EXHIBIT F-1

FDEP AGREEMENT NO. 22PLN21

ST. JOHNS COUNTY VULNERABILITY ASSESSMENT: SLR ASSET IMPACT AND REPETITIVE LOSS

St. Johns County

Final Project Report

This report is funded in part through a grant agreement from the Florida Department of Environmental Protection's Office of Resilience and Coastal Protection Resilient Florida Program. The views, statements, findings, conclusions, and recommendations expressed herein are those of the author(s) and do not necessarily reflect the views of the State of Florida or any of its subagencies.

June 2024

ST. JOHNS COUNTY VULNERABILITY ASSESSMENT:
SLR ASSET IMPACT AND REPETITIVE LOSS

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PART I. EXECUTIVE SUMMARY

St. Johns County applied for and received a Resilient Florida Grant Program (RFGP) planning grant to complete a Countywide Vulnerability Assessment (VA) as part of its continuing efforts to become a more resilient community and leverage grant-funding sources. Subsequently, the County hired Jones Edmunds to complete the VA. The County's grant agreement (work plan) with the Florida Department of Environmental Protection (FDEP) covers the following Tasks for the VA:

- Task 1 – Kickoff Meeting
- Task 2 – Grant Administration and Management
- Task 3 – Public Outreach and Steering Committee Meetings
- Task 4 – Acquire Background Data
- Task 5 – Exposure Analysis
- Task 6 – Sensitivity Analysis
- Task 7 – Identify Focus Areas
- Task 8 – Preliminary Adaptation Plan
- Task 9 – Final Vulnerability Assessment Report, Maps, and Tables

The primary goals/objectives of this VA are to:

- Complete a Countywide VA that satisfies FDEP RFGP guidelines and requirements in Section 380.093, Florida Statutes (FS).
- Identify critical community infrastructure that is vulnerable to flooding under existing and projected future conditions.
- Develop grant-fundable adaptation projects to protect the County's infrastructure that is most vulnerable to flooding.

Products and outcomes from this VA include:

- Inventory all critical community assets in the County.
- Map Countywide existing and future conditions extreme flood events from rainfall, tidal, and storm-surge flooding.
- Identify critical community assets that are vulnerable to rainfall, tidal, and storm-surge flooding.
- Prioritize critical community assets that are vulnerable to flooding.
- Identify focus areas for flood adaptation planning.
- Preliminarily identify flood adaptation strategies and/or projects.
- Produce tables and flood maps summarizing the results of the VA.

Project meetings included a kickoff meeting, steering committee meetings, and public meetings. The kickoff meeting included reviewing the project goals, scope, schedule, milestones/deliverables, and communication/points of contact; discussing the Steering Committee's role; and developing a draft list of Steering Committee members. The County assembled a Steering Committee that included internal and external stakeholders. Two steering committee meetings were held to:

- Review Project Goals.
- Review Draft Materials.

- Provide Input on Study Direction.
- Identify Geographic Context.
- Review Modeling Methods.
- Identify Available Data and Resources.
- Identify Relevant Assets.
- Review Study Findings and Recommendations.

Two public outreach meetings were held during the project. The first meeting allowed the public to provide input during the initial data collection stages on preferred methodologies, data for analyzing potential sea-level rise (SLR) impacts and/or flooding, guiding factors to consider, and critical assets important to the community. The second meeting informed the public and the County Commission on the methodologies being used for the VA, presented preliminary results from the study, and solicited input on priorities for adaptation planning.

Jones Edmunds compiled the topographic data, critical and regionally significant asset data, and flood scenario-related data required to perform the VA as defined in Section 380.093, FS. Jones Edmunds assembled the critical and regionally significant assets and required background data from existing local, state, and federal data sources. A total of 21,583 critical assets were identified Countywide. After evaluating the data, we provided a gap analysis with a plan for gap-filling.

The exposure analysis identifies the Countywide depth of water caused by tidal, storm surge, and rainfall flood-driven flooding. Table ES-1 shows the 40 scenarios for which we performed the exposure analysis.

Table ES-1 Matrix of Evaluated Flood Scenarios

Flooding Type	Tidal Flood Days	MHHW +2 feet	10-Year	25-Year	100-Year	500-Year
Tidal/Sunny-Day Flooding						
Existing	X	X	—	—	—	—
2040 Intermediate-Low	X	X	—	—	—	—
2040 Intermediate -High	X	X	—	—	—	—
2070 Intermediate -Low	X	X	—	—	—	—
2070 Intermediate -High	X	X	—	—	—	—
Rainfall-Induced Flooding						
Existing	—	—	—	X	X	X
2040 Intermediate-Low	—	—	—	X	X	X
2040 Intermediate -High	—	—	—	X	X	X
2070 Intermediate -Low	—	—	—	X	X	X
2070 Intermediate -High	—	—	—	X	X	X

Flooding Type	Tidal Flood Days	MHHW +2 feet	10-Year	25-Year	100-Year	500-Year
Storm-Surge Flooding						
Existing	—	—	X	X	X	—
2040 Intermediate - Low	—	—	X	X	X	—
2040 Intermediate - High	—	—	X	X	X	—
2070 Intermediate - Low	—	—	X	X	X	—
2070 Intermediate - High	—	—	X	X	X	—

Note: — = scenario not analyzed; MHHW = mean higher high water.
Yellow shaded cells = Scenarios required by State Statute.

For the sensitivity analysis, Jones Edmunds compared the flood elevations from the 40 scenarios to known or estimated critical asset elevations. We created a high/medium/low (H/M/L) ranking for the severity of flooding for each asset for each flood scenario. We developed a prioritization methodology that combined the severity of flooding with the criticality of each asset type to rank each predicted flooding problem and assign the critical assets into a highest, high, medium, low, or lowest priority category.

We identified adaptation Focus Areas based on public feedback and the geographic concentration of vulnerable critical assets. A prioritization of predicted critical asset flooding was provided within each Focus Area. The following focus areas were identified.

- Anastasia Island from the City of St. Augustine Beach (COSAB) to State Road (SR) 206.
- Anastasia Island from SR 206 to Matanzas Inlet.
- Anastasia Island from SR 312 to the City of St. Augustine (COSA) South Boundary.
- Vilano/North Beach.
- South Ponte Vedra Beach.
- Ponte Vedra Beach.
- SR 16, Lewis Speedway, and Masters Drive.
- Various low spots along County Road (CR) 13.
- Hastings.
- SR 16 Wastewater Treatment Plant.
- CR 210 at the intersection with Interstate 95.

The County's VA grant included funding to complete a preliminary Adaptation Plan. The County was also awarded a fiscal year 2024 RFGP planning grant to complete a standalone Countywide Adaptation Plan. This preliminary Adaptation Plan is an early-out prioritization of needs and adaptation strategies. It focuses on identifying solutions to the County's highest-priority critical assets identified in the sensitivity analysis so that the County can begin applying for RFGP implementation grants while the standalone Adaptation Plan is in progress. To identify high-priority adaptation strategies for inclusion in the preliminary Adaptation Plan, Jones Edmunds:

- Reviewed existing County drainage studies and previous RFGP implementation grant submissions for legacy projects that were previously developed.

- Received feedback from County staff and the Steering Committee members on their highest-priority areas of concern.
- Reviewed the highest-ranked critical assets from the sensitivity analysis and developed nine new adaptation project concepts. This included hydrologic and hydraulic (H&H) modeling, if necessary, and developing conceptual-level cost estimates.

PART II. METHODOLOGY

1 INTRODUCTION AND BACKGROUND

In 2021, Florida Senate Bill 1954 established the Resilient Florida Grant Program (RFGP) to be administered by the Florida Department of Environmental Protection (FDEP). The RFGP provides planning grants, which are 100-percent funded by the program, and implementation grants, which are 50-percent funded. Planning grants can be used by municipalities to complete various flood resiliency related planning activities, including vulnerability assessments (VAs). Implementation grants can be used to fund the design, permitting, and construction of adaptation projects. Requirements for RFGP-funded VAs were established in Section 380.093, Florida Statutes (FS). Senate Bill 1954 also required FDEP to complete a Statewide VA, independent from individual municipalities VAs. To apply for implementation grant funding for adaptation projects in future RFGP funding cycles, projects will be required to address flood vulnerabilities to critical assets that have been identified in the Statewide VA or an individual municipality's VA. Therefore, completing a VA is important for municipalities like St. Johns County.

As part of its continuing efforts to become a more resilient community and leverage grant-funding sources, St. Johns County applied for and received an RFGP planning grant to complete a Countywide VA. Subsequently, the County hired Jones Edmunds to complete the assessment. The County's grant agreement (work plan) with FDEP covers the following Tasks for the VA:

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- Develop grant-fundable adaptation projects to protect the County's infrastructure that is most vulnerable to flooding.

Products and outcomes from this VA include:

- Inventory all critical community assets in the County.
- Map Countywide existing and future conditions extreme flood events from rainfall, tidal, and storm surge flooding.

- Identify critical community assets that are vulnerable to rainfall, tidal, and surge flooding.
- Prioritize critical community assets that are vulnerable to flooding.
- Identify focus areas for flood adaptation planning.
- Preliminarily identify flood adaptation strategies and/or projects.
- Produce tables and flood maps summarizing the results of the VA.

This report documents the methodology and findings from the Countywide VA pursuant to the requirements in Section 380.093, FS.

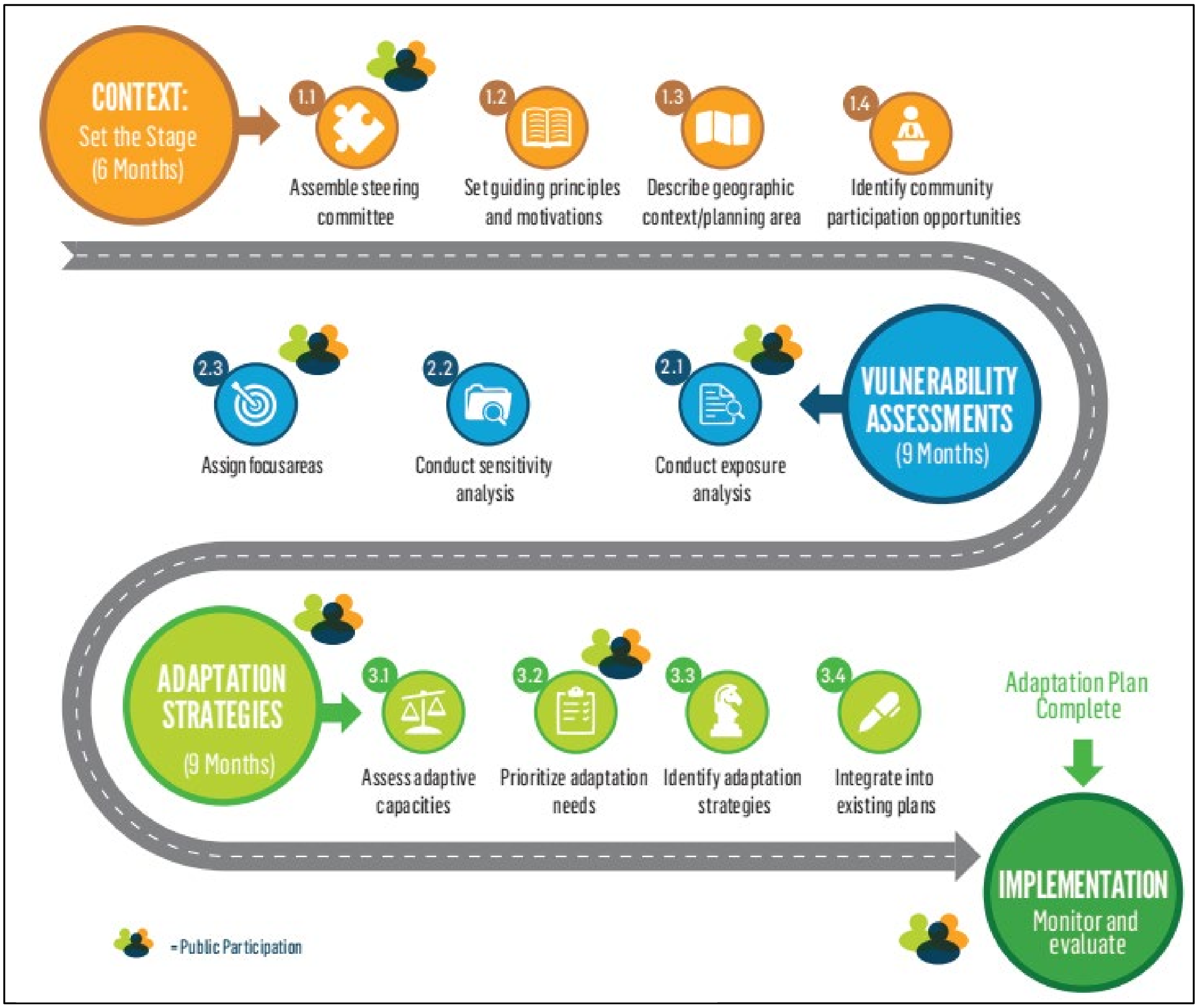
2 FLOOD RESILIENCY PLANNING OVERVIEW

The primary goals of flood resiliency planning are to identify a community's vulnerabilities to flooding under existing and future conditions, develop adaptation strategies/methods for the community to protect its most critically vulnerable assets, and develop a plan for implementing the adaptation strategies. According to FDEP's *Adaptation Planning Guidebook*, four recommended components are in this process:

1. Context – For this part of the process, communities are encouraged to consider factors typical of all planning exercises, focusing on how each factor relates to sea-level rise (SLR)/flood adaptation. This is referred to as the planning context and includes a survey of existing geographic, social, infrastructural, and environmental conditions. Also included is creating principles (e.g., goals, objectives, and policies) to guide the planning process, which are distinct from prioritized needs set during the adaptation strategies analysis phase. The sub-components in the context component include (1) assemble a steering committee, (2) set guiding principles and motivations, (3) describe geographic context, and (4) identify opportunities for community participation. (FDEP, 2018) (Appendix A).
2. Vulnerability Assessment – This component consists of measuring the impact of SLR/flooding and identifying the people, infrastructure, and land uses that may be affected. Vulnerability is often used interchangeably with risk when measuring hazard impacts. (FDEP, 2018)
3. Adaptation Strategies – This component provides a framework to respond to the findings of the VA. According to the National Oceanic and Atmospheric Administration (NOAA), an "adaptation plan identifies and assesses the impacts that are likely to affect the planning area, develops goals and actions to best minimize these impacts, and establishes a process to implement those actions. The ultimate goal is coastal states and communities that are organized to take action, have the tools to take action, and are taking action to plan for and adapt to the impacts of sea level rise climate change." Decision-making about applying specific adaptation strategies to the challenges outlined by the VA occurs in this step. A wide range of engineering, political, and planning solutions are used. (FDEP, 2018)
4. Implementation Strategies – Once a set of adaptation strategies has been developed and analyzed, the strategies should be transitioned from plans to actions. This process includes identifying, preparing for, and applying for potential funding opportunities; creating a schedule of adaptation actions for the future; and monitoring and evaluating progress. (FDEP, 2018)

Figure 1, taken from FDEP's *Adaptation Planning Guidebook*, graphically summarizes the main and sub-components included in this process. The County's VA addresses the context component through the steering committee and public meetings tasks and the VA component through the data collection, exposure analysis, sensitivity analysis, and focus area tasks. This VA also includes a preliminary Adaptation Plan, which begins the adaptation strategies component.

Figure 1 Flood Resiliency Planning Process



3 COORDINATION WITH MUNICIPALITY VULNERABILITY ASSESSMENTS

According to the requirement in Section 380.093, FS, RFGP-funded VAs must encompass the entire county of municipality that is being studied. For St. Johns County, this includes the incorporated Cities of St. Augustine (COSA) and St. Augustine Beach (COSAB).

At the time of submitting the application for funding to FDEP, St. Johns County intended to complete a Countywide VA that would have included COSA and COSAB. Following award of the grant, County staff realized that COSA and COSAB were awarded funding in the same funding cycle to complete their own VAs. In August 2022, a meeting was held with RFGP, the County, COSA, COSAB, and Jones Edmunds to discuss options for coordinating VA efforts between the three grantees. During the meeting, RFGP staff stated that they were able to be flexible with how the VAs were coordinated and that they were open to combining the VAs into one or keeping them as standalone assessments that did not overlap. Ultimately, in the best interest of the three municipalities, the attendees decided that the assessments would remain as separate standalone projects and that the County's assessment would exclude COSA and COSAB. However, although proceeding as separate VAs, the County continued to coordinate with COSA and COSAB. Representatives from both municipalities were included on the County's Steering Committee and were invited to attend the County's public meetings.

Regarding critical asset coordination, the COSA utility service area extends beyond the City's municipal boundary, and several critical utility assets (i.e., lift stations, water supply wells, etc.) are owned by COSA but are in unincorporated St. Johns County. The County coordinated with COSA regarding how these assets will be included in the two VAs. Based on discussions with COSA staff, the decision was that the COSA utility assets that are in unincorporated St. Johns County will be included in COSA's VA and excluded from the County's. COSA will use model results and inundation mappings from the County's exposure analysis to include/assess these assets in their VA. Likewise, the County owns critical assets within the COSAB municipal boundary. St. Johns County will include these assets in its VA.

4 PROJECT MEETINGS

This Section summarizes the required project meetings in the County's Grant Work Plan. These meetings include the project Kickoff Meeting, Steering Committee Meetings, and Public Outreach Meetings.

4.1 KICKOFF MEETING

The Kickoff Meeting was held on November 23, 2022, at the St. Johns County Building Department. The meeting included reviewing the project goals, scope, schedule, milestones/deliverables, communication/points of contact, discussing the Steering Committee's role, and developing a draft list of Steering Committee members. Appendix B includes the meeting minutes, a draft list of Steering Committee members, and a draft email inviting Steering Committee members to participate.

4.2 STEERING COMMITTEE MEETINGS

Based on FDEP guidance, the purpose and/or goals of the Steering Committee are as follows:

- Review Project Goals
- Review Draft Materials
- Provide Input on Study Direction
- Identify Geographic Context
- Review Modeling Methods
- Identify Available Data and Resources
- Identify Relevant Assets
- Review Study Findings and Recommendations

To achieve these goals, the County's Steering Committee consisted of representatives from the following County departments and/or external organizations:

- St. Johns County Land Management/Geographic Information System (GIS) Department
- St. Johns County Survey Department
- St. Johns County Public Works/Engineering Department
- St. Johns County Parks and Recreation Department
- St. Johns County Growth Management Department
- St. Johns County Sheriff's Department
- St. Johns County Utility Department
- St. Johns County Emergency Management Department
- St. Johns County Environmental Department
- St. Johns County Fire and Rescue Department
- St. Johns County School Board
- Florida Department of Transportation (FDOT)
- COSA
- Flagler Estates Road and Water Control District
- COSAB
- St. Johns River Water Management District (SJRWMD)

4.2.1 Steering Committee Meeting #1

The first Steering Committee Meeting was held on May 8, 2023, at the St. Johns County Utility Administration Building on 1205 State Road (SR) 16, St. Augustine, Florida. This meeting was to discuss the project background and goals, review the intended purpose and goals of the Steering Committee, review and obtain feedback on the critical asset inventory, and propose the methodology behind the inundation modeling and mapping. Appendix C includes the meeting presentation, summary report, and sign-in sheet.

4.2.2 Steering Committee Meeting #2

The second Steering Committee Meeting was held on February 7, 2024, at the St. Johns County Permit Center Conference Room, 4040 Lewis Speedway, St. Augustine, Florida. This meeting was to review results from the inundation mapping, review results of the critical asset prioritization, review draft focus areas, and brainstorm adaptation strategies. Appendix C includes the meeting presentation, summary report, and sign-in sheet.

4.3 Public Outreach Meetings

4.3.1 Public Outreach Meeting #1

The first Public Outreach Meeting was held on September 29, 2023, at the St. Johns County Commission Auditorium, 500 San Sebastian View, St. Augustine, Florida. The meeting was publicly advertised through local newspapers, the County's website, and the County's social media accounts and was broadcast live on the County's Government Television channel.

This meeting allowed the public to provide input during the initial data collection stages, input on preferred methodologies, data for analyzing potential SLR impacts and/or flooding, guiding factors to consider, and critical assets important to the community. Appendix D includes the meeting agenda, meeting presentation, summary report, and the meeting sign-in sheet. No public comments were made regarding requests for changes in methodologies.

Comments from the public were primarily related to specific areas of concern and additional clarification on parts of the study, which were responded to at the meeting. The public had the opportunity to provide feedback through a brief survey that was available at the meeting and on-line. The survey asked participants to select their 10 highest-priority critical asset types and identify specific geographic areas of concern regarding flooding/SLR. Results from the survey were used to rank/prioritize critical assets and identify focus areas for adaptation planning.

4.3.2 Public Outreach Meeting #2

The second Public Outreach Meeting was held during a County Commission meeting on January 20, 2024, at the same location as the first Public Outreach Meeting. This meeting was held to inform the public and the County Commission on the methodologies being used for the VA, present preliminary results from the study, and solicit input on priorities for adaptation planning. Appendix D includes the meeting agenda, meeting presentation, and minutes. No public comments were received during the meeting, and the County Commissioners had limited feedback/questions on the information presented.

5 BACKGROUND DATA

Jones Edmunds compiled the topographic data, critical and regionally significant asset data, and flood scenario related data required to perform the VA as defined in Section 380.093, FS. According to the State Statute and FDEP guidance, the following are requirements for this Task:

- All critical assets owned or maintained by the County are included.
- The most recent publicly available digital elevation model (DEM) is used.
- GIS data must adhere to the RFGP's GIS Data Standards, and data sources shall be defined in the associated metadata.
- SLR projections shall include 2017 NOAA intermediate-high and intermediate-low projections for 2040 and 2070.
- Storm-surge data must be equal to or exceed the 100-year return period flood event.
- Data gaps shall be identified where missing or low-quality information may limit the VA's extent or reduce the accuracy of the results.
- Gaps in necessary data shall be rectified.

The following subsections summarize the data collection process for each of the required data collection categories.

5.1 TOPOGRAPHIC DATA

As stated in Section 380.093, FS, the County is required to use the most recent publicly available DEM for their VA. The DEM serves as the primary input data for modeling and mapping flood inundation and is also used to assign elevations to the critical and regionally significant assets.

Jones Edmunds reviewed available light detection and ranging (LiDAR) topographic datasets and determined that the most recent available data were the US Geological Survey's (USGS) 2018 St. Johns County dataset. Jones Edmunds downloaded a copy of these data from the USGS website. The data were collected between November 30, 2018, and March 24, 2019. The data coordinate reference system is as follows:

- The horizontal datum is the North American Datum of 1983 with the 2011 Adjustment (NAD83 [2011]).
- The vertical datum is the North American Vertical Datum of 1988 (NAVD88).
- The coordinate system is NAD83 (2011) State Plane Florida East (US Survey Feet).
- The geoid model is Geoid12B.

The vertical accuracy of the LiDAR was reported as having a root-mean-square-error relative to non-vegetated checkpoints of 0.64 foot at the 95-percent confidence interval. The LiDAR was provided as a 2.5-foot-by-2.5-foot DEM.

The 2018 DEM was reviewed to ensure that the entire County was covered by the dataset. During the review, Jones Edmunds identified a small gap in the coverage at the south end of the County. To fill this gap in the data, Jones Edmunds downloaded the 2018 USGS LiDAR data for Flagler County and merged the necessary Flagler County data into the St. Johns

County DEM. The Flagler County data have the same Technical Specifications as the St. Johns County data listed above.

5.2 Critical and Regionally Significant Asset Inventory

The list of 39 critical asset types that are required to be included in RFGP VAs is defined in Section 380.093, FS. The asset types are broken into four asset classes:

- Transportation and Evacuation Routes – Airports, Bridges, Bus Terminals, Ports, Major Roadways, Marinas, Rail Facilities, and Railroad Bridges.
- Critical Infrastructure – Wastewater Treatment Facilities and Lift Stations, Stormwater Treatment Facilities and Pump Stations, Drinking Water Facilities, Water Utility Conveyance Systems, Electric Production and Supply Facilities, Solid and Hazardous Waste Facilities, Military Installations, Communications Facilities, and Disaster Debris Management Sites.
- Critical Community and Emergency Facilities – Schools, College and Universities, Community Centers, Correctional Facilities, Disaster Recovery Centers, Emergency Medical Service Facilities, Emergency Operation Centers, Fire Stations, Health Care Facilities, Hospitals, Law Enforcement Facilities, Local Government Facilities, Logistical Staging Areas, Affordable Public Housing, Risk Shelter Inventory, and State Government Facilities.
- Natural, Cultural, and Historical Resources – Conservation Lands, Parks, Shorelines, Surface Waters, Wetlands, and Historical and Cultural Assets.

The asset types identified in Section 380.093, FS, are all considered critical assets, but they are not all considered regionally significant assets. As defined in Section 380.093, FS, regionally significant assets are critical assets that support the needs of communities spanning multiple geopolitical jurisdictions including but not limited to water resources facilities, regional medical centers, emergency operations centers, regional utilities, major transportation hubs and corridors, airports, and seaports.

Based on the RFGP GIS Data Standards, the following background data are required to be provided for each asset:

- Entity Name – Name of entity (i.e., St. Johns County).
- Asset Name – Asset label or description (i.e., lift station #, fire station name, etc.).
- Asset Type – Statutory asset type from the list of 39 above.
- Asset Class – Statutory asset class from the list of four above.
- Asset Owner/Operator – The owner or maintainer of the asset.
- Asset Elevation – Elevation of the asset.
- Asset size/capacity data (i.e., capacity for wastewater facilities, acres, etc.).

Jones Edmunds assembled the critical and regionally significant assets and required background data from existing local, state, and federal data sources. Table 1 summarizes the asset class, asset type, dataset type, source, and data type. Figure 2 shows the locations of the critical assets. The GIS data for all of the asset types are stored in a geodatabase that meets RFGP GIS data standards. A total of 21,569 critical assets were identified Countywide. Table 2 summarizes the number of critical and regionally significant

Table 1 Critical and Regionally Significant Assets

Asset Class	Asset Type	Dataset	Source	Data Type	Elevation Source
Transportation and Evacuation Routes	Airports	Airports – Private	FDEM	Points (GIS)	2018 FDEM LiDAR DEM
		Airports – Public	FDEM	Points (GIS)	
	Bridges	Bridges	FDEM	Lines (GIS)	2018 FDEM LiDAR DEM
		Bridges	SJC GIS Datahub	Points (GIS)	
		Bridges	JE Data Review	Polygons (GIS)	
	Bus Terminals	N/A			N/A
	Ports	N/A			N/A
	Major Roadways	Major Roads	FDOT	Lines (GIS)	2018 FDEM LiDAR DEM
		SJC PMUs (Major and Minor Collectors)	SJC	Lines (GIS)	
	Marinas	Marinas	FDEM	Points (GIS)	2018 FDEM LiDAR DEM
		Marinas	SJC GIS Datahub	Points (GIS)	
	Railways	Railroad	SJC GIS Datahub	Lines (GIS)	2018 FDEM LiDAR DEM
	Railroad Bridges	Bridges	SJC GIS Datahub	Points (GIS)	2018 FDEM LiDAR DEM

Asset Class	Asset Type	Dataset	Source	Data Type	Elevation Source
Critical Infrastructure	Wastewater Treatment Facilities and Lift Stations	Wastewater Facilities	FDEM	Points (GIS)	2018 FDEM LiDAR DEM
		Facilities	SJCUD GIS Data	Points (GIS)	
		Reuse Facilities	SJCUD GIS Data	Points (GIS)	
		JEA_Sewer_Site	SJCUD GIS Data	Points (GIS)	
		JEA_Lift_Station	SJCUD GIS Data	Points (GIS)	
	Stormwater Treatment Facilities and Lift Stations	swNetworkStructure	SJC PW GIS Data	Points (GIS)	2018 FDEM LiDAR DEM
	Drinking Water Facilities	Water Treatment Plants	SJCUD GIS data	Points (GIS)	2018 FDEM LiDAR DEM
		Facilities	SJCUD GIS Data	Points (GIS)	
		Booster Station	SJCUD GIS Data	Points (GIS)	
		Water Treatment Plants	FDEM	Points (GIS)	
	Electric Production and Supply	Electric Facilities	FDEM	Points (GIS)	2018 FDEM LiDAR DEM
		Electric Substations	JE Data Review	Points (GIS)	
	Solid and Hazardous Waste Facilities	Solid Waste Facilities	FDEM	Points (GIS)	2018 FDEM LiDAR DEM
		Solid Waste Facilities	FDEP	Points (GIS)	
	Military Installations	National Guard	FDEM	Points (GIS)	2018 FDEM LiDAR DEM Building Footprint Extract
	Communications Facilities	Communications	FDEM	Points (GIS)	2018 FDEM LiDAR DEM
	Disaster Debris Management Sites	Disaster Debris Management Sites	SJC GIS Datahub	Points (GIS)	2018 FDEM LiDAR DEM

Asset Class	Asset Type	Dataset	Source	Data Type	Elevation Source
Critical Community and Emergency Facilities	Schools	Public Schools	FDEM	Points (GIS)	SJRWMD ERP/2018 FDEM LiDAR DEM Building Footprint Extract
		School Sites	SJC GIS Datahub	Points (GIS)	
		Private Schools	FDEM	Points (GIS)	
		Day Cares	FDEM	Points (GIS)	
			JE Data Review	Points (GIS)	
	Colleges and Universities	Colleges	FDEM	Points (GIS)	SJRWMD ERP/2018 FDEM LiDAR DEM Building Footprint Extract
	Community Centers	Community Centers	FDEM	Points (GIS)	SJRWMD ERP/2018 FDEM LiDAR DEM Building Footprint Extract
		Community Centers	JE Data Review	Points (GIS)	
	Correctional Facilities	Correctional Facilities	FDEM	Points (GIS)	SJRWMD ERP
	Disaster Recovery Centers	Disaster Recovery Center	FDEM	Points (GIS)	SJRWMD ERP/2018 FDEM LiDAR DEM Building Footprint Extract
		Disaster Recovery Center – Mobile	FDEM	Points (GIS)	
	Emergency Medical Service Facilities	Emergency Room	JE Data Review	Points (GIS)	SJRWMD ERP
	Emergency Operation Centers	Emergency Operation Center	FDEM	Points (GIS)	SJRWMD ERP
	Fire Stations	Fire Stations	SJC GIS Datahub	Points (GIS)	SJRWMD ERP/2018 FDEM LiDAR DEM Building Footprint Extract
		Fire Stations	FDEM	Points (GIS)	
	Health Care Facilities	Health Care Facilities	FDEM	Points (GIS)	SJRWMD ERP/2018 FDEM LiDAR DEM Building Footprint Extract
		Health Care Facilities	JE Data Review	Points (GIS)	
		Health Care Facilities	SJC GIS Datahub	Points (GIS)	
		Assisted Living Facilities	SJC Data Review	Points (GIS)	
		Health Care Facilities	FEMA	Points (GIS)	
	Hospitals	Hospitals	FDEM	Points (GIS)	SJRWMD ERP
		Hospitals	SJC Data Review	Points (GIS)	
	Law Enforcement Facilities	Law Enforcement	FDEM	Points (GIS)	SJRWMD ERP/2018 FDEM LiDAR DEM Building Footprint Extract
		Law Enforcement	SJC Data Review	Points (GIS)	

Asset Class	Asset Type	Dataset	Source	Data Type	Elevation Source
Critical Community and Emergency Facilities (Continued)	Local Government Facilities	Local Government Facilities	FDEM	Points (GIS)	SJRWMD ERP/2018 FDEM LiDAR DEM Building Footprint Extract
		Local Government Facilities	SJC Parcel Review	Points (GIS)	
		Libraries	FDEM	Points (GIS)	
	Logistical Staging Areas	N/A			N/A
	Affordable Public Housing	SJC Affordable Housing Resources	SJC Housing Website	Point (GIS)	SJRWMD ERP/2018 FDEM LiDAR DEM Building Footprint Extract
	Risk Shelter Inventory	Shelter	SJC GIS Datahub	Points (GIS)	SJRWMD ERP/2018 FDEM LiDAR DEM Building Footprint Extract
		Risk Shelter Inventory – General	FDEM	Points (GIS)	
		Risk Shelter Inventory – Pet Friendly	FDEM	Points (GIS)	
		Risk Shelter Inventory – Special	FDEM	Points (GIS)	
	State Government Facilities	State Government Facility	FDEM	Points (GIS)	SJRWMD ERP/2018 FDEM LiDAR DEM Building Footprint Extract
		State Government Facility	SJC Parcel Review	Points (GIS)	

Asset Class	Asset Type	Dataset	Source	Data Type	Elevation Source
Natural, Cultural, and Historical Resource	Conservation Lands	Parks	SJC GIS Datahub	Polygons (GIS)	2018 FDEM LiDAR DEM
		SJRWMD-Owned Conservation Easements	SJRWMD GIS Datahub	Polygons (GIS)	
		Regulatory Conservation Easements	SJRWMD GIS Datahub	Polygons (GIS)	
		Other Lands SJRWMD Owned	SJRWMD GIS Datahub	Polygons (GIS)	
	Parks	Parks	SJC GIS Datahub	Polygons (GIS)	2018 FDEM LiDAR DEM
		Parks	Open Street Map	Polygons (GIS)	
	Shorelines	Florida Shoreline	FWC	Lines (GIS)	2018 FDEM LiDAR DEM
	Surface Waters	Water	SJC GIS Datahub	Polygons (GIS)	2018 FDEM LiDAR DEM
		Land Cover/Land Use	SJRWMD Land Use	Polygons (GIS)	
	Wetlands	2014 Land Use	SJRWMD	Polygons (GIS)	2018 FDEM LiDAR DEM
	Historical and Cultural Assets	Historical and Cultural Assets	SHPO	Points (GIS)	2018 FDEM LiDAR DEM/ 2018 FDEM LiDAR DEM Building Footprint Extract
		Cemeteries	JE Review	Polygons (GIS)	
		Structures	SHPO	Points (GIS)	
		Sites	SHPO	Polygons (GIS)	

Notes: ERP = Environmental Resource Permit; FDEM = Florida Division of Emergency Management;
FDOT = Florida Department of Transportation; FEMA = Federal Emergency Management Agency;
FWC = Florida Fish and Wildlife Conservation Commission; GIS = Geographic Information System; JE = Jones Edmunds;
JEA = Jacksonville Electric Authority; N/A = Not Applicable; PMU = Pavement Management Unit;
SHPO = State Historic Preservation Office; SJC = St. Johns County; SJCUD = St. Johns County Utility Department;
SJRWMD = St. Johns River Water Management District.

Figure 2 Critical Asset Locations

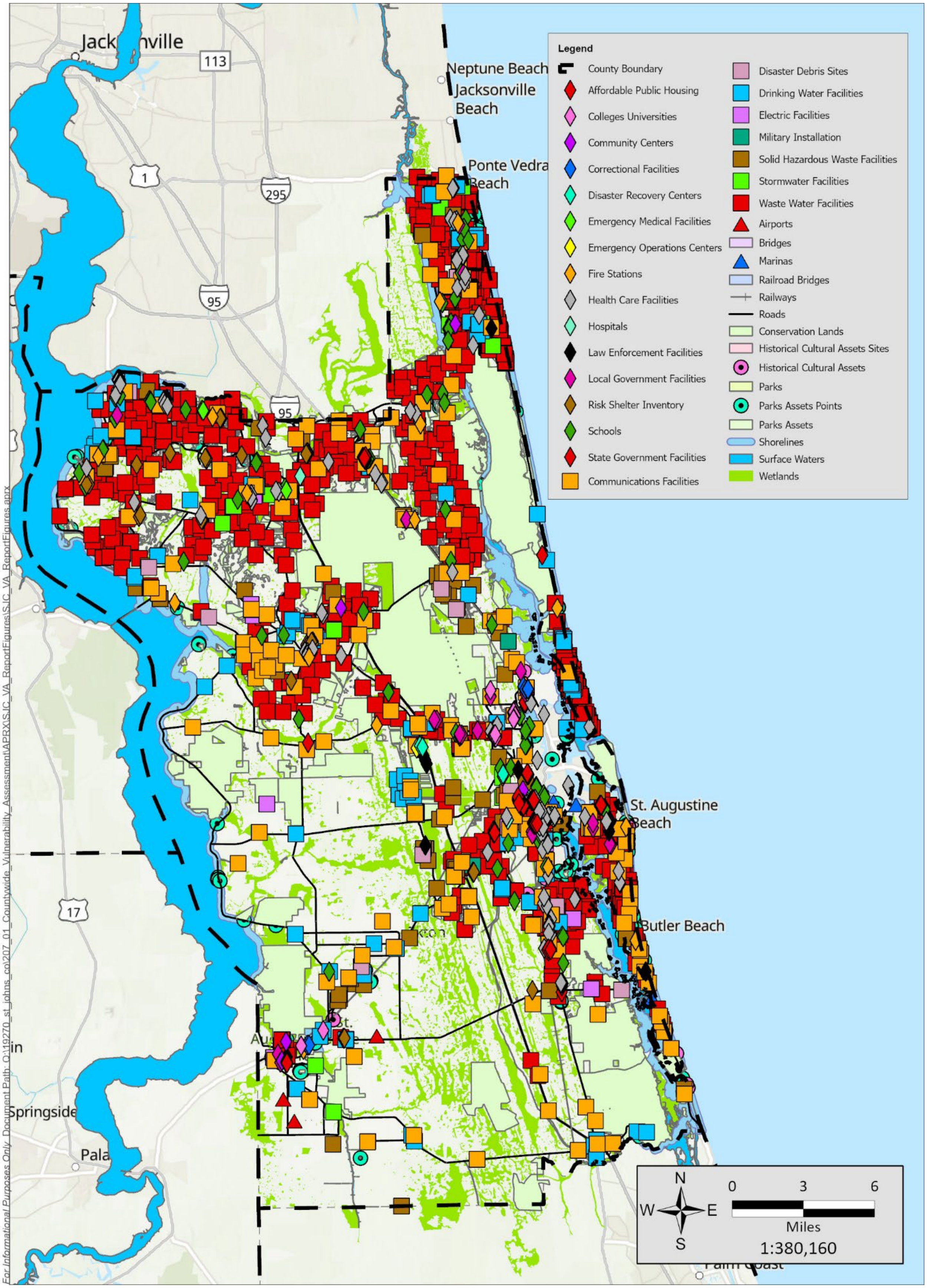


Table 2 Critical and Regionally Significant Assets by Type

Asset Type	Total Number of Assets
Affordable Public Housing	91
Airports	4
Bridges	118
Colleges and Universities	33
Community Centers	5
Conservation Lands	3,328
Correctional Facilities	7
Disaster Debris Management Sites	11
Disaster Recovery Centers	5
Electric Facilities	11
Emergency Medical Service Facilities	2
Emergency Operation Centers	3
Fire Stations	17
Ground Storage Tanks	19
Health Care Facilities	126
Historical and Cultural Assets	65
Hospitals	8
Law Enforcement Facilities	18
Lift Stations	679
Local Government Facilities	37
Marinas	10
Military Installations	2
Park Assets	654
Parks	168
Radio Communications Towers	180
Railroad Bridges	4
Risk Shelter Inventory	47
Roads	5,999
Schools	134
Solid and Hazardous Waste Facilities	77
State Government Facilities	7
Step Tank/Grinder Station	508
Stormwater Facility	14
Surface Waters	78
Waste Water Facilities	187
Water Distribution Pumps	24
Water Supply Wells	55
Water Treatment Plants	123
Wetlands	8,711
Total	**21,569**

assets that were identified by asset type. Some of the critical asset datasets obtained by Jones Edmunds **include location information exempt from Florida public records requests and protected under Section 119.071, FS**. A redacted version of the critical asset datasets has been submitted, which excludes the sensitive datasets that should not be shared with the public.

As required, an elevation was assigned to each of the critical and regionally significant assets. Where data were available, building assets were assigned finished floor elevations (FFEs) from site-specific surveys, construction plans, and/or as-builts found on the SJRWMD ERP website. Where site-specific FFE elevation data were not available, FFEs were estimated using the 2018 LiDAR DEM and the asset's building footprint. For assets not associated with buildings (i.e., parks, wetlands, surface waters, etc.), elevations were assigned based on the lowest DEM elevation within the asset footprint. Table 1 also summarizes the elevation data source(s) used for each asset type.

Jones Edmunds and the Steering Committee reviewed each dataset for completeness and accuracy as part of a gap analysis. Table 3 summarizes the data gaps that were identified for each asset type and the steps/actions that were taken to fill the gaps. No data gaps that would significantly impact the results and accuracy of the assessment were left unfilled.

Table 3 Data Gaps and Gap Filling Summary

Asset Class	Asset Type	Data Gaps	Gap Fill
Transportation and Evacuation Routes	Airports	No data gaps identified.	N/A
	Bridges	Some bridges are identified by point or line features. Polygons are the preferred data type for this asset.	Jones Edmunds reviewed the bridges and digitized polygon features where needed.
	Bus Terminals	No assets identified in the County.	The County confirmed that there are no bus terminals.
	Ports	No assets identified in the County.	The County confirmed that there are no ports.
	Major Roadways	Existing datasets are line features. Polygons are the preferred data type for this asset.	For County roads, Jones Edmunds identified a County pavement coverage polygon shapefile that was developed for a separate County project. For FDOT roads, Jones Edmunds buffered the line features and made manual updates as needed. Polygons from each of these sources were combined into one road polygons dataset.
	Marinas	No data gaps identified.	N/A
	Railways	No data gaps identified.	N/A
	Railroad Bridges	No data gaps identified.	N/A

Asset Class	Asset Type	Data Gaps	Gap Fill
Critical Infrastructure	Wastewater Treatment Facilities and Lift Stations	Missing WWTP capacities for JEA facilities.	Jones Edmunds researched and found the WWTP capacities.
		Missing WWTP capacities for Hastings WWTP and Innlet Beach WWTP.	SJCUD provided the capacity for the Hastings WWTP and informed Jones Edmunds that the Innlet Beach WWTP had been converted to a Master Pump Station.
		Are there any readily available elevation data for pump stations and WWTPs?	Jones Edmunds requested these data from SJCUD. No data were provided; elevations were estimated using the LiDAR DEM.
		Should grinder pumps/STEP tanks be included in this critical asset inventory?	SJCUD said to only include grinder pumps and STEP tanks owned by SJCUD.
		Missing water reuse facilities.	Jones Edmunds added reuse facilities from SJCUD asset data.
		Missing 1205 SR16 Administration Building, Operations Complex on Arc Drive, Laboratory Building on Inman Road.	Assets added based on SJCUD feedback.
		Missing critical SCADA equipment centers.	Assets added from the SJCUD asset database.
		Missing three booster stations and three wellfields.	Assets added based on SJCUD feedback.
	Stormwater Treatment Facilities and Lift Stations	No data gaps identified.	N/A
	Drinking Water Facilities	Need WTP capacities for JEA facilities.	WTP capacities were researched by Jones Edmunds and not found.
		Need WTP capacities for Innlet Beach, Marsh Landing, Plantation, and Sawgrass WTPs.	WTP capacities were provided by SJCUD.
		Are there any readily available elevation data for WTPs?	Jones Edmunds requested these data from SJCUD. No data were provided; elevations were estimated using the LiDAR DEM.
	Electric Production and Supply	No data gaps identified.	N/A
	Solid and Hazardous Waste Facilities	No data gaps identified.	N/A
	Military Installations	No data gaps identified.	N/A
	Communications Facilities	No data gaps identified.	N/A
	Disaster Debris Management Sites	No data gaps identified.	N/A

Asset Class	Asset Type	Data Gaps	Gap Fill
Critical Community and Emergency Facilities	Schools	No data gaps identified.	N/A
	Colleges and Universities	No data gaps identified.	N/A
	Community Centers	No data gaps identified.	N/A
	Correctional Facilities	No data gaps identified.	N/A
	Disaster Recovery Centers	No data gaps identified.	N/A
	Emergency Medical Service Facilities	Steering Committee member provided two locations to add to the inventory.	Jones Edmunds added the provided locations to the critical asset inventory.
	Emergency Operation Centers	No data gaps identified.	N/A
	Fire Stations	No data gaps identified.	N/A
	Health Care Facilities	Steering Committee member provided seven locations to add to the inventory.	Jones Edmunds added the provided locations to the critical asset inventory.
	Hospitals	Steering Committee member provided two locations to add to the inventory.	Jones Edmunds added the provided locations to the critical asset inventory.
	Law Enforcement Facilities	Steering Committee member identified three asset locations that were not originally included in the inventory.	Jones Edmunds added the assets to the inventory.
	Local Government Facilities	No data gaps identified.	N/A
	Logistical Staging Areas	Does the County have any of these?	The County confirmed that they do not have any of these.
	Affordable Public Housing	No data gaps identified.	N/A
	Risk Shelter Inventory	Steering Committee members provided four locations to remove and two locations to add to the inventory.	Jones Edmunds added/removed the provided locations to/from the critical asset inventory.
	State Government Facilities	No data gaps identified.	N/A

Asset Class	Asset Type	Data Gaps	Gap Fill
Natural, Cultural, and Historical Resource	Conservation Lands	No data gaps identified.	N/A
	Parks	Steering Committee member from the Park Department requested that all park assets identified in the County's on-going parks GIS inventory project be included in the VA.	Jones Edmunds added all of the park assets from the County's inventory.
	Shorelines	No data gaps identified.	N/A
	Surface Waters	No data gaps identified.	N/A
	Wetlands	No data gaps identified.	N/A
	Historical and Cultural Assets	No data gaps identified.	N/A

Notes: SCADA = Supervisory Control and Data Acquisition; STEP = Septic Tank Effluent Pumping; WTP = Water Treatment Plant; WWTP = Wastewater Treatment Plant.

5.3 FLOOD SCENARIO-RELATED DATA

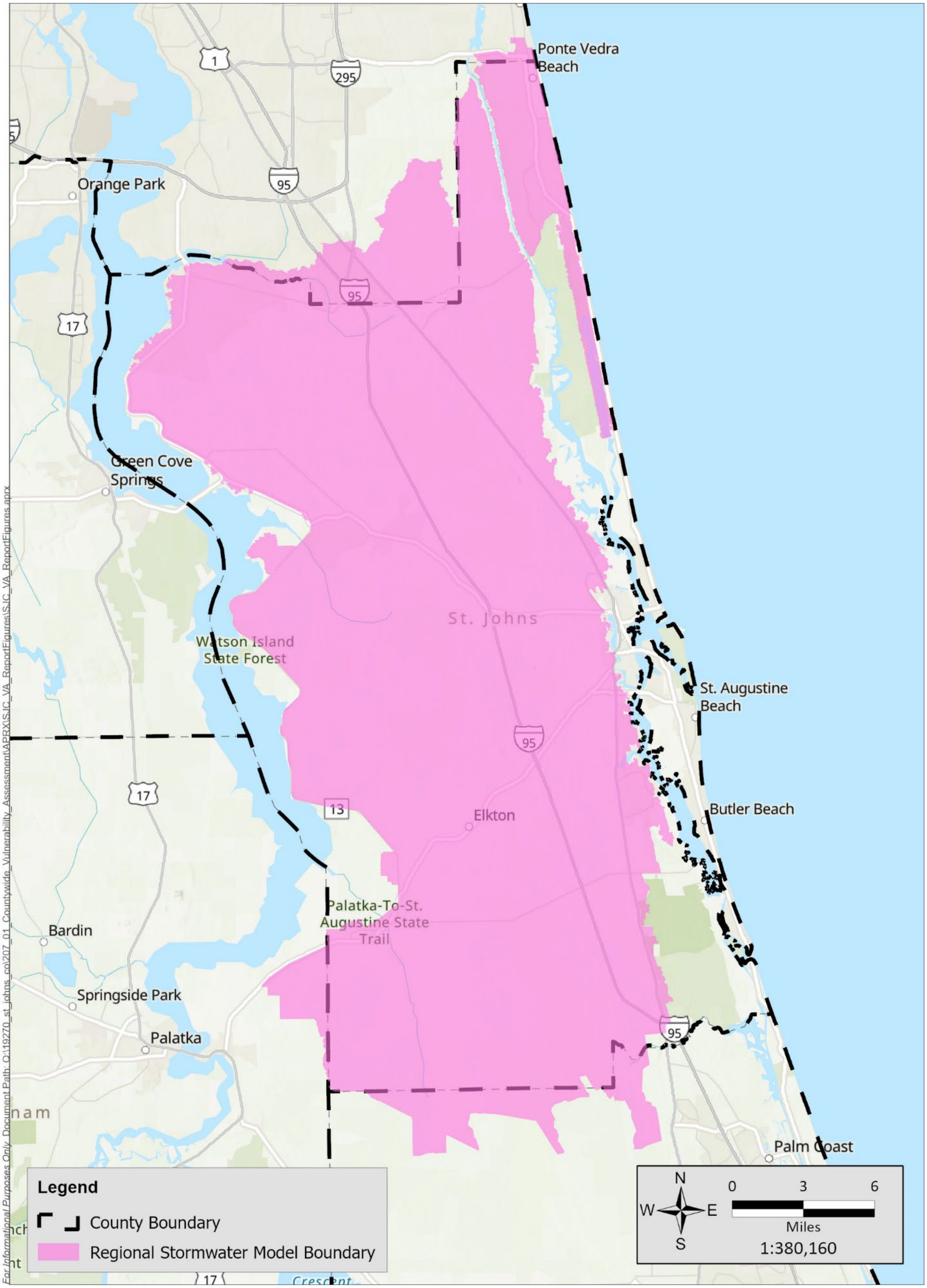
According to the requirements in Section 380.093, FS, the County was required to model and map rainfall, tidal, and storm surge-induced flooding Countywide for the existing, 2040, and 2070 conditions. This Section summarizes the background data that were collected to model and map the required flood scenarios.

5.3.1 RAINFALL-INDUCED FLOOD MODELING DATA

To model and map rainfall-induced flooding Countywide, Jones Edmunds collected the County's existing rainfall-induced flood model, Atlas 14 rainfall data, and future conditions rainfall change factors.

The County's rainfall-induced flood model, also known as *The St. Johns County Regional Stormwater Model* (SJC RSM), was developed by the County and Jones Edmunds between 2006 and 2019. The model covers most of the non-coastal areas in the County and has been used to model and map rainfall-induced flooding for the County. Figure 3 shows the extents of the model boundary. The model was originally developed as 10 separate watershed-scale models but was recently combined into a single Countywide model using Interconnected Pond Routing Version 4 (ICPR4) modeling software. The SJC RSM was primarily developed based on 2008 St. Johns County LiDAR data. Section 380.093, FS, requires this VA to be performed using the most recent LiDAR dataset described in Section 5.2. We compared the DEMs from the 2008 and 2019 LiDAR datasets to determine if differences between the two would invalidate parts of the model. The differences in the

Figure 3 SJC RSM Boundary



two LiDAR datasets were generally less than 0.5 foot. Areas where differences were greater were confined to be new developments that have occurred since the SJC RSM was developed.

Existing conditions rainfall volumes were collected from the NOAA Atlas 14 Volume 9, *Precipitation-Frequency Atlas of the United States, Southeastern States*, published in 2013. Jones Edmunds collected design storm rainfall depths across the County for the 24-hour duration 25-, 100-, and 500-year return period events. Table 4 summarizes the range of rainfall depths across the County for each of the storm events. The SJC RSM uses the Type II Florida-Modified Rainfall Distribution, which is the rainfall distribution that will be used for this VA.

Table 4 Existing Conditions Rainfall Depths

Storm Event	Rainfall Depth Range (inches)
25-Year/24-Hour	8.0 to 9.2
100-Year/24-Hour	10.9 to 12.6
500-Year/24-Hour	15 to 17.4

To model future conditions rainfall-induced flooding, rainfall change factors were collected from Florida International University's (FIU) Sea-Level Solutions Center (Updating the Statewide Extreme Rainfall Projections | Tableau Public) based on the 50th percentile. Table 5 shows the change factors that were used from the FIU website and the resulting rainfall depth ranges for the required 2040 and 2070 planning horizons.

Table 5 Rainfall Change Factors and Future Conditions Rainfall Depths

Storm Event	2040 Change Factor	2070 Change Factor	2040 Rainfall Depth Range (inches)	2070 Rainfall Depth Range (inches)
25-Year/24-Hour	1.27	1.34	10.1 to 11.7	10.7 to 12.3
100-Year/24-Hour	1.35	1.47	14.7 to 17.0	16.0 to 18.5
500-Year/24-Hour	1.39	1.54	20.8 to 24.2	23.1 to 26.8

Two data gaps/deficiencies were identified in the rainfall-induced flood modeling scenario data:

- The SJC RSM does not cover the entire County.
- The SJC RSM is based on 2008 LiDAR data, which is out of date for areas that have been developed since the models were created.

To address these data gaps/deficiencies, Jones Edmunds developed a new rainfall-induced flood model that covers the parts of the County that are not covered by the SJC RSM and updated the SJC RSM hydrologic parameters to account for the areas of new development. Section 6.1 summarizes these updates. Updating the entire SJC RSM based on the 2018 LiDAR DEM was not warranted because the differences between the 2008 and 2018 LiDAR DEMs were generally small and the changes would not significantly impact the model results. Additionally, updates of that magnitude could not be completed within the County's grant budget or schedule.

5.3.2 Tidal and Storm Surge Flooding Data

The tidal flooding analysis was based on available NOAA water-level data and NOAA's 2017 SLR projection curves. The data that Jones Edmunds used to calculate the MHHW elevation for existing conditions (2.5 feet NAVD88 for 2023) for the coastal regions in St. Johns County were taken from NOAA's Mayport Bar Pilots Dock gauge (Station Identification [ID] 8720218). The data used to calculate the MHHW elevation for existing conditions (1.07 foot NAVD88 for 2023) for the portions of St. Johns County along the St. Johns River were taken from NOAA's Palmetto Bluff (Station ID 8720653), Racy Point (Station ID 8720625), East Tocoi (Station ID 8720596), Green Cove Springs (Station ID 8720496), and Julington Creek (Station ID 8720409) gauges. Figure 4 shows the locations of the gauges, which are the closest sea-level trend stations to St. Johns County. Posted MHHW elevations at these gauges are based on the 1983 to 2001 tidal epoch, which has a midpoint year of 1992. The MHHW values were adjusted to present day values to account for SLR changes that have occurred since 1992.

Coastal St Johns County lies between the Mayport and Daytona Beach Shores NOAA SLR gauges. However, SLR on the St. Johns River side of the County only depends on the Mayport gauge at the mouth of the St. John River. Mean sea level and the NOAA 2017 SLR projections at the Mayport gauge exceed those at the Daytona Beach Shores gauge. Therefore, in accordance with Section 380.093(3)(d)3, FS, this study applies the Mayport gauge only to the coastal and intracoastal waterway (ICWW) portion of the County and the St. Johns River portion. SLR projections for intermediate-low and intermediate-high SLR for 2040 and 2070 were taken from NOAA's 2017 SLR projection curves for the Mayport Tide Station. Figure 5 shows the SLR curves and Table 6 summarizes the SLR values that were extracted from the curves and the existing and resulting future conditions MHHW elevations. The values in Table 6 represent the projected SLR from 2022 conditions.

The storm surge scenarios evaluated for this study were based on results from the FEMA Georgia/Northeast Florida coastal surge dataset Stillwater Elevation (SWEL) data, created as part of a Flood Insurance Study. The SWEL represents the storm surge (not including waves or wave run-up) calculated using an Advanced Circulation (ADCIRC) computer model analysis that runs hundreds of historical and synthetic storms over a given regional topography and bathymetry. For this analysis, the 10-year (10-percent annual chance), 25-year (4-percent annual chance), and the 100-year (1-percent annual chance) SWEL flood inundation scenarios were chosen and analyzed with and without SLR.

Figure 4 NOAA Gauge Locations

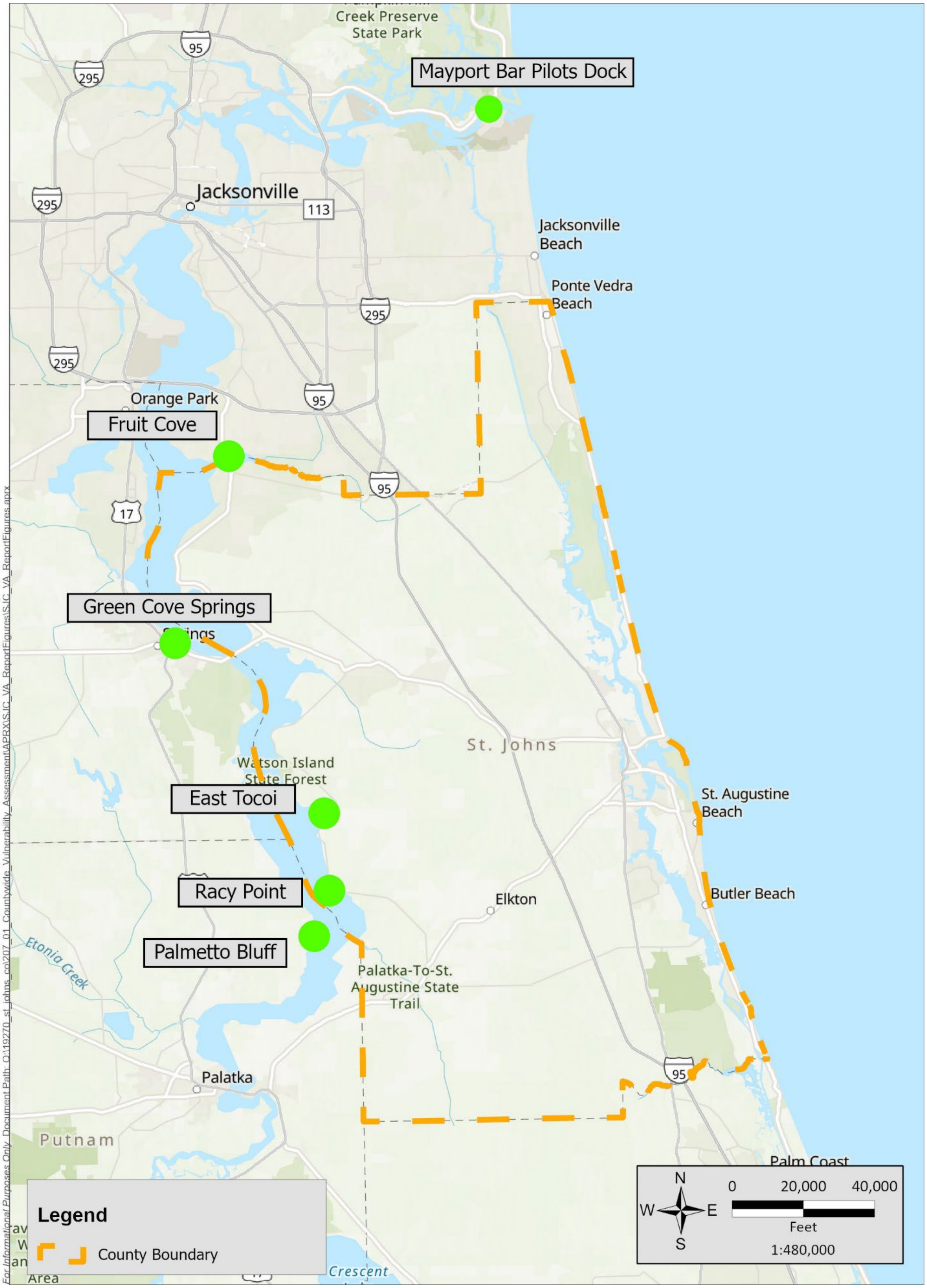


Figure 5 NOAA 2017 SLR Curves for the Mayport Tide Station

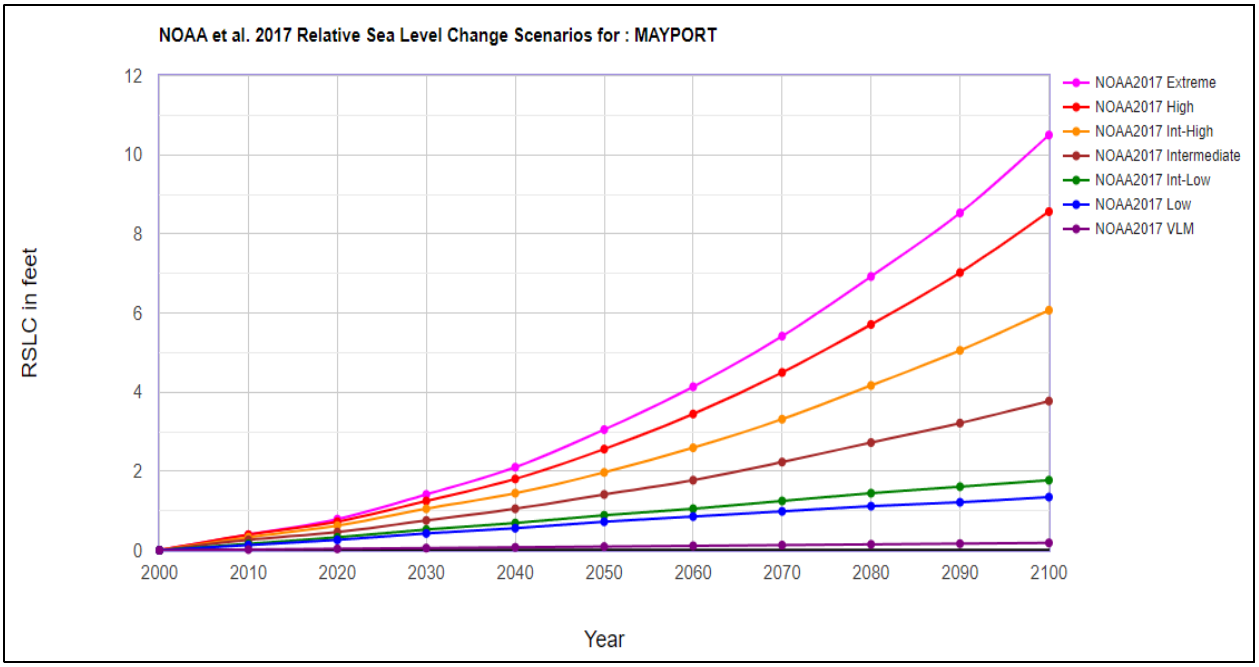


Table 6 Extracted SLR Values for St. Johns County

Planning Horizon	Projected SLR (feet)		MHHW Elevation (feet-NAVD88)		
	Intermediate-Low	Intermediate-High	Existing	Intermediate-Low	Intermediate-High
Existing Conditions	NA	NA	2.5	NA	NA
2040	0.26	0.72	NA	2.76	3.22
2070	0.82	2.59	NA	3.32	5.09

Note: NA = not applicable.

6 EXPOSURE ANALYSIS APPROACH

The exposure analysis identifies the Countywide depth of water caused by each SLR, storm surge, and rainfall flood scenario. According to Florida Statutes and FDEP guidance, the following were applicable requirements for this Task:

- Use the most recent publicly available DEM.
- Encompass the entire County.
- Map the depth of tidal flooding, including future high tide flooding. To the extent practicable, the analysis should also geographically display the number of tidal flood days expected for each scenario and planning horizon.
- Map the depth of current and future storm surge flooding using publicly available NOAA or FEMA storm-surge data. The initial storm surge event must equal or exceed the current 100-year flood event. Higher frequency storm events may be analyzed to understand the exposure of critical assets.
- To the extent practicable, map the depth of rainfall-induced flooding using spatiotemporal analysis or existing hydrologic and hydraulic (H&H) modeling results. Future boundary conditions should be modified to consider SLR and high tide conditions. Rainfall-induced mapping must include a 100-year and a 500-year storm, as defined by the applicable water management district or appropriate federal agency. Future rainfall conditions should be used if available.
- Perform the analyses in NAVD88.
- Include at least two local SLR scenarios, which must include the 2017 NOAA intermediate-low and intermediate-high SLR projections.
- Include at least two planning horizons that include 2040 and 2070.
- Use local sea-level data that has been interpolated between the two closest NOAA tide gauges. Local sea-level data may be taken from one such gauge if the gauge has a higher mean sea level. Data taken from an alternate tide gauge may be used with appropriate rationale and department approval as long as it is publicly available.

Based on these requirements and the County’s desire to include more frequent flood scenarios to better characterize the risk of flooding at each critical asset, Table 7 summarizes the flood scenarios that were included in this VA. Scenarios highlighted orange denote those required by State Statute. Flood stages were determined for each of these scenarios, and inundation extents/depths were mapped against the 2018 DEM.

This Section summarizes the methods used to determine the flood stages applied to map the extent and depth of flooding for each of these scenarios. Section 7 presents the results of the flood mapping for each scenario.

Table 7 Matrix of Evaluated Flood Scenarios

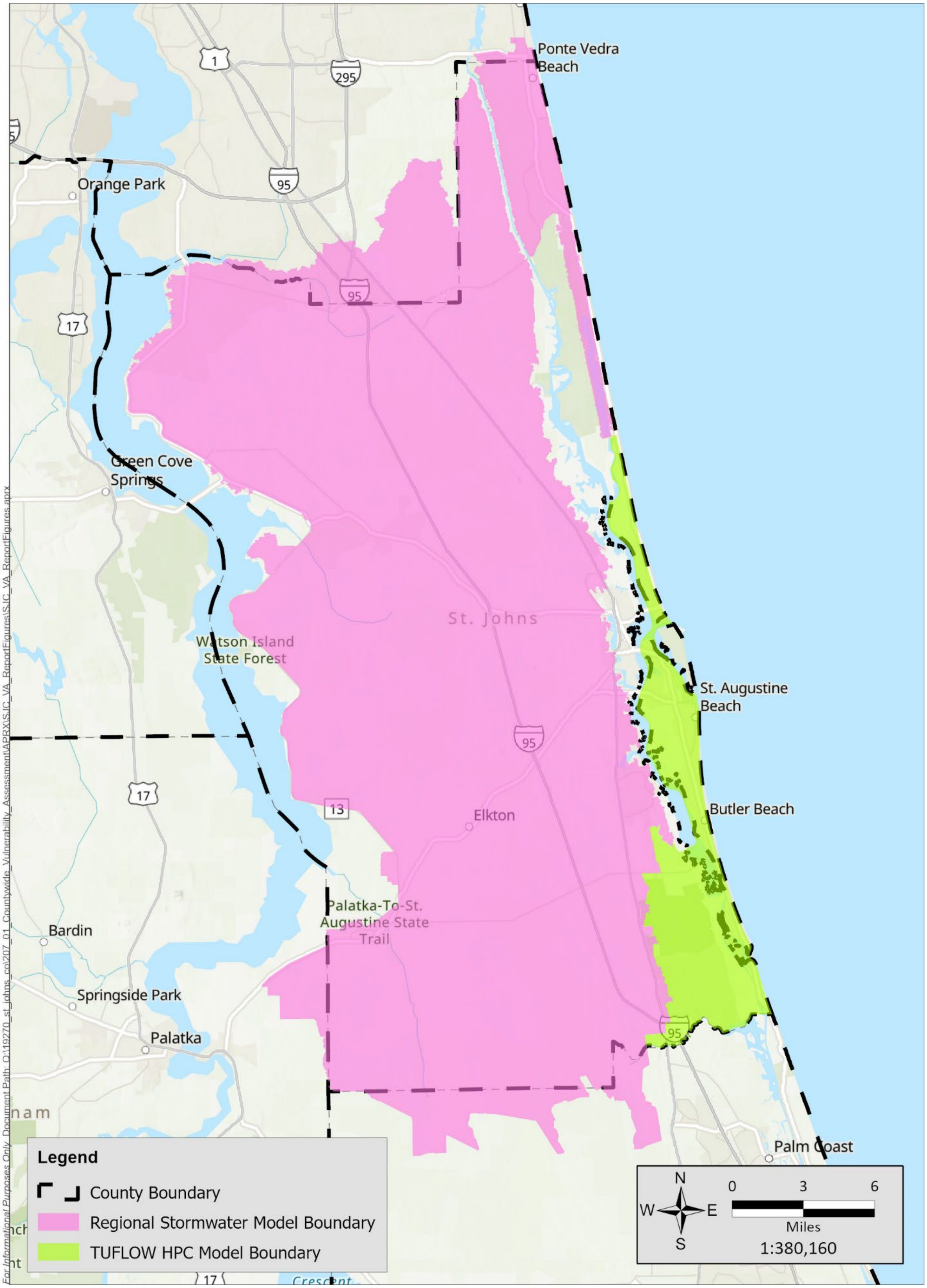
Flooding Type	Tidal Flood Days	MHHW +2 feet	10-Year	25-Year	100-Year	500-Year
Tidal/Sunny-Day Flooding						
Existing	X	X				
2040 Intermediate-Low	X	X				
2040 Intermediate -High	X	X				
2070 Intermediate -Low	X	X				
2070 Intermediate -High	X	X				
Rainfall Induced Flooding						
Existing				X	X	X
2040 Intermediate-Low				X	X	X
2040 Intermediate -High				X	X	X
2070 Intermediate -Low				X	X	X
2070 Intermediate -High				X	X	X
Storm Surge Flooding						
Existing			X	X	X	
2040 Intermediate-Low			X	X	X	
2040 Intermediate -High			X	X	X	
2070 Intermediate -Low			X	X	X	
2070 Intermediate -High			X	X	X	

6.1 Rainfall Modeling Approach

Rainfall-driven flooding occurs throughout St. Johns County, but not all flooded areas are presented in existing flood risk maps or represented in existing flood models. FEMA mapping studies typically focus on riverine or lake flooding with occurrence intervals of 100 or 500 years and a drainage area of at least 100 acres. These studies also focus on current rainfall conditions and do not consider the future probability of extreme rainfall events.

Jones Edmunds developed two existing and future conditions flood models for the County to determine rainfall-induced flood stages Countywide: a revised version of the SJC RSM and a TUFLOW HPC model covering the portions of the County not included in the SJC RSM. Figure 6 shows the model boundaries, and the following subsections summarize the methods used to develop each of the models.

Figure 6 Rainfall-Induced Flood Model Boundaries



6.1.1 Revised Existing Conditions St. Johns County Regional Stormwater Model

Jones Edmunds developed a revised existing conditions SJC RSM to be the basis for the existing conditions rainfall-induced flood depth mapping and the starting point for the future conditions flood scenarios. Adjustments to the SJC RSM included:

- Model boundary condition updates in the St. Johns River and the ICWW to account for SLR that has occurred since the model was originally developed.
- Model basin hydrologic parameter updates to account for significant new developments that have occurred since the SJC RSM was originally developed.
- Design storm rainfall depth updates to match the NOAA Atlas 14 rainfall depths (Table 4).

The SJC RSM tidal boundary conditions in the St. Johns River and the ICWW were originally set based on posted MHHW elevations for NOAA tide station data and tide interpolation points that were available when the model was being developed. Generally, the available MHHW elevations were based on data from the 1983 to 2001 tidal epoch, which has a mid-point year of 1992. These elevations do not account for changes in sea level that have occurred over the last 30-plus years. Jones Edmunds adjusted the SJC RSM tidal boundary conditions and model initial conditions to match the existing conditions MHHW elevations for the St. Johns River and the ICWW provided in Section 5.3.2.

Jones Edmunds reviewed the locations where significant differences between the 2008 and 2018 LiDAR DEMs exist against the SJC RSM schematic and the most recent available aerial imagery to determine where significant new developments have occurred since the SJC RSM was developed. As a result, 221 new development areas that were not accounted for in the SJC RSM were identified. Figure 7 shows the locations of the new development areas. To account for flood impacts from these areas, Jones Edmunds adjusted the curve numbers, directly connected impervious area percentages, and times of concentration for the model basins that intersected the new development areas. In total, adjustments were made to the hydrologic parameters for 815 model basins.

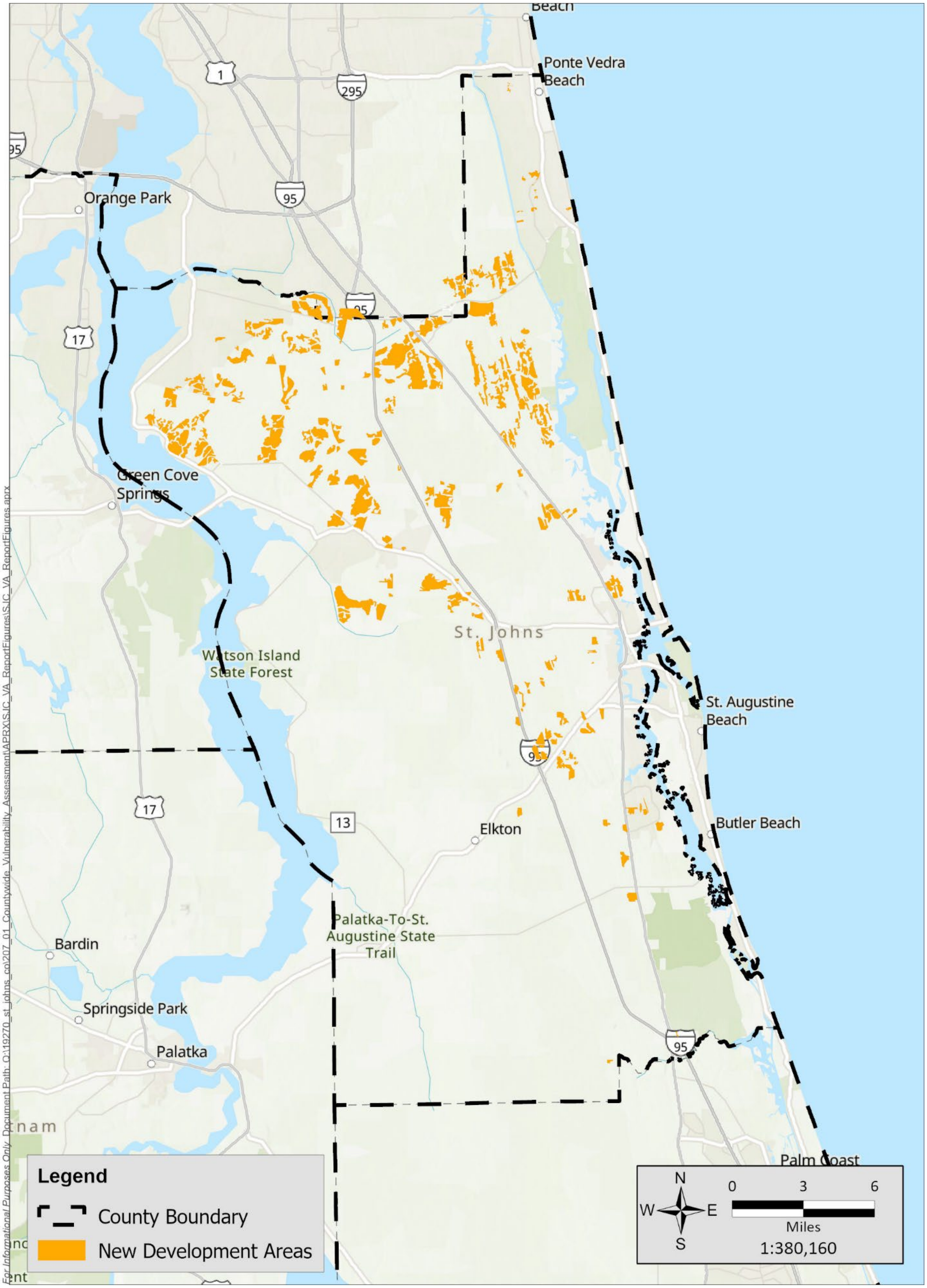
Rainfall depths in the SJC RSM were originally varied across the County by sub-watershed and were taken from SJRWMD design storm rainfall depths. Jones Edmunds determined the Atlas 14 rainfall depths for the 25-, 100-, and 500-year/24-hour design storm events for each sub-watershed and revised the rainfall input files accordingly.

6.1.2 Existing Conditions TUFLOW HPC Model Development

Jones Edmunds developed a two-dimension (2D) inundation model for St. Johns County within TUFLOW HPC (Release 2020-10-AF). The model, referred to herein as the TUFLOW model, covers 48.2 square miles not covered by the SJC RSM and uses a rapid-flood modeling approach to predict inundation areas for rainfall events.

The TUFLOW model employs grid-based H&H methods with a variable grid resolution. The grid resolution varies from 80 to 20 feet. The surface hydraulics are defined based on surface roughness and the 2.5-foot 2018 LiDAR DEM. The model uses sub-grid sampling that allows each model cell to account for ground elevation every 5 feet when determining conveyance between cells and storage within cells.

Figure 7 New Development Areas



An overview of the TUFLOW model development follows. The inputs to the TUFLOW model are stored within a combination of open-source GIS files (shapefiles and rasters) and text files.

6.1.2.1 Computational Mesh

Jones Edmunds developed the TUFLOW model using a variable-grid resolution. We set up the computational mesh to enable sub-grid sampling of elevations at least every 5 feet. The sub-grid sampling enabled the model to sample elevations every 5 feet along the cell edges to characterize the flow between the grid cells. The model also represents storage within each cell based on the sub-grid sampling resolution of 5 feet within each grid cell. The sub-grid sampling allows the model to take advantage of the high-resolution 2018 LiDAR. We initially ran the TUFLOW model at a grid resolution of 20 feet. We then increased the maximum grid size to 80 feet in rural areas to reduce model runtime.

6.1.2.2 Green-Ampt Soil Parameters

Jones Edmunds used the US Department of Agriculture-Natural Resources Conservation Service (USDA-NRCS) Soil Survey Geographic (SSURGO) database for classifying soils within each planning region. NRCS last updated the SSURGO data we downloaded in September 2019. Jones Edmunds used the SSURGO soil characteristic data combined with the *Characterization of Florida Soil* (University of Florida/Institute of Food and Agricultural Sciences [UF/IFAS], 2006) and other standard soil characterization references to develop the Green-Ampt infiltration parameters for the model.

6.1.2.3 Land Cover and Impervious Mapping

Jones Edmunds used the following sources to generate a land cover map over the model domain:

- 2014 SJRWMD land cover mapping.
- 2018 USGS National Hydrography Dataset (NHD).
- 2022 Microsoft statewide building footprints.
- The Roadedge feature class from St. Johns County’s 2008 LiDAR terrain dataset.

SJRWMD based their land use mapping on 2013 to 2016 digital orthoimagery. The USGS NHDPlus dataset uses the 10-meter Three-Dimensional Elevation Program Digital Elevation Model (3DEP DEM) and the National Watershed Boundary Dataset (WBD) to map stream networks and waterbodies.

Impervious mapping was developed to cover building footprints, roadways, and large parking lots. Building footprints were identified using 2022 Microsoft building footprints, roadway polygons were developed using the Roadedge polyline feature class from St. Johns County’s 2008 LiDAR terrain dataset, and parking lots were manually drawn.

We aggregated the land use classification sources to create a 5-foot TUFLOW model area land cover raster categorized into eight classes. Table 8 lists the eight classes. We then assigned each class a constant or depth-varying Manning's *n* value. We classified the classes as being impervious or pervious. Impervious land cover classes do not allow infiltration. In a traditional, lumped-parameter model, impervious areas are generally classified as being made of directly connected or unconnected areas. The connectedness of the impervious areas is not defined in a high-resolution distributed model such as TUFLOW because the model simulates the infiltration downstream of the mapped impervious areas.

Table 8 Modeled Landcover Parameters

Landcover	Roughness				Pervious/ Impervious
	Depth 1		Depth 2		
	Depth (inch)	Manning's *n*	Depth (inch)	Manning's *n*	
Building	0.1	0.02	0.3	3	Impervious
Compacted Dirt	0.1	0.022	0.3	0.022	Impervious
Forest	0.1	0.192	0.3	0.192	Pervious
Grassed	0.1	0.1	0.3	0.04	Pervious
Paved	0.1	0.011	0.3	0.011	Impervious
Water	0.1	0.03	0.3	0.03	Impervious
Wetland	0.1	0.1	0.3	0.1	Impervious
Open Space	0.1	0.06	0.3	0.06	Pervious

We based buildings on the 2022 Microsoft building footprints, which are represented explicitly in the land cover mapping. We defined buildings as having a low roughness at low-flow depths (0.1 inch) and a very high roughness at higher depths (0.3 inch). This representation allows the models to represent rainfall-induced runoff from building roofs with minimal attenuation while reducing overland flow velocity over areas defined as buildings within the land cover. Alternatives for modeling buildings included blocking buildings out of the 2D domain, which would prevent runoff from roofs or raising the DEM elevations over buildings creating discontinuities in the DEM surface that can result in model instabilities.

6.1.2.4 One-Dimension (1D) Hydraulic Features

Jones Edmunds obtained copies of asset databases from the County, COSA, and COSAB. Jones Edmunds reviewed the databases for completeness of pipe elevations and sizes and updated invert elevations where these elevations were missing or appeared unreasonable. We assigned these new elevations based on surrounding structure inverts or by setting a fixed cover relative to the LiDAR DEM.

Jones Edmunds then used the City and County data and a desktop review to identify stormwater culverts, pipes, and weirs to include in the TUFLOW model. We selected structures based on our estimate of the structure's impact on the inundation mapping especially for the simulated extreme rainfall events. We considered the intended planning-level accuracy of the final mapping when selecting these features. Most subsurface stormwater systems within the County are designed for more frequently occurring storms and do not significantly impact inundation during extreme, infrequent storms. However, the model included 3,537 pipes, culverts, and/or weirs. In some cases, we made assumptions for the invert elevations or pipe dimensions based on the LiDAR DEM, assumed pipe cover, and drainage area upstream of the structure.

6.1.2.5 Design-Storm Rainfall

Jones Edmunds used NOAA Atlas 14 rainfall totals to simulate the flood risk in the County for the following storms:

- 25-year/1-day.
- 100-year/1-day.
- 500-year/1-day.

We assigned rainfall using the NOAA Atlas 14 rainfall depths based on the centroid of the watershed. Table 9 shows the rainfall values (in inches) for each storm event for each scenario.

Table 9 Existing and Future Scenario Rainfall Values

Storm Event	Existing Conditions	2040 Intermediate-Low and Intermediate-High	2070 Intermediate-Low and Intermediate-High
25-Year/24-Hour	8.69	11.04	11.65
100-Year/24-Hour	12.2	16.47	17.94
500-Year/24-Hour	17.3	24.05	26.64

6.1.3 Future Conditions Models

Jones Edmunds developed future conditions model scenarios using the revised existing conditions SJC RSM and the TUFLOW model to simulate 2040 and 2070 with NOAA's 2017 intermediate-low and intermediate-high SLR conditions. Updates to the models to simulate the future conditions scenarios included:

- Increasing the St. Johns River and Intracoastal boundary conditions and node initial stages to account for projected NOAA 2017 SLR conditions.
- Increasing design storm event rainfall depths based on the future conditions rainfall change factors shown in Table 9.
- Reducing the amount of available soil storage thereby increasing the amount of runoff near the tidal boundaries to account for long-term increases in groundwater table elevations due to SLR.
- Adjusting runoff parameters for model basins where significant new developments are planned for the future. County staff provided Jones Edmunds with the locations of 23 planned future developments where updates were made. Figure 8 summarizes the locations of the new developments.

6.2 Tidal Flooding

According to FDEP and Florida Statutes, tidal flooding has been defined as the MHHW elevation plus 2 feet. To calculate the high tide flood elevation for existing conditions, we used the updated 2023 MHHW elevation presented in Section 5.3.2 plus 2 feet. High tide flooding elevations for the 2040 and 2070 conditions scenarios were calculated by adding the projected SLR values presented in Section 5.3.2 to the existing conditions tidal flood elevation. Table 10 summarizes the resulting tidal flooding elevations that were used.

Figure 8 Future Development Locations

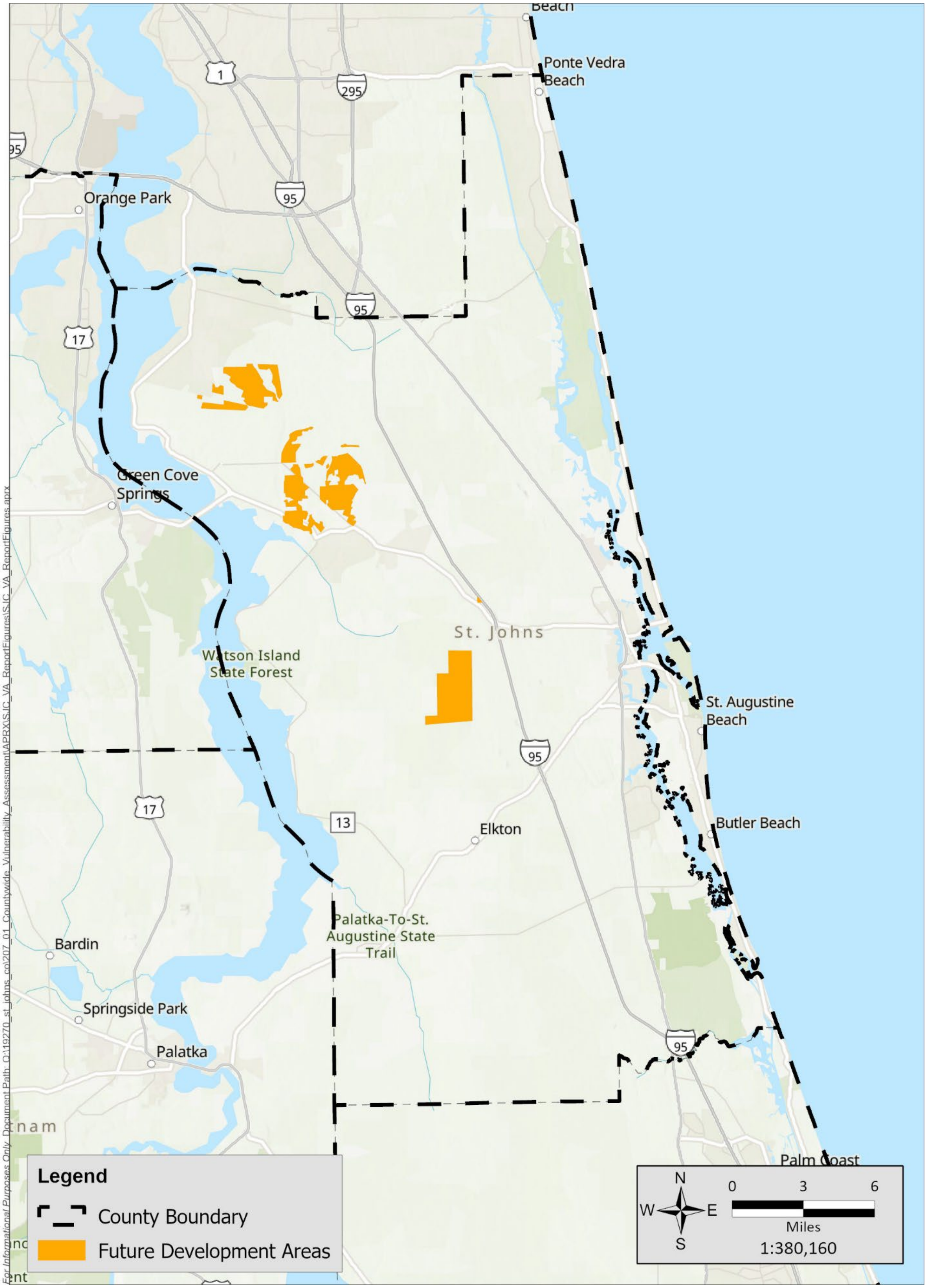


Table 10 Tidal Flood Elevations

Tidal Flood Scenario	St. Johns River Elevation (feet-NAVD88)	Coastal Elevation (feet-NAVD88)
2022 MHHW + 2 Feet	3.07	4.5
2040 MHHW + 2 Feet Intermediate-Low SLR	3.33	4.76
2040 MHHW + 2 Feet Intermediate-High SLR	3.79	5.22
2070 MHHW + 2 Feet Intermediate-Low SLR	3.89	5.32
2070 MHHW + 2 Feet Intermediate-High SLR	5.66	7.09

The expected number of tidal flooding days analysis compares a specified ground elevation to the NOAA-predicted daily high water values over at least 5 years. On any day of the predicted tidal record, if the daily high water exceeds the specified ground elevation, the analysis counts this as a tidal flooding day. The analysis sums the number of such flooding days over the entire tidal record, divides the summation by the total number of years of the record, and rounds the result up to a whole day to obtain the annual tidal flooding days for the specified ground elevation. For example, if the daily high water exceeds the specified ground elevation 462 times over a 5-year period, the number of annual tidal flooding days is 462 days/5 years = 92.4 or 93 tidal flooding days per year.

The analysis accounts for SLR by projecting the same annual tidal flooding days to the specified ground elevation plus the expected SLR. If the location expects the sea level to increase by 2.0 feet by 2070 and a ground elevation of +2.4 feet NAVD88 experiences 93 annual flooding days today, a ground elevation of +4.4 feet NAVD88 (2 feet + 2.4 feet NAVD88) can expect to experience 93 annual flood days in 2070.

For the St. Johns County VA, daily high water values were obtained at the St. Augustine Beach NOAA gauge (8720587) for the coastline and ICWW and the Racy Point gauge (8720625) for the St. Johns River. Table 11 summarizes the projected number of tidal flood days for the St. Johns River for the existing and future conditions. Table 12 summarizes the projected number of tidal flood days for coastal St. Johns County.

Table 11 Summary of Tidal Flood Days for the St. Johns River

Present Elevation (feet-NAVD88)	Expected Number of Tidal Flood Days per Year				
	2023	2040		2070	
		Intermediate-Low	Intermediate-High	Intermediate-Low	Intermediate-High
1.0	52	104	228	249	365
1.5	8	28	93	121	365
2.0	0	<1	24	33	365
2.5	0	0	0	<1	302
3.0	0	0	0	0	199
4.0	0	0	0	0	14
5.0	0	0	0	0	0

Table 12 Summary of Tidal Flood Days for Coastal St. Johns County

Present Elevation (feet-NAVD88)	Expected Number of Tidal Flood Days per Year				
	2023	2040		2070	
		Intermediate-Low	Intermediate-High	Intermediate-Low	Intermediate-High
2.0	40	56	88	95	201
2.5	18	28	53	60	174
3.0	6	11	26	31	146
4.0	1	1	2	3	78
5.0	0	0	0	0	21
6.0	0	0	0	0	1
7.0	0	0	0	0	0

6.3 Storm Surge Flooding

Storm surge elevations were calculated for the 10-, 25-, and 100-year storms for 2040 and 2070 intermediate-low and intermediate-high SLR projections. We started with the existing SWEL elevations discussed in Section 5.3.2 and created future conditions SWEL elevations by adding the SLR projections to the existing SWEL elevations. Table 13 summarizes the range of SWEL elevations across St. Johns County for each of the storm surge flooding scenarios.

Table 13 Summary of SWEL Elevation Ranges across St. Johns County

Flood Scenario	SWEL Elevation Range (feet-NAVD88)	
	St. Johns River	Coastal St. Johns County
10-Year, Existing Conditions	2.2 – 2.5	3.5 – 5.2
10-Year, 2040 Intermediate-Low	2.7 – 3.0	4.0 – 5.7
10-Year, 2040 Intermediate-High	3.2 – 3.5	4.5 – 6.2
10-Year, 2070 Intermediate-Low	3.3 – 3.6	4.6 – 6.3
10-Year, 2070 Intermediate-High	5.1 – 5.4	6.4 – 8.05
25-Year, Existing Conditions	2.4 – 2.7	3.7 – 5.5
25-Year, 2040 Intermediate-Low	2.9 – 3.2	4.2 – 6.0
25-Year, 2040 Intermediate-High	3.4 – 3.7	5.2 – 7.0
25-Year, 2070 Intermediate-Low	3.5 – 3.8	5.3 – 7.1
25-Year, 2070 Intermediate-High	5.3 – 5.6	6.6 – 8.4
100-Year, Existing Conditions	3.6 – 4.0	5.2 – 8.7
100-Year, 2040 Intermediate-Low	4.1 – 4.5	5.7 – 9.2
100-Year, 2040 Intermediate-High	4.6 – 5.0	6.2 – 9.7
100-Year, 2070 Intermediate-Low	4.7 – 5.1	6.3 – 9.8
100-Year, 2070 Intermediate-High	6.5 – 6.9	8.1 – 11.6

To map the surge inundation flooding, a GIS-based approach was used to evaluate the 15 coastal flood inundation scenarios and their associated flood depths. This GIS-based exposure analysis compares the SWEL of the 15 inundation scenarios to the ground elevations from 2018 LiDAR DEM.

To compare the SWEL data to the ground elevations, SWEL data are first converted to raster format. The elevations from the LiDAR raster data are then subtracted from the SWEL rasters. The result of this calculation is a depth raster that represents the depth of flooding for each scenario.

To delineate inundation extents for this analysis, a modified bathtub model was used. This model applies a hydrologic connectivity filter to remove isolated inundated areas not connected to a major waterway or stormwater system. St. Johns County's stormwater infrastructure GIS layer was used to inform these hydrologic connections in the model.

PART III. OUTCOME

7 EXPOSURE ANALYSIS

7.1 RAINFALL-INDUCED FLOODING

Jones Edmunds ran the SJC RSM and the TUFLOW model for the existing, 2040, and 2070 rainfall-induced flood scenarios shown in Table 7. Flood depth rasters and inundation extent polygons were developed for each of the scenarios using the model results and the 2018 LiDAR DEM. Figure 9 through Figure 23 show the flood depth rasters for each of the rainfall-induced flooding scenarios.

7.2 HIGH TIDE FLOODING

Based on the methodology summarized in Section 6.2, the number of projected tidal flood days were determined for each scenario and then plotted against the 2018 LiDAR DEM. Figure 24 through Figure 28 show the number of days of projected flooding due to high tides for existing, 2040, and 2070 conditions, respectively. The depth of tidal flooding was plotted using the 2018 LiDAR DEM and the MHHW elevations presented in Section 6.2. Figure 29 through Figure 33 show the depth of high tide flooding for existing, 2040, and 2070 conditions.

7.3 STORM SURGE FLOODING

Based on the methodology summarized in Section 6.3, storm surge flood elevations were determined for each storm surge scenario (Table 7). Flood depth rasters and inundation extent polygons were developed for each of the scenarios using the storm surge flood elevations and the 2018 LiDAR DEM. Figure 34 through Figure 48 show the flood depth rasters for each of the storm surge flooding scenarios.

Figure 9 Rainfall-Induced Flooding for the 25-Year, 24-Hour Storm Event under Existing Conditions

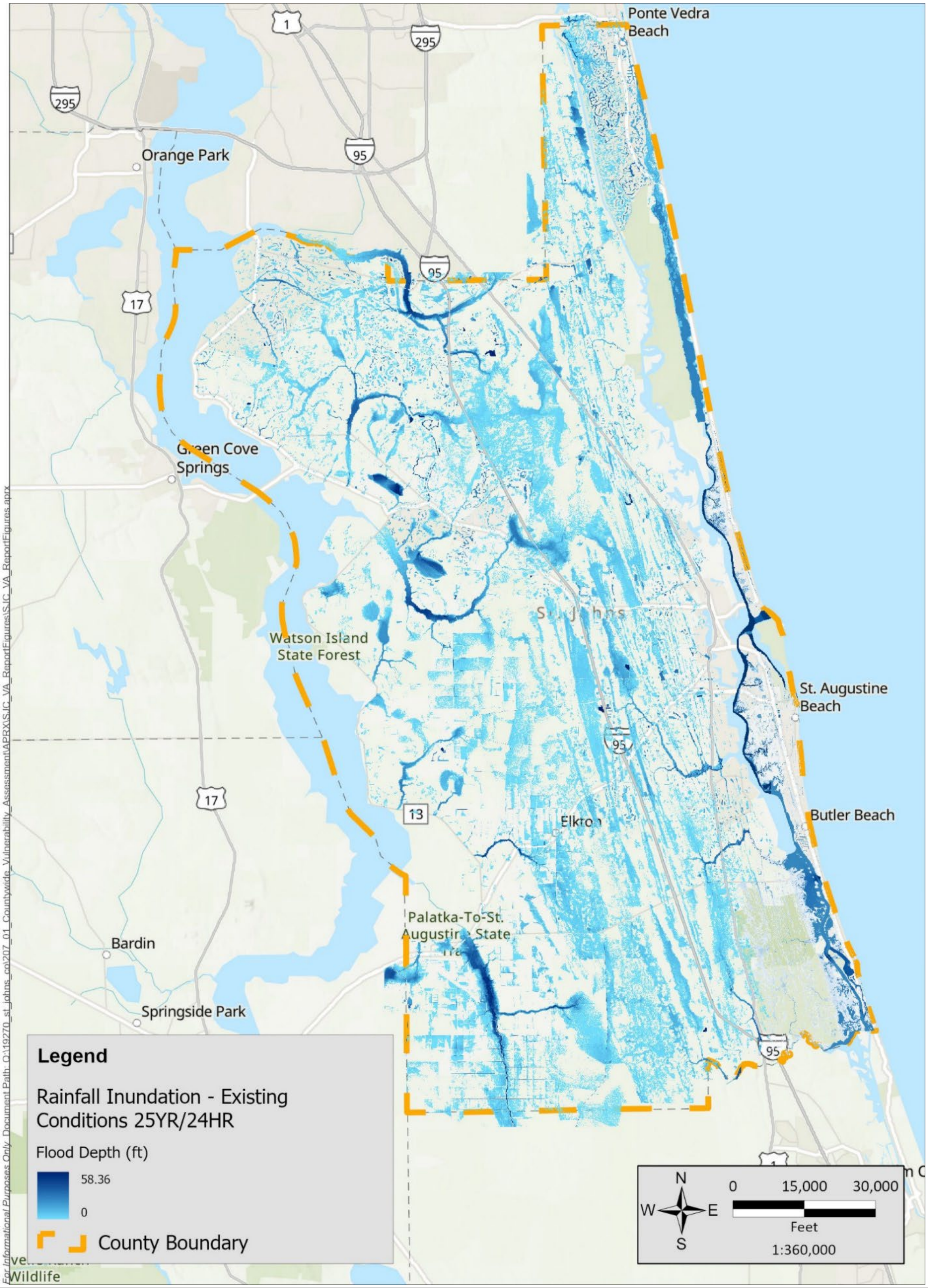


Figure 10 Rainfall-Induced Flooding for the 100-Year, 24-Hour Storm Event under Existing Conditions

Figure 11 Rainfall-Induced Flooding for the 500-Year, 24-Hour Storm Event under Existing Conditions

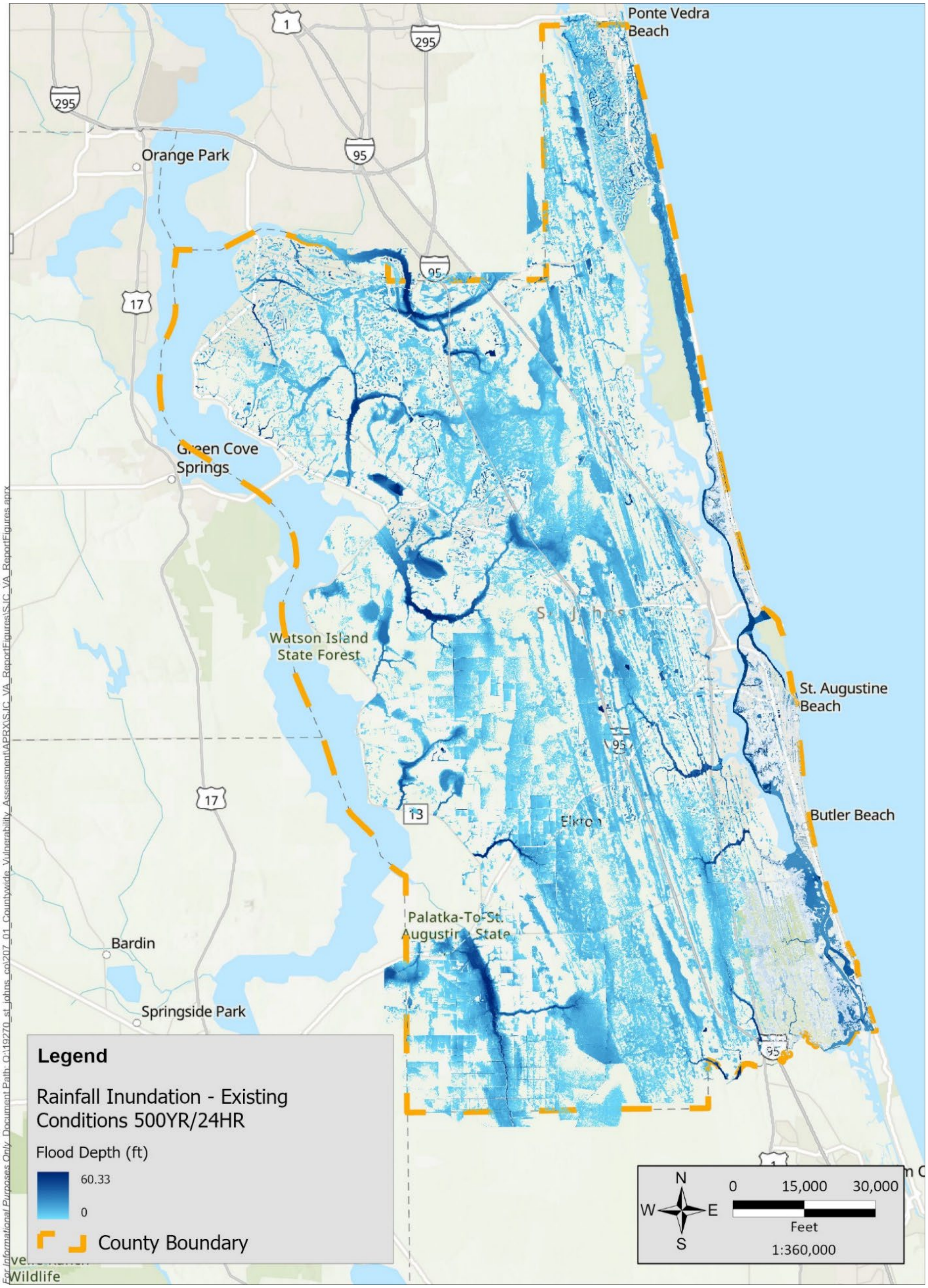


Figure 12 Rainfall-Induced Flooding for the 25-Year, 24-Hour Storm Event under 2040 Intermediate-Low SLR Conditions

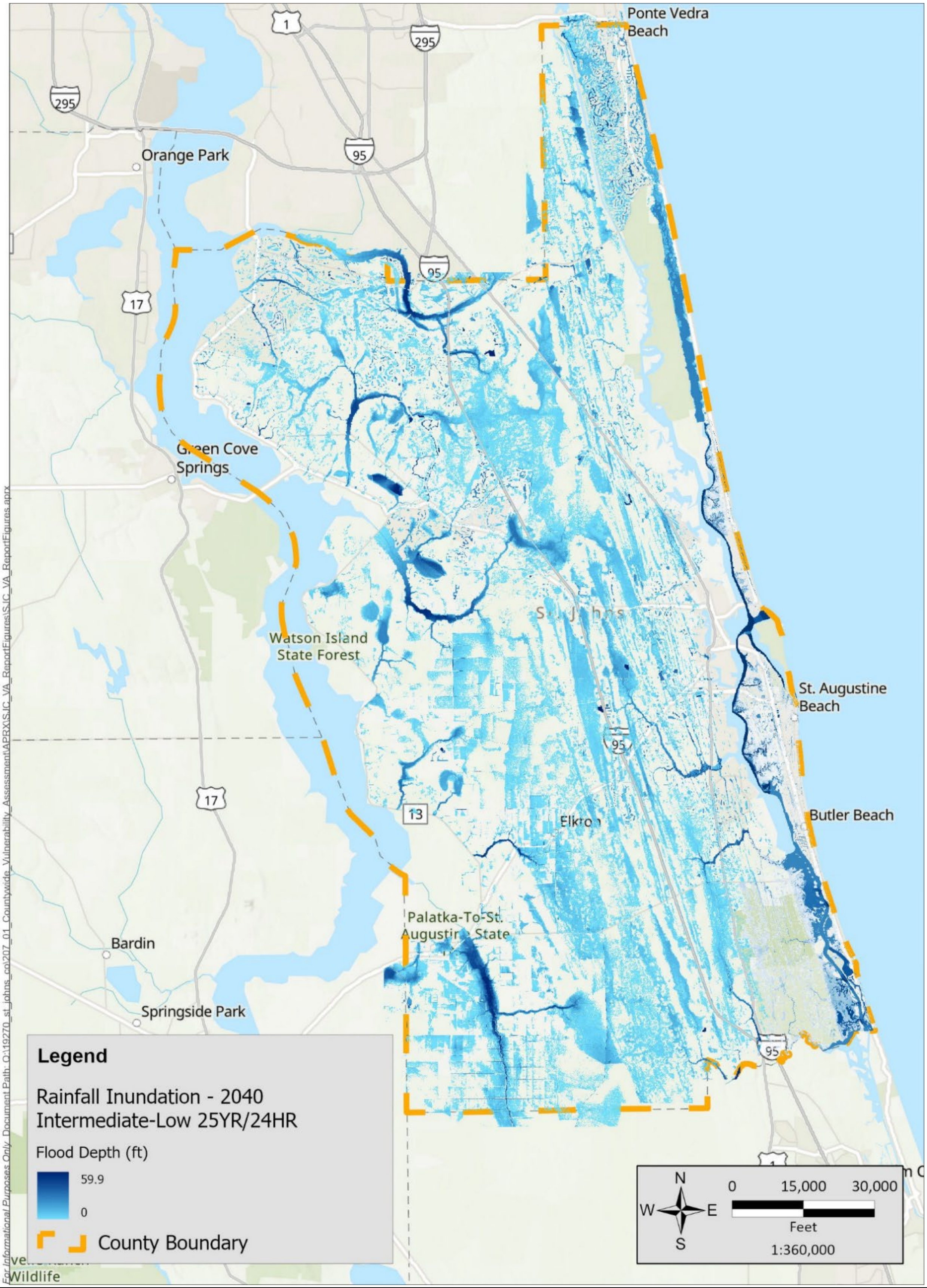


Figure 13 Rainfall-Induced Flooding for the 25-Year, 24-Hour Storm Event under 2040 Intermediate-High SLR Conditions

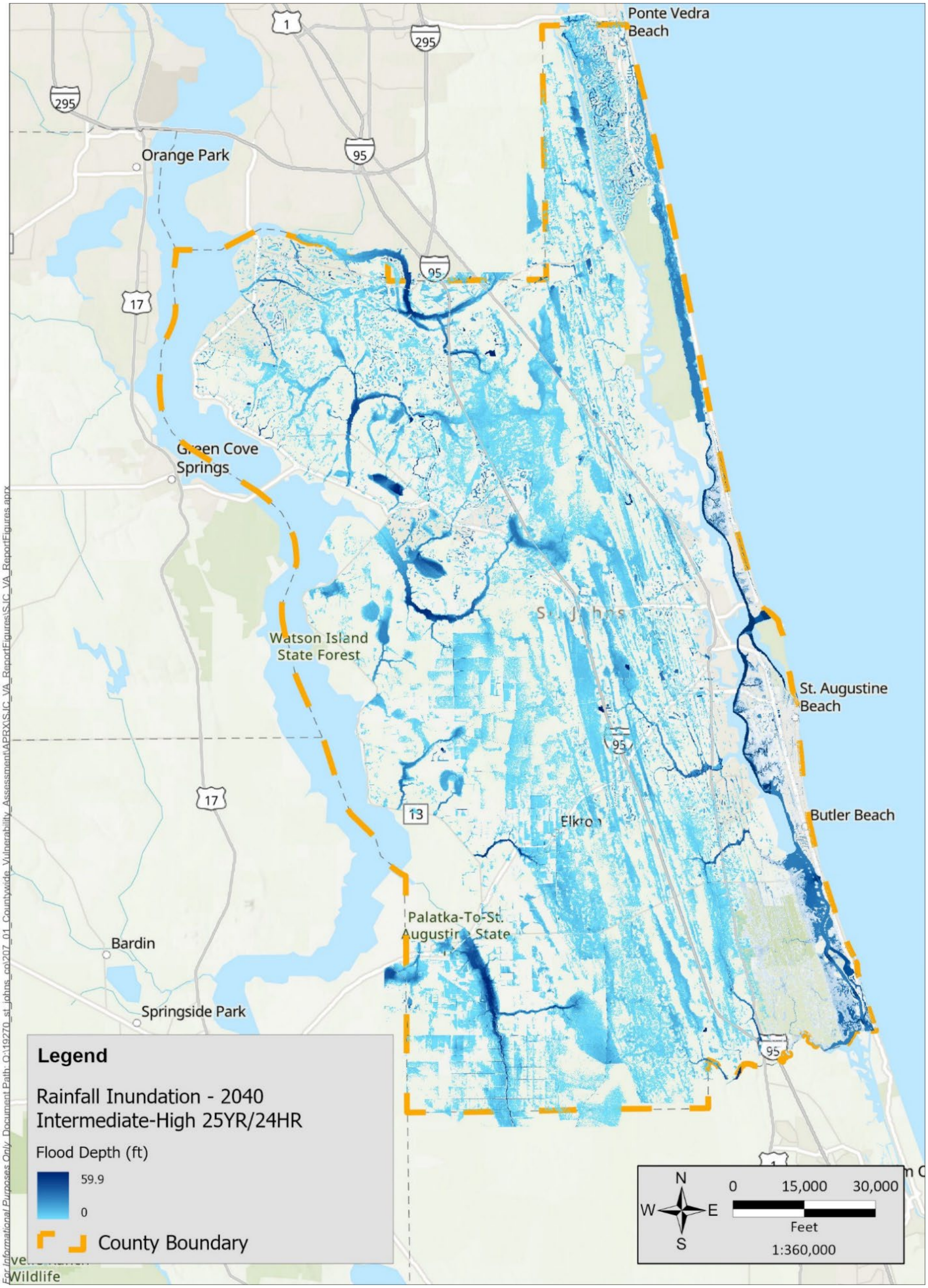


Figure 14 Rainfall-Induced Flooding for the 100-Year, 24-Hour Storm Event under 2040 Intermediate-Low SLR Conditions

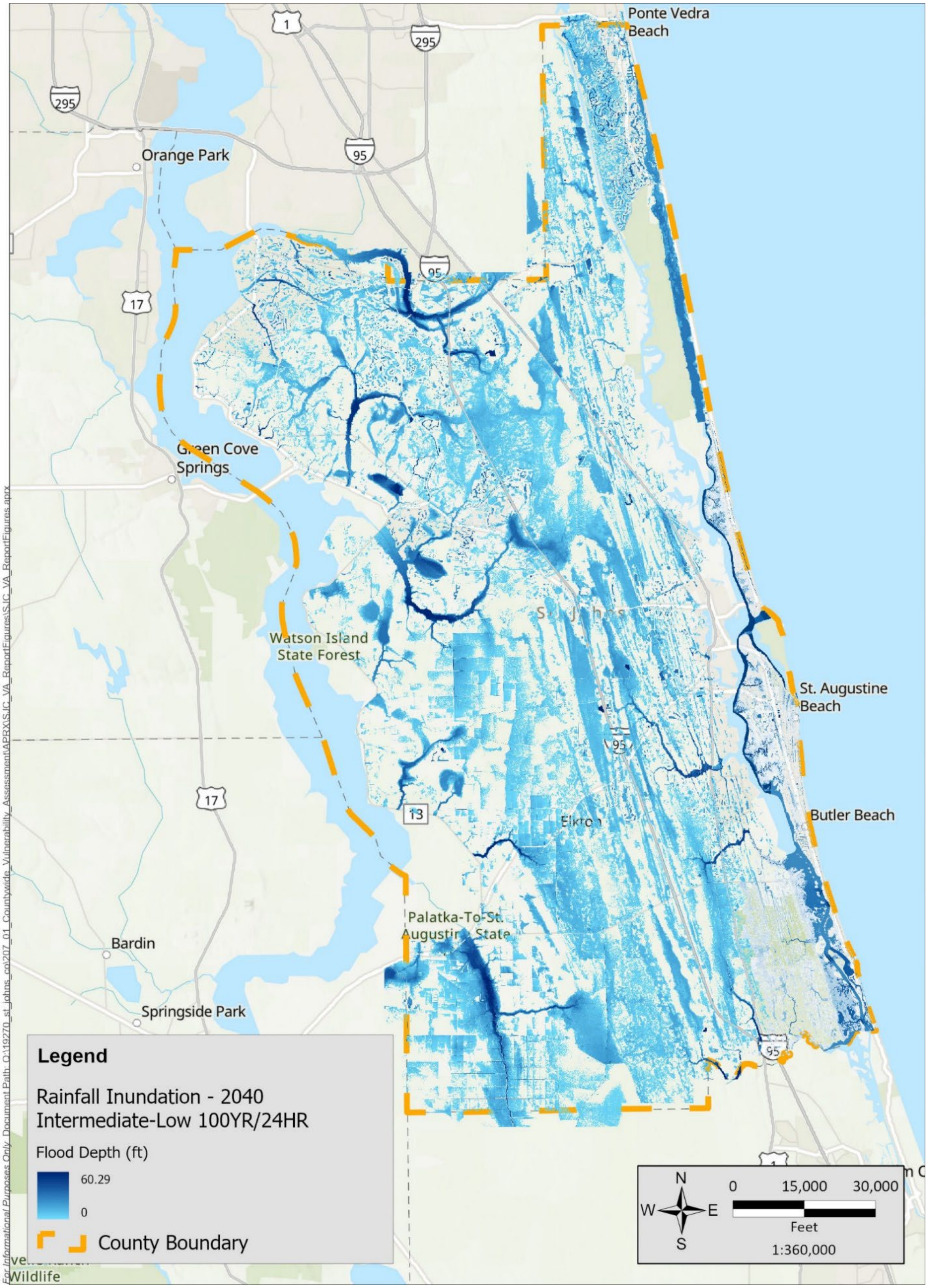


Figure 15 Rainfall-Induced Flooding for the 100-Year, 24-Hour Storm Event under 2040 Intermediate-High SLR Conditions

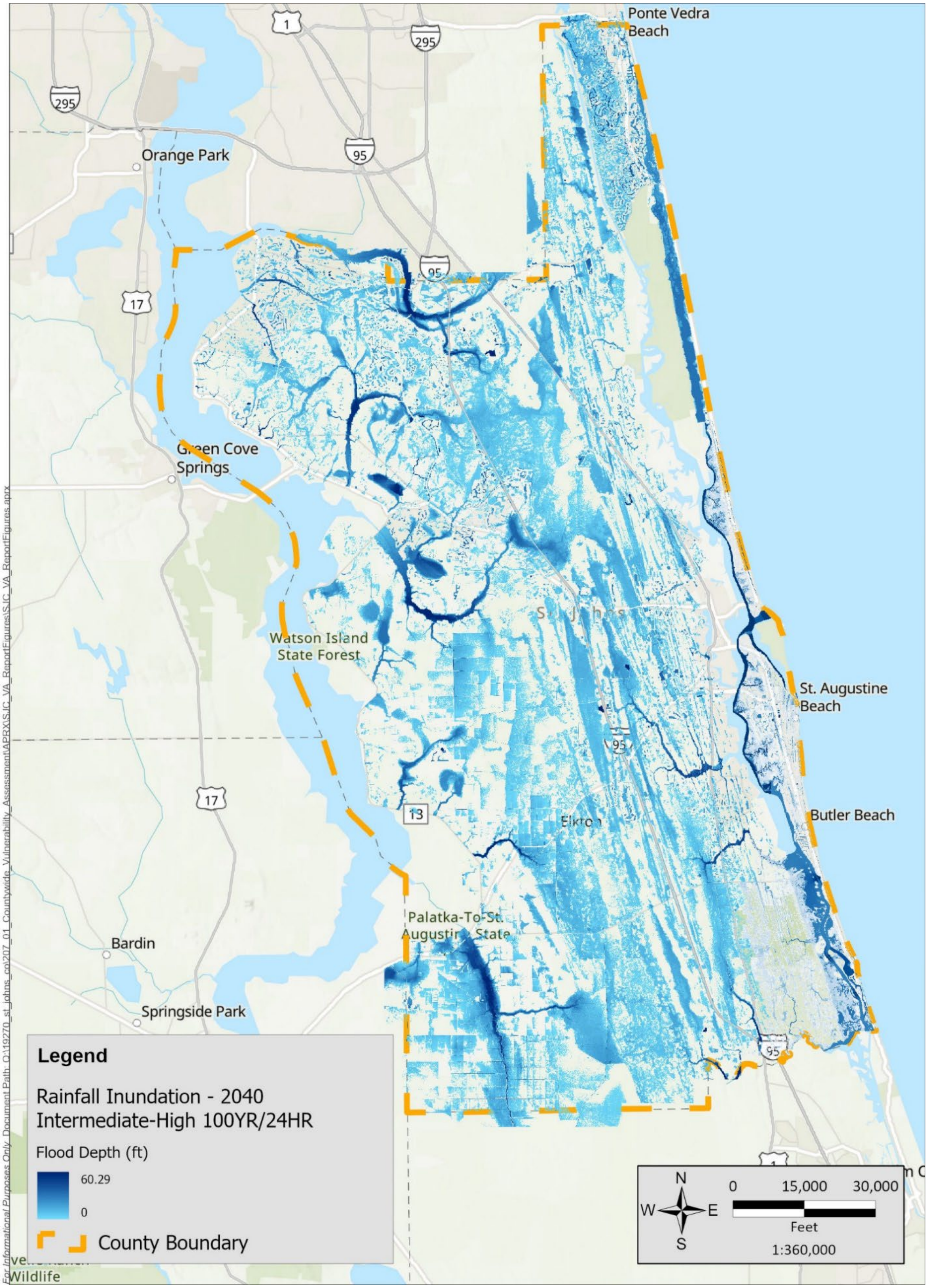


Figure 16 Rainfall-Induced Flooding for the 500-Year, 24-Hour Storm Event under 2040 Intermediate-Low SLR Conditions

Figure 17 Rainfall-Induced Flooding for the 500-Year, 24-Hour Storm Event under 2040 Intermediate-High SLR Conditions

Figure 18 Rainfall-Induced Flooding for the 25-Year, 24-Hour Storm Event under 2070 Intermediate-Low SLR Conditions

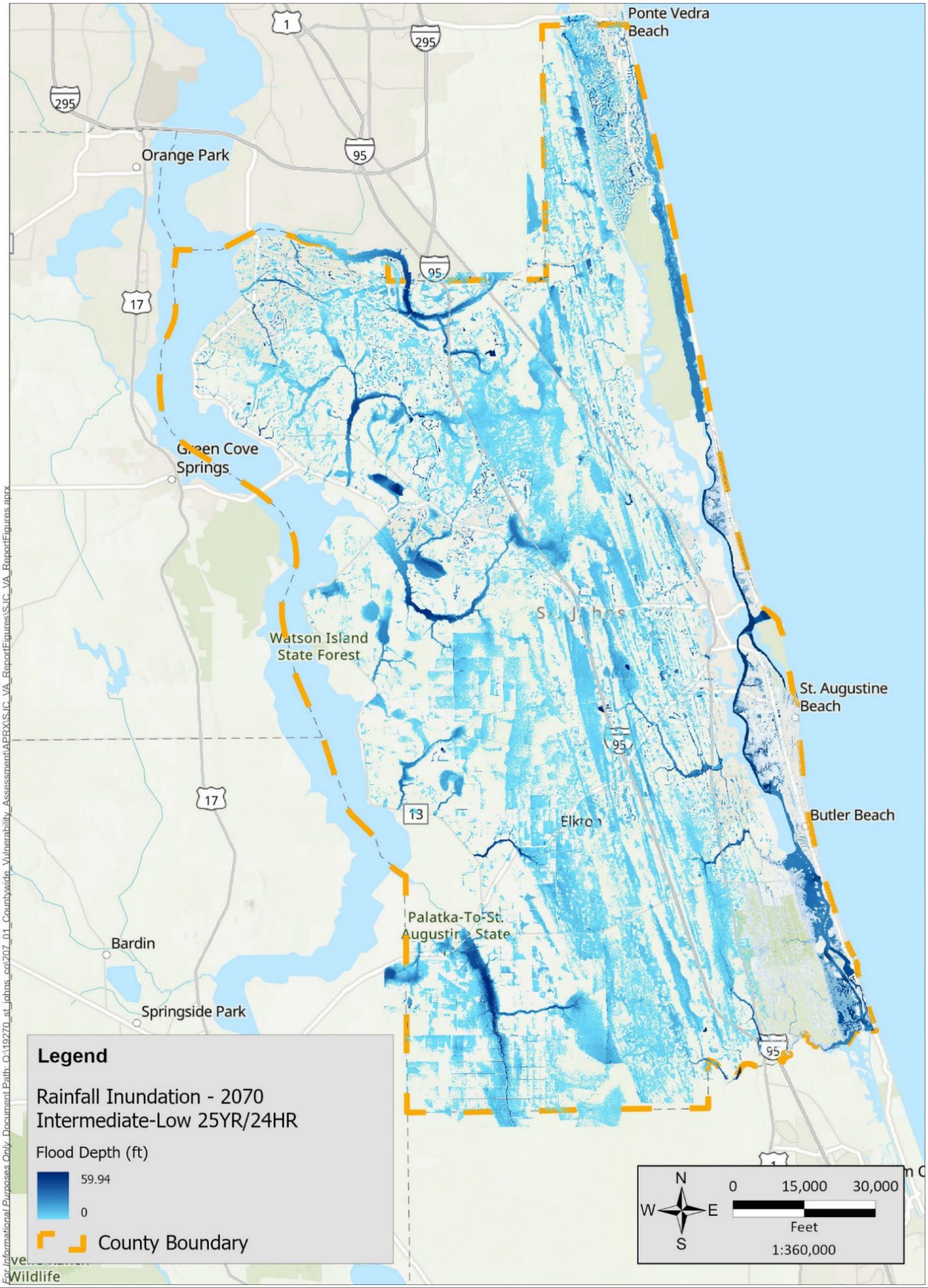


Figure 19 Rainfall-Induced Flooding for the 25-Year, 24-Hour Storm Event under 2070 Intermediate-High SLR Conditions

Figure 20 Rainfall-Induced Flooding for the 100-Year, 24-Hour Storm Event under 2070 Intermediate-Low SLR Conditions

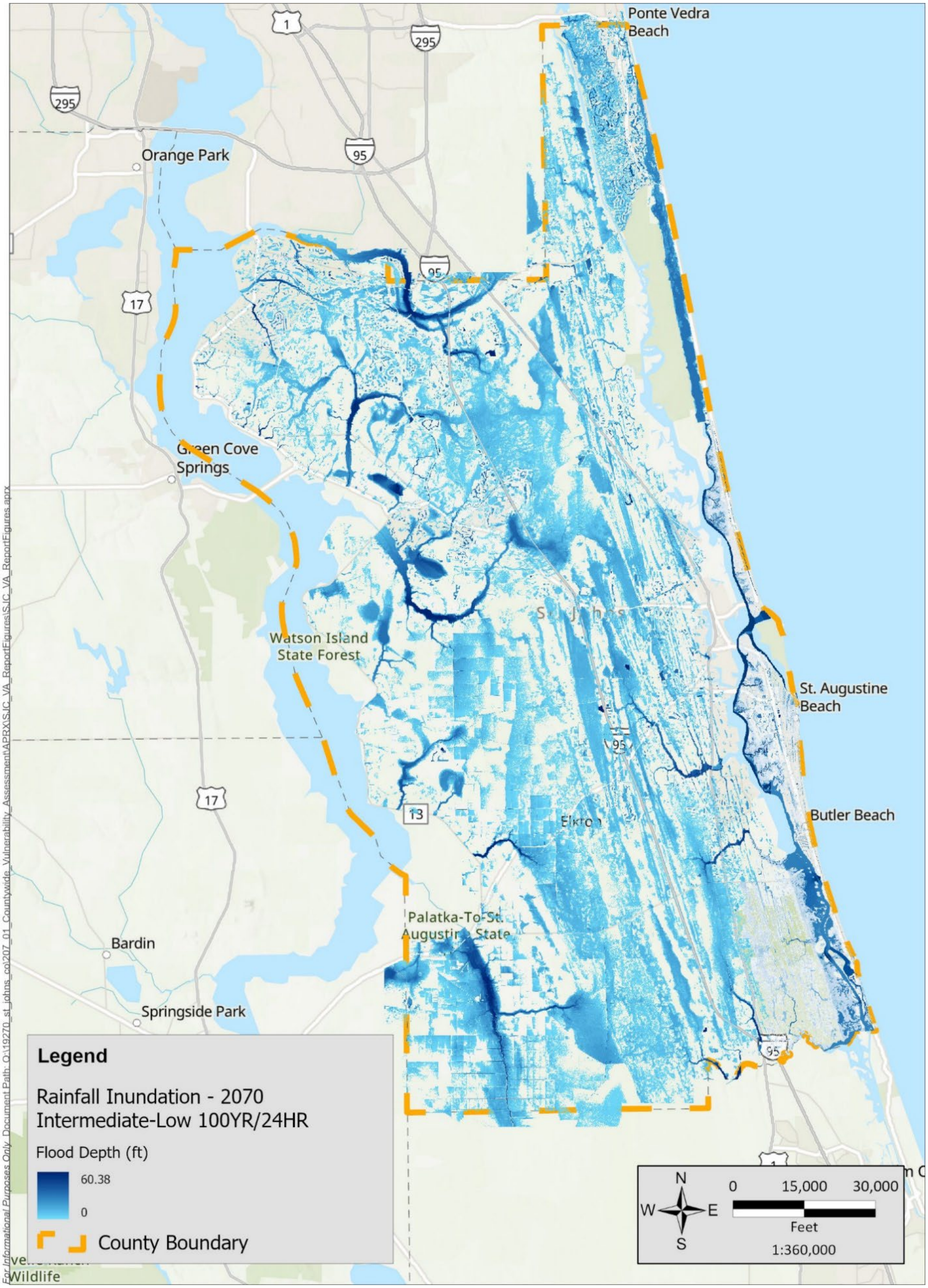


Figure 21 Rainfall-Induced Flooding for the 100-Year, 24-Hour Storm Event under 2070 Intermediate-High SLR Conditions

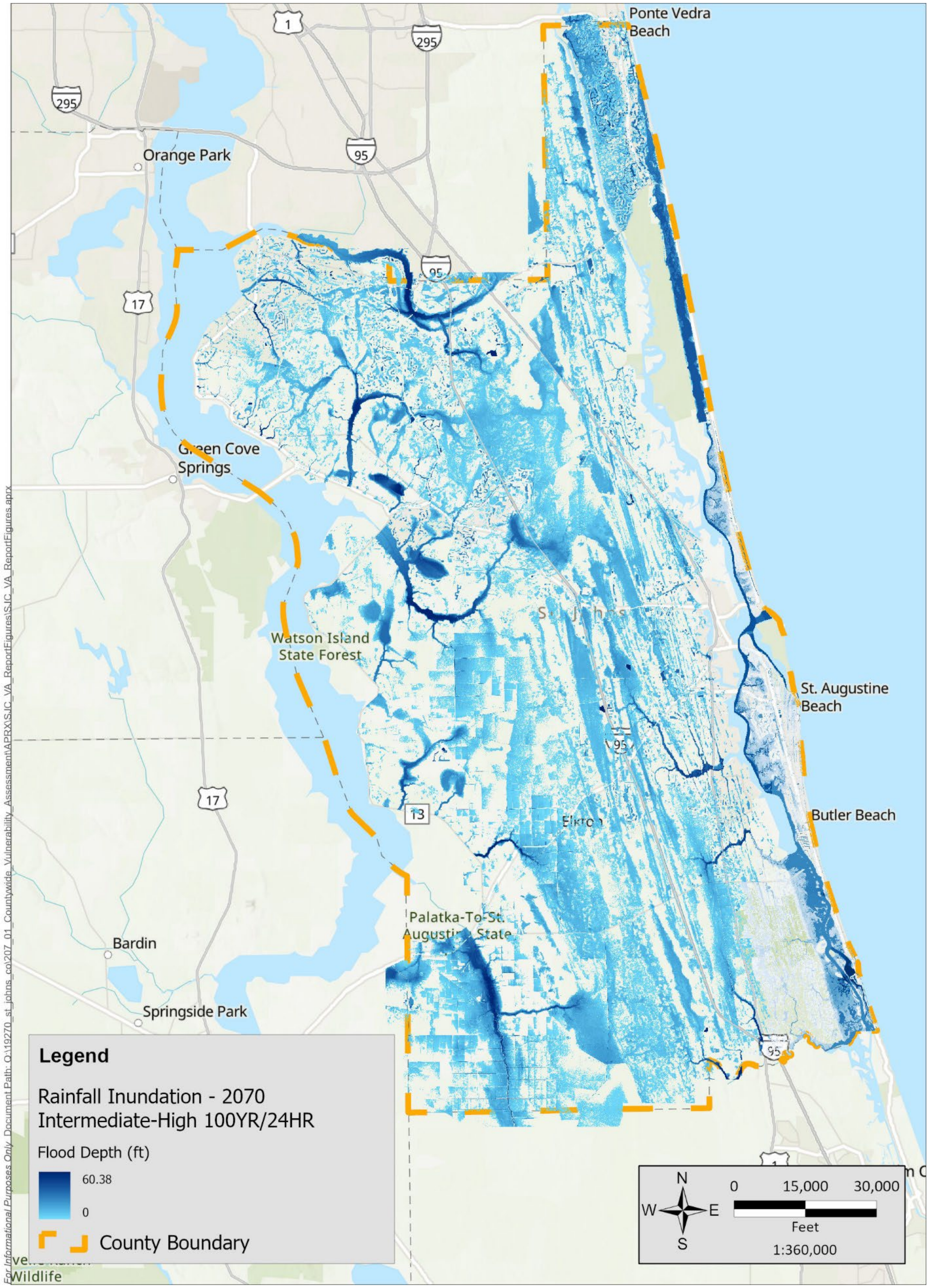


Figure 22 Rainfall-Induced Flooding for the 500-Year, 24-Hour Storm Event under 2070 Intermediate-Low SLR Conditions

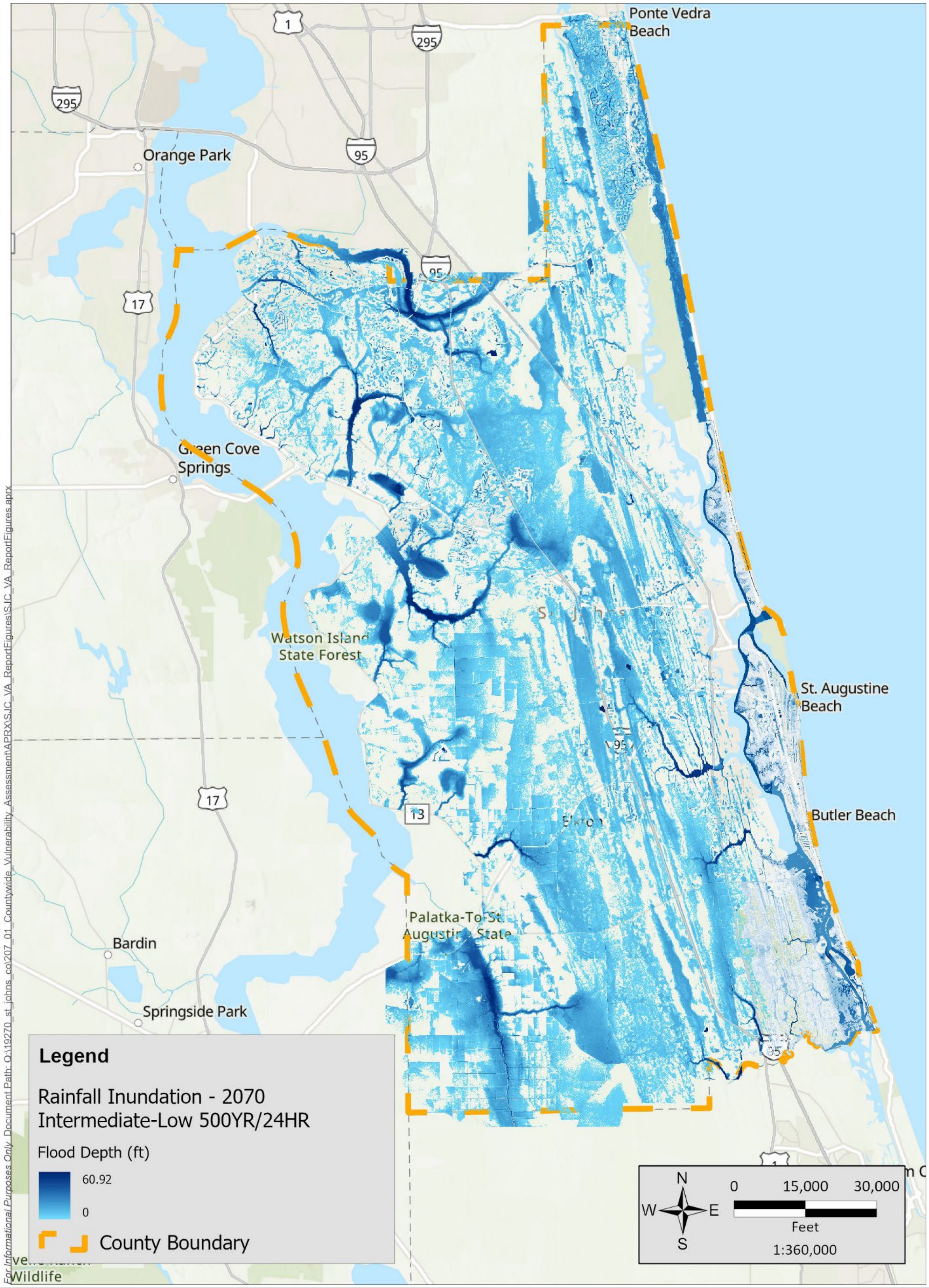


Figure 23 Rainfall-Induced Flooding for the 500-Year, 24-Hour Storm Event under 2070 Intermediate-High SLR Conditions

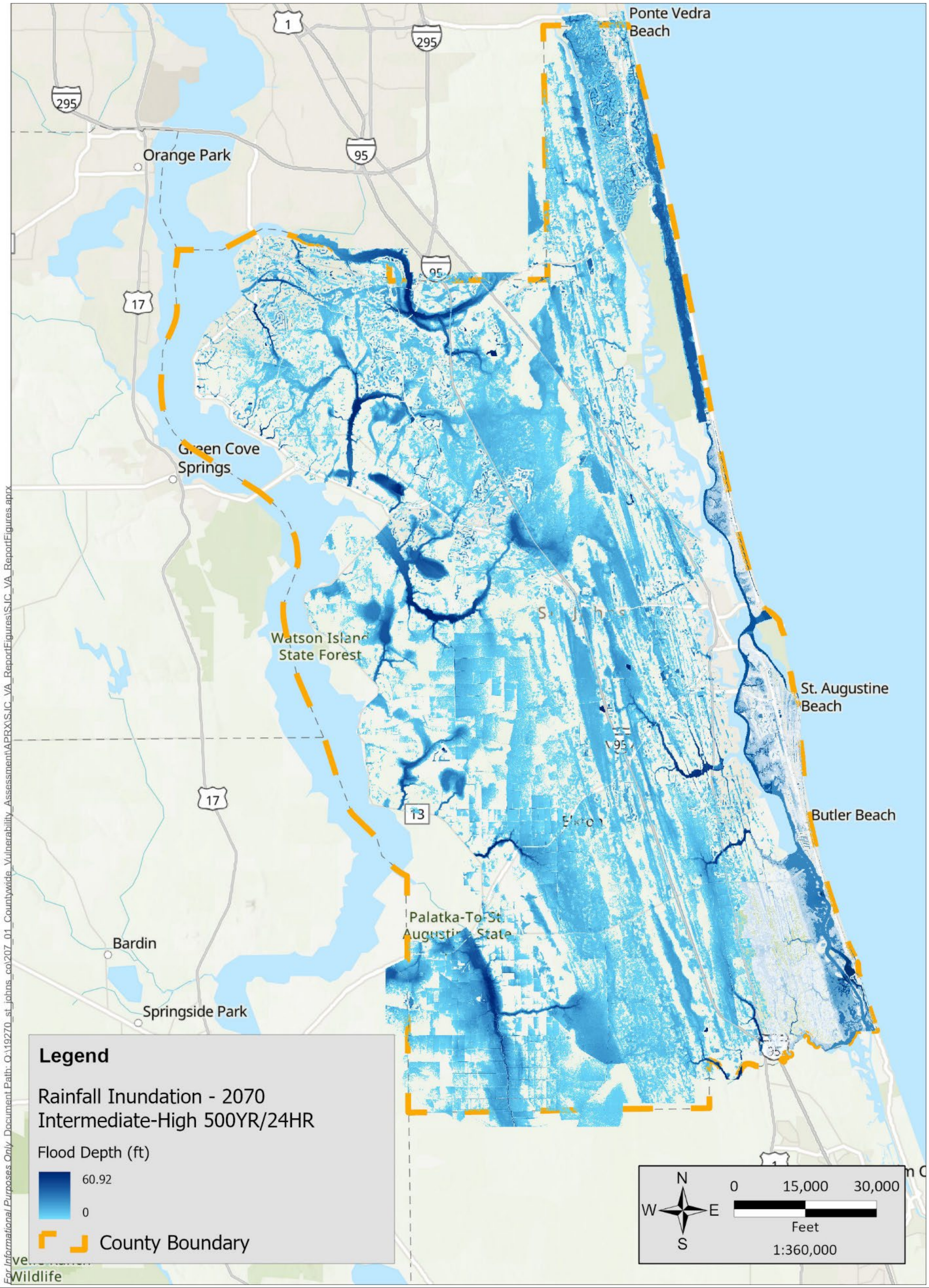


Figure 24 High Tide Flooding Days under Existing Conditions

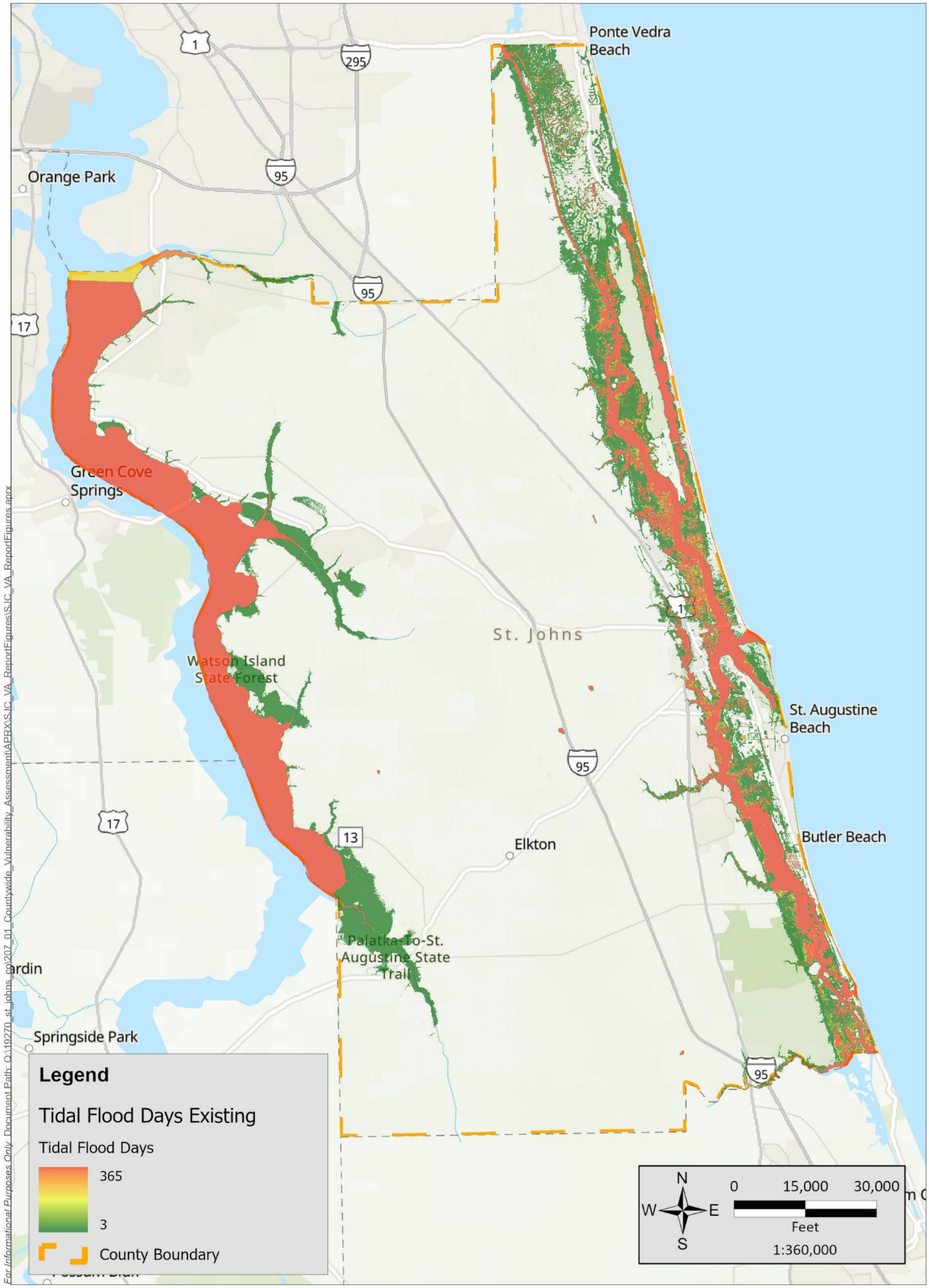


Figure 25 High Tide Flooding Days 2040 Intermediate-Low SLR Conditions

Figure 26 High Tide Flooding Days 2040 Intermediate-High SLR Conditions

Figure 27 High Tide Flooding Days 2070 Intermediate-Low SLR Conditions

Figure 28 High Tide Flooding Days 2070 Intermediate-High SLR Conditions

Figure 29 High Tide Flooding Depth under Existing Conditions

Figure 30 High Tide Flooding Depth 2040 Intermediate-Low SLR Conditions

Figure 31 High Tide Flooding Depth 2040 Intermediate-High SLR Conditions

Figure 32 High Tide Flooding Depth 2070 Intermediate-Low SLR Conditions

Figure 33 High Tide Flooding Depth 2070 Intermediate-High SLR Conditions

Figure 34 10-Year Storm Surge Flooding under Existing Conditions

Figure 35 25-Year Storm Surge Flooding under Existing Conditions

Figure 36 100-Year Storm Surge Flooding under Existing Conditions

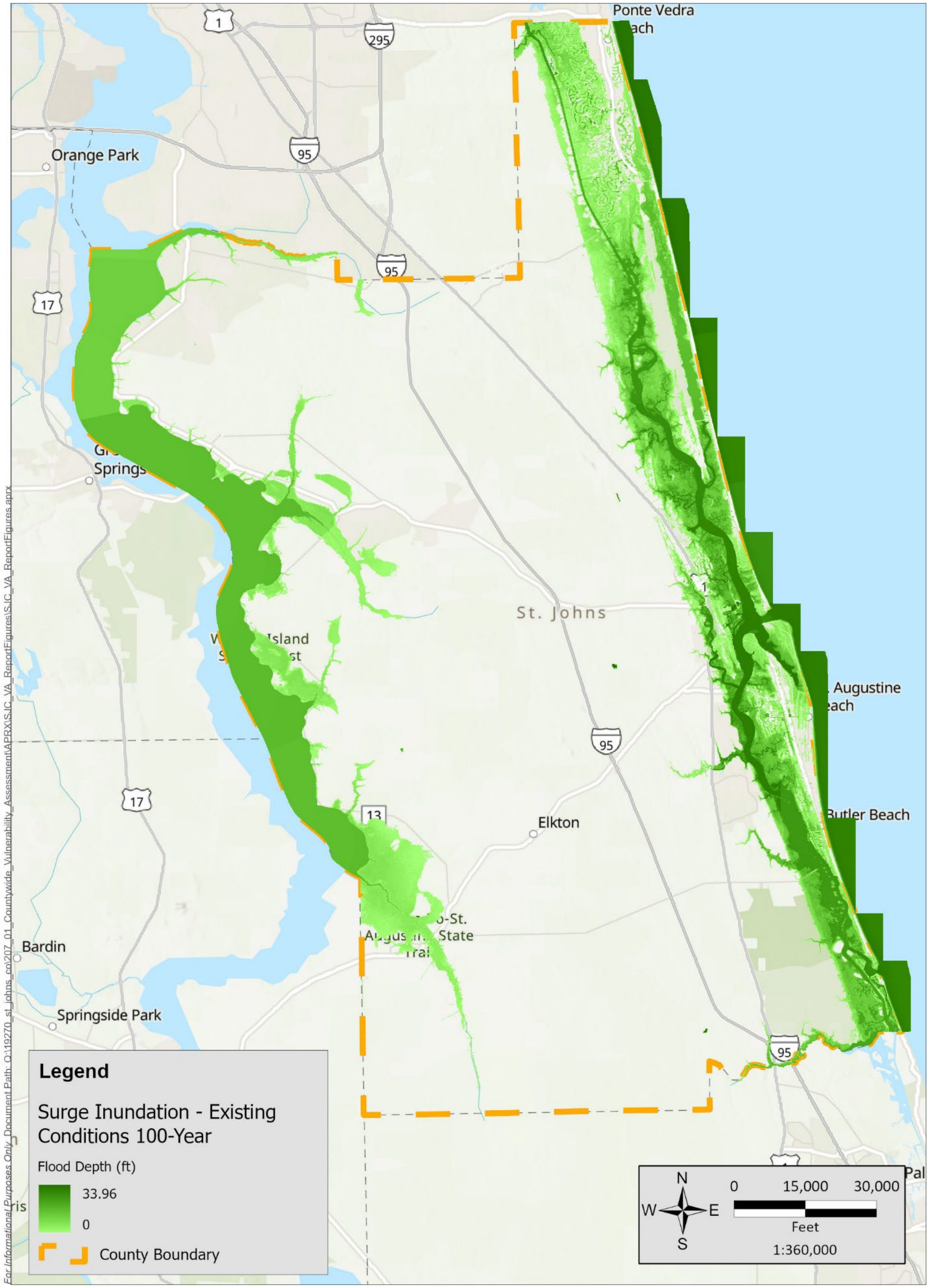


Figure 37 10-Year Storm Surge Flooding under 2040 Intermediate-Low SLR Conditions

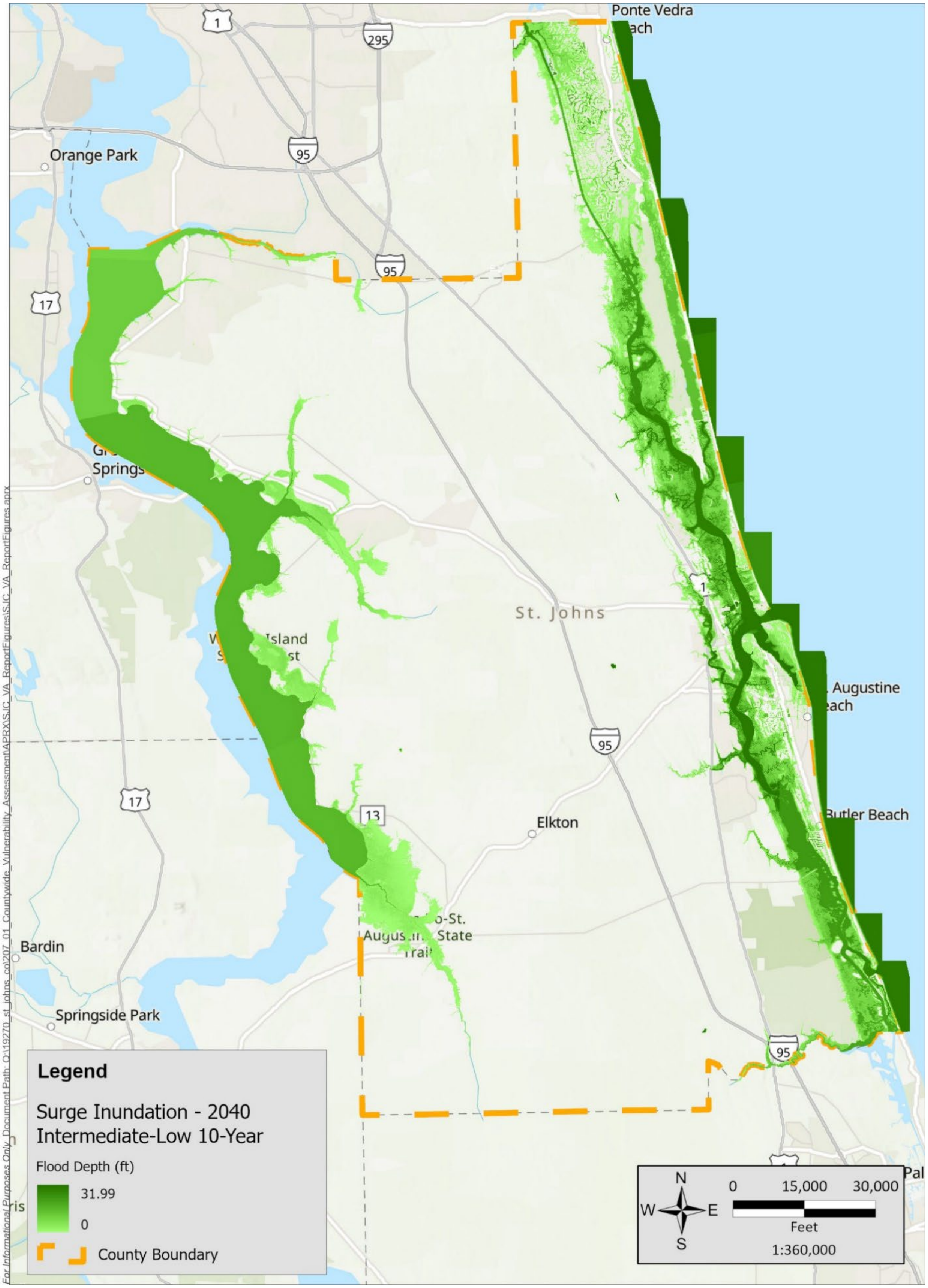


Figure 38 25-Year Storm Surge Flooding under 2040 Intermediate-Low SLR Conditions

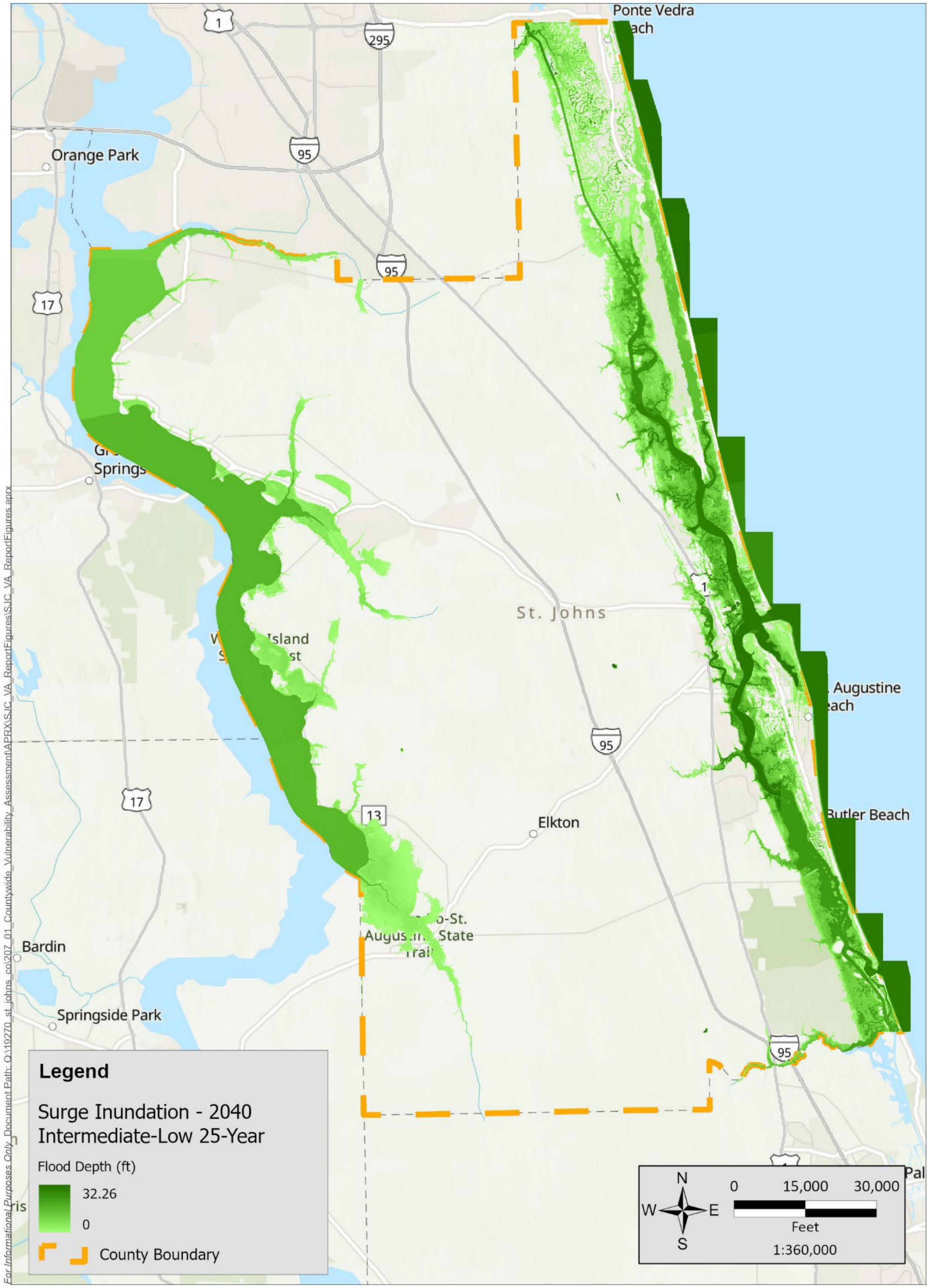


Figure 39 100-Year Storm Surge Flooding under 2040 Intermediate-Low SLR Conditions

Figure 40 10-Year Storm Surge Flooding under 2040 Intermediate-High SLR Conditions

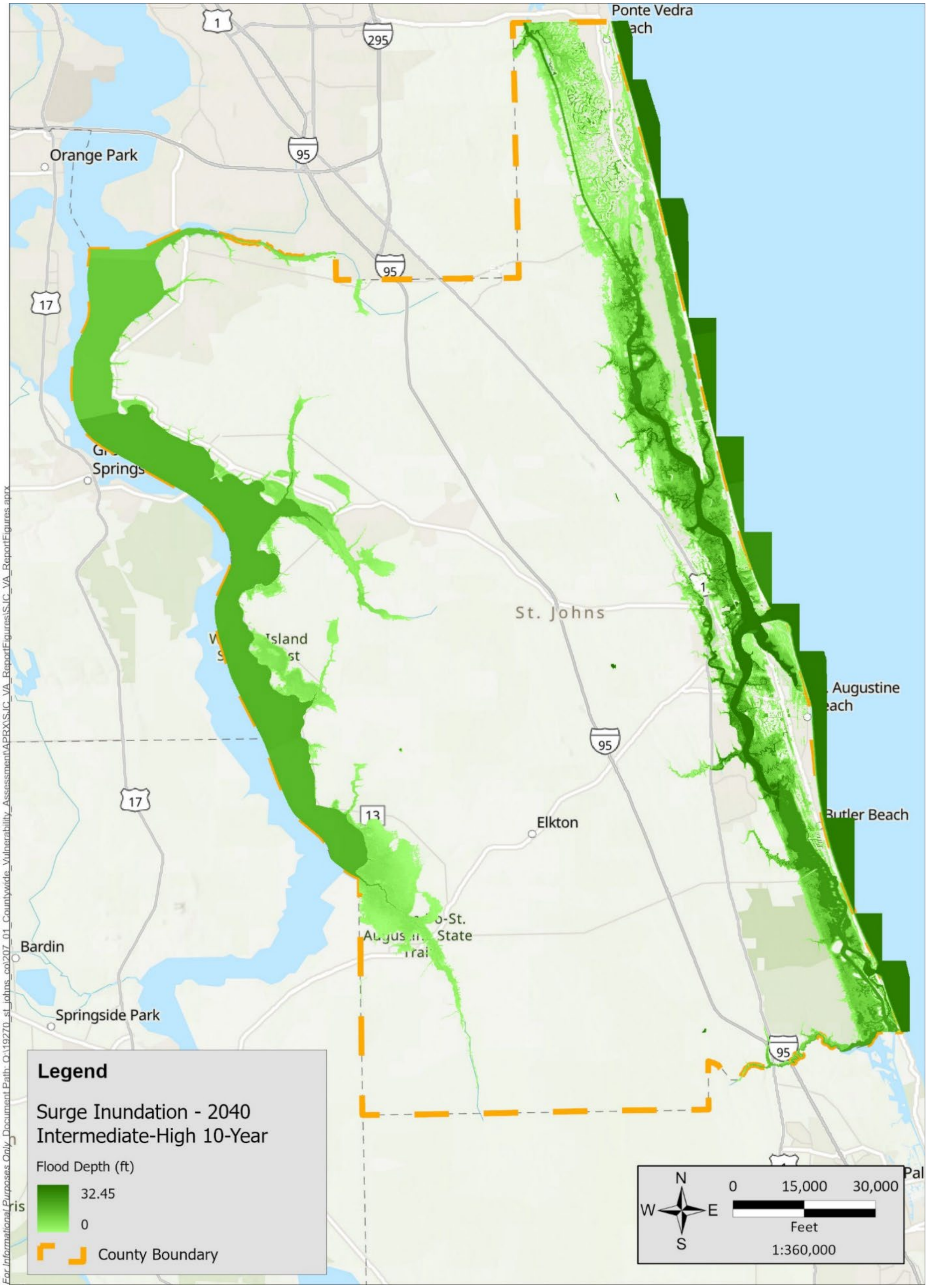


Figure 41 25-Year Storm Surge Flooding under 2040 Intermediate-High SLR Conditions

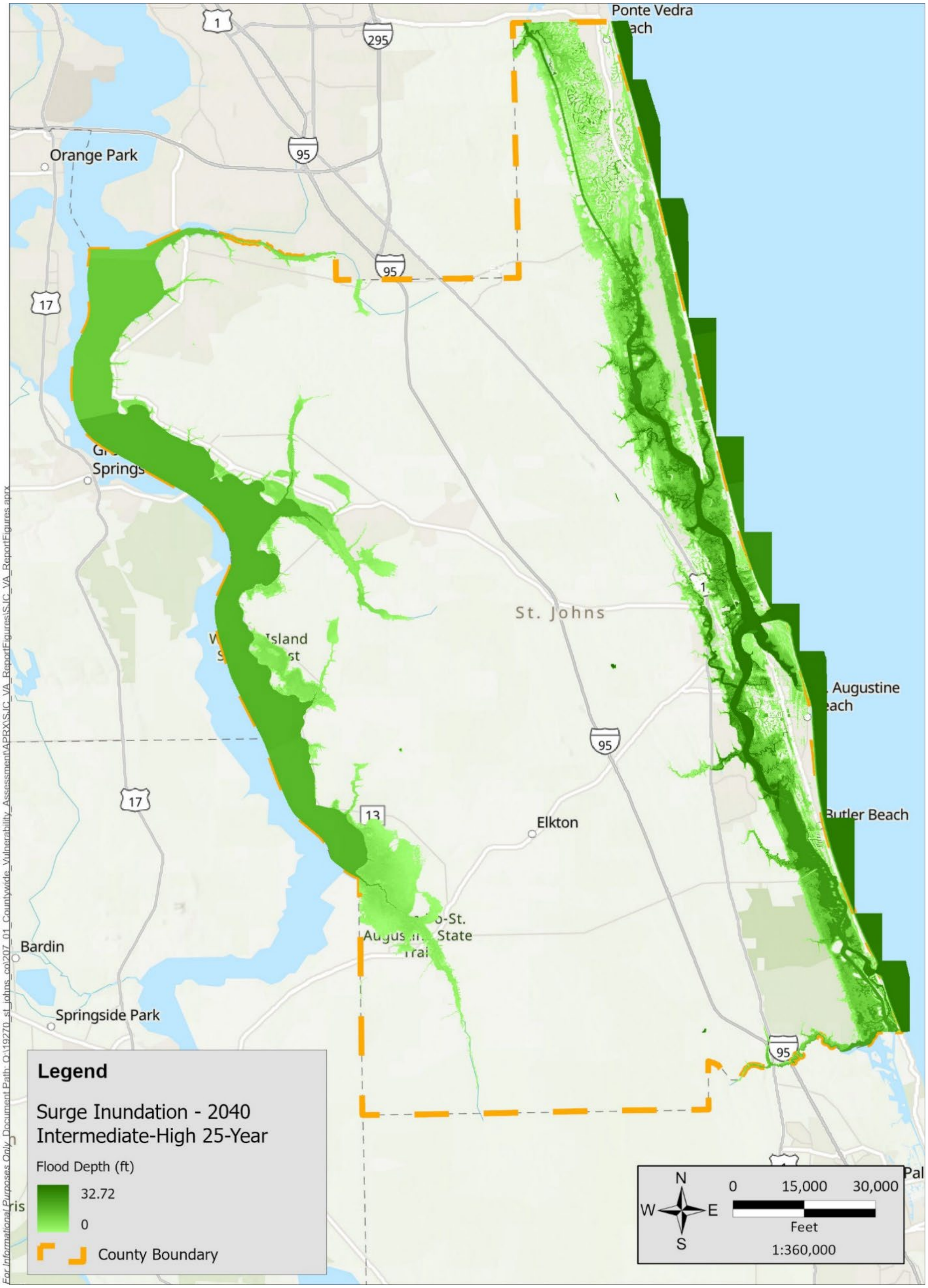


Figure 42 100-Year Storm Surge Flooding under 2040 Intermediate-High SLR Conditions

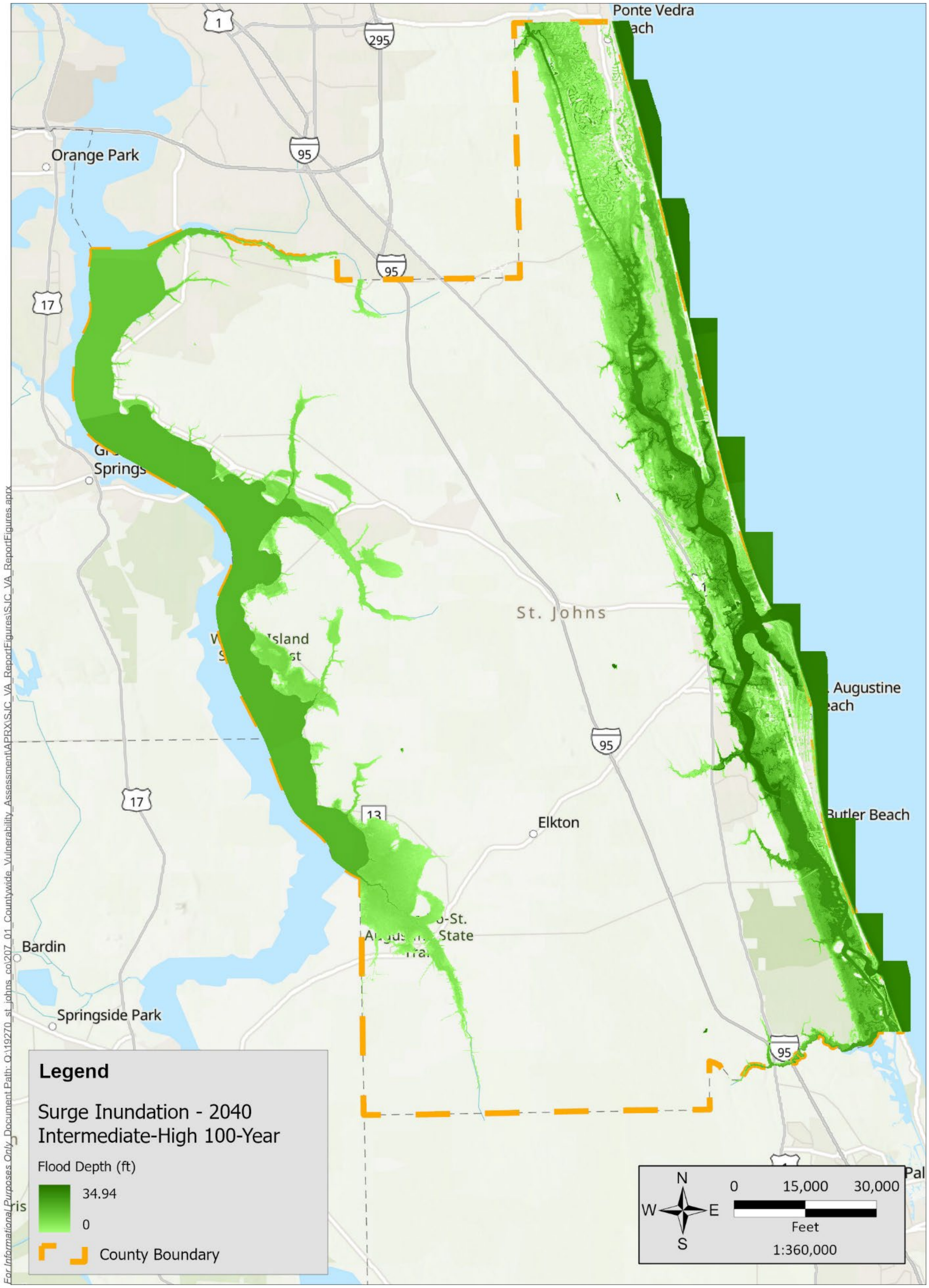


Figure 43 10-Year Storm Surge Flooding under 2070 Intermediate-Low SLR Conditions

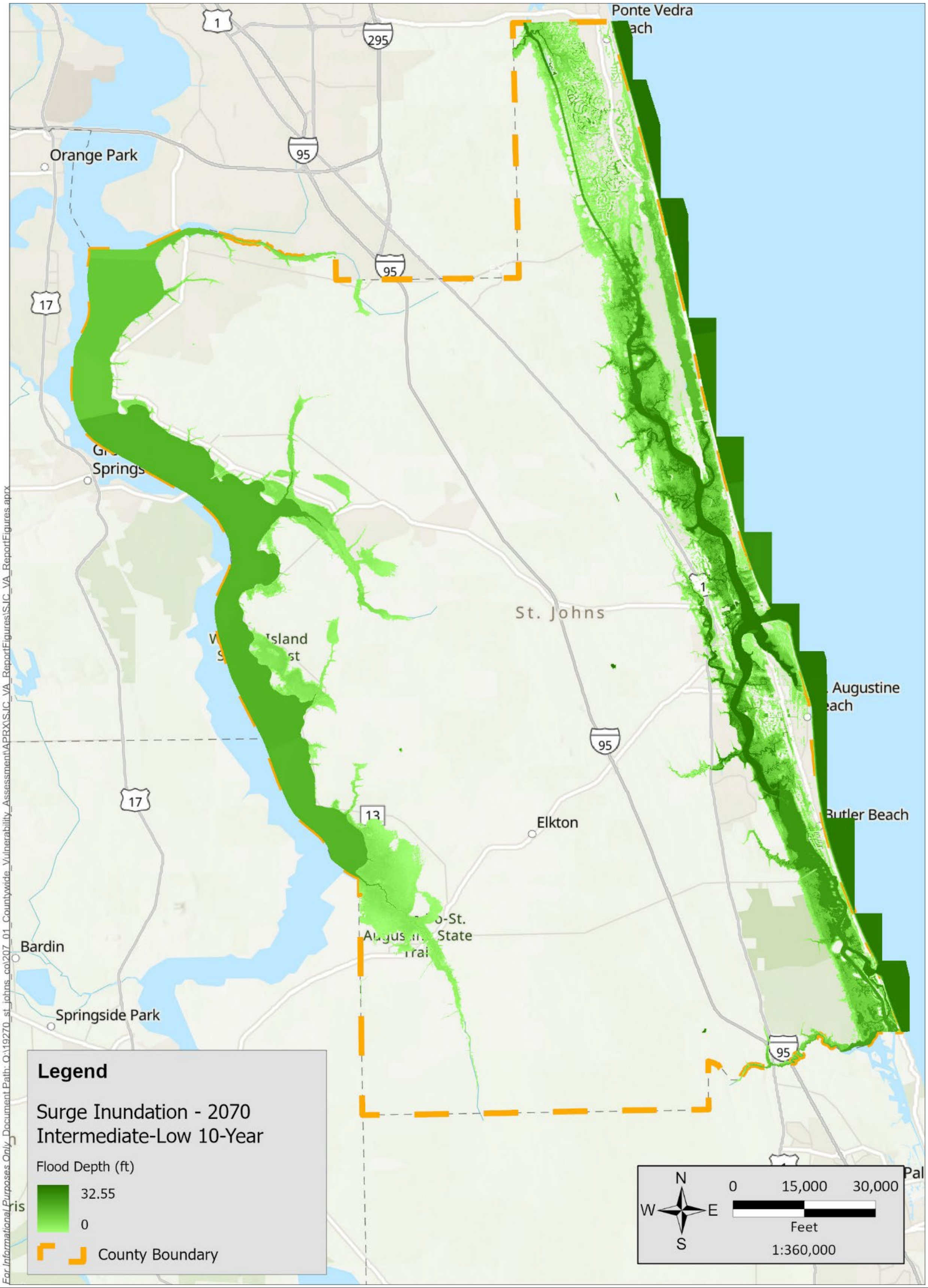


Figure 44 25-Year Storm Surge Flooding under 2070 Intermediate-Low SLR Conditions

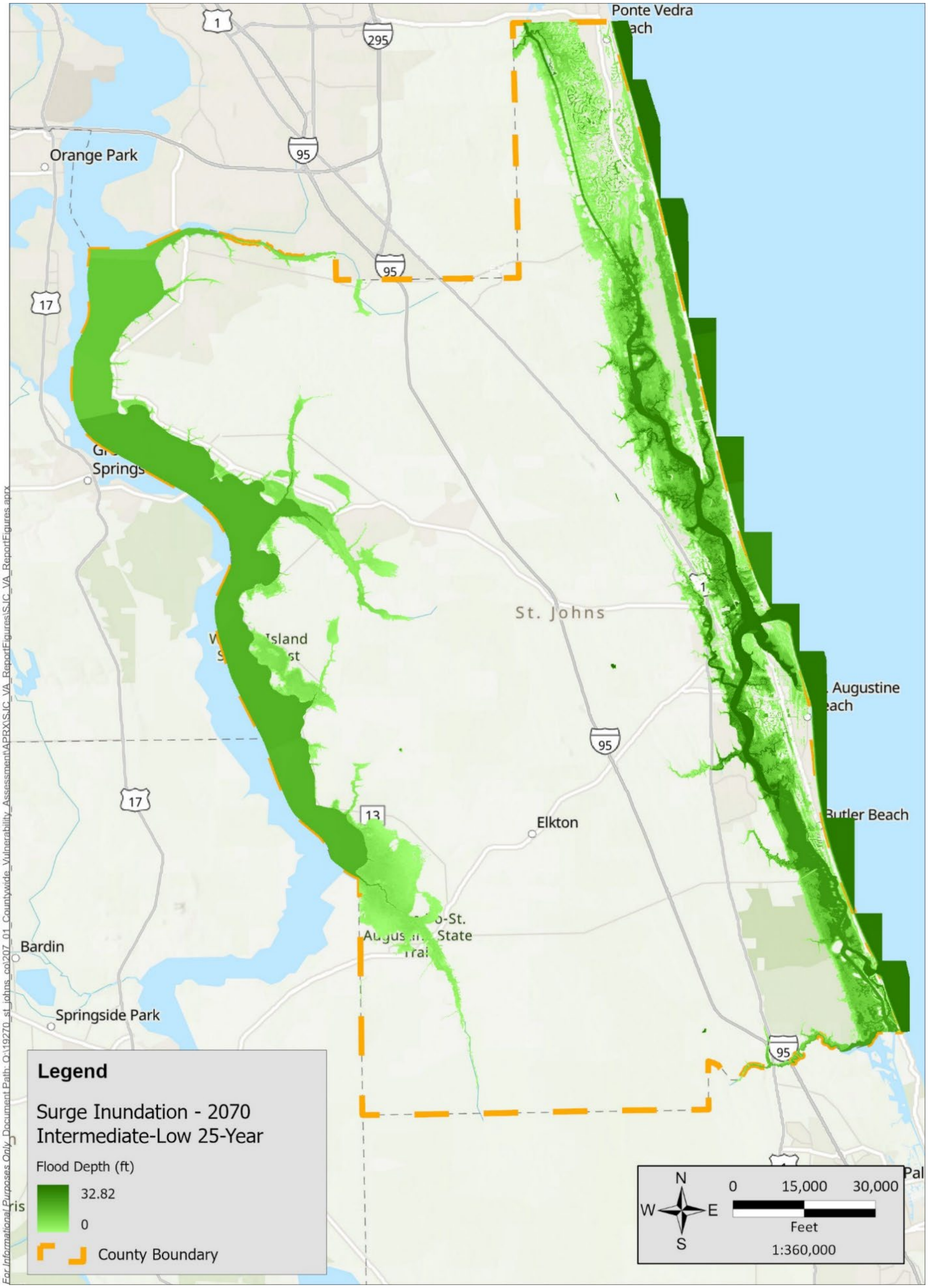


Figure 45 100-Year Storm Surge Flooding under 2070 Intermediate-Low SLR Conditions

Figure 46 10-Year Storm Surge Flooding under 2070 Intermediate-High SLR Conditions

Figure 47 25-Year Storm Surge Flooding under 2070 Intermediate-High SLR Conditions

Figure 48 100-Year Storm Surge Flooding under 2070 Intermediate-High SLR Conditions

8 SENSITIVITY ANALYSIS

The sensitivity analysis measures the impact of flooding on critical and regionally significant assets, applying the data from the exposure analysis to the inventory of critical assets. Requirements for this analysis include:

- Evaluating the impact of flood severity on each asset class at each flood scenario with an assignment of risk level based on the percentage and number of critical assets affected.
- Listing critical and regionally significant assets impacted by flooding. The list must be prioritized by area or immediate need and must identify which flood scenario(s) impacts each asset.

For the sensitivity analysis, Jones Edmunds began by comparing the results from the exposure analysis presented in Part III, Section 7, to the elevations of the critical and regionally significant assets presented in Part II, Section 5. Flood depth and/or number of expected tidal flood days were calculated for each critical asset for every flood scenario. A sensitivity level (high, medium, or low) was assigned to each asset for each scenario based on the asset type and the depth of flooding or the number of expected tidal flood days. Table 14 shows the severity levels assigned by critical asset type. Figure 49 through Figure 88 show the critical asset locations relative to the inundation results for each flood scenario from the exposure analysis.

Jones Edmunds developed a probability-of-failure/consequence-of-failure based methodology to rank and prioritize the vulnerable critical assets. With the sensitivity level assigned for each event as previously described, a weighting factor was developed for the 40 scenarios analyzed. Flood scenarios that occur sooner and more frequently were assigned a higher weighting factor. Table 15 shows the exposure weighting factors assigned for the 40 scenarios. The high/medium/low (H/M/L) sensitivity levels were assigned point values of 5/3/1, respectively. The sensitivity score for each scenario was then multiplied by its respective exposure weighting factor, and the highest scores from the tidal, rainfall, surge, and expected tidal flood days scenarios were totaled. The totals were then normalized by dividing by 40 to generally put scores in the 0 to 10 range. This score characterizes the probability of failure for each asset.

To characterize the consequence of failure, weighting factors were developed by asset type. Each asset type was assigned a flood impact score to characterize the environmental, social, and economic impacts if that type of asset was flooded and not able to function. To weight regionally significant assets higher, assets designated as regionally significant were given a weighting factor of 2.5. Based on feedback received from the public outreach survey discussed in Part II, Section 4.3, a community feedback score was assigned to each asset type. Table 16 shows the environmental, social, and economic impact scores and the community feedback scores assigned to each asset type.

The normalized flooding score was then multiplied by the sum of the regional significance score, the community feedback score, and the average of the three impact scores. Based on a distribution of the results, those numeric values were assigned a priority rating of highest, high, medium, low, lowest, or not vulnerable. Table 17 summarizes the priority ratings assigned by asset type. Attachment 1 shows the results of the sensitivity analysis by asset for tidal flooding, Attachment 2 for rainfall-induced flooding, and Attachment 3 for surge flooding. The results in the Attachments are sorted by the final priority rating assignment.

Table 14 Exposure Level for Critical Assets

Asset Type	Flood Depth Criteria			Flood Depth (in)			Expected Tidal Flood Days Criteria		
	High	Medium	Low	High	Medium	Low	High	Medium	Low
Airports	Exceeds critical elevation	Within 6 inches of critical elevation	Within 6-12 inches of critical elevation	0	-6	-12	30	15	0.1
Bridges	Greater than 12 inches above critical elevation.	Between 6-12 inches above critical elevation.	Greater than critical elevation but less than 6 inches.	12	6	0	30	15	0.1
Bus Terminals	Building flooding or greater than 12 inches of flooding on paved surface	No building flooding and 6-12 inches on paved surface	Between 0-6 inches on paved surface	12	6	0	30	15	0.1
Ports	Building flooding or greater than 12 inches of flooding on paved surface	No building flooding and 6-12 inches on paved surface	Between 0-6 inches on paved surface	12	6	0	30	15	0.1
Roads	Greater than 12 inches	Between 6-12 inches	Between 0-6 inches	12	6	0	30	15	0.1
Marinas	Greater than 12 inches	Between 6-12 inches	Between 0-6 inches	12	6	0	30	15	0.1
Rail Facilities	Building flooding or greater than 12 inches of flooding on paved surface	No building flooding and 6-12 inches on paved surface	Between 0-6 inches on paved surface	12	6	0	30	15	0.1
Railroad Bridges	Greater than 0	Within 3 inches of flooding	Within 6 inches of flooding	0	-3	-6	30	15	0.1
Waste Water Facilities	Greater than 0	Within 3 inches of flooding	Within 6 inches of flooding	0	-3	-6	30	15	0.1
Lift Stations	Greater than 12 inches of flooding	Between 0-12 inches	Within 6 inches of flooding	12	0	-6	30	15	0.1
Step Tank/Grinder Station	Greater than 12 inches of flooding	Between 0-12 inches	Within 6 inches of flooding	12	0	-6	30	15	0.1
Stormwater Facility	Greater than 12 inches of flooding	Between 0-12 inches	Within 6 inches of flooding	12	0	-6	30	15	0.1
Water Treatment Plants	Greater than 0	Within 3 inches of flooding	Within 6 inches of flooding	0	-3	-6	30	15	0.1
Water Supply Wells	Greater than 12 inches of flooding	Within 3 inches of flooding	Within 6 inches of flooding	12	0	-6	30	15	0.1
Ground Storage Tanks	Greater than 0	Within 3 inches of flooding	Within 6 inches of flooding	12	0	-6	30	15	0.1
Water Distribution Pumps	Greater than 0	Within 3 inches of flooding	Within 6 inches of flooding	12	0	-6	30	15	0.1
Electric Facilities	Greater than 0	Within 3 inches of flooding	Within 6 inches of flooding	0	-3	-6	30	15	0.1
Electric Substations	Greater than 6 inches	Between 3-6 inches	Between 0-3 inches	12	6	0	30	15	0.1
Solid and Hazardous Waste Facilities	Greater than 0	Within 3 inches of flooding	Within 6 inches of flooding	0	-3	-6	30	15	0.1
Military Installations	Greater than 0	Within 3 inches of flooding	Within 6 inches of flooding	0	-3	-6	30	15	0.1
Radio Communications Towers	Greater than 6 inches	Between 3-6 inches	Between 0-3 inches	6	3	0	30	15	0.1
Disaster Debris Management Sites	Greater than 6 inches	Between 3-6 inches	Between 0-3 inches	6	3	0	30	15	0.1
Schools	Greater than 0	Within 3 inches of flooding	Within 6 inches of flooding	0	-3	-6	30	15	0.1
Day Cares	Greater than 0	Within 3 inches of flooding	Within 6 inches of flooding	0	-3	-6	30	15	0.1
Colleges and Universities	Greater than 0	Within 3 inches of flooding	Within 6 inches of flooding	0	-3	-6	30	15	0.1
Community Centers	Greater than 0	Within 3 inches of flooding	Within 6 inches of flooding	0	-3	-6	30	15	0.1
Correctional Facilities	Greater than 0	Within 3 inches of flooding	Within 6 inches of flooding	0	-3	-6	30	15	0.1
Disaster Recovery Centers	Greater than 0	Within 3 inches of flooding	Within 6 inches of flooding	0	-3	-6	30	15	0.1
Emergency Medical Service Facilities	Greater than 0	Within 3 inches of flooding	Within 6 inches of flooding	0	-3	-6	30	15	0.1
Emergency Operation Centers	Greater than 0	Within 3 inches of flooding	Within 6 inches of flooding	0	-3	-6	30	15	0.1
Fire Stations	Greater than 0	Within 3 inches of flooding	Within 6 inches of flooding	0	-3	-6	30	15	0.1
Health Care Facilities	Greater than 0	Within 3 inches of flooding	Within 6 inches of flooding	0	-3	-6	30	15	0.1
Hospitals	Greater than 0	Within 3 inches of flooding	Within 6 inches of flooding	0	-3	-6	30	15	0.1
Law Enforcement Facilities	Greater than 0	Within 3 inches of flooding	Within 6 inches of flooding	0	-3	-6	30	15	0.1
Local Government Facilities	Greater than 0	Within 3 inches of flooding	Within 6 inches of flooding	0	-3	-6	30	15	0.1
Affordable Public Housing	Greater than 0	Within 3 inches of flooding	Within 6 inches of flooding	0	-3	-6	30	15	0.1
Risk Shelter Inventory	Greater than 0	Within 3 inches of flooding	Within 6 inches of flooding	0	-3	-6	30	15	0.1
State Government Facilities	Greater than 0	Within 3 inches of flooding	Within 6 inches of flooding	0	-3	-6	30	15	0.1
Conservation Lands	Greater than 24 inches	Between 18-24 inches	Between 12-18 inches	24	18	12	30	15	0.1
Parks	Greater than 36 inches	Between 24-36 inches	Between 12-24 inches	36	24	12	30	15	0.1
Park Assets	Greater than 6 inches	Between 3-6 inches	Between 0-3 inches	6	3	0	30	15	0.1
Shorelines	Greater than 24 inches	Between 18-24 inches	Between 12-18 inches	24	18	12	30	15	0.1
Surface Waters	Greater than 24 inches	Between 18-24 inches	Between 12-18 inches	24	18	12	30	15	0.1
Wetlands	Greater than 24 inches	Between 18-24 inches	Between 12-18 inches	24	18	12	30	15	0.1
Historical and Cultural Assets	Greater than 0	Within 3 inches of flooding	Within 6 inches of flooding	0	-3	-6	30	15	0.1
Historical Cultural Assets - Sites	Greater than 0	Within 3 inches of flooding	Within 6 inches of flooding	0	-3	-6	30	15	0.1

Table 15 Exposure Weighting Factors

Flood Scenario	Exposure Type Factor	Planning Horizon Scale Factor	Total Exposure Factor	Rank
Tidal Flooding – Existing	10	5	50	1
Tidal Flooding – 2040 – Intermediate-Low		4	40	2
Tidal Flooding – 2040 – Intermediate-High		3	30	6
Tidal Flooding – 2070 – Intermediate-Low		2	20	15
Tidal Flooding – 2070 – Intermediate-High		1	10	27
Rainfall Flooding – 25-Year – Existing	5	6	30	6
Rainfall Flooding – 100-Year – Existing	4		24	11
Rainfall Flooding – 500-Year – Existing	3		18	19
Rainfall Flooding – 25-Year – 2040 Intermediate-Low	5	4	20	15
Rainfall Flooding – 100-Year – 2040 Intermediate-Low	3		12	25
Rainfall Flooding – 500-Year – 2040 Intermediate-Low	1		4	40
Rainfall Flooding – 25-Year – 2040 Intermediate-High	5	3	15	21
Rainfall Flooding – 100-Year – 2040 Intermediate-High	3		9	31
Rainfall Flooding – 500-Year – 2040 Intermediate-High	1		3	41
Rainfall Flooding – 25-Year – 2070 Intermediate-Low	5	2	10	27
Rainfall Flooding – 100-Year – 2070 Intermediate-Low	3		6	35
Rainfall Flooding – 500-Year – 2070 Intermediate-Low	1		2	44
Rainfall Flooding – 25-Year – 2070 Intermediate-High	5	1	5	37
Rainfall Flooding – 100-Year – 2070 Intermediate-High	3		3	41
Rainfall Flooding – 500-Year – 2070 Intermediate-High	1		1	45
Surge Flooding – 10-Year – Existing	6	6	36	4
Surge Flooding – 25-Year – Existing	5		30	6
Surge Flooding – 100-Year – Existing	4		24	11
Surge Flooding – 10-Year – 2040 Intermediate-Low	7	4	28	9
Surge Flooding – 25-Year – 2040 Intermediate-Low	5		20	15
Surge Flooding – 100-Year – 2040 Intermediate-Low	3		12	25
Surge Flooding – 10-Year – 2040 Intermediate-High	7	3	21	14
Surge Flooding – 25-Year – 2040 Intermediate-High	5		15	21
Surge Flooding – 100-Year – 2040 Intermediate-High	3		9	31
Surge Flooding – 10-Year – 2070 Intermediate-Low	7	2	14	24
Surge Flooding – 25-Year – 2070 Intermediate-Low	5		10	27
Surge Flooding – 100-Year – 2070 Intermediate-Low	3		6	35
Surge Flooding – 10-Year 2070 – Intermediate-High	7	1	7	34
Surge Flooding – 25-Year – 2070 Intermediate-High	5		5	37
Surge Flooding – 100-Year – 2070 Intermediate-High	3		3	41
Tidal Flood Days – Existing	8	5	40	2
Tidal Flood Days – 2040 Intermediate-Low		4	32	5
Tidal Flood Days – 2040 Intermediate-High		3	24	11
Tidal Flood Days – 2070 Intermediate-Low		2	16	20
Tidal Flood Days – 2070 Intermediate-High		1	8	33

Figure 49 Critical Assets with Rainfall-Induced Flooding for the 25-Year, 24-Hour Storm Event under Existing Conditions

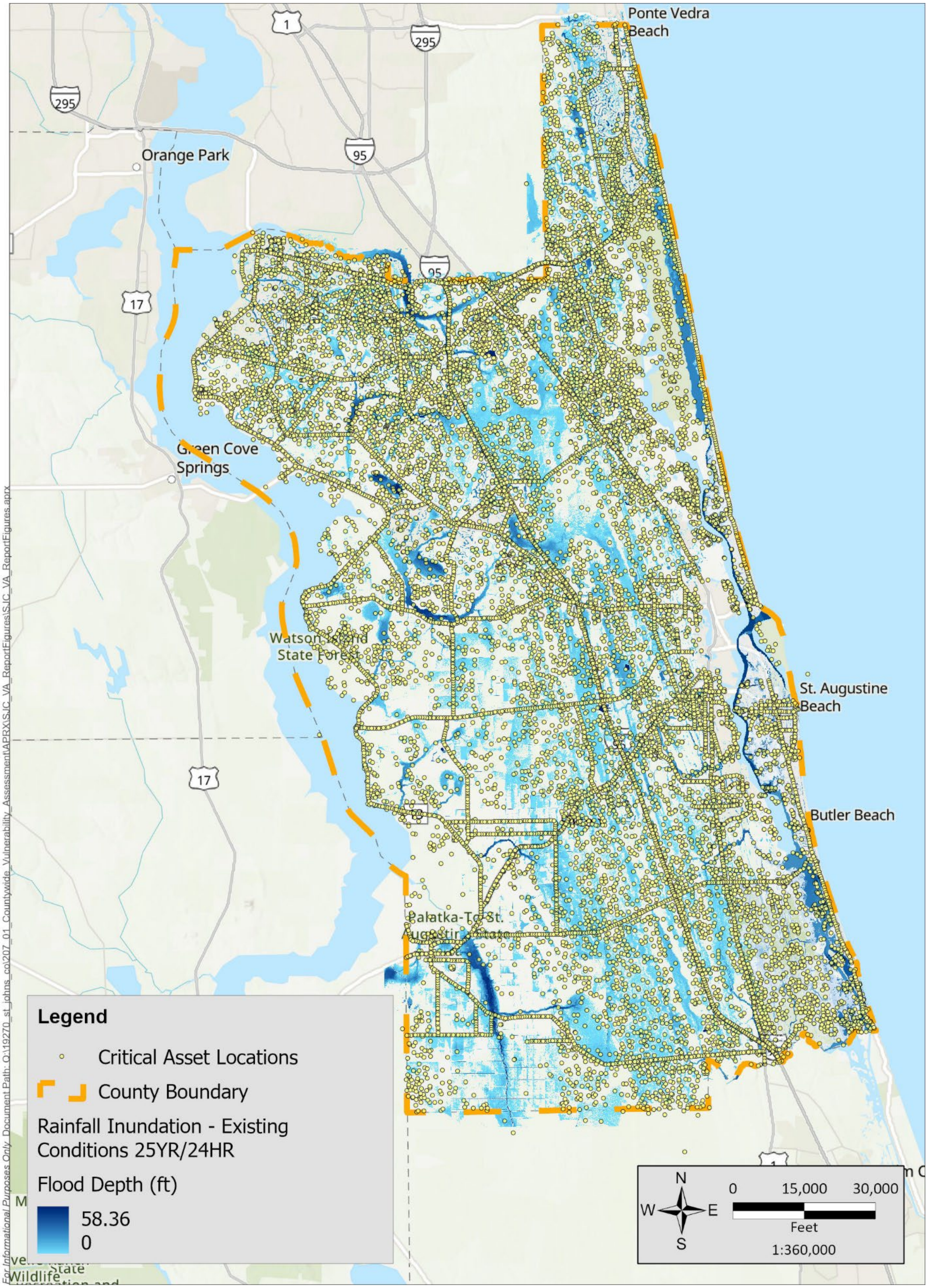


Figure 50 Critical Assets with Rainfall-Induced Flooding for the 100-Year, 24-Hour Storm Event under Existing Conditions

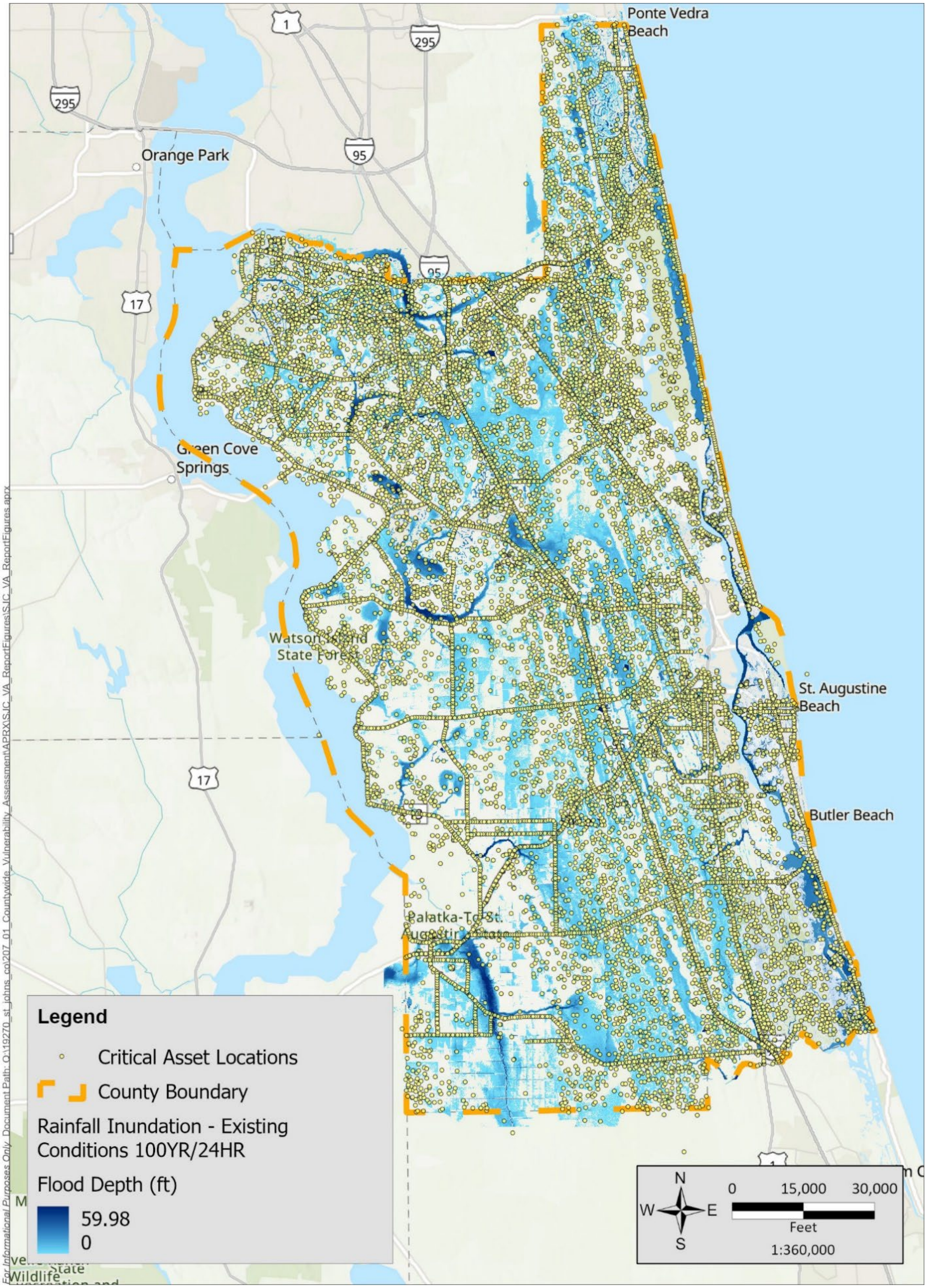


Figure 51 Critical Assets with Rainfall-Induced Flooding for the 500-Year, 24-Hour Storm Event under Existing Conditions

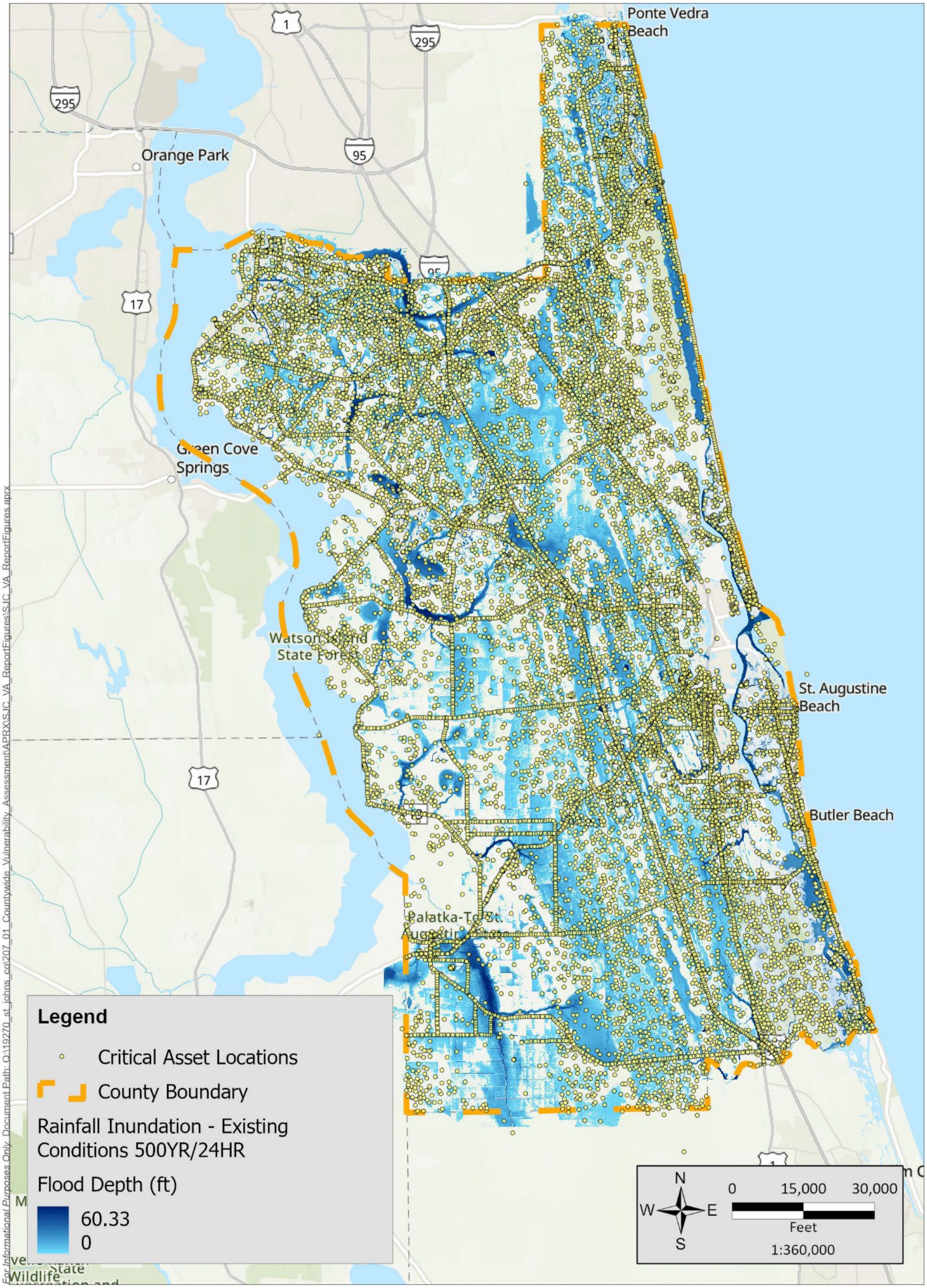


Figure 52 Critical Assets with Rainfall-Induced Flooding for the 25-Year, 24-Hour Storm Event under 2040 Intermediate-Low SLR Conditions

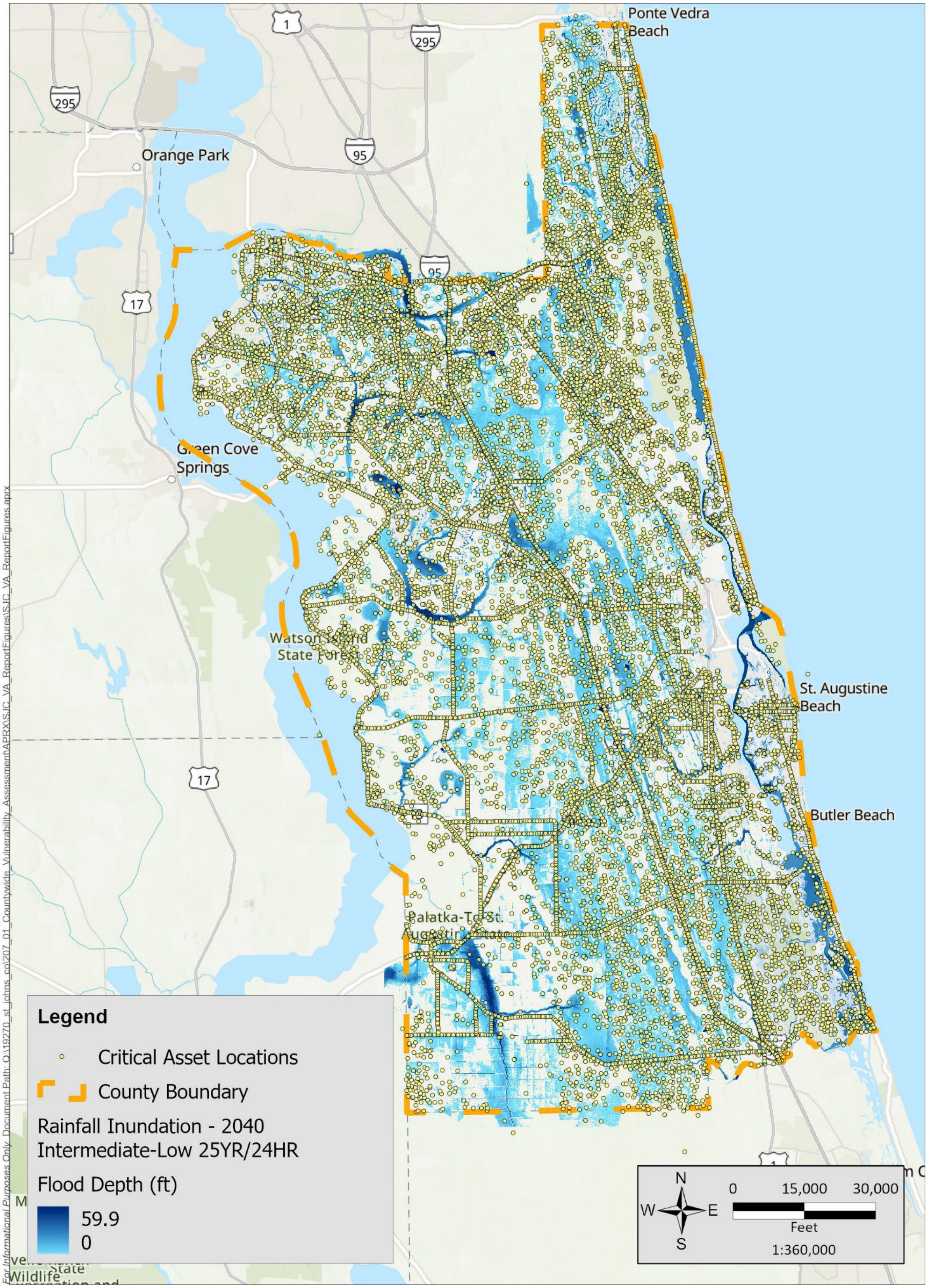


Figure 53 Critical Assets with Rainfall-Induced Flooding for the 25-Year, 24-Hour Storm Event under 2040 Intermediate-High SLR Conditions

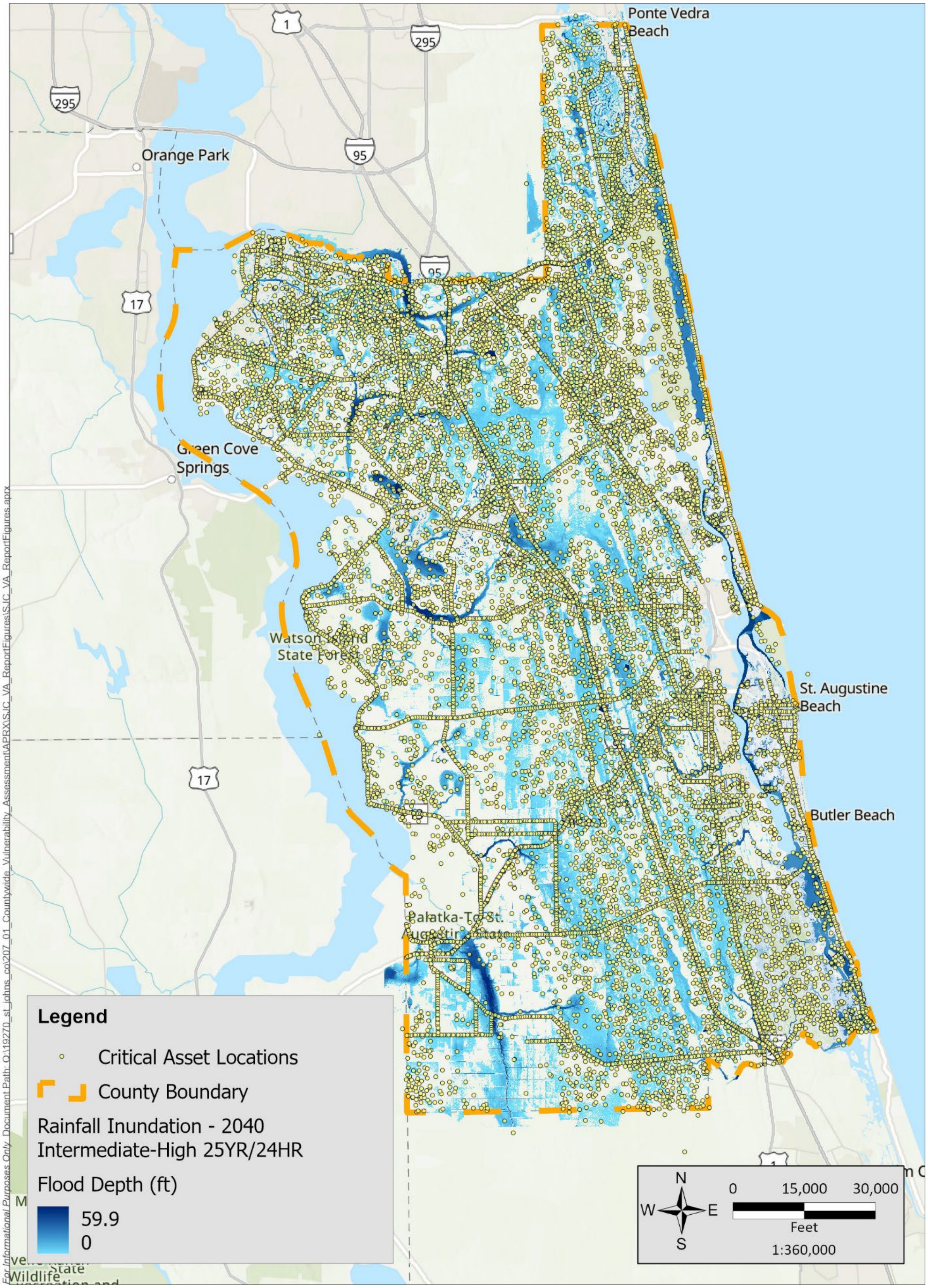


Figure 54 Critical Assets with Rainfall-Induced Flooding for the 100-Year, 24-Hour Storm Event under 2040 Intermediate-Low SLR Conditions

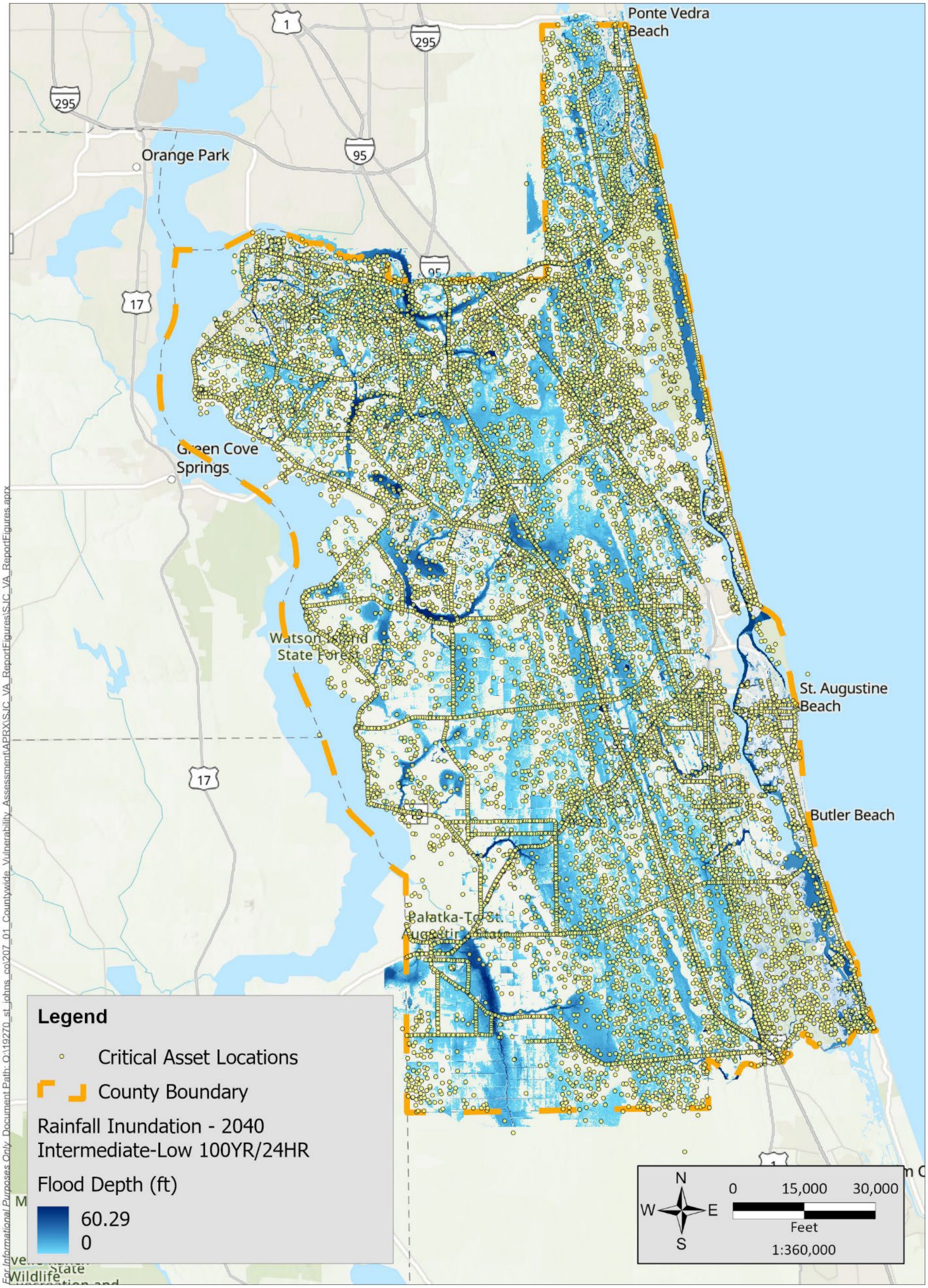


Figure 55 Critical Assets with Rainfall-Induced Flooding for the 100-Year, 24-Hour Storm Event under 2040 Intermediate-High SLR Conditions

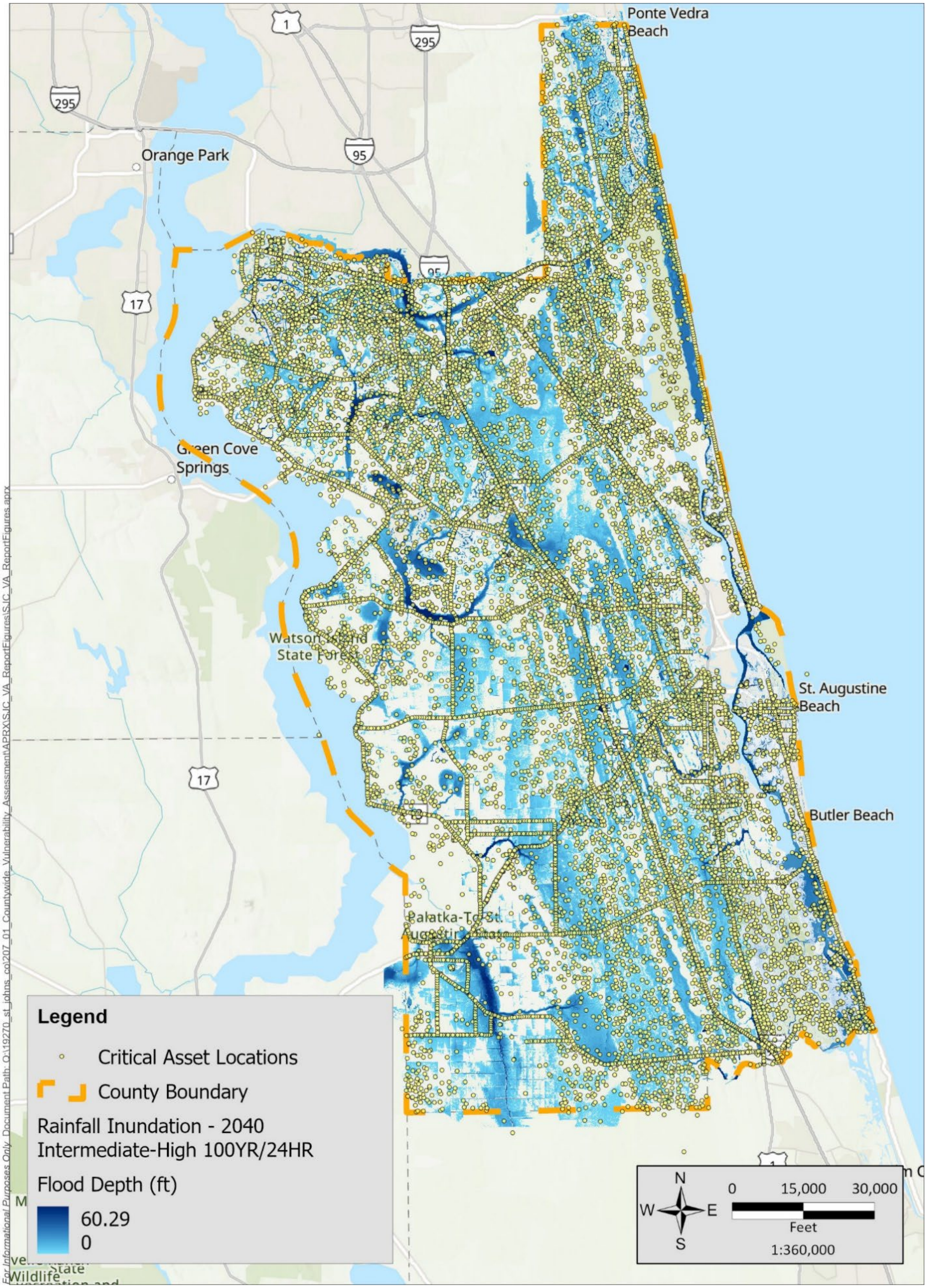


Figure 56 Critical Assets with Rainfall-Induced Flooding for the 500-Year, 24-Hour Storm Event under 2040 Intermediate-Low SLR Conditions

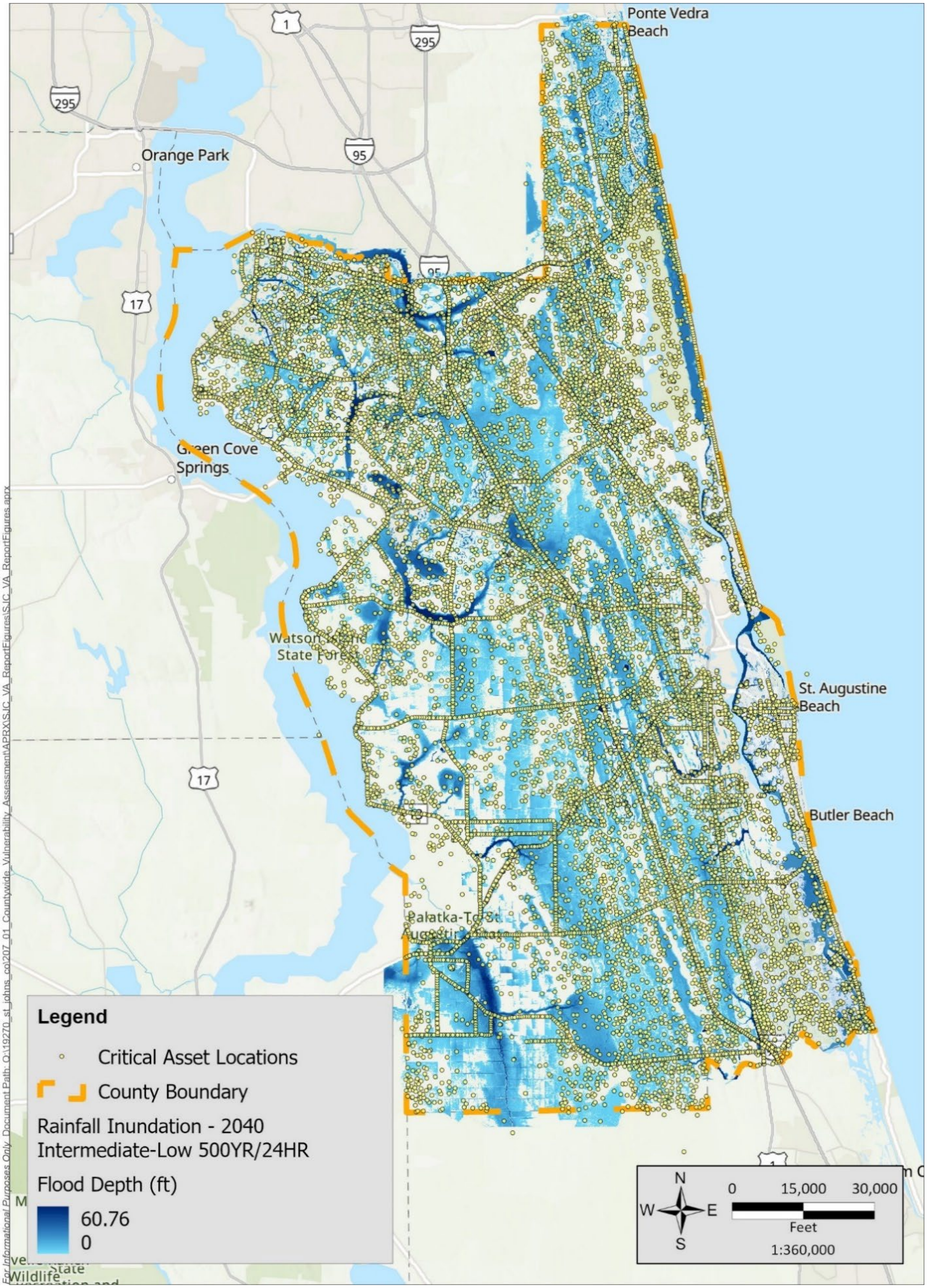


Figure 57 Critical Assets with Rainfall-Induced Flooding for the 500-Year, 24-Hour Storm Event under 2040 Intermediate-High SLR Conditions

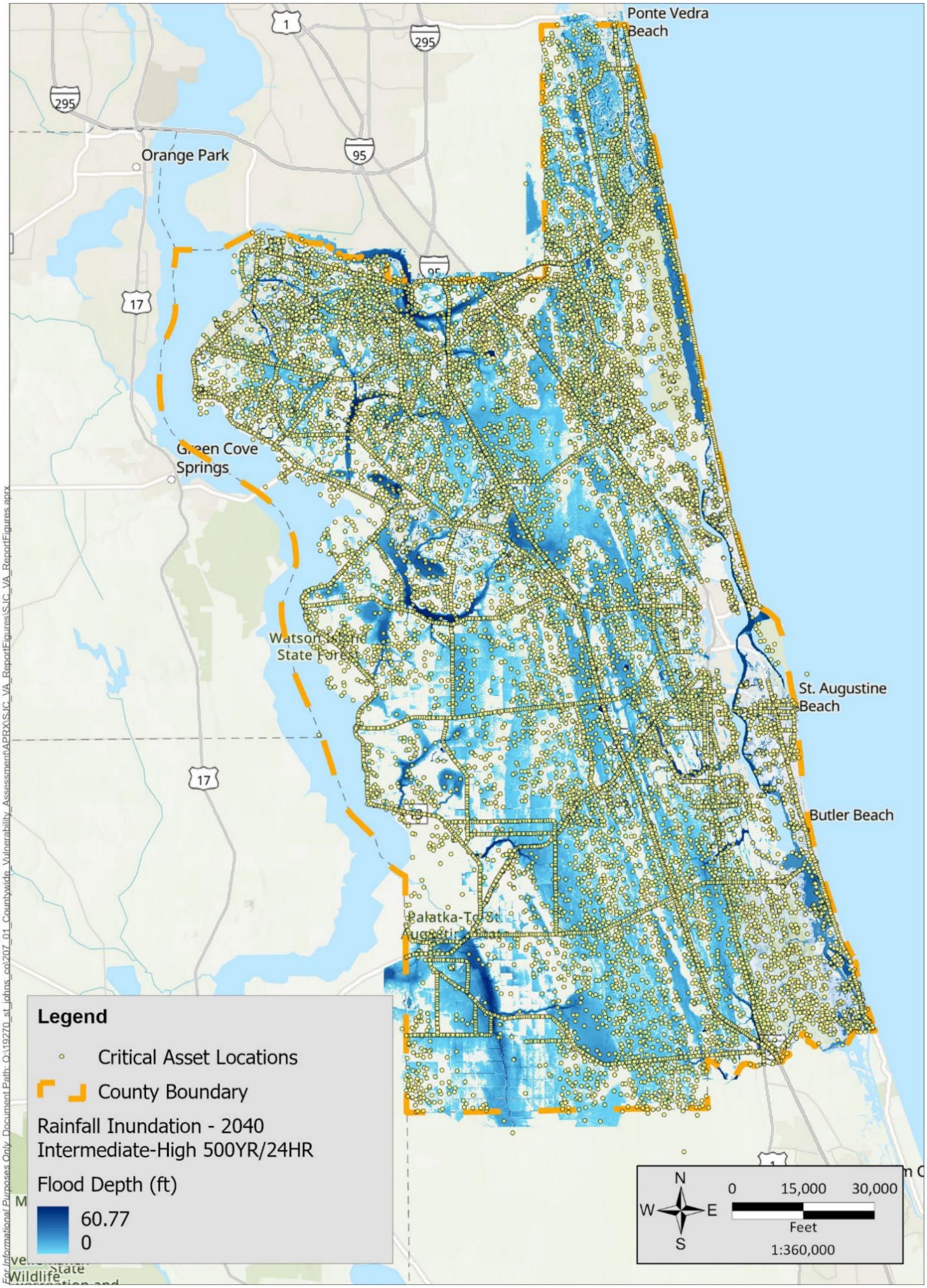


Figure 58 Critical Assets with Rainfall-Induced Flooding for the 25-Year, 24-Hour Storm Event under 2070 Intermediate-Low SLR Conditions

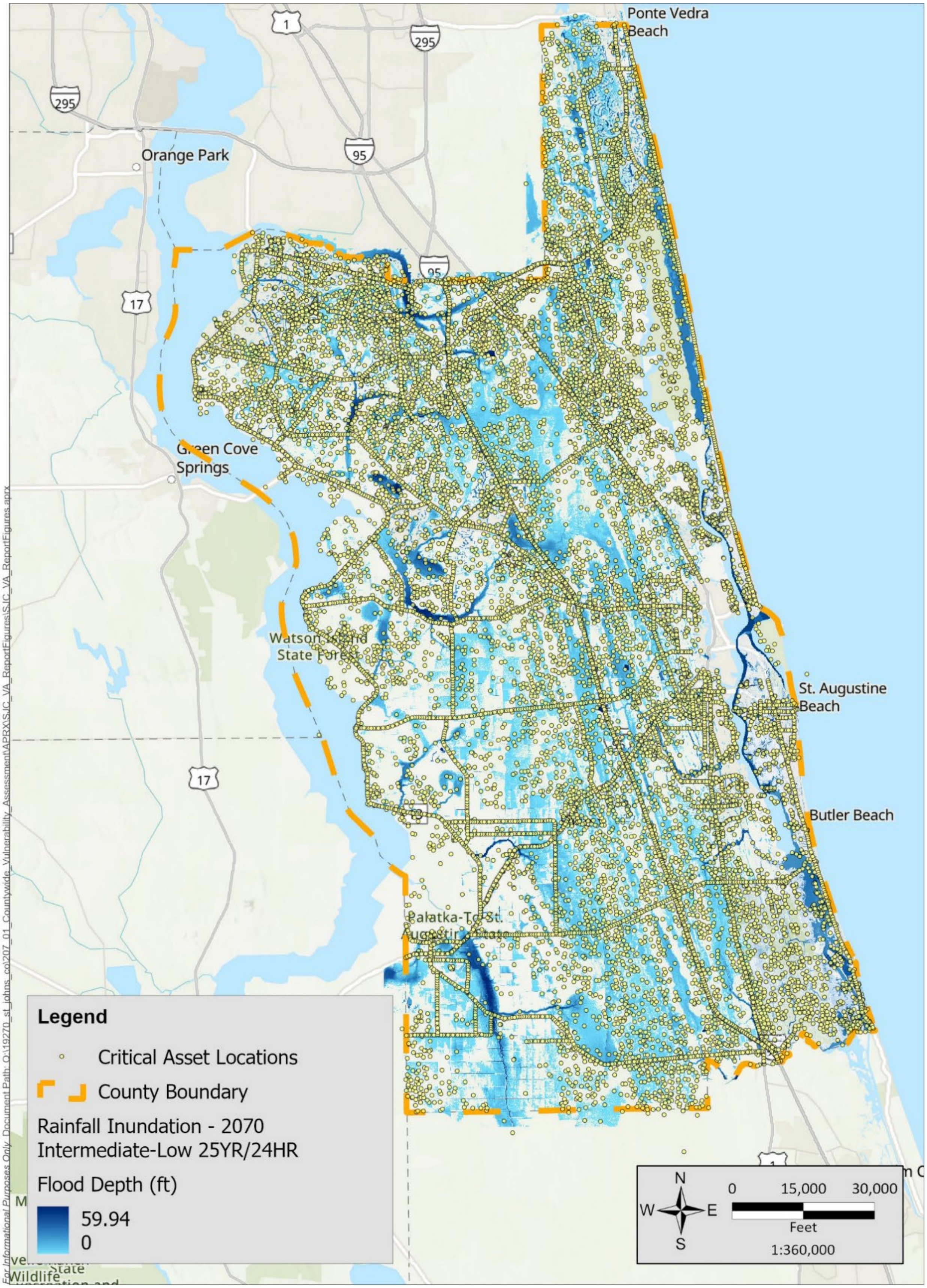


Figure 59 Critical Assets with Rainfall-Induced Flooding for the 25-Year, 24-Hour Storm Event under 2070 Intermediate-High SLR Conditions

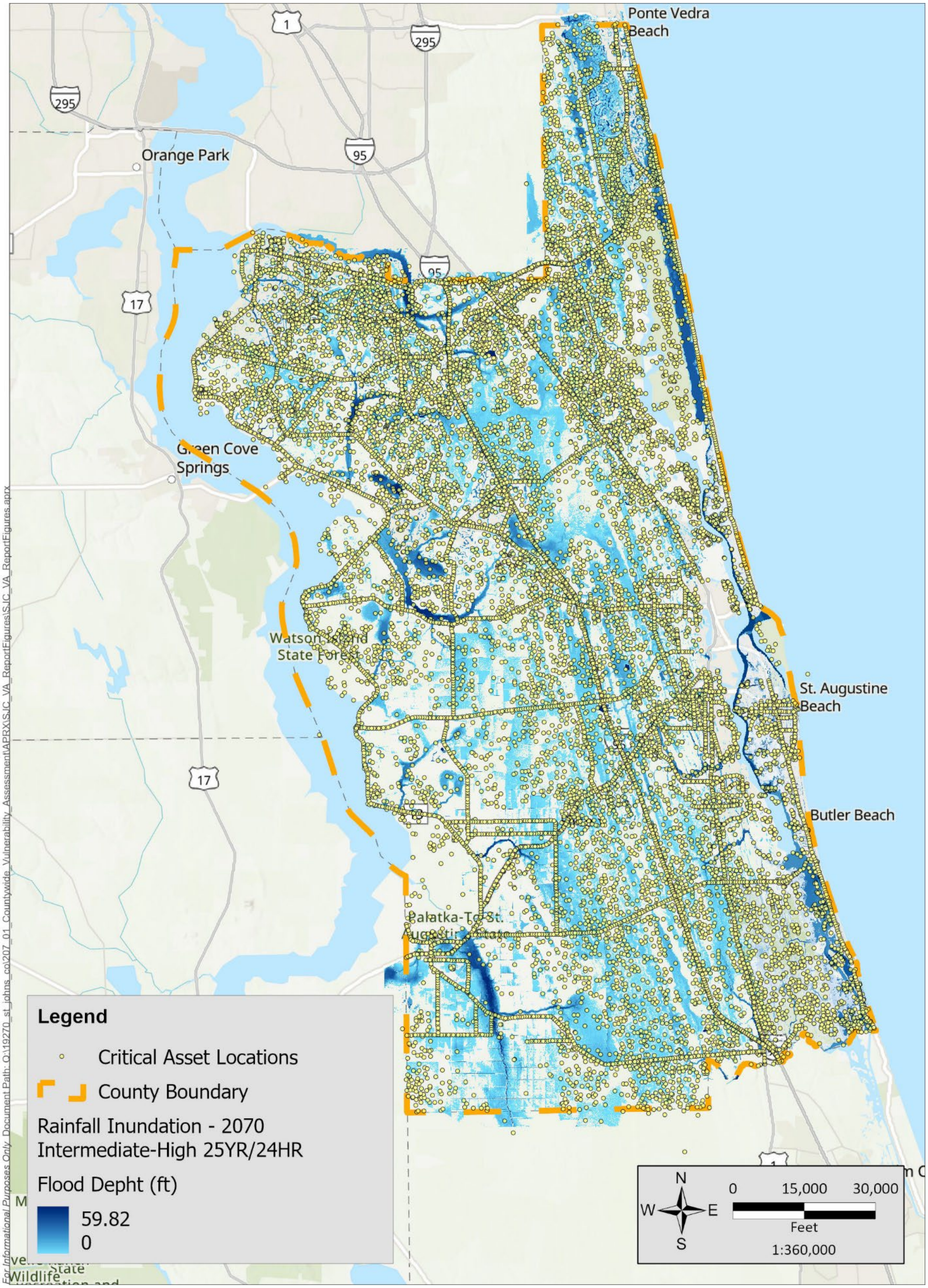


Figure 60 Critical Assets with Rainfall-Induced Flooding for the 100-Year, 24-Hour Storm Event under 2070 Intermediate-Low SLR Conditions

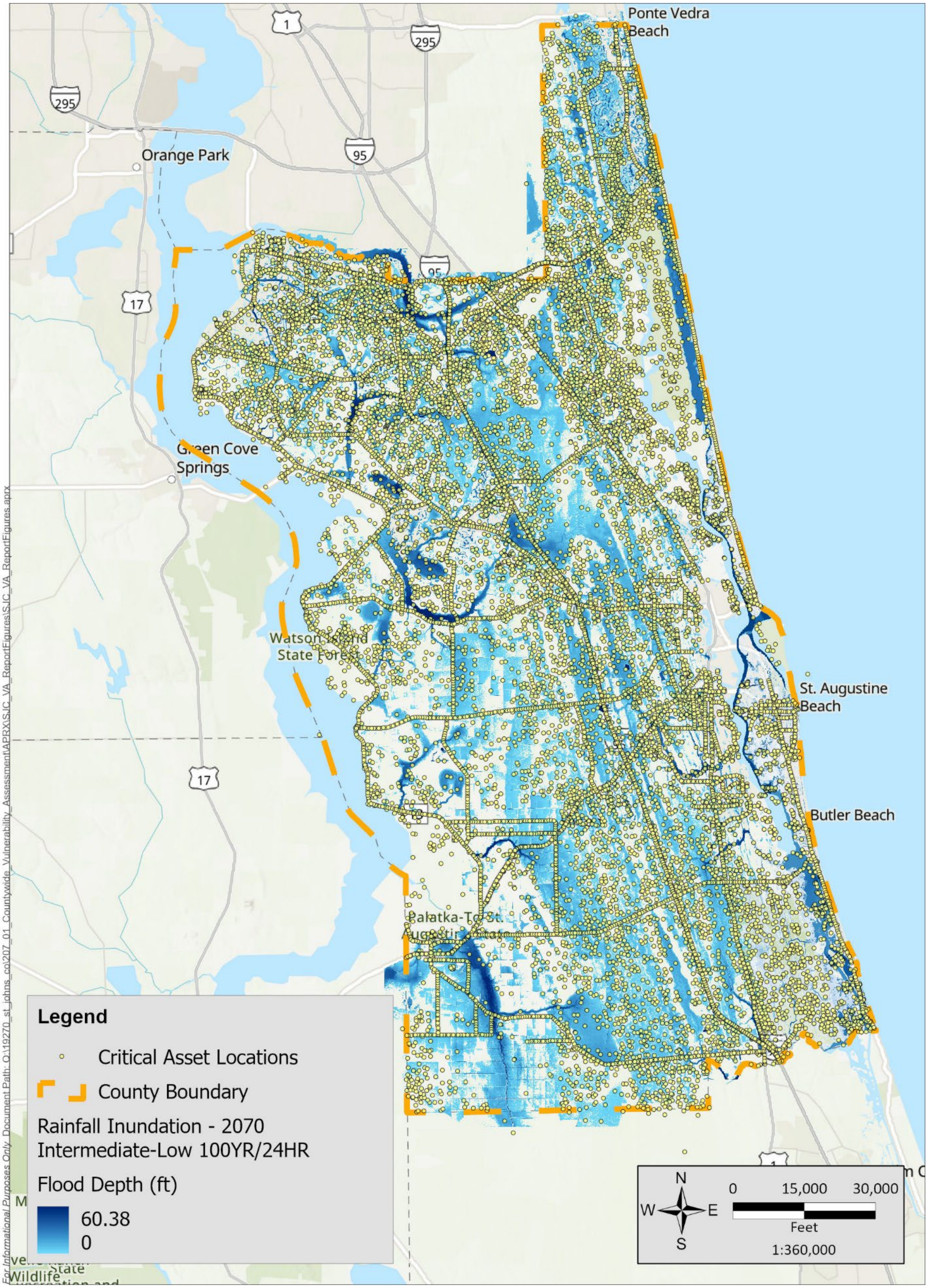


Figure 61 Critical Assets with Rainfall-Induced Flooding for the 100-Year, 24-Hour Storm Event under 2070 Intermediate-High SLR Conditions

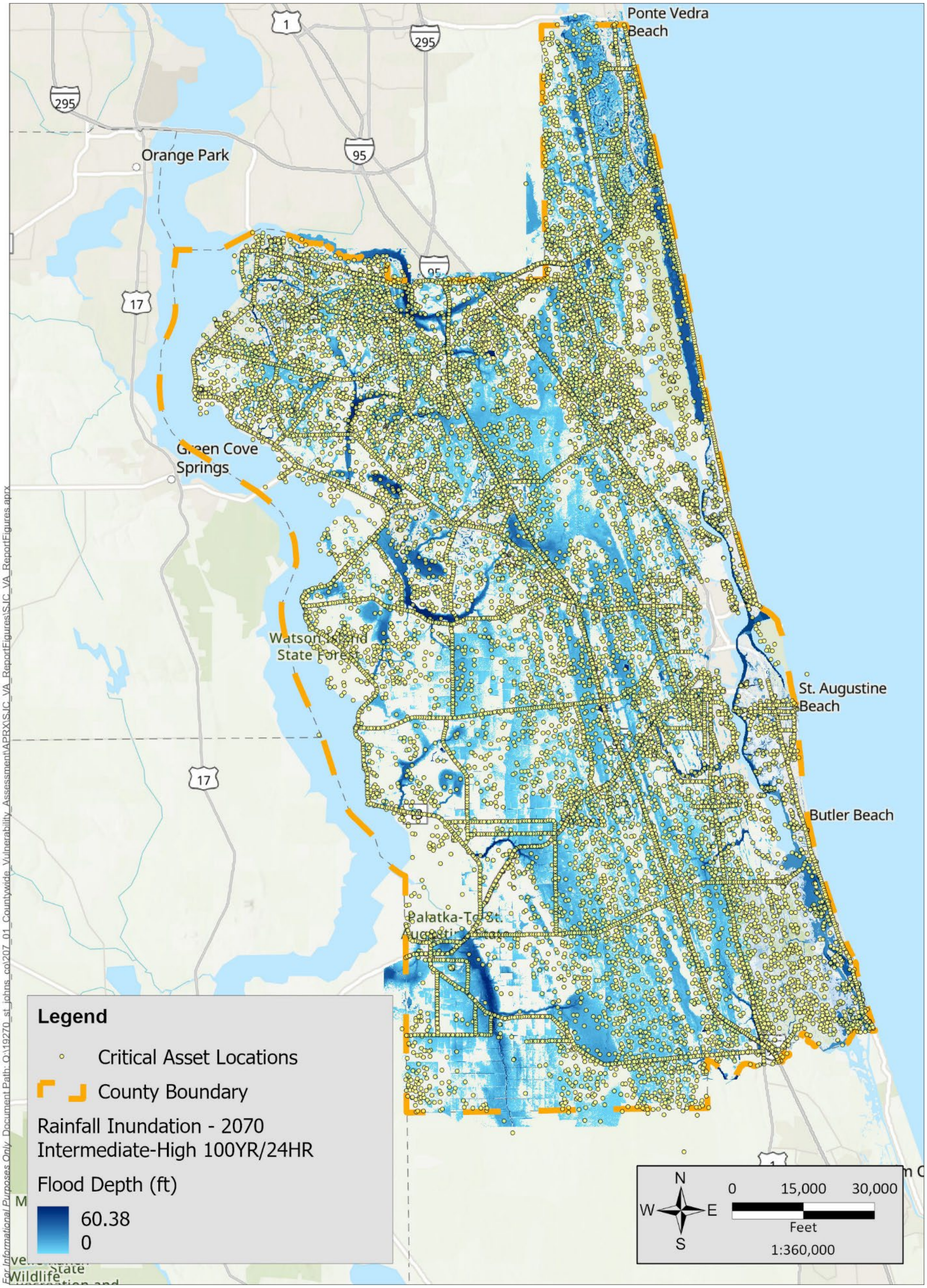


Figure 62 Critical Assets with Rainfall-Induced Flooding for the 500-Year, 24-Hour Storm Event under 2070 Intermediate-Low SLR Conditions

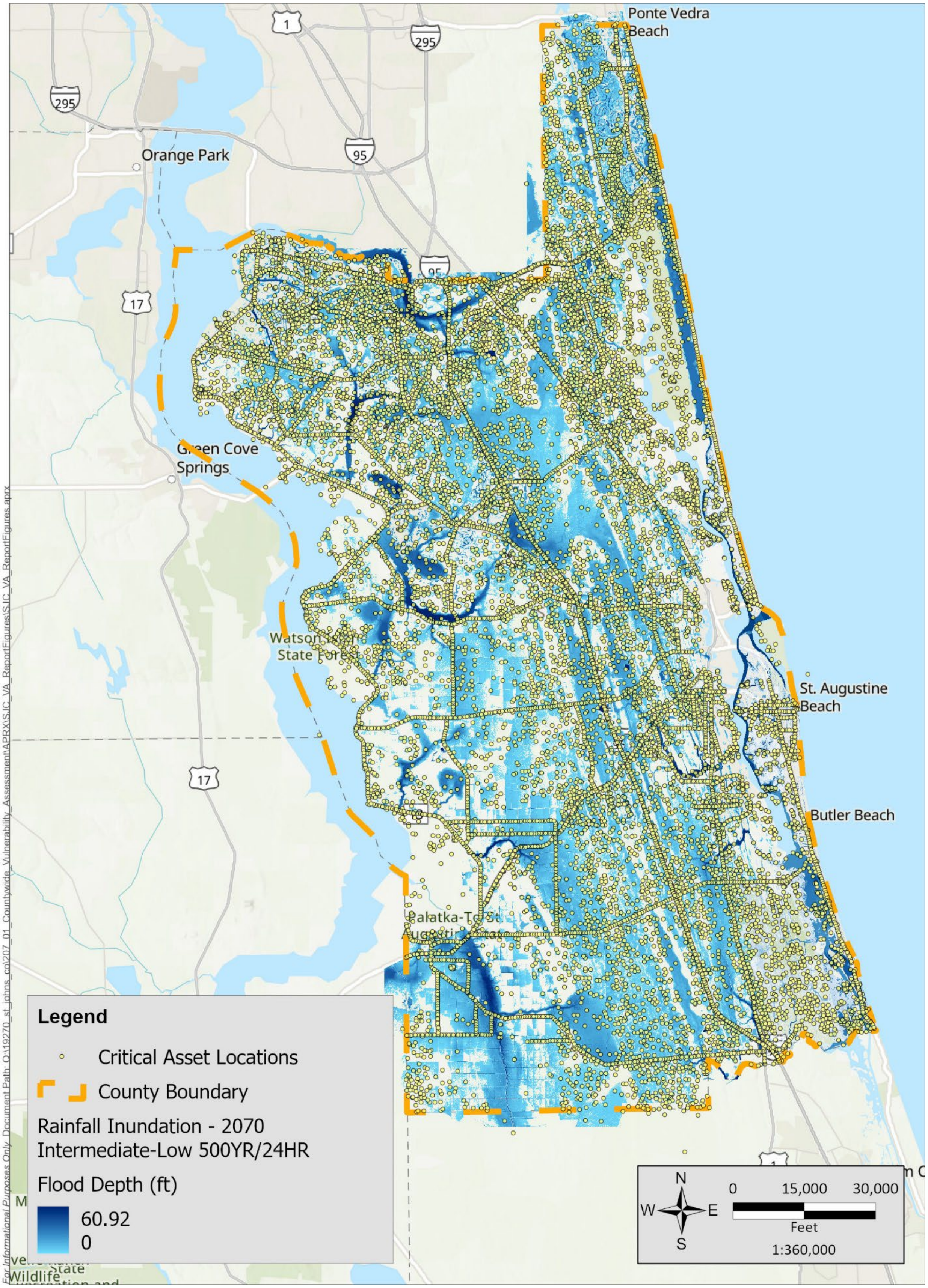


Figure 63 Critical Assets with Rainfall-Induced Flooding for the 500-Year, 24-Hour Storm Event under 2070 Intermediate-High SLR Conditions

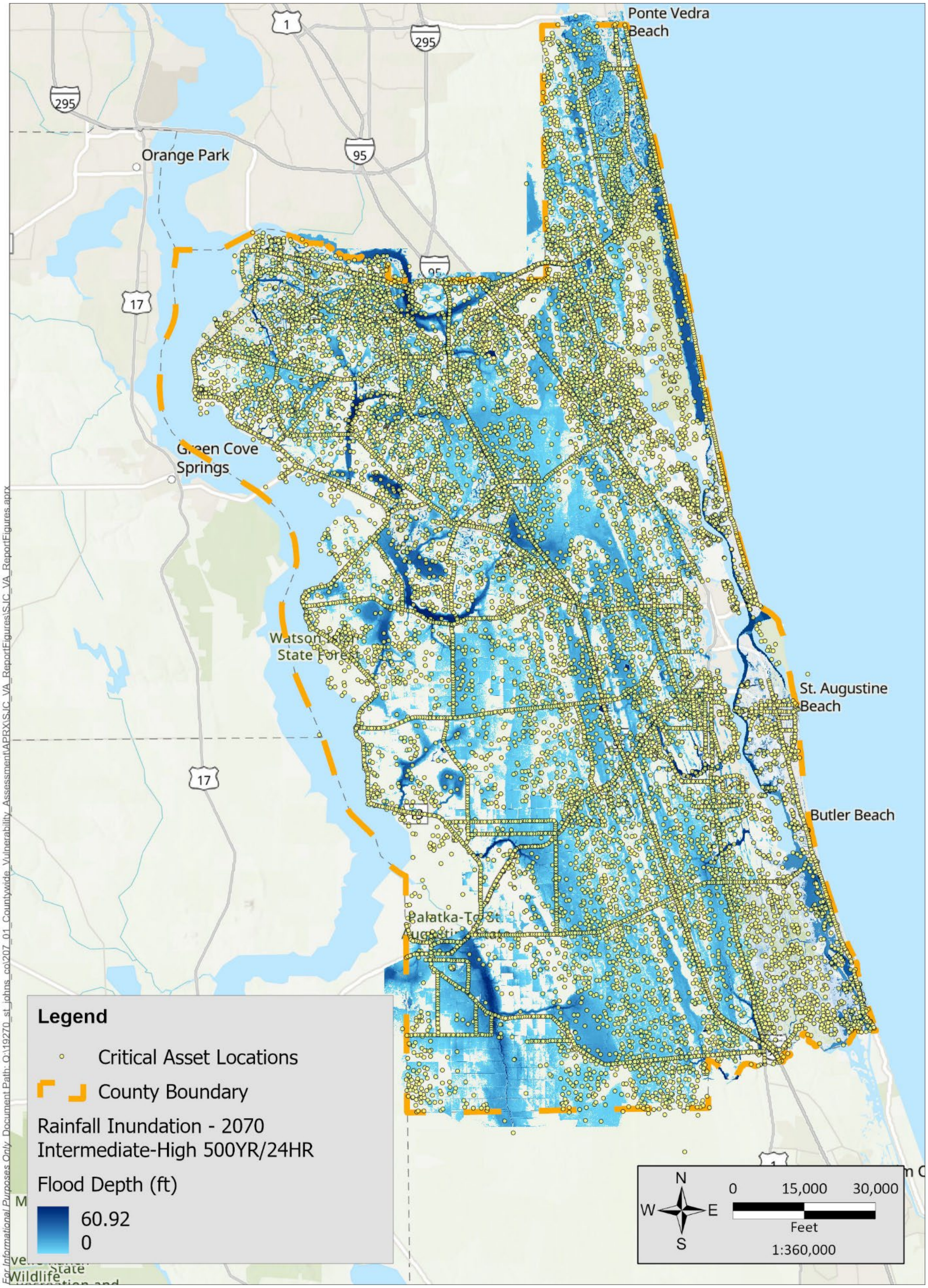


Figure 64 Critical Assets with High Tide Flooding Days under Existing Conditions

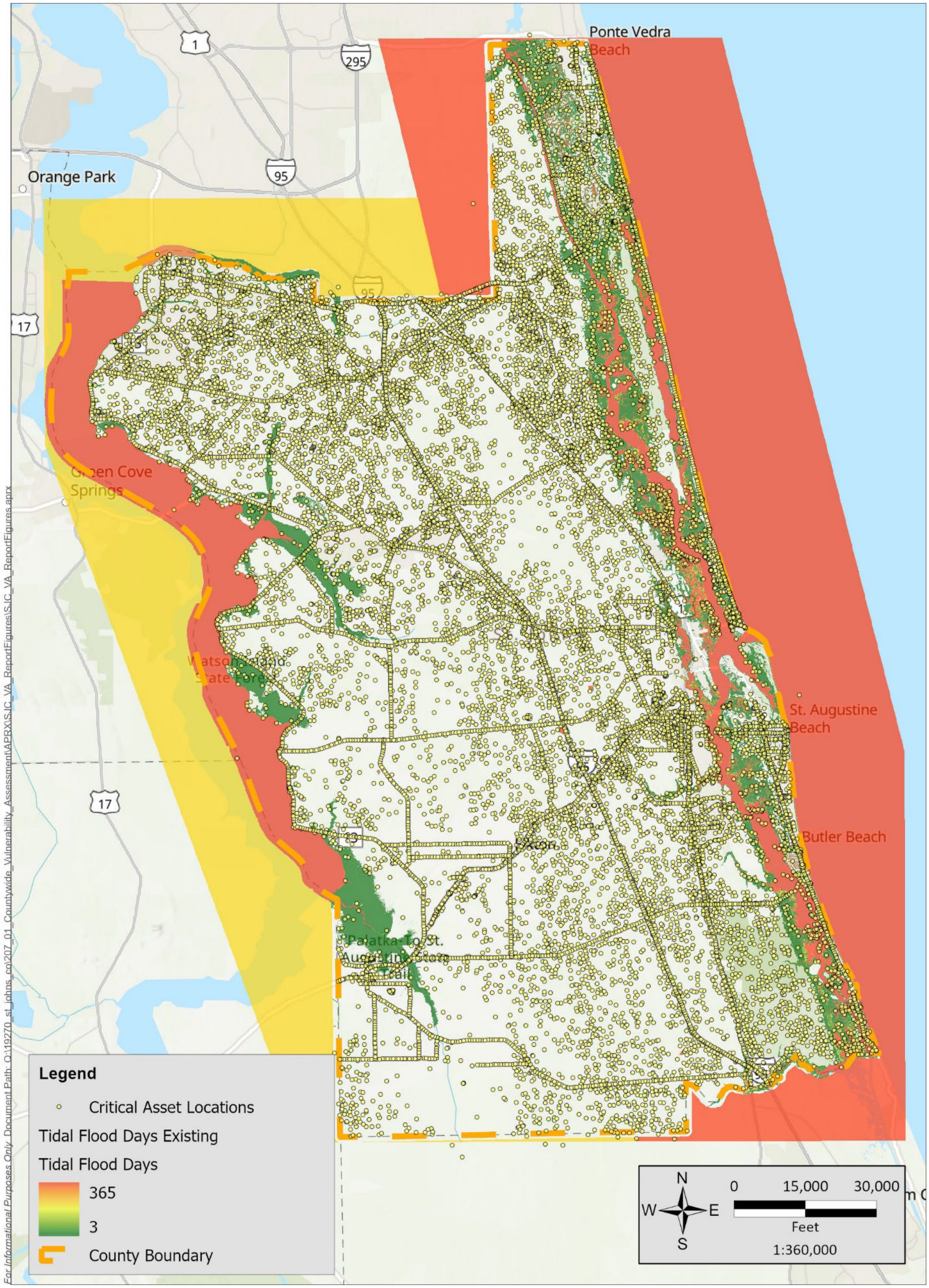


Figure 65 Critical Assets with High Tide Flooding Days 2040 Intermediate-Low SLR Conditions

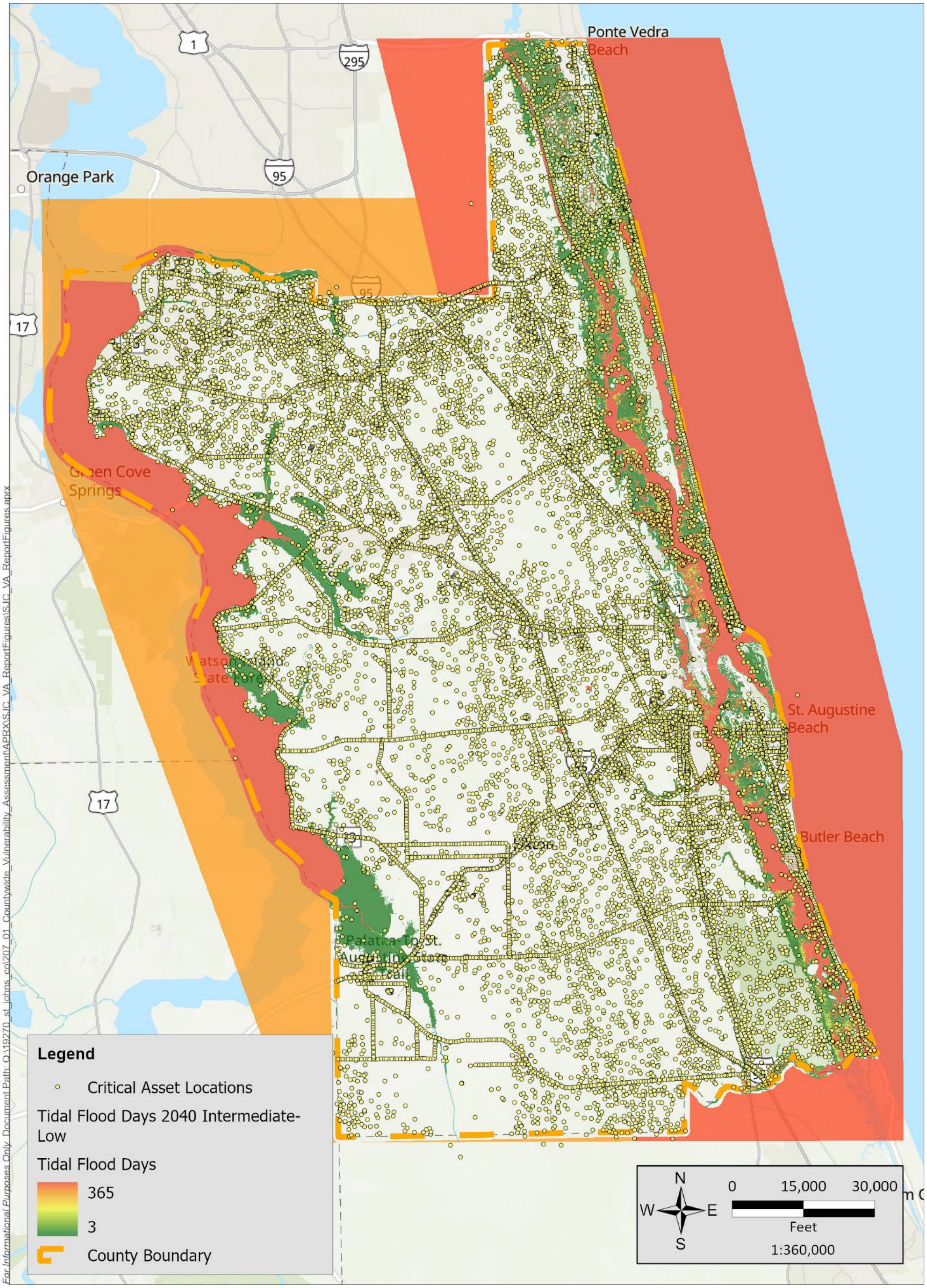


Figure 66 Critical Assets with High Tide Flooding Days 2040 Intermediate-High SLR Conditions

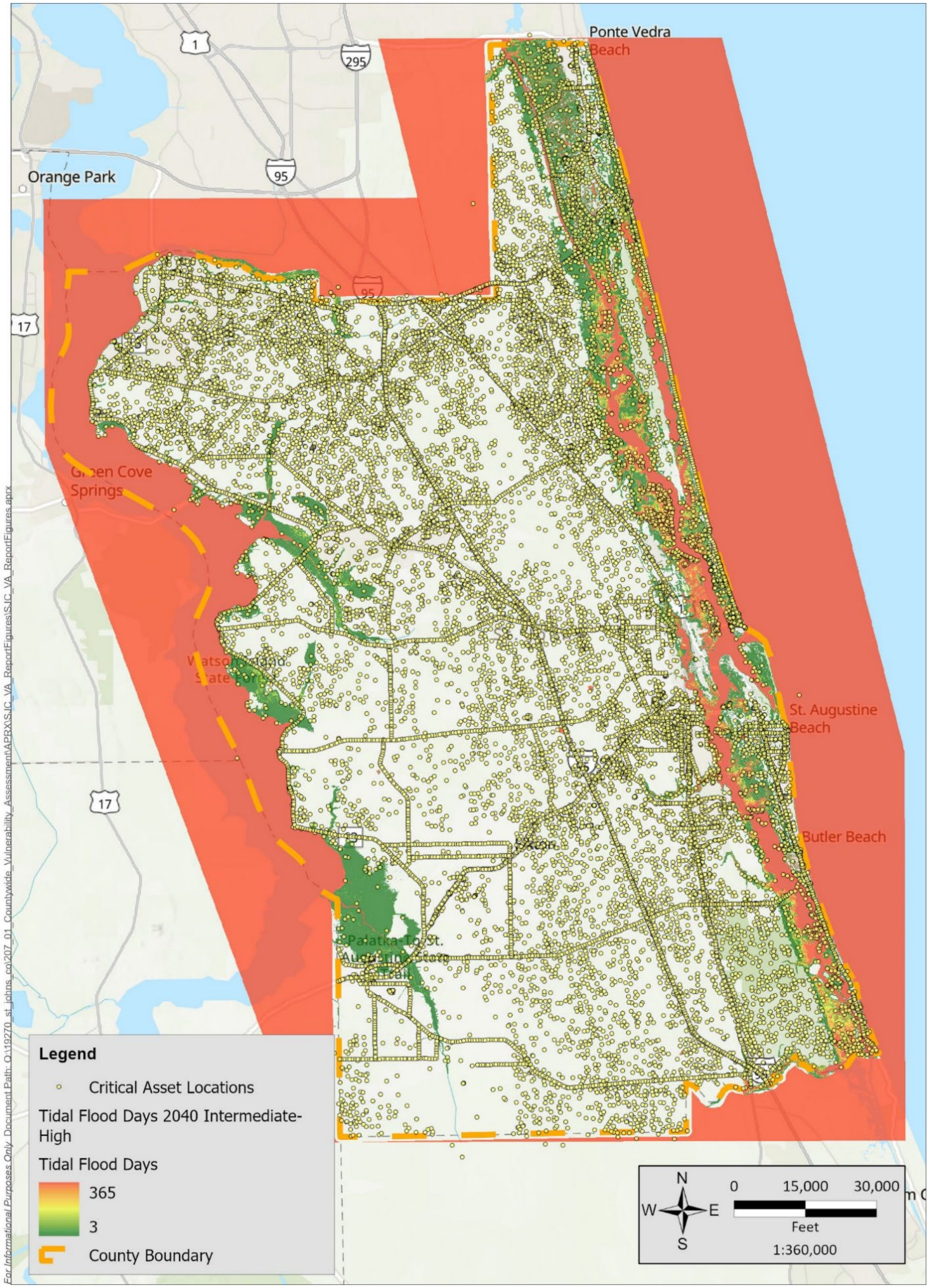


Figure 67 Critical Assets with High Tide Flooding Days 2070 Intermediate-Low SLR Conditions

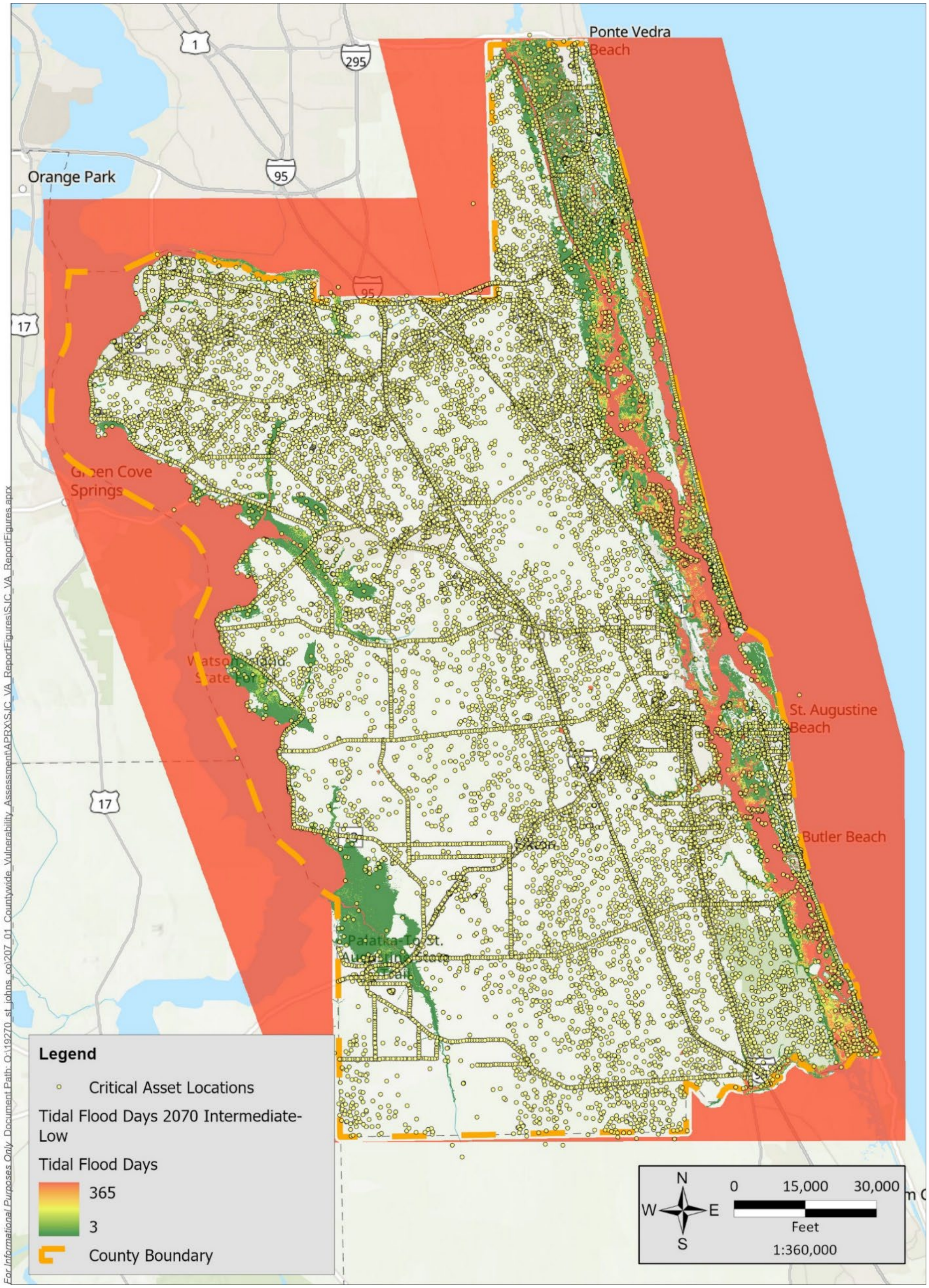


Figure 68 Critical Assets with High Tide Flooding Days 2070 Intermediate-High SLR Conditions

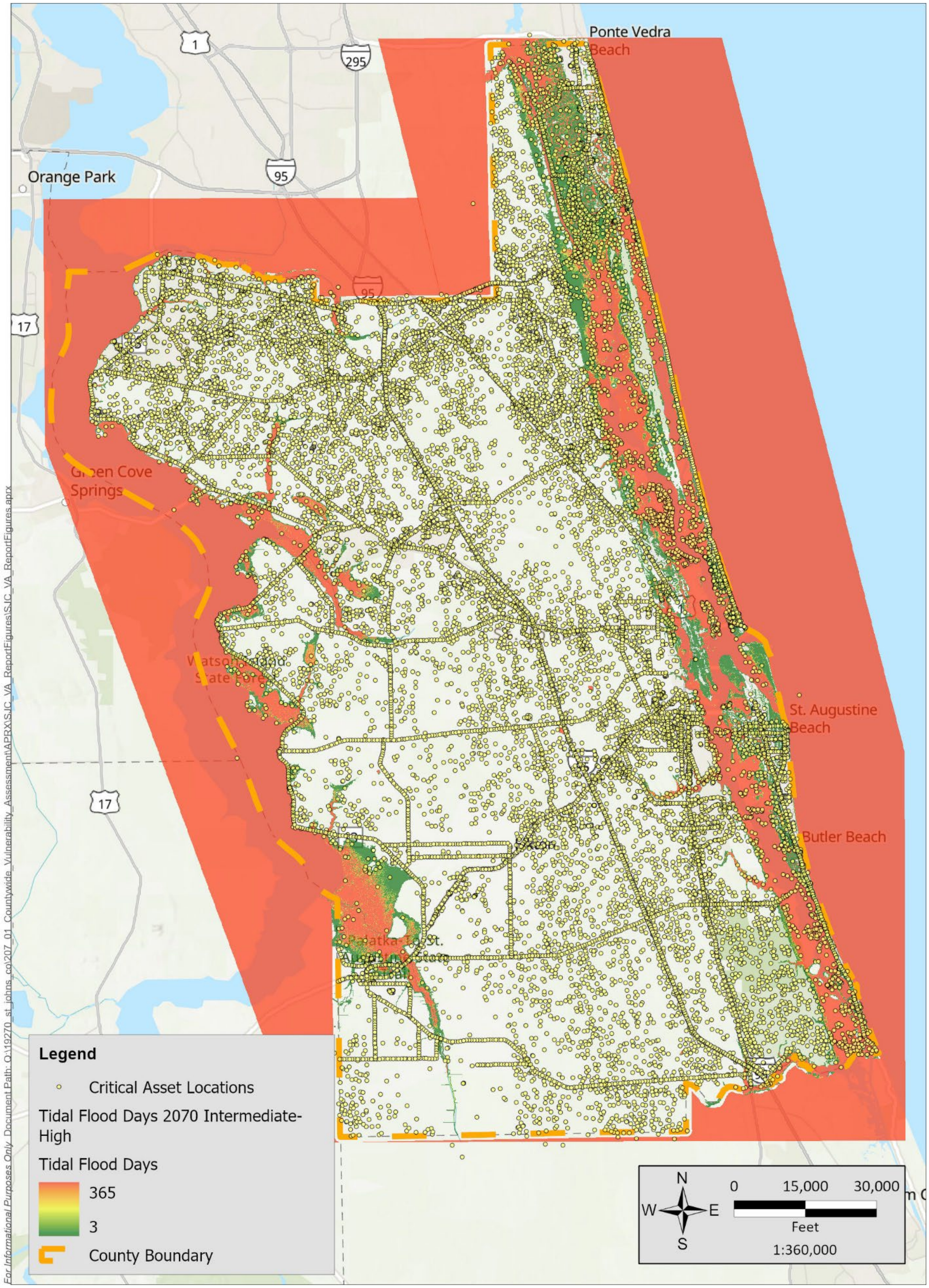


Figure 69 Critical Assets with High Tide Flooding Depth under Existing Conditions

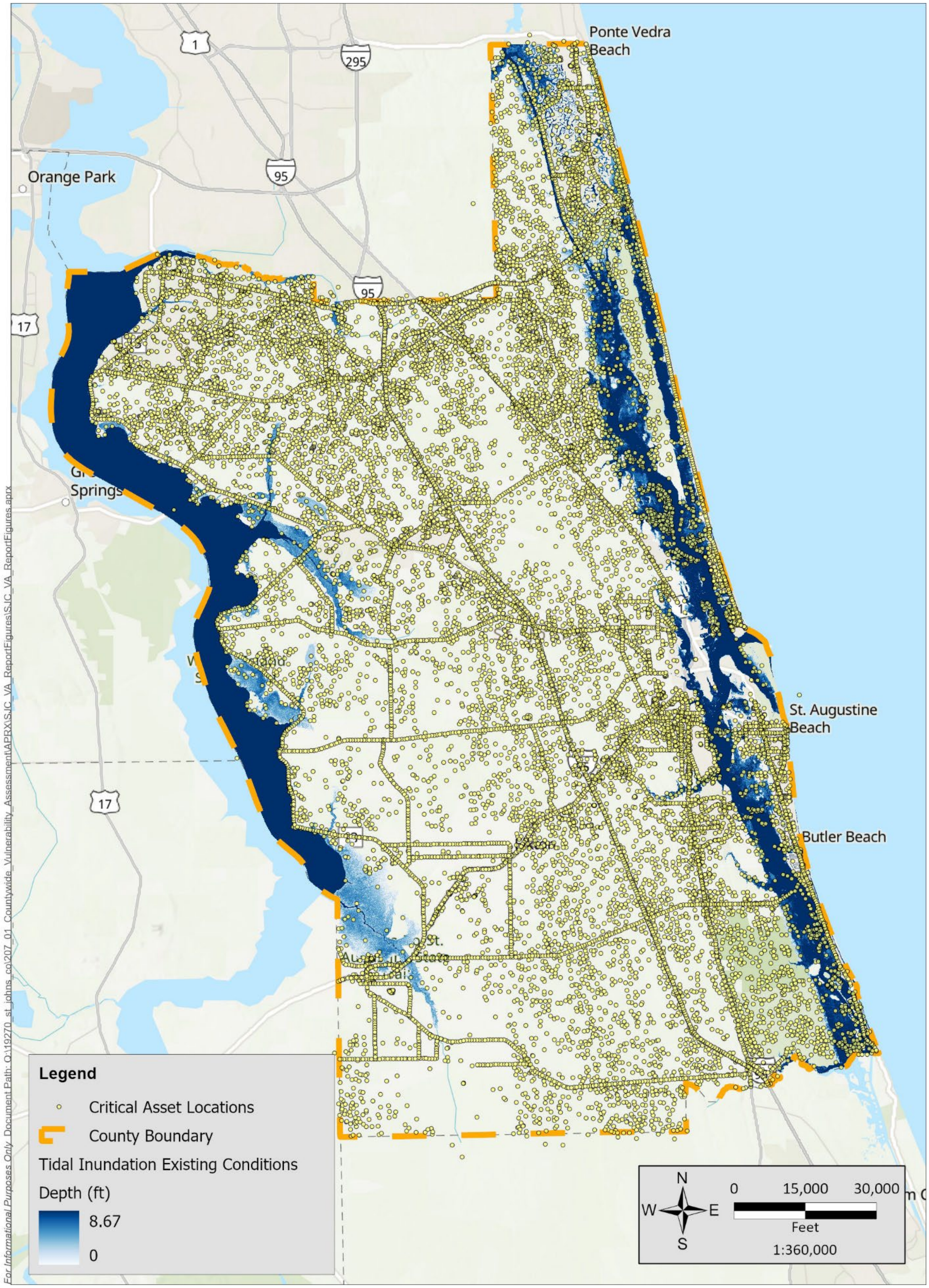


Figure 70 Critical Assets with High Tide Flooding Depth 2040 Intermediate-Low SLR Conditions

Figure 71 Critical Assets with High Tide Flooding Depth 2040 Intermediate-High SLR Conditions

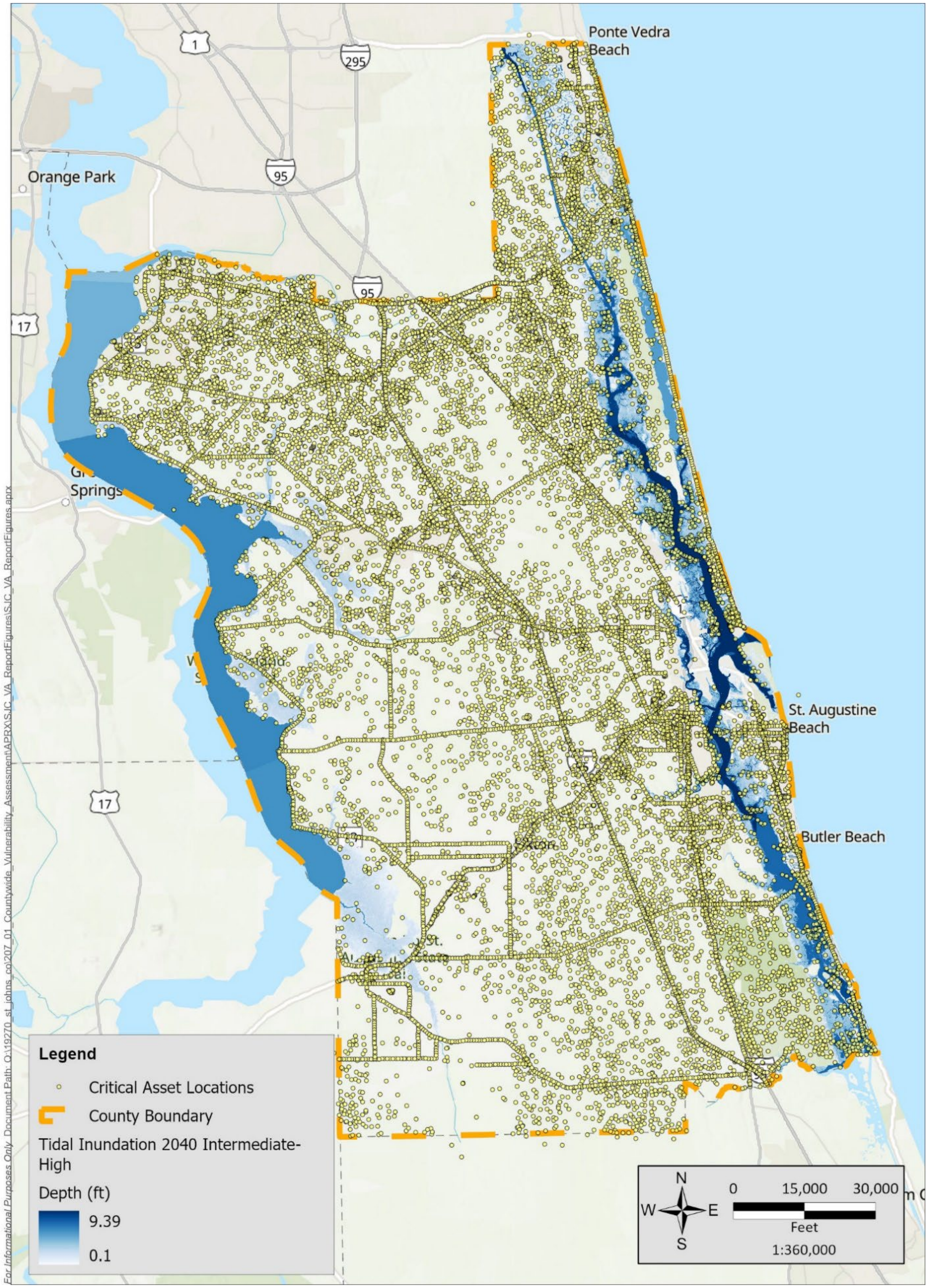


Figure 72 Critical Assets with High Tide Flooding Depth 2070 Intermediate-Low SLR Conditions

Figure 73 Critical Assets with High Tide Flooding Depth 2070 Intermediate-High SLR Conditions

Figure 74 Critical Assets with 10-Year Storm Surge Flooding under Existing Conditions

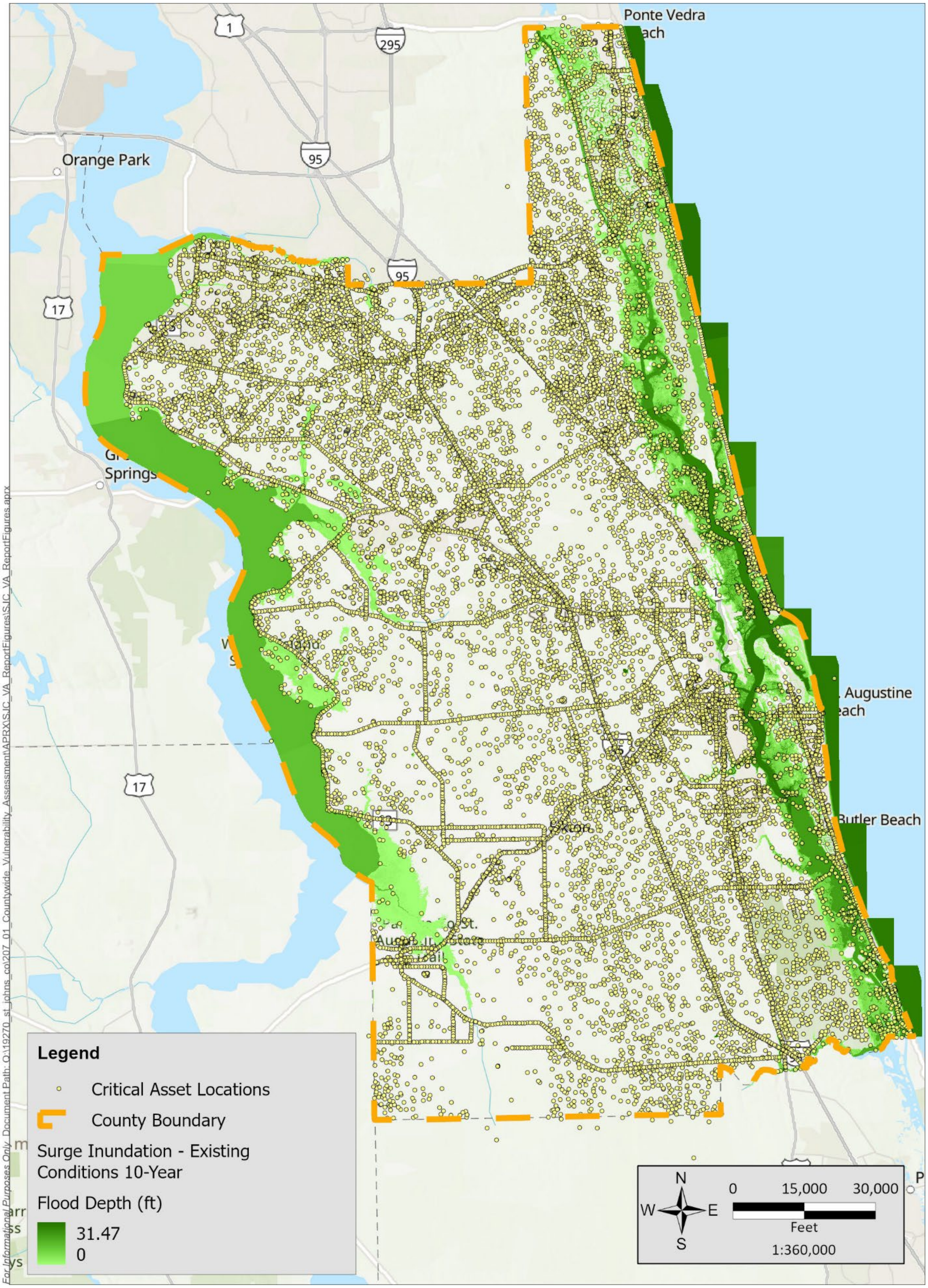


Figure 75 Critical Assets with 25-Year Storm Surge Flooding under Existing Conditions

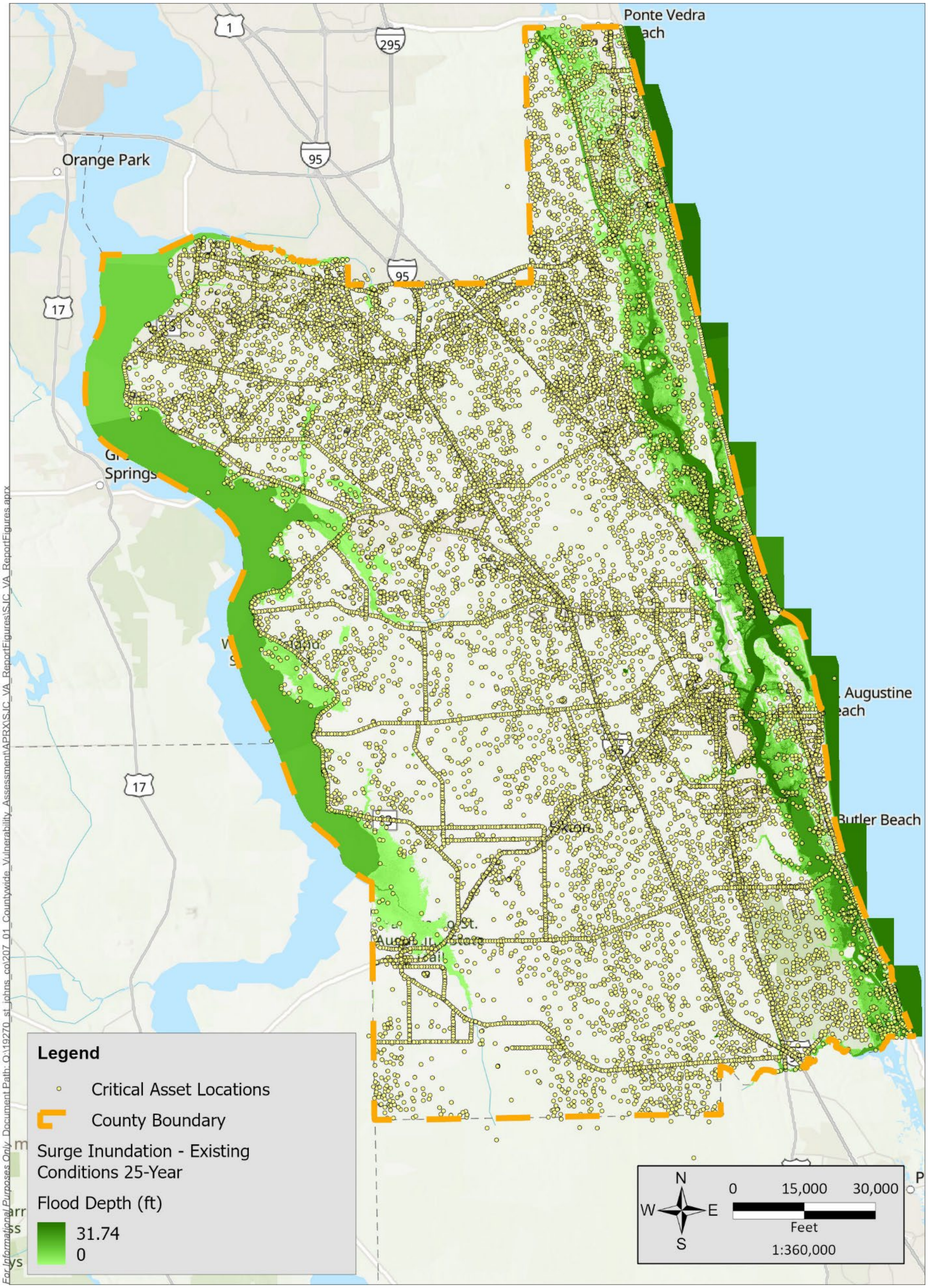


Figure 76 Critical Assets with 100-Year Storm Surge Flooding under Existing Conditions

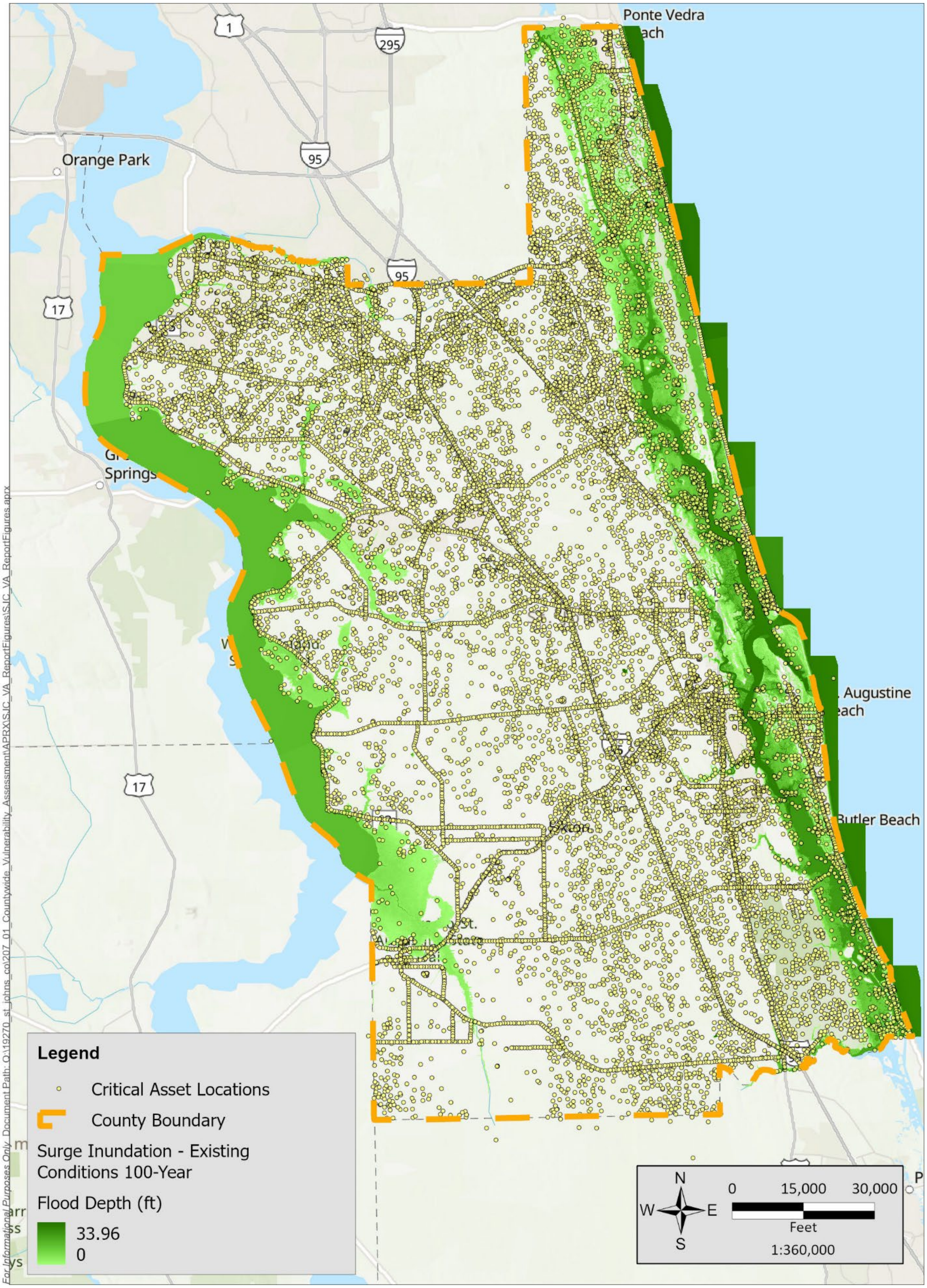


Figure 77 Critical Assets with 10-Year Storm Surge Flooding under 2040 Intermediate-Low SLR Conditions

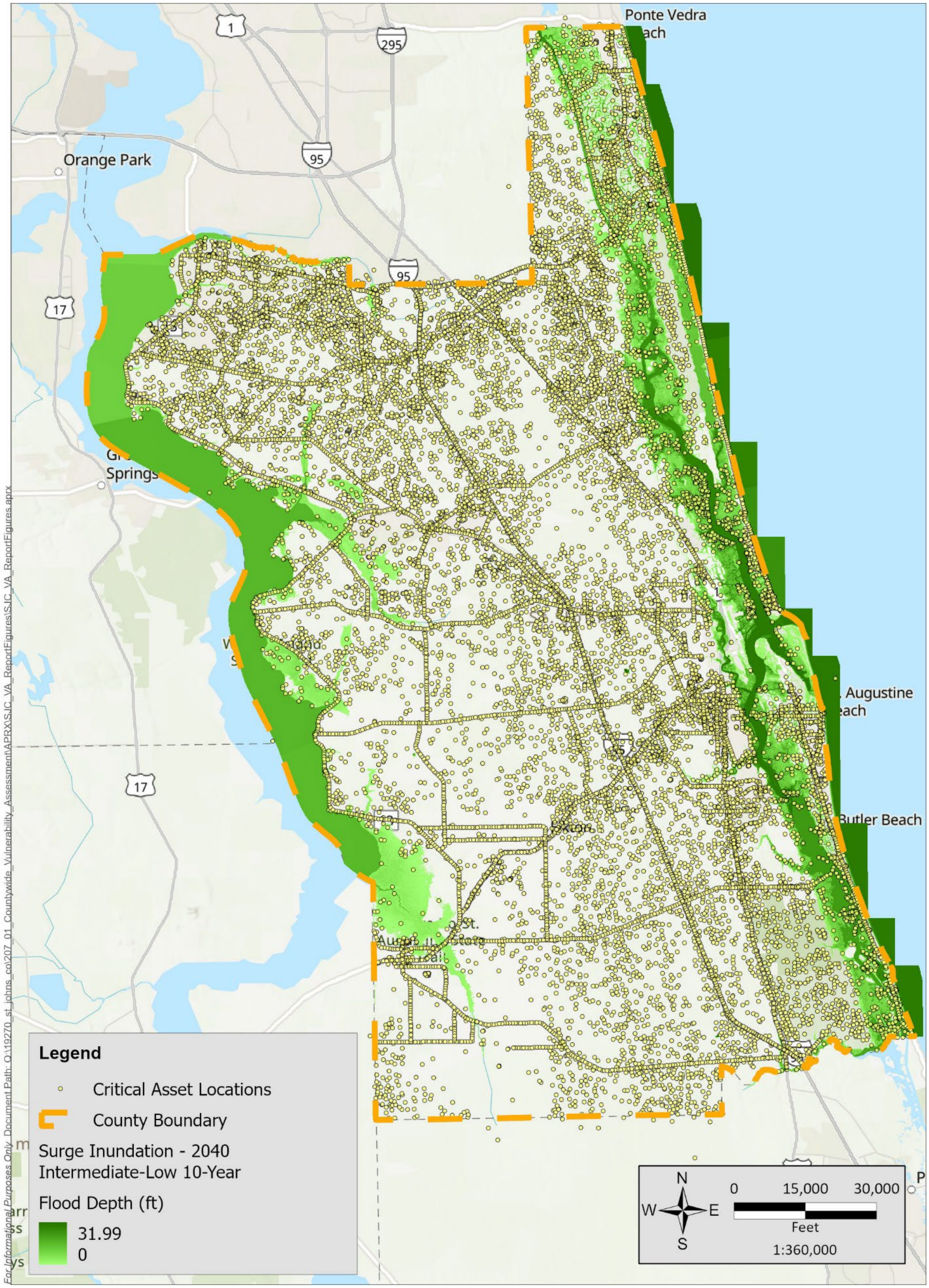


Figure 78 Critical Assets with 25-Year Storm Surge Flooding under 2040 Intermediate-Low SLR Conditions

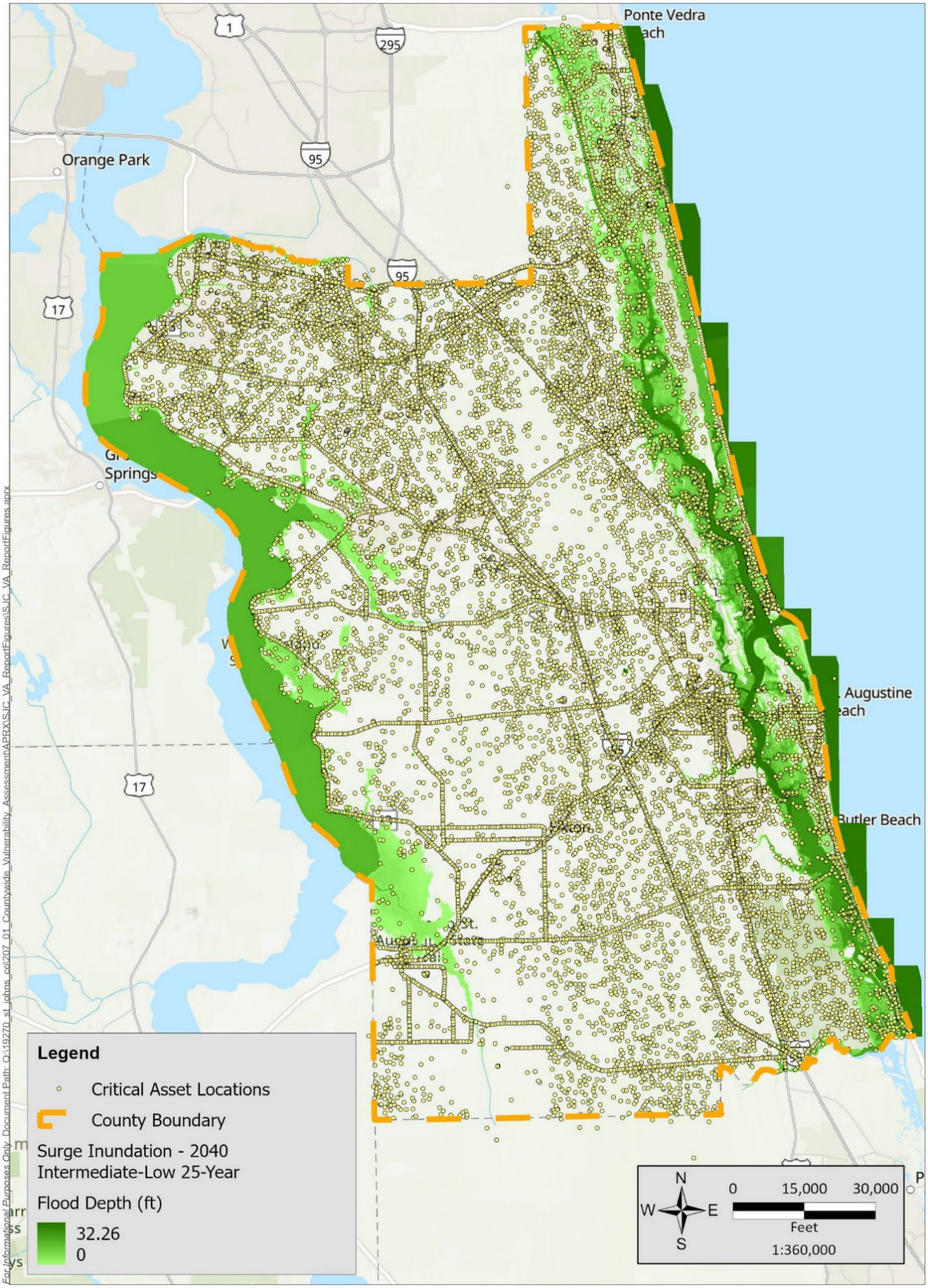


Figure 79 Critical Assets with 100-Year Storm Surge Flooding under 2040 Intermediate-Low SLR Conditions

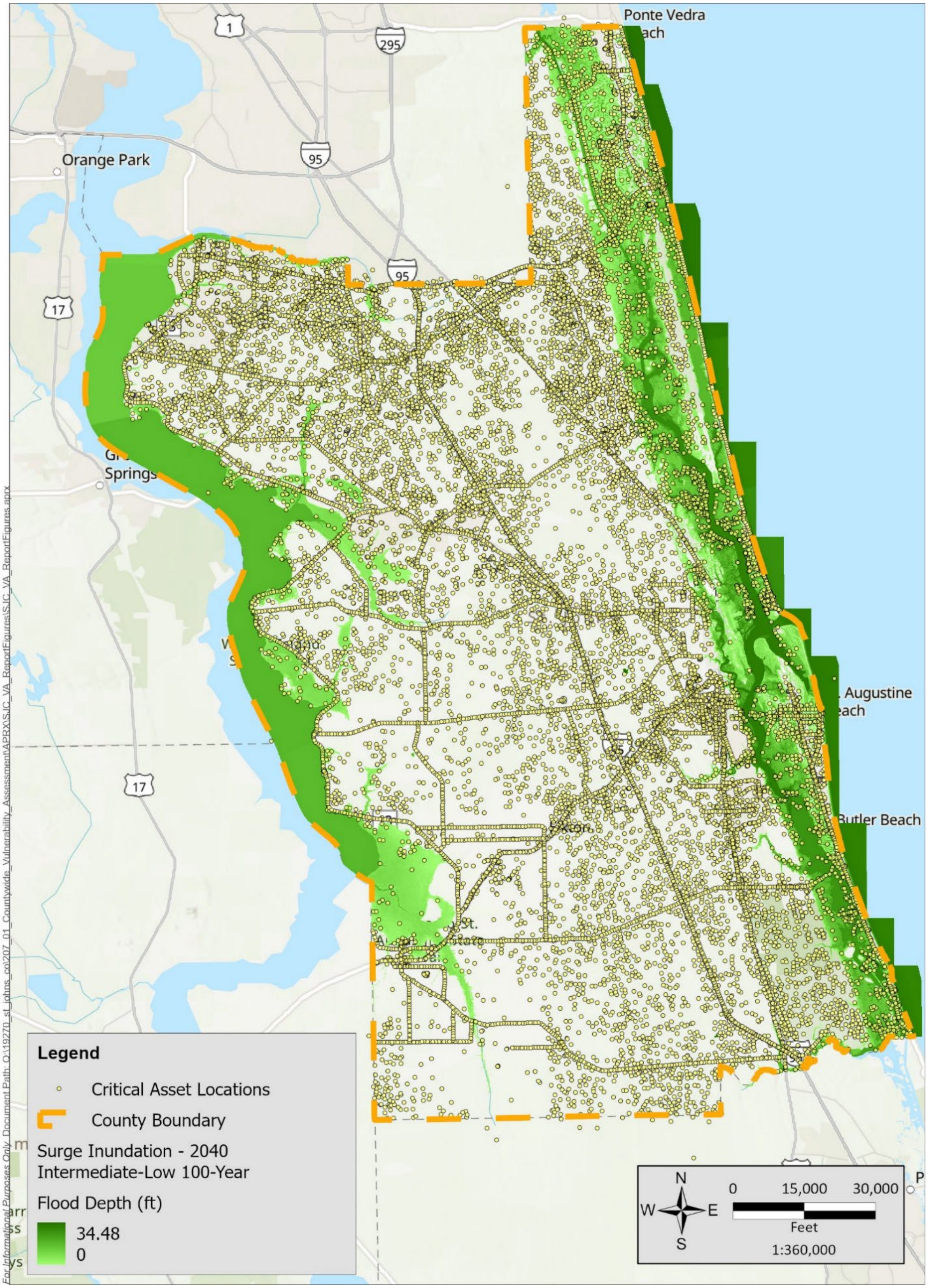


Figure 80 Critical Assets with 10-Year Storm Surge Flooding under 2040 Intermediate-High SLR Conditions

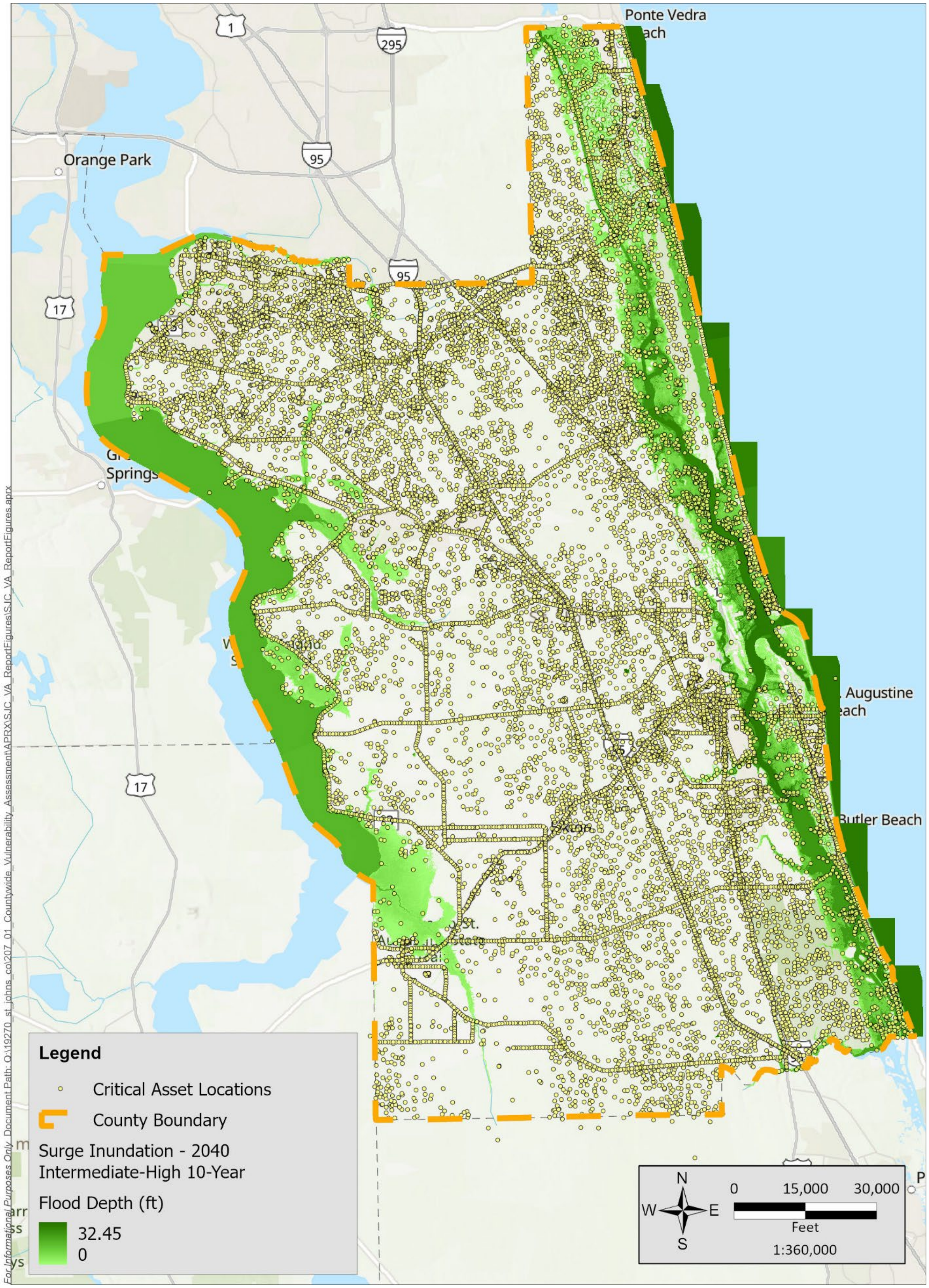


Figure 81 Critical Assets with 25-Year Storm Surge Flooding under 2040 Intermediate-High SLR Conditions

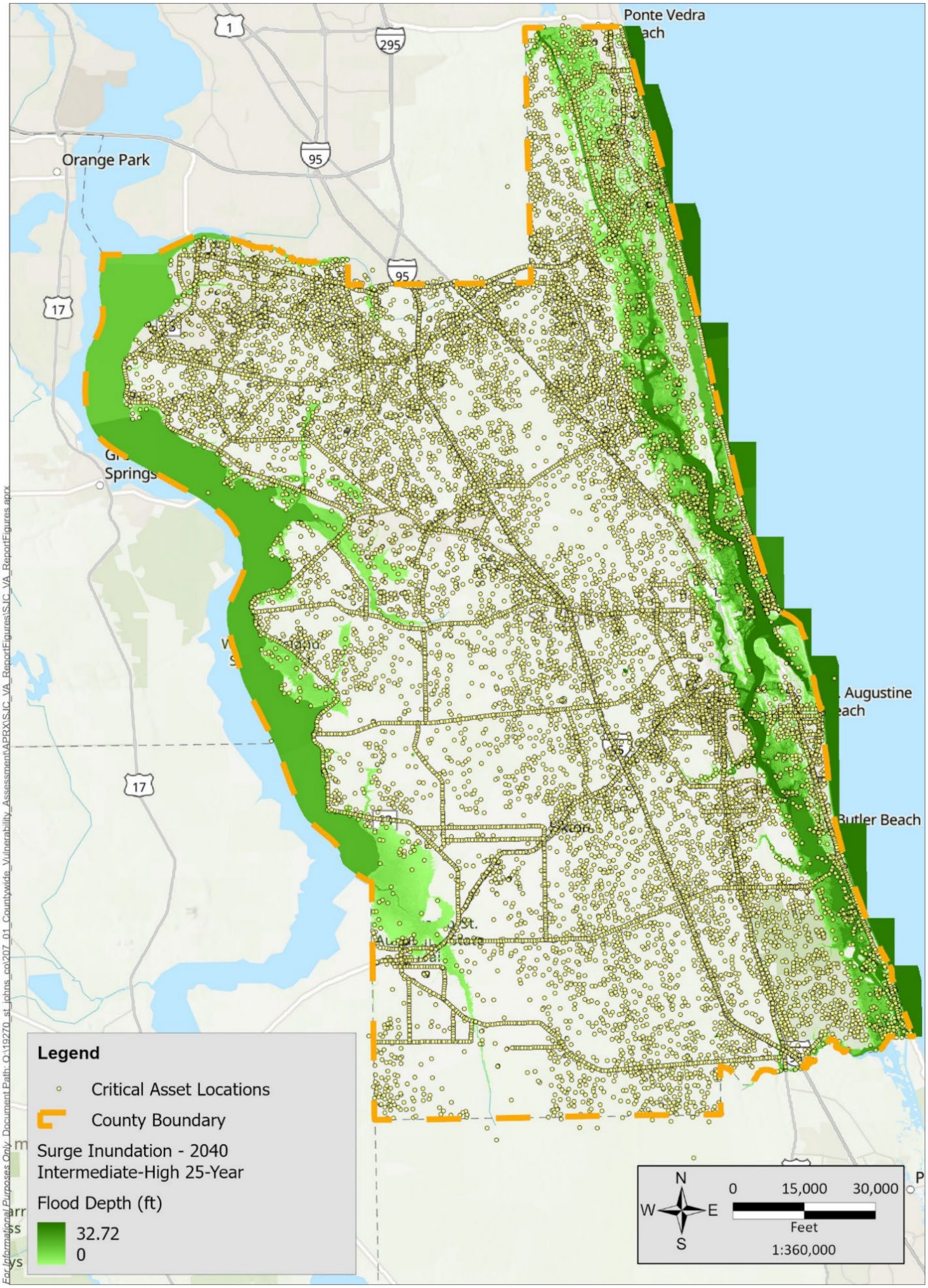


Figure 82 Critical Assets with 100-Year Storm Surge Flooding under 2040 Intermediate-High SLR Conditions

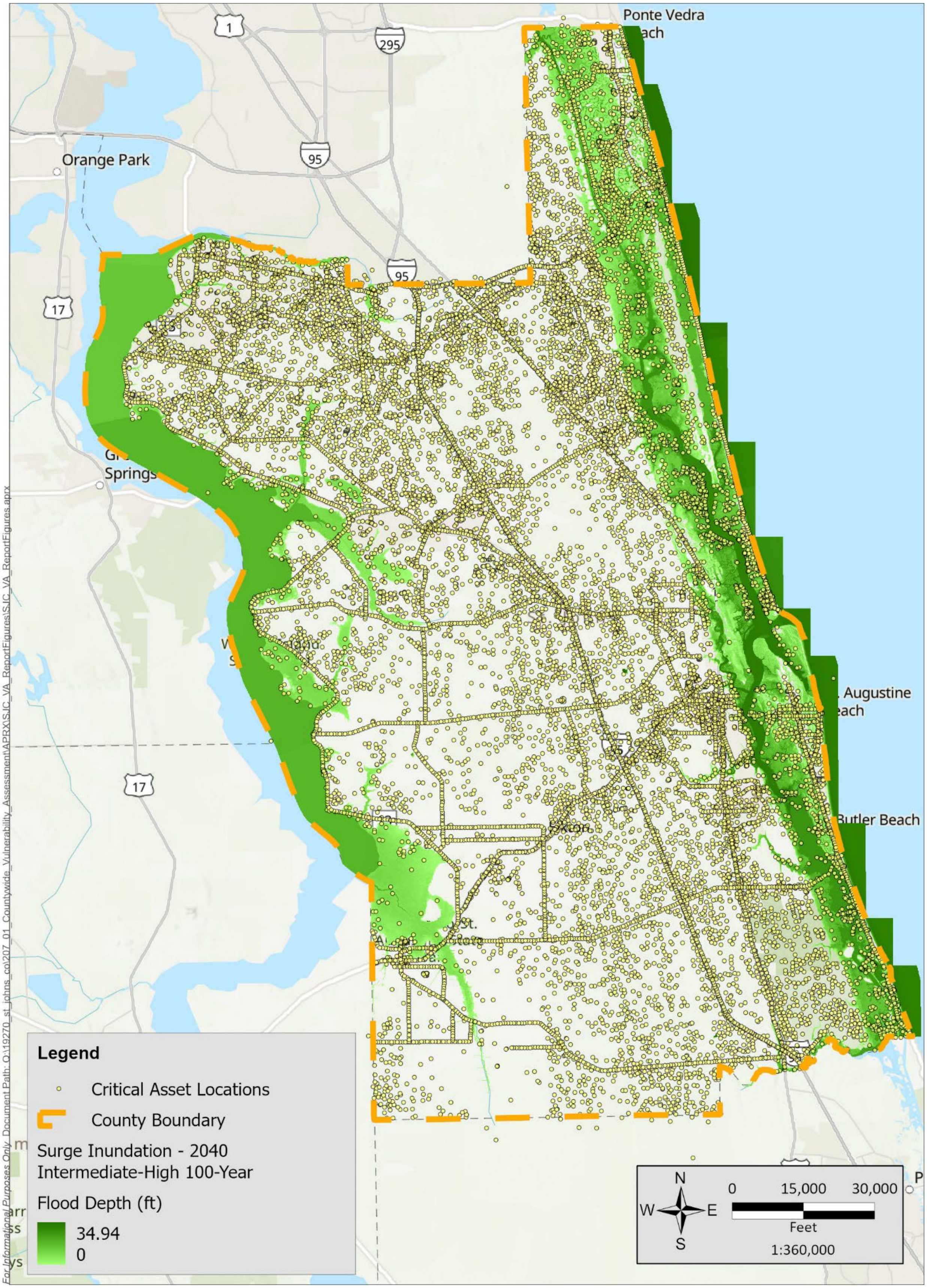


Figure 83 Critical Assets with 10-Year Storm Surge Flooding under 2070 Intermediate-Low SLR Conditions

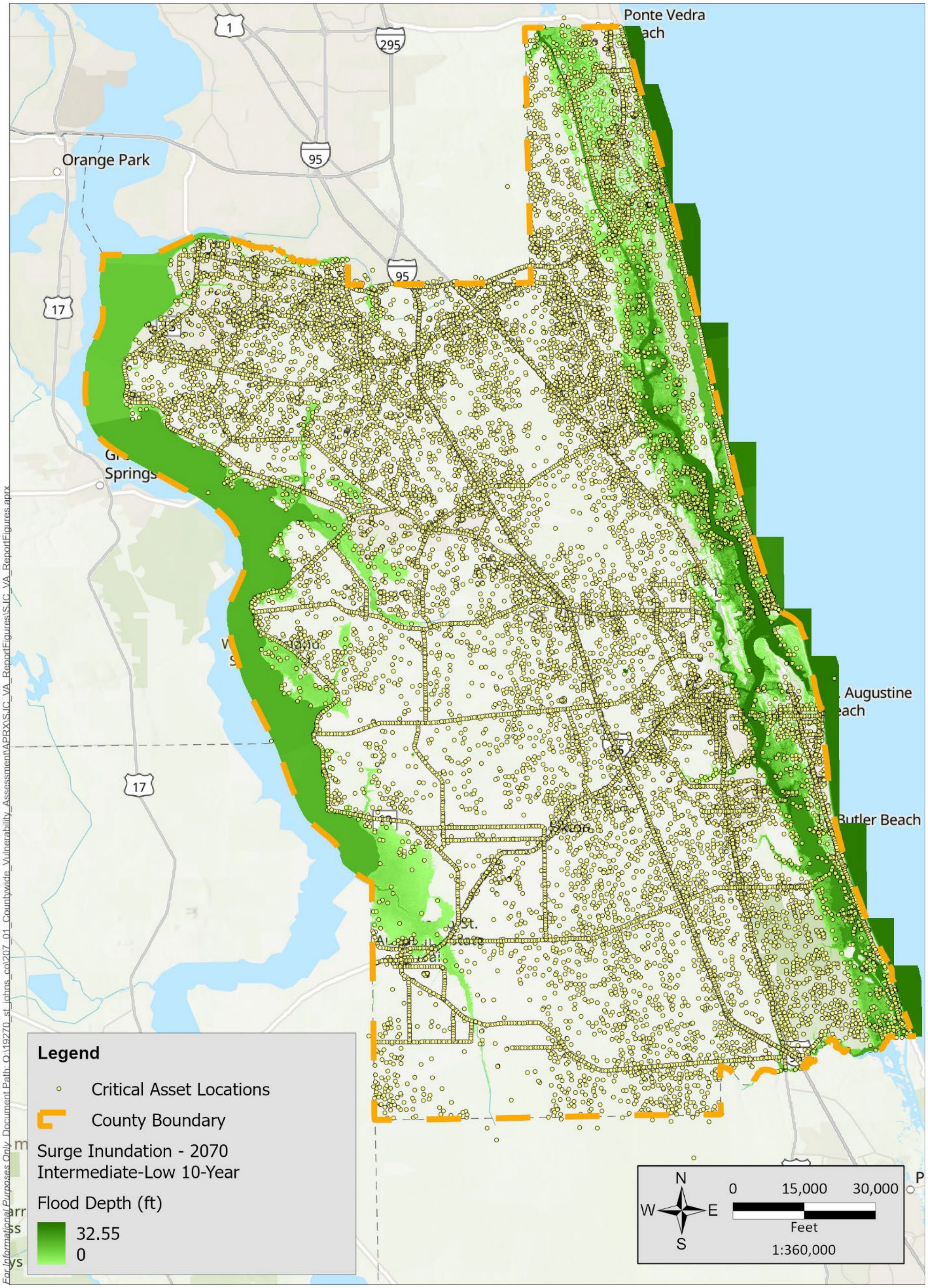


Figure 84 Critical Assets with 25-Year Storm Surge Flooding under 2070 Intermediate-Low SLR Conditions

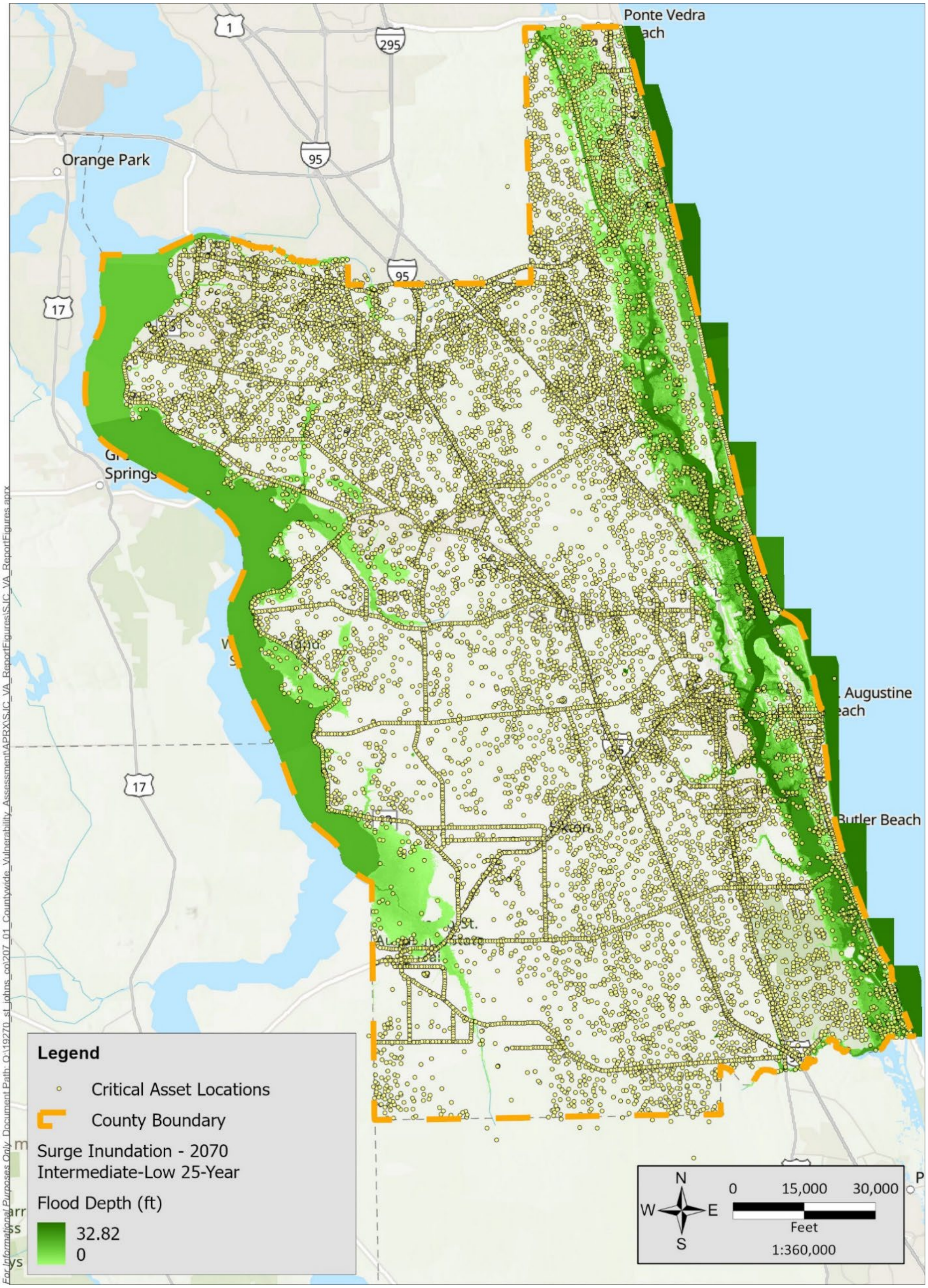


Figure 85 Critical Assets with 100-Year Storm Surge Flooding under 2070 Intermediate-Low SLR Conditions

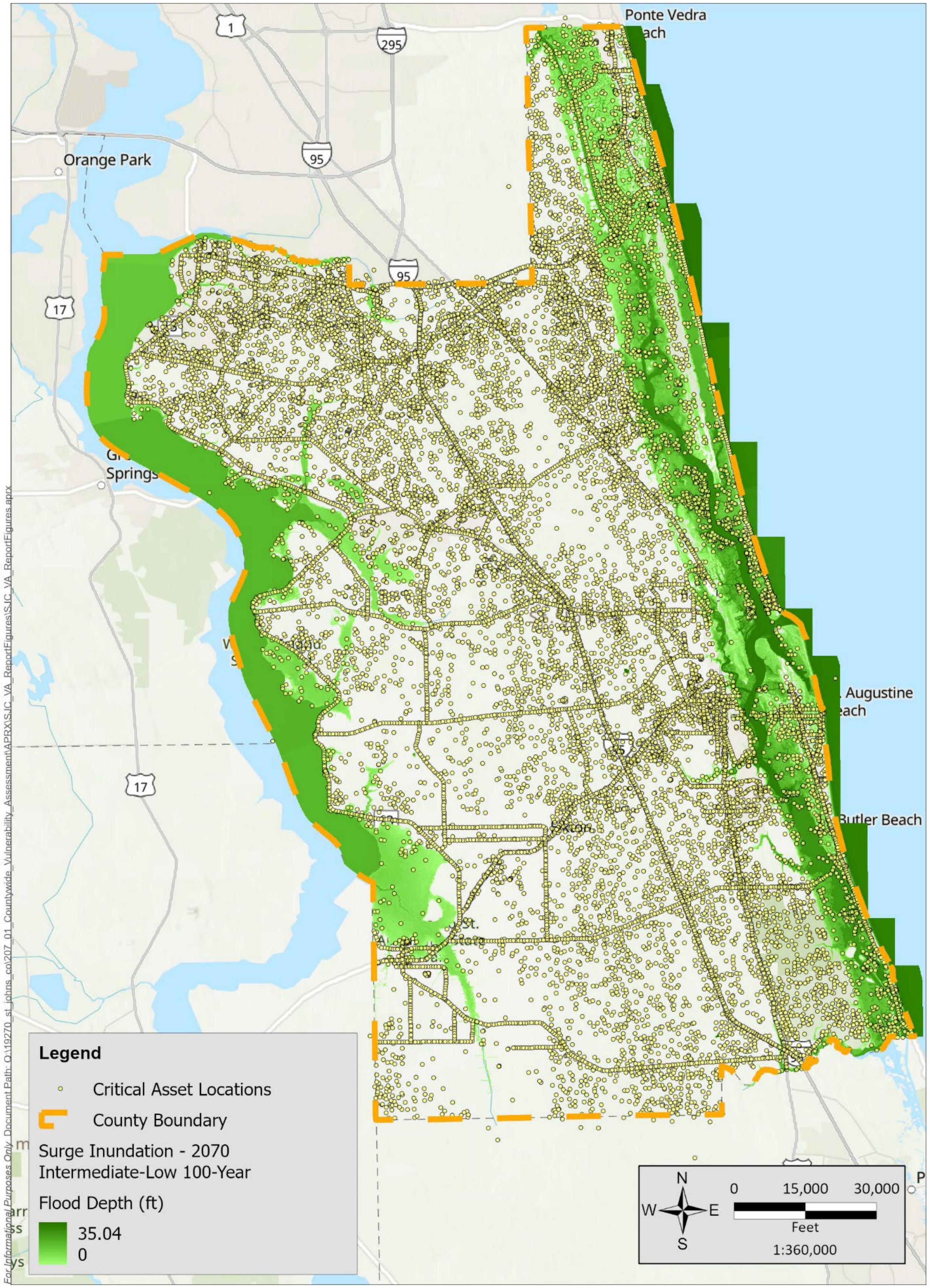


Figure 86 Critical Assets with 10-Year Storm Surge Flooding under 2070 Intermediate-High SLR Conditions

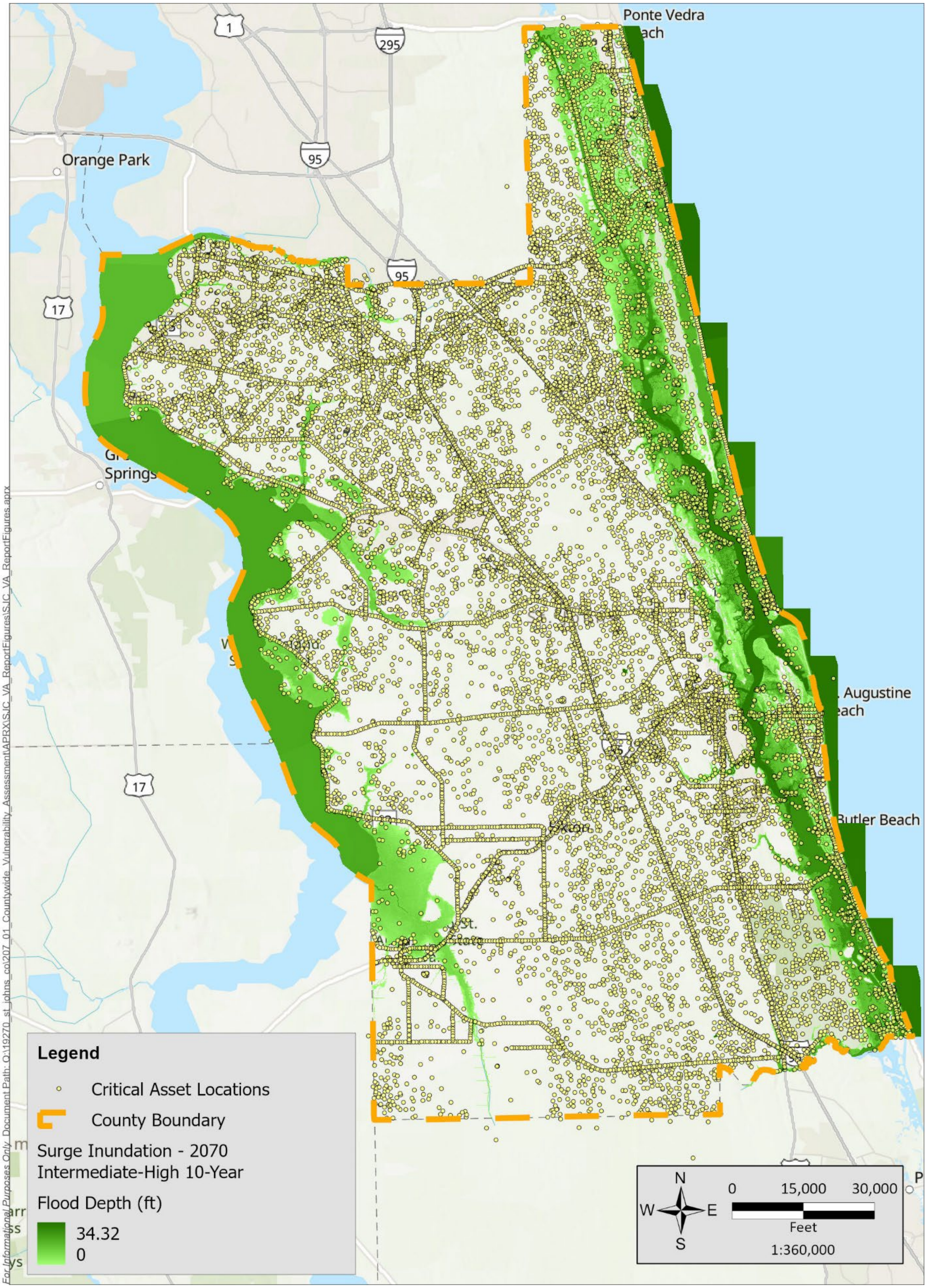


Figure 87 Critical Assets with 25-Year Storm Surge Flooding under 2070 Intermediate-High SLR Conditions

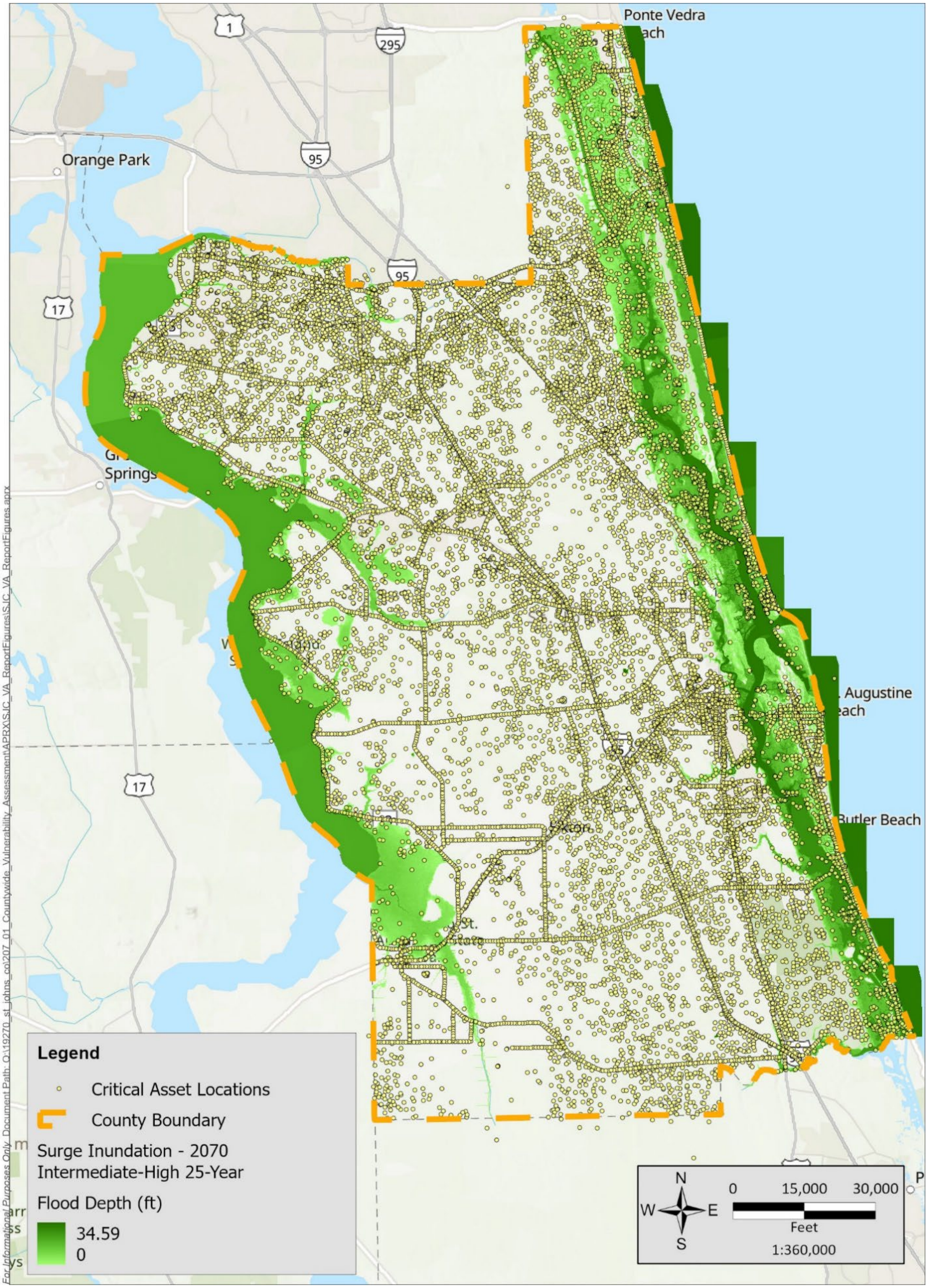


Figure 88 Critical Assets with 100-Year Storm Surge Flooding under 2070 Intermediate-High SLR Conditions

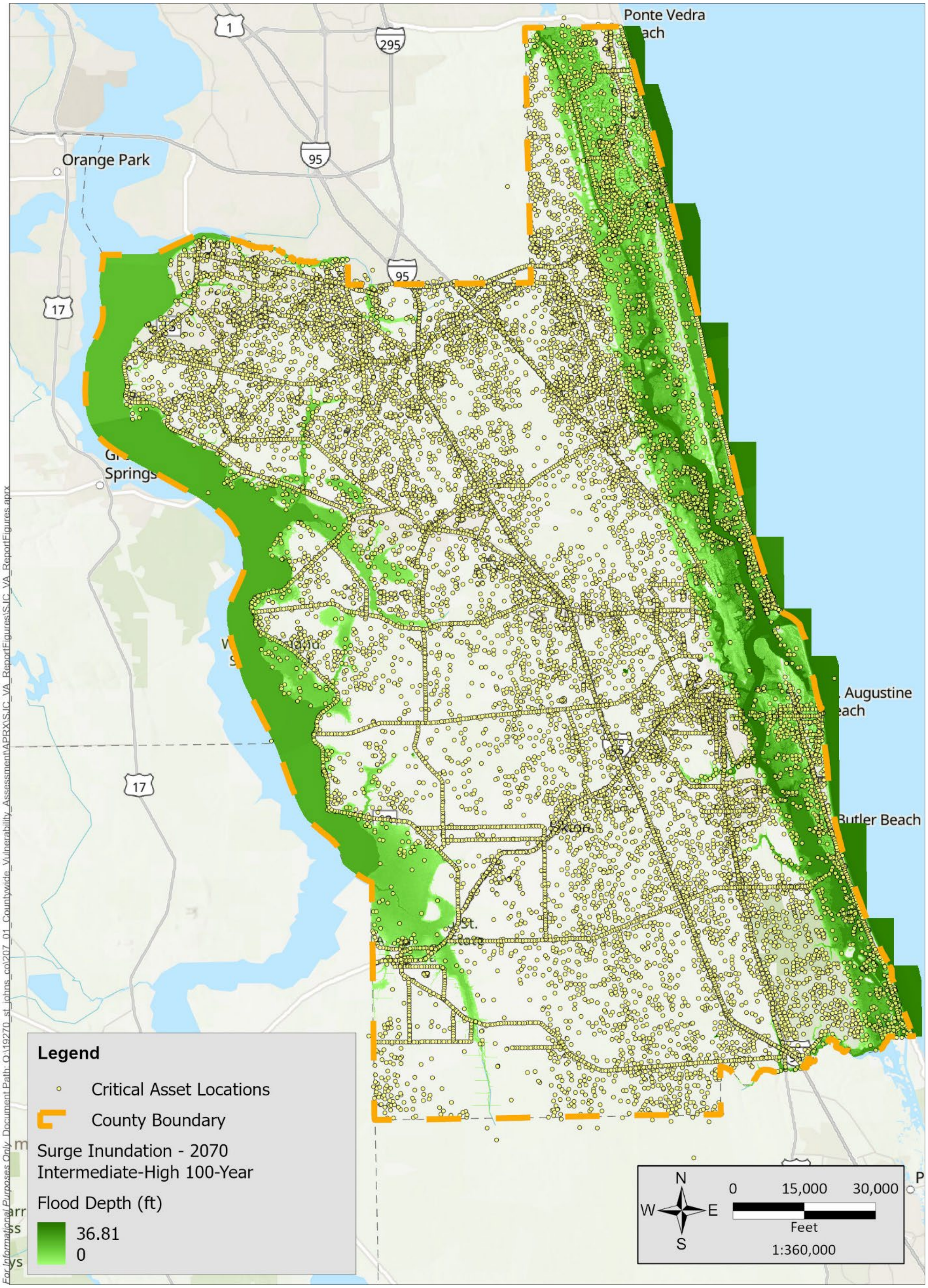


Table 16 Flood Impact and Community Feedback Scores

Asset Type	Impact Scores			Community Feedback Score
	Environmental	Social	Economic	
Airports	0	5	5	3
Bridges	0	5	5	5
Bus Terminals	0	3	3	1
Ports	0	3	5	1
Roads	0	5	5	5
Marinas	0	3	3	2
Rail Facilities	0	3	5	2
Railroad Bridges	0	3	5	1
Waste Water Facilities	5	5	5	5
Lift Stations	3	5	3	5
Step Tank/Grinder Station	3	1	1	5
Stormwater Facility	5	3	3	5
Water Treatment Plants	1	5	5	5
Water Supply Wells	1	5	5	5
Ground Storage Tanks	1	5	5	5
Water Distribution Pumps	1	5	5	5
Electric Facilities	0	5	5	4
Electric Substations	0	5	5	4
Solid and Hazardous Waste Facilities	3	3	1	3
Military Installations	0	5	1	2
Radio Communications Towers	0	5	1	3
Disaster Debris Management Sites	0	5	1	
Schools	0	5	5	4
Day Cares	0	5	3	4
Colleges and Universities	0	5	3	2
Community Centers	0	3	1	2
Correctional Facilities	0	5	1	1
Disaster Recovery Centers	0	5	3	2
Emergency Medical Service Facilities	0	5	3	4
Emergency Operation Centers	0	5	5	3
Fire Stations	0	5	3	5
Health Care Facilities	0	5	1	3
Hospitals	0	5	3	5
Law Enforcement Facilities	0	5	3	4
Local Government Facilities	0	3	3	2
Affordable Public Housing	0	3	1	3

Asset Type	Impact Scores: Environmental	Impact Scores: Social	Impact Scores: Economic	Community Feedback Score
Risk Shelter Inventory	0	5	1	1
State Government Facilities	0	3	3	1
Conservation Lands	0	0	0	4
Parks	0	1	0	4
Park Assets	0	1	0	4
Shorelines	3	3	1	5
Surface Waters	3	1	1	3
Wetlands	3	1	1	4
Historical and Cultural Assets	0	3	1	4
Historical Cultural Assets – Sites	0	3	1	4

Table 17 Priority Ratings by Asset Type

Asset Type	Total Number of Assets	Priority Rating: Highest	Priority Rating: High	Priority Rating: Medium	Priority Rating: Low	Priority Rating: Lowest	Priority Rating: N/A
Affordable Public Housing	91					4	87
Airports	4				2		2
Bridges	118		5	10	1	19	83
Colleges and Universities	33					6	27
Community Centers	5					1	4
Conservation Lands	3,328		289	141	223	2,036	639
Correctional Facilities	7				1		6
Disaster Debris Management Sites	11				1	2	8
Disaster Recovery Centers	5		1				4
Electric Facilities	11		1	1	1		8
Emergency Medical Service Facilities	2						2
Emergency Operation Centers	3						3
Fire Stations	17		2	1			14
Ground Storage Tanks	19		2	1	1	1	14
Health Care Facilities	126			2		10	114
Historical and Cultural Assets	65	19	10	11	4	7	14
Hospitals	8						8

Asset Type	Total Number of Assets	Priority Rating					
		Highest	High	Medium	Low	Lowest	N/A
Law Enforcement Facilities	18					3	15
Lift Stations	679	34	71	67	32	94	381
Local Government Facilities	37					4	33
Marinas	10		2	5	2	1	
Military Installations	2						2
Park Assets	654		21	36	32	116	449
Parks	168		43	11	18	46	50
Radio Communications Towers	180	1	5	12	9	37	116
Railroad Bridges	4						4
Risk Shelter Inventory	47						47
Roads	5,999	62	452	534	564	981	3,406
Schools	134			4	3	11	116
Solid and Hazardous Waste Facilities	77	3	1	7	2	6	58
State Government Facilities	7				1	2	4
Step Tank/Grinder Station	508	1	115	110	72	135	75
Stormwater Facility	14		1	5	3	1	4
Surface Waters	78						78
Wastewater Facilities	187	15	30	21	8	12	101
Water Distribution Pumps	24		3	1	2		18
Water Supply Wells	55	1	6	3		3	42
Water Treatment Plants	123	5	6	6	2	9	95
Wetlands	8,711						8,711
Grand Total	**21,569**	**145**	**1,072**	**990**	**984**	**3,548**	**14,844**

Jones Edmunds also determined the number of assets by asset type that experience flooding in each flood scenario. Table 18 through Table 20 summarize the percentage of assets by type that experience flooding in each flood scenario.

Table 18 Percentage of Assets Flooded by Asset Type for Tidal Flooding Scenarios

Asset Type	Total Number of Assets	Tidal Flooding					Tidal Flood Days				
		Tidal MHHW Existing Conditions	Tidal MHHW Int-Low 2040	Tidal MHHW Int-High 2040	Tidal MHHW Int-Low 2070	Tidal MHHW Int-High 2070	Tidal Flood Days Existing	Tidal Flood Days Int-Low 2040	Tidal Flood Days Int-High 2040	Tidal Flood Days Int-Low 2070	Tidal Flood Days Int-High 2070
Affordable Public Housing	91	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Airports	4	0	0%	0%	0%	0%	0%	0%	0%	0%	0%
Bridges	118	0	0%	0%	0%	1%	0%	0%	0%	0%	2%
Colleges and Universities	33	0	0%	0%	0%	0%	0%	0%	0%	0%	0%
Community Centers	5	0	0%	0%	0%	0%	0%	0%	0%	0%	0%
Conservation Lands	3328	293	10%	12%	12%	16%	13%	14%	15%	15%	18%
Correctional Facilities	7	0	0%	0%	0%	0%	0%	0%	0%	0%	0%
Disaster Debris Management Sites	11	0	0%	0%	0%	9%	0%	0%	0%	0%	9%
Disaster Recovery Centers	5	0	0%	0%	0%	0%	0%	0%	0%	0%	0%
Electric Facilities	11	0	0%	0%	0%	0%	0%	0%	0%	0%	0%
Emergency Medical Service Facilities	2	0	0%	0%	0%	0%	0%	0%	0%	0%	0%
Emergency Operation Centers	3	0	0%	0%	0%	0%	0%	0%	0%	0%	0%
Fire Stations	17	0	0%	0%	0%	12%	0%	0%	0%	0%	6%
Ground Storage Tanks	19	0	0%	5%	5%	16%	0%	0%	0%	0%	11%
Health Care Facilities	126	0	0%	0%	0%	0%	0%	0%	0%	0%	2%
Historical and Cultural Assets	65	26	42%	43%	43%	46%	42%	42%	42%	43%	46%
Hospitals	8	0	0%	0%	0%	0%	0%	0%	0%	0%	0%
Law Enforcement Facilities	18	0	0%	0%	0%	0%	0%	0%	0%	0%	0%
Lift Stations	679	0	4%	7%	7%	19%	0%	1%	3%	3%	14%
Local Government Facilities	37	0	0%	0%	0%	0%	0%	0%	0%	0%	0%
Marinas	10	0	20%	30%	30%	90%	0%	20%	30%	30%	90%
Military Installations	2	0	0%	0%	0%	0%	0%	0%	0%	0%	0%
Park Assets	654	0	6%	7%	8%	12%	2%	3%	5%	5%	12%
Parks	168	41	27%	28%	29%	33%	29%	29%	31%	31%	35%
Radio Communications Towers	180	0	1%	4%	4%	8%	1%	1%	1%	1%	7%
Railroad Bridges	4	0	0%	0%	0%	0%	0%	0%	0%	0%	0%
Risk Shelter Inventory	47	0	0%	0%	0%	0%	0%	0%	0%	0%	0%
Roads	5999	0	0%	0%	0%	2%	0%	0%	1%	1%	5%
Schools	134	0	0%	0%	0%	1%	0%	0%	0%	0%	2%
Solid and Hazardous Waste Facilities	77	2	6%	8%	8%	8%	4%	4%	5%	5%	8%
State Government Facilities	7	0	0%	0%	0%	14%	0%	0%	0%	0%	0%
Step Tank/Grinder Station	508	0	13%	20%	21%	54%	1%	2%	7%	9%	43%
Stormwater Facility	14	0	0%	0%	0%	14%	0%	0%	0%	0%	0%
Surface Waters	78	77	99%	100%	100%	100%	100%	100%	100%	100%	100%
Waste Water Facilities	187	0	0%	0%	0%	11%	0%	0%	0%	0%	5%
Water Distribution Pumps	24	0	0%	0%	0%	13%	0%	0%	0%	0%	8%
Water Supply Wells	55	0	2%	4%	5%	16%	0%	0%	2%	2%	11%
Water Treatment Plants	123	0	0%	2%	2%	8%	0%	0%	0%	0%	6%
Wetlands	8711	1620	19%	20%	21%	23%	21%	22%	22%	23%	24%

Table 19 Percentage of Assets Flooded by Asset Type for Rainfall Flooding Scenarios

Asset Type	Total Number of Assets	Rainfall Inundation														
		Rainfall 25-YR/24-HR Existing Conditions	Rainfall 100-YR/24-HR Existing Conditions	Rainfall 500-YR/24-HR Existing Conditions	Rainfall 25-YR/24-HR Int-Low 2040	Rainfall 100-YR/24-HR Int-Low 2040	Rainfall 500-YR/24-HR Int-Low 2040	Rainfall 25-YR/24-HR Int-High 2040	Rainfall 100-YR/24-HR Int-High 2040	Rainfall 500-YR/24-HR Int-High 2040	Rainfall 25-YR/24-HR Int-Low 2070	Rainfall 100-YR/24-HR Int-Low 2070	Rainfall 500-YR/24-HR Int-Low 2070	Rainfall 25-YR/24-HR Int-High 2070	Rainfall 100-YR/24-HR Int-High 2070	Rainfall 500-YR/24-HR Int-High 2070
Affordable Public Housing	91	0%	0%	0%	0%	0%	1%	0%	0%	1%	0%	0%	1%	0%	0%	1%
Airports	4	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Bridges	118	2%	8%	15%	7%	14%	21%	7%	14%	21%	8%	17%	27%	8%	18%	30%
Colleges and Universities	33	0%	0%	0%	0%	0%	6%	0%	0%	6%	0%	0%	15%	0%	0%	15%
Community Centers	5	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Conservation Lands	3328	76%	80%	84%	80%	84%	88%	80%	84%	88%	81%	85%	89%	81%	85%	89%
Correctional Facilities	7	0%	0%	0%	0%	0%	14%	0%	0%	14%	0%	14%	14%	0%	14%	14%
Disaster Debris Management Sites	11	9%	9%	18%	9%	18%	18%	9%	18%	18%	9%	18%	27%	9%	27%	27%
Disaster Recovery Centers	5	0%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
Electric Facilities	11	0%	0%	9%	0%	9%	18%	0%	9%	18%	0%	9%	18%	9%	18%	18%
Emergency Medical Service Facilities	2	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Emergency Operation Centers	3	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Fire Stations	17	0%	0%	6%	0%	6%	6%	0%	6%	6%	0%	6%	6%	0%	6%	6%
Ground Storage Tanks	19	0%	0%	0%	0%	0%	5%	0%	5%	5%	0%	5%	11%	11%	11%	11%
Health Care Facilities	126	0%	2%	2%	1%	2%	2%	1%	2%	2%	2%	2%	2%	2%	2%	2%
Historical and Cultural Assets	65	46%	49%	52%	49%	52%	57%	49%	52%	57%	49%	52%	58%	52%	55%	60%
Hospitals	8	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Law Enforcement Facilities	18	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	6%	0%	0%	6%
Lift Stations	679	5%	10%	17%	9%	17%	22%	10%	17%	25%	11%	19%	27%	18%	24%	30%
Local Government Facilities	37	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Marinas	10	0%	0%	0%	0%	10%	10%	0%	10%	10%	0%	10%	10%	10%	10%	10%
Military Installations	2	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Park Assets	654	4%	7%	10%	6%	10%	13%	6%	11%	16%	7%	12%	17%	11%	15%	20%
Parks	168	61%	65%	71%	65%	71%	74%	66%	71%	74%	66%	73%	76%	67%	72%	76%
Radio Communications Towers	180	4%	9%	17%	7%	17%	22%	7%	18%	22%	9%	19%	26%	11%	20%	28%
Railroad Bridges	4	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Risk Shelter Inventory	47	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Roads	5999	11%	18%	28%	16%	27%	37%	16%	28%	38%	18%	30%	40%	20%	31%	41%
Schools	134	0%	0%	1%	0%	1%	1%	0%	1%	1%	0%	1%	2%	0%	1%	2%
Solid and Hazardous Waste Facilities	77	10%	12%	16%	10%	16%	17%	10%	16%	18%	10%	16%	19%	12%	17%	19%
State Government Facilities	7	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	14%
Step Tank/Grinder Station	508	6%	17%	30%	14%	29%	35%	16%	31%	45%	19%	35%	51%	35%	49%	59%
Stormwater Facility	14	14%	36%	57%	36%	50%	64%	36%	50%	64%	36%	57%	64%	36%	57%	64%
Surface Waters	78	63%	63%	63%	63%	63%	63%	63%	63%	63%	63%	63%	63%	63%	63%	63%
Waste Water Facilities	187	6%	11%	16%	11%	15%	20%	11%	15%	21%	11%	17%	24%	12%	17%	26%
Water Distribution Pumps	24	4%	4%	8%	4%	8%	8%	4%	8%	8%	4%	8%	8%	8%	13%	17%
Water Supply Wells	55	0%	5%	9%	5%	9%	9%	5%	9%	11%	5%	11%	15%	13%	13%	20%
Water Treatment Plants	123	1%	3%	8%	2%	7%	11%	3%	8%	12%	4%	9%	15%	7%	11%	16%
Wetlands	8711	76%	77%	79%	77%	79%	81%	77%	79%	81%	77%	80%	81%	78%	80%	82%

Table 20 Percentage of Assets Flooded by Asset Type for Surge Flooding Scenarios

Asset Type	Total Number of Assets	Storm Surge Flooding (SWEL)														
		Storm Surge 10-YR Existing Conditions	Storm Surge 25-YR Existing Conditions	Storm Surge 100-YR Existing Conditions	Storm Surge 10-YR Int-Low 2040	Storm Surge 25-YR Int-Low 2040	Storm Surge 100-YR Int-Low 2040	Storm Surge 10-YR Int-High 2040	Storm Surge 25-YR Int-High 2040	Storm Surge 100-YR Int-High 2040	Storm Surge 10-YR Int-Low 2070	Storm Surge 25-YR Int-Low 2070	Storm Surge 100-YR Int-Low 2070	Storm Surge 10-YR Int-High 2070	Storm Surge 25-YR Int-High 2070	Storm Surge 100-YR Int-High 2070
Affordable Public Housing	91	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Airports	4	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Bridges	118	0%	0%	1%	0%	0%	1%	0%	0%	2%	0%	0%	2%	2%	2%	3%
Colleges and Universities	33	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Community Centers	5	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	20%
Conservation Lands	3328	13%	13%	17%	14%	14%	17%	15%	15%	18%	15%	16%	18%	18%	18%	20%
Correctional Facilities	7	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Disaster Debris Management Sites	11	0%	0%	0%	0%	0%	0%	0%	0%	9%	0%	0%	9%	9%	9%	9%
Disaster Recovery Centers	5	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Electric Facilities	11	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Emergency Medical Service Facilities	2	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Emergency Operation Centers	3	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Fire Stations	17	0%	0%	0%	0%	0%	12%	0%	0%	12%	0%	0%	18%	0%	12%	18%
Ground Storage Tanks	19	0%	0%	0%	0%	0%	5%	0%	0%	11%	0%	0%	11%	11%	11%	26%
Health Care Facilities	126	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	6%
Historical and Cultural Assets	65	40%	40%	43%	42%	42%	43%	42%	42%	48%	42%	42%	48%	46%	46%	54%
Hospitals	8	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Law Enforcement Facilities	18	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	6%
Lift Stations	679	1%	1%	12%	2%	3%	15%	4%	6%	18%	4%	6%	19%	16%	18%	28%
Local Government Facilities	37	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	5%
Marinas	10	0%	0%	60%	10%	30%	100%	40%	40%	100%	40%	50%	100%	90%	100%	100%
Military Installations	2	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Park Assets	654	4%	6%	12%	7%	8%	14%	8%	9%	16%	9%	10%	16%	14%	15%	22%
Parks	168	28%	29%	35%	30%	32%	36%	33%	33%	38%	33%	33%	39%	38%	38%	42%
Radio Communications Towers	180	1%	1%	7%	2%	2%	8%	2%	3%	11%	3%	4%	12%	8%	8%	18%
Railroad Bridges	4	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Risk Shelter Inventory	47	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Roads	5999	0%	0%	4%	1%	1%	6%	2%	2%	7%	2%	2%	8%	7%	7%	11%
Schools	134	0%	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	1%	1%	1%	8%
Solid and Hazardous Waste Facilities	77	5%	5%	8%	6%	6%	8%	6%	6%	8%	6%	6%	8%	8%	8%	8%
State Government Facilities	7	0%	0%	0%	0%	0%	14%	0%	0%	14%	0%	0%	14%	0%	14%	43%
Step Tank/Grinder Station	508	2%	4%	37%	7%	11%	46%	16%	18%	52%	17%	20%	53%	45%	48%	73%
Stormwater Facility	14	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	21%
Surface Waters	78	99%	99%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Waste Water Facilities	187	0%	0%	2%	0%	0%	7%	0%	0%	14%	0%	0%	16%	9%	13%	29%
Water Distribution Pumps	24	0%	0%	0%	0%	0%	8%	0%	0%	21%	0%	0%	21%	13%	13%	25%
Water Supply Wells	55	0%	2%	4%	2%	2%	9%	2%	4%	11%	4%	4%	11%	11%	11%	16%
Water Treatment Plants	123	0%	0%	4%	0%	0%	6%	0%	1%	7%	0%	1%	7%	7%	7%	10%
Wetlands	8711	21%	21%	23%	22%	22%	23%	23%	23%	24%	23%	23%	24%	24%	24%	25%

9 FOCUS AREAS

To identify focus areas, Jones Edmunds mapped the critical assets based on the priority ratings assigned for the sensitivity analysis. The mapping was reviewed to find areas that had a high density of vulnerable critical assets. Jones Edmunds also reviewed results from the public outreach survey to identify and consider specific locations of public concern when selecting focus areas. Based on this review, the following focus areas were identified and Figure 89 shows them in relation to the critical assets.

- Anastasia Island from COSAB to SR 206.
- Anastasia Island from SR 206 to Matanzas Inlet.
- Anastasia Island from SR 312 to the COSA south boundary.
- Vilano/North Beach.
- South Ponte Vedra Beach.
- Ponte Vedra Beach.
- SR 16, Lewis Speedway, and Masters Drive.
- Various low spots along CR 13.
- Hastings.
- SR 16 WWTP.
- CR 210 at the intersection with Interstate 95.

Table 21 summarizes the justification for selecting each of the focus areas. Attachment 4 provides a table summarizing the vulnerable critical assets contained within the focus areas.

Figure 89 Focus Areas

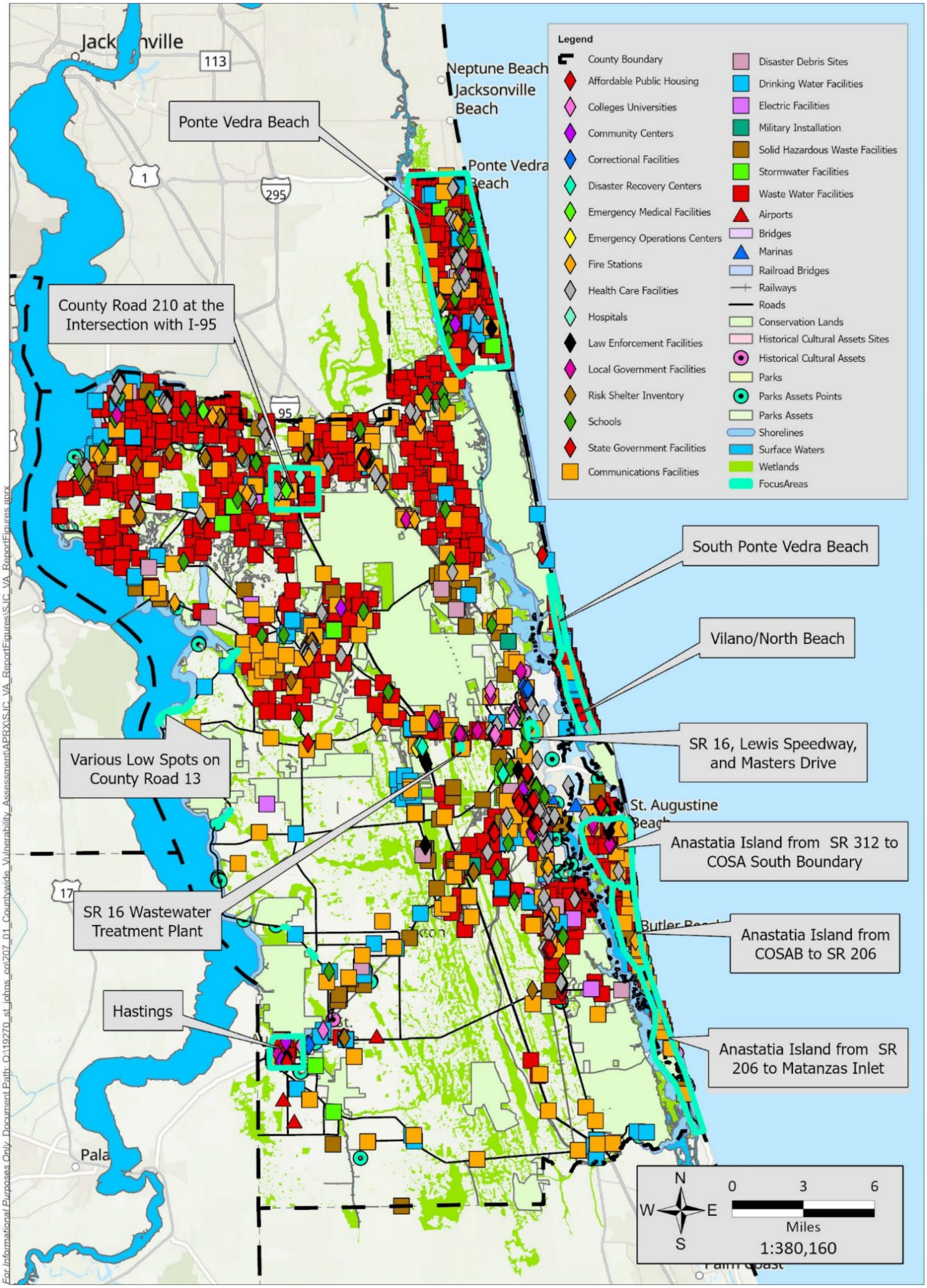


Table 21 Focus Area Justification

Focus Area	Justification Summary
Anastasia Island from COSAB to SR 206	Focus area has a high density of vulnerable critical assets, was identified as a priority area by County residents, and has experienced significant flooding during recent hurricanes. Based on results from the sensitivity analysis, 14 assets have a highest priority rating, 61 assets have a high priority rating, and 21 assets have a medium priority rating.
Anastasia Island from SR 206 to Matanzas Inlet	Focus area has a high density of vulnerable critical assets, was identified as a priority area by County residents, and has experienced significant flooding during recent hurricanes. Based on results from the sensitivity analysis, 30 assets have a highest priority rating, 39 assets have a high priority rating, and 24 assets have a medium priority rating.
Anastasia Island from SR 312 to the COSA south boundary	Focus area has a high density of vulnerable critical assets, was identified as a priority area by County residents, and has experienced significant flooding during recent hurricanes. Based on results from the sensitivity analysis, 21 assets have a highest priority rating, 102 assets have a high priority rating, and 65 assets have a medium priority rating.
Vilano/North Beach	Focus area has a high density of vulnerable critical assets, was identified as a priority area by County residents, and has experienced significant flooding during recent hurricanes. Based on results from the sensitivity analysis, 18 assets have a highest priority rating, 157 assets have a high priority rating, and 95 assets have a medium priority rating.
South Ponte Vedra Beach	Focus area has a high density of vulnerable critical assets, was identified as a priority area by County residents, and has experienced significant flooding during recent hurricanes. Based on results from the sensitivity analysis, 19 assets have a high priority rating and 8 assets have a medium priority rating.
Ponte Vedra Beach	Focus area has a high density of vulnerable critical assets, was identified as a priority area by County residents, and has experienced significant flooding during recent hurricanes. Based on results from the sensitivity analysis, 31 assets have a highest priority rating, 232 assets have a high priority rating, and 199 assets have a medium priority rating.
SR 16, Lewis Speedway, and Masters Drive	Focus area has a high density of vulnerable critical assets and has experienced significant flooding during recent hurricanes. Based on results from the sensitivity analysis, 6 assets have a highest priority rating, 5 assets have a high priority rating, and 1 asset has a medium priority rating.
Various low spots along CR 13	Focus area has a high density of vulnerable critical assets, was identified as a priority area by County residents, and has experienced significant flooding during recent hurricanes. Based on results from the sensitivity analysis, 8 assets have a highest priority rating, 30 assets have a high priority rating, and 13 assets have a medium priority rating.

Focus Area	Justification Summary
Hastings	Focus area has a high density of vulnerable critical assets, was identified as a priority area by County residents, and has experienced significant flooding during recent hurricanes. Based on results from the sensitivity analysis, 1 asset has a highest priority rating, 22 assets have a high priority rating, and 19 assets have a medium priority rating.
SR 16 WWTP	Focus area contains a regionally significant asset. Based on results from the sensitivity analysis, 4 assets have a high priority rating and 2 assets have a medium priority rating.
CR 210 at the intersection with Interstate 95	Focus area has a high density of vulnerable critical assets. Based on results from the sensitivity analysis, 13 assets have a high priority rating and 8 assets have a medium priority rating.

PART IV: FURTHER RECOMMENDATIONS

10 PRELIMINARY ADAPTATION PLAN

The County's VA grant included funding to complete a preliminary Adaptation Plan. The County was also awarded a fiscal year 2024 RFGP planning grant to complete a standalone Countywide Adaptation Plan. The County's standalone Adaption Plan will generally follow the guidance in FDEP's *Florida Adaptation Planning Guidebook* and will include the following items:

- Assessment of Adaptive Capacities
- Prioritization of Adaptation Needs
- Identification of Adaptation Strategies
- Integration into Existing Plans
- Prioritization of Projects for Each Asset Class

This preliminary Adaptation Plan is an early-out prioritization of needs and adaptation strategies. It focuses on identifying solutions to the County's highest priority critical assets identified in the sensitivity analysis so that the County can begin applying for RFGP implementation grants while the standalone Adaptation Plan is in progress. A preliminary assessment of adaptive capacity, prioritization of adaptation needs, and identification of adaptation strategies are included, but the budget provided in the VA did not support a complete/robust Adaptation Plan for the entire County. The preliminary Adaptation Plan will serve as a framework and starting place for the County's standalone Adaptation Plan, which will begin following the completion of the VA.

10.1 ASSESSMENT OF ADAPTIVE CAPACITY

According to the *Florida Adaptation Planning Guidebook*, adaptive capacity is defined by the Intergovernmental Panel on Climate Change as "the ability of a system to adjust to climate change (including climate variability and extremes), to moderate potential damages, to take advantage of opportunities, or to cope with the consequences." According to the Guidebook, communities should assess their capacity to address the impacts of SLR, which may include an assessment of:

- Regulatory and Planning Capabilities – What are the current development and redevelopment restrictions, coastal management regulations, hazard mitigation plans, sustainability initiatives, shoreline managements, and post-disaster recovery/emergency plans.
- Administrative and Technical Capabilities – How many SLR experts, planners, engineers, GIS and mapping resources, and modeling capabilities exist in the local government? Will consultants need to be hired?
- Fiscal Capacity – What taxes, bonds, grants, impact fees, withholding spending in hazard zones, insurance, or other measures can be taken to pay for adaptation strategies? Will grants and loans be necessary?
- Infrastructure – What existing flood and erosion control structures, evacuation routes and redundant water, wastewater, and power systems are either liabilities or assets?

10.1.1 Regulatory and Planning Capabilities

This section summarizes the County's current regulatory and planning capabilities that aid the County's ability to manage SLR and flood vulnerability.

The following are specific sections from the County's *Comprehensive Plan* that include objectives and policies related to SLR and flood vulnerability minimization:

- The County's *Comprehensive Plan Element E.1.2, Dune Preservation,* states that the County shall ensure the protection, conservation, and enhancement of the County's coastal areas, dunes, and beaches. This section includes four policies to achieve this objective.
- The County's *Comprehensive Plan Element E.1.3, Post Disaster Planning, Coastal Area Redevelopment, Sea Level Rise, Peril of Flood, and Hurricane Preparedness,* states that the County shall prepare post-disaster redevelopment plans, which will reduce or eliminate the exposure of human life and public and private property to natural hazards by implementing the policies of the Comprehensive Plan. The County shall restrict or limit certain activities in the Coastal High Hazard Areas (CHHA), which is defined in Section 163.3178(2)(h), Florida Statutes, to reduce the flood risk in coastal areas and related impacts of SLR. This section of the Comprehensive Plan includes 27 policies to achieve this objective.
- The County's *Comprehensive Plan Element E.1.5, Coastal Protection,* states that the County shall cooperate with and provide technical support and assistance to the appropriate state and federal agencies and it shall implement Policies in this Plan to protect, enhance, and restore the environmental quality of the County's Coastal Area waterways and wildlife. Waters that flow into either the ocean or the estuary shall be protected through established conservation techniques identified in the County Land Development Regulations. This section of the Comprehensive Plan includes 10 policies to achieve this objective.
- The County's *Comprehensive Plan Element E.1.6, Dredge and Fill,* states that dredging and filling in coastal areas shall be discouraged. This section of the Comprehensive Plan includes four policies to achieve this objective.
- The County's *Comprehensive Plan Element E.1.7, Infrastructure,* states that routing of new infrastructure and public services within the Coastal Area shall be designed to direct growth away from Environmentally Sensitive Lands (ESL) and the CHHA as defined in Section 163.3178(2)(h), Florida Statutes, and to limit public expenditures within the CHHA. This section of the Comprehensive Plan includes six policies to achieve this objective.
- The County's *Comprehensive Plan Element E.1.8, Protection of Coastal Historical/ Archaeological Resources,* states that the County shall provide for the protection, preservation, and sensitive reuse of Coastal Area historic and archaeological resources. This section of the Comprehensive Plan includes three policies to achieve this objective.
- The County's *Comprehensive Plan Element E.1.9, Hurricane Evacuation Time,* states that the County shall maintain hurricane evacuation times. This section of the Comprehensive Plan includes five policies to achieve this objective.
- The County's *Comprehensive Plan Element E.2.2, Native Forests, Floodplains, Wetlands, Upland Communities, and Surface Water,* states that the County shall protect native forests, floodplains, wetlands, upland communities, and surface waters within the

County from development impacts to provide for maintenance of environmental quality and wildlife habitats. This section of the Comprehensive Plan includes 23 policies to achieve this objective.
- The County's *Comprehensive Plan Element E.2.3, Surface Water Quality,* states that the surface waters of St. Johns County shall be protected to ensure that their quality is maintained. Waters that enter the estuaries and the ocean shall be improved, at a minimum, to the standards established by Chapter 62-302, FAC, and the Clean Water Act, Section 33 of the US Code (33 USC) 1251. This section of the Comprehensive Plan includes nine policies to achieve this objective.
- The County's *Comprehensive Plan Element E.2.6, Stormwater*, states that the County shall protect and appropriately use estuarine and freshwater systems. This section of the Comprehensive Plan includes eight policies to achieve this objective.

Section 3.03 of the County's Land Development Code details the County's flood regulations specific to flood-damage control. This section includes the following subsections, which are relevant to the County's ability to manage/limit flood exposure:

- Section 3.03.03, Duties and Power of the Floodplain Administrator
- Section 3.03.04, Permits
- Section 3.03.05, Site Plans and Construction Documents
- Section 3.03.06, Inspections
- Section 3.03.10, Flood Resistant Development

The County's Regional Stormwater Model, which was discussed in Section 5.3.1 and used for the exposure analysis, is also used by the County's Growth Management Department to assess stormwater impacts from new developments. Growth Management Staff review proposed new developments against peak stage, flow, and inundation mapping results from the model to assess the potential for unintended off-site drainage impacts. The model provides the County with a holistic view of the drainage system, which is much more robust than the site-specific analysis that is typically provided through the application process. This allows the County to make better informed decisions throughout the development review process and protects residents from future flooding caused by new development.

The County has a Local Mitigation Strategy (LMS), which is administered through the County's Emergency Management Department and is led by a committee that consists of representatives from multiple agencies. The purpose of the LMS is to provide guidance to the County in building a safer and more resilient community. The LMS is a living document that is updated periodically and includes the following main components:

- Goals and Guiding Principles
- Hazard Identification and Vulnerability Assessments
- Vulnerability and Loss Estimates
- Initiative Development and Selection
- Mitigation Initiatives
- Funding

The County has a Comprehensive Emergency Management Plan (CEMP). The CEMP is an operation-orientated document authorized by Chapter 252, Florida Statues. The CEMP establishes the framework to ensure that St. Johns County and its municipalities will be adequately prepared to deal with all hazards threatening the lives and property of St. Johns County citizens. The CEMP outlines the roles, responsibilities, and coordination mechanisms of local county and municipal governments, state, and federal agencies and volunteer organizations in a disaster.

10.1.2 Administrative and Technical Capabilities

This section summarizes the County's current administrative and technical capabilities that aid the County in managing SLR and flood vulnerability. The following summarizes the current administrative and technical positions within the County that allow the County to better manage flooding and the impacts from SLR:

- The County employs a Principal Resiliency Planning Analyst that oversees resiliency from a County-wide perspective.
- In addition to the Principal Resiliency Planning Analyst, the County has a dedicated Office of Intergovernmental Affairs that assist in the procurement of grant funding related to resiliency.
- Public Works Engineering employs two professional engineers and 12 Capital Improvement/Project managers who plan for and oversee the design and construction of public works improvement projects. This includes projects related to improving the County's stormwater management.
- Grow Management employs five professional engineers that evaluate developments for impacts to floodplains and stormwater management consistent with the Land Development Code.
- Growth Management employs 10 planners and two floodplain management staff.
- The County's Land Management Department employs nine GIS professionals who are responsible for managing and administering the County's GIS data to the public. This includes data and maps related to flooding, emergency management, etc.
- The County routinely hires outside experts/consultants for project-specific plans.
- St. Johns County's Emergency Management Team includes several emergency management professionals who manage and coordinate the County's Emergency Operations Center (EOC). The EOC serves as the central hub for partners to gather, coordinate, and make informed decisions to protect lives, property, and the environment. The County's Emergency Management Team is responsible for carrying out the County's CEMP.

10.1.3 Fiscal Capacity

This section briefly summarizes the County's current fiscal capacity to manage SLR and flood vulnerability. The County has a Capital Improvement Plan that is updated and funded annually to include projects in a 5-year period for planning, design, and construction. This Plan includes current and future projects related to stormwater management, resilient designs, and asset hardening. The County has received and continues to pursue state and federal appropriations and grant funding opportunities. Previous grant funding opportunities that the County has successfully pursued for flood mitigation projects include but are not limited to, FEMA's Hazard Mitigation Grant Program (HMGP), Community Development Block Grants (CDBG), and RFGP planning and implementation grants.

10.1.4 INFRASTRUCTURE

The County's critical infrastructure was identified and assessed relative to its vulnerability to tidal, storm surge, and rainfall flooding as part of the data collection, exposure analysis, and sensitivity analysis tasks of the VA. Sections 5, 6, 7, and 8 of this report summarize the analysis and findings from these tasks. The County used the results from the VA to identify adaptation needs and potential adaptation strategies for critical infrastructure. Sections 10.2 and 10.3 summarize the adaptation needs and strategies that were identified.

10.2 PRIORITIZATION OF ADAPTATION NEEDS

To identify adaptation needs for the preliminary Adaptation Plan, Jones Edmunds:

- Reviewed existing County drainage studies, previous RFGP implementation grant submissions, and the County's LMS for existing needs that had already been identified.
- Received feedback from County staff and the Steering Committee members on their highest priority areas of concern.
- Reviewed the highest-ranked critical assets from the sensitivity analysis and identified areas of potential adaptation need.

Based on this review, 72 areas of potential adaptation need were identified. Jones Edmunds reviewed the areas that were identified with County staff to determine the relative priority of the adaptation needs. Figure 90 shows the locations that were identified with a unique identifier assigned to each location. Table 22 summarizes the adaptation need and relative priority that was assigned to each location based on the unique identifier in Figure 90.

10.3 IDENTIFICATION OF ADAPTATION STRATEGIES

For the high-priority adaptation needs identified in Section 10.2, Jones Edmunds identified adaptation strategies for inclusion in the preliminary Adaptation Plan. Where available, projects/strategies were taken from legacy drainage studies or previous County RFGP implementation grant submissions and cost estimates were updated if needed. For new areas of need, Jones Edmunds developed adaptation strategies, which included H&H modeling if necessary and development of conceptual-level cost estimates. This Section summarizes the adaptation projects/strategies that were identified.

Additionally, multiple sections of SR A1A, which is owned and maintained by FDOT, were identified as critical high-priority adaptation needs. This Section summarizes the locations of need in more detail and recommends additional coordination efforts with FDOT.

Figure 90 Potential Adaptation Needs

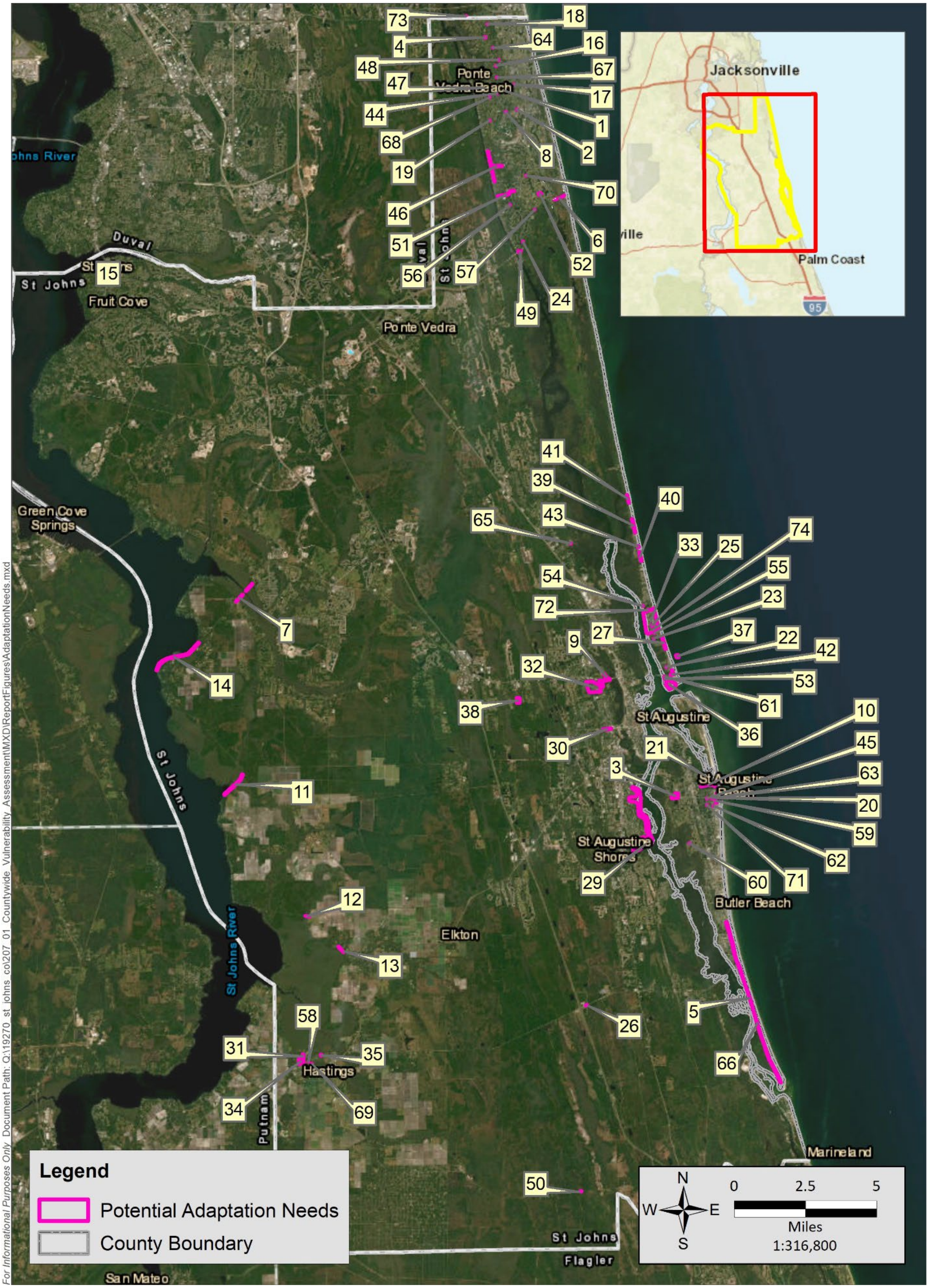


Table 22 Summary of Potential Adaptation Needs

Unique ID	Summary of Adaptation Need	Relative Priority
1	Lift station 224 is low-lying and vulnerable to flooding. Need to raise the station out of the floodplain or flood-proof it.	High
2	Lift station 231 is low-lying and vulnerable to flooding. Need to raise the station out of the floodplain or flood-proof it.	High
3	Anastasia Island WWTP is low-lying and vulnerable to flooding. Need to determine flood-hardening measures that are needed.	High
4	Marsh Landing WTP is low-lying and vulnerable to flooding. Need to determine flood-hardening measures that are needed.	High
5	SR A1A north/south of SR 206 is low-lying and vulnerable to flooding. Coordinate with FDOT on improvements.	High
6	Sections of Mickler Road and Ponte Vedra Boulevard are low-lying and vulnerable to flooding. Roadways need to be raised.	High
7	The Six Mile Creek bridge approaches on CR 13N are low-lying and vulnerable to flooding. Bridge approaches need to be raised.	High
8	Lift station 230 is low-lying and vulnerable to flooding. Need to raise the station out of the floodplain or flood-proof it.	High
9	Sections of Masters Drive, SR 16, and Lewis Speedway are low-lying and vulnerable to flooding. Roadways need to be raised.	High
10	Tidal waters backflow through the culverts under SR A1A Beach Boulevard and cause flooding in COSAB. Backflow prevention on culverts under SR A1A Beach Boulevard are needed.	High
11	Section of County Road 13N is low-lying and vulnerable to flooding. Roadway needs to be raised.	High
12	Cross-culvert under County Road 13 is undersized and causes overtopping of CR 13 in the 25-year storm event. Additional culvert capacity is needed.	High
13	Cross-culvert under CR 13 is undersized and causes overtopping of CR 13 in the 25-year storm event. Additional culvert capacity is needed.	High
14	Section of CR 13N is low-lying and vulnerable to flooding. Roadway needs to be raised.	High
15	Modeling shows isolated flooding at the intersection of SR 13 and Race Track Road. Improve stormwater drainage at the intersection.	Low
16	Lift station 210 is low-lying and vulnerable to flooding. Need to raise the station out of the floodplain or flood-proof it.	High
17	Lift station 225 is low-lying and vulnerable to flooding. Need to raise the station out of the floodplain or flood-proof it.	High
18	Lift station 202 is low-lying and vulnerable to flooding. Need to raise the station out of the floodplain or flood-proof it.	High
19	Lift station 228 is low-lying and vulnerable to flooding. Need to raise the station out of the floodplain or flood-proof it.	High
20	Modeling shows rainfall-induced flooding on SR A1A Beach Boulevard. Drainage improvements are needed to reduce flooding.	Medium
21	Modeling shows significant head-loss across culverts in Anastasia State Park. Culvert improvements may be needed to improve capacity.	Low
22	Sherwood Avenue lift station is low-lying and vulnerable to flooding. Need to raise the station out of the floodplain or flood-proof it.	High
23	Herron Point lift station is low-lying and vulnerable to flooding. Need to raise the station out of the floodplain or flood-proof it.	High
24	Lift station 298 is low-lying and vulnerable to flooding. Need to raise the station out of the floodplain or flood-proof it.	High
25	North Beach WTP is low-lying and vulnerable to flooding. Need to determine flood-hardening measures that are needed.	High
26	Modeling shows isolated flooding on SR 206. Side drain culvert capacity needs to be improved to reduce roadway flooding	Low

Unique ID	Summary of Adaptation Need	Relative Priority
27	Section of SR A1A washed out during previous tropical events. Coordinate with FDOT on hardening/erosion protection along vulnerable stretch of SR A1A.	High
29	Shore Drive is low-lying and vulnerable to flooding and erosion. Shore Drive should be raised or hardened.	Medium
30	King Street is low-lying and vulnerable to flooding. Roadway needs to be raised.	High
31	Hastings is low-lying and vulnerable to flooding. The Big Sooey stormwater pond/pump station could be constructed to reduce flooding in this area.	High
32	The Santa Rosa neighborhood south of SR 16 is vulnerable to flooding. Stormwater drainage improvements are needed.	High
33	North Beach is low-lying and vulnerable to flooding. Improvements are needed to protect critical assets.	High
34	Holtz and Chase Streets and the surrounding properties are vulnerable to floodings. Stormwater drainage improvements are needed.	Medium
35	Hastings is vulnerable to flooding. Culvert improvements at the Palatka Trail Crossing are needed to reduce flooding.	Medium
36	Porpoise Point is vulnerable to flooding. Additional outfall capacity is needed to reduce flooding.	Medium
37	The County could develop a flood-forecasting system to better inform emergency service personnel and residents about the frequency, location, and timing of expected flooding.	Medium
38	Modeling shows that the SR 16 WWTP is vulnerable to rainfall flooding. Stormwater improvements are needed to reduce flooding in the 100-year event.	Medium
39	Modeling shows rainfall-induced flooding along SR A1A. Coordinate with FDOT on potential drainage improvements.	Medium
40	Modeling shows rainfall-induced flooding along SR A1A. Coordinate with FDOT on potential drainage improvements.	Medium
41	Modeling shows rainfall-induced flooding along SR A1A. Coordinate with FDOT on potential drainage improvements.	Medium
42	The Vilano Road bridge approach is low-lying and vulnerable to flooding. Coordinate with FDOT on potential improvements.	High
43	Turtle Shores beach access area is low-lying and vulnerable as pointed out by residents in the area.	Low
44	Lift station 223 is low-lying and vulnerable to flooding. Need to raise the station out of the floodplain or flood-proof it.	High
45	Lift station 62 is low-lying and vulnerable to flooding. Need to raise the station out of the floodplain or flood-proof it.	High
46	Sections of Roscoe Boulevard and Canal Boulevard are low-lying and vulnerable to flooding. Roadways need to be raised.	High
47	Lift station 219 is low-lying and vulnerable to flooding. Need to raise the station out of the floodplain or flood-proof it.	High
48	Lift station 209 is low-lying and vulnerable to flooding. Need to raise the station out of the floodplain or flood-proof it.	High
49	Section of Roscoe Boulevard is low-lying and vulnerable to flooding. Roadway needs to be raised.	Medium
50	Modeling shows isolated flooding on CR 204. Side drain culvert capacity needs to be improved to reduce roadway flooding	Low
51	Landrum Lane is low-lying and vulnerable to flooding. Roadway needs to be raised.	High
52	The Plantation WTP is low-lying and vulnerable to flooding. Need to determine flood-hardening measures that are needed.	High
53	The Porpoise Point WTP is low-lying and vulnerable to flooding. Need to determine flood-hardening measures that are needed.	High

Unique ID	Summary of Adaptation Need	Relative Priority
54	The Myrtle and Fifth lift station is low-lying and vulnerable to flooding. Need to raise the station out of the floodplain or flood-proof it.	High
55	The Villages of Vilano lift station is low-lying and vulnerable to flooding. Need to raise the station out of the floodplain or flood-proof it.	High
56	Lift station 300 is low-lying and vulnerable to flooding. Need to raise the station out of the floodplain or flood-proof it.	High
57	Lift station 287 is low-lying and vulnerable to flooding. Need to raise the station out of the floodplain or flood-proof it.	High
58	Lift station 369 is low-lying and vulnerable to flooding. Need to raise the station out of the floodplain or flood-proof it.	High
59	Lift station 324 is low-lying and vulnerable to flooding. Need to raise the station out of the floodplain or flood-proof it.	High
60	Lift station 74 is low-lying and vulnerable to flooding. Need to raise the station out of the floodplain or flood-proof it.	High
61	The Beaches Rest 1 and 2 lift stations are low-lying and vulnerable to flooding. Need to raise the stations out of the floodplain or flood-proof them.	High
62	Lift station 323 is low-lying and vulnerable to flooding. Need to raise the station out of the floodplain or flood-proof it.	High
63	Lift station 61 is low-lying and vulnerable to flooding. Need to raise the station out of the floodplain or flood-proof it.	High
64	Lift station 208 is low-lying and vulnerable to flooding. Need to raise the station out of the floodplain or flood-proof it.	High
65	Lift station 152 is low-lying and vulnerable to flooding. Need to raise the station out of the floodplain or flood-proof it.	High
66	Lift station 6 is low-lying and vulnerable to flooding. Need to raise the station out of the floodplain or flood-proof it.	High
67	Lift station 222 is low-lying and vulnerable to flooding. Need to raise the station out of the floodplain or flood-proof it.	High
68	Lift station 221 is low-lying and vulnerable to flooding. Need to raise the station out of the floodplain or flood-proof it.	High
69	Lift station 267 is low-lying and vulnerable to flooding. Need to raise the station out of the floodplain or flood-proof it.	High
70	Lift station 284 is low-lying and vulnerable to flooding. Need to raise the station out of the floodplain or flood-proof it.	High
71	Lift station 365 is low-lying and vulnerable to flooding. Need to raise the station out of the floodplain or flood-proof it.	High
72	The Back Camp Resort lift station is low-lying and vulnerable to flooding. Need to raise the station out of the floodplain or flood-proof it.	High
73	Lift station 204 is low-lying and vulnerable to flooding. Need to raise the station out of the floodplain or flood-proof it.	High
74	Raise the North Beach production well out of the floodplain.	High

10.3.1 Legacy Adaptation Projects/Strategies

Jones Edmunds reviewed existing drainage studies and previous County RFGP implementation grant submissions and identified the following legacy adaptation projects for inclusion in the preliminary Adaptation Plan:

- North Beach Drainage Improvements
- Big Sooey Stormwater Pond/Pump Station
- Holtz and Chase Street Drainage Improvements
- Palatka Trail Crossing Improvements

- Santa Rosa Drainage Improvements South of SR 16
- Porpoise Point Drainage Improvements
- South Whitney and West King Street Drainage Improvements
- SR A1A and Pope Road Drainage Improvements

10.3.1.1 North Beach Drainage Improvements

The North Beach Drainage Improvements project was identified in the North Beach Drainage Study, which was completed for the County by Osiris9 Consulting in January 2024. The study identified three improvement alternatives to reduce tidal and storm surge flooding within the North Beach neighborhood between 23rd Street South and Euclid Avenue. Based on the sensitivity analysis results, this area has a high density of vulnerable critical assets, including 11 assets with a highest priority rating, 82 assets with a high priority rating, and 49 assets with a medium priority rating. This includes the North Beach WTP, 11 sanitary sewer lift stations, and 125 sanitary sewer grinder pump stations, all of which are owned and operated by St. Johns County. The alternatives in the Study provided varying levels of flood protection, and the construction cost estimates were between $2.6 million and $7.3 million. The North Beach Drainage Study provides detail on the proposed improvements and their flood-reduction benefits.

10.3.1.2 Big Sooey Stormwater Pond/Pump Station

The Big Sooey Stormwater Pond/Pump Station project was identified in the Hastings Drainage Study, which was completed for the County by Jones Edmunds in June 2019. This project includes constructing a stormwater pond and pump station on the Big Sooey ditch downstream of North Main Street. These improvements would help protect the Town of Hastings from flooding when water levels in the St. Johns River are elevated in conjunction with large rainfall events. Based on the sensitivity analysis results, this area has two assets with a high priority rating and one asset with a medium priority rating, this includes North Main Street, which provides access to the Hastings WWTP and the W.E. Harris Community Center. The original cost estimate for design and construction of this project was $2.4 million to $3.9 million. The County applied for grant funding for this project through the RFGP in 2023, but the project was not selected for funding during that cycle. The project is currently ranked 178 out of 196 projects on the Statewide Resilience Plan for fiscal year 2024–2025. Jones Edmunds provided an updated cost estimate of $4 million to $6.5 million for the grant application, which is more reflective of construction prices today. The Hastings Drainage Study provides detail on the proposed improvements and their flood-reduction benefits.

10.3.1.3 Holtz and Chase Street Drainage Improvements

The Holtz and Chase Street Drainage Improvements project was identified in the Hastings Drainage Study, which was completed for the County by Jones Edmunds in June 2019. This project includes conveyance improvements to roadside swales and cross-culverts along Holtz and Chase Streets to more efficiently convey water to the Big Sooey outfall ditch. Based on the sensitivity analysis results, this area has one asset with a high priority rating and two assets with a medium priority rating, this includes North Main Street, which provides access to the Hastings WWTP and the W.E. Harris Community Center. The original cost estimate for design and construction of this project was $340,000 to $560,000. Construction prices have increased significantly since the Hastings Drainage Study was completed. Jones Edmunds reviewed and updated the cost estimate based on current cost data. The updated cost estimate for this project is $900,000 to $1,200,000. The Hastings Drainage Study provides detail on the proposed improvements and their flood-reduction benefits.

10.3.1.4 Palatka Trail Crossing Improvements

The Palatka Trail Crossing Improvements project was identified in the Hastings Drainage Study, which was completed for the County by Jones Edmunds in June 2019. This project includes cross-culvert capacity improvements under the Palatka Trail and demolition of two 60-inch culverts downstream of the trail where the trail crosses an unnamed wetland slough east of the Town of Hastings. Based on the sensitivity analysis results, the project impact area has nine assets with a high priority rating and two assets with a medium priority rating. This project includes three sanitary sewer lift stations owned and maintained by St. Johns County and eight sections of the roadway along East St. Johns Avenue. The original cost estimate for design and construction of this project was $320,000 to $520,000. Construction prices have increased significantly since the Hastings Drainage Study was completed. Jones Edmunds reviewed and updated the cost estimate based on current cost data. The updated cost estimate for this project is $800,000 to $1,100,000. The Hastings Drainage Study provides detail on the proposed improvements and their flood-reduction benefits.

10.3.1.5 Santa Rosa Drainage Improvements South of SR 16

The Santa Rosa Drainage Improvements South of SR 16 project was identified in the County's Santa Rosa Drainage Improvements Project, which included evaluating drainage improvement alternatives in the Santa Rosa neighborhood south of SR 16. This evaluation was completed by Jones Edmunds and Osiris9 in August 2020. This project includes side-drain culvert improvements along the Cervantes Avenue outfall ditch, culvert improvements under Barcelona and Abbey Avenues, and construction of drainage collection systems along Menecal, El Rey, and Ucita Avenues. The project was designed and permitted in 2021, but the grant funding available at the time was not adequate to construct the improvements. Based on results from the sensitivity analysis, the project impacts area contains minimal vulnerable critical assets, but the project provides significant drainage improvements for County residents. The County applied for RFGP implementation funding for this project in 2023, but the project was not selected for funding. The project is currently ranked 149 out of 196 projects on the Statewide Resilience Plan for fiscal year 2024–2025. The estimated project cost submitted to FDEP in 2023 was $6,600,000.

10.3.1.6 Porpoise Point Drainage Improvements

The Porpoise Point Drainage Improvements project was previously identified by the County, and the County applied for RFGP implementation funding for this project in 2023 but it was not selected for funding. The project is currently ranked 121 out of 196 projects on the Statewide Resilience Plan for fiscal year 2024–2025. This project includes constructing a positive-gravity outfall that will enhance the effectiveness of the current drainage system with the goal of significantly reducing the duration of roadway inundation. The outfall will have a back-flow preventer designed to prevent beach sand from clogging or blocking stormwater release. The vehicle access ramp exiting Porpoise Point Drive to the south onto the beach will be raised and hardened to match the height of the existing, privately owned bulkheads adjacent to the ramp location. Based on results from the sensitivity analysis, the project impact area contains minimal vulnerable critical assets, but the project provides significant drainage improvements for County residents. The estimated project cost submitted to FDEP in 2023 was $575,000.

10.3.1.7 South Whitney and West King Streets Drainage Improvements

The South Whitney and West King Streets Drainage Improvements project is a joint project with St. Johns County and the City of St. Augustine. It includes raising the section of West King Street between the Florida East Coast Railroad and Travis Lane, raising South Whitney Street between West King Street and Scott Street, constructing a new box culvert under South Whitney Street, and improving the stormwater collection system on West King Street and South Whitney Street. The project will reduce rainfall, tidal, and storm surge related flooding on King Street, which is a County collector road and was assigned the highest priority rating based on the sensitivity analysis. The project was designed and permitted in 2020, put out for bid for construction in 2024, and received a low bid of $1.8 million.

10.3.1.8 CR A1A and Pope Road Drainage Improvements

The CR A1A and Pope Road Drainage Improvements project has been designed and permitted by COSAB. The project includes installing backflow prevention on the existing cross-culverts under CR A1A Beach Boulevard and Pope Road east of Santander Street. The project design and permitting was funded through a grant that the City received, but included improvements under County roadways so the project has not yet been constructed. Implementation of this project would protect many of the County's critical assets in the COSAB and the City's residents from storm surge and tidally driven flooding. In 2023, the construction cost estimate for this project was approximately $600,000.

10.3.2 New Adaptation Projects/Strategies

Jones Edmunds reviewed the highest ranked critical assets from the sensitivity analysis and developed nine new adaptation projects/strategies for which the County could pursue RFGP implementation grant funding. For each of the concepts, Jones Edmunds developed descriptions and/or figures summarizing the concepts, completed H&H modeling if needed, and developed conceptual-level cost estimates.

10.3.2.1 Detailed Evaluations of Vulnerable WTPs and WWTPs

WTPs and WWTPs are critical assets that are vital to the health and well-being of the County's residents. The sensitivity analysis identified highly ranked vulnerable critical assets at five County-owned and operated WTPs/WWTPs where additional evaluation of adaptation needs relative to projected flooding conditions is needed:

- Anastasia Island WWTP
- Marsh Landing WTP
- Plantation WTP
- Porpoise Point WTP
- North Beach WTP and Associated Water Supply Wells

Water/wastewater treatment facilities are complex and contain many different localized components that have varying sensitivities to flooding. An in-depth analysis of the localized system components for each of these treatment facilities is not feasible under the project scope/budget for the preliminary Adaptation Plan. Jones Edmunds recommends that the County pursue additional RFGP planning funding to complete an in-depth adaptation needs assessment for these critical vulnerable treatment facilities. We expect that an adaptation needs assessment for these five facilities should cost $50,000 to $100,000 to complete.

10.3.2.2 Elevate Six Mile Creek Bridge Approaches on CR 13N

CR 13N is owned and maintained by the County and is a major collector road and evacuation route for County residents. The Six Mile Creek bridge crossing of County Road 13N is at the mouth of Six Mile Creek where the Creek discharges into the St. Johns River. The bridge and bridge approaches are between Joe Ashton Road and Heritage Landing Parkway. Figure 91 shows the location of the bridge and its approaches.

Based on the 2018 LiDAR data, the lowest centerline elevation for the roadway on the south bridge approach is 2.6 feet-NAVD88 and the lowest elevation on the north approach is 3.9 feet-NAVD88. Surveyed high water mark data from Hurricanes Irma and Matthew showed that peak stages at the bridge were at approximately 5.0 feet-NAVD88 during both events, which caused significant flooding of the bridge approaches and roadway closures. Based on the sensitivity analysis, the south bridge approach was assigned a priority rating of "highest" and the north bridge approach was assigned a rating of "High." CR 13N is considered a regionally significant asset because it is an evacuation route. Results from the flood modeling and mapping show that the bridge approaches flood under existing conditions in the tidal, 100-year storm surge, and 500-year rainfall flood scenarios.

The proposed adaptation strategy to reduce the vulnerability of CR 13N at this location is to raise the bridge approaches to a minimum elevation of 6.0 feet-NAVD88. This would include raising approximately 1,800 linear feet of roadway on the south approach and approximately 2,100 linear feet of roadway on the north approach. Figure 92 shows the approximate limits of the roadway that would need to be raised and the existing and proposed profile of the bridge approaches.

Jones Edmunds developed an engineer's opinion of probable cost to estimate engineering and construction costs for the proposed improvement. The cost estimate is considered a conceptual-level Class 4 estimate (ASTM E2516), which typically has an accuracy range of -20 to +30 percent. Unit prices were taken from the FDOT 12-month moving average construction cost data when available. If FDOT cost data were not available for an item, unit costs were estimated based on other recently bid projects in the area. The estimated cost for this project is $5.1 million to $6.6 million. Table 1 in Attachment 5 provides the detailed cost estimate.

Figure 91 CR 13N Six Mile Creek Bridge Location

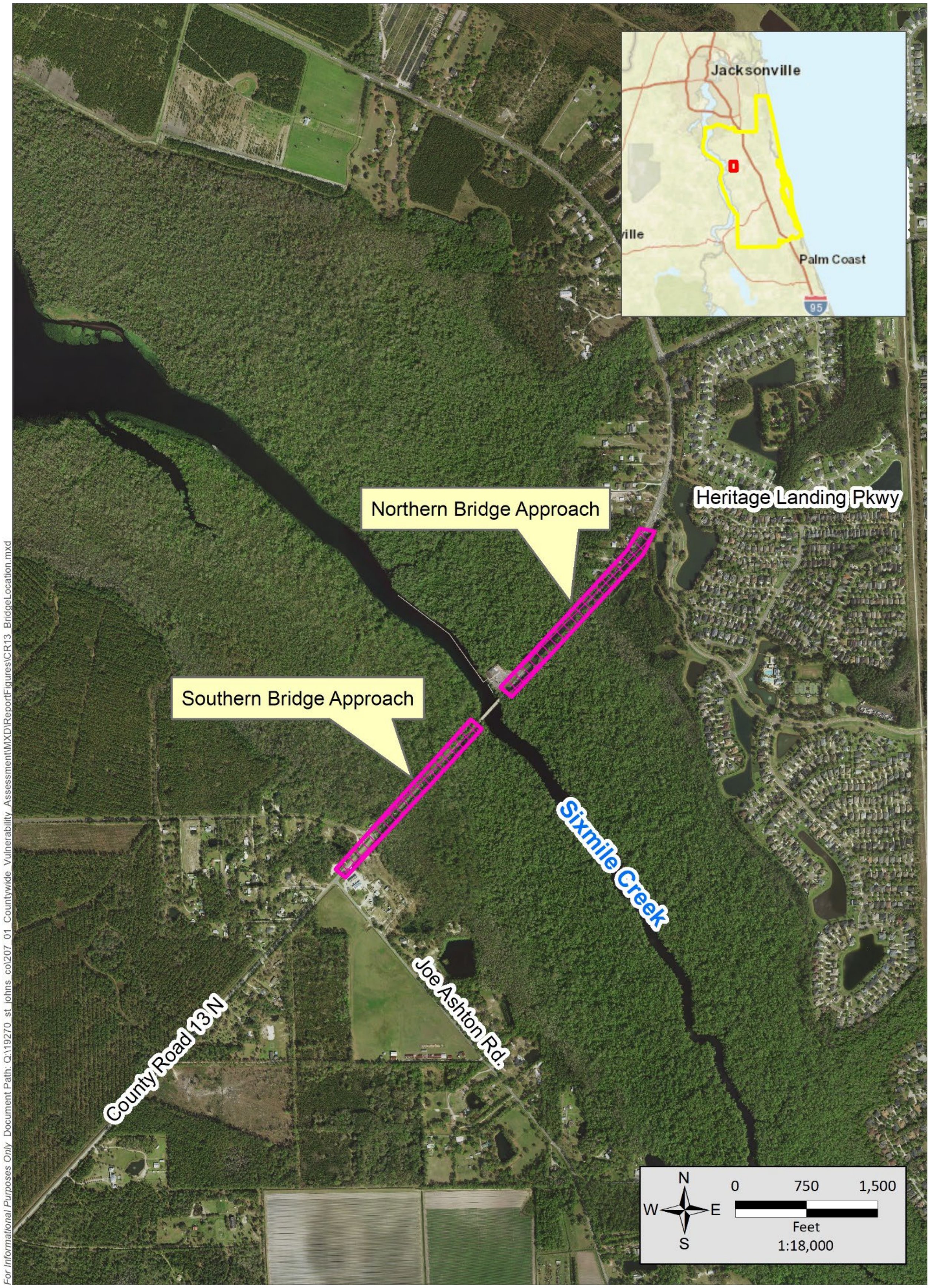
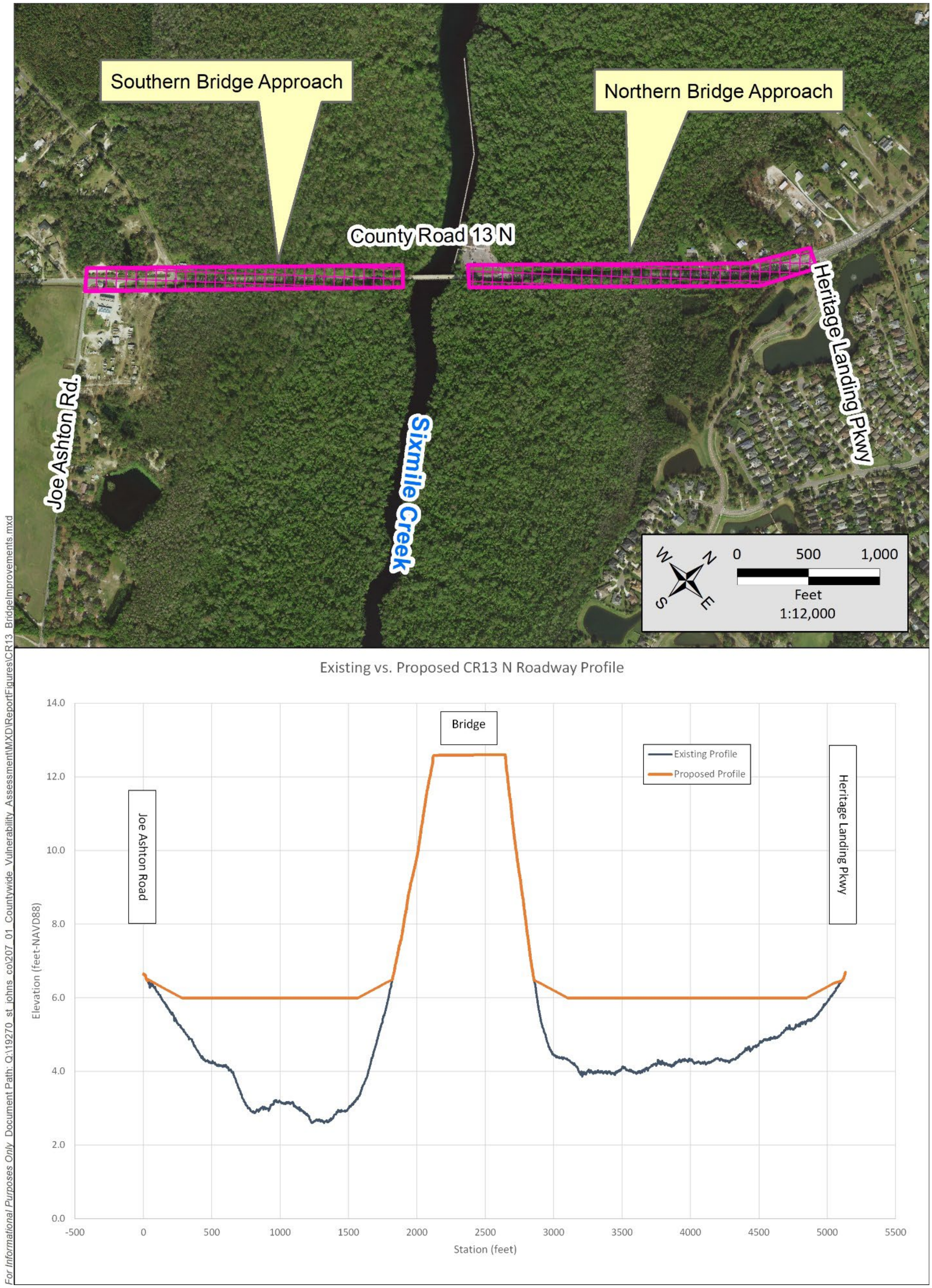


Figure 92 Summary of Proposed CR 13N Bridge Approach Improvements



10.3.2.3 CR 13 Cross-Culvert Capacity Improvements

CR 13N is owned and maintained by the County and is a major collector road and evacuation route for County residents. Results from the exposure and sensitivity analysis identified two cross-culvert locations along CR 13N between Don Manuel Road and McCullough Creek where CR 13N overtops from rainfall flooding during the 25-year/24-hour event because the cross-culverts are undersized. Figure 93 shows the crossing locations.

The first undersized cross-culvert is at Colson Branch approximately 0.5 mile east of CR 305 and has four existing 5-foot by 10-foot concrete box culverts. Based on the 2018 LiDAR DEM, the minimum centerline elevation of CR 13N at this location is 9.7 feet-NAVD88. Results from the exposure analysis at this location show that the roadway overtops from rainfall flooding during the 25-year/24-hour event, but no tidal or surge related flooding is predicted. As shown in Figure 94, rainfall-induced flooding was documented at this location during a storm event that occurred on May 3, 2013, which resulted in approximately 8 to 9 inches of rainfall in a 24-hour period.

The second undersized cross-culvert is at West Moccasin Branch, which is just north of the intersection of CR 13A and CR 13N and consists of four 48-inch corrugated metal pipes. Based on the 2018 LiDAR DEM, the minimum centerline elevation of CR 13N at this location is 9.0 feet-NAVD88. Additionally, a 3-foot-by-4-foot box culvert is under CR 13N approximately 850 linear feet southeast of CR 13A. Results from the exposure analysis at this location show that the roadway overtops from rainfall flooding during the 25-year/24-hour event, but no tidal or surge related flooding is predicted.

The proposed adaptation strategy to reduce the flood vulnerability of CR 13N at the Colson Branch crossing is to increase the culvert capacity from four to eight 5-foot-by-10-foot box culverts. Based on modeling completed for this alternative, this will eliminate rainfall-driven overtopping of CR 13N in the 100-year/24-hour event by reducing the peak stage on the upstream (north) side of the culverts from 10.5 to 9.6 feet-NAVD88. Figure 95 summarizes the proposed improvement at this location.

The proposed adaptation strategy to reduce the flood vulnerability of CR 13N at the West Moccasin Branch crossing is to increase the culvert capacity at the cross-culvert north of CR 13A to four 6-foot-tall by 7-foot-wide concrete box culverts and increase the culvert capacity at the cross-culvert south of CR 13A to two 4-foot-tall by 10-foot-wide concrete box culverts. This will eliminate rainfall-driven overtopping of CR 13N in the 100-year/24-hour event by reducing the peak stages on the upstream (east) side of the culverts from 9.5 to 8.1 feet-NAVD88. Figure 96 summarizes the proposed improvement at this location.

Jones Edmunds developed an engineer's opinion of probable cost to estimate engineering and construction costs for the proposed improvement. The cost estimate is considered a conceptual-level Class 4 estimate (ASTM E2516), which typically has an accuracy range of -20 to +30 percent. Unit prices were taken from the FDOT 12-month moving average construction cost data when available. If FDOT cost data were not available for an item, unit costs were estimated based on other recently bid projects in the area. The estimated cost for this project is $6.6 million to $8.6 million. Table 2 in Attachment 5 provides the detailed cost estimate.

Figure 93 CR 13N Undersized Culvert Crossing Locations

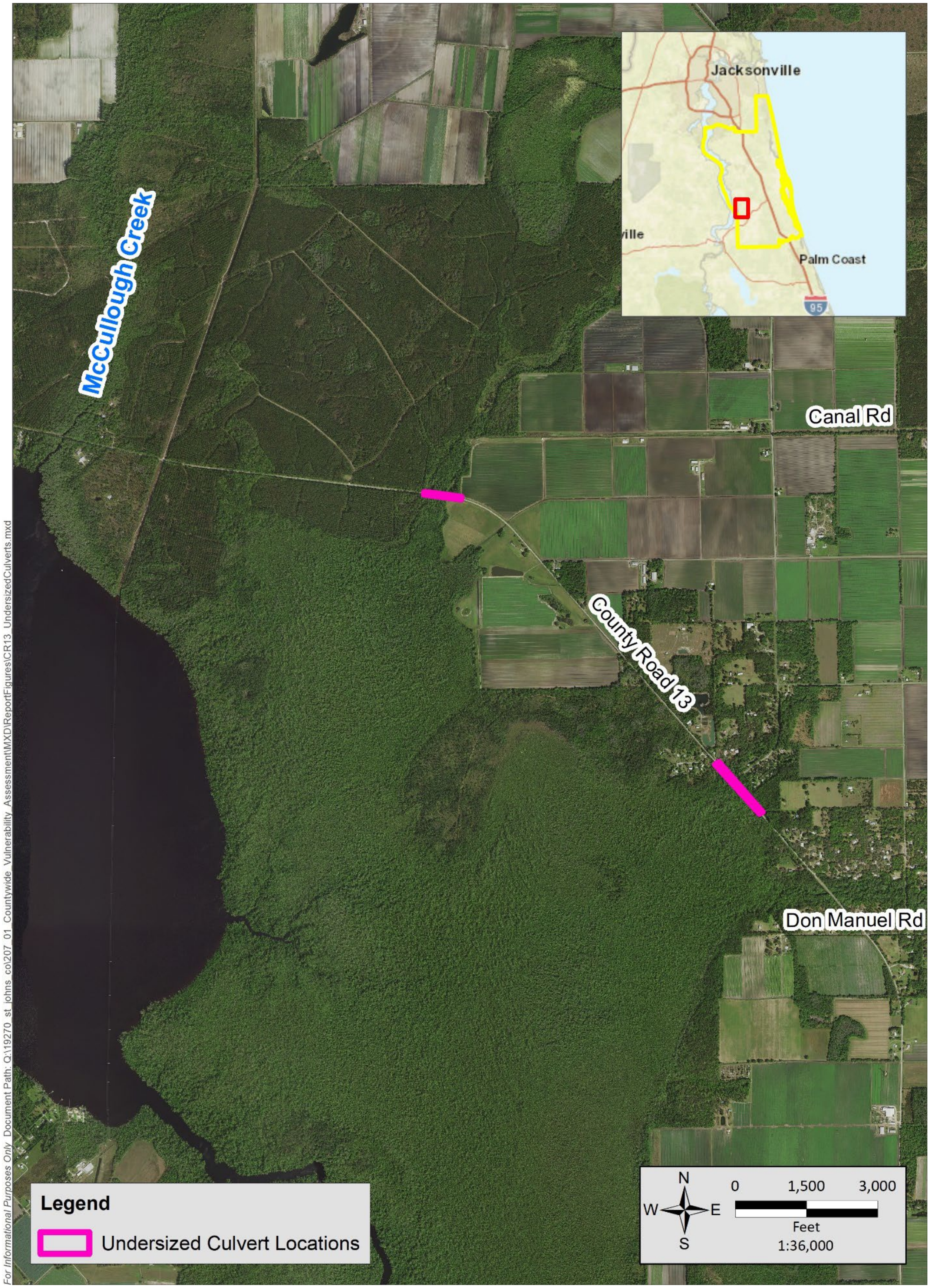


Figure 94 CR 13N Flooding During May 3, 2013 Rainfall Event

Figure 95 Proposed Improvements at Colson Branch

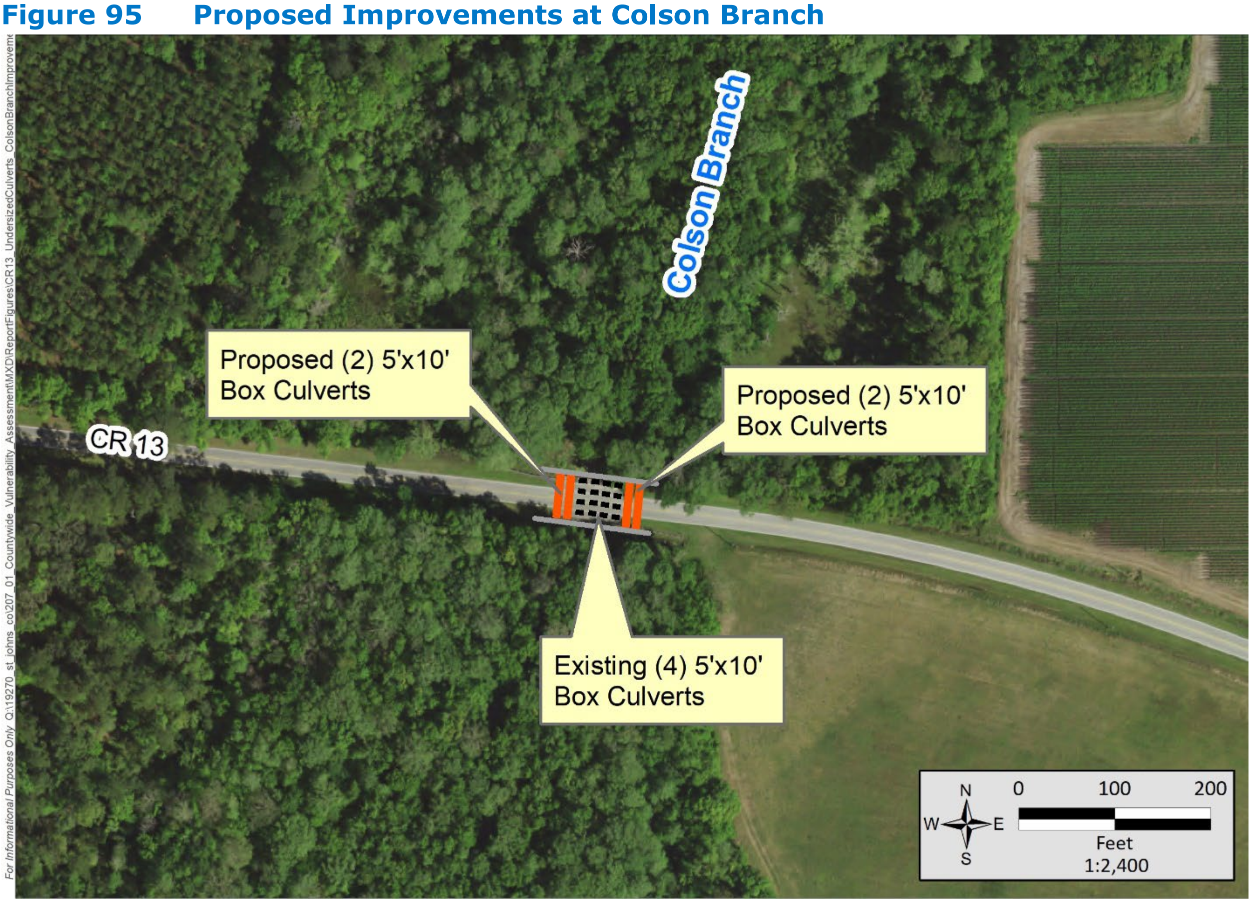
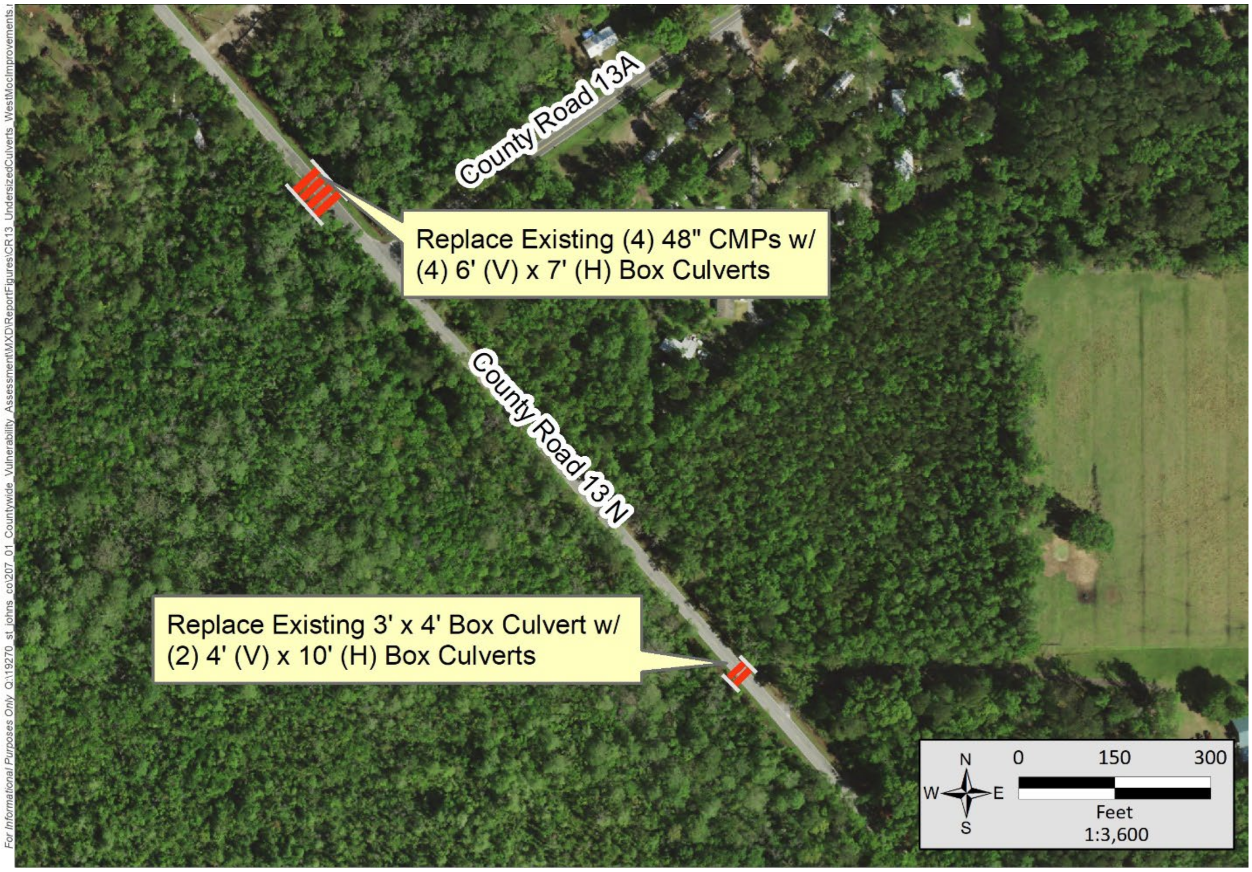


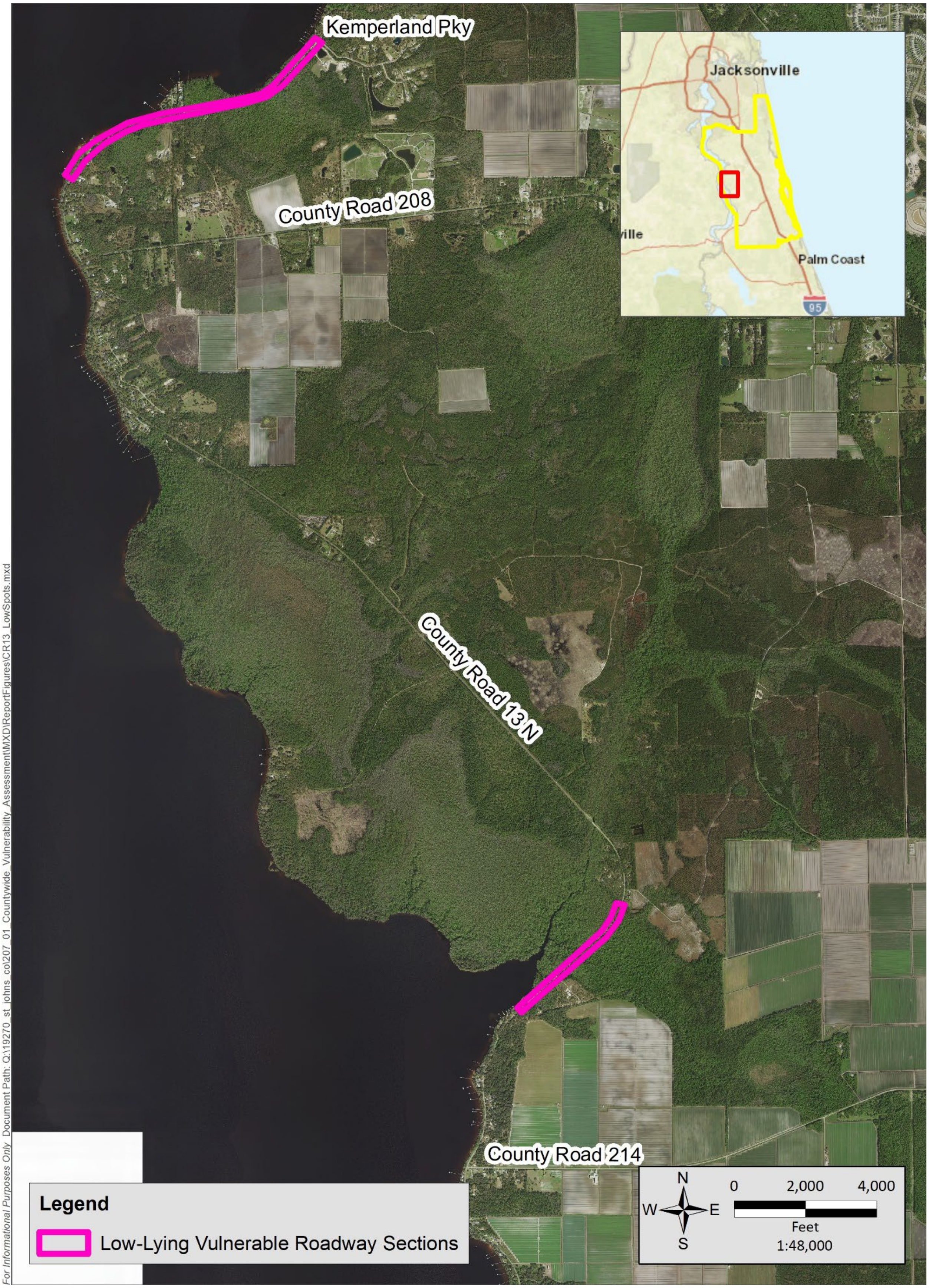
Figure 96 Proposed Improvements at West Moccasin Branch



10.3.2.4 Elevate Low Spots Along CR 13N

CR 13N is owned and maintained by the County and is a major collector road and evacuation route for County residents. Results from the exposure and sensitivity analysis identified two sections between CR 214 and Kemperland Parkway where CR 13N is low-lying and vulnerable to rainfall, tidal, and surge flooding under the existing conditions. Figure 97 shows the locations of the vulnerable sections. Both sections include segments of roadway that were identified as “highest” and “high” priority critical assets in the sensitivity analysis, and CR 13N was identified as a regionally significant asset.

Figure 97 Low-Lying Vulnerable Sections of CR13N



The first section of low-lying roadway begins just south of Kemperland Parkway and includes approximately 1.7 miles of two-lane roadway. Based on the 2018 LiDAR DEM, the minimum centerline elevation in this section is 3.2 feet-NAVD88, but most of the road is between 4.0 and 4.5 feet-NAVD88. The second section of low-lying roadway begins approximately 1 mile north of CR 214 and includes approximately 1.0 mile of two-lane roadway. Based on the 2018 LiDAR DEM, the minimum centerline elevation in this section is 3.6 feet-NAVD88. Surveyed high water mark data from Hurricanes Irma and Matthew showed that peak stages in the St. Johns River in this area were at approximately 5 feet-NAVD88 during both events, which caused significant flooding of CR 13N in these sections.

The proposed adaptation strategy to reduce the flood vulnerability of CR 13N in these sections is to raise the roads to a minimum elevation of 5.5 to 6.0 feet-NAVD88 and increase the cross-culvert capacity as needed to offset increases in peak stage from rainfall-induced flooding on the east side of CR 13N. Figure 98 summarizes the proposed improvements for the section south of Kemperland Parkway, and Figure 99 summarizes the proposed improvements for the section north of CR 214.

Figure 98 Proposed Improvements South of Kemperland Parkway

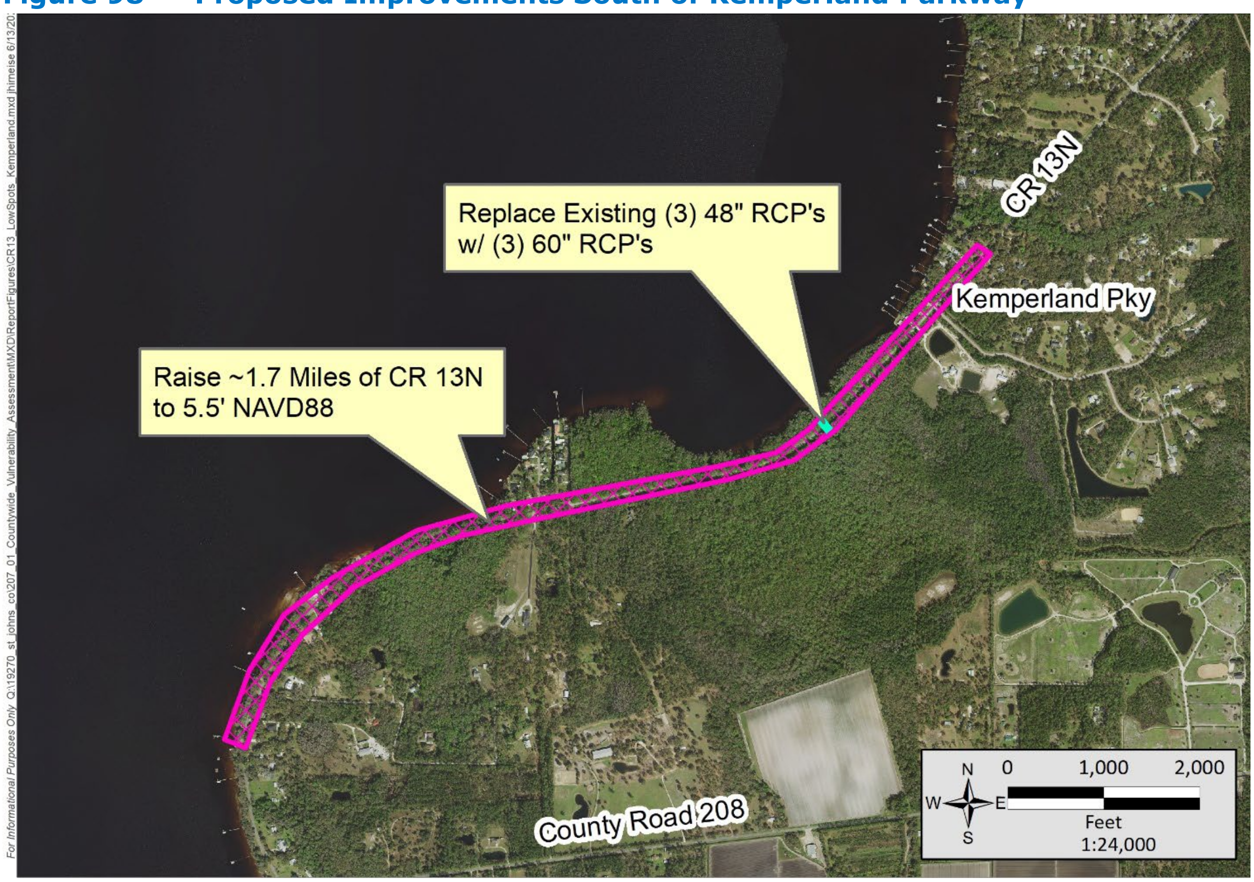
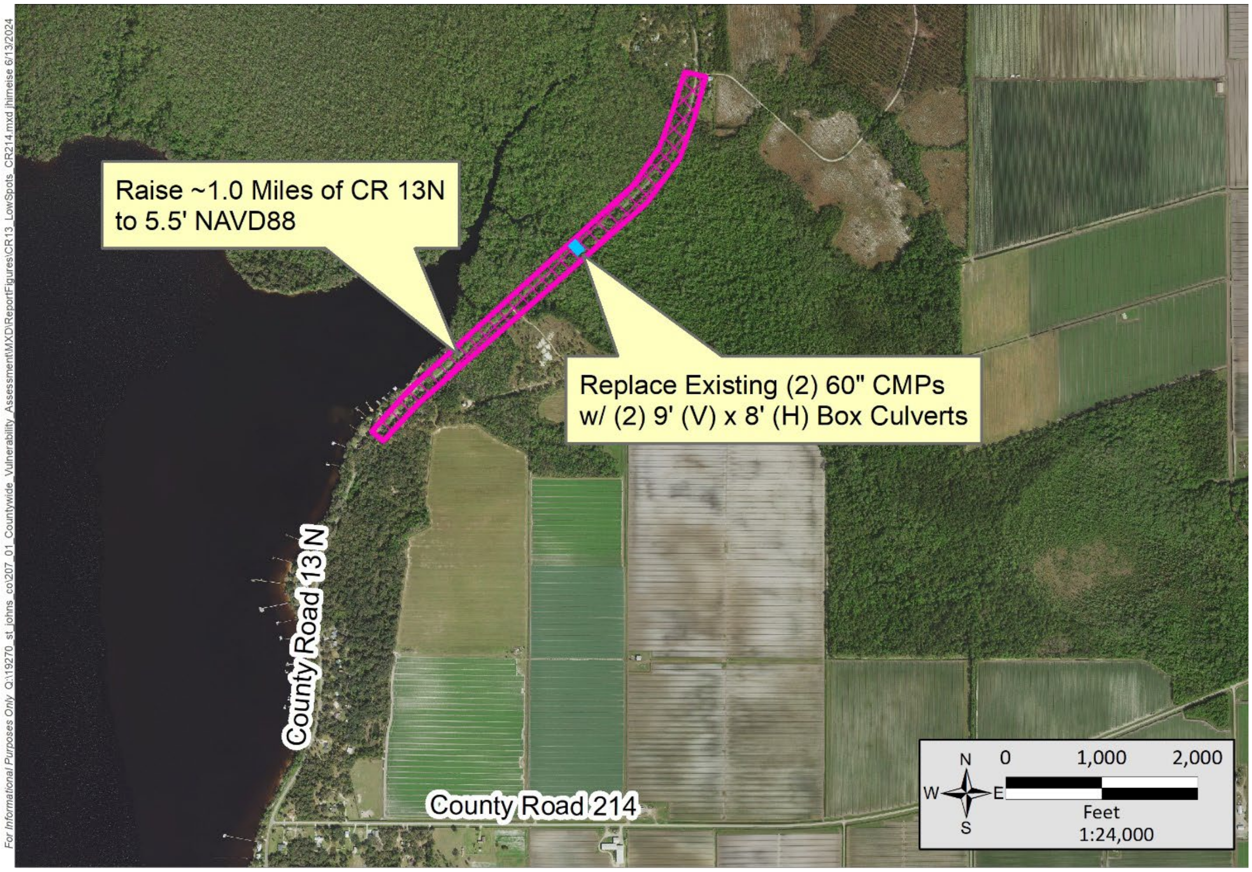


Figure 99 Proposed Improvements North of CR 214

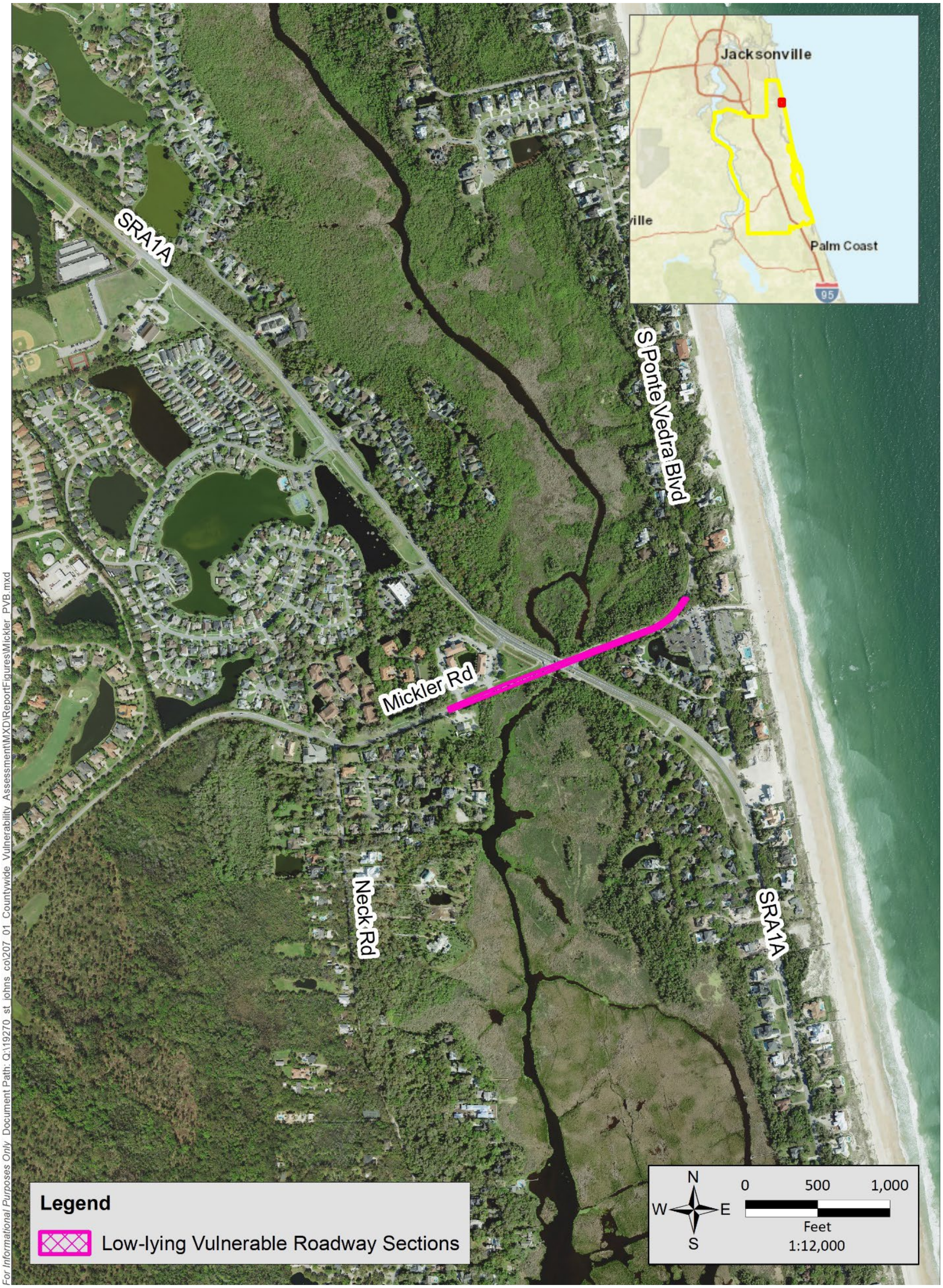


Jones Edmunds developed an engineer's opinion of probable cost to estimate engineering and construction costs for the proposed improvements. The cost estimate is considered a conceptual-level Class 4 estimate (ASTM E2516), which typically has an accuracy range of -20 to +30 percent. Unit prices were taken from the FDOT 12-month moving average construction cost data when available. If FDOT cost data were not available for an item, unit costs were estimated based on other recently bid projects in the area. The estimated cost for this project is $19 million to $24.8 million. Table 3 in Attachment 5 provides the detailed cost estimate.

10.3.2.5 Elevate Mickler Road and Ponte Vedra Boulevard Adjacent to SR A1A

Mickler Road and Ponte Vedra Boulevard are owned and maintained by the County and are major collector roads and evacuation routes for County residents. Results from the exposure and sensitivity analyses identified the low-lying section of Mickler Road west of SR A1A and the low-lying section of Ponte Vedra Boulevard east of SR A1A as vulnerable to rainfall, tidal, and surge flooding under existing conditions. Figure 100 shows the locations of the vulnerable sections. Both sections include segments of roadway that were identified as "highest" priority critical assets in the sensitivity analysis, and both roads were identified as regionally significant assets.

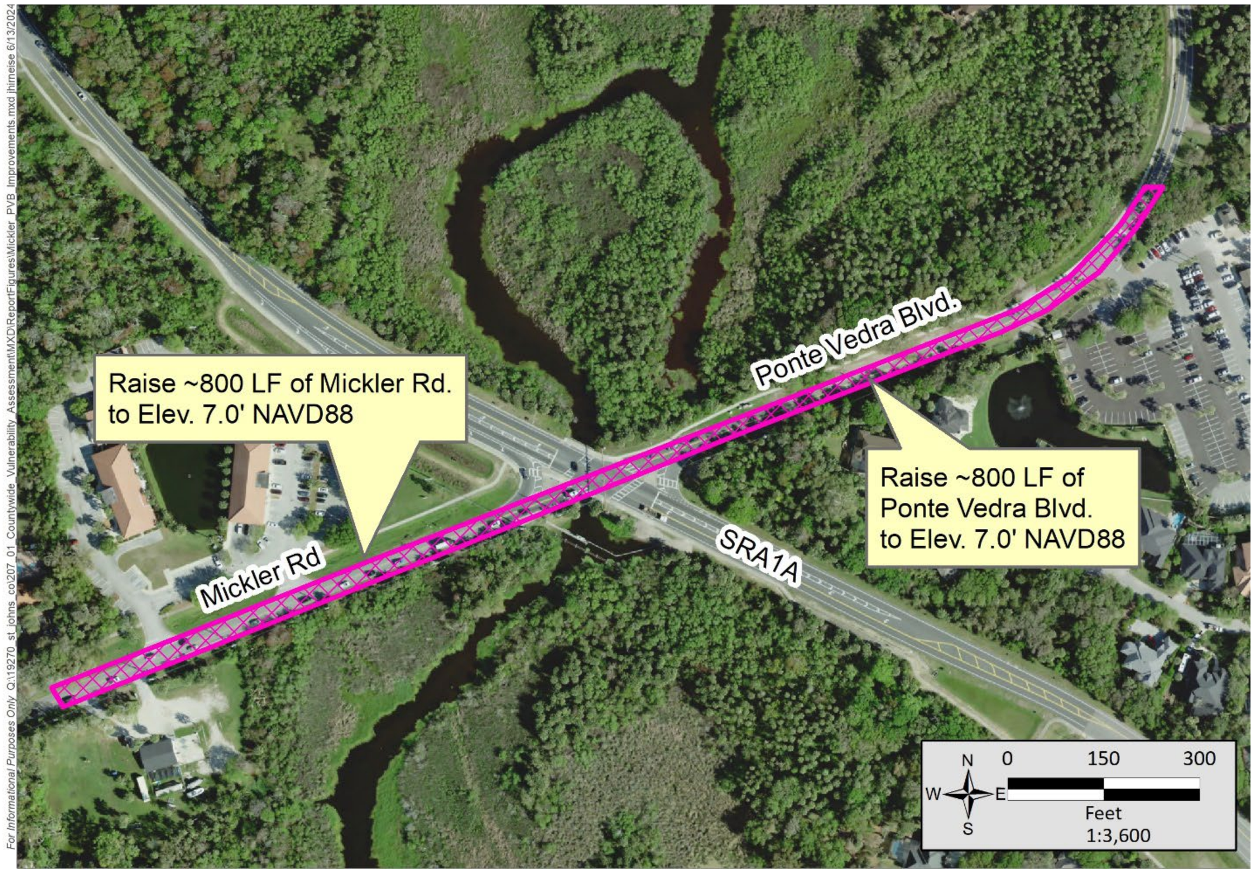
Figure 100 Low-Lying Vulnerable Sections of Mickler Road and Ponte Vedra Boulevard



The vulnerable section of Mickler Road includes approximately 650 linear feet of low-lying two-lane roadway that begins just west of the intersection with SR A1A. Based on the 2018 LiDAR DEM, the minimum centerline elevation in this section is 4.3 feet-NAVD88. The vulnerable section of Ponte Vedra Boulevard includes approximately 650 linear feet of low-lying two-lane roadway that begins just east of the intersection with SR A1A. Based on the 2018 LiDAR DEM, the minimum centerline elevation in this section is 4.3 feet-NAVD88.

The proposed adaptation strategy to reduce the flood vulnerability of these low-lying sections of roadway is to raise them to a minimum elevation of 7.0 feet-NAVD88. Figure 101 summarizes the proposed improvements.

Figure 101 Proposed Improvements for Mickler Road and Ponte Vedra Boulevard



Jones Edmunds developed an engineer's opinion of probable cost to estimate engineering and construction costs for the proposed improvements. The cost estimate is considered a conceptual-level Class 4 estimate (ASTM E2516), which typically has an accuracy range of -20 to +30 percent. Unit prices were taken from the FDOT 12-month moving average construction cost data when available. If FDOT cost data were not available for an item, unit costs were estimated based on other recently bid projects in the area. The estimated cost for this project is $3 to $3.8 million. Table 4 in Attachment 5 provides the detailed cost estimate.

10.3.2.6 Elevate Landrum Lane

Landrum Lane is in Ponte Vedra east of the Intracoastal Waterway and connects Roscoe Boulevard to Palm Valley Road. It is owned and maintained by the County and is considered a collector road. Results from the exposure and sensitivity analyses identified Landrum Lane as low-lying and vulnerable to rainfall and surge flooding under the existing conditions.

Figure 102 shows the location of Landrum Lane, which was identified as a "high" priority critical asset in the sensitivity analysis. Landrum Lane also provides the only access to Landrum Middle School and Ocean Palms Elementary School.

The vulnerable section of Landrum Lane includes approximately 3,600 linear feet of two-lane roadway. Based on the 2018 LiDAR DEM, the minimum centerline elevation in this section is 4.7 feet-NAVD88, but most of the roadway has a centerline elevation of 5.0 feet-NAVD88. Surveyed high water mark data from Hurricanes Irma and Matthew showed that peak stages in this area were at approximately 5.0 feet-NAVD88 during Hurricane Matthew and 5.5 to 6.0 feet-NAVD88 during Hurricane Irma, which would cause significant flooding of Landrum Lane.

The proposed adaptation strategy to reduce the flood vulnerability of Landrum Lane is to raise this road to a minimum elevation of 6.5 feet-NAVD88. Figure 103 summarizes the proposed improvements.

Jones Edmunds developed an engineer's opinion of probable cost to estimate engineering and construction costs for the proposed improvements. The cost estimate is considered a conceptual-level Class 4 estimate (ASTM E2516), which typically has an accuracy range of -20 to +30 percent. Unit prices were taken from the FDOT 12-month moving average construction cost data when available. If FDOT cost data were not available for an item, unit costs were estimated based on other recently bid projects in the area. The estimated cost for this project is $4.9 to $6.4 million. Table 5 in Attachment 5 provides the detailed cost estimate.

10.3.2.7 Elevate Low Sections of Roscoe Boulevard and Canal Boulevard

Roscoe Boulevard and Canal Boulevard are in Ponte Vedra east of the Intracoastal Waterway. Roscoe Boulevard runs north-south along the Intracoastal Waterway and Canal Boulevard runs east-west from Roscoe Boulevard to Palm Valley Road. Both roads are owned and maintained by the County and are considered collector roads. Results from the exposure and sensitivity analyses identified low-lying sections of Roscoe Boulevard and Canal Boulevard as vulnerable to rainfall and surge related flooding under the existing conditions. Figure 104 shows the sections of Roscoe Boulevard and Canal Boulevard that were identified as "highest" and "high" priority critical assets in the sensitivity analysis.

Figure 102 Low-Lying Vulnerable Section of Landrum Lane

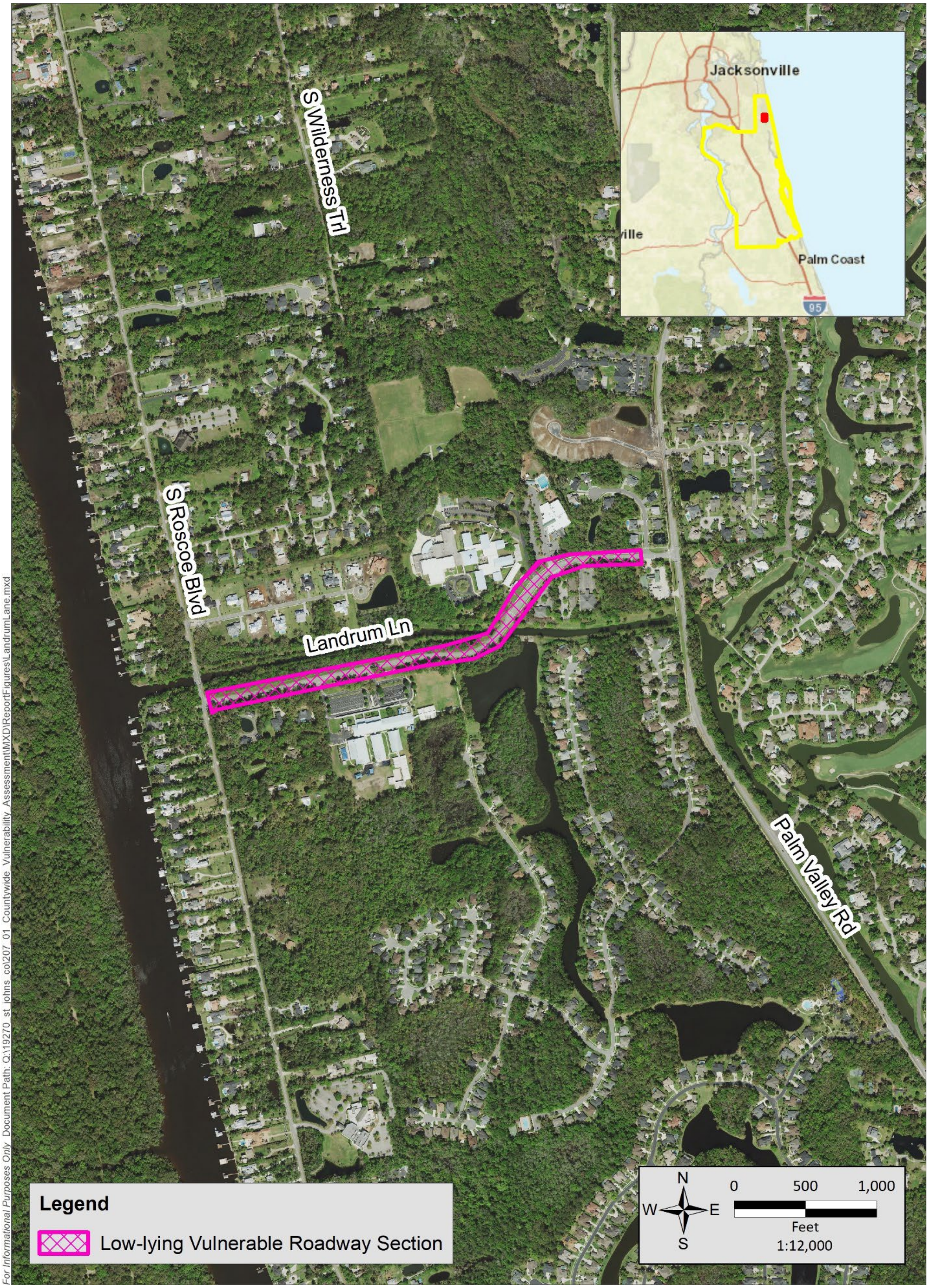
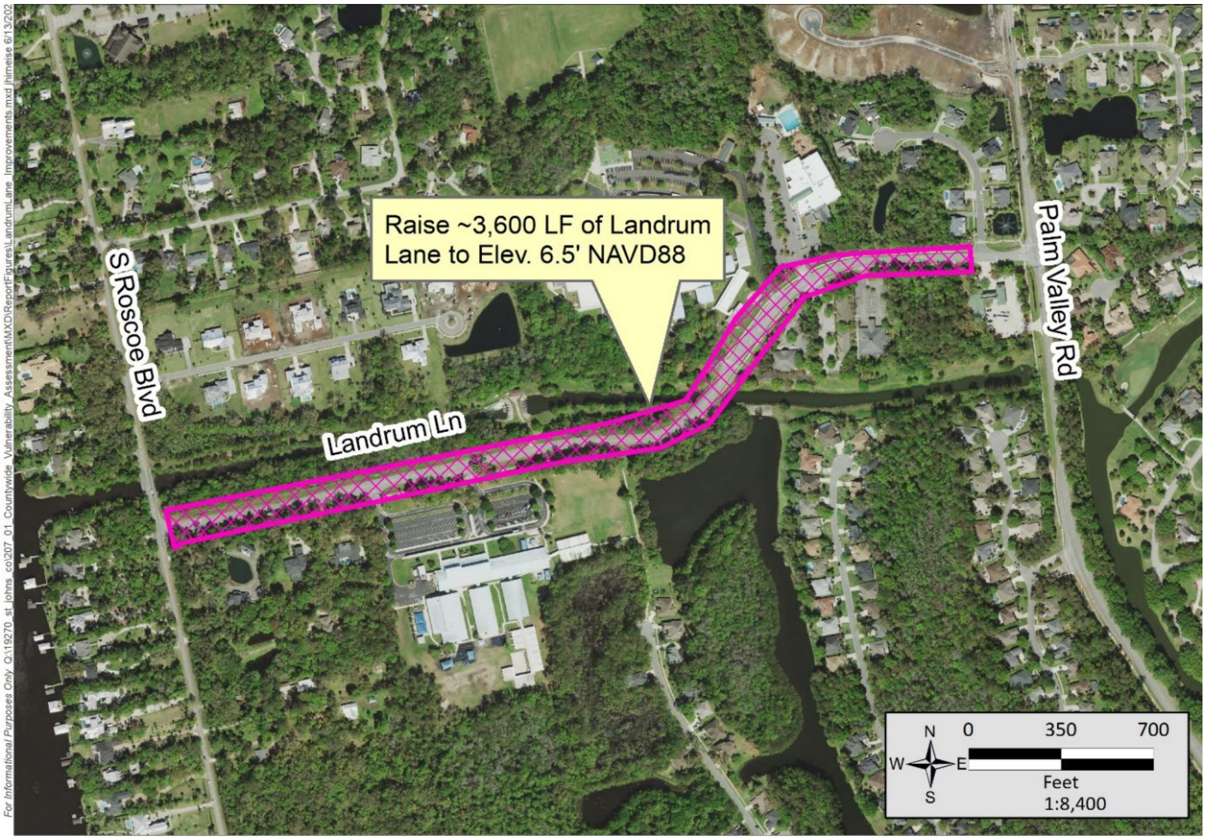


Figure 103 Proposed Improvements for Mickler Road and Ponte Vedra Boulevard



The vulnerable section of Roscoe Boulevard includes 1.1 miles of low-lying two-lane roadway between Sanctuary Estates Lane and Valley Gardens Road. Based on the 2018 LiDAR DEM, the minimum centerline elevation in this section is 4.2 feet-NAVD88. The vulnerable section of Canal Boulevard includes approximately 1,700 linear feet of low-lying two-lane roadway between Roscoe Boulevard and Wilderness Trail. Based on the 2018 LiDAR DEM, the minimum centerline elevation in this section is 5.0 feet-NAVD88. Both sections of roadway are vulnerable to rainfall- and surge-driven flooding under the existing conditions. Results from the rainfall-driven flood modeling show overtopping of the roadways beginning in the 25-year/24-hour storm event. Surveyed high water mark data from Hurricanes Irma and Matthew showed that peak stages in this area were at approximately 5.0 feet-NAVD88 during Hurricane Matthew and 5.5 to 6.0 feet-NAVD88 during Hurricane Irma, which would cause significant flooding of these roadways.

The proposed adaptation strategy to reduce the flood vulnerability of these low-lying sections of roadway is to raise them to a minimum elevation of 6.0 feet-NAVD88 and construct stormwater conveyance improvements to offset increases in rainfall-driven flood stages adjacent to the roadways. Figure 105 summarizes the proposed improvements.

Jones Edmunds developed an engineer’s opinion of probable cost to estimate engineering and construction costs for the proposed improvements. The cost estimate is considered a conceptual-level Class 4 estimate (ASTM E2516), which typically has an accuracy range of

Figure 104 Low-Lying Vulnerable Sections of Roscoe Boulevard and Canal Boulevard

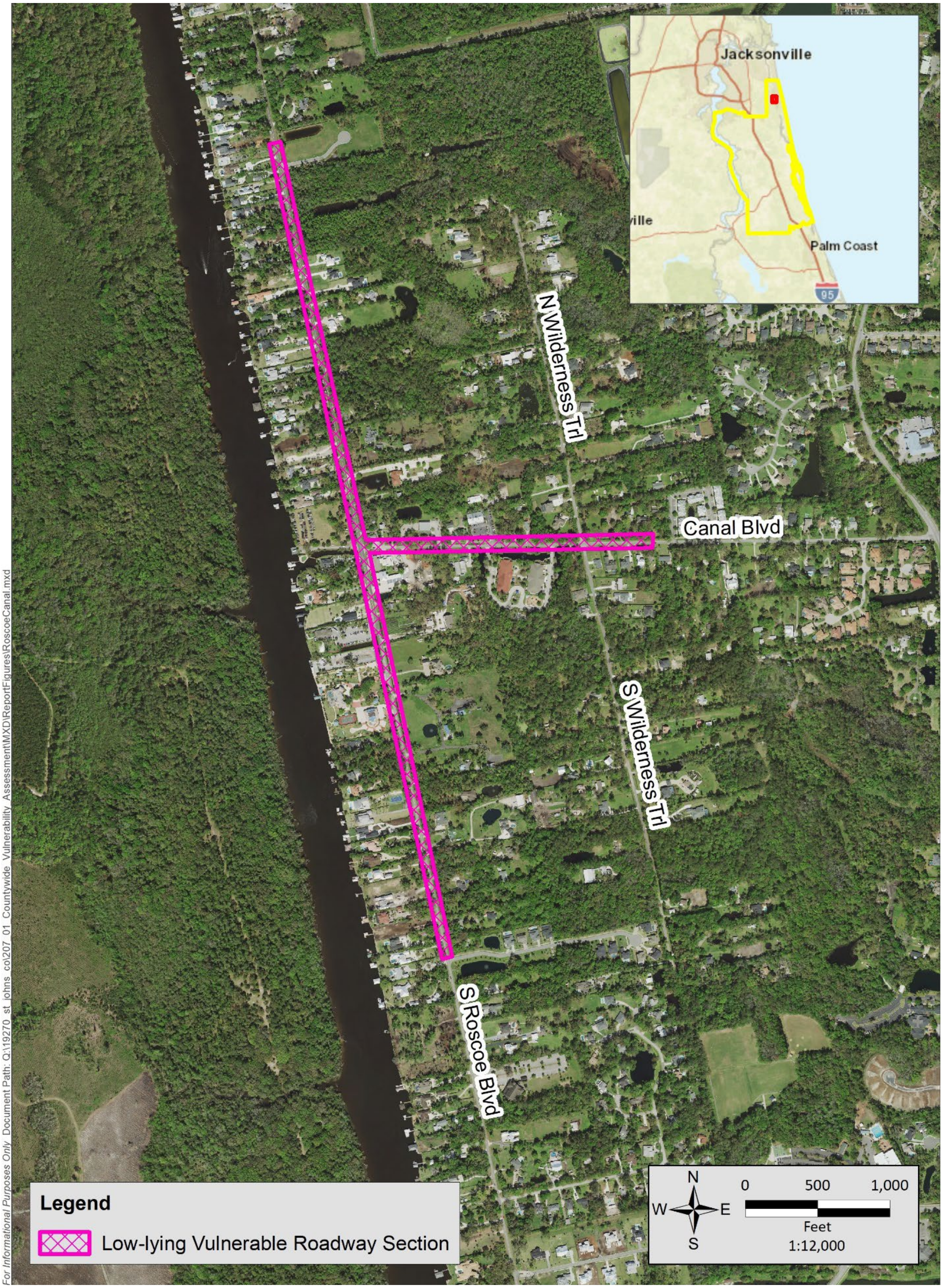
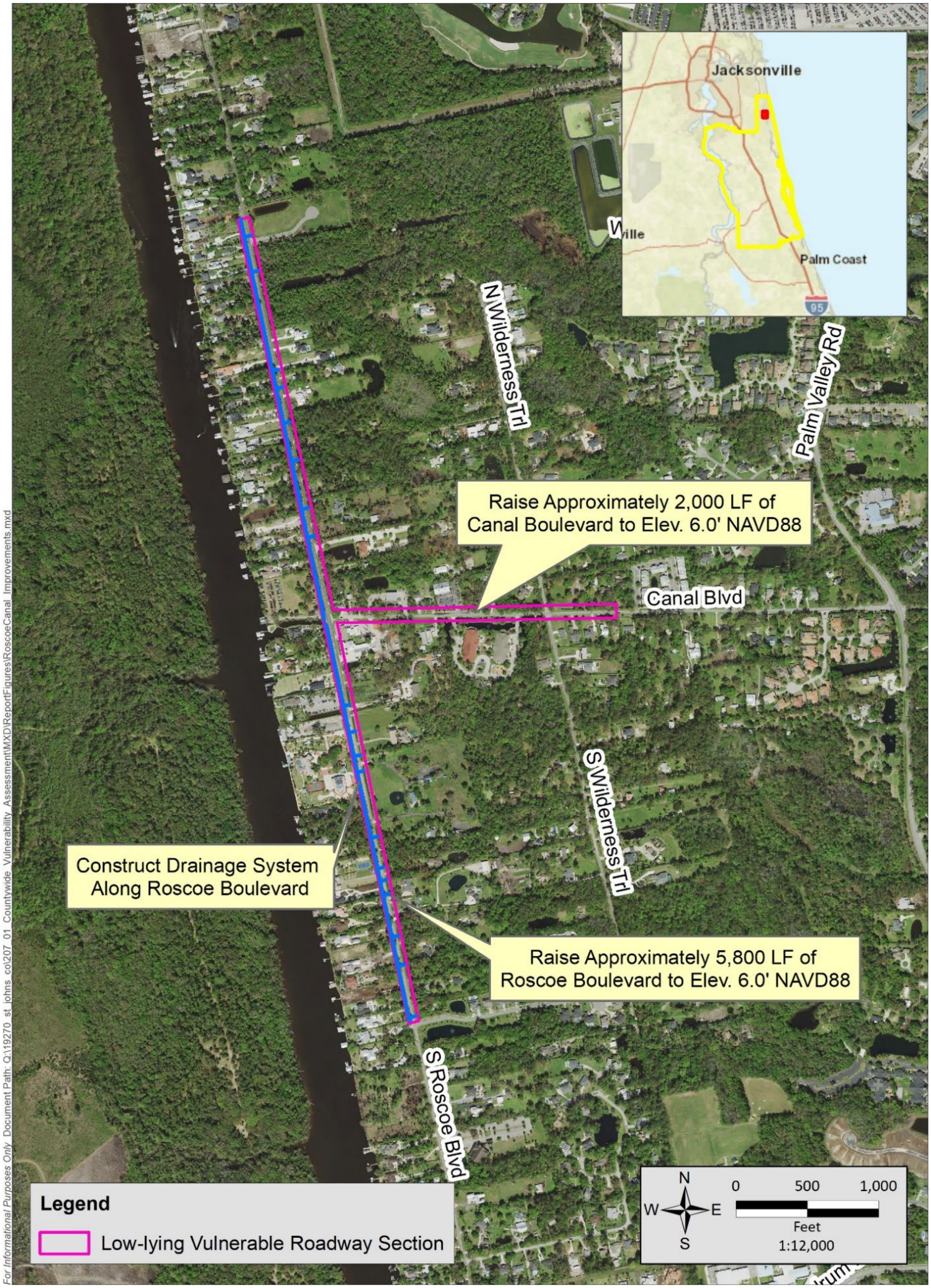


Figure 105 Proposed Improvements for Roscoe Boulevard and Canal Boulevard



-20 to +30 percent. Unit prices were taken from the FDOT 12-month moving average construction cost data when available. If FDOT cost data were not available for an item, unit costs were estimated based on other recently bid projects in the area. The estimated cost for this project is $14.3 million to $18.7 million. Table 6 in Attachment 5 provides the detailed cost estimate.

10.3.2.8 Elevate Masters Drive, SR 16, and Lewis Speedway

Masters Drive, SR 16, and Lewis Speedway are west of the San Sebastian River near downtown City of St. Augustine. SR 16 is an FDOT-owned and maintained roadway that runs east-west and is an evacuation route. Lewis Speedway and Masters Drive are owned and maintained by the County, run north-south, and are considered collector roads. Masters Drive dead ends into SR 16 from the south and Lewis Speedway dead ends into SR 16 from the north. Results from the exposure and sensitivity analyses identified low-lying sections of these roadways as vulnerable to rainfall and surge related flooding under the existing conditions. These vulnerable roadway sections include:

- The vulnerable section of Lewis Speedway includes approximately 1,400 linear feet of low-lying three- and four-lane roadway north of SR 16. Based on the 2018 LiDAR DEM, the minimum centerline elevation in this section is 4.2 feet-NAVD88.
- The vulnerable section of SR 16 includes approximately 1,500 linear feet of low-lying five-lane roadway between Lewis Speedway and Jardine Avenue. Based on the 2018 LiDAR DEM, the minimum centerline elevation in this section is 6.0 feet-NAVD88.
- The vulnerable section of Masters Drive includes approximately 1,000 linear feet of low-lying two-lane roadway south of SR 16. Based on the 2018 LiDAR DEM, the minimum centerline elevation in this section is 4.7 feet-NAVD88.

These sections of roadway are vulnerable to rainfall and surge driven flooding under the existing conditions. Results from the rainfall driven flood modeling show overtopping of the roadways beginning in the 25-year/24-hour storm event. Surveyed high water mark data from Hurricanes Matthew, Ian, and Nicole showed that peak stages in this area were at approximately 6.5 to 7.0 feet-NAVD88 during the events, which would cause significant flooding of these roadways. Figure 106 shows the sections that were identified as "highest" and "high" priority critical assets in the sensitivity analysis.

The proposed adaptation strategy to reduce the flood vulnerability of these low-lying sections of roadway is to raise them to a minimum elevation of 6.5 to 7.0 feet-NAVD88 and construct required stormwater conveyance improvements to offset flood-stage impacts from raising the roadways. Figure 107 summarizes the proposed improvements.

Jones Edmunds developed an engineer's opinion of probable cost to estimate engineering and construction costs for the proposed improvements. The cost estimate is considered a conceptual-level Class 4 estimate (ASTM E2516), which typically has an accuracy range of -20 to +30 percent. Unit prices were taken from the FDOT 12-month moving average construction cost data when available. If FDOT cost data were not available for an item, unit costs were estimated based on other recently bid projects in the area. The estimated cost for this project is $11.8 million to $15.4 million. Table 7 in Attachment 5 provides the detailed cost estimate.

Figure 106 Low-Lying Vulnerable Sections of Masters Drive, SR 16, and Lewis Speedway

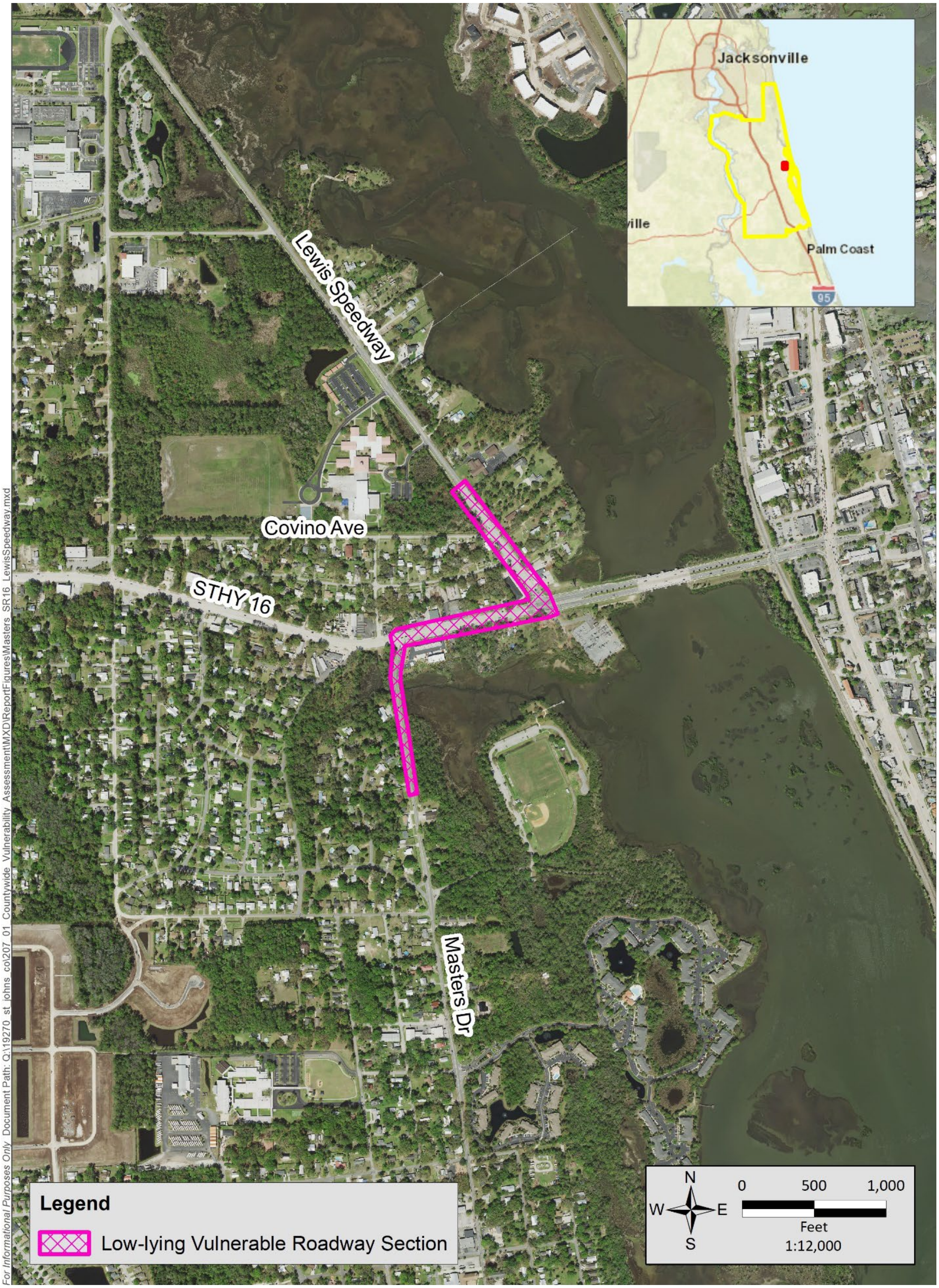
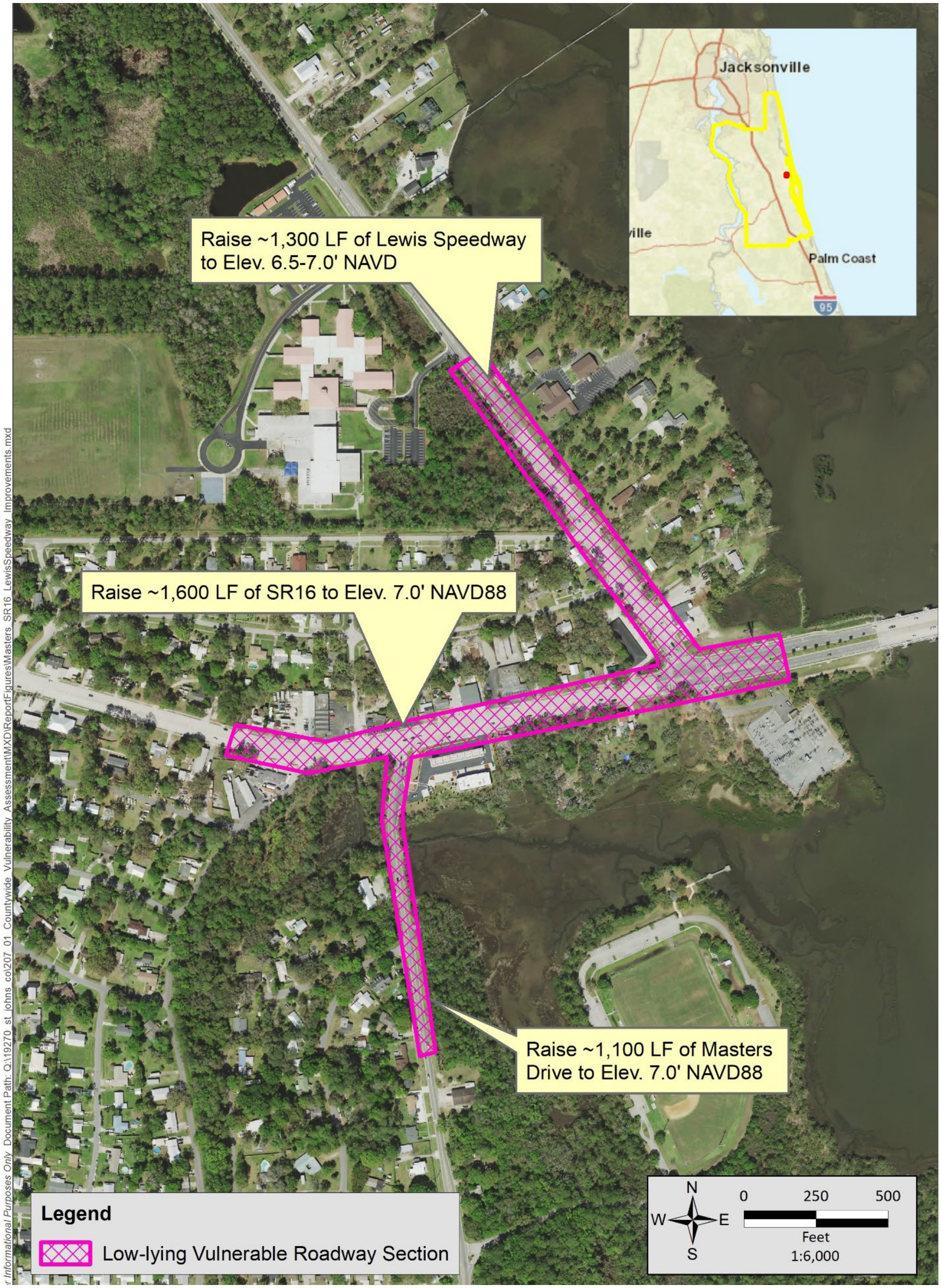


Figure 107 Proposed Improvements for Masters Drive, SR 16, and Lewis Speedway



10.3.2.9 Raise/Modify Vulnerable Sanitary Sewer Lift Stations

Jones Edmunds reviewed the sanitary sewer lift stations that were assigned the "highest" or "high" critical asset priority ratings to identify stations that may need to be raised out of the floodplain or modified to operate under the projected flooding conditions. The County has already received funding to raise/modify 31 vulnerable lift stations as part of an on-going project. Jones Edmunds reviewed the list of 31 lift stations to ensure that they were filtered out of the identification process. Jones Edmunds identified an additional 34 low-lying vulnerable lift stations that the County should consider elevating out of the floodplain or modifying to flood-proof them.

Figure 108 shows the lift stations that were identified and assigned a unique identifier. For each lift station shown in Table 23 provides the lift station FacilityID, name, general location, elevation, priority rating assigned to it, and elevations of adjacent high water marks from recent storm events where available.

A detailed cost estimate was not developed for this improvement alternative. The adaptation strategies will vary by lift station. A detailed assessment will be required to analyze each lift station's components relative to the projected flood elevations and determine the best strategy for modifying each station to handle the projected flooding conditions. For reference, the on-going County project to adapt/modify 27 lift station has a data collection, engineering, and construction budget of $300,000 per station. If this average cost per station is applied to the 34 stations identified in this alternative, the County could expect the construction cost to be in the $10 million to $11 million range.

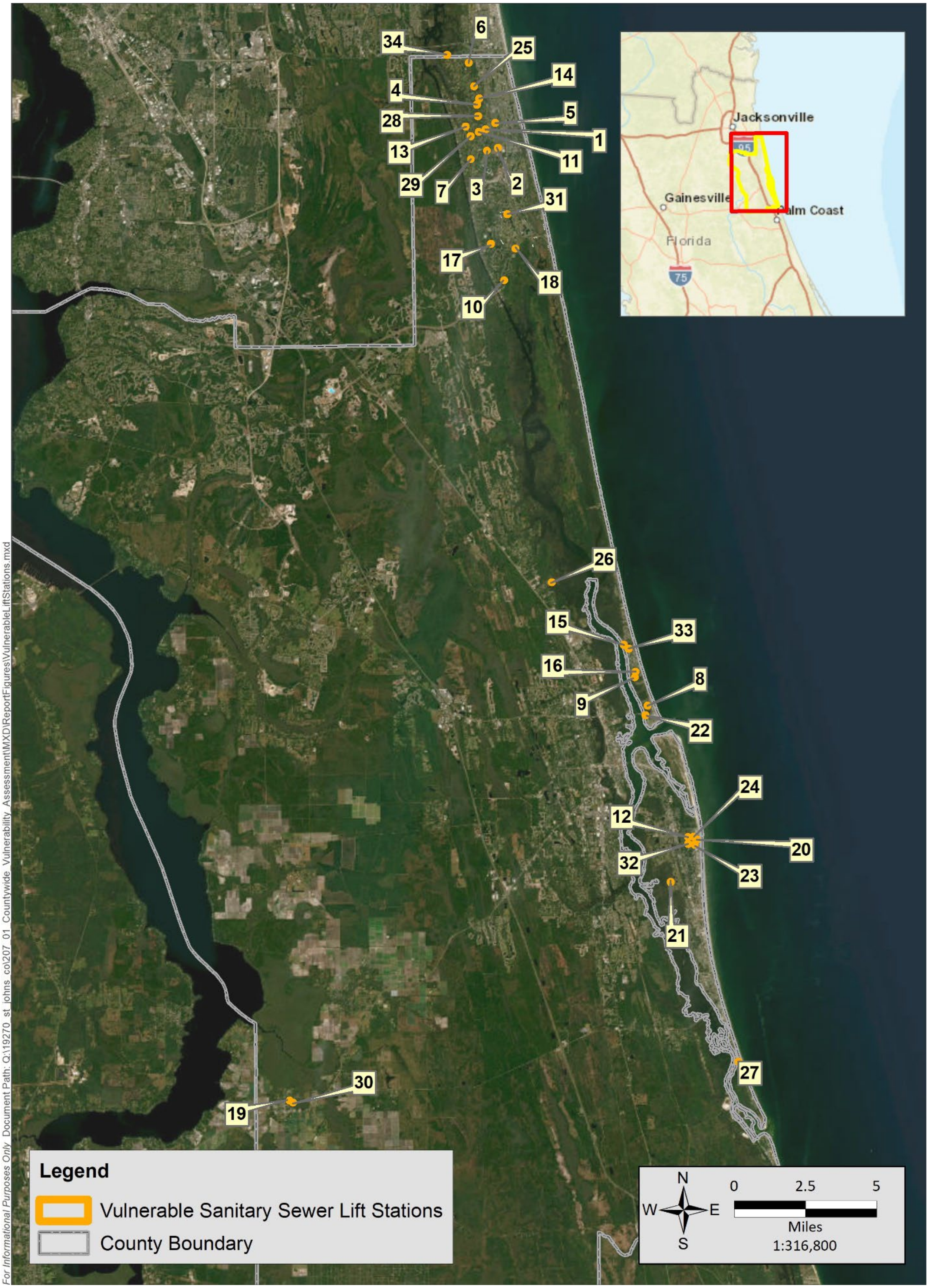
10.3.3 FDOT Coordination for SR A1A

SR A1A is owned and maintained by FDOT and is a critical evacuation route for the County's beach communities. Several sections of SR A1A were identified as vulnerable to rainfall, tidal, and storm surge flooding based on the Exposure and Sensitivity Analyses and feedback received from County residents through the public survey. Flooding and severe erosion along SR A1A during recent tropical storm events has been well documented. Figure 109 shows the sections of SR A1A that were assigned the "highest" and "high" critical asset priority rankings. Particular sections of note include:

- The section between SR 206 and Old A1A, which includes a continuous section of approximately 2 miles of roadway that is below 6.0 feet NAVD88 and has flooded several times during recent tropical events.
- The east approach to the Vilano Bridge.
- The section adjacent to Ocean Sand Beach Inn (3465 Coastal Highway), which has washed out during multiple recent tropical events.

Improvement alternatives to reduce the vulnerabilities along SR A1A were not developed for the preliminary adaptation plan because it is not owned or maintained by the County. Improvements to SR A1A would have to be initiated by FDOT. Based on previous communications with County staff, FDOT is aware of the vulnerabilities along SR A1A and is considering options for improvements. The County should continue coordinating with FDOT to share results from this study and provide support for potential SR A1A improvements.

Figure 108 Vulnerable Lift Station to Consider Raising/Modifying



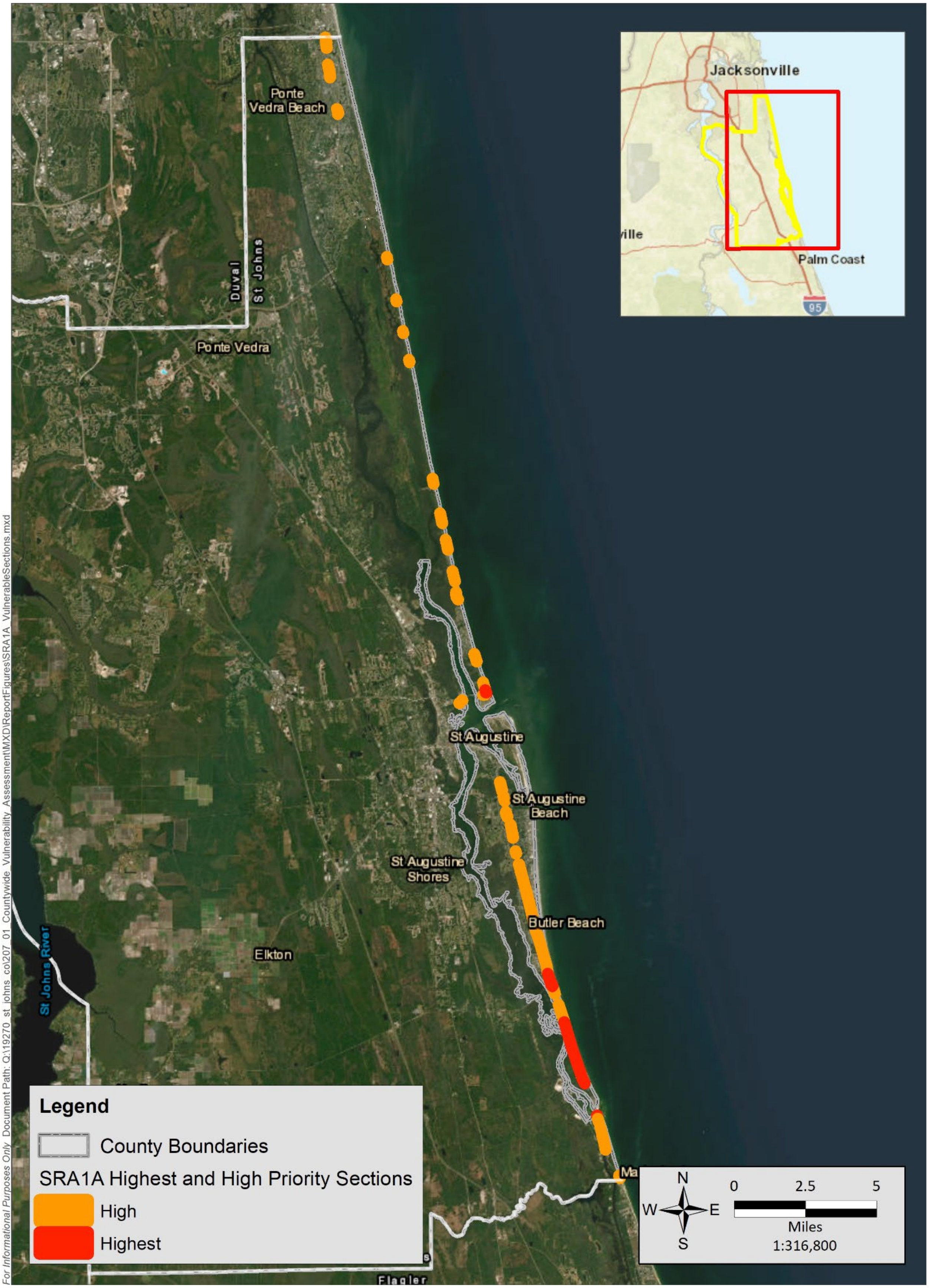
For Informational Purposes Only Document Path: Q:\19270_st_johns_co\207_01_Countywide_Vulnerability_Assessment\MXD\ReportFigures\VulnerableLiftStations.mxd

Table 23 Vulnerable Lift Station Summary Table

Map ID	Facility ID	Lift Station Name	General Location	Elevation (feet-NAVD88)	Priority Rating	Adjacent Flood Elevations from Recent Events (feet-NAVD88)
1	224	Bermuda Court	Ponte Vedra: TPC Sawgrass	3.2	Highest	Hurricane Matthew: 5.0 to 5.2. Hurricane Irma: 5.5 to 6.0. Hurricane Nicole: 5.2 to 5.5.
2	231	TPC #4	Ponte Vedra: TPC Sawgrass	3.2	Highest	Hurricane Matthew: 5.0 to 5.2. Hurricane Irma: 5.5 to 6.0. Hurricane Nicole: 5.2 to 5.5.
3	230	TPC #5	Ponte Vedra: TPC Sawgrass	4	Highest	Hurricane Matthew: 5.0 to 5.2. Hurricane Irma: 5.5 to 6.0. Hurricane Nicole: 5.2 to 5.5.
4	210	Heron Lake	Ponte Vedra: Marsh Landing	4.3	Highest	Hurricane Matthew: 5.0 to 5.2. Hurricane Irma: 5.5 to 6.0. Hurricane Nicole: 5.2 to 5.5.
5	225	Palmera	Ponte Vedra: TPC Sawgrass	4.4	Highest	Hurricane Matthew: 5.0 to 5.2. Hurricane Irma: 5.5 to 6.0. Hurricane Nicole: 5.2 to 5.5.
6	202	Marsh Landing #24	Ponte Vedra: Marsh Landing	4.3	Highest	Hurricane Matthew: 5.0 to 5.2. Hurricane Irma: 5.5 to 6.0. Hurricane Nicole: 5.2 to 5.5.
7	228	Seven Mile Drive	Ponte Vedra: TPC Sawgrass	4.4	Highest	Hurricane Matthew: 5.0 to 5.2. Hurricane Irma: 5.5 to 6.0. Hurricane Nicole: 5.2 to 5.5.
8	N/A (North Beach)	Sherwood Avenue	North Beach/ Vilano	4	Highest	Hurricane Matthew: 6.8. Hurricane Ian: 5.8. Hurricane Nicole: 5.9.
9	N/A (North Beach)	Herron Point 1 at Carcaba	North Beach/ Vilano	4.1	Highest	Hurricane Matthew: 6.8. Hurricane Ian: 5.8. Hurricane Nicole: 5.9.
10	298	Sawmill Lakes #2	Ponte Vedra: Sawmill Lakes	4.7	Highest	Hurricane Matthew: 5.0 to 5.2. Hurricane Irma: 5.5 to 6.0. Hurricane Nicole: 5.2 to 5.5.
11	223	Turtleback	Ponte Vedra: TPC Sawgrass	4.7	Highest	Hurricane Matthew: 5.0 to 5.2. Hurricane Irma: 5.5 to 6.0. Hurricane Nicole: 5.2 to 5.5.
12	62	16th Street and Mickler Road	City of St. Augustine Beach	5.6	High	Hurricane Matthew: 6.8 to 7.8. Hurricane Irma: 5.5 to 6.9. Hurricane Ian: 6.6 to 7.4. Hurricane Nicole: 5.5 to 6.3.
13	219	Clear Lake	Ponte Vedra: Marsh Landing	4.5	Highest	Hurricane Matthew: 5.0 to 5.2. Hurricane Irma: 5.5 to 6.0. Hurricane Nicole: 5.2 to 5.5.
14	209	Merganser Drive	Ponte Vedra: Marsh Landing	4.6	Highest	Hurricane Matthew: 5.0 to 5.2. Hurricane Irma: 5.5 to 6.0. Hurricane Nicole: 5.2 to 5.5.
15	N/A (North Beach)	Myrtle and Fifth	North Beach/Vilano	4.5	Highest	Hurricane Matthew: 6.8. Hurricane Ian: 5.8. Hurricane Nicole: 5.9.
16	N/A (North Beach)	Villages of Vilano 2	North Beach/Vilano	4.5	Highest	Hurricane Matthew: 6.8. Hurricane Ian: 5.8. Hurricane Nicole: 5.9.
17	300	Odoms Mills #2	Ponte Vedra: Odom's Mill	4.9	Highest	Hurricane Matthew: 5.0 to 5.2. Hurricane Irma: 5.5 to 6.0. Hurricane Nicole: 5.2 to 5.5.
18	287	Muirfield	Ponte Vedra: Plantation	5.8	High	Hurricane Matthew: 5.0 to 5.2. Hurricane Irma: 5.5 to 6.0. Hurricane Nicole: 5.2 to 5.5.

Map ID	Facility ID	Lift Station Name	General Location	Elevation (feet-NAVD88)	Priority Rating	Adjacent Flood Elevations from Recent Events (feet-NAVD88)
19	369	Hastings LS 6 – E. St. Johns Avenue	Hastings	3.4	High	Hurricane Matthew: 4.9. Hurricane Irma: 5.9 to 6.9. Hurricane Ian: 4.2.
20	324	14th Street (Minorca)	City of St. Augustine Beach	6.1	High	Hurricane Matthew: 6.8 to 7.8. Hurricane Irma: 5.5 to 6.9. Hurricane Ian: 6.6 to 7.4. Hurricane Nicole: 5.5 to 6.3.
21	74	Marsh Creek #2	Marsh Creek	5.6	High	Hurricane Matthew: 6.8 to 7.8. Hurricane Irma: 5.5 to 6.9. Hurricane Ian: 6.6 to 7.4. Hurricane Nicole: 5.5 to 6.3.
22	N/A (North Beach)	Beaches Rest and Marina 1	North Beach/Vilano	5.7	High	Hurricane Matthew: 6.8. Hurricane Ian: 5.8. Hurricane Nicole: 5.9.
23	323	10th Street (Chautauqua Beach)	City of St. Augustine Beach	6.1	High	Hurricane Matthew: 6.8 to 7.8. Hurricane Irma: 5.5 to 6.9. Hurricane Ian: 6.6 to 7.4. Hurricane Nicole: 5.5 to 6.3.
24	61	Anastasia Oaks	City of St. Augustine Beach	6.3	High	Hurricane Matthew: 6.8 to 7.8. Hurricane Irma: 5.5 to 6.9. Hurricane Ian: 6.6 to 7.4. Hurricane Nicole: 5.5 to 6.3.
25	208	St. Andrews	Ponte Vedra: Marsh Landing	4.8	High	Hurricane Matthew: 5.0 to 5.2. Hurricane Irma: 5.5 to 6.0. Hurricane Nicole: 5.2 to 5.5.
26	152	Eagle Creek #4	Eagle Creek	5.1	Medium	Hurricane Matthew: 6.8. Hurricane Ian: 5.8. Hurricane Nicole: 5.9.
27	6	Ocean House	Crescent Beach: Ocean House	5.7	Medium	Hurricane Matthew: 7.7. Hurricane Irma: 6.7. Hurricane Ian: 6.7. Hurricane Nicole: 6.6.
28	222	Salt Creek	Ponte Vedra: TPC Sawgrass	5.2	High	Hurricane Matthew: 5.0 to 5.2. Hurricane Irma: 5.5 to 6.0. Hurricane Nicole: 5.2 to 5.5.
29	221	Hammock Cove	Ponte Vedra: TPC Sawgrass	5.3	High	Hurricane Matthew: 5.0 to 5.2. Hurricane Irma: 5.5 to 6.0. Hurricane Nicole: 5.2 to 5.5.
30	367	Hastings LS-3 – Park Avenue	Hastings	3.9	High	Hurricane Matthew: 4.9. Hurricane Irma: 5.9 to 6.9. Hurricane Ian: 4.2.
31	284	Governors	Ponte Vedra: Plantation	5.5	High	Hurricane Matthew: 5.0 to 5.2. Hurricane Irma: 5.5 to 6.0. Hurricane Nicole: 5.2 to 5.5.
32	365	Ocean Ridge	City of St. Augustine Beach	6.7	High	Hurricane Matthew: 6.8 to 7.8. Hurricane Irma: 5.5 to 6.9. Hurricane Ian: 6.6 to 7.4. Hurricane Nicole: 5.5 to 6.3.
33	N/A (North Beach)	Back Camp Resort	North Beach/Vilano	5.5	High	Hurricane Matthew: 6.8. Hurricane Ian: 5.8. Hurricane Nicole: 5.9.
34	204	Royal Tern South	Ponte Vedra: Marsh Landing	4.7	High	Hurricane Matthew: 5.0 to 5.2. Hurricane Irma: 5.5 to 6.0. Hurricane Nicole: 5.2 to 5.5.

Figure 109 Highest and High Priority Sections of SRA1A



10.4 PRIORITIZED PROJECTS BY ASSET CLASS

As defined in Subsection 380.093(2), FS, Table 24 lists the prioritized adaptation strategies that were identified for the preliminary Adaptation Plan. The list of strategies and prioritization will be refined for the standalone adaptation plan.

Table 24 Prioritized Adaptation Projects by Asset Class

Asset Class	Adaptation Project	Priority	Estimated Cost (Millions)
Transportation and Evacuation Routes	Elevate Sixmile Creek Bridge Approaches of CR 13N	High	$5.1 – $6.6
	CR 13 Cross-Culvert Capacity Improvements	High	$6.6 – $8.6
	Elevate Low Spots on CR 13N	High	$19 – $24.8
	Elevate Mickler Road and Ponte Vedra Boulevard Adjacent to SR A1A	High	$3.0 – $3.8
	Elevate Landrum Lane	High	$4.9 – $6.4
	Elevate Low Sections of Roscoe Boulevard and Canal Boulevard	High	$14.3 – $18.7
	FDOT Coordination for SR A1A	High	N/A
	Elevate Masters Drive, SR 16, and Lewis Speedway	High	$11.8 - $15.4
	South Whitney and West King Street Drainage Improvements	High	Already Funded
	SR A1A and Pope Road Drainage Improvements	High	$0.6
	Big Sooey Stormwater Pond/Pump Station	Medium	$4 – $6.5
	Holtz and Chase Street Drainage Improvements	Medium	$0.9 – $1.2
	Palatka Trail Crossing Improvements	Medium	$0.8 – $1.1
	Santa Rosa Drainage Improvements	Medium	$6.6
	Porpoise Point Drainage Improvements	Medium	$0.6
Critical Infrastructure	North Beach Drainage Improvements	High	$2.6 – $7.3
	Raise/Modify Vulnerable Sanitary Sewer Lift Stations	High	$10 – $11
	Detailed Evaluations of Vulnerable WTPs and WWTPs	High	$0.05 – $0.1
	SR A1A and Pope Road Drainage Improvements	High	$0.6
	Big Sooey Stormwater Pond/Pump Station	Medium	$4 – $6.5
	Palatka Trail Crossing Improvements	Medium	$0.8 – $1.1
	Porpoise Point Drainage Improvements	Medium	$0.6
Critical Community and Emergency Facilities	No adaptation needs/projects were identified for the preliminary adaptation plan.	N/A	N/A
Natural, Cultural, and Historical Resources	North Beach Drainage Improvements	High	$2.6 – $7.3
	Big Sooey Stormwater Pond/Pump Station	Medium	$4 – $6.5