CHARLOTTE COUNTY
FLORIDA

CHARLOTTE COUNTY FLORIDA

VULNERABILITY ASSESSMENT

JUNE 2026

PREPARED BY:

WSP

COASTAL & HEARTLAND NATIONAL ESTUARY PARTNERSHIP

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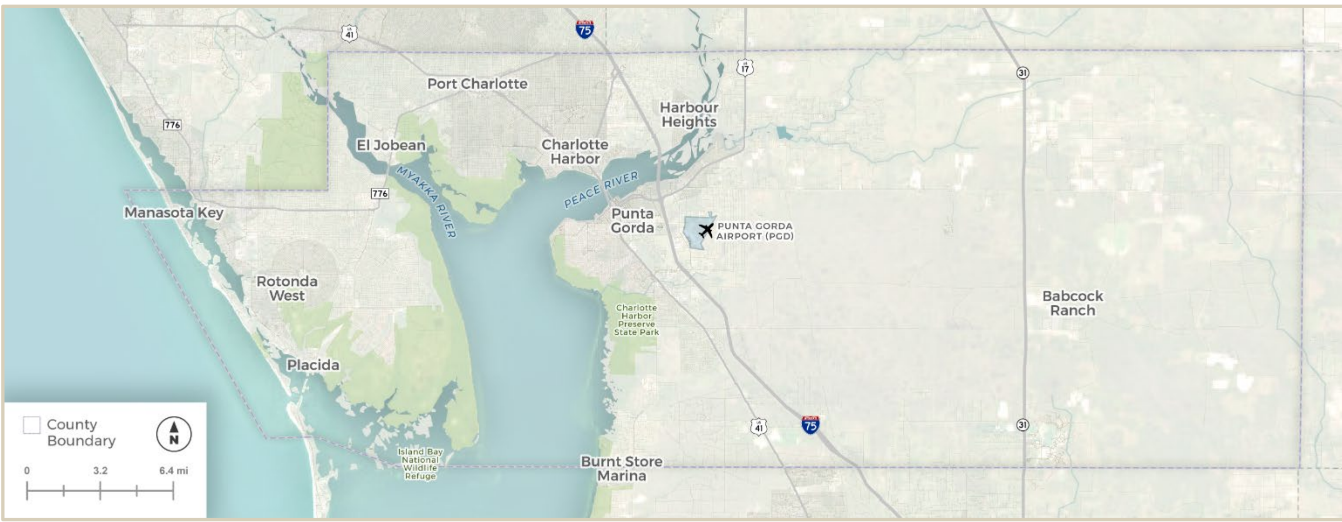
INTRODUCTION

Background

Charlotte County, Florida is a community that lives near and with water, includes extensive and diverse natural/biological systems, and is home to a growing population of approximately 217,212 people across 680 square miles in 2025. It sits on the southwest coast of Florida, at the shoreline of the Gulf of America, and surrounds Charlotte Harbor, which branches off into the Myakka and Peace Rivers, which stretch into the northern and eastern parts of the county, as shown in Figure 1. It is an exciting place to live and work in part because of the access to water throughout the county, and it is also an enjoyable place to visit to enjoy these areas and participate in outdoor activities.

Figure 1 Overview of Charlotte County



The county has experienced a number of significant weather events and tropical storms in the recent past with Hurricanes Irma, Ian, Idalia, Helene, and Milton passing by and through the county over the past few years, which resulted in significant flooding and varying levels of damage to a number of communities within the county, including significant impacts to the City of Punta Gorda. To this day, the county continues down the path of recovery from those events. Figure 2 shows the city of Punta Gorda after Hurricane Milton.

Figure 2 City of Punta Gorda after Hurricane Milton

Per Florida Statute 380.093, the county has commissioned this Vulnerability Assessment (VA) study to better define and address the risks from coastal flooding as well as the detrimental effects of potential future higher sea levels. Higher sea levels would be expected to inundate natural areas and some coastal properties in the county while contributing to increased detrimental impacts from storms. These worsening conditions would be due to higher water levels in the Gulf, harbor, and rivers, allowing for more water to be pushed shoreward at higher levels than would be anticipated today and extending farther inland.

The concern is compounded by state and federal recovery support resources becoming increasingly strained by the rising recovery costs of storm events, placing the county in a position of even higher responsibility in this area and highlighting the need for a more comprehensive understanding of changing conditions and risks, so the county can focus on taking effective impact mitigation actions, reducing recovery needs from the county.

Implementing Agencies

This Charlotte County Vulnerability Assessment is being funded through a program administered by the Coastal & Heartland National Estuary Partnership (CHNEP), part of the US Environmental Protection Agency National Estuary Program. The work was performed for Charlotte County, whose staff, together with CHNEP staff, led technical coordination with the consulting team, managed all internal stakeholder agency coordination, led public outreach, and will be responsible for implementation upon acceptance of findings and plan recommendations, ultimately creating a more resilient county as a result of these efforts.

Generally, these efforts provide the opportunity to put definition around an often uncertain concern, outline the pace of change possible from changing environmental conditions, and conduct a solid technical and science-based framework to assess this concern and provide guidance for the county's current and future residents and business owners, such that they can make appropriate decisions based on the analysis outlined in this report.

Florida's Resilient Florida Program

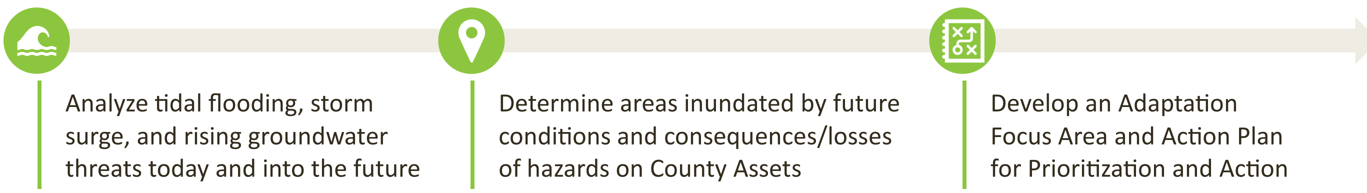
The vulnerability assessment study was conducted following a process framework established by the Florida Department of Environmental Protection, Office of Resilience and Coastal Protection, which administers a program established through state legislation and defined in (Section 380.093), FL Statute. This legislation also established a funding program called the Resilient Florida Program, which provides resources to communities across the state to conduct studies analyzing the impacts of climatological and meteorological events to their communities (such as flooding) and establish and implement appropriate risk-reduction actions as a result. The Resilient Florida Program has funding for both planning and implementation efforts, with the requirement that municipalities complete a compliant VA before becoming eligible for implementation funding. Thus, the county is completing this work in part to establish its eligibility for funding from that program.

The FDEP study framework implemented on this project was set up to establish a consistent analysis methodology to be able to support decision-making within the county, but also to support decision-making and investments at the state level. This is being completed by creating/assembling data representing conditions and vulnerabilities in the county that are common across the state. The framework establishes a method to allow for comparisons and help guide the state towards its most effective investments. The state administers funding to help advance community resilience and allocates funding in an annual Statewide Flooding and Sea Level Rise Resilience Plan, which could be an eventual target for county leadership for financial support, and is a program that other agencies are using to support long-term resilience actions.

The Vulnerability Assessment Approach

What follows in this report is a summary of methodology and findings that presents details on conditions of concern today and into future periods, and the consideration of how these conditions affect various natural areas and/or elevate risks to key assets (buildings, roadways, water, etc.). The intent is to provide the county the basis for determining a set of actions and priorities that can be taken to address these concerns. This is the basic framework of the plan and its intended outcomes. Figure 3 shows the methodology applied in this analysis.

Figure 3 Vulnerability Assessment Approach



This report presents the technical work completed to satisfy the requirements of the FDEP program, which is reliant on significant spatial data analysis to define potential concerns. The focus of the FDEP program and the analysis conducted for this study is toward determining concerns for critical assets within the county, which, if impacted, would be detrimental to the community's capacity to withstand and recover from significant storm events. Long-term resilience concerns extend to other factors beyond "brick and mortar" (e.g. social, economic, etc.), and those issues will be addressed in later planning phases to be conducted after the conclusion of this effort.

This document is accompanied by a series of technical appendices, which provide much more detail on the data assembled and applied to this work (Appendix C: ACUNE Sufficiency Analysis and Appendix D: Hazard and Asset Data), identified data gaps (Appendix D: Hazard and Asset Data), as well as the methodology utilized and a more comprehensive presentation of results (Appendix E Exposure and Sensitivity Analysis and Appendix F Adaptation Focus Area and Recommendations).

Considering Flood Risk Hazards in Charlotte County

Charlotte County is adjacent to and bisected by water, and thus is very familiar with tidal flooding, storm-related flooding, and groundwater rise. Those three concerns are analyzed in detail through this effort, assessing how environmental conditions may change in the future and the extent to which the county could be impacted by those conditions. The consideration of existing and future conditions and how they may impact the county includes two primary concerns[1]:

- **Chronic:** for the county, this is related to tidal inundation, which is a regular and common concern in low-lying areas, considering how those conditions may change in the future. This condition would be related to flooding at the shoreline but also influence elevating the groundwater table. Therefore, this concern would be related to natural areas in transition from wetlands to open water, coastal areas now becoming inundated, and underground utilities losing some of their effectiveness through infiltration of underground infrastructure.

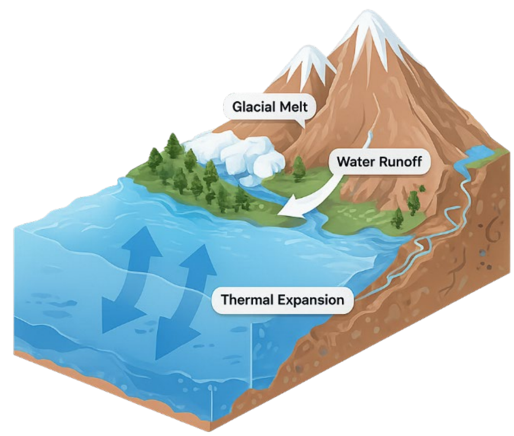
[1] Rainfall impacts were not considered in this assessment.

» **Acute:** These are conditions impacting the county from major coastal storms. The county's recent experiences with storms make it aware of the impact such storms can have on county communities. A consideration of how these events may become more frequent and/or intense in the future is important to define, so that appropriate actions can be implemented to now reduce their impact.

Sea Level Change and Tidal Flooding

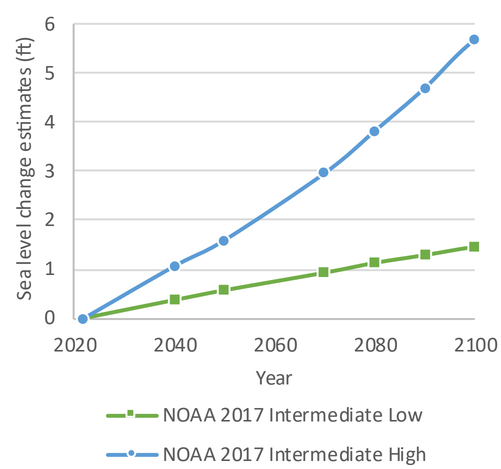
The ongoing change in sea levels, driven by a combination of thermal expansion, water runoff, and the melting of glacial ice (as shown in Figure 4), is leading to higher water levels in the Gulf and may increase the severity of storm surges that threaten properties and communities throughout Charlotte County. Thermal expansion is a condition that occurs as global temperatures increase, and oceans absorb more heat, causing water to expand. The accelerated melting of glaciers and ice sheets, particularly in regions such as Greenland and Antarctica, could add significant volumes of water to the ocean.

Figure 4 Causes of Sea Level Change



These interconnected processes, identified by the National Oceanic and Atmospheric Administration (NOAA), are anticipated to persist, underscoring the importance of understanding and preparing for the evolving risks associated with sea level change in the coming decades. There are two NOAA stations within the study area where sea levels are monitored and change estimates are available: Fort Myers and Naples. The values between these stations differ by 1cm or less; but to generate a solid understanding of what may occur across the region the water levels were averaged between the two stations to produce a single set of sea level and change values used for this study. These trends are visually represented in Figure 5.

Figure 5 NOAA Sea Level Change Projection



The sea level change chart illustrates how conditions are estimated to change over time and represents the inherent uncertainty in the estimates. The state of Florida has identified in statutes the scenarios to apply in conducting these vulnerability assessments, which are shown on the right. For Charlotte County and its decision-makers, it is most important to consider when these changes are expected to occur and then incorporate those timeframes into county processes and planning efforts. In interpreting the data, it can be noted generally that approximately one foot of sea level change is expected around 2040 (intermediate-high scenario), or in 2070 (intermediate-low scenario). An estimated three feet of sea level change is expected to occur around 2070 only for the intermediate-high scenario, as indicated in Figure 5 and Table 1.

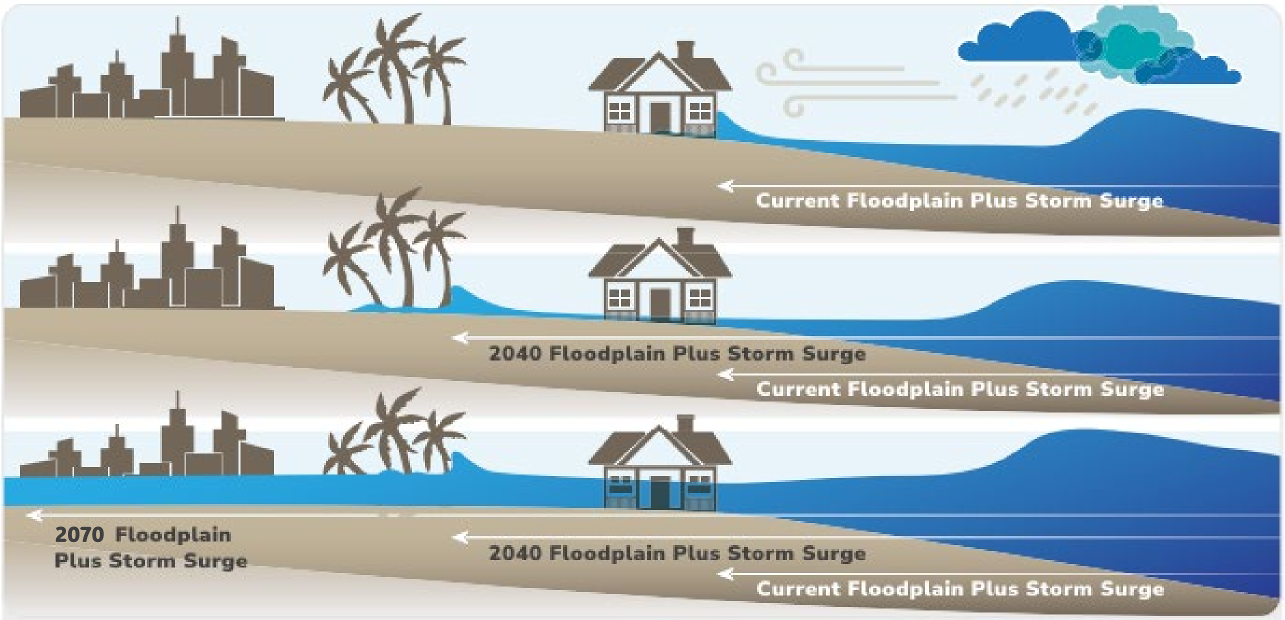
Table 1 Detailed Sea Level Change Estimates (feet) for Selected Policy Scenarios to meet Requirements (FDEP)

Year	Sea level change in feet from NOAA 2017	
	Intermediate-Low	Intermediate-High
2040	0.37	1.06
2070	0.93	2.96

Storm Surge

While sea level change presents ongoing chronic inundation risks, storm surge remains a significant and acute threat during storm events. Storm surges occur when strong winds propel ocean waters and waves toward the coast during such events. Elevated sea levels are expected to exacerbate storm surge risks due to increased water depth reaching the shoreline as heightened water levels and waves. Storm surge is projected to extend farther inland as a result of larger volumes of water being driven shoreward for similar events, as illustrated in Figure 6.

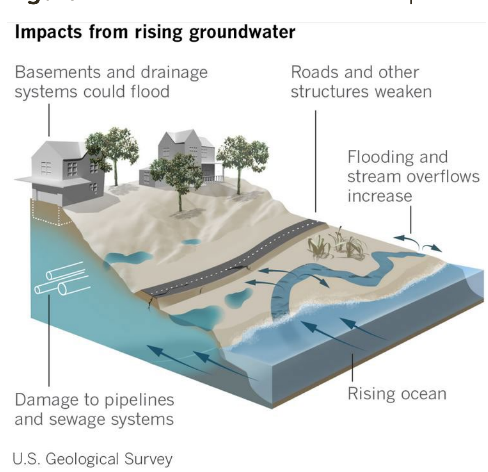
Figure 6 Storm Surge Examples



Groundwater Rise

As sea levels change along coastal regions like Charlotte County, the groundwater table beneath the surface is also expected to rise. When sea levels increase, the "baseline" water level that influences these underground systems also moves higher, pushing groundwater closer to the surface. Higher groundwater conditions (like those shown in Figure 7) will likely impact underground systems (stormwater, sewer, utility, etc.) and this condition should be considered as a part of county planning, policies and actions as well. Groundwater rise can also cause low-lying areas of the county near the coastline to become saturated, or even inundated, impacting the ability to use those areas for various activities.

Figure 7 Groundwater Rise and its Impacts



Source: Rosanna Xia / Los Angeles Times / Aug. 17, 2020

Critical Assets Considered

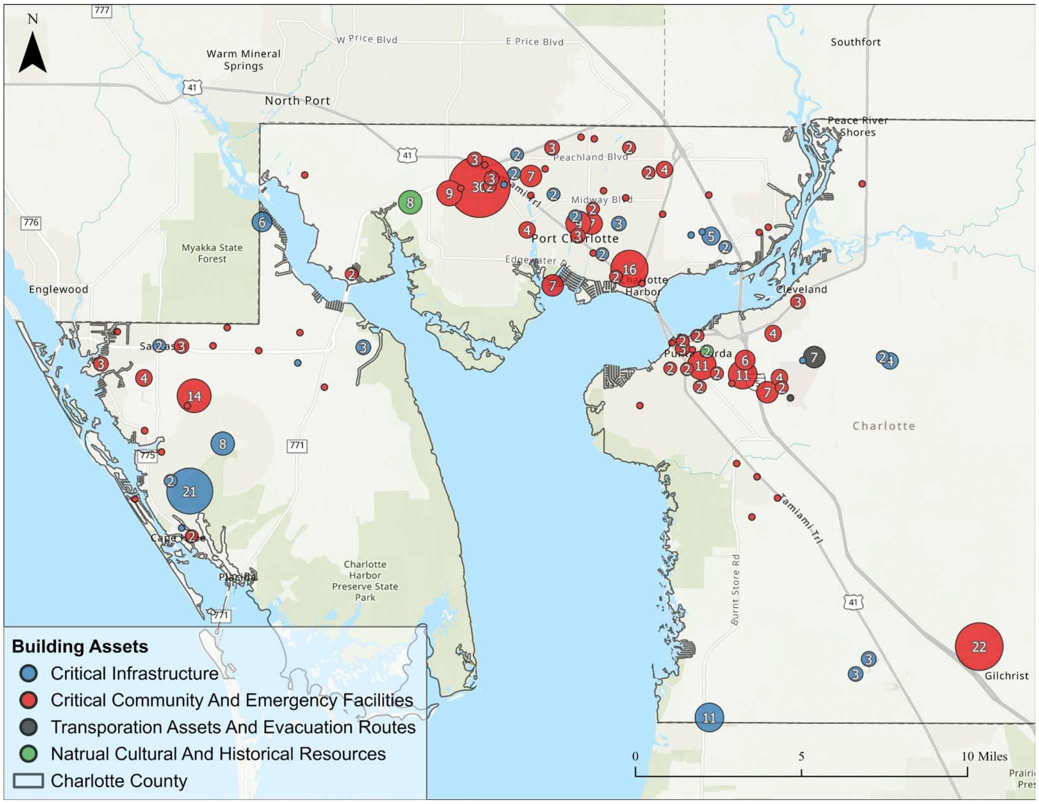
The FDEP program focuses on the assessment of critical assets to determine the potential impacts of conditions today and into the future, including regionally significant assets that support the needs of communities spanning multiple geopolitical jurisdictions, including, but not limited to, water resource facilities, regional medical centers, emergency operations centers, regional utilities, major transportation hubs and corridors, airports, and seaports.. Table 2 lists the asset types included in this work with findings presented in the following pages.

Table 2 Assets Considered in the Risk Assessment

Category	Asset Name	Category	Asset Name
Critical Community and Emergency Facilities	Affordable public housing	Critical Infrastructure	Communications facilities
	Airports		Lift Stations
	Colleges And Universities		Pump Stations
	Community Centers		Solid And Hazardous Waste Facilities
	Correctional Facilities		Wastewater Treatment Facilities
	Disaster Recovery Centers	Transportation and Evacuation Routes	Roadway
	Emergency Medical Service Facilities		Railway
	Fire Stations		Bridges
	Health Care Facilities		Culverts
	Hospitals	Natural, Cultural, and Historic Resources	Historic bridges
	Law Enforcement Facilities		Parks
	Local Government Facilities		Conservation Lands
	Logistical Staging Areas		Wetlands
	Schools		

Figure 8 below identifies the location of these assets and the associated categories throughout the county for reference. The map depicts the clusters of asset types by area of the county where they are present.

Figure 8 Assets Considered in the Analysis



Critical Infrastructure

90 Facilities

362 Lift Stations

Critical Community & Emergency Facilities

256 Buildings

Transportation & Evacuation

491 Mi Roads

45 Bridges

25 Mi Rail

Natural, Cultural, & Historic

657K AC Conservation

418K AC Wetlands

9 Historic Bridges

30 Parks

Stakeholder and Public Engagement

The project team conducted two public outreach meetings to inform stakeholders and solicit feedback regarding both the project's scope and the County's focus areas. In addition, the project team will participate in the Board of Charlotte County (BOCC) meeting to gather further input from committee members.

According to FDEP guidance on public engagement, outreach activities should occur during both the data collection and recommendation stages of a project. The initial meeting introduced the project to interested parties and invited their perspectives on setting general priority recommendations. The second meeting presented analysis results and sought feedback on the draft VA recommendations. Participants had the opportunity to offer community-specific insights related to the analysis outcomes. Detailed information about the public meetings and materials presented is available in Appendix B Stakeholder and Public Engagement.

Current and Future Risks in Charlotte County

Countywide Exposure

The County used sea level change projections to evaluate how critical assets might be affected by tidal flooding across 2040 and 2070 (the time periods identified by FDEP in their guidance), and surge flooding from a 100-year storm event across three time periods: 2022 (representative of today's conditions), 2040, and 2070. More information on the historical records and processes used to determine a 100-year storm event may be found in Appendix D: Hazard and Asset Data.

A "100-year event" refers to an event occurrence that has a 1% chance of happening in any given year. This does not mean the event will only happen once every 100 years, but rather that there is a small, but possible, risk of it occurring each year. As shown in Figure 9, a 100-year event could have an 18% chance of occurring at least once during 20 years and a 26% chance of occurring during 30 years.

Figure 9 Probability of a 100-year Event Occurring over Time

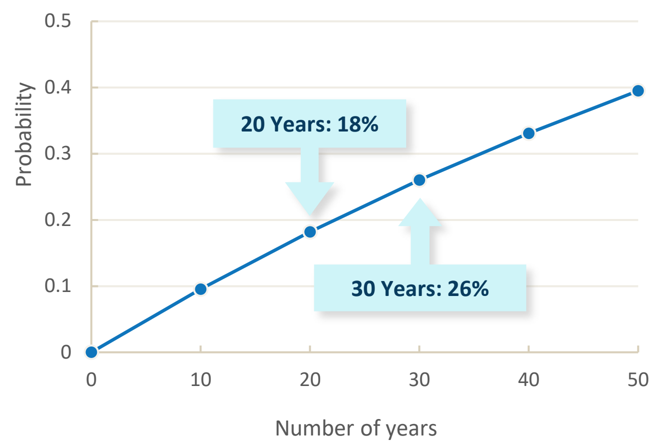


Figure 10 illustrates tidal flooding at the Intermediate-high sea level change scenario, showing where high tide events may increasingly affect land over time. The mapping applies projected sea level rise values on top of the Mean Higher High Water (MHHW) tidal datum, the average of the higher of the two daily high tides. Areas shown represent land at or below the projected future MHHW surface, meaning they would be subject to recurrent tidal flooding during routine high-tide cycles. This is not a rare event, but a chronic condition that intensifies over time. Light green areas indicate land exposed to tidal flooding risk by 2040, while dark green areas represent additional land at risk by 2070, illustrating the progressive expansion of coastal inundation as sea levels rise. Figure 11 shows the impact of storm surge from the present day through 2070 under the same scenario, highlighting locations vulnerable to flooding caused by storm surge events. While this map displays where flooding will occur, it does not show how flood depth increases over time, which is anticipated for many coastal areas in the future. Comparing Figure 10 and Figure 11 illustrates that storm surge scenarios result in more extensive and severe inundation of land than tidal flooding. Figure 12 highlights areas prone to groundwater rise with groundwater depth less than 1 ft, which may lead to increased flooding inland and affect infrastructure. As sea levels change, groundwater is projected to move significantly closer to the surface by 2070 compared to current conditions. Figure 13 illustrates expected transitions in natural system areas under sea level change scenarios, helping visualize how landscapes and ecosystems may shift over time. For example, wetlands may be permanently inundated and transition into open water, while upland areas could become new wetlands due to increased flooding and changes in groundwater levels. These transitions illustrate how landscapes and ecosystems are likely to evolve over time, potentially affecting habitat types, biodiversity, and the services these systems provide to the community.

Figure 10 Potential Tidal Inundation Areas

Figure 11 Potential Storm Surge Inundation Areas

Figure 11- A Current

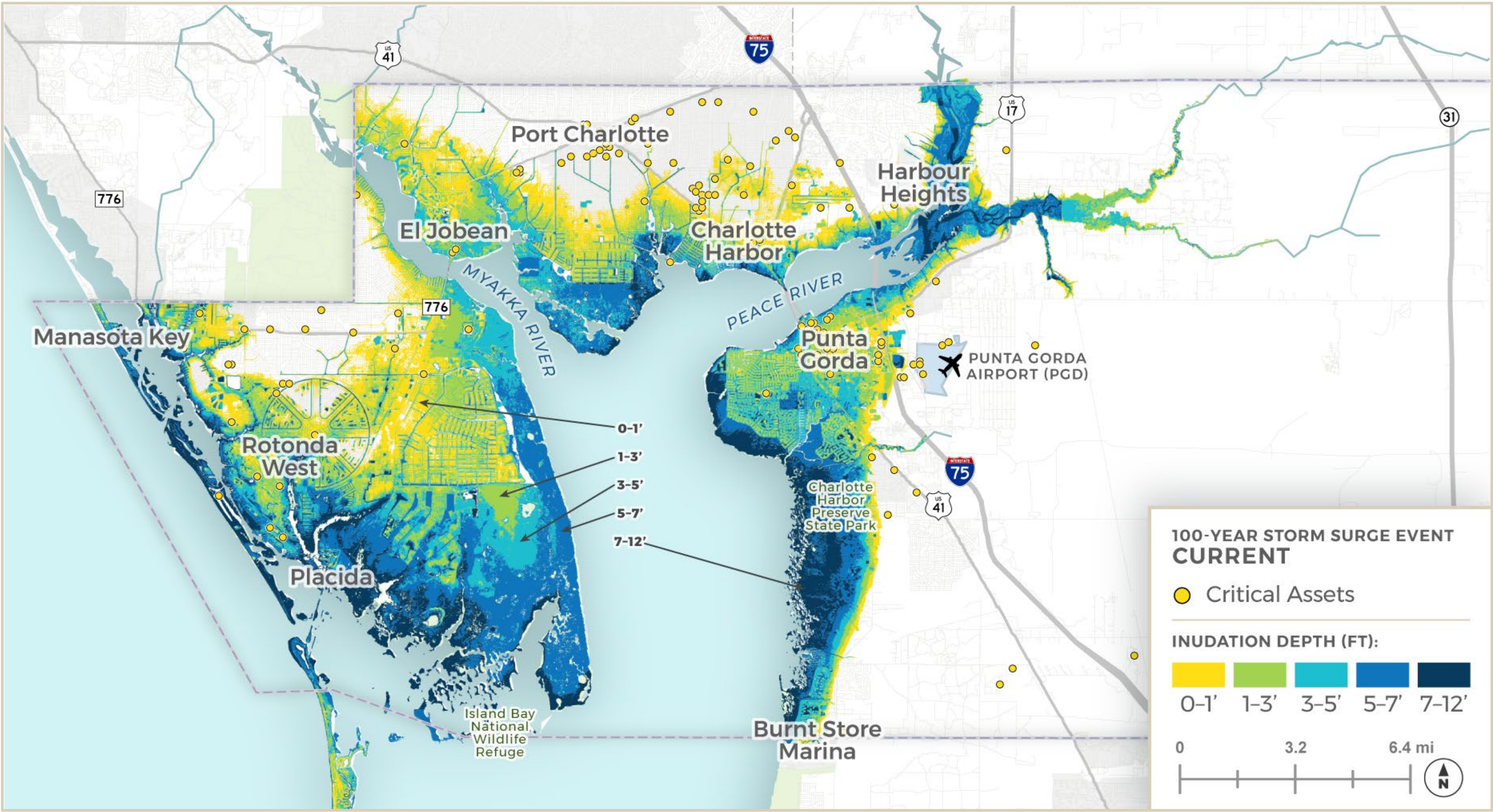


Figure 11- B 2040 High SLC

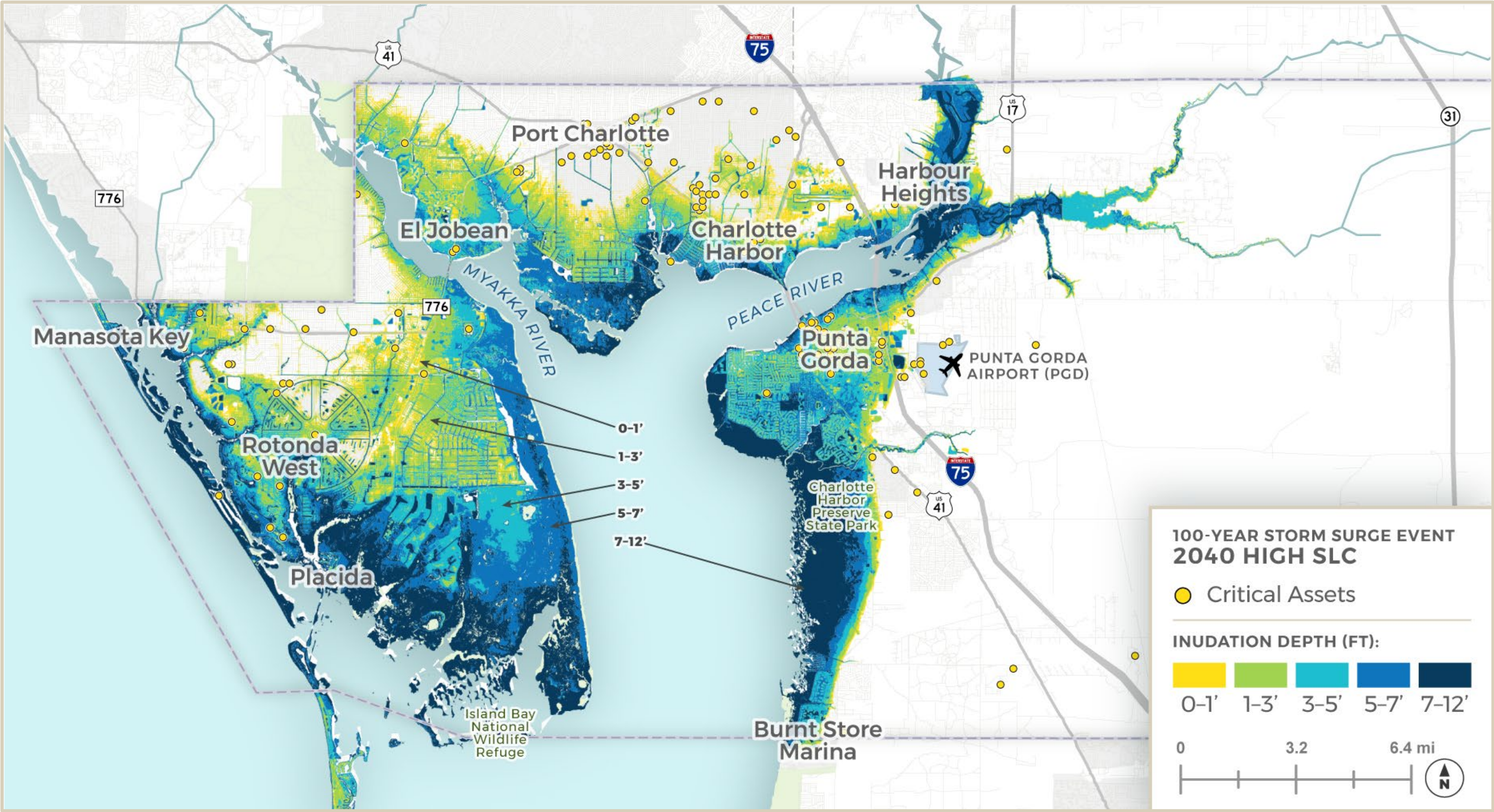


Figure 11- C 2070 High SLC

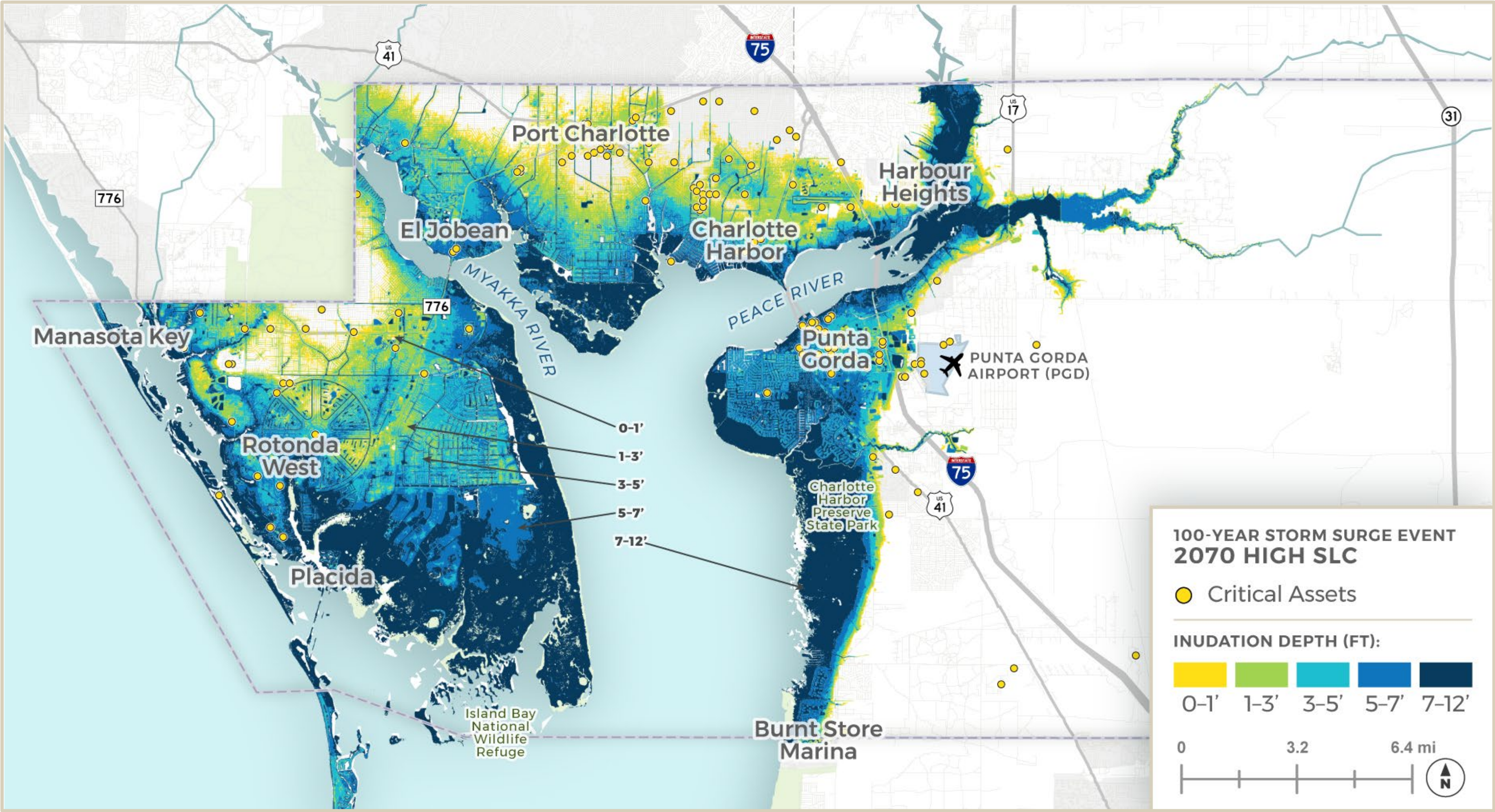


Figure 12 Potential Groundwater Rise Areas

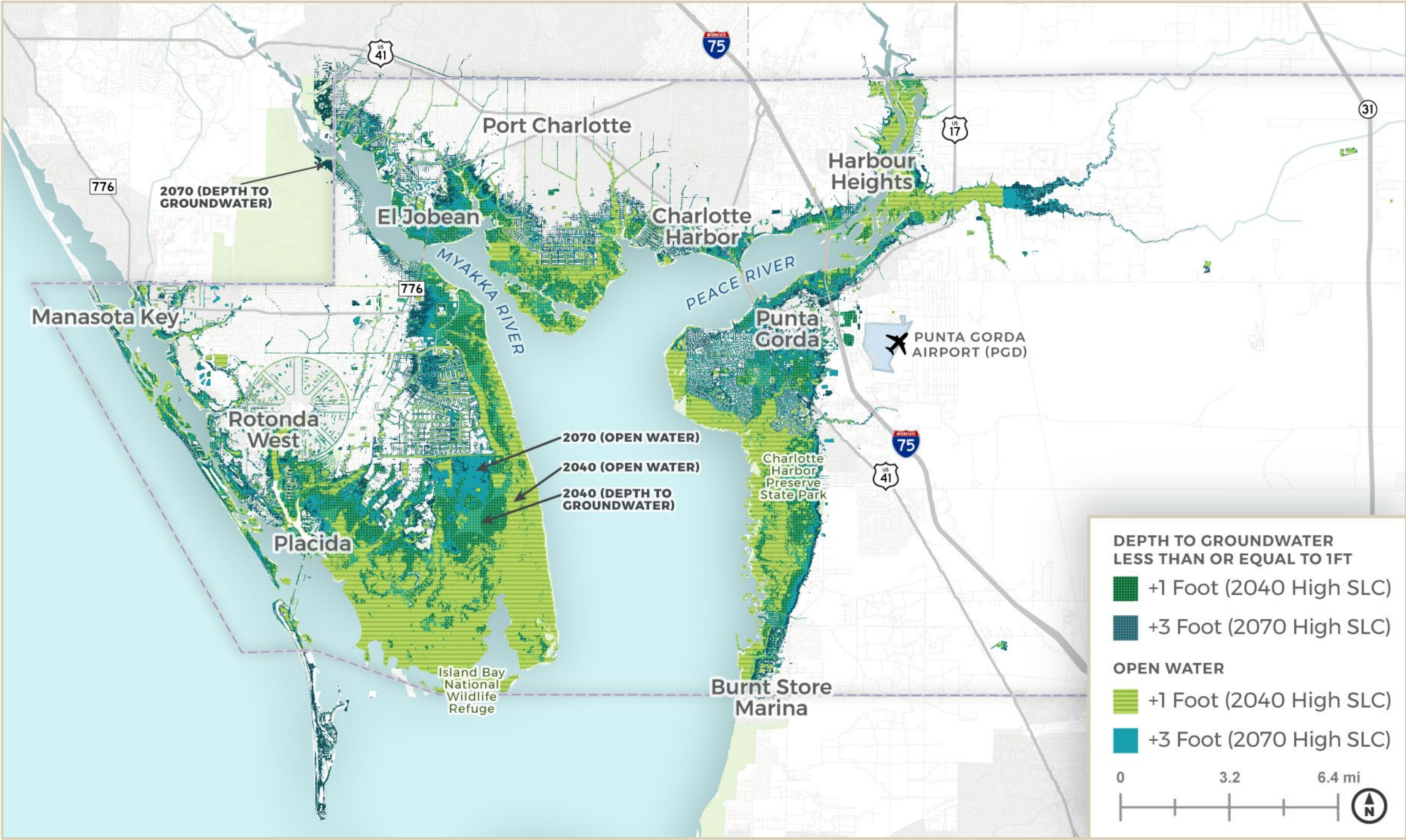


Figure 13 Potential Natural System Area Transition under Sea Level Change

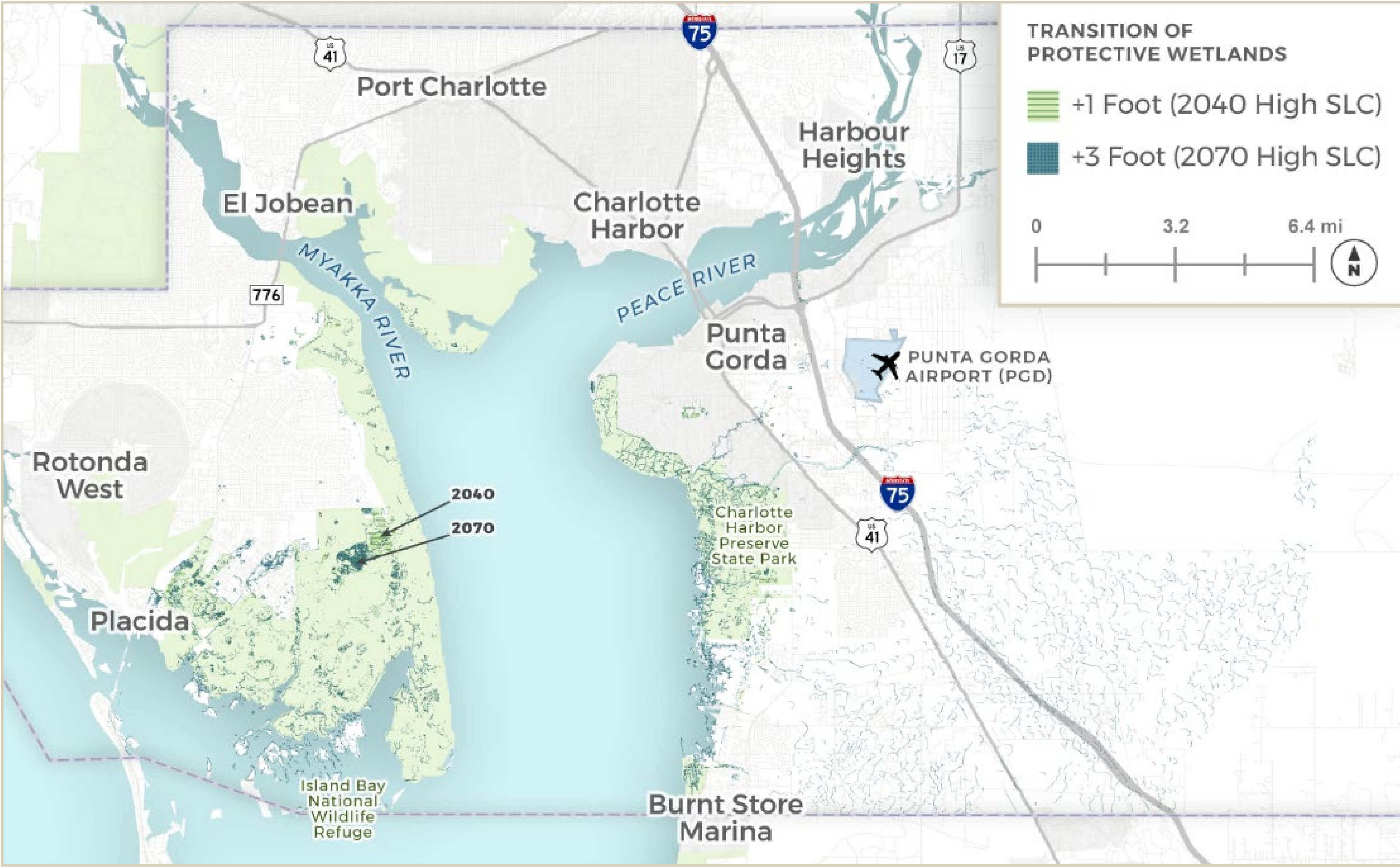


Figure 14, Figure 15, Figure 16 and Figure 17 present an overview of the findings at the county scale of this analysis for all types, identifying the amount of inundated land area for each condition and also the chance of inundation and the risk to critical assets and communities from sea level change and storm surge. The material highlights how this concern is expected to grow over time with changing future conditions.

Figure 14 Summary of Countywide Assets Inundated by Tidal Conditions over Time

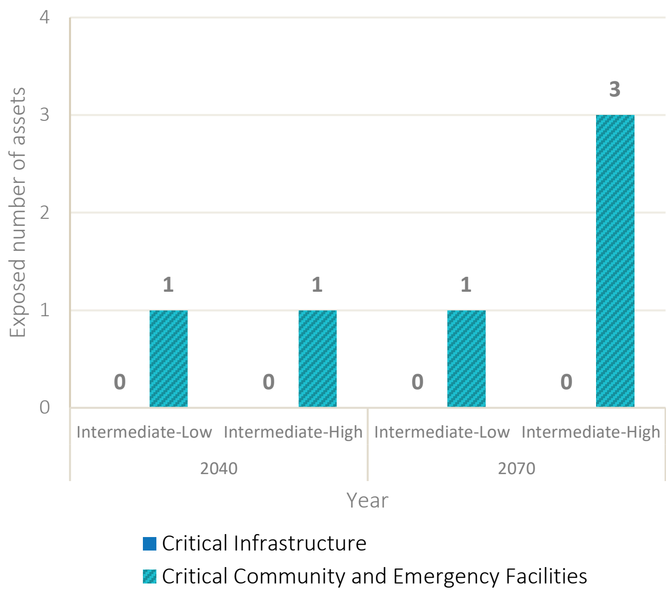


Figure 15 Summary of the Mileage of Roadways and Railways Inundated by Tidal Conditions over Time

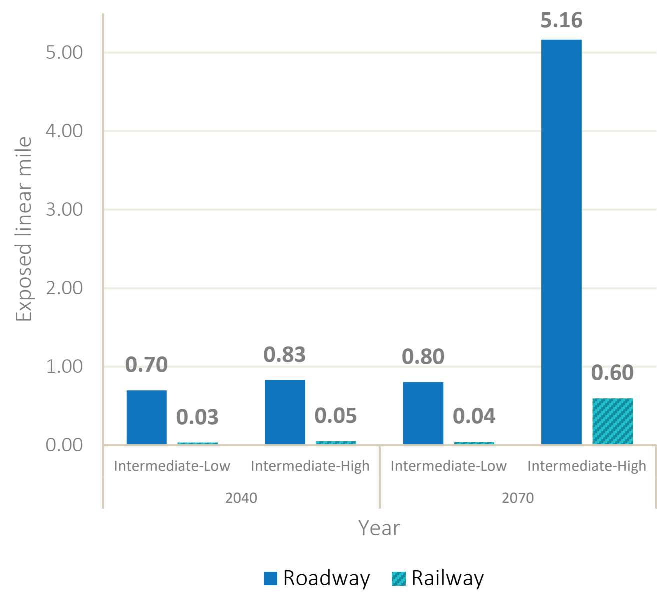


Figure 16 Summary of Countywide Asset Exposure to Storm Surge over Time

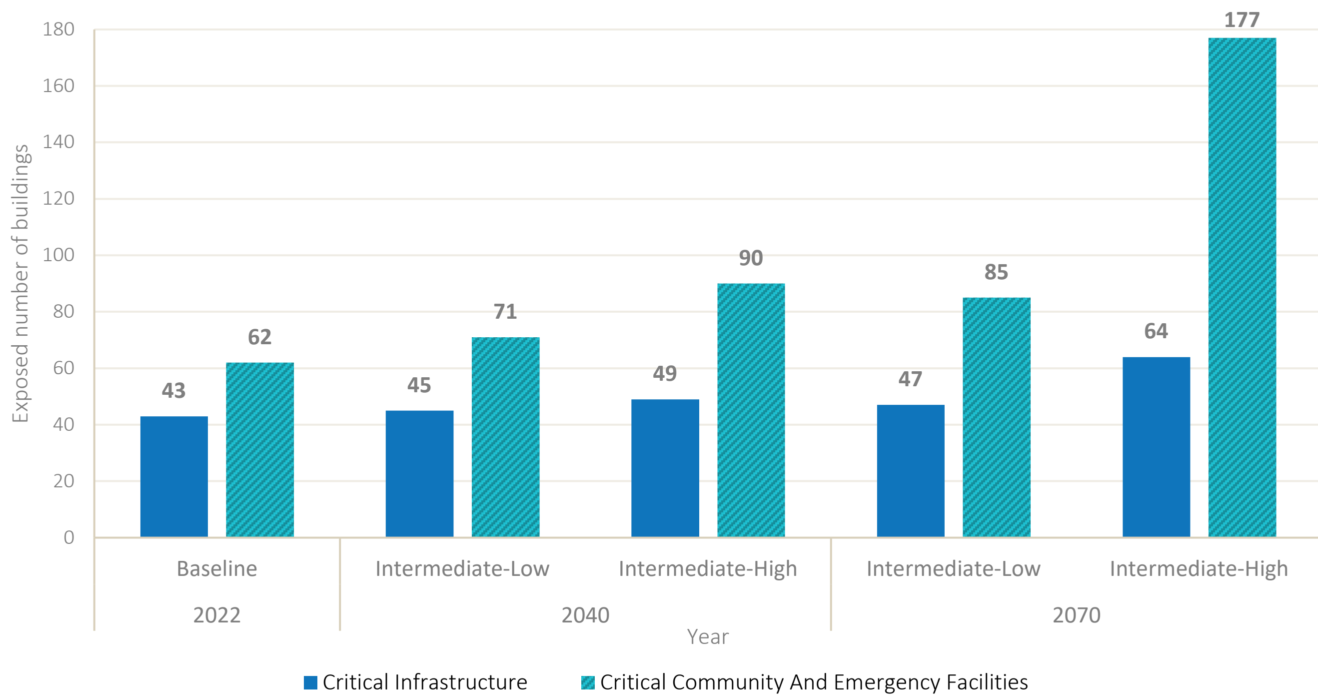
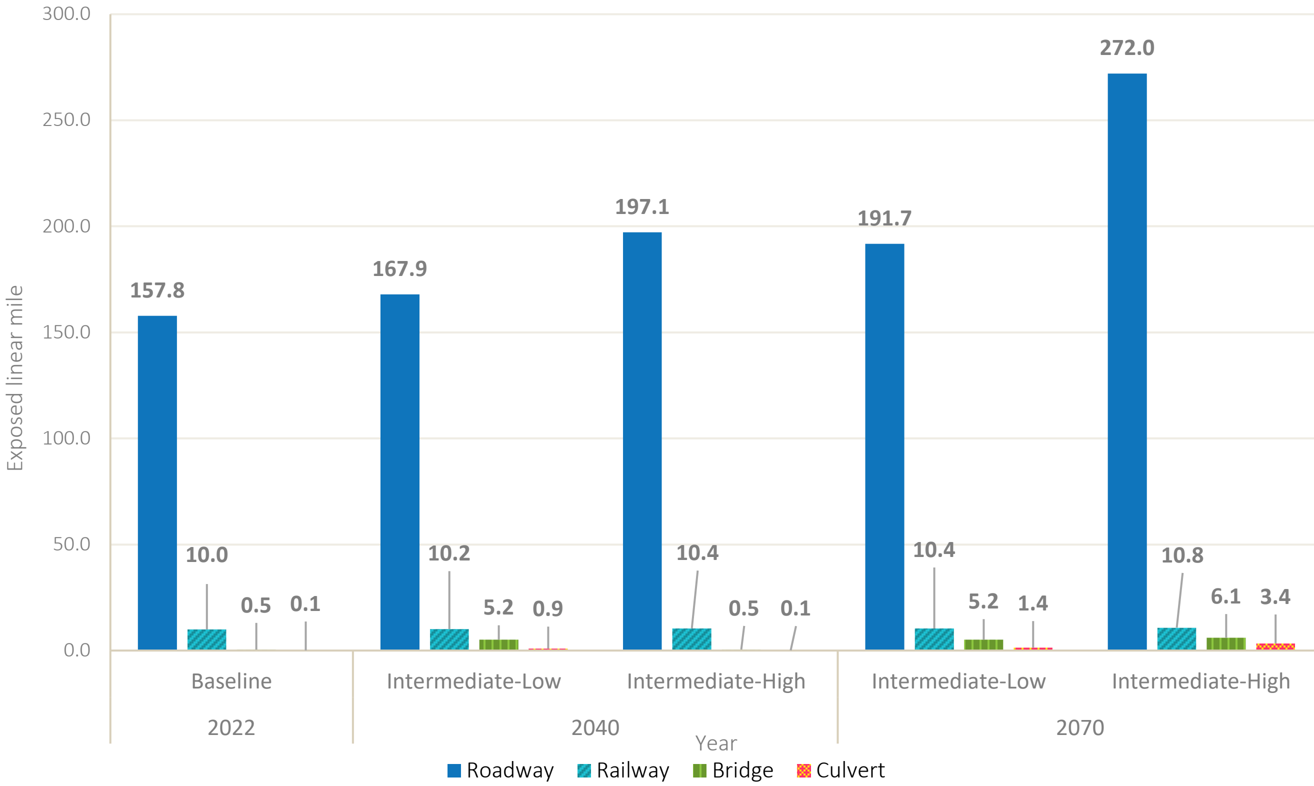


Figure 17 Summary of the Mileage of Roadways, Railways, Bridges, and Culverts Exposed to Storm Surge over Time



Risk Assessment

Preliminary Evaluation

The preliminary evaluation centers on the extent of land inundated under the specified scenario through exposure analysis (details about exposure analysis can be found in Appendix E Exposure and Sensitivity Analysis). Given Charlotte County's geographical position adjacent to both coastal and riverine areas, the results outlined in Table 3 are consistent with expectations.

Table 3 Percentage of Land Area Inundated - by Scenario

Time Horizon	Tidal Flooding		Storm Surge (100-year)	
	Intermediate-Low	Intermediate-High	Intermediate-Low	Intermediate-High
2040	2%	4%	21%	22%
2070	3%	8%	22%	26%

The data shows a clear trend of increasing land area inundation for Charlotte County as time progresses. By 2070, the risk of flooding is expected to become much more severe, bringing greater challenges related to storm surge and rising sea levels. Given these projections, it makes sense to approach flood mitigation across the entire county, not just in the areas currently considered high-risk. These results highlight the importance of understanding the effects of higher inundation levels on infrastructure and key community assets. Going forward, it will be necessary to consider both the spread of flooding and its impact on critical facilities and the county's resilience.

Risk Assessment Methodology

A pressing concern for storm surge flooding is how anticipated flooding affects and impacts the critical assets that are present in Charlotte County, which have been analyzed for this VA. To address this concern, the study team utilized information from a software program maintained and regularly updated by FEMA—HAZUS (Hazards United States), which is based upon observed impacts from storm events. This software program outlines and catalogs in digital form (GIS) the consequence elements for flood loss (and other sources of damage as well) relevant to the county. The consequences of flooding include the cost of damage to an asset, the estimated time to repair an asset, and the ancillary community and economic costs associated with these impacts. This step reflects the sensitivity and vulnerability of analyzed assets under hazards.

Figure 18 below shows conceptually how the program works to determine impacts, as costs to the county, that could be estimated during the recovery phase of any storm event. The key factors in determining costs are depth of flooding (above the floor elevation on the first floor), building size, and building type. These parameters are the basic factors applied (generally) to generate community costs of flooding.

Figure 18 Methodology Used to Calculate Consequence Costs for Each County Asset (Conceptual)

Methodology Used to Calculate Consequence Costs for Each County Asset (Conceptual)

	Asset 1	Asset 2	Asset 3	Asset 4
Flood Depth (ft) for the Analysis Storm	1 ft	2 ft	3 ft	4 ft
% Loss (building & contents)	10%	20%	30%	40%
Repair Time (days)	50	100	150	200
Broader Economic Costs (relocation, rental, etc.)	$10	$20	$30	$40

Under the same 100-year storm surge event (same sea level), flood depth increases as elevation decreases.
This leads to greater losses, longer repair times, and higher economic costs for assets closer to the coast.

Data Source: Federal Emergency Management Agency Research

For this study, the values currently maintained by HAZUS were applied directly (without adjustment) to support an efficient and effective analysis and enable comparisons of the cost of relative impact across all different asset types. The costs estimated and applied for this effort should be considered high-level estimates, which could and should be refined in the following phases. Key cost elements like repair construction costs would likely need to be updated, as they have increased dramatically over the past few years. The analysis results support the prioritization of vulnerable assets.

Prioritization Framework

Figure 19 Prioritization Considerations

Figure 20 Prioritization basis

The technical analysis outlines measures of impact to key assets within the county, for extreme conditions modeled for significant coastal events. The analysis leverages a few of the assembled data points to outline the results of the vulnerability assessment. For this planning-level vulnerability assessment, prioritization was developed as a screening framework to identify facilities that may warrant further evaluation in subsequent adaptation planning. The county has established its policy for priority to focus on the combination of asset importance for recovery and financial impact to the county as its two primary factors in establishing actions, as both of these factors impose significant penalties on community functioning. The framework considers three factors: potential flood exposure, estimated damage and service-loss cost, and the importance of the asset to broader community recovery, as shown in Figure 19.

The considerations include:

1. Potential flood depth indicates the estimated severity of exposure under the evaluated flood scenarios. This information helps identify where flooding may affect individual buildings or facilities and provides context for interpreting the estimated consequences.
2. The cost element outlines the significance of damage that would require a response from the county (and the damage that would be expected), highlighting those that would be most beneficial for protection.
3. The loss of some of the assets from the list (water treatment, energy, schools) would lead to loss of basic government functions in the county and would have a higher likelihood of imposing significant impacts to the broader community (not just the county) – for those that live and work in the county, likely require periods of closure, requiring relocation for county residents and businesses for a period of time.

Based on these considerations, the basis for prioritization is summarized in Figure 20 for this planning-level assessment.

These factors were not combined using a formal weighted scoring method, instead, estimated damage and service-loss cost was used as the primary basis for the High, Medium, and Low categories shown in Table 4, while potential flood exposure and broader community recovery considerations provide context for interpreting the results and identifying facilities that may require additional review.

Prioritization Results

Table 4 presents the preliminary results of this combined method, noting the cost associated with consequences. The actions needed for today, 2040, and 2070 are color-coded as High (> $ 15M), Medium ($ 10M – 15M), and Low ($ 5M- 10M) based on the cost of damage and service losses. The impacts to broader community during recovery need to be considered for subsequent stakeholder discussions and next-phase adaptation planning, where facility-specific service functions, recovery needs, and community priorities can be further evaluated.

Table 4 Prioritization List[2]

Prioritization Facility[3]	Number of Buildings Assessed	Today	2040 (SLC=1ft)	2070 (SLC=3ft)
Myakka River Elementary School	1	High	High	High
Charlotte High School	5	High	High	High
Baker Center Head Start	1	High	High	High
Lemon Bay High School	3	High	High	High
Punta Gorda Middle School*	1	Medium	High	High
Life Care Center Of Punta Gorda	1	Medium	High	High
Justice Center	1	Medium	High	High
Meadow Park Elementary School	4	Medium	High	High
Neil Armstrong Elementary School	1	Medium	High	High
Verandas Of Punta Gorda*	2	Low	Medium	Medium
Peace River Elementary School*	13	Low	High	High
Charlotte Harbor Event & Conf. Center	1	Low	Low	Medium
Punta Gorda Post Office	1	Low	Low	Low
Charlotte Behavioral Health Care*	1	Low	Low	Low
Port Charlotte Artificial Kidney Center	1	Low	Low	High
Brookdale Rotonda	1		Low	Medium
Sallie Jones Elementary School*	2		High	High
Punta Gorda Police Station 1	2			Low
CCU Eastport Treatment Plant*	8			Low
Charlotte Community Mental Health Services	1			Low
South County Annex	1			Medium
South County Regional Park	2			Low
Deep Creek Elementary School*	1		High	High
Fawcett Memorial Hospital	6		Low	Low
Family Christian Academy*	7			Medium
Family Services*	2			Medium
Charlotte Sports Park Stadium Clubhouse	1			Medium
Charlotte County Public Works- Florida Street*	5			Low

[2] Due to limitations in data availability, a first-floor elevation of 0.5 ft is assumed for facilities where first-floor elevation data are not available. This assumption will be refined once the appropriate elevation data become available. Facilities for which this assumption has been applied to one or more buildings are denoted by an asterisk (*).

[3] The facilities are named based off different sources of data used at the beginning of the project. For example, Police Station 1 is in 3 different data sources as different names, including "PG STA 1" "POLICE" "PG Station 1/Rescue 32" and "Punta Gorda Police Dept HQ". "Police Station 1" was used in this assessment. Data sources are noted in **Appendix D:** Hazard and Asset Data.

Prioritization Facility[3]	Number of Buildings Assessed	Today	2040 (SLC=1ft)	2070 (SLC=3ft)
Florida Southwestern State College - Charlotte Campus	9			High
Medical Examiner*	2			High
Charlotte County Community Development	1			Medium
County Administration*	1			Medium
Port Charlotte High School*	8			Medium
Port Charlotte Library	1			Low
Advent Port Charlotte	1			Low
Economic Development	1			Low
Port Charlotte Middle School	1			Low
St Charles School*	5			Low
Charlotte County Fleet Management	1			Low
East Elementary School*	4			Low
Charlotte Technical College*	22			Low

Findings in Table 4 and Appendix F Adaptation Focus Area and Recommendations are derived using different analytical approaches. Appendix F Adaptation Focus Area and Recommendations is based on single-building–level results and presented by the Adaptation Focus Area, whereas Table 4 aggregates individual building results to assess risk at the full facility level and reports findings at a countywide scale. As a public-facing document, the VA summarizes individual structure-level risks as facility-level outcomes to communicate risks clearly and effectively. Detailed single-building analysis results are not presented in the VA, but are documented in Appendix F Adaptation Focus Area and Recommendations for reference.

The prioritization list is not necessarily intended to be addressed in order. It is instead presented as a recognized policy need, to be woven into the regular processes the county will be undertaken through the business of government, to search for funding to mitigate known risks that may be targeted to different facility types, or to influence capital planning in the coming decades for facilities, or to advocate for changing county policies and practices that seek to directly address those risks identified through this analysis, as an important additional element/consideration to carry forward in parallel with others focused on maintaining Charlotte County as a viable community and wonderful place to live and work.

Advancing Towards Strategic Decision-Making

County Adaptation Focus Areas

"Focus Areas" is recommended as part of a holistic approach to resilience planning. These are specific zones within a jurisdiction where mitigation actions are necessary, based on risks highlighted in the vulnerability assessment. In Charlotte County, much of the region faces possible future flood threats. To better target efforts, the county has designated three focus areas: south, mid, and west, which are illustrated in Figure 21. These zones help collate risk issues, summarize vulnerability findings, and guide the development of targeted implementation strategies throughout the document.

Figure 21 County Adaptation Focus Areas

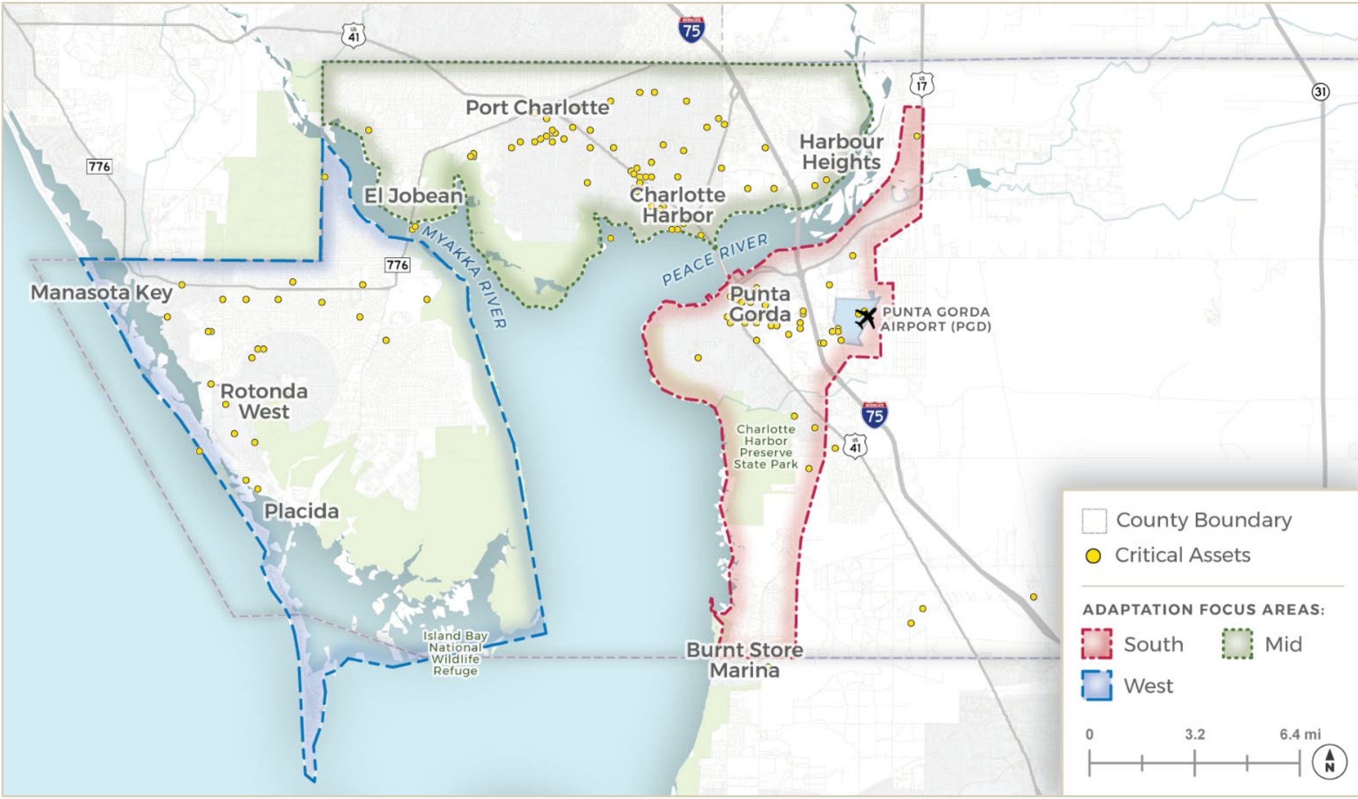


Table 5, Table 6, and Table 7 summarize the critical infrastructure, critical community and emergency facilities, and transportation and natural resources present in each Adaptation Focus Area.

Table 5 Summary of the Critical Infrastructure Buildings Present in Each Adaptation Focus Area

Critical Infrastructure	Total Quantity	South	Mid	West	Not Included
Wastewater Treatment Facilities	55	17	8	30	0
Solid And Hazardous Waste Facilities	9	0	2	1	6
Communications Facilities	6	2	3	1	0
Pump Stations	18	0	6	12	0
Lift Stations	2	0	2	0	0
Total	90	19	21	44	6

Table 6 Summary of the Critical Community and Emergency Facilities Buildings Present in Each Adaptation Focus Area

Critical Community and Emergency Facilities	Total Quantity	South	Mid	West	Not Included
Fire Stations	23	7	7	8	1
Correctional Facilities	28	6	0	0	22

Critical Community and Emergency Facilities	Total Quantity	South	Mid	West	Not Included
Local Government Facilities	22	11	9	2	0
Logistical Staging Areas	1	1	0	0	0
Health Care Facilities	21	5	13	3	0
Schools	108	15	74	19	0
Logistical Staging Areas, Emergency Operation Centers, Correctional Facilities	1	1	0	0	0
Emergency Medical Service Facilities	2	1	1	0	0
Affordable Public Housing	7	2	5	0	0
Law Enforcement Facilities, Airports	1	1	0	0	0
Law Enforcement Facilities	3	2	1	0	0
Airports, Law Enforcement Facilities	1	1	0	0	0
Colleges And Universities	9	9	0	0	0
Airports, Fire Stations	1	1	0	0	0
Community Centers	11	1	8	2	0
Law Enforcement Facilities, Fire Stations	1	1	0	0	0
Disaster Recovery Centers, Community Centers	2	0	1	1	0
Hospitals	8	1	7	0	0
Schools, Risk Shelter Inventory	6	0	6	0	0
Total	256	66	132	35	23

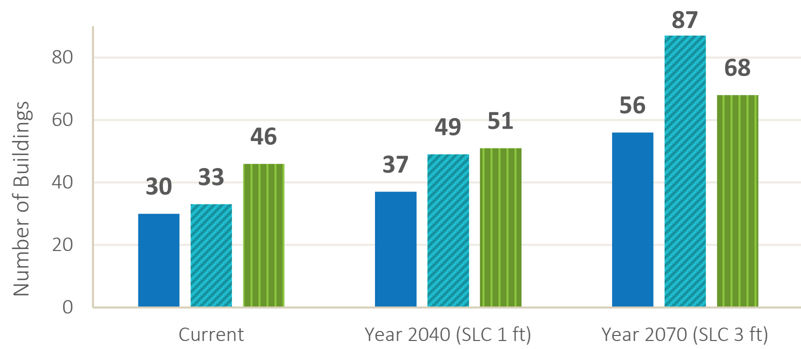
Table 7 Summary of Transportation and Natural Resources Present in Each Adaptation Focus Area

Adaptation Focus Area	Total Miles		Count			Total Acres
	Major Roads	Rail	Standalone Lift Station	Bridges/Culverts	Historic Bridges	Parks
South	131	16	54	26	3	30,078
Mid	177	0	194	68	0	375
West	106	0	104	56	6	578
Outside	68	9	10	2	0	28

Overall, the distribution of infrastructure and community assets across the Adaptation Focus Areas reflects the distinct roles and priorities of each region. The Mid area functions as the primary transportation and utility center, characterized by dense development and a high concentration of social services. The South area includes a greater number of parks, rail assets, and resilient emergency facilities, reflecting its exposure to coastal risks. The West area demonstrates a balance between community-serving facilities and historic preservation. Areas outside the

Adaptation Focus Areas contain fewer assets overall, consistent with lower population density and operational demand. These spatial differences provide important context for emergency response planning and future development decisions. The number of impacted buildings of each Adaptation Action Area across the time horizon is summarized in Figure 22.

Figure 22 The Number of Impacted Buildings in each Adaptation Action Area



Recommended Actions

Table 8 and Table 9 summarize recommended actions the County can take to enhance the County's resilience in the future, based on the findings outlined in the analysis above, a review of similar actions being taken by other agencies in Florida, and in coordination/collaboration with county stakeholder group members. The list of actions is intended to advance the county from its current position to one that is more robust in responding to changing conditions and heightened risks.

Table 8 Recommended Countywide Planning and Policy to Increase Resilience of Charlotte County

Category/Asset	Recommended Actions
Risk Assessment and Data Integration	○ Expand the analysis completed by this study to include private property, social, and economic concerns to develop a full inventory of risk from collective stressors. ○ Integrate climate hazard projections (e.g., sea level change, extreme rainfall, and storm surge) into future land-use, infrastructure investment decisions, and capital improvement programs.
Floodplain Management and Policy Development	○ Consider strengthening the existing Charlotte County floodplain ordinance by increasing freeboard requirements above the 100-year flood elevation (potentially to the 500-year flood) to further reduce future flood risks. ○ Establish a minimal roadway level of service or accessibility standards for transportation infrastructure located in flood-prone areas to ensure continued access during storm surge events. ○ Encourage elevation or floodproofing retrofits for existing structures located within high-risk flood zones identified in the vulnerability assessment.
Nature-Based Solutions and Risk Reduction Strategies	○ Promote nature-based solutions, such as wetlands restoration and green stormwater infrastructure, to improve flood storage and water quality. ○ Evaluate voluntary property acquisition and demolition programs for repetitive flood loss areas. These programs purchase high-risk properties, remove structures, and convert the land into open space or natural buffers, which can permanently reduce flood risks. ○ Undertake an effort to define county policies on managed retreat from future inundated areas.
Funding and Implementation Coordination	○ Complete a detailed scan of the funding sources that may be available to Charlotte County to address resilience concerns outlined in this assessment. ○ Develop grant/formula funding requests for various eligible sources (IIJA, FEMA, FDEP, etc.). ○ Strengthen coordination between county departments to integrate resilience considerations into transportation, utilities, and capital improvement planning.
Public Awareness and Community Engagement	○ Conduct an educational and public information campaign to increase stakeholder awareness of the concerns, and the planned county actions to address them.

Table 9 Recommended Actions to Increase Resilience of Charlotte County

Category	Recommended Actions
Wastewater Treatment Facility	◦ Evaluate the elevation of critical wastewater treatment equipment and consider elevating or floodproofing vulnerable components. ◦ Improve redundancy in power supply systems, such as installing backup generators and ensuring adequate fuel storage for extended outages. ◦ Upgrade drainage and stormwater management around wastewater facilities to prevent onsite flooding during extreme rainfall events. ◦ Develop emergency response procedures to maintain wastewater service continuity during hurricanes and major storm events. ◦ Consider alternative or supplemental power technologies for lift stations, such as solar photovoltaic systems with battery storage, to provide additional power resilience during grid outages. ◦ Evaluate the feasibility of microgrid systems or hybrid energy systems combining solar power, battery storage, and backup generators to improve redundancy and reliability for critical wastewater infrastructure.
Emergency Response Facilities (Fire Stations)	◦ Elevate critical building systems, including electrical panels, communications equipment, and generators above projected flood levels. ◦ Install deployable flood barriers or floodproof doors to reduce water intrusion. ◦ Elevate emergency vehicles or relocate vehicle storage areas where flooding risk is significant. ◦ Ensure backup power and communication systems remain functional during prolonged flood events.
Healthcare Facilities and Hospitals	◦ Elevate or floodproof mechanical, electrical, and medical support systems that are vulnerable to storm surge flooding. ◦ Ensure backup power systems and fuel storage are protected from floodwater. ◦ Protect building access points and entrances using flood barriers or elevation improvements. ◦ Develop contingency plans to maintain critical medical services during flood disruptions.
Schools And Shelter Facilities	◦ Elevate critical assets such as electrical systems, HVAC equipment, and generators above projected flood levels. ◦ Improve stormwater drainage systems around school campuses to reduce localized flooding during surge events. ◦ Retrofit selected schools to function as flood-resilient emergency shelters. ◦ Protect building entrances and utility rooms using flood barriers or floodproofing measures.
Community Facilities	◦ Elevate or floodproof critical mechanical and electrical equipment within facilities. ◦ Improve site drainage and install localized flood protection where feasible. ◦ Retrofit community facilities to support emergency operations during storm surge events
Local Government and Administrative Facilities	◦ Protect critical information technology infrastructure from flood exposure. ◦ Elevate electrical systems and communications equipment above flood-prone levels. ◦ Ensure backup power systems are protected from storm surge flooding.
Parks	◦ Revise and enhance the Resiliency Master Plan to address evolving needs and resilience strategies. ◦ Establish living shorelines on waterfront parks to improve natural defenses and adaptation. ◦ Plant native vegetation that can withstand high storm surge events, maintain shoreline stabilization and encourage wildlife utilization. ◦ Develop additional amenities throughout sites to provide comfortable spaces for visitors to find relief from the heat. ◦ Modernize/enhance stormwater systems using resilient design strategies that incorporate green infrastructure. This may include upstream detention basins and bioretention areas to reduce flood risk, increase infiltration, improve water quality, and strengthen long term system adaptability.
Transportation Infrastructure	◦ Incorporate green infrastructure strategies such as bioswales, permeable surfaces, and natural drainage features near bridge approaches and transportation corridors to reduce localized flooding during storm surge events. ◦ Integrate flood-resilient design considerations into transportation infrastructure upgrades, including bridge retrofits and roadway improvements located in surge-prone areas.

Category	Recommended Actions
Homeowner Flood Resilience Actions	○ Encourage property-level flood mitigation measures such as elevating utilities, installing flood barriers, or floodproofing critical building components. ○ Develop partnerships with community organizations to promote residential resilience and access to mitigation funding programs. ○ Provide education and outreach programs to inform homeowners about flood risk and available mitigation strategies.

Conclusion and Next Steps

This study provides Charlotte County with preliminary data to prioritize complex resiliency challenges across planning, programming, and stakeholder needs. By considering sea level change and storm surge impacts in decision-making, officials can start to create strategic policies and invest proactively, supporting long-term infrastructure, community, and economic stability. This framework enables the development of targeted mitigation and adaptation strategies to address rising flood risks.

Supporting Strategic Planning, Investment, and Shared Responsibility

With these details, the County possesses the foundational components necessary to implement an advanced decision-support system. This system can assist the County in:

- Estimating costs to the County of sea level change and storm surge.
- Informing effective capital investments.

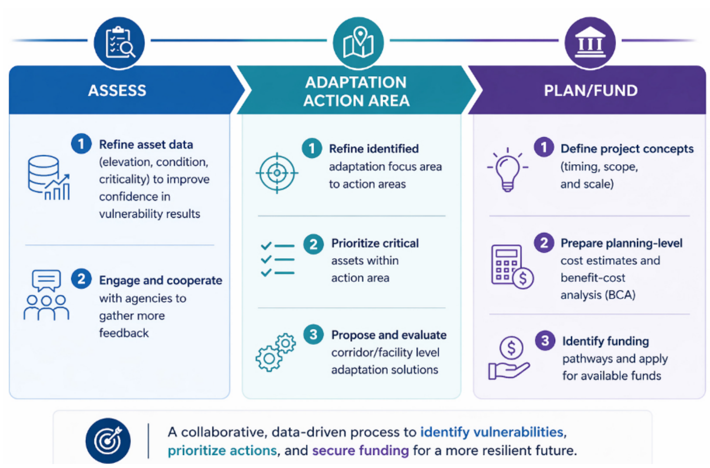
The data provided to Charlotte County from this assessment supplies the critical information required to support decision-making. It also highlights the shared responsibility of landowners, developers, businesses, residents, and government agencies who provide services in areas now identified as being at risk.

Sea level change and storm surge concerns are no longer uncertain possibilities; they must now be integrated into both public and private decision-making strategies. By recognizing these risks, Charlotte County can take proactive steps to ensure resilient communities and sustained infrastructure for the future.

Next Steps

It is important to note that this assessment represents an initial, preliminary study. The next phase will involve a more comprehensive and in-depth investigation to further refine findings and recommendations, including the exploration of other effects on the county other than to its critical assets (economy, community, etc.). This continued effort will provide Charlotte County with even more detailed insights to guide future planning and resiliency actions. The specific series of actions to take next to advance the program and to adhere to state guidance should include items listed in Figure 23.

Figure 23 Recommended Next Steps Based on this Study



Appendices

Appendix A: Compliance with FDEP Requirements

The development of the VA fulfills the criteria established by the FDEP for conducting these assessments. The subsequent sections present the details of the hazard and asset data collected and utilized to conduct this study. At the same time, the FDEP checklist is attached to list the key elements/requirements for compliance.

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
RESILIENT FLORIDA GRANT PROGRAM
VULNERABILITY ASSESSMENT COMPLIANCE CHECKLIST CERTIFICATION

Vulnerability Assessments using Statutory Requirements Effective through June 30, 2024

Exhibit I

Required for all planning grant agreements that include a Comprehensive Vulnerability Assessment.

DEP Agreement Number: ________________________

Project Title: Charlotte County Vulnerability Assessment

Grantee: Coastal & Heartland National Estuary Partnership

In accordance with subsection 380.093(3), F.S., for a Vulnerability Assessment initiated through June 30, 2024, the following components, scenarios, data, and information are required for a comprehensive Vulnerability Assessment (VA). The checklist must be completed and submitted with the final VA Report deliverable, pursuant to Attachment 3, Grant Work Plan. When filling out the checklist, please provide the corresponding page number in the VA or, if the item is not applicable, an explanation as to why it is not applicable. The Grantee must abide by the Resilient Florida Program's GIS Data Standards found on the Resilient Florida Program webpage:
https://floridadep.gov/rcp/resilient-florida-program/documents/resilient-florida-program-gis-data-standards

Resilient Florida – Program Requirements

Item ID	Check if Included	Item Description	Page Reference in VA Report (if applicable)
A	☑	The Final VA Report includes the Department's logo and funding source language, pursuant to Attachment 6 of the grant agreement.	Cover page with Department's logo, funding sources in page 5

Part 1 – Subparagraph 380.093(3)(c)2., F.S.

Item ID	Check if Included	Item Description	Page Reference in VA Report (if applicable)
B	☑	Final VA Report that provides details on the results and conclusions, including illustrations via maps and tables.	pages 6 -26
All electronic mapping data used to illustrate flooding and sea level rise impacts that are identified in the VA must be provided in the format consistent with the Department's GIS Data Standards and include the following three (3) items:			
C	☑	Geospatial data in an electronic file format.	
D	☑	GIS metadata.	
E	☑	An inventory of critical assets for each jurisdiction, including regionally significant assets, that are, impacted by flooding and sea level rise. The list must be prioritized by area or immediate need and must identify which flood scenario(s) impacts each asset. Critical assets and regionally significant assets are as defined in subsection 380.093(2), F.S.	pages 19-20, and appendix F

Part 2 – Subparagraphs 380.093(3)(d)1. and 380.093(3)(d)2., F.S.

Item ID	Check if Included	Item Description	Page Reference in VA Report (if applicable)
F	☑	Peril of Flood Comprehensive Plan amendments developed that address paragraph 163.3178(2)(f), F.S. *(as applicable)* ☐ Noncoastal community/Peril of Flood not required ☑ Already in compliance	
G	☑	Depth of tidal flooding, including future high tide flooding. The threshold for tidal flooding is 2 feet above mean higher high water. *(as applicable)*	Appendix E
	G.1	☐Analysis geographically displays the number of tidal flood days expected for each scenario and planning horizon. *(to the extent practicable)*	
H	☑	Depth of current and future storm surge flooding using publicly available NOAA or FEMA storm surge data. *(check one, as applicable)* ☑ NOAA data ☐ FEMA data	Appendix D
	H.1	☑ Initial storm surge event equals or exceeds current 100-year flood event. *(as applicable)*	Appendix D
	H.2	☐ Higher frequency storm analyzed for exposure of a critical asset. *(optional, but must provide additional detail if included)*	
I	☐	Rainfall-induced flooding was considered using spatiotemporal analysis or existing hydrologic and hydraulic modeling results. *(to the extent practicable but **required if Item F is noncoastal**)*	
	I.1	☐ Future boundary conditions have been modified to consider sea level rise and high tide conditions. For rainfall-induced flood modeling, the model inputs for the 2040/2070 rainfall scenarios should use projected sea level rise/high tide conditions. *(as applicable)*	
	I.2	☐ Depth of rainfall-induced flooding for 100-year storm and 500-year storm event. ***(required if Item F is noncoastal)***	
	I.3	☐ If Water Management District data is not available, data from an appropriate federal agency was used. Agency used:	
J	☐	Compound flooding or the combination of tidal, storm surge, and rainfall-induced flooding. *(to the extent practicable)*	

Part 3 – Subparagraph 380.093(3)(d)3., F.S.

Item ID	Check if Included	Item Description	Page Reference in VA Report (if applicable)
K	☑	All analyses in North American Vertical Datum of 1988.	
L	☑	Includes at least two local sea level rise scenarios, which must include the 2017 NOAA intermediate-low and intermediate-high sea level rise projections.	page 7
M	☑	Includes at least two planning horizons, which must include years 2040 and 2070.	page 7, page 19
N	☑	Uses local sea level data that has been interpolated between the two closest NOAA tide gauges.	Appendix D
	N.1	☐ Local, publicly available, sea level data was taken from one of the two closest NOAA tide gauges. Data may be taken from one such gauge if the gauge has a higher mean sea level.	
	N.2	☐ An alternate tide gauge with appropriate rationale and Department approval. *(if checked, provide Department approval)*	

Identify all counties and municipalities that are included in this Vulnerability Assessment:

Charlotte County	Coastal & Heartland National Estuary Partnership

I certify that, to the Grantee's knowledge, all information contained in this completed Vulnerability Assessment Compliance Checklist is true and accurate as of the date of the signature below.

____

Grantee's Grant Manager Signature

____

Print Name

____

Date

November 20, 2024

Mr. Eddy Bouza, Planning and Policy Administrator
Office of Resilience and Coastal Protection
Florida Department of Environmental Protection
2600 Blair Stone Road MS 235
Tallahassee, FL 32399-2400

RE: Time Sensitive Request Relating to Charlotte County Comprehensive Vulnerability Assessment

Dear Mr. Bouza,

Charlotte County has received funding from the Coastal & Heartland National Estuary Partnership (CHNEP) to conduct a Comprehensive Vulnerability Assessment (VA), for which the modeling component was previously completed and are thus currently in the data review and narrative development phase. We are writing to assure the completed VA is compliant with the requirements established by the Florida DEP, so that the County will be eligible to receive additional funding through programs administered by the agency. The County has experienced significant damage from recent storms, and is home to several low-lying communities, so the need is pressing. The County is working diligently to align this work so that it can access the needed funds in the earliest time possible.

The County recognizes that, since the passage of 380.093, F.S., FDEP has provided additional guidance and clarity on VA requirements. However, most of those were made available to local governments after the County had already initiated modeling activities for our VA. The County hired the University of Florida (UF) in 2021 to develop surge modeling for the region, with the intent to develop the flood raster data needed to define sea level rise (SLR) inundation and create storm surge data to inform the development of policies and support decision-making. This was an important and proactive step taken by the County to make progress on its resilience efforts. At that time, the FDEP standard was to apply the NOAA 2017 SLR scenarios for analysis (Int Low and Int High). The model prepared from these assumptions – the ACUNE model – has been leveraged for use in multiple County efforts and continues to act as a resource.

The ACUNE model is a hydrodynamic model, representing future flooding by applying the same basic methodology employed by FEMA in their studies, but incorporates a change to the ocean water levels (an increase) to reflect future conditions. The intent of this work was to create a needed assessment capability in that neither the Federal Emergency Management Agency (FEMA) nor the National Oceanic and Atmospheric Administration (NOAA) provided future flooding levels in a probabilistic manner. The County concluded that it was important to have data generated based on a good scientific basis.

With that data, the County was ready to advance to the VA phase, and utilized the funding administered by CHNEP to procure a consultant team for the work. Based on conversations with FDEP leadership in 2023 where it was conveyed "we do not want communities to be required to redo analyses, if what they have completed will suffice for the purposes of completing the DEP mission of developing a statewide Flooding and Sea Level Rise Data Set and Assessment", we began procurement with the current ACUNE model with the FDEP work scope for VA assessments that were in effect at that time. The consultant was awarded the contract in the middle of this year and the contract was negotiated and finalized 8/1/24. Outside of using the preexisting ACUNE and its associated parameters, the work scope provided by FDEP was the template used to develop the work scope and budget for the work.

Since this work was initiated, FDEP has issued updated guidelines for completing VAs, which are reflected in new guidance and an updated process checklist. Given the County initiated its efforts under previous guidance and applied the higher SLR values contained in the NOAA scenarios applicable at that time, the outcome of this work will be a more conservative analysis, ensuring the assessment meets the overall vision of the FDEP in presenting information to County stakeholders on future conditions that can/should be used in the development of subsequent planning documents.

Therefore, we respectfully request FDEP provide us confirmation (in writing by December 6th) that (1) Charlotte County is grandfathered under previous VA requirements given the initiation date for the County's VA work including the development of ACUNE, and that (2) FDEP will accept the document prepared under those parameters as being compliant (assuming all of the then guidance requirements are met). This will allow us to proceed with our Comprehensive Vulnerability Assessment in a timely manner, so the County will be in a position to apply for funding to update the VA and/or obtain implementation funding in future VA phases. We appreciate your response and your consideration of our request.

Sincerely

Brandon Moody
Water Quality and Resiliency Manager
Charlotte County, Florida

Jennifer Hecker
Executive Director
Coastal & Heartland National Estuary Partnership

Cc Alex Reed, FDEP

Appendix B: Stakeholder and Public Engagement

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CHARLOTTE COUNTY COMPREHENSIVE VULNERABILITY ASSESSMENT

CLIENT:

CHARLOTTE COUNTY, FL

FUNDED BY:

COASTAL & HEARTLAND NATIONAL ESTUARY PARTNERSHIP (CHNEP)

APPENDIX B: STAKEHOLDER AND PUBLIC ENGAGEMENT

DATE: JUNE 2026

WSP USA

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OVERVIEW

As part of the Charlotte County Comprehensive Vulnerability Assessment, stakeholder and public engagement activities were conducted to inform the project's development and ensure that community and agency perspectives were reflected in the assessment process. This appendix summarizes the outreach completed to date, including two public meetings and BOCC (Board of Charlotte County) meeting with attendee participation, survey responses, questions raised by participants, and key discussion outcomes. Together, these activities helped document local flooding experiences, identify community priorities, and provide input to support the assessment's findings, asset prioritization, and future resilience planning efforts.

PUBLIC MEETING #1 SUMMARY - NOVEMBER 6TH, 2024

INTRODUCTION

A public meeting was held on November 6th, 2024, in Punta Gorda, Florida, to initiate the public engagement element of the Charlotte County Vulnerability Assessment (VA). The selection of the venue and the timing of the event contributed to public interest due to the fact that county residents recently experienced significant property damage during Hurricane Helene and Hurricane Milton, with debris still present in the front yards of community residences.

The purpose of the Public Meeting was to gather public input on project goals and direction at the beginning of the project. The goals of the meeting were to (1) provide community members with an overview of the project work scope, (2) allow participants to share their insights and concerns, and (3) identify important community assets from their perspective that need protection.

An initial public town hall informational meeting was held to provide a presentation that reviews the goals of the project, where the public can review draft materials, and how the public can provide input (including assisting with identifying available data and resources for use in the project).

The purpose of this initial meeting is to allow the public to provide input during the initial data collection stages, preferred methodologies, and data for analyzing potential sea level rise impacts and/or flooding, guiding factors to consider, and critical assets important to the community. WSP will be responsible for preparing all media notifications, meeting invitations, meeting materials, presentations, and graphics utilized during the meeting, based on prior approval from the local government when necessary.

The meeting began with a presentation on the project purpose, expected outcomes, schedule of activities and key benchmarks, and the public input needs; an explanation of the roles of the Coastal & Heartland National Estuary Partnership (CHNEP) and the County in the project; and a description of the next steps in conducting the work. General information was presented on potential increases in sea levels and flooding impacts in the county. The attendees were invited to participate in a real-time online survey (via the Mentimeter platform) of multiple questions aimed at gathering their input on recent events and their perspectives on important county infrastructure. The intent of this information is to guide on the process for determining prioritization and adaptation strategies for regions of the county most vulnerable to storm and tidal surge flooding The public input will be summarized, categorized, and will help guide future work in the preparation of the final Vulnerability Assessment document, which is being developed for the county.

MEETING PARTICIPANTS FROM THE VA DELIVERY TEAM

Table 1: Attendee List for the First Public Meeting

Name	Organization
Brandon Moody	Charlotte County
Jennifer Hecker	CHNEP
Nicole Iadevaia	CHNEP
Mollie Holland	Charlotte County

Greg Corning	WSP
Michael Flood	WSP

FLOODING EXPERIENCES AND ASSET PRIORITIZATION

In real-time at the public meeting and after the meeting 38 participants submitted responses regarding information on the backgrounds of the participants, their experiences with flooding from recent storms, and thoughts on resilience and this process.   Examples of the types of information collected through the survey includes the content below, which highlights anecdotal information on recent events, the depth of water observed, the cause of flooding, and the facilities the participants felt most important to protect. The questions posed were developed to align with the basic elements of the FDEP vulnerability assessment framework.

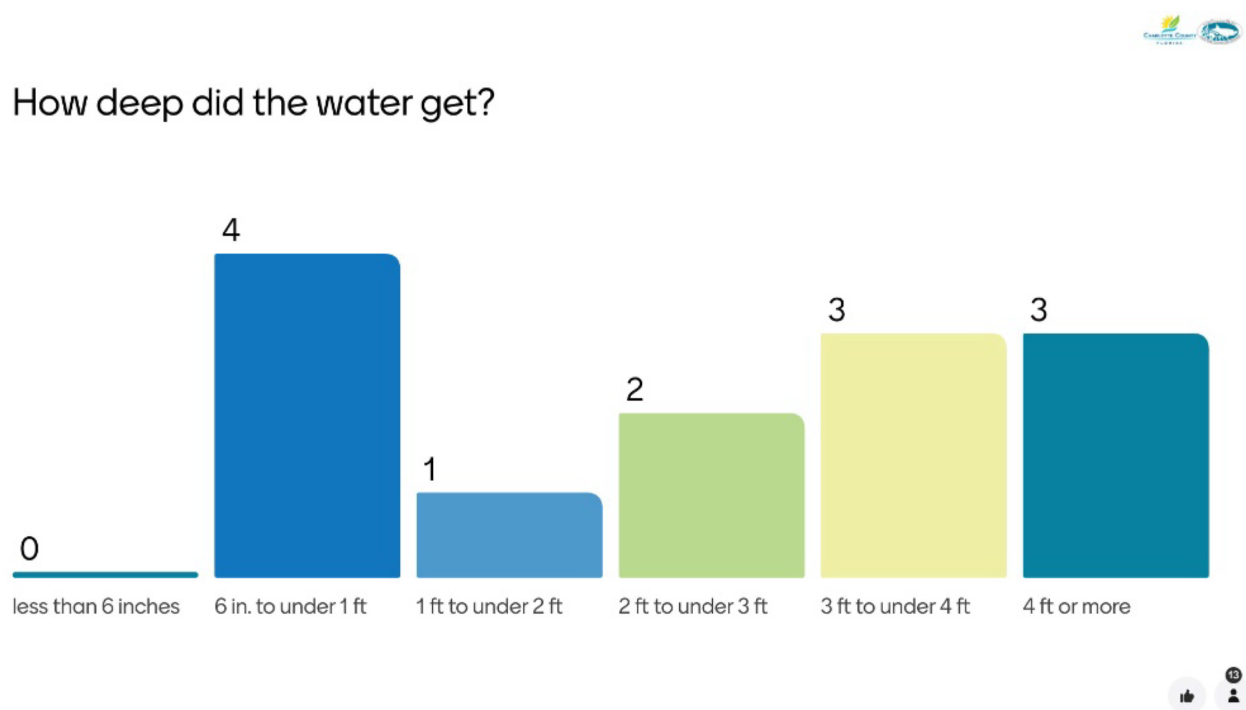

Figure 1: Survey Response - Depth of Flooding Observed

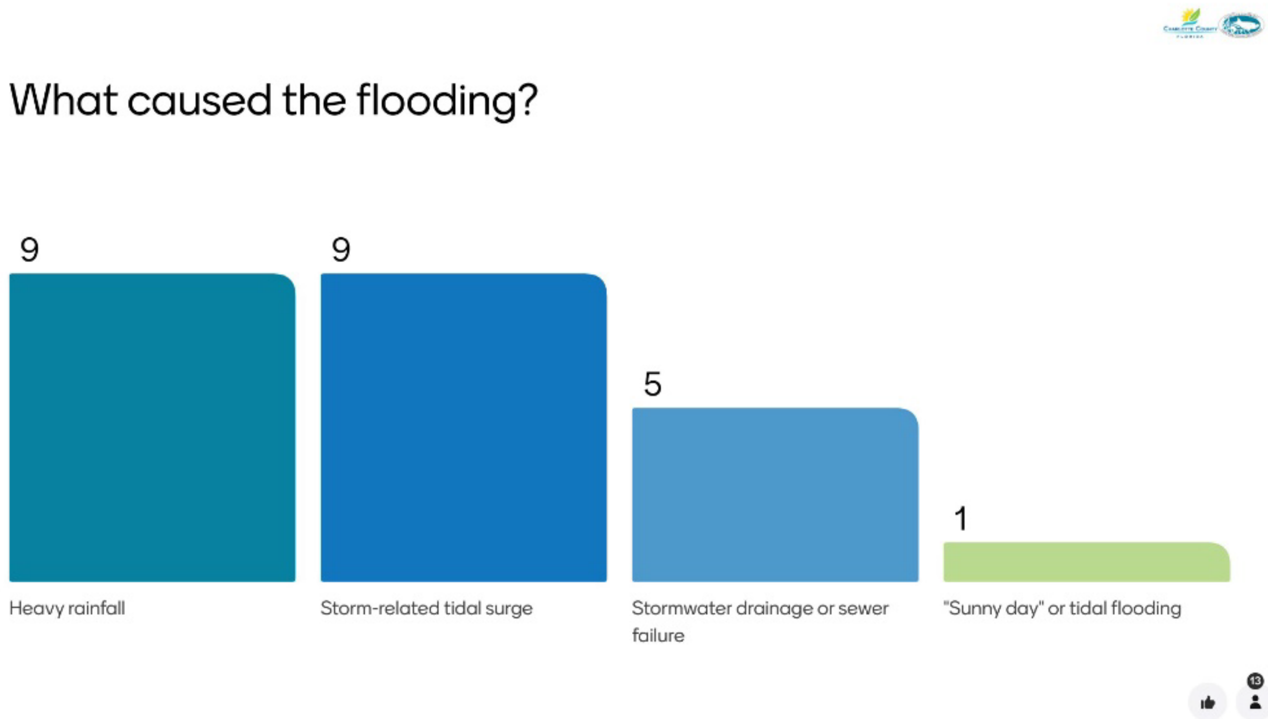

Figure 2: Cause of Observed Flooding

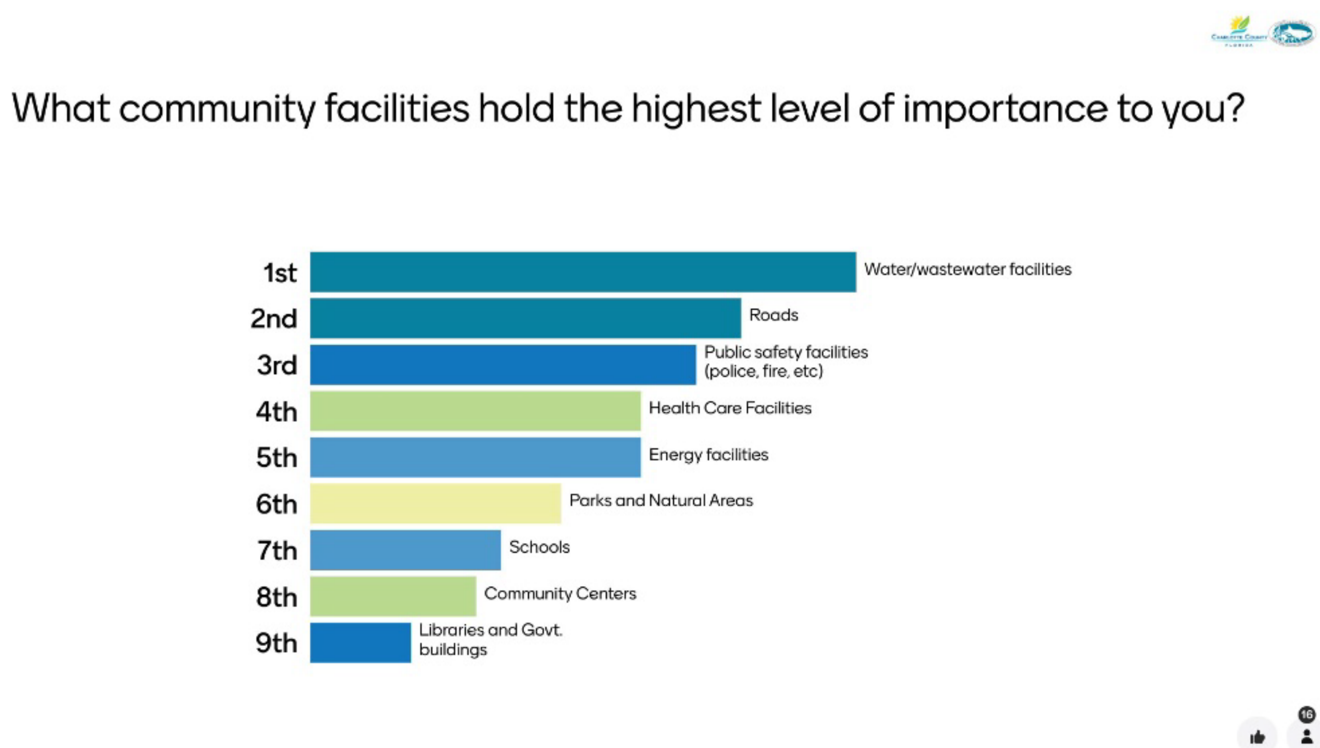

Figure 3: Facility Importance Measures Noted

Most participants of the survey were from Punta Gorda and Port Charlotte, with a few from Harbor Heights, North Port, and Englewood. All but one attendee were permanent residents, with most having lived in the county for a minimum of 5 years, while others had been residents for less than a year.

With respect to flooding experiences, most of the respondents reported flooding at their home or at a place of business. Out of 38 participants, 26 experienced flooded yards or parking lots, 27 faced flooded roads, 23 encountered flooded sidewalks or curbs, and 11 dealt with flooded buildings. The severity of the flooding varied, with half of the reported incidents being less than a foot of depth, while 11 participants reported flooding of 4 feet or more. The primary causes of flooding were identified as heavy rainfall and storm-related tidal surge, with stormwater drainage or sewer line failures causing 7 incidents, while "sunny day" or tidal flooding was reported only 5 times.

The time to restore asset/facility service varied, with 15 people reporting access was restored in less than a week, and 9 stating it took longer than a month. In terms of overall impact from the flooding, only 6 people reported experiencing no impact, 15 reported dealing with closed businesses or schools, 16 faced driving difficulties, and 15 dealt with property damage. When asked about the importance of resilience planning, respondents overwhelmingly indicated that it is either critical or extremely important, especially considering the recent storms in the area and the wide-ranging reported damage. These results underscore the varied and significant impacts of flooding observed in the community, highlighting the urgent need for action to protect infrastructure and to implement effective flood management strategies. The need to complete the VA and move into the hazard mitigation phase was clearly supported by the participants.

The participants were asked to rank the importance of various categories of community infrastructure. This information will be used in later prioritization activities that will occur in the recommendations phase of the project. The resulting infrastructure rankings were as follows:

CRITICAL ASSET HIERARCHY FOR IMPORTANCE

Table 2: Ranked critical assets by importance from the survey results.

Rank	Asset	Score
1	Water/Wastewater Facilities	254
2	Health Care Facilities	187
3	Public Safety Facilities	186
4	Energy Facilities	173
5	Roads	159
6	Schools	99
7	Parks and Natural Areas	98
8	Libraries and Government Buildings	74
9	Community Centers	70

The rankings in Table 2 Ranked critical assets by importance from the survey results. were determined using a weighted scoring system that accounted for both the number of votes and their assigned importance. Each ranking position was assigned a weight, with 1st place receiving 9 points, 2nd place 8 points, down to 9th place receiving 1 point. The number of votes in each position was multiplied by its respective weight, and the total score for each category was calculated by summing these weighted values. This method ensures that higher-ranked votes contribute more to the final score, reflecting the overall prioritization of infrastructure needs.

Participants submitted some questions as part of the Menti survey; some were addressed during the meeting. The team has assembled the series of questions posed below and has prepared responses for internal review.

QUESTIONS

Table 3: Survey Questions

Question	Response
How can we better engage the public in addressing the challenges of resilience and responses to climate change & climate related challenges and disasters?	The county and CHNEP will be working to engage various stakeholders through outreach that follows regular methods for other county processes, including posting of notices on the web site, and outreach to related community groups. The project will have three meetings where the public will be provided with information on the project and will be provided with an opportunity to comment on the project findings and recommendations.
Where do we find information on plans that are already in place (approved, funded)? Where do we find information on the vision that is driving the decisions leaders make?	The county has a series of related ongoing efforts and information can be found on the county website. The vision for county activities can be found in at the county One Charlotte, One Water Page for other efforts. County leadership will be engaged on this project and will be providing their input on the outcomes of the work, and the actions to undertake to implement a long-term action plan to enhance resilience in the county. More information on the FDEP program, the Resilient Florida program, which is an opportunity for the county on implementation can be found here.
Yes, it would be good to understand what options and costs would be involved. Why hasn't anything been done especially in the historic and downtown areas?	A determination of the relative cost of mitigation strategies will be identified. The county has an established hazard mitigation plan that identifies some preliminary actions and is working to identify others. Like all capital projects for a jurisdiction, the ability to implement projects is dependent on the availability of funding. For more information on planning efforts in Punta Gorda specially, you can find the links to that effort here.
How can we better engage the public in addressing the challenges of resilience and response to climate change & climate related challenges and disasters?	Repeat with Q1

Question	Response
How long will this planning process take?	The project is scheduled to be complete in mid-late 2026 at which point the county will have better information in hand to support further action.
Will there be more meetings like this to gather data?	The project has three public meetings scheduled. There will be one to review draft recommendations and get input, then one to review the pre-final documents and ensure they address stakeholder concerns to the extent practical for a study like this.
Are there any plans for creating or recommending more preservation of natural coastal areas?	Preservation of natural areas is an important activity – to preserve these areas as a community resource. Natural areas also serve as an important protective buffer for storm events and can limit more significant damage by moderating waves from storms.
Are there any initiates for the government to buy back land that is most vulnerable or will provide ecosystem services?	There are programs to buy at-risk properties and convert them back to natural lands. Here is some information on FEMA's Buy Back program, which is administered by the county with funding provided by FEMA.
While I wasn't personally impacted heavily, this community was. We were asked very general things. Downtown Punta Gorda was several FEET underwater. How is that being addressed by this study?	The county has a number of initiatives underway, as discussed, to address concerns – as does the City of Punta Gorda. This study is being conducted following a process defined and administered by FDEP which, when complete, makes the county eligible to request funds for infrastructure improvements So, this study is one step in what is recognized to be a larger need for fully defining needs across the county and identify steps for effective action.
Will a geographic map be developed That identifies areas that should not be developed?	This project will create geographic products that represent current and future flooding risks and identify whether county owned assets may be at risk. The identification of areas where development should be limited or restricted is not a part of this work.
Is there a line item for resiliency projects?	Not currently, no. The outcome of this work will be to identify projects that are recommended to address risks that are identified and compiled into a plan. The plan will be conceptual in nature and is intended to become a part of the county planning process at which funding and capital projects could be assessed.
how natural barriers and existing natural ecosystems being incorporated into this plane?	Natural systems will be identified in this plan and recommendations made on the types of hazard mitigation efforts could be recommended at the broad planning level.
What criteria will be used to rank the critical assets against the risks?	The plan will be assessing likelihood of flooding (through use of previous modeling efforts) and depths of flooding to determine the potential impacts to the assets being studied. So, the consequence to county assets for anticipated flooding will be used as the primary measure of ranking the critical assets.

Question	Response
A slide showed how many inches water will rise in the coming decades. We know that recent hurricanes have resulted in FEET of coastal flooding in the area. Isn't that the obvious area to address?	The study will address both changing chronic conditions (regular flooding exacerbated by SLR) and acute flooding (major storm events and the flooding caused by them). Both of these conditions, and the consideration of how they are anticipated to change will need to drive county actions moving forward.
Will this VA develop a list of projects and the cost estimate for adapting to the impacts of the risks?	The plan will recommend a series of recommended actions (protection, retreat, etc.) from the plan, organized into action areas (geographic areas where impacts may be clustered) to be carried forward as a recommendation. The development of an implementation strategy, comprised of specific projects and cost estimates would be developed in a later phase to inform county decision-making.
https://climatevulnerabilityindex.org/	Thank you for connecting us to this resource, we are aware of it.
How can we find a place to source mitigation possibilities once we do assessment, application and actually granted $	Step one in any similar assessment is the identification of concerns, followed by actions, funding requirements, phasing, etc. The source of funding tends to be a dynamic question – with state and federal sources typically identified as the desired funding source.
Where does the cost of engineering come from? Current funding?	Engineering design of recommended strategies is not covered under the current contracts, only conceptual planning. Engineering would be funded through later project phases.
How do I contribute to the map you mentioned?	County/CHNEP
If PG has been working on this since 2009, why have we only been approved a living shoreline? Shouldn't we have more due to our constant devastation	County/CHNEP
How do we get Florida officials (Senators, Representatives, Mayors, City and County Commissioners) to care about the environment, regenerative agriculture, and the Wildlife Corridor?	The state of Florida is currently budgeting near-unprecedented levels of funding towards water quality improvement, habitat conservation, and resiliency. Efforts like this Vulnerability Assessment is one of several steps by the county is taking to make sure we're positioned to compete for those funds. That said, we expect the long-term cost of needed improvements to exceed what we may be able to acquire from the state, so your voice is needed! Attend public workshops, reach out to your representatives (local and state), and make your voice heard on the policies that affect you, our county government, and the environment!
Why isn't infrastructure developed before subdivisions are developed?	New planned subdivisions are subject to current rules/regulations related to minimum construction elevation, stormwater management, and other measures designed to make them more resilient to impacts from tidal surge and flooding. In contrast, older communities which

Question	Response
	pre-date current regulations are among those at greatest risk of surge/flood events. Efforts like this and the Watershed Master Plan are designed to identify those pre-existing areas of concern and recommend strategies for mitigating that risk.
Where are the approved documents that show what the plans are for abatement or improvements?	For non-Utilities infrastructure, this effort (the Vulnerability Assessment) and the in-development Watershed Master Plan are designed to identify areas that are at greatest risk of flood impacts. These documents also include discussion of mitigation strategies for these at-risk regions. Utilities have multiple planning documents which guide construction of new infrastructure and enhancement of existing infrastructure. Plans which include discussion of resilience strategies are their Watershed Master Plan, and the Resiliency and Modernization Plan, currently in development.
Where are the analysis and documentation found to support this critical element of living in this environment?	County/CHNEP
I think you are not representing the Citizens' and Residents' best interest. You don't address Mosaic Fertilizer LLC Phosphate Mining Company Discharging Blended Acidic Chemical Laden Toxic Pollution.	This effort is concerned with water quantity/flood-related impacts to Charlotte County communities; water quality is not a specific focus of this project.
Impact of flooding on Mosaic Phosphate plant? Impact of that on Charlotte Harbor	County/CHNEP
Has any county received grant money from an assessment to date?	County/CHNEP
How important is stormwater treatment	County/CHNEP
Flow of funding? **Submit pics for high water survey?** **At PG CC mtg today they emphasized assessment must be done and then grant search and then this funding?**	County/CHNEP
Bayshore live oaks park? How long OOS?	County/CHNEP
Are you addressing all contributors of bad water quality? sources that are destroying our aquatic life and river water quality.	County/CHNEP
Is there a way for residence that didn't attend today to provide input?	County/CHNEP
will county commissioners take this Information and use this in decisions about commercial and residential development?	County
Is the county working on getting NOAA storm surge sensors?	County

Question	Response
Is there any consideration of highlighting education regarding climate vulnerabilities as a result of the data collected from the project to get more public engagement?	County/CHNEP
Can you suggest the disengaging of mines that may be destroying the aquifer?	County/CHNEP
Where is City of PG at in this process?	County/CHNEP
Is phosphate mining hurting our environment	County/CHNEP
How are these meetings announced to the public? Such as newspapers, news, et this meeting was found on Facebook?	County/CHNEP

MEETING OUTCOMES

The intended primary outcome of the meeting was to increase awareness of the project and to foster a better community understanding of the work being conducted. The meeting was fairly well attended and representatives from many county communities were in attendance so one could conclude that the first intended outcome was successful. The meeting materials will be made available to Charlotte County residents and businesses to provide them with a record of the material presented and an opportunity to share with their neighbors to help broaden general awareness of the project and associated processes.

The experiences recorded by the survey provided insight to how flooding has impacted residents across the county. Flooding in the area is a widespread issue noted as affecting various areas including Punta Gorda, Port Charlotte, Harbor Heights, North Port, and Englewood. It has impacted both long-time and more recent residents who have a vested interest in the community's resilience. Diverse flooding experiences were reported by those in attendance, with the primary cause of flooding being heavy rainfall and storm-related tidal surge. These experiences underscore the urgent need for robust flood management and resiliency planning to protect the community and its assets. This is good foundation for why the VA is needed, and how it will benefit the county when completed.

The information collected provided a community-level look into preferences for asset prioritization that would otherwise be missed solely from a desktop review. This will be helpful in developing later project materials, incorporating the community perspective on what is most consequential to them in terms of community service – which is the basic element of the prioritization framework. The asset prioritization exercise showed that of the four asset categories, "critical Infrastructure" held the highest importance among attendees, followed by "community and emergency assets." Interactive exercises to gather public input such as placing dots on maps where they observed flooding immediately after Ian or other large storm events could inform efforts to identify vulnerable county roads, building and other facilities.

PUBLIC MEETING #2 SUMMARY - MAY 21ST, 2026

INTRODUCTION

A public meeting was held on May 21, 2026, at Charlotte Harbor Event and Conference Center as part of the Charlotte County Vulnerability Assessment Project. This meeting built on prior outreach and was intended to share project progress, present key findings and recommendations, and gather public input to help inform the next phase of the work.

The purpose of Public Meeting #2 was to: (1) provide attendees with an update on the project and work completed to date, (2) summarize the major themes, findings, or draft recommendations presented in the meeting materials, (3) gather community feedback on the information presented, and (4) document questions, concerns, and suggestions raised by participants for consideration in the final project deliverables.

The meeting included a presentation by the project team and opportunities for discussion. Public input collected during the meeting is summarized in this report and will be used to refine the project recommendations, priorities, and next steps as applicable.

MEETING PARTICIPANTS

Table 4: Attendee List for Second Public Meeting

Name	Neighborhood or Organization
Brandon Moody	Charlotte County
Jennifer Hecker	CHNEP
Sarina Barnard	CHNEP
Mollie Holland	Charlotte County
Michael Flood	WSP
Kim Oo / Tony Spiotto	Harbor / Edgewater
Jeannie Calha	Harbor / Edgewater
Rhonda Harvey	Keep Charlotte Beautiful, Inc.
Nancy Tobin	Downtown Punta Gorda
Ronnie Gabel	Punta Gorda Isles
Rob Wilson	Gulf Cove Waterfront Estates
Joe Ellis	/
Tonya Bramlage	Case Planner

SUMMARY OF PARTICIPATION

The public discussion focused on flood risk, storm recovery, infrastructure vulnerability, funding, and long-term county planning. Attendees asked detailed questions about how the County is identifying priority assets, how recovery timelines affect the broader community, and how resilience planning may influence future public investment decisions.

Recurring discussion topics included the time required for infrastructure recovery after major storms, how facilities are prioritized for future analysis and investment, how septic-to-sewer conversion relates to rising groundwater, and how funding and regulations may affect implementation. Participants also emphasized the importance of clear communication, continued coordination, and community support as the project moves into future phases.

QUESTIONS AND RESPONSES

Table 5: Questions and Responses During the meeting

Question or Comment	Response / Follow-Up
Why does infrastructure recovery take so long after major storms?	The response explained that recovery is slowed by both physical damage and system complexity. For example, wastewater facilities may require structural repairs as well as restoration of treatment processes after saltwater intrusion. Recovery is also delayed because storms affect multiple communities at once, creating competition for contractors, crews, and materials.
How will the County use this information in future planning and investment decisions?	County staff said the assessment will help support future funding requests and guide more detailed work on priority facilities and surrounding areas. They noted that the next phase will refine data, update assumptions where needed, and help the County focus on practical resilience actions.
How accurate are the current data, and will the analysis be refined?	In response to questions about data quality, County staff and the consultant noted that this is a planning-level assessment based on the best available information. They acknowledged that some facility details still need refinement and said the next phase will improve those assumptions through coordination with facility owners and updated technical information.
How are septic systems and rising groundwater being considered in the County's planning?	County representatives explained that rising groundwater can reduce the effectiveness of septic systems and other underground infrastructure. They also noted that the County has been working on targeted septic-to-sewer conversion and is developing more refined methods to evaluate where future action is most needed.
How do funding and regulations affect the County's ability to act?	County staff explained that future implementation will depend on available funding and that assessment documents help support grant requests and other funding opportunities. They also noted that local regulatory options may be limited by state-level requirements, which makes public engagement and support especially important.
How can residents support the County's long-term resilience efforts?	County staff encouraged residents to stay engaged, communicate with neighbors, support resilience-related investments, and raise concerns with commissioners and legislative representatives when stronger standards or additional resources are needed. The meeting emphasized that long-term resilience would require continued collaboration among residents, businesses, public agencies, and elected officials.

MEETING OUTCOMES AND NEXT STEPS

The discussion gave residents an opportunity to ask detailed questions about flood risk, infrastructure vulnerability, recovery timelines, and the County's long-term approach to resilience planning. The conversation showed strong public interest in how technical findings will be translated into practical actions and funding decisions.

The public discussion highlighted several recurring concerns, including the pace of recovery after major storms, the need for accurate local data, the implications of rising groundwater for septic systems and infrastructure, and the role of funding and regulation in shaping future resilience actions. Participants also emphasized the importance of continued communication and transparency as the County moves forward.

Overall, the discussion highlighted the importance of continued public engagement as future planning and implementation efforts move forward. The questions raised during the meeting will help inform how the County communicates priorities, refines future analyses, and considers resilience actions in subsequent phases of work.

ANNEX 1 PUBLIC MEETING #1 PRESENTATION

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ANNEX 2 PUBLIC MEETING #2 PRESENTATION

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Charlotte County Vulnerability Assessment

Initial Public Town Hall Meeting

November 2024

Outline

- Key Definitions
- Resilient Florida Grant Program
- Scope of Work
- Project Timeline
- Community Input
- Next Steps

Key Definitions

- **Adaptation:** Prepare for and adapt to changing conditions, hazards, and threats and withstand and recover rapidly from disruption. This can be informed by past experiences to improve outcomes for future events.

- **Sea level rise:** Increase in the volume--and thus, elevation level--of the world's oceans resulting from warming temperatures.

- **Storm surge:** The abnormal rise in seawater level during a storm, measured as the height of the water above the normal predicted astronomical tide. Storm surge is caused primarily by a storm's winds pushing water onshore.

Resilient Florida Grant Program

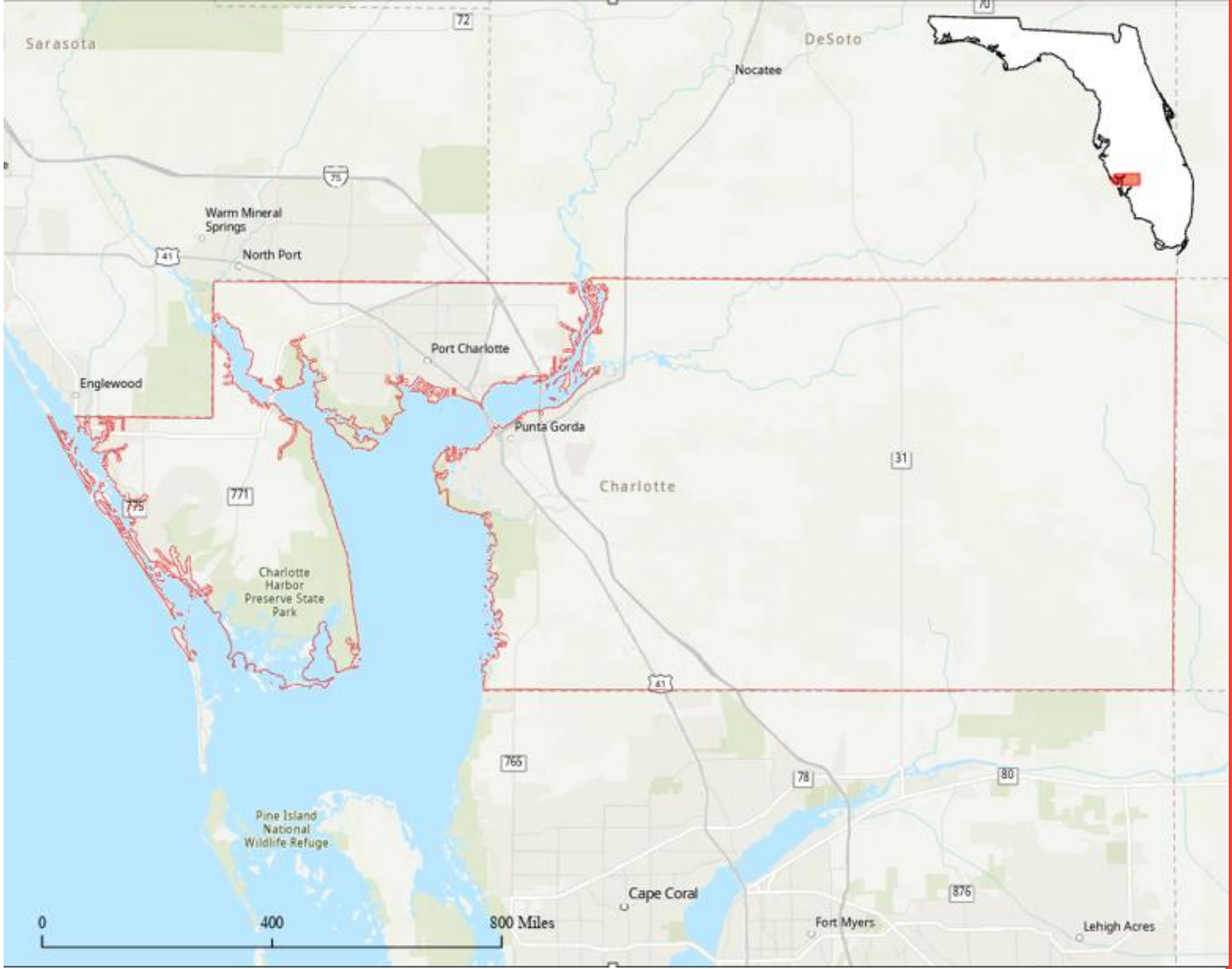
State funded grant program to implement projects for adaptation and mitigation.

Goals:

- **Economic Protection:** Reducing economic losses from climate-related disasters.
- **Public Health and Safety:** Improving outcomes for public health and safety.
- **Environmental Conservation:** Strengthening the resilience of environmental assets.
- **Infrastructure Security:** Securing critical state and regional infrastructure.
- **Community Planning:** Supporting municipalities and regional entities in strategic resilience planning.

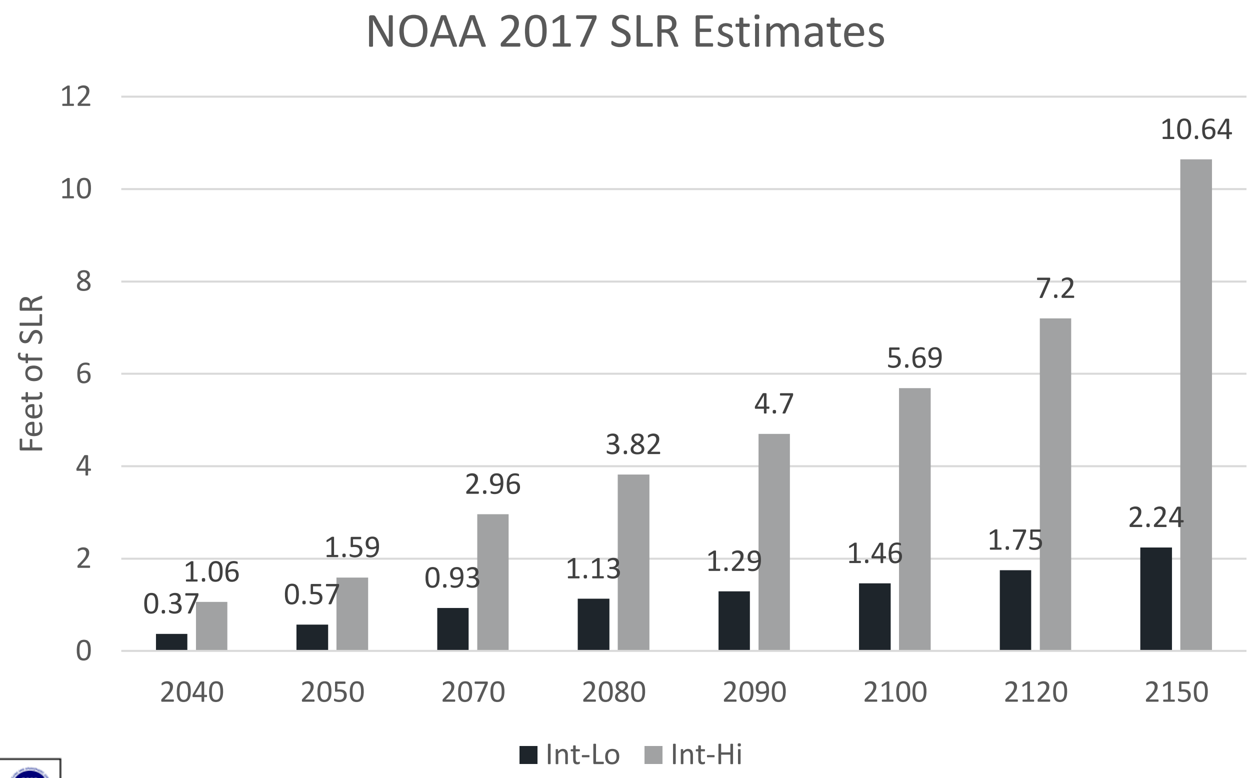
Scope of Work

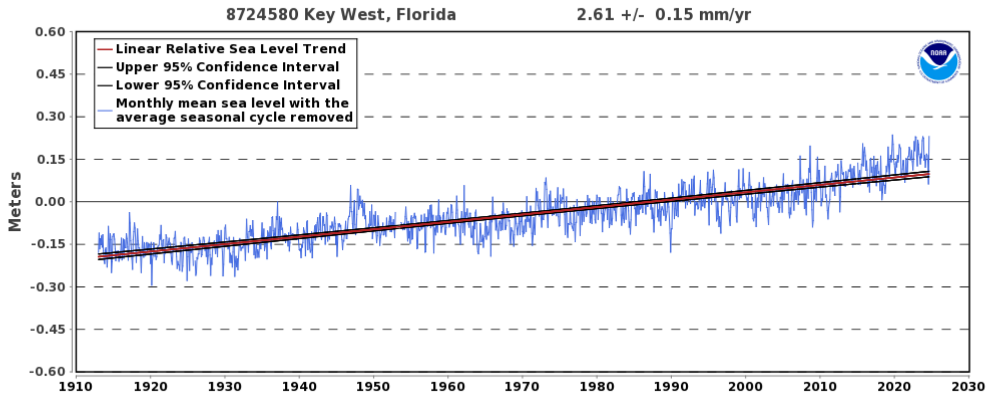
1. Assess current and future conditions
2. Determine the impacts over the landscape and community
3. Identify infrastructure and utility assets to prioritize for protection and investment
4. Planning for community action and adaptation

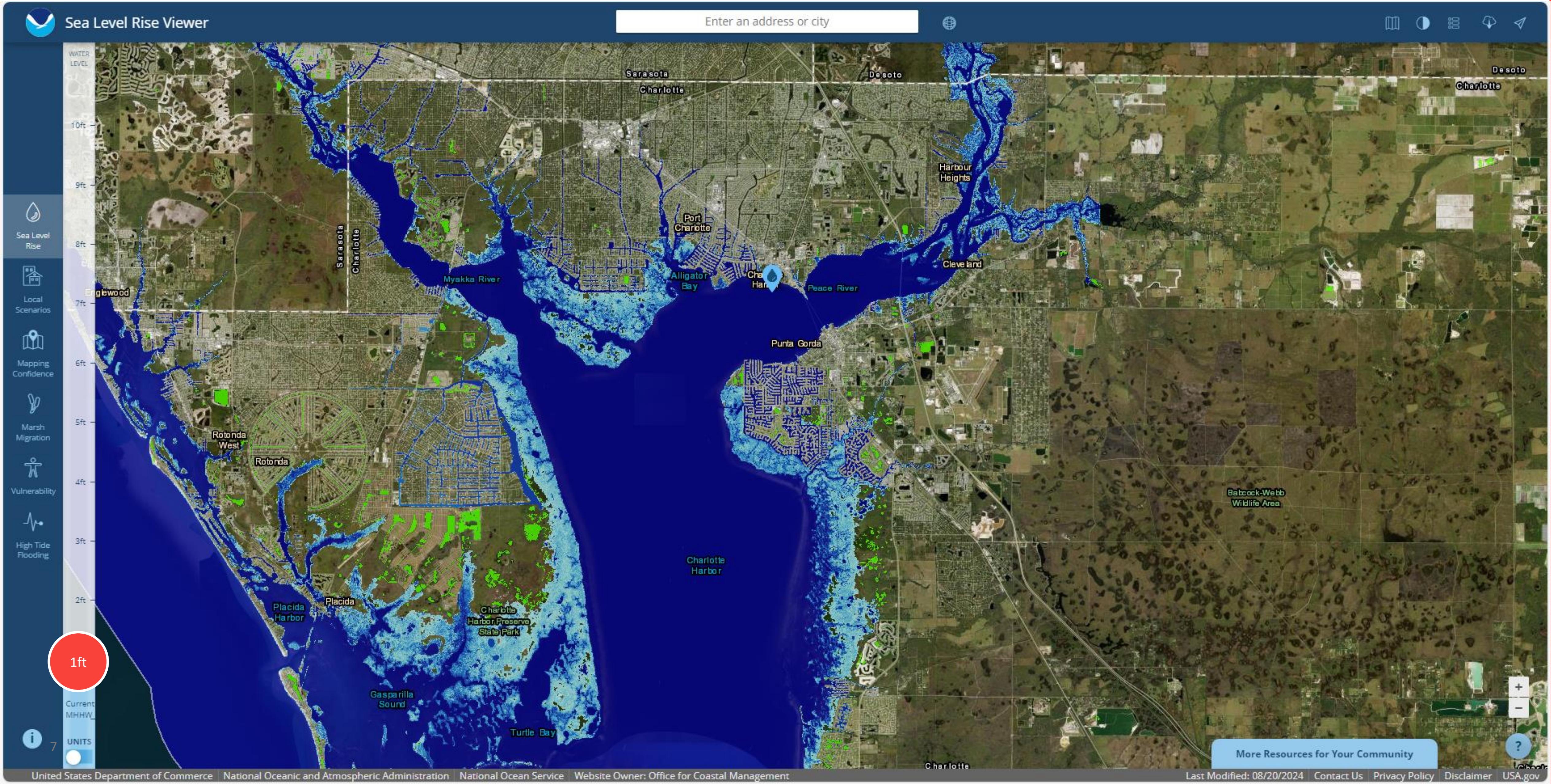


Sea Level Rise

- Sea levels have been increasing over the last 100 years of monitoring
- Estimates of future sea level conditions vary
  - A variety of factors are being researched
    - Primarily glacial melt and thermal expansion
- Ongoing research continues to refine these projections.
- Florida is evaluating these estimates to uniformly inform policy and investment decisions.







Sea Level Rise Viewer
Enter an address or city
Sea Level Rise
Local Scenarios
Mapping Confidence
Marsh Migration
Vulnerability
High Tide Flooding
10ft
9ft
8ft
7ft
6ft
5ft
4ft
3ft
2ft
1ft
Current MHHW
UNITS
Sarasota
Charlotte
Desoto
Harbour Heights
Port Charlotte
Alligator Bay
Myakka River
Peace River
Cleveland
Englewood
Punta Gorda
Rotonda West
Rotonda
Babcock-Webb Wildlife Area
Charlotte Harbor
Placida Harbor
Placida
Charlotte Harbor Preserve State Park
Gasparilla Sound
Turtle Bay
More Resources for Your Community
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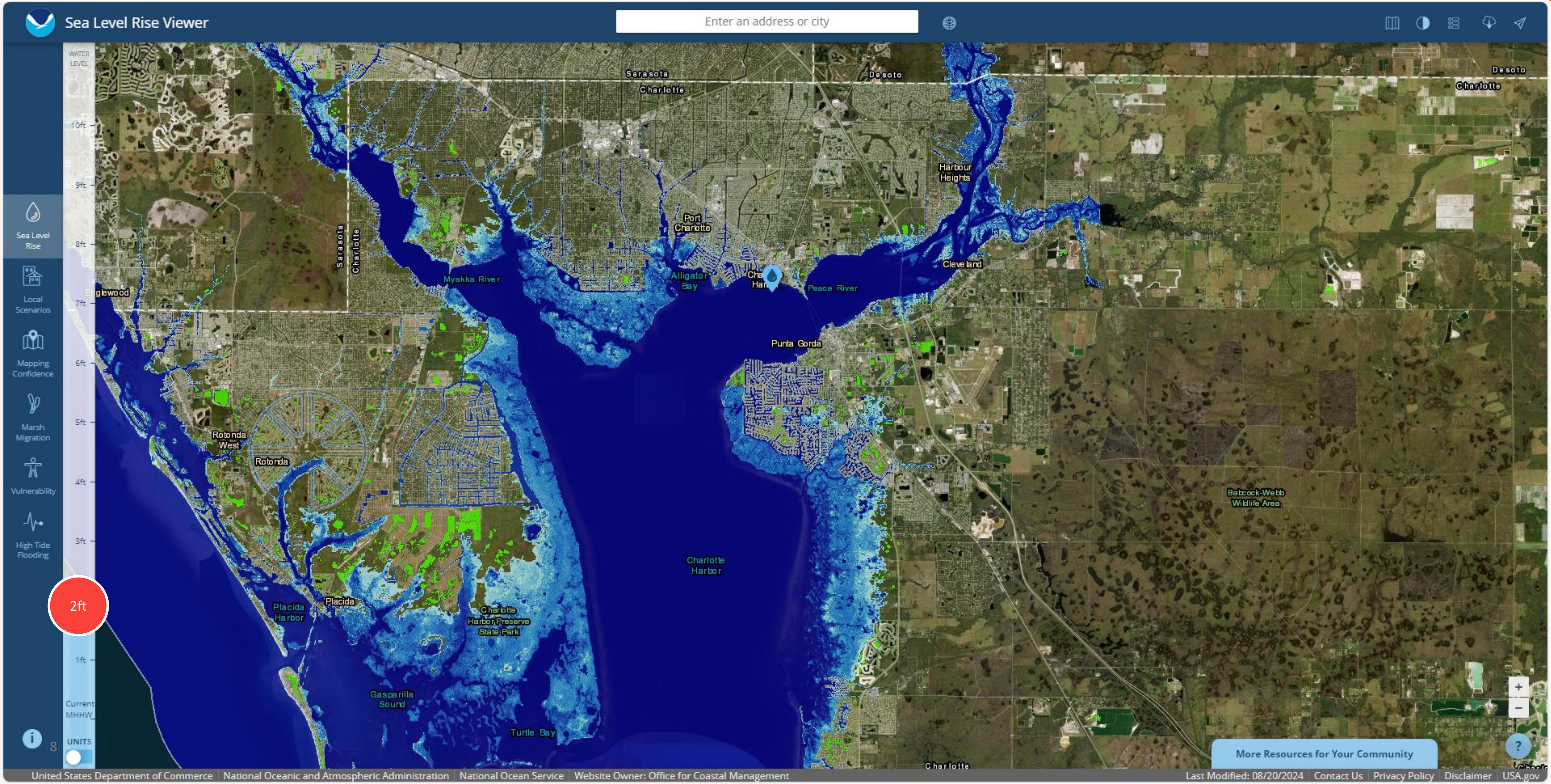

Sea Level Rise Viewer
Enter an address or city
WATER LEVEL
10ft
9ft
8ft
7ft
6ft
5ft
4ft
3ft
2ft
1ft
Current MHHW
UNITS
Sea Level Rise
Local Scenarios
Mapping Confidence
Marsh Migration
Vulnerability
High Tide Flooding
Sarasota
Charlotte
Desoto
Harbour Heights
Port Charlotte
Alligator Bay
Myakka River
Peace River
Cleveland
Punta Gorda
Englewood
Rotonda West
Rotonda
Babcock-Webb Wildlife Area
Charlotte Harbor
Placida Harbor
Placida
Charlotte Harbor Preserve State Park
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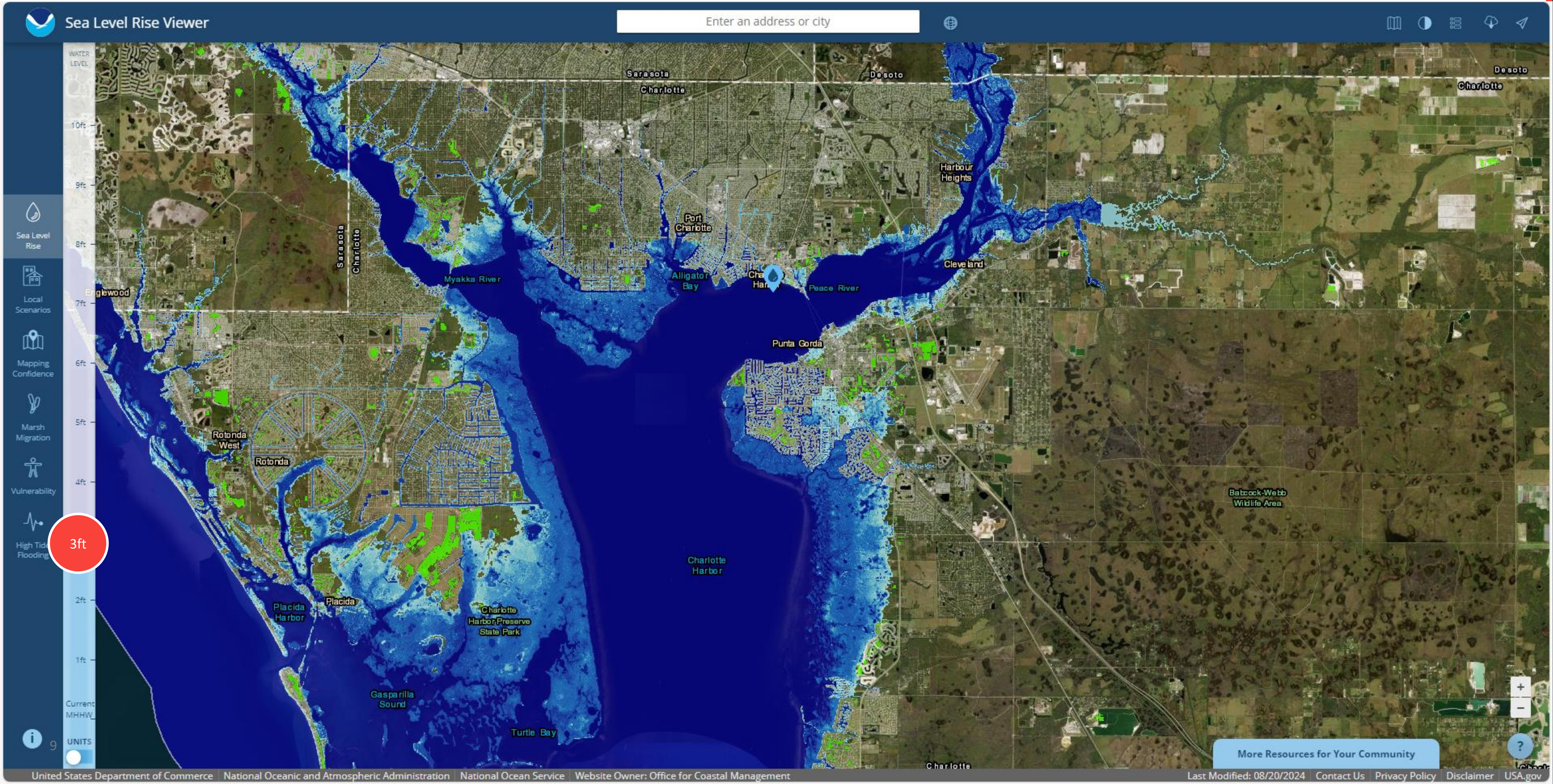

Sea Level Rise Viewer
Enter an address or city
WATER LEVEL
10ft
9ft
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Current MHHW
UNITS
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Alligator Bay
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Punta Gorda
Rotonda West
Rotonda
Placida Harbor
Placida
Charlotte Harbor Preserve State Park
Charlotte Harbor
Gasparilla Sound
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Babcock-Webb Wildlife Area
More Resources for Your Community
United States Department of Commerce | National Oceanic and Atmospheric Administration | National Ocean Service | Website Owner: Office for Coastal Management
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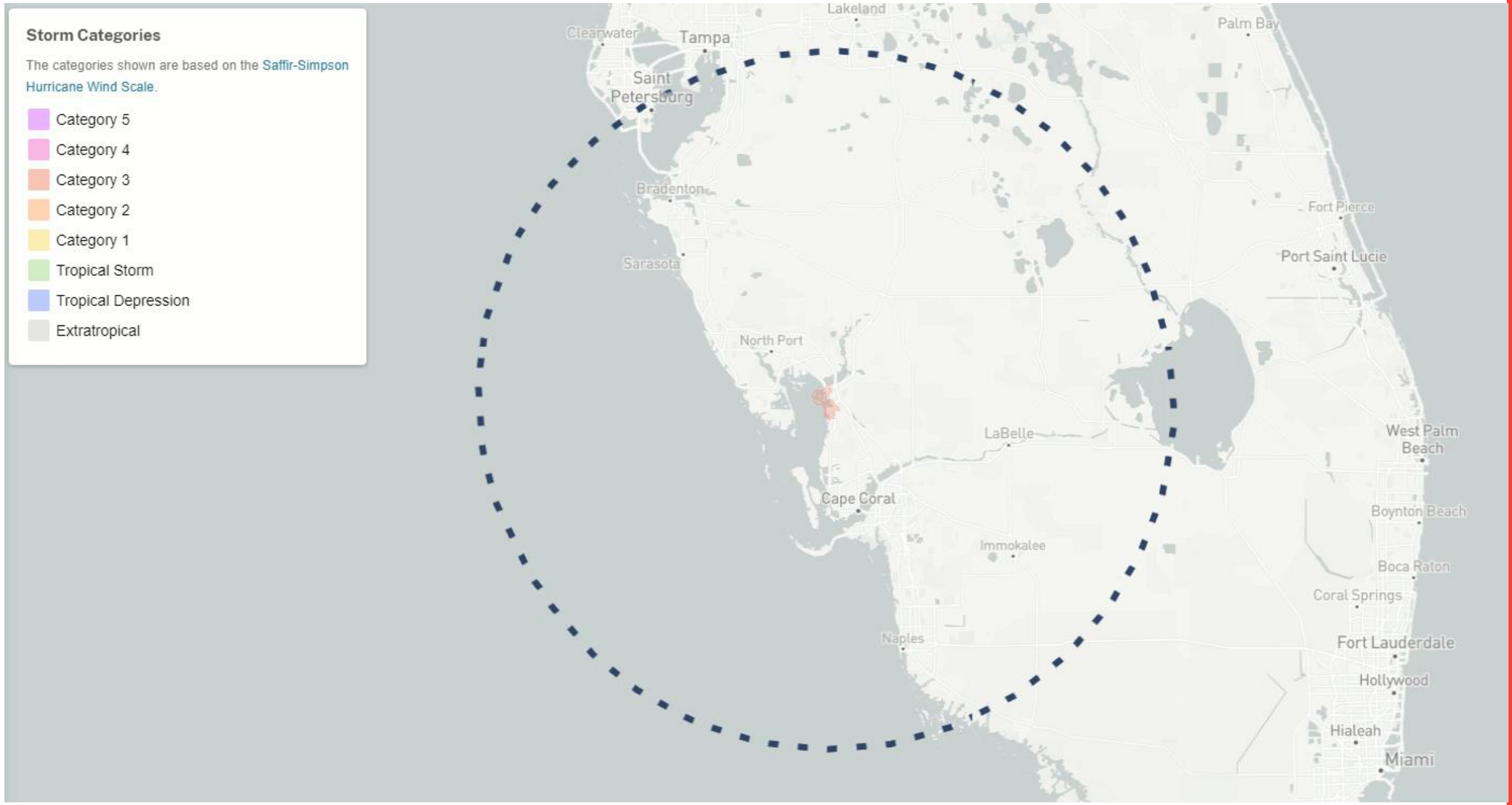
Assess What Has Occurred

Focus Areas:

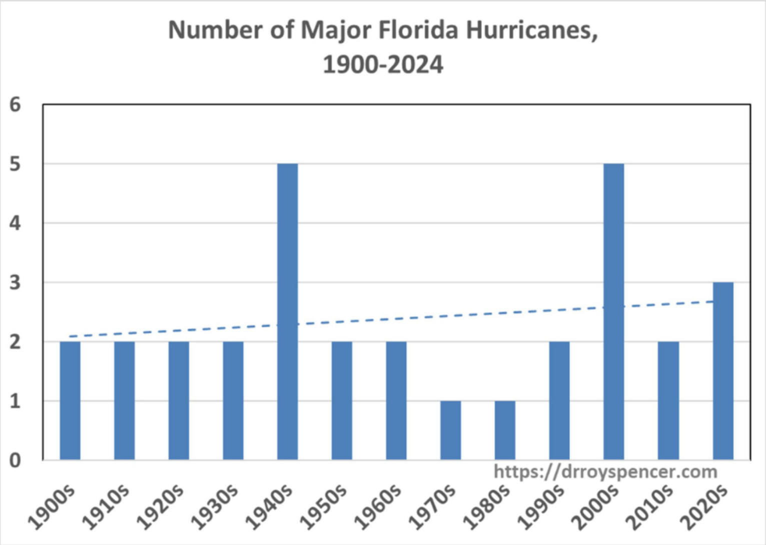
- **Storm Impacts:**
  What locations have been impacted by surge during past events?
- **Localized Tidal Flooding:**
  What areas are regularly flooded during high/king tide events?
- **Rainfall Flooding:**
  What areas are inundated during rainfall events that should be a concern?

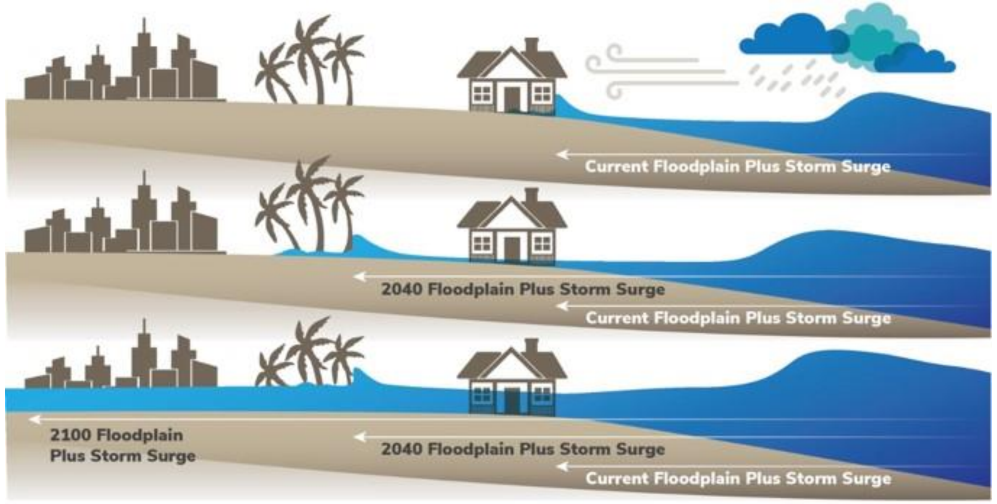


Consider Future Conditions

Focus Areas:

- **Flood Mitigation:** Combatting increased flooding due to more frequent and intense rainfall events.
- **Storm Surge Resilience:** Enhancing defenses against storm surges from severe weather systems.
- **Sea Level Rise Adaptation:** Preparing for the long-term impacts of rising sea levels.



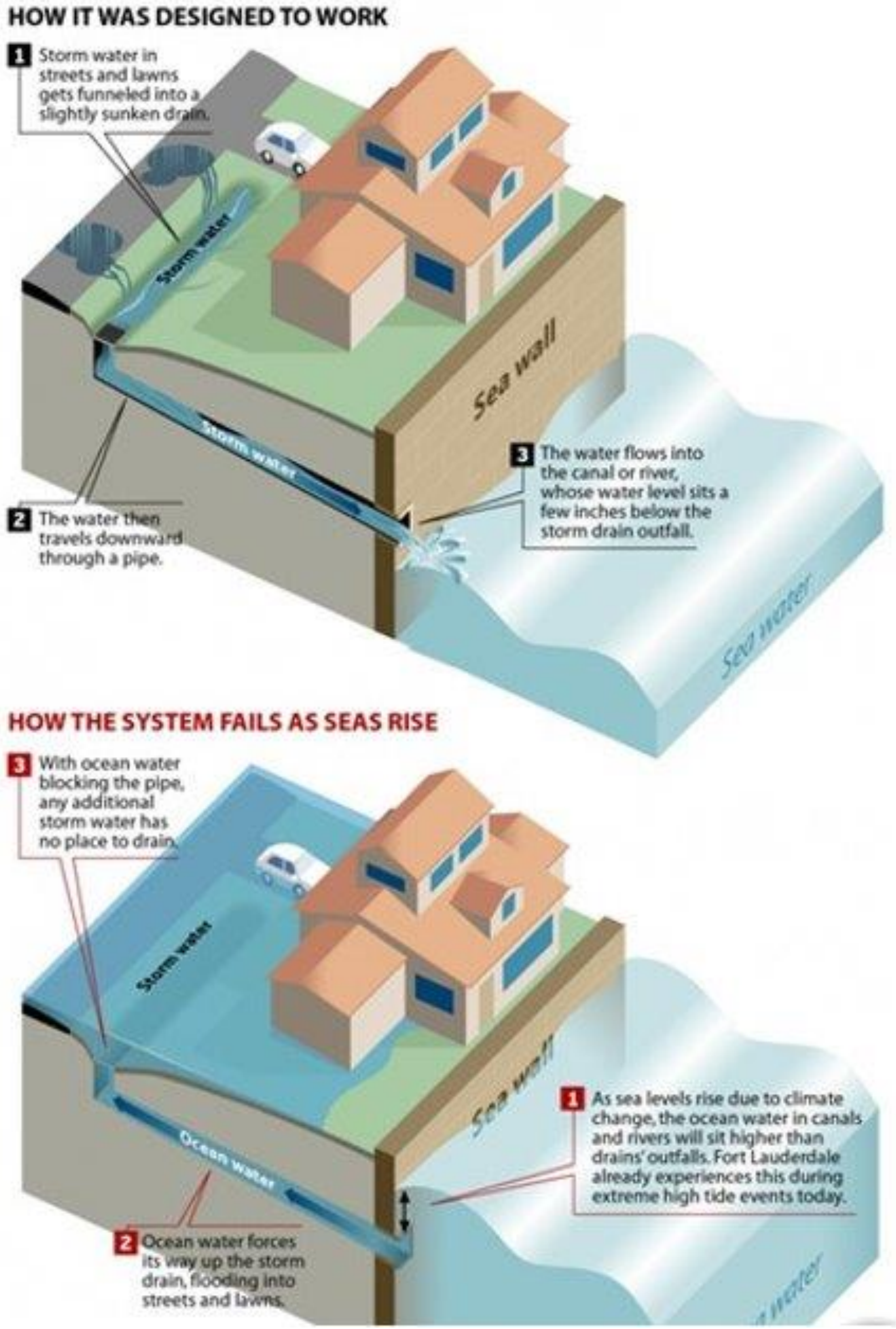


Hurricanes are likely to become stronger in the future and generate more rainfall - NOAA

Consideration: Flooding on Stormwater Systems

Rising sea levels could impact stormwater systems in multiple ways:

- Outfalls may become blocked, preventing effective stormwater processing.
- High tides or storm conditions could push seawater into the system, causing flooding in low-lying areas.
- Rising groundwater levels can inundate pipes, reducing their effectiveness.



Overview of the Project Work Scope

November 2024 — May 2024

Stakeholder Input and Public Engagement

Initial Town Hall Meeting		Draft Vulnerability Assessment Meeting		Final Vulnerability BOCC Meeting	
Critical / Regionally Significant Assets	Flood Scenario Related Data and ACUNE	Flood Scenario Related Data and ACUNE	Sensitivity Analysis	Action Areas	Vulnerability Assessment
	2 months		5 months	8 months	10 months

Project Steps

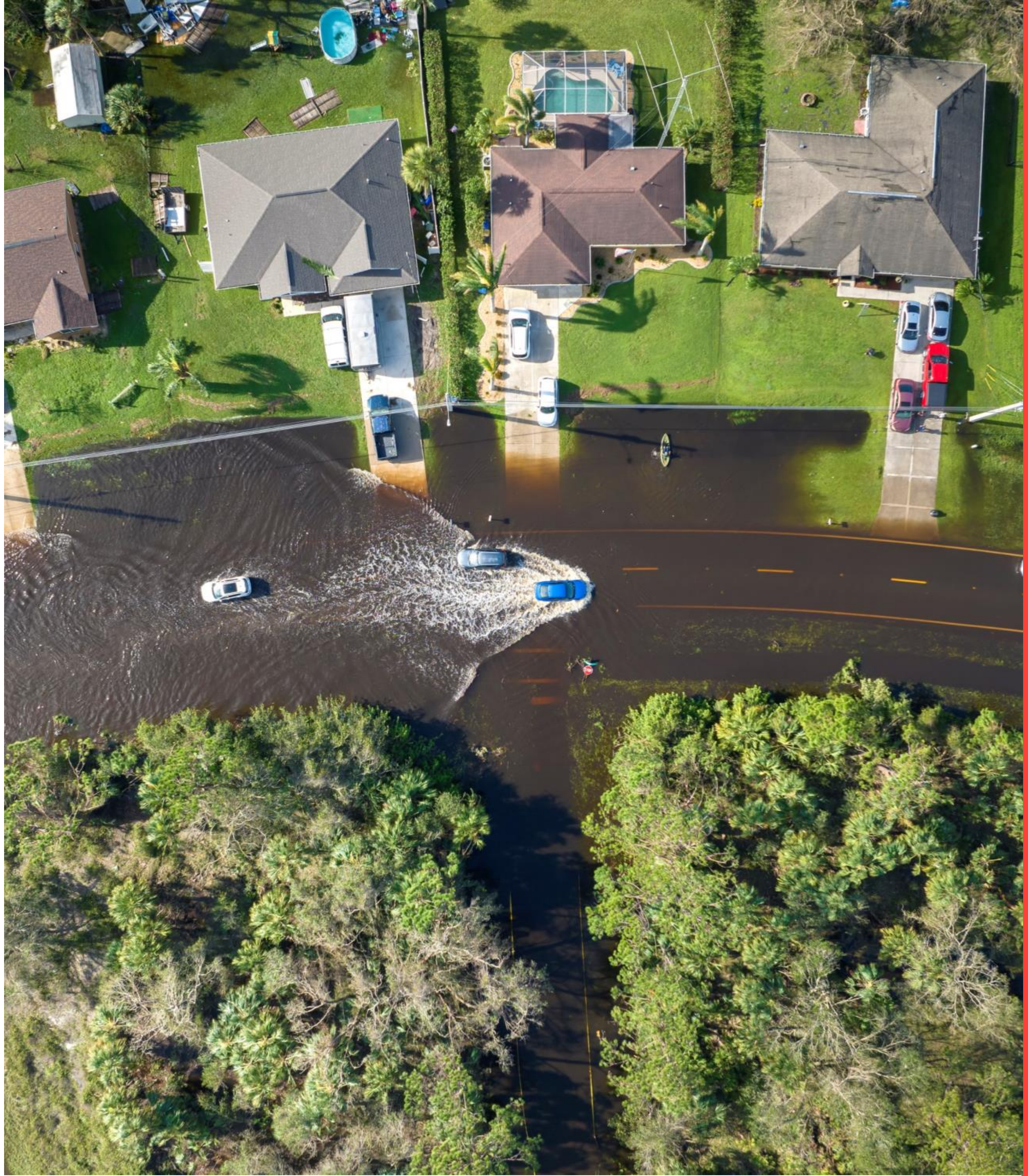
November 2024 — May 2024

Stakeholder Input and Public Engagement

Flood Hazards	Critical County Assets	Exposure	Sensitivity Analysis	Actions
Identify and model flood hazards	Create an inventory of critical assets	Assess exposure of assets to flood hazards	Measure the impact of flooding on assets	Identify adaptation actions

We Need Your Help

- For the County's critical assets, we'll need help understanding:
- How flooding may already be impacting you and your community,
- The consequences of past or current flooding,
- What areas should be protected
- Which county owned infrastructure that should be prioritized for protection
- This will build an understanding of the risks of flooding to the community



Thank You

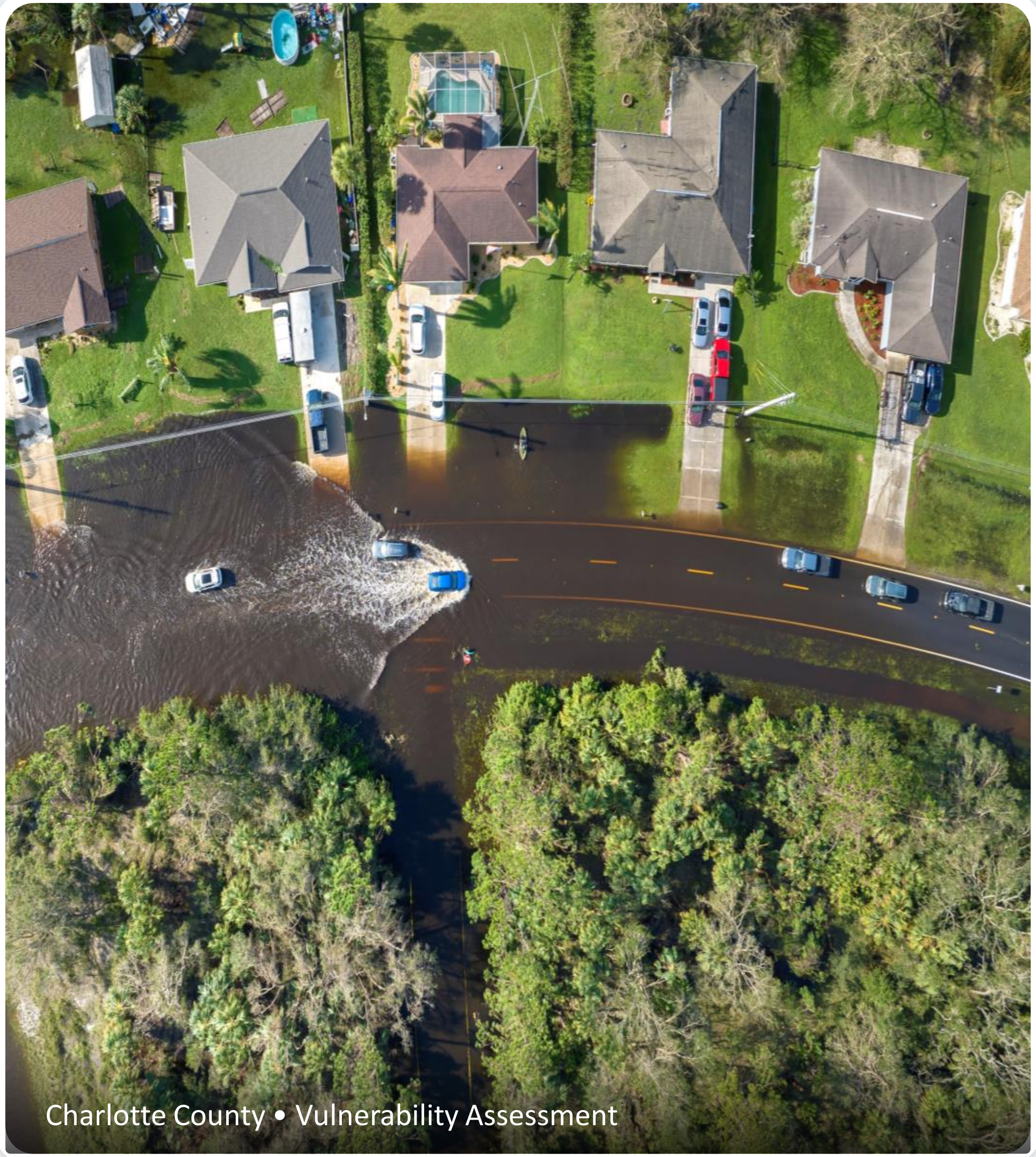
Charlotte County Vulnerability Assessment

Second Public Meeting

May 2026

Presentation Agenda

1. Project Background
2. Current and Future Flood Risk
   - 2.1 Chronic Flood Risk
   - 2.2 Acute Flood Risk
3. Strategic Decision-Making
4. Discussion & Next Steps



01 Project Background

Understanding the regulatory framework, program goals, and scope of the vulnerability assessment

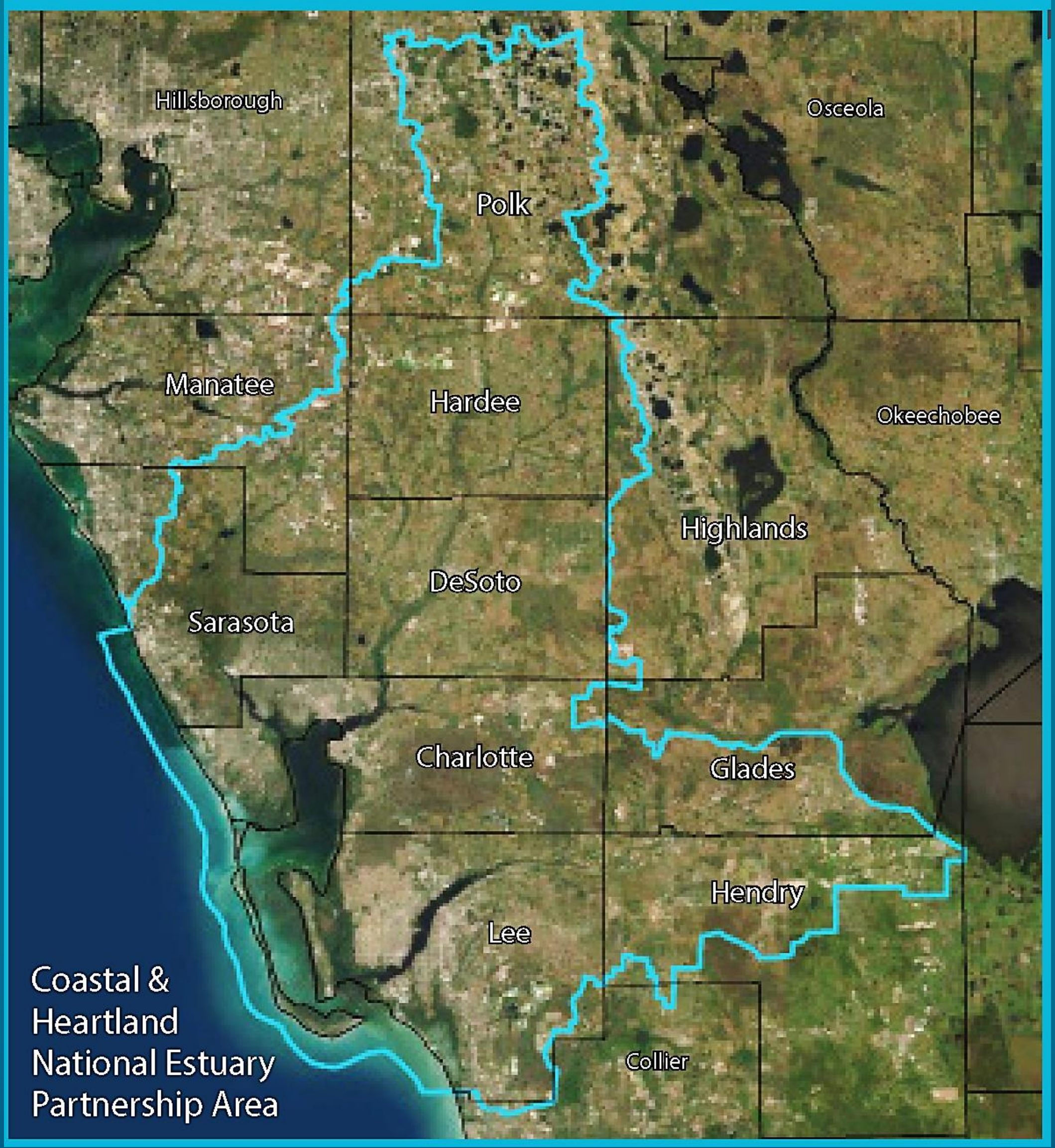
WHO WE ARE

Coastal & Heartland National Estuary Partnership

- **Formed in 1995 and one of only 28 Congressionally designated “estuaries of national significance” in the United States.**
- **Receive special funding and support from US EPA under the Clean Water Act to protect and restore water resources in the CHNEP area.**

WHERE WE WORK

- CHNEP area encompasses 5,416 sq. miles (3,146,280 acres)
- Estuaries include Lemon Bay, Dona & Roberts Bay, Charlotte Harbor, Pine Island Sound, Caloosahatchee, San Carlos Bay and Estero Bay
- Rivers including Myakka, Peace, Caloosahatchee, and Estero
- Inland and coastal Communities incl. 10 counties and 25+ cities!



THE POWER OF PARTNERSHIP

- CHNEP is:
  - Public-private partnership
  - Consensus-based
  - Non-regulatory
  - Science-based
  - Citizen-supported
- CHNEP, because of private contributions, volunteers and donated in-kind services has been able to provide more than 19 dollars of restoration for every dollar it receives of federal governmental funding!

HOW WE FIT INTO THIS PROJECT

- CHNEP is:
  - Funding for this project $$$
  - Providing project management support in:
    - participating in project meetings and reviewing deliverables to provide technical comment
    - disseminating project information to policymakers, general public, and other audiences

CHNEP is also planning to help with the implementation of County's Vulnerability Assessment and Adaptation Action Area Plans long-term!

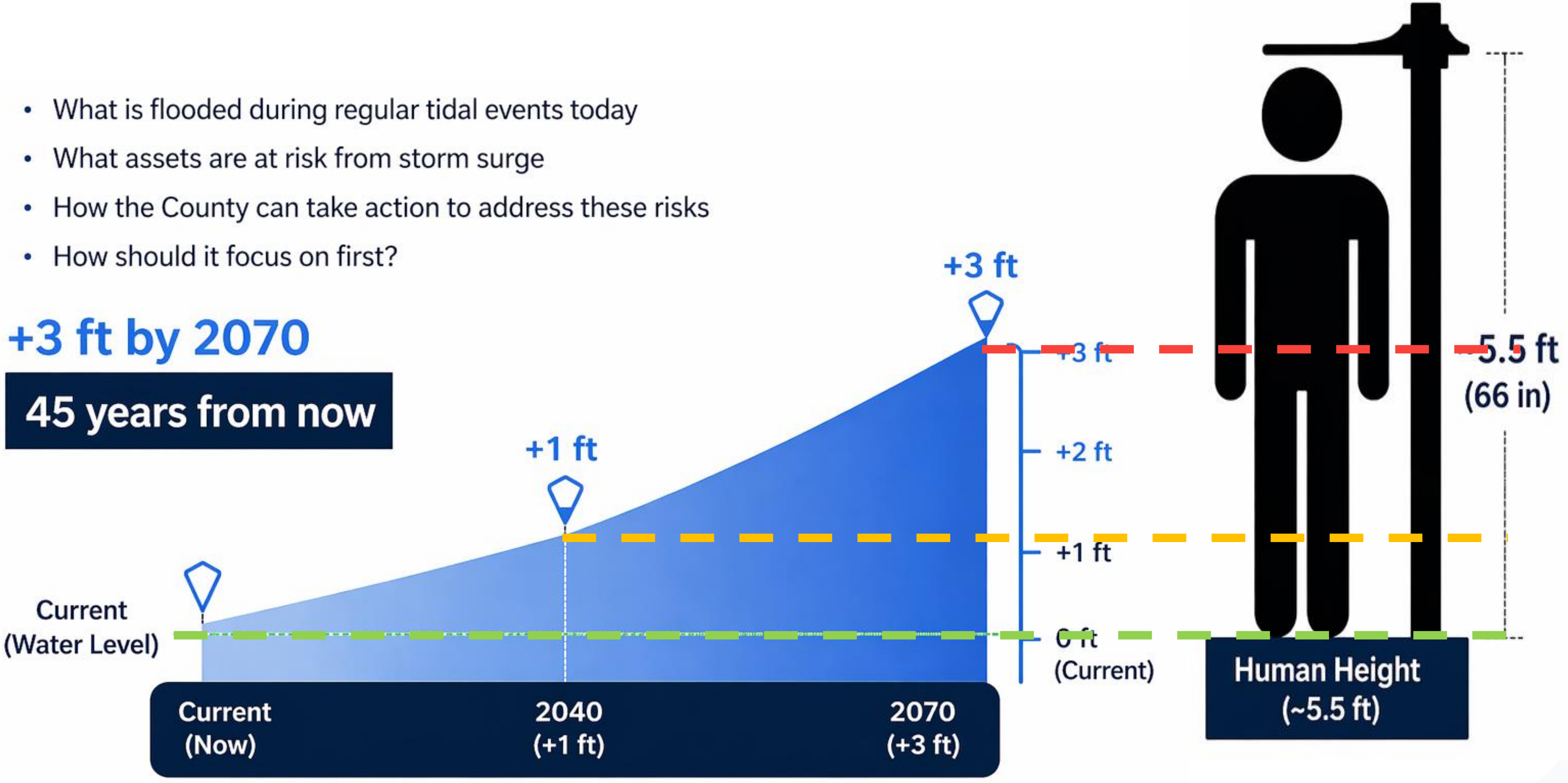
Florida Department of Environmental Protection (DEP) Program

- The Resilient Florida Program assists communities in addressing **sea level change, flooding, and related challenges** by conducting vulnerability assessments and developing adaptation plans.

- This initiative will help the County **fulfill the requirements** of the DEP program, improving its prospects for securing **future funding**.

Program Intended to Assess:

- What is flooded during regular tidal events today
- What assets are at risk from storm surge
- How the County can take action to address these risks
- How should it focus on first?

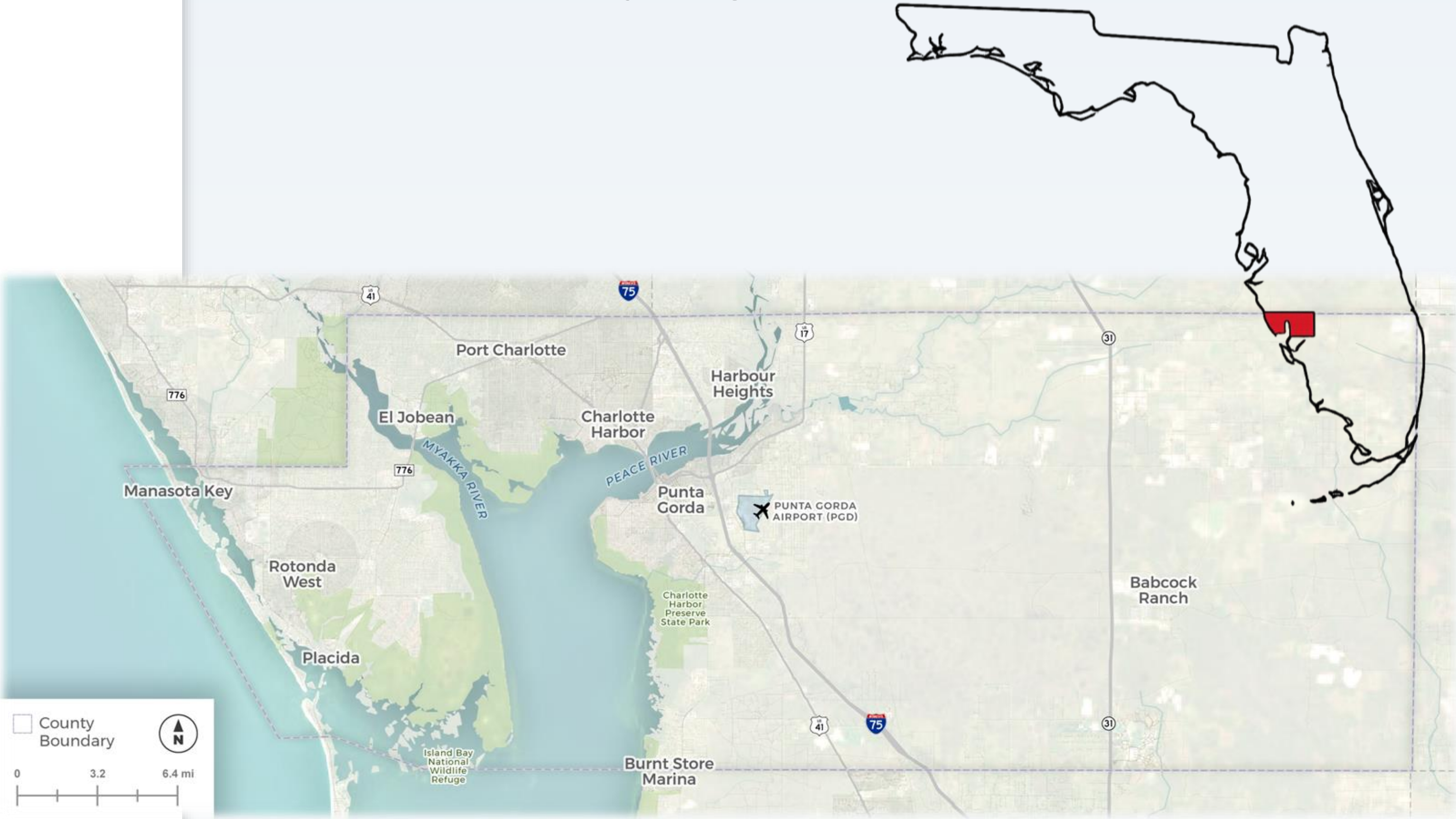


The Project Will

- ✓ Identify flooding impacts to Charlotte County now and in the future.
- ✓ Assess risks to essential infrastructure, transportation, and natural resources.
- ✓ Prioritize adaptation strategies
- ✓ Develop a decision-making process that works with various support programs.

Funded By

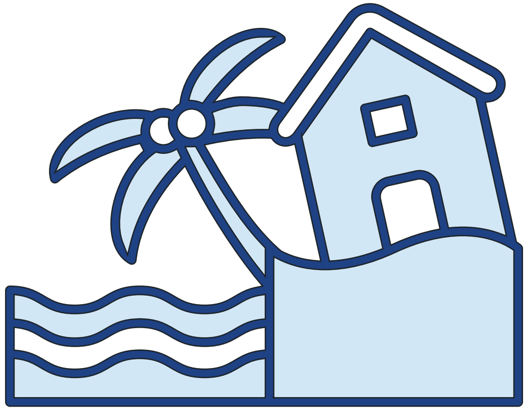
Coastal & Heartland National Estuary Partnership (CHNEP): EPA-IIJA funding for the National Estuary Program



Hazards assessed in this project include

Tidal Flooding

Groundwater Levels

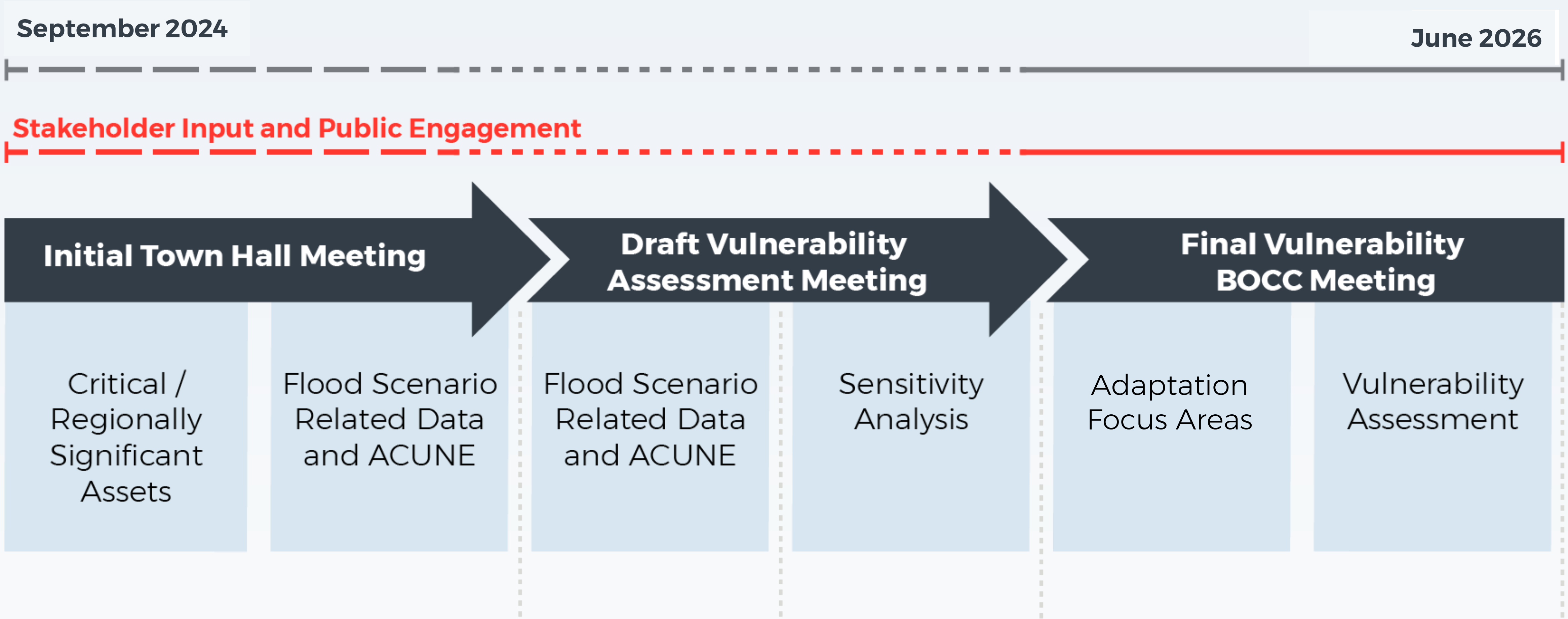


Storm Surge

Scope

Identify the **vulnerabilities** of Charlotte County's infrastructure, communities, and natural assets to **flooding hazards** and strengthen long-term resilience.

Project Timeline



Goals from this meeting

Share the Results of The Draft Vulnerability Assessment

Ensure Consistency and Alignment with County Needs

Gather Feedback from The Community

02

Current and Future Flood Risk

Assess the intensity, frequency, extent, and depth of natural hazards, and the impact on assets

Flood Concerns

Chronic vs. Acute Comparison

CHRONIC (DAILY CONDITION)

Ongoing, gradual flooding conditions that worsen over time

Sea Level Change
Rising ocean levels affect coastal and estuarine areas

Tidal Flooding
Regular high-tide inundation in low-lying zones

Groundwater Rise
Elevated water table infiltrates underground infrastructure

Wetland Transition
Environmental areas shifting from land to water

ACUTE (EXTREME EVENT)

Sudden, severe flooding from major coastal storms

More Severe & Frequent Storm Surge

Charlotte County's experience with recent storms highlights the growing impact of coastal storm events. **As storms become more intense,** proactive measures are essential to limit future damage to communities and infrastructure.

Critical Assets in Charlotte County

Asset categorization is a foundational step in the Vulnerability Assessment, organizing findings by function and meeting FDEP grant requirements.

1 **Critical Infrastructure**
Water, wastewater, stormwater, and power systems essential to county operations

2 **Critical Community & Emergency Facilities**
Schools, hospitals, shelters, fire stations, and emergency response centers

3 **Transportation & Evacuation Routes**
Roads, bridges, and key corridors for emergency evacuation and daily mobility

4 **Natural, Cultural & Historic Resources**
Parks, preserves, waterways, and heritage sites that define the county

Critical Assets in Charlotte County

Spatial distribution of critical assets across the county

Critical Infrastructure

90 facilities | **362** lift stations

Critical Community & Emergency Facilities

257 buildings

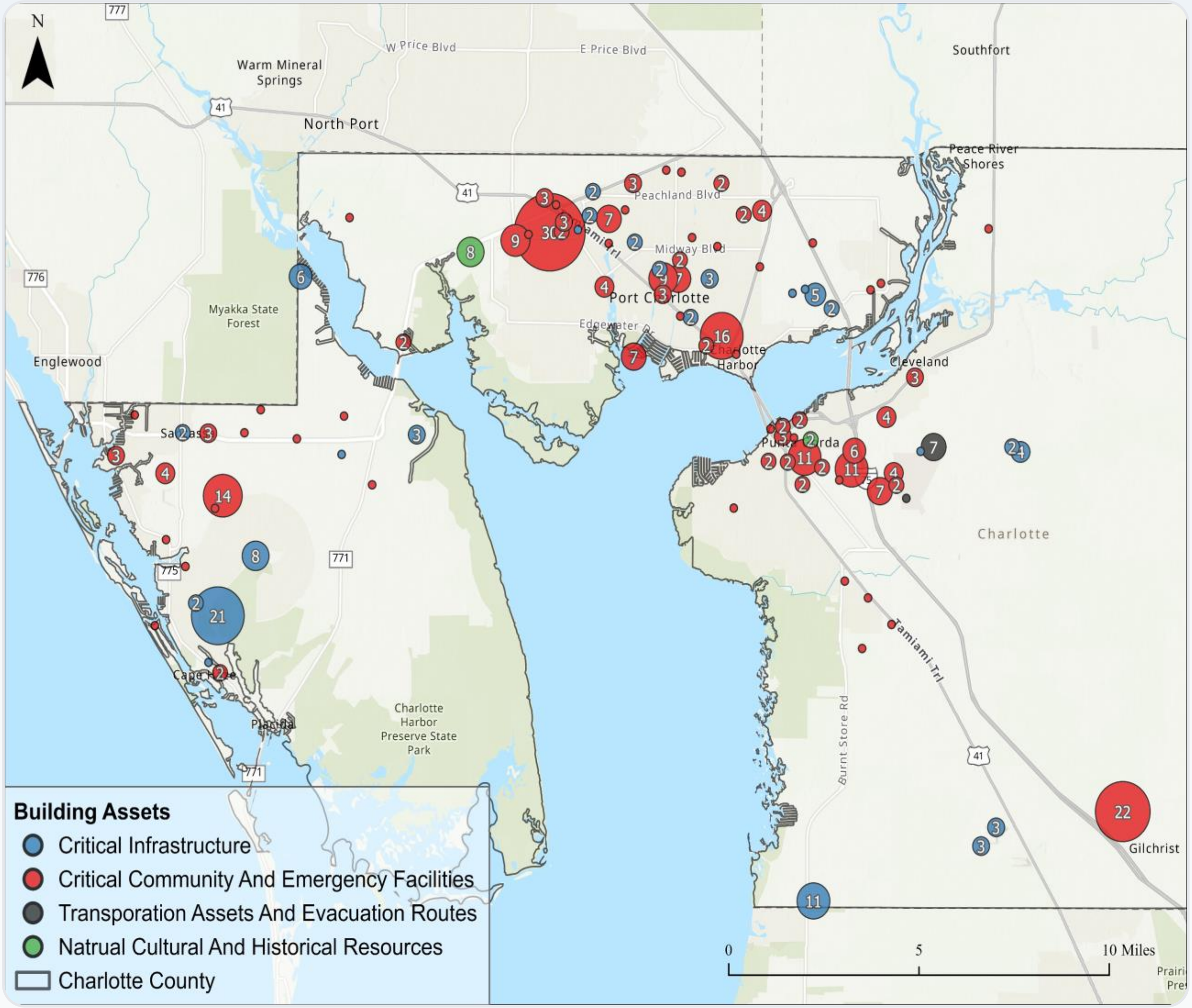
Transportation & Evacuation

491 mi roads | **45** bridges | **25** mi rail

Natural, Cultural & Historic

657K ac conservation | **418K** ac wetlands

9 historic bridges | **30** parks



Time Horizons and Planning Considerations

TODAY
2026

Immediate Term

Take immediate action to protect the community and its infrastructure from current flood hazards.

NEAR FUTURE
2040

In the Near Future

Implement strategies and actions that ensure our community remains resilient as conditions evolve.

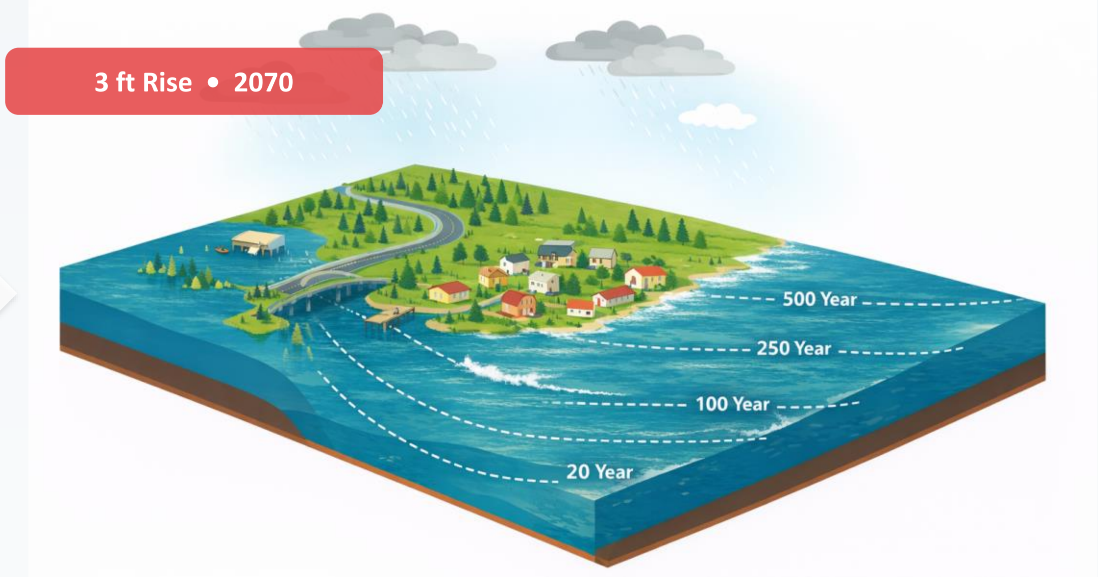
LONG TERM
2070

A More Distant Future

Introduce actions that will ensure long-term resilience for the county as sea levels continue to rise.

1 ft Rise • 2040

3 ft Rise • 2070



2.1

Chronic Flood Risk

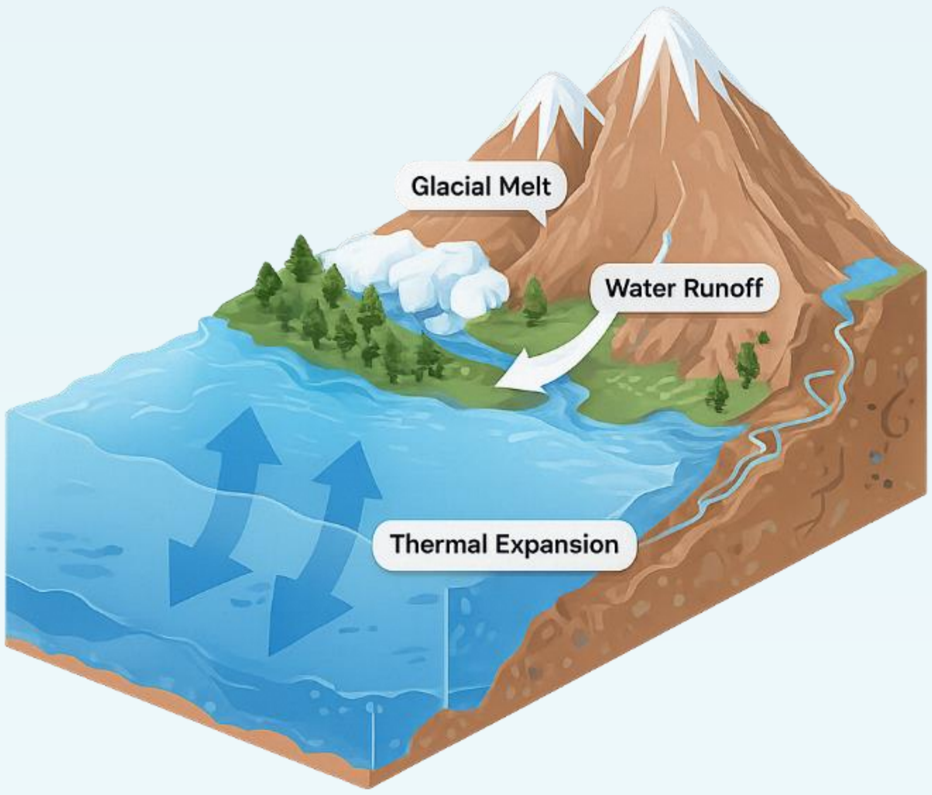
Understanding ongoing, gradual flooding conditions that affect Charlotte County over time

Sea Level Change

Tidal Flooding

Groundwater Rise

Wetland Transition

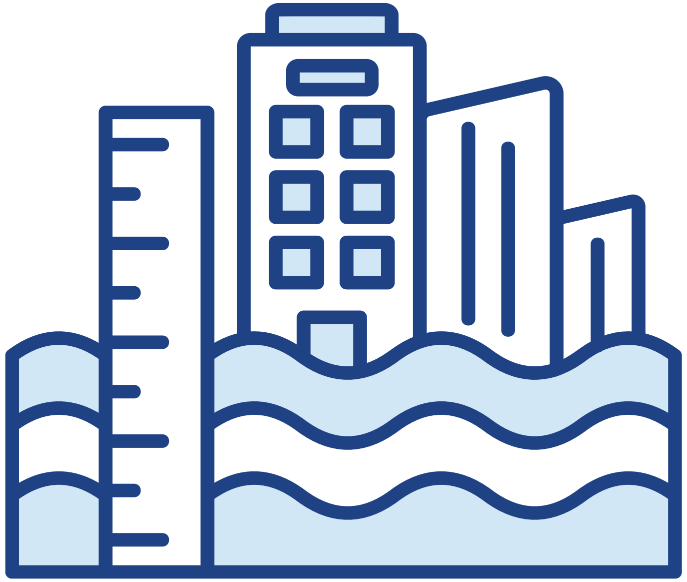


Sea Level Change

- Increase **frequency and severity of tidal flooding.**
- Cause **groundwater level rise,** impacting coastal infrastructure.
- Drive the **transition of wetlands,** resulting in ecological consequences

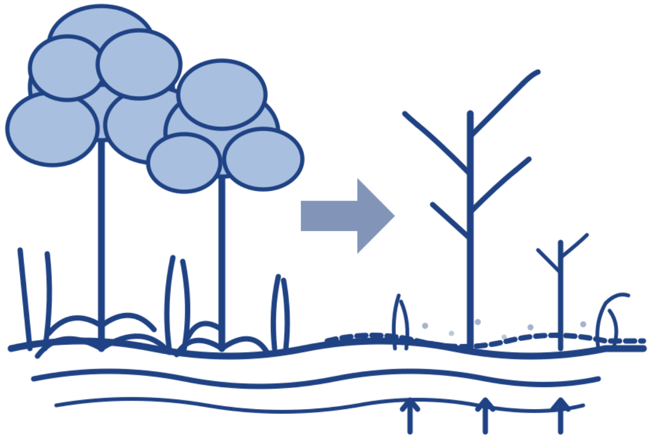
[Sea Level Rise and Coastal Flooding Impacts]

Sea Level Change will impact:



Tidal Flooding

Groundwater Levels



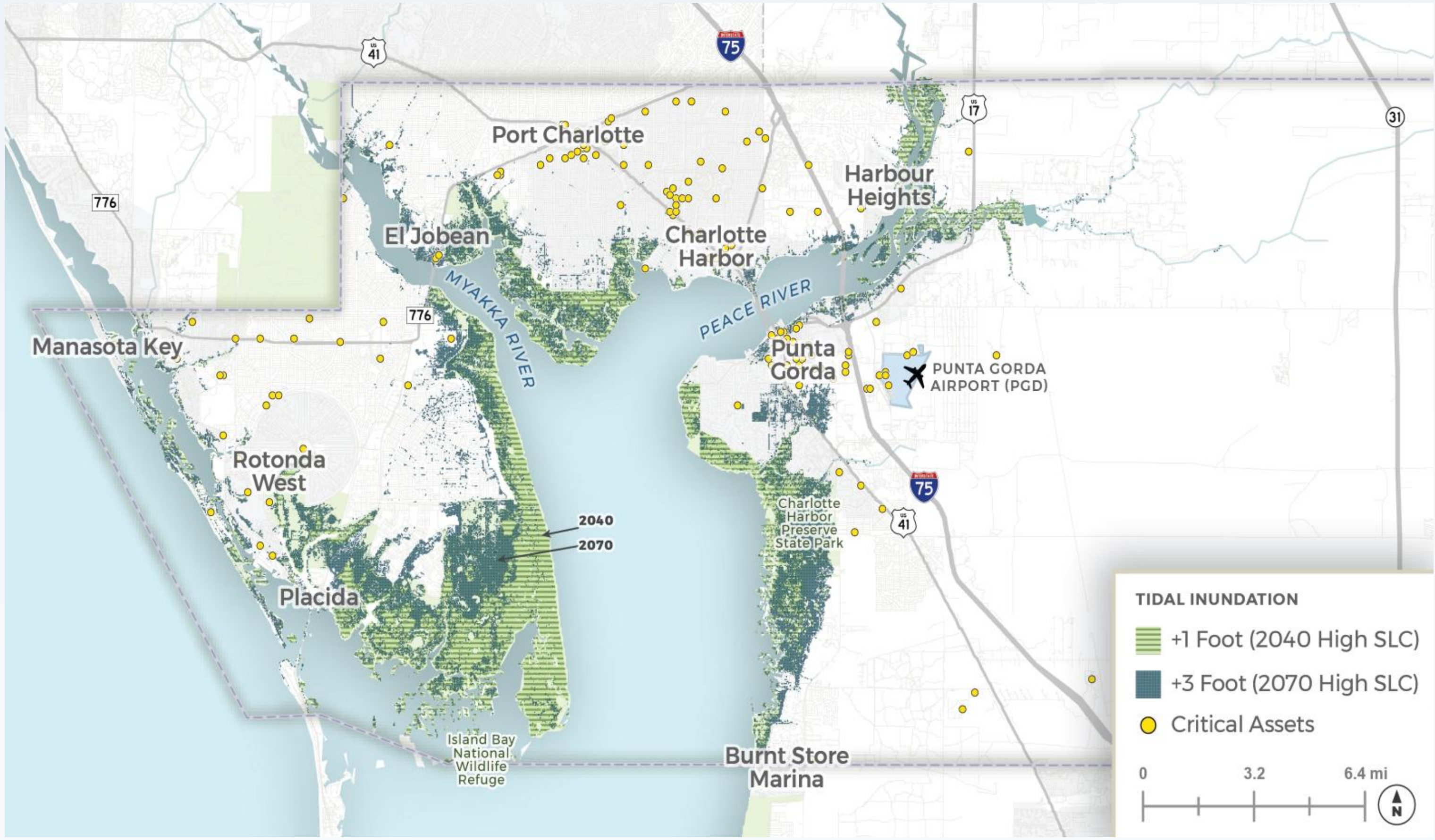
Wetland Transition

Sea Level Change and Tidal Flooding

Areas potentially affected by recurrent tidal flooding under projected sea level change. It affects low-lying coastal and estuarine areas even in the absence of storms.

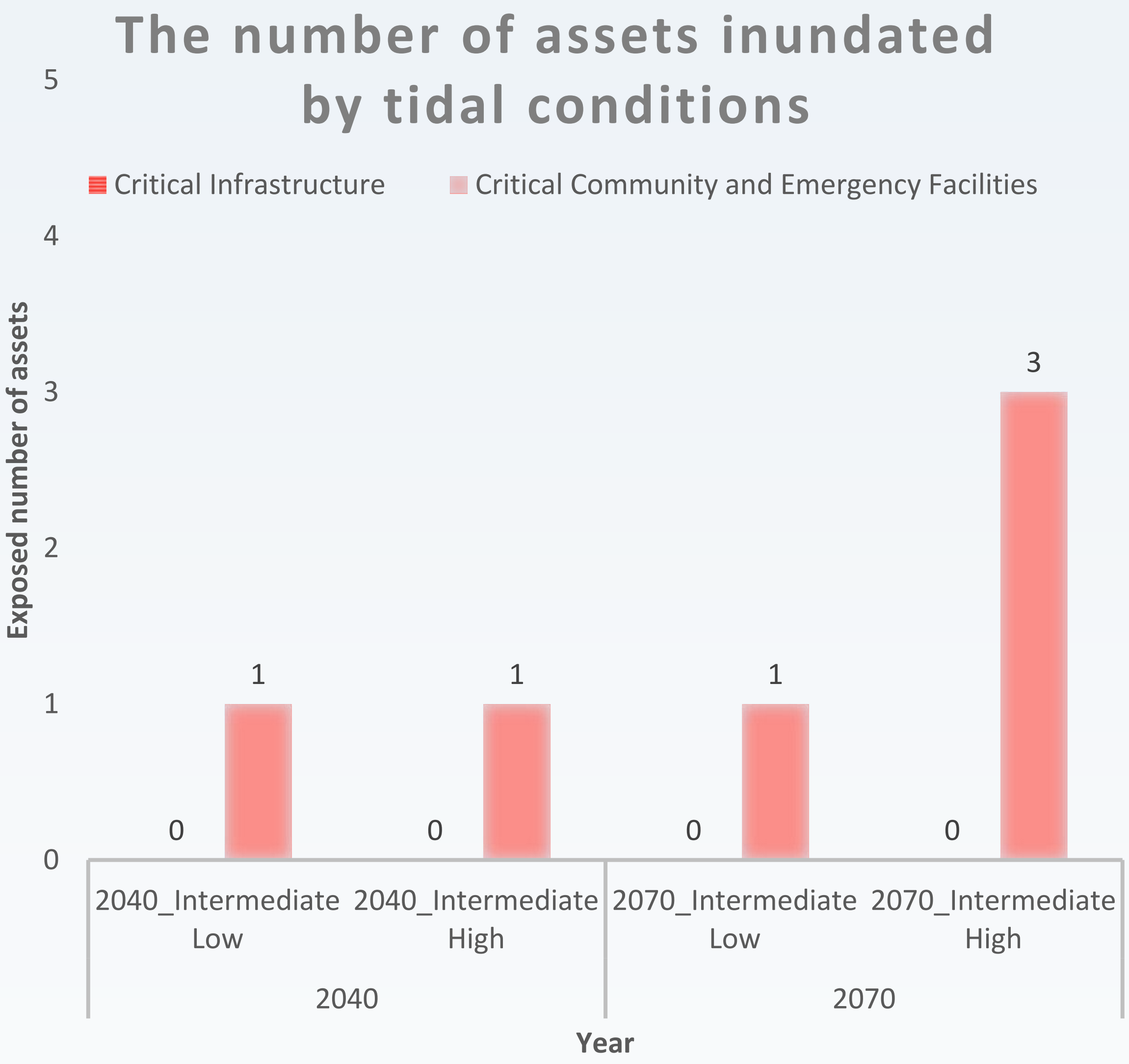
Year	Intermediate Low (ft)	Intermediate High (ft)
2040	Near Future= 1 ft	
2070	Long Term= 3 ft	

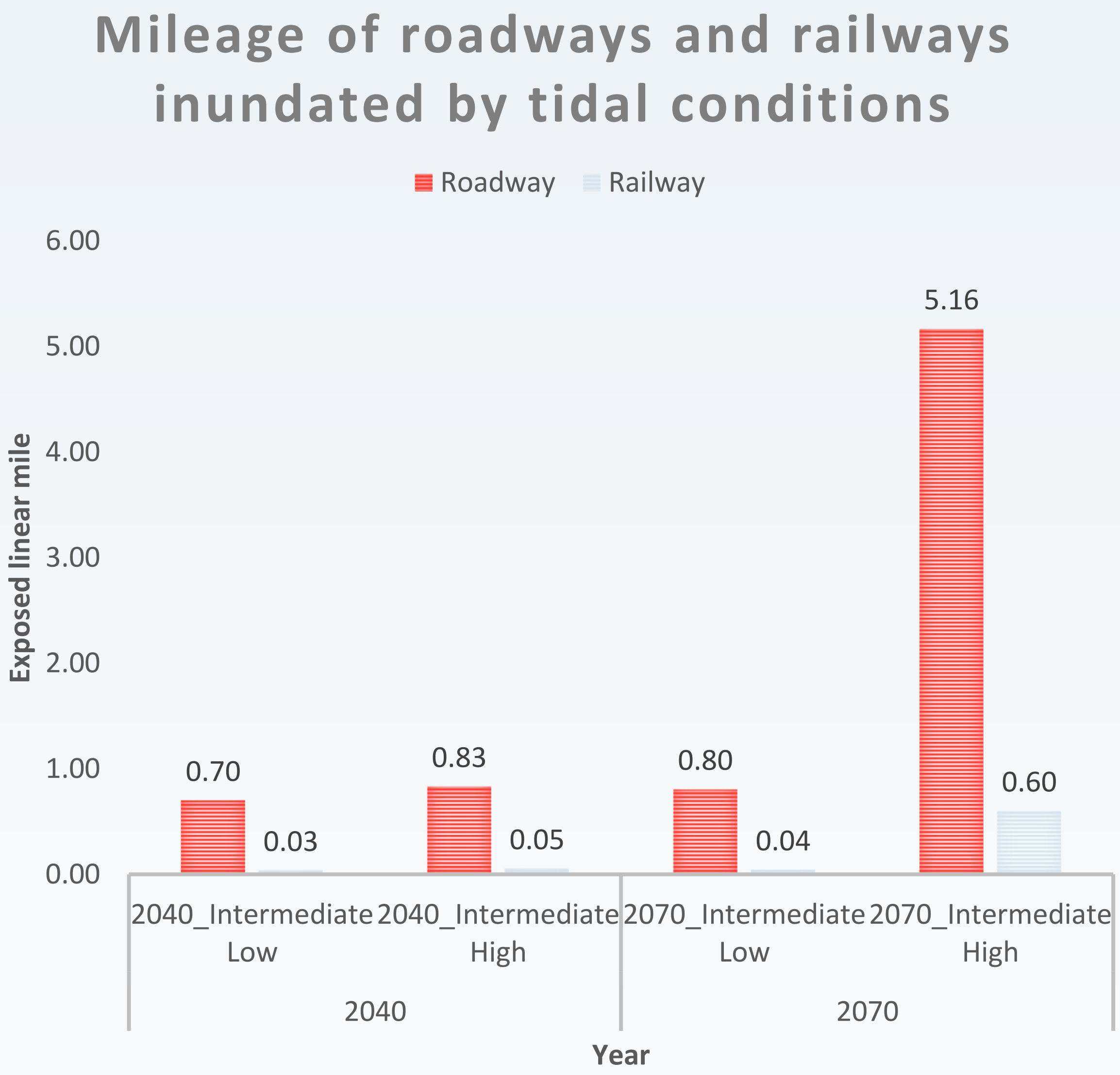
Source: NOAA 2017



Source: NOAA Office for Coastal Management, Sea Level Rise Viewer. (2025).

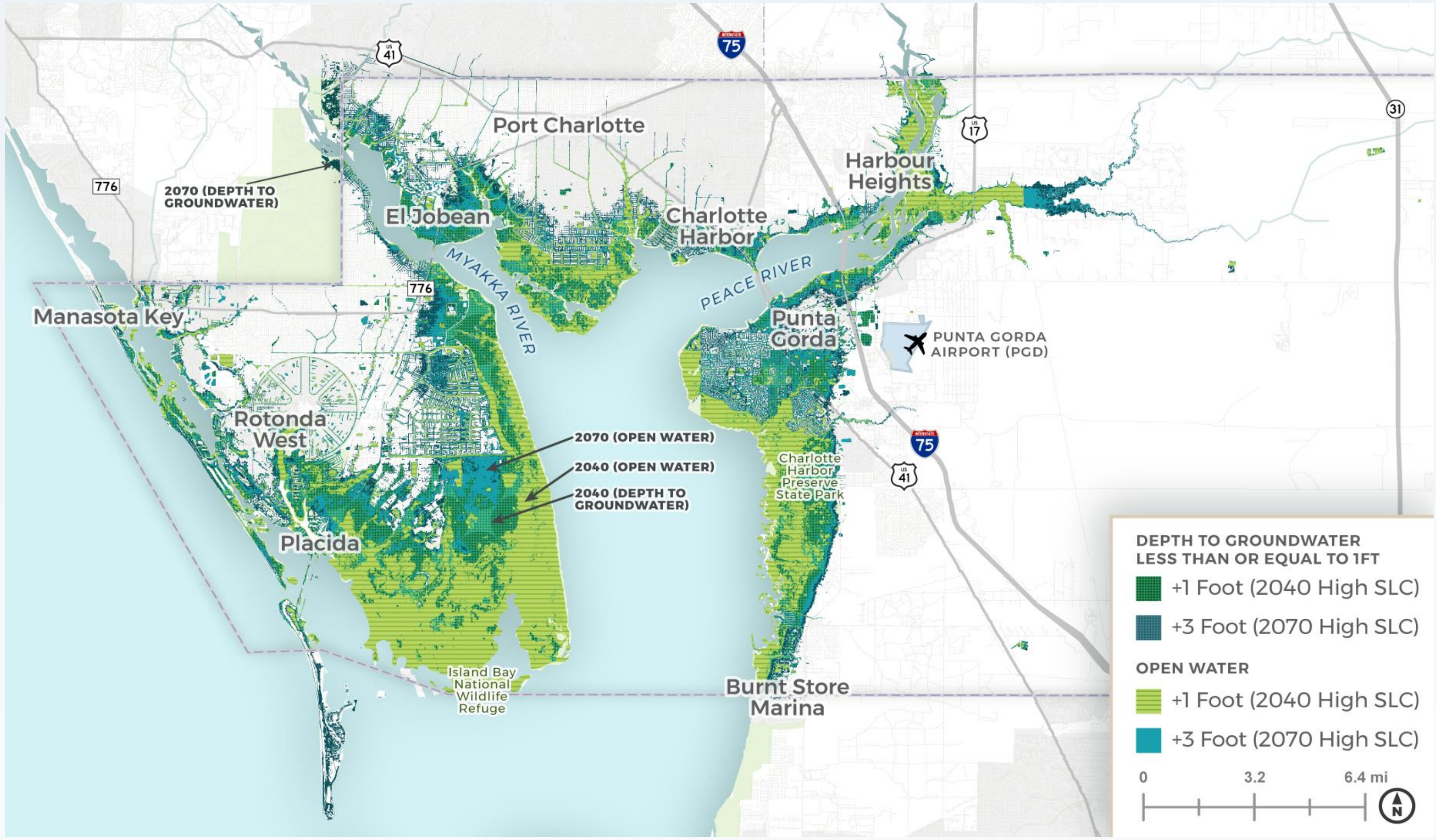
Inundation by Tidal Conditions





Rising Groundwater

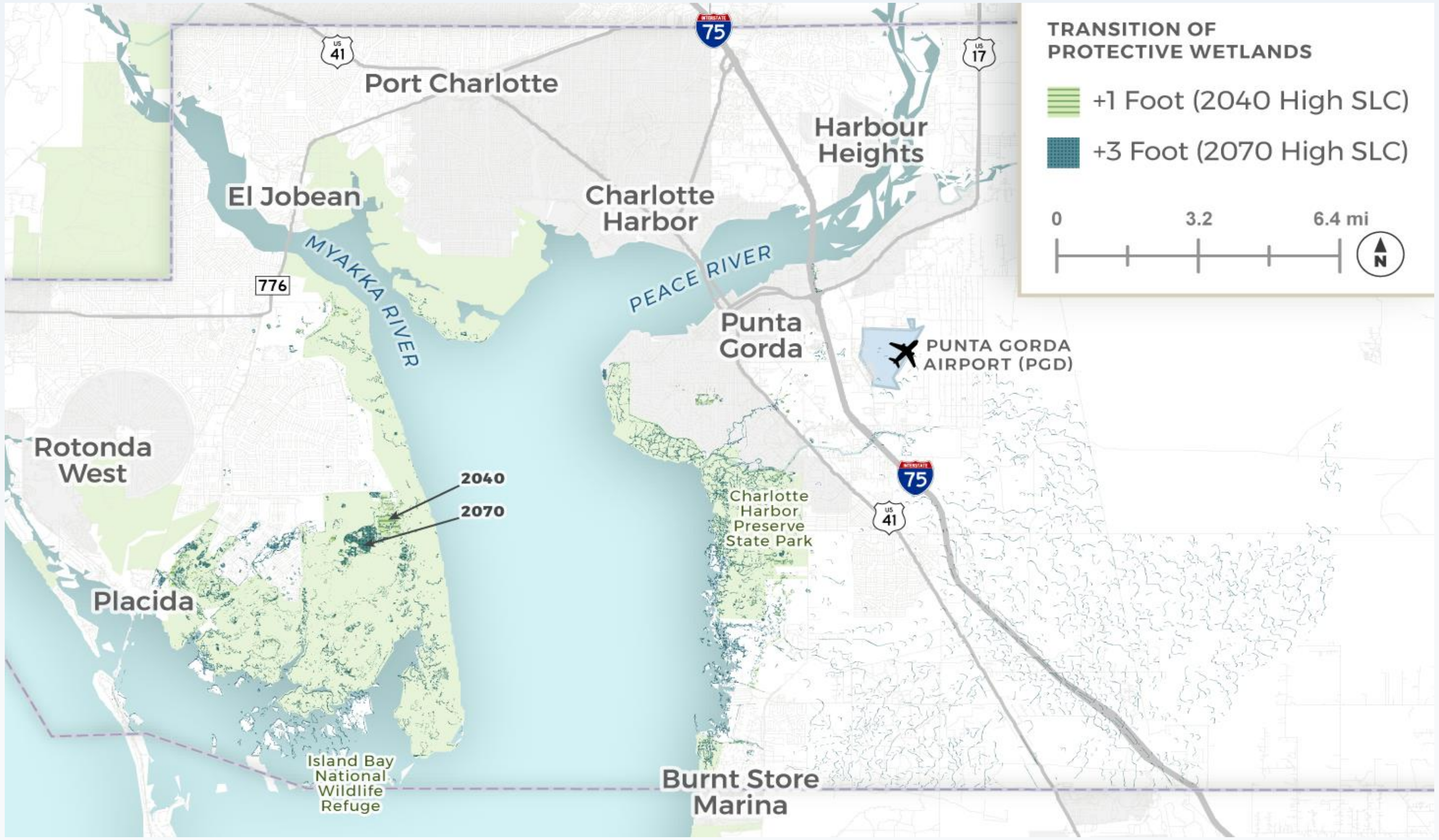
As sea levels change, groundwater tables can also rise, threatening underground utilities, foundations, and septic systems.



Source: NOAA Office for Coastal Management, Sea Level Rise Viewer. (2025).

Potential Natural System Area Transition under Sea Level Change

Protective wetlands along Charlotte Harbor, including mangrove forests and marshes within parks like Charlotte Harbor Preserve State Park, face significant ecological shifts.



Source: NOAA Office for Coastal Management, Sea Level Rise Viewer. (2025).

Wetland Transition

Projected loss of protective wetlands in Charlotte County

Current Protective Wetlands

37,315

acres

Mangroves, salt marshes, and freshwater wetlands providing natural flood protection

By 2040

-355

acres lost

Remaining: 36,960 acres

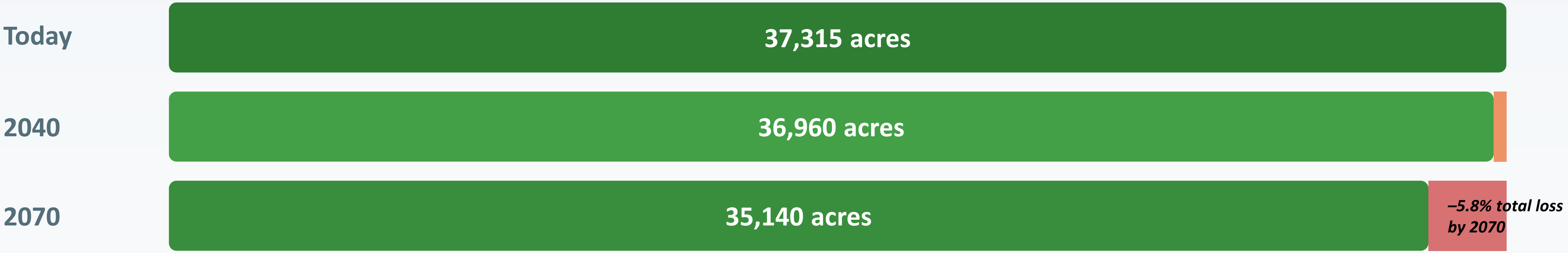
By 2070

-2,175

total acres lost

Remaining: 35,140 acres

Wetland Area Comparison



⚠ *Vegetated wetland loss reduces natural flood protection: every acre lost lessens community protection from storm surge and coastal flooding*

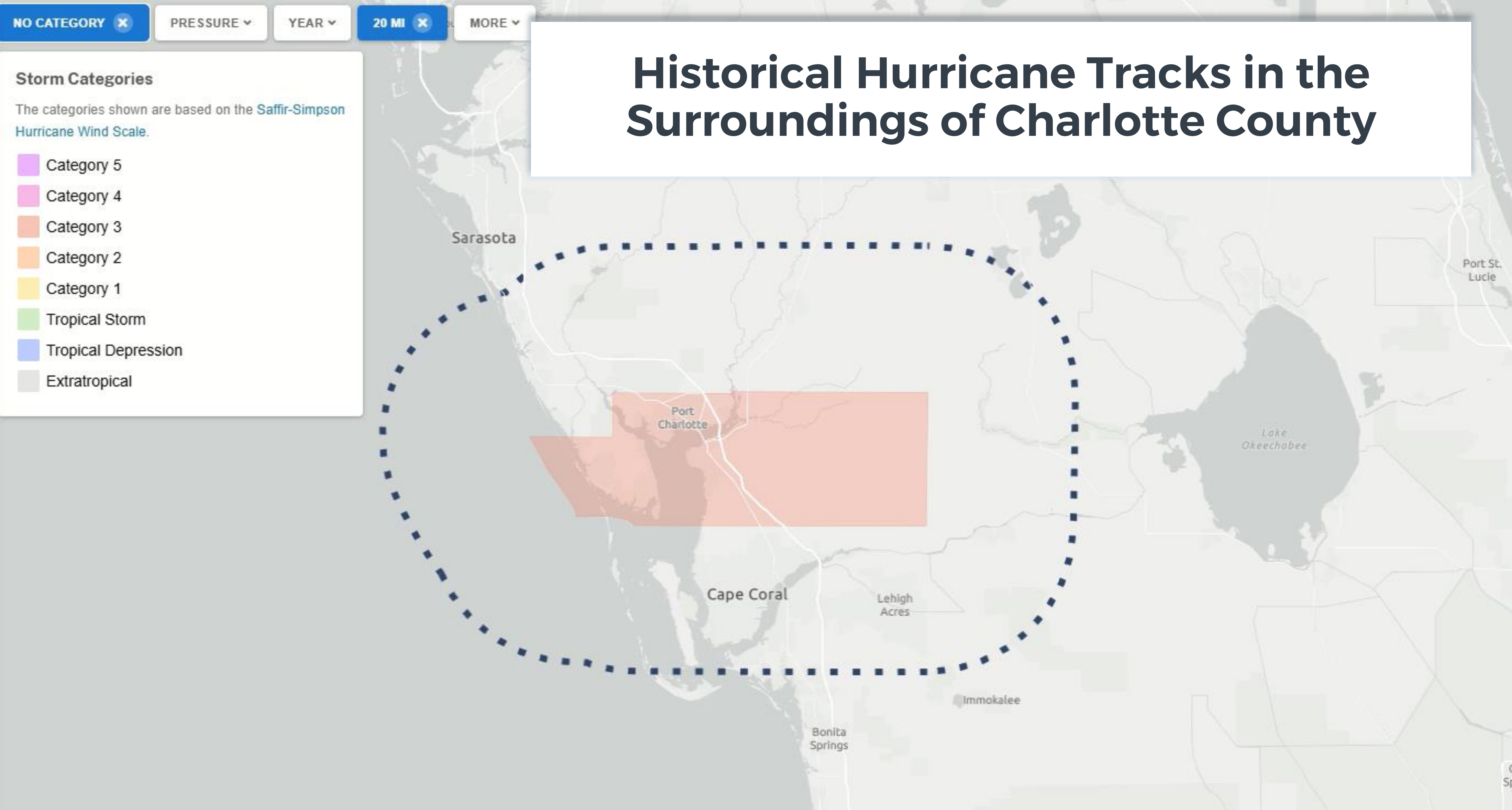
2.2

Acute
Flood Risk

Sudden, severe flooding from major coastal storms

More Severe &
Frequent Storm Surge

Historical Hurricane Tracks in the Surroundings of Charlotte County



[Historical Hurricane Tracks]

What is the 100-year event?

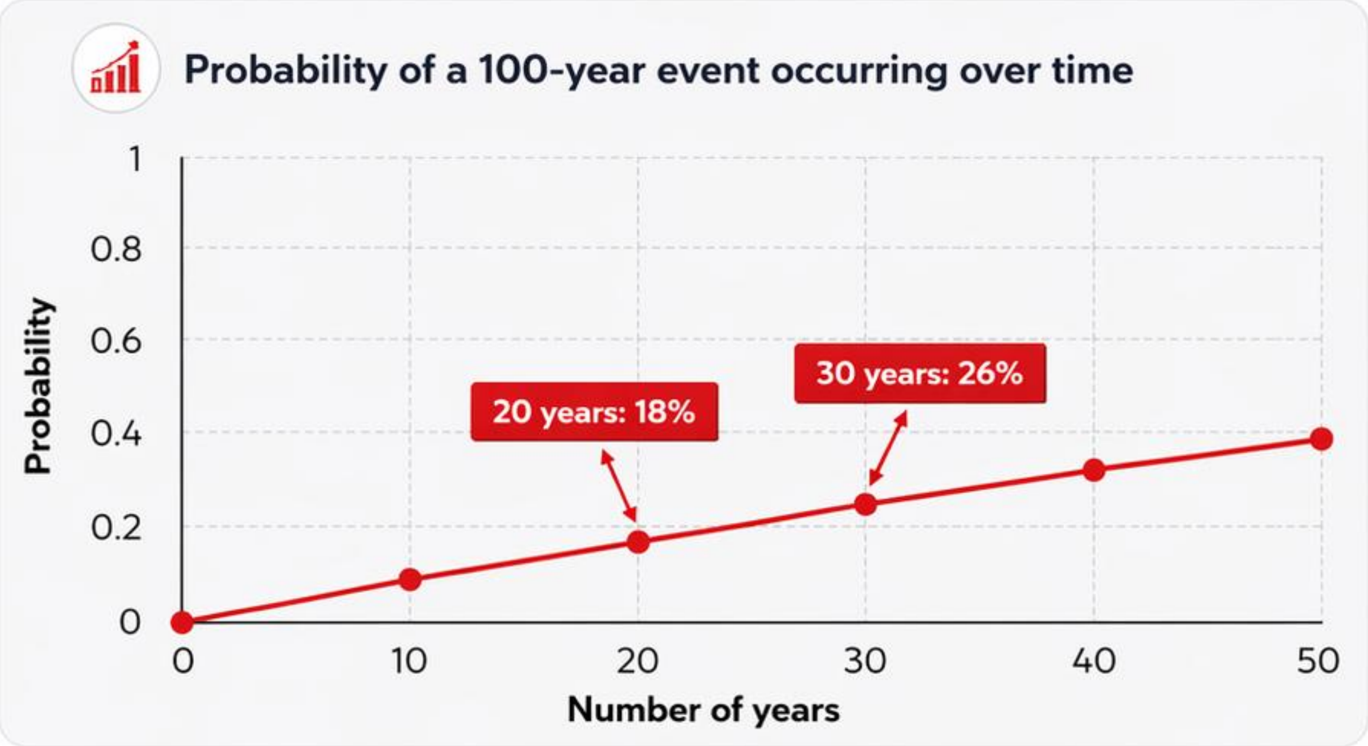
A 100-year event is a type of flood that has a **1% chance** of occurring in **any given year**.

It happens ~~once~~ every 100 years

This is a common misconeption. 100-year events can (and do) occur more than once within shorter time periods.

A type of hazard event that has a 1% chance of happening in any given year. (estimated)

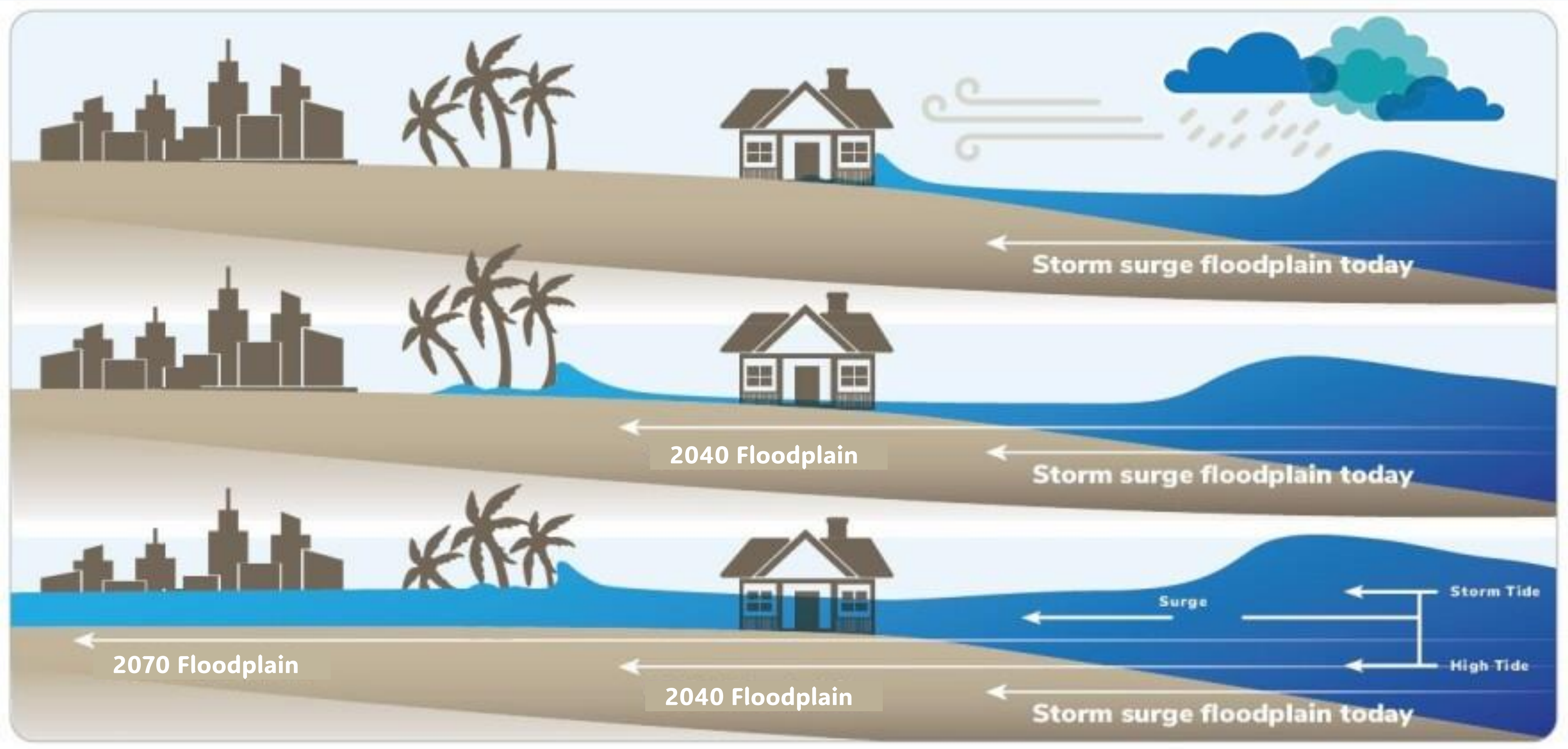
This probability remains the same each year.



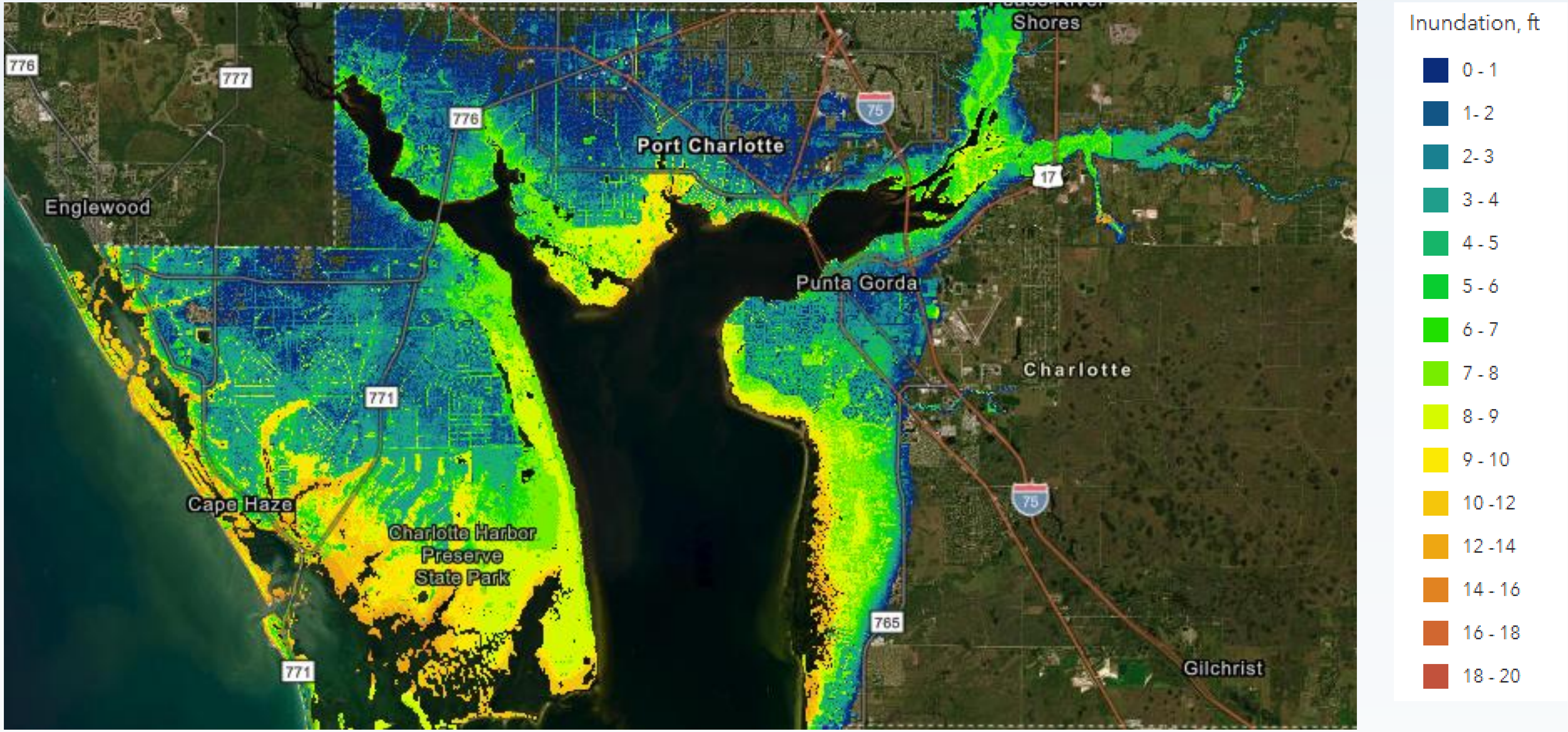
Used to support flood risk assessment, planning, and decision-making.

Changing future conditions affect these hazards :

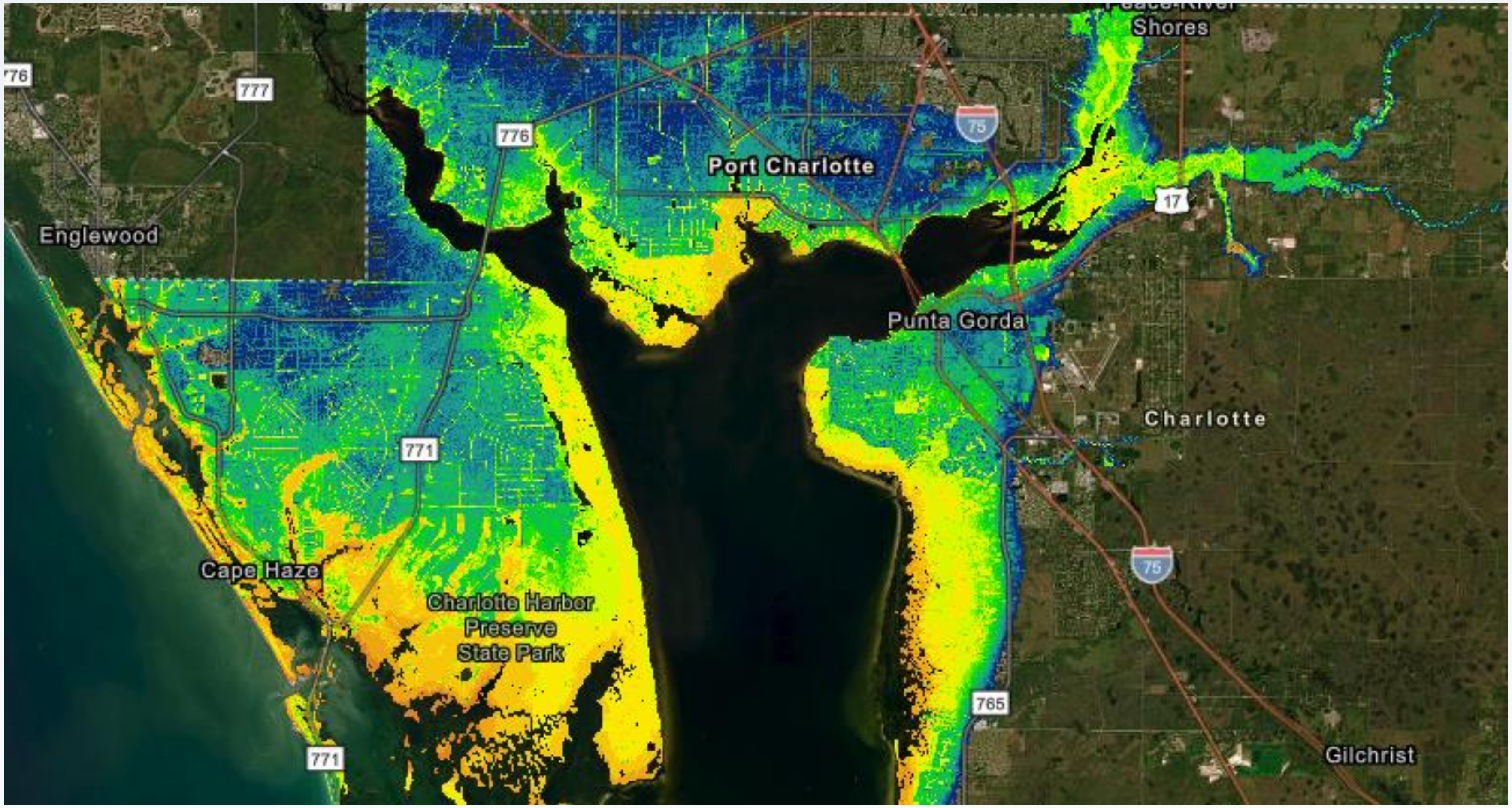
Deeper flood depths and **more extensive** flooding



1% Storm Surge Flood Risk, Current Sea Level Conditions



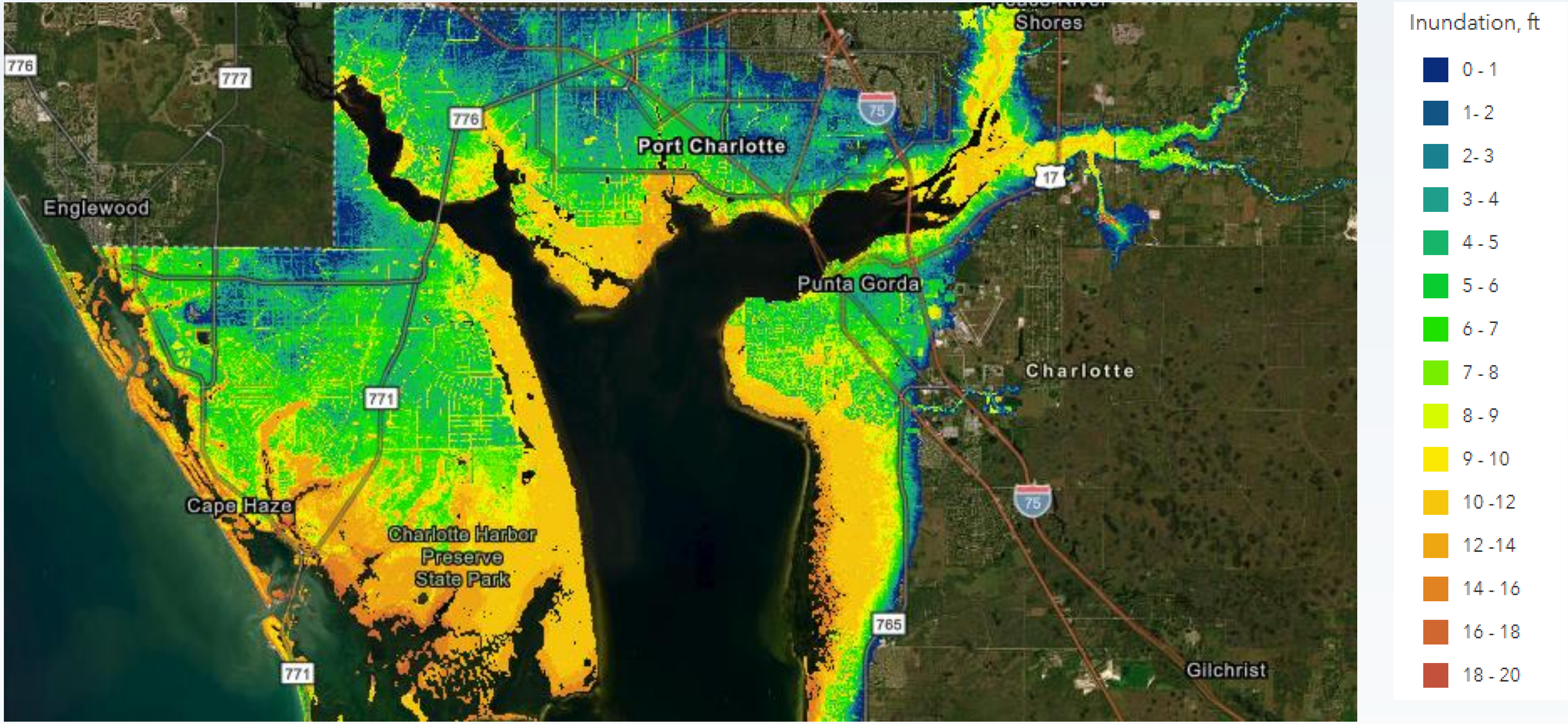
1% Storm Surge Flood Risk, 1 ft Sea Level Change (2040)



Inundation, ft

- 0 - 1
- 1 - 2
- 2 - 3
- 3 - 4
- 4 - 5
- 5 - 6
- 6 - 7
- 7 - 8
- 8 - 9
- 9 - 10
- 10 - 12
- 12 - 14
- 14 - 16
- 16 - 18
- 18 - 20

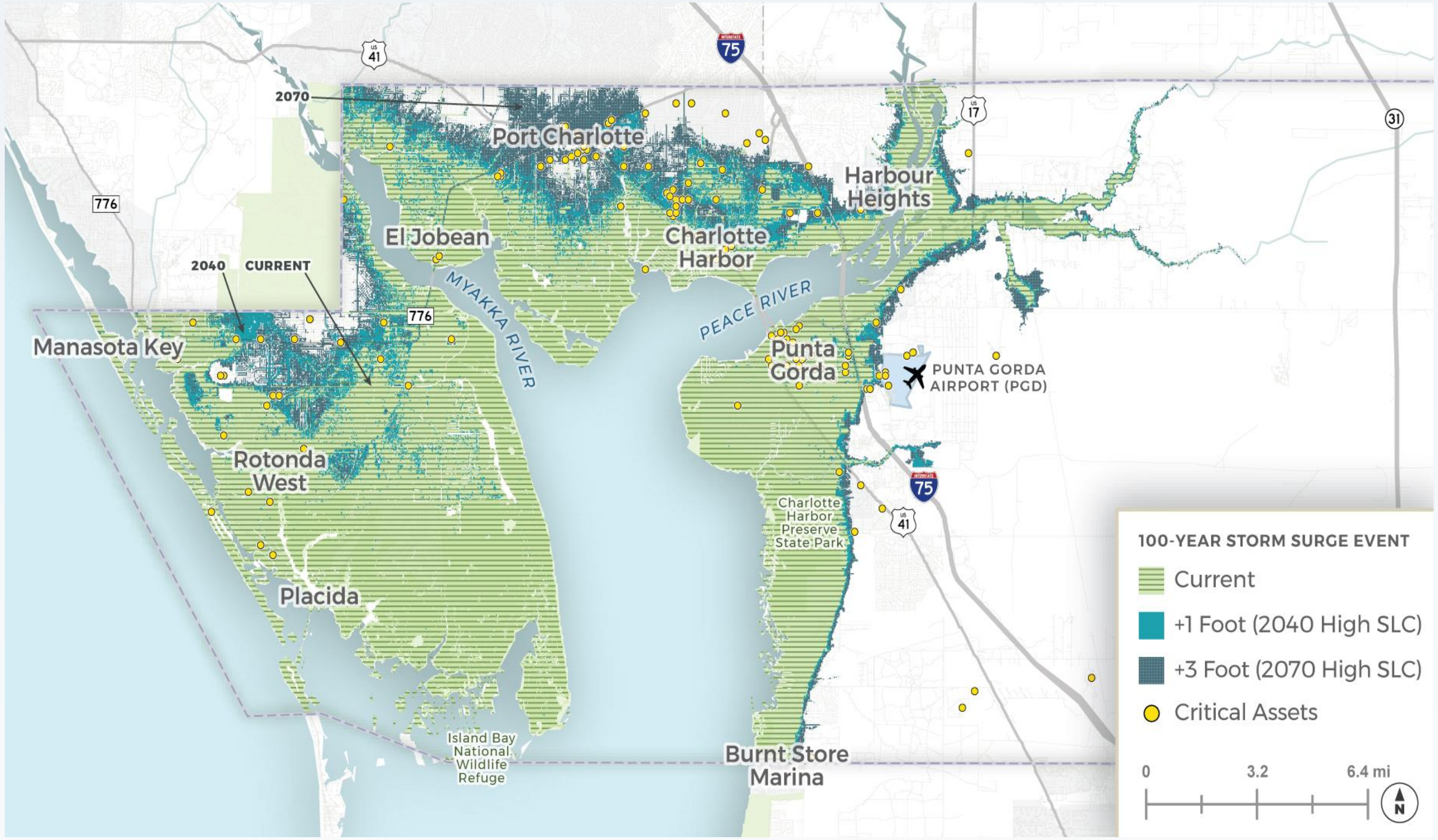
1% Storm Surge Flood Risk, 3 ft Sea Level Change (2070)



Storm Surge

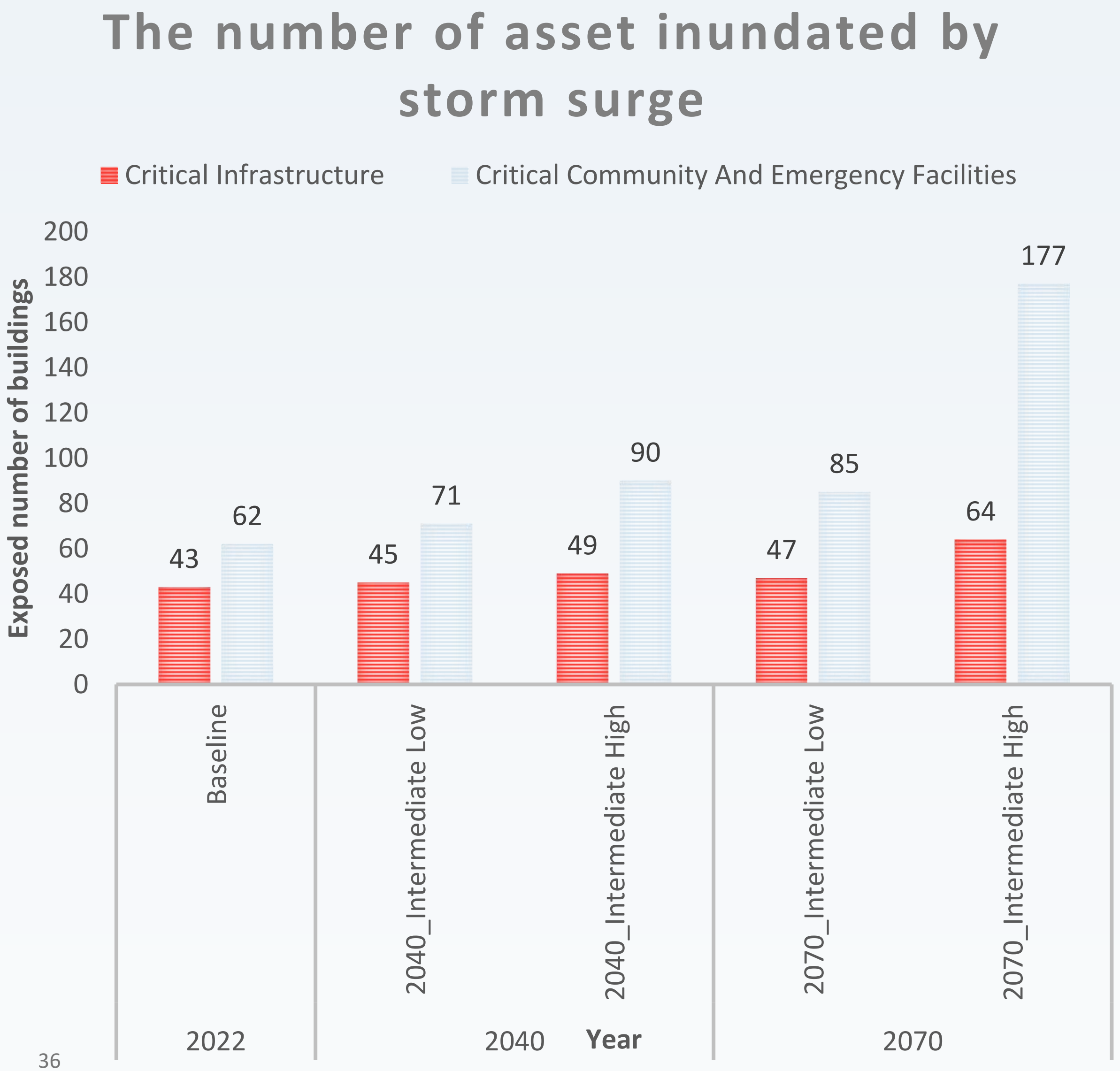
Driven by hurricanes and tropical storms, storm surge presents an immediate and severe flood risk to coastal areas.

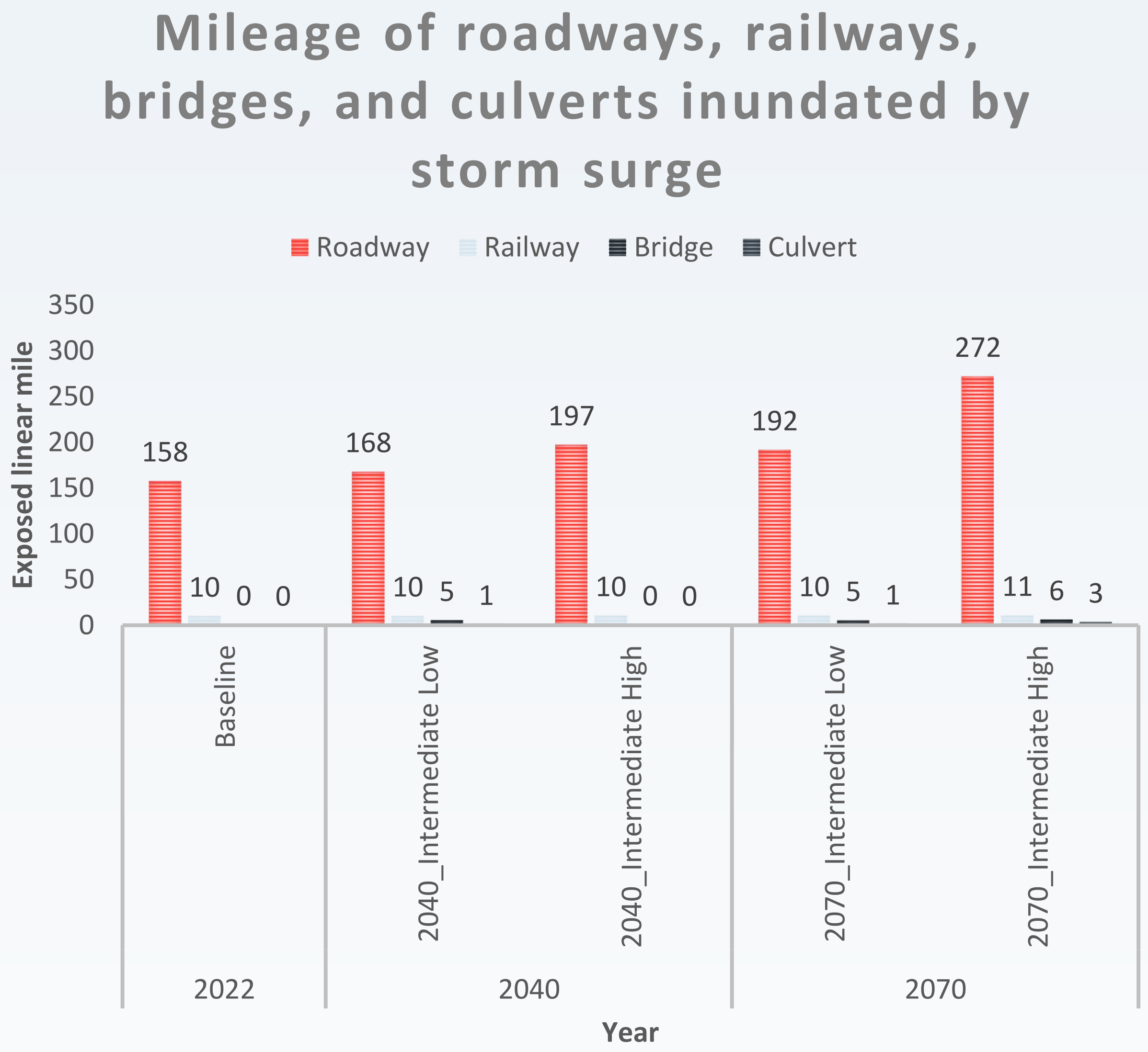
Estimated 1% annual surge-induced flooding event for the county



Source: ACUNE, (2022).

Inundation by Storm Surge





Preliminary Evaluation Summary

Percentage of county land area inundated under each scenario. Given Charlotte County’s position adjacent to both coastal and riverine areas, these results are consistent with expectations.

HAZARD TYPE

Tidal Flooding

YEAR	INTERMEDIATE LOW	INTERMEDIATE HIGH
2040	2% of county land	4% of county land
2070	3% of county land	8% of county land

HAZARD TYPE

Storm Surge (100-year)

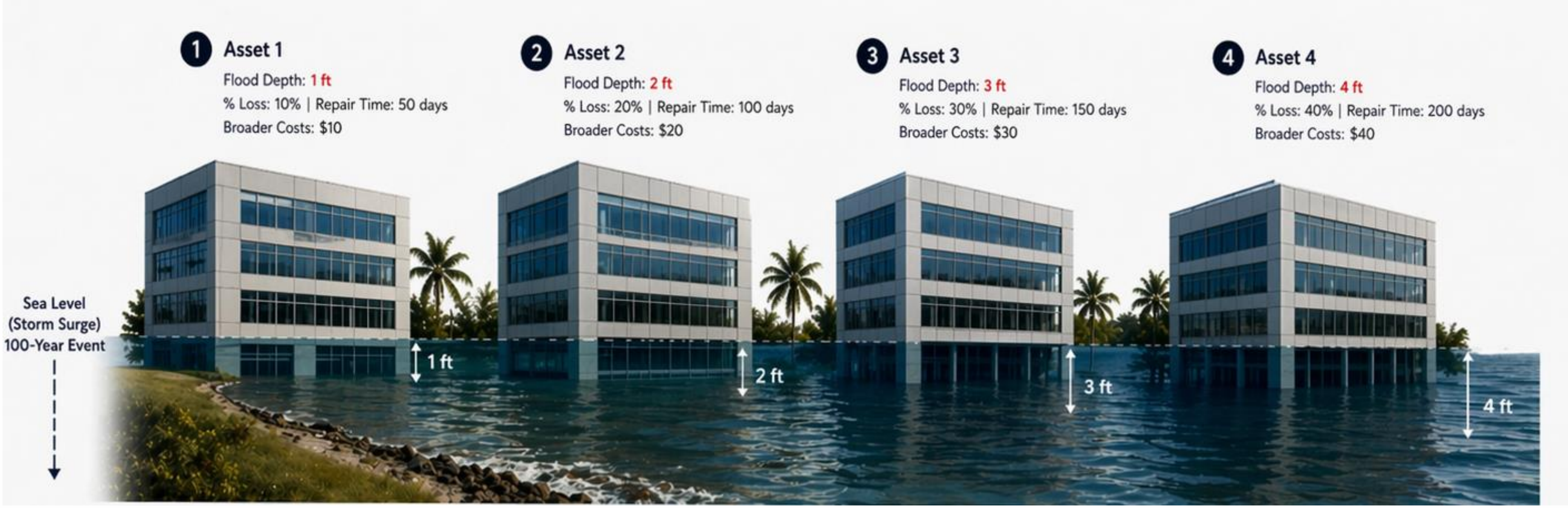
YEAR	INTERMEDIATE LOW	INTERMEDIATE HIGH
2040	21% of county land	22% of county land
2070	22% of county land	26% of county land

KEY TAKEAWAY

While tidal flooding exposure remains modest (2–8%), **storm surge is the dominant threat**, putting up to a quarter of county land at risk, consistent with Charlotte County’s coastal and riverine geography.

Methodology Used to Calculate Consequence Costs for Each County Asset (Conceptual)

	Asset 1	Asset 2	Asset 3	Asset 4
Flood Depth (ft) for the Analysis Storm	1 ft	2 ft	3 ft	4 ft
% Loss (building & contents)	10%	20%	30%	40%
Repair Time (days)	50	100	150	200
Broader Economic Costs (relocation, rental, etc.)	$10	$20	$30	$40



Under the same 100-year storm surge event (same sea level), flood depth increases as elevation decreases.
This leads to greater losses, longer repair times, and higher economic costs for assets closer to the coast.

Data Source: Federal Emergency Management Agency Research

Prioritization Framework

KEY CONSIDERATIONS

1

Flood Depths
from a 100 Year Event

2

Consequence Assessment
Cost of damage for the associated flood depth

3

Community Importance
Asset importance to community cohesion in the recovery period

PRIORITIZATION BASIS

$

COMMUNITY COST

Costs of Damage and Service Loss

Quantified dollar value of potential damage and lost services

Y/
N

BROADER COMMUNITY IMPACT

Impacts to Broader Community During Recovery

Qualitative assessment of community recovery disruption

To be decided by stakeholder discussion and next-phase planning

Prioritization List

Critical facilities assessed across time horizons • 41 facilities included • Current priority based on Costs of Damage and Service Loss • Further refinement based on broader community impact

CURRENT CONDITIONS

Today

15 facilities at risk

● 4 High ● 5 Medium ● 6 Low

HIGH PRIORITY (4)

- Myakka River Elementary School
- Charlotte High School
- Baker Center Head Start
- Lemon Bay High School

MEDIUM PRIORITY (5)

- Punta Gorda Middle School*
- Life Care Center of Punta Gorda
- Justice Center
- Meadow Park Elementary School
- Neil Armstrong Elementary School

SLR = 1 FT

2040

19 facilities at risk

● 12 High ● 1 Medium ● 6 Low

HIGH PRIORITY (12)

- All 4 from Today + 8
- Punta Gorda Middle School*
- Life Care Center of Punta Gorda
- Justice Center
- Meadow Park Elementary School
- Neil Armstrong Elementary School
- Peace River Elementary School *
- Sallie Jones Elementary School*
- Deep Creek Elementary School *

MEDIUM PRIORITY (1)

- Verandas Of Punta Gorda*

SLR = 3 FT

2070

41 facilities at risk

● 15 High ● 10 Med ● 16 Low

HIGH PRIORITY (15)

- All 12 from 2040 + 3
- Port Charlotte Artificial Kidney Center
- Florida Southwestern State College
- Medical Examiner*

MEDIUM PRIORITY (10)

- County Administration*
- Charlotte County Community Development
- Port Charlotte High School *
- and 7 others

Facilities marked with an asterisk (*) include one or more buildings assumed to have a first-floor elevation of 0.5 ft due to data limitations and may require further evaluation.

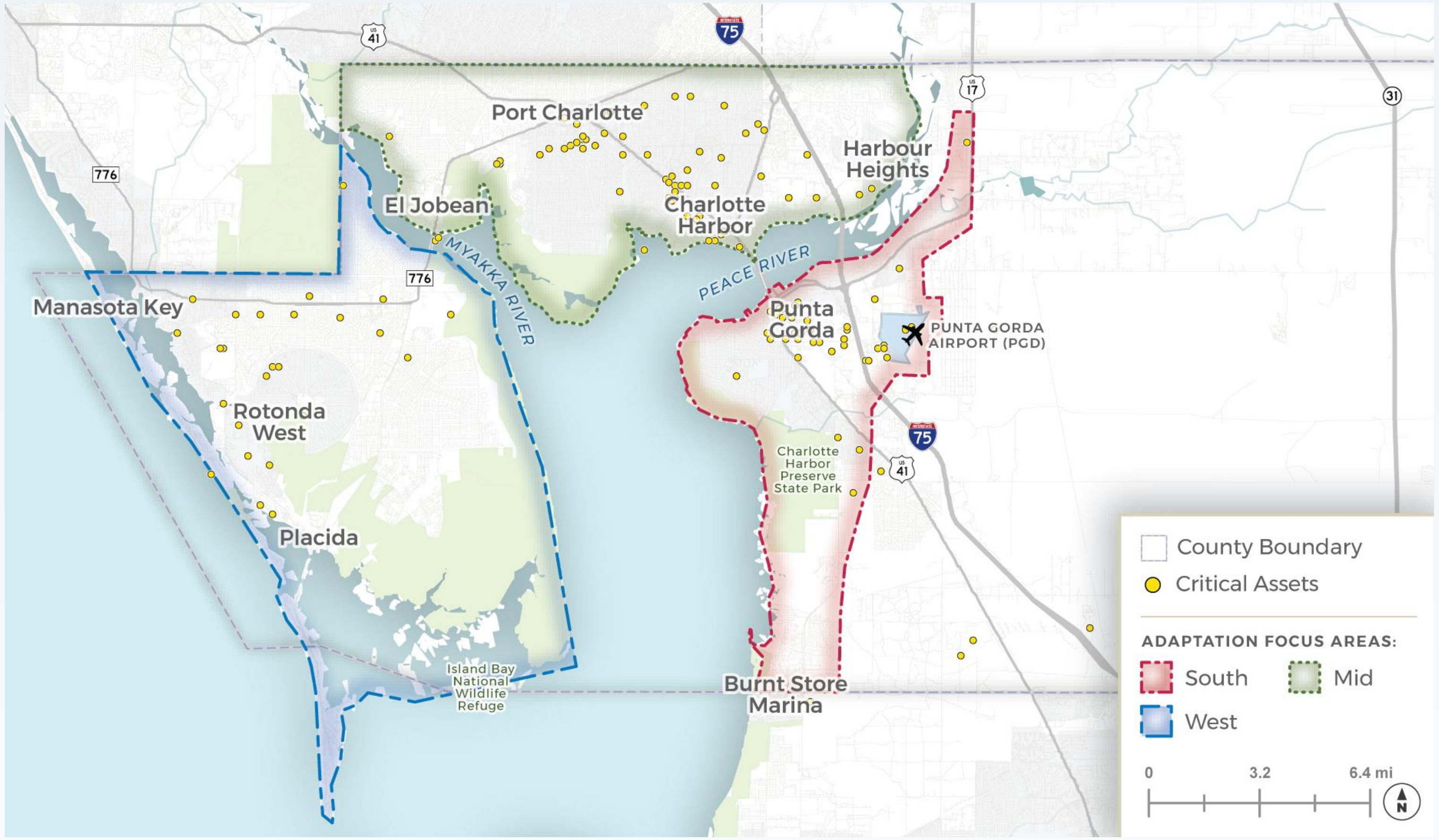
03

Advancing Towards Strategic Decision-making

Translating vulnerability insights into prioritized actions, investment strategies, and resilience recommendations

County Adaptation Focus Areas

- State regulations require “**focus areas**” in resilience planning: specific zones where mitigation actions are needed based on vulnerability findings.
- Charlotte County has designated three focus areas: **south, mid, and north**, to pinpoint risks and guide targeted adaptation strategies.



Recommended Actions

Countywide Planning & Policy

Risk Assessment & Data Integration

- Expand risk inventory to private residential property, social & economic concerns
- Integrate climate projections into land-use & capital planning

Floodplain Management & Development Policy

- Strengthen freeboard requirements to 500-year flood level
- Set roadway accessibility standards in flood-prone areas
- Encourage elevation retrofits for high-risk structures

Nature-Based Solutions & Risk Reduction

- Restore wetlands & deploy green stormwater infrastructure
- Evaluate voluntary buyout/retreat programs for repetitive loss areas
- Incorporate land acquisition strategies to create natural buffer/retention areas

Funding & Implementation

- Scan federal & state funding sources (FEMA, IIJA, FDEP)
- Strengthen cross-department resilience coordination

Community Engagement

- Launch public education campaign on flood risks & county actions

Recommended Actions

Facility-Specific Actions — Infrastructure & Emergency Services

Wastewater Treatment

- Elevate or floodproof critical treatment equipment
- Improve power redundancy with backup generators
- Upgrade drainage around wastewater facilities
- Develop emergency response procedures for service continuity
- Explore solar + battery storage for lift station resilience

Emergency Response (Fire Stations)

- Elevate electrical, comms & generators above flood levels
- Install deployable flood barriers at entry points
- Relocate vehicle storage from high-risk flood zones
- Ensure backup power & comms during prolonged floods

Healthcare Facilities

- Elevate or floodproof mechanical & medical support systems
- Protect backup power and fuel storage from floodwater
- Install flood barriers at building access points
- Develop contingency plans for critical medical services

Recommended Actions

Facility-Specific Actions — Public Services & Government

Schools & Shelter Facilities

- Elevate electrical, HVAC & generators above flood levels
- Improve stormwater drainage around campuses
- Retrofit selected schools as flood-resilient shelters
- Floodproof building entrances and utility rooms

Community Facilities

- Elevate or floodproof critical mechanical & electrical equipment
- Improve site drainage and install localized flood protection
- Retrofit facilities to support emergency operations

Local Government & Admin

- Protect critical IT infrastructure from flood exposure
- Elevate electrical & comms equipment above flood levels
- Ensure backup power systems are surge-protected

Recommended Actions

Facility-Specific Actions — Parks, Transportation & Homeowners

Parks & Natural Areas

- Revise Resiliency Master Plan for resilience strategies
- Establish living shorelines on waterfront parks
- Plant native vegetation that can withstand high storm surge events
- Modernize/enhance stormwater systems using resilient design strategies

Transportation Infrastructure

- Deploy green infrastructure (bioswales, permeable surfaces) near bridges
- Integrate flood-resilient design into road & bridge upgrades

Homeowner Flood Resilience

- Encourage property-level mitigation (elevate utilities, flood barriers)
- Build partnerships for residential resilience funding access
- Provide education & outreach on flood risk strategies

04

Discussion and Next Steps

Key questions, priority actions, and a path forward

for Charlotte County’s resilience strategy

Strategic Planning, Investment & Shared Responsibility

Foundational components for an advanced decision-support system

Decision Support

- Estimate costs of sea level rise & storm surge impacts
- Inform effective capital investment priorities
- Implement an advanced decision-support system

Shared Responsibility

- Landowners, developers & businesses in at-risk areas
- Residents and community stakeholders
- Government agencies providing critical services

Proactive Resilience

- Integrate flood risks into public & private strategies
- Ensure resilient communities & sustained infrastructure
- Move from uncertainty to decisive action

Sea level change and storm surge are no longer uncertain possibilities — they must now be integrated into both public and private decision-making.

This is a start...

The VAAP is a first step

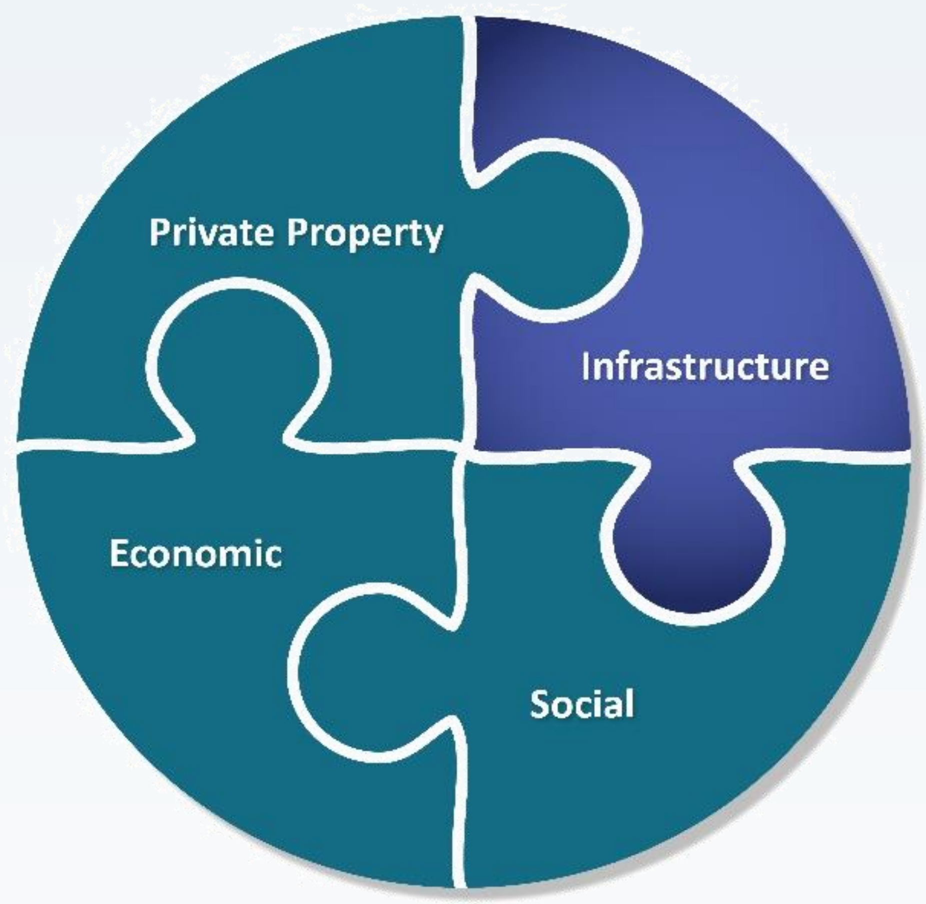
This plan establishes the foundation for enhancing Charlotte County's resilience to climate change. Additional action is needed to implement its findings.

Critical infrastructure identified

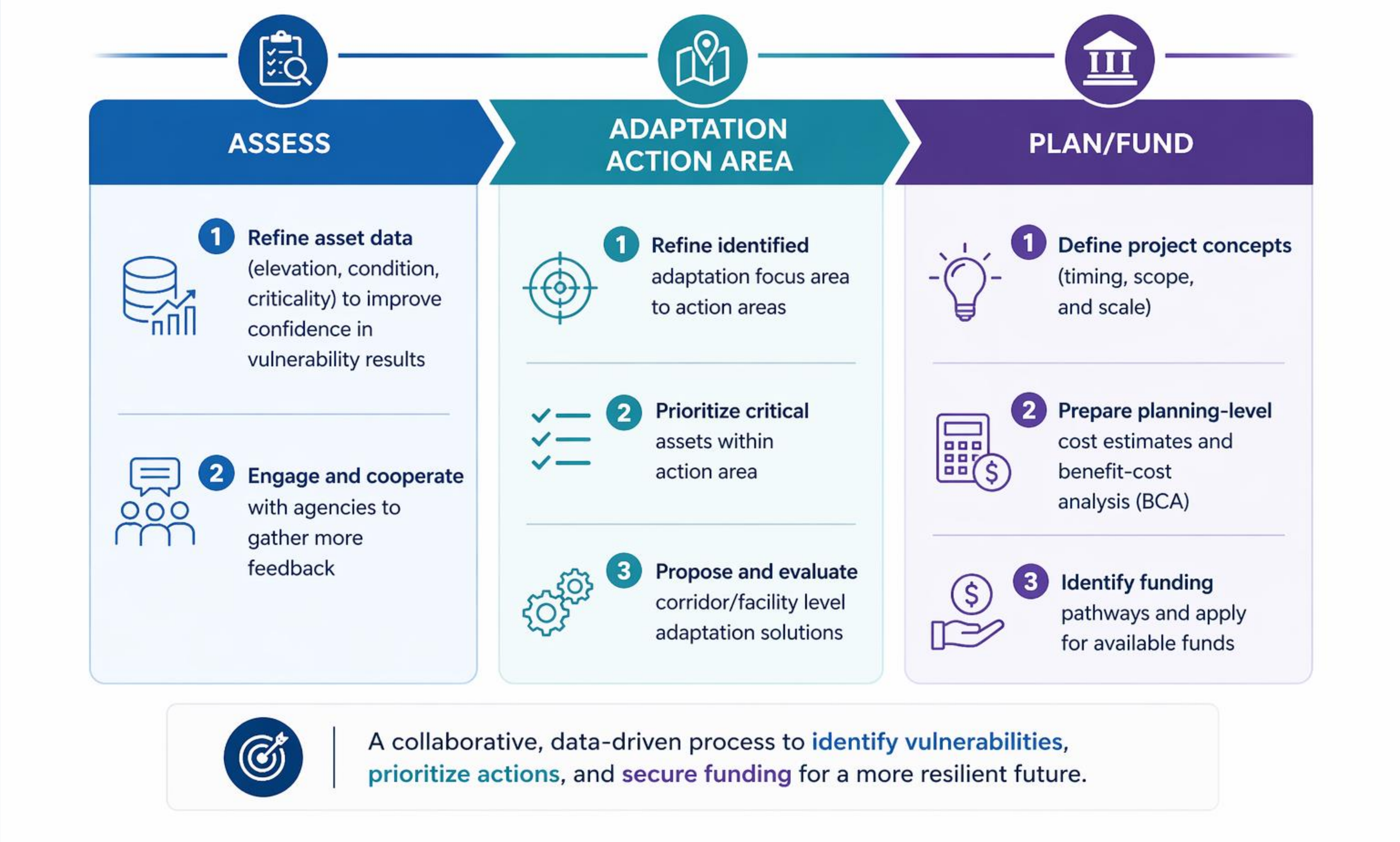
The FDEP framework provides a first pass at understanding flood risk, focusing on critical assets where action should be taken first.

Community-wide resilience matters

Prioritizing resilience should also consider the broader consequences of disruption to county systems and community services.



Next Steps


ASSESS
1 Refine asset data (elevation, condition, criticality) to improve confidence in vulnerability results
2 Engage and cooperate with agencies to gather more feedback
ADAPTATION ACTION AREA
1 Refine identified adaptation focus area to action areas
2 Prioritize critical assets within action area
3 Propose and evaluate corridor/facility level adaptation solutions
PLAN/FUND
1 Define project concepts (timing, scope, and scale)
2 Prepare planning-level cost estimates and benefit-cost analysis (BCA)
3 Identify funding pathways and apply for available funds
A collaborative, data-driven process to identify vulnerabilities, prioritize actions, and secure funding for a more resilient future.

Thank you!

Second Public Meeting

May 2026

Appendix C: ACUNE Sufficiency Analysis

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CHARLOTTE COUNTY COMPREHENSIVE VULNERABILITY ASSESSMENT

CLIENT:

CHARLOTTE COUNTY, FL

FUNDED BY:

COASTAL & HEARTLAND NATIONAL ESTUARY PARTNERSHIP (CHNEP)

APPENDIX C: ACUNE SUFFICIENCY ANALYSIS

DATE: JUNE 2026

WSP USA

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INTRODUCTION

This report describes the applicability/sufficiency of utilizing the ACUNE model (ACUNE-SWFL GeoTool – University of Florida), including the input model build data files and the output flood data to assess its applicability to complete this project work. This is being done to complete the coastal flooding portion of an effective and compliant-to-state-code vulnerability assessment (VA). Scope material provided by the county identified a few primary questions to be addressed, as being important for this assessment:

- Do the model and the parameters applied in its development for changes in sea levels and storm surge meet the requirements as established by the Florida Department of Environmental Protection (FDEP)?
- Can the data generated by the county for various planning purposes since the completion of the ACUNE study be utilized as a means to reflect updated/current planning assumptions embedded in the VA analysis?
- Do any updates need to be made to the data embedded in the ACUNE analysis to meet the requirements for a compliant VA?
- Do the data and information generated by the ACUNE model enable the county to complete a fully compliant VA across all requirements?
- Are there actions that can be undertaken to "enhance the accuracy" and utility of the model in generating beneficial products for completing the VA and "telling the story" of current and future flood risk to county residents and stakeholders?

DEVELOPMENT OF THE FDEP VA REQUIREMENTS

This document references different versions of the FDEP compliance requirements as these requirements have been updated many times over the years. To facilitate review, Table 1 has been prepared, highlighting in red text the changes that were implemented in successive versions.

The County received confirmation from FDEP on November 20th, 2024, that, for this project, the standards from 2022 would be applied in ensuring compliance with code requirements, as that was the guidance in place when the ACUNE model was initially developed. The correspondence is in Exhibit A: DEPs Grandfathering Correspondence.

Table 1 FDEP VA Compliance Checklist Versions

VULNERABILITY ASSESSMENT COMPLIANCE CHECKLIST CERTIFICATION					
Compliance Checklist 07.29.22		Compliance Checklist 12.15.23		Compliance Checklist - Latest	
				A	The Final VA Report includes the Department's logo and funding source language, pursuant to Attachment 6 of the grant agreement
a	Final Vulnerability Assessment Report that provides details on the results and conclusions, including illustrations via maps and tables.	A	Final Vulnerability Assessment Report that provides details on the results and conclusions, including illustrations via maps and tables.	B	Final Vulnerability Assessment Report that provides details on the results and conclusions, including illustrations via maps and tables.
b	Geospatial data in an electronic file format.	B	Geospatial data in an electronic file format.	C	Geospatial data in an electronic file format.
c	GIS metadata.	C	GIS metadata.	D	GIS metadata.
d	List of critical assets for each jurisdiction, including regionally significant assets, that are impacted by flooding and sea level rise. The list must be prioritized by area or immediate need and must identify which flood scenario(s) impacts each asset	D	List of critical assets for each jurisdiction, including regionally significant assets, that are impacted by flooding and sea level rise. The list must be prioritized by area or immediate need and must identify which flood scenario(s) impacts each asset. Critical assets and regionally significant assets are as defined in subsection 380.093(2), F.S.	E	List of critical assets for each jurisdiction, including regionally significant assets, that are currently, or within 50 years are reasonably expected to be, impacted by flooding and sea level rise. The list must be prioritized by area or immediate need and must identify which flood scenario(s) impacts each asset. Critical assets and regionally significant assets are as defined in subsection 380.093(2), F.S.
e	Peril of Flood Compliance Plan amendments developed that address paragraph 163.3178(2)(f), F.S., if applicable. ☐ Not applicable ☐ Already in compliance	E	Peril of Flood Comprehensive Plan amendments developed that address paragraph 163.3178(2)(f), F.S. (if applicable) ☐Noncoastal community/Peril of Flood not required ☐Already in compliance	F	Peril of Flood Comprehensive Plan amendments developed that address paragraph 163.3178(2)(f), F.S. (if applicable) ☐Noncoastal community/Peril of Flood not required ☐Already in compliance
f	Depth of tidal flooding, including future high tide flooding, using thresholds published and provided by the Department.	F	Depth of tidal flooding, including future high tide flooding. The threshold for tidal flooding is 2 feet above mean higher high water. (if applicable)	G	Depth of tidal flooding, including future high tide flooding. The threshold for tidal flooding is 2 feet above mean higher high water. (if applicable)
g	To the extent practicable, analysis geographically displays the number of tidal flood days expected for each scenario and planning horizon. (optional)	G	Analysis geographically displays the number of tidal flood days expected for each scenario and planning horizon. (to the extent practicable)	G.1	Analysis geographically displays the number of tidal flood days expected for each scenario and planning horizon. (to the extent practicable)
h	Depth of current and future storm surge flooding using publicly available NOAA or FEMA storm surge data. (check one) ☐NOAA data ☐FEMA data	H	Depth of current and future storm surge flooding using publicly available NOAA or FEMA storm surge data. (check one, if applicable) ☐ NOAA data ☐ FEMA data	H	Depth of current and future storm surge flooding using publicly available Florida Flood Hub (FFH) data.
				H.1	In the absence of FFH data, publicly available NOAA or FEMA storm surge data may be used. (check one, as applicable) (check one, if applicable) ☐ NOAA data ☐ FEMA data
i	Initial storm surge event equals or exceeds current 100-year flood event.	H.1	☐ Initial storm surge event equals or exceeds current 100-year flood event. (if applicable)	H.2	☐ Initial storm surge event equals or exceeds current 100-year flood event. (if applicable)
j	Higher frequency storm analyzed for exposure of a critical asset. (optional, but must provide additional detail if included)	H.2	☐ Higher frequency storm analyzed for exposure of a critical asset. (optional, but must provide additional detail if included)	H.3	☐ Higher frequency storm analyzed for exposure of a critical asset. (optional, but must provide additional detail if included)
k	To the extent practicable, rainfall-induced flooding was considered using spatiotemporal analysis or existing hydrologic and hydraulic modeling results. (required if item e is not applicable)	I	Rainfall-induced flooding was considered using spatiotemporal analysis or existing hydrologic and hydraulic modeling results. (to the extent practicable but required if item e is noncoastal)	I	Rainfall-induced flooding was considered using GIS-based spatiotemporal analysis or existing hydrologic and hydraulic modeling results. (to the extent practicable but required if item F is noncoastal)
l	Future boundary conditions have been modified to consider sea level rise and high tide conditions. (optional)	I.1	☐ Future boundary conditions have been modified to consider sea level rise and high tide conditions. For rainfall-induced flood modeling, the model inputs for the 2040/2070 rainfall scenarios should use projected sea level rise/high tide conditions. (if applicable)	I.1	☐ Future boundary conditions have been modified to consider sea level rise and high tide conditions. For rainfall-induced flood modeling, the model inputs for the 2050/2080 rainfall scenarios should use projected sea level rise/high tide conditions. (if applicable)
m	Depth of rainfall-induced flooding for 100-year storm and 500-year storm event. (required if item e is not applicable)	I.2	☐ Depth of rainfall-induced flooding for 100-year storm and 500-year storm event. (required if item e is noncoastal)	I.2	☐ Depth of rainfall-induced flooding for 100-year storm and 500-year storm event as defined by the applicable water management district (WMD). (required if item e is noncoastal)
				I.3	☐ If WMD data is not available, data from an appropriate federal agency as used. A
n	To the extent practicable, compound flooding or the combination of tidal, storm surge, and rainfall-induced flooding. (optional)	J	Compound flooding or the combination of tidal, storm surge, and rainfall-induced flooding. (to the extent practicable)	J	Compound flooding or the combination of tidal, storm surge, and rainfall-induced flooding. (to the extent practicable)
o	All analyses performed in North American Vertical Datum of 1988.	K	All analyses in North American Vertical Datum of 1988.	K	All analyses in North American Vertical Datum of 1988.
p	Includes at least two local sea level rise scenarios, which must include the 2017 NOAA intermediate-low and intermediate-high sea level rise projections.	L	Includes at least two local sea level rise scenarios, which must include the 2017 NOAA intermediate-low and intermediate-high sea level rise projections	L	Includes at least two local sea level rise scenarios, which must include the 2022 NOAA intermediate-low and intermediate sea level rise projections
q	Includes at least two planning horizons, which must include years 2040 and 2070.	M	Includes at least two planning horizons, which must include years 2040 and 2070.	M	Includes at least two planning horizons, which must include years 2050 and 2080.
				N	Utilizes local sea level data maintained by the FFH
r	Utilizes local sea level data that has been interpolated between the two closest NOAA tide gauges	N	Utilizes local sea level data that has been interpolated between the two closest NOAA tide gauges.	N1	☐In the absence of FFH data, local sea level data that has been interpolated between the two closest NOAA tide gauges. (as applicable)
s	Local, publicly available, sea level data was taken from one of the two closest NOAA tide gauges, which must be the gauge with the highest mean sea level (if so, provide Department approval).	N1	☐ Local, publicly available, sea level data was taken from one of the two closest NOAA tide gauges. Data may be taken from one such gauge if the gauge has a higher mean sea level. (if checked, provide Department approval).	N2	☐ Local, publicly available, sea level data was taken from one of the two closest NOAA tide gauges. Data may be taken from one such gauge if the gauge has a higher mean sea level.
				N3	☐ An alternate tide gauge with appropriate rationale and Departmental approval. (if checked, provide Department approval)

BACKGROUND ON THE ACUNE MODEL DEVELOPMENT

Charlotte County has invested significant resources in developing an analysis capability for conducting a vulnerability assessment on coastal communities and assets. These efforts have direct applicability to the ongoing vulnerability assessment, leading to important and critical information being provided to county residents, stakeholders, and - most critically – key county decision-makers. The efforts have included the development of the ACUNE model, completed by the University of Florida (UF), to analyze through hydrological modeling the environmental/coastal conditions that are of greatest concern to the county, those being:

- Higher sea levels, and
- Storm flooding conditions (extents and depths) associated with the statistically generated 1% annual exceedance probability coastal event (i.e., a 100-year storm).

The analysis results showed how tidal inundation and storm surge might be impacted by higher sea levels and how these conditions could then impact the county. These results were used to identify and communicate the potential changing chronic conditions (increased tidal inundation) and increased acute risks (extreme coastal flooding events) that could occur in the future. This was intended to provide a data foundation with which to support county actions. Figure 1, prepared by the National Oceanic and Atmospheric Administration (NOAA) and modified by WSP, shows conceptually how changing flood levels and the resulting risks to the county are not insignificant. Such information suggests that actions need to be taken today to mitigate or avoid future associated risks. As suggested by the figure, the effects of such changing environmental conditions could include:

- Higher water levels for associated storm events,
- Flooding farther inland during an event, and
- Higher wave heights as surge comes ashore, and wave conditions extending farther inland.

Each of these potential conditions creates challenges to the county, requiring policies and other actions to minimize associated risks. Such actions could include capital investments, changes in how future infrastructure and the built environment is planned and designed, mitigation strategies to prevent and minimize the impact of potential flooding, and a host of other strategies and outreach efforts to enhance the county's resilience to expected extreme weather events.

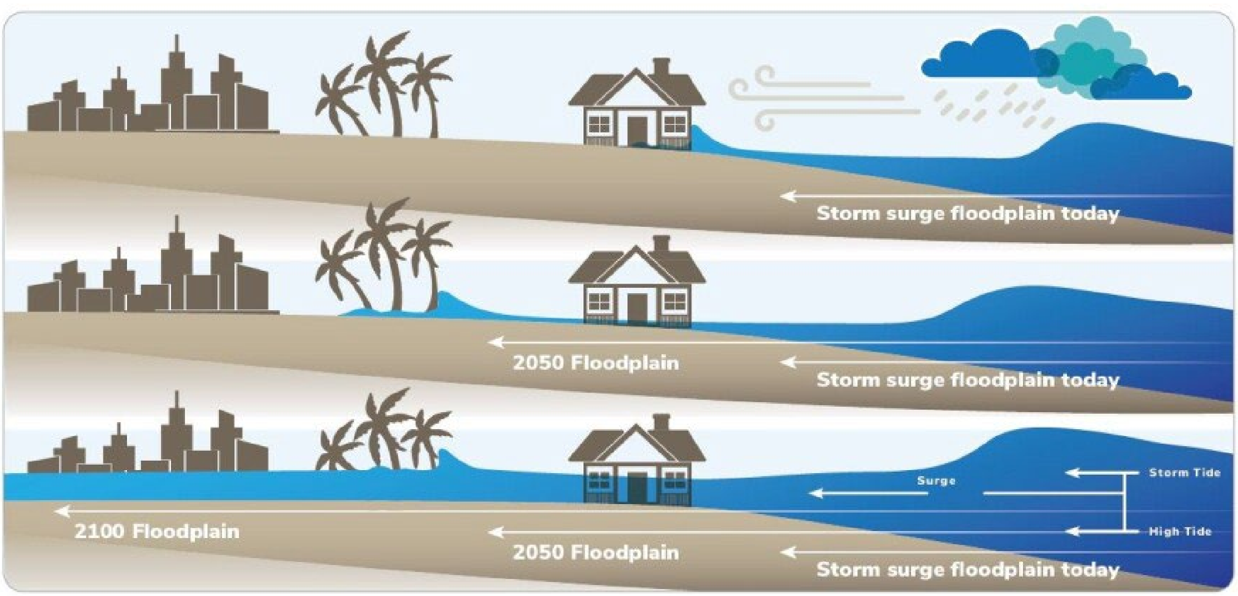

Figure 1 Effects of Increased Coastal Inundation on a Similar Storm Surge Event – Considerations for Policies and Decision-Making

The development and use of a selected storm probability value (e.g., a 100-year event) generated through statistical analysis techniques employed by the modeling team can be an important data point in producing credible information for decision-makers. The Federal Emergency Management Agency's (FEMA's) program relies on such determination as part of its policies for insurance program requirements.

Charlotte county could/should adopt a similar policy structure (guiding policies by storm probabilities) to support its decision-making processes and implementation policies. This recommendation is also supported by the prior actions of the county in investing resources to generate a representation of future 100-year storm surge events, so the data is there. This capability can be leveraged to help drive the development of the vulnerability assessment and help prioritize resilience investments.

TIDAL FLOOD ANALYSIS IN ACUNE

Analysis of the potential impacts of increased coastal inundation need to consider shoreline tidal inundation in order to represent conditions such as mean sea level, high tide, king tide, etc. that are already a concern in the county. The county contracted with UF to generate projections of tidal flooding conditions as a part of its ACUNE model development. This has created a valuable resource for examining potential future conditions and resulting impacts. Since this work was completed, FDEP has updated its requirements for vulnerability assessments to reflect advancements in science, new information from NOAA, and updated policy directions from state agencies related to how future environmental conditions should and will be considered in state and local decision making.

However, it is important to note that while ACUNE is sufficient for understanding general exposure to coastal flooding, the raster outputs generated from the model reflect tidal frequency inundation days by a threshold of feet. Depth of flooding at each asset for each scenario is required to be compliant with FDEP. To achieve full compliance at the asset level, depth of flooding analysis of tidal flooding under different sea level change scenarios must be performed. This level of detail is necessary to assess the functional impact of inundation on specific infrastructure and to guide resilient design or adaptation strategies.

When UF completed its analysis, the most useful estimates for coastal flood levels were contained in a summary document published by NOAA in 2017, which provided water level estimates for different scenarios reflecting future worldwide socioeconomic conditions. FDEP's guidance at that time was to "utilize the 'intermediate-low' and 'intermediate-high' scenarios from the NOAA document to represent a reasonable range of future conditions so as to support effective planning and decision-making.

In 2022, NOAA published updated information reflecting the then most recent science and understandings relative to the rate of change of sea levels worldwide, which had been informed by research on such factors as melting ice thaw rates, etc. State policymakers also designated the future scenarios to use in a vulnerability assessment, reflecting realistic representations of future change in environmental conditions. These scenarios are as before the "intermediate-low" emission scenario and a new "intermediate" scenario.

However, this policy change created a potential gap in the data available from the ACUNE model and its use in a state-compliant VA to current standards. FDEP did confirm that the county may submit a VA compliant with the version of the requirements current at the time of the beginning of the ACUNE effort, and that the agency anticipates the potential release of funding to bring the VA to current standards (see correspondence attached). For the county, it would be a good strategy to request funding to bring the analysis current in the near future – to enable a fuller assessment of requests for funding in a manner consistent with others around the state.

Table 2 shows the difference between what was created by UF for the purposes of generating the ACUNE model outcomes (NOAA 2017) and what represents the current requirements as established by FDEP (NOAA 2022). Note that the two planning horizons have shifted forward to facilitate long-term, capital decision-making.

Table 2 Detailed SLR Estimates for Selected Policy Scenarios for Previous and Updated Requirements (FDEP)

	NOAA 2017		NOAA 2022	
Year	Int.- Low	Int.-High	Int.-Low	Int.
2040	0.37	1.06	0.48	0.52
2050	0.57	1.59	0.68	0.81
2070	0.93	2.96	1.14	1.53
2080	1.13	3.82	1.37	2.06
2090	1.29	4.7	1.57	2.65
2100	1.46	5.69	1.79	3.37
2120	1.75	7.2	2.06	4.09
2150	2.24	10.64	3.07	6.52
*Note - shaded areas show the identified required values as per FDEP				

The ACUNE model outputs are sufficient to meet the updated FDEP requirements for completing a VA that accounts for increased coastal flooding. It is important to reiterate that FDEP has been stating in its public outreach on VA oversight that funding is available to update data to ensure compliance with state requirements for those communities with a work scope originally based on the 2017 NOAA estimates. **So, the county should consider applying for funds now to contract with UF to prepare updated flood model outputs**. The process of updating the models and outputs would likely stretch over 6 months, so starting now would enable the county to be in a good position to get current on state requirements near the end of the VA development process.

STORM SURGE

Storm surge represents a significant threat to several communities in Charlotte County, as evidenced by the storms over the past 2 years. FDEP requirements realize that this is a concern, as does the language in the state code. FDEP identifies the need to understand and define risks from storm surge today and in the future when considering coastal flooding.

The county has through its commitment made to complete the ACUNE modeling a representation of future storm surge that matches (roughly) with an enhanced storm surge with one foot of increased sea levels (NOAA 17 – 2040 "Intermediate High" and 2070 "Intermediate-Low") and 3 feet (NOAA 17 - 2070 "Intermediate-High"). This is credible information with which to complete the VA analysis, develop mitigation actions and policies, and establish priorities and implementation timeframes. This data, combined with the two other scenarios for which surge was analyzed, present a comprehensive look at future conditions within the county.

Importantly, the current ACUNE model outputs have been deemed acceptable by FDEP to meet compliance with the applicable standard at the time of project initiation (2022). What the county does not have is model output data for storm surge values that align with new FDEP guidance on incorporating the 2022 NOAA SLR values in the required analysis. This gap could be interpreted as needing additional analysis and modeling to become compliant with FDEP guidance.

However, it should be noted that FDEP does not link the SLR need to the storm surge requirement in its requirements, which leaves flexible the application of the current data in a compliant VA. The data developed in the previous analysis with the ACUNE model should be sufficient given FDEP guidance. **Moving forward, the county may want to contract with UF to create storm surge layers consistent with the updated SLR values to create a common orientation metric around the analysis, aligning the representation of SLR and storm surge in similar projection values (i.e., NOAA 2022 projections for 2050 and 2080).**

Given the guidance on surge (item h in the compliance table identified for work for this assessment) FDEP will likely request some items from the county specific to the model itself to ensure it complies with its guidance and state code, including:

- Consistency with FEMA or NOAA, which is identified in state guidance. The model leveraged FEMA information and data in its development, so the baseline information is aligned. The images shown in Figures 2 to 4 show that the baseline information is consistent.
- Represents a future condition. FDEP does not specify that surge (like tidal flooding) needs to be consistent with certain sea level change as denoted in other requirements. So, representing a future condition of surge is acceptable, and in this case the county has four scenarios to choose from.

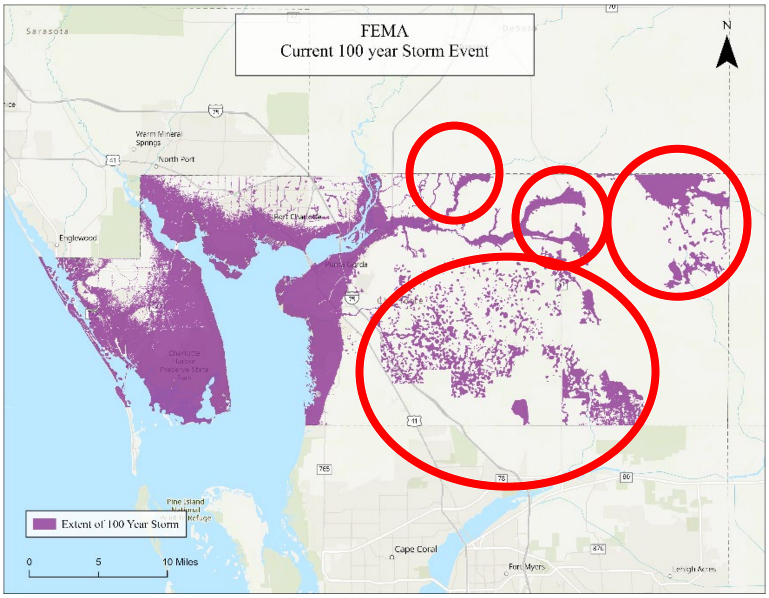

Figure 2 Current FEMA Storm Surge Data for a 100 Year Storm for All Flooding Sources

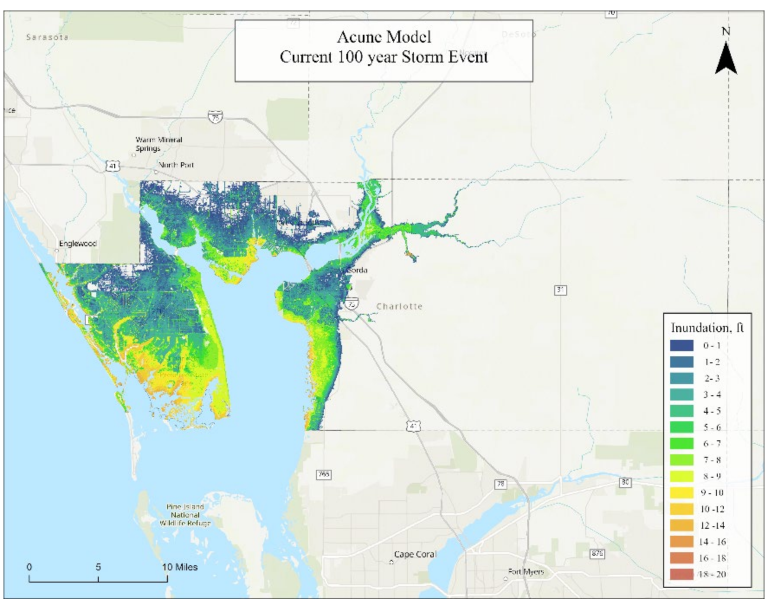

Figure 3 Baseline Model of Future 100 Year Storm - Showing Consistency with FEMA for Flooding in the Coastal Area

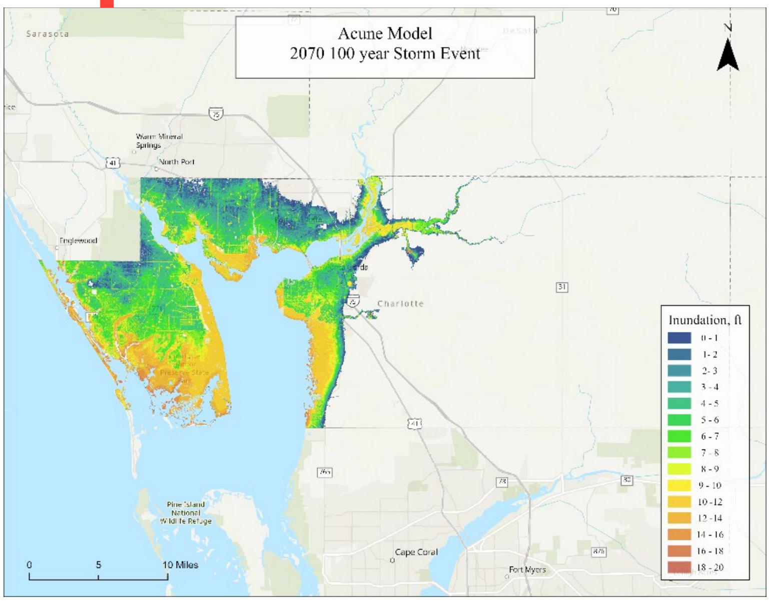

Figure 4 ACUNE Model Output for 2070 100 Year Event (w/ approximately 3' of SLR)

From a compliance standpoint, the storm surge data developed by the ACUNE model is compliant to meet FDEP requirements.

As noted, from a strategic standpoint, the county may want to consider requesting from FDEP funding to develop storm surge data for future scenarios through UF, noting that such data will be important to this and future efforts---and important to overall planning. And FDEP has stated their readiness to support communities in their transition to satisfying requirements under the new state codes.

CRITICAL AND REGIONALLY SIGNIFICANT DATA

Updated coastal flood inundation and storm surge data will need to be analyzed against the input data (infrastructure, etc.) to complete the VA. The county has indicated that changes in the data from development/investments over the last few years should be included in the analysis to represent the most up-to-date assumptions and be most representative of current and future conditions. Such an approach is recommended for the VA, with the following considerations:

- All updated data should be in hand before conducting the VA. This will maximize analysis efficiency and use of project resources.
- The county needs to agree that the data in hand (version and date) represent the most up-to-date versions of data prior to initiating the assessment.

Once there is agreement on this data, the process of generating the analysis to conduct the VA is straightforward, can be completed by WSP, and summarized in the final VA products.

The data collected and analyzed during the ACUNE model development phase represents much of the asset data within the county. However, there are a few items to be noted reflecting FDEP guidelines. Table 2 shows a comparison between the data FDEP has identified as important to completing a VA and the data identified by UF in the ACUNE analysis.

Table 2: Comparison Between FDEP Significant Data and ACUNE Analysis Data

FDEP Required Critical and Regionally Significant Data		ACUNE Analysis Data
Critical infrastructure		**ACUNE-SWFL GeoTool**
wastewater treatment facilities		

FDEP Required Critical and Regionally Significant Data		ACUNE Analysis Data
lift stations		
stormwater treatment facilities		
pump stations		
drinking water facilities		
solid and hazardous waste facilities		
military installations		
communications facilities		
disaster debris management sites		
Critical community and emergency facilities		
schools		Public schools (point layer)
colleges and universities		
community centers		
correctional facilities		
disaster recovery centers		
emergency medical service facilities		
emergency operation centers		
fire stations		Fire stations (point layer)
health care facilities		
hospitals		Hospitals (point layer)
law enforcement facilities		Police stations (point layer)
local government facilities		
logistical staging areas		
affordable public housing		
risk shelter inventory		
state government facilities		
Transportation assets and evacuation routes		
airports		
bridges		
bus terminals		
ports		
major roadways		Roads
evacuation routes		Evacuation routes
marinas		
Rail lines		
rail facilities		
railroad bridges		
Natural, cultural, and historical resources		
conservation lands		
parks		

FDEP Required Critical and Regionally Significant Data		ACUNE Analysis Data
shorelines		
surface waters		
wetlands		
historical and cultural assets		

The data provided by UF provides more details on stormwater systems, etc., but it is not reported in the methodology summary document.

Of note for this assessment, FDEP has requested that building footprints be included for analysis as well as parcels to enable measuring amount of land area flooded for these assets. Both of these elements are missing from the ACUNE data and will require updating before completing the assessment. **Therefore, the regional critical asset inventory is not compliant with FDEP requirements for the asset inventory.**

As part of delivering the scope and budget of this project, WSP updated the asset database to meet FDEP standards. However, there are still gaps in the dataset and opportunities for further refinement to improve the accuracy and completeness of critical assets for Charlotte County—particularly regarding stormwater infrastructure such as manholes, pipes, and related components. Additionally, key physical characteristics such as critical elevations and other relevant attributes that inform flood vulnerability are currently lacking and should be enhanced to support more robust analysis.

PRECIPITATION BASED FLOODING

Although items k, l, and m in the FDEP compliance checklist (Table 1) identify expectations for assessing vulnerabilities related to precipitation-driven flooding, this element is not included in the current vulnerability assessment development program for this study. This is because the assessment is not being funded by the FDEP, the county is coastal - and there are exceptions to requirements in those areas - and therefore **precipitation-based flooding is not a required component for this effort.**

FDEP guidance does recommend that precipitation-driven flooding be evaluated as a standalone hazard, particularly flood depths at critical asset locations—to support compound flooding assessments that incorporate rainfall, storm surge, and sea level change. And such an assessment would certainly be a benefit to county actions. However, the analysis currently available through ACUNE focuses primarily on the interaction of rainfall and riverine flooding under tidal or coastal influence, particularly at coastal-riverine junctions – as an input to expected flood levels in those areas. This approach does not meet FDEP expectations for an independent precipitation-based flooding assessment. It is important to assure compliance with state code at the project outset, to ensure the outcomes are as needed to fulfill that need. Review of code language was completed to facilitate this type of assessment. Per s. 380.093(3)(d)2.c., Florida Statutes, rainfall-induced flooding is required to be evaluated only "to the extent practicable." Furthermore, the statute specifies that noncoastal communities must conduct a rainfall-induced flood assessment, but does not explicitly require it for coastal communities, such as Charlotte County. For reference, the statute states:

> *"To the extent practicable, rainfall-induced flooding using a GIS-based spatiotemporal analysis or existing hydrologic and hydraulic modeling results. Future boundary conditions should be modified to consider sea level rise and high tide conditions. Vulnerability assessments for rainfall-induced flooding must include the depth of rainfall-induced flooding for a 100-year storm and a 500-year storm, as defined by the applicable water management district or, if necessary, the appropriate federal agency. Future rainfall conditions should be used, if available. Noncoastal communities must perform a rainfall-induced flooding assessment."*

Additionally, since the County initiated its vulnerability assessment, FDEP has updated the statutory requirements for compliance under s. 380.093, F.S. These updates, including new scenario requirements, apply only to assessments initiated on or after July 1, 2024, and therefore do not apply to the current effort. However, it may be advantageous for the County to consider updating its vulnerability assessment in the future to align with the most current standards.

The Resilient Florida Program offers 100% funded planning grants (no match required) to support such updates. The next grant application window is June 1 – August 1, 2025. This also presents an ideal opportunity for the County to apply for funding to complete a Resilient Florida Adaptation Plan, which is the next step in the planning process and positions communities to pursue funding for individual mitigation projects.

If the County is interested in updating the vulnerability assessment to meet the latest statutory standards or beginning an Adaptation Plan, our team is available to support the grant application process.

OTHER ELEMENTS OF FLOODING IDENTIFIED BY FDEP

The FDEP VA framework is intended to be broadly applied, supporting eligibility for a broad range of project types from coastal protection to stormwater system improvements. The data identified by FDEP is therefore also broadly outlined in the sample work scope to help guide the county and its consultant team to a successful completion of a VA. There are a few other data points that are important to clarify for this discussion. These data, and their potential application in the county VA, are outlined below.

GROUNDWATER LEVEL DATA

Groundwater data is typically analyzed to determine:

- Elevations at which stormwater systems begin to fail given the inundation of the underground pipes and the contributory effect on the capacity of stormwater systems
- Effects of higher groundwater on underground utilities like septic systems etcetera that's an important policy consideration, and
- Soil absorption capacity and a more limited capability for processing rainwater

Groundwater level is not directly relevant to a compliant VA given that no stormwater modeling is being conducted. Also, no data was generated in the ACUNE modeling to represent this condition. However, we have found it a useful data point to analyze and display in vulnerability assessments to show how changing underground conditions are going to have a more limiting effect on future systems. **Therefore, we recommend proceeding with the collection/development of this data, completing an assessment, and including it in the report.**

LAND USE DATA

Land use data, in particular the expectations for new development and a resulting increase in impervious areas, are often used to determine the effects on stormwater systems county-wide. This relates to studies that show newly developed areas no longer have the same capacity as in their natural state to absorb rainwater. The result is more localized flooding.

The ACUNE model project assembled land use data that could be packaged and sent to FDEP at the conclusion of this project. However, the project team does not anticipate a use for it in the technical analysis other than perhaps developing and determining some summaries of those areas anticipated to be impacted by sea level change inundation.

EVAPOTRANSPIRATION DATA

Evapotranspiration data is another data point specific to the analysis of surface flooding, runoff and stormwater systems, associated with soil moisture and the ability of the soil to store rainwater. This study is not focused on pluvial flooding or stormwater analysis and therefore this data does not need to be generated.

HYDRO STRATIGRAPHIC INFORMATION

These data are related to the movement and flow of underground water based on geologic conditions. It represents an analysis more closely aligned with concerns on long term effects on groundwater, which is not a focus of this study. Therefore, the data are not needed for this work.

River Channel Cross-Sections (if applicable)

These data are most often related to the determination of river discharges, meander, or erosion associated with flow. Given these factors are not a primary concern of the VA, the data are not required and will not be collected.

FINDINGS/RECOMMENDATIONS

This section outlines the work required to complete a vulnerability assessment that is compliant with the version of FDEP guidelines in effect at the time this scope was approved and funded. It demonstrates how the existing ACUNE data aligns with the relevant FDEP checklist criteria, confirming that the work can be completed within the current project budget. Table 3 summarizes the findings of the ACUNE sufficiency analysis, showing how the data meets the necessary standards for a compliant VA. While no additional funding is needed to fulfill the current requirements, updating the VA to reflect the latest FDEP standards would further strengthen the County's position and readiness for future planning and funding opportunities and is recommended.

Table 3: ACUNE Sufficiency Analysis for Completing a VA Approved by FDEP (7/22) Compared to Current FDEP Guidelines

VULNERABILITY ASSESSMENT COMPLIANCE CHECKLIST CERTIFICATION		ACUNE Sufficency	Notes
Compliance Checklist 07.29.22		Check for FDEP Requirements	
a	Final Vulnerability Assessment Report that provides details on the results and conclusions, including illustrations via maps and tables.	N/A	No VA that meets the requirements of FDEP
b	Geospatial data in an electronic file format.	Yes for SLR/Surge	Meets FDEP needs for SLR/Surge, but not other measures
c	GIS metadata.	Yes for SLR/Surge	Meets FDEP needs for SLR/Surge, but not other measures
d	List of critical assets for each jurisdiction, including regionally significant assets, that are impacted by flooding and sea level rise. The list must be prioritized by area or immediate need and must identify which flood scenario(s) impacts each asset	No, partial only	Assessment does not include the asset list identified by FDEP and in the work scope. Additional work needs to be done to provide a consistent framework across all asset classes
e	Peril of Flood Compliance Plan amendments developed that address paragraph 163.3178(2)(f), F.S., if applicable. ☐ Not applicable ☐ Already in compliance	N/A	Not an element of the ACUNE effort
f	Depth of tidal flooding, including future high tide flooding, using thresholds published and provided by the Department.	Yes for SLR	Need confirmation that measures comply with FDEP required analysis for this measure
g	To the extent practicable, analysis geographically displays the number of tidal flood days expected for each scenario and planning horizon. (optional)	Yes for SLR	This element is covered by FDEP
h	Depth of current and future storm surge flooding using publicly available NOAA or FEMA storm surge data. (check one) ☐NOAA data ☐FEMA data	No, But FDEP allowed	ACUNE does not directly apply FEMA/NOAA data in its development, but the model relies on similar methods as FEMA and has been approved as allowable in other jurisdictions.
i	Initial storm surge event equals or exceeds current 100-year flood event.	Yes	Yes, data represents the current and future 100-year flood event
j	Higher frequency storm analyzed for exposure of a critical asset. (optional, but must provide additional detail if included)	No	No, this measure is not addressed by ACUNE (i.e. - 50, 25 year events, etc)
k	To the extent practicable, rainfall-induced flooding was considered using spatiotemporal analysis or existing hydrologic and hydraulic modeling results. (required if item e is not applicable)	No	No, ACUNE applied a factor for localized/riverine flooding in its analysis of coastal flooding. But the model is not a H/H model intended for precipitation flooding analysis
l	Future boundary conditions have been modified to consider sea level rise and high tide conditions. (optional)	No	No. This is an element of riverine or stormwater flooding where boundary conditions are held at higher tidal conditions, increasing flooding in the system by blocking outfall areas.
m	Depth of rainfall-induced flooding for 100-year storm and 500-year storm event. (required if item e is not applicable)	No	No. ACUNE does not model precipitation based flooding in a manner that FDEP expects.
n	To the extent practicable, compound flooding or the combination of tidal, storm surge, and rainfall-induced flooding. (optional)	No	No, compound flooding is considered to be a combination of precipitation/riverine flooding, and coastal flooding and ACUNE does not explore fully precipitaiton based inland flooding.
o	All analyses performed in North American Vertical Datum of 1988.	Yes	ACUNE provides data that can be delivered in NAVD 88, but does not provide the full data requirements for delivery of a compliant VA
p	Includes at least two local sea level rise scenarios, which must include the 2017 NOAA intermediate-low and intermediate-high sea level rise projections.	Yes, for SLR/Surge	Yes, ACUNE provices this data for SLR and Surge, but not for precipitation based flooding (associated with item l)
q	Includes at least two planning horizons, which must include years 2040 and 2070.	Yes, for SLR/Surge	Yes, ACUNE provices this data for SLR and Surge, but not for precipitation based flooding (associated with item l)
r	Utilizes local sea level data that has been interpolated between the two closest NOAA tide gauges	Yes	Yes, UF utlized gauge data from Naples and Fort Meyers to create an average value for application on the ACUNE model outputs
s	Local, publicly available, sea level data was taken from one of the two closest NOAA tide gauges, which must be the gauge with the highest mean sea level (if so, provide Department approval).	Yes	Yes, UF utlized the Naples gauge to develop measures for historic SLR in the study area

TASK C2 – REGIONALLY SIGNIFICANT AND CRITICAL ASSETS

ACUNE does not meet all of the FDEP requirements for critical and regionally significant assets. There are several shortcomings:

1. Missing Asset Types: ACUNE lacks essential asset types, including but not limited to bridges, communications facilities, healthcare facilities, affordable public housing, and solid and hazardous waste facilities.
2. Inadequate Data Geometry: The asset data are represented in point feature classes rather than the required polygon geometry, which is necessary to understand flooding impacts on these assets.
3. Non-compliant Asset Information: Some asset information provided by ACUNE is not considered regionally significant or critical by FDEP standards.

These deficiencies underscore the need for a more comprehensive and compliant approach to asset data collection and organization. More accurate and useful information could be sourced from county and asset managers, as well as the FDEP Statewide database. Although the FDEP statewide database uses point feature geometry, Microsoft building footprints and parcels from the county tax assessor's database can be spatially joined to point data to retain location and attribute information. The statewide database is organized by asset type as required by FDEP and uses authoritative data sources.
Cost Estimate for Corrections/Revisions - $15,144.54

TASK C3 – TOPOGRAPHIC INFORMATION

To model hydraulic conditions accurately and meet FDEP guidelines, a 3-meter resolution DEM is required. ACUNE's 5-meter DEM resolution is insufficient for this purpose. Therefore, obtaining, assembling, resolving, and applying an available and compliant DEM is essential for precise hydraulic modeling and regulatory compliance.
Cost Estimate for Correction/Revision - $4,979.17

TASK C4 – FLOOD-RELATED DATA

The sections above demonstrate that ACUNE's coastal-focused products satisfy the VA under FDEM's grandfathering allowance. However, a major gap remains—stand-alone precipitation-based flooding—and several secondary omissions that, if addressed, would strengthen the VA:

1. Precipitation data is not presented in a way that supports the development of a 100-year floodplain, nor an exploration of how future precipitation values may change to impact localized flooding.
2. Precipitation flooding is not presented as a stand-alone concern. There is no presentation of fluvial flood plains associated with specific rainfall conditions, nor the presentation of pluvial, or localized flooding typically generated through stormwater modeling.
3. Supporting item 2 above, there is no presentation of pluvial or fluvial flooding through modeling that includes (item l in table 1 for the applicable criteria) elevated boundary conditions associated with coastal flood levels which would worsen these conditions over the landscape.
4. No work has been completed in the ACUNE analysis specific to groundwater rise, which could be an important item of concern in the low-lying areas of the county, requiring the completion of such analysis to develop this data point to support the development of the VA and to

The ongoing work in developing the watershed master plan may present data to help fulfill this requirement. Conclusions cannot be reached on this concern however given the data and information has not been available for review.
The cost to develop the information required to fulfill the precipitation flood portion of the VA and conduct the depth analysis required of the process is therefore currently uncertain. The range below represents a condition

where the data is readily available from existing modeling, to one where a model and the input parameters need to be developed to support this work:
Cost Estimate for Corrections/Revisions - $26,906 - $90,000

CONSIDERATIONS FOR AN APPLICATION FOR STATE FUNDING

The county may want to consider an application to the state to support updating the data needed to support the VA, bringing it current, and adding additional detailed data that will be beneficial to the long-term viability of the county effort and the benefits of making an effective business case for resilience investments.
A summary of the work scope and cost estimate for a next phase of work could include:

1. Updating ACUNE to incorporate current 2022 NOAA SLR values, and a broader suite of storm surge flood probabilities (25, 50, 100, 250, 500) to support better policies, better decision, making and the development of a financial risk model for coastal storms (repair cost, economic costs, etc.) – Est - $85,000
2. Completing the development of a rainfall/stormwater/flood model that enables the determination of the same suite of flood probabilities as above for precipitation-based flooding, enabling the same analysis for this concern – Est - $105,000
3. Development of a county-wide risk model (Est – $165,000) for flooding to form the foundation of a robust framework to support effective decisions, inclusive of economic valuation for:
    a. Property impacts of flooding, including transition of land to inundated soils due to groundwater rise
    b. Infrastructure damage – inclusive of repair cost and repair time.
    c. Economic impacts to the city in terms of lost property value and lost commercial activity.
    d. Environmental system impacts – inclusive of lost wetlands, habitat impacts, loss of community/park space.
    e. Relative impact costs – a determinant of impacts to communities of varying socio-economic conditions.
4. Capital program review – including the analysis and risk assessment of existing investments programmed in the county capital plan, to embed robust analysis of lifecycle risks to guide more effective investments inclusive of increasing risk - $75,000)

The completion of this work would bring the county current with state leaders in this concern, enabling the county to capitalize on available state funding and to leverage federal funding that may be available. Holding this capability is a difference maker in a competitive funding market.

EXHIBIT A: DEPS GRANDFATHERING CORRESPONDENCE

From: Bouza, Eddy
To: Moody, Brandon
Cc: Reed, Alex; Hecker, Jennifer
Subject: RE: Notice of Letter: Charlotte County Vulnerability Assessment Compliance
Date: Thursday, November 21, 2024 2:08:21 PM
Attachments: image001.png
image002.png
image003.png
image004.png
image005.png

Caution – This email originated from outside of our organization
Please do not open any attachments or click on any links from unknown sources or unexpected email.

Report Suspicious

Hi Brandon,
s. 380.093(5)(d), Florida Statutes, has language that specifically allows for projects to be submitted until your assessment can be updated to the new standards, shown below and highlighted. So if the assessment was in compliance with the statutory requirements in place at the time of model development, we would accept it for project submittal for projects addressing vulnerabilities shown therein, we would ask that you provide the VA report/final documentation and our Exhibit I for projects underway prior to June 30, 2024 to aid in our compliance review (some of the items may not be required such as C, D, and F since you weren't 'our' grantee).

> "For the plans submitted by December 1, 2024, such entities may submit projects identified in existing vulnerability assessments that do not comply with subsection (3) only if the entity is actively developing a vulnerability assessment that is either under a signed grant agreement with the department pursuant to subsection (3) or funded by another state or federal agency, or is self-funded and intended to meet the requirements of paragraph (3)(d) or if the existing vulnerability assessment was completed using previously compliant statutory requirements. Projects identified from this category of vulnerability assessments will be eligible for submittal until the prior vulnerability assessment has been updated to meet most recent statutory requirements."

We hope to receive more planning funding in the coming years if your VA will not meet the newest requirements, to assist with updating the VA.

Hope this helps,

Eddy Bouza
Resilient Florida Program | Program Management Director

Office of Resilience and Coastal Protection
Eddy.Bouza@FloridaDEP.gov
Desk: 850.245.7562
https://floridadep.gov/rcp

Click here to sign up for Resilient Florida Rulemaking Updates

From: Moody, Brandon <Brandon.Moody@charlottecountyfl.gov>
Sent: Thursday, November 21, 2024 10:33 AM
To: Bouza, Eddy <Eddy.Bouza@FloridaDEP.gov>
Cc: Reed, Alex <Alex.Reed@FloridaDEP.gov>; Hecker, Jennifer <jhecker@chnep.org>
Subject: Notice of Letter: Charlotte County Vulnerability Assessment Compliance

EXTERNAL MESSAGE
This email originated outside of DEP. Please use caution when opening attachments, clicking links, or responding to this email.

Good Morning Eddy,

This email is to provide notice regarding a letter recently sent your way concerning Charlotte County's developing Vulnerability Assessment. You might recall an email conversation last year between you, the county, and Mike Savarese/Peter Sheng (FGCU/UF, respectively) discussing our usage of ACUNE to predict flood and surge risk per requirements in 380.093, F.S. Through funding provided by the Coastal and Heartland National Estuary Partnership, our consultants are in the process of reviewing the model and assembling a draft of the Assessment. The crux of the issue surrounds our having conducted model development prior to the release of FDEP's scope guidance docs; as such, we wish to be absolutely certain that the underlying modeling work will be accepted by FDEP, and those conditions used in the ACUNE model that don't align with FDEP's scope guidance (such as intermediate low and high SLR projections from NOAA 2017) will still be accepted by FDEP as part of our VA submittal.

For reference, I've attached a scanned copy of the letter; please feel free to reach out with additional questions, or if you'd like to have a brief meeting with our consultants and county/CHNEP staff to talk through our request. Thank you very much for your time and consideration into this matter.

Brandon Moody
Water Quality Manager

Charlotte County Board of County Commissioners
Office: 941-743-1354
CharlotteCountyFL.gov
Delivering Exceptional Service

Appendix D: Hazard and Asset Data

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CHARLOTTE COUNTY COMPREHENSIVE VULNERABILITY ASSESSMENT

CLIENT:

CHARLOTTE COUNTY, FL

FUNDED BY:

COASTAL & HEARTLAND NATIONAL ESTUARY PARTNERSHIP (CHNEP)

APPENDIX D: HAZARD AND ASSET DATA

DATE: JUNE 2026

WSP USA

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PROJECT BACKGROUND

Charlotte County, located along the southwest coast of Florida, is bordered by the Gulf of America to the west and is bisected by Charlotte Harbor, the Peace River and the Myakka River which form the center of the county. Its expansive shoreline, low-lying topography, and interconnected waterways make the County particularly vulnerable to a variety of coastal and climate-related hazards. Major population centers such as Port Charlotte and Punta Gorda are situated near critical water bodies, increasing the community's exposure to increases in coastal flooding, storm surge, extreme precipitation, and compound flooding. These risks are exemplified by recent and recurring hurricane impacts, including Hurricane Ian (2022), Hurricane Idalia (2023), Hurricane Helene and Hurricane Milton (2024); all which caused widespread damage across the region. As these climate-driven events become more frequent and intense, it is increasingly critical for Charlotte County to evaluate and enhance its resilience to current and future environmental threats.

In recognition of this need, Charlotte County has undertaken efforts to assess its vulnerability of critical county assets to flooding and related hazards. This Vulnerability Assessment is being funded by the Coastal & Heartland National Estuary Partnership (CHNEP) in support of regional climate resilience efforts. Although CHNEP is the primary funder, the County is following the Florida Department of Environmental Protection (FDEP)'s standardized set of work tasks and deliverables as outlined in the Resilient Florida Program. Aligning with FDEP's framework ensures consistency and eligibility for future state funding and state agency project acceptance and makes the county eligible for future funding opportunities. The goal of the Vulnerability Assessment is to develop a comprehensive understanding of the potential hazards facing Charlotte County and to produce an Adaptation Plan that addresses climate risks in support of the long-term resilience of Charlotte County communities.

PURPOSE AND OBJECTIVES

This report focuses on the data collection tasks that encompassed the compilation of data in three primary categories:

1. Topographic data
2. Flood scenario-related data
3. Critical and regionally significant asset inventory

WSP USA Inc. is responsible for compiling and organizing these datasets to support the Vulnerability Assessment. The data collected serves as the foundation for identifying areas and assets at risk from current and future flooding hazards. The Critical and Regionally Significant Asset Inventory includes key infrastructure in a range of sectors including transportation; utilities; emergency services; community facilities; and natural, cultural, and historical resources. All data have been compiled into a GIS geodatabase that complies with the FDEP's Resilient Florida Program GIS Data Standards.

This structured approach ensures a consistent and thorough evaluation of vulnerabilities facing Charlotte County, thus enabling the County to prioritize adaptation strategies and support long-term resilience planning. The following sections detail the methodology, sources, and organization of the data collected. In addition, the final section identifies data gaps the currently exist in conducting the vulnerability assessment.

TOPOGRAPHIC DATA

The Digital Elevation Model (DEM) used for this project was primarily derived from bare-earth aerial LiDAR data provided by the Southwest Florida Water Management District (SWFWMD)/Hillsborough County (2017), SWFWMD/Pasco County (2018), and the U.S. Geological Survey (USGS) Florida Peninsula LiDAR Project (2019–2020). These hydro-flattened DEM files were classified and merged using Global Mapper™, with quality control performed at survey checkpoints to ensure consistency and accuracy. The resulting DEM supports 6-inch resolution orthophotography and has a point density equivalent to an 8-foot post spacing.

To supplement areas with insufficient coverage or specific features such as bridge decks, additional elevation data were generated through Semi-Global Matching (SGM) correlation and stereo collection. Where necessary, USGS 3DEP elevation data were also incorporated—particularly around water bodies and regions with poor LiDAR returns. All supplemental DEMs were reviewed, corrected for anomalies, and seamlessly feathered into the primary dataset to ensure data continuity.

Charlotte County also provided DEM tiles derived from orthophotography, which were mosaicked and incorporated into the final elevation surface. The complete DEM is referenced to the North American Vertical Datum of 1988 (NAVD88), reported in feet, with an 8-foot cell size, and is compliant with FDEP's Resilient Florida Program GIS Data Standards.

In addition to LiDAR and DEM data, traditional survey data were reviewed during this task. While no new survey fieldwork was conducted as part of this project, available survey datasets in **Available Data Sources** were evaluated for applicability. These datasets were primarily used for ground-truthing and quality assurance of the elevation surfaces where necessary but were not required for DEM generation due to the high resolution and quality of the LiDAR-based elevation data.

FLOOD SCENARIOS

Two primary datasets were utilized to represent flood scenarios in this analysis--one for storm surge flooding and one for tidal flooding. Both datasets were developed and provided by the University of Florida and used the following processes/tools to produce the data representing appropriate future scenarios.

1. ACUNE-SWFL GeoTool – University of Florida:[1] This dataset modeled storm surge flooding scenarios in southwest Florida and was used to assess potential impacts of surge-based coastal flooding under an extreme event intensity (1% annual event).
2. Sea Level Scenario Sketch Planning Tool – University of Florida:[2] This dataset represented tidal flooding under different sea level scenarios. It supported planning-level assessments of future high tide impacts based on projected sea levels.

While the contract outlines additional flood scenario-related datasets these were not included in this phase of the Vulnerability Assessment for the following reasons:

- **Hydrostratigraphic information** is primarily used in long-term groundwater studies and is not required for the coastal and tidal flooding focus of this assessment.
- **River channel cross-section data** are generally used for fluvial modeling and erosion analysis, which are outside the scope of this project.
- **Land use data** was collected as part of the ACUNE model effort but was not directly applicable to the vulnerability analysis, aside from potential use in summarizing future inundation impacts.
- **Evapotranspiration data** is typically used in stormwater and soil moisture modeling and is not necessary for the present analysis, which does not address pluvial flooding.

For a more detailed discussion of these data categories and their relevance, please refer to Appendix C: ACUNE Sufficiency Analysis.

Precipitation

Precipitation-induced flooding is not included in the current vulnerability assessment. This project is not funded by FDEP, and precipitation-induced flooding is not a required component for coastal communities under state code.

[1] https://storymaps.arcgis.com/stories/aad4c97c78234b5fae02ef3b90176ead

[2] https://sls.geoplan.ufl.edu/use/

Per Section 380.093(3)(d)2.c. of the Florida Statutes, an assessment of rainfall-induced flooding is required "to the extent practicable." The statute mandates this analysis for noncoastal communities but does not explicitly require it for coastal jurisdictions such as Charlotte County.

Sea Level Projections

Sea level projections were taken from National Oceanic and Atmospheric Administration (NOAA) (2017). Global and Regional Sea Level Scenarios for the United States. Intermediate-Low and Intermediate-High projections,[3] were used in the vulnerability assessment as per FDEP guidance at the time of initiating the technical work for this study. Table 1 shows projected sea water level changes in feet for NOAA's 2017 and 2022 measurements. A hydro-connectivity model, commonly referred to as the "Modified Bathtub" approach, was utilized in this assessment. This model applies a hydrologic connectivity filter to remove isolated, low-lying areas that are not hydrologically connected to larger water bodies, thus providing a more accurate depiction of flood risk.

[3] NOAA. 2017. Global and Regional Sea Level Rise Scenarios for the United States, NOAA Technical Report NOS CO-OPS 083. Accessed at https://tidesandcurrents.noaa.gov/publications/techrpt83_Global_and_Regional_SLR_Scenarios_for_the_US_final.pdf

Table 1: Detailed sea level change estimates (feet) for selected policy scenarios to meet requirements (FDEP)

	NOAA 2017	
Year	Int.- Low	Int.-High
2040	0.37	1.06
2070	0.93	2.96

Source: (NOAA, 2017)

Tidal Flooding

Charlotte County has experienced a rise in the frequency of annual tidal flooding events, commonly referred to as "sunny day" or nuisance flooding. This trend is primarily attributed to global sea level rise and regionally specific shoreline dynamics, including sediment erosion and accretion, which vary based on shoreline type (e.g., salt marsh, Juncus marsh, mangroves).

NOAA tide gauge data from Fort Myers (Station 8725520) reflects this growing trend. Between 2000 and 2020, the number of nuisance flooding days recorded each year more than tripled—from approximately 3 days annually to more than 10[4]. This increase highlights the growing impact of high tide events on low-lying infrastructure and coastal communities in Southwest Florida, including Charlotte County.

Sheehan and Crooks (2016) [8] evaluated accretion rates—the gradual buildup of sediment that can help offset sea level rise—in Tampa Bay. These rates are expected to be similar in Charlotte Harbor, which has comparable shoreline habitats. The study found that accretion varies not only between different habitat types but also within them. For example, mangrove shorelines—the dominant shoreline type in Charlotte Harbor (CHNEP 2019)—have reported accretion rates ranging from approximately 1.6 to 5 mm/year, depending on the specific mangrove species and local conditions. This natural process of sediment accumulation plays an important role in how coastal areas respond to rising seas and increasing tidal flooding. (CHNEP 2019)[9].

Tidal flooding was assessed using NOAA sea level values mapped on top of the Mean Higher High Water (MHHW) tidal datum. The MHHW represents the average of the higher of the two daily high tides and serves as a critical baseline for evaluating coastal inundation risks. A statewide grid for Florida, representing MHHW, was developed by NOAA's Office of Coastal Management (OCM)[5].

Figures 1 to 4 show projected feet of inundation per tidal flooding scenario.

---

[4] https://coast.noaa.gov/states/stories
[5] https://coast.noaa.gov/slr/#/layer/slr
[8] Sheehan, L. and S. Crooks. 2016. Tampa Bay Blue Carbon Assessment: Summary of Findings, TBEP Technical Report #07-16L. Sheehan, L. and S. Crooks. 2016. Tampa Bay Blue Carbon Assessment: Summary of Findings, TBEP Technical Report #07-16L St. Petersburg, FL.www.tbeptech.org/
[9] CHNEP (Coastal and Heartland National Estuary Partnership). 2019. Habitat Restoration Needs Plan. Environmental Science Associates. https://www.chnep.org/resources

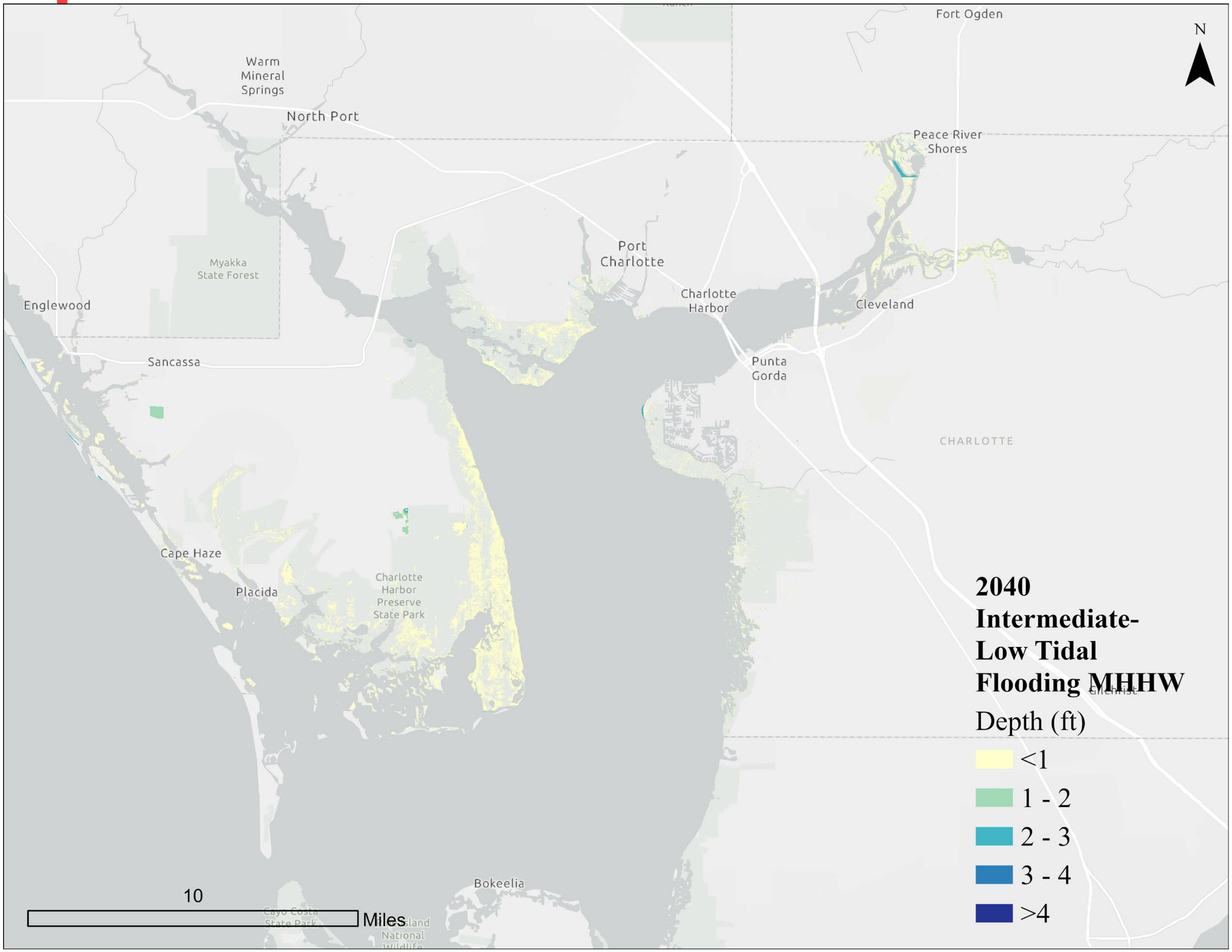

Figure 1: Mean high higher water flood depths - 2040 Intermediate-Low Scenario SLR

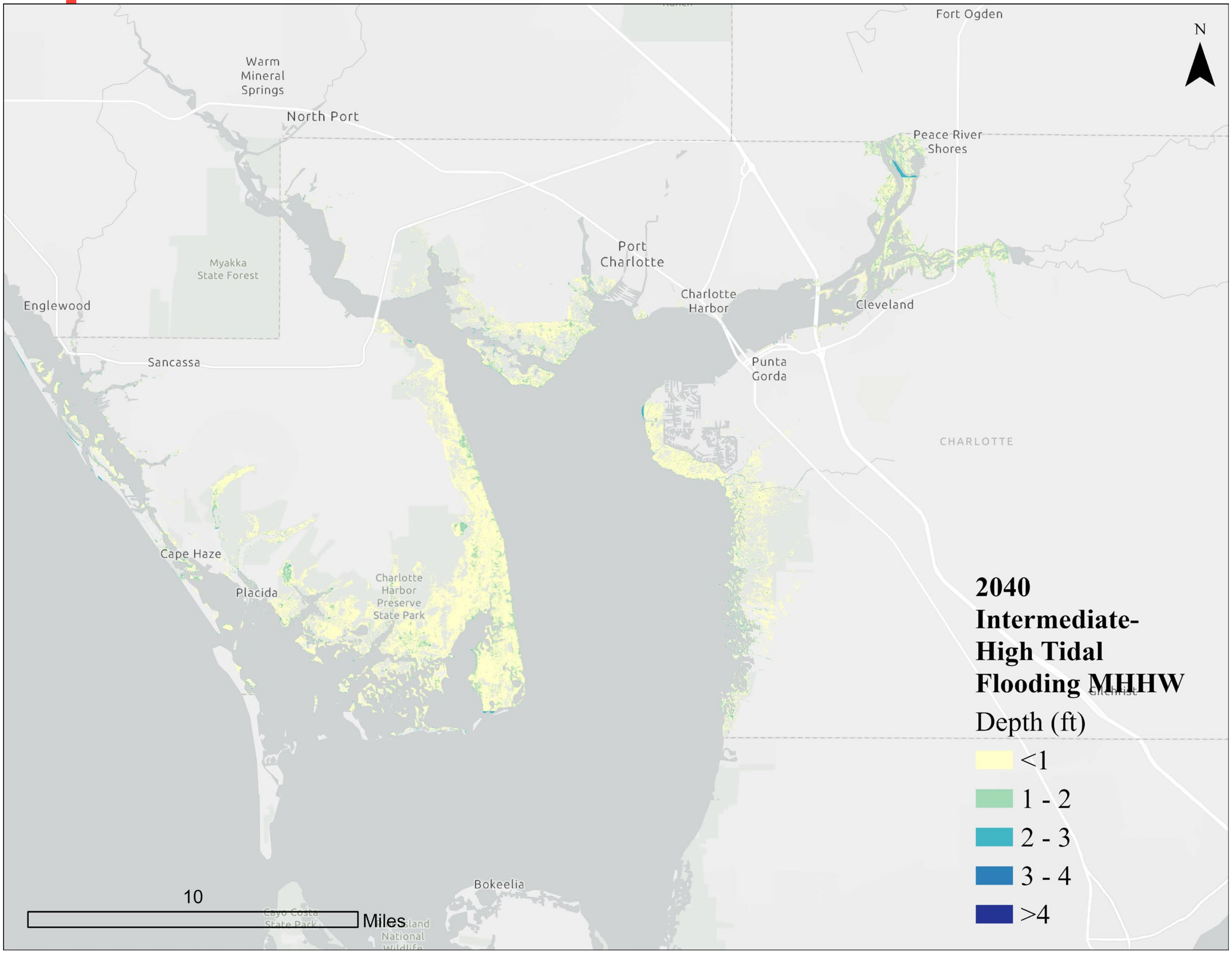

Figure 2: Mean high higher water flood depths - 2040 Intermediate-High Scenario SLR

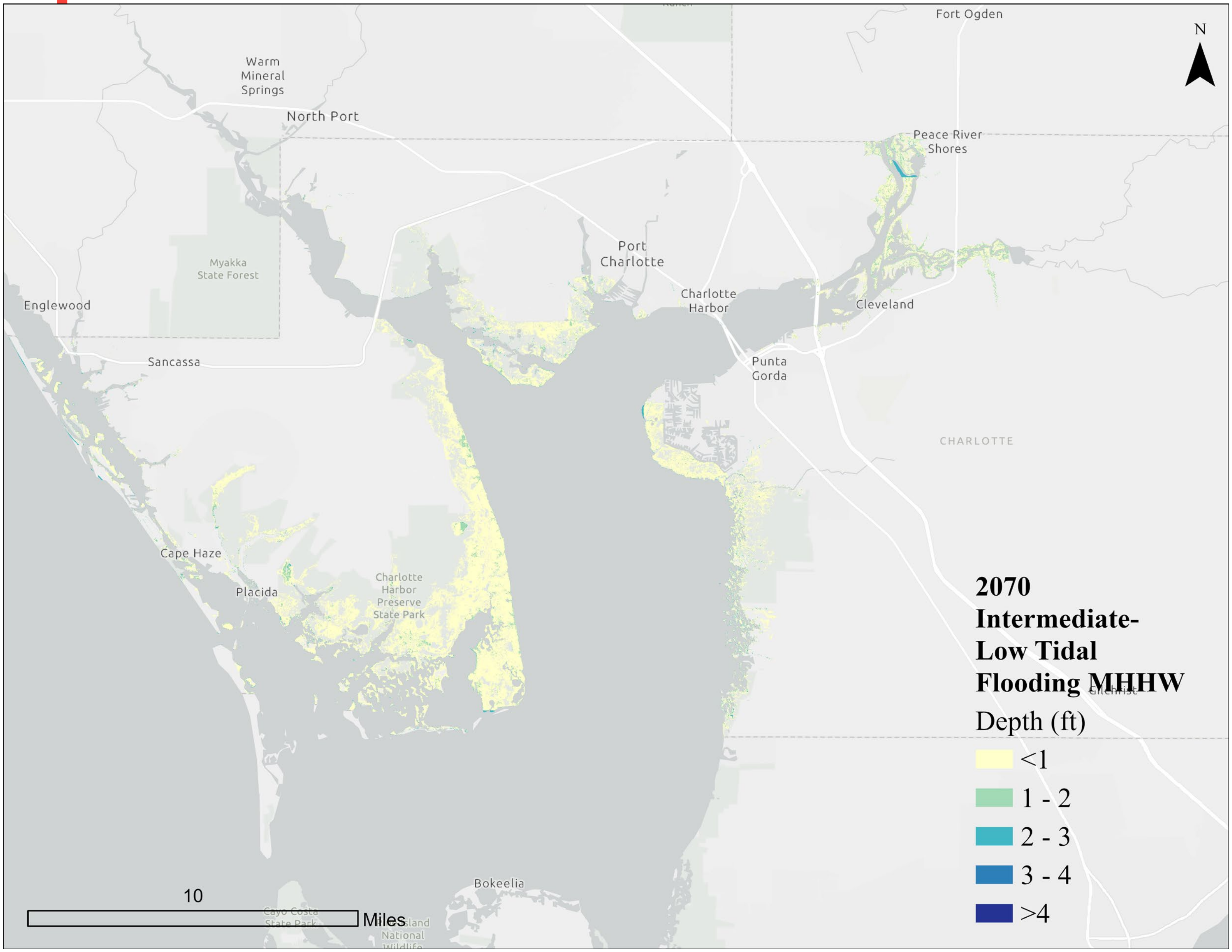

Figure 3: Mean high higher water flood depths - 2070 Intermediate-Low Scenario SLR

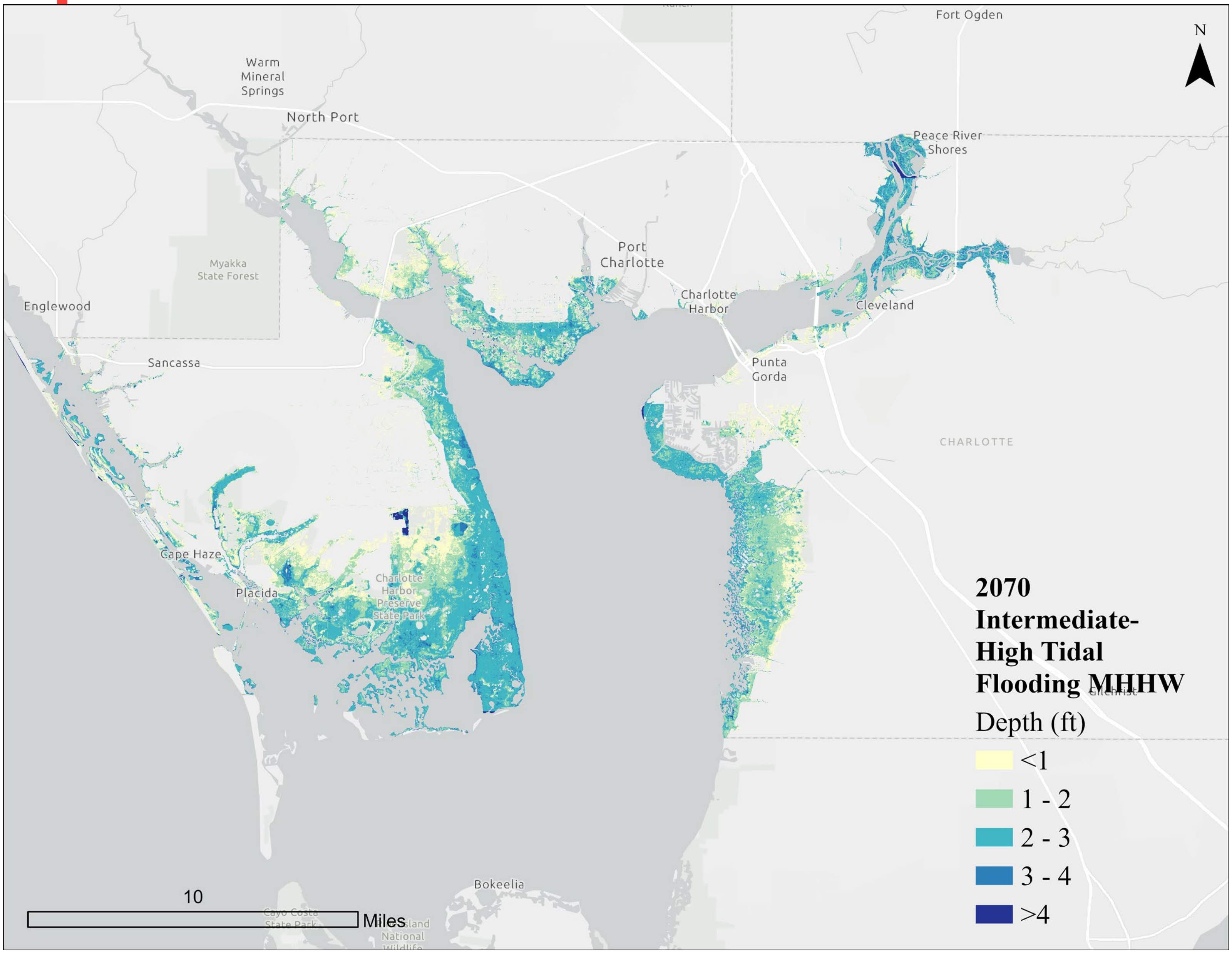

Figure 4: Mean high higher water flood depths - 2070 Intermediate-High Scenario SLR

Storm Surge

Storm surge poses a growing threat to Charlotte County as evidenced by several recent high-impact storm events. In 2023, Hurricane Idalia resulted in a storm surge inundation of 2 to 4 feet, along with heavy rainfall and tropical storm-force winds. The following year, Hurricanes Helene and Milton delivered even more severe impacts. Hurricane Helene, in September 2024, produced a storm surge of 6 to 8 feet in parts of Punta Gorda. Two weeks later, Hurricane Milton struck with another 5 to 8 feet of surge, resulting in significant damage across the county.

To analyze the potential concerns of such events, the University of Florida's ACUNE model was developed to determine 100-year storm surge conditions for current conditions, and flooding enhanced by NOAA sea level projections. A 1-ft increase in sea level combined with a 100-year storm surge event roughly corresponds to both NOAA's 2017 projection for the 2040 Intermediate-High and 2070 Intermediate-Low scenarios, and a 3-ft increase in sea level roughly corresponds to the 2070 Intermediate-High scenario, as shown in Table 1.

It should be noted that that is a key gap that exists between the sea level projections used in current storm surge models and the most recent requirements maintained by FDEP. The ACUNE model scenarios are based on NOAA's 2017 projections, while more recent and updated projections from NOAA's 2022 Sea Level Rise Technical Report[6] were integrated into FDEP's requirements and are now available and widely adopted in planning efforts statewide. Moving forward, Charlotte County may benefit from updating storm surge layers using the 2022 SLR scenarios with benchmarks for 2050 and 2080, to be consistent with state requirements and data analysis being conducted in other communities in Florida.

Note that the data used from the existing modeled scenarios provide credible information with which to complete the current VA analysis, develop mitigation actions and policies, and establish priorities and implementation timeframes. The scenarios for which surge was analyzed, present a comprehensive look at future conditions within the county. Importantly, the current ACUNE model outputs have been deemed acceptable by FDEP to meet compliance with the applicable standard at the time of project initiation (2022).

Figures 5 to 9 show storm surge flooding depth (in feet) for Charlotte County with different NOAA scenarios, and for the 100-year analysis framework.

[6] https://sealevel.globalchange.gov/resources/2022-sea-level-rise-technical-report/

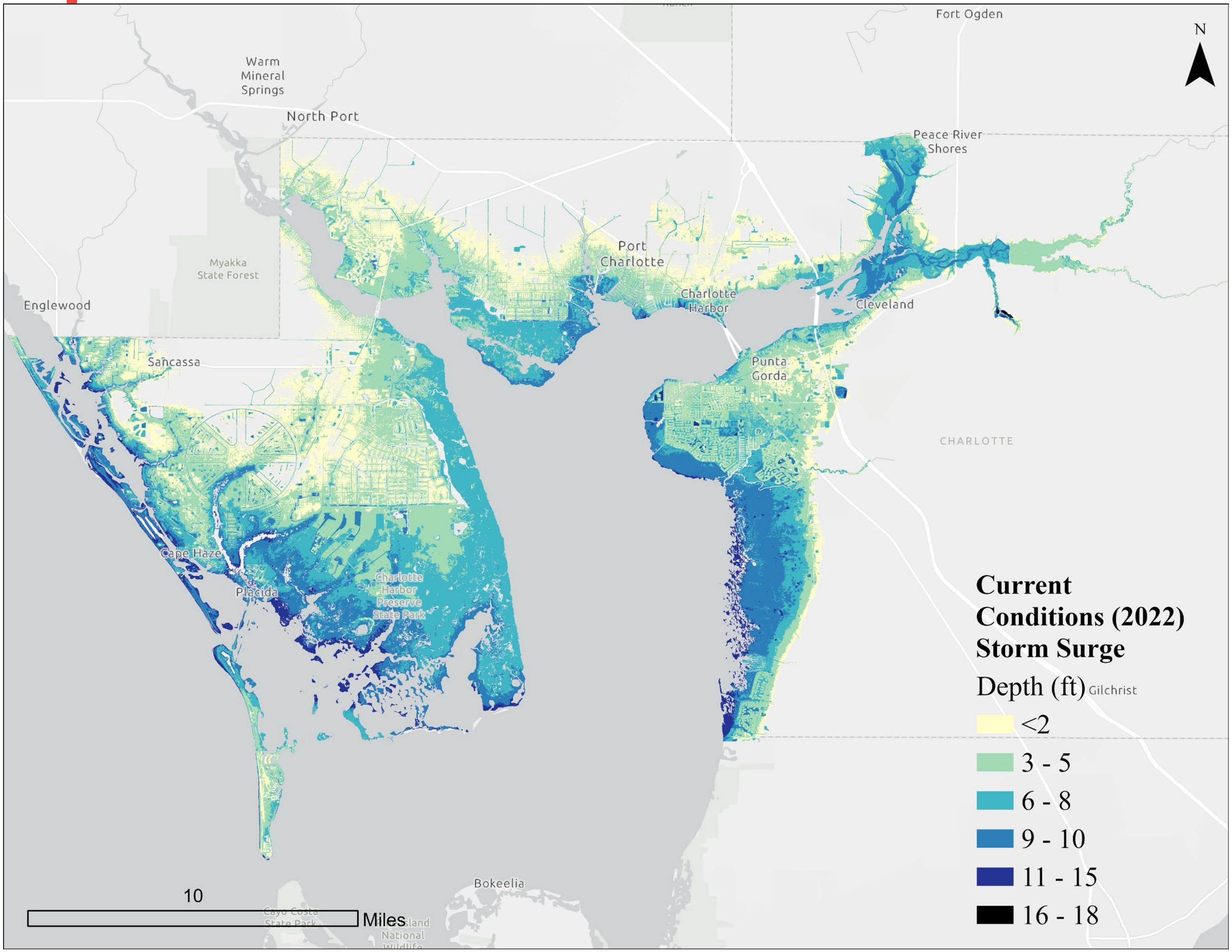

Figure 5: Storm surge flood depths for 100-year storm, Current Conditions (2022)

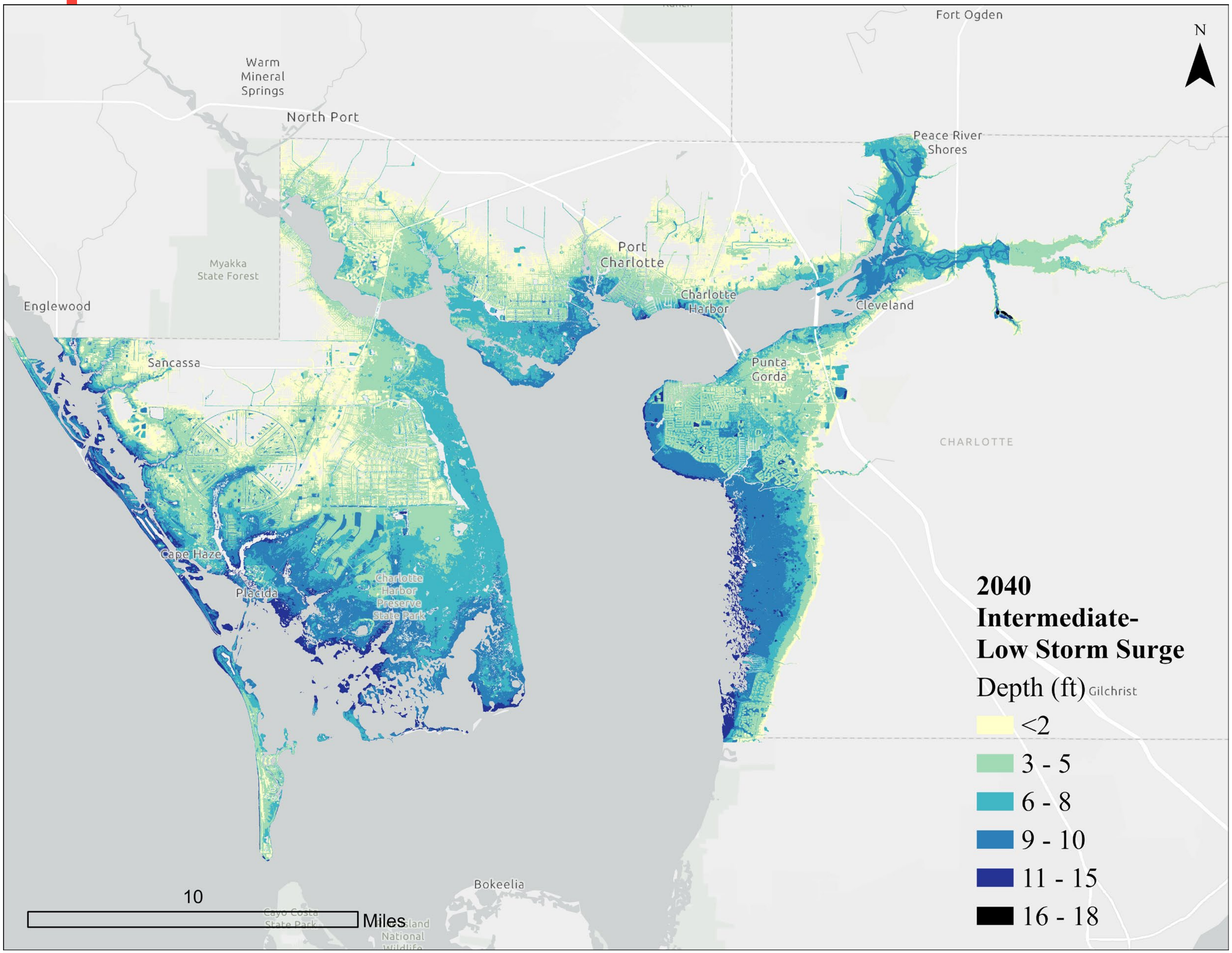

Figure 6: Storm surge flood depths for 100-year storm, 2040 Intermediate-Low Scenario

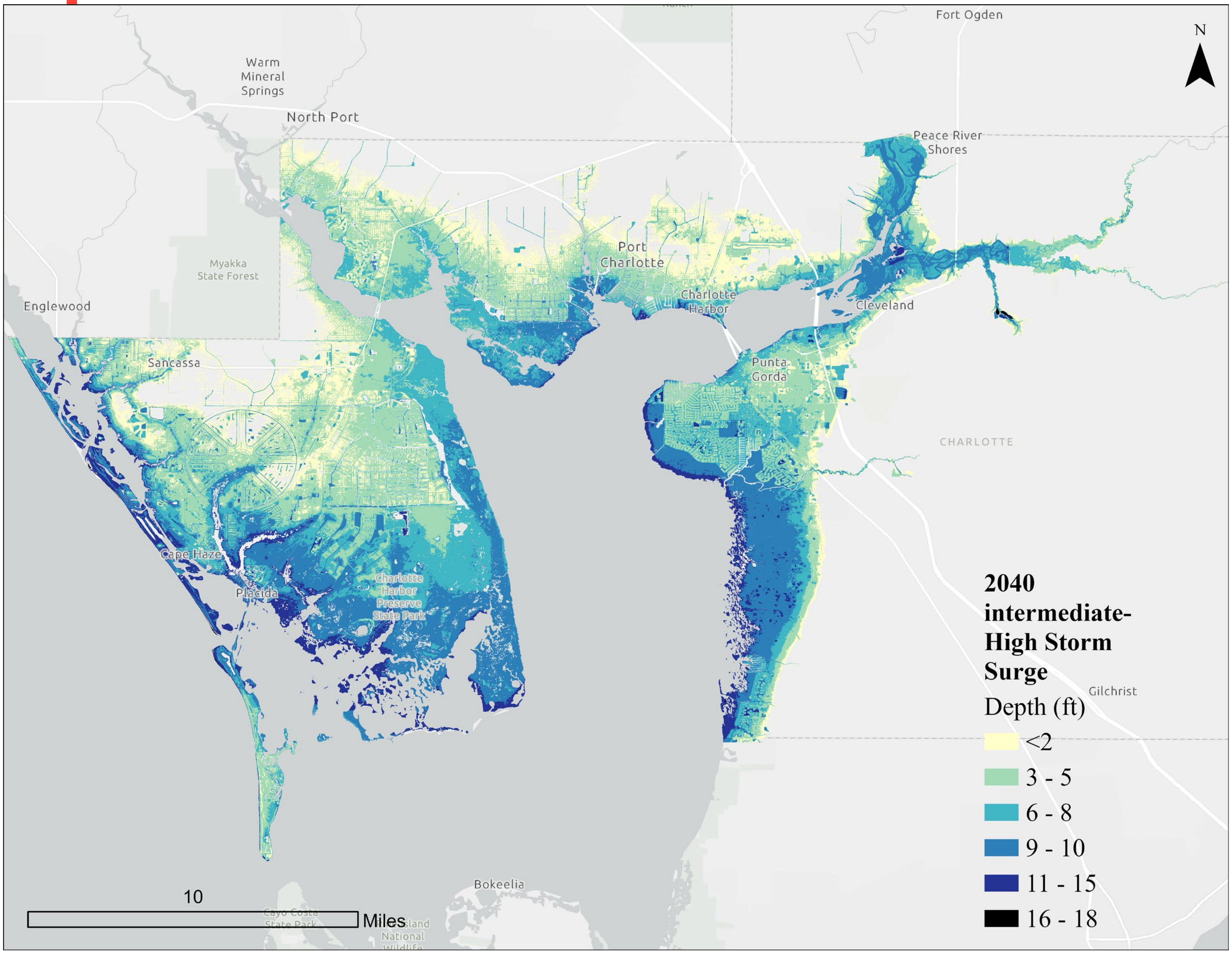

Figure 7: Storm surge flood depths for 100-year storm, 2040 Intermediate-High Scenario

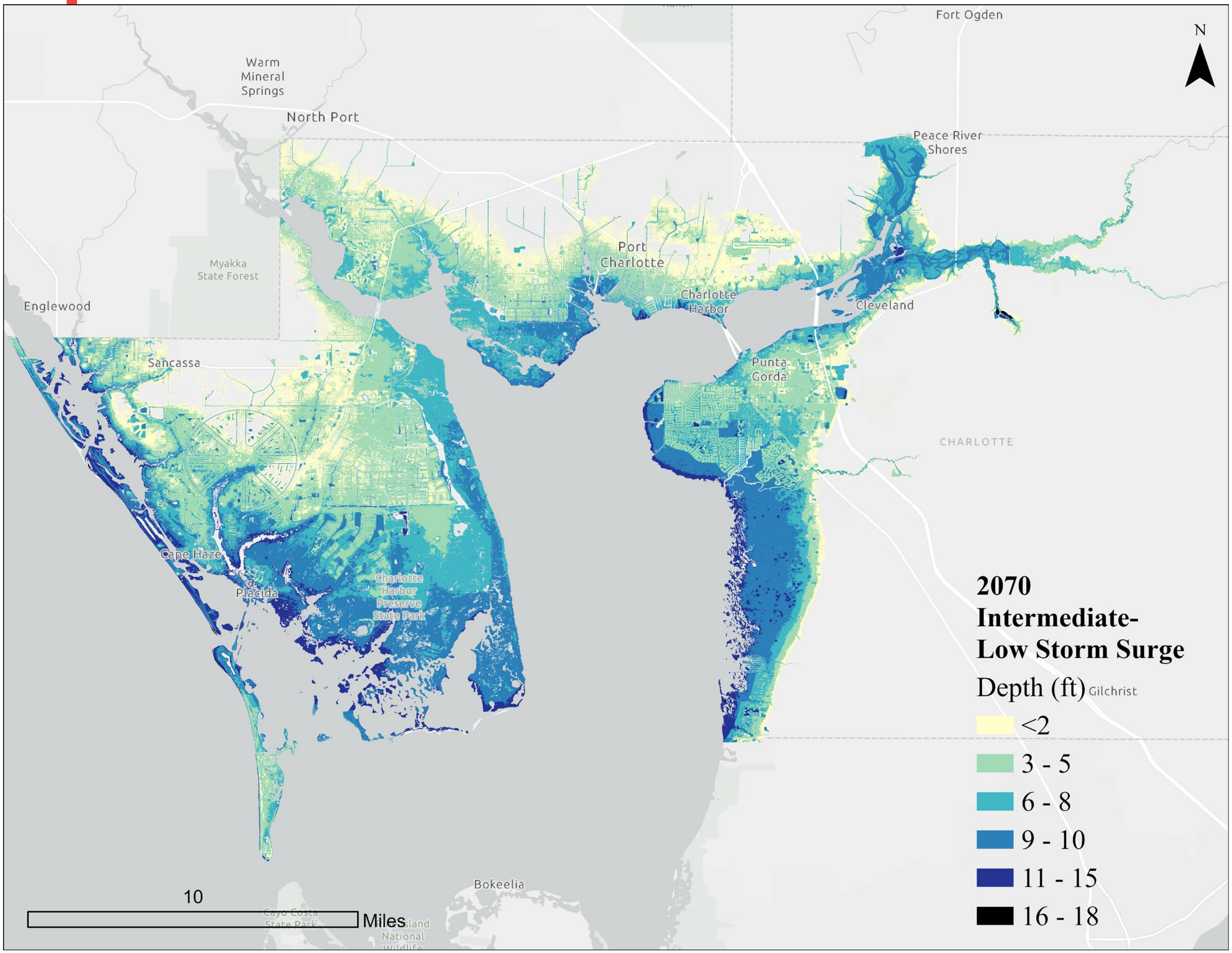

Figure 8: Storm surge flood depths for 100-year storm, 2070 Intermediate-Low Scenario

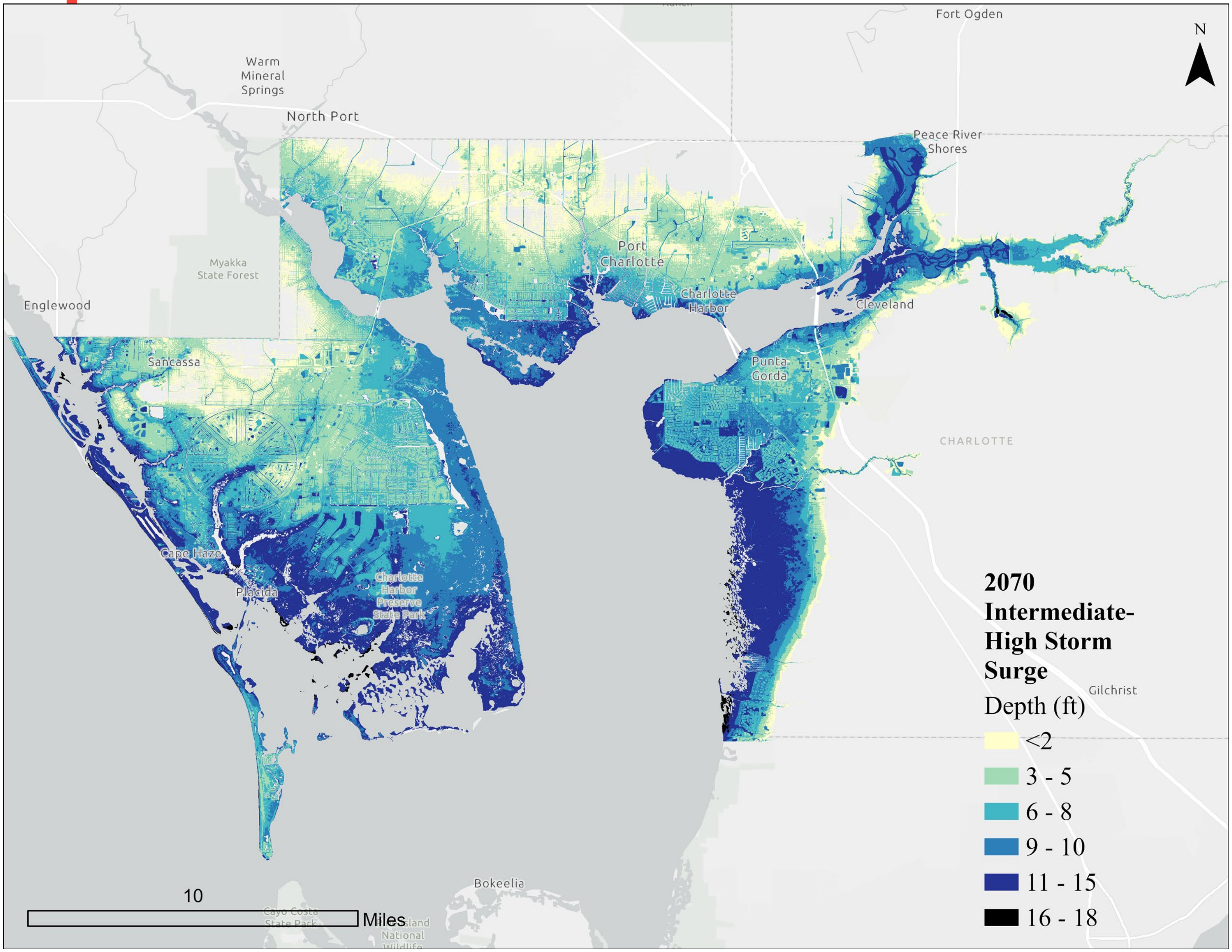

Figure 9: Storm surge flood depths for 100-year storm, 2070 Intermediate-High Scenario

RISING GROUNDWATER

As sea levels rise along coastal regions like Charlotte County, the groundwater table beneath the surface is also expected to rise. When sea levels increase, the "baseline" water level that influences these underground systems also moves higher, pushing groundwater closer to the surface. Higher groundwater conditions will impact underground systems (stormwater, sewer, utility, etc) and should be considered as a part of county policies and actions.

To evaluate this potential impact in Charlotte County, a simplified modeling approach was used, referred to as the "bathtub method." This method generally assumes that groundwater will rise at the same rate as the nearby sea level. Determining depth to groundwater is accomplished by subtracting projected sea level elevations from existing ground elevation data using a high-resolution DEM – with the difference being the derived and estimate depth to groundwater from the surface in all areas.

For this work, sea levels were identified based on the MHHW levels, which represents typical high tides and is more relevant to long-term groundwater changes. The final depth to groundwater estimates are calculated using this formula:

Projected Groundwater Depth = Ground Elevation – (MHHW + Sea Level Rise)

Figures 10 to 12 show depth-to-groundwater (in feet) for Charlotte County.   Feet measures were developed as criteria as they link to vulnerability analysis measures for some features (like roadways).

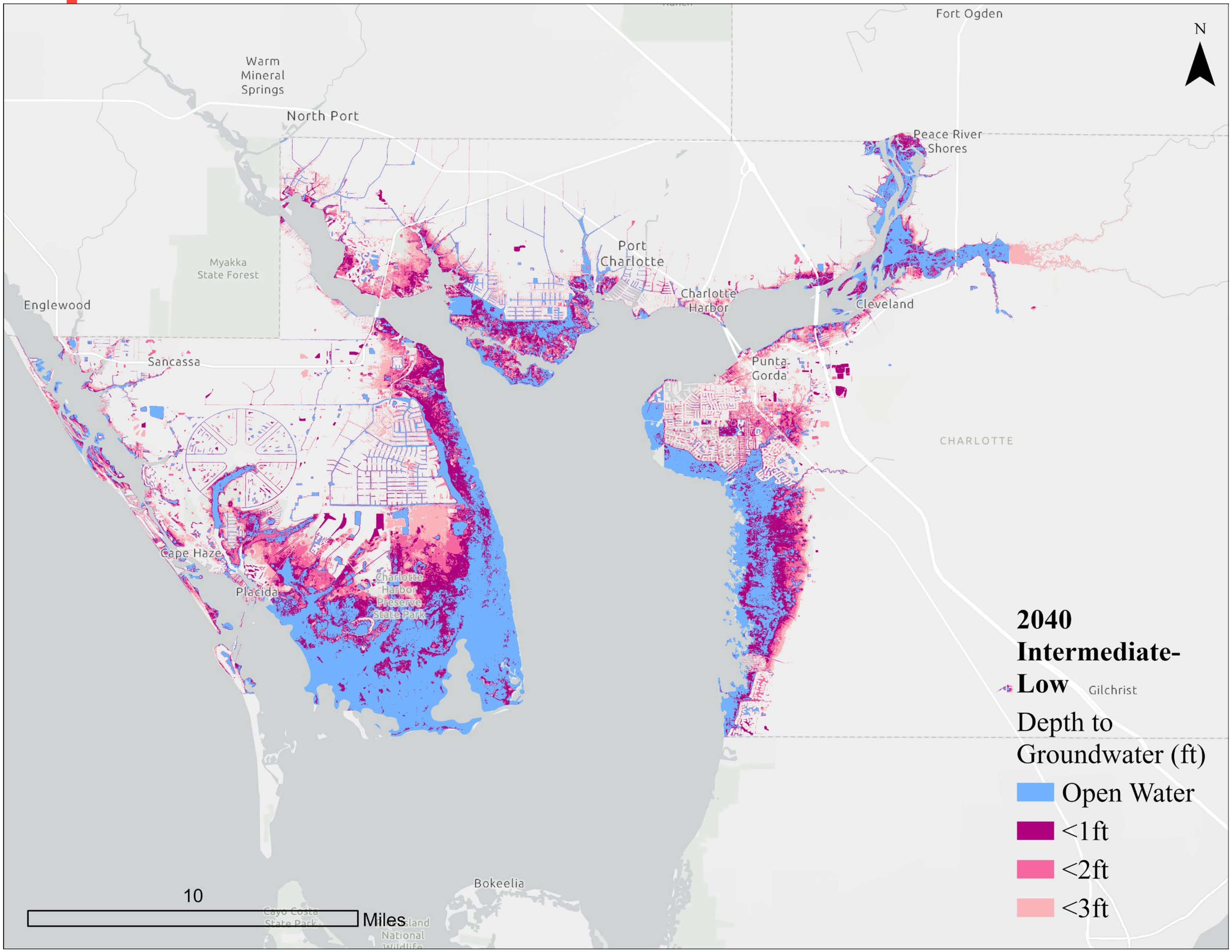

Figure 10: Depth to groundwater in feet for mean higher high water, 2040 Intermediate-Low Scenario

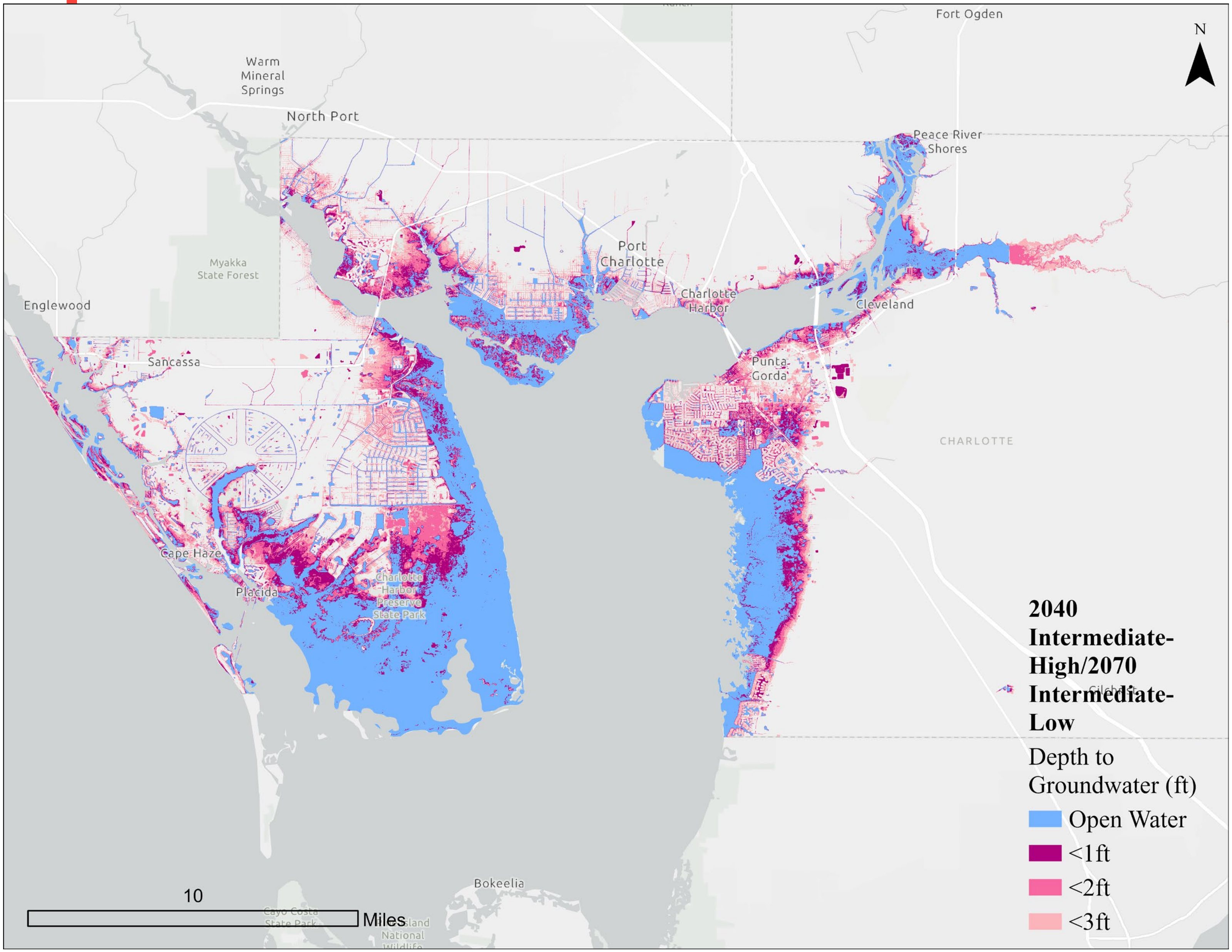

Figure 11 Depth to groundwater in feet for mean higher high water 2040 intermediate-high or 2070 intermediate-low scenario

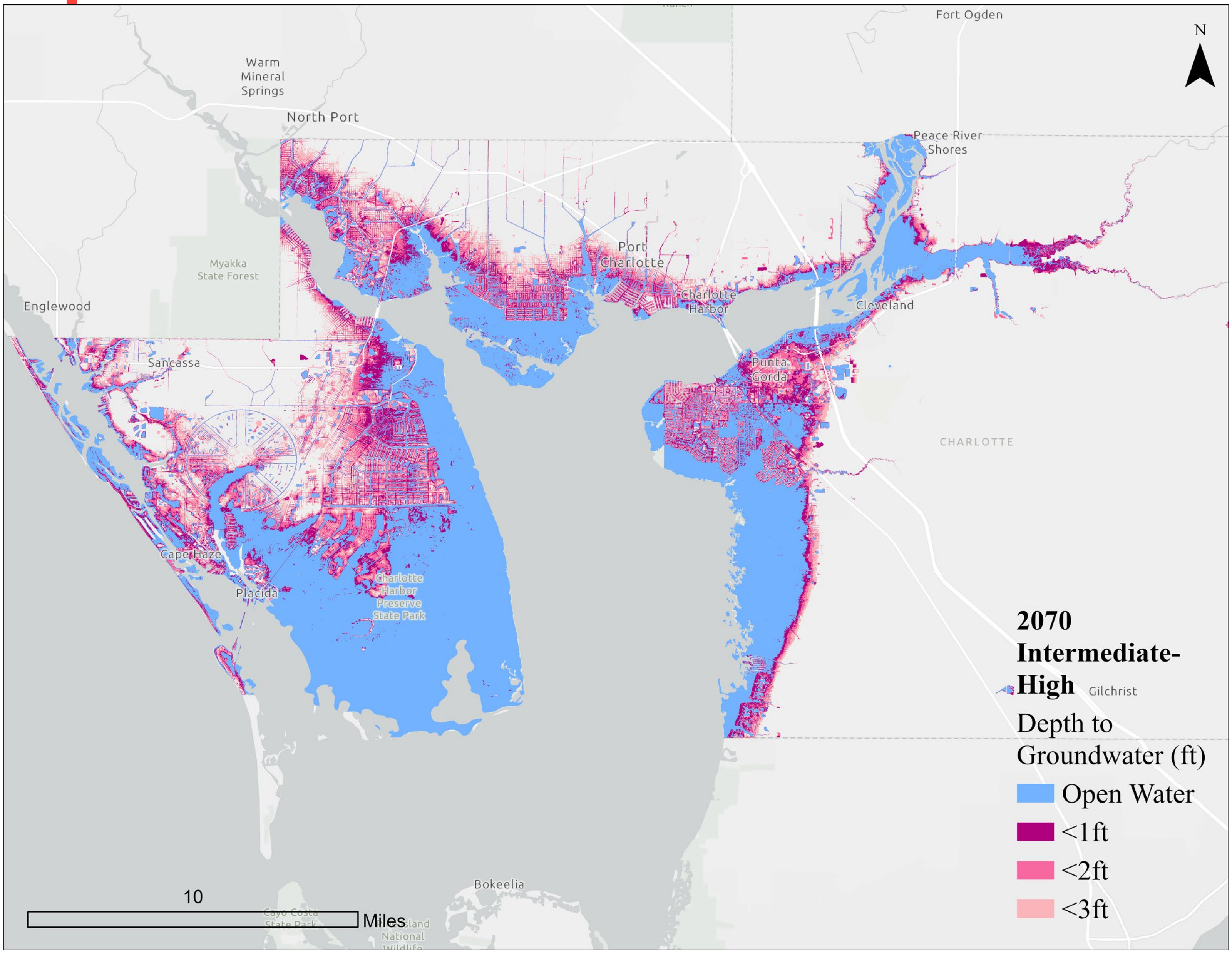

Figure 12: Depth to groundwater in feet for mean higher high water, 2070 Intermediate-High Scenario

CRITICAL/REGIONALLY SIGNIFICANT ASSETS INVENTORY

This section describes the asset inventory organization, data sources, and assets considered by the vulnerability assessment process. A critical part of the vulnerability assessment is obtaining, identifying, and organizing the critical and regionally-significant asset inventory. Categorizing assets helps to organize the findings of the vulnerability assessment based on asset function while also meeting FDEP grant requirements. The data provided to WSP was organized into four asset classes shown below and as defined in paragraphs *380.093(2)(a)1-4, F.S.*

- **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, solid and hazardous waste facilities, military installations, communications 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, and historic resources:** Conservation lands and parks, shorelines, surface waters and wetlands, historic and cultural assets.

AVAILABLE DATA SOURCES

The analysis utilized a combination of publicly-available and locally-provided datasets. Below is a list of the datasets used, along with a brief description of the attributes of each:

- Charlotte County Critical Facilities
  - Locally provided critical facilities including water treatment facilities, wastewater treatment facilities, fire stations, maintenance facilities, recreational facilities, and other asset types were provided with building footprints. These were the starting datasets for the critical asset inventory. Major roadways, evacuation routes, and bridges were also locally provided.
- Florida Statewide Resilience Dataset Statewide Critical Assets[7]
  - Served as a secondary dataset for the analysis. It provided a comprehensive point dataset covering all asset categories required by FDEP.
- ACUNE SWFL GeoTool Asset datasets
  - Point datasets included public schools, fire stations, hospitals, and police stations, linear features included major roads, and evacuation routes.
- Florida Department of Transportation (FDOT) Annual Average Daily Traffic (AADT)
  - Spatially joined AADT to the major roads, dataset provided by Charlotte County.
- Microsoft Building Footprints

[7] Florida Division of Emergency Management. 2023. *Florida Statewide Resilience Dataset: Statewide Critical Assets*. Available from https://floridadep.gov/sites/default/files/DEP%20Resilience%20Statewide%20Final%20Critical%20Assets%20Spatial%20Data%20Report-504.pdf

    - Spatially joined point datasets to building footprints to support the exposure analysis.
- Tax Parcels
    - Spatially joined building footprints to tax parcels to support the exposure analysis.
- Elevation Certificate (EC)
    - ECs were locally provided by Charlotte County to help determine an asset's critical elevation by providing precise measurements of the property's lowest floor elevation that could then be assessed relative to expected flood levels.
- U.S. Army Corps of Engineers (USACE) National Structures Inventory (NSI)
    - Point dataset used to estimate first-floor elevations to assess critical elevation thresholds. Where ECs were not available, NSI first-floor elevations were used to assume critical elevation.

ASSET INVENTORY

Table 2 highlights the asset inventory used for the vulnerability assessment, which included 386 buildings across 24 asset types, totaling more than 7.1 million square feet of built area. A significant portion of these assets are schools, which make up 30% of all buildings and account for 43% of the total built area, thus highlighting their importance in both daily operations and can support emergency response planning. Other prominent facility types include health care facilities, hospitals, and correctional facilities, each of which have large physical footprints and play critical roles in public safety and resilience. Additional key assets include local government facilities, fire stations, airports, and community centers, which support essential services, governance functions, and disaster response.

To complement the facility data, the inventory also includes 365 network infrastructure lift station points. These networked assets are widely distributed and critical for maintaining utility services. While their individual footprint is small (a related measure in FDEP analysis), their collective performance is essential for public health and environmental protection, particularly during and after hazard events.

Charlotte County contains essential transportation infrastructure that supports daily travel and emergency operations. The county includes 25 miles of railroad and approximately 491 miles of roadway, categorized by functional class as shown in Table 3. Of this network, over 260 miles serve as designated evacuation routes, primarily along interstates and arterial roads, which are critical during hurricane events and other emergencies.

The county's roadway system is supported by 104 bridges, 48 culverts, and 9 historic bridges (see Table 4), which provide critical crossings over water bodies and low-lying areas. These structures represent potential vulnerability points when damaged and are vital for maintaining access to key facilities before, during, and after hazard events.

Charlotte County is also rich in natural, cultural, and recreational resources, containing 31,059 acres of parks, 20,402 acres of conservation lands, and an extensive 1,012,652 acres of wetlands, as shown in Table 5. Additionally, the county features 337 miles of shoreline, making coastal system resilience a priority in planning efforts. These resources not only contribute to environmental health and quality of life in the county, but also require special consideration relating to climate-related hazards where changing conditions may threaten the existence of some of these areas.

Table 2: Critical assets within the study area, number of facilities, built area, and their proportional representation

Asset Type	Total Count of Buildings	Sum of Built Area (sq ft)	% of Total Count of Buildings	% of Total Sum of Built Area
Affordable Public Housing	7	132,682	2%	2%
Airports	12	301,951	3%	4%

Colleges and Universities	9	109,143	2%	2%
Communications Facilities	6	130,131	2%	2%
Community Centers	13	223,152	3%	3%
Correctional Facilities	29	532,186	8%	7%
Disaster Recovery Centers	2	138,314	1%	2%
Emergency Medical Service Facilities	2	21,624	1%	0.3%
Emergency Operation Centers	1	20,581	0%	0.3%
Fire Stations	25	147,855	6%	2%
Health Care Facilities	22	778,749	6%	11%
Historical and Cultural Assets	4	21,904	1%	0.3%
Hospitals	8	468,270	2%	7%
Law Enforcement Facilities	6	109,445	2%	2%
Lift Stations	2	1,579	1%	0.02%
Local Government Facilities	22	362,764	6%	5%
Logistical Staging Areas	2	32,644	1%	0.5%
Marinas	1	16,165	0%	0.2%
Parks	11	162,307	3%	2%
Pump Stations	18	18,694	5%	0.3%
Risk Shelter Inventory	6	142,135	2%	2%
Schools	114	3,057,219	30%	43%
Solid and Hazardous Waste Facilities	9	47,845	2%	0.7%
Wastewater Treatment Facilities	55	191,646	14%	3%
Total	**386**	**7,168,985**	**100%**	**100%**[8]

Table 3: Roadway linear mileage by functional class and evacuation route

Functional Class	Total Mileage	Evacuation Route Mileage
Interstate	52	44
Principal Arterial	76	69

[8] The sum does not equal 100% due to rounding of numbers.

Minor Arterial	161	113
Major Collector	200	34
Minor Collector	2	-

Table 4: Transportation infrastructure asset inventory

Structure	Number
Bridges	104
Culverts	48
Historic Bridges	9

Table 5: Natural, cultural, and historical resources, total acres of land

Land Use Type	Total Acres
Parks	31,059
Conservation Lands	20,402
Wetlands	1,012,652

DATA GAPS

While the assessment methodology utilizes the best available data to assess Charlotte County's vulnerability to climate-related hazards, there are several key data gaps that might limit the completeness or precision of the analysis. Addressing these gaps will enhance the County's ability to conduct future assessments, refine adaptation strategies, and pursue funding opportunities through programs such as FDEP's Resilient Florida Program.

Precipitation-induced Flooding Data

Stand-alone rainfall-based flooding was not included in the current analysis due to the lack of available data. Although not a mandatory requirement for coastal communities under s. *380.093, F.S.*, the inclusion of precipitation-based flood modeling (e.g., 100-year and 500-year rainfall events) would provide a more complete understanding of compound flooding risks. Future assessments should consider collaboration with regional water management districts or NOAA's Atlas 14 datasets to fill this gap.

Sea Level Scenarios

The current flood scenarios use NOAA's 2017 Sea level projections. Updated projections from NOAA's 2022 Sea Level Technical Report offer more recent estimates and are increasingly used in resilience planning given the tie in to Florida state codes. Incorporating these newer projections in future modeling for 2050 and 2080 benchmarks would improve alignment with current best practices in the state and align analysis/results with other communities.

Asset Inventory

All required asset types that exist within Charlotte County are present in the asset database. Several asset types listed in FDEP guidance do not exist within the county and were therefore excluded from the vulnerability assessment, including:

- Stormwater treatment facilities
- Drinking water facilities

- Military installations
- Bus terminals
- Ports
- Rail facilities
- Railroad bridges

The best available datasets were utilized to estimate critical elevations, which served as a key metric for assessing asset vulnerability. The DEM was used in most/all cases to determine land elevations at critical assets. Elevation certificates, provided locally by Charlotte County, offered additional detailed measurements of a property's lowest floor relative to expected flood levels and were used to determine an asset's critical elevation where available. While these sources provided a valuable foundation, they may not have fully captured actual asset conditions to a level that would enable a more detailed technical analysis. Data such as information on asset age, deterioration, or condition are lacking from the analysis, and could provide benefit to future assessments. Addressing these gaps in future assessments through field surveys or integration with local property appraiser data would improve the accuracy and reliability of vulnerability evaluations.

Appendix E: Exposure and Sensitivity Analysis

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CHARLOTTE COUNTY COMPREHENSIVE VULNERABILITY ASSESSMENT

CLIENT:

CHARLOTTE COUNTY, FL

FUNDED BY:

COASTAL & HEARTLAND NATIONAL ESTUARY PARTNERSHIP (CHNEP)

APPENDIX E: EXPOSURE AND SENSITIVITY ANALYSIS

JUNE 2026

WSP USA

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ACRONYMS LIST

AADT	Annual Average Daily Traffic
CHNEP	Coastal & Heartland National Estuary Partnership
EAL	Expected Annual Losses
EC	Elevation Certificates
FDEP	Florida Department of Environmental Protection
FDOT	Florida Department of Transportation
FEMA	Federal Emergency Management Agency
FFE	First Floor Elevation
HAZUS	Hazard U.S. Multi-Hazard Software
MHHW	Mean Higher High Water
NSI	National Structures Inventory
OCM	Office of Coastal Management
PV	Present Value
SLC	Sea Level Change
USACE	U.S. Army Corps of Engineers
VA	Vulnerability Assessment

TERM DEFINITION

EXPOSURE	The extent to which an asset, system, or community is subject to potential contact with hazards, typically described by the presence, location, and intensity of the asset within the hazard area.
SENSITIVITY	The degree to which an exposed asset is physically affected by a given hazard intensity (e.g., how much damage occurs to the asset at a certain flood depth).
VULNERABILITY	The expected degree of physical and/or functional impact, typically expressed in monetary terms, on an asset when it is exposed to a hazard of a given intensity.
RISK	The probability and consequences resulting form the interaction of hazard exposure, and vulnerability, often expressed as the loss or damage over a specified period.

1 INTRODUCTION

Charlotte County, located along the southwest coast of Florida, United States, is bordered by the Gulf of America to the west and Charlotte Harbor to the south. Its expansive shoreline, low-lying topography, and interconnected waterways make the County particularly vulnerable to a variety of coastal and climate-related hazards. Major population centers such as Port Charlotte and Punta Gorda are situated near critical water bodies, increasing their exposure to sea level change (SLC), storm surge, extreme precipitation, and compound flooding. These risks are illustrated by recent hurricanes, including Hurricane Ian (2022), Hurricane Idalia (2023), Hurricane Helene, and Hurricane Milton (2024). Each of these storms caused widespread damage across the region. As these types of hazards become more frequent and intense, Charlotte County needs to evaluate and enhance the resilience of its communities to current and future environmental threats.

In recognition of this need, Charlotte County is undertaking a Vulnerability Assessment (VA) to assess its vulnerability to flooding and related hazards. This VA is being funded by the Coastal & Heartland National Estuary Partnership (CHNEP) in support of regional climate resilience efforts. The County is following the Florida Department of Environmental Protection (FDEP)'s standardized set of work tasks and deliverables as outlined in the Resilient Florida Program to align the VA's tasks and outputs with state guidelines. This ensures program consistency and enhanced eligibility for future state funding and conformance with state project requirements. The goal of the VA is to develop a comprehensive understanding of the potential hazards facing Charlotte County and to produce an Adaptation Plan that addresses climate risks to enhance the long-term resilience of Charlotte County communities.

The following section outlines the critical and significant assets included in the VA. It is followed by a detailed explanation of the step-by-step methodology framework used to evaluate vulnerability and risk across Charlotte County. Sections 4 to 7 outline the key results for four main asset types, including their exposure, tidal flooding risks, and storm surge risks.

2 INVENTORY OF CRITICAL/REGIONALLY SIGNIFICANT ASSETS

This section describes the structure of the asset inventory, data sources, and the assets considered in the VA process.

2.1 ASSET CLASSES

Obtaining, identifying, and organizing the critical and regionally significant asset inventory is an important foundational step in the VA. Categorizing assets that are potentially impacted helps to organize the findings of the VA based on asset function while also meeting FDEP grant requirements. The data provided to WSP was organized into the four asset classes shown below (defined in paragraphs *380.093(2)(a)1-4, F.S.*):[1]

- **Critical infrastructure:** Wastewater treatment facilities and lift stations, stormwater treatment facilities and pump stations, drinking water facilities, solid and hazardous waste facilities, military installations, communications 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.
- **Transportation assets and evacuation routes:** Airports, bridges, bus terminals, ports, major roadways, marinas, rail facilities, and railroad bridges.
- **Natural, cultural, and historic resources:** Conservation lands and parks, shorelines, surface waters and wetlands, historic and cultural assets.

[1] Laws of Florida, Chapter 2021-28, Available from https://laws.flrules.org/2021/28

2.2 DATA SOURCES

The asset analysis utilized a combination of publicly available and locally provided datasets. Below is a list of the datasets used, along with a brief description of their attributes.

- Charlotte County - Critical Facilities Data
  - Critical facility (e.g., water treatment facilities, wastewater treatment facilities, fire stations, maintenance facilities, recreational facilities, and other asset types) data, including building footprints were provided from local sources. These were the starting datasets for the critical asset inventory. Major roadways, evacuation routes, and bridges were also provided locally.
- Florida Division of Emergency Management - Statewide Critical Assets Dataset[2]
  - This dataset served as a secondary source for the analysis. It provided a comprehensive point dataset covering all asset categories required by FDEP.
- Charlotte County and University of Florida - ACUNE SWFL GeoTool Asset Datasets
  - The point datasets included public schools, fire stations, hospitals, and police stations; linear features included major roads and evacuation routes.
- Florida Department of Transportation's (FDOT) - Annual Average Daily Traffic (AADT)
  - The FDOT AADT data were spatially joined to the major road dataset provided by Charlotte County.
- Microsoft - Building Footprints
  - Point datasets were spatially joined to building footprints to support the exposure analysis.
- Charlotte County - Tax Parcels
  - Building footprints were spatially joined to tax parcels to support the exposure analysis.
- Charlotte County - Elevation Certificates (EC)
  - ECs were locally provided by Charlotte County to help determine an asset's critical elevation. This included precise measurements of the property's lowest floor elevation that could then be assessed relative to expected flood levels.
- U.S. Army Corps of Engineers' (USACE) - National Structures Inventory (NSI)
  - This point dataset was used to estimate first-floor elevations to assess critical elevation thresholds. Where ECs were not available, NSI first-floor elevations were used to assume critical elevation.

2.3 DATA GAPS

The best available data sources were used to estimate critical elevations, which are a key factor in evaluating an asset's vulnerability to flooding. Where available, elevation certificates (ECs) provided by Charlotte County offered precise measurements of a structure's lowest floor elevation in relation to flood levels and served as the preferred source of critical elevation data. In cases where ECs were not available, estimates of first floor elevation (FFE) from the National Structure

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[2] Florida Division of Emergency Management. 2023. *Florida Statewide Resilience Dataset: Statewide Critical Assets*. Available from https://floridadep.gov/sites/default/files/DEP%20Resilience%20Statewide%20Final%20Critical%20Assets%20Spatial%20Data%20Report-504.pdf[3] The groundwater depth is defined as the difference between land elevation and tidal elevation in this analysis.

Inventory (NSI) were used as the next-best alternative. If neither ECs nor NSI-based FFE data were available, a mean FFE value (0.5 ft) was assigned based on the asset class using reference data from NSI.

While these sources provide a valuable starting point for analysis, they may not fully reflect actual site-specific conditions. Information such as the age, condition, or structural integrity of individual assets was not available and therefore not incorporated into the analysis. This missing information could result in an underestimation of flood vulnerability and adaptive capacity.

For the roadways, the analysis intended to use available data on the number of lanes and roadway thickness to support segment-level value estimation. However, the information about the number of lanes is limited, and the thickness data were unavailable. To use this information for road value estimation, as FEMA provides two road types with replacement costs: major roadway with 4 lanes or urban street with 2 lanes, a multi-criteria approach is used to categorize road segment types:

1. If the lane number is specified, the corresponding road type is assigned.
2. If lane number information is missing, and the road segment has a function of 0 or 1 (representing interstates and principal arterials) with a speed limit greater than 45 miles per hour, it is classified as a major road with four lanes.
3. Otherwise, it is considered an urban street with two lanes.

Additionally, roadway segment thickness data were not available for this analysis. As a result, thickness values were estimated based on roadway functional classifications and the guidelines provided in the Florida Pavement Design Standards.

Future assessments could benefit from closing these data gaps through targeted field surveys, improved integration with local property appraiser records, expanded access to municipal asset data, and agency management data. Enhancing the completeness and resolution of asset-level information would improve the accuracy and reliability of vulnerability evaluations and adaptation planning.

Further details on data sufficiency and gaps are provided in Appendix D Hazard and Asset Data.

While the assessment methodology utilizes the best available data to assess Charlotte County's vulnerability to climate-related hazards, there are several key data gaps that might limit the completeness or precision of the analysis. Addressing these gaps will enhance the County's ability to conduct future assessments, refine adaptation strategies, and pursue funding opportunities through programs such as FDEP's Resilient Florida Program.

2.3.1 Precipitation-induced Flooding Data

Stand-alone rainfall-based flooding was not included in the current analysis due to the lack of available data. Although not a mandatory requirement for coastal communities under s. *380.093, F.S.*, the inclusion of precipitation-based flood modeling (e.g., 100-year and 500-year rainfall events) would provide a more complete understanding of compound flooding risks. Future assessments should consider collaboration with regional water management districts or NOAA's Atlas 14 datasets to fill this gap.

2.3.2 Sea Level Scenarios

The current flood scenarios use NOAA's 2017 Sea level projections. Updated projections from NOAA's 2022 Sea Level Technical Report offer more recent estimates and are increasingly used in resilience planning given the tie to Florida state codes. Incorporating these newer projections in future modeling for 2050 and 2080 benchmarks would improve alignment with current best practices in the state and align analysis/results with other communities.

2.3.3 Asset Inventory

All required asset types that exist within Charlotte County are present in the asset database. Several asset types listed in FDEP guidance do not exist within the county and were therefore excluded from the vulnerability assessment, including:

- Stormwater treatment facilities
- Drinking water facilities
- Military installations
- Bus terminals
- Ports
- Rail facilities
- Railroad bridges

The best available datasets were utilized to estimate critical elevations, which served as a key metric for assessing asset vulnerability. The DEM was used in most/all cases to determine land elevations at critical assets. Elevation certificates, provided locally by Charlotte County, offered additional detailed measurements of a property's lowest floor relative to expected flood levels and were used to determine an asset's critical elevation where available. While these sources provided a valuable foundation, they may not have fully captured actual asset conditions to a level that would enable a more detailed technical analysis. Data such as information on asset age, deterioration, or condition are lacking from the analysis, and could provide benefit to future assessments. Addressing these gaps in future assessments through field surveys or integration with local property appraiser data would improve the accuracy and reliability of vulnerability evaluations.

3 VULNERABILITY AND RISK ASSESSMENT APPROACH

This section presents the framework used to evaluate vulnerability and risk within Charlotte County. It outlines the step-by-step methodology applied to assess asset exposure, vulnerability, and risks under current and future projections.

3.1 EXPOSURE ANALYSIS

Exposure analysis is the first step in understanding how climate hazards, such as tidal flooding, storm surge, and rising groundwater, impact critical assets and infrastructure. In this study, an "exposed" asset is defined as an asset that is located within the current or future extent of flooding (the extent of damage from this flooding is determined in the vulnerability analysis discussed below).

3.1.1 METHODS

The exposure analysis evaluates the extent and depth of flooding from tidal actions and storm surge, as well as potential flooding from elevated groundwater levels[3]. These scenarios align with FDEP's Resilient Florida Program standards and use GIS-based methodologies to analyze flood depths and extents spatially across Charlotte County's infrastructure, emergency facilities, transportation networks, and natural, cultural, and historical resources. A GIS-based analysis examined data overlays of asset locations and hazard characteristics for current and future scenarios (see Table 1). For each asset layer, the timing of exposure is recorded along with the depth or elevation of flooding.

3.1.2 HAZARD SCENARIOS FOR THE RISK ASSESSMENT

The estimation of risk to the county's critical assets for each infrastructure sector was based on the hazard scenarios summarized in Table 1.

[3] The groundwater depth is defined as the difference between land elevation and tidal elevation in this analysis.

Table 1 Hazard scenarios assessed

Hazard	Scenarios	Key Hazard Indicator	Data Source
Tidal Flooding (4 scenarios)	Mean Higher High Water (MHHW) for: • 2040: Intermediate-High • 2040: Intermediate-Low • 2070: Intermediate-High • 2070: Intermediate-Low	Flooding depth Flooding extent	NOAA's Office of Coastal Management (OCM)[4].
Storm Surge (5 scenarios)	100-year event for: • Today (2022) • 2040: Intermediate-High • 2040: Intermediate-Low • 2070: Intermediate-High • 2070: Intermediate-Low	Flooding depth Flooding extent	ACUNE
Rising Groundwater[5] (4 scenarios)	• 2040: Intermediate-High • 2040: Intermediate-Low • 2070: Intermediate-High • 2070: Intermediate-Low	Groundwater depth	NOAA's Office of Coastal Management (OCM)

3.2 VULNERABILITY ASSESSMENT

The vulnerability assessment characterizes the expected degree of physical and/or functional impact on an asset when it is exposed to a hazard of a given intensity, typically expressed in monetary terms. As part of the vulnerability analysis, a sensitivity analysis is conducted to quantify how sensitive the estimate of damage is to varying levels of hazards[6]. This impact characterization can be expressed both quantitatively and qualitatively.

3.2.1 QUANTITATIVE VULNERABILITY ASSESSMENT

Quantitative vulnerability assessments rely on complex modeling that quantifies the hazard impacts on an asset, defined by different measures such as cost to replace the asset, economic losses to the users of the facility, and economic losses to the broader community. In the context of quantitative flood risk assessment, vulnerability functions (also referred to as depth-damage functions, that is, what damage can be expected for different depths of flooding) for building assets are produced by FEMA as part of its Loss Estimation Methodology. [7]

The FEMA methodology aims to provide a standardized approach for conducting comparable quantitative risk assessments for natural hazards to support decision-making and planning for federal government purposes. The methodology is incorporated into the Hazard U.S. Multi-Hazard (HAZUS) software developed by FEMA that can be used to conduct such assessments. This VA uses FEMA's Loss Estimation Methodology and specific data and models in HAZUS to assess quantitatively the risk to buildings and transportation assets.

The Methodology allows the user to estimate two types of economic losses:

- Direct economic losses: Repair and replacement costs to assets based on expected damage from the occurrence of a hazard event.

[4] https://coast.noaa.gov/slr/#/layer/slr
[5] This hazard is specific to assessing potential risk to roadways.
[6] Florida Adaptation Planning Guidebook: https://floridadep.gov/sites/default/files/AdaptationPlanningGuidebook.pdf
[7] FEMA HAZUS Flood Technical Manual (2022): https://www.fema.gov/sites/default/files/documents/fema_hazus-flood-model-technical-manual-5-1.pdf

- Indirect economic losses: Loss of asset functionality given sustained damage; Represents financial consequences to the community from business interruption.

Vulnerability functions relate the degree of asset damage to the magnitude of the hazard. Table 2 is an example of this for an average medical office/clinic building facing a flood. At 2 feet of flood depth above the first-floor elevation, the expected structure cost is 12% of the replacement cost, and the contents damage is estimated at 51% of its replacement cost. If the water level increases up to 6 feet, 17% of the building structure is impacted, and the damage to the contents reaches 71% of the base value. It should be noted that a small baseline replacement cost (e.g. 2%) is sometimes present even at 0 feet of flooding to reflect minimal impacts and modeling uncertainty.

Table 2 Sample depth damage curve of an average medical office/clinic building from FEMA HAZUS (% of asset replacement value)

% Damage (By Type)	Flood Depth (ft) Relative to FFE												
	0	1	2	3	4	5	6	7	8	9	10	11	12
Structure	2.0	11.0	12.0	13.0	14.0	16.0	17.0	18.0	20.0	22.0	24.0	27.0	30.0
Contents	0.0	28.0	51.0	60.0	63.0	67.0	71.0	72.0	74.0	77.0	81.0	86.0	92.0

Damage ratios are translated into economic losses by multiplying these values by the asset base valuation. Asset valuation for building structure and contents is estimated as a function of the built area of the asset (see Table 6-2 and Table 6-9 from the FEMA HAZUS Flood Model Technical Manual)[8]. For this study, footprint areas were retrieved from publicly available datasets produced by Microsoft[9]. The number of stories for the building assets was retrieved from the National Structure Inventory[10] (NSI); however, this information was not available for 100% of the structures in the VA. Gaps in the number of stories were estimated by assuming the mean value for each of the building types.

HAZUS has a repository of depth damage functions that allow for the quantification of the expected damage ratio of a building asset as a function of the flood depth. These curves help modelers translate physical flood depth into quantitative (that is, monetary) loss estimates for each component. Based on the asset categories, physical properties, and functions of each building in the asset inventory, the corresponding depth-damage functions are identified and extracted for risk quantification. The damage ratio, provided by HAZUS depth damage functions, represents the asset's repair cost to the asset's replacement cost. These ratios are then multiplied by the replacement cost values to quantify monetary losses. HAZUS damage estimates are based on generalized building classes and depth-damage functions, which represent average performance across many facilities. Therefore, even though some individual structures may be completely destroyed at 12 feet of flooding (such as Table 2), the model output reflects an aggregated replacement cost ratio of about 30% for the building class as a whole.

For the transportation assets, there are no depth-damage functions for roadways and railways available in HAZUS repository. However, a comprehensive library of depth-damage functions has been established by various studies, including those compiled by the European Commission's Joint Research Centre.[11] These functions are based on extensive data collection and analysis of past flood events across different regions.

Given the similarities in roadway characteristics in both Europe and the U.S., the European depth-damage function for roads is applied in this analysis. This function provides a standardized approach to estimate the damage to road infrastructure at

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[8] FEMA HAZUS Flood Technical Manual (2022): https://www.fema.gov/sites/default/files/documents/fema_hazus-flood-model-technical-manual-5-1.pdf
[9] Microsoft Maps: GitHub - microsoft/USBuildingFootprints: Computer generated building footprints for the United States
[10] National Structure Inventory: https://www.hec.usace.army.mil/confluence/nsi/technicalreferences/latest/technical-documentation
[11] Habermann, N., & Hedel, R. (2018). Damage functions for transport infrastructure. *International journal of disaster resilience in the built environment*, *9*(4/5), 420-434.

varying flood depths. By using this function, quantifying direct economic loss of the roadway can be developed like the approach for buildings.

Similarly, for railway segments, the European depth-damage function is adapted due to the comparable nature of rail infrastructure. Railways, like roadways, are susceptible to flood damage that can disrupt transportation networks and incur significant repair costs. The depth-damage function for railways considers factors such as track type, ballast condition, and the materials used in construction. By applying this function, the damage to railway segments at various flood depths can be assessed, providing a consistent methodology for evaluating flood impacts on both roadways and railways.

3.2.2 QUALITATIVE VULNERABILITY ASSESSMENT

Qualitative vulnerability assessments describe in subjective terms (e.g., low, moderate, high) the expected degree of impact of an asset and are usually based on past observations and inputs from subject matter experts. These assessments are particularly useful when quantitative data is limited, or the available data cannot be translated into numeric indicators.

3.3 RISK ASSESSMENT

Risk assessment integrates the results of exposure and vulnerability analyses to estimate the potential consequences of hazards on critical assets. This section outlines both quantitative and qualitative approaches used to characterize hazard-related risks across infrastructure systems. Quantitative methods, based on the use of depth-damage functions, estimate direct economic losses and/or indirect economic losses, while qualitative methods evaluate risk where data constraints or asset complexity preclude obtaining quantitative results. Together, these approaches support informed decision-making by identifying where the most significant risks occur and which assets may require prioritized adaptation measures.

3.3.1 QUANTITATIVE RISK ASSESSMENT

Estimating the economic losses for buildings given a hazard scenario follows four major steps:

1. Obtain the flood depth at each of the building's location by conducting geospatial analysis and overlaying the raster files with the flood depths for the scenarios and the buildings to be assessed.
2. Estimate the flood depth relative to the first-floor elevation (FFE).

$$Flood\ depth\ relative\ to\ FFE = Flood\ depth\ at\ the\ asset's\ location - First\ floor\ elevation$$ *Equation 1*

3. Estimate the damage ratio from the assigned damage function given the flood depth obtained in step 1. To do this, the datapoints from the damage function (see Table 2) are used to interpolate and obtained the associated damage ratio.
4. Estimate the economic loss associated with structure and content damages by multiplying the damage ratio and the structure and contents valuation.

In addition to losses associated with asset replacement costs, the FEMA Methodology provides guidance to quantify the indirect losses based on estimated recovery time and building footprint area. The recovery time is determined using the maximum restoration time (in days) associated with the given flood depth and building type as documented in Section 6.2.2.1 HAZUS Flood Technical Manual[12]. Based on the identified flooding depth for each building, the maximum restoration days can be interpolated according to their type.

Based on this approach, the following categories of losses are quantified (see sections 6.2.2.2 to 6.2.2.5 from the FEMA HAZUS Flood Model Technical Manual[12]):

- Relocation expenses: Costs of transferring activities to a temporary space while the building is repaired.

[12] FEMA HAZUS Flood Technical Manual (2022): https://www.fema.gov/sites/default/files/documents/fema_hazus-flood-model-technical-manual-5-1.pdf

- Rental income losses: Loss of income for the property owner that would be received if the building were functional.

For roadways and railways, the following steps are applied to estimate the direct economic losses for a given hazard scenario:

1. Conduct geospatial analysis and overlay the raster files with the flood depths for the hazard scenarios and the roadway or railway segments to be assessed; obtain flood depth at each of the facility segments' location and the inundated length.
2. Estimate the damage ratio from the assigned damage function given the flood depth obtained in step 1. To do this, the datapoints from the damage function assigned are used to interpolate and obtain the associated damage ratio.
3. Calculate inundated road segments' valuation.
4. Estimate the direct economic loss associated with structural damage by multiplying the damage ratio and the estimated inundated road/railway segment valuation.

The indirect economic loss associated with roadways and railways is not considered quantitatively.

3.3.2 QUALITATIVE RISK ASSESSMENT

For risks that cannot be readily quantified through direct economic valuation, a qualitative risk assessment approach was employed to evaluate the potential non-monetary risks, such as mobility and structural degradation, to certain assets for specific hazard scenarios.

1. Identify key hazard indicators: Determine the relevant hazard indicators at each asset location for the specified hazard scenario.
2. Establish risk thresholds: Define risk thresholds for each asset type based on established guidelines, best practices, and relevant literature.
3. Classify risk levels: Assess and categorize the potential risks into qualitative levels (e.g., low, moderate, high) based on the defined thresholds.
4. Visualize risk distribution (optional): Present the qualitative risk levels spatially using maps to support interpretation and decision-making.

3.4 SUMMARY OF RISK ASSESSMENT APPROACHES IMPLEMENTED FOR CRITICAL ASSET CATEGORIES

Based on the approaches discussed above, Table 3 summarises the assessment approaches (quantitative or qualitative) implemented for the different asset types based on the best data availability.

Table 3 Risk assessment methodology summary

Critical Assets Category	Asset Types	Tidal Flooding	Storm Surge	Rising Groundwater
Critical Infrastructure	Building	Qualitative	Quantitative	N/A
	Lift Stations	Qualitative	Qualitative	N/A
Critical Community and Emergency Facilities	Building	Qualitative	Quantitative	N/A
Transportation Assets and Evacuation Routes	Roadway	Qualitative	Quantitative	Qualitative
	Evacuation Routes	Qualitative	Quantitative	Qualitative

Critical Assets Category	Asset Types	Tidal Flooding	Storm Surge	Rising Groundwater
	Railway	Qualitative	Quantitative	N/A
	Bridges and Culverts	Qualitative	Qualitative	N/A
Natural, Cultural, and Historic Resources	Conservation Lands	Qualitative	Quantitative	N/A
	Historic Bridge	Qualitative	Qualitative	N/A
	Parks	Qualitative	Qualitative	N/A
	Wetlands	Qualitative	Quantitative	N/A

While rising groundwater may pose a long-term risk to various types of infrastructure, the current analysis focuses specifically on roadway assets, which are known to be particularly sensitive to shallow groundwater conditions. Other asset types, such as buildings, lift stations, bridges and culverts, and natural, cultural, and historic resources, were not included in this analysis due to two main limitations: the lack of detailed subsurface design data and the lower relevance of groundwater-related damage mechanisms, especially in cases involving deep foundations or ecologically variable systems.

3.5 LIFECYCLE ANALYSIS AND QUANTIFICATION OF THE PRESENT VALUE OF RISK

Life cycle estimates are developed to capture the cumulative economic impact of flooding over a defined analysis period, building on the results of the quantitative risk approach defined in the previous sections. According to FEMA[13], expected annual losses (EAL) represent the average economic loss in dollars resulting from natural hazards each year. In this case, the EAL are estimated for each time horizon (i.e., 2022, 2040, and 2070) and or each scenario by multiplying the probability of the event (e.g., 1%) by the estimated losses from that event for each year.

Linear interpolation is used to estimate the average annual losses for the years in between the assessed time horizons. For this project, the analysis assumes a start year of 2025 and a 30-year analysis period extending through 2054. Figure 1 presents an example of projected losses.

[13] Definition of the Expected Annual Loss, FEMA: Expected Annual Loss | National Risk Index

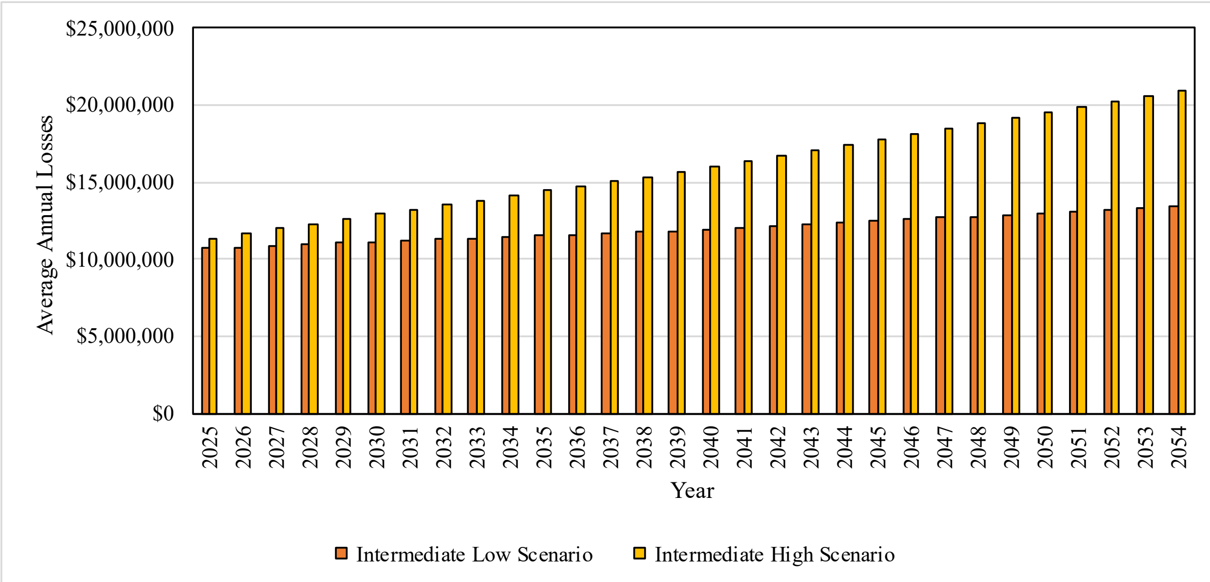


Figure 1 Average annual losses projected through the 30-year analysis period.

The present value (PV) represents the aggregate of future cash flows in today's monetary value. To estimate the PV of the losses from flooding events through the 30-year analysis period, the projected losses are discounted using Equation 2 where:

- The *future value* corresponds to the expected annual loss estimated for a given year.
- The *discount rate* corresponds to the factor used to reflect the time value of money in present value terms for the future cash flow. A real discount rate of 7.0%[14] is used following guidance from OMB.
- *n* corresponds to the period or number of years in which the cash flow is projected to occur with respect to the base year of the analysis. In this case, if the base year of the analysis is 2025, a cash flow projected to occur in 2029 has *n*=4.

$$Present\ Value = \frac{Future\ Value}{(1 + Discount\ rate)^n} \quad \text{Equation 2}$$

For each annual loss estimated as shown in Figure 1, Equation 2 is applied, and the sum over n years yields a total life cycle cost estimate, which is also defined as the monetary value of risk. Results are estimated for the Intermediate-High Scenario and Intermediate-Low Scenario.

[14] Definition of discount rate for BCA for Federal Programs according to the Office of Management and Budget (OMB) Circular A-94: M-25-23-Rescission-and-Reinstatement-of-Circular-No.-A-94.pdf

3.6 ECONOMIC VALUATION OF ECOSYSTEM SERVICE BENEFITS

For this study, natural resources correspond to conservation lands and wetlands. The expected change in ecosystem service benefits from changing sea levels is estimated for these two categories following FEMA[15]. This approach aims to monetize identified benefits from ecosystems to the environment and to the communities. These benefits are estimated annually in terms of $USD per unit area in acres.

The valuation of ecosystem services benefits has been used to estimate the expected monetized changes over time from reduced areas of wetlands and conservation lands. The assumption is that if the area of the ecosystem is reduced over time, it will not provide ecosystem service benefits anymore, and therefore, the associated economic benefit is considered lost.

To assess how different land cover types within these areas may be impacted by CSL, the habitat evolution model from SLAMM (Sea Level Affecting Marshes Model)[16] land use/land cover datasets for 2016, 2040, and 2070 were used. CSL was selected for this analysis because it models the long-term conversion of coastal habitats under various CSL scenarios, making it particularly suited for understanding how tidal and surge-related inundation may affect both natural and developed areas over time.

Based on the land cover classifications, Developed Upland–Hard represents rural areas with impervious surfaces, which are considered unable to provide meaningful ecosystem services. Similarly, Open Water is excluded from ecosystem service valuation due to its limited contribution in this context. In contrast, Developed Upland–Soft and Undeveloped Upland represent unpaved urban green spaces that can still offer ecological and recreational benefits. All remaining categories are classified as part of the coastal wetland ecosystem, which plays a vital role in providing a wide range of ecosystem services, as presented in Table 4.

Table 4 Equivalence of land categories in SLAMM is assumed to implement the FEMA Ecosystem Service Valuation Methodology[17]

Land Categories SLAMM	Land Categories in FEMA[15]
Undeveloped Upland	Rural green open spaces
Developed Upland - Soft	
Freshwater Marsh	Coastal wetlands
High Salt Marsh	
Mangroves	
Salt Barren	
Tidal Flat	
Open Water	Not applicable for ecosystem service benefits
Developed Upland - Hard	

[15] FEMA, "Ecosystem Service Value Updates," 2022, https://www.fema.gov/sites/default/files/documents/fema_ecosystem-service-value-updates_2022.pdf
[16] Sea Level Affecting Marshes Model
[17] FEMA, "Ecosystem Service Value Updates," 2022, https://www.fema.gov/sites/default/files/documents/fema_ecosystem-service-value-updates_2022.pdf

The ecosystem benefits defined in FEMA Ecosystem Service Value Updates[18]. are applied to quantify the benefits provided by the ecosystem. Their definitions are listed below:

- Aesthetic Value: Enjoying and appreciating the scenery, sounds, and smells of nature.
- Atmospheric Stabilization: Supporting a stable climate at global and local levels through carbon sequestration and other processes.
- Erosion Control: Retaining arable land, slope stability, and coastal integrity.
- Flood and Storm Hazard Risk Reduction: Preventing and mitigating natural hazards such as floods, hurricanes.
- Habitat: Providing shelter, promoting growth of species, and maintaining biological diversity
- Pollination: Pollinating wild and domestic plant species via wind, insects, birds, or other animals
- Recreation/Tourism: Experiencing the natural world and enjoying outdoor activities.
- Water Filtration: Removing water pollutants via soil filtration and transformation by vegetation and microbial communities.
- Water Supply: Regulating the rate of water flow through an environment and ensuring adequate water availability for all water users.

The annual ecosystem service benefits are shown in Table 5 and Table 6.

Table 5 Annual ecosystem service benefits for rural green open spaces from FEMA[15]

Benefit Category	2021$/acre/year	2025$/acre/year
Aesthetic Value	$7,505	$9,081
Atmospheric Stabilization	$77	$93
Erosion Control	$78	$94
Flood and Storm Hazard Risk Reduction	$0	$0
Habitat	$2,021	$2,445
Pollination	$350	$424
Recreation/Tourism	$601	$727
Water Filtration	$0	$0
Water Supply	$0	$0
Total	**$10,632**	**$12,865**

Table 6 Annual ecosystem service benefits for coastal wetlands from FEMA[15]

Benefit Category	2021$/acre/year	2025$/acre/year
Aesthetic Value	$1,648	$1,994
Atmospheric Stabilization	$125	$151
Erosion Control	$0	$0

[18] , FEMA Ecosystem Service Value Updates, June 2022

Benefit Category	2021$/acre/year	2025$/acre/year
Flood and Storm Hazard Risk Reduction	$1,035	$1,252
Habitat	$2,420	$2,928
Pollination	$0	$0
Recreation/Tourism	$1,624	$1,965
Water Filtration	$1,558	$1,885
Water Supply	$544	$658
Total	**$8,954**	**$10,834**

To quantify the annual ecosystem service benefits the area of rural green open spaces and coastal wetlands, the following steps were implemented:

1. Through GIS estimate the total SLAMM land use/land cover datasets for 2016, 2040, and 2070. For 2040 and 2070 there is information for the Intermediate-Low and Intermediate-High scenarios. In total 5 scenarios are assessed.
2. For each FEMA Land Cover Category, the ecosystem service benefits are estimated multiplying the unit benefits and the land area obtained in step 1.
3. Using as starting point year 2025, the difference between todays and future scenarios is estimated to understand how benefits could change over time.
4. The lifecycle analysis approach described in Section 3.5 is implemented. First, for each year of the analysis period linear interpolation between the ecosystem service benefits is implemented, and finally the present value (PV) of the change in benefits is quantified.

4 CRITICAL INFRASTRUCTURE

Critical infrastructure corresponds to a structure or system on which society depends, and which becomes an essential part of the response and recovery from a disruptive event[19]. The assets in this category correspond mostly to water and wastewater facilities and related infrastructure that provide the basic structure of community cohesion.

The section is organized into two main subsections to provide a clear distinction between types of critical infrastructure assets and the methods used to assess their risks:

1. Critical Infrastructure Buildings:

   This subsection focuses on various buildings, such as communication facilities, pump stations, and wastewater treatment facilities. It details their building's physical characteristics, including footprint size and number of floors. The analysis centers on the role these buildings play in supporting essential public services and their operational importance. The assessment focuses on quantitative evaluations of risks, as described in Section 3.3.1.

2. Standalone Lift Station Points:

   An additional analysis is conducted for lift station points, which are primarily county managed lift station. The dataset also includes privately owned residential lift stations. For those points, only geolocation is provided. As a result, qualitative assessments for these lift station points are applied, as described in Section 3.3.2.

4.1 CRITICAL INFRASTRUCTURE BUILDINGS

[19] Donald R Scott et al., "Resilience for Critical Facilities" (Gaithersburg, MD: National Institute of Standards and Technology (U.S.), January 24, 2023), https://doi.org/10.6028/NIST.GCR.23-037.

The critical infrastructure asset inventory includes 90 buildings within the study area, totaling nearly 390,000 square feet of gross floor area, as shown in Table 7. Wastewater treatment facilities represent the largest share (by size), accounting for over 60% of all buildings and nearly half of the gross floor area of buildings, underscoring their central role in providing essential public services. Communication facilities, while fewer in number, contribute significantly to the overall footprint, comprising 33% of the total gross floor area. Other key assets include solid and hazardous waste facilities, pump stations, and lift stations facilities, each supporting vital functions relating to environmental health, utility operations, and emergency response.

For lift stations, only associated buildings (e.g., control rooms or operator facilities) are included in the building asset inventory, while Section 4.2 discusses the standalone lift station, with only geolocation information available. Wastewater treatment facilities here refer specifically to wastewater plants and their associated buildings within the study area.

These assets were identified as critical based on their operational importance, potential consequences of disruption, and, where available, formal designations through local or federal assessments.

Table 7 Critical assets within the study area, including the number of facilities, built area, and their proportional representation.

Asset Type	Total Number of Buildings	Total Asset Built Area (sq ft)	% of Total Number of Asset Buildings	% of Total Asset Built Area
Communications Facilities	6	130,150	6.7	33.4
Lift Station Facilities	2	1,600	2.2	0.4
Pump Stations	18	18,700	20.0	4.8
Solid And Hazardous Waste Facilities	9	47,850	10.0	12.3
Wastewater Treatment Facilities	55	191,650	61.1	49.1
Total	**90**	**389,950**	**100.0**	**100.0**

These facilities consist of buildings, and from a physical perspective, the exposure to a flooding event will impact the building structure and its contents. Structural and content replacement values are then determined based on the building's footprint area, number of stories, and occupancy-specific replacement costs obtained from Table 6-2 and Table 6-9 in the HAZUS Inventory Technical Manual.[20] These values are subsequently adjusted to 2025 dollars using inflation factors.[21]

Table 8 Total assessed value for critical infrastructure assets in 2025$

Critical Infrastructure	Total Assessed Value
Communications Facilities	$56,214,250
Lift Station Facilities	$484,900
Pump Stations	$5,742,650
Solid and Hazardous Waste Facilities	$20,425,600
Wastewater Treatment Facilities	$90,725,600
Total	**$173,593,000**

[20] FEMA, "HAZUS Inventory Technical Manual," 2024, https://www.fema.gov/sites/default/files/documents/fema_hazus-inventory-technical-manual-6.1.pdf
[21] U.S. Bureau of Labor Statistics, "CPI Inflation Calculator," 2025, https://www.bls.gov/data/inflation_calculator.htm

4.1.1 TIDAL FLOODING RISK

There is no tidal flooding exposure in 2040 nor 2070 for buildings analyzed for this effort in the project area.

4.1.2 STORM SURGE RISK

The surge exposure analysis reveals that a substantial share of critical infrastructure assets, such as pump stations, wastewater treatment facilities, and communications centers, lie within the projected 100-year storm surge inundation areas, particularly under future CSL scenarios. Approximately half of all assets are exposed in 2022 (Table 9), and this percentage rises to over 70% by 2070 under the Intermediate-High CSL scenario (Table 11). Pump stations and wastewater facilities are among the categories that are most affected, with consistently high exposure across all time horizons (Table 9 to Table 11). Notably, by 2070, nearly all pump and lift station buildings, as well as a large majority of communication facility buildings, will fall within the storm surge zone.

Table 9 Number of critical infrastructure assets within the 100-year flooding extent in 2022

Asset Types	Total Number of Assets	2022	
		Number of Exposed Assets	Percentage of Exposed Assets per Asset Type
Communications Facilities	6	3	50
Pump Stations	18	13	72
Wastewater Treatment Facilities	55	27	49
Other categories (not exposed)	11	0	0
Total assets	**90**	**43**	**48**

Table 10 Number of critical infrastructure assets within the 100-year flooding extent projected in 2040

Asset Types	Total Number of Assets	Intermediate-High		Intermediate-Low	
		Number of Exposed Assets	Percentage of Exposed Assets	Number of Exposed Assets	Percentage of Exposed Assets
Communications Facilities	6	3	50	3	50
Pump Stations	18	15	83	13	72
Wastewater Treatment Facilities	55	31	56	29	53
Other categories (not exposed)	11	0	0	0	0
Total assets	**90**	**49**	**54**	**45**	**50**

Table 11 Number of critical infrastructure assets within the 100-year flooding extent 2022 vs. 2070

Asset Types	Total Number of Assets	Intermediate-High		Intermediate-Low	
		Number of Exposed Assets	Percentage of Exposed Assets	Number of Exposed Assets	Percentage of Exposed Assets
Communications Facilities	6	5	83	3	50
Lift Station Facilities	2	2	100	0	0
Pump Stations	18	18	100	13	72
Solid And Hazardous Waste Facilities	9	3	33	0	0
Wastewater Treatment Facilities	55	36	65	31	56
Total assets	**90**	**64**	**71**	**47**	**52**

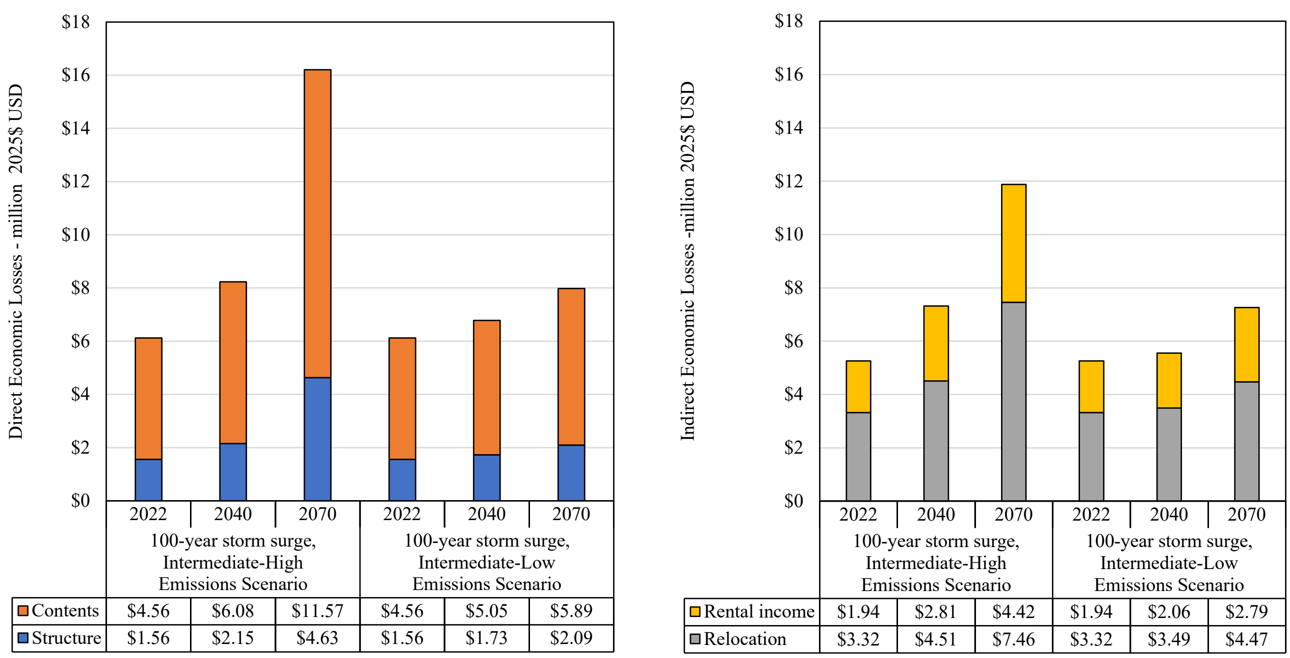
The exposure analysis provides the flooding depth for each asset location in each scenario. The information on asset type, location, and physical characteristics has likewise been collected. Flood-induced building losses are quantified using the FEMA Loss Estimation Methodology as described in Section 3. According to the simulated flood depth for each building and its FFE, the appropriate damage ratio is identified from the relevant depth-damage function. In addition to direct damage, indirect losses—such as relocation costs and rental income loss, are computed based on estimated recovery time and building footprint area.

All estimated monetary losses are converted to 2025 dollars to ensure consistency in valuation across scenarios. In summary, the total loss of each building for baseline (2022), Intermediate-High (2040 and 2070), and Intermediate-Low (2040 and 2070) scenarios can be estimated (see Table 12).

Table 12 Total economic losses for critical infrastructure assets in the 100-year storm surge event 2022, in 2040, and 2070

Year	Intermediate-High Scenario			Intermediate-Low Scenario		
	Total Direct Losses	Total Indirect Losses	Total Losses	Total Direct Losses	Total Indirect Losses	Total Losses
2022	$6,120,000	$5,260,000	$11,380,000	$6,120,000	$5,260,000	$11,380,000
2040	$8,230,000	$7,320,000	$15,550,000	$6,780,000	$5,550,000	$12,330,000
2070	$16,200,000	$11,880,000	$28,080,000	$7,980,000	$7,260,000	$15,230,000

Figure 2 presents estimated direct and indirect economic losses for critical infrastructure assets exposed to a 100-year storm surge event under both Intermediate-High and Intermediate-Low scenarios for the years 2022, 2040, and 2070.



a. Direct economic losses b. Indirect economic losses

Figure 2 Estimated direct and indirect economic losses for critical infrastructure assets in the 100-year storm surge event in 2022, 2040, and 2070

Panel (a) shows direct economic losses, which include damage to contents and structures. Under the Intermediate-High scenario, total direct losses rise substantially from approximately $6.1 million in 2022 to $16.2 million in 2070, driven primarily by increased damage to contents. A similar upward trend is observed under the Intermediate-Low scenario, although the increase is more modest, reaching $8.0 million by 2070.

Panel (b) displays indirect economic losses, including rental income loss and relocation costs. Under the Intermediate-High scenario in 2070, where total indirect losses peak at over $11.9 million. Relocation is the larger contributors to indirect losses. In contrast, the Intermediate-Low scenario results in lower overall impacts, with losses stabilizing around $7.3 million by 2070.

The lifecycle analysis approach described in Section 3.5 is implemented. As presented in Table 13 For a 30-year analysis period and a 7% discount rate the present value of losses in the Intermediate-High scenario is estimated at $1.94 million in 2025$. The present value of losses for the Intermediate-Low scenario is estimated at $1.61 million in 2025$.

Table 13 Lifecycle results for Critical Infrastructure assets

Lifecycle estimates	Intermediate-High		Intermediate-Low	
	Undiscounted	Discounted (7%)	Undiscounted	Discounted (7%)
Structure	$693,350	$273,200	$519,900	$223,550
Contents	$1,915,200	$768,600	$1,512,550	$652,050
Relocation	$1,376,100	$559,000	$1,070,550	$461,800
Rental income	$693,350	$273,200	$519,900	$223,550
Total for Critical Infrastructure	**$4,826,700**	**$1,941,400**	**$3,737,750**	**$1,609,500**

4.2 STANDALONE LIFT STATIONS

The inventory also covers 362 standalone lift station points across the county, 319 county-owned and 49 privates. These stations have only geolocation data, lacking footprint or structural details for quantitative analysis. As a result, they are analyzed qualitatively and discussed separately from the two lift station facilities in section 4.1.

While each individual station occupies a small physical footprint, its collective function is critical to the operation of the wastewater system, particularly in low-lying or flood-prone areas. These lift stations play a vital role in maintaining continuous utility services and protecting public health and the environment, especially during hazard events when system reliability is most at risk. Their inclusion in the inventory reflects both their operational significance and the county's commitment to capturing a comprehensive view of infrastructure vulnerabilities across both public and private systems.

4.2.1 TIDAL FLOODING RISK

The exposure analysis for lift stations under tidal flooding scenarios shows that only four lift stations are exposed to tidal flooding in 2070 under Intermediate-High scenario, which only takes 1% of the total lift stations. For all other scenarios, there is no exposure for lift stations to tidal flooding. The summary of the exposure results for lift stations is shown in Table 14.

Table 14 Standalone lift stations exposure to tidal flooding projected in 2040 and 2070

	Total	Tidal flooding: 2040		Tidal flooding: 2070	
		Intermediate-High	Intermediate-Low	Intermediate-High	Intermediate-Low
Number of Lift Stations	362	0	0	4	0
Percentage of Total	100	0	0	1	0

The results show a very limited risk of lift stations to tidal flooding.

4.2.2 STORM SURGE RISK

Across all scenarios, the number of lift stations exposed to storm surge inundation is around 50, representing 13%-15% of the total assessed lift stations. This low proportion indicates a limited exposure of lift stations to storm surge hazards.

Table 15 Lift stations exposure to 100-year storm surge events 2022, 2040, and 2070

	Total	Storm surge: 2022	Storm surge: 2040		Storm surge: 2070	
			Intermediate-High	Intermediate-Low	Intermediate-High	Intermediate-Low
Number of Lift Stations	362	46	53	50	54	53
Percentage of Total	100	13	15	14	15	15

5 CRITICAL COMMUNITY AND EMERGENCY FACILITIES

The Critical Community and Emergency Facilities asset inventory is of assets that provide essential services to the community and include public safety, health, education, disaster response, and other services such as community centers. Table 16 summarizes the distribution of critical community and emergency facilities within the study area. A total of 257 buildings is identified. Schools represent the largest share of these facilities by number and area (sq ft), which accounts for 42% of the total buildings and nearly 46% of total built area. Health care facilities are also significant, comprising 8.6% of buildings and 13.4% of total built area. Other notable categories include fire stations, hospitals, and correctional facilities. Facilities such as logistical staging areas, community centers, and emergency shelters hold a smaller share of total assets.

Table 16 Critical assets within the study area, including the number of facilities, built area, and their proportional representation.

Asset Type	Total Number of Asset Buildings	Total Asset Built Area (sq ft)	% of Total Number of Asset Buildings	% of Total Asset Built Area
Affordable Public Housing	7	132,700	2.7	2.3
Airports, Fire Stations	1	7,650	0.4	0.1
Airports, Law Enforcement Facilities	1	63,900	0.4	1.1
Colleges And Universities	9	109,150	3.5	1.9
Community Centers	11	84,850	4.3	1.5
Correctional Facilities	28	511,600	10.9	8.8
Disaster Recovery Centers, Community Centers	2	138,300	0.8	2.4
Emergency Medical Service Facilities	2	21,600	0.8	0.4
Fire Stations	23	119,000	8.9	2.0
Health Care Facilities	22	778,750	8.6	13.4
Hospitals	8	468,250	3.1	8.1
Law Enforcement Facilities	3	14,100	1.2	0.2
Law Enforcement Facilities, Airports	1	10,200	0.4	0.2

Asset Type	Total Number of Asset Buildings	Total Asset Built Area (sq ft)	% of Total Number of Asset Buildings	% of Total Asset Built Area
Law Enforcement Facilities, Fire Stations	1	21,250	0.4	0.4
Local Government Facilities	22	362,750	8.6	6.2
Logistical Staging Areas	1	12,050	0.4	0.2
Logistical Staging Areas, Emergency Operation Centers, Correctional Facilities	1	20,600	0.4	0.4
Schools	108	2,670,150	42.0	45.9
Schools, Risk Shelter Inventory	6	264,600	2.3	4.6
Total	**257**	**5,811,450**	**100.0**	**100.0**

Flooding events can damage both the structures and their contents to the facilities. To estimate the cost of replacing these elements, calculations are based on the building's footprint, number of floors, and occupancy-specific replacement costs, as outlined in Tables 6-2 and 6-9 of the HAZUS Inventory Technical Manual.[22] These estimated values are then updated to reflect 2025-dollar amounts using inflation adjustment factors.[23]

Table 17 Total assessed value for critical community and emergency facility assets in 2025$

Asset Type	Structure Value	Contents Value	Total Assessed Value
Affordable Public Housing	$34,035,000	$17,017,500	$51,052,500
Airports, Fire Stations	$2,483,650	$3,725,500	$6,209,150
Airports, Law Enforcement Facilities	$20,794,550	$31,191,850	$51,986,400
Colleges And Universities	$23,896,350	$35,844,500	$59,740,800
Community Centers	$22,366,250	$22,366,250	$44,732,500
Correctional Facilities	$131,915,400	$65,957,700	$197,873,050
Disaster Recovery Centers, Community Centers	$35,697,050	$35,697,050	$71,394,150
Emergency Medical Service Facilities	$6,492,100	$9,738,200	$16,230,300
Fire Stations	$45,691,800	$68,537,700	$114,229,550
Health Care Facilities	$272,469,950	$408,704,900	$681,174,800
Hospitals	$357,865,900	$536,798,850	$894,664,700
Law Enforcement Facilities	$7,523,150	$11,284,700	$18,807,850
Law Enforcement Facilities, Airports	$2,302,700	$2,302,700	$4,605,400
Law Enforcement Facilities, Fire Stations	$6,913,850	$10,370,750	$17,284,550

[22] FEMA, "HAZUS Inventory Technical Manual," 2024, https://www.fema.gov/sites/default/files/documents/fema_hazus-inventory-technical-manual-6.1.pdf
[23] U.S. Bureau of Labor Statistics, "CPI Inflation Calculator," 2025, https://www.bls.gov/data/inflation_calculator.htm

Asset Type	Structure Value	Contents Value	Total Assessed Value
Local Government Facilities	$90,964,400	$90,964,400	$181,928,850
Logistical Staging Areas	$1,852,900	$1,852,900	$3,705,800
Logistical Staging Areas, Emergency Operation Centers, Correctional Facilities	$6,697,300	$10,046,000	$16,743,300
Schools	$778,716,700	$778,716,700	$1,557,433,400
Schools, Risk Shelter Inventory	$109,188,850	$109,188,850	$218,377,650
Total	**$1,957,867,850**	**$2,250,307,000**	**$4,208,174,700**

5.1 TIDAL FLOODING RISK

Critical community and emergency facilities, such as hospitals, fire stations, schools, and designated shelters, play an indispensable role during and after flooding events. Exposure results to tidal flooding in 2040 and 2070 indicate that only a very limited number of assets in this category are directly affected by projected tidal flooding scenarios (see Table 18 and Table 19). Most facilities are located outside of the primary flooding extent, suggesting a relatively low level of direct physical exposure under current CSL and high tide projections. Only one asset (P.C. Beach Complex, Recreational Center) is exposed in all scenarios. For the 2070 Intermediate-High scenario, two more assets are exposed to this scenario, which are Harborside Surgery Center and Charlotte Regional Medical Center.

Table 18 Number of critical community and emergency facilities assets within the projected tidal flooding extent in 2040

Asset Type	Total Number of Buildings	Intermediate-High		Intermediate-Low	
		Number of Assets Exposed	Percentage of Exposed Assets	Number of Assets Exposed	Percentage of Exposed Assets
Community Centers	11	1	9.1	1	9.1
Other categories (not exposed)	246	0	0.0	0	0.0
Total	**257**	**1**	**0.4**	**1**	**0.4**

Table 19 Number of critical community and emergency facilities assets within the projected tidal flooding extent in 2070

Asset Type	Total Number of Buildings	Intermediate-High		Intermediate-Low	
		Number of Assets Exposed	Percentage of Exposed Assets	Number of Assets Exposed	Percentage of Exposed Assets
Community Centers	11	1	9.1	1	9.1
Health Care Facilities	22	1	4.5	0	0.0
Hospitals	8	1	12.5	0	0.0
Other categories (not exposed)	216	0	0.0	0	0.0
Total	**257**	**3**	**1.2**	**1**	**0.4**

Despite the low direct exposure to tidal flooding, the vulnerability of critical community and emergency facilities remains a concern due to their high importance to the community and reliance on interconnected infrastructure systems. Although the exposed assets are not essential for immediate emergency response, they still play significant roles in supporting community health, well-being, and post-event recovery. Even minor tidal flooding could lead to temporary closures, damage to medical equipment, or interruption of scheduled procedures and public services.

Given the limited geographic exposure and the moderate vulnerability of the identified facilities, the overall risk from tidal flooding to critical community and emergency assets is considered low to moderate.

5.2 STORM SURGE RISK

Exposure analysis reveals that a substantial share of critical community and emergency facility assets lie within the projected 100-year storm surge inundation areas, particularly under future CSL scenarios. Approximately 24% of all assets are exposed in 2022, and this proportion rises to about 69% by 2070 under the Intermediate-High CSL scenario (See Table 20 and Table 21).

Table 20 Number of critical community and emergency facility assets within the 100-year flooding extent in 2022

Asset Types	Total Number of Assets	2022	
		Number of Exposed Assets	Percentage of Exposed Assets per Asset Type
Affordable Public Housing	7	4	57
Airports, Fire Stations	1	0	0
Airports, Law Enforcement Facilities	1	0	0
Colleges And Universities	9	0	0
Community Centers	11	8	73
Correctional Facilities	28	0	0
Disaster Recovery Centers, Community Centers	2	0	0
Emergency Medical Service Facilities	2	1	50
Fire Stations	23	9	39
Health Care Facilities	21	7	33
Hospitals	8	1	13
Law Enforcement Facilities	3	1	33
Law Enforcement Facilities, Airports	1	0	0
Law Enforcement Facilities, Fire Stations	1	1	100
Local Government Facilities	22	3	14
Logistical Staging Areas	1	0	0
Logistical Staging Areas, Emergency Operation Centers, Correctional Facilities	1	0	0
Schools	108	26	24
Schools, Risk Shelter Inventory	6	1	17

Asset Types	Total Number of Assets	2022	
		Number of Exposed Assets	Percentage of Exposed Assets per Asset Type
Total	**256**	**62**	**24**

Table 21 Number of critical community and emergency facility assets within the 100-year flooding extent projected in 2040

Asset Type	Total Number of Buildings	Intermediate-High		Intermediate-Low	
		Number of Assets Exposed	Percentage of Exposed Assets	Number of Assets Exposed	Percentage of Exposed Assets
Affordable Public Housing	7	4	57	4	57
Airports, Fire Stations	1	0	0	0	0
Airports, Law Enforcement Facilities	1	0	0	0	0
Colleges And Universities	9	1	11	0	0
Community Centers	11	8	73	8	73
Correctional Facilities	28	0	0	0	0
Disaster Recovery Centers, Community Centers	2	0	0	0	0
Emergency Medical Service Facilities	2	1	50	1	50
Fire Stations	23	10	43	9	39
Health Care Facilities	21	9	43	8	38
Hospitals	8	4	50	1	13
Law Enforcement Facilities	3	1	33	1	33
Law Enforcement Facilities, Airports	1	0	0	0	0
Law Enforcement Facilities, Fire Stations	1	1	100	1	100
Local Government Facilities	22	10	45	6	27
Logistical Staging Areas	1	0	0	0	0
Logistical Staging Areas, Emergency Operation Centers, Correctional Facilities	1	0	0	0	0
Schools	108	40	37	31	29
Schools, Risk Shelter Inventory	6	1	17	1	17
Total	**256**	**90**	**35**	**71**	**28**

Table 22 Number of critical community and emergency facility assets within the 100-year flooding extent projected in 2070

Asset Type	Total Number of Buildings	Intermediate-High		Intermediate-Low	
		Number of Assets Exposed	Percentage of Exposed Assets	Number of Assets Exposed	Percentage of Exposed Assets
Affordable Public Housing	7	7	100	4	57
Airports, Fire Stations	1	0	0	0	0
Airports, Law Enforcement Facilities	1	0	0	0	0
Colleges And Universities	9	9	100	1	11
Community Centers	11	9	82	8	73
Correctional Facilities	28	2	7	0	0
Disaster Recovery Centers, Community Centers	2	2	100	0	0
Emergency Medical Service Facilities	2	1	50	1	50
Fire Stations	23	14	61	10	43
Health Care Facilities	21	16	76	9	43
Hospitals	8	8	100	1	13
Law Enforcement Facilities	3	2	67	1	33
Law Enforcement Facilities, Airports	1	0	0	0	0
Law Enforcement Facilities, Fire Stations	1	1	100	1	100
Local Government Facilities	22	17	77	9	41
Logistical Staging Areas	1	0	0	0	0
Logistical Staging Areas, Emergency Operation Centers, Correctional Facilities	1	0	0	0	0
Schools	108	88	81	39	36
Schools, Risk Shelter Inventory	6	1	17	1	17
Total	**256**	**177**	**69**	**85**	**33**

Flood depth at each asset location is determined by different scenarios. Concurrently, data on asset type, location, and physical characteristics are collected to support loss estimation. Flood-related building losses are assessed using FEMA's Loss Estimation Methodology as outlined in Section 3. Structural and content damages are calculated using depth-damage functions, which relate simulated flood depth and the building's first-floor elevation (FFE) to appropriate damage ratios.

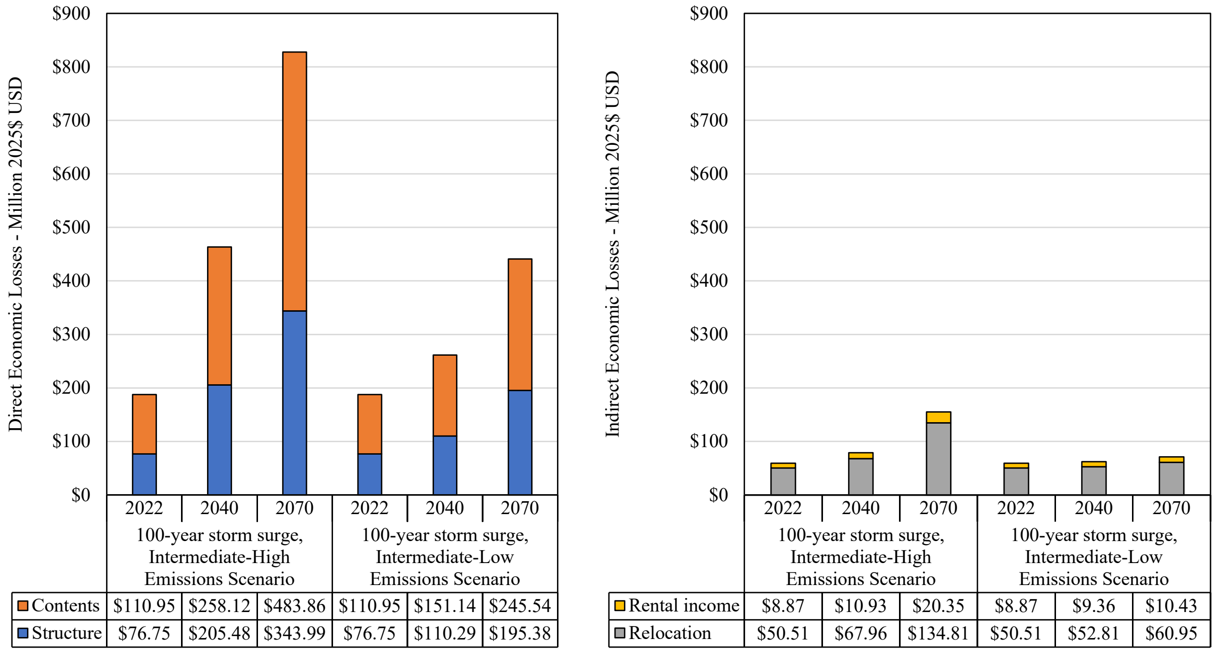
In addition to direct damage, indirect losses are estimated based on recovery time and building footprint. All indirect losses are then converted to 2025 dollars to ensure consistent valuation across scenarios.

Ultimately, total losses for each building are estimated for the baseline year (2022), as well as for the Intermediate-High and Intermediate-Low CSL scenarios in 2040 and 2070 (see Table 23).

Table 23 Total economic losses for critical community and emergency facilities in the 100-year storm surge event in 2022, 2040, and 2070

Year	Intermediate-High Scenario			Intermediate-Low Scenario		
	Total Direct Losses	Total Indirect Losses	Total Losses	Total Direct Losses	Total Indirect Losses	Total Losses
2022	$187,700,000	$161,460,000	$247,080,000	$187,700,000	$59,380,000	$247,080,000
2040	$463,600,000	$78,890,000	$542,490,000	$261,430,000	$62,170,000	$323,600,000
2070	$827,850,000	$155,160,000	$983,010,000	$440,920,000	$71,380,000	$512,290,000

Figure 3 illustrates the estimated direct and indirect economic losses for critical infrastructure assets exposed to a 100-year storm surge event under both Intermediate-High and Intermediate-Low scenarios for the years 2022, 2040, and 2070.



a. Direct economic losses b. Indirect economic losses

Figure 3 Estimated direct and indirect economic losses for critical community and emergency facility assets in the 100-year storm surge event in 2022, 2040, and 2070

Panel (a) shows direct economic losses, including damages to building structures and contents. Under the Intermediate-High scenario, losses increase significantly over time, with total direct losses rising from $187.7 million in 2022 to $827.9 million in 2070. Content losses consistently account for the larger portion, reflecting the high value of equipment and materials within these critical facilities. Under the Intermediate-High scenario, total direct losses reach $483.9 million by 2070, showing a slower growth rate compared to the Intermediate-High scenario.

Panel (b) presents indirect economic losses. The 2070 projection under the Intermediate-High scenario indicates the highest total losses, exceeding $155.2 million. Even under a lower pathway, 2070 losses remain substantial, driven primarily by increasing relocation costs.

The lifecycle analysis approach described in Section 3.5 is implemented. As presented in Table 24 for a 30-year analysis period and a 7% discount rate the present value of losses in the Intermediate-High scenario is estimated at $60.2 million in 2025$. The present value of losses for the Intermediate-Low scenario is estimated at $40.4 million in 2025$.

Table 24 Lifecycle results for Critical Infrastructure assets

Lifecycle estimates	Intermediate-High		Intermediate-Low	
	Undiscounted	Discounted (7%)	Undiscounted	Discounted (7%)
Structure	$57,910,400	$21,781,150	$33,829,500	$13,542,800
Contents	$75,526,200	$28,439,200	$45,966,700	$18,696,900
Relocation	$21,563,950	$8,603,500	$15,974,100	$6,951,950
Rental income	$57,910,400	$21,781,150	$33,829,500	$13,542,800
Total for Critical Community and Emergency Facilities	**$158,471,800**	**$60,235,800**	**$98,582,750**	**$40,417,050**

6 TRANSPORTATION AND EVACUATION ROUTES

The Transportation and Evacuation Routes asset inventory is of infrastructure necessary to transport people and goods via road and rail. Evacuation routes are designated roads intended to be used in times of emergency. This category mainly refers to roads and railroads, as well as other infrastructure such as bridges and culverts that are critical to ensure the connectivity of the transportation system.

6.1 ROADWAYS AND EVACUATION ROUTES

Charlotte County contains essential transportation infrastructure that supports daily travel and emergency operations. The county includes approximately 491 miles of roadway, categorized by functional class in Table 25, which reflects the role each roadway type plays in regional mobility and emergency operations. Of this network, over 260 miles serve as designated evacuation routes, primarily along interstates and arterial roads, which are critical during hurricane events and other emergencies. Interstates and Principal Arterials serve as the backbone of the regional transportation systems, typically accommodating high traffic volumes and high importance in connectivity. Minor Arterials provide connections between smaller communities and major roadways, supporting both local access and regional travel. Major Collectors and Minor Collectors function to gather traffic from local roads and direct it toward arterial roads, with limited portions designated for evacuation. Noted that roadway inventory considered in this section includes facilities under county, state, and federal jurisdiction.

Table 25 Roadway linear mileage by functional class and evacuation route.

Roadway Classes	Total Mileage	Evacuation Route Mileage	Non-Evacuation Route Mileage
Interstate	52	44	8
Principal Arterial	76	69	7
Minor Arterial	161	113	48
Major Collector	200	34	166
Minor Collector	2	-	2
Total	**491**	**260**	**231**

When a roadway is exposed to flooding, it limits access and the structure could be damaged, thus potentially impacting mobility. The total assessed value of roadways is decided by the unit road segment values and the length. The values for a unit road segment (per mile) are determined according to the road type or lane numbers and length, as outlined in the HAZUS Inventory Technical Manual Table 9-2.[24] Road types include major roads with four lanes and urban streets with two lanes in the HAZUS Manual, which is related to different unit values.

Evacuation routes were also identified using the roadway database. Based on this categorization, the corresponding total assessed values of roadways, adjusted to 2025 dollars using inflation factors, are listed in Table 26.

Table 26 Total assessed value for critical infrastructure assets in 2025$

Roadway Type	Total Assessed Value
Evacuation Route	$2,320,674,150
Non-Evacuation Route	$1,573,011,950
Total	**$3,893,686,100**

6.1.1 TIDAL FLOODING RISK

Exposure analysis of roadways under tidal flooding scenarios shows relatively limited inundation impacts under current and near-term future conditions, with a more pronounced increase under the 2070-Intermediate-High scenario (See Table 27). By 2040, exposure remains low in both the Intermediate-High and Intermediate-Low scenarios. However, by 2070, under the Intermediate-High scenario, road exposure increases to 5.16 miles (1.05%), which is still a very limited portion in the overall roadway network. These findings suggest that the exposure to tidal flooding is limited. However, even limited exposure could disrupt key segments of the transportation network. The exposure of designated evacuation routes to tidal flooding is relatively limited but increases over time, particularly under high CSL scenarios.

[24] FEMA, HAZUS Inventory Technical Manual (2022), https://www.fema.gov/sites/default/files/documents/fema_hazus-6-inventory-technical-manual.pdf

Table 27 Roadway exposure to the tidal flooding extent 2040 vs. 2070

Indicator	Year: 2040		Year: 2070	
	Intermediate-High	Intermediate-Low	Intermediate-High	Intermediate-Low
Total Length of Exposed Evacuation Routes (miles)	0.80	0.60	2.02	0.77
Percentage of Exposed Evacuation Routes (%)	0.31	0.23	0.78	0.30
Total Length of Exposed Non-Evacuation Routes (miles)	0.03	0.09	3.14	0.03
Percentage of Exposed Non-Evacuation Routes (%)	0.01	0.04	1.21	0.01
Total Length of Exposed Roads (miles)	0.83	0.70	5.16	0.80
Percentage of Exposed Roads (%)	0.08	0.07	0.53	0.08

While the percentage of roads exposed to tidal flooding remains relatively low under current and near-term conditions, the underlying mechanisms of flood-induced damage suggest potential vulnerabilities in structural integrity, safety, and operability. For roadways, prolonged water exposure weakens pavement layers by saturating base and subbase materials, leading to rutting, cracking, and eventual surface failure. In coastal or low-lying areas, wave action and repeated saltwater intrusion accelerate material degradation, strip surface binders, and promote pothole formation. Erosion at road shoulders and embankments further undermines structural support, particularly near culverts, bridges, or elevated segments.

Evacuation routes must remain accessible during extreme weather events to support evacuation and emergency response movements. Even shallow flooding, standing water, or damage to access points can severely hinder route functionality. Additionally, tidal flooding can degrade road surfaces, weaken shoulders, and limit vehicle maneuverability, which further reduces the usability of affected road segments during emergency situations.

The overall risk to roadways and evacuation routes from tidal flooding is currently low, reflecting limited spatial exposure. However, risk is not uniform across time horizons or scenarios. Under the 2070 Intermediate-High scenario, the increase in roadway exposure elevates system-wide risk, especially for low-lying corridors critical to evacuation and emergency response. For evacuation routes, the percentage of exposed routes remains below 1% across all scenarios, which means the risk for evacuation routes is relatively low, even though the consequences of their failure are high. Flooded or inaccessible evacuation corridors can delay response efforts and obstruct safe passage out of at-risk areas.

6.1.2 STORM SURGE RISK

Under 100-year storm surge scenarios, a substantial portion of the roadway network is projected to be affected with significant increases occurring over time, especially under higher CSL scenarios. Even in 2022, nearly one-third of the roadway network is already within flood-prone areas. By 2070, exposure increases sharply, particularly under the intermediate-high scenario where over half of the roadway network may be affected. For evacuation routes, Table 28 shows the exposure results for different scenarios. Note that the exposure of evacuation routes increases substantially over time, with the highest projected exposure reaching over 40% by 2070 under the Intermediate-High scenario. This shows a growing risk to emergency access and egress in coastal and low-lying areas.

Table 28 Road exposure to the 100-year storm surge 2022, 2040, and 2070

Indicator	2022	Year: 2040		Year: 2070	
		Intermediate-High	Intermediate-Low	Intermediate-High	Intermediate-Low
Total Length of Exposed Evacuation Routes (miles)	54.82	70.29	59.05	106.90	68.48
Percentage of Exposed Evacuation Routes (%)	21.15	27.11	22.78	41.23	26.41
Total Length of Exposed Non-Evacuation Routes (miles)	102.96	126.86	108.85	165.09	123.21
Percentage of Exposed Non-Evacuation Routes (%)	39.71	48.93	41.99	63.68	47.53
Total Length of Exposed Roads (miles)	158	197	168	272	192
Percentage of Exposed Roads (%)	32.18	40.12	12.03	55.40	39.10

Storm surge exposure varies significantly across roadway functional classifications. Table 29 shows the percentage of exposed roadway to the total roadway length for different functional classes for different time horizons.

Table 29 Percentage of total roadway network length exposed within each functional class under the 100-year storm surge 2022, 2040, and 2070 (%)

Road Functional Classes	2022	Year: 2040		Year: 2070	
		Intermediate-High	Intermediate-Low	Intermediate-High	Intermediate-Low
Interstate	0.50	0.77	0.55	1.30	0.75
Principal Arterial	3.83	4.43	3.94	7.52	4.33
Minor Arterial	10.74	14.38	11.78	20.41	14.05
Major Collector	16.92	20.44	17.80	25.81	19.78
Minor Collector	0.14	0.14	0.14	0.38	0.14
Total	32.14	40.16	34.20	55.42	39.05

Table 29 reveals that minor arterials and major collectors account for the largest shares of total exposure across all timeframes. These road classes consistently represent the most significant contributors to system-wide flood exposure, reflecting their extensive spatial coverage and tendency to be in lower-elevation or coastal areas.

Although interstates and principal arterials make up a smaller portion of the total exposed length, their critical role in mobility and evacuation warrants special attention. The exposure contribution from higher-class roads also increases under the 2070 Intermediate-High scenario, highlighting the expanding footprint of storm surge risk into higher-function corridors. Note that the percentages shown reflect each class's contribution to the total exposed roadway network.

Comparably, Table 30 shows the percentage of exposed roadway in different functional classes to the class-specific total length, which reflects the class-specific exposure rate.

Table 30 Percentage of roadway exposed to 100-year storm surge within each functional class (class-specific exposed length/class-specific total length) for 2022, 2040, and 2070

Road Functional Classes	2022	Year: 2040		Year: 2070	
		Intermediate-High	Intermediate-Low	Intermediate-High	Intermediate-Low
Interstate	4.70	7.26	5.20	12.27	7.03
Principal Arterial	24.90	28.79	25.60	48.82	28.14
Minor Arterial	32.67	43.73	35.81	62.08	42.74
Major Collector	41.56	50.19	43.70	63.39	48.57
Minor Collector	35.43	35.43	35.43	95.06	35.43

Table 30 indicates that the lower-class roads, such as minor arterials, major collectors, and minor arterials, are consistently experiencing the greatest exposure across all timeframes and scenarios. This suggests that these road types are not only spatially prevalent but also disproportionately situated in flood-prone areas.

By 2070 under the Intermediate-High scenario, nearly all minor collector roads (95.06%) and most major collectors (63.39%) and minor arterials (62.08%) are projected to be exposed to inundation. Even interstates, traditionally the least vulnerable due to higher design standards, show a more than doubling of exposure rates by 2070.

Flood-induced road structural direct losses are quantified similarly to building losses. Physical structural losses are estimated using depth-damage functions, which are adopted from Europe. For each road segment, the appropriate damage ratio is identified based on the simulated flood depth and the corresponding depth-damage function. Replacement values for a unit road segment (per mile) are then determined according to the road type or lane numbers and length, as outlined in the HAZUS Inventory Technical Manual Table 9-2.

Structural losses are estimated based on the damage ratio and replacement costs. All loss estimates are converted to 2025 dollars to ensure consistency in valuation across scenarios. In summary, the total loss for roadways can be estimated for intermediate-high and intermediate-low scenarios, as shown in Table 31.

Table 31 Total economic losses for roadways in the 100-year storm surge event 2022, in 2040, and 2070

Year	Total Losses	
	Intermediate-High Scenario	Intermediate-Low Scenario
2022	$5,568,300	$5,568,300
2040	$7,897,000	$6,227,300
2070	$12,625,900	$7,629,050

To effectively communicate the risk of flood-induced disruptions to transportation, a visual representation of road mobility impacts was developed based on predefined flooding depth thresholds (not including direct economic losses). These thresholds (see Table 32) are informed by hydrologic behavior[25], vehicle performance studies[26], and empirical evidence.[27] By categorizing mobility impact levels as having no or minimal impact, minor, moderate, and major impact, quantitative flood depth data can be translated into intuitive map-based visualizations. For example, roads with ponding depths up to 4 inches may still be passable with minor disruption, while depths exceeding 12 inches can significantly hinder vehicle speed or cause partial impassability. At 24 inches, roads are likely closed, as most vehicles would face unsafe conditions. This risk visualization provides a clear and accessible reference for road users, planners, and emergency responders, enabling them to quickly identify vulnerable segments and make informed decisions regarding travel routes and flood preparedness.

Table 32 Mobility Impact Thresholds

Flooding Depth (inches)	Flooding Level	Mobility Impact Level	Description
0	Dry or Damp	No or minimal impact	No or minimal impact on the mobility
4	Shallow flooding	Reduced mobility	Mobility starts to be impacted by the ponding water
12	Moderate flooding	Limited mobility	Roads may remain open or partially impassable, but vehicles will slow down significantly.
24	Deep inundation	Road closed	Roads have a high possibility of being closed, and travelers will prefer to reroute in this situation

Based on the exposure analysis results, the flooding depth for each road segment under various scenarios can be determined. Given the mobility impact threshold defined in Table 32, the road segment length impacted under different mobility disruption levels by storm surge scenarios can be calculated as shown in Figure 4.

[25] Pregnolato, M., Ford, A., Wilkinson, S. M., & Dawson, R. J. (2017). The impact of flooding on road transport: A depth-disruption function. *Transportation research part D: transport and environment*, *55*, 67-81.
[26] Tzavella, A. (2021). Emergency Response Resilience to Floods Operationalised with Applied Geoinformatics. [PhD-Thesis – Research and graduation external, Bergische Universität Wuppertal]. https://doi.org/10.25926/1919-TJ62
[27] FloodNet NYC, (2025). https://www.floodnet.nyc/

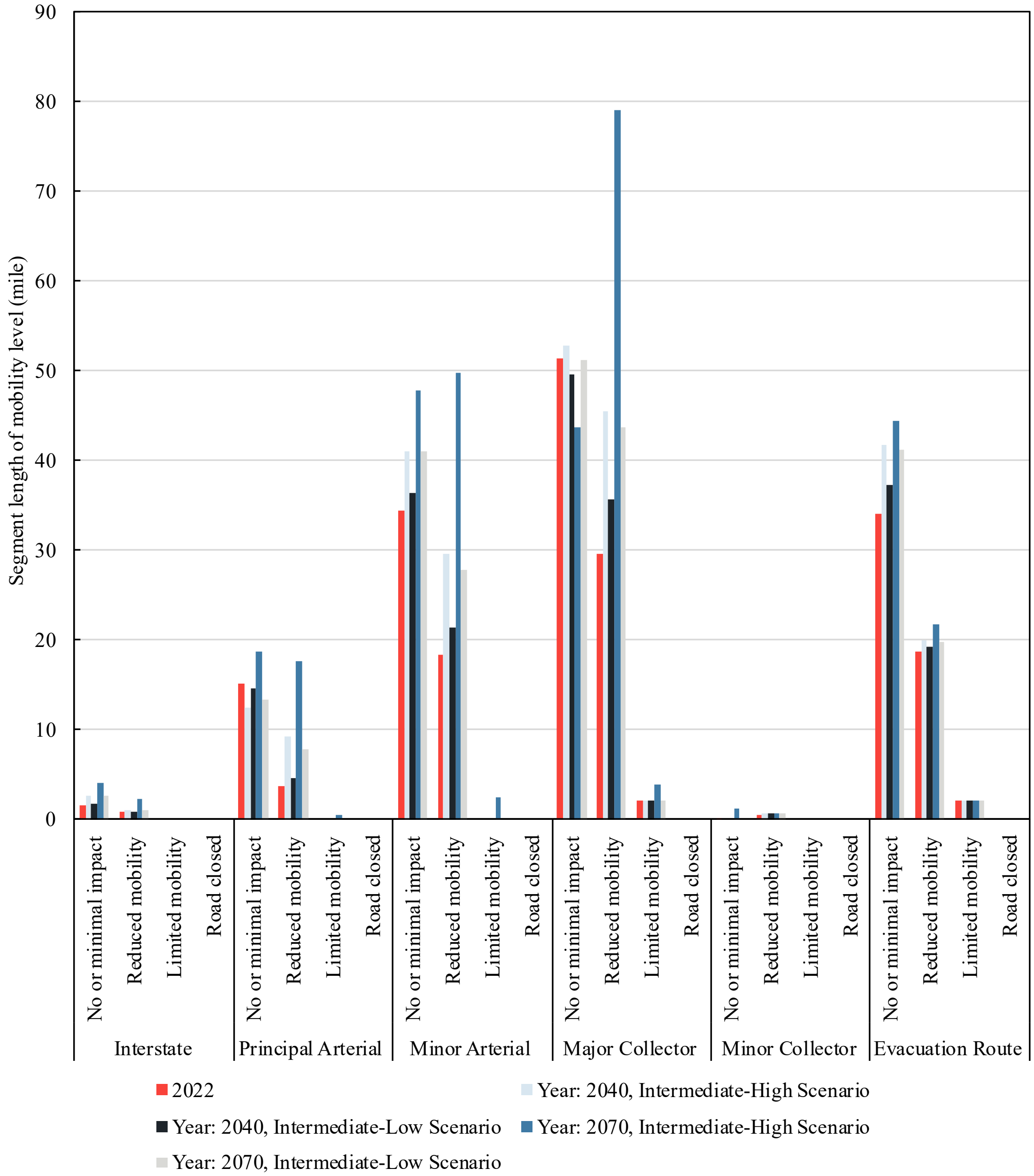


Figure 4 Road segment length impacted under different mobility disruption levels by storm surge scenarios in 2022, 2040, and 2070

The results show a clear escalation of impacts over time, with total affected mileage increasing, and disruption shifting toward more severe impact categories. Minor arterials and major collectors experience the highest cumulative impact across all scenarios, with substantial portions of their network reaching "reduced mobility" or "limited mobility" classification by 2070, particularly under the Intermediate-High scenario. In contrast, interstates show relatively minimal impact, though some segments do exhibit reduced mobility under future scenarios. Evacuation routes follow a similar trend, with increasing lengths experiencing reduced or limited mobility.

In addition to the extent of exposure, the potential level of traffic disruption is a critical dimension of flood risk. Average Annual Daily Traffic (AADT) data for each road segment was obtained from the Florida Department of Transportation (FDOT). Since some roads consist of multiple segments with varying AADT values, the following methodology was used to identify the most at-risk locations:

1. For each road, compile both the maximum and minimum AADT values across all segments.
2. A segment was considered impacted if the projected flooding depth in any scenario exceeded 4 inches, corresponding to the threshold where mobility starts to be reduced.
3. Record the highest AADT value among impacted roads as the maximum impacted traffic for that road.
4. Identify the top five roads with the greatest impacted traffic volumes (summarized in Table 33).

Table 33 Top 5 roads with the highest maximum impacted traffic (AADT)

Road	Maximum Impacted Traffic (AADT)	From	To
I-75 (South and North)	76,000	Harbor View Road	US-17
Tamiami Trail	61,000	Cochran Boulevard	Midway Boulevard
Kings Highway	45,500	Melbourne Street	Harbor Boulevard
South McCall Road	38,500	San Casa Drive	Gulfstream Boulevard
Duncan Road	29,500	Copeley Avenue	CR-75/Bermont Road

Table 33 highlights the roads with the highest potential traffic disruption due to storm surge-induced flooding. Both northbound and southbound segments of I-75 are among the top-impacted corridors, with up to 76,000 vehicles daily passing these segments. Tamiami Trail, with an AADT of 61,000, emerges as another major concern, likely due to its location within highly exposed low-lying areas. Kings Highway, South McCall Road, and Duncan Road round out the top five, indicating that high-traffic arterials beyond the interstate system are also vulnerable.

Some roads with relatively high AADT levels experience minimal or no flooding, making them relatively safe during storm surge events. Such roads include Veterans Boulevard, Jones Loop Road, and Burnt Store Road.

The following series of maps (see Figure 5 to Figure 9) illustrate projected roadway mobility conditions across Charlotte County under the 100-year storm surge scenario, modeled for 2022, 2040, and 2070. Road segments are color-coded to reflect anticipated mobility levels, from full functionality (green) to road closure (dark red), based on estimated flood depths and predefined impact thresholds as defined in Table 32. This spatial view allows us to identify where access will be most constrained during storm surge events.

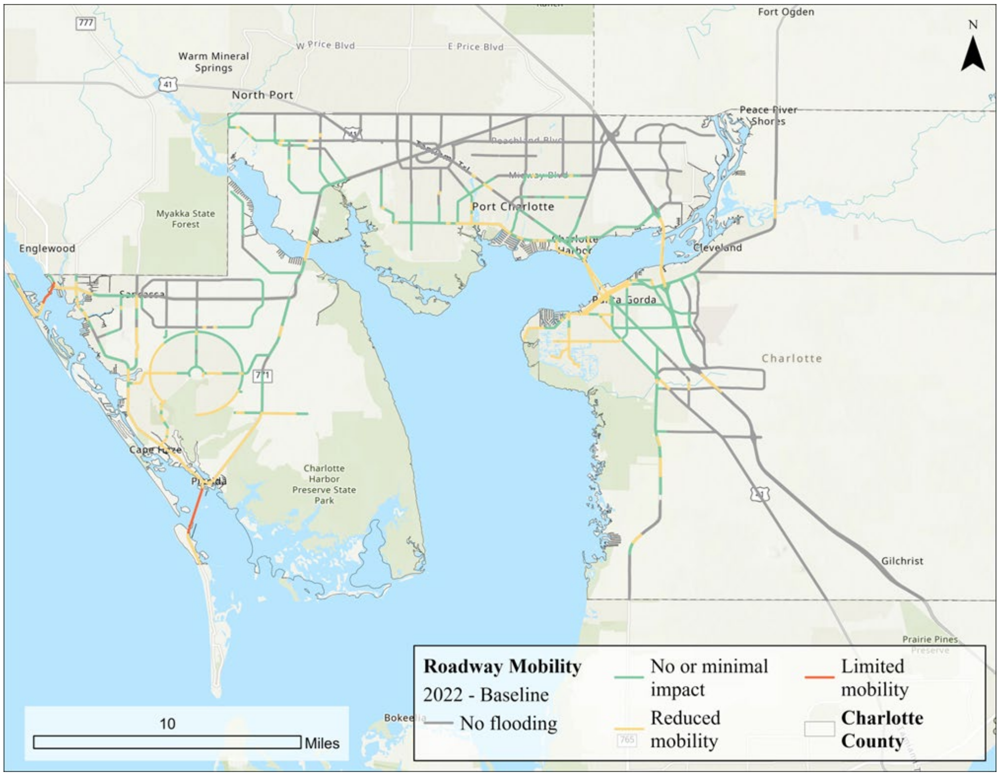


Figure 5 Roadway mobility conditions across Charlotte County, 2022

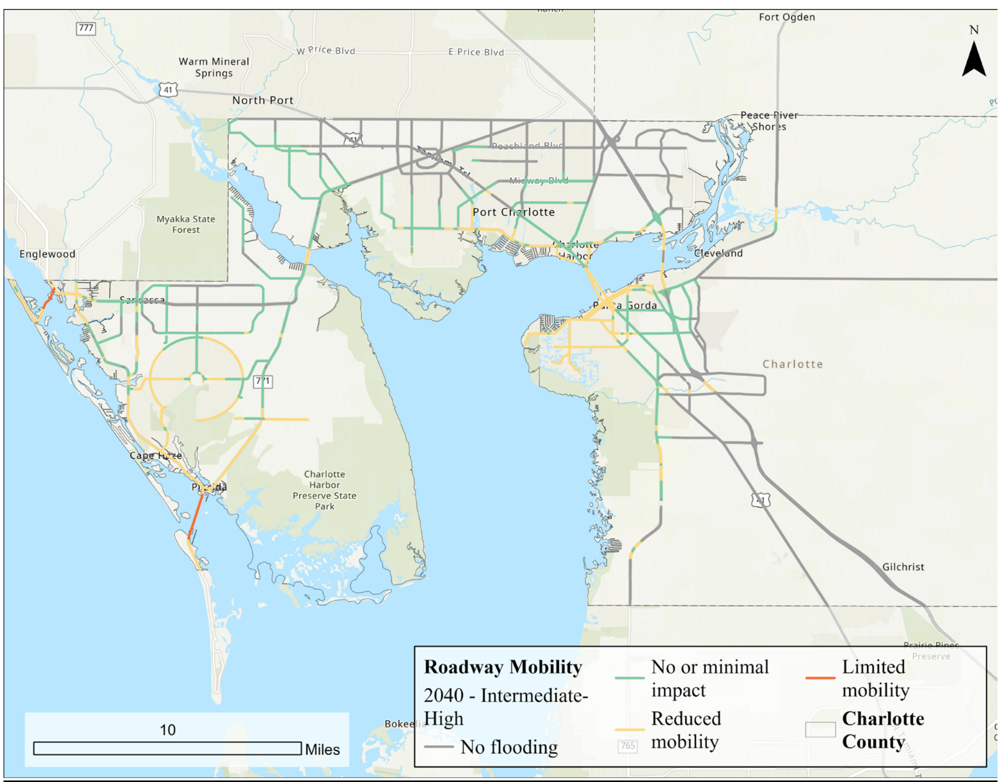


Figure 6 Roadway mobility conditions across Charlotte County, Year: 2040, Intermediate-High Scenario

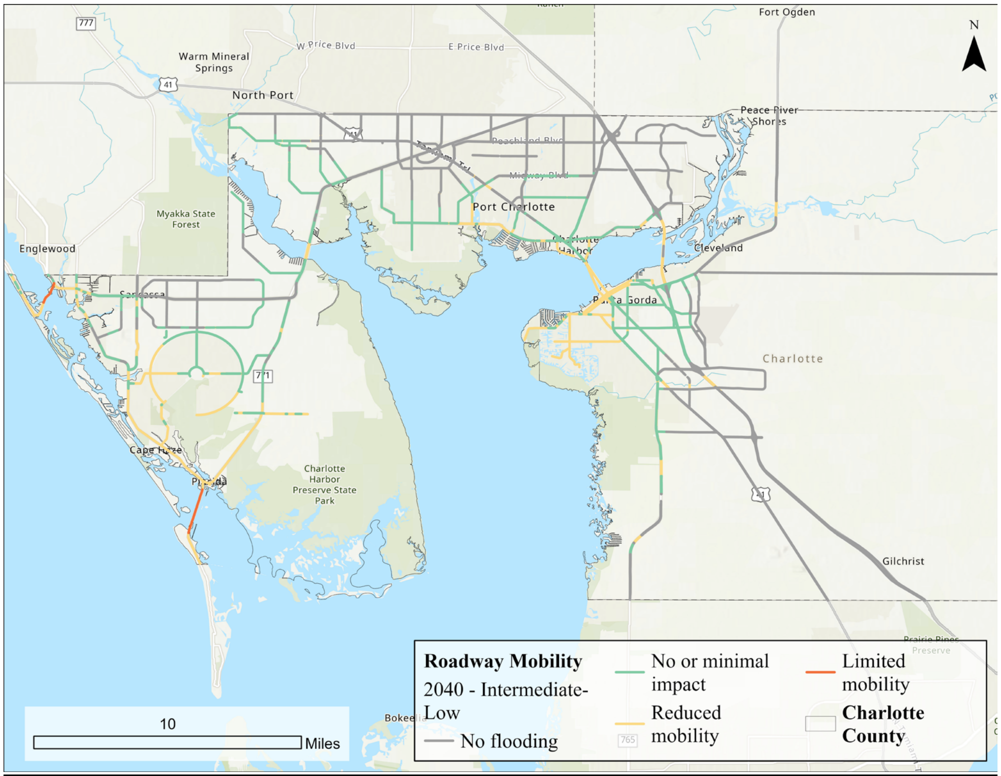


Figure 7 Roadway mobility conditions across Charlotte County, Year: 2040, Intermediate-Low Scenario

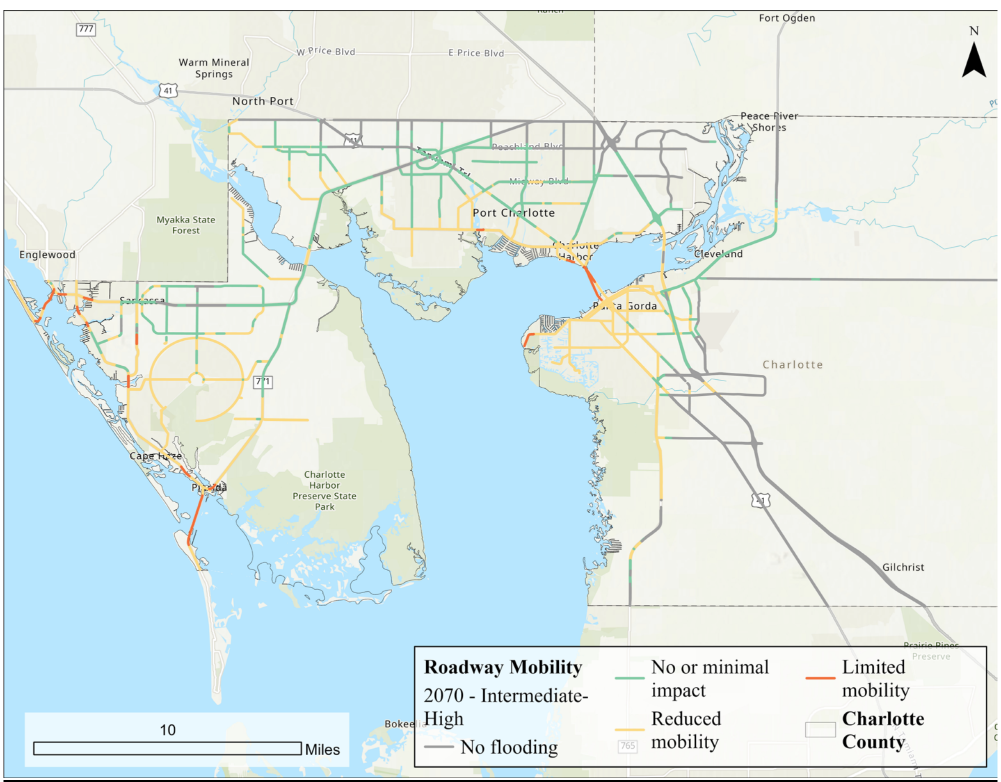


Figure 8 Roadway mobility conditions across Charlotte County, Year: 2070, Intermediate-High Scenario

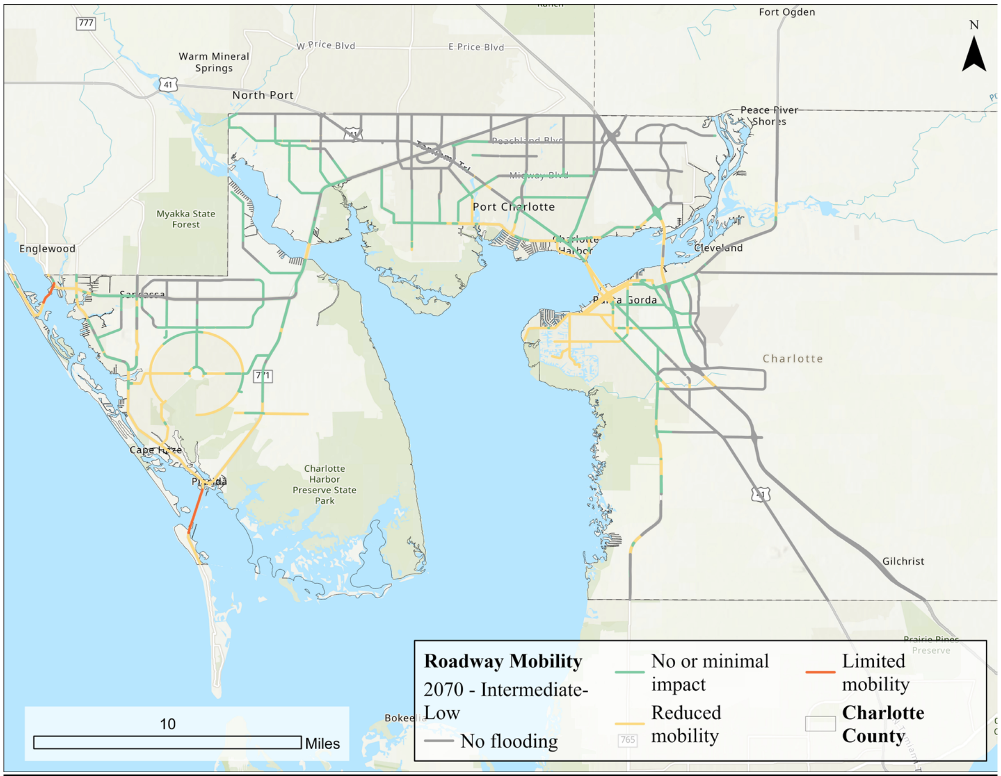


Figure 9 Roadway mobility conditions across Charlotte County, Year: 2070, Intermediate-Low Scenario

Under current conditions, the majority of the road network remains unaffected, with only a few isolated low-lying segments near coastal areas showing limited mobility conditions. This baseline reflects the relatively contained nature of surge impacts in 2022. By 2040, early signs of mobility disruption begin to emerge. Under the Intermediate-Low scenario, most of the county's major roads continue to operate normally, but some segments near the western coast and southern roads exhibit reduced mobility. Under the Intermediate-High scenario, the extent of impacted roadways increases modestly, with localized limited mobility appearing along the barrier islands and with several collector roads experiencing reduced access.

By 2070, the spatial footprint of mobility disruption expands substantially. Under the Intermediate-Low projection, coastal segments continue to degrade in mobility performance, but inland areas remain largely unaffected. In contrast, the 2070 Intermediate-High scenario reveals widespread functional loss across lower-elevation corridors. Numerous roads, especially minor arterials and collectors near the shoreline and estuarine zones, are projected to be significantly impacted during storm surge events. This series of maps illustrates the escalating risk to everyday travel when hazardous conditions occur. Roads that are functional today may face clear limitations in the future.

Note: Mobility impacts of water-crossing segments (bridges) noted in this report are likely to overrepresent possible impacts given the analysis methods applied. Bridge decks are not maintained in available elevation data, so flooding in those areas will show impacts to those facilities, in any area where any portion of the bridge, including the approaches, may be inundated by noted flood levels. Furthermore, focused work would resolve any outstanding questions on the facilities, once additional data is developed.

The lifecycle analysis approach described in Section 3.5 is implemented. For a 30-year analysis period and a 7% discount rate, the present value of losses in the Intermediate-High scenario is estimated at $96.41 Million in 2025$. The present value of losses for the Intermediate-Low scenario is estimated at $80.34 Million in 2025$.

Table 34 Lifecycle results for roadway assets

Lifecycle estimates	Intermediate-High		Intermediate-Low	
	Undiscounted	Discounted (7%)	Undiscounted	Discounted (7%)
Road physical loss	**$237,936,483**	**$96,408,029**	**$187,331,792**	**$80,337,052**

6.1.3 RISING GROUNDWATER RISK

Groundwater depth also poses risks for roadway structural integrity. To analyze the risks from rising groundwater, the base clearance needs to be defined as a reference basis. Base clearance refers to the vertical distance between the groundwater table and the bottom of the pavement structure, i.e., the structural layer directly beneath the asphalt or concrete surface. This clearance plays a critical role in preserving the structural integrity of roadways, especially in areas where surface flooding may not be present but subsurface saturation poses long-term risk.

As groundwater levels increase, base clearance decreases. When this clearance falls below a critical threshold, commonly 3 feet as suggested by FDOT officials, roads become increasingly vulnerable to a range of damage mechanisms, including capillary rise, pore pressure buildup, loss of subgrade strength, and accelerated degradation of pavement layers. Table 35 summarizes the projected extent of roads with base clearance less than 3 feet under four future CSL scenarios.

Table 35 Road base clearance due to groundwater rise in 2040, and 2070

Indicator	Year: 2040		Year: 2070	
	Intermediate-High	Intermediate-Low	Intermediate-High	Intermediate-Low
Total length of exposed roads where the base clearance is less than 3 ft (miles)	179	159	242	179
Percentage of exposed roads where the base clearance is less than 3 ft (%)	36.48	32.37	49.24	36.48

The results reveal that a substantial portion of the roadway system is projected to fall below the commonly used 3-foot clearance threshold in future scenarios.

Elevated groundwater levels can significantly compromise the structural performance of roadway sublayers, even in the absence of surface flooding. As the groundwater table rises closer to the pavement structure, capillary action and direct saturation reduce the strength and stiffness of unbound layers such as the subgrade and base course. This weakening occurs due to reduced effective stress and increased pore water pressure, which diminishes the soil's load-bearing capacity and shear strength. As a result, roads subjected to elevated groundwater are more prone to rutting, differential settlement, and accelerated degradation under repeated traffic loading. In areas with shallow water tables, particularly after heavy rainfall or tidal influence, the risk of premature pavement failure increases even without visible flooding. Recognizing these subsurface-driven vulnerabilities is essential for assessing the risk of the road segment.

Groundwater depth thresholds and associated damage mechanisms are summarized in Table 36.

Table 36 Base Clearance Thresholds

Groundwater Depth	Base Stability Level	Description
>3'	Safe	Groundwater is sufficiently separated from the pavement structure, maintaining base integrity and minimizing risk of moisture-related weakening
2'-3'	Minor	Slight reduction in base strength may occur under prolonged wet conditions

1'-2'	Moderate	Increased potential for moisture intrusion, capillary rise and strength loss in unbound layers
0-1'	Major	Base is highly susceptible to saturation and weakening. Capillary action and pore pressure buildup can accelerate pavement distress even without surface flooding.
<0	Groundwater Inundation	Groundwater is at or above the pavement structure. Full saturation leads to severe loss of load-bearing capacity and rapid structural failure under traffic.

Based on the Table 36 thresholds, the percentage of total roadway length under five roadway base stability levels is summarized in Table 37. While most roads remain in the "safe" category, the proportion of network segments classified under moderate to severe risk levels increases notably over time, particularly under the 2070 Intermediate-High scenario. Roads falling into the groundwater inundation category nearly double between 2040 and 2070 under the Intermediate-High scenario.

Table 37 Percentage of total roadway network length under different base stability level in 2040, and 2070 (%)

Base Stability Level	Year: 2040		Year: 2070	
	Intermediate-High	Intermediate-Low	Intermediate-High	Intermediate-Low
Safe	63.52	67.63	50.76	63.52
Minor	6.08	6.06	6.84	6.08
Moderate	5.90	6.93	5.93	5.90
Major	7.54	6.83	6.08	7.54
Groundwater Inundation	16.95	12.55	30.39	16.95

6.2 RAILWAYS

The county includes 25 miles of railways. The values of these railways are determined by the railway lengths and the unit length values from Table 9-2 in the HAZUS Inventory Technical Manual.[28] These values are subsequently adjusted to 2025 dollars using inflation factors.[29] Table 38 shows the resulting total assessed value of the rail network.

Table 38 Total assessed value for railways in 2025$

Transportation Assets	Total Assessed Value
Railway	$45,307,408

6.2.1 TIDAL FLOODING RISK

Analysis of railway exposure to tidal flooding indicates minimal impacts under current and near-term future conditions. However, a notable increase in exposure is projected under the 2070 intermediate-high CSL scenario (see Table 39). By 2040, exposure remains low across both intermediate-high and intermediate-low scenarios. In contrast, by 2070, the intermediate-high scenario shows railway exposure reaching 0.6 miles, or 2.4% of the network. These results highlight that while short- and mid-term risks are limited, long-term changes in sea level driven by higher greenhouse gas concentrations could have an impact on critical segments of the railway system.

Table 39 Railway exposure to the tidal flooding extent 2040 vs. 2070

[28] FEMA, "HAZUS Inventory Technical Manual," 2024, https://www.fema.gov/sites/default/files/documents/fema_hazus-inventory-technical-manual-6.1.pdf
[29] U.S. Bureau of Labor Statistics, "CPI Inflation Calculator," 2025, https://www.bls.gov/data/inflation_calculator.htm

Indicator	Year: 2040		Year: 2070	
	Intermediate-High	Intermediate-Low	Intermediate-High	Intermediate-Low
Total length of Exposed Railways (miles)	0.05	0.03	0.60	0.04
Percentage of Exposed Railways (%)	0.21	0.14	2.40	0.17

6.2.2 STORM SURGE RISK

Under 100-year storm surge scenarios, a significant portion of the railway network is projected to be impacted, with exposure increasing slightly over time (see Table 40). Currently, nearly 40% of the railway system already lies within flood-prone areas. By 2070, exposure rises to 43% under the intermediate-high scenario, indicating that while the risk does not change dramatically over time, approximately 40% of the railway network remains consistently vulnerable throughout the projection period.

Table 40 Railway exposure to the 100-year storm surge 2022, 2040, and 2070

Indicator	2022	Year: 2040		Year: 2070	
		Intermediate-High	Intermediate-Low	Intermediate-High	Intermediate-Low
Total length of exposed railways (miles)	9.95	10.44	10.16	10.79	10.42
Percentage of exposed railways (%)	39.88	41.81	40.69	43.24	41.74

Storm surge can rapidly inundate rail track segments, saturating the subgrade and ballast, which leads to track instability, misalignment, and reduced load bearing capacity. In severe cases, high-velocity surge flows can erode embankments and wash away ballast entirely, requiring full reconstruction before service can resume. Electro-mechanical components such as switches, signals, and communication systems are also highly susceptible to saltwater intrusion and short-circuiting. Even limited flooding can result in prolonged service outages due to the need for safety inspections and system resets.
Given the linear and interconnected nature of rail networks, localized damage from storm surge can cause widespread operational delay.

Based on the exposure analysis results, the flooding depth for railway segments under various scenarios was determined and combined with data on railway physical characteristics. Flood-induced railway losses are quantified similarly to building losses. Physical structural losses are estimated using depth-damage functions. For each railway segment, the appropriate damage ratio is identified based on the simulated flood depth and the depth-damage function. Replacement values for a unit railway segment (per mile) are then determined according to the railway length as outlined in the HAZUS Inventory Technical Manual.

Based on this process, the corresponding unit cost, adjusted to 2025 dollars using inflation factors, is determined. The total replacement cost for exposed railway segments is then calculated based on the total length of the railway where flood inundation exceeds 0 feet. Structural losses are estimated based on the damage ratio and replacement costs. All loss estimates are converted to 2025 dollars to ensure consistency in valuation across scenarios.

In summary, the total loss for each railway segment can be estimated for baseline (2022), intermediate-high (2040 and 2070), and intermediate-low (2040 and 2070) scenarios, as shown in Table 41.

Table 41 Total economic losses for railways in the 100-year storm surge event 2022, in 2040, and 2070

Year	Total Losses	
	Intermediate-High Scenario	Intermediate-Low Scenario
2022	$167,050	$167,050
2040	$177,800	$171,400
2070	$195,900	$177,250

The lifecycle analysis approach described in Section 3.5 is implemented. For a 30-year analysis period and a 7% discount rate, the present value of losses in the Intermediate-High scenario is estimated at $2.32 Million in 2025$. The present value of losses for the Intermediate-Low scenario is estimated at $2.26 Million in 2025$.

Table 42 Lifecycle results for railway assets

Lifecycle estimates	Intermediate-High		Intermediate-Low	
	Undiscounted	Discounted (7%)	Undiscounted	Discounted (7%)
Railway physical loss	**$5,332,850**	**$2,324,632**	**$5,136,375**	**$2,260,170**

6.3 BRIDGES AND CULVERTS

The county's roadway system includes 45 bridges and 25 culverts (see Table 43), which provide critical crossings over water bodies and low-lying areas. These structures represent potentially vulnerable locations and are vital for maintaining access to key facilities before, during, and after hazard events. It should be noted that portions of the roadway system (including bridges and culverts) fall under State and Federal jurisdiction, and those agencies are assumed to conduct their own vulnerability assessments for their respective assets.

Table 43 Bridges and culverts asset counts.

Transportation assets	Assets Crossing Water Bodies		Inland Assets		Total Assets
	Number	Percentage (%)	Number	Percentage	
Bridges	44	62.86	1	1.43	45
Culverts	21	30.00	4	5.71	25
Total	**65**	**92.86**	**5**	**7.14**	**70**

Only a qualitative risk analysis was used for bridges and culverts. Therefore, the asset values are not assessed in this section.

6.3.1 TIDAL FLOODING RISK

Due to the lack of direct bridge deck elevation and inundation data, the exposure of bridges was approximated using the flood exposure status of their approaching roadway segments. Specifically, if either side of the bridge road approach intersected tidal inundation zones, the bridge was assumed to be exposed under that scenario. The number, percentage, and length of the exposed assets where tidal flooding inundation is greater than zero are summarized in Table 44.

Table 44 Bridges exposure to the tidal flooding extent 2040 vs. 2070

Structure Type	Indicator	Year: 2040 Intermediate-High	Year: 2040 Intermediate-Low	Year: 2070 Intermediate-High	Year: 2070 Intermediate-Low
Bridges-Cross Water Body	Number of Exposed Assets	2	1	5	2
	Length of Exposed Assets (miles)	0.046	0.002	0.364	0.043
	Percent of Exposed Assets per Asset Type (%)	4.55	2.27	11.36	4.55
Bridges-Inland	No exposure				

Table 45 Culverts exposure to the tidal flooding extent 2040 vs. 2070

Structure Type	Indicator	Year: 2040 Intermediate-High	Year: 2040 Intermediate-Low	Year: 2070 Intermediate-High	Year: 2070 Intermediate-Low
Culverts-Cross Water Body	Number of Exposed Assets	No exposure	No exposure	2	No exposure
	Length of Exposed Assets (miles)			0.040	
	Percent of Exposed Assets per Asset Type (%)			9.52	
Culverts-Inland	No exposure				

The results in Table 44 and Table 45 reveal that only a small subset of bridges and culverts intersect with tidal flooding extents under future climate scenarios. Even under the more extreme 2070 Intermediate-High scenario, only a few such assets are projected to be exposed, and these represent a very limited portion of the total asset inventory.

Inland assets do not have exposure to tidal flooding. However, for assets over waterways, localized impacts may occur, particularly at a few vulnerable bridges over waterways; however, the overall exposure footprint is small. This low exposure contributes to a low system-wide risk level.

Bridges and culverts could be vulnerable to tidal flooding due to their direct interaction with water bodies and reliance on stable hydraulic and structural conditions. These assets are often located at low elevations near coastlines, estuaries, or drainage outfalls, making them susceptible to high tide events. Repeated tidal inundation can accelerate structural deterioration through corrosion of steel components, undermining of abutments and foundations due to scour, and degradation of bearings and road approaches. Even modest flood depths can render crossings impassable during high tide cycles, disrupting mobility and emergency response. In addition, smaller culverts, if undersized or clogged, can exacerbate upstream flooding and road overtopping, especially under compound flood conditions.

Although bridges and culverts are functionally critical components of the transportation network, often enabling access across water bodies with few alternative routes, their overall risk from tidal flooding is currently limited due to low spatial exposure. Analysis shows that only a small number of such assets intersect projected tidal inundation areas under future conditions. The results suggest that most structures are sufficiently elevated or located outside of vulnerable zones.

6.3.2 STORM SURGE RISK

Bridges and culverts experience intense hydrodynamic and structural stresses during storm surge events. Surge flows often carry high volumes of water at elevated velocities, which can induce scour around bridge piers, abutments, and culvert inlets. Prolonged exposure to saltwater accelerates corrosion of steel components and weakens reinforced concrete, particularly in older or unprotected structures. Culverts may become overwhelmed or blocked by storm debris, leading to upstream flooding and pressure-induced failure.

For bridges and culverts, the number, percentage, and length of the exposed assets where storm surge inundation is greater than zero are summarized in Table 46.

Table 46 Bridges' exposure to the 100-year storm surge in 2022, 2040, and 2070

Structure Type	Indicator	2022	Year: 2040 Intermediate-High	Year: 2040 Intermediate-Low	Year: 2070 Intermediate-High	Year: 2070 Intermediate-Low
Bridges-Cross Water Body	Number of Exposed Assets	44	44	44	44	44
	Length of Exposed Assets (miles)	0.454	0.488	5.097	5.910	5.051
	Percent of Exposed Assets per Asset Type (%)	100%	100%	100%	100%	100%
Bridges-Inland	Number of Exposed Assets	1	1	1	1	1
	Length of Exposed Assets (miles)	0.004	0.004	0.113	0.176	0.111
	Percent of Exposed Assets per Asset Type (%)	100%	100%	100%	100%	100%

Table 47 Culverts' exposure to the 100-year storm surge in 2022, 2040, and 2070

Structure Type	Indicator	2022	Year: 2040 Intermediate-High	Year: 2040 Intermediate-Low	Year: 2070 Intermediate-High	Year: 2070 Intermediate-Low
Culverts-Cross Water Body	Number of Exposed Assets	8	12	9	18	11
	Length of Exposed Assets (miles)	0.059	0.086	0.941	2.951	1.353
	Percent of Exposed Assets per Asset Type (%)	38.10	57.14	42.86	85.71	52.38
Culverts-Inland	Number of Exposed Assets	No exposure	No exposure	No exposure	1	No exposure

Structure Type	Indicator	2022	Year: 2040 Intermediate-High	Year: 2040 Intermediate-Low	Year: 2070 Intermediate-High	Year: 2070 Intermediate-Low
	Length of Exposed Assets (miles)				0.425	
	Percent of Exposed Assets per Asset Type (%)				25.00	

The exposure results show two distinct patterns. Bridges over water bodies consistently show high levels of exposure across all timeframes and CSL scenarios. This number exposure remains steady, but the length exposed from the present day to 2070 increases. In contrast, inland bridges and culverts show very limited exposure overall, with only a small number of isolated cases, primarily under more extreme future scenarios. While a few culverts that cross water bodies demonstrate moderate exposure, the inland category remains largely unaffected.

The risks of disruption due to storm surge events for bridges can be significant for specific high-traffic locations. The five bridges identified in Table 48 serve as critical links in the transportation network, with maximum impacted traffic volumes ranging from over 15,000 to 21,000 vehicles per day. Given their high AADT, temporary loss of access or damage to these crossings during major surge events could result in substantial mobility impacts, including detour delays, emergency response challenges, and economic disruption.

Table 48 Top 5 bridges with the highest maximum impacted traffic (AADT)

Approaching Roads for the Bridges-Crossing Water Body	Crossing	Maximum Impacted Traffic (AADT)
Burnt Store Road	Alligator Creek	21,000
Placida Road	Ainger Creek	16,200
Placida Road	Oyster Creek	16,200
Placida Road	Buck Creek	16,200
Edgewater Drive	Olman Waterway	15,300

Note: Bridge impacts noted in this report are likely to overrepresent possible impacts given the analysis methods applied. Bridge decks are not maintained in available elevation data, so flooding in those areas will show impacts to those facilities, in any area where any portion of the bridge, including the approaches, may be inundated by noted flood levels. Furthermore, focused work would resolve any outstanding questions on the facilities, once additional data is developed.

7 NATURAL, CULTURAL, AND HISTORIC RESOURCES

This category includes natural systems such as conservation lands, historical and cultural structures, parks, and wetlands, as shown in Figure 10. These resources not only contribute to environmental health and quality of life but also require protection from climate-related hazards. Charlotte County contains 31,059 acres of parks, 656,835 acres of conservation lands, and 418,270 acres of wetlands. Additionally, the county features 337 miles of shoreline, making coastal resilience a priority in planning efforts.

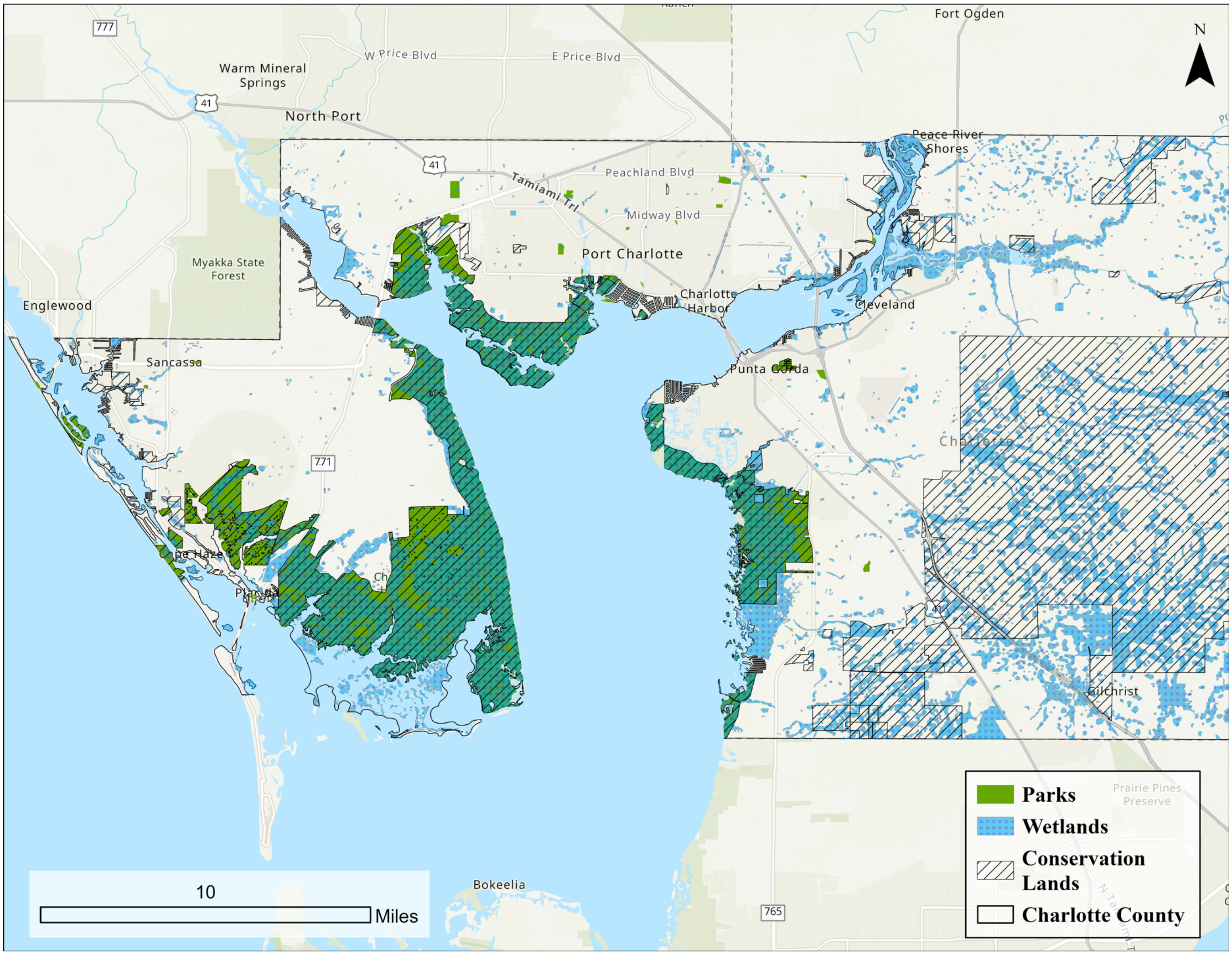


Figure 10 Natural Resources in Charlotte County

Table 49 Natural, cultural, and historical resources by total acres of land.

Natural, Cultural, and Historical Resources	Total Acres
Conservation Lands	656,835
Parks	31,050
Wetlands	418,270

Conservation Lands are areas specifically designated for the purpose of preserving natural resources, biodiversity, and ecological integrity. These lands can be either publicly or privately owned and are managed under legal or administrative frameworks to ensure long-term conservation. The designation of conservation lands is not necessarily based on the current physical characteristics or land cover, but rather on their management status. In Florida, for example, the Florida Natural Areas Inventory maintains a dataset that tracks these lands, updating them as new areas are acquired or as the management status of existing lands changes. These boundaries are legal in nature and reflect conservation intent, regardless of the actual ecological condition of the land at any given time.

Parks in this report are defined as publicly accessible recreational and conservation areas compiled from three complementary datasets. The primary source is the Florida State Parks Boundaries dataset, published by the Florida Department of Environmental Protection (FDEP), which outlines the official extents of all designated state parks[30]. To capture developed recreational use within these parks, the Florida State Park Structures layer was also incorporated; parcels containing built features like recreation centers were included when associated with these structures[31]. Additionally, the County Facilities dataset provided by the local government was used to identify county-managed parks, encompassing both active-use areas (e.g., sports fields and playgrounds) and passive-use green spaces (e.g., trails and picnic areas).

Wetlands are defined by their physical and ecological characteristics. They are areas where water saturation is the dominant factor determining the nature of soil development and the types of plant and animal communities living there. Wetlands are identified based on actual land cover and ecological conditions, typically using remote sensing technologies such as aerial or satellite imagery. These classifications are updated periodically to reflect changes in the landscape. Unlike conservation lands, wetlands are not defined by ownership or management status—they can exist within protected conservation areas or in completely unprotected, privately owned spaces. Their classification is rooted in environmental science rather than legal designation.

In summary, conservation lands are defined by their legal designation and management status, while wetlands are identified based on their ecological and physical characteristics. Parks, in contrast, are designated public spaces that may serve recreational, ecological, or conservation purposes, and are identified through a combination of state and county datasets. These three classifications are not mutually exclusive—a wetland may exist within a conservation area or a park, and a conservation area may include or exclude wetlands and park infrastructure. In Charlotte County, there are notable instances where these land types of overlap, such as within the Charlotte Harbor Preserve State Park, which encompasses protected conservation land, ecologically significant wetlands, and designated park areas. To provide a clearer understanding of their distinct roles and characteristics, the following section will analyze conservation lands, parks, and wetlands separately.

7.1 CONSERVATION LANDS

This analysis focuses on areas designated as managed conservation lands. These include public and select private lands that are recognized for their natural resource value and are managed, at least in part, for conservation purposes. In Charlotte County, these lands include over 656,835 acres and form the basis for evaluating exposure to future flood hazards.

The Habitat Evolution Model based on SLAMM from a CHNEP study provides information for the years 2016, 2040, and 2070. To estimate the area for today's condition (2025), a linear interpolation was assumed between each of the subcategories of conservation lands using as a base the estimated areas from 2016 and 2040 Intermediate-High scenarios. Table 50 to Table 52 listed the conservation land areas changes from today to projected 2040 and 2070.

Table 50 Conservation land areas projected today

Asset Category	2016		2025	
	Area (Acres)	Percentage of Total Area	Area (Acres)	Percentage of Total Area
Developed Upland - Hard	750	0.1	750	0.1
Developed Upland - Soft	8,795	1.3	8,795	1.3
Freshwater Marsh	160,340	24.4	159,575	24.3
High Salt Marsh	36,450	5.5	35,631	5.4
Mangroves	158,470	24.1	160,116	24.4

30 https://geodata.dep.state.fl.us/datasets/FDEP::florida-state-parks-boundaries/about
31 https://maps-fdep.opendata.arcgis.com/datasets/FDEP::florida-state-park-structures/about?layer=0

Asset Category	2016		2025	
	Area (Acres)	Percentage of Total Area	Area (Acres)	Percentage of Total Area
Open Water	13,460	2.0	13,739	2.1
Salt Barren	3,870	0.6	4,403	0.7
Tidal Flat	135	0.0	116	0.0
Undeveloped Upland	274,565	41.8	273,710	41.7
Total	**656,835**	**100.0**	**656,835**	**100**

Table 51 Conservation land areas projected in 2040

Asset Category	Intermediate-High		Intermediate-Low	
	Area (Acres)	Percentage of Total Area	Area (Acres)	Percentage of Total Area
Developed Upland - Hard	750	0.1	750	0.1
Developed Upland - Soft	8,795	1.3	8,795	1.3
Freshwater Marsh	158,300	24.1	159,565	24.3
High Salt Marsh	34,265	5.2	36,535	5.6
Mangroves	162,860	24.8	159,795	24.3
Open Water	14,205	2.2	13,450	2.0
Salt Barren	5,290	0.8	4,015	0.6
Tidal Flat	85	0.0	90	0.0
Undeveloped Upland	272,285	41.5	273,830	41.7
Total	**656,835**	**100.0**	**656,825**	**100.0**

Table 52 Conservation land areas projected in 2070

Asset Category	Intermediate-High		Intermediate-Low	
	Area (Acres)	Percentage of Total Area	Area (Acres)	Percentage of Total Area
Developed Upland - Hard	735	0.1	750	0.1
Developed Upland - Soft	8,785	1.6	8,795	1.3
Freshwater Marsh	118,425	21.3	157,450	24.0
High Salt Marsh	14,730	2.7	34,390	5.2
Mangroves	174,635	31.4	161,260	24.6
Open Water	23,650	4.3	16,350	2.5
Salt Barren	11,275	2.0	6,590	1.0

Asset Category	Intermediate-High		Intermediate-Low	
	Area (Acres)	Percentage of Total Area	Area (Acres)	Percentage of Total Area
Tidal Flat	85	0.0	85	0.0
Undeveloped Upland	203,345	36.6	271,180	41.3
Total	**555,665**	**100.0**	**656,850**	**100.0**

By 2040, the total area of the conservation lands will stay relatively stable in both Intermediate-High and low scenarios. The shifts among different land types are also not obvious, which indicates that many current conservation lands may remain viable with minimal displacement under CSL by 2040.

From Table 52, it can be observed that by 2070, the conservation landscape is projected to respond differently under two CSL scenarios. Under the Intermediate-High scenario, the total conserved area shrinks notably, driven by the loss of freshwater marsh, high salt marsh, and undeveloped upland zones. Some land types, like mangroves, salt barren, see slight expansion due to saltwater intrusion. Meanwhile, the open water area increases dramatically due to CSL. However, these gains do not compensate for the overall reduction in conserved acreage, suggesting pressure on higher-elevation habitats. In contrast, the Intermediate-Low scenario shows relative stability, with total conserved land nearly unchanged from today and only minor shifts among asset categories, indicating a less disruptive impact on the existing ecological distribution.

According to the area changes, the benefits/losses provided by the ecosystem are quantified by using the approach documented in Section 3.6. As the lifecycle analysis starts in 2025, the difference in the ecosystem service valuation is estimated using this year as the baseline. If the difference yields a positive value, it means that the area of the ecosystem increased based on today's condition, providing more ecosystem service benefits. If the difference results in a negative value, it means that there is a reduction in the acreage of the ecosystem; hence, ecosystem services may be lost over time.

Table 53 Total ecosystem service valuation and difference among 2025, 2040, and 2070

Valuation	2025	2040		2070	
		Intermediate-High	Intermediate-Low	Intermediate-High	Intermediate-Low
Total Ecosystem Service Valuation Based on Land Cover	$7,532,983,401	$7,525,045,370	$7,536,253,890	$6,186,772,665	$7,499,724,656
Difference in Benefits Projected from Reduced Acreage	$0	-$7,200,052	$3,208,344	-$1,309,764,931	-$31,948,509

Table 53 illustrates the projected total ecosystem service values based on land cover for three time periods—present day, 2040, and 2070—under both the Intermediate-High and Intermediate-Low scenarios. In the Intermediate-High scenario, there is a significant decline in valuation over time, largely driven by the loss of land that supports ecosystem functions. Conversely, the Intermediate-Low scenario reveals a different pattern: a modest increase in value by 2040, followed by a marked decrease by 2070. This short-term rise is linked to a slight expansion of coastal wetlands projected for 2040, which temporarily boosts ecosystem service capacity before subsequent losses reduce overall value.

Table 54 Present value of ecosystem service benefits based on land cover

Scenarios	Discounted Net Benefits in Present Value
Intermediate-High	-$935,485,121
Intermediate-Low	-$500,309

Table 54 summarizes the discounted total ecosystem service benefits in present value, representing the net ecosystem service gains or losses from 2025 to 2054 over a 30-year analysis period using a 7% discount rate, compared to today's baseline (2025). Under the Intermediate-High scenario, the net benefit is negative, indicating a significant decline in ecosystem services due to the substantial loss of coastal wetland area. In contrast, the Intermediate-Low scenario yields a slight negative net benefit, reflecting a modest decrease in ecosystem services over time, driven by the temporary shrinkage of coastal wetlands and reduced degradation relative to the high scenario.

It is important to note that this ecosystem service valuation does not account for the impacts of flooding, as up-to-date and comprehensive flood extent data were unavailable for inclusion. The analysis was constrained by inconsistencies between datasets—specifically, flood extent data were limited to the 2022 storm surge events, while the SLAMM model relies on land cover data from 2016. This temporal mismatch limited the ability to assess how flooding might influence ecosystem service delivery. Nonetheless, it is recognized that areas subject to inundation are likely to undergo both physical and functional degradation, diminishing their ability to provide ecosystem services at the same level as non-inundated areas.

7.1.1 TIDAL FLOODING RISK

Tidal flooding exposure is assessed for conservation lands based on the approach described in Section 3.1.The summary of exposure results with the tidal flooding extent projected in 2040 and 2070 is listed in Table 55 and Table 56.

Table 55 Exposure of conservation lands within the tidal flooding extent projected in 2040

Asset Category	Intermediate-High			Intermediate-Low		
	Total Area Projected (Acres)	Exposed Area (Acres)	Percentage of Exposed Area	Total Area Projected (Acres)	Exposed Area (Acres)	Percentage of Exposed Area
Developed Upland - Hard	750	0	0.0	750	0	0.0
Developed Upland - Soft	8,795	0	0.0	8,795	0	0.0
Freshwater Marsh	158,300	25	0.0	159,565	5	0.0
High Salt Marsh	34,265	13,600	39.7	36,535	4,020	11.0
Mangroves	162,860	101,025	62.0	159,795	41,105	25.7
Open Water	14,205	1,360	9.6	13,450	280	2.1
Salt Barren	5,290	605	11.4	4,015	210	5.2
Tidal Flat	85	0	0.0	90	0	0.0
Undeveloped Upland	272,285	20	0.0	273,830	5	0.0
Total	**656,835**	**116,635**	**17.8**	**656,825**	**45,625**	**6.9**

Table 56 Exposure of conservation lands within the tidal flooding extent projected in 2070

Asset Category	Intermediate-High			Intermediate-Low		
	Total Area Projected (Acres)	Exposed Area (Acres)	Percentage of Exposed Area	Total Area Projected (Acres)	Exposed Area (Acres)	Percentage of Exposed Area
Developed Upland - Hard	735	5	0.7	750	0	0.0
Developed Upland - Soft	8,785	60	0.7	8,795	0	0.0
Freshwater Marsh	118,425	150	0.1	157,450	5	0.0
High Salt Marsh	14,730	13,715	93.1	34,390	11,020	32.0
Mangroves	174,635	170,035	97.4	161,260	91,055	56.5
Open Water	23,650	11,070	46.8	16,350	2,285	14.0
Salt Barren	11,275	6,940	61.6	6,590	230	3.5
Tidal Flat	85	0	0.0	85	0	0.0
Undeveloped Upland	203,345	445	0.2	271,180	10	0.0
Total	**555,665**	**202,420**	**36.4**	**656,850**	**104,605**	**15.9**

By 2040, tidal flooding is projected to impact conservation lands significantly, especially under the Intermediate-High scenario. Approximately 18% of conservation lands are projected to be exposed, primarily driven by widespread inundation of mangroves, high salt marshes, and salt barren. These low-lying ecosystems, especially mangroves, show exposure rates exceeding 60%. In contrast, under the Intermediate-Low scenario, only 6.9% exposure is found for the conservation lands, indicating that most conservation lands would remain above projected tidal extents, especially upland and marsh systems.

By 2070, the extent and severity of exposure increase considerably, especially under Intermediate-High scenarios, where over 36% of conservation land is projected to be affected. Notably, nearly all mangroves and salt marshes are exposed. The Intermediate-Low scenario still shows substantial expansion of tidal reach compared to 2040, affecting 15.9% of the area, with high salt marsh and mangroves again being the most impacted.

These results indicate that while tidal flooding impacts are relatively limited by 2040, the risks escalate significantly by 2070.

7.1.2 <u>STORM SURGE RISK</u>

Storm surge exposure is assessed for conservation lands based on the approach described in Section 3.1. Storm surge exposure results for current, 2040, and 2070 intermediate-low and intermediate-high results can be found in Table 57 and Table 58.

Table 57 Exposure of conservation lands within the 100-year flooding extent projected in 2040

Asset Category	Intermediate-High			Intermediate-Low		
	Total Area Projected (Acres)	Exposed Area (Acres)	Percentage of Exposed Area	Total Area Projected (Acres)	Exposed Area (Acres)	Percentage of Exposed Area
Developed Upland - Hard	750	165	22.0	750	165	22.0
Developed Upland - Soft	8,795	715	8.1	8,795	660	7.5
Freshwater Marsh	158,300	7,850	5.0	159,565	8,870	5.6
High Salt Marsh	34,265	33,645	98.2	36,535	35,670	97.6
Mangroves	162,860	151,645	93.1	159,795	148,265	92.8
Open Water	14,205	4,395	30.9	13,450	4,330	32.2
Salt Barren	5,290	4,285	81.0	4,015	3,575	89.0
Tidal Flat	85	0	0.0	90	0	0.0
Undeveloped Upland	272,285	21,465	7.9	273,830	22,535	8.2

Asset Category	Intermediate-High			Intermediate-Low		
	Total Area Projected (Acres)	Exposed Area (Acres)	Percentage of Exposed Area	Total Area Projected (Acres)	Exposed Area (Acres)	Percentage of Exposed Area
Total	**656,835**	**224,165**	**34.1**	**656,825**	**224,070**	**34.1**

Table 58 Exposure of conservation lands within the 100-year flooding extent projected in 2070

Asset Category	Intermediate-High			Intermediate-Low		
	Total Area Projected (Acres)	Exposed Area (Acres)	Percentage of Exposed Area	Total Area Projected (Acres)	Exposed Area (Acres)	Percentage of Exposed Area
Developed Upland - Hard	735	155	21.1	750	165	22.0
Developed Upland - Soft	8,785	785	8.9	8,795	710	8.1
Freshwater Marsh	118,425	910	0.8	157,450	7,050	4.5
High Salt Marsh	14,730	14,725	100.0	34,390	33,750	98.1
Mangroves	174,635	169,520	97.1	161,260	150,925	93.6
Open Water	23,650	13,210	55.9	16,350	5,605	34.3
Salt Barren	11,275	11,275	100.0	6,590	5,240	79.5
Tidal Flat	85	0	0.0	85	0	0.0
Undeveloped Upland	203,345	8,470	4.2	271,180	20,715	7.6
Total	**555,665**	**219,050**	**39.4**	**656,850**	**224,160**	**34.1**

Storm surge presents a more immediate and widespread threat than tidal flooding to conservation lands. By 2040, over one-third of conservation lands are exposed to 100-year surge events in both scenarios, including nearly total exposure of high salt marsh, mangroves, and salt barren. By 2070, although the total exposure under the intermediate-high scenario slightly decreases, due to some land types being completely inundated and converted, vulnerability remains high across both scenarios, with critical habitat types consistently exposed. This suggests that even in more moderate CSL trajectories, storm surge could result in substantial disruption to the county's natural systems.

7.2 HISTORICAL AND CULTURAL STRUCTURES

This category mainly focuses on the historic bridges in Charlotte County. A total of nine historic bridges is identified in the study area, collectively spanning approximately 15,650 feet. The bridges include Alligator Creek Bridge, Bridge No. 010006, Charlotte Harbor and Northern Railway (CHN) Coral Creek Trestle, Coral Creek Bridge, El Jobean Bridge, Myakka Fishing Piers, Placida Bridge, Shell Creek Bridge, and South Bridge – Boca Grande Causeway. These bridges are often older, constructed with the materials or techniques not commonly used in modern infrastructure, and may lack the elevation or structural resilience required to withstand current and future hazards.

Asset Type	Total Number of Assets	Total length (ft)
Historic bridges	9	15,650

7.2.1 TIDAL FLOODING RISK

Tidal flooding exposure is assessed for historic and cultural structures based on the approach described in Section 3.1. The exposure analysis for historic bridges under tidal flooding scenarios shows that three bridges are consistently exposed to tidal flooding, including Placida Bridge, Charlotte Harbor and Northern Railroad (CH&N RR) Coral Creek Trestle, and Shell Creek

Bridge for 2040 and 2070 hazard scenarios. But for the 2070 Intermediate-High scenario, in addition to the above three bridges, Alligator Creek Bridge also starts to be exposed to the tidal inundation risks. The summary of the exposure results for historic bridges is shown in Table 59.

Table 59 Historic bridges exposure to tidal flooding projected in 2040 and 2070

	Total	Exposure to Tidal flooding: 2040		Exposure to Tidal flooding: 2070	
		Intermediate-High	Intermediate-Low	Intermediate-High	Intermediate-Low
Number of historic bridges	9	3	3	4	3
Percentage of Total		33	33	44	33

7.2.2 STORM SURGE RISK

Storm surge exposure is assessed for historic and cultural structures based on the approach described in Section 3.1. Across all scenarios, the number of historic bridges exposed to storm surge inundation remains constant at 8, representing 88.89% of the total assessed historic bridges as presented in Table 60. This high proportion highlights a widespread exposure of historic structures to storm surge hazards. Only Coral Creek Bridge remains safe from storm surge hazards.

Table 60 Historic bridge exposure to 100-year storm surge events 2022, 2040, and 2070

	Total	Exposure to Storm surge: 2022	Exposure to Storm surge: 2040		Exposure to Storm surge: 2070	
			Intermediate-High	Intermediate-Low	Intermediate-High	Intermediate-Low
Number of historic bridges	9	8	8	8	8	8
Percentage of Total		89	89	89	89	89

The results show the high risk of majority of historic bridges. These bridges may experience erosion, foundation undermining, or collapse due to prolonged inundation and hydrodynamic forces. Culturally and historically, the damage to this kind of assets represents the loss of heritage and community identity. Additionally, repair or restoration of historic bridges often require higher costs and technical expertise.

7.3 PARKS

There are 30 parks included in the study area, whose total area is 31,000 acres, as presented in Table 61. These parks provide essential recreational space, ecological functions, and stormwater management benefits for the surrounding communities. Many of them serve as public gathering spaces and wildlife habitats.

Table 61 Number of parks within the study area, including the number of assets and built area

Asset Type	Total Number of Assets	Total Area (acres)
Parks	30	31,000

The location of parks is shown in Figure 11.

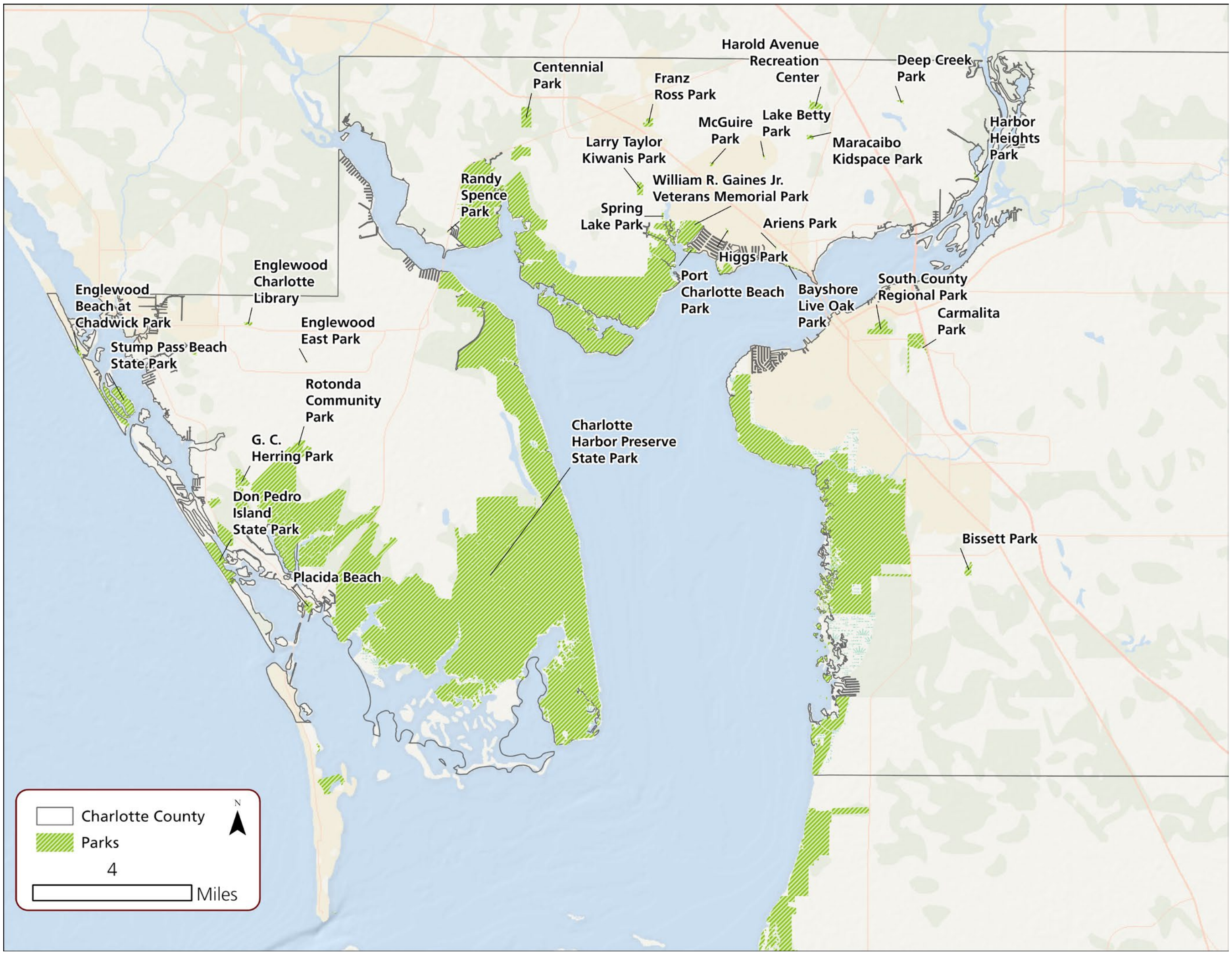


Figure 11 Parks in Charlotte County

7.3.1 TIDAL FLOODING RISK

Tidal flooding exposure is assessed for parks based on the approach described in Section 3.1. Given the typical proximity to water bodies, parks are often to be impacted by tidal flooding. The analysis shows a clear trend of expanding exposure over time, particularly under the Intermediate-High scenario. By 2070, a substantial portion of the county's total park area is projected to fall within the tidal inundation zone.

Table 62 Parks exposure to tidal flooding projected in 2040 and 2070

	Total	Exposure to Tidal flooding: 2040 Intermediate-High	Exposure to Tidal flooding: 2040 Intermediate-Low	Exposure to Tidal flooding: 2070 Intermediate-High	Exposure to Tidal flooding: 2070 Intermediate-Low
Area (Acres)	31,050	13,200	5,300	24,850	11,900
Percentage of Total		43	17	80	38

While the structural damage to parks may be less economically severe than for built infrastructure, repeated inundation can lead to erosion, vegetation loss, contamination, and long-term degradation of recreational facilities and trails. In addition, flooding may reduce park accessibility and limit the delivery of community services.

7.3.2 STORM SURGE RISK

Storm surge exposure is assessed for parks based on the approach described in Section 3.1. Storm surge events pose an obvious threat to the functionality and value of natural park systems, with most of the county's parks projected to be affected under both current and future storm scenarios.

Table 63 Parks exposure to 100-year storm surge events 2022, 2040 and 2070

	Total	Exposure to Storm surge: 2022	Exposure to Storm surge: 2040		Exposure to Storm surge: 2070	
			Intermediate-High	Intermediate-Low	Intermediate-High	Intermediate-Low
Area (Acres)	31,050	29,050	29,150	29,100	29,250	29,150
Percentage of Total		94	94	94	94	94

7.4 WETLANDS

This analysis focuses on areas designated as wetlands. In Charlotte County, these lands include over 418,270 acres and form the basis for evaluating exposure to future flood hazards. Wetlands in this context refer to land cover types classified using regional land use/land cover datasets compiled by Florida's five Water Management Districts. These areas include a variety of natural wetland systems such as freshwater marshes, forested wetlands, and mangrove swamps, which play critical roles in flood attenuation, water quality, and habitat support.

By applying the same approach as conservation lands (see Section 3.6), the changes of land cover type and exposure area to tidal flooding and storm surge events, along with the time horizon, are identified and summarized in this section.

The SLAMM data provides information for the years 2016, 2040, and 2070. To estimate the area for today's condition (2025), a linear interpolation was assumed between each of the subcategories of wetlands using as base the estimated areas from 2016 and 2040 Intermediate-High scenario. Table 64 to Table 66 listed the wetland areas changes from today to projected 2040 and 2070.

Table 64 Wetland areas projected today

Asset Category	2016		2025	
	Area (Acres)	Percentage of Total Area	Area (Acres)	Percentage of Total Area
Developed Upland - Hard	495	0.1	495	0.1
Developed Upland - Soft	475	0.1	475	0.1
Freshwater Marsh	176,965	42.3	175,928	42.1
High Salt Marsh	39,810	9.5	38,927	9.3
Mangroves	184,830	44.2	186,156	44.5
Open Water	2,345	0.6	3,112	0.7
Salt Barren	4,350	1.0	4,266	1.0
Tidal Flat	145	0.0	141	0.0

Asset Category	2016		2025	
	Area (Acres)	Percentage of Total Area	Area (Acres)	Percentage of Total Area
Undeveloped Upland	8,855	2.1	8,780	2.1
Total	**418,270**	**100.0**	**418,279**	**100**

Table 65 Wetland areas projected in 2040

Asset Category	Intermediate-High		Intermediate-Low	
	Area (Acres)	Percentage of Total Area	Area (Acres)	Percentage of Total Area
Developed Upland - Hard	495	0.1	495	0.1
Developed Upland - Soft	475	0.1	475	0.1
Freshwater Marsh	174,200	41.6	175,775	42.0
High Salt Marsh	37,455	9.0	40,045	9.6
Mangroves	188,365	45.0	186,185	44.5
Open Water	4,390	1.0	2,345	0.6
Salt Barren	4,125	1.0	4,065	1.0
Tidal Flat	135	0.0	135	0.0
Undeveloped Upland	8,655	2.1	8,765	2.1
Total	**418,295**	**100.0**	**418,285**	**100.0**

Table 66 Wetland areas projected in 2070

Asset Category	Intermediate-High		Intermediate-Low	
	Area (Acres)	Percentage of Total Area	Area (Acres)	Percentage of Total Area
Developed Upland - Hard	515	0.1	495	0.1
Developed Upland - Soft	665	0.2	475	0.1
Freshwater Marsh	160,255	39.7	173,200	41.4
High Salt Marsh	14,240	3.5	37,720	9.0
Mangroves	196,760	48.8	186,010	44.5
Open Water	15,875	3.9	7,190	1.7
Salt Barren	5,155	1.3	4,485	1.1
Tidal Flat	120	0.0	135	0.0
Undeveloped Upland	9,690	2.4	8,605	2.1
Total	**403,275**	**100.0**	**418,315**	**100.0**

By 2040, the total wetland area is projected to remain largely stable across both CSL scenarios, with only minimal shifts in total acreage and internal distribution. By 2070, a more obvious transition can be observed from the Intermediate-High scenario. The reduction in freshwater and high salt marshes and a corresponding increase in mangrove and open water areas can be found.

According to the area changes, the benefits/losses provided by the ecosystem are quantified by using the approach documented in Section 3.6. As the lifecycle analysis starts in 2025, the difference in the ecosystem service valuation is estimated using this year as the baseline. If the difference yields a positive value, it means that the area of the ecosystem increased based on today's condition providing more ecosystem service benefits. If the difference results in negative value, it means that there is a reduction in the acreage of the ecosystem, hence ecosystem services may be lost over time.

Table 67 Total ecosystem service valuation and difference among 2025, 2040, and 2070

Valuation	2025	2040		2070	
		Intermediate-High	Intermediate-Low	Intermediate-High	Intermediate-Low
Total Ecosystem Service Valuation Based on Land Cover	$4,511,494,021	$4,497,561,869	$4,519,833,093	$4,212,668,216	$4,467,340,885
Difference in Benefits Projected from Reduced Acreage	$0	-$13,867,417	$8,346,840	-$299,395,473	-$44,062,507

Table 67 presents the estimated total ecosystem service valuation based on land cover for three timeframes: 2025, 2040, and 2070, under both the Intermediate-High and Intermediate-Low scenarios. Under the Intermediate-High scenario, the valuation declines sharply over time, primarily due to significant reductions in land area that support ecosystem services. In contrast, the Intermediate-Low scenario shows a different trend: a slight increase in valuation by 2040 compared to 2025, followed by a noticeable decline by 2070. This temporary increase is attributed to a modest expansion in coastal wetland area projected for 2040 under the Intermediate-Low scenario, which enhances ecosystem service capacity before eventual losses occur.

Table 68 Present value of ecosystem service benefits based on land cover

Scenarios	Discounted Net Benefits in Present Value
Intermediate-High	-$294,445,792
Intermediate-Low	$25,176,920

Table 68 summarizes the discounted total ecosystem service benefits in present value, representing the net ecosystem service gains or losses from 2025 to 2054 over a 30-year analysis period using a 7% discount rate, compared to today's baseline (2025). Under the Intermediate-High scenario, the net benefit is negative, indicating a decline in ecosystem services due to the substantial loss of coastal wetland area. In contrast, the Intermediate-Low scenario yields a slight positive net benefit, reflecting a modest increase in ecosystem services over time, driven by the temporary expansion of coastal wetlands and reduced degradation relative to the high scenario.

It should be noted that the ecosystem service valuation assessment did not include flooding risk impacts, as current and comprehensive flooding extent data were not available for analysis. The assessment was limited by inconsistencies between datasets—specifically, the flooding extent data only reflects the 2022 storm surge events, while the SLAMM model is based on 2016 land cover information. This temporal mismatch constrained the ability to evaluate how flooding might affect ecosystem service delivery. Nevertheless, it is important to recognize that inundated areas are likely to experience both physical and functional degradation, reducing their capacity to provide the same level of ecosystem services as non-inundated areas.

7.4.1 TIDAL FLOODING RISK

Tidal flooding exposure is assessed for wetlands based on the approach described in Section 3.1. The exposure to tidal flooding in 2040 and 2070 of wetlands is summarized in Table 69 and Table 70.

Table 69 Exposure of wetlands within the tidal flooding extent projected in 2040

Asset Category	Total Area 2016	Intermediate-High			Intermediate-Low		
		Total Area Projected	Exposed Area (Acres)	Percentage of Exposed Area	Total Area Projected	Exposed Area (Acres)	Percentage of Exposed Area
Developed Upland - Hard	495	495	5	1.0	495	0	0.0
Developed Upland - Soft	475	475	0	0.0	475	0	0.0
Freshwater Marsh	176,965	174,200	30	0.0	175,775	10	0.0
High Salt Marsh	39,810	37,455	14,580	38.9	40,045	4,110	10.3
Mangroves	184,830	188,365	115,460	61.3	186,185	46,300	24.9
Open Water	2,345	4,390	1,380	31.4	2,345	305	13.0
Salt Barren	4,350	4,125	615	14.9	4,065	235	5.8
Tidal Flat	145	135	0	0.0	135	0	0.0
Undeveloped Upland	8,855	8,655	5	0.1	8,765	0	0.0
Total	**418,270**	**418,295**	**132,075**	**32**	**418,285**	**50,960**	**12**

Table 70 Exposure of wetlands within the tidal flooding extent projected in 2070

Asset Category	Total Area 2016	Intermediate-High			Intermediate-Low		
		Total Area Projected	Exposed Area (Acres)	Percentage of Exposed Area	Total Area Projected	Exposed Area (Acres)	Percentage of Exposed Area
Developed Upland - Hard	495	515	60	11.7	495	5	1.0
Developed Upland - Soft	475	665	10	1.5	475	0	0.0
Freshwater Marsh	176,965	160,255	280	0.2	173,200	10	0.0
High Salt Marsh	39,810	14,240	13,080	91.9	37,720	11,610	30.8
Mangroves	184,830	196,760	192,075	97.6	186,010	102,655	55.2
Open Water	2,345	15,875	13,350	84.1	7,190	2,900	40.3
Salt Barren	4,350	5,155	3,255	63.1	4,485	225	5.0
Tidal Flat	145	120	0	0.0	135	0	0.0
Undeveloped Upland	8,855	9,690	35	0.4	8,605	0	0.0
Total	**418,270**	**403,275**	**222,145**	**55**	**418,315**	**117,405**	**28**

By 2040, tidal flooding is projected to expose a substantial portion of wetland areas, especially under the Intermediate-High scenario, where more than 32% of the total wetland area becomes inundated. The most vulnerable systems include mangroves, high salt marshes, and open water areas. Under the Intermediate-Low scenario, the exposure footprint is more restrained, affected about 12% of wetlands, but still with concentrated impacts on mangroves and open water areas.

Looking ahead to 2070, exposure levels rise even further under the Intermediate-High scenario, with 55% of wetlands projected to be impacted by tidal flooding. Under the Intermediate-Low scenario, exposure increases to 28% from the 2040 Intermediate-Low scenario, indicating that even with moderated CSL, long-term inundation pressures remain considerable.

7.4.2 STORM SURGE RISK

Storm surge exposure is assessed for wetlands based on the approach described in Section 3.1. The exposure to 100-year storm surge events in 2040 and 2070 of wetlands is summarized in Table 71 and Table 72.

Table 71 Exposure of wetlands within the 100-year flooding extent projected in 2040

Asset Category	Total Area 2016	Intermediate-High			Intermediate-Low		
		Total Area Projected	Exposed Area (Acres)	Percentage of Exposed Area	Total Area Projected	Exposed Area (Acres)	Percentage of Exposed Area
Developed Upland - Hard	495	495	215	43.4	495	195	39.4
Developed Upland - Soft	475	475	25	5.3	475	20	4.2
Freshwater Marsh	176,965	174,200	13,625	7.8	175,775	14,780	8.4
High Salt Marsh	39,810	37,455	37,160	99.2	40,045	39,450	98.5
Mangroves	184,830	188,365	179,585	95.3	186,185	175,865	94.5
Open Water	2,345	4,390	1,540	35.1	2,345	1,355	57.8
Salt Barren	4,350	4,125	4,115	99.8	4,065	4,010	98.6
Tidal Flat	145	135	0	0.0	135	0	0.0
Undeveloped Upland	8,855	8,655	1,230	14.2	8,765	1,320	15.1
Total	**418,270**	**418,295**	**237,495**	**57**	**418,285**	**236,995**	**57**

Table 72 Exposure of wetlands within the 100-year flooding extent projected in 2070

Asset Category	Total Area 2016	Intermediate-High			Intermediate-Low		
		Total Area Projected	Exposed Area (Acres)	Percentage of Exposed Area	Total Area Projected	Exposed Area (Acres)	Percentage of Exposed Area
Developed Upland - Hard	495	515	175	34.0	495	215	43.4
Developed Upland - Soft	475	665	30	4.5	475	25	5.3
Freshwater Marsh	176,965	160,255	4,430	2.8	173,200	12,600	7.3
High Salt Marsh	39,810	14,240	14,230	99.9	37,720	37,410	99.2
Mangroves	184,830	196,760	191,345	97.2	186,010	178,400	95.9
Open Water	2,345	15,875	12,070	76.0	7,190	3,180	44.2
Salt Barren	4,350	5,155	5,155	100.0	4,485	4,475	99.8
Tidal Flat	145	120	0	0.0	135	0	0.0
Undeveloped Upland	8,855	9,690	495	5.1	8,605	1,175	13.7
Total	**418,270**	**403,275**	**227,930**	**57**	**418,315**	**237,480**	**57**

By 2040, wetlands are projected to experience widespread exposure to 100-year storm surge under both high and low scenarios, with an identical total exposure percentage of 57%. Under the Intermediate-High scenario, nearly all high salt marsh and mangrove areas (over 99% and 95%, respectively) are expected to be inundated. The Intermediate-Low scenario shows a similar pattern. By 2070, this pattern remains consistent, with total exposure again reaching 57% under both two scenarios. The Intermediate-High scenario continues to show near-complete inundation of high salt marsh, mangroves, and salt barren.

Appendix F: Adaptation Focus Areas and Recommendations

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CHARLOTTE COUNTY COMPREHENSIVE VULNERABILITY ASSESSMENT

CLIENT:

CHARLOTTE COUNTY, FL

FUNDED BY:

COASTAL & HEARTLAND NATIONAL ESTUARY PARTNERSHIP (CHNEP)

APPENDIX F: ADAPTATION FOCUS AREAS AND RECOMMENDATIONS

DATE: JUNE 2026

WSP USA

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1 OVERVIEW

Charlotte County faces significant and growing exposure to multiple flood hazards, including storm surge from tropical systems, extreme rainfall, king tide flooding, and long-term sea level change. The County is currently completing a Vulnerability Assessment (VA) designed to meet Florida Department of Environmental Protection (FDEP) standards, which evaluates how critical community assets, such as government facilities, public safety buildings, water/wastewater plants, energy infrastructure, and transportation routes, may be impacted by future flood conditions. The VA incorporates the best available modeling of tidal flooding, storm surge, and sea level change to determine which assets and geographic areas face the greatest risk.

The County's flood analysis highlights that Charlotte County is a low-lying coastal region influenced by the Peace and Myakka Rivers, Charlotte Harbor, the Gulf of America, and an extensive network of tributaries. Flooding may result from upstream river rise, high tides, coastal surge, and compound events involving multiple water sources. These combined hazards create vulnerability across coastal and riverine communities. In this report, the storm surge and sea level change are considered as the main flooding stressor to meet the requirements for a compliant VA under FDEP guidance.

The Adaptation Focus Area determination is essential to align the county's long-term resilience strategy with FDEP requirements. Adaptation Action Areas are an area of policy focus within FDEP guidance, and the county will be transitioning to that in the future. This focus area determination within that program allows the county to establish areas of initial policy concern and identify them within this VA documentation.

Many grant and funding programs typically require references to past planning studies, including confirmation that affected assets are located within designated areas of concern for county policy. The county has established the policy areas noted in this document as geographic locations where the combination of potential flooding and community impacts is of such concern that they need to be designated for action.

It is worth noting that this assessment currently focuses on county-owned assets (as per FDEP guidance) and does not encompass all county concerns, such as economic or community-wide needs. This limitation results in a decision-making gap that could restrict the scope of resilience initiatives if left unaddressed. To partially help to address this, it was identified that the effort to establish these areas should follow FDEP guidance on requirements and be as inclusive as possible.

The ultimate goal of identifying the Adaptation Focus Areas is to guide Charlotte County's future adaptation strategies, allowing the County to prioritize resilience actions, optimize resource allocation, and strengthen emergency preparedness for flood-prone areas.

2 OBJECTIVES

The primary objectives of this Adaptation Focus Areas identification are to:

- **Prioritize Vulnerable Locations:** Identify geographical areas with the highest concentration of vulnerable critical assets based on quantitative exposure and sensitivity analysis results.
- **Guide Adaptation Planning:** Establish focused areas for developing targeted adaptation strategies that maximize the protection of critical community functions and services.
- **Optimize Resource Allocation:** Enable the County to strategically direct limited resources toward areas with the greatest vulnerability and adaptation potential.
- **Enhance Community Resilience:** Focus adaptation efforts on locations that are essential for maintaining community functionality during and after flood events.
- **Support Emergency Planning:** Identify critical areas requiring enhanced emergency preparedness and response capabilities.

- **Comply with FDEP Guideline:** Ensure Adaptation Action Areas Focus Areas identification follows Resilient Florida Program guidelines and GIS data standards for consistency with statewide planning efforts.

3 METHODOLOGY

The methodology for identifying Adaptation Focus Areas for Charlotte County follows the process outlined in Chapter 2 of the 2018 Florida Adaptation Planning Guidebook. It is a hybrid approach that combines robust, data-driven analysis with client engagement to ensure the selected areas are both technically defensible and reflective of community priorities. This methodology is designed to ensure that the identification of Adaptation Focus Areas is not only grounded in the best available scientific data but also informed by the local knowledge and priorities of the community.

3.1 DATA-DRIVEN ANALYSIS

The core of the methodology involved a geospatial analysis that overlaid the results of the flood hazard modeling with the County's critical asset inventory. This allowed for the identification of geographic "hot spots" where risk is concentrated and where the potential for cascading failures is highest.

Key data inputs included:

- **Critical Assets Inventory:** A comprehensive GIS database of the County's critical assets, categorized as required by the Florida Statute 380.093 into Critical Community and Emergency Facilities; Critical Infrastructure; Transportation and Evacuation Routes; and Natural, Cultural, and Historical Resources.
- **Exposure and Sensitivity Analysis Results:** Detailed findings from the previous project tasks, which quantified the number of assets exposed to flooding and their degree of sensitivity under different flood scenarios. This data was crucial for identifying which assets are most at risk and under which conditions.
- **Flood Hazard Models:** Storm surge and tidal flooding models for current and future conditions with sea level change projections.
- **Transportation Networks:** Major roadways, evacuation routes, and critical transportation infrastructure.

3.2 SELECTION CRITERIA

Based on the 2018 Florida Adaptation Planning Guidebook and best practices from other Florida communities, the following criteria were used to guide the selection and delineation of Adaptation Focus Areas:

- **Concentration of Vulnerable Assets:** Areas with a high spatial density of critical assets determined to be sensitive to flood hazards.
- **Presence of Regionally Significant or Sole-Function Assets:** Areas containing critical assets whose failure would have cascading, county-wide, or regional consequences (e.g., the wastewater treatment facility).
- **Flood Hazard Risks:** Areas where multiple flood hazards are likely to interact, creating a greater total impact.
- **Community and Economic Significance:** Areas vital to the County's economy, cultural identity, and daily function.
- **Historical Flooding Experience:** Areas with recurring flooding problems based on local knowledge and past storm events that validate technical modeling results.
- **Critical Service Dependencies:** Areas where interdependencies between critical assets could create cascading failures affecting multiple neighborhoods or essential services.

3.3 FACILITY RANKING BASIS

The facility ranking process undertaken in this effort serves to inform the identification and justification of Adaptation Focus Areas. By translating analytical results into a structured, planning-level framework, this approach synthesizes data on flood exposure, damage potential, and estimated losses to pinpoint geographic locations where flood hazards intersect with essential services. The primary objective is to establish a clear rationale for directing resilience planning initiatives towards specific areas of Charlotte County that are most vulnerable to flood-related impacts.

This ranking is grounded in anticipated flood-induced monetized losses, which have been estimated in risk assessment (details can be found in the exposure and vulnerability report). Meanwhile, the flood damage severity is provided utilizing damage classification concepts (affected, minor, major, and destroyed) adapted from FEMA's Preliminary Damage Assessment guidance to ensure a consistent screening process. The definition of these two primary factors is provided below:

- **Flood-induced monetized losses:** Cost to the county from flood-related impacts for a facility, including direct damage, repair costs, loss of service, and downtime-related indirect losses. These losses may occur even when direct structural damage is limited or absent, particularly where surrounding flooding affects access, operations, inspection, cleanup, or restoration time.
- **Flood damage severity:** Direct physical damage to a facility from flood depth relative to the first floor elevation – in terms of loss percentage, to outline how complete the impacts may be to individual facilities, regardless of the value of the building itself, which was a similarly important policy point.

3.3.1 FLOOD-INDUCED MONETIZED LOSSES

Flood-induced monetized loss levels were classified into four categories to support relative ranking and screening of impacted facilities. Facilities with estimated losses greater than $15 million were classified as High, losses between $10 million and $15 million were classified as Medium, losses between $5 million and $10 million were classified as Low, and losses greater than $0 but less than $5 million were classified as Minimal. Facilities with no estimated losses were not assigned a monetized loss level. These thresholds are intended to distinguish relative levels of financial impact across facilities and support prioritization, rather than to represent absolute damage thresholds.

3.3.2 FLOOD DAMAGE SEVERITY

To identify values to determine a method for estimating some categories of loss to reflect the flood damage severity, specifically relating to the % of loss for flood depth. To develop the threshold for each flood damage severity based on the available data applied, the team:

1. Assembled data points for the percentage of damage to a building for contents, and the structure itself (maintained as two different data points by FEMA)
2. Combined the data from step 1 into a single defined value (HAZUS Inventory Technical Manual Tables 6-2 and 6-9).
3. Determined the percentage loss by flood depth for all facility types included in the county analysis (see graphic below).
4. Identified the various categories that roughly represented damage percentages to represent four levels: affected (10%), Minor (20%), Major (up to 50%), and Destroyed (above 50%)
5. Calculated the flood depth that represented the four levels of impact noted in #4 above for each facility type
6. Calculated the average flood depth that best represented that range across all facility types

The results of that analysis are shown in the table provided (Table 1).

Table 1 Flood depth threshold for various flood damage severities

Damage Severity	Damage state	Flood depth	Damage ratio relative to replacement cost

Affected	Facilities with minimal cosmetic damage (e.g., water depth below the first floor elevation with limited damage to skirting or enclosure elements) and no disruption to essential operations.	<10’’	<10%
Minor	Facilities with non-structural damage (e.g., water depth has reached the first floor elevation but limited in occupied, operational, or equipment spaces).	10’’-25’’	10%-20%
Major	Facilities sustaining structural or functional damage requiring extensive repairs (e.g., water depth within occupied or operational spaces but below the ceiling), with likely interruption of essential services.	25’’-68’’	20%-50%
Destroyed	Facilities are a high loss (e.g., structural frame is bent, twisted, or otherwise compromised), requiring replacement to restore service.	>68’’	>50%

It should be noted that the flood damage severity classification is intended to represent direct physical or functional damage to the facility, as informed by FEMA/HAZUS depth-damage relationships. As such, the damage severity categories are applied only when the modeled flood depth reaches or exceeds the first-floor elevation. Facilities with negative flood depths are therefore not assigned a damage severity category, because the modeled floodwater does not directly inundate the occupied or damageable building space. Nevertheless, these facilities may still incur flood-induced monetized losses. The loss estimation method incorporates restoration-time assumptions that assign limited downtime for flood depths between -4 ft and 0 ft. Losses in this range reflect indirect operational impacts, including potential access constraints, temporary service disruption, cleanup or inspection needs, and delayed restoration. Accordingly, negative-depth facilities may appear with no assigned damage severity category while still being included in the loss ranking as Minimal losses.

By adopting this loss-based screening approach with damage severity information, the process ensures a consistent and defensible comparison of facilities throughout the county, thereby identifying geographic areas where flood risks pose the greatest threat to critical services and infrastructure.

4 IDENTIFIED ADAPTATION FOCUS AREAS

Based on the application of the methodology and criteria described above, three Adaptation Focus Areas have been identified for Charlotte County, as shown in Figure 1. The following sections provide a detailed description of each Adaptation Focus Area, including the rationale for its selection, a comprehensive summary of the critical assets located within its boundaries, and maps showing its geographic extent and exposure to flood hazards (Figure 2).

Figure 1 Charlotte County Adaptation Focus Areas

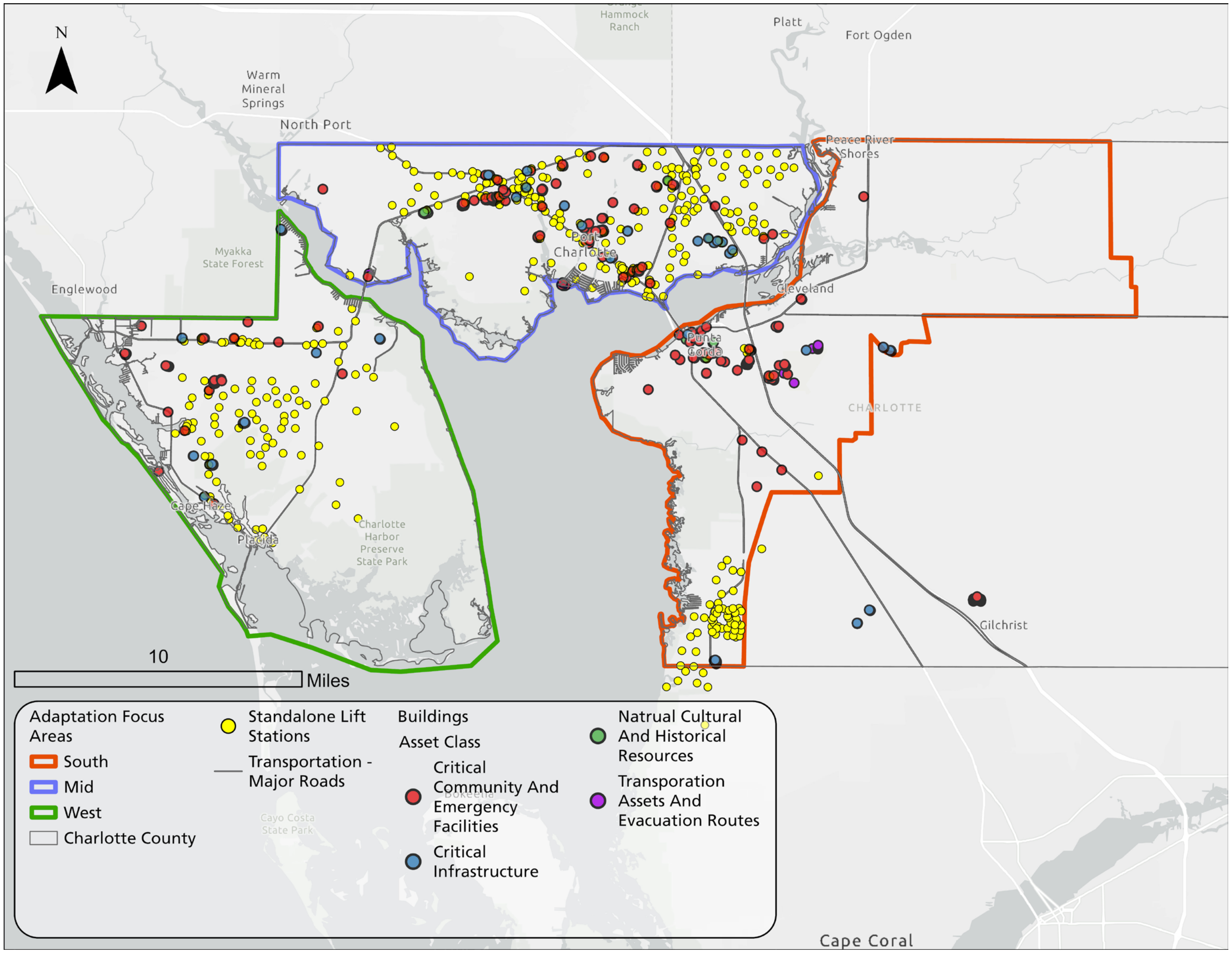


Figure 2 Charlotte County Adaptation Focus Areas: Current Storm Surge Flooding

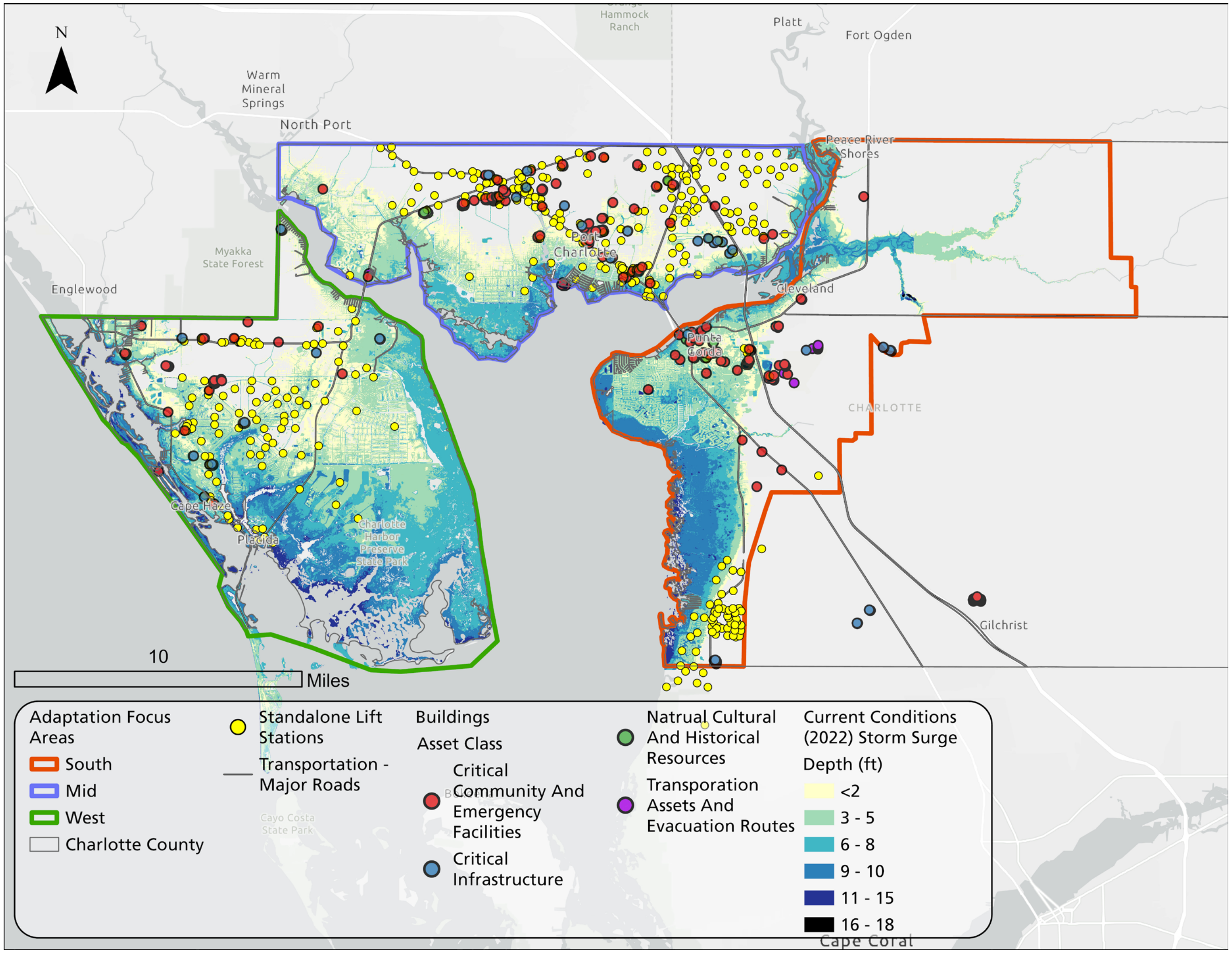


Figure 3 Charlotte County Adaptation Focus Areas: 2040 Intermediate-High Storm Surge Flooding plus 1ft Sea Level Change

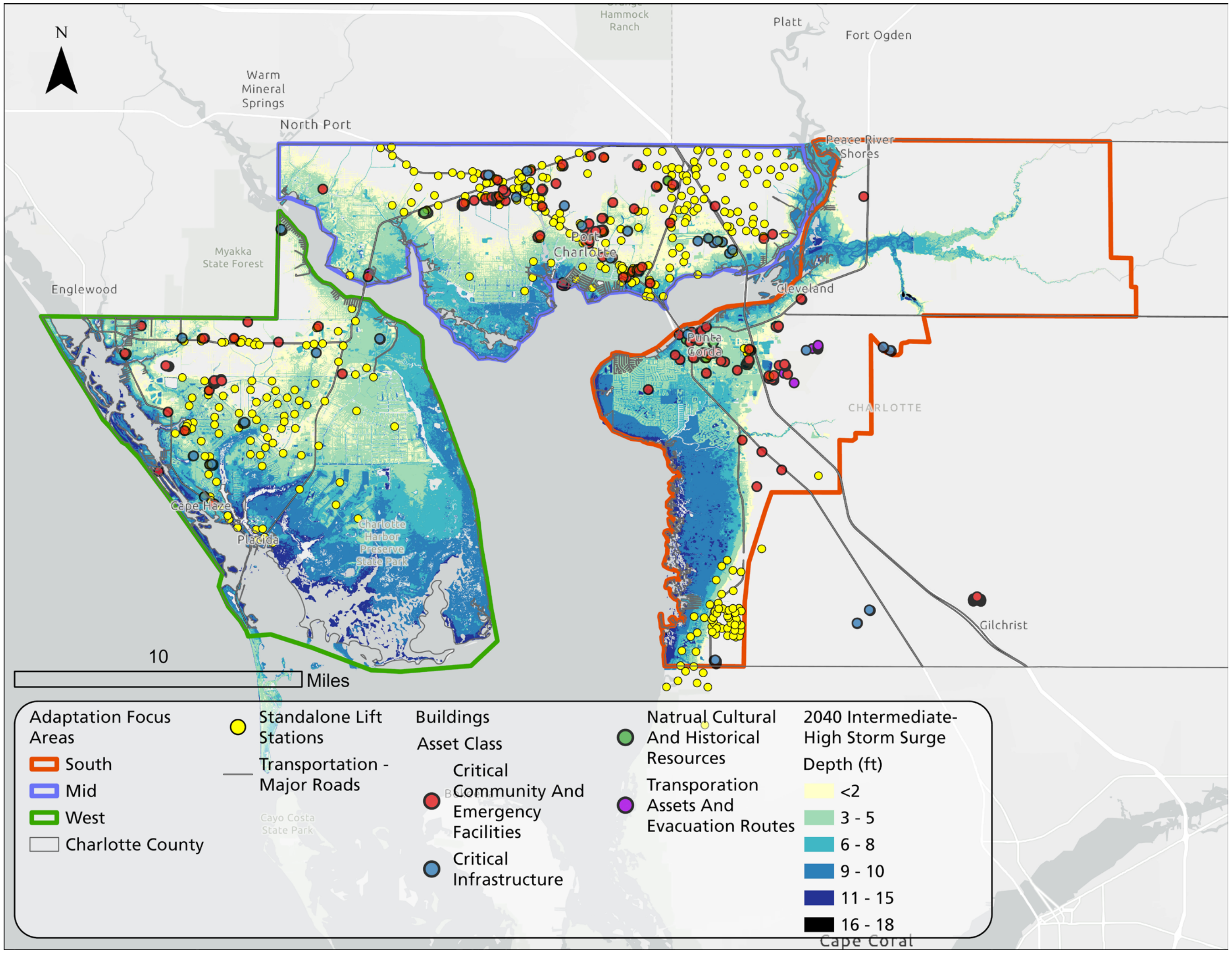
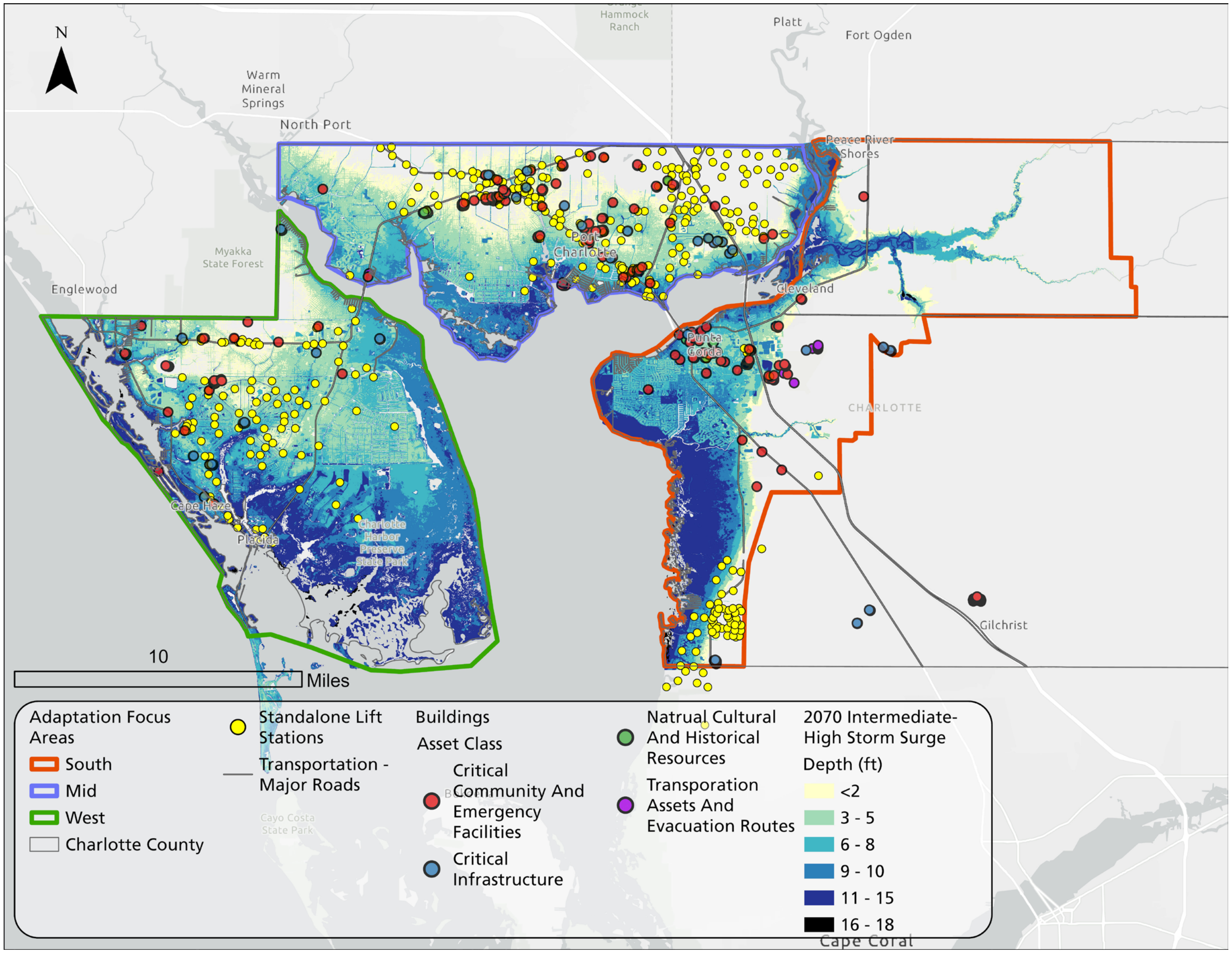


Figure 4 Charlotte County Adaptation Focus Areas: 2070 Intermediate-High Storm Surge Flooding plus 3ft Sea Level Change



The maps show three asset types: building assets, standalone lift stations, and major transportation roads. Within the building asset category, some critical infrastructure assets are lift station facilities represented by building footprints (as listed in Table 2). By contrast, standalone lift stations are mapped as point features to indicate their geographic locations (as listed in Table 4). The standalone lift station dataset primarily includes county-managed facilities, but it also contains some privately owned residential lift stations. Although both represent lift stations, their differing data formats require different analytical approaches, as described in the Exposure and Sensitivity Technical Report.

Table 2 Summary of the Critical Infrastructure Buildings Present in Each Adaptation Focus Area

Critical Infrastructure	Total Quantity	South	Mid	West	Not included
Wastewater Treatment Facilities	55	17	8	30	0
Solid And Hazardous Waste Facilities	9	0	2	1	6
Communications Facilities	6	2	3	1	0
Pump Stations	18	0	6	12	0
Lift Station Facilities	2	0	2	0	0
Total	**90**	**19**	**21**	**44**	**6**

Table 2 provides a breakdown of critical infrastructure facilities across three areas: south, mid, and west, as well as those not included in these regions. The categories listed are Wastewater Treatment Facilities, Solid and Hazardous Waste Facilities, Communications Facilities, Pump Stations, and Lift Station Facilities. Wastewater Treatment Facilities represent the largest group, with a total of 55 facility buildings. Of these, 17 are in Area south, 8 in Area mid, and 30 in Area west, with none excluded from the focus areas. Solid and Hazardous Waste Facilities total 9, with 2 in Area mid and 1 in Area west, while the remaining 6 are not included in any focus area due to their geolocation. Specifically, these 6 facilities are located farther inland, away from any identified adaptation focus areas, and are not indicated to experience tidal surge risk. As a result, they are not considered at significant risk, since their locations are not susceptible to tidal surge or similar coastal hazards. Communications Facilities are fewer, totaling 6, distributed as 2 in Area south, 3 in Area mid, and 1 in Area west. Pump Stations account for 18 facilities, all located in Area mid (6) and Area west (12), with none in Area south or outside the focus areas. Lift Station Facilities are the least numerous, with just 2, both situated in Area mid. The total count for all facility buildings is 90, with 19 in Area south, 21 in Area mid, 44 in Area west, and 6 not included in any Adaptation focus area. This distribution highlights that Area west contains the largest share of critical infrastructure, particularly in wastewater treatment and pump stations, while Area south and Area mid have fewer facilities overall.

Table 3 Summary of the Critical Community and Emergency Facilities Buildings Present in Each Adaptation Focus Area

Critical Community and Emergency Facilities	Total Quantity	South	Mid	West	Not included
Fire Stations	23	7	7	8	1
Correctional Facilities	28	6	0	0	22
Local Government Facilities	22	11	9	2	0
Logistical Staging Areas	1	1	0	0	0
Health Care Facilities	21	5	13	3	0

Critical Community and Emergency Facilities	Total Quantity	South	Mid	West	Not included
Schools	108	15	74	19	0
Logistical Staging Areas, Emergency Operation Centers, Correctional Facilities	1	1	0	0	0
Emergency Medical Service Facilities	2	1	1	0	0
Affordable Public Housing	7	2	5	0	0
Law Enforcement Facilities, Airports	1	1	0	0	0
Law Enforcement Facilities	3	2	1	0	0
Airports, Law Enforcement Facilities	1	1	0	0	0
Colleges And Universities	9	9	0	0	0
Airports, Fire Stations	1	1	0	0	0
Community Centers	11	1	8	2	0
Law Enforcement Facilities, Fire Stations	1	1	0	0	0
Disaster Recovery Centers, Community Centers	2	0	1	1	0
Hospitals	8	1	7	0	0
Schools, Risk Shelter Inventory	6	0	6	0	0
Total	**256**	**66**	**132**	**35**	**23**

Table 3 presents a detailed inventory of critical community and emergency facilities across the three Adaptation focus areas. In total, 256 facilities are catalogued. Area mid houses the largest number of facility buildings, with 132 in total, followed by Area south (66), Area west (35), and 23 facility buildings outside the designated focus areas. Schools make up the most substantial category, numbering 108, with the majority concentrated in Area mid (74), reflecting its role as an educational hub. Fire stations are relatively evenly distributed, with 7 each in Area south and mid, 8 in west, and one outside the focus areas, indicating broad coverage across the regions for fire protection services. Correctional facilities are notable for their presence largely outside the Adaptation focus areas, with 22 of the 28 total facility buildings situated beyond the defined zones. Local government facilities, on the other hand, are primarily located within Area south (11) and Area mid (9), suggesting these areas serve as administrative centres. Health care facilities are also heavily concentrated in Area mid (13 of 21), which includes hospitals (7 of 8), emphasizing the importance of this region in providing medical care and support. Logistical and emergency operation centres, affordable public housing, community centres, and law enforcement facilities are distributed across the regions, with Area mid and south containing the majority. Area west, while having fewer facilities overall, maintains a mix of schools, fire stations, and community centres, contributing to its infrastructure for emergency response and community support. The presence of specialized assets such as airports, colleges and universities, and disaster recovery centres further illustrates the multifaceted nature of the regions' preparedness and service provision. For example, Area south contains all nine colleges and universities, while Area mid is the primary location for risk shelter inventory associated with schools.

Table 4 Summary of Transportation and Natural Resources Present in Each Adaptation Focus Area

Adaptation Focus Area	Total Miles		Count			Total Acres
	Major Roads	Rail	Standalone Lift Station	Bridges/Culverts	Historic Bridges	Parks
1 - South	131.2	16.2	54	26	3	30,078.0
2 - Mid	176.9	0	194	68	0	374.9
3 - West	106.2	0	104	56	6	577.6
Outside	67.8	8.8	10	2	0	28.3

Table 4 provides a comparative overview of various infrastructure and community assets across the three Adaptation Focus Areas and those located outside the designated focus areas. The categories examined include major roads, rail, standalone lift stations, bridges/culverts, historic bridges[1], and parks, with the respective measurements in miles, counts, and total acres.

- Adaptation Focus Area 1 – South stands out with the second highest mileage of major roads (131.2 miles) and a significant presence of rail infrastructure (16.2 miles). It also has a moderate count of standalone lift stations (54), bridges/culverts (26), and historic bridges (3). Notably, the South area contains an exceptionally large share of parks, totaling 30,078 acres, which far exceeds the park acreage in other areas.
- Adaptation Focus Area 2 – Mid has the highest mileage of major roads (176.9 miles), suggesting it is a central corridor for transportation. Although it lacks rail infrastructure, it leads in the number of standalone lift stations (194) and bridges/culverts (68), which may point to a dense development pattern and the need for extensive stormwater management. However, its park acreage is relatively modest at 374.9 acres, possibly due to more urbanized land use or limited open space compared to the South.
- Adaptation Focus Area 3 – West features a smaller network of major roads (106.2 miles) and no rail infrastructure. It has 104 standalone lift stations and 56 bridges/culverts, along with 6 historical bridges, more than either of the other focus areas. Parks in the West account for 577.6 acres.

The "Outside" category, representing areas not included within the three focus areas, shows limited infrastructure and assets, with only 67.8 miles of major roads, 8.8 miles of rail, minimal counts of standalone lift stations (10), bridges/culverts (2), and no historic bridges. Parkland is also limited, at just 28.3 acres. These areas are not included in the focus area because they are not at risk of flooding for the scenarios noted as the basis for this work.

Overall, the distribution of infrastructure and community assets across the Adaptation Focus Areas highlights each region's unique priorities: the Mid area serves as the main transportation and utility hub with dense development and social services; the South has more parks, rail connections, and resilient emergency facilities

[1] Asset data for historical and cultural assets was sourced from the Bureau of Archaeological Research and consists of layers for cemeteries, historic bridges, historic structures, and resource groups (historical districts, archaeological districts or building complexes). These data are ultimately sourced from the Florida Master Site File (FMSF), the State of Florida's official inventory of historical and cultural Resources

due to coastal risks; and the West balances community support with historic preservation. Areas outside the Adaptation Focus Areas have fewer assets overall, reflecting lower population and operational needs. These differences inform emergency response and development planning.

The following sections illustrate the details of each Adaptation Focus Area.

4.1 ADAPTATION FOCUS AREA 1 – SOUTH

4.1.1 FOCUS AREA OVERVIEW

This area includes southern Charlotte County shoreline communities that face high exposure to storm surge, tidal flooding, and sea level change. Coastal assets near Punta Gorda are highly sensitive to surge events, which may overwhelm neighborhoods, wastewater infrastructure, and road networks. River discharge from the Peace River can intensify flooding even in the absence of local storms, making this area vulnerable to compound events, even though the riverine flooding is not considered in this analysis. Critical facilities, transportation routes, and public safety buildings in this zone are essential for emergency response during major weather events.

The area contains a variety of critical facilities that support both emergency management and everyday community needs. Among these are fire stations, local government buildings, and health care centres, all strategically located to deliver efficient emergency response and essential services. The fire stations and public safety buildings are positioned in key locations to maximize coverage, ensuring swift action during major weather events, such as storm surges and flooding. Given the area's heightened vulnerability to coastal hazards, these facilities play a vital role in disaster preparedness and recovery. Their presence underscores the importance of resilient infrastructure in protecting residents and maintaining essential operations during emergencies.

4.1.2 IMPACTED FACILITIES

The following table identifies the facility buildings within Adaptation Focus Area 1 – South that are projected to be affected and sustain damage due to 100-year storm surge events. These facilities, which include schools, fire stations, local government buildings, health care centers, and represent critical community and emergency assets. The preliminary ranking is decided by the estimated building losses (as described in Appendix D Technical Approach and Appendix E Exposure and Sensitivity Analysis). The ranking basis is introduced in Section 3.3.1 Flood-induced monetized losses and the estimated damage severity is provided in the table, decided according to the rules introduced in Section 3.3.2 Flood damage severity. An asterisk next to an asset name indicates a 0.5 ft first floor elevation was assumed for estimating flood losses due to limited data. Loss estimates can be revised if more precise elevation information becomes available.

Table 5 Preliminary Ranking of Impacted Facilities in Adaptation Focus Area 1- South under Current Condition

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
1	Charlotte High School	Schools	Critical Community And Emergency Facilities	-82.0379	26.9274	263,316	1.1	Minor	$30.2M	High
2	Baker Center Head Start	Schools	Critical Community And Emergency Facilities	-82.0433	26.9337	60,387	1.5	Minor	$24.5M	High
3	Punta Gorda Middle School*	Schools	Critical Community And Emergency Facilities	-82.0342	26.9285	112,601	1.4	Minor	$14.1M	Medium
4	Life Care Center Of Punta Gorda	Health Care Facilities	Critical Community And Emergency Facilities	-82.0557	26.9268	47,559	0.8	Affected	$13.6M	Medium
5	Justice Center	Local Governmen t Facilities	Critical Community And Emergency Facilities	-82.0474	26.9383	64,606	0.2	Affected	$11.5M	Medium
6	Verandas Of Punta Gorda*	Affordable Public Housing	Critical Community And Emergency Facilities	-82.0403	26.9178	62,922	4.9	Major	$9.1M	Low

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
7	Charlotte Harbor Event & Conf. Center	Local Government Facilities	Critical Community And Emergency Facilities	-82.0536	26.9370	50,151	4.3	Major	$7.7M	Low
8	Punta Gorda Post Office	Communications Facilities	Critical Infrastructure	-82.0495	26.9372	27,378	3.7	Major	$6.2M	Low
9	Charlotte Behavioral Health Care*	Health Care Facilities	Critical Community And Emergency Facilities	-82.0307	26.9233	22,522	1.6	Minor	$6.0M	Low
10	Charlotte Regional Medical Center	Hospitals	Critical Community And Emergency Facilities	-82.0400	26.9409	103,909	0.6	Affected	$4.8M	Minimal
11	South County Employee Health Center	Health Care Facilities	Critical Community And Emergency Facilities	-82.0403	26.9255	11,095	0.8	Affected	$3.0M	Minimal
12	Punta Gorda Library	Community Centers	Critical Community And Emergency Facilities	-82.0532	26.9245	9,178	4.0	Major	$2.6M	Minimal
13	Harborside Surgery Center	Health Care Facilities	Critical Community And Emergency Facilities	-82.0424	26.9392	6,734	3.4	Major	$2.4M	Minimal

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
14	Sallie Jones Elementary School	Schools	Critical Community And Emergency Facilities	-82.0415	26.9280	88,868	(0.4)	Affected	$2.3M	Minimal
15	Rai Care Centers - Punta Gorda	Health Care Facilities	Critical Community And Emergency Facilities	-82.0467	26.9354	6,593	2.3	Major	$2.1M	Minimal
16	Punta Gorda Police Station 1	Law Enforcement Facilities, Fire Stations	Critical Community And Emergency Facilities	-82.0466	26.9255	21,246	0.6	Affected	$1.7M	Minimal
17	Charlotte Community Mental Health Services	Health Care Facilities	Critical Community And Emergency Facilities	-82.0327	26.9237	16,273	0.3	Affected	$1.5M	Minimal
18	Punta Gorda Fd St 3/17*	Fire Stations	Critical Community And Emergency Facilities	-82.0692	26.9094	3,793	3.2	Major	$1.3M	Minimal
19	South County Annex	Local Government Facilities	Critical Community And Emergency Facilities	-82.0483	26.9332	30,413	(0.9)	Affected	$1.1M	Minimal
20	Punta Gorda	Historical And	Natural, Cultural, And	-82.0406	26.9254	2,332	0.7	Affected	$0.6M	Minimal

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
	History Center*	Cultural Assets	Historical Resources							
21	Punta Gorda Fd St 2*	Fire Stations	Critical Community And Emergency Facilities	-82.0220	26.8840	7,402	0.6	Affected	$0.5M	Minimal
22	Charlotte High School	Schools	Critical Community And Emergency Facilities	-82.0365	26.9276	4,186	1.1	Minor	$0.5M	Minimal
23	South County Regional Park	Parks	Natural, Cultural, And Historical Resources	-82.0363	26.9333	3,438	0.4	Affected	$0.5M	Minimal
24	Verandas Of Punta Gorda	Affordable Public Housing	Critical Community And Emergency Facilities	-82.0400	26.9175	1,248	0.7	Affected	$0.4M	Minimal
25	South County Employee Health Center, Annex[2]	Health care Facilities	Critical Community And Emergency Facilities	-82.0402	26.9253	536	1.0	Minor	$0.2M	Minimal
26	Sallie Jones Elementary School*	Schools	Critical Community And	-82.0408	26.9280	5,132	-	Affected	$0.1M	Minimal

[2] This is a smaller structure associated with the Grace Street Health Center. The official name needs to be further determined.

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
			Emergency Facilities							
27	Punta Gorda Police Station 1	Law Enforcement Facilities	Critical Community And Emergency Facilities	-82.0459	26.9253	2,624	(0.2)	Affected	$0.1M	Minimal
28	Charlotte High School	Schools	Critical Community And Emergency Facilities	-82.0390	26.9275	2,179	(0.4)	Affected	$0.1M	Minimal
29	Charlotte High School	Schools	Critical Community And Emergency Facilities	-82.0390	26.9273	1,247	(0.3)	Affected	$0.03M	Minimal
30	Charlotte High School	Schools	Critical Community And Emergency Facilities	-82.0390	26.9276	1,171	(0.3)	Affected	$0.03M	Minimal

Table 6 Preliminary Ranking of Impacted Facilities in Adaptation Focus Area 1- South when Change in Sea Level Exceeds 1 ft

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
1	Charlotte High School	Schools	Critical Community And	-82.0379	26.9274	263,316	2.1	Major	$40.3M	High

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
			Emergency Facilities							
2	Justice Center	Local Government Facilities	Critical Community And Emergency Facilities	-82.0474	26.9383	64,606	1.3	Minor	$38.9M	High
3	Baker Center Head Start	Schools	Critical Community And Emergency Facilities	-82.0433	26.9337	60,387	2.5	Major	$25.9M	High
4	Life Care Center Of Punta Gorda	Health Care Facilities	Critical Community And Emergency Facilities	-82.0557	26.9268	47,559	1.8	Minor	$24.8M	High
5	Sallie Jones Elementary School	Schools	Critical Community And Emergency Facilities	-82.0415	26.9280	88,868	0.7	Affected	$24.7M	High
6	Punta Gorda Middle School*	Schools	Critical Community And Emergency Facilities	-82.0342	26.9285	112,601	2.4	Major	$18.7M	High
7	Verandas Of Punta Gorda*	Affordable Public Housing	Critical Community And Emergency Facilities	-82.0403	26.9178	62,922	6.0	Destroyed	$9.8M	Low

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
8	Charlotte Harbor Event & Conf. Center	Local Government Facilities	Critical Community And Emergency Facilities	-82.0536	26.9370	50,151	5.4	Major	$8.5M	Low
9	Charlotte Behavioral Health Care*	Health Care Facilities	Critical Community And Emergency Facilities	-82.0307	26.9233	22,522	2.7	Major	$7.5M	Low
10	Punta Gorda Post Office	Communications Facilities	Critical Infrastructure	-82.0495	26.9372	27,378	4.7	Major	$6.8M	Low
11	Charlotte Regional Medical Center	Hospitals	Critical Community And Emergency Facilities	-82.0400	26.9409	103,909	1.6	Minor	$5.2M	Low
12	Charlotte Community Mental Health Services	Health Care Facilities	Critical Community And Emergency Facilities	-82.0327	26.9237	16,273	1.3	Minor	$3.8M	Minimal
13	South County Employee Health Center	Health Care Facilities	Critical Community And Emergency Facilities	-82.0403	26.9255	11,095	1.9	Minor	$3.6M	Minimal
14	Punta Gorda Police Station 1	Law Enforcement Facilities, Fire Stations	Critical Community And Emergency Facilities	-82.0466	26.9255	21,246	1.6	Minor	$3.0M	Minimal

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
15	Punta Gorda Library	Community Centers	Critical Community And Emergency Facilities	-82.0532	26.9245	9,178	5.0	Major	$2.8M	Minimal
16	Harborside Surgery Center	Health Care Facilities	Critical Community And Emergency Facilities	-82.0424	26.9392	6,734	4.4	Major	$2.5M	Minimal
17	Rai Care Centers - Punta Gorda	Health Care Facilities	Critical Community And Emergency Facilities	-82.0467	26.9354	6,593	3.3	Major	$2.3M	Minimal
18	South County Annex	Local Government Facilities	Critical Community And Emergency Facilities	-82.0483	26.9332	30,413	0.1	Affected	$2.2M	Minimal
19	Sallie Jones Elementary School*	Schools	Critical Community And Emergency Facilities	-82.0408	26.9280	5,132	1.0	Minor	$2.1M	Minimal
20	Punta Gorda Fd St 3/17*	Fire Stations	Critical Community And Emergency Facilities	-82.0692	26.9094	3,793	4.2	Major	$1.7M	Minimal
21	Punta Gorda Fd St 2*	Fire Stations	Critical Community And	-82.0220	26.8840	7,402	1.6	Minor	$1.1M	Minimal

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
			Emergency Facilities							
22	South County Regional Park	Parks	Natural, Cultural, And Historical Resources	-82.0363	26.9333	3,438	1.4	Minor	$0.8M	Minimal
23	Punta Gorda History Center *	Historical And Cultural Assets	Natural, Cultural, And Historical Resources	-82.0406	26.9254	2,332	1.7	Minor	$0.8M	Minimal
24	Verandas Of Punta Gorda	Affordable Public Housing	Critical Community And Emergency Facilities	-82.0400	26.9175	1,248	1.7	Minor	$0.7M	Minimal
25	Charlotte High School	Schools	Critical Community And Emergency Facilities	-82.0365	26.9276	4,186	2.2	Major	$0.6M	Minimal
26	Florida Southwestern State College - Charlotte Campus	Colleges And Universities	Critical Community And Emergency Facilities	-82.0183	26.9237	6,223	0.2	Affected	$0.6M	Minimal
27	Punta Gorda Police Station 1	Law Enforcement Facilities	Critical Community And Emergency Facilities	-82.0459	26.9253	2,624	0.8	Affected	$0.5M	Minimal

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
28	Public Works	Local Government Facilities	Critical Community And Emergency Facilities	-82.0182	26.9293	9,954	(0.4)	Affected	$0.4M	Minimal
29	Charlotte County Public Works*	Local Government Facilities	Critical Community And Emergency Facilities	-82.0177	26.9290	3,422	0.3	Affected	$0.4M	Minimal
30	Florida Southwestern Collegiate High School - Charlotte Campus	Schools	Critical Community And Emergency Facilities	-82.0185	26.9245	13,187	(0.4)	Affected	$0.3M	Minimal
31	Charlotte High School	Schools	Critical Community And Emergency Facilities	-82.0390	26.9275	2,179	0.7	Affected	$0.2M	Minimal
32	South County Employee Health Center, Annex[3]	Health Care Facilities	Critical Community And Emergency Facilities	-82.0402	26.9253	536	2.1	Minor	$0.2M	Minimal
33	Charlotte County Public Works*	Local Government Facilities	Critical Community And Emergency Facilities	-82.0180	26.9295	1,917	0.2	Affected	$0.2M	Minimal

[3] This is a smaller structure associated with the Grace Street Health Center. The official name needs to be further determined.

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
34	Charlotte County Public Works*	Local Government Facilities	Critical Community And Emergency Facilities	-82.0174	26.9291	2,401	0.1	Affected	$0.2M	Minimal
35	Charlotte County Public Works*	Local Government Facilities	Critical Community And Emergency Facilities	-82.0184	26.9298	919	0.4	Affected	$0.1M	Minimal
36	Charlotte High School	Schools	Critical Community And Emergency Facilities	-82.0390	26.9273	1,247	0.8	Affected	$0.1M	Minimal
37	Charlotte High School	Schools	Critical Community And Emergency Facilities	-82.0390	26.9276	1,171	0.8	Affected	$0.1M	Minimal

Table 7 Preliminary Ranking of Impacted Facilities in Adaptation Focus Area 1- South when Change in Sea Level Exceeds 3 ft

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
1	Charlotte High School	Schools	Critical Community And	-82.0379	26.9274	263,316	4.1	Major	$59.2M	High

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
			Emergency Facilities							
2	Justice Center	Local Government Facilities	Critical Community And Emergency Facilities	-82.0474	26.9383	64,606	3.3	Major	$42.8M	High
3	Sallie Jones Elementary School	Schools	Critical Community And Emergency Facilities	-82.0415	26.9280	88,868	2.7	Major	$38.5M	High
4	Life Care Center Of Punta Gorda	Health Care Facilities	Critical Community And Emergency Facilities	-82.0557	26.9268	47,559	3.8	Major	$32.1M	High
5	Baker Center Head Start	Schools	Critical Community And Emergency Facilities	-82.0433	26.9337	60,387	4.5	Major	$27.1M	High
6	Punta Gorda Middle School*	Schools	Critical Community And Emergency Facilities	-82.0342	26.9285	112,601	4.4	Major	$25.8M	High
7	Charlotte Regional Medical Center	Hospitals	Critical Community And Emergency Facilities	-82.0400	26.9409	103,909	3.6	Major	$24.9M	High

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
8	Verandas Of Punta Gorda*	Affordable Public Housing	Critical Community And Emergency Facilities	-82.0403	26.9178	62,922	7.9	Destroyed	$11.2M	Medium
9	Charlotte Harbor Event & Conf. Center	Local Government Facilities	Critical Community And Emergency Facilities	-82.0536	26.9370	50,151	7.3	Destroyed	$10.2M	Medium
10	Florida Southwestern State College - Charlotte Campus	Colleges And Universities	Critical Community And Emergency Facilities	-82.0187	26.9233	23,702	1.5	Minor	$10.2M	Medium
11	South County Annex	Local Government Facilities	Critical Community And Emergency Facilities	-82.0483	26.9332	30,413	2.1	Major	$10.0M	Medium
12	Florida Southwestern State College - Charlotte Campus	Colleges And Universities	Critical Community And Emergency Facilities	-82.0190	26.9228	21,229	1.3	Minor	$9.1M	Low
13	Charlotte Behavioral Health Care*	Health Care Facilities	Critical Community And Emergency Facilities	-82.0307	26.9233	22,522	4.7	Major	$8.6M	Low
14	Punta Gorda Post Office	Communications Facilities	Critical Infrastructure	-82.0495	26.9372	27,378	6.7	Destroyed	$8.3M	Low

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
15	Florida Southwestern State College - Charlotte Campus	Colleges And Universities	Critical Community And Emergency Facilities	-82.0200	26.9220	17,803	1.5	Minor	$7.6M	Low
16	Florida Southwestern State College - Charlotte Campus	Colleges And Universities	Critical Community And Emergency Facilities	-82.0192	26.9219	16,767	1.5	Minor	$7.2M	Low
17	Florida Southwestern State College - Charlotte Campus	Colleges And Universities	Critical Community And Emergency Facilities	-82.0195	26.9223	14,626	1.3	Minor	$6.3M	Low
18	Charlotte Community Mental Health Services	Health Care Facilities	Critical Community And Emergency Facilities	-82.0327	26.9237	16,273	3.3	Major	$5.8M	Low
19	Punta Gorda Police Station 1	Law Enforcement Facilities, Fire Stations	Critical Community And Emergency Facilities	-82.0466	26.9255	21,246	3.6	Major	$5.6M	Low
20	South County Regional Park	Parks	Natural, Cultural, And Historical Resources	-82.0368	26.9330	19,286	1.4	Minor	$4.3M	Minimal
21	East Elementary School*	Schools	Critical Community And Emergency Facilities	-82.0041	26.9407	89,820	0.1	Affected	$4.3M	Minimal

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
22	South County Employee Health Center	Health Care Facilities	Critical Community And Emergency Facilities	-82.0403	26.9255	11,095	3.9	Major	$4.0M	Minimal
23	Transit Department	Local Government Facilities	Critical Community And Emergency Facilities	-82.0244	26.9192	15,303	0.7	Affected	$3.8M	Minimal
24	Public Works	Local Government Facilities	Critical Community And Emergency Facilities	-82.0182	26.9293	9,954	1.6	Minor	$3.2M	Minimal
25	Punta Gorda Fd St 2*	Fire Stations	Critical Community And Emergency Facilities	-82.0220	26.8840	7,402	3.6	Major	$2.9M	Minimal
26	Punta Gorda Library	Community Centers	Critical Community And Emergency Facilities	-82.0532	26.9245	9,178	7.0	Destroyed	$2.9M	Minimal
27	Harborside Surgery Center	Health Care Facilities	Critical Community And Emergency Facilities	-82.0424	26.9392	6,734	6.4	Destroyed	$2.8M	Minimal
28	Florida Southwestern State College - Charlotte Campus	Colleges And Universities	Critical Community And	-82.0183	26.9237	6,223	2.2	Major	$2.7M	Minimal

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
			Emergency Facilities							
29	Rai Care Centers - Punta Gorda	Health Care Facilities	Critical Community And Emergency Facilities	-82.0467	26.9354	6,593	5.3	Major	$2.6M	Minimal
30	Sallie Jones Elementary School*	Schools	Critical Community And Emergency Facilities	-82.0408	26.9280	5,132	3.0	Major	$2.3M	Minimal
31	Punta Gorda Fd St 3/17*	Fire Stations	Critical Community And Emergency Facilities	-82.0692	26.9094	3,793	6.2	Destroyed	$2.2M	Minimal
32	Florida Southwestern State College - Charlotte Campus	Colleges And Universities	Critical Community And Emergency Facilities	-82.0198	26.9226	4,623	1.2	Minor	$2.0M	Minimal
33	Florida Southwestren Collegiate High School - Charlotte Campus	Schools	Critical Community And Emergency Facilities	-82.0185	26.9245	13,187	1.6	Minor	$1.8M	Minimal
34	Police Station 1	Law Enforcement Facilities	Critical Community And Emergency Facilities	-82.0459	26.9253	2,624	2.8	Major	$1.4M	Minimal

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
35	Florida Southwestern State College - Charlotte Campus	Colleges And Universities	Critical Community And Emergency Facilities	-82.0190	26.9225	3,164	1.2	Minor	$1.4M	Minimal
36	Lighting District Administration*	Local Government Facilities	Critical Community And Emergency Facilities	-82.0177	26.9290	3,422	2.3	Major	$1.1M	Minimal
37	Verandas Of Punta Gorda	Affordable Public Housing	Critical Community And Emergency Facilities	-82.0400	26.9175	1,248	3.7	Major	$1.1M	Minimal
38	South County Regional Park	Parks	Natural, Cultural, And Historical Resources	-82.0363	26.9333	3,438	3.4	Major	$1.0M	Minimal
39	Charlotte High School	Schools	Critical Community And Emergency Facilities	-82.0365	26.9276	4,186	4.2	Major	$0.9M	Minimal
40	Historic District*	Historical And Cultural Assets	Natural, Cultural, And Historical Resources	-82.0406	26.9254	2,332	3.7	Major	$0.8M	Minimal
41	Public Works*	Local Government Facilities	Critical Community And Emergency Facilities	-82.0174	26.9291	2,401	2.1	Major	$0.8M	Minimal

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
42	Florida Southwestren Collegiate High School - Charlotte Campus	Schools	Critical Community And Emergency Facilities	-82.0186	26.9242	6,014	1.5	Minor	$0.8M	Minimal
43	East Elementary School*	Schools	Critical Community And Emergency Facilities	-82.0036	26.9414	4,292	0.4	Affected	$0.7M	Minimal
44	Public Works*	Local Government Facilities	Critical Community And Emergency Facilities	-82.0180	26.9295	1,917	2.2	Major	$0.6M	Minimal
45	East Elementary School*	Schools	Critical Community And Emergency Facilities	-82.0049	26.9411	17,345	(0.2)	Affected	$0.5M	Minimal
46	Sheriff - Jail	Correctional Facilities	Critical Community And Emergency Facilities	-82.0060	26.9165	6,330	1.4	Minor	$0.5M	Minimal
47	Florida Southwestern State College - Charlotte Campus	Colleges And Universities	Critical Community And Emergency Facilities	-82.0192	26.9232	1,006	1.3	Minor	$0.4M	Minimal
48	Charlotte High School	Schools	Critical Community And	-82.0390	26.9275	2,179	2.7	Major	$0.4M	Minimal

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
			Emergency Facilities							
49	Public Works*	Local Government Facilities	Critical Community And Emergency Facilities	-82.0184	26.9298	919	2.4	Major	$0.3M	Minimal
50	Sheriff - Jail	Correctional Facilities	Critical Community And Emergency Facilities	-82.0076	26.9159	6,086	0.7	Affected	$0.3M	Minimal
51	Historic Courthouse	Historical And Cultural Assets	Natural, Cultural, And Historical Resources	-82.0502	26.9346	7,941	(2.2)	Affected	$0.3M	Minimal
52	Charlotte High School	Schools	Critical Community And Emergency Facilities	-82.0390	26.9273	1,247	2.8	Major	$0.2M	Minimal
53	Charlotte High School	Schools	Critical Community And Emergency Facilities	-82.0390	26.9276	1,171	2.8	Major	$0.2M	Minimal
54	Public Works*	Local Government Facilities	Critical Community And Emergency Facilities	-82.0180	26.9293	599	1.3	Minor	$0.2M	Minimal

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
55	South County Employee Health Center, Annex[4]	Health care Facilities	Critical Community And Emergency Facilities	-82.0402	26.9253	536	4.1	Major	$0.2M	Minimal
56	East Elementary School*	Schools	Critical Community And Emergency Facilities	-82.0044	26.9411	5,935	(0.2)	Affected	$0.2M	Minimal

[4] This is a smaller structure associated with the Grace Street Health Center. The official name needs to be further determined.

4.2 ADAPTATION FOCUS AREA 2 – MID

4.2.1 FOCUS AREA OVERVIEW

Central Charlotte County includes the area surrounding the Port Charlotte and connected neighborhoods. This region contains a high concentration of critical assets identified in the VA, including government buildings, public safety facilities, utilities, and major transportation corridors. Its proximity to the Peace and Myakka Rivers, combined with rainfall-driven flooding and storm surge funneling into Charlotte Harbor, creates significant exposure to multi-hazard flooding. However, only coastal hazards were considered in this analysis.

Area mid stands out as the core hub for Charlotte County's critical infrastructure and community services, housing the largest number of facility buildings among the Adaptation Action Areas. With 132 out of 256 total community and emergency facility buildings, Area mid is particularly notable for its concentration of schools, 74 buildings in total, highlighting its role as the county's educational center. This area also contains the majority of health care facilities (13 of 21), including nearly all hospitals (7 of 8), as well as significant numbers of local government offices and community centers. Additionally, Area mid is the location for all lift station facilities and a substantial portion of pump stations, underlining its importance for both utility infrastructure and public service provision. The broad array of assets in Area mid reflects a dense, multifaceted service area that supports high population density and functions as an administrative and emergency response nucleus for the region.

4.2.2 IMPACTED FACILITIES

provides a detailed listing of facility buildings located in Adaptation Focus Area 2 – Mid that are anticipated to experience impacts and potential damage resulting from 100-year storm surge events. The facilities included encompass essential community and emergency assets such as affordable public housing, community centers, fire stations, wastewater treatment facilities, etc. The preliminary ranking is decided by the estimated building (as described in Appendix D Technical Approach and Appendix E Exposure and Sensitivity Analysis). An asterisk next to an asset name indicates a 0.5 ft first floor elevation was assumed for estimating flood losses due to limited data. Loss estimates can be revised if more precise elevation information becomes available.

Table 8 Preliminary Ranking of Impacted Facilities in Adaptation Focus Area 2 - Mid under Current Condition

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
1	Neil Armstrong Elementary School	Schools, Risk Shelter Inventory	Critical Community And Emergency Facilities	-82.0870	27.0035	91,561	0.1	Affected	$11.0M	Medium
2	Meadow Park Elementary School	Schools	Critical Community And Emergency Facilities	-82.1247	26.9859	92,185	0.2	Affected	$10.9M	Medium
3	Peace River Elementary School*	Schools	Critical Community And Emergency Facilities	-82.0749	26.9693	24,279	0.6	Affected	$6.1M	Low
4	Port Charlotte Artificial Kidney Center	Health Care Facilities	Critical Community And Emergency Facilities	-82.0685	26.9631	142,902	(1.7)	Affected	$5.1M	Low
5	Marian Manor	Affordable Public Housing	Critical Community And Emergency Facilities	-82.0803	26.9658	20,510	2.2	Major	$2.0M	Minimal
6	Ccu Eastport Treatment Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.0283	26.9778	36,206	(1.2)	Affected	$1.3M	Minimal
7	Peace River	Schools	Critical Community And	-82.0745	26.9693	4,777	0.4	Affected	$0.8M	Minimal

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
	Elementary School*		Emergency Facilities							
8	Gulf Coast Marine Center Inc	Marinas	Transporati on Assets And Evacuation Routes	-82.2097	26.9679	16,165	(0.5)	Affected	$0.6M	Minimal
9	Charlotte County Fire & Ems St 3*	Fire Stations	Critical Community And Emergency Facilities	-82.2102	26.9662	4,377	1.5	Minor	$0.6M	Minimal
10	Ccu Eastport Treatment Plant	Wastewater Treatment Facilities	Critical Infrastructu re	-82.0389	26.9855	9,808	0.3	Affected	$0.4M	Minimal
11	Peace River Elementary School*	Schools	Critical Community And Emergency Facilities	-82.0747	26.9696	929	1.0	Minor	$0.4M	Minimal
12	Peace River Elementary School*	Schools	Critical Community And Emergency Facilities	-82.0749	26.9696	853	1.2	Minor	$0.3M	Minimal
13	Port Charlotte Post Office	Communic ations Facilities	Critical Infrastructu re	-82.0883	26.9755	5,593	0.3	Affected	$0.3M	Minimal
14	St. Charles Housing Ii	Affordable Public Housing	Critical Community And Emergency Facilities	-82.0816	26.9661	14,493	0.1	Affected	$0.3M	Minimal

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
15	Charlotte County Fire & Ems St 1	Fire Stations	Critical Community And Emergency Facilities	-82.0921	26.9762	8,559	(3.9)	Affected	$0.3M	Minimal
16	Charlotte Harbor School*	Schools	Critical Community And Emergency Facilities	-82.0770	26.9686	4,722	-	Affected	$0.2M	Minimal
17	Peace River Elementary School*	Schools	Critical Community And Emergency Facilities	-82.0738	26.9695	5,439	(0.5)	Affected	$0.1M	Minimal
18	Meadow Park Elementary School	Schools	Critical Community And Emergency Facilities	-82.1243	26.9864	4,959	(0.4)	Affected	$0.1M	Minimal
19	Meadow Park Elementary School	Schools	Critical Community And Emergency Facilities	-82.1237	26.9868	4,732	(0.5)	Affected	$0.1M	Minimal
20	Meadow Park Elementary School	Schools	Critical Community And Emergency Facilities	-82.1247	26.9863	4,335	(0.6)	Affected	$0.1M	Minimal
21	Gleneagles Water Booster Station*	Pump Stations	Critical Infrastructure	-82.0797	26.9892	2,417	-	Affected	$0.1M	Minimal

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
22	Ambitrans Medical Transport	Emergency Medical Service Facilities	Critical Community And Emergency Facilities	-82.0871	26.9759	2,287	(3.1)	Affected	$0.1M	Minimal
23	Peace River Elementary School*	Schools	Critical Community And Emergency Facilities	-82.0738	26.9689	865	0.1	Affected	$0.04M	Minimal
24	Peace River Elementary School*	Schools	Critical Community And Emergency Facilities	-82.0739	26.9690	899	(0.1)	Affected	$0.02M	Minimal
25	Gleneagles Water Booster Station*	Pump Stations	Critical Infrastructure	-82.0795	26.9892	405	0.6	Affected	$0.02M	Minimal
26	Gleneagles Water Booster Station*	Pump Stations	Critical Infrastructure	-82.0796	26.9890	153	(0.2)	Affected	$0.01M	Minimal

Table 9 Preliminary Ranking of Impacted Facilities in Adaptation Focus Area 2 - Mid when Change in Sea Level Exceeds 1 ft

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
1	Neil Armstrong Elementary School	Schools, Risk Shelter Inventory	Critical Community And Emergency Facilities	-82.0870	27.0035	91,561	1.2	Minor	$71.3M	High
2	Deep Creek Elementary School*	Schools	Critical Community And Emergency Facilities	-82.0107	26.9856	114,838	0.9	Minor	$40.9M	High
3	Meadow Park Elementary School	Schools	Critical Community And Emergency Facilities	-82.1247	26.9859	92,185	1.3	Minor	$37.3M	High
4	Peace River Elementary School*	Schools	Critical Community And Emergency Facilities	-82.0749	26.9693	24,279	1.6	Minor	$9.9M	Low
5	Port Charlotte Artificial Kidney Center	Health Care Facilities	Critical Community And Emergency Facilities	-82.0685	26.9631	142,902	(0.7)	Affected	$5.8M	Low
6	Fawcett Memorial Hospital	Hospitals	Critical Community And Emergency Facilities	-82.0982	26.9886	125,200	-	Affected	$5.6M	Low

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
7	Family Services	Local Government Facilities	Critical Community And Emergency Facilities	-82.0919	26.9956	20,306	0.4	Affected	$2.9M	Minimal
8	Major League Clubhouse	Parks	Natural, Cultural, And Historical Resources	-82.1806	26.9989	34,383	(0.6)	Affected	$2.8M	Minimal
9	Marian Manor	Affordable Public Housing	Critical Community And Emergency Facilities	-82.0803	26.9658	20,510	3.2	Major	$2.4M	Minimal
10	Community Christian School	Schools	Critical Community And Emergency Facilities	-82.1222	27.0100	20,758	1.1	Minor	$2.4M	Minimal
11	Peace River Elementary School*	Schools	Critical Community And Emergency Facilities	-82.0745	26.9693	4,777	1.4	Minor	$1.9M	Minimal
12	Charlotte Harbor School*	Schools	Critical Community And Emergency Facilities	-82.0770	26.9686	4,722	1.1	Minor	$1.9M	Minimal
13	Community Christian School*	Schools	Critical Community And	-82.1227	27.0100	20,712	0.7	Affected	$1.8M	Minimal

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
			Emergency Facilities							
14	Ccu Eastport Treatment Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.0283	26.9778	36,206	(0.2)	Affected	$1.4M	Minimal
15	Peace River Elementary School*	Schools	Critical Community And Emergency Facilities	-82.0738	26.9695	5,439	0.5	Affected	$1.3M	Minimal
16	Meadow Park Elementary School	Schools	Critical Community And Emergency Facilities	-82.1243	26.9864	4,959	0.6	Affected	$1.3M	Minimal
17	Gulf Coast Marine Center Inc	Marinas	Transportation Assets And Evacuation Routes	-82.2097	26.9679	16,165	0.5	Affected	$1.2M	Minimal
18	Family Services*	Local Government Facilities	Critical Community And Emergency Facilities	-82.0926	26.9956	22,526	-	Affected	$1.1M	Minimal
19	Ccu Eastport Treatment Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.0270	26.9797	29,043	(0.2)	Affected	$1.1M	Minimal
20	Meadow Park Elementary School	Schools	Critical Community And	-82.1237	26.9868	4,732	0.5	Affected	$1.1M	Minimal

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
			Emergency Facilities							
21	Charlotte County Fire & Ems St 3*	Fire Stations	Critical Community And Emergency Facilities	-82.2102	26.9662	4,377	2.5	Major	$1.1M	Minimal
22	Peace River Elementary School*	Schools	Critical Community And Emergency Facilities	-82.0743	26.9690	7,363	0.3	Affected	$1.1M	Minimal
23	St. Charles Housing Ii	Affordable Public Housing	Critical Community And Emergency Facilities	-82.0816	26.9661	14,493	1.1	Minor	$1.0M	Minimal
24	Peace River Elementary School*	Schools	Critical Community And Emergency Facilities	-82.0737	26.9692	4,718	0.4	Affected	$0.8M	Minimal
25	Meadow Park Elementary School	Schools	Critical Community And Emergency Facilities	-82.1247	26.9863	4,335	0.4	Affected	$0.8M	Minimal
26	Peace River Elementary School*	Schools	Critical Community And Emergency Facilities	-82.0747	26.9689	4,870	0.4	Affected	$0.8M	Minimal

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
27	Port Charlotte Post Office	Communications Facilities	Critical Infrastructure	-82.0883	26.9755	5,593	1.4	Minor	$0.7M	Minimal
28	Building B	Parks	Natural, Cultural, And Historical Resources	-82.1800	26.9983	14,945	(1.0)	Affected	$0.6M	Minimal
29	Fawcett Memorial Hospital	Hospitals	Critical Community And Emergency Facilities	-82.0993	26.9891	12,859	(0.4)	Affected	$0.6M	Minimal
30	Peace River Elementary School*	Schools	Critical Community And Emergency Facilities	-82.0736	26.9694	3,873	0.3	Affected	$0.5M	Minimal
31	Ccu Eastport Treatment Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.0389	26.9855	9,808	1.4	Minor	$0.5M	Minimal
32	Gulf Coast Dialysis	Health Care Facilities	Critical Community And Emergency Facilities	-82.0991	26.9829	11,653	(1.1)	Affected	$0.4M	Minimal
33	Peace River Elementary School*	Schools	Critical Community And Emergency Facilities	-82.0747	26.9696	929	2.1	Minor	$0.4M	Minimal

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
34	Peace River Elementary School*	Schools	Critical Community And Emergency Facilities	-82.0749	26.9696	853	2.3	Major	$0.4M	Minimal
35	Peace River Elementary School*	Schools	Critical Community And Emergency Facilities	-82.0738	26.9689	865	1.1	Minor	$0.3M	Minimal
36	Peace River Elementary School*	Schools	Critical Community And Emergency Facilities	-82.0739	26.9690	899	0.9	Minor	$0.3M	Minimal
37	Community Christian School*	Schools	Critical Community And Emergency Facilities	-82.1225	27.0102	2,494	1.0	Minor	$0.3M	Minimal
38	Charlotte County Fire & Ems St 1	Fire Stations	Critical Community And Emergency Facilities	-82.0921	26.9762	8,559	(2.9)	Affected	$0.3M	Minimal
39	Community Christian School*	Schools	Critical Community And Emergency Facilities	-82.1226	27.0096	9,120	(0.3)	Affected	$0.2M	Minimal
40	Charlotte County Fire & Ems St 15	Fire Stations	Critical Community And	-82.2330	27.0103	6,378	(0.8)	Affected	$0.2M	Minimal

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
			Emergency Facilities							
41	Peace River Elementary School*	Schools	Critical Community And Emergency Facilities	-82.0737	26.9690	934	0.4	Affected	$0.2M	Minimal
42	Fawcett Memorial Hospital	Hospitals	Critical Community And Emergency Facilities	-82.0985	26.9895	2,653	(0.4)	Affected	$0.1M	Minimal
43	Gleneagles Water Booster Station*	Pump Stations	Critical Infrastructure	-82.0797	26.9892	2,417	1.0	Minor	$0.1M	Minimal
44	Community Christian School*	Schools	Critical Community And Emergency Facilities	-82.1225	27.0103	838	1.0	Minor	$0.1M	Minimal
45	Ambitrans Medical Transport	Emergency Medical Service Facilities	Critical Community And Emergency Facilities	-82.0871	26.9759	2,287	(2.1)	Affected	$0.1M	Minimal
46	Community Christian School*	Schools	Critical Community And Emergency Facilities	-82.1226	27.0102	1,048	0.6	Affected	$0.1M	Minimal
47	Peace River Elementary School*	Schools	Critical Community And	-82.0738	26.9691	947	0.1	Affected	$0.1M	Minimal

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
			Emergency Facilities							
48	Gleneagles Water Booster Station*	Pump Stations	Critical Infrastructure	-82.0795	26.9892	405	1.6	Minor	$0.02M	Minimal
49	Gleneagles Water Booster Station*	Pump Stations	Critical Infrastructure	-82.0796	26.9890	153	0.8	Affected	$0.01M	Minimal

Table 10 Preliminary Ranking of Impacted Facilities in Adaptation Focus Area 2 - Mid when Change in Sea Level Exceeds 3 ft

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
1	Neil Armstrong Elementary School	Schools, Risk Shelter Inventory	Critical Community And Emergency Facilities	-82.0870	27.0035	91,561	3.2	Major	$78.6M	High
2	Deep Creek Elementary School*	Schools	Critical Community And Emergency Facilities	-82.0107	26.9856	114,838	2.9	Major	$50.7M	High
3	Meadow Park Elementary School	Schools	Critical Community And	-82.1247	26.9859	92,185	3.3	Major	$41.1M	High

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
			Emergency Facilities							
4	Port Charlotte Artificial Kidney Center	Health Care Facilities	Critical Community And Emergency Facilities	-82.0685	26.9631	142,902	1.3	Minor	$33.1M	High
5	Medical Examiner*	Health Care Facilities	Critical Community And Emergency Facilities	-82.1450	27.0148	130,784	1.2	Minor	$29.0M	High
6	Community Development	Local Government Facilities	Critical Community And Emergency Facilities	-82.1420	27.0078	24,480	1.4	Minor	$14.7M	Medium
7	County Administration*	Local Government Facilities	Critical Community And Emergency Facilities	-82.1411	27.0086	43,124	1.6	Minor	$14.0M	Medium
8	Major League Clubhouse	Parks	Natural, Cultural, And Historical Resources	-82.1806	26.9989	34,383	1.4	Minor	$13.6M	Medium
9	Peace River Elementary School*	Schools	Critical Community And Emergency Facilities	-82.0749	26.9693	24,279	3.6	Major	$10.8M	Medium
10	Port Charlotte Library	Disaster Recovery	Critical Community	-82.0991	26.9929	120,312	0.5	Affected	$9.4M	Low

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
		Centers, Community Centers	And Emergency Facilities							
11	Advent Port Charlotte	Hospitals	Critical Community And Emergency Facilities	-82.0956	26.9891	189,011	0.5	Affected	$8.7M	Low
12	Economic Development	Local Government Facilities	Critical Community And Emergency Facilities	-82.1422	27.0100	12,649	3.6	Major	$8.4M	Low
13	Port Charlotte Middle School	Schools	Critical Community And Emergency Facilities	-82.0763	27.0004	134,244	0.3	Affected	$7.5M	Low
14	Family Services*	Local Government Facilities	Critical Community And Emergency Facilities	-82.0926	26.9956	22,526	2.0	Minor	$7.4M	Low
15	Family Services	Local Government Facilities	Critical Community And Emergency Facilities	-82.0919	26.9956	20,306	2.4	Major	$6.8M	Low
16	Fawcett Memorial Hospital	Hospitals	Critical Community And Emergency Facilities	-82.0982	26.9886	125,200	2.0	Minor	$6.5M	Low

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
17	Fleet Management	Local Government Facilities	Critical Community And Emergency Facilities	-82.1511	27.0172	18,758	2.3	Major	$6.3M	Low
18	St Charles School*	Schools	Critical Community And Emergency Facilities	-82.0925	26.9895	54,329	0.8	Affected	$4.9M	Minimal
19	Tidewell Hospice Inc	Health Care Facilities	Critical Community And Emergency Facilities	-82.1156	27.0131	18,863	1.3	Minor	$4.4M	Minimal
20	Community Christian School	Schools	Critical Community And Emergency Facilities	-82.1222	27.0100	20,758	3.1	Major	$4.0M	Minimal
21	Port Charlotte High School	Schools	Critical Community And Emergency Facilities	-82.1501	27.0048	134,338	-	Affected	$4.0M	Minimal
22	Stadium	Parks	Natural, Cultural, And Historical Resources	-82.1821	26.9988	41,981	-	Affected	$3.8M	Minimal
23	Community Christian School*	Schools	Critical Community And	-82.1227	27.0100	20,712	2.7	Major	$3.7M	Minimal

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
			Emergency Facilities							
24	Murdock Post Office	Communications Facilities	Critical Infrastructure	-82.1357	27.0062	38,307	0.7	Affected	$3.2M	Minimal
25	Peace River Elementary School*	Schools	Critical Community And Emergency Facilities	-82.0743	26.9690	7,363	2.3	Major	$3.1M	Minimal
26	Building B	Parks	Natural, Cultural, And Historical Resources	-82.1800	26.9983	14,945	1.0	Minor	$3.1M	Minimal
27	Marian Manor	Affordable Public Housing	Critical Community And Emergency Facilities	-82.0803	26.9658	20,510	5.2	Major	$3.0M	Minimal
28	Port Charlotte High School	Schools	Critical Community And Emergency Facilities	-82.1497	27.0055	24,381	1.2	Minor	$2.9M	Minimal
29	St Lucy'S Outpatient Surgical Center	Health Care Facilities	Critical Community And Emergency Facilities	-82.0985	26.9873	17,789	0.6	Affected	$2.5M	Minimal
30	Peace River Elementary School*	Schools	Critical Community And Emergency Facilities	-82.0738	26.9695	5,439	2.5	Major	$2.3M	Minimal

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
31	Port Charlotte Annex Post Office	Communications Facilities	Critical Infrastructure	-82.1497	27.0173	20,561	0.6	Affected	$2.3M	Minimal
32	Gulf Coast Dialysis	Health Care Facilities	Critical Community And Emergency Facilities	-82.0991	26.9829	11,653	0.9	Minor	$2.2M	Minimal
33	Meadow Park Elementary School	Schools	Critical Community And Emergency Facilities	-82.1243	26.9864	4,959	2.6	Major	$2.1M	Minimal
34	Gulf Coast Marine Center Inc	Marinas	Transportation Assets And Evacuation Routes	-82.2097	26.9679	16,165	2.5	Major	$2.1M	Minimal
35	Peace River Elementary School*	Schools	Critical Community And Emergency Facilities	-82.0745	26.9693	4,777	3.4	Major	$2.1M	Minimal
36	Tandem Health Care Of Port Charlotte	Health Care Facilities	Critical Community And Emergency Facilities	-82.1411	27.0044	50,370	(0.4)	Affected	$2.1M	Minimal
37	Charlotte Harbor School*	Schools	Critical Community And Emergency Facilities	-82.0770	26.9686	4,722	3.1	Major	$2.1M	Minimal
38	Charlotte County Fire & Ems St 3*	Fire Stations	Critical Community And	-82.2102	26.9662	4,377	4.5	Major	$2.1M	Minimal

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
			Emergency Facilities							
39	Peace River Elementary School*	Schools	Critical Community And Emergency Facilities	-82.0747	26.9689	4,870	2.4	Major	$2.1M	Minimal
40	Meadow Park Elementary School	Schools	Critical Community And Emergency Facilities	-82.1237	26.9868	4,732	2.5	Major	$2.0M	Minimal
41	Peace River Elementary School*	Schools	Critical Community And Emergency Facilities	-82.0737	26.9692	4,718	2.4	Major	$2.0M	Minimal
42	Charlotte Harbor School	Schools	Critical Community And Emergency Facilities	-82.0770	26.9690	91,676	(3.1)	Affected	$2.0M	Minimal
43	Ccu Eastport Treatment Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.0283	26.9778	36,206	1.8	Minor	$1.9M	Minimal
44	Meadow Park Elementary School	Schools	Critical Community And Emergency Facilities	-82.1247	26.9863	4,335	2.4	Major	$1.8M	Minimal
45	Charlotte Vocational Technical Center*	Schools	Critical Community And	-82.1451	27.0063	26,667	0.5	Affected	$1.8M	Minimal

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
			Emergency Facilities							
46	Port Charlotte High School*	Schools	Critical Community And Emergency Facilities	-82.1509	27.0056	53,158	0.1	Affected	$1.8M	Minimal
47	St. Charles Housing Ii	Affordable Public Housing	Critical Community And Emergency Facilities	-82.0816	26.9661	14,493	3.1	Major	$1.7M	Minimal
48	Peace River Elementary School*	Schools	Critical Community And Emergency Facilities	-82.0736	26.9694	3,873	2.3	Major	$1.6M	Minimal
49	Medical Examiner	Health Care Facilities	Critical Community And Emergency Facilities	-82.1490	27.0172	7,961	1.0	Minor	$1.6M	Minimal
50	Ccu Eastport Treatment Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.0270	26.9797	29,043	1.8	Minor	$1.5M	Minimal
51	Community Christian School*	Schools	Critical Community And Emergency Facilities	-82.1226	27.0096	9,120	1.7	Minor	$1.3M	Minimal
52	Building A	Parks	Natural, Cultural, And	-82.1811	26.9984	8,935	0.4	Affected	$1.3M	Minimal

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
			Historical Resources							
53	Port Charlotte Post Office	Communications Facilities	Critical Infrastructure	-82.0883	26.9755	5,593	3.4	Major	$1.2M	Minimal
54	Fawcett Memorial Hospital	Hospitals	Critical Community And Emergency Facilities	-82.0994	26.9878	24,112	1.3	Minor	$1.2M	Minimal
55	Charlotte Vocational Technical Center*	Schools	Critical Community And Emergency Facilities	-82.1472	27.0058	31,756	0.1	Affected	$1.1M	Minimal
56	Mid County Regional Library	Community Centers	Critical Community And Emergency Facilities	-82.1224	27.0014	41,110	(0.1)	Affected	$1.1M	Minimal
57	St. Charles Housing	Affordable Public Housing	Critical Community And Emergency Facilities	-82.0932	26.9885	13,976	1.3	Minor	$1.0M	Minimal
58	Homestand & Kid'S Clubhouse Concession	Parks	Natural, Cultural, And Historical Resources	-82.1819	26.9983	4,293	1.6	Minor	$1.0M	Minimal
59	Promenades Surgery Center	Health Care Facilities	Critical Community And Emergency Facilities	-82.1006	26.9840	15,359	0.1	Affected	$0.9M	Minimal

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
60	Community Christian School*	Schools	Critical Community And Emergency Facilities	-82.1225	27.0093	10,490	0.7	Affected	$0.9M	Minimal
61	Ccu Eastport Treatment Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.0319	26.9836	15,960	1.3	Minor	$0.8M	Minimal
62	Ticket Sales & First Aid - Stadium	Parks	Natural, Cultural, And Historical Resources	-82.1824	26.9984	3,782	1.0	Minor	$0.8M	Minimal
63	Charlotte Vocational Technical Center*	Schools	Critical Community And Emergency Facilities	-82.1472	27.0055	9,494	0.6	Affected	$0.8M	Minimal
64	Port Charlotte High School	Schools	Critical Community And Emergency Facilities	-82.1507	27.0049	27,574	(0.4)	Affected	$0.7M	Minimal
65	Charlotte County Fire & Ems St 15	Fire Stations	Critical Community And Emergency Facilities	-82.2330	27.0103	6,378	1.2	Minor	$0.7M	Minimal
66	Ccu Eastport Treatment Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.0389	26.9855	9,808	3.4	Major	$0.6M	Minimal
67	Sheriff - District 3	Law Enforcement Facilities	Critical Community And	-82.0988	26.9844	7,690	0.7	Affected	$0.6M	Minimal

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
			Emergency Facilities							
68	Fawcett Memorial Hospital	Hospitals	Critical Community And Emergency Facilities	-82.0993	26.9891	12,859	1.6	Minor	$0.6M	Minimal
69	Port Charlotte High School	Schools	Critical Community And Emergency Facilities	-82.1491	27.0049	3,119	0.2	Affected	$0.5M	Minimal
70	Port Charlotte High School	Schools	Critical Community And Emergency Facilities	-82.1491	27.0052	1,515	0.4	Affected	$0.5M	Minimal
71	Community Christian School*	Schools	Critical Community And Emergency Facilities	-82.1225	27.0102	2,494	3.0	Major	$0.5M	Minimal
72	Charlotte Vocational Technical Center*	Schools	Critical Community And Emergency Facilities	-82.1464	27.0060	7,337	0.5	Affected	$0.5M	Minimal
73	St Charles School	Schools	Critical Community And Emergency Facilities	-82.0934	26.9895	17,222	(0.1)	Affected	$0.5M	Minimal
74	Peace River Elementary School*	Schools	Critical Community	-82.0747	26.9696	929	4.1	Major	$0.4M	Minimal

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
			And Emergency Facilities							
75	Fawcett Memorial Hospital	Hospitals	Critical Community And Emergency Facilities	-82.0984	26.9893	8,080	1.4	Minor	$0.4M	Minimal
76	Peace River Elementary School*	Schools	Critical Community And Emergency Facilities	-82.0739	26.9690	899	2.9	Major	$0.4M	Minimal
77	Peace River Elementary School*	Schools	Critical Community And Emergency Facilities	-82.0737	26.9690	934	2.4	Major	$0.4M	Minimal
78	Peace River Elementary School*	Schools	Critical Community And Emergency Facilities	-82.0738	26.9691	947	2.1	Major	$0.4M	Minimal
79	Peace River Elementary School*	Schools	Critical Community And Emergency Facilities	-82.0738	26.9689	865	3.1	Major	$0.4M	Minimal
80	Peace River Elementary School*	Schools	Critical Community And Emergency Facilities	-82.0749	26.9696	853	4.3	Major	$0.4M	Minimal

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
81	St Charles School*	Schools	Critical Community And Emergency Facilities	-82.0916	26.9889	3,135	1.3	Minor	$0.4M	Minimal
82	St Charles School*	Schools	Critical Community And Emergency Facilities	-82.0920	26.9898	5,731	0.5	Affected	$0.4M	Minimal
83	St Charles School*	Schools	Critical Community And Emergency Facilities	-82.0922	26.9888	2,904	1.4	Minor	$0.4M	Minimal
84	Charlotte County Fire & Ems St 1	Fire Stations	Critical Community And Emergency Facilities	-82.0921	26.9762	8,559	(0.9)	Affected	$0.3M	Minimal
85	Groundskeeping Maintenance Building C	Parks	Natural, Cultural, And Historical Resources	-82.1815	26.9978	3,009	0.1	Affected	$0.3M	Minimal
86	Transit Authority*	Local Government Facilities	Critical Community And Emergency Facilities	-82.1284	27.0195	5,350	0.1	Affected	$0.3M	Minimal
87	Presbyterian Homes Of Charlotte	Affordable Public Housing	Critical Community And	-82.1014	26.9906	16,119	0.1	Affected	$0.3M	Minimal

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
			Emergency Facilities							
88	Charlotte Vocational Technical Center*	Schools	Critical Community And Emergency Facilities	-82.1466	27.0051	10,567	(0.3)	Affected	$0.3M	Minimal
89	Charlotte County Fire & Ems St 2*	Fire Stations	Critical Community And Emergency Facilities	-82.1568	27.0045	6,980	(0.1)	Affected	$0.3M	Minimal
90	Ccu Eastport Treatment Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.0345	26.9841	5,541	0.9	Minor	$0.3M	Minimal
91	Gertrude Water Booster Station	Pump Stations	Critical Infrastructure	-82.1026	26.9918	4,173	1.3	Minor	$0.2M	Minimal
92	Charlotte County Fire & Ems St 11	Fire Stations	Critical Community And Emergency Facilities	-82.0066	26.9876	4,863	(0.6)	Affected	$0.2M	Minimal
93	Community Christian School*	Schools	Critical Community And Emergency Facilities	-82.1226	27.0102	1,048	2.6	Major	$0.2M	Minimal
94	Charlotte Vocational Technical Center*	Schools	Critical Community And Emergency Facilities	-82.1475	27.0051	6,628	(0.4)	Affected	$0.2M	Minimal
95	Charlotte Vocational Technical Center*	Schools	Critical Community	-82.1468	27.0055	6,399	-	Affected	$0.2M	Minimal

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
			And Emergency Facilities							
96	Charlotte Vocational Technical Center*	Schools	Critical Community And Emergency Facilities	-82.1457	27.0064	1,342	1.3	Minor	$0.2M	Minimal
97	Community Christian School*	Schools	Critical Community And Emergency Facilities	-82.1225	27.0103	838	3.0	Major	$0.2M	Minimal
98	Gleneagles Water Booster Station*	Pump Stations	Critical Infrastructure	-82.0797	26.9892	2,417	3.0	Major	$0.1M	Minimal
99	Charlotte Vocational Technical Center*	Schools	Critical Community And Emergency Facilities	-82.1463	27.0050	5,244	(0.2)	Affected	$0.1M	Minimal
100	Ccu Eastport Treatment Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.0361	26.9833	3,128	0.2	Affected	$0.1M	Minimal
101	Fawcett Memorial Hospital	Hospitals	Critical Community And Emergency Facilities	-82.0985	26.9895	2,653	1.6	Minor	$0.1M	Minimal
102	Port Charlotte High School	Schools	Critical Community And Emergency Facilities	-82.1510	27.0048	1,555	0.1	Affected	$0.1M	Minimal

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
103	Fawcett Memorial Hospital	Hospitals	Critical Community And Emergency Facilities	-82.0983	26.9895	2,446	1.3	Minor	$0.1M	Minimal
104	Charlotte County Lf #2/Wtcc-71676	Solid And Hazardous Waste Facilities	Critical Infrastructure	-82.0443	26.9841	24,888	-	Affected	$0.1M	Minimal
105	Ambitrans Medical Transport	Emergency Medical Service Facilities	Critical Community And Emergency Facilities	-82.0871	26.9759	2,287	(0.1)	Affected	$0.1M	Minimal
106	Electrical/Mechanical Vault	Parks	Natural, Cultural, And Historical Resources	-82.1816	26.9984	624	0.6	Affected	$0.1M	Minimal
107	Charlotte Vocational Technical Center*	Schools	Critical Community And Emergency Facilities	-82.1481	27.0046	3,478	(0.1)	Affected	$0.1M	Minimal
108	Charlotte Vocational Technical Center*	Schools	Critical Community And Emergency Facilities	-82.1481	27.0049	1,528	0.2	Affected	$0.1M	Minimal
109	Charlotte Vocational Technical Center*	Schools	Critical Community And Emergency Facilities	-82.1456	27.0063	863	0.7	Affected	$0.1M	Minimal

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
110	Presbyterian Homes Of Charlotte*	Affordable Public Housing	Critical Community And Emergency Facilities	-82.1014	26.9908	3,414	0.1	Affected	$0.1M	Minimal
111	Ccu Eastport Treatment Plant*	Wastewater Treatment Facilities	Critical Infrastructure	-82.0343	26.9842	1,206	0.7	Affected	$0.1M	Minimal
112	Charlotte Vocational Technical Center*	Schools	Critical Community And Emergency Facilities	-82.1479	27.0049	1,545	-	Affected	$0.05M	Minimal
113	Quesada Lift Station	Lift Stations	Critical Infrastructure	-82.1308	27.0110	993	0.8	Affected	$0.04M	Minimal
114	Port Charlotte High School*	Schools	Critical Community And Emergency Facilities	-82.1490	27.0052	409	0.6	Affected	$0.03M	Minimal
115	Charlotte Vocational Technical Center*	Schools	Critical Community And Emergency Facilities	-82.1478	27.0052	1,099	-	Affected	$0.03M	Minimal
116	Ccu Eastport Treatment Plant*	Wastewater Treatment Facilities	Critical Infrastructure	-82.0359	26.9832	684	0.5	Affected	$0.03M	Minimal
117	Quesada Lift Station*	Lift Stations	Critical Infrastructure	-82.1306	27.0111	586	1.5	Minor	$0.03M	Minimal
118	Gleneagles Water Booster Station*	Pump Stations	Critical Infrastructure	-82.0795	26.9892	405	3.6	Major	$0.03M	Minimal
119	Charlotte Vocational Technical Center*	Schools	Critical Community	-82.1478	27.0054	919	(0.2)	Affected	$0.02M	Minimal

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
			And Emergency Facilities							
120	Eagle St Rwbs*	Pump Stations	Critical Infrastructure	-82.1114	27.0019	469	0.3	Affected	$0.02M	Minimal
121	Charlotte Vocational Technical Center*	Schools	Critical Community And Emergency Facilities	-82.1477	27.0049	472	-	Affected	$0.01M	Minimal
122	Mid County Mini Transfer Station*	Solid And Hazardous Waste Facilities	Critical Infrastructure	-82.1302	27.0193	6,231	-	Affected	$0.01M	Minimal
123	Eagle St Rwbs*	Pump Stations	Critical Infrastructure	-82.1115	27.0018	243	0.7	Affected	$0.01M	Minimal
124	Gleneagles Water Booster Station*	Pump Stations	Critical Infrastructure	-82.0796	26.9890	153	2.8	Major	$0.01M	Minimal

4.3 ADAPTATION FOCUS AREA 3 – WEST

4.3.1 FOCUS AREA OVERVIEW

Western Charlotte County features barrier-island-adjacent communities that face substantial coastal surge risk, king tide flooding, and long-term sea level change threats. The County's VA inventory identifies multiple critical assets and residential concentrations in these regions that would require evacuation in severe storm scenarios. The area is also being considered for enhanced flood-monitoring systems, such as remote storm-elevation sensors along the Myakka River, Charlotte Harbor, and Lemon Bay, efforts aimed at improving preparedness and real-time response.

Area west, while containing fewer total facility buildings (35 out of 256), plays a critical role in supporting essential services, especially in the domain of infrastructure. Area west has the highest number of wastewater treatment facilities (30 of 55) and pump stations (12 of 18), indicating its significance for water management and operational resilience. The area maintains a balanced mix of schools, fire stations, and community centers, ensuring continued educational access and community support despite its smaller size. Although Area west houses fewer health care and government facilities compared to Area mid, its infrastructure profile positions it as a vital support area for emergency response and service continuity, especially in scenarios involving water and waste management. This distribution reflects Area west's strategic value in maintaining community resilience and operational stability during disruptive events.

4.3.2 IMPACTED FACILITIES

Error! Reference source not found. presents a ranked list of facility buildings within Adaptation Focus Area 3– West, that are anticipated to be impacted by 100-year storm surge events. These assets have been identified based on projected flood depths, including schools, fire stations, local government offices, and health care centers. The preliminary ranking is decided by the estimated building (as described in Appendix D Technical Approach and Appendix E Exposure and Sensitivity Analysis). An asterisk next to an asset name indicates a 0.5 ft first floor elevation was assumed for estimating flood losses due to limited data. Loss estimates can be revised if more precise elevation information becomes available.

Table 11 Preliminary Ranking of Impacted Facilities in Adaptation Focus Area 3 - West under Current Condition

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
1	Myakka River Elementary School	Schools	Critical Community And Emergency Facilities	-82.2351	26.9412	109,481	1.2	Minor	$44.2M	High
2	Lemon Bay High School	Schools	Critical Community And Emergency Facilities	-82.3326	26.9276	132,676	0.3	Affected	$12.3M	Medium
3	Brookdale Rotonda	Health Care Facilities	Critical Community And Emergency Facilities	-82.3025	26.8888	34,396	0.4	Affected	$3.7M	Minimal
4	Charlotte County Fire & Ems St 10	Fire Stations	Critical Community And Emergency Facilities	-82.3155	26.8682	2,157	8.7	Destroyed	$3.6M	Minimal
5	Lemon Bay High School	Schools	Critical Community And Emergency Facilities	-82.3321	26.9269	132,707	(0.3)	Affected	$3.5M	Minimal
6	Placida Post Office	Communications Facilities	Critical Infrastructure	-82.2926	26.8555	17,522	0.7	Affected	$1.6M	Minimal
7	Englewood Fire Dept Station 76*	Fire Stations	Critical Community And Emergency Facilities	-82.2877	26.8520	1,814	5.1	Major	$0.9M	Minimal

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
8	Englewood Fire Dept Station 76*	Fire Stations	Critical Community And Emergency Facilities	-82.2877	26.8517	4,687	1.2	Minor	$0.5M	Minimal
9	Rotonda Reserve Osmosis Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2899	26.8717	10,461	(0.1)	Affected	$0.4M	Minimal
10	Englewood Fd St 74	Fire Stations	Critical Community And Emergency Facilities	-82.2900	26.9090	6,399	(0.4)	Affected	$0.2M	Minimal
11	Five Lands Water Booster Station	Pump Stations	Critical Infrastructure	-82.2982	26.8760	2,463	2.3	Major	$0.1M	Minimal
12	Rotonda Reserve Osmosis Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2891	26.8716	3,220	(1.4)	Affected	$0.1M	Minimal
13	Five Lands Water Booster Station	Pump Stations	Critical Infrastructure	-82.2979	26.8761	2,107	2.2	Major	$0.1M	Minimal
14	Englewood Fd St 72	Fire Stations	Critical Community And Emergency Facilities	-82.3107	26.8981	2,886	(2.4)	Affected	$0.1M	Minimal
15	Rotonda Reserve	Wastewater Treatment Facilities	Critical Infrastructure	-82.2882	26.8718	2,217	(1.1)	Affected	$0.1M	Minimal

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
	Osmosis Plant									
16	Rotonda Reserve Osmosis Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2887	26.8712	2,190	(1.4)	Affected	$0.1M	Minimal
17	Ccu - Booster Station 6	Pump Stations	Critical Infrastructure	-82.2719	26.8926	1,416	-	Affected	$0.1M	Minimal
18	Rotonda Reserve Osmosis Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2883	26.8714	1,436	(1.2)	Affected	$0.1M	Minimal
19	Ccu - Booster Station 6	Pump Stations	Critical Infrastructure	-82.2727	26.8924	1,569	(0.2)	Affected	$0.05M	Minimal
20	Ccu Westport Treatment Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2040	26.9347	1,176	0.2	Affected	$0.05M	Minimal
21	Lemon Bay High School	Schools	Critical Community And Emergency Facilities	-82.3318	26.9274	1,588	(1.3)	Affected	$0.04M	Minimal
22	Rotonda Reserve Osmosis Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2896	26.8717	782	(1.5)	Affected	$0.03M	Minimal
23	Rotonda Reserve Osmosis Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2889	26.8719	727	(1.2)	Affected	$0.03M	Minimal

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
24	Ccu Gulf Cove Water Treatment Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2536	26.9894	671	(0.8)	Affected	$0.03M	Minimal
25	Rotonda Reserve Osmosis Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2889	26.8716	629	(1.4)	Affected	$0.02M	Minimal
26	Ccu Gulf Cove Water Treatment Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2539	26.9898	560	(1.0)	Affected	$0.02M	Minimal
27	Rotonda Reserve Osmosis Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2881	26.8715	557	(1.3)	Affected	$0.02M	Minimal
28	Ccu - Booster Station 6	Pump Stations	Critical Infrastructure	-82.2724	26.8930	602	(0.3)	Affected	$0.02M	Minimal
29	Ccu - Booster Station 6	Pump Stations	Critical Infrastructure	-82.2731	26.8924	597	(0.3)	Affected	$0.02M	Minimal
30	Rotonda Reserve Osmosis Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2896	26.8718	446	(1.1)	Affected	$0.02M	Minimal
31	Rotonda Reserve Osmosis Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2885	26.8713	355	(1.5)	Affected	$0.01M	Minimal

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
32	Rotonda Reserve Osmosis Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2885	26.8716	339	(1.5)	Affected	$0.01M	Minimal
33	Ccu - Booster Station 6	Pump Stations	Critical Infrastructure	-82.2731	26.8923	358	(0.2)	Affected	$0.01M	Minimal
34	Ccu - Booster Station 6	Pump Stations	Critical Infrastructure	-82.2730	26.8926	364	(0.3)	Affected	$0.01M	Minimal
35	Rotonda Reserve Osmosis Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2882	26.8718	270	(1.5)	Affected	$0.01M	Minimal
36	Ccu Gulf Cove Water Treatment Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2534	26.9896	233	(0.9)	Affected	$0.01M	Minimal
37	Rotonda Reserve Osmosis Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2888	26.8717	242	(1.6)	Affected	$0.01M	Minimal
38	Ccu Gulf Cove Water Treatment Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2540	26.9902	217	(1.0)	Affected	$0.01M	Minimal
39	Rotonda Reserve Osmosis Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2884	26.8717	166	(1.3)	Affected	$0.01M	Minimal

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
40	Ccu Gulf Cove Water Treatment Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2537	26.9895	121	(0.9)	Affected	$0.004M	Minimal
41	Ccu - Booster Station 6	Pump Stations	Critical Infrastructure	-82.2727	26.8926	129	(0.4)	Affected	$0.004M	Minimal
42	Rotonda Reserve Osmosis Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2887	26.8720	101	(1.4)	Affected	$0.004M	Minimal
43	Ccu - Booster Station 6	Pump Stations	Critical Infrastructure	-82.2728	26.8923	129	(0.6)	Affected	$0.003M	Minimal
44	Rotonda Reserve Osmosis Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2889	26.8717	45	(1.5)	Affected	$0.002M	Minimal
45	Rotonda Reserve Osmosis Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2889	26.8717	41	(1.6)	Affected	$0.001M	Minimal
46	Rotonda Reserve Osmosis Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2889	26.8717	38	(1.6)	Affected	$0.001M	Minimal

Table 12 Preliminary Ranking of Impacted Facilities in Adaptation Focus Area 3 - West when Change in Sea Level Exceeds 1 ft

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
1	Myakka River Elementary School	Schools	Critical Community And Emergency Facilities	-82.2351	26.9412	109,481	2.2	Major	$45.6M	High
2	Lemon Bay High School	Schools	Critical Community And Emergency Facilities	-82.3326	26.9276	132,676	1.3	Minor	$40.4M	High
3	Lemon Bay High School	Schools	Critical Community And Emergency Facilities	-82.3321	26.9269	132,707	0.7	Affected	$11.3M	Medium
4	Brookdale Rotonda	Health Care Facilities	Critical Community And Emergency Facilities	-82.3025	26.8888	34,396	1.4	Minor	$8.3M	Low
5	Charlotte County Fire & Ems St 10	Fire Stations	Critical Community And Emergency Facilities	-82.3155	26.8682	2,157	9.7	Destroyed	$3.6M	Minimal
6	Placida Post Office	Communications Facilities	Critical Infrastructure	-82.2926	26.8555	17,522	1.8	Minor	$2.5M	Minimal
7	Englewood Fire Dept Station 76*	Fire Stations	Critical Community And	-82.2877	26.8520	1,814	6.1	Destroyed	$1.0M	Minimal

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
			Emergency Facilities							
8	Englewood Fire Dept Station 76*	Fire Stations	Critical Community And Emergency Facilities	-82.2877	26.8517	4,687	2.2	Major	$1.0M	Minimal
9	Rotonda Reserve Osmosis Plant	Wastewater Treatment Facilities	Critical Infrastructu re	-82.2899	26.8717	10,461	0.9	Minor	$0.5M	Minimal
10	Ccu Westport Treatment Plant	Wastewater Treatment Facilities	Critical Infrastructu re	-82.2044	26.9351	8,749	2.0	Minor	$0.5M	Minimal
11	Englewood Fd St 74	Fire Stations	Critical Community And Emergency Facilities	-82.2900	26.9090	6,399	0.6	Affected	$0.5M	Minimal
12	Five Lands Water Booster Station	Pump Stations	Critical Infrastructu re	-82.2982	26.8760	2,463	3.4	Major	$0.2M	Minimal
13	Ccu Westport Treatment Plant	Wastewater Treatment Facilities	Critical Infrastructu re	-82.2042	26.9347	2,863	1.3	Minor	$0.1M	Minimal
14	Five Lands Water Booster Station	Pump Stations	Critical Infrastructu re	-82.2979	26.8761	2,107	3.2	Major	$0.1M	Minimal

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
15	Rotonda Reserve Osmosis Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2891	26.8716	3,220	(0.4)	Affected	$0.1M	Minimal
16	Englewood Fd St 72	Fire Stations	Critical Community And Emergency Facilities	-82.3107	26.8981	2,886	(1.4)	Affected	$0.1M	Minimal
17	Rotonda Reserve Osmosis Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2882	26.8718	2,217	(0.1)	Affected	$0.1M	Minimal
18	Rotonda Reserve Osmosis Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2887	26.8712	2,190	(0.4)	Affected	$0.1M	Minimal
19	Ccu Gulf Cove Water Treatment Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2537	26.9897	1,788	-	Affected	$0.1M	Minimal
20	Ccu - Booster Station 6	Pump Stations	Critical Infrastructure	-82.2727	26.8924	1,569	0.8	Affected	$0.1M	Minimal
21	Ccu - Booster Station 6	Pump Stations	Critical Infrastructure	-82.2719	26.8926	1,416	1.1	Minor	$0.1M	Minimal
22	Ccu Westport Treatment Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2040	26.9347	1,176	1.2	Minor	$0.1M	Minimal
23	Rotonda Reserve	Wastewater Treatment Facilities	Critical Infrastructure	-82.2883	26.8714	1,436	(0.2)	Affected	$0.1M	Minimal

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
	Osmosis Plant									
24	Pump Stations*	Pump Stations	Critical Infrastructure	-82.3037	26.9353	981	1.4	Minor	$0.05M	Minimal
25	Lemon Bay High School	Schools	Critical Community And Emergency Facilities	-82.3318	26.9274	1,588	(0.2)	Affected	$0.04M	Minimal
26	Rotonda Reserve Osmosis Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2896	26.8717	782	(0.5)	Affected	$0.03M	Minimal
27	Rotonda Reserve Osmosis Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2889	26.8719	727	(0.2)	Affected	$0.03M	Minimal
28	Ccu Gulf Cove Water Treatment Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2536	26.9894	671	0.2	Affected	$0.03M	Minimal
29	Ccu - Booster Station 6	Pump Stations	Critical Infrastructure	-82.2724	26.8930	602	0.7	Affected	$0.03M	Minimal
30	Ccu - Booster Station 6	Pump Stations	Critical Infrastructure	-82.2731	26.8924	597	0.7	Affected	$0.02M	Minimal
31	Rotonda Reserve Osmosis Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2889	26.8716	629	(0.4)	Affected	$0.02M	Minimal

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
32	Ccu Gulf Cove Water Treatment Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2539	26.9898	560	-	Affected	$0.02M	Minimal
33	Rotonda Reserve Osmosis Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2881	26.8715	557	(0.3)	Affected	$0.02M	Minimal
34	Rotonda Reserve Osmosis Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2896	26.8718	446	(0.1)	Affected	$0.02M	Minimal
35	Ccu - Booster Station 6	Pump Stations	Critical Infrastructure	-82.2730	26.8926	364	0.8	Affected	$0.02M	Minimal
36	Ccu - Booster Station 6	Pump Stations	Critical Infrastructure	-82.2731	26.8923	358	0.8	Affected	$0.02M	Minimal
37	Rotonda Reserve Osmosis Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2885	26.8713	355	(0.5)	Affected	$0.01M	Minimal
38	Rotonda Reserve Osmosis Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2885	26.8716	339	(0.5)	Affected	$0.01M	Minimal
39	Rotonda Reserve Osmosis Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2882	26.8718	270	(0.5)	Affected	$0.01M	Minimal
40	Ccu Gulf Cove Water Treatment Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2534	26.9896	233	0.1	Affected	$0.01M	Minimal

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
41	Rotonda Reserve Osmosis Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2888	26.8717	242	(0.6)	Affected	$0.01M	Minimal
42	Ccu Gulf Cove Water Treatment Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2540	26.9902	217	-	Affected	$0.01M	Minimal
43	Rotonda Reserve Osmosis Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2884	26.8717	166	(0.3)	Affected	$0.01M	Minimal
44	Pump Stations*	Pump Stations	Critical Infrastructure	-82.3039	26.9352	119	2.1	Major	$0.01M	Minimal
45	Ccu - Booster Station 6	Pump Stations	Critical Infrastructure	-82.2727	26.8926	129	0.7	Affected	$0.01M	Minimal
46	Ccu - Booster Station 6	Pump Stations	Critical Infrastructure	-82.2728	26.8923	129	0.5	Affected	$0.01M	Minimal
47	Ccu Gulf Cove Water Treatment Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2537	26.9895	121	0.1	Affected	$0.01M	Minimal
48	Rotonda Reserve Osmosis Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2887	26.8720	101	(0.4)	Affected	$0.004M	Minimal
49	Rotonda Reserve Osmosis Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2889	26.8717	45	(0.5)	Affected	$0.002M	Minimal

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
50	Rotonda Reserve Osmosis Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2889	26.8717	41	(0.6)	Affected	$0.002M	Minimal
51	Rotonda Reserve Osmosis Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2889	26.8717	38	(0.6)	Affected	$0.001M	Minimal

Table 13 Preliminary Ranking of Impacted Facilities in Adaptation Focus Area 3 - West when Change in Sea Level Exceeds 3 ft

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
1	Lemon Bay High School	Schools	Critical Community And Emergency Facilities	-82.3326	26.9276	132,676	3.2	Major	$70.7M	High
2	Myakka River Elementary School	Schools	Critical Community And Emergency Facilities	-82.2351	26.9412	109,481	4.2	Major	$49.0M	High
3	Lemon Bay High School	Schools	Critical Community And Emergency Facilities	-82.3321	26.9269	132,707	2.6	Major	$23.4M	High

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
4	Brookdale Rotonda	Health Care Facilities	Critical Community And Emergency Facilities	-82.3025	26.8888	34,396	3.4	Major	$12.2M	Medium
5	Placida Post Office	Communications Facilities	Critical Infrastructure	-82.2926	26.8555	17,522	3.7	Major	$4.0M	Minimal
6	Charlotte County Fire & Ems St 10	Fire Stations	Critical Community And Emergency Facilities	-82.3155	26.8682	2,157	11.6	Destroyed	$3.8M	Minimal
7	Vineland Elementary School*	Schools	Critical Community And Emergency Facilities	-82.2839	26.9141	92,992	-	Affected	$2.5M	Minimal
8	Englewood Fire Dept Station 76*	Fire Stations	Critical Community And Emergency Facilities	-82.2877	26.8517	4,687	4.2	Major	$2.1M	Minimal
9	Englewood Fd St 74	Fire Stations	Critical Community And Emergency Facilities	-82.2900	26.9090	6,399	2.5	Major	$1.6M	Minimal
10	Englewood Fire Dept Station 76*	Fire Stations	Critical Community And Emergency Facilities	-82.2877	26.8520	1,814	8.0	Destroyed	$1.1M	Minimal

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
11	L. A. Ainger Middle School*	Schools	Critical Community And Emergency Facilities	-82.2875	26.9130	32,969	(0.2)	Affected	$0.9M	Minimal
12	Englewood Fd St 75*	Fire Stations	Critical Community And Emergency Facilities	-82.2775	26.9353	6,210	1.5	Minor	$0.9M	Minimal
13	L. A. Ainger Middle School*	Schools	Critical Community And Emergency Facilities	-82.2868	26.9130	28,481	(0.2)	Affected	$0.8M	Minimal
14	L. A. Ainger Middle School*	Schools	Critical Community And Emergency Facilities	-82.2875	26.9140	27,434	(0.3)	Affected	$0.7M	Minimal
15	Ccu Westport Treatment Plant	Wastewater Treatment Facilities	Critical Infrastructur e	-82.2044	26.9351	8,749	3.9	Major	$0.7M	Minimal
16	L. A. Ainger Middle School*	Schools	Critical Community And Emergency Facilities	-82.2878	26.9123	24,334	-	Affected	$0.6M	Minimal
17	L. A. Ainger Middle School*	Schools	Critical Community And Emergency Facilities	-82.2862	26.9135	22,683	(0.3)	Affected	$0.6M	Minimal

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
18	Rotonda Reserve Osmosis Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2899	26.8717	10,461	2.9	Major	$0.6M	Minimal
19	Englewood Charlotte Library	Disaster Recovery Centers, Community Centers	Critical Community And Emergency Facilities	-82.2929	26.9351	18,002	(1.2)	Affected	$0.4M	Minimal
20	Tidewell Hospice Inc	Health Care Facilities	Critical Community And Emergency Facilities	-82.2552	26.9333	8,238	(0.3)	Affected	$0.4M	Minimal
21	L. A. Ainger Middle School*	Schools	Critical Community And Emergency Facilities	-82.2875	26.9135	12,391	(0.3)	Affected	$0.3M	Minimal
22	Charlotte County Fire & Ems St 4*	Fire Stations	Critical Community And Emergency Facilities	-82.2231	26.9173	4,261	0.4	Affected	$0.3M	Minimal
23	L. A. Ainger Middle School*	Schools	Critical Community And Emergency Facilities	-82.2879	26.9130	8,846	(0.1)	Affected	$0.2M	Minimal
24	Lemon Bay High School	Schools	Critical Community And Emergency Facilities	-82.3318	26.9274	1,588	1.7	Minor	$0.2M	Minimal

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
25	Englewood Fd St 72	Fire Stations	Critical Community And Emergency Facilities	-82.3107	26.8981	2,886	0.6	Affected	$0.2M	Minimal
26	L. A. Ainger Middle School*	Schools	Critical Community And Emergency Facilities	-82.2869	26.9139	7,364	(0.2)	Affected	$0.2M	Minimal
27	Five Lands Water Booster Station	Pump Stations	Critical Infrastructur e	-82.2982	26.8760	2,463	5.3	Major	$0.2M	Minimal
28	Ccu Westport Treatment Plant	Wastewater Treatment Facilities	Critical Infrastructur e	-82.2042	26.9347	2,863	3.3	Major	$0.2M	Minimal
29	L. A. Ainger Middle School*	Schools	Critical Community And Emergency Facilities	-82.2879	26.9135	6,655	(0.2)	Affected	$0.2M	Minimal
30	Rotonda Reserve Osmosis Plant	Wastewater Treatment Facilities	Critical Infrastructur e	-82.2891	26.8716	3,220	1.6	Minor	$0.2M	Minimal
31	Five Lands Water Booster Station	Pump Stations	Critical Infrastructur e	-82.2979	26.8761	2,107	5.2	Major	$0.2M	Minimal
32	L. A. Ainger	Schools	Critical Community And	-82.2869	26.9135	5,924	(0.4)	Affected	$0.2M	Minimal

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
	Middle School*		Emergency Facilities							
33	Rotonda Reserve Osmosis Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2882	26.8718	2,217	1.9	Minor	$0.1M	Minimal
34	Rotonda Reserve Osmosis Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2887	26.8712	2,190	1.6	Minor	$0.1M	Minimal
35	Ccu Gulf Cove Water Treatment Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2537	26.9897	1,788	2.0	Minor	$0.1M	Minimal
36	Ccu - Booster Station 6	Pump Stations	Critical Infrastructure	-82.2727	26.8924	1,569	2.8	Major	$0.1M	Minimal
37	Ccu - Booster Station 6	Pump Stations	Critical Infrastructure	-82.2719	26.8926	1,416	3.0	Major	$0.1M	Minimal
38	Rotonda Reserve Osmosis Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2883	26.8714	1,436	1.8	Minor	$0.1M	Minimal
39	Ccu Westport Treatment Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2040	26.9347	1,176	3.2	Major	$0.1M	Minimal
40	Pump Stations*	Pump Stations	Critical Infrastructure	-82.3037	26.9353	981	3.4	Major	$0.1M	Minimal
41	Rotonda Reserve	Wastewater Treatment Facilities	Critical Infrastructure	-82.2896	26.8717	782	1.5	Minor	$0.04M	Minimal

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
	Osmosis Plant									
42	Rotonda Reserve Osmosis Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2889	26.8719	727	1.8	Minor	$0.04M	Minimal
43	Ccu Gulf Cove Water Treatment Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2536	26.9894	671	2.2	Major	$0.04M	Minimal
44	Ccu - Booster Station 6	Pump Stations	Critical Infrastructure	-82.2724	26.8930	602	2.7	Major	$0.04M	Minimal
45	Ccu - Booster Station 6	Pump Stations	Critical Infrastructure	-82.2731	26.8924	597	2.7	Major	$0.03M	Minimal
46	L. A. Ainger Middle School*	Schools	Critical Community And Emergency Facilities	-82.2871	26.9125	1,271	(0.4)	Affected	$0.03M	Minimal
47	Rotonda Reserve Osmosis Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2889	26.8716	629	1.6	Minor	$0.03M	Minimal
48	Ccu Gulf Cove Water Treatment Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2539	26.9898	560	2.0	Minor	$0.03M	Minimal
49	Rotonda Reserve Osmosis Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2881	26.8715	557	1.7	Minor	$0.03M	Minimal

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
50	Rotonda Reserve Osmosis Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2896	26.8718	446	1.9	Minor	$0.02M	Minimal
51	Ccu - Booster Station 6	Pump Stations	Critical Infrastructure	-82.2730	26.8926	364	2.7	Major	$0.02M	Minimal
52	Ccu - Booster Station 6	Pump Stations	Critical Infrastructure	-82.2731	26.8923	358	2.8	Major	$0.02M	Minimal
53	Rotonda Reserve Osmosis Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2885	26.8713	355	1.4	Minor	$0.02M	Minimal
54	Rotonda Reserve Osmosis Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2885	26.8716	339	1.5	Minor	$0.02M	Minimal
55	Rotonda Reserve Osmosis Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2882	26.8718	270	1.5	Minor	$0.01M	Minimal
56	Ccu Gulf Cove Water Treatment Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2534	26.9896	233	2.1	Major	$0.01M	Minimal
57	Rotonda Reserve Osmosis Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2888	26.8717	242	1.4	Minor	$0.01M	Minimal
58	Ccu Gulf Cove Water Treatment Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2540	26.9902	217	2.0	Minor	$0.01M	Minimal

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
59	Rotonda Reserve Osmosis Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2884	26.8717	166	1.7	Minor	$0.01M	Minimal
60	Pump Stations*	Pump Stations	Critical Infrastructure	-82.3039	26.9352	119	4.1	Major	$0.01M	Minimal
61	Ccu - Booster Station 6	Pump Stations	Critical Infrastructure	-82.2727	26.8926	129	2.6	Major	$0.01M	Minimal
62	Ccu - Booster Station 6	Pump Stations	Critical Infrastructure	-82.2728	26.8923	129	2.4	Major	$0.01M	Minimal
63	West County Mini Transfer Station	Solid And Hazardous Waste Facilities	Critical Infrastructure	-82.2362	26.9279	4,190	(0.1)	Affected	$0.01M	Minimal
64	Ccu Gulf Cove Water Treatment Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2537	26.9895	121	2.1	Minor	$0.01M	Minimal
65	Rotonda Reserve Osmosis Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2887	26.8720	101	1.6	Minor	$0.01M	Minimal
66	Rotonda Reserve Osmosis Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2889	26.8717	45	1.5	Minor	$0.002M	Minimal
67	Rotonda Reserve Osmosis Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2889	26.8717	41	1.4	Minor	$0.002M	Minimal

Rank	Asset Name	Asset Type	Asset Class	Longitude	Latitude	Area (sqft)	Potential Flood Depth (ft)	Estimated Damage Severity	Estimated 100-year Storm Event Losses ($)	Estimated 100-year Storm Event Losses Level
68	Rotonda Reserve Osmosis Plant	Wastewater Treatment Facilities	Critical Infrastructure	-82.2889	26.8717	38	1.3	Minor	$0.002M	Minimal

5 NEXT STEPS

The vulnerability assessment indicates that several facility types, including pump stations, fire stations, healthcare facilities, and community facilities, experience higher levels of disruption under storm surge flooding scenarios. Facilities identified and ranked through this effort are anticipated to be further evaluated and prioritized in future phases based on detailed vulnerability, feasibility, cost, and benefit considerations.

The subsequent section details the specific areas of alignment with the strategies outlined in the Charlotte County Local Mitigation Strategy, demonstrating the intended interlinked initiatives undertaken by local agencies to strengthen community resilience. Additionally, recommended actions for addressing facility vulnerabilities are identified, alongside a summary of potential funding sources available to support these resilience-building measures.

5.1 ALIGNMENT WITH CHARLOTTE COUNTY LOCAL MITIGATION STRATEGY

This section examines how vulnerable facilities identified in this assessment correspond to mitigation projects listed in the Charlotte County Local Mitigation Strategy (LMS). The comparison focuses on whether existing/proposed mitigation projects address critical facilities and infrastructure identified as vulnerable in the vulnerability assessment. The results show that several ongoing or planned projects support the resilience of key emergency and infrastructure systems within the county. Selected examples of aligned mitigation projects that address identified facility vulnerabilities are summarized in Table 14.

Table 14 Alignment between Identified Vulnerable Facilities and LMS Projects

Projects	Hazards Mitigated	Agency Responsible for Implementation	Status	Timeframe to Complete
Hardening of Westport and Rotonda Wastewater Treatment Plants	Hurricanes, Tropical storms, Flooding	Charlotte County Utilities	Submitted under DR-4806	36 months from award date
Charlotte County Lift Station Portable Generator Resilience Project	Hurricanes, Tropical storms, Flooding	Charlotte County Utilities	Submitted under DR-4806	36 months from award date
Punta Gorda Library Mobile-Generator	Hurricanes, Tropical storms, Flooding	Charlotte County Community Services	Submitted under DR-4828	36 months from award date
Punta Gorda Library Floodproofing	Hurricanes, Tropical storms, Flooding	Charlotte County Community Services	Submitted under DR-4834	36 months from award date
Charlotte Harbor Event Center Floodproofing	Hurricanes, Tropical storms, Flooding	Charlotte County Community Services	Submitted under DR-4834	36 months from award date

5.2 RECOMMENDED ACTIONS TO INCREASE RESILIENCE OF CHARLOTTE COUNTY

This section outlines recommended actions to enhance resilience against storm-surge events.

5.2.1 COUNTYWIDE PLANNING AND POLICY

Based on the vulnerability assessment results, the following policy and planning actions are recommended to reduce long-term storm-surge flood risks in Charlotte County.

5.2.1.1 RISK ASSESSMENT AND DATA INTEGRATION

(1). Expand the analysis completed by this study to include private property, social, and economic concerns to develop a full inventory of risk from collective stressors.

(2). Integrate climate hazard projections (e.g., sea level change, extreme rainfall, and storm surge) into future land-use, infrastructure investment decisions, and capital improvement programs.

5.2.1.2 FLOODPLAIN MANAGEMENT AND DEVELOPMENT POLICY

(1). Consider strengthening the existing Charlotte County floodplain ordinance by increasing freeboard requirements above the 100-year flood elevation (potentially to the 500-year flood) to further reduce future flood risks.

(2). Establish a minimal roadway level of service or accessibility standards for transportation infrastructure located in flood-prone areas to ensure continued access during storm surge events.

Encourage elevation or floodproofing retrofits for existing structures located within high-risk flood zones identified in the vulnerability assessment.

5.2.1.3 NATURE-BASED SOLUTIONS AND RISK REDUCTION STRATEGIES

(1). Promote nature-based solutions, such as wetlands restoration and green stormwater infrastructure, to improve flood storage and water quality.

(2). Evaluate voluntary property acquisition and demolition programs for repetitive flood loss areas. These programs purchase high-risk properties, remove structures, and convert the land into open space or natural buffers, which can permanently reduce flood risks.

(3). Undertake an effort to define county policies on managed retreat from future inundated areas.

5.2.1.4 FUNDING AND IMPLEMENTATION COORDINATION

(1). Complete a detailed scan of the funding sources that may be available to Charlotte County to address resilience concerns outlined in this assessment.

(2). Develop grant/formula funding requests for various eligible sources (IIJA, FEMA, FDEP, etc.).

(3). Strengthen coordination between county departments to integrate resilience considerations into transportation, utilities, and capital improvement planning.

5.2.1.5 PUBLIC AWARENESS AND COMMUNITY ENGAGEMENT

(1). Conduct an educational and public information campaign to increase stakeholder awareness of the concerns, and planned county actions to address them.

5.2.2 WASTEWATER TREATMENT FACILITY

Pump stations and lift stations are particularly vulnerable to flooding due to their low elevations and reliance on electrical and mechanical equipment. Recommended adaptation measures include:

(1). Evaluate the elevation of critical wastewater treatment equipment and consider elevating or floodproofing vulnerable components.

(2). Improve redundancy in power supply systems, such as installing backup generators and ensuring adequate fuel storage for extended outages.

(3). Upgrade drainage and stormwater management around wastewater facilities to prevent onsite flooding during extreme rainfall events.

(4). Develop emergency response procedures to maintain wastewater service continuity during hurricanes and major storm events.

(5). Consider alternative or supplemental power technologies for lift stations, such as solar photovoltaic systems with battery storage, to provide additional power resilience during grid outages.

(6). Evaluate the feasibility of microgrid systems or hybrid energy systems combining solar power, battery storage, and backup generators to improve redundancy and reliability for critical wastewater infrastructure.

5.2.3 EMERGENCY RESPONSE FACILITIES (FIRE STATIONS)

Fire stations are critical for emergency response during disasters and must remain operational during flooding events. Recommended strategies include:

(1). Elevate critical building systems, including electrical panels, communications equipment, and generators above projected flood levels.

(2). Install deployable flood barriers or floodproof doors to reduce water intrusion.

(3). Elevate emergency vehicles or relocate vehicle storage areas where flooding risk is significant.

(4). Ensure backup power and communication systems remain functional during prolonged flood events.

5.2.4 HEALTHCARE FACILITIES AND HOSPITALS

Healthcare facilities must maintain continuous operation during extreme events. Flood resilience strategies include:

(1). Elevate or floodproof mechanical, electrical, and medical support systems vulnerable to storm surge flooding.

(2). Ensure backup power systems and fuel storage are protected from floodwaters.

(3). Protect building access points and entrances using flood barriers or elevation improvements.

(4). Develop contingency plans to maintain critical medical services during flood disruptions.

5.2.5 SCHOOLS AND SHELTER FACILITIES

Schools represent a large share of public facilities and may serve as emergency shelters during disasters. Recommended measures include:

(1). Elevate critical infrastructure such as electrical systems, HVAC equipment, and generators above projected flood levels.

(2). Improve stormwater drainage systems around school campuses to reduce localized flooding during surge events.

(3). Retrofit selected schools to function as flood-resilient emergency shelters.

(4). Protect building entrances and utility rooms using flood barriers or floodproofing measures.

5.2.6 COMMUNITY FACILITIES

Community centers and other public facilities often serve as gathering points during emergencies and may experience flood-related disruptions. Recommended measures include:

(1). Elevate or floodproof critical mechanical and electrical equipment within facilities.

(2). Improve site drainage and install localized flood protection where feasible.

(3). Retrofit community facilities to support emergency operations during storm surge events.

5.2.7 LOCAL GOVERNMENT AND ADMINISTRATIVE FACILITIES

Local government facilities support emergency coordination and recovery operations. Recommended measures include:

(1). Protect critical information technology infrastructure from flood exposure.

(2). Elevate electrical systems and communications equipment above flood-prone levels.

(3). Ensure backup power systems are protected from storm surge flooding.

5.2.8 PARKS

Parks serve as vital spaces for recreation, community gatherings, and environmental stewardship, making their resilience essential during emergencies. Recommended measures include:

(1). Revise and enhance the Resiliency Master Plan to address evolving needs and resilience strategies.

(2). Establish living shorelines on waterfront parks to improve natural defenses and adaptation.

(3). Plant native vegetation that can withstand high storm surge events, maintain shoreline stabilization and encourage wildlife utilization.

(4). Develop additional amenities throughout sites to provide comfortable spaces for visitors to find relief from the heat.

(5). Modernize/enhance stormwater systems using resilient design strategies that incorporate green infrastructure. This may include upstream detention basins and bioretention areas to reduce flood risk, increase infiltration, improve water quality, and strengthen long term system adaptability.

5.2.9 TRANSPORTATION INFRASTRUCTURE

Transportation infrastructure serves as the backbone of community mobility and economic activity, enabling the safe and efficient movement of people, goods, and emergency services across the region. Recommended measures include:

(1). Incorporate green infrastructure strategies such as bioswales, permeable surfaces, and natural drainage features near bridge approaches and transportation corridors to reduce localized flooding during storm surge events.

(2). Integrate flood-resilient design considerations into transportation infrastructure upgrades, including bridge retrofits and roadway improvements located in surge-prone areas.

5.2.10 HOMEOWNER FLOOD RESILIENCE ACTIONS

While the current vulnerability assessment primarily focuses on critical facilities and public infrastructure, expanding the analysis to include private residential properties in high-risk storm surge areas could provide additional opportunities to reduce long-term community flood risk. Recommendation actions include:

(1). Encourage property-level flood mitigation measures such as elevating utilities, installing flood barriers, or floodproofing critical building components.

(2). Develop partnerships with community organizations to promote residential resilience and access to mitigation funding programs.

(3). Provide education and outreach programs to inform homeowners about flood risk and available mitigation strategies.

5.3 INDUSTRY STANDARDS COST ESTIMATION

The purpose of providing industry-standard cost estimates for resilience upgrades and mitigation measures is to offer a preliminary reference for budgeting and planning. These estimates are intended to guide stakeholders in understanding potential financial requirements before undertaking detailed facility-level analyses. However, it is important to note that such figures are broad benchmarks only; actual costs may differ significantly depending on the project scale, location, facility age, current condition, and site-specific vulnerabilities. Published guidelines, historical benchmarks, and typical wage rates, equipment pricing guides, and material cost references are used to inform these estimates, with adjustments made to reflect regional context where appropriate. Despite these adjustments, the estimates do not reflect the unique specifics of Charlotte County and should not be relied upon for definitive budgeting. Labor, equipment, and material pricing are based on generalized rates and market data, and while regional conditions are considered, a detailed analysis for Charlotte County has not been conducted. For precise budgeting and implementation, a thorough facility-level assessment is required to address the unique needs of each asset and ensure accuracy.

Table 15 Industry Standard Costs Reference

Recommended Actions	Note	Unit	Estimated Unit Cost (2025$)
Temporary Flood Barriers & Deployable Floodwalls		Square foot	$372.79
Floodwalls		Square foot	$70.62
Asset Elevation	Up to 1 ft	Each	$3,529
Asset Elevation	1-6 ft	Each	$6,072
Dry Flood Proofing	Seal Building Wall	Square foot	$0.7
	Permanently Seal Building Openings	Each	$8,048
	Temporarily Flood Shields for Openings	Each	$4,158
	Building Interior Drainage	Each	$7,739
Sandbag and sandbag alternatives		Linear foot	$27.02
Detention ponds		Acre	$109,760.18
Permeable pavers		Square foot	$40.96

5.4 POTENTIAL FUNDING SOURCES

Identifying and securing potential funding sources is a critical step in advancing resilience initiatives for county infrastructure and emergency facilities. Access to federal and state programs can significantly bolster the county's capacity to implement mitigation measures and respond effectively to climate-related hazards. By leveraging these funding opportunities, local authorities can ensure that vital assets remain operational during emergencies, while also fostering long-term community safety and sustainability.

5.4.1 POTENTIAL FEDERAL AND STATE FUNDING SOURCES

Table 16 lists potential federal and state funding sources that can be accessed to support county resilience projects. By utilizing these resources, local authorities can strengthen the operational reliability of vital assets during emergencies and promote long-term community safety and sustainability.

Table 16 Potential Federal and State Funding Sources Funding Sources

Funding Source	Level	Notes
FEMA Building Resilient Infrastructure and Communities (BRIC)	Federal	The program aims to support communities as they build capability and capacity. BRIC also encourages and aids innovation. It helps partnerships grow; supports infrastructure projects; and fosters flexibility and consistency.
FEMA Hazard Mitigation Grant Program (HMGP)	Federal	Available following federal disaster declarations to support mitigation projects that reduce future disaster losses. To receive HMGP funding, all state, local, tribal and territorial governments must develop and adopt hazard mitigation plans.
HUD Community Development Block Grant - Mitigation (CDBG-MIT)	Federal	CDBG Mitigation (CDBG-MIT) is a unique and significant opportunity for eligible grantees to use this assistance in areas impacted by recent disasters to carry out strategic and high-impact activities to mitigate disaster risks and reduce future losses.
USDOT Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation (PROTECT)	Federal	PROTECT provides funding to ensure surface transportation resilience to natural hazards including climate change, sea level change, flooding, extreme weather events, and other natural disasters through support of planning activities, resilience improvements, community resilience and evacuation routes, and at-risk coastal infrastructure.
NOAA Coastal Resilience Grants	Federal	The National Coastal Resilience Fund is a partnership between the National Fish and Wildlife Foundation and NOAA to enhance fish and wildlife habitat and protect coastal communities. The focus for these projects is on restoring, increasing, and strengthening natural infrastructure to protect communities while also enhancing habitats for fish and wildlife.
U.S. Fish and Wildlife Service Coastal Program	Federal	The program often supports ecosystem-based solutions that provide both environmental and flood resilience benefits.
NFWF National Coastal Resilience Fund	Federal	NFWF will make investments in planning, design, and implementation of nature-based solutions to enhance protection for coastal communities from the impacts of storms, floods, and other natural hazards while improving habitats for fish and wildlife.

Funding Source	Level	Notes
Better Utilizing Investments to Leverage Development (BUILD) Grant Program | US Department of Transportation	Federal	The BUILD grant program provides grants for surface transportation infrastructure projects with significant local or regional impact. Project sponsors, including state and local governments, counties, Tribal governments, transit agencies, and port authorities, can pursue multi-modal and multi-jurisdictional projects that are more difficult to fund through other grant programs.
USDOT Reconnecting Communities Pilot Program	Federal	Reconnecting Communities Pilot Program will restore community connectivity by removing, retrofitting, or mitigating highways or other transportation facilities that create barriers to community connectivity, including to mobility, access, or economic development.
DOI Refuge System Resiliency	Federal	To fund projects on National Wildlife Refuges and state wildlife management areas that combat invasive species, restore and increase the resiliency of habitats, and/or build resilient infrastructure, with a focus on nature-based solutions where possible.
USDA Watershed and Flood Prevention Operations	Federal	Provides planning, design and construction of measures that address resource concerns in a watershed.
USDA State Fire Assistance	Federal	Through the State Fire Assistance program, the Forest Service supports and assists State Foresters and local communities in building capacity for wildfire prevention, mitigation, control, and suppression on non-Federal lands. The program helps State agencies create more fire-adapted communities by implementing pre-fire prevention and mitigation programs and emphasizing pre-fire planning and risk reduction in the Wildland Urban Interface. The program funds important training in safer initial attack responses to wildfire that are also effective. Additionally, the program improves capacity to assist other Federal, State, and local agencies in aiding communities affected by fire and non-fire emergencies, such as hurricanes and floods.
FEMA Emergency Management Performance Grant (EMPG)	Federal	The Emergency Management Performance Grant provides state, local, tribal and territorial emergency management agencies with the resources required for implementation of the National Preparedness System. The EMPG's allowable costs support efforts to build and sustain core capabilities across the prevention, protection, mitigation, response and recovery mission areas.
FEMA Safeguarding Tomorrow Revolving Loan Fund Program (STORM)	Federal	Provides capitalization grants to states, eligible federally recognized tribes, territories and the District of Columbia to establish revolving loan funds that provide

Funding Source	Level	Notes
		hazard mitigation assistance for local governments to reduce risks from natural hazards and disasters.
FEMA Flood Mitigation Assistance Grants (National Flood Insurance Act Sec 1366)	Federal	The Flood Mitigation Assistance program makes Federal funds available to States, U.S. territories, Federally recognized Tribal governments, and local communities to reduce or eliminate the risk of repetitive flood damage to buildings and structures insured by the National Flood Insurance Program (NFIP), and with NFIP-participating communities.
USDA Emergency Community Water Assistance Grants (ECWAG)	Federal	This program helps eligible communities prepare, or recover from, an emergency that threatens the availability of safe, reliable drinking water. Events that can qualify as an emergency include: drought or flood, earthquake, tornado or hurricane, disease outbreak, chemical spill, leak or seepage, other disasters.
EPA Water Infrastructure Finance and Innovation Program	Federal	The WIFIA program accelerates investment in water and wastewater infrastructure of national and regional significance by offering creditworthy borrowers loans for up to 49 percent of eligible project costs. WIFIA can fund planning, design, and construction activities for a wide variety of eligible water infrastructure projects.
Florida Resilient Coastlines Program (FDEP)	State	The Resilient Florida Program includes a selection of grants that are available to counties, municipalities, special districts with specific responsibilities and regional resilience entities. To effectively address the impacts of flooding and sea level change that the state faces, eligible applicants may receive funding assistance to analyze and plan for vulnerabilities, as well as implement projects for adaptation and mitigation.
Florida Fish and Wildlife Conservation Commission (FWC) Grants	State	Supports environmental restoration efforts that can also reduce coastal flood risks.

5.4.2 ALTERNATIVE FUNDING SOURCES

Charlotte County faces a likely public funding gap for future resilience investments. To help address this, we recommend developing a Resilience Funding and Financing Blueprint tailored to the County's key investment needs.

The blueprint development would involve three workstreams. First, a focused review of Charlotte County's resilience funding landscape, evaluating and prioritizing the most promising federal, state, and local funding opportunities. Second, an assessment of local revenue sources best suited to resilience expenditures — such as project revenues, performance-based incentives, taxes, charges, and tradable credits. Third, once specific projects are identified, the development of optimal funding and financing structures, including capital stacks aligned to project types, priorities, and capex/OpEx needs — drawing on instruments such as long-term debt, bonds, public-private partnerships, and revolving loan funds where appropriate.

The resulting blueprint would provide decision-making frameworks for revenue and financing, as well as an implementation guide for deploying these mechanisms across different resilience investment types over the short, medium, and long term.

6 SUMMARY

This document represents an intermediate step in the County's resilience planning process. The identification and ranking of facilities within Adaptation Focus Areas establishes a foundation for future, more detailed analyses, including facility-level vulnerability assessments and project development efforts. Upon completion of this task, the ranked facilities and focus areas are anticipated to inform subsequent phases of work, including the prioritization of assets for detailed evaluation, concept-level adaptation strategy development, and advancement of implementation-ready projects. These next steps are expected to be pursued through future funding opportunities, such as the Resilient Florida Grant Program, allowing the County to transition from planning-level identification to targeted resilience investments.