

# PROPOSED REVISIONS TO COASTAL MANAGEMENT ELEMENT

These counterclockwise-rotating, extreme low pressure storms can reach ten miles in height, can spread over several hundred miles in diameter, and can generate winds in excess of 74 miles per hour (MPH), the minimum wind speed necessary to be classified as a hurricane. The official hurricane season extends from June 1st to November 30th, with 62 percent of all Florida hurricanes occurring during September and October.

While extensive rainfall commonly occurs during a hurricane and may cause widespread inland flooding, the greatest danger associated with a hurricane is storm surge. Storm surge can be described as the rise in wave and tidal heights associated with a hurricane. The vulnerability of an area to storm surge is dependent upon the potential height that a storm surge can achieve along a particular coast and the distance to which the surge can penetrate inland upon making landfall. Thus, low-lying coastal topography, such as inlets, beaches and estuaries, are especially susceptible to the destructive forces of a storm surge (Hurricane Manual for Marine Interests in Indian River County).

- Coastal High Hazard Area

The Coastal High Hazard Area (CHHA) is defined as the area below the storm surge line of a Category 1 hurricane as established by a Sea, Lake, and Overland Surges from Hurricanes (SLOSH) computer model. The CHHA is depicted in figure 9.11.

As of 2018, Indian River County has also designated the CHHA as an “Adaptation Action Area” (AAA) in accordance with Section 163.3164(1) F.S and in support of Objective 15 of this Element and its associated policies. An AAA is defined as one or more areas that experience coastal flooding due to extreme high tides and storm surge, and that are vulnerable to the related impacts of rising sea levels for the purpose of prioritizing funding for infrastructure needs and adaptation planning.

Within the CHHA, most of the land is designated for residential use, with permitted densities ranging from 3 to 10 units per acre. A substantial portion of this land is currently developed. Much of that development took place at a time when the CHHA was more narrowly defined as land on the barrier island, east of the Coastal Construction Control Line (CCCL).

- Hurricane Vulnerability Zone

Although many areas are subject to coastal flooding associated with the severe weather of hurricanes, other areas face imminent danger from the storms. Those areas which face severe erosion, flooding, storm surge, or other direct storm related damages from a Category III hurricane constitute the Hurricane Vulnerability Zone (HVZ). The HVZ is depicted in Figure 9.12. This zone has been identified for special planning and evacuation purposes.

- Comprehensive Emergency Management Plan

In accordance with Chapter 252, F.S., Indian River County has adopted a Comprehensive Emergency Management Plan (CEMP). The CEMP replaces the Peacetime Emergency Plan (PEP), the Florida

Line” (D.S.S.L.). Other than approved dune walkovers, minor structures or erosion control projects, construction is not allowed seaward (east) of this regulatory line.

Within Indian River County, the Coastal Barrier Resource Act (CoBRA) recognizes and discourages development in two areas: an area south of Ambersand Beach on the northern portion of the barrier island; and an area in the southern portion of the barrier island near the Indian River - St. Lucie County line.

Because these relatively undeveloped areas are recognized as having the greatest potential for storm damage, federal flood insurance is unavailable in these areas. Should a Category V storm event occur, much of the barrier island and particularly the areas identified by CoBRA could be completely destroyed.

Even with significant measures in place to reduce potential storm damage, hurricanes Francis and Jeanne in 2004 caused wide-spread damage to structures along the beach as well as structures inland.

### Sea Level Rise

Sea level rise (SLR) is typically defined in terms of either global (eustatic) sea level rise or relative sea level rise. Global sea level rise represents the average change in the height of all of Earth’s oceans relative to the land. Conversely, relative sea level rise refers to measured changes in sea level height at specific locations on land relative to localized variations in land elevation, including changes due to ocean rise and/or land subsidence.

Global sea level rise is directly influenced by fluctuations in the mass or volume of the ocean. Fluctuations in the volume of the ocean are the result of climatological and geological forces such as thermal expansion and contraction, tectonic shift, lift/subsidence, and sedimentation, while ocean mass is affected by factors including melting or accretion rates of glaciers, snow accumulation, and global water storage and redistribution mechanisms. Based on the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5), many of these climate related phenomena have been directly influenced by greenhouse-gas emissions increases since the pre-industrial era and other feedback mechanisms. With respect to SLR, the IPCC AR5 indicates that global average land and ocean surface temperatures will likely continue to increase and contribute to the acceleration of SLR encountered in the future.

In Florida, baseline relative sea level measurements can be derived from historical tide gauge records of mean monthly sea level. In fact, average monthly sea level measurements have been recorded at tide stations located in Key West, Cedar Key, and Fernandina Beach for more than a century. The yearly averages of these historic data, depicted in Figure 9.14, indicate a gradual trend of rising mean sea level between 1897 and 2017. Moreover, these data highlight regional variability that may be observed among local relative sea level datasets. Based on those data sets, sea levels at Key West, Cedar Key, and Fernandina Beach rose approximately 12.72”, 12.66”, and 15.63” over the last 100 years.

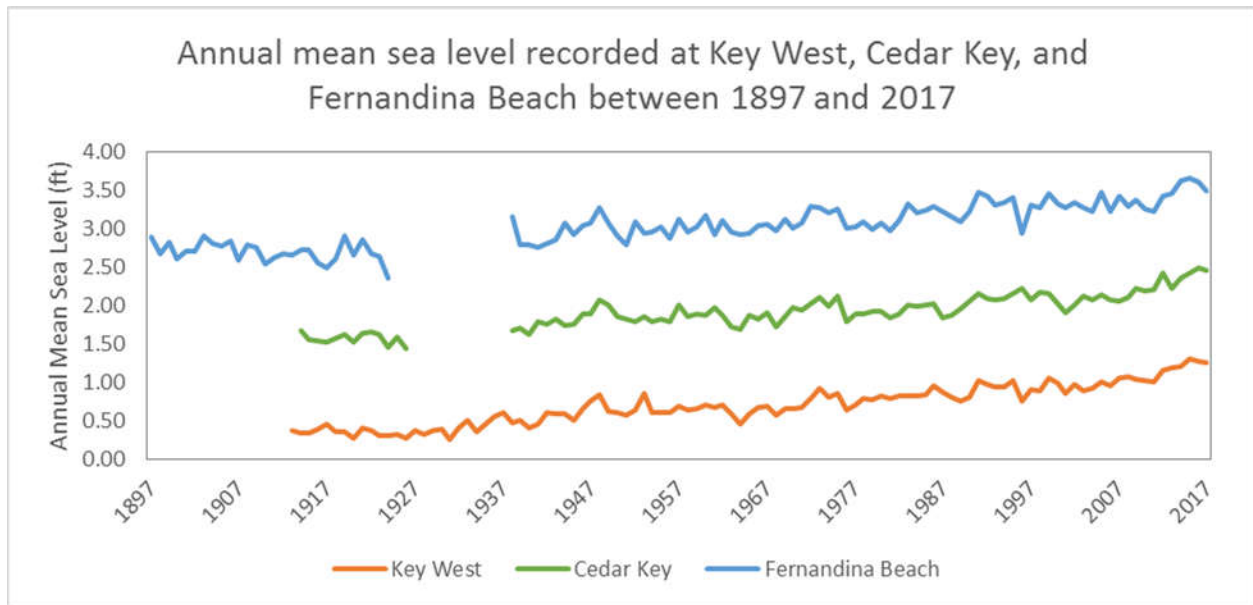


Figure 9.14: Annual mean sea level recorded at Key West, Cedar Key, and Fernandina Beach between 1897 and 2017. Data obtained from the National Oceanic and Atmospheric Administration National Ocean Service.

Regional mapping and vulnerability assessment studies related to sea-level rise (SLR) were initially developed by federal, state, and local government agencies in the early 2000s. Circa 2009, development of consistent regional climate change adaptation strategies became the basis for formation of the Southeast Florida Regional Climate Change Compact (SFRCCC), which was represented by four coastal counties, Monroe, Miami-Dade, Broward, and Palm-Beach. The SFRCCC created a Unified Sea Level Rise Projection for Southeast Florida in 2011 based on U.S. Army Corps of Engineers Engineering Circulars guidance documents, historical tidal data from Key West (1913-1999), and available scientific literature on the subject at the time. This Unified SLR Projection was later revised in 2015 based on updated guidance documents from USACE, NOAA, and the United Nations Intergovernmental Panel on Climate Change (IPCC) (Figure 9.15). According to the revised projection the region may experience between 14 and 34 inches of sea level rise (above 1992 mean sea level) by 2060.

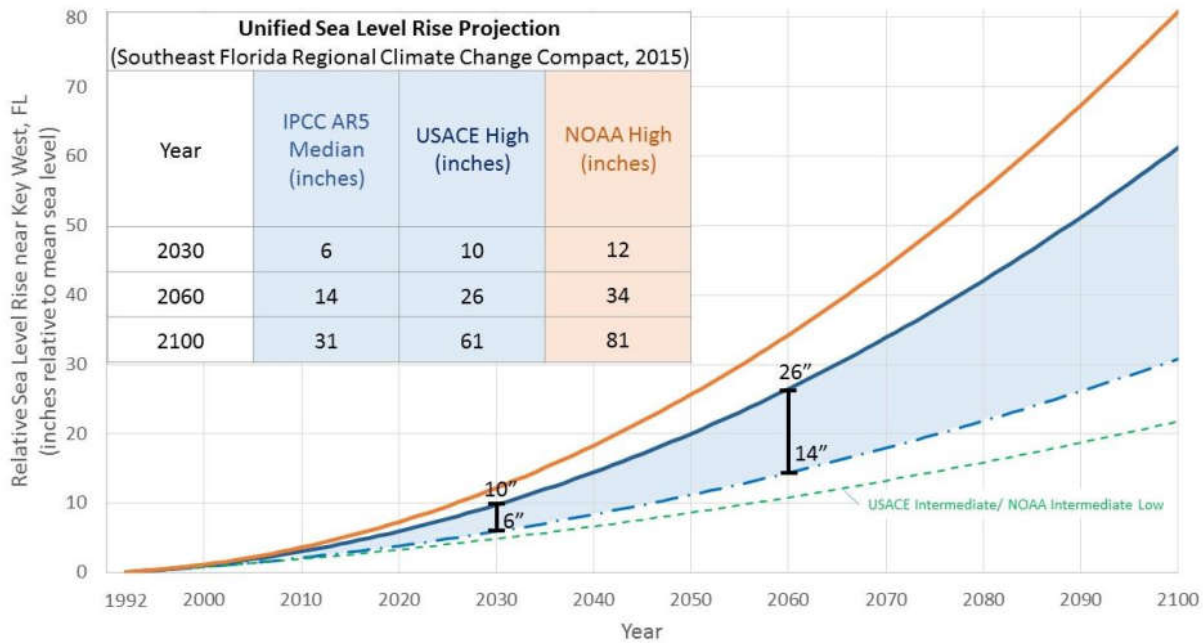


Figure 9.15: SFRCCC Unified Sea Level Rise Projection (2015). Source: Southeast Florida Regional Climate Change Compact Sea Level Rise Work Group (Compact). October 2015. *Unified Sea Level Rise Projection for Southeast Florida*. A document prepared for the Southeast Florida Regional Climate Change Compact Steering Committee. 35 p.

Concurrently, the National Oceanographic and Atmospheric Administration (NOAA) Coastal Services Center began development of the web-based SLR and Coastal Flooding Impacts Viewer to aid visualization and adaptation planning efforts for various SLR scenarios. Pilot studies initially focused on specific geographic areas along the coasts of Delaware, Mississippi, and Alabama; however, the viewer (now called the Sea Level Rise Viewer) has been regularly updated to include a broad range of coastal areas, including nearly all of Indian River County east of Interstate 95 (I-95).

For informational purposes, Indian River County was included in a similar SLR vulnerability assessment in 2012 that was coordinated by the Seven50 initiative and the Southeast Florida Regional Partnership, which incorporated methodologies developed by the SFRCCC. The assessment, whose results were presented in the 2013 report “Analysis of the Vulnerability to Sea Level Rise of the Northern SE FL Counties in the Seven50 Planning Region” (Appendix A), evaluated three SLR inundation scenarios (e.g. 1, 2, and 3 feet of inundation) and characterized local geographic areas at potential flood risk due to potential SLR. Baseline land elevation measurements, upon which the one foot, two foot, and three foot inundation levels were mapped, were derived from Light Detection and Ranging (LiDAR) vertical elevation data that were obtained from the NOAA Coastal Services Center. These data were originally collected in 2007 for the Florida Department of Emergency Management (FDEM).

SLR inundation maps depicted flood risks based on two levels of confidence, 80-100% certainty and 20-79.9% certainty, and were categorized as either “more likely” to be inundated or “possibly” inundated, respectively. The local maps presented in the 2013 Seven50 report, provided a clear visual comparison of the magnitude of flood-related impacts that may be encountered in Indian River County under 1, 2, and 3-ft SLR inundation scenarios.

Moreover, other data comparisons were evaluated in the analysis including taxable property value ranges impacted based on inundation level, degree of impacts to higher and lower functional classification roads, and total acres impacted based on future land use designation. Those baseline data provided critical insights for implementation of long range adaptation planning strategies.

## **ANALYSIS**

### **Land Use**

This analysis section addresses issues, problems, and opportunities within the coastal zone. A complete analysis of land use data, including a comparison of land use acreages by classification, is contained in the Future Land Use Element of the Comprehensive Plan.

In the past, comprehensive plan policies, including the Future Land Use Map, have successfully directed new residential and nonresidential development to designated areas of the county. Consequently, there have been few amendments to the land use map and only minor adjustments to the county's Urban Service Area boundary since the county's current comprehensive plan was adopted in 1990. In fact, the only significant changes to the Future Land Use Map in the previous decade have been amendments designating publicly acquired environmental lands for conservation.

Going forward, the major land use issues facing Indian River County in the coastal zone and in the county overall are urban sprawl, rural sprawl, agricultural preservation, and conservation of natural systems within the context of development.

### **Economy**

Generally, the county's economy is limited in diversity and largely reliant on service oriented industries. Despite this current lack of economic diversity, Indian River County has attractive qualities that certain businesses look for. These qualities, which include an available development-ready supply of land and an exceptional quality of life (warm weather, beaches, minimal population density, resource-based recreational opportunities, etc.), will aid the county as it seeks to increase its economic base in the future.

- Eco Tourism

A significant aspect of the County's quality of life is its natural resources, not the least of which is the Indian River Lagoon. Resources such as the lagoon provide significant economic benefits to the county. According to the Indian River Lagoon Economic Assessment and Analysis Update (2007), the total economic impact in 2007 of visitors to the Indian River Lagoon in Indian River County was over \$110 million.

Because of its natural assets, as well as cultural heritage, Indian River County has an opportunity to capitalize on ecotourism. From an economic development standpoint, the County, through its County Environmental Lands Program, is actively preserving some of its greatest natural assets and

Indian River Lagoon, the St. Sebastian River, or other surface water bodies, the County's policy should be to promote the connection of waterfront subdivisions to the sanitary sewer system. A complete analysis of sanitary sewer is provided in the Sanitary Sewer Sub-Element.

- Stormwater Management

Since 1990, stormwater management facilities in the county have been designed to handle a 25 year/24 hour storm event, as well as to provide treatment before discharging stormwater runoff. Because many sections of the county were developed prior to 1990, the level of service for stormwater management facilities continues to vary throughout the county. Over the past several years, the county has made progress in reducing flood hazards by constructing stormwater management projects in certain areas of the county with known flooding problems, including Vero Lake Estates, east Gifford and the Rockridge Subdivision. Moreover, projects such as the Sebastian Stormwater Park and the North Relief Canal Pollution Control Facility, described previously in this report, contribute to improved stormwater quality. Despite implementation of these projects, the county needs to continue to identify, seek funding, and construct new stormwater improvement projects in areas where needed. A more complete analysis of the County's stormwater management facilities is contained in the Stormwater Management Sub-Element.

### Sea Level Rise

Since the completion of the SLR vulnerability assessment in 2012 that was described in the Existing Conditions section, Senate Bill 1094 was enacted, modifying Florida Statute section 163.3178(2)(f) to require, among other provisions, that local governments in Florida “include development and redevelopment principles, strategies, and engineering solutions that reduce the flood risk in coastal areas which results from high-tide events, storm surge, flash floods, stormwater runoff, and the related impacts of sea-level rise” within the coastal management elements of their comprehensive plans. In accordance with this legislation, and based on the best available data from the NOAA Coastal Service Center sea level projection models and best available local projected inundation data, County SLR inundation maps have been incorporated into this Coastal Management Element for planning purposes (Figures 9.16, 9.17, and 9.18).

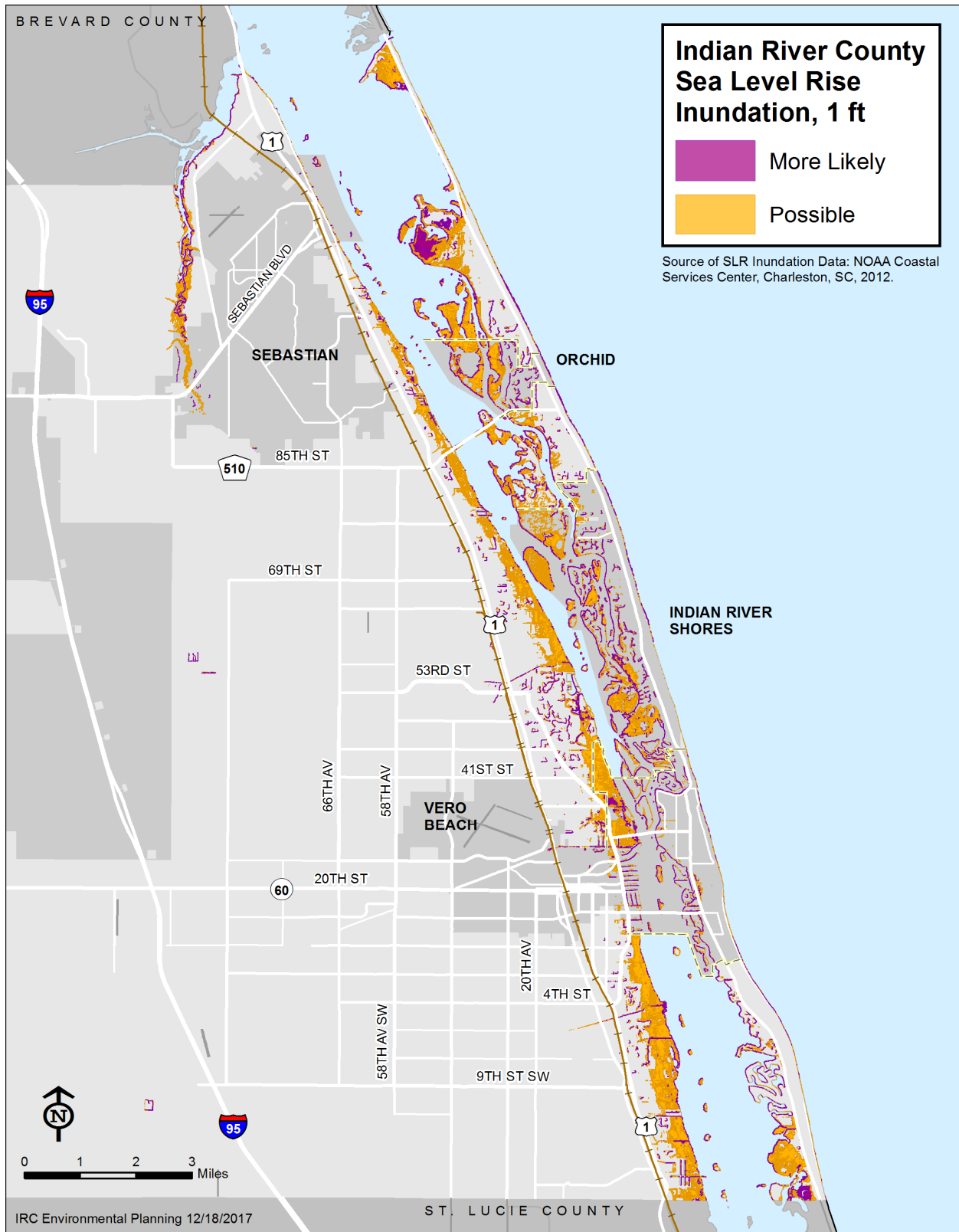


Figure 9.16: 1-Foot Sea Level Rise Scenario in Indian River County, FL

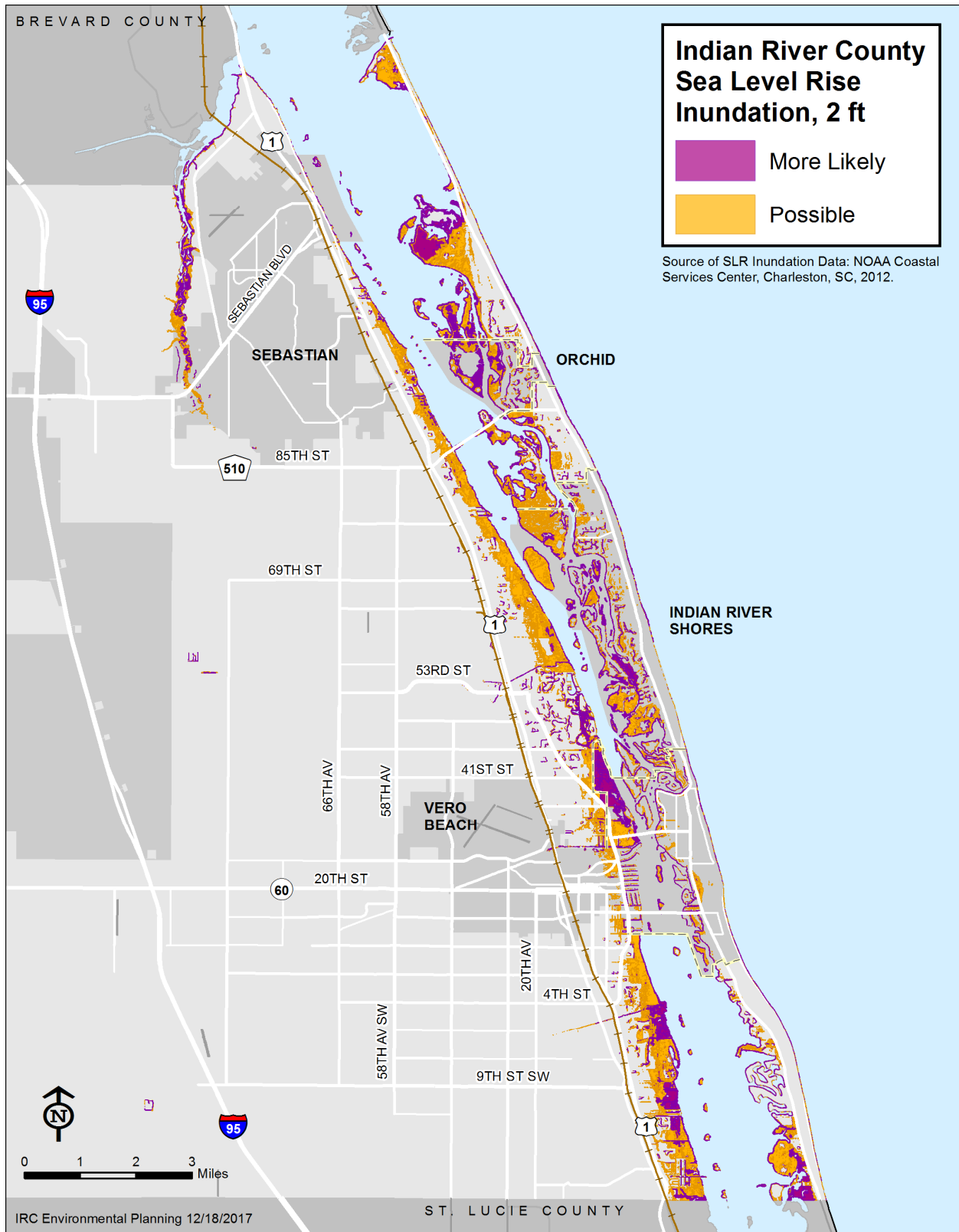


Figure 9.17: 2-Foot Sea Level Rise Scenario in Indian River County, FL



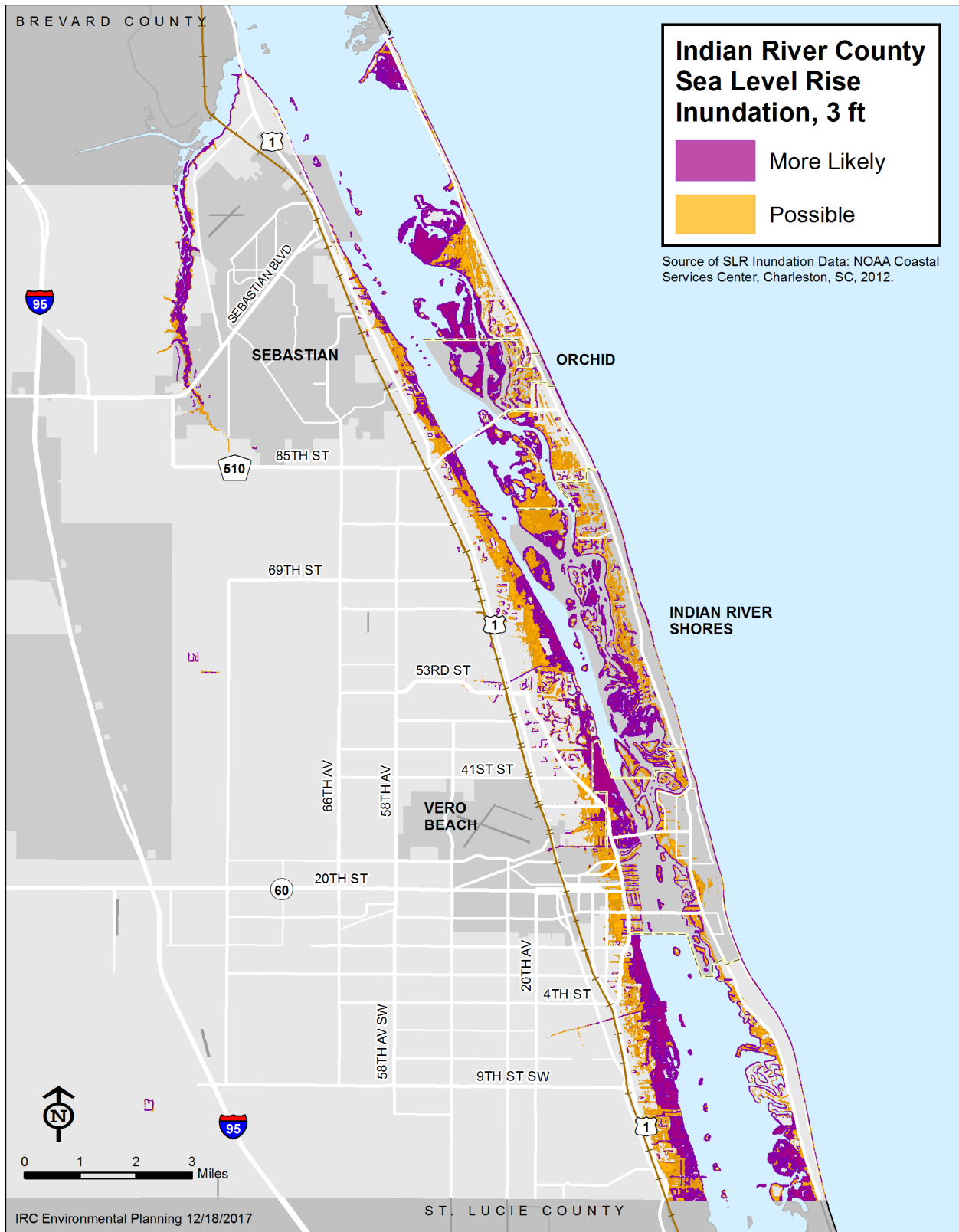


Figure 9.18: 3-Foot Sea Level Rise Scenario in Indian River County, FL

**Table 9.4: Revised Sea Level Rise Inundation Estimates for Indian River County, Florida\***

| <u>Probability Category</u> | <u>1ft Inundation Area (in Sq. Miles)</u> | <u>2ft Inundation Area (in Sq. Miles)</u> | <u>3ft Inundation Area (in Sq. Miles)</u> |
|-----------------------------|---|---|---|
| <u>Possible</u>             | <u>5.95</u>                               | <u>6.95</u>                               | <u>6.05</u>                               |
| <u>More Likely</u>          | <u>0.90</u>                               | <u>2.84</u>                               | <u>6.54</u>                               |
| <u>Probability Category</u> | <u>(Acres)</u>                            | <u>(Acres)</u>                            | <u>(Acres)</u>                            |
| <u>Possible</u>             | <u>3,809.97</u>                           | <u>4,447.07</u>                           | <u>3,871.39</u>                           |
| <u>More Likely</u>          | <u>575.53</u>                             | <u>1,814.65</u>                           | <u>4,187.81</u>                           |

\*Source: NOAA Coastal Services Center, Charleston, S.C., 2012, and Indian River County Environmental Planning, 2017. Note: The geographic areas within the probability categories “Possible” and “More Likely” do not overlap.

**Inundation Risk by Land Use**

The total land use area at risk from each SLR inundation scenario was analyzed. When evaluated based on total acres inundated, the data indicate that under all three inundation scenarios the greatest impacts of SLR are on lands designated Conservation and Recreation. Notably, privately owned estuarine wetlands and undeveloped lagoon island conservation areas appear to be the most vulnerable to SLR inundation impacts. It is estimated that more than 85% of currently existing coastal wetlands are at risk of inundation under the 3 foot sea level rise scenario.

Physical infrastructure such as roadways, power plants, ports and airports, landfills, hospitals and schools were determined to be critical facilities that were initially evaluated in the 2013 Seven50 report. Based on the best available data from the NOAA Coastal Service Center sea level projection models, risks to physical infrastructure at the one, two and three foot scenarios are described below.

- Indian River County has 4 airports east of I-95. No impacts were reported.
- FPL has seven parcels under the category of Electrical Power Substation. The City of Vero Beach has nine. No impacts were reported.
- FEC Railroad rights of way were assessed but did not show a vulnerability to sea level rise (no miles of track impacted).
- The water and wastewater treatment plant analysis included the Indian River Wastewater and Water Treatment facilities. Significant impacts may be encountered at facilities located along the Indian River Lagoon which incorporate coastal mosquito impoundments and estuarine marshes.
- Indian River County has 2 parcels under the data category of landfills. No impacts were reported.

- Hospital facilities are mainly concentrated in Vero Beach. Under the 2 and 3 foot scenarios approximately 6.8 and 16.5 acres of inundation, respectively, could be possible on the Indian River Medical Center parcel<sup>1</sup>. Impacts were to undeveloped portions of the parcel and no building infrastructure would be affected.
- The Indian River County Schools include five charter schools, eight public schools, 11 private schools and Indian River Community College. Fourteen total schools are designated as storm shelters. None of these were impacted at any scenario.
- Evacuation Routes to and from the barrier islands were not shown to be vulnerable to sea level rise at the three scenarios tested.

<sup>1</sup>Note: the currently undeveloped and unelevated east end of the overall IRMC parcel could be impacted under the scenarios tested.

### **Mitigation and adaptation strategies**

Based on the analysis provided in this element, the majority of the inundation impacts are projected to occur within the Coastal High Hazard Area (CHHA); consequently, mitigation strategies that will likely have the greatest effect on reducing exposure to inundation risk due to one foot, two foot and three foot SLR scenarios involve reducing the potential population and vulnerable development within the CHHA. Therefore, the CHHA area should be used as an “Adaptation Action Area” (AAA) to implement strategies that address sea level rise impacts. Strategies that accomplish these objectives include reducing public infrastructure expenditures in at risk areas identified on the inundation maps, preventing or capping the number of assisted living facilities and similar special needs populations and higher density developments within the CHHA/AAA, and acquiring conservation and open space lands in the CHHA/AAA when feasible.

Future adaptation strategies may include relocation and/or elevation of critical infrastructure facilities and roadways where appropriate, incorporation of living shorelines that provide coastal resilience and carbon sequestration benefits, and improvements to stormwater conveyance systems that may be susceptible to failure as a result of rising groundwater and tide levels. Additionally, saltwater intrusion will be a growing concern based on the cumulative effects of projected potential SLR inundation and rising groundwater levels.

Policy 13.2: The county, in cooperation with the FWC, USFWS, FIND, and the ELC, will distribute manatee awareness and boating safety materials to local boaters at the time of yearly boat registration and other appropriate locations such as marinas, bait and tackle shops, and public parks.

Policy 13.3: By 2010, the county shall initiate a monofilament line recycling program by placing marked collection receptacles at boat ramps, marinas, bridges, and strategic locations.

Policy 13.4: All existing and new boat facilities (public and private) shall be required to post manatee awareness signs.

Policy 13.5: By 2010, all rental vessels, including personal watercraft, in Indian River County shall be required to display stickers or plasticized cards with boating safety and manatee protection information.

#### **OBJECTIVE 14      Manatee Protection Measures**

**Through 2015, the annual number of manatee mortalities in Indian River County shall be no more than five (5), excluding unusual events such as red tide or disease outbreaks. Of these annual mortalities, no more than one (1) mortality shall be watercraft-related.**

Policy 14.1: The county, in cooperation with the City of Vero Beach Utilities Department and the FWC Bureau of Protected Species Management will ensure that disruptions to outflow, and/or inadequate temperatures to sustain manatees during winter are minimized, and that all necessary precautions to minimize hazards at the power plant are initiated.

Policy 14.2: The county shall continue to assist the Indian River Mosquito Control District to identify and retrofit any remaining culverts or pipes that pose a threat of manatee entrapment.

#### **OBJECTIVE 15      Sea Level Rise Adaptation Strategies**

**Through 2060, the County shall adopt, implement, and pursue strategies that increase community resiliency and protect property, infrastructure, and cultural and natural resources from the impacts of sea level rise.**

Policy 15.1: By 2022, Public properties and infrastructure, including but not limited to water and wastewater facilities, stormwater systems, roads, bridges, governmental buildings, hospitals, coastal wetlands, transit infrastructure and other public assets that may be at risk to sea level rise impacts shall be identified. Based on risk inventory findings, resiliency improvements and relocation of infrastructure shall be considered as part of capital improvement plans, where warranted.

Policy 15.2: During major evaluations and overall updates to the comprehensive plan, the best available data and sea level rise projections such as those made by the United States Army Corps of Engineers, National Oceanic and Atmospheric Association, and the Southeast Florida

Regional Climate Change Compact, shall be taken into consideration when evaluating or updating policies related to sea level rise.

Policy 15.3: Beginning in 2022, and every 5 years thereafter, the County shall review the best available data on local sea level rise projections and County sea level rise inundation maps and shall update inundation maps and related analysis, as warranted.

Policy 15.4: The County shall coordinate with local municipalities regarding sea level rise adaptation and mitigation measures.

Policy 15.5: The County hereby adopts the Coastal High Hazard Area (CHHA) as an “Adaptation Action Area” (AAA) as defined in this Coastal Management Element to identify the geographic areas most vulnerable to the impacts of projected potential sea level rise and most appropriate for mitigation measures and resiliency improvements. Furthermore, the County shall apply this Element’s Objective 5 CHHA policies to limit public infrastructure expenditures within the AAA.

Policy 15.6: By 2023, the County shall re-evaluate flood zone requirements and mitigation strategies within the AAA.

Policy 15.7: The County shall prohibit location within the AAA of new adult congregate living facilities, nursing homes, and other similar facilities that serve special needs populations.

Policy 15.8: No increase in land use designation density shall be approved by the County for properties that lie within the AAA.

## **PLAN IMPLEMENTATION**

An important part of any plan is its implementation. Implementation involves execution of the plan's policies by taking actions and achieving results.

For the Coastal Management Element, implementation involves various activities. While some of these actions will be ongoing, others are activities that will be taken by certain points in time. For each policy in this element, Table 9.4 identifies the type of action required, the entity or entities responsible for taking the action, the timing, and whether or not the policy necessitates a capital expenditure.

To implement the Coastal Management Element, several types of action must be taken. These include, but are not limited to: coordination with jurisdictional and reviewing agencies, establishing marina facilities siting criteria, and protecting/preserving estuarine resources.

Overall plan implementation responsibility will rest with the Community Development Department. Besides its responsibilities as identified in Table 9.4, the Community Development Department has the additional responsibility of ensuring that other entities discharge their responsibilities. This will entail notifying other applicable departments of capital expenditures to be included in their budgets,