CITY OF ISLE OF PALMS

SEA LEVEL RISE ADAPTATION PLAN

2024

SEAMONWHITESIDE

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ACKNOWLEDGMENTS

Sandra Brotherton
Environmental Advisory Committee

Dane Buckout
Environmental Advisory Committee

Nicole Elko, PhD
Elko Coastal Consulting

Elizabeth Fly
The Nature Conservancy

Doug Hatler
Environmental Advisory Committee

Rick Karkowski, PE
Thomas & Hutton

Douglas Kerr
City of Isle of Palms

Laura Lovins
Environmental Advisory Committee

Todd Murphy
Environmental Advisory Committee

Belvin Olasov
Environmental Advisory Committee

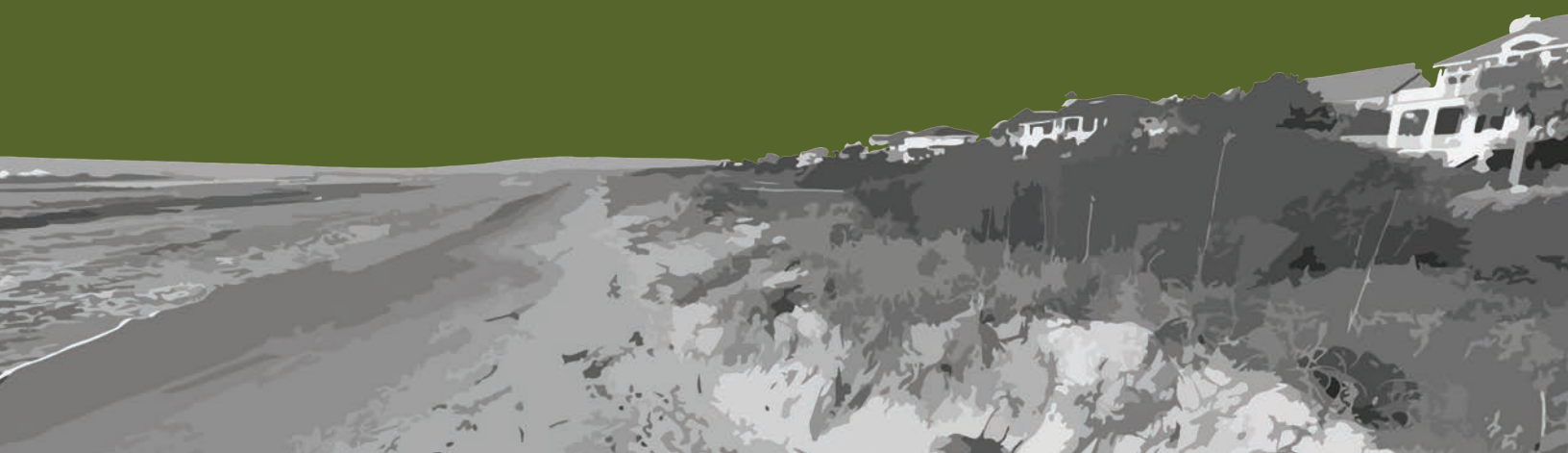
Mary Pringle
Environmental Advisory Committee

Matt Simms
City of Isle of Palms

Lucia Spiotta
Environmental Advisory Committee

Steve Traynum
Coastal Science & Engineering

INTRODUCTION



EXECUTIVE SUMMARY

The City of Isle of Palms is a focal point for the Charleston area, is home to thousands of residents, and serves as a vacationing playground for millions around the globe. Life on Isle of Palms depends on a pristine landscape and flowing coastal waterways. However, sea level rise may cause those recreational waterways to become the City's greatest threat if ignored. Based on the premonition of future flooding from sea level rise, the City has made an instrumental decision to begin planning for the future.

The purpose of this Sea Level Rise Adaptation Plan is to outline the potential risk due to sea level rise and outline strategies to mitigate against its effects.

The sea level rise and vulnerability analysis completed for this plan determined that an appropriate elevation target to mitigate/protect against future sea level rise is 7 feet NAVD88 (~10 feet MLLW) which should provide protection for the vast majority of tidal events (~99.5% based on statistical data; excluding hurricanes and/or tropical storm events) experienced in the year 2050.

Adaptation strategies that the City should consider implementing to help mitigate the impacts of sea level rise are assessed in this plan (along with suggested implementation timelines) and divided into three categories: Policies, Projects, and Programs. "Policies" cover adaptation strategies that can be initiated at an administrative level or through City Council (i.e., updates to zoning or building ordinances, additional plans or studies needed, etc.). "Projects" are physical construction projects that the City can implement to help bolster the resiliency of the island against future sea level rise (i.e., perimeter protection, green infrastructure/LID, stormwater improvements, septic to sewer conversion, etc.). "Programs" are educational opportunities and incentivization strategies aimed at engaging citizens and leveraging their assistance on private property to bolster their community's resiliency.

This sea level rise adaptation plan should be considered a "living document" and as such should be reviewed and updated every 5 years to ensure continued relevance and effectiveness.

CURRENT & ONGOING PROJECTS

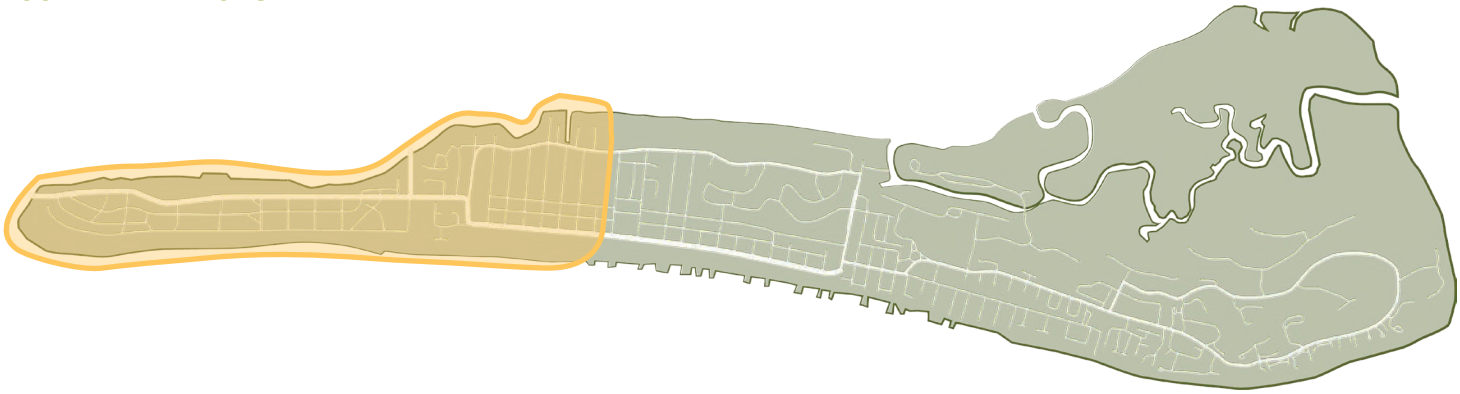
1 DRAINAGE STUDY & MASTER PLAN

2 WATERWAY BLVD. IMPROVEMENTS

3 BEACH PRESERVATION

1 DRAINAGE STUDY & MASTER PLAN

COMPLETED 2023



A comprehensive drainage study was recently (2023) completed for the area between Breach Inlet and 29th Avenue. The purpose of this study was to complete a full inventory and assessment (including documentation and recommendations of immediate maintenance priorities) of existing drainage infrastructure and develop solutions to address systemic rainfall and tidal-driven flooding.

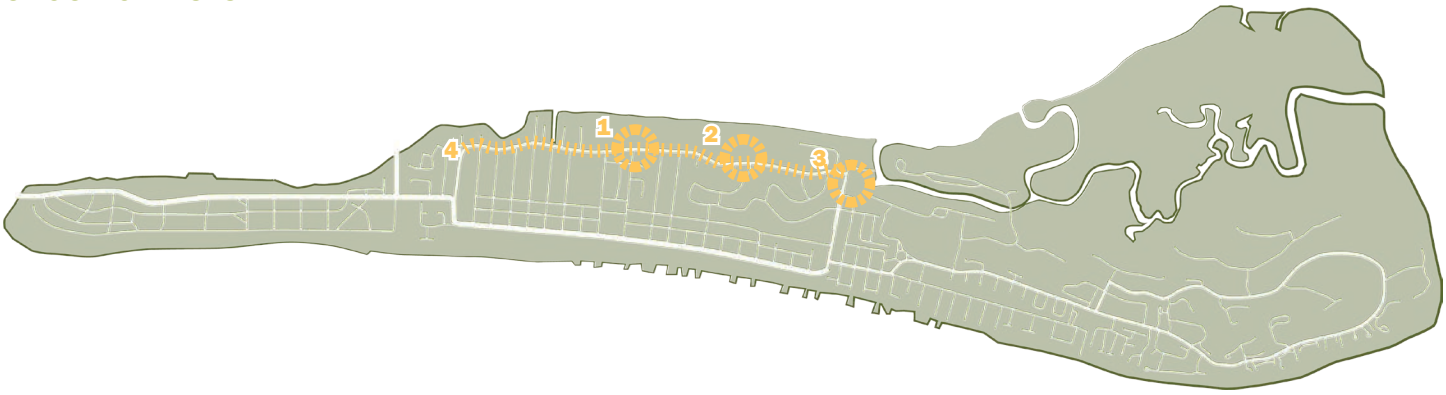
Additional components included providing resilience planning to address future climate change conditions in project recommendations, public engagement and involvement using stakeholder meetings and web-based tools, deploying real-time monitoring stations to calibrate/validate hydraulic analyses, reviewing and recommending changes to existing stormwater ordinances, and assessing potential funding avenues/sources (i.e., state or federal grants) for recommended projects.

This study resulted in approximately 31 drainage improvement projects (with priority established) being recommended to mitigate flooding and sea level rise. These projects included a diverse mix of infrastructure improvements including low impact development, green infrastructure, pipe upgrades, cleaning out interior canals/ditches, installation of tide gates, dune infiltration systems, and vegetated berms. The next step will be for the City to secure funding for the design and construction of the high priority improvements (primarily the outfall and major improvements seen in Figure 1).

Figure 1
Approximate locations of project recommendations (Davis & Floyd, 2023).

2 WATERWAY BLVD. IMPROVEMENTS

ONGOING + FUTURE



1 30th Street Improvements

2 Forest Trail Improvements

3 41st Avenue Improvements

Originally initiated by City Council in 2017, a drainage study was completed for the area between 29th Avenue and 41st Avenue. Outfall improvements recommended as part of this study have been completed for the drainage systems at 30th Avenue, 36th Avenue, and 41st Avenue. These outfall improvements will provide significant mitigation against tidal flooding as well as provide ancillary benefits to the performance of the upstream drainage infrastructure.

Additional smaller drainage improvements are also planned for areas around Sparrow Drive, Forest Trail, Cross Lane, and 32nd Avenue.

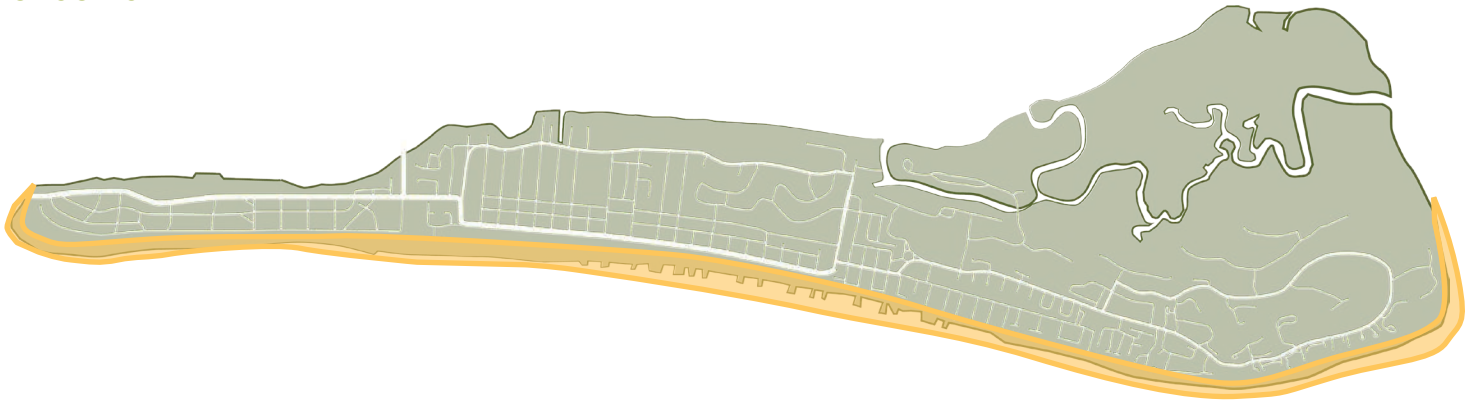
4 WATERWAY BLVD. MULTI-USE PATH ELEVATION PROJECT

The City is currently working on the design and engineering of the 1.7 mile Waterway Boulevard Multi-Use Path, which seeks to raise the path, while also improving local drainage and adding tide gates and valves to eliminate tidal intrusion.

The original study recommended a plan to improve tidal flooding protection to elevation 6 feet (NAVD 88), which would protect the City from most king tides. The City is evaluating the feasibility of increasing the level of protection by elevating the path an additional foot and pursuing grant funding to implement this project.

3 BEACH PRESERVATION

ONGOING



Beach preservation and stabilization will be critical to the long-term resiliency of the City of Isle of Palms. While the majority of the island's beachfront is stable or even naturally accretional, there are portions (i.e., Breach Inlet and the north end) which are highly dynamic and erosional. As such there have been several beach renourishment projects over the past few decades to help stabilize some of these areas.

The city sponsors periodic monitoring and analysis of the shoreline to assess stability and determine if interventions are necessary. The most recent study was completed by Coastal Science & Engineering in May of 2024 and makes several recommendations to address current and future beach erosion. The majority of these recommendations focus on renourishment efforts to the north end of the island as well as Breach Inlet.

Analysis of the north end concluded that while shoal migration events have generally added to the sand supply, episodic erosional patterns have resulted in a net loss, typically migrating sand supply downcoast that helps to maintain the rest of the island. It was recommended that periodic addition of sand (approximately 100,000 cubic yards of sand per year on average) occur at this location, sourced from offshore nourishment projects.

North Wild Dunes

Breach Inlet, conversely, has experienced accelerated erosion over the past few years resulting in critically eroded areas. A historically accreational area, increased storm activity and impacts of sea level rise are contributing factors to the increased erosion rate. Unless these recent trends reverse, it was recommended that the area be re-nourished at a rate of approximately 68,000 cubic yards of sand per year on average.

Breach Inlet

Overall, the study recommends that the City plan on completing these recommended renourishment efforts every 8-10 years (on average) after initial stabilization efforts are completed. Costs for completing these initial renourishment efforts were estimated at approximately $22 million, with future efforts assuming a 3% increase per year to account for inflation. It was recommended that the City of Isle of Palms does not solely bear the full cost of these improvements, and instead should seek cost-sharing opportunities (i.e., with Wild Dunes or Sullivan's Island), state beach nourishment assistance, and federal funding.

COMMUNITY & ENGAGEMENT

PUBLIC SURVEY

As part of this Sea Level Rise Adaptation Plan, community feedback was gathered via an online survey with the following questions:

PART 1: SEA LEVEL RISE IMPACTS & STRATEGIES

1. How concerned are you about the long term impacts of sea level rise on Isle of Palms?

1. Not at all concerned
2. Somewhat concerned, but other issues feel more pressing
3. Concerned - this is as important as many other issues facing IOP
4. Very concerned - this is the most critical issue
5. Other/Need more information

2. Please select the concerns related to increasing water levels you are most worried about:

1. Storm and tidal flooding
2. Road closures and infrastructure damage from flooding
3. Loss of native ecological habitat
4. Septic and wastewater contamination
5. Displacement of residents
6. Other

3. Please select the sea level rise strategies you would like to see on Isle of Palms:

1. Dune re-nourishment
2. Improved storm drains
3. Underground stormwater storage
4. Living shorelines
5. Tidal control structures on drainage pipes
6. Vegetated berms along the marsh
7. Clean out interior canals for better drainage
8. Low impact drainage (rain gardens and bioswales)
9. Other/Need more information

4. The following are potential incentive programs targeted at encouraging homeowners and residents to bolster their property and neighbors' property from sea level rise. What, if any, would you consider participating in?

1. Using rain barrels (to capture runoff for yard irrigation)
2. Adding rain gardens or bioswales in flood prone yards
3. Replacing lawn with native planting
4. Increasing tree canopy
5. Upgrading from septic to sewer
6. Reducing impervious surfaces
7. Installing a green roof
8. Adding a pollinator garden
9. Other

PART 2: SITE SPECIFIC CONCERNS

1. Which of the following categories best describes your concerns:

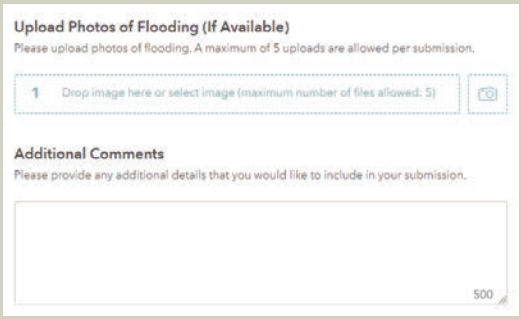
1. Flooding
2. Septic tank concern
3. Natural/critical habitat concern
4. Beach erosion
5. Damage to structures
6. Damage to infrastructure (including pipes, drains, sidewalks, roads)
7. Other

2. Please locate on this map your area(s) of concern:

3. Severity of concern:

1. Nuisance
2. Minor
3. Severe

4. Photo upload and additional comments:



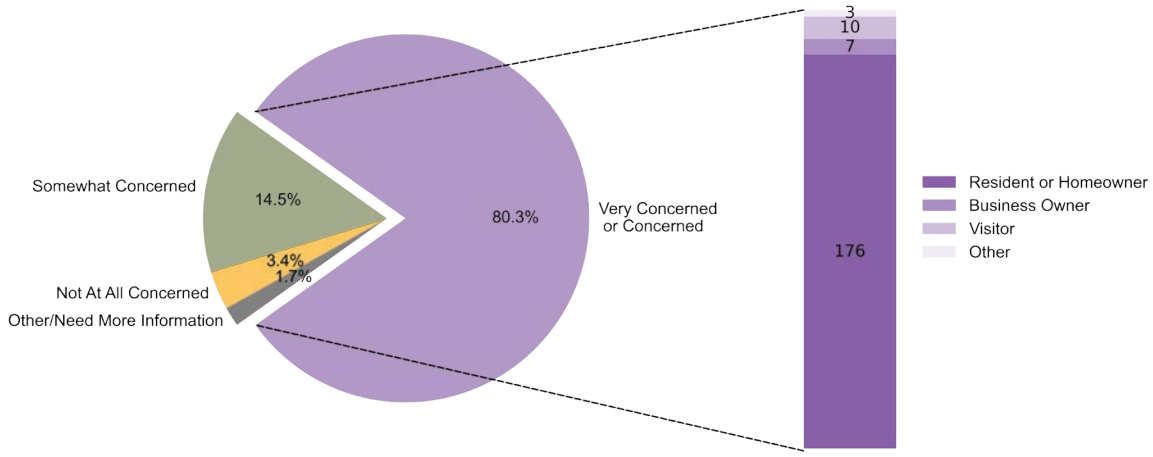
SURVEY RESULTS

Level of Concern

Of the 233 responses, the vast majority of respondents were very concerned or concerned about the impacts of sea level rise. Of those respondents who were concerned or very concerned, most were residents or homeowners. A small fraction of the respondents were somewhat or not at all concerned.

233 RESPONSES

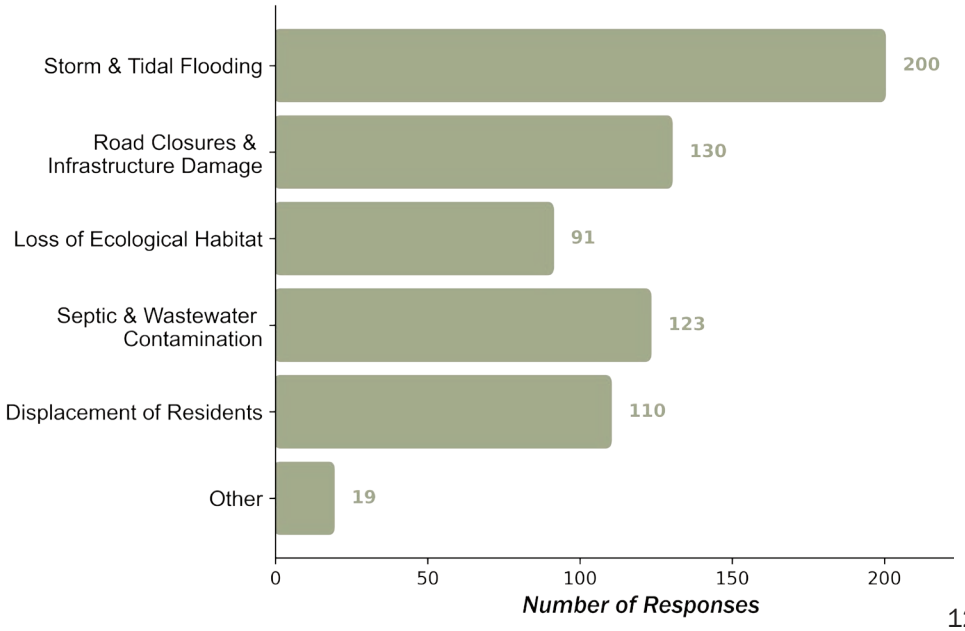
221 Residents/Homeowners
9 Business owners
10 Visitors
4 Other



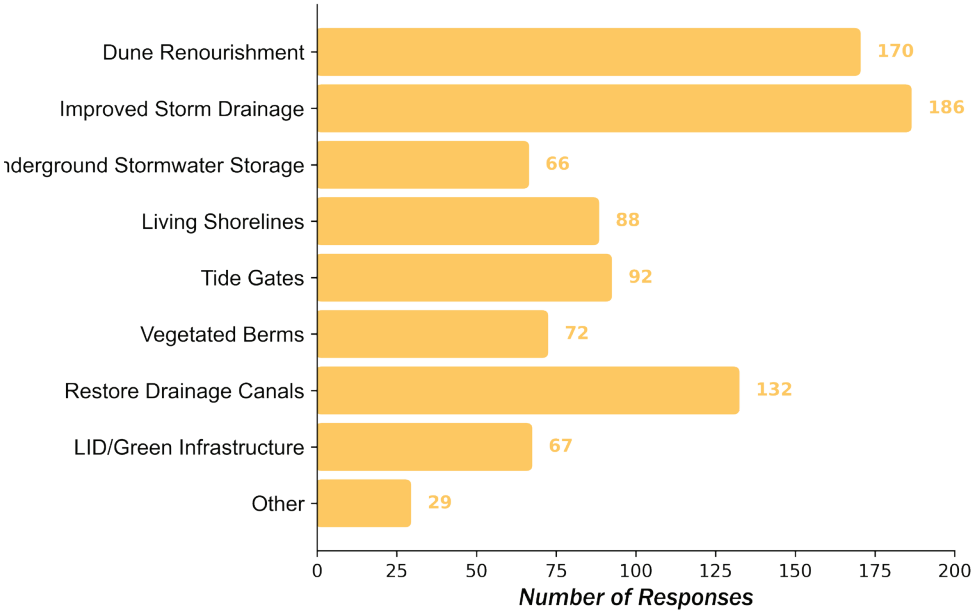
"We are worried about the long-term viability of living on the island. It's our home and we don't want to go anywhere else..."

Areas of Concern

Respondents were asked to choose what sea level rise impacts they were most concerned about. Storm and tidal flooding were identified as the highest area of concern amongst respondents. Road and infrastructure damage as well as septic contamination received the next most selections.

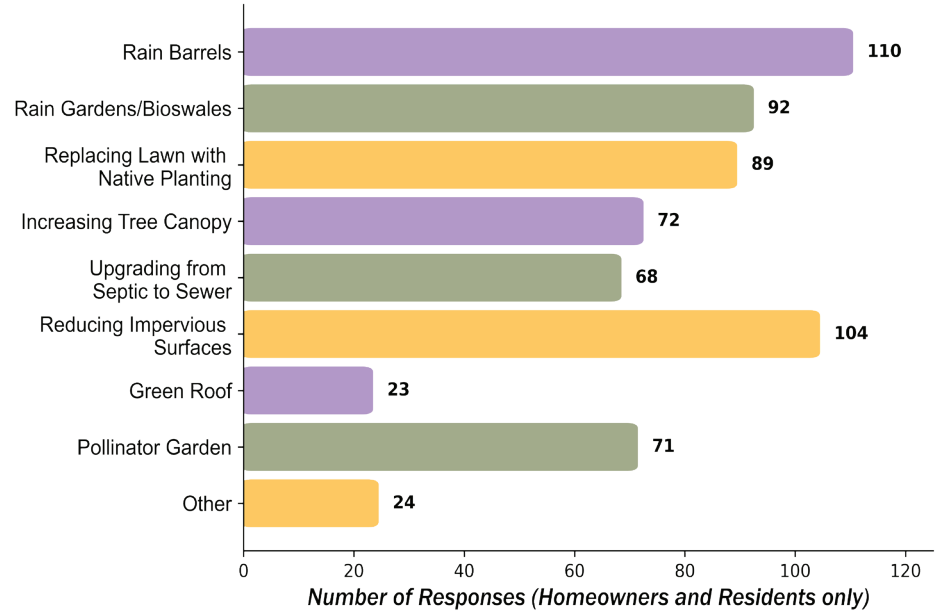


SURVEY RESULTS



SLR Strategy Interest

Respondents were asked to select the adaptation strategies they would most like to see the City implement. Improving storm drainage and dune renourishment were top selections. While green infrastructure strategies were not selected as frequently, they should still be considered for a holistic adaptation approach.



Incentive Program Interest

Respondents were asked to select incentive programs they would be interested in participating in that would involve strategies to help mitigate the impacts of sea level rise on their properties. The top selections were rain barrels, reducing impervious surfaces, rain gardens/ bioswales, and replacing turf with native panting. These strategies should be considered if the City were to adapt incentive programs moving forward.

"Extremely concerned about flooding in our area. The extent of water intrusion into our yard and garage has increased significantly over the past few years..."

COMMITTEE MEETINGS

The following meetings happened during the spring of 2024 to help guide the creation of this planning document and establish known concerns regarding sea level rise on Isle of Palms.

TECHNICAL REVIEW COMMITTEE

2/22/2024

The Isle of Palms Technical Review Committee discussed the goals and strategies for the Sea Level Rise Adaptation Plan, emphasizing actionable steps to protect infrastructure, and maintain community livability amidst rising sea levels and coastal flooding.

The committee reviewed existing data, completed and ongoing projects, and considered strategies from other communities like Folly Beach and Charleston to guide their efforts.

The meeting concluded with plans for future community engagement and coordination with the Planning Commission.

PLANNING COMMISSION

5/08/2024

During the Isle of Palms Planning Commission workshop on the Sea Level Rise Adaptation Plan, the Planning Commission reviewed the project background, sea level rise projections through 2050, and discussed actionable strategies.

The workshop focused on the results from a preliminary vulnerability analysis and potential policies, programs, and projects which may mitigate these risks.

ENVIRONMENTAL ADVISORY COMMITTEE

5/09/2024

During the Environmental Advisory Committee meeting, the same feedback was generated as the Planning Commission Workshop. See the Planning Commission Meeting for details.

Additionally, the Environmental Advisory Committee provided valuable feedback on environmental issues facing the island including subsidence, areas of known flooding, and the importance of low-impact development. Their feedback was instrumental in guiding the key elements of the plan.

SEA LEVEL RISE AND VULNERABILITY ANALYSIS

INTRODUCTION OF TIDAL DATUMS

Tidal datums are the elevation reference used for measuring local water levels and communicating this data to the public. The specific elevation reference used to establish common tidal datums is based on different statistical interpretations of observed tidal data within the most recent tidal epoch, or 19-year observation window. The current established tidal epoch is from 1983 through 2001 and is considered for revision every 20-25 years.

Tidal data is commonly presented as a height relative to Mean Lower-Low Water (MLLW). MLLW is a tidal datum whose reference elevation is set as the average of the daily lowest tide measurements observed during the most current tidal epoch. For example, if it is forecasted that an 8-foot tide will occur, this water level is equivalent to 8 feet above the MLLW reference elevation for a location. Given that the current tidal epoch ended in 2001, an updated tidal epoch and subsequent reference elevations are possible. Therefore, tides expressed in MLLW today may not be equivalent to tides expressed in MLLW in the future.

To provide consistency for this sea level rise adaptation plan and simplify planning and engineering design efforts, tidal data presented herein are benchmarked to a fixed reference of the North American Vertical Datum 1988 (NAVD 88).

For additional information regarding tidal datums please visit the following NOAA webpage: **Tidal Datums**

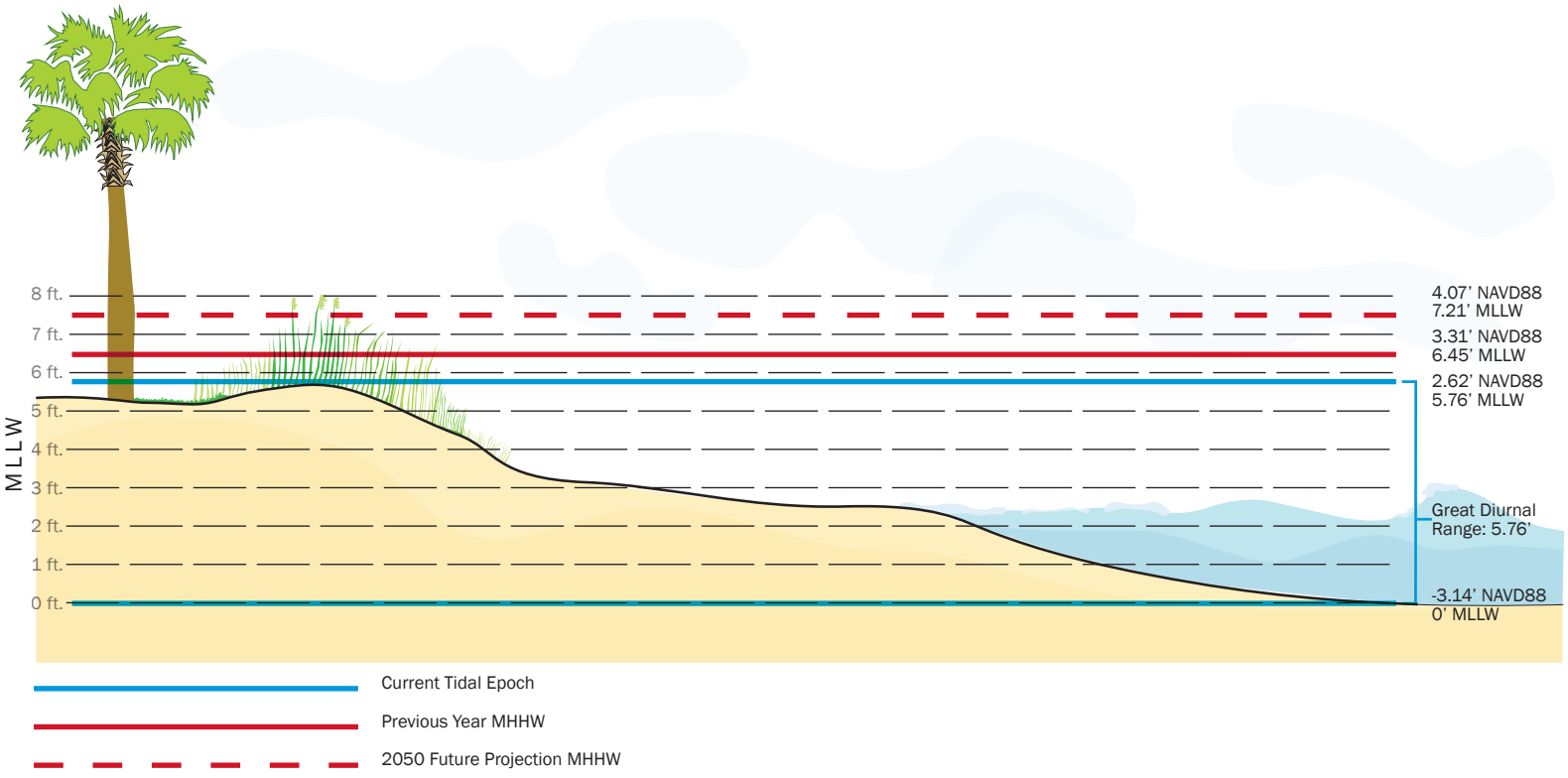


Figure 2
Historic and projected tidal datums based on the Charleston Harbor NOAA Station (Station 8665530).

SEA LEVEL RISE

A sea level rise analysis was performed to establish baseline tidal conditions and determine the target elevation that the City, planners, and engineers should use as guidance when developing flood mitigation solutions.

Baseline Tidal Conditions

The baseline tidal conditions for this analysis were established using observations from the Charleston Harbor NOAA Station (Station 8665530). This station has been collecting high-resolution tidal water level data for several decades over which increases in sea level can be observed (see Figure 3).

The baseline tidal elevation for this sea level rise analysis was based on statistical interpretations of the observed daily higher-high tides for 2023 (see Figure 4). This year represents an excellent baseline for quantifying future sea level rise because: 1) it is the most recent observation year, 2) the mean higher-high tide for the year aligns with long-term data trends, and 3) several extreme tidal events occurred during 2023 with the most extreme occurring outside of a hurricane or tropical storm event. To provide a conservative baseline for providing coastal protection, the 99.5% daily higher-high tide (5.97 ft NAVD 88) for the year 2023 was selected as the baseline tidal elevation for this analysis.

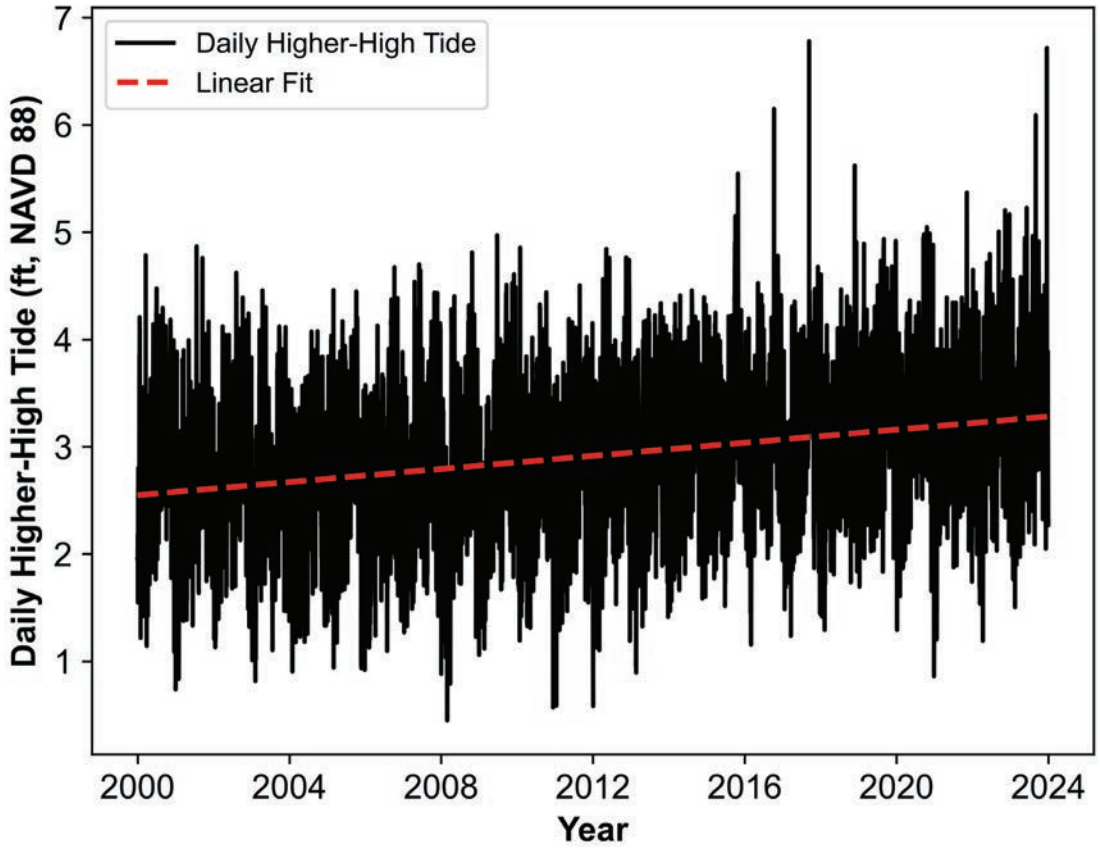


Figure 3
Daily higher-high tide from 2000-2023 for Charleston, SC (NOAA Station ID 8665530) along with a linear fit of the data.

Sea Level Rise Projections

Projections of future sea level rise have been established by the Sea Level Rise and Coastal Flood Hazard Scenarios and Tools Interagency Task Force. The projections and scenarios presented by this task force represent the most comprehensive and current (last updated 2022) information when investigating the impact of sea level rise along the U.S. coastline.

Overall, sea level rise projections presented by the task force represent the results of scenarios based on climate models which result in varying levels of risk and probability. Individual components included in these projections include sterodynamic sea level change (changes in ocean circulation, temperature, and salinity), impacts from glaciers, changes in land water storage (variability in the global water cycle), changes to the Greenland and Antarctic ice sheets, and estimates for land subsidence. For the purposes of this planning document, the intermediate projection for the year 2050 was selected as the sea level rise scenario to determine the local impact of future sea level rise.

For additional information regarding sea level rise scenarios please visit: Sea Level Rise Projections

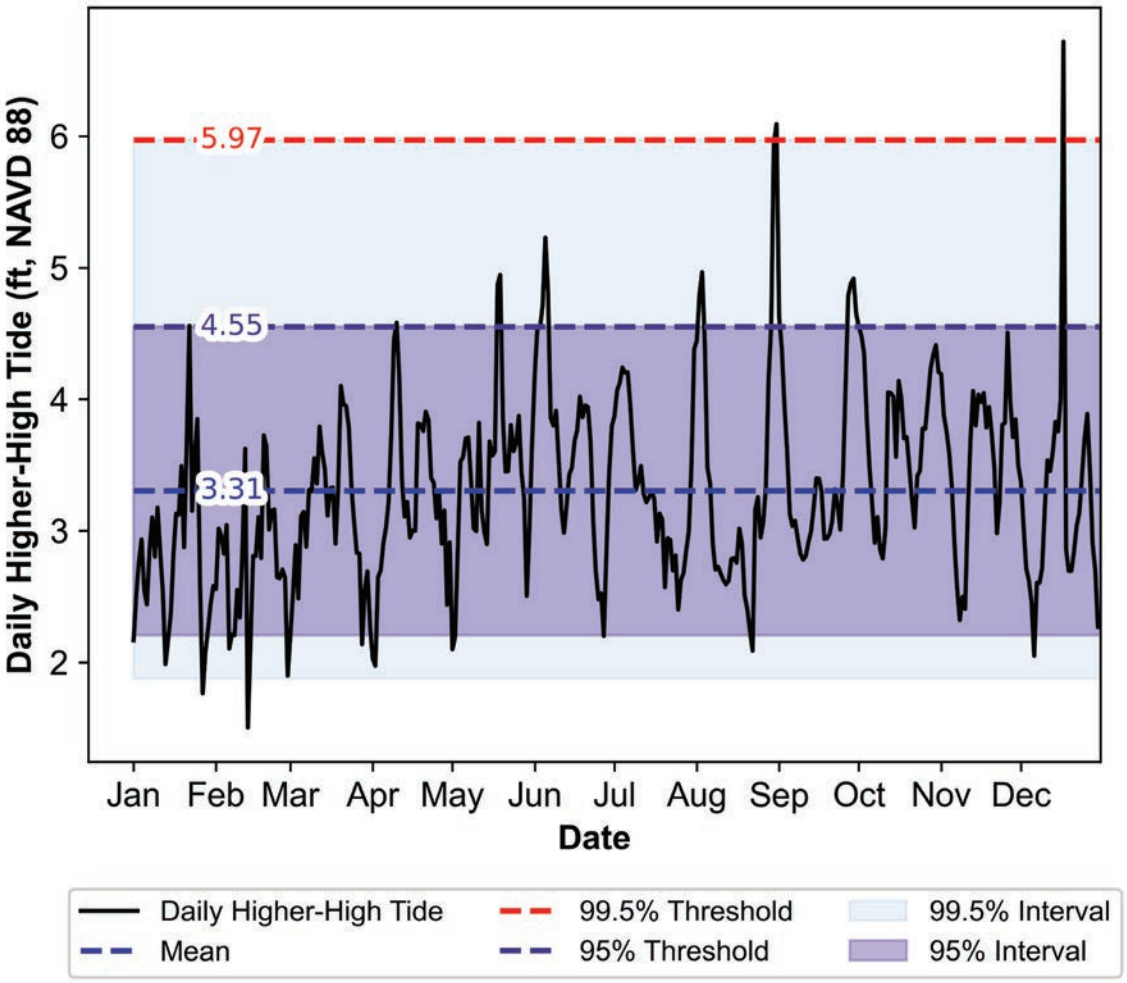


Figure 4
Daily higher-hide tide for Charleston, SC (NOAA Station ID 8665530) during 2023 along with quantile thresholds.

Localized Vertical Land Subsidence

An additional hazard affecting coastal communities is vertical land subsidence, or the rate at which the surrounding landscape is sinking. It is hypothesized that the major contributors to this phenomenon include ground-water extraction and soil compaction in urban areas. While sea level rise projections from the Interagency Task Force do account for some level of vertical land subsidence, these estimates are not based on localized, higher-resolution data. The full interagency report recommends integrating higher-resolution data when available to be able to assess the impact of vertical land motion at finer scales (i.e., at the community level) whose rates may not be representative (i.e., communities with increased vertical land motion rates) of what is approximated in the sea level rise projections.

Higher resolution data for the City of Isle of Palms is available. Research has quantified these rates for the entirety of the U.S. eastern coastline based on vertical land motion data from 2007 to 2020 published by the United States Geological Survey. Analysis of the data points available within the municipal boundary for the City of Isle of Palms concluded that on average the landscape was sinking at a rate of approximately 0.15 inches/year. This rate far outpaces what is estimated in the interagency sea level rise projections. Therefore, this data was incorporated into this study as a supplemental sea level rise component (in addition to the vertical land motion rates included in the projections) to provide more conservative sea level rise projections for the City.

For additional information regarding this research on vertical land subsidence please visit:
Vertical Land Subsidence Research

2050 Sea Level Rise Mitigation Target

The previous datasets were used in the development of a sea level rise mitigation target for the City of Isle of Palms for the year 2050. Based on this analysis, the elevation target to mitigate/protect against future sea level rise is 7 feet NAVD88 (see Table 1; ~10 feet MLLW) which should provide protection for the vast majority of typical tides (excluding hurricanes and/or tropical storm events) experienced in the year 2050.

Table 1
Development of elevation target to mitigate future sea level rise

Individual Components	Value
Current MHHW (2023; 99.5% Threshold)	5.97 feet NAVD88
Projected Sea Level Rise (Intermediate Scenario; Projected 2024 to 2050)	0.763 feet
Vertical Land Subsidence (Average Observed; Projected 2024 to 2050)	0.329 feet
Sea Level Rise Target (2050)	**7.061 feet NAVD88**

Sea Level Rise Target (2050) is elevation 7' NAVD88

VULNERABILITY ANALYSIS

To assist planning efforts of potential mitigation projects, a vulnerability analysis was performed to identify impacted critical infrastructure and areas at risk of tidal flooding.

This vulnerability analysis was performed using a 2D HEC-RAS model developed to simulate overland flow processes and the island's response to tidal-driven flooding. Several tidal boundary conditions were analyzed within this analysis representative of the tidal elevations for the years 2023, 2030, 2040, and 2050 (developed using the previously discussed methodology; see Table 2) to allow this analysis to identify which areas/infrastructure would be most immediately impacted.

Each tide cycle was developed based on an idealized tide cycle with a frequency of 12.5 hours wherein the peak and amplitude were determined using the MHHW (2.62 feet NAVD 88) and MLLW (-3.14 feet NAVD88) tidal values from the Charleston Harbor NOAA Station (Station 8665530) and shifted vertically to match the peak tide elevation for each target year.

Table 2
Development of additional elevation targets used to develop tide cycles for the vulnerability analysis.

Target Year	Individual Components	Value
2023	Current MHHW (2023; 99.5% Threshold)	5.97 feet NAVD88
	Projected Sea Level Rise	N/A
	Vertical Land Subsidence	N/A
	Sea Level Rise Target (2023)	**5.97 feet NAVD88**
2030	Current MHHW (2023; 99.5% Threshold)	5.97 feet NAVD88
	Projected Sea Level Rise (Intermediate Scenario; Projected 2024 to 2030)	0.153 feet
	Vertical Land Subsidence (Average Observed; Projected 2024 to 2030)	0.076 feet
	Sea Level Rise Target (2030)	**6.199 feet NAVD88**
2040	Current MHHW (2023; 99.5% Threshold)	5.97 feet NAVD88
	Projected Sea Level Rise (Intermediate Scenario; Projected 2024 to 2040)	0.442 feet
	Vertical Land Subsidence (Average Observed; Projected 2024 to 2030	0.202 feet
	Sea Level Rise Target (2040)	**6.614 feet NAVD88**

Post-processing of the results from the vulnerability analysis allowed for maximum flood inundation boundaries to be developed for each tidal scenario. These flood inundation boundaries are useful tools for communicating flood risk at different timescales across the island.

However, it is important to note that inaccuracies in the simulated flood boundaries are possible due to model limitations. For example, the model does not account for recent projects which may mitigate tidal flow paths as well as stormwater networks which through tidal backflow may allow tides to ingress further into the island. Additionally, this model assumes stagnant topographic elevations and does not evaluate erosional and accretional forces which may impact the City. It should be assumed for the purposes of this analysis that continued preservation of the beach and dune systems occur as outlined in the beach management plan.

Therefore, these flood boundaries and results should be considered for planning purposes only. An example of this can be found in Figure 5 which depicts the results of the vulnerability analysis for an area near the intersection of Palm Boulevard and 4th Avenue. Please reference Appendix A for the results of this analysis across the entire island.

Figure 5
Example results from the vulnerability analysis near Palm Boulevard and 4th Avenue.

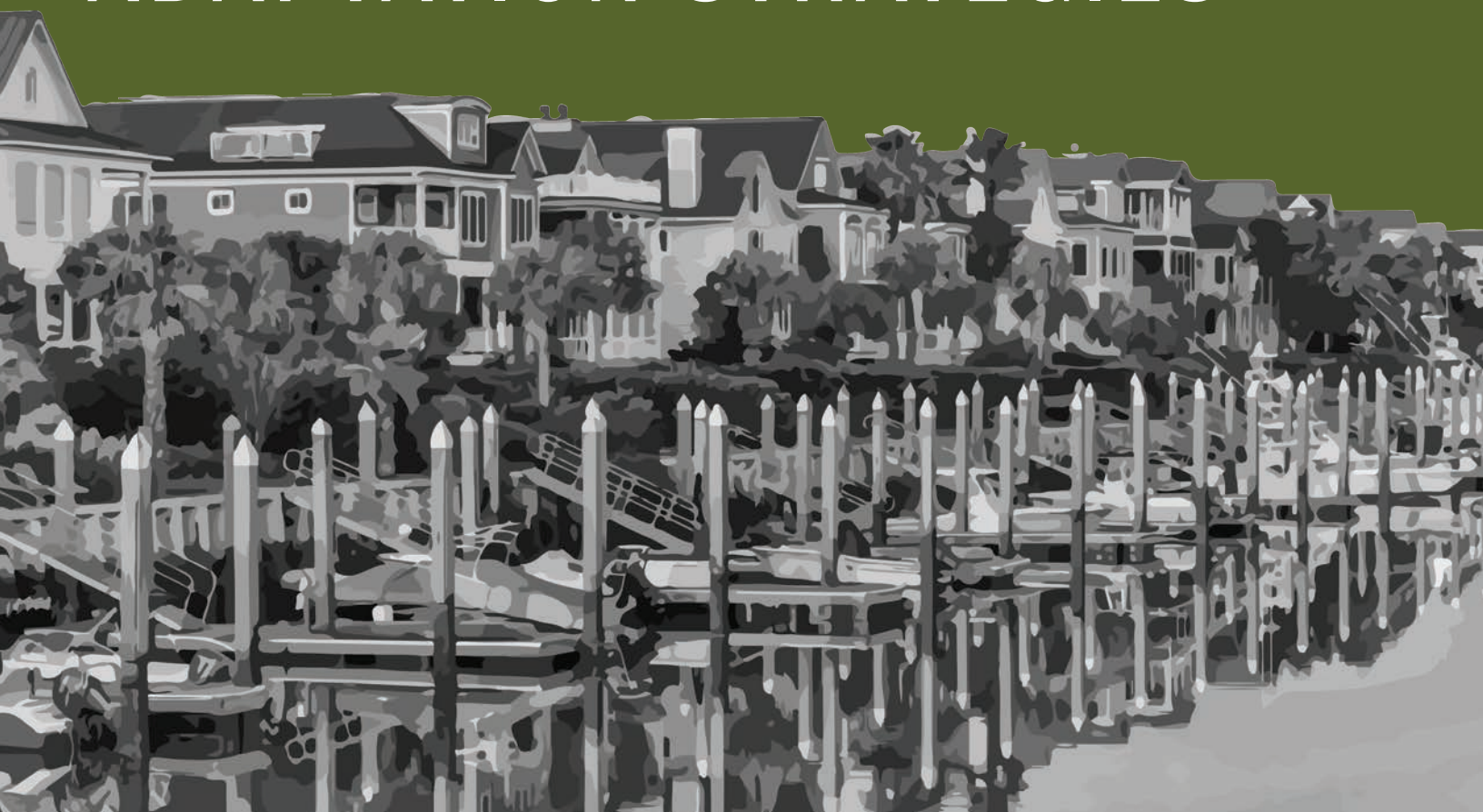
A summary of the impacts at each projection year observed in the vulnerability analysis can be found below in Table 3. Specifically, the linear miles of roadways inundated and how parcels may be impacted (i.e. septic impacts and assessed value) are quantified below.

Overall, it can be interpreted from these results that the year 2040 is a critical year for the City, with the observed impacts substantially increasing from 2040 to 2050 at a rate greater than any other year-to-year comparison in this analysis.

Table 3
Summary of sea level rise impacts observed in the vulnerability analysis.

Year	Parcels Impacted	Appraised Value of Impacted Parcels ($million)	Parcels Impacted on Septic	Roadways Impacted (miles)
2023	1041	1415.28	235	3.37
2030	1221	1530.45	289	4.53
2040	1556	1791.70	410	6.95
2050	2011	2115.69	524	13.88

ADAPTATION STRATEGIES



ADAPTATION STRATEGIES OVERVIEW

Policies

- A Elevated Tide and Emergency Response Program
- B Zoning and Ordinance Updates for Redevelopment
- C Create Design Tool for Redevelopment
- D Develop Water Quality Assessment Plan and Marsh Management Plan

Projects

- A Grey/ Rigid Infrastructure
- B Infrastructure Maintenance
- C Green Infrastructure
- D Perimeter Protection

Programs

- A Purchasing Flood Prone Property
- B Incentivizing Private LID Stormwater Systems
- C Educational Programs
- D Create Demonstration LID Sites

POLICIES

A Elevated Tide and Emergency Response Program

The City can adopt an operations policy to address storm surge and elevated seasonal tides as they happen more frequently. This policy should address:

- Advanced warning timeline strategy of when to inform the public and when to require public action as needed (evacuation, road closures, etc.)
- Timeline and implementation of barricades and signage for public safety
- Coordination with other agencies and municipalities
- Debris cleanup following a storm event

B Zoning and Building Ordinance Updates for Redevelopment

As growth continues on Isle of Palms, it is imperative that the City Ordinance require new development and redevelopment to assist with the mitigation of sea level rise and increased flooding.

Updates to the Zoning Ordinance in addition to what exists in the City Ordinance may include:

- On all new development and any redevelopment, an engineer must review and sign off on grading plan and drainage report to ensure compliance
- Development to prioritize routing runoff to adjacent drainage infrastructure (where applicable) within the right-of-way
- Increase volume/flow offset for stormwater control
- Increase allowed fill on developed parcels that fall under the projected sea level rise plan elevation target
- Prohibiting new septic fields/tanks on sites where there is an available sewer tie-in or on parcels that are lower than elevation 7' NAVD88
- Increase setbacks on septic fields from the OCRM critical line and areas prone to flooding
- Limit/restrict new development in flood prone areas
- Maintain and strengthen marsh setbacks and add elevation considerations in setback requirements
- Increase tree canopy requirements to help better stabilize soil and slow the rate of runoff. Currently, the only required tree planting in the zoning ordinance is in the buffer yard requirements for commercial properties. This planting requirement should be expanded to require interior parcel tree planting for commercial and residential properties as well as require tree save minimums.
- Tree replacement for removal of historic trees currently requires half the DBH caliper inches of the removed tree. The replacement requirement can be increased up to the entire DBH in caliper inches to help restore a stabilizing root system and further deter the unnecessary removal of historic trees.
- Clarify the code to better define pervious paving. Sec. 5-4-13 (c) states that all newly installed hardscape elements be pervious, but does not define (or limit) what those materials are.
- Restrict the construction of bulkheads or revetments on the marsh side of the island. In February 2024, the City passed an emergency ordinance allowing property owners to erect protective bulkheads on beach front property between 100 and 914 Ocean Blvd. That allowance should not extend to the marsh fronting properties as bulkheads can cause long term erosion and degradation of the marsh ecosystem. Instead, fill or vegetated berms outside of the critical area should be allowed to provide adequate tidal protection.

POLICIES

C Create Design Tool for Redevelopment

The City can create and deploy an apparatus to facilitate LID practices on any new redevelopment. This can come in the form of any of the following:

- A points-based certification program that rewards developers for incorporating sustainable design practices. The program combines required levels of flood mitigation and Low Impact Development (LID) strategies with additional incentives for exceeding these standards.
- Tiered certification system that works similarly to the points based system that provides a hierarchy (gold, silver, bronze, etc.) of sustainable strategies. This would be structured similar to LEED or SITES certifications.
- A digital graphic or model that calculates LID requirements as required by any redevelopment. This will help guide developers through the process more effectively.

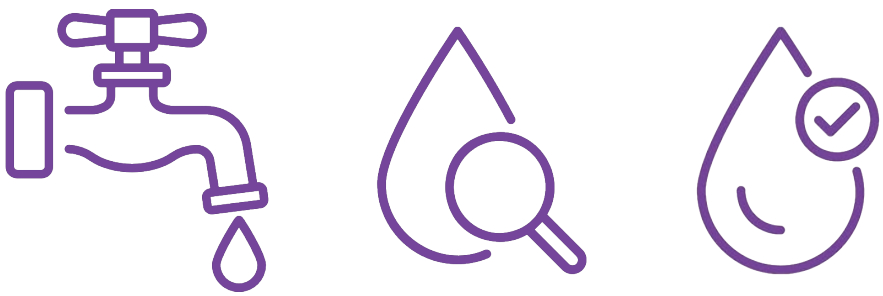
Any of these tools will require the City to develop the LID strategies desired for redevelopment. Some of these strategies can include:

- Requiring redevelopment to transition to sewer (if applicable)
- Increasing canopy cover
- Bioswales and rain gardens
- Rain cisterns
- Setting limitations on irrigation and utilizing stormwater for irrigation
- Grey water recycling
- Establishing a living shoreline (if site applicable)
- Installing vegetated inland berm for flood mitigation (if site applicable)

D Develop Water Quality Assessment Plan and Marsh Management Plan

The Water Quality Assessment Plan would be a strategic document that evaluates and analyzes the health and quality of water in the City. This plan could identify pollutants, understand sources of contaminants, monitor environmental and human health risks, and guide water management efforts. The structure of the water quality assessment plan could start with site and scope selection, then select water quality indicators and parameters, create and outline sampling, analyze and interpret data, and provide management and mitigation recommendations as needed.

Marsh management is one of the most critical aspects to combating sea level rise on Isle of Palms as the most impactful tidal flooding comes through the Intracoastal Waterway marsh. The City can prepare a study and plan that establishes concerns with sea level rise and increased flooding impacts on the marsh ecosystem and make recommendations to monitor, protect, and restore the marsh as necessary. This study can provide site specific solutions and implementation strategies, which may include living shoreline strategies.



PROJECTS

A Grey/Rigid Infrastructure

Built infrastructure can help capture, store, and control storm and tidal water through improvements to the stormwater systems.

- **Upgrading and replacing pipes** to increase flow capacity and ensure positive drainage
- **Installing tide gates** on stormwater outfalls to prevent tidal backflow through stormwater networks.
- **Providing underground storage** for stormwater such as chamber systems or dune infiltration systems. Dune Infiltration Systems are a type of underground detention system that relies on the naturally high infiltration of sandy soils to infiltrate stormwater into the dunes.
- **Transitioning properties** to sewer will reduce risk of contamination during flood events.

Check valves on marsh outfall

Improved drainage structure

Increase storm pipe size and structure

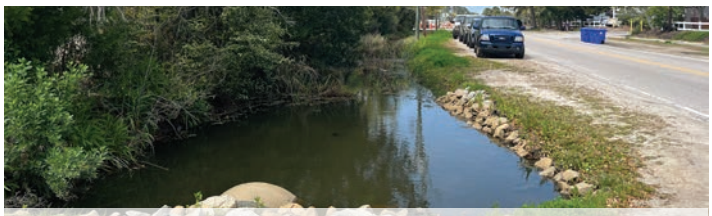
Dune infiltration system

B Infrastructure Maintenance

Maintenance and upkeep of existing systems will help mitigate flooding impacts by restoring existing systems.

- **Cleaning and upkeep** of public storm drains, pipes, ditches, and swales. This effort can be directed by the results from the drainage masterplan and public feedback of clogged utilities. This will require coordination with SCDOT if infrastructure lies within SCDOT right-of-way.
- **Continue beach renourishment** efforts to add sand and stabilize the City's beachfront.

Beach nourishment at Breach Inlet



Cleaned and reinforced existing ditch in the right-of-way

PROJECTS

C Green Infrastructure

Using low impact development practices, the City can help mitigate the impacts of increased flooding and sea level rise using more natural and less invasive practices. Many of these strategies can also create a more planted and aesthetically interesting space.

- **Living shorelines** reinforce marsh and coastal shorelines by decreasing bank slopes and using natural materials to not only help mitigate damage from flooding and erosion, but re-create and bolster a natural ecosystem. These living materials can range from native plants, oyster beds and shell bags, coir logs (biodegradable coconut fiber), rocks (riprap is prohibited as beach erosion control method per City zoning ordinance), and any combination of those elements. Living shorelines are created at or below the critical line.
- **Creating bioswales and rain gardens** in the right-of-way and public space can utilize space that is either empty and/or prone to flooding to capture runoff. Both of these strategies will require native plantings to slow the flow of runoff and stabilize from erosion. Low maintenance plant species should be selected.

Living Shorelines

Living Shorelines

Public Rain Garden

Right-Of-Way Bioswale

PROJECTS

D Perimeter Protection

As Isle of Palms is a barrier island, protecting its edges from flooding and sea level rise will be critical to its long-term resiliency.

- **Raising Waterway Boulevard** to elevation 7 feet NAVD88 will provide a barrier for the interior of the island against tidal flooding from the Intracoastal Waterway, as most of flooding comes through the ICW.
- In addition to the ongoing dune restoration project on the south end of the island, further **dune/beach renourishment projects** will likely be necessary along the beach front. The placing and shaping of the new sand will help protect the beach from further erosion and serve as a physical barrier along the oceanside.
- **Constructing vegetated berms** can provide flooding protection in site specific applications.

Waterway Boulevard


Berm on Pawley's Island

Dune renourishment efforts at Ocean Isle Beach, NC

PROGRAMS

A Purchasing Flood Prone Property

As grant funding becomes available, properties that continuously flood could be considered for land acquisition. Once acquired, they can be utilized as open green spaces that host flood mitigation projects.

B Incentivizing Private LID Stormwater Systems

Property owners can help overall water management through the implementation of strategies on their properties. Using tax credits, water and utility rebates, group purchasing, and other incentives, the City can encourage property owners to install and maintain LID stormwater projects to manage on-site stormwater. These strategies can help alleviate the volume of stormwater the City's storm system captures during storm events and help stabilize the soil to reduce erosion.

Examples of the LID strategies can include:

- Rain gardens
- Bioswales
- Replacing lawn with native planting
- Rain cisterns
- Increased tree canopy
- Green roof installation

Rain Gardens with Cistern

Bioswales

Replacing sod with native planting

Rain Cisterns

Tree canopy to stabilize soil

Green roof installation on Kiawah

PROGRAMS

C Educational Programs

The City can develop educational programs aimed at empowering developers and residents with knowledge and practical strategies for resilience. These programs will cover topics such as sustainable building techniques, nature-based solutions like living shorelines, and low impact development strategies. By collaborating with environmental scientists, urban planners, and engineers, the City can offer workshops, webinars, and hands-on training. These sessions and workshops will be designed to help teach residents how to protect their homes and properties while encouraging developers to adopt resilient building standards.

Examples can include:

- Resilient building and retrofitting seminars for builders and developers
- Flood-resilient landscaping workshops
- Rain garden and cistern workshops
- Volunteer based living shoreline demonstration project with educational information and signage online
- Emergency preparedness workshops

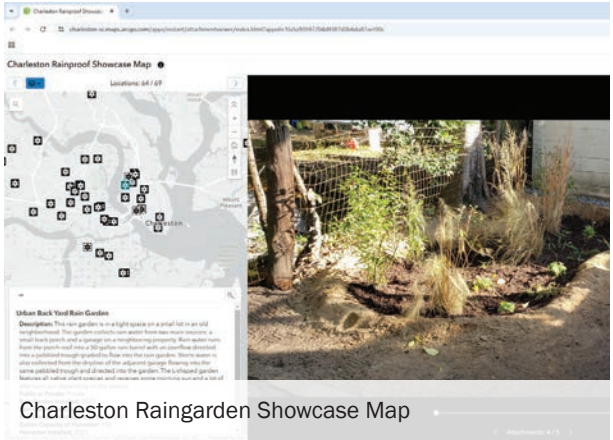
South Carolina Oyster Recycling and Enhancement (SCORE) Volunteer Program

MUSC hosts Rain Garden installation class in Downtown Charleston

D Create Demonstration LID Sites

To showcase sustainable strategies, the City can create a demonstration rain garden, living shoreline, and dune infiltration system as educational pilot projects. These demonstration sites could be located in key waterfront areas and paired with educational programs to provide in-ground examples of active resiliency strategies.

To begin, the City can partner with environmental organizations (like Clemson's Master Rain Gardener, SC Department of Natural Resources, or the Lowcountry Landtrust) to provide design guidance and engage local volunteers for planning and installation.



Charleston Raingarden Showcase Map

Local families installing rain gardens to bring beauty to their yards and help manage stormwater naturally

MOVING FORWARD

IMPLEMENTATION STRATEGIES

	POLICIES	PROJECTS	PROGRAMS
Short Term Goals (Immediate Action)	• Implement elevated tide and emergency operations. • Update zoning ordinances for redevelopment. • Begin Development of Redevelopment Design Tool.	• Begin design and permitting of outfall improvements recommended as part of the Phase 4 Masterplan. • Initiate Pilot Projects including: *Living shorelines* *Bioswales and rain gardens.* • Continue dune and beach nourishment projects. • Begin implementation of vegetated berms for perimeter protection.	• Launch a pilot program for private Low Impact Development (LID) stormwater management. • Develop a public education program on resilient strategies.
Intermediate Goals (Achievable by 2030)	• Implement Redevelopment Design Tool. • Conduct a comprehensive water quality assessment. • Develop a comprehensive marsh management plan. • Update and enforce zoning ordinances.	• Finalize outfall improvements recommended as part of the Phase 4 Masterplan. • Install tide gates as recommended. • Begin installation of underground storage solutions. • Transition high-risk properties from septic to sewer systems. • Complete Waterway Boulevard enhancements.	• Establish educational and volunteer programs to promote community involvement.
Long Term Goals (Achievable by 2050)	• Incorporate recommended improvements from the water quality assessment. • Incorporate marsh management plan.	• Transition all at-risk properties from septic to sewer systems. • Finish construction of all required perimeter protection. • Complete additional stormwater projects recommended as part of the Phase 4 Masterplan.	• Purchase flood-prone property to preserve and or demonstrate conservation practices.

Review Cycle: This plan will be re-evaluated every 5 years to ensure continued relevance and effectiveness.

RESOURCES

RESOURCES

PREVIOUS PLANS AND STUDIES FOR THE CITY OF ISLE OF PALMS

Comprehensive Plan

From the Isle of Palms Comprehensive Plan: "This Comprehensive Plan is intended to document the history of development on the Isle of Palms, identify the community's problems and needs, and articulate a vision for its future. The Plan is also intended to help guide future decision making in matters affecting the physical, social, and economic growth, development and redevelopment of the community.This plan is not a final product; it is part of a continuing planning process and should be updated and revised as new information becomes available or as new problems and needs arise".

This planning document is typically reviewed and revised every 10 years with the last update in 2015. The most recent update can be accessed by *clicking this link.*

Phase 4 Drainage Masterplan – Drainage Study and Recommendations for Improvements

From the Phase 4 Drainage Masterplan: "In a proactive approach to improve long-term community resiliency, the city has been completing stormwater master plans and improvement projects on a phase-by-phase approach. The City began the Phase 4 masterplan in the fall of 2021 with an overall purpose to analyze and assess the capacity and condition of drainage infrastructure serving the city identified within the Phase 4 footprint [bound by 29th Avenue to the east and Breach Inlet to the west]. As a result, the overall purpose of this report is to summarize an in-depth drainage study completed wherein existing flood conditions were identified, solutions to mitigate existing flood conditions were developed, costs to implement such solutions were estimated, and potential funding to finance solutions were identified." The study was completed in 2023 and makes several recommendations that would assist with flood mitigation efforts to combat sea level rise. A draft of the report can be accessed by *clicking this link.*

Isle of Palms Beach Management Planning Scenarios

Completed in May of 2024, this study analyzed the stability of the City's beachfronts and makes several recommendations to address current and future beach erosion. The report can be accessed by *clicking this link.*

Local Comprehensive Beach Management Plan – 5-Year Review

From the plan: "The City's LCBMP [Local Comprehensive Beach Management Plan] represents considerable effort, inventory, and deliberation on the part of the City, and establishes a strategy for the management of the Isle of Palms beach for the sustainable enjoyment by residents and visitors. This LCBMP is intended for incorporation into the State Beachfront Management Plan in accordance with the provisions of the State Beachfront Management Act.

The plan is reviewed and updated every 5 years with the most recent updated completed in 2023. The most recent update can be accessed by *clicking this link.*

TIDAL DATUMS AND DATA RESOURCES

Tidal Datums

Descriptions and definitions of tidal datums used to describe the relative water level of the tides can be accessed by *clicking this link.*

Charleston NOAA Tide Gauge

Current and historic tidal data for the Charleston, SC NOAA tide gauge can be accessed by *clicking this link.*

SEA LEVEL RISE RESOURCES

Sea Level Rise Projections

Sea level rise scenarios for Charleston, SC were based on the information contained within the 2022 Sea Level Rise Technical Report (as developed by the Sea Level Rise and Coastal Flood Hazard Scenarios and Tools Interagency Task Force). These projections

provide the most comprehensive and up-to-date information for planning for the impacts of sea level rise. Projections are classified into five risk scenarios and all values are relative to a baseline year of 2000. These projections can be accessed by *clicking this link.*

The full Sea Level Rise Technical Report as well as an application guide for assisting decision makers with applying the information contained within the report can be accessed using the following links: *Global and Regional Sea Level Rise Scenarios for the United States* and *Application Guide for the 2022 Sea Level Rise Technical Report.*

Sea Level Rise Viewer

This tool, developed by the National Oceanic and Atmospheric Administration, allows users to view the potential for flooding under future sea level rise scenarios. These inundation levels are meant to be used for high-level planning purposes only as the methodology used to develop this tool and associated flood inundation layers does not account for additional factors such as erosion, subsidence, future construction, or stormwater infrastructure.
The tool can be accessed by *clicking this link.*

Vertical Land Subsidence

This reference was used to determine higher-resolution, local vertical land subsidence rates for the City of Isle of Palms. The research analyzed vertical land subsidence rates at a 50 meter scale across the entirety of the US east coast. The research article can be accessed by *clicking this link.*

OTHER COMMUNITIES

Sea Level Rise Adaptation Plans

Several other coastal communities within South Carolina have developed similar sea level rise adaptation plans to assist with long-term community and resiliency planning.

These plans/resources can be accessed below:
City of Charleston, Town of Pawleys Island, City of Folly Beach, and Town of Edisto Beach

PHOTO CREDITS

Charleston Rainproof

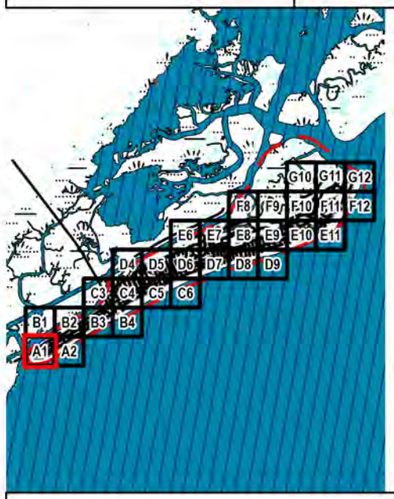
Rainproof images on page 31 of this document were sourced from the Charleston Rainproof Showcase Map. This map features both private and public rainproof gardens installed throughout the Charleston metropolitan area. You can access the map by *clicking this link.*


SW
SEAMONWHITESIDE
CITY OF ISLE OF PALMS
1953
SOUTH CAROLINA

City of Isle of Palms, South Carolina
Sea Level Rise Adaptation Plan

Vulnerability Analysis

Appendix A	Sector A1	Page 1 of 30



NOTES:

1. Flood inundation boundaries created using a 2D HEC-RAS model of the study area.
2. Tidal boundaries conditions were developed for each target year based on projected sea level rise and vertical land subsidence (following methodology discussed in the Sea Level Rise Adaptation Plan).
3. Existing structure and parcel boundary locations are approximate.
4. Parcels considered at-risk if inundation boundary intersects parcel boundary.
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6. These results do not account for the impact of rainfall-driven flooding.
7. These results assume topography is stationary within the the study area. No erosional or accretional (i.e., beach erosion, shoal migration, etc.) forces were considered within this study. Stabilization or continued preservation of the beaches is assumed.

Legend

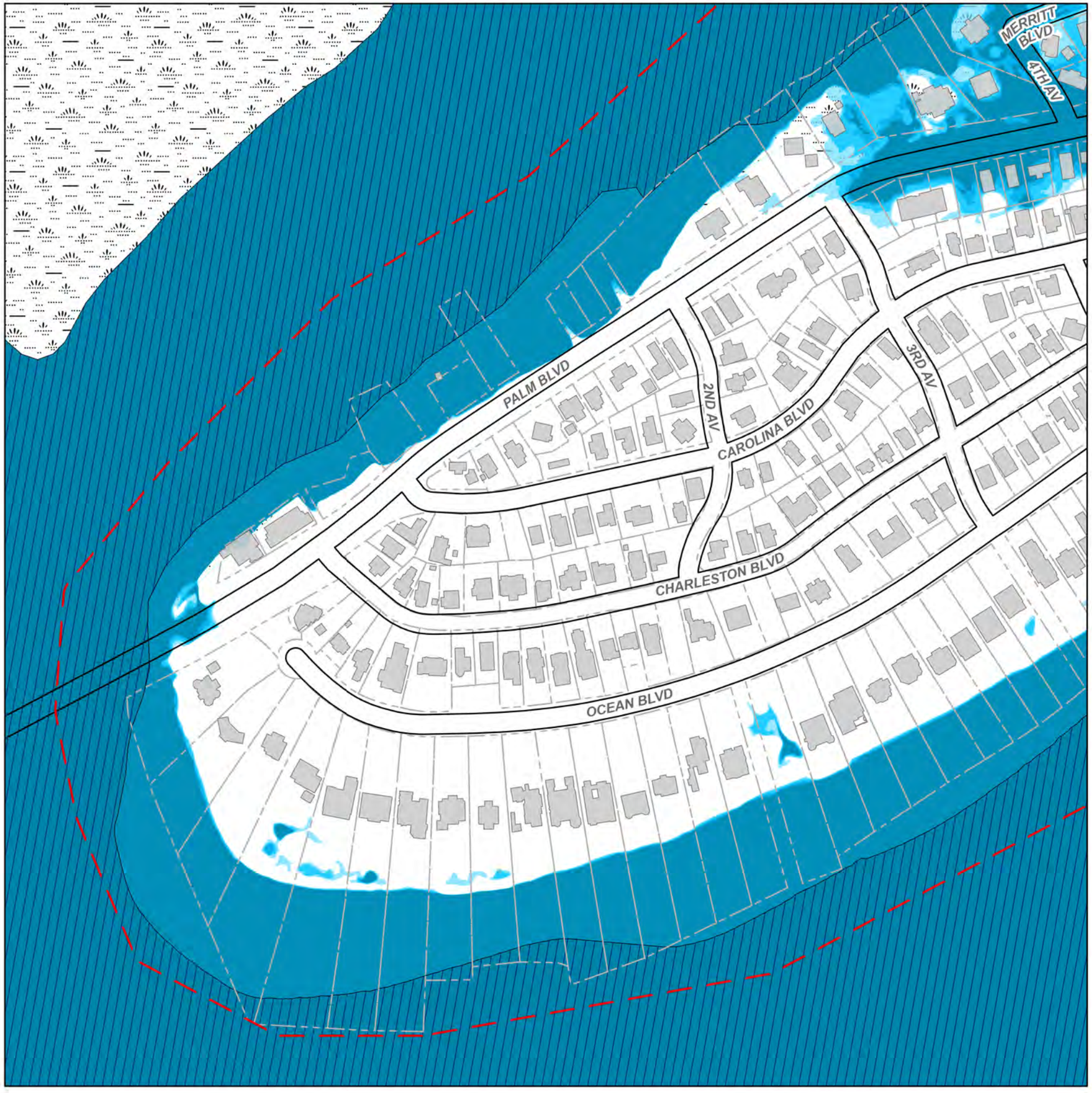
- Study Boundary
- Existing Structure
- Parcel Boundary
- Roadway
- Waterway
- Marsh

Maximum Inundation Boundary

- 2023
- 2030
- 2040
- 2050

N W E S

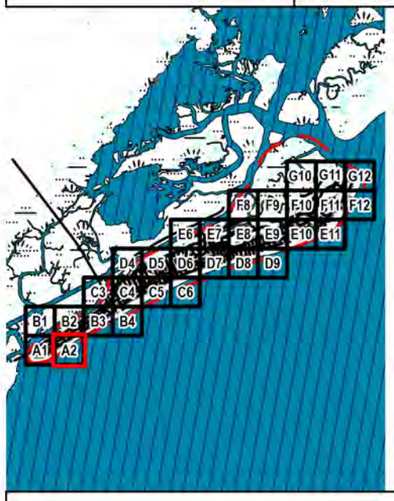
0 250 500 1,000 Feet



City of Isle of Palms, South Carolina
Sea Level Rise Adaptation Plan

Vulnerability Analysis

Appendix A	Sector A2	Page 2 of 30



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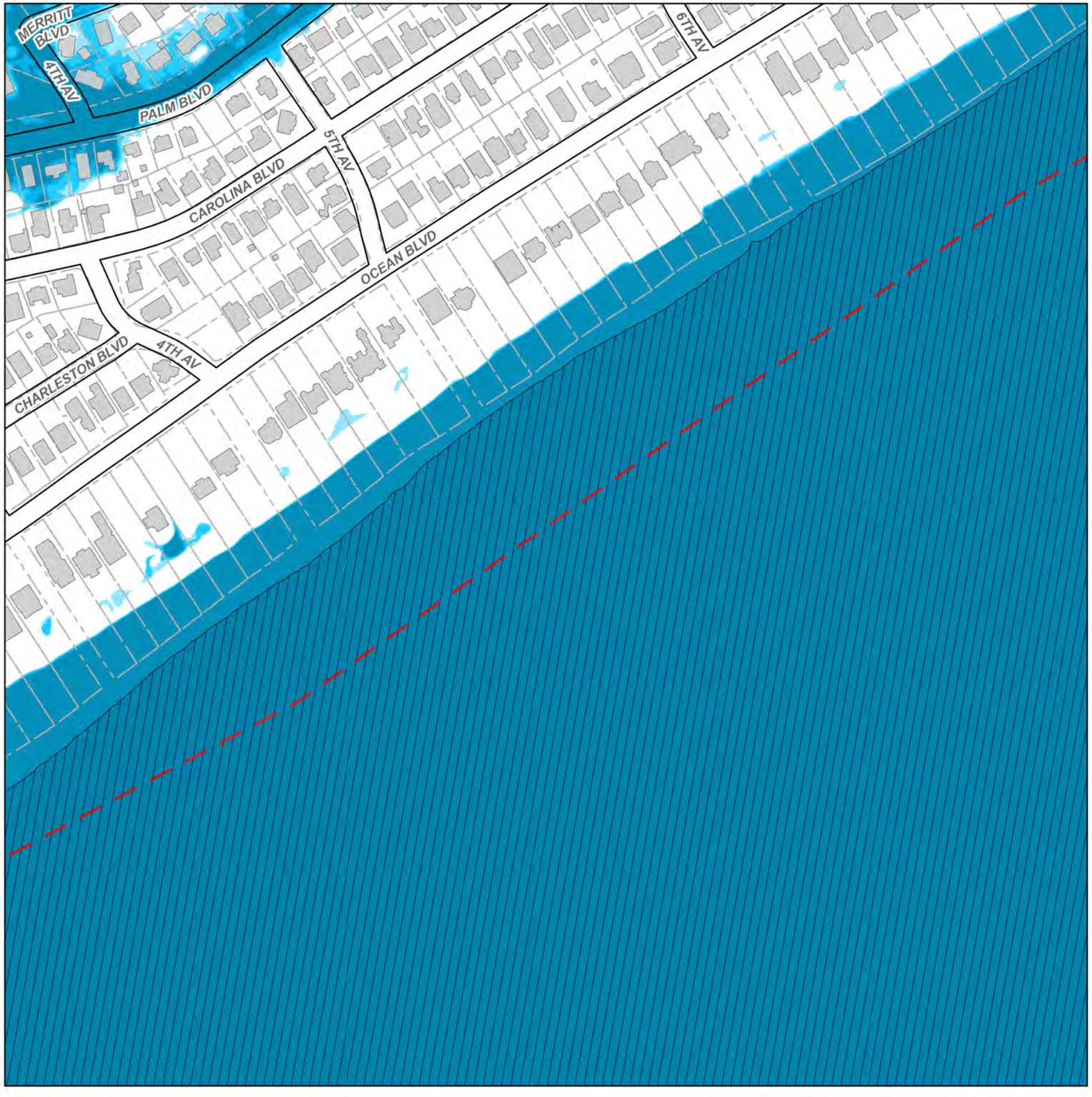

Legend

- Study Boundary
- Existing Structure
- Parcel Boundary
- Roadway
- Waterway
- Marsh

Maximum Inundation Boundary

- 2023
- 2030
- 2040
- 2050

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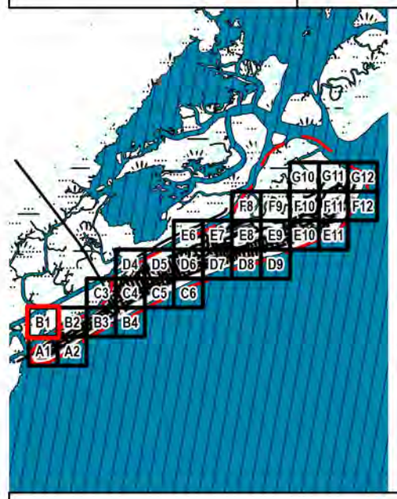
City of Isle of Palms, South Carolina
Sea Level Rise Adaptation Plan

Vulnerability Analysis



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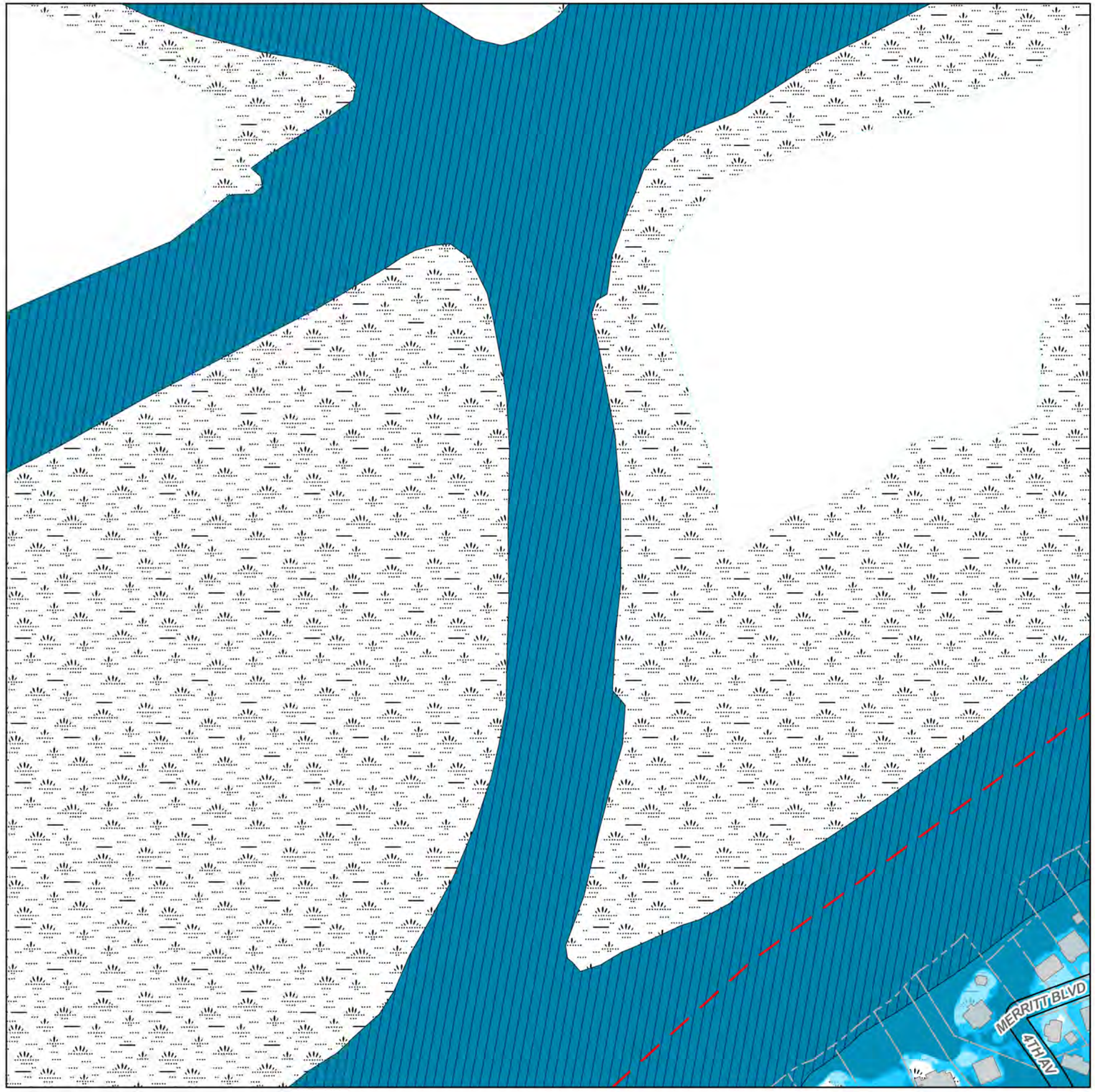
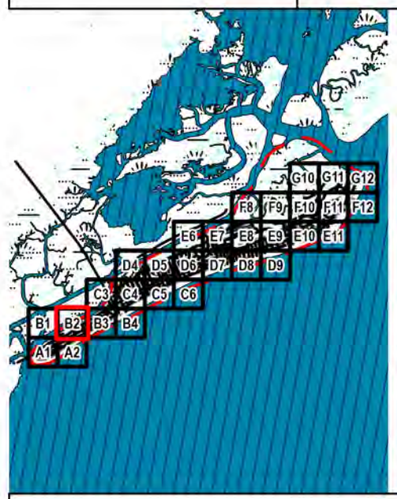


City of Isle of Palms, South Carolina
Sea Level Rise Adaptation Plan

Vulnerability Analysis



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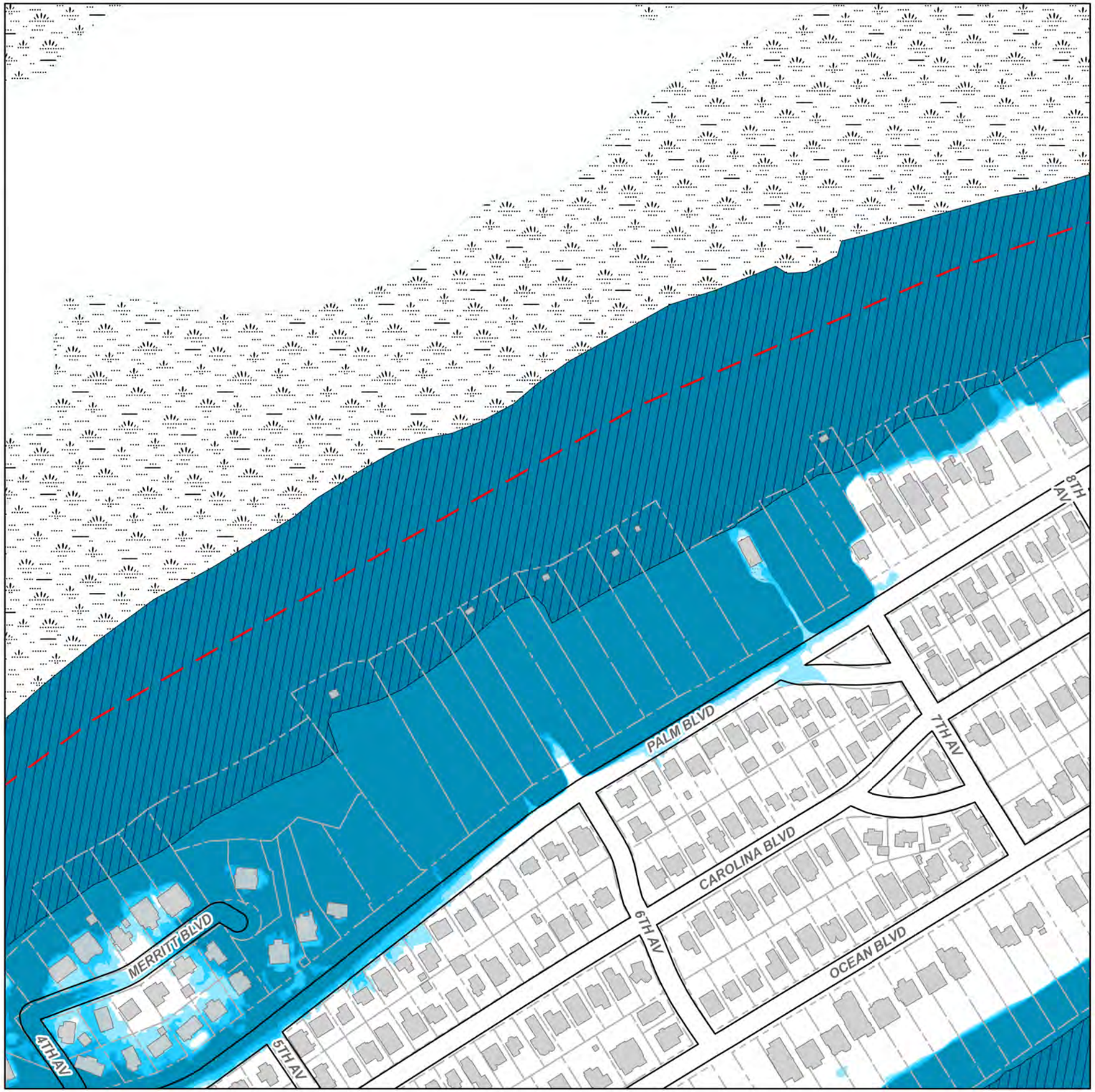
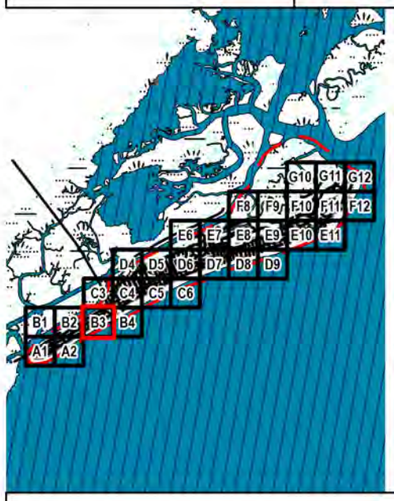


City of Isle of Palms, South Carolina
Sea Level Rise Adaptation Plan

Vulnerability Analysis

Appendix A	Sector B3	Page 5 of 30



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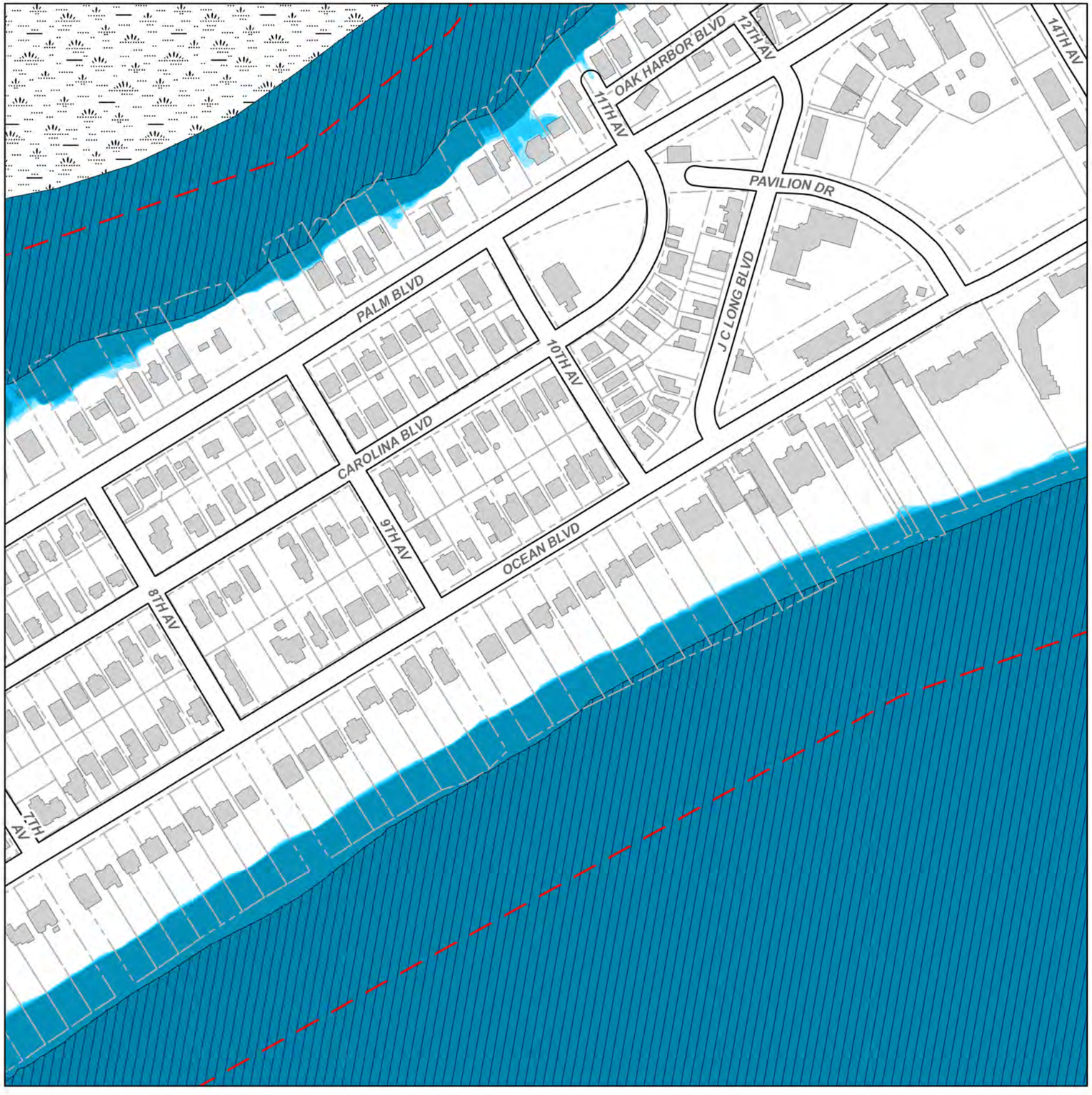
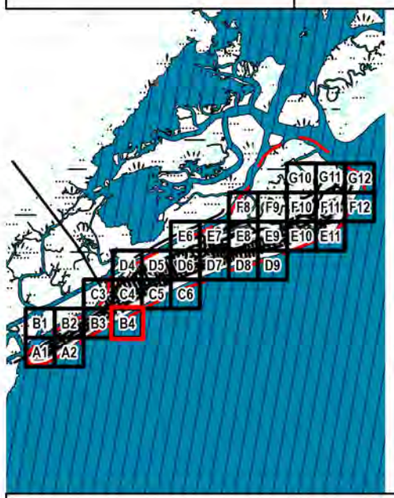


City of Isle of Palms, South Carolina
Sea Level Rise Adaptation Plan

Vulnerability Analysis

Appendix A	Sector B4	Page 6 of 30



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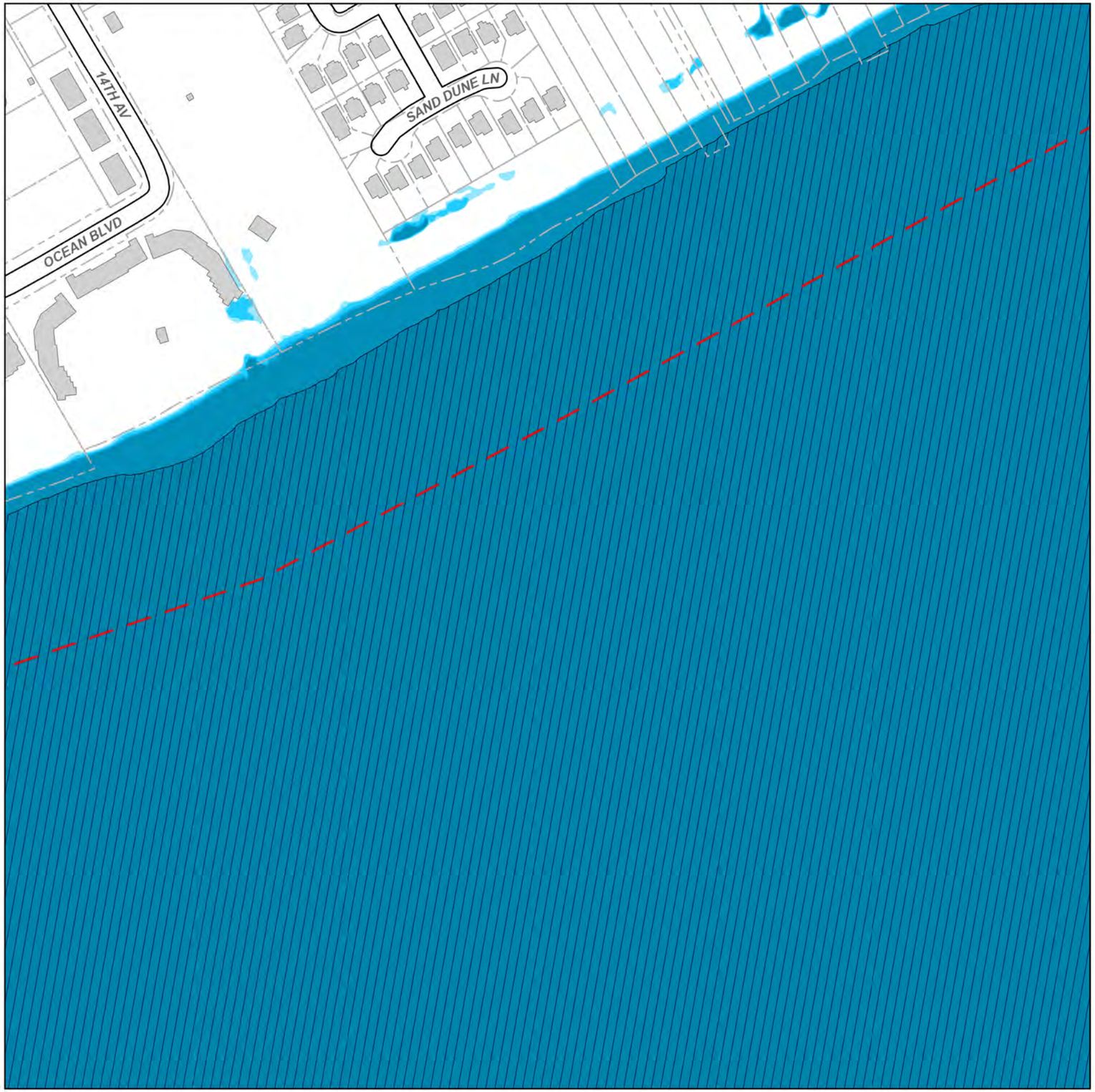
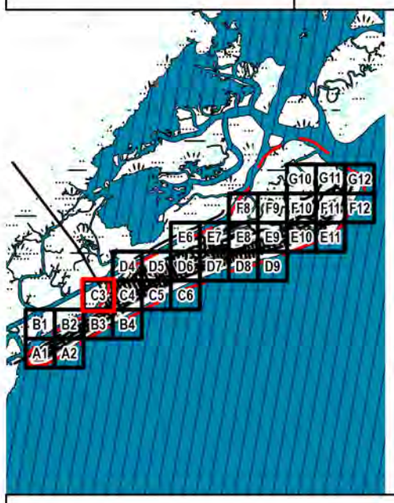


City of Isle of Palms, South Carolina
Sea Level Rise Adaptation Plan

Vulnerability Analysis

Appendix A	Sector C3	Page 7 of 30



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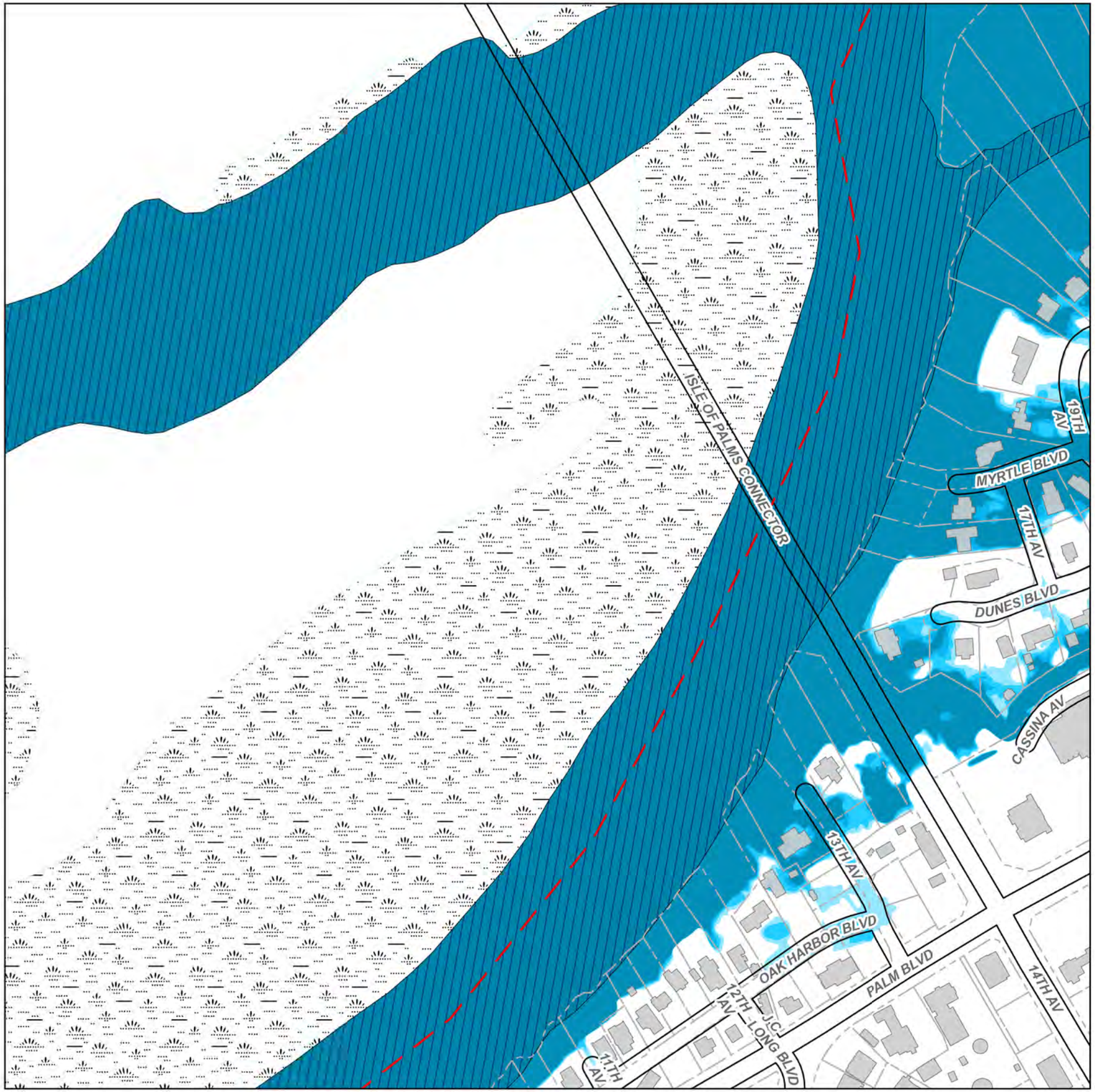
N W E S

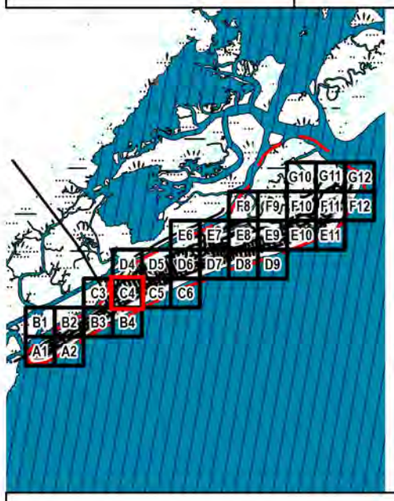
0 250 500 1,000 Feet



City of Isle of Palms, South Carolina
Sea Level Rise Adaptation Plan

Vulnerability Analysis

Appendix A	Sector C4	Page 8 of 30



NOTES:

1. Flood inundation boundaries created using a 2D HEC-RAS model of the study area.
2. Tidal boundaries conditions were developed for each target year based on projected sea level rise and vertical land subsidence (following methodology discussed in the Sea Level Rise Adaptation Plan).
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6. These results do not account for the impact of rainfall-driven flooding.
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Legend

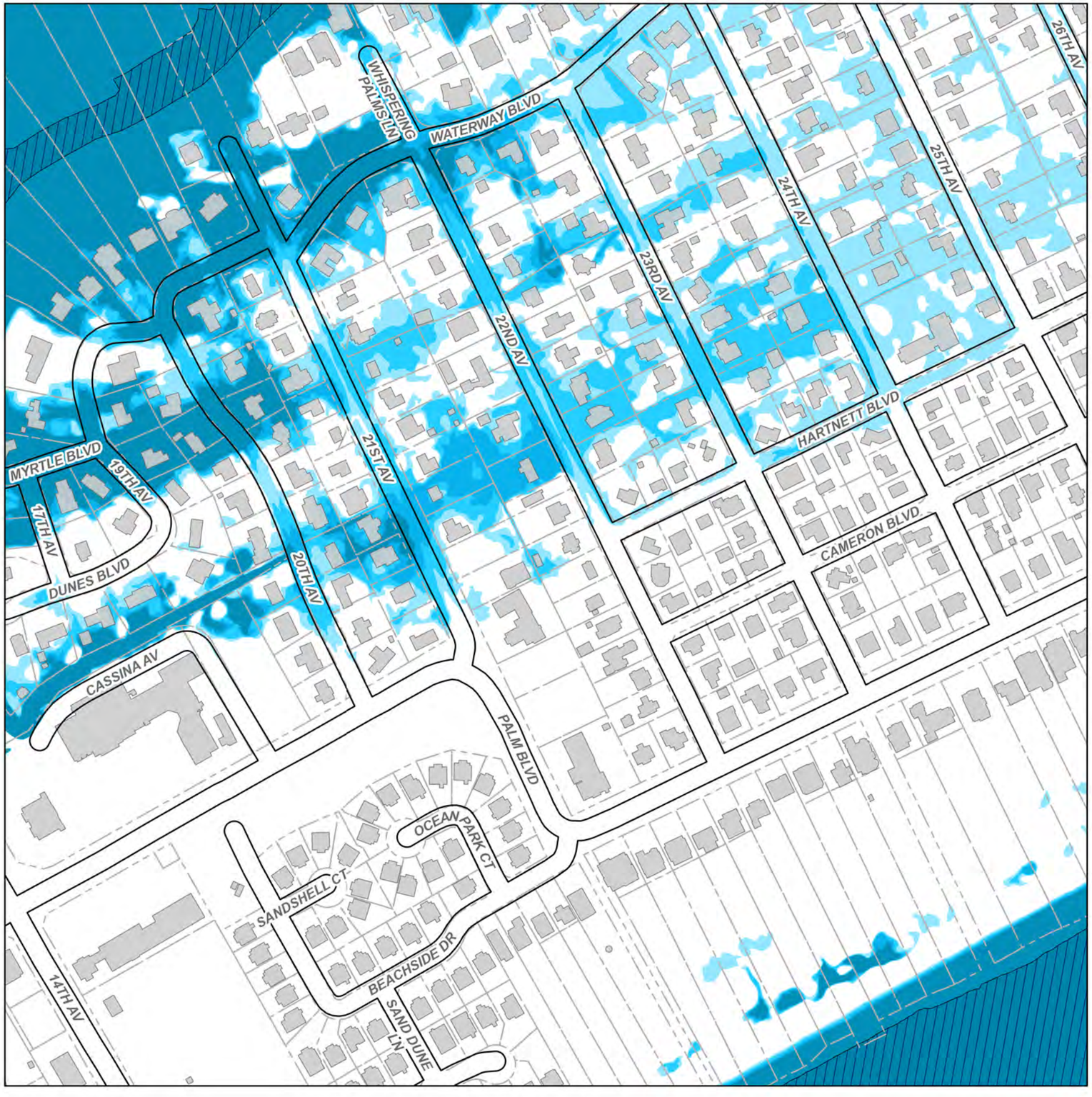
- Study Boundary
- Existing Structure
- Parcel Boundary
- Roadway
- Waterway
- Marsh

Maximum Inundation Boundary

- 2023
- 2030
- 2040
- 2050

N W E S

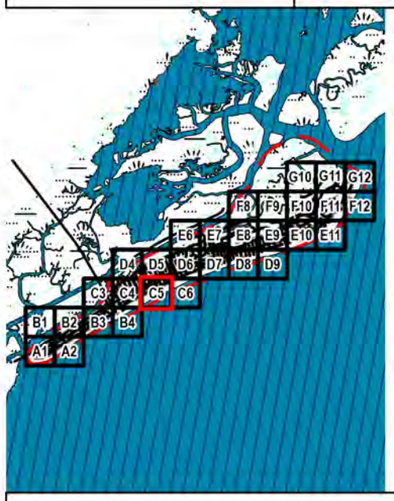
0 250 500 1,000 Feet



City of Isle of Palms, South Carolina
Sea Level Rise Adaptation Plan

Vulnerability Analysis

Appendix A	Sector C5	Page 9 of 30



NOTES:

1. Flood inundation boundaries created using a 2D HEC-RAS model of the study area.
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Legend

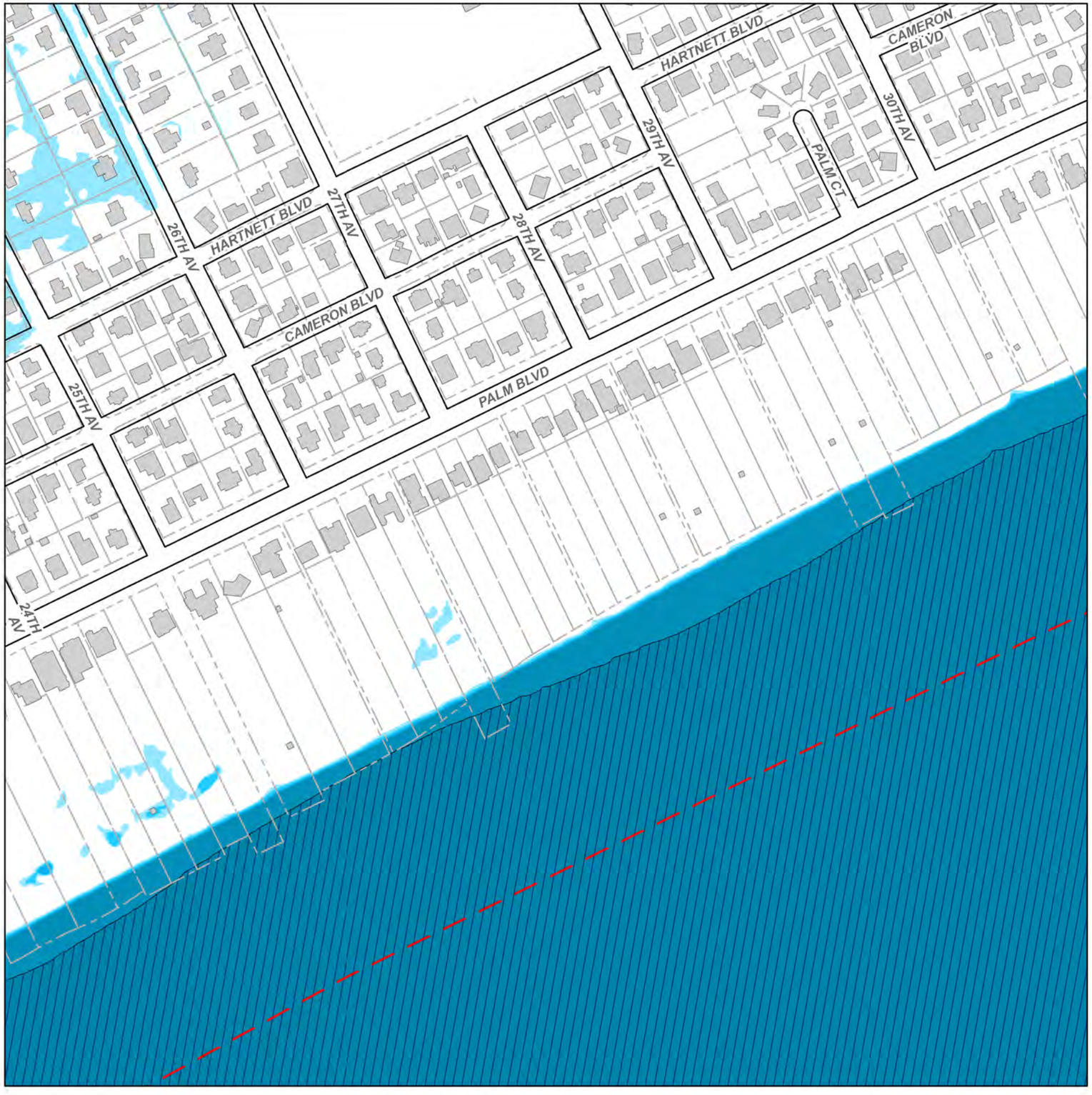
- Study Boundary
- Existing Structure
- Parcel Boundary
- Roadway
- Waterway
- Marsh

Maximum Inundation Boundary

- 2023
- 2030
- 2040
- 2050

N
W
E
S

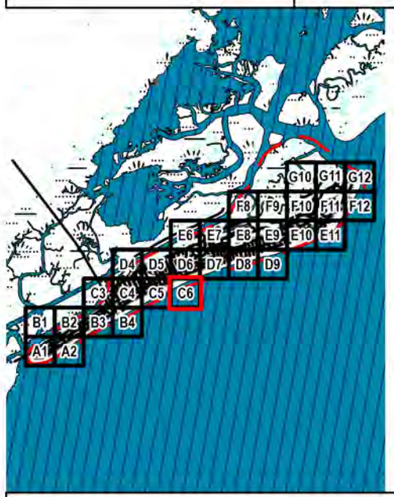
0 250 500 1,000 Feet



City of Isle of Palms, South Carolina
Sea Level Rise Adaptation Plan

Vulnerability Analysis

Appendix A	Sector C6	Page 10 of 30



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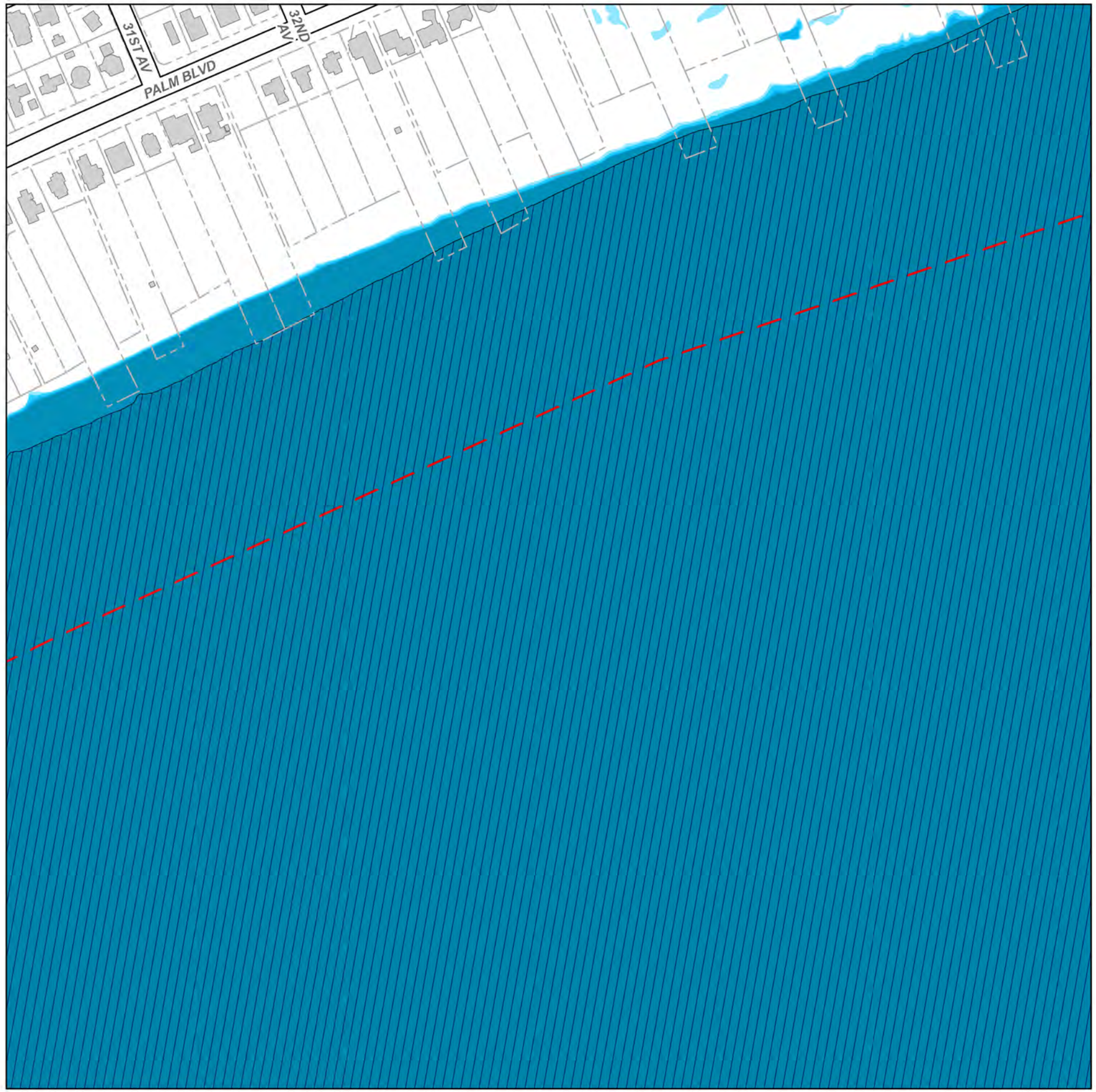


Legend

- Study Boundary
- Existing Structure
- Parcel Boundary
- Roadway
- Waterway
- Marsh

Maximum Inundation Boundary

- 2023
- 2030
- 2040
- 2050

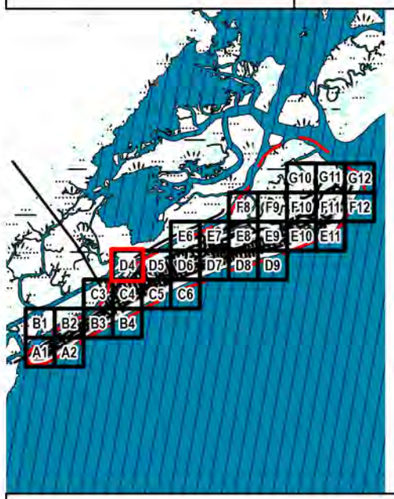
N
W
E
S

0 250 500 1,000 Feet

City of Isle of Palms, South Carolina
Sea Level Rise Adaptation Plan

Vulnerability Analysis

Appendix A	Sector D4	Page 11 of 30



NOTES:

1. Flood inundation boundaries created using a 2D HEC-RAS model of the study area.
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Legend

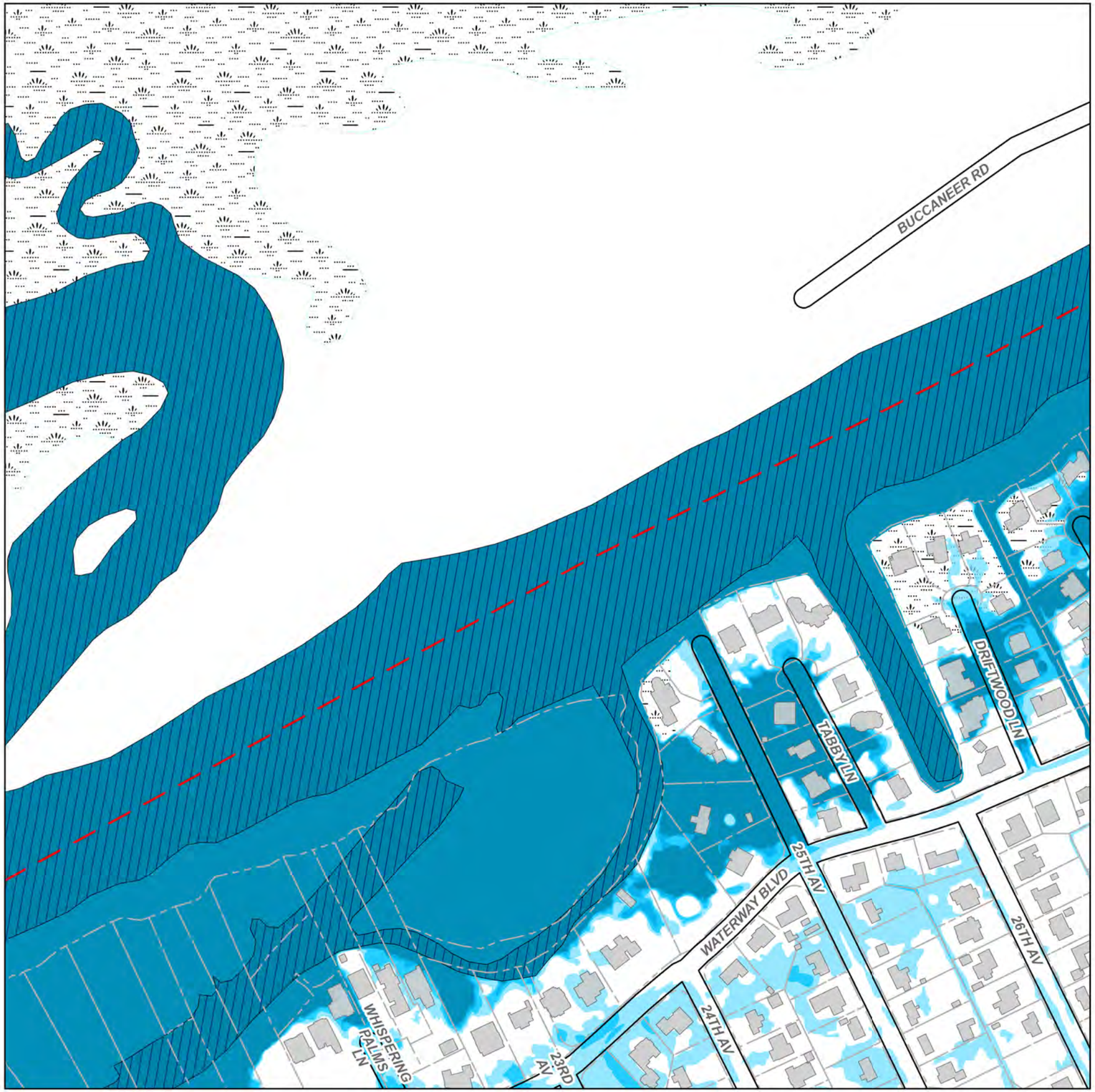
- Study Boundary
- Existing Structure
- Parcel Boundary
- Roadway
- Waterway
- Marsh

Maximum Inundation Boundary

- 2023
- 2030
- 2040
- 2050

N
W E
S

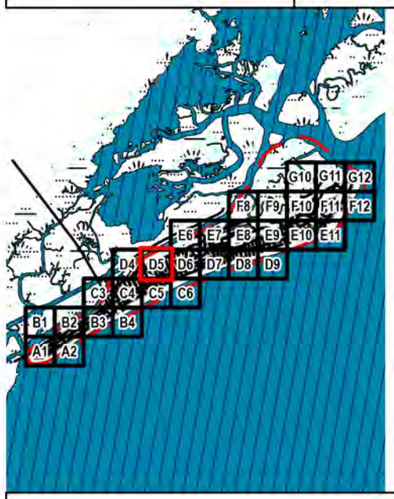
0 250 500 1,000 Feet



City of Isle of Palms, South Carolina
Sea Level Rise Adaptation Plan

Vulnerability Analysis

Appendix A	Sector D5	Page 12 of 30



NOTES:

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Legend

- Study Boundary
- Existing Structure
- Parcel Boundary
- Roadway
- Waterway
- Marsh

Maximum Inundation Boundary

- 2023
- 2030
- 2040
- 2050

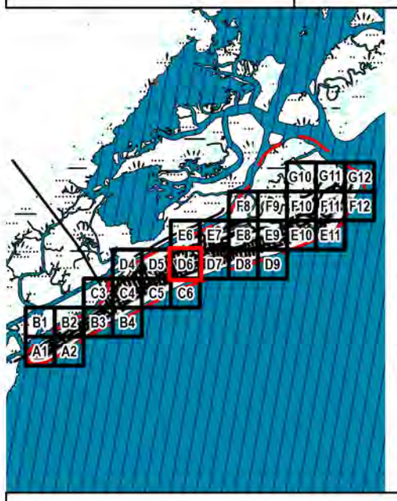
N W E S

0 250 500 1,000 Feet

City of Isle of Palms, South Carolina
Sea Level Rise Adaptation Plan

Vulnerability Analysis

Appendix A	Sector D6	Page 13 of 30



NOTES:

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Legend

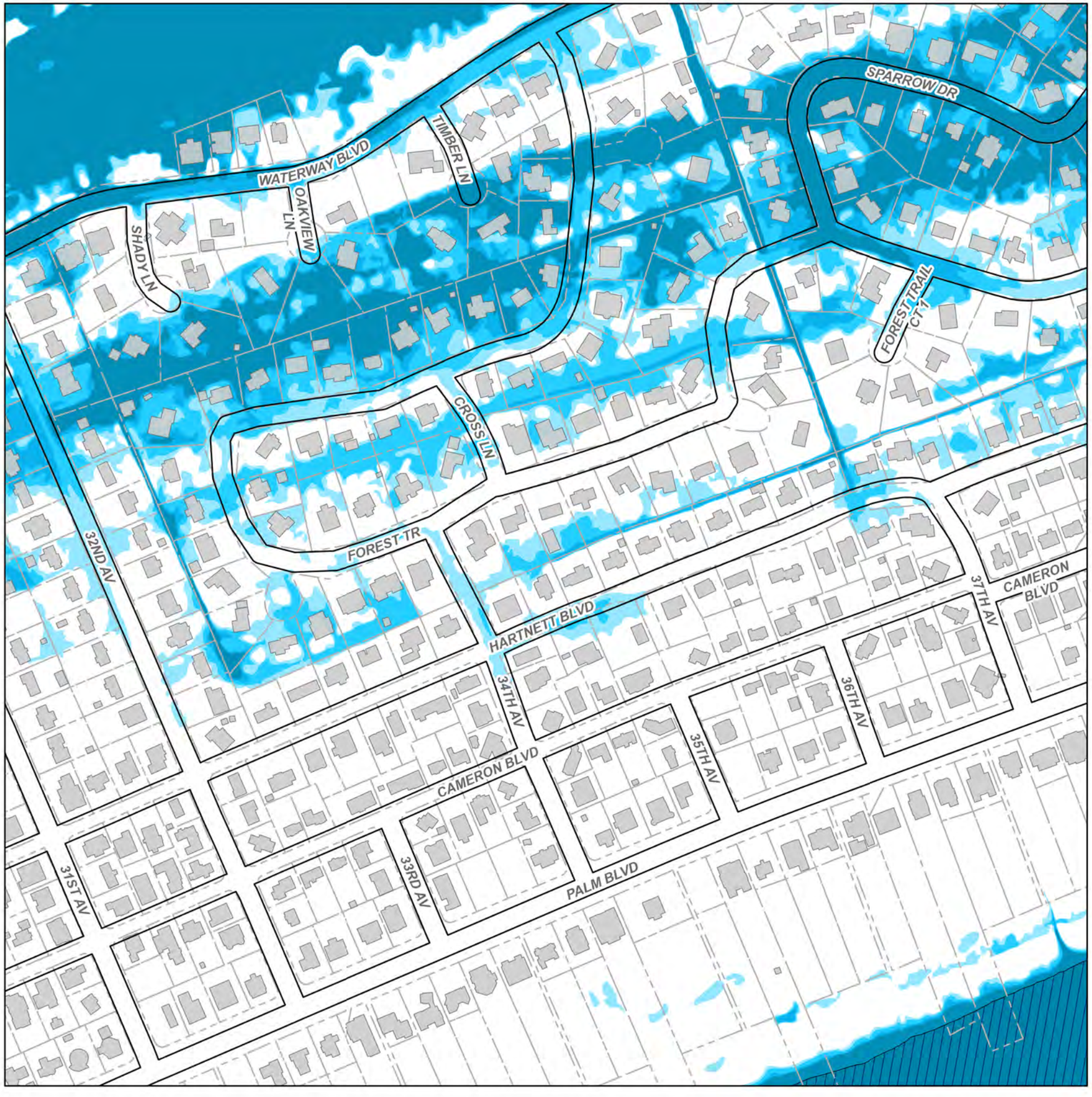
- Study Boundary
- Existing Structure
- Parcel Boundary
- Roadway
- Waterway
- Marsh

Maximum Inundation Boundary

- 2023
- 2030
- 2040
- 2050

N
W
E
S

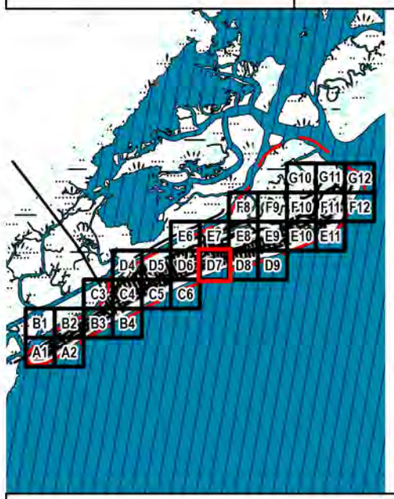
0 250 500 1,000 Feet



City of Isle of Palms, South Carolina
Sea Level Rise Adaptation Plan

Vulnerability Analysis

Appendix A	Sector D7	Page 14 of 30



NOTES:

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Legend

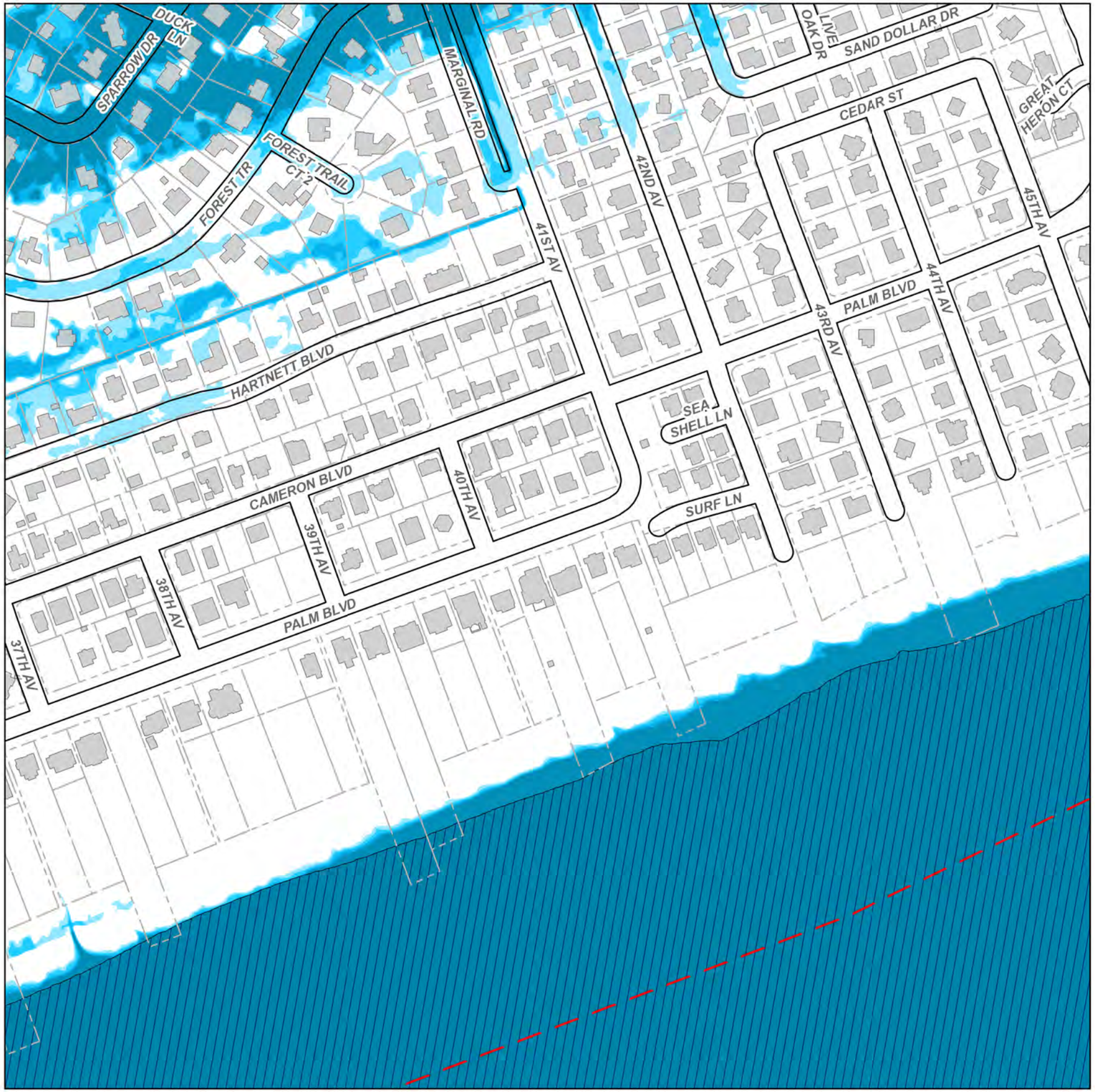
- Study Boundary
- Existing Structure
- Parcel Boundary
- Roadway
- Waterway
- Marsh

Maximum Inundation Boundary

- 2023
- 2030
- 2040
- 2050

N
W
E
S

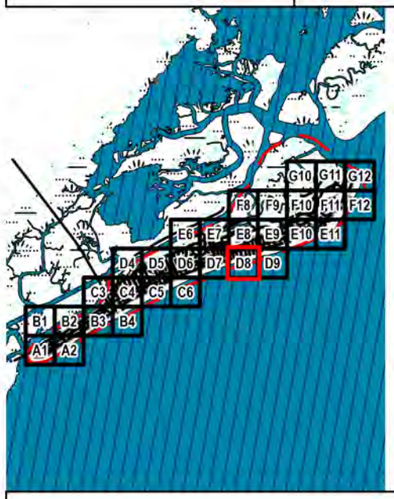
0 250 500 1,000 Feet



City of Isle of Palms, South Carolina
Sea Level Rise Adaptation Plan

Vulnerability Analysis

Appendix A	Sector D8	Page 15 of 30



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Legend

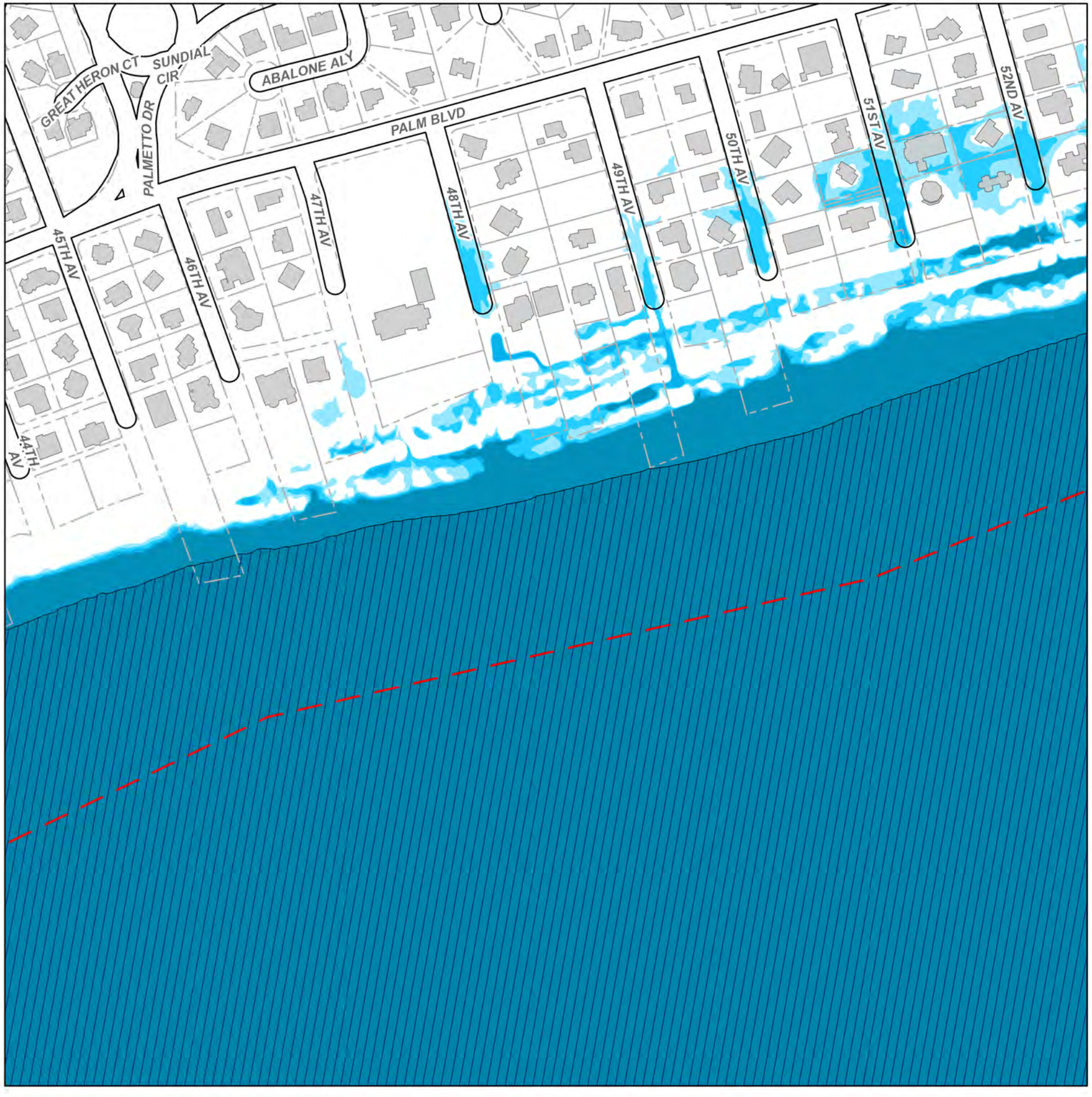
- Study Boundary
- Existing Structure
- Parcel Boundary
- Roadway
- Waterway
- Marsh

Maximum Inundation Boundary

- 2023
- 2030
- 2040
- 2050

N
W
E
S

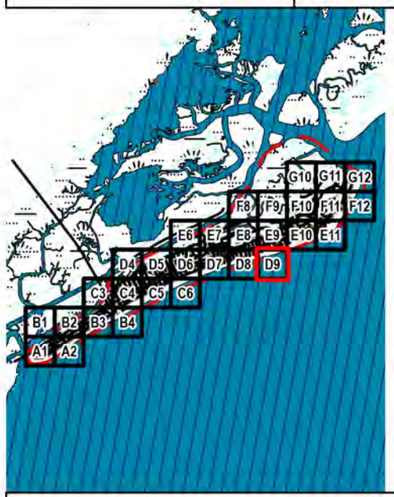
0 250 500 1,000 Feet



City of Isle of Palms, South Carolina
Sea Level Rise Adaptation Plan

Vulnerability Analysis

Appendix A	Sector D9	Page 16 of 30



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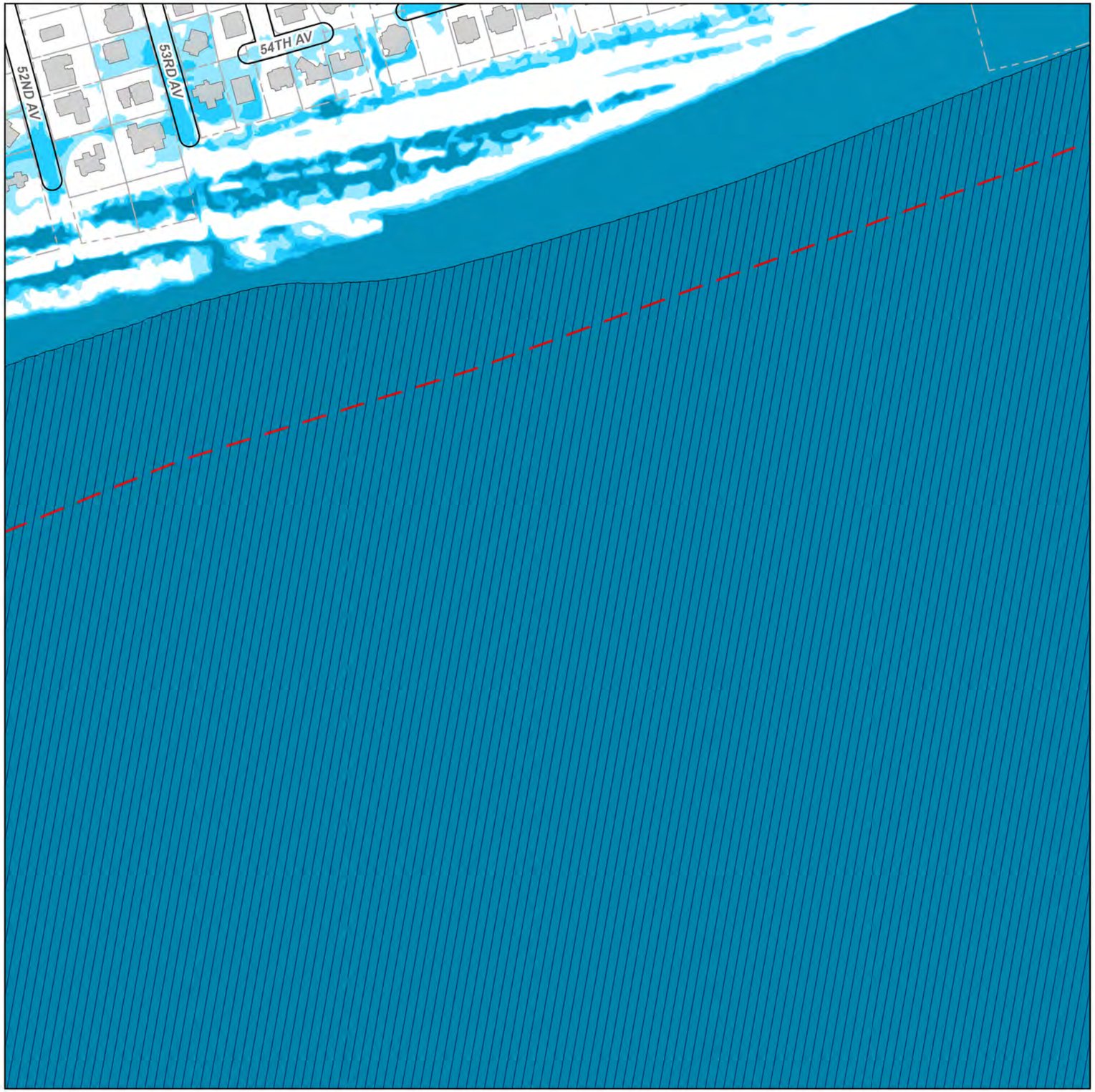


Legend

- Study Boundary
- Existing Structure
- Parcel Boundary
- Roadway
- Waterway
- Marsh

Maximum Inundation Boundary

- 2023
- 2030
- 2040
- 2050

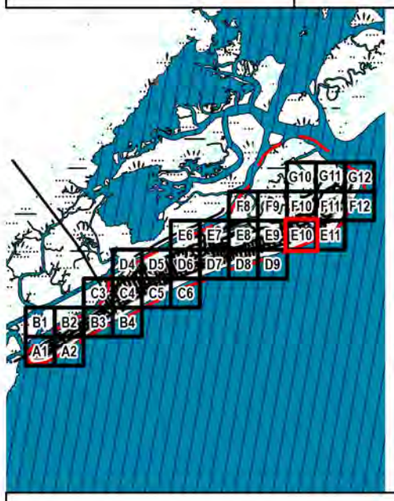
N
W
E
S

0 250 500 1,000 Feet

City of Isle of Palms, South Carolina
Sea Level Rise Adaptation Plan

Vulnerability Analysis

Appendix A	Sector E10	Page 17 of 30



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Legend

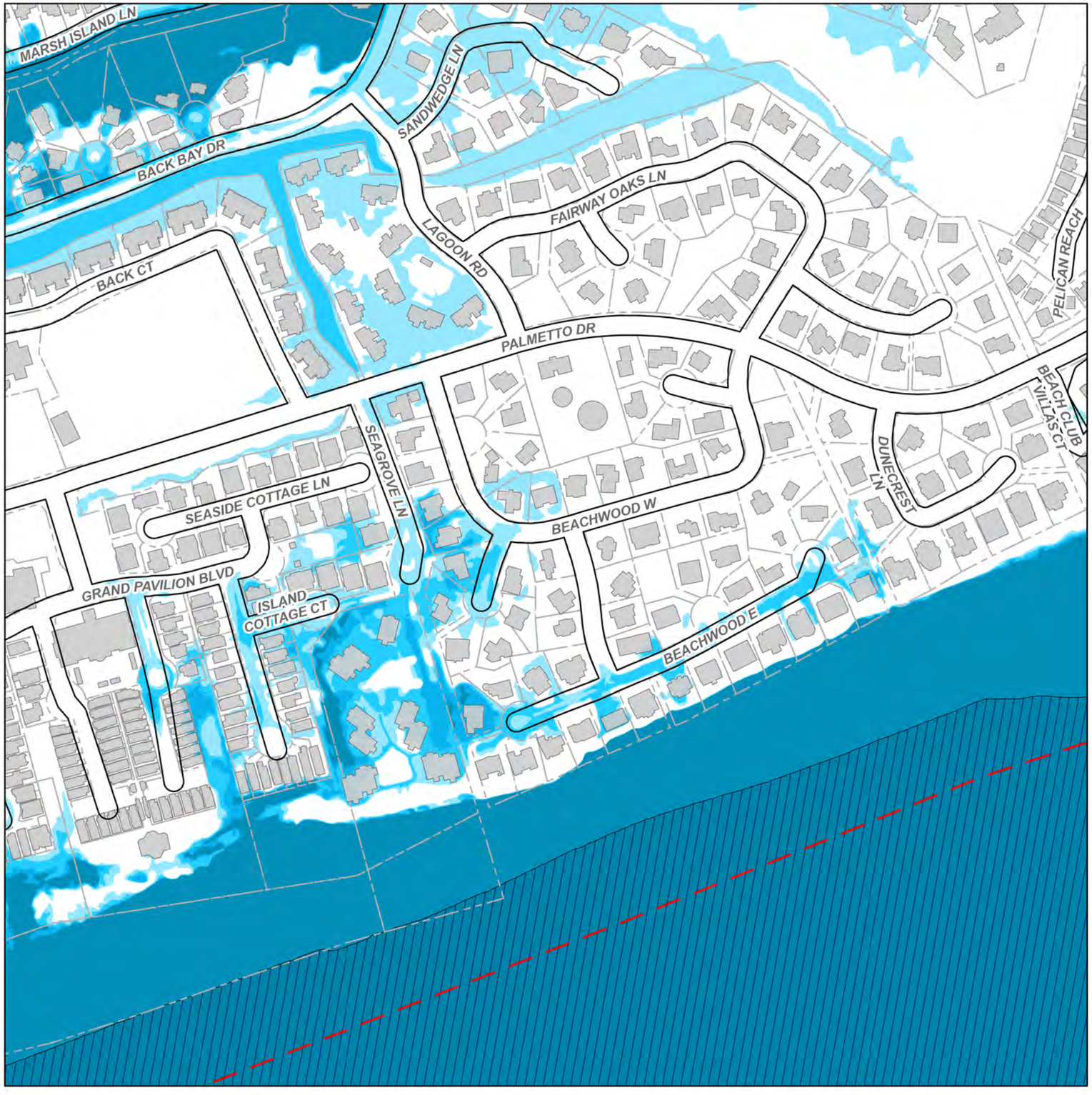
- Study Boundary
- Existing Structure
- Parcel Boundary
- Roadway
- Waterway
- Marsh

Maximum Inundation Boundary

- 2023
- 2030
- 2040
- 2050

N
W
E
S

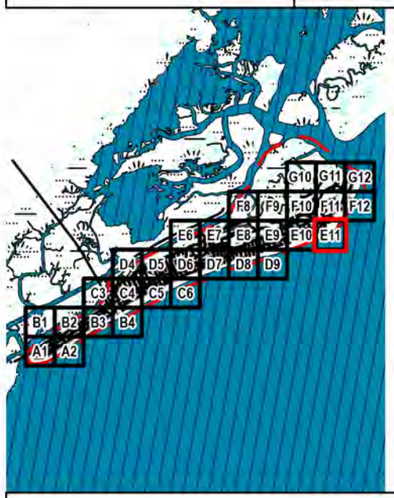
0 250 500 1,000 Feet



City of Isle of Palms, South Carolina
Sea Level Rise Adaptation Plan

Vulnerability Analysis

Appendix A	Sector E11	Page 18 of 30



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Legend

- Study Boundary
- Existing Structure
- Parcel Boundary
- Roadway
- Waterway
- Marsh

Maximum Inundation Boundary

- 2023
- 2030
- 2040
- 2050

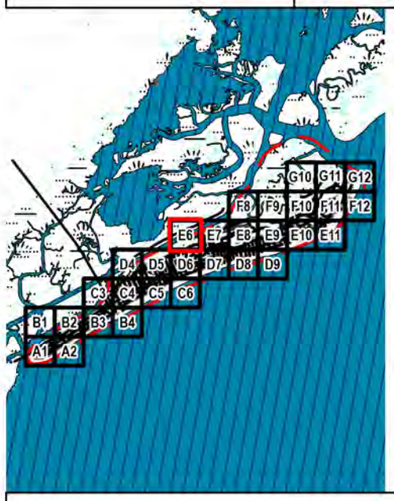
N
W
E
S

0 250 500 1,000 Feet

City of Isle of Palms, South Carolina
Sea Level Rise Adaptation Plan

Vulnerability Analysis

Appendix A	Sector E6	Page 19 of 30



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Legend

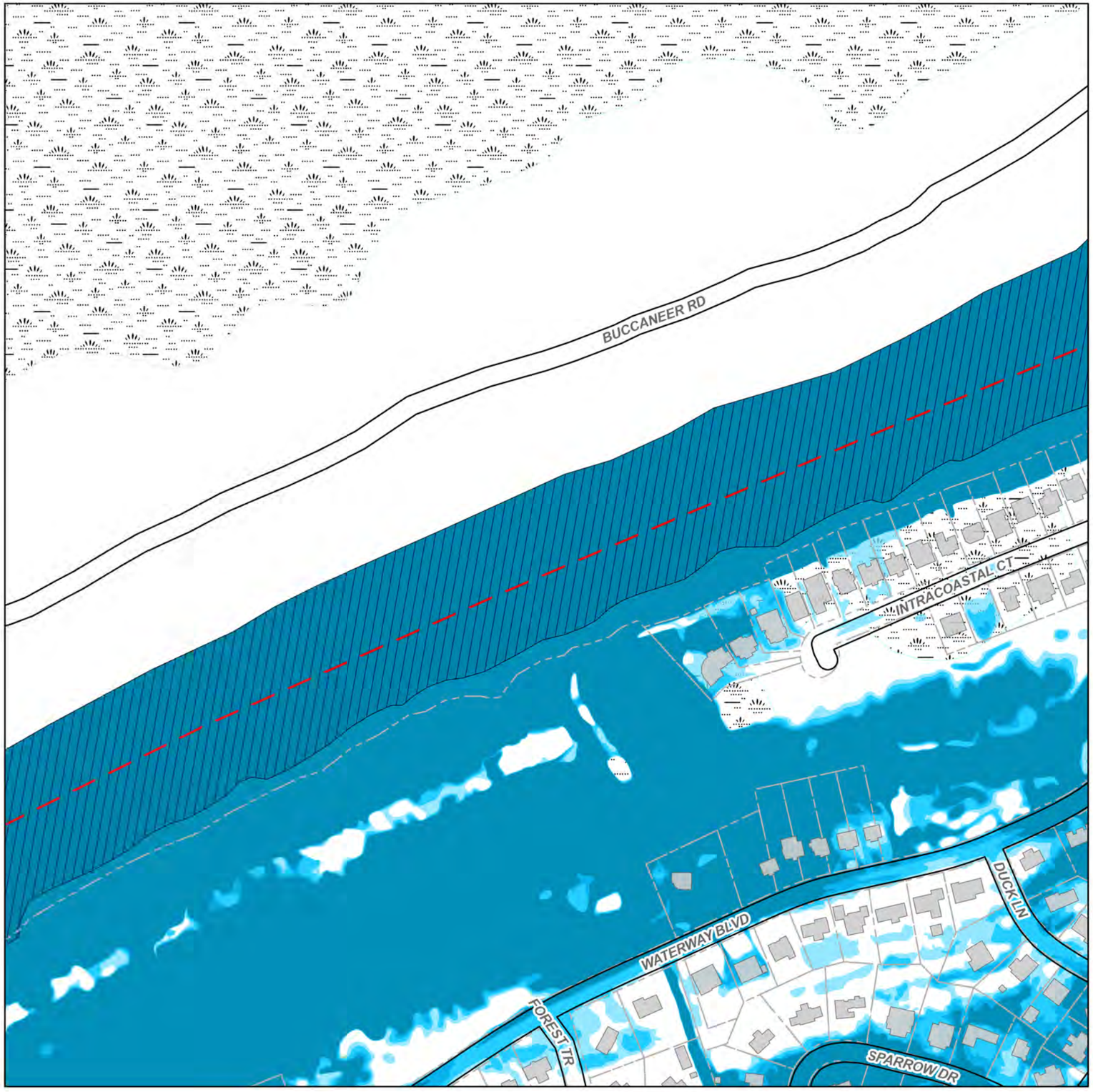
- Study Boundary
- Existing Structure
- Parcel Boundary
- Roadway
- Waterway
- Marsh

Maximum Inundation Boundary

- 2023
- 2030
- 2040
- 2050

N
W E
S

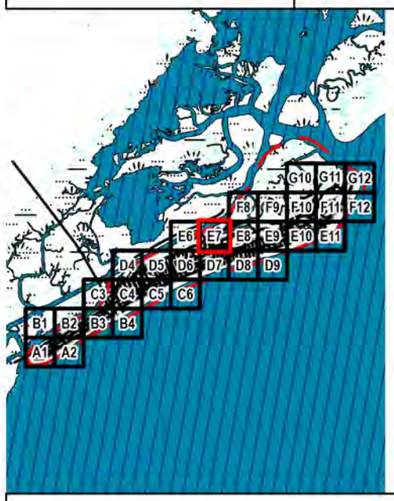
0 250 500 1,000 Feet



City of Isle of Palms, South Carolina
Sea Level Rise Adaptation Plan

Vulnerability Analysis

Appendix A	Sector E7	Page 20 of 30



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Legend

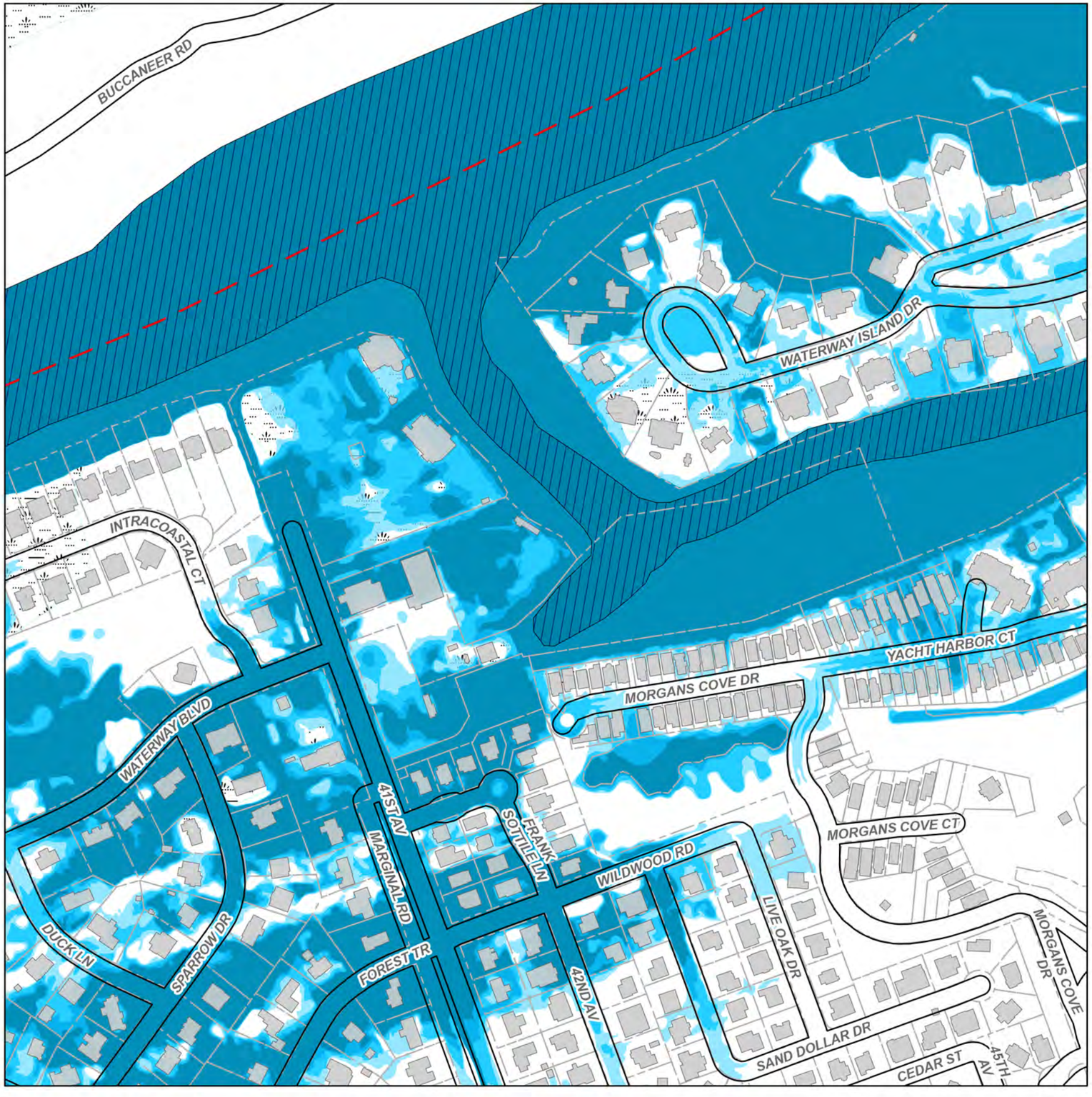
- Study Boundary
- Existing Structure
- Parcel Boundary
- Roadway
- Waterway
- Marsh

Maximum Inundation Boundary

- 2023
- 2030
- 2040
- 2050

N
W
E
S

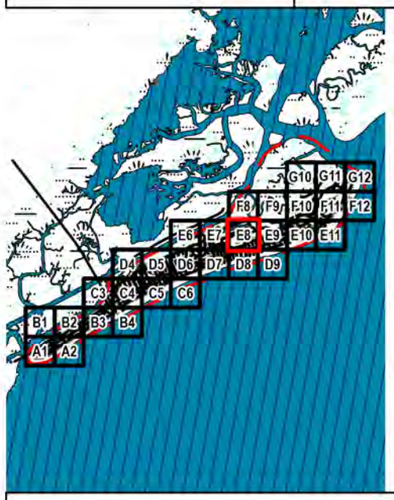
0 250 500 1,000 Feet



City of Isle of Palms, South Carolina
Sea Level Rise Adaptation Plan

Vulnerability Analysis

Appendix A	Sector E8	Page 21 of 30



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Legend

- Study Boundary
- Existing Structure
- Parcel Boundary
- Roadway
- Waterway
- Marsh

Maximum Inundation Boundary

- 2023
- 2030
- 2040
- 2050

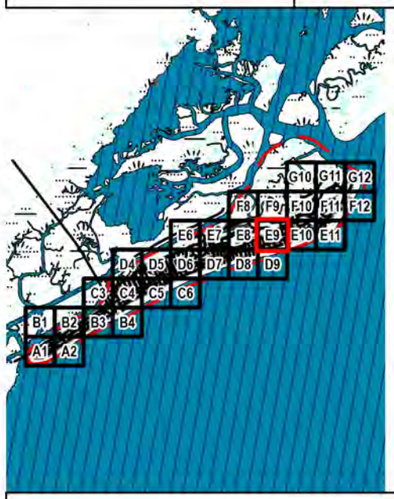
N
W
E
S

0 250 500 1,000 Feet

City of Isle of Palms, South Carolina
Sea Level Rise Adaptation Plan

Vulnerability Analysis

Appendix A	Sector E9	Page 22 of 30



NOTES:

1. Flood inundation boundaries created using a 2D HEC-RAS model of the study area.
2. Tidal boundaries conditions were developed for each target year based on projected sea level rise and vertical land subsidence (following methodology discussed in the Sea Level Rise Adaptation Plan).
3. Existing structure and parcel boundary locations are approximate.
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6. These results do not account for the impact of rainfall-driven flooding.
7. These results assume topography is stationary within the the study area. No erosional or accretional (i.e., beach erosion, shoal migration, etc.) forces were considered within this study. Stabilization or continued preservation of the beaches is assumed.

Legend

- Study Boundary
- Existing Structure
- Parcel Boundary
- Roadway
- Waterway
- Marsh

Maximum Inundation Boundary

- 2023
- 2030
- 2040
- 2050

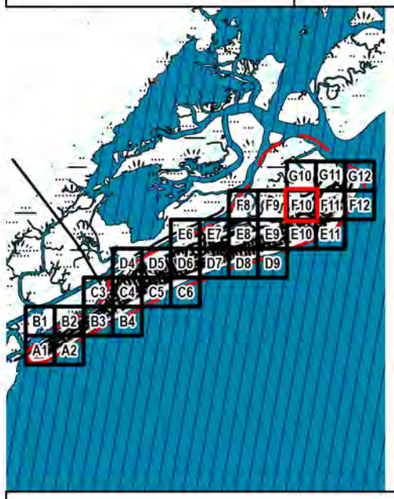
N W E S

0 250 500 1,000 Feet

City of Isle of Palms, South Carolina
Sea Level Rise Adaptation Plan

Vulnerability Analysis

Appendix A	Sector F10	Page 23 of 30



NOTES:

1. Flood inundation boundaries created using a 2D HEC-RAS model of the study area.
2. Tidal boundaries conditions were developed for each target year based on projected sea level rise and vertical land subsidence (following methodology discussed in the Sea Level Rise Adaptation Plan).
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Legend

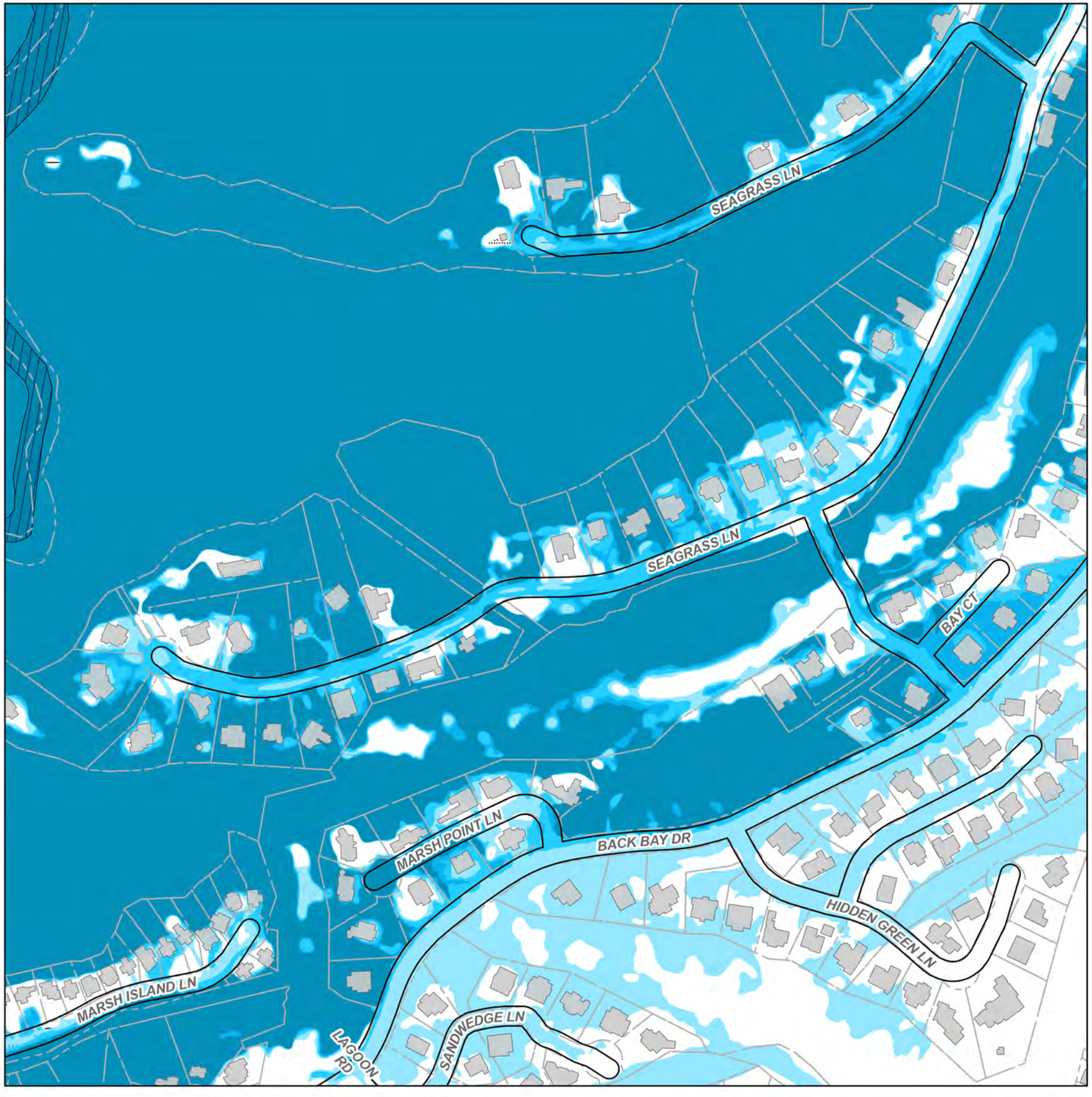
- Study Boundary
- Existing Structure
- Parcel Boundary
- Roadway
- Waterway
- Marsh

Maximum Inundation Boundary

- 2023
- 2030
- 2040
- 2050

N W E S

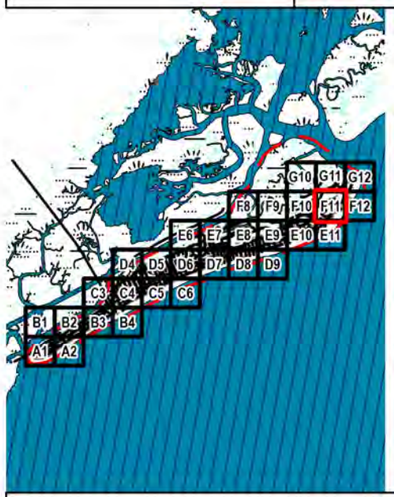
0 250 500 1,000 Feet



City of Isle of Palms, South Carolina
Sea Level Rise Adaptation Plan

Vulnerability Analysis

Appendix A	Sector F11	Page 24 of 30



NOTES:

1. Flood inundation boundaries created using a 2D HEC-RAS model of the study area.
2. Tidal boundaries conditions were developed for each target year based on projected sea level rise and vertical land subsidence (following methodology discussed in the Sea Level Rise Adaptation Plan).
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Legend

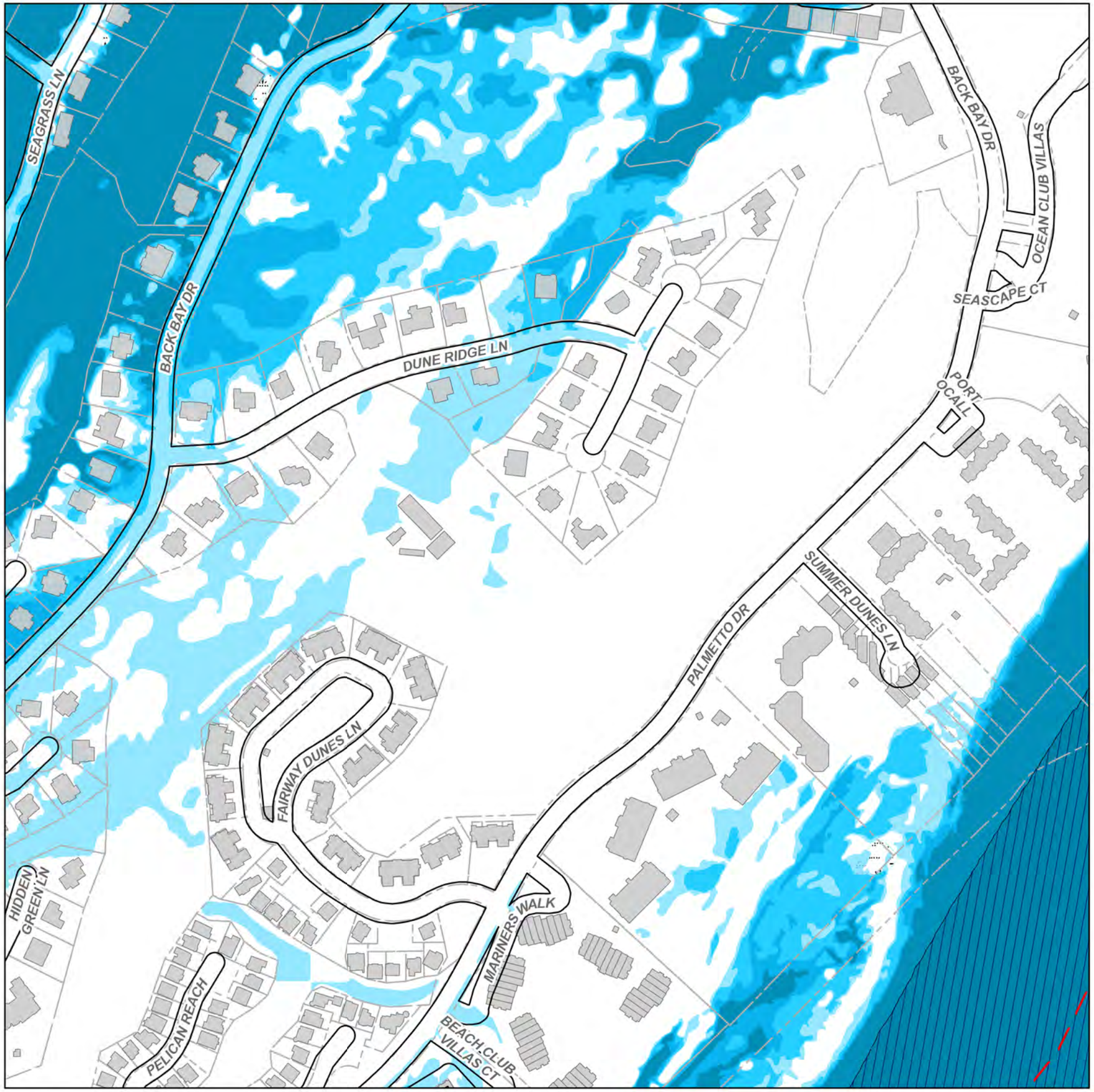
- Study Boundary
- Existing Structure
- Parcel Boundary
- Roadway
- Waterway
- Marsh

Maximum Inundation Boundary

- 2023
- 2030
- 2040
- 2050

N
W
E
S

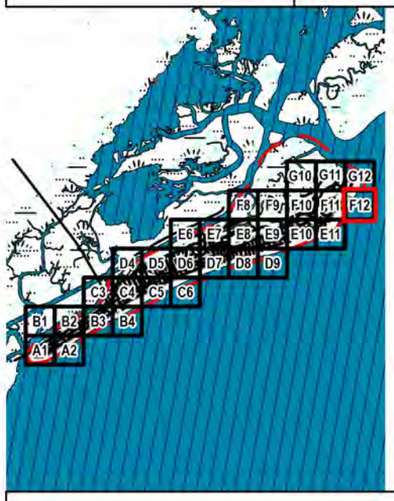
0 250 500 1,000 Feet



City of Isle of Palms, South Carolina
Sea Level Rise Adaptation Plan

Vulnerability Analysis

Appendix A	Sector F12	Page 25 of 30



NOTES:

1. Flood inundation boundaries created using a 2D HEC-RAS model of the study area.
2. Tidal boundaries conditions were developed for each target year based on projected sea level rise and vertical land subsidence (following methodology discussed in the Sea Level Rise Adaptation Plan).
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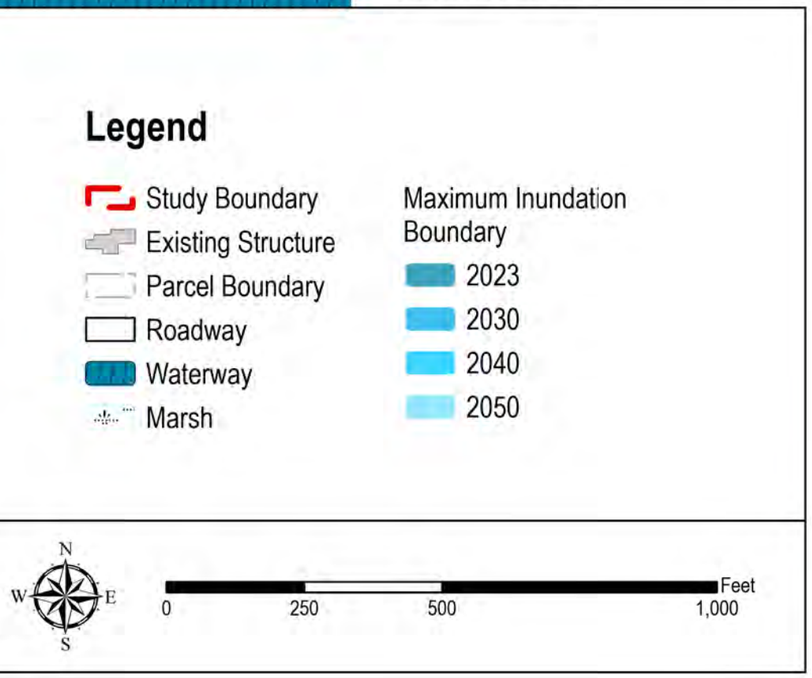
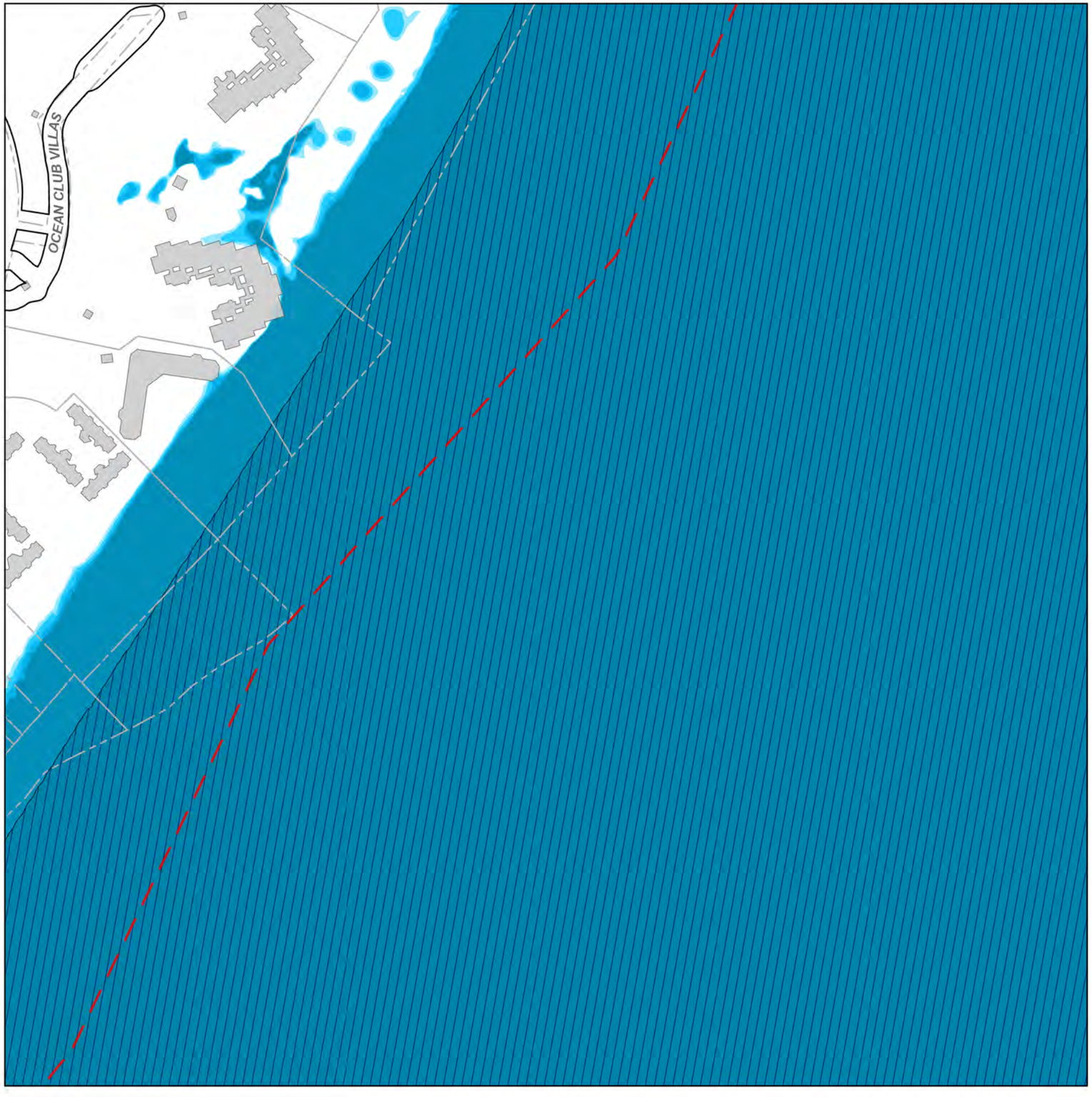
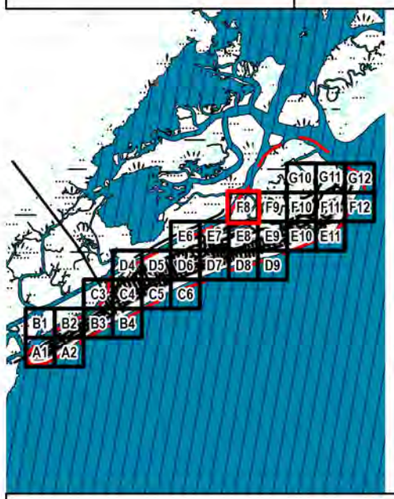




City of Isle of Palms, South Carolina
Sea Level Rise Adaptation Plan

Vulnerability Analysis

Appendix A	Sector F8	Page 26 of 30



NOTES:

1. Flood inundation boundaries created using a 2D HEC-RAS model of the study area.
2. Tidal boundaries conditions were developed for each target year based on projected sea level rise and vertical land subsidence (following methodology discussed in the Sea Level Rise Adaptation Plan).
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Legend

- Study Boundary
- Existing Structure
- Parcel Boundary
- Roadway
- Waterway
- Marsh

Maximum Inundation Boundary

- 2023
- 2030
- 2040
- 2050

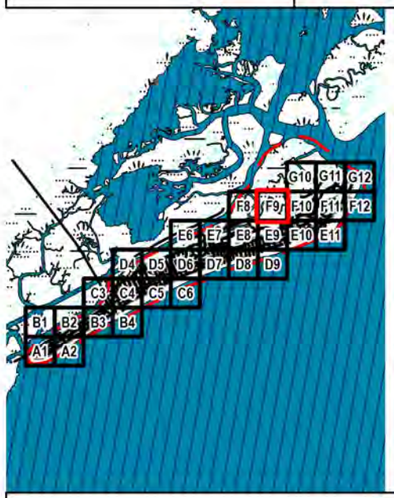
N
W
E
S

0 250 500 1,000 Feet

City of Isle of Palms, South Carolina
Sea Level Rise Adaptation Plan

Vulnerability Analysis

Appendix A	Sector F9	Page 27 of 30



NOTES:

1. Flood inundation boundaries created using a 2D HEC-RAS model of the study area.
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Legend

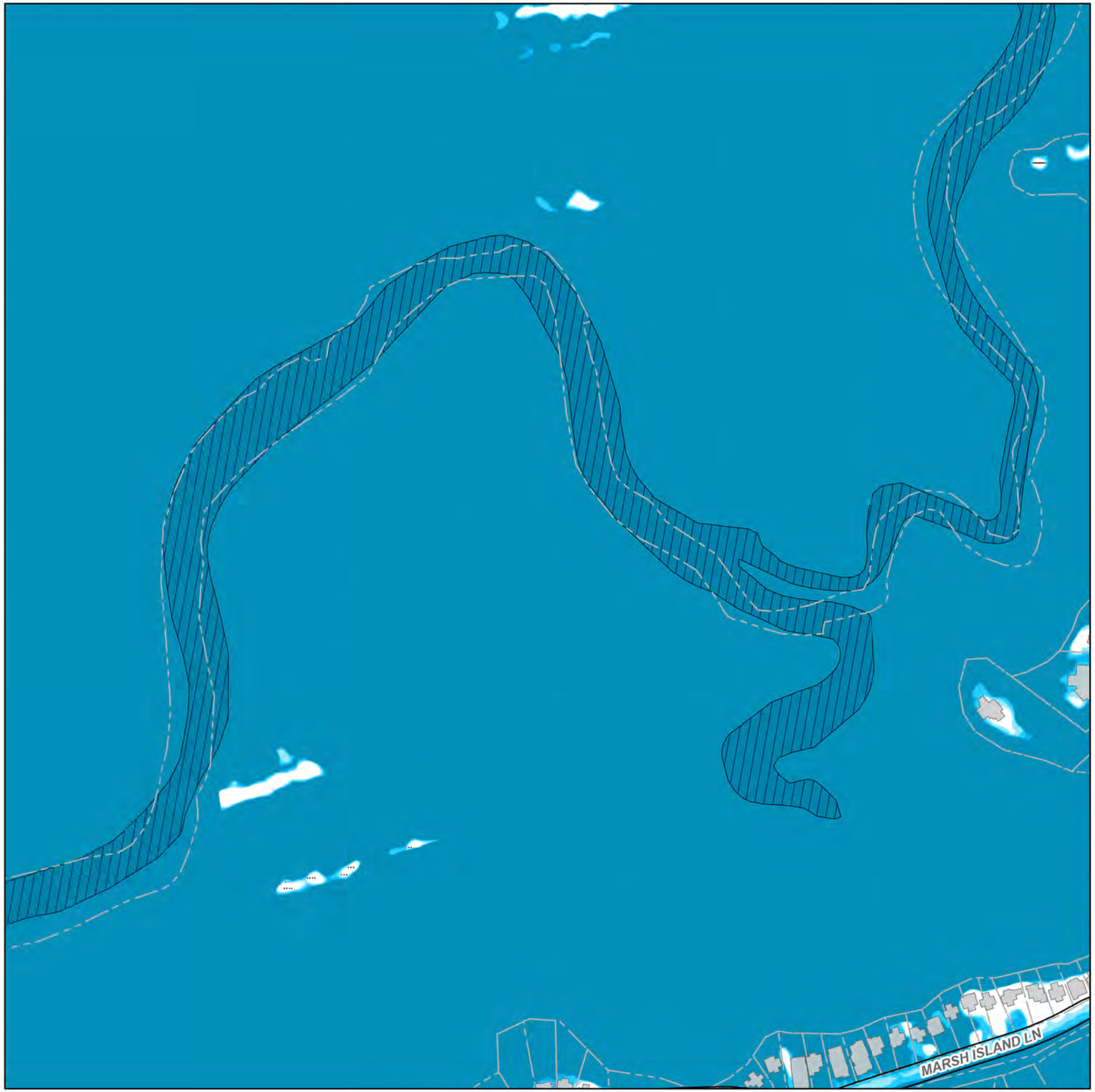
- Study Boundary
- Existing Structure
- Parcel Boundary
- Roadway
- Waterway
- Marsh

Maximum Inundation Boundary

- 2023
- 2030
- 2040
- 2050

N
W
E
S

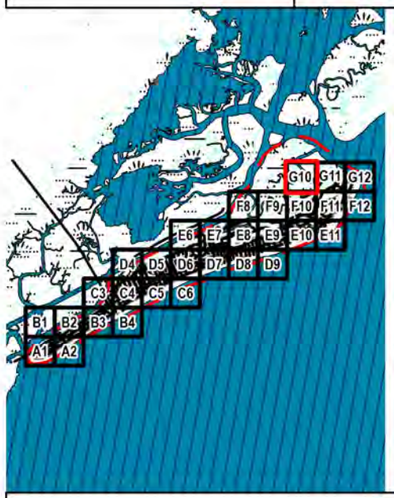
0 250 500 1,000 Feet



City of Isle of Palms, South Carolina
Sea Level Rise Adaptation Plan

Vulnerability Analysis

Appendix A	Sector G10	Page 28 of 30



NOTES:

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Legend

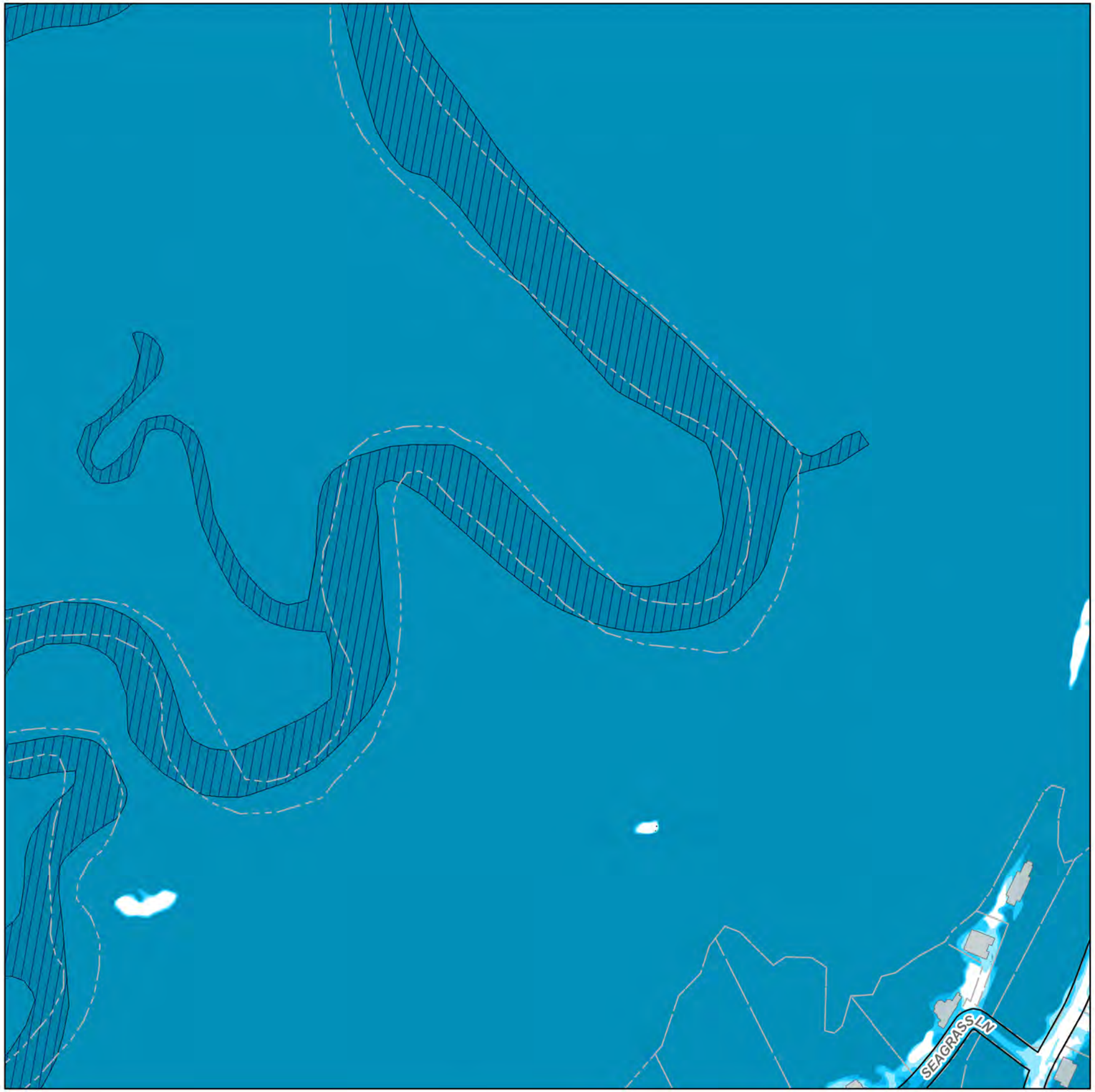
- Study Boundary
- Existing Structure
- Parcel Boundary
- Roadway
- Waterway
- Marsh

Maximum Inundation Boundary

- 2023
- 2030
- 2040
- 2050

N
W
E
S

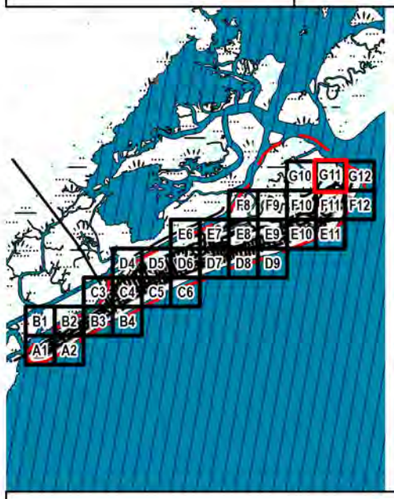
0 250 500 1,000 Feet



City of Isle of Palms, South Carolina
Sea Level Rise Adaptation Plan

Vulnerability Analysis

Appendix A	Sector G11	Page 29 of 30



NOTES:

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Legend

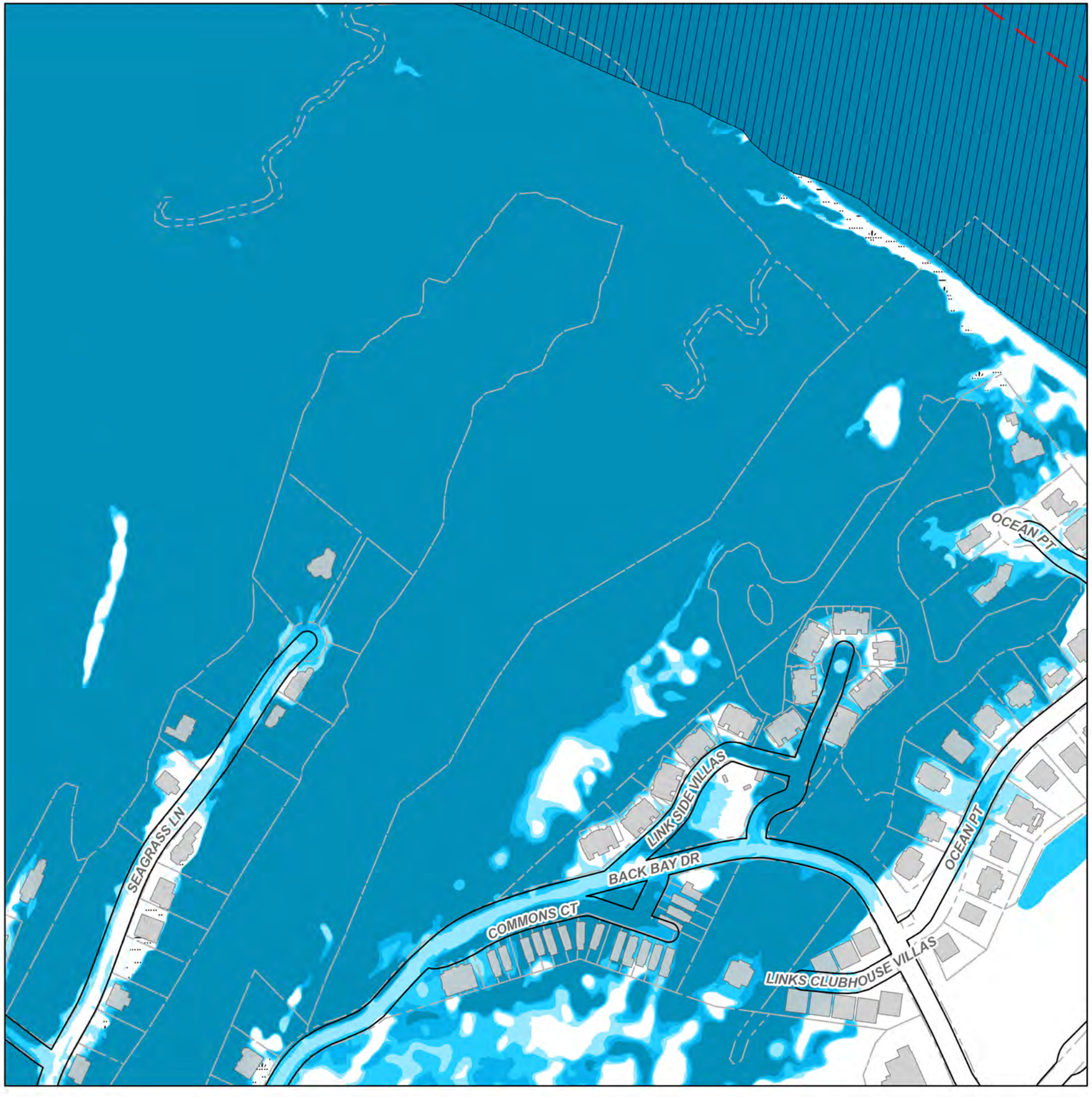
- Study Boundary
- Existing Structure
- Parcel Boundary
- Roadway
- Waterway
- Marsh

Maximum Inundation Boundary

- 2023
- 2030
- 2040
- 2050

N
W
E
S

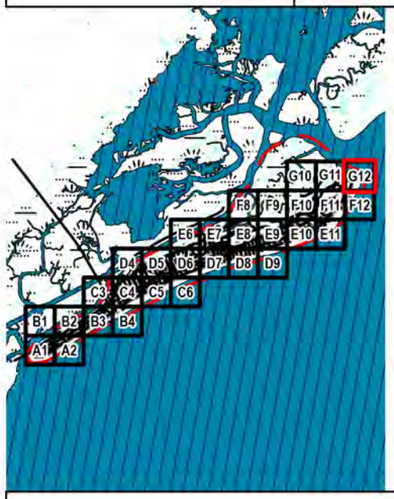
0 250 500 1,000 Feet



City of Isle of Palms, South Carolina
Sea Level Rise Adaptation Plan

Vulnerability Analysis

Appendix A	Sector G12	Page 30 of 30



NOTES:

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Legend

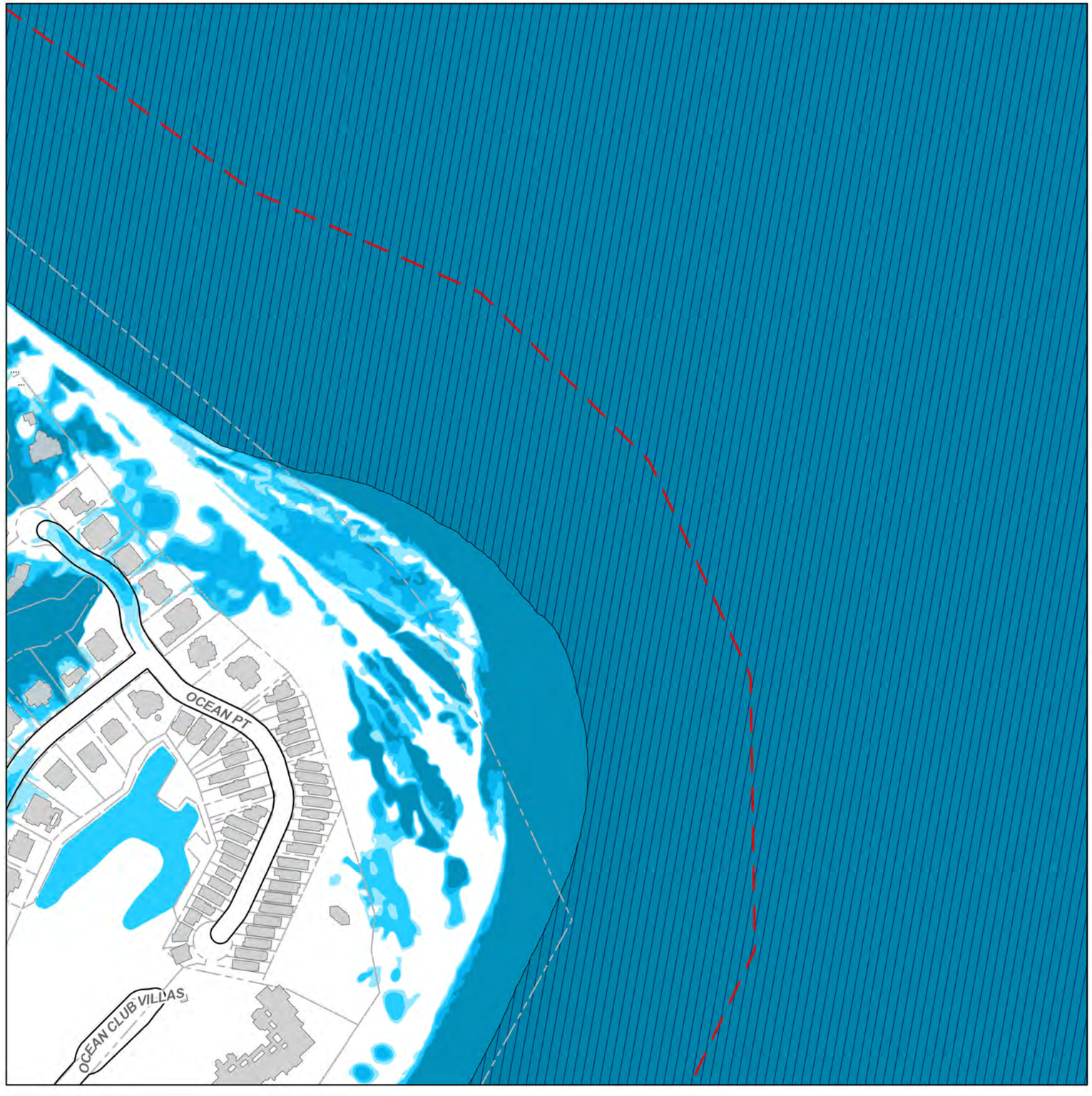
- Study Boundary
- Existing Structure
- Parcel Boundary
- Roadway
- Waterway
- Marsh

Maximum Inundation Boundary

- 2023
- 2030
- 2040
- 2050

N
W
E
S

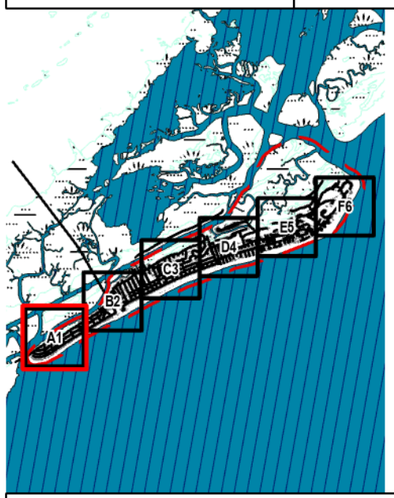
0 250 500 1,000 Feet



City of Isle of Palms, South Carolina
Sea Level Rise Adaptation Plan

Vulnerability Analysis
Sewer Master Plan Supplementary Data

Appendix B	Sector A1	Page 1 of 6



NOTES:

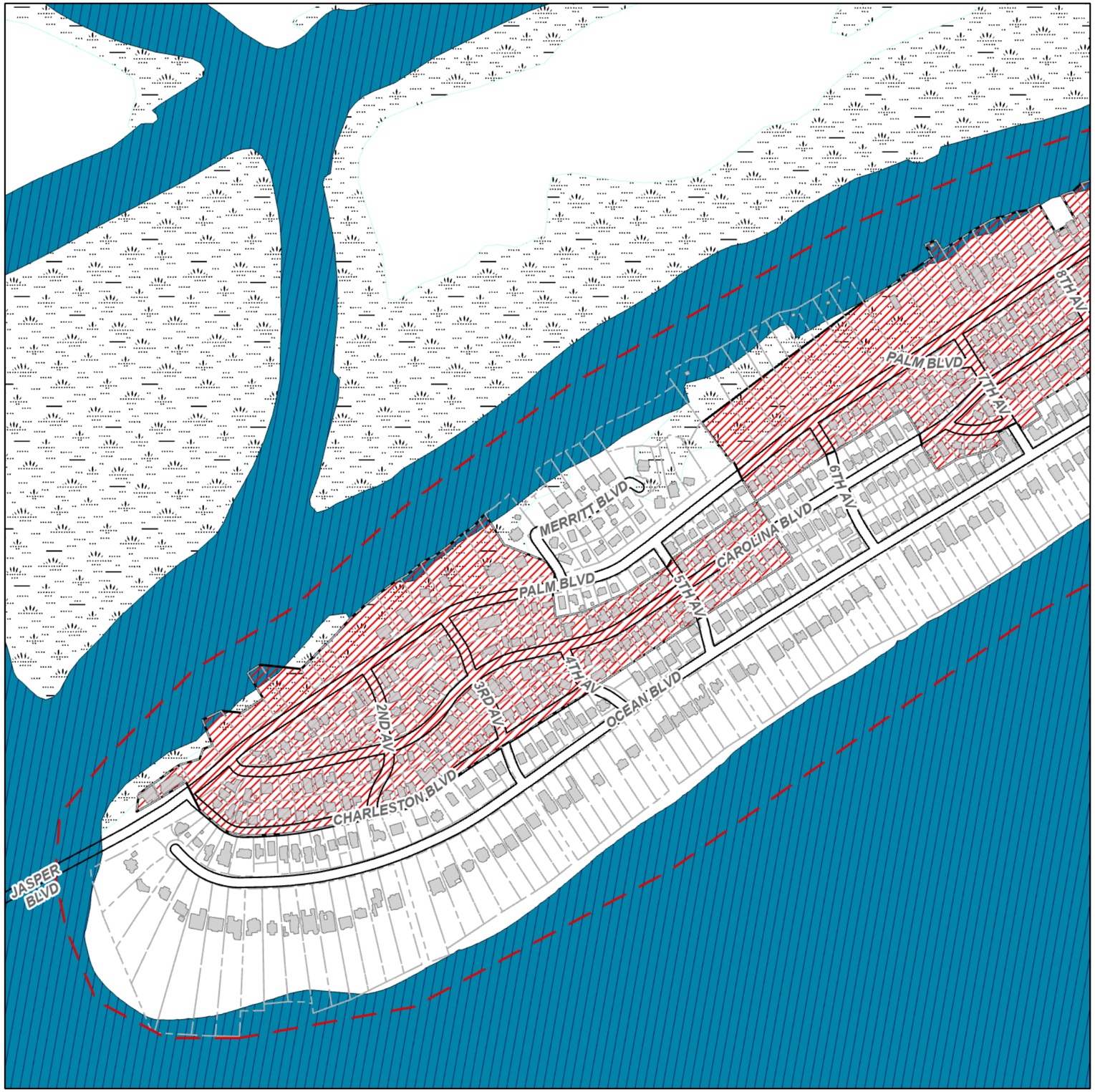
1. Existing structure and parcel boundary locations are approximate.
2. Septic service boundaries delineated based on 2018 Sewer Master Plan and may not account for recent improvements.

Legend

- Study Boundary
- Existing Structure
- Parcel Boundary
- Areas on Septic
- Roadway
- Waterway
- Marsh

N
W E
S

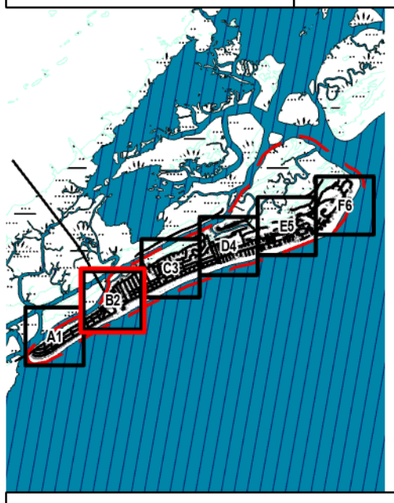
0 500 1,000 2,000 Feet



City of Isle of Palms, South Carolina
Sea Level Rise Adaptation Plan

Vulnerability Analysis
Sewer Master Plan Supplementary Data

Appendix B	Sector B2	Page 2 of 6



NOTES:

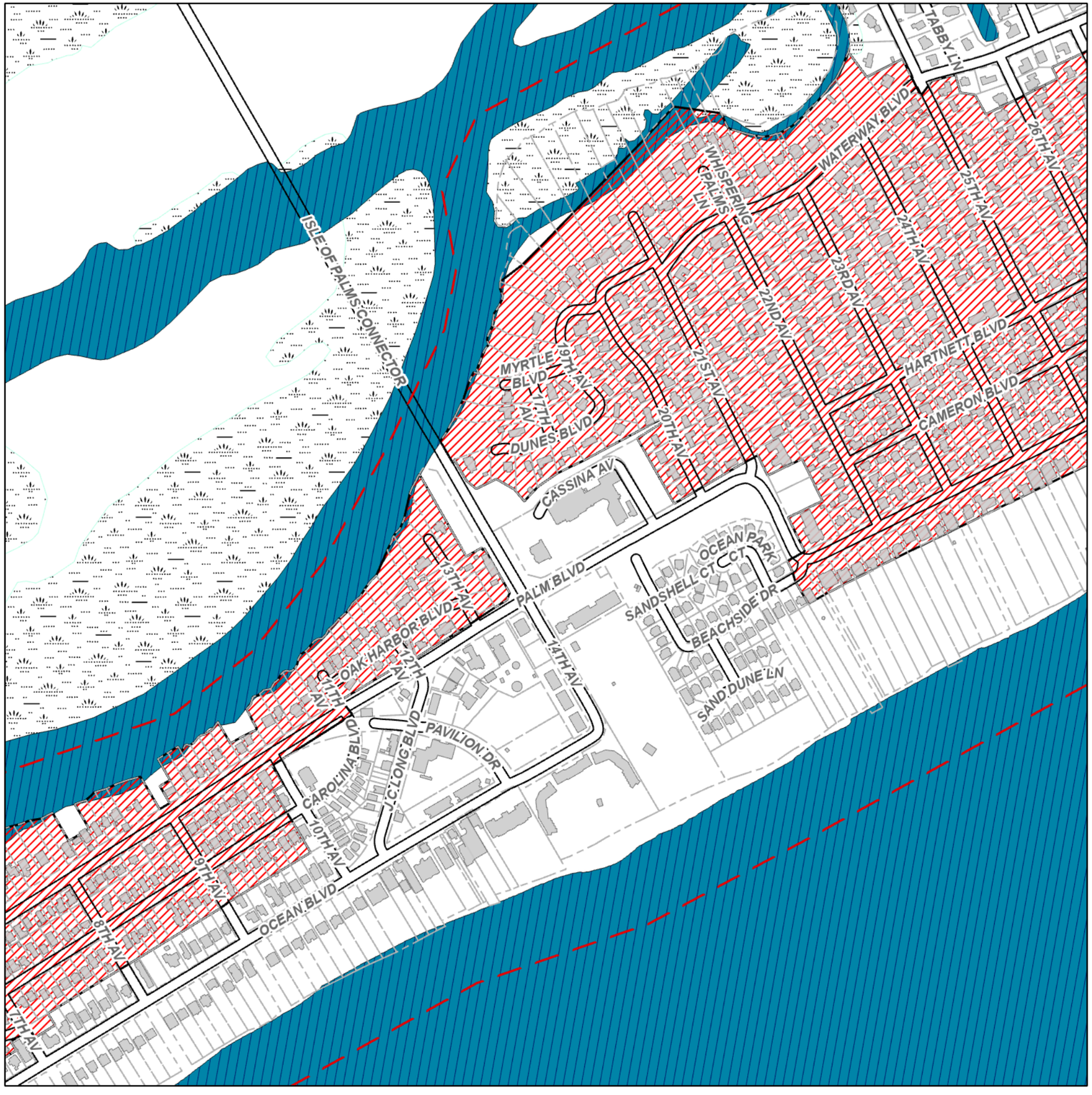
1. Existing structure and parcel boundary locations are approximate.
2. Septic service boundaries delineated based on 2018 Sewer Master Plan and may not account for recent improvements.

Legend

- Study Boundary
- Existing Structure
- Parcel Boundary
- Areas on Septic
- Roadway
- Waterway
- Marsh

N
W E
S

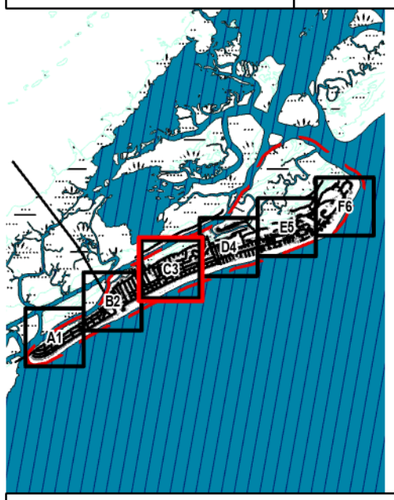
0 500 1,000 2,000 Feet



City of Isle of Palms, South Carolina
Sea Level Rise Adaptation Plan

Vulnerability Analysis
Sewer Master Plan Supplementary Data

Appendix B	Sector C3	Page 3 of 6



NOTES:

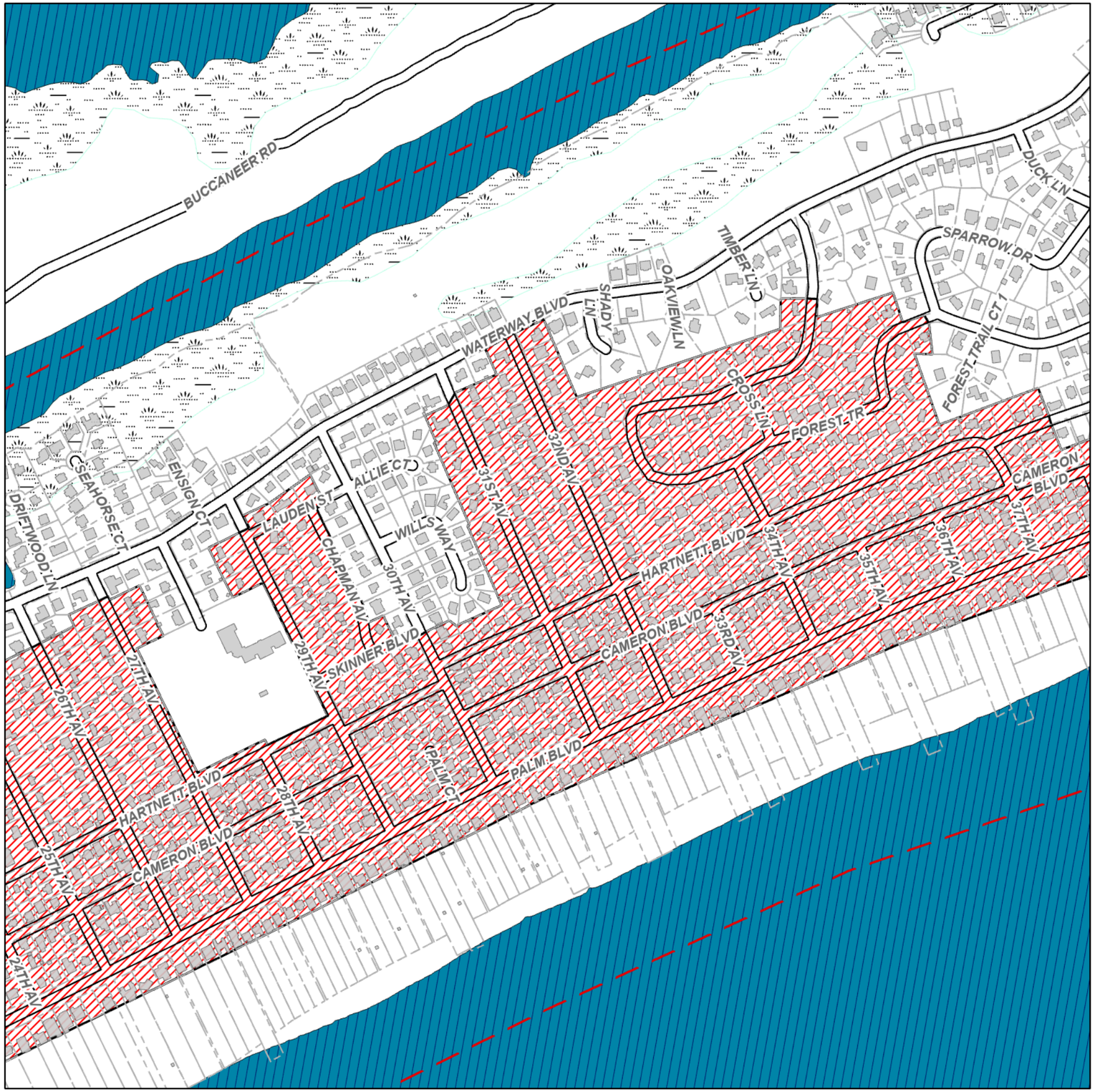
1. Existing structure and parcel boundary locations are approximate.
2. Septic service boundaries delineated based on 2018 Sewer Master Plan and may not account for recent improvements.

Legend

- Study Boundary
- Existing Structure
- Parcel Boundary
- Areas on Septic
- Roadway
- Waterway
- Marsh

N W E S

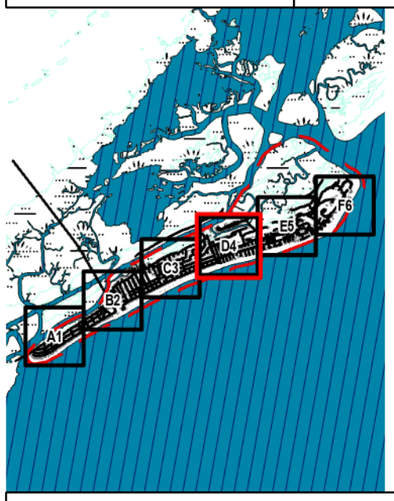
0 500 1,000 2,000 Feet



City of Isle of Palms, South Carolina
Sea Level Rise Adaptation Plan

Vulnerability Analysis
Sewer Master Plan Supplementary Data

Appendix B	Sector D4	Page 4 of 6



NOTES:

1. Existing structure and parcel boundary locations are approximate.
2. Septic service boundaries delineated based on 2018 Sewer Master Plan and may not account for recent improvements.

Legend

- Study Boundary
- Existing Structure
- Parcel Boundary
- Areas on Septic
- Roadway
- Waterway
- Marsh

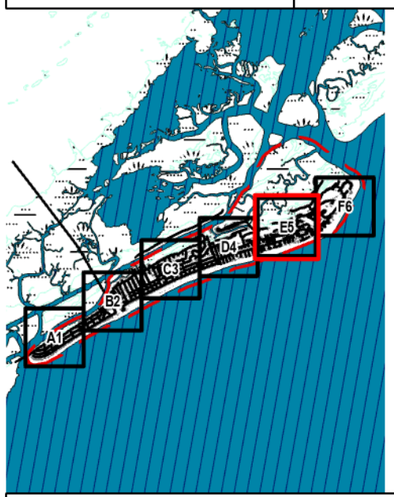
N W E S

0 500 1,000 2,000 Feet

City of Isle of Palms, South Carolina
Sea Level Rise Adaptation Plan

Vulnerability Analysis
Sewer Master Plan Supplementary Data

Appendix B	Sector E5	Page 5 of 6



NOTES:

1. Existing structure and parcel boundary locations are approximate.
2. Septic service boundaries delineated based on 2018 Sewer Master Plan and may not account for recent improvements.

Legend

- Study Boundary
- Existing Structure
- Parcel Boundary
- Areas on Septic
- Roadway
- Waterway
- Marsh

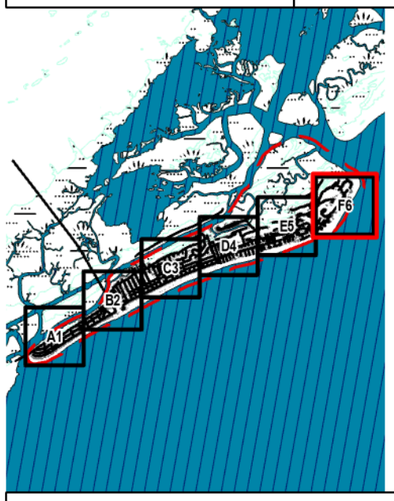
N
W E
S

0 500 1,000 2,000 Feet

City of Isle of Palms, South Carolina
Sea Level Rise Adaptation Plan

Vulnerability Analysis
Sewer Master Plan Supplementary Data

Appendix B	Sector F6	Page 6 of 6



NOTES:

1. Existing structure and parcel boundary locations are approximate.
2. Septic service boundaries delineated based on 2018 Sewer Master Plan and may not account for recent improvements.

Legend

- Study Boundary
- Existing Structure
- Parcel Boundary
- Areas on Septic
- Roadway
- Waterway
- Marsh

N
W E
S

0 500 1,000 2,000 Feet