

TECHNICAL MEMORANDUM

SOUTHEAST PALM BEACH COUNTY COASTAL RESILIENCY PARTNERSHIP

Date: June 19, 2019

Project No.: 11346A00

City of Boynton Beach, Florida

Prepared By: Sarah Deslauriers, PE, ENV SP**Reviewed By:** Rebecca Harvey, Ana Puszkin, Katelyn Cucinotta, Lindsey Nieratka, Aladdine Joroff**Subject:** DEP Agreement No. R1817 Task 3 Deliverable Technical Memorandum:
Coastal Resiliency Partnership Climate Vulnerability Assessment Methodology

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Background

Beyond the need for communities to prepare for and adapt to the impacts of climate change, there are clear drivers and incentives for further investigating and performing climate resilience planning efforts that should be considered. These include:

- [America's Water Infrastructure Act](#) (AWIA) – Signed in October of 2018, the AWIA requires community water systems serving more than 3,300 people to update or prepare Risk and Resiliency Assessments (RRAs) followed by Emergency Response Plans (ERPs) over the next two years. The RRAs and ERPs must take into consideration both malevolent acts and natural hazards with respect to physical- and cyber-security. However, resulting assessments and plans will not be required to cover the full breadth of climate change impacts the CRP is targeting and will not impact water systems serving less than 3,300 people.
- Florida's [Peril of Flood Act](#) – Signed in 2015, this Act requires that Comprehensive Plans to include sea level rise as one of the causes of flood risk addressed in the section on "redevelopment principles, strategies, and engineering solutions."
- [Resiliency Florida](#) – Resiliency Florida is a non-profit organization whose mission is to "act as a conduit for developing local government and private sector partnerships to secure funding and regulatory and legislative support for resiliency and adaptation strategies at the state and federal levels." Resiliency Florida promotes the exchange of ideas and resources to help communities prepare for and become more resilient to sea level rise, extreme weather, flooding and other broader challenges stemming from climate change.
- [Florida Resilient Coastlines Program](#) (FRCP) – Through the FRCP, the FDEP is working to ensure collaboration among coastal communities dealing with the impacts of climate change. The FRCP is committed to coordinating resources to prepare Florida's coastal communities and habitats for the effects of climate change through technical assistance and financial support. The program is specifically focused on rising sea levels, increasingly complex flooding, erosion, and habitat shifts.

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- [Southeast FL Regional Climate Change Compact](#) (SFRCCC or Compact) – The SFRCCC, a collaboration between Broward, Miami-Dade, Monroe, and Palm Beach Counties that began in 2010, is focused on coordinating mitigation and adaptation activities across county lines. The Compact represents a new form of regional climate governance that allows local governments to set the agenda for adaptation, while providing state and federal agencies access to technical assistance/support.

Recognizing the significant benefits of taking a regional approach to climate change planning, FDEP distributed a portion of its funds to the FRCP in fiscal year 2018/2019. This money was to be used for Resilience Planning Grants (RPGs), and awarded to projects that promote community resilience planning, development of vulnerability assessments, adaptation plans and comprehensive plan goals, objectives, policies, and regional coordination. The goal is to provide financial assistance aimed at preparing coastal Florida communities for current and future effects of rising sea levels, including coastal flooding, erosion and ecosystem changes. In November of 2018, the Southeast Palm Beach County Coastal Resilience Partnership (CRP) was awarded a \$72,000 RPG to develop a regional framework to assess climate vulnerability and prioritize adaptation strategies.

The CRP members began meeting informally in early 2017 and formally in 2018 to proactively plan for implementing adaptive measures to withstand today's extreme weather events, be responsive to legislation calling for jurisdictions to plan for impacts of climate change, and implement measures to prepare for future effects of sea level rise and further climate change. The CRP has seven Guiding Principles it keeps in mind when approaching any project:

Partnership & Collaboration. Climate change and its impacts do not stop at municipal borders, and the adaptation of one community can be strengthened or weakened by actions in another. The CRP will work to coordinate climate adaptation efforts across neighboring jurisdictions, consider public investments/initiatives, and examine opportunities for public-private partnerships.

Infrastructure & Built Environment. Strategies to protect the built environment should incorporate the best available climate science and projections from sources such as the Southeast Florida Regional Climate Change Compact. Climate projections and adaptation strategies will be based on a time horizon relevant to the lifespan and criticality of the asset(s) in question. The CRP recognizes that adaptation should balance engineering solutions, including nature-based strategies, with long-term planning strategies including managed retreat. The CRP will identify and use Adaptation Action Areas¹ to prioritize public investments and limit new development in areas most vulnerable to climate impacts.

Economy. Adapting to climate change is essential to the region's economy. Impacted sectors should be identified to mitigate economic losses and transition the labor force to growth sectors. Where economic development is appropriate, it should be accomplished in a manner that protects, maintains, and enhances coastal resources, the built environment, historic sites, and tourism. It should also respect local Land Development Regulations and evolving private property rights jurisprudence.

Natural Environment. Policy development should consider climate change impacts based on the best available science and aim for highest possible level of protection of natural resources, biodiversity, natural systems (ecosystems/habitats), and environmental quality. Strategies identified within the Adaptation Action Areas¹ will allow for green or planned open space, protect and possibly expand habitats, and reduce or mitigate sources of pollution.

¹ While Adaptation Action Areas are an optional designation within a local government's comprehensive plan for areas that experience coastal flooding (and are vulnerable to the related impacts of rising sea levels), they are important to consider since they are used to prioritize funding for infrastructure needs and adaptation planning.

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Social Equity. Among other priorities, adaptation and resilience strategies should strive to protect human life, public and private property, and cultural resources from climate change impacts. Development and evaluation of such strategies should consider economic and social vulnerabilities and opportunities to avoid climate impacts that may disproportionately affect disadvantaged communities and populations.

Emergency Response. Emergency response plans and communication strategies should help municipalities prepare for and respond to major disruptions resulting from climate change impacts. The goal of maintaining and quickly recovering critical operations to reduce adverse effects on people, property, and the environment.

Communication. Stakeholder outreach and messaging about the CRP's work should be directed to all populations, via social and traditional media. Outreach materials should include a basic introduction to the issues, description of potential responses, and discussion of potential impacts of a changing environment on services. Messaging should be science-based, nonpartisan, and transparent with the aim of allowing stakeholders to make informed decisions.

Over the last year, the CRP utilized the FDEP grant (i.e., RPG) for Phase 1 in a three-phase process: developing the methodology for a regional climate change vulnerability assessment (CCVA). The steps for the regional CCVA, which will be carried out in Phase II, were adapted from the [U.S. Climate Resilience Toolkit](#), [American Flood Coalition](#), [FDEP Adaptation Planning Guidebook](#), the [National Oceanic and Atmospheric Administration's \(NOAA\) Vulnerability Assessment website](#), and the [Southeast Florida Regional Climate Change Compact](#). The three phases of this process and the adapted methodology (Phase II) are summarized below:

Phase I²

Phase I was completed during January through June 2019 with funding from a FDEP 2018/2019 RPG. The intent of this phase was for the CRP to collect information and perform tasks in preparation for Phase II. The tasks performed that feed directly into Phase II include:

- Identifying a preliminary list of key asset categories (people, property, water infrastructure, transportation infrastructure, natural assets, critical facilities, economy).
- Identifying a preliminary list of climate change impacts affecting the asset categories (e.g., sea level rise, storm surge, precipitation, lightning, temperature, extreme winds, and wildfires).
- Performing a data inventory and gap analysis to understand the depth and breadth of data available in each community for assessing the exposure, sensitivity, and adaptive capacity of assets (included as Appendix A: GIS Data Inventory and Gap Analysis).
- Developing the CCVA methodology that comprises Phase II and serves as the basis for the request for qualifications/proposals (RFQ/RFP) to be distributed fall of 2019.

Phase II³

Phase II consists of the following five steps representing the core of the CCVA methodology to be completed between the fall of 2019 and fall of 2020. These steps were decided upon by the CRP in Phase I, and will be performed by a firm selected via the RFQ/RFP process:

² FDEP 2018/2019 RPG funds have covered Phase I. Based on the Data Gap Analysis results, additional funding may be needed to resolve the data gaps to perform the CCVA.

³ Phase II will be funded by CRP members and possibly supplemented by FDEP 2019/20 RPG funds (if awarded).

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1. *Explore Climate Threats*: Vet the preliminary identification of climate threats and select the specific climate threats to be considered as part of this assessment with final approval from the CRP Working Group, taking into account the CRP budget and the data that are available for the Southeast Florida region.
2. *Identify & Evaluate Community Assets*: Select the asset categories and specific community assets within each category to be evaluated as part of this assessment, considering both the climate threats selected in step 1 and the CRP budget. The CRP has included a proposed list of asset categories and a prioritized list of the types of community assets in each category in Appendix B for the firm's consideration and the CRP Working Group's final approval.
3. *Assess Vulnerabilities and Risks*: Evaluate the propensity of the community assets to be adversely affected by each climate threat by assessing their exposure, sensitivity, and adaptive capacity; and estimate the magnitude of potential losses.
4. *Investigate Potential Adaptation Strategies*: Identify asset-specific adaptive measures to reduce vulnerability, including physical protective measures, updating design and/or operational guidelines, nature-based strategies, building and zoning code modifications, and educational approaches. For all adaptive measures, identify potential funding sources or financing options to provide a basis for prioritizing adaptation strategies.
5. *Prioritize Adaptation Strategies*: Document benefits of adaptation strategies, develop planning level cost estimates, and develop a prioritized list of adaptation strategies.

More detailed information on the actual scope of work for Phase II is provided in the Phase II – Detailed Scope of Work section.

Phase III⁴

Phase III takes place after the completion of the CCVA outlined in Phase II, and will not be included in the scope of the RFQ/RFP. The work in Phase III consists of developing implementation plans for the prioritized adaptation strategies determined in Phase II, and taking action in driving those plans forward.

At the start of Phase III, CRP members will determine if any of the prioritized adaptation strategies identified in Phase II fit within CRP members' existing capital improvement programs (CIPs) and whether they are better suited for increasing the resilience of an individual community or the entire CRP region. To do this, each CRP member will review their respective CIPs (or Master Plans) to determine if any of the prioritized adaptation strategies can be added to existing CIP projects and/or if the existing CIP can be modified to accommodate the needed adaptation strategy. The CRP membership will then work to refine the list of adaptation strategies that could apply to more than one CRP community, in turn identifying opportunities for collaborative/regional efforts. The list of regional strategies will be used to develop a regional adaptation strategies implementation plan, which will serve as a timeline for planning, program development, materials preparation, design/construction, and outreach of prioritized projects that benefit multiple communities.

Any prioritized adaptation strategies that are not included in the regional adaptation strategies implementation plan will continue to be tracked as "stand-alone" community-level projects. Once the prioritized adaptation strategies have been categorized as community-level projects, or part of the regional adaptation strategies implementation plan, CRP members will decide next steps (or actions) to be taken for the implementation.

⁴ Phase III is to be funded by the CRP membership or individual members depending on the scope of the project.

Phase II – Detailed Scope of Work (Planned for Fiscal Year 19/20)

The goal of Phase II is to perform a multi-jurisdictional CCVA in Fiscal Year 19/20. The CRP will distribute an RFQ/RFP in the fall of 2019 soliciting support for performing the CCVA. The project's scope of work will include the five steps as outlined below. This scope may be refined, expanded, or reduced depending on the total funds that are budgeted by CRP members (plus possible supplemental grant funding).

1. *Explore Climate Threats.* In Phase I, the CRP identified a preliminary list of climate threats that the membership determined are important to consider. In the initial step of Phase II, the selected firm will determine which threats are of most concern and should be included the CCVA.
 - a. Identify climate-related threats to be assessed in this project, which may include but not be limited to the following: extreme precipitation events, coastal storms, storm surge, high winds, lightning, beach erosion, sea level rise, saltwater intrusion, drought, extreme heat, and wildfire.
 - b. Review the latest regional climate science and available data, and select at least two scenario projections⁵ to be assessed with respect to the range in magnitude and frequency of each threat (identified in Step 1.a). This task includes review of CCVA's performed for surrounding communities (e.g., West Palm Beach's Resilience Assessment and the work of the [Southeast Florida Regional Climate Change Compact](#)) to determine if the climate change scenarios (and the associated projections for selected climate threats) can be reasonably applied to the CRP region, or if collaboration with a local academic or research institution is needed to develop unique scenario projections. The climate threats are to be evaluated over 10-, 25-, and 50-year time horizons or in accordance with horizons recommended by the selected firm.

Step 1 deliverables to be incorporated into final deliverables:

- Summary of selected climate threats for the CCVA and projected changes for each for at least two scenarios spanning the selected time horizons. This summary is to include the approach for selecting the climate threats, as well as the basis for the selected scenarios and time horizons.
2. *Identify and Evaluate Community Assets.* In Phase I, the CRP determined the following asset categories should be included in the CCVA: people, property, critical facilities, water infrastructure, transportation infrastructure, economy, and natural resources. A preliminary assessment of the geographic information system (GIS) data available for each asset category was performed in Phase I and is included in Appendix A of this document. In Phase II, the selected firm will work with the CRP to refine the draft list of community assets and attributes within each asset category (listed in Appendix B), determine the scale at which the community assets and/or attributes will be assessed (in some cases the assets/attributes may be assessed in aggregate), and assess data availability for each.

Step 2 deliverables to be incorporated into final deliverables:

- Final list of assets and attributes within each asset category to be included in the CCVA, providing the scale at which each will be assessed and the level of data available for each.

⁵ In compliance with the "Peril of Flood" statute for communities with a Coastal Management Element in their comprehensive plan, a minimum of two sea level rise scenarios should be evaluated. Additionally, communities in southeast Florida are advised to use the Southeast Florida Regional Climate Change Compact Unified Sea-Level Rise Projections.

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3. *Assess Vulnerabilities and Risks.* The central step of the CCVA is to evaluate the vulnerability to climate threats across each asset category (people, property, water infrastructure, transportation infrastructure, critical facilities, economy, natural resources). Below is a representative, but not exhaustive, explanation of the level of detail expected for the CCVA.

- a. Climate vulnerability is a measure of the degree to which an asset or a system is susceptible to and able/unable to cope with adverse effects of climate change/threats. To assess climate vulnerability and risk, this step needs to document how the selected assets are affected by climate threats in terms of the following:
 - i. Exposure: the presence of people, assets, and ecosystems in places where they could be adversely affected by hazards
 - ii. Sensitivity: the degree to which a system, population, or resource is or might be affected by hazards/threats
 - iii. Adaptive Capacity: the ability of a person, asset, or system to adjust to a hazard, take advantage of new opportunities, or cope with change

The selected firm will work with the CRP to select one or more supporting tools best suited to assess the vulnerability of assets with respect to each climate threat. These tools may be publically or privately sourced, e.g., EPA's Climate Resilience Evaluation and Awareness Tool, U.S. Climate Resilience Toolkit, Asset-Threat Comparison, Social Vulnerability Index, GIS mapping tools. The firm will then run the assessments using the selected tools, and produce outputs (e.g., asset-threat sheets, consequence matrix, maps) illustrating the impact of each climate threat to each asset/attribute.

- b. When mapping asset types/categories relative to the impacts of climate threats, potential Adaptation Action Areas (AAAs) should be identified (per the Community Planning Act, Chapter 163.3177, F.S., 2011) as this is a recommendation of FDEP for the purpose of prioritizing funds for infrastructure needs.¹ The selected firm is expected to use one or more criterion for designating AAAs, show the AAAs using a mapping tool, and tabulate the assets included within each designated AAA. It may be necessary to provide alternative AAAs for the CRP to consider. The selected firm is also expected to develop policy-level language that can be used in local ordinances in order to advance designation of the AAAs within CRP member jurisdictions, as well as programs and projects that will be targeted within the AAAs.
- c. The comprehensive report submitted with the final CCVA shall include planning level cost estimates for the projected damage or loss due to the climate threats assessed for each asset category by community (assuming no adaptation strategies have been put into place).

Step 3 deliverables to be incorporated into final deliverables:

- Summary of approach(es) and tool(s) selected to conduct the CCVA per asset, including the formatted outputs of the CCVA.
- Spatial designation of AAAs and a summary of assets included within each AAA.
- Planning level cost estimates for the projected damage/loss by asset.

The results/outputs of Step 3 are needed to perform the tasks in Steps 4 and 5.

4. *Investigate Potential Adaptation Strategies.* This step involves the identification of options/strategies to build community resilience to climate threats, by reducing vulnerability, or supporting response and recovery efforts in the event that a threat occurs. Options/strategies may also be identified by considering those that have been effective in communities dealing with

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similar vulnerabilities and risks. To accomplish this, this step seeks to develop a comprehensive list of adaptation strategies that:

- a. Identify asset- or site-specific protective measures to reduce or at least minimize prolonged service interruption and flood risk (including nature-based solutions).
- b. Identify community outreach methods and education efforts to improve communication of threats and adaptive measures that can be or have been taken to protect sensitive populations.
- c. Identify potential design guidelines for future infrastructure upgrades/designs or changes in operations that assist in mitigating flood risk.
- d. Identify potential design guidelines for future property development (building and landscape) that mitigate flood risk, heat impacts, etc.
- e. Identify assets that may be considered for relocation, as well as parcels that are unsuitable for additional asset development or should remain as undeveloped open space.
- f. In Step 4, the selected firm should also identify available programs and strategies to fund and finance implementation of adaptive measures. These may include federal and state funding sources (in addition to funds from FDEP), best practices with respect to special taxing districts, revolving loan funds, public-private partnerships, innovative insurance tools, and other practices.

Step 4 deliverable to be incorporated into final deliverables:

- A comprehensive list of adaptation strategies by asset.
 - A list of potential funding mechanisms for implementation of adaptive measures.
5. *Prioritize Adaptation Strategies.* This step involves documenting the benefits of adaptation strategies (including how they may be referenced in the Local Mitigation Strategy) and developing planning level cost estimates (to estimate the level of potential avoided costs), in an effort to prioritize adaptation strategies identified in Step 4. To develop the prioritized list of adaptation strategies, this step seeks to:
- a. Document potential benefits (effectiveness to reduce interruption, damage, or complete loss of assets, etc.) of each type of adaptation strategy.
 - b. Develop planning level cost estimates for each type of adaptation strategy for comparison with estimated costs if no adaptation strategy were implemented (Step 3.b) to ultimately determine potential avoided costs.
 - c. Develop a comprehensive list of prioritized adaptation strategies based on how much each reduces vulnerability (5.a), their ability to be implemented (based on estimated costs (5.b) and funds available (5.f)), and other criteria established by the CRP and selected firm.

Step 5 deliverables to be incorporated into final deliverables:

- Building upon the Step 4 deliverable, add the potential benefits to each type of adaptation strategy.
- Planning level cost estimates for each type of adaptation strategy.
- Prioritized list of adaptation strategies.

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Phase II Final Deliverables & Meetings

The CRP expects the following deliverables for this project and will produce ADA compliant copies of each:

1. Executive Summary (formatted summary of the CCVA to use for public education and outreach)
2. Comprehensive Report (to document the details of the CCVA process, results of the analyses performed, and recommendations)
3. GIS-based Interactive Map

The selected firm will also be expected to prepare for and actively participate in multiple in-person meetings:

1. A minimum of two (2) formal presentations to elected officials and citizens within the CRP to be held in different locations.
2. At least three (3) interactive workshops with the CRP Working Group members participating in the CCVA.

More detailed descriptions of each deliverable, as envisioned by the CRP membership, are provided as follows.

1. Executive Summary

The firm will prepare a non-technical Executive Summary of the major findings of the CRP CCVA incorporating representative color maps and graphics for distribution to the public to promote community engagement. The Executive Summary will be formatted to allow each participating municipality to display the summary of regional findings alongside their community-specific findings, as well as key adaptation strategies identified for implementation and the benefits of those strategies.

2. Comprehensive Report

The Comprehensive Report will present the approach taken to perform the regional CCVA, the findings compiled at a regional-scale geography as well as highlights of community-specific information at the municipal/neighborhood level, and the process followed to identify and prioritize adaptation strategies. The community-specific information should be sufficiently detailed to allow for municipalities to develop projects and programs. The Comprehensive Report should include:

- A summary of the overall CCVA methodology.
- A discussion of:
 - selected climate threats and asset types (by asset category, as determined in Step 1);
 - the approach taken to evaluate the impact of each climate threat per asset type (including a summary of each tool used to perform the evaluation)
 - the exposure, sensitivity and adaptive capacity of each asset (per Step 2)
 - the operational and contextual challenges faced by each CRP participant;
 - a sensitivity analysis; and
 - the results of the CCVA by region and community, including a summary of potential costs due to loss/damages (Step 3).

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- A summary of best practices (a list of example models) within the CRP membership or the state.
- Identification and prioritization of adaptation strategies (Steps 4 & 5) organized by geographic region. The explanation of adaptation strategies should note their benefits (Step 4) and whether two or more jurisdictions have common vulnerabilities arising from interdependencies. Planning level cost estimates should also be included for each (Step 5), along with whether collaboration among jurisdictions may be able to leverage resources.

The Comprehensive Report should also include a list of data and analyses used in the CCVA in an appendix at the community/municipal or sub-municipal level. The data should be formatted to highlight issues that are specific to each CRP member.

The Comprehensive Report figures should include descriptive color maps, tables, and an annotated bibliography of sources and references.

3. GIS-Based Interactive Map

The future implementation of selected adaptive strategies will require ongoing analyses and occasional updates. Thus the information is to be provided in an interactive mapping platform/tool which CRP staff can access, view and modify.

The selected firm will develop a GIS-based interactive mapping tool that allows users to view multiple data layers and data sets, as well as aggregate and disaggregate vulnerabilities by asset type, threat type, time horizon and/or climate change model. The tool should allow the user to zoom in and out to different geographic levels to examine vulnerabilities at different scales. The tool needs to have the capability of assigning permission levels in order to restrict access to sensitive data and protect the integrity of data sets.

Appendix A

Southeast Palm Beach County Coastal Resilience Partnership

GIS Data Inventory and Gap Analysis

Introduction

The Southeast Palm Beach County Coastal Resilience Partnership (CRP) is comprised of local communities and Palm Beach County. The goal of the CRP is to advance resiliency efforts within the partnership geographical area. These efforts will foster synergy and consistency in assessing climate vulnerability, prioritizing adaptation needs, and identifying adaptation strategies among the CRP members. This report summarizes data collected for the Task 1 deliverable of the CRP's Phase I project, supported by a FY18/19 Resilience Planning Grant from the Florida DEP. The focus of this task is to determine what data exist on community assets potentially affected by climate change (including residential parcels, commercial parcels, buildings, critical facilities, water and stormwater, infrastructure, parks, natural areas, etc.) and to evaluate the remaining data needs required to perform a comprehensive climate change vulnerability assessment. Data on climate threats (e.g., sea level rise, precipitation, temperature, extreme winds) will be collected and explored during Phase II. The goal of the current task was to verify and collect available data for each of the CRP communities, which will contribute to developing the scope of the vulnerability assessment and reduce the cost of Phase II.

Project Effort

The role of Florida Technical Consultants (FTC) in this project is to contact each CRP member that chose to participate in the resilience study. The following communities are involved in the study: City of Boca Raton, City of Boynton Beach, City of Delray Beach, City of Lake Worth Beach, Town of Briny Breezes, Town of Lantana, Town of Ocean Ridge, Town of Manalapan, Town of Highland Beach, Town of Hypoluxo, Town of Gulf Stream, Town of South Palm Beach, and Palm Beach County. Once initial contact was made, FTC met with each community to discuss the types of data needed for the study.

Data Inventory

To collect data from each of the participants, FTC used various web-based data sharing applications as well as data transfers using an external hard drive. If the participant was unable to provide copies of datasets, the participant then verified the datasets they have existing. After the data were collected or verified, it was organized into a matrix that is included as Exhibit A (Resiliency Study – Data Matrix) of this report. Exhibit A shows (by participant) types of state, county, and community level data that were requested and/or verified, as well as specific areas of concern per direct feedback from each community.

The goal of the data inventory is to determine what data exist on community assets that can be used to assess climate change vulnerability. Each of the larger cities have provided basic infrastructure such as the potable water system, sanitary sewer collection system, and stormwater collection systems. The Town of Hypoluxo, Town of Lantana, and Town of Manalapan also provided this infrastructure data. Palm Beach County provided County datasets that cover the boundaries to many of the CRP members. These County datasets include GIS information such as parcels, parks or natural areas, zoning, and wellfield protection areas. Additionally, the National Oceanic and Atmospheric Administration (NOAA) provides valuable statewide data, such as flood frequency and sea level rise.

Data Gap Analysis

While most of the participating municipalities have provided data, the City of Delray Beach has not yet provided data.

The City of Boca Raton provided a matrix list of the data they have available, which will be provided in Phase II. Additionally, the Town of Briny Breezes and Town of South Palm Beach have been in contact with FTC but specified they do not have GIS data available. The Town of Manalapan is not a CRP member, but they provide water to Hypoluxo. Palm Beach County provided flood maps and land use data which cover the communities that have not submitted any data to date. In addition to Exhibit A, Exhibit B consists of various maps summarizing data collected by County and Community.

In order to perform a complete climate change vulnerability assessment, further analysis of the collected data is necessary. Key data sets include the following:

- Stormwater Systems (Structures, Pipes and Lift Stations)
- Sanitary Sewer Systems (Structures, Pipes and Pump Stations)
- Water Systems (Structures, Pipes and Treatment Facilities)
- Critical Facilities (Hospitals, Emergency Centers, Fire Stations, etc.)
- Generator Locations

The scope of the climate change vulnerability assessment (Phase II) will be determined by the CRP and will depend in part on the data sets that are available. Effort and cost to complete data sets will vary among the various communities depending on their size, current data, staffing, and funds available. Once spatial data are obtained for all relevant assets, light detection and ranging (LiDAR) data can be used to extract ground surface elevations for each asset. The elevation information can then be related back to data pertaining to the climate threat of interest and help identify vulnerable areas within each community.

EXHIBIT A

Exhibit A: Resiliency Study - Data Matrix

Data that has been provided by the County or local community has a box checked by an "X". State and County data will also be checked by an "X" in a local community if there is data within that boundary.

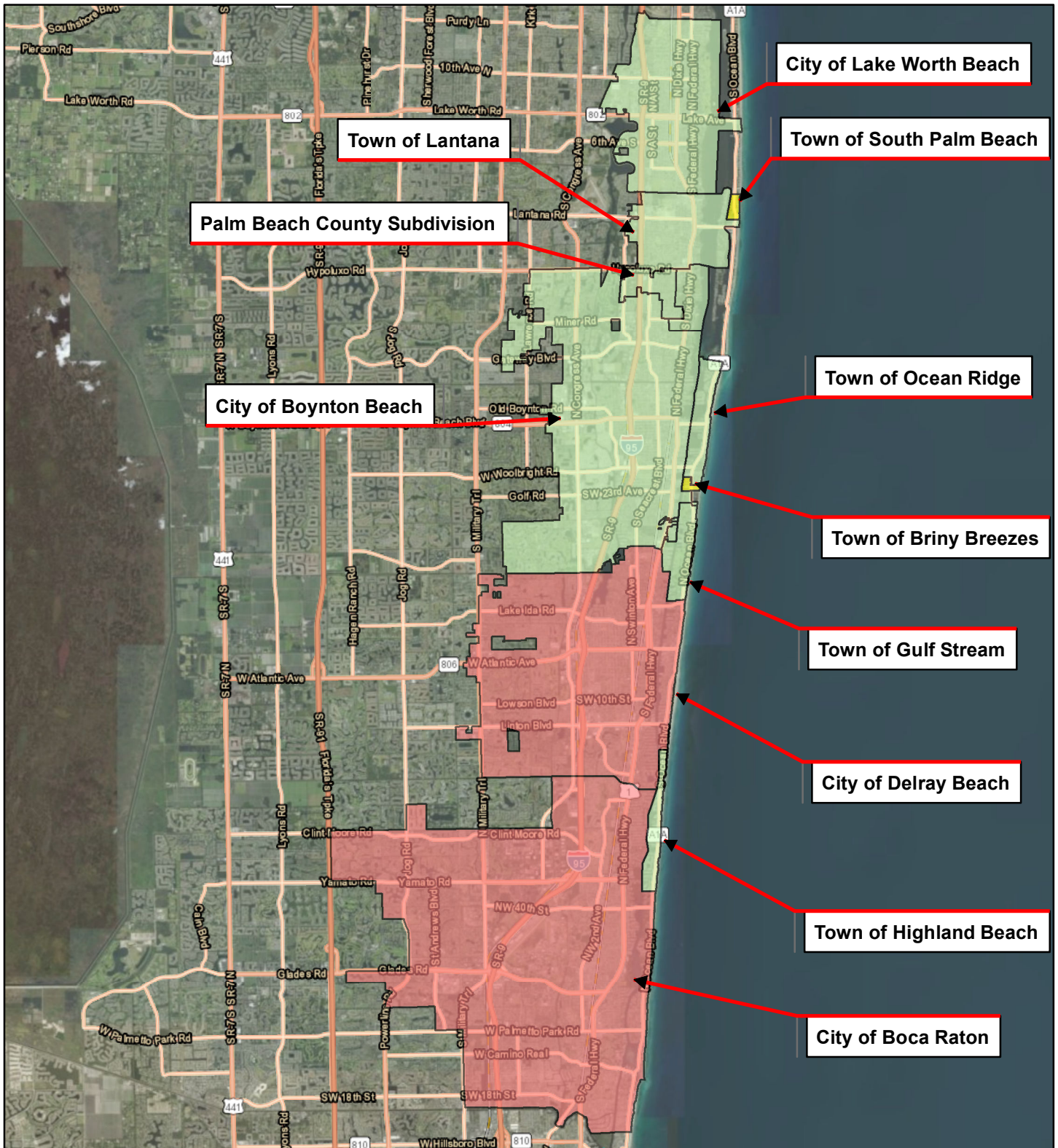
	Palm Beach County	City of Boca Raton	City of Boynton Beach	City of Delray Beach	City of Lake Worth Beach	Town of Briny Breezes	Town of Gulf Stream	Town of Highland Beach	Town of Hypoluxo	Town of Lantana	Town of Manalapan	Town of Ocean Ridge	Town of South Palm Beach
State Data from National Oceanic and Atmospheric Administration (NOAA)													
Flood Frequency	X	X	X	X	X	X	X	X	X	X	X	X	X
Sea Level Rise	X	X	X	X	X	X	X	X	X	X	X	X	X
County Data													
Boundaries	X	X	X	X	X	X	X	X	X	X	X	X	X
Buildings													
Cemetery	X	X	X	X	X								
Critical Facility (Hospitals, Emergency Centers, Fire Stations, etc.)	X	X	X	X	X	X	X	X	X	X	X	X	X
Flood Zones	X	X	X	X	X	X	X	X	X	X	X	X	X
Parcels	X	X	X	X	X	X	X	X	X	X	X	X	X
Parks/Natural Areas	X	X	X	X	X	X	X	X	X	X	X	X	X
Roads, highways, freeways, bridges	X	X	X	X	X	X	X	X	X	X	X	X	X
Community Data													
Canals (With Ownership)		X											
Critical Beach Erosion Line							X						
Green Space Parcels			X		X		X			X		X	
Land Use	X	X	X	X	X	X	X	X	X	X	X	X	X
Raw Water Pipes					X								
Raw Water Structures		X*			X								
Reclaimed Water Pipes		X*	X										
Reclaimed Water Structures		X*	X										
Sanitary Sewer Pipes	**	X*	X		X	X	X	-	X	X			
Sanitary Sewer Structures	**	X*	X		X	X	X	-	X	X			
Storm Evacuation Areas		X*					X						
Stormwater Pipes		X*						-	X	X			
Stormwater Structures		X*	X					-	X	X			
Treated Wastewater Outfalls		X*			X								
Wastewater Treatment Plants		X*											
Water Pipes	**	X*	X		X	X	X	-	X	X		X	
Water Structures	**	X*	X		X	X	X	-	X	X		X	
Water Supply Sources	**	X*			X								
Water Treatment Plant		X*											
Wellfield Protection Areas	X	X*	X	X	X				X	X			
Zoning		X*					X						
Areas of Concern													
Areas of Economic Susceptibility													
Areas of Public Health Concern													
Attractions													
Boat Ramps		X	X	X	X								
Hotels													
Known Areas of King Tide Flooding		X	X										
Lifeguard Stands		X											
Marinas								X		X			
Neighborhoods		X											
Other Vulnerable Infrastructure													
Piers										X			
Restaurants													
Roads/ Paths/ Walkways/ Parking Lot		X											
Seawalls / Protection													
Signs/Signals		X					X						
Storm Drain Facilities That Do Not Drain		X	X										
Stormwater Master Plan		X	X	X	X								
Vulnerable Populations													
Water Walkway													

*: Stated that this data is available, but has not provided hard copies

**: Stated this data will be available in Phase 2

EXHIBIT B

Exhibit A: Resiliency Study - Data Summary



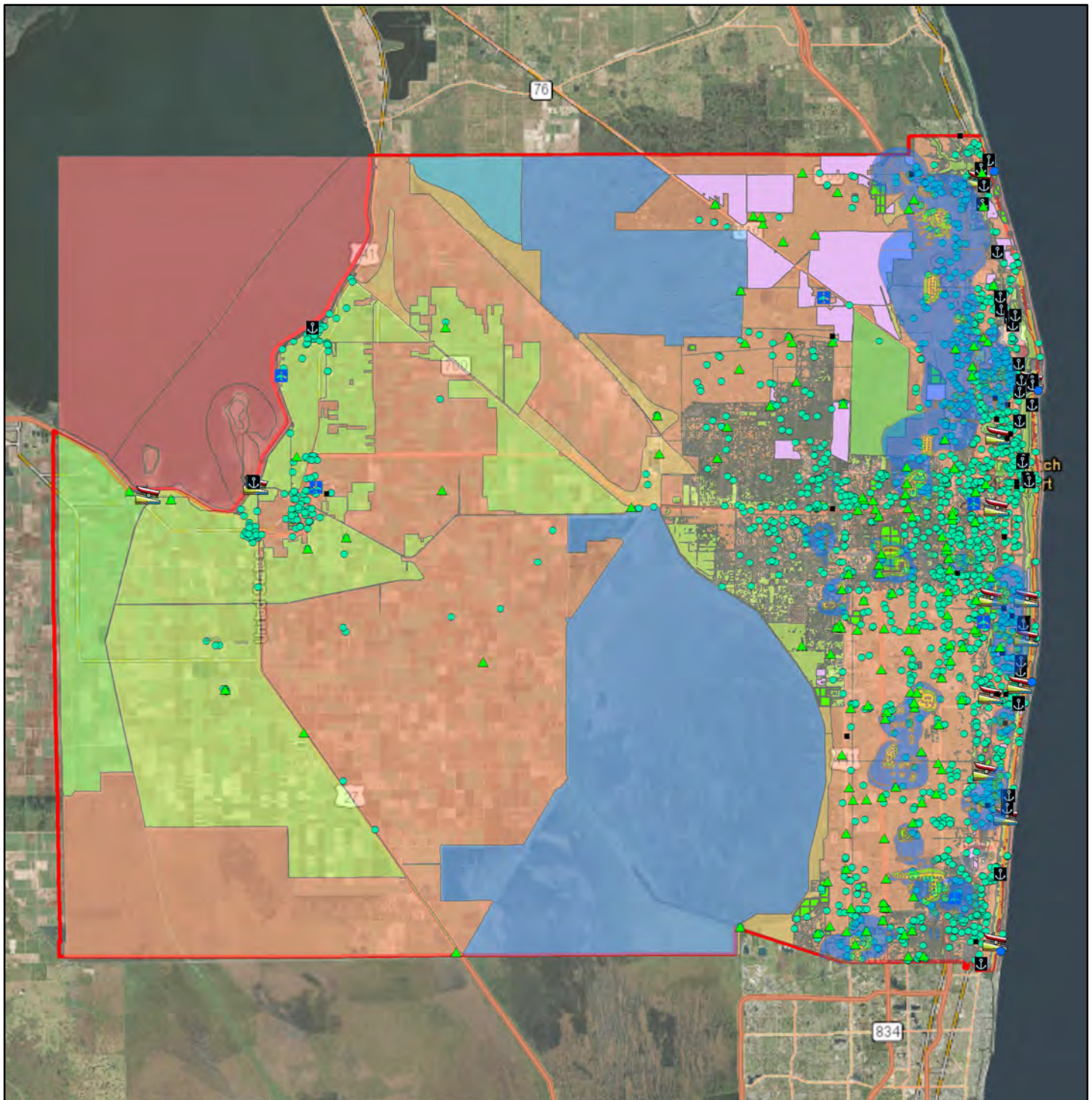
Legend

- Data Provided
- No Data Available
- No Data Provided

Data Submittal Tracker

As of April 18, 2019
Map is not to scale





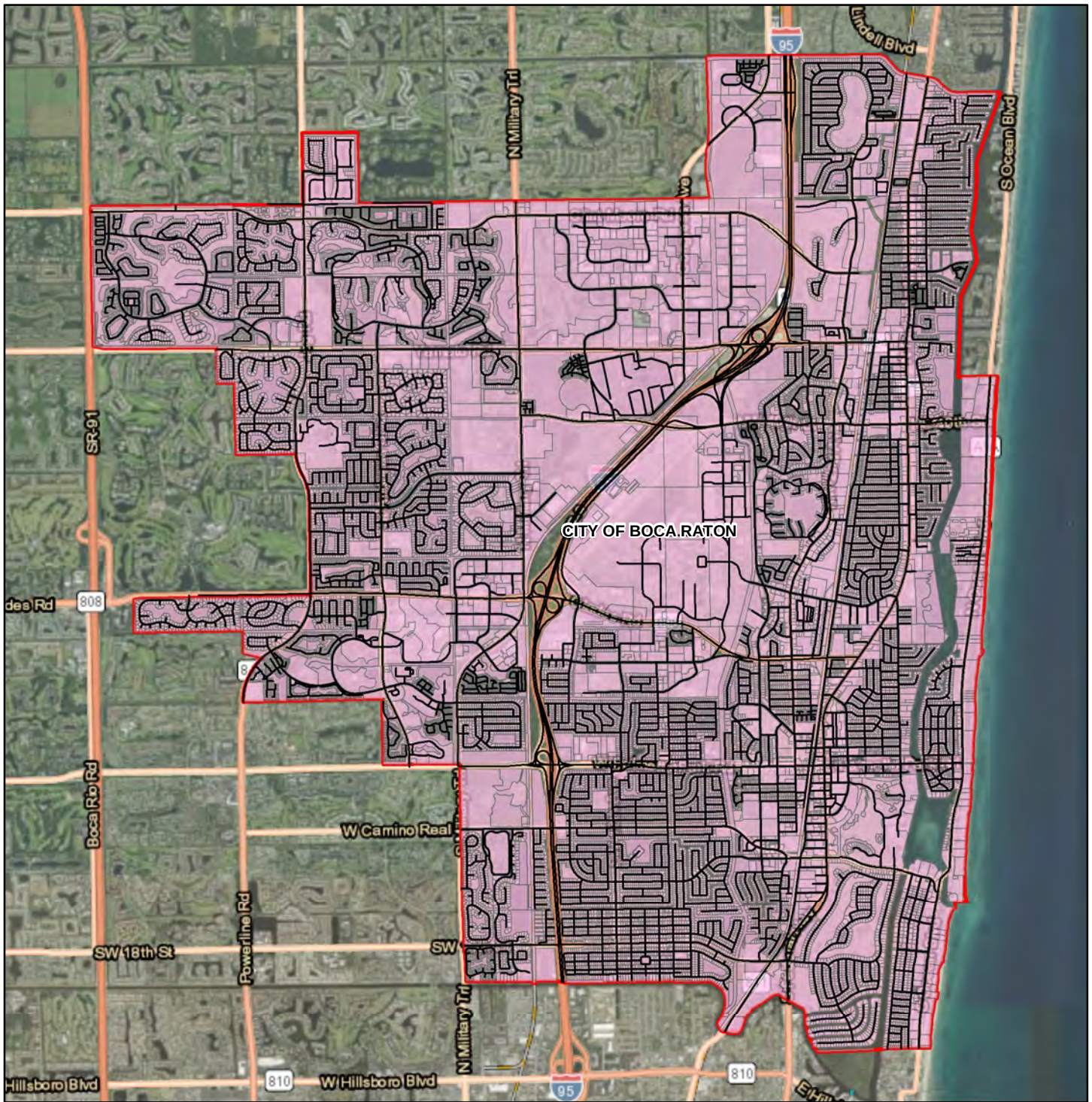
Legend

- | | |
|------------------------|--------------------------------------|
| ▲ Communication Towers | ■ County Parks |
| ● Nautical Inlets | ■ Natural Areas Boundary |
| ⚓ Marinas | ■ Flood Zone - D |
| ■ Cemeteries | ■ Flood Zone - 0.2 PCT ANNUAL CHANCE |
| 🚤 Boat Ramps | ■ Flood Zone - A |
| ✈ Airports | ■ Flood Zone - AE |
| ● Critical Facilities | ■ Flood Zone - AH |
| ■ Wellfield Zone 1 | ■ Flood Zone - AO |
| ■ Wellfield Zone 2 | ■ Flood Zone - X |
| ■ Wellfield Zone 3 | ■ Flood Zone - VE |
| ■ Wellfield Zone 4 | ■ Study Area |

PALM BEACH COUNTY County Level Data

Map is not to scale





Legend

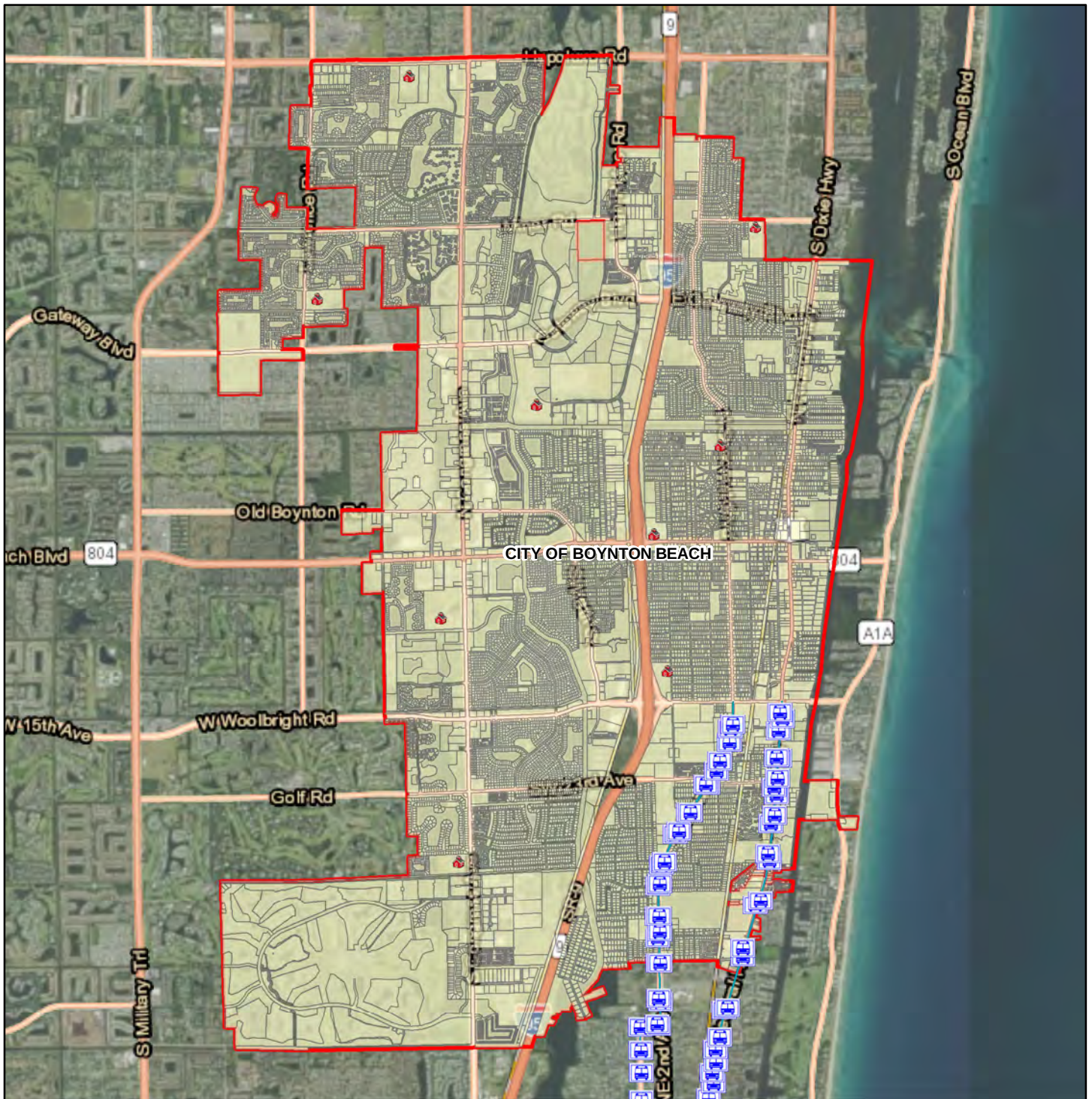
- Boca Raton Centerlines
- Boca Raton Parcels
- Study Area

CITY OF BOCA RATON Examples of City Level Data

Not all data collected is
visible in map

Map is not to scale





Legend

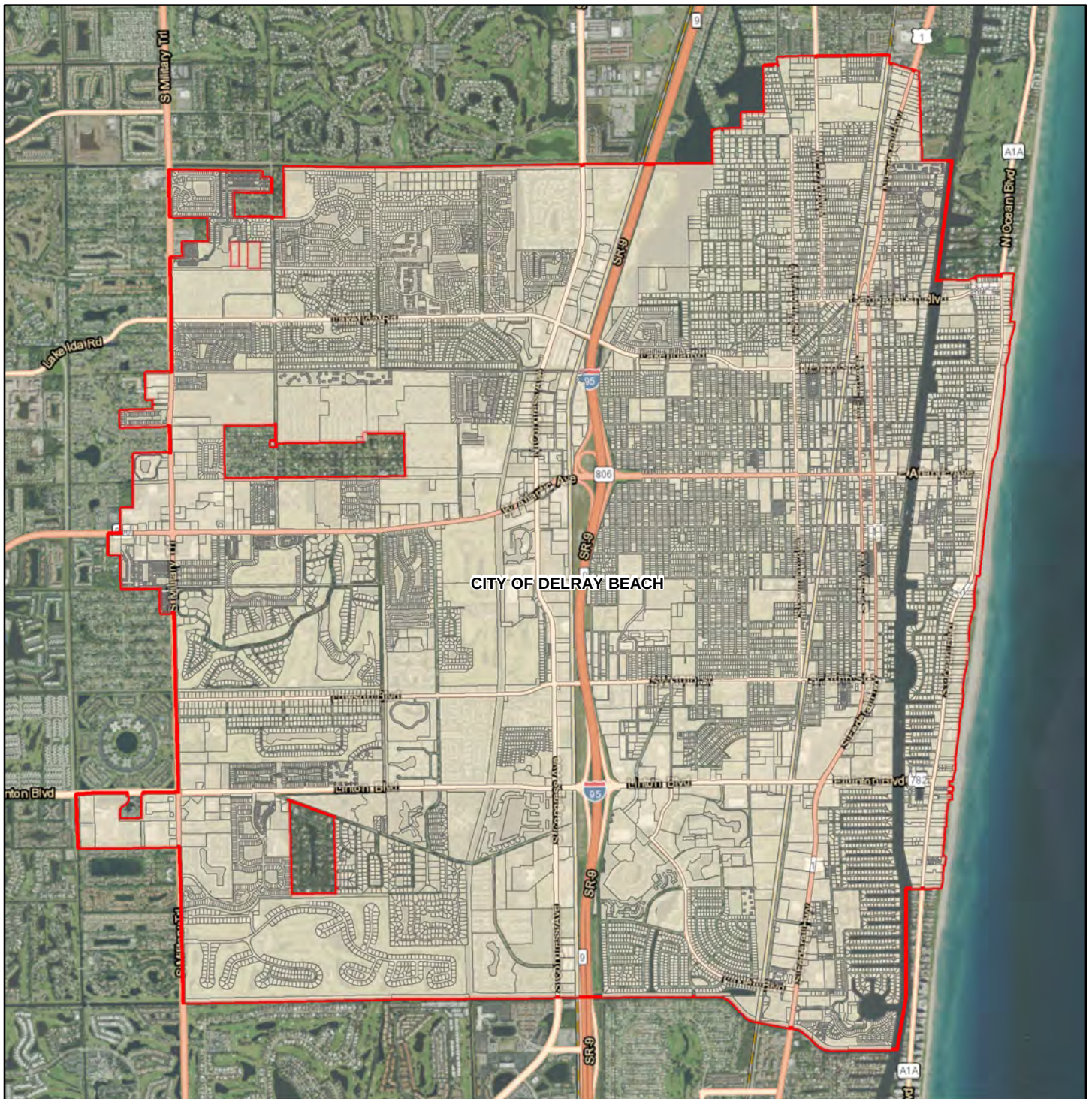
-  Bus Stops
-  Bus Routes
-  Boynton Beach Schools
-  Boynton Beach Parcels
-  Study Area

CITY OF BOYNTON BEACH Examples of City Level Data

Not all data collected is
visible in map

Map is not to scale





Legend

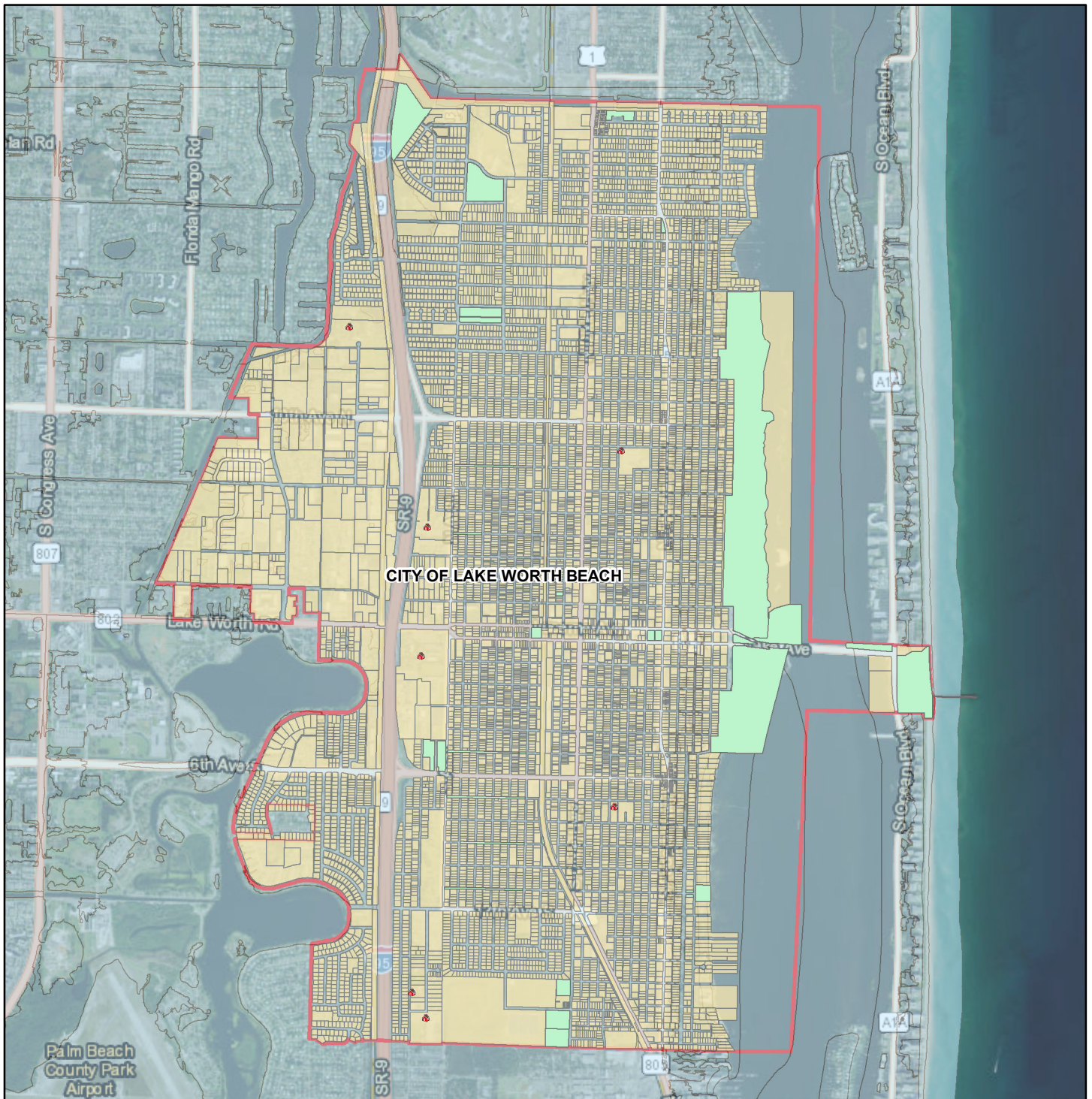
- Delray Beach Parcels
- Study Area

CITY OF DELRAY BEACH Examples of City Level Data

Not all data collected is
visible in map

Map is not to scale





Legend

- Lake Worth Schools
- Parks/Recreation/Open Spaces
- Lake Worth Parcels
- Flood Zones
- Study Area

CITY OF LAKE WORTH BEACH **Examples of City Level Data**

Not all data collected
is visible in map

Map is not to scale





Legend

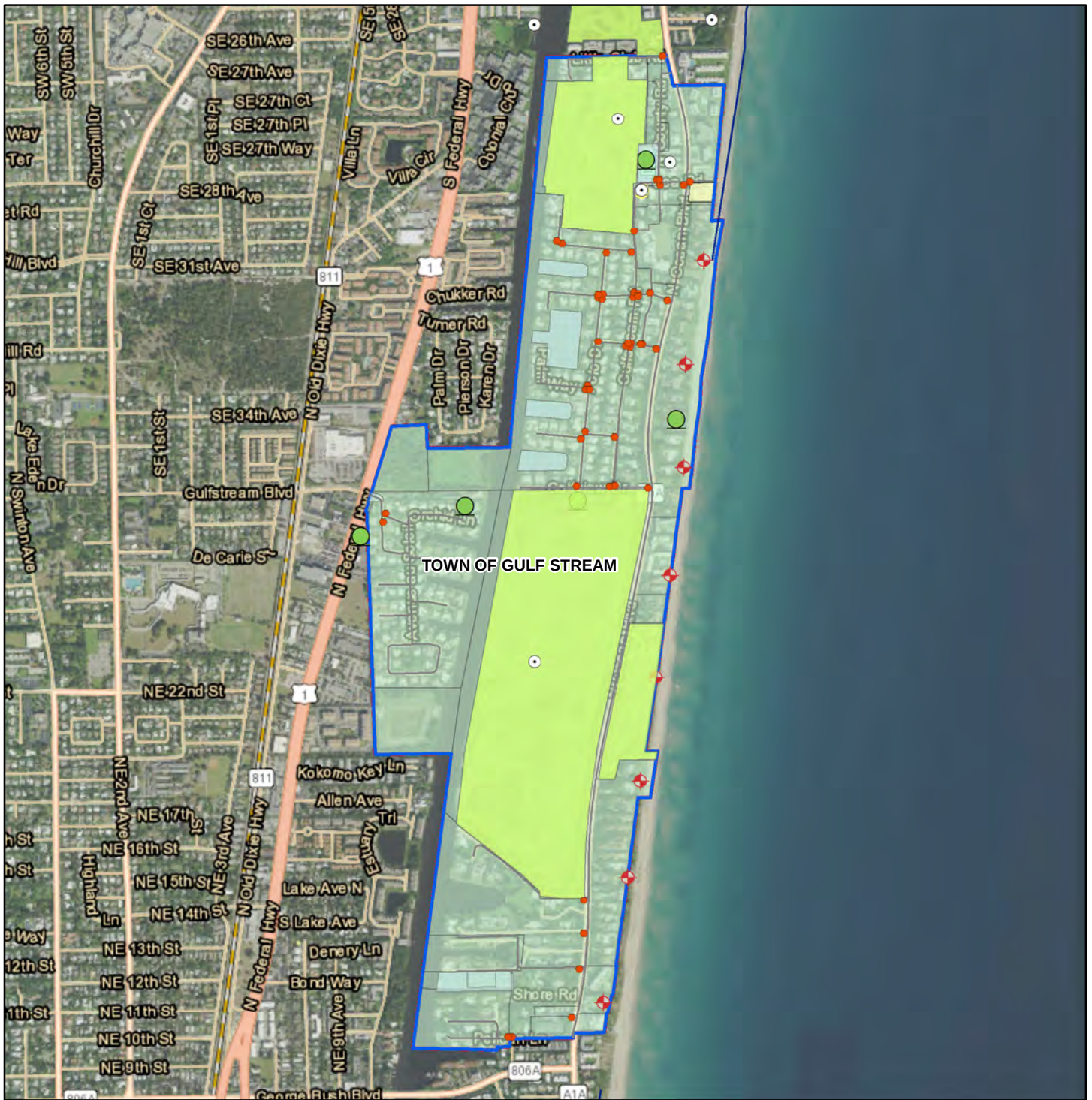
- Briny Breezes Centerlines
- Briny Breezes Parcels
- Study Area

TOWN OF BRINY BREEZES Examples of City Level Data

Not all data collected is
visible in map

Map is not to scale





Legend

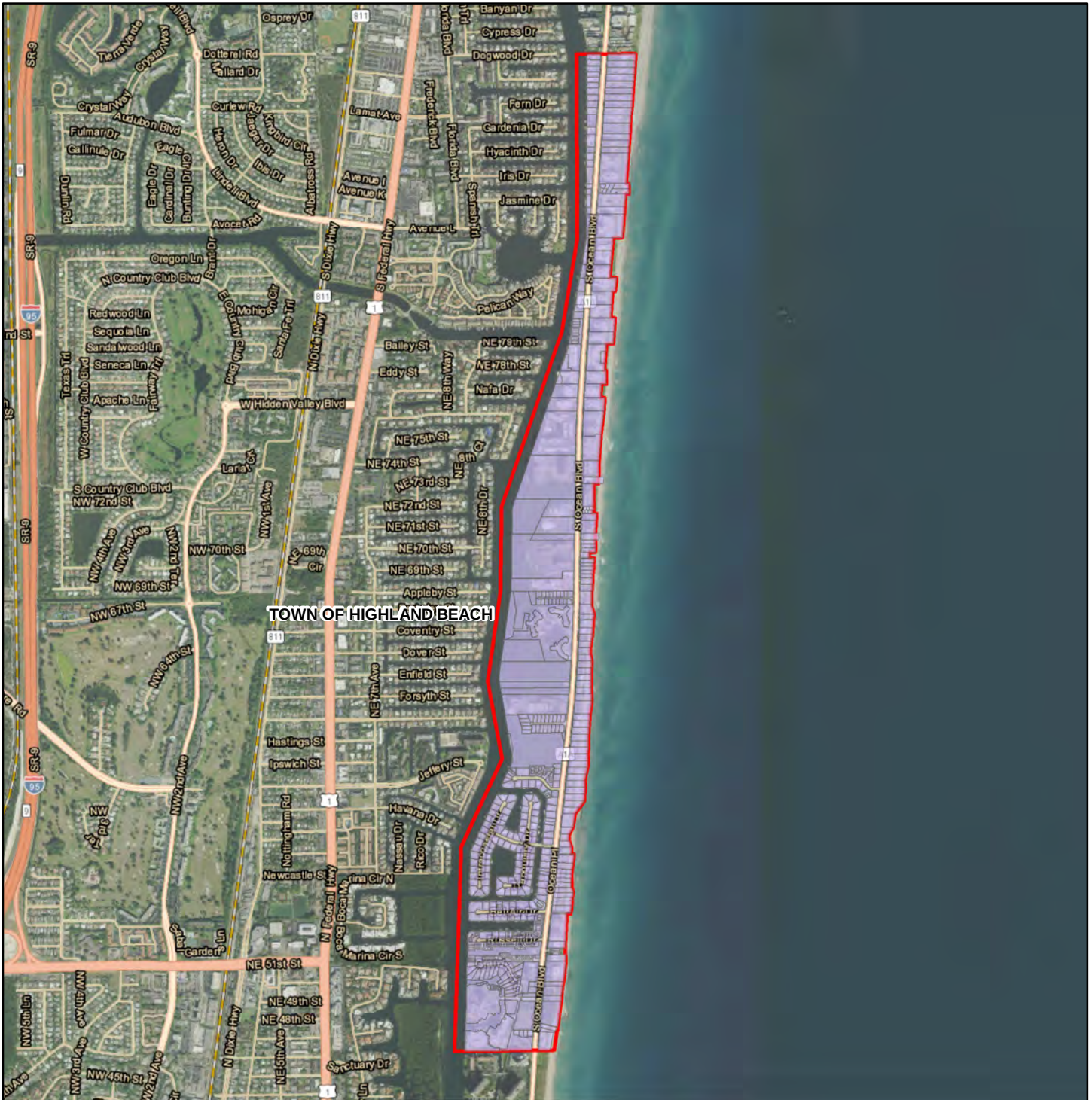
- Stop Signs
- Landmarks
- Golf Courses
- ◆ DEP Monitoring Location
- Tanks
- Critical Beach Erosion
- Roads
- Town of Gulf Stream Owned Property
- Gulf Stream Boundary
- Police Station
- Town Hall
- Senior Community
- Zoning Areas
- Study Area

TOWN OF GULF STREAM Examples of City Level Data

Not all data collected is
visible in map

Map is not to scale





Legend

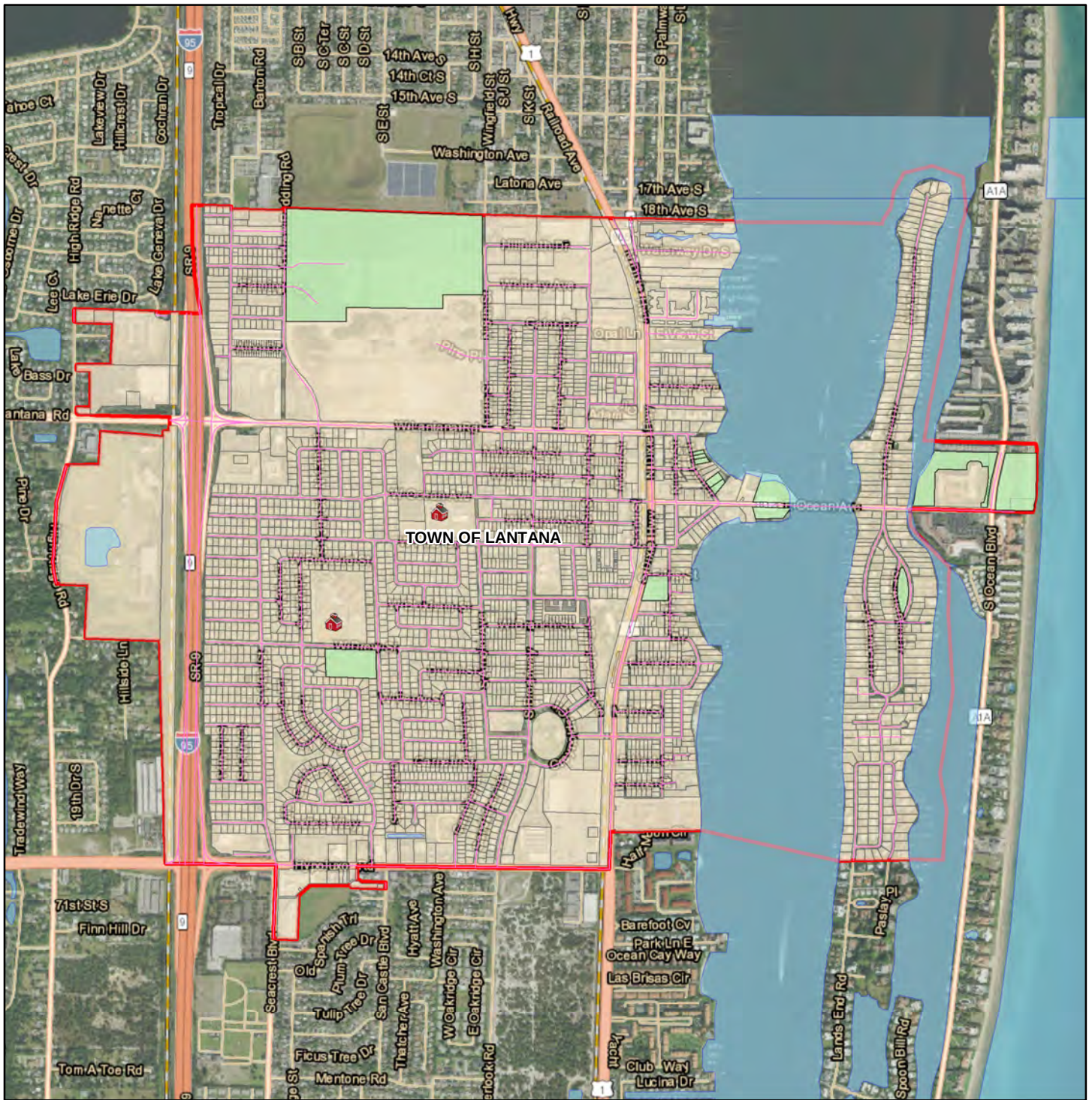
- Highland Beach Parcels
- Study Area

TOWN OF HIGHLAND BEACH Examples of City Level Data

Not all data collected is
visible in map

Map is not to scale





Legend

-  Lantana Schools
-  Lantana Centerlines
-  Water Bodies
-  Recreation Parks
-  Lantana Parcels
-  Study Area

TOWN OF LANTANA Examples of City Level Data

Not all data collected is
visible in map

Map is not to scale





Legend

- Commercial
- Government
- Res. Multi-Family
- Res. Single Family
- Study Area

TOWN OF SOUTH PALM BEACH Examples of City Level Data

Not all data collected is
visible in map

Map is not to scale



Appendix B

Proposed Asset Categories and Prioritized Community Asset Types

Level of Importance of each Asset/Attribute

Prefer it be Included

Useful and Desired, Not Necessary

Supplemental, Not Necessary

People (to be updated with U.S. 2020 Census data)

Total Population

Population Aggregated by Age (e.g., below age 5, below age 18, over age 65)

Population by Group/Institutional Living

No. of Households

Household Size

Race/Ethnicity

Renters versus Owners

Households by Income

Households in Poverty

Homeowners and tenants-speak English "less than well"

Households with Disabled Individuals

Single-Parent Households

Seasonal Population

Employment Status – unemployed vs employed

Education Level – no HS diploma vs HS diploma

Population with Asthma

Property - Private

Buildings by use type (residential, commercial, industrial, mixed use cultural, institutional etc.)

Residential by type – single family, multi-family, etc

Buildings – Institutional Residents (senior living, group homes etc.)

Buildings by year built

Building first Floor Elevations

Property Taxable Value

Property Market Value

Insured Value

Vacant land

Properties on Septic tanks

Buildings Pre-firm and Post-Firm

Building Pre and Post adoption of Miami-Dade Wind code

% of Homes with FEMA NFIP insurance

Data on household insurance costs and share of household income

Data on commercial property insurance costs and share of annual revenue

Critical Facilities

City-owned, County-owned and School Board

Critical Facilities

Medical and Hospital

Pharmacies
Assisted Living Facilities
Energy Utility
Fire Stations & Life Rescue
Police Stations
Correctional Facilities
Emergency Shelters
Housing & Homeless Shelters
Major Food Distribution Centers
Hazardous Waste Manufacturing Centers
Emergency Operations Centers
Fuel Stations
Marina & Boat access ramps
Seawalls
Day Cares, Pre-Schools (non-school board educational sites)
Libraries & Community Centers
Piers

Water Infrastructure

Water Treatment Plants
Wastewater Treatment Plants
Reclaimed Water Pipes
Reclaimed Water Structures
Sanitary Sewer Pipes
Sanitary Sewer Structures
Stormwater Pipes
Stormwater Structures
Treated Wastewater (Effluent) Outfalls
Water Pipes
Water Structures
Water Supply Sources
Wellfield Protection Areas
Aquifer Storage & Recovery (ASR) Wells
Storm Outfalls
Lift Stations
Drainage Canals & Flood Control Structures
Wet & Dry Retention Areas

Transportation Infrastructure

Airports
Road (Roads in Flood zones)
Highways vs Major Roads, Neighborhoods
Rail Lines & Stations
Bridges (especially for Emergency Response Access)
Intermodal Stations
Bus Depots & Storage

Sidewalks & Bike Trails

Economy

Tourism

Number of Hotel/Lodging Facilities (location, size/beds/ economic value)

Number of Jobs (in Tourism)

Sales & Bed Tax generated

Visitor Data

Salaries & Wages (in Tourism)

Consumer Spending

Recreation

Private Marinas & Boating Destinations

Fishing Areas (piers/docks/seawalls)

Diving Charter Boats & Sites

Golf Courses

Equestrian Centers

Sports Complexes

Gardens

Agriculture (if applicable)

Number of Establishments (ornamentals and nurseries versus food production)

Acreage of Agricultural Land

Number of Jobs/Wages Directly Supported by Agriculture

Elevation of Agricultural Land

Natural Resources

Natural Areas/Preserves

Wetlands

Beaches

Mangroves

Recreation Parks & Associated Assets

Lakes & Waterways (Lake Worth Lagoon)

Greenways - Trailways

Tree Canopy