CONCEPT DEVELOPMENT AND EVALUATION TECHNICAL MEMO

Florida Department of Transportation
District 5
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Executive Summary

Project Background and Purpose

This project was requested by the City of Titusville to coordinate the development of a future vision for the State Road (SR) 406 (Garden Street) corridor that will establish a multimodal approach to addressing future transportation needs. The Florida Department of Transportation (FDOT) completed a Corridor Planning Study (CPS) for SR 406 from the South Lake Elementary School (formerly the North Area Adult Education Center) to US 1 Northbound (Washington Avenue) in September 2016. The purpose of the CPS was to develop a multimodal design-driven vision, rather than a model-driven vision to determine how to best meet the needs of the current and future end users of the corridor, and to establish a long-term plan to guide evolution of the corridor, in coordination with local and regional partners, including Space Coast Transportation Planning Organization (SCTPO), Brevard County, the City of Titusville, Space Coast Area Transit (SCAT), and the Titusville Community Redevelopment Area (CRA). The process combined planning and engineering efforts to develop a range of potential improvement strategies to more forward to the Concept Development and Evaluation Study phase. This study was conducted in parallel with the US 1 Concept Development and Evaluation Study.

In July 2017, the project process continued with the start of the Concept Development and Evaluation Study. This study advanced the concepts developed in the CPS and provided further analysis, the creation of concept plans, and identified and evaluated potential impacts. The study also continued engagement with the public and local agency partners. For this next phase, the project limits were extended to include from South Lake Elementary School to Indian River Avenue.

Concept Development and Evaluation Process

During the CPS, data was collected and analyzed to determine the existing and future conditions of the study corridor. As part of the Concept Development and Evaluation study, the Existing Conditions Report and Future Conditions Technical Memorandum were updated to include any changes that may have occurred since the completion of the CPS. This included a comprehensive on-site field review to document actual existing conditions along the corridor.

Once the existing and future conditions update was complete, the Issues and Opportunities, Purpose and Need, and Goals and Objectives developed during the CPS were reviewed and confirmed to be still appropriate for the study corridor. The following is the Purpose and Need for the SR 406 project:

Purpose: *To provide improved multimodal mobility, with consistent roadway design that will enhance safety and connectivity while supporting economic and community development goals.*

Need: *Enhancing multimodal mobility is necessary to shift emphasis to non-vehicular modes that have been traditionally underserved in this corridor. Observations of the existing corridor characteristics reveal the following supporting data:*

- *Sporadic/underutilized on-street parking*
- *Inconsistent lane widths*
- *Properties with multiple and unused driveways*
- *Multiple full access medians that do not provide adequate storage for left turn refuge*
- *Large transit dependent community*
- *Minimal bus stop accommodations provided (lack of shelters, ADA issues)*

- *Lack of ADA accommodations*
- *Lack of bicycle facilities*
- *Lack of pedestrian crossing opportunities*
- *Desire by local stakeholders to enhance aesthetics*
- *Desire by City for gateway feature(s) entering Downtown Titusville*

Once the data was updated and the SR 406 Purpose and Need Statement was reviewed, the following CPS recommended improvement strategies were developed and evaluated in greater detail:

- Corridor wide typical section enhancements to include addition of buffered bicycle lanes
- Road diet options
- Roundabout at Singleton Avenue

Concept plans for the alternatives were detailed and refined, including a comprehensive review and field verification process. A proposed roundabout at the intersection of SR 406 (Garden Street) and Singleton Avenue was evaluated by the FDOT Roundabout Screening, a three-step process established to determine if a roundabout is the appropriate control measure for a proposed intersection improvement. The screening evaluation revealed that the roundabout at is an appropriate treatment for the intersection.

Public Involvement

Throughout the Concept Development and Evaluation Study, the project team engaged public and local agencies to bring diverse viewpoints and values between all interested people, groups, government organizations into the decision-making process regarding the development of the project. These public involvement activities included the following:

- Two Project Visioning Team (PVT) Meetings were held at key points during the study process (November 8, 2017 and June 27, 2018) to discuss progress of the concepts
- Small group meeting with the City of Titusville staff to review study findings and garner support from the city representatives (March 30, 2018)
- Public meeting to present the final recommendations and allow interested parties an opportunity to provide feedback and comments about the project (September 20, 2018)
- Presentation of study results to the City of Titusville Council and the Space Coast Transportation Planning Organization's Board and subcommittees in October 2018

Final Recommendations

The final recommendations for the SR 406 Concept Development and Evaluation Study includes the following improvements:

- Repurpose the existing typical section between South Lake Elementary School and Dixie Avenue to provide consistent travel lanes, wider raised median, and buffered bicycle lanes, while minimizing the need for new, outside curb
- Roundabout at the SR 406 and Singleton Avenue intersection
- Modify existing typical section between Dixie Avenue and US 1 Southbound (Hopkins Avenue) to convert to a three-lane section with two travel lanes, one center turn lane, and buffered bicycle lanes. The curbs are proposed to be moved in in this design to provide a wider utility strip and sidewalks

The purpose of the recommended improvements is to improve safety, provide multimodal facilities for the traveling public, and to create a corridor that is in line with the vision of the City of Titusville. Right of way impacts anticipated with the recommendations are up to .148 acres. The total project cost including right of way, and design is estimated to be $10 million. The cost including the US 1 and SR 406 roundabout (which was developed as part of the US 1 and Concept Development Study) is estimated to be $26.3 million.

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1 Introduction

1.1 Purpose of Technical Memorandum

The purpose of this Concept Development Technical Memorandum is to develop proposed concepts for the State Road (SR) 406 (Garden Street) corridor from west of the interchange with I-95 at South Lake Elementary School (formerly the North Area Adult Education Center (NAAEC)) to Indian River Avenue based on projected future needs through 2040. This technical memorandum will include existing conditions of the corridor as well as a forecast of future traffic conditions. The latest available development and growth projections have been compiled to create an accurate picture of future traffic demand. Future traffic projections are used by this study to influence, improve and validate potential improvement strategies identified through the rigorous study and public engagement during the preceding Corridor Planning Study. These traffic projections have been used to analyze the concepts described in this report. Finally, the memorandum will describe the concepts for the proposed alternatives.

1.2 Project Background and Purpose

In January 2015, the Florida Department of Transportation (FDOT) began a Corridor Planning Study for SR 406 (Garden Street) from South Lake Elementary School to US 1 in Titusville, Florida. Figure 1 illustrates the Study Area. A Corridor Planning Study is a high-level evaluation of safety, environmental and geometric concerns along a transportation corridor where needs, possible improvement options and planning level cost estimates are identified. This project was requested by the City of Titusville to coordinate the development of a future vision for the SR 406 (Garden Street) corridor that will establish a multimodal approach to addressing future transportation needs. Multimodal corridor projects are essential to network efficiency, safety, and livability within the context of future transportation needs.

The Corridor Planning Study involved a community-based evaluation to determine how best to meet the needs of current and future users. It then established a long-term plan to guide the evolution of the corridor that appropriately correlates the balance between land use and transportation planning. This project was coordinated with local and regional agency partners, such as the Space Coast Transportation Planning Organization (SCTPO), Brevard County, the City of Titusville, Space Coast Area Transit (SCAT), Titusville Community Redevelopment Area (CRA) and Florida East Coast (FEC)

Railway to develop potential solutions that establish a more multimodal urban environment utilizing a context-sensitive approach. As part of the analysis, previous studies, improvement plans, as well as an inventory of existing traffic, pedestrian and bicycle, and transit conditions and facilities were evaluated. This process combined planning and engineering efforts to develop a range of potential improvement strategies. The Corridor Planning Study concluded in September 2016. Full documentation for this study can be found at CFLRoads.com.

In July 2017, the project process continued with the start of the Concept Development and Evaluation Study. This study builds upon what was started in the Corridor Planning Study by further evaluating the alternatives identified, creating concept plans, as well as identifying and evaluating impacts. This study continued the public and stakeholder involvement effort that was previously established by continuing to engage the Project Visioning Team throughout the process as well as holding a public meeting to receive local input.

The proposed alternatives produced by the study are access management improvements, a roundabout at the intersection of SR 406 (Garden Street) and Singleton Avenue as well as a lane modification between Dixie Avenue and the study end. Details of these proposed alternatives are provided in Section 5 of this report. This study was conducted in parallel with the US 1 Concept Development and Evaluation Study.

SR 406 Concept Development & Evaluation

SOUTH LAKE ELEMENTARY SCHOOL TO INDIAN RIVER AVENUE

FIGURE 1
Study Area Location Map

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Existing Conditions

2.1 Roadway and Intersection Characteristics

The SR 406 (Garden Street) study area consists of an approximately 3.1-mile section of SR 406 (Garden Street) within the City of Titusville in Brevard County, Florida. The study area begins at South Lake Elementary School west of the I-95 interchange and extends east to Indian River Avenue. The study area corridor can be characterized as an urbanized, 4-lane divided section with primarily residential and commercial development throughout the Study Area. Based on the FDOT Context Classification Guidance, the segments of the corridor from South Lake Elementary School to Clarewood Blvd, and from Dahlia Avenue to Hilltop Drive are classified as C3C Suburban Commercial; the segment between them from Clarewood Avenue to Dahlia Avenue is classified as C3R Suburban Residential. The rest of the corridor, from Hilltop Drive to Indian River Avenue is classified at C4 Urban General. The context classification designations are discussed further in Section 2.4.2.

SR 406 (Garden Street) from I-95 to Indian River Avenue is classified as an "urban principal arterial other". There are two predominate typical sections of the corridor; a three-lane bidirectional segment from South Lake Elementary School to I-95, and a four-lane bidirectional segment from I-95 to Indian River Avenue. The posted speed limit varies along SR 406 (Garden Street); from west of the study area to east of the I-95 interchange the posted speed limit is 35 miles per hour (MPH), from east of I-95 to west of Einig Avenue it transitions to 40 MPH, and from west of Einig Avenue to east of Indian River Avenue the posted speed is 30 MPH.

2.2 Summary of Transportation Plans

A review of various transportation plans was performed to understand planned improvements throughout the Study Area. Relevant documents can be found in **Appendix K**. During this exercise, the following documents were reviewed:

- Space Coast Transportation Planning Organization's (SCTPO) 2040 Long Range Transportation Plan;
- SCTPO Transportation Improvement Plan;
- SCTPO Bicycle & Pedestrian Mobility Plan;
- SCTPO Intelligent Transportation Systems (ITS) Master Plan;

- FDOT Five Year Work Program;
- Space Coast Area Transit's Transit Development Plan; and
- City of Titusville Comprehensive Plan.

SCTPO 2040 Long Range Transportation Plan (LRTP)

The SCTPO 2040 LRTP identifies a multimodal range of improvements for Brevard County through 2040. The LRTP identifies a section of SR 406 (Garden Street) from Park Avenue to US 1 SB (Hopkins Avenue) in which to add sharrows and 'Bike May Use Full Lane' (BMUFL) signage with an estimated cost of $109,000.

SCTPO Transportation Improvement Plan (TIP) FY 2019-FY 2023

The TIP is a priority list of federal and state funded projects that have been scheduled for implementation by the SCTPO. The TIP includes financially feasible multimodal projects that were previously adopted by state and local officials, and transportation agencies funded through FY 2023. This plan was updated in July 2018. A resurfacing is funded for construction in FY 2019 for SR 406 (Garden Street) from East of Petty Circle (West of Forrell Avenue North) to US 1 NB (Washington Avenue) with an estimated cost of $2 million.

SCTPO Bicycle & Pedestrian Mobility Plan

The SCTPO Bicycle & Pedestrian Mobility Plan, published in 2013, documents future improvements to the bicycle/pedestrian network within Brevard County. It is a synthesis of prior plans, regional projects and local plans which identifies short and long-term improvements that address gaps or deficiencies in the bicycle/pedestrian network. After review of the priority project list, one project was identified along SR 406 (Garden Street) in the Study Area. The identified project is to install a Designated Bike Lane on SR 406 (Garden Street) from 600' west of Park Avenue to US 1 NB (Washington Avenue). Funding is currently not available for this improvement.

SCTPO Intelligent Transportation System (ITS) Master Plan

The SCTPO ITS Master Plan, published in 2015, provides the framework for determining the region's future ITS needs. As part of this effort, the ITS Master Plan documents the existing ITS infrastructure as well as expected future needs. As shown in Table 6, the segment of SR 406 from I-95 east to US 1 (2.79 miles) includes three (3) Arterial Dynamic Message Signs along the corridor and one (1) closed-circuit television camera at the US 1 intersection. Table 7 indicated the same segment of SR 406 FDOT-owned fiber as well.

Based on the identification of future ITS infrastructure needs, the ITS Master Plan proposed additional CCTV deployments at the Singleton Avenue intersection and the Dixie Avenue intersection. Bluetooth devices were also proposed for deployment along SR 406 near the Christian Court intersection and at the west end of the Max Brewer Memorial Parkway bridge. These proposed improvements were not included as part of the ITS Master Plan Priority list, however.

FDOT Five-Year Work Program FY 2019-FY 2023

Each year, FDOT develops the Five-Year Work Program in accordance with Section 339.135, Florida Statutes. The plan reviewed was updated in November 2018. The Five-Year Work Program is an ongoing process that is used to forecast the funds needed for upcoming transportation system improvements scheduled for the next five years. The development of this Work Program involves extensive coordination with local governments, including Metropolitan Planning Organizations and other city and county officials.

After review of the programmed improvements, there were three relevant projects identified in the Five-Year Work Program. The most relevant is a resurfacing project from west of Forrell Avenue North to US 1 NB (Washington Avenue). This project was also identified in the SCTPO TIP and is funded for construction in FY 2018/19. Work began on this project on October 22, 2018. This project is also being completed along with a resurfacing east of the study limits from an FWCC Driveway to Merritt Island Refuge. In addition, approximately $700,000 was also allocated to emergency operations along the corridor for FY 2019.

Space Coast Area Transit 2013-2022 Transit Development Plan

The Space Coast Area Transit (SCAT) 2013-2022 Transit Development Plan (TDP) documents future transit improvements throughout Brevard County for a ten-year window. Transit improvements can include new routes, expanded hours of operation, or increased frequencies. The SCAT TDP identified several improvements to the routes running through the Study Area. All these improvements are noted as unfunded. These improvements are summarized by implementation year below.

Year 2019

- Increase weekday frequency to 30 minutes on Route 2
- Increase Saturday frequency to 30 minutes on Route 2
- Start Sunday service on Route 2

Year 2020

- Extend service on Weekdays and Saturdays to 9 PM on Route 2

Year 2022

- Create a new route that connects Downtown Titusville to Canaveral National Seashore. This is documented in the TDP as Alternative 21: Canaveral National Seashore. The route would begin at SR 405 and move north/south along US 1 before connecting east to Canaveral National Seashore along SR 406 (Garden Street).

City of Titusville Comprehensive Plan Policies

The City of Titusville Comprehensive Plan, adopted in 1988 and last revised in April of 2014, has adopted multiple Comprehensive Plan Objectives and Policies that focus on multi-modal transportation options. Some of these include complete streets, street beautification and a system-wide multimodal transportation network master plan. The Comprehensive Plan primarily focuses on the US 1 corridor at the eastern end of the Study Area.

Objective 1.13 of the Future Land Use Element identifies policies and strategies concerning land uses along the US 1 corridor. The City of Titusville has also adopted policies that the 2006 US 1 Corridor Master Plan recommended regarding strengthening and encouraging a pedestrian-friendly, mixed-use district along US 1, that can include, but is not limited to high density residential, retail, and public realm areas, and that is intended to contain urban elements of increased density, intensity and height.

SR 406 (Garden Street) is also identified in the City of Titusville Vision Plan 2017 as a “Gateway” corridor, which is defined as important to create a positive first impression for people visiting Titusville.

2.2.1 Local Small Area Plans and Community Redevelopment Areas

The Community Redevelopment Agency (CRA) program was created in Florida in 1969 to help communities revitalize downtown areas. The Florida Legislature established criteria to allow and encourage CRA redevelopment and revitalization activities when certain conditions exist, including but not limited to the presence of substandard or inadequate structures, higher crime rates than surrounding areas, inadequate infrastructure, insufficient roadways, deterioration of sites or other improvements, and inadequate parking.

The northern boundary of the Downtown Titusville CRA is Buffalo Road. The CRA encompasses land from Buffalo Road in the north, to Grace Street in the south, and lands from the Indian River Lagoon in the east to the FEC railroad in the west. The CRA has accomplished many projects and plans within the Study Area. While these plans and projects primarily serve the US 1 corridor, the SR 406 (Garden Street) Study Area is affected due the land areas in the eastern portion of the Study Area which are within the CRA, specifically the land designated as Downtown Mixed-Use.

A 2006 Downtown Master Plan led to the development of a Downtown Mixed-Use Smart Code for the CRA which was adopted in 2010. These standards were revised in 2013 and were intended to encourage mixed-use buildings for infill development and new public facilities, while maintaining the historic character of the community.

In 2014, a Community Redevelopment Plan update was created to "develop a plan for coordinated growth in the Downtown CRA" and to create a downtown area with a vibrant mixed-use town center environment. The FY 2018/2022 Five-Year Capital Improvement Plan, published in the 2017 CRA Adopted Budget, does not identify any projects for the SR 406 (Garden Street) corridor.

2.2.2 Developments of Regional Impact

Information on Developments of Regional Impact (DRIs) was collected from the Florida Department of Economic Opportunity (DEO), East Central Florida Regional Planning Council, Brevard County and FDOT. There are no DRIs located within one mile of the Study Area.

2.2.3 Related Traffic Studies

A safety study was performed at the intersection of SR 406 (Garden Street) and US 1 one-way pair intersections in February 2017 to evaluate the operations and safety of the intersections. Due to the high angle crash history, many short- and mid-term improvements were recommended to help reduce crashes along the corridor. Combining both intersections into one with an elongated roundabout was identified as a long-term improvement. This was considered long-term due to the significant right of way (R/W) needed for such a facility.

2.3 Land Use

Land use data was compiled from the Brevard County Property Appraiser parcel data and Florida DOT District Five Generalized Land Use Data generated in 2015. This data was used to conduct an inventory of existing land uses around the Study Area.

2.3.1 Existing Land Use

Residential uses are the predominant existing land uses for the Study Area. Over one third of the land within a ¼ mile of the Study Area currently is classified residential. The next highest percentage of land use is retail, with approximately 14 percent of the existing land use. The majority of this area has road frontage along the corridor. Over 11 percent of the land within a ¼ mile of the Study Area is currently vacant. Figure 2 depicts the existing land uses (Brevard County Property Appraiser, 2017 and University of Florida GeoPlan Center "Florida Parcel Data Statewide-2017").

2.3.2 Future Land Use

The Future Land Uses (FLUs) assigned to the Study Area, Figure 3 (City of Titusville, 2015), are generally consistent with the existing land uses along, and adjacent to the corridor.

All the land adjacent to the eastern half of the corridor is designated as Downtown Mixed-Use. The City of Titusville specifies that the Downtown Mixed-Use FLU is permitted to have a maximum density of 20 dwelling units per acre and a maximum intensity of 5.0 Floor Area Ratio (FAR). The FAR is the ratio of a buildings total floor area (Gross Floor Area) to the size of the parcel that it is built on, and is generated by dividing the building area by the parcel area. The Downtown Mixed-Use FLU was established by the City of Titusville to "pursue the renewal of Downtown Titusville as the center of professional, governmental, financial and unique retail and redevelop blighted areas." The purpose is to enhance the visual attractiveness of downtown, utilize the waterfront, encourage and promote pedestrian spaces, and emphasize development and redevelopment east of US 1 that uses the waterfront as an amenity.

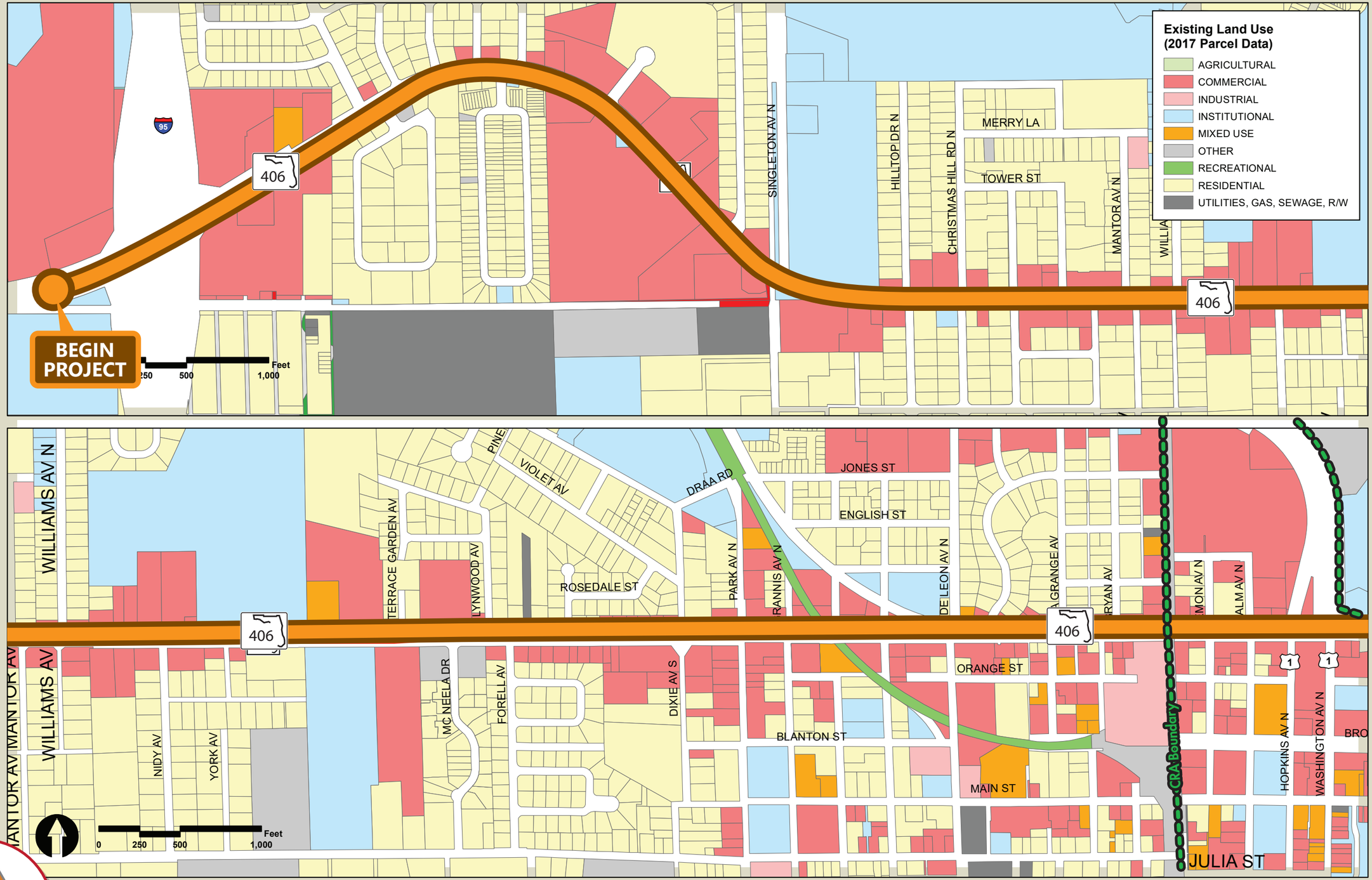
Moving to the western half of the western terminus, the primary land use transitions to commercial designations, with maximum intensities of 1.0 FAR. Commercial Low (C-L) and Commercial High (C-H) FLUs are adjacent to the Study Area. Both commercial FLUs have the same siting criteria, including locations along an arterial or collector, and compatibility with adjacent land uses, as well as the same maximum intensity; the difference, however is the intended user. C-H areas can include automotive-oriented businesses to provide commercial services to the community and region, while C-L areas are intended to be oriented towards neighborhood needs and convenience factors.

Other land uses adjacent to the Study Area consist of Educational, Residential and Public, which includes the Arthur Dunn Airpark.

The majority of the land that is near, but not adjacent to the Study Area is designated as residential. Most of the land is shown as Residential-Low, which allows a maximum of 5 dwelling units per acre. Neighborhoods of Residential Medium, 10 dwelling units per acre, and Residential High, 15 dwelling units per acre, also exist in close proximity to the Study Area.

The land south of the eastern portion of the Study Area near the SR 406 (Garden Street)/US 1 intersection, is designated as Industrial and Urban Mixed Use. The Industrial FLU provides for a maximum intensity of 1.0 FAR, and is intended to be master planned to share infrastructure and to be clustered in limited areas for the purpose of maximizing employment centers and convenient access. The Urban Mixed-Use FLU allows a maximum density of 15 dwelling units per acre and a maximum intensity of 1.0 FAR. This FLU was established to "focus private and public efforts on redevelopment of blighted structures and maintenance of the built environment" as well as to "encourage a mix of uses including but not limited to high density residential, retail, and public realm areas (pavilions, amphitheaters, and similar open gathering areas) that contain urban elements of increased density, intensity and height."

Source: Brevard County Property Appraiser (2017) and University of Florida GeoPlan Center "Florida Parcel Data Statewide-2017"



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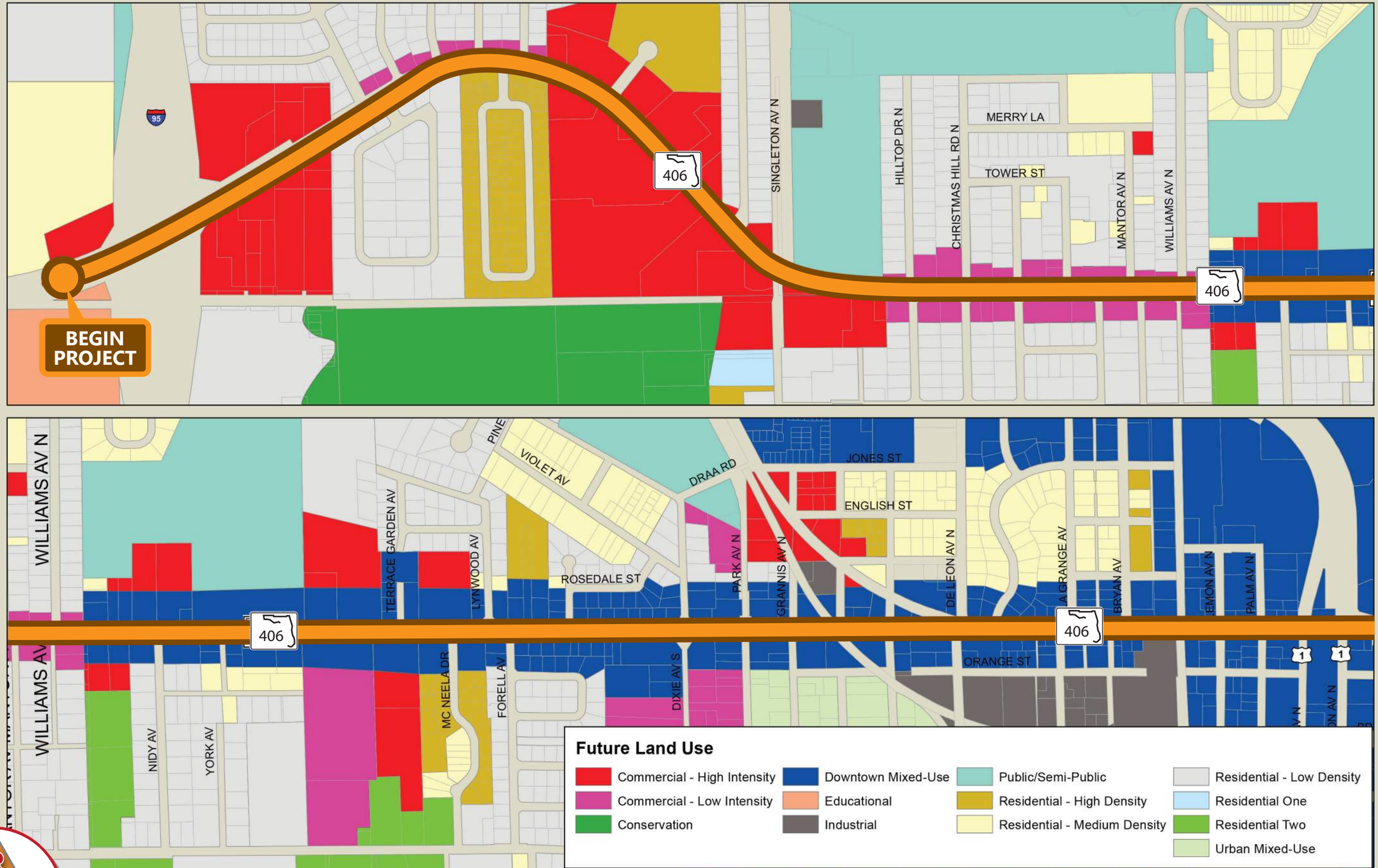
SOUTH LAKE ELEMENTARY SCHOOL TO INDIAN RIVER AVENUE

FIGURE 2
Existing Land Use Map

Source: City of Titusville (2015)



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NORTH AREA ADULT EDUCATION CENTER TO INDIAN RIVER AVENUE

FIGURE 3
Future Land Use Map

2.4 Existing Physical Features

The existing physical features were collected through field inspection and design/construction plans obtained from FDOT and the affected jurisdictions. The features evaluated include utilities, lighting, pedestrian and bicycle facility, and parking locations. Existing features of the SR 406 (Garden Street) corridor that do not meet current design standards are considered deficient and may be recommended for continued monitoring, rehabilitation, or upgrading.

2.4.1 Roadway Classification, Jurisdiction, and Posted Speed

SR 406 (Garden Street) from South Lake Elementary School to US 1 Northbound (NB) (Washington Avenue) is classified as an "urban principal arterial other" and owned and maintained by the Florida Department of Transportation. Its roadway ID is 70002000. The Study Area extends the entire length of the state-maintained length from mile post (MP) 0 to MP 2.949. The roadway ID for the section of SR 406 (Garden Street) from US 1 NB (Washington Avenue) to Indian River Avenue is 70160001. This section of roadway is within MP 0 to 0.332 and is owned by FDOT but considered "active off the State Highway System (SHS)".

The posted speed limit on SR 406 (Garden Street) from South Lake Elementary School to east of Enig Avenue is 40 miles per hour (mph), and it transitions to 30 mph for the remainder of the corridor to US 1 NB (Washington Avenue). The posted speed from US 1 NB (Washington Avenue) to Indian River Avenue is 30 mph.

2.4.2 Context Classification

The context classification of a roadway is a standard adopted by FDOT that provides information about who the users are along the roadway, the regional and local travel demand of the roadway, and the challenges and opportunities of each roadway user. The context classification and transportation characteristics of a roadway determine key design criteria for all non-limited access state roadways.

SR 406 is classified C3C from South Lake Elementary School to Clarewood Boulevard and from Dahlia Avenue to Hilltop Drive; C3R from Clarewood Boulevard to Dahlia Avenue; and C4 from Hilltop Drive to Indian River Avenue.

C3R classification is described as a roadway with mostly residential uses within large blocks and a disconnected or sparse roadway network. C3C classification is described as a roadway with mostly non-residential uses with large building footprints and large parking lots within large blocks and a disconnected or sparse roadway network. C4 classification is described as roadways with a mix of uses set within small blocks with a well-connected roadway network. The roadway network usually connects to residential neighborhoods immediately along the corridor or behind the uses fronting the roadway. A memorandum showing the primary and secondary measures, and the results of the context classification evaluation can be found in **Appendix A**.

2.4.3 Right of Way

The roadway right of way (R/W) has been inventoried for the roadway corridors within the Study Area using FDOT R/W maps obtained from the FDOT District 5 Survey and Mapping Unit. Table 1: Right of Way Summary shows the available R/W by roadway segment.

Table 1: Right of Way Summary

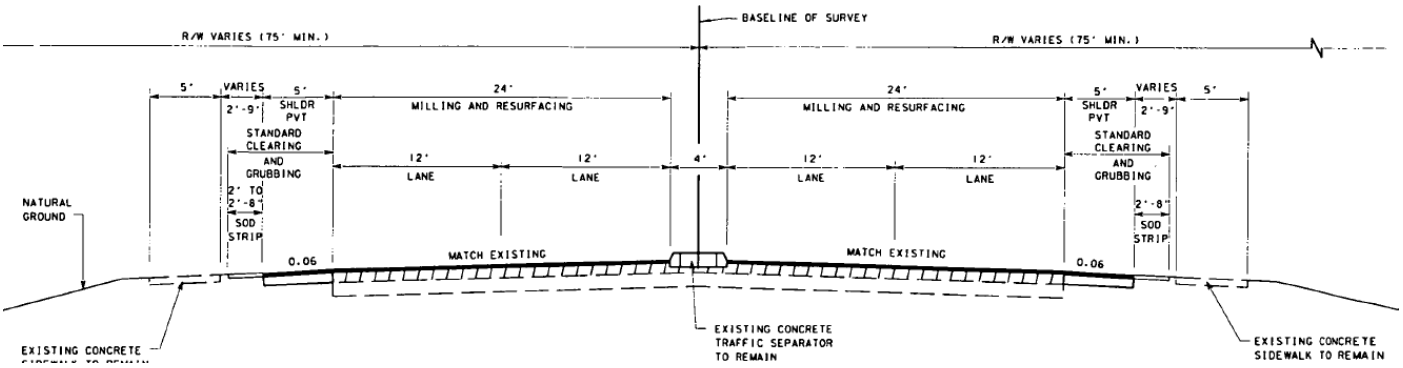
Roadway	Roadway ID	From	To	R/W Width (Feet)
SR 406 (Garden Street)	70002000	South Lake Elementary School	East of I-95	150-200
SR 406 (Garden Street)	70002000	East of I-95	Dixie Avenue	100
SR 406 (Garden Street)	70002000	Dixie Avenue	US 1 SB (Hopkins Street)	80
SR 406 (Garden Street)	70002000	US 1 SB (Hopkins Street)	US 1 NB (Washington Avenue)	74
SR 406 (Garden Street)	70160001	US 1 NB (Washington Avenue)	Indian River Avenue	100-200

Source: FDOT R/W Maps

2.4.4 Typical Sections

The typical sections found within the Study Area are illustrated below. Figure 4, Figure 5, Figure 6 and Figure 7 are taken from the Final As-Built Plan provided by FDOT for a Milling and Resurfacing project along the corridor, Financial Project ID 237632-1-52-01.

Figure 4: South Lake Elementary School to I-95



The exceptions to this typical section exist at the old entrance of South Lake Elementary School with the addition of a westbound left turn lane into the education center. In the eastbound direction fronting South Lake Elementary School, the travel lane transitions from one to two lanes and the concrete separator median is not present directly in front of South Lake Elementary School.

Figure 5: I-95 to Dixie Avenue

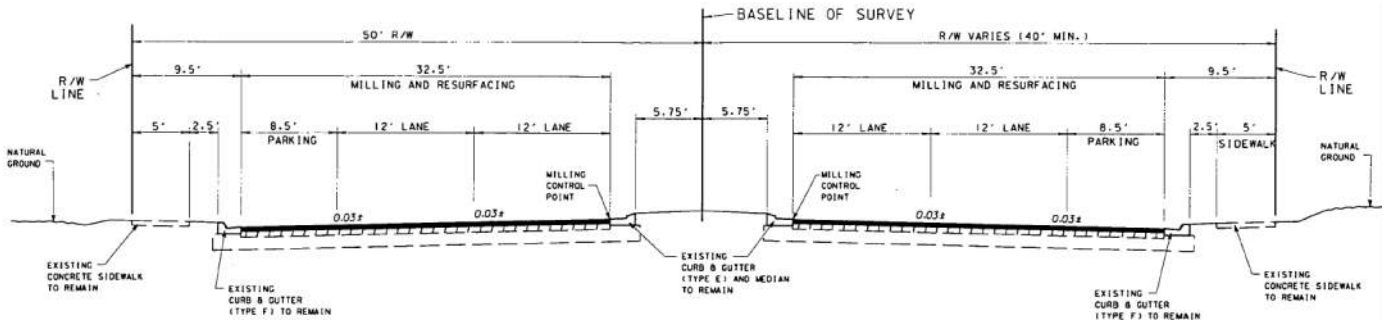
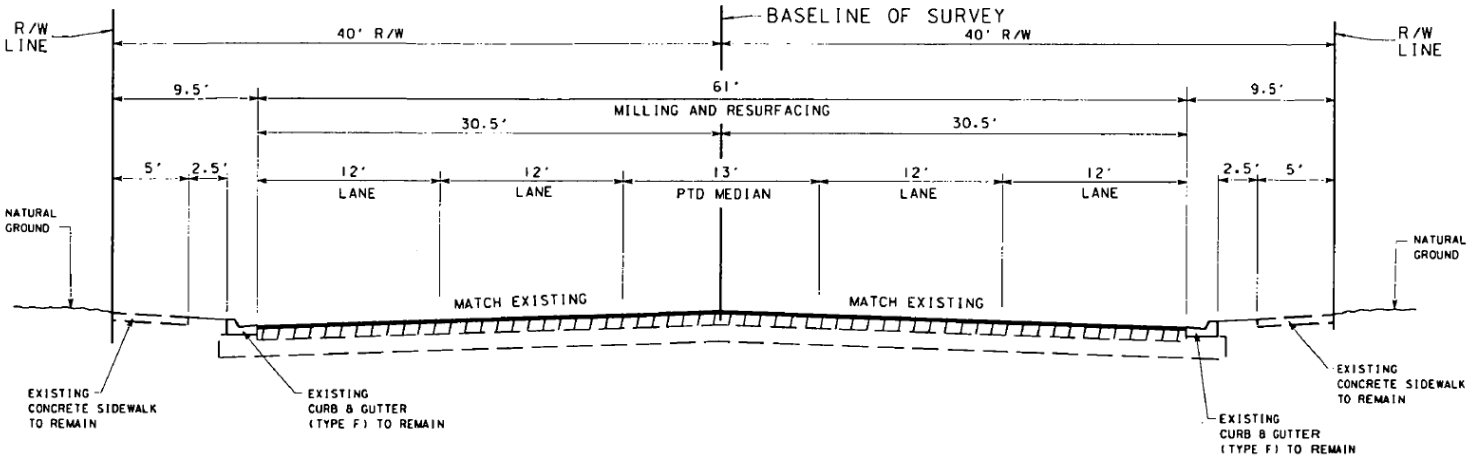
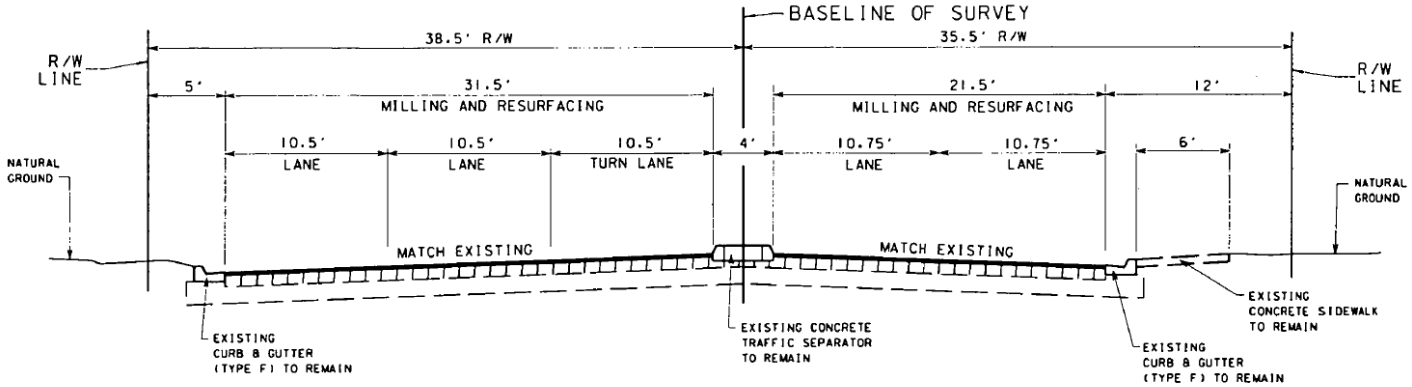


Figure 6: Dixie Avenue to US 1 SB (Hopkins Avenue)



The only exception for this typical section is located between Palm Avenue and US 1 Southbound where the median is striped closed.

Figure 7: US 1 SB (Hopkins Avenue) to US 1 NB (Washington Avenue)



2.4.5 Access Management

FDOT classifies access on state roadways using a seven-tier access management system established in rule 14-97 of the Florida Administrative Code (FAC). The classification system ranges from Access Class 1, reserved for limited access freeways, to Access Class 7, assigned to lower priority state highways in areas that are already highly urbanized. This classification system assigns standards for driveway connections, spacing, median opening spacing, and signal spacing.

Table 2 shows the approximate limits for Access Class categories and corresponding posted speed limits (MPH) for the Study Area. The spacing standards for each Access Class as per FDOT are shown in Table 3. These Access Classes and posted speeds dictate the allowable spacing of signalized intersections, pedestrian crossing opportunities and local street connections for the corridor. The most restrictive Access Class (1) is for limited access roadways and allows for no signalized intersections or driveways. The least restrictive Access Class (7) allows signalized intersections at 1,320-foot (1/4-mile) spacing.

Table 2: FDOT Access Management Classifications and Posted Speeds

Roadway	Limits	Access Class	Posted Speed
SR 406 (Garden Street)	South Lake Elementary School (MP 0.000) to CR 405/Park Avenue (MP 2.265)	5	40
SR 406 (Garden Street)	CR 405/Park Avenue (MP 2.265) to E of Maiden lane (MP 2.670)	6	40
SR 406 (Garden Street)	E of Maiden Lane (MP 2.670) to US 1 NB (Washington Avenue) (MP 2.949)	6	30

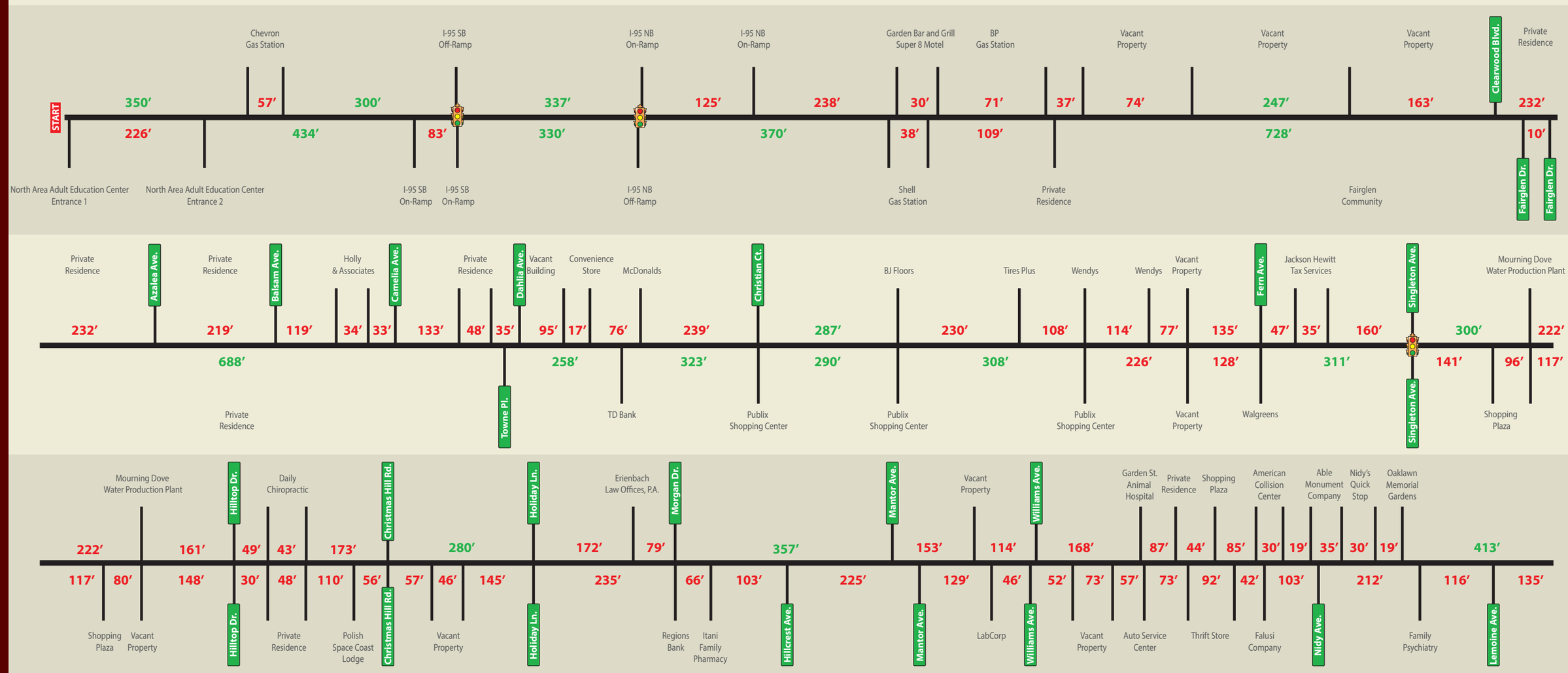
Source: FDOT Straight Line Diagram, FDOT Roadway Characteristic Inventory (RCI) Data

Table 3: Access Class Spacing Standards

FDOT Access Management Class	Minimum Connection Spacing (feet)	Minimum Median Opening Spacing (feet)		Minimum Signal Spacing (feet)
		Directional	Full	
Class 5	440/245[1]	660	2,640/1,320[1]	2,640/1,320[1]
Class 6	440/245[1]	NA	NA	1,320

Source: Section 14-97.003, Florida Administrative Code
[1] Greater than 45 MPH / Less than or equal to 45 MPH

Figure 8 through Figure 13 illustrate the existing access management and indicate whether or not the median, connection, and signal spacing are currently satisfying access management standards.



LEGEND

000 - Meets Access Management Standards

000 - Does Not Meet Access Management Standards

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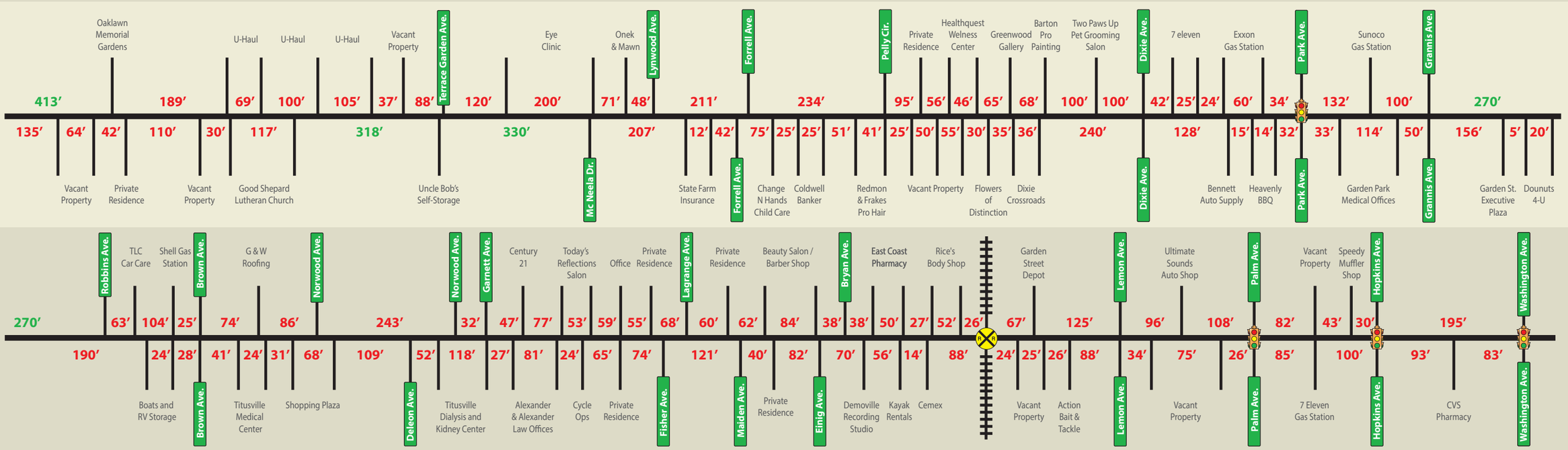
SOUTH LAKE ELEMENTARY SCHOOL TO INDIAN RIVER AVENUE

FIGURE 8
Connection Spacing



LEGEND

000 - Meets Access Management Standards

000 - Does Not Meet Access Management Standards

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SOUTH LAKE ELEMENTARY SCHOOL TO INDIAN RIVER AVENUE

FIGURE 9
Connection Spacing

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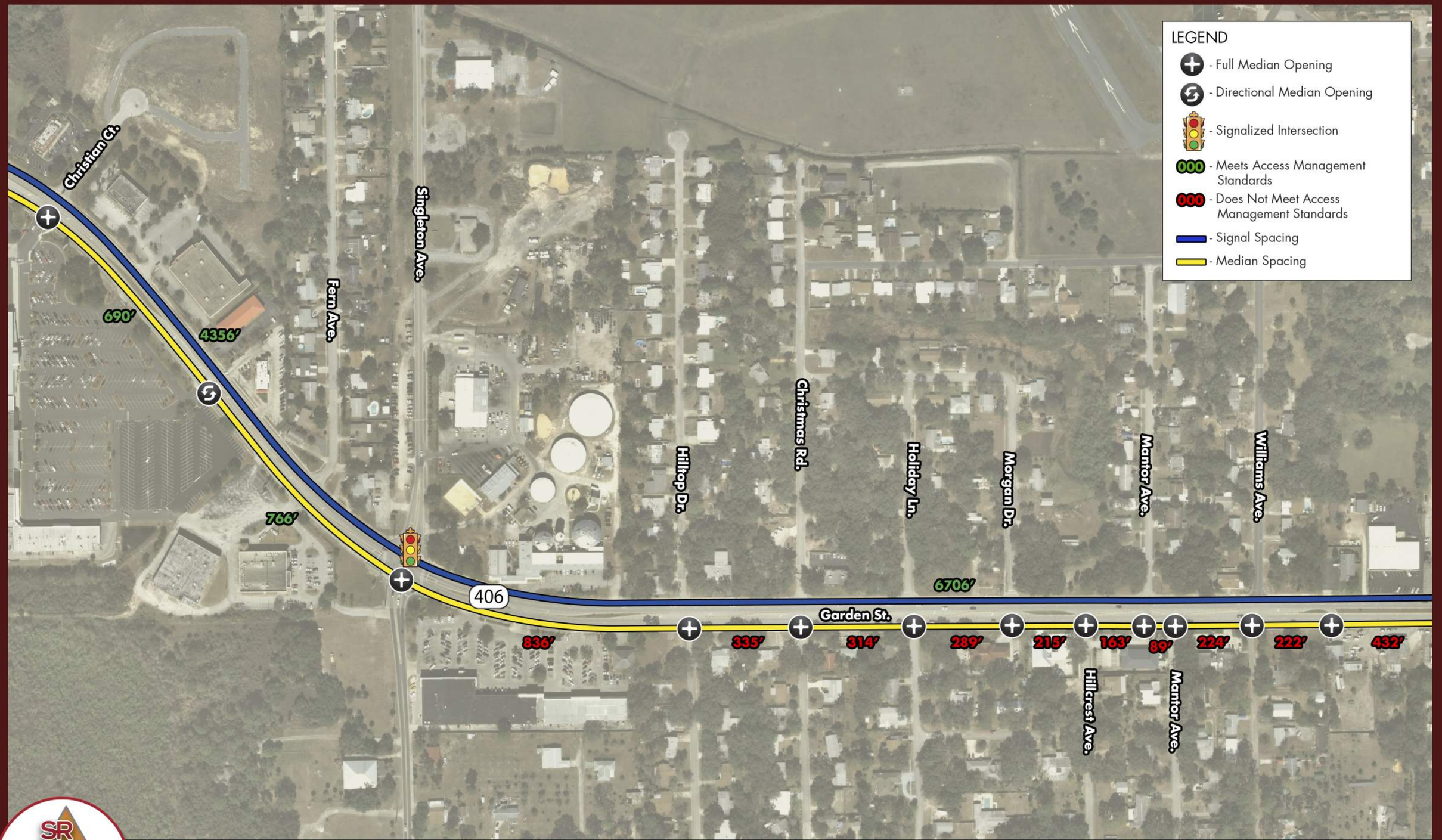
SOUTH LAKE ELEMENTARY SCHOOL TO INDIAN RIVER AVENUE

FIGURE 10

Access Management - Signalized Intersection and Median Spacing



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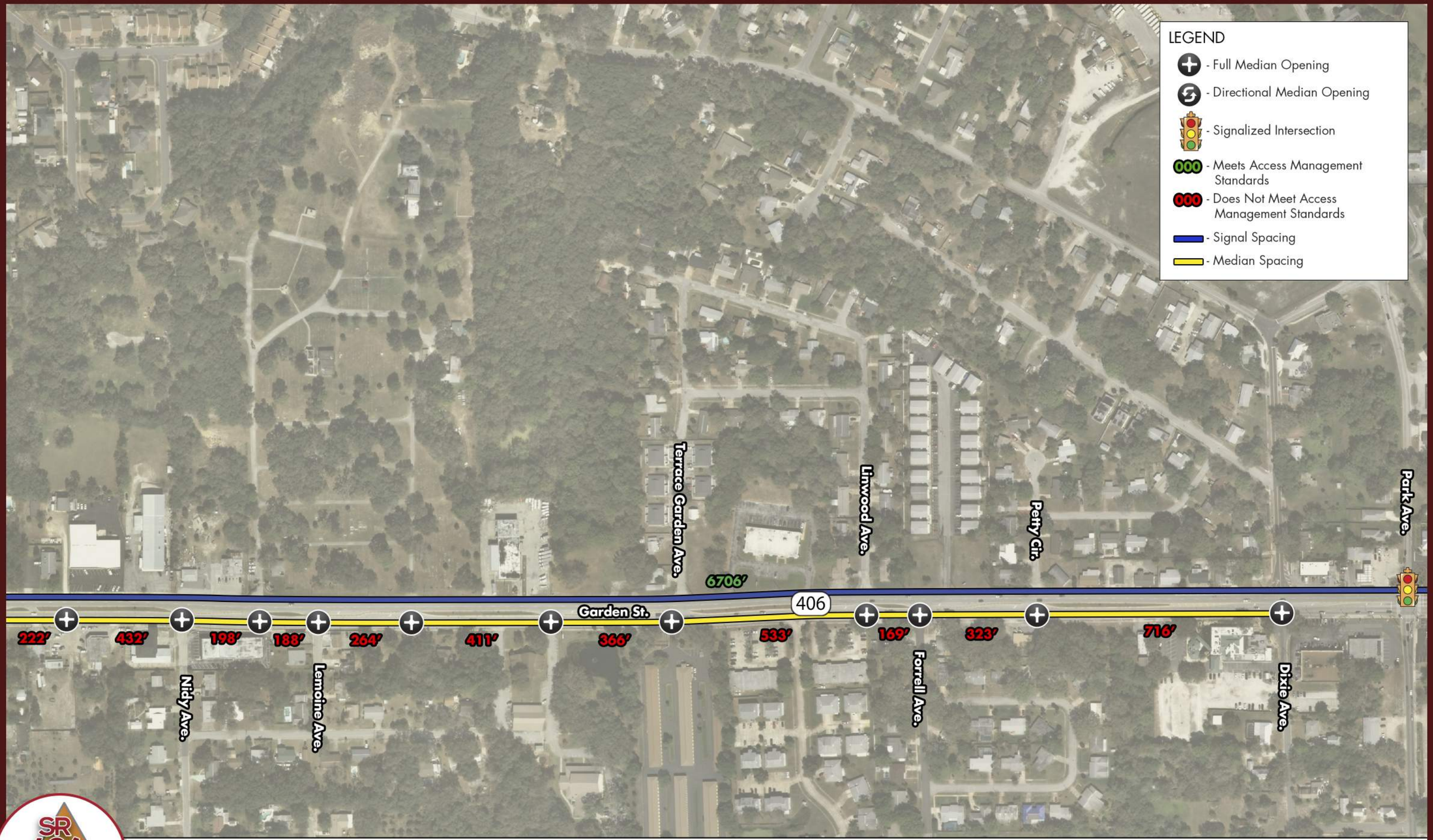
SOUTH LAKE ELEMENTARY SCHOOL TO INDIAN RIVER AVENUE

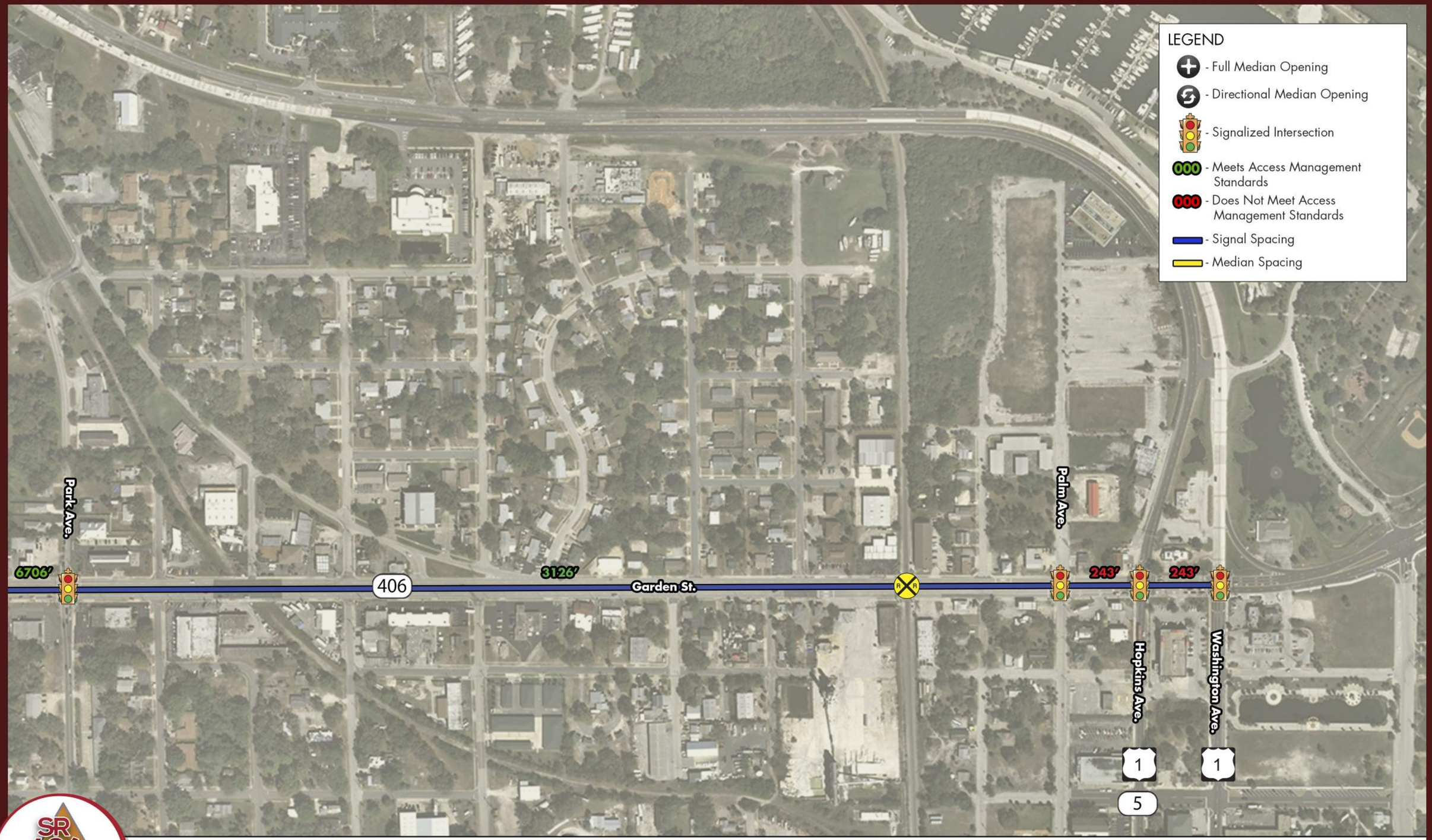
FIGURE 11
Access Management - Signalized Intersection and Median Spacing



SR 406 Concept Development & Evaluation

SOUTH LAKE ELEMENTARY SCHOOL TO INDIAN RIVER AVENUE

FIGURE 12
Access Management - Signalized Intersection and Median Spacing



SR 406 Concept Development & Evaluation

SOUTH LAKE ELEMENTARY SCHOOL TO INDIAN RIVER AVENUE

FIGURE 13
Access Management - Signalized Intersection and Median Spacing

2.4.6 Existing Intersection Geometry

Figure 14 provides the year 2017 intersection geometry for all the following signalized intersections in the Study Area:

- SR 406 (Garden Street) / I-95 Southbound Ramps
- SR 406 (Garden Street) / I-95 Northbound Ramps
- SR 406 (Garden Street) / Singleton Avenue
- SR 406 (Garden Street) / Park Avenue
- SR 406 (Garden Street) / Palm Avenue
- SR 406 (Garden Street) / US 1 SB (Hopkins Avenue)
- SR 406 (Garden Street) / US 1 NB (Washington Avenue)

2.4.7 Parking

Approximately 1,950 linear feet of on-street parking bays are provided along the south side of the corridor while 850 linear feet of parking is provided along the north side. All available parking throughout the Study Area is located between I-95 and Dixie Avenue due to R/W constraints east of Dixie Avenue. Figure 14 illustrates the on-street parking locations.

2.4.8 Lighting

Street lighting is provided along both sides of the corridor with the exception of the areas just east and west of the I-95 interchange area. The overhead cantilever lighting is either self-contained or mounted to existing power poles. Lighting was installed at the interchange in 2016, but the areas just east and west of the interchange still lack lighting. These unlit areas extend approximately 500 feet east and west from the new lighting at the interchange. Specific lighting locations are illustrated on Figure 14.

West

East

Garden St.

406

Singleton Ave.

Palm Ave.

Park Ave.

Washington Ave.

Hopkins Ave.

Indian River Ave.

I-95 SB Off Ramp

I-95 SB On Ramp

I-95 NB On Ramp

I-95 NB Off Ramp

LEGEND

- Signalized Intersection
- Stop-Controlled Intersection
- Intersection Lane Geometry
- On-Street Parking Areas
- Street Lighting

SR 406 Concept Development & Evaluation

SOUTH LAKE ELEMENTARY SCHOOL TO INDIAN RIVER AVENUE

FIGURE 14
Existing Intersection Geometry, Parking, and Lighting Facilities

2.4.9 Utilities

A Sunshine One Call ticket was processed in August 2017 to identify a list of potential utility providers within the corridor. A 500-foot buffer was applied around the Study Area to identify the utility companies located adjacent to the corridor as well. Table 4 presents the utility companies/agencies that have facilities located within the Study Area. The full information obtained on utilities is provided in **Appendix B**.

Table 4: Utility Agencies and Contact Information

Utility Company	Notes
Florida City Gas *Bock Kreinhagen* *(321) 638-3424*	3-inch steel pipe runs from west of the Study Area along the south side of SR 406 (Garden Street) to Hilltop Drive where it continues south out of the Study Area. This pipe branches off and crosses between Dahlia Avenue and Fern Avenue, as well as running both north and south along the west side of Singleton. 3-inch pipe can also be found crossing SR 406 (Garden Street) on the east side of Brown Avenue. 1-inch steel pipe crosses SR 406 (Garden Street) on the west side of Hilltop Drive and Christmas Hill Road both ending up heading east and west along Tropic Street. 1.25-inch steel can be found along the north side of SR 406 (Garden Street) between Hilltop Drive and Christmas Hill Road, and also crossing SR 406 (Garden Street) on the west side of Forrell Avenue. 4-inch polyethylene pipe runs along the west side of Park Avenue crossing over SR 406 (Garden Street).
CenturyLink *George McElvain* *(303) 992-9931*	No information provided.
Florida Power & Light *Joel Bray* *(954) 581-3088*	Utilities can be found along the north side of SR 406 (Garden Street). Off this main utility line, many other utility lines cross over SR 406 (Garden Street) including two between I-95 and Clarewood Boulevard, one east of Balsam Avenue, one between Balsam Avenue and Camela Avenue, one east of Camela Avenue, and one east of Dahlia Avenue. A utility runs along the west side of Singleton Avenue crossing over SR 406 (Garden Street). There are also crossings at and east of Williams Avenue, east of Lemoine Avenue, east of Pamela Street, east of Petty Circle, and one crossing over on the west side of Dixie Avenue. Park Avenue, Deleon Avenue, just west of Lemon Avenue, and Palm Avenue also carry utilities that cross over SR 406 (Garden Street).
AT&T Distribution *Bryan Coughlin* *(954) 249-0558*	Underground duct bank can be found from the east end of the Study Area along the north side of SR 406 (Garden Street) until Singleton Avenue where it crosses over to the south side, terminating at Hilltop Drive. It is also located from Dixie Avenue to Brown Avenue along the south side of SR 406. Aerial cable can be found along the south side of SR 406 (Garden Street) from east of Singleton Avenue to west of Dixie Avenue. It then picks back up at Park Avenue and Einig Avenue. It is also found on the north side of SR 406 (Garden Street) from Hilltop Drive to Williams Avenue. Another segment on the north is located from between Terrace Garden Avenue to west of Dixie Avenue. Buried cable can be found along both the north and the south sides of SR 406 (Garden Street). The northern segment commences west of Clarewood Boulevard and terminates east of Azalea Avenue. The southern segment terminates east of Camelia Avenue. It is also located on the north and south of SR 406 from Dahlia Avenue to Christian Court. Another segment of buried cable is on the north side of SR 406 (Garden Street) from Williams Avenue to west of Nidy Avenue. The final segment along the north side is from Garnet Avenue between Lagrange Avenue and Bryan Avenue. Underground duct banks cross SR 406 at

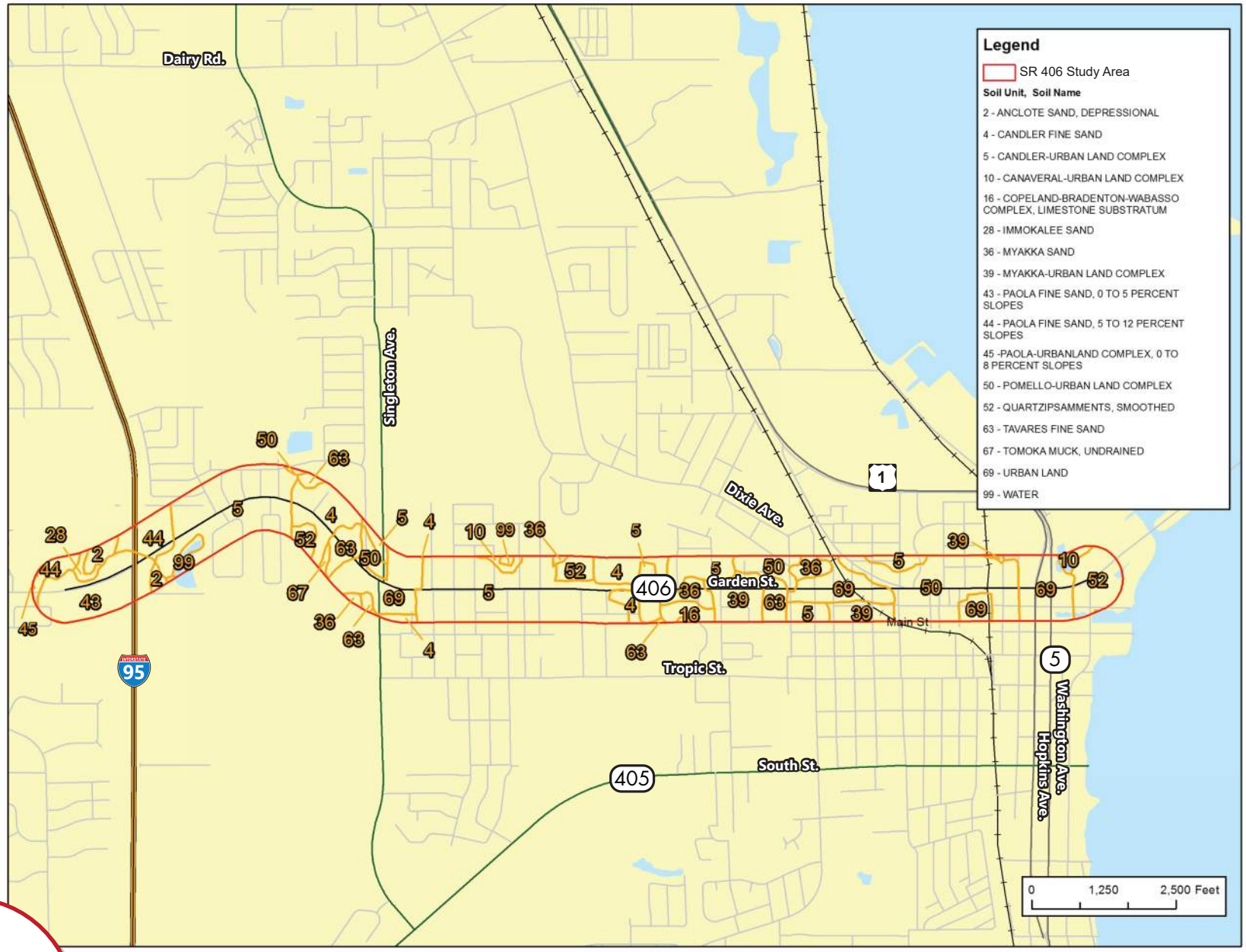
	Singleton Avenue, Hilltop Drive, Dixie Avenue, and Brown Avenue. Underground cables cross at Towne Place, Christmas Hill Road, Williams Avenue, Terrace Garden Avenue, between Terrace Garden Avenue and McNeala Drive, Mcneala Drive, east of Lynwood Avenue, east of Forrell Avenue, Dixie Avenue, and Hopkins Avenue. Aerial cables cross SR 406 at Park Avenue, Grannis Avenue, Deleon Avenue, Palm Avenue, and Hopkins Avenue.
MCI (Verizon) *Dean Boyers* *(469) 886-4238*	Underground utilities can be found within the railroad R/W coming from south of the Study Area crossing over SR 406 (Garden Street) west of Lemon Avenue then heading north of the Study Area. The utilities split off at SR 406 (Garden Street) and head along the north side ending at the bridge.
Transcore *Tushar Patel* *(386) 943-5315*	Utilities can be found along the north side of SR 406 (Garden Street) from I-95 to US 1 SB (Hopkins Avenue). They also parallel I-95 on the west side crossing SR 406 near the southbound ramps. There are also utilities that cross SR 406 (Garden Street) coming from south of the study area along the west side of Singleton Avenue and US 1 SB (Hopkins Avenue) both ending at SR 406 (Garden Street).
City of Titusville *Jimmy Gager* *(321) 567-3883*	No information provided.
Spectrum *Paul Rymer* *(321) 757-6451*	Underground fiber optic cables can be found just east of the northbound I-95 ramps along the north side of SR 406 (Garden Street). It can also be found just east of Fairglen Drive along the south side of SR 406 (Garden Street), as well as from Hilltop Drive to Mantor Avenue along the north side of the roadway. Another segment is from Lynwood Avenue to Petty Circle along the north side of SR 406 (Garden Street). Overhead fiber optic cables can be found starting east of I-95 along the north side of SR 406 (Garden Street) to Singleton Avenue where it stops, then picks back up east of Hilltop Drive to Christmas Hills Road. It can also be found along the north side of the roadway from Mantor Avenue to west of Indian River Avenue. Overhead fiber optics cross SR 406 (Garden Street) east of the northbound ramps of I-95, east of Dahlia Avenue, at Singleton Avenue, at Williams Drive, at Terrace Garden Avenue, east of Petty Circle, at Grannis Avenue, at Brown Avenue, at Deleon Avenue, east of Garnet Avenue, at and east of Bryan Avenue, west of Lemon Avenue, at Palm Avenue, at US 1 SB (Hopkins Avenue), and east of US 1 NB (Washington Avenue). Underground fiber optics cross SR 406 (Garden Street) west of Fairglen Drive, at Towne Place, at Christmas Hills Road, at Holiday Lane, at Mantor Avenue, and at Park Avenue.
Level 3 Communications LLC *Michael Nunez* *(877) 366-8344* *Ext: 2*	Underground utilities can be found within the railroad R/W coming from south of the Study Area crossing over SR 406 (Garden Street) west of Lemon Avenue then heading north of the Study Area.
Sprint Nextel *Mark Caldwell* *(407) 422-6670*	Utility company representatives specified that Sprint is only in the FEC railroad R/W. No other information was provided.
Tower Cloud, INC *James Davis* *(904) 813-2063*	No Information Provided
Crown Castle *David Antol* *(724) 416-2180*	No Information Provided

Source: Sunshine State One. Data was aggregated to reflect Study Area section limits

2.4.10 Soils

Soil conditions were inventoried within the Study Area using data provided by the National Resources Conservation Service. Seventeen soil units, including open water occur within the corridor and are represented on Figure 15 (Florida SSURGO (Soil Survey Geographic Database) (2010) via Florida Geographic Data Library (FGDL) (2017)). However, given the level of urbanization, most of the soils have been disturbed and reworked during development.

Source: Florida SSURGO (Soil Survey Geographic Database) (2010) via Florida Geographic Data Library (FGDL) (2017)



SR 406 Concept Development & Evaluation

SOUTH LAKE ELEMENTARY SCHOOL TO INDIAN RIVER AVENUE

FIGURE 15
Soils Map

2.4.11 Drainage

The general stormwater conveyance system that serves the SR 406 (Garden Street) corridor is curb and gutter along the roadway with storm pipes that direct runoff from the roadway either to wetlands, a stormwater management facility, or directly to an outfall. The curb and gutter typical section transitions to an open swale system just east of I-95 and continues South Lake Elementary School; the western limit of the Study Area. SR 406 (Garden Street) is generally depicted as flat terrain along the corridor however elevations decrease as the corridor approaches Indian River Avenue; the eastern limit of the Study Area. The United States Geological Survey (USGS) maps indicate a high point approximately at Christmas Hill Road. The roadway elevation is approximately 48 National Geodetic Vertical Datum (NGVD) at this point and reduces to 28 NGVD at the western limit of the Study Area and 2 NGVD at the eastern limit. There are other local low points to facilitate drainage within the closed system. The site is in the Upper St. Johns River Basin and the North Indian River Lagoon Basin. Ultimately, the stormwater runoff from the SR 406 (Garden Street) corridor flows to the St. Johns River, west of the Study Area, and the Indian River, east of the Study Area.

Floodplain

As shown in Figure 16, according to the Federal Emergency Management Agency (FEMA) Digital Flood Insurance Rate Map (DFIRM) for Brevard County (community panels 12009C0205G and 12009C0210G dated May 2016) SR 406 (Garden Street) has a small portion of the roadway within Floodplain Zone X. This zone has areas of 0.2% annual chance of flood; areas of 1% chance of flood with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance of flood. The area in Zone X is located near US 1 to the eastern limit of the Study Area. This area is also adjacent to a Floodplain Zone AE, where the base flood elevations have been determined (1.7 NAVD). Any fill placed in this area between the Seasonal Highwater Level (SHWL) and the floodplain elevation will require floodplain compensation. No net encroachment into the floodplain is allowed between the SHWL and the floodplain elevation.

Existing Drainage Conditions and Considerations

Stormwater runoff from the SR 406 (Garden Street) corridor flows to the St. Johns River, west of the Study Area, and the Indian River, east of the Study Area. The roadway runoff is conveyed to a curb and gutter system that provides drainage for the SR 406 (Garden Street) corridor. Along the corridor there are curb inlets and catch basins that are connected to a storm sewer system directing runoff to wetlands, a stormwater management facility, or directly to an outfall.

The detailed existing drainage conditions in the corridor improvement areas are described below. These were obtained from field observation, aerial review, general topography review, as-builts provided by FDOT and adjacent permits. The roadway itself does not have a permit with the St. Johns River Water Management District (SJRWMD). As-builts for the entire extent of the roadway were not available. Therefore, some existing storm sewer pipe and ponds were not located. The overall drainage pattern is shown in Figure 16. Permit research and field notes are provided in **Appendix D**.

There are four known discharge locations that provide an outfall to the SR 406 (Garden Street) corridor. The first outfall is located at the Publix parking lot west of Singleton Avenue. From the SJRWMD permit 120490-2 for St. Johns Plaza Publix (Transfer), an inlet on SR 406 (Garden Street) gutter connects to stormsewer pipes underneath the Publix parking lot that discharge to a wetland system. This system ultimately outfalls to the St. Johns River. The stormsewer system on SR 406 (Garden Street) from approximately Clarewood Boulevard to Christmas Hill Road drains to this location. See the Drainage Map & Field Notes SR 406 & Singleton Avenue figure found in **Appendix D**.

The second outfall is located at Nidy Avenue. The stormsewer system on SR 406 (Garden Street) from approximately Christmas Hill Road to Lemoine Avenue drains to this location. This system drains south on Nidy Avenue to Tropic Street where it outfalls to a wetland. From SJRWMD permit 102787-1 for SR 405 SR 50 to SR 5, the wetland system outfalls to the St. Johns River.

The third outfall is located at Forrell Avenue. The stormsewer system on SR 406 (Garden Street) from approximately Lemoine Avenue to Petty Circle drains to this location. This system drains south on Forrell Avenue to a ditch located east of Forrell Avenue between South Lilac Circle and North Eden Circle. The ditch is connected to a stormsewer system on Main Street that outfalls east to the Indian River.

The forth outfall is located on Orange Street. The stormsewer system from SR 406 (Garden Street) between Hopkins Avenue and Washington Avenue discharges to Space Park pond, a wet detention pond on Orange Street before outfalling east in a 60-inch concrete storm sewer pipe along Orange Street to the Indian River. It is unclear how much of the SR 406 (Garden Street) stormsewer system is connected to this outfall. See Drainage Map & Field Notes SR 406 & US 1 figure in **Appendix D**.

Intersection of SR 406 (Garden Street) and Singleton Avenue

As shown in the Drainage Map & Field Notes SR 406 & Singleton Avenue figure in **Appendix D**, all the drainage in the vicinity of this intersection consists of a curb and gutter section draining to curb inlets.

The stormwater from Singleton Avenue flows toward the intersection of SR 406 (Garden Street) and Singleton Avenue. There are several median inlets on SR 406 (Garden Street) west and east of the intersection. The eastbound lanes have a superelevation towards the median in this area. Stormwater runoff mainly flows northeast across the intersection; however, it is a large intersection with inlets at all corners.

From as-built review, it appears that offsite runoff from the shopping center located to the east of the SR 406 (Garden Street) and Singleton Avenue intersection, south of SR 406 (Garden Street) is draining to the SR 406 (Garden Street) stormsewer system.

Intersection of SR 406 (Garden Street) and US 1

As shown in the Drainage Map & Field Notes SR 406 & US 1 figure in **Appendix D**. All the drainage in the vicinity of this intersection consists of a curb and gutter section draining to curb inlets. From SJRWMD permits 34976-1 (CVS) and 56330-3 (Titusville Downtown Stormwater Park), the conveyance of stormwater runoff in this area is as follows:

The storm sewer system on SR 406 (Garden Street) flows east along SR 406 (Garden Street) and then south along US 1 NB (Washington Avenue). It discharges to the Space Park pond on Orange Street. In the past, this pond has been an alum injection treatment system, before outfalling east in a 60-inch concrete storm sewer pipe along Orange Avenue to the Indian River. It is unclear if this pond is still an alum treatment system. The existing pond is shown in the Drainage Map & Field Notes SR 406 & US 1 figure in **Appendix D**.

St. Johns River Water Management District Criteria

Proposed improvements to SR 406 (Garden Street) are subject to the St. Johns River Water Management District (SJRWMD) criteria that are current at the time of the improvement. In addition, the FDOT Drainage Manual requires that roadway projects' stormwater management facilities comply with Chapter 14-86 of the Florida Administrative Code regarding water quality, rate and volume.

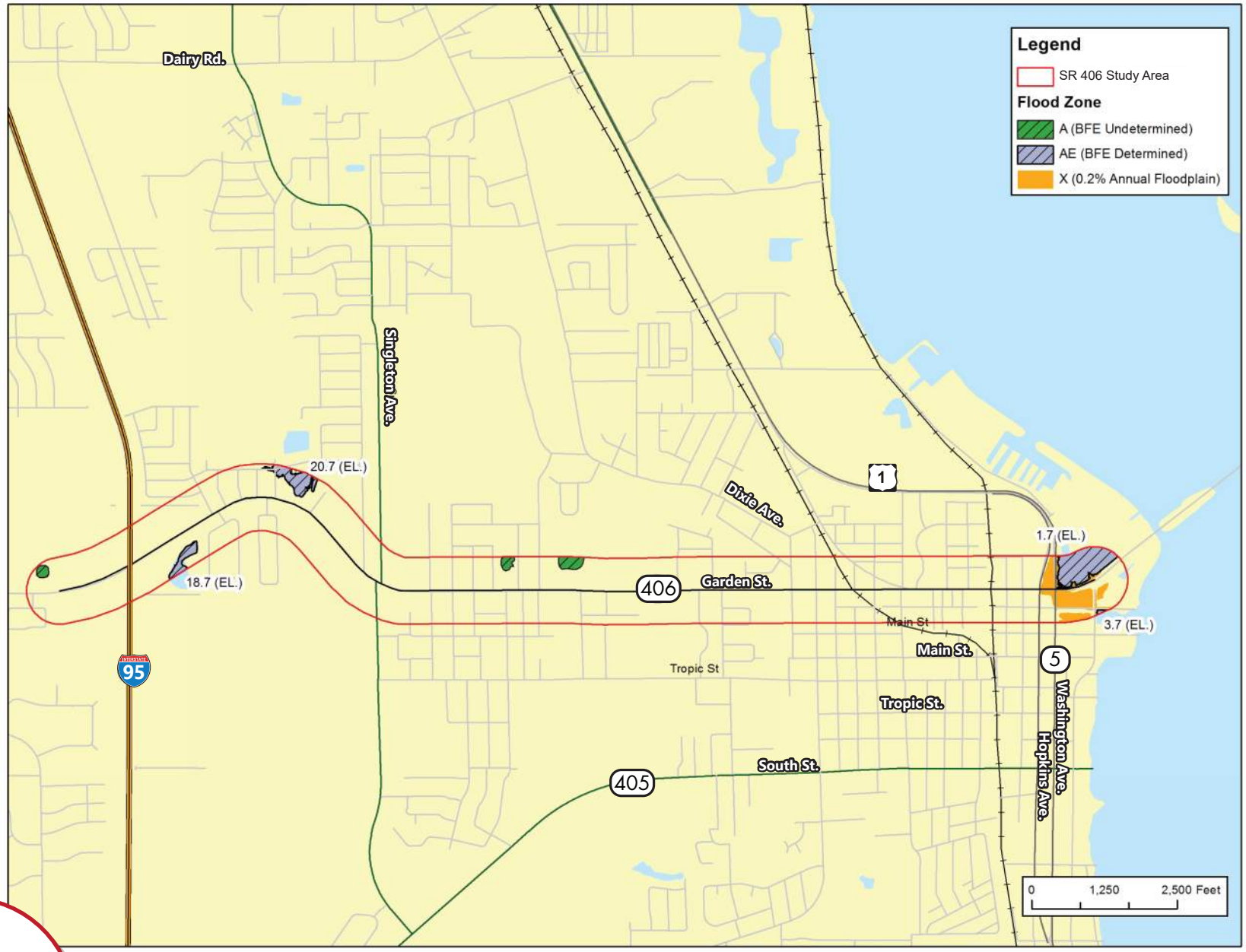
The site is in the Upper St. Johns River Basin and the North Indian River Lagoon Basin, which are hydraulically open basins that are impaired for nutrients.

Stormwater may need to be treated prior to its discharge to the respective water bodies and adequate erosion and turbidity barriers will be used during the proposed construction activities.

For the portion of the roadway in the Upper St. Johns River Basin, there is special criteria. A system may not result in an increase in the amount of water being diverted from the Upper St. Johns River Hydrologic Basin into coastal receiving waters. For stormwater detention systems, the post-development peak rate of discharge will not exceed the existing peak rate of discharge generated by the 10-year and 25-year storm events. On-site storage and outlet capacity should be designed for the 25-year storm. Outlet capacity design should be checked and further refined, if necessary, for the 10-year storm.

If treatment volumes are required, and wet detention systems are used, the project will need to provide storage for the water quality volume equal to 1-inch of runoff detention over the drainage area, or 2.5-inches times the percentage of impervious (excluding water bodies), whichever is greater. Additional water quality treatment volume and permanent pool volume are required because the Upper St. Johns River and North Indian River are Class III. Water quality classifications are arranged in order of the degree of protection required, with Class I water having generally the most stringent water quality criteria and Class V the least. Class III designation necessitates that the waterbody remained viable for fish consumption; as well as recreation, propagation and maintenance of a healthy, well-balanced population of fish and wildlife.

Source: Flood Hazard Zones of the Digital Flood Insurance Rate Map (DFIRM) in the State of Florida – May 2016 (FEMA)



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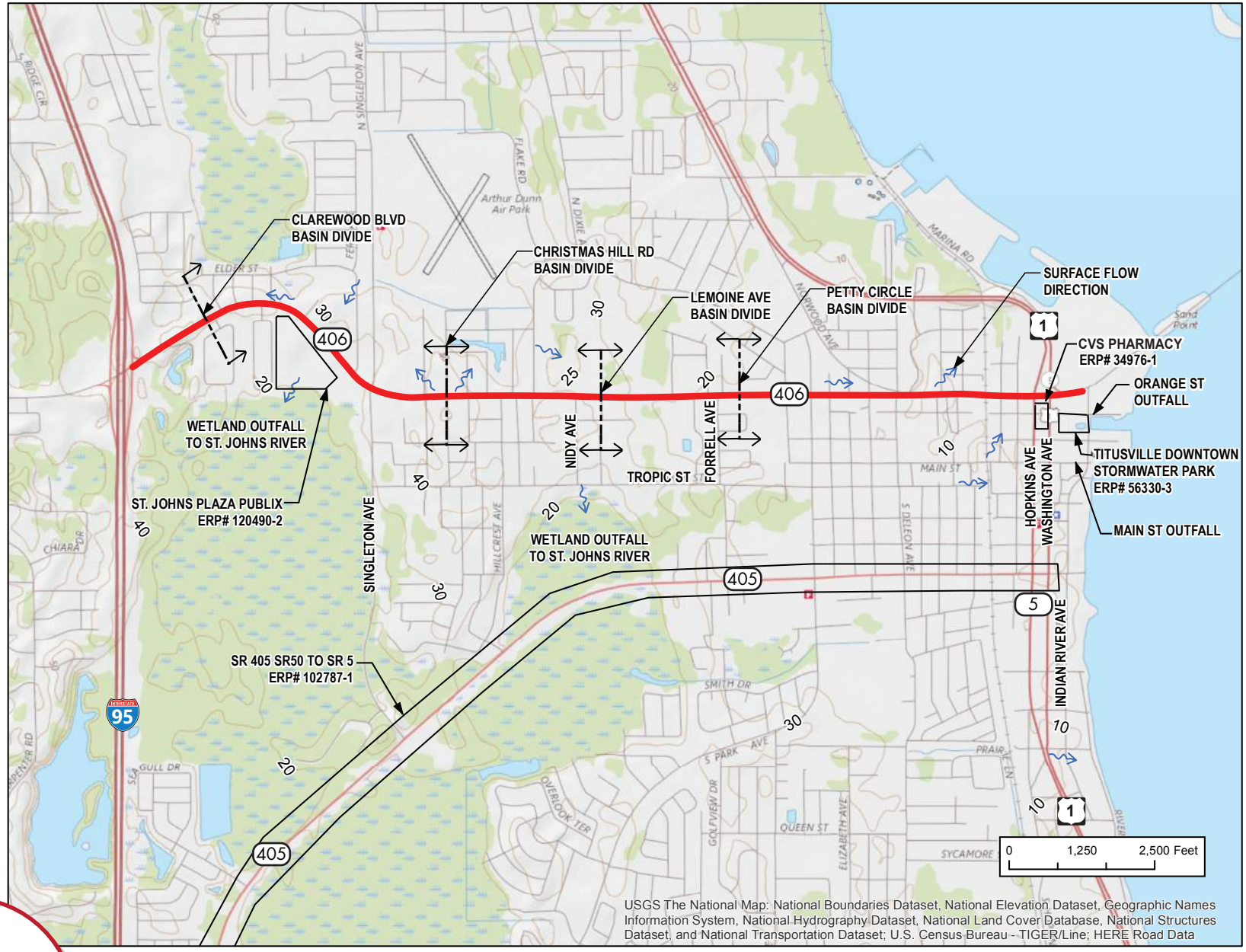
SOUTH LAKE ELEMENTARY SCHOOL TO INDIAN RIVER AVENUE

FIGURE 16
Floodplains Map



SR 406 Concept Development & Evaluation

SOUTH LAKE ELEMENTARY SCHOOL TO INDIAN RIVER AVENUE

FIGURE 17
USGS Drainage Map

2.4.12 Bicycle and Pedestrian Infrastructure

Bicycle and pedestrian connectivity play an important role within the Study Area given the number of commercial and institutional uses along the corridor. This section details the existing bicycle and pedestrian network in the Study Area.

Bicycle Facilities

Designated bicycle facilities are present from just west of I-95 southbound ramps to just east of the I-95 northbound ramps. Paved shoulders are provided for a short segment between South Lake Elementary School and the start of the bike lanes just west of I-95 and from the bike lane just east of I-95 for approximately 400 feet east. Figure 18 illustrates the existing designated bicycle facilities.

Sidewalks

Sidewalks are provided on both sides of SR 406 (Garden Street) for the entire length of the Study Area with exception to the north side of the corridor between US 1 SB (Hopkins Avenue) and US 1 NB (Washington Avenue) and within the channelizing island at Norwood Avenue. The gaps in sidewalk coverage are shown in Figure 18.

Crosswalks

Marked crosswalks with pedestrian signals are provided at all approaches of the signalized intersections along SR 406 (Garden Street) in the Study Area with the exception of the east and west approach at both I-95 ramps. There is one midblock crosswalk and several unsignalized marked crosswalks located throughout the corridor. Marked crosswalks within the Study Area are presented in Figure 18.

Trails

There are two trail segments within the Study Area, the East Central Regional Rail Trail – Titusville Segment and the Downtown Connector Trail. These two segments will comprise the Florida Coast-to-Coast Connector Trail and the Space Coast Loop Trail. The Florida Coast-to-Coast Connector Trail includes a number of regional trail systems that together provide a 250-mile multiuse trail from Florida's west coast (St. Petersburg area) to Florida's east coast (Space Coast).

The East Central Florida Regional Rail Trail – Titusville Segment (shown in Figure 18) crosses SR 406 diagonally (northwest) between N Grannis Avenue and N Robbins Avenue with a pedestrian overpass which was funded in the City of Titusville Capital Improvement Plan. This trail connects to an existing segment of the East Central Florida Regional Rail Trail (ECFRRT) to the northwest and to the Downtown Connector Trail to the east.

The Downtown Titusville Trail, illustrated in Figure 18, crosses both US 1 NB (Washington Avenue) and US 1 SB (Hopkins Avenue) at the Main Street intersections across the southern leg. The Downtown Titusville Trail connects to the East Central Florida Regional Rail Trail to the northwest

and the Future Space Coast Trail to the east. These trails are all part of the Coast-to-Coast trail network connecting St. Petersburg to the Space Coast.

Parallel Bicycle and Pedestrian Routes

There are no parallel bicycle and pedestrian routes within close proximity to the SR 406 (Garden Street) Study Area.

School Bus Routes

There is one public school with bus service and one school bus compound located adjacent to the Study Area:

- **Astronaut High School** is located approximately 0.3 miles north of the Study Area just east of I-95. The school is in a highly residential area with small local roads. School buses travel along and across SR 406 (Garden Street) to stops east and south of the Study Area. Clearwood Boulevard, providing access from SR 406 (Garden Street) to the high school, is the heaviest utilized cross street.
- **North Brevard County School Bus Compound** is located approximately 0.3 miles north of the SR 406 (Garden Street) /Park Avenue intersection. This Compound houses and services all the school buses for north Brevard County. The main entrance to this compound is accessed via Park Avenue. Therefore, school buses will utilize the SR 406 (Garden Street) /Park Avenue to access SR 406 (Garden Street) or to travel through it.

West

East

LEGEND

- Existing Bike Lane
- Paved Shoulder
- Signalized Crosswalk
- Non-Signalized Crosswalk
- Designated Mid-Block Crosswalk

Paved Shoulder

Paved Shoulder

95

406 Garden St.

406 Garden St.

East Central Florida Regional Rail Trail

Sidewalk Gap

Sidewalk Gap

Downtown Titusville Trail

Hopkins Ave.

Washington Ave.

1

1

1

5

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SOUTH LAKE ELEMENTARY SCHOOL TO INDIAN RIVER AVENUE

FIGURE 18
Existing Bike Lanes, Sidewalk Gaps, Marked Crosswalks & Proposed Trails

2.4.13 Transit Service and Infrastructure

Existing transit service in the Study Area is operated by Space Coast Area Transit (SCAT). This sub-section discusses these services.

Overview of SCAT

SCAT provides transit service within Brevard County, featuring 19 local fixed bus routes. SCAT also provides paratransit service and commuter assistance vanpools. The existing SCAT transit service types found within the Study Area are described below in more detail.

Fixed-route – Regular local bus service providing frequent stops typically spaced every two blocks.

Paratransit Service – The paratransit program provides service for eligible individuals who are not able to use the regular fixed-route bus service because of a disability or other limitations. Paratransit service is subsidized depending on the type of trip through one of the following: the Americans with Disabilities Act (ADA) program, the Transportation Disadvantaged (TD) program, or a negotiated agency contract.

Commuter Assistance Vanpools – The vanpool program provides vehicles that are purchased by the Brevard County Commission with support from federal capital grants. These vehicles are then provided to a third party, vRide, who then lease these vehicles to commuters. The leasing rate includes all maintenance, insurance, and administration costs.

The paratransit service and the commuter assistance vanpool programs are available on a case-by-case basis by request.

SCAT Transit Service

SCAT fixed-routes located along or intersecting with the SR 406 (Garden Street) Study Area include:

- Route 2 (Titusville) – This route serves as a local circulator for Titusville, operating in a counter-clockwise loop around the City. Within the Study Area, Route 2 provides service in the westbound direction along SR 406 (Garden Street) from Park Avenue to the Publix Shopping Center just west of Singleton Avenue.
- Route 5 (Titusville/Mims) – This route connects Titusville with Mims. Within the Study Area, this route crosses SR 406 (Garden Street) at US 1 NB (Washington Avenue) and serves SR 406 (Garden Street) as it moves east before turning south onto US 1 (Hopkins Avenue).

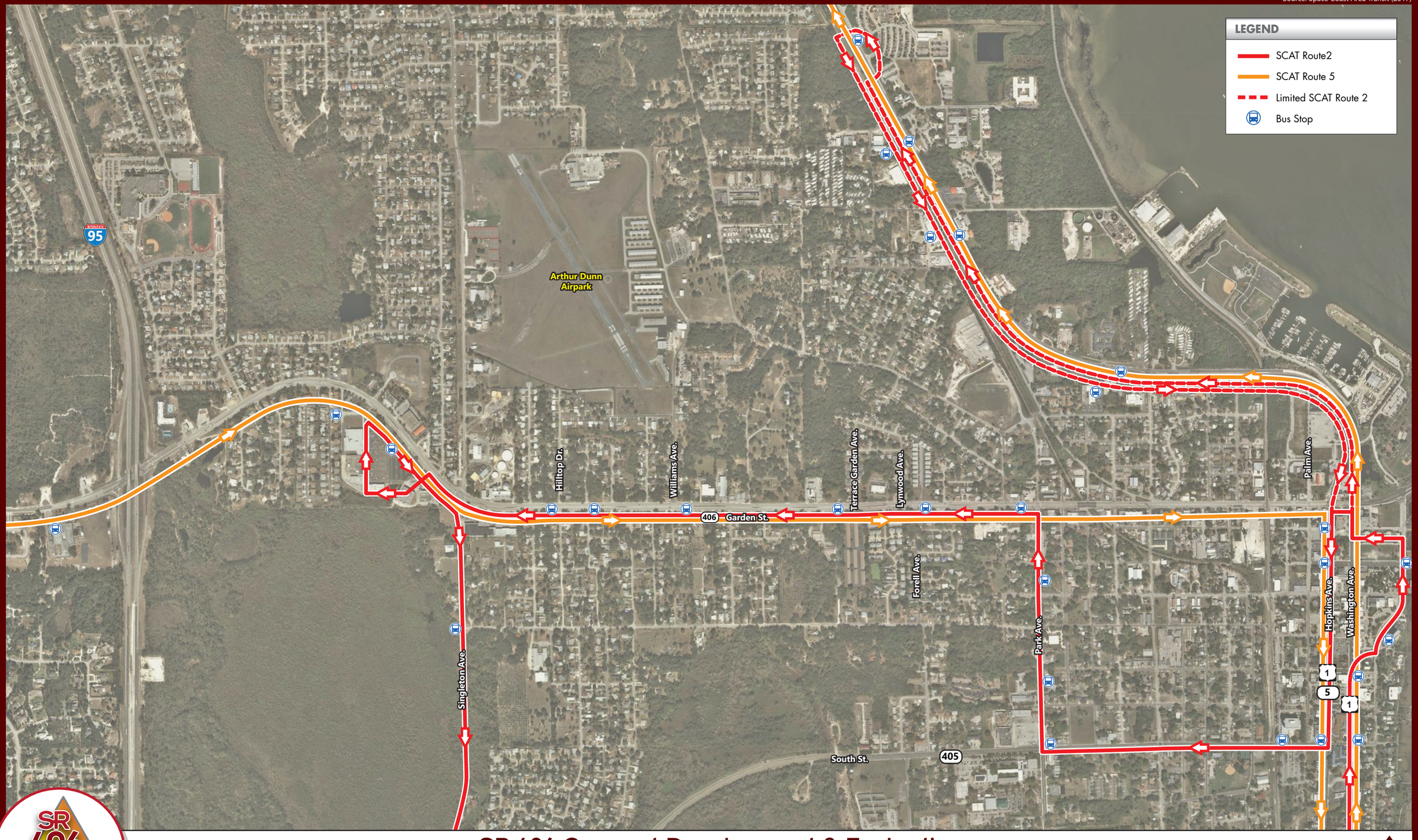
There are no transit centers located within the Study Area. Figure 19 shows the transit route alignments serving the Study Area. SCAT service in the Study Area is provided on weekdays and Saturdays, with service not provided on select major holidays. Table 5 presents the span of service, frequency, and ridership for Routes 2 and 5.

Table 5: SCAT Study Area Route Summary

Route	Route Description	Span of Service	Service Frequency	Flag Stop Route	October 2016 – August 2017 Total Ridership
2	Titusville	6:55 AM to 7:55 PM Monday – Friday 9:00 AM to 5:55 PM Saturday	60 Min 60 Min	No	82,807
5	Mims/Titusville	8:00 AM to 4:55 PM Monday – Friday 8:00 AM to 4:55 PM Saturday	60 Min 60 Min	Yes	44,089

*Note: Limited Service for Route 2 extends north on US 1 for the first and last 3 runs of the day for weekday service and at 1 PM and 5 PM on Saturday
Source: SCAT Posted Timetables (Effective 08/01/2017), SCAT 2013 Transit Development Plan, FY 2017 ridership provided by SCAT

Source: Space Coast Area Transit (2017)



SR 406 Concept Development & Evaluation

SOUTH LAKE ELEMENTARY SCHOOL TO INDIAN RIVER AVENUE

FIGURE 19
Transit Routes & Facilities

2.4.14 Field Reviews

Two field reviews were conducted for the SR 406 corridor study. Field review #1 was conducted on September 27, 2017, its purpose was to verify the existing conditions data collection and note additional findings. The field review team began at the Publix Shopping Center north of Singleton Avenue. The team began walking west along SR 406 to Fairglen Drive then south past Singleton Avenue to Christmas Hill Road. The team then drove down to the CVS Pharmacy at the SR 406 and US 1 intersections and began walking west to the railroad crossing. The team also reviewed east of US 1 to eastern limit of the SR 406 project (Indian River Avenue). Observations recorded include utilities, cross section measurements, drainage infrastructure, and potential design and MOT requirements for the proposed improvements.

Field Review #2 was conducted on May 18, 2018. The purpose of this field review was to understand the corridor in perspective of the proposed concepts and to understand potential design challenges. The team walked east along SR 406 from the Publix Shopping Center north of Singleton Avenue to Singleton Avenue. The team then drove down to the CVS Pharmacy at the SR 406 and US 1 intersections and began walking east to the limit of the SR 406 project (Indian River Avenue). The team also walked the corridor between Dixie Avenue and Brown Avenue to assess the viability of the transition from four to three lanes. Finally, the team waked along SR 406 just east of I-95. Observations recorded include utilities, cross section measurements, drainage infrastructure, and potential design and MOT requirements for the proposed improvements. A summary of the field review observations and actions items from both Field Review #1 and Field Review #2 can be found in **Appendix D**.

2.5 Safety and Crash Analysis

2.5.1 Total Crashes

Crash Data was obtained from Signal Four Analytics for the previous five years (January 01, 2011 to December 31, 2015) along SR 406 (Garden Street) from west of I-95 Southbound Ramp to U.S. 1 Northbound. A total of 476 crashes, including 201 injuries, were reported over the five-year period along SR 406 (Garden Street) within the Study Area limits, as illustrated by Table 6.

Table 6: Crash Data Summary

Year	Total Number of Crashes	Number of Injury Crashes	Total Number of Injuries	Number of Fatal Crashes	Total Number Fatalities	Number of Night Crashes	Number of Wet Crashes
2011	65	18	26	0	0	12	4
2012	96	26	39	0	0	17	13
2013	104	31	48	0	0	12	8
2014	115	31	44	0	0	15	15
2015	96	28	44	0	0	11	12
2011-2015	476	134	201	0	0	67	52
Average	***95.2***	***26.8***	***40.2***	***0***	***0***	***13.4***	***10.4***
Percent	***-***	***28.20%***	***-***	***0.00%***	***-***	***14.10%***	***10.90%***

Table 7 summarizes the number of crashes by harmful event along the SR 406 (Garden Street) corridor. The predominant crash types were angle (22.1%), rear-end (18.3%), and left turn crashes (10.9%).

Table 7: Crash Data Summary by Harmful Event

Crash Type	2011	2012	2013	2014	2015	2011-2015	Average Per Year	Percent
Angle	5	9	10	13	6	43	**8.6**	**21.0%**
Sideswipe	4	9	3	10	8	34	**6.8**	**16.6%**
Rear End	3	4	9	8	8	32	**6.4**	**15.6%**
Left Turn	0	4	4	3	3	14	**2.8**	**6.8%**
Off Road	0	1	6	4	2	13	**2.6**	**6.3%**
Bicycle	2	0	0	2	0	4	**0.8**	**2.0%**
Right Turn	0	0	0	0	2	2	**0.4**	**1.0%**
Head On	0	0	0	0	1	1	**0.2**	**0.5%**
Pedestrian	0	0	0	1	0	1	**0.2**	**0.5%**
Rollover	0	1	0	0	0	1	**0.2**	**0.5%**
Other	11	10	16	15	8	60	**12.0**	**29.3%**
Total	***25***	***38***	***48***	***56***	***38***	***205***	***-***	***100.0%***

Segment crash rates in crashes per million vehicle-miles traveled were calculated for the SR 406 (Garden Street) corridor in order to compare the actual crash rate of the corridor to the statewide average crash rate for similar facilities during the study period. The FDOT average crash rate statistics used in the comparison were extracted from the FDOT Crash Analysis Reporting System (CARS). Each transition in crash rate category or AADT (annual average daily traffic) requires a break in the segment crash rate calculation, resulting in five (5) distinct segments for which an individual crash rate was calculated and compared to the statewide average for the corresponding crash rate category.

Table 8 presents the roadway segments of SR 406 (Garden Street) (from South Lake Elementary School to I-95 and from US 1 SB (Hopkins Avenue) to US 1 NB (Washington Avenue)) that experienced an average crash rate higher than the average crash rate for similar locations through FDOT's state wide average. The length of the two segments, from US 1 SB (Hopkins Avenue) to US 1 NB (Washington Avenue) and US 1 NB (Washington Avenue) to Indian River Avenue, is 0.161 and 0.120 respectively. The short segment lengths imply a higher per-mile concentration of crashes compared to the statewide average crash rate. All segments, with the exception of South Lake Elementary School to I-95, are above the statewide average crash rate for their respective categories. These rates will be noted as the planning process continues to advance alternatives. Crashes are summarized by type and location in Figure 20.

Table 8: Crash Data Rate

From/To	Number [1] of Crashes	Length (miles)	AADT[2]	ACR[3]	High Crash Segment?	AVG[4]	High Crash Segment?
Roadway: SR 406 (Garden Street) Roadway ID: 70002000 Milepost: 0.000 to 2.949							
South Lake Elementary School to I-95	6	0.16	7,300	2.81	Urban 2-3 ln 2 way Divided Rsd	5.85	NO
I-95 to Singleton Avenue	126	0.87	16,000	4.96	Urban 4-5 ln 2 way Divided Rsd	3.12	YES
Singleton Avenue to Park Avenue	144	1.26	16,000	3.91	Urban 4-5 ln 2 way Divided Rsd	3.12	YES
Park Avenue to Palm Avenue	81	0.59	14,000	5.37	Urban 4-5 ln 2 way Divided Pvd	4.70	YES
Palm Avenue to US 1 Southbound	8	0.05	10,000	8.77	Urban 4-5 ln 2 way Divided Pvd	4.70	YES
US 1 Southbound to US 1 Northbound	46	0.05	9,900	50.92	Urban 4-5 ln 2 way Divided Rsd	3.12	YES
US 1 Northbound to Indian River Avenue	65	0.12	7,000	42.40	Urban 4-5 ln 2 way Divided Rsd	3.12	YES

1- Number of crashes from January 1, 2011 to December 31, 2015.
2- Data obtained from existing traffic conditions section.
3- Average Crash Rate (ACR) = (N*1,000,000)/(365*Y*AADT*L), where N = number of crashes, Y = number of years, AADT = Annual Average Daily Traffic, and L = Length of the segment in miles.
4- AVG = Statewide Average Crash Rate for Corresponding Category.
5- Segments are defined as including the 'from' intersection, but not including the 'to' intersection.

2.5.2 Bicycle and Pedestrian Crashes

A total of seven (7) crashes involving bicycles and pedestrians have occurred in the Study Area of SR 406 (Garden Street) corridor five of which involved bicycles and the other two involved pedestrians. The first pedestrian crash occurred between Hilltop Drive and Singleton Avenue, while the other occurred at the Dixie Avenue intersection. Both incidents occurred during clear and dry daytime conditions. Two (2) bicycle crashes occurred at the Dixie Avenue intersection as well as two at the Christian Court intersection. The final one occurred at the Lemoine Avenue intersection. Three of these crashes took place during clear and dry daytime conditions, and one during clear and dry nighttime conditions. The final incident occurred during rainy weather conditions and a wet surface. There were no fatalities as a result of these crashes.

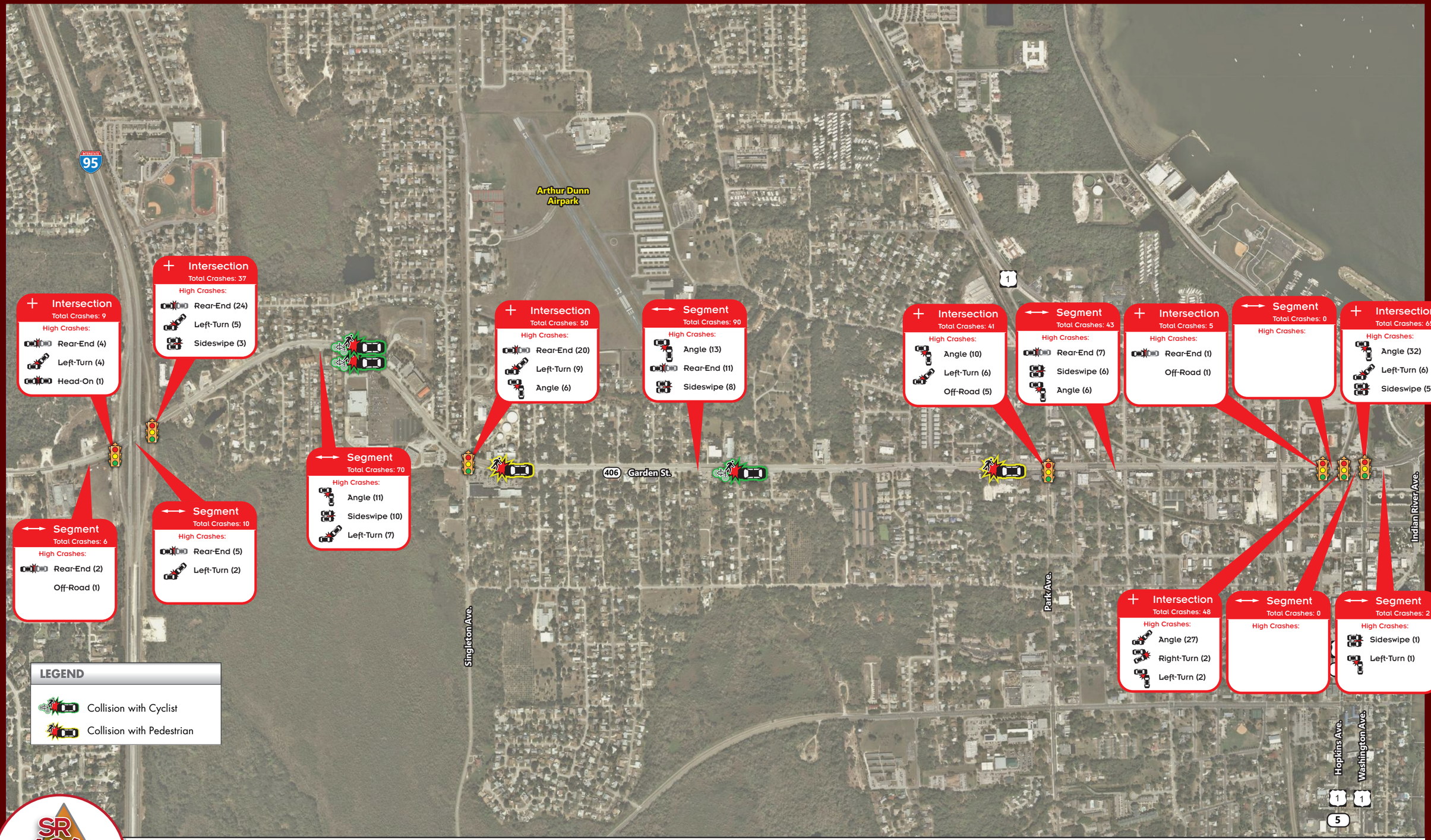


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FIGURE 20
2011-2015 Crash Type and Location

2.6 Existing Traffic Conditions

2.6.1 Existing Traffic Volumes

Traffic counts were conducted in August 2017 at the following Study Area locations:

24-hr Continuous Volume (Tube) Count Locations
- West of I-95
- East of I-95
- East of Singleton Ave
- East of Park Avenue
- West of US 1 SB (Hopkins Avenue)
- Between US 1 NB (Washington Avenue) and US 1 SB (Hopkins Avenue)
- East of US 1 NB (Washington Avenue)

Existing roadway 24-Hour bi-directional volume counts were collected at the above-mentioned locations and weekday turning movement counts were collected at the Study Area intersections during the AM (7:00 – 9:00 AM) and PM (4:00 – 6:00 PM) peak hours.

Intersection Turning Movement Counts
- SR 406 (Garden Street) /I-95 Southbound Ramp
- SR 406 (Garden Street) /I-95 Northbound Ramp
- SR 406 (Garden Street) /Singleton Avenue
- SR 406 (Garden Street) /Park Avenue
- SR 406 (Garden Street) /Palm Avenue
- SR 406 (Garden Street) /US 1 SB (Hopkins Avenue)
- SR 406 (Garden Street) /US 1 NB (Washington Avenue)

All traffic count data collected was adjusted utilizing the latest (2016) FDOT axle (where applicable) and seasonal adjustment factors for Brevard County to provide 2017 annual average conditions. All collected traffic counts and seasonal factors are provided in **Appendix E**. Existing 2017 volumes are illustrated in Figure 21 and Figure 22.

2.6.2 Year 2017 Level of Service Analysis

Existing 2017 operational analysis was conducted to determine the Level of Service (LOS) for the roadway segments and the Study Area intersections. Peak hour peak direction volumes along the different segments were compared against the latest Generalized Peak Hour Directional Service Volumes Tables from the 2012 FDOT Quality/Level of Service Handbook to obtain the arterial LOS. The LOS for the Study Area intersections were determined using the procedures as outlined in the Transportation Research Board's (TRB) – Highway Capacity Manual (HCM 2000) using Synchro Software (version 8.0).

Roadway Operational Analysis
According to FDOT, SR 406 (Garden Street) in the Study Area is classified as an "urban principal arterial other" and has an adopted LOS "D". The generalized peak hour directional service volumes for the LOS letters "A" through "F" were obtained from the 2012 FDOT Quality/Level of Service Handbook and compared with volumes collected from the 24-hour bi-directional tube

counts after seasonal and axle adjustments were applied to create average annual daily traffic for SR 406 (Garden Street) in the Study Area. A summary of the LOS analysis for the study roadways is included in Table 9.

Table 9: Existing Roadway Level of Service

Roadway/Segment	Daily		AM Peak			PM Peak		
	AADT	LOS	Volume	Pk. Dr.	LOS	Volume	Pk. Dr.	LOS
SR 406 (Garden Street)								
South Lake Elementary School to I-95	7,300	D	390	EB	C	390	WB	C
I-95 to Singleton Avenue	16,000	C	680	EB	C	690	WB	C
Singleton Avenue to Park Avenue	16,000	C	660	EB	C	760	WB	C
Park Avenue to Palm Avenue	14,000	C	610	EB	C	750	EB	C
Palm Avenue to US 1 SB (Hopkins Avenue)	10,000	C	390	EB	C	470	WB	C
US 1 Southbound to US 1 NB (Washington Avenue)	9,900	C	440	EB	C	600	WB	C
US 1 NB (Washington Avenue) to Indian River Avenue	7,000	C	600	EB	C	680	EB	C

2012 FDOT Quality/Level of Service Handbook Tables
AM and PM Peak Volumes and LOS are based off of Peak Direction
AADT = Data Collected * Seasonal Factor (1.06) * Axle Factor (0.99)

As shown in Table 9, the SR 406 (Garden Street) corridor currently operates within acceptable LOS standards. The existing arterial LOS conditions are illustrated in Figure 21.

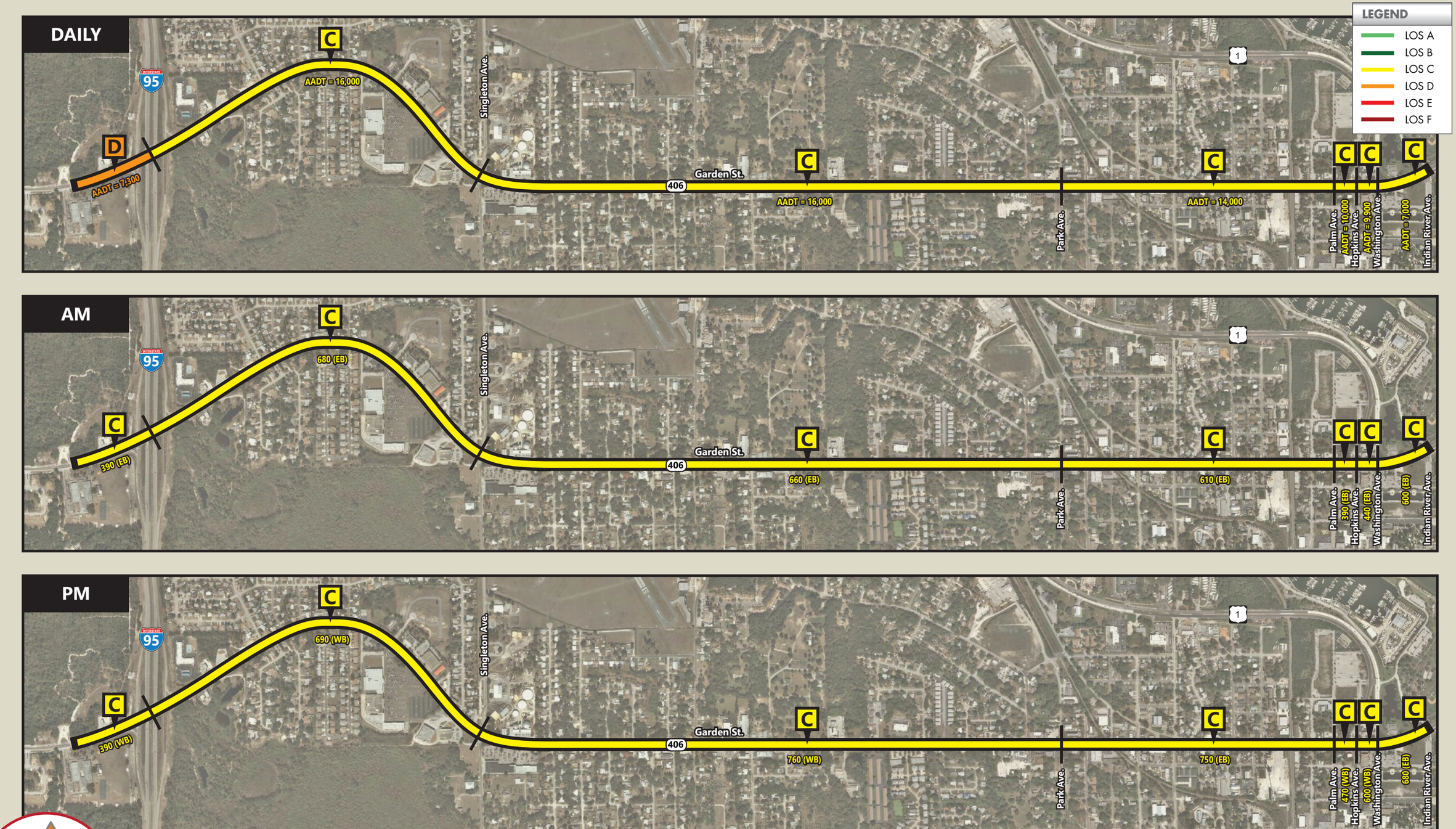

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FIGURE 21
Existing 2017 Roadway Operations

Intersection Operational Analysis

The Year 2017 intersection LOS is obtained by applying the seasonally adjusted TMCs to the existing intersection geometry. Existing signal timings were obtained from the City of Titusville and were utilized at all signalized intersections along the corridor. According to the Highway Capacity Manual (HCM) 2010, for signalized intersections, an average control delay per vehicle from 55 seconds up to 80 seconds is considered to be a LOS E condition. Beyond 80 seconds is considered to be a LOS F condition. As for unsignalized intersections, between 35 and 50 seconds is a LOS E conditions while anything about 50 seconds is LOS F. A summary of the LOS analysis for the study intersections is included in Table 10.

Table 10: Existing Intersection Level of Service

Intersection	Control	AM Peak		PM Peak	
		Delay	LOS	Delay	LOS
SR 406 (Garden Street)/I-95 SB Ramps	Signalized	11.0	B	8.8	A
SR 406 (Garden Street)/I-95 NB Ramps	Signalized	12.3	B	13.0	B
SR 406 (Garden Street)/Singleton Avenue	Signalized	27.4	C	33.4	C
SR 406 (Garden Street)/Park Avenue	Signalized	16.9	B	16.4	B
SR 406 (Garden Street)/Palm Avenue	Signalized	3.4	A	4.6	A
SR 406 (Garden Street)/US 1 SB (Hopkins Avenue)	Signalized	13.0	B	13.0	B
SR 406 (Garden Street)/US 1 NB (Washington Avenue)	Signalized	8.8	A	9.9	A

As seen in Table 10, the SR 406 (Garden Street) corridor currently operates under acceptable LOS conditions during the AM and PM peak hours. The existing intersection LOS conditions are graphically displayed in Figure 22. The Synchro Summary Sheets are provided in **Appendix C**.

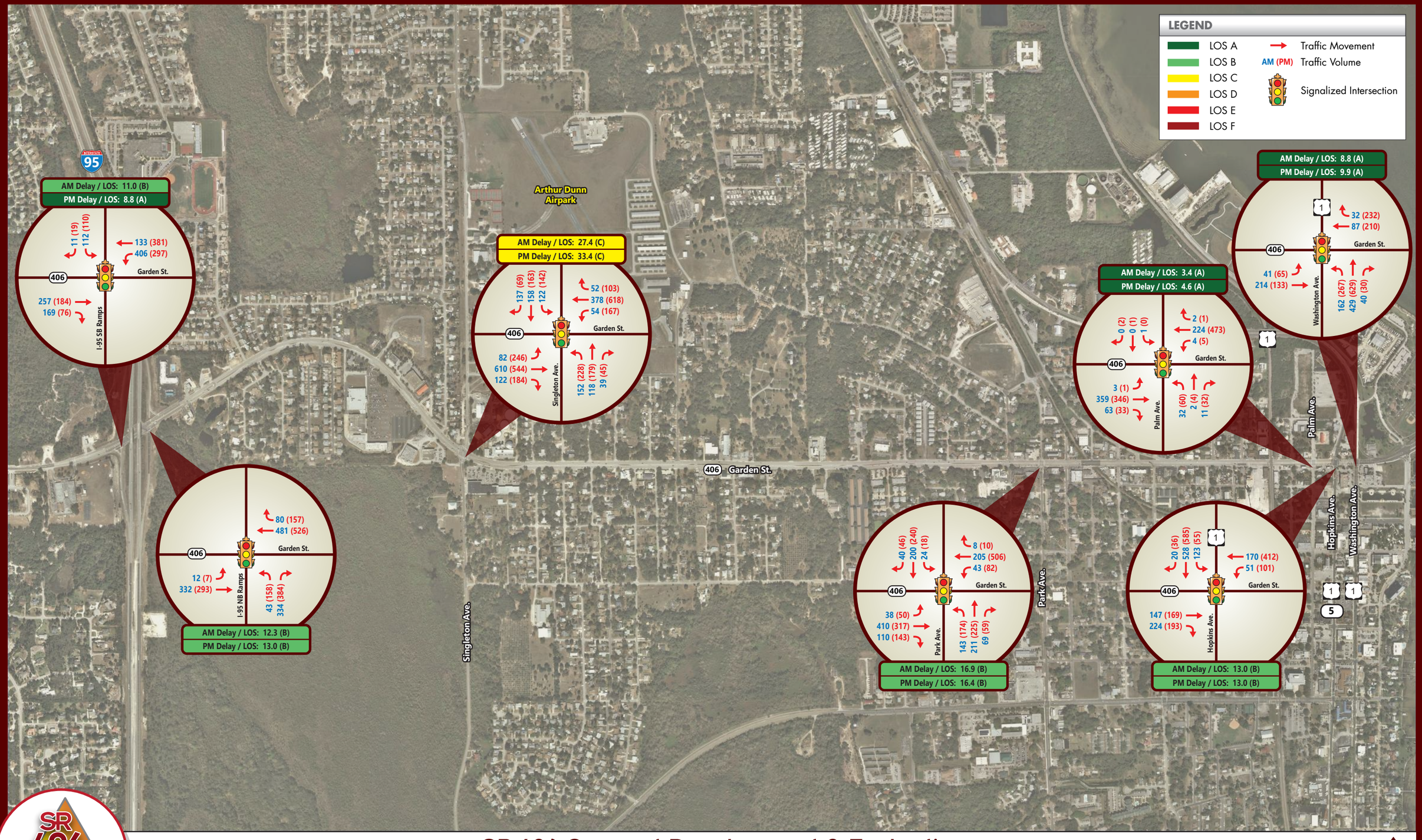

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FIGURE 22
Existing 2017 Intersection Operations

2.7 Environmental Character

The existing environmental information for the Study Area was extracted from Geographical Information System (GIS) datasets maintained by the Florida Geographic Data Library (FGDL). For purposes of this environmental analysis, a buffer of 500 feet was used for the Study Area.

The following were examined as part of this review:

- Cultural Resources
- Social Resources
- Population Characteristics
- Socioeconomic Data
- Major Employers and Activity Centers
- Threatened and Endangered Species
- Wetlands
- Floodplains
- Contamination

2.7.1 Cultural Resources

Cultural resources are defined by the National Historic Preservation Act (NHPA) of 1966 and governed by federal and state regulations. Section 106 of the NHPA provides a general process for cultural resource assessments and requires that historic and archaeological resources be considered in project planning for federally funded or permitted projects. Cultural resources or "historic properties" include any "prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in the *National Register of Historic Places (NRHP)."*

Archaeological sites or historic resources that are listed, determined eligible, or considered potentially eligible by the State Historic Preservation Office (SHPO) for listing in the NRHP are listed Table 11 These sites along with other state recorded sites and survey locations are graphically depicted in Figure 23.

Table 11: Summary of Cultural Resources

Cultural Resources	Within Study Area
SHPO Structures	30
SHPO Bridges	0
SHPO Resource Groups	2
National Register (Site, District, Building)	0
Archaeological Sites	0
SHPO Surveys	6

Source: FGDL, ETDM

According to the 2016 Florida Master Site File (FMSF), no known sites or structures eligible for listing on the NHRP are located within the Study Area. However, 30 FMSF historic standing structures are present, five of which have not been evaluated. These include 127, 124, and 132 Dixie Avenue S, and 112 and 802 Orange Street. Additional resource evaluation may be required for these structures should they be affected by the project. The two historic resource groups are linear resources associated with the Florida East Coast Railroad and US 1.

Source: Florida State Historic Preservation Office (SHPO) Survey (2016)

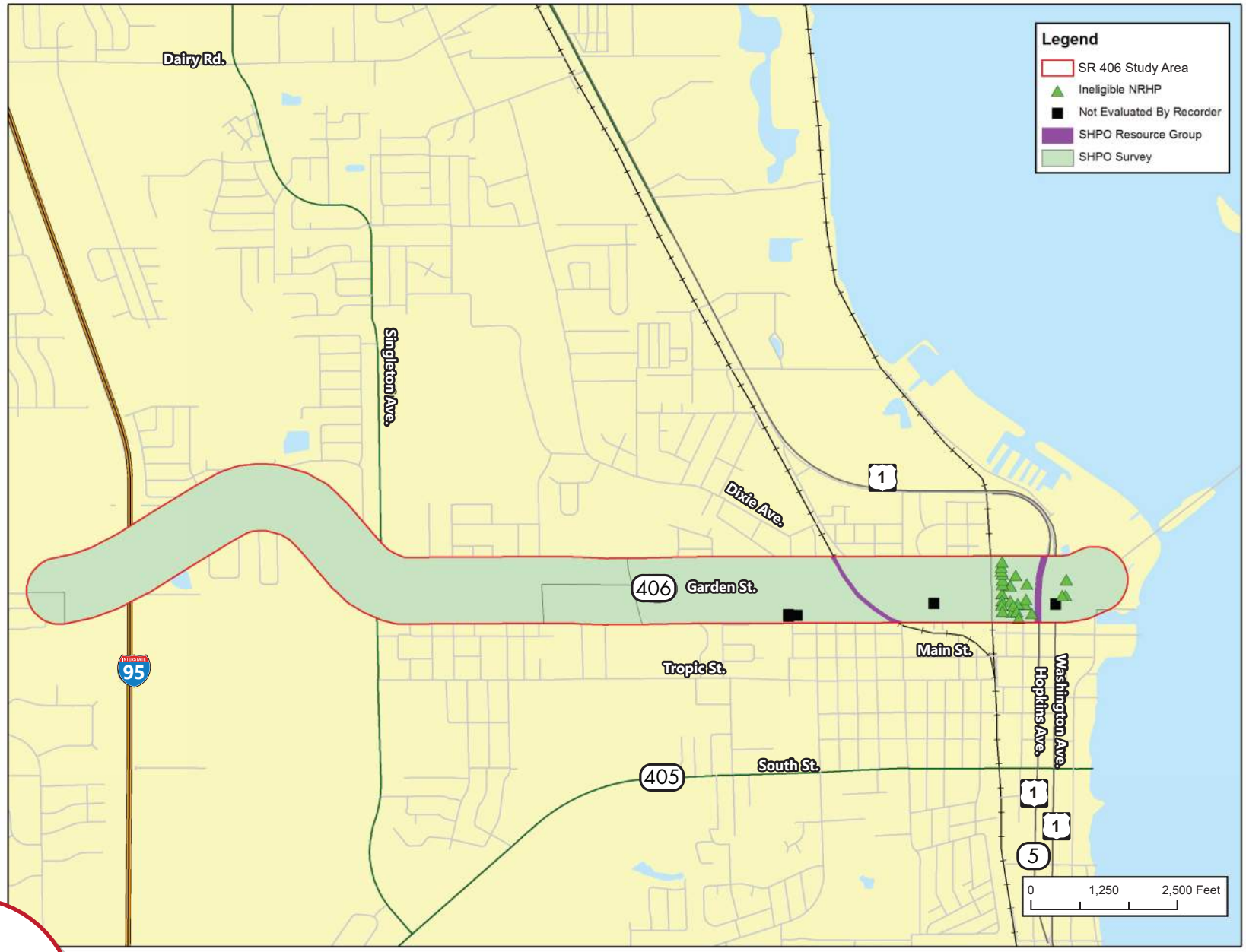

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FIGURE 23
Cultural Resources Map

2.7.2 Social Resources

Any public or private social resources that were considered relevant to the Study Area were considered. Table 12 below summarizes the public facilities within the Study Area. Figure 24 graphically displays the results of the social resource evaluation.

Table 12: Summary of Public Facilities

Social Resources	Within Study Area
FDEM Places of Worship	0
Florida Marine Facilities	1
Cemeteries	1
Community Centers	3
Cultural Centers	0
Fire Stations	0
Government Buildings	0
Health Care Facilities	11
Homeowner and Condominium Associations	1
Parks	2
Religious Centers	4
Schools	1
Social Service Facilities	0
Veteran Facilities	0

Source: University of Florida GeoPlan Center, FGDL 2017, ETDM

The Study Area is adjacent to Sand Point Park and Space View Park along the eastern extents of the project. These parks are protected under the Department of Transportation Act (DOT Act) of 1966, Section 4(f), which limits the use of public land. Space View Park contains the existing Marine Facility and is considered a nature park with a dock/pier. Sand Point Park is a neighborhood and athletic/recreational park. The Study Area also intersects part of the Indian River Lagoon National Scenic Byway. The Indian River Lagoon National Scenic Byway received its recognition in 2000 for its outstanding scenic, historic, cultural, natural, recreational and archeological qualities. Oaklawn Memorial Gardens Cemetery is located north of SR 406 (Garden Street) in the central portion of the corridor. Any construction activities adjacent to the cemetery may require ground-penetrating radar (GPR) to ensure there is no disturbance to past activity. Eleven health care facilities found within the corridor include ten doctor's offices and one clinic. There is also one listed school near the western edge of the corridor, which is now an adult education center.

Source: University of Florida GeoPlan Center (Accessed via FGDL, July 2017)

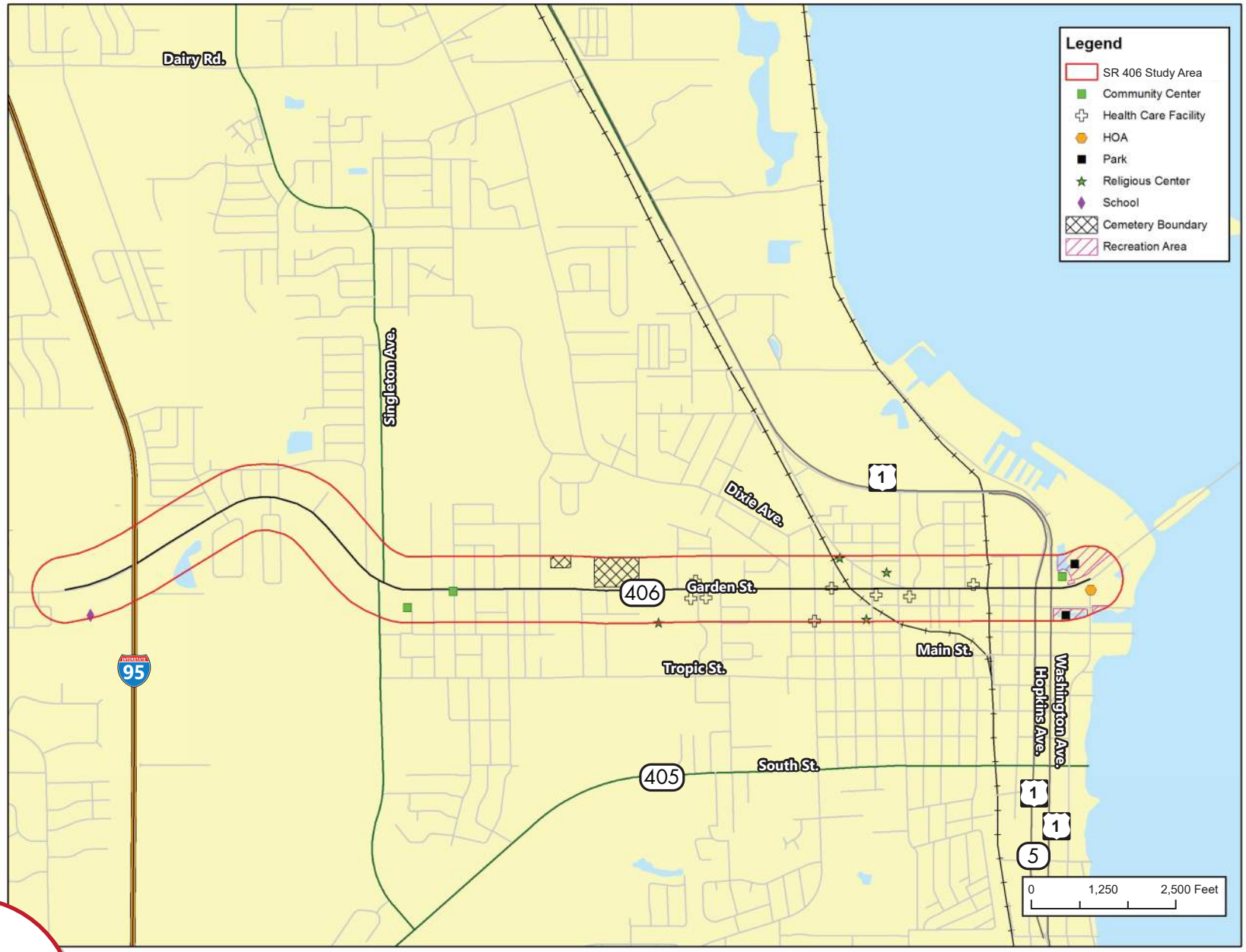

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FIGURE 24
Public Facilities Map

2.7.3 Population Characteristics

An overview of the corridor population and demographics data collected from the US Census 2010 and the American Community Survey (ACS) are provided in Table 13. The data presented reflects an analysis based on abutting Census Tracts. The area abutting the SR 406 (Garden Street) corridor consists of a population density of approximately 3.04 persons per acre and a housing density of 1.39 households per acre. Average household size is approximately 2.44 persons per household and the median age is 45 years old.

Table 13: Population Characteristics

Population Characteristics	Study Area Data
Total Population	3,535
Population Density (Persons per Acre)	3.04
Total Households	1,422
Average Household Size	2.44
Household Density (Households per Acre)	1.39
Median Age	45
Population over 65	17.7%
Male	46.5%
Female	53.5%

2.7.4 Socioeconomic Data

Table 14 provides an overview of the socioeconomic characteristics obtained from the US Census Bureau 2009-2013 5-Year ACS. In the SR 406 (Garden Street) Study Area, the median household income is $40,907, and 24.3 percent of the households are below the poverty line. Forty-seven and two-tenths percent of the 1,822 total housing units are owner-occupied, and 30.8 percent are renter-occupied. The remaining 22.0 percent of housing units in the Study Area are vacant. Eleven and two-tenths percent of the households have no vehicle available and 38.4 percent have only one vehicle available. The majority of the population, 75.4 percent, in the Study Area identifies as white only, and 20.8 percent identify themselves as black or African American. Given the statistics for those below the poverty line and those identifying as minorities, environmental justice issues will need to be evaluated. Figure 25 and Figure 26 illustrate the median household incomes for the Study Area, as well as, the percentage of zero car households.

Table 14: Socioeconomic Characteristics

Socioeconomic Characteristics	Study Area Data
Median Household Income	$40,907
Households Below Poverty Level	24.3%
Total Housing Units	1,822
Owner-Occupied	47.2%
Renter-Occupied	30.8%
Vacant	22.0%
Households with No Vehicle	11.2%
Households with 1 Vehicle	38.4%
Total Population	3,535
White	75.4%
Hispanic or Latino	75.4%
Not Hispanic or Latino	4.7%
Black or African American	20.8%
Asian	0.0%
Other	3.8%

2.7.5 Major Employers and Activity Centers

Publix Supermarket is the largest employer in the Study Area, employing 349 persons. The other companies that are among the top five largest employers along the SR 406 (Garden Street) corridor include Dixie Crossroads, Kelsey's Pizza, Walgreen's and Oaklawn Memorial Gardens.

Source: U.S. Census Bureau, 2009-2013 5-Year American Community Survey

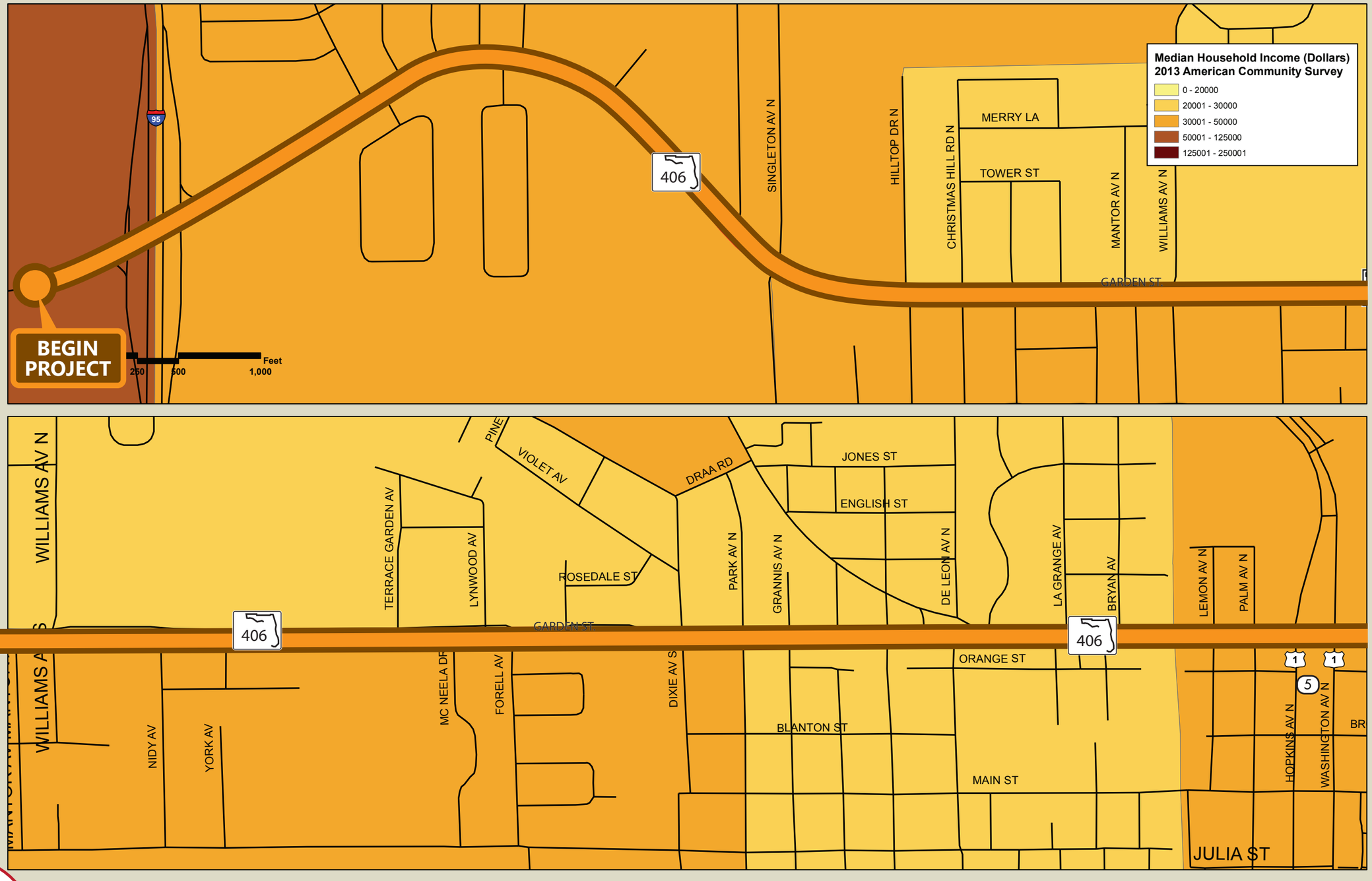

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FIGURE 25
Median Household Income Map

Source: U.S. Census Bureau, 2009-2013 5-Year American Community Survey

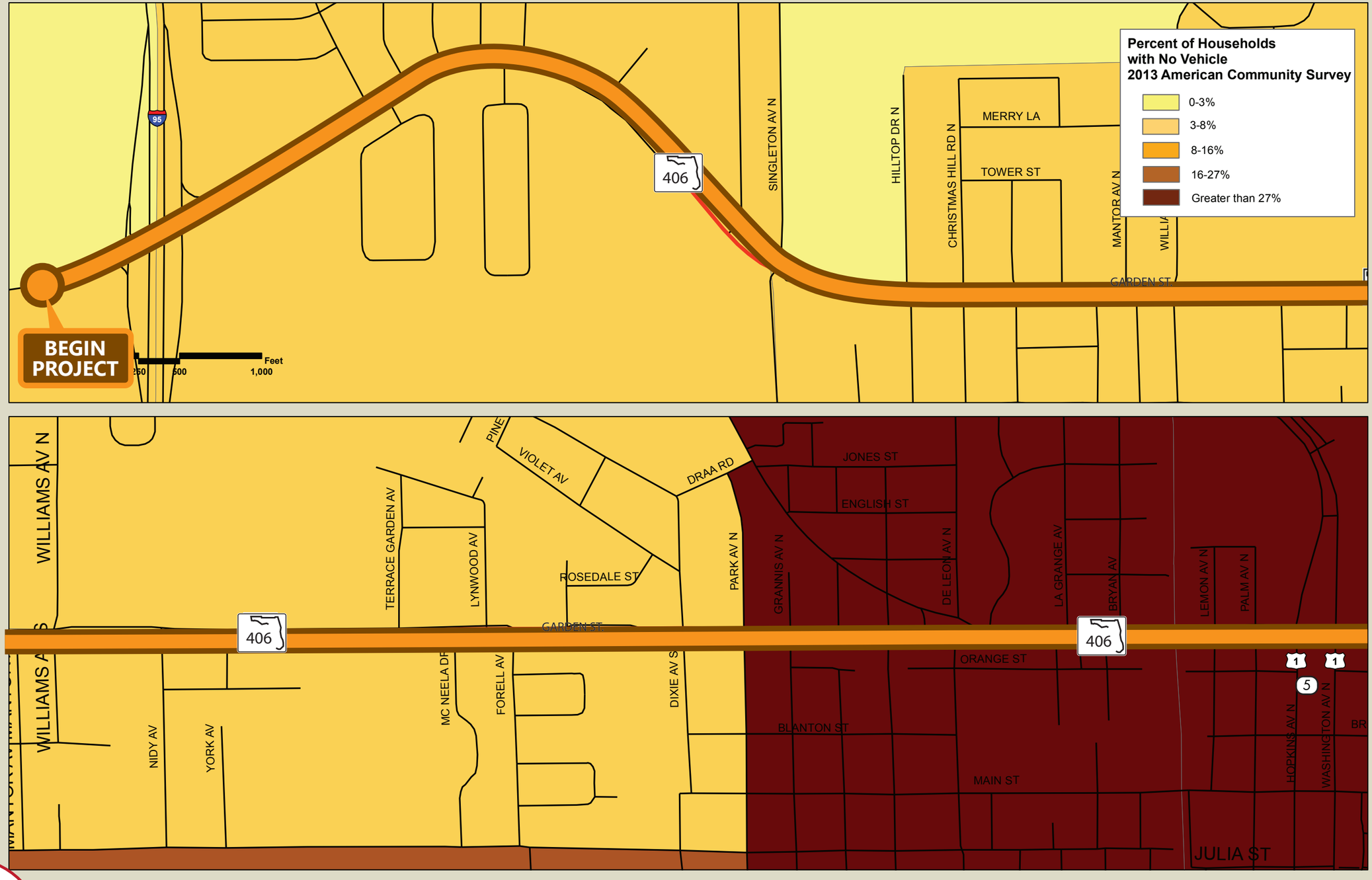

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FIGURE 26
Households With No Vehicles Map

2.7.6 Threatened and Endangered Species

Reviews of the Florida Natural Areas Inventory (FNAI) and GIS data from the US Fish and Wildlife Service (USFWS) and Florida Fish and Wildlife Conservation Commission (FWC) identified critical habitat/habitat richness and/or consultation areas for threatened or endangered species. Consultation areas identified by USFWS encompass all areas where populations are known to exist. These threatened and endangered species consultation areas and/or critical habitats are summarized in Table 15 and shown in Figure 27. It must be noted that the existing roadway is located within low quality habitat with limited habitat richness due to the developed nature of the area. However, several areas within the Study Area are known to have moderate species richness containing three to five species. The highest likelihood for protected species is along the west side. Two areas contain environmentally sensitive lands. The first is located north of SR 406 (Garden Street), just west of Interstate 95. The second is located south of SR 406 (Garden Street), just east of Interstate 95.

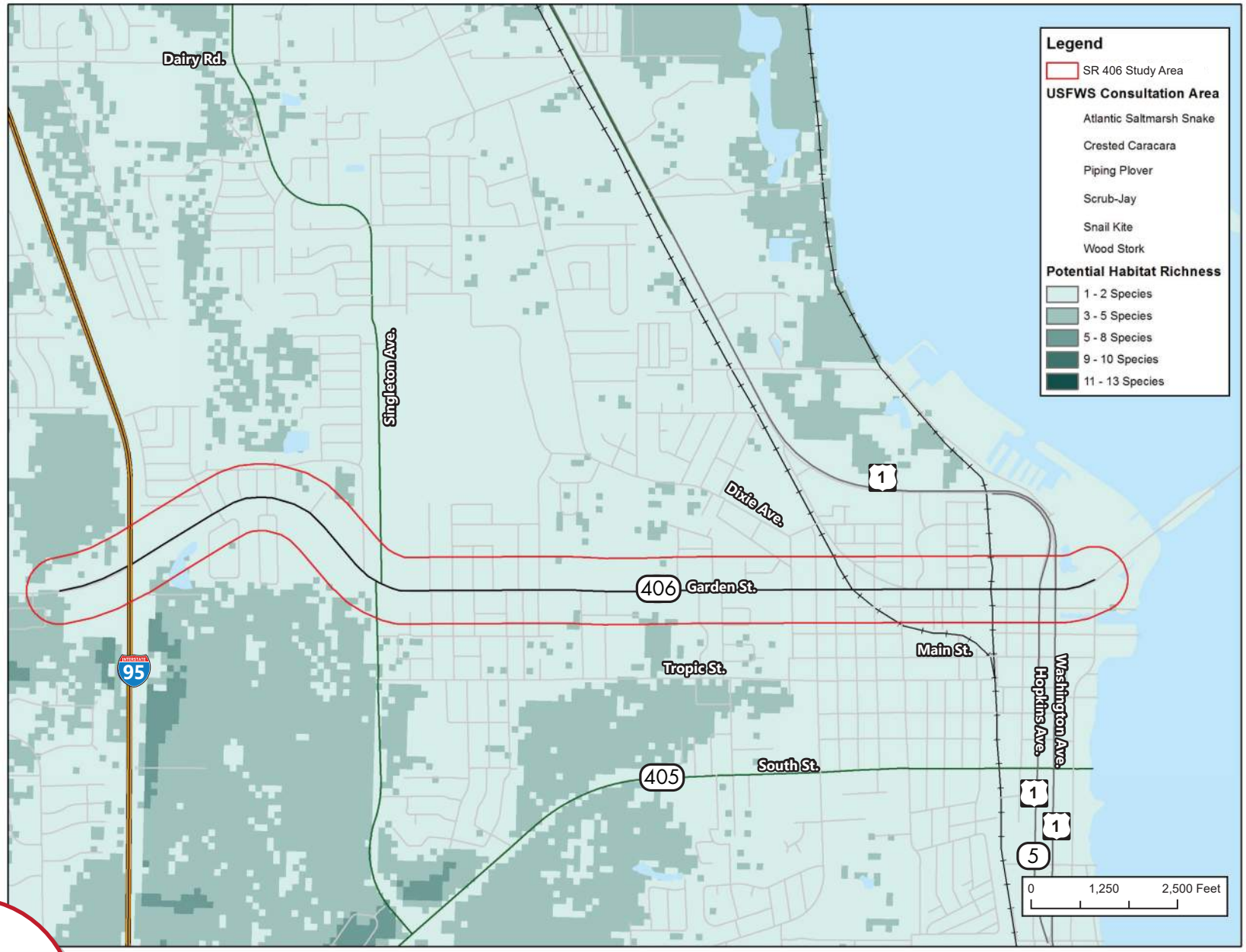
Table 15: Summary of Wildlife and Habitat

Wildlife and Habitat	Abutting Buffer	Study Area	Habitat Within Study Area
Wood Stork Core Foraging Areas	Yes	Yes	Yes
Red-cockaded Woodpecker Consultation Areas	No	No	Minimal
Crested Caracara Consultation Area	Yes	Yes	Minimal
Florida Scrub Jay Consultation Area	Yes	Yes	No
Atlantic Salt Marsh Snake	Yes	Yes	No
Snail Kite Consultation Area	Yes	Yes	No
Piping Plover Consultation Area	Yes	Yes	No

Source: US Fish and Wildlife Service (USFWS), 2011; Florida Natural Areas Inventory (FNAI), 2009.

Vacant parcels within the Study Area may contain habitat suitable for the gopher tortoise (*Gopherus Polyphemus*), a State Threatened species. If gopher tortoise burrows are found onsite, the appropriate permits will need to be obtained from FWC to relocate the tortoises to an approved offsite recipient area prior to construction activities. No permit will be required if all burrows can be avoided by a 25-foot radius. Furthermore, onsite wetlands, ponds, and swales may also provide intermittent habitat for wading and colonial birds that may utilize these areas for nesting and foraging.

Source: US Fish and Wildlife Service (USFWS), 2011; Florida Natural Areas Inventory (FNAI), 2009



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SOUTH LAKE ELEMENTARY SCHOOL TO INDIAN RIVER AVENUE

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FDOT

FIGURE 27
Wildlife & Habitat Map

2.7.7 Wetlands

The wetlands analysis used 2012 GIS data available from the St. Johns River Water Management District (SJRWMD). The data shows that one (1) mixed scrub-shrub wetland is located within the central southwest portion of the Study Area. This wetland is located behind an existing shopping center and will not be impacted by the project. "Other surface waters", which include ponds and drainage swales/ditches are also present within the area. Figure 28 illustrates the wetland and surface water system locations as presented in the data; however, drainage swales and ditches are not depicted.

2.7.8 Contamination

Contaminated sites within the Study Area were identified using data from the Florida Department of Health (FDOH) and the Florida Department of Environmental Protection (FDEP). Table 16 summarizes the areas that have the potential for contamination and Figure 29 illustrates the location of these sites. It must be noted that the facilities shown are regulated facilities which have the potential for contamination or environmental concern, but are not necessarily contaminated.

Table 16: Summary of Contamination Analysis

Analysis Type	Within Study Area
Brownfield Location Boundaries	0
Biomedical Waste	25
Hazardous Waste Facilities	21
Petroleum Contamination Monitoring Sites	21
Storage Tank Contamination Monitoring (STCM)	21
US EPA Resource Conservation and Recovery Act (RCA) Regulated Facilities	20
Toxic Release Inventory Sites	1
Waste Cleanup Responsible Party Sites - Open	1

As shown in the figure, the Study Area contains "potential" hazards and risk sites which include 21 hazardous waste facilities and 25 sites with the potential for biomedical waste. The Study Area contains eight facilities being monitored for petroleum contamination with work underway, ten facilities which have been closed, and three facilities that require no cleanup. No offsite contamination notices have been issued by FDEP within the Study Area. All sites being monitored are within regulation and there were no hazardous contamination sites found. One active cleanup site located at 2935 Garden Street (SR 406) is currently open and associated with potential groundwater contamination classified as a moderate level of concern. Furthermore, while not listed in the existing data, railway data shows that contaminants may also be associated with rail lines and spurs. Work in these areas may warrant further investigation.

Source: SJRWMD SDE database (March, 2012)

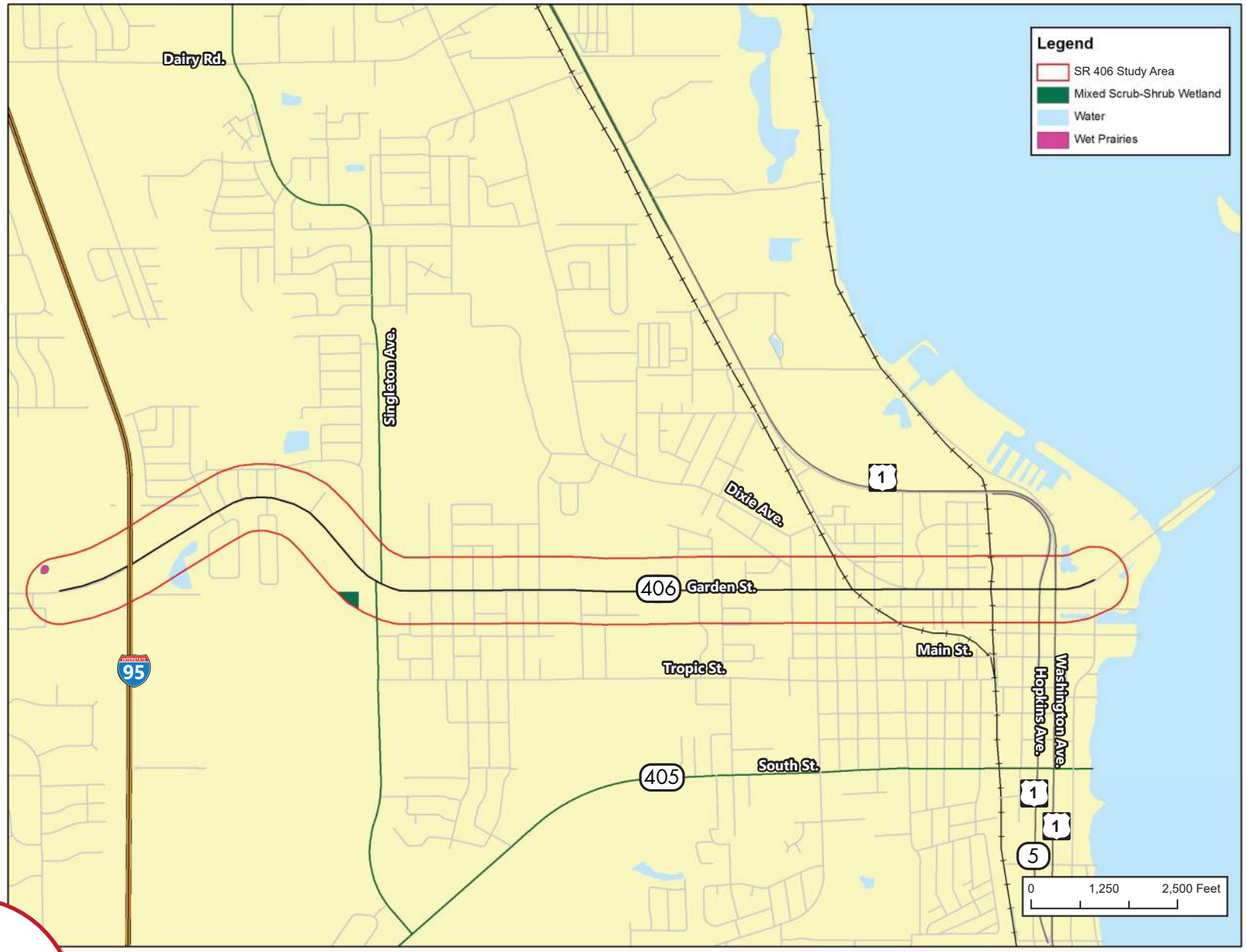

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FIGURE 28
Wetlands Map

Source: Florida Department of Environmental Protection (FDEP) and Florida Department of Health (FDOH) – (Accessed via FGDL, July 2017)

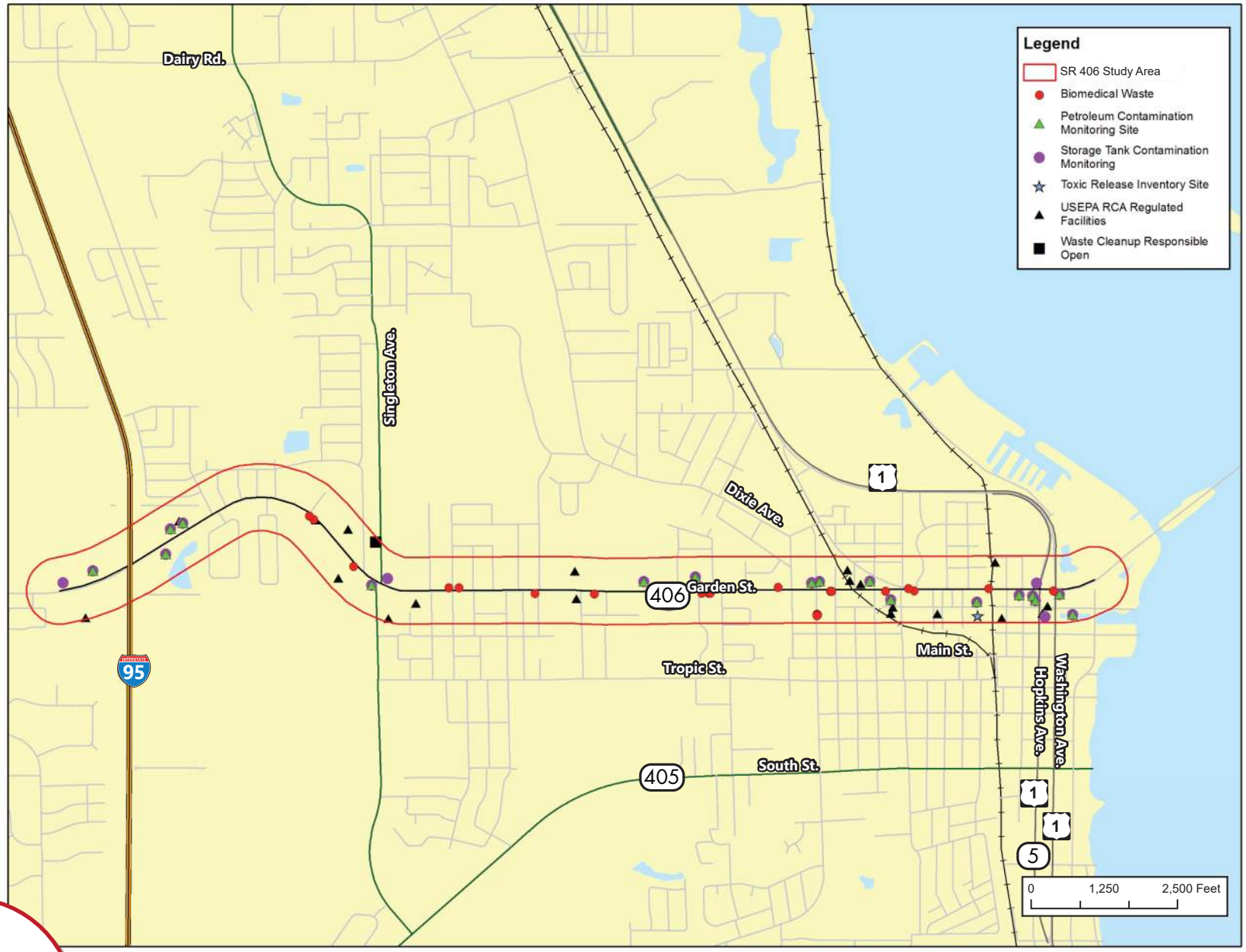

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FIGURE 29
Contamination Map

3

Future Traffic Development

3.1 Model Validation

The Central Florida Regional Planning Model (CFRPM) 6.1 year 2016 subarea model validation was performed to most accurately reflect 2016 traffic conditions inside the study area. This validation helped to create a better forecast of future traffic. The model refinement was performed by fine-tuning the network using the guidelines identified in "FSUTMS (Florida Standard Urban Transportation Model Structure)-Cube Framework Phase II Model Calibration and Validation Standards – Final Report, October 2, 2008". Validation methods used include volume-over-count ratio and percent error by facility type and by volume group for the study area.

Table 17 shows the percent deviation error by facility type. The percent deviation is defined as (year 2016 model assignment in AADT – year 2016 ground count in AADT) / (year 2016 ground count in AADT).

Table 17: Volume-Over-Count Ratio and Percent Error by Facility Type

	FDOT Standards[1]			
	Acceptable	**Preferable**	**Before**	**After**
Freeway (FT1X, FT8X, FT9X)	+/- 7%	+/- 6%	-37.79%	9.81%
Divided Arterial (FT2X)	+/- 15%	+/- 10%	-27.58%	-10.06%
Undivided Arterial (FT3X)	+/- 15%	+/- 10%	-44.80%	3.93%
Collector (FT 4X)	+/- 25%	+/- 20%	-40.54%	-4.04%
OneWay (FT 6X)	+/- 25%	+/- 20%	-20.67%	-5.75%
Ramp (FT 7X)			30.58%	11.54%

*text in red indicates out of acceptable range

1- Table 3-9, TMIP Travel Model Validation and Reasonableness Checking Manual

In addition, the percent deviation error by volume group performed for the study area is shown in Table 18. The results of this validation method show the model is in preferable range of standards.

Table 18: Volume-Over-Count Ratio and Percent Error by Volume Group

	FDOT Standards			
Statistic	**Acceptable**	**Preferable**	**Before**	**After**
LT 10,000 Volume	50%	25%	-21.71%	-1.46%
10,000-30,000	30%	20%	-27.62%	-8.34%
30,000-50,000	25%	15%	37.79%	9.81%
50,000-65,000	20%	10%	N/A	N/A
65,000-75,000	15%	10%	N/A	N/A
GT 75,000	10%	5%	N/A	N/A

*text in red indicates out of acceptable range

The percent Root Mean Square Error (RMSE) for the study area is another aggregate measure to validate the model against the ground counts gathered within the study area. The RMSE for the study area comprising of 25 roadway links is 3.32% and usually can be ± 35% to 45%. This validates that the adjusted network accurately represents the ground counts within the study area. Table 19 provides on overview of the RMSE output within the study area.

Table 19: RSME Model Validation

Volume Group	% RMSE	Acceptable % RMSE	Preferable % RMSE
1-5,000:	8.82%	100%	45%
5,000-10,000:	3.03%	45%	35%
10,000-15,000:	5.07%	35%	27%
15,000- 20,000:	N/A	30%	25%
20,000- 30,000:	12.29%	27%	15%
30,000- 50,000:	9.09%	25%	15%
50,000- 60,000:	N/A	20%	10%
60,000+:	N/A	*19%*	10%
Areawide	**3.32%**	***45%***	**35%**

Based on the validation efforts performed, the model is considered acceptable for use in estimating future travel demand within the study area. The validation adjustments were carried over to the year 2040 model to achieve optimal results.

Coordination with the Project Visioning Team and City of Titusville staff revealed several planned developments within the study area that were not included in the original adopted 2040 model. The

developments were included in the updated year 2040 model to account for additional traffic that will be generated within the study area. The following lists those planned developments:

- Housing development with 170 single family homes northwest of I-95 at SR 406 interchange. These were added to TAZ 2925.
- Gas station on the northwest quadrant of US 1 Southbound at SR 406 intersection, added to TAZ 2934.
- A 120,000 SF shopping center was assumed for the area northwest of US 1 Southbound at SR 406 intersection. Although this development information is not certain, a higher traffic demanding land use was assumed for this location to make a conservative analysis of future traffic. This land use was added to TAZ 2934.

3.2 Growth Projections and Assumptions

In order to determine an acceptable growth rate for the SR 406 (Garden Street) study area, growth projections from various available sources were considered. This included the latest year Central Florida Regional Planning Model, Version 6.1 (CFRPM 6.1) released in 2016, FDOT historical Annual Average Daily Traffic (AADT) growth trends, and Brevard County population projections from the Bureau of Economic and Business Research (BEBR) Volume 51, Bulletin 180 (January 2018). The trends analysis sheet and model output files are provided in **Appendix F**. Table 20 below presents the comparison of resulting growth rates.

Table 20: Growth Rate Comparison

Growth Method	Growth Rate
Historic Trends Analysis	-1.34%
Model Growth Analysis	0.81%
BEBR Growth Analysis	
Brevard County Medium	0.90%
Brevard County High	1.69%
Growth Rate Used	**0.85%**

The historic growth trends were not applied due to the r-squared values being less than 75% and being a negative value as illustrated in Table 20. The model growth analysis identified an annual growth rate of 0.81%. Accounting for future development, planned roadway improvements, as well as historic growth rates, the model is considered to be the most detailed predictor of future traffic growth. Specifically, the model applied for this analysis included aggressive development estimates. For a conservative analysis of growth, this rate was averaged with BEBR's Brevard County medium projected growth rate of 0.90% annually. The average of BEBR medium growth and CFRPM model is 0.85%, which is the rate used for analysis of future traffic growth along the corridor.

3.3 2040 No-Build Operational Analysis

Future 2040 operational analysis was conducted to determine the LOS for the roadway segments and the study area intersections in a no-build scenario. The build scenario analysis can be found in Section 5.2. Future Traffic volumes were project by using preferred growth rate and growing existing traffic to the future year. The future level of service was determined by using the 2012 FDOT Quality/Level of Service tables, similar to the existing conditions analysis.

3.3.1 2040 No-Build Projected Roadway Operations

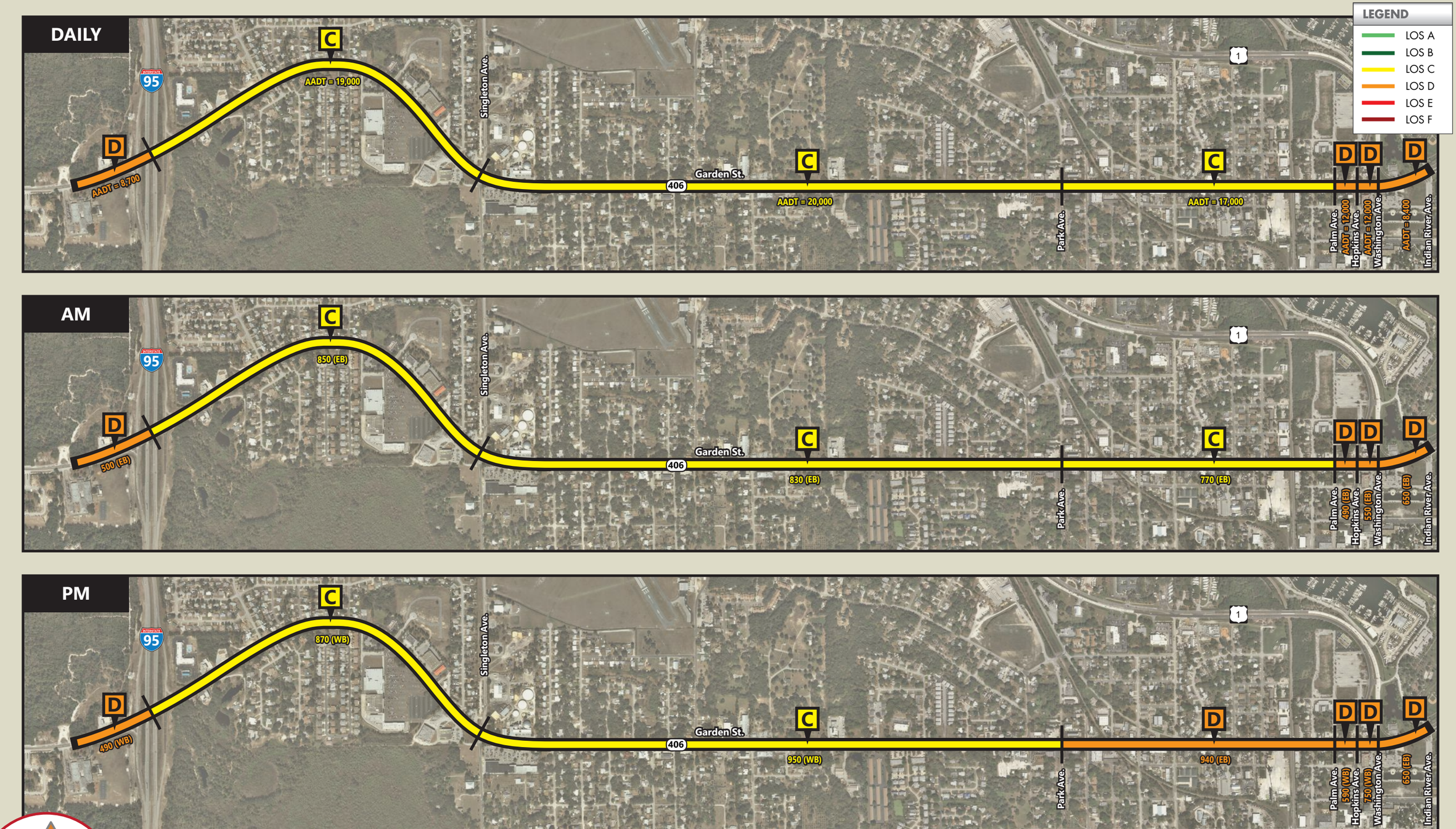
According to FDOT, the study corridor is classified as an "urban principal arterial other" and has an adopted LOS "D". The generalized peak hour directional service volumes for the LOS letters "A" through "F" were obtained from Table 7 of the 2012 FDOT Quality/Level of Service Handbook and compared with projected 2040 volumes calculated using the 2017 existing volumes with the previously-identified 0.85% annual growth factor applied. The 2040 projected roadway operations are provided in Table 21 and Figure 30 for daily, AM peak hour, and PM peak hour.

Table 21: 2040 Projected Roadway Level of Service: No-Build

Roadway/Segment	Daily		AM Peak			PM Peak		
	AADT	LOS	Volume	Peak Direction.	LOS	Volume	Peak Direction	LOS
SR 406 (Garden Street)								
South Lake Elementary School to I-95	8,700	D	500	EB	D	490	WB	D
I-95 to Singleton Avenue	19,000	C	850	EB	C	870	WB	C
Singleton Avenue to Park Avenue	20,000	C	830	EB	C	950	WB	C
Park Avenue to Palm Avenue	17,000	C	770	EB	C	940	EB	D
Palm Avenue to US 1 SB (Hopkins Avenue)	12,000	D	490	EB	D	590	WB	D
US 1 Southbound to US 1 NB (Washington Avenue)	12,000	D	550	EB	D	750	WB	D
US 1 NB (Washington Avenue) to Indian River Avenue	8,400	D	650	EB	D	650	EB	D

2012 FDOT Quality/Level of Service Handbook Tables
*AADT = Data Collected * Seasonal Factor (1.06) * Axle Factor (0.98) (if need)*

As shown in Table 21, the SR 406 corridor currently operates within acceptable LOS standards.



SR 406 Concept Development & Evaluation

SOUTH LAKE ELEMENTARY SCHOOL TO INDIAN RIVER AVENUE

FIGURE 30
2040 Projected Roadway Volumes and Operations

3.3.2 2040 No-Build Projected Intersection Operations

According to the HCM 2010, for signalized intersections, and average control delay per vehicle from 55 seconds up to 80 seconds is considered to be a LOS E condition. Beyond 80 seconds is considered to be a LOS F condition. A summary of the 2040 projected intersection operations for all study area intersections is provided in Table 22 for the AM and PM peak hours. The signal timings were optimized under the assumption that signal timings will be regularly maintained through 2040. Future volume analysis sheets are located in **Appendix F**.

Table 22: 2040 Projected Intersection Level of Service: No-Build

Intersection	Control	AM Peak		PM Peak	
		Delay	LOS	Delay	LOS
SR 406 (Garden Street)/I-95 SB Ramps	Signalized	10.7	B	8.6	A
SR 406 (Garden Street)/I-95 NB Ramps	Signalized	11.8	B	12.3	B
SR 406 (Garden Street)/Singleton Avenue	Signalized	30.8	C	37.6	D
SR 406 (Garden Street)/Park Avenue	Signalized	16.1	B	16.4	B
SR 406 (Garden Street)/Palm Avenue	Un-Signalized	1.2	A	2.3	A
SR 406 (Garden Street)/US 1 SB (Hopkins Avenue)	Signalized	13.7	B	13.5	B
SR 406 (Garden Street)/US 1 NB (Washington Avenue)	Signalized	7.9	A	8.9	A

As presented in Table 22 above, all of the study area intersections are anticipated to operate at acceptable LOS in 2040. The 2040 study area intersection operations are presented in Figure 31 for the AM and PM peak hours. Synchro reports are located in **Appendix C**.

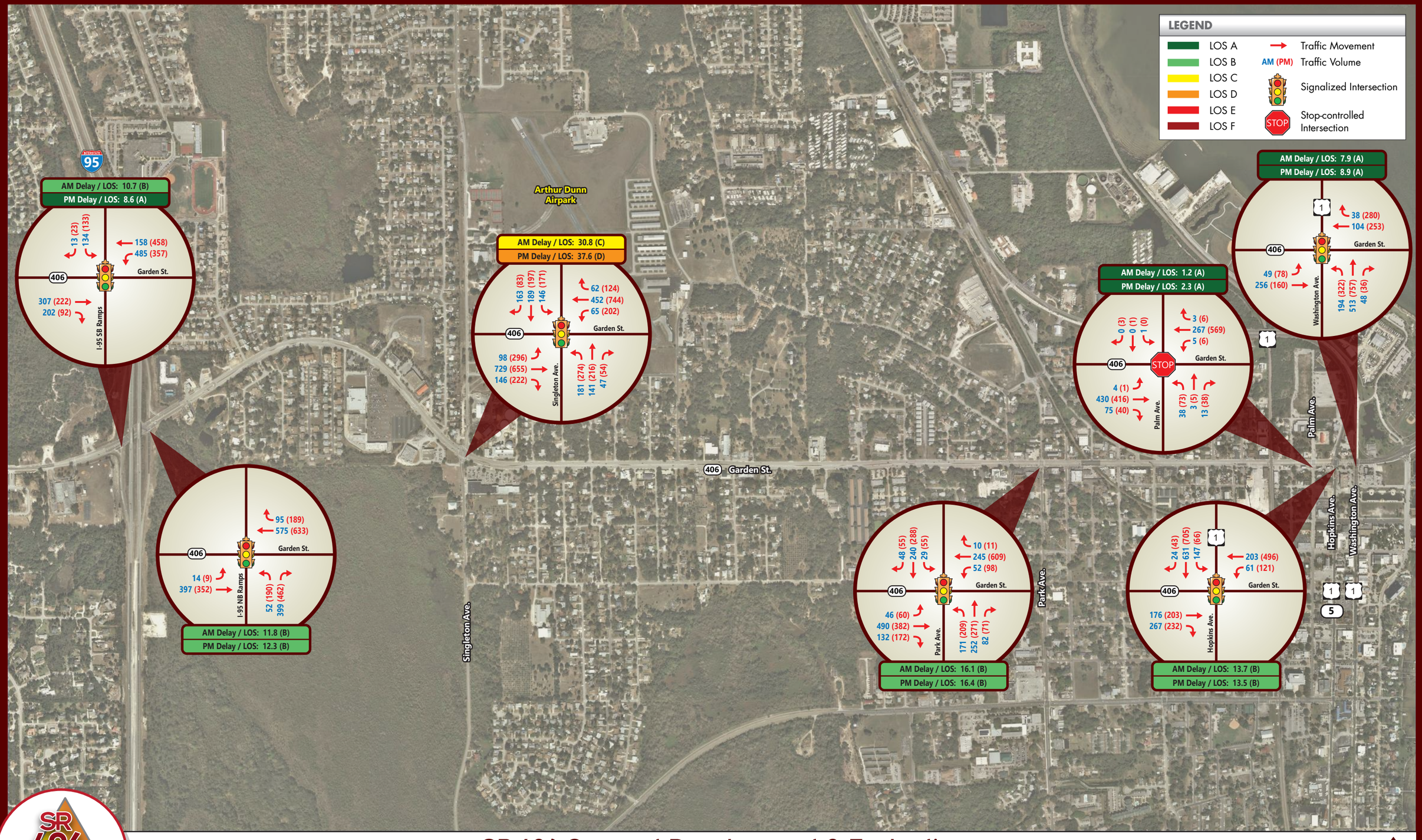


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FIGURE 31
2040 Projected No Build Intersection Volumes and Operations

3.4 Understanding the Problem

It is essential to understand the problems facing the roadway prior to determining practical solutions for a corridor. During the Corridor Planning Study, the existing and future conditions discovered for the study corridor were analyzed to define the Issues & Opportunities, Guiding Principles, and Purpose and Need Statement for the project. As part of this Concept Development and Evaluation Study, the existing and future conditions collection and analysis was updated to include any changes that may have occurred since the completion of the previous study. Following the update, the Purpose and Need was reviewed and confirmed to be appropriate for the study corridor.

3.4.1 Issues & Opportunities

This section is intended to summarize the issues and opportunities that were identified and used to develop the potential improvement strategies along the study corridor. During the data collection and existing conditions inventory process, elements within the corridor found to be deficient were noted appropriately. Wherever possible, other aspects of the corridor that represent potential opportunities to support future enhancements were documented. The following is an accumulation of the data collection and stakeholder input comprising of the Issues & Opportunities for the SR 406 (Garden Street) study corridor:

Existing Typical Section

Due to the variation in on-street parking and median treatments, there are inconsistent lane widths throughout the SR 406 (Garden Street) study corridor. There are segments that contain up 20-foot wide outside travel lanes that have an opportunity to be repurposed for additional facilities using the existing roadway pavement.

Figure 32: Inconsistent Lane Widths

Access Management

There are a high number of driveways that have direct access to SR 406 (Garden Street) due to the designated land uses surrounding the corridor. Locations with multiple driveways to individual parcels have been identified as well. These represent opportunities to condense driveway access without restricting business access or circulation. There are locations of older (not utilized), or unutilized driveways as illustrated by Figure 33 below.

Multiple full access medians are present throughout the length of the corridor within the Study Area. There are currently locations that do not provide adequate storage for left turn refuge from the side streets within the median, causing cars to block a portion of the travel lane in order to make a left turn on to SR 406 (Garden Street).

Figure 33: Location with Multiple Driveways

Parking Facilities

There is sporadic on-street parking provided on SR 406 (Garden Street), in multiple locations adjacent to large parking lots. These on-street parking spaces are generally not utilized. This provides an opportunity to reutilize pavement if needed. Figure 34 is an example of existing unutilized/underutilized on-street parking.

Figure 34: Unutilized On-Street Parking

Bicycle and Pedestrian Infrastructure

There are gaps in sidewalk coverage along the SR 406 (Garden Street) corridor within the channelizing island at Norwood Avenue and between US 1 NB (Washington Avenue) and US 1 SB (Hopkins Avenue). Figure 35 illustrates the gap at Norwood Avenue. No bicycle facilities are provided except for the existing bike lanes in the vicinity of the I-95 interchange.

Figure 35: Sidewalk Gap at Norwood Avenue

Transit Service

There are six bus stops on SR 406 (Garden Street) within the Study Area offering minimal amenities, most with only a bus stop sign and a bus schedule as shown in Figure 36. Two of the

six bus stops do have wooden benches; however, no shelters are provided at any bus stop location within the Study Area. All bus stops are located in areas where there is existing sidewalk. However, all of them lack landing pads which provide a connection from the sidewalk to the bus doors. Landing pads are especially helpful for wheelchair users and the elderly that have difficulty navigating the grass buffer when entering/exiting the bus.

After review of the average household income and the no car household maps there is an opportunity to identify potential areas along the corridor that would benefit from providing or upgrading the existing transit amenities and/or service. This may also involve upgrades to the existing bicycle and pedestrian network to serve these transit dependent neighborhoods.

Figure 36: Existing Transit Amenities

Existing Traffic Conditions

Analysis of the existing traffic volumes and LOS revealed that the traffic volumes are between 20%-40% of the maximum service volume on SR 406 (Garden Street) within the Study Area. This provides a potential opportunity to reworking existing roadway while keeping capacity issues to a minimum.

Crash Analysis and Safety

All segments, with the exception of South Lake Elementary School to I-95, are above the statewide average crash rate for their respective categories. These segments have been analyzed to determine any potential solutions to identify contributing factors of these crashes.

3.4.2 Guiding Principles

Using the Issues & Opportunities identified in the previous section, along with input from local stakeholders, the guiding principles of the study were developed and agreed upon. As part of this exercise, the vision, major users, and desired role of the corridor were identified.

Vision

The vision for the SR 406 (Garden Street) corridor is to create a regional and local facility that can serve all modes of traffic and provide a gateway into the City of Titusville.

Major Users

Local residents, cyclists and pedestrians, business patrons, commuters, transit, recreational and freight.

Desire Role

A multimodal regional and local connector to provide a gateway into the City of Titusville.

Guiding Principles

The following guiding principles were developed based on the corridor vision, major users, and desired role:

- Safety
- Bicycle and Pedestrian Mobility
- Design Consistency
- Aesthetics
- Transit

3.4.3 Purpose and Need

Following the identification and definition of the guiding principles of the corridor, the clear statement of purpose and need was developed.

Purpose Statement

To provide improved multimodal mobility, with consistent roadway design that will enhance safety and connectivity while supporting economic and community development goals.

Needs Statement

Enhancing multimodal mobility is necessary to shift emphasis to non-vehicular modes that have been traditionally underserved in this corridor. Observations of the existing corridor characteristics reveal the following supporting data:

- Sporadic / underutilized on-street parking
- Inconsistent lane widths
- Properties with multiple & unused driveways
- Multiple full access medians that do not provide adequate storage for left turn refuge
- Large transit dependent community
- Minimal bus stop accommodations provided (lack of shelters, ADA issues)
- Lack of ADA accommodations
- Lack of bicycle facilities
- Lack of pedestrian crossing opportunities
- Desire by local stakeholders to enhance aesthetics
- Desire by City for gateway feature(s) entering Downtown Titusville

4

Public Involvement

Successful public involvement is about building credibility, facilitating understanding and building consensus. This requires a process characterized by technical competence, integrity, and effectively listening to input provided by project stakeholders. The public involvement framework for this study was built around these principles.

The goal of outreach efforts performed during this study was to allow people living and working within the project study area, and other interested parties, to contribute to the decision-making process and to influence the choices made about improving the SR 406 (Garden Street) corridor. The following sections summarize the public involvement activities held during the SR 406 (Garden Street) Concept Development and Evaluation. Summaries of the following activities, including details on the feedback received, are provided in **Appendix G**.

4.1 2040 Public Involvement Plan

Public involvement brings diverse viewpoints and values between all interested people, groups, and government organizations into the decision-making process regarding the development of a project. A Public Involvement Program (PIP) was drafted at the beginning of the study as a living document to assist FDOT in developing a project that meets the needs of the community, in addition to gaining greater acceptance and support of the project. The PIP indicates the general approach to the public involvement process determined for this study and documents the contact persons, media outlets, agency and project stakeholders, and the means used to involve them in the process. The PIP is included in **Appendix G**.

4.2 Project Visioning Team (PVT)

During the Corridor Planning Study, specific agency staff and other interested parties were identified to actively participate as part of a Project Visioning Team (PVT) that assisted and guided the planning process throughout the study in the development of a multi-modal planning approach. The PVT consisted of approximately 20 members, including representatives from the following:

- Florida Department of Transportation
- Space Coast Transportation Planning Organization (SCAT)

- Brevard County
- City of Titusville
- Space Coast Area Transit
- Titusville Community Redevelopment Agency
- Greater Titusville Renaissance

At the beginning of the Concept Development and Evaluation study, the PVT was reassembled. The list of members was updated to reflect any position changes and to the extent that any additional or new local residents, businesses, or property owners wished to become engaged as stakeholders in the process. The complete list of PVT members is included in **Appendix G**. The following subsections summarize the two PVT meetings held during the Concept Development and Evaluation study.

4.2.1 PVT Meeting #1

PVT Meeting #1 was held on November 8, 2017 at the City of Titusville City Hall Council Chambers from 9:00 am to 12:00 pm. The meeting was attended by staff representing Brevard County, City of Titusville, Space Coast TPO, Titusville Police Department, Florida East Coast (FEC) Railway, and Greater Titusville Renaissance. The meeting began with a presentation covering the role of the PVT, review of the Corridor Planning Study and key differences between that study and the Concept Development and Evaluation phase, and updates made to the existing and future conditions reports. The PVT then gathered for open discussion around a roll plot of the recommended improvement strategies carried through from the Corridor Planning Study. A meeting summary including details of the open discussion are included in **Appendix G**.

4.2.2 PVT Meeting #2

PVT Meeting #2 was held on June 27, 2018 at the City of Titusville City Hall Council Chambers from 9:00 am to 12:00 pm. The meeting was attended by staff representing the City of Titusville, Brevard County, Space Coast TPO and Space Coast Area Transit (SCAT). The meeting began with a presentation recapping the role of the PVT, project background and progress to date, and the Concept Development and Evaluation process. The study team then provided an update on progress since PVT Meeting #1 and presented the final recommendation for the study corridor. The PVT then gathered for open discussion around a roll plot of the final recommendations developed during the study. The meeting was wrapped up with next steps and project schedule. A summary of the meeting including details of the open discussion are included in **Appendix G**.

4.3 Public Meeting

A public meeting was held on Thursday, September 20, 2018 from 6:00 pm to 7:30 pm at the City of Titusville City Hall Council Chambers. The purpose of the public meeting was to explain the project and study process, present the recommendations, and allow interested people an opportunity to provide feedback and comments to the study team about the project.

The Public Information Meeting was held in an open house format. A fourteen-minute informational looping presentation was looped for attendees to view. Upon the video's conclusion,

participants were directed to display boards with information about the projects. In total there were seven meeting stations: 1. Welcome Station 2. Presentation Video 3. Roundabout 4. Lane Modifications 5. Future Traffic Operations 6. Corridor-Wide Conceptual Roll Plots 7. Comments. Study team staff were available around the room to answer questions and obtain stakeholder feedback. The video presentation, boards, resource station, and study team staff were available throughout the meeting. Printed copies of the *Existing Conditions Report and Future Conditions Report* for the U.S. 1 and S.R. 406 studies was also available for public review.

While study team members were available to discuss the project, meeting participants were strongly encouraged to also provide their comment or question on the comment forms provided so that their feedback could be accurately recorded. There were 36 members of the public and nine (9) Study Team members in attendance.

A comment form was provided to submit during the meeting or until the comment period end date, September 30, 2018. A summary of the meeting, including notices, materials presented at the meeting, and comments and responses are included in **Appendix G**.

4.4 Small Group Meetings and Coordination

4.4.1 City of Titusville Coordination

Following the development of the future conditions analysis and concept plans, the study team met with the staff from the City of Titusville, on March 30, 2018, to gather feedback and ensure the City was supportive of the recommendations for the study corridor. City of Titusville representatives in attendance at the meeting included City Manager, Redevelopment Planner, Economic Development Director, and City Planning Manager. The City of Titusville representatives agreed the alternatives for US 1 with the Grace Street roundabout and elongated roundabout at SR 406 (Garden Street) and US 1 could move forward into concept development to assess the further the benefits and issues with the. A summary of the meeting is available in **Appendix G.**

After further coordination, a letter of support for the concepts was submitted to the Department on July 2, 2018 and is signed by City Manager Scott Larese. This letter states, “We are supportive of the Department proceeding with a lane reduction along SR 406 (Garden Street) between Park Avenue and Indian River Avenue … In addition to the lane reduction, the City of Titusville would also like to express its support for the proposed roundabouts… at SR 406 and Singleton Avenue and the system involving the rework of the interface between US 1 and SR 406.” This letter is attached in **Appendix G.**

4.4.2 Agency Update Presentations

An update presentation was given at the conclusion of the study, during the regularly scheduled City of Titusville City Council meeting and the Space Coast Transportation Planning Organization (SCTPO) Board and sub committees meetings. The update presentations provided the final findings and recommendations of the study for final comment and acceptance. Meeting

summaries can be found in **Appendix G**. The following lists the dates of the meetings presented at:

- City of Titusville City Council – September 25, 2018
- SCTPO Technical and Citizens Advisory Committee (TAC/CAC) – October 08, 2018
- SCTPO Board – October 11, 2018

4.4.3 Additional Communication

Additional communication with the public made throughout the study, but not during meetings is listed below in Table 23. This includes communication by mail, telephone, and email. Copies of the additional communication is included in **Appendix G**.

Table 23: Additional Public Communication

Sender	Initial Contact Date	Form of Communication	Subject
Don Forward	September 11, 2018	E-mail	General Questions
"Titusville, Fl....The TRUTH about what's happening?" Facebook Group	September 13, 2018	Facebook Group	Community Discussion on the Topic

5

Alternatives Selection and Refinement

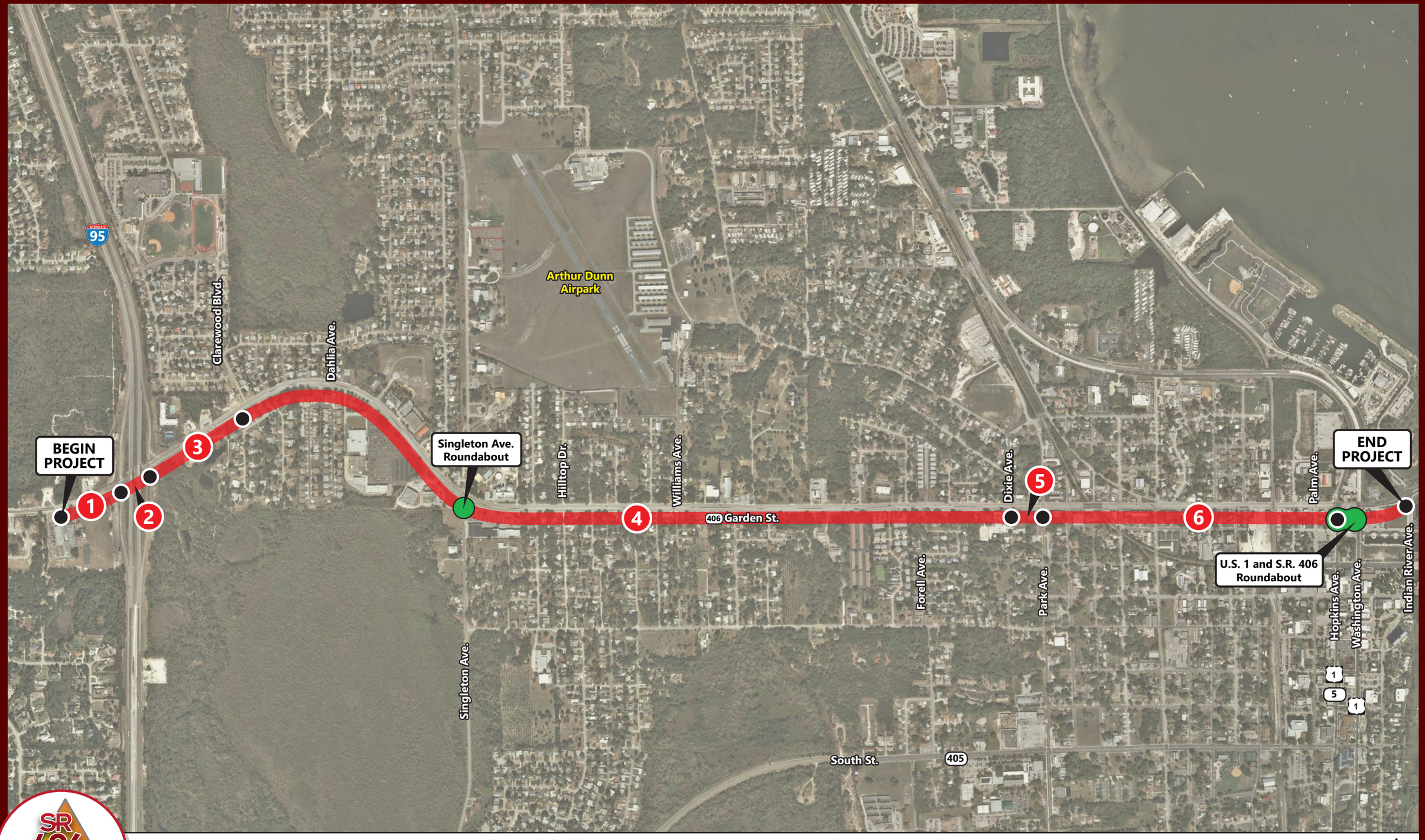
5.1 Alternatives Selection

The proposed alternatives for SR 406 (Garden Street) are derived from the preceding SR 406 Corridor Planning Study as well as extensive review of existing and future conditions and a thorough public engagement process. The proposed alternatives include typical section and access management improvements from South Lake Elementary School to Dixie Avenue, a roundabout at Singleton Avenue, and a lane modification from 5-lanes to 3-lanes from Dixie Avenue to Indian River Avenue.

Two build scenarios were explored in the Future Conditions Report, with differences only in the duration of the lane modification. In build scenario #1, the lane modification began at Singleton Avenue and was proposed to be a two-lane section from Singleton Avenue to Dixie Avenue and then a three-lane section east of Dixie Avenue. Build scenario #2 was proposed as a lane modification east of Dixie Avenue. While build scenario #1 would provide the benefit of a safer and more attractive roadway coming into downtown Titusville, the section Singleton Avenue to Park Avenue still carries sufficient enough volumes that retaining the four-lane section is warranted. For this reason, build scenario #2 was chosen as the proposed alternative. All proposed alternatives are described in detail in the following sections.

5.2 Alternatives Refinement

Overall, seven-foot buffered bike lanes are proposed throughout the full corridor. A roundabout at SR 406 (Garden Street) and the US 1 one-way pairs (Hopkins Avenue and Washington Avenue) is also recommended as part of the concurrent US 1 Concept Development and Evaluation Study. More details can be seen below in the proposed typical sections as well as in **Appendix H** for details concept plans.



SR 406 Concept Development & Evaluation

SOUTH LAKE ELEMENTARY SCHOOL TO INDIAN RIVER AVENUE

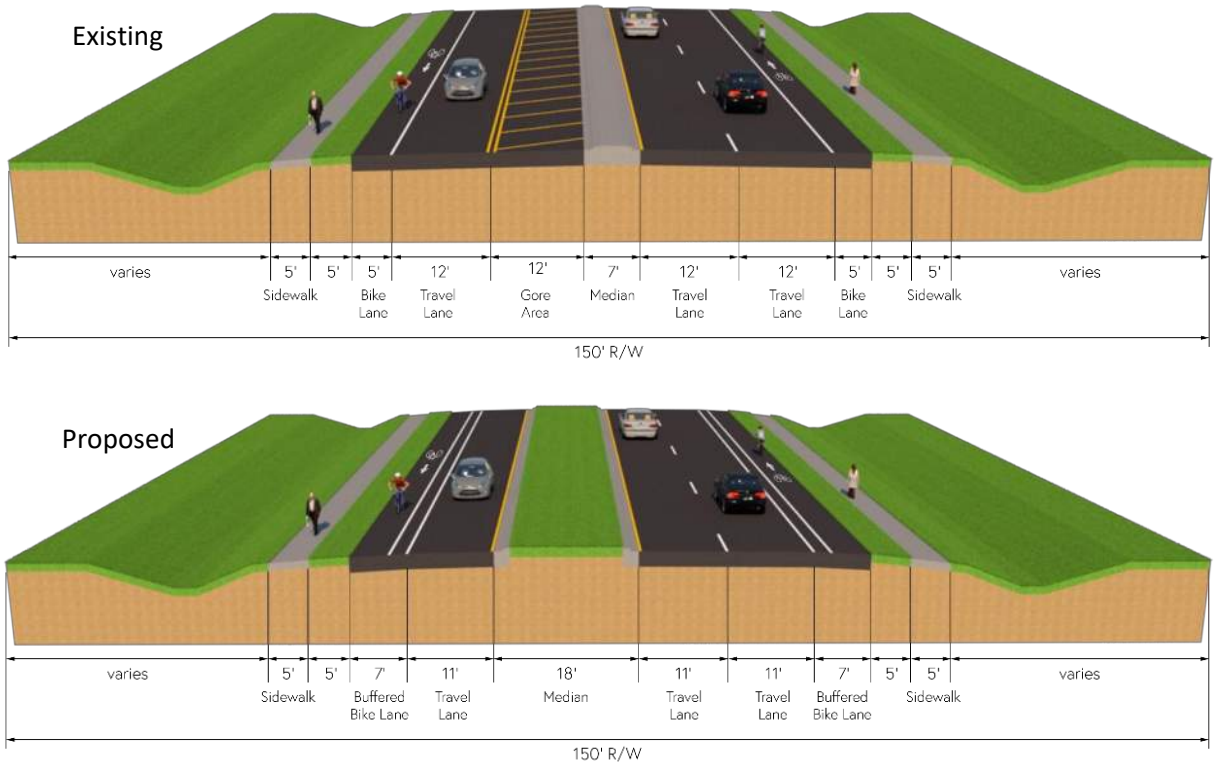
FIGURE 37
Overview of Typical Sections

5.2.1 South Lake Elementary School to Dixie Avenue

Figures 38 to 41 show the existing and proposed typical sections for the SR 406 (Garden Street) corridor from South Lake Elementary School to Dixie Avenue.

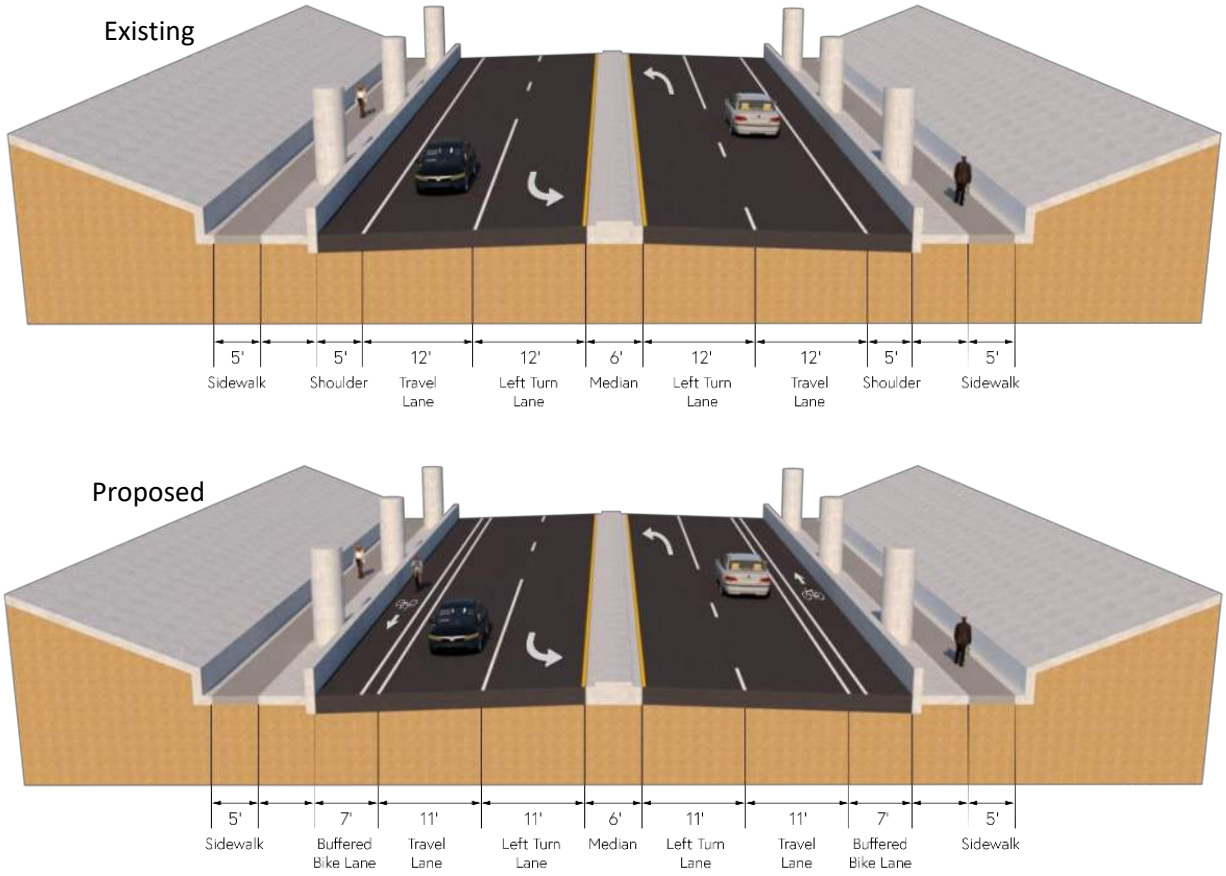
Today there are 33 median openings along the corridor. With the proposed improvements, this number will be reduced to 16. Currently there are 32 full and 1 directional median opening. There are 7 full and 9 directional median openings proposed within the concept plans. Under the proposed access management plan, eight median openings will not meet rule 14-97 of the FAC spacing requirements due to the existing signal and roadway configuration. Reasons for retaining these openings are detailed in Section 5.3.3.

Figure 38: Typical Section 1: Begin Project to I-95



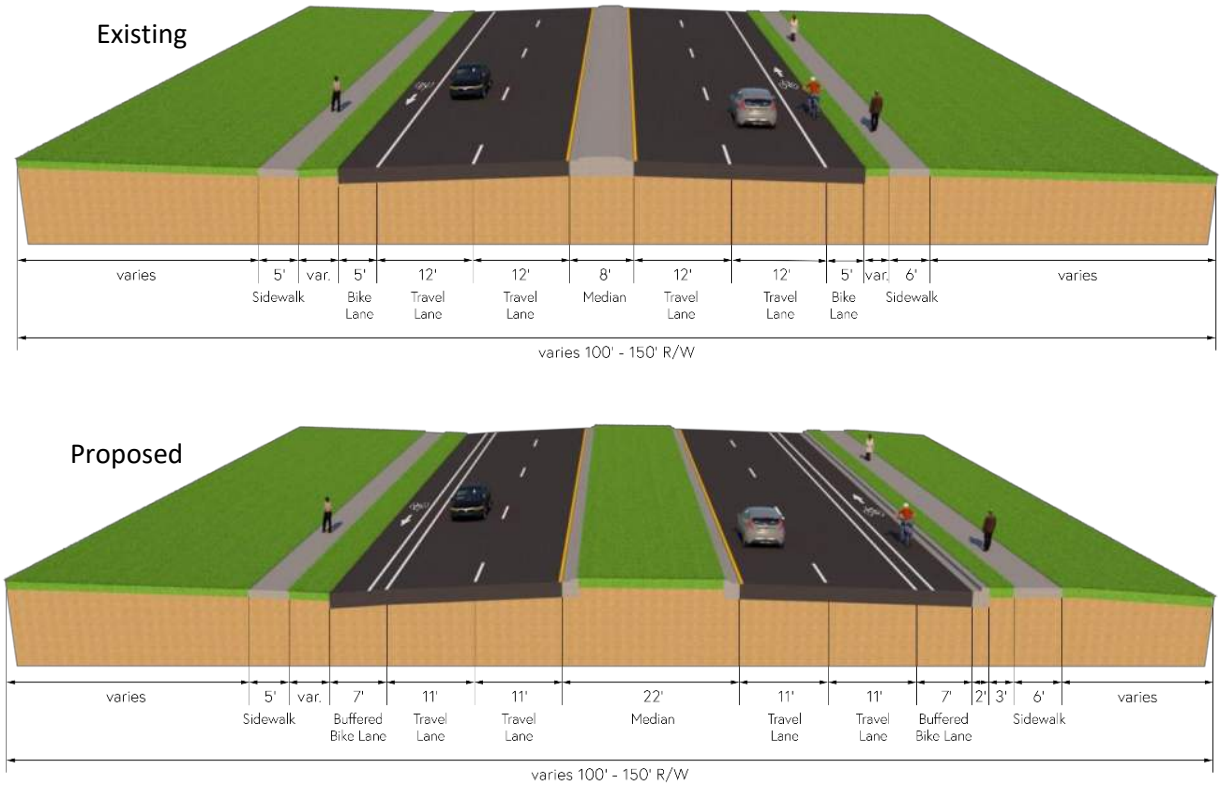
West of I-95, it is proposed that buffered 7-foot bike lanes be added, travel lanes be reduced from 12 feet to 11 feet, that the gore area and traffic separator be converted to a raised 18-foot grass median. The existing edge of pavement is to be retained along with existing five-foot sidewalks and R/W. While FDOT standards would call for 6-foot sidewalks, the substantial investment needed for this change would be cost prohibitive. Six-foot sidewalks are suggested in other portions of the corridor where changes to the sidewalks must be made to accommodate other proposed changes.

Figure 39: Typical Section 2: Under I-95



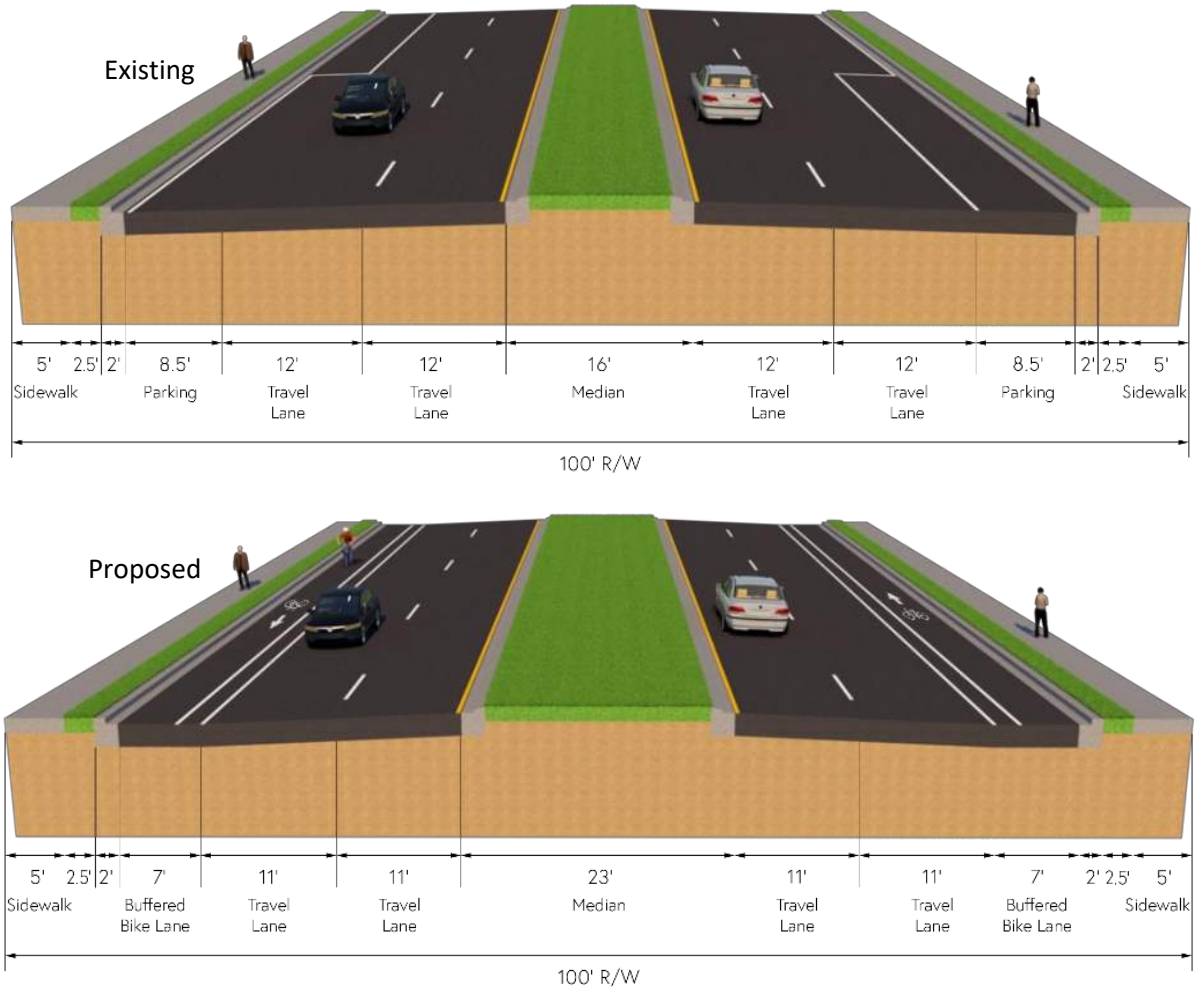
Under I-95, it is proposed that buffered 7-foot bike lanes be added and travel lanes be reduced from 12 feet to 11 feet. The existing curb line traffic separator and sidewalks are to be retained. While FDOT standards would call for 6-foot sidewalks, the substantial investment needed for this change would be cost prohibitive.

Figure 40: Typical Section 3: I-95 to west of Clarewood Avenue



From I-95 to west of Clarewood Avenue, it is proposed that buffered 7-foot bike lanes be added, travel lanes be reduced from 12 feet to 11 feet and the 8-foot median be replaced by a 22-foot standard median. The edge of pavement should be maintained on the north side of the road and widened on the south side. The 5-foot sidewalks should be maintained on the north side and 6-foot sidewalks should be constructed on the south side in since the existing sidewalk needs to be removed and replaced. The R/W is to remain as it is. The increased median size will allow for improved access to the businesses east of I-95 and provide a consistent design with what is proposed to the east.

Figure 41: Typical Section 4: West of Clarewood Avenue to Dixie Avenue



From west of Clarewood Avenue to Dixie Avenue, the 8.5-foot parking lanes should be replaced with 7-foot buffered bicycle lanes. The 12-foot lanes should be reduced to 11 feet and the 16-foot median widened to 23 feet. The widened median will allow for better median refuge for turning vehicles and facilitate in easier U-turns for users. The existing curb line, sidewalks and R/W should be maintained.

5.2.2 Singleton Avenue Roundabout

A roundabout is proposed at Singleton Avenue. A roundabout at this intersection is anticipated to improve current safety conditions by reducing severe intersection crashes and promoting slower speeds as traffic enters downtown Titusville from the west. This roundabout can also serve as a gateway feature for the City of Titusville, as it does currently with the Titusville sign in the southeast corner of the intersection.

The Singleton Roundabout requires approximately 0.148 acres of R/W and impacts city owned property in the northwest and northeast quadrants of the intersection. The southwest corner of the intersection is privately owned, vacant commercial property. The grade differential will require a

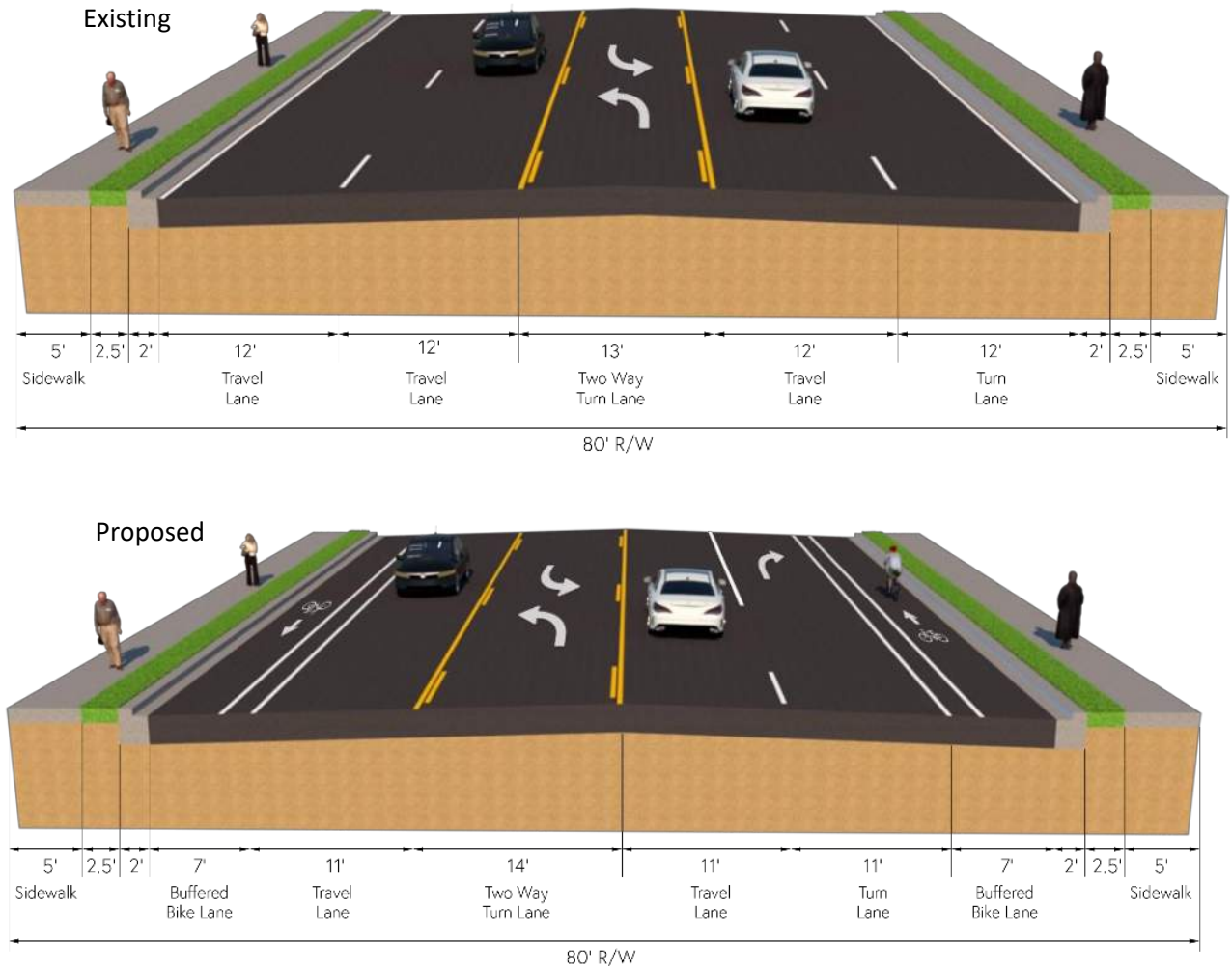
small gravity wall to tie back to existing grade to minimize R/W impact. More details can be found in Section 5.3.5 Roundabout Process.

Figure 42: Proposed Concept for the Singleton Avenue Roundabout

5.2.3 Dixie Avenue to Indian River Avenue

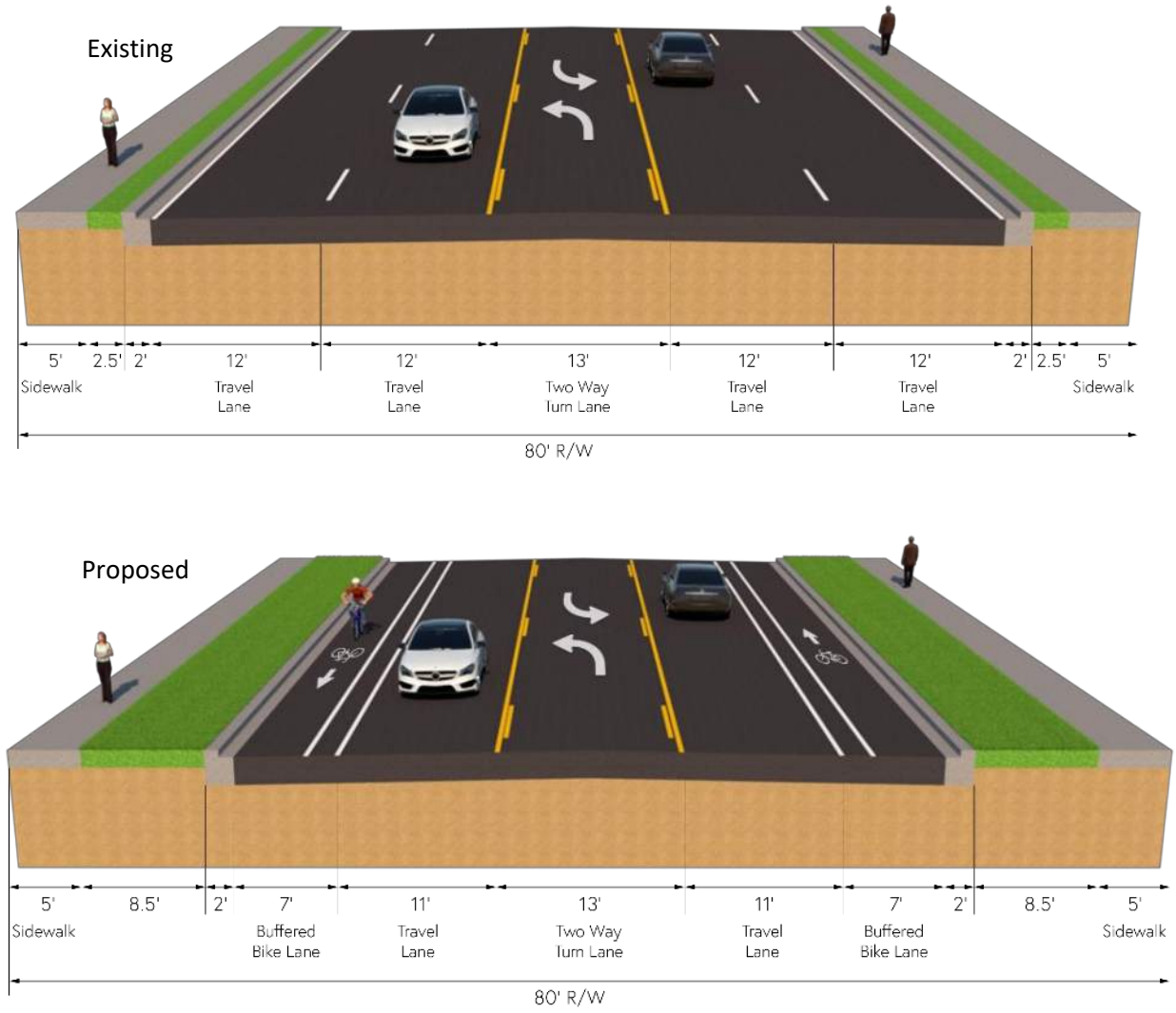
From Dixie Avenue to Indian River Avenue, a lane modification from the current 5-lane section is proposed. The new 3-lane section will provide two 11-foot travel lanes with a continuous, bi-directional left center turn lane. This lane modification will capitalize on the available capacity that this corridor offers and repurposes it to provide buffered 7-foot bike lanes. The signal at Palm Avenue is planned to be removed with the currently funded resurfacing project. The intersection does not meet signal warrant criteria for existing or future traffic. Improvements made along this section of the corridor will also allow for improvement to transit infrastructure.

Figure 43: Typical Section 5: Dixie Avenue to Park Avenue



From Dixie Avenue to Park Avenue, the outside eastbound lane should change to a right turn lane drop to facilitate the transition from 5 lane to 3 lane section. This is a significant traffic movement and will help to reduce congestion as the roadway transitions to a three-lane section. As with the section of SR 406 (Garden Street) from Park Avenue to US 1 southbound (Hopkins Avenue), travel lanes should be reduced to 11 feet and seven-foot buffered bikes lanes should be continued. Existing sidewalks and R/W should remain in place. These measures would support the corridor's designation as a downtown secondary area by the *City of Titusville Vision Plan 2017*. Demographic information also suggests there is a contingent of zero-vehicle households in the surrounding area. Improving pedestrian and bicycle infrastructure and establishing safety measures could provide additional benefits for those households, as well as those individuals traveling to Blanton Park just south of the intersection. More information regarding the FDOT Lane Elimination process can be found in section 5.3.6.

Figure 44: Typical Section 6: Park Avenue to US 1 SB (Hopkins Avenue)



From Park Avenue to US 1 southbound (Hopkins Avenue), the roadway is proposed to be reduced to 3 lanes. Travel lanes should be reduced to 11 feet and seven-foot buffered bikes lanes should be continued. Existing sidewalks and R/W are to remain, but the curb is proposed to be moved in for a more attractive and walkable corridor as SR 406 (Garden Street) approached downtown Titusville. While the curbs are to be moved, it is recommended that the drainage system be left in place to reduce the project cost. As the new curb line approaches the existing drainage system, the curb should "flare in" to accommodate the existing drainage system.

There is also a proposed roundabout at the intersection of SR 406 (Garden Street) and US 1 that is recommended as part of the US 1 Concept Development and Evaluation Study (FM# 435627-1). The roundabout would bring the two closely spaced signalized intersection of SR 406 and US 1 (Northbound and Southbound) into one intersection. Further information about this specific roundabout can be found in the US Concept Development and Evaluation Study Report. The proposed roundabout concept can be seen in Figure 45.

Figure 45: Proposed Concept for the US 1 and SR 406 (Garden Street) Roundabout

5.3 2040 Proposed Alternatives Analysis

5.3.1 2040 Proposed Alternatives Projected Roadway Operations

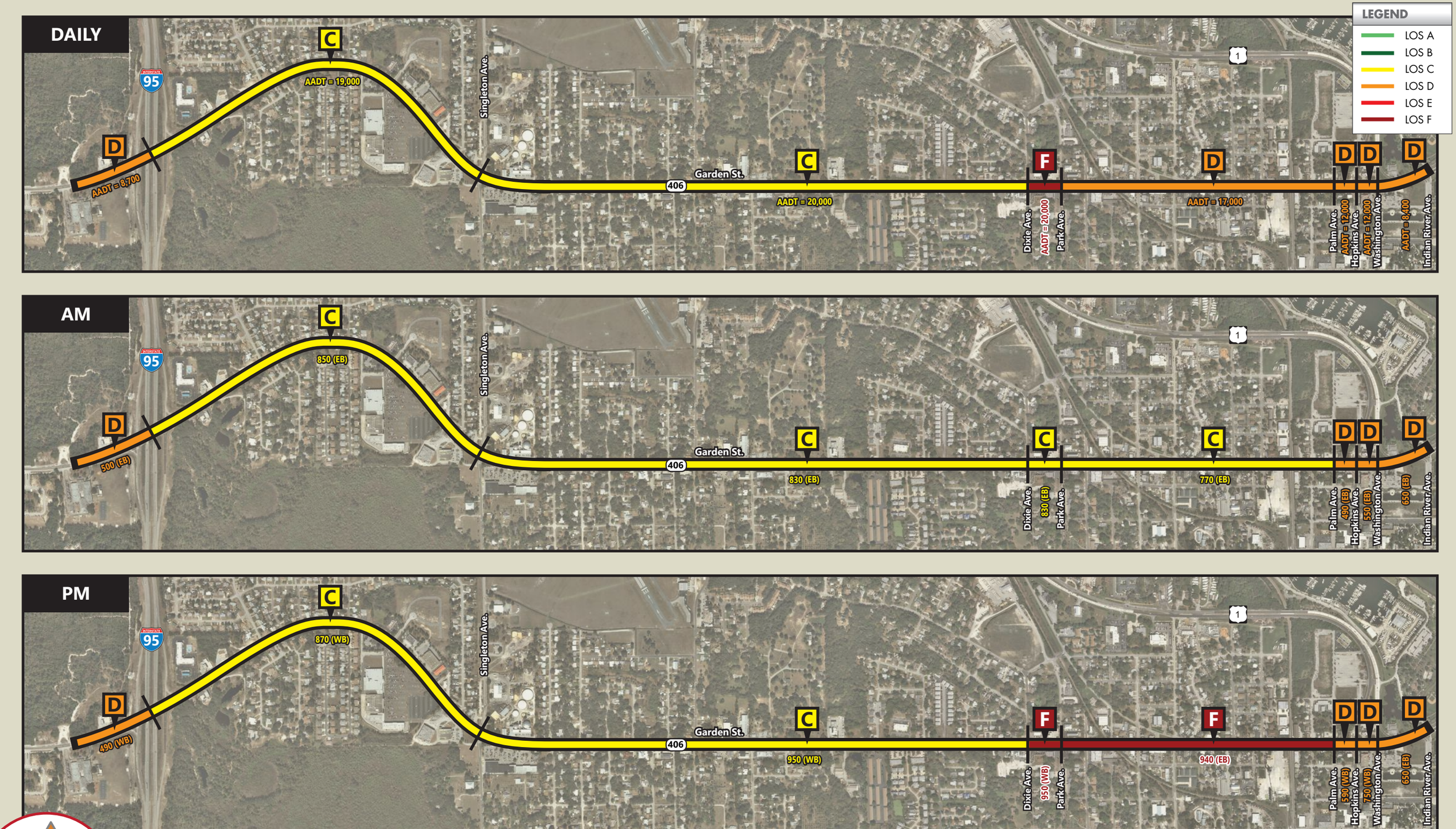
This section analyzes future traffic projections in 2040 if all the proposed improvements are implemented. The generalized peak hour directional service volumes for the LOS letters "A" through "F" were obtained from Table 7 of the 2012 FDOT Quality/Level of Service Handbook and compared with projected 2040 volumes calculated using the 2017 existing volumes with the previously-identified .85% annual growth factor applied. The 2040 projected roadway operations are provided in Table 24 and Figure 46 for daily, AM peak hour, and PM peak hour.

Table 24: 2040 Projected Roadway Level of Service: Proposed Alternatives

Roadway/Segment	Daily		AM Peak			PM Peak		
	AADT	LOS	Volume	Peak Direction	LOS	Volume	Peak Direction	LOS
SR 406 (Garden Street)								
South Lake Elementary School to I-95	8,700	D	500	EB	D	490	WB	D
I-95 to Singleton Avenue	19,000	C	850	EB	C	870	WB	C
Singleton Avenue to Dixie Avenue	20,000	C	830	EB	C	950	WB	C
Dixie Avenue to Park Avenue	20,000	F	830	EB	C	950	WB	F
Park Avenue to Palm Avenue	17,000	D	770	EB	C	940	EB	F
Palm Avenue to US 1 SB (Hopkins Avenue)	12,000	D	490	EB	D	590	WB	D
US 1 Southbound to US 1 NB (Washington Avenue)	12,000	D	550	EB	D	750	WB	D
US 1 NB (Washington Avenue) to Indian River Avenue	8,400	D	650	EB	D	650	EB	D

2012 FDOT Quality/Level of Service Handbook Tables / Brevard County 2016 Peak Season Factor Category Report
*AADT = Data Collected * Seasonal Factor (1.06) * Axle Factor (0.98) (if need)*

As shown in Table 24, the SR 406 (Garden Street) corridor currently operates within acceptable LOS standards with the exception of the short segment between Dixie Avenue and Park Avenue, approximately 368 feet long, in the daily and PM peak hour as well as the segment between Park Avenue and Palm Avenue in the PM peak hour. According to the intersection operations at Park Avenue, the intersection will operate sufficiently. With the addition of the southbound right turn lane, these issues are unlikely to cause significant congestion along the corridor.



SR 406 Concept Development & Evaluation

SOUTH LAKE ELEMENTARY SCHOOL TO INDIAN RIVER AVENUE

FIGURE 46

2040 Projected Roadway Volumes and Operations: Propsed Alternatives

5.3.2 2040 Proposed Alternatives Projected Intersection Operations

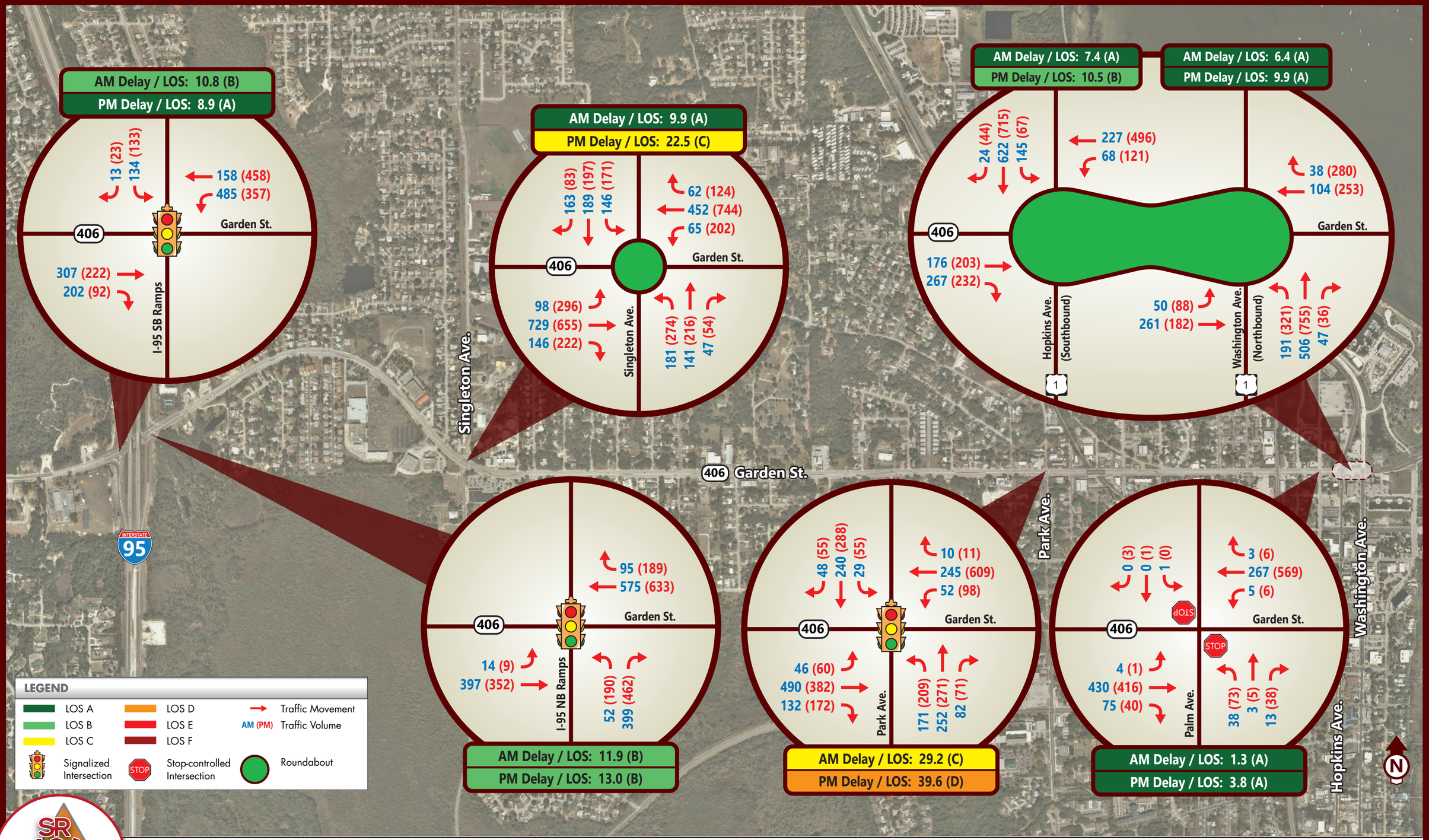
According to the HCM 2010, for signalized intersections, and average control delay per vehicle from 55 seconds up to 80 seconds is considered to be a LOS E condition. Beyond 80 seconds is considered to be a LOS F condition. A summary of the 2040 projected intersection operations for all study area intersections is provided in Table 25 for the AM and PM peak hours. The signal timings were optimized under the assumption that signal timings will be regularly maintained through 2040. Analysis output sheets for the roadway operations are attached.

Table 25: 2040 Projected Intersection Level of Service: Proposed Alternatives

Intersection	Control	AM Peak		PM Peak	
		Delay	LOS	Delay	LOS
SR 406 (Garden Street)/I-95 SB Ramps	Signalized	10.8	B	8.9	A
SR 406 (Garden Street)/I-95 NB Ramps	Signalized	11.9	B	13.0	B
SR 406 (Garden Street)/Singleton Avenue	Signalized	19.6	B	29.7	C
	Roundabout	9.9	A	22.5	C
SR 406 (Garden Street)/Park Avenue	Signalized	29.2	C	39.6	D
SR 406 (Garden Street)/Palm Avenue	Un-Signalized	1.3	A	3.8	A
SR 406 (Garden Street)/US 1 SB (Hopkins Avenue)	Roundabout[1]	7.4	A	10.5	B
SR 406 (Garden Street)/US 1 NB (Washington Avenue)	Roundabout[1]	6.1	A	9.9	A

1- Values shown for the proposed US 1 and SR 406 (Garden Street) roundabout detailed in the US 1 Concept Development Study

As presented in Table 25 above, all of the study area intersections are anticipated to operate at acceptable LOS in 2040. The 2040 projected intersection operations are presented in Figure 47 for the AM and PM peak hours. Synchro Output sheet are provided in **Appendix C**.



SR 406 Concept Development & Evaluation

SOUTH LAKE ELEMENTARY SCHOOL TO INDIAN RIVER AVENUE

FIGURE 47

2040 Projected Intersection Volumes and Operations: Proposed Alternatives

5.3.3 Access Management

The existing access management along SR 406 (Garden Street) is not in accordance with rule 14-97 of the FAC; the distance between median openings being too short in most instances. The proposed updates to the SR 406 (Garden Street) access management address these short distances and, where appropriate, proposed changes to bring the access management more closely in accordance with rule 14-97 of the FAC. Most of the SR 406 (Garden Street) corridor is classified as Access Class 5 with a short segment from Dixie Avenue to Palm Avenue classified as Access Class 6. Table 26 below shows the total median opening counts for the corridor, and Table 27 shows the requirements for median opening spacing for Access Classes 5 and 6.

Table 26: Median Opening Count

Median Type	Number
Full (Signals/Roundabouts)	11 (3/2)
Directional (Dual)	11 (8)

Table 27: Rule 14-97 of the FAC

Access Management Spacing Standards (ft)				
		Signal	**Full**	**Directional**
Access Class 5	PS ≤ 45 mph	1,320	1,320	660
	10% Deviation	1,188	1,188	594
Access Class 6	PS ≤ 45 mph	1,320	N/A	N/A
	10% Deviation	1,188	N/A	N/A

While the proposed access management improvements seek to improve safety along the corridor, there are eight (8) median openings that do not satisfy spacing standards of rule 14-97 of the FAC. The reasons are as follows:

1. The first deviation is located at the entrance to the abandoned gas station west if I-95. It is only 177 feet away from the previous opening at South Lake Elementary School as opposed to the required 1,320 feet of distance. The South Lake Elementary School opening is only available to those exiting South Lake Elementary School and turning left onto SR 406 (Garden Street) westbound. This opening prevents drivers from having to make a U-turn past the I-95 interchange and having to travel through four traffic lights in order to turn left, so it is recommended that the opening be maintained as is proposed.

2. The second case occurs at the full opening west of the I-95 interchange. While rule 14-97 of the FAC standards require 1,320 feet between full openings, the proposed plan places the opening 462 feet from the signalized full opening at the I-95 south-bound ramp. Despite this opening being classified as full, it will effectively function as a west bound directional opening.

The north side connection leads to an abandoned gas station and there is no south side connection. Additionally, the existing median openings east of the I-95 interchange will be closed, as such, west bound traffic will have to travel farther to U-turn; this median opening is recommended to prevent drivers u-turning at the signalized openings for the I-95 north and south bound ramps.

3. The third case occurs at the interchange of SR 406 (Garden Street) and I-95. The signalized openings for the north and south bound ramps are placed 269 feet apart where rule 14-97 of the FAC requires that they be 1,320 feet apart. No other updates for the interchange are recommended, and to attempt to space the intersections farther apart would cause unnecessary difficulties and project cost. As such, it is recommended that their spacing be left as is.

4. The fourth deviation occurs at the entrance to the Executive Motel Garden Titusville, the opening is 494 feet east of the opening for the I-95 northbound ramps as opposed to the required 1320 feet. This opening has been included to facilitate the movement of traffic to and from the interstate, and as such, it is recommended that it be kept as it is.

5. The fifth case is located at the entrance to the proposed Dunkin Donuts where the distance from the previous opening is 530 feet rather than the required 660 feet for directional openings. The opening allows for turns from the interstate (either into the Dunkin Donuts property or U-turns) to be made with greater ease, especially for trucks and semis. Therefore, it is recommended that this opening be kept as is.

6. The sixth deviation involves the dual directional opening at Clarewood Boulevard/Fairglen Drive which is 333 feet from the opening for the proposed Dunkin Donuts as opposed to the required 660 feet between directional openings. The Clarewood opening is needed to serve the residential areas to the north and south of SR 406 (Garden Street) as well as Astronaut High School to the north of SR 406 (Garden Street). For this reason, it is recommended that the Clarewood Boulevard/Fairglen Drive opening be left as is.

7. The seventh deviation involves the intersection at Palm Avenue and the proposed roundabout at US 1/Washington Ave. The distance between the two openings is 271 feet as opposed to the required 1,320 feet. The opening at Palm Avenue is unique in this corridor in that, the roadway is Access Class 6 to the west of it and Access Class 5 to the east of it. Currently, the intersection is signalized, it is proposed that it be changed to an unsignalized full opening, allowing for largely unrestricted movement of vehicles through the intersection. As such, it is not expected to cause problems and is not recommended to be moved from its current position.

8. The final case occurs at the full opening at Indian River Avenue. The north side connection is a gated utility road into Sand Point Park that is very rarely used. Indian River Avenue generally has low traffic volumes, the majority of which turn left at the opening onto SR 406 (Garden Street), it is recommended that the opening be retained as it provides a median refuge for

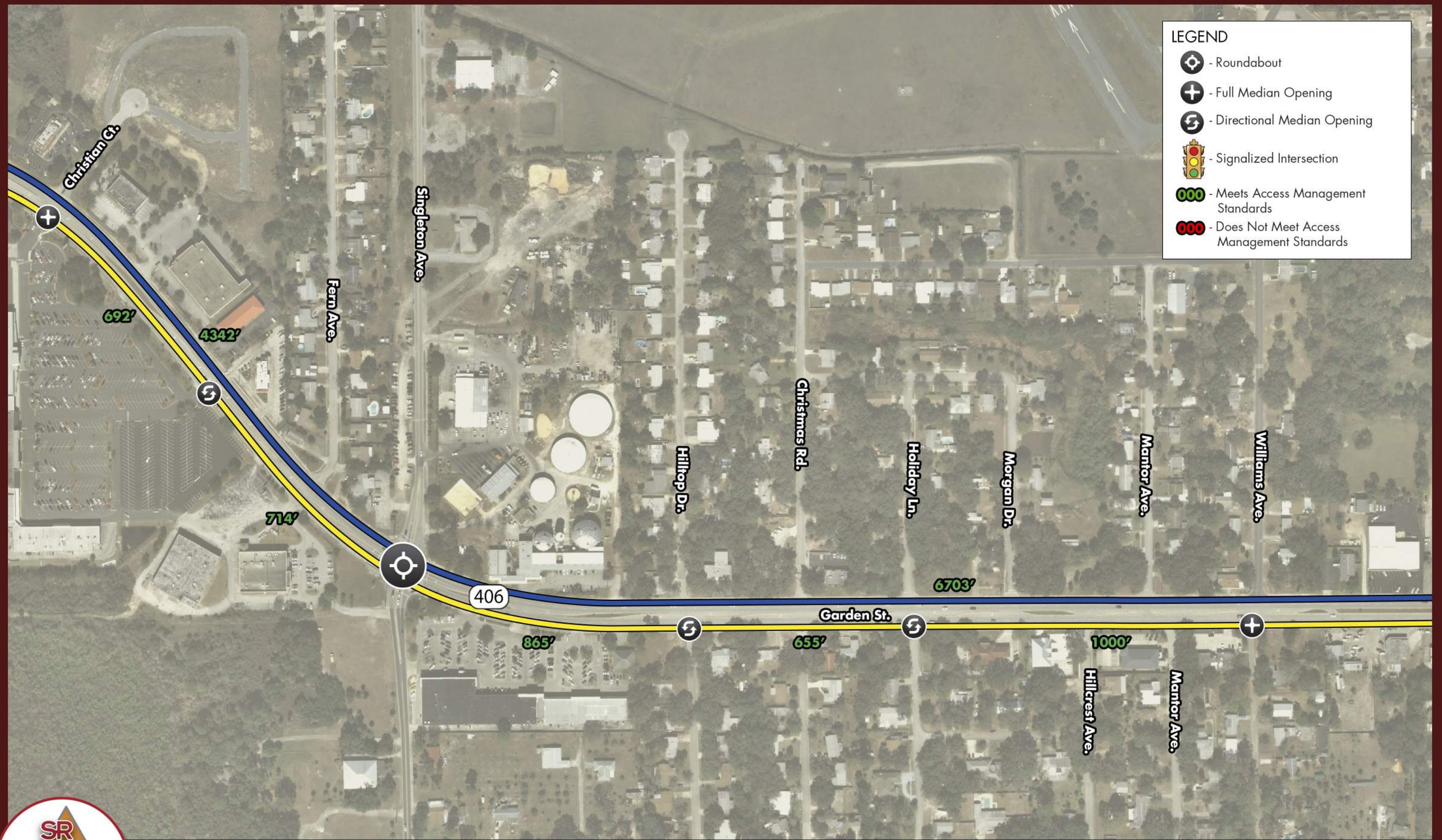
left turning vehicles and prevents drivers from having to perform a U-turn farther east along SR 406 (Garden Street) where the road decreases from 4 to 2 lanes as it approaches the bridge over the Indian River.

Figures 48 through 51 on the following pages show the proposed median opening spacing along the SR 406 (Garden Street) corridor, differentiating between those that comply with rule 14-97 of the FAC and those that do not.

SR 406 Concept Development & Evaluation

SOUTH LAKE ELEMENTARY SCHOOL TO INDIAN RIVER AVENUE

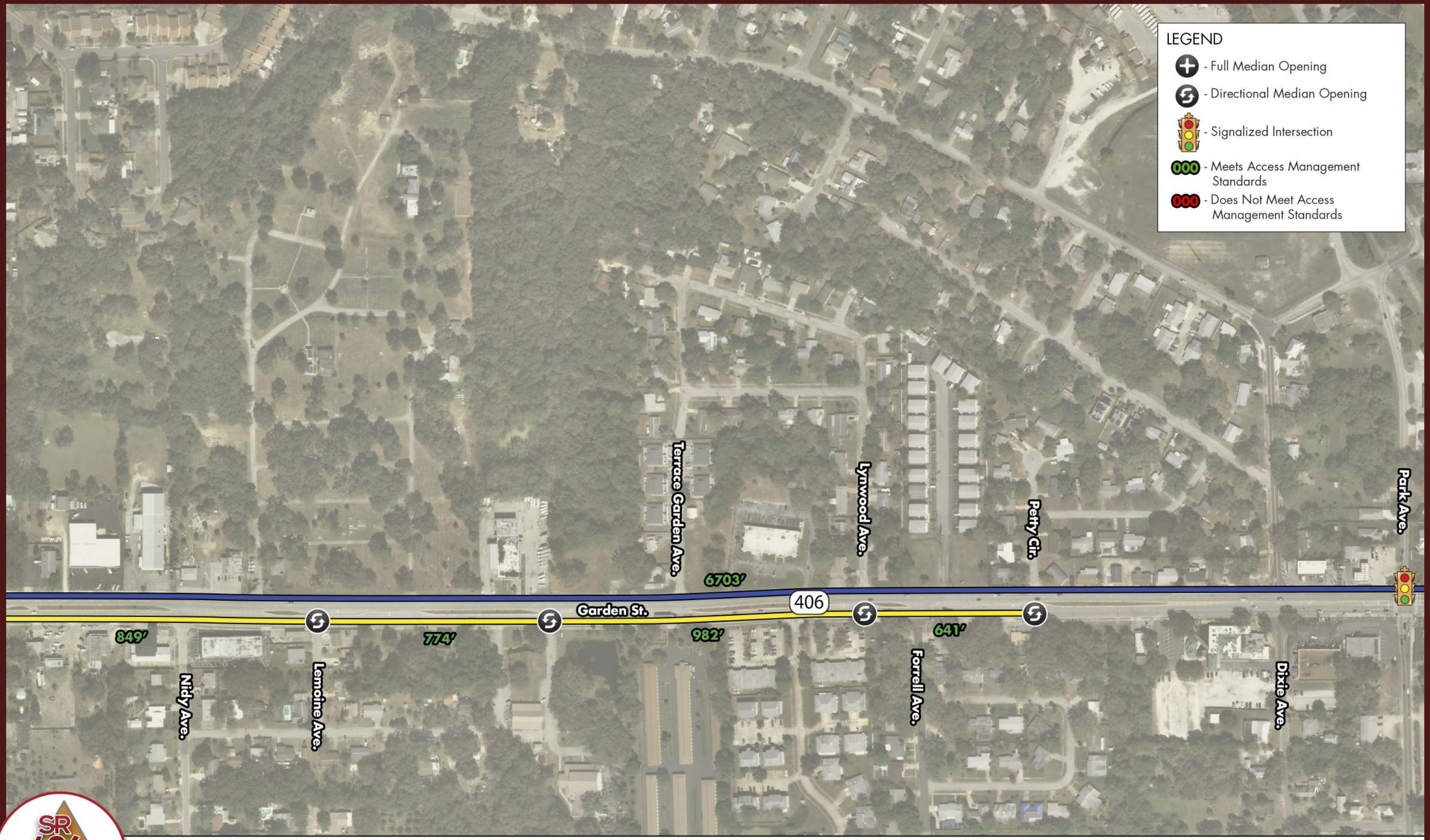
FIGURE 48
Access Management 1: Project Begin to Christian Court



SR 406 Concept Development & Evaluation

SOUTH LAKE ELEMENTARY SCHOOL TO INDIAN RIVER AVENUE

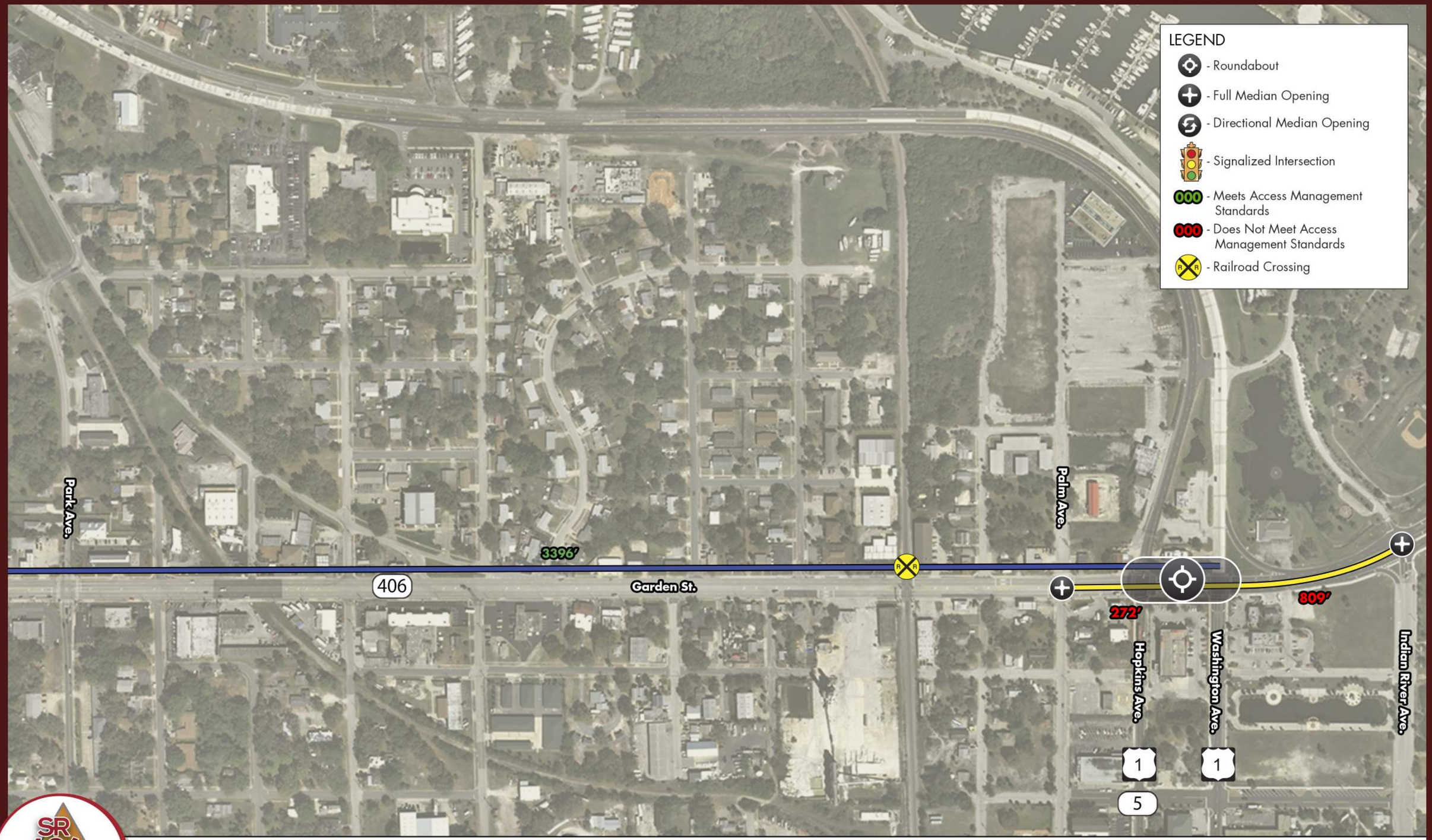
FIGURE 49
Access Management 2: Christian Court to Williams Avenue



SR 406 Concept Development & Evaluation

SOUTH LAKE ELEMENTARY SCHOOL TO INDIAN RIVER AVENUE

FIGURE 50
Access Management 3: Williams Avenue to Park Avenue



SR 406 Concept Development & Evaluation

SOUTH LAKE ELEMENTARY SCHOOL TO INDIAN RIVER AVENUE

FIGURE 51
Access Management 4: Park Avenue to Project End

5.3.4 Drainage

Stormwater runoff from the SR 406 (Garden Street) corridor flows to the St. Johns River, west of the Study Area, and the Indian River, east of the Study Area. The roadway runoff is conveyed to a curb and gutter system that provides drainage for the SR 406 (Garden Street) corridor. Along the corridor there are curb inlets and catch basins that are connected to a storm sewer system directing runoff to wetlands, a stormwater management facility, or directly to an outfall.

The proposed drainage system should consist of the following:

From Station 36+00 to Sta 44+00 on the right, the proposed roadway improvements include the addition of curb and gutter. A closed stormwater system will need to be added. This is depicted on the proposed conceptual plans. A final stormwater spread calculation will need to be developed to determine the exact spacing of the curb inlets.

This system will outfall to a headwall at approximately station 40+00 on the right. The headwall itself will have to be relocated and that culvert extended, to accommodate the proposed sidewalk. The system will continue to outfall to the wetland system in the southeast corner of the intersection of SR 406 (Garden Street) and I-95. There is no additional impervious area added to this outfall.

From Station 50+00 to Sta 67+00, the proposed roadway improvements include new configurations for medians and turn lanes in the center of the roadway. This section of roadway is super elevated. There are existing inlets in this section that will need to be relocated. Additional inlets will be needed to pick up roadway runoff from new low points. New inlets can connect to the existing stormwater pipes under the roadway and continue to outfall to the same location as in the existing condition. There is no additional impervious area added to this outfall.

From Station 76+00 to Sta 82+00, the proposed roadway improvements include the addition of a new roundabout at S. Singleton Avenue. As shown in the Drainage Map & Field Notes SR 406 & Singleton Avenue figure in **Appendix D**, all the existing drainage in the vicinity of this intersection consists of a curb and gutter section draining to curb inlets. The existing inlets in this section will need to be relocated and additional inlets will be needed at strategic locations along this intersection and to pick up roadway runoff from new low points. New inlets can connect to the existing stormsewer pipes under the roadway and continue to outfall to the same location as in the existing condition. There is not additional impervious area added to this outfall.

From Station 146+00 to Sta 182+00 on both sides, the proposed roadway improvements include the addition of curb and gutter. The curb and gutter will provide curb cuts so roadway runoff can still flow to the existing inlets. No other drainage improvement is needed in this section. This is depicted on the proposed conceptual plans.

Environmental Permitting of Proposed Improvements

All of the proposed improvements described above do not add any additional impervious area and thus stormwater runoff to the ultimate outfalls either remains the same or is decreased. There is a strong possibility that the improvement options will be exempt from permitting per 62-330.051 (4)(c). The SJRWMD considers many of the proposed roadway improvements as safety

improvements. Safety improvements qualify under the following conditions for a permit exemption under certain length and width thresholds:

(4)(c) Minor roadway safety construction, alteration, or maintenance, and operation, provided:

1. There is no work in wetlands other than those in drainage ditches constructed in uplands;
2. There is no alteration to a project previously permitted under Part IV of Chapter 373, F.S.; and
3. All work is conducted in compliance with subsection 62-330.050(9), F.A.C.; and
4. The work is limited to:
   a) Sidewalks having a width of six feet or less;
   b) Turn lanes less than 0.25 mile in length, and other safety-related intersection improvements; and
   c) Road widening and shoulder paving that does not create additional traffic lanes and is necessary to meet current, generally accepted roadway design and safety standards.

There is also a possibility that any sidewalk widening option will be exempt from permitting per 62-330.051 (10)(b):

(10)(b) Have a width of eight feet or less for pedestrian paths, and 14 feet or less for multi-use recreational paths.

A pre-application meeting SJRWMD would confirm the improvements are exempt from permitting and the project is exempt from providing any additional water quality or attenuation volumes.

5.3.5 Roundabout Process

Steps one through three of the FDOT roundabout process were conducted for the SR 406 (Garden Street) intersections at Singleton Avenue. Details of the screenings can be found in **Appendix I**. The roundabout passed the roundabout screening (step 1) of the process and advanced to the next step.

During Step 2 of the FDOT roundabout process, a Benefit-Cost Analysis was performed. The results of this analysis are below in Table 28. While the Singleton Avenue signal was recently reconstructed, the crash history at this location justifies an investment. The details of this analysis can be seen below in Table 28. After preparation of step 2 the project team met with the Roundabout Committee who had some comments on the design and requested them to be tweaked as the changes may result in higher cost that could trip the roundabout to not being a benefit.

Following comments from the Roundabout Committee, design for the Singleton Avenue roundabout was updated to improve safety and performance. Updates in design were minimal and in fact decreased the total R/W necessary for taking by 1,985 total square feet. It was therefore determined that a revision of the Roundabout Process would not change the outcome

of Step 2. The roundabout is recommended, further updates can be completed during the design phase with more current data as needed.

Table 28: Singleton Avenue Roundabout Benefit-Cost Analysis

Safety Benefit of Roundabout	**$ 6,229,331**
Delay Reduction Benefit of a Roundabout	$ 1,136,363
Total Benefit	**$ 7,365,694**
Added O & M Costs of a Roundabout	$ (37,600)
Added Capital Costs of a Roundabout	$ 4,207,383
Total Cost	**$** 4,169,783
Life Cycle Benefit/Cost Ratio	**1.8**

5.3.6 FDOT Lane Elimination Process

While the FDOT Lane Elimination Committee is a new establishment in District 5, the project team has worked closely with the District on the proposed concepts. At the time of publishing, the Lane Elimination approval is on hold. The project recently fell off the Space Coast TPO's Project Priority List, therefore no funding is currently scheduled or would be scheduled for the design phase. The concepts will also need to be discussed and confirmed with FDOT Central Office. This process will provide guidance and set precedent for future lane elimination processes in District 5.

In preparation for these discussions, a document was prepared based on the FDOT Design Manual (FDM) section 126. Specifically, this document was based on Form 126-A, the initial meeting checklist. This form provides basic information about the project including the conceptual plan, existing and long-range future AADT, anticipated changes to the corridor, ideas for funding sources and more. The full documentation for the initial lane elimination meeting can be found in **Appendix J**.

5.3.7 Utilities

Much of the utility impacts for the proposed alternatives are at the Singleton Avenue roundabout. Two utility poles and transmission lines will be impacted on the west side of the intersection, for cost estimates, this was assumed to cost $500,000. These lines will either need to be buried or relocated. An ITS pole, lighting and pull boxes located west of the intersection will have to be relocated with the reconstruction of the sidewalk. The Walgreens sign on the southwest corner of the intersection will be relocated and the driveway off Singleton Avenue reconstructed. An AT&T utility box is located on the northwest corner of the intersection. In addition to these utility impacts, there will be minimal utility impacts to lighting facilities along SR 406 (Garden Street) that should be coordinated with this process.

5.3.8 Transportation Systems Management and Operations (TSM&O)

Transportation Systems Management and Operations (TSM&O) is a program that provides alternative transportation strategies that are tailored toward improving safety and mobility in a cost-efficient and effective manner. These strategies typically focus on operational improvements that can maintain and even restore the performance of the existing transportation system before major capital improvement projects are needed.

The *TSM&O Strategy Guide*, developed by FDOT District Five for use in Planning and PD&E studies, was consulted to identify potential TSM&O strategies that could be applied to identified transportation issues in the study corridor. Issues found in the study area that were entered into the TSM&O Strategy Guide include:

- Excessive Speeding (less than 10% over the speed limit)
- High Crash Rate (Various)
- Minimal Bike/Ped Infrastructure
- Obstructed Motorist View

Based on these inputs, some of the TSM&O strategies suggested by the application include:

- Adaptive Signal Control
- Arterial Access Management
- Complete Streets program
- Enhance Bike/Ped Infrastructure (bike lanes and sidewalks)
- Roadway Diet (Lane Modification)
- Roundabout

While the SR 406 (Garden Street) corridor is not in need of capacity improvements, the proposed improvements, which include roundabouts at the Singleton Avenue intersection and at the US 1 intersection, should improve safety and efficiency along the corridor. For more information regarding the proposed roundabouts, see Section 5.1. A lane modification from five lanes to three lanes is also proposed for SR 406 from Park Avenue to US 1, allowing for 7-foot bike lanes in both directions. This improvement would provide bicycle infrastructure and reduce traffic speeds, which will promote safety for all modes of transportation and support the corridor's designation as part of the Titusville downtown area.

In addition to the proposed roundabouts and lane modification, access management improvements are proposed throughout the SR 406 study corridor. Conflict points and high-crash locations were identified along the study corridor, particularly for left turns onto SR 406. There were also medians in non-compliance along the corridor. Access management improvements have been developed to reduce or eliminate these conflicts and bring medians into compliance with rule 14-97 of the FAC. For more information regarding the access management improvements along SR 406, see Section 5.2.3 and Figures 48 through 51.

As part of the development of alternatives, Adaptive Signal Control Technology (ASCT) was considered as a supplemental component to the program of other improvements detailed above.

However, it was determined that the existing and future traffic conditions of the corridor do not merit the ASCT deployment.

5.3.9 Right of Way

Overall, 6,463 square feet of R/W must be taken to construct the roundabout at Singleton Avenue. The majority of these square feet come from the vacant lot at the southwest corner of the intersection. All R/W needs are pictured in Figure 52. No additional R/W is needed to implement the proposed alternatives along the rest of the SR 406 (Garden Street) corridor.

Figure 52: R/W Necessary to Construct the Singleton Avenue Roundabout

5.3.10 Cost Estimates

The project does not anticipate any R/W costs except for at the proposed Singleton Avenue roundabout. The Singleton Avenue roundabout will cost an estimated $1.3 million for R/W and utility costs in addition to the construction costs. Preliminary engineering is estimated to be $1 million for the Singleton Roundabout and $1.3 million for the lane modification. The total cost of the proposed alternatives along SR 406 are $10,050,000, excluding the US 1 and SR 406 roundabout discussed in the US 1 Concept Development and Evaluation Study Report. Construction Cost Estimates for the corridor are shown in Table 29.

Table 29: SR 406 (Garden Street) Estimated Construction Costs

Improvement	Cost
Begin Project to Singleton Avenue Construction	$1,800,000
Singleton Avenue Roundabout Construction	$1,900,000
Singleton Avenue to Dixie Avenue Construction	$1,650,000
Dixie Avenue to Indian River Avenue (excluding roundabout at US 1) Construction	$1,100,000
Total Cost	**$ 6,450,000**

5.3.11 Measures of Success

Measures of success were identified during the Corridor Planning Study in order to evaluate the effectiveness of the recommendations selected for the study corridor. These measures are based on the guiding principles identified for the corridor.

Safety, bicycle and pedestrian mobility and aesthetics are three of the guiding principles. The seven-foot buffered bike lanes to be added throughout the corridor will improve bicycle mobility and safety. The proposed access management plan in the western part of the corridor will improve safety and efficiency for motorists. The roundabout at Singleton Avenue will improve aesthetics coming into downtown Titusville as well as improve safety at the intersection. The lane modification from Dixie Avenue to the study end will decrease speeds and make the corridor a safer, more beautiful place to drive, walk, bike and shop. Improved lighting along the corridor will make walking and biking safer and easier.

6 Conclusion

Based on analysis performed to determine the 2040 projected volumes and operations of SR 406 (Garden Street) within the study area, the no-build demonstrates that there are no intersection operational issues. This allowed the proposed alternatives to focus on improving safety and creating a multi-modal friendly environment.

Under the proposed alternatives, the corridor is anticipated to provide significant safety, aesthetically pleasing bicycle and pedestrian improvements. Access management improvement along the corridor would potentially improve safety. The proposed roundabout at Singleton Avenue would also potentially improve safety and traffic flow, while providing the opportunity for an improved gateway into downtown Titusville. The lane modification allows for the addition of multimodal features including buffered bike lanes, widened sidewalks, planting strips, and improved bus stop facilities by repurposing the existing configurations within the roadway R/W. This pedestrian and bicycle friendly typical section supports the aesthetic character of the area desired by local stakeholders and the community. The lane modification also encourages slower speeds, ultimately providing a safer corridor.

6.1 Implementation

This Concept Development and Evaluation Study was completed in conjunction with the US 1 Concept Development and Evaluation Study. The US 1 study proposes the construction of a roundabout at SR 406 (Garden Street) and the US 1 one-way pairs of Hopkins Avenue and Washington Avenue. Because of the interdependencies in these implementations, it is recommended that the lane modification along SR 406 (Garden Street) and US 1 at SR 406 roundabout be implemented and funded as an individual project. Other proposed alternatives for the SR 406 (Garden Street) corridor can be implemented in a prior phase, to be completed with an impending resurfacing to be schedule in the future.

While neither of these phases are in the Space Coast TPO Long Range Transportation Plan, there is support from both the TPO and the City of Titusville for these projects. In a letter signed on July 2, 2018, the city said, “We are supportive of the Department proceeding with a lane reduction along SR 406 (Garden Street) between Park Avenue and Indian River Avenue … In addition to the lane reduction, the City of Titusville would also like to express its support for the proposed roundabouts… at SR 406 and Singleton Avenue and the system involving the rework of the

interface between US 1 and SR 406." For the implementation of these concepts to move forward, the Space Coast TPO would need to add the projects to their LRTP as priorities. At this point, funding could be explored through the Department or other interested agencies. Figure 53 shows the proposed phasing for both the US 1 and SR 406 (Garden Street) Concept Development proposed alternatives.

Figure 53: Proposed Phasing of the US 1 & SR 406 (Garden Street) Concept Development Studies

Florida Department of Transportation District 5

CONCEPT DEVELOPMENT AND EVALUATION TECHNICAL MEMO

406

FDOT