Town of Ponce Inlet

TOWN COUNCIL AGENDA
SPECIAL JOINT MEETING
WITH PLANNING BOARD

TUESDAY
JUNE 4, 2024 at 10:00 AM

TOWN COUNCIL CHAMBERS
4300 S. ATLANTIC AVENUE, PONCE INLET, FL

1. Call to Order.

2. Pledge of Allegiance.

3. Roll Call of Town Council.
   Roll Call of Planning Board.

4. Additions, Corrections or Deletions to the Agenda.

5. Review and approval of Watershed Master Plan to meet the statutory requirements for CRS Activity 450 – Stormwater Management.

7. Adjournment.

If a person decides to appeal any decision made by the Town Council with respect to any matter considered at a meeting or hearing, he/she will need a record of the proceedings and that for such purpose, he/she may need to ensure that a verbatim record of the proceedings is made, which record includes the testimony and evidence upon which the appeal is to be based. Persons who require an accommodation in order to attend this meeting should contact the Ponce Inlet Town Hall at 236-2150 **by 4:00 pm two business days prior to the meeting** in order to request such assistance.

A complete copy of the materials for this agenda is available at Town Hall.

MEMORANDUM

TOWN OF PONCE INLET, PLANNING AND DEVELOPMENT DEPARTMENT

The Town of Ponce Inlet staff shall be professional, caring, and fair in delivering community excellence while ensuring Ponce Inlet citizens obtain the greatest value for their tax dollar.

To: Michael, E. Disher AICP, Town Manager

From: Patty Rippey, AICP, Principal Planner

Through: Darren Lear, AICP, Planning & Development Director

Date: May 16, 2024

Subject: Approval of Watershed Master Plan Report

MEETING DATE: June 4, 2024

INTRODUCTION

On October 15, 2020, the Town Council authorized Staff to apply for state grants to fully fund preparation of a Watershed Master Plan (WMP) for the Town. On January 19, 2023, the Town Council authorized execution of the FDEP Grant Agreement No. 22PLN23 for the WMP preparation and the agreement with Collective Water Resources, LLC, (Consultant) as a sole-source provider, to prepare the WMP. The Consultant is a Florida-based engineering firm that has over 120 years of water resource experience including the areas of stormwater modeling, floodplain mapping, master planning, vulnerability assessments, and the FEMA CRS program. They have completed this same type of study for many other coastal cities, such as West Palm Beach and Fort Lauderdale.

PROJECT OVERVIEW

The WMP is a specialized type of vulnerability study intended to comply with the National Flood Insurance Program's Community Rating System (CRS) requirements for Activity 450 - Stormwater Management. It follows the Town's more generalized Vulnerability Assessment completed in February of 2022 by the East Central Florida Regional Planning Council. The WMP analyzes the combined impacts on the Town's drainage system from existing and expected development, various long-duration rainfall events (such as the 100-year storm), tidal flooding, and projected sea level rise. Based on these projections, the WMP also provides policy recommendations for future decision-making.

The Watershed Master Plan project will allow the Town to improve its CRS rating. With a Class 5 rating already, the Town's floodplain management program has been able to achieve significant insurance savings for its residents. Based on its latest program evaluation, the Town's score is high enough to move to a Class 4 or possibly even to Class 3, once certain prerequisites are met. A Watershed Master Plan satisfies one such prerequisite and will allow the Town to make use of the points it has already achieved in its comprehensive floodplain management program. For Town property owners in special flood hazard areas, the points will translate into direct insurance premium savings by an additional 5% to 10%. Completion of the WMP is one of the Town Council's goals for the Building Division.

WATERSHED MASTER PLAN PROJECT

Beginning in January 2023, the consultant conducted monthly meetings with staff during preparation of the WMP to gain input and provide project status updates. The tasks and deliverables required by FDEP are listed below.

Task 1: Collection of Background Data

Deliverables:

1) A summary table to outline the data compiled and finding of the gap analysis.
2) A summary with recommendations to address the identified data gaps and actions taken to rectify them.
3) GIS files with appropriate metadata of the data compiled, to include location of critical assets owned or maintained by the Grantee as well as regionally significant assets that are classified and as defined by statute 380.093(2)(a) 1-4, F.S.

Task 2: Exposure Analysis

Deliverables:

1) A draft WMP report that provides details on the modeling process, type of models utilized, and resulting tables and maps illustrating flood depths for each flood scenario.
2) GIS files with results of exposure analysis for each flood scenario as well as the appropriate metadata that identifies the methods used to create the flood layers.

Task 3: Sensitivity Analysis

Deliverables:

1) A draft WMP report that provides details of the findings of the exposure analysis and the sensitivity analysis and includes visual presentation of the data via maps and tables, based on statutorily required scenarios and standards.
2) An initial list of critical and regionally significant assets that are impacted by flooding.

Task 4: Final WMP Report, VA Maps, Tables, and Public Presentation

Deliverables:

1) Final WMP report that provides details and conclusions, including illustrations via maps and tables, based on requirements in CRS Activity 450 and statutory-required scenarios and standards.
2) A final list of critical and regionally significant assets prioritized by area or immediate need and must identify which flood scenario(s) impact each asset.
3) All electronic mapping data used to illustrate flooding and sea level rise impacts identified in the WMP, to include geospatial data in an electronic file format and GIS metadata.
4) A signed VA Compliance Checklist Certification.
5) Meeting agendas to include location, date, and time of each meeting.
6) Meeting sign-in sheets with attendee names and affiliation, materials created in preparation of or for distribution at the meeting.
7) A copy of the presentation and any public announcement as applicable.
8) A copy of the file or weblink of the video or audio recording of the meeting.
9) A summary report including attendee input and meeting outcomes.

The deliverables, including the Final WMP report are due for delivery to FDEP by June 30, 2024. The contract expires on September 30, 2024.

REPORT OUTLINE

The draft WMP report outline is provided below.

CONSULTANT RECOMMENDATIONS

The report includes specific drainage improvement recommendations in the short-, intermediate-, and long-term including:

1. Future Land Use Map changes, code modifications, public information
2. Flap gates to prevent backflow from the Halifax River on low-lying streets
3. Additional storage/new retention ponds
4. Increase inlet and pipe capacity
5. Additional inlets and outfalls to the river
6. Raised inlet control structures
7. Expand and connect existing stormwater systems
8. Increase capacity of outfalls and pipes connecting ponds and depressions
9. Increase stormwater system flow capacity
10. Additional swales
11. Relocation of critical and regionally significant assets
12. Structural controls for water quantity and quality such as stormwater planters, bio-swales, rain gardens and permeable pavement

13. Low-impact development
14. Seawalls with flap gates
15. Design standards for replacement seawalls
16. Implement a "Better Site Design" program to reduce impervious area for new development/redevelopment
17. Increase minimum on-site retention requirement to 2.5 inches for new development/ redevelopment
18. Inlet and pipe cleaning
19. Acquisition of flood-prone areas
20. Reduce use of street curbs and gutters
21. Creation of stormwater utility to provide dedicated funding for all stormwater-related activities

Recommended construction projects identified through this process are eligible for 50% construction grants through FDEP's Resilient Florida program.

RECOMMENDATION

Staff requests approval of the WMP to meet the statutory requirements for CRS Activity 450 – Stormwater Management. The report will allow the Town to reduce flood insurance costs for residents and prioritize resiliency projects for future funding considerations and grants applications.

ATTACHMENT

Draft Watershed Master Plan

DEP AGREEMENT NO. 22PLN23

TOWN OF PONCE INLET WATERSHED MASTER PLAN UNDER CRS ACTIVITY 450 - STORMWATER MANAGEMENT

Town of Ponce Inlet

Final Project Report

May 16, 2024, Draft

This report is funded in part through a grant agreement from the Florida Department of Environmental Protection. 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.

1. Executive Summary

The Town of Ponce Inlet (Town) conducted the *Town of Ponce Inlet Watershed Master Plan (WMP) under Community Rating System (CRS) Activity 450 – Stormwater Management* Project (Project). Under the Project, data needed to develop the WMP as per CRS requirements for Activity 450 and perform the flood vulnerability assessment (VA), based on the requirements as defined in Section 380.093 Florida Statutes (F.S.), was collected and reviewed. Using the available data, analyses were performed to identify the exposure to four types of flooding: stormwater (also referred to as rainfall-induced), tidal, storm surge, and compound flooding (a hypothetical combined stormwater and storm surge) event. All flooding types were analyzed for current conditions as well as two future time horizons: 2040, 2070. Additionally, stormwater exposure was analyzed for year 2100. For all future time horizons, two sea-level rise projections were evaluated: 2017 NOAA Intermediate-Low and Intermediate-High. Results were intersected with critical and regionally-significant assets with the Town to evaluate sensitivity to flooding and prioritize assets as needing immediate, intermediate, or long-term needs based on current and potential future flooding impacts. Additionally, the WMP provides recommendations for future decision-making and mitigation.

2. Methodology

The Town conducted the Town of Ponce Inlet Watershed Master Plan under CRS Activity 450 – Stormwater Management Project (Project). The Town's WMP, included as Appendix A and all associated appendices, is a specialized VA intended to comply with the Federal Emergency Management Agency's (FEMA's) National Flood Insurance Program's (NFIP's) CRS requirements for Activity 450 – Stormwater Management as well as Section 380.093, F.S. that details Resilient Florida Program requirements. The WMP summarizes the acquisition and compilation of background data; presents the flood exposure and sensitivity analyses for stormwater, tidal, storm surge, and compound flooding under both current conditions and future scenarios; includes a discussion of the Town's current regulatory standards; and presents structural and non-structural recommendations for mitigation and adaptation measures to reduce flood vulnerabilities.

The acquisition, review, and compilation of data was performed by Collective Water Resources (Collective) per a professional services contract with the Town. Acquired data for the WMP and VA are classified into three main categories: 1) critical and regionally significant asset inventory, 2) topographic data, and 3) flood scenario-related data. More details regarding these data categories can be found in Appendix B, Task 1: Acquire Background Data Technical Memorandum. Collective gathered and reviewed publicly available data from numerous federal, State, regional, and local sources to identify data for all three categories. A full inventory of assets was developed from collected data, organized into a geospatial database, and associated metadata prepared for each of the four categories defined by 380.093, F.S.:

- Transportation Assets and Evacuation Routes
- Critical Infrastructure

- Critical Community and Emergency Facilities
- Natural, Cultural, Historic Assets

Recent topographic data (collected December 2018 through March 2019), published by the United Sates Geological Service (USGS), serves as the base topographic layer for all Project analyses and mapping.

Flood scenario-related datasets were collected to support the analyses of stormwater, tidal, storm surge, and compound flooding. These datasets include: rainfall depth for design storm events, soil mapping and parameters, land use and land cover, impervious area mapping, tidal datums and measured elevations, storm surge elevations, stormwater management system infrastructure, and flooding complaints.

A summary table of compiled data, findings of Collective's gap analysis, and summary of recommendations taken to rectify gaps was prepared as well and is included in Appendix B.

The Town's floodplain management and stormwater regulations were reviewed and summarized with particular attention to defining the types of development that are regulated and the standards used to determine potential impacts.

The depths and extents of flooding caused by four types of flooding were evaluated for the Town: stormwater (or rainfall-induced), tidal, storm surge, and compound (stormwater and storm surge combined). Specifics of these analyses can be found in Appendix A, with additional details presented in Appendices C (Stormwater Model Development Technical Memorandum), D (Stormwater Model Simulation Node Peak Stage Report), and E (Storm Surge and Tidal Flooding Mapping Methodology Letter). Collective developed a hydrologic and hydraulic model of the Town using the Interconnected Pond and Routing (ICPR) Version 4 model. The stormwater model was developed to a level of detail appropriate for determining the potential flooding threat and impact on the Town's drainage system from existing and expected development, various long-duration rainfall events and projected sea level rise, and recommendations for future decision-making and mitigation of or adaptation to such events. The model was calibrated to Hurricane Ian based on written flood reports and photos of flooding extents collected by the Town as part of this Project. Brizaga, as a sub-consultant to Collective, completed an analysis of the frequency and severity of annual tidal flooding from measured data from the past decade. Additionally, Brizaga evaluated the severity of high tide flooding and surge flooding associated with Tropical Storm, Category 2 Hurricane, and Category 4 Hurricane storm categories utilizing available data from National Oceanic and Atmospheric Administration (NOAA) and FEMA. Lastly, the impact of a hypothetical combined rainfall-induced and storm surge flood event was evaluated. Brizaga generated an idealized storm surge time series reflecting a Category 1 Hurricane. Collective superimposed this storm surge time series onto the existing boundary conditions of the stormwater model to identify the depths of water across the Town caused by this compound event. For each of these flood types (including current and future scenarios), the total flooding inundation and the number of unique parcel IDs/property owners that will be exposed to some amount of flooding. Maps illustrating depth of flooding were also prepared and are included in **Appendix F: Task 2 Flood Exposure Analysis Maps**. Exposure to flooding for each flood types and scenarios were determined for each critical/regionally-significant asset and are summarized in **Appendix G: Task 2 Asset Flod Exposure Summary Table**. Building and roadway asset exposure was determined based on depth of flooding, while property asset exposure was based on the percent area of inundation.

Collective performed an analysis of each critical and regionally-significant assets to rank the sensitivity to flooding and quantify the Town's risk of flood inundation damage and overall asset risk. A level of sensitivity to flooding to each asset was assigned as either not applicable (N/A), low, medium, or high depending on the depth of flooding (for buildings and roadways) and percent flooded area (for properties) criteria established for the Project. Additionally, the overall risk of the Town was determined for each flood type and scenario based on total area inundated as well as the number of highly sensitive critical and regionally-significant assets. Prioritization recommendations for each asset can be found in the summary tables within **Appendix I**. Buildings, properties, and roadway segments were prioritized as 1 (Immediate Needs), 2 (Intermediate Needs) and 3 (Long-Term Needs). The type of asset was considered in assigning initial prioritization.

Based on exposure and sensitivity analyses results, focus areas were identified throughout the Town and a suite of recommended strategies was prepared by Collective. Strategies include the following categories:

- Regulations
- Public information
- Structural controls for water quantity & quality
- Non-structural controls
- Protection of sensitive natural areas
- Acquisition of flood prone properties
- Additional recommendations

Eight of the structural and non-structural control recommendations were evaluated with the Town's stormwater model to estimate the potential improvements in flooding (elevations and duration).

3. Outcome

Flooding tends to occur along the riverside of the barrier island as well as within the topographic troughs located at the southern end of the Town. Additionally, stormwater also produces flooding in the south-central portion of the Town between Oceanview Avenue and Beach Street. The majority of the Town's area experiences regular tidal inundation since the corporate limits include the Halifax River and a large area of tidal wetlands/salt marshes, which are permanently inundated by the Mean Higher High tide currently. The barrier island portion of the Town south of Oceanview Avenue as well as the riverside portion west of South Peninsula Drive are susceptible to tidal and hurricane surge inundation. For the Category 4 Hurricane, the area west of S Peninsula Drive and much of the area south of Beach Street would be under several feet of surge. Compound flood inundation area increases over 1,300 acres and exposes an additional 682 unique parcel IDs/property owners compared to stormwater flooding alone (for the same rainfall amount).

Sensitivity analyses results show immediate needs are primarily the major roadways and evacuation routes within the Town – fourteen of which have flooding under current conditions. A total of 21 buildings are identified as Immediate Needs. Many of these buildings are at risk of flooding from storm surge and are primarily older structures and several businesses along the coastline of the Halifax River. Sixteen properties have been identified as Immediate Needs given the current extent of flooding, particularly storm surge.

Future exposure and sensitivity of the Town and individual assets increase over time with rising sea levels with the most dramatic relative increase between the 2070 IL and 2070 IH scenarios. Trends in the types of assets exposed are maintained – with major roads and evacuation routes representing the most exposure and sensitivity and buildings the least as well as Category 2 storm surge and compound flooding representing the greatest impact to the Town and its assets. Total land inundation risk for the corporate limits not including the open waters the Halifax River, Ponce de Leon Inlet, and Atlantic Ocean are categorized for all flood types and scenarios as follows:

- **Low risk** (less than 25-percent of the land area): stormwater flooding for 2023 and 2040 IL,
- **Medium risk** (greater than or equal to 25-percent but less than 50-percent): stormwater flooding for all other flood scenarios, all high tide scenarios, Category 2 storm surge for all but the 2070 IH scenario, and compound for both 2023 and 2040 IL
- **High risk** (greater than or equal to 50-percent but less than or equal to 75-percent): Category 2 storm surge flooding for 2070 IH and compound flooding for 2040 IH, 2070 IL and 2070 IH

The overall risk of the Town's highly sensitive critical and regionally-significant assets for each flood scenario generally follows a similar trend.

Seven focus areas within the Town were further investigated to address effects of future land use changes from development/re-development and current stormwater flooding problem areas. Focus areas were analyzed with potential alternatives (such as stormwater management system improvements as well as increased retention requirements) with a target to provide improved stormwater flood protection for the 100-year/24-hour, 2100 IL scenario. For several of the focus areas, a combination of improvements will need to be implemented.

Lastly, seven categories of more general recommendations strategies are presented including: Code modifications, public information, structural controls for water quantity/quality, non-structural control policies and practices, protection of sensitive areas, acquisition of flood prone properties, and stormwater utility.

4. Further Recommendations

<This section will be completed after the joint meeting with the Town Council and the Town's Planning Board scheduled for June 2024.>

Appendix A

Town of Ponce Inlet

Watershed Master Plan and Flood Vulnerability Assessment Report

Town of Ponce Inlet Watershed Master Plan and Flood Vulnerability Assessment

Prepared For:
Town of Ponce Inlet
4300 South Atlantic Avenue
Ponce Inlet, Florida 32127

Resilient Florida Program Agreement Number 22PLN23

Prepared By:
Collective Water Resources, Inc.
250 S. Australian Avenue, Suite 1110
West Palm Beach, Florida 33460

and

Brizaga, Inc.
2101 W. Commercial Boulevard
Fort Lauderdale, Florida 33309

____
Stephanie Y. Dunham, P.E.
Florida P.E. No. 59782
Project Manager
Collective Water Resources, LLC

____
Joel G. Jordan, P.E.
Florida P.E. No. 51986
Principal Engineer
Collective Water Resources, LLC

1. Introduction

1.1 Authorization

Collective Water Resources (Collective) has prepared a Watershed Master Plan (WMP) according to the Federal Emergency Management Agency's (FEMA's) Community Rating System (CRS) Activity 450 and associated flood vulnerability assessment (VA) under a professional engineering services agreement entered on January 27, 2023, with the Town of Ponce Inlet (Town).

1.2 Objectives

The Town, pursuant to funding received from the State of Florida Department Environmental Protection (FDEP) under the *Resilient Florida Grant Program*, desires to perform a WMP and Flood VA to determine the potential flooding threat and impact on the Town's drainage system from existing and expected development, various long-duration rainfall events and projected sea level rise, and recommendations for future decision-making and mitigation of such events.

1.3 Location and Town Overview

Ponce Inlet is located on the south end of a barrier island in eastern Volusia County, Florida. It is bordered on the east by the Atlantic Ocean, the south by the Ponce de Leon Inlet, the west by the Halifax River and U.S. Highway 1 (also referred to as South Ridgewood Avenue and North Dixie Freeway), and the north by another coastal community, Wilbur by the Sea. The Town location is shown in **Figure 1**.

Ponce Inlet was incorporated in 1963. The corporate limits of the Town are currently about 4,093 acres (6.4 square miles) and roughly extend 3.5 miles from north to south and 2.5 miles from east to west. Terrestrial access to the Town is only via two roadways from the north side: South Atlantic Avenue and South Peninsula Drive. Based on 2020 U.S. Census data, the Town had a population of 3,364 and total of 3,071 housing units[1]. Population has grown by 851 people, or 34-percent (%) since 2000[2]. Housing units have grown even more during this same twenty-year period: 1,865 units, or 155%. Based on the 2023 parcel data from Volusia County, there are a total of 3,600 unique parcel identification numbers (IDs)/property owners within the Town. Multiple parcel IDs/property owners may be associated with the same property area – for instance in condominium buildings.

---

[1] U.S. Census Bureau. *Decennial Census, DEC Redistricting Data (PL 94-171), Table P1*, 2020, https://data.census.gov/table/DECENNIALPL2020.P1?g=160XX00US1258200. Accessed on February 27, 2024.

[2] U.S. Census Bureau. Decennial Census, Table DP-1, 2000, https://www.floridajobs.org/library/census/dp1-4/1601258200.pdf. Accessed on February 27, 2024.

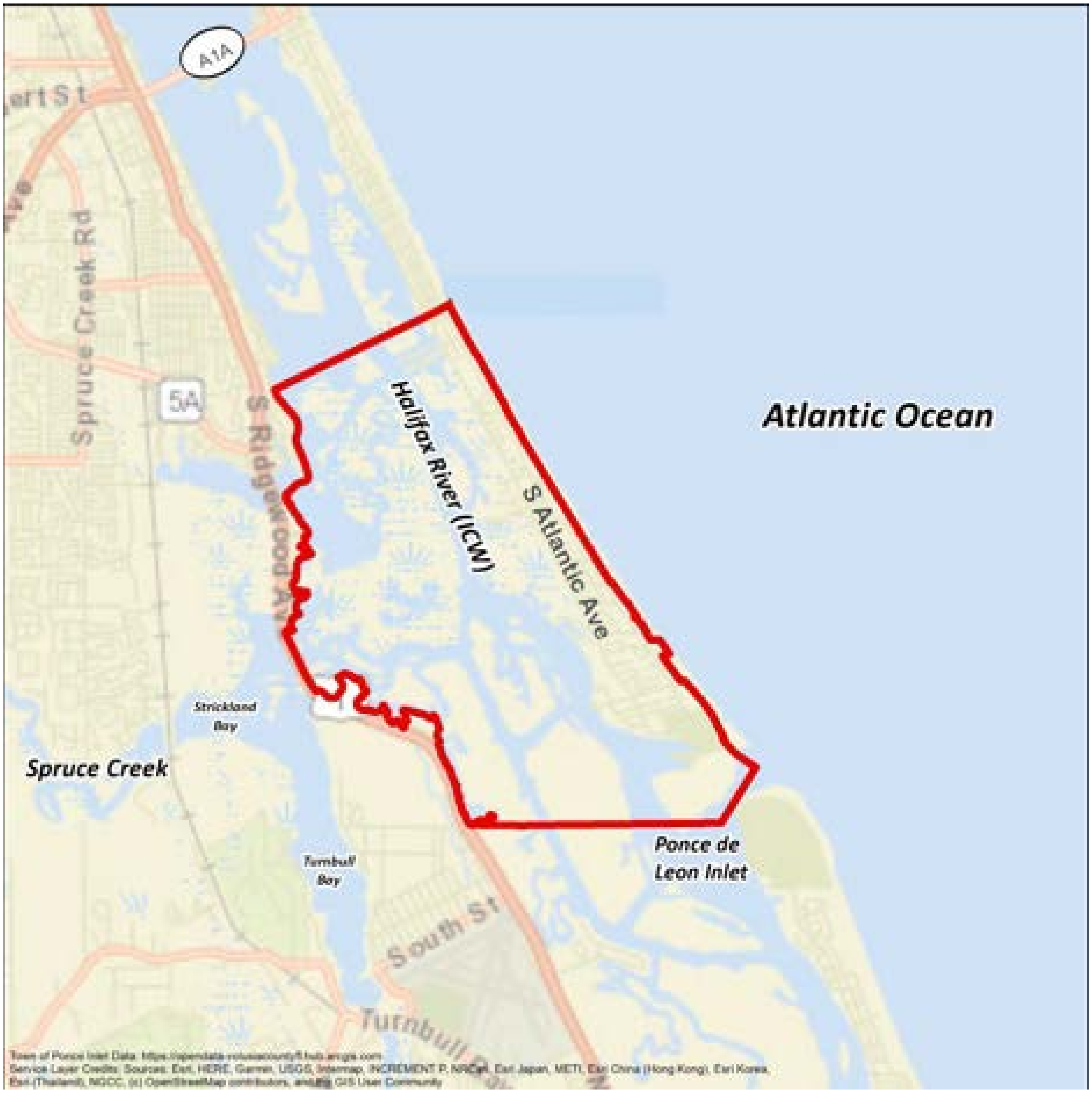


Figure 1. Ponce Inlet Town Limits

1.4 Hydrologic Characteristics

For the purposes of this WMP, the Town was defined as two watersheds: (1) the barrier island lands within the Town's corporate limits and (2) the Halifax River. **Figure 2** illustrates the barrier island watershed versus the Halifax River watershed with respect to the corporate limits of Ponce Inlet.

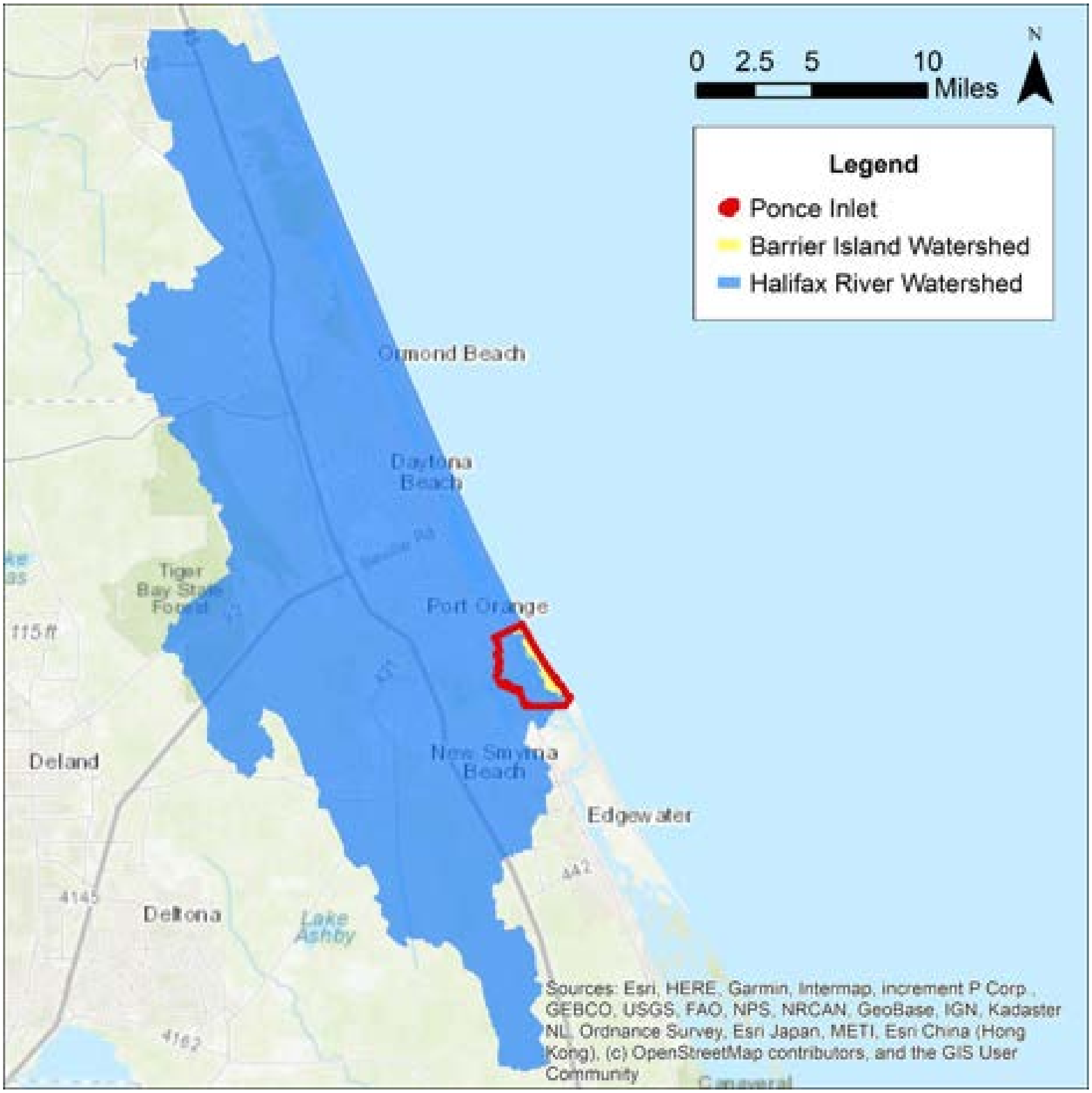


Figure 2. Ponce Inlet Watersheds

The Town's barrier island watershed, which includes all developed/developable lands and conservation and park lands, is approximately 1.33 square miles (852 acres). A total of 5.06 square miles (3,241 acres) of the Town's corporate limits is within the Halifax River watershed and is comprised of the Halifax River, salt marshes, and spoil islands. Based on the primary tributary basin defined by the St. Johns River Water Management District (SJRWMD) the approximate area of the

Halifax River watershed is 325 square miles[3]. The Halifax River is a 23-mile-long estuary that is also part of the Intracoastal Waterway (ICW). The Halifax River originates at Tomoka Bay near Flagler Beach and connects with the Atlantic Ocean at the southern end of the Town via the Ponce de Leon Inlet. The Halifax River watershed was not analyzed in this WMP but served as a boundary condition for the barrier island watershed.

Ponce Inlet's hydrology is characterized by its subtropical climate, topography, land use/land cover, and soils. The 12-month average temperature within Volusia County is 70.7 degrees Fahrenheit (from May 1900 to April 2023)[4], with a 12-month average increase of 4.3 degrees Fahrenheit over the same period[3]. Temperatures typically range from 48 degrees to 85 degrees Fahrenheit. The wettest months are between June and October, with the average annual total precipitation of 51.2 inches (from May 1900 to April 2023)[3]. The annual total precipitation has decreased 3.9 inches from May 1900 to April 2023[3]. The area experienced one of its wettest months of this period in September 2022, when a total of 18.8 inches of rainfall fell due to Hurricane Ian. According to town staff, closer to 21-inches of rainfall fell during the storm event.

The topography of the barrier island is primarily characterized by a continuous ridge running parallel with the Atlantic Ocean coastline with elevations ranging from -1.6 to 35.25 feet, referenced to the North America Vertical Datum of 1988 (NAVD88). The ridge roughly coincides with South Atlantic Avenue. Runoff from this watershed discharges to the Atlantic Ocean from the eastern edge of the ridge and to the Halifax River from the western edge of the ridge. However, within the southern half of this watershed, there are several topographic troughs, oriented roughly parallel to the Atlantic coastline, which lie to the west of the coastal ridge. These topographic troughs significantly influence runoff within the watershed.

Land uses within this watershed are predominantly water and wetlands – comprising over 77% of the Town. The distribution by major land use classification is summarized in **Table 1**.

[3] Adamus, C., D. Clapp, and S. Brown. Technical Publication SJ97-1. Surface Water Drainage Basin Boundaries St. Johns River Water Management District: A Reference Guide.
[4] USA Facts. National Centers for Environmental Information, Climate in Volusia County, Florida. https://usafacts.org/issues/climate/state/florida/county/volusia-county/ accessed in March 2024.

Table 1. Land Use Distribution

Land Use Description	Area (Acres)	Percentage
Urban and Built-up	661	16%
Rangeland	51	1%
Upland Forests	158	4%
Water	1,555	38%
Wetlands	1,611	39%
Barren Land	41	1%
Transportation, Communication and Utilities	16	<1%

Soils within the corporate limits of the Town are primarily characterized as Hydraquents (40.7%) that are typical of tidal marshes and Water (31.7%) based on data from the Natural Resources Conservation Service (NRCS) Soil Survey in the Soil Survey Geographic (SSURGO) database. The distribution of hydrologic soil groups (HSGs), which indicate the rate of water infiltration, throughout the Town is as follows:

- **HSG A**: 19%
- **HSG A/D**: 8%
- **HSG C/D**: 41%
- **Water**: 32%

Group A soils have a high infiltration rate when wet, such as well drained sands. Group C soils have a slow infiltration rate when wet. Group D soils have a very slow infiltration rate and high runoff potential. Soils with a dual group assignment tend to behave according to the first group letter in drained areas, and the second in undrained areas. Water is assumed to behave as the Hydraquents soils, which are type C/D.

1.5 Floodplain Management and Stormwater Regulations

The Town's floodplain management and stormwater regulations are addressed in multiple sections of the Code of Ordinances1[5] Parts II and III as described below. A copy of the Town's complete Code of Ordinances is included in **Appendix J**.

[5] The Code of Ordinances Ponce Inlet, Florida. 3/09/2023. Published by Municode, accessed 3/04/2024. Weblink: THE CODE OF ORDINANCES TOWN OF PONCE INLET, FLORIDA | Code of Ordinances | Ponce Inlet, FL | Municode Library

1.5.1 Part II Code or Ordinances

1.5.1.1 Floodplain Management

Article X Floodplain Management in Chapter 18 of Part II of the Code of Ordinances states in Sec. 18-271 that the State Model Floodplain Management Code has been adopted. A copy of the full floodplain management code is provided in **Appendix K**. The specific language from the Code of Ordinances is provided below.

> *The "Town of Ponce Inlet Floodplain Management Code as Amended in 2017," attached to this ordinance is hereby adopted in its entirety. The "Town of Ponce Inlet Floodplain Management Code as Amended in 2017" consists of the 2012 State Model Floodplain Management Code along with the model 2017 amendments thereto and is on file in the office of the town clerk.*
>
> *(Ord. No. 2021-02, § 2(Exh. A), 2-18-2021)*

1.5.1.2 Chapter 66 Stormwater and Conservation

The Code of Ordinances Part II Chapter 66 deals with stormwater and conservation and is known as "The Ponce Inlet Stormwater and Conservation Ordinance". This chapter describes the stormwater and permitting requirements.

General Requirements

Section 66-5 provides the general stormwater requirements which include:

- The hydrologic requirements are consistent with the latest releases of USDA SCS TR55 "Urban Hydrology for Small Watersheds"[6] and the SCS National Engineering Handbook Section 4 Hydrology[7].
- Describes the performance standards for any alternative management strategies which include, in part:
  - Requires that the discharge hydrograph produced for the developed or redeveloped site shall not exceed by more than ten percent, in terms of peak flow and total volume, the hydrograph produced by conditions existing before development or redevelopment for a 25-year frequency storm.

---

[6] Urban Hydrology for Small Watersheds TR-55, United States Department of Agriculture, Natural Resources Conservation Service. June 1986. Weblink: TN1315 - USDA (U.S. Department of Agriculture), 1986, Urban Hydrology for Small Watersheds, Technical Release 55, Natural Resources Conservation Service, Washington, D.C. (nrc.gov)

[7] National Engineering Handbook, Section 630 Hydrology. United States Department of Agriculture, National Resources Conservation Services, September 1997 Amendment 90 March 2020. Weblink: eDirectives (usda.gov)

- The peak discharge resulting from a 100-year frequency storm on the developed or redeveloped site shall not exceed the peak discharge resulting from a 100-year frequency storm for existing conditions on the site.
- Stormwater runoff shall be subjected to best management practice prior to discharge into natural or artificial drainage systems.

The entire Section 66-5 is provided below.

Sec. 66-5. General requirements**.**

(a) *The hydrologic requirements mandated by this chapter shall be developed in accordance with the latest releases and revisions of the U.S. Department of Agriculture Soil Conservation Service's technical release number 55, entitled "Urban Hydrology for Small Watersheds[2]," and SCS National Engineering Handbook, section 4, entitled "Hydrology[3]." Alternate methods may be used if, in the opinion of the town engineer, the method produces similar results to the technical guides listed in this subsection. Innovative approaches to stormwater management shall be encouraged and the concurrent control of erosion, sedimentation and flooding shall be mandatory.*

(b) Alternative stormwater management and conservation control strategies shall meet the following performance standards and requirements:

(1) The discharge hydrograph produced for the developed or redeveloped site shall not exceed by more than ten percent, in terms of peak flow and total volume, the hydrograph produced by conditions existing before development or redevelopment for a 25-year frequency storm. However, the first one inch of rainfall for each storm falling on all areas caused by or resulting from the project shall be retained on-site. In addition, the cumulative impact of the outflow hydrograph on downstream flow shall be considered. Runoff rates and volumes resulting from the project, in excess of existing amounts, shall be accommodated on-site.

(2) The peak discharge resulting from a 100-year frequency storm on the developed or redeveloped site shall not exceed the peak discharge resulting from a 100-year frequency storm for existing conditions on the site.

(3) Stormwater runoff shall be subjected to best management practice prior to discharge into natural or artificial drainage systems. For purposes of this subsection, the term "best management practice" shall mean a practice or combination of practices determined by the town engineer to be the most effective, practical means of preventing or reducing the amount of pollution generated by the project to a level compatible with Florida water quality standards found in F.A.C. ch. 17-3.

(4) Runoff computations shall be based on the most critical situation (rainfall duration, distribution and antecedent soil moisture condition) and conform to acceptable engineering practices using rainfall data and other local information applicable to the affected area.

(5) No site alteration shall cause siltation of wetlands or pollution of downstream wetlands or reduce the natural retention or filtering capabilities of wetlands.

(6) No site alteration shall allow water to become a health hazard or contribute to the breeding of mosquitoes.

(7) All site alteration activities shall provide for such water retention and settling structures and flow attenuation devices as may be necessary to ensure that the standards and requirements set forth in this subsection are met.

(8) Design of water retention structures or water detention structures and flow attenuation devices shall be subject to the approval of the town engineer pursuant to the standards contained in this section.

(Code 1984, § 18-4)

Variances and Exemptions

Sections 66-9 and 66-10 provide for variances from Chapter 66 that may be obtained and exemptions for emergency work. These sections are provided below.

Sec. 66-9. Variances.

Upon request in writing by any person required to obtain a permit under this chapter and where it may be shown that an increase in the rate or volume of surface runoff shall not be harmful to the water resources of the town or to the natural sand dune system of the town, the planning board, acting as the board of adjustments, and based upon testimony, including recommendation by the town engineer, may grant or deny a variance from the terms of this chapter. Any person aggrieved by a decision of the planning board may appeal the decision to the town council within 30 days after rendition of the planning board's decision, upon payment of any appeal fee established by resolution of the town council. The appeal shall be heard at the soonest available council meeting.

(Code 1984, § 18-8; Ord. No. 2010-03, § 2, 4-22-2010

Sec. 66-10. Exemption for emergency work.

(a) *This chapter shall not be construed to prevent the doing of any act necessary to prevent material harm to or destruction of real or personal property as a result of a present emergency, including but not limited to fire, infestation by pests, or hazards resulting from violent storms or hurricanes or when the property is in imminent peril and the necessity of obtaining a permit is impractical and would cause undue hardship in the protection of the property.*

(b) A report of any such emergency action shall be made to the chief building official by the owner or person in control of the property upon which emergency action was taken as soon as practicable, but not more than ten days following such action. Remedial action may be required by the town engineer and council in the event of dispute. This section pertaining to emergency exemption shall not apply to any provision pertaining to the protection of a natural sand dune of the town.

(Code 1984, § 18-9)

Permits

Article II Permits Sections 66-41 and 66-42 describe the activities that require a permit and those that are exempted. Briefly, activity that clears land or construction that involves more than 1,000 ft^2 of impervious area will require a permit.

These two sections are provided below.

Sec. 66-41. Activities requiring permit.

No person may subdivide or make any change in the use of land or construct a structure or change the size of a structure, or rebuild a structure, except as exempted in section 66-42, without first obtaining a permit from the town for any of the following activities:

(1) Clearing and/or draining of land as an adjunct to construction.

(2) Clearing and/or draining of nonagricultural land for agricultural purposes.

(3) Converting agricultural lands to nonagricultural uses.

(4) Subdividing land.

(5) Replatting recorded subdivisions and the development of recorded and unrecorded subdivisions.

(6) Changing the use of land and/or the construction of a structure or a change in the size of one or more structures.

(7) Altering the shoreline or bank of any surface water body.

(8) Any other activity which may potentially alter or disrupt the existing stormwater runoff pattern, unless specifically exempted by section 66-42.

(Code 1984, § 18-26)

Sec. 66-42. Exemptions.

For the purposes of this chapter, the following activities shall be exempt from the formal permitting procedures of this article:

(1) Customary accessory structures, on previously platted lots or where the town subdivision regulations are not applicable.

(2) Bona fide agricultural pursuits, including forestry, except where an artificial drainage system will be used to increase the flow of surface water from the applicant's land.

(3) Maintenance work performed on existing mosquito control drainage canals for the purpose of public health and welfare.

(4) Any maintenance, alteration, renewal, use or improvement of an existing structure not changing or affecting the rate or volume of stormwater runoff, and the construction of any structure or addition not otherwise exempt not exceeding 1,000 square feet of impervious area on or parallel to the ground.

(5) Subdivision approval pursuant to the town subdivision regulations shall not require a separate permit pursuant to this chapter; however, the appropriate permit fee shall be paid. Compliance with this chapter shall be demonstrated as a part of the review procedures pursuant to the town subdivision regulations.

(6) Maintenance work on utility or transportation systems may be performed within rights-of-way or easements provided such maintenance work does not alter the purpose and intent of the system as constructed.

(Code 1984, § 18-27)

Maintenance

Section 66-7 Maintenace of Installed System requires the stormwater system owner/applicant to properly maintain the system unless the Town has accepted it for maintenance. If the owner fails to maintain the system, the Town has the right to inspect and maintain it as described in the first paragraph of the Section "The system to be maintained by the owner shall have adequate easements to permit the town to inspect and, if necessary, to take corrective action should the owner fail to properly maintain the system."

The complete maintenance section is provided below.

Sec. 66-7. Maintenance of installed system.

The installed system required by this chapter shall be maintained by the owner/applicant, except that the town may accept certain systems for town maintenance. The selection of critical areas and/or structures to be maintained by the town (or other appropriate governmental authority) shall be recommended to the town council by the town engineer. All areas and/or structures to be maintained by the town must be dedicated to the town by plat or separate instrument and accepted by the town council. The system to be maintained by the owner shall have adequate easements to permit the town to inspect and, if necessary, to take corrective action should the owner fail to properly maintain the system. Should the owner fail to properly maintain the system, the chief building official shall give such owner written notice of the nature of the corrective action necessary. Should the owner fail, within 30 days from the date of the notice, to take, or commence taking, corrective action to the satisfaction of the chief building official, the town may enter upon lands, take corrective action and place a lien on the property of the owner for the costs thereof.

Owner/applicant maintained systems shall submit to the town an annual inspection report prepared by an approved agency as determined by the town's chief building official or a licensed engineer on or before January 31st of each year. Owner/applicants may request the town's approved agency or engineer to perform this required annual inspection at the owner/applicants expense. If the owner/applicant requests the town's approved agency or engineer perform the required annual inspection, owner/applicant shall pay the town in advance for all costs associated with this service. The annual inspection report shall include a report on the condition of all components of the system and a recommendation of any necessary repairs or replacement of any parts of the system found to be deficient.

(Code 1984, § 18-6; Ord. No. 2010-19, § 2, 10-21-2010)

1.5.2 Part III Land Use Development Code

Part III of the Town's Code of Ordinances provides detailed requirements for the development and redevelopment of land within the corporate limits. All sections of the Land Use and Development Code, including those that are summarized below applicable to stormwater management, can be found in the full Code of Ordinances within **Appendix J**.

1.5.2.1 Stormwater Management and Conservation (Section 4.9)

This section describes the purpose, applicability, and stormwater requirements for development.

The purpose of this section includes, in part:

- Protect and maintain groundwater and surface waters
- Protect natural drainage systems
- Encourages the construction of stormwater management systems that aesthetically and functionally approximate natural systems.

Permits

Under Section 4.9.2 a stormwater management permit will be required for any development activity that involves construction or a change in land use. Section 4.9.3 exempts construction involving less than 1,000 ft^2 of impervious area.

General Requirements

Section 4.9.3 of the Code describes the general requirements of the stormwater management system. It has the same requirements as Section 66-5 General Requirements of Article II of the Code of Ordinances.

Stormwater Management Permit Criteria

Section 4.9.6 describes factors considered by the Town to decide whether or not to issue a stormwater permit. This complete section is provided below.

4.9.6 Stormwater management permit criteria.

At a minimum, the following factors shall be considered in the determination of whether or not a stormwater management permit will be issued:

A. The characteristics and limitations of the soil at the proposed site;

B. The existing topography of the proposed site and the extent of topographical changes after development;

C. The existing vegetation of the proposed site and the extent of vegetational changes after development;

D. The existing hydrologic cycle of the site and the impact of the proposed alterations on the existing hydrologic cycle;

E. The impact the proposed project will have on the natural recharge capabilities of the site;

F. The impact the proposed project will have on downstream water quantity and quality and specifically the potential for downstream flooding conditions;

G. The plans and specifications of structures or devices the applicant intends to employ for on-site water retention, detention, erosion control and flow attenuation;

H. The effect the proposed water retention or detention structures will have upon mosquito breeding habitat; and

I. The effect of the project upon the natural sand dune system of the town.

1.5.2.2 Stormwater Drainage System (Section 5.9.4)

This section provides the level of service (LOS) standards for stormwater systems, which include:

- Retain the first inch of runoff on site
- Post-development discharge hydrograph maintains pre-development conditions
- Post-development peak discharge shall not exceed the pre-development peak discharge for the 100-year storm.

The entire section is provided below.

5.9.4 Stormwater drainage system.

No development shall be approved unless there is sufficient available capacity to sustain the following levels of service for the stormwater drainage system established in the comprehensive plan.

A. Level-of-service standards.

1. *First inch of rainfall shall be retained on site.*
2. *Discharge hydrograph for post-development conditions shall maintain pre-development conditions.*
3. *Peak discharge from post-development conditions shall not exceed peak discharge from pre-development conditions for a 100-year frequency storm.*

B. Concurrency evaluation. Stormwater drainage systems designed to accommodate the impacts of proposed development shall meet all applicable design and construction standards of this code, in addition to the LOS standards for concurrency, including requirements for flood hazard reduction and water quality.

1.5.2.3 Low Impact Development (LID)

The land development code does not have a specific LID section, but does require various LID features (bioswales, rain gardens, etc.) to be used and allows for other LID features such as green roofs. For example, Section 4.10.3 Landscaping, Buffering and Screening details the requirements for LID type features for parking areas and landscaping.

Multi-family and non-residential development landscaping requirements for paved parking areas are provided in Section 4.10.3.C.3. The requirements include:

- Interior planters must include at least 10% of the paved area
- Planters must break up rows of 10 parking spaces
- Planters must have a minimum area of 80 square feet (ft^2), and a minimum width of 5 feet
- Planters shall be designed at the same elevation as the adjacent vehicular use area so that they are visible and relieve the visual impact and glare of the paved area. However, the elevation may be adjusted to save existing trees or to provide additional stormwater drainage treatment capacity for the site as a bio-swale, rain garden, or low-impact stormwater management system.
- Curbing and/or wheel stops shall be placed adjacent to landscaped areas in accordance with section 4.7 if needed to protect landscaped areas and existing vegetation but shall otherwise be minimized to allow stormwater runoff sheetflow into properly designed bio-swales, rain gardens, or low-impact stormwater management systems.

Section 4.7.3, Surfacing of off-street parking and loading facilities, does allow for the use of pervious surfaces for off-street parking and loading areas. Pervious surface may be factored into the stormwater runoff and storage calculations of a property. Additionally, approval of pervious pavement use must show, in the opinion of the Town's engineer, a reduction in the quantity or improvement in the quality of stormwater runoff, or the pavement will not create on-going erosion and maintenance problems.

Other sections of the land development code describe roadway swale requirements for roads that do not have curb and gutter systems.

Besides the items noted above, the Code does not generally mandate specific LID features, but allows and encourages their use. Section 4.10.I.3 describes the relationship between landscaping and stormwater standards and is provided below.

> *Relationship of stormwater standards to landscaping. Sheet drainage flow of stormwater run-off may be permitted through mulched planting beds if designed as a bio-swale, rain garden, or low-impact stormwater management system. Otherwise, surface run-off shall be routed into flumes or pipes through the planting beds, spaced no less than one flume for every 50 lineal feet of pavement edge. Stormwater retention areas within street yards shall be designed as attractive integral parts of the overall design. Artificially created, open stormwater retention areas shall not occupy more than one-third of the street yard.*

1.5.4 Coastal Management & Conservation

The Code addresses coastal management and conservation in multiple sections, but Part IV Comprehensive Plan, Chapter VI Coastal Management Element and Conservation Element is the primary area where these concerns are addressed. This section lists a number of goals, objectives, and policies to allow the Town to meet its coastal management and conservation goals. A brief, partial list of the relevant goals and objectives is provided below.

- Goal 1. Conserve, protect, and restore coastal natural resources in order to maintain and enhance native habitats, floral and faunal species diversity, water quality, and natural surface water characteristics: and preserve and expand opportunities for the general public to access, use and enjoy the ocean beaches, the Halifax River, and other natural resource areas with recreational potential.
- Policy 1.1.3: The Town shall work with Volusia County and state entities to acquire, restore, and enhance natural and open space areas such as critical wetland and upland habitats, including threatened and endangered species and species of special concerns, to the extent feasible when considering future flood conditions. This may include restoring or enhancing degraded natural areas such as restoration of natural communities, restoration of natural hydrology and/or removal of non-native vegetation.
- Policy 1.1.5: The Town shall work with the county and state entities to protect the wetland resources west of South Peninsula Drive and to maintain the continuity and functional integrity of the ecological corridor as part of the review process of private developments or community enhancement projects.
- Policy 1.2.2: The Town shall maintain and protect the natural functions and flood hazard mitigation benefits of its wetland areas by avoiding wetland impacts wherever practical and

by maintaining mitigation standards for unavoidable wetland impacts. Development adjacent to riverine shoreline areas shall maintain a vegetated habitat buffer zone (living shoreline) to protect or conserve the canopy, understory and ground cover of native upland vegetation and wetlands. Buffers not less than 25 feet in width shall be established adjacent to and surrounding all wetlands. Wetland buffers greater than 25 feet in width may be required if the upland activity adversely impacts the wetlands' beneficial functions. Criteria and standards to alter and mitigate for development within the wetland buffer shall be maintained in the LUDC.

- Objective 1.4: The Town shall develop strategies on a continuous basis or as the need arises to lessen the impact of natural disasters and future flood conditions on human life, property, critical public facilities, and natural resources.
- Policy 1.4.1: The Coastal High Hazard Area (CHHA) is defined as the area below the elevation of the Category 1 storm surge line as established by a Sea, Lake, and Overland Surges from Hurricanes (SLOSH) computerized storm surge model. Since a substantial portion of the Town is located within the CHHA, the Town has adopted Policy 1.1.4 in its Future Land Use Element, to mitigate the effect of land use reclassifications that would allow any increase in residential net density.
- Policy 1.4.3: The Town shall apply regulatory and management techniques in the LUDC, as needed, for proposed development in the CHHA to mitigate the threat to human life and property. Such techniques shall include, but not be limited to:
    - Requirements to reinforce buildings to withstand impacts of wind loads that meet or exceed requirements of the Florida Building Code;
    - Requirements to set the minimum finished floor elevation at least one foot above the maximum design flood elevation (100-year flood level) per the Residential Building Code and the National Flood Insurance Program (NFIP)
- Policy 1.4.4: The Town shall guide redevelopment in a manner that eliminates inappropriate and unsafe development in the coastal areas as opportunities arise. Specifically, the Town will:
    - Continue to utilize the LUDC and the Code of Ordinances to implement principles, strategies, and engineering solutions that reduce the flood risk in coastal areas resulting from high-tide events, storm surge, flash floods, stormwater runoff, and the related impacts of sea-level rise. Such strategies include but are not limited to:
        - Low-impact development (LID)/redevelopment practices
        - Green/Nature-based infrastructure
        - Dune protection
    - Apply best practices, principles, strategies, and engineering solutions that will result in the removal of coastal property from Federal Emergency Management Agency (FEMA) flood zone designations. Such strategies include but are not limited to acquiring repetitive-loss properties for mitigation purposes and requiring the

elevation of new and reconstructed structures to be elevated at least one foot above the current base flood elevation to account for projected sea level rise over their structural lifespan.
- Implement LID site design techniques and best practices that reduce losses due to flooding and claims made under flood insurance policies issued in the state of Florida. LID site design techniques and nature-based best practices include but are not limited to: rain gardens, pervious pavement, living shorelines, enhanced vegetated buffers, bio-swales, elevating electrical boxes and equipment above anticipated future flood levels, and breakaway walls on the first floor for flood water attenuation.
- Be consistent with, or more stringent than, the flood-resistant construction requirements in the Florida Building Code and applicable flood plain management regulations set forth in Title 44 Code of Federal Regulation part 60 (Flood Plain Management).
- Require that any construction activities seaward of the FDEP coastal construction control lines be consistent with F.S. 161 (Beach and Shore Preservation).

- Policy 1.4.11: The Town recognizes the sea level rise projections and planning horizons provided in the East Central Florida Regional Planning Council's Regional Resilience Action Plan, the current projects for which are depicted in a chart in this element (Figure VI-7 Sea Level Rise Projections). As models are updated, the Regional Planning Council will notify its members of updated projections. The Town will update polices based on new projection models as they are received.
- Policy 1.4.13: The Town shall annually allocate funding to address the vulnerability of existing roadways and other public infrastructure from future flood conditions, as established in the capital improvement element schedule (Figure VI-8).
- Policy 1.4.15: The Town shall provide property owners access to information of current and future vulnerability reports, studies, and plans that show projected storm surge and sea level rise conditions.
- Policy 2.2.3: The Town's long-term post-disaster planning efforts shall include the gradual relocation of residential units away from flood-prone areas. Examples of relocation include increased setbacks, freeboard elevation, ocean dune stabilization or restoration, or acquisition of repetitive-loss properties.
- Policy 3.1.5: The Town shall, to the greatest extent feasible, assess historic structures to determine appropriate mechanisms and strategies to reduce flood impacts, such as hardening or moving electrical equipment to higher elevations. Future assessments of this manner shall be done in coordination with the Cultural Services, Historic Preservation, and Tree Advisory Board to ensure preservation of the historic value of a structure or site.

1.5.5 SUMMARY

The Town's current stormwater codes and regulations require:

- Development of greater than 1,000 ft^2 of impervious area or a land use change requires a stormwater permit
- The first inch of runoff is to be retained on site
- The post-development hydrograph must match the pre-development
- The post-development 100-year peak discharge should be equal to or less than the pre-development peak discharge
- The stormwater system owner is required to maintain the system, allow the Town to inspect it, and provide easements so that the Town can maintain it if the owner fails to
- Ponce Inlet has robust policies and codes to protect the natural resources, manage coastal areas, and minimize flooding within development/redevelopment of the Town.

The Town's stormwater permitting thresholds are stricter than those of the SJRWMD, the agency that issues Environmental Resource Permits (ERP) for Ponce Inlet and other jurisdictions within the district on behalf of the State of Florida. For example, the SJRWMD[8] exempts from permitting single family, duplexes, triplexes, and quadruplexes that have a total area of no more than 10 acres and less than two acres of impervious area (Section 3.1.4 Permit Thresholds). These developments would all require a permit under the Town's regulations.

2. Background Data Acquisition

The acquisition, review, and compilation of data was performed by Collective at the request of the Town to develop the WMP as per FEMA's CRS requirements for Activity 450[9,10] and perform the flood VA, based on the requirements as defined in Section 380.093, Florida Statutes (F.S.)[11]. Data for the WMP and VA are classified into three main categories and are briefly described below: 1) critical and regionally significant asset inventory, 2) topographic data, and 3) flood scenario-related data. More

---

[8] Environmental Resource Permit Applicant's Handbook, Volume I, St. Johns River Water Management District, Effective Date December 22, 2020. Weblink: https://www.sjrwmd.com/static/permitting/AH_I_thru_Appendix_D_DOS-Final-12-22-2020.pdf

[9] National Flood Insurance Program Community Rating System Coordinator's Manual, 2017: https://www.fema.gov/sites/default/files/documents/fema_community-rating-system_coordinators-manual_2017.pdf

[10] Addendum to the 2017 CRS Coordinator's Manual, 2021: https://www.fema.gov/sites/default/files/documents/fema_community-rating-system_coordinator-manual_addendum-2021.pdf

[11] Resilient Florida Grant Program, 380.093,F.S.: http://www.leg.state.fl.us/statutes/index.cfm?App_mode=Display_Statute&Search_String=&URL=0300-0399/0380/Sections/0380.093.html

details regarding these data categories can be found in **Appendix B, *Task 1: Acquire Background Data Technical Memorandum***. Below is a summary of each.

2.1. Critical and Regionally Significant Asset Inventory

Four asset classes and associated asset types are defined by 380.093, F.S., to establish a consistent suite of assets that are to be evaluated as part of a flood VA under the *Resilient Florida* program:

- **Transportation Assets 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, communication facilities, and disaster debris management sites.
- **Critical Community and Emergency Facilities**: schools, colleges/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, Historic Assets**: conservation lands, parks, shorelines, surface waters, wetlands, and historical and cultural assets.

Collective gathered and reviewed publicly available data from numerous federal, State, regional, and local sources to identify critical and regionally-significant assets within the corporate limits of Ponce Inlet. For several asset types, data layers were available from multiple sources. Upon comparison, Collective determined that often different data sources for the same asset type did not reflect the same list of assets and one source alone did not reflect a complete inventory of all assets within the Town. Based on a review and determination of the quality of the data source, Collective prepared a full inventory of assets within the Town. Data was reviewed with Town staff to address missing assets. At the request of the Town, petroleum storage and business locations were also incorporated as a supporting data layer. Unique identification numbers were assigned by Collective for each asset. **Figures 3** through **7** illustrate the number and distribution of identified assets under each of the four asset classes. Individual locations may be reflected in multiple asset classes. For instance, Inlet Harbor Marina is reflected as a *Transportation Assets and Evacuation Routes* asset, *Critical Infrastructure* asset since it has an active National Pollutant Discharge Elimination System (NPDES) stormwater discharge permit and a petroleum storage facility, and *Natural, Cultural, Historic* asset since one of the structures of the Off The Hook at Inlet Harbor restaurant is a historical structure. As required by 380.093, F.S., shorelines, surface Waters, and wetlands (illustrated in Figure 7) were collected as part of the Natural, Cultural, Historic Asset inventory and assigned asset identification numbers. These features were not assessed for flood exposure or sensitivity since these hydrologic features are intended to flood.

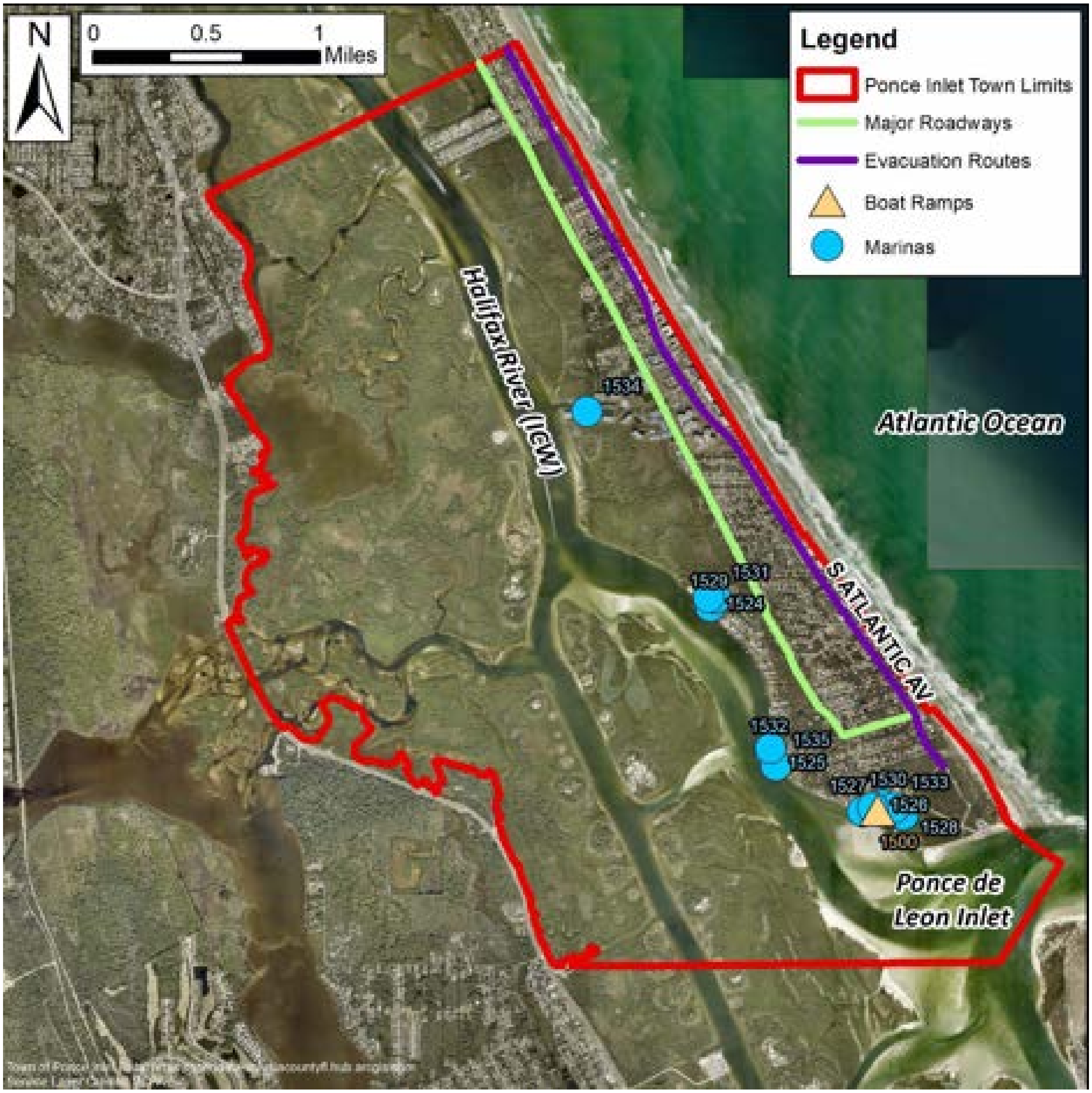


Figure 3: Ponce Inlet Transportation Assets and Evacuation Routes

Figure 4: Ponce Inlet Critical Infrastructure

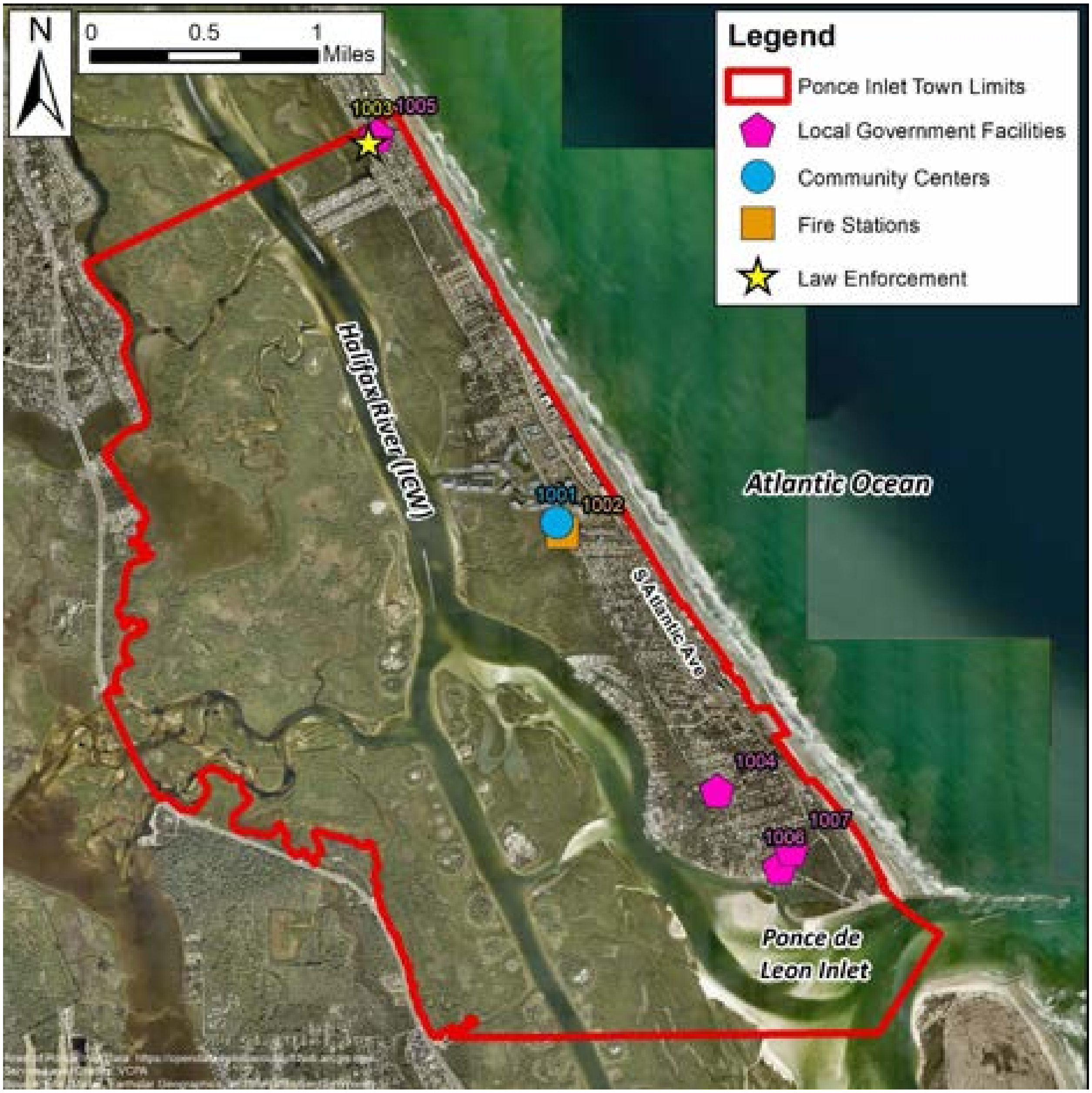


Figure 5: Ponce Inlet Critical Community and Emergency Facilities

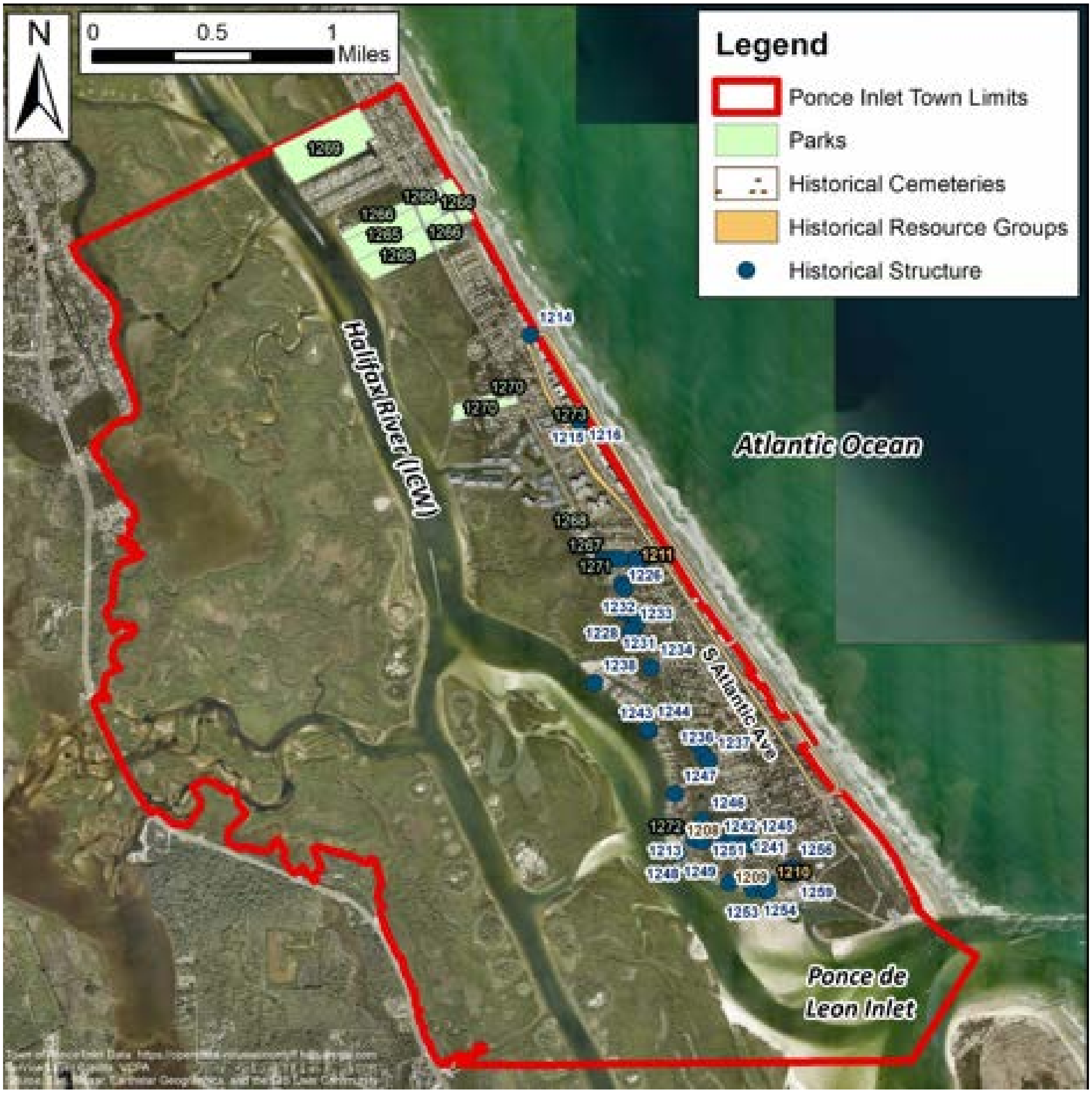


Figure 6: Ponce Inlet Natural, Cultural, Historic Assets – Parks and Historic Only

Figure 7: Ponce Inlet Natural, Cultural, Historic Assets – Conservation Lands, Shoreline, Surface Waterbodies, and Wetlands

2.2. Topographic Data

The most recent digital topographic data for the Town is published by the United States Geological Service (USGS) in partnership with the Florida Department of Emergency Management (FDEM) reflecting light detection and ranging (lidar) data acquisition between December 4, 2018, and March

22, 2019 (Dewberry 2022[12]). Collective prepared a seamless Ponce Inlet digital elevation model (DEM) raster from the available USGS data. The DEM is referenced to North American Datum of 1983 with the 2011 Adjustment (NAD83_2011) horizontal datum, Florida State Plane Zone East coordinate system and North American Vertical Datum of 1988 (NAVD88) vertical datum. This Ponce Inlet DEM serves as the base topographic layer for all project analyses and mapping. Within the Town's limits, surface elevations range from -1.6 to 35.25 feet NAVD88 with the highest elevations present along the northeast side along the coastal ridge.

2.3. Flood Scenario-Related Data

To support the development of a flood analyses and mapping of Ponce Inlet, Collective researched and compiled the following flood scenario-related data sets, which are detailed in Appendix B:

- **Precipitation**: rainfall depth for five design storm events were collected from the National Oceanic and Atmospheric Administration (NOAA). Rainfall depths range from 7.40 inches (10-year/24-hour recurrence interval) to 16.9 inches (100-year/96-hour recurrence interval).
- **Soils**: NRCS SSURGO database was downloaded to identify the major soil mapping units within the Town's corporate limits. Water and Hydraquents (flat, poorly drained soils typical of tidal marshes) make up over 72-percent of the land area.
- **Water Table**: The SSURGO database was used to establish the depth to water table for each soil group within the project area.
- **Land Use/Land Cover**: Mapping developed by the St. Johns River Water Management District (SJRWMD) defines the current land use and land cover.
- **Impervious Area**: AutoCAD mapping obtained from the Town, which included outlines of building footprints, roadways, driveways, sidewalks, and parking, was used to establish impervious area estimates for the various land uses.
- **Tidal Datums**: Mean Higher High Water (MHHW) tidal datums were collected for five NOAA tidal stations closest to Ponce Inlet. These data were used to establish the 2023 MHHW for both the Atlantic Ocean and ICW/Halifax River: 1.62-feet NAVD88 and 1.18 ft NAVD88, respectively.
- **Storm Surge Elevations**: storm surge elevations for tropical storms through Category 5 hurricane were obtained from NOAA's National Weather Service (NWS) Seas, Lakes, and Overland Surges from Hurricanes (SLOSH) model simulations. Additionally, estimated still water elevation data for the 1-percent annual chance storm surge flooding in Volusia County was obtained from the Federal Emergency Management Agency (FEMA).

[12] FL Peninsular 2018 Lidar Project – Volusia County, Report Produced for USGS, 2021: https://rockyweb.usgs.gov/vdelivery/Datasets/Staged/Elevation/metadata/FL_Peninsular_2018_D18/FL_Peninsular_Volusia_2018/reports/Volusia_County_Report.pdf

- **Stormwater Management Infrastructure**: The Town provided mapping of the public stormwater management system, which included physical characteristics (e.g., inverts, diameters, materials, etc.) for much of the system. Additionally, Collective obtained publicly-available Environmental Resource Permit (ERP) information from SJRWMD for 22 developments.
- **Flooding Complaints:** a flood survey was distributed to residents of Ponce Inlet by Town staff and through the Town's website. Responses were compiled by Collective into a spatial database, identifying the location associated with the reported flooding and attaching the completed surveys and/or photos documenting impact of flooding. Most flooding reports are associated with Hurricanes Ian (September 2022) and/or Nicole (November 2022). Additionally, previous flood reports documented in the Town's 2003 Stormwater Master Plan were added to the database.

3. Current Conditions Flooding Exposure Analyses

The depths and extents of flooding caused by four types of flooding were evaluated for the Town: stormwater (or rainfall-induced), tidal, storm surge, and compound (stormwater and storm surge combined). The sections below summarize the analyses and results for each current condition (2023) flood scenario to quantify where each type of flooding may occur and the number of unique parcel IDs/property owners that will be exposed to some amount of flooding. Maps illustrating the depth of water anticipated for each of these flood scenarios can be found in **Appendix F**. When reviewing the maps, it is important to consider the maximum depths of flooding shown may not occur all at the same time but rather over the course of the event or soon thereafter.

3.1. Stormwater Flooding Analysis

Collective developed a hydrologic and hydraulic model of the Town using the Interconnected Pond and Routing (ICPR) Version 4 model. The stormwater model was developed to a level of detail appropriate for determining the potential flooding threat and impact on the Town's drainage system from existing and expected development, various long-duration rainfall events and projected sea level rise, and recommendations for future decision-making and mitigation of or adaptation to such events. The model was calibrated to Hurricane Ian based on written flood reports and photos of flooding extents. The model was then used to map flood inundation extents and associated depths for five design storm events, provide information on the potential effects of future development and sea level rise (see Section 4.2), and evaluate the effect of proposed improvements to the stormwater system. Specifics about the parameterization and development of the model can be found in **Appendix C**. A summary of node peak stages for each design storm simulation can be found in **Appendix D**.

Based on the results of the current conditions model, **Table 2** summarizes the total area, percent area and number of parcel IDs/property owners exposed to stormwater flooding for each design storm event. As previously mentioned, the Town includes a total of 3,600 unique parcel IDs/property owners, but multiple IDs may be associated with a specific property such as a condominium. Total unique parcel IDs were selected for reporting since this metric better reflects the number of property owners that may be exposed to the impacts of flooding.

Maps illustrating the extent of flooding associated with all design storm events are presented in **Appendix F Figures F1** through **F10.** Flooding tends to occur along the western edge of the barrier island (along the Halifax River) as well as within the topographic troughs located at the southern end of the Town. Additional rainfall amounts, associated with decreasing frequency of storms, also produce flooding in the south-central portion of the town between Oceanview Avenue and Beach Street.

Table 2. Current Conditions Stormwater Exposure

Exposure Parameter	**10-Year/24-hour Event** *(7.40 inches)*	**25-Year/24-hour Event** *(9.46 inches)*	**25-year/96-hour Event** *(12.1 inches)*	**100-year/24-hour Event** *(13.2 inches)*	**100-year/96-hour Event** *(16.9 inches)*
Incorporated Area (acres)	2,104	2,111	2,116	2,133	2,145
Percent of Incorporated Area	51.4%	51.5%	51.7%	52.1%	52.4%
Number of Parcel IDs	837	880	926	1,002	1,107

3.2. Tidal Flooding Analysis

Brizaga completed an analysis of the frequency and severity of annual tidal flooding within the corporate limits of the Town. **Appendix E** includes a summary document prepared by Brizaga that presents the data collected, analysis approach, and mapping methodology. Tidal analysis is based on data for the two closest NOAA tidal stations: Mayport (Jacksonville, Florida) and Trident Pier (Port Canaveral, Florida). For 2023, the high tide flooding (HTF) threshold for the Town is 3.42 feet NAVD88. **Appendix F Figures F39** and **F40** illustrate the number of annual tidal flood days for current conditions. **Appendix F Figures F49** and **F50** depict the depth of HTF across the corporate limits. The majority of the Town's area experiences regular tidal inundation since the corporate limits include the Halifax River and a large area of tidal wetlands/salt marshes, which are permanently inundated by the Mean Higher High tide (as illustrated in Figures F49 and F50). **Table 3** summarizes the total area, percent area and number of parcel IDs exposed to high tide flooding currently.

Table 3. Current Conditions High Tide Flooding Exposure

Exposure Parameter	High Tide Flooding *(3.42 ft, NAVD88)*
Incorporated Area (acres)	3,096
Percent of Incorporated Area	75.6%
Number of Parcel IDs	658

3.3. Storm Surge Flooding Analysis

Additionally, Brizaga analyzed the severity of surge flooding associated with Tropical Storm, Category 2 Hurricane, and Category 4 Hurricane storm categories within the Town. Specifics on the data sources, analysis approach, and mapping methodology for the storm surge analysis are included in **Appendix E**. Maximum of Maximums (MOM) surge elevations representing historical, hypothetical, and predicted storm events and that capture the worst-case high-water level that could occur at a particular location were determined for each storm category. These surge elevations range according to the values presented in **Table 4** and vary geographically within the Town. These elevations were mapped against the current surface topography to determine the depths of surge flooding for the three storm categories analyzed. Storm surge depth maps are included in **Appendix F Figures F59, F60, F69, F70, F79** and **F80** for each of the three storm categories. **Table 5** summarizes the total area, percent area and number of parcel IDs exposed to surge flooding for Tropical Storm, Category 2 Hurricane, and Category 4 Hurricane storm categories. A considerable amount of the barrier island portion of the Town is susceptible to hurricane surge inundation – particularly south of Oceanview Avenue as well as the western edge from the Halifax River and east towards South Peninsula Drive. For the Category 4 Hurricane, the area west of S Peninsula Drive and much of the area south of Beach Street would be under several feet of surge.

Table 4. Current Conditions Storm Surge Elevations

Storm Category	2023 Surge Elevations (ft, NAVD88)
Tropical Storm	3.0 – 4.2
Category 2 Hurricane	5.1 – 8.1
Category 4 Hurricane	11.3 -15.1

Table 5. Current Conditions Storm Surge Flooding Exposure By Storm Category

Exposure Parameter	Tropical Storm Surge	Category 2 Hurricane Surge	Category 4 Hurricane Surge
Incorporated Area (acres)	3,143	3,436	3,807
Percent of Incorporated Area	76.8%	83.9%	93.0%
Number of Parcel IDs	698	1,351	3,267

3.4. Compound Flooding Analysis

Lastly, the impact of a hypothetical combined rainfall-induced and storm surge flood event was evaluated. Brizaga generated an idealized storm surge time series reflective of a Category 1 Hurricane, which is detailed in **Appendix E**. Collective superimposed this storm surge time series onto the existing boundary conditions of the stormwater model to identify the depths of water across the Town caused by this compound event. The timing of the peak surge elevation was assumed to approximately coincide with the peak runoff time for most basins. Flood depths for the 100-year/24-hour design storm event with the idealized Category 1 surge are mapped in **Appendix F Figures F89** and **F90**. Flooding extents and depths both increase compared to rainfall-only flooding due to coastal inundation from the surge as well as the decreased capacity of the Town's stormwater management system to discharge collected runoff. **Table 6** summarizes the total area, percent area, and number of parcel IDs exposed to compound flooding.

Table 6. Current Conditions Compound Flooding Exposure

Exposure Parameter	100-year/24-hour Rainfall + Category 1 Hurricane Storm Surge
Incorporated Area (acres)	3,525
Percent of Incorporated Area	86.1%
Number of Parcel IDs	1,684

3.5. Critical and Regionally Significant Asset Exposure Analysis

Collective evaluated the exposure of the critical and regionally-significant assets within the corporate limits of Ponce Inlet to 2023 flooding. Assets were analyzed to determine the depth of flooding within/on each asset from the following flood scenarios:

- 100-year/24-hour stormwater flooding
- High tide flooding

- Category 2 Hurricane storm surge flooding
- Compound 100-year/24-hour stormwater flooding with idealized Category 1 Hurricane storm surge flooding

The Town was able to provide finished floor elevations for 12 of the 65 buildings based on permit information or FEMA elevation certificates. For the remaining buildings, finished floor elevations were estimated based on the average of the mean and maximum surface elevations within a 5-foot buffer around each building. **Table 7** below summarizes the total number of assets exposed to flooding for each flood scenario. Properties reflect those assets that do not have occupiable buildings such as parks, marinas, lift stations, communication tower, etc. Roadway segments reflect the major roads and evacuation routes divided at intersections. **Appendix G** summarizes the flood depths estimated for each building and roadway segment asset and percent area of inundation for the property assets.

Table 7. Percentage of Critical and Regionally Significant Asset Exposed to Current Flooding

Assets	Total Number of Assets	Stormwater Flooding	High Tide Flooding	Storm Surge Flooding	Compound Flooding
Buildings	65	14%	12%	34%	38%
Properties	50	**58%**	44%	**70%**	**80%**
Roadway Segments	47	**57%**	9%	36%	**77%**

4. Future Conditions Flooding Exposure Analyses

Three future periods were evaluated to understand the potential changes in flood exposure and vulnerability over time due to sea level rise: 2040, 2070, and 2100. Resilient Florida requirements (Section 380.093, F.S.) specify both years 2040 and 2070 to be included in a VA and FEMA CRS requirements specify Watershed Master Plans for coastal communities need to evaluate sea level rise impacts at least to the year 2100. In addition to sea level rise impacts, potential land use changes in line with the Town's adopted future land use zoning were incorporated into the future conditions analyses.

To support the development of the future flood analyses and mapping of Ponce Inlet, Collective collected the following flood scenario-related data sets, which are further detailed in **Appendix B**:

- **Future Land Use:** future zoning map adopted by the Town along with density limits defined by the Town's building code for each zoning district were utilized to establish future land use conditions and impervious area.
- **Sea Level Rise Projections**: As defined in Section 380.093, F.S., NOAA 2017 sea level rise projections for both intermediate-low (IL) and intermediate-high (IH) curves were used to

determine relative sea level rise from current conditions (2023) to years 2040, 2070, and 2100. For the Town, sea level rise is expected to range from 0.27 feet (2040 IL) to 5.23 feet (2100 IH). More specifically, **Table 8** summarizes the relative change in sea levels compared to 2023 for each of the time horizons and sea level rise projections.

Table 8. Projected Relative Sea Level Rise Estimated from Year 2023

Year	NOAA 2017 IL (ft, NAVD88)	NOAA 2017 IH (ft, NAVD88)
2040	0.27	0.7
2070	0.77	2.51
2100	1.22	5.23

The depths and extents of potential future flooding caused by the stormwater, tidal, storm surge, and compound flooding were evaluated for the Town. However, not all time horizons were evaluated for each flooding type; **Table 9** summarizes the specific future flood scenarios evaluated for each. The sections below summarize the analyses and exposure results for each flooding type for the flood scenarios investigated. Maps illustrating the depth of water anticipated for each of these future flood scenarios can be found in **Appendix F**.

Table 9. Future Flood Scenarios Evaluated By Type

Flood Type	2040 IL	2040 IH	2070 IL	2070 IH	2100 IL	2100 IH
Stormwater	◆	◆	◆	◆	◆	◆
Tidal	◆	◆	◆	◆		
Storm Surge	◆	◆	◆	◆		
Compound	◆	◆	◆	◆		

4.1. Future Stormwater Flooding Analysis

The current conditions stormwater model was revised to reflect future land use and associated impervious area parameters, consistent with the Town's future zoning maps and density limitations. Each future flood scenario reflects the same future land use conditions. Additionally, tidal boundary conditions and initial conditions for tidally influenced nodes were revised to adjust for the relative sea level rise, consistent with the amounts listed in **Table 8**. Water table and associated percolation/exfiltration parameters were adjusted by the same sea level rise. Specifics about the parameterization and development of the model can be found in **Appendix C**. A summary of node peak stages for each design storm simulation can be found in **Appendix D**.

Based on the results of the future conditions models, **Table 10** summarizes the total area, percent area and number of parcel IDs exposed to stormwater flooding for the 100-year/24-hour design storm event (13.2 inches of rainfall total in 24 hours). Changes in exposure reflect the effects of rising sea levels. For the 2100 Intermediate High scenario, almost 79% of the Town's unique parcel ID's/property owners could be exposed to flooding.

Maps illustrating the extent of flooding associated with the 100-year/24-hour design storm event for the 2040IL, 2040IH, 2070IL, and 2070IH scenarios as well as all design storm events for both the 2100IL and 2100IH scenarios are presented in **Appendix F Figures F11** through **F38.** Flooding along the western edge of the barrier island (along the Halifax River to S Peninsula Drive) increases with rising tidal conditions and the flooding in the south-central portion is exacerbated as well. Flooding around the Harbor Village Golf and Yacht Club increases as well with the rise in sea levels.

Table 10. Future Conditions 100-Year/24-Hour Stormwater Exposure

Exposure Parameter	2040 IL	2040 IH	2070 IL	2070 IH	2100 IL	2100 IH
Incorporated Area (acres)	2,333	2,705	2,768	3,243	3,002	3,577
Percent of Incorporated Area	57.0%	66.1%	67.6%	79.2%	73.3%	87.4%
Number of Parcel IDs	1,065	1,108	1,116	2,035	1,217	2,842

4.2. Future Tidal Flooding Analysis

Brizaga applied the projected sea level changes to the Town's current conditions high tide flood elevations to determine the frequency and depth of future, annual tidal flooding in years 2040 and 2070. Please reference **Appendix E** for the summary document prepared by Brizaga presenting the analysis approach and mapping methodology. **Appendix F Figures F41** through **F48** illustrate the number of annual tidal flood days for the four future flood scenarios evaluated. **Appendix F Figures F51** through **F58** depict the depth of HTF across the corporate limits. Based on the Intermediate High sea level rise projections, an additional 335 acres within the Town could be exposed to high tide flooding by 2070. Some of this additional area is within the spoils areas and marshes within the corporate limits, but developed areas along the western edge and southwest corner will be impacted by chronic flooding as well. **Table 11** summarizes the total area, percent area and number of parcel IDs exposed to high tide flooding for each of the four future high tide flood scenarios.

Table 11. Potential Future High Tide Flooding Exposure

Exposure Parameter	2040 IL	2040 IH	2070 IL	2070 IH
Incorporated Area (acres)	3,137	3,198	3,208	3,431
Percent of Incorporated Area	76.6%	78.1%	78.3%	83.8%
Number of Parcel IDs	682	719	727	1,250

4.3. Future Storm Surge Flooding Analysis

Additionally, Brizaga analyzed potential future flooding associated with rising sea levels applied to Tropical Storm, Category 2 Hurricane, and Category 4 Hurricane storm surge. **Appendix E** may be referenced for Brizaga's analysis approach and mapping methodology. Potential future storm surge depth maps are included in **Appendix F Figures F61** through **F68, F71** through **F78, and F81** through **F88**. **Tables 12** through **14** summarize the total area, percent area and number of parcel IDs exposed to future surge scenarios for Tropical Storm, Category 2 Hurricane, and Category 4 Hurricane storm categories, respectively. As sea levels rise, the amount of flooded area within the barrier island portion of the town increases and the flooding impacts along the west edge and southern portions are exacerbated. Based on the 2070 Intermediate High scenario, storm surge from a Category 4 hurricane could expose 96% of the Town's area and 97% of the property owners (unique parcel IDs).

Table 12. Potential Future Tropical Storm Surge Flooding Exposure

Exposure Parameter	2040 IL	2040 IH	2070 IL	2070 IH
Incorporated Area (acres)	3,182	3,241	3,250	3,463
Percent of Incorporated Area	77.7%	79.2%	79.4%	84.6%
Number of Parcel IDs	720	759	766	1,437

Table 13. Potential Future Category 2 Storm Surge Flooding Exposure

Exposure Parameter	2040 IL	2040 IH	2070 IL	2070 IH
Incorporated Area (acres)	3,464	3,504	3,510	3,624
Percent of Incorporated Area	84.6%	85.6%	85.8%	88.5%
Number of Parcel IDs	1,390	1,455	1,468	2,266

Table 14. Potential Future Category 4 Storm Surge Flooding Exposure

Exposure Parameter	2040 IL	2040 IH	2070 IL	2070 IH
Incorporated Area (acres)	3,821	3,842	3,846	3,928
Percent of Incorporated Area	93.3%	93.9%	94.0%	96.0%
Number of Parcel IDs	3,283	3,330	3,344	3,475

4.4. Future Compound Flooding Analysis

Finally, the Town's exposure to a hypothetical, combined 100-year/24-hour design storm and Category 1 hurricane storm surge flood event was evaluated for the 2040- and 2070-time frames, applying both the IL and IH sea level rise projections. Flood depths for these four scenarios are mapped in **Appendix F Figures F91** through **F98**. Flooding extents and depths both increase particularly for the areas of town west of S Peninsula Drive and south of Oceanview Avenue. **Table 15** summarizes the total area, percent area, and number of parcel IDs exposed to compound flooding.

Table 15. Potential Future Compound Flooding Exposure

Exposure Parameter	2040 IL	2040 IH	2070 IL	2070 IH
Incorporated Area (acres)	3,551	3,586	3,591	3,688
Percent of Incorporated Area	86.8%	87.6%	87.7%	90.1%
Number of Parcel IDs	1,732	1,870	1,880	2,767

Figures 8 and **9** graph the total inundated area and total number of unique parcel IDs exposed for each flood type and scenarios analyzed. As shown in the graphs below, compound flooding exposes the most total area and parcel IDs. Stormwater flood inundation area exhibits the most change relative to sea level rise of all the flood types. The greatest increase in exposure of property IDs/property owners relative to sea level rise is associated with compound flooding.

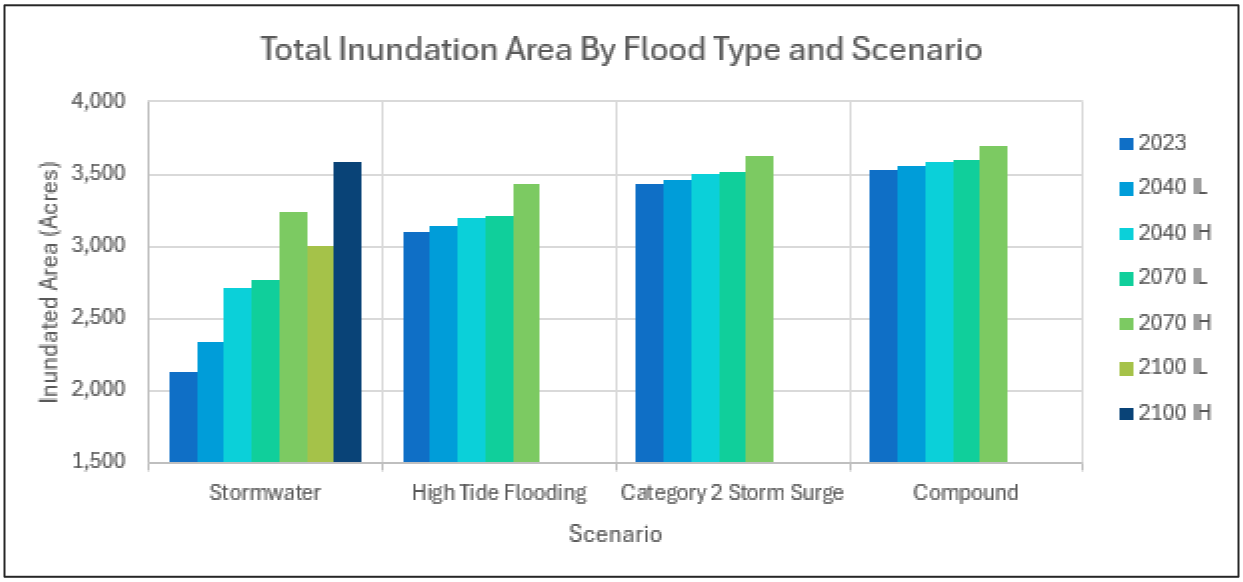


Figure 8. Total Flood Inundation Area By Flood Type and Scenario

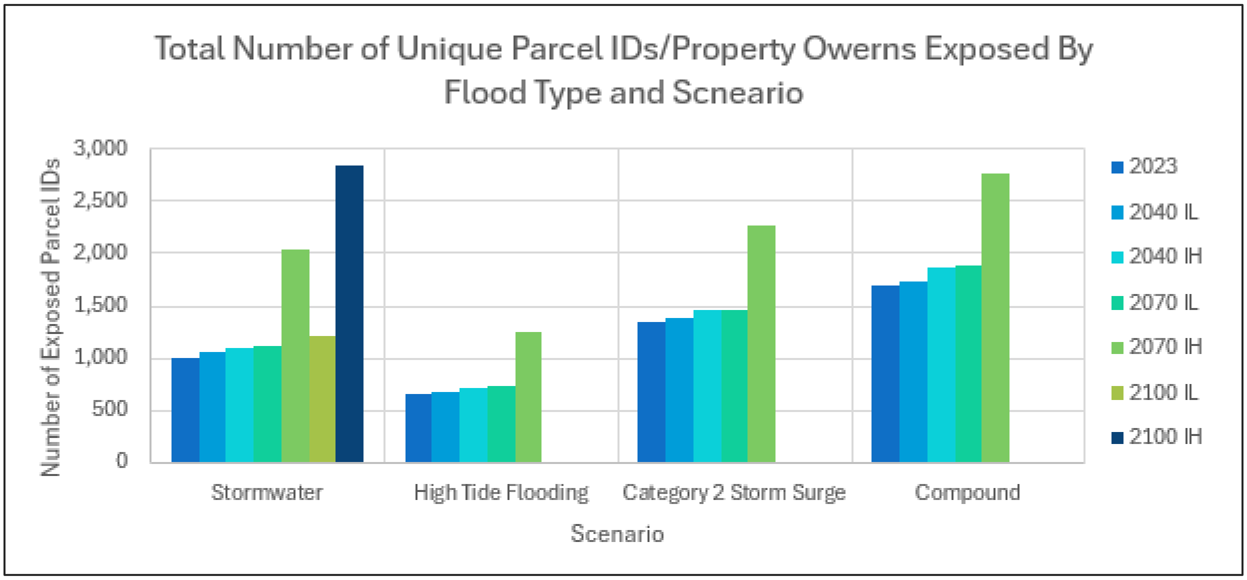


Figure 9. Total Unique Parcel IDs/Property Owners Exposure By Flood Type and Scenario

4.5. Critical and Regionally Significant Asset Exposure Analysis

The exposure analysis of the critical and regionally-significant assets within Ponce Inlet was expanded to estimate the increase in exposure due to potential future flooding conditions. Assets were analyzed to determine the potential depth of flooding within/on each asset from the following flood scenarios:

- 100-year/24-hour stormwater flooding
- High tide flooding

- Category 2 Hurricane storm surge flooding
- Compound 100-year/24-hour stormwater flooding with idealized Category 1 Hurricane storm surge flooding

Table 16 summarizes the total number of assets exposed to flooding for each future flood scenario. Properties reflect those assets that do not have occupiable buildings such as parks, marinas, lift stations, communication tower, etc. Critical and regionally-significant buildings, properties and roadways are most susceptible to flooding from compound rainfall/storm surge events for all scenarios. The significant percentage of properties exposed is heavily influenced by the number of coastal parks and conservation lands that are within this dataset. **Figures 10 through 12** illustrate (for the buildings, properties, and roadways assets, respectively) the increasing exposure with sea level rise for each flood type. Evaluating the exposure based on flood type for the 2023 to 2040 time period, projected building exposure increases the most from stormwater flooding, property exposure increases the most due to high tide flooding, and roadway exposure increases the most from Category 2 storm surge. For the 2040 to 2070 time period, building, property and roadway exposure see the greatest relative increase from high tide (frequent) flooding. **Appendix G** summarizes the flood depths estimated for each building and roadway segment asset and percent area of inundation for the property assets.

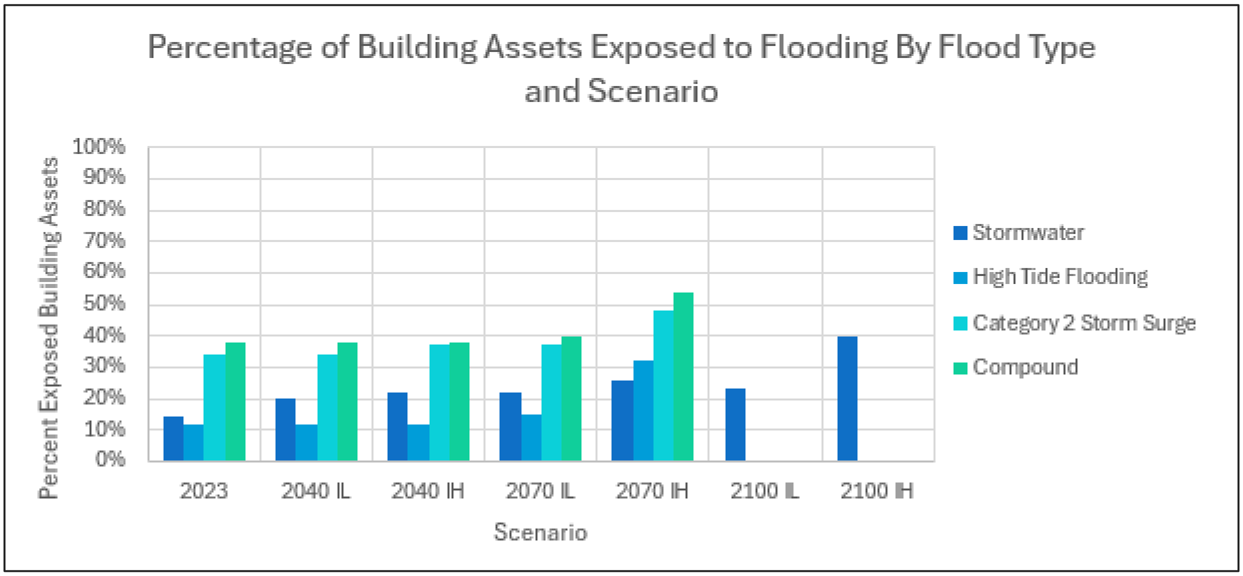


Figure 10. Percentage of Building Assets Exposed to Flooding by Flood Type and Scenario

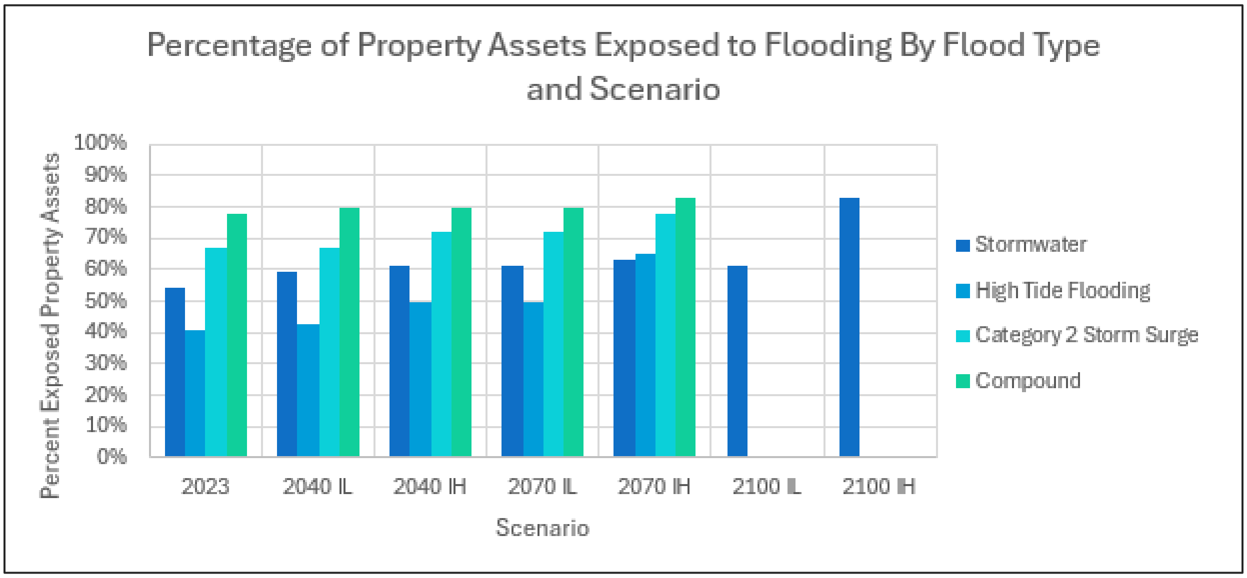


Figure 11. Percentage of Property Assets Exposed to Flooding by Flood Type and Scenario

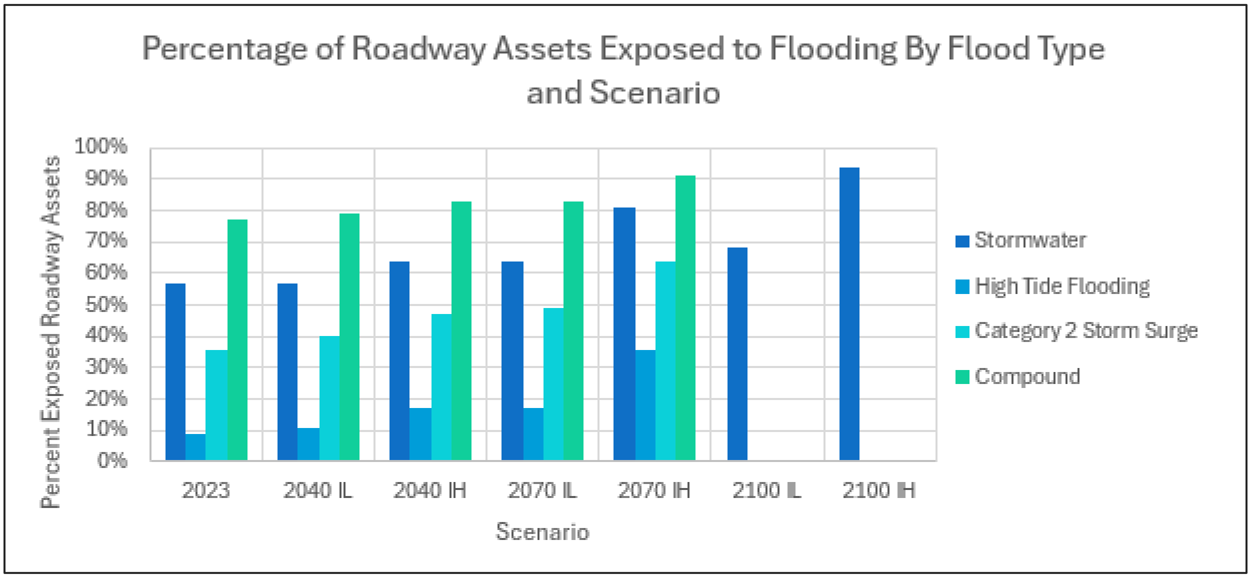


Figure 12. Percentage of Roadway Assets Exposed to Flooding by Flood Type and Scenario

Table 16. Percentage of Critical and Regionally Significant Asset Exposed to Potential Future Flooding

Assets	Total Number of Assets	100-Year/24-Hour Stormwater						High Tide				Category 2 Hurricane Storm Surge				Compound Rainfall + Storm Surge			
		2040 IL	2040 IH	2070 IL	2070 IH	2100 IL	2100 IH	2040 IL	2040 IH	2070 IL	2070 IH	2040 IL	2040 IH	2070 IL	2070 IH	2040 IL	2040 IH	2070 IL	2070 IH
Buildings	65	20%	22%	22%	26%	23%	40%	12%	12%	15%	32%	34%	37%	37%	48%	38%	38%	40%	**54%**
Properties	50	62%	64%	64%	66%	64%	**84%**	48%	54%	54%	68%	72%	74%	74%	**80%**	**82%**	**82%**	**82%**	**84%**
Roadway Segments	47	**57%**	**64%**	**64%**	**81%**	**68%**	**94%**	11%	17%	17%	36%	40%	47%	49%	**64%**	**79%**	**83%**	**83%**	**91%**

5. Sensitivity Analysis

Collective performed an analysis of the Town's critical and regionally-significant assets to rank the sensitivity of each asset to flooding and quantify the Town's risk of flood inundation damage and overall asset risk.

5.1. Sensitivity Level

Collective assigned a level of sensitivity to flooding to each asset as either not applicable (N/A), low, medium, or high. Table 17 summarizes the criteria used to assign the sensitivity level depending upon the type of asset – building, property, or roadway.

Table 17. Sensitivity Level Definitions

Asset Type	N/A	Low	Medium	High
Building	Flood elevation is more than 12 inches below finished floor elevation	Flood elevation is between 12 inches and 6 inches below finished floor elevation	Flood elevation is less than 6 inches below finished floor elevation	Flood elevation is at or above finished floor elevation
Property	No flooding with property	Flooded area 10% or less than total area	Flooded area greater than 10% and less than or equal to 50% of total area	Flooded area greater than 50% of total area
Roadway	No flooding within the right-of-way	Flooding within the right-of-way but not on pavement	Flooding up to 6-inches of depth on pavement	Flooding greater than 6-inches of depth on pavement

Table 18 summarizes the number of unique assets, by type, within each sensitivity level for all current and future flood scenarios. Sensitivity levels are mapped for all critical and regionally significant assets in **Appendix H**.

5.2. Flood Inundation and Risk Assessment

The overall risk of the Town to flood inundation is summarized in **Table 19** below. Risk levels are defined as follows per *Resilient Florida* requirements:

- **None** = no flood inundation
- **Low** = less than 25-percent of the land area inundated

- **Medium** = greater than or equal to 25-percent but less than 50-percent of the land area inundated
- **High** = greater than or equal to 50-percent but less than or equal to 75-percent of the land area inundated
- **Extreme** = greater than 75-percent of the land area inundated

Table 19 includes the Town's overall risk of flood inundation damage for each type of flooding for all time horizon/sea level rise scenarios analyzed. For this assessment, the area of the Town regularly inundated by the waters of the Halifax River, Ponce Inlet, and Atlantic Ocean were removed from the total flood inundation area to provide a better indication of flood risk. More specifically, the waters of the Halifax River, Ponce Inlet, and Atlantic Ocean with elevations in the surface DEM less than zero feet, NAVD88, or approximately 1542 acres, were removed. If these major water features are not excluded from the land area, then the Town's risk to flood inundation would be defined as "Extreme" for all flood scenarios, except for current (2023), 2040 IL, 2040 IH, and 2070 IL stormwater flooding which would be high risk.

Additionally, the overall risk of the Town's critical and regionally-significant assets for each flood scenario is presented in **Table 19**. Only highly sensitive buildings, properties, and roadways were included to establish the risk level. Highly sensitive assets reflect buildings with flooding at or above the finished floor, properties that are inundated by more than 50-percent, and roadway segments that have 6-inches or more of flooding upon the pavement, which will likely result in damage or the asset being unusable for a period of time. Risk levels for critical and regionally-significant assets are defined relative to the total number of assets as follows per *Resilient Florida* requirements:

- None = no highly sensitive critical assets
- Low = less than 25% of all assets are highly sensitive to flooding
- Medium = greater than or equal to 25-percent but less than 50-percent of assets are highly sensitive to flooding
- High = greater than or equal to 50-percent but less than or equal to 75-percent of assets are highly sensitive to flooding
- Extreme = greater than 75-percent of assets are highly sensitive to flooding

Prioritization recommendations for each asset can be found in the summary tables within **Appendix I**. Buildings, properties, and roadway segments are prioritized as 1 (Immediate Needs), 2 (Intermediate Needs) and 3 (Long-Term Needs). The type of asset was considered in assigning initial prioritization. For instance, park and conservation lands are acceptable locations for flooding to occur. Also, evacuation routes, such as S Atlantic Avenue, typically have smaller depth-of-flooding tolerances compared to major roadways such as arterials and collectors.

Sensitivity analyses results show immediate needs are primarily the major roadways and evacuation routes within the Town – fourteen of which have flooding under current conditions. A total of 21 buildings are identified as Immediate Needs. Many of these buildings are at risk of flooding from storm surge and are primarily older structures and several businesses along the coastline of the Halifax River. The Ponce Inlet Fire Station is also considered a high priority due to its exposure to current compound flooding and increasing exposure to storm surge. Sixteen properties have been identified as Immediate Needs given the current extent of flooding, particularly storm surge. The Town's Public Works site and four lift station warrant further evaluation to determine critical components, such as electrical boxes, which may be susceptible to stormwater and storm surge flooding on site.

Table 18. Sensitivity of Critical and Regionally Significant Asset to Flooding

Assets	Total Number of Assets	100-Year/24-Hour Stormwater							High Tide					Category 2 Hurricane Storm Surge					Compound Rainfall + Storm Surge				
		2023	2040 IL	2040 IH	2070 IL	2070 IH	2100 IL	2100 IH	2023	2040 IL	2040 IH	2070 IL	2070 IH	2023	2040 IL	2040 IH	2070 IL	2070 IH	2023	2040 IL	2040 IH	2070 IL	2070 IH
Buildings	**65**																						
N/A		61	58	58	58	52	57	41	61	61	61	59	46	45	45	44	43	35	42	42	42	41	32
Low		1	2	1	1	2	2	1	4	1		1	1					1	2				1
Medium		3	5	6	6	10	6	3		3	2	2	3				1	1	1	2	1	1	3
High						1		20			2	3	15	20	20	21	21	28	20	21	22	23	29
Properties	**50**																						
N/A		21	19	18	18	17	18	8	28	26	23	23	16	15	14	13	13	10	10	9	9	9	8
Low		10	10	11	11	4	11	1	10	9	7	7	5	4	5	4	4	4	4	4	3	3	
Medium		12	11	9	8	12	8	15	7	9	10	10	10	12	8	10	10	5	9	8	9	9	8
High		7	10	12	13	17	13	26	5	6	10	10	19	19	23	23	23	31	27	29	29	29	34
Roadway Segments	**47**																						
N/A		20	20	17	17	9	15	3	43	42	39	39	30	30	28	25	25	17	11	10	8	8	4
Low		5	4	4	4	5	4	1	4	5	7	7	5	3	4	3	3	3	4	1	1	1	
Medium		13	13	15	15	11	15	11			1	1		6	6	5	5	3	14	12	12	11	7
High		9	10	11	11	22	13	32					12	8	9	14	15	24	18	24	26	27	36

Table 19. Risk Assessment Summary to Flood Inundation and Affected Critical and Regionally Significant Asset

Risk Metric	100-Year/24-Hour Stormwater							High Tide					Category 2 Hurricane Storm Surge					Compound Rainfall + Storm Surge				
	2023	2040 IL	2040 IH	2070 IL	2070 IH	2100 IL	2100 IH	2023	2040 IL	2040 IH	2070 IL	2070 IH	2023	2040 IL	2040 IH	2070 IL	2070 IH	2023	2040 IL	2040 IH	2070 IL	2070 IH
Land Area Inundation	Low	Low	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium	**High**	Medium	Medium	**High**	**High**	**High**
Highly Sensitive Assets	Low	Low	Low	Low	Low	Low	Medium	Low	Low	Low	Low	Medium	Medium	Medium	Medium	Medium	**High**	Medium	Medium	Medium	Medium	**High**

6. Focus Areas

There are eight focus areas analyzed for this study to address effects of the future land use changes from development/re-development and flooding problem areas. The flooding problem areas include those identified from flood reports from residents, FEMA repetitive loss areas, and those identified by the sensitivity analysis.

The focus areas were analyzed with potential alternatives for multiple future scenarios with a target to provide flood protection for the 100 year/24-hour 2100 IL scenario (1.22 feet sea level rise), if feasible. If the alternatives could not provide the desired protection, additional storms and scenarios were run to determine the storm/scenario where the impacts of sea level rise overcame reasonable flood protection alternatives.

6.1 Future Land Use Changes

The future land use is based on future zoning provided by the Town and further detailed in **Appendix C**, Section 6.1. The changes in land use from existing conditions are shown in **Figure 13** and reflect the land use categorization defined by the SJRWMD (which is used to define existing land use) and mapping guided by the Town's future zoning categories and land use development codes for density and intensity of use characterization. Of the 4,093 acres in the Town, 381 acres change in land use type for future scenarios. The land use changes primarily occur along the riverfront and the southwest portion of the Town with scattered changes along the central and coastal portions. The major changes are from Low Density Residential to Medium Density Residential and Forested to Medium Density Residential, primarily in the southern end of peninsula. The changes in land use are provided in the following **Table 20**.

The new Conservation Lands/Rural Residential land use occurs mainly along the river and allows up to a 2,500 square foot structure per 20 acres. Most of the new medium density residential is currently low density residential per the SJRWMD photointerpretation applied to assign land use/land cover. These subdivisions usually have some form of stormwater management which would be incorporated into the converted low density residential. With the current regulations in place, which require 1-inch of retention and to not increase runoff capacity, the future land use changes under existing hydraulic conditions do not increase the floodplain as shown in **Figure 14**. Reductions in flooding extents, as highlighted by the blue areas shown in Figure 14, are associated with a reduction in the development density and intensity if these areas are redeveloped per current future zoning classifications and Town's development codes.

Table 20. Net Land Use Changes

Land Use Description	Net Change from Existing to Future (Acres)
Forested	-44
Rangeland	-13
Wetlands	-9
Beach/Open Lands/Golf	-11
Marinas & Fish Camps	-6
Commercial & Services	18
Conservation Land/Rural Residential	17
Low Density Residential	-142
Medium Density Residential	169
High Density Residential	10
Institutional	11

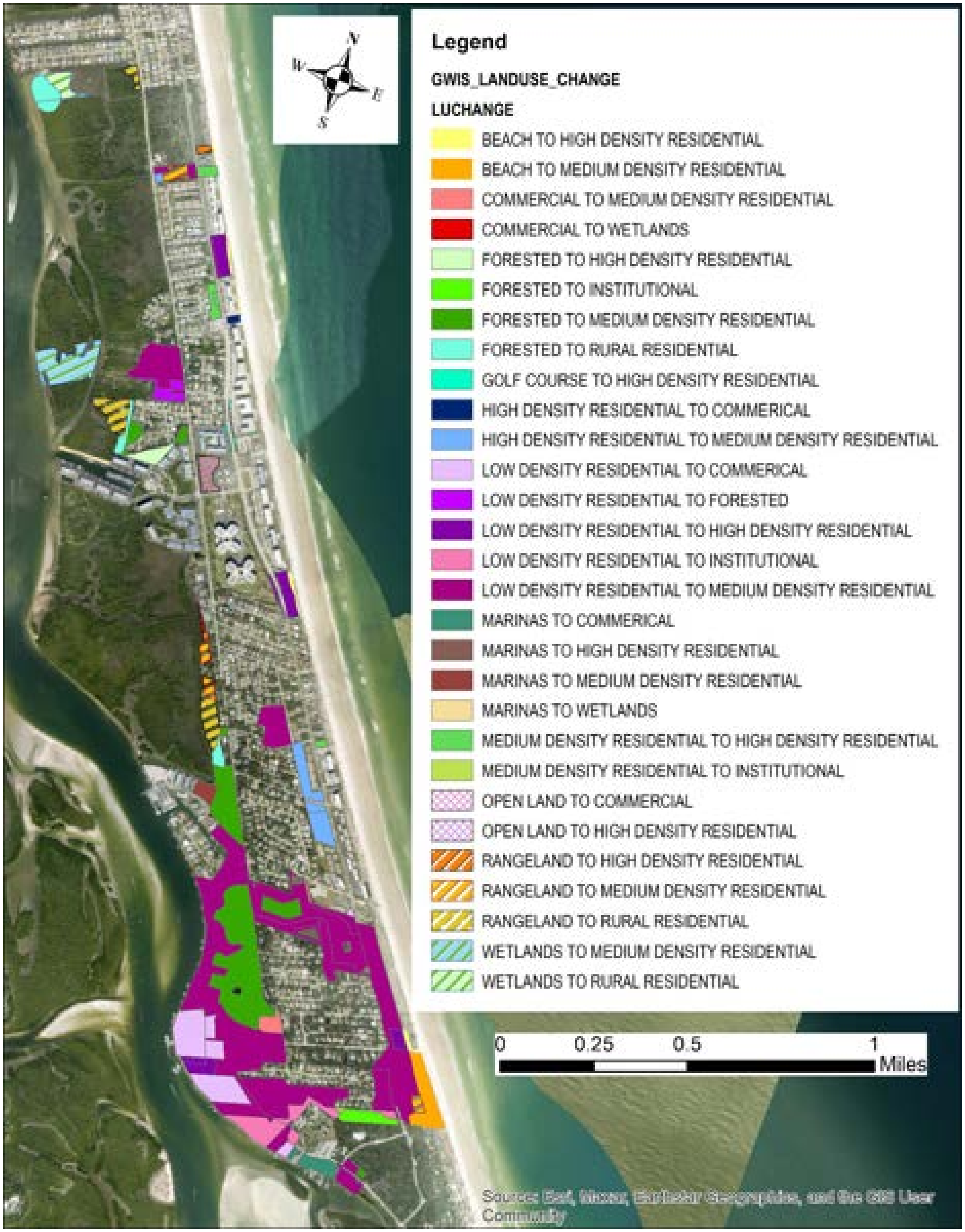


Figure 13. Land Use Changes

Figure 14. Floodplains, Existing Conditions with Future Land Use

6.2 Old Carriage Road and Anchor Drive Areas

Old Carriage Road and Anchor Drive are two small streets (located in the Emeral Isle and Yacht Haven subdivisions respectively) jutting into the Halifax River west of Peninsuala Drive. Under existing conditions, the 100-year/24-hour floodplain inundates over 80% of the roads. Since each road is the only way in/out to Peninsula Drive, the flooding can impact the ability of residents and emergency vehicles to enter/leave the area. The floodplain also abuts several residences.

These roads are generally fairly low in elevation, compared to remainder of the barrier island portion of the Town, with the stormwater grates at approximately elevation 2.8 feet-NAVD88. During very high tide events, water from the Halifax River can back up onto the street. The soils along these streets consist of Turnbull Variant sand with a depth to water table of 1.97 feet. As the sea level rises, the depth to water table will decrease which in turn reduces the soil storage capacity increasing the runoff volume.

The single-family residential land use along these streets does not change for the future scenarios and they are not expected to receive surface runoff overflows from other areas. At about elevation 3.9 ft-NAVD88, tidal waters can begin to inundate the residential lots from the river.

The current stormwater system for each road consists of curb and gutter conveying runoff to a central low point where it is collected by two type C inlets and discharged to the Halifax River through 18-inch reinforced concrete pipe (RCP) culverts. The alternative evaluations included:

- Flapgates to prevent backflow from the river
- Increased inlet capacity
- Increased pipe capacity.

Various combinations of pipe and inlet improvements were evaluated to identify the one that provided the desired level of flood protection. The proposed configurations for each system include:

- Replace the two type C inlets on each road with inlets with the equivalent capacity of two type D inlets to handle the increased runoff associated with sea level rise
- Replace the 18-inch culverts with 30-inch RCPs
- Install flapgates

This proposed configuration will provide stormwater protection up to the 2100 IL scenario with minimal road flooding. Flooding protections from the 100-year/24-hour 2070 IH and 2100 IH scenarios are not able to be provided without extraordinary measures such as seawalls and pumping. The sea level rise from the 2070 IH and 2100 IH scenarios will reduce the soil depth to water table to zero and the Halifax River water elevations are above the road elevations preventing outflow except at flood depths of 0.9 feet or greater. For the 2100 IH scenarios, the Halifax River elevations are above the land surface in these subdivisions.

The peak stages for these improvements are provided in **Table 21** and shown in **Figure 15**. Please note that the figure reflects the model schematic of the analyzed alternative, not the specific pipe lengths.

Table 21. Old Carriage Road & Anchor Drive Peak Stage Improvements, 100-year/24-hour Storm

Node Name, General Location	Existing Peak Stage (ft)	2100 IL Peak Stage (ft)	Change in Peak Stage (ft)
N_Outfall_1300, Old Carriage Road	4.38	3.75	-0.63
N_Outfall_1400, Anchor Drive	4.11	3.57	-0.54

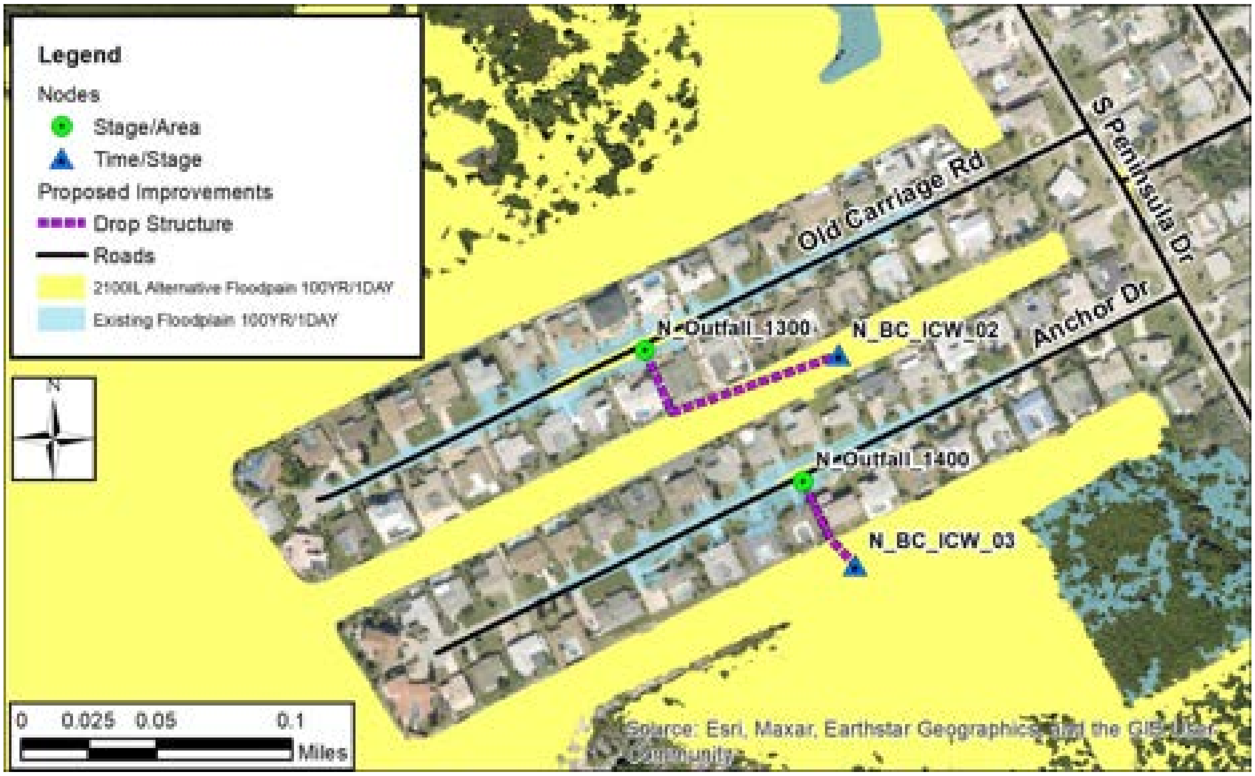


Figure 15. Old Carriage Road and Anchor and Anchor Drive

6.3 Calumet Avenue Area

The Calumet Avenue area is part of the Oceanside Village subdivision and is a closed system with no positive outfall. The existing drainage system has two inlets along the road that discharge through an 18-inch RCP into a linear depression between the Lighthouse Shores and Oceanside Village subdivisions. The Calumet Avenue area has recorded flooding complaints and a section of the road had to be closed due to flooding after Hurricane Ian.

The modeling for this area confirms reported flooding and is expected to include the road and a couple of houses for the 100-year/24-hour storm event. The flooding is predicted to increase significantly for the future scenarios, especially 2070 and beyond. The goal for this area is to reduce the 100-year flooding below the elevation for road and building flooding (estimated elevation 7.5 feet) for the 2100 IL scenario.

This area was evaluated for the impact of retrofit of 2.5-inches of additional retention, which proved insufficient as it only reduced flooding to slightly more than existing for the 2100 IL scenario.

The impact of constructing a positive outfall from the current depression used to store runoff to the Halifax River was evaluated. This option was able to provide protection for the 2100 IL 100-year/24-hour storm with the following conceptual outfall configuration:

- 360 feet of 30-inch RCP from S. Peninsula Drive to the Halifax River. An inlet will be added to collect roadside runoff.
- 370 feet of 24-inch RCP from the west end of the depression to S. Peninsula Drive. A raised inlet control structure will be used to provide the required treatment volume in the depression prior to discharge.

This option would require acquisition of a drainage easement west of S. Peninsula Drive. Alternative gravity outfall locations along with associated changes in the pipe network configurations (such as the use of a force main and temporary pumping) and drainage easement acquisitions may provide similar flood protection benefits and should be evaluated in preliminary design.

Without a new gravity outfall to the Halifax River, the other alternatives that were evaluated were not able to provide the desired flood reduction under existing or future scenarios. The peak stages for these improvements are provided in **Table 22** and shown in **Figure 16**. Please note that the figure reflects the model schematic of the analyzed alternative, not the specific pipe lengths.

Table 22. Calumet Avenue Peak Stage Improvements, 100-year,24-hour Storm

Node Name, General Location	Existing Peak Stage (ft)	2100 IL Peak Stage (ft)	Change in Peak Stage (ft)
N_Outfall_2500, existing depression	9.66	6.46	-3.20
N_Misc_1900, S. Peninsula Drive	9.11	8.58	-0.53

Figure 16. Calumet Avenue Improvements

6.4 Michael Lane (Oceanside Village Subdivision) Area

Stormwater flooding associated with Hurricane Ian has impacted both Michael Lane and Inlet Harbor Road and residences within the Oceanside Village subdivision based on property owner reports. Collective's analyses confirm the flooding within the area. The existing drainage system includes inlets conveying runoff to two depressions- one between Buschman Drive and Michael Lane and the other between Michael Lane and Inlet Harbor Road. In response to flooding complaints, the Town recently commissioned a separate analysis of the area by Zev Cohen and Associates (ZCA), completed in March

2024. The system analyzed by ZCA was limited to the capacity of three retention areas (one located between Calumet Avenue and Buschman Drive, one within the circle formed by Buschman Drive and Michael Lane, and the third between Michael Lane and Inlet Harbor Road) and two pipes and a swale connecting these three areas. Flooding impacts of the overall subdivision area, such as the roadways, was not included in the analysis.

Based on Collective's modeling, the flooding in the Michael Lane area is predicted to increase significantly for the future scenarios, especially 2070 and beyond. The goal for this area is to reduce the 100-year flooding below the elevation for road and building flooding (estimated elevation 7.8 feet) for the 2100 IL scenario.

This area was evaluated for the impact of retrofit of 2.5-inches of additional retention, which proved insufficient as it only reduced flooding to slightly more than existing for the 2100 IL scenario and would still have road and home flooding.

The impact of constructing a positive outfall from the second depression to the Halifax River was evaluated. This option was able to provide protection for the 2100 IL 100-year/24-hour storm with the following conceptual configuration, which evaluated current development and considered potential drainage easement locations:

- 110 feet of 18-inch RCP connecting the two depressions.
- 350 feet of 30-inch RCP from the depression south of Michael Lane to a new manhole east of S. Peninsula Drive. A raised inlet control structure will be used to provide the required treatment volume in the depression prior to discharge.
- 270 feet of 30-inch RCP from the new manhole to the west side of S. Peninsula Drive.
- 140 feet of 30-inch RCP from the west side of S. Peninsula Drive to the Halifax River.

Without a new gravity outfall to the Halifax River, the other alternatives that were evaluated were not able to provide the desired flood reduction under existing or future scenarios. Alternative outfall locations along with associated changes in the pipe network configurations and drainage easement acquisitions may provide similar flood protection benefits and should be evaluated in preliminary design.

The peak stages for these improvements are provided in **Table 23** and shown in **Figure 17**. Please note that the figure reflects the model schematic of the analyzed alternative, not the specific pipe lengths. For instance, the proposed outfall would actually discharge in upstream end of the excavated canal between Inlet Harbor Road and Ponce De Leon Circle.

Table 23 Michael Lane Peak Stage Improvements, 100-year,24-hour Storm

Node Name, General Location	Existing Peak Stage (ft)	2100 IL Peak Stage (ft)	Change in Peak Stage (ft)
N_Outfall_2600, depression north of Michael Lane	8.16	7.01	-1.05
N_Outfall_2610, depression south of Michael Lane	8.16	7.57	-0.59
N_Closed_3900, depression south of Inlet Harbor Road	8.16	7.58	-0.58

Figure 17. Michael Lane Improvements

6.5 Las Olas Subdivision

The Las Olas subdivision was included in the focus areas because it has by far the most undeveloped lots in any subdivision in Ponce Inlet and the purpose is to demonstrate that developing these many lots will not have adverse flooding impacts. There are no reported flooding complaints or predicted stormwater flooding for the existing conditions 100-year/24-hour design storm. Additionally, road or building flooding are not expected for the 2100 IL future scenario. This subdivision has four ponds to provide stormwater storage; the subdivision has no positive outfall to the Halifax River.

For this alternative, the ICPR model was modified to include:

- The low portions of mainly undeveloped depressional basin *B_Closed_1700* was filled to elevation 9.0 feet-NAVD88 to simulate expected conditions when lots are developed.
- A new 18-inch culvert was added to connect the development in the basin to the existing stormwater system.

The peak stages for these improvements are provided in **Table 24** and shown in **Figure 18**.

Table 24. Las Olas Subdivision Peak Stages, 100-year/24-hour Storm

Node Name, General Location	Existing Peak Stage (ft)	2100 IL Peak Stage (ft)	Change in Peak Stage (ft)
N_Outfall_400, existing pond	7.01	7.00	-0.01
N_Outfall_800, existing pond	7.01	6.99	-0.01
N_Closed_1700, basin to be developed	6.40	7.00	+0.6

Note that for node N_Closed_1700, the developed basin, even though the peak stage increases, it is still below the road and house elevations and produces no adverse impacts.

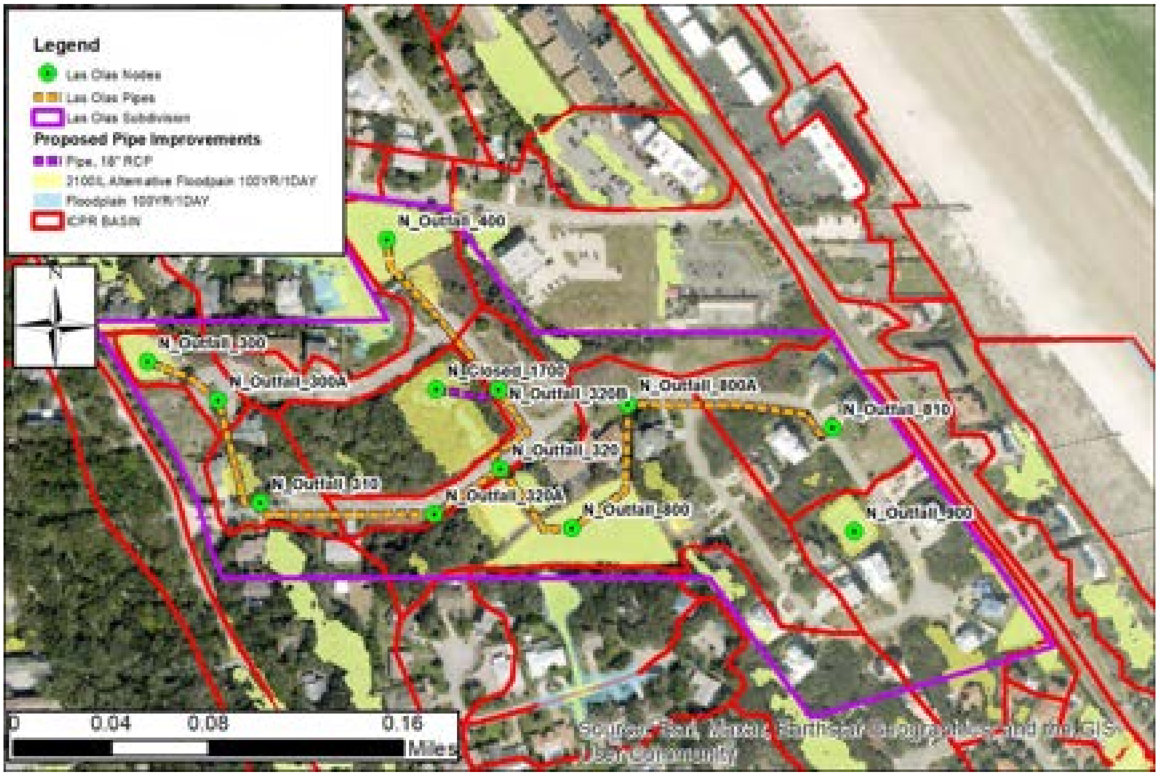


Figure 18 Las Olas Subdivision Improvements

6.6 Bay Harbour Drive to Beach Street Area

There are several topographic valleys running north/south through the peninsula that are prone to flooding due to the limited ability of runoff to surface overflow to the Halifax River. The area from Bay Harbour Drive south to Beach Street has many flood reports from residences and has FEMA repetitive loss structures. The stormwater management system consists of connected depressions and ponds that collect runoff that is discharged through a 24-inch outfall on Beach Street to the Halifax River. The Town has two portable pump stations that are used to drawdown ponds at Inlet Point Boulevard and Beach Street prior to large storm events and continue to run after the storm until the pond levels return to normal.

The goal is to provide flood protection for the 2100 IL scenario, if practical. Collective looked at several alternatives to achieve this goal, including:

- Pond drawdown utilizing temporary pumping and the Town's existing force main
- Retrofit of 2.5-inches of retention/storage
- Expanding the existing ponds where feasible
- Increasing the outfall capacity and that of the pipes connecting the ponds and depressions.

6.6.1 Pumping

The impact of the continued use of the Town's temporary pumps was evaluated with the following operating conditions as provided to Collective by Town staff:

- Drawdown the ponds by two feet prior to major storm events.
- Modify the pumps on/off so that they will continue to try to maintain this lower pond level during the storm.

The pumps are able to provide some flood protection under current conditions. The benefit provided by these pumps decreases for the future scenarios. By itself, pumping cannot provide complete flood protection for future scenarios but can decrease the duration of flooding.

6.6.2 Retrofit Retention/Storage

Collective also evaluated the impact of requiring all new development and redevelopment to provide 2.5-inches of retention/storage and the retrofit of this same increased retention for all areas where feasible. This alternative cannot provide full flood relief, but does provide noticeable flood reduction benefits. For the 2100 IL 100-year/24-hour scenario, this option reduces the flood stages to slightly more than predicted under existing conditions. However, road and building flooding is still predicted for this alternative.

6.6.3 Expanding Existing Ponds

This alternative evaluated the impact of expanding the existing ponds at Inlet Point Boulevard and Beach Street. As with the other alternatives, this option provides some relief, but does not provide full protection for the future scenarios.

6.6.4 Increasing Stormwater System Flow Capacity

This alternative evaluated the flood reduction benefits of increasing the Beach Street outfall capacity and the pipes connecting the ponds and depressions used to store runoff. The improvements included:

Beach Street

- Replace the existing 24-inch RCP with 29-inch x 45-inch elliptical RCP pipe from the Halifax River to 310 feet east of Inlet Point Boulevard and install a flapgate on the upgraded outfall pipe (approximately 2,190 feet of pipe).

- Replace the existing 24-inch RCP with 36-inch RCP from 310 east of Inlet Point Boulevard to the Beach Street Pond.

Connection between Inlet Point Boulevard Pond to Beach Street Pond

- Replace the existing 18-inch pipe with 24-inch RCP connecting the two ponds.
- Modify the existing control structure at the Inlet Point Boulevard pond to increase its flow capacity (Type D Inlet or equivalent).

Inlet Point Boulevard

- Replace the existing 18-inch RCP under the road with a 24-inch RCP.
- Increase the capacity of the inlet control structures of the ponds on each side of the road (Type D inlet or equivalent).

Inlet Point Boulevard to Bay Harbour Drive

- Replace the existing 18-inch RCP with 24-inch RCP from the pond on the north side of Inlet Point Boulevard to midway up the east end of Jennifer Circle.
- Replace the existing 15-inch RCP with 18-inch RCP from midway up the east end Jennifer Circle to the middle of the north part of Jennifer Circle.
- Replace the existing 12-inch RCP with 18-inch RCP from Jennifer Circle to the depression on the south side of Bay Harbour Drive.

This alternative requires a complete upgrade of the stormwater system piping from Beach Street to Bay Harbour Drive. However, this option provides more flood protection than the other alternatives. For the 2070 IL 100-year/24-hour scenario, it can reduce the predicted flooding to below that of the existing system. For the 2100 IL scenario, the combination of higher Halifax River tailwater and reduced depth to groundwater table prevent the improved system from providing full flood protection for the 100-year storm.

The peak stages for these improvements are provided in **Table 25** and shown in **Figure 19**. Please note that the figure reflects the model schematic of the analyzed alternative, not the specific pipe lengths.

Table 25 Bay Harbour Drive to Beach Street Peak Stages, 100-yr24-hr Storm

Node Name, General Location	Existing Peak Stage (ft)	2100 IL Peak Stage (ft)	Change in Peak Stage (ft)
N_Outfall_3130, Beach Street pond	5.34	4.64	-0.70
N_Outfall_500, Inlet Point Boulevard south pond	6.19	5.55	-0.64
N_Outfall_600, Inlet Point Boulevard north pond	6.19	5.69	-0.50
N_Outfall_620, middle of east end of Jennifer Circle	6.22	5.77	-0.45
N_Outfall_630, depression on south side of Bay Harbour	6.35	6.01	-0.34
N_Outfall_640, depression on north side of Bay Harbour	6.35	6.02	-0.33

Note that the base 2070 IL peak stages are approximately 0.5 ft higher than the existing conditions. The flood protection improvements associated with the stormwater system improvements would be increased with the implementation of other alternatives, such as additional retention requirements and pond expansion.

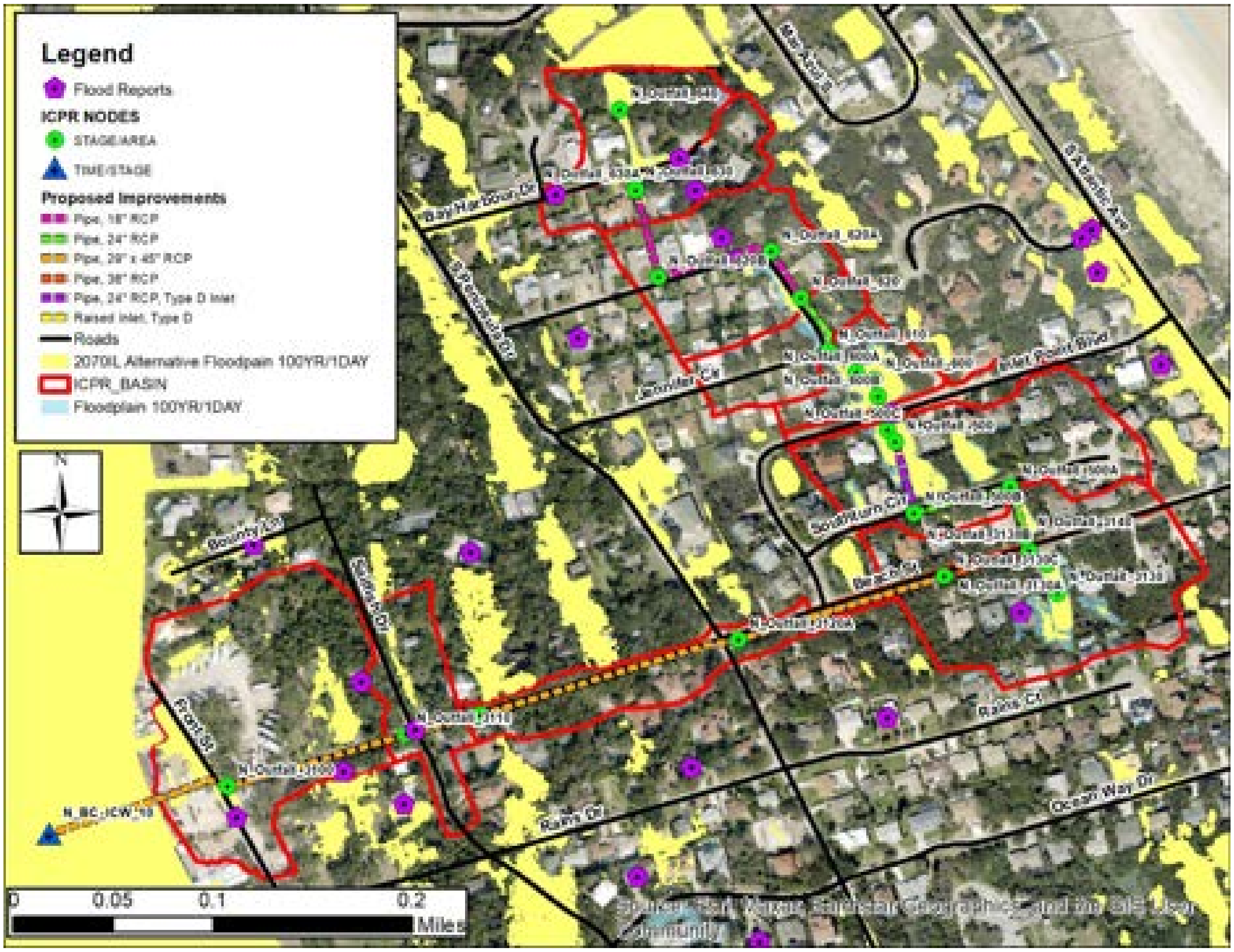


Figure 19. Bay Harbour Drive to Beach Street Improvements

6.6.5 Recommendation

No single alternative will provide the desired level of flood protection by itself, so a combination of the alternatives is recommended.

Near-Term Recommendations

- Per permitted conditions, continue to drawdown flood stages in the Bay Harbour Drive to Beach Street area with Town's temporary pumps and Beach Street force main
- Modify the Code to require 2.5-inches of retention/storage for new development and redevelopment (such as landscaping requirements for significant building exterior improvements). Where feasible, retrofit retention of this same amount with public improvements.

- If the land is available, acquire the currently vacant lot on the south side of the Inlet Point Boulevard pond and expand the pond.

Intermediate-Term Recommendations

- Construct the culvert improvements. This can be done in phases:
  - Phase 1: Beach Street
  - Phase 2: Connection between Inlet Point Boulevard Pond to Beach Street Pond
  - Phase 3: Bay Harbour Drive to Inlet Point Boulevard Pond

To prevent upstream improvements from aggravating flooding downstream areas, the Beach Street improvements should occur before the others.

6.7 South Atlantic Avenue

Portions of South Atlantic Avenue, an evacuation route, partially flood during moderate storms (multiple times a year) and the flooding can be more extensive during severe storm events. This flooding generally occurs in areas served by shallow, narrow swales that are not able to store and infiltrate enough runoff to prevent flooding. Other areas have no swales or other drainage systems. Collective evaluated the impacts of adding new swales (four locations) and modifying existing ones (three locations) along South Atlantic Avene. These swales were placed to provide flood protection under both existing and future sea level rise conditions. These swale locations are provided in **Figure 20**.

Figure 20. South Atlantic Avenue Swale Locations

6.7.1 Swale Site 1 Across from Town Hall

There is existing flooding at this site which currently has a small stormwater storage area located south of the driveway on S. Atlantic Avenue; which, after construction provides this portion of roadway some protection for minor rainfall events (capacity for less than 2-inches of rainfall, per Town correspondence May 2024). The proposed addition of continuous, linear swales in this location eliminated the road flooding through the 2100 IL scenario. The peak stages are shown in **Table 26** and the flood reduction is shown in **Figure 21**.

Table 26. Site 1 Swale Peak Stages for the 100-year/24-hour Storm

Node Name, General Location	Existing Peak Stage (ft)	2100 IL Peak Stage (ft)	Change in Peak Stage (ft)
N_Misc_100, across from Town Hall	13.72	13.47	-0.25

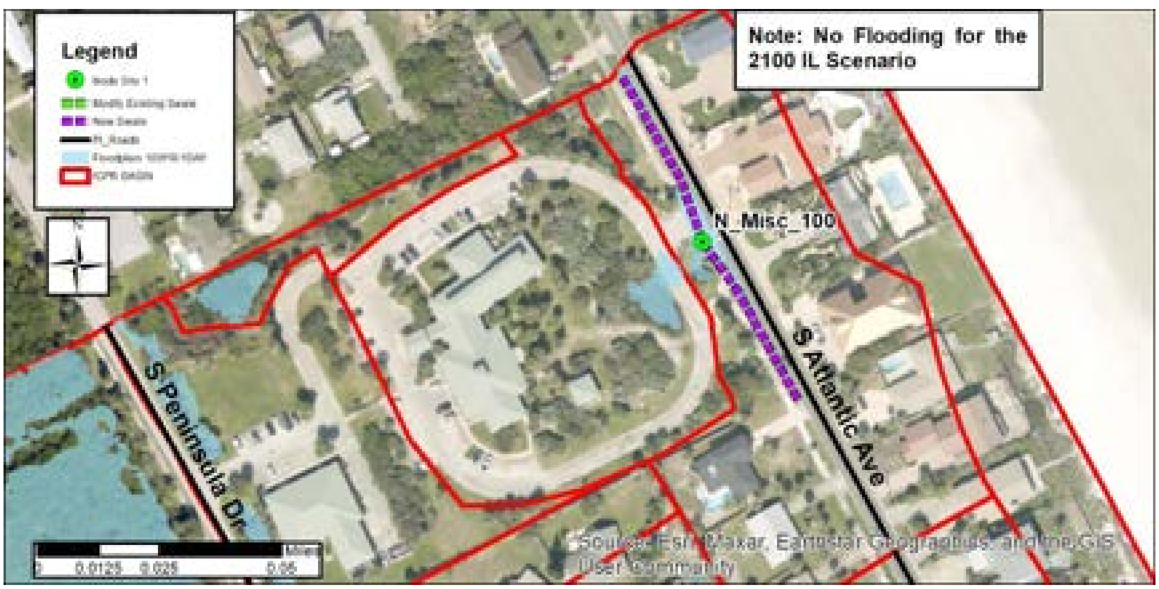


Figure 21. Site 1 Across from Town Hall, Swale Flooding and Reduction

6.7.2 Swale Site 2 Along Ponce Preserve Park

There is existing flooding at this site which currently has no swales. The proposed addition of swales eliminated the road flooding through the 2100 IL scenario. The peak stages are shown in **Table 27** and the flood reduction is shown in **Figure 22**.

Table 27 Site 2 Swale Peak Stages for the 100-year/24-hour Storm

Node Name, General Location	Existing Peak Stage (ft)	2100 IL Peak Stage (ft)	Change in Peak Stage (ft)
N_Closed_3500, near Ponce Preserve Park	13.37	11.50	-1.87

Figure 22. Site 2 Ponce Preserve Park, Swale Flooding and Reduction

6.7.3 Swale Site 3 North of Marie Drive

Flooding is not reported at this location, bit it is predicted in the future scenarios. The modification of the existing swales could prevent road flooding through the 2100 IL scenario. The peak stages are shown in **Table 28** and the flood reduction is shown in **Figure 23**.

Table 28. Site 3 Swale Peak Stages for the 100-year/24-hour Storm

Node Name, General Location	Existing Peak Stage (ft)	2100 IL Peak Stage (ft)	Change in Peak Stage (ft)
N_Misc_700, North of Marie Drive	11.80	11.92	+0.12

Figure 23. Site 3 North of Marie Drive, Swale Flooding and Reduction

6.7.4 Swale Site 4 South of Marie Drive

Like Swale Site 3, flooding is not reported at this location, bit it is predicted in the future scenarios. The modification of the existing swales could prevent road flooding through the 2100 IL scenario. The peak stages are shown in **Table 29** and the flood reduction is shown in **Figure 24**. Please note that the figure reflects the model schematic of the analyzed alternative, not the proposed swale configuration/lengths. The proposed swale would run parallel and along the eastern side of S Atlantic Avenue.

Table 29. Site 4 Swale Peak Stages for the 100-year/24-hour Storm

Node Name, General Location	Existing Peak Stage (ft)	2100 IL Peak Stage (ft)	Change in Peak Stage (ft)
N_Misc_2600, South of Marie Drive	11.51	10.93	-0.58

Figure 24. Site 4 South of Marie Drive, Swale Flooding and Reduction

6.7.5 Swale Site 5 South of Harbour Village Boulevard

There is significant predicted flooding at this location. The modification of the existing swales reduced predicted road flooding to below existing levels through the 2100 IL scenario. The peak stages are shown in **Table 30** and the flood reduction is shown in **Figure 25**. Please note that the figure reflects the model schematic of the analyzed alternative, not the proposed swale configuration/lengths. The proposed swale would run parallel and along the eastern side of S Atlantic Avenue.

Table 30. Site 5 Swale Peak Stages for the 100-year/24-hour Storm

Node Name, General Location	Existing Peak Stage (ft)	2100 IL Peak Stage (ft)	Change in Peak Stage (ft)
N_Misc_1500, South of Harbour Village Boulevard	11.47	11.10	-0.37

Figure 25. Site 5 South of Harbour Village Boulevard Swale Flooding and Reduction

6.7.6 Swale Site 6 North of Calumet Avenue

There is some predicted flooding at this site which currently has no swales. The addition of swales had minimal impact on road flooding, keeping it the same as existing. The peak stages are shown in **Table 31** and the flood reduction is shown in **Figure 26**. Please note that the figure reflects the model schematic of the analyzed alternative, not the proposed swale configuration/lengths. The swales would run parallel and along both sides of South Atlantic Avenue.

Table 31. Site 6 Swale Peak Stages for the 100-year/24-hour Storm

Node Name, General Location	Existing Peak Stage (ft)	2100 IL Peak Stage (ft)	Change in Peak Stage (ft)
N_Misc_1700, north of Calumet Avenue	14.83	14.83	+0.0

Figure 26. Site 6 North of Calumet Avenue Swale Flooding and Reduction

6.7.7 Swale Site 7 Across from Oceanside Village

There is predicted and reported flooding at this site which currently has a very shallow swale constructed by Volusia County in some locations along this portion of South Atlantic Avenue as well as an existing exfiltration system. The addition/expansion of swales had minimal impact on road flooding for the 21000 IL Scenario; however, for some of the future 2040/2070 scenarios, the addition of swales reduces the predicted flooding to below existing levels. In the near-term, this alternative would provide benefits and the support of residents in the area. The peak stages are shown in **Table 32** and the flood reduction is shown in **Figure 27**. Please note that the figure reflects the model schematic of the analyzed alternative, not the proposed swale configuration/lengths. The swales would run parallel and along both sides of South Atlantic Avenue.

Table 32. Site 7 Swale Peak Stages for the 100-year/24-hour Storm

Node Name, General Location	Existing Peak Stage (ft)	2100 IL Peak Stage (ft)	Change in Peak Stage (ft)
N_Exfil_2500, across from Oceanside Village	13.74	13.74	+0.0

Figure 27. Site 7 Across from Oceanside Village Swale Flooding and Reduction

6.7.8 Recommendations

As South Atlantic Avenue is an evacuation route, Collective recommends that the Town coordinate with Volusia County on improving the existing swales and constructing new ones where the analysis indicated there would be flood protection benefits.

6.8 Riverfront Area

The western portion of the Town fronting the Halifax River has six general areas with FEMA repetitive loss structures. Some of these areas have multiple repetitive losses. The stormwater, tidal, and storm surge sensitivity analyses indicate that this may be a combination of inadequate stormwater management and high tidal conditions. The riverfront areas generally have low elevations for the peninsula and if there is a stormwater outfall, its functionality would be reduced by high tides. These conditions will be exacerbated by sea level rise within the Halifax River.

6.8.1 Soil Ground Water Rise Impacts

As the Halifax River rises, the overall depth to groundwater will decrease impacting the soils' ability to store water and increase runoff. By the 2070 IH scenario, the depth to water table could decrease to zero for about a fourth of the riverfront area with the rest of the riverfront soils having an estimated depth to water table of about 1.7 feet. By the 2100 IH scenario, almost all of the riverfront area could have a soil depth to water table of zero. This will significantly decrease the ability of the soils to infiltrate rainfall for the 2070 IH scenario and virtually eliminate it for the 2100 IH scenario during the wet season. The estimated soil depths to water table for these future scenarios are shown in **Figures 28 and 29**.

6.8.2 Sea Level Rise Rise Boundary Condition (Tidal) Impacts

The direct tidal impacts associated with sea level rise are minor to moderate for the 2040 IL, 2040 IH, 2070 IL, and 2100 IL scenarios. However, the impacts become more severe for the 2070 IH scenario and very severe for the 2100 IH scenario with much of the riverfront inundated just from the tide. These direct tidal impacts are presented in **Figures 30 and 31**.

Both of these figures show the riverfront inundation, but also inland low areas that can be flooded by tidal backflow into drainage systems and rise in water table.

Figures 32 and 33 show the tidal flooding from Hurricane Nicole in November 2022, which had a high tidal surge, but little rainfall. The water from the Halifax River flowed onto the peninsula flooding both roads and houses.

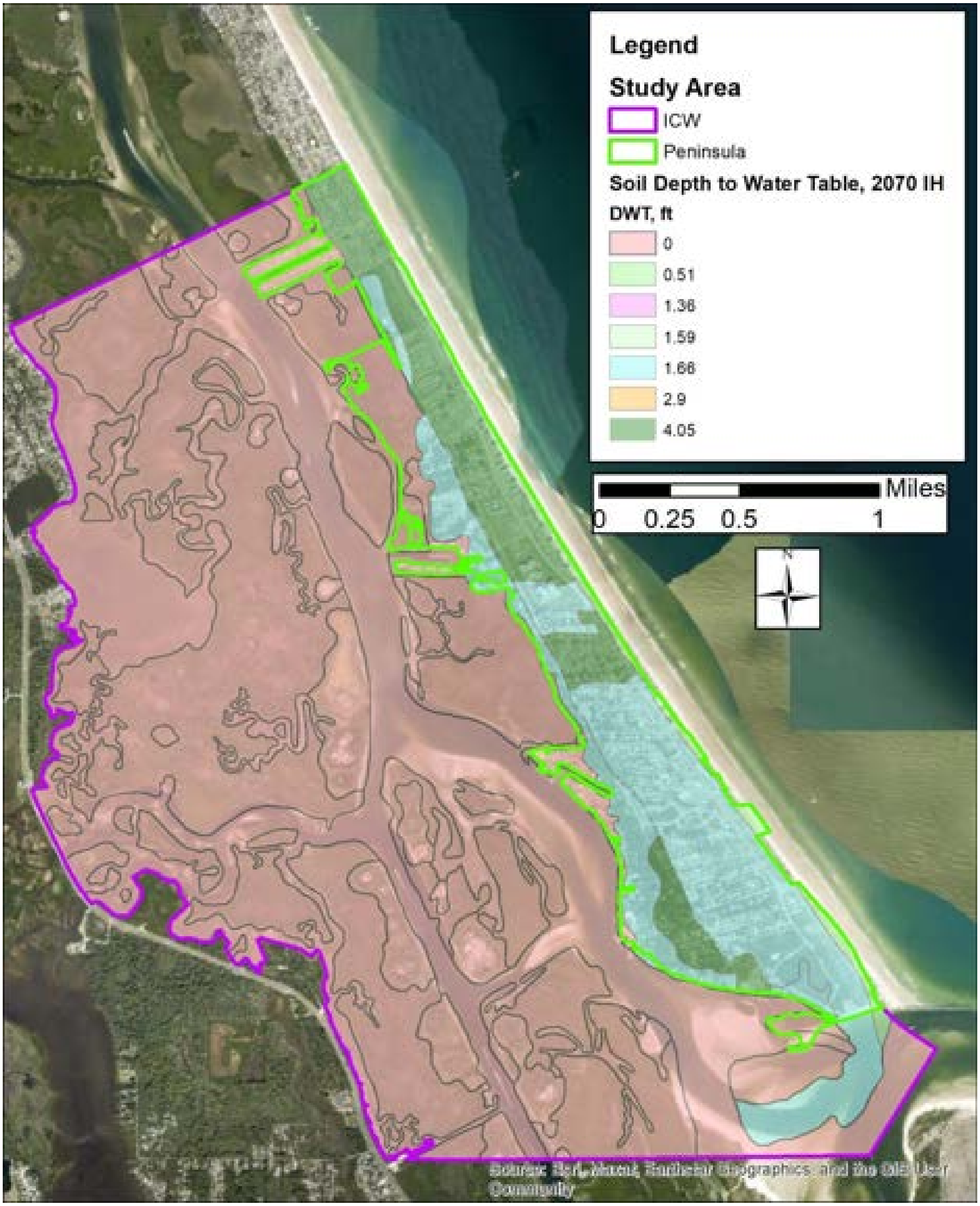


Figure 28. Estimated Soil Depth to Water Table, 2070 IH Scenario

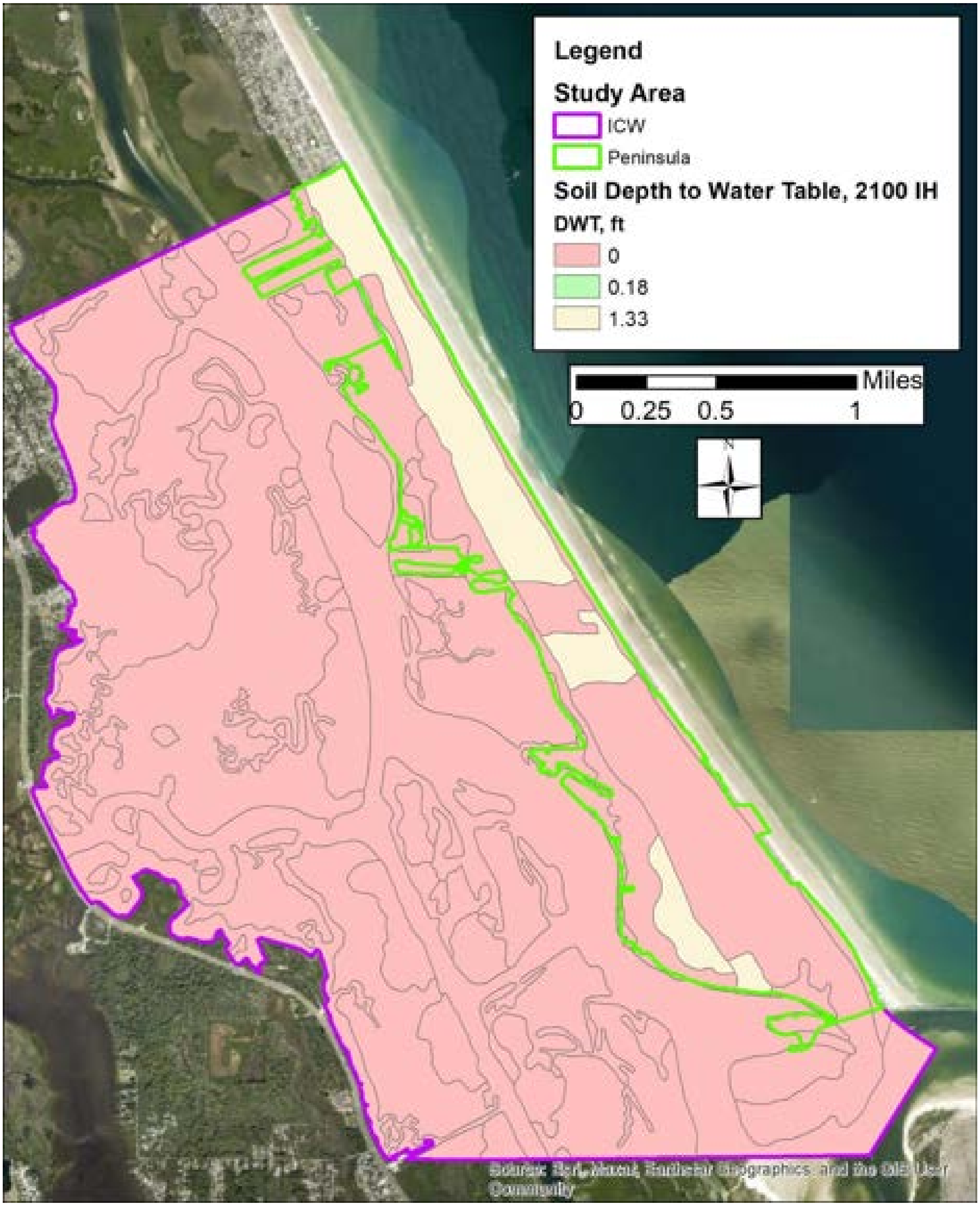


Figure 29. Estimated Soil Depth to Water Table, 2100 IH Scenario

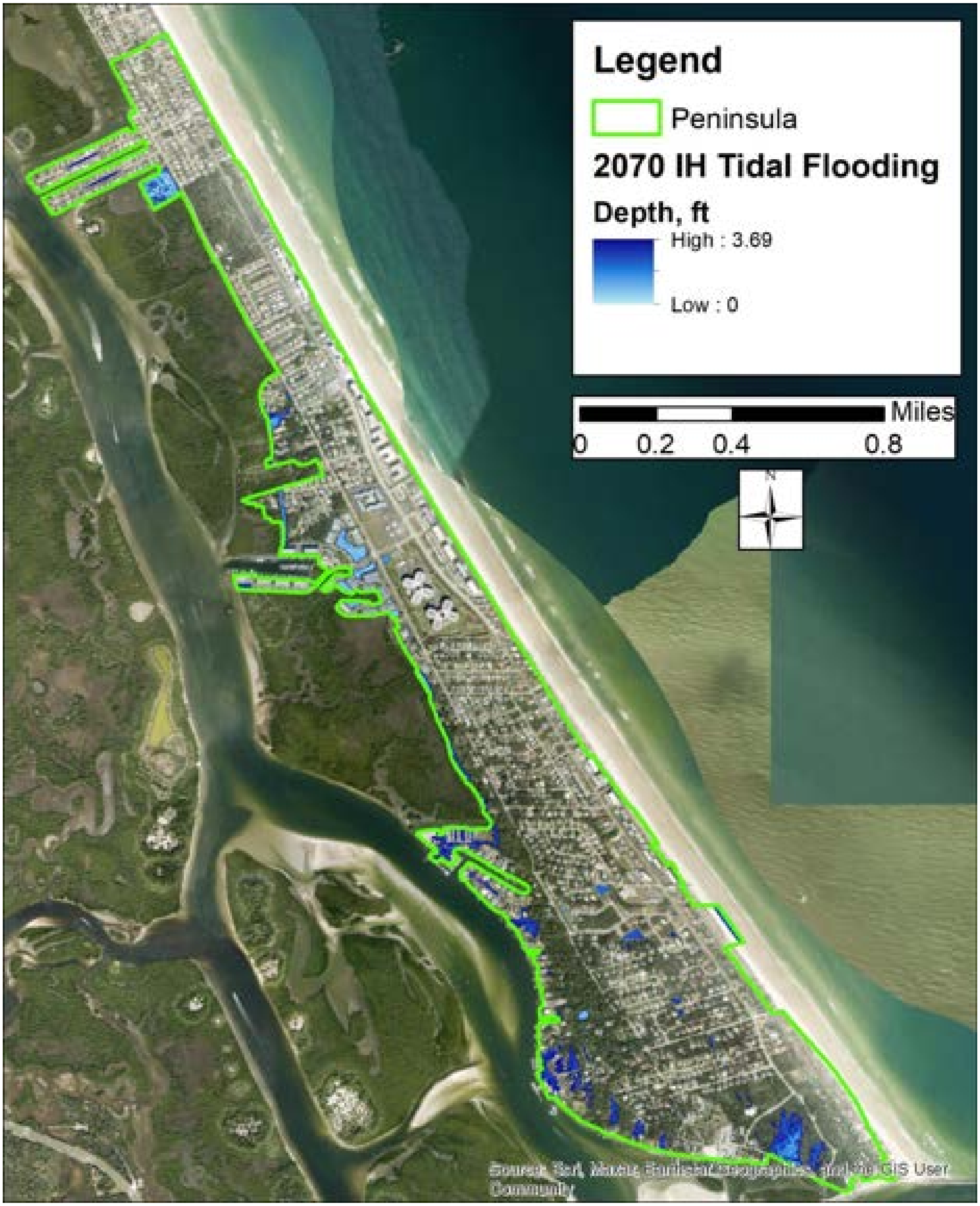


Figure 31. Peninsula Tidal Flooding, 2070 IH Scenario

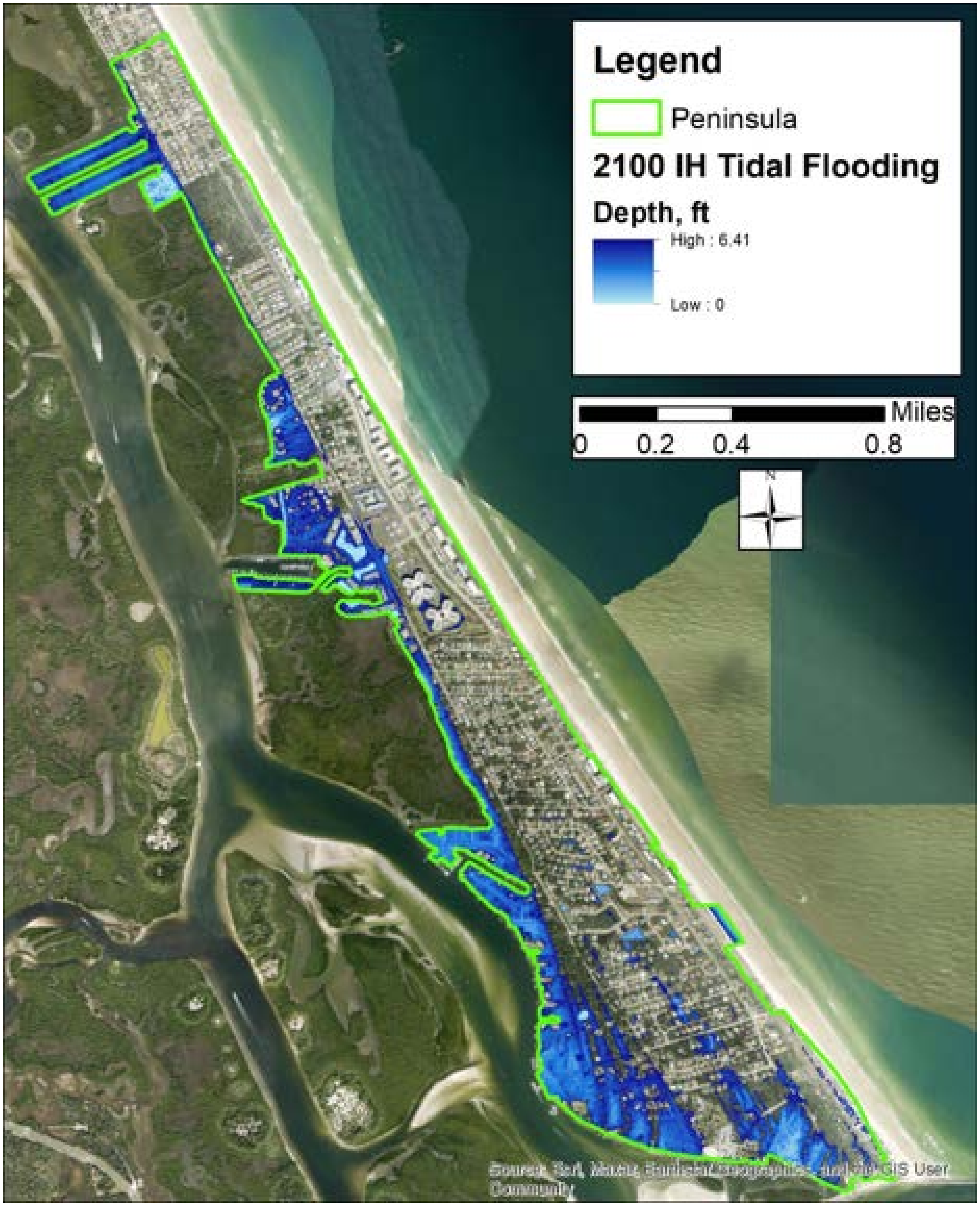


Figure 32. Peninsula Tidal Flooding, 2100 IH Scenario

Figure 32. Hurricane Nicole Tidal Flooding, Sailfish Drive

Figure 33. Hurricane Nicole Tidal Flooding, Front Street

6.8.3 Flood Reduction Strategies

There are a number of flood reduction strategies that can help alleviate the flooding along the riverfront as described below.

Flapgates

Flapgates on existing stormwater outfalls will provide some relief from tidal flooding but will not provide substantial protection by themselves. There are a number of inlets in the southwest portion of the Town where inlet grate elevations are lower than the current extreme tide elevations and the tidal elevations from some of the future scenarios. The outfall pipes connected to these inlets are candidates where a flapgate may provide some relief. This is a near-term, partial solution.

Additional Storage

In the near to intermediate term (up to 2040 scenarios), providing additional storage capacity may provide some relief. This can be done by requiring all new development and re-development/significant upgrades to have more than the currently required 1-inch of rainfall retention. The Town currently requires landscape upgrades in conjunction with significant exterior building improvements. It is recommended that at least 2.5-inches of retention should be required, and additional storage retrofit added to public improvements wherever feasible.

This will provide some relief for the 2040 IL, 2040 IH, 2070 IL, and 2100 IL scenarios. Due to the flow from the Halifax River onto the peninsula and the reduction in depth to water table, this will provide less protection for the 2070 IH and 2100 IH scenarios.

2040 IL Scenario

As shown in **Figure 34**, retrofitting the Town with 2.5-inches of retention has noticeable improvements to the 100-year/24-hour floodplain. In some isolated areas, locations flooded under existing conditions are no longer flooded.

2070 IL Scenario

Figure 35 shows the flood reduction in the southwest portion of the Town for the 2070 IL scenario for retrofit 2.5-inches of on-site storge. There is noticeable flood reduction for this scenario. However,for areas flooded from the existing 100-year/24-hour storm event will continue to experience some flooding for this scenario.

2100 IL Scenario

The impacts of retrofit storage of 2.5-inches for the 2100 IL Scenario is provided in **Figure 36**. As with the other scenarios, there is a noticeable reduction in the future floodplain.

Figure 34. 2040 IL Floodplain with 2.5-Inches of Retrofit Retention/Storage

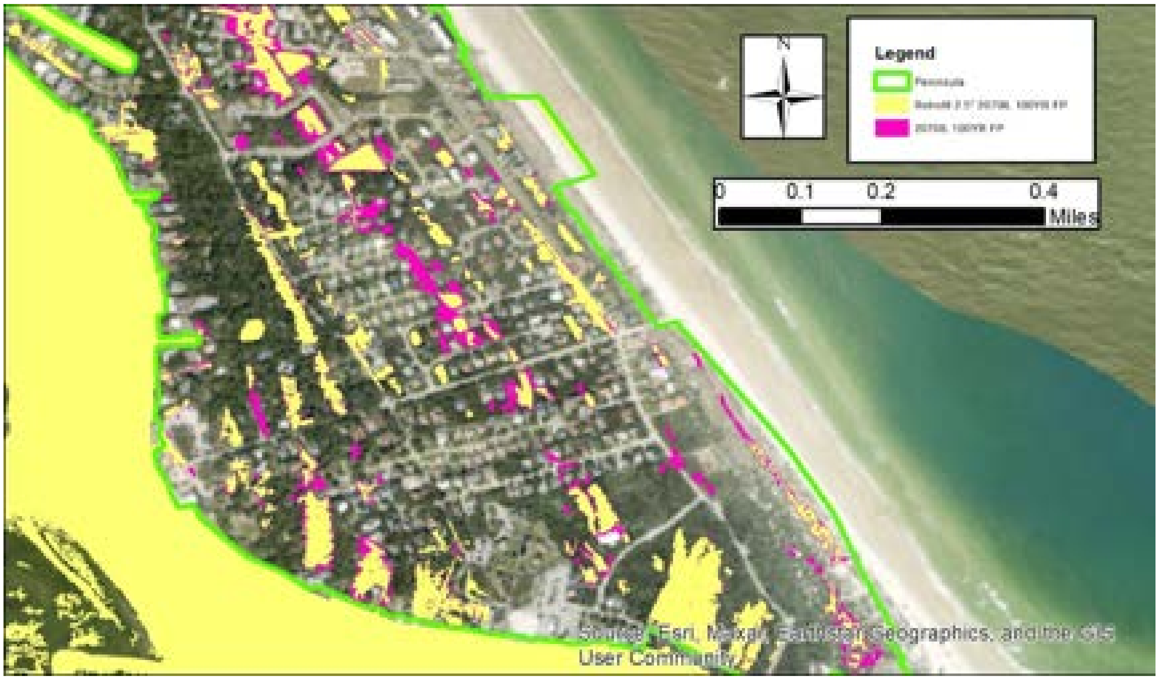


Figure 35. 2070 IL Floodplain with 2.5-Inches of Retrofit Retention/Storage

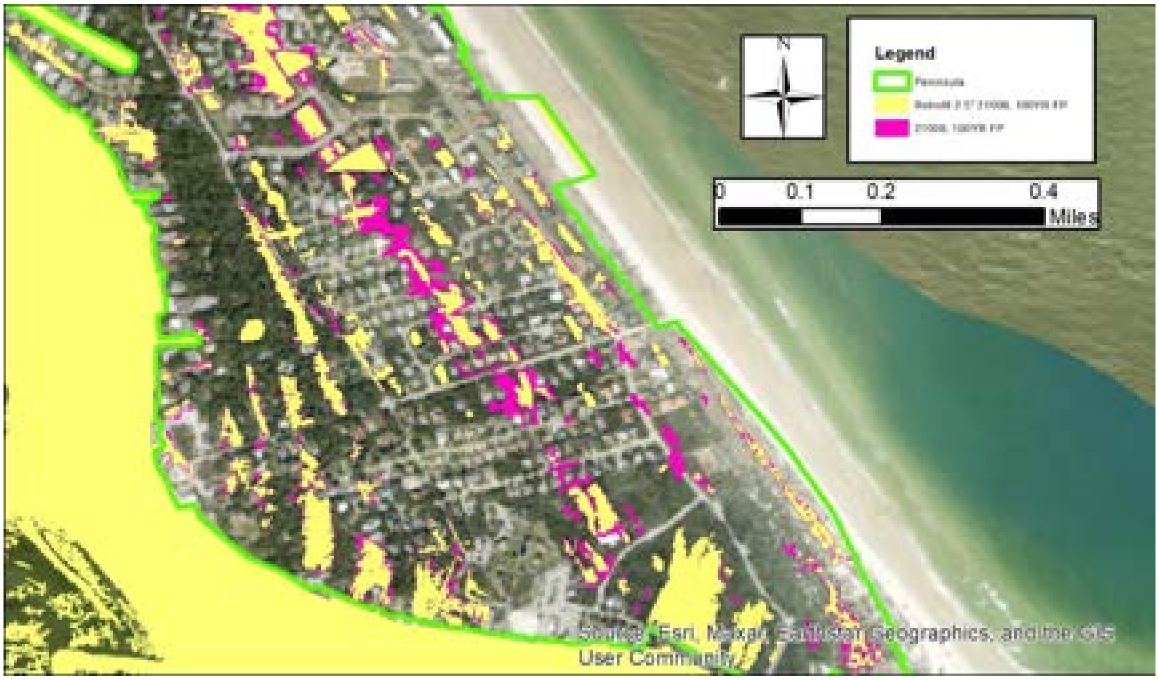


Figure 36. 2100 IL Floodplain with 2.5-Inches of Retrofit Retention/Storage

Additional Outfall Capacity

Additional stormwater capacity will alleviate flooding in some areas for future scenarios except for the 2070 IH and 2100 IH where the impacts of sea level rise negate any benefits from increased flow capacity. As discussed previously, this is an effective strategy for the Old Carriage Road and Anchor Drive areas when combined with flapgates. It may also provide some reduction in the western areas of the Beach Street gravity outfall. Additional outfall capacity is an immediate to mid-term strategy. Long-term, sea level rise impacts are expected to overcome any feasible outfall capacity improvements.

Seawalls and Pumping

As described above, predicted tides for the 2070 IH and 2100 IH scenarios will inundate large sections of the riverfront, flooding many roads and buildings. In addition, the associated groundwater table rise will lower the soil's ability to infiltrate rainfall, increasing stormwater runoff. Strategies to limit runoff by increasing onsite storage and retention, using flapgates, additional outfall capacity cannot overcome the direct inundation of water from the Halifax River due to sea level rise. A strategy that has been used elsewhere in Florida is to evaluate the use of seawalls to prevent the inflow from sea level rise onto developed areas. This would only be considered as a long-term strategy as it would be prohibitively expensive, difficult to implement, and costly to maintain.

The data previously shown in **Figures 31 and 32** were evaluated to determine the length of seawall need to protect the riverfront for the 2070 IH and 2100 IH scenarios which are provided below.

- 2070 IH Scenario – 5,200 feet of seawall with a minimum elevation of 3.69 feet to provide protection for the estimated Mean Higher High tide.
- 2100 IH Scenario – 38,700 feet of seawall with a minimum elevation of 6.41 feet to provide protection for the estimated Mean Higher High tide.

It should be noted that for both scenarios, there are peninsula areas that are below the tidal elevations and runoff collected in these low areas cannot be discharged to the Halifax River by gravity outfall and pumping would be needed. If implemented, the seawalls would need to create an unbroken barrier that includes the seawalls and adjoining natural land above the seawall top elevation to prevent tidal waters from bypassing the seawall through gaps.

The seawall locations for the 2070 IH and 2100 IH scenarios are provided in **Figure 37 and 38**.

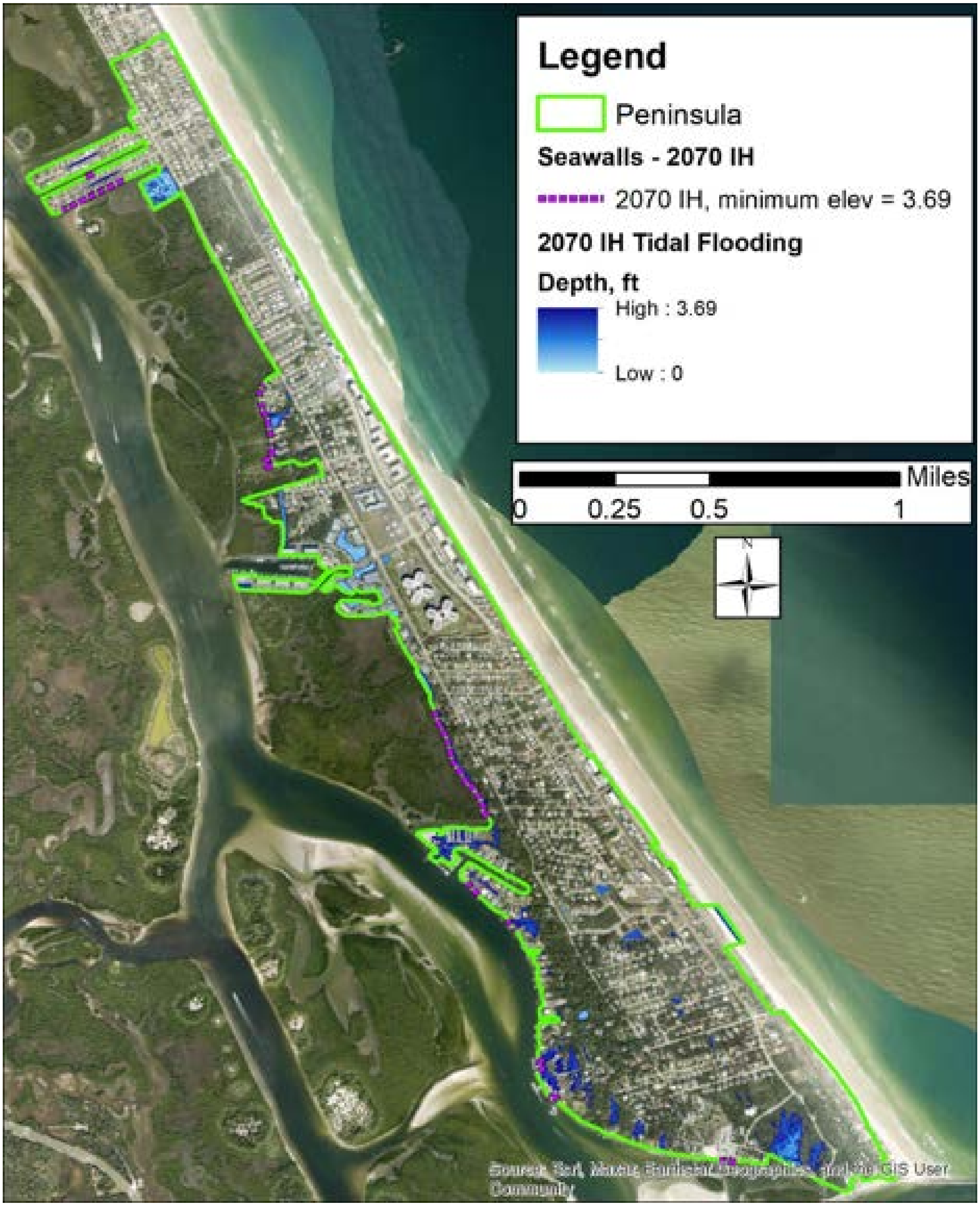


Figure 37. 2070 IH Seawall Locations

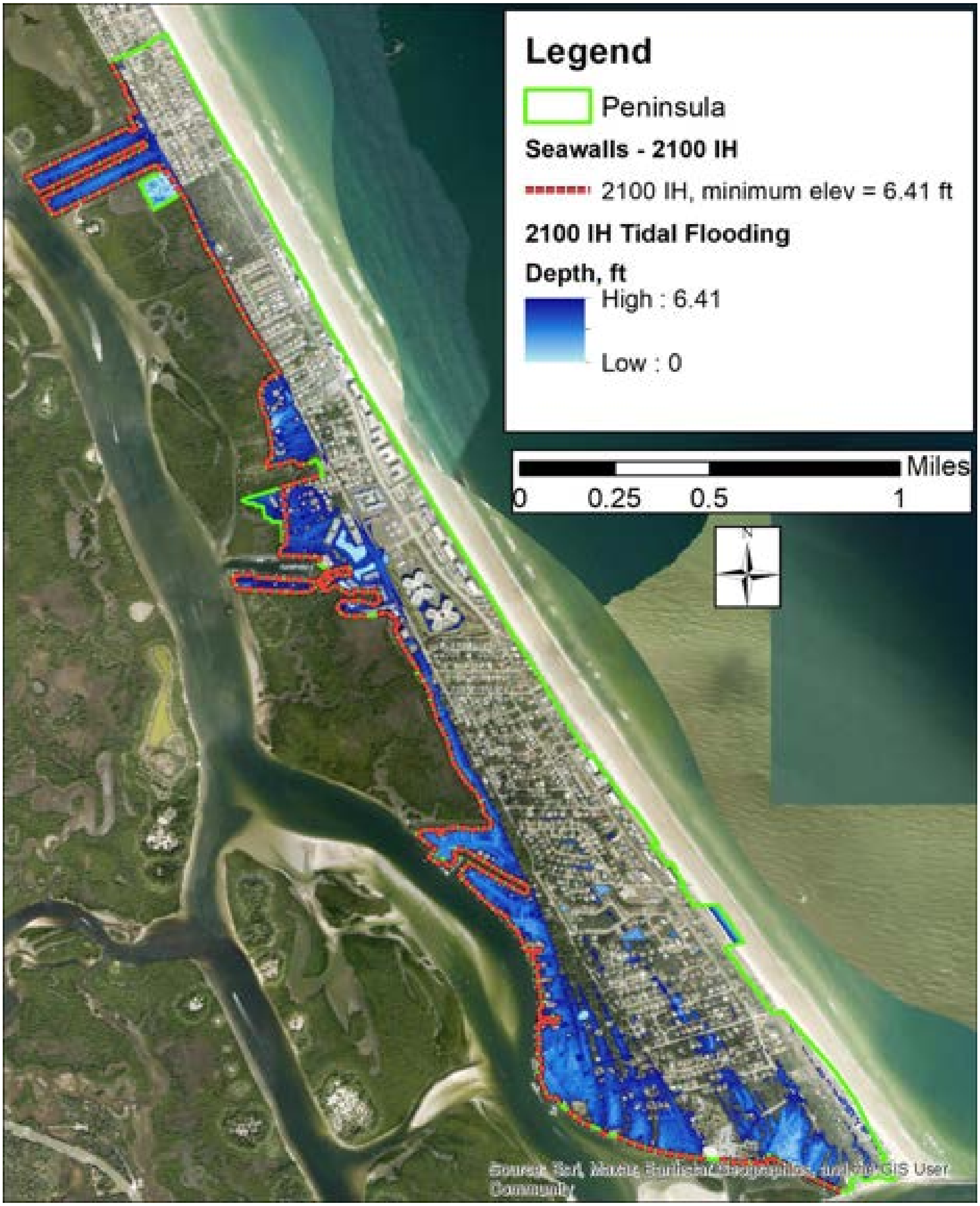


Figure 38. 2100 IH Seawall Locations

Relocation of Critical and Regionally-Significant Assets

It may be impractical to provide flood protection for the 2100 IH scenario or for any tidal increase of more than 4 feet. In this case, the Town may want to consider the relocation of critical/regionally significant assets away from areas expected to be impacted by extreme tidal increases. This is a strategy that can be implemented in stages:

- Any new facilities planned, site them in areas outside of the potential severe tidal impact areas – Immediate Strategy.
- When performing any major renovations/improvements to any facilities in the impact areas, include floodproofing or elevation above the predicted high tide flooding elevation commensurate with the design life of the facility – Intermediate term strategy.
- Relocate critical and regionally-significant infrastructure – Long term strategy.

Overall Riverfront Strategy

The following overall riverfront strategy is recommended to provide flood protection.

Near-Term Strategy

- Install flapgates on stormwater outfall at areas where backflow from the Halifax River is known to occur.
- Modify the Code to require 2.5-inches of retention/storage for new development, redevelopment, and retrofit where feasible.
- Improve the outfall capacities at Old Carriage Road and Anchor Drive.
- Continue use of the Town's temporary pumps, per permitted conditions, to drawdown their respective ponds prior to large storm events.
- Establish elevation and floodproofing requirements factoring in projected sea level rise, particularly for critical and regionally-significant assets.
    - High projection sea level rise curve should be applied when evaluating assets that cannot easily be adapted, has a 50+ year design life, will be implemented after 2060, or if failure would have catastrophic impacts;
    - The low projection curve should be applied for lower risk projects with an approximate design life of 10-20 years, could easily be adapted or replaced, or would have limited impact if failure occurred.
    - The projection zone between the low and high curves should be used for projects with a planning horizon or design life on the order of 30- to 50-years.

Intermediate Term Strategy

- Improve the capacity of the Beach Street gravity outfall.
- Add storage capacity in the southwest portion of the Town where feasible in addition to the 2.5-icnhes recommended above.

Long Term Strategy

- Relocate critical and regionally-significant infrastructure.
- Construct seawall and the associated stormwater improvements (pumping and flapgates on all outfalls).

7. Recommended Strategies

Beyond the specific focus areas, seven general categories of recommended strategies to improve flood protection and address flood vulnerabilities under both current and future conditions throughout the Town have been developed by Collective and are described in more detail in the following subsections.

7.1. Regulations

There are several Code modifications that are recommended to improve stormwater management and flood protection for the Town. These recommendations are described below.

7.1.1 Section 66-5 General Requirements

7.1.1.1 Stormwater Manual

Collective recommends the Town develop a stormwater manual that is referenced in this section of the Code. TR55 and the NEH are good sources for analysis, but something similar to portions of the FDOT Drainage Manual provide more specifics of the stormwater system design. The manual should include such topics as:

- Required/acceptable hydrologic and hydraulic analysis techniques
- Minimum pipe diameters and material
- Minimum pipe slopes
- Minimum pipe cover requirements
- Acceptable distances between access points (manholes or similar) to facilitate cleaning and maintenance
- Required design storms frequency as well as associated rainfall depth, distribution, and duration
- Peak discharge requirements
- Storage and treatment requirements
- Acceptable low impact development features
- Level of Service requirements (10-year storm for local roads, 100-year storm for structures and evacuation routes for example).

- Data delivery standards

Technical guidance may be provided as well for design approach and hydrologic and hydraulic parameters.

7.1.1.2 Section 66-5 part b subpart 1

This part of the section pertains to 25-year storm performance standards for alternative analysis methods. Suggested changes include:

- Striking the portion allowing the 25-year storm proposed conditions to have up to 10% more peak flow and total volume than the existing conditions. This is contrary to CRS requirements for obtaining maximum points (post-condition peak flows must be less than or equal to pre-conditions).

7.1.1.3 Section 66-5 part b subpart 2

This part of the section pertains to 100-year storm peak discharge requirements. The recommended changes to comply with CRS requirements are shown below.

Existing text

"The peak discharge resulting from a 100-year frequency storm on the developed or redeveloped site shall not exceed the peak discharge resulting from a 100-year frequency storm for existing conditions on the site."

Proposed text (changes in **BOLD**)

"The peak discharge resulting from the **10-year, 25-year, and** 100-year frequency **storms** on the developed or redeveloped site shall not exceed the peak discharge resulting from the **corresponding** frequency **storms** for existing conditions on the site."

7.1.2 Land Development Code, Section 5.9.4 Stormwater Drainage System, Part A Level of Service Standards

This section provides the LOS standards for stormwater systems. The following changes are recommended (changes in **BOLD**).

- First **2.5-inches** of rainfall shall be retained on site.
- Discharge hydrograph for post-development conditions shall maintain pre-development conditions **for all required storm events (10-year, 25-year, and 100-year)**.
- Peak discharge from post-development conditions shall not exceed peak discharge from pre-development conditions **for all required storm events (10-year, 25-year, and 100-year)**.
- **(NEW) All new development/redevelopment shall use low impact development techniques to the maximum extant practical before the design and use of a retention or detention pond to meet flow control requirements. Acceptable LID techniques can be found at *[insert***

section reference].

- **(New) Stormwater runoff shall be subjected to best management practices prior to discharge into natural or artificial drainage systems. For purposes of this subsection, the term "best management practice" shall mean a practice or combination of practices determined by the town engineer to be the most effective, practical means of preventing or reducing the amount of pollution generated by the project to a level compatible with Florida water quality standards found in F.A.C. Ch. 17-3.** (*Note:* this is from Section 66-5 b3 and should apply to all designs).

Note that these recommended changes may necessitate corresponding updates in other portions of the Code.

7.2. Public Information

An effective stormwater management system requires continual maintenance and modifying existing systems and adding new systems to address water quantity and quality problem areas. Public involvement/engagement is also important to the success of the program. There are several recommendations to increase this public involvement that also tie into the CRS program and are provided below.

Recommendation 1. Annual letters to homeowners and businesses located in high hazard areas

Recommendation 2. Annual letters to homeowners and business owners within repetitive loss areas (according to the Town's list of properties)

Recommendation 3. Annual letters to homeowners and business owners located in inundation areas (as predicted by the current ICPR model)

Specific language in these annual letters must be used to secure CRS points.

Recommendation 4. Host an annual community meeting with the following suggested topics:

- Frequency and types of flooding (urgent, tidal, nuisance, etc.) and who to call when it occurs. A leave-behind brochure should be created with this information.
- The importance of carrying flood insurance. FEMA provides a number of leave-behind documents that can be used to supplement this presentation.
- Proper disposal of yard waste and keeping inlets unobstructed and clear of debris.
- Nonpoint source pollution prevention.
- Retrofitting homes and businesses with green stormwater technologies such as downspout disconnects with rain gardens and rainfall cisterns.
- The importance of swale and right-of-way maintenance.

Recommendation 5. The Town should consider the formation of Citizen Stormwater Task Force. This task force could perform the following functions:

- Encouraging residents to inspect their stormwater system (inlets in particular) before a hurricane or significant rain event to ensure that inlets and gutters are unobstructed, and that yard debris is properly disposed.
- Educating their neighborhoods (in collaboration with the Town) on stormwater and floodplain issues. Education on purchasing flood insurance and reducing nonpoint source pollution through individual action may be particularly helpful.
- Capturing and transmitting photos to the Town after large storms and high tide events. These photos are helpful to Town staff for multiple purposes. It is particularly helpful when a structure is captured in each photo so that a depth and elevation can later be determined.

Recommendation 6. The Town should keep their website updated on stormwater management, flood protection activities, and provide public education.

7.3. Structural Controls for Water Quantity & Quality

Structural controls are physical features installed to control stormwater runoff and prevent pollutants from entering waterways and sensitive natural areas. The Town already encourages and mandates certain structural controls. Additional recommendations are provided below that will help reduce both the volume of runoff generated and the associated peak flow.

7.3.1 Green Streets Program

Initiate a Green Streets Program[13]. This program can provide environmental, social, and economic benefits by incorporating natural processes to control stormwater, such as:

- Bioretention (rain gardens)
- Bio-swales
- Stormwater curb extensions
- Stormwater planters
- Street trees
- Exfiltration trench
- Subsurface infiltration and detention
- Permeable pavement

[13] Green Streets Handbook, United States Environmental Protection Agency, EPA 841-B-18-001, March 2021. Weblink: Green Streets Handbook (epa.gov)

Some of these features are already included in the Town Code. As there are very limited locations for new streets in the Town, a Green Streets program would be primarily concerned with the retrofit of existing streets to the extent practical to incorporate these features.

7.3.2 Low Impact Development

Require the use of low impact development (LID) in new development and redevelopment.

7.3.3 Seawalls & Other Shoreline Protection

This section contains recommendations for shoreline protection for both the oceanside and riverside portions of the Town. It should be noted that to be effective, riverside seawalls would need to be used in conjunction with flapgates (discussed in section 7.34), and for the 2070 and 2100 scenarios, with pumping. Riverside seawalls in combination with outfall pumping were evaluated using the stormwater model developed by Collective; this alternative is discussed in section 7.3.3.4 below. Seawalls and the associated pumping are the most expensive alternative evaluated, but the only one that may be able to provide protection for existing and future properties for the 2070 and 2100 scenarios.

7.3.3.1 Seawalls - Oceanside

As part of the Comprehensive Plan Objective 2.1, the Town has several policies related to the construction of seawalls fronting the Atlantic Ocean. Policy 1.4.5 states:

> *The Town shall regulate development that could impact the ocean dune system by requiring development applications to provide a plan that avoids disturbances to dunes, if possible, and provides dune protection and stabilization measures that protects natural, living shorelines to the greatest extent possible. Where living shorelines by themselves re not likely to provide adequate protection and sea walls are necessary, living shorelines shall be required to be installed, where possible, and maintained seaward of the wall and vegetative buffer landward. Specific requirements for development adjacent to any ocean dunes shall be maintained within the LUDC.*

Policy 2.1.4 states:

> *The Town shall encourage the usage of natural erosion control methods such as living shorelines to prevent erosion of the existing dunes and shoreline along the Atlantic Ocean coast, within the jurisdictional areas of the Town. Volusia County and FDEP may permit seawalls, bulkheads, and other hardened shoreline structures to be installed east of the Coastal Construction Control Line on properties that front the Atlantic Ocean to protect existing structures from damage or destruction caused by erosion and shall be in accordance with FDEP and Volusia County standards.*

The Town has many single-family homes and condominium buildings fronting the ocean that have existing seawalls. These existing seawalls will need regular repair and maintenance to be effective.

Many of the existing oceanside seawalls in the Town experienced damage due to Hurricane Nicole and various repairs and new seawalls have been constructed as a result of this storm event. A standardized approach to seawall repair and replacement would be beneficial to protect properties, dunes, and other natural resources.

Recommendation 1. Develop a standard approach to seawall repair and replacement for ocean fronting properties. The approach may include:

- Develop informational packets for property owners with seawalls that provide recommendations for their inspection and repair that are mailed annually. Many seawalls in the south peninsula (not just Ponce Inlet) are decades old and may be nearing the end of their design life. Indicators of failing seawalls include panel separation allowing sand and water to flow between the panels, spalling of the concrete panels and cap, and exposed rebar which all weaken the seawall. Annual/bi-annual inspections would identify these deficiencies and allow for their correction.
- Develop design standards for replacement seawalls that will both protect the natural features of the dunes to the extent practical while also providing protection from hurricanes. These standards may include:
    - Recommended minimum and maximum seawall height (coordinate with FDEP and Volusia County standards) based on a desired level of service protection (such as Tropical Storm or Category 2 storm surge elevations, for example) commensurate with the typical design life of seawalls, 30- to 50-years
    - Maximum of one-foot difference between new seawalls and existing seawalls on adjacent properties
    - Acceptable seawall materials
    - Minimum cap dimensions
    - Minimum depth panels should be sunk below the mean high water line
    - Spacing of deadmen/tiebacks
    - Weephole requirements to allow for hydrostatic pressure release
    - Requiring the panels have no gaps that allow the passage of water through the seawall
    - Required dune protection and restoration
    - Require seawall owners to properly maintain the seawall

7.3.3.2 Seawalls – Riverside

Due to sea level rise and the associated rise in the water levels in the Halifax River, riverside seawalls would be needed to reduce tidal inundation for adjacent properties under future scenarios. A rough estimate of the length of new/modified seawall that would be needed to provide protection from the MHHW tide for each of the future scenarios is provided below in **Table 33**.

The values in the table are rough estimates and do not consider any storm surge or wind driven waves against the seawalls, which would increase the height and length of seawall needed for protection. The riverside has several areas with current seawalls that may need to be modified to provide future protection. As shown in the table, as the Halifax River water levels rise, the length of shoreline needing protection increases, drastically so, for the 2070 and 2100 scenarios. The 2100 IH scenario would require seawalls along almost the entire riverside to provide MHHW protection for riverfront properties.

Table 33. Potential Riverside Seawall Lengths Required for Future Scenarios

Future Scenario	River MHHW Elevation (ft)	Length of Seawall Required (ft)
2040 Intermediate Low	1.45	350
2040 Intermediate High	1.88	1,400
2070 Intermediate Low	1.95	1,500
2070 Intermediate High	3.69	5,200
2100 Intermediate Low	2.40	1,750
2100 Intermediate High	6.41	38,700

Recommendation 1. Include a section in the seawall design standards listed in Section 7.3.3.1 specifically for riverside seawall/bulkheads. This will support the Town's Comprehensive Plan Policy 1.4.17 Shoreline Armoring – Halifax River. Riverside specific design standards would additionally include:

- Placement of the seawalls in relation to the river's edge
- Requiring the seawall construction to minimize impacts to the river ecology and wetlands
- Require/encourage the use of "living shorelines[1]" as described by Florida Living Shorelines (floridalivingshorelines.com) which use living plants and oyster reefs to minimize erosion and protect natural resources and property, consistent with the Town's Comprehensive Plan Policy 1.2.2 Wetland Buffer

7.3.3.3 Artificial Reefs

Artificial reefs are known to help dissipate wave energy and to provide a rich environment for sea life to congregate and grow. There are currently three artificial reefs offshore of Ponce Inlet and eight more several miles to the north offshore of Dunlawton Boulevard. These reefs are under State jurisdiction.

Recommendation 1. Construct artificial breakwaters and living shorelines along the Halifax River to improve storm surge protection as well as address resident complaints about boat wakes during high tides along Old Carriage Road and Anchor Drive.

Recommendation 2. The Town should encourage Volusia County, State and/or federal agencies to construct more artificial reefs along the coast with the primary purpose of the reefs to be wave energy dissipation. The ecological benefits of the reefs will occur naturally.

7.3.3.4 Seawalls and Outfall Pumping Alternative

Collective evaluated the potential reduction in stormwater exposure that may be realized by implementing seawalls for properties along the riverside of the Town and outfall pumping. This alternative can provide significant reduction in future scenario flooding when it is combined with pumping. The pumping will be necessary because the riverside seawalls and high river elevations will prevent surface flow and gravity pipe outfall to the river for almost all of the existing outfalls. This option will not be needed in the near term and is a very expensive, high maintenance, high operating cost solution. Therefore, it is more of a last resort option to implement when other options have been exhausted.

7.3.4 Flapgates on Riverside Outfalls Alternative

Flapgates were evaluated by Collective as an additional structural alternative. Flapgates are one-way valves that are added to the outfall segment of a stormwater system that would prevent water from backflowing into the system from the Halifax River. The Town is in the process of installing flapgates on several outfalls to prevent high tides from flooding low areas. Flapgates are generally cost-effective measure to minimize the impacts from backflow from high tidal conditions.

The Town has 14 outfalls to the Halifax River that are reflected within the ICPR model and 12 were identified that may warrant a flapgate to prevent tidal flooding. The ICPR model was modified to evaluate the impact of installing flapgates.

- Three outfalls may benefit from a flapgate for all future scenarios
- Eight outfalls may benefit from a flapgate for the 2070 and 2100 future scenarios
- One outfall may only benefit for a flapgate for the 2100 scenarios

Specific improvements provided within the focus areas are presented in Section 6.

7.3.5 Increase Outfall Capacity Alternative

Collective evaluated increasing the capacity of some of the existing outfalls and potentially adding new outfalls for closed systems experiencing severe flooding. Of the fourteen outfalls to the Halifax

River, three of them were identified as candidates for increasing their flow capacity and two sites where a new outfall was needed. These sites have flooding reported under existing conditions which is expected to increase in severity for the future scenarios.

This alternative included making associated improvements needed such as increasing inlet dimensions and increasing the capacity of pipes conveying flow existing ponds connected to the outfall.

Two of the outfalls evaluated did not have existing water quality treatment and would need to have some form of pre-treatment installed. Additionally, the potential new outfalls will need to have raised inlet control structures to provide stormwater treatment.

If this alternative was implemented, it should be done in conjunction with other improvements to minimize disruption, such as:

- Roadway improvements
- Any utility upgrades that were being considered for the area
- Installing flapgates
- Adding LID features where practical

This alternative can provide some flood relief under existing conditions and the future scenarios. For maximum benefits, it should be combined with elements of other alternatives. Specific improvements provided within the focus areas are presented in Section 6.

The results for the areas evaluated were previously provided in Sections 6.2 to 6.6. Generally, flooding improvement could be provided for the 2100 IL scenario, but the combination of increased tailwater and decreasing depth to groundwater levels make it impractical to provide full flood protection for the 2070 IH and 2100 IH future scenarios.

7.3.6 South Atlantic Avenue Swales

The benefits of expanding/adding to the swales along South Atlantic Avenue were also evaluated by Collective. The swales were constructed by Volusia County, and many are too shallow and narrow to provide substantial flood protection benefit.

The simulated flooding along this primary evacuation route under existing and future scenarios was reviewed to identify locations where swale modifications may provide flood protection benefits. Eight of the basins along Atlantic Avenue were identified where:

- Flooding is known to occur or predicted to occur in the existing and/or future scenarios
- There is existing space to add new swales or modify existing ones

The locations of the five basins with new swales and the three basins with modified swales are provided in **Figures 39, 40** and **41**.

The swales were conceptually sized to utilize as much of the green space between the road edge and sidewalk as practical. The depths ranged from 1.0 to 1.25 feet, the widths ranged from 10 to 18 feet, and the side slopes from 5:1 to 6:1.

For the existing and future scenarios, expanding the existing swales and adding new ones was able to provide noticeable flood protection benefits for this evacuation route.

The results for implementing new and modified swales along South Atlantic Avenue were discussed in more detail in Section 6.7. For several of the swale areas, they are predicted to be able to prevent flooding for the 2100 IL scenario. For a few others, they were able to keep the 2100 IL scenario flooding from being worse than existing conditions.

Figure 39. S Atlantic Avenue New Swale Locations Between Major Street and Ponce Preserve

Figure 40. S Atlantic Avenue Swale Modification Locations Between North Turn Approach and Cindy Lane

Figure 41. S Atlantic Avenue Additional Swale Locations Between Glenview Avenue and Beach Street

7.3.7 Additional Storage Facilities (Ponds & Retention Areas) Alternative

There are many ponds in the Town that are incorporated into the stormwater management system. Some of the pond systems have outfalls to the Halifax River and others are part of closed systems. For this alternative, sites were evaluated by Collective for the potential to expand existing ponds and add new retention areas. An initial screening was performed to identify ponds and depressions where stormwater is collecting and are expected or known to flood for the 100-year storm event. Next, these initial sites were evaluated using aerial imagery to screen out locations where there is no additional space available to expand the pond or to add a retention area. Finally, these sites were field visited to confirm that the open space was still available. The field visit eliminated one site, leaving seven, which include:

- Three sites where existing depressions could be converted to retention areas. Note that two of these sites are within the same ICPR basin.
- Four sites where there may be space available to expand the existing ponds to provide additional storage of stormwater runoff.

The locations of these proposed facilities are illustrated in **Figure 42**. The conceptual design parameters for these facilities are provided in the following subsections.

Figure 42. Potential New and Expanded Stormwater Storage Facilities

7.3.7.1 New Retention Ponds

The following design parameters were used to conceptually design the retention ponds and develop the parameters needed for this alternative within the model.

- Use a 10-feet wide maintenance buffer at the outer perimeter of the parcel containing the retention pond site.
- Identify the typical ground elevation of the site.
- Identify the depth-to-water table based on the soil type (4.2 feet for all sites). The pond bottom elevation is the depth to water table minus 1 foot (3.2 feet below the ground elevation).
- Use 4:1 side slopes from the interior edge of the maintenance buffer to the pond bottom elevation.

7.3.7.2 Expand Existing Ponds

The following design parameters were used to conceptually design the expansion of the existing ponds and develop the parameters needed for this alternative evaluation.

- Use a 10-feet wide maintenance buffer at the outer perimeter of the parcel containing the pond site.
- Identify the typical ground elevation of the site
- Note the normal water level of the existing pond
- Assume an expanded pond depth of 8 feet
- Use 4:1 side slopes from the interior edge of the maintenance buffer to 2 feet below the pond normal water level.
- Use 2:1 side slopes from the 2 feet below the normal water level to 8 feet below the normal water level.

7.3.7.3 Alternative Results

As previous discussed in Sections 6.3, 6.4, and 6.6 (Calumet Avenue, Michael Lane and Bay Harbour Drive to Beach Street focus areas), implementing pond improvements as an option to retro-fit retention provides some stormwater flood protection benefits, but alone do not address current and future flooding. This alternative provides significant benefits for the existing, the 2040 and 2070IL future scenarios and lesser benefits for the 2070IH and 2100 scenarios. For maximum benefit, this alternative should be combined with other alternatives.

7.3.8 Pumping Alternative

The Town utilizes two mobile pumps to drawdown stormwater ponds prior to a major storm event and to continue pumping during and after the storm to help alleviate flooding. As part of the alternative evaluation, Collective quantified the benefits of using these pumps for current conditions only, as these are a temporary option at present. Pump 1 pumps water from a pond at Inlet Point Boulevard to a pipe system discharging to a pond at Beach Street. Pump 2 pumps water from the Beach Street pond to a downstream portion of the Town's outfall system located along Beach Street. The modeling indicates that Pump 1 can have a significant impact on peak stages while Pump 2's impact on peak stage is less. Both pumps significantly reduce the duration of flooding:

- Pump 1 at Inlet Point Boulevard pond: reduces flooding duration by *50* hours for the current conditions (2023) 100-year/24-hour storm
- Pump 2 at the Beach Street pond: reduces flooding duration by *3* hours for the current conditions 100-year/24-hour storm.

More specifically, the pumps produce peak stage differences as summarized in **Table 34** and reductions in flooding as illustrated in **Figure 43**. The Town should continue to operate these pumps as needed per permitted conditions for short-term stormwater flooding relief and implement the recommended stormwater system improvements presented in Section 6.6.

Table 34. Peak Stage Differences for Current Stormwater Scenarios from Pumping

Node Name, General Location	2023 Existing Conditions with Pumps Operating Change in Peak Stage (ft)				
	10yr24hr	25yr24hr	25yr96hr	100yr24hr	100yr96hr
N_Exfil_1700, depression on Inlet Point Boulevard (exfiltration)	0	0	-1.04	-2.57	-0.22
N_Outfall_3120A, intersection of Beach Street and S Peninsula Dr	0.16	0.17	0.15	0.2	-0.04
N_Outfall_3130, Beach Street pond	0.05	0.03	0	0.07	-0.44
N_Outfall_3140, depression north of Beach Street	0.09	0.08	0.04	0.11	-0.5
N_Outfall_500, Inlet Point Boulevard south pond	-2	-1.82	-2.53	-0.89	-0.22
N_Outfall_600, Inlet Point Boulevard north pond	-1.96	-1.78	-2.49	-0.87	-0.22
N_Outfall_610, north of Inlet Point Bouldevard north pond on Jennifer Circle	-1.93	-1.74	-2.46	-0.87	-0.22
N_Outfall_620, north of Inlet Point Bouldevard north pond on Jennifer Circle	-1.39	-1.68	-2.3	-0.86	-0.22

Figure 43. Pumping Alternative Floodplain Improvements, Current Conditions 100year/24hour storm

7.4. Non-Structural Controls

Non-structural controls are policies and practices that are designed to reduce stormwater runoff, reduce pollutant loading, and preserve natural features. Several recommendations are provided below.

7.4.1 Better Site Design

Collective recommends that the Town consider implementing a "Better Site Design" program[14]. This type of program encourages or requires new development/re-development that reduces impervious area and conserves natural areas. The existing Town Code has several policies/requirements that fall

[14] [14] Minnesota Stormwater Manual, Better Site Design, Minnesota Pollution Control Agency, 2024. Weblink: [Better site design - Minnesota Stormwater Manual (state.mn.us)]

into this type of program. Specific items to include in a "Better Site Design" program include:

- Preserving natural areas
- Disconnecting and distributing runoff
    - Disconnecting impervious areas so that stormwater runoff must flow over pervious areas prior to entering a collection point.
    - Rooftop disconnection – prohibit roof drains from connecting to a stormwater system without first flowing over pervious areas.
    - Stormwater landscaping, such as rain gardens, that accept runoff and have plants selected accordingly.
- Reducing impervious area
    - Narrower streets
    - Slimmer sidewalks
    - Smaller cul-de-sacs
    - Shorter driveways
    - Smaller parking lots
    - Use of pervious paving

7.4.2 Inlet and Pipe Cleaning

Collective recommends that the Town implement a program for scheduled stormwater system inlet and pipe cleaning. The Town is currently in the process of cleaning all its stormwater pipes. As a coastal community, sand and other debris accumulation in/around inlets and pipes is an ongoing problem that can reduce the flow capacity and adversely impact the ability of the stormwater system to function as designed. The recommendations area:

- Coordinate with the recommended Citizen Stormwater Task Force on clogged inlets and other structures and clean as needed based on reporting.
- Develop a schedule and dedicated funding source to clean inlets and pipes.

7.4.3 Reduce the use of curbs and gutters.

Where practical, require the use of swales for roadside drainage. This disconnection of the road pavement from the stormwater system should reduce the overall volume of stormwater to be managed by allowing it to infiltrate from the swales.

7.4.4 Increase Retention to 2.5-Inches for New/Redevelopment

The Town currently requires all new development and redevelopment to retain the first inch of rainfall on site. Collective evaluated the impact of increasing this requirement to 2.5-inches of rainfall. From a practical standpoint, this would be accomplished by increasing the amount of various LID-type features on the lot.

The modeling of this alternative indicates that modifying the Town Code to implement this change would have some positive impact on future flooding, but alone will not solve flooding issues.

7.4.5 Retrofit Retention of 2.5-Inches for All Development

Additionally, Collective evaluated the potential reduction in flooding if all development was required to retain the first 2.5-inches of rainfall. This would apply to both existing and future development. For existing development, there would need to be some type of retrofit implementation of various LID and green design features to capture the additional rainfall.

This alternative would be implemented by modifying the Code to require 2.5-inches of retention for new/redevelopment and a policy to retrofit existing development whenever practical. The road right-of-ways are generally a minimum of 50 feet wide which may allow space for retrofitting additional LID features. This alternative could be implemented by:

- Including 2.5-inches of LID/Green features to all roadway projects and Town construction projects
- Encouraging homeowners, businesses, and condominium associations to increase the retention features (cisterns, bio-swales, rain gardens, retention areas, etc.) on their property
- For any permit that includes landscaping upgrades (such as significant exterior building improvements), require additional retention to meet the retrofit target

This alternative was predicted to make a significant impact on some of the known and predicted flooding areas. By itself, this alternative cannot solve the flooding in the town.

7.5. Protection of Sensitive Natural Areas

The Code provides for the protection of sensitive natural areas in multiple sections of the code, including the Chapter VI - COASTAL MANAGEMENT ELEMENT AND CONSERVATION ELEMENT. The existing codes, goals, and policies seem to be adequate and no additional strategies are recommended.

7.6. Acquisition of Flood Prone Properties

The Code currently has a mechanism in place that provides for the acquisition of land (Article 7, Section 2-322 Public Land Acquisition and Facility Fund). Revenue from franchise fees provides the funding for land acquisition under this fund. The fund can be used for land acquisition for a number of different purposes.

The Code PART IV - COMPREHENSIVE PLAN Chapter II - FUTURE LAND USE ELEMENT - 2017 GOALS, OBJECTIVES AND POLICES, has Policy 1.1.1 concerning land acquisition in the floodplain and is provided below.

> *Policy 1.1.1 Undisturbed segments of floodplains associated with the Halifax River and other surface water bodies shall continue to be protected through public acquisition, land use controls, conservation easements or other methods considered appropriate by the Town.*

In addition to the funding mechanism described above, the Town also seeks out grants for land acquisition. The Town has used these types of funding to acquire flood prone properties to mitigate flood losses as shown in **Figure 44**. The Town currently has 12 remaining repetitive loss structures, located primarily on the western and southern sides. The locations are generally illustrated in **Figure 44**.

The strategy recommendations for flood prone properties include the following:

- Create a dedicated fund for the acquisition of flood prone properties. A portion of the existing land acquisition fund based on franchise fees can be reallocated to the new flood prone properties fund.
- Develop and update as needed a list of flood prone properties that are ranked by acquisition priority. The ranking could take into account:
  - acquisition costs
  - property area
  - frequency of flooding
  - suitability of property for use as a stormwater management feature such as a wet pond or retention area.
- To the extant practical, convert acquired flood prone properties to stormwater management features to help alleviate flooding of adjacent roads and properties.
- For any flood prone properties along the riverside, the Town should pursue NOAA funding for coastal zone management to support habitat restoration.
- The Town should pursue FEMA Building Resilient Infrastructure and Communities (BRIC) and Resilient Florida grants.

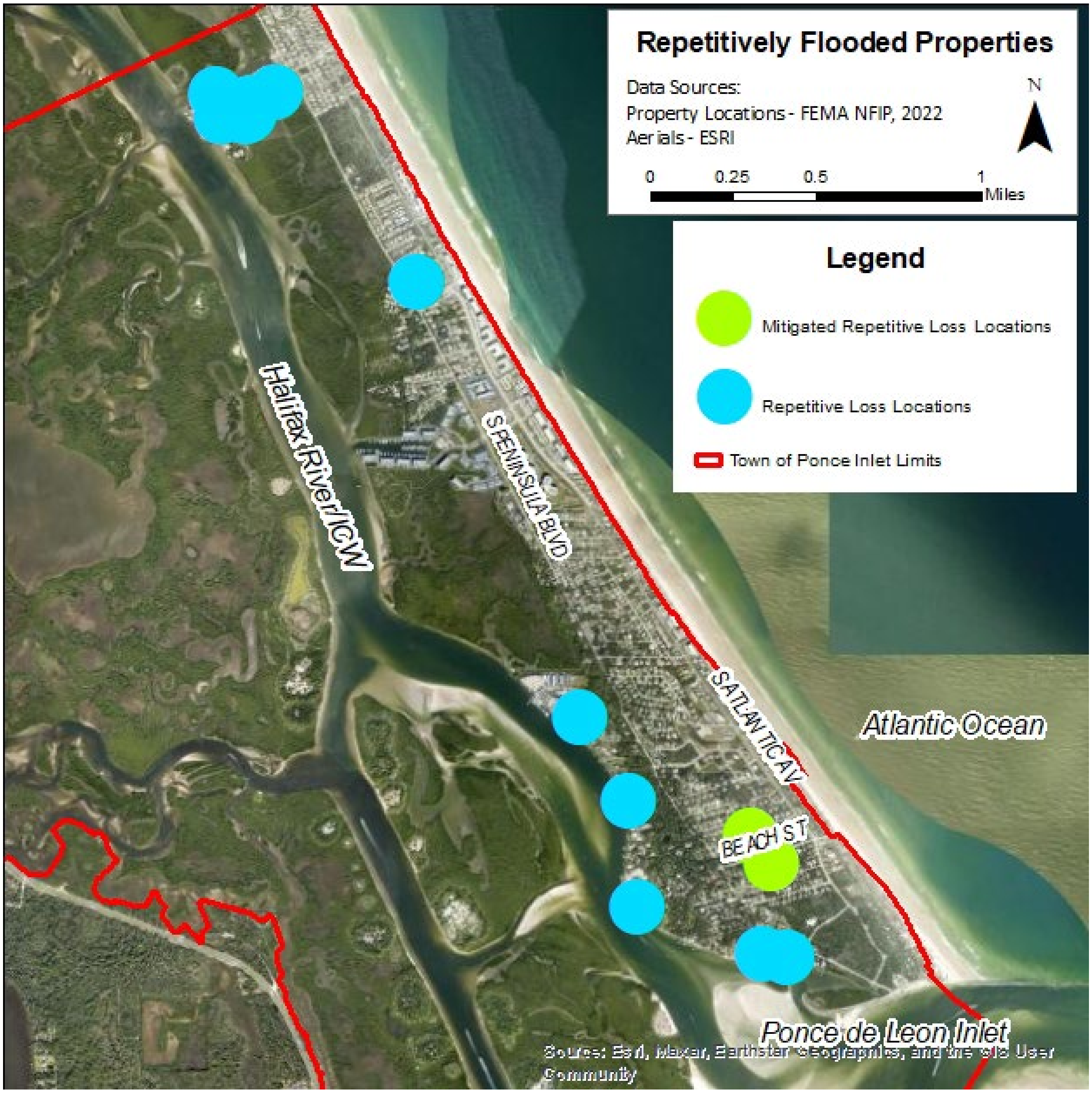


Figure 44. Repetitively Flooded Properties

7.7. Additional Recommendations

Additional recommendations that do not fall in one of the above categories are provided below.

7.7.1 Stormwater Utility

The Town should move forward with developing a dedicated stormwater utility as allowed under Florida law. The stormwater utility charge would be part of the annual property assessment to real property and could be based on the parcel's amount of impervious area converted to the number of equivalent residential units (ERU) – the average impervious area of residential parcels in the Town. There are other, less popular methodologies, such as gross area with an intensity of development factor, which could be used to determine stormwater rates.

The stormwater utility would provide a dedicated funding source for all stormwater related activities, including:

- Operation and maintenance of the stormwater system,
- Design and construction of stormwater improvements,
- Acquiring flood prone properties and converting the sites to stormwater features.

In developing a stormwater utility, Collective recommends impervious area fieldwork be conducted for a subset of parcels to quantify the amount of impervious area for each potential rate category (e.g., single family residential, residential condominium, general, etc.) to a specified confidence interval (e.g., 90%, 95%, etc.).

8. Public Presentation

<This section will be completed after the joint meeting with the Town Council and the Town's Planning Board scheduled for June 2024.>

9. Conclusions

<This section will be completed after the joint meeting with the Town Council and the Town's Planning Board scheduled for June 2024.>

Appendix B

Task 1: Acquire Background Data Technical Memorandum

Technical Memorandum

Town of Ponce Inlet Watershed Master Plan and Flood Vulnerability Assessment

Subject:	**Task 1: Acquire Background Data**
Date:	July 19, 2023 (Revised April 8, 2024)
To:	Town of Ponce Inlet
From:	Collective Water Resources, LLC (S. Dunham)
Copy to:	File

1. Introduction

Collective Water Resources (Collective) researched and compiled available data to prepare a Watershed Master Plan (WMP) and flood vulnerability assessment (VA) for the Town of Ponce Inlet (Town). The acquisition, review, and compilation of data was performed at the request of the Town to develop the WMP as per the Federal Emergency Management Agency's (FEMA's) Community Rating System (CRS) requirements for Activity 450[1,2] and perform the VA, based on the requirements as defined in Section 380.093, Florida Statutes (F.S.)[3]. Data for the WMP and VA are classified into three main categories and are described below: 1) critical and regionally significant asset inventory, 2) topographic data, and 3) flood scenario-related data. These data will be utilized in subsequent tasks to perform flood analyses and mapping, exposure analysis, and sensitivity analysis as well as prepare recommendations of actions for mitigation, adaptation strategies, and regulatory standards and/or code changes.

2. Critical/Regionally Significant Assets Inventory

Data were collected from the Florida Geographic Data Library (FGDL), Florida Department of Environmental Protection (FDEP), Florida Department of Revenue (FDOR), Volusia County, East Central Florida Regional Planning Council (ECFRPC), and the Town. FGDL reflects a regularly updated source of geospatial data collected by the University of Florida's GeoPlan Center acquired for numerous federal,

---

[1] National Flood Insurance Program Community Rating System Coordinator's Manual, 2017: https://www.fema.gov/sites/default/files/documents/fema_community-rating-system_coordinators-manual_2017.pdf

[2] Addendum to the 2017 CRS Coordinator's Manual, 2021: https://www.fema.gov/sites/default/files/documents/fema_community-rating-system_coordinator-manual_addendum-2021.pdf

[3] Resilient Florida Grant Program, 380.093,F.S.: http://www.leg.state.fl.us/statutes/index.cfm?App_mode=Display_Statute&Search_String=&URL=0300-0399/0380/Sections/0380.093.html

State, regional, and local sources. The ECFRPC data represents assets that were identified and evaluated as part of the Town's first VA completed in 2022[4].

Table 1 summarizes the various data layers compiled by Collective under each Asset Class satisfying 380.093, F.S., as well as supporting data for the WMP and VA. Data layer names represent the asset type, the data provider, and source year according to the data provider. Those assets marked not applicable (N/A) do not exist within the Town's limits. Collected data were clipped to the Town's boundary to reflect only those assets within the jurisdictional limits. For data layers collected from the FGDL, the original source of the data is also included in the summary table below. The data layers identified below reflect all the locations identified in the Town's original vulnerability assessment performed by the ECFRPC as well as additional assets required by 380.093, F.S. and those requested by the Town (marked with an asterisk).

Table 1. Summary of Collected Asset and other Vulnerability Assessment Data

Asset Class	Asset Type Data Layer	Source	Data Type
Transportation Assets and Evacuation Routes	**BoatRamp_FGDL2020**	FGDL (Florida Fish and Wildlife Conservation Commission-Fish and Wildlife Research Institute)	Point feature class
	Evacuation_Routes_Volusia2022	Volusia County	Polyline feature class
	Major_Roadway_FGDL2023	FGDL (Florida Department of Transportation, FDOT)	Polyline feature class
	Marinas_FGDL2017	FGDL (Florida Fish and Wildlife Conservation Commission)	Point feature class
	Marinas_PonceInlet2023	Ponce Inlet	Addresses only
	Marinas_Volusia2022	Volusia County	Point feature class
	Airports	N/A	N/A
	Bridges	N/A	N/A
	Bus terminals	N/A	N/A
	Ports	N/A	N/A
	Railroads	N/A	N/A

[4] Resilient Ponce Inlet report, February 2022: https://www.ponce-inlet.org/DocumentCenter/View/3735/Ponce-Inlet-Vulnerability-Assessment-

Asset Class	Asset Type Data Layer	Source	Data Type
Critical Infrastructure	**Communication_Antenna_FGDL2022**	FGDL (Federal Communications Commission)	Point feature class
	Communication_Fac_ECFRPC2021 (communications equipment building)	ECFRPC	Point feature class
	Lift_Stations_PonceInlet2023	Port Orange and Ponce Inlet	addresses only
	NPDES_Stormwater_Fac_FGDL2022 (active NPDES Multisector General Permits)	FGDL (FDEP)	Point feature class
	***Petroleum_Fac_Storage_Tanks_FGDL2023**	FGDL (FDEP)	Point feature class
	Disaster debris management sites	N/A	N/A
	Electric production and supply facilities	N/A	N/A
	Military installations/facilities	N/A	N/A
	Potable/Drinking water facilities	N/A	N/A
	Solid and hazardous waste facilities	N/A	N/A
	Stormwater pump stations	N/A	N/A
	Wastewater treatment facilities	N/A	N/A
Community and Emergency Facilities	**Community_Center_FGDL2015**	FGDL	Point feature class
	Fire_Station_FGDL2019	FGDL (FDEM)	Point feature class
	Law_Enforcement_FGDL2019	FGDL (FDEM)	Point feature class
	Local_Government_Fac_ECFRPC2021 (Town facilities)	ECFRPC	Point feature class
	Local_Government_Fac_FGDL2019 (County facilities)	FGDL (FDEM)	Point feature class
	Affordable public housing	N/A	N/A
	Colleges and universities	N/A	N/A
	Correctional facilities	N/A	N/A
	Disaster recovery centers	N/A	N/A
	Emergency medical service facilities	N/A	N/A
	Emergency operation centers	N/A	N/A
	Health care facilities	N/A	N/A
	Hospitals	N/A	N/A
	Logistical staging areas	N/A	N/A
	Risk shelter inventory	N/A	N/A
	Schools	N/A	N/A
	State government facilities	N/A	N/A

Asset Class	Asset Type Data Layer	Source	Data Type
Natural, Cultural, and Historical Resources	**Conservation_Lands_FGDL2021**	FGDL (FDEP)	Polygon feature class
	Critical_Erosion_Beach_FGDL2014	FGDL (FDEP)	Polyline feature class
	Historical_Cemeteries_FGDL2023	FGDL (Florida Department of State)	Polygon feature class
	Historical_ResourceGroups_FGDL2023	FGDL (Florida Department of State)	Polygon feature class
	Historical_Structures_FGDL2023	FGDL (Florida Department of State)	Point feature class
	Parks_FGDL2021 (beach access)	FGDL (FDEP)	Polygon feature class
	Parks_Volusia2023	Volusia County	Polygon feature class
	Shoreline _FGDL2022	FGDL (U.S. Fish and Wildlife Service)	Polygon feature class
	SurfWaters_ FGDL2022	FGDL (U.S. Fish and Wildlife Service)	Polygon feature class
	Wetlands_FGDL2022	FGDL (U.S. Fish and Wildlife Service)	Polygon feature class
	Monuments	N/A	N/A
Boundaries and Support Data	***Businesses_PonceInlet2023**	Google Maps	Addresses only
	LandUse_l3_FGDL2021	FGDL (St. Johns River Water Management District 2014 for area of interest)	Polygon feature class
	Parcels_FDOR2022	FDOR	Polygon feature class
	PonceInlet_TownLimits_Volusia2023	Volusia County	Polygon feature class
	Streets_Volusia2023	Volusia County	Polyline feature class

* These assets are not specifically mentioned in 380.093, F.S. but were requested by the Town

For several asset types, data layers were available from multiple sources. Upon comparison, Collective determined that often different data sources for the same asset type did not reflect the same list of assets and one source alone did not reflect a complete inventory of all assets within the Town. **Table 2** summarizes overlaps for assets that had multiple sources and how collected data layers were refined to prepare a full inventory of assets within the Town without duplicates.

Table 2. Data Overlaps and Resolution

Asset Class	Asset Type Data Layers	Overlaps	Resolution
Transportation Assets and Evacuation Routes	Evacuation_Routes_Volusia2022 and Major_Roadway_FGDL2023	Portions of Atlantic Avenue represented in both layers	Duplicate line segments removed from Major_Roadway_FGDL2023
	Marinas_Volusia2022 and Marinas_FGDL2017	5 marina locations were represented in both layers	Duplicates removed from the Marinas_FGDL2017
Community and Emergency Facilities	Community_Center_FGDL2015	Lions Club and Community Center reflected as separate points but located in the same structure	Removed Lions Club point
	Fire_Station_FGDL2019	Fire Station and Emergency Medical Services (EMS) reflected as separate points but located in same structure	Removed EMS point
	Law_Enforcement_FGDL2019	Duplicate points entered for Police Department with same location	Removed GCID 3646 point
Natural, Cultural, and Historical Resources	Conservation_Lands_FGDL2021, Parks_FGDL2021, Parks_Volusia2023	Duplicate areas reflected in all three layers	Removed County & municipal parks from Conservation_Lands_FGDL2021; removed State and Special District conservation lands from Parks_Volusia2023; removed duplicates of Conservation_Lands_FGDL2021 and Parks_Volusia2023 from Parks_FGDL2021
Transportation Assets & Evacuation Routes & Boundaries & Support Data	Evacuation_Routes_Volusia2022, Major_Roadway_FGDL2023, Streets_Volusia2023	Evacuation routes and major road included in Streets layer	Duplicate line segments removed from Streets_Volusia2023

Data were reviewed by Collective along with Town staff to determine missing assets, or gaps. Assets marked as not applicable (N/A) in Table 1 do not exist within the Town limits so do not qualify as gaps. **Table 3** summarizes the gaps that were identified along with how these were resolved.

Table 3. Data Gaps and Resolution

Asset Class	Asset Type Data Layer	Gap	Resolution
Transportation Assets and Evacuation Routes	Marinas_PonceInlet2023	Daytona Beach Parasail and private marina for Lighthouse Boat Yard not included in available data	Created point feature based on locations identified by the Town
Critical Infrastructure	Lift_Stations_PonceInlet2023	No spatial data	Created point feature class based on addresses
Boundaries and Support Data	Businesses_PonceInlet2023	No comprehensive list or spatial data	Google Map search for businesses within non-residential buildings and created point feature class based on building location within aerial imagery

For analysis purposes under subsequent tasks, the following concerns are noted relating to the asset data summarized above:

- Assets will only be analyzed if they are owned by the Town or are critical to public safety and welfare within the Town. For example, street and parcel layers are included, but flood vulnerability will not be analyzed for every street and parcel within the Town's limits; analysis will be limited to evacuation routes and major roads and properties with critical assets.
- Natural resources will be evaluated based on engineer's/analyst's judgement. Since many of these assets can and should be inundated (e.g., wetlands), they will be evaluated based on that criterion versus the analyses that related to manmade assets (that ideally, are never inundated).

3. Topographic Data

The most recent digital topographic data for the Town is published by the United States Geological Service (USGS) in partnership with the Florida Department of Emergency Management (FDEM) reflecting light detection and ranging (lidar) data acquisition between December 4, 2018, and March 22, 2019 (Dewberry 2022[5]). The Volusia County data collection and post-processing were completed as part of the Florida Peninsular 2018 D18 project. Lidar products include classified LAS point files, breaklines, digital elevation model (DEM) rasters, and associated reports for a total of 1,375 5,000 feet-by-5,000 feet tiles (approximately 1,233 square miles) of coverage across the county. Twenty-three (23) tiles, which cover the Town's limits, were mosaiced by Collective to create a seamless Ponce Inlet DEM raster (as a TIFF file,

[5] FL Peninsular 2018 Lidar Project – Volusia County, Report Produced for USGS, 2021: https://rockyweb.usgs.gov/vdelivery/Datasets/Staged/Elevation/metadata/FL_Peninsular_2018_D18/FL_Peninsular_Volusia_2018/reports/Volusia_County_Report.pdf

floating point, 32-bit, 1 band) with 2.5 feet by 2.5 feet cell size referenced to North American Datum of 1983 with the 2011 Adjustment (NAD83_2011) horizontal datum, Florida State Plane Zone East coordinate system and North American Vertical Datum of 1988 (NAVD88) vertical datum. This Ponce Inlet DEM will serve as the base topographic layer for subsequent project analyses and mapping. **Figure 1** illustrates the ground surface elevations throughout the town and surrounding areas. Specifically, within the Town's limits, surface elevations range from -1.6 to 35.25 feet NAVD88 with the highest elevations present in the northeast side of the town along the coastal ridge.

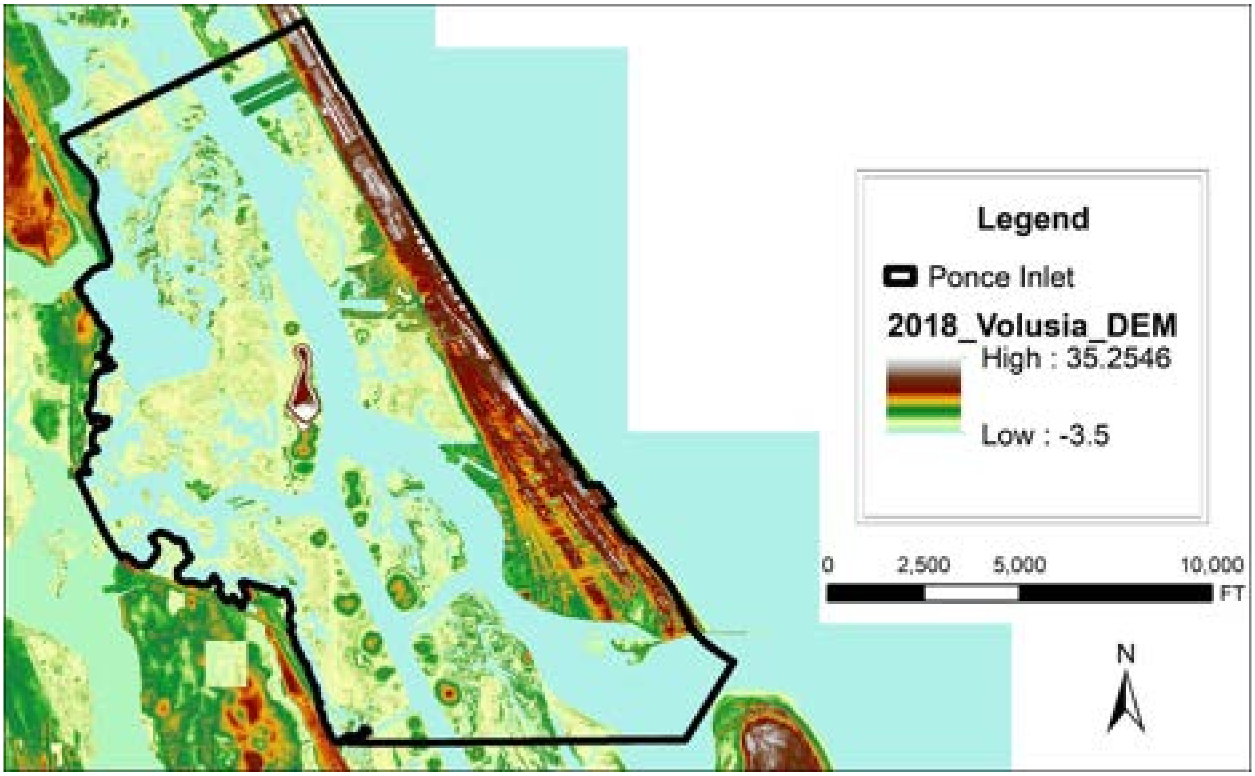


Figure 1. Ground Surface Elevations throughout Ponce Inlet, feet NAVD88

4. Flood Scenario-Related Data

Precipitation data

Collective gathered precipitation data related to the following five (5) design storms based on the St. Johns River Water Management District (SJRWMD) Environmental Resource Permitting (ERP) requirements and floodplain analysis procedures[6], the Town's stormwater and conservation general Code of Ordinances requirements[7], and CRS WMP guidelines:

- 10-year 24-hour,
- 25-year 24- hour,
- 25-year 96-hour,
- 100-year 24-hour, and
- 100-year 96-hour.

[6] SJRWMD Permit Information Manual, 2018: https://www.sjrwmd.com/static/permitting/PIM-20180601.pdf
[7] Town of Ponce Inlet Code of Ordinances, 2023: https://library.municode.com/fl/ponce_inlet/codes/code_of_ordinances

Precipitation depths for each of these design storm events were collected from the National Oceanic and Atmospheric Administration's (NOAA's) National Weather Service Hydrometeorological Design Studies Center's *Atlas 14 Precipitation-Frequency Atlas of the United States Volume 9 Version 2.0 (*or *NOAA Atlas 14 Volume 9 Version 2*)[8]. *NOAA Atlas 14 Volume 9 Version 2* was published in 2013 and covers the southeastern states: Alabama, Arkansas, Florida, Georgia, Louisiana, and Mississippi. The estimates have been calculated for a range of frequencies and durations and have utilized a regional frequency analysis procedure that is based on L-moment statistics. The annual maximum series were calculated from precipitation measurements taken at random interval or constant interval increments ranging from one-minute to one-day and were gathered from a multitude of sources. The closest NOAA precipitation station to Ponce Inlet is New Smyrna Beach. The precipitation depths, with 90% confidence intervals, estimated for Ponce Inlet using NOAA's Precipitation Frequency Data Server[9] (based on Latitude 29.0969°, Longitude -80.9373° along Oceanview Avenue approximately halfway between S Peninsula Drive and S Atlantic Avenue) are summarized in **Table 4** below.

Table 4. Ponce Inlet Precipitation Frequency Estimates (NOAA Atlas 14, Volume 9, Version 2)

Recurrence Interval, Duration	Precipitation Estimate with 90% Confidence Intervals (inches)
10-year, 24-hour	**7.40** (6.08-9.00)
25-year, 24-hour	**9.46** (7.65-12.2)
25-year, 96-hour	**12.1**(9.94-15.5)
100-year, 24-hour	**13.2** (10.0-17.7)
100-year, 96-hour	**16.9** (13.0-22.4)

Groundwater Level Data

Water table elevations influence the soil storage capacity and runoff potential and are a key parameter for stormwater analyses to be conducted under a subsequent project task. Depth to water table data were collected from the Natural Resources Conservation Service (NRCS) Soil Survey in the Soil Survey Geographic (SSURGO) database. Data for Ponce Inlet reflect spatial data published in September 2019 and tabular data published in September 2022 and are available from the Web Soil Survey[10]. Within the Town, depth to water table was determined based on the weighted average of all component soils for the June through October time frame. Water tables depths may be reanalyzed for model calibration. **Figure 2** illustrates the soil mapping units throughout the town and **Table 5** summarizes the initial depth to water table in inches and provides the total area and percent area by each soil mapping unit.

[8] NOAA Atlas 14 Precipitation-Frequency Atlas of the United States, Volume 9 Version 2.0, 2013: https://www.weather.gov/media/owp/hdsc_documents/Atlas14_Volume9.pdf
[9] NOAA Precipitation Frequency Data Server, Florida: https://hdsc.nws.noaa.gov/pfds/pfds_map_cont.html?bkmrk=fl
[10] Web Soil Survey application: https://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx

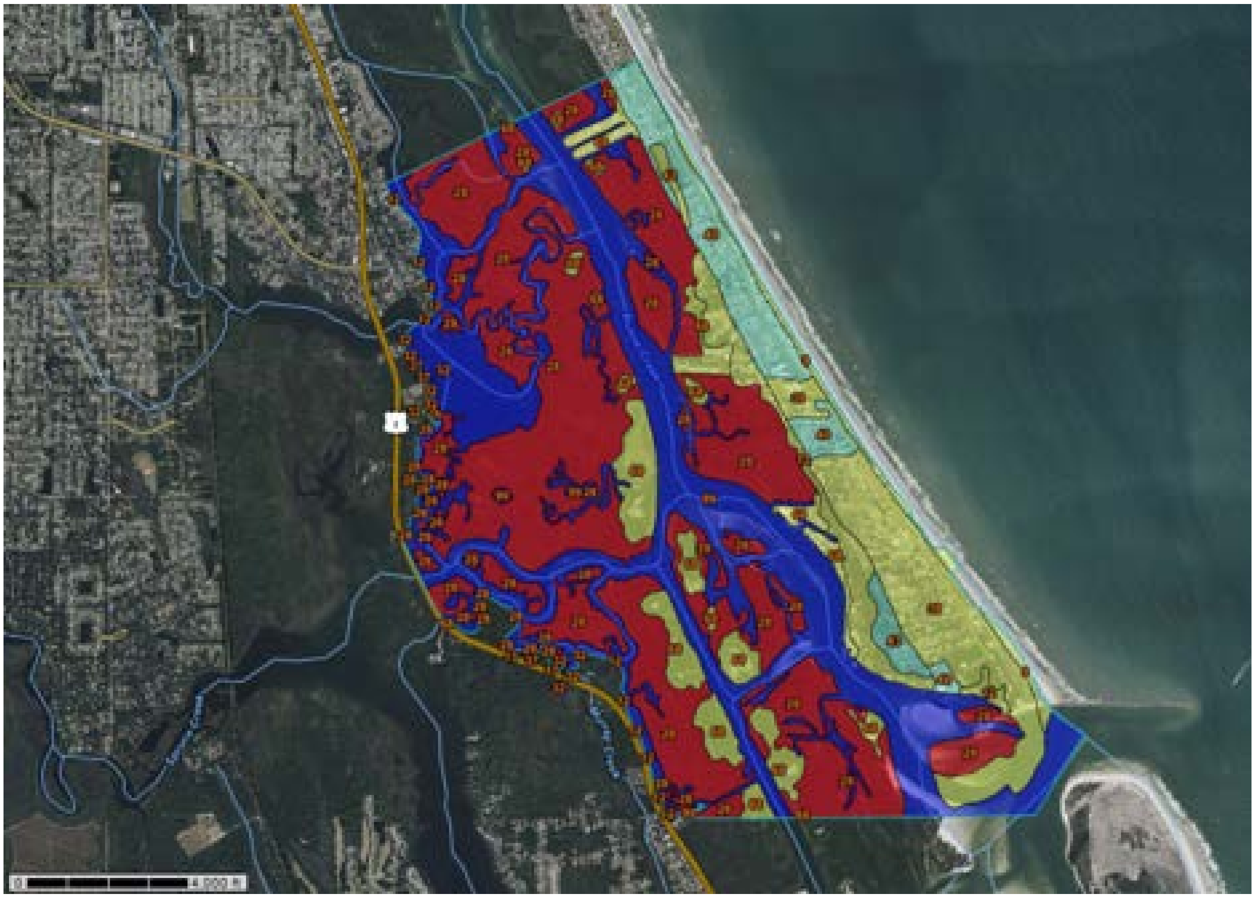


Figure 2. SSURGO Soil Map Units

Table 5. Depth to Water Table Summary By Soil Map Unit within Ponce Inlet

Map unit symbol	Map unit name	Depth to Water Table (inches)	Acres in Town	Percent of Town
9	Beaches	36	49.8	1.2%
12	Canaveral sand, 0 to 5 percent slopes	28	138.4	3.4%
13	Cassia fine sand, 0 to 2 percent slopes	29	<0.01	<0.01%
28	Hydraquents	4	1,665.3	40.7%
32	Myakka-Myakka, wet, fine sands, 0 to 2 percent slopes	10	0.5	<0.01%
37	Orsino fine sand, 0 to 5 percent slopes	48	0.1	<0.01%
39	Palm Beach sand, 0 to 8 percent slopes	30	343.0	8.4%
40	Palm Beach-Urban land-Paola complex, 0 to 8 percent slopes	43	216.5	5.3%
42	Paola fine sand, 0 to 8 percent slopes	30	11.7	0.3%
43	Paola fine sand, 8 to 17 percent slopes	54	34.2	0.8%
68	Turnbull variant sand	24	335.9	8.2%
99	Water	0	1,298.4	31.7%
Totals for Town of Ponce Inlet =			**4,093.7**	**100.0%**

Sea level rise projections

Based on the requirements as defined in Section 380.093, F.S., NOAA 2017[11] sea level rise projections utilized for this project are as follows:

- Year 2040 with sea level rise projected based on NOAA intermediate-low
- Year 2040 with sea level rise projected based on NOAA intermediate-high
- Year 2070 with sea level rise projected based on NOAA intermediate-low
- Year 2070 with sea level rise projected based on NOAA intermediate-high

Additionally, to satisfy CRS requirements projections for the year 2100 with sea level rise based on both the NOAA intermediate-low and intermediate-high were also determined.

Sea level changes for each of these six scenarios were estimated with the United States Army Corps of Engineers (USACE) Sea Level Change Curve Calculator[12] using the Daytona Beach tidal gauge since it is the closest station to Ponce Inlet. Relative sea level change estimated from year 2023 for each decade up to 2100 is summarized in **Table 6** for both projection curves, with the six scenarios that will be analyzed highlighted in green.

Table 6. Projected Relative Sea Level Rise Estimated from Year 2023

Year	NOAA 2017 INT-LOW (ft, NAVD88)	NOAA 2017 INT-HIGH (ft, NAVD88)
2023	0	0
2030	0.11	0.27
2040	**0.27**	**0.7**
2050	0.44	1.19
2060	0.6	1.82
2070	**0.77**	**2.51**
2080	0.93	3.33
2090	1.09	4.21
2100	**1.22**	**5.23**

Tidal datums

Mean Higher High Water (MHHW) tidal datum data were collected from NOAA's Tides and Currents for the two long-term tidal stations closest to Ponce Inlet: Station 8720218 Mayport (Bar Pilots Dock)[13] and Station 8721604 Trident Pier, Port Canaveral[14]. These two stations are both similarly far from Ponce Inlet, so the MHHW was interpolated between these two. Additionally, the published tidal datums are still limited to the previous tidal epoch (1983-2001), so the interpolated MHHW was also adjusted to include

[11] NOAA Technical Report NOS CO-OPS 083, Global and Regional Sea Level Rise Scenarios for the United States, 2017: https://tidesandcurrents.noaa.gov/publications/techrpt83_Global_and_Regional_SLR_Scenarios_for_the_US_final.pdf
[12] USACE Sea Level Change Curve Calculator (2022.72): https://cwbi-app.sec.usace.army.mil/rccslc/slcc_calc.html
[13] Mayport Station Home: https://ports.noaa.gov/stationhome.html?id=8720218
[14] Trident Pier Station Home: https://ports.noaa.gov/stationhome.html?id=8721604

observed sea level rise between 2001 and 2023 to establish a current year MHHW at Ponce Inlet for the Atlantic Ocean side of the town: **1.62 feet-NAVD88**.

Additionally, MHHW data were collected from NOAA stations along the Intracoastal Waterway (ICW)/Halifax River. Three stations were evaluated by Collective: 8721138 Halifax River, Ponce Inlet[15]; 8721147 Ponce De Leon Inlet South[16]; and 8720954 Ormond Beach, Halifax River[17]. MHHW for these three stations were similarly adjusted to current year (2023) based on observed sea level rise between 2001 and 2023 at the Mayport station. Table 7 summarizes the adjusted MHHW for each of these stations. Based on the period of record for the tidal datum analysis period, the Ponce De Leon Inlet South station is recommended for establishing MHHW along the ICW/Halifax River.

Table 7. MHHW Adjusted to Year 2023

Station Name	MHHW adjusted to 2023 (ft, NAVD88)
Halifax River, Ponce Inlet	1.21
Ponce De Leon Inlet South	**1.18**
Ormond Beach, Halifax River	0.18

Storm Surge

Storm surge flood elevations for all storm categories (tropical storm through Category 5 hurricane) were obtained from NOAA's National Weather Service (NWS) Seas, Lakes, and Overland Surges from Hurricanes (SLOSH) model simulations used to estimate storm surge heights. Specifically, the Maximum of Maximum Envelope of Water (or MOMs), which represents the maximum potential storm surge for each grid cell as simulated by the SLOSH model for each category.

Additionally, intermediate data submittals (IDS) were obtained by Ponce Inlet from FEMA associated with the coastal flood risk study completed in 2017, which included estimated still water elevation data for the 1-percent annual chance storm surge flooding throughout the Advanced Circulation (ADCIRC) model domain for Volusia County.

Land Use Data

Land Use data is derived and updated from the St. Johns River Florida Water Management District (SJRWMD) Land Cover Land Use (LCLU) data from 2014 as assembled by the FGDL. SJRWMD created the data by updating 2009 vector data using 2013-2016 aerial photography and classifying data with a version of the Florida Land Use, Cover and Forms Classification System (FLUCCS) originally created by the Florida Department of Transportation (FDOT). For Volusia County, imagery representing the December 2015 through March 2016 time frame were utilized. The data layer collected from FGDL reflect land use/land cover categories to level 3 of the FLUCCS classification system. **Figure 3** illustrates the major

[15] Halifax River, Ponce Inlet Station Home: https://ports.noaa.gov/stationhome.html?id=8721138
[16] Ponce De Leon Inlet South Station Home: https://ports.noaa.gov/stationhome.html?id=8721147
[17] Ormand Beach, Halifax River Station Home: https://ports.noaa.gov/stationhome.html?id=8720954

land use classifications, or level 1, within the Town limits. The majority of the Town consists of both water and wetland land use/land cover.

For future model simulations, the Town's future zoning and associated density limits will be utilized to reflect future development/redevelopment land use and associated impervious area throughout the Town. **Figure 4** reflects the Town's adopted future land use.

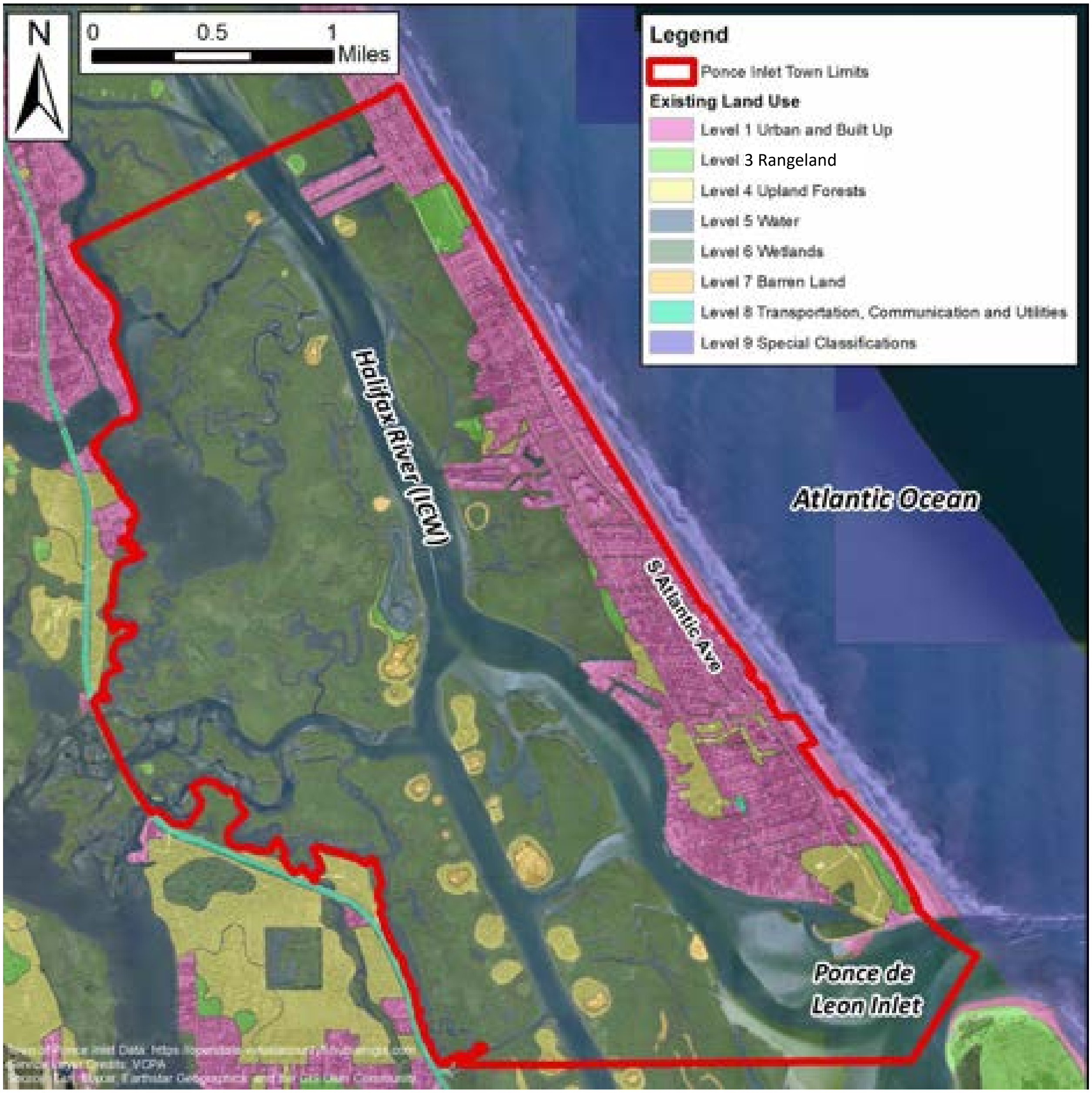


Figure 3. Current Land Use/Land Cover Level 1 Classifications

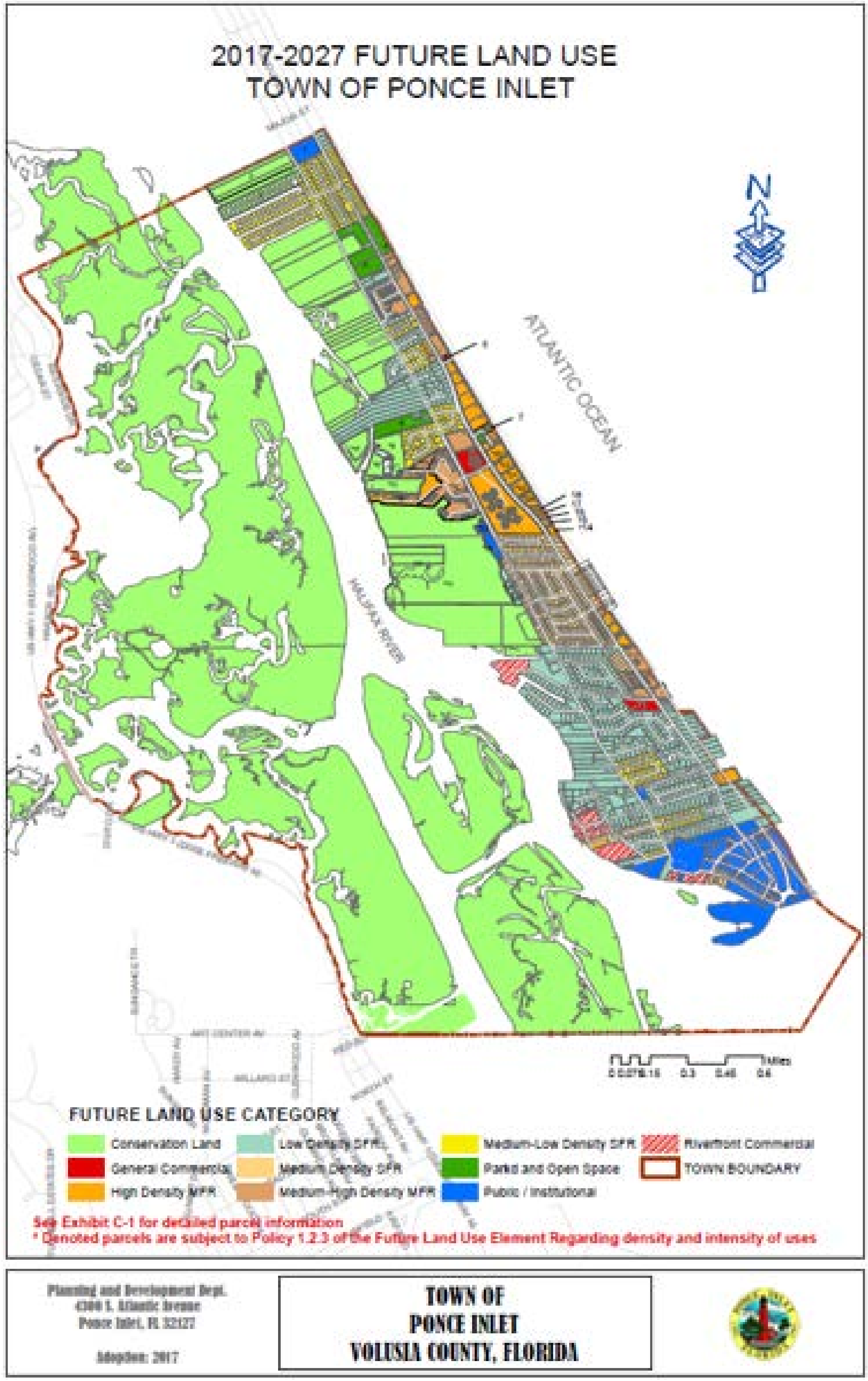


Figure 4. Adopted Future Land Use Categories

Appendix C

Task 2: Stormwater Model Development Technical Memorandum

Technical Memorandum

Ponce Inlet Watershed Master Plan and Flood Vulnerability Assessment

Subject:	**Task 2: Stormwater Model Development**
Date:	March 22, 2024 (Revised April 8, 2024)
To:	Mike Disher (Town of Ponce Inlet)
From:	Joel Jordan, P.E. (Collective Water Resources)
Copy to:	Hank Baker (Town of Ponce Inlet)
	Fred Griffith (Town of Ponce Inlet)
	Ami Pierce (Town of Ponce Inlet)
	Patty Rippey (Town of Ponce Inlet)

Collective Water Resources (Collective) developed a stormwater model using the Interconnected Pond and Routing, Version 4, (ICPR) model for the Town of Ponce Inlet (Town) as part of the Town's Watershed Master Plan and Flood Vulnerability Assessment. This is a deliverable under Task 2, Exposure Analysis, of an agreement between Collective and the Town for professional services to support the Town's *Resilient Florida Program* grant agreement 22PLN23 with the Florida Department of Environmental Protection (FDEP). The hydrologic and hydraulic model was developed to determine the potential flooding threat and impact on the Town's drainage system from existing and expected development, various long-duration rainfall events and projected sea level rise, and recommendations for future decision-making and mitigation of such events.

1. Introduction

The Town of Ponce Inlet is located on the south end of a barrier island in eastern Volusia County. It is bordered on the east by the Atlantic Ocean, the south by the Ponce de Leon Inlet, the west by U.S. Highway 1/North (N) Dixie Freeway, and the north by another coastal community, Wilbur by the Sea. The Halifax River (also referred to as the Intracoastal Waterway, or ICW) roughly bisects the Town limits from north to south and reflects the western edge of the developed portion of the Town. The Town location is shown in **Figure 1**.

The total Town area is about 4,093 acres of which about 852 acres are land areas and the remaining 3,241 acres are comprised of the Halifax River, marshes and spoil islands. The Town has 20 stormwater outfalls to the Halifax River with pipe diameters from 12-inches up to 48-inches. The

Town also has many exfiltration trenches with no positive outfall and closed lake systems. About 30-percent (%) of the Town's stormwater runoff drains to natural depressional areas.

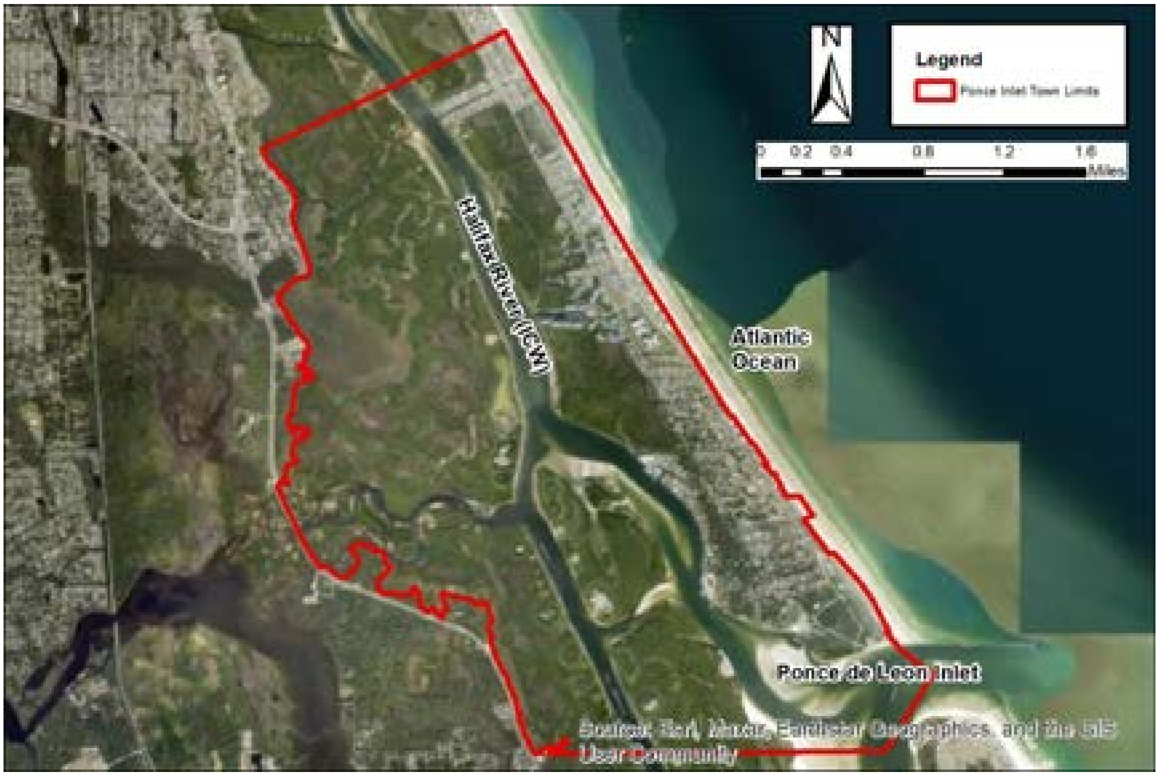


Figure 1. Ponce Inlet Town Limits

All the stormwater outfalls to the Halifax River, closed lake systems, and exfiltration systems are included in the ICPR model. Collective developed the ICPR model inputs using GIS ArcHydro tools. The model includes all data needed to simulate the Town's service area, including:

- Basins
- Nodes
- Links
- Cross-Sections
- All parameters for the above features.

2. Base Data

A more detailed description of the sources and processing of the base data used in the model development is provided in **Appendix B, *Task 1: Acquire Background Data*** technical memorandum prepared by Collective (July 2023, Revised March 2024). The base data is briefly described below.

Topography

2018 LiDAR-based digital elevation model (DEM) was obtained from the USGS and used to develop basin boundaries, flowpaths, surface storage stage/area relationships, and inter-basin surface overflows. The DEM topographic data is presented in **Figure 2**.

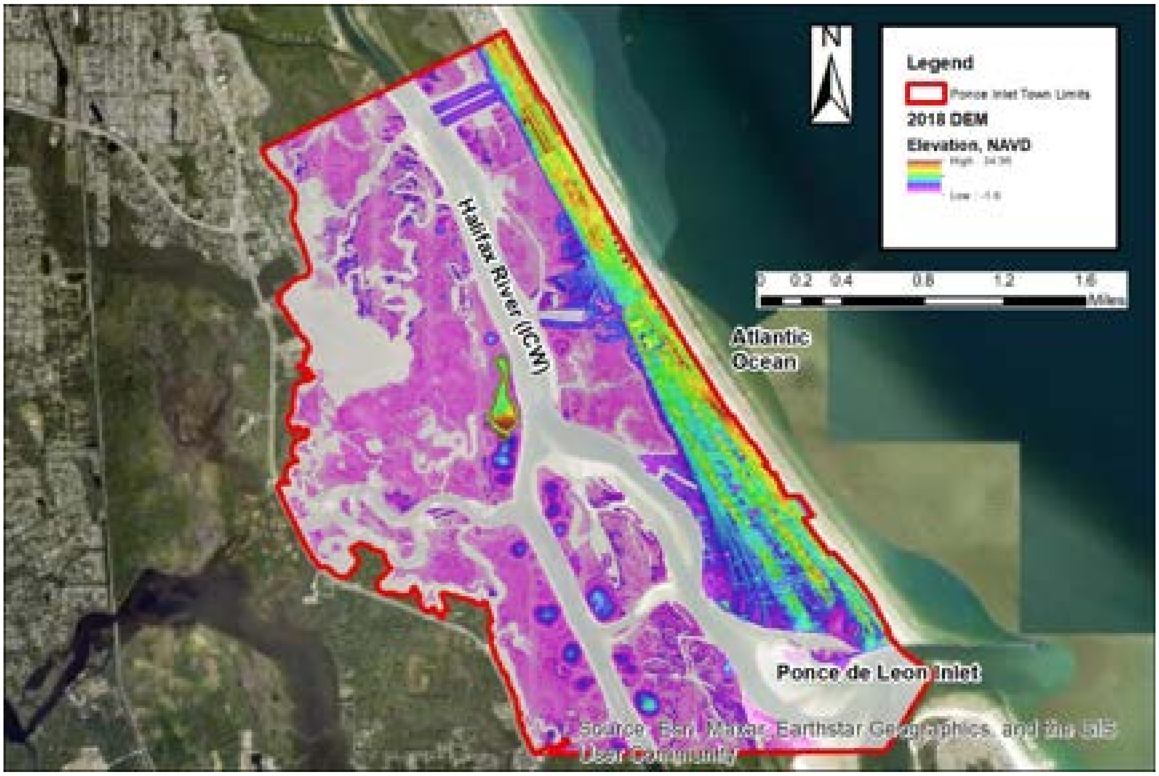


Figure 2. 2018 LiDAR-based DEM

Stormwater Infrastructure

Stormwater inventory CADD files provided by the Town and St. Johns River Water Management District (SJRWMD) Environmental Resource Permit (ERP) plan sets are the primary source of stormwater infrastructure data. These sources were supplemented by desktop evaluations using aerial imagery and field visits.

Land Use/Land Cover

Digital land use data was obtained from the SJRWMD (2014 data set) as assembled by the Florida Geographic Data Library (FGDL) and was manually updated using 2021 aerial imagery. The data set includes the Florida Department of Transportation (FDOT) Florida Land Use Class/Cover (FLUCCS) designations. FLUCCS codes for the following land uses in the Town include:

- 1100 Class series – Low Density Residential
- 1200 Class series – Medium Density Residential

- 1300 Class series – High Density Residential
- 1400 Class series – Commercial and Services
- 1700 Class series – Institutional/Governmental
- 1800 Class series – Recreational
- 1900 Class series – Open land
- 3000 Class series – Rangeland
- 4000 Class series – Upland Forests
- 5000 Class series – Water
- 6000 Class series – Wetlands
- 7000 Class series – Barren Land
- 8000 Class series – Transportation, Communication, and Utilities
- 9000 Class series – Special Classifications (Custom land uses)

Soils

Digital Soil Survey Geographic (SSURGO) data was obtained from the Web Soil Survey application provided by the Natural Resources Conservation Service (NRCS). The digital data includes various properties (conductivity, depth to groundwater, moisture content, etc.) that are used in the modeling effort.

Precipitation

National Oceanic and Atmospheric Administration (NOAA) Atlas 14, Volume 9, Version 2 was used to obtain rainfall volumes for selected design storm events. Measured rainfall data for Hurricane Ian and Nicole was also obtained from the SJRWMD for model verification purposes.

Tidal Datums

Mean Higher High Water (MHHW) tidal datum data was collected from NOAA's Tides and Currents for the two long-term tidal stations closest to Ponce Inlet: Station 8720218 Mayport (Bar Pilots Dock) and Station 8721604 Trident Pier, Port Canaveral. The MHHW was interpolated between the two stations and adjusted to account for recent sea level rise conditions to develop a 2023 MHHW elevation to represent current conditions for the Atlantic Ocean-side of the Town.

Additionally, the MHHW tidal datum data for Station 8721147 Ponce De Leon Inlet South was adjusted to 2023, based on historical sea rise at the Mayport station, to represent current conditions for the Halifax River/ICW.

Groundwater Data

Depth to water table data was obtained from the SSURGO dataset by soil map unit. The depths to water table, based on June to October (wet season) conditions, ranged from 0-inches (Water mapping units) to 6.6-feet (Paola fine sand, 8 to 17 percent slope, mapping unit).

Future Land Use/Land Cover

Future land use mapping, adopted for the 2017-2027 period, from the Town was used to update the existing land use data to future land use.

Sea Level Rise

Sea level rise projections utilized for this project are as follows:

- Year 2040 with sea level rise projected based on NOAA 2017 intermediate-low
- Year 2040 with sea level rise projected based on NOAA 2017 intermediate-high
- Year 2070 with sea level rise projected based on NOAA 2017 intermediate-low
- Year 2070 with sea level rise projected based on NOAA 2017 intermediate-high

Additionally, to satisfy Community Rating System (CRS) requirements for activity 450 projections for the year 2100 with sea level rise based on both the NOAA intermediate-low and intermediate-high were also determined. While a 2022 Sea Level Rise Technical Report has been published by NOAA and is the resource that should be selected according to CRS requirements, Section 380.093 F.S. requires the 2017 projections to be utilized for all Resilient Florida projects. In comparing the 2022 projections to 2017, both the intermediate-low and intermediate-high sea level rise projections are more conservative in the 2017 report.

3. Current Conditions Parameterization

3.1 Datums

The vertical datum used for the model is the North American Vertical Datum of 1988, or NAVD 1988. All data from the stormwater atlas, plans, permits, etc. was converted to this datum (NAVD = NGVD – 1.20 feet) where appropriate.

The datum conversion was obtained from the NOAA VDatum software datum conversion package. The study area is within four VDatum pixels, with over 90% of the Town in a single pixel which was used for conversion. The conversion factor was -1.204, which was rounded to -1.20.

3.2 Basins

Collective developed basins for the Town extents using the following datasets:

- 2018 LiDAR-derived DEM
- Town's stormwater atlas
- 2021 aerial imagery

- ERPs from the SJRWMD

The basins were developed taking into account the existing drainage system, closed basins with no outfall, and known flooding areas. The Town area is divided into 184 basins that included:

- 46 basins that discharge to stormwater systems with a positive outfall to the Halifax River/ICW
- 31 basins draining to exfiltration systems
- 7 closed basins with a lake/pond as the main collection point for runoff
- 46 closed basins with runoff collecting in well-defined depressions
- 37 basins with no defined drainage system and poorly defined depressional areas
- 9 basins that surface overflow to the ICW
- 8 basins that surface overflow to the Atlantic Ocean

Collective obtained flood complaint information from residents that was used to identify flooding problem areas where more detail was desired. The draft basins were reviewed with Town staff and modified as needed based on their input.

The basins are presented in **Figure 3**. Basin information (name, load point node, area, basin description) are provided in **Table 1**.

Figure 3. Stormwater Basins

Table 1. Basin Data

Basin Name	Node Name	Acres	Basin Description
B_Closed_100	N_Closed_100	11.46	Closed Basin - Drains to Depression
B_Closed_1000	N_Closed_1000	2.32	Closed Basin - Drains to Depression
B_Closed_1100	N_Closed_1100	8.96	Closed Basin - Drains to Depression
B_Closed_1200	N_Closed_1200	3.53	Closed Basin - Drains to Depression
B_Closed_1300	N_Closed_1300	3.95	Closed Basin - Drains to Depression
B_Closed_1400	N_Closed_1400	3.30	Closed Basin - Drains to Depression
B_Closed_1500	N_Closed_1500	1.74	Closed Basin - Drains to Depression
B_Closed_1600	N_Closed_1600	10.78	No Well-Defined Drainage System
B_Closed_1700	N_Closed_1700	2.31	Closed Basin - Drains to Depression
B_Closed_1800	N_Closed_1800	0.31	Closed Basin - Drains to Depression
B_Closed_1900	N_Closed_1900	1.37	Closed Basin - Drains to Depression
B_Closed_200	N_Closed_200	1.32	Closed Basin - Drains to Depression
B_Closed_2000	N_Closed_2000	0.90	Closed Basin - Drains to Depression
B_Closed_2100	N_Closed_2100	1.90	Closed Basin - Drains to Depression
B_Closed_2200	N_Closed_2200	5.86	Closed Basin - Drains to Depression
B_Closed_2300	N_Closed_2300	7.58	Closed Basin - Drains to Depression
B_Closed_2400	N_Closed_2400	6.66	Closed Basin - Drains to Depression
B_Closed_2500	N_Closed_2500	2.79	Closed Basin - Drains to Depression
B_Closed_2600	N_Closed_2600	1.22	Closed Basin - Drains to Depression
B_Closed_2700	N_Closed_2700	0.81	Closed Basin - Drains to Depression
B_Closed_2800	N_Closed_2800	6.47	Closed Basin - Drains to Depression
B_Closed_2900	N_Closed_2900	14.54	Closed Basin - Drains to Depression
B_Closed_300	N_Closed_300	0.76	Closed Basin - Drains to Depression
B_Closed_3000	N_Closed_3000	10.31	Closed Basin - Drains to Depression
B_Closed_3100	N_Closed_3100	1.65	Closed Basin - Drains to Depression

Basin Name	Node Name	Acres	Basin Description
B_Closed_3200	N_Closed_3200	5.59	Closed Basin - Drains to Depression
B_Closed_3300	N_Closed_3300	0.79	No Well-Defined Drainage System
B_Closed_3400	N_Closed_3400	2.99	No Well-Defined Drainage System
B_Closed_3500	N_Closed_3500	4.86	No Well-Defined Drainage System
B_Closed_3600	N_Closed_3600	4.05	Closed Basin - Drains to Depression
B_Closed_3700	N_Closed_3700	6.91	Closed Basin - Drains to Depression
B_Closed_3800	N_Closed_3800	0.64	Closed Basin - Drains to Depression
B_Closed_3900	N_Closed_3900	5.38	Closed Basin - Drains to Depression
B_Closed_400	N_Closed_400	1.35	No Well-Defined Drainage System
B_Closed_4000	N_Closed_4000	6.75	Closed Basin - Drains to Depression
B_Closed_4100	N_Closed_4100	0.84	Closed Basin - Drains to Depression
B_Closed_4200	N_Closed_4200	6.01	Closed Basin - Drains to Depression
B_Closed_500	N_Closed_500	2.03	Closed Basin - Drains to Depression
B_Closed_600	N_Closed_600	6.81	No Well-Defined Drainage System
B_Closed_700	N_Closed_700	5.48	No Well-Defined Drainage System
B_Closed_800	N_Closed_800	6.51	No Well-Defined Drainage System
B_Closed_900	N_Closed_900	21.18	Closed Basin - Drains to Depression
B_Exfil_100	N_Exfil_100	2.71	Closed Basin - Exfiltration System
B_Exfil_1000	N_Exfil_1000	0.56	Closed Basin - Exfiltration System
B_Exfil_1100	N_Exfil_1100	2.49	Closed Basin - Exfiltration System
B_Exfil_1200	N_Exfil_1200	0.56	Closed Basin - Exfiltration System
B_Exfil_1201	N_Exfil_1201	1.46	Closed Basin - Exfiltration System
B_Exfil_1400	N_Exfil_1400	1.44	Closed Basin - Exfiltration System
B_Exfil_1600	N_Exfil_1600	1.05	Closed Basin - Exfiltration System
B_Exfil_1700	N_Exfil_1700	0.85	Closed Basin - Exfiltration System
B_Exfil_1800	N_Exfil_1800	1.45	Closed Basin - Exfiltration System

Basin Name	Node Name	Acres	Basin Description
B_Exfil_2000	N_Exfil_2000	2.71	Closed Basin - Exfiltration System
B_Exfil_2002	N_Exfil_2002	6.49	Closed Basin - Exfiltration System
B_Exfil_2005	N_Exfil_2005	0.53	Closed Basin - Exfiltration System
B_Exfil_2100	N_Exfil_2100	2.44	Closed Basin - Exfiltration System
B_Exfil_2300	N_Exfil_2300	1.28	Closed Basin - Exfiltration System
B_Exfil_2400	N_Exfil_2400	0.77	Closed Basin - Exfiltration System
B_Exfil_2500	N_Exfil_2500	2.87	Closed Basin - Exfiltration System
B_EXfil_2600	N_EXfil_2600	2.56	Closed Basin - Exfiltration System
B_EXfil_2700	N_EXfil_2700	2.43	Closed Basin - Exfiltration System
B_EXfil_2800	N_EXfil_2800	1.10	Closed Basin - Exfiltration System
B_Exfil_300	N_Exfil_300	0.45	Closed Basin - Exfiltration System
B_Exfil_301	N_Exfil_301	1.64	Closed Basin - Exfiltration System
B_Exfil_500	N_Exfil_500	0.34	Closed Basin - Exfiltration System
B_Exfil_501	N_Exfil_501	0.89	Closed Basin - Exfiltration System
B_Exfil_502	N_Exfil_502	0.58	Closed Basin - Exfiltration System
B_Exfil_600	N_Exfil_600	1.93	Closed Basin - Exfiltration System
B_Exfil_700	N_Exfil_700	2.49	Closed Basin - Exfiltration System
B_Exfil_800	N_Exfil_800	8.20	Closed Basin - Exfiltration System
B_Exfil_900	N_Exfil_900	2.29	Closed Basin - Exfiltration System
B_ICW_100	N_ICW_100	3241.50	ICW (Halifax River)
B_Misc_100	N_Misc_100	3.29	No Well-Defined Drainage System
B_Misc_1000	N_Misc_1000	1.73	No Well-Defined Drainage System
B_Misc_1100	N_Misc_1100	3.44	Outfall to Halifax River
B_Misc_1200	N_Misc_1200	2.05	Outfall to Halifax River
B_Misc_1400	N_Misc_1400	1.17	Outfall to Halifax River
B_Misc_1500	N_Misc_1500	5.09	No Well-Defined Drainage System

Basin Name	Node Name	Acres	Basin Description
B_Misc_1600	N_Misc_1600	8.93	No Well-Defined Drainage System
B_Misc_1700	N_Misc_1700	3.56	No Well-Defined Drainage System
B_Misc_1800	N_Misc_1800	2.41	No Well-Defined Drainage System
B_Misc_1900	N_Misc_1900	1.79	No Well-Defined Drainage System
B_Misc_200	N_Misc_200	3.79	No Well-Defined Drainage System
B_Misc_2000	N_Misc_2000	6.37	Closed Basin - Drains to Depression
B_Misc_2100	N_Misc_2100	3.20	No Well-Defined Drainage System
B_Misc_2200	N_Misc_2200	3.19	No Well-Defined Drainage System
B_Misc_2300	N_Misc_2300	0.87	No Well-Defined Drainage System
B_Misc_2400	N_Misc_2400	0.40	Closed Basin - Drains to Depression
B_Misc_2500	N_Misc_2500	1.27	Closed Basin - Drains to Depression
B_Misc_2600	N_Misc_2600	2.18	No Well-Defined Drainage System
B_Misc_300	N_Misc_300	1.10	No Well-Defined Drainage System
B_Misc_400	N_Misc_400	4.76	No Well-Defined Drainage System
B_Misc_500	N_Misc_500	2.00	No Well-Defined Drainage System
B_Misc_600	N_Misc_600	14.80	No Well-Defined Drainage System
B_Misc_700	N_Misc_700	6.71	No Well-Defined Drainage System
B_Misc_800	N_Misc_800	1.64	No Well-Defined Drainage System
B_Misc_900	N_Misc_900	0.98	No Well-Defined Drainage System
B_OceanFront_010	N_Ocean_000	5.18	Surface Overflow to Atlantic Ocean
B_OceanFront_020	N_Ocean_000	6.85	Surface Overflow to Atlantic Ocean
B_OceanFront_030	N_Ocean_000	11.16	Surface Overflow to Atlantic Ocean
B_OceanFront_040	N_Ocean_000	6.57	Surface Overflow to Atlantic Ocean
B_OceanFront_050	N_Ocean_000	1.39	Surface Overflow to Atlantic Ocean
B_OceanFront_060	N_Ocean_000	5.71	Surface Overflow to Atlantic Ocean
B_OceanFront_070	N_Ocean_000	2.63	Surface Overflow to Atlantic Ocean

Basin Name	Node Name	Acres	Basin Description
B_OceanFront_080	N_Ocean_000	1.28	Surface Overflow to Atlantic Ocean
B_Outfall_100	N_Outfall_100	2.64	Outfall to Halifax River
B_Outfall_1010	N_Outfall_1010	2.07	Outfall to Halifax River
B_Outfall_1100	N_Outfall_1100	0.59	Outfall to Halifax River
B_Outfall_1110	N_Outfall_1110	3.94	Outfall to Halifax River
B_Outfall_1200	N_Outfall_1200	15.22	Outfall to Halifax River
B_Outfall_1300	N_Outfall_1300	6.42	Outfall to Halifax River
B_Outfall_1400	N_Outfall_1400	6.24	Outfall to Halifax River
B_Outfall_1500	N_Outfall_1500	0.26	Outfall to Halifax River
B_Outfall_1510	N_Outfall_1510	3.76	Outfall to Halifax River
B_Outfall_1600	N_Outfall_1600	0.70	Outfall to Halifax River
B_Outfall_1610	N_Outfall_1610	2.57	No Well-Defined Drainage System
B_Outfall_1620	N_Outfall_1620	6.22	Closed Basin - Drains to Depression
B_Outfall_1800	N_Outfall_1800	11.42	Outfall to Halifax River
B_Outfall_1810	N_Outfall_1810	0.94	Outfall to Halifax River
B_Outfall_1820	N_Outfall_1820	1.21	Outfall to Halifax River
B_Outfall_1900	N_Outfall_1900	2.18	Closed Basin - Exfiltration System
B_Outfall_1902	N_Outfall_1902	2.89	Closed Basin - Exfiltration System
B_Outfall_200	N_Outfall_200	3.46	Outfall to Halifax River
B_Outfall_2000	N_Outfall_2000	3.65	Outfall to Halifax River
B_Outfall_2100	N_Outfall_2100	0.46	Outfall to Halifax River
B_Outfall_2110	N_Outfall_2110	19.47	Outfall to Halifax River
B_Outfall_2130	N_Outfall_2130	1.35	Outfall to Halifax River
B_Outfall_2200	N_Outfall_2200	1.45	Outfall to Halifax River
B_Outfall_2400	N_Outfall_2400	0.16	Outfall to Halifax River
B_Outfall_2410	N_Outfall_2410	1.51	Outfall to Halifax River

Basin Name	Node Name	Acres	Basin Description
B_Outfall_2500	N_Outfall_2500	6.50	Closed Basin - Drains to Depression
B_Outfall_2600	N_Outfall_2600	9.32	Closed Basin - Drains to Depression
B_Outfall_2610	N_Outfall_2610	4.34	Closed Basin - Drains to Depression
B_Outfall_2700	N_Outfall_2700	5.31	Outfall to Halifax River
B_Outfall_2800	N_Outfall_2800	5.78	Outfall to Halifax River
B_Outfall_300	N_Outfall_300	0.72	Closed Basin - Drains to Lake/Pond
B_Outfall_3000	N_Outfall_3000	5.83	Closed Basin - Exfiltration System
B_Outfall_310	N_Outfall_310	1.17	Closed Basin - Drains to Lake/Pond
B_Outfall_3100	N_Outfall_3100	8.30	Outfall to Halifax River
B_Outfall_3110	N_Outfall_3110	2.38	Outfall to Halifax River
B_Outfall_3120	N_Outfall_3120	2.61	Outfall to Halifax River
B_Outfall_3130	N_Outfall_3130	5.53	Outfall to Halifax River
B_Outfall_3140	N_Outfall_3140	1.97	Outfall to Halifax River
B_Outfall_320	N_Outfall_320	1.72	Closed Basin - Drains to Lake/Pond
B_Outfall_3200	N_Outfall_3200	4.41	Outfall to Halifax River
B_Outfall_3300	N_Outfall_3300	25.10	Closed Basin - Drains to Depression
B_Outfall_3310	N_Outfall_3310	5.36	Closed Basin - Drains to Depression
B_Outfall_3600	N_Outfall_3600	4.66	Outfall to Halifax River
B_Outfall_3700	N_Outfall_3700	1.18	No Well-Defined Drainage System
B_Outfall_3800	N_Outfall_3800	1.21	Outfall to Halifax River
B_Outfall_3900	N_Outfall_3900	0.85	Outfall to Halifax River
B_Outfall_3910	N_Outfall_3910	0.69	Outfall to Halifax River
B_Outfall_400	N_Outfall_400	2.64	Closed Basin - Drains to Lake/Pond
B_Outfall_4000	N_Outfall_4000	0.48	Outfall to Halifax River
B_Outfall_4100	N_Outfall_4100	8.18	Outfall to Halifax River
B_Outfall_500	N_Outfall_500	5.48	Outfall to Halifax River

Basin Name	Node Name	Acres	Basin Description
B_Outfall_600	N_Outfall_600	1.54	Outfall to Halifax River
B_Outfall_610	N_Outfall_610	1.83	Outfall to Halifax River
B_Outfall_620	N_Outfall_620	4.08	Outfall to Halifax River
B_Outfall_630	N_Outfall_630	2.08	Outfall to Halifax River
B_Outfall_640	N_Outfall_640	2.43	Outfall to Halifax River
B_Outfall_700	N_Outfall_700	1.34	Outfall to Halifax River
B_Outfall_800	N_Outfall_800	5.99	Closed Basin - Drains to Lake/Pond
B_Outfall_810	N_Outfall_810	2.60	Closed Basin - Drains to Lake/Pond
B_Outfall_900	N_Outfall_900	4.16	Closed Basin - Drains to Lake/Pond
B_RiverFront_010	N_ICW_100	4.83	Surface Overflow to Halifax River
B_RiverFront_020	N_ICW_100	9.75	Surface Overflow to Halifax River
B_RiverFront_030	N_ICW_100	4.49	Surface Overflow to Halifax River
B_RiverFront_040	N_RiverFront_040	1.14	No Well-Defined Drainage System
B_RiverFront_050	N_ICW_100	61.15	Surface Overflow to Halifax River
B_RiverFront_060	N_RiverFront_060	3.76	No Well-Defined Drainage System
B_RiverFront_070	N_RiverFront_070	8.08	No Well-Defined Drainage System
B_RiverFront_080	N_ICW_100	9.17	Surface Overflow to Halifax River
B_RiverFront_090	N_RiverFront_090	4.99	Outfall to Halifax River
B_RiverFront_100	N_ICW_100	26.95	Surface Overflow to Halifax River
B_RiverFront_110	N_ICW_100	6.09	Surface Overflow to Halifax River
B_RiverFront_120	N_RiverFront_120	21.15	No Well-Defined Drainage System
B_RiverFront_130	N_RiverFront_130	2.63	No Well-Defined Drainage System
B_RiverFront_140	N_RiverFront_140	6.61	Closed Basin - Drains to Depression
B_RiverFront_150	N_RiverFront_150	14.13	Closed Basin - Drains to Depression
B_RiverFront_160	N_RiverFront_160	5.23	Closed Basin - Drains to Depression
B_RiverFront_170	N_RiverFront_170	6.35	No Well-Defined Drainage System

Basin Name	Node Name	Acres	Basin Description
B_RiverFront_180	N_RiverFront_180	3.87	No Well-Defined Drainage System
B_RiverFront_190	N_RiverFront_190	5.14	Surface Overflow to Halifax River
B_RiverFront_200	N_ICW_100	14.66	No Well-Defined Drainage System

3.3 Impervious Area

The Town provided Collective with CADD files that included the approximate footprints/limits for the following layers:

- Streets and roads
- Buildings
- Sidewalks
- Curbs
- Parking lots
- Other paved areas
- Water bodies
- Other infrastructure

This data was converted to GIS feature classes and the 2021 aerials were used to update the data as needed. The impervious area (IA) features were then assigned either "DCIA" or "NDCIA" as appropriate:

- Directly Connected Impervious Area (DCIA) – Impervious area that drains directly to a stormwater management system (roads with curb & gutter/inlets, paved areas with inlets, etc.).
- Non-Directly Connected Impervious Area (NDCIA) Impervious area that does not directly connect to a stormwater system (no local stormwater system, flows over grassed/natural areas before reaching a stormwater system or collection point).

The IA data was used to develop representative IA/DCIA data for each land uses listed in Section 2. Waterbodies and wetlands were assigned IA and DCIA values of 0% and designated as 100% direct, which applies rainfall directly to the basin outlet.

3.4 Time of Concentration

The NRCS TR55 methodology was used to develop the Time of Concentration (TOC) values for each of the basins in the study area. The TOC is the time it takes for runoff to reach the collection point from the farthest point of the basin. A minimum TOC value of 10 minutes was assigned to the basins as suggested by NRCS guidelines.

3.5 Unit Hydrograph

The NRCS unit hydrograph method is used for the study area. The UH100 unit hydrograph was assigned to undeveloped areas and UH256 was assigned to developed areas.

3.6 Rainfall Excess Method

The Green-Ampt (GA) rainfall excess method was used to simulate the quantity of runoff generated by storm events. The NRCS soils data was used to develop the GA parameters used by ICPR. The GA required data includes:

- Soils zone name
- Vertical Conductivity (K_{v}) Saturated, feet/day
- Moisture Content - Saturated, decimal
- Moisture Content - Residual, decimal
- Moisture Content - Initial, decimal
- Moisture Content - Field, decimal
- Moisture Content - Wilting, decimal
- Pore Size Index, decimal
- Bubble Pressure, inches
- Depth to Water Table - Initial, feet

These parameters were included in or derived from the SSURGO database.

The K_v relates to how fast water can infiltrate into the soil column and the other parameters relate to how much water storage space is available in the soil column.

3.7 Design Storms

Collective gathered precipitation data related to five (5) design storms based on the SJRWMD ERP requirements and floodplain analysis procedures, the Town's Stormwater and Conservation General Code of Ordinances requirements, and CRS WMP guidelines. These are summarized in **Table 2** below.

Table 2. Ponce Inlet Precipitation Frequency Estimates (NOAA Atlas 14, Volume 9, Version 2)

Recurrence Interval, Duration	Precipitation Estimate with 90% Confidence Intervals (in inches)
10-year, 24-hour	**7.40** (6.08-9.00)
25-year, 24-hour	**9.46** (7.65-12.2)
25-year, 4-day	**12.1** (9.94-15.5)
100-year, 24-hour	**13.2** (10.0-17.7)
100-year, 4-day	**16.9** (13.0-22.4)

More information about the development and design storm analysis is provided in Section 4 of the **Appendix B, *Task 1: Acquire Background Data*** technical memorandum.

3.8 Storage

The 2018 DEM was used to develop the storage stage/area relationships for the load point nodes in the model. The ArcHydro Drainage Area Calculation (DAC) tool was used to determine the area at elevations in 0.1-foot increments. These storage relationships allow the model to calculate the inundation depth and extent for the storm events.

For nodes connected to pipes, the stage/area relationship produced by the DAC tool was manually adjusted to set the minimum elevation at the invert of the lowest connecting pipe and the associated area at 0.00065 acre, equivalent to a 6-feet diameter manhole.

For the two ponds where drawdown may occur, areas below the normal water line were estimated to be able to simulate the ponds pumped down prior to an expected storm event.

3.9 Initial Water Levels/Stages

The initial water levels/stages were determined by the type of stormwater system containing the model node.

For each lake and pond node, the initial water level was set to the bleed-down device elevation of the control structure obtained from the CADD files or ERP plans.

For each conveyance system node that is part of stormwater system discharging to the ICW, the initial stage was set to the higher of the lowest connecting conduit or the ICW boundary condition.

For a node part of an exfiltration system, the initial stage was set to the bottom of the gravel-filled trench.

For a node part of systems discharging to a pond without a discharge, the initial stage was set to the higher of the pond initial water level or the invert of the lowest connecting pipe.

For a node representing a depressional closed basin, the initial stage was set to the lowest elevation in the basin as determined by DAC tool.

3.10 Boundary Conditions

Boundary conditions were developed for the Atlantic Ocean and the ICW (Halifax River) and are provided below in **Tables 3** and **4** for the years 2023, 2040, 2070, and 2100.

Table 3. Atlantic Ocean Boundary Conditions

	MHHW (ft, NAVD88)	
Year	**Intermediate-Low (ft, NAVD88)**	**Intermediate-High (ft, NAVD88)**
2023	1.62	1.62
2040	1.89	2.32
2070	2.39	4.13
2100	2.84	6.85

Table 4. Halifax River Boundary Conditions

	MHHW (ft, NAVD88)	
Year	**Intermediate-Low (ft, NAVD88)**	**Intermediate-High (ft, NAVD88)**
2023	1.18	1.18
2040	1.45	1.88
2070	1.95	3.69
2100	2.40	6.41

More information about the development of the boundary conditions is provided in Section 4 of the **Appendix B, *Task 1: Acquire Background Data*** technical memorandum.

3.11 Hydraulic Infrastructure

A model schematic of the hydraulic features was developed that includes the primary stormwater system and its major components, including pipes, drop structures, exfiltration systems, structural weirs, swales, and surface overflow weirs. The exfiltration system and swale links also include associated percolation links to simulate the runoff infiltrating to groundwater. These model components are described in more detail below and shown in **Figure 4**. For clarity, the percolation links are not shown in the figure.

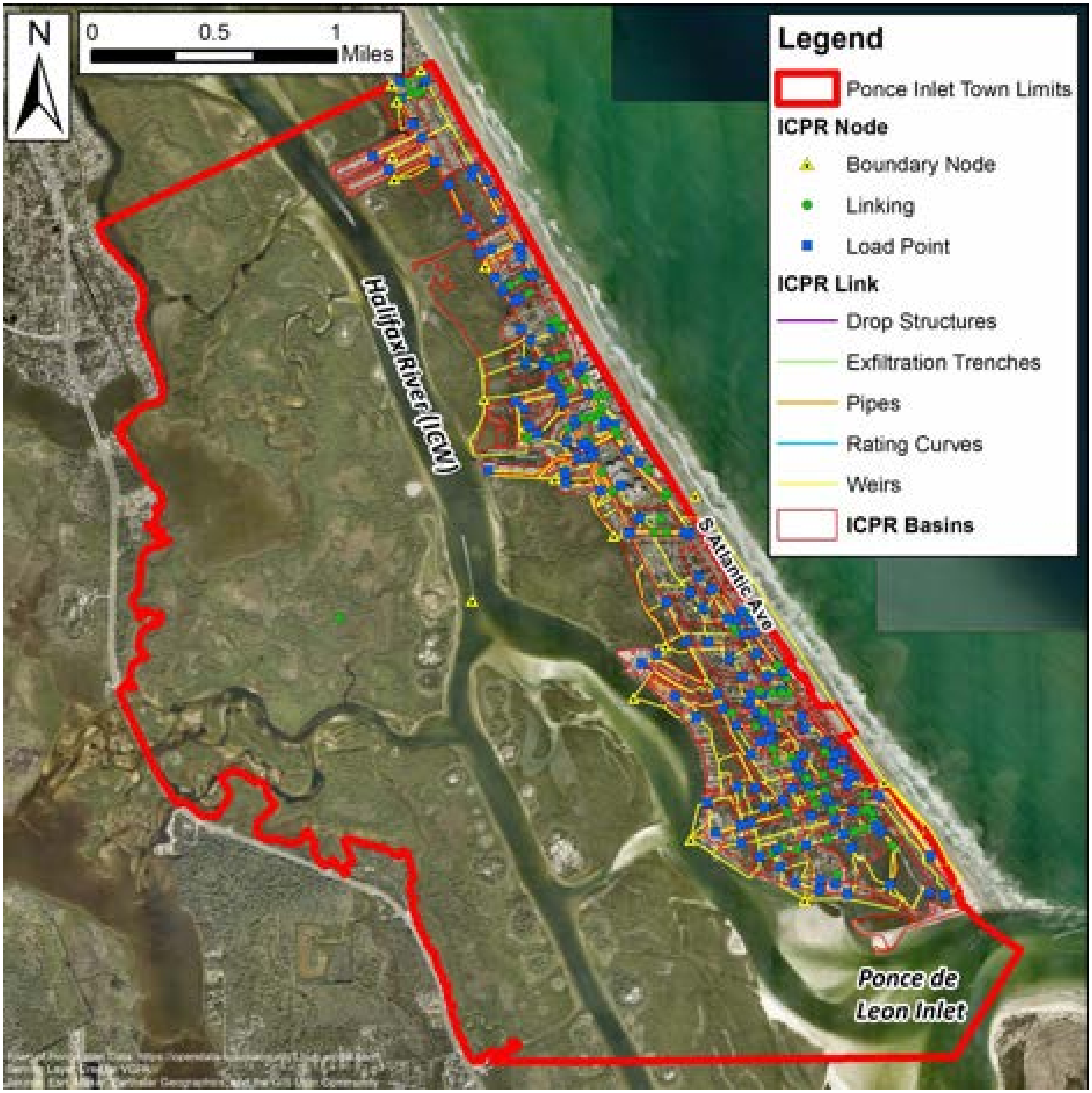


Figure 4. Model Schematic

Pipes

The Ponce Inlet model includes 57 pipe links that comprise the stormwater outfalls within the town. Physical characteristics for these pipes was obtained from the CADD files and ERPs. Pipe data included:

- Diameter (width and height)
- Shape - circular and elliptical are used in Ponce Inlet

- Upstream and downstream inverts
- Length
- Roughness - FDOT Drainage Manual values of 0.012 for concrete and HDPE and 0.024 for CMP were used.
- Entrance and exit losses

Structural Weirs

Structural weirs are used to control flow in/out of a hydraulic feature. Examples include a weir to control outflow of a pond/lake and a weir inside a manhole/junction box that forces water to raise to the weir crest elevation before existing the manhole. Structural weir data includes:

- Weir shape
    - Rectangular
    - Circular (orifices)
- Weir Type
    - Horizontal (typical grate inlets)
    - Sharp
- Span (inches)
- Rise (inches)
- Invert elevation
- Control elevation – typically same as invert unless an elbow type bleed down device is used
- Discharge coefficient (the typical value of 3.1 was used)
- Orientation
    - Horizontal
    - Sharp crested, vertical

The Ponce Inlet ICPR model includes 21 structural weir links. A control structure may contain multiple weirs.

Drop Structures

Drop structures combine weir(s) and pipe(s) in a single model component. Drop structures typically represent control structures or inlets. A drop structure may include multiple weirs such as a bleed down opening and a main overflow weir. Physical characteristics for these links were obtained from the CADD files and ERPs. The ICPR model includes 15 drop structure links.

Exfiltration Systems

Exfiltration systems are comprised of perforated pipes surrounded by a gravel-filled trench. Runoff enters the system by inlet(s) and is distributed to the trench gravel by the perforated pipes. The volume stored in the trench percolates over time to the surrounding soils. The exfiltration system may have a pop off to an outfall system. The exfiltration trench parameterization data includes the pipe data described above and:

- Trench width
- Trench length
- Trench height
- Gravel porosity
- Trench depth below invert

Trench configurations were available for only a few of the exfiltration systems. The data from those was used to estimate trench parameters for the others.

An exfiltration link within ICPR will only store the runoff contained within the pipes and trench. To simulate exfiltration, a percolation link was added for each exfiltration link. The percolation links require:

- Aquifer base elevation – set at -50 feet NAVD88; determined from U.S. Geological Survey (USGS) Digital Surfaces and Thicknesses of Selected Hydrologic Units of the Floridan Aquifer System, Data Series 926 (2015)
- Horizontal and vertical conductivities – determined from SSURGO data
- Water table elevation – established from permit data
- Layer thickness (bottom of trench minus water table elevation)
- Fillable porosity – assumed 0.25 per ICPR guidance
- Annual recharge rate – set to zero; USGS Water Resource Investigation report 90-4069 (Geology, Hydrology, and Water Quality of the Surficial Aquifer System in Volusia County, Florida, 1990) reports very low upward leakage from the Upper Floridian aquifer to the surficial system
- The perimeter of the groundwater mound – per ICPR guidance

Percolation links are typically used for long-term simulations or for estimating drawdown rather than for estimating peak stages. However, due to the high infiltration capacities of soils in the Town, percolation in the swales and exfiltration systems have a significant impact on reducing peak stages after rainfall events.

The Ponce Inlet ICPR model includes 129 percolation links.

Surface Overflow Weirs

Surface overflow weirs (SOWs) are used to simulate surface overflow from one basin to an adjacent basin. Surface overflow weirs are added for any location where flow is expected across a basin boundary. A model with the initial SOWs is run and a draft floodplain raster is produced and reviewed. A SOW is added for any location where a floodplain abuts a basin boundary that does not already have a SOW.

The SOWs require the same parameterization data as other weirs, plus a cross-section representing the basin segment where overflow may occur. The SOW cross-section is produced by converting the basin polygon to line segments. The GIS Stack Profile tool is then used to produce station/elevation data for the line segment cross-section.

The Ponce Inlet ICPR model includes 335 surface overflow links.

4. Model Verification

Collective worked with the Town to develop flood complaint forms related to Hurricanes Ian and Nicole which occurred in the fall of 2022. The forms were made available online at distributed at public meetings. Over 40 forms were returned by residents that provided varying degrees of flood information for the two hurricanes as well as other storm events. The information included flooding descriptions, pictures, and video. The locations of these flooding complaints are illustrated in **Figure 5**. The majority of the flooding complaints are from the low areas in the southwest portion of the Town near the Halifax River and the topographic troughs running north/south through the town south of Loggerhead Court.

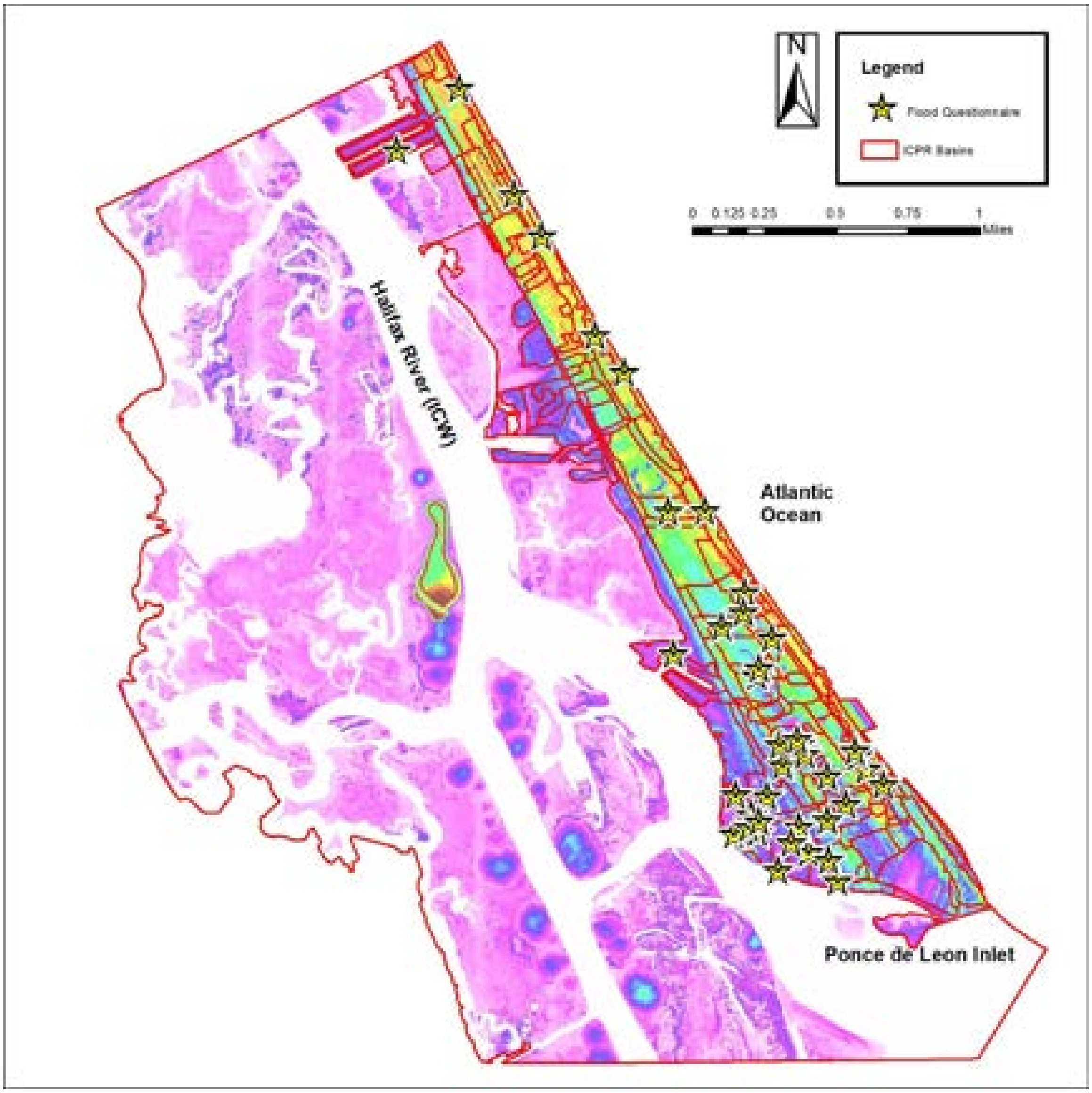


Figure 5. Returned Flood Questionnaire Locations

Collective obtained 15-minute measured rainfall from SJRWMD for data station 18073682 Ponce Inlet Weather Site at US Coast Guard Station and NOAA tidal data for both Hurricanes Ian (September/October 2022) and Nicole (November 2022) and simulated them with the ICPR model to compare the results to the reported flooding. Of the two hurricanes, only Ian produced significant rainfall (19.55 inches) which had a return period greater than 100 years. The rainfall associated with Hurricane Nicole was equivalent to a return period of less than 2 years, and ultimately was not used for ICPR model verification.

In addition to the complaint forms, Collective reviewed the design storm results with Town staff to obtain feedback on the reasonableness of the predicted flooded areas. Collective also drove portions of the Town after storms to obtain information on flooding for smaller, more frequent storm events.

Model parameters were modified to obtain reasonable matches between the observed and simulated data. Both hydrologic and hydraulic parameters were modified during the verification process as described below.

Hydrologic Adjustments

Three different types of hydrologic parameters were modified to either adjust the amount of runoff simulated by ICPR for Hurricane Ian. All modifications were within the reasonable ranges for the specific parameters adjusted.

Impervious Area (IA)/Directly Connected Impervious Area (DCIA) by Land Use

The developed land uses were further broken down by whether the land use had significant DCIA from storm sewered roads or inlets connected to culverts. For example, FLUCCS 1201 (medium density land use with little/no DCIA) and FLUCCS 1202 (medium density land use with significant DCIA). These changes had impacts study area wide and produced simulated results more closely matching observed data. The final land use and IA/DCIA values are provided in **Table 5**.

Table 5. Existing Land Use and Impervious Area

FLUCCS	Land Use Description	IA (%)	DCIA (%)
1101	Low Density Residential, low DCIA	20	1
1102	Low Density Residential, high DCIA	26	10
1201	Medium Density Residential, low DCIA	36	0
1202	Medium Density Residential, high DCIA	39	13
1301	High Density Residential, low DCIA	49	0
1302	High Density Residential, high DCIA	53	41
1303	High Density Residential, high DCIA, 2.5" initial abstraction	53	41
1401	Commercial, low DCIA	44	0
1402	Commercial, high DCIA	57	51
1701	Institutional, low DCIA	30	9
1702	Institutional, high DCIA	34	26

FLUCCS	Land Use Description	IA (%)	DCIA (%)
1810	Swimming Beach	2	0
1820	Golf Courses	6	2
1840	Marinas and Fish Camps	50	14
1900	Open Land	2	1
3200	Shrub & Brushland	0	0
3300	Mixed Rangeland	0	0
4200	Upland Hardwood Forests	4	0
4340	Hardwood Coniferous Mixed	0	0
5100	Stream & Waterways	0	0
5300	Reservoirs	0	0
5400	Bays & Estuaries	0	0
5430	Enclosed Saltwater Ponds Within a Salt Marsh	0	0
6120	Mangrove Swamps	0	0
6420	Saltwater Marshes	0	0
6460	Treeless Hydric Savanna	0	0
6500	Non-Vegetated Wetlands	0	0
7430	Spoil Areas	0	0
8140	Roads & Highways	99	0
8180	Auto Parking Facilities	64	63
8330	Water Supply Plants	32	0
9000	Custom Land Use (swales)	100	100

FLUCCS 1303 was added to account for a condo area with a local exfiltration system that was not practical to add to the model, given no data were available. Since the exfiltration system was not explicitly modeled, 2.5-inches of initial abstraction (surface depressional storage that does not contribute to runoff) was used to account for runoff stored in the exfiltration system.

FLUCCS 9000 is a custom land use for the roadside swales along Atlantic Avenue. The swales have percolation links, so the IA and DCIA were both set to 100% to avoid double counting for infiltration. The land use classes used for existing conditions are illustrated in **Figure 6**.

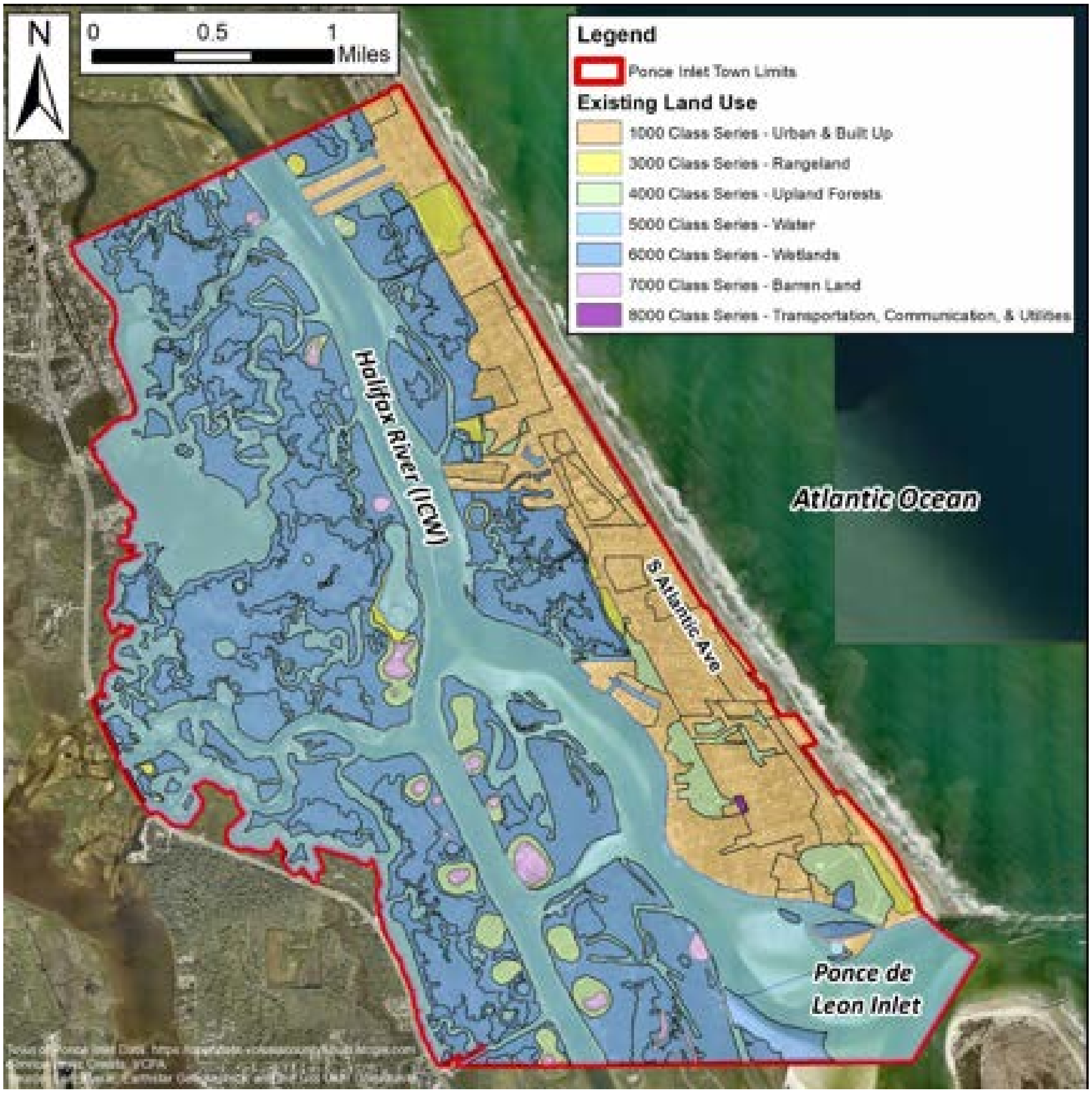


Figure 6. Updated Existing Conditions Land Use Classes

Hydraulic Conductivity (Kv)

The hydraulic conductivity values for some swales and exfiltration systems were increased to better simulate the ponding extent observed from smaller storm events.

Green-Ampt Depth to Water Table

The depth to water table parameter was increased for several of the soil types to account for the local soils seemingly able to store more runoff than the initial analysis of the NRCS SSURGO data indicated. Water table elevations were established for the same June through October time period, but only the first 200 centimeters of the soil column was included as well as eliminating soil components that are less than 5-percent of the soil unit. This parameter change was made during the Ian storm evaluation and produced flooding more closely matching observed extents.

Hydraulic Adjustments

Rating curves were included in the model to simulate the two portable pumps the Town uses on an as-needed basis to drawdown pond systems. Rating curve parameterization includes:

- On/off elevation
- Rating curve data (head vs flow)

The portable pumps are used at ponds along Inlet Point Boulevard and Beach Street. The Town provided pumping rates (500 to 800 gallons per minute) and that the pumps were used to drawdown the ponds before Hurricane Ian and continued running after the storm until the ponds returned to their normal water levels.

Verification of Results

The overall Hurricane Ian floodplain is provided in **Figure 7**. The figure also reflects how well simulated floodplain extents and depths compare against the collected flood reports. A discussion of the simulated Hurricane Ian floodplain compared to the citizen and Town officials reporting is provided below.

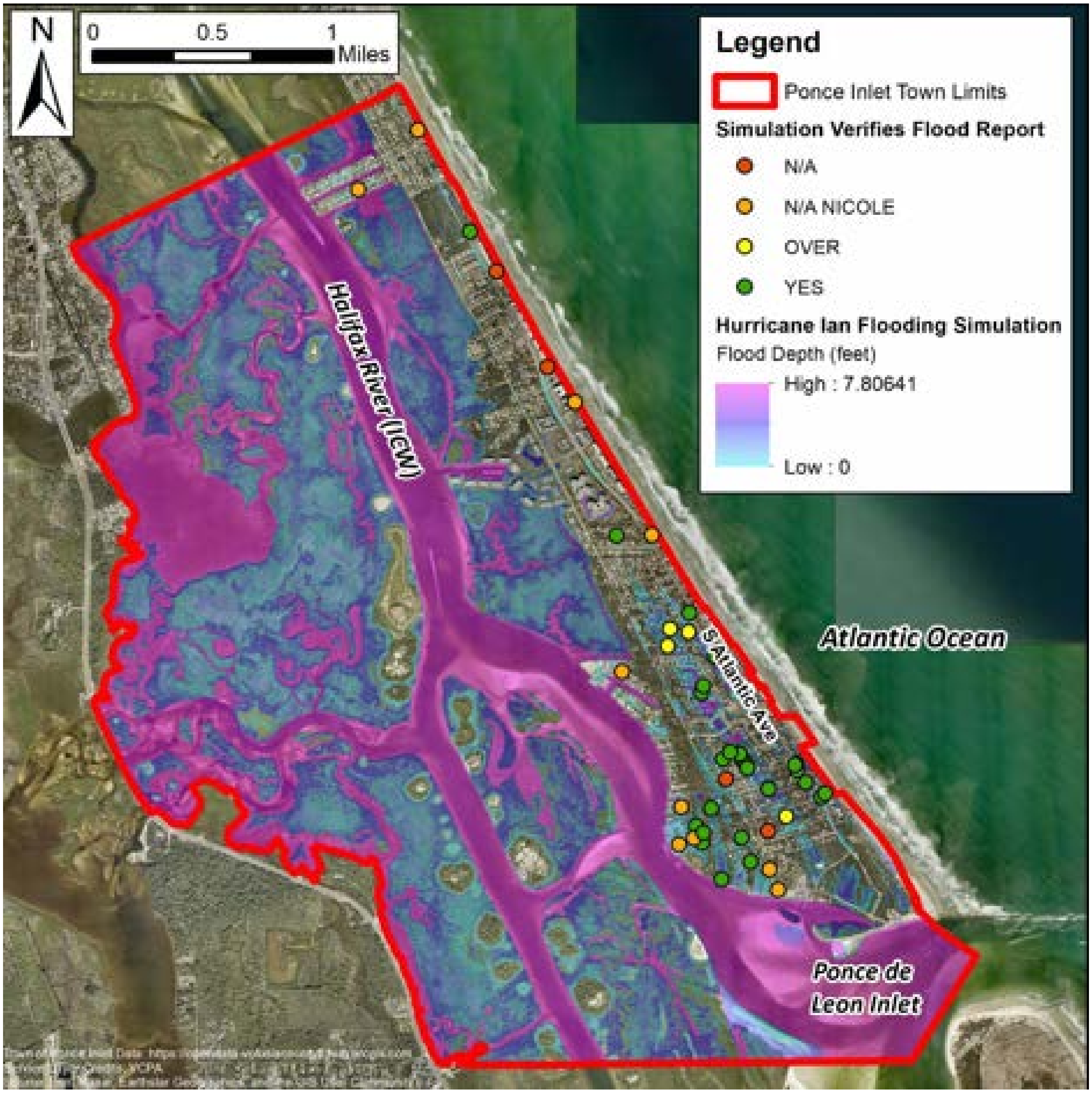


Figure 7. Hurricane Ian Simulated Floodplain and Verification Result

Area 1: Aurora Avenue to Jennifer Circle

There are 17 returned flood questionnaires related to flooding during Hurricane Ian in this area located approximately in the middle of the town. This portion of the town experienced widespread flooding, especially along the north/south valley. Of these 17 locations, the validation model:

- Under predicted flooding for 1 location

- Over predicted flooding for 4 locations (Beverly Hill Boulevard, Glenview Avenue, Riverglen Boulevard, and Calumet Avenue areas). The model predicts flooding impacting buildings and the flooding pictures provided by residents show widespread street flooding only.
- Matched the flooding for 12 locations (Michael Lane, Inlet Harbour Road, Bay Harbour Drive, Jennifer Circle, and Coastal Oaks Circle).

For the over predicted areas, the difference between the predicted flooding stage and the estimated peak stage from flood photos is only several inches. A review of the DEM and aerial imagery of the areas indicates that the DEM may not be capturing the raised house pad elevations which could account for the over predicted flooding.

For the location where the flooding was under reported (4764 S. Atlantic Ave.), the model predicts flooding occurring along the roadway about 100 to 200 feet to the south.

Overall, the ICPR model provided a reasonable match for the reported flooding in this area. Some examples of the reported flooding and simulated flooding are provided below.

1. Bay Harbour Drive

According to the flood reports this area experienced both roadway and building flooding which was matched by the model. Flooding pictures (**Figures 8 and 9**) and simulated model flooding (**Figure 10**) are provided below.

Figure 8. Hurricane Ian Flooding at Bay Harbor Drive Facing East

Figure 9. Bay Harbour Drive Near Beacon Court Facing East

Figure 10. Simulated Hurricane Ian Flooding for Bay Harbour Drive Area

2. Coastal Oaks Circle

According to the flood reports this area experienced both roadway and building flooding which was matched by the model. Flooding pictures (**Figures 11 and 12**) and the simulated model flooding (**Figure 13**) are provided below.

Figure 11. Hurricane Ian Flooding at Southwest Corner of Coastal Oaks Circle and S Atlantic Avenue

Figure 12. Hurricane Ian Flooding on S Atlantic Avenue at Inlet Point Boulevard

Figure 13. Simulated Hurricane Ian Flooding for Coastal Oaks Circle Area and S Atlantic Avenue

Area 2: Jennifer Circle to South End of Town

There are 14 returned flood questionnaires related to flooding during Hurricane Ian. This portion of the town experienced widespread, severe flooding, especially along the north/south topographic valleys and along the Halifax River. Of these 14 locations, the validation model:

- Under predicted flooding for 1 location (Bounty Lane)
- Over predicted flooding for 1 location (between Beach Street and Rains Court)
- Matched the flooding for 12 locations (South Atlantic Avenue, portions of Beach Street, Inlet Point Boulevard, Sailfish Drive, and Peninsula Drive).

For the location that over predicted flooding the reported flooding was about 6-inches in the yard and the model predicted yard flooding up to a foot deep.

The model generally matched the flooding extents, depths, and where building flooding was experienced. An example is provided below.

1. Inlet Point Boulevard Area

According to the flood reports this area experienced approximately 6-inches of roadway flooding which was matched by the ICPR model. Flooding pictures (**Figures 14 and 15**) and the simulated model flooding (**Figure 16**) are provided below.

Figure 14. Hurricane Ian Flooding on Inlet Point Boulevard Facing West

Figure 15. Hurricane Ian Flooding on Inlet Point Boulevard Facing West

Figure 16. Simulated Hurricane Ian Flooding for Inlet Point Boulevard Area

5. Current Conditions Floodplain Analysis

The verified model was run for the design storms shown previously in Table 2 and the level-pool floodplains generated using GIS tools and the simulated peak stage. Small, isolated floodplains with an area of less than 1,500 ft^2 were removed. The overall 100-year/24-hour floodplain is provided in **Figures F1** through **F10** within **Appendix F** for the entire study area. A summary of the floodplain is below:

- Total 100-yearr/24-hour floodplain area: 2132.6 acres, 52.1% of the Town area
- ICW and associated spoil areas and wetlands floodplain area: 2041.0 acres, 95.7% of total FP area
- Peninsula area of Town floodplain area: 91.6 acres, 10.8% of the peninsula portion of the Town
- The floodplain is primarily along the southwest coast by the ICW and the valleys that runs north/south through the southern half of the Town.

A list of the predicted 100-year/24-hour floodplain areas in the Town is provided below. More information related to flooding exposure and sensitivity of critical and regionally significant assets is presented in **Appendix A**.

North Town limits to Jana Drive

There are a number of floodplain areas in the developed area. These include:

- Old Carriage Road and Anchor Drive in the development that extends into the Halifax River.
- Portions of South Atlantic Avenue
- Jana Drive near South Atlantic.

Jana Drive to south of Marie Drive

The predicted flooding in this area includes:

- Portions of South Atlantic Avenue
- Portions of South Peninsula Drive
- Portions of Jana Drive
- Sea Haven Drive near Atlantic Avenue

South of Marie Drive to Aurora Avenue

The predicted flooding in this area includes:

- Portions of South Atlantic Avenue
- Portions of South Peninsula Drive
- The intersection of Aurora Avenue and Riverglen Boulevard
- The depression at the intersection of Alberta Avenue and Montrose Avenue

Aurora Avenue to Jennifer Circle

The predicted flooding in this area includes:

- Portions of South Atlantic Avenue
- Portions of South Peninsula Drive
- The western half of Glenview Avenue
- Most of Dixie Circle
- Portions of Beverly Hills Avenue
- Portions of Riverglen Boulevard
- Portions of Calumet Avenue
- The east end of Kelly Bea Court
- Portions of Bay Harbour Drive
- Portions of Jennifer Circle
- Portions of Coastal Oaks Circle
- The west end of Inlet Harbour Road
- The west end on Ponce de Leon Circle

Several buildings are predicted to be impacted by the 100-year/24-hour design storm.

Jennifer Circle to South End of Town

The predicted flooding in this area includes:

- Portions of South Atlantic Avenue
- Portions of South Peninsula Drive
- Portions of Front Street
- Portions of Sailfish Drive

A number of buildings are predicted to be impacted by the 100-year/24-hour design storm.

6. Future Conditions Parameterization

The existing conditions ICPR model was modified for the following future conditions:

- 2040 Intermediate-Low
- 2040 Intermediate-High
- 2070 Intermediate-Low
- 2070 Intermediate-High
- 2100 Intermediate-Low
- 2100 Intermediate-High

Each one of these six conditions was set up as a separate ICPR model. The changes for these future flood scenarios are described below.

6.1. Land Use/Land Cover

The existing land use (ELU) was modified to generate a future land use (FLU) representing the expected future maximum development density for the Town. The FLU modifications were based on:

- The 2017-2027 Future Land Use Categories map provided by the Town
- The Town's land use development codes for density and intensity of use characterizations

During the generation of the FLU, a new FLUCCS code of 1180 (rural residential) was used for the Conservation Land category that the Town's development code allows to be developed at a density of one 2,500 square foot housing unit per 20 acres.

Other FLUCCS land use codes added included 1100, 1200, 1300, 1400, and 1700 which represented the future land uses of the land cover types. It should be noted that under the Town's future land use and codes, some areas changed to a less intensive density condition as established by the SJRWMD ELU mapping.

The land use changes were used for all six future scenarios and the FLU map is shown in **Figure 17**.

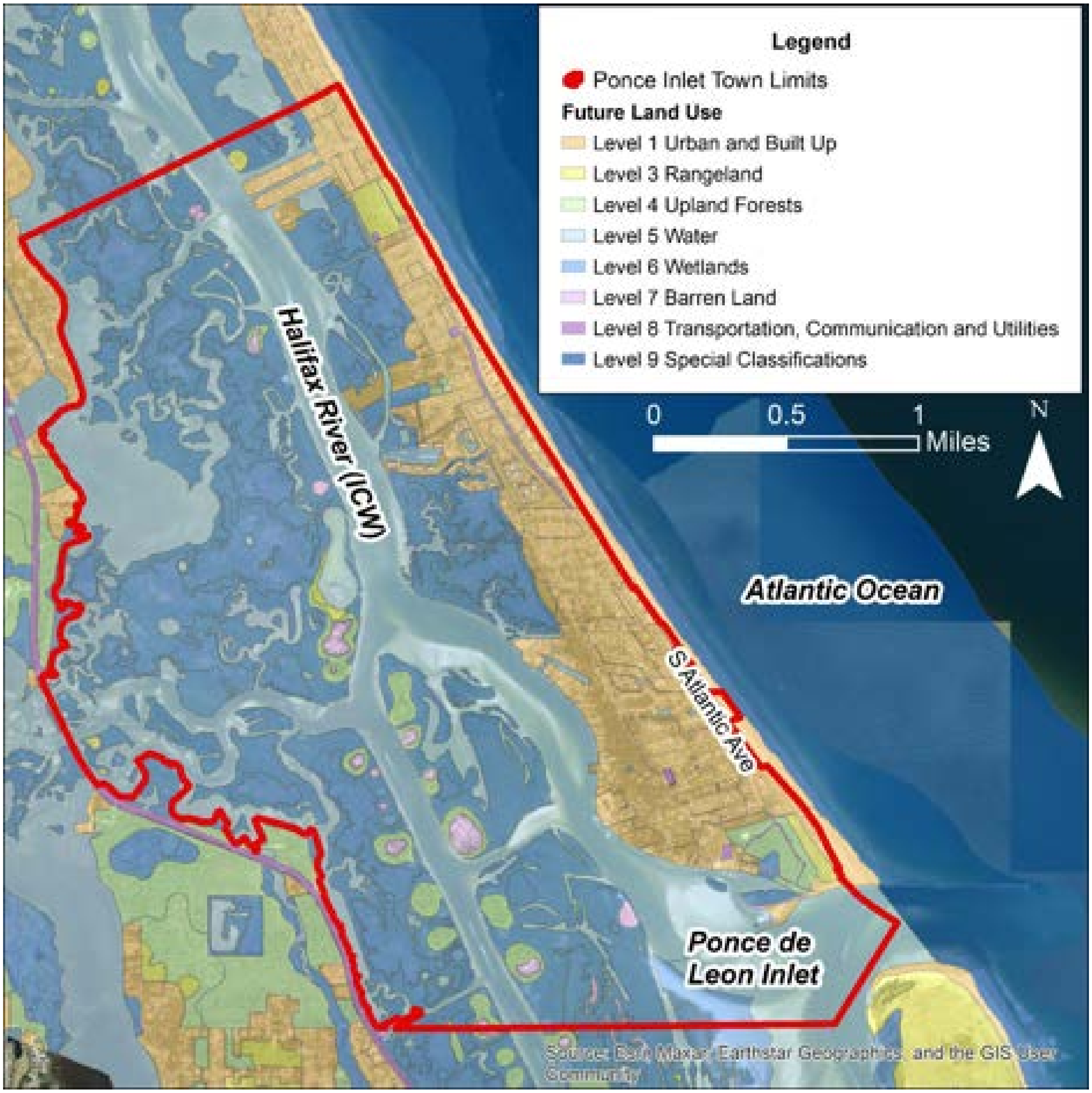


Figure 17. Future Land Use

6.2. Impervious Area

The impervious area characteristics for the land uses did not change from the ELU to FLU condition. These IA values were used for all six future scenarios and are shown in **Table 6**.

Table 6. Future Land Use and Impervious Area

FLUCCS	Land Use Description	IA (%)	DCIA (%)
1100	Low Density Residential, Future Scenarios Only	20	1
1101	Low Density Residential, low DCIA	20	1
1102	Low Density Residential, high DCIA	26	10
1200	Medium Density Residential, Future Scenarios Only	32	6
1201	Medium Density Residential, low DCIA	36	0
1202	Medium Density Residential, high DCIA	39	13
1300	Medium Density Residential, Future Scenarios Only	45	33
1301	High Density Residential, low DCIA	49	0
1302	High Density Residential, high DCIA	53	41
1303	High Density Residential, high DCIA, 2.5" initial abstraction	53	41
1400	Commercial, Future Scenarios Only	44	27
1401	Commercial, low DCIA	44	0
1402	Commercial, high DCIA	57	51
1700	Institutional, Future Scenarios Only	28	23
1701	Institutional, low DCIA	30	9
1702	Institutional, high DCIA	34	26
1810	Swimming Beach	2	0
1820	Golf Courses	6	2
1840	Marinas and Fish Camps	50	14
1900	Open Land	2	1
3200	Shrub & Brushland	0	0
3300	Mixed Rangeland	0	0
4200	Upland Hardwood Forests	4	0
4340	Hardwood Coniferous Mixed	0	0
5100	Stream & Waterways	0	0

FLUCCS	Land Use Description	IA (%)	DCIA (%)
5300	Reservoirs	0	0
5400	Bays & Estuaries	0	0
5430	Enclosed Saltwater Ponds Within a Salt Marsh	0	0
6120	Mangrove Swamps	0	0
6420	Saltwater Marshes	0	0
6460	Treeless Hydric Savanna	0	0
6500	Non-Vegetated Wetlands	0	0
7430	Spoil Areas	0	0
8140	Roads & Highways	99	0
8180	Auto Parking Facilities	64	63
8330	Water Supply Plants	32	0
9000	Custom Land Use (swales)	100	100

6.3. Time of Concentration

The time of concentrations for the basins did not change from the existing to future conditions.

6.4. Rainfall Excess Method

The rainfall excess method (Green-Ampt infiltration) did not change from existing to future conditions. However, the depth to water table was decreased based on the increasing tidal boundary conditions due to sea level rise. The depth to water table values used for the future scenarios are provided in **Table 7**.

Table 7. Future Scenarios GA Depth to Water Table

Soil Type	GA Depth to Water Table (ft)						
	Existing	2040 IL	2040 IH	2070 IL	2070 IH	2100 IL	2100 IH
Beaches	3.02	2.75	2.32	2.25	0.51	1.80	0.00
Canaveral sand, 0 to 5 percent slopes	4.17	3.90	3.47	3.40	1.66	2.95	0.00

Soil Type	GA Depth to Water Table (ft)						
	Existing	2040 IL	2040 IH	2070 IL	2070 IH	2100 IL	2100 IH
Cassia fine sand, 0 to 2 percent slopes	4.10	3.83	3.40	3.33	1.59	2.88	0.00
Hydraquents	0.33	0.06	0.00	0.00	0.00	0.00	0.00
Myakka-Myakka, wet, fine sands, 0 to 2 percent slopes	3.87	3.60	3.17	3.10	1.36	2.65	0.00
Orsino fine sand, 0 to 5 percent slopes	5.41	5.14	4.71	4.64	2.90	4.19	0.18
Palm Beach sand, 0 to 8 percent slopes	4.17	3.90	3.47	3.40	1.66	2.95	0.00
Palm Beach-Urban land-Paola complex, 0 to 8 percent slopes	6.56	6.29	5.86	5.79	4.05	5.34	1.33
Paola fine sand, 0 to 8 percent slopes	4.17	3.90	3.47	3.40	1.66	2.95	0.00
Paola fine sand, 8 to 17 percent slopes	6.56	6.29	5.86	5.79	4.05	5.34	1.33
Turnbull variant sand	1.97	1.70	1.27	1.20	0.00	0.75	0.00
Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00

As the groundwater table (GWT) rises, the ability of the soil to absorb runoff decreases. On average, the soils in the study area have a saturated porosity of 0.42, meaning that about 42% of the soil column may be used for storing rainfall. If the depth to water table decreases to zero, the soil column can no longer store rainfall runoff.

For example, significant portions of the western part of the Town by the Halifax River are Canaveral Sand and as the ground water table rises, the areas in the 100-year floodplain may experience more severe flooding and the floodplain extent may increase.

For the 2100 IH scenario which reflect 5.32 feet of sea level rise from 2023 conditions, the GWT has risen to ground surface for 8 of the 11 non-water soil types which will have significant impacts on the ability of the soils to infiltrate runoff.

Figure 18 shows the impact of the rise in boundary condition and associated GWT on flooding in the south part of the town for the 2040 IH, 2070 IH, and 2100 IH scenarios.

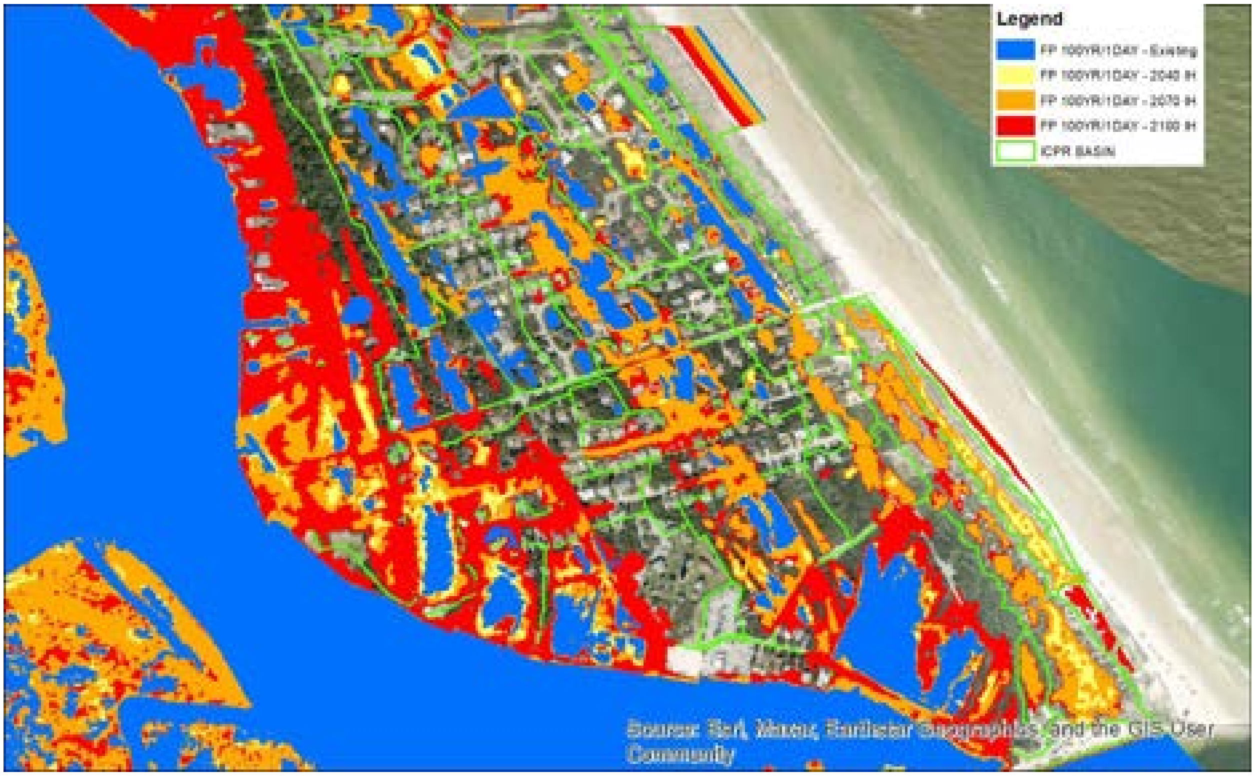


Figure 18. Impacts of SLR and Rising Ground Water Table on Flooding

The figure shows that as the Halifax River and Atlantic Ocan water levels and associated GWT increases due to sea level rise, the extent of the flooding increases. There is moderate increase of floodplain area for the 2040 IH scenario, but the flooding is greatly increased for the 2070 IH scenario and even more for the 2100 IH scenario where several of the soil types would no longer be capable of storing rainfall from very large storm events.

6.5. Design Storms

The design storms rainfall depths and distribution did not change from existing to future conditions.

6.6. Initial Water Levels

The initial water levels were developed using the same methodology previously described in Section 3.9 and using the boundary condition data in Tables 3 and 4.

6.7. Boundary Conditions

The future condition tidal boundary elevations were previously provided in Tables 3 and 4.

7. Future Conditions Floodplain Analysis

The existing conditions ICPR model was modified to incorporate the changes described above to generate each future conditions scenario, simulated and the floodplains developed. Based on the sea level rise projections, the expected order of increased peak stages and floodplain extent relative to the existing conditions (2023) model is:

- 2040 IL (relative rise of 0.27 feet)
- 2040 IH (relative rise of 0.70 feet)
- 2070 IL (relative rise of 0.77 feet)
- 2100 IL (relative rise of 1.22 feet)
- 2070 IH (relative rise of 2.51 feet)
- 2100 IH (relative rise of 5.23 feet)

The node peak stages generally followed this expected order with a few anomalies that appear to be related to how the model was transitioning from vertical to horizontal flow for some of the percolation links under changing groundwater table conditions. For these limited number of nodes, the generated floodplains were manually adjusted as appropriate.

Map of the predicted future floodplain depths are provided in **Figures F11-F38 within Appendix F**. As with the existing floodplains, individual floodplains with an area less than 1,500 ft^2 were removed.

A summary of the floodplains for the future scenarios is provided below:

Total 100-year/24-hour floodplain area

- 2040 IL: 2,332.7 acres, 57.0% of the town. 9.4% increase from the existing floodplain area
- 2040 IH: 2,704.8 acres, 66.1% of the town. 26.8% increase from the existing floodplain area
- 2070 IL: 2,767.8 acres, 67.6% of the town. 39.8% increase from the existing floodplain area
- 2070 IH: 3,243.0 acres, 79.2% of the town. 52.1% increase from the existing floodplain area
- 2100 IL: 3,001.7 acres, 73.3% of the town. 40.8% increase from the existing floodplain area
- 2100 IH: 3,576.9 acres, 87.4% of the town. 67.7% increase from the existing floodplain area

Intra-Coastal Waterway and associated spoil areas & wetlands

- 2040 IL: 2,225.5 acres, 95.4% of the floodplain. 9.0% increase from the existing ICW floodplain
- 2040 IH: 2,567.2 acres, 94.9% of the floodplain. 25.8% increase from the existing ICW floodplain
- 2070 IL: 2,625.8 acres, 94.9% of the floodplain. 28.7% increase from the existing ICW floodplain
- 2070 IH: 3,029.5 acres, 93.4% of the floodplain. 48.4% increase from the existing ICW floodplain
- 2100 IL: 2,848.8 acres, 94.6% of the floodplain. 39.1% increase from the existing ICW floodplain
- 2100 IH: 3,190.6 acres, 89.2% of the floodplain. 56.3% increase from the existing ICW floodplain

Peninsula area of Town

- 2040 IL: 107.5 acres, 12.6% of the peninsula portion of the town. 17.4% increase from the existing floodplain area
- 2040 IH: 137.6 acres, 16.2% of the peninsula portion of the town. 50.2% increase from the existing floodplain area
- 2070 IL: 142.0 acres, 16.7% of the peninsula portion of the town. 55.0% increase from the existing floodplain area
- 2070 IH: 213.5 acres, 25.1% of the peninsula portion of the town. 133.1% increase from the existing floodplain area
- 2100 IL: 163.0 acres, 19.1% of the peninsula portion of the town. 77.9% increase from the existing floodplain area
- 2100 IH: 386.4 acres, 45.4% of the peninsula portion of the town. 321.8% increase from the existing floodplain area

More information related to future flooding exposure and sensitivity of critical and regionally significant assets is presented in **Appendix A**.

Appendix D

Task 2: Stormwater Model Simulation Node Peak Stage Report

	CURRENT (2023)					FUTURE SCENARIO 2040IL					FUTURE SCENARIO 2040IH				
NODE NAME	100YR24HR	100YR96HR	10YR24HR	25YR24HR	25YR96HR	100yr24hr	100YR96HR	10YR24HR	25YR24HR	25YR96HR	100yr24hr	100YR96HR	10YR24HR	25YR24HR	25YR96HR
GWT	2.5	2.5	2.5	2.5	2.5	2.7	2.7	2.7	2.7	2.7	3.2	3.2	3.2	3.2	3.2
N_BC_ICW_01	1.18	1.18	1.18	1.18	1.18	1.45	1.45	1.45	1.45	1.45	1.88	1.88	1.88	1.88	1.88
N_BC_ICW_02	1.18	1.18	1.18	1.18	1.18	1.45	1.45	1.45	1.45	1.45	1.88	1.88	1.88	1.88	1.88
N_BC_ICW_03	1.18	1.18	1.18	1.18	1.18	1.45	1.45	1.45	1.45	1.45	1.88	1.88	1.88	1.88	1.88
N_BC_ICW_04	1.18	1.18	1.18	1.18	1.18	1.45	1.45	1.45	1.45	1.45	1.88	1.88	1.88	1.88	1.88
N_BC_ICW_05	1.18	1.18	1.18	1.18	1.18	1.45	1.45	1.45	1.45	1.45	1.88	1.88	1.88	1.88	1.88
N_BC_ICW_06	1.18	1.18	1.18	1.18	1.18	1.45	1.45	1.45	1.45	1.45	1.88	1.88	1.88	1.88	1.88
N_BC_ICW_07	1.18	1.18	1.18	1.18	1.18	1.45	1.45	1.45	1.45	1.45	1.88	1.88	1.88	1.88	1.88
N_BC_ICW_08	1.18	1.18	1.18	1.18	1.18	1.45	1.45	1.45	1.45	1.45	1.88	1.88	1.88	1.88	1.88
N_BC_ICW_09	1.18	1.18	1.18	1.18	1.18	1.45	1.45	1.45	1.45	1.45	1.88	1.88	1.88	1.88	1.88
N_BC_ICW_10	1.18	1.18	1.18	1.18	1.18	1.45	1.45	1.45	1.45	1.45	1.88	1.88	1.88	1.88	1.88
N_BC_ICW_11	1.18	1.18	1.18	1.18	1.18	1.45	1.45	1.45	1.45	1.45	1.88	1.88	1.88	1.88	1.88
N_BC_North_01	4.82	4.82	4.82	4.82	4.82	4.82	4.82	4.82	4.82	4.82	4.82	4.82	4.82	4.82	4.82
N_BC_North_02	13.38	13.38	13.38	13.38	13.38	13.38	13.38	13.38	13.38	13.38	13.38	13.38	13.38	13.38	13.38
N_Closed_100	11.19	12.29	10.82	10.96	11.11	11.89	12.95	11.32	11.49	11.78	12.16	13.3	11.32	11.53	11.84
N_Closed_1000	10.74	11.42	8.21	8.47	10.17	11.18	11.43	8.63	8.75	10.86	11.42	11.44	8.63	9.27	11.19
N_Closed_1100	9.11	9.75	7.98	8.02	8.68	9.3	9.8	7.27	7.92	9.04	9.54	9.85	7.27	8.17	9.24
N_Closed_1200	8.93	9.75	7.75	8.27	8.78	9.15	9.8	8.13	8.2	8.77	9.54	9.85	8.13	8.29	8.84
N_Closed_1300	9.21	9.75	6.87	7.54	8.34	9.23	9.8	7.1	7.83	8.38	9.54	9.85	7.1	7.98	8.79
N_Closed_1400	10.34	10.32	10.03	10.2	10.17	10.38	10.33	10.12	10.24	10.2	10.41	10.36	10.12	10.24	10.21
N_Closed_1500	10.21	10.15	9.34	9.93	9.89	10.26	10.18	9.36	9.97	9.93	10.27	10.21	9.34	9.95	9.93
N_Closed_1600	10.87	10.95	10.53	10.72	10.73	10.92	11.05	10.5	10.74	10.76	11.04	11.19	10.58	10.76	10.82
N_Closed_1700	6.4	8.61	6.28	6.33	6.38	7.71	8.67	5.65	5.65	7.31	8.55	8.74	5.65	6.34	7.73
N_Closed_1800	8.31	9.2	7.49	7.68	7.91	9.08	9.48	7.78	8.01	8.78	9.47	9.51	7.78	8.05	9.03
N_Closed_1900	9.12	9.21	8.57	8.72	8.84	9.27	9.38	8.57	8.72	8.91	9.34	9.46	8.57	8.73	9.15
N_Closed_200	13.8	13.82	13.61	13.67	13.71	10.06	11.29	10.06	10.06	10.06	11.02	11.54	10.06	10.06	10.61
N_Closed_2000	9.12	9.21	7.71	8.48	8.51	9.27	9.37	7.66	8.51	8.92	9.33	9.46	7.66	8.57	9.15
N_Closed_2100	9.12	9.21	7.71	8.48	8.51	9.27	9.37	7.59	8.51	8.92	9.33	9.45	7.59	8.57	9.16
N_Closed_2200	8.35	8.47	8.15	8.27	8.28	8.4	8.51	7.9	8.07	8.3	8.46	8.56	7.9	8.11	8.33
N_Closed_2300	7.25	7.27	6.92	7.1	7.2	7.27	7.32	6.77	7.04	7.22	7.3	7.35	6.77	7.21	7.23
N_Closed_2400	5.61	5.64	4.92	5.17	5.45	5.63	5.68	4.87	5.13	5.51	5.68	5.75	4.87	5.15	5.53
N_Closed_2500	10.03	10.04	8.94	9.23	9.55	10.04	10.06	8.94	9.23	9.96	10.07	10.13	8.94	9.23	9.99
N_Closed_2600	8.93	8.89	8.89	8.91	8.88	8.93	8.91	8.89	8.91	8.88	8.93	8.96	8.89	8.91	8.88
N_Closed_2700	7.65	10.03	7.33	7.47	7.6	9.97	10.2	6.13	6.13	9.41	10.21	10.21	6.13	7.65	9.99
N_Closed_2800	4	6.13	3.97	3.98	3.99	6.44	7.8	3.85	4.88	6.12	7.05	8.3	3.85	5.61	6.59
N_Closed_2900	4.34	5.83	4.21	4.26	4.32	6.41	7.6	3.69	3.69	6.03	6.82	8.3	3.69	4.77	6.47
N_Closed_300	13.79	13.82	13.61	13.67	13.7	11.71	12.48	11.19	11.53	11.67	12.07	12.89	11.43	11.61	11.81
N_Closed_3000	4.65	4.91	4.27	4.39	4.5	4.98	5.31	4.73	4.87	4.88	5.26	5.53	4.73	4.87	4.89
N_Closed_3100	3.73	4.53	3.73	3.73	3.73	3.73	5.78	3.73	3.73	3.73	3.73	6.79	3.73	3.73	3.73
N_Closed_3200	7.08	7.1	5.57	5.63	7.02	7.11	7.16	5.54	5.98	7.04	7.15	7.2	5.54	6.8	7.06
N_Closed_3300	17.27	17.21	17.23	17.24	17.18	17.27	17.21	17.23	17.24	17.18	17.27	17.22	17.23	17.24	17.18
N_Closed_3400	7.41	7.36	7.35	7.37	7.33	7.41	7.36	7.35	7.38	7.33	7.41	7.36	7.35	7.38	7.33
N_Closed_3500	13.37	13.38	13.22	13.29	13.31	13.1	13.16	12.87	12.96	13.06	13.1	13.16	12.87	12.96	13.06
N_Closed_3600	4.32	4.35	1.85	2.01	3.04	4.41	4.53	1.85	2.29	4.25	4.49	4.64	1.85	3.09	4.29
N_Closed_3700	7	7	6.94	6.95	6.97	7	7.02	6.94	6.95	6.97	7.02	7.04	6.94	6.95	6.97
N_Closed_3800	13.64	13.98	12.98	13.24	13.53	13.64	13.98	12.98	13.24	13.53	13.64	13.98	12.98	13.24	13.53
N_Closed_3900	8.16	8.86	6.78	6.97	7.43	8.52	9	6.65	6.84	7.94	8.87	9.37	6.65	6.9	8.52
N_Closed_400	12.84	12.71	12.65	12.74	12.59	12.87	12.71	12.69	12.76	12.61	12.87	12.71	12.69	12.76	12.61
N_Closed_4000	12.83	12.71	12.65	12.73	12.59	12.86	12.7	12.68	12.76	12.61	12.86	12.71	12.68	12.76	12.6
N_Closed_4100	9.12	9.2	8.3	8.41	8.53	9.27	9.38	8.23	8.33	8.92	9.34	9.47	8.23	8.44	9.15

	CURRENT (2023)					FUTURE SCENARIO 2040IL					FUTURE SCENARIO 2040IH				
NODE NAME	100YR24HR	100YR96HR	10YR24HR	25YR24HR	25YR96HR	100yr24hr	100YR96HR	10YR24HR	25YR24HR	25YR96HR	100yr24hr	100YR96HR	10YR24HR	25YR24HR	25YR96HR
N_Closed_4200	10.74	11.42	10.07	10.16	10.55	11.18	11.43	8.77	8.77	10.86	11.42	11.44	8.77	10.11	11.19
N_Closed_500	11.98	12.05	11.85	11.91	11.96	11.98	13.24	11.85	11.91	11.96	11.98	13.25	11.85	11.91	11.96
N_Closed_600	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8
N_Closed_700	8.7	8.7	8.52	8.7	8.7	8.7	8.7	8.65	8.7	8.7	8.7	8.7	8.67	8.7	8.7
N_Closed_800	6.63	6.63	6.63	6.63	6.63	6.63	6.63	6.63	6.63	6.63	6.63	6.63	6.63	6.63	6.63
N_Closed_900	9.68	9.81	9.01	9.15	9.49	9.82	9.82	8.98	9.12	9.72	9.82	9.84	8.98	9.2	9.79
N_Exfil_100	15.3	15	12.77	14.54	12.62	15.29	14.98	12.77	14.53	12.61	15.29	14.94	12.76	14.51	12.59
N_Exfil_1000	6.63	6.4	5.72	6.32	5.78	6.66	6.42	5.9	6.38	5.95	6.71	6.54	6.2	6.46	6.23
N_Exfil_1001	4.56	3.42	3	3.1	3	4.59	3.71	3	3.27	3	5.3	5.03	3.28	3.94	3.35
N_Exfil_101	15.29	15	12.77	14.54	12.62	15.29	14.98	12.77	14.53	12.61	15.29	14.94	12.75	14.51	12.59
N_Exfil_102	15.29	15	12.77	14.54	12.62	15.29	14.98	12.76	14.53	12.61	15.29	14.94	12.75	14.51	12.59
N_Exfil_103	15.29	15	12.77	14.54	12.62	15.28	14.97	12.76	14.52	12.6	15.28	14.93	12.75	14.5	12.58
N_Exfil_104	15.29	15	12.77	14.54	12.62	15.28	14.97	12.76	14.52	12.6	15.28	14.93	12.74	14.5	12.58
N_Exfil_105	15.29	15	12.76	14.54	12.61	15.28	14.97	12.75	14.52	12.6	15.28	14.92	12.74	14.5	12.58
N_Exfil_1100	8.93	9.74	6.52	6.89	6.35	9.15	9.8	7.31	7.61	7.17	9.54	9.85	7.09	7.41	8.16
N_Exfil_1101	8.92	9.74	6.51	6.88	6.34	9.14	9.79	7.3	7.6	7.16	9.53	9.84	7.08	7.39	8.16
N_Exfil_1102	8.91	9.74	6.51	6.88	5.32	9.13	9.79	7.29	7.6	7.16	9.53	9.84	7.07	7.39	8.16
N_Exfil_1200	5.55	4.7	4.69	4.77	4.63	5.82	4.88	4.73	4.81	4.66	6.17	5.29	5.01	5.2	5.01
N_Exfil_1200JB	5.54	4.57	4.08	4.42	4.08	5.82	4.87	4.55	4.79	4.56	6.17	5.28	5	5.2	5.01
N_Exfil_1201	10.22	9.6	8.9	9.6	8.63	10.22	9.58	8.96	9.66	8.62	10.22	9.48	8.92	9.59	8.57
N_Exfil_1202	10.22	9.6	8.89	9.6	8.62	10.22	9.58	8.96	9.66	8.61	10.21	9.48	8.91	9.59	8.56
N_Exfil_1400	9.11	9.2	5.68	6.29	5.32	9.27	9.38	5.54	6.09	8.59	9.33	9.46	5.3	5.64	9.15
N_Exfil_1401	9.11	9.2	5.68	6.29	5.32	9.27	9.38	5.53	6.08	8.59	9.33	9.46	5.28	5.64	9.14
N_Exfil_1402	9.11	9.2	5.67	6.29	5.32	9.26	9.37	5.53	6.08	8.59	9.32	9.45	5.21	5.63	9.14
N_Exfil_1600	9.12	9.21	4.95	5.34	7.26	9.27	9.38	4.94	6.78	8.92	9.33	9.46	4.88	8.57	9.15
N_Exfil_1601	9.12	9.2	4.88	5.34	7.26	9.27	9.37	4.64	6.78	8.91	9.33	9.45	3.98	8.56	9.15
N_Exfil_1700	6.2	6.36	3.09	3.26	4.19	6.1	6.62	3.38	3.56	3.43	6.6	7.28	3.77	3.96	3.9
N_Exfil_1701	6.19	6.35	3.09	3.26	4.18	6.1	6.61	3.37	3.55	3.42	6.6	7.28	3.76	3.96	3.9
N_Exfil_1800	11.87	13.1	10.39	10.8	11.26	12.97	13.13	9.44	9.72	11.99	13.13	13.15	9.44	9.91	12.99
N_Exfil_1801	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7
N_Exfil_1802	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7
N_Exfil_2000	4.92	4.85	4.87	4.89	4.8	4.88	4.94	4.81	4.85	4.59	4.92	4.98	4.81	4.85	4.6
N_Exfil_2001	4.98	4.85	4.89	4.92	4.8	4.93	5.14	4.82	4.86	4.59	5.11	5.28	4.82	4.86	4.59
N_Exfil_2002	5.02	4.85	4.9	4.95	4.79	4.97	5.3	4.82	4.87	4.58	5.26	5.53	4.82	4.87	4.59
N_Exfil_2003	4.92	4.79	4.82	4.86	4.74	4.96	5.32	4.75	4.79	4.55	5.26	5.55	4.76	4.8	4.56
N_Exfil_2004	4.68	4.58	4.58	4.62	4.55	4.94	5.35	4.52	4.56	4.42	5.27	5.58	4.54	4.57	4.43
N_Exfil_2005	4.56	4.32	3.8	4.2	3.86	4.93	5.41	3.83	4.31	3.83	5.27	5.65	3.92	4.35	3.94
N_Exfil_2100	5.21	5.21	5.13	5.15	5.16	2	2	2	2	2	2	2	2	2	2
N_Exfil_2101	5.21	5.21	5.13	5.15	5.16	2	2	2	2	2	2	2	2	2	2
N_Exfil_2102	5.21	5.21	5.13	5.15	5.16	2	2	2	2	2	2	2	2	2	2
N_Exfil_2103	5.21	5.21	5.13	5.15	5.16	2	2	2	2	2	2	2	2	2	2
N_Exfil_2300	7.72	7.58	7.63	7.66	7.53	7.72	7.58	7.63	7.66	7.53	7.72	7.58	7.63	7.66	7.53
N_Exfil_2301	7.72	7.58	7.63	7.66	7.53	7.72	7.58	7.63	7.66	7.53	7.72	7.58	7.63	7.66	7.53
N_Exfil_2400	14.81	12.17	11.3	12.38	10.83	14.77	11.93	11.2	12.18	10.72	14.64	11.48	11	11.83	10.51
N_Exfil_2401	14.8	12.17	11.3	12.38	10.83	14.77	11.93	11.2	12.18	10.72	14.64	11.47	11	11.83	10.5
N_Exfil_2402	14.8	12.17	11.3	12.37	10.83	14.76	11.93	11.19	12.17	10.72	14.63	11.47	11	11.82	10.5
N_Exfil_2403	14.8	12.17	11.3	12.38	10.83	14.77	11.93	11.2	12.18	10.72	14.64	11.47	11	11.83	10.5
N_Exfil_2500	13.74	13.7	13.63	13.68	13.58	13.77	13.71	13.66	13.7	13.6	13.8	13.76	13.66	13.7	13.6
N_Exfil_2501	13.73	13.7	13.63	13.67	13.58	13.77	13.71	13.66	13.7	13.6	13.8	13.75	13.66	13.7	13.6
N_Exfil_2502	13.73	13.7	13.63	13.67	13.58	13.77	13.71	13.66	13.7	13.6	13.8	13.75	13.66	13.7	13.6

	CURRENT (2023)					FUTURE SCENARIO 2040IL					FUTURE SCENARIO 2040IH				
NODE NAME	100YR24HR	100YR96HR	10YR24HR	25YR24HR	25YR96HR	100yr24hr	100YR96HR	10YR24HR	25YR24HR	25YR96HR	100yr24hr	100YR96HR	10YR24HR	25YR24HR	25YR96HR
N_EXfil_2600	4.91	4.92	4.9	4.9	4.89	5.13	6.21	2	2	4.91	5.86	6.69	2	4.91	4.92
N_EXfil_2600A	2.85	4.58	2.5	2.5	2.5	5	5.56	2.77	2.77	3.41	5.39	5.85	3.2	3.41	4.43
N_EXfil_2600JB	2.78	4.59	2.59	2.62	2.6	5.12	6.2	2.77	2.77	3.41	5.86	6.69	3.2	3.41	4.44
N_EXfil_2700	6.6	6.62	6.58	6.59	6.57	6.68	7.2	6.57	6.58	6.56	6.77	8.31	6.57	6.58	6.58
N_EXfil_2700JB	4.34	5.24	3.91	4.06	3.91	5.57	7.17	3.8	3.9	4.52	6.44	8.29	3.95	4.09	5.03
N_EXfil_2800	6.01	5.99	5.99	6	5.98	6.01	6.06	2	2	5.97	6.04	6.69	2	5.98	5.98
N_EXfil_2800JB	3.42	3.05	3.04	3.2	2.89	3.6	4.17	2.77	2.77	2.98	4.26	6.68	3.2	3.4	3.47
N_EXfil_2801	2.54	2.5	2.5	2.5	2.5	3.2	4.15	2.77	2.77	2.77	4.25	6.64	3.2	3.25	3.35
N_Exfil_300	6.33	5.19	5.11	5.2	5.08	6.2	5.21	5.14	5.21	5.13	6.52	5.37	5.21	5.27	5.18
N_Exfil_300JB	6.33	4.7	4.03	4.28	4.02	6.2	4.95	4.14	4.44	4.15	6.52	5.36	4.77	5.09	4.81
N_Exfil_301	13.48	13.37	12.38	13.16	12.33	13.48	13.37	12.48	13.25	12.38	13.48	13.37	12.47	13.23	12.35
N_Exfil_302	13.48	13.37	12.37	13.16	12.32	13.48	13.37	12.48	13.24	12.38	13.48	13.36	12.47	13.23	12.35
N_Exfil_500	6.25	6.16	6.1	6.15	6.14	6.24	6.15	6.11	6.16	6.14	6.24	6.15	6.11	6.16	6.14
N_Exfil_500JB	6.25	6.17	6.1	6.15	6.14	6.25	6.16	6.11	6.16	6.14	6.24	6.15	6.11	6.16	6.14
N_Exfil_501	8.95	8.86	7.96	8.82	7.99	8.94	8.85	7.93	8.75	7.93	8.94	8.71	7.86	8.61	7.81
N_Exfil_501JB	8.95	8.86	7.96	8.82	7.99	8.94	8.85	7.93	8.75	7.93	8.93	8.71	7.85	8.61	7.81
N_Exfil_502	8.79	8.17	8.2	8.27	8.11	8.77	8.16	8.2	8.26	8.11	8.72	8.16	8.19	8.26	8.1
N_Exfil_503	8.79	7.9	7.9	8.12	7.9	8.76	7.9	7.9	8.1	7.9	8.72	7.9	7.9	8.05	7.9
N_Exfil_600	5.81	5.81	5.81	5.81	5.81	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8
N_Exfil_601	5.81	5.81	5.81	5.81	5.81	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8
N_Exfil_700	4.51	4.51	4.51	4.51	4.51	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
N_Exfil_701	4.51	4.51	4.51	4.51	4.51	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
N_Exfil_800	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8
N_Exfil_801	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.79	4.79	4.79	4.8	4.8	4.79	4.8	4.8
N_Exfil_900	10.71	9.71	9.78	9.88	9.59	10.69	10.19	9.78	9.88	9.59	10.66	12.64	9.78	9.88	9.59
N_Exfil_901	10.7	9.7	9.55	9.78	9.37	10.69	10.19	9.55	9.77	9.35	10.65	12.63	9.54	9.75	9.33
N_Exfil_902	10.7	9.7	8.72	9.77	8.13	10.68	10.18	8.69	9.76	8.13	10.65	12.63	8.64	9.75	8.13
N_Exfil_C_600	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8
N_Exfil_C_700	8.7	8.7	8.52	8.7	8.7	8.7	8.7	8.64	8.7	8.7	8.7	8.7	8.67	8.7	8.7
N_Exfil_C_800	6.63	6.63	6.63	6.63	6.63	6.63	6.63	6.63	6.63	6.63	6.63	6.63	6.63	6.63	6.63
N_ICW_100	1.18	1.18	1.18	1.18	1.18	1.45	1.45	1.45	1.45	1.45	1.88	1.88	1.88	1.88	1.88
N_Misc_100	13.72	13.55	13.55	13.57	13.53	13.71	13.55	13.55	13.57	13.53	13.71	13.55	13.55	13.57	13.53
N_Misc_1000	7.19	7.03	7.08	7.13	6.99	7.19	7.03	7.08	7.13	6.99	7.19	7.03	7.08	7.13	6.99
N_Misc_1100	4.6	4.61	4.54	4.57	4.5	4.6	4.62	4.54	4.57	4.5	4.63	4.69	4.54	4.57	4.5
N_Misc_1200	4.7	4.72	4.67	4.68	4.66	4.7	4.73	4.67	4.68	4.66	4.73	4.76	4.67	4.68	4.66
N_Misc_1400	4.51	4.47	4.47	4.48	4.45	4.51	4.47	4.47	4.48	4.45	4.51	4.48	4.47	4.48	4.45
N_Misc_1500	11.47	11.14	11.12	11.22	11.01	11.66	11.44	11.3	11.5	11.15	11.66	11.44	11.3	11.5	11.15
N_Misc_1500_S1	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8
N_Misc_1500_S2	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6
N_Misc_1600	11.99	11.99	11.99	11.99	11.99	11.99	11.99	11.99	11.99	11.99	11.99	11.99	11.99	11.99	11.99
N_Misc_1600_S	12.11	12.11	12.11	12.11	12.11	12.11	12.11	12.11	12.11	12.11	12.11	12.11	12.11	12.11	12.11
N_Misc_1700	14.83	14.79	14.78	14.8	14.74	14.86	14.79	14.8	14.82	14.76	14.86	14.8	14.8	14.82	14.76
N_Misc_1800	9.88	9.93	8.82	8.82	9.8	9.9	9.98	8.82	8.82	9.81	9.95	10.03	8.82	9.8	9.84
N_Misc_1900	9.66	9.72	8.98	9.05	9.57	9.69	9.78	8.98	9.05	9.59	9.74	9.81	8.98	9.34	9.62
N_Misc_200	4.64	4.62	4.62	4.63	4.61	4.64	4.62	4.62	4.63	4.62	4.64	4.63	4.62	4.63	4.62
N_Misc_2000	8.33	8.42	7.94	8.03	8.16	8.38	8.51	7.93	8.09	8.2	8.47	8.59	7.93	8.16	8.26
N_Misc_2100	3.52	3.48	3.45	3.49	3.45	3.53	3.5	3.46	3.49	3.45	3.53	3.51	3.47	3.49	3.45
N_Misc_2200	9.12	9.21	8.81	8.83	8.83	9.27	9.37	8.71	8.84	8.92	9.33	9.46	8.71	8.85	9.16
N_Misc_2300	6.55	6.49	6.5	6.52	6.47	6.55	6.49	6.5	6.52	6.47	6.55	6.49	6.5	6.52	6.47
N_Misc_2400	7.12	7.08	7.03	7.08	7.07	7.12	7.08	7.03	7.08	7.07	7.12	7.08	7.03	7.08	7.07

NODE NAME	CURRENT (2023)					FUTURE SCENARIO 2040IL					FUTURE SCENARIO 2040IH				
	100YR24HR	100YR96HR	10YR24HR	25YR24HR	25YR96HR	100yr24hr	100YR96HR	10YR24HR	25YR24HR	25YR96HR	100yr24hr	100YR96HR	10YR24HR	25YR24HR	25YR96HR
N_Misc_2500	10.87	10.92	10.75	10.8	10.81	10.94	10.87	10.89	10.91	10.86	10.94	10.87	10.89	10.91	10.86
N_Misc_2600	11.51	11.4	11.39	11.44	11.34	11.57	11.44	11.43	11.49	11.38	11.57	11.44	11.43	11.49	11.38
N_Misc_2600_S1	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8
N_Misc_2600_S2	11.49	11.2	11.2	11.34	11.2	11.56	11.39	11.33	11.46	11.2	11.56	11.39	11.32	11.45	11.2
N_Misc_300	5.6	5.54	5.55	5.57	5.52	5.59	5.54	5.54	5.56	5.51	5.59	5.58	5.54	5.56	5.51
N_Misc_400	5.05	4.98	4.96	5	4.93	5.05	4.98	4.97	5.01	4.94	5.05	4.99	4.97	5.01	4.94
N_Misc_500	5.08	5.04	5.05	5.06	5.02	5.09	5.05	5.05	5.07	5.03	5.09	5.05	5.05	5.07	5.03
N_Misc_600	5.58	5.45	5.46	5.52	5.4	5.61	5.48	5.49	5.55	5.42	5.61	5.48	5.49	5.55	5.42
N_Misc_700	11.8	11.73	11.72	11.76	11.69	11.84	11.77	11.75	11.79	11.72	11.84	11.77	11.75	11.79	11.72
N_Misc_700_S	14.85	14.85	14.85	14.85	14.85	14.85	14.85	14.85	14.85	14.85	14.85	14.85	14.85	14.85	14.85
N_Misc_800	6.11	6	5.99	6.02	5.97	6.11	6	5.99	6.02	5.97	6.1	6	5.99	6.02	5.97
N_Misc_900	6.29	6.28	6.28	6.28	6.28	6.3	6.29	6.29	6.29	6.28	6.3	6.29	6.29	6.29	6.28
N_Ocean_000	1.62	1.62	1.62	1.62	1.62	1.89	1.89	1.89	1.89	1.89	2.32	2.32	2.32	2.32	2.32
N_Ocean_001	1.62	1.62	1.62	1.62	1.62	1.89	1.89	1.89	1.89	1.89	2.32	2.32	2.32	2.32	2.32
N_Outfall_100	2.21	2.12	2.12	2.16	2.08	2.22	2.13	2.13	2.17	2.09	2.23	2.13	2.14	2.17	2.1
N_Outfall_1000	1.94	1.99	1.87	1.9	1.93	1.94	1.99	1.87	1.9	1.93	1.94	1.99	1.87	1.9	1.93
N_Outfall_1010	5	4.81	4.82	4.87	4.78	5	4.81	4.82	4.87	4.78	5	4.81	4.82	4.87	4.78
N_Outfall_1100	2.33	1.88	1.89	2.02	1.71	2.31	1.81	1.82	1.95	1.69	2.26	2	2	2.07	1.94
N_Outfall_1110	4.37	4.3	4.29	4.32	4.27	4.37	4.29	4.29	4.32	4.27	4.37	4.29	4.29	4.32	4.27
N_Outfall_1200	5.56	5.53	5.01	5.51	4.38	5.56	4.93	5.01	5.51	4.28	5.56	4.93	5.01	5.51	4.28
N_Outfall_1300	4.38	4.08	3.55	4.08	3.55	4.39	4.12	3.78	4.16	3.65	4.41	4.19	4.02	4.24	3.8
N_Outfall_1400	4.11	3.99	3.38	3.94	3.49	4.11	4.01	3.63	4.01	3.58	4.12	4.04	3.9	4.06	3.74
N_Outfall_1500	3.17	2.88	2.7	2.88	2.6	3.17	2.67	2.7	2.88	2.6	3.17	2.67	2.7	2.88	2.6
N_Outfall_1510	3.3	3	2.78	2.98	2.7	3.3	2.76	2.78	2.98	2.7	3.3	2.76	2.78	2.98	2.7
N_Outfall_1600	12.84	12.71	12.65	12.73	12.59	12.87	12.71	12.68	12.76	12.61	12.87	12.71	12.68	12.76	12.6
N_Outfall_1610	12.89	12.87	12.85	12.86	12.81	12.87	12.78	12.79	12.81	12.77	12.87	12.78	12.79	12.81	12.77
N_Outfall_1620	12.88	12.77	12.79	12.82	12.73	12.96	12.85	12.87	12.91	12.8	12.96	12.86	12.87	12.91	12.8
N_Outfall_1800	3.45	3.17	2.97	3.17	3.02	3.51	3.19	3.05	3.23	3.04	3.57	3.19	3.13	3.27	3.04
N_Outfall_1800A	3.52	3.19	2.98	3.2	3.03	3.61	3.21	3.07	3.27	3.05	3.66	3.21	3.15	3.31	3.05
N_Outfall_1810	3.66	3.23	3.01	3.27	3.05	3.81	3.26	3.11	3.36	3.07	3.83	3.26	3.2	3.39	3.07
N_Outfall_1820	10.38	10.28	10.27	10.31	10.23	10.42	10.3	10.29	10.33	10.24	10.42	10.3	10.29	10.33	10.24
N_Outfall_1820_S1	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.2
N_Outfall_1820_S2	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8
N_Outfall_1900	7.44	7.45	7.27	7.3	7.34	7.64	7.55	7.45	7.55	7.5	7.5	7.44	7.27	7.3	7.33
N_Outfall_1900_MH	1.85	1.88	1.2	1.3	1.43	3.05	2.36	1.88	2.41	2.1	2.3	2.11	1.93	1.97	1.92
N_Outfall_1900A	3.96	3.57	3.53	3.7	3.37	4.09	3.65	3.61	3.79	3.44	4.09	3.65	3.61	3.79	3.44
N_Outfall_1900B	5.16	4.77	4.73	4.9	4.58	5.29	4.85	4.82	4.99	4.64	5.29	4.85	4.82	4.99	4.64
N_Outfall_1900C	5.16	4.77	4.73	4.9	4.58	5.29	4.85	4.82	4.99	4.64	5.29	4.85	4.81	4.99	4.64
N_Outfall_1900JB1	7.48	7.49	7.27	7.31	7.35	7.76	7.59	7.46	7.61	7.52	7.51	7.45	7.27	7.3	7.33
N_Outfall_1900JB2	8.1	7.83	7.85	7.94	7.69	8.14	7.85	7.86	7.97	7.75	7.71	7.54	6.69	7.28	6.84
N_Outfall_1901	8.69	7.97	8.03	8.25	7.76	8.62	7.97	8.06	8.29	7.83	7.9	7.56	6.69	7.28	6.84
N_Outfall_1902	8.69	7.97	8.03	8.25	7.76	8.63	7.98	8.06	8.29	7.83	7.92	7.57	6.7	7.29	6.84
N_Outfall_200	2.32	2.18	2.2	2.25	2.14	2.32	2.18	2.21	2.25	2.14	2.32	2.18	2.21	2.25	2.14
N_Outfall_2000	1.94	1.85	1.37	1.47	1.26	2.08	1.86	1.52	1.61	1.6	2.26	2.09	1.94	1.98	1.95
N_Outfall_2000A	2.59	3	1.88	1.88	2.17	2.59	3	1.88	1.88	2.16	2.65	3.15	1.93	1.98	2.17
N_Outfall_2000B	3.32	3.66	2.64	2.64	2.92	3.32	3.66	2.64	2.64	2.92	3.41	3.82	2.64	2.64	2.93
N_Outfall_2100	4.04	4.02	3.9	3.93	3.95	4.09	4.03	3.91	3.97	3.99	4.09	4.03	3.91	3.97	3.99
N_Outfall_2110	9.01	9.08	8.19	8.69	8.94	9.01	9.08	8.19	8.69	8.94	9.03	9.11	8.19	8.69	8.94
N_Outfall_2120_MH1	1.36	1.29	1.2	1.24	1.21	1.78	1.6	1.49	1.58	1.53	2.08	1.98	1.93	1.97	1.92
N_Outfall_2130	4.12	4.04	3.9	3.93	3.95	4.25	4.06	3.91	3.98	4.01	4.25	4.06	3.91	3.98	4.01

	CURRENT (2023)					FUTURE SCENARIO 2040IL					FUTURE SCENARIO 2040IH				
NODE NAME	100YR24HR	100YR96HR	10YR24HR	25YR24HR	25YR96HR	100yr24hr	100YR96HR	10YR24HR	25YR24HR	25YR96HR	100yr24hr	100YR96HR	10YR24HR	25YR24HR	25YR96HR
N_Outfall_2200	1.65	1.52	1.53	1.58	1.47	1.68	1.56	1.57	1.61	1.52	1.95	1.91	1.91	1.93	1.9
N_Outfall_2400	5.86	5.68	5.71	5.77	5.62	5.86	5.84	5.71	5.77	5.62	5.87	6.17	5.71	5.77	5.62
N_Outfall_2410	6.15	5.94	5.98	6.04	5.87	6.15	5.94	5.98	6.04	5.87	6.15	6.21	5.98	6.04	5.87
N_Outfall_2500	9.11	9.75	7.74	8.02	8.68	9.3	9.8	7.74	8.02	9.04	9.55	9.84	7.74	8.16	9.24
N_Outfall_2600	8.16	8.86	7.69	7.97	7.99	8.52	9	7.69	7.97	8	8.88	9.38	7.69	7.97	8.52
N_Outfall_2610	8.16	8.86	5.86	6.5	7.43	8.52	9	5.86	6.5	7.94	8.87	9.38	5.86	6.55	8.52
N_Outfall_2700	3.4	3.32	3.34	3.37	3.3	3.4	3.32	3.35	3.37	3.3	3.4	3.32	3.35	3.37	3.3
N_Outfall_2800	3.76	3.19	2.31	3.52	2.22	3.76	3.55	2.77	3.61	2.4	3.79	3.69	3.47	3.69	2.84
N_Outfall_300	7.01	8.6	4.93	5.59	6.28	8	8.64	1.94	4.78	6.76	8.54	8.67	1.94	4.95	7.61
N_Outfall_3000	9.21	9.12	9.11	9.15	9.03	9.2	9.12	9.09	9.14	9.02	9.2	9.37	9.09	9.14	9.02
N_Outfall_3001	10.05	10.03	8.25	9.91	9.88	10.07	10.04	9.35	9.94	9.91	10.07	10.05	8.75	9.92	9.91
N_Outfall_3002	10.13	10.09	8.25	9.92	9.88	10.16	10.11	9.35	9.95	9.91	10.17	10.13	8.75	9.93	9.92
N_Outfall_3003	10.21	10.15	8.26	9.93	9.89	10.25	10.18	9.36	9.97	9.92	10.26	10.21	8.75	9.94	9.93
N_Outfall_3004	10.21	10.15	8.25	9.93	9.89	10.25	10.17	9.35	9.96	9.92	10.26	10.2	8.75	9.94	9.92
N_Outfall_300A	7.01	8.6	4.93	5.59	6.28	8	8.65	3.34	4.81	6.76	8.54	8.67	3.34	4.95	7.61
N_Outfall_310	7.01	8.6	4.93	5.59	6.28	8	8.65	3.58	4.82	6.76	8.55	8.68	3.58	4.95	7.61
N_Outfall_3100	2.99	2.95	2.07	2.54	1.93	3.16	3.1	3.01	3.08	2.95	3.19	3.17	3.04	3.1	3
N_Outfall_3110	3.2	3.6	2.07	2.6	2.05	4.1	4.28	3.1	3.29	3.12	4.26	4.38	3.13	3.3	3.18
N_Outfall_3120	3.32	3.85	2.47	2.68	2.59	4.31	4.65	3.16	3.41	3.21	4.69	5.11	3.19	3.42	3.27
N_Outfall_3120A	4.83	4.96	4.48	4.65	4.59	5.05	5.24	4.72	4.87	4.78	5.31	5.74	4.72	4.87	4.78
N_Outfall_3130	5.34	5.6	4.64	4.95	4.84	5.45	5.61	4.81	5.09	4.91	5.73	6.25	4.81	5.09	4.91
N_Outfall_3130A	5.32	5.59	4.63	4.94	4.84	5.44	5.6	4.81	5.08	4.9	5.72	6.25	4.81	5.08	4.9
N_Outfall_3130B	5.3	5.59	4.63	4.93	4.83	5.44	5.59	4.82	5.08	4.9	5.72	6.24	4.82	5.08	4.9
N_Outfall_3130C	5.2	5.43	4.61	4.88	4.79	5.33	5.48	4.8	5.03	4.87	5.58	6.06	4.8	5.03	4.87
N_Outfall_3131	5.35	5.6	4.64	4.95	4.85	5.46	5.62	4.82	5.09	4.91	5.73	6.26	4.82	5.09	4.91
N_Outfall_3140	5.32	5.69	4.63	4.93	4.83	5.48	5.68	4.85	5.11	4.93	5.84	6.34	4.85	5.11	4.93
N_Outfall_320	7.01	8.61	4.93	5.59	6.28	8	8.67	4.39	4.85	6.76	8.55	8.74	4.39	4.95	7.61
N_Outfall_3200	5.64	5.62	5.27	5.4	5.06	5.71	5.75	5.27	5.4	5.06	5.79	6.5	5.27	5.4	5.06
N_Outfall_320A	7.01	8.6	4.93	5.59	6.28	8	8.66	4.39	4.85	6.76	8.55	8.72	4.39	4.95	7.61
N_Outfall_320B	7.01	8.68	4.93	5.59	6.28	8	8.8	4.39	4.86	6.76	8.64	9	4.39	4.96	7.61
N_Outfall_3300	3.71	3.88	3.22	3.4	3.59	3.9	3.91	3.23	3.41	3.81	3.91	3.93	3.25	3.45	3.86
N_Outfall_3300A	4.08	4.07	3.43	3.75	3.59	4.47	4.73	3.48	3.84	3.82	4.67	4.85	3.53	3.87	3.9
N_Outfall_3310	4.52	4.27	3.75	4.15	3.81	4.82	5.27	3.8	4.28	3.83	5.15	5.47	3.89	4.32	3.93
N_Outfall_3600	3.7	3.5	3.51	3.6	3.44	3.7	3.5	3.53	3.61	3.44	3.7	3.5	3.56	3.62	3.44
N_Outfall_3700	5.08	5.03	5.04	5.06	5.02	5.09	5.04	5.04	5.06	5.02	5.09	5.05	5.04	5.06	5.02
N_Outfall_3800	1.35	1.25	1.2	1.23	1.21	1.68	1.54	1.48	1.54	1.5	2.05	1.96	1.92	1.96	1.91
N_Outfall_3900	3.5	3.19	2.98	3.2	3.03	3.58	3.22	3.07	3.27	3.06	3.64	3.22	3.15	3.31	3.06
N_Outfall_3910	3.89	3.87	3.86	3.87	3.86	3.92	3.9	3.89	3.9	3.88	3.92	3.9	3.89	3.9	3.88
N_Outfall_400	7.01	8.78	4.93	5.59	6.28	8	8.99	4.39	4.86	6.76	8.8	9.37	4.39	4.96	7.61
N_Outfall_4000	2.21	2.11	2.09	2.15	1.85	3.09	2.56	2.18	2.26	2.11	3.13	3.04	2.2	2.26	2.15
N_Outfall_4100	4.54	4.45	4.48	4.51	4.31	4.58	4.51	4.53	4.55	4.48	4.58	4.54	4.53	4.55	4.48
N_Outfall_500	6.19	6.35	4.95	5.42	5.74	6.1	6.61	3.28	3.86	3.49	6.6	7.28	3.28	3.86	3.49
N_Outfall_500A	5.47	5.87	4.63	4.93	4.83	5.53	5.92	4.9	5.16	4.98	6.07	6.57	4.9	5.16	4.98
N_Outfall_500B	5.71	6.15	4.63	4.93	4.83	5.61	6.47	4.97	5.24	5.06	6.5	7.14	4.97	5.24	5.06
N_Outfall_500C	6.19	6.36	4.95	5.43	5.74	6.1	6.61	3.28	3.86	3.5	6.6	7.28	3.28	3.86	3.5
N_Outfall_600	6.2	6.36	4.95	5.43	5.74	6.11	6.62	3.32	3.9	3.53	6.61	7.29	3.32	3.9	3.53
N_Outfall_600A	6.2	6.36	4.95	5.43	5.74	6.12	6.62	3.33	3.91	3.54	6.61	7.29	3.33	3.91	3.54
N_Outfall_600B	6.2	6.36	4.95	5.43	5.74	6.11	6.62	3.31	3.89	3.53	6.61	7.28	3.31	3.89	3.53
N_Outfall_610	6.22	6.37	4.96	5.43	5.74	6.14	6.62	3.35	3.94	3.56	6.61	7.29	3.35	3.94	3.56
N_Outfall_620	6.22	6.37	4.96	5.43	5.74	6.15	6.63	3.56	3.99	3.59	6.62	7.29	3.56	3.99	3.59

	CURRENT (2023)					FUTURE SCENARIO 2040IL					FUTURE SCENARIO 2040IH				
NODE NAME	100YR24HR	100YR96HR	10YR24HR	25YR24HR	25YR96HR	100yr24hr	100YR96HR	10YR24HR	25YR24HR	25YR96HR	100yr24hr	100YR96HR	10YR24HR	25YR24HR	25YR96HR
N_Outfall_620A	6.24	6.4	4.96	5.43	5.74	6.16	6.64	3.64	4.07	3.66	6.64	7.29	3.64	4.07	3.66
N_Outfall_620B	6.27	6.44	4.96	5.42	5.75	6.19	6.65	3.95	4.24	4.03	6.68	7.29	3.95	4.24	4.03
N_Outfall_630	6.35	6.57	4.96	5.42	5.75	6.27	6.7	4.27	4.75	4.47	6.8	7.29	4.27	4.75	4.47
N_Outfall_630A	6.34	6.57	4.96	5.42	5.75	6.27	6.7	4.26	4.74	4.46	6.79	7.29	4.26	4.74	4.46
N_Outfall_640	6.35	6.57	4.96	5.42	5.75	6.27	6.7	4.63	4.79	4.63	6.8	7.3	4.63	4.79	4.63
N_Outfall_700	6.35	6.57	4.96	5.42	5.75	6.28	6.71	4.64	4.8	4.66	6.8	7.3	4.64	4.8	4.66
N_Outfall_800	7.01	8.56	4.93	5.59	6.28	8	8.6	4.39	4.85	6.76	8.51	8.63	4.39	4.96	7.61
N_Outfall_800A	7.01	8.56	6.39	6.48	6.28	8	8.6	5.8	5.8	6.76	8.51	8.64	5.8	6.11	7.61
N_Outfall_810	7.01	8.56	6.58	6.69	6.4	8	8.61	5.73	5.73	6.76	8.52	8.65	5.73	6.21	7.61
N_Outfall_900	6.7	9.2	5.44	5.86	6.35	9.08	9.49	6	6.5	8.38	9.48	9.51	6	6.66	9.03
N_RiverFront_040	3.01	2.84	2.77	2.88	2.7	3.03	2.84	2.81	2.91	2.72	3.03	2.86	2.81	2.9	2.72
N_RiverFront_060	4.15	4.24	3.36	3.51	3.98	4.2	4.3	3.39	3.98	4.01	4.31	4.36	3.39	4.03	4.1
N_RiverFront_070	2.23	2.26	2.18	2.19	2.15	2.38	2.4	2.31	2.34	2.25	2.43	2.51	2.31	2.34	2.25
N_RiverFront_090	2.27	2.13	1.91	1.99	1.9	3.45	3.31	2.59	3.17	2.3	3.47	3.46	2.74	3.28	2.46
N_RiverFront_090A	1.97	1.91	1.74	1.83	1.73	2.59	2.3	1.98	2.18	1.89	2.76	2.7	2.12	2.27	2.04
N_RiverFront_120	3.58	3.54	3.44	3.51	3.5	3.6	3.64	3.49	3.54	3.5	3.66	3.68	3.51	3.55	3.5
N_RiverFront_130	4.09	4.07	4.04	4.06	4.05	4.11	4.14	4.05	4.07	4.05	4.14	4.16	4.06	4.07	4.07
N_RiverFront_140	3.41	3.44	3.33	3.35	3.31	3.64	3.61	3.53	3.56	3.48	3.67	3.74	3.53	3.56	3.53
N_RiverFront_150	4.28	4.97	3.52	3.62	3.86	4.98	5.02	4.14	4.33	4.8	5.02	5.04	4.14	4.41	4.94
N_RiverFront_160	4.02	4.71	3.38	3.55	3.71	4.49	4.81	3.91	4.06	4.35	4.63	4.81	3.91	4.13	4.47
N_RiverFront_170	4.2	4.2	3.8	3.99	3.93	4.41	4.36	4.22	4.3	4.25	4.42	4.42	4.22	4.3	4.25
N_RiverFront_180	2.92	2.9	2.91	2.91	2.89	2.99	2.94	2.95	2.96	2.92	2.99	2.95	2.95	2.96	2.92
N_RiverFront_190	1.9	1.84	1.72	1.79	1.71	1.96	1.94	1.79	1.86	1.75	2.02	2.1	1.92	1.94	1.91

NODE NAME	FUTURE SCENARIO 2070IL					FUTURE SCENARIO 2070IH					FUTURE SCENARIO 2100IL				
	100yr24hr	100YR96HR	10YR24HR	25YR24HR	25YR96HR	100yr24hr	100YR96HR	10YR24HR	25YR24HR	25YR96HR	100yr24hr	100YR96HR	10YR24HR	25YR24HR	25YR96HR
GWT	3.27	3.27	3.27	3.27	3.27	5.01	5.01	5.01	5.01	5.01	3.72	3.72	3.72	3.72	3.72
N_BC_ICW_01	1.95	1.95	1.95	1.95	1.95	3.69	3.69	3.69	3.69	3.69	2.4	2.4	2.4	2.4	2.4
N_BC_ICW_02	1.95	1.95	1.95	1.95	1.95	3.69	3.69	3.69	3.69	3.69	2.4	2.4	2.4	2.4	2.4
N_BC_ICW_03	1.95	1.95	1.95	1.95	1.95	3.69	3.69	3.69	3.69	3.69	2.4	2.4	2.4	2.4	2.4
N_BC_ICW_04	1.95	1.95	1.95	1.95	1.95	3.69	3.69	3.69	3.69	3.69	2.4	2.4	2.4	2.4	2.4
N_BC_ICW_05	1.95	1.95	1.95	1.95	1.95	3.69	3.69	3.69	3.69	3.69	2.4	2.4	2.4	2.4	2.4
N_BC_ICW_06	1.95	1.95	1.95	1.95	1.95	3.69	3.69	3.69	3.69	3.69	2.4	2.4	2.4	2.4	2.4
N_BC_ICW_07	1.95	1.95	1.95	1.95	1.95	3.69	3.69	3.69	3.69	3.69	2.4	2.4	2.4	2.4	2.4
N_BC_ICW_08	1.95	1.95	1.95	1.95	1.95	3.69	3.69	3.69	3.69	3.69	2.4	2.4	2.4	2.4	2.4
N_BC_ICW_09	1.95	1.95	1.95	1.95	1.95	3.69	3.69	3.69	3.69	3.69	2.4	2.4	2.4	2.4	2.4
N_BC_ICW_10	1.95	1.95	1.95	1.95	1.95	3.69	3.69	3.69	3.69	3.69	2.4	2.4	2.4	2.4	2.4
N_BC_ICW_11	1.95	1.95	1.95	1.95	1.95	3.69	3.69	3.69	3.69	3.69	2.4	2.4	2.4	2.4	2.4
N_BC_North_01	4.82	4.82	4.82	4.82	4.82	4.82	4.82	4.82	4.82	4.82	4.82	4.82	4.82	4.82	4.82
N_BC_North_02	13.38	13.38	13.38	13.38	13.38	13.38	13.38	13.38	13.38	13.38	13.38	13.38	13.38	13.38	13.38
N_Closed_100	12.26	13.35	11.32	11.54	11.85	13.74	14.11	12.19	12.9	13.53	12.77	13.65	11.32	11.61	12.4
N_Closed_1000	11.43	11.44	8.63	9.7	11.23	11.53	11.56	11.22	11.44	11.45	11.44	11.46	8.63	10.82	11.41
N_Closed_1100	9.6	9.85	7.27	8.34	9.24	10.11	10.21	9.28	9.79	9.86	9.86	9.92	7.27	8.98	9.33
N_Closed_1200	9.59	9.86	8.13	8.4	8.84	10.12	10.22	9.14	9.79	9.86	9.87	9.93	8.13	8.8	9.33
N_Closed_1300	9.59	9.86	7.12	8.02	8.85	10.13	10.24	8.97	9.79	9.87	9.87	9.93	7.33	8.42	9.33
N_Closed_1400	10.41	10.37	10.12	10.24	10.22	10.66	10.52	10.28	10.47	10.42	10.46	10.42	10.11	10.26	10.25
N_Closed_1500	10.27	10.22	9.34	9.94	9.93	10.55	10.48	9.37	10	10.1	10.31	10.34	9.34	9.92	9.92
N_Closed_1600	11.08	11.21	10.62	10.76	10.83	11.73	11.39	11.04	11.35	11.25	11.26	11.31	10.72	10.81	10.93
N_Closed_1700	8.61	8.76	5.65	6.56	7.79	9.31	9.46	7.77	8.69	8.75	8.76	9	5.65	7.27	8.5
N_Closed_1800	9.49	9.51	7.78	8.1	9.12	9.88	9.83	8.8	9.49	9.53	9.52	9.58	7.78	8.63	9.43
N_Closed_1900	9.35	9.47	8.57	8.73	9.16	9.82	9.72	9.3	9.54	9.57	9.47	9.57	8.57	9.19	9.23
N_Closed_200	11.1	11.57	10.06	10.06	10.79	11.95	12.65	11.51	11.69	11.88	11.43	11.76	10.06	10.62	11.3
N_Closed_2000	9.35	9.46	7.66	8.77	9.16	9.81	9.71	9.29	9.53	9.56	9.46	9.56	8.46	9.2	9.23
N_Closed_2100	9.34	9.46	7.62	8.77	9.16	9.81	9.7	9.29	9.53	9.56	9.46	9.56	8.46	9.2	9.23
N_Closed_2200	8.48	8.57	7.9	8.17	8.33	8.88	8.99	8.43	8.6	8.64	8.56	8.63	7.9	8.35	8.41
N_Closed_2300	7.31	7.35	6.77	7.22	7.23	7.46	7.42	7.3	7.38	7.38	7.36	7.39	6.93	7.25	7.27
N_Closed_2400	5.69	5.76	4.87	5.17	5.54	5.94	5.91	5.61	5.76	5.81	5.75	5.82	4.87	5.53	5.58
N_Closed_2500	10.07	10.14	8.94	9.23	9.99	10.34	10.25	10.03	10.14	10.19	10.11	10.18	8.94	9.82	10.01
N_Closed_2600	8.93	8.97	8.89	8.91	8.88	9.15	9.07	8.93	9.03	9.02	8.98	9.02	8.89	8.91	8.88
N_Closed_2700	10.21	10.22	6.13	8.18	10.07	10.35	10.34	10.06	10.22	10.25	10.22	10.25	6.13	9.35	10.19
N_Closed_2800	7.16	8.37	4.14	5.71	6.71	8.68	8.76	7.46	8.13	8.54	7.77	8.56	5.46	6.31	7.38
N_Closed_2900	6.88	8.4	3.69	5.13	6.55	9.23	9.76	7.08	8.13	8.96	7.58	8.91	3.69	6.04	6.98
N_Closed_300	12.13	12.95	11.45	11.61	11.92	13.29	13.43	12.47	12.64	13.08	12.42	13.23	11.56	11.79	12.29
N_Closed_3000	5.32	5.56	4.73	4.87	4.89	5.95	5.97	5.04	5.7	5.78	5.62	5.76	4.73	4.89	4.91
N_Closed_3100	3.73	6.92	3.73	3.73	3.73	8.16	9.16	5.41	6.74	7.8	5.89	7.65	3.73	3.73	4.73
N_Closed_3200	7.16	7.21	5.54	6.96	7.06	7.32	7.28	7.13	7.22	7.24	7.2	7.24	6.09	7.08	7.1
N_Closed_3300	17.27	17.22	17.23	17.24	17.18	17.35	17.27	17.25	17.28	17.24	17.28	17.24	17.23	17.24	17.18
N_Closed_3400	7.41	7.36	7.35	7.38	7.33	7.47	7.36	7.35	7.38	7.33	7.41	7.36	7.35	7.38	7.33
N_Closed_3500	13.1	13.16	12.87	12.96	13.06	13.1	13.29	12.88	12.97	13.06	13.1	13.16	12.88	12.96	13.06
N_Closed_3600	4.51	4.65	1.85	3.21	4.3	4.93	4.83	4.42	4.65	4.71	4.62	4.72	2.29	4.33	4.37
N_Closed_3700	7.02	7.04	6.94	6.95	6.97	7.12	7.08	7.02	7.07	7.06	7.05	7.07	6.94	6.98	6.99
N_Closed_3800	13.64	13.98	12.98	13.24	13.53	13.64	15.12	12.98	13.24	13.53	13.64	13.98	12.98	13.24	13.53
N_Closed_3900	8.9	9.44	6.65	6.98	8.6	9.97	10.1	8.51	9.01	9.4	9.25	9.72	6.65	7.8	8.82
N_Closed_400	12.87	12.72	12.69	12.76	12.61	12.94	12.78	12.72	12.81	12.69	12.88	12.75	12.69	12.77	12.61
N_Closed_4000	12.86	12.71	12.68	12.76	12.6	12.93	12.77	12.71	12.8	12.68	12.87	12.74	12.68	12.76	12.61
N_Closed_4100	9.35	9.47	8.23	8.57	9.16	9.81	9.73	9.3	9.54	9.57	9.47	9.57	8.23	9.19	9.23

NODE NAME	FUTURE SCENARIO 2070IL					FUTURE SCENARIO 2070IH					FUTURE SCENARIO 2100IL				
	100yr24hr	100YR96HR	10YR24HR	25YR24HR	25YR96HR	100yr24hr	100YR96HR	10YR24HR	25YR24HR	25YR96HR	100yr24hr	100YR96HR	10YR24HR	25YR24HR	25YR96HR
N_Closed_4200	11.43	11.44	8.77	10.4	11.23	11.54	11.56	11.22	11.44	11.45	11.44	11.46	8.77	10.82	11.41
N_Closed_500	11.98	13.25	11.85	11.91	11.96	13.3	13.34	11.85	11.91	13.25	11.98	13.26	11.85	11.91	11.96
N_Closed_600	6.8	6.8	6.8	6.8	6.8	12.22	12.09	12.05	12.12	12.03	6.8	6.8	6.8	6.8	6.8
N_Closed_700	8.7	8.7	8.67	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7
N_Closed_800	6.63	6.63	6.63	6.63	6.63	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5
N_Closed_900	9.83	9.85	8.98	9.29	9.79	9.91	9.91	9.8	9.84	9.86	9.84	9.87	8.98	9.65	9.8
N_Exfil_100	15.29	14.93	12.75	14.51	12.59	15.28	14.66	12.68	14.36	12.47	15.29	14.88	12.74	14.48	12.57
N_Exfil_1000	6.72	6.56	6.23	6.47	6.26	10.14	9.6	6.92	8.02	7.88	6.82	6.95	6.37	6.54	6.36
N_Exfil_1001	5.51	5.34	3.38	4.06	3.46	10.13	9.59	6.91	8.02	7.88	6.72	6.94	4.11	4.83	4.51
N_Exfil_101	15.29	14.93	12.75	14.51	12.59	15.28	14.65	12.67	14.36	12.47	15.29	14.87	12.74	14.48	12.56
N_Exfil_102	15.29	14.93	12.75	14.5	12.59	15.28	14.65	12.67	14.36	12.47	15.29	14.87	12.73	14.48	12.56
N_Exfil_103	15.28	14.92	12.74	14.5	12.58	15.27	14.65	12.67	14.35	12.46	15.28	14.87	12.73	14.47	12.56
N_Exfil_104	15.28	14.92	12.74	14.5	12.58	15.27	14.64	12.66	14.35	12.46	15.28	14.86	12.73	14.47	12.55
N_Exfil_105	15.28	14.92	12.74	14.49	12.58	15.27	14.64	12.66	14.35	12.46	15.27	14.86	12.72	14.47	12.55
N_Exfil_1100	9.59	9.86	7.03	7.35	8.53	10.12	10.23	9.14	9.79	9.87	9.87	9.93	6.82	7.19	9.32
N_Exfil_1101	9.58	9.85	7.02	7.33	8.52	10.11	10.21	9.13	9.78	9.86	9.86	9.92	6.8	7.16	9.32
N_Exfil_1102	9.58	9.85	7.01	7.33	8.52	10.1	10.21	9.13	9.78	9.86	9.86	9.92	6.79	7.16	9.31
N_Exfil_1200	6.22	5.36	5.07	5.27	5.08	7.33	7.1	6.74	6.95	6.81	6.59	5.79	5.49	5.68	5.51
N_Exfil_1200JB	6.22	5.35	5.07	5.26	5.07	7.33	7.09	6.74	6.95	6.8	6.59	5.79	5.48	5.68	5.51
N_Exfil_1201	10.21	9.46	8.91	9.58	8.57	9.88	8.66	8.68	8.96	8.47	10.2	9.33	8.85	9.49	8.52
N_Exfil_1202	10.21	9.46	8.91	9.58	8.55	9.88	8.63	8.44	8.96	8.07	10.2	9.33	8.84	9.48	8.45
N_Exfil_1400	9.35	9.47	5.29	5.57	9.15	9.82	9.72	9.29	9.54	9.57	9.47	9.57	5.24	9.19	9.22
N_Exfil_1401	9.34	9.46	5.27	5.57	9.15	9.81	9.72	9.29	9.53	9.56	9.46	9.56	5.22	9.19	9.22
N_Exfil_1402	9.34	9.46	5.12	5.56	9.15	9.8	9.72	9.28	9.53	9.56	9.46	9.56	4.46	9.18	9.22
N_Exfil_1600	9.35	9.46	4.87	8.77	9.16	9.81	9.71	9.29	9.53	9.56	9.46	9.56	4.92	9.2	9.23
N_Exfil_1601	9.34	9.46	3.97	8.77	9.16	9.81	9.71	9.29	9.53	9.56	9.46	9.56	4.48	9.19	9.22
N_Exfil_1700	6.75	7.33	3.83	4.03	4.01	7.83	7.98	6.1	7.21	7.39	7.41	7.52	4.28	4.53	4.79
N_Exfil_1701	6.75	7.33	3.83	4.03	4.01	7.83	7.97	6.1	7.21	7.38	7.4	7.51	4.28	4.53	4.79
N_Exfil_1800	13.14	13.16	9.44	10.17	13.08	13.38	13.35	13.03	13.16	13.22	13.17	13.24	9.44	11.83	13.09
N_Exfil_1801	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7
N_Exfil_1802	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7
N_Exfil_2000	4.93	5	4.81	4.85	4.6	5.2	5.08	4.96	5.07	5.02	5.02	5.05	4.82	4.85	4.87
N_Exfil_2001	5.15	5.29	4.82	4.86	4.59	5.58	5.6	5.08	5.38	5.44	5.32	5.42	4.82	4.86	4.87
N_Exfil_2002	5.32	5.56	4.82	4.87	4.59	5.98	6	5.17	5.7	5.79	5.61	5.76	4.82	4.87	4.87
N_Exfil_2003	5.32	5.58	4.76	4.8	4.56	6.03	6.04	5.18	5.71	5.81	5.61	5.77	4.76	4.8	4.82
N_Exfil_2004	5.33	5.61	4.54	4.58	4.43	6.1	6.11	5.19	5.72	5.84	5.61	5.79	4.55	4.58	4.75
N_Exfil_2005	5.35	5.69	3.93	4.35	3.97	6.23	6.2	5.22	5.79	5.89	5.66	5.86	3.99	4.39	4.71
N_Exfil_2100	2	2	2	2	2	5.07	5.19	2	2	2	2	4.59	2	2	2
N_Exfil_2101	2	2	2	2	2	5.07	5.19	2	2	2	2	4.59	2	2	2
N_Exfil_2102	2	2	2	2	2	5.07	5.19	2	2	2	2	4.59	2	2	2
N_Exfil_2103	2	2	2	2	2	5.07	5.19	2	2	2	2	4.59	2	2	2
N_Exfil_2300	7.72	7.58	7.63	7.66	7.53	7.72	7.59	7.63	7.66	7.54	7.72	7.58	7.63	7.66	7.53
N_Exfil_2301	7.72	7.58	7.63	7.66	7.53	7.72	7.59	7.63	7.66	7.54	7.72	7.58	7.63	7.66	7.53
N_Exfil_2400	14.61	11.4	10.97	11.76	10.46	11.49	10.89	10.54	10.87	10.46	12.65	10.78	10.63	11.22	10.21
N_Exfil_2401	14.61	11.39	10.96	11.76	10.46	11.49	10.89	10.53	10.87	10.45	12.65	10.77	10.62	11.21	10.11
N_Exfil_2402	14.6	11.39	10.96	11.75	10.45	11.48	10.88	10.53	10.86	10.44	12.64	10.77	10.62	11.21	10.03
N_Exfil_2403	14.6	11.39	10.96	11.75	10.46	11.48	10.89	10.53	10.87	10.45	12.64	10.77	10.62	11.21	10.07
N_Exfil_2500	13.8	13.76	13.66	13.7	13.6	14.02	13.88	13.74	13.87	13.8	13.85	13.8	13.66	13.7	13.65
N_Exfil_2501	13.8	13.76	13.66	13.7	13.6	14.02	13.88	13.74	13.86	13.8	13.85	13.8	13.66	13.7	13.64
N_Exfil_2502	13.8	13.76	13.66	13.7	13.6	14.02	13.88	13.74	13.86	13.8	13.85	13.8	13.66	13.7	13.64

NODE NAME	FUTURE SCENARIO 2070IL					FUTURE SCENARIO 2070IH					FUTURE SCENARIO 2100IL				
	100yr24hr	100YR96HR	10YR24HR	25YR24HR	25YR96HR	100yr24hr	100YR96HR	10YR24HR	25YR24HR	25YR96HR	100yr24hr	100YR96HR	10YR24HR	25YR24HR	25YR96HR
N_EXfil_2600	6.02	6.74	2	4.92	4.92	7.13	7.04	5.75	6.84	6.89	6.69	6.88	2	4.94	5
N_EXfil_2600A	5.48	5.89	3.27	3.67	4.48	6.4	6.37	5.34	6	6.09	5.86	6.05	3.71	4.67	4.82
N_EXfil_2600JB	6.01	6.73	3.27	3.68	4.49	7.13	7.05	5.74	6.84	6.9	6.69	6.87	3.71	4.69	4.86
N_EXfil_2700	6.82	8.35	6.57	6.58	6.58	9	8.85	6.71	8.48	8.57	8.29	8.56	6.57	6.61	6.64
N_EXfil_2700JB	6.7	8.33	3.97	4.52	5.06	8.98	8.83	5.9	8.46	8.55	8.27	8.54	4.28	5.21	5.34
N_EXfil_2800	6.05	6.74	2	5.98	5.98	7.15	7.06	6.34	6.84	6.9	6.69	6.88	2	5.99	6.03
N_EXfil_2800JB	4.43	6.73	3.27	3.46	3.52	7.14	7.05	6.33	6.84	6.9	6.69	6.88	3.72	4.05	4.36
N_EXfil_2801	4.42	6.69	3.27	3.42	3.5	7.13	7.04	6.32	6.83	6.88	6.66	6.84	3.72	4.04	4.36
N_Exfil_300	6.58	5.43	5.22	5.27	5.19	8.24	7	6.66	6.84	6.73	7	5.81	5.45	5.63	5.48
N_Exfil_300JB	6.58	5.42	4.9	5.19	4.94	8.24	7	6.66	6.84	6.73	7	5.81	5.45	5.62	5.47
N_Exfil_301	13.48	13.37	12.47	13.23	12.35	13.47	13.26	12.4	13.11	12.19	13.48	13.36	12.46	13.21	12.32
N_Exfil_302	13.48	13.36	12.47	13.22	12.35	13.47	13.25	12.39	13.11	12.19	13.48	13.36	12.46	13.2	12.31
N_Exfil_500	6.24	6.15	6.11	6.16	6.14	6.64	6.59	6.51	6.58	6.53	6.23	6.15	6.11	6.16	6.14
N_Exfil_500JB	6.24	6.15	6.11	6.16	6.14	6.64	6.59	6.51	6.58	6.53	6.23	6.15	6.11	6.16	6.14
N_Exfil_501	8.94	8.66	7.84	8.59	7.79	8.45	8.12	7.29	7.72	7.55	8.92	8.32	7.71	8.37	7.59
N_Exfil_501JB	8.93	8.66	7.84	8.58	7.79	8.45	8.12	7.28	7.71	7.54	8.92	8.31	7.71	8.37	7.58
N_Exfil_502	8.71	8.16	8.19	8.26	8.1	8.31	8.1	8.13	8.22	7.95	8.64	8.16	8.19	8.26	8.09
N_Exfil_503	8.71	7.9	7.9	8.04	7.9	8.21	7.9	7.9	7.9	7.9	8.64	7.9	7.9	7.96	7.9
N_Exfil_600	5.8	5.8	5.8	5.8	5.8	6.64	6.59	6.5	6.58	6.53	5.8	5.8	5.8	5.8	5.8
N_Exfil_601	5.8	5.8	5.8	5.8	5.8	6.64	6.59	6.5	6.58	6.53	5.8	5.8	5.8	5.8	5.8
N_Exfil_700	4.5	4.5	4.5	4.5	4.5	7.45	7.37	7.31	7.37	7.3	7.35	7.29	7.3	7.32	7.28
N_Exfil_701	4.5	4.5	4.5	4.5	4.5	7.45	7.37	7.31	7.37	7.3	7.35	7.29	7.3	7.32	7.28
N_Exfil_800	4.8	4.8	4.8	4.8	4.8	10.32	10.59	7.84	9.13	9.52	8.35	9.02	5.43	5.84	5.9
N_Exfil_801	4.8	4.8	4.8	4.8	4.8	10.32	10.59	7.84	9.12	9.52	8.34	9.02	5.42	5.84	5.9
N_Exfil_900	11.04	12.64	9.78	9.88	9.59	12.75	12.69	10.16	12.67	12.67	12.65	12.68	9.78	9.88	9.59
N_Exfil_901	11.03	12.64	9.54	9.75	9.32	12.75	12.68	10.15	12.67	12.66	12.65	12.67	9.53	9.73	9.28
N_Exfil_902	11.03	12.63	8.63	9.74	8.13	12.74	12.68	10.15	12.66	12.66	12.64	12.67	8.57	9.72	8.13
N_Exfil_C_600	6.8	6.8	6.8	6.8	6.8	12.22	12.09	12.05	12.12	12.03	6.8	6.8	6.8	6.8	6.8
N_Exfil_C_700	8.7	8.7	8.67	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7
N_Exfil_C_800	6.63	6.63	6.63	6.63	6.63	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5
N_ICW_100	1.95	1.95	1.95	1.95	1.95	3.69	3.69	3.69	3.69	3.69	2.4	2.4	2.4	2.4	2.4
N_Misc_100	13.71	13.55	13.55	13.57	13.53	13.7	13.58	13.55	13.57	13.53	13.71	13.55	13.55	13.57	13.53
N_Misc_1000	7.19	7.03	7.08	7.13	6.99	7.61	7.43	7.33	7.44	7.32	7.38	7.31	7.32	7.35	7.29
N_Misc_1100	4.65	4.7	4.54	4.57	4.5	4.91	4.79	4.68	4.8	4.71	4.76	4.73	4.61	4.65	4.58
N_Misc_1200	4.74	4.76	4.67	4.68	4.66	4.84	4.79	4.73	4.79	4.76	4.78	4.78	4.67	4.68	4.7
N_Misc_1400	4.51	4.48	4.47	4.48	4.45	4.53	4.49	4.47	4.49	4.46	4.51	4.48	4.47	4.48	4.45
N_Misc_1500	11.66	11.44	11.3	11.5	11.15	11.68	11.49	11.31	11.51	11.17	11.66	11.45	11.3	11.49	11.15
N_Misc_1500_S1	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8
N_Misc_1500_S2	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6
N_Misc_1600	11.99	11.99	11.99	11.99	11.99	11.99	11.99	11.99	11.99	11.99	11.99	11.99	11.99	11.99	11.99
N_Misc_1600_S	12.11	12.11	12.11	12.11	12.11	12.11	12.11	12.11	12.11	12.11	12.11	12.11	12.11	12.11	12.11
N_Misc_1700	14.86	14.81	14.8	14.82	14.76	14.98	14.89	14.82	14.87	14.84	14.87	14.83	14.8	14.82	14.76
N_Misc_1800	9.96	10.05	8.82	9.83	9.84	10.19	10.1	9.98	10.1	10.06	10.06	10.09	8.82	9.86	9.91
N_Misc_1900	9.75	9.82	8.98	9.59	9.62	9.89	9.85	9.76	9.85	9.83	9.83	9.84	8.98	9.64	9.69
N_Misc_200	4.64	4.63	4.62	4.63	4.62	4.74	4.72	4.63	4.66	4.68	4.65	4.65	4.62	4.63	4.62
N_Misc_2000	8.49	8.59	7.93	8.21	8.27	8.81	8.74	8.48	8.65	8.66	8.61	8.67	8.09	8.31	8.39
N_Misc_2100	3.54	3.51	3.47	3.49	3.45	3.7	3.7	3.7	3.7	3.7	3.55	3.52	3.47	3.49	3.46
N_Misc_2200	9.35	9.46	8.8	8.85	9.16	9.81	9.71	9.3	9.53	9.56	9.46	9.56	8.83	9.2	9.23
N_Misc_2300	6.55	6.49	6.5	6.52	6.47	6.83	6.74	6.65	6.75	6.64	6.73	6.63	6.65	6.68	6.6
N_Misc_2400	7.12	7.08	7.03	7.08	7.07	7.12	7.08	7.03	7.08	7.07	7.12	7.08	7.03	7.08	7.07

NODE NAME	FUTURE SCENARIO 2070IL					FUTURE SCENARIO 2070IH					FUTURE SCENARIO 2100IL				
	100yr24hr	100YR96HR	10YR24HR	25YR24HR	25YR96HR	100yr24hr	100YR96HR	10YR24HR	25YR24HR	25YR96HR	100yr24hr	100YR96HR	10YR24HR	25YR24HR	25YR96HR
N_Misc_2500	10.94	10.87	10.89	10.91	10.86	11.03	10.94	10.89	10.93	10.91	10.94	10.9	10.89	10.91	10.86
N_Misc_2600	11.57	11.44	11.43	11.49	11.38	11.96	11.82	11.71	11.83	11.7	11.57	11.44	11.43	11.48	11.38
N_Misc_2600_S1	11.8	11.8	11.8	11.8	11.8	11.95	11.81	11.8	11.81	11.8	11.8	11.8	11.8	11.8	11.8
N_Misc_2600_S2	11.56	11.39	11.32	11.45	11.2	11.95	11.82	11.71	11.82	11.7	11.56	11.38	11.31	11.45	11.2
N_Misc_300	5.59	5.59	5.54	5.56	5.51	5.66	5.61	5.57	5.62	5.58	5.62	5.6	5.54	5.56	5.51
N_Misc_400	5.05	4.99	4.97	5.01	4.94	5.09	5.02	4.99	5.03	4.98	5.06	5.01	4.97	5.01	4.94
N_Misc_500	5.09	5.05	5.05	5.07	5.03	5.09	5.05	5.05	5.07	5.03	5.09	5.05	5.05	5.07	5.03
N_Misc_600	5.61	5.48	5.49	5.55	5.42	5.61	5.48	5.49	5.55	5.42	5.61	5.48	5.49	5.55	5.42
N_Misc_700	11.84	11.77	11.75	11.79	11.72	12.2	12.09	12.04	12.11	12.03	11.84	11.77	11.75	11.79	11.72
N_Misc_700_S	14.85	14.85	14.85	14.85	14.85	14.85	14.85	14.85	14.85	14.85	14.85	14.85	14.85	14.85	14.85
N_Misc_800	6.1	6	5.99	6.02	5.97	6.64	6.58	6.51	6.57	6.53	6.09	6	5.99	6.02	5.97
N_Misc_900	6.3	6.29	6.29	6.29	6.28	6.64	6.58	6.5	6.57	6.53	6.3	6.3	6.29	6.29	6.28
N_Ocean_000	2.39	2.39	2.39	2.39	2.39	4.13	4.13	4.13	4.13	4.13	2.84	2.84	2.84	2.84	2.84
N_Ocean_001	2.39	2.39	2.39	2.39	2.39	4.13	4.13	4.13	4.13	4.13	2.84	2.84	2.84	2.84	2.84
N_Outfall_100	2.23	2.15	2.14	2.17	2.1	3.71	3.7	3.7	3.7	3.7	2.45	2.45	2.42	2.43	2.42
N_Outfall_1000	1.94	1.99	1.87	1.9	1.93	3.73	3.72	3.71	3.72	3.71	1.94	1.99	1.87	1.9	1.93
N_Outfall_1010	5	4.81	4.82	4.87	4.78	5	4.81	4.82	4.87	4.78	5	4.81	4.82	4.87	4.78
N_Outfall_1100	2.3	2.05	2.06	2.12	2.01	3.99	3.77	3.78	3.83	3.73	2.72	2.48	2.48	2.53	2.44
N_Outfall_1110	4.37	4.29	4.29	4.32	4.27	4.37	4.29	4.29	4.32	4.27	4.37	4.29	4.29	4.32	4.27
N_Outfall_1200	5.56	4.93	5.01	5.51	4.28	5.55	4.52	4.59	5.25	4.2	5.56	4.93	5.01	5.51	4.28
N_Outfall_1300	4.41	4.2	4.05	4.24	3.83	4.47	4.38	4.33	4.4	4.29	4.43	4.25	4.13	4.28	3.99
N_Outfall_1400	4.12	4.05	3.93	4.06	3.76	4.16	4.11	4.1	4.12	4.07	4.13	4.07	4.01	4.08	3.92
N_Outfall_1500	3.17	2.67	2.7	2.88	2.6	3.73	3.7	3.7	3.7	3.7	3.17	2.67	2.7	2.88	2.6
N_Outfall_1510	3.3	2.76	2.78	2.98	2.7	3.76	3.7	3.7	3.7	3.7	3.3	2.76	2.78	2.98	2.7
N_Outfall_1600	12.87	12.71	12.68	12.76	12.6	12.94	12.78	12.72	12.81	12.68	12.88	12.74	12.68	12.76	12.61
N_Outfall_1610	12.87	12.78	12.79	12.81	12.77	12.94	12.83	12.8	12.82	12.77	12.88	12.78	12.79	12.81	12.77
N_Outfall_1620	12.96	12.86	12.87	12.91	12.8	12.99	12.87	12.89	12.93	12.82	12.97	12.87	12.87	12.91	12.8
N_Outfall_1800	3.59	3.2	3.14	3.28	3.04	4.68	4.48	4.17	4.44	4.2	3.74	3.35	3.17	3.34	3.05
N_Outfall_1800A	3.69	3.22	3.16	3.32	3.05	5.13	4.61	4.24	4.59	4.26	3.82	3.37	3.19	3.38	3.06
N_Outfall_1810	3.89	3.28	3.2	3.4	3.07	6.07	4.89	4.39	4.91	4.38	3.99	3.42	3.24	3.46	3.08
N_Outfall_1820	10.42	10.29	10.29	10.33	10.24	10.72	10.56	10.47	10.57	10.45	10.41	10.29	10.29	10.33	10.24
N_Outfall_1820_S1	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.2
N_Outfall_1820_S2	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8
N_Outfall_1900	7.65	7.55	7.38	7.5	7.47	7.58	7.52	7.28	7.42	7.4	7.52	7.47	7.27	7.31	7.33
N_Outfall_1900_MH	3.09	2.48	2.02	2.28	2.19	4.54	4.25	3.74	3.83	3.81	2.84	2.65	2.45	2.47	2.44
N_Outfall_1900A	4.09	3.64	3.61	3.79	3.44	6.93	5.25	4.56	5.29	4.52	4.12	3.64	3.61	3.79	3.44
N_Outfall_1900B	5.29	4.85	4.81	4.99	4.64	8.13	5.85	5.48	5.9	5.41	5.29	4.84	4.81	4.99	4.64
N_Outfall_1900C	5.29	4.85	4.81	4.99	4.64	8.13	5.85	5.48	5.9	5.41	5.29	4.84	4.81	4.99	4.64
N_Outfall_1900JB1	7.77	7.59	7.39	7.52	7.49	7.63	7.54	7.28	7.42	7.41	7.53	7.47	7.27	7.31	7.33
N_Outfall_1900JB2	8.15	7.85	7.79	7.9	7.71	7.93	7.75	7.55	7.7	7.58	7.76	7.61	6.95	7.46	7.14
N_Outfall_1901	8.65	7.98	7.91	8.15	7.76	8.22	7.84	7.59	7.8	7.61	7.93	7.65	6.96	7.48	7.14
N_Outfall_1902	8.66	7.98	7.92	8.16	7.77	8.23	7.84	7.59	7.81	7.61	7.94	7.65	6.96	7.48	7.14
N_Outfall_200	2.32	2.19	2.21	2.25	2.14	3.71	3.7	3.7	3.7	3.7	2.5	2.46	2.44	2.46	2.42
N_Outfall_2000	2.41	2.18	2.01	2.06	2.03	4.74	4.66	3.75	3.84	3.89	2.73	2.75	2.45	2.48	2.46
N_Outfall_2000A	2.69	3.22	2.01	2.06	2.18	6.72	6.8	3.75	3.92	4.47	2.89	4.47	2.45	2.48	2.46
N_Outfall_2000B	3.45	3.92	2.64	2.64	2.94	8.7	9.07	3.75	4.09	5.09	3.62	6.13	2.64	2.64	3.02
N_Outfall_2100	4.09	4.03	3.91	3.97	3.99	4.75	4.66	3.91	3.97	3.99	4.09	4.03	3.91	3.97	3.99
N_Outfall_2110	9.04	9.12	8.19	8.69	8.94	9.64	10.07	8.61	9.04	9.11	9.07	9.19	8.19	8.69	8.96
N_Outfall_2120_MH1	2.27	2.09	2	2.05	2	4.08	4.01	3.74	3.78	3.77	2.61	2.53	2.45	2.47	2.44
N_Outfall_2130	4.25	4.06	3.91	3.98	4.01	4.76	4.66	3.92	3.98	4.01	4.25	4.06	3.92	3.98	4.01

NODE NAME	FUTURE SCENARIO 2070IL					FUTURE SCENARIO 2070IH					FUTURE SCENARIO 2100IL				
	100yr24hr	100YR96HR	10YR24HR	25YR24HR	25YR96HR	100yr24hr	100YR96HR	10YR24HR	25YR24HR	25YR96HR	100yr24hr	100YR96HR	10YR24HR	25YR24HR	25YR96HR
N_Outfall_2200	2.01	1.97	1.98	1.99	1.97	3.73	3.71	3.7	3.71	3.7	2.44	2.43	2.42	2.43	2.41
N_Outfall_2400	5.9	6.24	5.71	5.77	5.62	9.24	9.25	5.8	6.23	6.56	6.13	6.75	5.71	5.77	5.62
N_Outfall_2410	6.15	6.29	5.98	6.04	5.87	9.73	9.69	6.07	6.61	6.61	6.33	6.82	5.98	6.04	5.87
N_Outfall_2500	9.6	9.85	7.74	8.33	9.24	10.11	10.2	9.28	9.79	9.86	9.86	9.92	7.74	8.98	9.33
N_Outfall_2600	8.9	9.45	7.69	7.97	8.6	9.98	10.11	8.51	9.02	9.41	9.26	9.73	7.69	8.07	8.83
N_Outfall_2610	8.9	9.44	5.86	6.61	8.6	9.98	10.11	8.51	9.01	9.4	9.26	9.73	5.86	7.8	8.82
N_Outfall_2700	3.4	3.32	3.35	3.37	3.3	3.7	3.69	3.69	3.7	3.69	3.4	3.32	3.35	3.37	3.3
N_Outfall_2800	3.8	3.7	3.52	3.7	2.91	3.91	3.82	3.8	3.84	3.78	3.83	3.74	3.65	3.73	3.44
N_Outfall_300	8.59	8.67	1.94	5.12	7.73	8.75	8.79	7.18	8.65	8.67	8.68	8.72	2.44	6.24	8.5
N_Outfall_3000	9.2	9.44	9.09	9.14	9.02	9.97	10.1	9.1	9.2	9.4	9.25	9.72	9.09	9.14	9.02
N_Outfall_3001	10.07	10.06	8.64	9.91	9.91	10.11	10.12	8.89	9.93	9.98	10.08	10.09	7.87	9.9	9.89
N_Outfall_3002	10.17	10.14	8.64	9.92	9.91	10.3	10.28	8.9	9.95	10.02	10.19	10.21	7.87	9.9	9.9
N_Outfall_3003	10.26	10.22	8.65	9.94	9.93	10.55	10.47	8.9	10	10.09	10.3	10.33	7.88	9.92	9.91
N_Outfall_3004	10.26	10.21	8.64	9.93	9.92	10.54	10.47	8.9	9.99	10.09	10.3	10.33	7.87	9.91	9.91
N_Outfall_300A	8.6	8.68	3.34	5.12	7.73	8.77	8.8	7.18	8.65	8.68	8.68	8.73	4.62	6.24	8.5
N_Outfall_310	8.6	8.68	3.58	5.12	7.73	8.79	8.82	7.18	8.66	8.68	8.69	8.74	4.62	6.24	8.5
N_Outfall_3100	3.19	3.19	3.04	3.1	3.01	3.73	3.72	3.7	3.71	3.71	3.24	3.26	3.07	3.11	3.06
N_Outfall_3110	4.28	4.38	3.13	3.31	3.18	4.55	4.51	4.24	4.4	4.43	4.37	4.43	3.15	3.34	3.83
N_Outfall_3120	4.75	5.15	3.19	3.43	3.27	5.64	5.57	4.5	5.16	5.29	5.11	5.32	3.22	3.46	3.94
N_Outfall_3120A	5.38	5.81	4.72	4.87	4.78	6.44	6.43	5.14	5.88	6.06	5.81	6.08	4.72	4.87	4.82
N_Outfall_3130	5.82	6.35	4.81	5.09	4.91	7.07	7.21	5.57	6.45	6.69	6.42	6.72	4.81	5.09	4.98
N_Outfall_3130A	5.82	6.34	4.81	5.08	4.9	7.07	7.21	5.56	6.44	6.68	6.43	6.71	4.81	5.08	4.98
N_Outfall_3130B	5.81	6.33	4.82	5.08	4.9	7.07	7.21	5.55	6.44	6.67	6.43	6.71	4.82	5.08	4.98
N_Outfall_3130C	5.66	6.14	4.8	5.03	4.87	6.85	6.93	5.43	6.24	6.46	6.2	6.49	4.8	5.03	4.94
N_Outfall_3131	5.83	6.35	4.82	5.09	4.91	7.06	7.21	5.58	6.46	6.69	6.43	6.72	4.82	5.09	4.99
N_Outfall_3140	5.93	6.43	4.85	5.11	4.93	7.48	7.56	5.6	6.54	6.81	6.81	7.3	4.85	5.11	5.01
N_Outfall_320	8.61	8.75	4.39	5.12	7.73	9.29	9.44	7.18	8.68	8.74	8.75	8.99	4.39	6.24	8.5
N_Outfall_3200	5.93	6.52	5.27	5.4	5.06	7.05	7.19	5.76	6.62	6.69	6.53	6.72	5.27	5.4	5.06
N_Outfall_320A	8.6	8.73	4.39	5.12	7.73	9.11	9.21	7.18	8.67	8.72	8.73	8.9	4.39	6.24	8.5
N_Outfall_320B	8.72	9.03	4.39	5.12	7.73	9.57	9.71	7.18	8.82	9.01	8.95	9.29	4.39	6.24	8.51
N_Outfall_3300	3.91	3.93	3.25	3.47	3.86	4.25	4.27	3.91	3.98	4.06	3.95	4.01	3.29	3.7	3.89
N_Outfall_3300A	4.71	4.87	3.54	3.88	3.92	5.33	5.33	4.45	4.92	5.07	4.88	5.01	3.59	3.97	4.25
N_Outfall_3310	5.22	5.51	3.9	4.32	3.96	6	5.91	5.13	5.63	5.72	5.47	5.67	3.96	4.35	4.63
N_Outfall_3600	3.7	3.5	3.56	3.62	3.44	3.78	3.72	3.73	3.75	3.71	3.7	3.5	3.56	3.62	3.45
N_Outfall_3700	5.09	5.05	5.04	5.06	5.02	5.22	5.16	5.05	5.1	5.11	5.09	5.07	5.04	5.06	5.02
N_Outfall_3800	2.16	2.05	1.99	2.03	1.99	3.88	3.84	3.74	3.77	3.75	2.57	2.5	2.44	2.47	2.43
N_Outfall_3900	3.67	3.23	3.16	3.31	3.06	4.72	4.58	4.2	4.48	4.21	3.81	3.38	3.19	3.38	3.07
N_Outfall_3910	3.92	3.9	3.89	3.9	3.88	4.75	4.64	4.21	4.49	4.23	3.92	3.9	3.89	3.9	3.88
N_Outfall_400	8.89	9.44	4.39	5.13	7.73	9.97	10.1	7.19	9	9.4	9.25	9.72	4.39	6.24	8.54
N_Outfall_4000	3.17	3.12	2.26	2.32	2.22	3.75	3.73	3.7	3.71	3.71	3.33	3.31	2.72	2.78	2.69
N_Outfall_4100	4.58	4.54	4.53	4.55	4.48	4.63	4.59	4.53	4.57	4.55	4.58	4.55	4.53	4.55	4.48
N_Outfall_500	6.75	7.33	3.28	3.86	3.49	7.83	7.97	6.1	7.21	7.38	7.4	7.51	3.28	4.25	5.61
N_Outfall_500A	6.17	6.74	4.9	5.16	4.98	7.6	7.71	5.65	6.71	7.01	7.02	7.38	4.9	5.16	5.06
N_Outfall_500B	6.64	7.22	4.97	5.24	5.06	7.81	7.94	5.73	7.07	7.33	7.35	7.5	4.97	5.24	5.14
N_Outfall_500C	6.75	7.33	3.28	3.86	3.5	7.83	7.98	6.1	7.21	7.39	7.4	7.51	3.28	4.25	5.62
N_Outfall_600	6.76	7.34	3.32	3.9	3.53	7.84	7.99	6.11	7.22	7.39	7.41	7.52	3.32	4.3	5.64
N_Outfall_600A	6.76	7.34	3.33	3.91	3.54	7.84	7.99	6.11	7.22	7.39	7.41	7.52	3.33	4.3	5.65
N_Outfall_600B	6.75	7.33	3.31	3.89	3.53	7.84	7.98	6.1	7.21	7.39	7.41	7.52	3.31	4.29	5.64
N_Outfall_610	6.76	7.34	3.35	3.94	3.56	7.84	7.99	6.14	7.22	7.39	7.41	7.52	3.35	4.32	5.66
N_Outfall_620	6.76	7.34	3.56	3.99	3.59	7.85	8	6.14	7.22	7.4	7.42	7.53	3.56	4.34	5.67

NODE NAME	FUTURE SCENARIO 2070IL					FUTURE SCENARIO 2070IH					FUTURE SCENARIO 2100IL				
	100yr24hr	100YR96HR	10YR24HR	25YR24HR	25YR96HR	100yr24hr	100YR96HR	10YR24HR	25YR24HR	25YR96HR	100yr24hr	100YR96HR	10YR24HR	25YR24HR	25YR96HR
N_Outfall_620A	6.77	7.34	3.64	4.07	3.66	7.85	8	6.16	7.22	7.4	7.42	7.53	3.64	4.35	5.67
N_Outfall_620B	6.79	7.34	3.95	4.24	4.03	7.85	8	6.19	7.22	7.4	7.42	7.53	3.95	4.38	5.69
N_Outfall_630	6.84	7.35	4.27	4.75	4.47	7.85	8.01	6.28	7.23	7.4	7.42	7.53	4.27	4.75	5.72
N_Outfall_630A	6.83	7.35	4.26	4.74	4.46	7.85	8.01	6.28	7.23	7.4	7.42	7.53	4.26	4.74	5.72
N_Outfall_640	6.84	7.35	4.63	4.79	4.63	7.85	8.01	6.28	7.23	7.4	7.42	7.53	4.63	4.79	5.72
N_Outfall_700	6.84	7.35	4.64	4.8	4.66	8.54	8.17	6.29	7.23	7.41	7.43	7.54	4.64	4.8	5.73
N_Outfall_800	8.55	8.64	4.39	5.12	7.73	9.02	9.14	7.18	8.61	8.63	8.65	8.71	4.39	6.24	8.48
N_Outfall_800A	8.55	8.65	5.8	6.15	7.73	9.21	9.45	7.18	8.61	8.64	8.66	8.71	5.8	6.29	8.48
N_Outfall_810	8.56	8.66	5.73	6.27	7.73	10.36	10.22	7.49	9.58	9.13	8.87	9.51	5.73	6.44	8.49
N_Outfall_900	9.49	9.52	6	6.89	9.12	9.9	9.85	8.79	9.5	9.53	9.53	9.59	6	8.05	9.44
N_RiverFront_040	3.03	2.86	2.81	2.9	2.72	3.7	3.7	3.7	3.7	3.7	3.04	2.9	2.81	2.91	2.72
N_RiverFront_060	4.33	4.36	3.39	4.03	4.11	4.55	4.38	4.27	4.42	4.32	4.42	4.38	3.97	4.11	4.2
N_RiverFront_070	2.45	2.52	2.31	2.34	2.25	3.7	3.7	3.7	3.7	3.7	2.57	2.56	2.41	2.42	2.42
N_RiverFront_090	3.49	3.48	2.81	3.31	2.53	4.75	4.7	4.18	4.57	4.52	4.09	4.05	3.25	3.39	2.98
N_RiverFront_090A	2.85	2.82	2.19	2.33	2.11	4.49	4.45	4.05	4.34	4.31	3.66	3.64	2.63	2.77	2.56
N_RiverFront_120	3.67	3.68	3.51	3.55	3.51	3.8	3.74	3.71	3.74	3.72	3.71	3.7	3.52	3.55	3.57
N_RiverFront_130	4.15	4.16	4.06	4.07	4.07	4.22	4.18	4.13	4.17	4.16	4.17	4.17	4.06	4.08	4.11
N_RiverFront_140	3.67	3.75	3.53	3.56	3.53	3.99	3.99	3.72	3.78	3.82	3.72	3.82	3.53	3.58	3.55
N_RiverFront_150	5.03	5.05	4.14	4.44	4.95	5.37	5.41	4.83	5.03	5.12	5.05	5.17	4.18	4.65	4.97
N_RiverFront_160	4.65	4.81	3.91	4.14	4.49	4.85	4.88	4.36	4.67	4.81	4.78	4.82	3.95	4.21	4.64
N_RiverFront_170	4.43	4.42	4.22	4.3	4.25	4.61	4.56	4.33	4.47	4.47	4.48	4.47	4.22	4.3	4.26
N_RiverFront_180	2.99	2.95	2.95	2.96	2.92	3.7	3.69	3.69	3.7	3.69	2.99	2.96	2.95	2.96	2.92
N_RiverFront_190	2.06	2.12	1.98	2	1.97	3.79	3.74	3.71	3.73	3.72	2.49	2.48	2.42	2.43	2.42

	FUTURE SCENARIO 2100IH					COMPOUND RAINFALL + SURGE				
						2023	2040IL	2040IH	2070IL	2070IH
NODE NAME	100yr24hr	100YR96HR	10YR24HR	25YR24HR	25YR96HR	100yr24hr	100yr24hr	100yr24hr	100yr24hr	100yr24hr
GWT	7.73	7.73	7.73	7.73	7.73	2.5	2.7	3.2	3.27	5.01
N_BC_ICW_01	6.41	6.41	6.41	6.41	6.41	6.69	6.96	7.39	7.46	9.2
N_BC_ICW_02	6.41	6.41	6.41	6.41	6.41	6.69	6.96	7.39	7.46	9.2
N_BC_ICW_03	6.41	6.41	6.41	6.41	6.41	6.69	6.96	7.39	7.46	9.2
N_BC_ICW_04	6.41	6.41	6.41	6.41	6.41	6.69	6.96	7.39	7.46	9.2
N_BC_ICW_05	6.41	6.41	6.41	6.41	6.41	6.69	6.96	7.39	7.46	9.2
N_BC_ICW_06	6.41	6.41	6.41	6.41	6.41	6.69	6.96	7.39	7.46	9.2
N_BC_ICW_07	6.41	6.41	6.41	6.41	6.41	6.69	6.96	7.39	7.46	9.2
N_BC_ICW_08	6.41	6.41	6.41	6.41	6.41	6.69	6.96	7.39	7.46	9.2
N_BC_ICW_09	6.41	6.41	6.41	6.41	6.41	6.69	6.96	7.39	7.46	9.2
N_BC_ICW_10	6.41	6.41	6.41	6.41	6.41	6.69	6.96	7.39	7.46	9.2
N_BC_ICW_11	6.41	6.41	6.41	6.41	6.41	6.69	6.96	7.39	7.46	9.2
N_BC_North_01	4.82	4.82	4.82	4.82	4.82	4.82	4.82	4.82	4.82	4.82
N_BC_North_02	13.38	13.38	13.38	13.38	13.38	13.38	13.38	13.38	13.38	13.38
N_Closed_100	14.56	14.64	13.99	14.23	14.31	11.19	11.89	12.16	12.26	13.74
N_Closed_1000	11.82	11.68	11.6	11.7	11.64	10.74	11.18	11.42	11.43	11.53
N_Closed_1100	10.49	10.48	10.04	10.25	10.26	9.11	9.3	9.54	9.6	10.11
N_Closed_1200	10.56	10.51	10.05	10.27	10.29	8.93	9.15	9.54	9.59	10.12
N_Closed_1300	10.6	10.54	10.06	10.29	10.3	9.21	9.23	9.54	9.59	10.13
N_Closed_1400	10.74	10.58	10.53	10.62	10.45	10.34	10.38	10.41	10.41	10.66
N_Closed_1500	10.75	10.57	10.48	10.6	10.42	10.21	10.26	10.27	10.27	10.55
N_Closed_1600	11.81	11.39	11.47	11.6	11.26	10.87	10.92	11.04	11.08	11.73
N_Closed_1700	9.87	9.87	9.15	9.46	9.57	6.4	7.71	8.55	8.61	9.31
N_Closed_1800	10.1	9.92	9.71	9.9	9.79	8.31	9.08	9.47	9.49	9.9
N_Closed_1900	10.02	9.76	9.71	9.81	9.65	9.12	9.27	9.34	9.35	9.84
N_Closed_200	13.78	13.86	12.32	13.61	13.66	13.8	10.06	11.02	11.1	11.95
N_Closed_2000	10.01	9.75	9.7	9.8	9.64	9.12	9.27	9.33	9.35	9.83
N_Closed_2100	10	9.75	9.69	9.8	9.63	9.12	9.27	9.33	9.34	9.83
N_Closed_2200	9.27	9.28	8.73	8.98	9.05	8.35	8.4	8.46	8.48	9.2
N_Closed_2300	7.51	7.46	7.42	7.46	7.42	7.25	7.27	7.3	7.43	9.2
N_Closed_2400	6.5	6.47	6.45	6.46	6.45	6.67	6.95	7.38	7.45	9.2
N_Closed_2500	10.41	10.25	10.29	10.34	10.2	10.03	10.04	10.07	10.07	10.34
N_Closed_2600	9.18	9.07	9.08	9.12	9.02	8.93	8.93	8.93	8.93	9.23
N_Closed_2700	10.43	10.34	10.34	10.39	10.31	7.65	9.97	10.21	10.21	10.35
N_Closed_2800	9	9.2	8.41	8.64	8.7	4	6.44	7.05	7.16	8.97
N_Closed_2900	9.93	10.01	9.24	9.67	9.78	4.34	6.41	6.82	6.88	9.23
N_Closed_300	13.77	13.85	13.43	13.61	13.66	13.79	11.71	12.07	12.13	13.29
N_Closed_3000	6.47	6.45	6.43	6.44	6.43	6.68	6.95	7.38	7.45	9.2
N_Closed_3100	9.41	9.44	8.42	8.97	9.37	3.73	3.73	3.73	3.73	8.16
N_Closed_3200	7.41	7.33	7.29	7.33	7.29	7.08	7.11	7.37	7.44	9.2
N_Closed_3300	17.36	17.27	17.29	17.32	17.24	17.27	17.27	17.27	17.27	17.35
N_Closed_3400	7.67	7.54	7.35	7.44	7.4	7.41	7.41	7.42	7.48	9.21
N_Closed_3500	13.75	13.81	13.32	13.46	13.53	13.37	13.1	13.1	13.1	13.1
N_Closed_3600	6.43	6.42	6.42	6.42	6.42	6.69	6.95	7.38	7.45	9.2
N_Closed_3700	7.14	7.1	7.09	7.11	7.07	7	7	7.38	7.45	9.2
N_Closed_3800	16.81	17.58	14.6	15.55	16.49	13.64	13.64	13.64	13.64	13.64
N_Closed_3900	10.43	10.43	9.84	10.1	10.18	8.16	8.52	8.87	8.9	9.98
N_Closed_400	13.31	13.11	12.85	13.06	12.96	12.86	12.89	12.89	12.89	12.96
N_Closed_4000	13.3	13.1	12.85	13.05	12.95	12.85	12.88	12.88	12.89	12.95
N_Closed_4100	10.03	9.78	9.7	9.82	9.66	9.11	9.27	9.34	9.35	9.83

	FUTURE SCENARIO 2100IH					COMPOUND RAINFALL + SURGE				
						2023	2040IL	2040IH	2070IL	2070IH
NODE NAME	100yr24hr	100YR96HR	10YR24HR	25YR24HR	25YR96HR	100yr24hr	100yr24hr	100yr24hr	100yr24hr	100yr24hr
N_Closed_4200	11.83	11.69	11.61	11.71	11.65	10.74	11.18	11.42	11.43	11.54
N_Closed_500	13.47	13.41	13.39	13.43	13.39	11.98	11.98	11.98	11.98	13.3
N_Closed_600	12.31	12.2	12.11	12.17	12.12	6.8	6.8	6.8	6.8	12.22
N_Closed_700	12.21	12.19	10.73	11.87	12.04	8.7	8.7	8.7	8.7	8.7
N_Closed_800	12.22	12.15	11.51	11.81	11.77	6.63	6.63	6.63	6.63	8.5
N_Closed_900	10.18	10.11	9.98	10.08	10.04	9.68	9.82	9.82	9.83	9.91
N_Exfil_100	15.49	15.4	12.29	15.24	15.28	15.3	15.29	15.29	15.29	15.28
N_Exfil_1000	15.29	13.58	11.36	12.8	11.7	6.63	6.66	6.71	6.72	10.14
N_Exfil_1001	15.26	13.57	11.35	12.78	11.69	4.56	4.59	5.3	5.51	10.13
N_Exfil_101	15.49	15.39	12.28	15.24	15.28	15.29	15.29	15.29	15.29	15.28
N_Exfil_102	15.48	15.39	12.28	15.23	15.27	15.29	15.29	15.29	15.29	15.28
N_Exfil_103	15.47	15.38	12.27	15.23	15.27	15.29	15.28	15.28	15.28	15.27
N_Exfil_104	15.47	15.37	12.27	15.22	15.26	15.28	15.28	15.28	15.28	15.27
N_Exfil_105	15.47	15.37	12.27	15.22	15.26	15.28	15.28	15.28	15.28	15.27
N_Exfil_1100	10.57	10.52	10.05	10.28	10.29	8.92	9.15	9.54	9.59	10.12
N_Exfil_1101	10.56	10.52	10.05	10.27	10.29	8.91	9.14	9.53	9.58	10.11
N_Exfil_1102	10.55	10.51	10.05	10.27	10.28	8.91	9.13	9.53	9.58	10.1
N_Exfil_1200	8.4	8.29	8.14	8.27	8.25	5.6	5.82	6.17	6.22	9.2
N_Exfil_1200JB	9.12	8.45	8.14	8.38	8.32	5.6	5.82	6.17	6.22	9.19
N_Exfil_1201	10.88	10.56	10.19	10.49	10.44	10.22	10.22	10.22	10.21	9.88
N_Exfil_1202	10.87	10.55	10.18	10.48	10.43	10.22	10.22	10.21	10.21	9.88
N_Exfil_1400	10.02	9.77	9.71	9.82	9.66	9.11	9.27	9.33	9.35	9.84
N_Exfil_1401	10.02	9.77	9.7	9.81	9.65	9.11	9.27	9.33	9.34	9.83
N_Exfil_1402	10.02	9.77	9.7	9.81	9.65	9.11	9.26	9.32	9.34	9.83
N_Exfil_1600	10.01	9.76	9.7	9.81	9.64	9.12	9.27	9.33	9.35	9.84
N_Exfil_1601	10.01	9.76	9.7	9.8	9.64	9.12	9.27	9.33	9.34	9.83
N_Exfil_1700	8.3	8.33	7.85	8	8.06	6.2	6.15	6.96	7.07	9.21
N_Exfil_1701	8.3	8.33	7.84	8	8.05	6.2	6.15	6.95	7.07	9.19
N_Exfil_1800	13.49	13.35	13.36	13.42	13.31	11.87	12.97	13.13	13.14	13.38
N_Exfil_1801	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7
N_Exfil_1802	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7
N_Exfil_2000	6.43	6.42	6.42	6.42	6.42	6.68	6.96	7.38	7.45	9.2
N_Exfil_2001	6.48	6.47	6.44	6.45	6.44	6.68	6.95	7.38	7.44	9.2
N_Exfil_2002	6.52	6.51	6.45	6.47	6.45	6.68	6.95	7.37	7.44	9.21
N_Exfil_2003	6.6	6.54	6.51	6.54	6.49	6.61	6.93	7.36	7.43	9.21
N_Exfil_2004	6.72	6.6	6.59	6.63	6.55	6.53	6.92	7.36	7.43	9.21
N_Exfil_2005	6.86	6.67	6.67	6.73	6.61	6.49	6.91	7.37	7.44	9.22
N_Exfil_2100	6.43	6.42	6.42	6.42	6.42	6.68	6.95	7.38	7.45	9.2
N_Exfil_2101	6.43	6.42	6.42	6.42	6.42	6.68	6.95	7.38	7.45	9.2
N_Exfil_2102	6.43	6.42	6.42	6.42	6.42	6.68	6.95	7.38	7.45	9.2
N_Exfil_2103	6.43	6.42	6.42	6.42	6.42	6.68	6.95	7.38	7.45	9.2
N_Exfil_2300	7.77	7.66	7.63	7.67	7.59	7.72	7.72	7.72	7.72	9.2
N_Exfil_2301	7.77	7.66	7.63	7.67	7.59	7.72	7.72	7.72	7.72	9.2
N_Exfil_2400	14.8	14.54	13.41	13.82	13.5	14.81	14.77	14.64	14.61	11.49
N_Exfil_2401	14.8	14.53	13.4	13.81	13.5	14.8	14.77	14.64	14.61	11.49
N_Exfil_2402	14.79	14.53	13.4	13.81	13.49	14.8	14.76	14.63	14.6	11.48
N_Exfil_2403	14.8	14.53	13.4	13.81	13.5	14.8	14.77	14.64	14.6	11.48
N_Exfil_2500	14.05	13.88	13.91	13.97	13.81	13.74	13.77	13.8	13.8	14.02
N_Exfil_2501	14.05	13.88	13.9	13.96	13.81	13.73	13.77	13.8	13.8	14.02
N_Exfil_2502	14.05	13.88	13.9	13.96	13.81	13.73	13.77	13.8	13.8	14.02

	FUTURE SCENARIO					COMPOUND RAINFALL + SURGE				
	2100IH					2023	2040IL	2040IH	2070IL	2070IH
NODE NAME	100yr24hr	100YR96HR	10YR24HR	25YR24HR	25YR96HR	100yr24hr	100yr24hr	100yr24hr	100yr24hr	100yr24hr
N_EXfil_2600	7.27	7.1	7.07	7.14	7.01	6.25	6.92	7.37	7.44	9.22
N_EXfil_2600A	6.94	6.76	6.75	6.82	6.7	6.39	6.91	7.36	7.43	9.21
N_EXfil_2600JB	7.27	7.1	7.07	7.14	7.02	6.24	6.92	7.37	7.44	9.22
N_EXfil_2700	9.2	8.92	8.84	8.99	8.73	6.6	6.89	7.34	7.41	9.34
N_EXfil_2700JB	9.18	8.9	8.83	8.97	8.72	6.24	6.88	7.34	7.41	9.34
N_EXfil_2800	7.3	7.12	7.08	7.16	7.02	6.01	6.92	7.37	7.44	9.23
N_EXfil_2800JB	7.3	7.12	7.09	7.16	7.03	3.42	6.91	7.36	7.43	9.22
N_EXfil_2801	7.3	7.13	7.09	7.17	7.03	2.54	6.82	7.3	7.37	9.16
N_Exfil_300	9.89	9.78	9.63	9.76	9.74	6.44	6.2	6.52	6.58	8.24
N_Exfil_300JB	10.09	9.83	9.64	9.8	9.76	6.44	6.2	6.52	6.58	8.24
N_Exfil_301	14.15	13.83	13.48	13.79	13.71	13.48	13.48	13.48	13.48	13.47
N_Exfil_302	14.15	13.83	13.47	13.79	13.71	13.48	13.48	13.48	13.48	13.47
N_Exfil_500	6.89	6.8	6.66	6.78	6.75	6.25	6.68	7.25	7.34	9.2
N_Exfil_500JB	7.14	6.86	6.67	6.82	6.78	6.25	6.68	7.25	7.34	9.2
N_Exfil_501	9.67	9.32	9.01	9.28	9.21	8.95	8.94	8.94	8.94	9.21
N_Exfil_501JB	9.7	9.33	9	9.29	9.21	8.94	8.94	8.93	8.93	9.2
N_Exfil_502	10.33	10.16	9.92	10.11	10.09	8.79	8.77	8.72	8.71	8.31
N_Exfil_503	10.33	10.15	9.92	10.11	10.08	8.79	8.76	8.72	8.71	8.21
N_Exfil_600	6.87	6.8	6.66	6.77	6.74	5.81	5.83	5.9	5.91	9.2
N_Exfil_601	6.87	6.8	6.66	6.77	6.74	5.81	5.83	5.9	5.91	9.2
N_Exfil_700	7.57	7.51	7.37	7.47	7.43	4.5	4.5	4.5	4.51	9.2
N_Exfil_701	7.57	7.51	7.37	7.47	7.43	4.5	4.5	4.5	4.51	9.2
N_Exfil_800	11.77	11.88	10.79	11.22	11.26	4.8	4.8	4.8	4.8	10.32
N_Exfil_801	11.77	11.87	10.79	11.21	11.25	4.8	4.8	4.8	4.8	10.32
N_Exfil_900	12.78	12.7	11.83	12.69	12.62	10.71	10.69	10.66	11.04	12.75
N_Exfil_901	12.69	12.66	11.77	12.61	12.56	10.7	10.69	10.65	11.03	12.75
N_Exfil_902	12.68	12.65	11.77	12.6	12.55	10.7	10.68	10.65	11.03	12.74
N_Exfil_C_600	12.31	12.2	12.11	12.17	12.12	6.8	6.8	6.8	6.8	12.22
N_Exfil_C_700	12.21	12.19	10.73	11.87	12.04	8.7	8.7	8.7	8.7	8.7
N_Exfil_C_800	12.22	12.15	11.51	11.81	11.77	6.63	6.63	6.63	6.63	8.5
N_ICW_100	6.41	6.41	6.41	6.41	6.41	6.69	6.96	7.39	7.46	9.2
N_Misc_100	14.17	14.06	13.78	13.92	13.92	13.72	13.71	13.71	13.71	13.7
N_Misc_1000	7.78	7.68	7.42	7.59	7.5	7.19	7.19	7.2	7.21	9.21
N_Misc_1100	6.43	6.43	6.42	6.43	6.42	6.69	6.96	7.38	7.45	9.2
N_Misc_1200	6.43	6.42	6.42	6.42	6.42	6.69	6.96	7.39	7.46	9.2
N_Misc_1400	6.42	6.42	6.42	6.42	6.42	6.69	6.96	7.39	7.46	9.2
N_Misc_1500	12.22	12.14	11.33	11.81	11.76	11.47	11.66	11.66	11.66	11.68
N_Misc_1500_S1	12.22	12.14	11.8	11.81	11.8	11.8	11.8	11.8	11.8	11.8
N_Misc_1500_S2	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6
N_Misc_1600	11.99	11.99	11.99	11.99	11.99	11.99	11.99	11.99	11.99	11.99
N_Misc_1600_S	12.11	12.11	12.11	12.11	12.11	12.11	12.11	12.11	12.11	12.11
N_Misc_1700	15.01	14.89	14.91	14.95	14.85	14.83	14.86	14.86	14.86	14.98
N_Misc_1800	10.2	10.1	10.13	10.16	10.06	9.88	9.9	9.95	9.96	10.19
N_Misc_1900	9.89	9.85	9.86	9.87	9.83	9.66	9.69	9.74	9.75	9.89
N_Misc_200	6.42	6.42	6.42	6.42	6.42	6.69	6.96	7.39	7.46	9.2
N_Misc_2000	8.85	8.74	8.73	8.78	8.67	8.33	8.38	8.47	8.49	9.21
N_Misc_2100	6.41	6.41	6.41	6.41	6.41	6.69	6.96	7.39	7.46	9.2
N_Misc_2200	10.01	9.76	9.7	9.8	9.64	9.13	9.27	9.33	9.35	9.83
N_Misc_2300	6.95	6.9	6.77	6.88	6.85	6.55	6.55	7.23	7.31	9.2
N_Misc_2400	7.21	7.16	7.04	7.12	7.13	7.12	7.12	7.36	7.43	9

	FUTURE SCENARIO 2100IH					COMPOUND RAINFALL + SURGE				
						2023	2040IL	2040IH	2070IL	2070IH
NODE NAME	100yr24hr	100YR96HR	10YR24HR	25YR24HR	25YR96HR	100yr24hr	100yr24hr	100yr24hr	100yr24hr	100yr24hr
N_Misc_2500	11.04	10.94	10.97	11	10.91	10.87	10.94	10.94	10.94	11.03
N_Misc_2600	12.08	12	11.79	11.91	11.85	11.51	11.57	11.57	11.57	11.96
N_Misc_2600_S1	12.08	11.99	11.8	11.9	11.83	11.8	11.8	11.8	11.8	11.95
N_Misc_2600_S2	12.08	11.99	11.78	11.9	11.84	11.49	11.56	11.56	11.56	11.95
N_Misc_300	6.42	6.42	6.42	6.42	6.42	6.69	6.96	7.39	7.46	9.2
N_Misc_400	6.42	6.42	6.42	6.42	6.42	6.69	6.96	7.39	7.46	9.2
N_Misc_500	6.42	6.41	6.41	6.41	6.41	6.69	6.96	7.39	7.46	9.2
N_Misc_600	6.43	6.42	6.42	6.42	6.42	6.69	6.96	7.38	7.45	9.2
N_Misc_700	12.29	12.19	12.1	12.16	12.11	11.8	11.84	11.84	11.84	12.2
N_Misc_700_S	14.85	14.85	14.85	14.85	14.85	14.85	14.85	14.85	14.85	14.85
N_Misc_800	6.87	6.8	6.66	6.77	6.74	6.17	6.67	7.23	7.31	9.2
N_Misc_900	6.86	6.79	6.65	6.77	6.74	6.43	6.69	7.25	7.33	9.2
N_Ocean_000	6.85	6.85	6.85	6.85	6.85	7.13	7.4	7.83	7.9	9.64
N_Ocean_001	6.85	6.85	6.85	6.85	6.85	7.13	7.4	7.83	7.9	9.64
N_Outfall_100	6.41	6.41	6.41	6.41	6.41	6.69	6.96	7.39	7.46	9.2
N_Outfall_1000	6.41	6.41	6.41	6.41	6.41	4.26	4.46	4.78	4.83	7.03
N_Outfall_1010	6.39	6.39	6.39	6.39	6.39	6.67	6.93	7.36	7.43	9.13
N_Outfall_1100	6.41	6.41	6.41	6.41	6.41	6.69	6.96	7.39	7.46	9.19
N_Outfall_1110	6.41	6.41	6.41	6.41	6.41	6.68	6.95	7.38	7.45	9.18
N_Outfall_1200	6.44	6.43	6.42	6.42	6.42	6.69	6.96	7.39	7.46	9.19
N_Outfall_1300	6.41	6.41	6.41	6.41	6.41	6.69	6.96	7.39	7.46	9.2
N_Outfall_1400	6.41	6.41	6.41	6.41	6.41	6.69	6.96	7.39	7.46	9.2
N_Outfall_1500	6.41	6.41	6.41	6.41	6.41	6.69	6.96	7.39	7.46	9.2
N_Outfall_1510	6.42	6.42	6.41	6.42	6.42	6.69	6.96	7.39	7.46	9.2
N_Outfall_1600	13.31	13.11	12.85	13.05	12.96	12.85	12.89	12.89	12.89	12.96
N_Outfall_1610	13.32	13.12	12.89	13.06	12.97	12.89	12.89	12.89	12.9	12.96
N_Outfall_1620	13.38	13.16	12.95	13.12	13.03	12.89	12.96	12.96	12.96	13
N_Outfall_1800	6.42	6.42	6.42	6.42	6.41	6.69	6.96	7.39	7.46	9.2
N_Outfall_1800A	6.55	6.53	6.46	6.49	6.47	6.7	6.96	7.39	7.46	9.2
N_Outfall_1810	6.83	6.76	6.54	6.65	6.59	6.7	6.97	7.4	7.47	9.21
N_Outfall_1820	11.03	10.94	10.53	10.66	10.58	10.38	10.42	10.42	10.42	10.87
N_Outfall_1820_S1	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.2
N_Outfall_1820_S2	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8
N_Outfall_1900	8.13	7.89	7.55	7.63	7.58	7.44	7.69	7.51	7.81	9.21
N_Outfall_1900_MH	7.53	7.37	6.77	7.04	6.88	6.69	7.26	7.37	7.59	9.2
N_Outfall_1900A	8.2	8.08	6.82	7.27	6.99	6.73	7.01	7.44	7.51	9.69
N_Outfall_1900B	10.09	9.91	7.21	8.12	7.54	6.79	7.12	7.54	7.61	10.45
N_Outfall_1900C	10.09	9.91	7.21	8.12	7.54	6.79	7.12	7.54	7.61	10.45
N_Outfall_1900JB1	8.48	8.25	7.59	7.71	7.63	7.48	7.79	7.52	7.92	9.23
N_Outfall_1900JB2	8.87	8.65	7.86	8.01	7.91	8.1	8.14	7.72	8.19	9.33
N_Outfall_1901	10.05	9.85	8.01	8.29	8.09	8.69	8.62	7.9	8.68	9.79
N_Outfall_1902	10.06	9.85	8.01	8.29	8.09	8.69	8.63	7.92	8.69	9.8
N_Outfall_200	6.41	6.41	6.41	6.41	6.41	6.69	6.96	7.39	7.46	9.2
N_Outfall_2000	6.43	6.43	6.42	6.42	6.42	6.69	6.96	7.39	7.46	9.2
N_Outfall_2000A	8.7	8.74	7.64	8.09	8.27	6.69	6.96	7.39	7.46	9.12
N_Outfall_2000B	10.86	10.95	8.81	9.68	10.02	6.69	6.96	7.39	7.46	9.36
N_Outfall_2100	6.44	6.43	6.42	6.43	6.43	6.69	6.96	7.39	7.46	9.2
N_Outfall_2110	11.77	11.88	9.34	10.37	10.77	9.01	9.01	9.03	9.04	9.82
N_Outfall_2120_MH1	6.45	6.45	6.43	6.44	6.43	6.69	6.96	7.39	7.45	9.2
N_Outfall_2130	6.44	6.44	6.42	6.43	6.43	6.7	6.97	7.4	7.47	9.21

	FUTURE SCENARIO 2100IH					COMPOUND RAINFALL + SURGE				
						2023	2040IL	2040IH	2070IL	2070IH
NODE NAME	100yr24hr	100YR96HR	10YR24HR	25YR24HR	25YR96HR	100yr24hr	100yr24hr	100yr24hr	100yr24hr	100yr24hr
N_Outfall_2200	6.42	6.41	6.41	6.41	6.41	6.69	6.96	7.39	7.46	9.2
N_Outfall_2400	9.62	9.54	9.37	9.5	9.46	6.78	7.05	7.48	7.55	9.29
N_Outfall_2410	9.88	9.81	9.72	9.8	9.77	6.8	7.08	7.51	7.58	9.76
N_Outfall_2500	10.48	10.48	10.04	10.24	10.26	9.11	9.3	9.55	9.6	10.11
N_Outfall_2600	10.45	10.45	9.85	10.11	10.2	8.16	8.52	8.88	8.9	9.99
N_Outfall_2610	10.44	10.44	9.84	10.11	10.19	8.16	8.52	8.87	8.9	9.98
N_Outfall_2700	6.41	6.41	6.41	6.41	6.41	6.69	6.96	7.39	7.46	9.2
N_Outfall_2800	6.41	6.41	6.41	6.41	6.41	6.69	6.96	7.39	7.46	9.2
N_Outfall_300	8.92	8.87	8.73	8.76	8.81	7.01	8	8.54	8.59	9.17
N_Outfall_3000	10.42	10.43	9.84	10.1	10.18	9.21	9.2	9.2	9.2	9.98
N_Outfall_3001	10.45	10.45	10.13	10.16	10.21	10.05	10.07	10.07	10.07	10.11
N_Outfall_3002	10.52	10.51	10.3	10.38	10.28	10.13	10.16	10.17	10.17	10.3
N_Outfall_3003	10.74	10.57	10.48	10.6	10.41	10.21	10.25	10.26	10.26	10.55
N_Outfall_3004	10.74	10.57	10.47	10.59	10.41	10.2	10.25	10.26	10.26	10.54
N_Outfall_300A	8.93	8.9	8.74	8.78	8.82	7.01	8	8.54	8.6	9.17
N_Outfall_310	8.95	8.94	8.76	8.81	8.84	7.01	8	8.55	8.6	9.2
N_Outfall_3100	6.42	6.42	6.41	6.42	6.41	6.69	6.96	7.39	7.46	9.2
N_Outfall_3110	6.42	6.42	6.42	6.42	6.42	6.68	6.95	7.38	7.45	9.2
N_Outfall_3120	6.48	6.46	6.44	6.45	6.44	6.68	6.95	7.38	7.45	9.2
N_Outfall_3120A	7.11	7.12	6.92	7	6.97	6.33	6.74	7.35	7.44	9.22
N_Outfall_3130	7.55	7.58	7.2	7.35	7.31	6.19	6.49	7.32	7.41	9.21
N_Outfall_3130A	7.55	7.58	7.21	7.35	7.31	6.18	6.49	7.3	7.4	9.21
N_Outfall_3130B	7.55	7.58	7.22	7.36	7.32	6.17	6.49	7.27	7.38	9.21
N_Outfall_3130C	7.4	7.43	7.12	7.24	7.2	6.18	6.52	7.29	7.39	9.22
N_Outfall_3131	7.54	7.58	7.2	7.34	7.3	6.2	6.5	7.32	7.42	9.21
N_Outfall_3140	7.78	7.8	7.49	7.58	7.61	6.16	6.48	7.12	7.35	9.21
N_Outfall_320	9.83	9.84	9.14	9.43	9.54	7.01	8	8.55	8.61	9.29
N_Outfall_3200	7.5	7.53	7.18	7.32	7.28	6.47	6.69	7.33	7.42	9.2
N_Outfall_320A	9.48	9.49	9	9.2	9.28	7.01	8	8.55	8.6	9.11
N_Outfall_320B	10.07	10.08	9.43	9.71	9.8	7.01	8	8.64	8.72	9.57
N_Outfall_3300	6.42	6.42	6.42	6.42	6.42	6.69	6.96	7.38	7.45	9.2
N_Outfall_3300A	6.45	6.43	6.43	6.44	6.42	6.68	6.95	7.38	7.45	9.2
N_Outfall_3310	6.47	6.44	6.44	6.45	6.43	6.68	6.95	7.38	7.45	9.21
N_Outfall_3600	6.41	6.41	6.41	6.41	6.41	6.69	6.96	7.39	7.46	9.2
N_Outfall_3700	6.42	6.42	6.42	6.42	6.42	6.69	6.96	7.39	7.46	9.2
N_Outfall_3800	6.42	6.42	6.42	6.42	6.42	6.69	6.96	7.39	7.46	9.2
N_Outfall_3900	6.44	6.43	6.42	6.43	6.42	6.7	6.97	7.39	7.46	9.21
N_Outfall_3910	6.44	6.43	6.42	6.42	6.42	6.69	6.96	7.39	7.46	9.2
N_Outfall_400	10.42	10.42	9.83	10.1	10.18	7.01	8	8.8	8.89	9.97
N_Outfall_4000	6.42	6.41	6.41	6.41	6.41	6.69	6.96	7.39	7.46	9.2
N_Outfall_4100	6.42	6.42	6.42	6.42	6.42	6.69	6.96	7.39	7.46	9.2
N_Outfall_500	8.28	8.31	7.84	7.99	8.05	6.2	6.15	6.95	7.07	9.21
N_Outfall_500A	7.96	7.98	7.62	7.73	7.76	6.14	6.44	6.94	7.12	9.22
N_Outfall_500B	8.24	8.27	7.82	7.97	8.01	6.11	6.37	6.85	6.96	9.23
N_Outfall_500C	8.29	8.32	7.85	8	8.05	6.2	6.15	6.96	7.07	9.21
N_Outfall_600	8.32	8.35	7.85	8.01	8.06	6.21	6.16	6.96	7.08	9.21
N_Outfall_600A	8.33	8.35	7.86	8.01	8.07	6.21	6.16	6.96	7.08	9.2
N_Outfall_600B	8.32	8.34	7.85	8	8.06	6.2	6.16	6.96	7.07	9.21
N_Outfall_610	8.34	8.37	7.86	8.01	8.07	6.22	6.2	6.97	7.08	9.2
N_Outfall_620	8.35	8.38	7.86	8.02	8.08	6.23	6.2	6.97	7.08	9.21

	FUTURE SCENARIO 2100IH					COMPOUND RAINFALL + SURGE				
						2023	2040IL	2040IH	2070IL	2070IH
NODE NAME	100yr24hr	100YR96HR	10YR24HR	25YR24HR	25YR96HR	100yr24hr	100yr24hr	100yr24hr	100yr24hr	100yr24hr
N_Outfall_620A	8.36	8.39	7.87	8.02	8.08	6.25	6.23	6.97	7.08	9.21
N_Outfall_620B	8.37	8.4	7.87	8.02	8.08	6.28	6.27	6.97	7.08	9.21
N_Outfall_630	8.38	8.41	7.87	8.03	8.09	6.36	6.4	6.97	7.09	9.21
N_Outfall_630A	8.37	8.41	7.87	8.03	8.09	6.36	6.39	6.97	7.09	9.21
N_Outfall_640	8.38	8.41	7.87	8.03	8.09	6.36	6.4	6.98	7.09	9.2
N_Outfall_700	9.36	8.83	8.38	8.77	8.27	6.37	6.41	6.98	7.09	9.59
N_Outfall_800	9.42	9.43	8.86	9.13	9.21	7.01	8	8.51	8.55	9.02
N_Outfall_800A	9.78	9.8	9.04	9.44	9.5	7.01	8	8.51	8.55	9.53
N_Outfall_810	10.43	10.31	10.03	10.3	10.11	7.01	8	8.52	8.56	10.37
N_Outfall_900	10.15	9.95	9.72	9.93	9.81	6.7	9.08	9.48	9.49	9.93
N_RiverFront_040	6.41	6.41	6.41	6.41	6.41	6.69	6.96	7.39	7.46	9.2
N_RiverFront_060	6.42	6.42	6.41	6.41	6.41	6.69	6.96	7.39	7.46	9.2
N_RiverFront_070	6.41	6.41	6.41	6.41	6.41	6.69	6.96	7.38	7.45	9.2
N_RiverFront_090	6.43	6.42	6.42	6.42	6.42	6.69	6.96	7.39	7.46	9.2
N_RiverFront_090A	6.43	6.42	6.42	6.42	6.42	6.69	6.96	7.39	7.46	9.2
N_RiverFront_120	6.41	6.41	6.41	6.41	6.41	6.69	6.96	7.39	7.46	9.2
N_RiverFront_130	6.42	6.42	6.41	6.42	6.41	6.69	6.96	7.39	7.46	9.2
N_RiverFront_140	6.42	6.42	6.42	6.42	6.42	6.68	6.96	7.39	7.45	9.2
N_RiverFront_150	6.44	6.43	6.42	6.43	6.42	6.68	6.95	7.38	7.45	9.2
N_RiverFront_160	6.42	6.42	6.41	6.42	6.41	6.69	6.96	7.39	7.46	9.2
N_RiverFront_170	6.42	6.42	6.41	6.42	6.41	6.69	6.96	7.39	7.46	9.2
N_RiverFront_180	6.41	6.41	6.41	6.41	6.41	6.69	6.96	7.39	7.46	9.2
N_RiverFront_190	6.43	6.42	6.42	6.42	6.42	6.69	6.96	7.39	7.46	9.2

Appendix E

Task 2: Storm Surge and Tidal Flooding Mapping Methodology Letter

July 26, 2023

Stephanie Y. Dunham, PE
Collective Water Resources, LLC
250 S Australian Ave UNIT 1110,
West Palm Beach, FL 33401

P 561-353-6971
E sdunham@collectivewater.com

RE: Town of Ponce Inlet Vulnerability Assessment
Storm Surge and Tidal Flooding Mapping Methodology Technical Memo
Brizaga Project No. 222019.00

Dear Ms. Dunham,

Please find this letter to summarize Brizaga's methodologies as they pertain to the Town of Ponce Inlet Watershed Master Plan Vulnerability Assessment. More specifically, they are related to the data sources and mapping of storm surge and tidal flooding.

Should you have any questions or require additional information, please do not hesitate to contact me via email at michael@brizaga.com or at 954-520-2384.

Sincerely,

Michael Antinelli, PE, CFM
Principal & Co-Founder

Data Collected

Ponce Inlet's vulnerability assessment will be grant eligible as defined by 380.093, Florida Statutes. The requirements of this Statute include a range of maps depicting the impacts of High Tide Flooding, storm surge flooding, and annual number of tidal flooding days. These maps must evaluate flooding across various time scales and sea level scenarios. The table below summarizes these requirements and the associated data sources utilized.

Vulnerability Assessment Component	Data Source
High Tide Flooding Elevations	NOAA's Sea Level Rise Technical report provides an adopted High Tide flooding threshold across the United States.[1]
Tidal flooding day elevations	From the NOAA tidal stations at Mayport and Trident Pier, all tidal data over the past ten years was extracted. This, however, is raw data and further analysis to get the individual elevations for the ranges of annual tidal flooding days is described in the following section.
Hurricane storm surge elevations	Publicly available storm surge model results from the Seas, Lakes, and Overland Surge from Hurricanes (SLOSH) program, as administered by FEMA, were imported into the GIS database.[2] These model results indicate storm surge flood elevations in a gridded format for hurricanes of all categories, as well as tropical storms.
Sea Level Rise Curves	For this assessment to be in line with Florida Statute the sea level rise projections utilized are as follows: • Year 2040 with sea level rise based on the NOAA intermediate-low projection • Year 2040 with sea level rise based on the NOAA intermediate-high projection • Year 2070 with sea level rise based on the NOAA intermediate-low projection • Year 2070 with sea level rise based on the NOAA intermediate-high projection The projections were obtained from the Army Corps of Engineers Sea-Level Change Curve Calculator.[3] The tidal station selected within the calculator was Daytona Beach (NOAA et al. 2017) due to its proximity to Ponce Inlet.
Digital Elevation Model (DEM)	The LiDAR Digital Elevation Model (DEM) developed using data collected in 2019 throughout Volusia County by FDEM was utilized for this assessment.

[1] NOAA's 2022 Sea Level Rise Technical Report, available at: https://oceanserviceeus2-dev.azurewebsites.net/hazards/sealevelrise/sealevelrise-tech-report-sections.html
[2] NOAA SLOSH Model, available at: https://www.nhc.noaa.gov/surge/slosh.php
[3] Army Corps of Engineers Sea-Level Change Curve Calculator, available at: https://cwbi-app.sec.usace.army.mil/rccslc/slcc_calc.html

Mapping Methodology

Tidal Flooding:

The impacts of tidal flooding at a given location can be expected well before Mean Sea Level (MSL) or even Mean Higher High Water (MHHW) reaches the elevation of that location. The Resilient Florida Grant Program (380.093) currently requires all vulnerability assessments to calculate the depth of "Tidal flooding, including future high tide flooding, which must use thresholds published and provided by the department. To the extent practicable, the analysis should also geographically display the number of tidal flood days expected for each scenario and planning horizon."[4]

Ordinarily, MHHW is obtained from tidal stations managed and monitored by the National Oceanic and Atmospheric Administration (NOAA). However, due to the large distance between the Town of Ponce Inlet (Town) and the nearest tidal station, the MHHW was interpolated between the two closest tidal stations: Mayport (Jacksonville) and Trident Pier (Port Canaveral). The MHHW datum is limited to the previous tidal epoch (1983-2001), which does not include observed sea level rise between 2001 and 2023. To account for recent sea level rise conditions, historical water level data at both tidal stations was statistically analyzed to obtain the observed MHHW at each station.

An interpolation is produced between these datasets to identify the current MHHW at the Town. This elevation was identified to be **1.62 feet NAVD.** For high tide flooding (HTF), a similar interpolation was made between the same tidal stations' "minor flood" elevations identified in the 2022 Sea Level Rise Technical Report published by NOAA. Adding that interpolated figure to the local MHHW yields the local HTF threshold of **3.42 feet NAVD**. The following tables detail the interpolated MHHW and HTF elevations as well as the relative sea level rise for the area.

Relative Sea Level Rise Projections (measured in feet, estimated from the year 2023)		
Year	**NOAA Int-Low**	**NOAA Int-High**
2023	0.00	0.00
2030	0.11	0.27
2040	0.27	0.70
2050	0.44	1.19
2060	0.60	1.82
2070	0.77	2.51

Projected Mean Higher High Water Elevation (measured in feet, NAVD)		
Year	**NOAA Int-Low**	**NOAA Int-High**
2023	1.62	1.62
2030	1.73	1.89
2040	1.89	2.32
2050	2.06	2.81
2060	2.22	3.44
2070	2.39	4.13

High Tide Flooding Threshold Elevation (measured in feet, NAVD)		
Year	**NOAA Int-Low**	**NOAA Int-High**
2023	3.42	3.42
2030	3.53	3.69
2040	3.69	4.12
2050	3.86	4.61
2060	4.02	5.24
2070	4.19	5.93

Tables 1, 2, & 3. *Tables containing elevations for relative sea level rise, MHHW, and HTF at the Town of Ponce Inlet.*

[4] The Resilient Florida Grant Program, Florida statute 380.093, available at: http://www.leg.state.fl.us/statutes/index.cfm?App_mode=Display_Statute&Search_String=&URL=0300-0399/0380/Sections/0380.093.html

In accordance with these requirements of 380.093, Florida Statutes, the frequency and severity of annual tidal flooding across the Town of Ponce Inlet was evaluated and mapped. Tidal data was once again obtained from both Mayport and Trident Pier NOAA tidal stations via NOAA Tides and Currents.[5] From these stations, all quality tidal data measuring high tide and low tide elevations was extracted. Using this information, a density function was developed using statistical analysis to determine the probability of high tide reaching a specific elevation with a specific frequency.

These sets of elevations, which correspond to the number of annual tidal flood days, were interpolated to create a set of elevations for Ponce Inlet. These final elevation figures were compared with the Digital Elevation Model for the Town and mapped to visually demonstrate the extent, depth, and frequency of tidal flooding expected under current conditions. Projected sea level rise was also applied to these datasets and mapped to illustrate the extent, depth, and frequency of tidal flooding under the various sea level rise scenarios.

Storm Surge:

The outputs of the Seas, Lakes, and Overland Surges from Hurricanes (SLOSH) model published by NOAA were utilized as a baseline condition for storm surge flooding for all storm categories analyzed (Tropical Storm, Category 2 Hurricane, and Category 4 Hurricane). Sea level rise projections for the timescales and scenarios required by Statute were then applied to the flood stage for each storm category to estimate the associated storm surge flood depth.

This analysis relied on the NOAA SLOSH Model Maximum of Maximums (MOMs) for each category of hurricane analyzed. The NOAA SLOSH Model is a “numerical model developed by the National Weather Service to estimate storm surge heights resulting from historical, hypothetical, or predicted hurricanes by taking into account the atmospheric pressure, size, forward speed, and track data.” The Maximum of Maximums (MOM) “provides a worst-case snapshot for a particular storm category under ‘perfect’ storm conditions.” Additionally, “no single hurricane will produce the regional flooding depicted in the MOMs. Instead, the product is intended to capture the worst-case high-water value at a particular location.” SLOSH model outputs are typically used by emergency managers for declaring evacuation orders, and they provide estimates of the worst-case scenario for each category of hurricane.

Storm surge is dependent on variables such as forward speed, radius of maximum winds, and angle of approach, and does not always have a direct relationship with wind speed, which is how hurricane categories are defined. Because SLOSH model outputs represent worst-case storm conditions, the flood extents and depths illustrated in maps and data tables for storm surge flooding are likely an overestimation of actual expected conditions, however they do represent the differences in storm surge exposure for Town-wide assets.

Below are the elevation ranges for the various storm surge scenarios. These are provided as ranges as the storm surge flood elevation varies geographically within the Town. interpolation was performed where

[5] NOAA Tides and Currents, Available from: https://tidesandcurrents.noaa.gov/

values were not provided by the SLOSH outputs, which can generally be attributed to the scale of the SLOSH model and the absence of downscaling to local levels.

Storm Category	2023 Surge Elevation	2040 Surge Elevation (NOAA Int-Low)	2040 Surge Elevation (NOAA Int-High)	2070 Surge Elevation (NOAA Int-Low)	2070 Surge Elevation (NOAA Int-High)
Tropical Storm	3.0’ - 4.2’	3.3’ - 4.5’	3.7’ - 4.9’	3.8’ – 5.0’	5.5’ - 6.7’
Category 2	5.1’ - 8.1’	5.4’ - 8.4’	5.8’ - 8.8’	5.9’ - 8.9’	7.6’ - 10.6’
Category 4	11.3’ - 15.1’	11.6’ - 15.4’	12.0’ - 15.8’	12.1’ - 15.9’	13.8’ - 17.6’

Table 4. E*levation ranges for storm surge (worst case tropical storm, category 2, and category 4 hurricanes) at the Town of Ponce Inlet.*

Storm Surge Boundary Conditions for Compound Flooding:

To create storm surge boundary conditions based on limited data and without modeling, an idealized storm surge shape function was developed to simulate the evolution of water levels due to storm surge. The storm surge time series developed through this exercise is intended to be superimposed on existing boundary conditions for precipitation models. The shape function follows a Gaussian distribution based on parameters related to storm surge height, forward speed of the storm, and the radius of the storm.

$$f(t, A, T, R, TTI) = A * \exp\left(-4.5 * \frac{\left(T * (t - TTI)\right)^2}{R^2}\right)$$

Figure 1. *Formula utilized for storm surge time series, where:*

t = time
A = Maximum surge height above background water level
T = Translation speed of storm
TTI= Time to Impact
R = Radius of surge influence

The storm surge height (A) has been selected as a Category 1 Maximum of Maximums, utilizing the SLOSH model outputs with a datum transformation referencing the background water level conditions. The radius of storm influence (R) was selected to be 30 miles and represents the distance between the storm center and the shoreline at the time storm surge influences begin to be observed. The storm forward speed (T) was assumed to be 8 miles per hour. The time to impact (TTI) was selected to be 20 hours, but may be adjusted such that the timing of the peak storm surge aligns with the peak runoff.

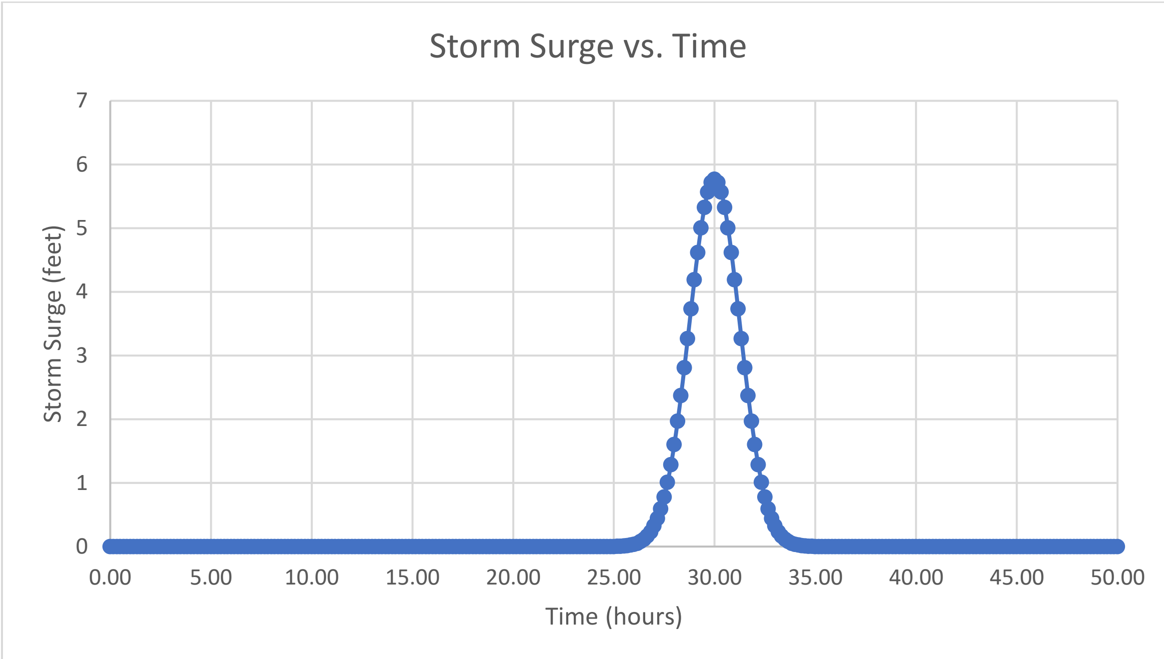


Figure 2*. Gaussian distribution of idealized Category 1 Hurricane storm surge at Ponce Inlet*

Appendix F

Task 2: Flood Exposure Analysis Maps

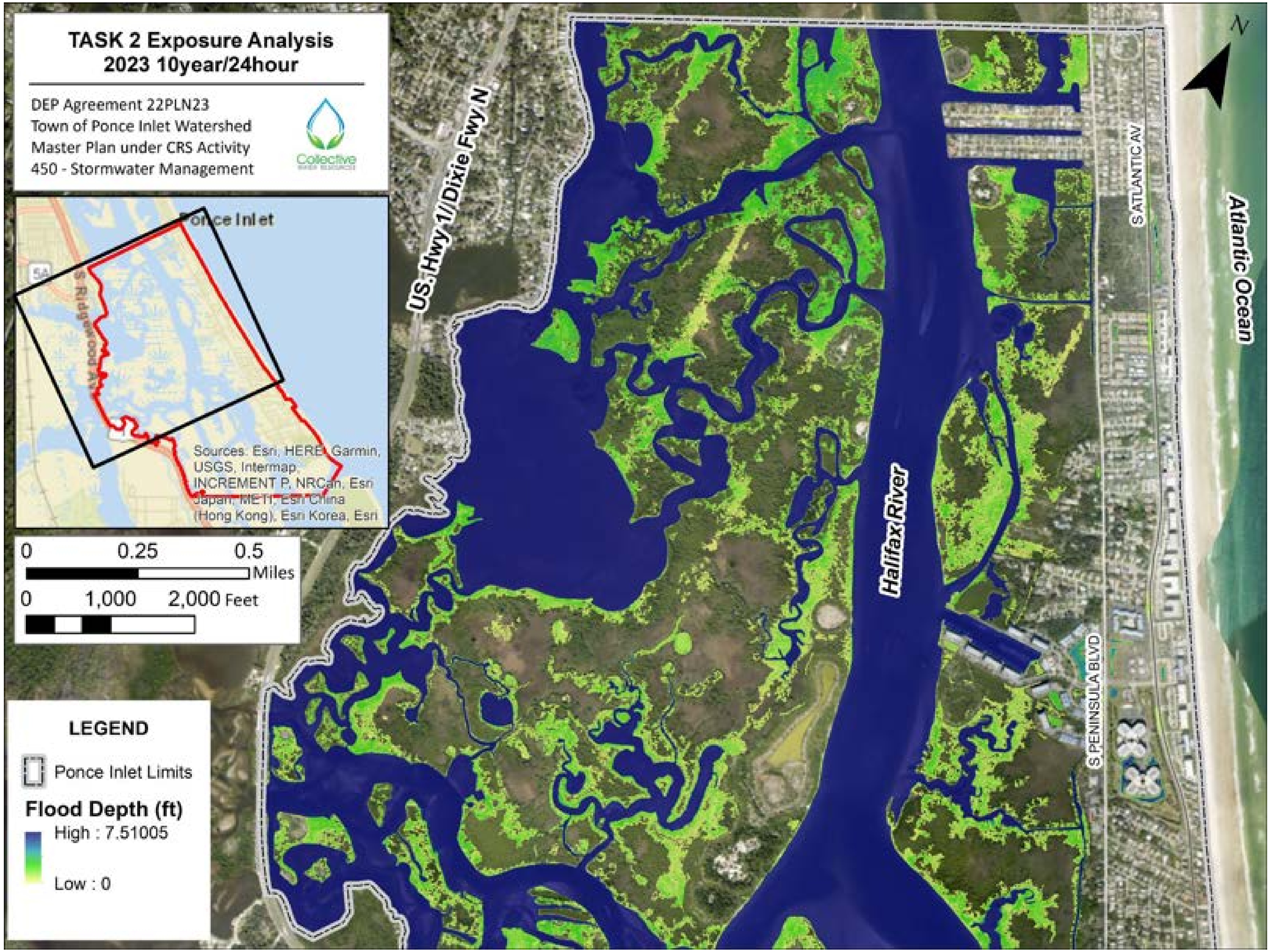


Figure F1 Stormwater Exposure 2023, 10year/24hour design storm North

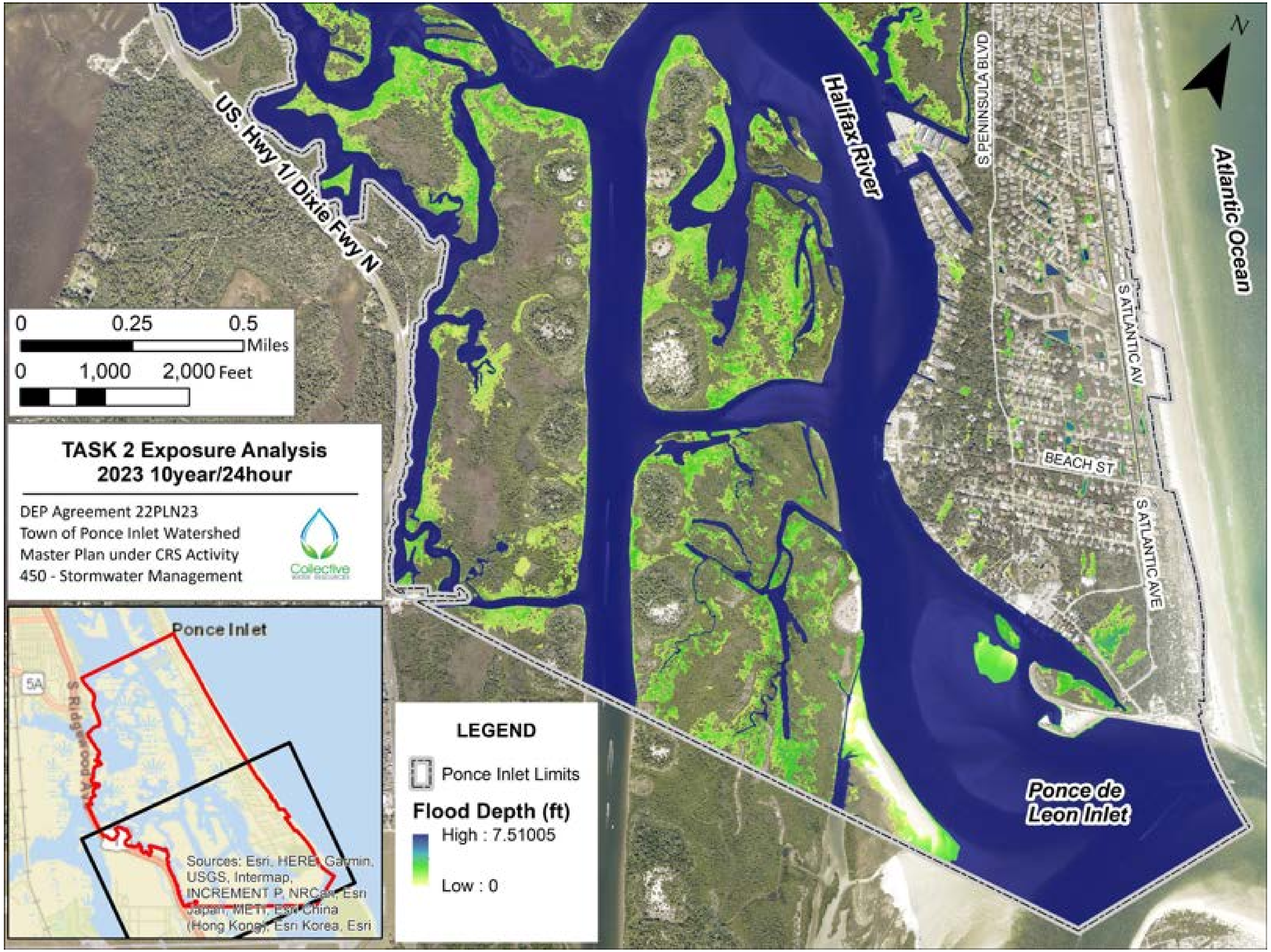


Figure F2 Stormwater Exposure 2023, 10year/24hour design storm South

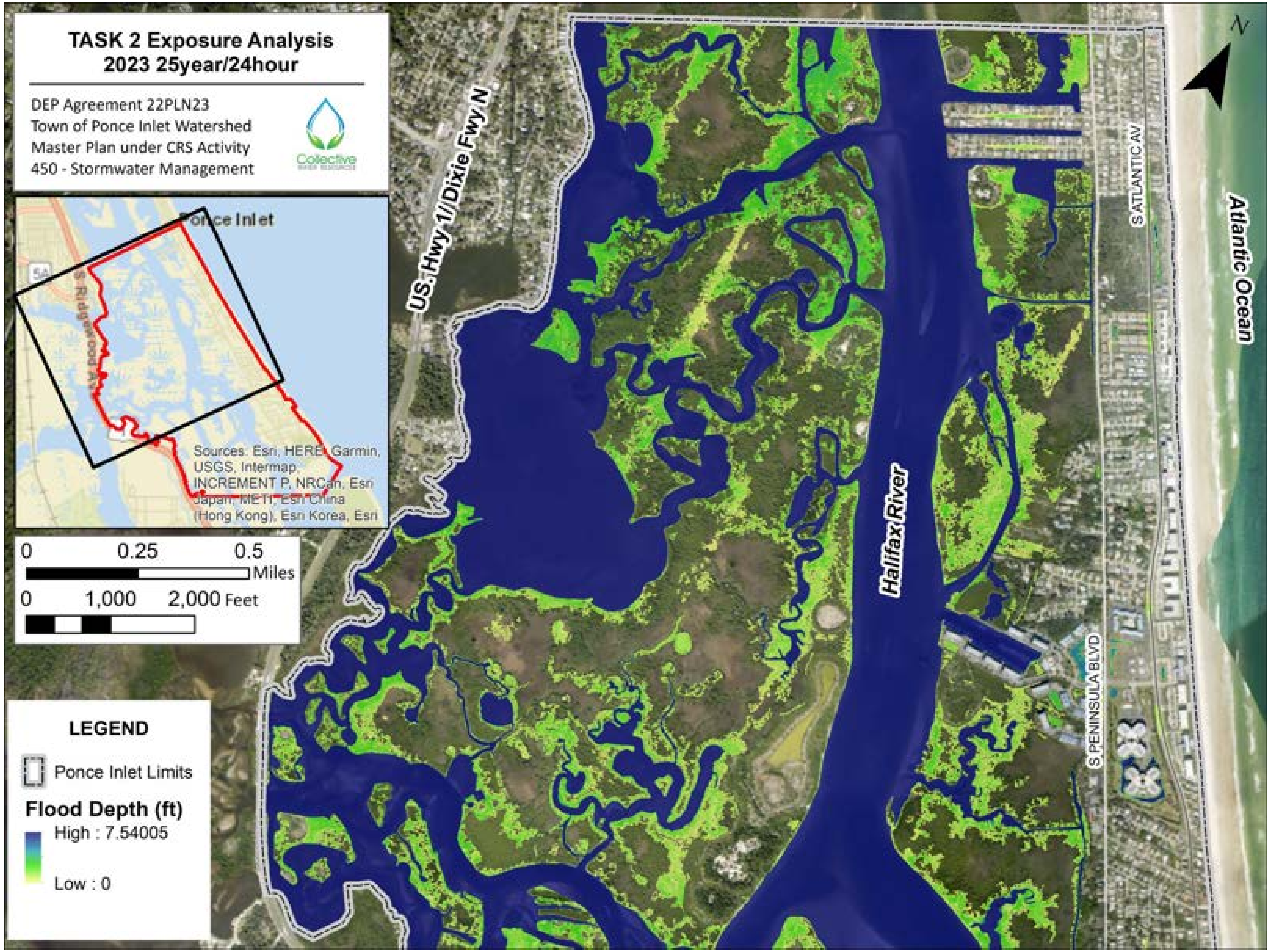


Figure F3 Stormwater Exposure 2023, 25year/24hour design storm North

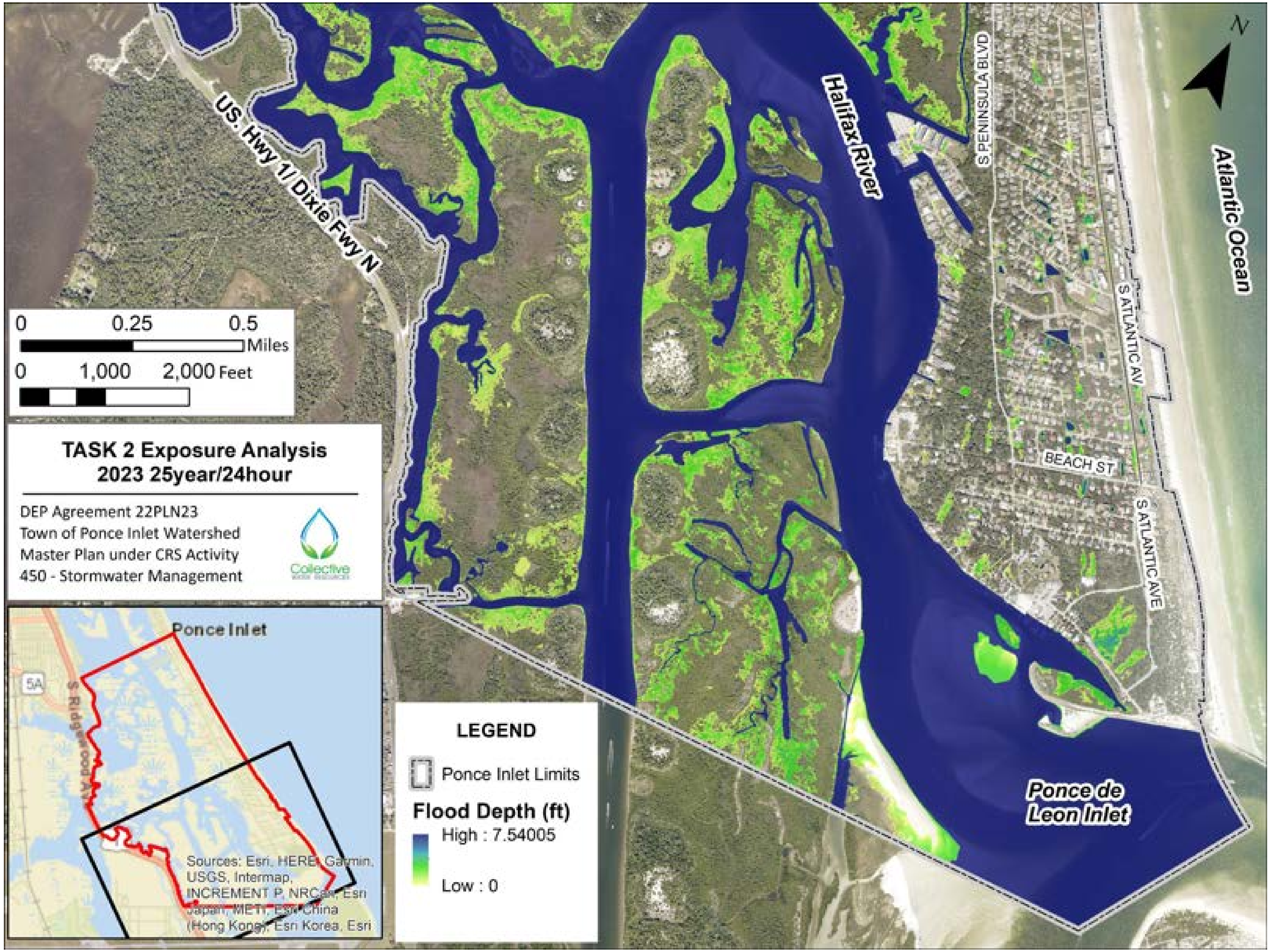


Figure F4 Stormwater Exposure 2023, 25year/24hour design storm South

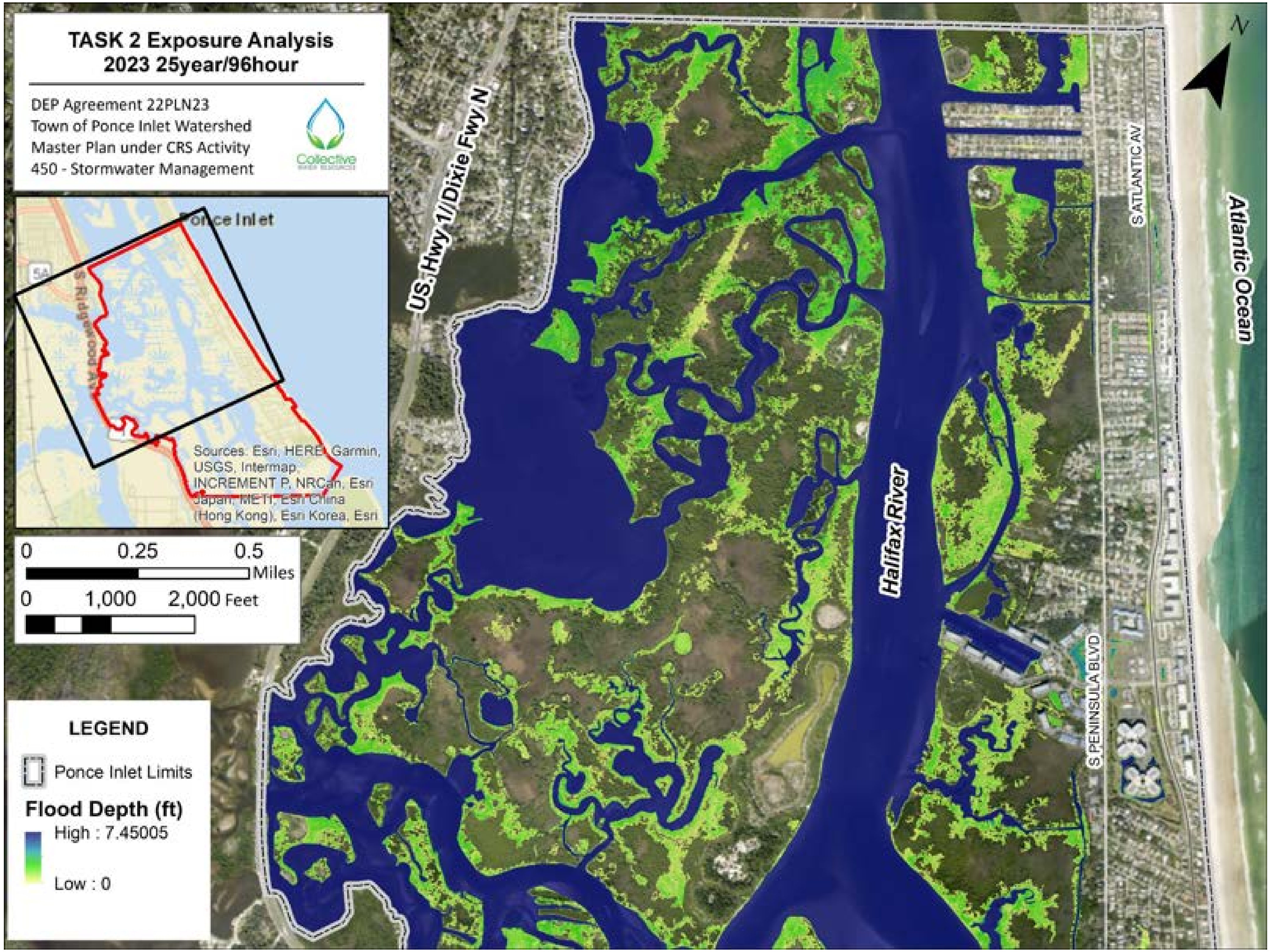


Figure F5 Stormwater Exposure 2023, 25year/96hour design storm North

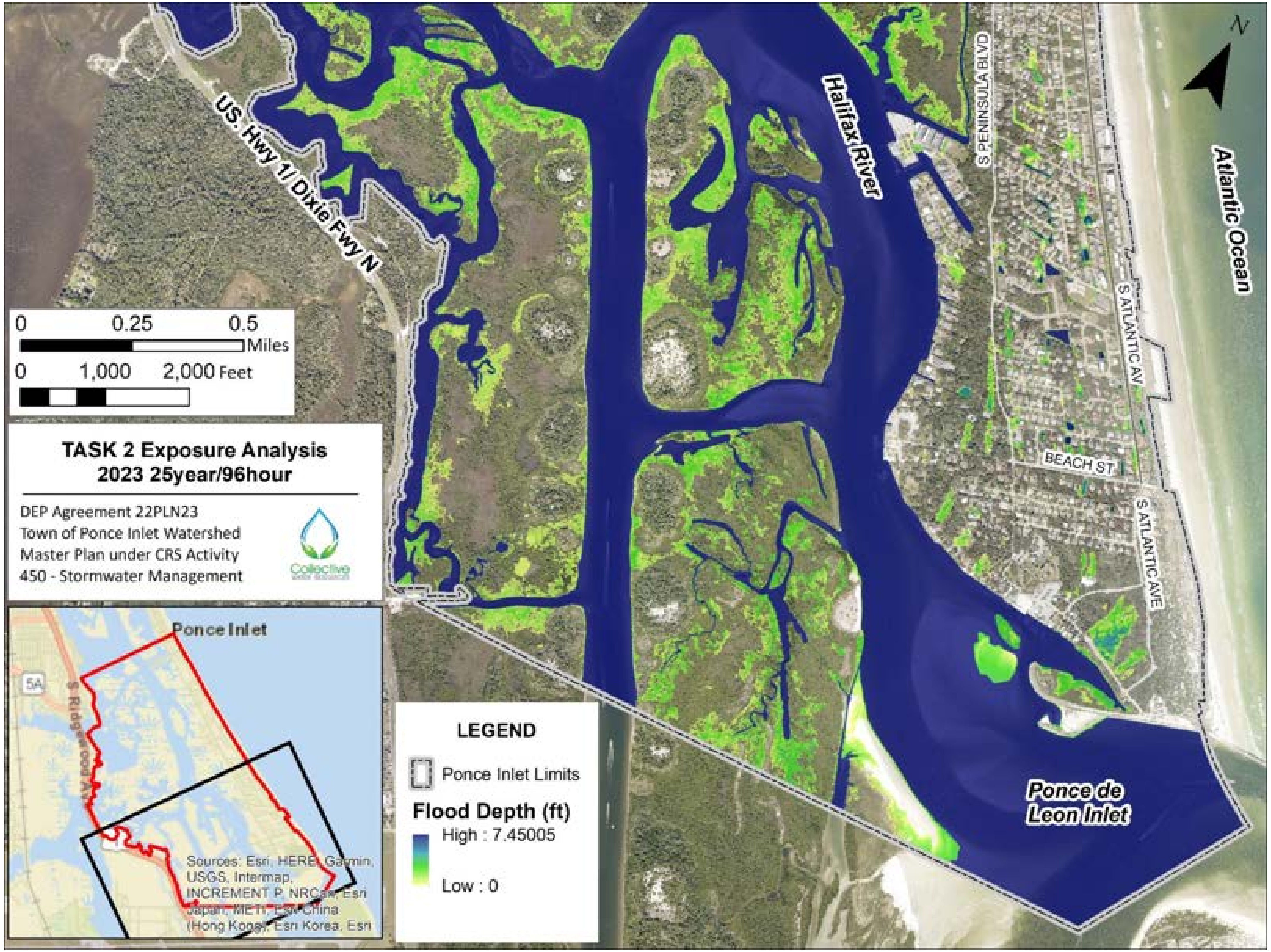


Figure F6 Stormwater Exposure 2023, 25ear/96hour design storm South

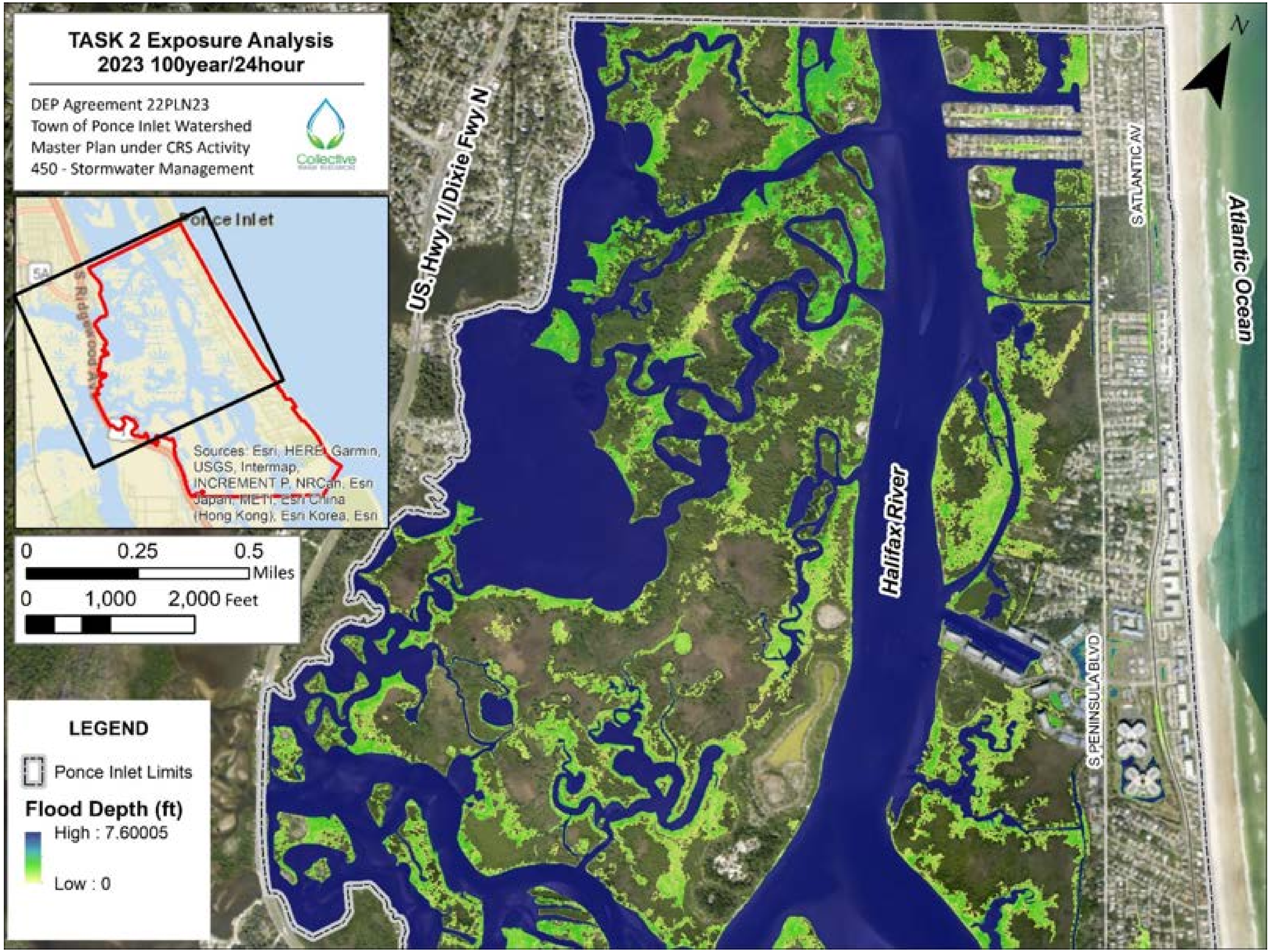


Figure F7 Stormwater Exposure 2023, 100year/24hour design storm North

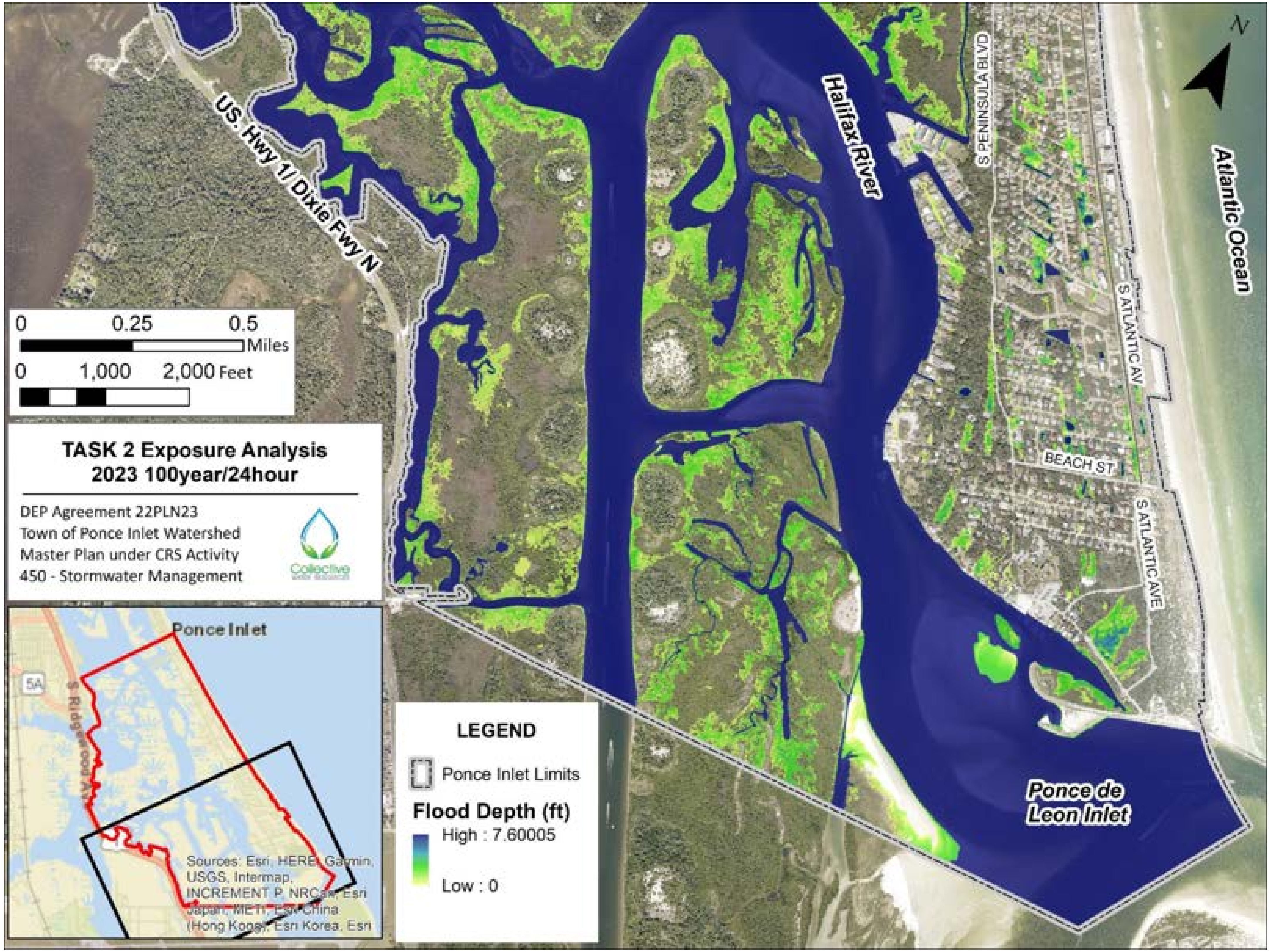


Figure F8 Stormwater Exposure 2023, 100year/24hour design storm South

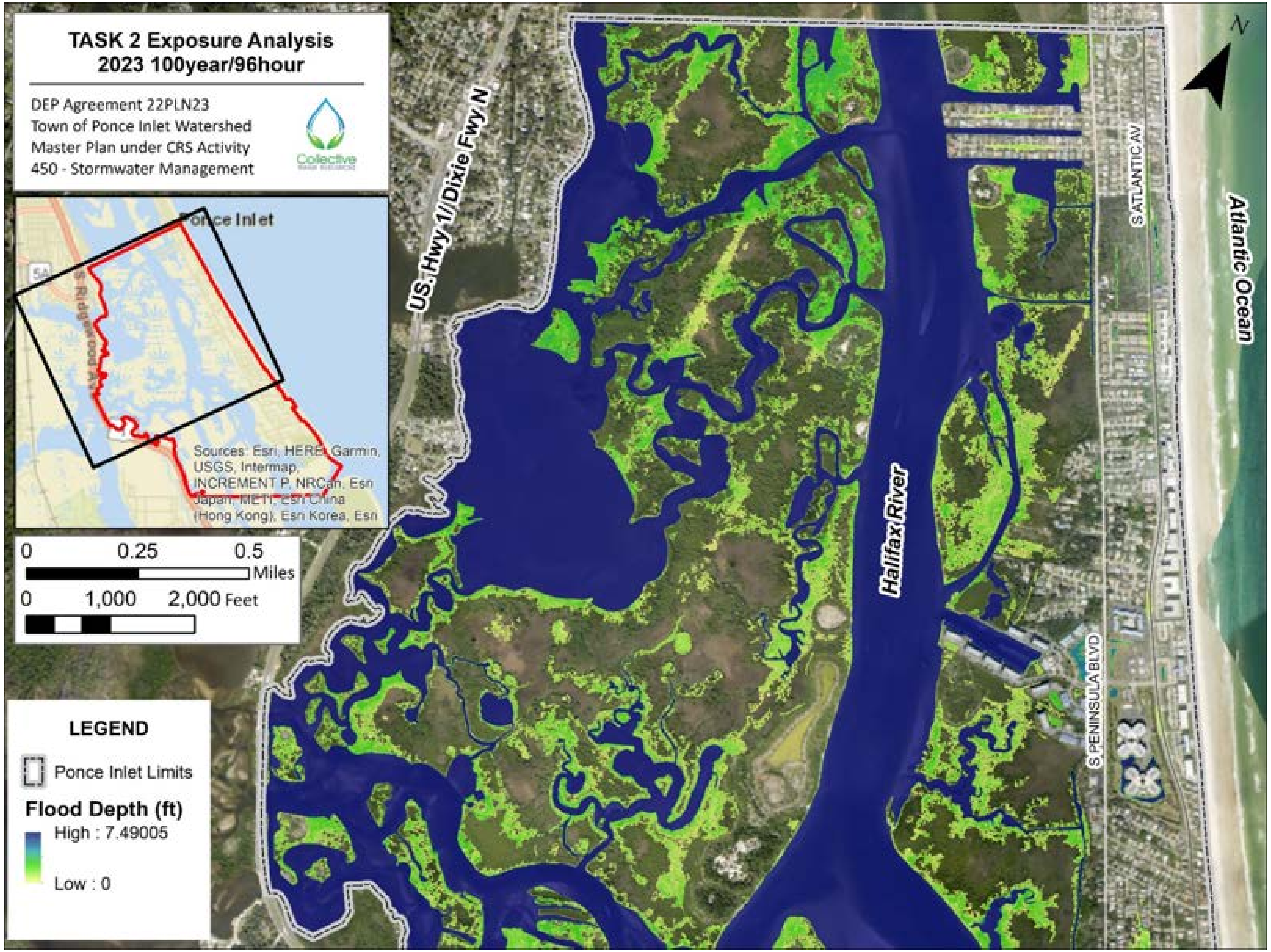


Figure F9 Stormwater Exposure 2023, 100year/96hour design storm North

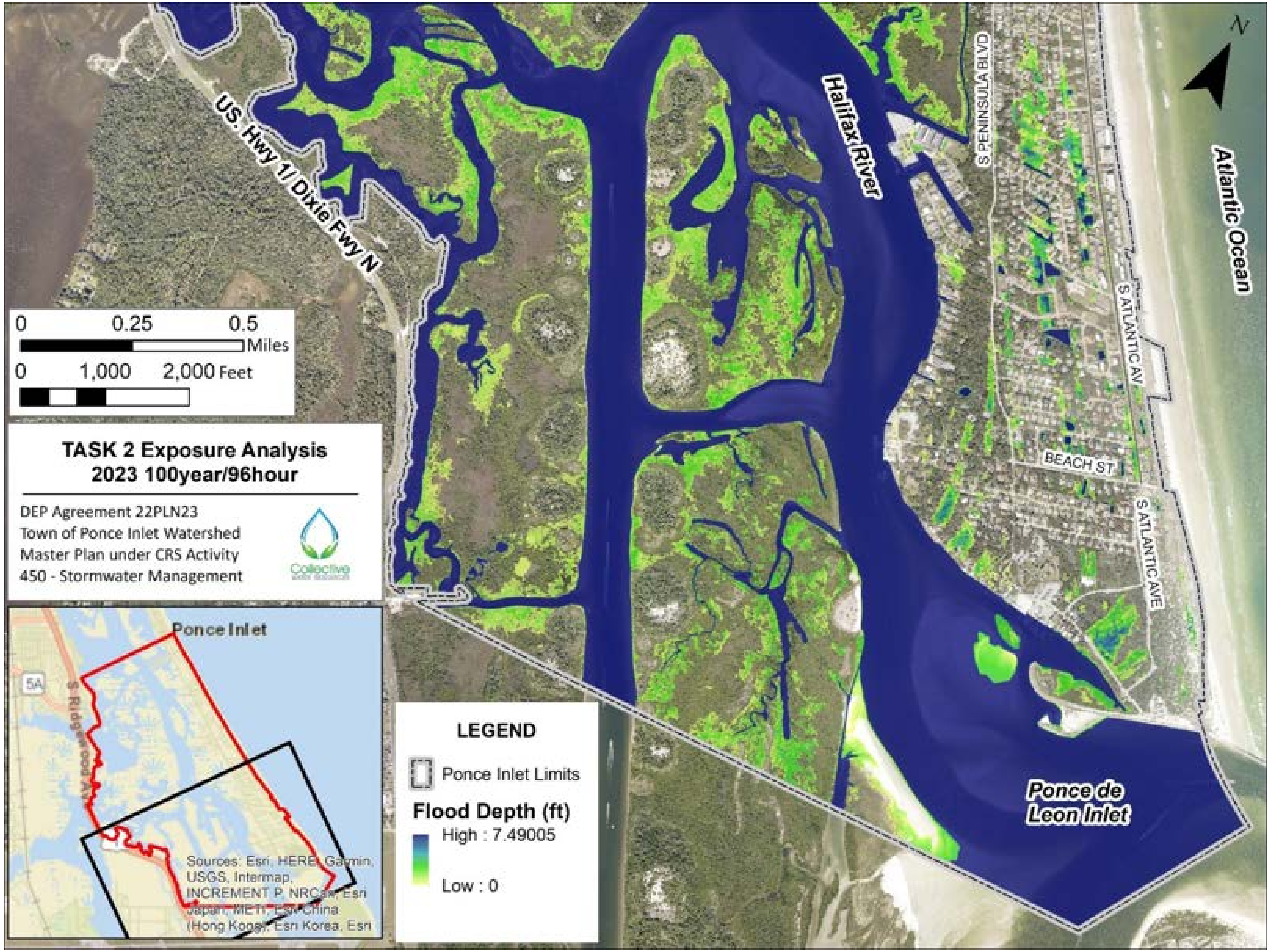


Figure F10 Stormwater Exposure 2023, 100year/96hour design storm South

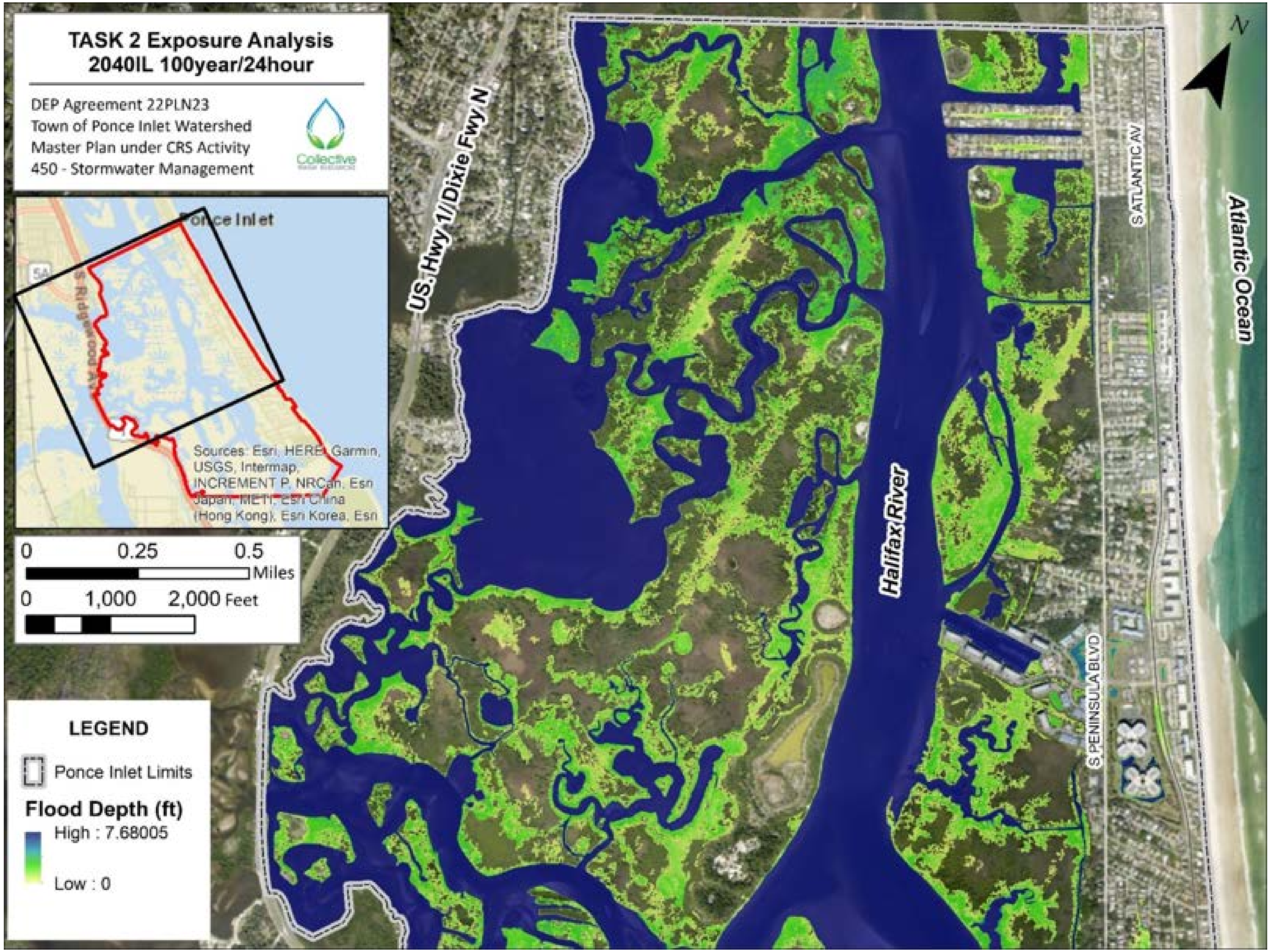


Figure F11 Stormwater Exposure 2040IL, 100year/24hour design storm North

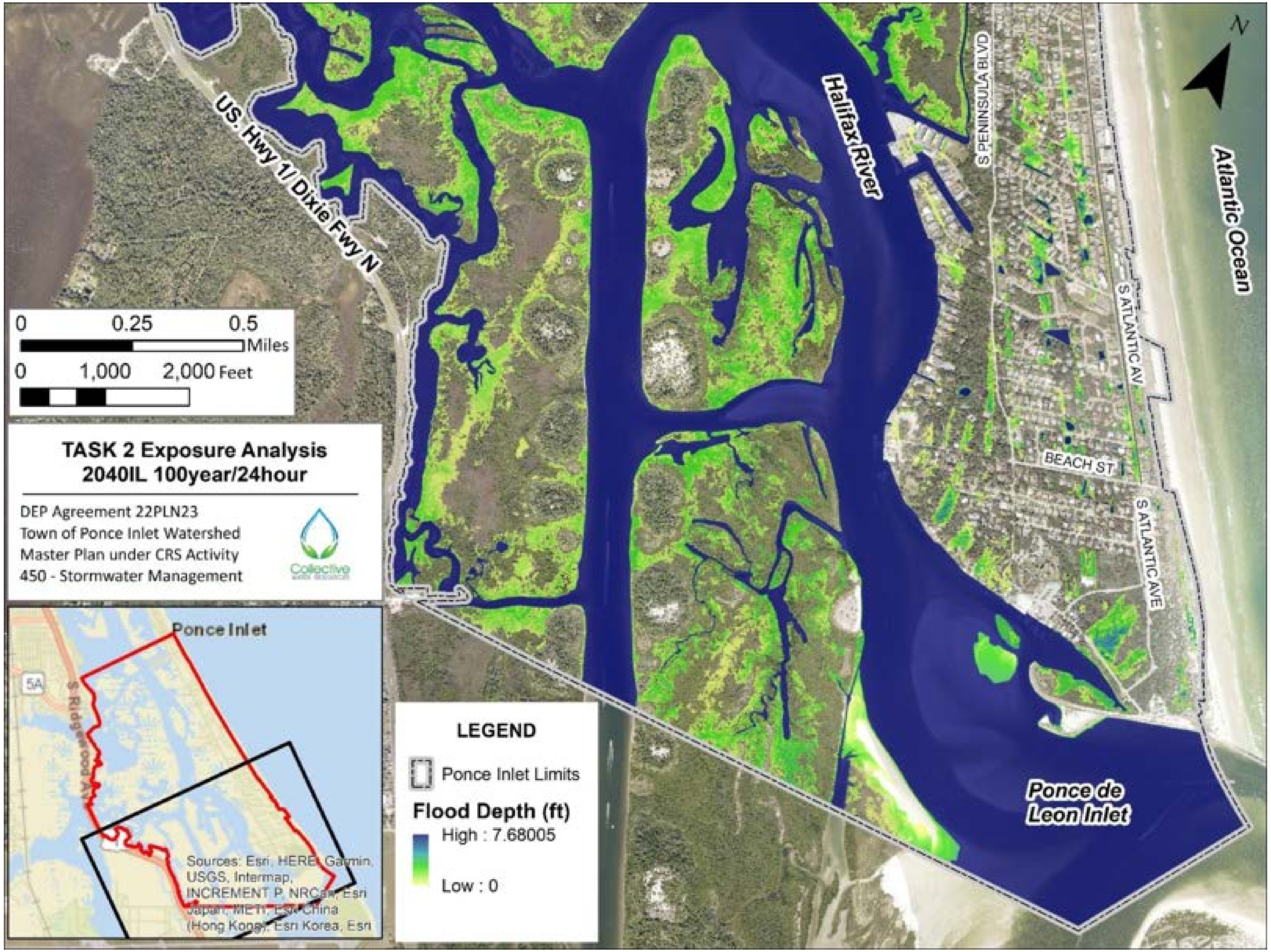


Figure F12 Stormwater Exposure 2040IL, 100year/24hour design storm South

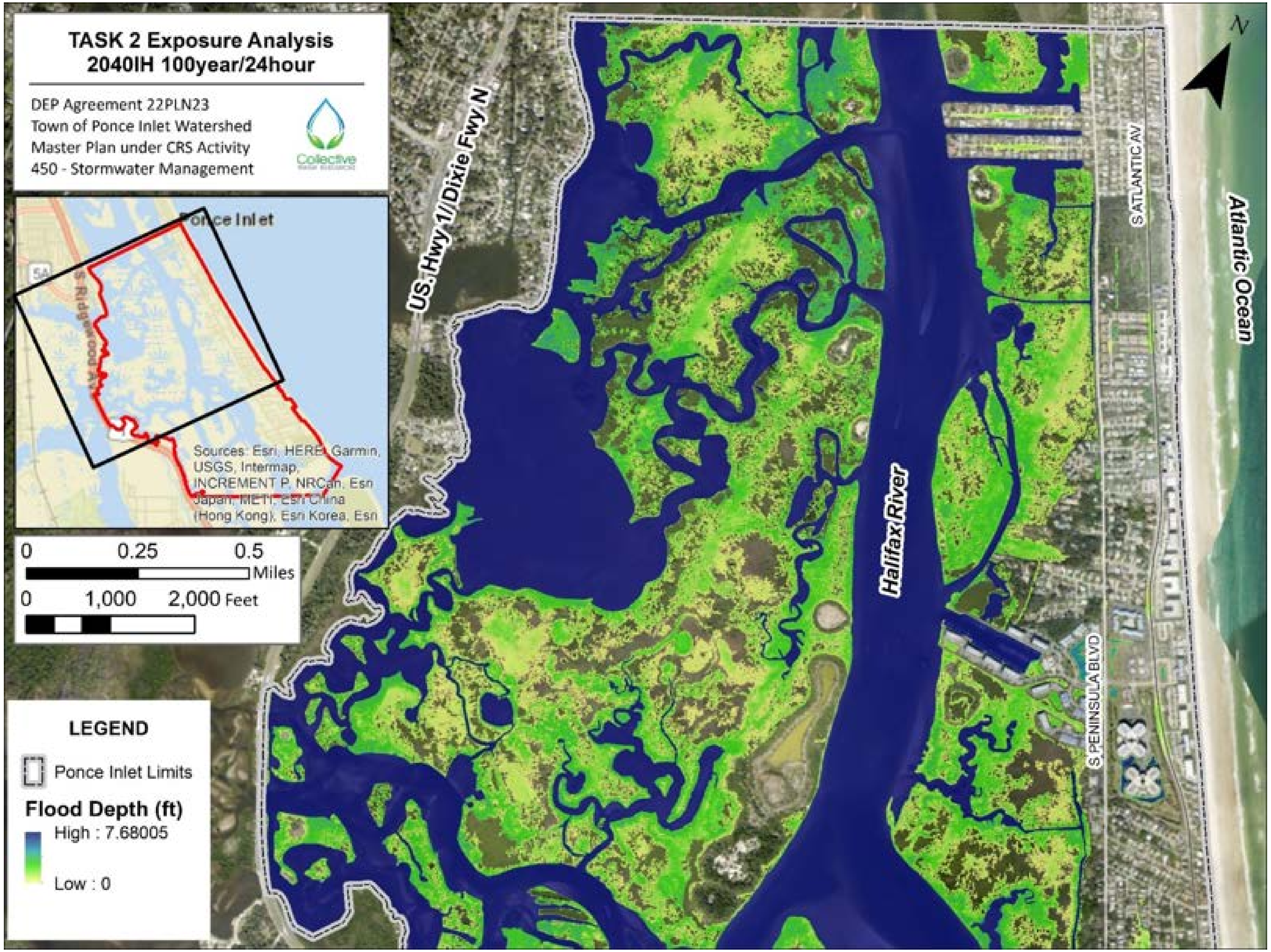


Figure F13 Stormwater Exposure 2040IH, 100year/24hour design storm North

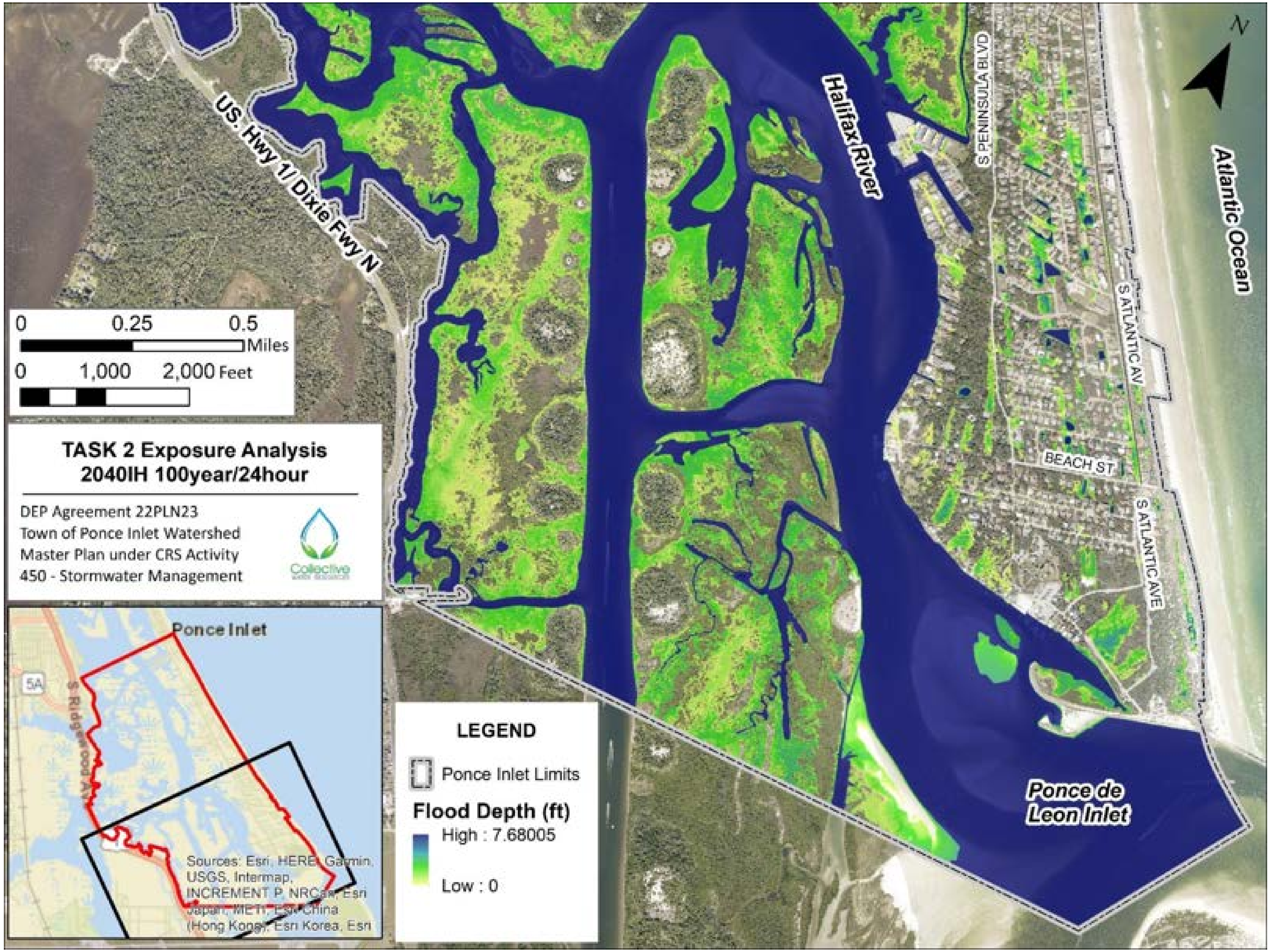


Figure F14 Stormwater Exposure 2040IH, 100year/24hour design storm South

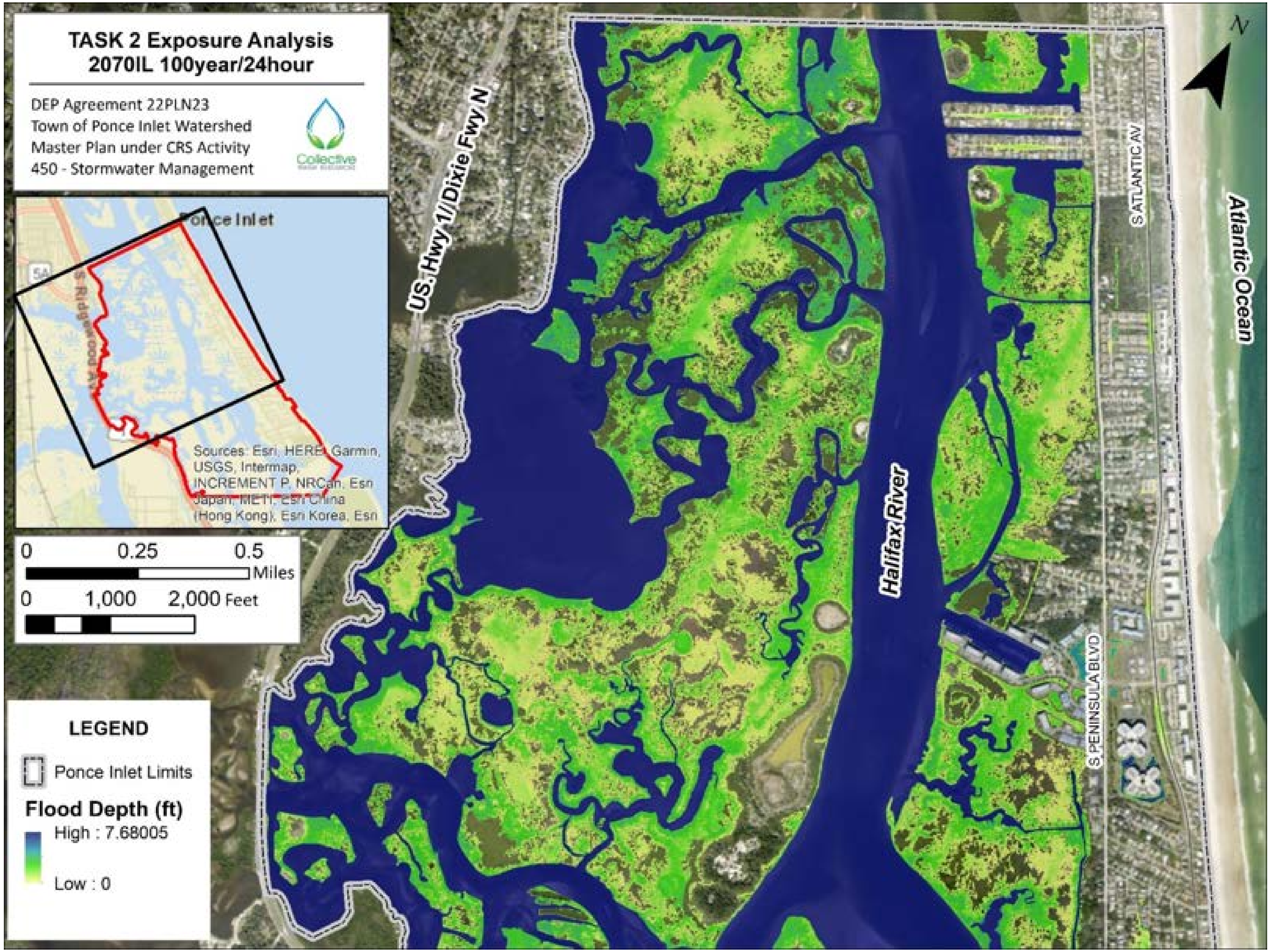


Figure F15 Stormwater Exposure 2070IL, 100year/24hour design storm North

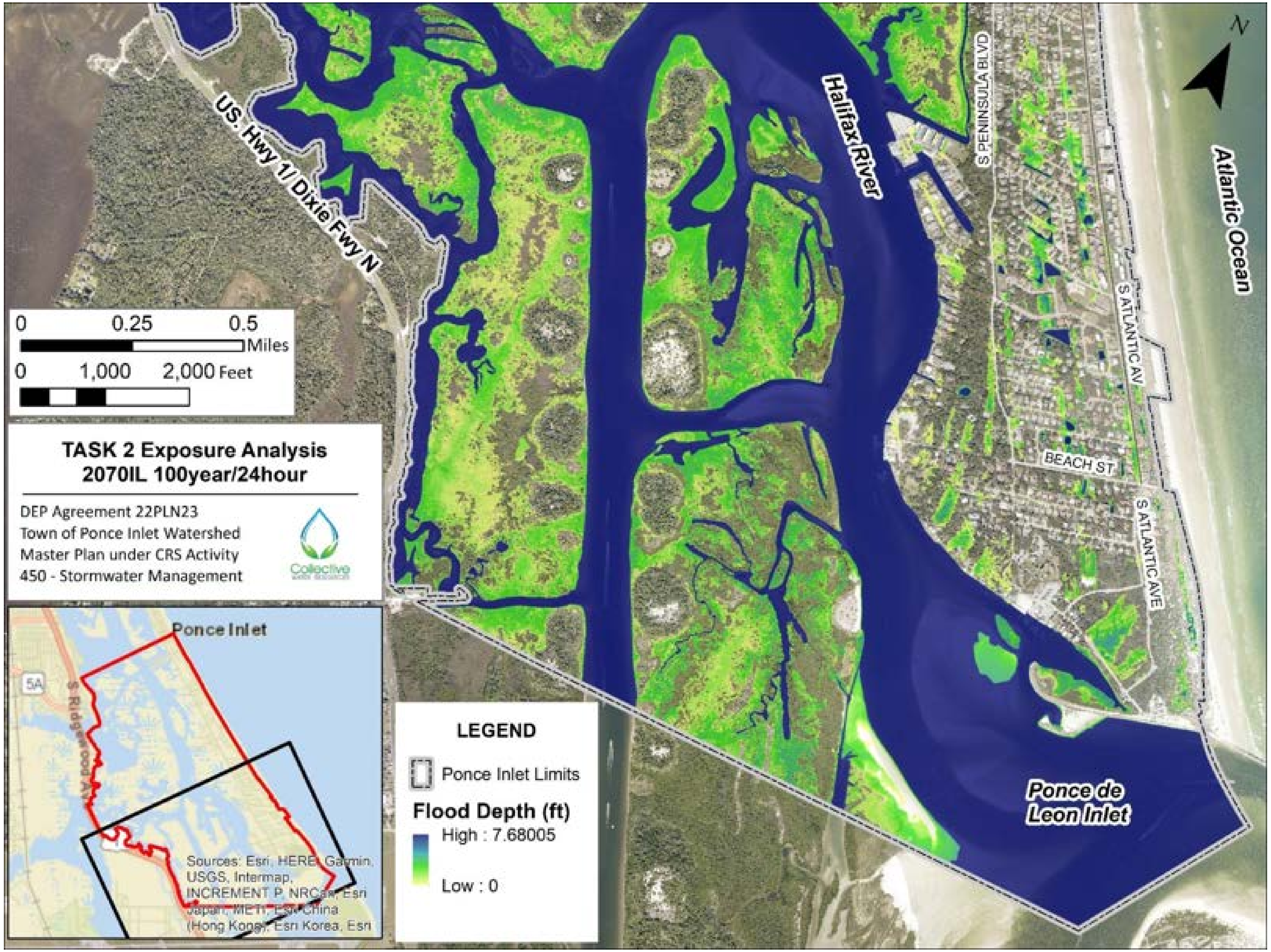


Figure F16 Stormwater Exposure 2070IL, 100year/24hour design storm South

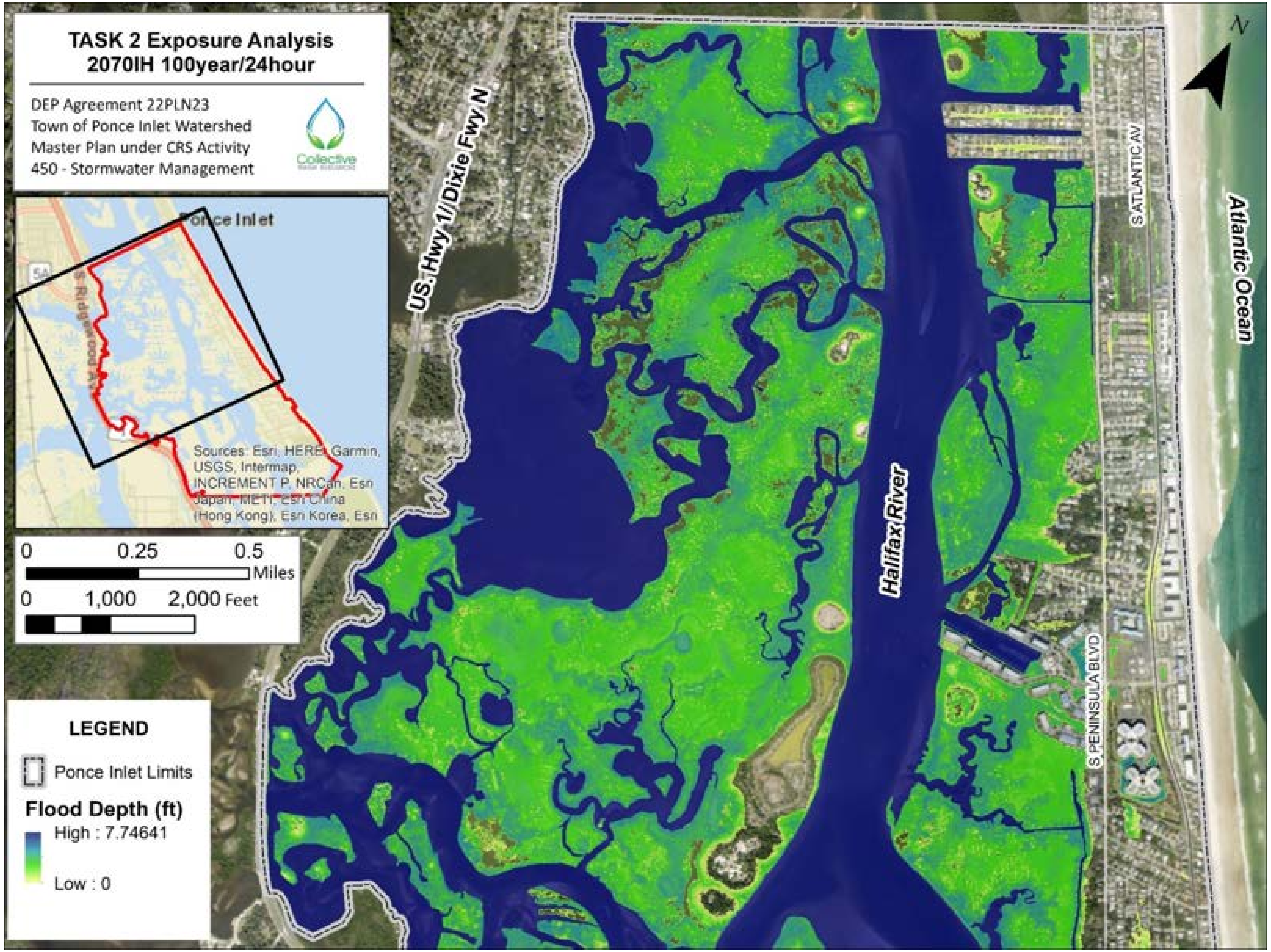


Figure F17 Stormwater Exposure 2070IH, 100year/24hour design storm North

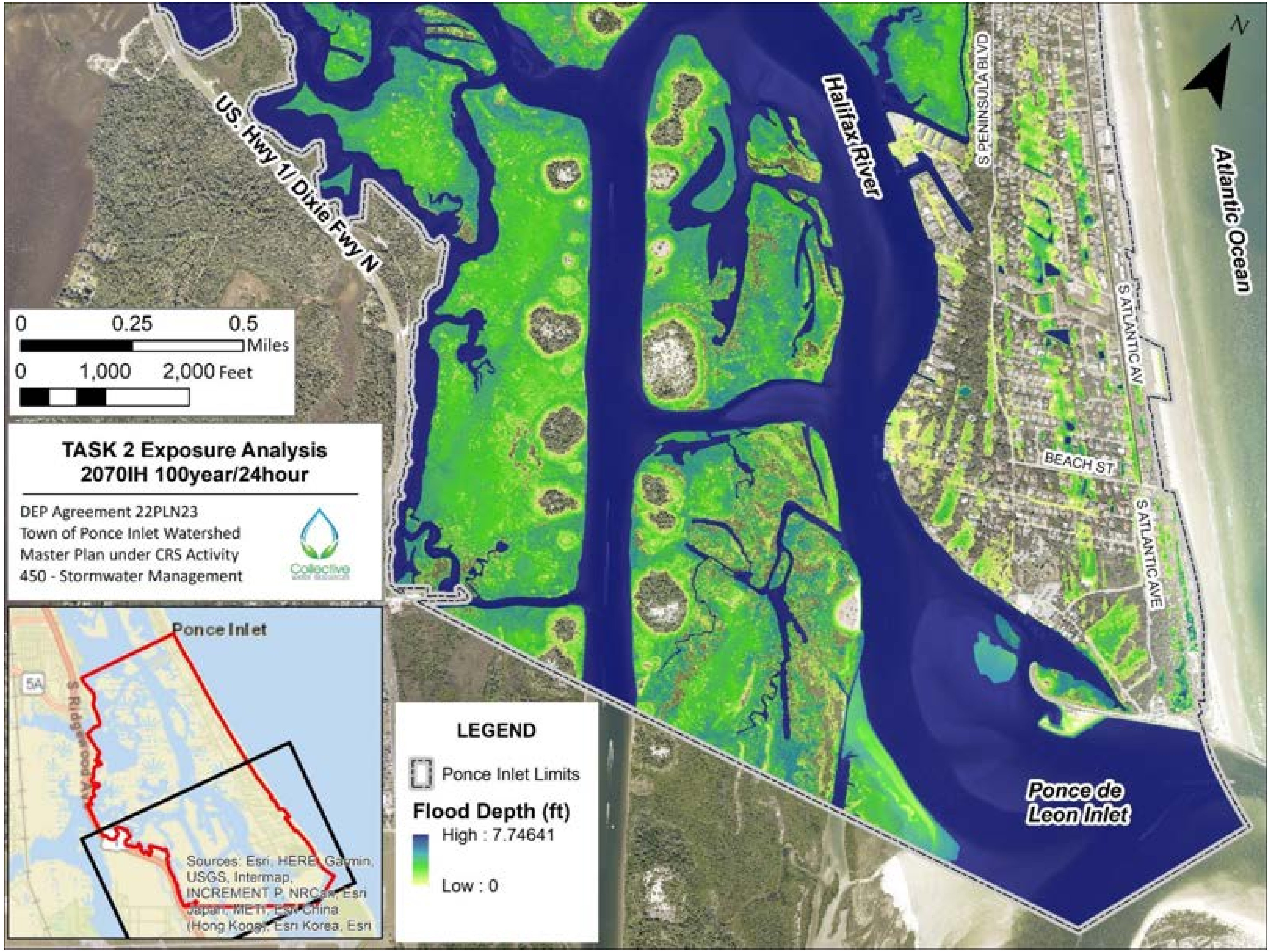


Figure F18 Stormwater Exposure 2070IH, 100year/24hour design storm South

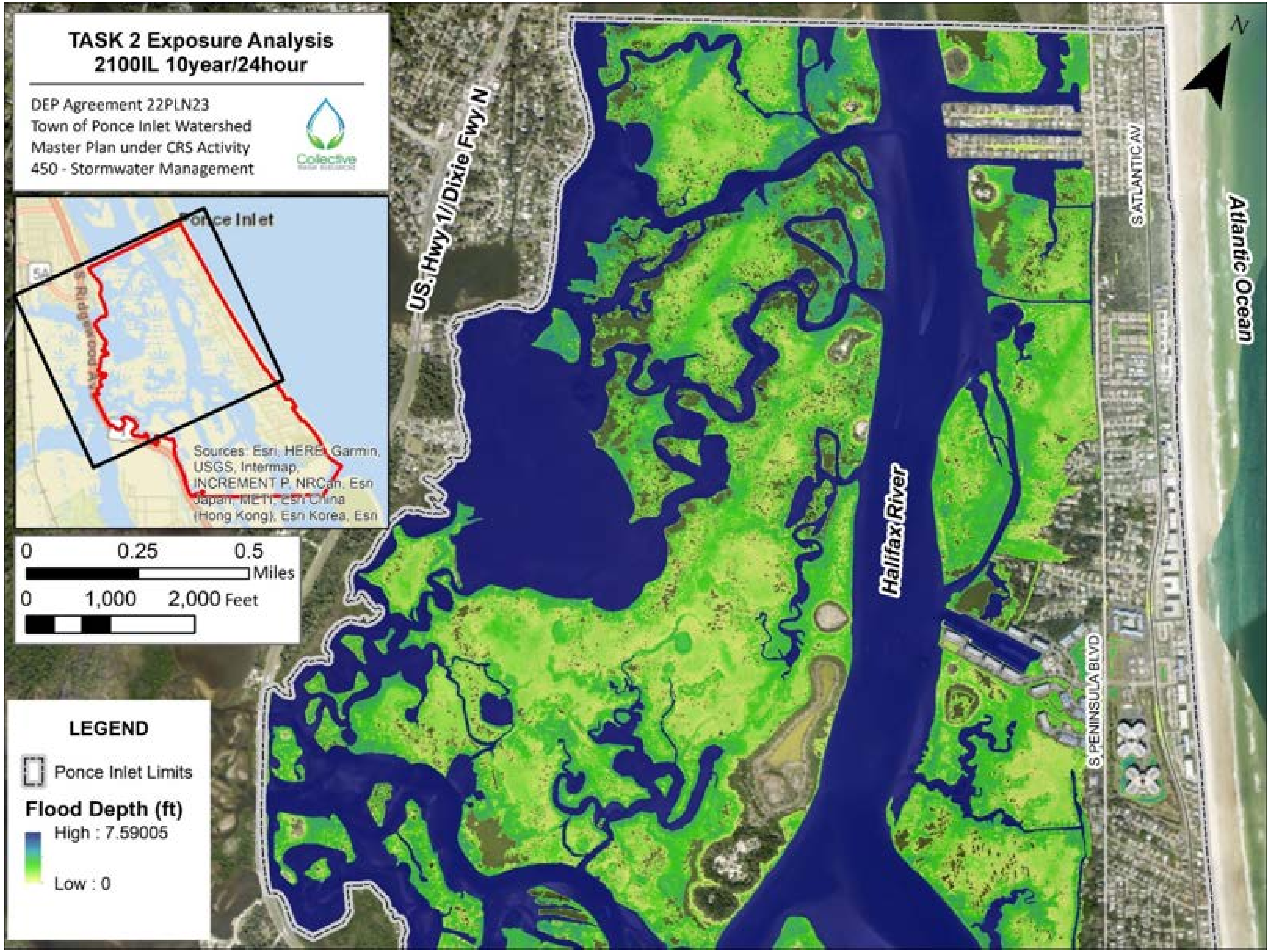


Figure F19 Stormwater Exposure 2100IL, 10year/24hour design storm North

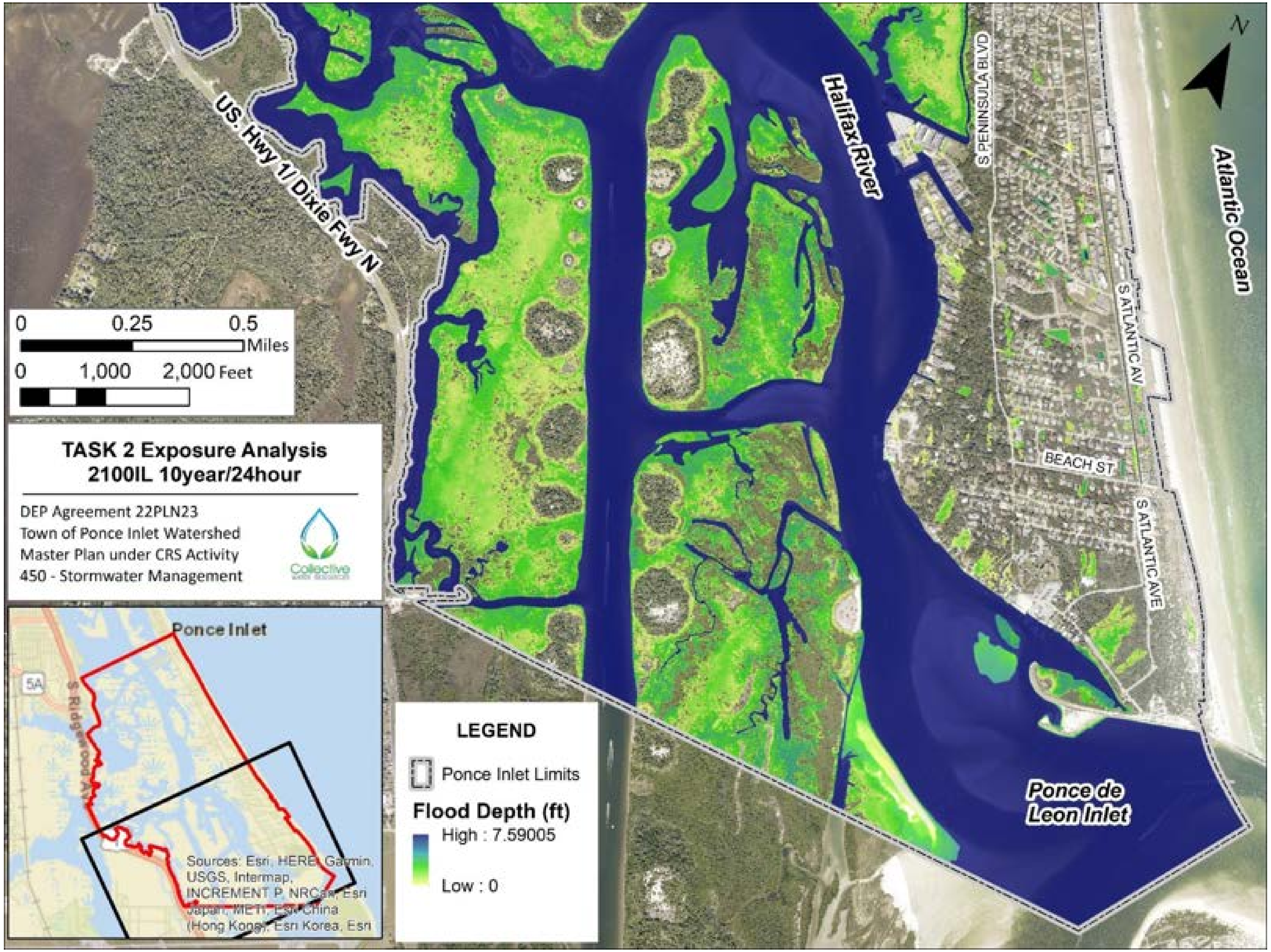


Figure F20 Stormwater Exposure 2100IL, 10year/24hour design storm South

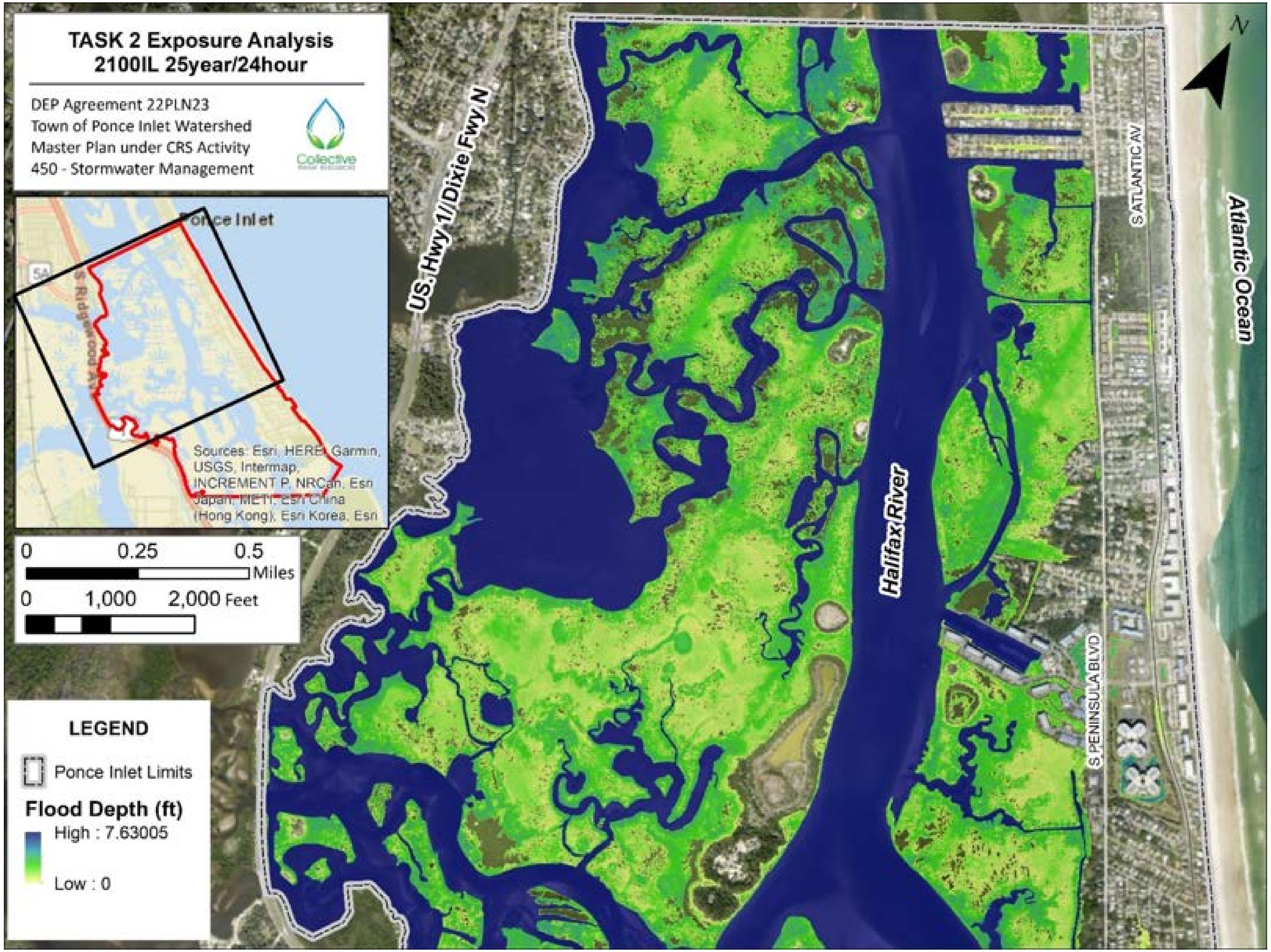


Figure F21 Stormwater Exposure 2100IL, 25year/24hour design storm North

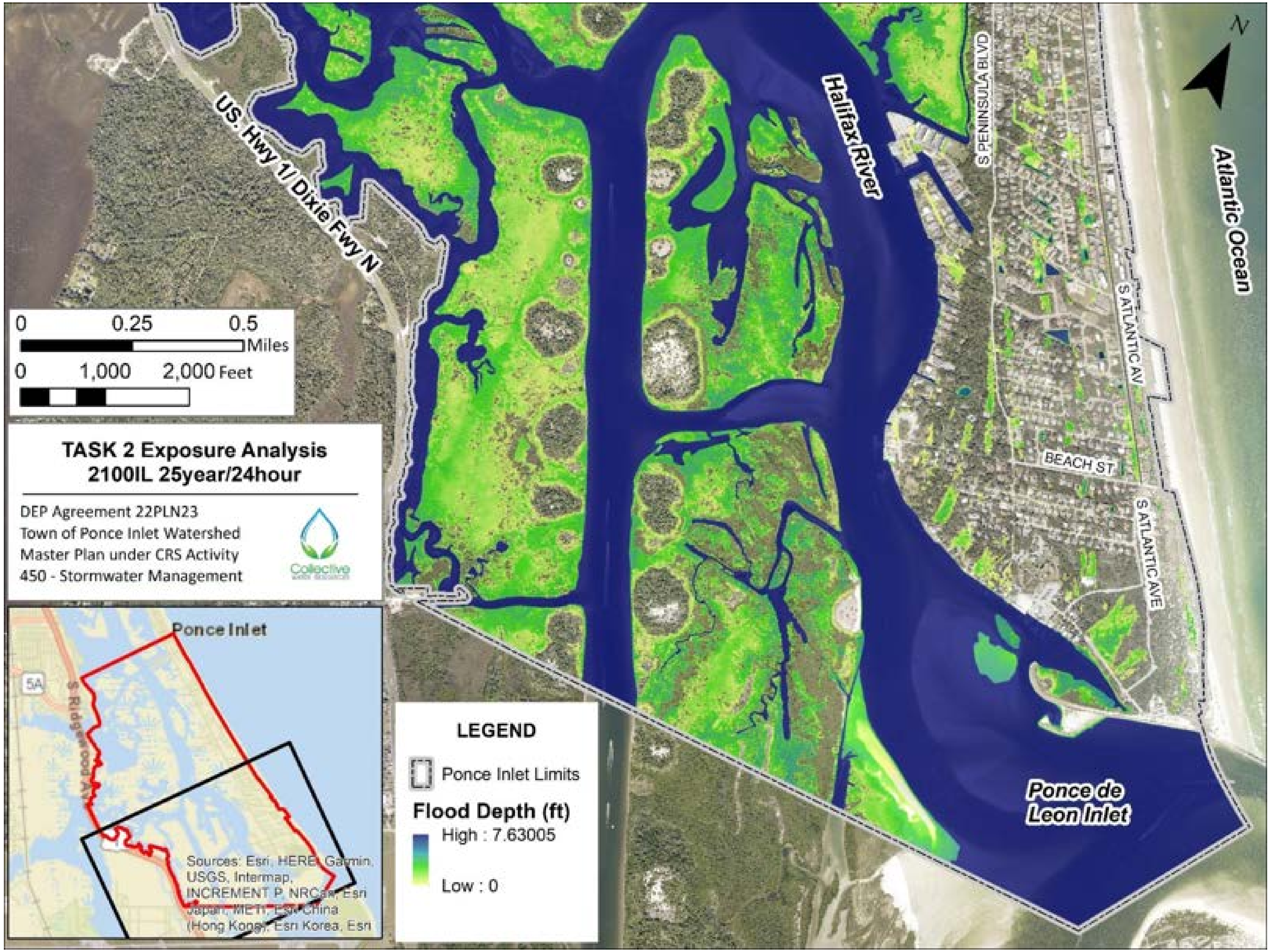


Figure F22 Stormwater Exposure 2100IL, 25year/24hour design storm South

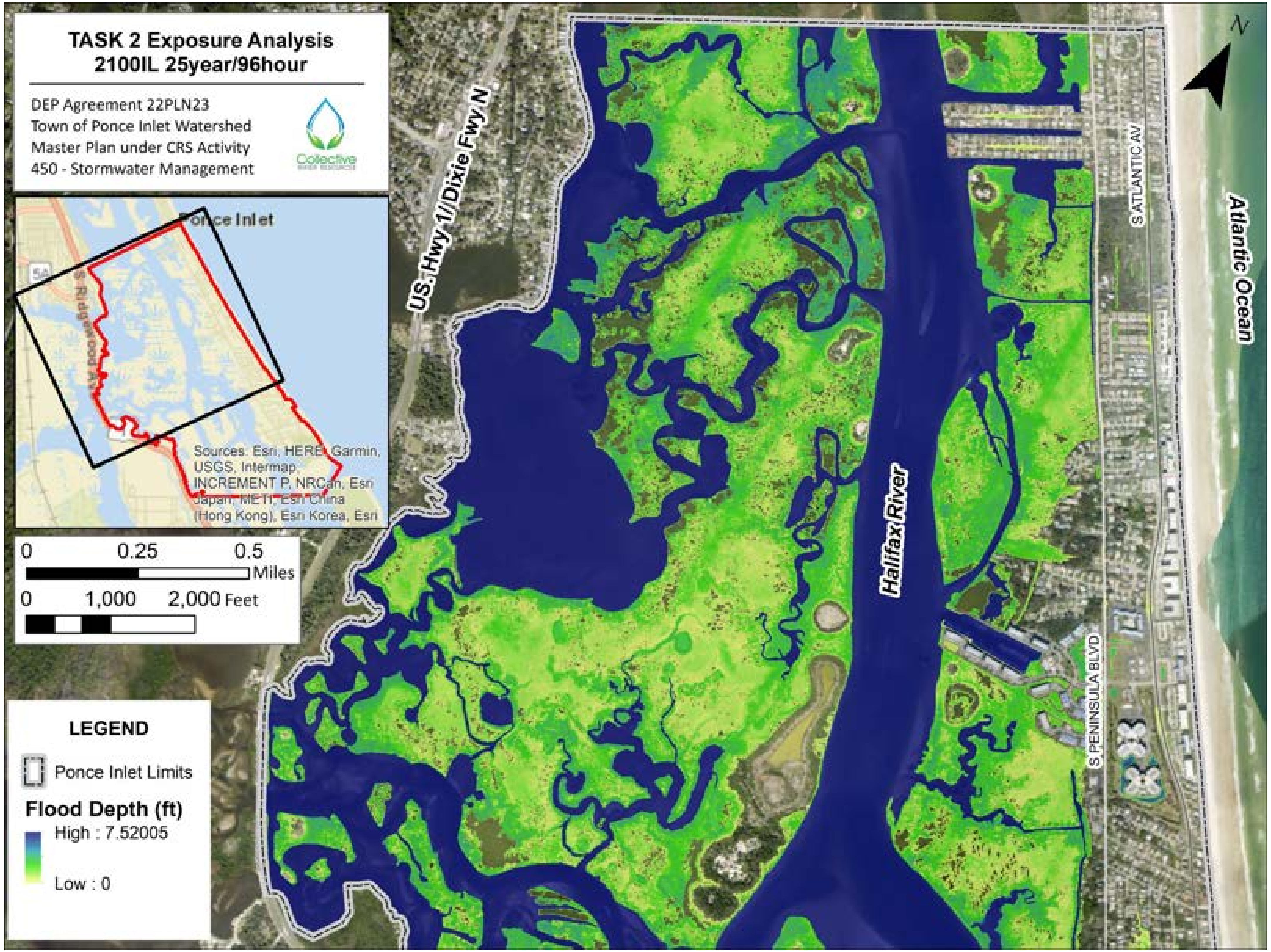


Figure F23 Stormwater Exposure 2100IL, 25year/96hour design storm North

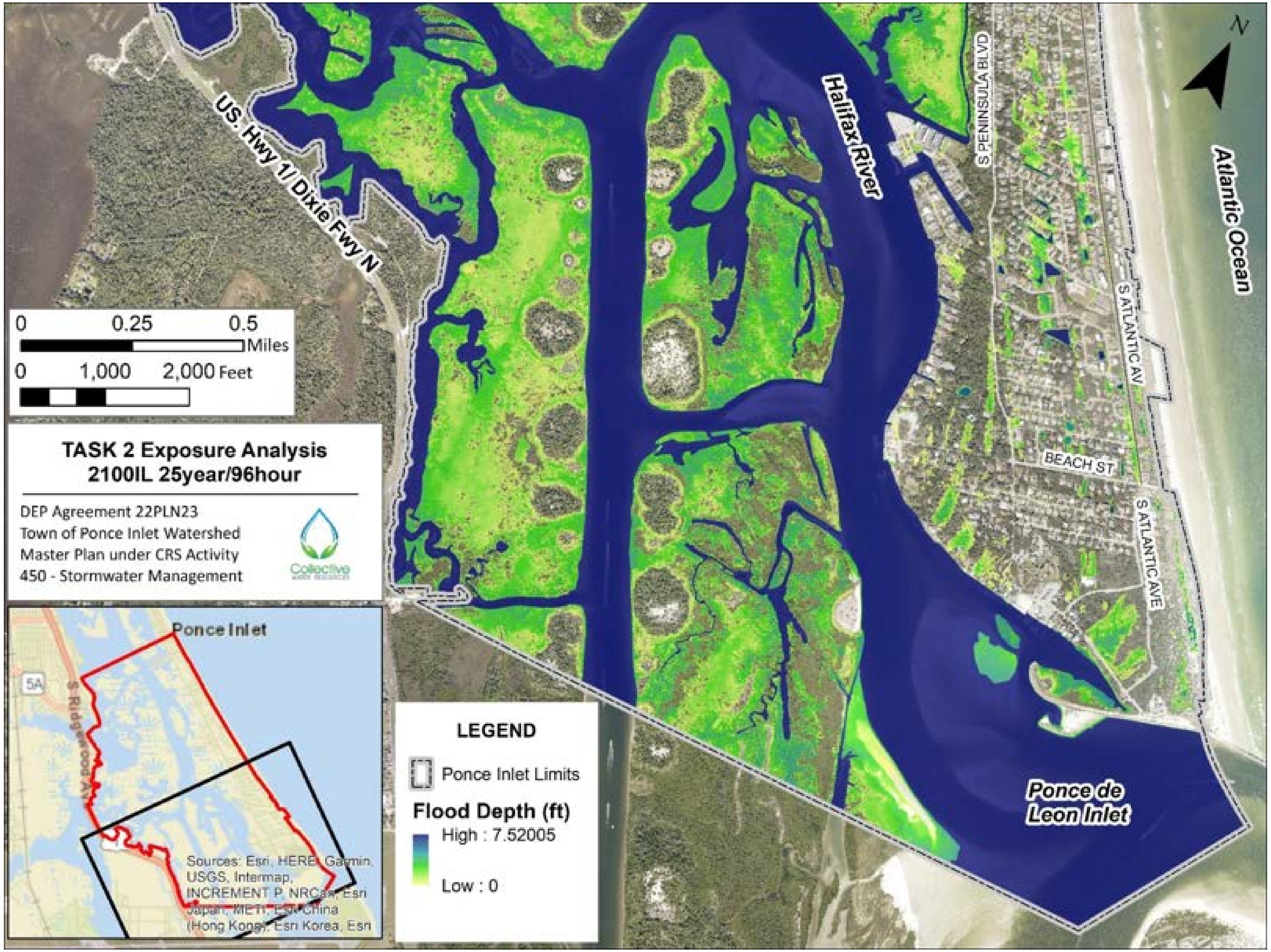


Figure F24 Stormwater Exposure 2100IL, 25year/96hour design storm South

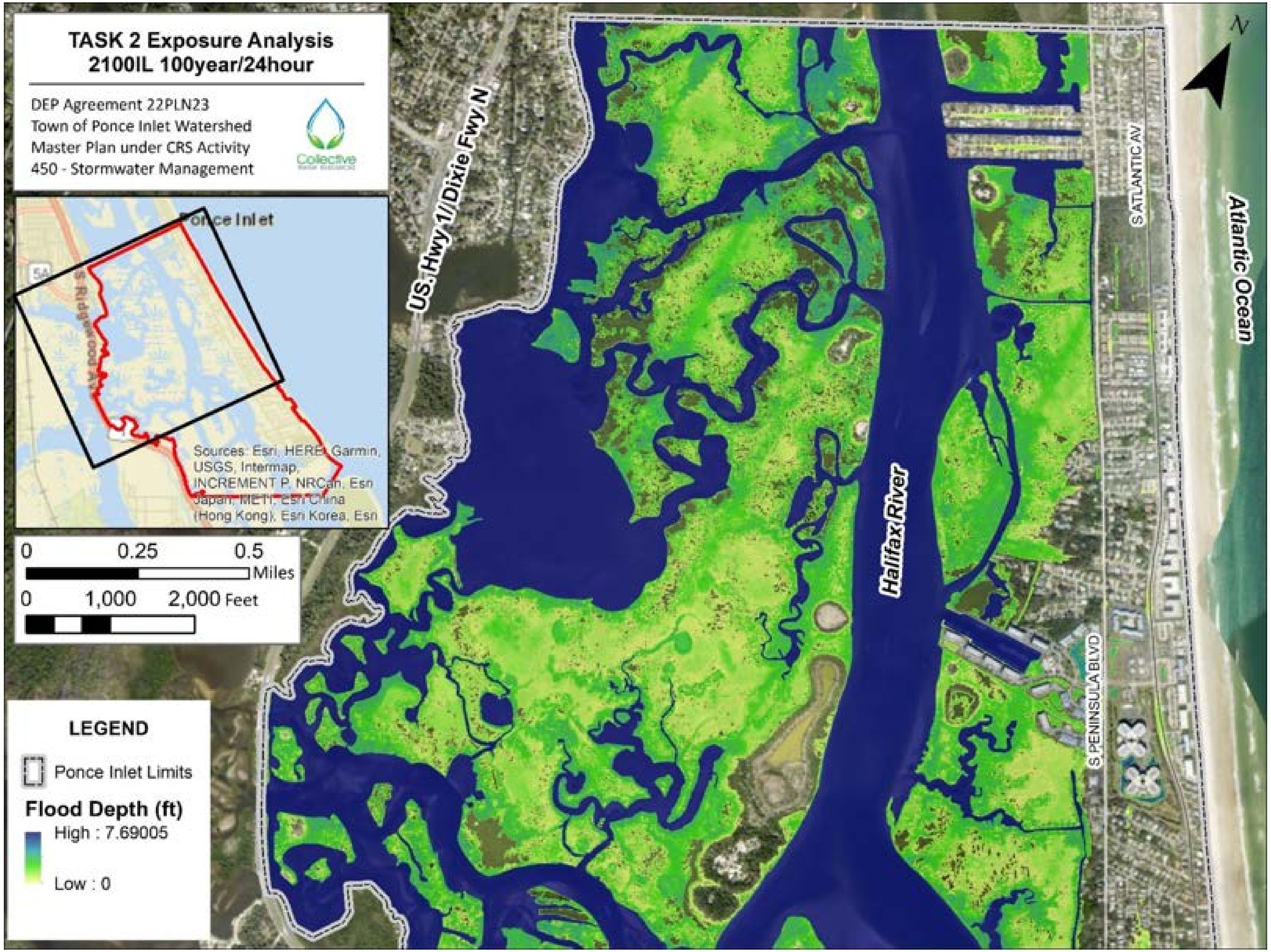


Figure F25 Stormwater Exposure 2100IL, 100year/24hour design storm North

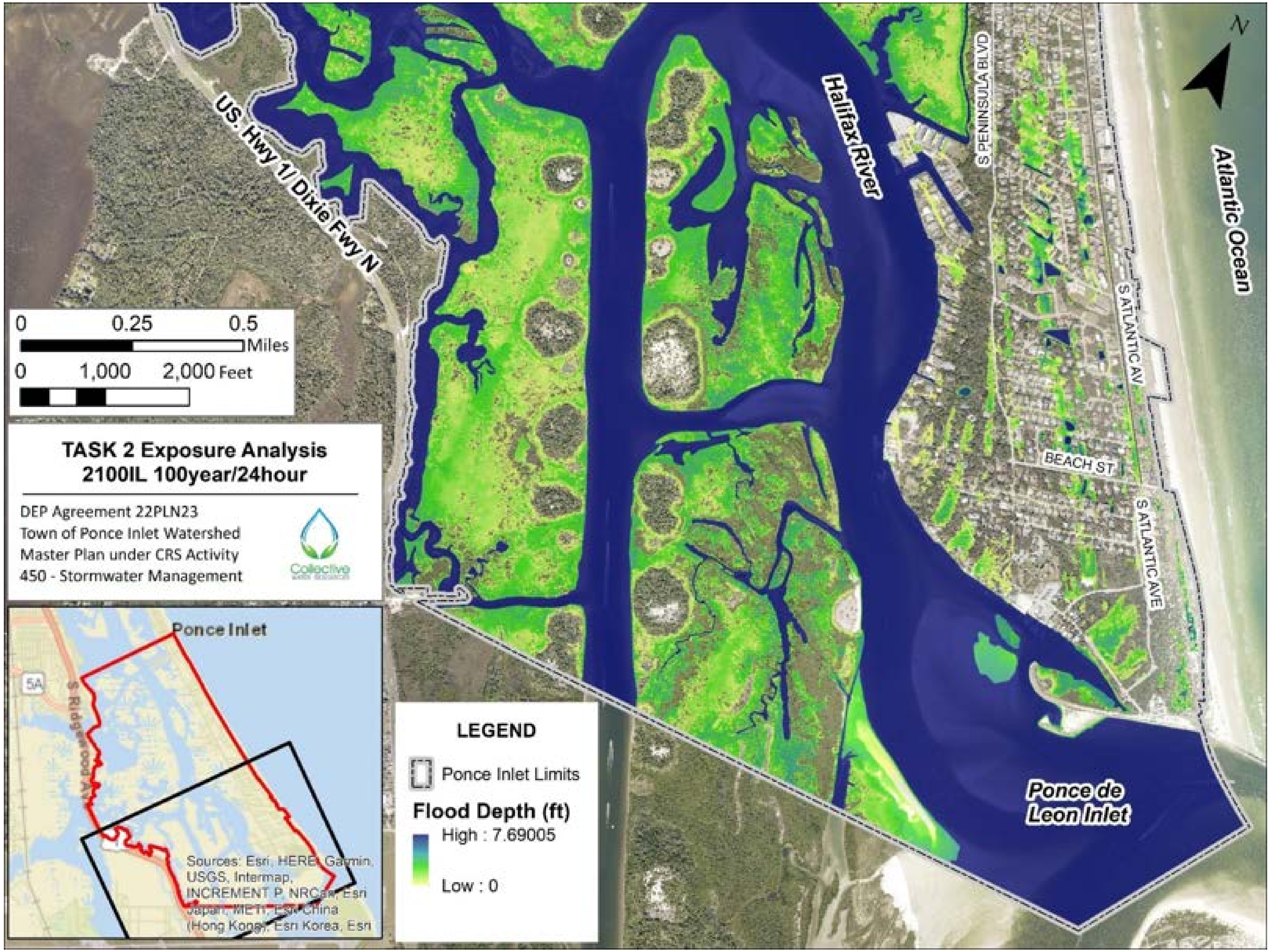


Figure F26 Stormwater Exposure 2100IL, 100year/24hour design storm South

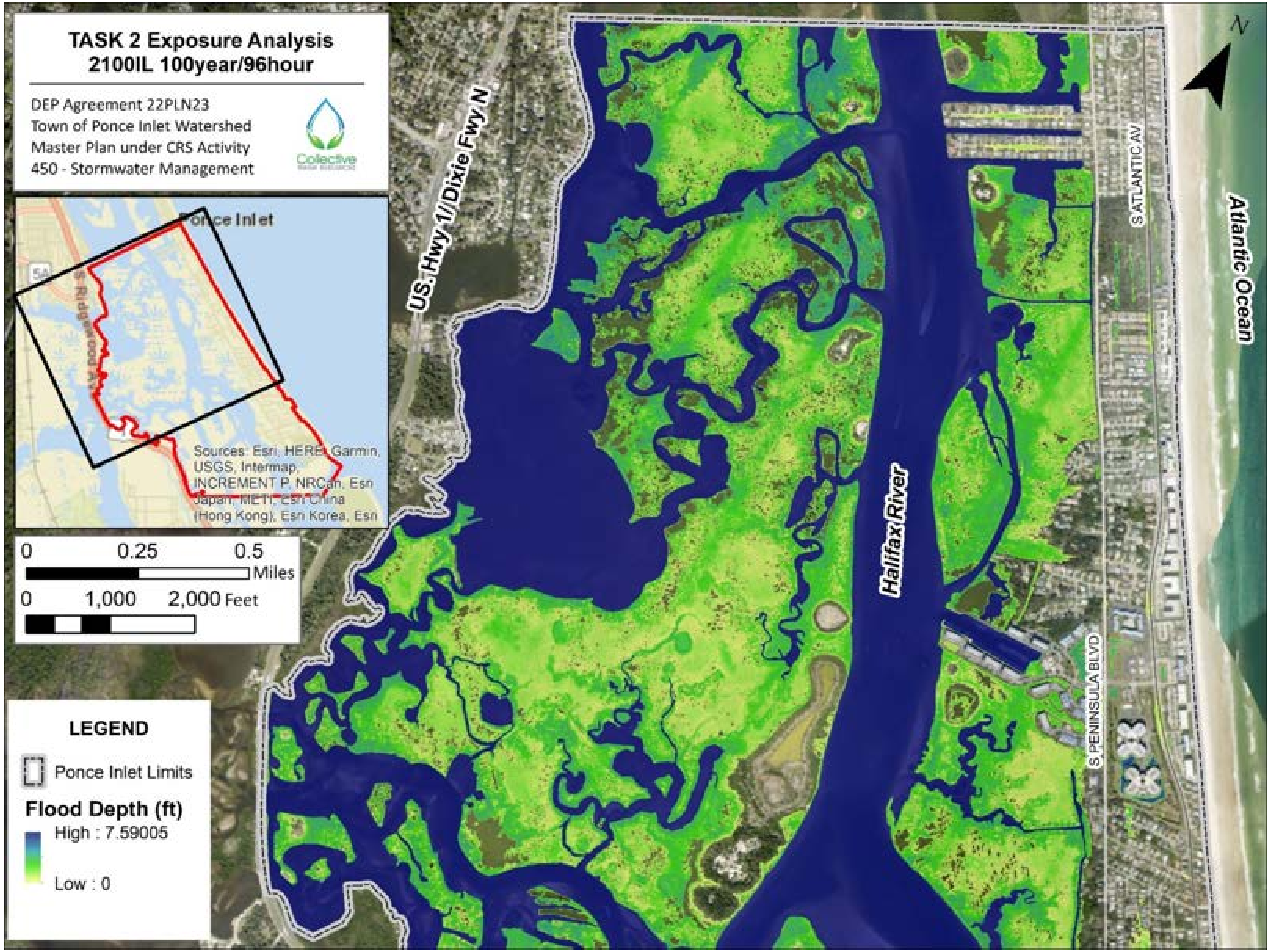


Figure F27 Stormwater Exposure 2100IL, 100year/96hour design storm North

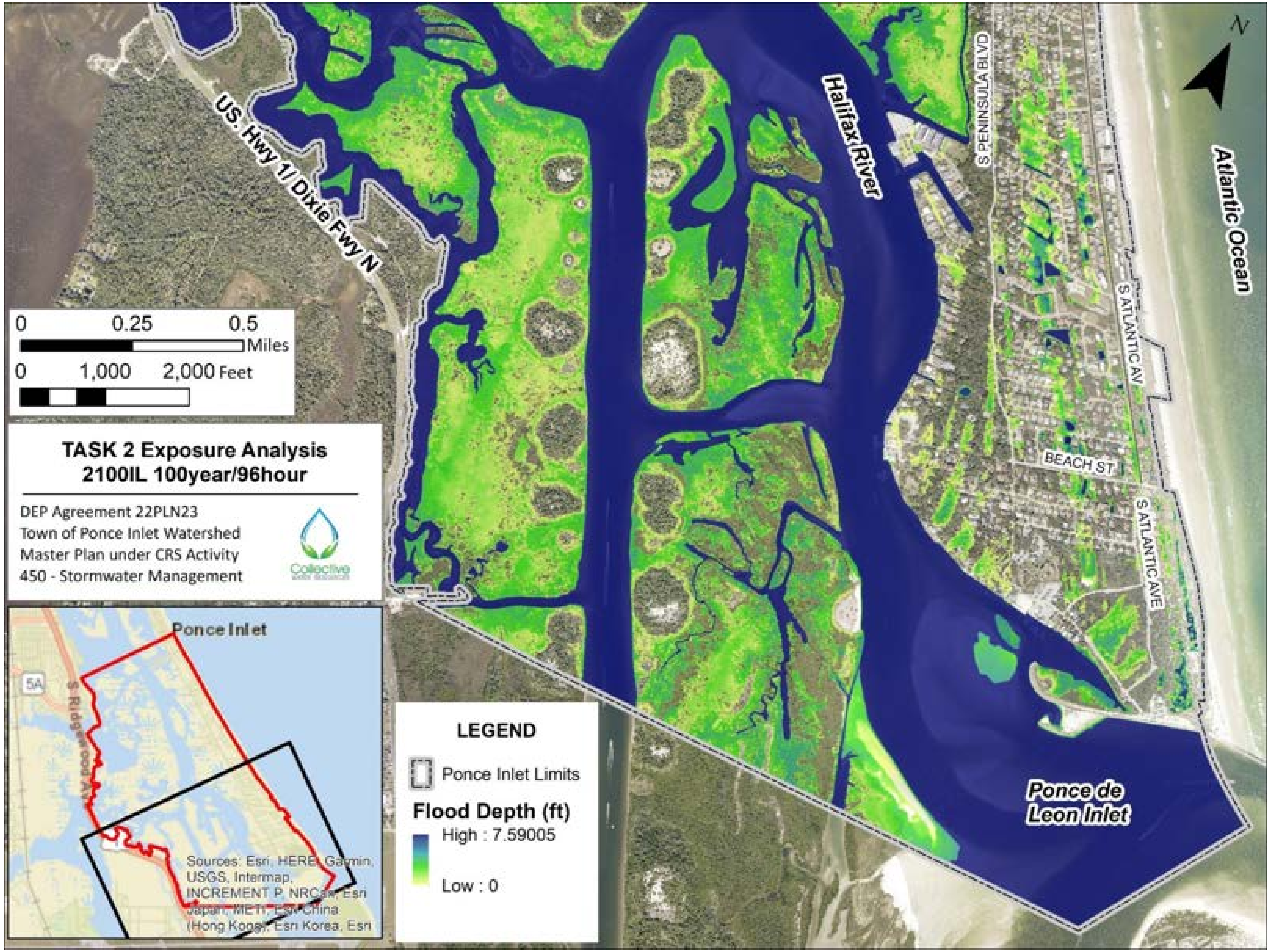


Figure F28 Stormwater Exposure 2100IL, 100year/96hour design storm South

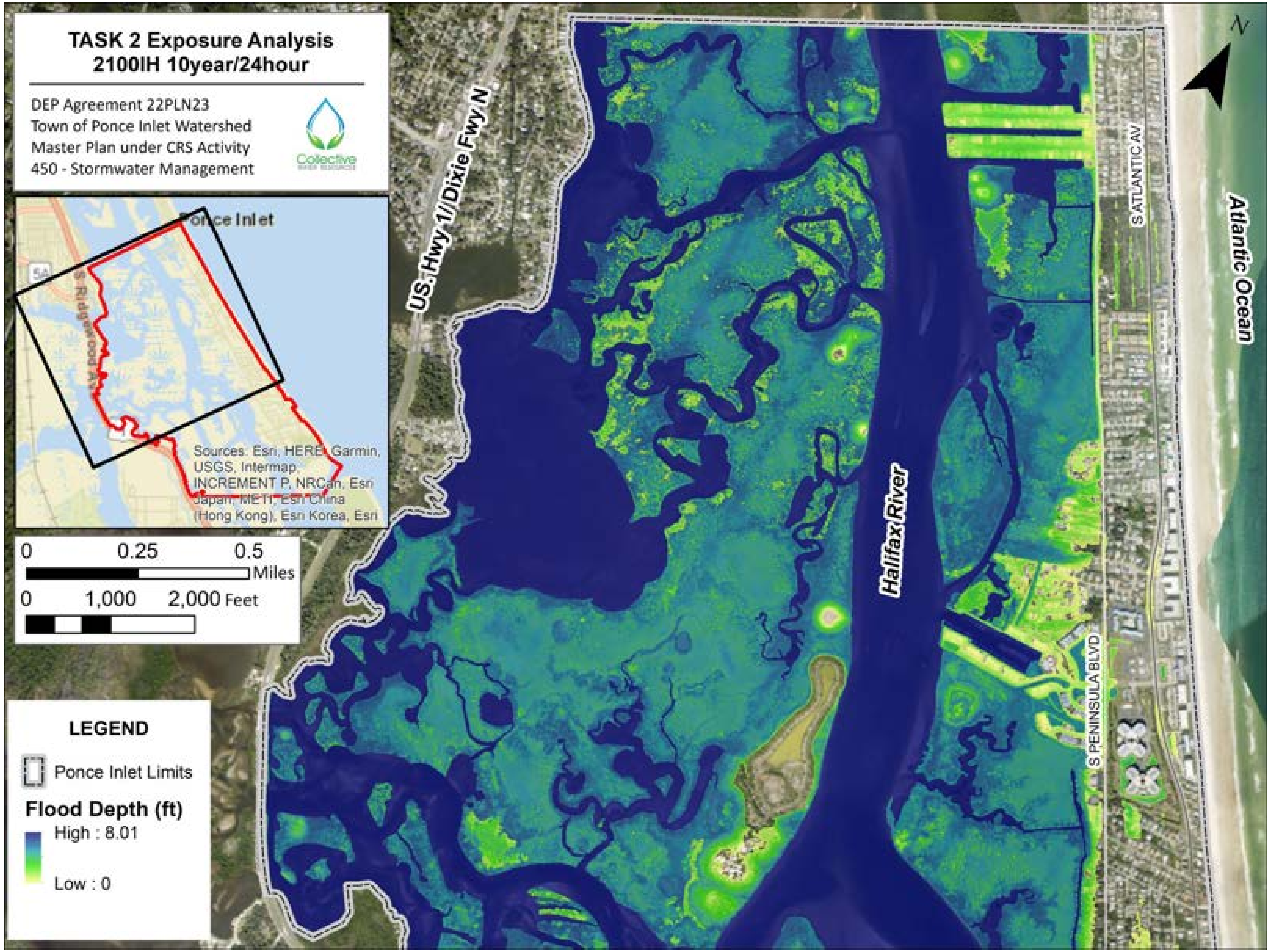


Figure F29 Stormwater Exposure 2100IH, 10year/24hour design storm North

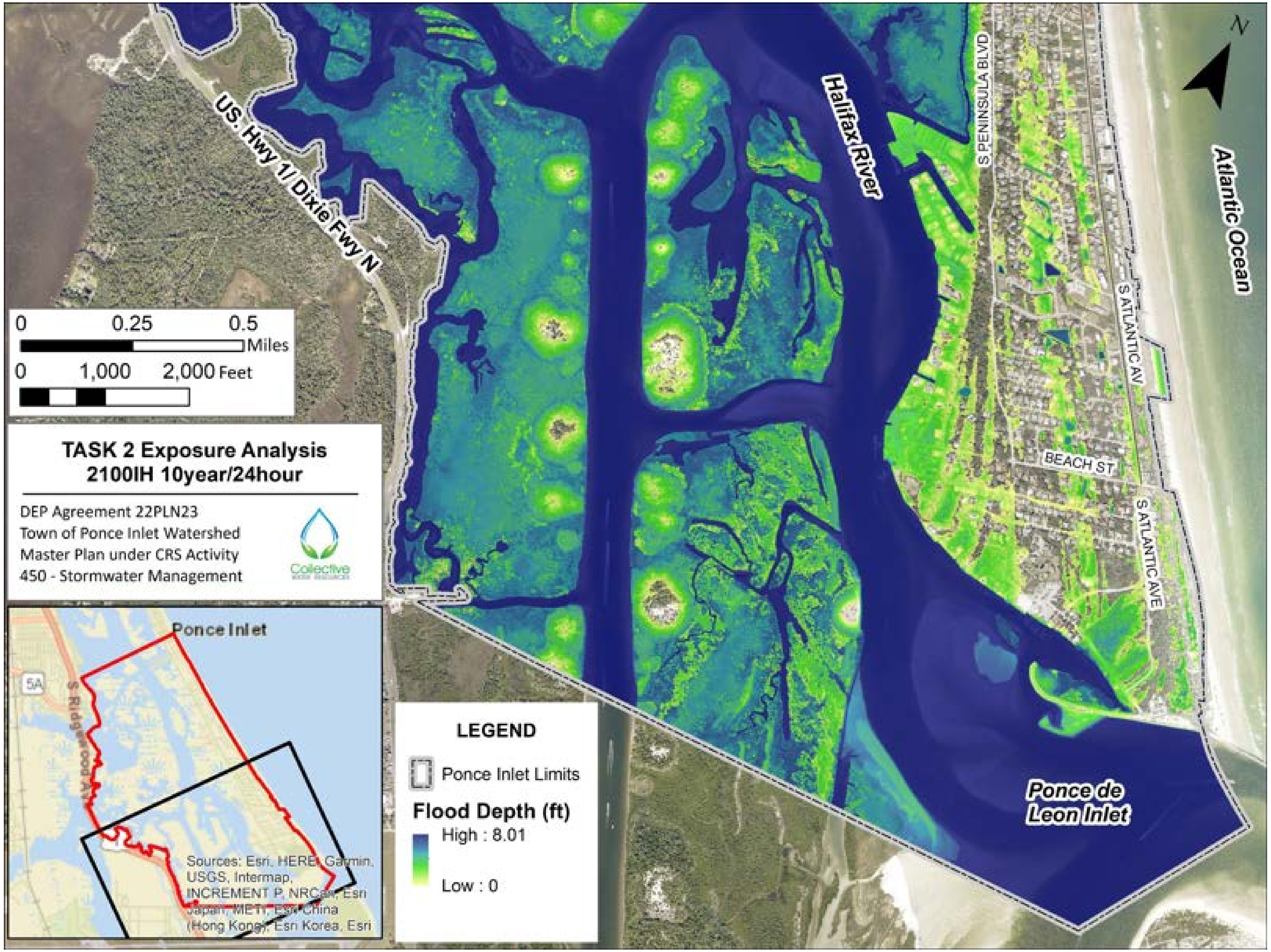


Figure F30 Stormwater Exposure 2100IH, 10year/24hour design storm South

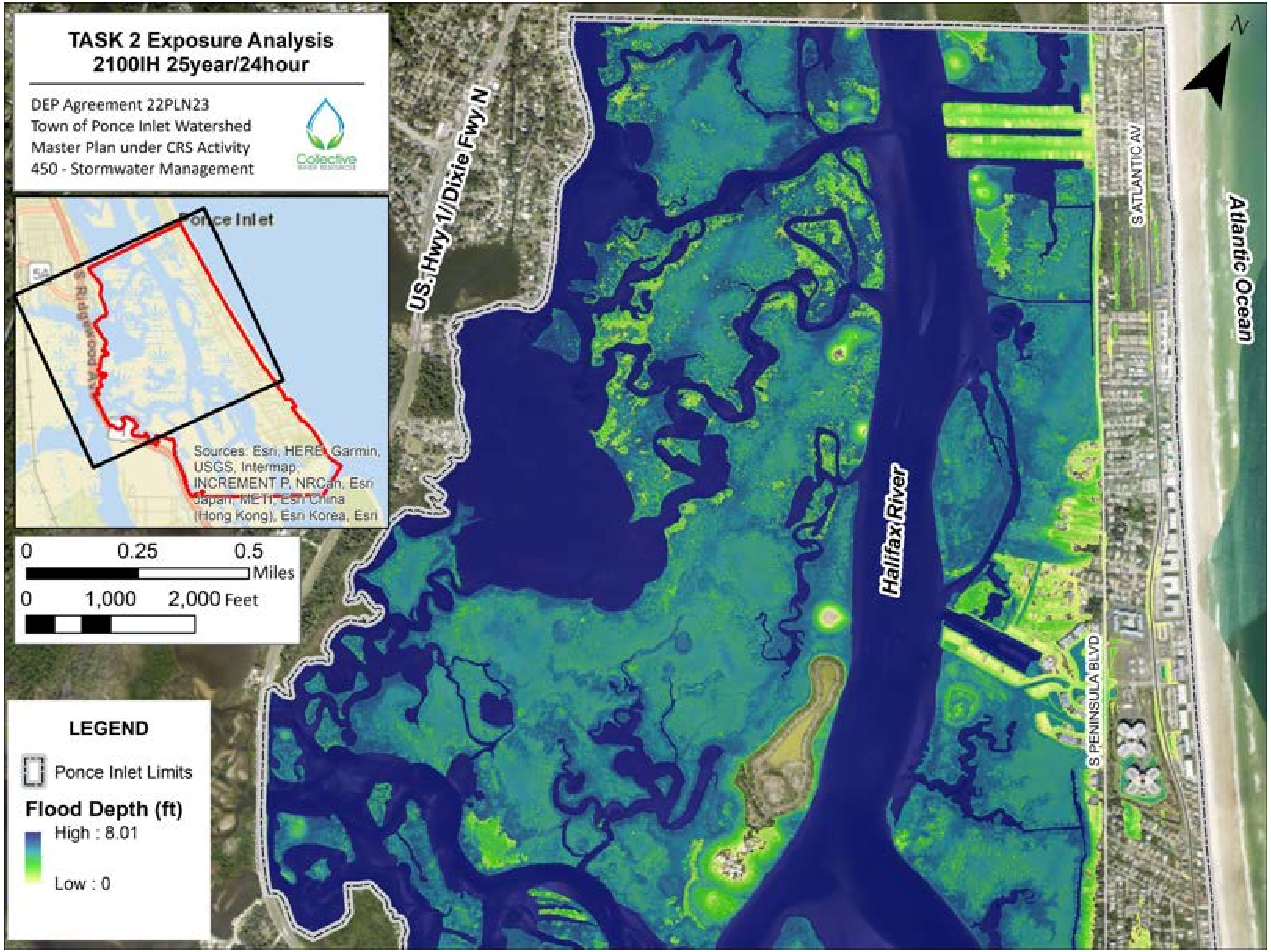


Figure F31 Stormwater Exposure 2100IH, 25year/24hour design storm North

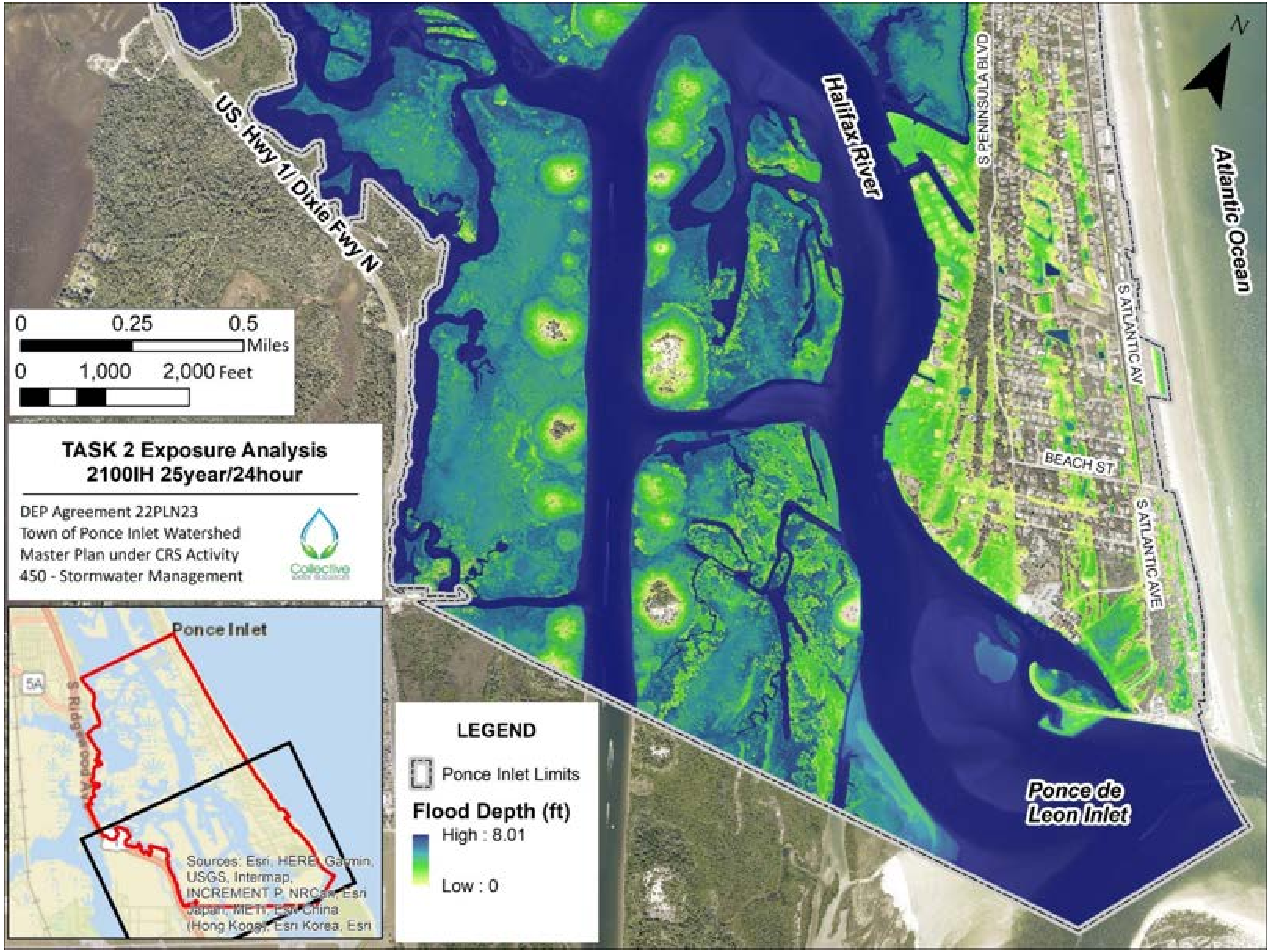


Figure F32 Stormwater Exposure 2100IH, 25year/24hour design storm South

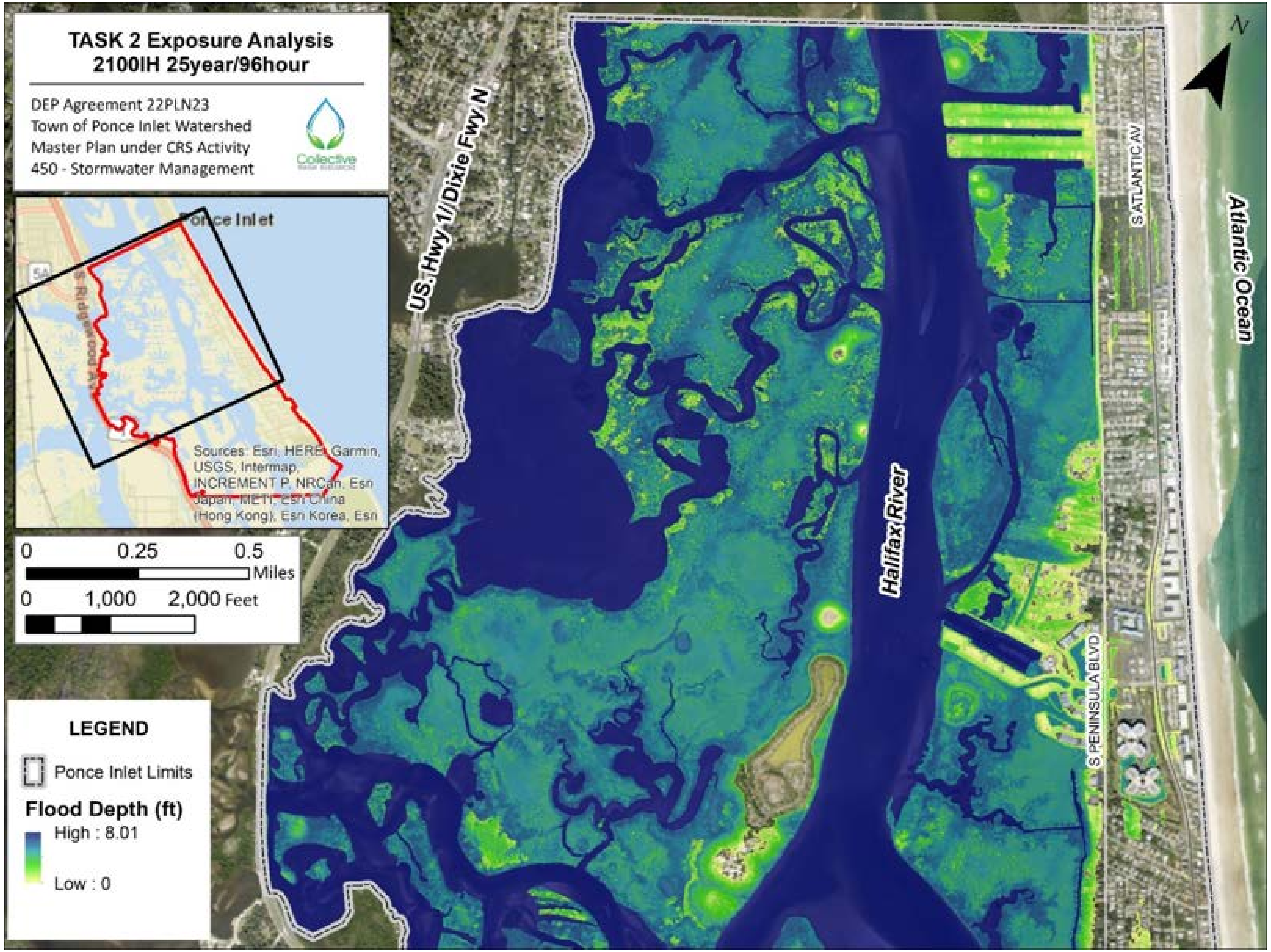


Figure F33 Stormwater Exposure 2100IH, 25year/96hour design storm North

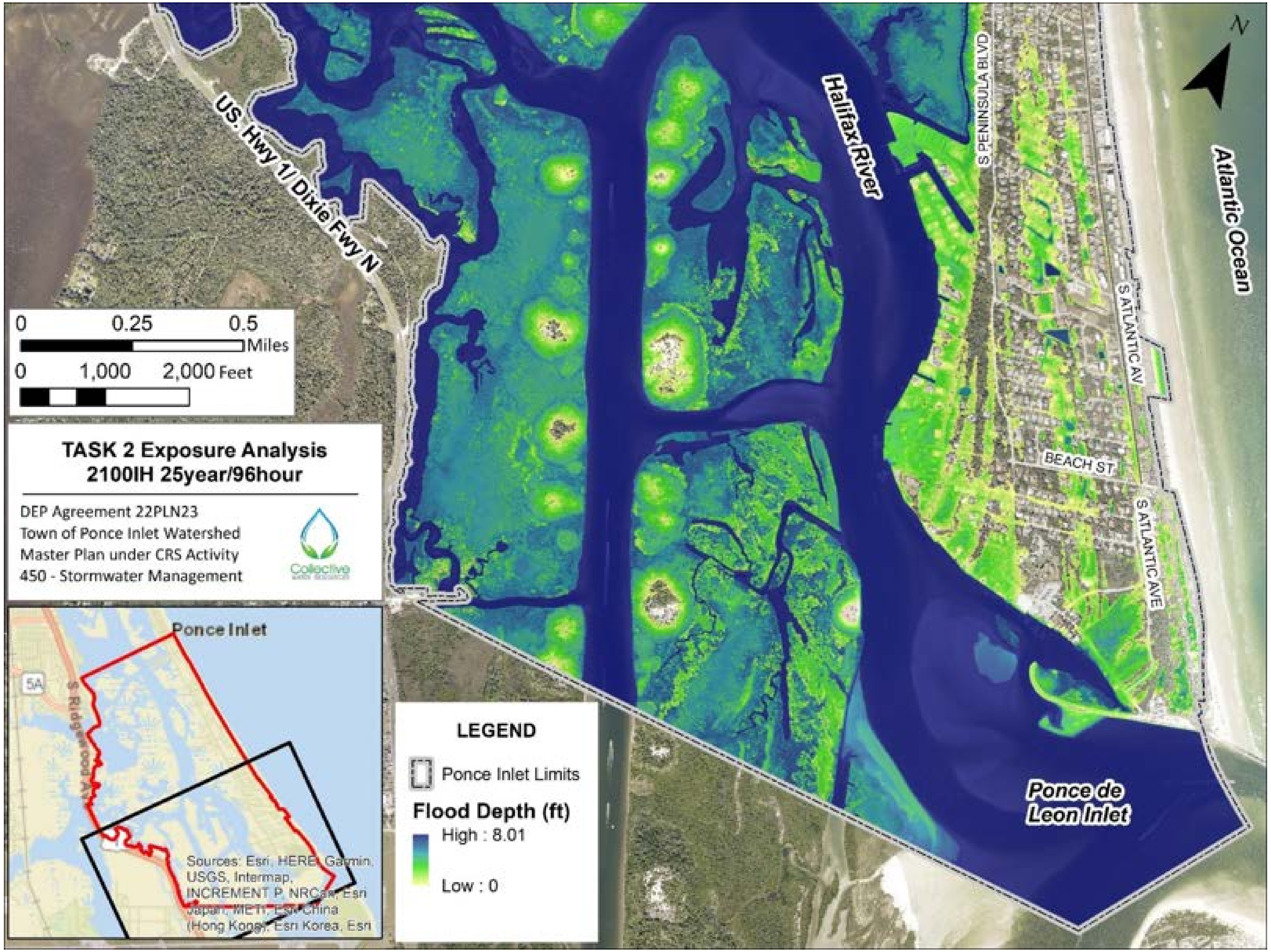


Figure F34 Stormwater Exposure 2100IH, 25year/96hour design storm South

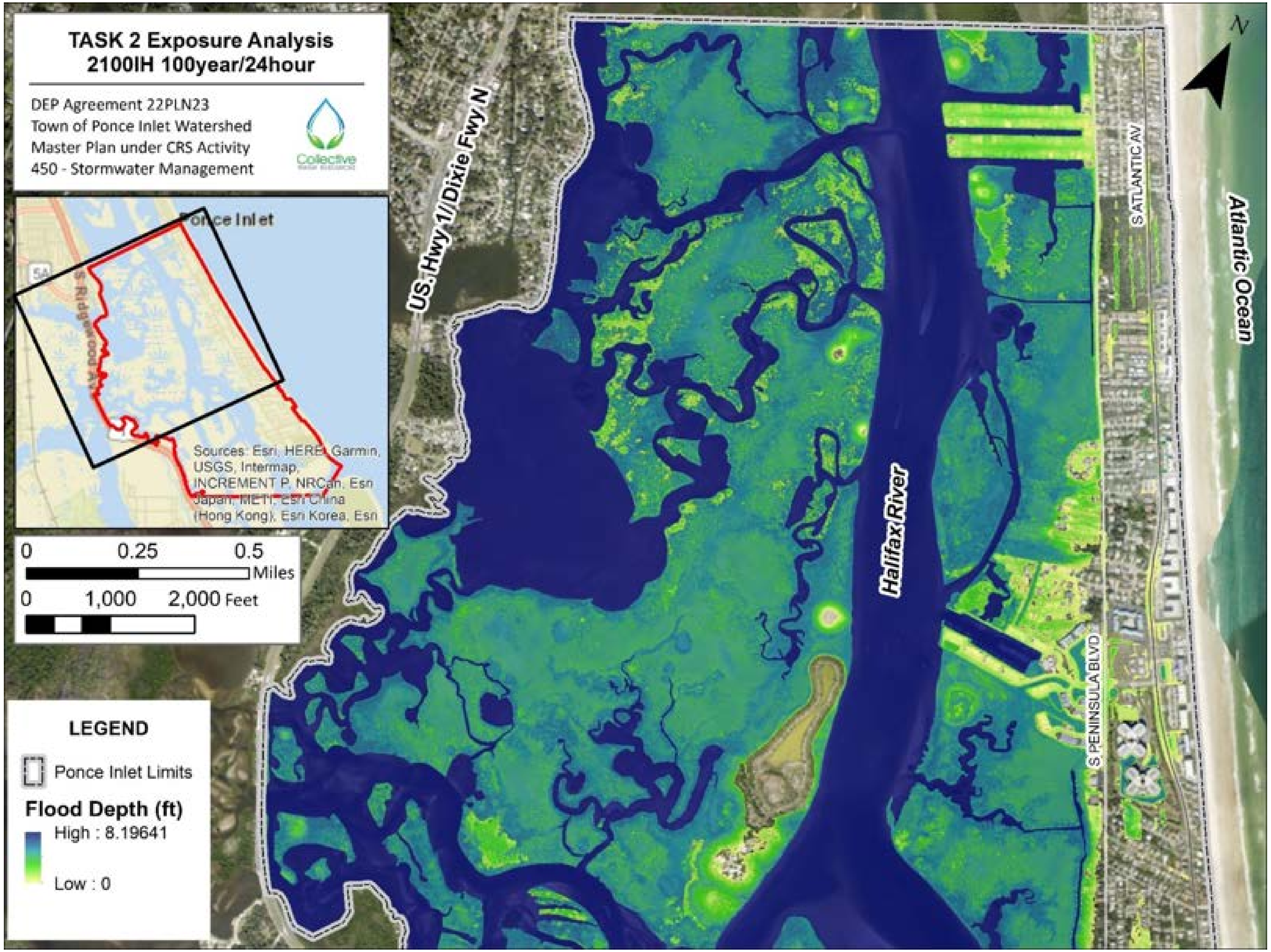


Figure F35 Stormwater Exposure 2100IH, 100year/24hour design storm North

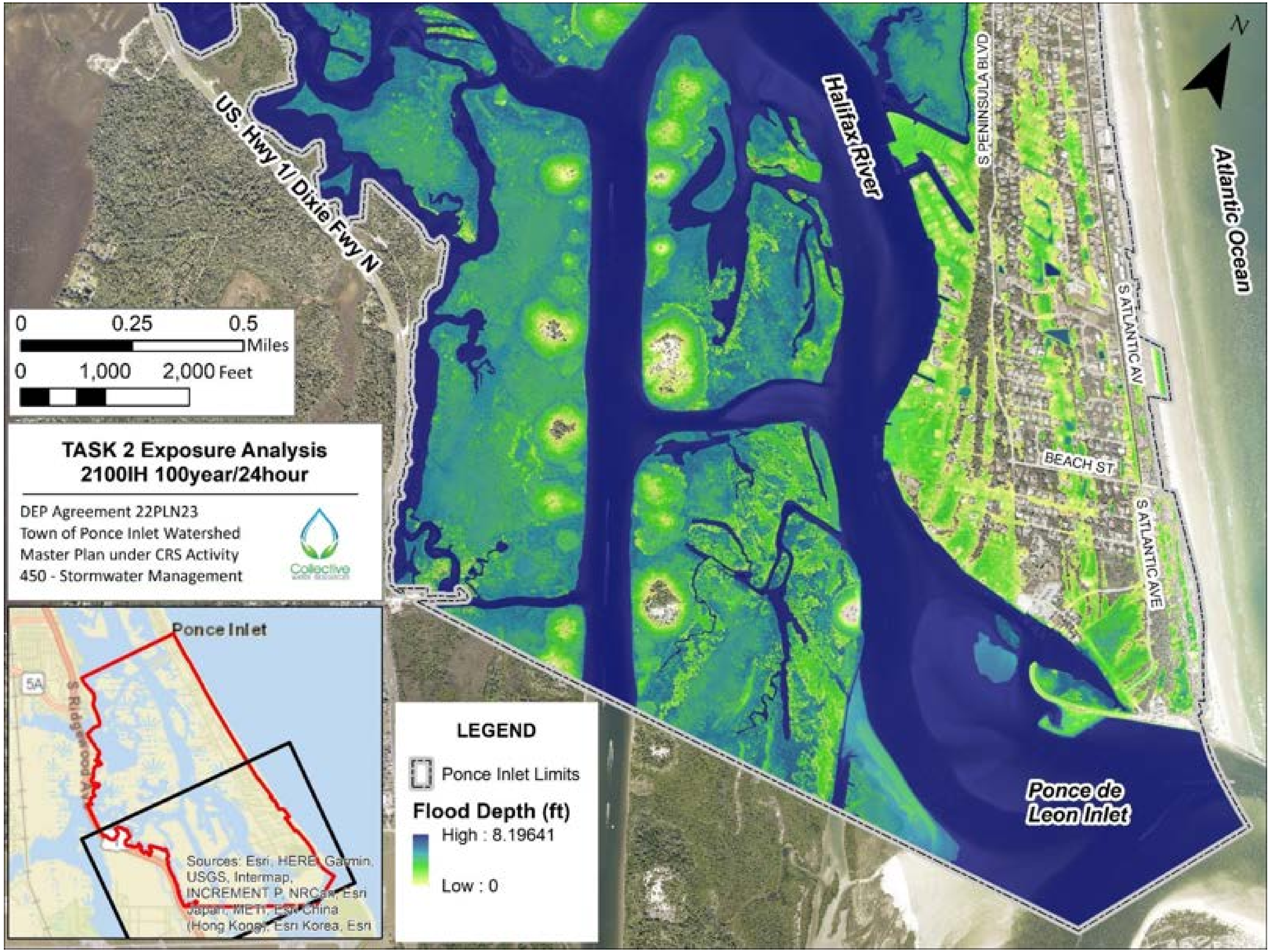


Figure F36 Stormwater Exposure 2100IH, 100year/24hour design storm South

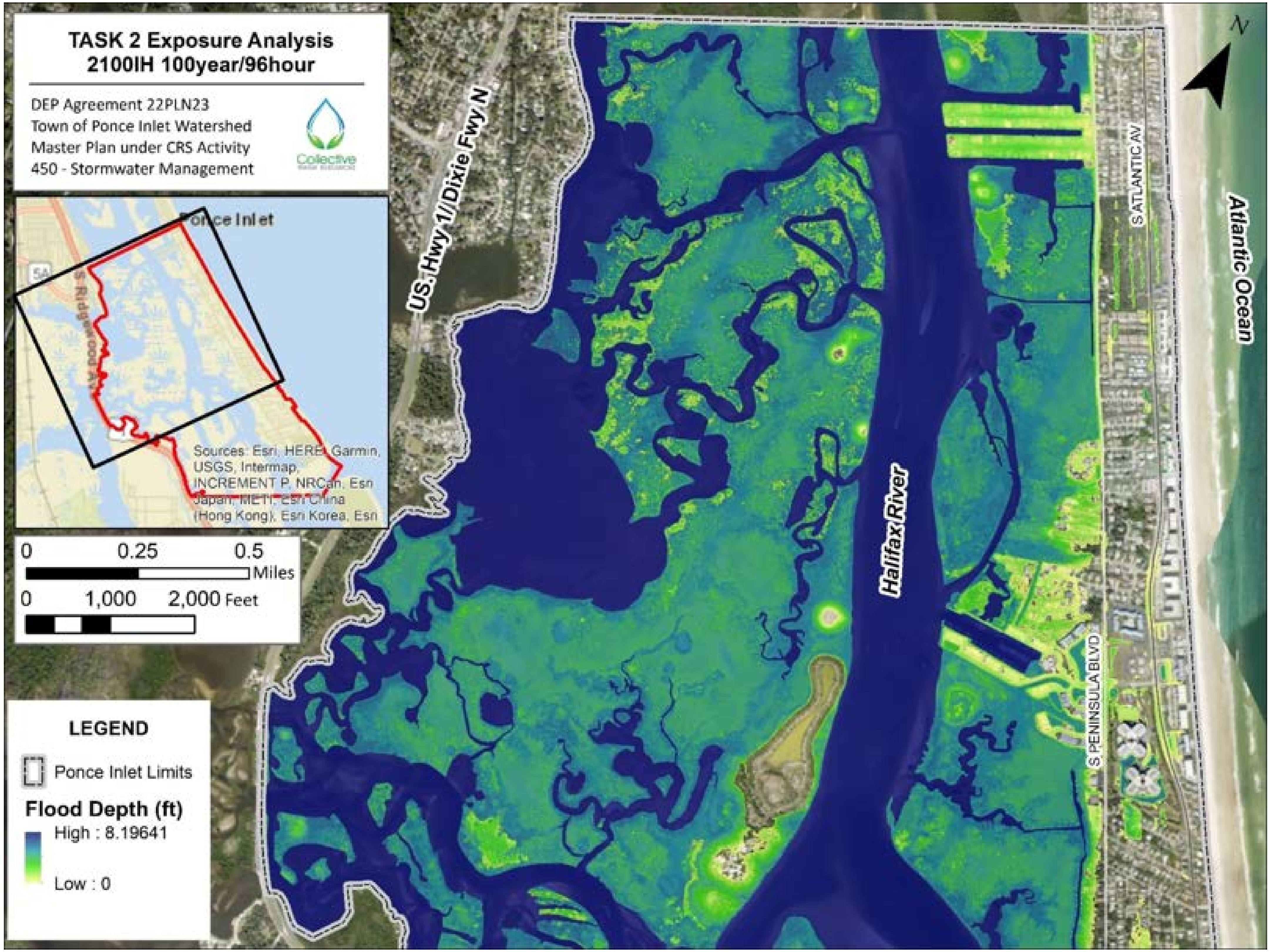


Figure F37 Stormwater Exposure 2100IH, 100year/96hour design storm North

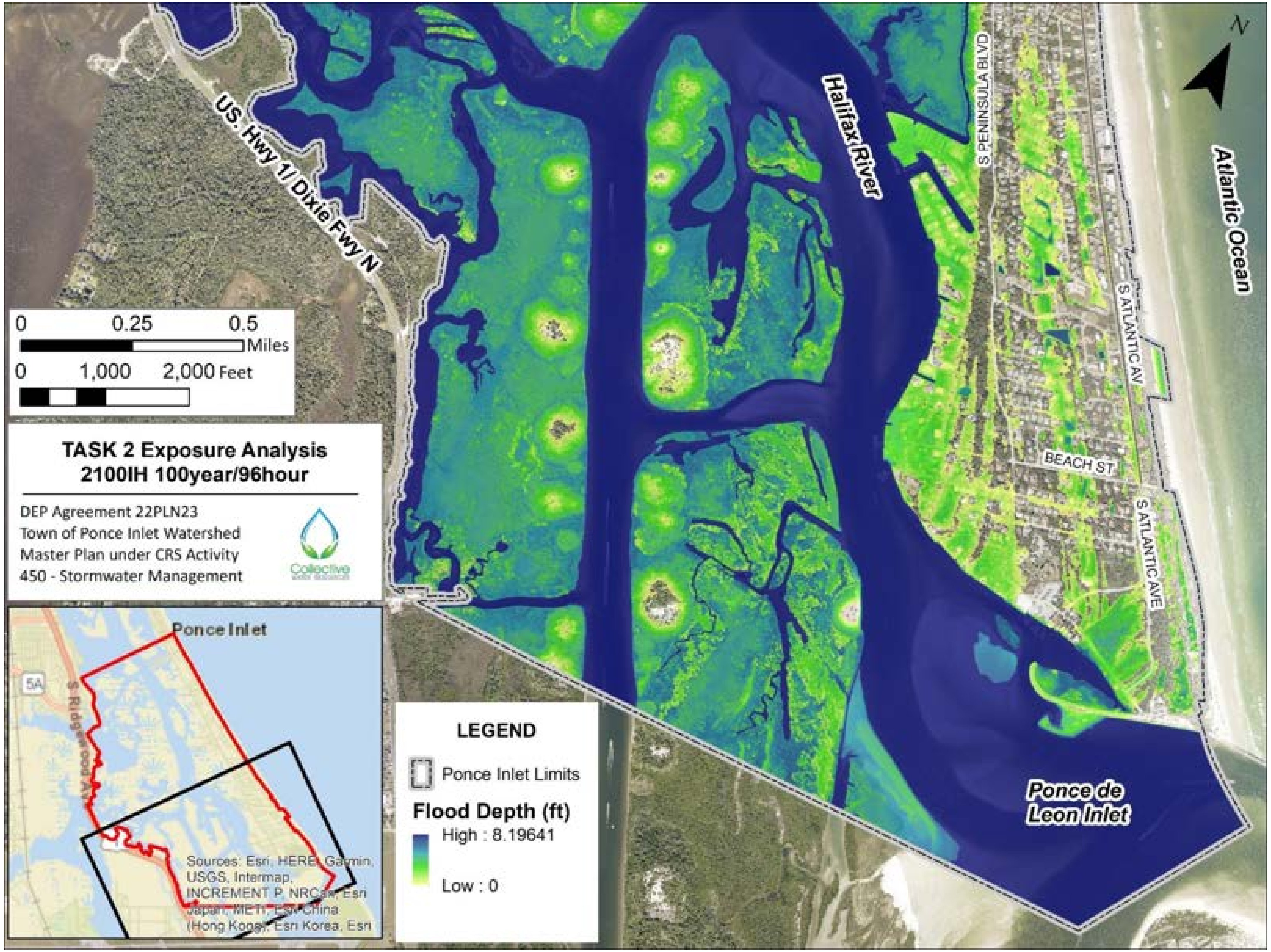


Figure F38 Stormwater Exposure 2100IH, 100year/96hour design storm South

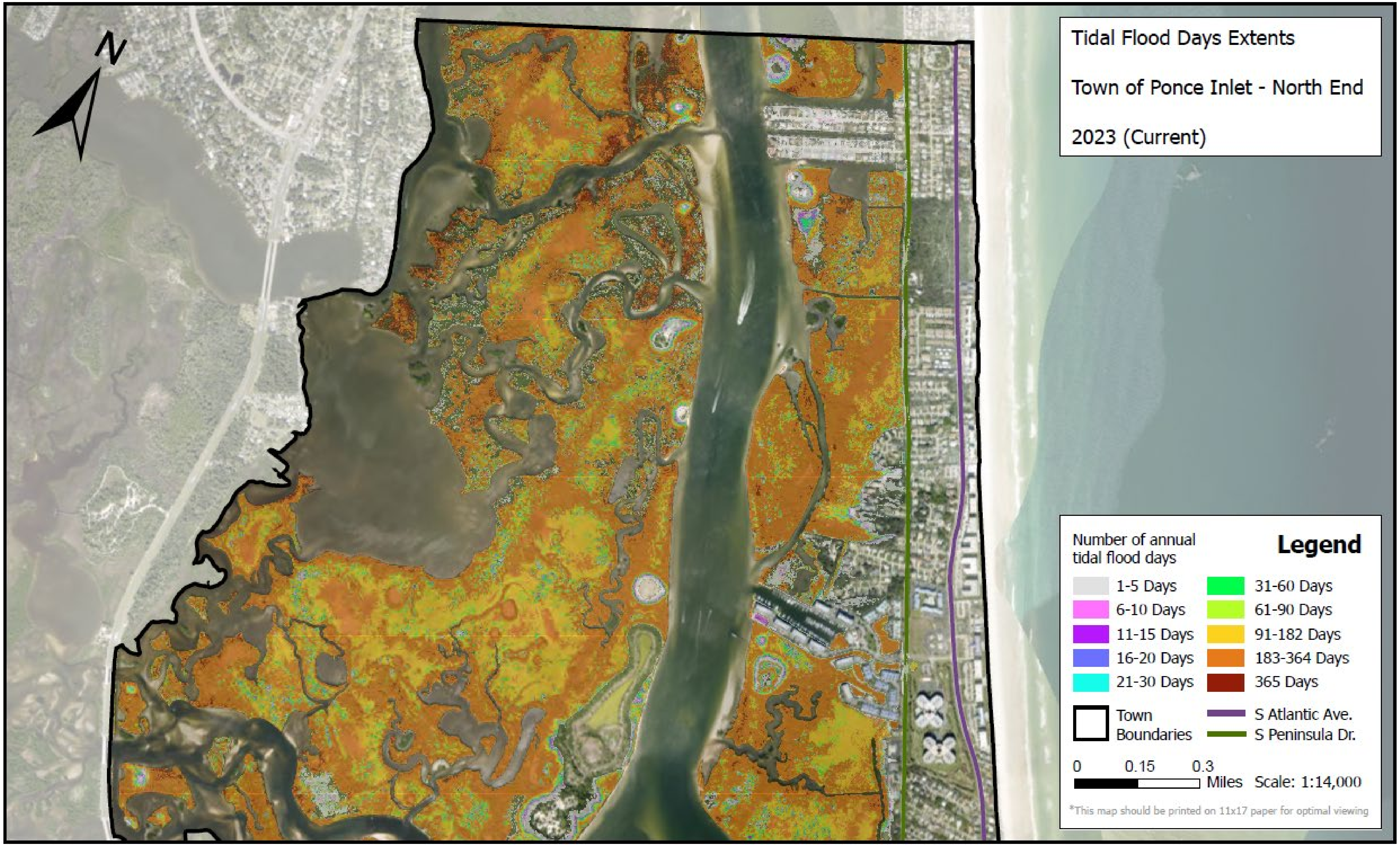


Figure F39 Annual Tidal Flood Days 2023 North

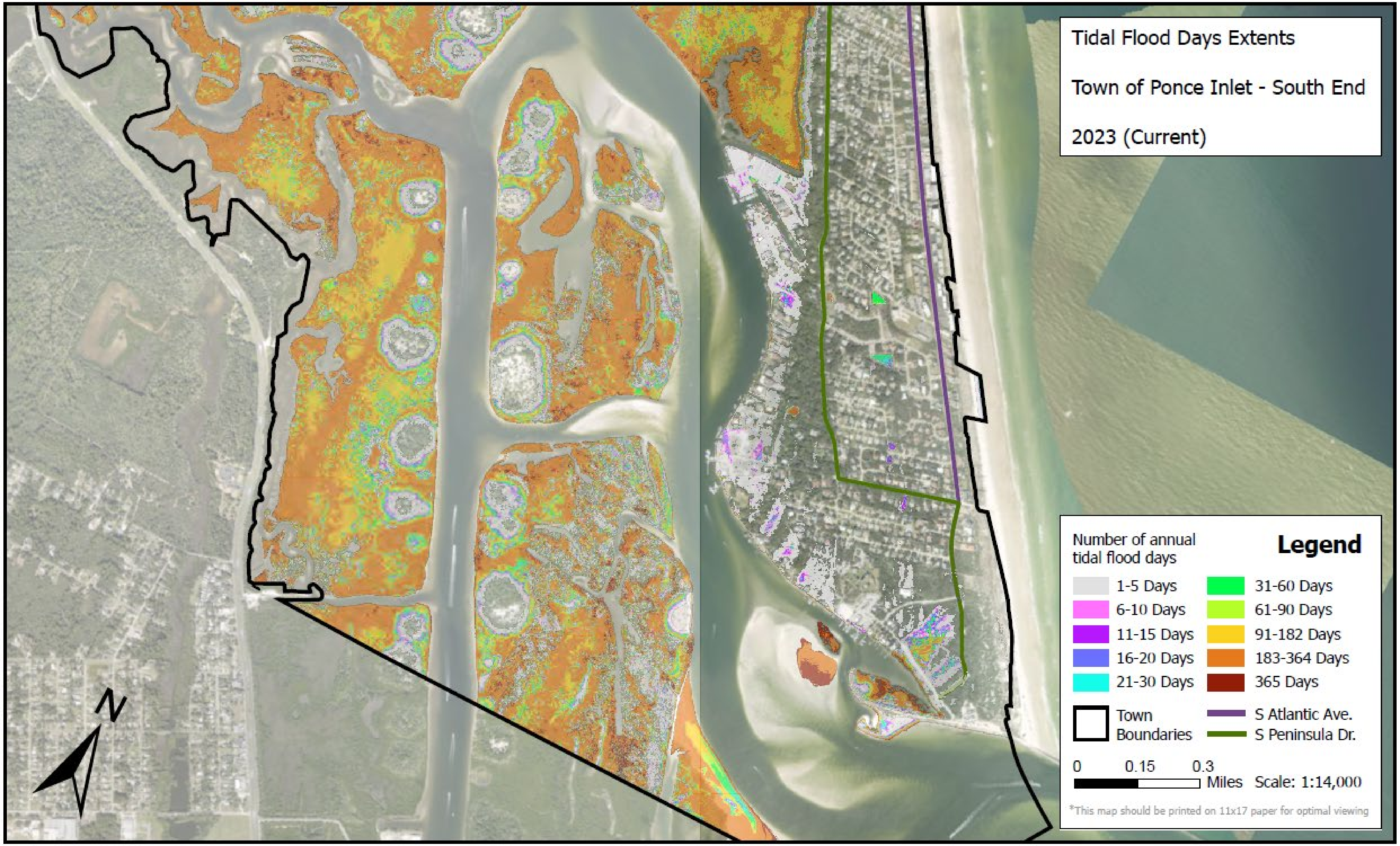


Figure F40 Annual Tidal Flood Days 2023 South

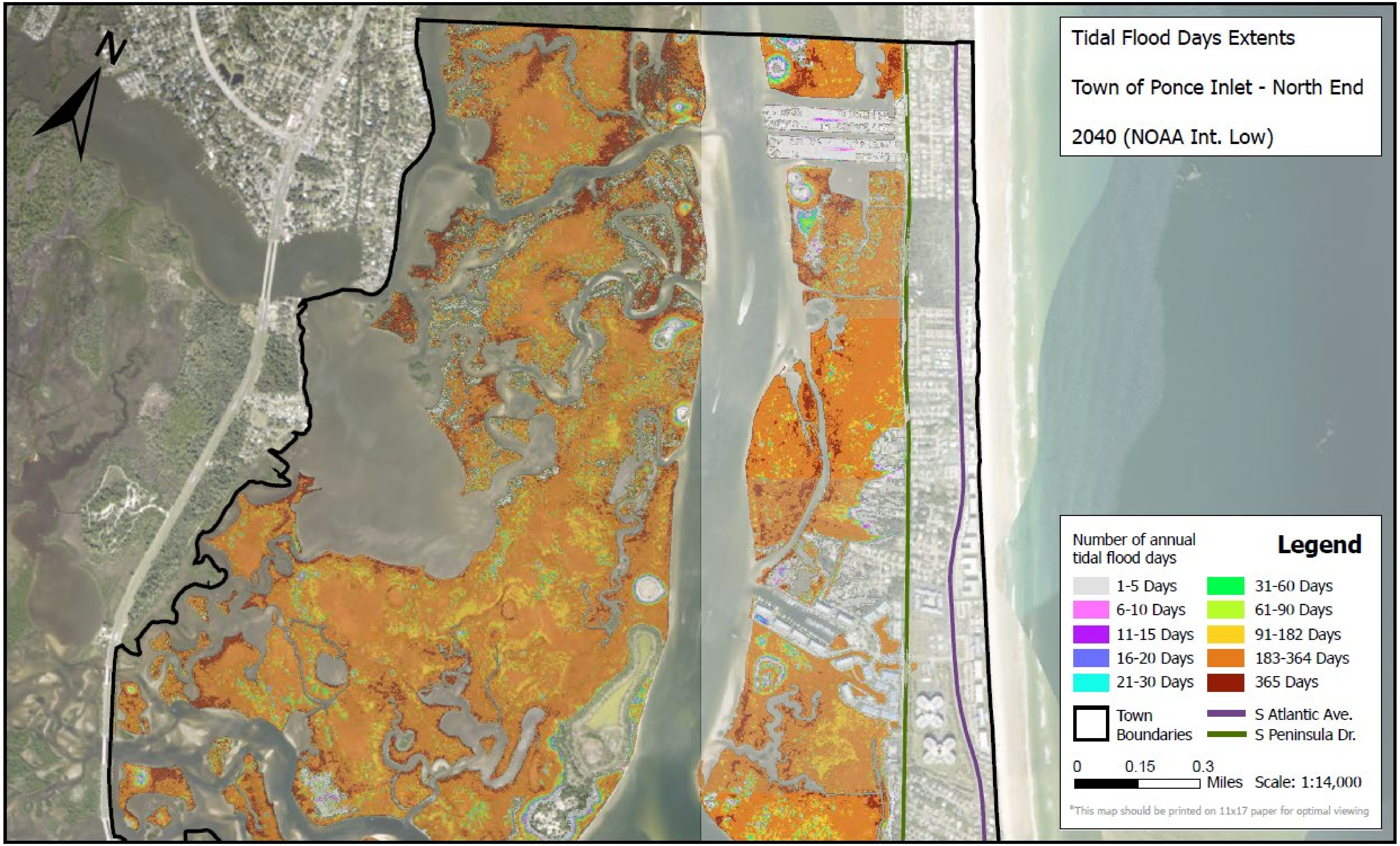


Figure F41 Annual Tidal Flood Days 2040IL North

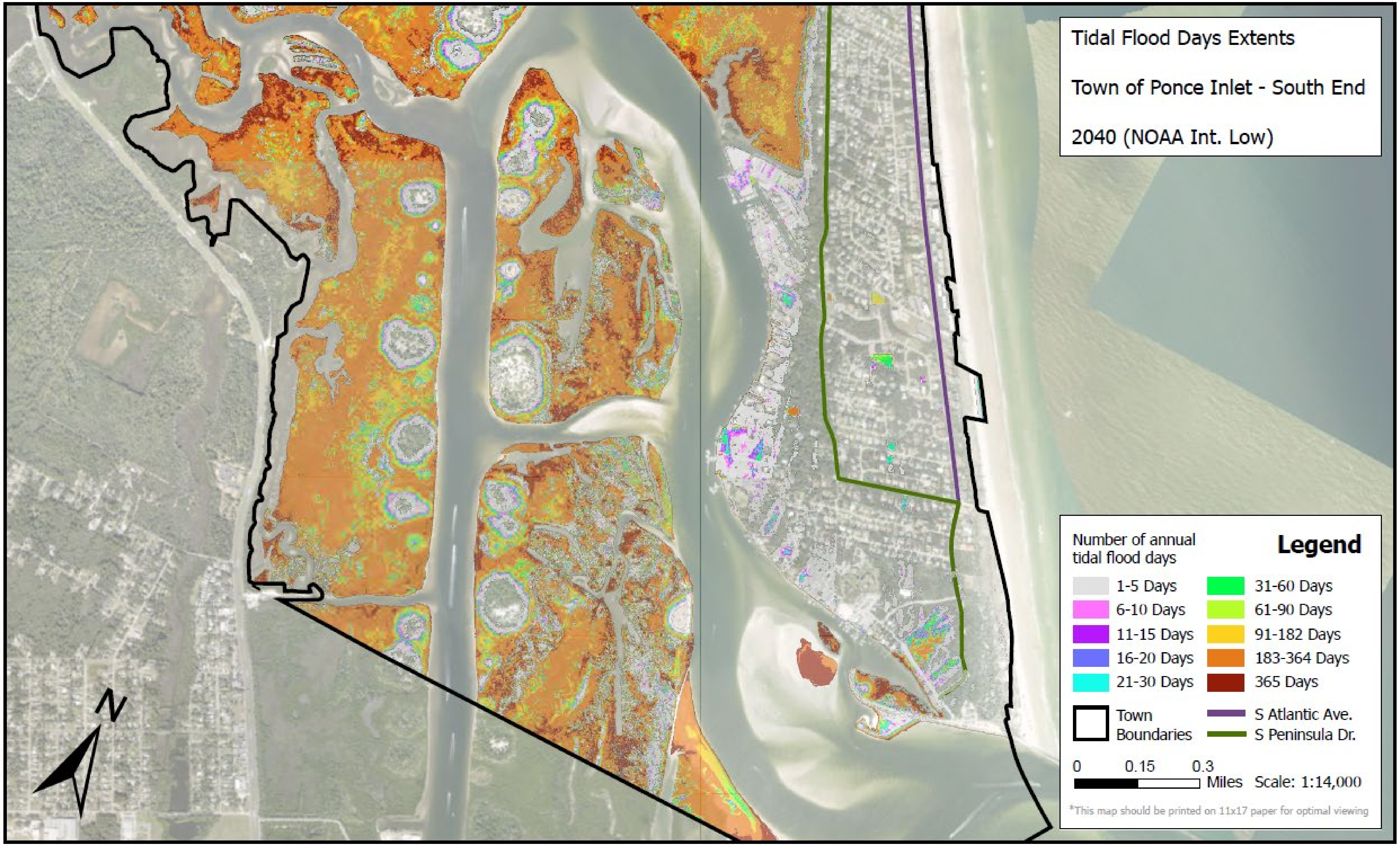


Figure F42 Annual Tidal Flood Days 2040IL South

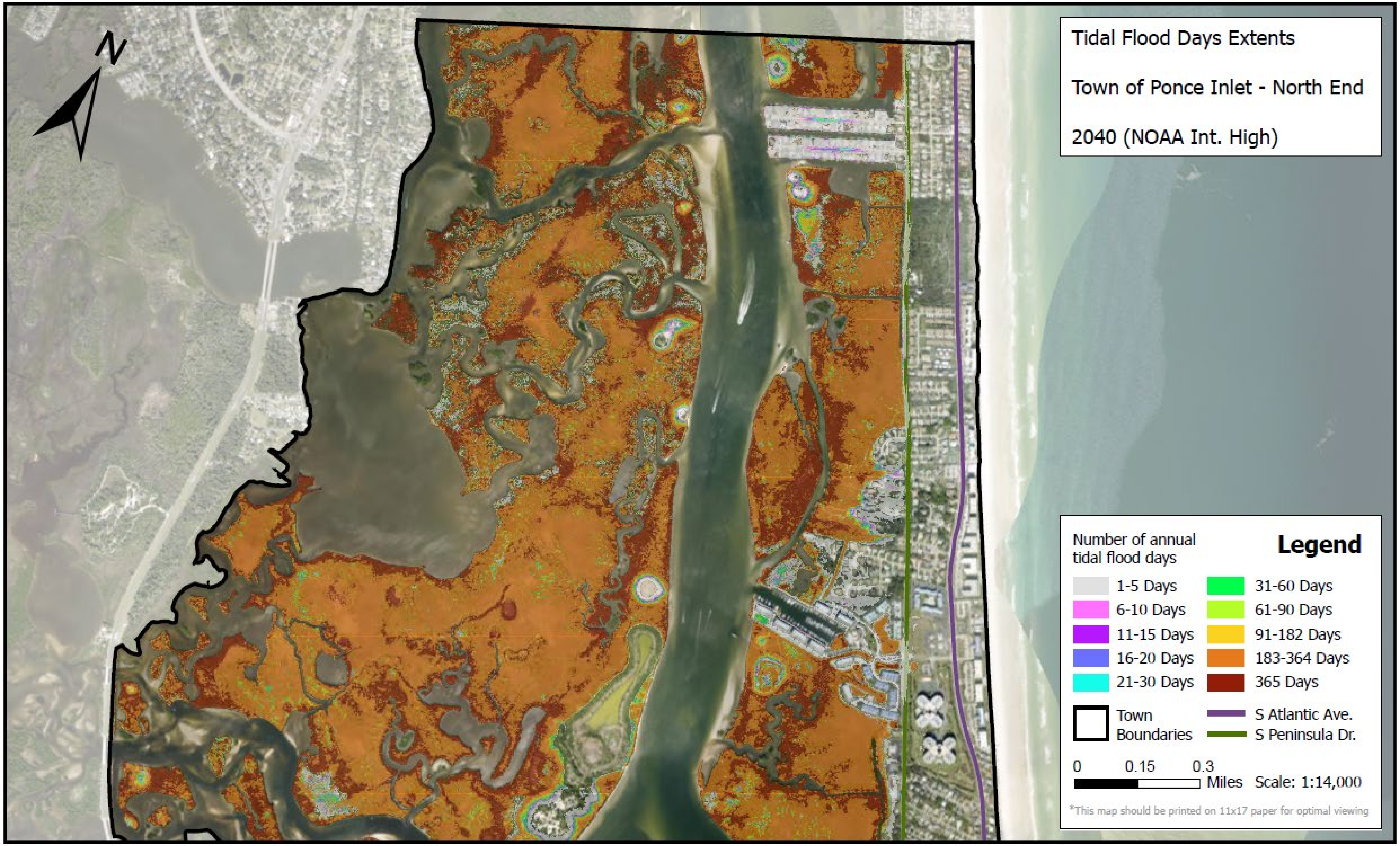


Figure F43 Annual Tidal Flood Days 2040IH North

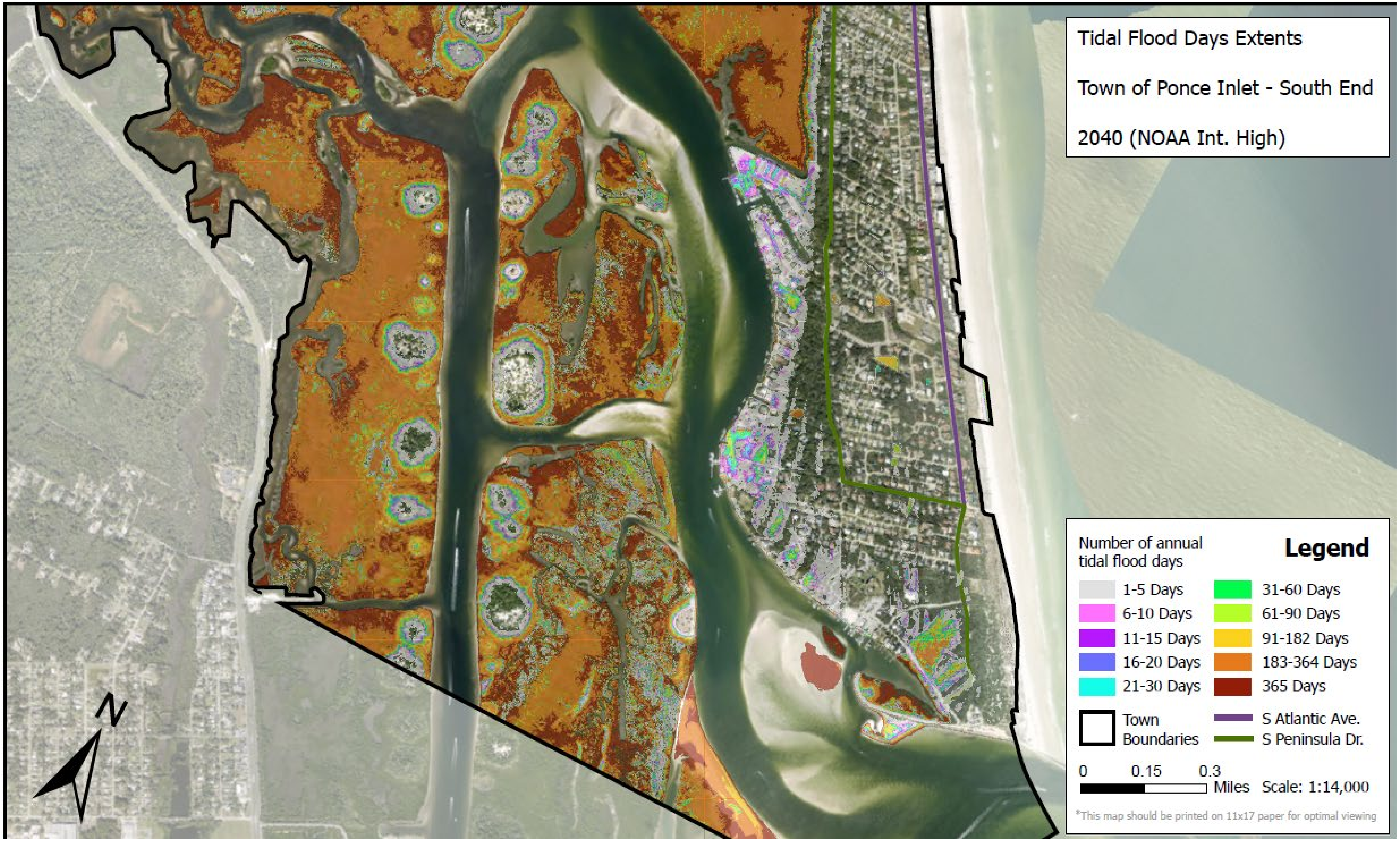


Figure F44 Annual Tidal Flood Days 2040IH South

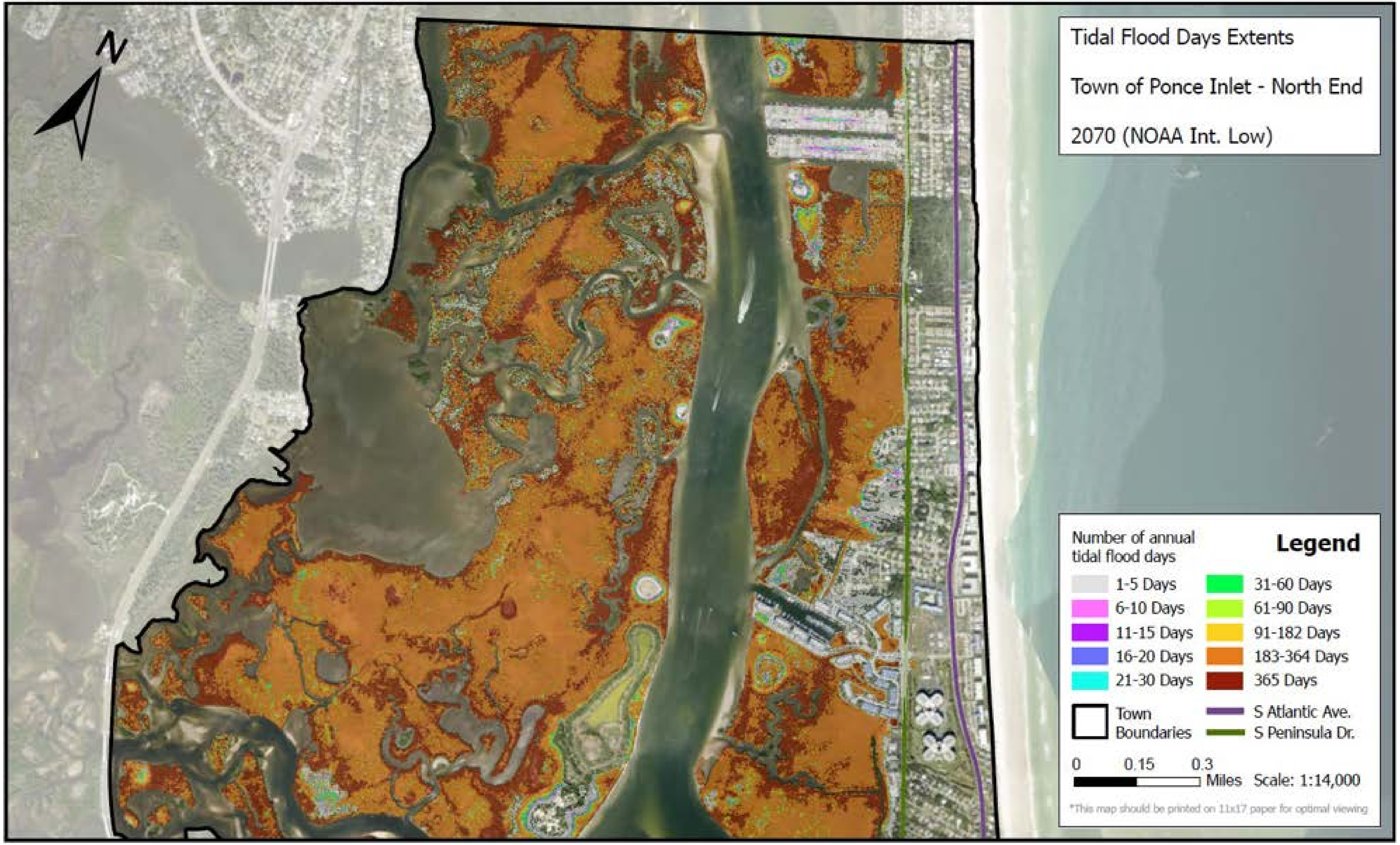


Figure F45 Annual Tidal Flood Days 2070IL North

Figure F46 Annual Tidal Flood Days 2070IL South

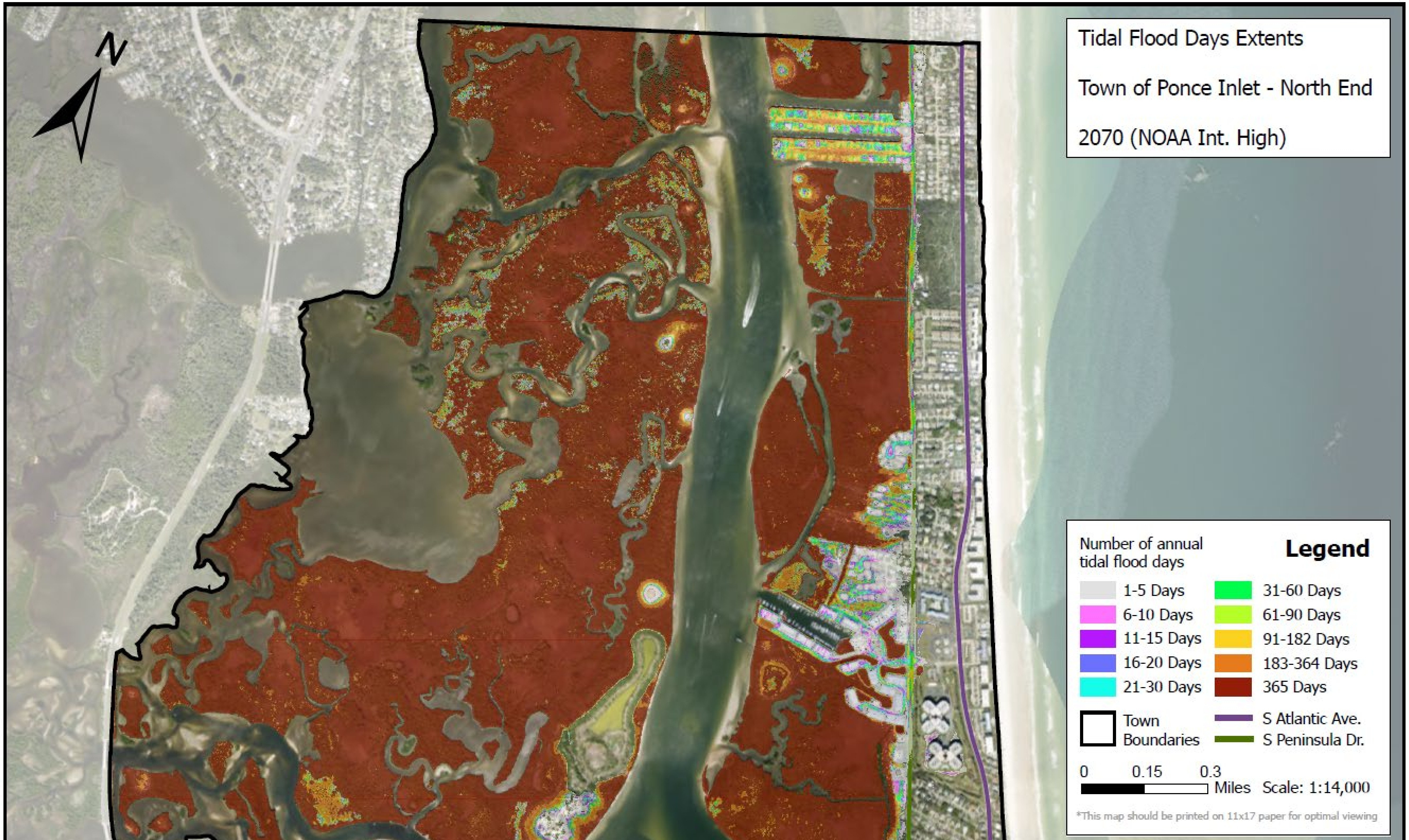


Figure F47 Annual Tidal Flood Days 2070IH North

Figure F48 Annual Tidal Flood Days 2070IH South

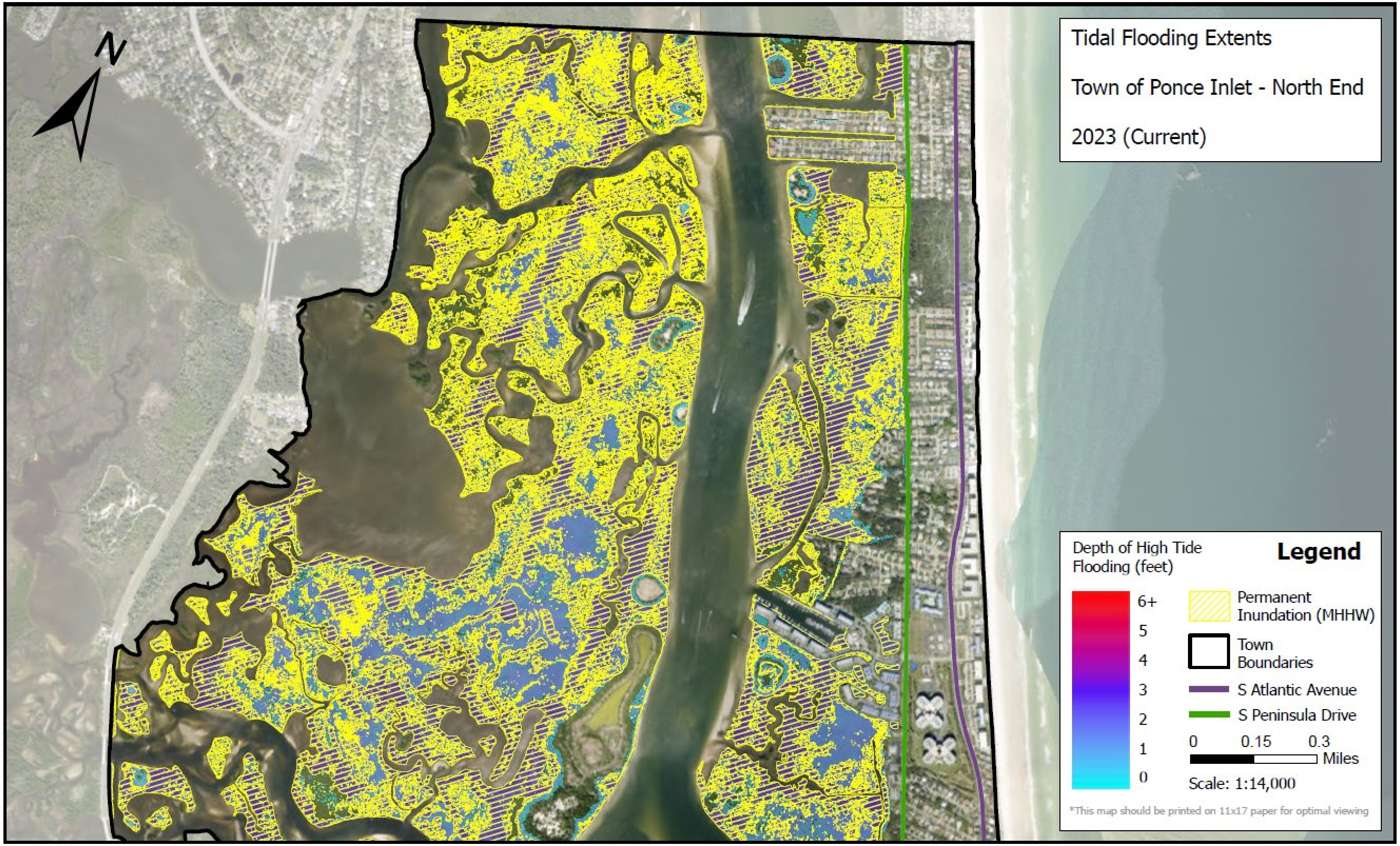


Figure F49 High Tide Flooding Exposure 2023 North

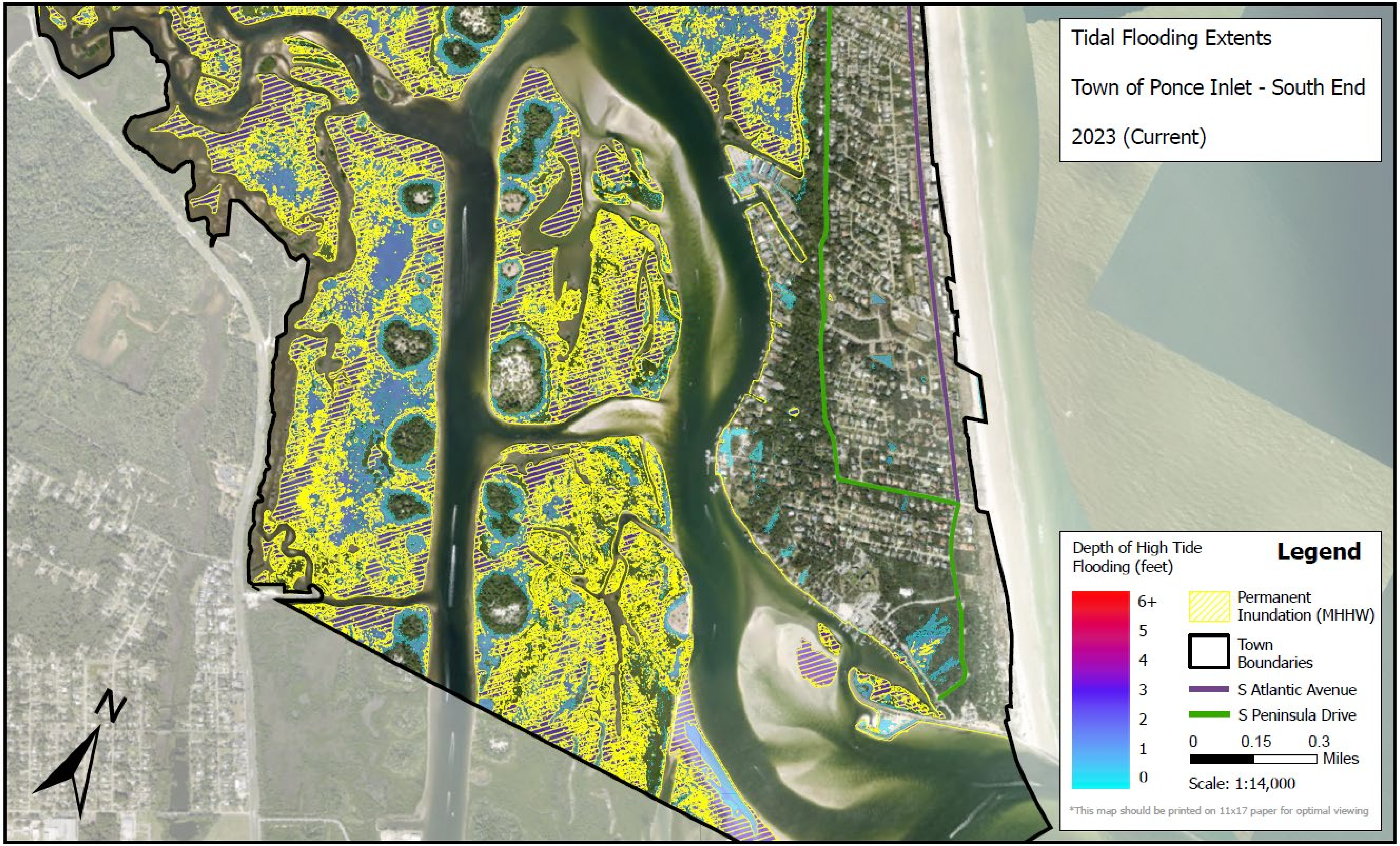


Figure F50 High Tide Flooding Exposure 2023 South

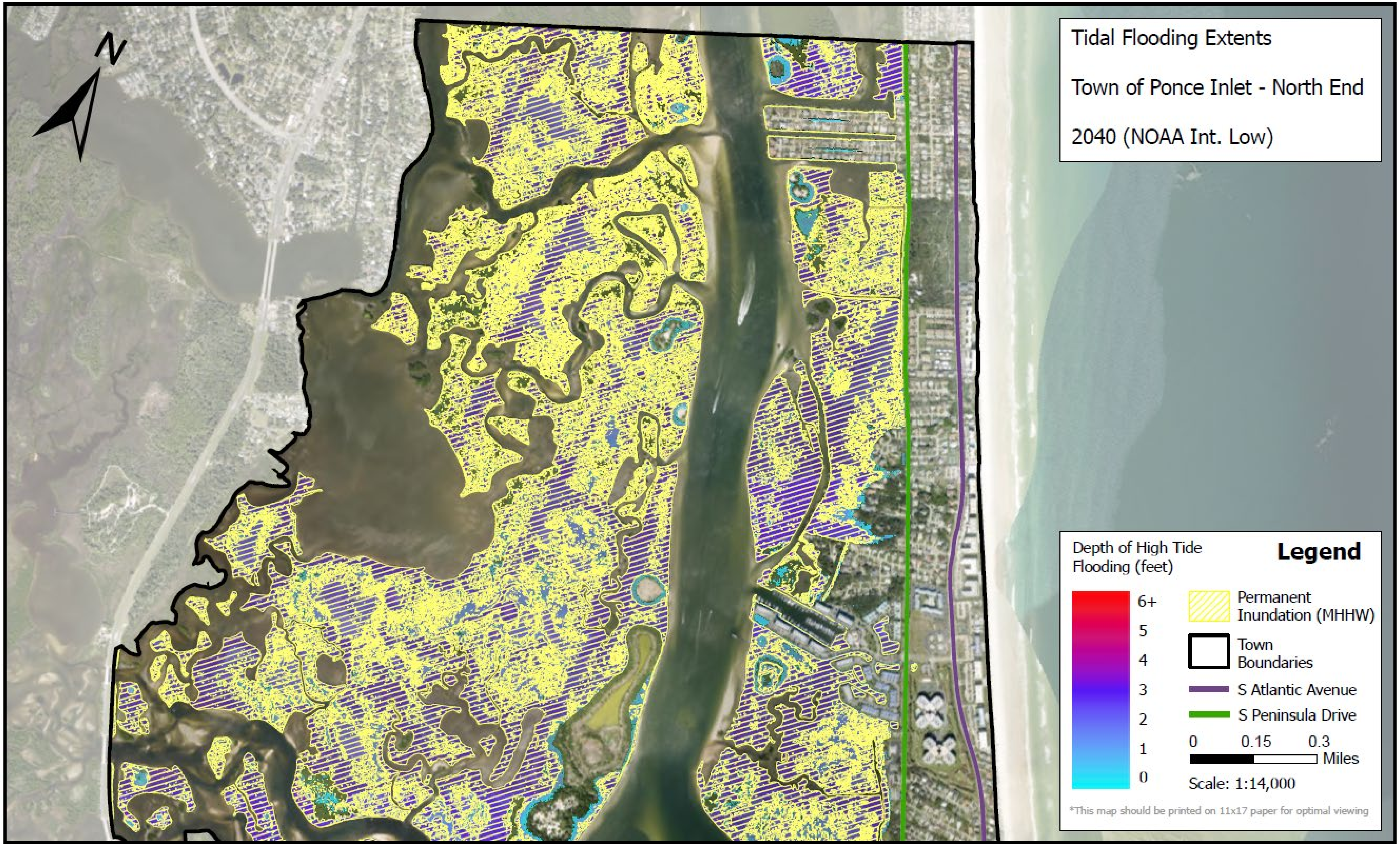


Figure F51 High Tide Flooding Exposure 2040IL North

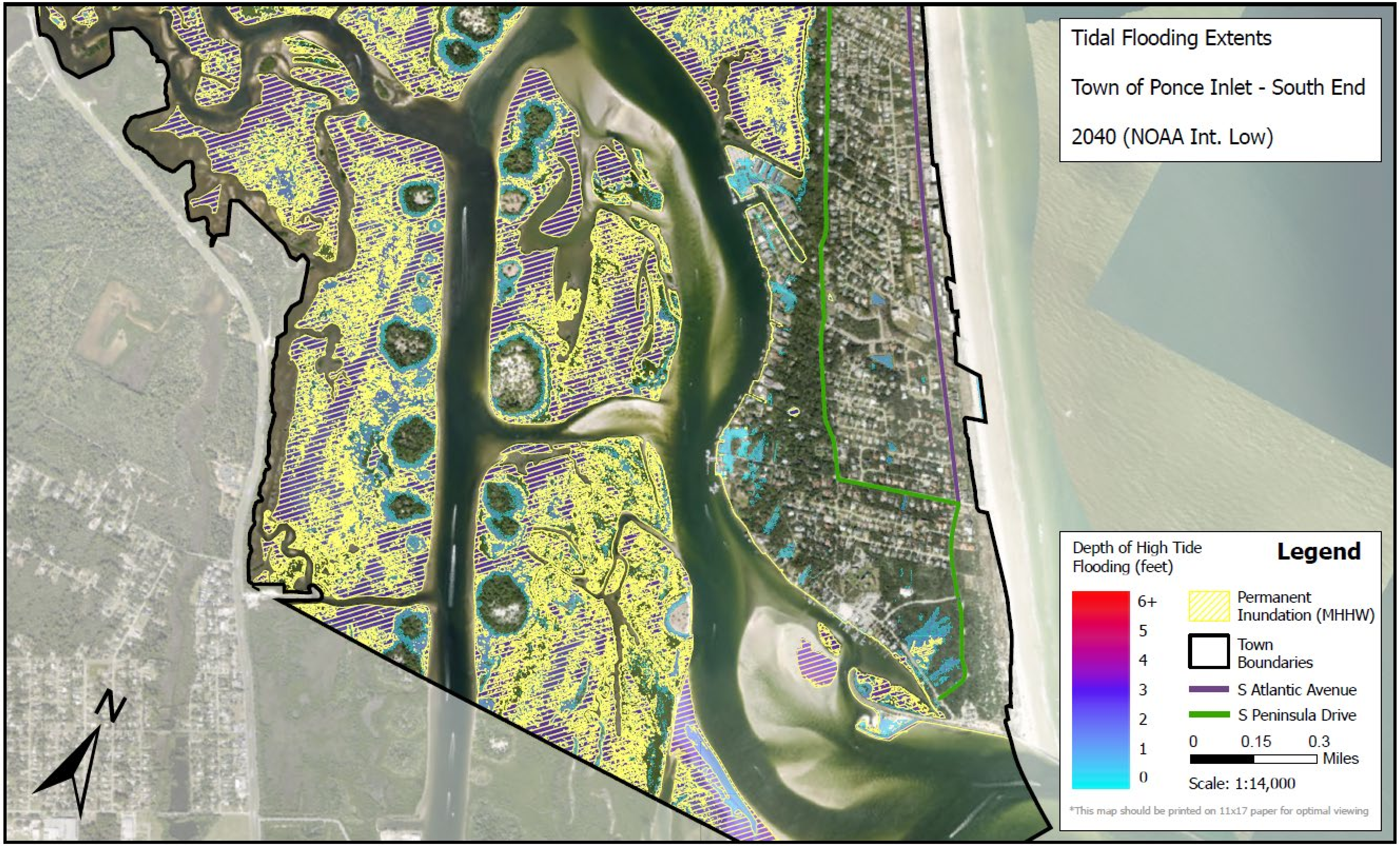


Figure F52 High Tide Flooding Exposure 2040IL South

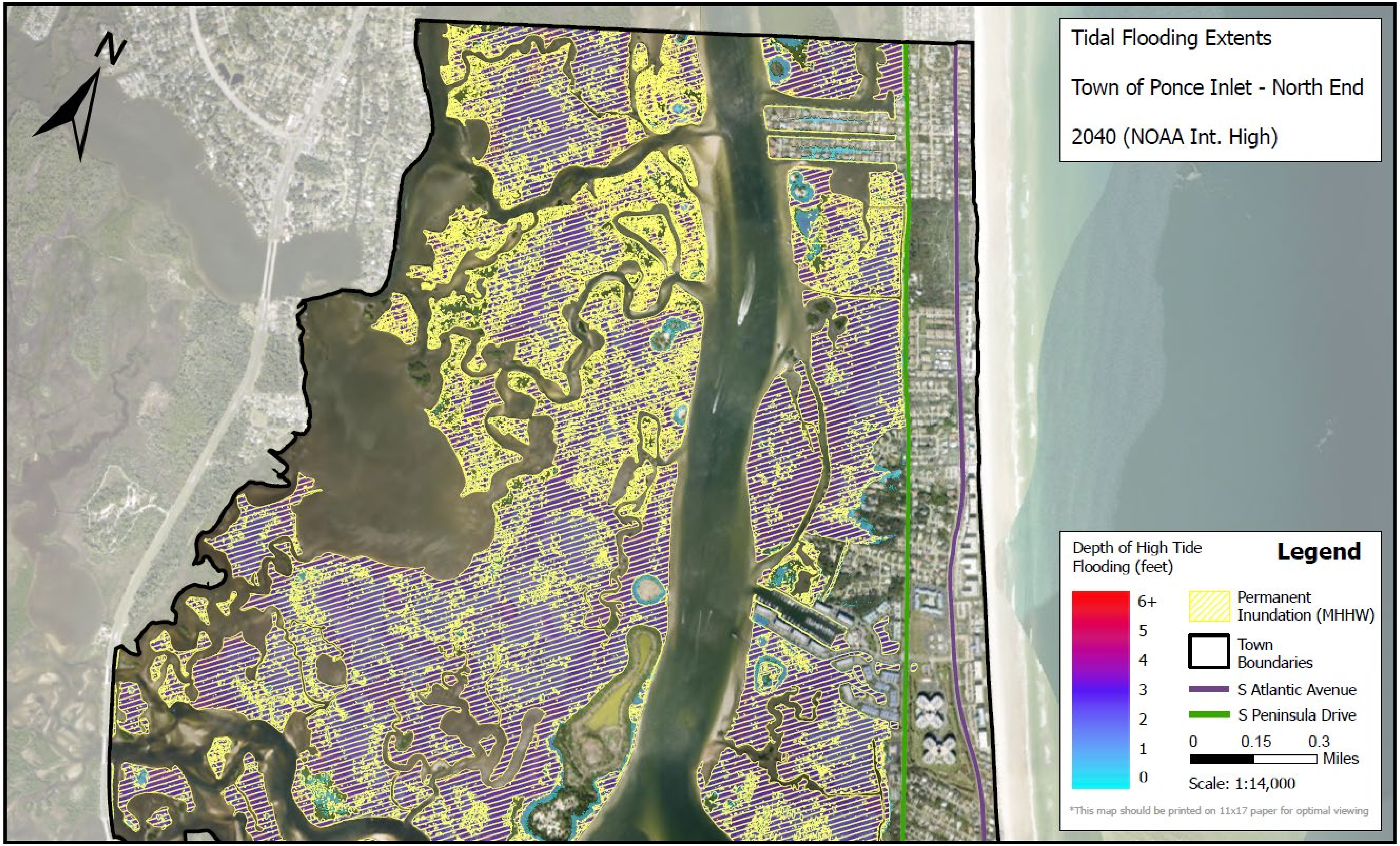


Figure F53 High Tide Flooding Exposure 2040IH North

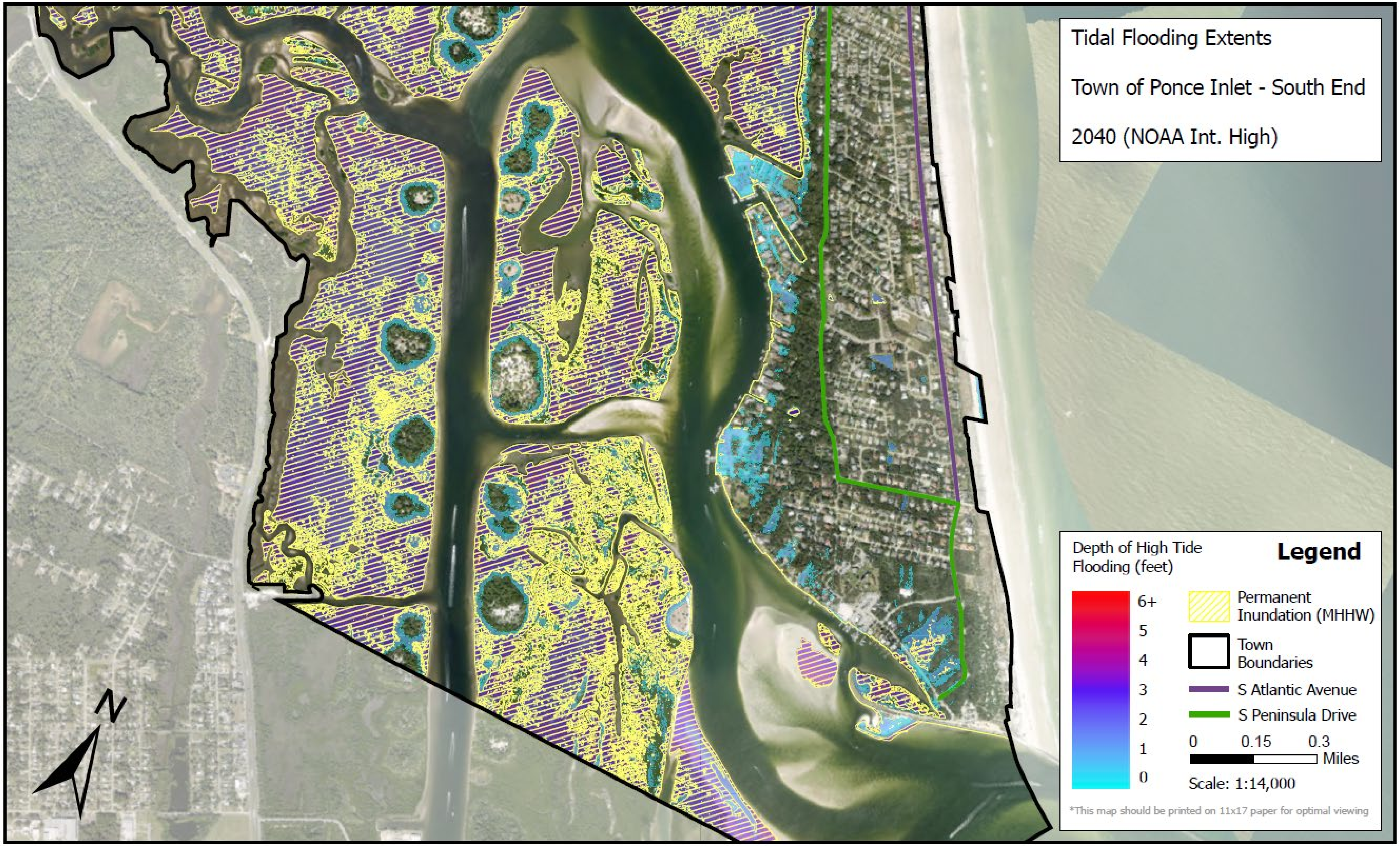


Figure F54 High Tide Flooding Exposure 2040IH South

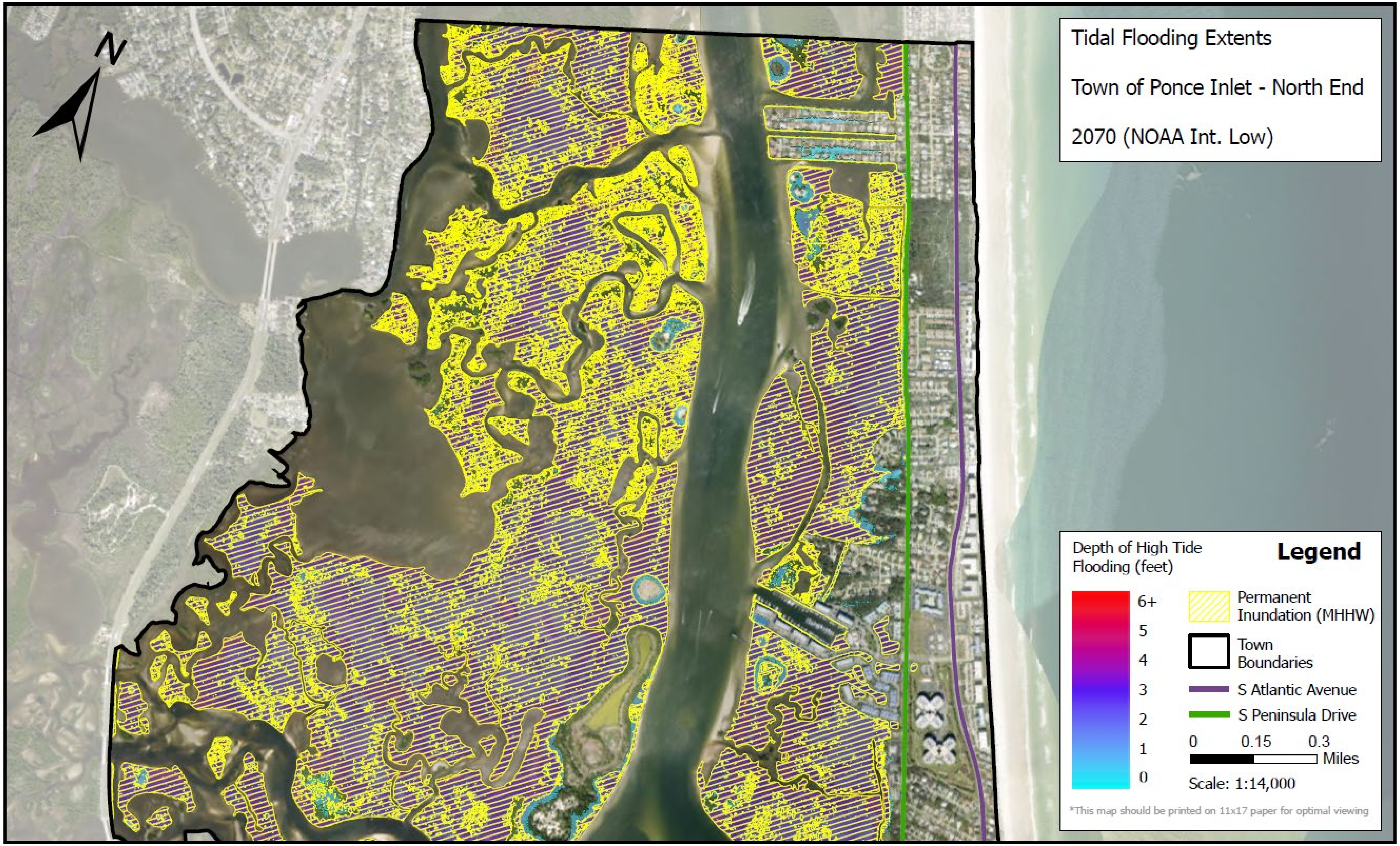


Figure F55 High Tide Flooding Exposure 2070IL North

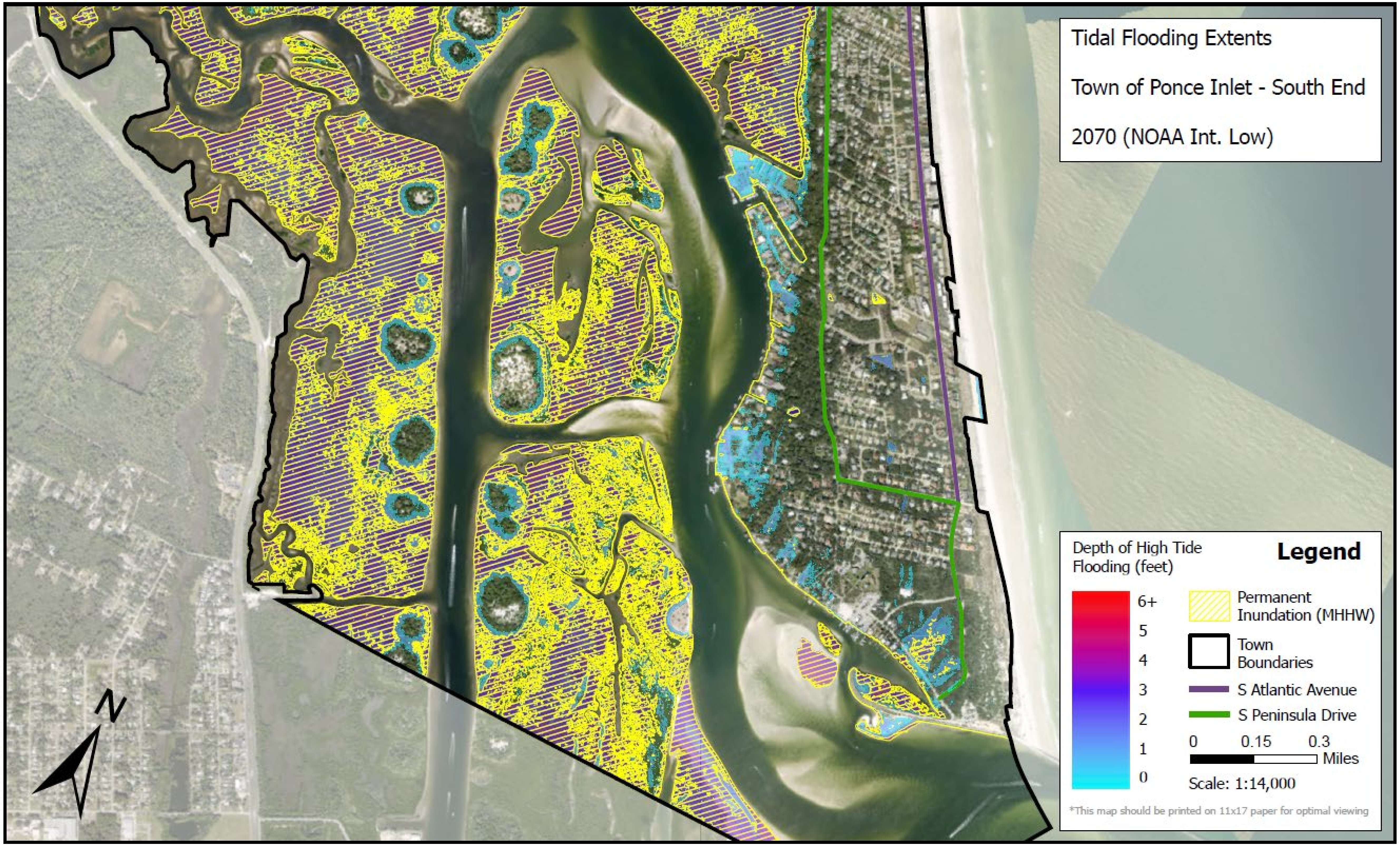


Figure F56 High Tide Flooding Exposure 2070IL South

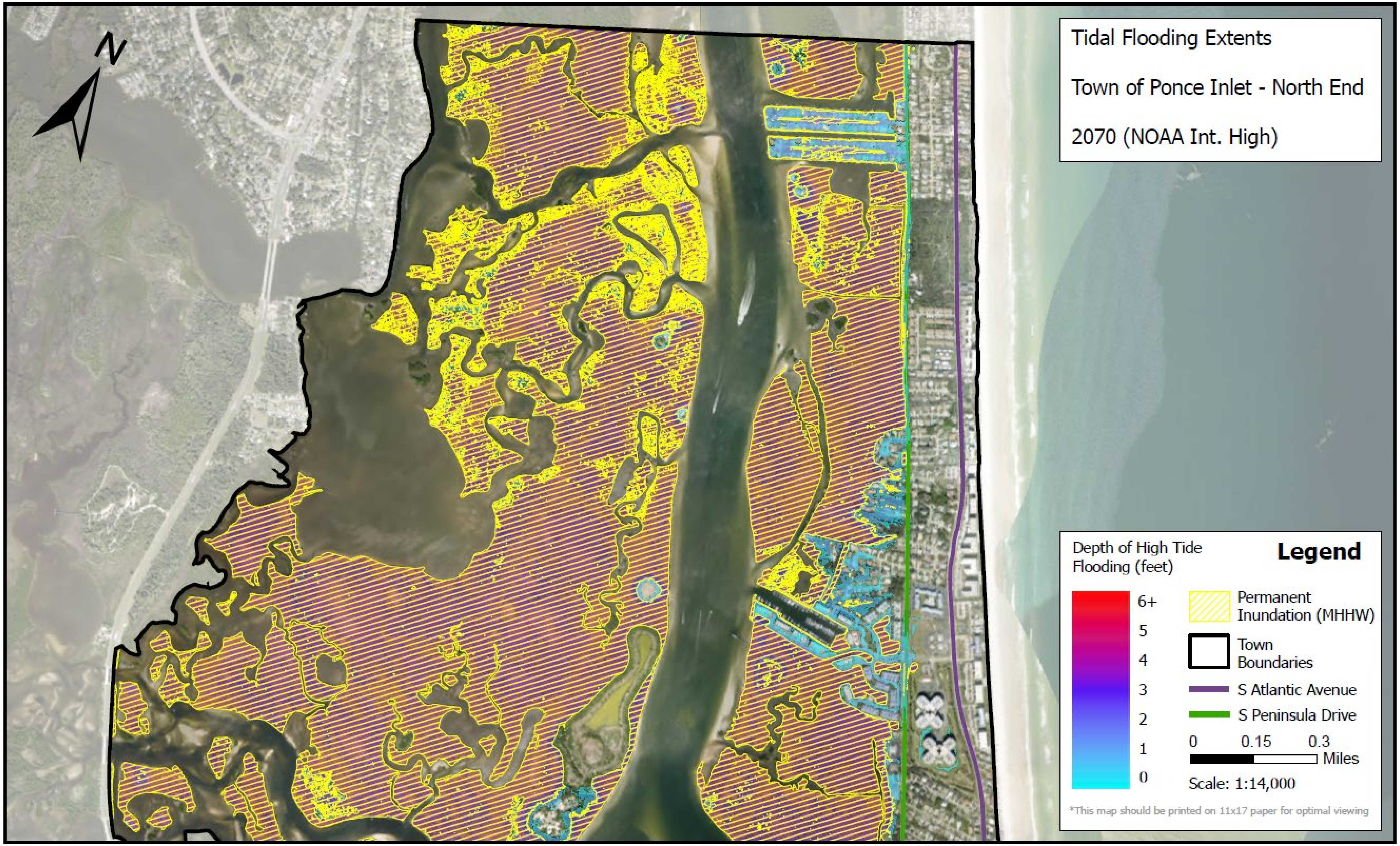


Figure F57 High Tide Flooding Exposure 2070IH North

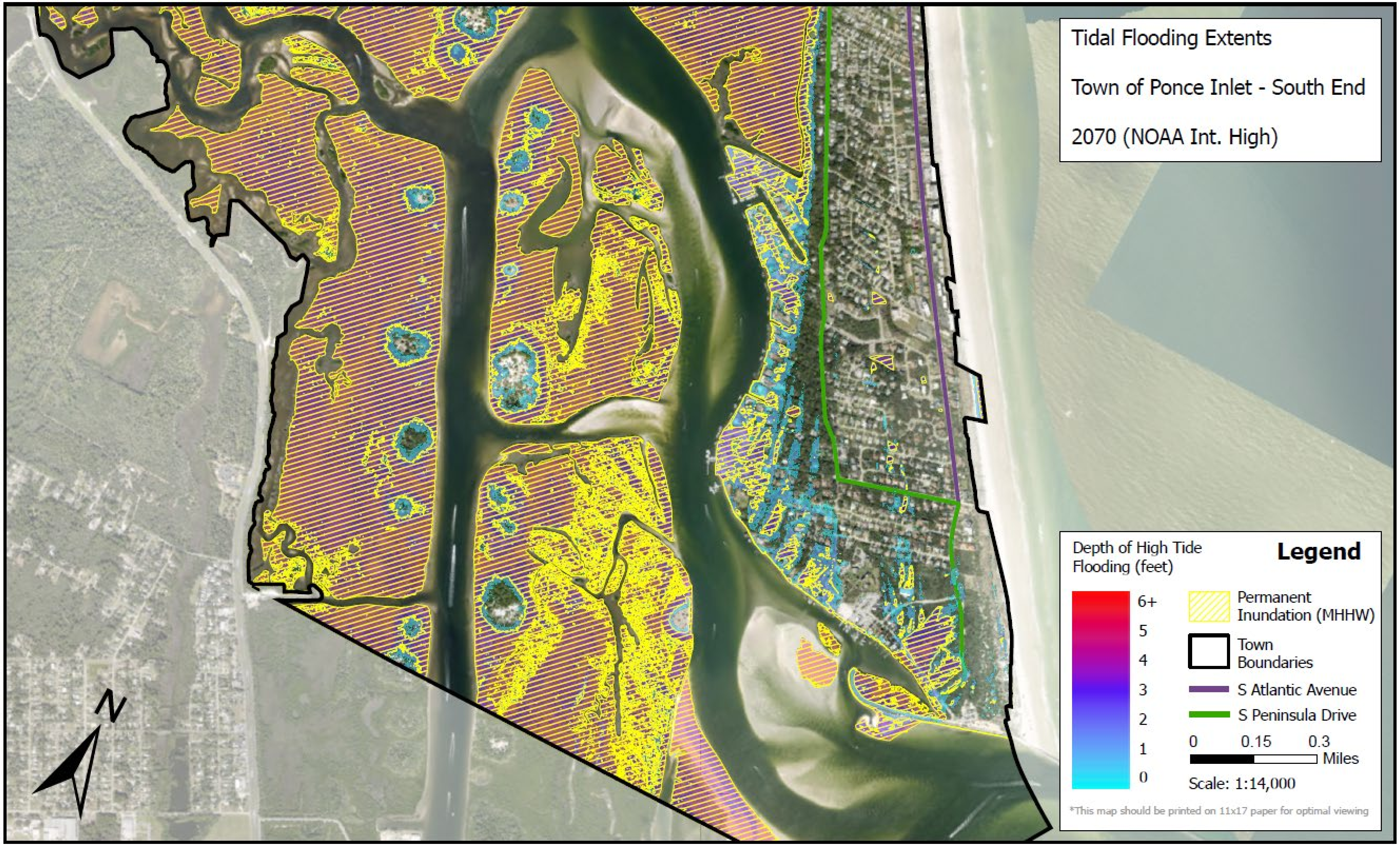


Figure F58 High Tide Flooding Exposure 2070IH South

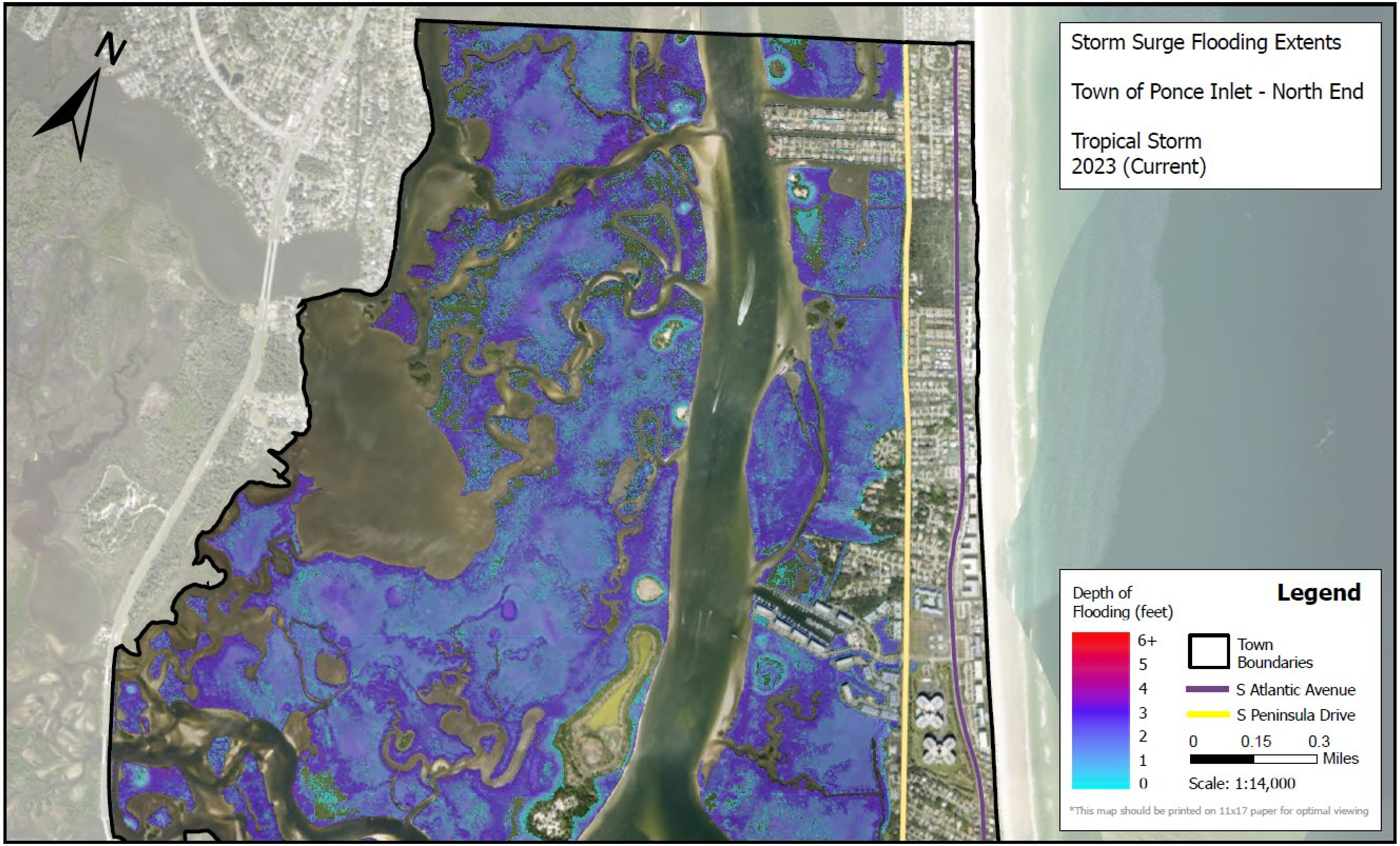


Figure F59 Tropical Storm Surge Exposure 2023 North

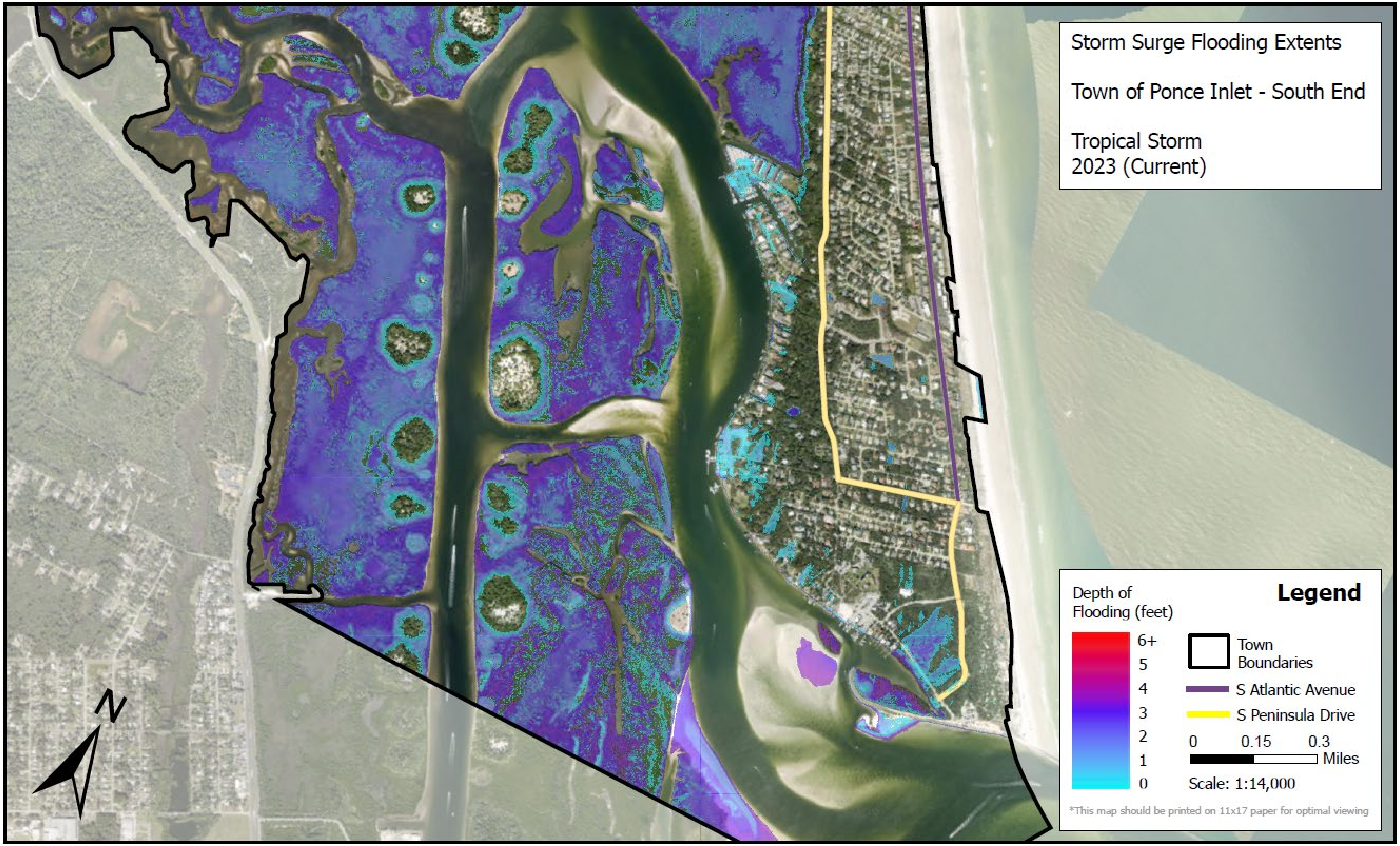


Figure F60 Tropical Storm Surge Exposure 2023 South

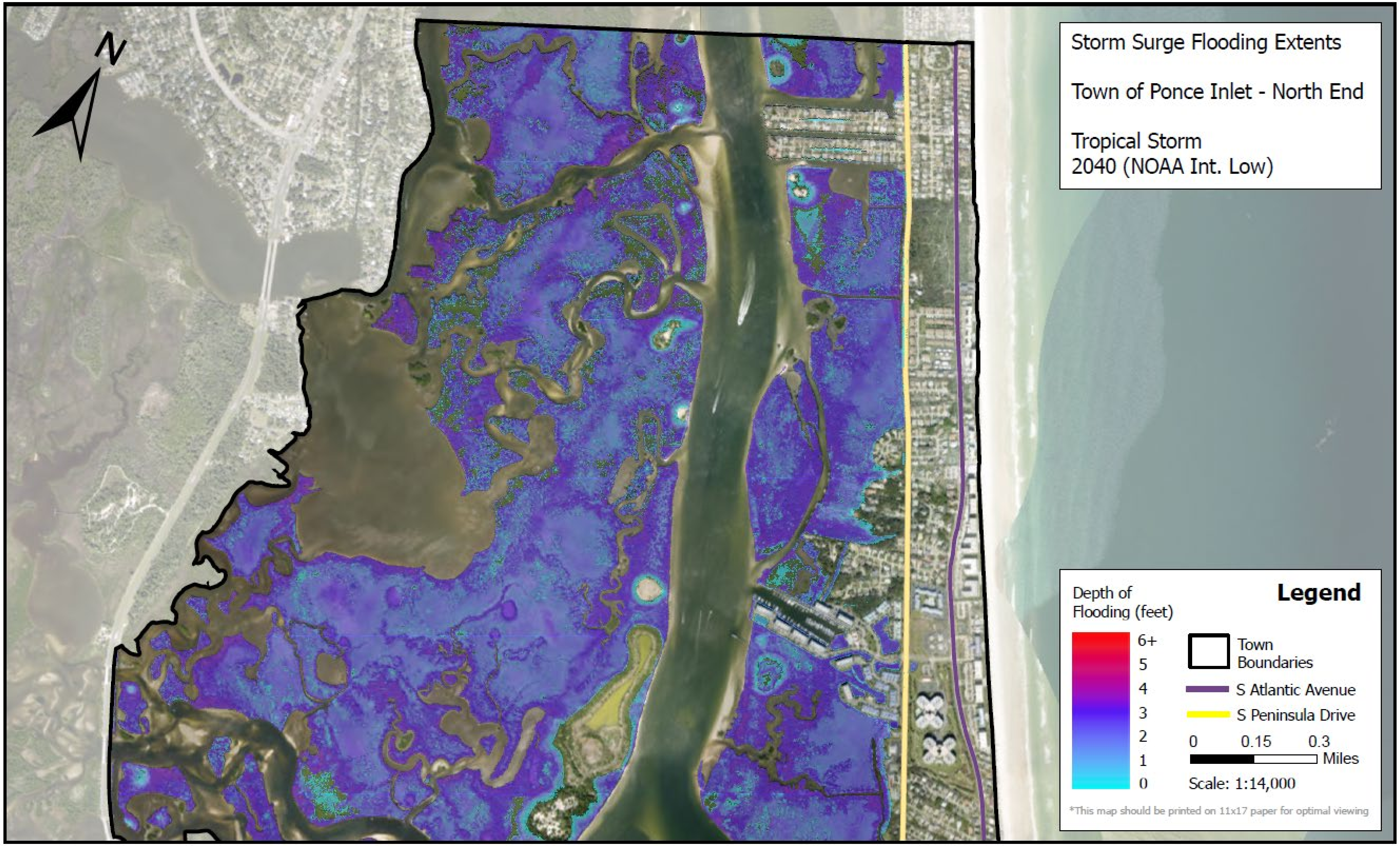


Figure F61 Tropical Storm Surge Exposure 2040IL North

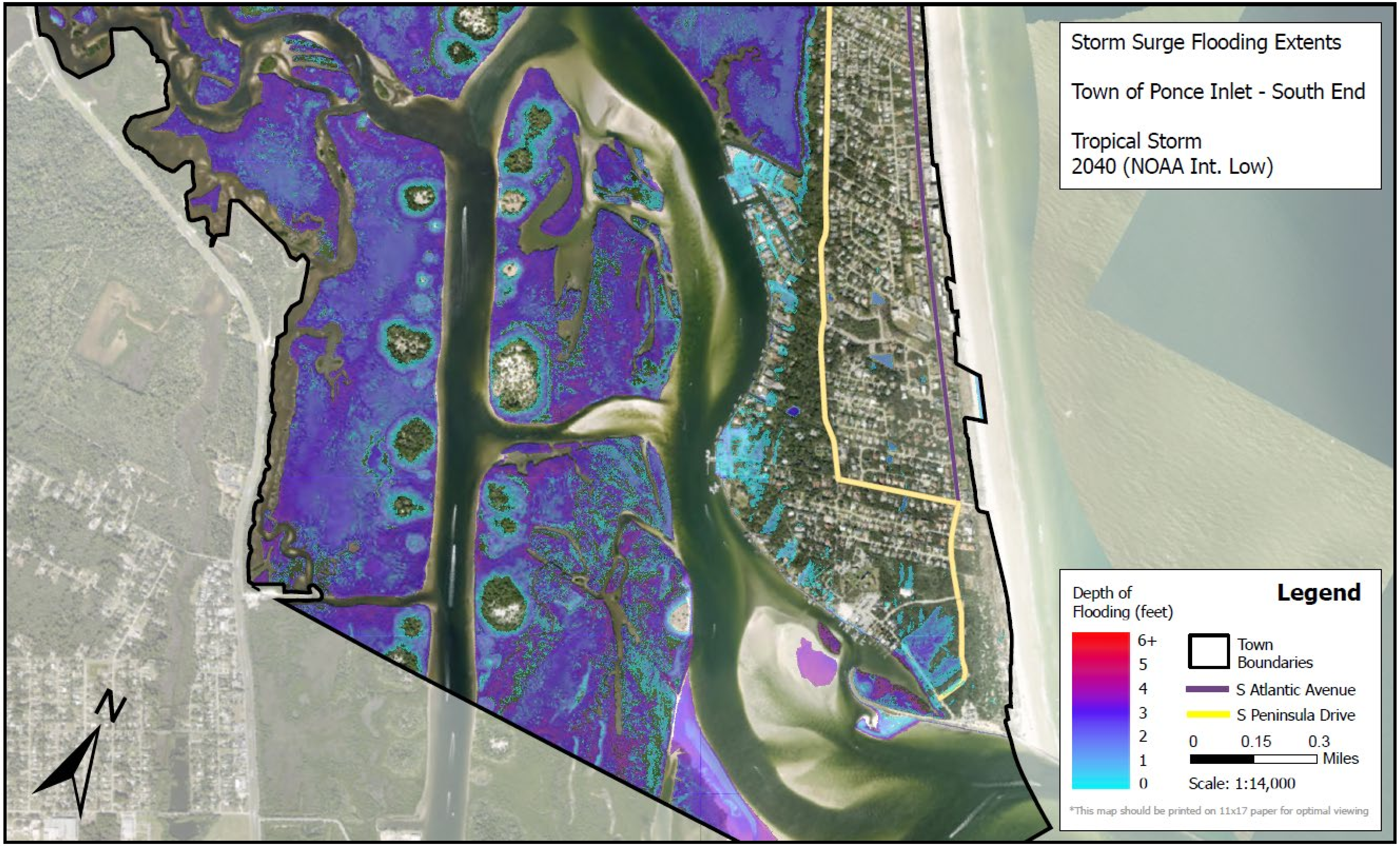


Figure F62 Tropical Storm Surge Exposure 2040IL South

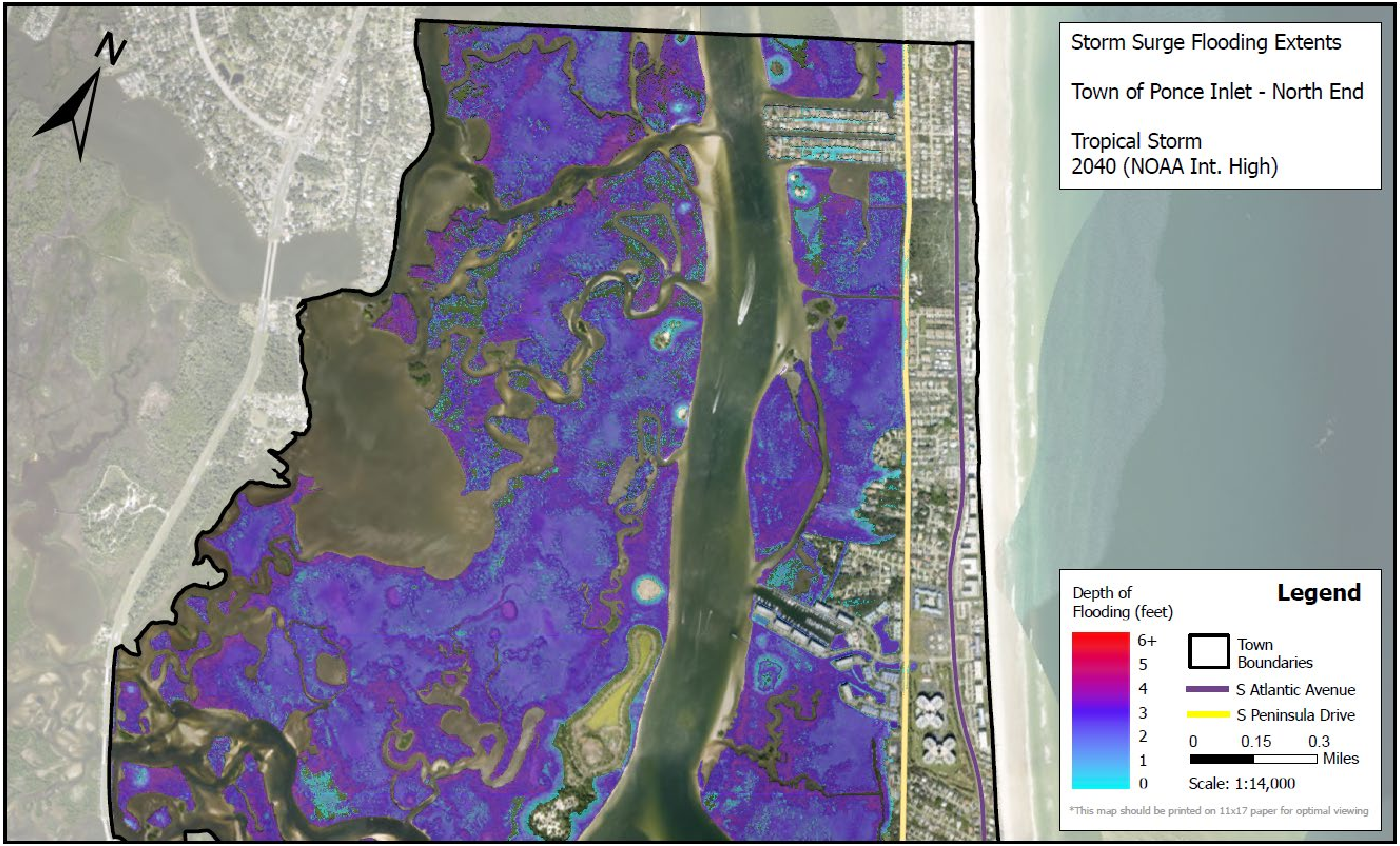


Figure F63 Tropical Storm Surge Exposure 2040IH North

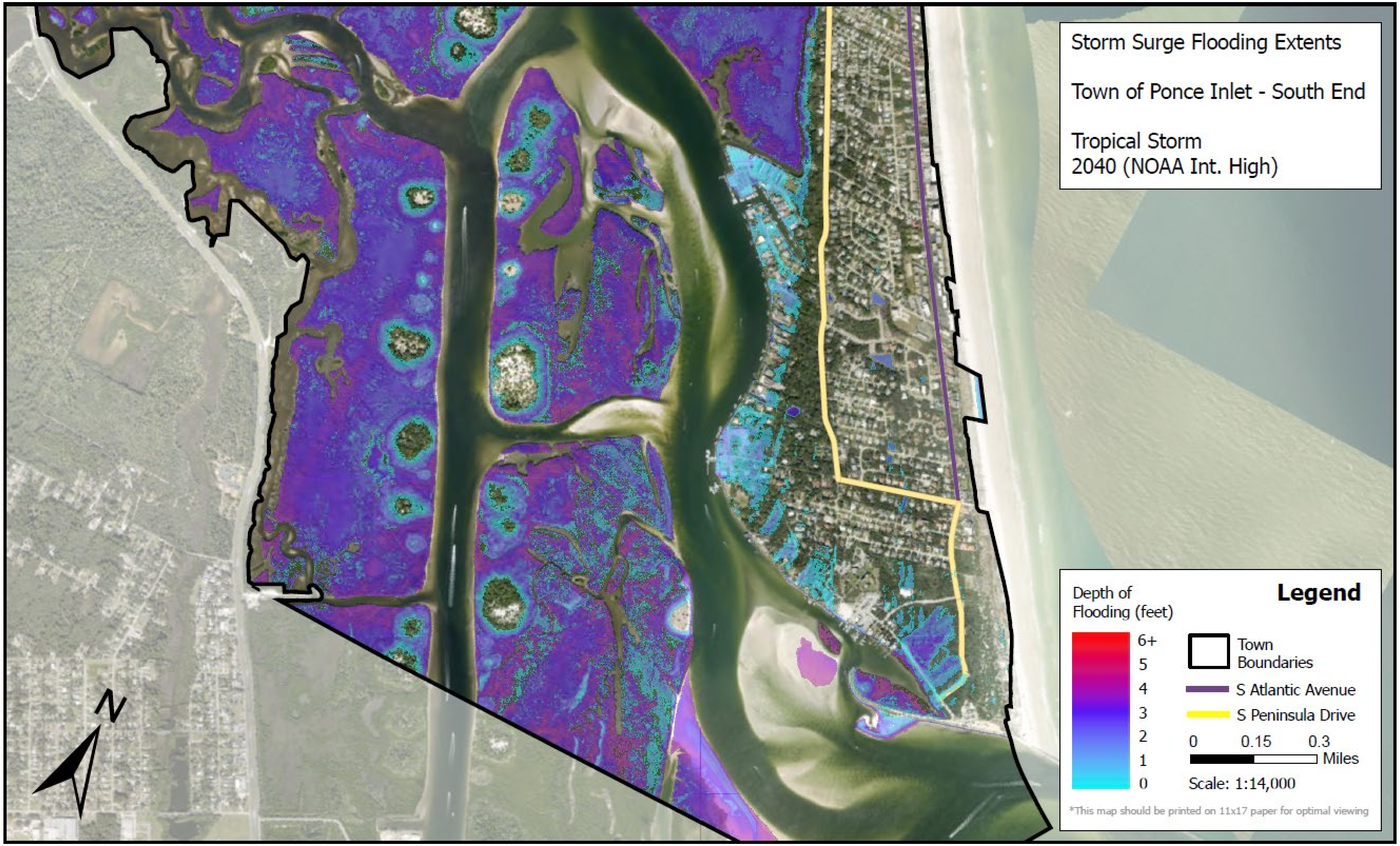


Figure F64 Tropical Storm Surge Exposure 2040IH South

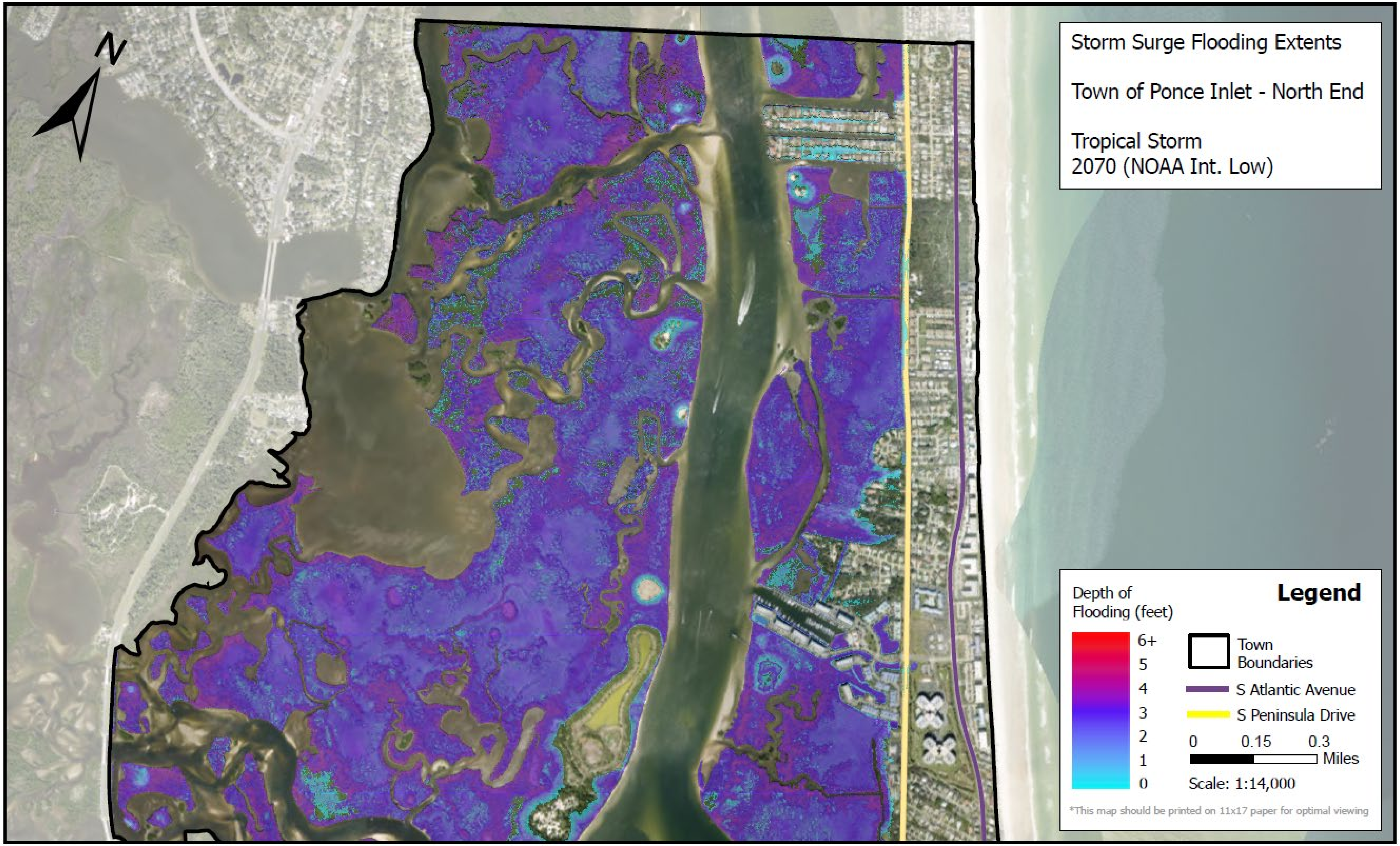


Figure F65 Tropical Storm Surge Exposure 2070IL North

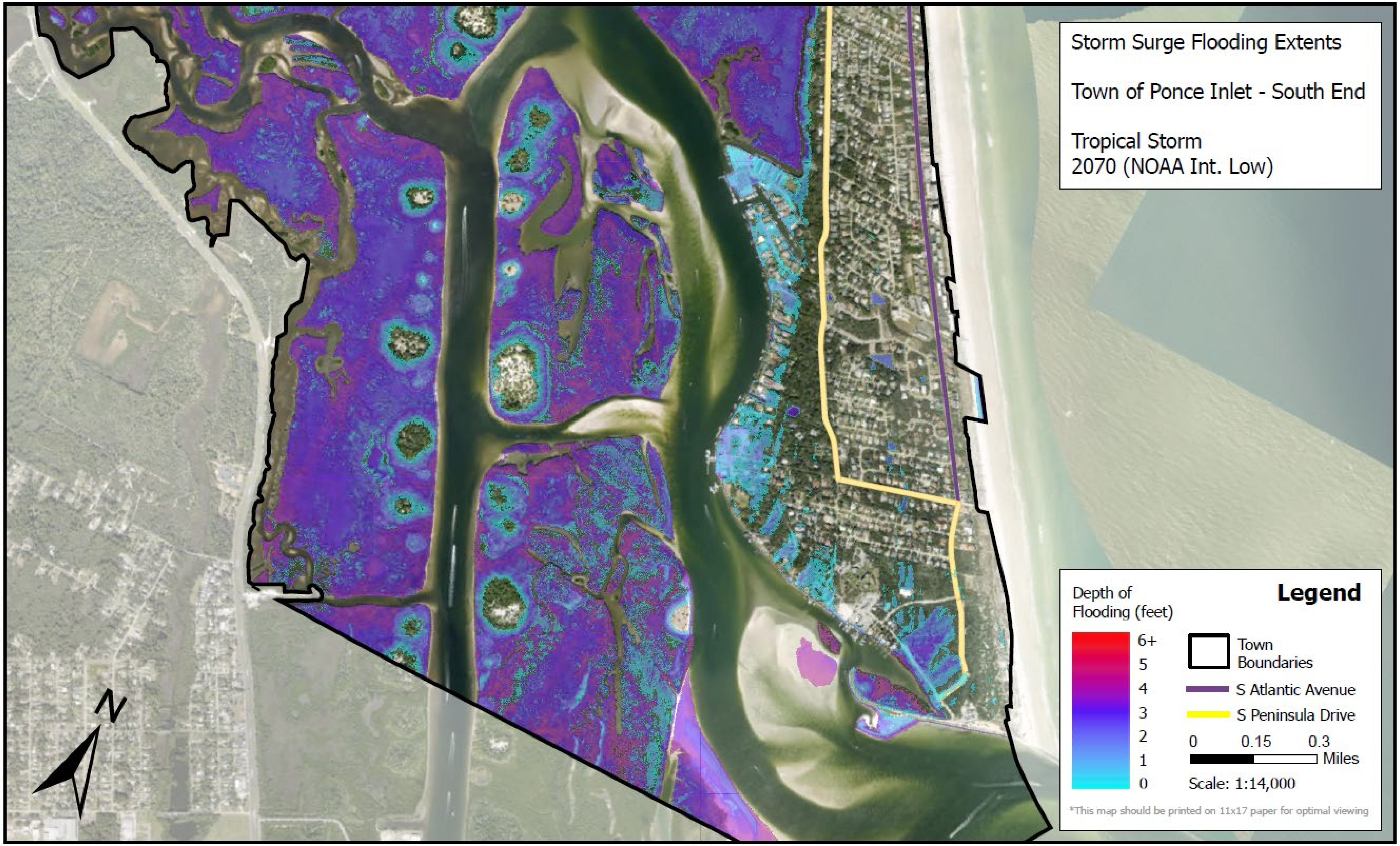


Figure F66 Tropical Storm Surge Exposure 2070IL South

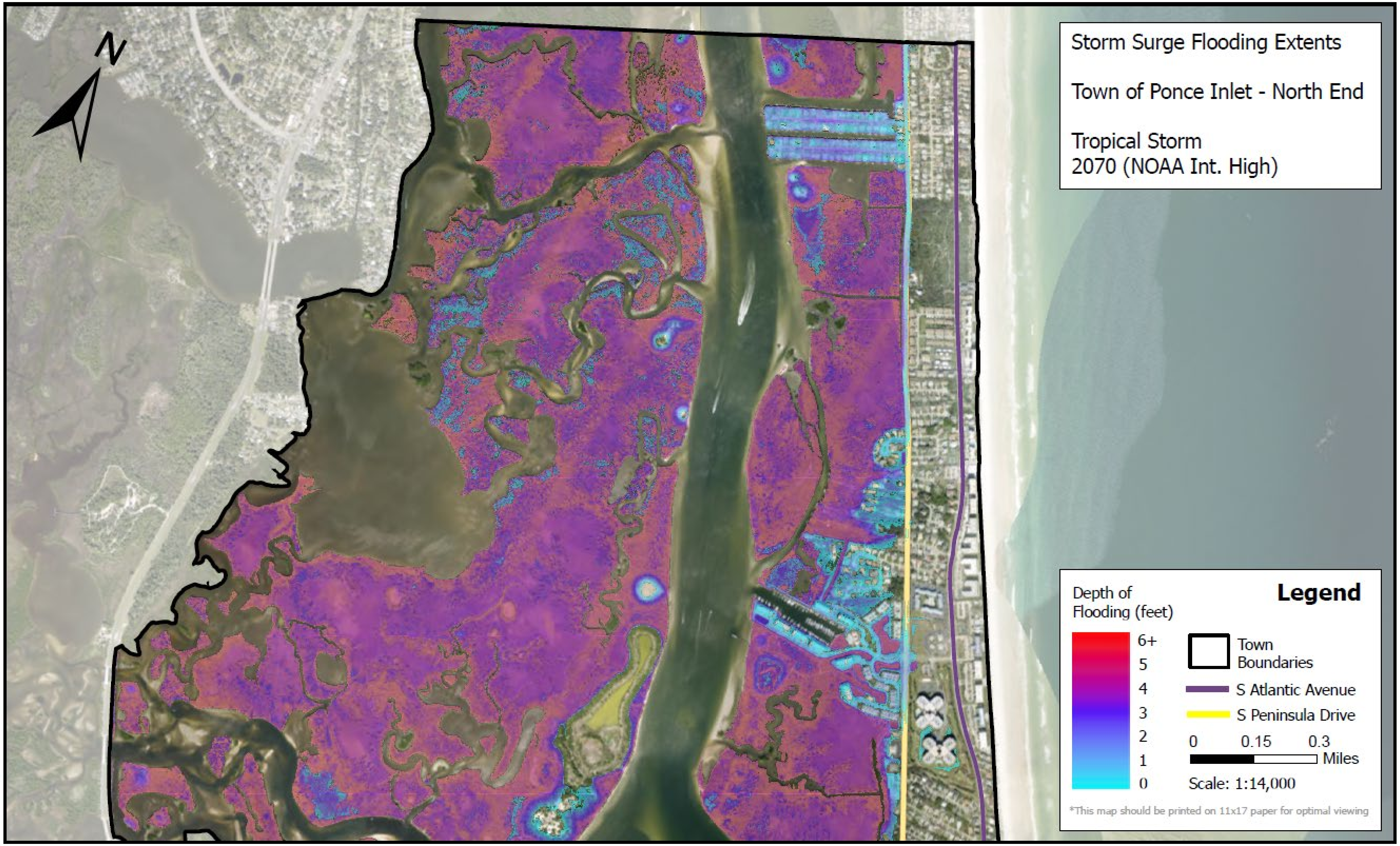


Figure F67 Tropical Storm Surge Exposure 2070IH North

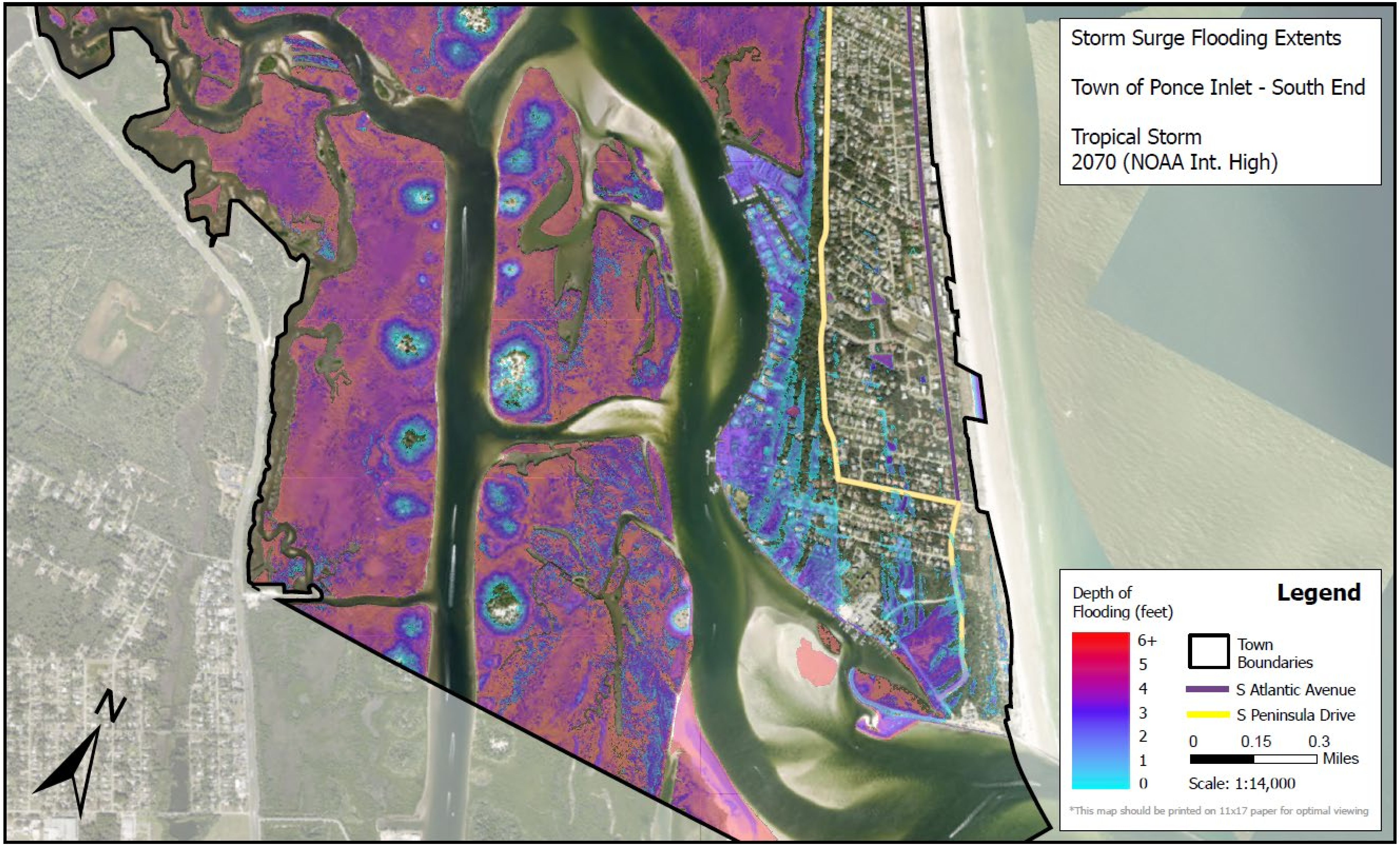


Figure F68 Tropical Storm Surge Exposure 2070IH South

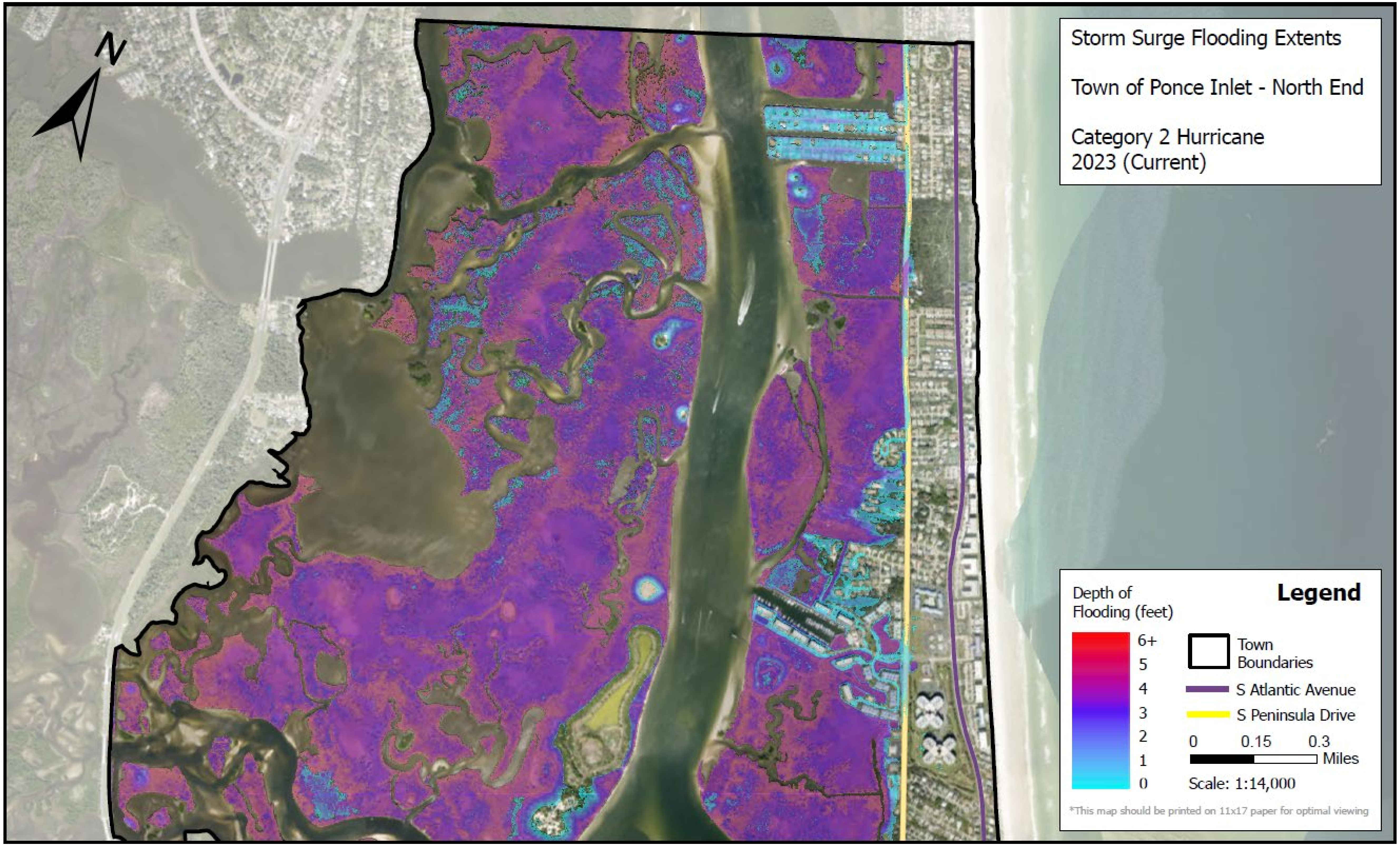


Figure F69 Category 2 Hurricane Storm Surge Exposure 2023 North

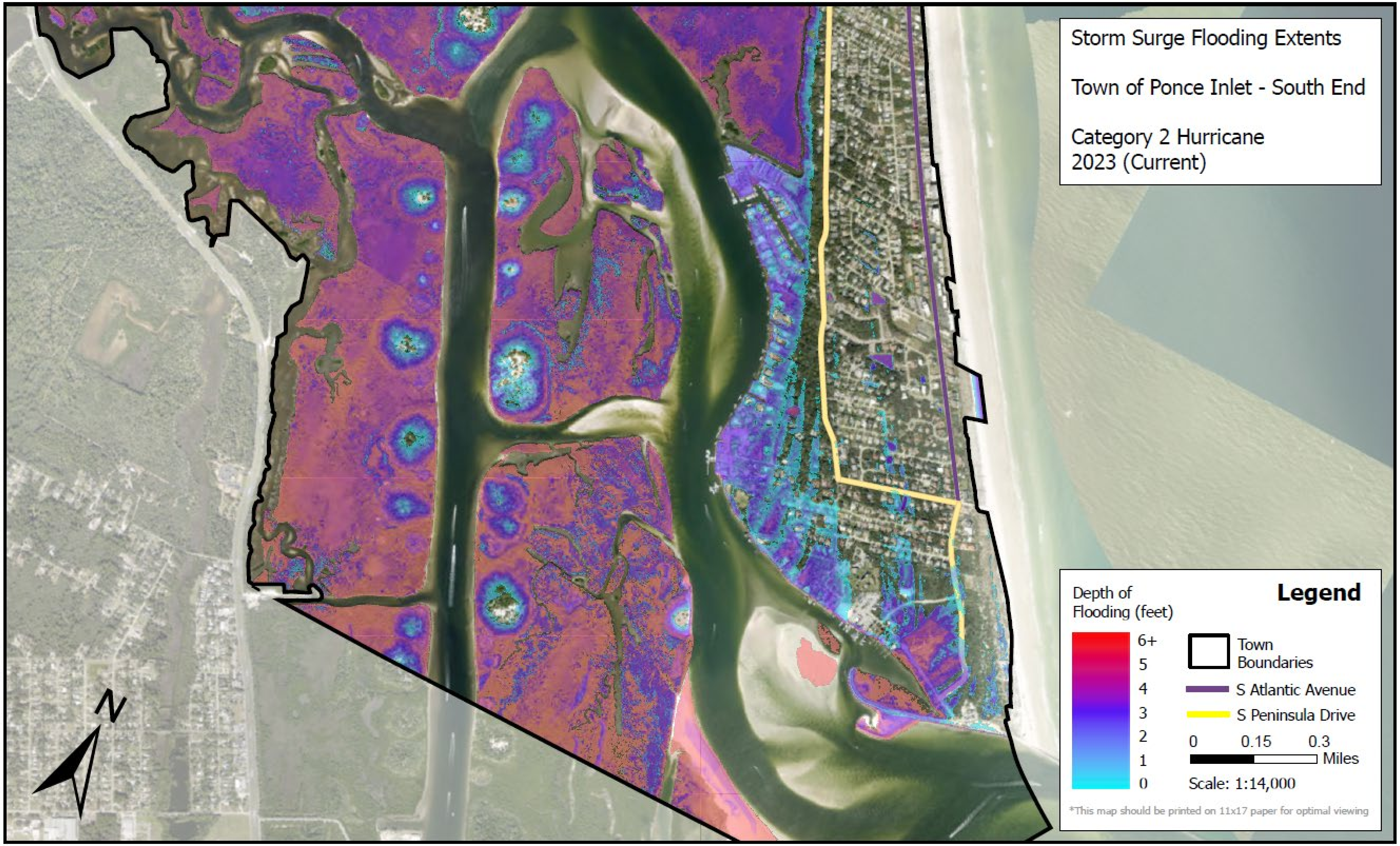


Figure F70 Category 2 Hurricane Storm Surge Exposure 2023 South

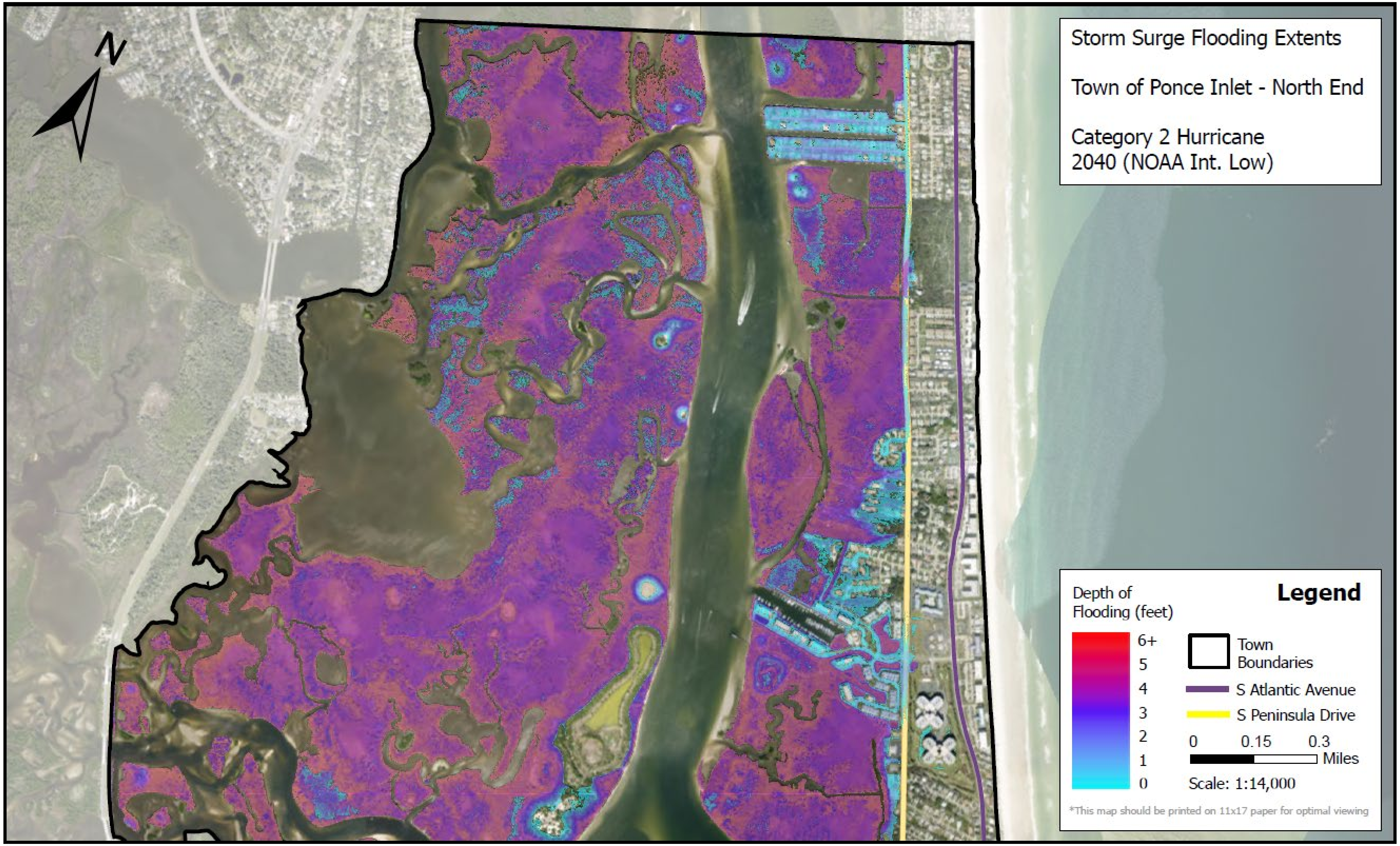


Figure F71 Category 2 Hurricane Storm Surge Exposure 2040IL North

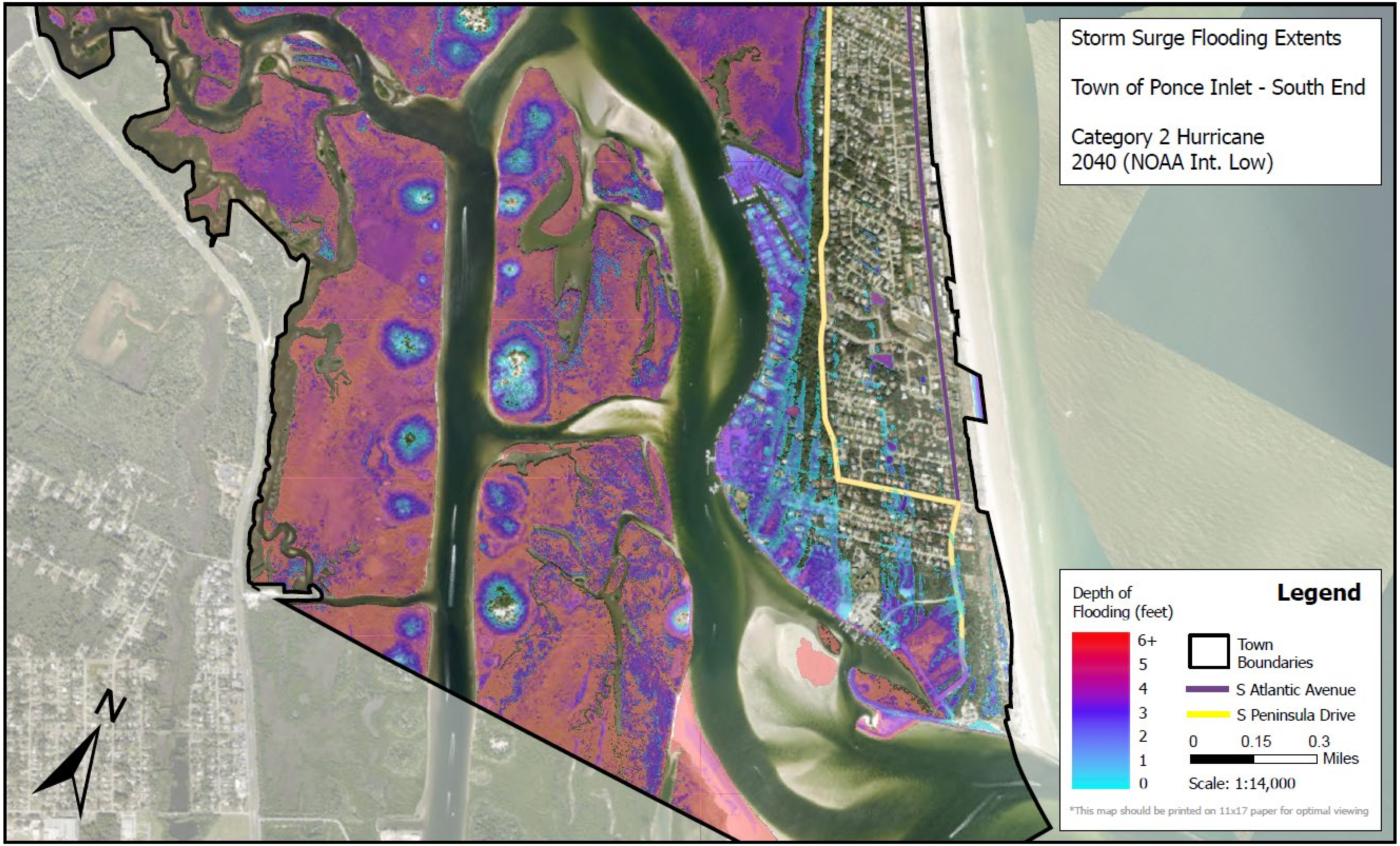


Figure F72 Category 2 Hurricane Storm Surge Exposure 2040IL South

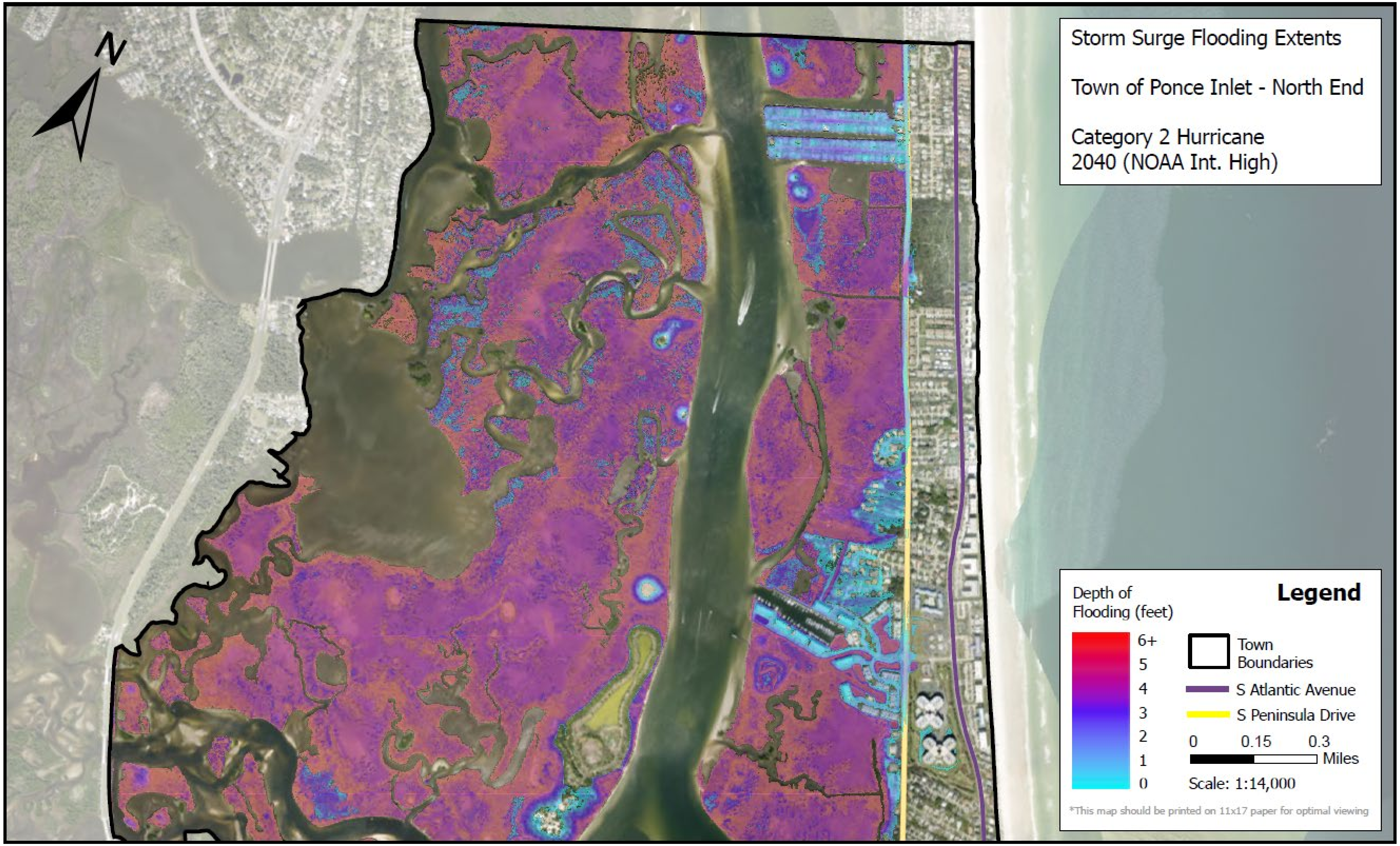


Figure F73 Category 2 Hurricane Storm Surge Exposure 2040IH North

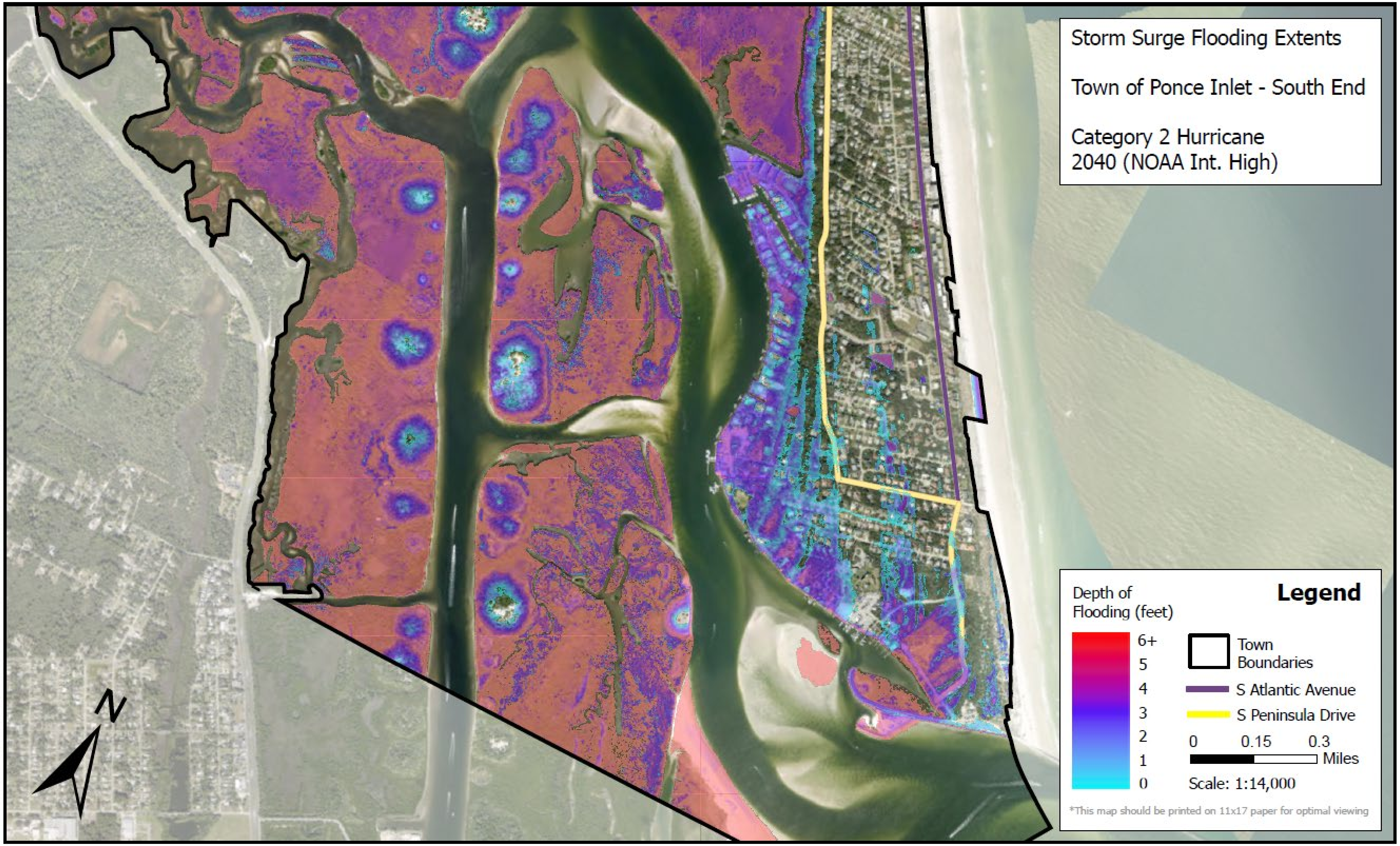


Figure F74 Category 2 Hurricane Storm Surge Exposure 2040IH South

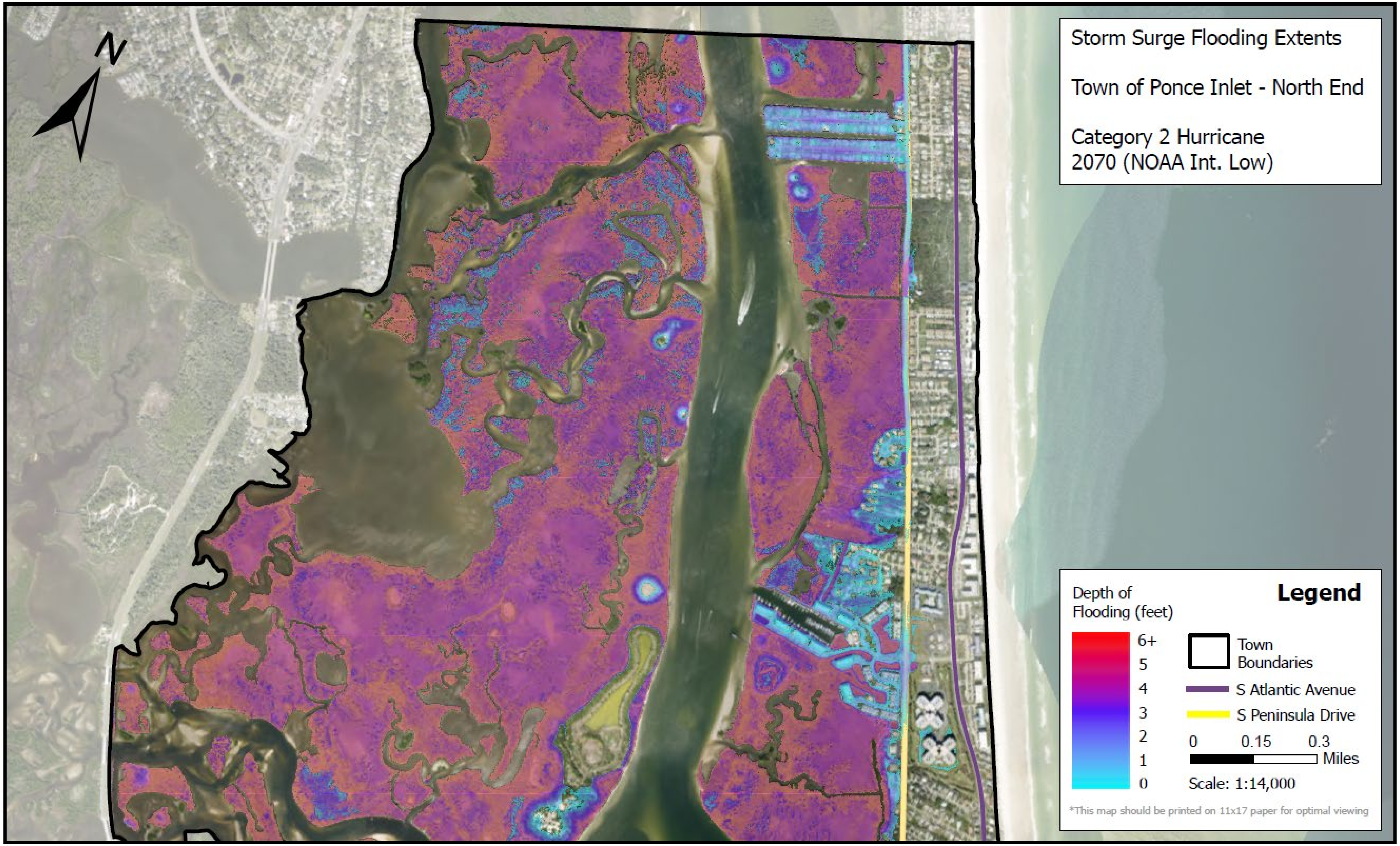


Figure F75 Category 2 Hurricane Storm Surge Exposure 2070IL North

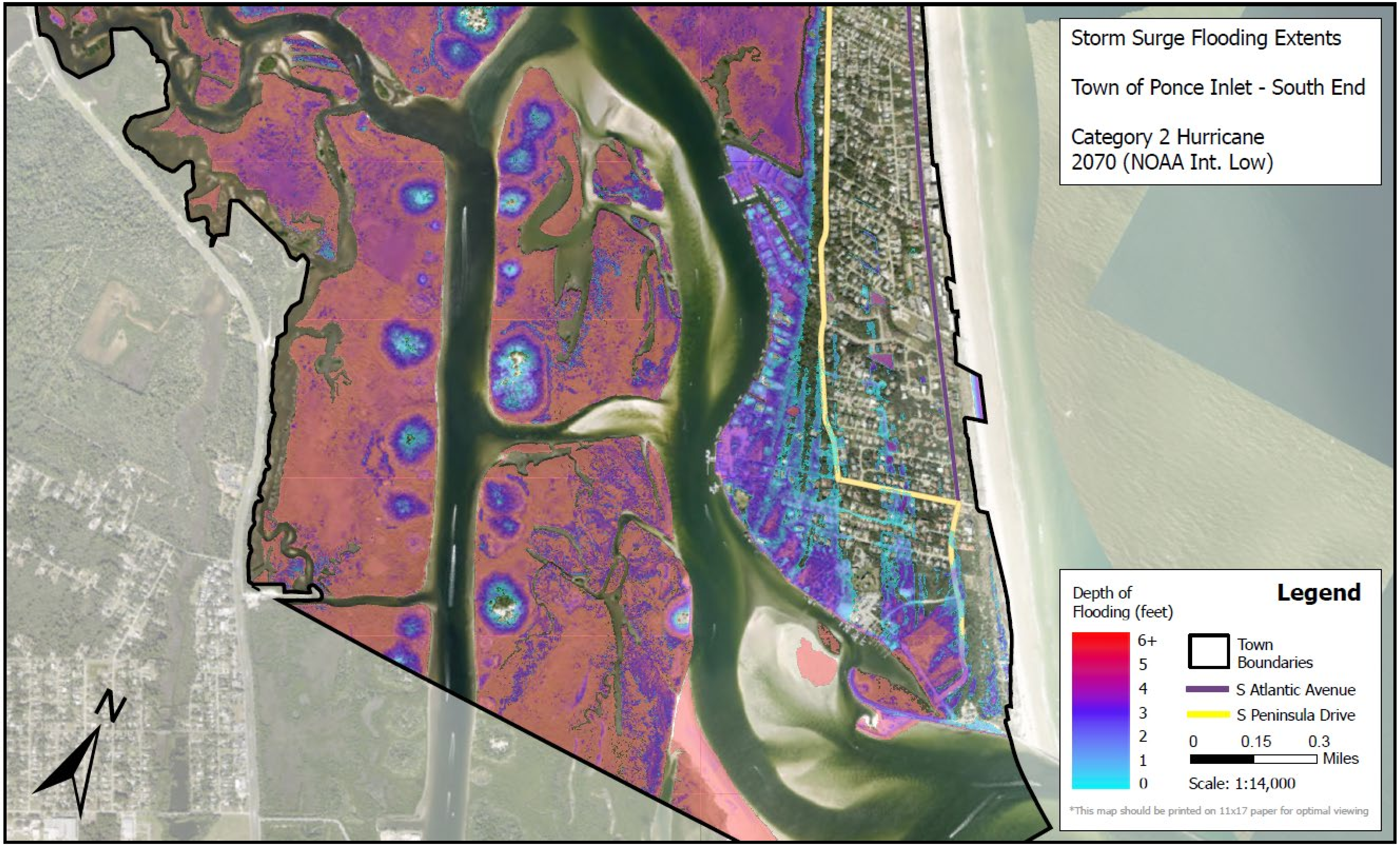


Figure F76 Category 2 Hurricane Storm Surge Exposure 2070IL South

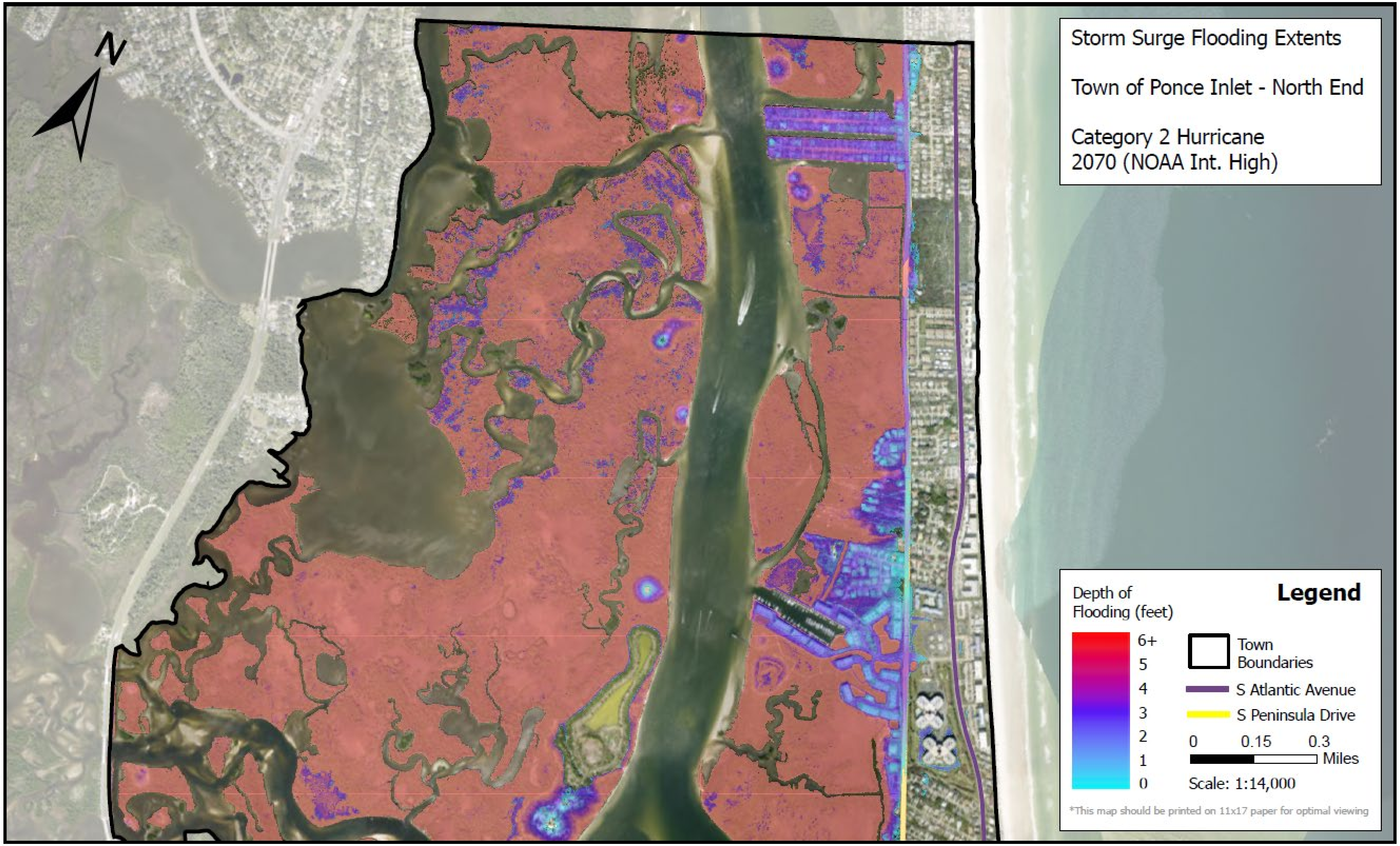


Figure F77 Category 2 Hurricane Storm Surge Exposure 2070IH North

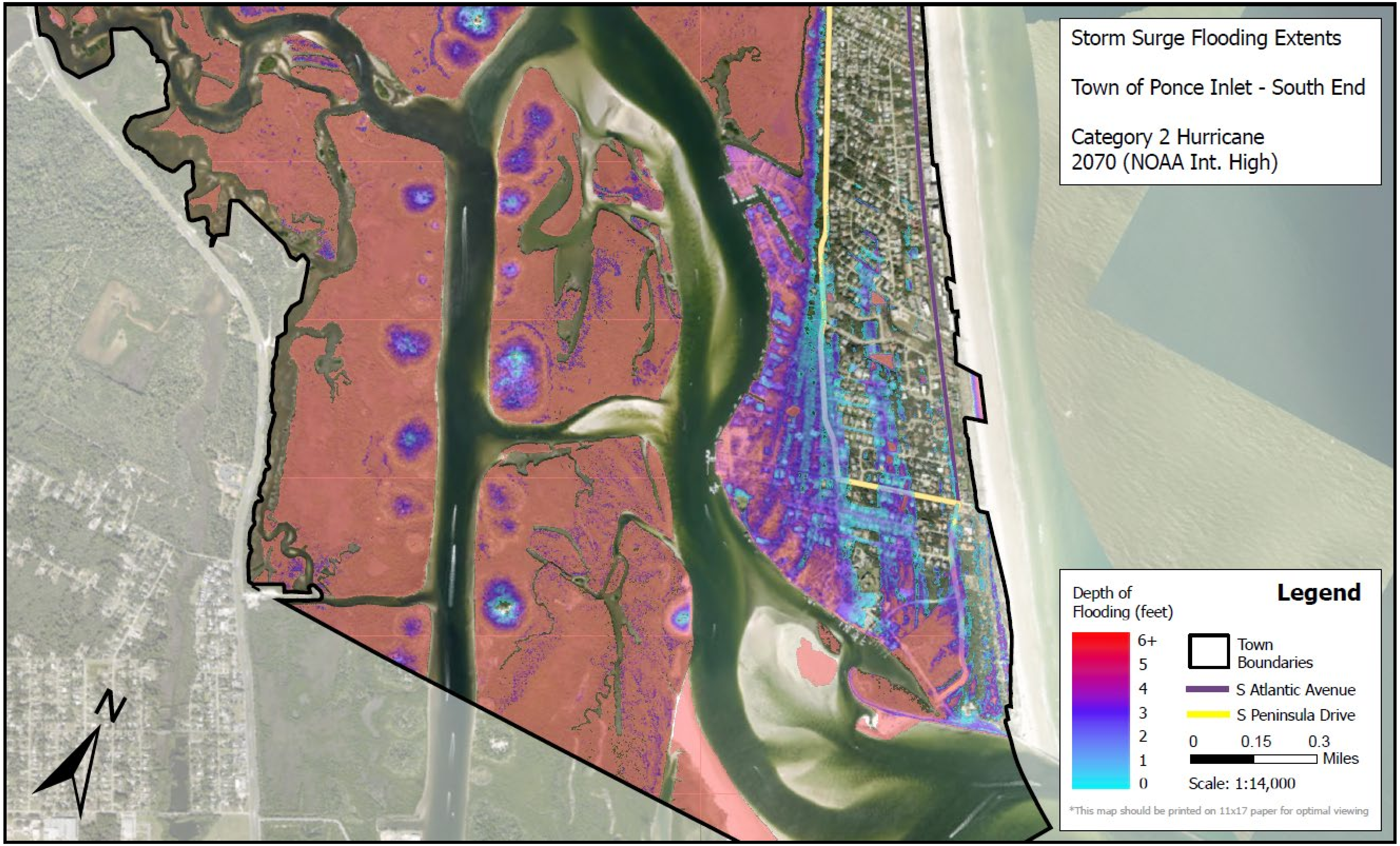


Figure F78 Category 2 Hurricane Storm Surge Exposure 2070IH South

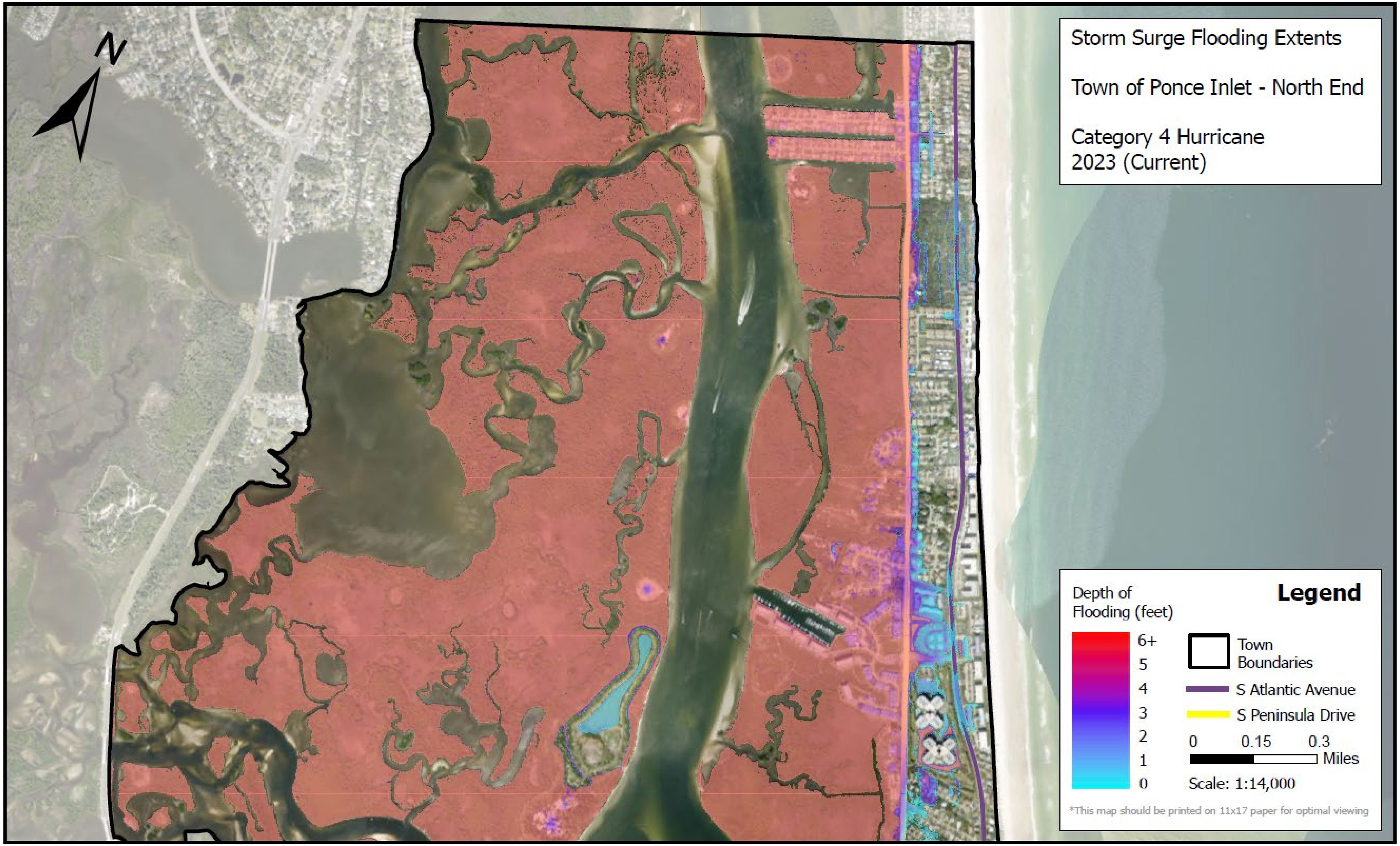


Figure F79 Category 4 Hurricane Storm Surge Exposure 2023 North

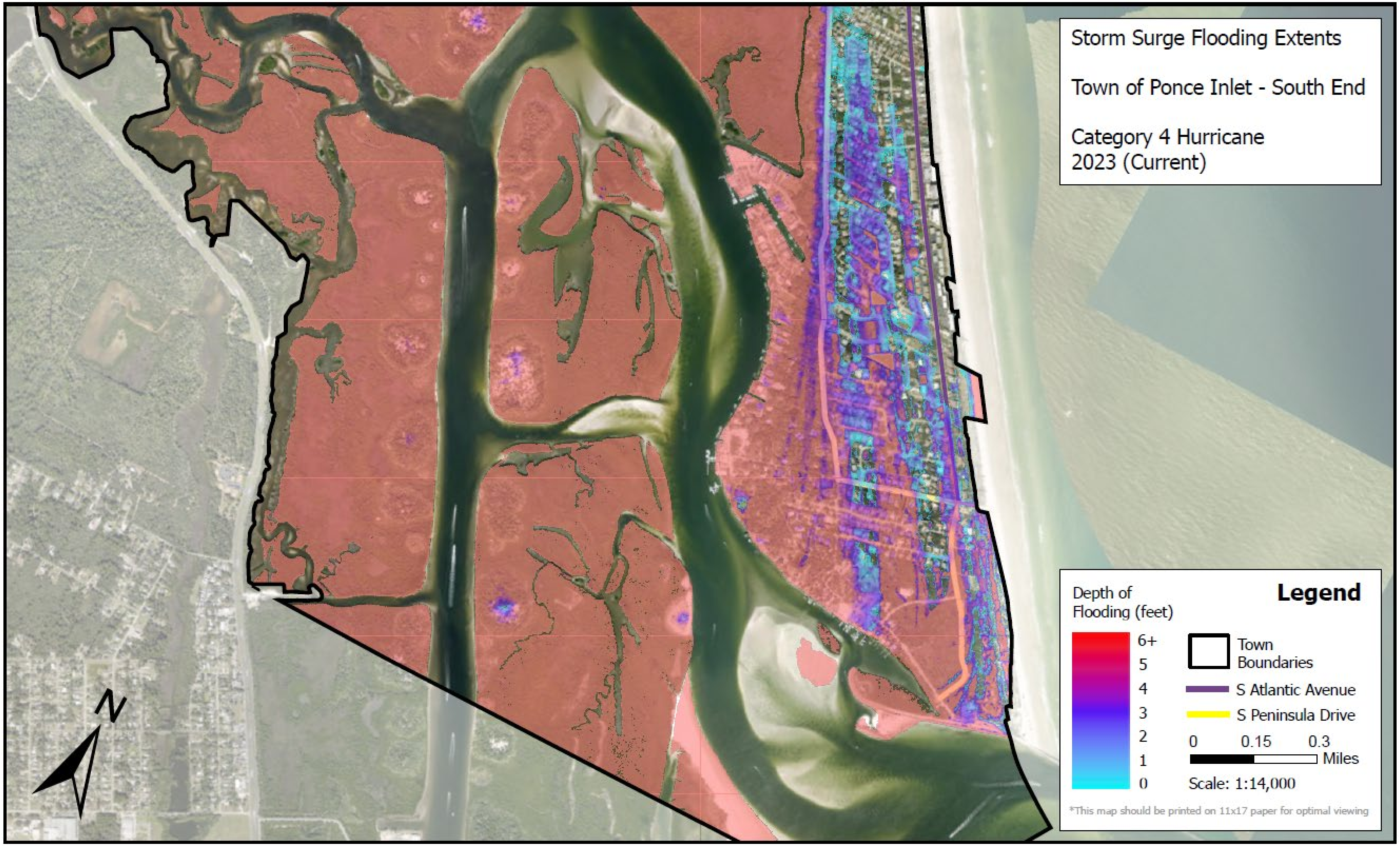


Figure F80 Category 4 Hurricane Storm Surge Exposure 2023 South

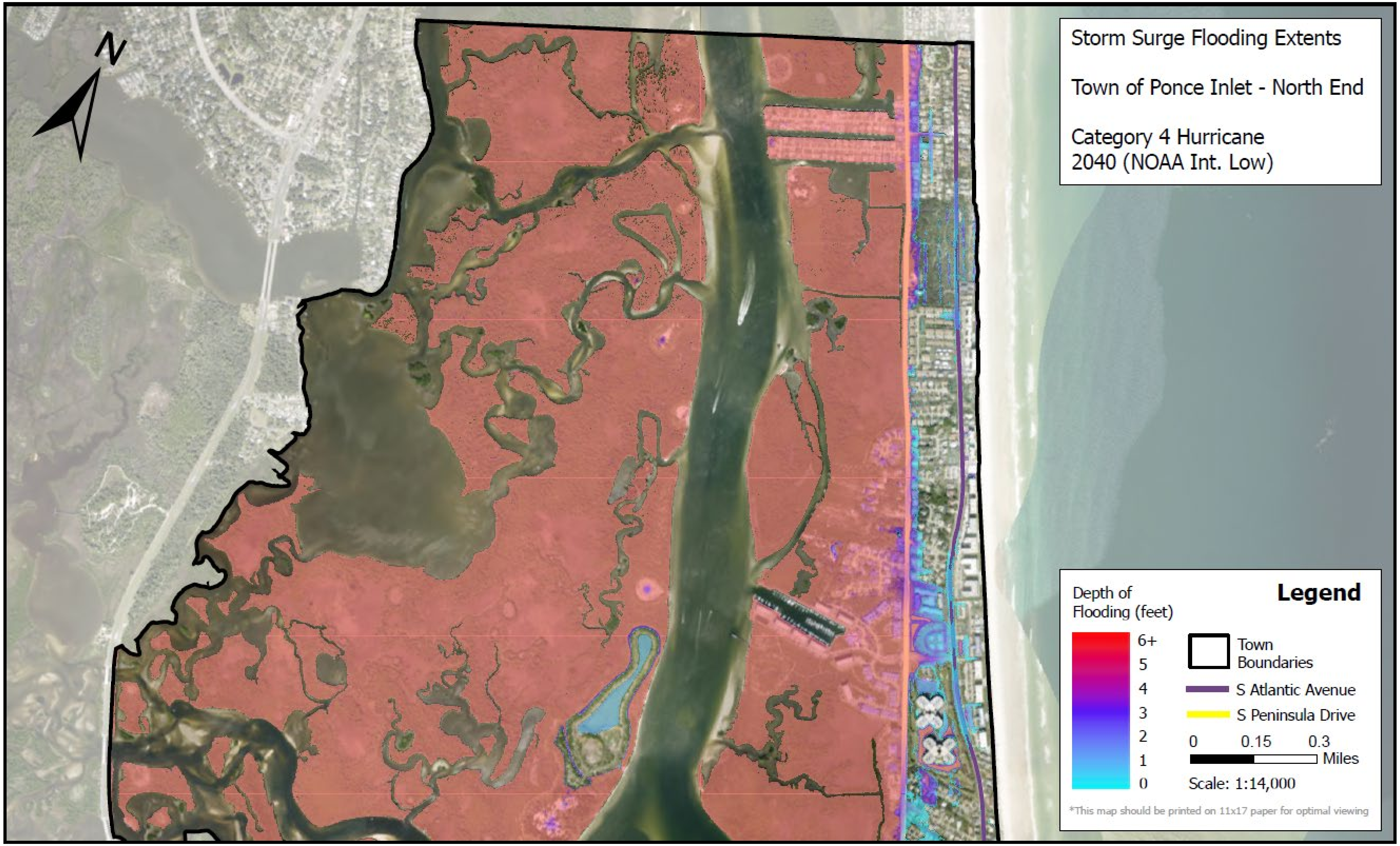


Figure F84 Category 4 Hurricane Storm Surge Exposure 2040IL North

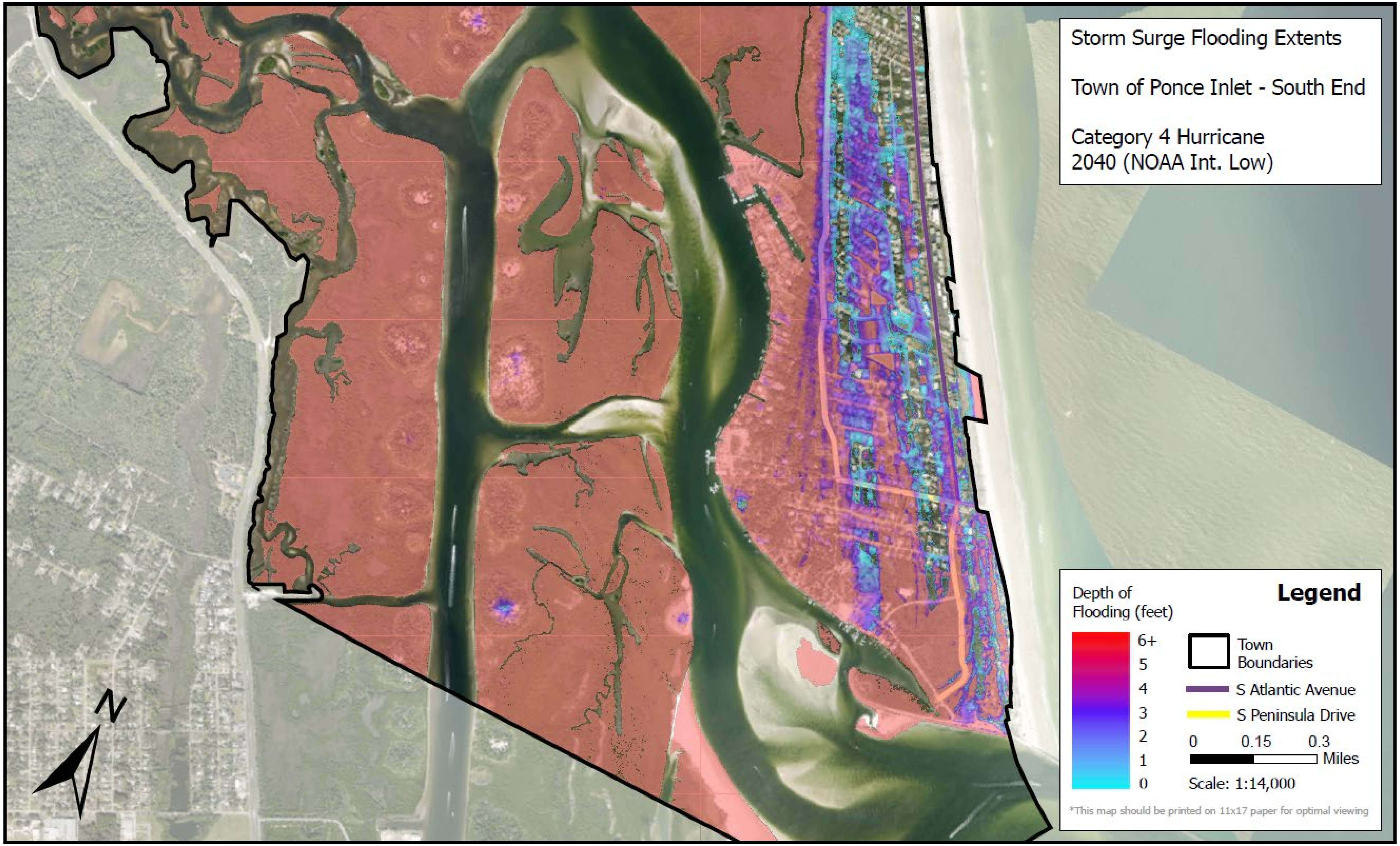


Figure F82 Category 4 Hurricane Storm Surge Exposure 2040IL South

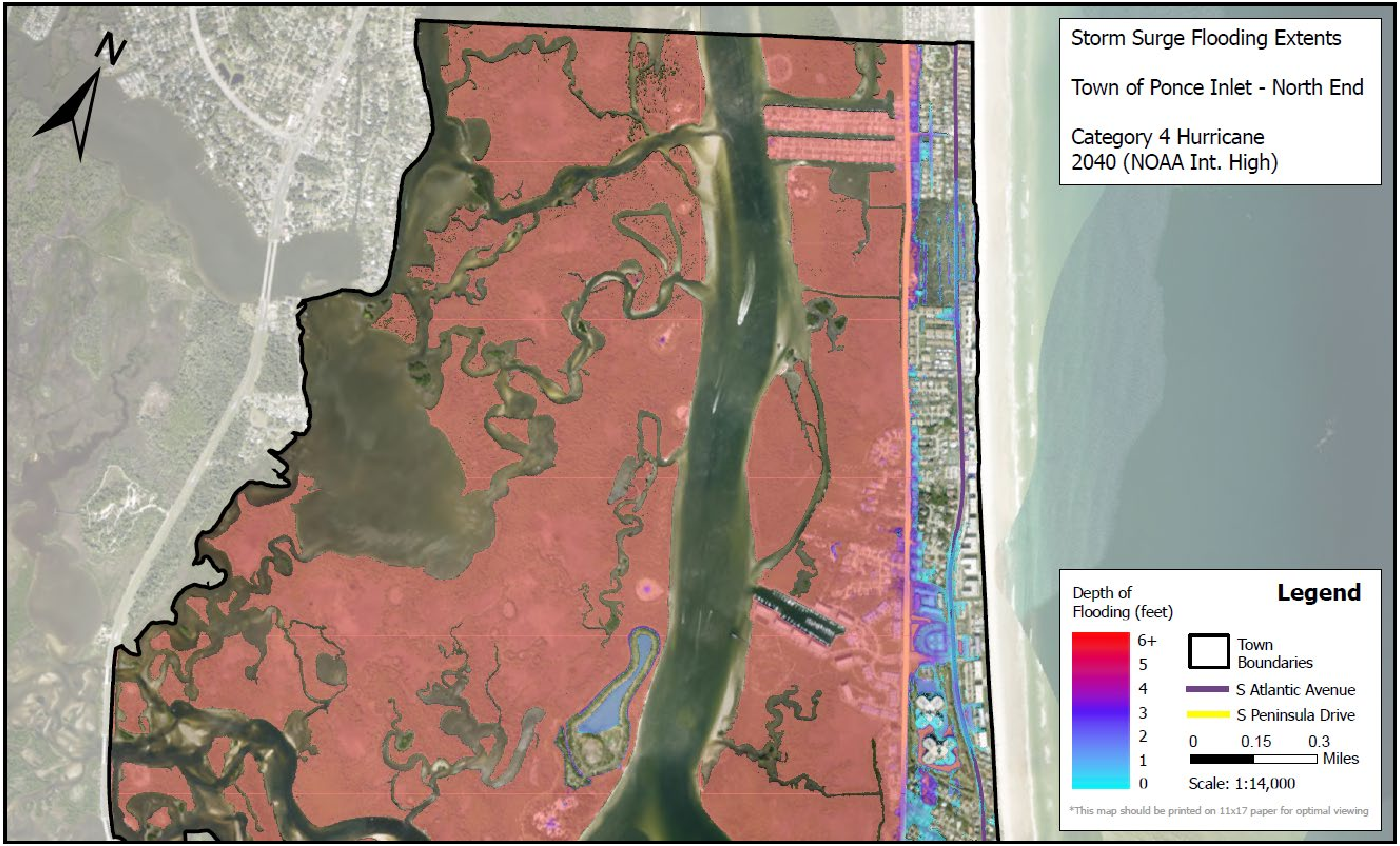


Figure F83 Category 4 Hurricane Storm Surge Exposure 2040IH North

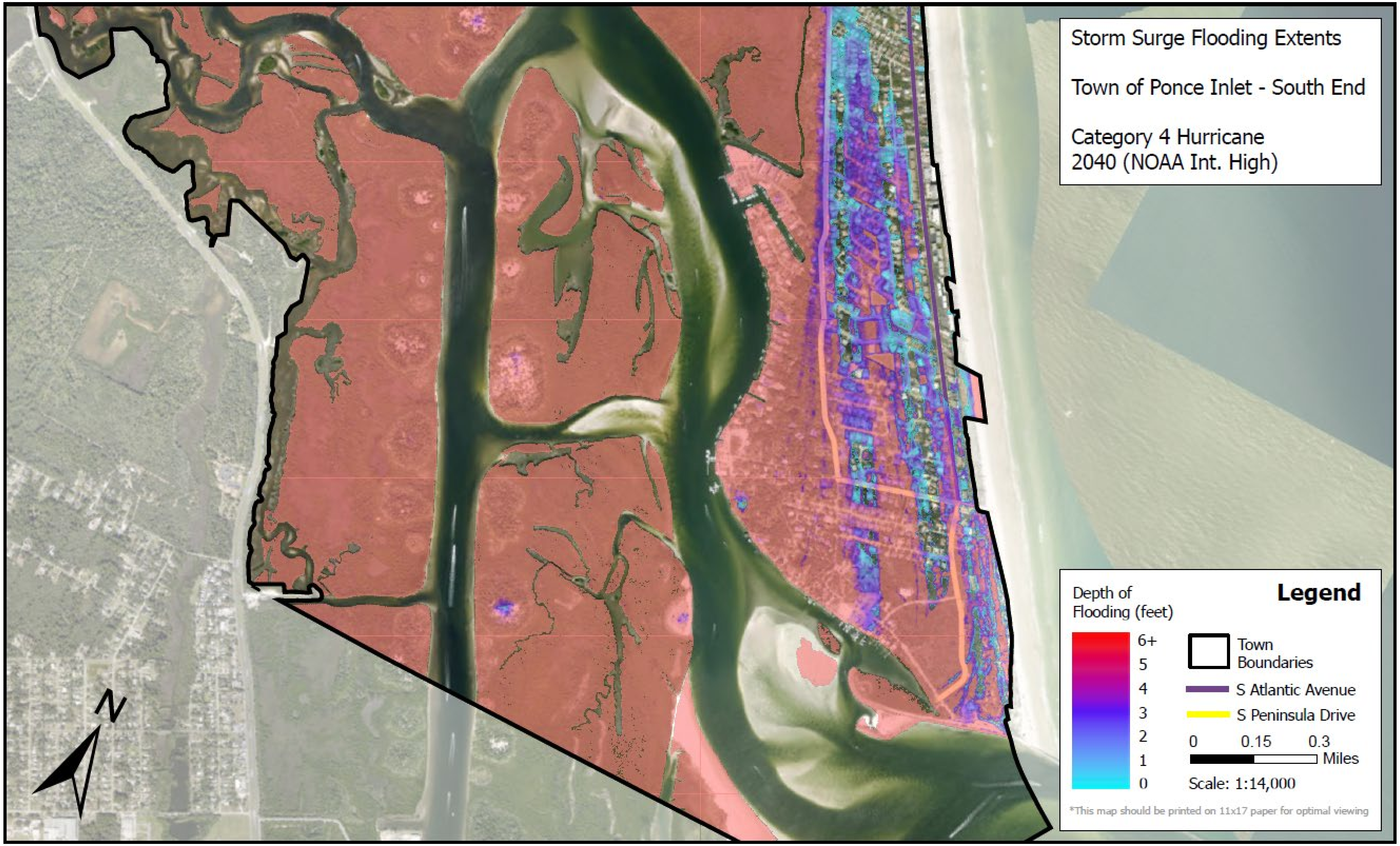


Figure F84 Category 4 Hurricane Storm Surge Exposure 2040IH South

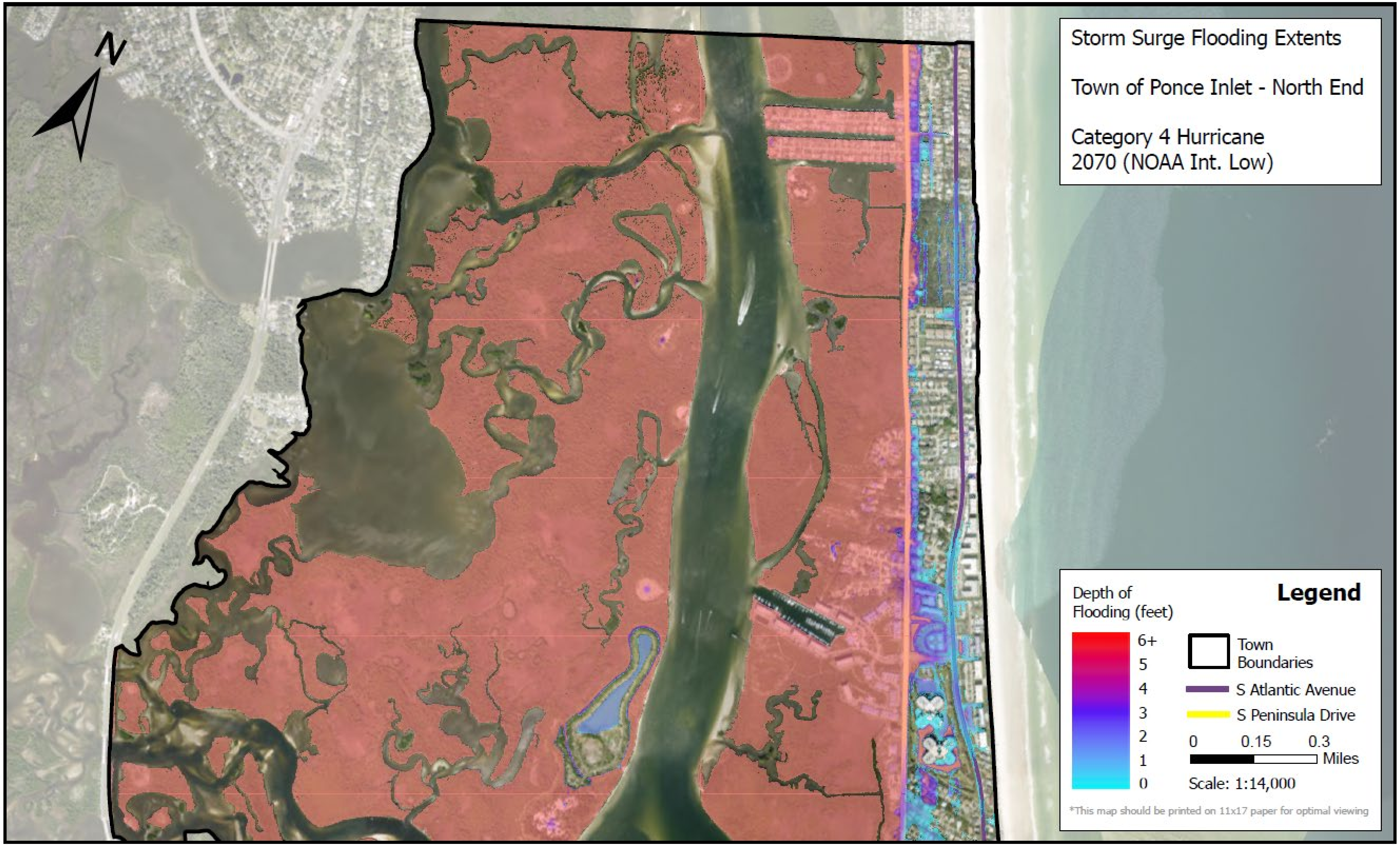


Figure F85 Category 4 Hurricane Storm Surge Exposure 2070IL North

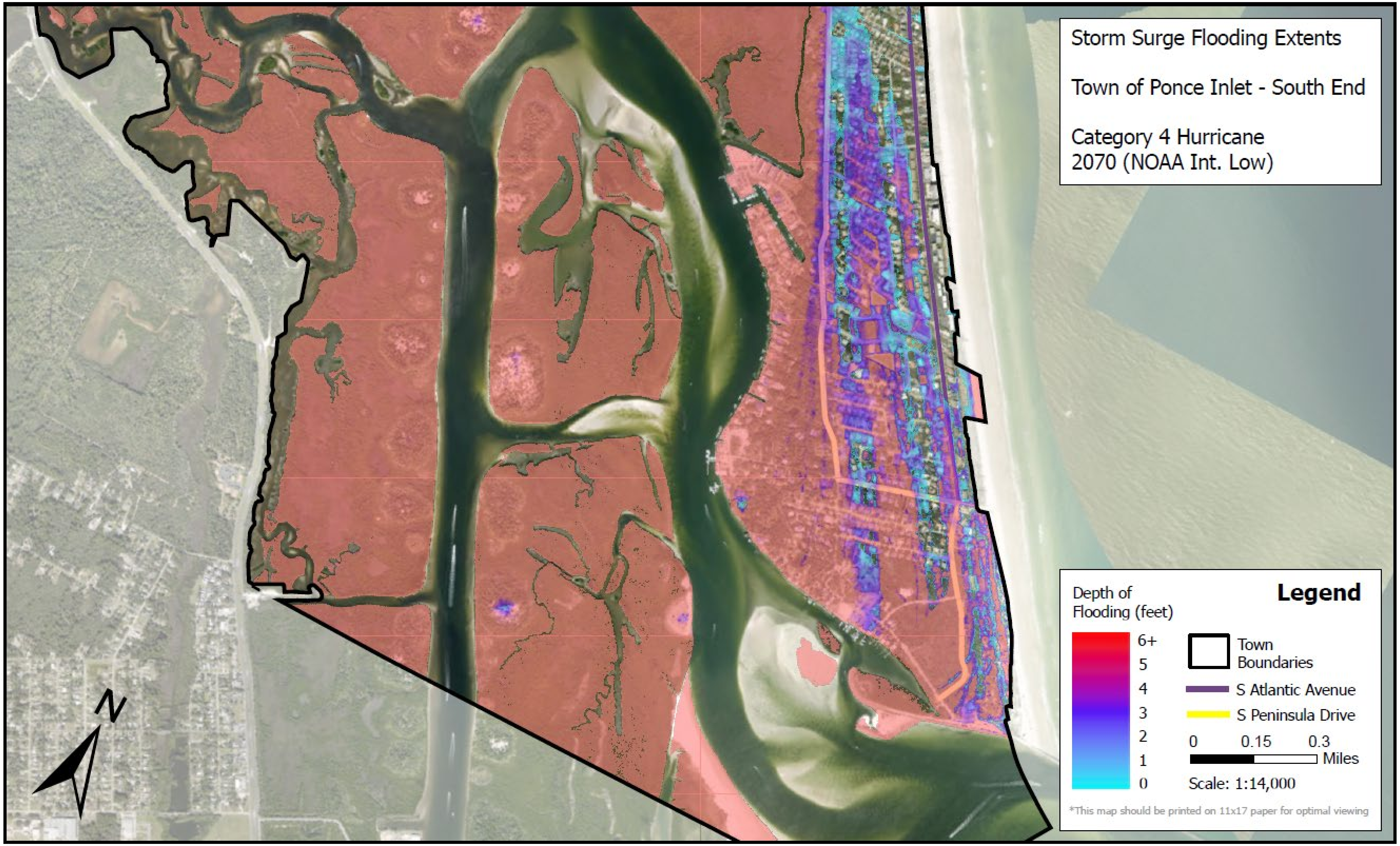


Figure F86 Category 4 Hurricane Storm Surge Exposure 2070IL South

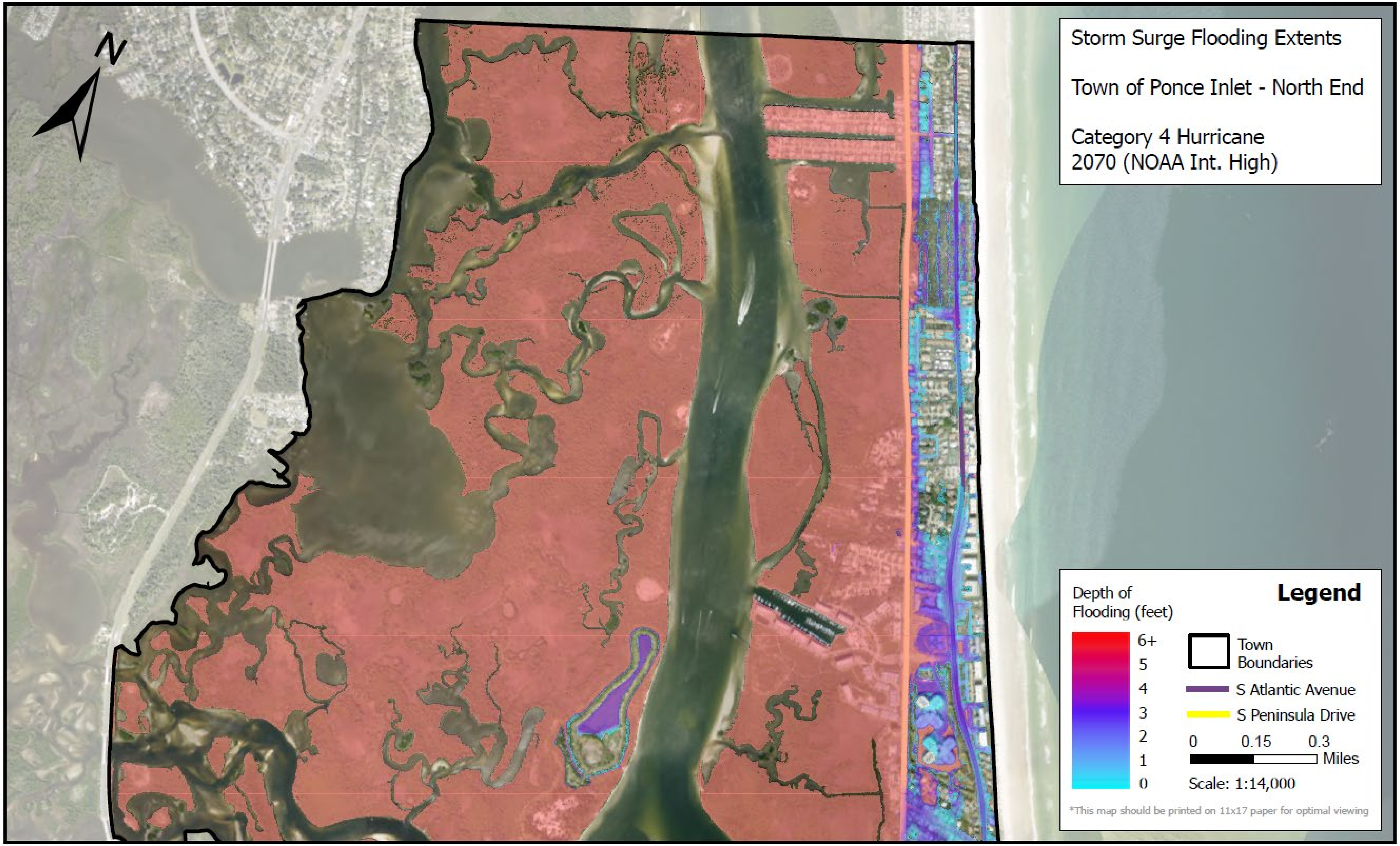


Figure F87 Category 4 Hurricane Storm Surge Exposure 2070IH North

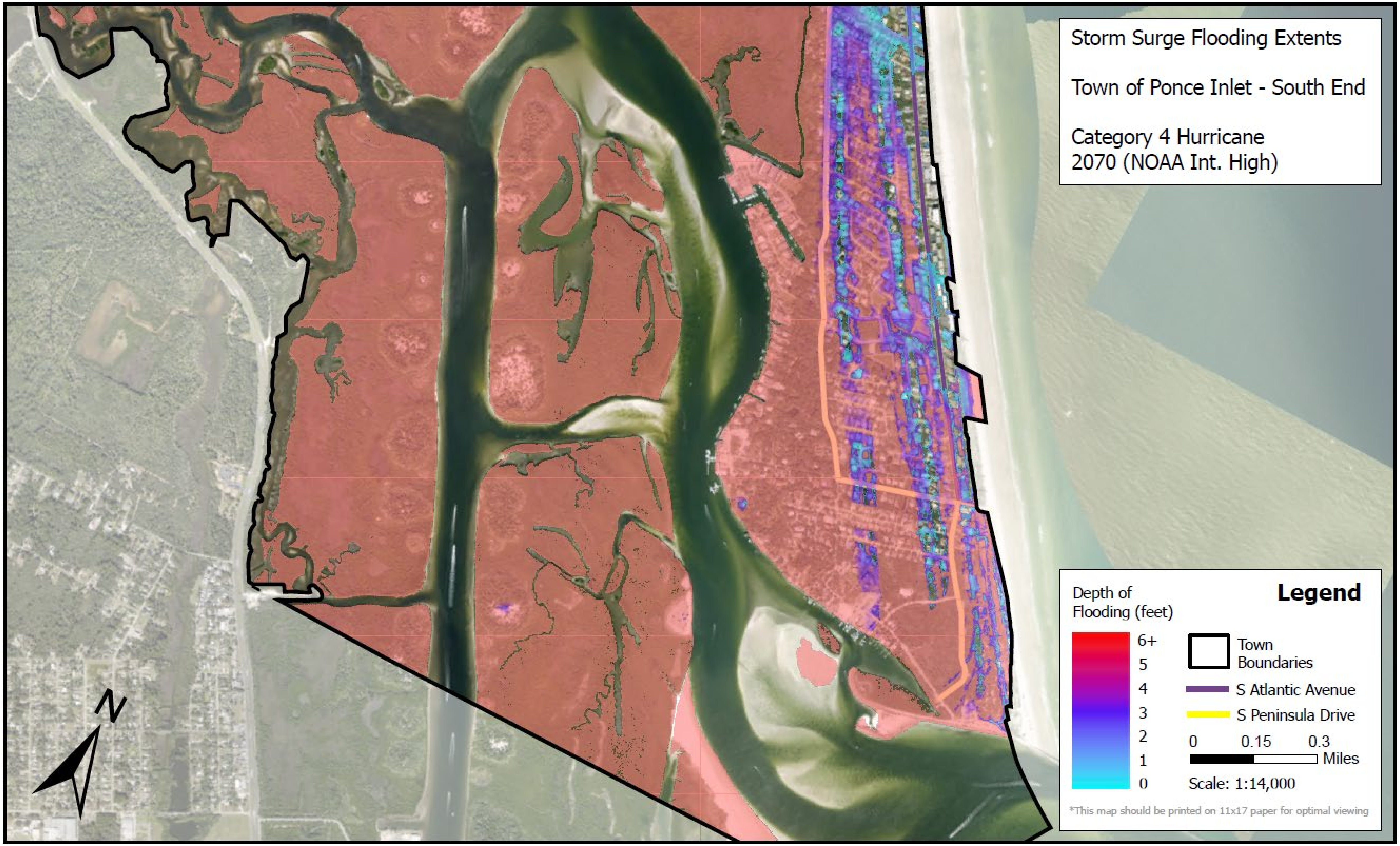


Figure F88 Category 4 Hurricane Storm Surge Exposure 2070IH South

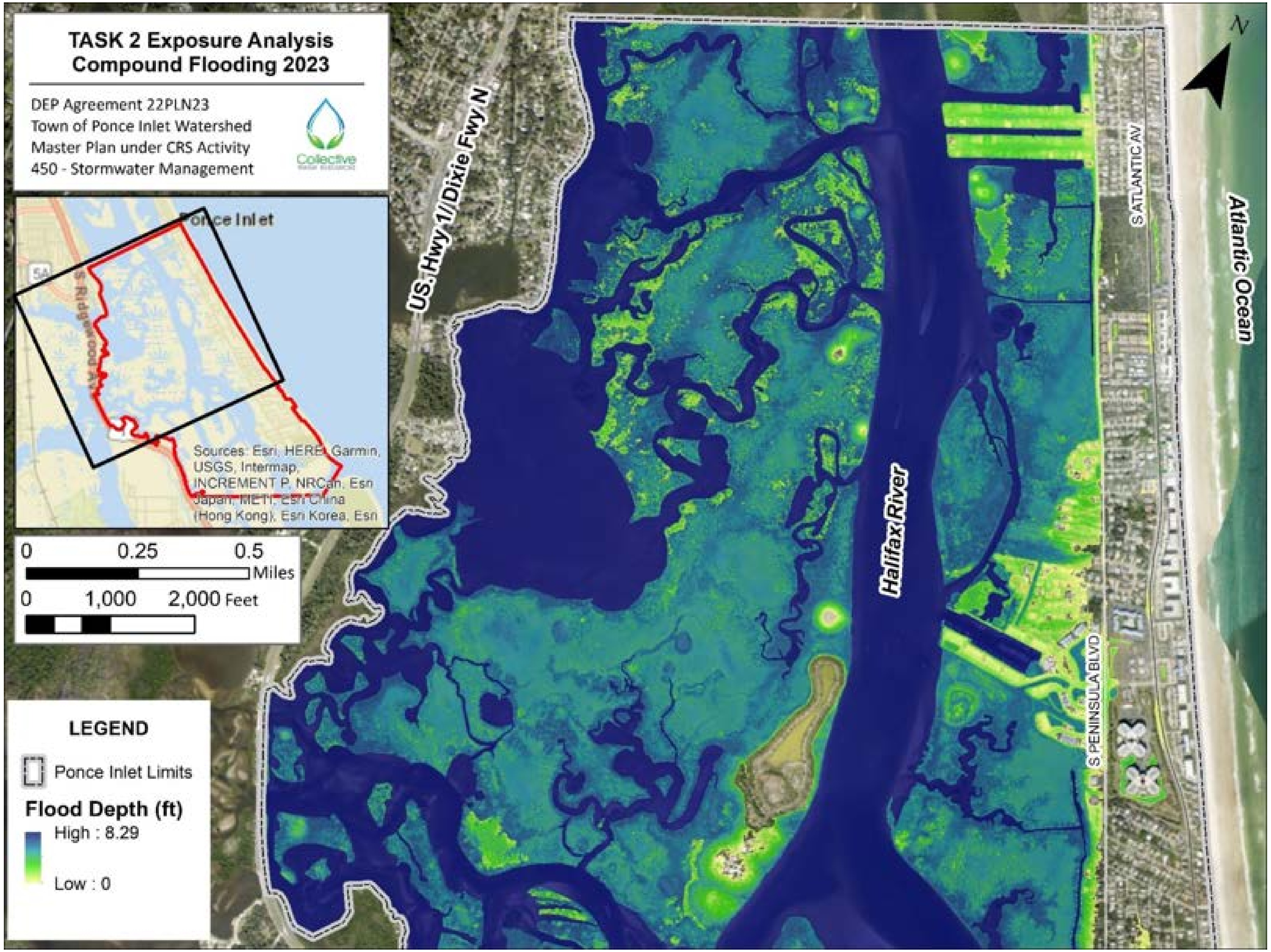


Figure F89 Compound 100year/24hour Rainfall + Category 1 Storm Surge Exposure 2023 North

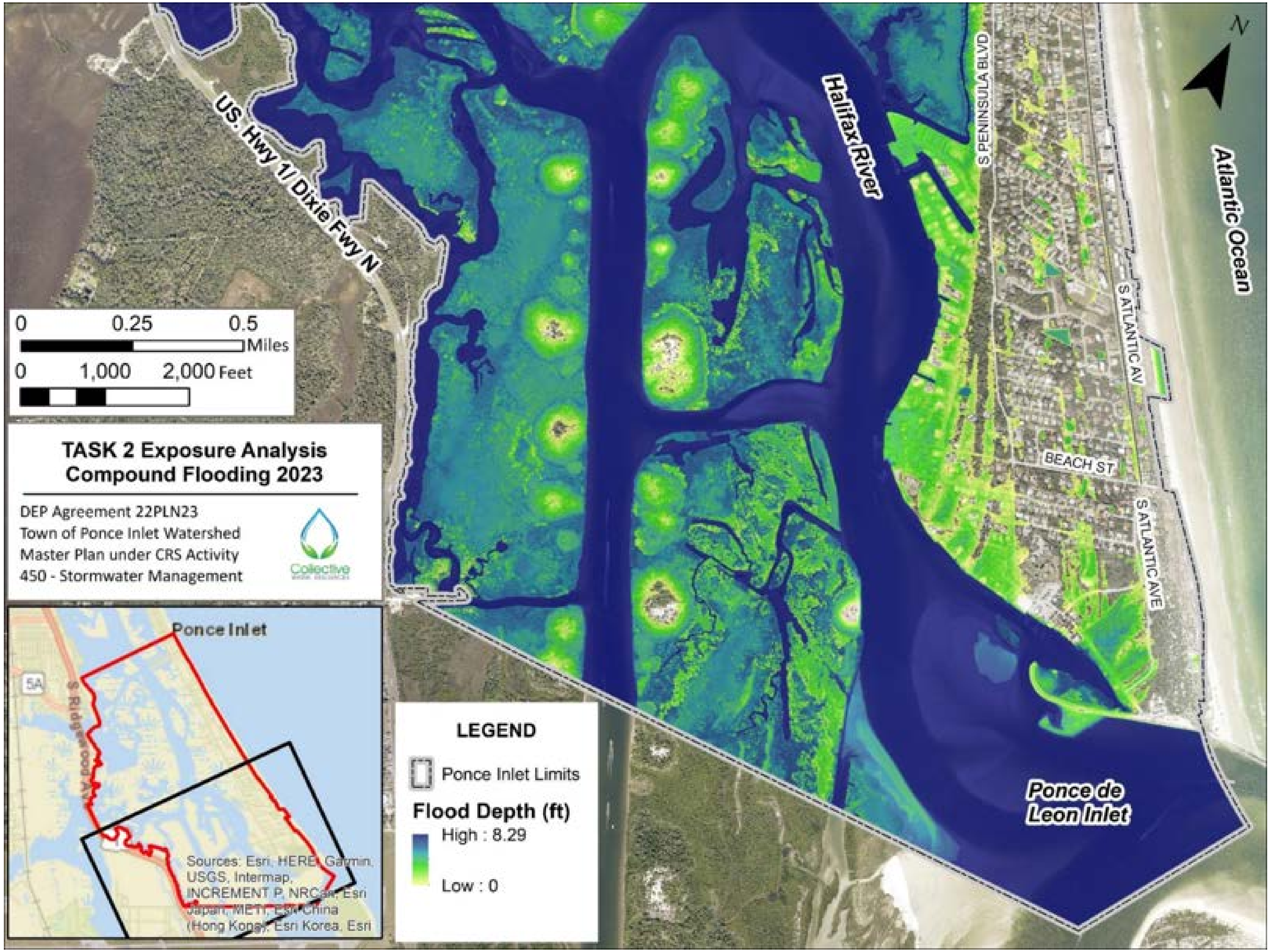


Figure F90 Compound 100year/24hour Rainfall + Category 1 Storm Surge Exposure 2023 South

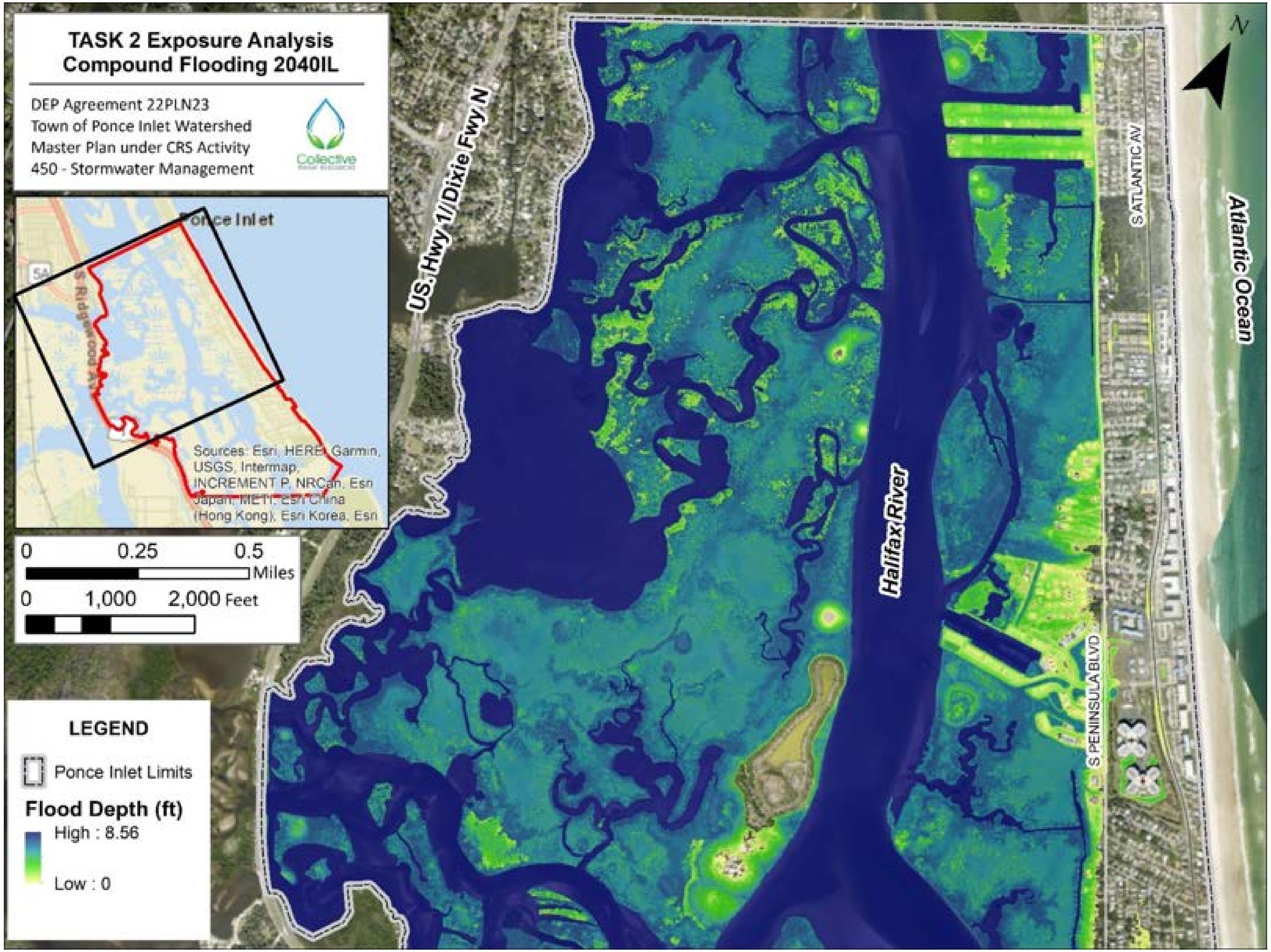


Figure F91 Compound 100year/24hour Rainfall + Category 1 Storm Surge Exposure 2040IL North

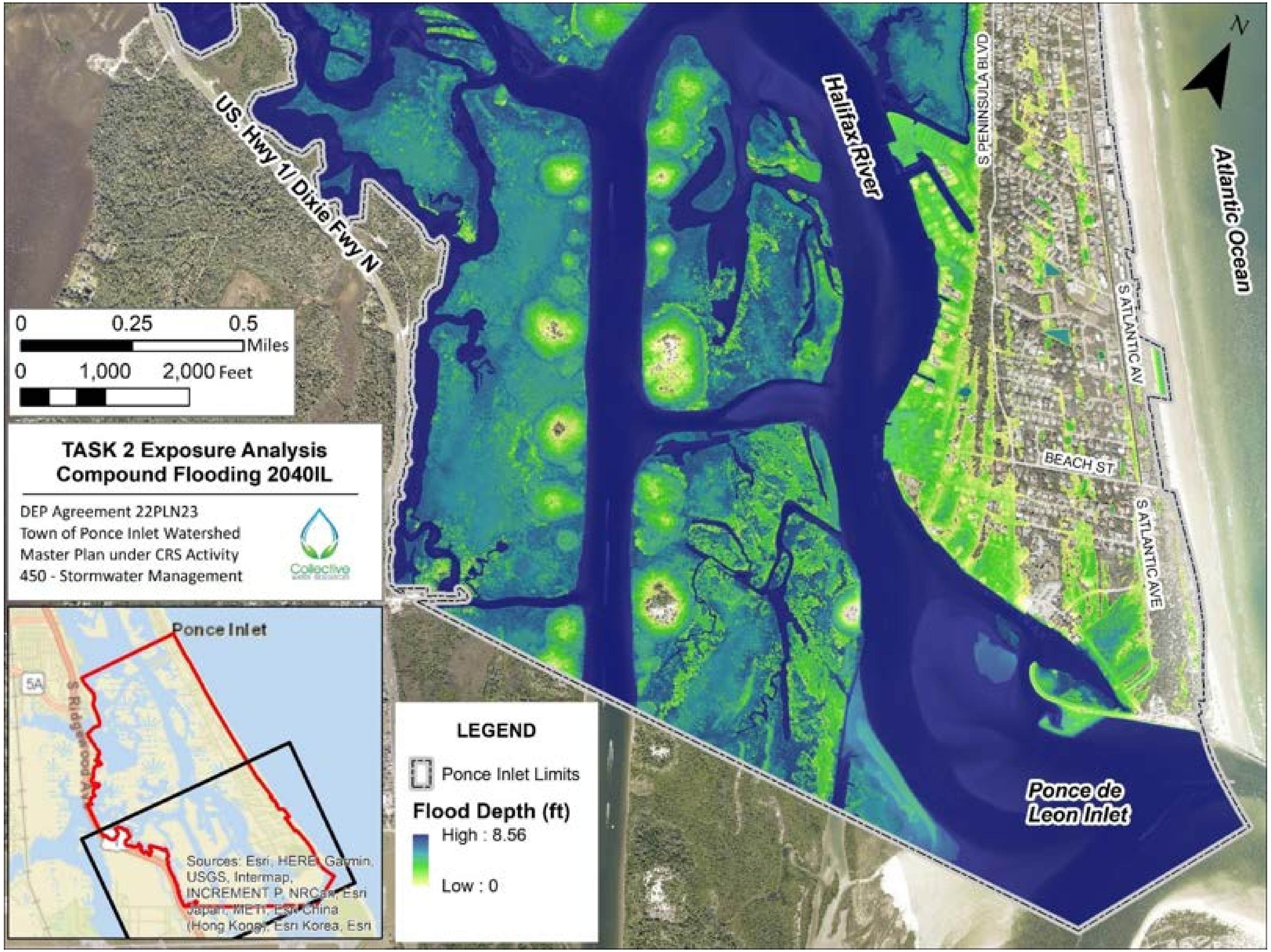


Figure F92 Compound 100year/24hour Rainfall + Category 1 Storm Surge Exposure 2040IL South

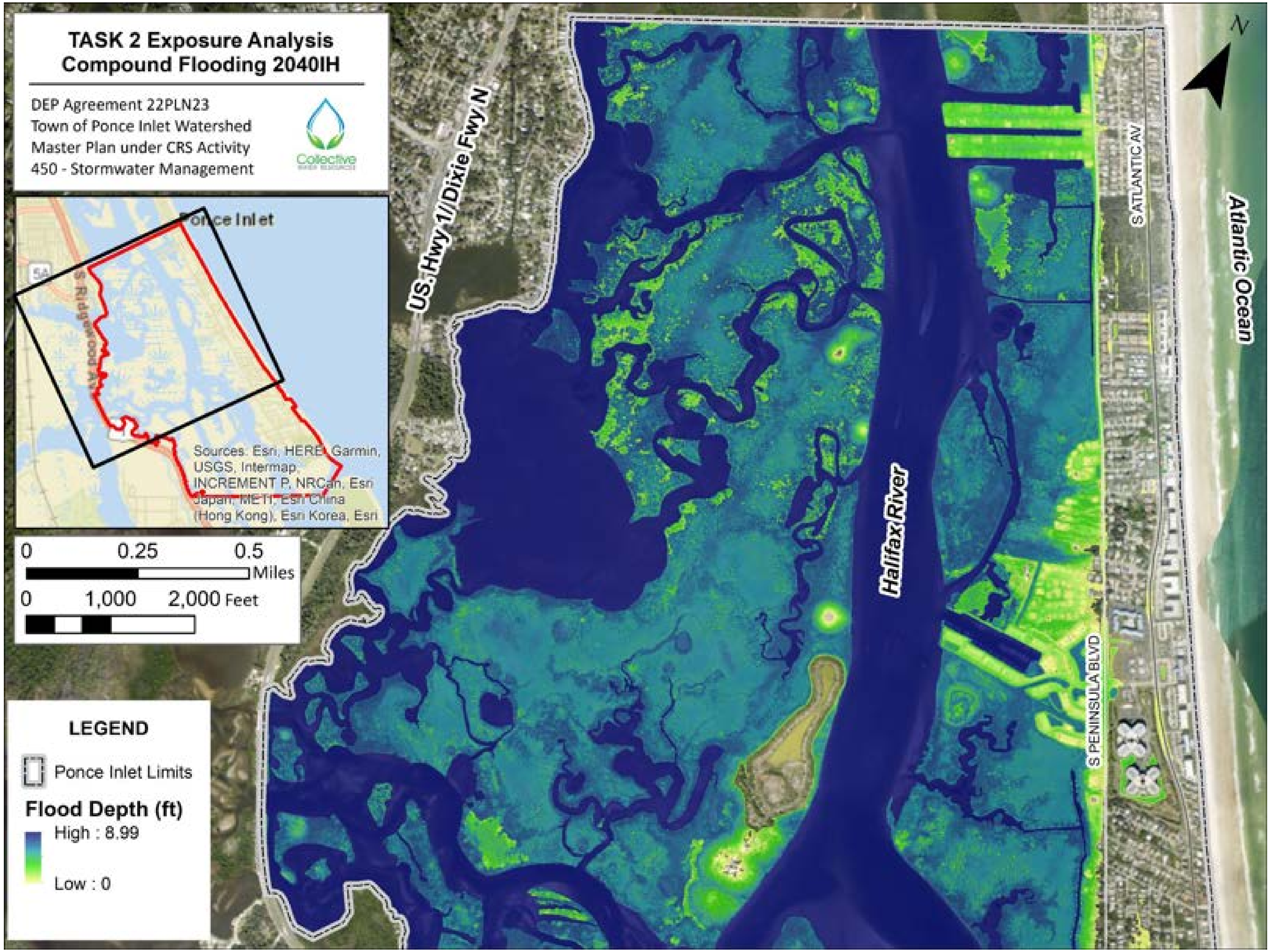


Figure F93 Compound 100year/24hour Rainfall + Category 1 Storm Surge Exposure 2040IH North

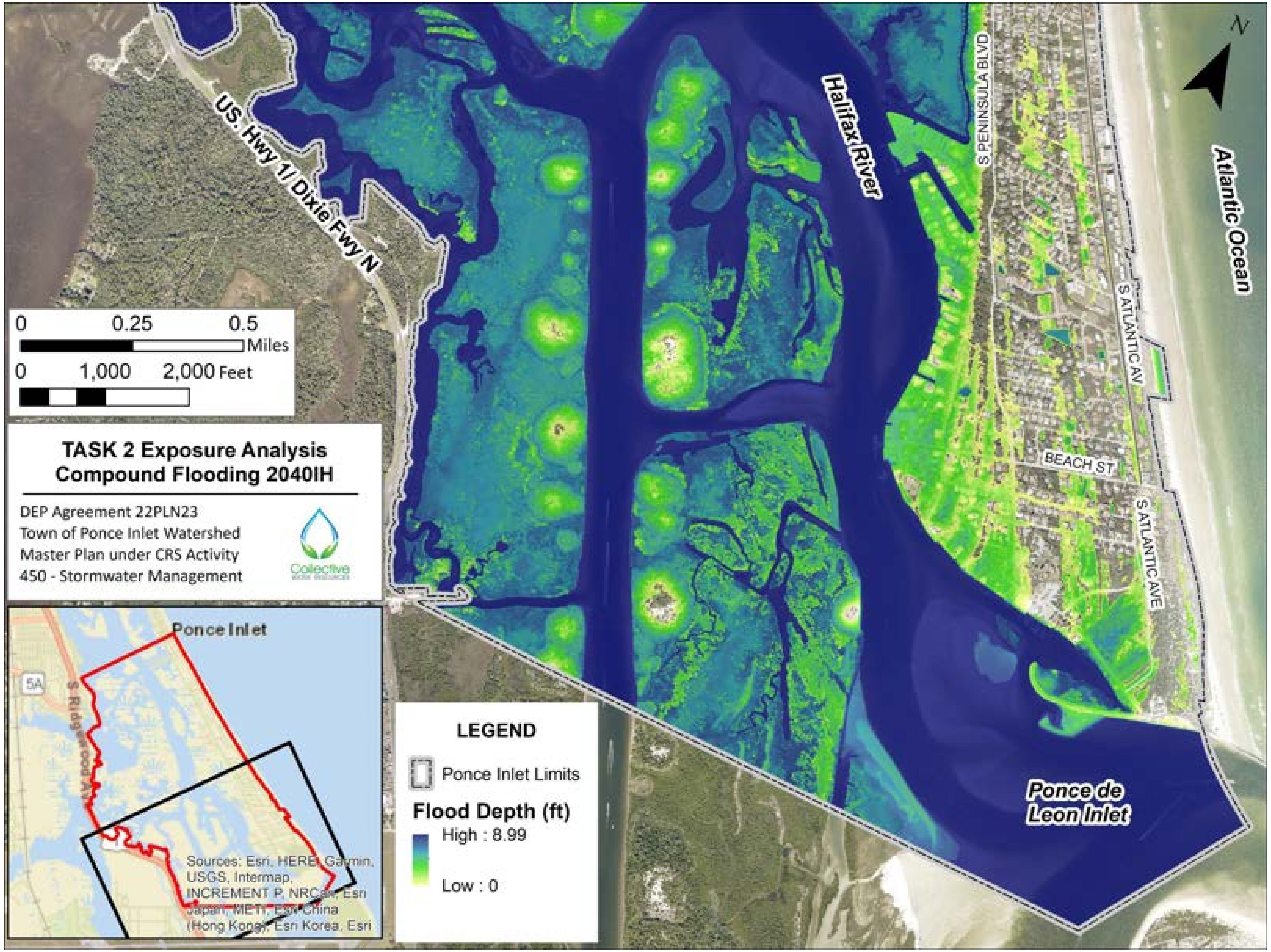


Figure F94 Compound 100year/24hour Rainfall + Category 1 Storm Surge Exposure 2040IH South

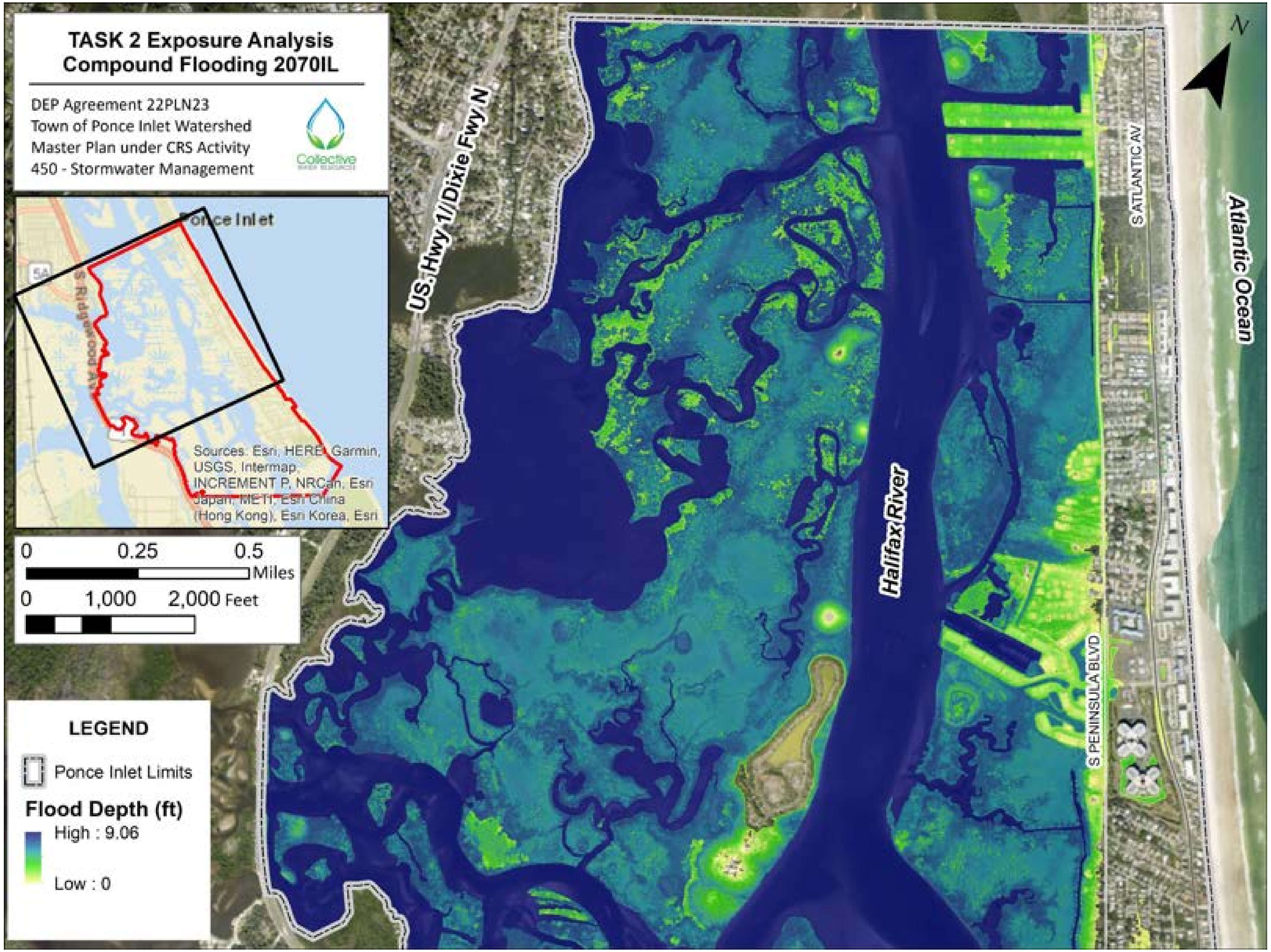


Figure F95 Compound 100year/24hour Rainfall + Category 1 Storm Surge Exposure 2070IL North

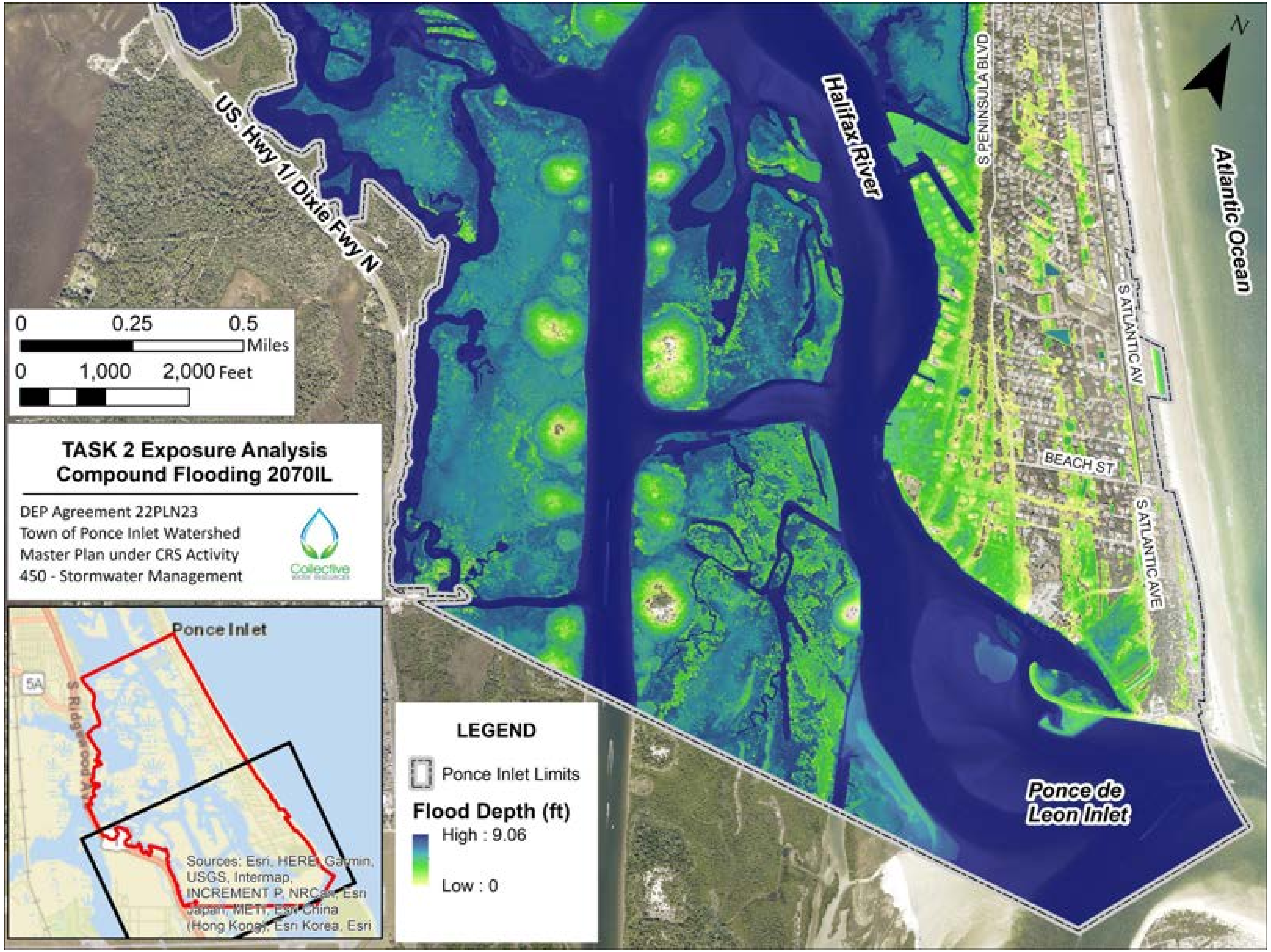


Figure F96 Compound 100year/24hour Rainfall + Category 1 Storm Surge Exposure 2070IL South

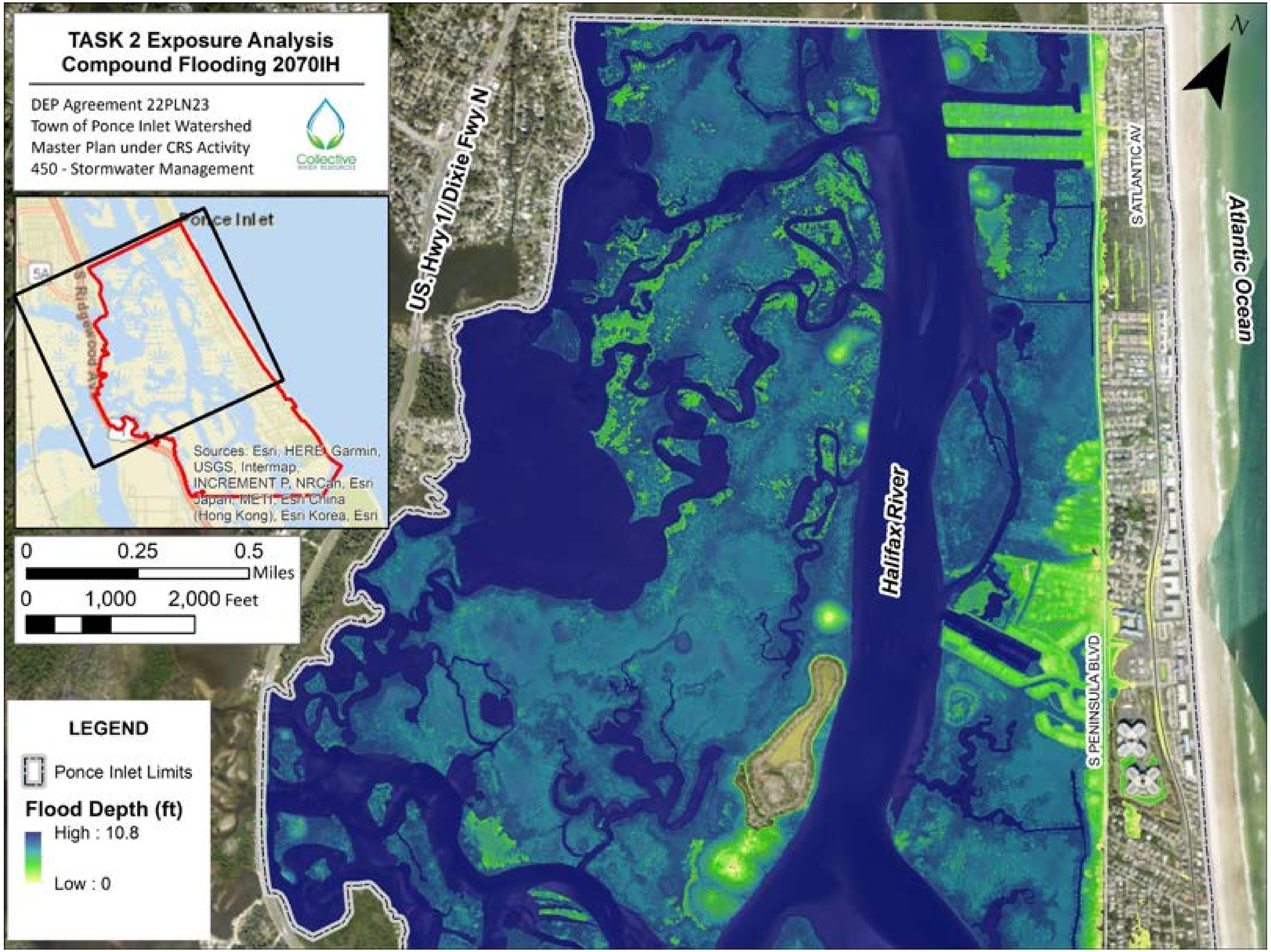


Figure F97 Compound 100year/24hour Rainfall + Category 1 Storm Surge Exposure 2070IH North

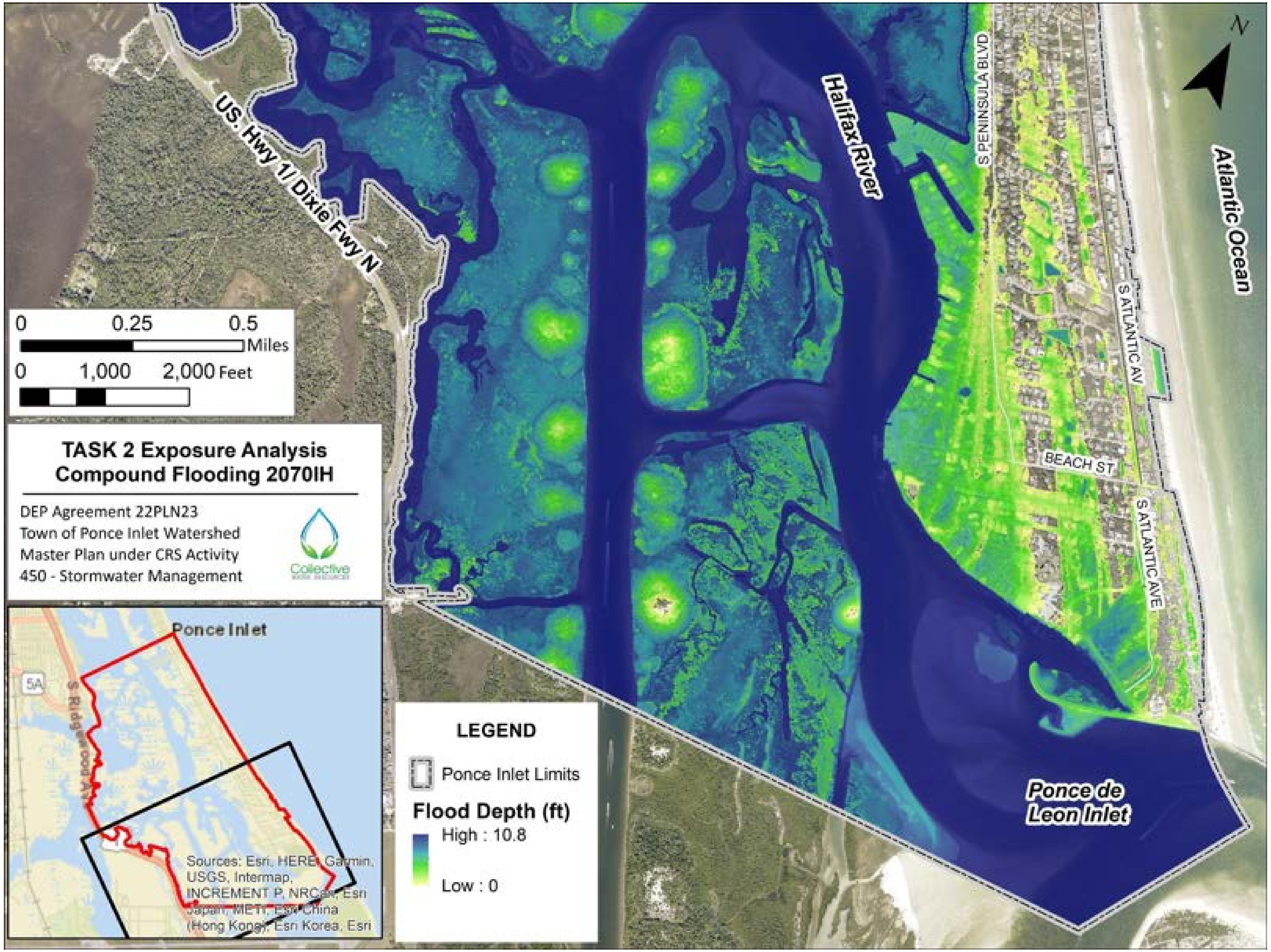


Figure F98 Compound 100year/24hour Rainfall + Category 1 Storm Surge Exposure 2070IH South

Appendix G

Task 2: Asset Flood Exposure Summary Table

Asset ID1	Asset ID2	Asset Name	Address	Finished Floor Elevation (ft)	Stormwater Building Flood Depth (ft)							High Tide Building Flood Depth (ft)					Category 2 Hurricane Surge Building Flood Depth (ft)					Compound Building Flood Depth (ft)				
					2023	2040IL	2040IH	2070IL	2070IH	2100IL	2100IH	2023	2040IL	2040IH	2070IL	2070IH	2023	2040IL	2040IH	2070IL	2070IH	2023	2040IL	2040IH	2070IL	2070IH
1001		PONCE INLET COMMUNITY CENTER	4670 S PENINSULA DR	7.4							-0.99								-1.01	-0.92	0.97	-0.71	-0.44	-0.01	0.06	1.80
1002		PONCE INLET FIRE RESCUE ST 78	4680 S PENINSULA DR	5.5							0.91								0.80	0.87	2.84	1.19	1.46	1.89	1.96	3.70
1003		PONCE INLET POLICE DEPT	4301 S PENINSULA DR	8.9																	-0.84					0.23
1004		PONCE INLET PUBLIC WORKS	4875 S. Peninsula Dr.	8.00																	0.93					1.20
1005		PONCE INLET TOWN HALL	4300 S. Atlantic Ave.	19.6																						
1006		BIRD SANCTUARY LIGHTHOUSE PARK	4965 S PENSINSULA DR	10.5																						
1007		MARINE SCIENCE CENTER	100 LIGHTHOUSE DR	11.6	-6.95	-6.62	-6.34	-6.28	-5.65	-5.98	-5.13					-5.67	-5.01	-4.74	-4.31	-4.24	-2.50	-4.92	-4.65	-4.22	-4.15	-2.40
1102		AT&T EQUIPMENT BUILDING	48 Inlet Harbor Rd.	17.07																						
1212		MEYER-DAVIS HOUSE	143 BEACH ST	5.76							0.66					0.17	0.74	1.01	1.44	1.51	3.25	0.93	1.20	1.63	1.70	3.44
1213		HASTY COTTAGE	143 BEACH ST	4.34	-0.93	-0.70	-0.67	-0.67	-0.35	-0.62	2.08	-0.92	-0.65	-0.22	-0.15	1.59	2.04	2.31	2.74	2.81	4.55	2.35	2.62	3.05	3.12	4.86
1214	1606	Racing's North Turn Restaurant	4511 S ATLANTIC AVE	16.39																						
1215			4591 S ATLANTIC AVE	17.21																						
1216			4595 S ATLANTIC AVE	16.34																						
1217			58 OCEANVIEW AVE	13.60																						
1218			46 OCEANVIEW AVE	14.64																						
1219			50 OCEANVIEW AVE	13.78																						
1220			54 OCEANVIEW AVE	13.77																						
1221			4722 DIXIE DR	12.58																						
1222			4724 DIXIE DR	11.66																						
1223			96 OCEANVIEW AVE	12.22																						
1224			86 OCEANVIEW AVE	14.09																						
1225			82 OCEANVIEW AVE	12.71																						
1226			74 OCEANVIEW AVE	12.13																						
1227			4740 PENINSULA DR	9.03																						0.17
1228			4744 PENINSULA DR S	8.75																						0.45
1229			4747 PENINSULA DR S	11.76																						
1230			4749 PENINSULA DR S	11.82																						
1231			4753 PENINSULA DR S	11.22																						
1232			4755 PENINSULA DR S	10.61					-0.42		-0.41															-0.42
1233			4757 PENINSULA DR S	9.22																						-0.02
1235			4829 PENINSULA DR S	8																	1.16					1.20
1236			4835 PENINSULA DR S	7.90					-0.44	-0.54	-0.39										1.34				-0.47	1.30
1237			4837 PENINSULA DR S	8.32																	0.67					0.88
1238	1611	Off the Hook at Inlet Harbor, Inlet Harbor Marina	133 INLET HARBOR RD	5.56	-4.38	-4.11	-3.68	-3.61	-1.86	-3.16	0.85	-2.14	-1.87	-1.44	-1.37	0.37	1.11	1.38	1.81	1.88	3.62	1.13	1.40	1.83	1.90	3.64
1239			120 RAINS DR	5.47		-0.49	-0.45	-0.44	-0.10	-0.42	0.97					0.46	1.17	1.44	1.87	1.94	3.68	1.21	1.48	1.91	1.98	3.73
1240			112 RAINS DR	6.05							0.39					-0.12	0.35	0.62	1.05	1.12	2.86	0.63	0.90	1.33	1.40	3.15
1241			107 RAINS DR	5.46		-0.48	-0.44	-0.43	-0.09	-0.41	0.98					0.47	1.07	1.34	1.77	1.84	3.58	1.22	1.49	1.92	1.99	3.74
1242			105 RAINS DR	5.85					-0.48		0.59					0.08	0.53	0.80	1.23	1.30	3.04	0.83	1.10	1.53	1.60	3.35
1243	1244		4818 PENINSULA DR S	3.97	-0.39	-0.37	-0.31	-0.30	-0.17	-0.26	2.44	-0.55	-0.28	0.15	0.22	1.96	2.48	2.75	3.18	3.25	4.99	2.72	2.99	3.42	3.49	5.23
1245			101 RAINS DR	5.90							0.54					0.03	0.67	0.94	1.37	1.44	3.18	0.78	1.05	1.48	1.55	3.30

Asset ID1	Asset ID2	Asset Name	Address	Finished Floor Elevation (ft)	Stormwater Building Flood Depth (ft)							High Tide Building Flood Depth (ft)					Category 2 Hurricane Surge Building Flood Depth (ft)					Compound Building Flood Depth (ft)				
					2023	2040IL	2040IH	2070IL	2070IH	2100IL	2100IH	2023	2040IL	2040IH	2070IL	2070IH	2023	2040IL	2040IH	2070IL	2070IH	2023	2040IL	2040IH	2070IL	2070IH
1246		JONES/PRESTON/WILKINSON HOUSE	4879 SAILFISH DR	5.55			-1.29	-1.27	-1.00	-1.18	0.87				-1.36	0.38	0.86	1.13	1.56	1.63	3.37	1.13	1.40	1.83	1.90	3.65
1247		JAMES HOUSE	4856 SAILFISH DR	5.98							0.43					-0.05	0.50	0.77	1.20	1.27	3.01	0.71	0.98	1.41	1.48	3.22
1248	1610	DOWN THE HATCH	4894 FRONT ELEVATION ST	4	-2.82	-2.55	-2.12	-2.05	-0.31	-1.60	2.42	-0.58	-0.31	0.12	0.19	1.93	2.80	3.07	3.50	3.57	5.31	2.69	2.96	3.39	3.46	5.20
1249		BATELLE, INC.	4928 SAILFISH DR	10							-3.58					-4.07	-2.91	-2.64	-2.21	-2.14	-0.40	-3.31	-3.04	-2.61	-2.54	-0.80
1250		PACETTI HOTEL	4928 S PENINSULA DR	6.7	-2.50	-2.29	-2.28	-2.27	-2.09	-2.22	-0.28	-3.28	-3.01	-2.58	-2.51	-0.77	0.46	0.73	1.16	1.23	2.97	-0.01	0.26	0.69	0.76	2.50
1251			4894 SAILFISH DR	4.17		-0.53	-0.50	-0.50	-0.18	-0.45	2.25	-0.75	-0.48	-0.05	0.03	1.76	2.44	2.71	3.14	3.21	4.95	2.51	2.79	3.22	3.28	5.03
1252			4932 PENINSULA DR S	5.94		-1.53	-1.52	-1.51	-1.33	-1.46	0.48					-0.01	1.09	1.36	1.79	1.86	3.60	0.75	1.02	1.45	1.52	3.26
1253			4932 PENINSULA DR S	4.67	-0.47	-0.26	-0.25	-0.24	-0.06	-0.19	1.75				-0.48	1.26	2.42	2.69	3.12	3.19	4.93	2.02	2.29	2.72	2.79	4.53
1254			4932 PENINSULA DR S	4.60	-0.40	-0.19	-0.18	-0.17	0.01	-0.12	1.82					1.33	2.78	3.05	3.48	3.55	5.29	2.09	2.36	2.79	2.86	4.60
1255		PONCE DE LEON INLET LIGHTHOUSE	4931 S PENINSULA DR	11.66																						
1256		ASSISTANT KEEPER'S COTTAGE	4931 S PENINSULA DR	11.92																						
1257		LIGHTHOUSE KEEPER'S COTTAGE	4931 S PENINSULA DR	11.89																						
1258		OIL STORAGE BUILDING	4931 S PENINSULA DR	12.16																						
1259		LIGHTHOUSE OIL STORAGE BUILDING	4931 S PENINSULA DR	11.32																						
1600		Kopec Insurance Kopec Insurance	4604 S Atlantic Ave	11.37																						
1601		Adams Cameron & Co Realtors & Ho Daddy O's	4600 S Atlantic Ave	11.42																						
1602	1607	Harbour Village Ship Store + Bar & Grill	4621 Rivers Edge Village Ln	7.21																	1.32	-0.52	-0.25	0.18	0.25	1.99
1603		Waverly Tower	55 Inlet Harbor Rd	12.45																						
1604		Lighthouse Marina Commercial Building	4958 S Peninsula Dr	9.66																	0.59					-0.46
1605		Daytona Beach Parasail	4936 S Peninsula Dr Suite A	4.81							1.61						2.28	2.55	2.98	3.05	4.79	1.88	2.15	2.58	2.65	4.39
1608		Jerry's Italian Grill & Tiki Bar, Surf Shop	33 Inlet Harbor Rd	11.37																						
1609		Hidden Treasure Rum Bar & Grill	4940 S Peninsula Dr	5.6	-1.40	-1.19	-1.18	-1.17	-0.99	-1.12	0.82	-2.18	-1.91	-1.48	-1.41	0.33	2.20	2.47	2.90	2.97	4.71	1.09	1.36	1.79	1.86	3.60
1612		East Wind Condos Management Office	125 Inlet Harbor Rd	4.85							1.56	-1.43	-1.16	-1.16	-0.66	1.07	1.54	1.81	2.24	2.31	4.05	1.84	2.11	2.54	2.61	4.35
1613		7-Eleven	4618 S Atlantic Ave	11.17																						
1614		Commercial/Retail Shop	4616 S Atlantic Ave	11.22																						

Where:

##	Flooding within the right-of-way but not on pavement
##	Flooding up to 6-inches of depth on pavement
##	Flooding greater than 6-inches of depth on pavement

Asset ID1	Asset ID2	Asset ID3	Asset ID4	Asset ID5	Asset ID6	Asset Name	Address	Min Elev (ft)	Property Percent Area Inundated By Flooding (%)																					
									Stormwater							High Tide					Category 2 Hurricane					Compound				
									2023	2040IL	2040IH	2070IL	2070IH	2100IL	2100IH	2023	2040IL	2040IH	2070IL	2070IH	2023	2040IL	2040IH	2070IL	2070IH	2023	2040IL	2040IH	2070IL	2070IH
1004	1122					PUBLIC WORKS YARD	4875 S. PENINSULA D	4.93	26	26	27	27	30	28	31					9	13	19	30	33	91	26	26	46	50	91
1101						Cell Tower at Pollard Park	4680 S PENINSULA DR	4.54							99					94	78	91	100	100	100	99	99	99	99	99
1103						4354 S Peninsula Lift Station	4354 S PENINSULA DR	4.63							100					97	100	100	100	100	100	100	100	100	100	100
1104						4427 S Peninsula Lift Station	4427 S PENINSULA DR	6.39							0.5										11	1	2	5	6	31
1105						4650 S Peninsula Lift Station	4650 S PENINSULA DR	5.89							24								16	21	100	49	65	96	97	100
1106						4875 S Peninsula Lift Station	4875 S PENINSULA DR	5.80	96	96	96	96	96	96	97						46	84	96	96	100	96	96	99	100	100
1107						81 Oceanway Lift Station	81 OCEANWAY DR	9.82																						
1108	1114	1608				31 Inlet Harbor Lift Station	31 INLET HARBOR RD	8.91	3	3	3	3	18	4	29											3	3	3	3	18
1009						127 Ponce De Leon Cir Lift Station	127 PONCE DE LEON CIR	3.58	87	87	87	87	92	90	97		82	100	100	100	97	97	97	97	97	97	97	97	97	97
1110	1112	1115	1238	1524	1529	INLET HARBOR MARINA	133 INLET HARBOR RD	-1.60	19	20	20	20	52	21	100	25	49	86	88	96	96	96	96	96	96	100	100	100	100	100
1111	1116	1119	1533	1604		LIGHTHOUSE BOATYARD LLC	4958 S PENINSULA DR	-1.60	2	2	2	2	10	3	18	8	9	11	12	16	17	18	20	21	66	18	19	19	19	49
1113	1530					Ocean Support, Inc.	4950 S PENINSULA DR	-1.60	2	2	2	2	11	2	21	7	10	14	14	17	80	88	93	94	99	30	59	80	83	99
1117	1120					SNOW WHITE BOAT	4890 Front Street	-1.60	7	8	9	9	58	10	100	18	50	92	93	93	94	94	94	94	94	100	100	100	100	100
1118	1248	1535	1610			SEA LOVE BOAT WORKS INC FUEL STORAGE	4884 FRONT ST	-1.60	1	1	2	2	37	4	100	12	36	89	92	99	99	99	99	99	99	100	100	100	100	100
1121						4329 CANDLEWOOD LANE FUEL STORAGE	4329 CANDLEWOOD LN	13.72																						
1200						LIGHTHOUSE POINT [SOLARIS ID: A184]	5000 S ATLANTIC AVE	-1.60	100	100	100	100	100	100	100											100	100	100	100	100
1201						BEACH ACCESS [SOLARIS ID: A2099]	INLET HARBOR RD & S ATLANTIC AVE	11.51																						
1202						LPP NORTH PENINSULA [SOLARIS ID: A13898]	5000 S ATLANTIC AVE	-1.60	28	33	35	36	49	39	68	20	22	27	27	43	50	51	53	54	62	60	64	67	68	78
1203						NON-PROJECT ACQUISITION [SOLARIS ID: A46882]	PONCE DE LEON INLET	-1.60	94	94	94	94	94	94	94											94	94	94	94	94

Asset ID1	Asset ID2	Asset ID3	Asset ID4	Asset ID5	Asset ID6	Asset Name	Address	Min Elev (ft)	Property Percent Area Inundated By Flooding (%)																					
									Stormwater							High Tide					Category 2 Hurricane					Compound				
									2023	2040IL	2040IH	2070IL	2070IH	2100IL	2100IH	2023	2040IL	2040IH	2070IL	2070IH	2023	2040IL	2040IH	2070IL	2070IH	2023	2040IL	2040IH	2070IL	2070IH
1204						LIGHTHOUSE POINT PARK [SOLARIS ID: CL11182]	5000 S ATLANTIC AVE	8.70							47										2					
1205						LIGHTHOUSE POINT PARK [SOLARIS ID: CL11183]	5000 S ATLANTIC AVE	3.88		0.3	1	1	9	3	42			2	3	22	37	40	44	44	56	32	34	37	37	53
1206						LIGHTHOUSE POINT PARK [SOLARIS ID: CL11184]	5000 S ATLANTIC AVE	3.63	9	13	17	18	40	25	54			5	5	38	46	60	83	85	98	66	83	95	97	100
1207						LIGHTHOUSE POINT PARK [SOLARIS ID: CL11185]	5000 S ATLANTIC AVE	3.74					3		93			2	2	50	100	100	100	100	100	96	99	100	100	100
1208						HASTY FAMILY PLOT	BEACH ST & SAILFISH DR	2.83	32	54	55	55	79	56	99	71	79	85	85	97	100	100	100	100	100	99	99	99	99	99
1209						PACETTI FAMILY PLOT	SAILFISH DR & S PENINUSULA DR	3.51	27	56	56	57	67	61	93		2	25	34	91	96	97	99	99	100	94	96	97	98	100
1210						Kay and Ayers Davies Lighthouse Park	4931 S PENINSULA DR	5.98													1	2	5	6	21		0.4	1	1	15
1211						FIRST RACETRACK NASCAR	S ATLANTIC AVE	-3.50	6	7	7	7	12	8	16	1	1	1	1	3	3	3	3	3	4	8	10	10	10	13
1234						UNKNOWN HISTORICAL STRUCTURE	4784 S PENINSULA DR	4.40							27					20	25	30	38	39	69	32	37	45	46	78
1260						BEACH ST BEACH ACCESS	BEACH ST & ATLANTIC AVE	4.41																	22					59
1261						GLENVIEW AVENUE BEACH ACCESS	GLENVIEW AVE & S ATLANTIC AVE	10.98																						
1262						OCEANVIEW AVENUE BEACH ACCESS	OCEANVIEW AVE & S ATLANTIC AVE	11.52																						
1263						NORTH TURN BEACH ACCESS	4511 S ATLANTIC AVE	5.48							19					11		9	13	13	33	24	28	32	33	44
1264						CALUMET AVENUE BEACH ACCESS	CALUMET AVE & S ATLANTIC AVE	4.50																						
1265						Green Mound State Archaeological Site	Ponce Preserve - S PENINSULA DR	-1.60	24	34	50	52	74	58	84	65	67	69	70	75	74	75	75	76	77	83	84	84	84	86
1266						Ponce Preserve	4401 S PENINSULA DR	-1.60	21	24	38	41	55	46	64	45	46	47	48	52	54	54	55	55	58	60	60	61	61	66
1267						Timothy Pollard Memorial Park	4680 S PENINSULA DR	1.84			0.02	0.03	9	0.2	84	5	9	14	15	51	47	51	56	57	64	86	87	90	90	97

Asset ID1	Asset ID2	Asset ID3	Asset ID4	Asset ID5	Asset ID6	Asset Name	Address	Min Elev (ft)	Property Percent Area Inundated By Flooding (%)																					
									Stormwater							High Tide					Category 2 Hurricane					Compound				
									2023	2040IL	2040IH	2070IL	2070IH	2100IL	2100IH	2023	2040IL	2040IH	2070IL	2070IH	2023	2040IL	2040IH	2070IL	2070IH	2023	2040IL	2040IH	2070IL	2070IH
1269						Wilbur Bay Wetlands	4324 S PENINSULA DR	-1.60	56	65	77	79	92	83	99	66	68	70	70	75	73	74	75	75	75	100	100	100	100	100
1270						Timucuan Oaks Botanical Garden	4550 S PENINSULA DR	-1.60	26	38	49	50	72	58	88	69	71	75	75	86	82	84	87	87	93	88	89	91	91	98
1271						Happy Tails Dog Park	4700 S PENINSULA DR	4.32							46					32	25	31	41	43	73	55	60	65	66	85
1272						Elber's Sunset Park	FRONT ST	-1.60	98	99	99	99	100	99	100	2	2	2	2	2	2	2	2	2	2	100	100	100	100	100
1273						Winterhaven Park	4589 S ATLANTIC AVE	9.84							21															
1500						Ponce Inlet Boating Facility at Lighthouse Park	4944 S PENINSULA DR	-1.60	63	66	71	72	94	78	99	35	40	45	45	46	46	46	46	46	46	99	99	99	99	99
1525	1532					SEA LOVE BOAT WORKS	4877 FRONT STREET	-1.60	35	48	50	50	81	54	100	62	69	86	87	87	87	87	87	87	87	100	100	100	100	100
1526						HIDDEN TREASURE MARINA	4940 S PENINSULA DR	-1.60	20	42	43	44	58	48	100	2	2	14	19	94	95	95	95	95	95	100	100	100	100	100
1527						DATYONA BEACH PARASAIL MARINA	4936 S. PENINSULA DR.	-1.60	35	52	53	53	68	56	100	6	6	24	29	85	90	90	90	90	90	100	100	100	100	100
1531						INLET COVE MARINA	125 INLET HARBOR RD	-1.60	7	7	8	8	22	9	100	9	21	55	60	99	100	100	100	100	100	100	100	100	100	100
1528						LIGHTHOUSE BOAT YARD - PRIVATE	4958 S PENINSULA DR	-1.60	0.5	0.5	1	1	2	1	21	1	1	2	2	14	27	27	29	30	51	22	24	26	27	40
1534						HARBOR VILLAGE GOLF & YACHT CLUB	4622 LINKS VILLAGE DR	-1.60	16	20	23	24	46	35	99	39	42	47	48	93	91	93	94	94	95	99	99	99	99	99
2200						LIGHTHOUSE POINT PARK, PONCE INLET PORT AUTHORITY	5000 S ATLANTIC AVE	5.53		12	20	22	39	31	46					8	3	5	6	6	7	6	18	27	28	48
2201						LIGHTHOUSE POINT PARK, US DEPT OF INTERIOR	5000 S ATLANTIC AVE	-1.60	8	8	9	9	12	10	16	5	5	6	6	9	23	31	39	40	56	17	17	28	31	57

Where:

- ## (green) Flooding within the property is less than or equal to 10% of area
- ## (blue) Flooding within the property is greater than 10% and less than or equal to 50% of area
- ## (yellow) Flooding within the property is greater than 50% of area

Asset ID1	Roadway	Segment Location	Min Elev (ft)	Maximum Pavement Flood Depth (ft)																					
				Stormwater							High Tide					Category 2 Hurricane					Compound				
				2023	2040IL	2040IH	2070IL	2070IH	2100IL	2100IH	2023	2040IL	2040IH	2070IL	2070IH	2023	2040IL	2040IH	2070IL	2070IH	2023	2040IL	2040IH	2070IL	2070IH
1501	S ATLANTIC AVE	CARIBBEAN WAY & OCEAN WAY DR	6.24					0.91	0.45	1.06					ROW ONLY	0.04	0.31	0.74	0.81	2.55	ROW ONLY	0.68	1.13	1.20	2.99
1502	S ATLANTIC AVE	BEACH ST & CARIBBEAN WAY	6.24					1.54	0.83	1.74						0.06	0.33	0.76	0.83	2.57		0.68	1.13	1.20	2.99
1503	S ATLANTIC AVE	OCEAN WAY & LIGHTHOUSE DR	4.60			0.55	0.62	1.40	0.87	1.87					1.34	1.72	1.99	2.42	2.49	4.23	2.08	2.35	2.78	2.85	4.61
1504	S ATLANTIC AVE	GLENVIEW AVE & CALUMET AVE	14.57	0.26	0.29	0.29	0.29	0.41	0.30	0.44											0.26	0.29	0.29	0.29	0.41
1505	S ATLANTIC AVE	CINDY LN & OCEANVIEW AVE	12.77																						
1506	S ATLANTIC AVE	OCEANVIEW AVE & GLENVIEW AVE	13.77																						
1507	S ATLANTIC AVE	COASTAL OAKS CIR & INLET POINT BLVD	9.00	0.12	0.27	0.33	0.35	0.81	0.46	1.01									ROW ONLY	ROW ONLY	0.12	0.27	0.33	0.35	0.84
1508	S ATLANTIC AVE	WINTERHAVEN PARK & HARBOUR VILLAGE BLVD	11.00					0.21		0.33															0.21
1509	S ATLANTIC AVE	HARBOUR VILLAGE BLVD & CINDY LN	10.63	0.84	1.03	1.03	1.03	1.05	1.03	1.59										ROW ONLY	0.84	1.03	1.03	1.03	1.05
1510	S ATLANTIC AVE	MAR AZUL N & COASTAL OAKS CIR	9.03	0.08	0.24	0.30	0.32	0.79	0.44	0.99										ROW ONLY	0.08	0.24	0.30	0.32	0.81
1511	S ATLANTIC AVE	INLET HARBOR RD & MAR AZUL N	15.31																						
1512	S ATLANTIC AVE	JANA DR & SEAHAVEN DR	12.14	0.70	0.73	0.73	0.73	0.80	0.74	1.17											0.71	0.75	0.75	0.75	0.82
1513	S ATLANTIC AVE	PONCE PRESERVE & JANA DR	12.00	1.37	1.10	1.10	1.10	1.10	1.10	1.75											1.37	1.10	1.10	1.10	1.10
1514	S ATLANTIC AVE	SEAHAVEN DR & N TURN APPROACH	12.37	0.47	0.50	0.50	0.50	0.57	0.51	0.94											0.48	0.52	0.52	0.52	0.59
1515	S ATLANTIC AVE	N TURN APPROACH & POMPANO DR	11.51					0.69		0.78															0.69
1516	S ATLANTIC AVE	POMPANO DR & WINTERHAVEN PARK	10.97	0.54	0.60	0.60	0.60	0.99	0.60	1.11											0.54	0.60	0.60	0.60	0.99
1517	S ATLANTIC AVE	CALUMET AVE & INLET HARBOR RD	12.83	0.91	0.94	0.97	0.97	1.19	1.02	1.22											0.91	0.94	0.97	0.97	1.19
1518	S ATLANTIC AVE	CITY LIMIT & OLD CARRIAGE RD	13.37	0.14	0.13	0.13	0.13	0.12	0.13	0.68											0.14	0.13	0.13	0.13	0.12
1519	S ATLANTIC AVE	INLET POINT BLVD & BEACH ST	8.51	0.61	0.76	0.82	0.84	1.30	0.95	1.50										0.27	0.61	0.76	0.82	0.84	1.32
1520	BEACH ST	S PENINSULA DR & S ATLANTIC AVE	6.86	0.16	0.31	0.37	0.38	0.85	0.50	1.04					ROW ONLY	ROW ONLY	ROW ONLY	0.14	0.21	1.95	0.16	0.31	0.46	0.55	2.35
1521	ROBERT A MERRIL PKWY	LIGHTHOUSE DR & S PENINSULA DR	3.83		0.07	0.08	0.08	0.42	0.12	2.59			0.30	0.37	2.11	3.61	3.88	4.31	4.38	6.12	2.86	3.13	3.55	3.62	5.37
152301	S PENINSULA DR	CITY LIMIT & OLD CARRIAGE RD	4.67	ROW ONLY	ROW ONLY	ROW ONLY	ROW ONLY	ROW ONLY	ROW ONLY	1.74	ROW ONLY	ROW ONLY	ROW ONLY	ROW ONLY	1.34	0.70	0.97	1.40	1.47	3.21	2.02	2.29	2.72	2.79	4.52
152302	S PENINSULA DR	OLD CARRIAGE RD W & OLD CARRIAGE RD E	5.21							1.20					0.75	0.11	0.38	0.81	0.88	2.62	1.48	1.75	2.18	2.25	3.99
152303	S PENINSULA DR	OLD CARRIAGE RD E & ANCHOR DR	4.94							1.47					1.00	0.36	0.63	1.06	1.13	2.87	1.75	2.02	2.45	2.52	4.26
152304	S PENINSULA DR	ANCHOR DR & JANA DR	4.29	0.61	0.61	0.61	0.61	0.65	0.62	2.12	ROW ONLY	ROW ONLY	ROW ONLY	ROW ONLY	1.70	3.53	3.80	4.23	4.30	6.04	2.40	2.67	3.10	3.17	4.91
152305	S PENINSULA DR	JANA DR & TIA MARIA CIR	5.22						ROW ONLY	1.20	ROW ONLY	ROW ONLY	ROW ONLY	ROW ONLY	0.72	0.18	0.45	0.88	0.95	2.69	1.47	1.74	2.17	2.24	3.98
152306	S PENINSULA DR	TIA MARIA CIR & SUN DUNES CIR	4.40	0.68	0.69	0.69	0.69	0.69	0.69	2.02	ROW ONLY	ROW ONLY	ROW ONLY	ROW ONLY	1.54	1.00	1.27	1.70	1.77	3.51	2.29	2.56	2.99	3.06	4.80
152307	S PENINSULA DR	SUN DUNES CIR & SEAWINDS CIR	4.42	0.66	0.67	0.67	0.67	0.67	0.67	2.00			ROW ONLY	ROW ONLY	1.52	0.98	1.25	1.68	1.75	3.49	2.27	2.54	2.97	3.04	4.78
152308	S PENINSULA DR	SEAWINDS CIR	5.40							1.02					0.54	0.001	0.27	0.70	0.77	2.51	1.29	1.56	1.99	2.06	3.80
152309	S PENINSULA DR	SEAWINDS CIR & MAURA TER	6.29							0.14					ROW ONLY	ROW ONLY	ROW ONLY	ROW ONLY	ROW ONLY	1.63	0.40	0.67	1.09	1.16	2.91
152310	S PENINSULA DR	MAURA TER & DAGGETT COVE DR	6.43					ROW ONLY		0.46										1.48	ROW ONLY	0.10	0.82	0.91	2.77
152311	S PENINSULA DR	DAGGETT COVE DR & POMPANO DR	6.05	0.24	0.25	0.25	0.25	0.59	0.25	0.81					ROW ONLY		ROW ONLY	0.05	0.12	1.86	0.38	0.64	1.20	1.28	3.15
152312	S PENINSULA DR	POMPANO DR & MARIE DR	6.11	0.18	0.19	0.19	0.19	0.53	0.19	0.75								ROW ONLY	0.06	1.80	0.32	0.58	1.14	1.22	3.09

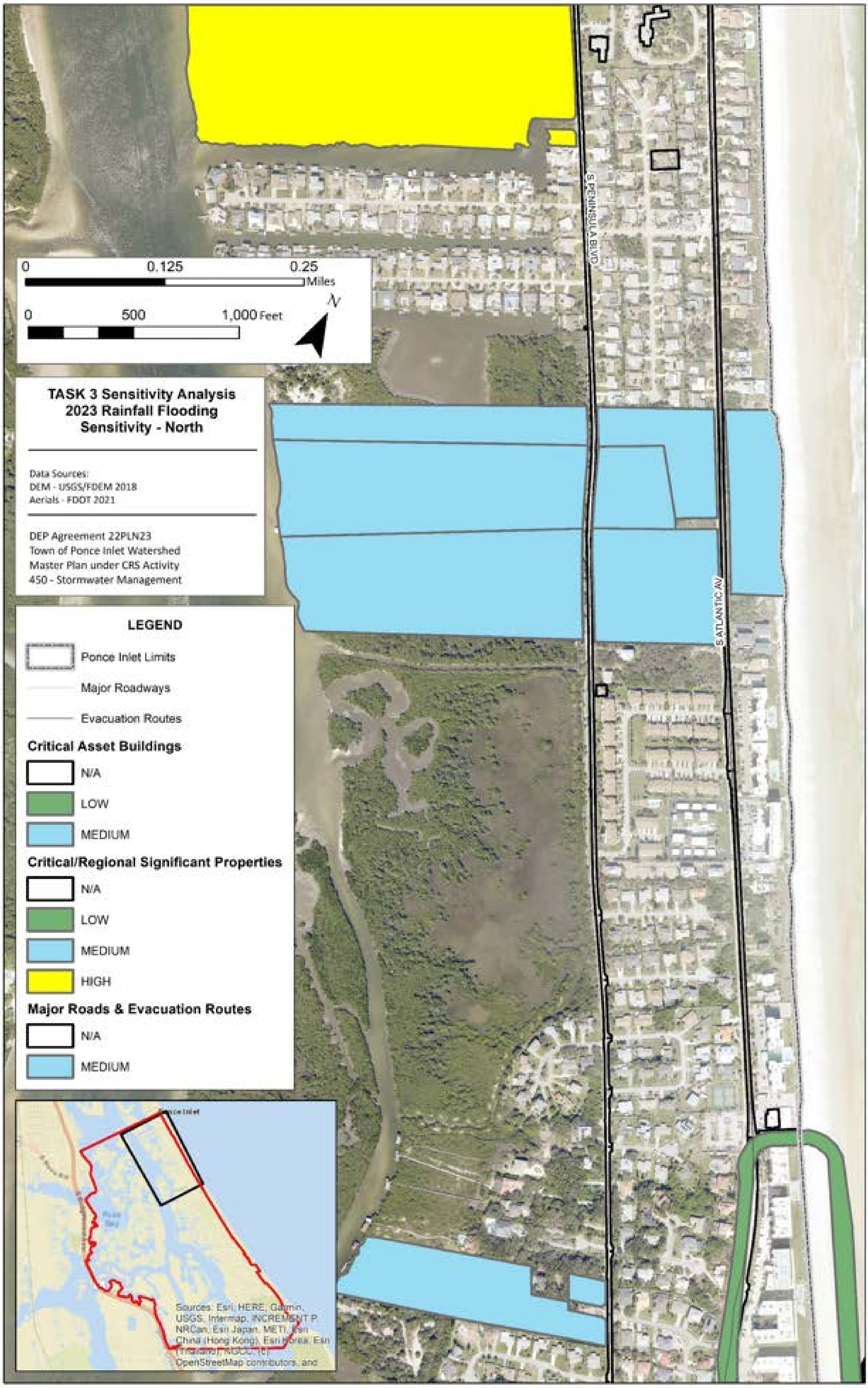
Asset ID1	Roadway	Segment Location	Min Elev (ft)	Maximum Pavement Flood Depth (ft)																					
				Stormwater							High Tide					Category 2 Hurricane					Compound				
				2023	2040IL	2040IH	2070IL	2070IH	2100IL	2100IH	2023	2040IL	2040IH	2070IL	2070IH	2023	2040IL	2040IH	2070IL	2070IH	2023	2040IL	2040IH	2070IL	2070IH
152313	S PENINSULA DR	MARIE DR & HARBOUR VILLAGE BLVD	4.59	ROW ONLY	ROW ONLY	ROW ONLY	ROW ONLY	ROW ONLY	ROW ONLY	1.85			ROW ONLY	ROW ONLY	1.35	0.97	1.24	1.67	1.74	3.48	2.10	2.37	2.80	2.87	4.61
152314	S PENINSULA DR	HARBOUR VILLAGE BLVD & LOGGERHEAD CT	4.23	ROW ONLY	ROW ONLY	ROW ONLY	ROW ONLY	0.51	ROW ONLY	2.20		ROW ONLY	ROW ONLY	ROW ONLY	1.71	1.36	1.63	2.06	2.13	3.87	2.46	2.73	3.16	3.23	4.97
152315	S PENINSULA DR	LOGGERHEAD CT & CINDY LN	8.58							0.32															0.62
152316	S PENINSULA DR	CINDY LN & OCEANVIEW AVE	9.32					0.17		0.44															0.17
152317	S PENINSULA DR	OCEANVIEW AVE & ALBERTA AVE	9.74							0.06															
152318	S PENINSULA DR	ALBERTA AVE & CALUMET AVE	9.51	0.15	0.18	0.23	0.24	0.45	0.32	0.46											0.15	0.18	0.23	0.24	0.45
152319	S PENINSULA DR	CALUMET AVE & BUSCHMAN DR	9.50	0.16	0.19	0.24	0.25	0.39	0.33	0.39											0.16	0.19	0.24	0.25	0.39
152320	S PENINSULA DR	BUSCHMAN DR & INLET HARBOR RD	8.88			ROW ONLY	ROW ONLY	ROW ONLY	ROW ONLY	ROW ONLY										0.01			ROW ONLY	ROW ONLY	0.33
152321	S PENINSULA DR	INLET HARBOR RD & PONCE DE LEON CIR	8.34	ROW ONLY	0.04	0.13	0.15	0.47	0.27	0.51										0.49	ROW ONLY	0.04	0.13	0.15	0.87
152322	S PENINSULA DR	PONCE DE LEON CIR & MAR AZUL N	8.16	ROW ONLY	ROW ONLY	0.14	0.16	0.48	0.28	0.52										0.71	ROW ONLY	ROW ONLY	0.14	0.16	1.04
152323	S PENINSULA DR	MAR AZUL N & BAY HARBOUR DR	6.94	0.31	0.33	0.36	0.37	0.52	0.42	0.57							ROW ONLY	0.06	0.13	1.87	0.31	0.33	0.41	0.49	2.26
152324	S PENINSULA DR	BAY HARBOUR DR & JENNIFER CIR	7.08	0.06	0.08	0.11	0.12	0.27	0.17	0.33								ROW ONLY	ROW ONLY	1.68	0.06	0.08	0.29	0.36	2.12
152325	S PENINSULA DR	JENNIFER CIR	6.98	0.002	0.03	0.07	0.08	0.24	0.12	0.33								0.04	0.11	1.85	0.002	0.03	0.40	0.47	2.22
152326	S PENINSULA DR	JENNIFER CIR & BEACH ST	6.57	0.43	0.43	0.45	0.45	0.55	0.48	0.57					ROW ONLY	ROW ONLY	0.06	0.49	0.56	2.30	0.43	0.43	0.81	0.88	2.63

Where:

ROW ONLY	Flooding within the right-of-way but not on pavement
##	Flooding up to 6-inches of depth on pavement
##	Flooding greater than 6-inches of depth on pavement

Appendix H

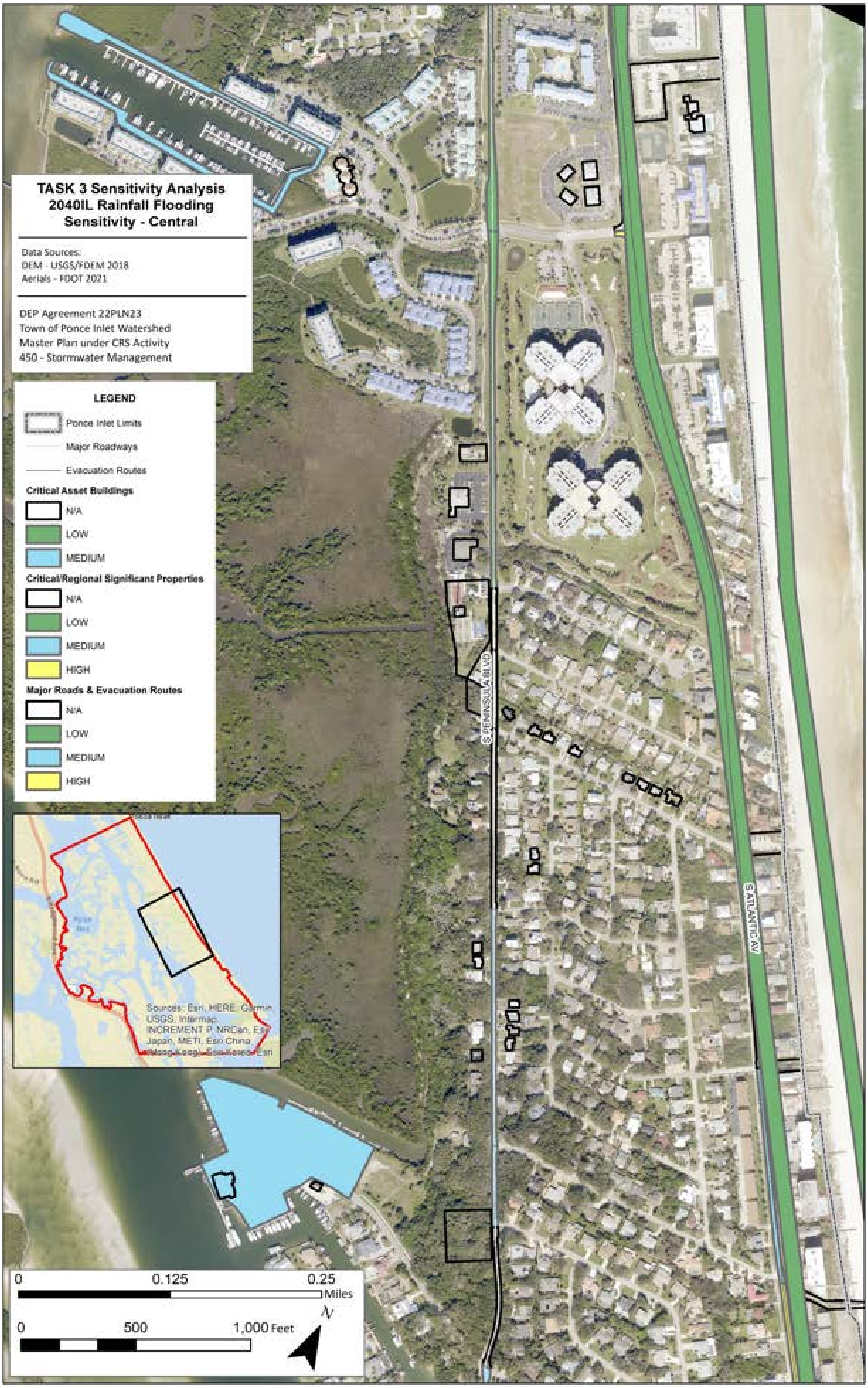
Task 3: Flood Sensitivity Analysis Maps


0
0.125
0.25
Miles
0
500
1,000 Feet
N
TASK 3 Sensitivity Analysis
2023 Rainfall Flooding
Sensitivity - North
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed
Master Plan under CRS Activity
450 - Stormwater Management
LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
LOW
MEDIUM
Critical/Regional Significant Properties
N/A
LOW
MEDIUM
HIGH
Major Roads & Evacuation Routes
N/A
MEDIUM
S PENINSULA BLVD
S ATLANTIC AV

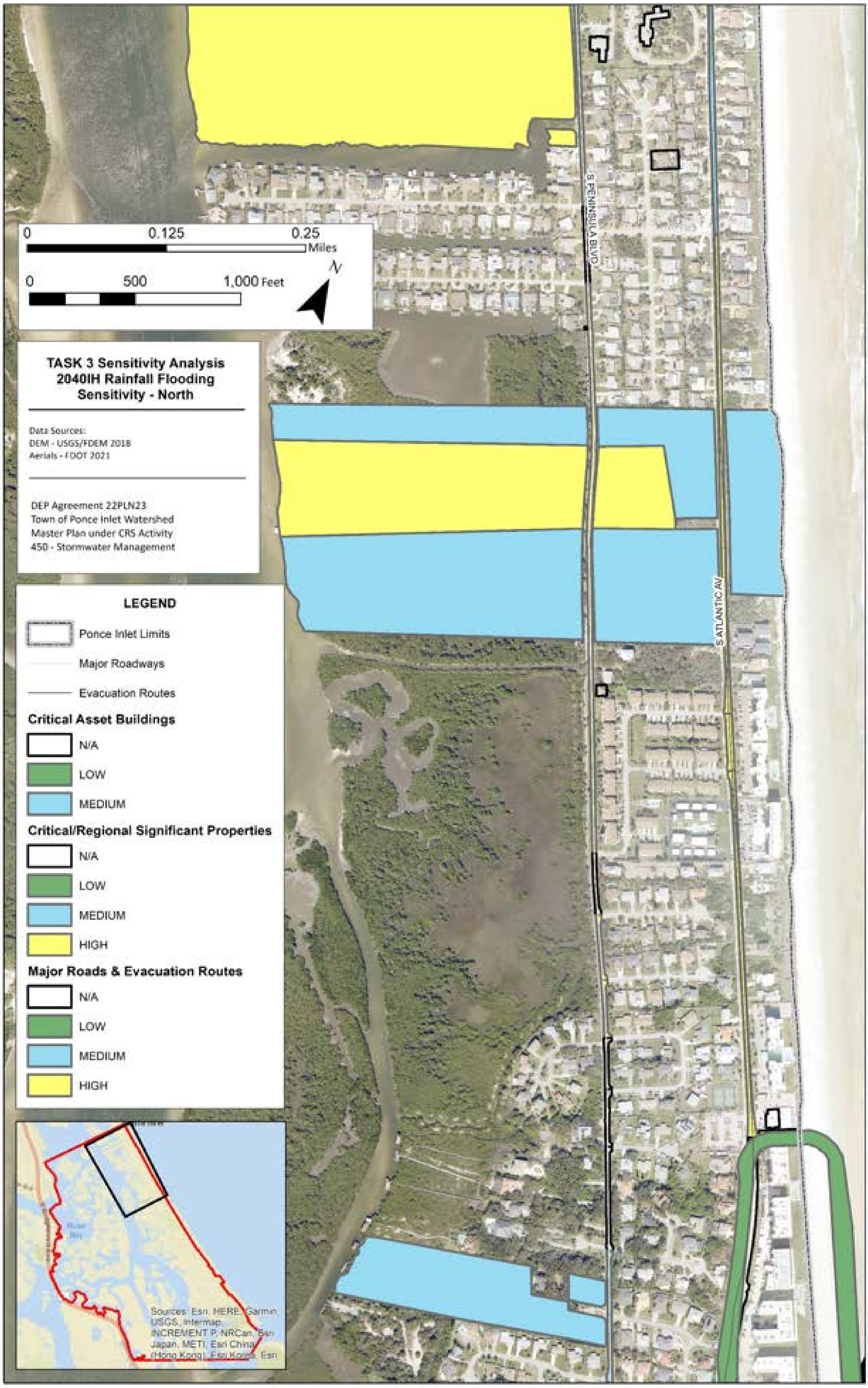

TASK 3 Sensitivity Analysis
2023 Rainfall
Flooding Sensitivity - Central
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed
Master Plan under CRS Activity
450 - Stormwater Management
LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
LOW
MEDIUM
Critical/Regional Significant Properties
N/A
LOW
MEDIUM
HIGH
Major Roads & Evacuation Routes
N/A
MEDIUM
S PENINSULA BLVD
S ATLANTIC AV
0
0.125
0.25
Miles
0
500
1,000 Feet
N


TASK 3 Sensitivity Analysis
2023 Rainfall Flooding
Sensitivity - South
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed
Master Plan under CRS Activity
450 - Stormwater Management
LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
LOW
MEDIUM
Critical/Regional Significant Properties
N/A
LOW
MEDIUM
HIGH
Major Roads & Evacuation Routes
N/A
MEDIUM
S PENINSULA BLVD
S ATLANTIC AV
BEACH ST
S ATLANTIC AVE
S ROBERT MERRELL PKY
0
0.125
0.25
Miles
0
500
1,000 Feet
N


0
0.125
0.25
Miles
0
500
1,000 Feet
N
TASK 3 Sensitivity Analysis
2040IL Rainfall Flooding
Sensitivity - North
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed
Master Plan under CRS Activity
450 - Stormwater Management
LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
LOW
MEDIUM
Critical/Regional Significant Properties
N/A
LOW
MEDIUM
HIGH
Major Roads & Evacuation Routes
N/A
LOW
MEDIUM
HIGH
S PENINSULA BLVD
S ATLANTIC AV
Ponce Inlet
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and

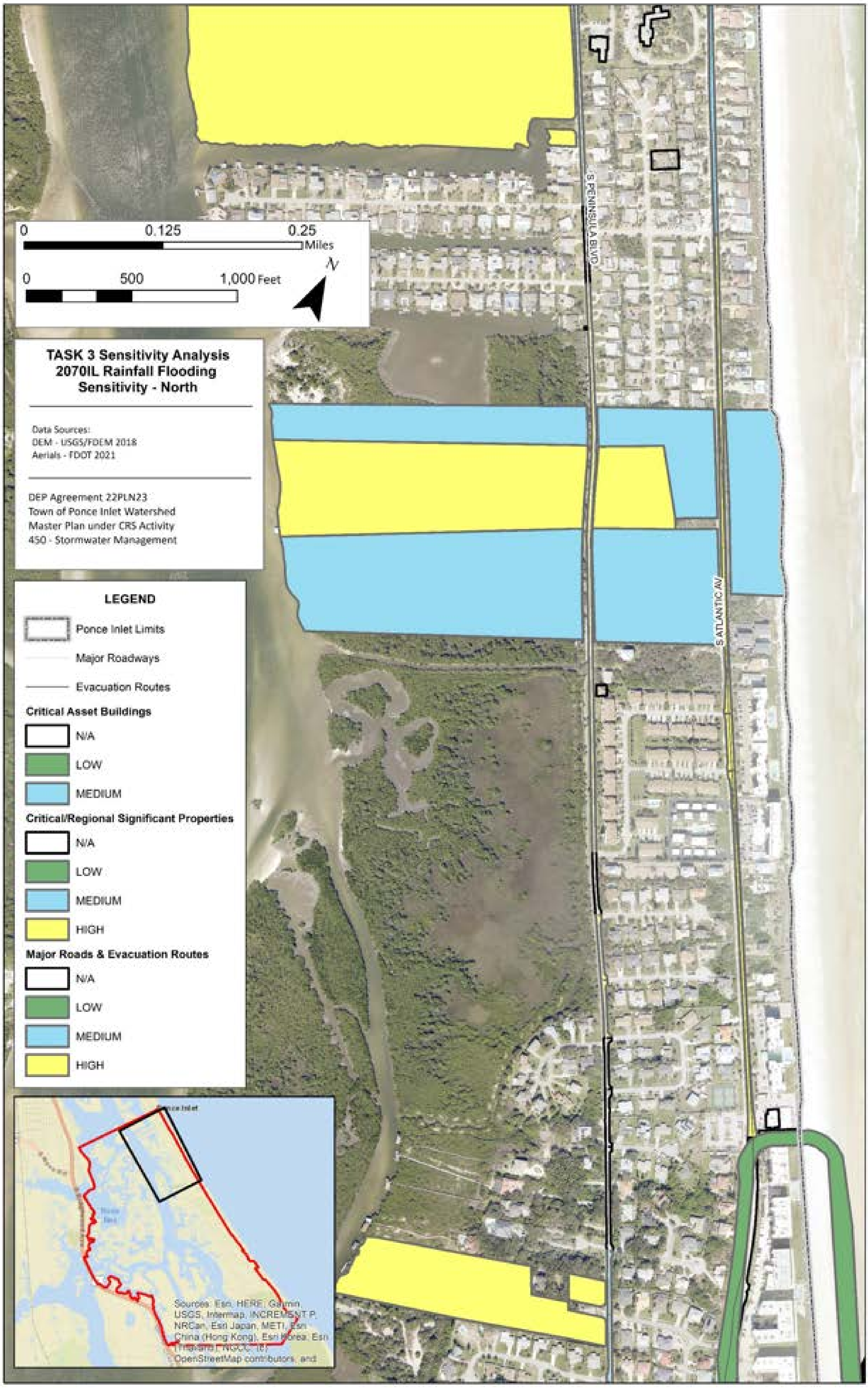

TASK 3 Sensitivity Analysis
2040IL Rainfall Flooding
Sensitivity - Central
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed
Master Plan under CRS Activity
450 - Stormwater Management
LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
LOW
MEDIUM
Critical/Regional Significant Properties
N/A
LOW
MEDIUM
HIGH
Major Roads & Evacuation Routes
N/A
LOW
MEDIUM
HIGH
S PENINSULA BLVD
S ATLANTIC AV
0
0.125
0.25
Miles
0
500
1,000 Feet
N


S PENINSULA BLVD
S ATLANTIC AV
BEACH ST
S ATLANTIC AVE
LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
LOW
MEDIUM
Critical/Regional Significant Properties
N/A
LOW
MEDIUM
HIGH
Major Roads & Evacuation Routes
N/A
LOW
MEDIUM
HIGH
TASK 3 Sensitivity Analysis
2040IL Rainfall Flooding
Sensitivity - South
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed
Master Plan under CRS Activity
450 - Stormwater Management
0 0.125 0.25 Miles
0 500 1,000 Feet
N
Ponce Inlet


0
0.125
0.25
Miles
0
500
1,000 Feet
N
TASK 3 Sensitivity Analysis
2040IH Rainfall Flooding
Sensitivity - North
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed
Master Plan under CRS Activity
450 - Stormwater Management
LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
LOW
MEDIUM
Critical/Regional Significant Properties
N/A
LOW
MEDIUM
HIGH
Major Roads & Evacuation Routes
N/A
LOW
MEDIUM
HIGH
S PENINSULA BLVD
S ATLANTIC AV
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri

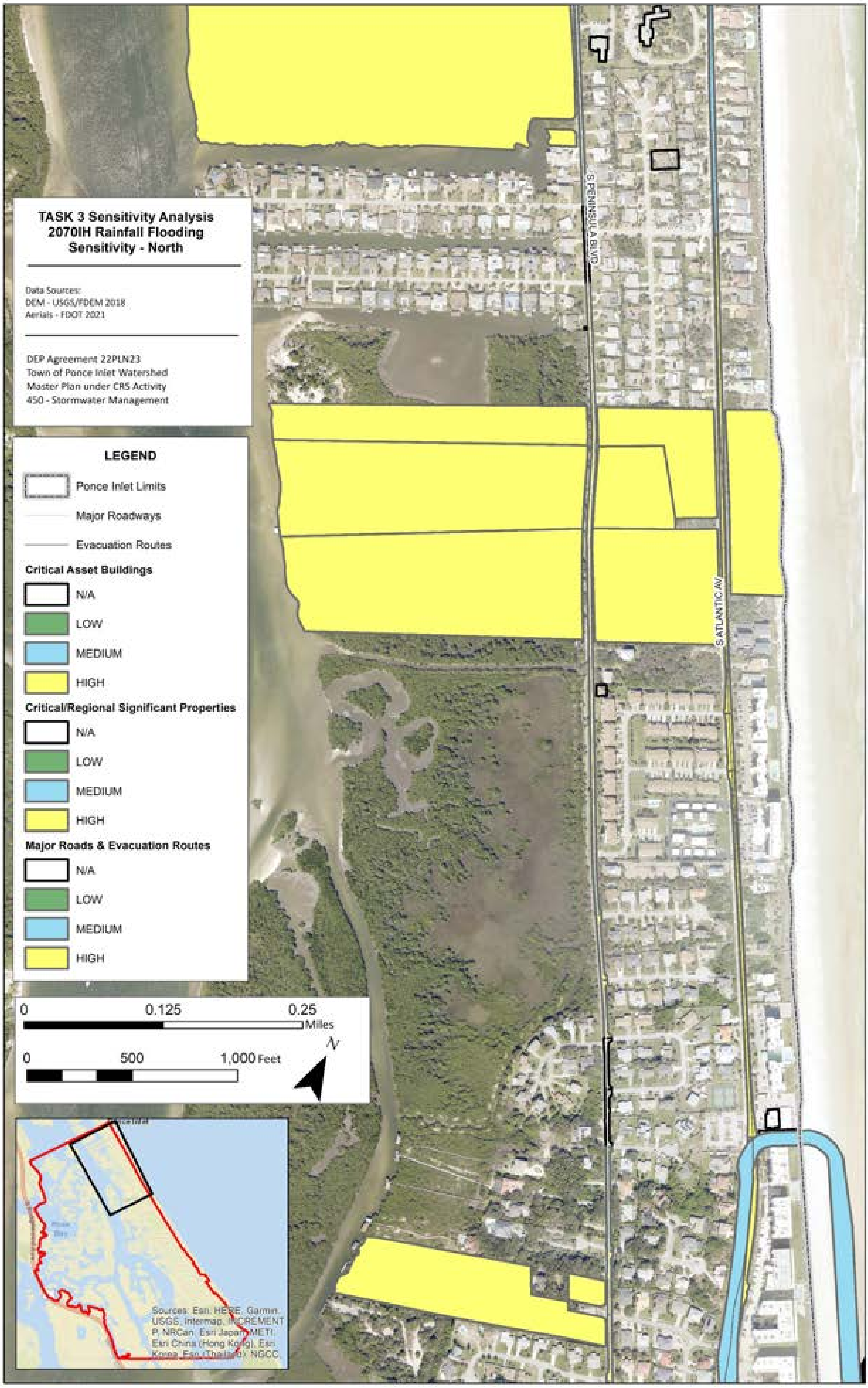

TASK 3 Sensitivity Analysis
2040IH Rainfall Flooding
Sensitivity - Central
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed
Master Plan under CRS Activity
450 - Stormwater Management
LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
LOW
MEDIUM
Critical/Regional Significant Properties
N/A
LOW
MEDIUM
HIGH
Major Roads & Evacuation Routes
N/A
LOW
MEDIUM
HIGH
S PENINSULA BLVD
S ATLANTIC AV
0
0.125
0.25
Miles
0
500
1,000 Feet
N


S PENINSULA BLVD
S ATLANTIC AV
BEACH ST
S ATLANTIC AVE
LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
LOW
MEDIUM
Critical/Regional Significant Properties
N/A
LOW
MEDIUM
HIGH
Major Roads & Evacuation Routes
N/A
LOW
MEDIUM
HIGH
TASK 3 Sensitivity Analysis
2040IH Rainfall Flooding
Sensitivity - South
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed
Master Plan under CRS Activity
450 - Stormwater Management
0 0.125 0.25 Miles
0 500 1,000 Feet
N
Ponce Inlet


0
0.125
0.25
Miles
0
500
1,000 Feet
N
TASK 3 Sensitivity Analysis
2070IL Rainfall Flooding
Sensitivity - North
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed
Master Plan under CRS Activity
450 - Stormwater Management
LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
LOW
MEDIUM
Critical/Regional Significant Properties
N/A
LOW
MEDIUM
HIGH
Major Roads & Evacuation Routes
N/A
LOW
MEDIUM
HIGH
S PENINSULA BLVD
S ATLANTIC AV
Ponce Inlet

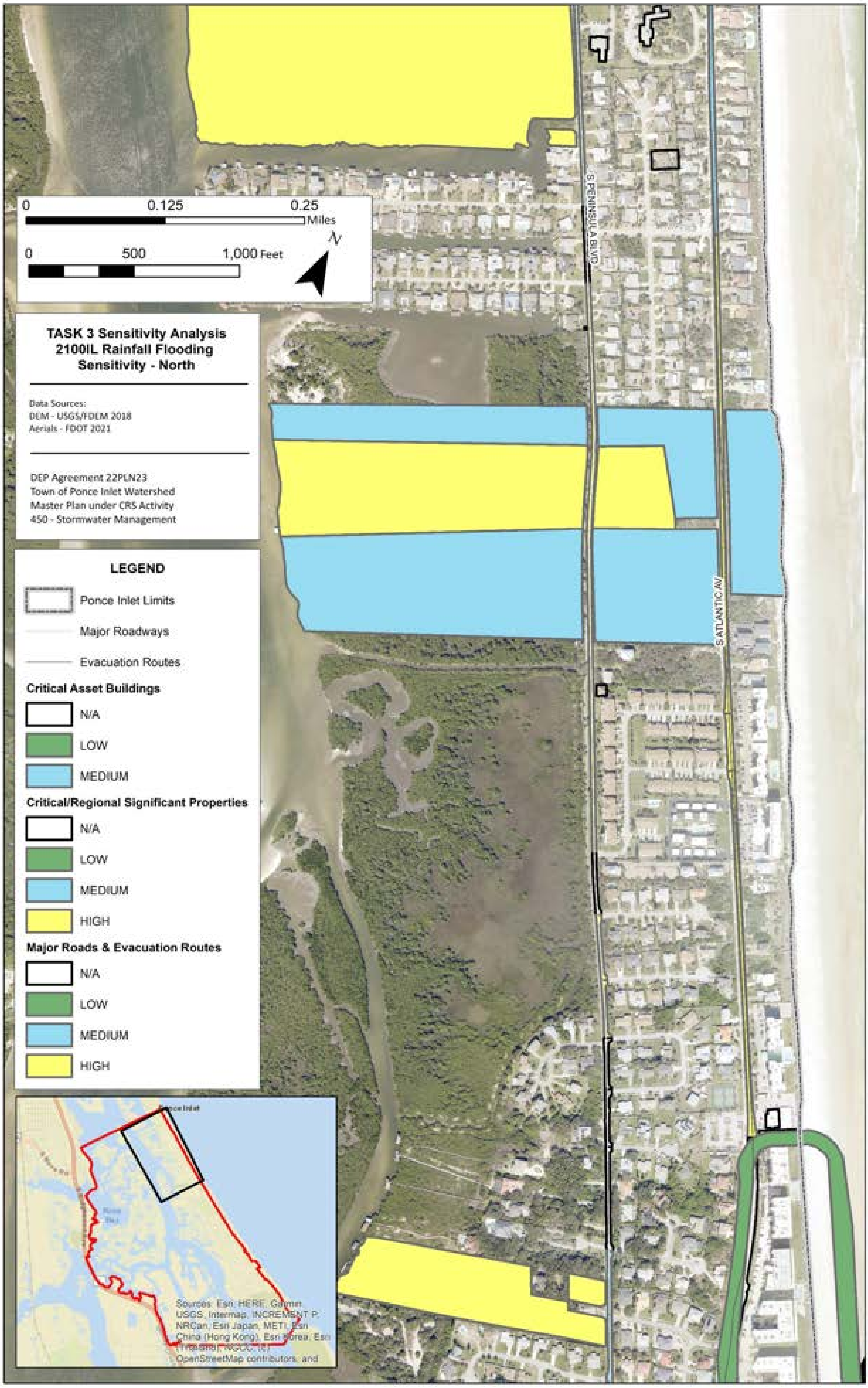

TASK 3 Sensitivity Analysis
2070IL Rainfall Flooding
Sensitivity - Central
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed
Master Plan under CRS Activity
450 - Stormwater Management
LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
LOW
MEDIUM
Critical/Regional Significant Properties
N/A
LOW
MEDIUM
HIGH
Major Roads & Evacuation Routes
N/A
LOW
MEDIUM
HIGH
S PENINSULA BLVD
S ATLANTIC AV
0
0.125
0.25
Miles
0
500
1,000 Feet
N


TASK 3 Sensitivity Analysis
2070IL Rainfall Flooding
Sensitivity - South
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed
Master Plan under CRS Activity
450 - Stormwater Management
LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
LOW
MEDIUM
Critical/Regional Significant Properties
N/A
LOW
MEDIUM
HIGH
Major Roads & Evacuation Routes
N/A
LOW
MEDIUM
HIGH
S PENINSULA BLVD
S ATLANTIC AV
BEACH ST
S ATLANTIC AVE
S ROBERT MERRELL PKY
0
0.125
0.25
Miles
0
500
1,000 Feet
N


TASK 3 Sensitivity Analysis
2070IH Rainfall Flooding
Sensitivity - North
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed
Master Plan under CRS Activity
450 - Stormwater Management
LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
LOW
MEDIUM
HIGH
Critical/Regional Significant Properties
N/A
LOW
MEDIUM
HIGH
Major Roads & Evacuation Routes
N/A
LOW
MEDIUM
HIGH
0
0.125
0.25
Miles
0
500
1,000 Feet
N
S PENINSULA BLVD
S ATLANTIC AV

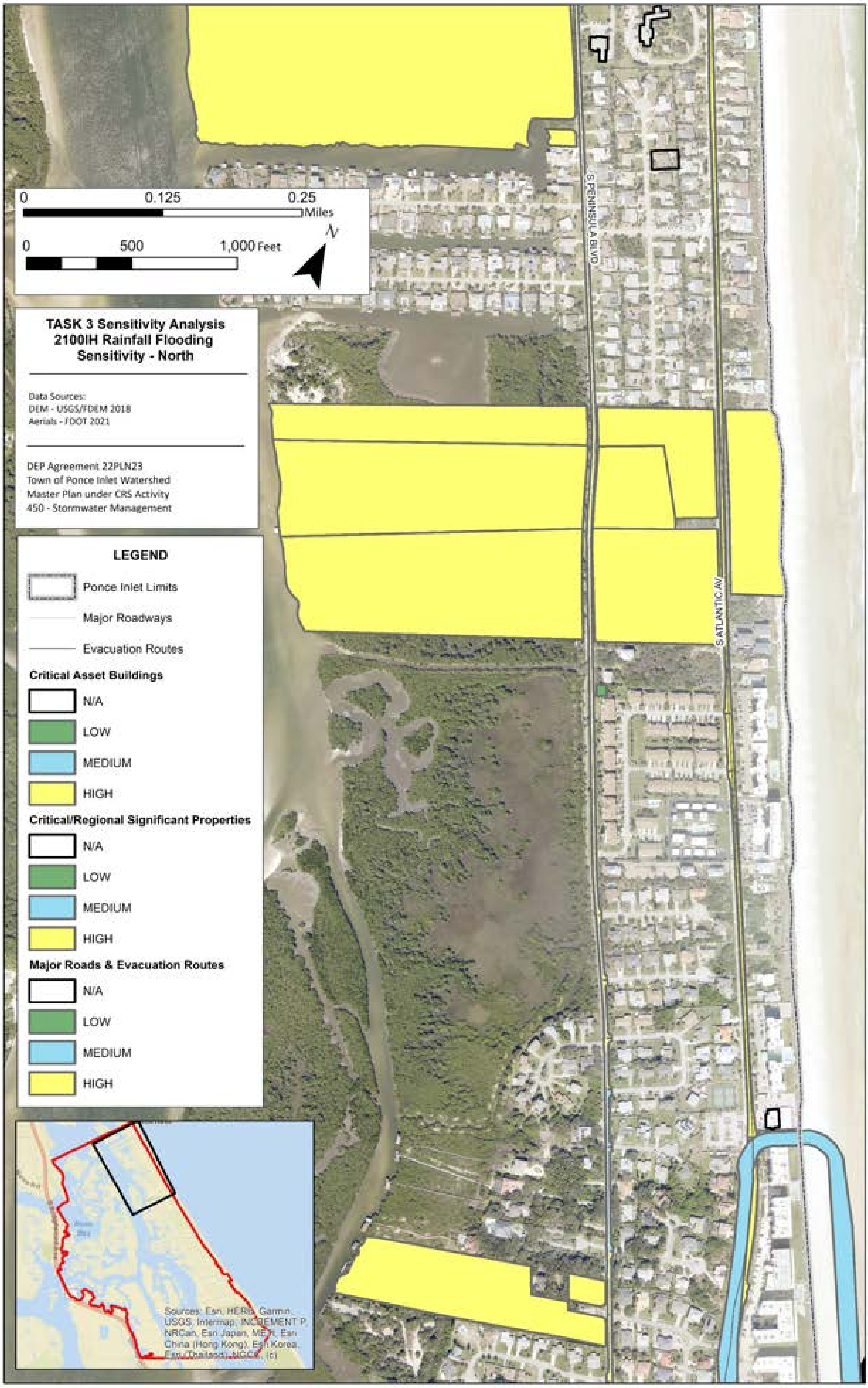

TASK 3 Sensitivity Analysis
2070IH Rainfall Flooding
Sensitivity - Central
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed
Master Plan under CRS Activity
450 - Stormwater Management
LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
LOW
MEDIUM
HIGH
Critical/Regional Significant Properties
N/A
LOW
MEDIUM
HIGH
Major Roads & Evacuation Routes
N/A
MEDIUM
HIGH
S PENINSULA BLVD
S ATLANTIC AV
0
0.125
0.25
Miles
0
500
1,000 Feet
N


S PENINSULA BLVD
S ATLANTIC AV
BEACH ST
S ATLANTIC AVE
LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
LOW
MEDIUM
HIGH
Critical/Regional Significant Properties
N/A
LOW
MEDIUM
HIGH
Major Roads & Evacuation Routes
HIGH
LOW
MEDIUM
N/A
TASK 3 Sensitivity Analysis
2070IH Rainfall Flooding
Sensitivity - South
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed
Master Plan under CRS Activity
450 - Stormwater Management
0
0.125
0.25
Miles
0
500
1,000 Feet
N


0
0.125
0.25
Miles
0
500
1,000 Feet
N
TASK 3 Sensitivity Analysis
2100IL Rainfall Flooding
Sensitivity - North
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed
Master Plan under CRS Activity
450 - Stormwater Management
LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
LOW
MEDIUM
Critical/Regional Significant Properties
N/A
LOW
MEDIUM
HIGH
Major Roads & Evacuation Routes
N/A
LOW
MEDIUM
HIGH
S PENINSULA BLVD
S ATLANTIC AV
Ponce Inlet
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and

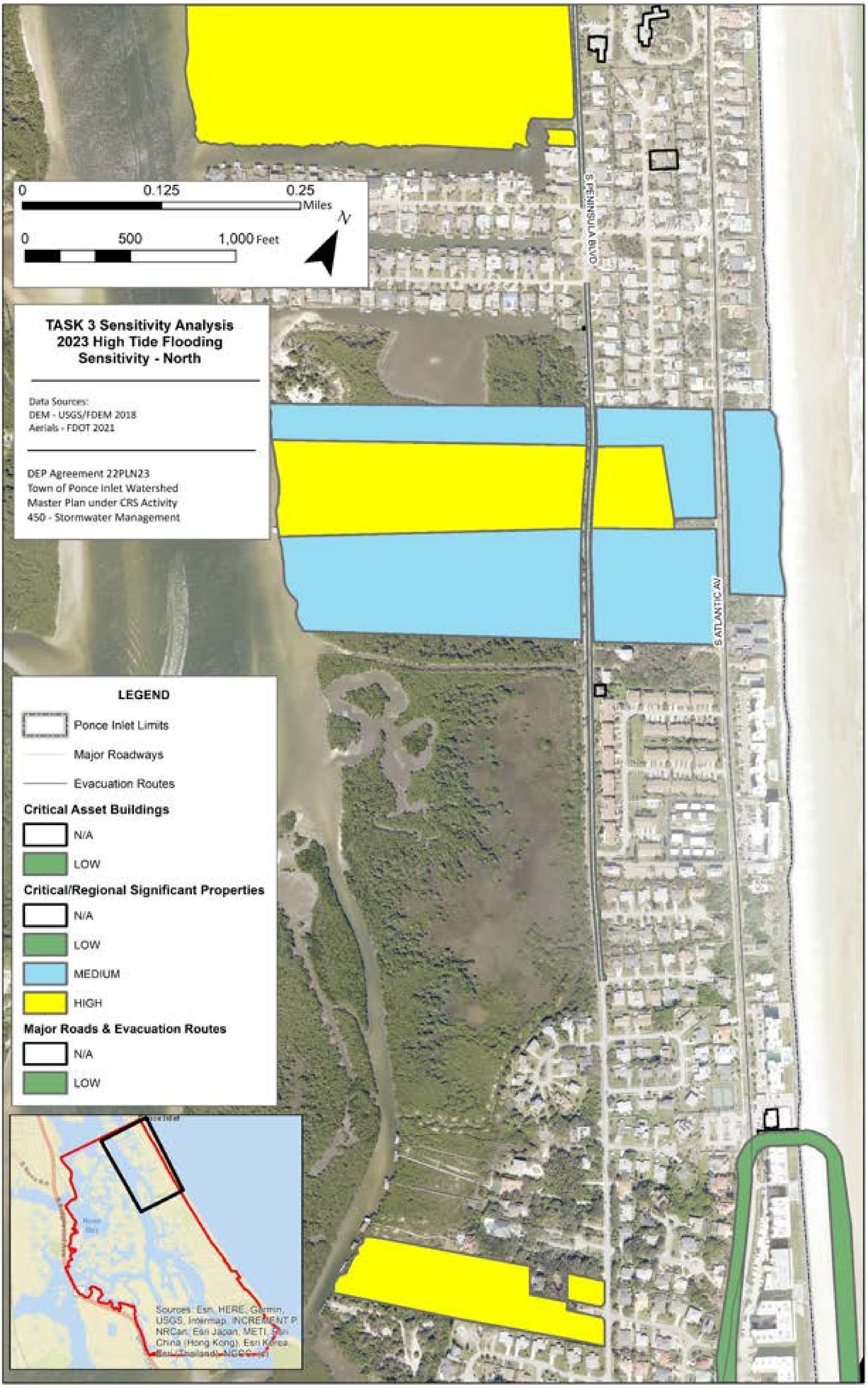

TASK 3 Sensitivity Analysis
2100IL Rainfall Flooding
Sensitivity - Central
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed
Master Plan under CRS Activity
450 - Stormwater Management
LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
LOW
MEDIUM
Critical/Regional Significant Properties
N/A
LOW
MEDIUM
HIGH
Major Roads & Evacuation Routes
N/A
LOW
MEDIUM
HIGH
S PENINSULA BLVD
S ATLANTIC AV
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri
0
0.125
0.25
Miles
0
500
1,000 Feet
N


S PENINSULA BLVD
S ATLANTIC AV
BEACH ST
S ATLANTIC AVE
LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
LOW
MEDIUM
Critical/Regional Significant Properties
N/A
LOW
MEDIUM
HIGH
Major Roads & Evacuation Routes
N/A
LOW
MEDIUM
HIGH
TASK 3 Sensitivity Analysis
2100IL Rainfall Flooding
Sensitivity - South
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed
Master Plan under CRS Activity
450 - Stormwater Management
0
0.125
0.25
Miles
0
500
1,000 Feet
N

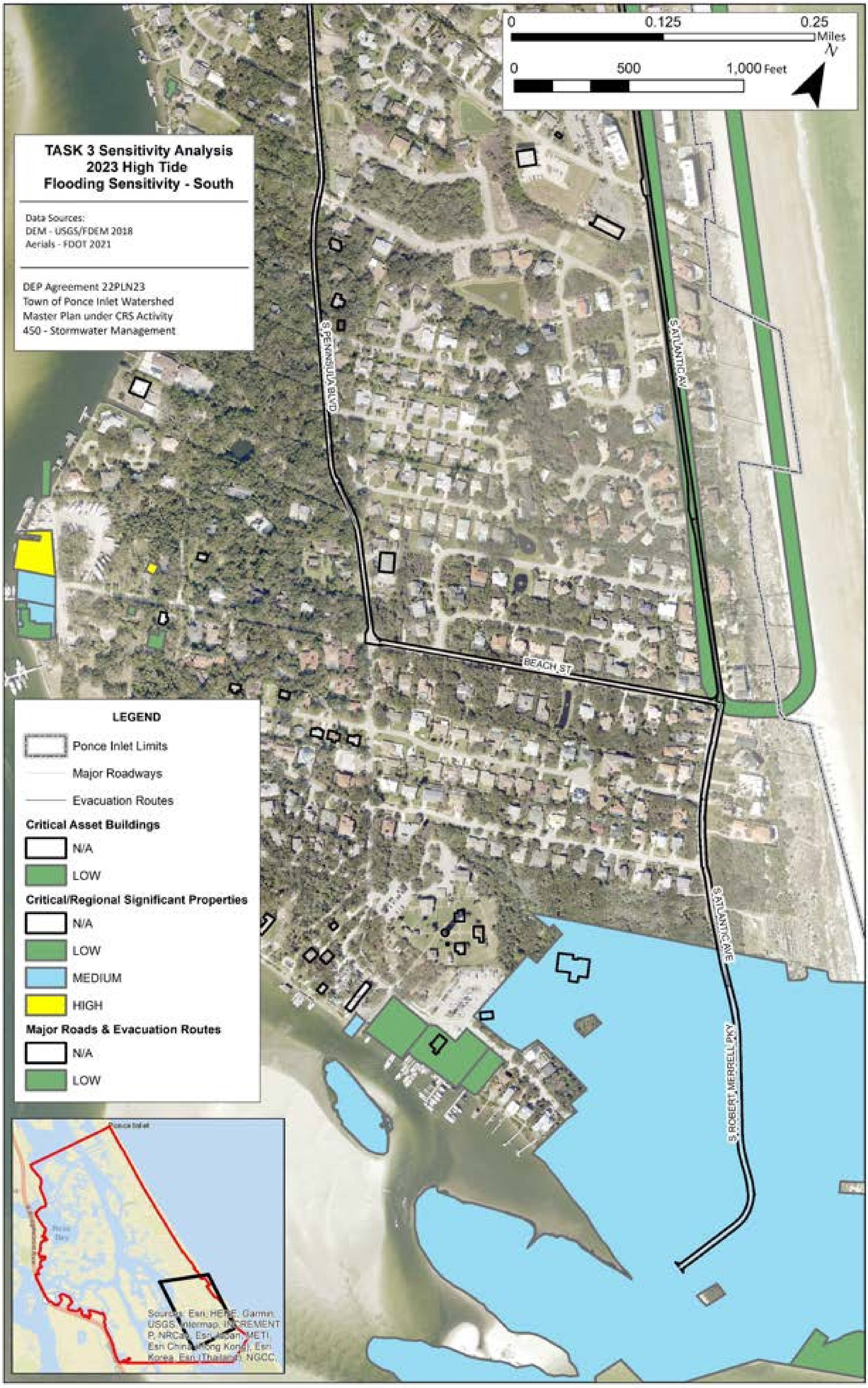

0
0.125
0.25
Miles
0
500
1,000 Feet
N
TASK 3 Sensitivity Analysis
2100IH Rainfall Flooding
Sensitivity - North
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed
Master Plan under CRS Activity
450 - Stormwater Management
LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
LOW
MEDIUM
HIGH
Critical/Regional Significant Properties
N/A
LOW
MEDIUM
HIGH
Major Roads & Evacuation Routes
N/A
LOW
MEDIUM
HIGH
S PENINSULA BLVD
S ATLANTIC AV

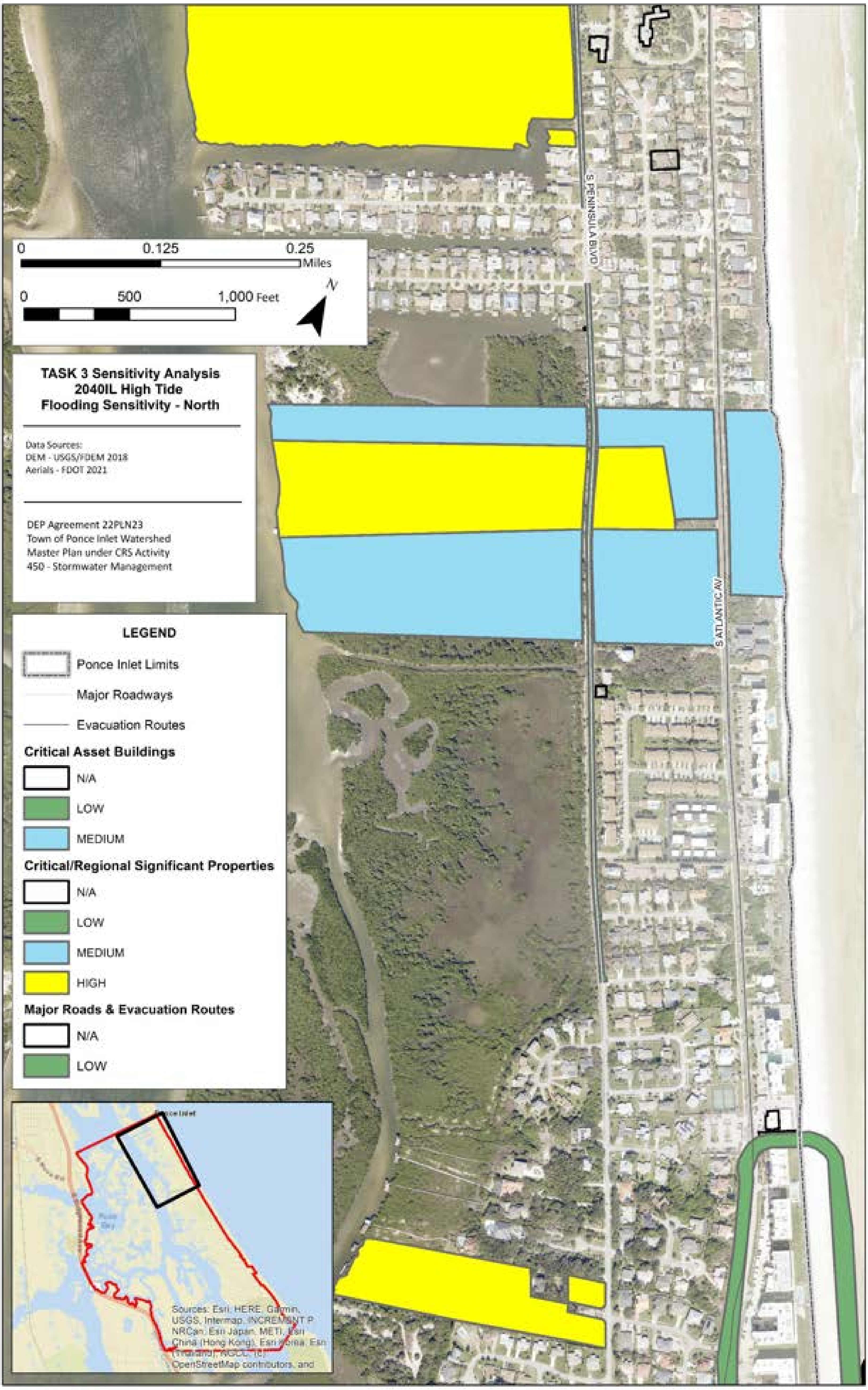

TASK 3 Sensitivity Analysis
2100IH Rainfall Flooding
Sensitivity - Central
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed
Master Plan under CRS Activity
450 - Stormwater Management
LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
LOW
MEDIUM
HIGH
Critical/Regional Significant Properties
N/A
LOW
MEDIUM
HIGH
Major Roads & Evacuation Routes
N/A
LOW
MEDIUM
HIGH
S PENINSULA BLVD
S ATLANTIC AV
0
0.125
0.25
Miles
0
500
1,000 Feet
N

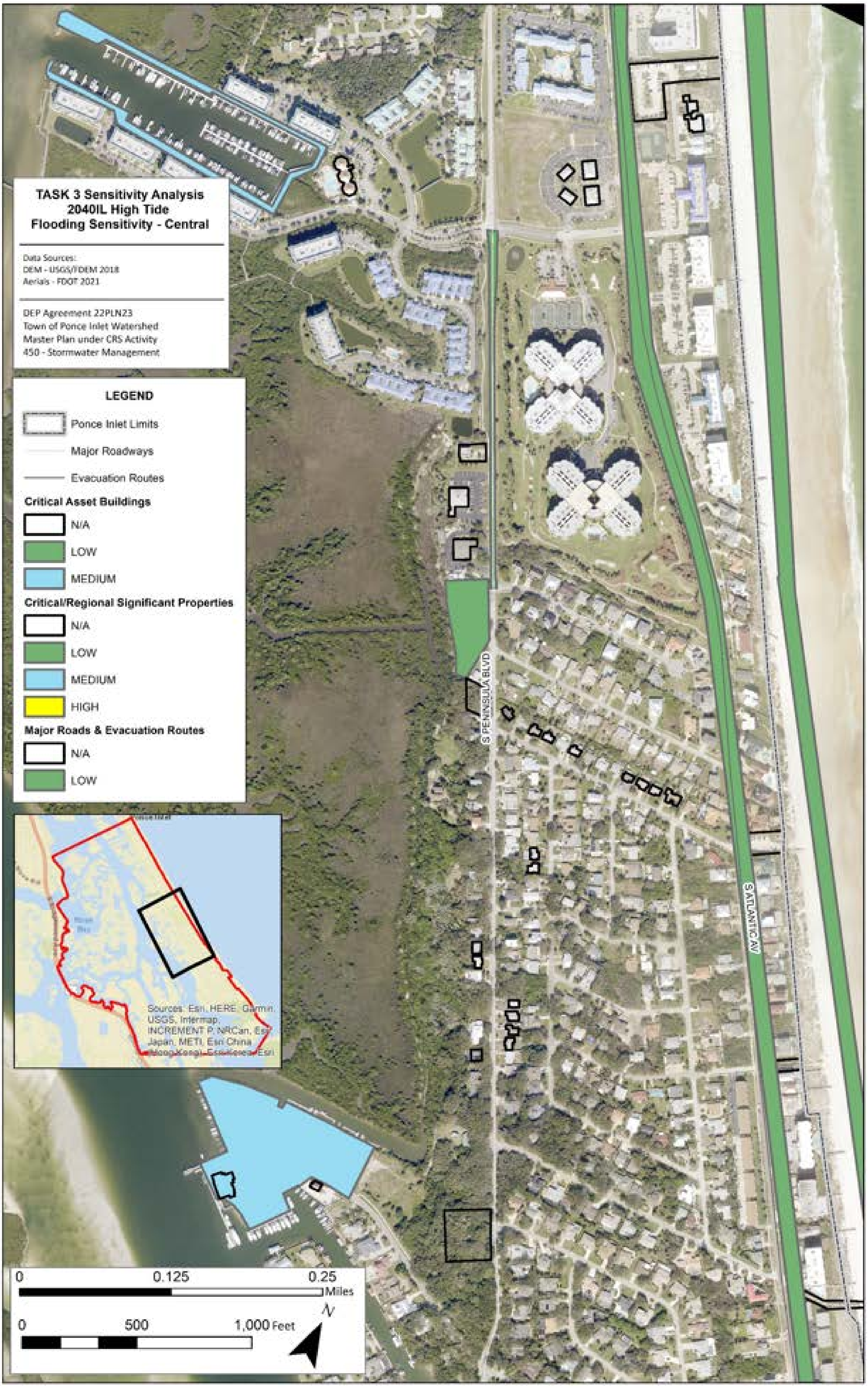

S PENINSULA BLVD
S ATLANTIC AV
BEACH ST
S ATLANTIC AVE
LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
LOW
MEDIUM
HIGH
Critical/Regional Significant Properties
N/A
LOW
MEDIUM
HIGH
Major Roads & Evacuation Routes
N/A
LOW
MEDIUM
HIGH
TASK 3 Sensitivity Analysis
2100IH Rainfall Flooding
Sensitivity - South
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed
Master Plan under CRS Activity
450 - Stormwater Management
0 0.125 0.25 Miles
0 500 1,000 Feet
N

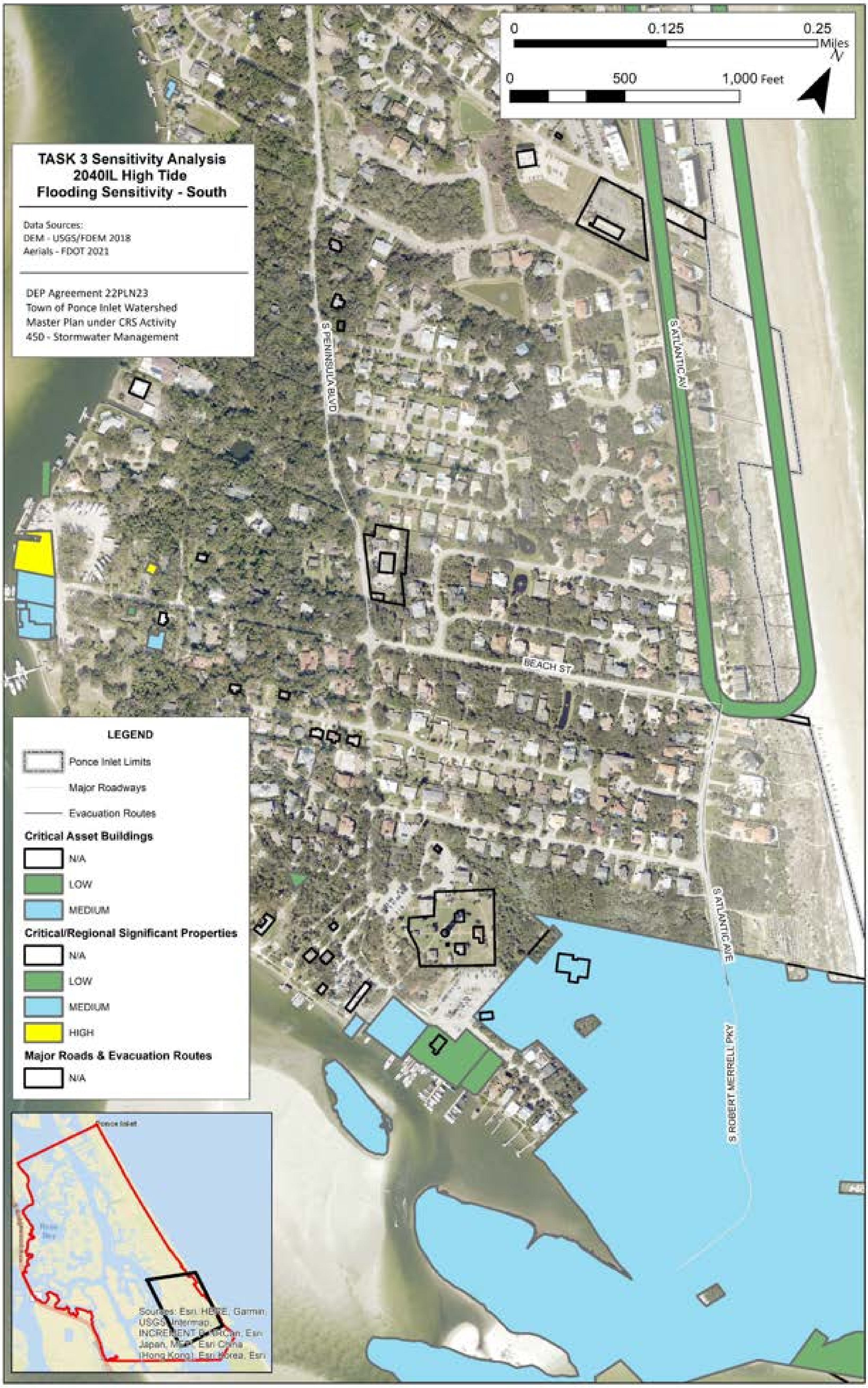

0
0.125
0.25
Miles
0
500
1,000 Feet
N
S PENINSULA BLVD
S ATLANTIC AV
TASK 3 Sensitivity Analysis
2023 High Tide Flooding
Sensitivity - North
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed
Master Plan under CRS Activity
450 - Stormwater Management
LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
LOW
Critical/Regional Significant Properties
N/A
LOW
MEDIUM
HIGH
Major Roads & Evacuation Routes
N/A
LOW

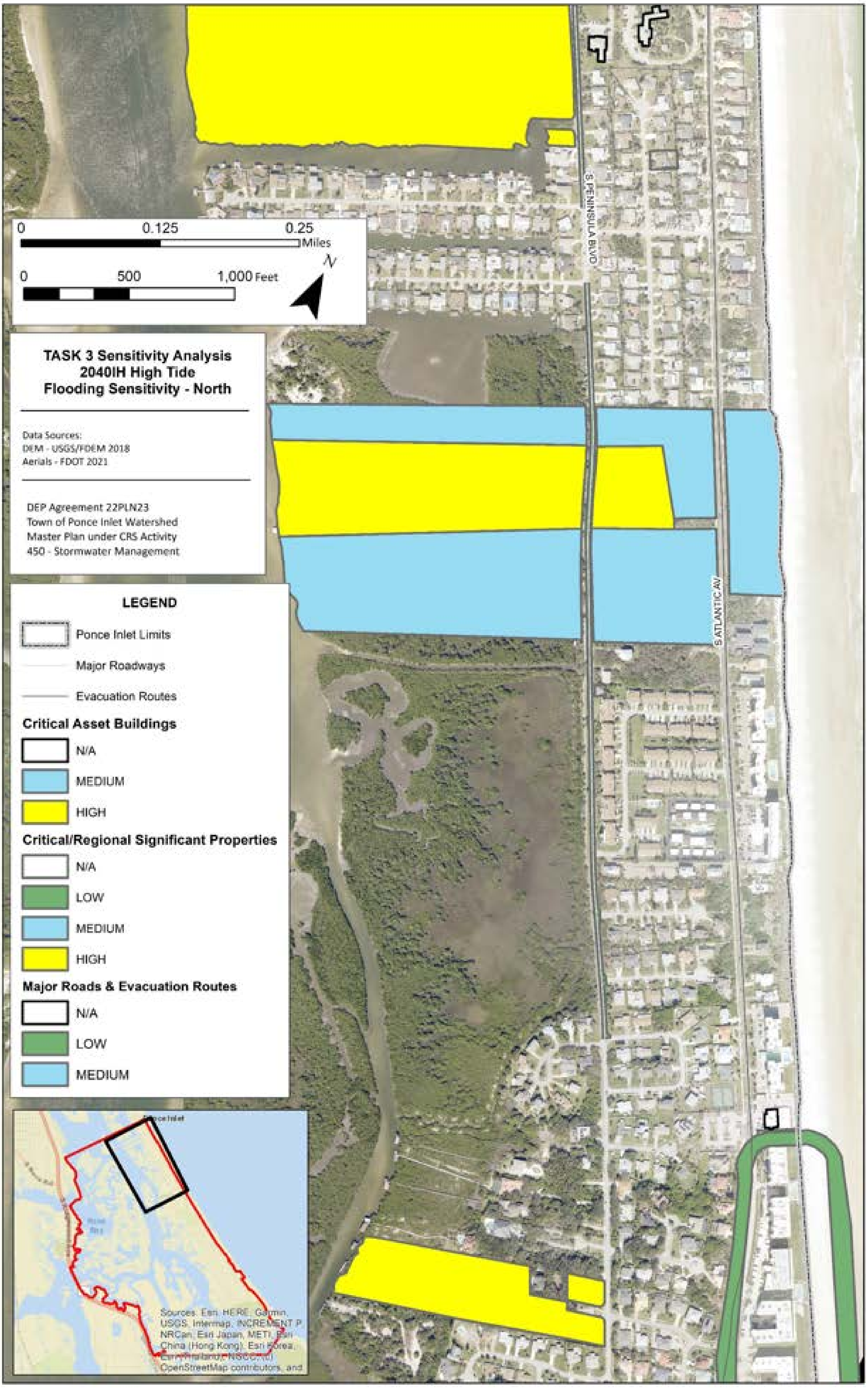

LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
LOW
Critical/Regional Significant Properties
N/A
LOW
MEDIUM
HIGH
Major Roads & Evacuation Routes
N/A
LOW
TASK 3 Sensitivity Analysis
2023 High Tide
Flooding Sensitivity - Central
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed
Master Plan under CRS Activity
450 - Stormwater Management
S PENINSULA BLVD
S ATLANTIC AV
0
0.125
0.25
Miles
0
500
1,000 Feet
N


0
0.125
0.25
Miles
0
500
1,000 Feet
N
TASK 3 Sensitivity Analysis
2023 High Tide
Flooding Sensitivity - South
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed
Master Plan under CRS Activity
450 - Stormwater Management
S PENINSULA BLVD
S ATLANTIC AV
BEACH ST
S ATLANTIC AVE
S ROBERT MERRELL PKY
LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
LOW
Critical/Regional Significant Properties
N/A
LOW
MEDIUM
HIGH
Major Roads & Evacuation Routes
N/A
LOW

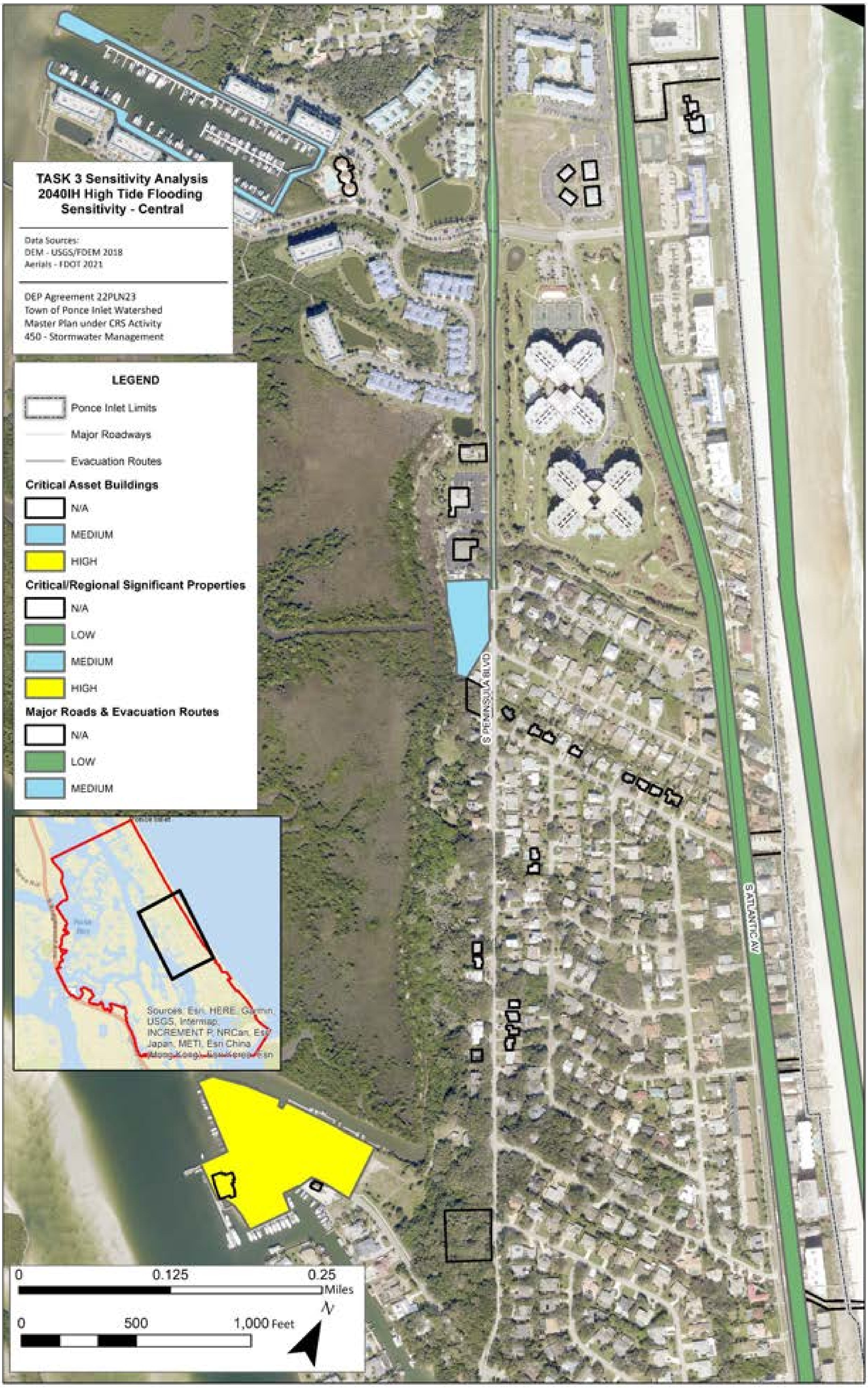

S PENINSULA BLVD
S ATLANTIC AV
0 0.125 0.25 Miles
0 500 1,000 Feet
N
TASK 3 Sensitivity Analysis
2040IL High Tide
Flooding Sensitivity - North
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed
Master Plan under CRS Activity
450 - Stormwater Management
LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
LOW
MEDIUM
Critical/Regional Significant Properties
N/A
LOW
MEDIUM
HIGH
Major Roads & Evacuation Routes
N/A
LOW


TASK 3 Sensitivity Analysis
2040IL High Tide
Flooding Sensitivity - Central
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed
Master Plan under CRS Activity
450 - Stormwater Management
LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
LOW
MEDIUM
Critical/Regional Significant Properties
N/A
LOW
MEDIUM
HIGH
Major Roads & Evacuation Routes
N/A
LOW
S PENINSULA BLVD
S ATLANTIC AV
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri
0
0.125
0.25
Miles
0
500
1,000 Feet
N

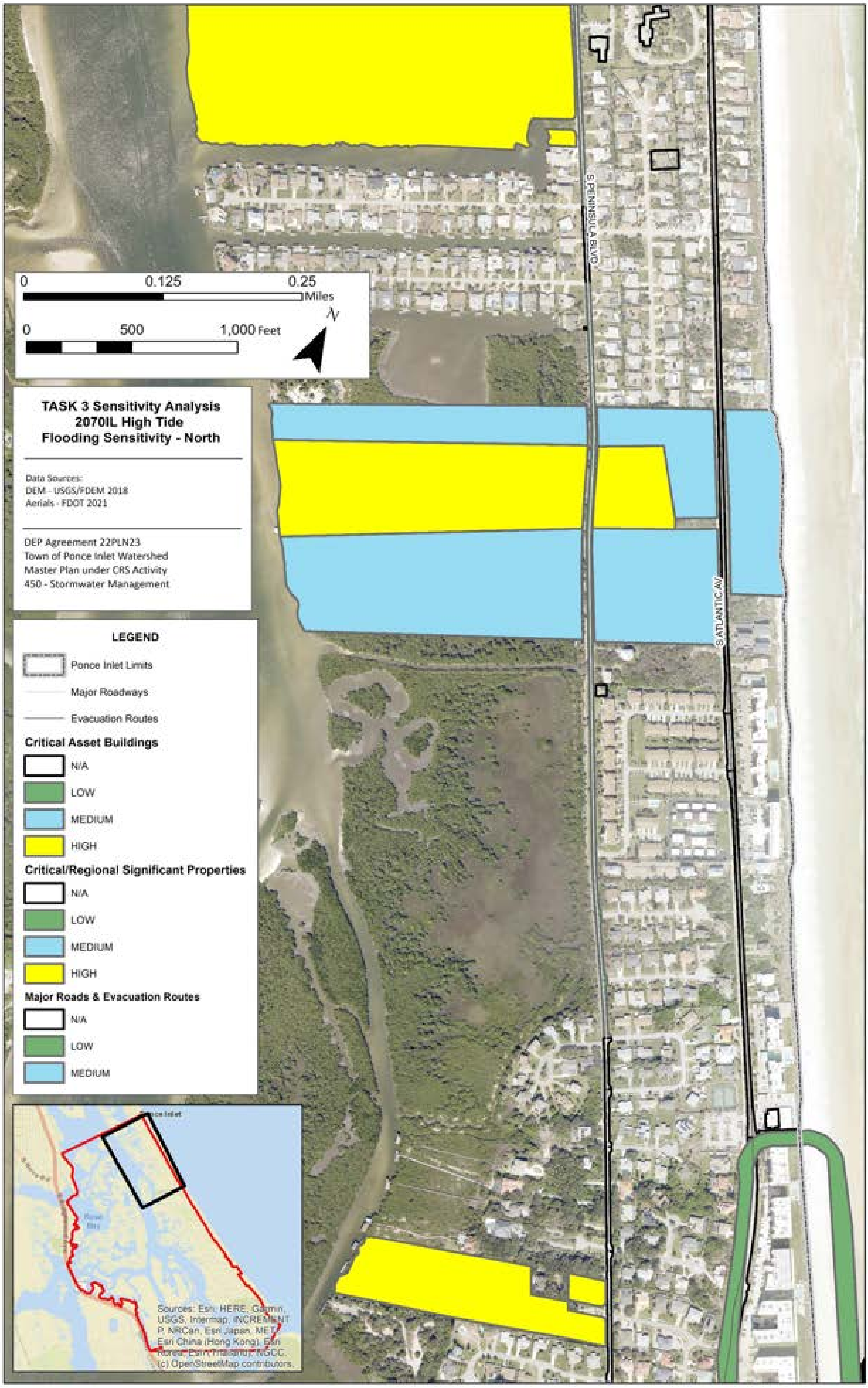

0
0.125
0.25
Miles
0
500
1,000 Feet
N
TASK 3 Sensitivity Analysis
2040IL High Tide
Flooding Sensitivity - South
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed
Master Plan under CRS Activity
450 - Stormwater Management
S PENINSULA BLVD
S ATLANTIC AV
BEACH ST
S ATLANTIC AVE
S ROBERT MERRELL PKY
LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
LOW
MEDIUM
Critical/Regional Significant Properties
N/A
LOW
MEDIUM
HIGH
Major Roads & Evacuation Routes
N/A
Ponce Inlet

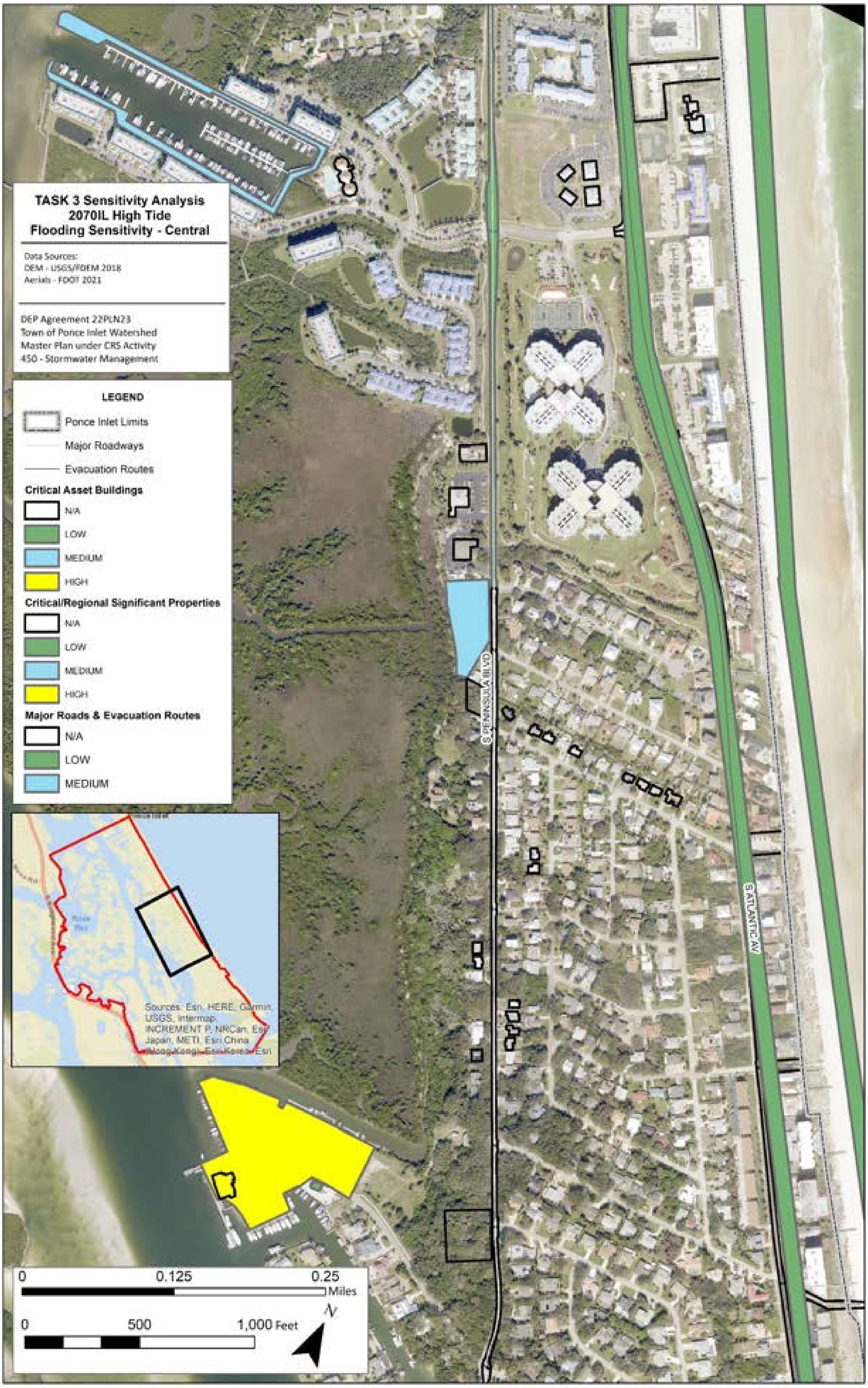


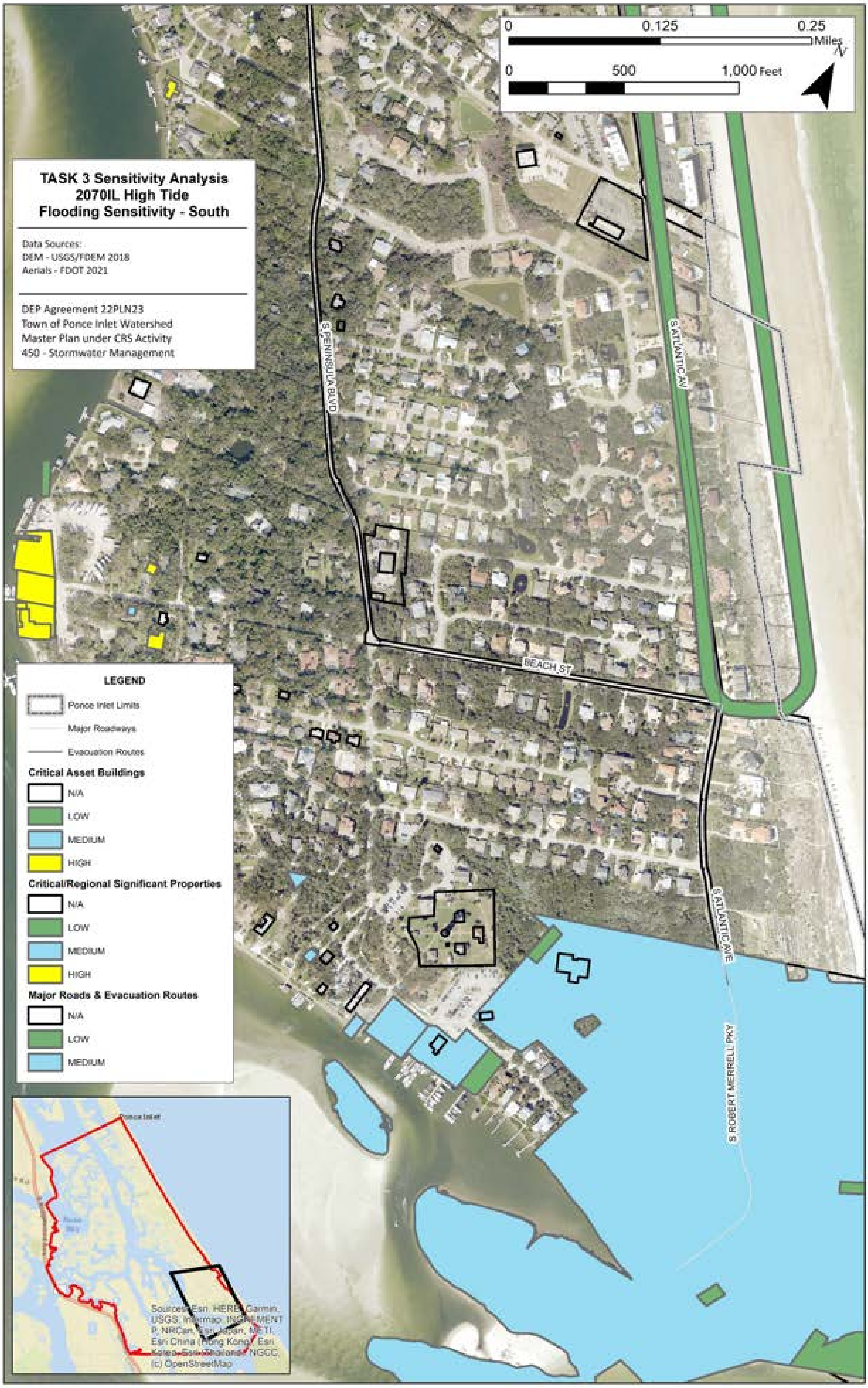
S PENINSULA BLVD
S ATLANTIC AV
0
0.125
0.25
Miles
0
500
1,000 Feet
N
TASK 3 Sensitivity Analysis
2040IH High Tide
Flooding Sensitivity - North
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed
Master Plan under CRS Activity
450 - Stormwater Management
LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
MEDIUM
HIGH
Critical/Regional Significant Properties
N/A
LOW
MEDIUM
HIGH
Major Roads & Evacuation Routes
N/A
LOW
MEDIUM
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and

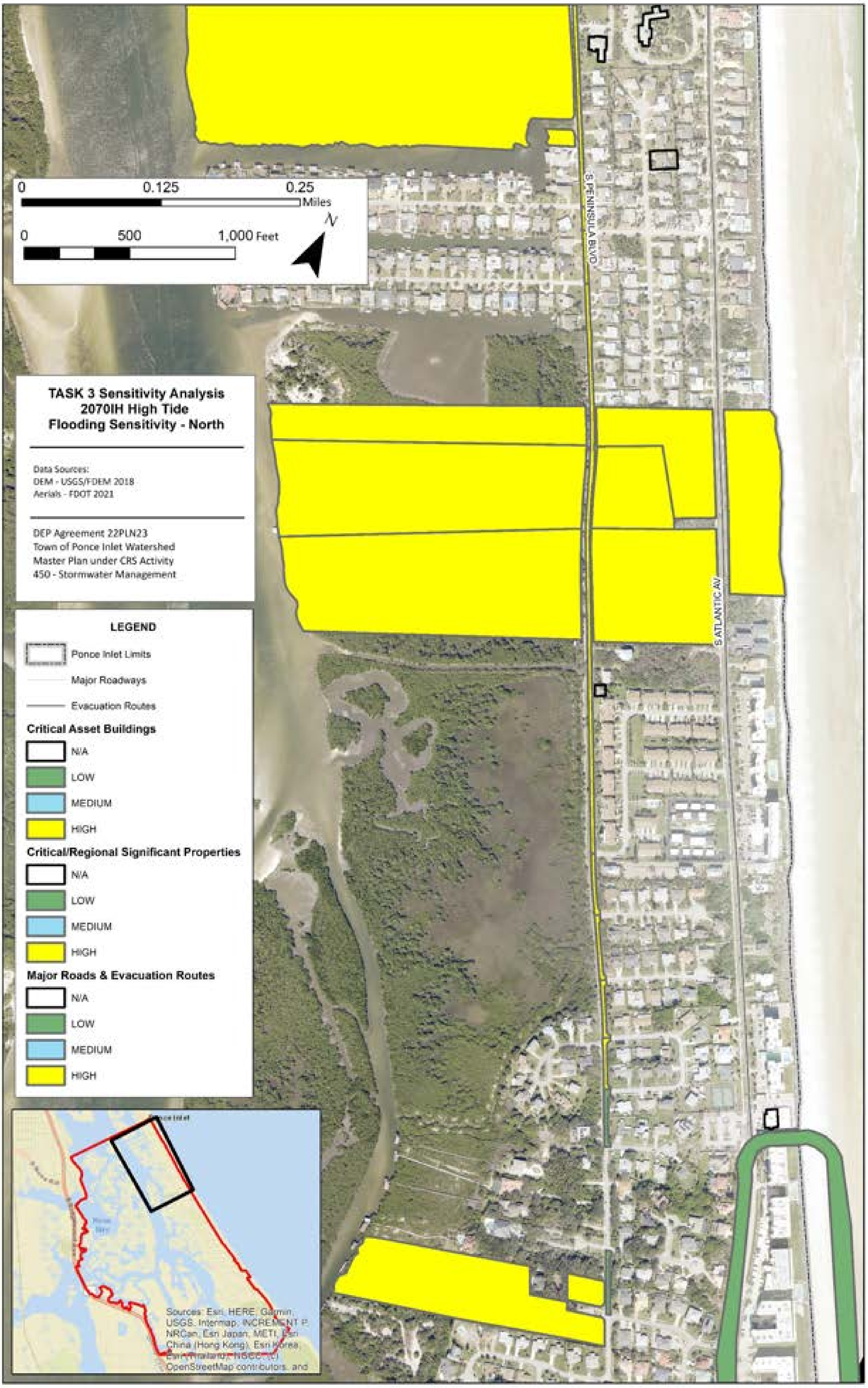

TASK 3 Sensitivity Analysis
2040IH High Tide Flooding
Sensitivity - Central
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed
Master Plan under CRS Activity
450 - Stormwater Management
LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
MEDIUM
HIGH
Critical/Regional Significant Properties
N/A
LOW
MEDIUM
HIGH
Major Roads & Evacuation Routes
N/A
LOW
MEDIUM
S PENINSULA BLVD
S ATLANTIC AV
0
0.125
0.25
Miles
0
500
1,000 Feet
N

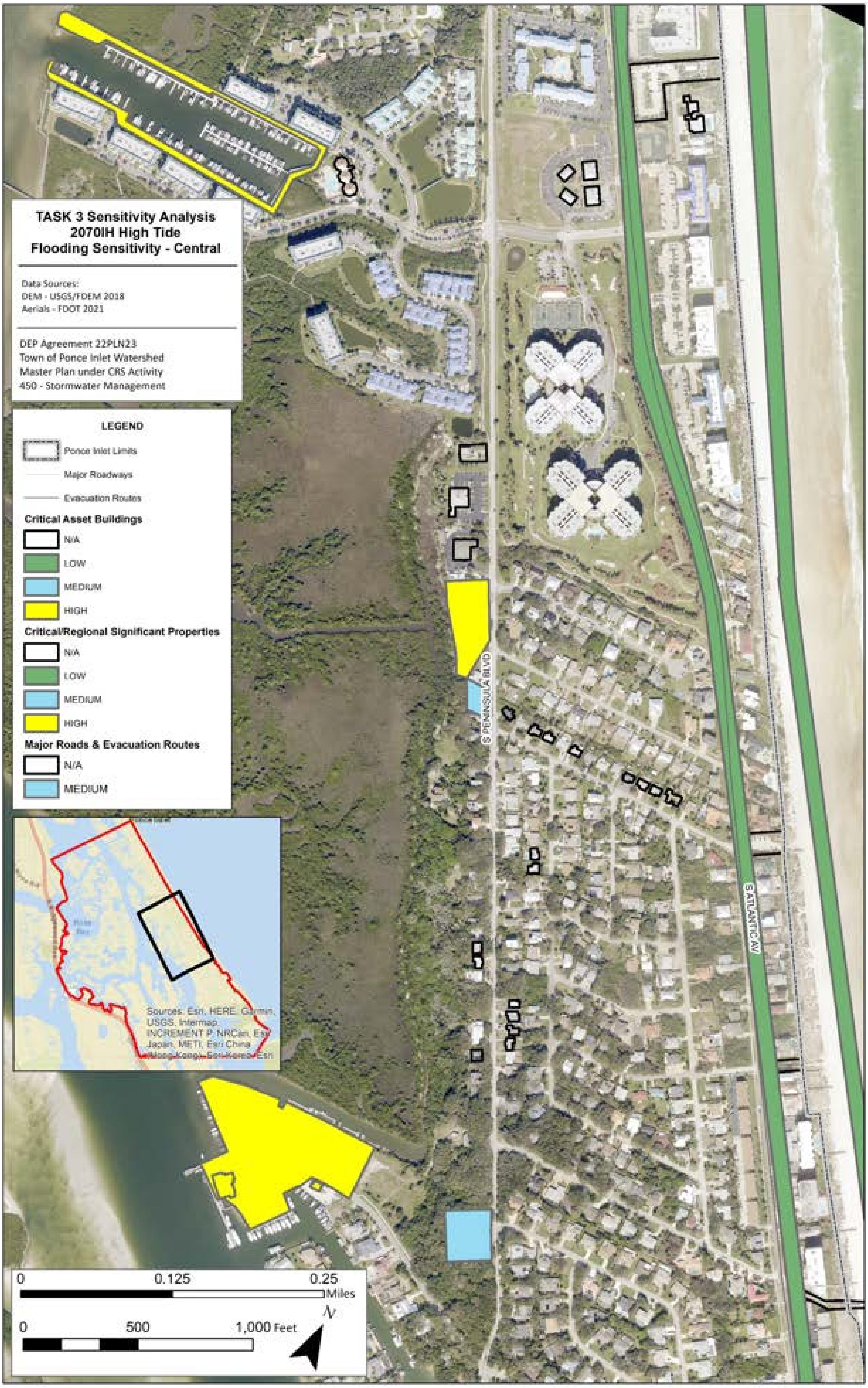

TASK 3 Sensitivity Analysis
2040IH High Tide
Flooding Sensitivity - South
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed
Master Plan under CRS Activity
450 - Stormwater Management
0
0.125
0.25
Miles
0
500
1,000 Feet
N
S PENINSULA BLVD
S ATLANTIC AV
BEACH ST
S ATLANTIC AVE
S ROBERT MERRELL PKY
LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
MEDIUM
HIGH
Critical/Regional Significant Properties
N/A
LOW
MEDIUM
HIGH
Major Roads & Evacuation Routes
N/A
LOW
MEDIUM

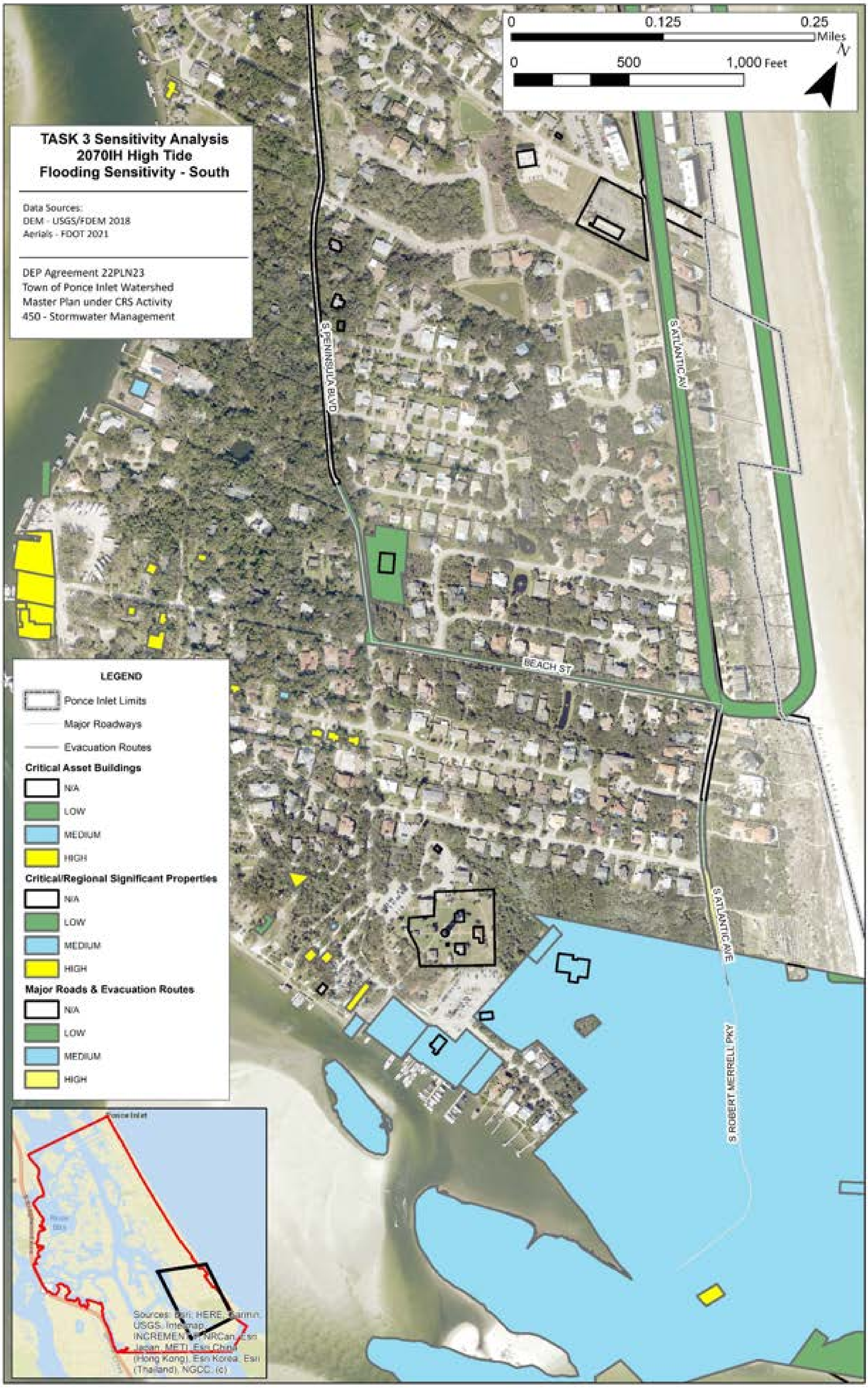

S PENINSULA BLVD
S ATLANTIC AV
0
0.125
0.25
Miles
0
500
1,000 Feet
N
TASK 3 Sensitivity Analysis
2070IL High Tide
Flooding Sensitivity - North
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed
Master Plan under CRS Activity
450 - Stormwater Management
LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
LOW
MEDIUM
HIGH
Critical/Regional Significant Properties
N/A
LOW
MEDIUM
HIGH
Major Roads & Evacuation Routes
N/A
LOW
MEDIUM

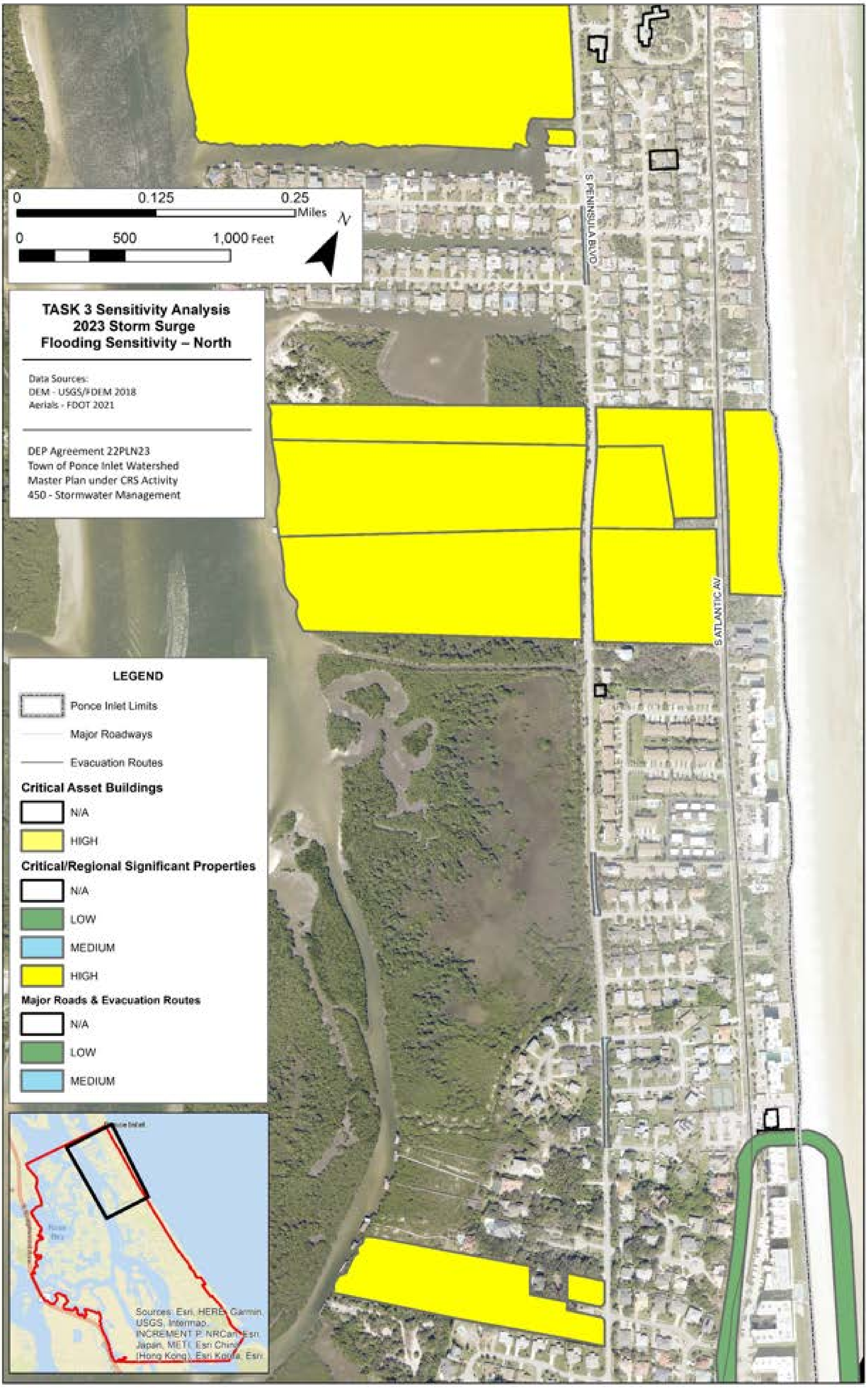

TASK 3 Sensitivity Analysis
2070IL High Tide
Flooding Sensitivity - Central
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed
Master Plan under CRS Activity
450 - Stormwater Management
LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
LOW
MEDIUM
HIGH
Critical/Regional Significant Properties
N/A
LOW
MEDIUM
HIGH
Major Roads & Evacuation Routes
N/A
LOW
MEDIUM
S PENINSULA BLVD
S ATLANTIC AV
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri
0
0.125
0.25
Miles
0
500
1,000 Feet
N

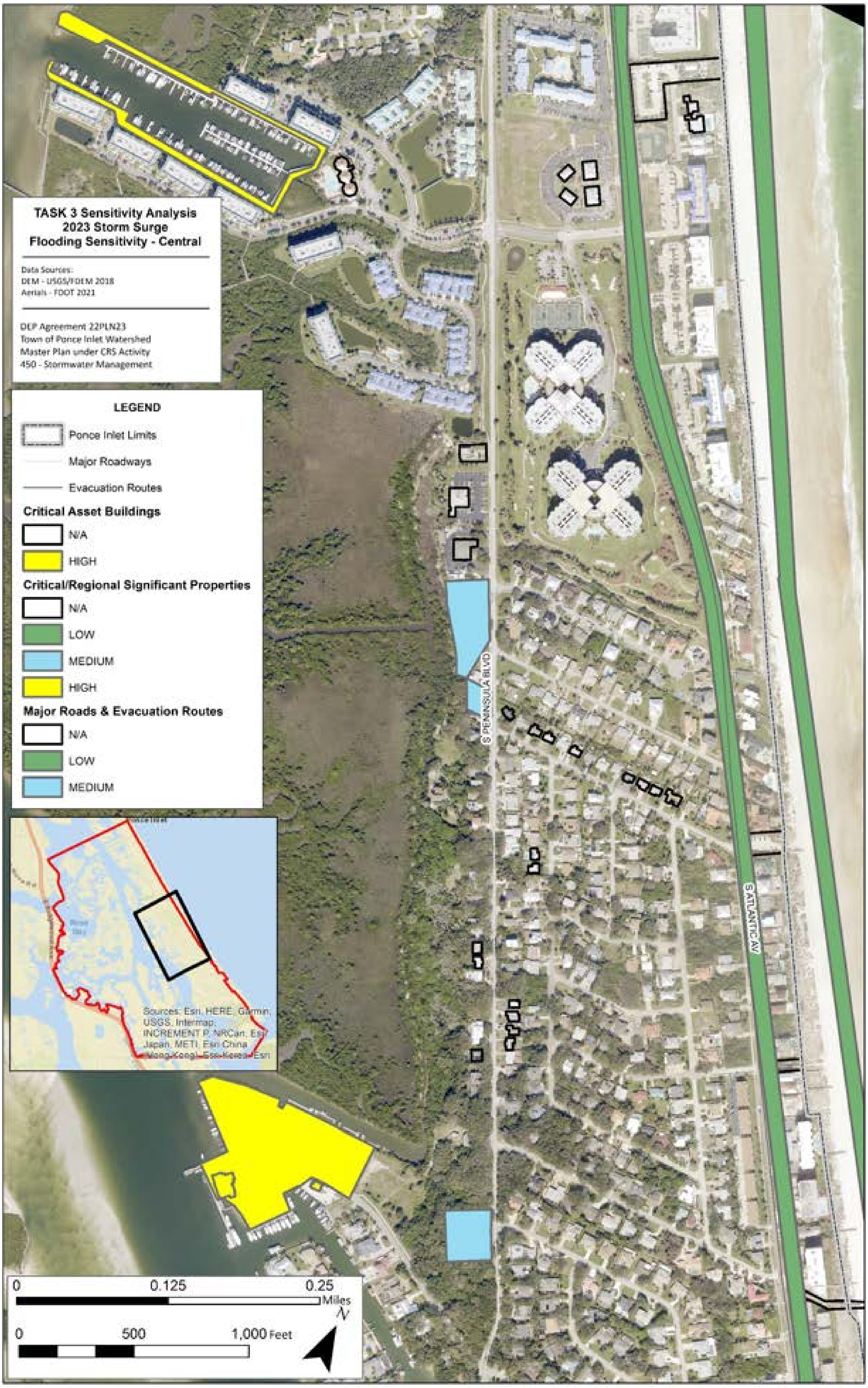

TASK 3 Sensitivity Analysis
2070IL High Tide
Flooding Sensitivity - South
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed
Master Plan under CRS Activity
450 - Stormwater Management
0
0.125
0.25
Miles
0
500
1,000 Feet
N
S PENINSULA BLVD
S ATLANTIC AV
BEACH ST
S ATLANTIC AVE
S ROBERT MERRELL PKY
LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
LOW
MEDIUM
HIGH
Critical/Regional Significant Properties
N/A
LOW
MEDIUM
HIGH
Major Roads & Evacuation Routes
N/A
LOW
MEDIUM
Ponce Inlet
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap

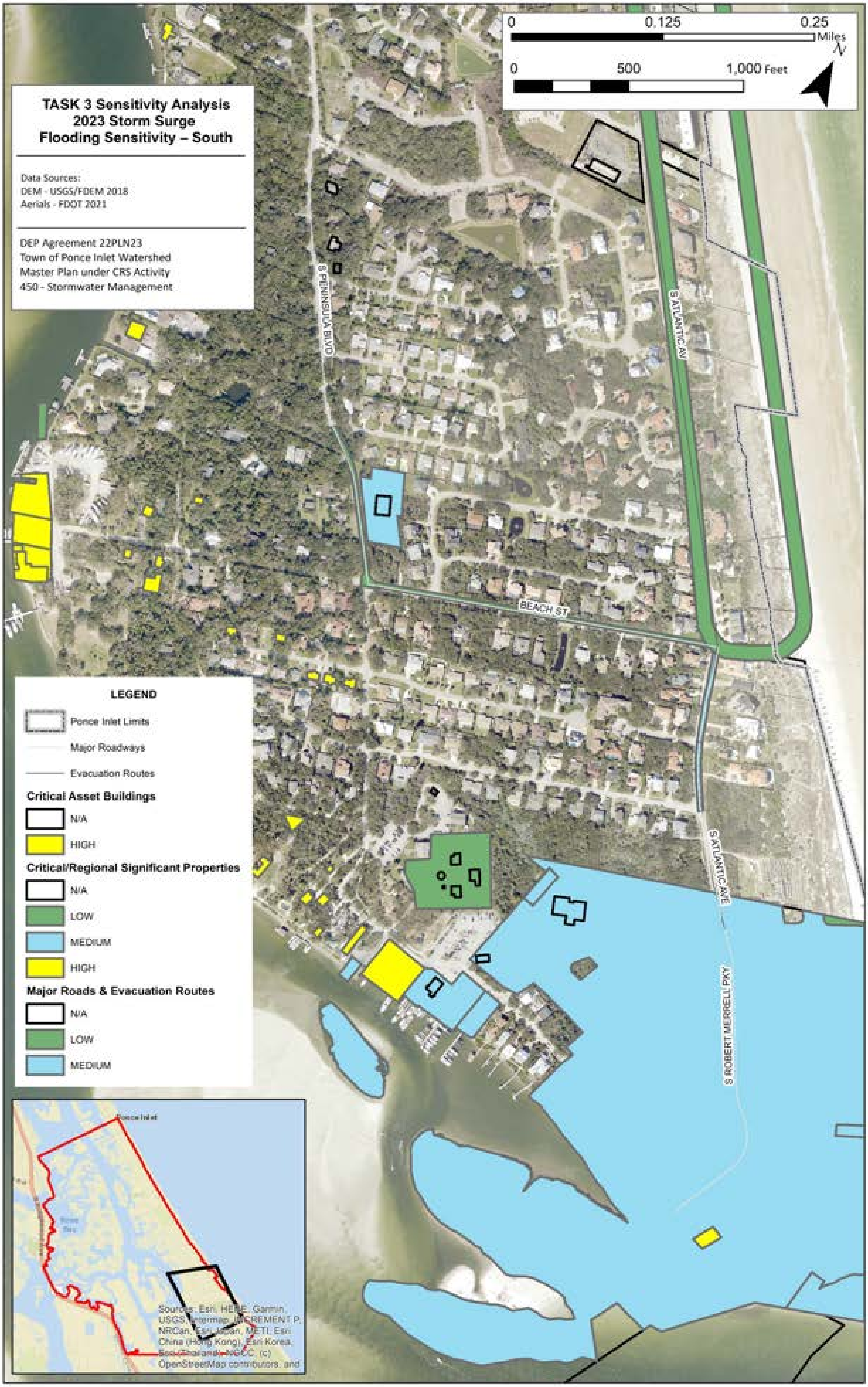

0
0.125
0.25
Miles
0
500
1,000 Feet
N
S PENINSULA BLVD
S ATLANTIC AV
TASK 3 Sensitivity Analysis
2070IH High Tide
Flooding Sensitivity - North
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed
Master Plan under CRS Activity
450 - Stormwater Management
LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
LOW
MEDIUM
HIGH
Critical/Regional Significant Properties
N/A
LOW
MEDIUM
HIGH
Major Roads & Evacuation Routes
N/A
LOW
MEDIUM
HIGH
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and

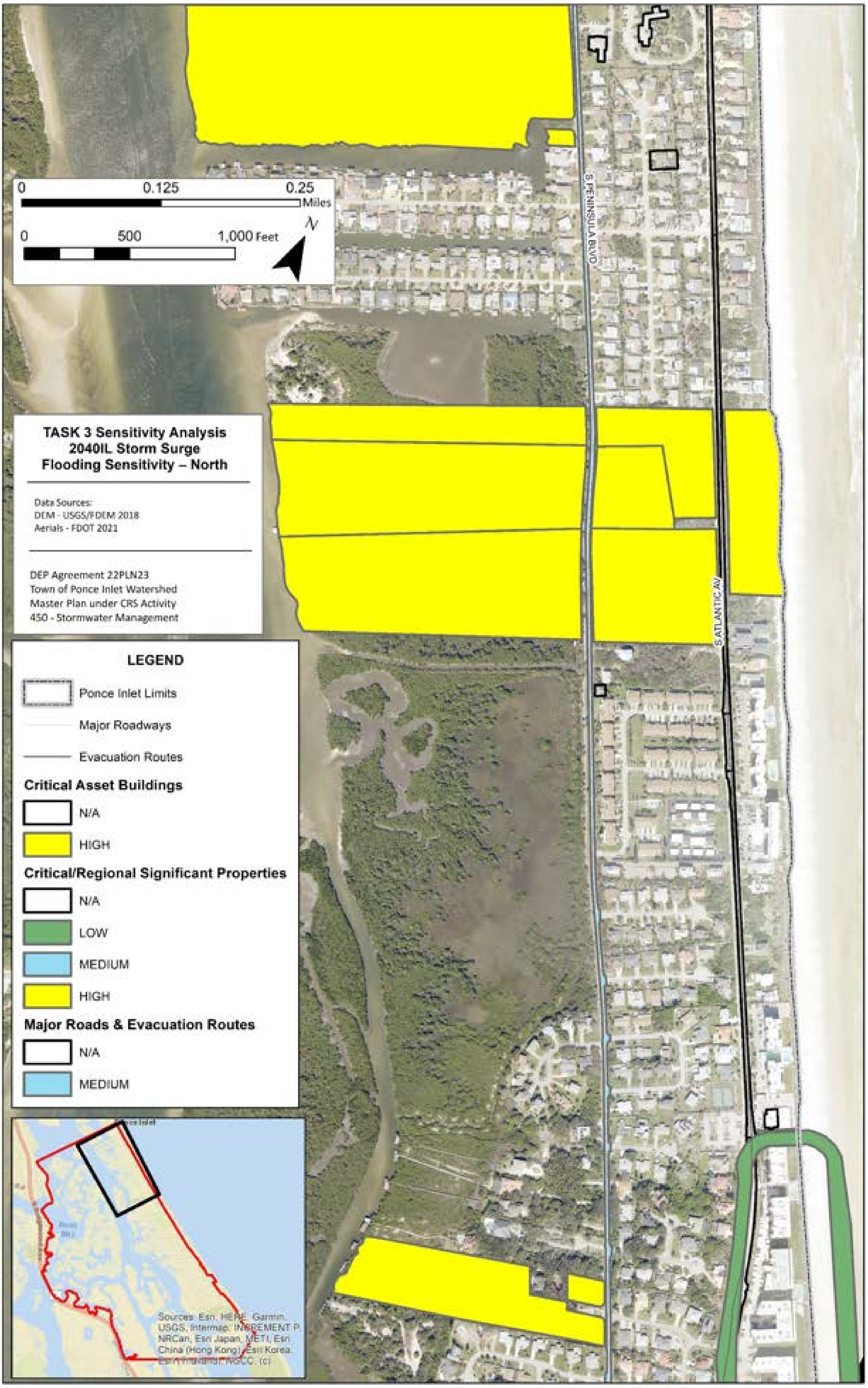

TASK 3 Sensitivity Analysis
2070IH High Tide
Flooding Sensitivity - Central
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed
Master Plan under CRS Activity
450 - Stormwater Management
LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
LOW
MEDIUM
HIGH
Critical/Regional Significant Properties
N/A
LOW
MEDIUM
HIGH
Major Roads & Evacuation Routes
N/A
MEDIUM
S PENINSULA BLVD
S ATLANTIC AV
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri
0
0.125
0.25
Miles
0
500
1,000 Feet
N

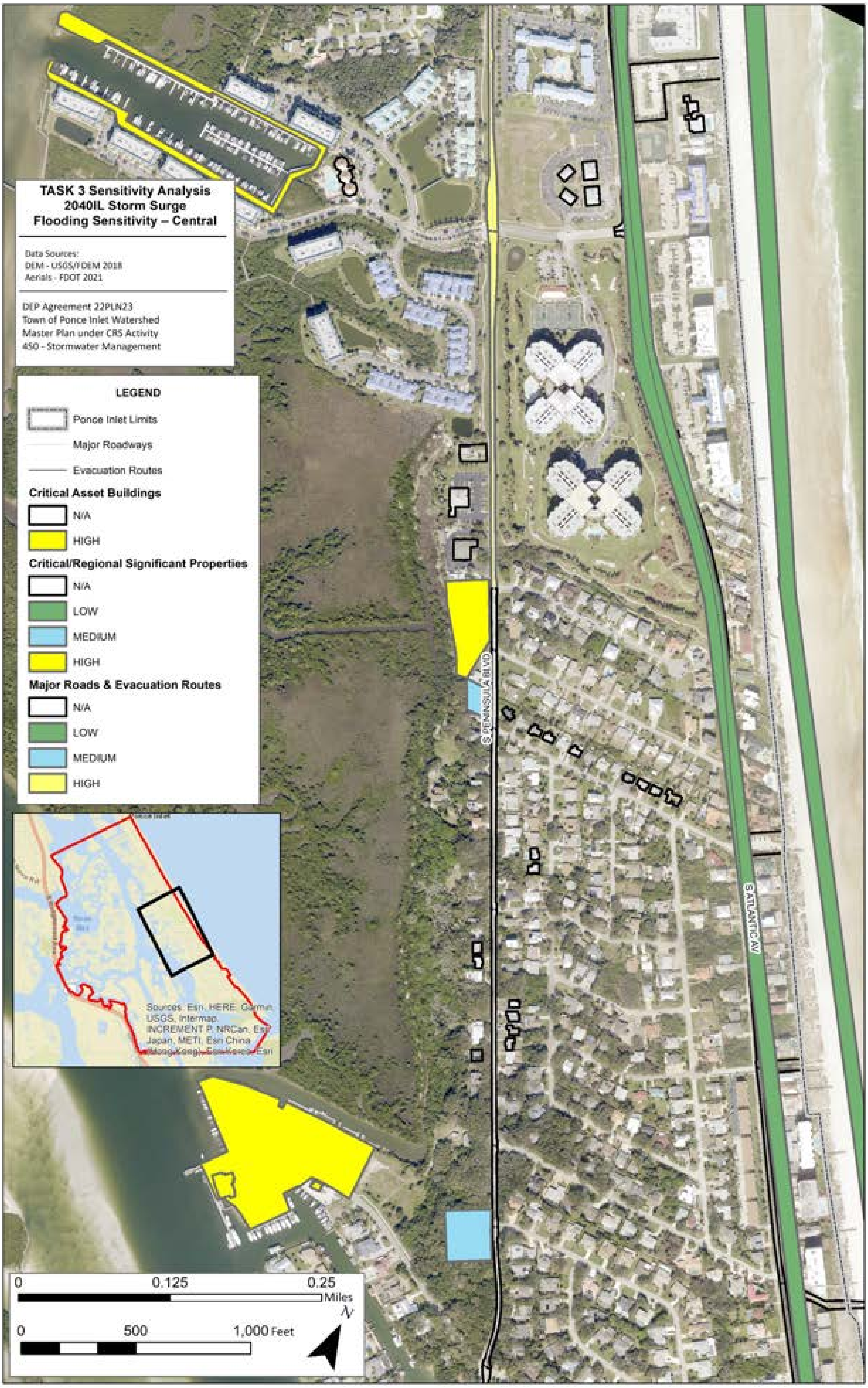

0
0.125
0.25
Miles
0
500
1,000 Feet
N
TASK 3 Sensitivity Analysis
2070IH High Tide
Flooding Sensitivity - South
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed
Master Plan under CRS Activity
450 - Stormwater Management
S PENINSULA BLVD
S ATLANTIC AV
BEACH ST
S ATLANTIC AVE
S ROBERT MERRELL PKY
LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
LOW
MEDIUM
HIGH
Critical/Regional Significant Properties
N/A
LOW
MEDIUM
HIGH
Major Roads & Evacuation Routes
N/A
LOW
MEDIUM
HIGH
Ponce Inlet
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c)


0
0.125
0.25
Miles
0
500
1,000 Feet
N
TASK 3 Sensitivity Analysis
2023 Storm Surge
Flooding Sensitivity – North
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed
Master Plan under CRS Activity
450 - Stormwater Management
LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
HIGH
Critical/Regional Significant Properties
N/A
LOW
MEDIUM
HIGH
Major Roads & Evacuation Routes
N/A
LOW
MEDIUM
S PENINSULA BLVD
S ATLANTIC AV

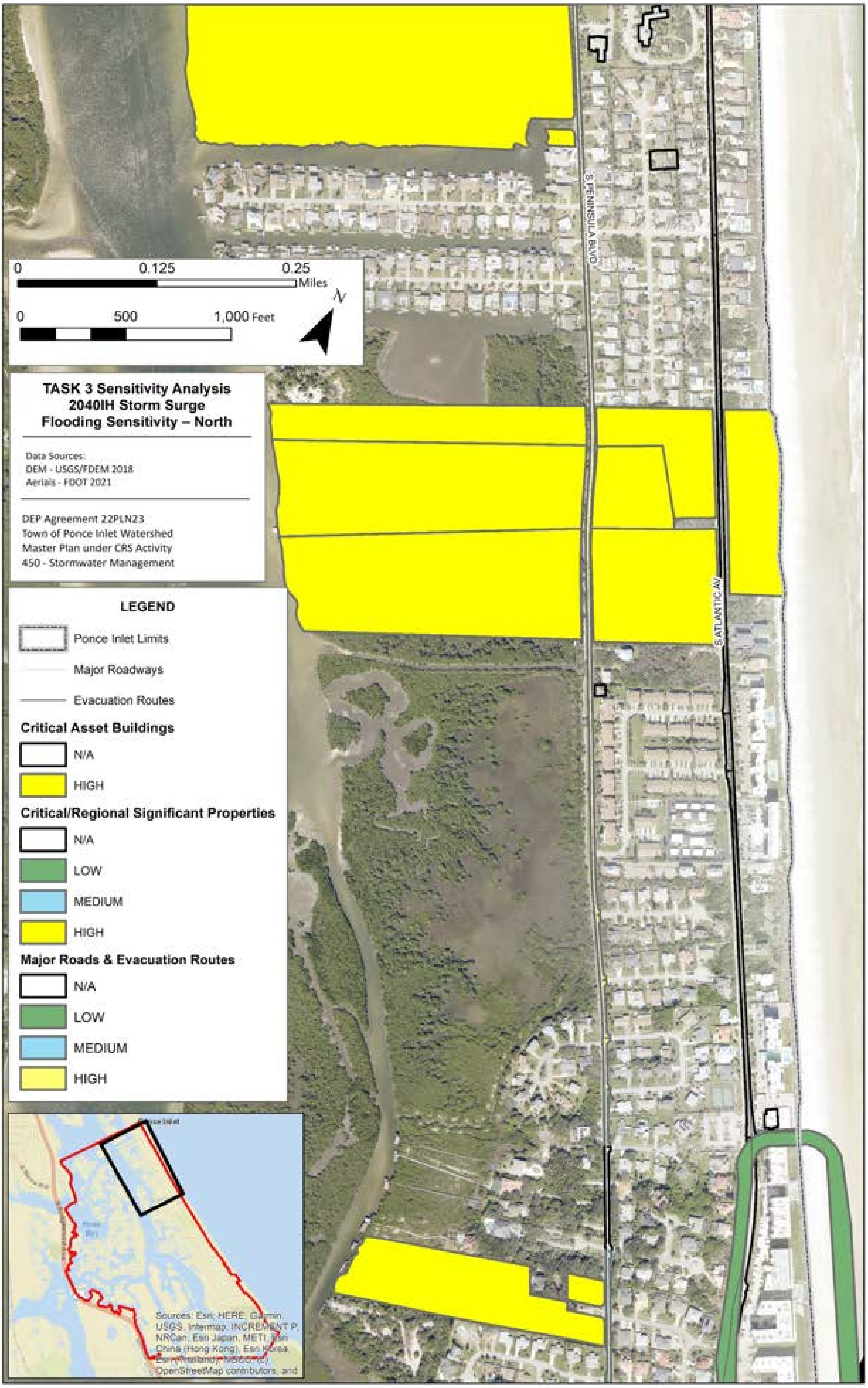

TASK 3 Sensitivity Analysis
2023 Storm Surge
Flooding Sensitivity - Central
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed
Master Plan under CRS Activity
450 - Stormwater Management
LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
HIGH
Critical/Regional Significant Properties
N/A
LOW
MEDIUM
HIGH
Major Roads & Evacuation Routes
N/A
LOW
MEDIUM
S PENINSULA BLVD
S ATLANTIC AV
0
0.125
0.25
Miles
0
500
1,000 Feet
N

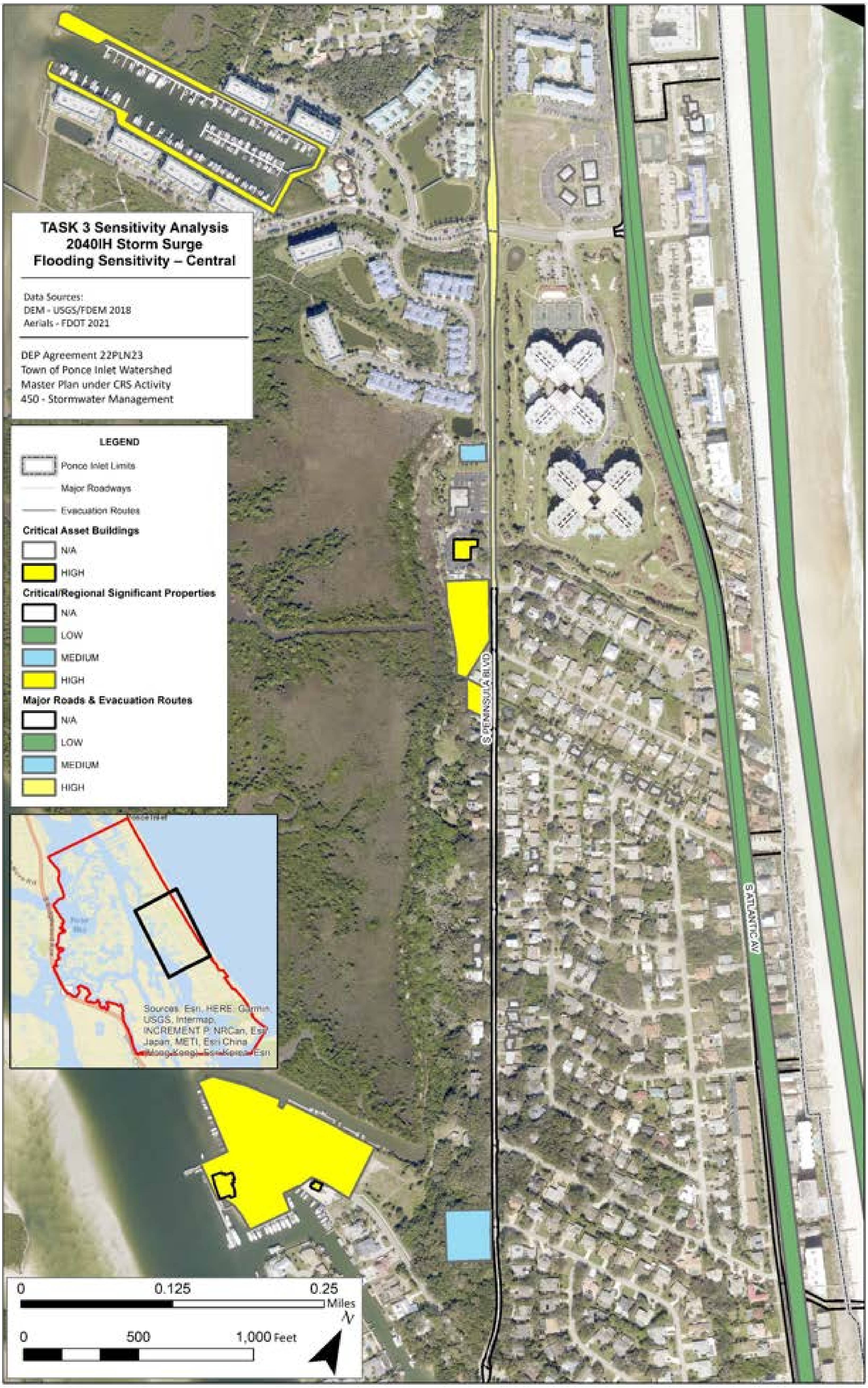

TASK 3 Sensitivity Analysis
2023 Storm Surge
Flooding Sensitivity – South
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed
Master Plan under CRS Activity
450 - Stormwater Management
0
0.125
0.25
Miles
0
500
1,000 Feet
N
S PENINSULA BLVD
S ATLANTIC AV
BEACH ST
S ATLANTIC AVE
S ROBERT MERRELL PKY
LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
HIGH
Critical/Regional Significant Properties
N/A
LOW
MEDIUM
HIGH
Major Roads & Evacuation Routes
N/A
LOW
MEDIUM
Ponce Inlet


0
0.125
0.25
Miles
0
500
1,000 Feet
N
S PENINSULA BLVD
S ATLANTIC AV
TASK 3 Sensitivity Analysis
2040IL Storm Surge
Flooding Sensitivity – North
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed
Master Plan under CRS Activity
450 - Stormwater Management
LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
HIGH
Critical/Regional Significant Properties
N/A
LOW
MEDIUM
HIGH
Major Roads & Evacuation Routes
N/A
MEDIUM

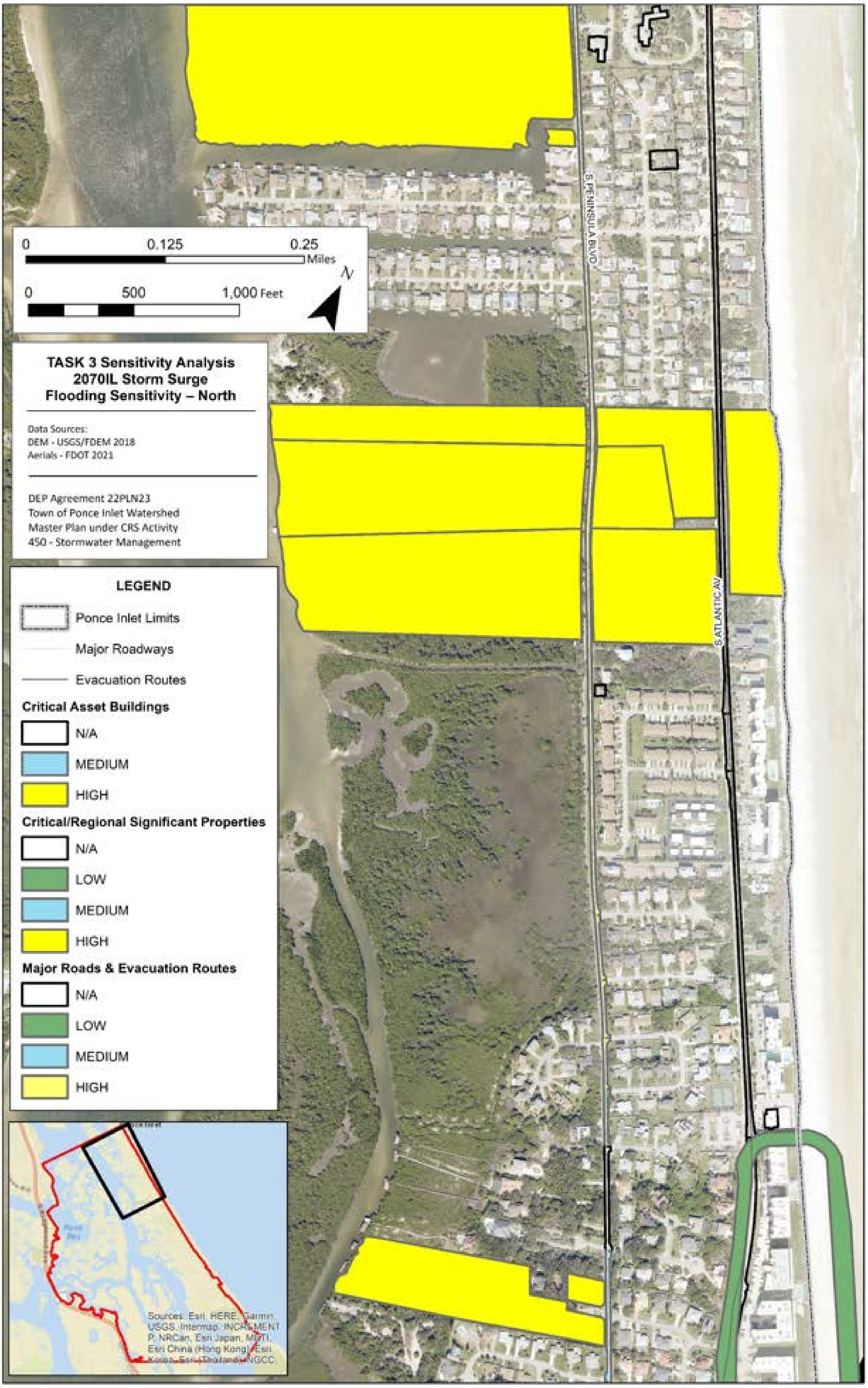

TASK 3 Sensitivity Analysis
2040IL Storm Surge
Flooding Sensitivity – Central
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed Master Plan under CRS Activity 450 - Stormwater Management
LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
HIGH
Critical/Regional Significant Properties
N/A
LOW
MEDIUM
HIGH
Major Roads & Evacuation Routes
N/A
LOW
MEDIUM
HIGH
S PENINSULA BLVD
S ATLANTIC AV
0
0.125
0.25
Miles
0
500
1,000 Feet
N

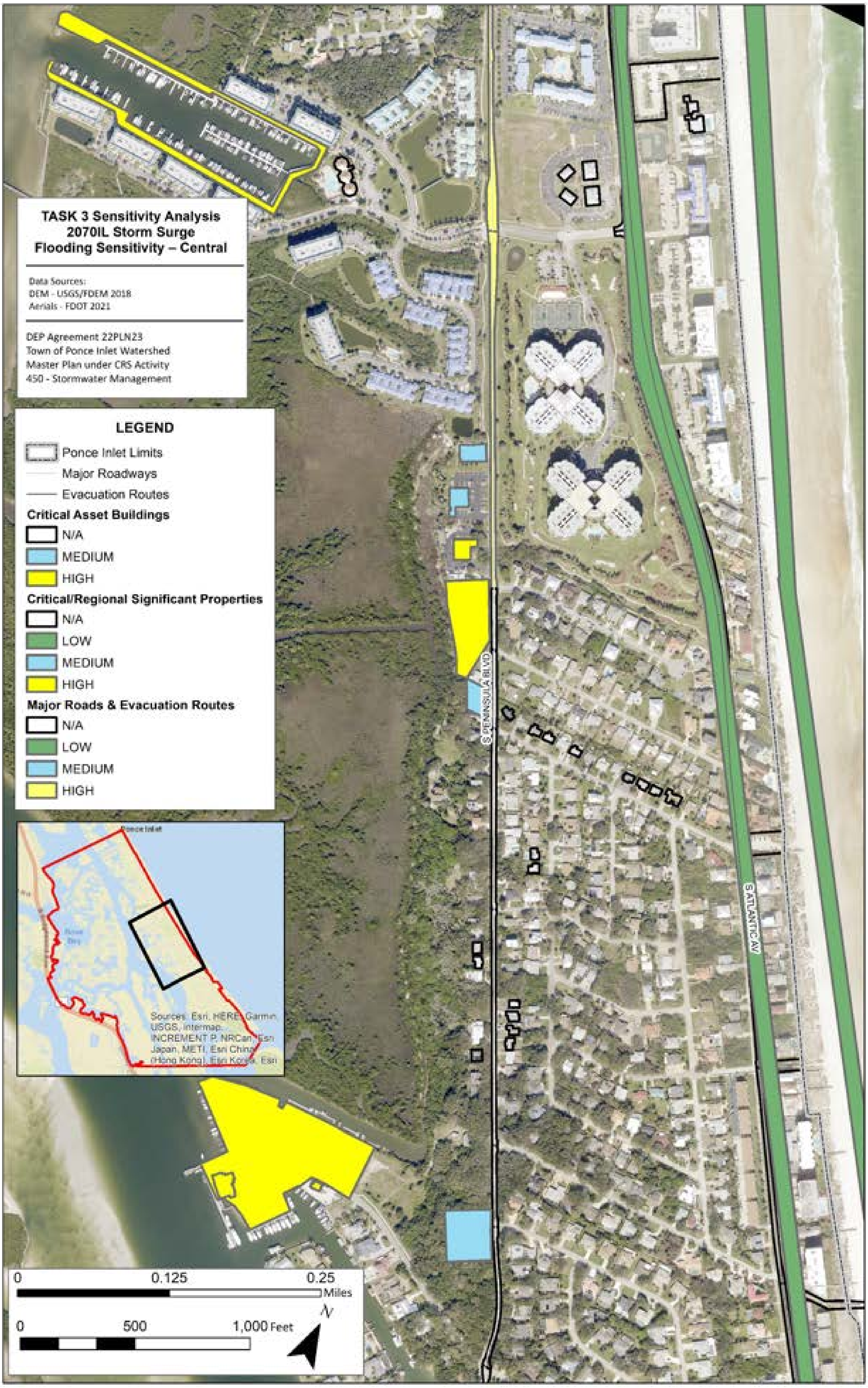

TASK 3 Sensitivity Analysis
2040IL Storm Surge
Flooding Sensitivity – South
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed
Master Plan under CRS Activity
450 - Stormwater Management
S PENINSULA BLVD
S ATLANTIC AV
BEACH ST
S ATLANTIC AVE
S ROBERT MERRELL PKY
LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
HIGH
Critical/Regional Significant Properties
N/A
LOW
MEDIUM
HIGH
Major Roads & Evacuation Routes
N/A
MEDIUM
Ponce Inlet
0
0.125
0.25
Miles
0
500
1,000 Feet
N


0
0.125
0.25
Miles
0
500
1,000 Feet
N
TASK 3 Sensitivity Analysis
2040IH Storm Surge
Flooding Sensitivity – North
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed
Master Plan under CRS Activity
450 - Stormwater Management
LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
HIGH
Critical/Regional Significant Properties
N/A
LOW
MEDIUM
HIGH
Major Roads & Evacuation Routes
N/A
LOW
MEDIUM
HIGH
S PENINSULA BLVD
S ATLANTIC AV
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and

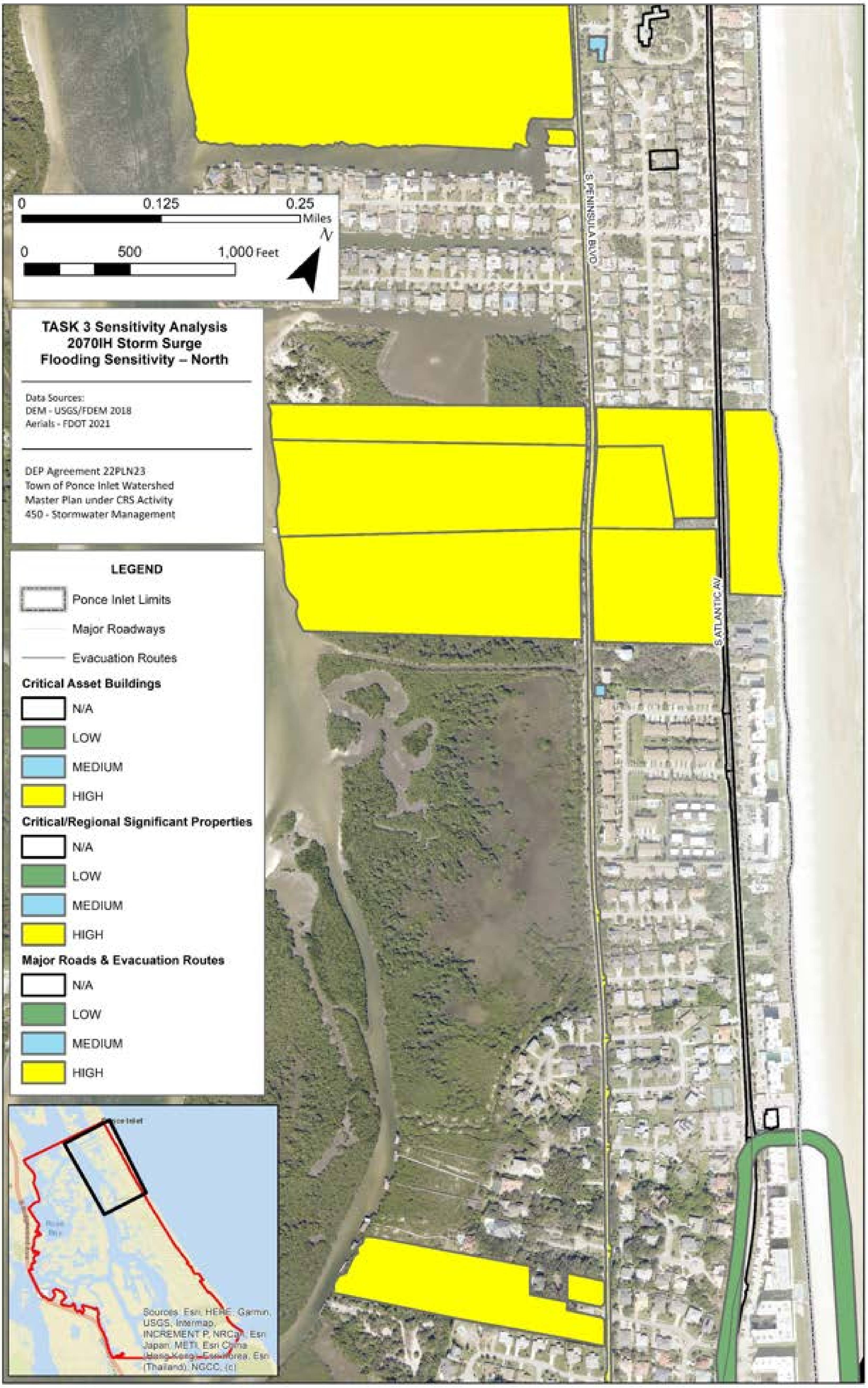

TASK 3 Sensitivity Analysis
2040IH Storm Surge
Flooding Sensitivity – Central
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed
Master Plan under CRS Activity
450 - Stormwater Management
LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
HIGH
Critical/Regional Significant Properties
N/A
LOW
MEDIUM
HIGH
Major Roads & Evacuation Routes
N/A
LOW
MEDIUM
HIGH
S PENINSULA BLVD
S ATLANTIC AV
0
0.125
0.25
Miles
0
500
1,000 Feet
N

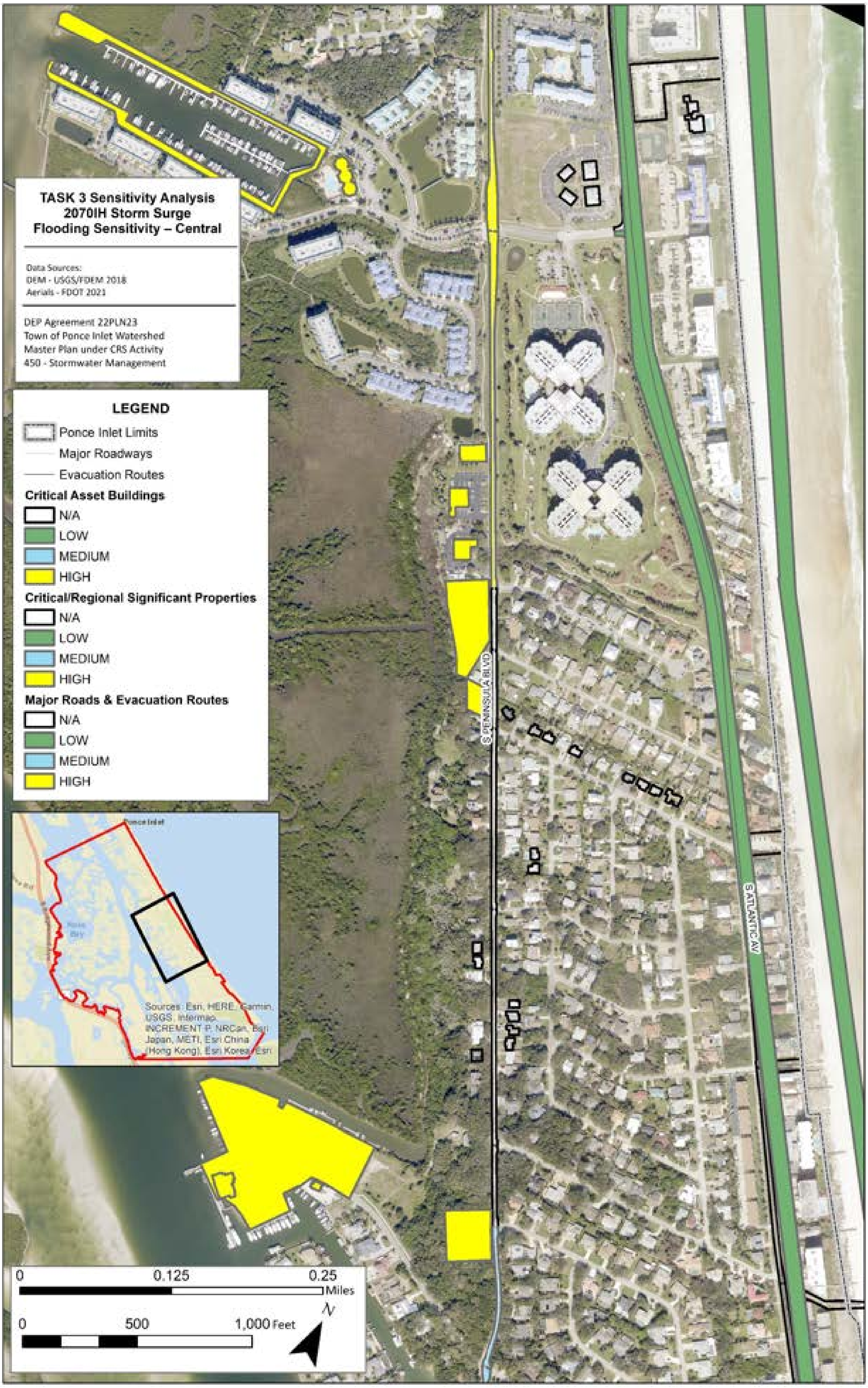

TASK 3 Sensitivity Analysis
2040IH Storm Surge
Flooding Sensitivity – South
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed
Master Plan under CRS Activity
450 - Stormwater Management
0
0.125
0.25
Miles
0
500
1,000 Feet
N
S PENINSULA BLVD
S ATLANTIC AV
BEACH ST
S ATLANTIC AVE
S ROBERT MERRELL PKY
LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
HIGH
Critical/Regional Significant Properties
N/A
LOW
MEDIUM
HIGH
Major Roads & Evacuation Routes
N/A
LOW
MEDIUM
HIGH
Ponce Inlet
(Thailand), NGCC, (c)

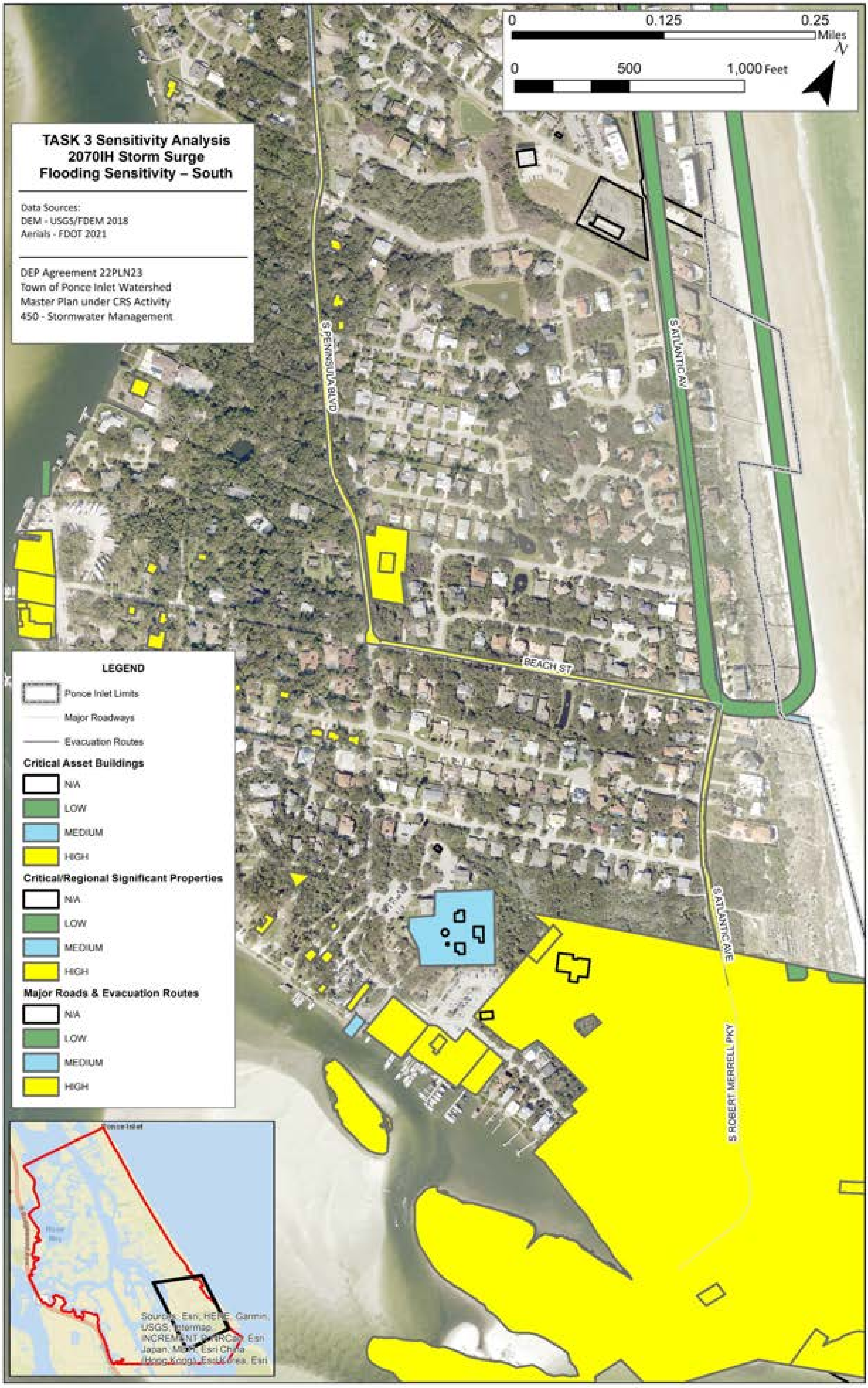

0
0.125
0.25
Miles
0
500
1,000 Feet
N
TASK 3 Sensitivity Analysis
2070IL Storm Surge
Flooding Sensitivity – North
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed
Master Plan under CRS Activity
450 - Stormwater Management
LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
MEDIUM
HIGH
Critical/Regional Significant Properties
N/A
LOW
MEDIUM
HIGH
Major Roads & Evacuation Routes
N/A
LOW
MEDIUM
HIGH
S PENINSULA BLVD
S ATLANTIC AV

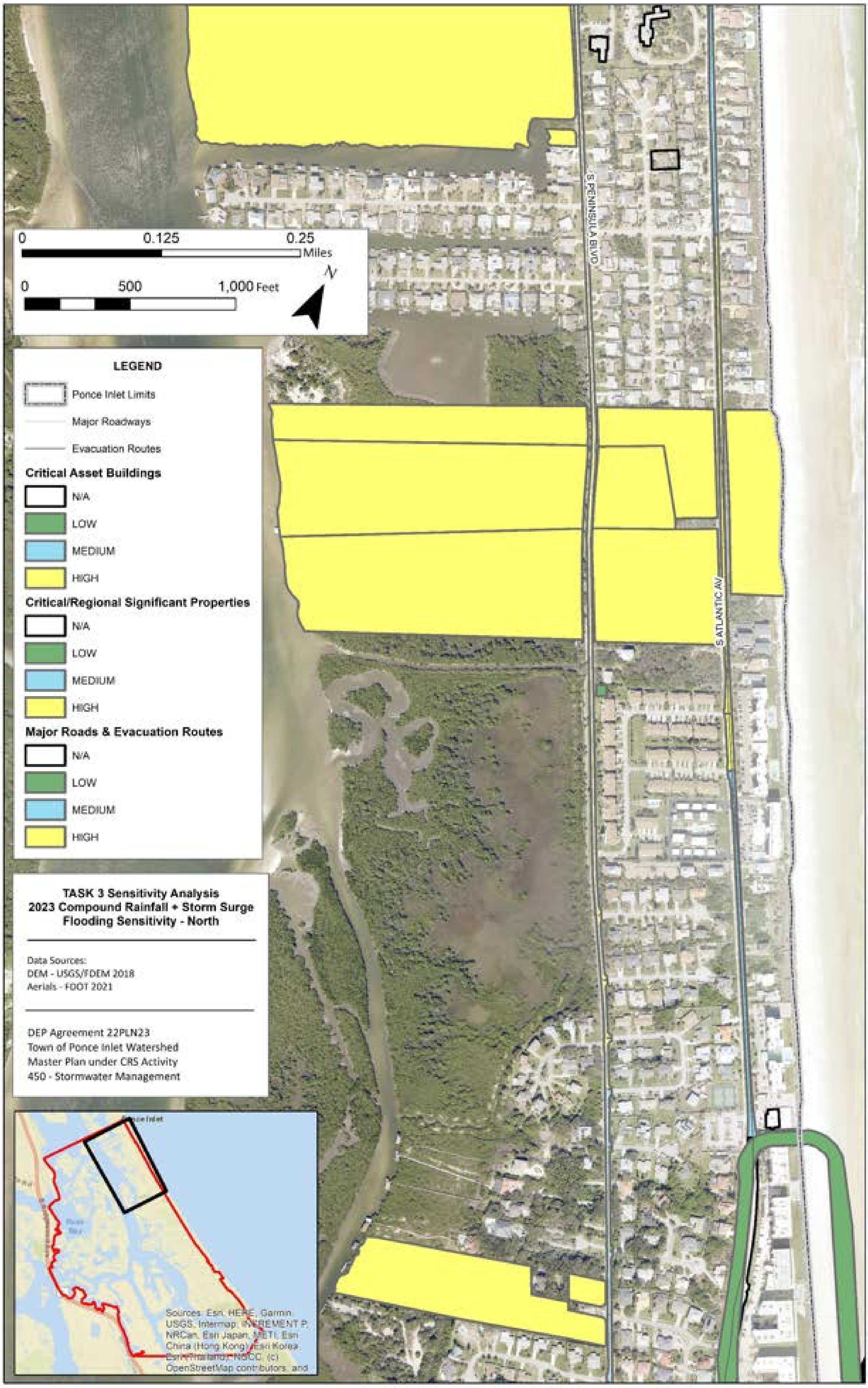

TASK 3 Sensitivity Analysis
2070IL Storm Surge
Flooding Sensitivity – Central
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed
Master Plan under CRS Activity
450 - Stormwater Management
LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
MEDIUM
HIGH
Critical/Regional Significant Properties
N/A
LOW
MEDIUM
HIGH
Major Roads & Evacuation Routes
N/A
LOW
MEDIUM
HIGH
S PENINSULA BLVD
S ATLANTIC AV
0
0.125
0.25
Miles
0
500
1,000 Feet
N

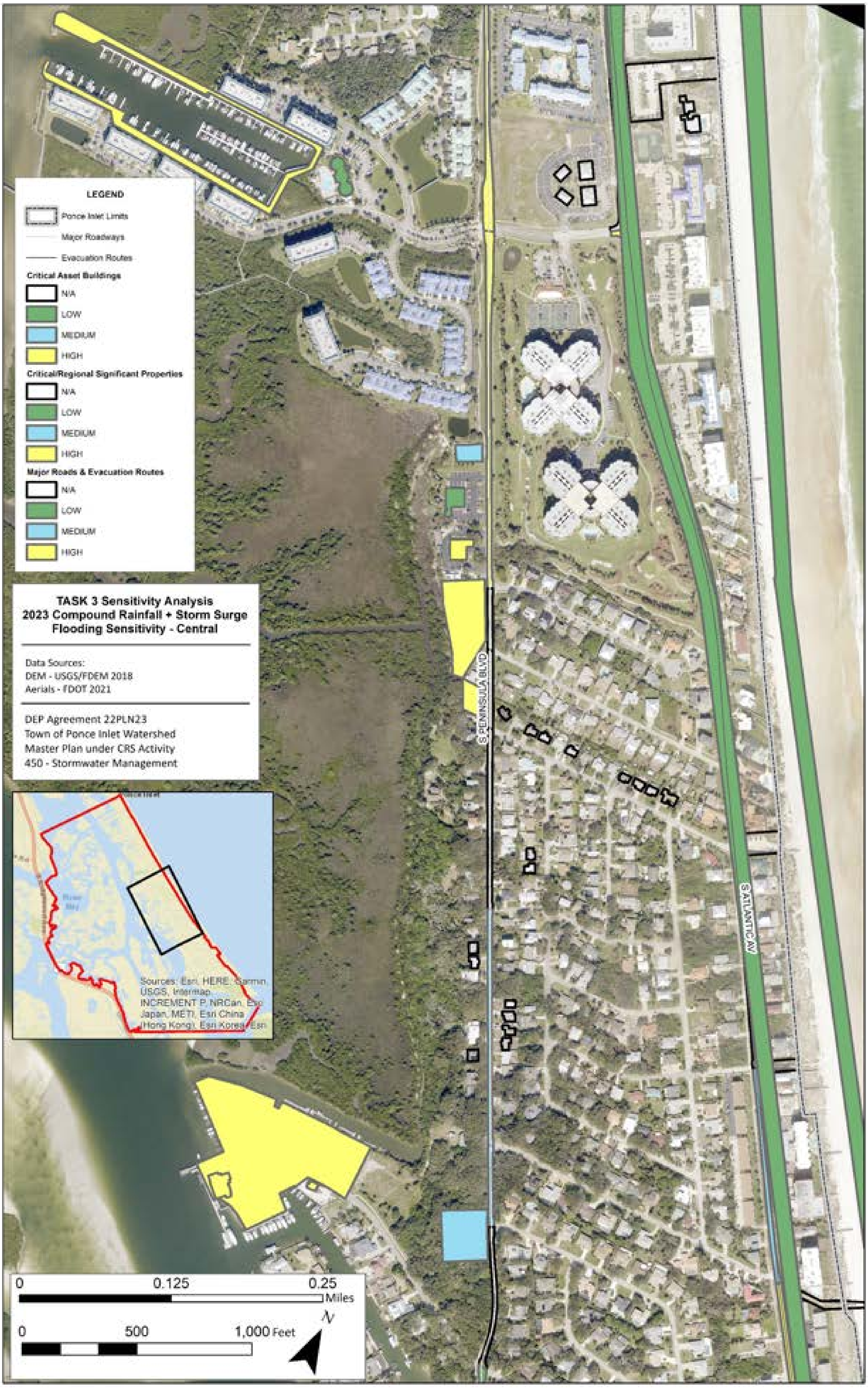

TASK 3 Sensitivity Analysis
2070IL Storm Surge
Flooding Sensitivity – South
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed
Master Plan under CRS Activity
450 - Stormwater Management
0 0.125 0.25 Miles
0 500 1,000 Feet
N
S PENINSULA BLVD
S ATLANTIC AV
BEACH ST
S ATLANTIC AVE
S ROBERT MERRELL PKY
LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
MEDIUM
HIGH
Critical/Regional Significant Properties
N/A
LOW
MEDIUM
HIGH
Major Roads & Evacuation Routes
N/A
LOW
MEDIUM
HIGH
Ponce Inlet


0
0.125
0.25
Miles
0
500
1,000 Feet
N
TASK 3 Sensitivity Analysis
2070IH Storm Surge
Flooding Sensitivity – North
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed
Master Plan under CRS Activity
450 - Stormwater Management
LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
LOW
MEDIUM
HIGH
Critical/Regional Significant Properties
N/A
LOW
MEDIUM
HIGH
Major Roads & Evacuation Routes
N/A
LOW
MEDIUM
HIGH
S PENINSULA BLVD
S ATLANTIC AV

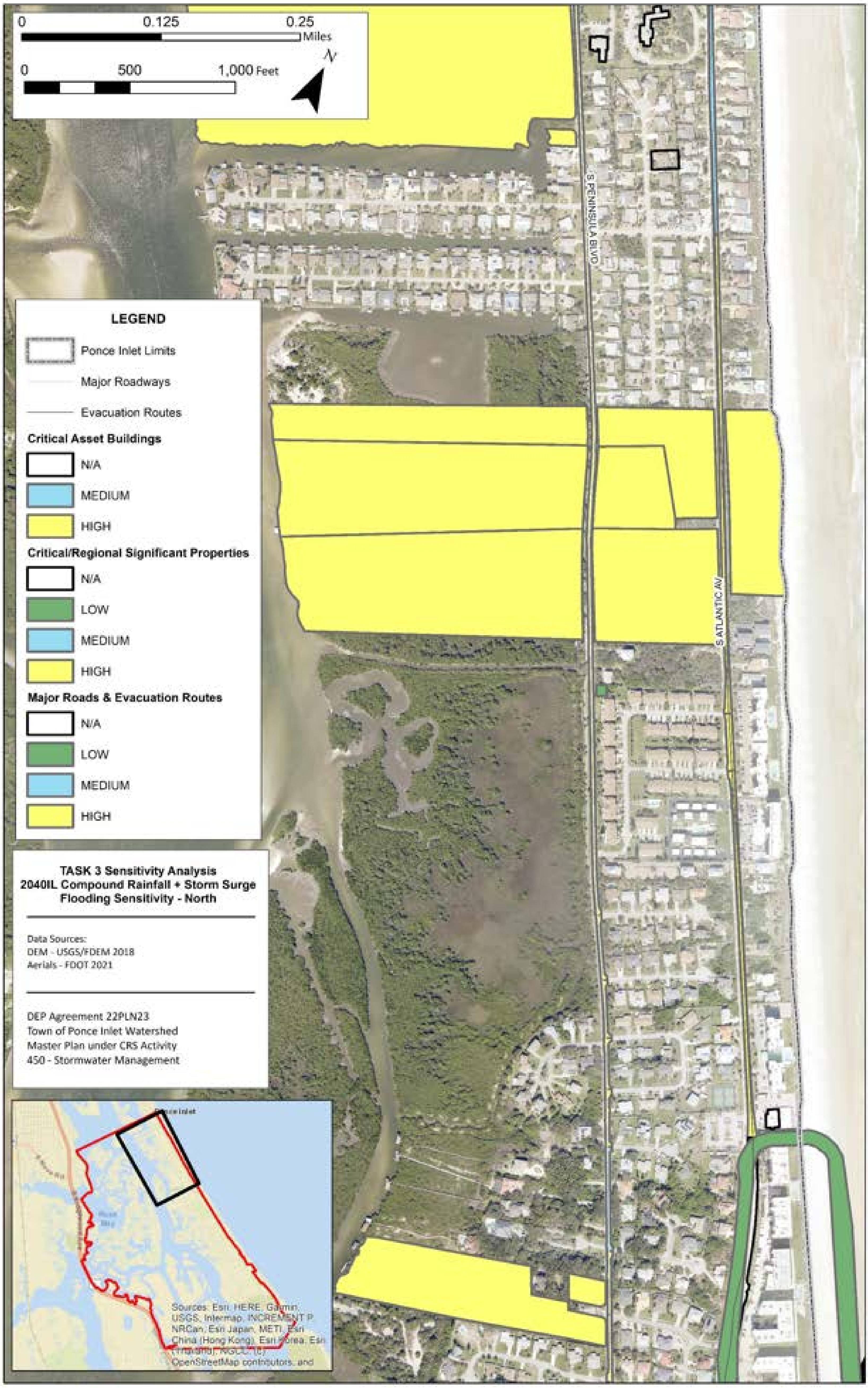

TASK 3 Sensitivity Analysis
2070IH Storm Surge
Flooding Sensitivity – Central
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed
Master Plan under CRS Activity
450 - Stormwater Management
LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
LOW
MEDIUM
HIGH
Critical/Regional Significant Properties
N/A
LOW
MEDIUM
HIGH
Major Roads & Evacuation Routes
N/A
LOW
MEDIUM
HIGH
S PENINSULA BLVD
S ATLANTIC AV
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri
0 0.125 0.25 Miles
0 500 1,000 Feet
N


TASK 3 Sensitivity Analysis
2070IH Storm Surge
Flooding Sensitivity – South
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed
Master Plan under CRS Activity
450 - Stormwater Management
0 0.125 0.25 Miles
0 500 1,000 Feet
N
S PENINSULA BLVD
S ATLANTIC AV
BEACH ST
S ATLANTIC AVE
S ROBERT MERRELL PKY
LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
LOW
MEDIUM
HIGH
Critical/Regional Significant Properties
N/A
LOW
MEDIUM
HIGH
Major Roads & Evacuation Routes
N/A
LOW
MEDIUM
HIGH
Ponce Inlet


0
0.125
0.25
Miles
0
500
1,000 Feet
N
LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
LOW
MEDIUM
HIGH
Critical/Regional Significant Properties
N/A
LOW
MEDIUM
HIGH
Major Roads & Evacuation Routes
N/A
LOW
MEDIUM
HIGH
TASK 3 Sensitivity Analysis
2023 Compound Rainfall + Storm Surge
Flooding Sensitivity - North
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed
Master Plan under CRS Activity
450 - Stormwater Management
S PENINSULA BLVD
S ATLANTIC AV

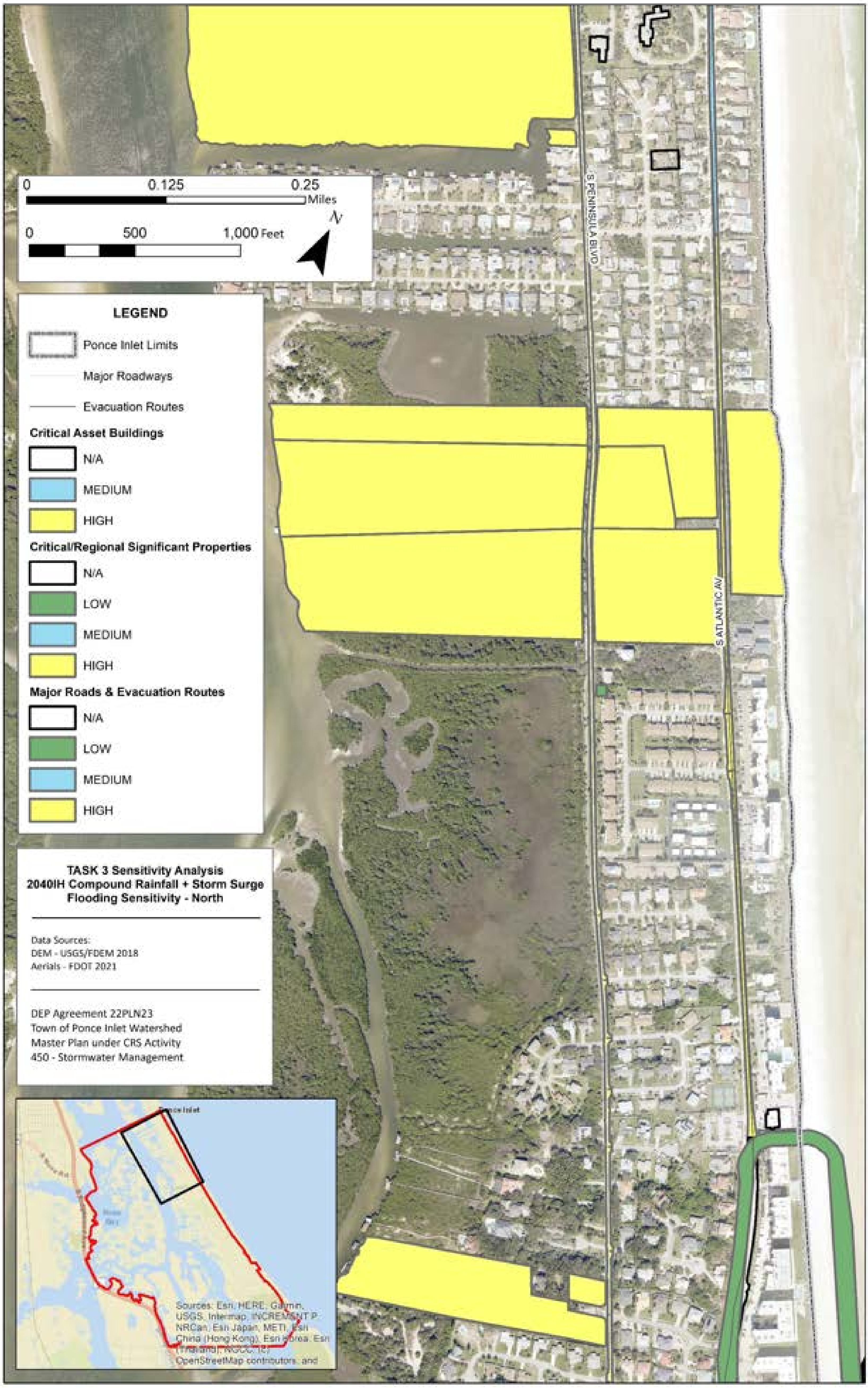

LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
LOW
MEDIUM
HIGH
Critical/Regional Significant Properties
N/A
LOW
MEDIUM
HIGH
Major Roads & Evacuation Routes
N/A
LOW
MEDIUM
HIGH
TASK 3 Sensitivity Analysis
2023 Compound Rainfall + Storm Surge
Flooding Sensitivity - Central
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed
Master Plan under CRS Activity
450 - Stormwater Management
S PENINSULA BLVD
S ATLANTIC AV
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri
0 0.125 0.25 Miles
0 500 1,000 Feet
N

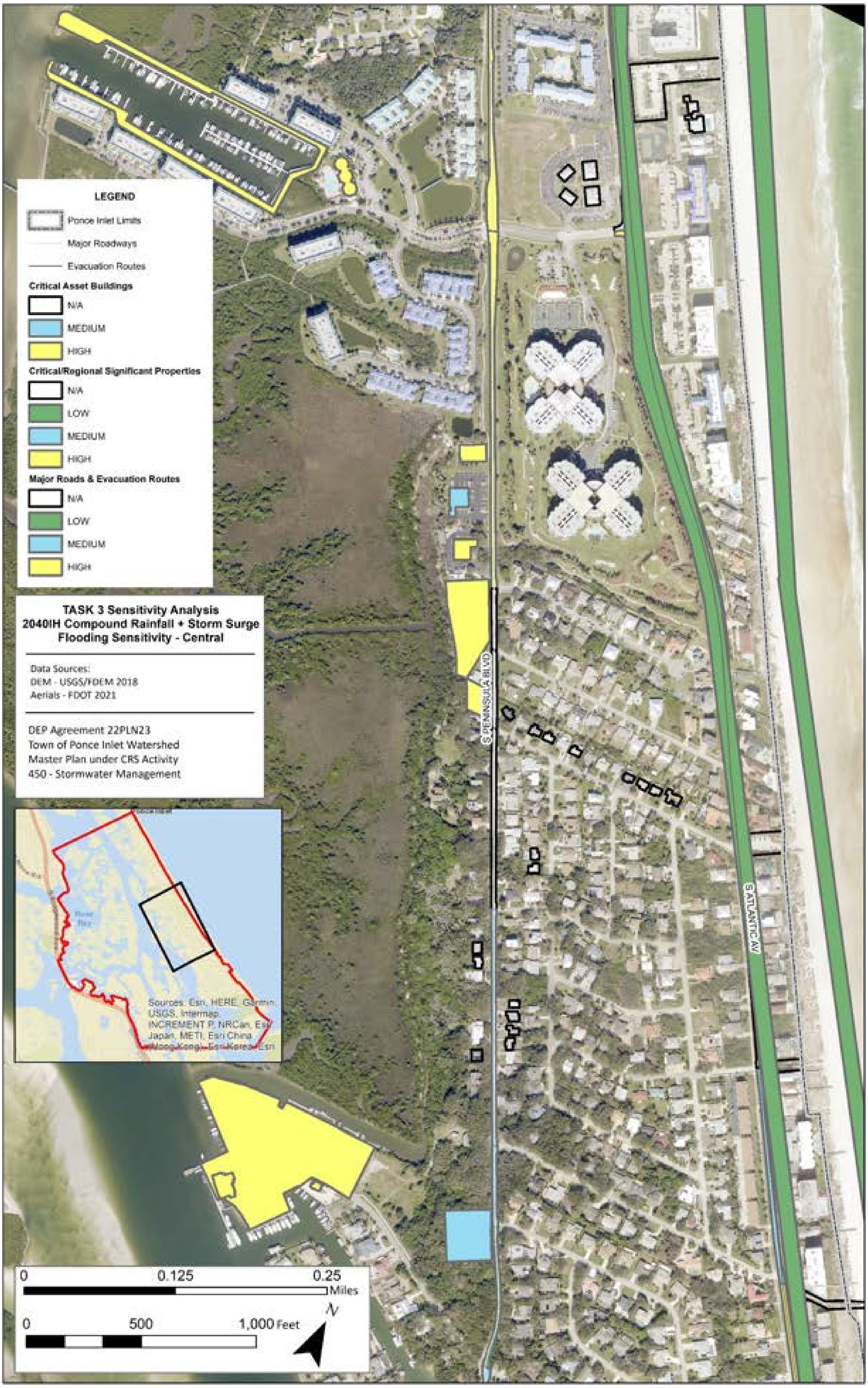

S PENINSULA BLVD
S ATLANTIC AV
BEACH ST
S ATLANTIC AVE
LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
LOW
MEDIUM
HIGH
Critical/Regional Significant Properties
N/A
LOW
MEDIUM
HIGH
Major Roads & Evacuation Routes
N/A
LOW
MEDIUM
HIGH
TASK 3 Sensitivity Analysis
2023 Compound Rainfall + Storm Surge
Flooding Sensitivity - South
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed
Master Plan under CRS Activity
450 - Stormwater Management
0 0.125 0.25 Miles
0 500 1,000 Feet
N
Ponce Inlet


0
0.125
0.25
Miles
0
500
1,000 Feet
N
S PENINSULA BLVD
S ATLANTIC AV
LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
MEDIUM
HIGH
Critical/Regional Significant Properties
N/A
LOW
MEDIUM
HIGH
Major Roads & Evacuation Routes
N/A
LOW
MEDIUM
HIGH
TASK 3 Sensitivity Analysis
2040IL Compound Rainfall + Storm Surge
Flooding Sensitivity - North
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed
Master Plan under CRS Activity
450 - Stormwater Management

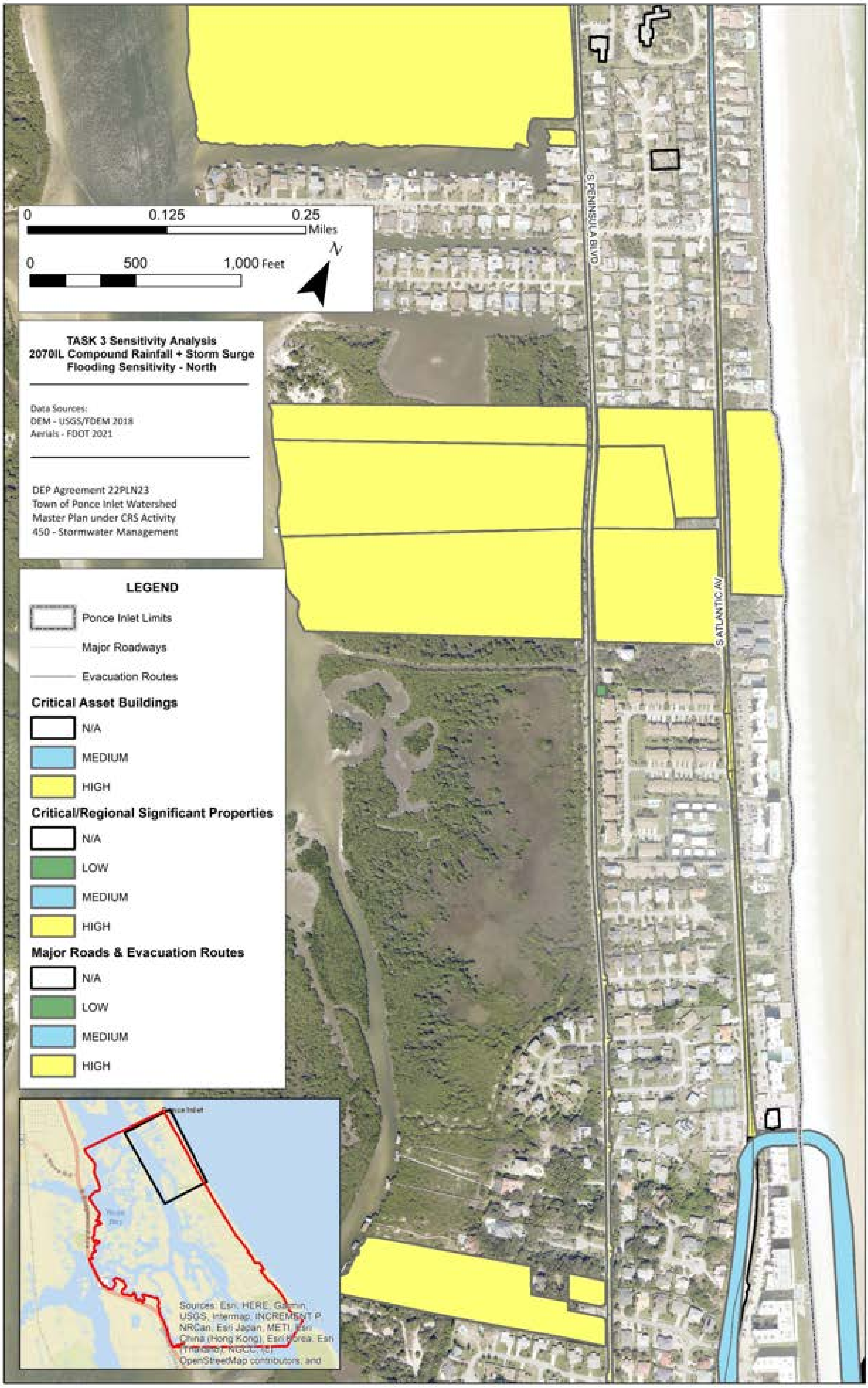

TASK 3 Sensitivity Analysis
2040IL Compound Rainfall + Storm Surge
Flooding Sensitivity - Central
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed
Master Plan under CRS Activity
450 - Stormwater Management
LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
MEDIUM
HIGH
Critical/Regional Significant Properties
N/A
LOW
MEDIUM
HIGH
Major Roads & Evacuation Routes
N/A
LOW
MEDIUM
HIGH
S PENINSULA BLVD
S ATLANTIC AV
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri
0
0.125
0.25
Miles
0
500
1,000 Feet
N


S PENINSULA BLVD
S ATLANTIC AV
BEACH ST
S ATLANTIC AVE
LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
MEDIUM
HIGH
Critical/Regional Significant Properties
N/A
LOW
MEDIUM
HIGH
Major Roads & Evacuation Routes
N/A
LOW
MEDIUM
HIGH
TASK 3 Sensitivity Analysis
2040IL Compound Rainfall + Storm Surge
Flooding Sensitivity - South
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed
Master Plan under CRS Activity
450 - Stormwater Management
0
0.125
0.25
Miles
0
500
1,000 Feet
N

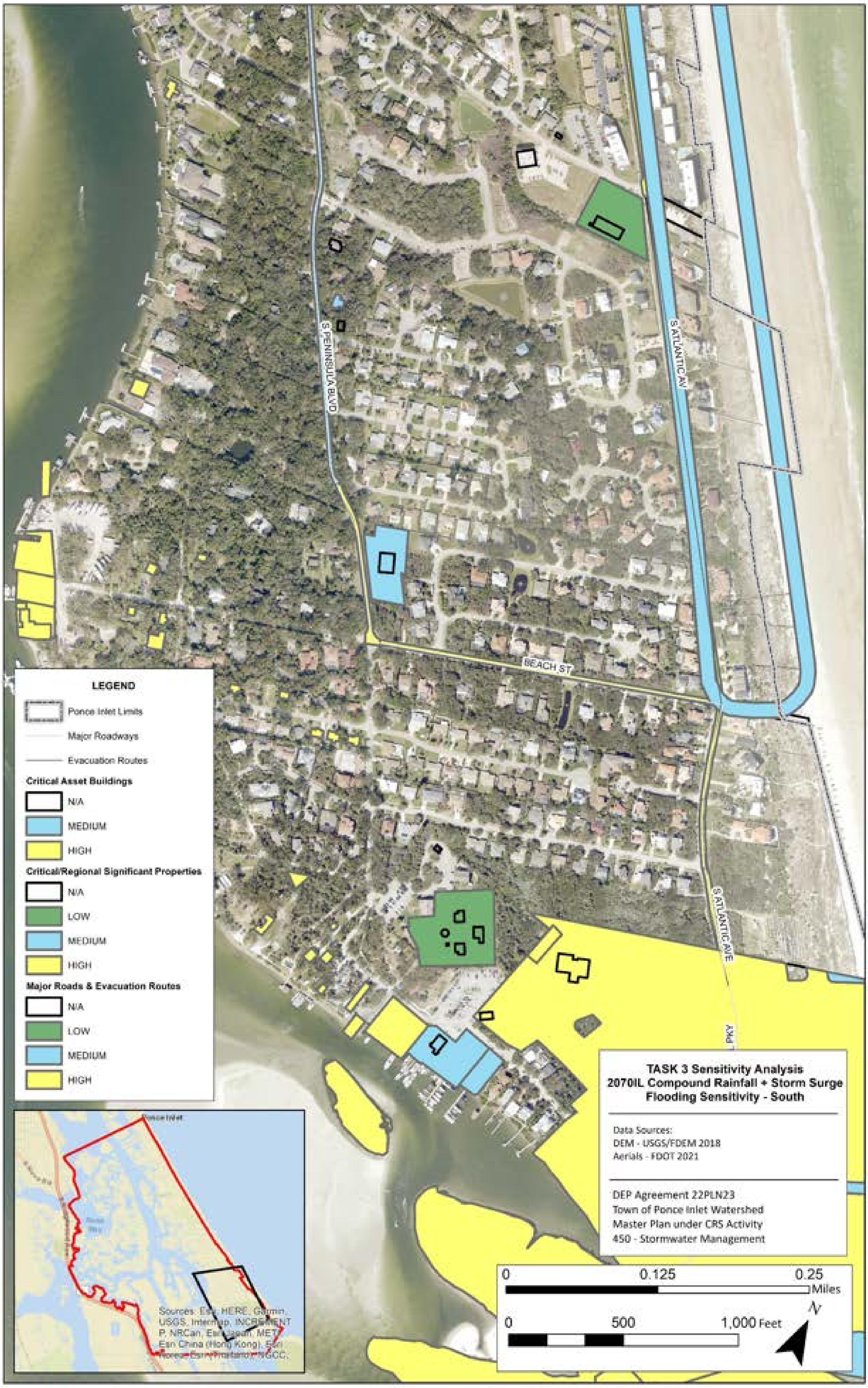

0
0.125
0.25
Miles
0
500
1,000 Feet
N
S PENINSULA BLVD
S ATLANTIC AV
LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
MEDIUM
HIGH
Critical/Regional Significant Properties
N/A
LOW
MEDIUM
HIGH
Major Roads & Evacuation Routes
N/A
LOW
MEDIUM
HIGH
TASK 3 Sensitivity Analysis
2040IH Compound Rainfall + Storm Surge
Flooding Sensitivity - North
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed
Master Plan under CRS Activity
450 - Stormwater Management
Ponce Inlet

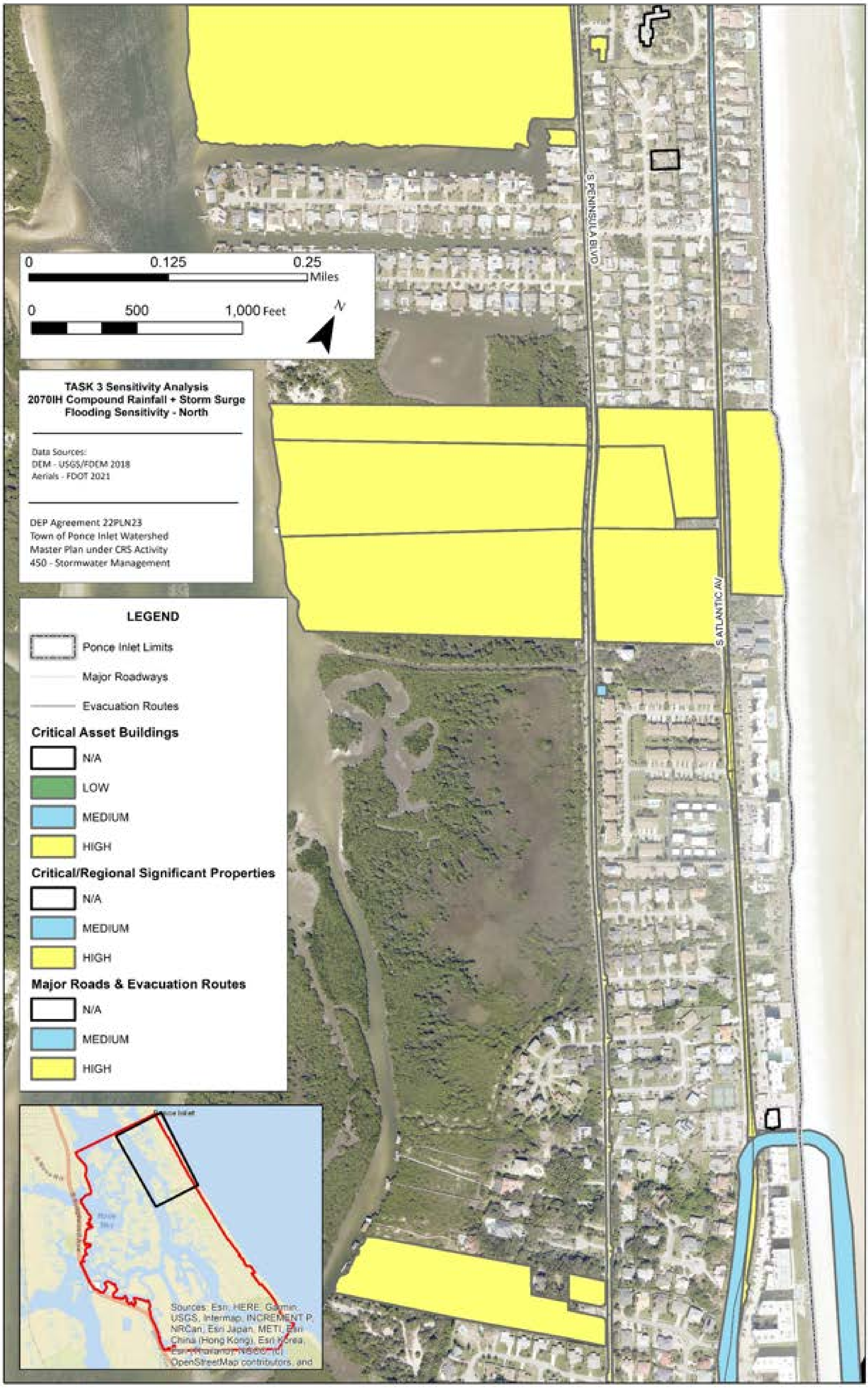

LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
MEDIUM
HIGH
Critical/Regional Significant Properties
N/A
LOW
MEDIUM
HIGH
Major Roads & Evacuation Routes
N/A
LOW
MEDIUM
HIGH
TASK 3 Sensitivity Analysis
2040IH Compound Rainfall + Storm Surge
Flooding Sensitivity - Central
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed
Master Plan under CRS Activity
450 - Stormwater Management
S PENINSULA BLVD
S ATLANTIC AV
0 0.125 0.25 Miles
0 500 1,000 Feet
N


S PENINSULA BLVD
S ATLANTIC AV
BEACH ST
S ATLANTIC AVE
LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
MEDIUM
HIGH
Critical/Regional Significant Properties
N/A
LOW
MEDIUM
HIGH
Major Roads & Evacuation Routes
N/A
LOW
MEDIUM
HIGH
TASK 3 Sensitivity Analysis
2040IH Compound Rainfall + Storm Surge
Flooding Sensitivity - South
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed
Master Plan under CRS Activity
450 - Stormwater Management
0
0.125
0.25
Miles
0
500
1,000 Feet
N


0
0.125
0.25
Miles
0
500
1,000 Feet
N
TASK 3 Sensitivity Analysis
2070IL Compound Rainfall + Storm Surge
Flooding Sensitivity - North
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed
Master Plan under CRS Activity
450 - Stormwater Management
LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
MEDIUM
HIGH
Critical/Regional Significant Properties
N/A
LOW
MEDIUM
HIGH
Major Roads & Evacuation Routes
N/A
LOW
MEDIUM
HIGH
S PENINSULA BLVD
S ATLANTIC AV
Ponce Inlet
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and


TASK 3 Sensitivity Analysis
2070IL Compound Rainfall + Storm Surge
Flooding Sensitivity - Central
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed
Master Plan under CRS Activity
450 - Stormwater Management
LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
MEDIUM
HIGH
Critical/Regional Significant Properties
N/A
LOW
MEDIUM
HIGH
Major Roads & Evacuation Routes
N/A
LOW
MEDIUM
HIGH
S PENINSULA BLVD
S ATLANTIC AV
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri
0
0.125
0.25
Miles
0
500
1,000 Feet
N


S PENINSULA BLVD
S ATLANTIC AV
BEACH ST
S ATLANTIC AVE
LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
MEDIUM
HIGH
Critical/Regional Significant Properties
N/A
LOW
MEDIUM
HIGH
Major Roads & Evacuation Routes
N/A
LOW
MEDIUM
HIGH
TASK 3 Sensitivity Analysis
2070IL Compound Rainfall + Storm Surge
Flooding Sensitivity - South
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed
Master Plan under CRS Activity
450 - Stormwater Management
0
0.125
0.25
Miles
0
500
1,000 Feet
N
Ponce Inlet


0 0.125 0.25 Miles
0 500 1,000 Feet
N
TASK 3 Sensitivity Analysis
2070IH Compound Rainfall + Storm Surge
Flooding Sensitivity - North
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed
Master Plan under CRS Activity
450 - Stormwater Management
LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
LOW
MEDIUM
HIGH
Critical/Regional Significant Properties
N/A
MEDIUM
HIGH
Major Roads & Evacuation Routes
N/A
MEDIUM
HIGH
S PENINSULA BLVD
S ATLANTIC AV


TASK 3 Sensitivity Analysis
2070IH Compound Rainfall + Storm Surge
Flooding Sensitivity - Central
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed
Master Plan under CRS Activity
450 - Stormwater Management
LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
LOW
MEDIUM
HIGH
Critical/Regional Significant Properties
N/A
MEDIUM
HIGH
Major Roads & Evacuation Routes
N/A
MEDIUM
HIGH
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri
S PENINSULA BLVD
S ATLANTIC AV
0
0.125
0.25
Miles
0
500
1,000 Feet
N


S PENINSULA BLVD
S ATLANTIC AV
BEACH ST
S ATLANTIC AVE
LEGEND
Ponce Inlet Limits
Major Roadways
Evacuation Routes
Critical Asset Buildings
N/A
LOW
MEDIUM
HIGH
Critical/Regional Significant Properties
N/A
MEDIUM
HIGH
Major Roads & Evacuation Routes
N/A
MEDIUM
HIGH
TASK 3 Sensitivity Analysis
2070IH Compound Rainfall + Storm Surge
Flooding Sensitivity - South
Data Sources:
DEM - USGS/FDEM 2018
Aerials - FDOT 2021
DEP Agreement 22PLN23
Town of Ponce Inlet Watershed
Master Plan under CRS Activity
450 - Stormwater Management
0
0.125
0.25
Miles
0
500
1,000 Feet
N

Appendix I

Task 3: Asset Prioritization Summary Table

Asset ID1	Asset ID2	Building Asset Name	Building Address	Building Prioritization
1002		PONCE INLET FIRE RESCUE ST 78	4680 S PENINSULA DR	**1**
1212		MEYER-DAVIS HOUSE	143 BEACH ST	**1**
1213		HASTY COTTAGE	143 BEACH ST	**1**
1238	1611	Off the Hook at Inlet Harbor, Inlet Harbor Marina	133 INLET HARBOR RD	**1**
1239			120 RAINS DR	**1**
1240			112 RAINS DR	**1**
1241			107 RAINS DR	**1**
1242			105 RAINS DR	**1**
1243	1244		4818 PENINSULA DR S	**1**
1245			101 RAINS DR	**1**
1246		JONES/PRESTON/WILKINSON HOUSE	4879 SAILFISH DR	**1**
1247		JAMES HOUSE	4856 SAILFISH DR	**1**
1248	1610	DOWN THE HATCH	4894 FRONT ELEVATION ST	**1**
1250		PACETTI HOTEL	4928 S PENINSULA DR	**1**
1251			4894 SAILFISH DR	**1**
1252			4932 PENINSULA DR S	**1**
1253			4932 PENINSULA DR S	**1**
1254			4932 PENINSULA DR S	**1**
1605		Daytona Beach Parasail	4936 S Peninsula Dr Suite A	**1**
1609		Hidden Treasure Rum Bar & Grill	4940 S Peninsula Dr	**1**
1612		East Wind Condos Management Office	125 Inlet Harbor Rd	**1**
1001	1268	PONCE INLET COMMUNITY CENTER	4670 S PENINSULA DR	2
1602	1607	Harbour Village Ship Store + Bar & Grill	4621 Rivers Edge Village Ln	2
1003		PONCE INLET POLICE DEPT	4301 S PENINSULA DR	3
1004		PONCE INLET PUBLIC WORKS	4875 S. Peninsula Dr.	3
1005		PONCE INLET TOWN HALL	4300 S. Atlantic Ave.	3
1006		BIRD SANCTUARY LIGHTHOUSE PARK	4965 S PENSINSULA DR	3
1007		MARINE SCIENCE CENTER	100 LIGHTHOUSE DR	3
1102		AT&T EQUIPMENT BUILDING	48 Inlet Harbor Rd.	3
1214	1606	Racing's North Turn Restaurant	4511 S ATLANTIC AVE	3
1215			4591 S ATLANTIC AVE	3
1216			4595 S ATLANTIC AVE	3
1217			58 OCEANVIEW AVE	3
1218			46 OCEANVIEW AVE	3
1219			50 OCEANVIEW AVE	3
1220			54 OCEANVIEW AVE	3
1221			4722 DIXIE DR	3
1222			4724 DIXIE DR	3
1223			96 OCEANVIEW AVE	3
1224			86 OCEANVIEW AVE	3
1225			82 OCEANVIEW AVE	3
1226			74 OCEANVIEW AVE	3
1227			4740 PENINSULA DR	3
1228			4744 PENINSULA DR S	3
1229			4747 PENINSULA DR S	3
1230			4749 PENINSULA DR S	3
1231			4753 PENINSULA DR S	3
1232			4755 PENINSULA DR S	3
1233			4757 PENINSULA DR S	3
1235			4829 PENINSULA DR S	3
1236			4835 PENINSULA DR S	3
1237			4837 PENINSULA DR S	3
1249		BATELLE, INC.	4928 SAILFISH DR	3
1255		PONCE DE LEON INLET LIGHTHOUSE	4931 S PENINSULA DR	3
1256		ASSISTANT KEEPER'S COTTAGE	4931 S PENINSULA DR	3
1257		LIGHTHOUSE KEEPER'S COTTAGE	4931 S PENINSULA DR	3
1258		OIL STORAGE BUILDING	4931 S PENINSULA DR	3
1259		LIGHTHOUSE OIL STORAGE BUILDING	4931 S PENINSULA DR	3
1600		Kopec Insurance	4604 S Atlantic Ave	3
1601		Adams Cameron & Co Realtors & Ho Daddy O's	4600 S Atlantic Ave	3
1603		Waverly Tower	55 Inlet Harbor Rd	3
1604		Lighthouse Marina Commercial Building	4958 S Peninsula Dr	3
1608		Jerry's Italian Grill & Tiki Bar, Surf Shop	33 Inlet Harbor Rd	3
1613		7-Eleven	4618 S Atlantic Ave	3
1614		Commercial/Retail Shop	4616 S Atlantic Ave	3

Asset ID1	Asset ID2	Asset ID3	Asset ID4	Asset ID5	Asset ID6	Property Asset Name	Property Address	Property Prioritization
1004	1122					PUBLIC WORKS YARD	4875 S. PENINSULA DR.	1
1101						Cell Tower at Pollard Park	4680 S PENINSULA DR	1
1103						4354 S Peninsula Lift Station	4354 S PENINSULA DR	1
1106						4875 S Peninsula Lift Station	4875 S PENINSULA DR	1
1108	1114	1608				31 Inlet Harbor Lift Station	31 INLET HARBOR RD	1
1109						127 Ponce De Leon Cir Lift Station	127 PONCE DE LEON CIR	1
1110	1112	1115	1238	1524	1529	INLET HARBOR MARINA	133 INLET HARBOR RD	1
1113	1530					Ocean Support, Inc.	4950 S PENINSULA DR	1
1117	1120					Snow White Boat	4890 Front Street	1
1118	1248	1535	1610			SEA LOVE BOAT WORKS	4884 FRONT ST	1
1269						Wilbur Bay Wetlands	4324 S PENINSULA DR	1
1525	1532					SEA LOVE BOAT WORKS	4877 FRONT STREET	1
1526						HIDDEN TREASURE MARINA	4940 S PENINSULA DR	1
1527						DATYONA BEACH PARASAIL MARINA	4936 S. PENINSULA DR.	1
1531						INLET COVE MARINA	125 INLET HARBOR RD	1
1534						HARBOR VILLAGE GOLF & YACHT CLUB	4622 LINKS VILLAGE DR	1
1104						4427 S Peninsula Lift Station	4427 S PENINSULA DR	2
1105						4650 S Peninsula Lift Station	4650 S PENINSULA DR	2
1111	1116	1119	1533	1604		LIGHTHOUSE BOATYARD LLC	4958 S PENINSULA DR	2
1265						Green Mound State Archaeological Site	Ponce Preserve - S PENINSULA DR	2
1107						81 Oceanway Lift Station	81 OCEANWAY DR	3
1121						4329 CANDLEWOOD LANE FUEL STORAGE	4329 CANDLEWOOD LN	3
1200						LIGHTHOUSE POINT [SOLARIS ID: A184]	5000 S ATLANTIC AVE	3
1201						BEACH ACCESS [SOLARIS ID: A2099]	INLET HARBOR RD & S ATLANTIC AVE	3
1202						LPP NORTH PENINSULA [SOLARIS ID: A13898]	5000 S ATLANTIC AVE	3
1203						NON-PROJECT ACQUISITION [SOLARIS ID: A46882]	PONCE DE LEON INLET	3
1204						LIGHTHOUSE POINT PARK [SOLARIS ID: CL11182]	5000 S ATLANTIC AVE	3
1205						LIGHTHOUSE POINT PARK [SOLARIS ID: CL11183]	5000 S ATLANTIC AVE	3
1206						LIGHTHOUSE POINT PARK [SOLARIS ID: CL11184]	5000 S ATLANTIC AVE	3
1207						LIGHTHOUSE POINT PARK [SOLARIS ID: CL11185]	5000 S ATLANTIC AVE	3
1208						HASTY FAMILY PLOT	BEACH ST & SAILFISH DR	3
1209						PACETTI FAMILY PLOT	SAILFISH DR & S PENINUSULA DR	3
1210						Kay and Ayers Davies Lighthouse Park	4931 S PENINSULA DR	3
1211						FIRST RACETRACK NASCAR	S ATLANTIC AVE	3
1234						UNKNOWN HISTORICAL STRUCTURE	4784 S PENINSULA DR	3
1260						BEACH ST BEACH ACCESS	BEACH ST & ATLANTIC AVE	3
1261						GLENVIEW AVENUE BEACH ACCESS	GLENVIEW AVE & S ATLANTIC AVE	3
1262						OCEANVIEW AVENUE BEACH ACCESS	OCEANVIEW AVE & S ATLANTIC AVE	3
1263						NORTH TURN BEACH ACCESS	4511 S ATLANTIC AVE	3
1264						CALUMET AVENUE BEACH ACCESS	CALUMET AVE & S ATLANTIC AVE	3
1266						Ponce Preserve	4401 S PENINSULA DR	3
1267						Timothy Pollard Memorial Park	4680 S PENINSULA DR	3
1270						Timucuan Oaks Botanical Garden	4550 S PENINSULA DR	3
1271						Happy Tails Dog Park	4700 S PENINSULA DR	3
1272						Elber's Sunset Park	FRONT ST	3
1273						Winterhaven Park	4589 S ATLANTIC AVE	3
1500						Ponce Inlet Boating Facility at Lighthouse Park	4944 S PENINSULA DR	3
1528						LIGHTHOUSE BOAT YARD - PRIVATE	4958 S PENINSULA DR	3
2200						LIGHTHOUSE POINT PARK, PONCE INLET PORT AUTHORITY	5000 S ATLANTIC AVE	3
2201						LIGHTHOUSE POINT PARK, US DEPT OF INTERIOR	5000 S ATLANTIC AVE	3

Asset ID1	Roadway	Segment Location	Roadway Prioritization
1504	S ATLANTIC AVE	GLENVIEW AVE & CALUMET AVE	1
1507	S ATLANTIC AVE	COASTAL OAKS CIR & INLET POINT BLVD	1
1509	S ATLANTIC AVE	HARBOUR VILLAGE BLVD & CINDY LN	1
1512	S ATLANTIC AVE	JANA DR & SEAHAVEN DR	1
1513	S ATLANTIC AVE	PONCE PRESERVE & JANA DR	1
1514	S ATLANTIC AVE	SEAHAVEN DR & N TURN APPROACH	1
1516	S ATLANTIC AVE	POMPANO DR & WINTERHAVEN PARK	1
1517	S ATLANTIC AVE	CALUMET AVE & INLET HARBOR RD	1
1519	S ATLANTIC AVE	INLET POINT BLVD & BEACH ST	1
1521	ROBERT A MERRIL PKWY	LIGHTHOUSE DR & S PENINSULA DR	1
152304	S PENINSULA DR	ANCHOR DR & JANA DR	1
152306	S PENINSULA DR	TIA MARIA CIR & SUN DUNES CIR	1
152307	S PENINSULA DR	SUN DUNES CIR & SEAWINDS CIR	1
152326	S PENINSULA DR	JENNIFER CIR & BEACH ST	1
1502	S ATLANTIC AVE	BEACH ST & CARIBBEAN WAY	2
1503	S ATLANTIC AVE	OCEAN WAY & LIGHTHOUSE DR	2
1510	S ATLANTIC AVE	MAR AZUL N & COASTAL OAKS CIR	2
1518	S ATLANTIC AVE	CITY LIMIT & OLD CARRIAGE RD	2
1520	BEACH ST	S PENINSULA DR & S ATLANTIC AVE	2
152301	S PENINSULA DR	CITY LIMIT & OLD CARRIAGE RD	2
152311	S PENINSULA DR	DAGGETT COVE DR & POMPANO DR	2
152312	S PENINSULA DR	POMPANO DR & MARIE DR	2
152313	S PENINSULA DR	MARIE DR & HARBOUR VILLAGE BLVD	2
152314	S PENINSULA DR	HARBOUR VILLAGE BLVD & LOGGERHEAD CT	2
152323	S PENINSULA DR	MAR AZUL N & BAY HARBOUR DR	2
1501	S ATLANTIC AVE	CARIBBEAN WAY & OCEAN WAY DR	3
1505	S ATLANTIC AVE	CINDY LN & OCEANVIEW AVE	3
1506	S ATLANTIC AVE	OCEANVIEW AVE & GLENVIEW AVE	3
1508	S ATLANTIC AVE	WINTERHAVEN PARK & HARBOUR VILLAGE BLVD	3
1511	S ATLANTIC AVE	INLET HARBOR RD & MAR AZUL N	3
1515	S ATLANTIC AVE	N TURN APPROACH & POMPANO DR	3
152302	S PENINSULA DR	OLD CARRIAGE RD W & OLD CARRIAGE RD E	3
152303	S PENINSULA DR	OLD CARRIAGE RD E & ANCHOR DR	3
152305	S PENINSULA DR	JANA DR & TIA MARIA CIR	3
152308	S PENINSULA DR	SEAWINDS CIR	3
152309	S PENINSULA DR	SEAWINDS CIR & MAURA TER	3
152310	S PENINSULA DR	MAURA TER & DAGGETT COVE DR	3
152315	S PENINSULA DR	LOGGERHEAD CT & CINDY LN	3
152316	S PENINSULA DR	CINDY LN & OCEANVIEW AVE	3
152317	S PENINSULA DR	OCEANVIEW AVE & ALBERTA AVE	3
152318	S PENINSULA DR	ALBERTA AVE & CALUMET AVE	3
152319	S PENINSULA DR	CALUMET AVE & BUSCHMAN DR	3
152320	S PENINSULA DR	BUSCHMAN DR & INLET HARBOR RD	3
152321	S PENINSULA DR	INLET HARBOR RD & PONCE DE LEON CIR	3
152322	S PENINSULA DR	PONCE DE LEON CIR & MAR AZUL N	3
152324	S PENINSULA DR	BAY HARBOUR DR & JENNIFER CIR	3
152325	S PENINSULA DR	JENNIFER CIR	3

Appendix J
THE CODE OF ORDINANCES

Available for review at the following link:

https://library.municode.com/fl/ponce_inlet/codes/code_of_ordinances?nodeId=THCOORTOPOINFL

Appendix K
Floodplain Management Code

ARTICLE X. - FLOODPLAIN MANAGEMENT

Sec. 18-271. - State Model Floodplain Management Code adopted.

The "Town of Ponce Inlet Floodplain Management Code as Amended in 2017," attached to this ordinance is hereby adopted in its entirety. The "Town of Ponce Inlet Floodplain Management Code as Amended in 2017" consists of the 2012 State Model Floodplain Management Code along with the model 2017 amendments thereto and is on file in the office of the town clerk.

(Ord. No. 2021-02, § 2 (Exh. A), 2-18-2021)

Secs. 18-272—18-410. - Reserved.

Town of Ponce Inlet
Floodplain Management Code
As Amended in 2017

Originally Adopted by Ordinance 2012-17
Amended in 2017 by Ordinance 2017-08

(Underlined words constitute 2017 additions to the Town of Ponce Inlet Floodplain Management Code; ~~Strikethrough~~ constitutes deletions from the 2012 Code)

History and Purpose
The Florida Division of Emergency Management (SERT) has developed the State of Florida Model Floodplain Management Code with the Cooperation and approval of The Federal Emergency Management Agency (FEMA), the Florida Building Commission, and The Building Officials Association of Florida. The purpose and intent was the development of a State Wide Floodplain Code compliant with FEMA and the newly adopted 2010 Florida Building Codes which for the first time contain mandatory Floodplain Code Sections. Each county and municipality within the state of Florida is encouraged to adopt the Model Code. In addition each county and municipality is allowed to amend the Model Floodplain Code in order to remain compliant with standards adopted as a participant in the FEMA Community Rating System CRS. The Town of Ponce Inlet Model Floodplain Management Code with amendments has been reviewed and approved by (SERT) and (FEMA).

TABLE OF CONTENTS

CHAPTER 1 ADMINISTRATION

SECTION 101 GENERAL

101.1 Title. These regulations shall be known as the *Floodplain Management Code* of **TOWN OF PONCE INLET**, hereinafter referred to as "this Code."

101.2 Scope. The provisions of this Code shall apply to all development that is wholly within or partially within any flood hazard area, including but not limited to the subdivision of land; filling, grading, and other site improvements and utility installations; construction, alteration, remodeling, enlargement, improvement, replacement, repair, relocation or demolition of buildings, structures, and facilities that are exempt from the *Florida Building Code*; placement, installation, or replacement of manufactured homes and manufactured buildings; installation or replacement of tanks; placement of recreational vehicles; installation of swimming pools; and any other development.

101.3 Intent. The purposes of this Code and the flood load and flood resistant construction requirements of the *Florida Building Code* are to establish minimum requirements to safeguard the public health, safety, and general welfare and to minimize public and private losses due to flooding through regulation of development in flood hazard areas to:

1. Minimize unnecessary disruption of commerce, access and public service during times of flooding;
2. Require the use of appropriate construction practices in order to prevent or minimize future flood damage;
3. Manage filling, grading, dredging, mining, paving, excavation, drilling operations, storage of equipment or materials, and other development which may increase flood damage or erosion potential;
4. Manage the alteration of flood hazard areas, watercourses, and shorelines to minimize the impact of development on the natural and beneficial functions of the floodplain;
5. Minimize damage to public and private facilities and utilities;
6. Help maintain a stable tax base by providing for the sound use and development of flood hazard areas;
7. Minimize the need for future expenditure of public funds for flood control projects and response to and recovery from flood events; and
8. Meet the requirements of the National Flood Insurance Program for community participation as set forth in the Title 44 Code of Federal Regulations, Section 59.22.

101.4 Coordination with the *Florida Building Code*. This Code is intended to be administered and enforced in conjunction with the *Florida Building Code*. Where cited, ASCE 24 refers to the edition of the standard that is referenced by the *Florida Building Code*.

101.5 Warning. The degree of flood protection required by this Code and the *Florida Building Code*, as amended by this community, is considered the minimum reasonable for regulatory purposes and is based on scientific and engineering considerations. Larger floods can and will occur. Flood heights may be increased by man-made or natural causes. This Code does not imply that land outside of mapped special flood hazard areas, or that uses permitted within such flood hazard areas, will be free from flooding or flood damage. The flood hazard areas and base flood elevations contained in the Flood Insurance Study and shown on Flood Insurance Rate Maps and the requirements of Title 44 Code of Federal Regulations, Sections 59 and 60 may be revised by the Federal Emergency Management Agency, requiring this community to revise these regulations to remain eligible for participation in the National Flood Insurance Program. No guaranty of vested use, existing use, or future use is implied or expressed by compliance with this Code.

101.6 Disclaimer of Liability. This Code shall not create liability on the part of **the TOWN COUNCIL** of **the TOWN OF PONCE INLET** or by any officer or employee thereof for any flood damage that results from reliance on this Code or any administrative decision lawfully made thereunder.

SECTION 102 APPLICABILITY

102.1 General. Where there is a conflict between a general requirement and a specific requirement, the specific requirement shall be applicable.

102.2 Areas to which this Code applies. This Code shall apply to all flood hazard areas within the **TOWN OF PONCE INLET**, as established in Section 102.3 of this Code.

Sec. 102.3 Basis for establishing flood hazard areas. The Flood Insurance Study for **Volusia** County, Florida and Incorporated Areas dated September 29, 2017 ~~September 29, 2011~~, and all subsequent amendments and revisions, and the accompanying Flood Insurance Rate Maps (FIRM), and all subsequent amendments and revisions to such maps, are adopted by reference as a part of this Code and shall serve as the minimum basis for establishing flood hazard areas. Studies and maps that establish flood hazard areas are on file at the **Town of Ponce Inlet, Town Hall, Planning and Development Department, located at 4300 S. Atlantic Ave.**

102.3.1 Submission of additional data to establish flood hazard areas. To establish flood hazard areas and base flood elevations, pursuant to Section 105 of this Code the Floodplain Administrator may require submission of additional data. Where field surveyed topography prepared by a Florida licensed professional surveyor or digital topography accepted by the community indicates that ground elevations:

1. Are below the closest applicable base flood elevation, even in areas not delineated as a special flood hazard area on a FIRM, the area shall be considered as flood hazard area and subject to the requirements of this Code and, as applicable, the requirements of the *Florida Building Code*.
2. Are above the closest applicable base flood elevation, the area shall be regulated as special flood hazard area unless the applicant obtains a Letter of Map Change that removes the area from the special flood hazard area.

102.4 Other laws. The provisions of this Code shall not be deemed to nullify any provisions of local, state or federal law.

102.5 Abrogation and greater restrictions. This Code supersedes any Code in effect for management of development in flood hazard areas. However, it is not intended to repeal or abrogate any existing ordinances including but not limited to land development regulations, zoning ordinances, stormwater management regulations, or the *Florida Building Code*. In the event of a conflict between this Code and any other ordinance, the more restrictive shall govern.

This Code shall not impair any deed restriction, covenant or easement, but any land that is subject to such interests shall also be governed by this Code.

102.6 Interpretation. In the interpretation and application of this Code, all provisions shall be:

1. Considered as minimum requirements;
2. Liberally construed in favor of the governing body; and
3. Deemed neither to limit nor repeal any other powers granted under state statutes.

SECTION 103 DUTIES AND POWERS OF THE FLOODPLAIN ADMINISTRATOR

103.1 Designation. The **BUILDING OFFICIAL** is designated as the Floodplain Administrator. The Floodplain Administrator may delegate performance of certain duties to other employees.

103.2 General. The Floodplain Administrator is authorized and directed to administer and enforce the provisions of this Code. The Floodplain Administrator shall have the authority to render interpretations of this Code consistent with the intent and purpose of this Code and may establish policies and procedures in order to clarify the application of its provisions. Such interpretations, policies, and procedures shall not have the effect of waiving requirements specifically provided in this Code without the granting of a variance pursuant to Section 107 of this Code.

103.3 Applications and permits. The Floodplain Administrator, in coordination with other pertinent offices of the community, shall:

1. Review applications and plans to determine whether proposed new development will be located in flood hazard areas;
2. Review applications for modification of any existing development in flood hazard areas for compliance with the requirements of this Code;
3. Interpret flood hazard area boundaries where such interpretation is necessary to determine the exact location of boundaries; a person contesting the determination shall have the opportunity to appeal the interpretation;
4. Provide available flood elevation and flood hazard information;
5. Determine whether additional flood hazard data shall be obtained from other sources or shall be developed by an applicant;
6. Review applications to determine whether proposed development will be reasonably safe from flooding;
7. Issue floodplain development permits or approvals for development other than buildings and structures that are subject to the *Florida Building Code*, including buildings, structures and facilities exempt from the *Florida Building Code*, when compliance with this Code is demonstrated, or disapprove the same in the event of noncompliance; and
8. Coordinate with and provide comments to the Building Official to assure that applications, plan reviews, and inspections for buildings and structures in flood hazard areas comply with the applicable provisions of this Code.

103.4 Substantial improvement and substantial damage determinations ~~Determinations for existing buildings and structures~~. For applications for building permits to improve buildings and structures, including alterations, movement, enlargement, replacement, repair, change of occupancy, additions, rehabilitations, renovations, substantial improvements, repairs of substantial damage, and any other improvement of or work on such buildings and structures, the Floodplain Administrator, in coordination with the duties as Building Official, shall:

1. Estimate the market value, or require the applicant to obtain an appraisal of the market value prepared by a qualified independent appraiser, of the building or structure before the start of construction of the proposed work; in the case of repair, the market value of the building or structure shall be the market value before the damage occurred and before any repairs are made;
2. Compare the cost to perform the improvement, the cost to repair a damaged building to its pre-damaged condition, or the combined costs of improvements and repairs, if applicable, to the market value of the building or structure;
3. Determine and document whether the proposed work constitutes substantial improvement or repair of substantial damage; the determination requires evaluation of previous permits issued for improvements and repairs as specified in the definition of "substantial improvement"; and
4. Notify the applicant if it is determined that the work constitutes substantial improvement or repair of substantial damage and that compliance with the flood resistant construction requirements of the *Florida Building Code* and this Code is required.

103.5 Modifications of the strict application of the requirements of the *Florida Building Code.* The Floodplain Administrator shall review requests submitted to the Building Official that seek approval to modify the strict application of the flood load and flood resistant construction requirements of the *Florida Building Code* to determine whether such requests require the granting of a variance pursuant to Section 107 of this Code.

103.6 Notices and orders. The Floodplain Administrator shall coordinate with appropriate local agencies for the issuance of all necessary notices or orders to ensure compliance with this Code.

103.7 Inspections. The Floodplain Administrator shall make the required inspections as specified in Section 106 of this Code for development that is not subject to the *Florida Building Code*, including buildings, structures and facilities exempt from the *Florida Building Code*. The Floodplain Administrator shall inspect flood hazard areas to determine if development is undertaken without issuance of a permit.

103.8 Other duties of the Floodplain Administrator. The Floodplain Administrator shall have other duties, including but not limited to:

1. Establish, in coordination with duties as Building Official, procedures for administering and documenting determinations of substantial improvement and substantial damage made pursuant to Section 103.4 of this Code;
2. Require that applicants proposing alteration of a watercourse notify adjacent communities and the Florida Division of Emergency Management, State Floodplain Management Office, and submit copies of such notifications to the Federal Emergency Management Agency (FEMA);

3. Require applicants who submit hydrologic and hydraulic engineering analyses to support permit applications to submit to FEMA the data and information necessary to maintain the Flood Insurance Rate Maps if the analyses propose to change base flood elevations, flood hazard area boundaries, or floodway designations; such submissions shall be made within 6 months of such data becoming available;
4. Review required design certifications and documentation of elevations specified by this Code and the Florida Building Code ~~and this Code~~ to determine that such certifications and documentations are complete;
5. Notify the Federal Emergency Management Agency when the corporate boundaries of **the TOWN OF PONCE INLET** are modified; and
6. Advise applicants for new buildings and structures, including substantial improvements, that are located in any unit of the Coastal Barrier Resources System established by the Coastal Barrier Resources Act (Pub. L. 97-348) and the Coastal Barrier Improvement Act of 1990 (Pub. L. 101-591) that federal flood insurance is not available on such construction; areas subject to this limitation are identified on Flood Insurance Rate Maps as "Coastal Barrier Resource System Areas" and "Otherwise Protected Areas."

103.9 Floodplain management records. Regardless of any limitation on the period required for retention of public records, the Floodplain Administrator shall maintain and permanently keep and make available for public inspection all records that are necessary for the administration of this Code and the flood resistant construction requirements of the *Florida Building Code*, including Flood Insurance Rate Maps; Letters of Map Change; records of issuance of permits and denial of permits; determinations of whether proposed work constitutes substantial improvement or repair of substantial damage; required design certifications and documentation of elevations specified by the *Florida Building Code* and this Code; notifications to adjacent communities, FEMA, and the state related to alterations of watercourses; assurances that the flood carrying capacity of altered watercourses will be maintained; documentation related to appeals and variances, including justification for issuance or denial; and records of enforcement actions taken pursuant to this Code and the flood resistant construction requirements of the *Florida Building Code*. These records shall be available for public inspection at **TOWN OF PONCE INLET TOWN HALL, 4300 S. ATLANTIC AVE.**

SECTION 104 PERMITS

104.1 Permits required. Any owner or owner's authorized agent (hereinafter "applicant") who intends to undertake any development activity within the scope of this Code, including buildings, structures and facilities exempt from the *Florida Building Code*, which is wholly within or partially within any flood hazard area shall first make application to the Floodplain Administrator, and the Building Official if applicable, and shall obtain the required permit(s) and approval(s). No such permit or approval shall be issued until compliance with the requirements of this Code and all other applicable codes and regulations has been satisfied.

104.2 Floodplain development permits or approvals. Floodplain development permits or approvals shall be issued pursuant to this Code for any development activities not subject to the requirements of the *Florida Building Code*, including buildings, structures and facilities exempt from the *Florida Building Code*. Depending on the nature and extent of proposed development that includes a building or structure, the Floodplain Administrator may determine that a floodplain development permit or approval is required in addition to a building permit.

104.2.1 Buildings, structures and facilities exempt from the *Florida Building Code*. Pursuant to the requirements of federal regulation for participation in the National Flood Insurance Program (44 C.F.R. Sections 59 and 60), floodplain development permits or approvals shall be required for the following buildings, structures and facilities that are exempt from the *Florida Building Code* and any further exemptions provided by law, which are subject to the requirements of this Code:

1. Railroads and ancillary facilities associated with the railroad.
2. Nonresidential farm buildings on farms, as provided in section 604.50, F.S.
3. Temporary buildings or sheds used exclusively for construction purposes.
4. Mobile or modular structures used as temporary offices.
5. Those structures or facilities of electric utilities, as defined in section 366.02, F.S., which are directly involved in the generation, transmission, or distribution of electricity.
6. Chickees constructed by the Miccosukee Tribe of Indians of Florida or the Seminole Tribe of Florida. As used in this paragraph, the term "chickee" means an open-sided wooden hut that has a thatched roof of palm or palmetto or other traditional materials, and that does not incorporate any electrical, plumbing, or other non-wood features.
7. Family mausoleums not exceeding 250 square feet in area which are prefabricated and assembled on site or preassembled and delivered on site and have walls, roofs, and a floor constructed of granite, marble, or reinforced concrete.
8. Temporary housing provided by the Department of Corrections to any prisoner in the state correctional system.
9. Structures identified in section 553.73(10)(k), F.S., are not exempt from the *Florida Building Code* if such structures are located in flood hazard areas established on Flood Insurance Rate Maps

104.3 Application for a permit or approval. To obtain a floodplain development permit or approval the applicant shall first file an application in writing on a form furnished by the community. The information provided shall:

1. Identify and describe the development to be covered by the permit or approval.
2. Describe the land on which the proposed development is to be conducted by legal description, street address or similar description that will readily identify and definitively locate the site.
3. Indicate the use and occupancy for which the proposed development is intended.
4. Be accompanied by a site plan or construction documents as specified in Section 105 of this Code.
5. State the valuation of the proposed work.
6. Be signed by the applicant or the applicant's authorized agent.
7. Give such other data and information as required by the Floodplain Administrator.

104.4 Validity of permit or approval. The issuance of a floodplain development permit or approval pursuant to this Code shall not be construed to be a permit for, or approval of, any violation of this Code, the *Florida Building Codes*, or any other ordinance of this community. The issuance of permits based on submitted applications, construction documents, and information shall not prevent the Floodplain Administrator from requiring the correction of errors and omissions.

104.5 Expiration. A floodplain development permit or approval shall become invalid unless the work authorized by such permit is commenced within 180 days after its issuance, or if the work authorized is suspended or abandoned for a period of 180 days after the work commences. Extensions for periods of not more than 180 days each shall be requested in writing and justifiable cause shall be demonstrated.

104.6 Suspension or revocation. The Floodplain Administrator is authorized to suspend or revoke a floodplain development permit or approval if the permit was issued in error, on the basis of incorrect, inaccurate or incomplete information, or in violation of this Code or any other ordinance, regulation or requirement of this community.

104.7 Other permits required. Floodplain development permits and building permits shall include a condition that all other applicable state or federal permits be obtained before commencement of the permitted development, including but not limited to the following:

1. The **St. Johns River** Water Management District; section 373.036, F.S.
2. Florida Department of Health for onsite sewage treatment and disposal systems; section 381.0065, F.S. and Chapter 64E-6, F.A.C.
3. Florida Department of Environmental Protection for construction, reconstruction, changes, or physical activities for shore protection or other activities seaward of the coastal construction control line; section 161.141, F.S.
4. Florida Department of Environmental Protection for activities subject to the Joint Coastal Permit; section 161.055, F.S.
5. Florida Department of Environmental Protection for activities that affect wetlands and alter surface water flows, in conjunction with the U.S. Army Corps of Engineers; Section 404 of the Clean Water Act.
6. Federal permits and approvals.

SECTION 105 SITE PLANS AND CONSTRUCTION DOCUMENTS

105.1 Information for development in flood hazard areas. The site plan or construction documents for any development subject to the requirements of this Code shall be drawn to scale and shall include, as applicable to the proposed development:

1. Delineation of flood hazard areas, floodway boundaries and flood zone(s), base flood elevation(s), and ground elevations if necessary for review of the proposed development.
2. Where ~~flood hazard areas,~~ base flood elevations, or floodway data are not included on the FIRM or in the Flood Insurance Study, they shall be established in accordance with Section 105.2(2) or (3) of this Code.
3. Where the parcel on which the proposed development will take place will have more than 50 lots or is larger than 5 acres and the base flood elevations are not included on the FIRM or in the Flood Insurance Study, such elevations shall be established in accordance with Section 105.2(1)~~ or (2)~~ of this Code.
4. Location of the proposed activity and proposed structures, and locations of existing

buildings and structures; in coastal high hazard areas, new buildings shall be located landward of the reach of mean high tide.

5. Location, extent, amount, and proposed final grades of any filling, grading, or excavation.
6. Where the placement of fill is proposed, the amount, type, and source of fill material; compaction specifications; a description of the intended purpose of the fill areas; and evidence that the proposed fill areas are the minimum necessary to achieve the intended purpose.
7. Delineation of the Coastal Construction Control Line or notation that the site is seaward of the coastal construction control line, if applicable.
8. Extent of any proposed alteration of sand dunes or mangrove stands, provided such alteration is approved by the Florida Department of Environmental Protection.
9. Existing and proposed alignment of any proposed alteration of a watercourse.

The Floodplain Administrator is authorized to waive the submission of site plans, construction documents, and other data that are required by this Code but that are not required to be prepared by a registered design professional if it is found that the nature of the proposed development is such that the review of such submissions is not necessary to ascertain compliance with this Code.

105.2 Information in flood hazard areas without base flood elevations (approximate Zone A). Where flood hazard areas are delineated on the FIRM and base flood elevation data have not been provided, the Floodplain Administrator shall:

1. Require the applicant to include base flood elevation data prepared in accordance with currently accepted engineering practices.

2\. ~~1.~~ Obtain, review, and provide to applicants base flood elevation and floodway data available from a federal or state agency or other source or require the applicant to obtain and use base flood elevation and floodway data available from a federal or state agency or other source~~; or~~.

3\. ~~2.~~ Where base flood elevation data and floodway data are not available from another source, where the available data are deemed by the Floodplain Administrator do not reasonably reflect flooding conditions, or where the available data are known to be scientifically or technically incorrect or otherwise inadequate:

   a. Require the applicant to include ~~develop~~ base flood elevation data prepared in accordance with currently accepted engineering practices; or

   b. Specify that the base flood elevation is two (2) feet ~~three (3) feet~~ above the highest adjacent grade at the location of the development, provided there is no evidence indicating flood depths have been or may be greater than two (2) feet ~~three (3) feet~~.

4\. ~~3.~~ Where the base flood elevation data are to be used to support a Letter of Map Change from FEMA, advise the applicant that the analyses shall be prepared by a Florida licensed engineer in a format required by FEMA, and that it shall be the responsibility of the applicant to satisfy the submittal requirements and pay the processing fees.

105.3 Additional analyses and certifications. As applicable to the location and nature of the proposed development activity, and in addition to the requirements of this section, the applicant shall have the following analyses signed and sealed by a Florida licensed engineer for submission with the site plan and construction documents:

1. For development activities proposed to be located in a regulatory floodway, a floodway encroachment analysis that demonstrates that the encroachment of the proposed development will not cause any increase in base flood elevations; where the applicant proposes to undertake development activities that do increase base flood elevations, the applicant shall submit such analysis to FEMA as specified in Section 105.4 of this Code and shall submit the Conditional Letter of Map Revision, if issued by FEMA, with the site plan and construction documents.
2. For development activities proposed to be located in a riverine flood hazard area for which base flood elevations are included in the Flood Insurance Study or on the FIRM and floodways have not been designated, hydrologic and hydraulic analyses that ~~a floodway encroachment analysis which~~ demonstrates that the cumulative effect of the proposed development, when combined with all other existing and anticipated flood hazard area encroachments, will not increase the base flood elevation more than one (1) foot at any point within the community. This requirement does not apply in isolated flood hazard areas not connected to a riverine flood hazard area or in flood hazard areas identified as Zone AO or Zone AH.
3. For alteration of a watercourse, an engineering analysis prepared in accordance with standard engineering practices which demonstrates that the flood-carrying capacity of the altered or relocated portion of the watercourse will not be decreased, and certification that the altered watercourse shall be maintained in a manner which preserves the channel's flood-carrying capacity; the applicant shall submit the analysis to FEMA as specified in Section 105.4 of this Code.
4. For activities that propose to alter sand dunes or mangrove stands in coastal high hazard areas (Zone V), an engineering analysis that demonstrates that the proposed alteration will not increase the potential for flood damage.

105.4 Submission of additional data. When additional hydrologic, hydraulic or other engineering data, studies, and additional analyses are submitted to support an application, the applicant has the right to seek a Letter of Map Change from FEMA to change the base flood elevations, change floodway boundaries, or change boundaries of flood hazard areas shown on FIRMs, and to submit such data to FEMA for such purposes. The analyses shall be prepared by a Florida licensed engineer in a format required by FEMA. Submittal requirements and processing fees shall be the responsibility of the applicant.

SECTION 106 INSPECTIONS

106.1 General. Development for which a floodplain development permit or approval is required shall be subject to inspection.

106.1.1 Development other than buildings and structures. The Floodplain Administrator shall inspect all development to determine compliance with the requirements of this Code and the conditions of issued floodplain development permits or approvals.

106.1.2 Buildings, structures and facilities exempt from the *Florida Building Code*. The

Floodplain Administrator shall inspect buildings, structures and facilities exempt from the *Florida Building Code* to determine compliance with the requirements of this Code and the conditions of issued floodplain development permits or approvals.

106.1.2.1 Buildings, structures and facilities exempt from the *Florida Building Code*, lowest floor inspection. Upon placement of the lowest floor, including basement, and prior to further vertical construction, the owner of a building, structure or facility exempt from the *Florida Building Code*, or the owner's authorized agent, shall submit to the Floodplain Administrator:

1. If a design flood elevation was used to determine the required elevation of the lowest floor, the certification of elevation of the lowest floor prepared and sealed by a Florida licensed professional surveyor; or
2. If the elevation used to determine the required elevation of the lowest floor was determined in accordance with Section 105.2(3)(2)(b) of this Code, the documentation of height of the lowest floor above highest adjacent grade, prepared by the owner or the owner's authorized agent.

106.1.2.2 Buildings, structures and facilities exempt from the *Florida Building Code*, final inspection. As part of the final inspection, the owner or owner's authorized agent shall submit to the Floodplain Administrator a final certification of elevation of the lowest floor or final documentation of the height of the lowest floor above the highest adjacent grade; such certifications and documentations shall be prepared as specified in Section 106.1.2.1 of this Code.

106.1.3 Manufactured homes. The **BUILDING OFFICIAL** shall inspect manufactured homes that are installed or replaced in flood hazard areas to determine compliance with the requirements of this Code and the conditions of the issued permit. Upon placement of a manufactured home, certification of the elevation of the lowest floor shall be submitted to the **Building Official.**

SECTION 107 VARIANCES AND APPEALS

107.1 General. The **TOWN OF PONCE INLET PLANNING BOARD** shall hear and decide on requests for appeals and requests for variances from the strict application of this Code. Pursuant to section 553.73(5), F.S., the **TOWN OF PONCE INLET PLANNING BOARD** shall hear and decide on requests for appeals and requests for variances from the strict application of the flood resistant construction requirements of the *Florida Building Code*. This section does not apply to Section 3109 of the *Florida Building Code, Building.*

107.2 Appeals. The **TOWN OF PONCE INLET PLANNING BOARD** shall hear and decide appeals when it is alleged there is an error in any requirement, decision, or determination made by the Floodplain Administrator in the administration and enforcement of this Code. Any person aggrieved by the decision of the **TOWN OF PONCE INLET PLANNING BOARD** may appeal such decision to the Circuit Court, as provided by Florida Statutes.

107.3 Limitations on authority to grant variances. The **TOWN OF PONCE INLET PLANNING BOARD** shall base its decisions on variances on technical justifications submitted by applicants, the considerations for issuance in Section 107.6 of this Code, the conditions of issuance set forth in Section 107.7 of this Code, and the comments and recommendations of the Floodplain Administrator and the Building Official. The **TOWN OF PONCE INLET**

PLANNING BOARD has the right to attach such conditions as it deems necessary to further the purposes and objectives of this Code.

107.3.1 Restrictions in floodways. A variance shall not be issued for any proposed development in a floodway if any increase in base flood elevations would result, as evidenced by the applicable analyses and certifications required in Section 105.3 of this Code.

107.4 Historic buildings. A variance is authorized to be issued for the repair, improvement, or rehabilitation of a historic building that is determined eligible for the exception to the flood resistant construction requirements of the *Florida Building Code, Existing Building*, Chapter 11 Historic Buildings, upon a determination that the proposed repair, improvement, or rehabilitation will not preclude the building's continued designation as a historic building and the variance is the minimum necessary to preserve the historic character and design of the building. If the proposed work precludes the building's continued designation as a historic building, a variance shall not be granted and the building and any repair, improvement, and rehabilitation shall be subject to the requirements of the *Florida Building Code*.

107.5 Functionally dependent uses. A variance is authorized to be issued for the construction or substantial improvement necessary for the conduct of a functionally dependent use, as defined in this Code, provided the variance meets the requirements of Section 107.3.1, is the minimum necessary considering the flood hazard, and all due consideration has been given to use of methods and materials that minimize flood damage during occurrence of the base flood.

107.6 Considerations for issuance of variances. In reviewing requests for variances, the **TOWN OF PONCE INLET PLANNING BOARD** shall consider all technical evaluations, all relevant factors, all other applicable provisions of the Florida Building Code regarding design and performance of all development and construction within special flood hazard zones, this Code, and the following:

1. The danger that materials and debris may be swept onto other lands resulting in further injury or damage;
2. The danger to life and property due to flooding or erosion damage;
3. The susceptibility of the proposed development, including contents, to flood damage and the effect of such damage on current and future owners;
4. The importance of the services provided by the proposed development to the community;
5. The availability of alternate locations for the proposed development that are subject to lower risk of flooding or erosion;
6. The compatibility of the proposed development with existing and anticipated development;
7. The relationship of the proposed development to the comprehensive plan and floodplain management program for the area;
8. The safety of access to the property in times of flooding for ordinary and emergency vehicles;
9. The expected heights, velocity, duration, rate of rise and debris and sediment transport of the floodwaters and the effects of wave action, if applicable, expected at the site; and

10. The costs of providing governmental services during and after flood conditions including maintenance and repair of public utilities and facilities such as sewer, gas, electrical and water systems, streets and bridges.

107.7 Conditions for issuance of variances. Variances shall be issued only upon:

1. Submission by the applicant, of a showing of good and sufficient cause that the unique characteristics of the size, configuration, or topography of the site limit compliance with any provision of this Code or the required elevation standards;
2. Determination by the **TOWN OF PONCE INLET PLANNING BOARD** that:
    a. Failure to grant the variance would result in exceptional hardship due to the physical characteristics of the land that render the lot undevelopable; increased costs to satisfy the requirements or inconvenience do not constitute hardship;
    b. The granting of a variance will not result in increased flood heights, additional threats to public safety, extraordinary public expense, nor create nuisances, cause fraud on or victimization of the public or conflict with existing local laws and ordinances; and
    c. The variance is the minimum necessary, considering the flood hazard, to afford relief;
3. Receipt of a signed statement by the applicant that the variance, if granted, shall be recorded in the Office of the Clerk of the Court in such a manner that it appears in the chain of title of the affected parcel of land; and
4. If the request is for a variance to allow construction of the lowest floor of a new building, or substantial improvement of a building, below the required elevation, a copy in the record of a written notice from the Floodplain Administrator to the applicant for the variance, specifying the difference between the base flood elevation and the proposed elevation of the lowest floor, stating that the cost of federal flood insurance will be commensurate with the increased risk resulting from the reduced floor elevation (up to amounts as high as $25 for $100 of insurance coverage), and stating that construction below the base flood elevation increases risks to life and property.

SECTION 108 VIOLATIONS

108.1 Violations. Any development that is not within the scope of the *Florida Building Code* but that is regulated by this Code that is performed without an issued permit, that is in conflict with an issued permit, or that does not fully comply with this Code, shall be deemed a violation of this Code. A building or structure without the documentation of elevation of the lowest floor, other required design certifications, or other evidence of compliance required by this Code or the *Florida Building Code* is presumed to be a violation until such time as that documentation is provided.

108.2 Authority. For development that is not within the scope of the *Florida Building Code* but that is regulated by this Code and that is determined to be a violation, the Floodplain Administrator is authorized to serve notices of violation or stop work orders to owners of the property involved, to the owner's agent, or to the person or persons performing the work.

108.3 Unlawful continuance. Any person who shall continue any work after having been served with a notice of violation or a stop work order, except such work as that person is directed to perform to remove or remedy a violation or unsafe condition, shall be subject to penalties as prescribed by law **and The Town of Ponce Inlet Code of Ordinances Chapter 2, Article V. Code Enforcement**

CHAPTER 2 DEFINITIONS

SECTION 201 GENERAL

201.1 Scope. Unless otherwise expressly stated, the following words and terms shall, for the purposes of this Code, have the meanings shown in this section.

201.2 Terms defined in the *Florida Building Code*. Where terms are not defined in this Code and are defined in the *Florida Building Code*, such terms shall have the meanings ascribed to them in that code.

201.3 Terms not defined. Where terms are not defined in this Code or the *Florida Building Code*, such terms shall have ordinarily accepted meanings such as the context implies.

SECTION 202 DEFINITIONS

Alteration of a watercourse. A dam, impoundment, channel relocation, change in channel alignment, channelization, or change in cross-sectional area of the channel or the channel capacity, or any other form of modification which may alter, impede, retard or change the direction and/or velocity of the riverine flow of water during conditions of the base flood.

Appeal. A request for a review of the Floodplain Administrator's interpretation of any provision of this Code~~ or a request for a variance~~.

ASCE 24. A standard titled *Flood Resistant Design and Construction* that is referenced by the *Florida Building Code*. ASCE 24 is developed and published by the American Society of Civil Engineers, Reston, VA.

Base flood. A flood having a 1-percent chance of being equaled or exceeded in any given year. [Also defined in FBC, B, Section 1612.2.] The base flood is commonly referred to as the "100-year flood" or the "1-percent-annual chance flood."

Base flood elevation. The elevation of the base flood, including wave height, relative to the National Geodetic Vertical Datum (NGVD), North American Vertical Datum (NAVD) or other datum specified on the Flood Insurance Rate Map (FIRM). [Also defined in FBC, B, Section 1612.2.]

Basement. The portion of a building having its floor subgrade (below ground level) on all sides. [Also defined in FBC, B, Section 1612.2.]

Coastal construction control line. The line established by the State of Florida pursuant to section 161.053, F.S., and recorded in the official records of the community, which defines that portion of the beach-dune system subject to severe fluctuations based on a 100-year storm surge, storm waves or other predictable weather conditions.

Coastal high hazard area. A special flood hazard area extending from offshore to the inland limit of a primary frontal dune along an open coast and any other area subject to high velocity wave action from storms or seismic sources. Coastal high hazard areas are also referred to as "high hazard areas subject to high velocity wave action" or "V Zones" and are designated on Flood Insurance Rate Maps (FIRM) as Zone V1-V30, VE, or V. ~~[Note: The FBC,B defines and uses the term "flood hazard areas subject to high velocity wave action" and the FBC, R uses the term "coastal high hazard areas."]~~

Design flood. The flood associated with the greater of the following two areas: [Also defined in FBC, B, Section 1612.2.]

1. Area with a floodplain subject to a 1-percent or greater chance of flooding in any year; or
2. Area designated as a flood hazard area on the community's flood hazard map, or otherwise legally designated.

Design flood elevation. The elevation of the "design flood," including wave height, relative to the datum specified on the community's legally designated flood hazard map. In areas designated as Zone AO, the design flood elevation shall be the elevation of the highest existing grade of the building's perimeter plus the depth number (in feet) specified on the flood hazard map. In areas designated as Zone AO where the depth number is not specified on the map, the depth number shall be taken as being equal to 2 feet. [Also defined in FBC, B, Section 1612.2.]

Development. Any man-made change to improved or unimproved real estate, including but not limited to, buildings or other structures, tanks, temporary structures, temporary or permanent storage of equipment or materials, mining, dredging, filling, grading, paving, excavations, drilling operations or any other land disturbing activities.

Encroachment. The placement of fill, excavation, buildings, permanent structures or other development into a flood hazard area which may impede or alter the flow capacity of riverine flood hazard areas.

Existing building and **existing structure.** Any buildings and structures for which the "start of construction" commenced before **August 9, 1974.** [Also defined in FBC, B, Section 1612.2.]

Existing manufactured home park or subdivision. A manufactured home park or subdivision for which the construction of facilities for servicing the lots on which the manufactured homes are to be affixed (including, at a minimum, the installation of utilities, the construction of streets, and either final site grading or the pouring of concrete pads) is completed before **August 9, 1974**.

Expansion to an existing manufactured home park or subdivision. The preparation of additional sites by the construction of facilities for servicing the lots on which the manufactured homes are to be affixed (including the installation of utilities, the construction of streets, and either final site grading or the pouring of concrete pads).

Federal Emergency Management Agency (FEMA). The federal agency that, in addition to carrying out other functions, administers the National Flood Insurance Program.

Flood or flooding. A general and temporary condition of partial or complete inundation of normally dry land from: [Also defined in FBC, B, Section 1612.2.]

1. The overflow of inland or tidal waters.
2. The unusual and rapid accumulation or runoff of surface waters from any source.

Flood damage-resistant materials. Any construction material capable of withstanding direct and prolonged contact with floodwaters without sustaining any damage that requires more than cosmetic repair. [Also defined in FBC, B, Section 1612.2.]

Flood hazard area. The greater of the following two areas: [Also defined in FBC, B, Section 1612.2.]

1. The area within a floodplain subject to a 1-percent or greater chance of flooding in any year.
2. The area designated as a flood hazard area on the community's flood hazard map, or otherwise legally designated.

Flood Insurance Rate Map (FIRM). The official map of the community on which the Federal Emergency Management Agency has delineated both special flood hazard areas and the risk premium zones applicable to the community. [Also defined in FBC, B, Section 1612.2.]

Flood Insurance Study (FIS). The official report provided by the Federal Emergency Management Agency that contains the Flood Insurance Rate Map, the Flood Boundary and Floodway Map (if applicable), the water surface elevations of the base flood, and supporting technical data. [Also defined in FBC, B, Section 1612.2.]

Floodplain Administrator. The office or position designated and charged with the administration and enforcement of this Code (may be referred to as the Floodplain Manager).

Floodplain development permit or approval. An official document or certificate issued by the community, or other evidence of approval or concurrence, which authorizes performance of specific development activities that are located in flood hazard areas and that are determined to be compliant with this Code.

Floodway. The channel of a river or other riverine watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than one (1) foot. [Also defined in FBC, B, Section 1612.2.]

Floodway encroachment analysis. An engineering analysis of the impact that a proposed encroachment into a floodway is expected to have on the floodway boundaries and base flood elevations; the evaluation shall be prepared by a qualified Florida licensed engineer using standard engineering methods and models.

Florida Building Code. The family of codes adopted by the Florida Building Commission, including: *Florida Building Code, Building; Florida Building Code, Residential; Florida Building Code, Existing Building; Florida Building Code, Mechanical; Florida Building Code, Plumbing; Florida Building Code, Fuel Gas.*

Functionally dependent use. A use which cannot perform its intended purpose unless it is located or carried out in close proximity to water, including only docking facilities, port facilities that are necessary for the loading and unloading of cargo or passengers, and ship building and ship repair facilities; the term does not include long-term storage or related manufacturing facilities.

Highest adjacent grade. The highest natural elevation of the ground surface prior to construction next to the proposed walls or foundation of a structure.

Historic structure. Any structure that is determined eligible for the exception to the flood hazard area requirements of the *Florida Building Code, Existing Building*, Chapter 12 ~~Chapter 11~~ Historic Buildings.

Letter of Map Change (LOMC). An official determination issued by FEMA that amends or revises an effective Flood Insurance Rate Map or Flood Insurance Study. Letters of Map Change include:

Letter of Map Amendment (LOMA): An amendment based on technical data showing that a property was incorrectly included in a designated special flood hazard area. A LOMA amends the current effective Flood Insurance Rate Map and establishes that a specific property, portion of a property, or structure is not located in a special flood hazard area.

Letter of Map Revision (LOMR): A revision based on technical data that may show changes to flood zones, flood elevations, special flood hazard area boundaries and floodway delineations, and other planimetric features.

Letter of Map Revision Based on Fill (LOMR-F): A determination that a structure or parcel of land has been elevated by fill above the base flood elevation and is, therefore, no longer located within the special flood hazard area. In order to qualify for this determination, the fill must have been permitted and placed in accordance with the community's floodplain management regulations.

Conditional Letter of Map Revision (CLOMR): A formal review and comment as to whether a proposed flood protection project or other project complies with the minimum NFIP requirements for such projects with respect to delineation of special flood hazard areas. A CLOMR does not revise the effective Flood Insurance Rate Map or Flood Insurance Study; upon submission and approval of certified as-built documentation, a Letter of Map Revision may be issued by FEMA to revise the effective FIRM.

Light-duty truck. As defined in 40 C.F.R. 86.082-2, any motor vehicle rated at 8,500 pounds Gross Vehicular Weight Rating or less which has a vehicular curb weight of 6,000 pounds or less and which has a basic vehicle frontal area of 45 square feet or less, which is:

1. Designed primarily for purposes of transportation of property or is a derivation of such a vehicle, or
2. Designed primarily for transportation of persons and has a capacity of more than 12 persons; or
3. Available with special features enabling off-street or off-highway operation and use.

Lowest floor. The lowest floor of the lowest enclosed area of a building or structure, including basement, but excluding any unfinished or flood-resistant enclosure, other than a basement, usable solely for vehicle parking, building access or limited storage provided that such enclosure is not built so as to render the structure in violation of the non-elevation requirements of the *Florida Building Code* or ASCE 24. [Also defined in FBC, B, Section 202.]

Manufactured home. A structure, transportable in one or more sections, which is eight (8) feet or more in width and greater than four hundred (400) square feet, and which is built on a permanent, integral chassis and is designed for use with or without a permanent foundation when attached to the required utilities. The term "manufactured home" does not include a "recreational vehicle" or "park trailer." [Also defined in 15C-1.0101, F.A.C.]

Manufactured home park or subdivision. A parcel (or contiguous parcels) of land divided into two or more manufactured home lots for rent or sale.

Market value. The price at which a property will change hands between a willing buyer and a willing seller, neither party being under compulsion to buy or sell and both having reasonable knowledge of relevant facts. As used in this Code, the term refers to the market value of buildings and structures, excluding the land and other improvements on the parcel. Market value may be established by a qualified independent appraiser, Actual Cash Value (replacement cost depreciated for age and quality of construction), or tax assessment value adjusted to approximate market value by a factor provided by the Property Appraiser.

New construction. For the purposes of administration of this Code and the flood resistant construction requirements of the *Florida Building Code*, structures for which the "start of construction" commenced on or after **August 9, 1974** and includes any subsequent improvements to such structures.

New manufactured home park or subdivision. manufactured home park or subdivision for which the construction of facilities for servicing the lots on which the manufactured homes are to be affixed (including at a minimum, the installation of utilities, the construction of streets, and either final site grading or the pouring of concrete pads) is completed on or after **August 9, 1974**.

Park trailer. A transportable unit which has a body width not exceeding fourteen (14) feet and which is built on a single chassis and is designed to provide seasonal or temporary living quarters when connected to utilities necessary for operation of installed fixtures and appliances. [Defined in section 320.01, F.S. ~~15C-1.0101, F.A.C.~~]

Recreational vehicle. A vehicle, including a park trailer, which is: [See ~~Defined in~~ section 320.01~~(b)~~, F.S.)

1. Built on a single chassis;
2. Four hundred (400) square feet or less when measured at the largest horizontal projection;
3. Designed to be self-propelled or permanently towable by a light-duty truck; and
4. Designed primarily not for use as a permanent dwelling but as temporary living quarters for recreational, camping, travel, or seasonal use.

Sand dunes. Naturally occurring accumulations of sand in ridges or mounds landward of the beach.

Special flood hazard area. An area in the floodplain subject to a 1 percent or greater chance of flooding in any given year. Special flood hazard areas are shown on FIRMs as Zone A, AO, A1-A30, AE, A99, AH, V1-V30, VE or V. [Also defined in FBC, B Section 1612.2.]

Start of construction. The date of issuance of permits for new construction and substantial improvements ~~to existing structures~~, provided the actual start of construction, repair, reconstruction, rehabilitation, addition, placement, or other improvement is within 180 days of the date of the issuance. The actual start of construction means either the first placement of permanent construction of a building (including a manufactured home) on a site, such as the pouring of slab or footings, the installation of piles, the construction of columns.

Permanent construction does not include land preparation (such as clearing, grading, or filling), the installation of streets or walkways, excavation for a basement, footings, piers, or foundations, the erection of temporary forms or the installation of accessory buildings such as garages or sheds not occupied as dwelling units or not part of the main buildings. For a substantial improvement, the actual "start of construction" means the first alteration of any wall, ceiling, floor or other structural part of a building, whether or not that alteration affects the external dimensions of the building. [Also defined in FBC, B Section 1612.2.]

Substantial damage. Damage of any origin sustained by a structure whereby the cost of restoring the structure to its before-damaged condition would equal or exceed 50 percent of the market value of the structure before the damage occurred. The term also includes flood-related damage sustained by a structure on two separate occasions during a 10-year period for which the cost of repairs at the time of each such flood event, on average, equals or exceeds 25 percent of the market value of the structure before the damage occurred.

Substantial improvement. Any combination of repair, reconstruction, rehabilitation, addition or improvement of a building or structure taking place during a one-year period, the cumulative cost of which equals or exceeds 50 percent of the market value of the structure either (i) before the improvement or repair is started; or (ii) if the structure has been damaged, before the damage occurred. For each building or structure the one-year period begins on the date of the first improvement or repair of that building or structure. If the structure has sustained substantial damage, any repairs are considered substantial improvement regardless of the actual repair work performed. For the purposes of this definition, substantial improvement is considered to occur when the first alteration of any wall, ceiling, floor, or other structural part of the building commences, whether or not that alteration affects the external dimensions of the building. The term does not, however, include either:

1. Any project for improvement of a building required to correct existing health, sanitary or safety code violations identified by the building official and that are the minimum necessary to assure safe living conditions.
2. Any alteration of a historic structure provided that the alteration will not preclude the structure's continued designation as a historic structure.

Variance. A grant of relief from the requirements of this Code, or the flood resistant construction requirements of the *Florida Building Code*, which permits construction in a manner that would not otherwise be permitted by this Code or the *Florida Building Code*.

Watercourse. A river, creek, stream, channel or other topographic feature in, on, through, or over which water flows at least periodically.

CHAPTER 3 FLOOD RESISTANT DEVELOPMENT

SECTION 301 BUILDINGS AND STRUCTURES

301.1 Design and construction of buildings, structures and facilities exempt from the *Florida Building Code*. Pursuant to Section 104.2.1 of this Code, buildings, structures, and facilities that are exempt from the *Florida Building Code*, including substantial improvement or repair of substantial damage of such buildings, structures and facilities, shall be designed and constructed in accordance with the flood load and flood resistant construction requirements of ASCE 24.

Structures exempt from the *Florida Building Code* that are not walled and roofed buildings shall comply with the requirements of Section 307 of this Code.

301.2 Buildings and structures seaward of the coastal construction control line. If extending, in whole or in part, seaward of the coastal construction control line and also located, in whole or in part, in a flood hazard area:

1. Buildings and structures shall be designed and constructed to comply with the more restrictive applicable requirements of the *Florida Building Code, Building* Section 3109 and Section 1612 or *Florida Building Code, Residential* Section R322.
2. Minor structures and non-habitable major structures as defined in section 161.54, F.S., shall be designed and constructed to comply with the intent and applicable provisions of this Code and ASCE 24.

SECTION 302 SUBDIVISIONS

302.1 Minimum requirements. Subdivision proposals, including proposals for manufactured home parks and subdivisions, shall be reviewed to determine that:

1. Such proposals are consistent with the need to minimize flood damage and will be reasonably safe from flooding;
2. All public utilities and facilities such as sewer, gas, electric, communications, and water systems are located and constructed to minimize or eliminate flood damage; and
3. Adequate drainage is provided to reduce exposure to flood hazards; in Zones AH and AO, adequate drainage paths shall be provided to guide floodwaters around and away from proposed structures.

302.2 Subdivision plats. Where any portion of proposed subdivisions, including manufactured home parks and subdivisions, lies within a flood hazard area, the following shall be required:

1. Delineation of flood hazard areas, floodway boundaries and flood zones, and design flood elevations, as appropriate, shall be shown on preliminary plats ~~and final plats~~;
2. Where the subdivision has more than 50 lots or is larger than 5 acres and base flood elevations are not included on the FIRM, the base flood elevations determined in accordance with Section 105.2(1) ~~or (2)~~ of this Code; and
3. Compliance with the site improvement and utilities requirements of Section 303 of this Code.

SECTION 303 SITE IMPROVEMENTS, UTILITIES AND LIMITATIONS

303.1 Minimum requirements. All proposed new development shall be reviewed to determine that:

1. Such proposals are consistent with the need to minimize flood damage and will be reasonably safe from flooding;
2. All public utilities and facilities such as sewer, gas, electric, communications, and water systems are located and constructed to minimize or eliminate flood damage; and
3. Adequate drainage is provided to reduce exposure to flood hazards; in Zones AH and AO, adequate drainage paths shall be provided to guide floodwaters around and away from proposed structures.

303.2 Sanitary sewage facilities. All new and replacement sanitary sewage facilities, private sewage treatment plants (including all pumping stations and collector systems), and on-site waste disposal systems shall be designed in accordance with the standards for onsite sewage treatment and disposal systems in Chapter 64E-6, F.A.C. and ASCE 24 Chapter 7 to minimize or eliminate infiltration of floodwaters into the facilities and discharge from the facilities into flood waters, and impairment of the facilities and systems.

303.3 Water supply facilities. All new and replacement water supply facilities shall be designed in accordance with the water well construction standards in Chapter 62-532.500, F.A.C. and ASCE 24 Chapter 7 to minimize or eliminate infiltration of floodwaters into the systems.

303.4 Limitations on sites in regulatory floodways. No development, including but not limited to site improvements, and land disturbing activity involving fill or re-grading, shall be authorized in the regulatory floodway unless the floodway encroachment analysis required in Section 105.3(1) of this demonstrates that the proposed development or land disturbing activity will not result in any increase in the base flood elevation.

303.5 Limitations on placement of fill. Subject to the limitations of this Code, fill shall be designed to be stable under conditions of flooding including rapid rise and rapid drawdown of floodwaters, prolonged inundation, and protection against flood-related erosion and scour. In addition to these requirements, if intended to support buildings and structures (Zone A only), fill shall comply with the requirements of the *Florida Building Code*.

303.6 Limitations on sites in coastal high hazard areas (Zone V). In coastal high hazard areas, alteration of sand dunes and mangrove stands shall be permitted only if such alteration is approved by the Florida Department of Environmental Protection and only if the engineering analysis required by Section 105.3(4) of this Code demonstrates that the proposed alteration will not increase the potential for flood damage. Construction or restoration of dunes under or around elevated buildings and structures shall comply with Section 307.8(3) of this Code.

SECTION 304 MANUFACTURED HOMES

304.1 General. All manufactured homes installed in flood hazard areas shall be installed by an installer that is licensed pursuant to section 320.8249, F.S., and shall comply with the requirements of Chapter 15C-1, F.A.C. and the requirements of this Code. If located seaward of the coastal construction control line, all manufactured homes shall comply with the more restrictive of the applicable requirements.

304.2 Foundations. All new manufactured homes and replacement manufactured homes installed in flood hazard areas shall be installed on permanent, reinforced foundations that:

1. In flood hazards areas (Zone A) other than coastal high hazard areas, are designed in accordance with the foundation requirements of the *Florida Building Code, Residential* Section R322.2 and this Code. Foundations for manufactured homes subject to Section 304.6 of this Code are permitted to be reinforced piers or other foundation elements of at least equivalent strength.
2. In coastal high hazard areas (Zone V), are designed in accordance with the foundation requirements of the *Florida Building Code, Residential* Section R322.3 and this Code.

304.3 Anchoring. All new manufactured homes and replacement manufactured homes shall be installed using methods and practices which minimize flood damage and shall be securely anchored to an adequately anchored foundation system to resist flotation, collapse or lateral movement. Methods of anchoring include, but are not limited to, use of over-the-top or frame ties to ground anchors. This anchoring requirement is in addition to applicable state and local anchoring requirements for wind resistance.

304.4 Elevation. Manufactured homes that are placed, replaced, or substantially improved shall comply with Section 304.4.1 or 304.4.2 of this Code, as applicable.

304.4.1 General elevation requirement. Unless subject to the requirements of Section 304.4.2 of this Code, all manufactured homes that are placed, replaced, or substantially improved on sites located: (a) outside of a manufactured home park or subdivision; (b) in a new manufactured home park or subdivision; (c) in an expansion to an existing manufactured home park or subdivision; or (d) in an existing manufactured home park or subdivision upon which a manufactured home has incurred "substantial damage" as the result of a flood, shall be elevated such that the bottom of the frame is at or above the elevation required, as applicable to the flood hazard area, in the *Florida Building Code, Residential* Section R322.2 (Zone A) or Section R322.3 (Zone V).

304.4.2 Elevation requirement for certain existing manufactured home parks and subdivisions. Manufactured homes that are not subject to Section 304.4.1 of this Code, including manufactured homes that are placed, replaced, or substantially improved on sites located in an existing manufactured home park or subdivision, unless on a site where substantial damage as result of flooding has occurred, shall be elevated such that either the:

1. Bottom of the frame of the manufactured home is at or above the elevation required, as applicable to the flood hazard area, in the *Florida Building Code, Residential* Section R322.2 (Zone A) or Section R322.3 (Zone V); or
2. Bottom of the frame is supported by reinforced piers or other foundation elements of at least equivalent strength that are not less than 48~~36~~ inches in height above grade.

304.5 Enclosures. ~~Fully e~~Enclosed areas below elevated manufactured homes shall comply with the requirements of the *Florida Building Code, Residential* Section R322.2 or R322.3 for such enclosed areas, as applicable to the flood hazard area.

304.6 Utility equipment. Utility equipment that serves manufactured homes, including electric, heating, ventilation, plumbing, and air conditioning equipment and other service facilities, shall comply with the requirements of the *Florida Building Code, Residential* Section R322, as applicable to the flood hazard area.

SECTION 305 RECREATIONAL VEHICLES AND PARK TRAILERS

305.1 Temporary placement. Recreational vehicles and park trailers placed temporarily in flood hazard areas shall:

1. Be on the site for fewer than 180 consecutive days; or
2. Be fully licensed and ready for highway use, which means the recreational vehicle or park model is on wheels or jacking system, is attached to the site only by quick-disconnect type utilities and security devices, and has no permanent attachments such as additions, rooms, stairs, decks and porches.

305.2 Permanent placement. Recreational vehicles and park trailers that do not meet the limitations in Section 305.1 of this Code for temporary placement shall meet the requirements of Section 304 of this Code for manufactured homes.

SECTION 306 TANKS

306.1 Underground tanks. Underground tanks in flood hazard areas shall be anchored to prevent flotation, collapse or lateral movement resulting from hydrodynamic and hydrostatic loads during conditions of the design flood, including the effects of buoyancy assuming the tank is empty.

306.2 Above-ground tanks, not elevated. Above-ground tanks that do not meet the elevation requirements of Section 306.3 of this Code shall:

1. Be permitted in flood hazard areas (Zone A) other than coastal high hazard areas, provided the tanks are anchored or otherwise designed and constructed to prevent flotation, collapse or lateral movement resulting from hydrodynamic and hydrostatic loads during conditions of the design flood, including the effects of buoyancy assuming the tank is empty and the effects of flood-borne debris.
2. Not be permitted in coastal high hazard areas (Zone V).

306.3 Above-ground tanks, elevated. Above-ground tanks in flood hazard areas shall be attached to and elevated to or above the design flood elevation on a supporting structure that is designed to prevent flotation, collapse or lateral movement during conditions of the design flood. Tank-supporting structures shall meet the foundation requirements of the applicable flood hazard area.

306.4 Tank inlets and vents. Tank inlets, fill openings, outlets and vents shall be:

1. At or above the design flood elevation or fitted with covers designed to prevent the inflow of floodwater or outflow of the contents of the tanks during conditions of the design flood; and
2. Anchored to prevent lateral movement resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy, during conditions of the design flood.

SECTION 307 OTHER DEVELOPMENT

307.1 General requirements for other development. All development, including man-made changes to improved or unimproved real estate for which specific provisions are not specified in this Code or the *Florida Building Code*, shall:

1. Be located and constructed to minimize flood damage;
2. Meet the limitations of Section 303.4 of this Code if located in a regulated floodway;
3. Be anchored to prevent flotation, collapse or lateral movement resulting from hydrostatic loads, including the effects of buoyancy, during conditions of the design flood;
4. Be constructed of flood damage-resistant materials; and
5. Have mechanical, plumbing, and electrical systems above the design flood elevation <u>or meet the requirements of ASCE 24</u>, except that minimum electric service required to address life safety and electric code requirements is permitted below the design flood elevation provided it conforms to the provisions of the electrical part of building code for

wet locations.

307.2 Fences in regulated floodways. Fences in regulated floodways that have the potential to block the passage of floodwaters, such as stockade fences and wire mesh fences, shall meet the limitations of Section 303.4 of this Code.

307.3 Retaining walls, sidewalks and driveways in regulated floodways. Retaining walls and sidewalks and driveways that involve the placement of fill in regulated floodways shall meet the limitations of Section 303.4 of this Code.

307.4 Roads and watercourse crossings in regulated floodways. Roads and watercourse crossings, including roads, bridges, culverts, low-water crossings and similar means for vehicles or pedestrians to travel from one side of a watercourse to the other side, that encroach into regulated floodways shall meet the limitations of Section 303.4 of this Code. Alteration of a watercourse that is part of a road or watercourse crossing shall meet the requirements of Section 105.3. (3) of this Code.

307.5 Concrete slabs used as parking pads, enclosure floors, landings, decks, walkways, patios and similar nonstructural uses in coastal high hazard areas (Zone V). In coastal high hazard areas, concrete slabs used as parking pads, enclosure floors, landings, decks, walkways, patios and similar nonstructural uses are permitted beneath or adjacent to buildings and structures provided the concrete slabs are designed and constructed to be:

1. Structurally independent of the foundation system of the building or structure;
2. Frangible and not reinforced, so as to minimize debris during flooding that is capable of causing significant damage to any structure; and
3. Have a maximum slab thickness of not more than four (4) inches.

307.6 Decks and patios in coastal high hazard areas (Zone V). In addition to the requirements of the *Florida Building Code*, in coastal high hazard areas decks and patios shall be located, designed, and constructed in compliance with the following:

1. A deck that is structurally attached to a building or structure shall have the bottom of the lowest horizontal structural member at or above the design flood elevation and any supporting members that extend below the design flood elevation shall comply with the foundation requirements that apply to the building or structure, which shall be designed to accommodate any increased loads resulting from the attached deck.
2. A deck or patio that is located below the design flood elevation shall be structurally independent from buildings or structures and their foundation systems, and shall be designed and constructed either to remain intact and in place during design flood conditions or to break apart into small pieces to minimize debris during flooding that is capable of causing structural damage to the building or structure or to adjacent buildings and structures.
3. A deck or patio that has a vertical thickness of more than twelve (12) inches or that is constructed with more than the minimum amount of fill necessary for site drainage shall not be approved unless an analysis prepared by a qualified registered design professional demonstrates no harmful diversion of floodwaters or wave runup and wave reflection that would increase damage to the building or structure or to adjacent buildings and structures.

4. A deck or patio that has a vertical thickness of twelve (12) inches or less and that is at natural grade or on nonstructural fill material that is similar to and compatible with local soils and is the minimum amount necessary for site drainage may be approved without requiring analysis of the impact on diversion of floodwaters or wave runup and wave reflection.

307.7 Other development in coastal high hazard areas (Zone V). In coastal high hazard areas, development activities other than buildings and structures shall be permitted only if also authorized by the appropriate federal, state or local authority; if located outside the footprint of, and not structurally attached to, buildings and structures; and if analyses prepared by qualified registered design professionals demonstrate no harmful diversion of floodwaters or wave runup and wave reflection that would increase damage to adjacent buildings and structures. Such other development activities include but are not limited to:

1. Bulkheads, seawalls, retaining walls, revetments, and similar erosion control structures;
2. Solid fences and privacy walls, and fences prone to trapping debris, unless designed and constructed to fail under flood conditions less than the design flood or otherwise function to avoid obstruction of floodwaters; and
3. On-site sewage treatment and disposal systems defined in 64E-6.002, F.A.C., as filled systems or mound systems.

307.8 Nonstructural fill in coastal high hazard areas (Zone V). In coastal high hazard areas:

1. Minor grading and the placement of minor quantities of nonstructural fill shall be permitted for landscaping and for drainage purposes under and around buildings.
2. Nonstructural fill with finished slopes that are steeper than one unit vertical to five units horizontal shall be permitted only if an analysis prepared by a qualified registered design professional demonstrates no harmful diversion of floodwaters or wave runup and wave reflection that would increase damage to adjacent buildings and structures.
3. Where authorized by the Florida Department of Environmental Protection or applicable local approval, sand dune construction and restoration of sand dunes under or around elevated buildings are permitted without additional engineering analysis or certification of the diversion of floodwater or wave runup and wave reflection if the scale and location of the dune work is consistent with local beach-dune morphology and the vertical clearance is maintained between the top of the sand dune and the lowest horizontal structural member of the building.