historic Architecture Review Board ensure the City's ordinances are enforced and reviews proposed projects.	✓		✓	✓	✓	✓	✓
Public Works Department	Provides professional services for the planning, design and construction of the City's infrastructure and assets including mobility, parking, HDPF, engineering, development and management support, streets and grounds maintenance and community redevelopment. Operates parking shuttles for remote parking lots when active (currently contract with Elite services).	✓		✓	✓	✓	✓	✓
Utilities Department	Manages and operates the C's utilities including water and wastewater treatment and distribution, stormwater, and solid waste management.	✓		✓				
Human Resources	Oversees compliance with labor law and employment standards, administration of employee benefits, hiring and offboarding.	✓		✓				

Stakeholder and Users	User Class Profiles	Advise	Funding	Policy	Systems Engineering	Final Design	Implementation	Operations and Maintenance
Planning and Building Department	Provides certified professional services for the enforcement of the City's codes relating to the of land and the State of Florida regulations relating to the health, safety, and welfare of residents and visitors of St. Augustine. St. Augustine is the only City in the Nation that has a City Archeologist. The position is also the dedicated staff for the Historic Architecture Review Board ensure the City's ordinances are enforced and reviews proposed projects.	✓		✓				
Information Technology	Manages the City's information technology and communications assets	✓	✓	✓	✓	✓	✓	✓
State of Florida	Governs the state including the administration and enforcement of laws and rules.							
Florida Department of Emergency Management	Manages the state operations and all state resources during emergencies.	✓			✓	✓		✓
FDOT	Partners with the City to plan, design, construct and maintain state roads within the City. Manages and operates the statewide 511 system. Staffs the tender for the Bridge of Lions which activates the bridge closure notification system.	✓	✓	✓	✓	✓	✓	✓
St. Johns County	Partners with the City in the delivery of public services.							
Traffic Operations Department	Responsible for the management and operations of traffic signals on the state and local roads	✓			✓	✓	✓	✓
St. Johns County Sherriff	Enforces laws to promote a positive and peaceful quality of life for citizens and visitors.	✓			✓			✓
Tourist Development Council	Partnering with Visit St. Augustine web site and mobile app.	✓			✓	✓	✓	✓
School Board	Operates the public-school system for Crookshank Elementary School.	✓						✓
St. Johns County Council on Aging	Operates paratransit, The Sunshine Bus Company and Coastal Connection	✓		✓	✓	✓	✓	✓
Florida Highway Patrol	Enforces laws to promote a positive and peaceful quality of life for citizens and visitors	✓			✓			✓
JTA	Operates express, normal, and fixed route bus services that connect to Council on Aging services. Manages and operate EAV systems and commuter rail services.	✓	✓	✓	✓	✓	✓	✓
North Florida TPO	Plans, funds, and coordinates federal transportation funding in Clay, Duval, Nassau, and St. Johns counties. Champion for Smart North Florida.	✓	✓	✓	✓			
Smart North Florida, Inc.	Coordinates the deployment and operations of regional Smart City strategies as a 501(c)(3).	✓		✓				
Press	Partners with public affairs staff to educate and inform the public.	✓						
Contractors/Vendors	Implements the projects as defined in specific scopes of work and project requirements.	✓	✓	✓	✓	✓	✓	✓

8.3.4.5 Fire Department

Protects the City from fires and natural disasters, serves as first responders to emergencies and performs enforcement of codes and ordinances.

- Enforces the laws and ordinances of the state and county
- Coordinates with FDOT, county and FHP on traffic operations
- Coordinates with FDOT, county and FHP on traffic incident management
- Coordinates with FDOT, county and FHP on work zone management
- Coordinates with FDOT, county and FHP on road weather management
- Coordinates with FDOT, county and FHP on first responder needs
- Coordinates with FDOT, county and FHP on special events management
- Has site command and control during some emergency scenarios

8.3.4.6 Police Department

Enforces laws to promote a positive and peaceful quality of life for citizens and visitors.

- Enforces the laws and ordinances of the state and county
- Coordinates with FDOT, county and FHP on traffic operations
- Coordinates with FDOT, county and FHP on traffic incident management
- Coordinates with FDOT, county and FHP on work zone management
- Coordinates with FDOT, county and FHP on road weather management
- Coordinates with FDOT, county and FHP on first responder needs
- Coordinates with FDOT, county and FHP on special events management
- Has site command and control during some emergency scenarios

8.3.4.7 General Services Department

8.3.4.7.1 Purchasing

Acquires goods and services for the City.

- Prepares advertisements
- Administer the procurement process
- Engage stakeholders as appropriate in the evaluation, negotiations, and selection
- Document the negotiations compliance with the advertisement through traceability matrices and internal Procurement protocols
- Prepares final contract documents with terms, conditions, requirements, specifications, and performance management conditions
- Coordinates the review of the final agreement with stakeholders as required
- Executes the agreement

8.3.4.7.2 Information Technology

Manages and operates the City's information technology infrastructure, coordinates with outside vendors and other agencies to implement and maintain systems to support City operations, provides technical assistance to end users by answering questions or troubleshooting issues. Responsible for evaluating the operational efficiency of systems.

- Participates in the systems engineering process
- Serves as the technical advisor in the procurement process for delivery of the project
- Provides technical, constructability and compliance reviews
- May manage the delivery, operations and maintenance of systems or subsystems when directed by the project manager

8.3.4.8 Communications Division

Responsible for the management and distribution of all public information and communications for the City of St. Augustine.

- Serves as the primary point of contact for the media with regards to City government activities
- Develops or approves public information campaigns
- Prepares press releases
- Prepares public service videos
- Manages social media
- Develops website content
- Coordinates media interviews

8.3.4.9 Public Works

8.3.4.9.1 Engineering Department

Provides professional services for the planning, design and construction of the City's infrastructure and assets. Assigns a project manager to serve as the single point of contact for each project.

- Facilitates the coordination of all stakeholders
- Generates and maintains the contact list of all responsible stakeholders
- Shares data that is required to support this effort with stakeholders as appropriate
- Executes agreements documenting the roles and responsibilities of the stakeholders in the design, procurement, operations, and maintenance of the system
- Ensure all federal and state requirements are met
- Manages the systems engineering process in accordance with the Systems Engineering Management Plan
- Manages the project development
    - Prepares preliminary plans and functional requirements for the advertisement
    - Coordinates with utilities to develop preliminary work schedules
    - Completes certifications required as part any agreements with other stakeholders
    - Acquires any right-of-way needed for the project as temporary construction easements or acquisitions before construction can begin
    - Leads the utility coordination process
- Serves as the technical advisor in the procurement process for delivery of the project
- Manages the design performed by the vendor
- Provides technical, constructability and compliance reviews
- Coordinates the reviews of other stakeholders
- Executes utility work schedules prepared by the designer with the utilities

- Ensure the project is designed consistent with the requirements and commitments to stakeholders
- Releases plans for construction
- Manages the construction
- Performs construction engineering and inspection in accordance with the project's approved plans, standards, and specifications
- Coordinates the construction with other stakeholders
- Conducts testing of technologies in accordance with the contract specifications
- Accepts the final construction with concurrence from other stakeholders
- Supervises and monitors the operations
- Shares operational data with other agencies as agreed
- Monitors performance metrics and compliance of the project with requirements
- Partners closely with first responders
- Operates and maintains deployments
- Coordinates with FDOT to acquire licensing for all radios
- Acquires and maintains security credentials

8.3.4.9.2 Stormwater Department

Oversees the management of drainage and stormwater treatment facilities within the City to meet federal and state requirements.

- Participates in the systems engineering process
- Serves as the technical advisor in the procurement process for delivery of the project
- Provides technical, constructability and compliance reviews
- Coordinates the reviews of other stakeholders
- Executes utility work schedules prepared by the designer with the utilities
- Ensure the project is designed consistent with the requirements and commitments to stakeholders
- May manage the delivery, operations and maintenance of systems or subsystems when directed by the project manager

8.3.4.9.3 Mobility Department

Coordinates the multimodal mobility options within the City.

- Participates in the systems engineering process
- Serves as the technical advisor in the procurement process for delivery of the project
- Provides technical, constructability and compliance reviews
- Coordinates the reviews of other stakeholders
- Executes utility work schedules prepared by the designer with the utilities
- Ensure the project is designed consistent with the requirements and commitments to stakeholders
- May manage the delivery, operations and maintenance of systems or subsystems when directed by the project manager

8.3.4.9.4 Parking Department

Manages, operates, and enforces the City's parking infrastructure and ordinances. When delegated the department may:

- Participate in the systems engineering process
- Serve as the technical advisor in the procurement process for delivery of the project
- Provide technical, constructability and compliance reviews
- Coordinate the reviews of other stakeholders
- Ensure the project is designed consistent with the requirements and commitments to stakeholders
- Manage the delivery, operations and maintenance of systems or subsystems when directed by the project manager
- Operate parking shuttles for remote parking lots when active (currently contract with Elite services)

8.3.4.9.5 Streets and Grounds Department

Performs the maintenance of streets and grounds on City property.

- Participates in the systems engineering process
- Serves as the technical advisor in the procurement process for delivery of the project
- Provides technical, constructability and compliance reviews
- Coordinates the reviews of other stakeholders
- Executes utility work schedules prepared by the designer with the utilities
- Ensures the project is designed consistent with the requirements and commitments to stakeholders
- May manage the delivery, operations and maintenance of systems or subsystems when directed by the project manager

8.3.4.10 Utilities Department

8.3.4.10.1 Solid Waste Department

Manages and operates the collection of garbage and solid waste in the City.

- Participates in the systems engineering process
- Serves as the technical advisor in the procurement process for delivery of the project
- Provides technical, constructability and compliance reviews
- Coordinates the reviews of other stakeholders
- Executes utility work schedules prepared by the designer with the utilities
- Ensures the project is designed consistent with the requirements and commitments to stakeholders
- May manage the delivery, operations and maintenance of systems or subsystems when directed by the project manager

8.3.4.10.2 Water and Wastewater Department

Manages and operates the City's potable water, sanitary sewer treatment and wastewater collection systems. Fund the final design of any new utility services needed.

- Participates in the systems engineering process
- Serves as the technical advisor in the procurement process for delivery of the project
- Provides technical, constructability and compliance reviews
- Executes utility work schedules prepared by the designer with the utilities
- Relocates or adjusts utilities as needed for the project in accordance with a utility work schedule
- Ensures the project is designed consistent with the requirements and commitments to stakeholders
- May manage the delivery, operations and maintenance of systems or subsystems when directed by the project manager

8.3.4.10.3 Planning and Building

Provides certified professional services for the enforcement of the City's codes relating land within the city and State of Florida regulations.

- Participates in the systems engineering process
- Serves as the technical advisor in the procurement process for delivery of the project
- Provides technical, constructability and compliance reviews
- May manage the delivery, operations and maintenance of systems or subsystems when directed by the project manager

8.3.5 State of Florida

Governs the state include the administration and enforcement of laws and rules.

8.3.5.1 Florida Department of Emergency Management

Manages the state operations and resources during states of emergency.

8.3.5.2 FDOT

Partners with the City to plan, design, construct and maintain state roads within the City.

- Administers the state funding for the TAPS-LA grant, Local Agency Program (LAP) and other distributions of state or federal funding
- Participates in the systems engineering process by reviewing systems engineering documents
- Reviews and approves all plans, specifications and engineering estimates associated with projects on state roads or projects funded with state or federal programs
- Provides final acceptance for all projects on state roads or projects funded with state or federal programs
- Assists in the monitoring of operations for special events
- Assists in the performance evaluation of the vendor
- Utilizes communication links provided by the City and St. Johns County to provide operations support from the Regional Transportation Management Center with SunGuide™ and ATMS.NOW.
- Allows City to have secondary operations control of dynamic message signs when approved
- Provides secondary operations of the City's traffic signal system

- Coordinates with the City's Fire and Police departments on operations and emergency response
- Coordinates with the St. Johns County Sherriff's Office on operations and emergency response
- Coordinate with the St. Johns County Fire and Rescue Department on operations and emergency response
- Coordinates with Florida Highway Patrol on operations and emergency response
- Coordinates with the State Emergency Operations Center during "states of emergency"
- Staffs the Bridge of Lions bridge tender and provides notifications for the bridge closure notification system

8.3.6 St. Johns County

8.3.6.1 County Commission

Elected officials who govern the City and make final approvals for all policies, ordinances, and rules for the City.

8.3.6.2 County Manager and County Commission

Partners with the City in the delivery of public services.

8.3.6.3 Traffic Operations Division

Regulates, installs, and maintains street markings, signs, signals, and other vehicular and pedestrian traffic control devices on City-owned roadways. Through an agreement with the FDOT, the division also maintains traffic signals on state-owned roadways.

- Participates in the systems engineering process
- Reviews and approves alternate signal timing plans
- Assists in the final acceptance of all communications and roadside technology infrastructure improvements
- Integrates new traffic signal controllers and software into the traffic management center
- Assists in the monitoring of operations
- Adjusts and modifies traffic signal timing based on traffic demand
- Communicates with the FDOT Regional Transportation Management Center
- Coordinates with the St. Johns County Sherriff's Office for operations and emergency dispatch
- Coordinates with the Florida Highway Patrol for operations and emergency dispatch
- Monitors the use of traffic signal controllers, cabinets, signal poles and fiber optic networks for signal interconnect
- Assists in the monitoring of maintenance of the systems
- Assists in managing remote parking operations when County facilities are used

8.3.6.4 St. Johns County Council on Aging

- Manages paratransit services in the county
- Operates The Sunshine Bus Company
- Manages Coastal Transportation Services that provides private charter services
- Provides traveler information for route planning and on-time arrival
- Coordinates with the City for operations and emergency management
- Coordinates with the St. Johns County Sherriff's Office for operations and emergency management

- Coordinates with the Florida Highway Patrol for operations and emergency management
- Coordinates with JTA for operations and emergency management

8.3.6.5 St. Johns County Sherriff

Enforces laws to promote a positive and peaceful quality of life for citizens and visitors.

- Enforces the laws and ordinances of the state and county
- Coordinates with City and county staff on traffic operations capitalize County consistently when referring to gov agency
- Coordinates with City and county staff on traffic incident management
- Coordinates with City and county staff on work zone management
- Coordinates with City and county staff on road weather management
- Coordinates with City and county staff for first responder needs
- Coordinates with City and county staff for special events management
- Has site command and control during some emergency scenarios
- Coordinates community programs
    - Operation Medicine Cabinet
    - Community Watch Partners
    - Safe Trak/C.A.R.E
    - Safety Information
    - Victims Advocacy
    - Youth Services
    - Cuddly Care
    - Retirees

8.3.6.6 School Board

The school board operates the schools in St. Johns County.

- Provides access for the installation of the public Wi-Fi MPPs at
    - Crookshank Elementary School
    - Sebastian Middle School
    - St. Augustine High School
- Provides connections to an ISP at each school
- Coordinates the Public Wi-Fi access for the underserved

8.3.7 Florida Highway Patrol

Enforces laws to promote a positive and peaceful quality of life for citizens and visitors.

- Coordinates with City and county staff on traffic operations
- Coordinates with City and county staff for first responder needs
- Coordinates with City and county staff for special events management
- Has site command and control during some emergency scenarios

8.3.8 JTA

JTA operates express, regular bus service and on-demand services in Duval County and paratransit for the disabled and elderly in Duval and Clay County. Six of The Sunshine Bus Company routes connect to the JTA services at the Avenues Mall. JTA also provides the St. Johns Express Select service.

- Provides traveler information for route planning and on-time arrival
- Coordinates with the City for operations and emergency management
- Coordinates with the St. Johns County Sherriff's Office for operations and emergency management
- Coordinates with the Florida Highway Patrol for operations and emergency management
- Coordinates with Council on Aging for operations and emergency management services related to paratransit, transportation for the disadvantaged and The Sunshine Bus Company
- Provides connections from The Sunshine Bus Company at Avenues Walk to service in Jacksonville and operates the St. Johns Express Select service.
- Operates and maintains EAV systems

8.3.9 North Florida TPO

Plans, funds, and coordinates federal transportation funding in Clay, Duval, Nassau, and St. Johns counties.

- Serves as a champion for Smart North Florida.
- Participates in the systems engineering process by reviewing SE documents in accordance with FHWA Rule 940
- Programs the federal funds deployed for this project in the North Florida TPO's TIP, UPWP and LRTP per federal and state statutes
- Coordinates the planning and funding schedules for Smart North Florida initiatives.
- Engage all stakeholders in the North Florida TPO-developed integrated data exchange and congestion management dashboard for sharing information across agencies in the coalition

8.3.10 Smart North Florida, Inc.

501(c)3 organization that coordinates the deployment and operations of regional Smart City strategies. Its role and responsibilities are to be determined as a new organization.

8.3.11 Press

Partners with public affairs staff to educate and inform the public.

8.3.12 Contractors and Vendors

Implements the projects as defined in specific scopes of work and project requirements to be defined later in this project.

8.3.13 Summary

Table 24 summarizes each stakeholders role by project component.

Table 24. Summary of Stakeholders' Roles by Project Component

Systems	City Commissions	Boards and Committees	City Manager	City Archeologist	City Attorney	Communications	Planning and Building	Fire	Police	Engineering	Stormwater	Mobility	Parking	Streets and Grounds	Solid Waste	Water and Wastewater	Purchasing	Information Technology	Visit St. Augustine	FDEM	FDOT	St. Johns County	St. Johns County Council on Aging	JTA	North Florida TPO
Foundational Activities																									
Preserve the Historic and Architectural Character of St. Augustine		✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓				✓		✓	✓	✓
Software integration			✓				✓			✓	✓	✓	✓	✓	✓	✓	✓				✓		✓	✓	✓
Broadband Wi-Fi			✓		✓	✓	✓	✓	✓	✓		✓					✓	✓	✓				✓	✓	✓
Improve Safety																									
Crosswalk Improvements			✓	✓						✓		✓					✓								
Bicycle and Pedestrian Sensors			✓							✓		✓					✓					✓			
Bicycle and Pedestrian Safety App			✓							✓		✓					✓	✓	✓						
Smart Lighting			✓							✓		✓					✓	✓	✓						
Enhance Mobility																									
Truck Parking Management System			✓						✓	✓		✓	✓				✓								
For-Hire Vehicle Management System			✓							✓		✓					✓								
Arterial Dynamic Messaging Signs			✓							✓		✓					✓				✓	✓	✓	✓	
Parking Dynamic Message Signs on Local Roads			✓							✓		✓					✓				✓	✓	✓	✓	
Virtual Dynamic Message Signs			✓							✓		✓					✓	✓	✓		✓	✓	✓	✓	
Smart and Connected Signals			✓							✓		✓					✓	✓	✓		✓	✓	✓	✓	
Advanced Signal Performance Measures and Real-time Condition Monitoring			✓							✓		✓					✓				✓	✓	✓	✓	
Bridge Closure Notification System			✓							✓		✓					✓	✓	✓		✓	✓	✓	✓	
EAV Shuttle			✓							✓		✓					✓	✓	✓		✓	✓	✓	✓	
Smart Kiosk			✓							✓		✓					✓	✓	✓						
Integrated Trip Planning App			✓							✓		✓					✓	✓	✓		✓	✓	✓	✓	
Provide Sustainable Solutions																									
Solar Path Pilot			✓							✓							✓								
Streetlight LED Replacement			✓							✓							✓								
Electric Vehicle Charging Stations		✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓			✓	✓	✓						
Provide Ladders of Opportunity																									
Shared-vehicle Incentives			✓							✓							✓								
Digital Equity in Underserved Neighborhoods			✓							✓							✓	✓							
Transportation Network Companies and Health Care Provider Partnerships			✓							✓							✓	✓							
Create Resilient Communities																									
Stormwater Sensors and Monitoring			✓								✓						✓	✓							
Street Flood Notification System			✓								✓						✓	✓							
Resiliency Risk Assessments and Data Analytics			✓								✓						✓								
Manage Assets and Services																									
Smart Waste Management			✓											✓	✓		✓	✓				✓			
Utility Management Systems			✓											✓		✓	✓	✓				✓			
Pavement Management Systems			✓							✓			✓	✓			✓	✓				✓			
Integrated Asset Management App			✓											✓	✓	✓	✓	✓				✓			

8.4 Assumptions and Constraints

The needs, issues, problems, objectives, and support environment within the community are:

- City of St. Augustine Strategic Plan
- St. Augustine Mobility Institute
- St. Augustine Smart Parking Management Plan
- Bridge of Lions Traffic Diversion Plan
- St. Augustine For-hire Vehicle Study
- Smart North Florida Master Plan
- Smart Parking Concept of Operations and Regional ITS Architecture Update
- Smart Parking Pilot deployment review

The project will need to be fully vetted with each of the stakeholders to achieve consensus on the roles and responsibilities, operational scenarios, and the concepts for the deployment. Since SMART St. Augustine will be deployed in phases, this is a living document that will need to be updated with each phase to ensure it reflects the needs, support environment and solutions available at that time. SMART St. Augustine will be deployed in phases in a way to avoid conflicts and unnecessary costs for implementation of future phases.

8.4.1 Support Environment

The support environment for this project involves many stakeholders who each have a role in the successful deployment of SMART St. Augustine. The requires coordination and monitoring to ensure each stakeholder is an active participant in their roles and responsibilities as outlined in this section.

8.4.2 Relationship Agreements Needed

Coordination with several external stakeholders are needed to implement this project. The needed coordination or formal agreements are summarized in Table 25. The existing maintenance agreements are provided in Appendix

Table 25. Stakeholder Agreements Needed with the City

Stakeholder	Coordination	Status

Visit St. Augustine app	Develop a public-private partnership to deploy an integrated parking and traffic information app with embedded bicycle and pedestrian location services. A model agreement for FDOT sharing of traveler information is provided in Appendix A. Form 750-04-003.	Coordination ongoing
Wi-Fi WPP Locations	Lease of access to towers and ISP for the public Wi-Fi. A model agreement for FDOT use of a tower is provided in Appendix A. Form 750-04-001.	Deferred until funding is available
St. Johns County - School Board and Fire/Rescue	Locate public Wi-Fi WPP access points, connect to ISP and management of the Wi-Fi access for students in the underserved areas. A model agreement for FDOT use of a tower is provided in Appendix A. Form 750-04-001.	Deferred until funding is available
FDOT	Funding, local agency program, data sharing, property agreements, and operations and maintenance agreements. https://www.fdot.gov/programmanagement/lap/default.shtm	Deferred until funding is available
Flagler College	Locating equipment on Flagler College properties for the Public Wi-Fi. A model agreement for FDOT use of a tower is provided in Appendix A. Form 750-04-001.	Deferred until funding is available
Flagler Hospital	Medical appointment incentives participation and commitments.	Deferred until funding is available
JTA	Coordinate TNC services to underserved, incentives for medical appointments at Flagler College, and integrated trip planning app with services in Duval County	Deferred until funding is available
St. Johns Council on Aging	Coordination of The Sunshine Bus and Paratransit service information in the integrated trip planning app.	Deferred until funding is available
United Way	Integration of services for the underserved in the 211 services.	Deferred until funding is available
EV Charging Station Provider	For coordination on placement, operations and maintenance	Deferred until funding is available
North Florida TPO	Funding and data sharing	Deferred until funding is available
Smart North Florida	Data sharing	Ongoing

9 Project Evaluation and Data Management Plan

This project evaluation plan was prepared consistent with the requirements of the Evaluation Methods and Techniques: Advanced Transportation and Congestion Management for the Technologies Deployment Program associated with Advanced Transportation Congestion Management Technologies Deployment (ATCMTD) Program grant projects.[48]

9.1 Goals, Objectives and Performance Measures

Section 6 enumerates the goals and objectives for this project. Table 26 summarizes the performance measures identified for this project. These measures are consistent the ATCMTD program objectives.

Table 26. Performance Measures

Goal	Performance Measure and Benchmark
Improve Safety – provide a safer transportation network to work toward a goal of zero deaths.	• Reduce bicycle and pedestrian fatal and serious injury crashes by 25% • Reduce property-damage only bicycle and pedestrian crashes by 25% • Reduce all vehicular crashes by 5%
Enhance Mobility – provide mobility options that reduce travel times, improve reliability, and meet the needs of the residents and six million visitors to St. Augustine each year.[49]	• Reduce congestion by 8% from smart parking and traveler information systems • Reduce congestion by 2% from signalization and CVE systems • Reduce congestion by 0.5% by implementing the bridge closure notification system and flood detection sensors • Improve on-time reliability by 5%
Provide Sustainable Solutions – reduce greenhouse gas emissions through more effective mobility options, waste management, energy efficiency and green energy.	• Reduce the City's carbon footprint based on the delay reduction from mobility improvements[50] • Increase EV use by providing public charging stations at mobility hubs
Provide Ladders of Opportunity – provide multi-modal options that are accessible, reliable, and affordable for individuals with varied needs.	• Achieve 95% reliable internet accessibility for underserved populations in target areas • Implement subsidies for TNC use • Implement incentives for attending scheduled medical appointments at Flagler Hospital

[48] *https://ops.fhwa.dot.gov/publications/fhwahop19053/fhwahop19053.pdf*

[49] *Since the number of visitors are likely to increase over time the benefits evaluation are based on an index of growth in visitors (%) times the baseline congestion costs.*

[50] *The cost of carbon emissions is included in the congestion reduction benefits.*

Goal	Performance Measure and Benchmark
Grow North Florida – leverage smart community strategies and tactics that encourage commerce and present business opportunities.	• Grow the cities domestic product by 5% attracting and retaining more visitors • The availability of information to visitors as part of satisfaction surveys for residents and achieve 85% satisfaction • Number of hits on the traveler information app inclusive of the kiosks provided at mobility hubs
Create Resilient Communities – provide strategic technologies that support resiliency strategies adopted in the City's resilience master plan: Resilient Heritage in the Nation's Oldest City .	• Use new sensors to improve risk modeling for sea-level rise • Implement management systems and strategies to minimize the impact of sea-level rise on public services in accordance with the City's reliability management approach
Manage Assets and Services – leverage technologies to construct, manage and operate the infrastructure and services for streets, drainage, water, sewer, and waste management.	• Use sensor data to develop predictive analytics to reduce the life-cycle costs for infrastructure management • Achieve a 95% reliability for the operations and maintenance of all systems • Reduce life-cycle costs for projects • Result in a positive return on investment
Preserve the Historic and Architectural Character – protect and preserve the historic and architectural heritage of this unique community.	• Provide for context sensitive designs that are approved by the Historical and Architectural Board and vetted through a public involvement process

Table 27. Summary of Performance Measures by System

Systems	Reduce bicycle and pedestrian crashes	Reduce total crashes	Reduce vehicle-hours of delay	Improve on-time reliability	Reduce carbon emissions	Increase EV use	Provide reliable internet access	Implement subsidies for TNC for use by the underserved	Implement incentives for attending medical appointments	Grow domestic product	Have satisfied visitors and residents	Monitor use of traveler information	Improve resiliency	Use predictive analytics to manage assets	Provide asset reliability	Reduce life-cycle costs	Optimize return on investment	Provide context sensitive solutions
Foundational Activities																		
Historic and Architectural Character	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Software integration	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Broadband Wi-Fi							✓			✓								✓
Improve Safety																		
Crosswalk Improvements	✓	✓	✓	✓	✓													✓
Bicycle and Pedestrian Sensors	✓	✓	✓	✓	✓													✓
Bicycle and Pedestrian Safety App	✓	✓	✓	✓	✓													✓
Smart Lighting	✓	✓	✓	✓	✓													✓
Enhance Mobility																		
Truck Parking Management System			✓	✓	✓						✓							✓
For-Hire Vehicle Management System			✓	✓	✓						✓							✓
Arterial Dynamic Messaging Signs			✓	✓	✓						✓							✓
Parking Information Message Signs			✓	✓	✓						✓							✓
Virtual Dynamic Message Signs			✓	✓	✓						✓	✓						✓
Smart and Connected Signals			✓	✓	✓						✓	✓						✓
ATSPMs			✓	✓	✓						✓							✓
Bridge Closure Notification System			✓	✓	✓						✓							✓
EAV Shuttle			✓	✓	✓						✓							✓
Smart Kiosk			✓	✓	✓						✓	✓						✓
Integrated Trip Planning App			✓	✓	✓						✓	✓						✓
Provide Sustainable Solutions																		
Solar Path Pilot					✓													✓
Streetlight LED Replacement					✓													✓
Electric Vehicle Charging Stations					✓													✓
Provide Ladders of Opportunity																		
Shared-vehicle Incentives								✓	✓									✓
Digital Equity							✓	✓	✓									✓
TNC and Health Care Partnerships								✓										✓
Create Resilient Communities																		
Stormwater Sensors and Monitoring													✓					✓
Street Flood Notification System													✓					✓
Resiliency Risk Assessments													✓					✓
Manage Assets and Services																		
Smart Waste Management														✓	✓	✓	✓	✓
Utility Management Systems														✓	✓	✓	✓	✓
Pavement Management Systems														✓	✓	✓	✓	✓
Integrated Asset Management App														✓	✓	✓	✓	✓

9.2 Data Collection

This section summarizes an inventory of the existing and data collection systems, proposed deployment and the gaps in data needed to measure the effectiveness proposed. The section is organized by the data sources for each of the performance measures summarized in Table 31.

9.2.1 Safety

The safety performance measures of bicycle, pedestrian and vehicle crashes will be reported based on the data collected in FDOT's SunGuide™ traffic management software and Signal4Analytics.

9.2.2 Mobility

Congestion will be calculated based on the average vehicle delay per year. Two data sources will be used and compared for the analysis.

9.2.2.1 ATSPMs

The collection of traffic volume counts using ATSPM (Purdue-method) techniques at each signal is proposed. A traffic signal system inventory was performed prior to the procurement for this project and each of the signals. The inventory summary is provided in Appendix A. Video and loop detection is used at the intersection except for the I-75 Southbound exit ramp at SR 331. It is assumed the detector will be installed or replaced in advance of the data collection at this location.

To deploy ATSPM using the Purdue method, a vehicle count detector is required using either video or loop systems at each intersection and a detector for each lane is preferred.

The methodology requires vehicle counts to be available at the intersection. It is desirable for each lane to have an individual detector, but acceptable performance measures can be obtained with parallel lanes joined under a single detector and at intersections that lack detectors for noncritical permitted movements, such as right turns.

It is assumed that all detectors involved in this project can collect vehicle counts and not just presence.

The performance measures that are available from ATSPM are summarized in Table 28.

Table 28. ATSPMs

Objective	Layers	Performance Measure
Field Infrastructure Reliability	Communications and detection	• Diagnostic analysis • Communications and detector health
Congestion	Local control	• Pedestrian utilization • Vehicle flow rates • Volume-to-capacity ratio • Phase termination type • Red or green occupancy rates • Estimated delay • Red-light running • Oversaturation severity index • Time to service • Measured travel time
Signal Management	System control	• Bandwidth • Time space diagram • Purdue coordination diagram • Cyclic flow diagram • Percent on green • Platoon ratio • Longitudinal analysis • Diagnostic analysis of events

9.2.2.2 Probe Vehicle Data Sources for On-time Reliability

On-time reliability will be reported based on probe vehicle sources in the FDOT SunGuide™ software. SunGuide™ currently uses data from HERE and Waze™. Sustainability

The data needed to determine these measures are calculated using the data collected on delay and vehicle miles traveled. Since this project includes improvements on local roads, a probe vehicle source, such as Streetlight™ will be used to estimate vehicle-miles traveled. The data sources recommended by the North Florida TPO resulting from an ongoing study on probe vehicle data sources using mobile phones, Bluetooth™ and on-board units to include in the congestion management process. The data sources being evaluated are summarized in Table 29.

To assess the benefits of the parking and traveler information systems, a correlation to the congestion when messages are provided on the DMS or through the apps to changes in volumes, delay and reliability will be performed if the data can be successfully correlated.

Table 29. Summary of Candidate Probe Vehicle Data Sources

No.	Provider	Use
1	BlueToad RSU	Travel times and origin-destination using Bluetooth™ devices and from the CVE
2	Siemens RSU	Travel times, origin destination and safety data from the CVE
3	Traffic Technology Systems (GreenWave™)	Travel times, origin destination and safety data from the CVE
4	HERE™	Travel times, origin destination from the CVE
5	Otonomo	Travel times, hard breaking other safety data, origin destination from the CVE
6	Mapbox	Travel times, origin destination from smart phone location services
7	Streetlight	Travel times, volumes and origin destination for bike, ped and vehicles from smart phone location services
8	Modalgo Limited	Travel times, origin destination from smart phone location services
9	Bosch	Travel times, origin destination from roadside sensors and cameras
10	Inrix	Travel times, volumes and origin destination for bike, ped and vehicles from smart phone location services
11	Google/Waze™	Travel times, volumes and origin destination for bike, ped and vehicles from smart phone location services
12	GeoTab	Travel times, hard breaking, origin destination from the CVE

9.2.3 Sustainability

The cost of carbon will be the primary performance measure calculated. The measures of effectiveness for emissions will be reported in annual emissions of carbon monoxide, carbon dioxide, nitrous oxides, particulates less than 10 microns and volatile organic compounds. The emissions reduction from use of EV and the total number of vehicles that use the EV stations placed at the mobility hubs will be based on the data reported by the EV charging station providers. The right-of-way use agreements developed as part of the partnerships will include a clause require the reporting of this data in exchange for the right-of-way use. The cost of emissions associated with vehicle delays will be determined using the information provided in the latest edition of the Benefit-Cost Analysis Guidance for Discretionary Grant Programs; Office of the Secretary, U.S. Department of Transportation.[51]

9.2.3.1 Resiliency

Qualitative data will be reported on resiliency based on the performance measures provided which are related to accomplishing the objectives of implementing and using sensors to improve risk analysis.

[51] *https://www.transportation.gov/office-policy/transportation-policy/benefit-cost-analysis-guidance-discretionary-grant-programs-0*

9.2.3.2 Asset Management

Data available from SCADA software being implemented for water and wastewater will be used and a cooperation with Florida Power and Light will be used to report on power outages.

Machine-based pavement condition assessments will be collected using vendors. The North Florida TPO conducted a technology review of vendors and conducted a pilot project in 2019. http://northfloridatpo.com/uploads/Studies/Final-Pavement-Management-Report-v2.pdf The lessons learned from this project will be applied. Data on pavement assessment will be maintained by the City's Information Technology office and included in the North Florida TPO's IDE.

Predictive analytics will be developed as part of the project by the selected vendor.

Security of the deployment should be measures from two perspectives: the systems management and the user applications. In both cases, the most meaningful performance measures to understand the security performance of the system include:

- Average time to detect security breaches
- Average time to respond to security breaches
- Number of users impacted
- Risk impacts of the breach

To track these measures the traffic management center's operating system and network management software should provide information on when breaches occur. The average time to detect and respond to the breaches will need to be recorded by the operators if this process is not automated through the SunGuide™ software. Partnerships with the vehicle application providers is needed to know about and understand any breaches. An important part of the evaluation of these breaches will be the assessment of the meaningfulness of the breaches. These assessments will most likely be qualitative vs. quantitative for this deployment.

9.2.3.3 Return on Investment

The return on investment and benefit cost analysis of each strategy will be assessed the greatest extent possible using the data collected for the other measures of effectiveness. The analysis will be performed using the methods outlined in the Benefit-Cost Analysis Guidance for Discretionary Grant Programs. The outcomes will be reported in a return on investment and benefit: cost ratio.

9.2.4 Historic and Architectural Character

Any devices deployed or construction projects off the state highway system will be reviewed by the City's HARB before implementation.

9.2.5 Data Limitations and Constraints

No data limitations are anticipated at this time. Existing data sources, or data to be collected through the deployment of this project are available to report the system performance measures for this project.

9.3 Data Management Plan

All data will be maintained in the Smart North Florida IDE https://smartnorthflorida.com/data-exchange/. The Data Governance Policy for the IDE is included in

10 Project and Risk Management Plan

10.1 Project Phases

10.1.1 Systems Engineering

The systems engineering phase activities are described in greater detail in Section 2.

10.1.2 PD&E

The PD&E process is FDOT's implementation of the National Environmental Policy Act (NEPA) for projects on the state highway system and FDOT's LAP.

Although this process is eligible for a Type 1 Programmatic Categorical Exclusion under 23 CRR 771.117 as a project that involves ITS, information systems, software and traffic signals, because of the risk associated with archeological and historical resources, an environmental review of this project will be performed in accordance with FDOT's PD&E process.

Additional information is available on the process at
https://www.fdot.gov/environment/pubs/pdeman/pdeman-current

10.1.3 Final Design

Final design for this project will involve the development of construction plans, specifications and estimates for the installation of field devices and communications infrastructure. The design will be performed in accordance with the FDOT standard plans and Specifications for Roadway and Bridge Construction consistent with any modification required as part the LAP program. Technical special provisions for equipment that are not approved products will be prepared if needed.

Additional information on the LAP program is available at
https://www.fdot.gov/programmanagement/lap/default.shtm

Temporary lane closures may be required for installation of devices to avoid acquisition of temporary construction. All work will be performed in accordance with the FDOT's Standard Plans and FDOT Standard Specifications for Road and Bridge Construction.

10.1.4 Right of Way

Based on a preliminary field review of the proposed projects, no right-of-way acquisition is anticipated. Work for the installation of all field devices can be performed within the existing rights of way.

10.1.5 Construction

Construction involves Furnishing and Installing (F&I) field equipment, devices and other infrastructure needed for the deployment.

10.1.6 Software and Systems Integration

Acquisition or development of software and the integration of field devices and infrastructure or apps specific to meet the needs of the project.

10.1.7 Operations and Maintenance (O&M)

Operations and maintenance are the phase to ensure the performance requirements for the life cycle of the project are being met.

10.2 Procurement Options

The National Cooperative Highway Research Project 560 Guide to Contracting ITS Projects[52] identifies four dimensions to selecting procurement methods for ITS projects that are comparable to SMART St. Augustine based on the project phases, method of award, contract form and contract type as summarized in Figure 59.

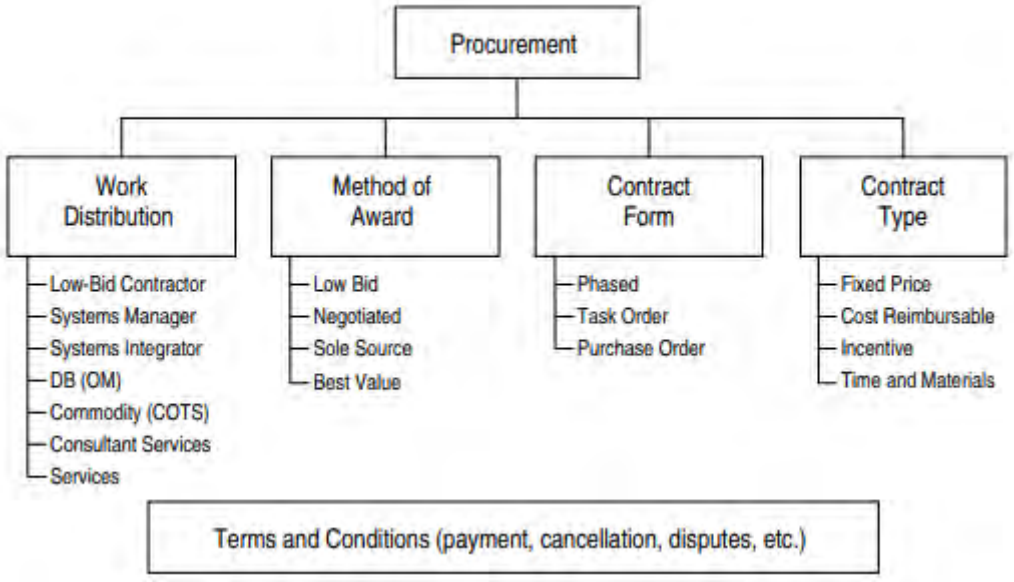


Figure 59. Procurement Options for ITS

A decision support system tool is provided in the National Cooperative Highway Research Project 560 Guide to Contracting ITS Projects that is based primarily on:

- **Project Complexity and Risk.** The TAPS-LA phase of the project involves proven technologies and that FDOT has recent experience and approved products and the system requirements are largely well defined and understood. This phase of SMART St. Augustine will be classified as moderate complex/moderate risk.
- **Agency Capability.** FDOT and the consultant community has well defined procedures and experience with similar deployments. However, this type of project is new for the City. As a result, a moderate capability is assigned.

[52] National Academies of Sciences, Engineering, and Medicine 2006. Guide to Contracting ITS Projects. Washington, DC: The National Academies Press. https://doi.org/10.17226/13925.

10.2.1 Proposed Procurement

The following procurements are contemplated.

10.2.1.1 Owner's Representative Consultant or General Engineering Consultant

An owner's representative consultant is needed to assist the City to deliver this project through the LAP considering the complexity of this project. This consultant will provide staff assistance with

- Perform technology evaluations
- Invite potential vendors to perform a demonstration of their products
- Coordinated testing and approval of the products at the Traffic Engineering Research Laboratory or the testbed at the FDOT North Florida Regional Transportation Management Center
- Work with FDOT to develop scopes of work and procurement packages
- Assist in the installation and integration of field devices
- Perform the before-after-studies and other assessments of the deployment

The procurement will be a request for qualifications consistent with the Consultant Competitive Negotiations Act (CCNA). Work will be performed on a task work order basis using cost reimbursable method of compensation.

10.2.1.2 PD&E and Final Design Consultant

Acquisition of consulting firm to complete the PD&E and final design phases discussed above is needed.

The procurement will be a request for qualifications consistent with the Consultant Competitive Negotiations Act (CCNA). Work will be performed on a task work order basis using cost reimbursable method of compensation.

10.2.1.3 Software Development and Integration

Acquiring the new software systems proposed in this project through a separate procurement is recommended. A low bid contractor for infrastructure and software are very different skill sets with different risks and skill sets.

A services contract with a best value selection is proposed since software development is not subject to CCNA. Lump sum compensation phased contracting is proposed.

10.2.1.4 Design-Bid Build (Low-Bid Contractor) for Field Deployments

Conventional design-bid-build procurement using a low-bid method of award is proposed.

10.2.1.5 Construction Engineering and Inspection Consulting Services

The procurement will be a request for qualifications consistent with the Consultant Competitive Negotiations Act (CCNA). Work will be performed on a task work order basis using cost reimbursable method of compensation.

10.2.2 Other Procurement Options Considered but Not Selected

10.2.2.1 Design-Build (Best Value)

Design-build procurements hire a single contractor or private developer that performs the final design and construction of improvements. A set of requirements, specification for work and preliminary design are typically provided to define the scope for the design-build contractor and for them to provide a

reasonable bid and to minimize change orders during the project. Design-build procurement usually allows for innovation by the contractor so a best-value selection can be made.

A design-build criteria package is required for the procurement consistent with the FDOT's procurement or LAP procurement requirements.

- Standards
- Specifications
- Scope of Work
- Deliverables
- Schedule Requirements
- Intellectual Property
- Change Management

Standards, specifications and the design-build contractor's scope of work need to include a designation of minimum requirements and other priorities to assist in the assessment of best value.

A concept layout that describes the infrastructure requirements, operational route and other elements necessary for the proposer to understand the intent of the project should be included.

Evaluation criteria will be developed to be used in assessing best value of each proposal for the technology and systems integration elements of the proposals. The evaluation will occur in two phases: (1) screening of the proposal to see if they comply with the requirements of the bid and (2) shortlist ranking of the qualified proposers.

10.2.2.2 Systems Manager

Using a systems manager approach to procurement is a viable option for this project. The systems manager will be hired through a qualifications-based selection. Their role will be:

- Perform technology evaluations
- Invite potential vendors to perform a demonstration of their products
- Shortlist the vendors based on the demonstration or other considerations determined by FDOT
- Coordinate testing and approval of the products at the Traffic Engineering Research Laboratory or the testbed at the FDOT North Florida Regional Transportation Management
- Work with FDOT to develop scopes of work and procurement packages for requests for proposals for a qualifications-based selection of a construction engineering and inspection firm
- Work with FDOT to develop scopes of work and procurement packages for requests for bid from contractors to furnish, install and integrate the components of the project
- Assist in the installation and integration of field devices
- Perform the before-after-studies and other assessments of the deployment as directed by FDOT

10.3 Costs

A summary of the estimated life-cycle costs for this project in 2020$ is provided in Table 28. The basis of estimates and summary is provided in Appendix F.

10.4 Risk Management

The FDOT Project Risk Assessment and Regulatory Compliance Checklist Form 750-040-05 is provided in Appendix B.

10.4.1 Project Implementation Risks

In addition to the risks identified with the support environment, the other most significant risk is security and privacy. Data security refers to the tools, policies, practices, and procedures used to protect data from being accessed, manipulated, or destroyed or being leveraged by those with a malicious intent or are unauthorized to do so. Data privacy is the reasonable expectation that data of a sensitive nature will be kept confidential, sanitized and/or encrypted, and respectfully and responsibly maintained by all users, managers, and collectors of the data, while adhering to applicable laws and regulations, policies, and procedures.

A project implementation risk matrix was prepared and is summarized in Table 29.

10.4.2 Technology Maturity Assessment

The following levels of technology readiness are used to assess each technology. For less mature components, pilot projects or limited deployments that assessed the technology are identified.

1. Basic principles observed (first known proposed application)
2. Technology concept formulated but no pilot projects are known
3. Technology demonstrated in relevant environment, pilot projects completed and successful
4. Actual system proven in operational environment, in permanent operations.
5. Full maturity with adopted standards, specifications and approved products by FDOT or related agency.

A technology maturity assessment is provided in Table 30.

10.5 Project Team

A high-level organization chart for the delivery of this project is provided in Figure 63.

10.6 Schedule

Project Evaluation Review Technique (PERT) schedule is shown on Figure 60, Figure 61, and Figure 62.

Table 30. Summary of Costs (2020$)

System/Project	%	Costs	Maintenance of Traffic	Mobilization	Total Implementation	O&M Costs
448653-1 Connected Vehicle Controller Upgrades and RSU Installation (Phase 1)		$612,214	$91,832	$70,405	$774,451	$56,265
Arterial DMS		$3,138,639	$470,796	$360,943	$3,970,378	$20,398
Audible Pedestrian Countdown Signals		$184,855	$27,728	$21,258	$233,841	$4,410
Automated Traffic Signal Performance Measures		$22,500			$22,500	$1,500
Bridge Closure Notification System		$14,816	$2,222	$1,704	$18,742	$50
Connected Vehicle Controller Upgrades and RSU Installation (Phase 2)		$535,588	$80,338	$61,593	$677,519	$56,265
EAV Shuttle Infrastructure		$500,000	$75,000	$57,500	$632,500	$56,265
EAV Shuttle Vehicles		$2,019,382	$302,907	$232,229	$2,554,518	$322,782
Flood Detection Sensors		$75,000	$11,250	$8,625	$94,875	$75,000
Historic Downtown Parking Garage		$70,000	$10,500	$8,050	$88,550	$1,173
Integrated Data Exchange and Real-time CMD		$25,000			$25,000	$15,000
Integration of Bike/Ped apps into Visit St. Augustine		$200,000			$200,000	$50,000
LED Street Lighting Conversion		$195,500	$29,325	$22,483	$247,308	-$45,215
Machine Learning Pavement Condition Assessments		$100,000			$100,000	$15,000
Mobility Hubs		$715,000	$107,250	$82,225	$904,475	$12,500
Mobility Hubs - Wi-Fi		$105,000	$15,750	$12,075	$132,825	$22,100
Parking Availability Sensors		$227,000	$34,050	$26,105	$287,155	$22,700
Parking Information DMS		$612,524	$91,879	$70,440	$774,843	$6,326
Pedestrian Crosswalk Improvements		$347,984	$52,198	$40,018	$440,200	$1,800
Pedestrian Sensors for Automatic Detection at Signalized Crossings		$11,736	$1,760	$1,350	$14,846	$1,200
Public Involvement		$50,000			$50,000	$15,000
Public Wi-Fi for Underserved Areas		$725,208	$108,781	$83,399	$917,388	$72,521
Resiliency Risk Assessment Data Management		$150,000			$150,000	$5,000
Smart Lighting Pilots		$22,476	$3,371	$2,585	$28,433	$750
SunGuide Software Integration		$100,000			$100,000	$5,000
TNC Incentives for Medical Appointments		$15,000			$15,000	$15,000
Truck Parking Management Devices		$69,961	$10,494	$8,046	$88,501	$4,800
Truck Parking Management Systems		$100,000			$100,000	$10,000
Vehicle Fleet OBU		$150,000			$150,000	$15,000
Virtual DMS with Geofencing		$150,000			$150,000	$15,000
Subtotal		**$11,245,383**	**$1,527,432**	**$1,171,032**	**$13,943,847**	**$853,590**
Project Unknowns	10%				$1,394,385	
Subtotal					$15,338,231	
PD&E	3%				$424,017	
PE	15%				$2,334,920	
CEI	20%				$3,067,646	
Project Administration	20%				$3,067,646	
GRAND TOTAL					**$24,232,461**	

Table 31. Risk Matrix

RISK NUMBER	TASK	RISK OWNER	RISK IDENTIFICATION	PROBABILITY (1-5)	IMPACT (1-5)	SEVERITY (P*I)	RISK RESPONSE	RISK MITIGATION STRATEGY	CLOSING RISK DATE	Action
1	Public Controversy	City	Achieve consensus in a dynamic and engaged public environment.	2	4		Public information campaign is included in project.	Conduct public information campaign and workshops	Complete during systems engineering phase with four-month duration.	Mitigate
2	Historic and Architectural Review Board Approval	City	Receiving approval for design of parking DMS signs.	2	4		Preliminary design and locations provided with the concept of operations.	Conduct workshop with board and use visualization to demonstrate specific design to mitigate any visual impacts.	Complete during systems engineering phase with four-month duration.	Mitigate
3	Historic and Architectural Review Board Approval	City	Receiving approval for design of small cell devices and CCTV.	2	4		Preliminary design and locations provided with the concept of operations.	Conduct workshop with board and use visualization to demonstrate specific design to mitigate any visual impacts.	Complete during systems engineering phase with four-month duration.	Mitigate
4	Historical and Archeological Resources	City	Encountering archeological or historical resources during construction.	2	5		Modify location of field devices or avoid potentially sensitive sites.	Prepare cultural resources assessment during preliminary engineering phase.	Completion of construction.	Mitigate
5	Timing for manufacture of cantilever sign structures and mast arms	FDOT	Delivery times for contractors have been four to six months.	4	2		Include in project schedule.	Early design of structures in project schedule.	First three months of project.	Contingency
6	Software integration with Visit St. Augustine	City	Ability to negotiate partnership and maintain accurate and timely transfer of data.	1	5		Early negotiations and discussion.	Discussions are ongoing now (April 2021)	First three months of project.	Mitigate
7	Technology and software maturity (other than AV Shuttles)	All	Technology	1	1		All systems in project were deployed as part of other projects as a permanent deployment or as part of pilot projects.	Use of systems manager procurement with independent testing and integration.	Prior to field deployment.	Mitigate
8	Technology and software maturity for AV Shuttles.	TBD	AV shuttle technology is not mature.	1	1		Watch and learn from JTA BUILD Grant for U2C.	Delay this system until technology maturity is achieved.	TBD	Avoid
9	Right of Way	FDOT	Need for temporary construction easements.	2	4		Performed field review and concept plans for major field elements. All work should be able to be completed within existing rights of way	In final design, adjust the location or removed field elements in required to avoid right-of-way impacts.	Final design.	Mitigate

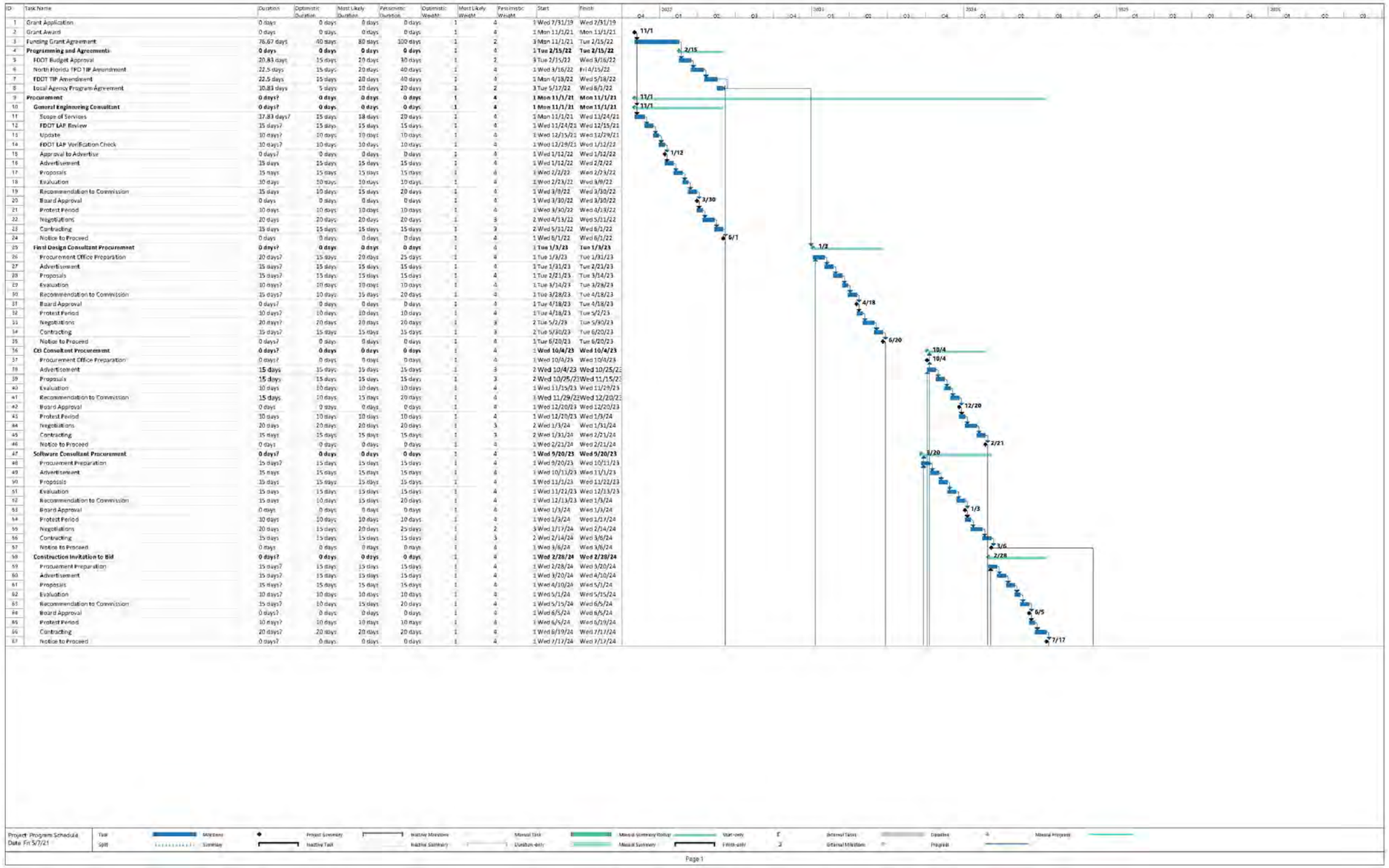
RISK NUMBER	TASK	RISK OWNER	RISK IDENTIFICATION	PROBABILITY (1-5)	IMPACT (1-5)	SEVERITY (P*I)	RISK RESPONSE	RISK MITIGATION STRATEGY	CLOSING RISK DATE	Action
10	Right of Way	FDOT	Processing of recording of property agreements for deployment of field elements on off-system public rights of way.	1	3		Large number of parcels identified	Use Districtwide right of way consultant to prepare sketches.	Final design.	Mitigate
11	Right of Way	FDOT	Propose of mobility hubs at Castillo de San Marco National Monument and Anastasia State Park.	1	2		Potential for regulatory or other restrictions at these sites	Discuss with owners and if likely to present interagency or regulatory challenges. If challenges exist and they are fatal flaws, these optional mobility hub sites can be removed from the project.	Preparing scope for final design.	Contingency or Avoid
12	Schedule	All	Ability to deliver within project schedule.	2	4		Include in float and PERT analysis with project schedule.	Monitor and manage risk continuously during the project.	Continuous	Contingency
13	Budget	All	Ability to deliver within project budget.	2	4		Include contingency in project budget.	Use of systems manager procurement with independent testing and integration will also allow for value engineering on a continuous basis.	Continuous	Contingency
14	Operations and Maintenance	All	Maintaining products during life cycle of the deployment.	2	4		Include O&M costs and execute letters of commitment.	Budget is included in the life-cycle costs based on history by FDOT or from other deployments.	Continuous	Contingency
15	Cybersecurity	All	Maintaining the privacy of the users and ability to manage the system.	3	5		Always include security threat and vulnerability assessments and monitor the system.	Develop detailed cybersecurity protocols and standards that go beyond security credentialling management	Continuous	Mitigate

Impact						
	5	5	10	15	20	25
	4	4	8	12	16	20
	3	3	6	9	12	15
	2	2	4	6	8	10
	1	1	2	3	4	5
		1	2	3	4	5
		Probability				

Table 32. Technical Maturity Assessment

Systems	Level of Maturity	Examples
Improve Safety		
Crosswalk Improvements	5	FDOT Specifications 654 FDOT Approved Products: https://fdotwp1.dot.state.fl.us/ApprovedProductList/ProductTypes/Index/491 FDOT Approved Products: https://fdotwp1.dot.state.fl.us/ApprovedProductList/ProductTypes/Index/704
Audible Pedestrian Countdown Signals	5	FDOT Specifications 653 FDOT Approved Products: https://fdotwp1.dot.state.fl.us/ApprovedProductList/ProductTypes/Index/422
Bicycle and Pedestrian Sensors	5	FDOT Specification 665 FDOT Approved Products: https://fdotwp1.dot.state.fl.us/ApprovedProductList/ProductTypes/Index/627 Proven at SR 13 San Jose Boulevard at Henley Road in Jacksonville
Bicycle and Pedestrian Safety App	3	Rated 3 based on limited know active projects. Multiple products were tested through pilot projects including: • New York City's Connected Intersection Challenge: https://gcn.com/Articles/2014/10/27/Apps-traffic-pedestrian-safety.aspx?m=1 • Austin, TX Bicycle Safety App: https://www.kimley-horn.com/project/austin-advanced-traffic-management-system-atms/ https://www.youtube.com/watch?v=vVnPIWabTqY
Smart Lighting	3	Rated 3 based on limited U.S. applications. Adopted design standards exist in Europe under • European Standards Committee Standard EN 13201 Dynamic Road Lighting https://www.interreg-central.eu/Content.Node/Dynamic-Light/04-DL-Handbook-about-interpretation-of-EN-13201.pdf • European Union Institute (ENI) Standard 160351 LED Street Lighting Documents download module (europa.eu) Example projects: • Portimão, Spain https://www.schreder.com/en/projects/smart-lighting-pedestrian-crossings-optimises-safety-costs • Turku, Finland https://www.floriance.eu/apl/ Benefits evaluation: https://www.mdpi.com/2313-576X/6/2/20
Enhance Mobility		
Historic Downtown Parking Garage Parking Management System	5	Multiple vendors are available, and implementations are active.
Truck Parking Management System	5	Multiple vendors are available, and implementations are active. Apply same technology as TPAS. https://ops.fhwa.dot.gov/freight/infrastructure/truck_parking/workinggroups/technology_data/product/best_practices.htm Multiple vendors for city street applications including Trucks Park Here https://trucksparkhere.com/
For-Hire Vehicle Management System	5	Use of GPS sensors for probe vehicle tracking is a mature technology widely used by many probe vehicle providers such as Waze, Inrix, Streetlight, Otonomo, and others
Arterial Dynamic Messaging Signs	5	FDOT Specification 700-023 Approved Products: https://fdotwp1.dot.state.fl.us/ApprovedProductList/ProductTypes/Index/486
Local Street Dynamic Message Signs	5	FDOT Specification 700-024 Approved Products: https://fdotwp1.dot.state.fl.us/ApprovedProductList/ProductTypes/Index/505
Virtual Dynamic Message Signs	4	Multiple vendors and active projects in U.S. including Waze and KITS.
Smart and Connected Signals	5	Multiple pilot projects in Florida: https://www.fdot.gov/traffic/its/projects-deploy/cv/connected-vehicles FDOT Approved Product: https://fdotwp1.dot.state.fl.us/ApprovedProductList/Search
Advanced Signal Performance Measures and Real-time Condition Monitoring	5	Current traffic management system software Cubic Trafficware ATMS provide module.
Bridge Closure Notification System	5	Used standard FDOT products for an "incident notification."
EAV Shuttle	2	Not recommended for implementation at this time based on limited proof of concept projects.
Smart Kiosk	5	Multiple vendors exist in the transit market that will be adopted.
Integrated Trip Planning App	5	Multiple apps are available, and information will be shared with common market providers such as Google/Waze and Apple Maps.

Systems	Level of Maturity	Examples
Provide Sustainable Solutions		
Solar Path Pilot	2.5	Multiple proof of concept projects completed with mixed success based on climate and lifespan of product in US and Europe. One example includes The Ray in Georgia. The two most prominent vendors are: • Colas Solar Road https://www.colas.com/en/innovation/solar-road • Reanco Geluidswerende voorzieningen (reanco.nl) • Wattway https://solarimpulse.com/efficient-solutions/wattway-solar-road FDOT recently completed BDV31-977-78 Design and Construction of an Integrated Solar Lighting Pedestrian Crosswalk(s) and Sidewalks with Enhanced Visibility to assess solar photovoltaic modules for path lighting and photoluminescent stones for lighted pathways. https://fdotwww.blob.core.windows.net/sitefinity/docs/default-source/research/reports/fdot-bdv31-977-77-rpt.pdf?sfvrsn=4bb50c39_4
Streetlight LED Replacement	5	FDOT Specification 715-009 Retrofit FDOT Policy Bulletin 17-09 https://www.fdot.gov/docs/default-source/design/bulletins/RDB17-09.pdf
Mobility Hubs including Electric Vehicle Charging Stations	5	Multiple vendors exist and are deployed within the vicinity and City limits
Provide Ladders of Opportunity		
Digital Equity in Underserved Neighborhoods- Public Wi-Fi	4	Multiple public projects are active throughout the U.S. OakWi-fi received a BUILD grant in 2018 and implementation is nearing completion. https://www.oaklandca.gov/topics/oakwifi
Transportation Network Companies and Health Care Provider Partnerships	4	FTA has an active grant program and multiple projects are active. https://www.transit.dot.gov/funding/grants/fy-2016-rides-wellness-demonstration-and-innovative-coordinated-access-and-mobility
Create Resilient Communities		
Stormwater Sensors and Monitoring for Street Flooding	4	Multiple active projects in U.S.
Resiliency Risk Assessments and Data Analytics	4	Multiple active projects in U.S.
Manage Assets and Services		
Smart Waste Management	5	Active project in St. Augustine using BigBelly on St. George Street: https://bigbelly.com/
Utility Management Systems	5	CivicPlus the current city management app has an existing module for asset management.
Pavement Management Systems	4	Pilot project conducted by North Florida TPO in 2019 for Clay County. Currently being implemented in Nassau County. Multiple vendors and active projects in the U.S.
Integrated Asset Management App	5	CivicPlus the current city management app has an existing module for asset management.
Integrated Data Exchange and Real-time Congestion Management Dashboard	5	Current active within North Florida https://smartnorthflorida.com/ and https://cmp.northfloridatpo.com/



ID	Task Name	Duration	Optimistic Duration	Most Likely Duration	Pessimistic Duration	Optimistic Weight	Most Likely Weight	Pessimistic Weight	Start	Finish
1	Grant Application	0 days	0 days	0 days	0 days	1	4	1	Wed 7/31/19	Wed 7/31/19
2	Grant Award	0 days	0 days	0 days	0 days	1	4	1	Mon 11/1/21	Mon 11/1/21
3	Funding Grant Agreement	76.67 days	40 days	80 days	100 days	1	2	1	Mon 11/1/21	Tue 2/15/22
4	**Programming and Agreements**	**0 days**	**0 days**	**0 days**	**0 days**	1	4	1	**Tue 2/15/22**	**Tue 2/15/22**
5	FDOT Budget Approval	20.83 days	15 days	20 days	30 days	1	2	1	Tue 2/15/22	Wed 3/16/22
6	North Florida TPO TIP Amendment	22.5 days	15 days	20 days	40 days	1	4	1	Wed 3/16/22	Fri 4/15/22
7	FDOT TIP Amendment	22.5 days	15 days	20 days	40 days	1	4	1	Mon 4/18/22	Wed 5/18/22
8	Local Agency Program Agreement	10.83 days	5 days	10 days	20 days	1	2	1	Tue 5/17/22	Wed 6/1/22
9	**Procurement**	**0 days?**	**0 days**	**0 days**	**0 days**	1	4	1	**Mon 11/1/21**	**Mon 11/1/21**
10	**General Engineering Consultant**	**0 days?**	**0 days**	**0 days**	**0 days**	1	4	1	**Mon 11/1/21**	**Mon 11/1/21**
11	Scope of Services	17.83 days?	15 days	18 days	20 days	1	4	1	Mon 11/1/21	Wed 11/24/21
12	**FDOT LAP Review**	15 days?	15 days	15 days	15 days	1	4	1	Wed 11/24/21	Wed 12/15/21
13	Update	10 days?	10 days	10 days	10 days	1	4	1	Wed 12/15/21	Wed 12/29/21
14	**FDOT LAP Verification Check**	10 days?	10 days	10 days	10 days	1	4	1	Wed 12/29/21	Wed 1/12/22
15	Approval to Advertise	0 days?	0 days	0 days	0 days	1	4	1	Wed 1/12/22	Wed 1/12/22
16	Advertisement	15 days	15 days	15 days	15 days	1	4	1	Wed 1/12/22	Wed 2/2/22
17	Proposals	15 days	15 days	15 days	15 days	1	4	1	Wed 2/2/22	Wed 2/23/22
18	Evaluation	10 days	10 days	10 days	10 days	1	4	1	Wed 2/23/22	Wed 3/9/22
19	Recommendation to Commission	15 days	10 days	15 days	20 days	1	4	1	Wed 3/9/22	Wed 3/30/22
20	Board Approval	0 days	0 days	0 days	0 days	1	4	1	Wed 3/30/22	Wed 3/30/22
21	Protest Period	10 days	10 days	10 days	10 days	1	4	1	Wed 3/30/22	Wed 4/13/22
22	Negotiations	20 days	20 days	20 days	20 days	1	3	2	Wed 4/13/22	Wed 5/11/22
23	Contracting	15 days	15 days	15 days	15 days	1	3	2	Wed 5/11/22	Wed 6/1/22
24	Notice to Proceed	0 days	0 days	0 days	0 days	1	4	1	Wed 6/1/22	Wed 6/1/22
25	**Final Design Consultant Procurement**	**0 days?**	**0 days**	**0 days**	**0 days**	1	4	1	**Tue 1/3/23**	**Tue 1/3/23**
26	Procurement Office Preparation	20 days?	15 days	20 days	25 days	1	4	1	Tue 1/3/23	Tue 1/31/23
27	Advertisement	15 days?	15 days	15 days	15 days	1	4	1	Tue 1/31/23	Tue 2/21/23
28	Proposals	15 days?	15 days	15 days	15 days	1	4	1	Tue 2/21/23	Tue 3/14/23
29	Evaluation	10 days?	10 days	10 days	10 days	1	4	1	Tue 3/14/23	Tue 3/28/23
30	Recommendation to Commission	15 days?	10 days	15 days	20 days	1	4	1	Tue 3/28/23	Tue 4/18/23
31	Board Approval	0 days?	0 days	0 days	0 days	1	4	1	Tue 4/18/23	Tue 4/18/23
32	Protest Period	10 days?	10 days	10 days	10 days	1	4	1	Tue 4/18/23	Tue 5/2/23
33	Negotiations	20 days?	20 days	20 days	20 days	1	3	2	Tue 5/2/23	Tue 5/30/23
34	Contracting	15 days?	15 days	15 days	15 days	1	3	2	Tue 5/30/23	Tue 6/20/23
35	Notice to Proceed	0 days?	0 days	0 days	0 days	1	4	1	Tue 6/20/23	Tue 6/20/23
36	**CEI Consultant Procurement**	**0 days?**	**0 days**	**0 days**	**0 days**	1	4	1	**Wed 10/4/23**	**Wed 10/4/23**
37	Procurement Office Preparation	0 days?	0 days	0 days	0 days	1	4	1	Wed 10/4/23	Wed 10/4/23
38	Advertisement	15 days	15 days	15 days	15 days	1	3	2	Wed 10/4/23	Wed 10/25/23
39	Proposals	15 days	15 days	15 days	15 days	1	3	2	Wed 10/25/23	Wed 11/15/23
40	Evaluation	10 days	10 days	10 days	10 days	1	4	1	Wed 11/15/23	Wed 11/29/23
41	Recommendation to Commission	15 days	10 days	15 days	20 days	1	4	1	Wed 11/29/23	Wed 12/20/23
42	Board Approval	0 days	0 days	0 days	0 days	1	4	1	Wed 12/20/23	Wed 12/20/23
43	Protest Period	10 days	10 days	10 days	10 days	1	4	1	Wed 12/20/23	Wed 1/3/24
44	Negotiations	20 days	20 days	20 days	20 days	1	3	2	Wed 1/3/24	Wed 1/31/24
45	Contracting	15 days	15 days	15 days	15 days	1	3	2	Wed 1/31/24	Wed 2/21/24
46	Notice to Proceed	0 days	0 days	0 days	0 days	1	4	1	Wed 2/21/24	Wed 2/21/24
47	**Software Consultant Procurement**	**0 days?**	**0 days**	**0 days**	**0 days**	1	4	1	**Wed 9/20/23**	**Wed 9/20/23**
48	Procurement Preparation	15 days?	15 days	15 days	15 days	1	4	1	Wed 9/20/23	Wed 10/11/23
49	Advertisement	15 days	15 days	15 days	15 days	1	4	1	Wed 10/11/23	Wed 11/1/23
50	Proposals	15 days	15 days	15 days	15 days	1	4	1	Wed 11/1/23	Wed 11/22/23
51	Evaluation	15 days	15 days	15 days	15 days	1	4	1	Wed 11/22/23	Wed 12/13/23
52	Recommendation to Commission	15 days	10 days	15 days	20 days	1	4	1	Wed 12/13/23	Wed 1/3/24
53	Board Approval	0 days	0 days	0 days	0 days	1	4	1	Wed 1/3/24	Wed 1/3/24
54	Protest Period	10 days	10 days	10 days	10 days	1	4	1	Wed 1/3/24	Wed 1/17/24
55	Negotiations	20 days	15 days	20 days	25 days	1	2	1	Wed 1/17/24	Wed 2/14/24
56	Contracting	15 days	15 days	15 days	15 days	1	3	2	Wed 2/14/24	Wed 3/6/24
57	Notice to Proceed	0 days	0 days	0 days	0 days	1	4	1	Wed 3/6/24	Wed 3/6/24
58	**Construction Invitation to Bid**	**0 days?**	**0 days**	**0 days**	**0 days**	1	4	1	**Wed 2/28/24**	**Wed 2/28/24**
59	Procurement Preparation	15 days?	15 days	15 days	15 days	1	4	1	Wed 2/28/24	Wed 3/20/24
60	Advertisement	15 days?	15 days	15 days	15 days	1	4	1	Wed 3/20/24	Wed 4/10/24
61	Proposals	15 days?	15 days	15 days	15 days	1	4	1	Wed 4/10/24	Wed 5/1/24
62	Evaluation	10 days?	10 days	10 days	10 days	1	4	1	Wed 5/1/24	Wed 5/15/24
63	Recommendation to Commission	15 days?	10 days	15 days	20 days	1	4	1	Wed 5/15/24	Wed 6/5/24
64	Board Approval	0 days?	0 days	0 days	0 days	1	4	1	Wed 6/5/24	Wed 6/5/24
65	Protest Period	10 days?	10 days	10 days	10 days	1	4	1	Wed 6/5/24	Wed 6/19/24
66	Contracting	20 days?	20 days	20 days	20 days	1	4	1	Wed 6/19/24	Wed 7/17/24
67	Notice to Proceed	0 days?	0 days	0 days	0 days	1	4	1	Wed 7/17/24	Wed 7/17/24

Figure 60. Schedule – Procurement Phases

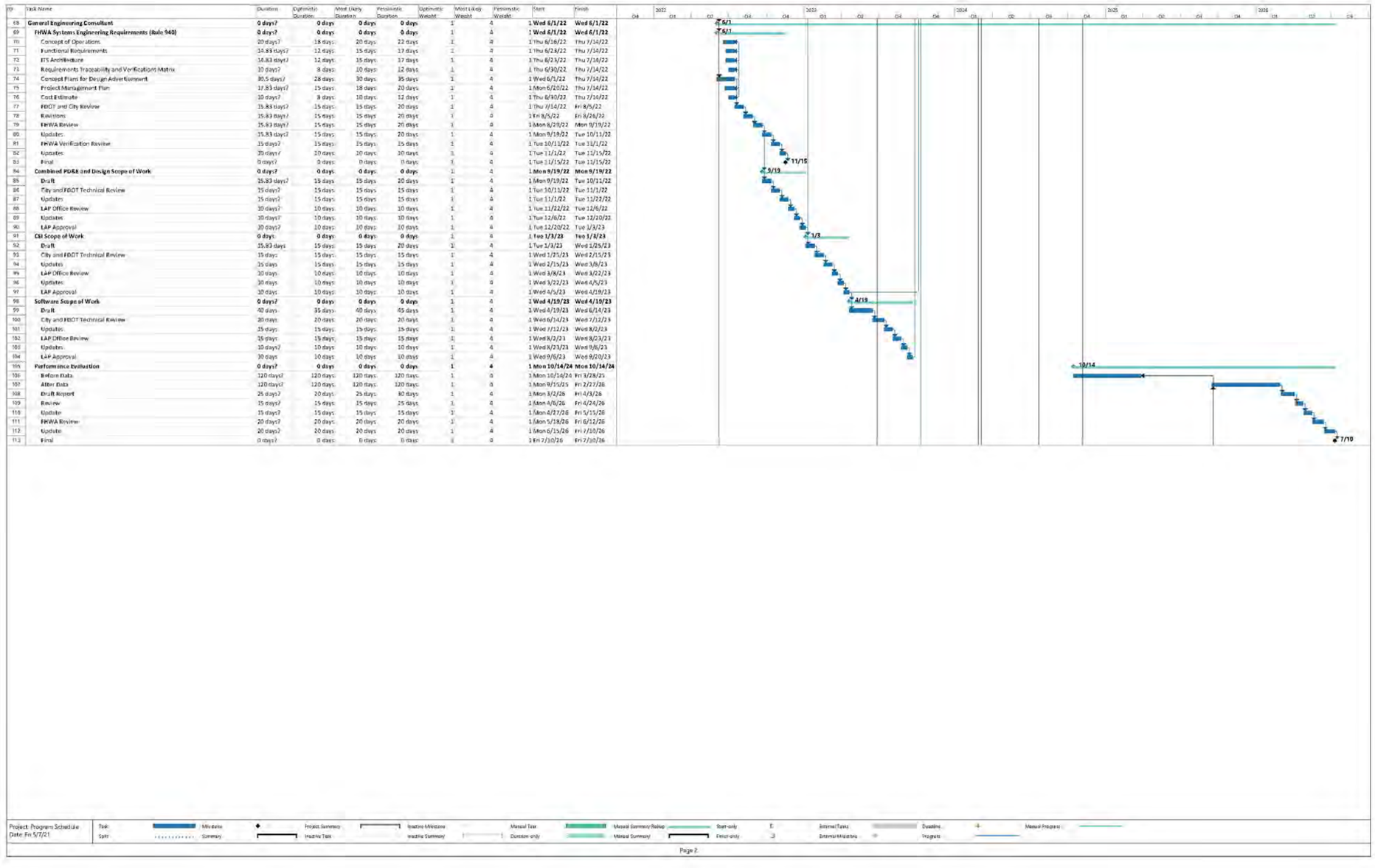


Figure 61. Schedule - Support Services

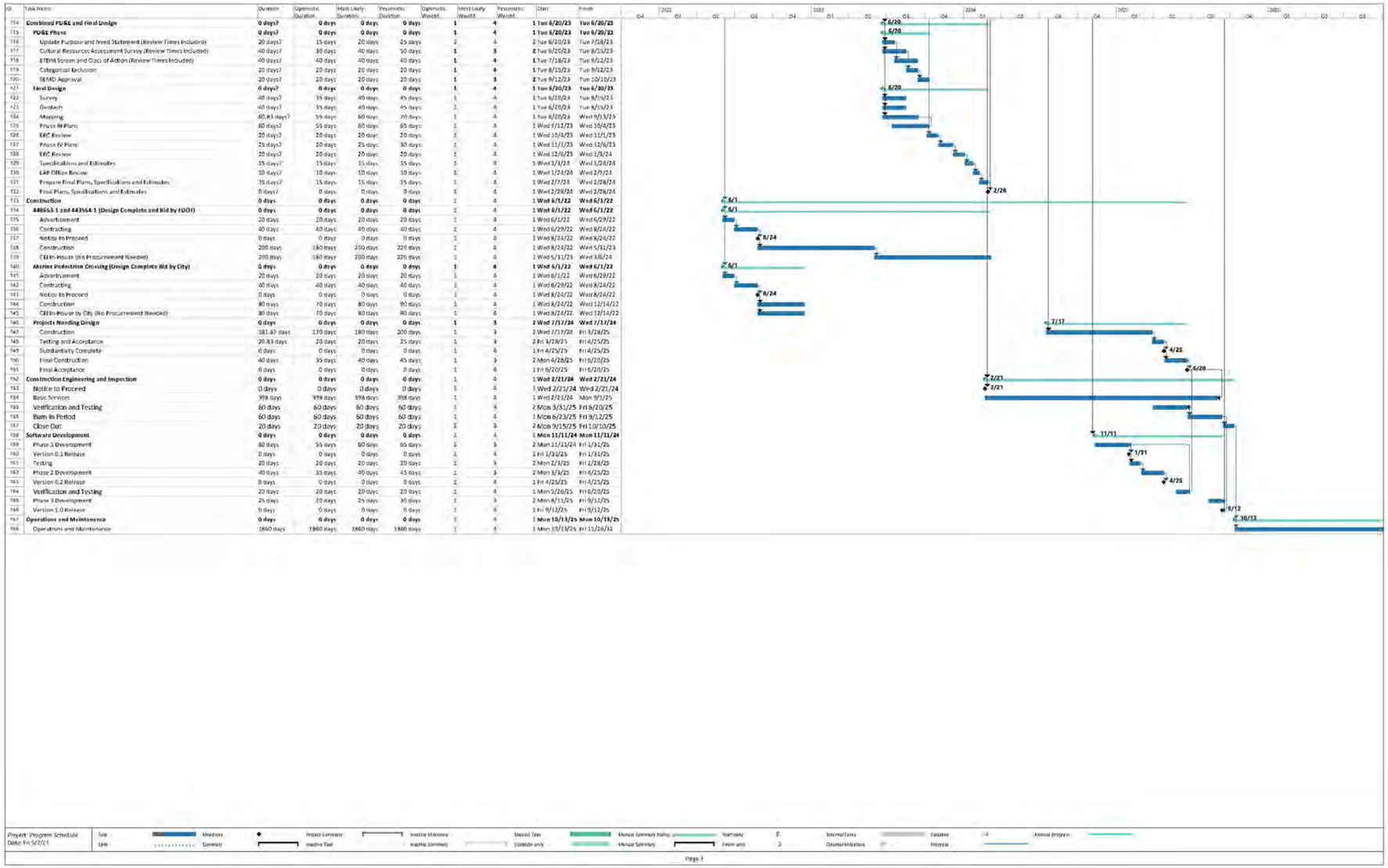


Figure 62. Schedule - Implementation Phases

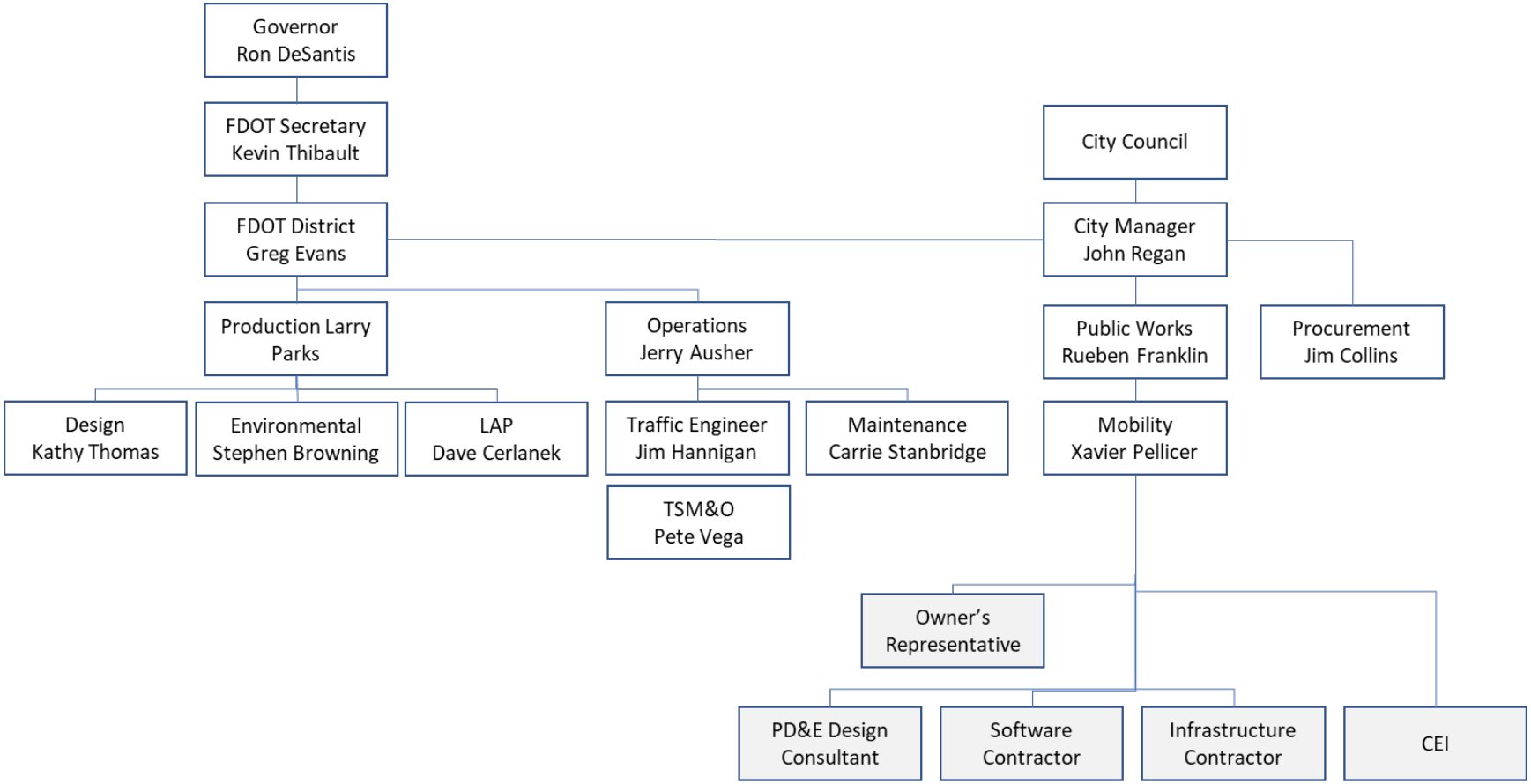


Figure 63. Project Organization Chart

11 High-level System Validation Requirements

Multiple coordination meetings were conducted with the key stakeholders for this project. A copy of the presentations for these meetings are provided in Appendix G. The needs they identified for systems validation are summarized in Table 31.

Table 33. Performance Measures for System Validation

User Need ID	User Need Summary
100.01	Preserve the historic and architectural fabric of the City
101.01	Data will be stored consistent with FDOT procedures at the RTMC
102.01	Data will be shared in real-time with the North Florida TPO congestion management dashboard
102.02	ATSPM for operations
102.03	Collect measures of effectiveness
102.04	Store performance data at RTMC
102.05	Collect condition data on status of field devices
102.06	Store status information at RTMC
102.07	Store video at the RTMC for training purposes
103.01	Conduct a video-based inventory of pavement conditions at least annually
103.02	Assess pavement conditions using machine learning software
104.01	Provide continuous electrical power and communications
104.02	Provide grounding protection for any field devices
105.01	Provide roadside traveler information for parking and other conditions
105.02	Provide roadside parking information on local streets
105.03	Provide roadside parking information in constrained environments on local streets
105.04	Integrate all systems with the parking payment software
105.05	Provide parking reservations for truck parking
105.06	Provide dynamic loading zone truck parking management
105.07	Detect when vehicles are occupying parking spaces in real-time on-street
105.08	Detect when vehicles are occupying parking spaces in real-time in public parking lots
105.09	Record license tag information when parking rules are violated for enforcement
105.10	Detect when vehicles are occupying parking spaces in real-time in public parking garages
105.11	Provide parking information to travelers on parking availability within garages in real-time
105.12	Provide information when Amphitheatre parking lot is full
105.13	Provide information when to use remote parking lots
105.14	Provide information when remote parking lot shuttles are operating
105.15	Provide information when remote park-and-walk lots are open
105.16	Integrate regional smart parking payment systems
105.17	Detect when trucks are parked in loading zones

User Need ID	User Need Summary
105.18	Record license tag information when parking rules are violated for enforcement
105.19	Provide information on parking occupancy to the RTMC
106.01	Convert city street lighting to LED
106.02	Convert state road lighting to LED
106.03	Provide illumination when pedestrians are using mid-block crossings at night
106.04	Meet FHWA lighting criteria at all signalized intersections
106.05	Meet FHWA lighting criteria at all mid-block crossings.
107.01	Collect GPS data from for-hire vehicles to monitor traffic conditions
107.02	User private sector probe data to monitor traffic conditions
108.01	Implement alternate signal timing plan at SR 16 and SR A1A when Bridge closed to traffic
109.01	Install roadside units to implement connected vehicle environment
109.02	Provide all available message sets to drivers
109.03	Provide all available data to the RTMC
109.04	Provide pedestrians with audible information at signals
109.05	Detect vulnerable road users at mid-block crossings to initiate notification system
109.06	Notify drivers when a vulnerable road user is using a mid-block crossing
110.01	Construct mid-block pedestrian crossings that are ADA compliant
110.02	Provide traveler information on incidents via smart phone in real time
110.03	Integrate all software into the SunGuide Traffic Management Center software
110.04	ATSPM for operations
110.05	Collect measures of effectiveness
110.06	Store performance data at RTMC
110.07	Collect condition data on status of field devices
110.08	Store status information at RTMC
110.09	Store video at the RTMC for training purposes
111.01	Provide bicycle racks at mobility hubs
111.02	Provide public use electric vehicle charging stations at mobility hubs
111.03	Provide information on events in real-time at mobility hubs
111.04	Provide public Wi-Fi at mobility hubs
111.05	Provide phone charging at mobility hubs
111.06	Provide assistance for the visual and hearing impaired at mobility hubs
111.07	Provide emergency call buttons at mobility hubs
112.01	Provide information when a traffic crash occurs
112.02	Provide information when the Bridge of Lions is closed to traffic
112.03	Provide information when streets may be flooded in real- time
112.04	Provide information on water levels and flow in outfall pipes of key flood paths
112.05	Provide information on the location and vector of pedestrians in real time
112.06	Provide information on the location and vector of bicyclists in real-time

User Need ID	User Need Summary
112.07	Provide information if a vulnerable road user is located within a detection area in real-time
113.01	Reduce energy consumption of streetlights
114.01	Provide shuttle service between the Historic Downtown Garage and the Historic Downtown
114.02	Provide shuttle service between the Historic Downtown Garage and the Lightner Museum
114.03	Provide shuttle service between the Historic Downtown Garage and the Flagler Garage
114.04	Provide shuttle service between the Historic Downtown Garage and the Rowley Garage (future)
115.01	Provide public Wi-Fi in the West St. Augustine vulnerable population
116.01	Provide smart waste receptacles to improve efficiency
116.02	Provide smart waste receptacles to improve cleanliness
117.01	Implement SCADA in water and wastewater
118.01	Provide portal for all maintenance purchase orders
118.02	Provide real-time information of maintenance purchase orders
118.03	Provide portal for all customer complaints
118.04	Provide real-time information of status of customer complaints
118.05	Control the release high-resolution data
119.01	Provide the ability to control and limit user access via user privileges
119.02	Allow remote access using a secure Virtual Private Network
119.03	Authenticate individual users
119.04	Provide full access to the administrator
119.05	Tie user logins to user types
119.06	Restrict users
119.07	Maintain the traffic signal management software on a separate server
119.08	Provide software to manager 25 signals
119.09	Allow remote operations with the same functionality
120.01	Obtain Security Credential Management Systems
120.02	Obtain FCC licensing for roadside units
121.01	Provide maintenance according to a separate maintenance contract
121.02	Warrant the system to be free of defects in materials and workmanship for a period of 3 years
121.03	Provide maintenance training to up to 10 City staff members
121.04	Provide "bug" fixes for the life of the contract
121.05	Provide a warranty for all hardware components
121.06	Provide software updates including new features for the life of the contract

Appendix A. Concept Plans for TAPS-LA Project

Appendix B. FDOT Forms for Systems Engineering, ITS Architecture Change and Risk Assessment

Appendix C. SET-IT ITS Architecture

Appendix D. Adaptive Signal Analysis

Appendix E. Benefits Evaluation

Appendix F. North Florida IDE Data Governance Policy

Appendix G. Cost Estimates

Appendix H. Stakeholder Coordination