Captiva Erosion Prevention District

January 2023 Board Meeting

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Please follow page numbers on top right corner

Captiva Erosion Prevention District

Board Meeting Agenda

Date: Monday, January 9th, 2023
Time: 1:00 P.M.
Location: Via Zoom - https://us02web.zoom.us/j/88304094458
Telephone: +1 (305) 224-1968

1. **Call to Order**

2. **Roll Call**

3. **Commissioner Appointment**

4. **Approval of Minutes**
   A. December 12th, 2022, Board Meeting
   B. December 15th, 2022, Workshop

5. **General Public Comments –** Limit 3 minutes per person

6. **Changes to the Agenda**

7. **Financial Reports**

8. **Old Business**
   A. Aptim Vulnerability Assessment
   B. Aptim Phase 2
   C. Becker Update
   D. Apportionment

9. **New Business**
   A. Beach Tilling

10. **Administrative Update**

11. **Commissioner Comments**

12. **Adjournment**

In accordance with the Americans with Disability Act and F.S. 286.26; any person with a disability requiring any additional reasonable accommodation to participate in this meeting should call the CEPD office at phone 239.472.2472 or email a written request to mycepd@mycepd.com. One or more elected or appointed local government officials, including but not limited to the Captiva Erosion Prevention District, may be in attendance at this meeting. Any person who decides to appeal any decision of the Board of Commissioners with respect to any matter considered at this meeting will need a record of the proceedings and for such purposes may need to ensure that a verbatim record of the proceedings is made, which record includes the testimony and evidence upon which the appeal is to be based. The law does not require the CEPD to transcribe verbatim minutes; therefore, the applicant must make the necessary arrangements with a private reporter or private reporting firm and bear the resulting expense.

CAPTIVA EROSION PREVENTION DISTRICT
COMMISSIONER APPOINTMENT INFORMATION FORM

This Appointment Information Form, when completed and filed with the CEPD Office, is a PUBLIC RECORD under Chapter 119, Florida Statutes, and, therefore, is open to public inspection by any person.

YOU ARE RESPONSIBLE TO KEEP THE INFORMATION ON THIS FORM CURRENT.
PLEASE NOTE IF ANY OF THEINFORMATION ON THE APPLICATION IS EXEMPT FROM PUBLIC DISCLOSURE OR CONFIDENTIAL PURSUANT TO STATE OR FEDERAL LAW

Please Type, if possible (or print clearly) Date: December 16, 2022

Name: Laird, Linda m
(Last) (First) (Middle)

Address: (H) 37 Sea Hibiscus Ct

Captiva, Florida Zip Code 33924

(O) Summer Address: 107 East Cove Lane

Shohola, PA Zip Code 18458

Phone: (H) 9088030288 (O) _____

Occupation: Retired

Employer: _____

Position: _____ How Long: _____

Education: Highest education level achieved and institutions attended:

Name & Location	Dates Attended	Degrees Earned
Carnegie Mellon University, 1974-75, MSEE		
University of Michigan, 1970-75, BS		

Have you ever held a professional or business license or certificate? Yes _____ No x

If "Yes", please provide the title, issue date and issuing authority.

License/Certificate Title	Issue Date	Issuing Authority

District for which you are applying: CPED

1. Are you a registered voter? Yes x No _____
2. Are you a Captiva Resident? Yes x No _____
3. Are you currently residing in the District applied for? Yes x No _____
4. Are you currently serving on another Board, Authority, or Commission? Yes x No _____
   If yes, what Board, etc. and since when? Captiva Community Panel - 2020 to current

Work Experience: Professor of Software Engineering, Stevens Institute of Technology 2000 - 2015
Group Director AT&T/Lucent/Bell Labs 1974-2000

Community Involvement: 1) Current CEPD Commissioner 2) Panel Member, 3) Member of CCA, CYC, Sanibel Rec, Big Arts 4) Previously on Board of Sunset Captiva 5) Currently on Board of HOA in Pennsylvania 6) Member of Twin Lakes Sailing Fleet for ~40 years

Interests/Activities: Art, Biking, Sailing, Pickelball

Why do you desire to serve? 1) Passionate about protecting Captiva from Sea-level rise 2) The work is interesting 3) I believe i can positively contribute to Captiva

A resume or separate sheet with additional information may be included.

Florida law requires that members of the Board of Commissioners file a financial disclosure form. Would you be willing to file a financial disclosure form? Yes x No_____

Board Members are expected to attend each of the monthly board meetings physically, and at least one briefing meeting (virtually or physically) per month. Board members are also expected to participate in correspondence via email and phone with CEPD staff as necessary.

I understand the responsibilities associated with being a CEPD board member, and I have adequate time to serve.

LINDA M. LAIRD (SIGNED)
Signature

12/16/2022
Date

If you have any questions, please call the district office at 239-472-2472. Return this original form to:

Captiva Erosion Prevention District Office, 11513 Andy Rosse Ln, Ste 4, Captiva, FL 33924 or
Email applications to jelston@mycepd.com

FOR OFFICIAL USE ONLY
Interviewed: Date:_____ Yes_____ No_____

Board Action: Date:_____

APPENDIX A

Captiva Erosion Prevention District
Board of Commissioners
Requirements and Expectations

Requirements, as stated in the Legislature of the State of Florida, Chapter 2000-399, House Bill No. 927.

The Board of Five Commissioners, who shall constitute the Captiva Erosion Prevention District Board, shall be:

- Qualified electors residing within the District.
  Shall each serve a period of 4 years (unless removed for cause by the Governor of Florida).
- Shall receive no compensation.
- Shall be subject to and elected by the qualified electors residing within the District, at next election after appointment.
- Candidates seeking election to the District Board shall qualify between noon of the 50th day and noon of the 46th day prior to the election.
- A candidate seeking election to the District Board must qualify by paying a filing fee of $25 or by obtaining the signatures of at least 3 percent of the qualified electors residing within the District on a petition to be verified by the Lee County Supervisor of Elections.
- Any candidates seeking election to the District Board will open a depository and appoint a campaign treasurer before accepting any contributions or expending any funds for the purpose of seeking election to the District Board. However, if the only campaign expenditure of a candidate seeking election to the District Board is the fee required for the checking of signatures on the petition for filing, and the candidate accepts no contributions and expends no other campaign funds, it will not be necessary to open a campaign depository.
- If a vacancy occurs on the Board due to the resignation, death, or removal of a Board member, the remaining members may appoint a qualified person to fill out the remainder of the unexpired term. Notification of all resignations, vacancies, or appointments shall be filed with the Lee County Supervisor of Elections.

Expectations:

- Attendance at the monthly Board meeting, and the following (as listed in the Rules and Regulations):
    1. Must vote on every motion in which he/she has no personal interest. A commissioner may not abstain unless he/she has a bona fide conflict of interest as defined in Section 112.3143, F.S., as amended.
    2. May, only after recognition by the Chair, introduce motions, discuss subjects and vote.
    3. May request to consider a subject informally, if no objection. If there is objection, he/she is obliged to put a motion which must be seconded to determine the result by a majority 6 vote. This is debatable, but not amendable.
    4. May appeal a decision of the Chair without a second. This is debatable if the question was debatable, is not amendable and is decided by a majority vote.
    5. May move to refer the subject to the next regular meeting. This is seconded, decided by a majority vote, is debatable and amendable.
    6. May informally request a recess in a meeting for a reasonable time. If there is an objection, the Commissioner shall state the request in the form of a motion, which must be seconded, to determine the result by a majority vote. The length of time of the recess and the time the meeting will be reconvened must be announced before recessing. A meeting may not be recessed for more than five hours and must be reconvened the same day.
    7. If no motion is pending, may move to adjourn. Upon the completion of the agenda, an adjourned meeting may be "moved" by specifying time and date of the next regular meeting. These motions are seconded and decided by a majority vote. They are not debatable but are amendable as to time.

OATH OF OFFICE

(Art. II. § 5(b), Fla. Const.)

STATE OF FLORIDA

County of _____

I do solemnly swear (or affirm) that I will support, protect, and defend the Constitution and Government of the United States and of the State of Florida; that I am duly qualified to hold office under the Constitution of the State, and that I will well and faithfully perform the duties of

_____

(Title of Office)

on which I am now about to enter, so help me God.

[NOTE: If you affirm, you may omit the words "so help me God." *See* § 92.52, Fla. Stat.]

_____

Signature

Sworn to and subscribed before me by means of ___ physical presence or ___online notarization, this ____ day of _____, _____.

_____

Signature of Officer Administering Oath or of Notary Public

_____

Print, Type, or Stamp Commissioned Name of Notary Public

Personally Known ☐ ***OR*** *Produced Identification* ☐

Type of Identification Produced _____

ACCEPTANCE

I accept the office listed in the above Oath of Office.

Mailing Address: ☐ Home ☐ Office

_____ _____

Street or Post Office Box **Print Name**

_____ _____

City, State, Zip Code **Signature**

DS-DE 56 (Rev. 02/20)

PRINT RESET

Captiva Erosion Prevention District

December 2022 Board Meeting Minutes

1. **Call to Order – See Video (00:00:00)**

   Chairman Silvia called to order the December Board Meeting for the Captiva Erosion Prevention District at approximately 1 p.m. on December 12, 2022.

2. **Roll Call – See Video (00:00:10)**

   Commissioners:
   - Seat 1, Linda Laird, Commissioner (Present)
   - Seat 2, Rene Miville, Vice Chairman (Present)
   - Seat 3, Bob Walter, Commissioner (Present)
   - Seat 4, John Silvia, Chairman (Present)
   - Seat 5, Richard Pyle, Treasurer (Present)

   CEPD Staff:
   - Daniel Munt, Executive Director (Present)
   - John Riegert, Deputy Director (Present)
   - Ralf Brookes, CEPD Attorney (Present)

3. **Approval of Minutes – See Video (00:00:40)**
   A. November 7th, 2022, Board Meeting

   Commissioner Pyle made a motion to approve the minutes and Commissioner Laird seconded the motion. The motion passed unanimously

4. **General Public Comments – See Video (00:02:25)**

   A comment was made from the public to address the apportionment issues caused by Hurricane Ian. Staff suggested that this be addressed in the Administrative Update.

5. **Changes to the Agenda – See Video (00:04:50)**

   Commissioner Pyle motioned to move the Financial Reports to agenda item "Old Business, C" and Commissioner Silvia seconded the motion. The motion passed unanimously.

6. **Old Business – See Video (00:07:40)**
   A. Becker Update – See Video (00:07:40)

   Nick Matthews updated the board on the status of the Local Support Grant Program and the office of the Governor's decision to veto the entirety of the program. He also updated the board on items that affect Captiva during the Special Legislative Session.

B. Aptim Update – See Video (00:38:50)

Nicole Sharp provided an update on the post storm survey. Commissioner Laird requested that there be workshops on the topics regarding recovery post Hurricane Ian.

C. Financial Update – See Video (01:09:10)

Commissioner Pyle updated the board on the November Financials.

7. New Business – See Video (01:16:30)

A. Organization of the Board

Executive Director Munt led the organization of the board and the nominations and appointments are as follows:

Bob Walter, Chairman
John Silvia, Vice Chairman
Linda Laird, Secretary
Richard Pyle, Treasurer
René Miville, Commissioner

8. Administrative Update – See Video (01:28:00)

Executive Director Munt provided an update to the board regarding the assessment letters and payment process, vacancy of seat one on the board, and the upcoming FSBPA conference.

9. Commissioner Comments – See Video (01:45:20)

Commissioner Laird commented on a review and approval process for communications that go out to the community and requested a summary of the Vulnerability Assessment.

10. Adjournment (01:50:15)

Commissioner Silvia adjourned the meeting.

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Captiva Erosion Prevention District

December 15th, 2022 Workshop Minutes

1. **Call to Order**

   Commissioner Laird called the meeting to order

2. **Roll Call**

   Commissioners:
   - Seat 1, Linda Laird, Commissioner (Present)
   - Seat 2, Rene Miville, Vice Chairman (Present)
   - Seat 3, Bob Walter, Commissioner (Not Present)
   - Seat 4, John Silvia, Chairman (Not Present)
   - Seat 5, Richard Pyle, Treasurer (Not Present)

   CEPD Staff:
   - Daniel Munt, Executive Director (Present)
   - John Riegert, Deputy Director (Present)

3. **Internal Discussion**

   - Commissioner Laird requested that Carrie Schuman (SCCF) review the Vulnerability Assessment and assist in Commissioner preparation for when the presentation is given by APTIM.
   - Nick Matthews (BECKER) provided an update on the Special Legislative Session.
   - Commissioner Laird requested information on how CEPD can declare Captiva beaches as safe for the public. Staff reminded commissioners that CEPD does not supersede the authority of Lee County Parks & Recreation and the Florida Department of Health to declare public safety and would have to defer to their ruling. Commissioners gave Staff an action item to produce a beach brief regarding beach and water quality.

4. **Adjournment (01:50:15)**

   Commissioner Laird adjourned the meeting.

In accordance with the Americans with Disability Act and F.S. 286.26; any person with a disability requiring any additional reasonable accommodation to participate in this meeting should call the CEPD office at phone 239.472.2472 or email a written request to mycepd@mycepd.com. One or more elected or appointed local government officials, including but not limited to the Captiva Erosion Prevention District, may be in attendance at this meeting. Any person who decides to appeal any decision of the Board of Commissioners with respect to any matter considered at this meeting will need a record of the proceedings and for such purposes may need to ensure that a verbatim record of the proceedings is made, which record includes the testimony and evidence upon which the appeal is to be based. The law does not require the CEPD to transcribe verbatim minutes; therefore, the applicant must make the necessary arrangements with a private reporter or private reporting firm and bear the resulting expense.

12:17 PM
1/5/2023
Prepared by: JS

Captiva Erosion Prevention District
General Fund - Budget Performance Summary
For the Three Months Ended December 31, 2022

	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)
	Actual - December '22	Budget - December '22	Actual - December '21	Budget - December '21	Actual YTD	YTD Budget	YTD Variance	Annual Budget	Residual Budget
Ordinary Income/Expense									
Income									
Ad Valorem Tax	$ 165,509.73	$ 54,245.83	$ 354,078.26	$ 54,245.75	$ 183,197.23	$ 162,737.50	$ 20,459.73	$ 650,950.00	$ 467,752.77
Interest Income	7.29	12.50	10.08	12.50	16.29	37.50	(21.21)	150.00	133.71
Other Income	200.00	416.67	1,239.79	416.67	1,451.05	1,250.00	201.05	5,000.00	3,548.95
Total Income	165,717.02	54,675.00	355,328.13	54,674.92	184,664.57	164,025.00	20,639.57	656,100.00	471,435.43
Expense									
Administrative Expenses	2,753.72	7,916.67	3,176.71	7,312.49	25,596.03	23,750.00	(1,846.03)	95,000.00	69,403.97
Cost of Collecting Ad Valorem	3,310.20	1,708.33	0.00	1,625.00	3,594.47	5,125.00	1,530.53	20,500.00	16,905.53
Wages	14,955.78	12,500.00	16,376.47	14,666.67	29,609.83	37,500.00	7,890.17	150,000.00	120,390.17
Professional Fees	1,400.00	2,916.67	3,000.00	3,416.67	4,200.00	8,750.00	4,550.00	35,000.00	30,800.00
Reserves Transfer	7,037.50	7,037.50	7,037.50	7,037.50	21,112.50	21,112.50	0.00	84,450.00	63,337.50
Total Expense	29,457.20	32,079.17	29,590.68	34,058.33	84,112.83	96,237.50	12,124.67	384,950.00	300,837.17
Net Income	$ 136,259.82	$ 22,595.83	$ 325,737.45	$ 20,616.59	$ 100,551.74	$ 67,787.50	$ 32,764.24	$ 271,150.00	$ 170,598.26

Cash basis- omitted all note disclosures
No assurance is provided on these financial statements.

12:17 PM
1/5/2023
Prepared by: JS

Captiva Erosion Prevention District
General Fund - Budget Performance Detail
For the Three Months Ended December 31, 2022

	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)
	Actual - December '22	Budget - December '22	Actual - December '21	Budget - December '21	Actual YTD	YTD Budget	YTD Variance	Annual Budget	Residual Budget
Ordinary Income/Expense									
Income									
Ad Valorem Tax	165,509.73	54,245.83	354,078.26	54,245.75	183,197.23	162,737.50	20,459.73	650,950.00	467,752.77
Interest Income	7.29	12.50	10.08	12.50	16.29	37.50	(21.21)	150.00	133.71
Other Income	200.00	416.67	1,239.79	416.67	1,451.05	1,250.00	201.05	5,000.00	3,548.95
Total Income	165,717.02	54,675.00	355,328.13	54,674.92	184,664.57	164,025.00	20,639.57	656,100.00	471,435.43
Expense									
Administrative Expenses									
Advertising	74.90	1,250.00	1,208.15	1,333.33	3,598.18	3,750.00	151.82	15,000.00	11,401.82
Bank Service Charges	202.76	250.00	227.12	83.33	611.59	750.00	138.41	3,000.00	2,388.41
Board Meeting Expenses	0.00	83.33	0.00	83.33	504.64	250.00	(254.64)	1,000.00	495.36
Dues and Subscriptions	0.00	625.00	500.00	416.67	240.00	1,875.00	1,635.00	7,500.00	7,260.00
Insurance	0.00	1,416.67	0.00	583.33	14,155.00	4,250.00	(9,905.00)	17,000.00	2,845.00
Office Expense	723.95	833.33	0.00	1,729.17	2,355.22	2,500.00	144.78	10,000.00	7,644.78
Postage	0.00	41.67	0.00	41.67	0.00	125.00	125.00	500.00	500.00
Rent Expense	1,048.08	1,250.00	1,198.81	1,250.00	1,975.13	3,750.00	1,774.87	15,000.00	13,024.87
Repairs	0.00	83.33	0.00	83.33	0.00	250.00	250.00	1,000.00	1,000.00
Travel and Per Diem	0.00	833.33	0.00	625.00	0.00	2,500.00	2,500.00	10,000.00	10,000.00
Telephone	204.03	250.00	0.00	208.33	612.84	750.00	137.16	3,000.00	2,387.16
Utilities	0.00	333.33	42.63	208.33	98.53	1,000.00	901.47	4,000.00	3,901.47
Website & Computer Maintenance	500.00	666.67	0.00	666.67	1,444.90	2,000.00	555.10	8,000.00	6,555.10
Total Administrative expenses	2,753.72	7,916.67	3,176.71	7,312.49	25,596.03	23,750.00	(1,846.03)	95,000.00	69,403.97
Wages and Professional Fees									
Wages	14,955.78	12,500.00	16,376.47	14,666.67	29,609.83	37,500.00	7,890.17	150,000.00	120,390.17
Professional Fees	1,400.00	2,916.67	3,000.00	3,416.67	4,200.00	8,750.00	4,550.00	35,000.00	30,800.00
Total Legal and Professional Fees	16,355.78	15,416.67	19,376.47	18,083.34	33,809.83	46,250.00	12,440.17	185,000.00	151,190.17
Cost of Collecting Ad Valorem									
Property Tax Appraiser Fees	0.00	416.67	0.00	458.33	0.00	1,250.00	1,250.00	5,000.00	5,000.00
Tax Collector Commissions	3,310.20	1,291.67	0.00	1,166.67	3,594.47	3,875.00	280.53	15,500.00	11,905.53
Total Cost of Collecting Ad Valorem	3,310.20	1,708.33	0.00	1,625.00	3,594.47	5,125.00	1,530.53	20,500.00	16,905.53
Reserves									
Operating Reserves Transfers	7,037.50	7,037.50	7,037.50	7,037.50	21,112.50	21,112.50	0.00	84,450.00	63,337.50
Total Expense	29,457.20	32,079.17	29,590.68	34,058.33	84,112.83	96,237.50	12,124.67	384,950.00	300,837.17
Net Income	$ 136,259.82	$ 22,595.83	$ 325,737.45	$ 20,616.59	$ 100,551.74	$ 67,787.50	$ 32,764.24	$ 271,150.00	$ 170,598.26

Cash basis - omitted all note disclosures
No assurance is provided on these financial statements.

12:17 PM
1/5/2023
Prepared: JS

Captiva Erosion Prevention District
Capital Projects Fund - Budget Performance Summary
For the Three Months Ended December 31, 2022

	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)
	Actual - December '22	Budget - December '22	Actual - December '21	Budget - December '21	YTD Actual	YTD Budget	YTD Variance	Tentative Budget	Residual Budget
Ordinary Income/Expense									
Income									
Grant Income	$ -	$ 15,000.00	$ -	$ 932,250.00	$ -	$ 45,000.00	$ (45,000.00)	$ 180,000.00	$ 180,000.00
Interest Income	27.43	83.33	231.25	2,250.00	42.51	250.00	(207.49)	1,000.00	957.49
Other Miscellaneous Income	0.00	83.33	22,500.00	83.33	0.00	250.00	(250.00)	1,000.00	1,000.00
Parking Lot Revenue	0.00	60,000.00	51,674.00	70,833.33	0.00	180,000.00	(180,000.00)	720,000.00	720,000.00
Reserves - General	7,037.50	7,037.50	7,037.50	7,037.50	21,112.50	21,112.50	0.00	84,450.00	63,337.50
Special Assessments	886,892.47	191,666.67	0.00	0.00	1,976,869.43	575,000.00	1,401,869.43	2,300,000.00	323,130.57
Total Income	893,957.40	273,870.83	81,442.75	1,012,454.16	1,998,024.44	821,612.50	1,176,411.94	3,286,450.00	1,288,425.56
Expense									
General Expenses	1,250.81	3,458.33	1,198.81	4,916.66	8,444.77	10,375.00	1,930.23	41,500.00	33,055.23
Parking Lot	32.95	18,833.33	15,513.69	17,062.51	7,988.87	56,500.00	48,511.13	226,000.00	218,011.13
Wages	16,220.15	16,666.67	31,081.96	23,512.50	32,211.76	50,000.00	17,788.24	200,000.00	167,788.24
Professional Fees	13,400.00	9,166.67	6,000.00	15,416.67	28,200.00	27,500.00	(700.00)	110,000.00	81,800.00
Capital Projects	94,437.06	59,583.33	8,528,768.11	1,168,790.42	120,298.53	178,750.00	58,451.47	715,000.00	594,701.47
Debt Service	0.00	232,979.08	0.00	0.00	190,763.30	698,937.25	508,173.95	2,795,749.00	2,604,985.70
Total Expense	125,340.97	340,687.42	8,582,562.57	1,229,698.76	387,907.23	1,022,062.25	634,155.02	4,088,249.00	3,700,341.77
Net Income	$ 768,616.43	$ (66,816.58)	$ (8,501,119.82)	$ (217,244.60)	$ 1,610,117.21	$ (200,449.75)	$ 1,810,566.96	$ (801,799.00)	$ (2,411,916.21)

Cash basis - omitted all note disclosures
No assurance is provided on these financial statements.

1/5/2023
12:18 PM
Prepared: JS

Captiva Erosion Prevention District
Capital Projects Fund - Budget Performance Detail
For the Three Months Ended December 31, 2022

	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)
	Actual - December '22	Budget - December '22	Actual - December '21	Budget - December '21	YTD Actual	YTD Budget	YTD Variance	Annual Budget	Residual Budget
Ordinary Income/Expense									
Income									
Grant Income - Local	$ -	$ 15,000.00	$ -	$ 488,083.33	$ -	$ 45,000.00	$ (45,000.00)	$ 180,000.00	$ 180,000.00
Grant Income - State	0.00	0.00	0.00	344,166.67	0.00	0.00	0.00	0.00	0.00
Grant Income - Federal (FEMA)	0.00	0.00	0.00	100,000.00	0.00	0.00	0.00	0.00	0.00
Interest Income	27.43	83.33	231.25	2,250.00	42.51	250.00	(207.49)	1,000.00	957.49
Other Miscellaneous Revenues	0.00	83.33	22,500.00	83.33	0.00	250.00	(250.00)	1,000.00	1,000.00
Parking Lot Revenue	0.00	60,000.00	51,674.00	70,833.33	0.00	180,000.00	(180,000.00)	720,000.00	720,000.00
General Reserves	7,037.50	7,037.50	7,037.50	7,037.50	21,112.50	21,112.50	0.00	84,450.00	63,337.50
Special Assessments Principal	886,892.47	191,666.67	0.00	0.00	1,976,869.43	575,000.00	1,401,869.43	2,300,000.00	323,130.57
Total Income	893,957.40	273,870.83	81,442.75	1,012,454.16	1,998,024.44	821,612.50	1,176,411.94	3,286,450.00	1,288,425.56
Expense									
Advertising	0.00	0.00	0.00	833.33	0.00	0.00	0.00	0.00	0.00
Dues & Subscriptions	0.00	0.00	0.00	416.67	0.00	0.00	0.00	0.00	0.00
Service Charges	202.74	41.67	0.00	83.33	611.55	125.00	(486.55)	500.00	(111.55)
Cost of Assessment Collections	0.00	833.33	0.00	83.33	1,563.10	2,500.00	936.90	10,000.00	8,436.90
Insurance	0.00	416.67	0.00	583.33	4,295.00	1,250.00	(3,045.00)	5,000.00	705.00
Office Expenses	0.00	83.33	0.00	1,666.67	0.00	250.00	250.00	1,000.00	1,000.00
Rent	1,048.07	1,250.00	1,198.81	1,250.00	1,975.12	3,750.00	1,774.88	15,000.00	13,024.88
Beach Vehicle	0.00	833.33	0.00	0.00	0.00	2,500.00	2,500.00	10,000.00	10,000.00
Total General Expense	1,250.81	3,458.33	1,198.81	4,916.66	8,444.77	10,375.00	1,930.23	41,500.00	33,055.23
Parking Lot Expenses									
Parking Collection Fees	32.95	3,000.00	379.30	1,916.67	98.85	9,000.00	8,901.15	36,000.00	35,901.15
Parking Maintenance	0.00	2,500.00	3,185.11	2,916.67	2,000.00	7,500.00	5,500.00	30,000.00	28,000.00
Portable Toilets	0.00	9,583.33	10,096.42	7,500.00	0.00	28,750.00	28,750.00	115,000.00	115,000.00
Signage	0.00	0.00	905.25	41.67	0.00	0.00	0.00	0.00	0.00
Utilities	0.00	0.00	214.78	83.33	0.00	0.00	0.00	0.00	0.00
Sales Tax Expense	0.00	3,750.00	732.83	4,604.17	5,890.02	11,250.00	5,359.98	45,000.00	39,109.98
Total Parking Lot Expenses	32.95	18,833.33	15,513.69	17,062.51	7,988.87	56,500.00	48,511.13	226,000.00	218,011.13
Wages and Professional Fees									
Wages	16,220.15	16,666.67	31,081.96	23,512.50	32,211.76	50,000.00	17,788.24	200,000.00	167,788.24
Professional Fees	13,400.00	9,166.67	6,000.00	15,416.67	28,200.00	27,500.00	(700.00)	110,000.00	81,800.00
Total Wages and Professional Fees	29,620.15	25,833.33	37,081.96	38,929.17	60,411.76	77,500.00	17,088.24	310,000.00	249,588.24
Capital Projects									
Project Expenses	94,437.06	51,250.00	8,528,768.11	1,168,790.42	120,298.53	153,750.00	33,451.47	615,000.00	494,701.47
Grants to other agencies	0.00	8,333.33	0.00	0.00	0.00	25,000.00	25,000.00	100,000.00	100,000.00
Total Capital Projects	94,437.06	59,583.33	8,528,768.11	1,168,790.42	120,298.53	178,750.00	58,451.47	715,000.00	594,701.47
Debt Service									
Interest	0.00	31,940.83	0.00	0.00	190,763.30	95,822.50	(94,940.80)	383,290.00	192,526.70
Principal	0.00	201,038.25	0.00	0.00	0.00	603,114.75	603,114.75	2,412,459.00	2,412,459.00
Total Debt Service	0.00	232,979.08	0.00	0.00	190,763.30	698,937.25	508,173.95	2,795,749.00	2,604,985.70
Total Expense	125,340.97	340,687.42	8,582,562.57	1,229,698.76	387,907.23	1,022,062.25	634,155.02	4,088,249.00	3,700,341.77
Net Income	768,616.43	(66,816.58)	(8,501,119.82)	(217,244.60)	1,610,117.21	(200,449.75)	1,810,566.96	(801,799.00)	(2,411,916.21)

Cash basis - omitted all note disclosures.
No assurance is provided on these financial statements.

CEPD - GENERAL FUND
Balance Sheet

	December 31, 2022	December 31, 2021
ASSETS		
Current Assets		
Checking/Savings		
BOTI Checking	$ 712,632.68	$ 742,876.87
Total Checking/Savings	712,632.68	742,876.87
Other Current Assets		
Due from Capital Projects Fund	-	52,320.06
Total Other Current Assets	-	52,320.06
Total Current Assets	712,632.68	795,196.93
TOTAL ASSETS	$ 712,632.68	$ 795,196.93
LIABILITIES & EQUITY		
Liabilities		
Current Liabilities		
Other Current Liabilities		
Accrued Liabilities	844.85	875.74
Due to Capital Projects Fund	296,263.33	-
Total Other Current Liabilities	297,108.18	875.74
Total Current Liabilities	297,108.18	875.74
Total Liabilities	297,108.18	875.74
Equity		
Fund Balance	314,972.76	354,440.15
Net Income	100,551.74	439,881.04
Total Equity	415,524.50	794,321.19
TOTAL LIABILITIES & EQUITY	$ 712,632.68	$ 795,196.93

Cash basis - omitted all note disclosures
No assurance is provided on these financial statements.

CEPD - CAPITAL PROJECTS FUND
Balance Sheet

	December 31, 2022	December 31, 2021
ASSETS		
Current Assets		
Checking/Savings		
BOTI Checking	$ 1,740,063.87	$ 5,145,790.08
Fifth Third Investment Account	2,876,104.18	1,959,186.74
Fifth Third Treasury Bill #07	-	418,000.00
Fifth Third Treasury Bill #09	-	494,000.00
Sanibel Captiva Bank - CD	-	256,161.35
Total Current Assets	4,616,168.05	8,273,138.17
Other Current Assets		
Utility Deposit	300.00	300.00
Due From General Fund	296,263.33	-
Total Other Current Assets	296,563.33	300.00
Total Current Assets	4,912,731.38	8,273,438.17
TOTAL ASSETS	$ 4,912,731.38	$ 8,273,438.17
LIABILITIES & EQUITY		
Liabilities		
Current Liabilities		
Due to General Fund	$ -	$ 52,320.06
Equity		
Accumulated Reserves	936,041.00	3,461,813.00
Fund Balance	2,366,573.17	18,958,582.14
Net Income	1,610,117.21	(14,199,277.03)
Total Equity	4,912,731.38	8,221,118.11
TOTAL LIABILITIES & EQUITY	$ 4,912,731.38	$ 8,273,438.17

CAPTIVA EROSION PREVENTION DISTRICT
RESERVE ACCUMULATIONS
FISCAL YEAR ENDING 9/30/2023

	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23
Beginning Balance	$ 2,914,929	$ 921,966	$ 929,004	$ 936,041	$ 936,041	$ 936,041	$ 936,041	$ 936,041	$ 936,041	$ 936,041	$ 936,041	$ 936,041
Reserves Transferred In												
Parking Revenue	-	-	-									
Operating Reserves	7,037	7,038	7,037									
2021 Project Contribution (Estimated)	(2,000,000)	-	-									
Increase (Decrease) in Reserves	(1,992,963)	7,038	7,037	-	-	-	-	-	-	-	-	-
Total Accumulated Reserves	**$ 921,966**	**$ 929,004**	**$ 936,041**	**$ 936,041**	**$ 936,041**	**$ 936,041**	**$ 936,041**	**$ 936,041**	**$ 936,041**	**$ 936,041**	**$ 936,041**	**$ 936,041**

Cash basis - omitted all note disclosures
No assurance is provided on these financial statements.

Sea Level Rise Vulnerability Analysis

PHASE 1

OCTOBER 2022

SUBMITTED TO

Captiva Erosion Prevention District (CEPD)
11513 Andy Rosse Lane
Captiva, FL 33924

SUBMITTED BY:

Aptim Coastal Planning & Engineering, LLC (APTIM)
6401 Congress Avenue, Suite 140
Boca Raton, FL 33487

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Executive Summary

Continuing to protect coastal infrastructure and valued resources through strategic adaptation will become increasingly pertinent as sea level rise accelerates and tidal flooding and severe storm surge events increase in frequency. The Captiva Erosion Prevention District (CEPD) has actively invested in coastal resilience for decades through beach and dune nourishment and shoreline enhancement projects. The CEPD authorized the development of the "Sea Level Rise Vulnerability Analysis" for Captiva Island to identify geographic areas and physical assets vulnerable to current and future flooding. This effort supports the incorporation of future conditions planning into the CEPD's Beach and Shore Preservation Program and will serve as the first phase of development of a comprehensive resilience strategy.

To maximize grant funding potential from the Resilient Florida Program, this vulnerability assessment was conducted in alignment with state guidance and legislation. The analysis accounts for sea level rise projected for 2040 and 2070, tidal flooding, storm surge, and rainfall and surge flooding expected from a 100-year storm and 500- year storm under existing sea level conditions. The flood and sea level scenarios were visualized and mapped to determine the extent of the island and the on and off island critical infrastructure that would be exposed. The potential impacts associated with each scenario were summarized by asset type including critical infrastructure, critical facilities, and valued resources on the island. The likelihood of occurrence of specific scenarios and the associated magnitude of impact of the flooding was analyzed island-wide and by asset to assess risk and rank vulnerabilities. The findings of the vulnerability assessment are intended to support subsequent funding pursuits and project conceptualization to increase community and coastal resilience.

Key Findings:

- Bayfront shorelines are more vulnerable to frequent flooding than the oceanfront shorelines. Flood trespassing across the bayfront shorelines causes critical infrastructure like the fire station to be vulnerable in the near term.
- Vulnerabilities that may be addressed through policy and adaptation measures are clustered in four Adaptation Action Areas (AAA): Chadwick Bayou AAA, Central Captiva AAA, Roosevelt Channel AAA, and Blind Pass AAA. The assets primarily affected in these areas are shorelines, roads (including the evacuation route), critical facilities (wastewater plants, fire station, recovery center, communication), and critical infrastructure (stormwater).
- The following three flood scenarios represent "tipping points" or points of significant change in overall island inundation and in degree of impact to critical assets:
    - The tidal flooding occurring in recent years has impacted stormwater management and water supply facilities, compounded impacts of simultaneous rainfall flooding and disrupted traffic on some roads, creating a nuisance for the community today with minimal impacts. Approximately 37% of buildings on the island (based on footprints) are affected on the island and experience less than one foot of flooding by tides.
    - The next tipping point may occur during a storm with ocean surge elevations predicted to occur every 10 years or during the highest high tides in year 2040 or during typical conditions in 2070. These flood elevations are similar and may cause flooding along most of the bayfront parcels and within the mangrove areas, along most of the roads south of the library, and impacting the evacuation route, fire station and the north end of the island, creating disruption for the community. Approximately 71% of buildings on the island (based on footprints) would be affected on the island by this point. 30% of impacted buildings would experience less than one foot of flooding and 70% would experience between 1-2 feet of flooding during a 10 year surge event or during the highest tides in 2040.

- The most severe tipping point may be represented by the 100-year flood scenario, as was observed during Hurricane Ian. Flooding across most oceanfront parcels may occur, resulting in catastrophic damage to the community. While this type of extreme event occurs rarely today, with predicted sea level rise by 2070, the anticipated frequency of storm surge of this magnitude is anticipated to occur once every 25 years rather than once every 100 years. More than 95% of buildings (based on footprints) on the island would be affected on the island by this point and experience greater than two feet of flooding.

This organization of this document is outlined on the next page. A glossary is included to define key technical terms. To simplify the presentation of analysis findings, the aforementioned three primary tipping points are described in detail in the main document sections while the results from the ten scenarios analyzed are included in the appendices. The appendix also included an introductory presentation to the topics discussed in this analysis (Appendix VIII).

Introduction

Provides background context, technical definitions, introduces sea level rise scenarios and planning horizons, and discusses Hurricane Ian in context

Exposure Analysis

Determines what parts of the island are likely to be affected by each flooding scenario and when flooding may occur. Compares difference in flood extents and ranks flood scenarios based on tipping points in land area exposed.

Sensitivity Analysis

Determines the depth of flooding for each scenario. Summarizes impacts and flood depths by asset sectors. Asset impacts described in five sections: critical infrastructure, transportation and evacuation route, critical facilities and island resources.

Risk Assessment

Ranks risks to assets based on likelihood of flood scenario occurrence and impact of flooding.

Adaptation Action Areas Consideration

Identifies vulnerable areas based on the exposure, sensitivity and risk analyses for focus in resilience and adaptation planning. Shares preliminary adaptation strategies for future evaluation.

Next Steps

Highlights opportunities for CEPD to enhance resilience strategy

Introduction

Glossary

The following definitions provide explanation of technical terms and provide context for how the terms are used in the report. The introductory community presentation attached in Appendix VIII provides additional visuals for improved understanding of some of the listed terms.

100 Year Flood

The level of flooding that has a 1% chance of occurring in any given year, and has an equal chance of occurring every year, regardless of whether or not it occurred in previous years.

500 Year Flood

The flood level that has a 0.2% chance of occurring in any given year.

Asset

A physical resource containing economic value and/or future benefit. A critical asset is one whose loss, damage, disruption, or degradation would result in significant adverse impacts to human life, health, or security,

Compound Flooding

Compound flooding results from two or more flooding sources occurring simultaneously or subsequently within a short period of time. The combination of flood sources (storm surge, sea level rise, and heavy rainfall) can lead to higher inundation levels. Compound flooding is often the result of major storms or hurricanes.

Disturbance

Higher levels of inundation than nuisance flooding (1-2 feet) that poses more significant threats to public safety or causes greater property damage.

Exposure

A measure of how much change in inundation an asset or community is likely to experience.

Heavy Rainfall

Inland flooding caused by rainfall occurs as the result of steady rainfall occurring over several days and/or a short and intense period of rainfall, often associated with a storm or hurricane.

Impact

Extreme levels of inundation than nuisance flooding (>2 feet) associated with rainfall flooding, that poses extreme threats to public safety or causes major property damage.

Inundation

The rising of a body of water and its overflowing onto normally dry land. Generally refers to the condition of being flooded.

Nuisance

Low levels of inundation (<1 foot) associated with rainfall flooding, river flooding, and/or coastal flooding. Nuisance flooding does not pose significant threats to public safety or cause major property damage, but can disrupt routine day-to-day activities, put added strain on infrastructure systems such as roadways and sewers, and cause minor property damage.

Risk

A function of the likelihood of inundation occurrence and the impact of inundation.

Sea Level Rise

Global warming is causing global mean sea level to rise in two ways- thermal expansion caused by warming of the ocean (water expands as it warms) and increased melting of land-based ice (glaciers and ice sheets). The ocean is absorbing more than 90 percent of the increased atmospheric heat associated with emissions from human activity, which causes sea level to rise. Sea level plays a role in flooding, shoreline erosion, and hazards from storms. Higher sea level also means more frequent high-tide flooding or "nuisance flooding"

Sensitivity

A measure of whether and how an asset or community is likely to be affected by a given change in inundation.

Storm Surge

Storm surge is the rise in seawater level caused solely by a storm. The surge is caused primarily by a storm's winds pushing water onshore. Higher sea levels mean that storm surges push farther inland.

Tidal Flooding

The temporary inundation of low-lying areas, especially streets, during exceptionally high tide events, such as at full and new moons. The highest tides of the year may be known as the king tide, with the month varying by location.

Vulnerability

A measure of how susceptible a given asset or community is to the impacts of flooding.

Background

As the frequency and intensity of climate- related hazards increases, it is becoming extremely important for local municipalities and entities to identify and quantify vulnerability and determine appropriate measures to address risk. Flooding caused by sea level rise, storm surge, and precipitation, is a major climate-related hazard impacting communities worldwide, nationwide, and especially within the state of Florida. The Captiva Erosion Prevention District (CEPD) recognizes this threat and has contracted APTIM to produce a state regulation compliant, flood vulnerability analysis. This assessment is necessary for state funding eligibility and additional immediate preparatory actions to support applications for resilience and coastal infrastructure funding.

In 2020, Integral Consulting produced a Captiva Island Resiliency Assessment, which served to summarize if roads, parcels, structures and specific on-island critical facilities would be affected under 1, 2, 4 and 7 foot sea level rise scenarios. The results of this assessment helped lay the foundation for understanding flood vulnerability for this area, however it did not account for various causes and intensities of flooding, nor did it quantify risk.

In 2021, state legislation 380.093 F.S. provided criteria for establishing a statewide risk assessment and resilience plan inclusive of projects ranked by priority for potential funding allocations. The Florida Department of Environmental Protection has initiated implementing this legislation by collecting grant applications for resilience projects to be included in the state plan and providing guidance on vulnerability assessments with the requirement that guidance-consistent reports and geodata from assessments to be submitted with applications.

This "Flood Vulnerability Analysis" (2022) accounts for the sea level rise scenarios required by the state (NOAA Intermediate High and Intermediate Low in 2040 and 2070) and several additional scenarios. These scenarios represent inundation levels caused by storm surge, tidal flooding, and additional extreme flood events, which paints a comprehensive picture of flood vulnerability. Moreover, it completes the analysis of the regional asset inventory of Captiva Island (including on and off island critical infrastructure) for both exposure and sensitivity to flooding and ranks the island's vulnerabilities by risk level. Preliminary actions and next steps are outlined to support development of the next phase of the comprehensive resilience strategy and funding applications.

Datums, Flood Scenarios and Planning Horizons

In order to determine, discuss, and compare water elevation levels for various flood scenarios, it is first necessary to understand the relevant vertical datum and tidal datums that will be referenced. The following definitions were derived directly from the NOAA Tides and Currents glossary. In general, a **datum** is a base elevation used as a reference from which to reckon heights or depths. A **vertical datum** is a surface of zero elevation to which heights of various points are referenced. The current vertical datum for the contiguous United States and Alaska is the North American Vertical Datum of 1988 (NAVD88).

A **tidal datum** is a standard elevation defined by a certain phase of the tide. Tidal datums are used as references or benchmarks to measure local water levels. The National Tidal Datum Epoch is a 19-year period adopted by the National Ocean Service as the official time period over which tide observations are taken to determine mean values for tidal datums. Elevation and water levels utilized for the purpose of this analysis are measured in feet NAVD with reference to local tidal datum. Specific tidal datums that will be referenced within this report include the following:

Mean Higher High Water (MHHW)

The average of the higher high water height of each tidal day observed over the National Tidal Datum Epoch.

Mean High Water(MHW)

The average of all the high water heights observed over the National Tidal Datum Epoch.

Mean Sea Level (MSL)

The arithmetic mean of hourly heights observed over the National Tidal Datum Epoch.

Mean Low Water (MLW)

The average of all the low water heights observed over the National Tidal Datum Epoch.

The Captiva Erosion Prevention District (CEPD) is located in close proximity to two tide gauges- station 8725520 in Fort Myers, FL and station 8725110 in Naples, FL (see Figure 1). Both gauges are operated and maintained by NOAA/NOS/CO-OPS, and published on NOAA's Tides & Currents website (http:\\tidesandcurrents.noaa.gov).

Figure 1. Tide Gauge Locations Near Captiva, FL

Sea level data utilized for mapping purposes in this assessment was retrieved from the Fort Myers station as it is the closest gauge with the highest mean sea level (-0.41 NAVD, compared to -0.62 MSL at the Naples, FL gauge). Relative to the current Mean High High Water (MHHW) level at the Fort Myers gauge, the sea level change scenarios for Fort Myers indicate a water level of 0.63 ft NAVD according to the 2040 Intermediate Low scenario, a water level of 1.31 ft NAVD according to the 2040 Intermediate High scenario and a water level of 3.22 ft NAVD according to the 2070 Intermediate High scenario. These projections are consistent with the most recent state requirements for resiliency grant funding eligibility. Figure 2 depicts the NOAA 2017 relative sea level rise change scenarios for Fort Myers.

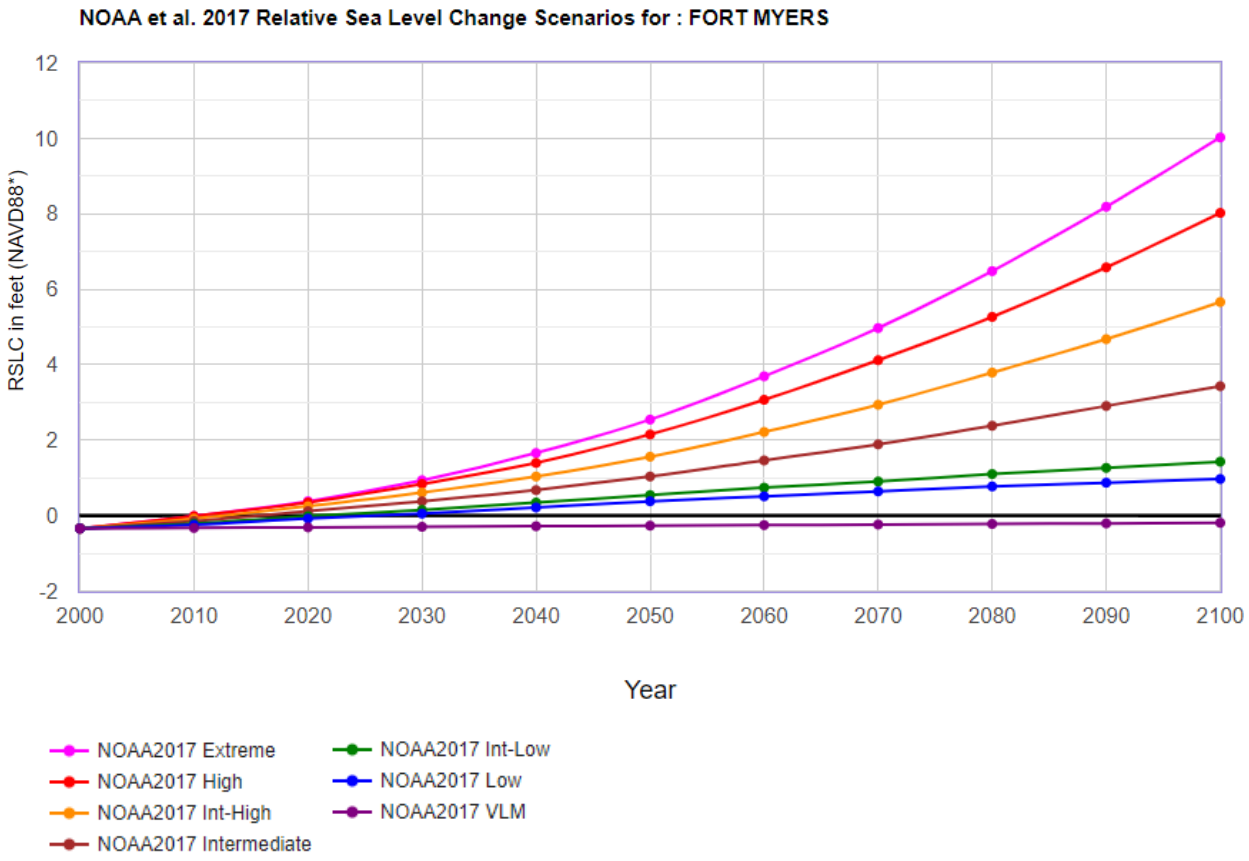


Figure 2. NOAA 2017 Relative Sea Level Change Scenarios for Fort Myers, FL

Water levels reflecting +1 ft SLR, +2 ft SLR, +4 ft SLR, and +7 ft SLR relative to the current Mean High High Water (MHHW) level at the Fort Myers gauge were also projected. The inclusion of these water level elevations represents the intent to compare levels and associated impacts to those measurements of identical methodology from the 2020 Captiva Island Resiliency Assessment.

Additional conditions and associated water level elevations that may occur such as a tidal flooding event and a 10 year return interval storm surge event, were also mapped. The 2017 king tides have been the highest experienced in recent past, and serve as a tidal flooding extreme. Thus, the highest king tide elevation in Fort Myers during this time is used to represent the upper bound of current or existing tidal flooding (2.31 ft NAVD on October 7, 2017).

The water level for the 10 YR Surge was derived from the Lee County FEMA Flood Insurance Study (FIS). The FIS indicated that the stillwater elevation for a 10-year storm for Matlacha Pass would be 3.5 feet NAVD. Also derived from the FIS, were the stillwater elevations for a **1 percent annual chance flood or an Existing 100 Year Flood Event** (8.8 ft NAVD) and a **0.2 percent annual chance flood or an Existing 500 Year Flood Event** (11.1 ft NAVD).

The water level elevations are outlined in Table 1 and associated island inundation maps are included in the CEPD Exposure Analysis section of this report. Technical water level names are listed and those in red represent "duplicate" elevations, as there is a difference of less than six inches between them and other water levels.

Table 1. Original Water Level Elevations for Captiva, FL

Scenarios	Feet NAVD
2040 NOAA Intermediate Low MHHW	0.6
2070 NOAA Intermediate Low MHHW	1.2
MHHW 0.28 'NAVD @ Fort Myers +1' SLR	1.3
2040 NOAA Intermediate High MHHW	1.3
MHHW 0.28' NAVD @ Fort Myers +2' SLR	2.3
Tidal Flooding, Existing	2.3
2070 NOAA Intermediate High MHHW	3.2
Tidal Flooding, 2040	3.3
10YR Surge, Existing	3.5
MHHW 0.28' NAVD @ Fort Myers +4' SLR	4.3
10YR Surge, 2040	4.5
Tidal Flooding, 2070	5.2
10YR Surge, 2070	6.4
MHHW 0.28' NAVD @ Fort Myers +7' SLR	7.3
1 percent annual chance flood	8.8
.2 percent annual chance flood	11.1

These scenarios were not mapped for exposure or sensitivity purposes as their inundation extent and resulting impact are accounted for by proxy by the water elevations close in measurement. More specifically:

- 2070 NOAA Intermediate Low scenario (1.2 ft NAVD) and MHHW 0.3 'NAVD @ Fort Myers +1' SLR are "duplicates" of 2040 NOAA Intermediate High scenario (1.3 ft NAVD)
- MHHW 0.3' NAVD @ Fort Myers +2' SLR (2.3 ft NAVD) is a "duplicate" of Existing Tidal Flooding scenario (2.3 ft NAVD)
- 2040 Tidal Flooding scenario (3.3 ft NAVD) and Existing 10 YR Surge scenario (3.5 ft NAVD)are "duplicates" of 2070 NOAA Intermediate High MHHW (3.2 ft NAVD)
- 2040 10 YR Surge scenario (4.5 ft NAVD) is a duplicate of MHHW 0.3' NAVD @ Fort Myers +4' SLR scenario (4.3 ft NAVD)

Table 2 depicts the finalized ten scenarios that were utilized for the exposure and sensitivity analysis of Captiva, FL. The updated scenario names in table reflect the consolidation of the identified "duplicate" water levels and represent simplified terminology. These names will be utilized throughout the report.

Table 2. Consolidated Water Level Elevations for Captiva, FL.

Scenarios	Feet NAVD
2040 NOAA Int Low	0.6
2040 NOAA Int High/ 2070 NOAA Int Low/ + 1 ft SLR	1.2-1.3
2017 Tidal Flooding / + 2 ft SLR	2.3
2070 NOAA Int High/ Existing 10 YR Surge/ 2040 Tidal Flooding	3.2-3.5
2040 10 YR Surge/ + 4 ft SLR	4.3-4.5
2070 Tidal Flooding	5.2
2070 10 YR Surge	6.4
+ 7 ft SLR	7.3
Existing 100 Year Flood	8.8
Existing 500 Year Flood	11.1

The process of consolidation involved an in-depth review of the individual comparable scenarios. Specifically, the comparable flood scenarios were overlaid with critical infrastructure to identify any significant differences in impact between the incremental water levels between the scenarios. The results of this review demonstrated very minimal differences between the individual scenarios that were grouped. Thus, no resolution was lost in the sensitivity analysis by consolidating scenarios, and in fact the consolidation helped to streamline and identify major benchmarks of inundation.

The Existing 100 and 500 year flood extents proved to be slightly different from their associated **current** (effective) FIRM flood zone(s). Instead, they are more consistent with the **future** (preliminary) FIRM zones resulting from FEMA's Coastal Flood Risk Study. The future flood zones align with the Category 1 and Category 2 storm surge risk zones, and thus, the storm surge zones were utilized to conduct the sensitivity analysis for the Existing 100 Year and 500 Year Flood Events.

Figure 3 depicts the Fort Myers water elevations for relevant tidal datums in comparison to the flood scenarios outlined in Table 2. The purpose of this comparison is to help visualize the depth discrepancy and incrementation between the mean local elevations and the predicted flood elevations. All levels are in NAVD88.

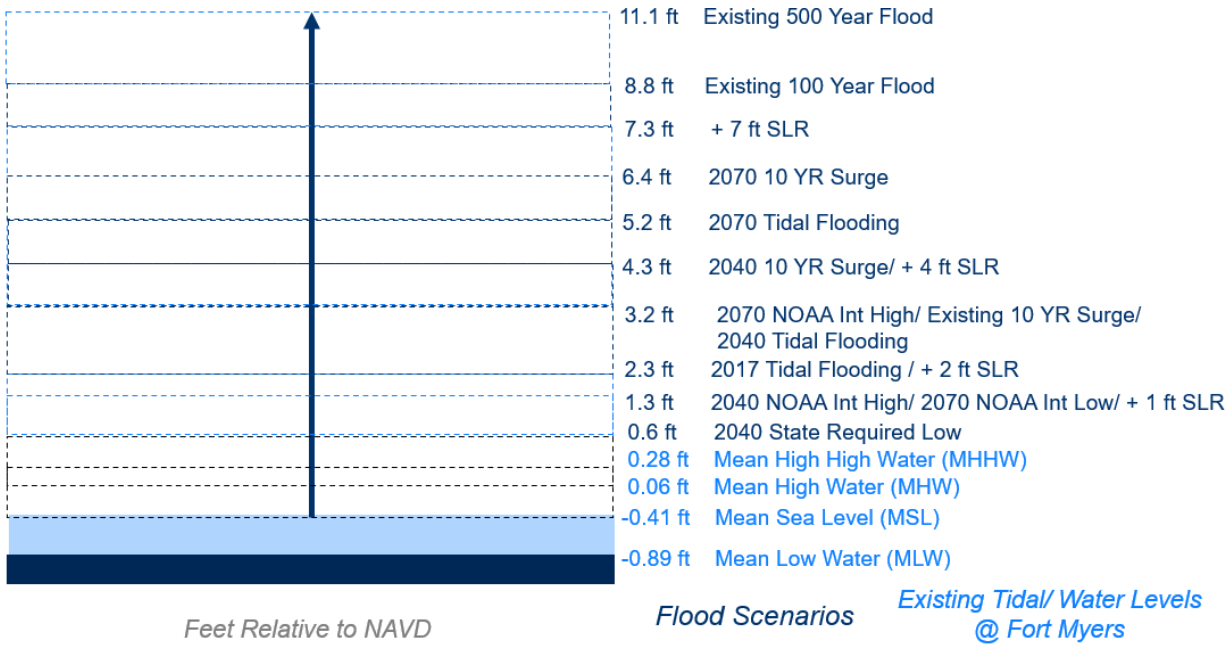


Figure 3. Comparison of Local Tidal Datum Elevations and Flood Elevations

Local Context and Recent Storms

Figure 4. Captiva Island

Captiva Island is located off the southwest coast of Florida and is part of the barrier islands along the state's southern peninsula (Figure 4). The island connects to Sanibel Island, through a road bridge at Blind Pass. The coastline of Captiva Island including its beaches, the bayside and inlets is 19 miles long. According to the Captiva Island Resiliency Assessment from 2020, Captiva's coastline is comprised of mangroves (39%), beaches (27%) and a mix of intermittent mangroves and landscaping (22%).

Since 1900, there have been eight hurricanes within 20 nautical miles from the island of Captiva. The geomorphic composition of the island is actually the result of a 1921 hurricane which separated Captiva into two islands (now Captiva and North Captiva) at Redfish Pass. Tropical Storm Eta devastated the island in 2020, causing significant erosion to its beach and dunes. The structural impacts of this event have put the island at greater risk of flooding with future storm surges and sea level rise.

On September 28, 2022, during the completion of this assessment, Captiva was significantly impacted by Hurricane Ian. Hurricane Ian made landfall on the island as a Category 4 storm with storm surge nearing 12 feet, and 155 mph sustained winds. More specifically, according to the Sanibel- Captiva Conservation Foundation (SCCF) team, who located an intact water logger on west Sanibel, the maximum depth recorded was 11.6 feet at 2:05 p.m. on September 28, 2022, and there was over 8 feet of water from 12-3:30 p.m (Figure 5). The storm surge experienced was comparable but one foot higher than flooding anticipated for a 500-year flood event in the area.

The SCCF team also noted a significant decrease in beach elevation relative to mean sea level across Sanibel and Captiva after Hurricane Ian. The average elevation of Captiva's sea turtle nest sites was of 7.2 feet before the storm, and decreased to 3.6 feet after the storm.

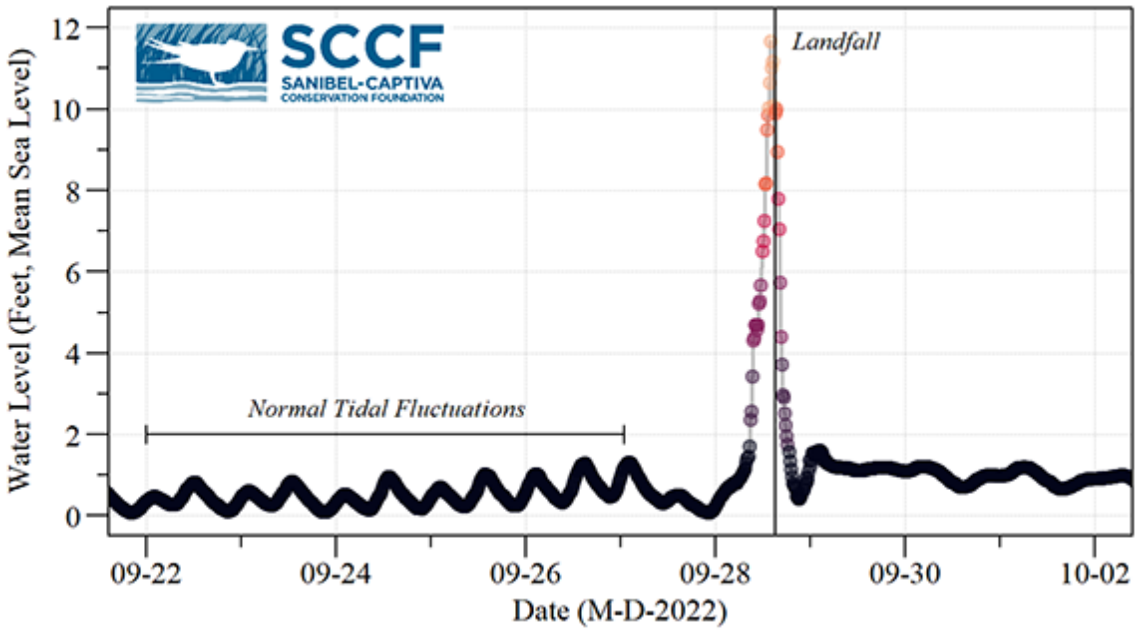


Figure 5. Hurricane Ian Water Elevation Data near Sanibel, FL

The experienced water level exceeded the level anticipated for a 10-year storm surge event in 2070, which serves as the second highest water level mapped for the purpose of this assessment. Figure 6 depicts the approximate inundation extent for the area, under these conditions, according to the NOAA Sea Level Rise Viewer.

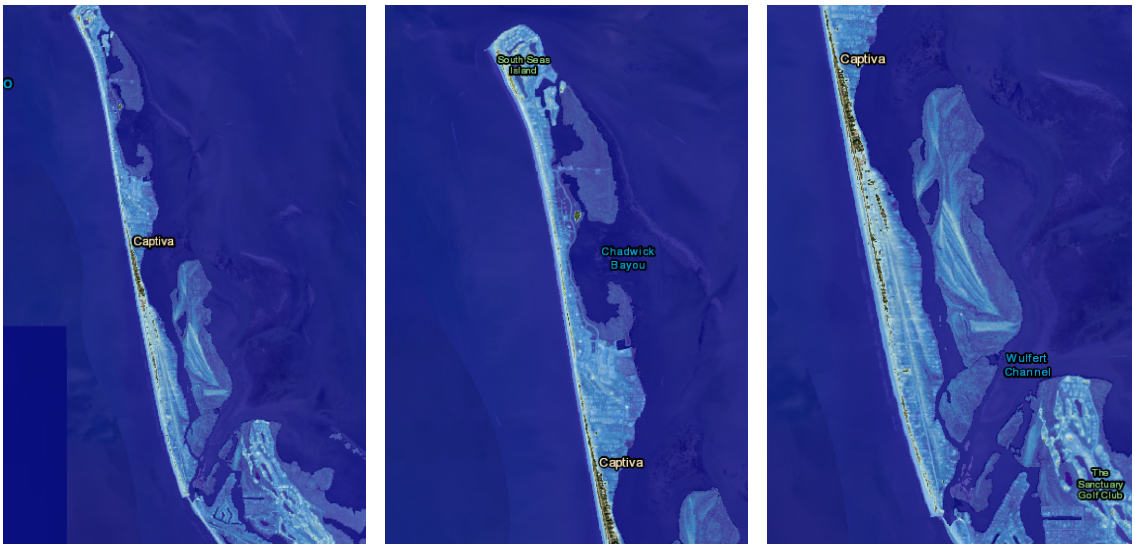


Figure 6. Captiva Inundation Under Eight Feet SLR- NOAA Sea Level Rise Viewer

The bayside of the island experienced the greatest degree of flooding, which resulted in significant infrastructure, communication, and roadway damage. According to FPL's Power Tracker, 85% of Lee County FPL customers were without power the morning after the storm. Much of Captiva's key infrastructure such as its local Fire Station, water treatment plants, and evacuation route were all impacted by inundation. Figure 7 highlights examples of infrastructure damage in the aftermath of Ian. The storm's aggressive storm surge and powerful winds resulted in the collapse of approximately 50 to 65 feet of the Sanibel Causeway bridge (Figure 7). This bridge serves as the only vehicle connection from Captiva and Sanibel to the mainland of Florida, and thus its destruction served as a catastrophic threat to on island residents as they were unable to access resources and aid

Figure 7. Hurricane Ian Damage on Captiva

CEPD Exposure Analysis

Overview

To provide a comprehensive view of inundation, it is important to review the exposure predictions of Captiva Island under all relevant scenarios and planning horizons mentioned. By doing so, various inundation depths and spatial extents can be compared to each other and in relation to the depths utilized in the 2020 Captiva Island Resiliency Assessment and more incremental flooding can be visualized (Figures 9-12). Figure 8 compares the overall percentage of island inundation for each of the scenarios.

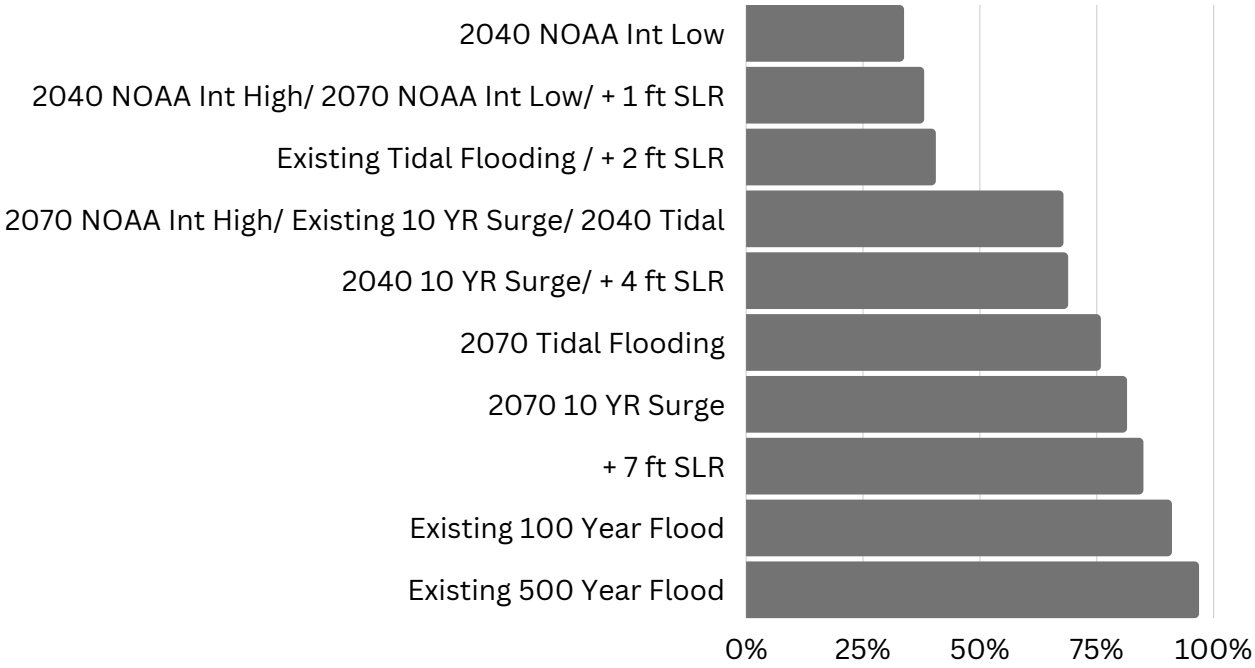


Figure 8. Percentage of Island Inundation Across All Flood Scenarios

For this effort, rainfall flooding was not uniquely analyzed like the other flooding scenarios. Rainfall flooding is not as severe as storm surge and future flooding scenarios. According to the NOAA Precipitation Frequency Data Server, rainfall during a 5-year event would cause similar flooding to the Existing Tidal Flooding scenario if no drainage capacity is assumed. A 100 Year rainfall event would precipitate between 8 to 12 inches for a 6 hour and 24-hour duration storm. Even an event of this magnitude would not result in impactful flooding. For example, the June 4, 2022 rainfall event precipitated over 11 inches overnight but resulted in only a few inches of standing floodwaters. Severe rainfall in addition to surge, known as compound flooding, has the potential for exacerbating severe flooding.

NOAA Scenario Consolidation

The state guidance for vulnerability assessments requests the use of the 2017 NOAA intermediate-low and intermediate-high sea level rise projections for the planning horizons of 2040 and 2070. As stated previously, due to the close proximity of water elevation levels, the 2040 NOAA Intermediate High (1.2 ft NAVD) and 2070 NOAA Intermediate Low (1.3 ft NAVD) do not represent significant differences in inundation extent or depth. Because of this the two scenarios were compared for the purpose of the sensitivity analysis. Figure 9 displays no difference between the scenarios' exposure analysis, which further validated the comparison.

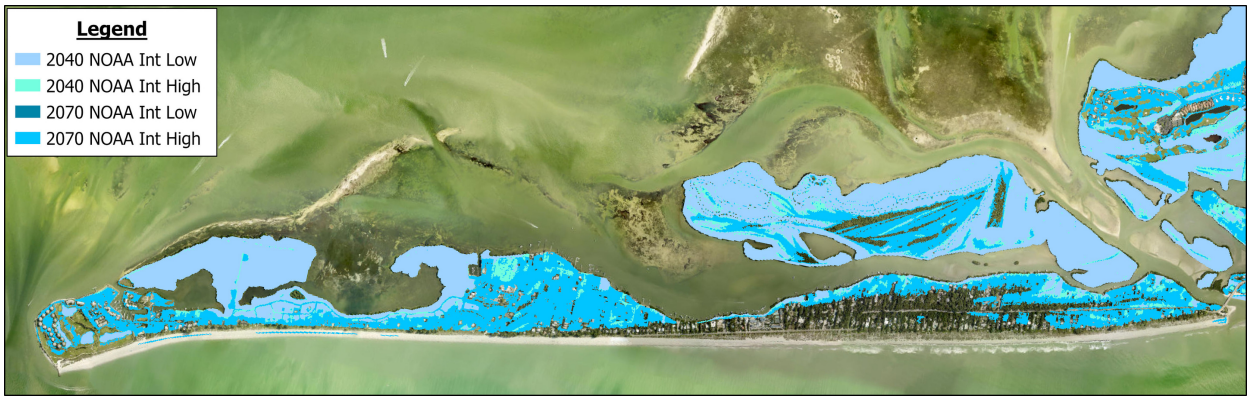


Figure 9. Island Inundation Comparison Map for NOAA Scenarios- 2040 NOAA Intermediate High and 2070 NOAA Intermediate Low

Island Exposure Maps

The results of the exposure analysis for the ten scenarios outlined in Table are represented in Figures 10-12. Scenarios were layered and mapped in order of increasing water elevation to show incremental inundation change across the island. The ten scenarios were mapped across three figures in order to show relative change within specific water elevation level increments and to prevent visual confusion.

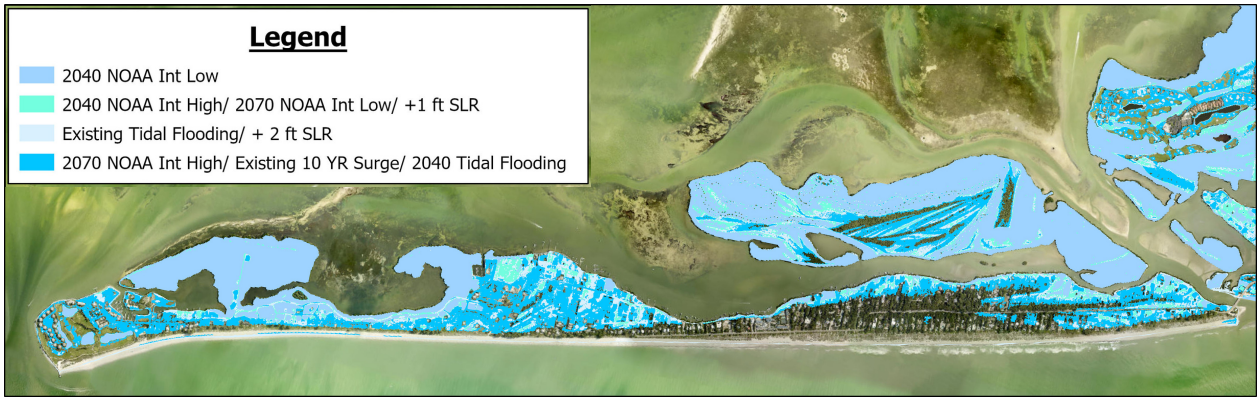


Figure 10. Island Exposure Map 1

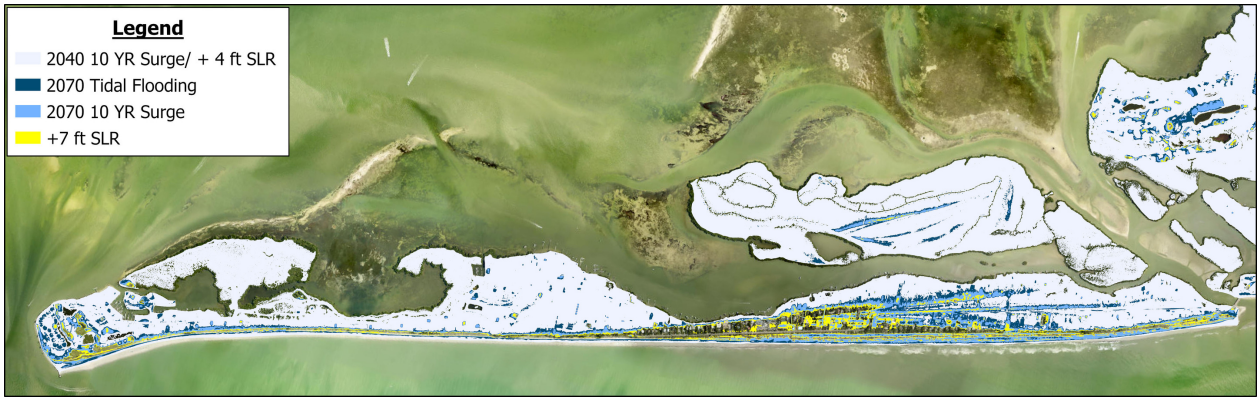


Figure 11. Island Exposure Map 2

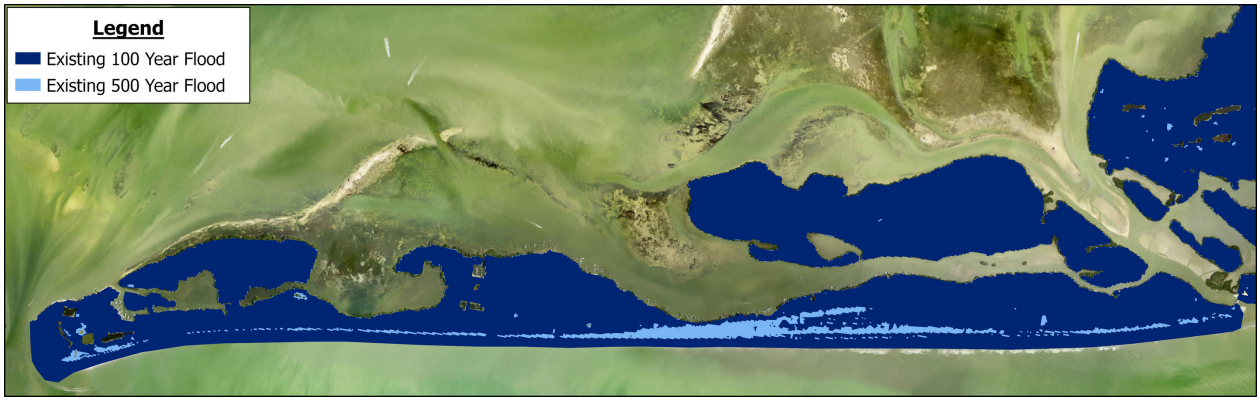


Figure 12. Island Exposure Map 3

Inundation Tipping Point Scenarios

The assessment of asset and infrastructure sensitivity was conducted for all of the ten flood scenarios outlined in Table 2, in order to satisfy the new state requirements for resiliency grant funding eligibility. Throughout this report, the overall sensitivity per scenario will be briefly outlined at a high level, however the entirety of the analysis results per critical asset will be detailed in Appendices II-VI. For the purpose of this report and to identify key areas of concern, three of the twelve scenarios were identified as "tipping points" of impact for the island of Captiva and these three scenarios will be fully explored and addressed within the report. These three scenarios, outlined below, represent significant changes in overall island inundation and in degree of impact to critical assets and thus will be the focus of this analysis:

1

Existing Tidal Flooding/ +2 ft SLR

Begin to see inundation from bay front, flooding around fire station and stormwater infrastructure, minimal flooding of evacuation route, and flooding impacts to some roads.

2

2070 NOAA State Required High/ Existing 10 YR Surge/ 2040 Tidal Flooding

Begin to see more significant flooding of roads south of the Captiva Library, flooding of all parcels along the shoreline, and mangrove inundation.

3

Existing 100 Year Flood Event

Flooding of all oceanfront parcels.

Critical Infrastructure Sensitivity Analysis

Parcels

Parcel data was obtained from the Florida Department of Revenue (FDOR) and analyzed for inundation impact from the various flood scenarios. A total of 1,118 parcels exist within Captiva. Figure 13 depicts the number of parcels likely to experience flooding per scenario.

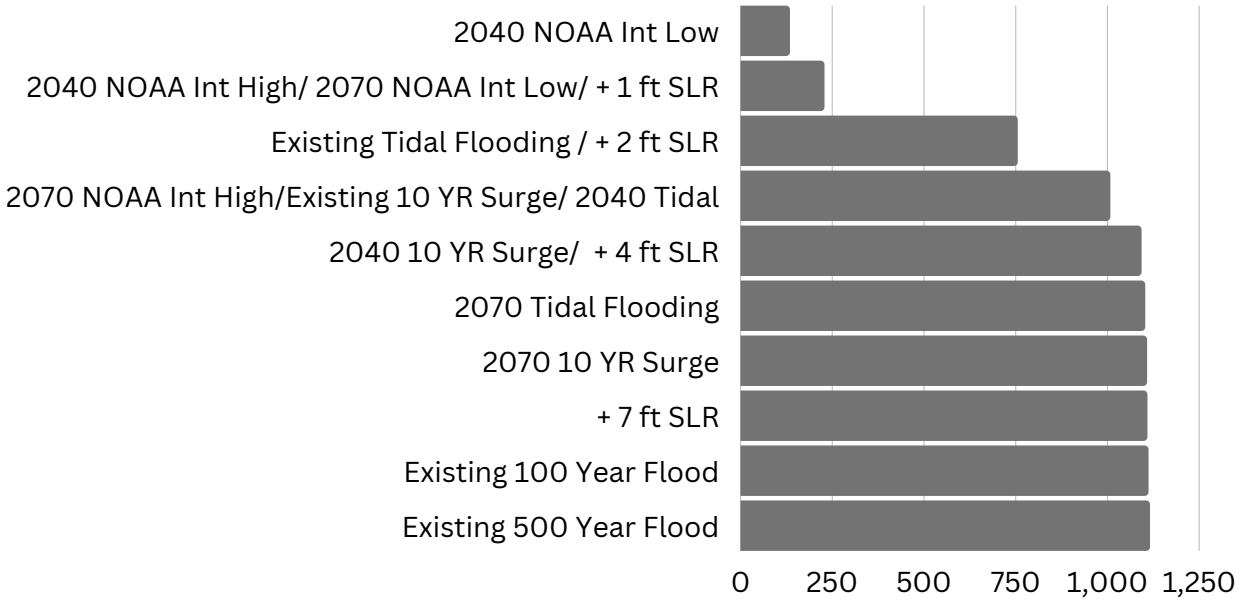


Figure 13. Predicted Parcel Inundation Across All Flood Scenarios

Figure 14 displays the number and percentage of inundated parcels for each of the three inundation tipping point scenarios. Figure 15 depicts a spatial view of the results of this analysis.

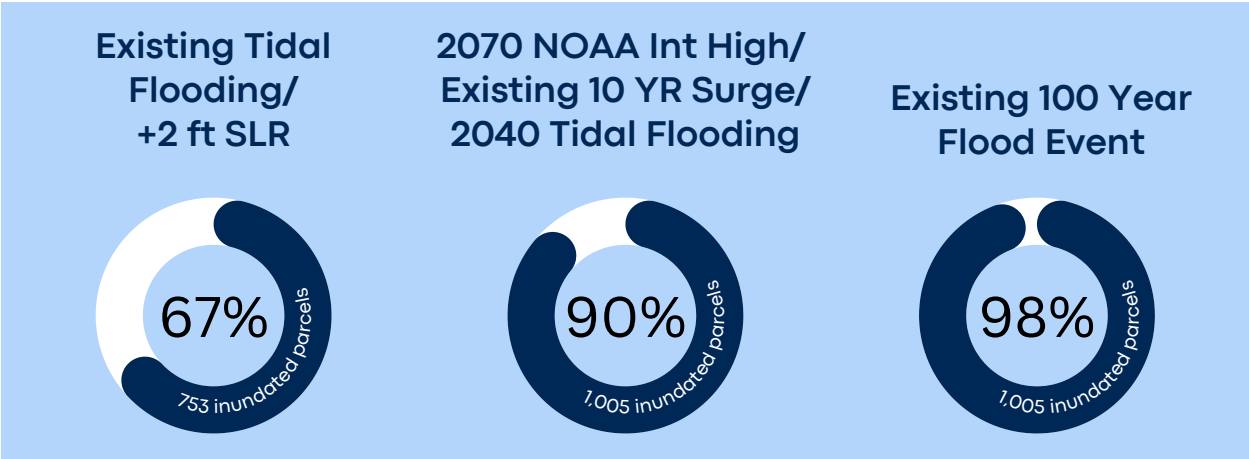


Figure 14. Percentage of Parcel Inundation Under Inundation Tipping Point Scenarios

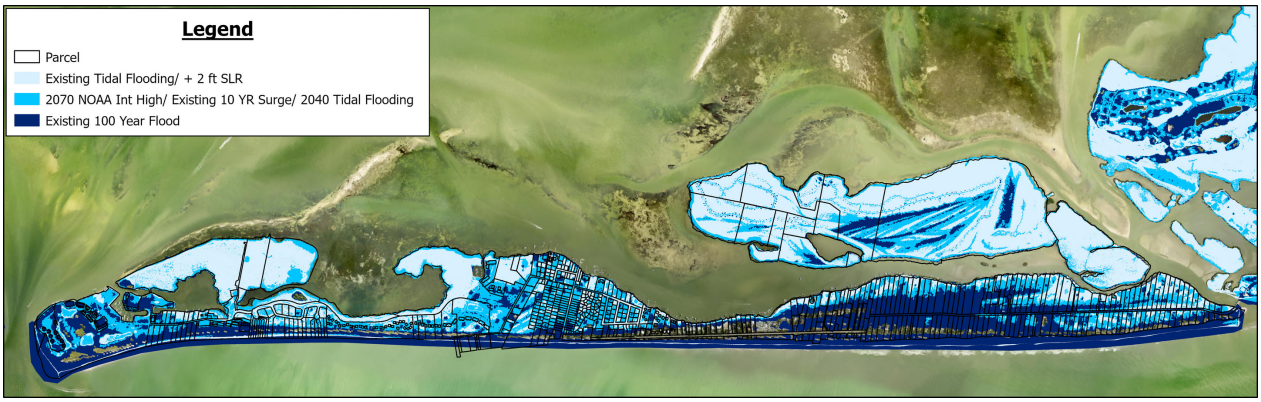


Figure 15. Parcel Inundation Map for Inundation Tipping Point Scenarios.

A subsequent deeper analysis included estimating the average inundation depth of parcels per scenario and utilizing the building footprint estimated value to help estimate the value of inundated parcels. Average depth is represented by the center of the inundation grid per parcel, and thus the total impacted number of parcels is reduced as not every parcel that intersects the inundation polygons has the center point that falls on it. These center points were averaged across the parcel if there were multiple. The overall results of the inundation depth analysis can be seen in Figure 16.

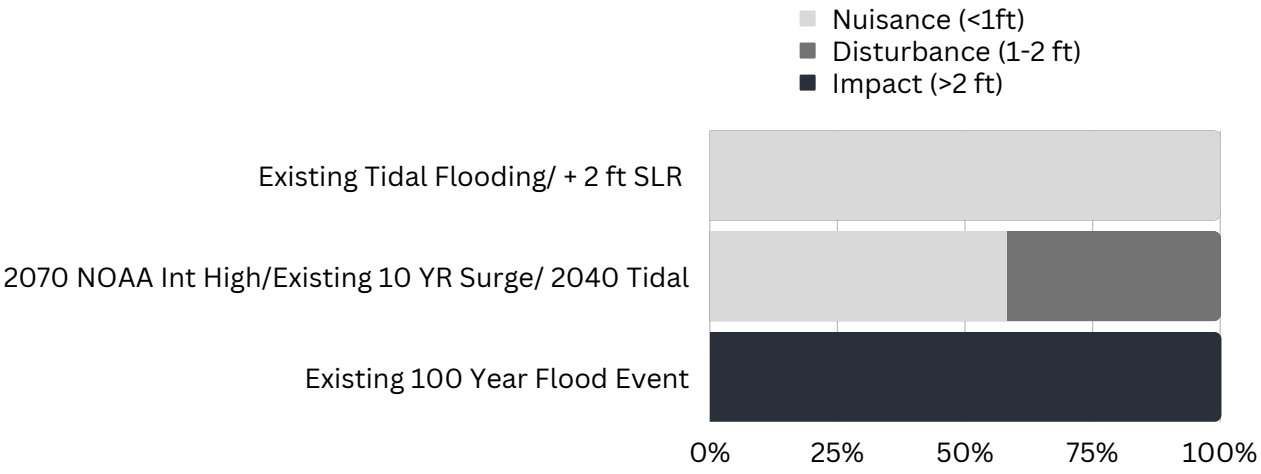


Figure 16. Parcel Inundation Depth Under Inundation Tipping Point Scenarios

Under the Existing Tidal Flooding/ +2 ft SLR scenario, 100% of inundated parcels will experience nuisance flooding of a depth of below one foot. The market value of affected parcels is of $1,144,851,123, however, damage costs of nuisance flooding would be anticipated to be minimal or null.

Under the 2070 NOAA Int High/Existing 10 YR Surge/ 2040 Tidal Flooding, 42% of parcels are potentially subject to nuisance flooding and 58% of all parcels are potentially subject to flooding >1 foot of depth. The inundation from this scenario is projected to impact parcels totaled at a value of $1,348,535,683. Of the 1109 parcels projected to be impacted by inundation via the Existing 100 Year Flood Event, 98% of them will experience flooding at a depth greater than 2 ft. The value of the parcels impacted equates to $1,591,834,927.

The age of the structures built were reviewed in relation to the 1983 FEMA base flood elevation standard (Figure 17). For presentation purposes, structure ages were grouped by decade and compared to 1980 rather than 1983. Specifically, under the Existing Tidal Flooding/ +2 ft SLR scenario, 60% of vulnerable parcels were built before 1980, with an estimated present market value of $495,093,551 . Under the 2070 NOAA Int High/ Existing 10 YR Surge/ 2040 Tidal Flooding, 64% of the total vulnerable parcels were built before 1980, with an estimated present market value of $612,140,970. According to the Existing 100-year Flood Event, 60% of impacted parcels were built before 1980, and 40% were built after. The impacted parcels have an estimated present market value of $649,760,664 .For the purpose of this evaluation, those parcels without a designated built year (labeled "N/A"), were not included in the total parcel count as it is unclear if these parcels were built before or after the implementation of the 1983 FEMA base flood elevation standard.

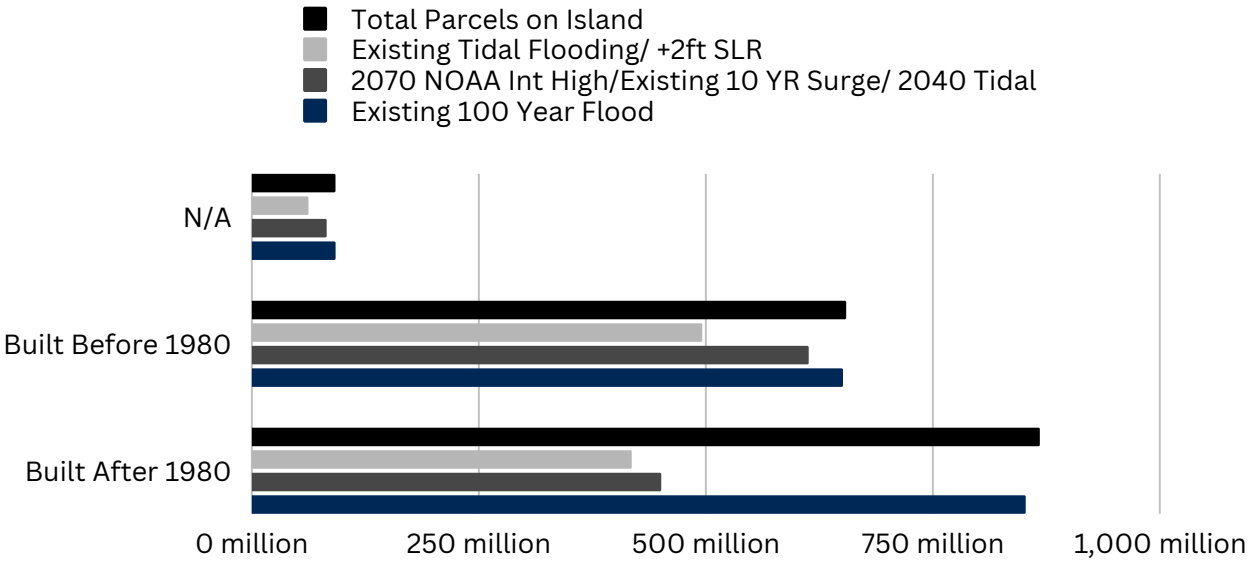


Figure 17. Impacted Parcels by Decade Built and Parcel Value

Buildings

Seven hundred and forty-seven buildings are located on Captiva. The building footprints for Captiva were obtained from Lee County and analyzed for initial inundation impact under the various flood scenarios. Figure 18 displays the number of building footprints that may experience flooding if their elevations is at ground level. This analysis does not account for elevation certificates or actual structure first floor elevations.

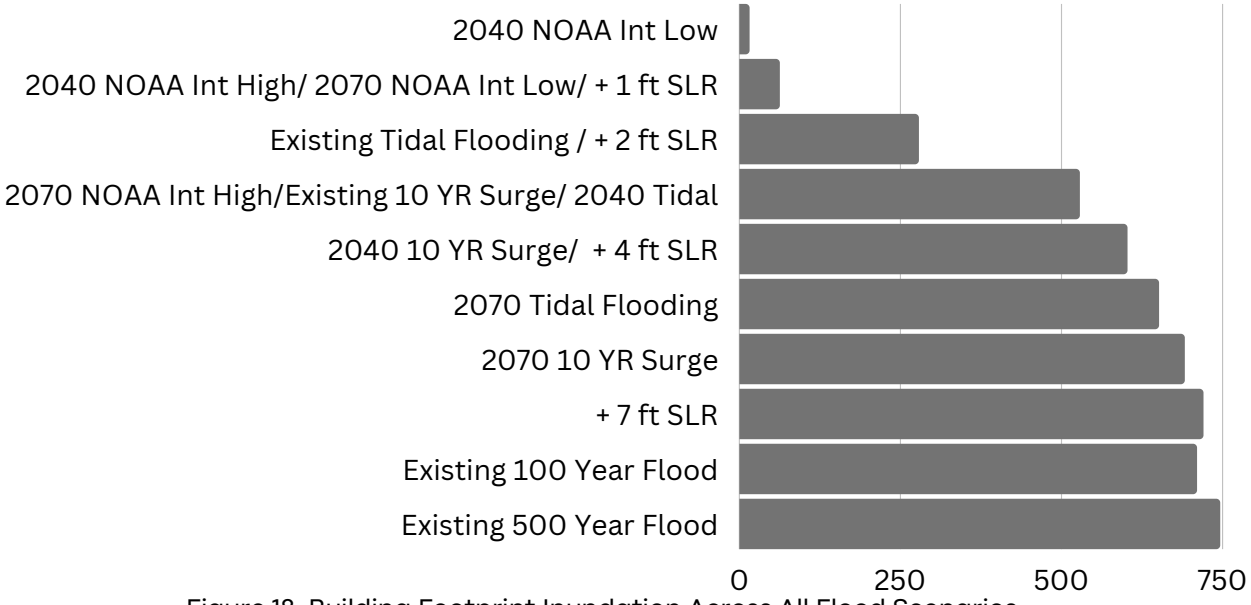


Figure 18. Building Footprint Inundation Across All Flood Scenarios

Figure 19 displays the number and percentage of inundated building footprints for each of the three inundation tipping point scenarios. The location and extent of building impact per scenario can be seen in Figure 20 .

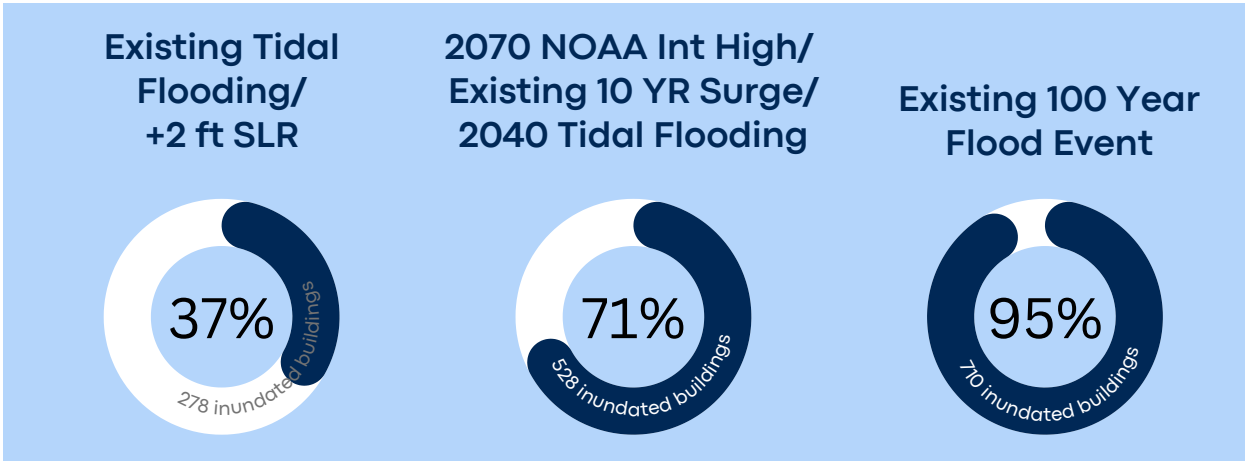


Figure 19. Percentage of Building Footprint Inundation Under Inundation Tipping Point Scenarios

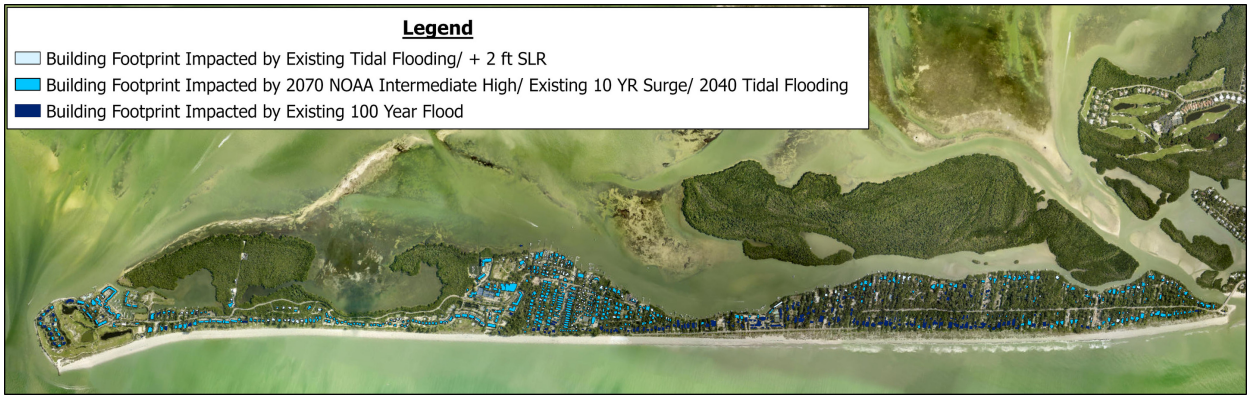


Figure 20. Building Footprint Inundation Map for Inundation Tipping Point Scenarios

A more thorough analysis of building footprint inundation included estimating average building footprint inundation depth, classifying the building footprint data by decade built, and estimating building value per scenario. The methodology used here is the same as that used to complete the parcel inundation analysis. As stated previously, average depth is represented by the center of the raster grid of inundation, and thus the total impacted number of building footprints is reduced as not every footprint that spatially intersects the inundation polygons has the center point that falls on it. Figure 21 details building sensitivity per scenario and the associated flooding type- nuisance (< 1 foot of flooding), disturbance (1-2 feet of flooding), and impact (> 2 feet of flooding).

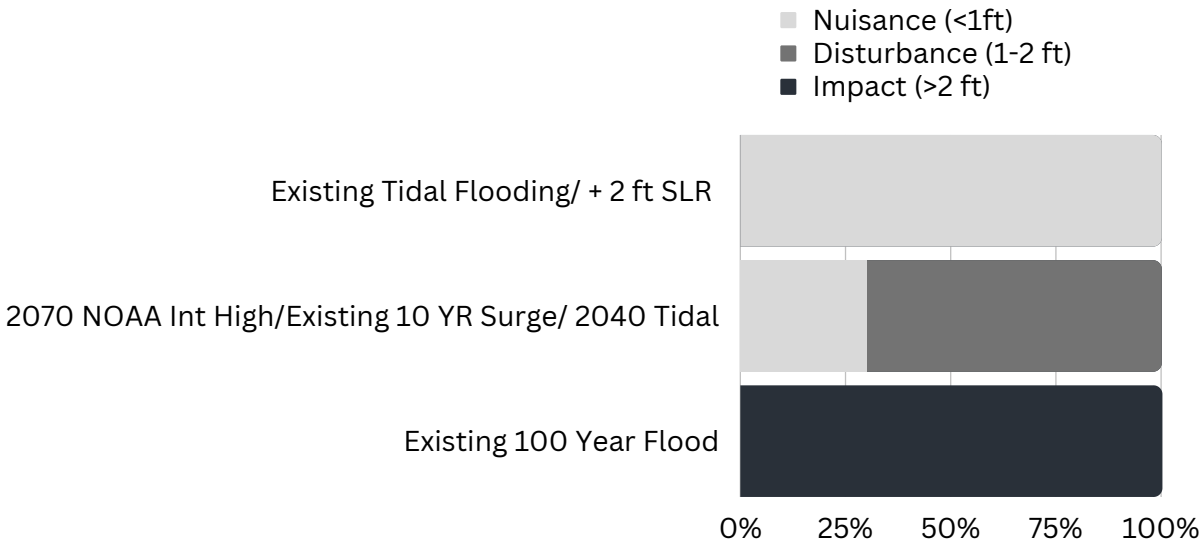


Figure 21. Building Footprint Inundation Depth Under Inundation Tipping Point Scenarios

When classifying projected inundated buildings by flooding type, 100% of all impacted buildings under the Existing Tidal Flooding/ +2 ft SLR scenario will experience flooding at a depth below 1 foot. This percentage decreases to 30% under the 2070 NOAA Intermediate High/ Existing 10 Year Surge/ 2040 Tidal Flooding scenario, with 60% of buildings projected to experience flooding of 1-2 feet deep. both the degree and depth of flooding across impacted buildings increases. Under the Existing 100-year flood event, 100% of all impacted buildings will experience flooding at a depth greater than 2 feet.

When reviewing the distribution of the predicted inundated buildings and their associated estimated value over the decades (Figure 22), it is clear that the approximately half of the vulnerable buildings were built before the flood insurance standard (before 1983). Under tidal flooding conditions experienced today, 36% of the buildings experiencing inundation will have been built before 1980. These buildings have a combine estimated value of $149,263,455 . According the 2070 NOAA Intermediate High/ Existing 10 Year Surge/ 2040 Tidal Flooding scenario, 49% of the buildings predicted to be inundated are buildings built before 1980, with a total estimated value of$236,912,497. Under the Existing 100 Year Flood Event, 46% of effected buildings were built before 1980, with an estimated value of $248,084,248. As stated previously, parcels without a designated built year were not included in the total parcel count.

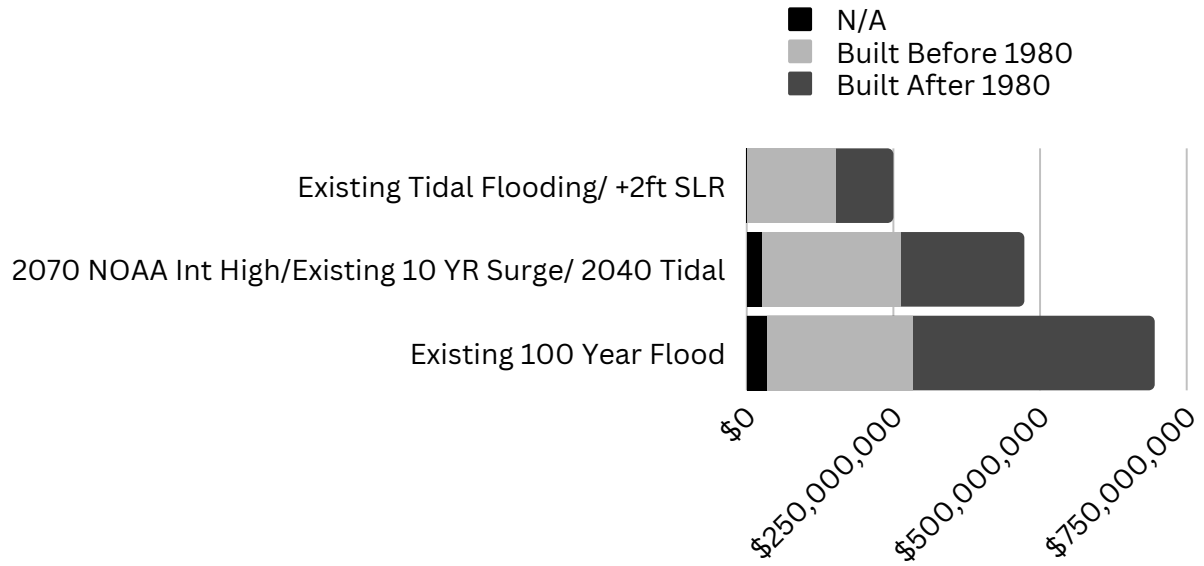


Figure 22 Impacted Building Footprints by Decade Built and Property Value

Seawalls

Seawalls line portions of Captiva's shoreline, serving as a source of coastal defense against erosion, high tides and surges. Specifically, Captiva's seawalls shield the most vulnerable areas of private land and residences, protecting them from severe flooding events. Local seawalls along Captiva were digitized from 2021 aerial imagery. It is important to note that a considerable degree of vegetation exists along the shoreline of the island which obscures the view of some areas, and thus it is possible that not all seawalls were seen and digitized. As-built survey data was not available for the analysis of seawall height, so an alternate method was performed using available ground elevation data for parcels.

To obtain the greatest level of accuracy as possible, Lee County parcels were consulted and reviewed for recorded seawall distinctions and any additional information recovered was used to inform the final database. The result of this digitization depicts a total of 8,556.9 linear feet of seawall along Captiva. The predicted inundation of seawalls per scenarios is depicted in Figure 23.

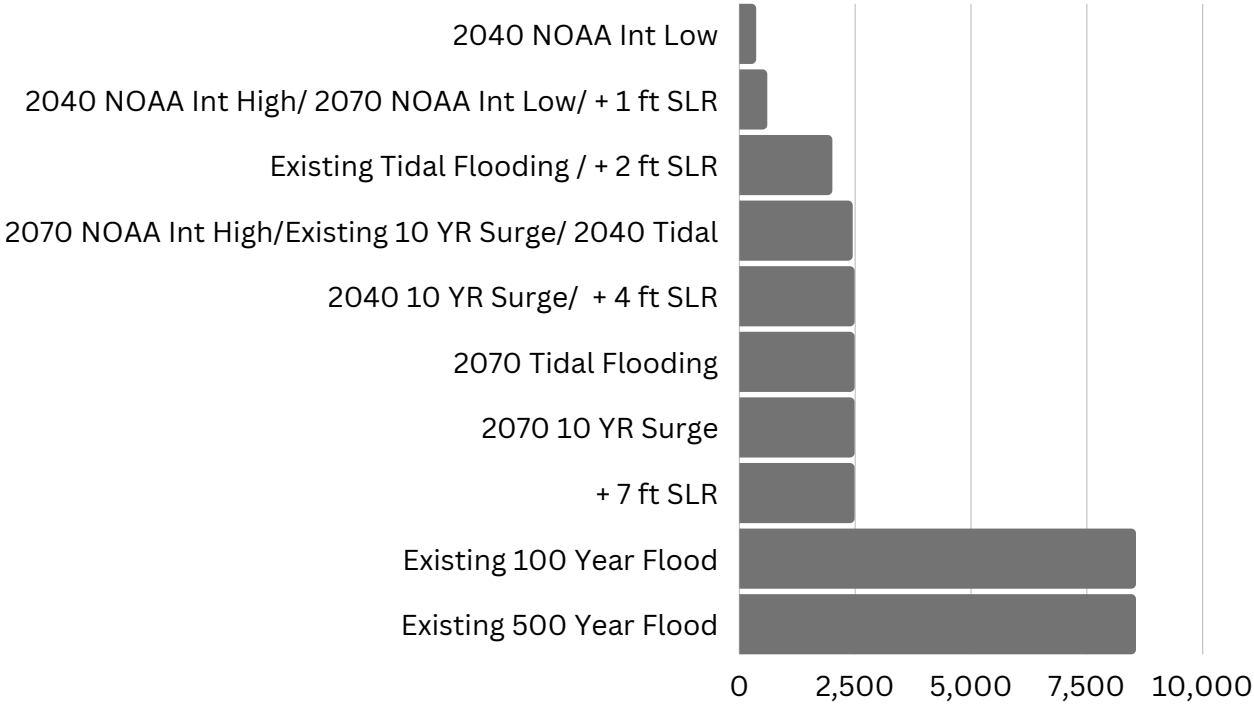


Figure 23. Seawall Inundation Across All Flood Scenarios

A total of 8,557 linear feet of seawalls exists along Captiva Island. The seawall inundation trend across the island depicted in Figure 24 serves as a visual justification for the inundation tipping point scenarios. These three scenarios driving the content of this report represent distinct increases in water level across local flood scenarios. Specifically, inundation impacts only 591 linear feet of seawall before increasing to 1,997 linear feet by the first inundation tipping point scenario (Existing Tidal Flooding/ +2 ft SLR). Seawall inundation increases significantly again (2,437 linear feet) under the 2070 NOAA Int High/Existing 10 YR Surge/ 2040 Tidal scenario. As is evident in Figure 24, the degree of seawall inundation remains rather constant across the island under the incremental scenarios between this scenario and the next tipping point scenario (Existing 100-year Flood Event). At this water level, all of Captiva's seawalls will experience flooding. The locations and extents of inundated seawalls per sea level rise scenario can be viewed in Figure 25.

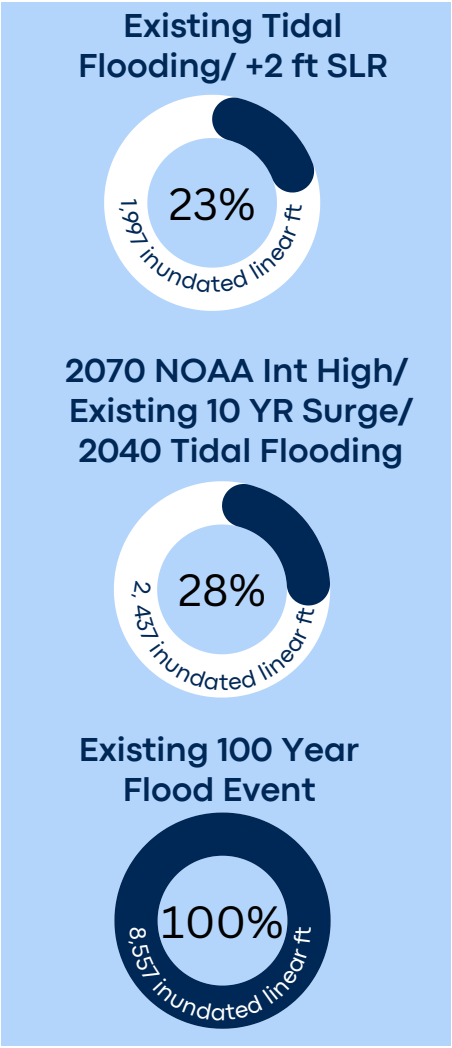


Figure 24. Percentage of Seawall Inundation Under Inundation Tipping Point Scenarios

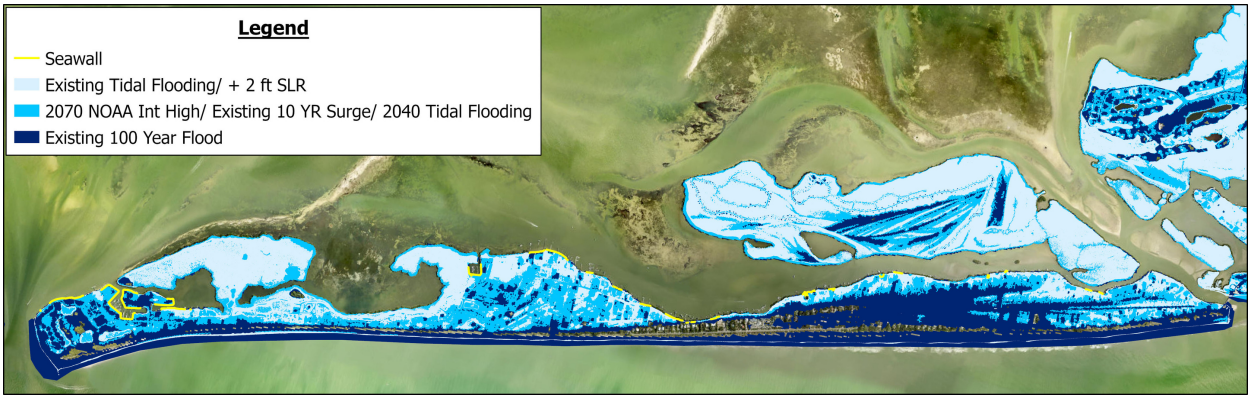


Figure 25. Seawall Inundation Map for Inundation Tipping Point Scenarios

Wastewater Treatment Facilities and Lift Stations

In July 2021, Kimley-Horn completed an engineering study to determine the best ways a central sewer system can fit within Captiva's landscape. The firm prepared a conceptual layout for a wastewater collection and conveyance system for the unsewered portion of Captiva that consists of the areas outside the South Seas Resort, which has its own system. More specifically, this includes three areas currently serviced by package Wastewater Treatment plants- the Village Service Area, the Tween Waters Service Area, and the Estates Service Area (Figure 26).

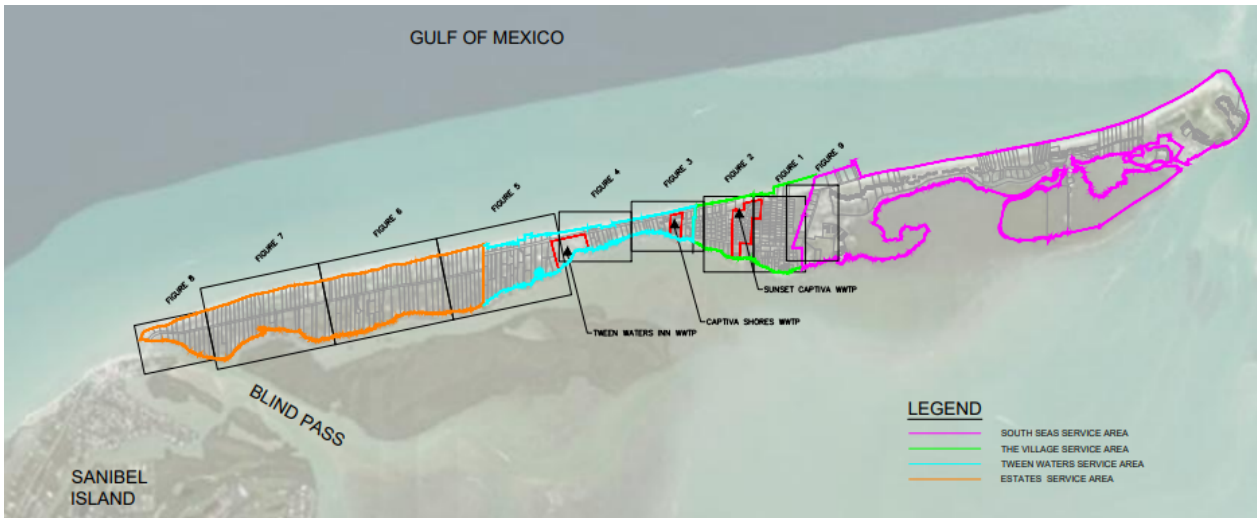


Figure 26. July 2021 Kimley-Horn Study- Unsewered Service Areas of Captiva

Data acquired from Lee County was utilized to map the four Wastewater Treatment Plants (WWTP) located on Captiva to determine potential inundation impacts. The analysis results depict the greatest average depth of inundation occurring at the South Seas Plantation WWTP, which is the only WWTP at risk of inundation across the three inundation tipping point scenarios. The South Seas Plantation WWTP is likely to experience inundation at an average depth of 0.3 feet under existing tidal flooding conditions, 3.4 feet under the 2070 NOAA Int High, and 6 ft under the Existing 100 Year Flood Event (Table 3). The Tween Waters Inn WWTP is not expected to experience flooding under any of the three inundation tipping point scenarios.

The results of the analysis depict an average flood depth of 1.5 feet for the Captiva Shores Condominium WWTP under Scenario 2 and an average depth of 4 feet under Scenario 3. Lastly, for the Sunset Captiva WWTP, nuisance flooding is anticipated under the 2070 NOAA Int High scenario (average depth of 0.7 ft), and flooding with an average depth of 3 feet is anticipated under the Existing 100 Year Flood Event (Table 3).

Table 3. Wastewater Treatment Plant Average Inundation Depth (in feet) Under Inundation Tipping Point Scenarios

WWTP Location	Existing Tidal Flooding/ +2 ft SLR	2070 NOAA Int High/ Existing 10 YR Surge/ 2040 Tidal Flooding	Existing 100 Year Flood Event
South Seas Plantation	0.3	3.4	6
Tween Waters Inn	None	None	None
Captiva Shores Condominium	None	1.5	4
Sunset Captiva	None	0.7	3

Five lift stations are located on the island of Captiva- one at each of the three package plant stations, one small lift station associated with the Sunset Captiva Condominiums, and one City of Sanibel lift station at Turner Beach that serves the Lee County Park. The locations of the lift stations were identified in Kimley Horns project design and were approximated for the purposes of this assessment. Figure 27 highlights the locations of the lift stations, and the wastewater treatment plants on Captiva.

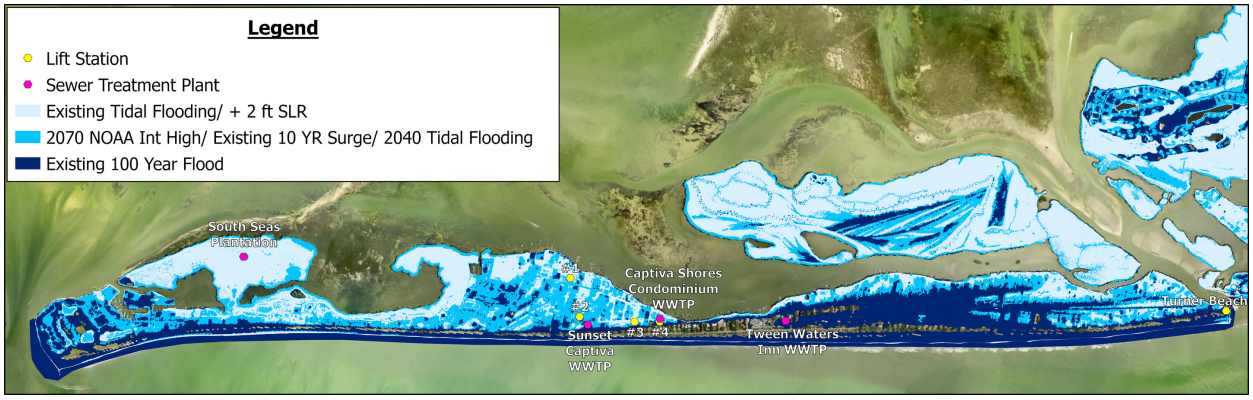


Figure 27. Wastewater Treatment Plant and Lift Station Inundation Map for Inundation Tipping Point Scenarios

Lift Station #3 is the only station predicted to experience some degree of flooding across all three major scenarios. Specifically, the predicted average inundation depth for tipping point Scenario 1 is 0.6 feet (nuisance, for tipping point Scenario 2 is two feet (disturbance), and for tipping point Scenario 3 is five feet (impact). While not flooded at tipping point Scenario 1, lift stations #1 and #2 will likely flood at the remaining two scenarios. Under tipping point Scenario 2, the average inundation depths are 0.9 ft and 1 ft for station #1 and #2, respectively. Under tipping point Scenario 3, both stations are predicted to experience an average flood depth of four feet.

Lift station #4 and the Turner Beach lift station are not likely to experience flooding under inundation tipping point Scenarios 1 and 2 but will experience flooding under inundation tipping point Scenario 3 with an average depth of four and three feet, respectively. Average inundation depths are outlined in Table 4.

Concern for sea level rise is one of the motivators for a wastewater collection system, as the existing septic systems will become largely inoperable due to high ground water if sea level rises as predicted. Consideration of the impacts of sea level rise, following NOAA guidance, helped guide the collection system design. In order for the collection systems to be functional in high ground water situations, lift stations will need to be hardened to storm surge and existing lift stations will need to be rebuilt to a higher "utility grade" standard.

Table 4. Lift Station Average Inundation Depth (in feet) Under Inundation Tipping Point Scenarios

Lift Station	Existing Tidal Flooding/ +2 ft SLR	2070 NOAA Int High/ Existing 10 YR Surge/ 2040 Tidal Flooding	Existing 100 Year Flood Event
Lift station #1	None	0.9	4
Lift station #2	None	1	4
Lift station #3	0.6	2	5
Lift station #4	None	None	4
Turner Beach Lift Station	None	None	3

Stormwater Treatment Facilities and Pump Stations

Comprehensive stormwater data for the island of Captiva was not available for the purpose of this assessment. Instead, limited longitudinal data was extracted from the 2011 Captiva Water Quality Assessment Project Final Report prepared by the SCCF Marine Laboratory in Sanibel, FL. This report was generated for the Lee County Tourist Development Council (TDC) and the Captiva Community Panel (CCP) and its overall purpose was to investigate the conditions of Captiva's nearshore waters and the potential problems contributing to local water quality. Included within the data collection was a list of all water quality sites established for the project, which included site types related to stormwater infrastructure and storm water occurrences. Specifically, longitudinal data for Captiva catch basins and pipes, swales and retention ponds, standing water, sewer, and outfalls from the report were plotted and assessed for inundation impacts (Figure 28).

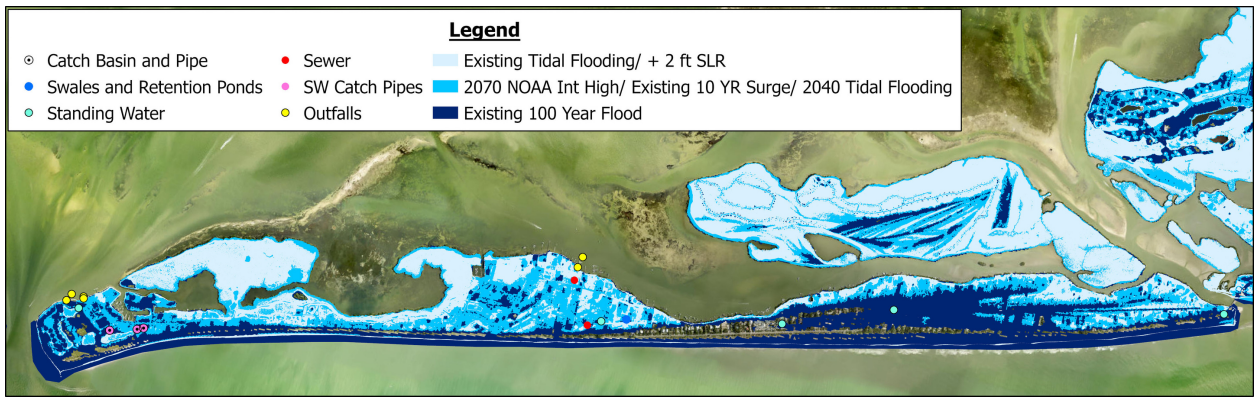


Figure 28. Stormwater Infrastructure Inundation Map for Inundation Tipping Point Scenarios

The water quality report includes sites for three catch basin pipes, one retention pond, six standing water areas, two sewers, and two outfalls located on Captiva Island. These assets do not represent the entirety of the stormwater infrastructure on the island, and with more complete surveying, a future, more comprehensive analysis should be completed. The retention pond is vulnerable to flooding across all three inundation tipping point flood scenarios. Regarding the other stormwater infrastructure types, the number of assets impacted by flooding increase across the tipping point scenarios (Table 5). Similarly, the average depth of the predicted inundated increases across tipping point scenarios (Table 6).

Table 5. Stormwater Infrastructure Inundation for Inundation Tipping Point Scenarios

Type	Total Number	Inundation (feet)		
		Existing Tidal Flooding/ +2 ft SLR	2070 NOAA Intermediate High/ Existing 10 Year Surge/ 2040 Tidal Flooding	Existing 100 Year Flood Event
Catch Basin Pipe	3	0	2	3
Swales and Retention Pond	1	1	1	1
Standing Water	6	2	2	5
Sewer	2	0	1	1
Outfalls	2	2	2	1

Table 6. Stormwater Infrastructure Average Inundation Depth (in feet) Under Inundation Tipping Point Scenarios

Type	Average Inundation (feet)		
	Existing Tidal Flooding/ +2 ft SLR	2070 NOAA Intermediate High/ Existing 10 Year Surge/ 2040 Tidal Flooding	Existing 100 Year Flood Event
Catch Basin Pipe	N/A	0.9	3.7
Swales and Retention Pond	0.5	1.9	5
Standing Water	0.4	2.4	3.5
Sewer	N/A	1.5	5
Outfalls	1.8	1.2	6

Solid and Hazardous Waste Facilities

A Solid and Hazardous Waste Facility does not exist on Captiva Island. The nearest facility, the Sanctuary Golf Club was examined for the purpose of this assessment and is located one mile from Captiva's southern tip (Figure 29). The average depth of anticipated inundation under the three inundation tipping point scenarios are as follows:

1. **Existing Tidal Flooding/ +2ft SLR:** 0.4 feet
2. **2070 NOAA State Required High/ Existing 10 YR Surge/ 2040 Tidal Flooding:** 0.8 feet
3. **Existing 100 Year Flood Event:** 3.1 feet

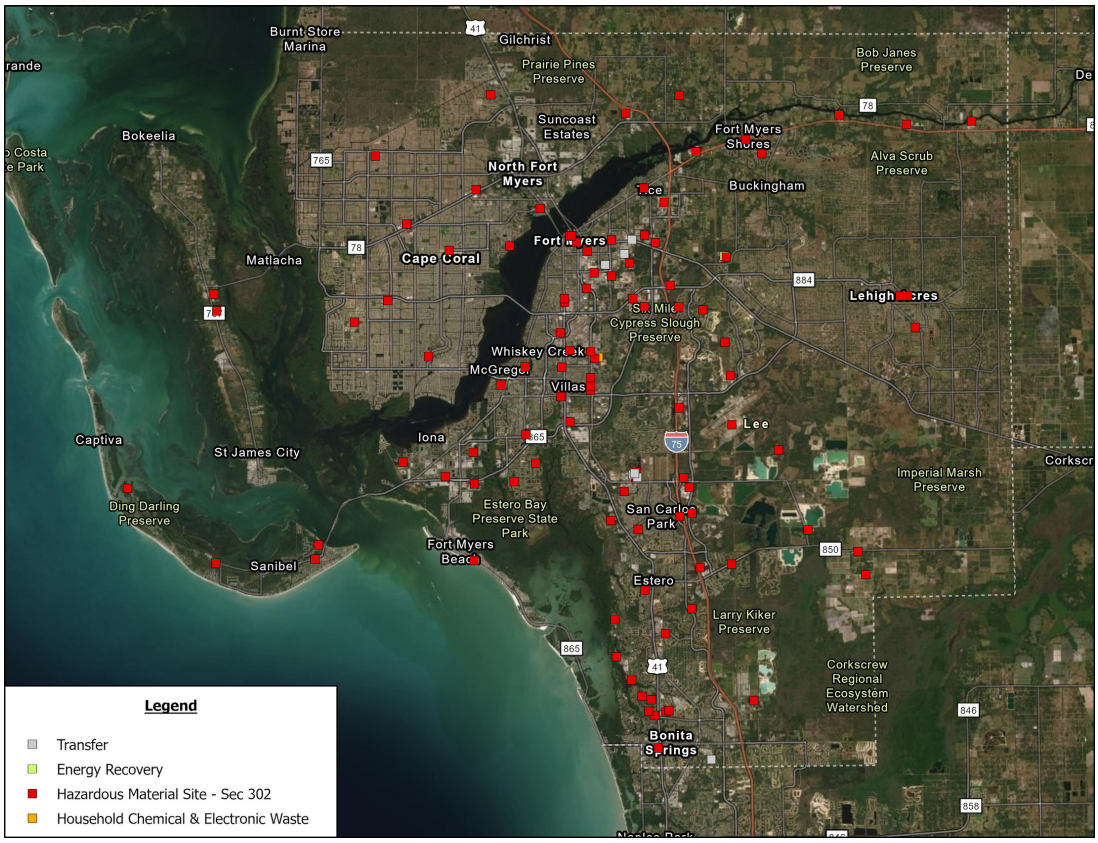


Figure 29. Lee County Solid and Hazardous Waste Facilities

Drinking Water Facilities

Captiva's drinking water facility is located adjacent to the South Seas Wastewater Treatment plant. Flooding is anticipated at this location under all ten flood scenarios utilized for the purpose of this assessment. Figure 30 displays the inundation extent for the three inundation tipping point scenarios.

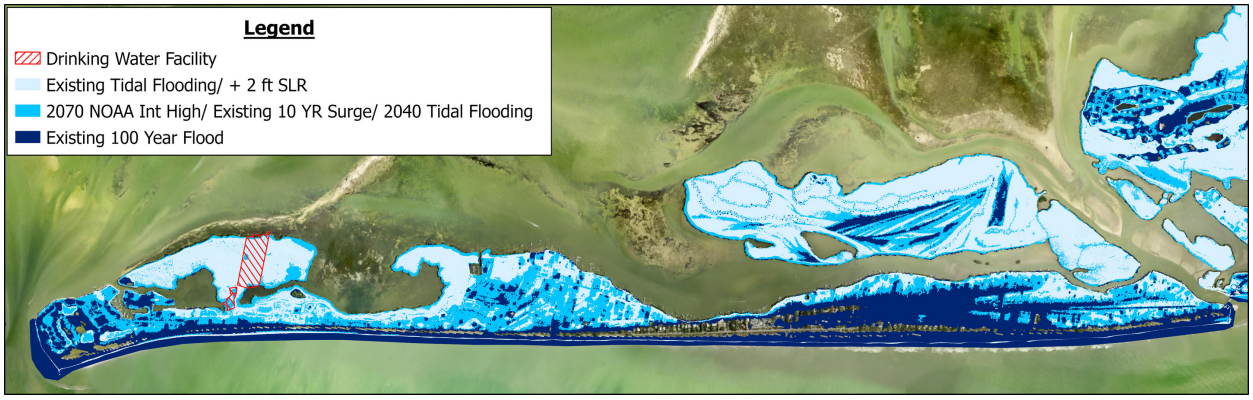


Figure 30. Drinking Water Facilities Inundation Map for Inundation Tipping Point Scenarios

Across all three scenarios, there is a high probability that the drinking water facility will experience flooding. Under existing tidal flooding conditions, 81% of the facility is projected to experience inundation and under the 2070 NOAA tipping point scenario, 96% of the facility will likely flood. Lastly, the entire facility will be inundated under the Existing 100 Year Flood Event. Average inundation depths for the three scenarios are as follows:

1. **Existing Tidal Flooding/ +2ft SLR:** 1.1 feet
2. **2070 NOAA State Required High/ Existing 10 YR Surge/ 2040 Tidal Flooding:** 2.3 feet
3. **Existing 100 Year Flood Event:** 6.7 feet

Communication Facilities

Individuals rely on communication facilities to relay information, connect with pothers, call for help, etc. If a communication tower is flooded and inoperable, it could result in nearby residents and facilities being unable to reach or receive calls which can be dangerous, especially because the local Emergency Medical Services (EMS) facility is located on the island. Figure 31 displays the two communication facilities on Captiva-one located at the East Side of Chadwick's Square Shopping Center and one located directly west of the South Seas Wastewater Treatment Plant. The South Seas tower was identified in the 2020 Captiva Island Resiliency Assessment produced by Integral consulting. Additional communication facilities across Lee County can be viewed in Appendix I.

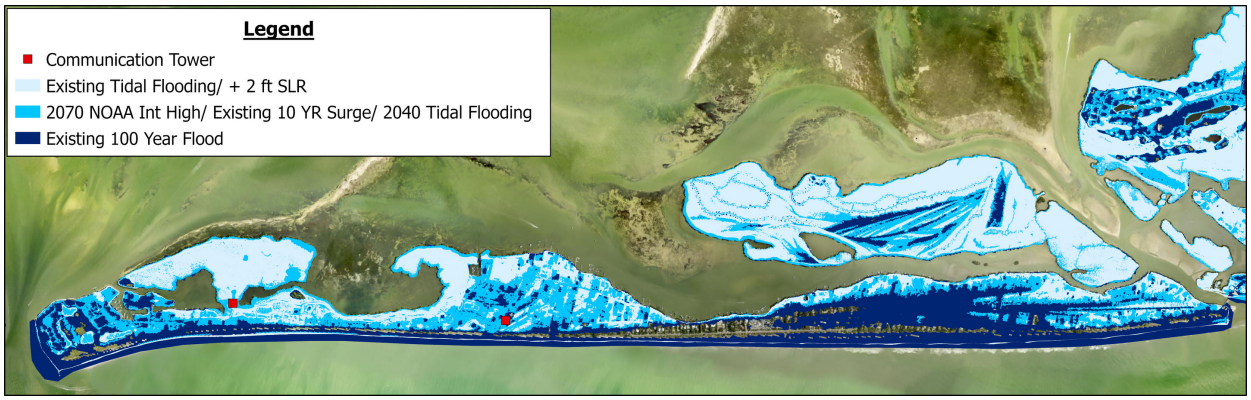


Figure 31. Communications Facilities Inundation Map for Inundation Tipping Point Scenarios

The closest inundation point was utilized to predict potential flood impacts to the communication towers. The results of this analysis predict that under existing tidal flooding conditions, neither communication tower will be impacted. According to the 2070 NOAA High tipping point scenario, the Chadwhick's Square tower will experience inundation with an average depth of one foot and the South Seas Tower will experience inundation with an average depth of .8 feet. The flooding threat to both of the communication towers increases significantly under the Existing 100 Year Flood Event- the Chadwhick's Square tower is projected to flood at an average depth of five feet and the South Seas tower is projected to flood at an average depth of six feet.

Disaster Debris Management Sites

One Disaster Debris Management Site (DDMS) is located on Captiva Island (Figure 32. A DDMS is a temporary staging area for disaster debris including demolition waste and yard waste. If the site becomes unreachable, residents will be unable to concentrate storm debris.

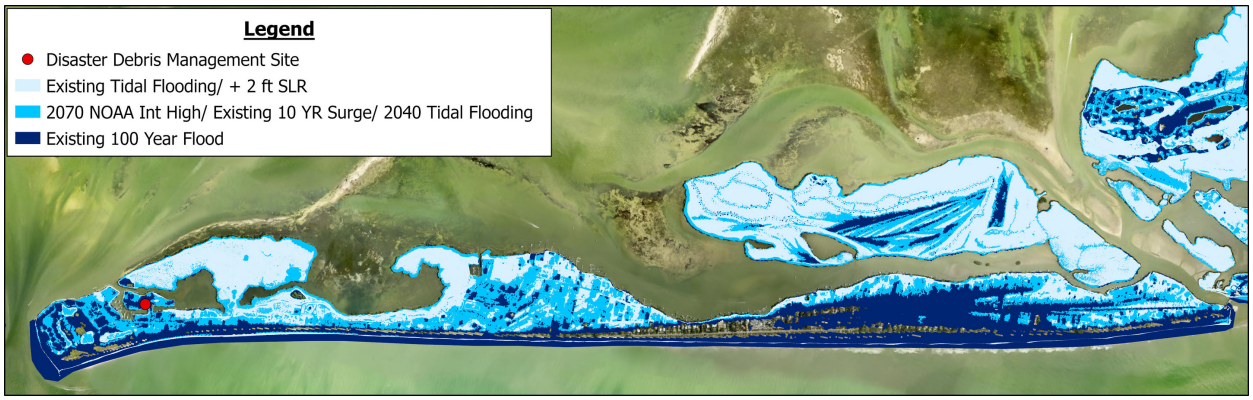


Figure 32. Disaster Debris Management Sites Inundation Map for Inundation Tipping Point Scenarios

The site itself does not intersect with the inundation projections for existing tidal flooding or the 2070 NOAA Int High scenarios. However, the surrounding parcels, roads, and infrastructure are projected to be inundated by 2070, which would decrease or eliminate the accessibility of the site. Under the Existing 100-year Flood Event, the site will be impacted by inundation with an average depth of 3 feet.

Transportation Assets and Evacuation Routes Sensitivity Analysis

- 48 Roadways and Bridges
- 51 Evacuation Routes
- 53 Marinas
- 57 Airports, Ports, Bases, and Bus Terminals

Roadways and Bridges

Major roadways along Captiva Island are essential not only in emergencies, but in everyday life as residents depend on them to sustain their lifestyles. The functionality of roadways determines the mobility of people and the accessibility of places and resources. Flooding can significantly impact road networks making them unusable and unreliable. To determine the level of impact flooding is predicted to have on roads within Captiva, roadway data was downloaded from UF Geoplan Center. Linear footage of roadway inundation and roadway type were identified for each flood scenario.

A total of 108,579 linear feet of roads exists on Captiva and Figure 33 outlines roadway inundation percentages per scenario. Under existing tidal flooding conditions, 11% of roads will be impacted by flooding, and under the 2070 NOAA State Required High/ Existing 10 YR Surge/ 2040 Tidal Flooding scenario, 33% of roads will be impacted. The percentage of roadway inundation increases to 40% under a Existing 100 Year Flood Event.

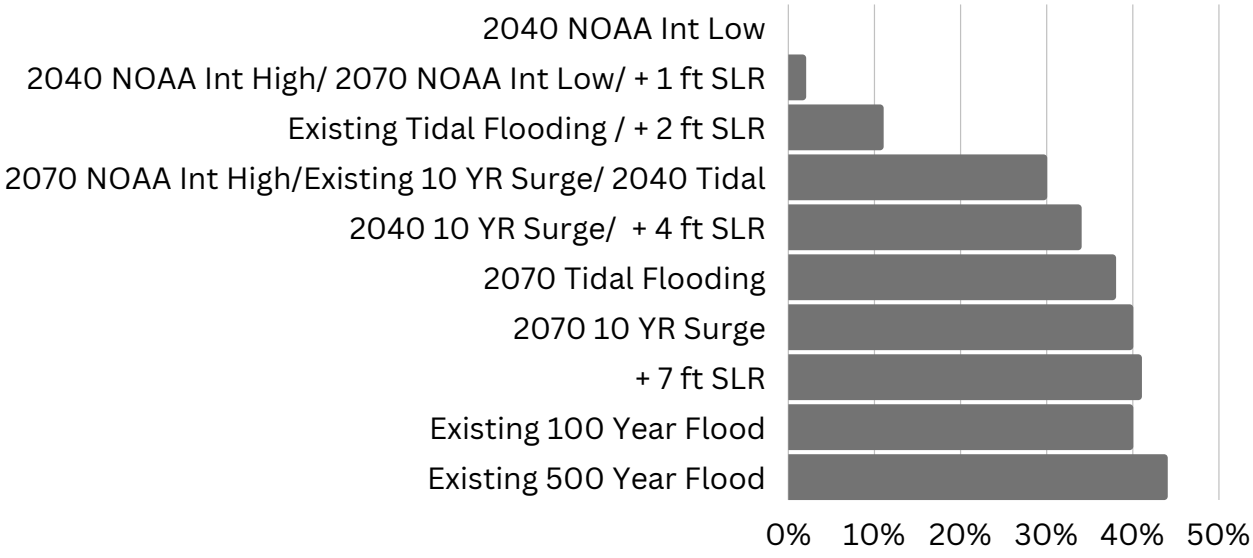


Figure 33. Percentage of Roadway Inundation Across All Flood Scenarios

Figure 34 depicts road elevation for all roads on Captiva, which helps to visualize low lying areas and road segments that would be the first to flood. It is evident that the majority of roads on the northern half of the island are at a significantly lower elevation than roads on the southern half of the island.

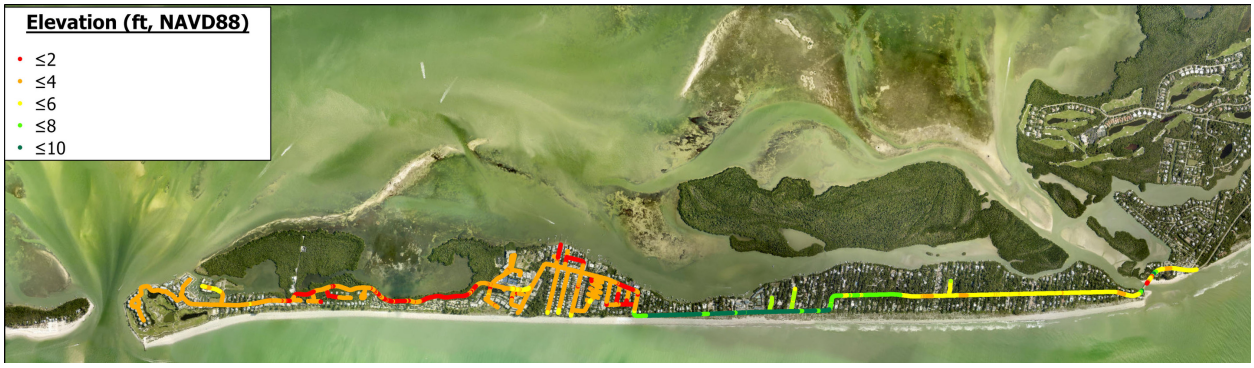


Figure 34. Captiva Roads Elevation Map

Inundated roads were also classified by owner (Table 7). For the purpose of this analysis, minor collector roads refer to roads that collect traffic from local roads and conduct it to a higher class of road. This evaluation and level of detail helps to characterize the impact of inundation on major larger roads versus minor collector roads, or smaller, more localized roads. Moreover, it helps determine jurisdiction and inform decision making regarding adaptation and mitigation. Figure 35 displays this breakdown via percentages to show approximately half of inundation impacts occur to minor collector roads and half occur to Local Neighborhood Roads and City Streets, under the three tipping point scenarios.

Table 7. Inundated Roadways Classified by Owner Under Inundation Tipping Point Scenarios

	Road Owner - Linear feet (% of total)			
	Urban: Minor Collector Roads (federal aid)	Local Neighborhood Road, Rural Road, or City Street	Private Roads for Service Vehicles	Total Roadways
Existing Tidal Flooding/ ~2 ft SLR	6,551 (55%)	5,448 (45%)	0 (0%)	11,999
2070 NOAA State Required High/ Existing 10 YR Surge/ 2040 Tidal Flooding	16,149 (46%)	19,097 (54%)	45 (0.1%)	35,291
Existing 100 Year Flood Event	22,028 (51%)	20,877 (49%)	45 (0.1%)	42,950

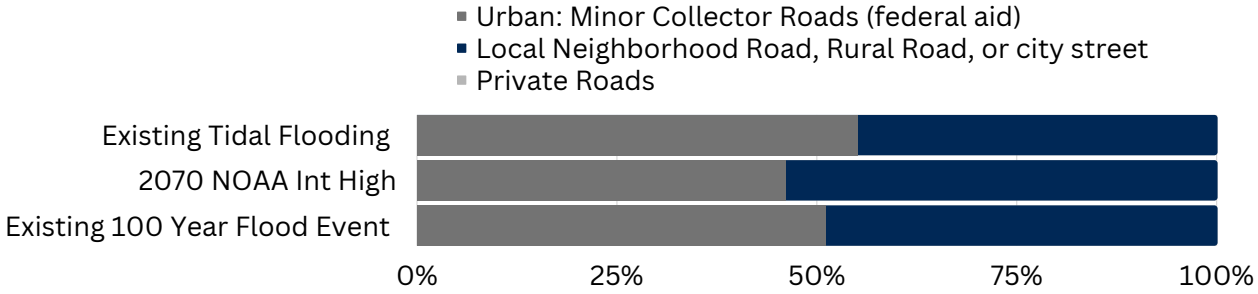


Figure 35. Percentage of Roadway Inundation by Roadway Type for Inundation Tipping Point Scenarios

When evaluating the vulnerability of roadways, it is important to identify any bridges along major routes that may also be vulnerable to flooding. The only bridge that exists on Captiva Island connects the Island to Sanibel Island. The road before the bridge on the Captiva side is predicted to experience inundation as is the parcel adjacent to the bridge (Figure 36). The vulnerability of the surrounding infrastructure and connected roadways will consequently impact the bridge's accessibility and reliability. If connected roadways are flooded and residents are unable to access the bridge, the mobility and movement of people and resources will be severely impacted.

The elevation of the lowest point of the ascending bridge is 6.9 ft NAVD, resulting in anticipated flooding of the bridge itself at 7 feet of sea level rise, and during an Existing 100 year and 500 year flood event. Table 7 depicts the predicted average inundation depths for each of these scenarios.

Table 8. Bridge Average Inundation Depth (in feet) for Relevant Scenarios

Scenario	Average inundation Depth (feet)
+ 7 ft SLR	0.4
Existing 100 Year Flood Event	1.92
Existing 500 Year Flood Event	4.22

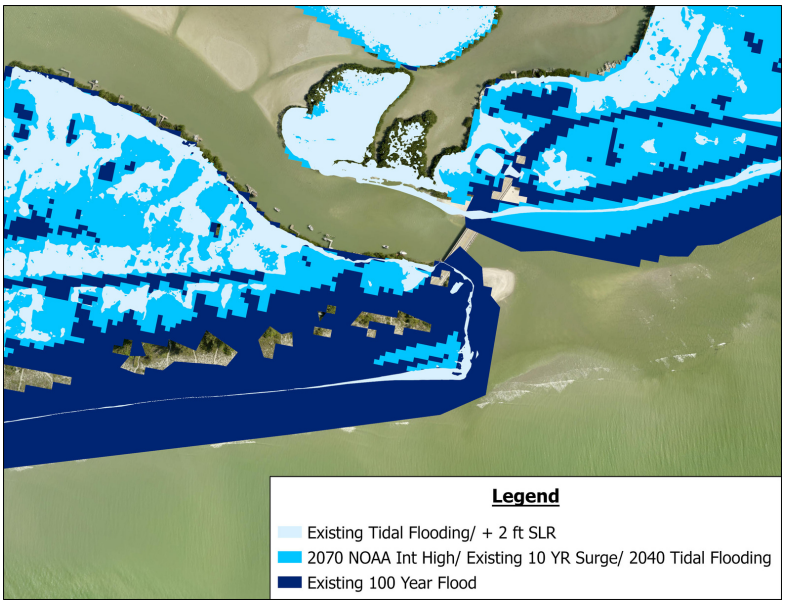


Figure 36. Bridge Inundation for Inundation Tipping Point Scenarios

Evacuation Routes

Captiva Drive serves as the island's evacuation route and its only connection to Sanibel. Inundation along this roadway could result in service interruptions, road closures, traffic delays, emergency service delays and overall loss of evacuation. The elevation of this roadway was assessed to determine the specific segments of the roadway at the lowest elevations, as these areas are most likely to flood first and to pose the greatest threat to service and evacuation interruptions. Figure 37 depicts the results of the initial elevation evaluation. Overall, the Northern portion of Captiva Island sits at a lower elevation than the remainder of the roadway and runs in close proximity to the bayside edge of the island with little to no buffer against the water body.

Figure 37. Captiva Evacuation Route Elevation

Utilizing the approximate centerline of Captiva Drive, road segments were then assessed to determine specific locations and magnitudes of inundation per scenario. The average inundation depth in feet for the evacuation route per scenario is outlined in Figure 38.

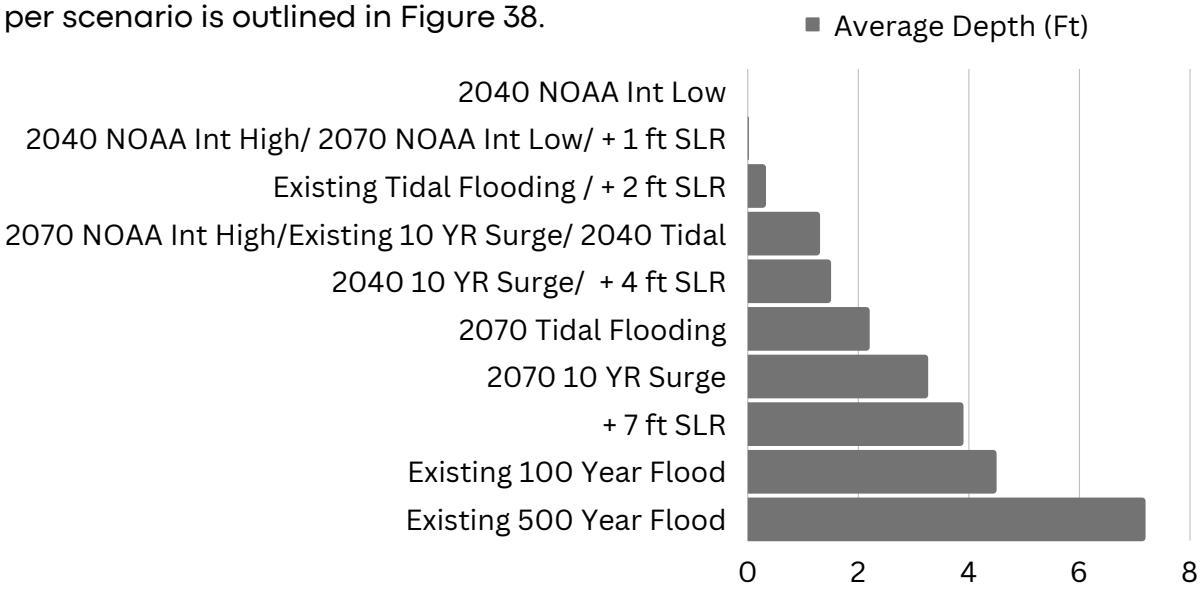


Figure 38. Captiva Evacuation Route Average Inundation Depth Across All Flood Scenarios

The average, minimum, and maximum, inundation depth for each inundation tipping point scenario is outlined in Table 9.

Table 9. Evacuation Route Elevation Summary Under Inundation Tipping Point Scenarios

	Inundation Depth (feet)		
	Average	Minimum	Maximum
Existing Tidal Flooding	0.3	0	0.9
2070 NOAA Int High/ Existing 10 YR Surge/ 2040 Tidal Flooding	1.3	0	2.4
Existing 100 Year Flood Event	4.5	1	8

Flooding depths greater than one foot have the ability to not only inhibit mobility but can eliminate the ability of emergency response and evacuation to and from the northern region of the island. In instances of hurricanes and storms, this can be extremely dangerous, leaving residents stranded without the ability to reach resources and aid. Figures 39 depicts the predicted evacuation route inundation for the three inundation tipping point scenarios.

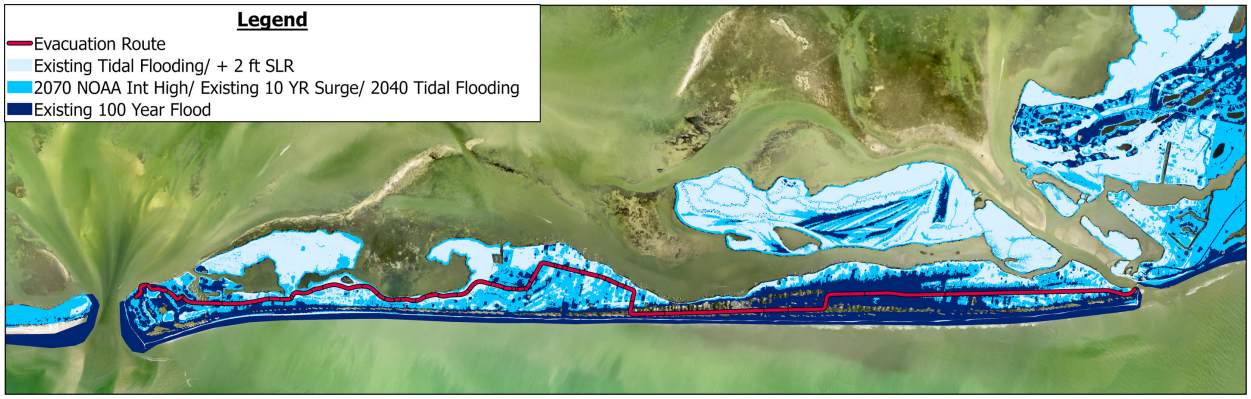


Figure 39. Evacuation Route Inundation Map for Inundation Tipping Point Scenarios

Marinas

Seven marinas exist on Captiva Island (Figure 40). The associated parcel for each marina coordinate point was utilized to estimate inundation under the ten flooding scenarios.

Figure 40. Captiva Marinas

All scenarios cause flooding to all seven marinas, except for the 2040 NOAA Intermediate Low and the 2040 NOAA Int High/ 2070 NOAA Int Low/ + 1 ft SLR, which impact four and six marinas respectively. To better understand the magnitude of this inundation, inundation depth was estimated for each marina, under each flood scenario. The results of this analysis for the three inundation tipping point scenarios are summarized in the subsequent pages, in Figures 41-47 and Table 10 and Table 11.

Depth represents the average across the relevant parcel so while a greater extent of inundation may exist under certain scenarios, the flooding depths across the expanded area vary and reduced depths in some areas can result in a reduced overall average depth. Under existing tidal flood conditions, six of the seven marinas will experience nuisance flooding (<1 ft deep), and one marina (located at 2800-5640 South Seas Plantation Road) will experience more significant flooding at 1.6 ft deep. According to the 2070 NOAA tipping point scenario, the average inundation at all impacted marinas will be greater than 1.5 feet. Again, the marina located at 2800-5640 South Seas Plantation Road is anticipated to experience flooding at a greater depth than the others, at an average of 2.8 ft deep. The marina located at 15903 Captiva Drive is also projected to experience more impactful flooding, with an average inundation depth of 2.4 feet. The extent of flooding exposure for each marina was examined in detail to identify specific impacts on infrastructure and accessibility. The results of this qualitative review for inundation tipping points 1 and 2 are summarized in Table 12 .The Existing 100 Year Flood Event was not included in Table 12 because the majority of the island is inundated under this scenario, resulting in the inundation of all marinas.

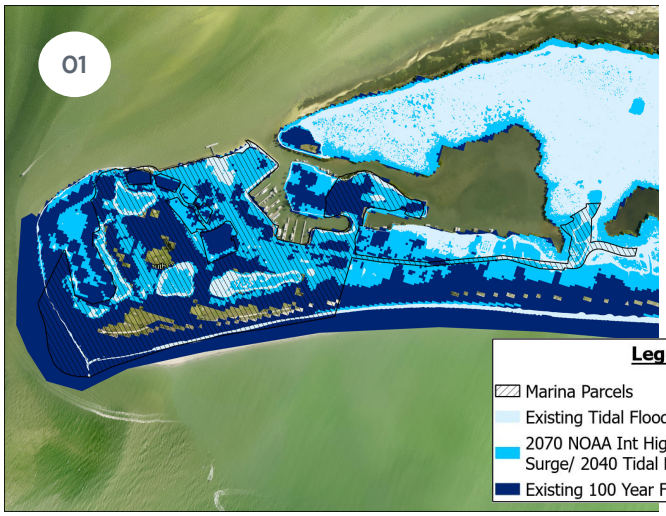


Figure 41. 1057-1900 South Seas Plantation Road Marina Inundation Map

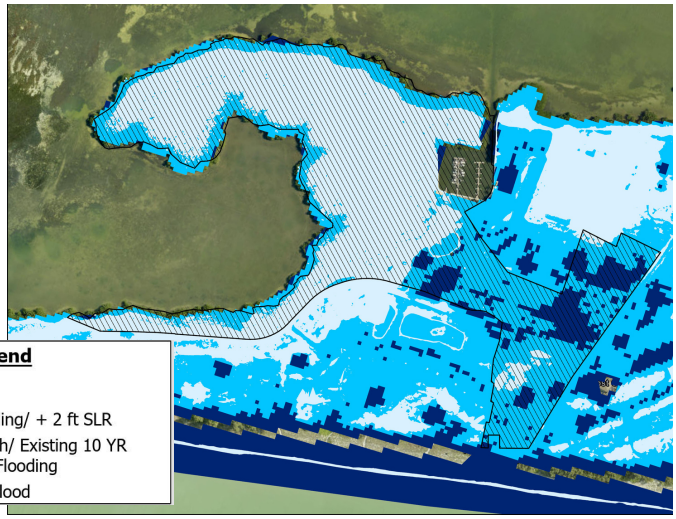


Figure 42. 2800-5640 South Seas Plantation Road Marina Inundation Map

Table 10. Marina Average inundation Depth (in feet) Under Inundation Tipping Point Scenarios-Part 1

		Average Inundation Depth (feet)		
	Marina Address	Existing Tidal Flooding	2070 NOAA State Required High/ Existing 10 YR Surge/ 2040 Tidal Flooding	Existing 100 Year Flood Event
01	1057-1900 South Seas Plantation Road	0.7	1.6	4
02	2800-5640 South Seas Plantation Road	1.6	2.8	6
03	11401 Andy Rosse Lane	0.2	1.7	6
04	15107 Captiva Drive	0.3	1.7	6

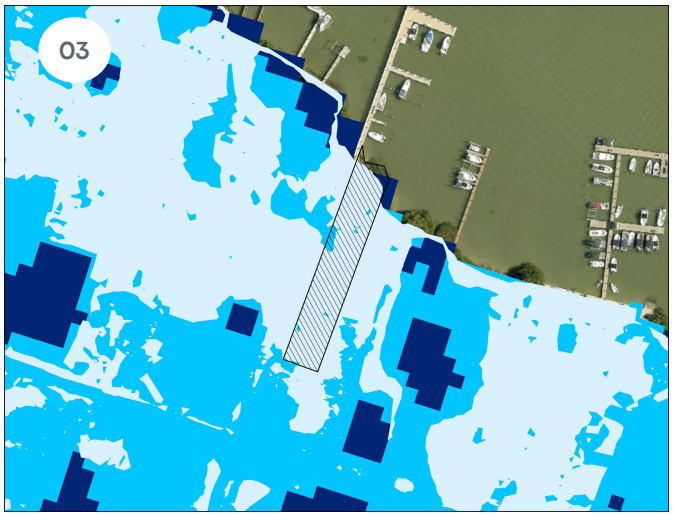


Figure 43. 11401 Andy Rosse Lane Marina Inundation Map

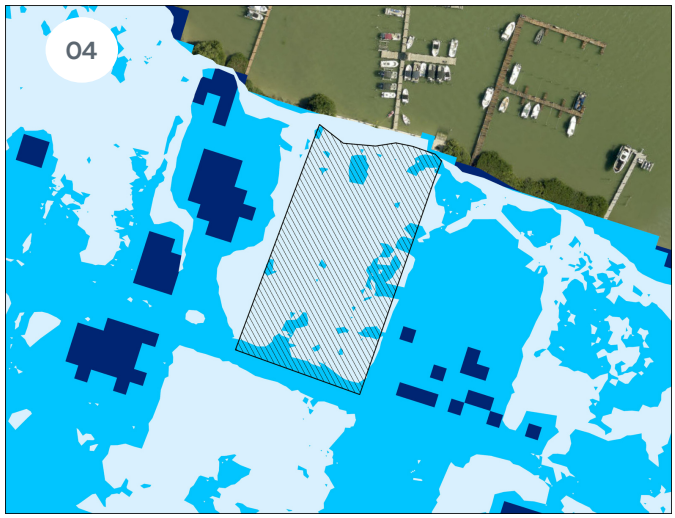


Figure 44. 15107 Captiva Drive Marina Inundation Map

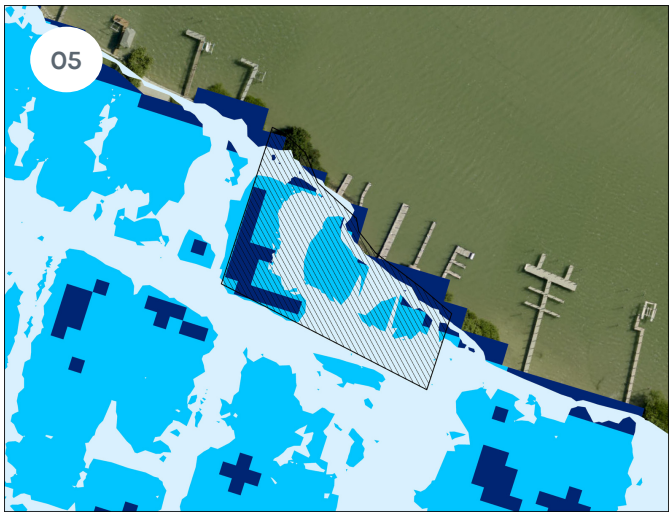


Figure 45. 15183 Captiva Drive
Marina Inundation Map

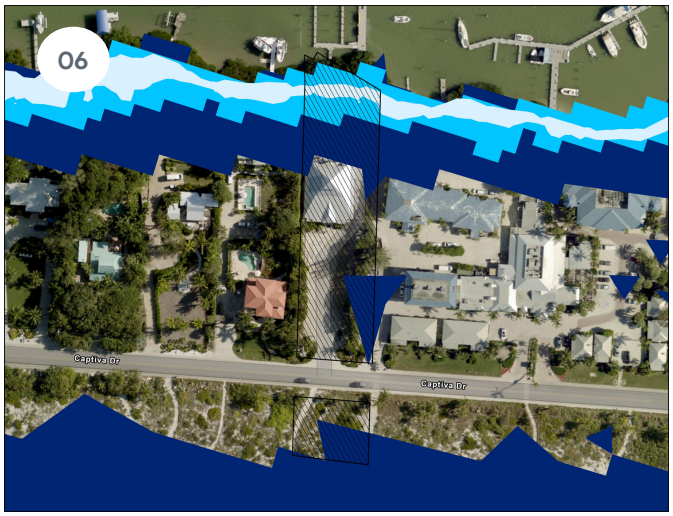


Figure 46. 15903 Captiva Drive
Marina Inundation Map

Table 11. Marina Average inundation Depth (in feet) Under Inundation Tipping Point Scenarios-Part 2

		Average Inundation Depth (feet)		
	Marina Address	Existing Tidal Flooding	2070 NOAA State Required High/ Existing 10 YR Surge/ 2040 Tidal Flooding	Existing 100 Year Flood Event
05	15183 Captiva Drive	0.2	1.5	5
06	15903 Captiva Drive	0.7	2.4	3
07	15951 Captiva Road	0.9	1.8	3

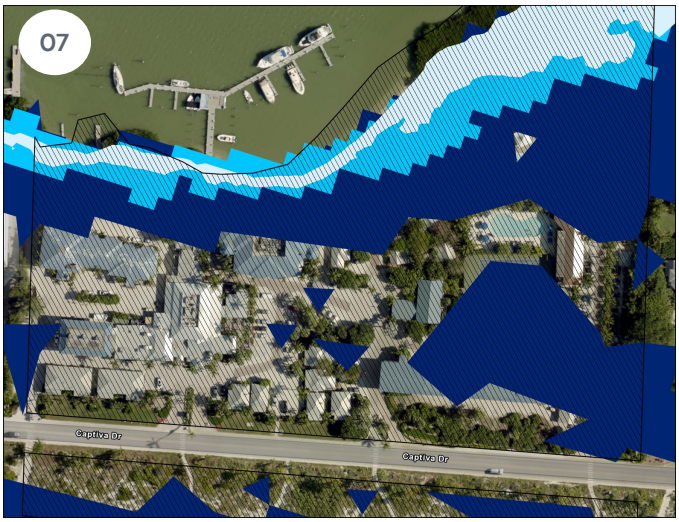


Figure 47. 15951 Captiva Road
Marina Inundation Map

Table 12. Marina Impact Under Inundation Tipping Point Scenarios

	Marina Address	Existing Tidal Flooding	2070 NOAA State Required High/ Existing 10 YR Surge/ 2040 Tidal Flooding
01	1057-1900 South Seas Plantation Road	Entire mangrove area impacted by flooding. Southern portion of Plantation Road and bayside parcels begin to flood. Portions of South Seas Resort flooded.	The majority of Plantation Road and local roads experience inundation. Major points of entry, bayside properties, resorts, and marina infrastructure impacted.
02	2800-5640 South Seas Plantation Road	Significant portions of mangroves and inland greenspace flooded, along with Plantation Road, local roads surrounding marina, and bayfront properties.	Anticipated flooding along major segments of Bayside Vls and Bayside Marina and other local roads, and along the parking lot and structures at the entrance of marina.
03	11401 Andy Rosse Lane	Initial inundation to the entire marina parcel- major roads, parking lot, and marina structures.	All land access to marina is estimated to be inundated- major roads, parking lot, and marina structures.
04	15107 Captiva Drive	Initial inundation to majority of marina parcel and to bayfront. Majority of Captiva Drive not impacted.	All land access to marina is estimated to be inundated- major roads, parking lot, and marina structures.
05	15183 Captiva Drive	Majority of marina parking lot and building impacted by flooding. Neighboring parcels and Captiva Drive flooded.	The remainder of the marina parking lot is inundated, along with all nearby roads and parcels.
06	15903 Captiva Drive	Minor anticipated flooding along the pathway from marina to parking lot and vegetation.	Greater extent of anticipated flooding along the pathway from marina to parking lot and inland along eastern edge of parking lot.
07	15951 Captiva Road	Similar conditions as observed for Marina 6, as they are adjacent. Initial flooding along bayside impacting pathway from marina to parking lot.	More severe flooding along the pathway from marina to parking lot and along eastern edge of parking lot.

Airports, Ports, Bases, and Bus Terminals

While there are no airports, ports, or seaplane bases located on Captiva, the nearest facilities were mapped (Figure 48). There are no bus terminals or routes on Captiva either. Table 13 depicts the names of these facilities and the distance to them from Captiva.

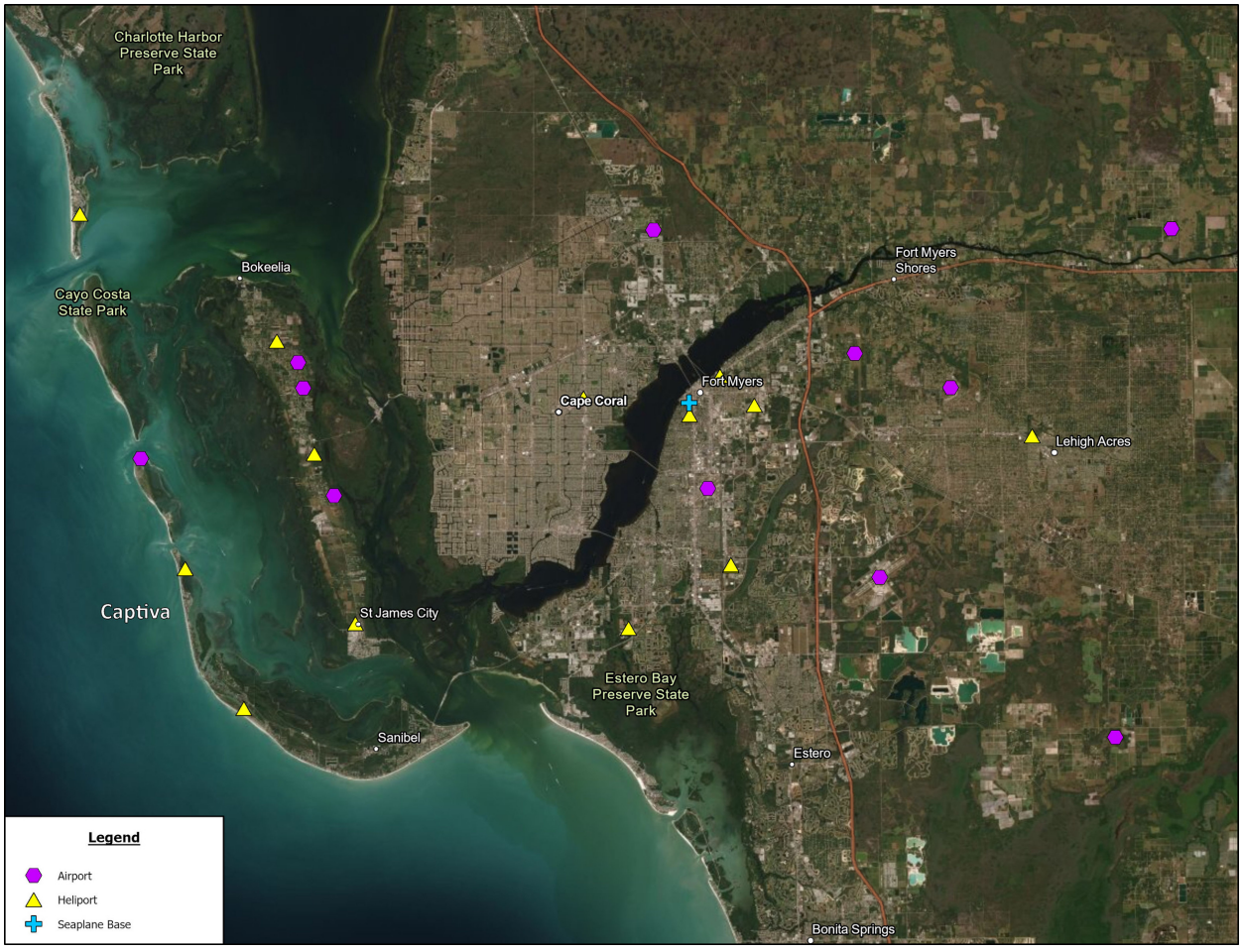


Figure 48. Lee County Airports, Ports, Bases, and Bus Terminals

Table 13. Nearest Bus terminal, Airport, Port, and Seaplane Base

Facility Type	Facility Name	Approximate Distance from Captiva (miles)
Bus Terminal	Lee Tran Intermodal Transfer Center	15
Airport	Page Field Airport	21
Seaplane Base	Caloosa Downtown Seaplane Base	22
Port	Port Manatee	85

The heliport location on Captiva was assessed for anticipated inundation. According to the analysis results, the Captiva heliport, is likely to experience flooding with an average depth of 1.8 feet under existing tidal flooding conditions, an average doeth of 3.6 feet under the 2070 NOAA Int High scenario, and an average depth of 7 feet under the Existing 100 Year Flood Event scenario. A flooding depth greater than one foot is expected to disturb functioning and accessibility, and greater than two feet is expected to have serious impacts on the facility. Thus, depths of 3.6 feet and 7 feet would likely pose disastrous impacts to the heliport.

Critical Community and Emergency Facilities Sensitivity Analysis

60

Critical Community Facilities

Schools and Colleges

Community Centers

Fire and Police Stations

Local and State Government Facilities

Correctional Facilities

Health Care Facilities and Hospitals

Affordable Public Housing

64

Emergency Facilities

Disaster Recovery Centers

Logistical Staging Areas

Emergency Medical Service Facilities

Emergency Operations Centers

Risk Shelter Inventory

Critical Community Facilities

Critical community facilities are those facilities that are vital to the community's functioning, safety, and health. For the island of Captiva, critical facilities include schools, community centers, fire stations, law enforcements facilities, correctional facilities, local and state government facilities, healthcare facilities and hospitals. Point data for the nearest critical facilities were obtained and utilized for this analysis. As is evident in Figure 49, while some critical facilities serving the island are located on the island, many are located outside of the CEPD boundary. These facilities within the larger area of Lee County were still included within this analysis as they are critical to the functioning and wellbeing of the CEPD community and any risk of inundation and potential disturbance to these facilities would impact the lives of the CEPD residents dependent on them.

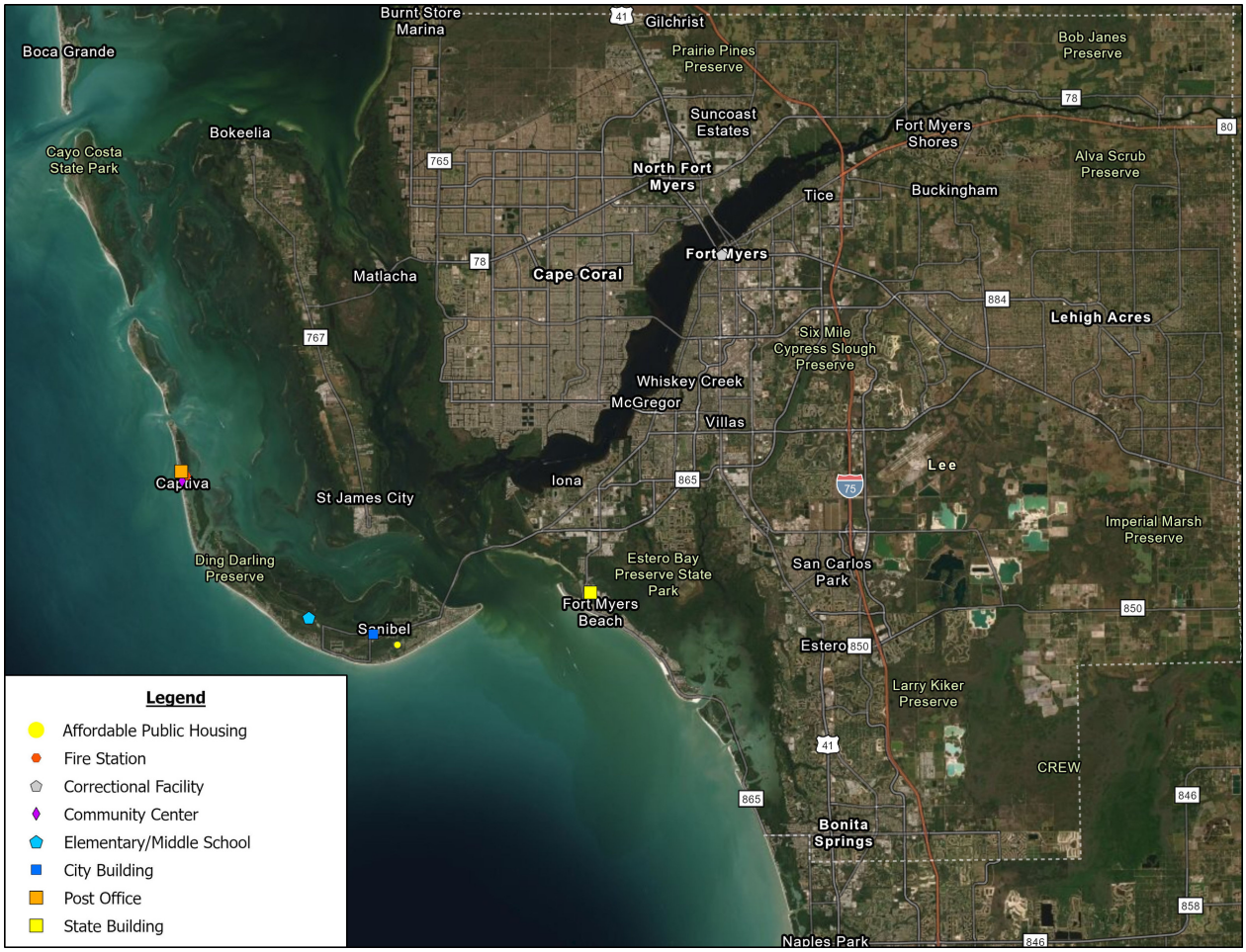


Figure 49. Off Island Critical Community Facilities Map

In summary, point data for the closest major critical facilities to CEPD were analyzed for initial inundation impact under the three inundation tipping point scenarios. One community center (Captiva Civic Association, Inc), one fire station (Captiva Fire Station #181), and one federal government facility (U S. Postal Service Captiva) are located on the island of Captiva and serve the island's community (Figure 50).

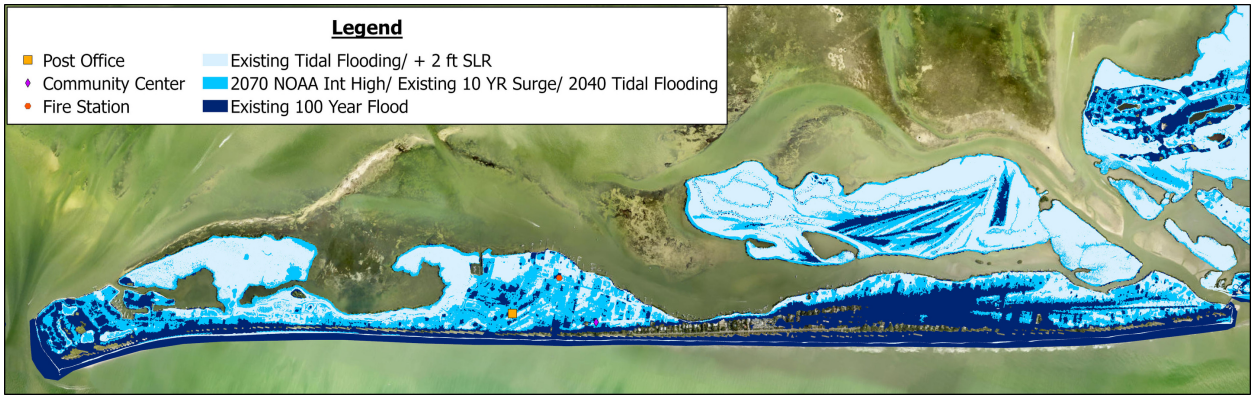


Figure 50. On Island Critical Community Facilities Map

It is anticipated that these three facilities will experience flooding under all three inundation tipping point scenarios. The specificities of inundation depth for each asset under each scenario is outlined in Table 14. The three assets are expected to experience nuisance flooding under existing tidal flooding conditions and the 2070 NOAA Int High topping point scenario. However, more severe flooding with a depth of three feet or more is expected under the Existing 100 Year Flood Event, which would have extreme impacts. Major transportation routes and adjacent parcels may also experience inundation which could further reduce the accessibility to these critical structures.

Table 14. On Island Critical Community Facilities Inundation Depth (in feet) Under Inundation Tipping Point Scenarios

			Inundation Depth (feet)		
Facility Type	Island Total	Facility Name	Existing Tidal Flooding/ +2 ft SLR	2070 NOAA Intermediate High/ Existing 10 Year Surge/ 2040 Tidal Flooding	Existing 100 Year Flood Event
Community Centers	1	Captiva Civic Association, Inc	0.7	0.7	5
Fire Stations	1	Captiva Fire -Station #181	0.2	0.9	3.6
Federal Government Facilities	1	U S. Postal Service Captiva	.1	0.3	3

The remaining critical facility types included in this assessment do not exist on the island of Captiva, and thus, for the purpose of this analysis, the closest location within Lee County representing each facility type was assessed for future inundation. Table 15 details the facility type, the approximate distance in miles to the closest facility outside of Captiva (straight line from end of island to facility), the facility name, and the estimated inundation under the three inundation tipping point scenarios.

Correctional Facility, Hospital, and Local Government Facility

The nearest correctional facility (Lee County Jail), located 5 miles from Captiva, is not estimated to experience any inundation across the scenarios. The nearest hospital (Lee Health- HealthPark Hospital) located 17 miles from Captiva and the nearest local government facility (Island Civic Center) located 7 miles from Captiva will not experience flooding under the inundation tipping points 1 and 2, however will experience impactful inundation under an Existing 100 Year Flood Event. The average inundation depth for these two facilities under this scenario is around 3 feet.

School and Health Care Facility

The closest school serving the island of Captiva is the Sanibel School K-8, located 5 miles off the Southern tip of Captiva. Flooding is anticipated at this location for all tipping point scenarios at a depth of 1.3 feet, 1.8 feet, and 5 feet, respectively. The San-Cap Medical Center serves as the health care facility for Captiva residents and is approximately 4 miles from the island's southern tip. This center proves to be at risk for inundation, with an estimated inundation depth of 1.8 feet under the 2070 NOAA Int High Tipping Point scenario and a depth of 5.8 feet under an Existing 100 Year Flood Event.

Law Enforcement Facility and State Government Facility

The nearest law enforcement facility (Sanibel Police Dept) and the nearest affordable housing unit (unit 2) experience a similar incremental inundation pattern. Very minimal flooding (<.08 feet) under existing tidal flooding conditions is unlikely to cause disruption or impact the functionality of these facilities. However, under the 2070 NOAA Int High scenario, both facilities will experience disturbance from flood levels which could limit or prohibit normal operations and under the Existing 100 Year Flood Event, the facilities will be inoperable. Flooding of the police department could result in reduced response time and reduced ability and accessibility to immediate aid. The state government facility (SW Florida Marine Institute) would not be of highest priority in the case of a flood, but similar to other facilities, it still proves to be highly vulnerable under the Existing 100 Year Flood Event (average flood depth is 7.5 feet). The inundation depths per scenario are outlined in Table 15.

Table 15. Off Island Critical Community Facilities Inundation Depth (in feet) Under Inundation Tipping Point Scenarios

			Inundation Depth (feet)		
Facility Type	Distance to Closest (mi)	Facility Name	Existing Tidal Flooding/ +2 ft SLR	2070 NOAA Intermediate High/ Existing 10 Year Surge/ 2040 Tidal Flooding	Existing 100 Year Flood Event
Schools and colleges	5	The Sanibel School K-8	1.3	1.8	5
Correctional Facilities	22	Lee County Jail	0	0	0
Health Care Facilities	4	San-Cap Medical Center	0	1.8	5.8
Hospitals	17	Lee Health - HealthPark Hospital	0	0	3.1
Law Enforcement	7	Sanibel Police Dept	.05	1.7	5.7
Local Government Facilities	7	Island Civic Center	0	0	3
State Government Facilities	15	SW Florida Marine Institute	0	.3	7.5
Affordable Public Housing	8	Community Housing and Resources Minor Subdivision at Sanibel Highlands Desc in Instr # 2016000176662 Unit 2	.08	1.2	7

Emergency Facilities

Emergency facilities included in this assessment consist of three facilities on Captiva and two outside of Captiva, displayed in Figure 51. These facilities can be critical to the safety and survival of residents during and after a hazard or disaster.

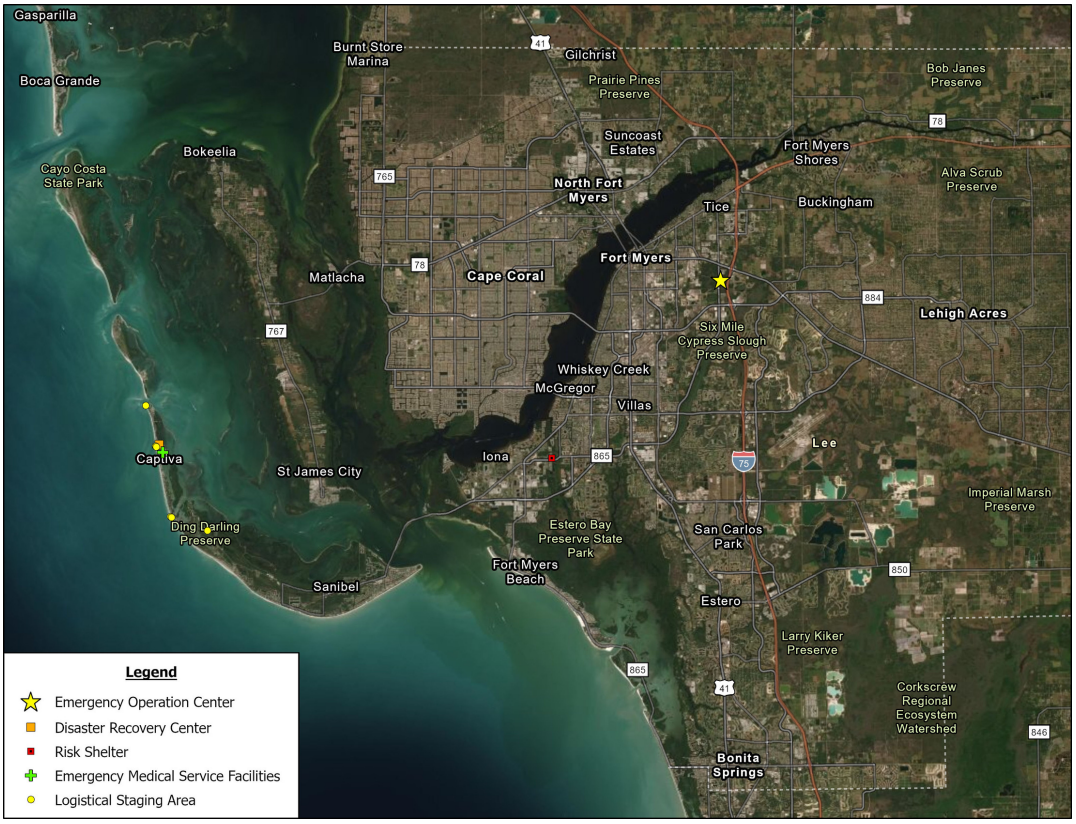


Figure 51. Off Island Emergency Facilities Map

The emergency medical service facility, disaster recovery center, and logistical staging area, are located on the island of Captiva (Figure 51). The local fire station (Captiva Fire Station #18) mentioned previously serves as the local emergency medical service facility and will respond to emergency calls on the island of Captiva. The results of the fire station inundation analysis were reviewed in the previous section.

The Chadwick's at South Seas Plantation is the on-island disaster recovery center (DRC) which serves as the dedicated, accessible and established location where survivors are assisted through the recovery process via information and resources. This DCR is not expected to experience any flooding under existing tidal conditions.

However, according to the NOAA 2017 Int High scenario and the Existing 100 Year Flood Event, Chadwick's is likely to experience impactful inundation at an average depth of 2.8 and 5.8 feet, respectively. This degree of flooding has the potential to make the DCR inoperable, which would prohibit residents from receiving the aid and assistance needed. The logistical staging areas along the island are predicted to experience nuisance flooding under Existing Tidal Conditions (with an average depth of 0.6 feet) and under the 2070 NOAA Int High Tipping Point (with an average depth of 0.1 feet). While a higher water level is expected for the 2070 NOAA Int High scenario, the type of flooding impacts the direction and introduction of water to the area, and when averaged across multiple parcels, the average can sometimes be reduced. Inundation depths for the individual Staging Areas can be reviewed in Appendix VI. Table 16 summarizes inundation depths and Figure 52 represents the spatial impacts to the facilities under the three inundation scenarios.

Table 16. On Island Emergency Facilities Inundation Depth (in feet) Under Inundation Tipping Point Scenarios

Facility Type	Island Total	Facility Name	Inundation Depth (feet)		
			Existing Tidal Flooding/ +2 ft SLR	2070 NOAA Intermediate High/ Existing 10 Year Surge/ 2040 Tidal Flooding	Existing 100 Year Flood Event
Emergency Medical Service Facilities	1	Captiva Fire -Station #181	0.2	0.9	3.6
Disaster Recovery Centers	1	Chadwick's at South Seas Plantation	0	2.8	5.8
Logistical Staging Areas	5	Multiple	0.6	0.1	4

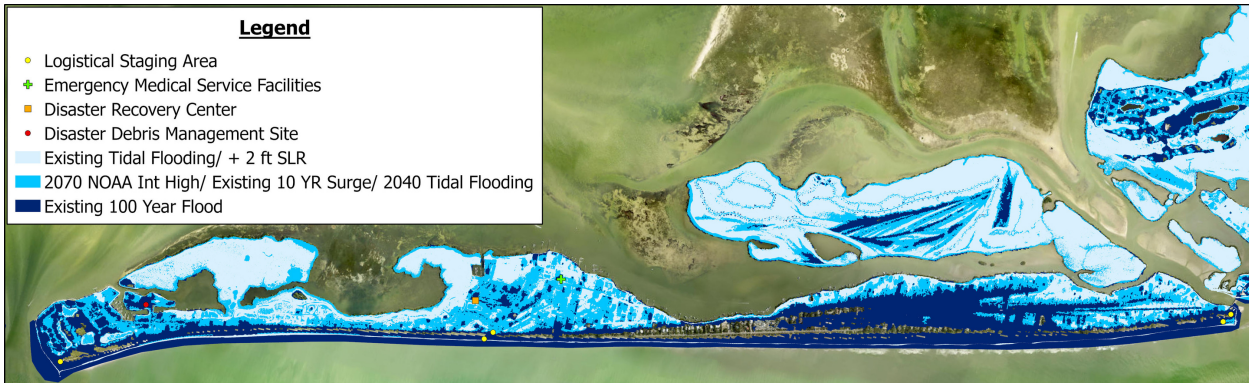


Figure 52 On Island Emergency Facilities Map

Table 17 outlines the off-island emergency facilities and their average inundation depths under the relevant scenarios. The closest emergency operations center to Captiva is located in Fort Myers, about 25 miles from the Southern tip of Captiva. According to FEMA, an Emergency Operations Center is a protected site from which State and local civil government officials coordinate, monitor, and direct emergency response activities during an emergency. Situated inland and away from the coast, no inundation is anticipated for this center, however, road inundation between Captiva and the center could serve as an obstacle for Captiva residents under various flood scenarios.

Approximately 16 miles from Captiva, the nearest risk shelter (Heights Elementary School) will likely not experience flood risk under existing tidal conditions and would thus be operable and accessible to Captiva residents. Under the greater water elevation levels predicted for the 2070 NOAA Intermediate High/ Existing 10 Year Surge/ 2040 Tidal Flooding scenario and for the Existing 100 Year Flood Event, flooding is predicted at a depth of 2.2 ft and 5 ft, respectively. Flooding at these depths would eliminate the accessibility and protection of the shelter. A shelter slightly closer to Captiva is located on Fort Myers but was not included in this assessment because the included shelter at approximately the same distance is located more mainland and should experience less severe flooding.

Table 17. Off Island Emergency Facilities Inundation Depth (in feet) Under Inundation Tipping Point Scenarios

			Inundation Depth (feet)		
Facility Type	**Distance to Closest (mi)**	**Facility Name**	**Existing Tidal Flooding/ +2 ft SLR**	**2070 NOAA Intermediate High/ Existing 10 Year Surge/ 2040 Tidal Flooding**	**Existing 100 Year Flood Event**
Emergency Operations Centers	25	Emergency Operations Center	0	0	0
Risk Shelter Inventory	16	Heights Elementary School	0	2.2	5

Natural, Cultural, and Historical Resources Sensitivity Analysis

Conservation Lands

While not necessarily critical to the survival or basic functionality of the island, the natural and cultural and historical resources on Captiva prove to be essential to the island's integrity and identity. Protecting them against flooding and prioritizing lands and structures will be a key facet of adaptation moving forward. The natural resources considered in this report include conservation lands, parks, and wetlands. Conservation land data was downloaded from the Florida Natural Areas Inventory and was analyzed for impact and average depth over the entire areas. Figure 53 depicts the acreage of conservation lands inundated for each flood scenario. It is important to note that the results of this analysis and the subsequent analysis of mangrove inundation represent some degree of overlap.

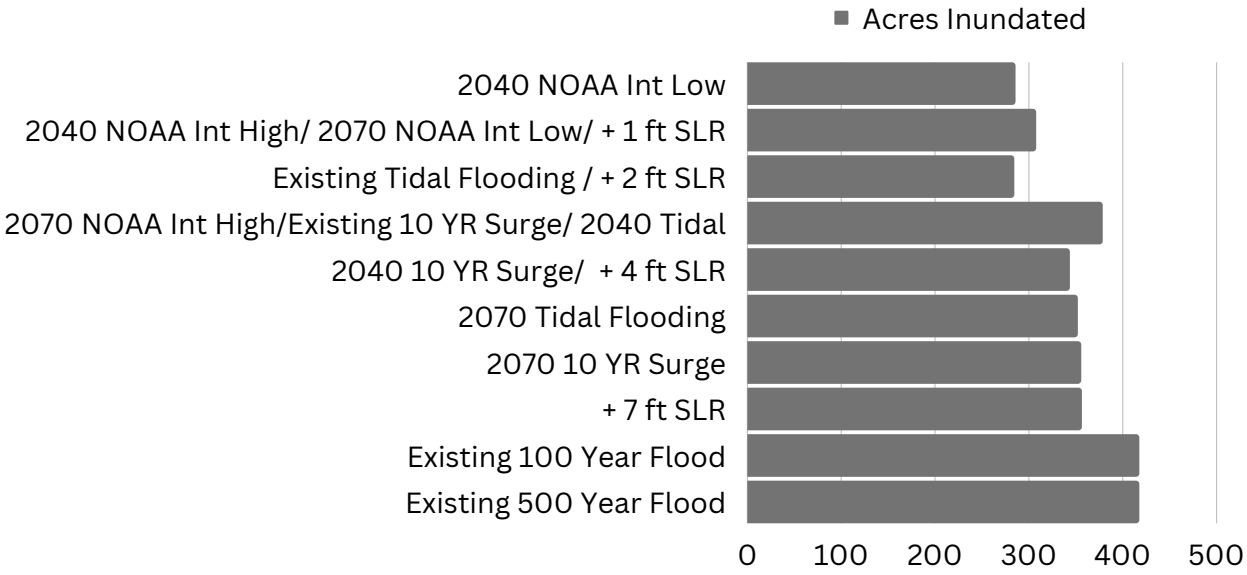


Figure 53. Conservation Land Inundation Across All Flood Scenarios

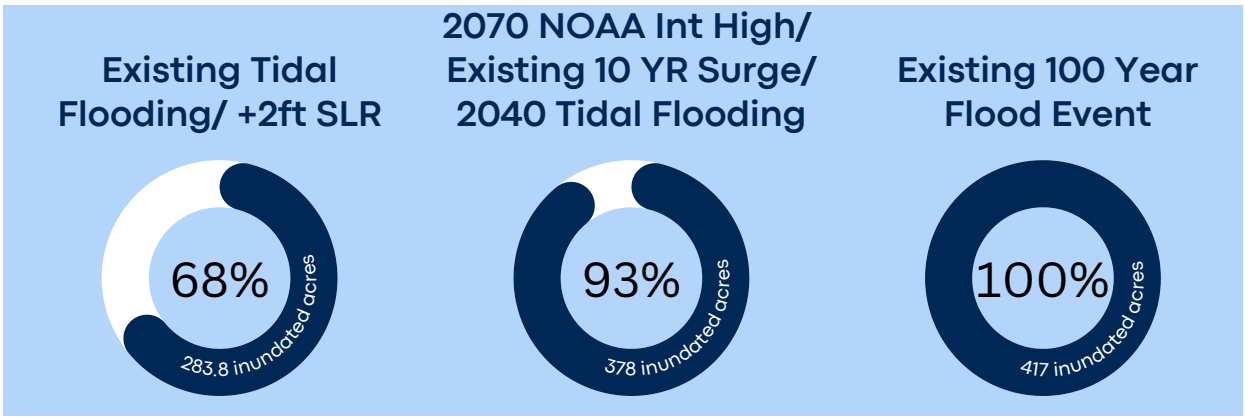


Figure 54. Percentage of Conservation Land Inundation Under Inundation Tipping Point Scenarios

Figure 54 serves as a comparison of inundation percentage between the three inundation tipping point scenarios. Under existing tidal flooding conditions, 68% of conservation lands will flood at an average depth of 1.7 feet and under the 2070 NOAA Int High/ Existing 10 YR Surge/ 2040 Tidal Flooding scenario 93% of conservation lands will flood at an average depth of 3.3 feet. The entirety of conservation lands on Captiva Island are expected to be inundated under the Existing 100 Year Flood Event scenario, with an average inundation depth of 6.5 feet. The difference in location and spatial extent of inundated conservation lands between the three inundation tipping point scenarios is evident in Figure 55.

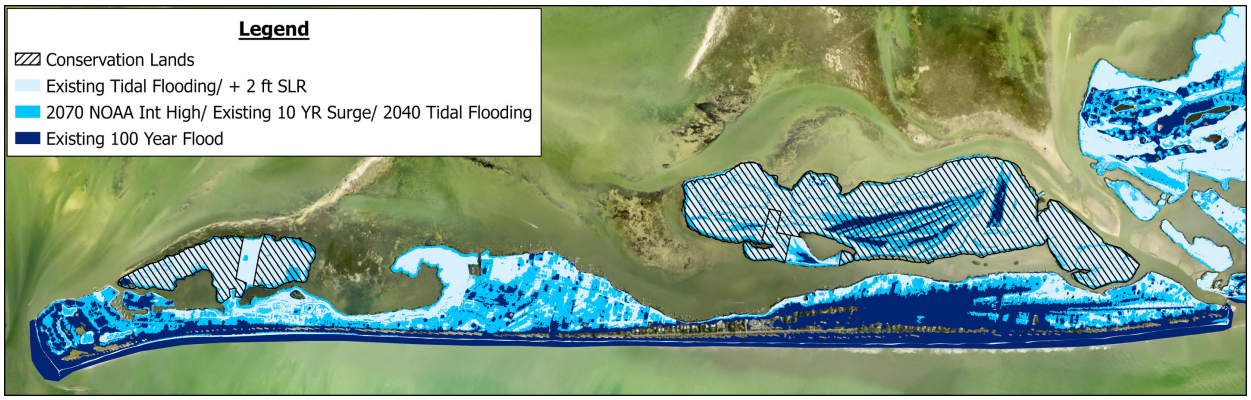


Figure 55. Conservation Land Inundation Map for Inundation Tipping Point Scenarios

Figure

Wetlands

Data from the Fish and Wildlife Research Institute painted a picture of the location and extent of the mangroves along Captiva Island. As previously stated, when analyzing mangroves for inundation extent and depth, it is important to note that some of these areas overlap with conservation lands and thus some of the resulting metrics may be duplicative in nature. Figure 56 represents the inundation comparison of Captiva's wetlands for all scenarios.

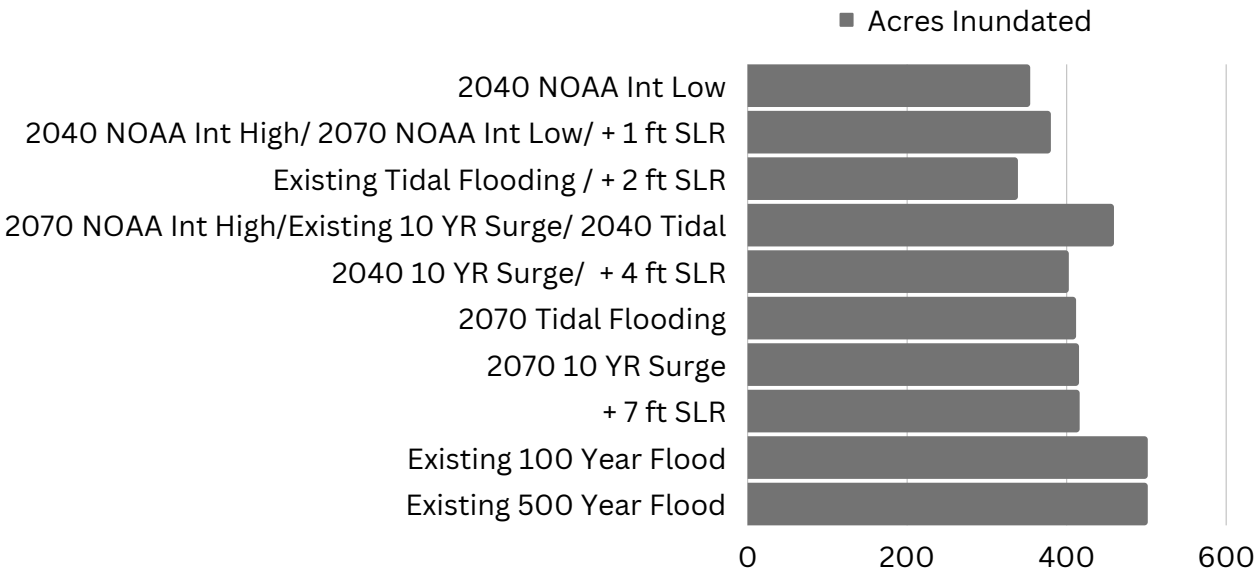


Figure 56. Wetland Inundation (in acres) Across All Flood Scenarios

The results of the analysis show that 68% of the total 501 acres of mangroves on the island will experience flooding according to the Existing Tidal flooding scenario with an average depth of 1.5 feet. The 2070 NOAA Int High/ Existing 10 YR Surge/ 2040 Tidal Flooding scenario depicts 92% of mangroves inundated with an average depth of 3.2 feet. lastly, 100% of all Captiva Mangroves will be inundated under the Existing 100 Year Flood Event Scenario with an average depth of 6.5 feet.

Parks

County parks, preserves, and zoned parks related to greenspace, totaling 2.4 acres, were included in the following analysis as they are mostly all managed by CEPD. Figure 57 depicts projected inundation impacts for all parks along Captiva Island under the inundation tipping point scenarios. Park inundation does not prove to be a major anticipated threat under the existing tidal flooding conditions, which estimate that only 8% of parks will experience flooding with an average depth of .7 feet. The predicted average inundation depth is the same under the 2070 NOAA tipping point scenario, with only 12% of parks inundated. As was the case with the conservation lands and wetlands, under the Existing 100 Year Flood Event scenario, 100% of all parks will experience flooding (average depth: 6.5 feet).

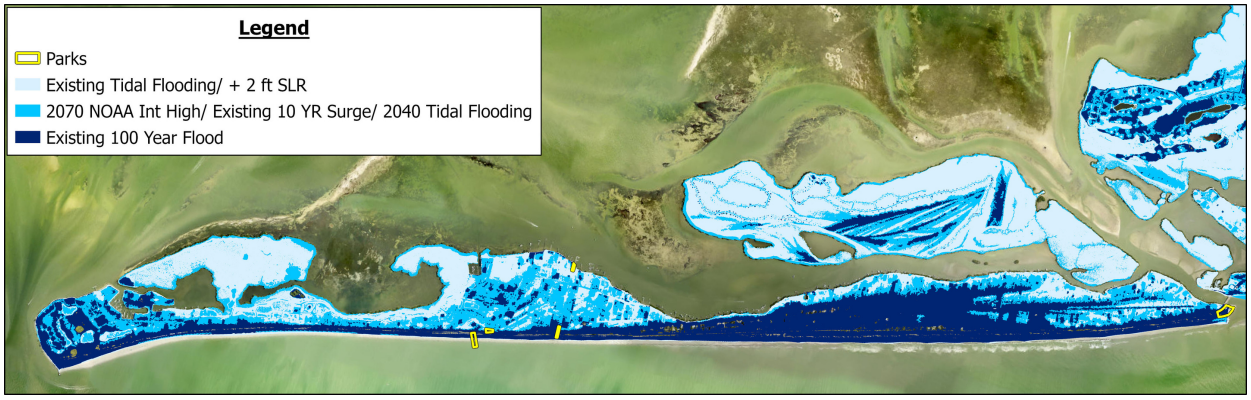


Figure 57. Wetland Inundation Map for Inundation Tipping Point Scenarios

Shorelines and Surface Waters

To determine estimated shoreline inundation, the Erosion Control Line (ECL) was assessed under the relevant inundation scenarios. To determine estimated shoreline inundation, the Erosion Control Line (ECL) was assessed under the relevant inundation scenarios. Figure 58 highlights the elevation of Captiva's shoreline.

Figure 58. Shoreline Elevation Map.

Captiva possesses 25,823 linear feet of shoreline and under existing tidal flooding conditions, 0% of the shoreline will experience inundation. The degree of shoreline inundation increases to only 1% according to the 2070 NOAA Int High tipping point scenario. Shoreline inundation increases drastically under the Existing 100 Year Flood Event scenario, which anticipates that 60% of shorelines will be impacted by flooding (Figure 59).

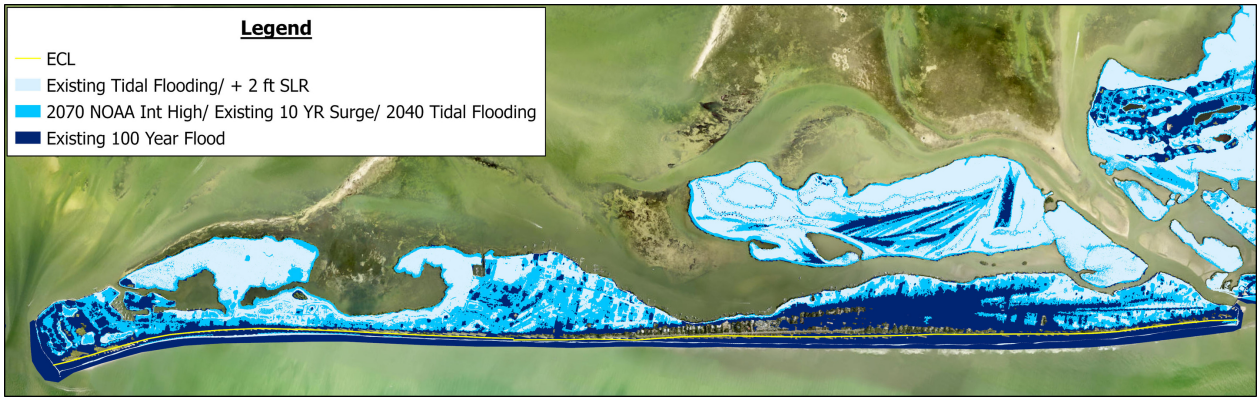


Figure 59. Shoreline Inundation Map for Inundation Tipping Point Scenarios.

According to Lee County's data reserve, six surface water bodies exist in Captiva, shown in Figure 60. The surface waters equate to a total of 40.4 acres.

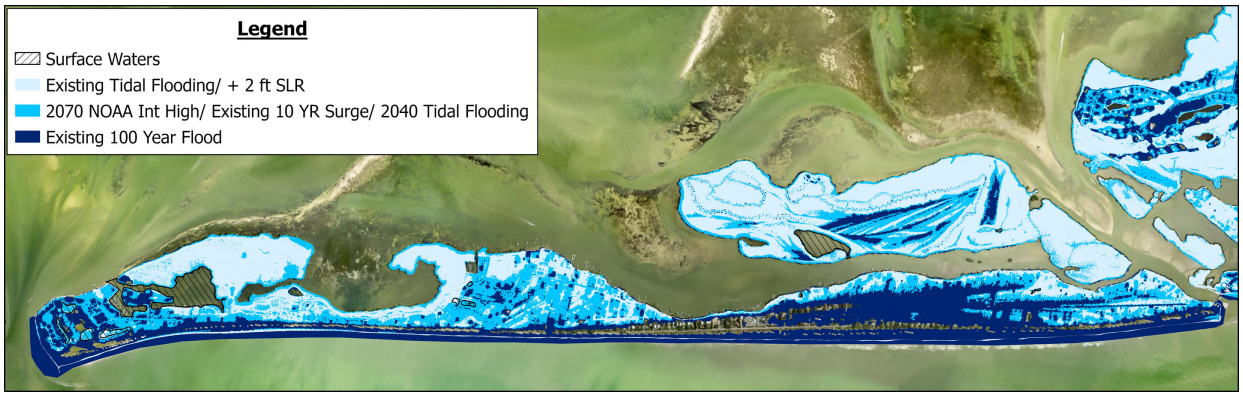


Figure 60. Surface Waters Inundation Map for Inundation Tipping Point Scenarios.

Minimal surface water inundation is anticipated for the first two inundation tipping point scenarios, however 100% of surface waters are expected to experience inundation under the third inundation tipping point scenario. The specific results of the analysis are outlined in Figure 61.

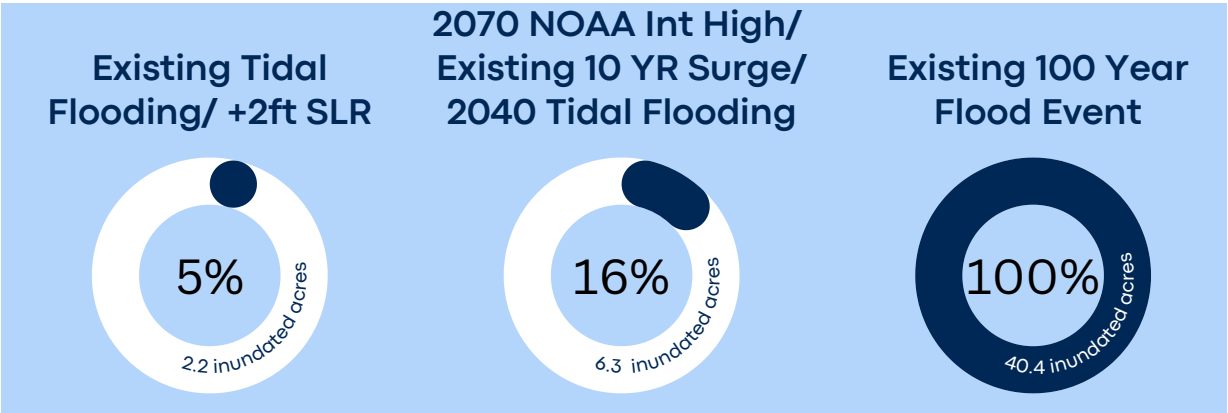


Figure 61. Surface Waters Inundation Map for Inundation Tipping Point Scenarios.

Historical and Cultural Assets

Historic and cultural facility data are logged and maintained at the state level by the Florida's State Historic Preservation Offices (SHPO) of the Florida Bureau of Historic Preservation (BHP). Nationally, facilities are tracked by the National Park Service (NPS) who compile the National Register of Historic Places (NRHP). The NRHP is the official list of properties and areas recognized as historical and nationally preserved, two of which are located within Captiva (the Captiva School and Chapel-by-the-Sea Historic Districts). Figure 62 depicts the general locations of these historic districts, indicated by stars on the map. An additional 73 properties have been identified by the SHPO as potential historical and cultural sites, labeled on Figure 62 as "Not Evaluated by SHPO".

When assessing the NRHP districts and the SHPO potential historical places for predicted inundation, 21% are likely to experience flooding under the existing tidal flooding conditions, 45% are likely to experience flooding under the 2070 NOAA Int High Tipping Point scenario, and 69% are likely to experience flooding under the 100 Year Flood Event.

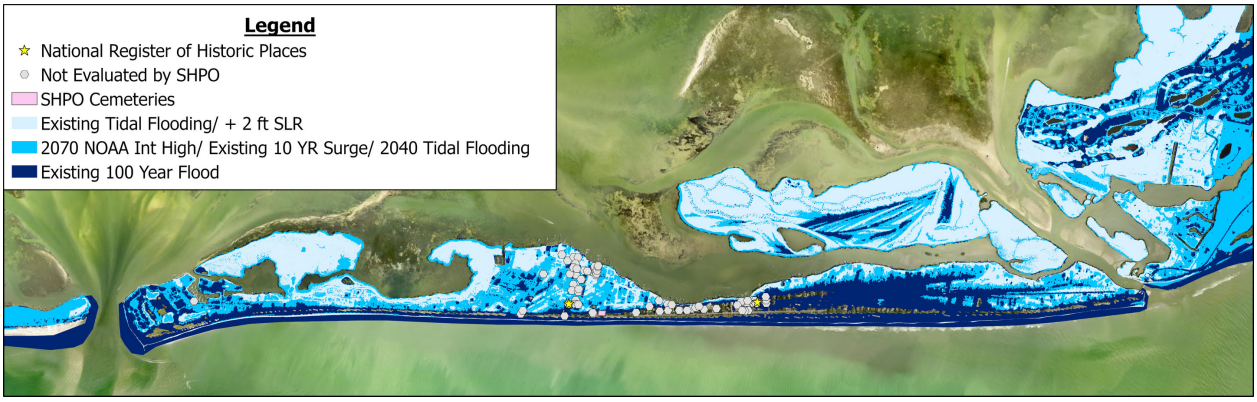


Figure 62. Historical and Cultural Assets Inundation Map for Inundation Tipping Point Scenarios

Risk Assessment

Determining the risk of the various types, degrees, and occurrences of flooding helps to qualify the susceptibility of critical assets on the island of Captiva. Determined inundation depths and flood scenarios are utilized to generate a standardized risk score on a scale to help compare risks of assets and prioritize them for adaptation purposes.

More specifically, flood risk is a combination of the probability (likelihood or chance) of an event happening and the consequences (impact) if it occurred. Risk was calculated by multiplying likelihood by impact and then assigning a rank of high low, medium, or high risk based on value. The following equation and descriptions outline the evaluation of risk per asset:

Likelihood (or probability) of a given flood scenario occurring in a year [Table 17] **X** **Impact Score** (based on the anticipated depth) of the asset under the given flood scenario [Table 18] **=** **Risk Score** [Table 19]

The likelihood of occurrence of each flood scenario was assigned a probability based on annual probability of occurrence. Annual probability of occurrence ranges are outlined in Table 18.

Table 18. Flood Likelihood per Scenario

Scenario	Likelihood/ Probability
2040 NOAA Int Low	4.345
2040 NOAA Int High/ 2070 NOAA Int Low/ + 1 ft SLR	1.873
Existing Tidal Flooding/ +2ft SLR	.53
2070 NOAA Int High/ Existing 10 YR Surge/ 2040 Tidal Flooding	.143
2040 10 YR Surge/ +4 ft SLR	.075
2070 Tidal Flooding	.053
2070 10 YR Surge	.031
+ 7 ft SLR	.021
Existing 100 Year Flood	.01
Existing 500 Year Flood	.002

The impact of hazard was determined by the anticipated inundation depth of an asset under the relevant flood scenario. Each asset was assigned an impact score of 0,1, 33, 66, or 100 based on the inundation depth ranges outlined in Table 19. Calculated risk scores were then assigned a qualitative risk rank based on the risk score value according to the ranges outlined in Table 20.

Table 19. Impact Score per inundation Depth Range (in feet)

Inundation Depth (feet)	Impact Score
0	0
0-1 foot	1
1-2 feet	33
2-5 feet	66
>5 feet	100

Table 20. Risk Ranks per Score Range

Risk Score	Risk Rank
0	No Foreseeable Risk
0 -4.5	Low Risk
4.5 -20	Medium Risk
> 20	High Risk

An example of the risk calculation is outlined below for an asset under the 2070 Tidal Flooding Scenario experiencing inundation at a depth of 2.5 feet:

Table 21 displays the finalized risk matrix that was utilized to determine risk per asset for this assessment. Table 22 summarizes risk across the inundation tipping point scenarios for singular on island assets and Table 23 summarizes risk rank counts for grouped island assets.

Table 21. Risk Matrix

		Water Depth =0	Water Depth 0-1 ft	Water Depth 1-2 ft	Water Depth 2-5 ft	Water Depth >5 ft
		0	1	33	66	100
2040 NOAA Int Low (P=434.5%)	4.345	No Foreseeable Risk	Low Risk	High Risk	High Risk	High Risk
2040 NOAA Int High/ 2070 NOAA Int Low/ + 1 ft SLR (P=187.3%)	1.873	No Foreseeable Risk	Low Risk	High Risk	High Risk	High Risk
Existing Tidal Flooding/ +2ft SLR (P=53.4%)	0.534	No Foreseeable Risk	Low Risk	Medium Risk	High Risk	High Risk
2070 NOAA Int High/ Existing 10 YR Surge/ 2040 Tidal Flooding (P=14.3%)	0.143	No Foreseeable Risk	Low Risk	Medium Risk	Medium Risk	Medium Risk
2040 10 YR Surge/ +4 ft SLR (P=7.5%)	0.075	No Foreseeable Risk	Low Risk	Low Risk	Medium Risk	Medium Risk
2070 Tidal Flooding (P=5.3%)	0.053	No Foreseeable Risk	Low Risk	Low Risk	Low Risk	Medium Risk
2070 10 YR Surge (P=3.1%)	0.031	No Foreseeable Risk	Low Risk	Low Risk	Low Risk	Low Risk
+ 7 ft SLR (P=2.1%)	0.021	No Foreseeable Risk	Low Risk	Low Risk	Low Risk	Low Risk
Existing 100 Year Flood (P=1%)	0.01	No Foreseeable Risk	Low Risk	Low Risk	Low Risk	Low Risk
Existing 500 Year Flood (P=.2%)	0.002	No Foreseeable Risk	Low Risk	Low Risk	Low Risk	Low Risk

Table 22. Risk Ranks for On Island Singular Assets

		Asset Risk		
Asset Type	Name of Asset(s)	Existing Tidal Flooding/ +2ft SLR	2070 NOAA Int High/ Existing 10 YR Surge/ 2040 Tidal Flooding	Existing 100 Year Flood Event
Community Centers	Captiva Civic Association, Inc. (11550 Chapin Lane, Captiva, FL 33924)	Low Risk	Low Risk	Low Risk
Fire Station/ EMS	Captiva Fire Station #181 (14981 Captiva Dr, Captiva, FL 33924)	Low Risk	Low Risk	Low Risk
Federal Government Facilities	U S. Postal Service Captiva (14812 Captiva Dr SW, Captiva, FL 33924)	Low Risk	Low Risk	Low Risk
Disaster Recovery Centers	Chadwick's at South Seas Plantation (5400 Plantation Rd, Captiva, FL 33924)	No Foreseeable Risk	Medium Risk	Low Risk
Heliport	Captiva Heliport	Medium Risk	Medium Risk	Low Risk
Wastewater Treatment Facilities	South Seas Plantation	Low Risk	Medium Risk	Low Risk
	Tween Waters Inn WWTP	No Foreseeable Risk	No Foreseeable Risk	No Foreseeable Risk
	Captiva Shores Condominium WWTP	No Foreseeable Risk	Medium Risk	Low Risk
	Sunset Captiva WWTP	No Foreseeable Risk	Low Risk	Low Risk
Lift Stations	Lift station #1	No Foreseeable Risk	Low Risk	Low Risk
	Lift station #2	No Foreseeable Risk	Medium Risk	Low Risk
	Lift station #3	Low Risk	Medium Risk	Low Risk
	Lift station #4	No Foreseeable Risk	No Foreseeable Risk	Low Risk
	Turner Beach Lift Station	No Foreseeable Risk	No Foreseeable Risk	Low Risk
Communications Facilities	East Side of Chadwick's Square Shopping Center	No Foreseeable Risk	Medium Risk	Low Risk
	Communication Tower at north end near Wastewater Treatment	No Foreseeable Risk	Low Risk	Low Risk

		Asset Risk		
Asset Type	Name of Asset(s)	Existing Tidal Flooding/ +2ft SLR	2070 NOAA Int High/ Existing 10 YR Surge/ 2040 Tidal Flooding	Existing 100 Year Flood Event
Marinas	1057-1900 South Seas Plantation Road	Low Risk	Medium Risk	Low Risk
	11401 Andy Rosse Lane	Low Risk	Medium Risk	Low Risk
	15107 Captiva Drive	Low Risk	Medium Risk	Low Risk
	15183 Captiva Drive	Low Risk	Medium Risk	Low Risk
	15903 Captiva Drive	Low Risk	Medium Risk	Low Risk
	15951 Captiva Drive	Low Risk	Medium Risk	Low Risk
	2800-5640 South Seas Plantation Road	Medium Risk	Medium Risk	Low Risk
Historical and Cultural Assets	Tween Waters Inn Historic District	No Foreseeable Risk	No Foreseeable Risk	No Foreseeable Risk
	Captiva School and Chapel-by-the-Sea Historic District	No Foreseeable Risk	No Foreseeable Risk	Low Risk
Conservation Lands/ Wetlands	Mangrove Swamp North	Medium Risk	Medium Risk	Low Risk
	Mangrove Swamp South	Medium Risk	Medium Risk	Low Risk
	J. N. Ding Darling National Wildlife Refuge 1	Medium Risk	Medium Risk	Low Risk
	J. N. Ding Darling National Wildlife Refuge 2	Medium Risk	Medium Risk	Low Risk
	J. N. Ding Darling National Wildlife Refuge 3	Medium Risk	Medium Risk	Low Risk
	J. N. Ding Darling National Wildlife Refuge 4	High Risk	Medium Risk	Low Risk
	Sanibel-Captiva Conservation Foundation Conservation Lands 1	Medium Risk	Medium Risk	Low Risk
	Sanibel-Captiva Conservation Foundation Conservation Lands 2	Medium Risk	Medium Risk	Low Risk

		Asset Risk		
Asset Type	Name of Asset(s)	Existing Tidal Flooding/ +2ft SLR	2070 NOAA Int High/ Existing 10 YR Surge/ 2040 Tidal Flooding	Existing 100 Year Flood Event
Parks	Turner Beach	Low Risk	No Foreseeable Risk	Low Risk
	Andy Rosse Lane Kayak Launch	Low Risk	Medium Risk	Low Risk
	Andy Rosse Lane Beach Access	Low Risk	Low Risk	Low Risk
	Alison Hagerup Beach Park 1	Medium Risk	No Foreseeable Risk	Low Risk
	Alison Hagerup Beach Park 2	No Foreseeable Risk	Low Risk	Low Risk
Logistical Staging Areas	South Seas Island Resort	Medium Risk	No Foreseeable Risk	Low Risk
	Allison Hangerup Beach Park A	Medium Risk	No Foreseeable Risk	Low Risk
	Allison Hangerup Beach Park B	No Foreseeable Risk	Low Risk	Low Risk
	Turner Beach A	Low Risk	Low Risk	Low Risk
	Turner Beach B	No Foreseeable Risk	No Foreseeable Risk	Low Risk
Stormwater Treatment Facilities and Pump Stations	SSPGCCB1	No Foreseeable Risk	Low Risk	Low Risk
	SSPGCCB2	No Foreseeable Risk	Medium Risk	Low Risk
	SSPGCCB3	No Foreseeable Risk	No Foreseeable Risk	Low Risk
	Retention Pond	Low Risk	Medium Risk	Low Risk
	Swale10	No Foreseeable Risk	No Foreseeable Risk	Low Risk
	Swale19	No Foreseeable Risk	No Foreseeable Risk	Low Risk
	Swale20	No Foreseeable Risk	No Foreseeable Risk	Low Risk
	Swale21	Low Risk	Medium Risk	Low Risk
	Swale23	No Foreseeable Risk	Low Risk	Low Risk
	Sewer 1- ST62	Low Risk	Medium Risk	Low Risk
	Sewer 2- Influent at Sunset Captiva WWTP	No Foreseeable Risk	No Foreseeable Risk	No Foreseeable Risk
	AROUT	High Risk	Low Risk	Low Risk
	SSPOutFall1	Medium Risk	Low Risk	Low Risk

Table 23. Risk Rank Counts for Grouped Island Assets

	Risk (NFR, L, M, H)	Existing Tidal Flooding/ +2ft SLR	2070 NOAA Int High/ Existing 10 YR Surge/ 2040 Tidal Flooding	Existing 100 Year Flood Event
Parcels (#)	No Foreseeable Risk	378	891	240
	Low Risk	682	16	878
	Medium	57	211	0
	High	1	0	0
Building Footprints (#)	No Foreseeable Risk	469	228	253
	Low Risk	272	268	494
	Medium	6	251	0
	High	0	0	0
Roadways (ft)	No Foreseeable Risk	96,607	78,542	66,435
	Low Risk	11799	9421	42144
	Medium	0	20616	0
	High	173	0	0
Shorelines (ft)	No Foreseeable Risk	25,810	25,618	7,143
	Low Risk	5	156	18,680
	Medium	5	49	0
	High	3		0
Surface waters (acres)	No Foreseeable Risk	30.4	30.4	28.4
	Low Risk	0	0	12
	Medium	0	10	0
	High	10	0	0

The risk ranks for individual and grouped assets across Captiva and across flood scenarios help to identify the assets most susceptible when considering not only flood extent and depth but also timeframe. All conservation lands and Captiva marinas prove to be at risk across all inundation tipping point scenarios, all of which are at medium risk under Scenario 2. The Marina located at 2800-5640 South Seas Plantation Road and the J. N. Ding Darling National Wildlife Refuge 4 are most at risk under existing tidal conditions.

The Captiva Civic Association, Fire Station, U.S Postal Service, Captiva Heliport, South Seas Plantation WWTP, and Lift Station # 3, prove to be at risk across all tipping point scenarios. It is important to note the assets that are under no risk across the topping point scenarios- Tween Waters Inn WWTP, Tween Waters Inn Historic District, and Sewer #2. Aside from these assets, all individual assets are at low risk under the inundation tipping point Scenario 3. The following subsection outlines additional takeaways from the risk assessment for each of the three inundation tipping point scenarios. Risk per asset for the remaining scenarios can be viewed in Appendices V and VI.

1 Existing Tidal Flooding/ +2 ft SLR

70% of parcels at risk (92% at ow risk)
37% of buildings at risk (98% at low risk)
11% of linear ft of roads at risk (99% at low risk)

2 2070 NOAA State Required High/ Existing 10 YR Surge/ 2040 Tidal Flooding

20% of parcels at risk (7% at ow risk)
36% of buildings at risk (52% at low risk)
3% of linear ft of roads at risk (31% at low risk)

3 Existing 100 Year Flood Event

79% of parcels at risk (100% at ow risk)
66% of buildings at risk (100% at low risk)
39% of linear ft of roads at risk (100% at low risk)

Adaptation Action Areas Considerations

Adaptation Action Areas Overview

The findings of this assessment were reviewed as a whole to identify areas most at risk and to determine applicable adaptation strategy options. Based on the results presented in this report, four major Adaptation Action Areas (AAA) were identified- Chadwick Bayou AAA, Central Captiva AAA Roosevelt Channel AAA, and Blind Pass AAA (Figure 63). Each Adaptation Action Area is projected to experience inundation and presents a unique opportunity for both green and gray infrastructure adaptation to minimize flooding impacts. The following subsections propose general potential strategies for each AAA, the specifics of which will be explored and determined in the next phase of work.

An Adaptation Action Area

is an area that experiences coastal flooding due to extreme high tides and storm surge, and that are vulnerable to the related impacts of rising sea levels for the purpose of prioritizing funding for infrastructure needs and adaptation planning.

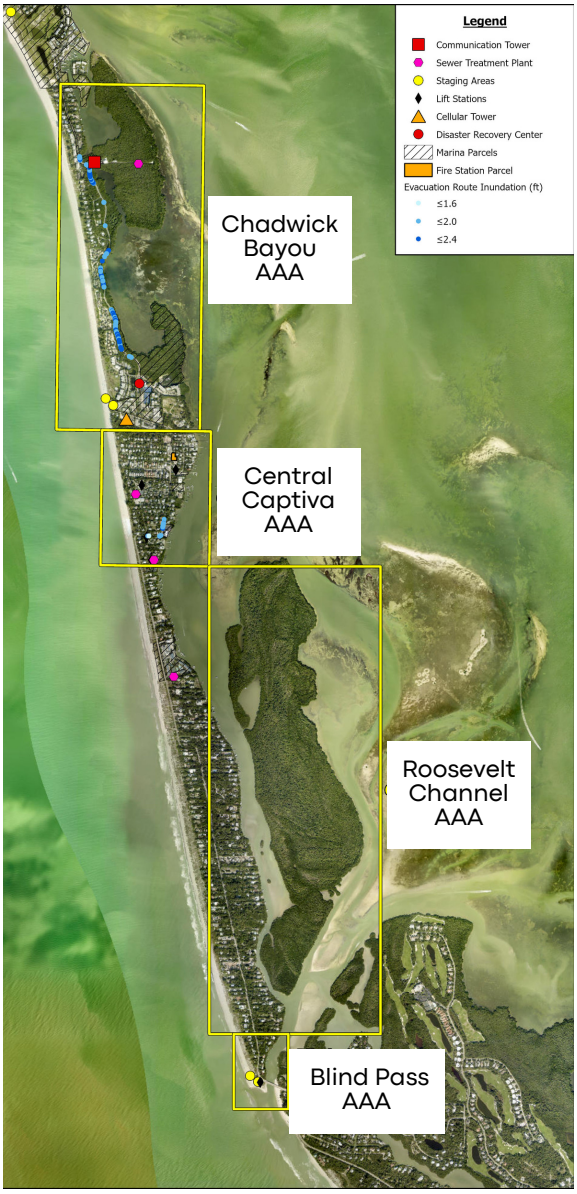


Figure 63. AAA Overview Map

CHADWICK BAYOU AAA

The Chadwick Bayou AAA is the Northern most AAA identified on Captiva (Figure 64). This area contains various vulnerable critical facilities including a sewer treatment plant, a disaster recovery center, the Captiva post office, logistical staging areas, marinas, and low-lying evacuation route road segments. The flood risk for this area is along the bayside of the island, as little land buffers Captiva's roads and infrastructure from the Chadwick Bayou's waters. To create protection along this area, the following strategies can be implemented:

- Mangrove enhancement
- Connect mangroves or design something to allow flushing at high tide level that can be adapted over the years
- Sediment supply for mangroves coupled with shoreline protection (long term adaptation strategy)
- Enhance seagrass to stabilize the narrow island portion
- Elevate or protect vulnerable low-lying road segments

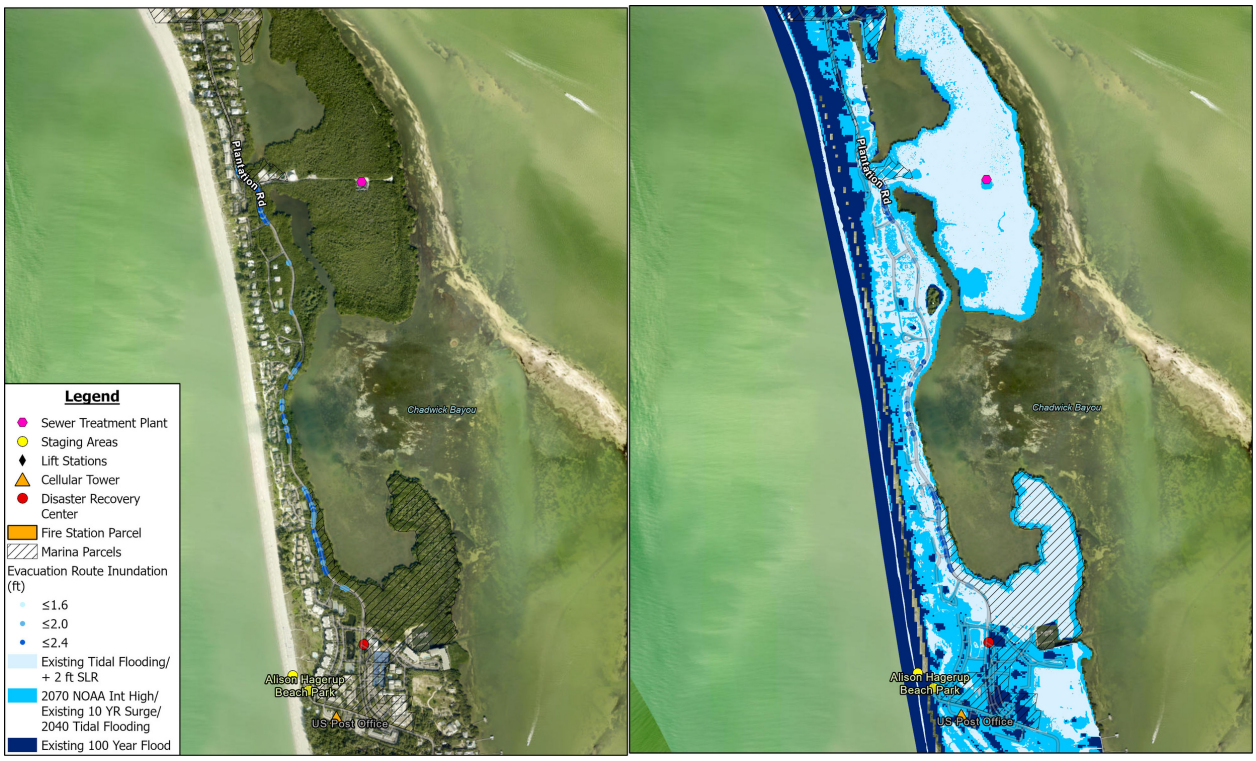


Figure 64. Chadwick Bayou AAA Map

CENTRAL CAPTIVA AAA

Predicted future inundation for the Central Captiva AAA is also predicted mostly along the bayside of the island (Figure 66). More specifically, a few areas of sea level rise flooding along the bayside of Captiva serve as entry points for inland flooding, allowing water to move towards and threaten critical infrastructure. Such infrastructure includes the Captiva Fire Station, Captiva Memorial Library, two treatment plants, four lift stations, marinas, and low-lying evacuation route road segments. Initial adaptation strategies could include:

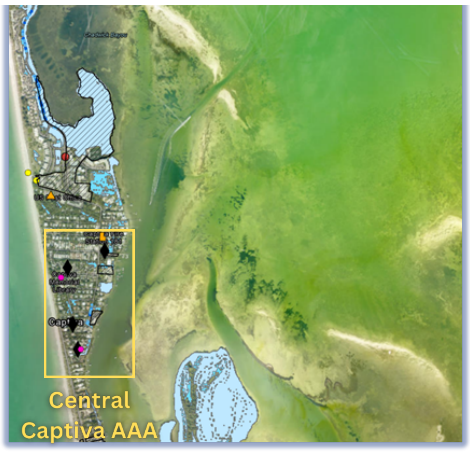


Figure 65. Central Captiva AAA Context Map

- Introduce sill or encourage seagrass between sandbars depicted in Figure 65 to reduce surge, wave action, and erosion at the narrowest point of the island on the backside
- Seal up vulnerable bayside area with seawalls or berms to prevent flow across property onto main road (policy)
- Harden fire station and tide valves
- Establish sill to slow surge around this area

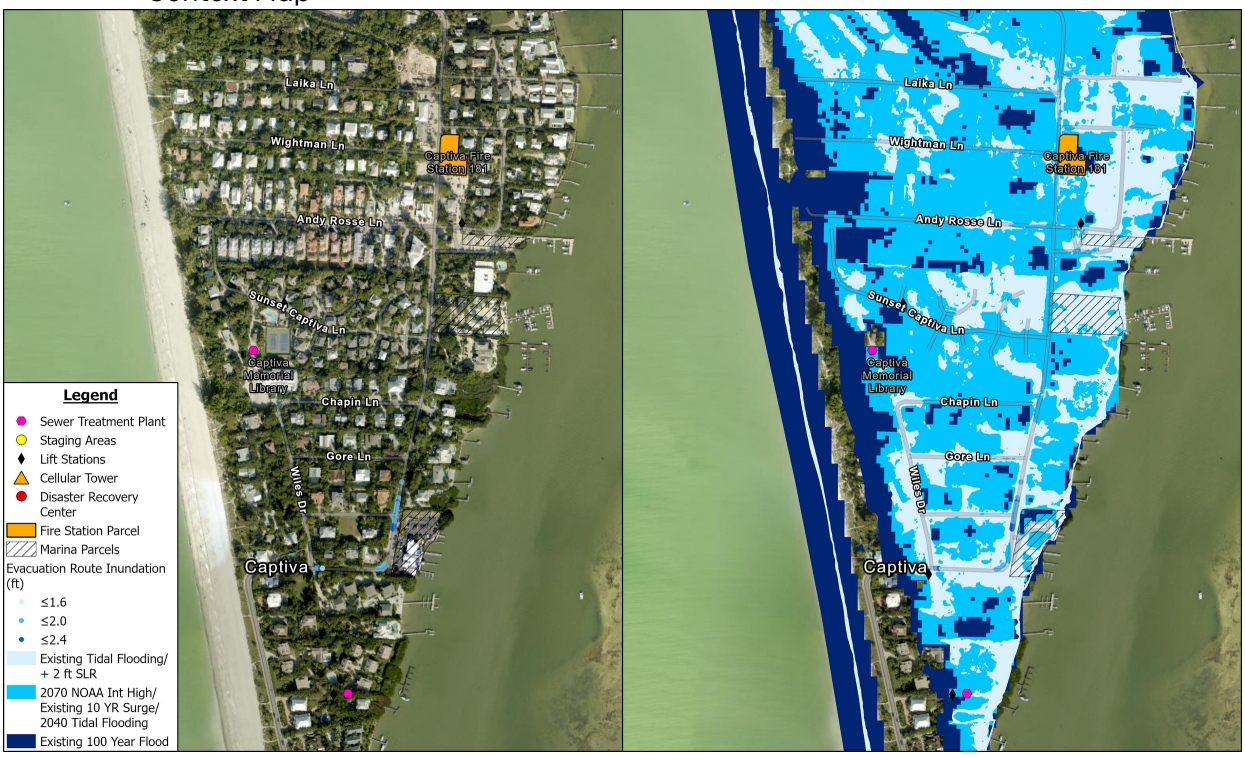


Figure 66. Central Captiva AAA Map

ROOSEVELT CHANNEL AAA

The focus of the Roosevelt Channel AAA is the area anticipated to flood along the eastern shoreline, west of the mangrove island (Figure 67). Of particular concern are the few concentrations of flood water in the southeastern portion of the AAA, where rising sea level is projected to slowly encroach inland across properties and roads. Flooding is also anticipated to threaten the treatment plants in the northern section of the AAA. To reduce and help contain the projected flooding, strategies include:

- Install flood gates at the north and south end of Roosevelt Channel
- Elevate buildings along eastern bayfront
- Install seawalls along the shoreline to property against flooding (policy)

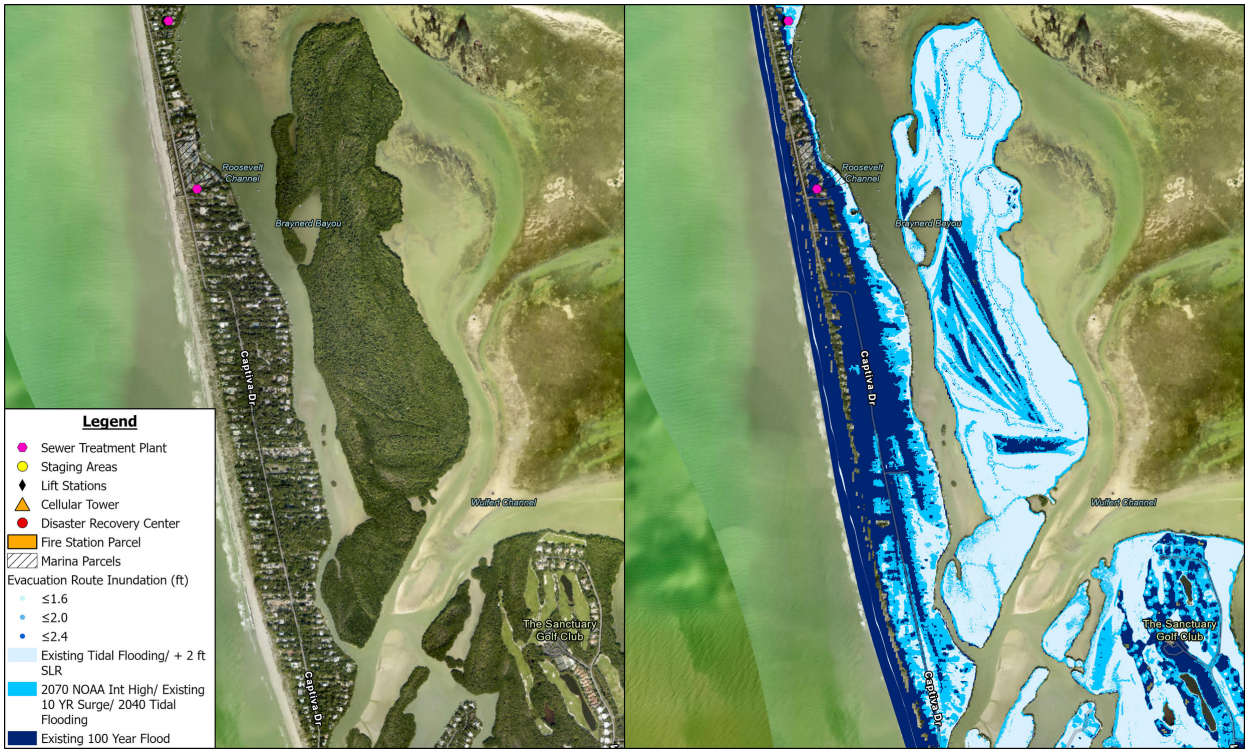


Figure 67. Roosevelt Channel AAA Map

BLIND PASS AA

The Blind Pass AAA is the smallest and most southern area in need of adaptation. Specifically, there is a major entry point for sea level rise flooding (Figure 68) which if not prevented or minimized could spread inland and impact the major evacuation route on the island. To address this, the bayside area requires seawall policy implementation to seal up this vulnerable area and to prevent flow across property.

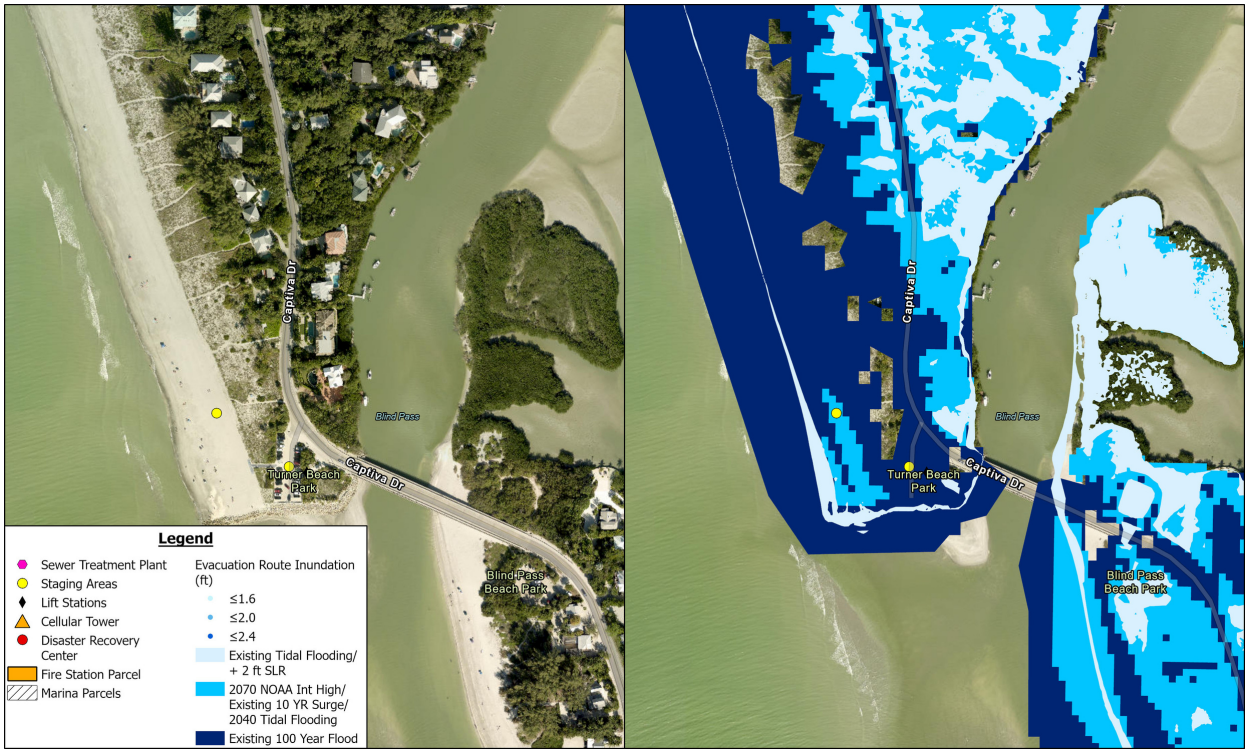


Figure 68. Blind Pass AAA Map

Next Steps

CEPD Authority

In order to recommend tangible next steps and feasible strategies for CEPD to pursue, it was necessary to analyze the scope of the legal authority of the Captiva Erosion Prevention District (CEPD) to implement sea level rise infrastructure and resilience projects. To do so, the statutory history of Part II of Chapter 161, F.S. creating the statutory framework for beach and shore preservation districts was reviewed and the legislative history of Ch. 71-730, 76-403, 81-413, 88-449, 97-255 and 2000-399, Laws of Fla. creating specifically the CEPD, were reviewed.

In summary, there is nothing specifically related to sea level rise in either the legal authority establishing the CEPD pursuant to special law or anything in Chapter 161, F.S. Both legal authorities were established and enacted well before the State of Florida began promulgating statutes or rules related to sea level rise planning, adaptation or funding. The only current treatment in the law is relative to Section 380.093(5)(d)2.c., F.S. allowing erosion control districts to submit proposed projects to the state that mitigate the risks of flooding or sea level rise on water supplies or water resources of the state for consideration in the Statewide Flooding and Sea Level Rise Resilience Plan.

In furtherance of guiding the research, three primary issues were evaluated:

I**ssue 1.** The structure of the CEPD and determination of CEPD's authority to implement sea level rise infrastructure and resilience projects

Issue 2. CEPD jurisdiction over adaptations by private property on Captiva

Issue 3. Existing enforcement mechanisms

The following subsections summarize the findings related to each issue.

Issue 1: The structure of the CEPD and determination of CEPD's authority to implement sea level rise infrastructure and resilience projects

The CEPD can regulate and supervise all physical work or activity along the county shoreline which is likely to have a material physical effect on existing coastal conditions or natural shore processes including, but not be limited to, installation of groins, jetties, moles, breakwaters, seawalls, revetments, and other coastal construction as defined herein. Coastal construction is defined broadly. The CEPD may develop standards and criteria, issue permits and conduct inspections. The statute does not make any limitation on that to a certain type of property, for example public or private. The CEPD can construct, acquire, operate and maintain works and facilities and make rules and regulations to carry out its purposes. There is no limitation on the regulations related to private property. It can also bond and assess for project costs. If the CEPD is implementing a resilience project, and if it is addressing an impact created by sea level rise such as coastal flooding or erosion, the cause of it such as sea level rise, is likely of little consequence or distinction. Such projects can be implemented on beaches and shores. There is no definition for shore or shoreline in Chapter 161, F.S.

Issue 2: CEPD jurisdiction over adaptations by private property on Captiva

The territorial boundary of the CEPD is the entire island of Captiva from the centerline of Blind Pass to centerline of Redfish Pass and extend 300' into the Gulf of Mexico and Pine Island Sound including Roosevelt Channel. This boundary is without distinction between publicly and privately owned property. CEPD can exercise jurisdiction, control, and supervision over the construction of any Erosion Prevention Project, by CEPD, a public entity or a private one. There are no distinctions between public projects or private ones.

Issue 3:Existing enforcement mechanisms

CEPD can make and enforce such rules and regulations for the maintenance and operation of any such Projects as may in the judgment of the District Board be necessary or desirable for the efficient operation of such Project. CEPD can restrain, enjoin, or otherwise prevent any person, firm, or corporation, public or private, from establishing or constructing any Erosion Prevention Project within the District without the prior written approval of the District Board. CEPD can restrain, enjoin, or otherwise prevent the violation of any provision of this act or of any resolution, rule, or regulation adopted pursuant to its powers. The CEPD also has a related enforcement mechanism through assessments as long as it follows all procedures in developing the supporting technical information and processes to levy such an assessment.

In conclusion, the CEPD has broad authority to implement projects to prevent erosion on beaches and shorelines with a territorial scope that encompasses then entirety of Captiva including some nearshore resources. There are procedures required for the development of an overall plan of improvement (beyond the scope of this research), but implementation of sea level rise adaptation and flooding projects, with the purpose of improving beaches or shorelines within the territorial boundaries, and regulating those projects on public or private lands, is likely within the scope of CEPD's legal authority.

Conclusions

The Sea Level Rise Vulnerability Analysis for Captiva Island has identified the geographic areas and physical assets vulnerable to current and future flooding. Higher frequency storm surge and mid-term sea level rise pose medium level risk to the island's assets and resources. Extreme storms and sea level rise in 2070 pose less risk comparatively given their lower likelihood of severe impacts. Adapting coastal infrastructure to resist flood elevations of at least 3.5 feet NAVD would be prudent. Without this level of protection, evacuation routes, 27% of roads, the fire station, two water treatment facilities, the post office, the library and up to 70% of building footprints are at risk of some flooding in the near to mid-term. Adaptation is primarily the responsibility of private owners on Captiva; however, there are funding partnership opportunities that would likely assist in addressing the vulnerabilities of the evacuation route, the oceanfront shorelines and recurrent flood risks in the floodplain. In order to guide private adaptation and increase the likelihood that the community has systemic resilience to flooding, new policy regarding tidal flood barriers along shorelines and enhancement of green infrastructure along the waterfront is recommended.

Four geographic areas were noted as having concentrated vulnerabilities co-located with key critical assets within Captiva Island. These areas include properties and resources adjacent to Chadwick Bayou, Central Captiva, the Roosevelt Channel and Blind Pass. In addition, the bayside of the island was found to be more vulnerable to flooding than the oceanside. Short term, flooding of various types along the bay could lead to flood trespassing across bayfront shorelines. Addressing the vulnerabilities in these areas through policy and strategy will be a primary focus of the next phase of effort, the resilience plan.

Three tipping points were defined through the analysis as leading to particularly problematic flooding for the community. The first, tidal flooding under present conditions, was found to affect 67% of all Captiva parcels with an average inundation depth under one foot. The second, storm surge typically occurring once a decade or tidal flooding in 2040, was determined to potentially affect 90% of Captiva parcels. While more than half of these parcels may flood less than one foot, the remainder may flood up to two feet. Tidal flooding in 2040 is projected to occur over 200 days per year. The third resulted in catastrophic flooding island wide.

Mapping assets and projected conditions and analyzing risk was an essential first step for resilience strategy development. Planning now for future water levels benefits property owners in multiple ways including risk mitigation, value preservation, bond rating security and insurance and maintenance cost avoidance. With consideration of CEPD's responsibilities and authority to prevent erosion and protect shorelines, an adaptation strategy consisting of alternative pathways or sequences of progressive actions triggered by changing conditions can be developed as a next step. The findings of this analysis will directly support advancement of future work including the forthcoming conceptualization, feasibility analysis and evaluation of adaptation and resilience strategies for the community, funded in part by a 2022 state resilience grant to CEPD.

Appendices

Appendix I: Lee County Facilities Maps

Appendix II: Parcel and Building Impacts for all Scenarios

Appendix III: Parcel Impacts, Inundation Depths, and Estimated Values for all Scenarios

Appendix IV: Building Impacts, Inundation Depths, and Estimated Values for all Scenarios

Appendix V: Evacuation Route Inundation for all Scenarios

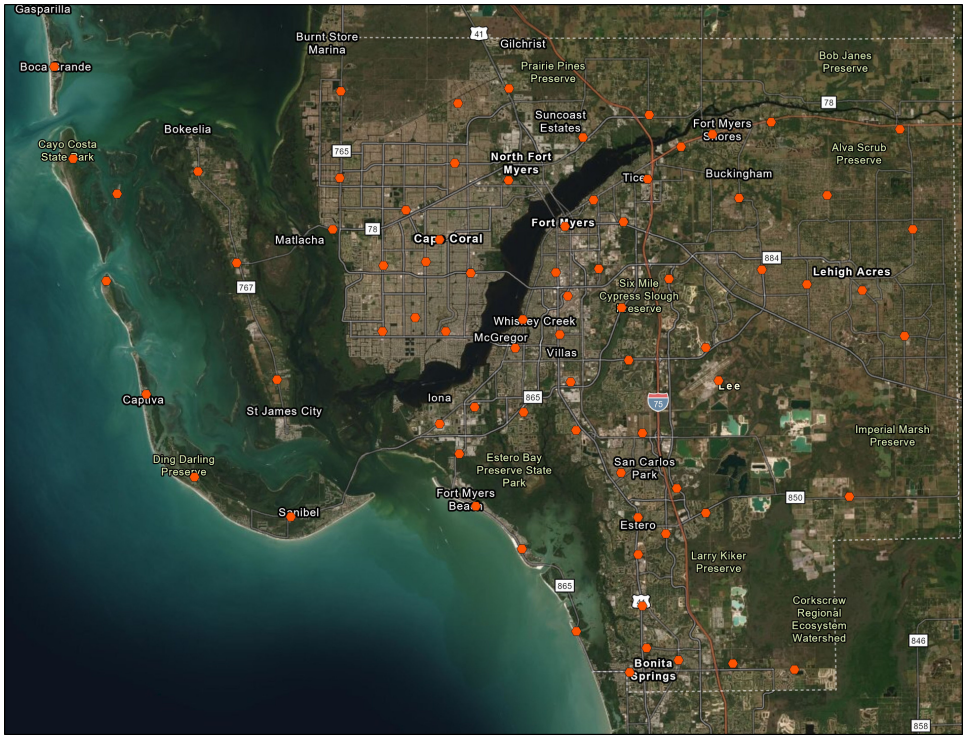
Appendix VI: On Island Singular Asset Inundation Depths and Risk Scores for all Scenarios

Appendix VII: Risk Rank Counts for Grouped Island Assets for all Scenarios

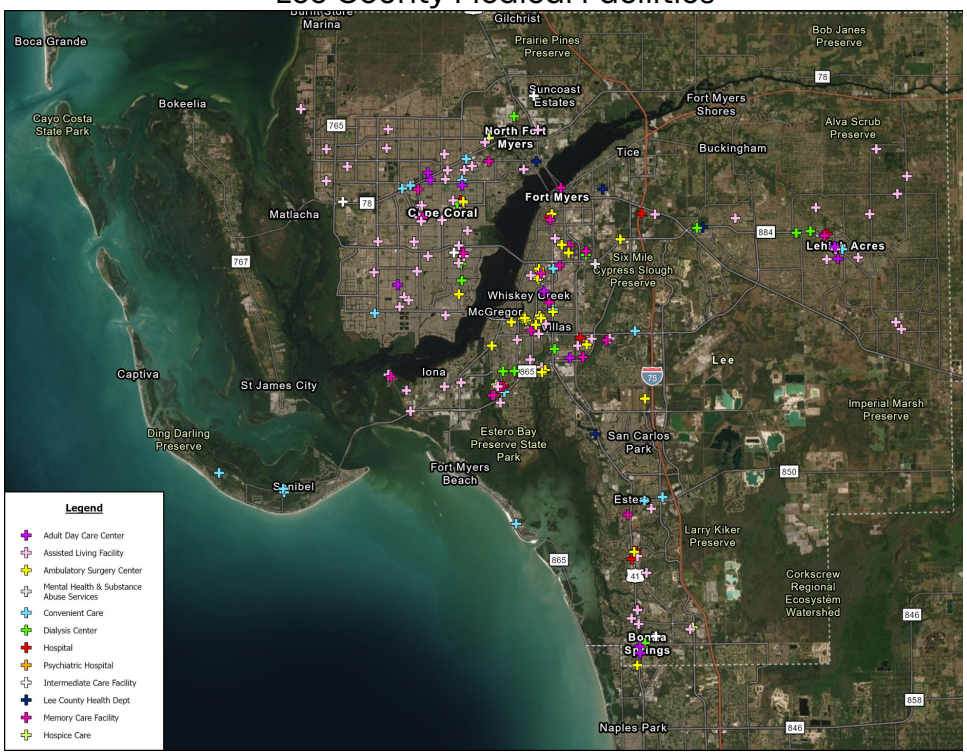
Appendix VIII: Community Presentation

Appendix I: Lee County Facilities Maps

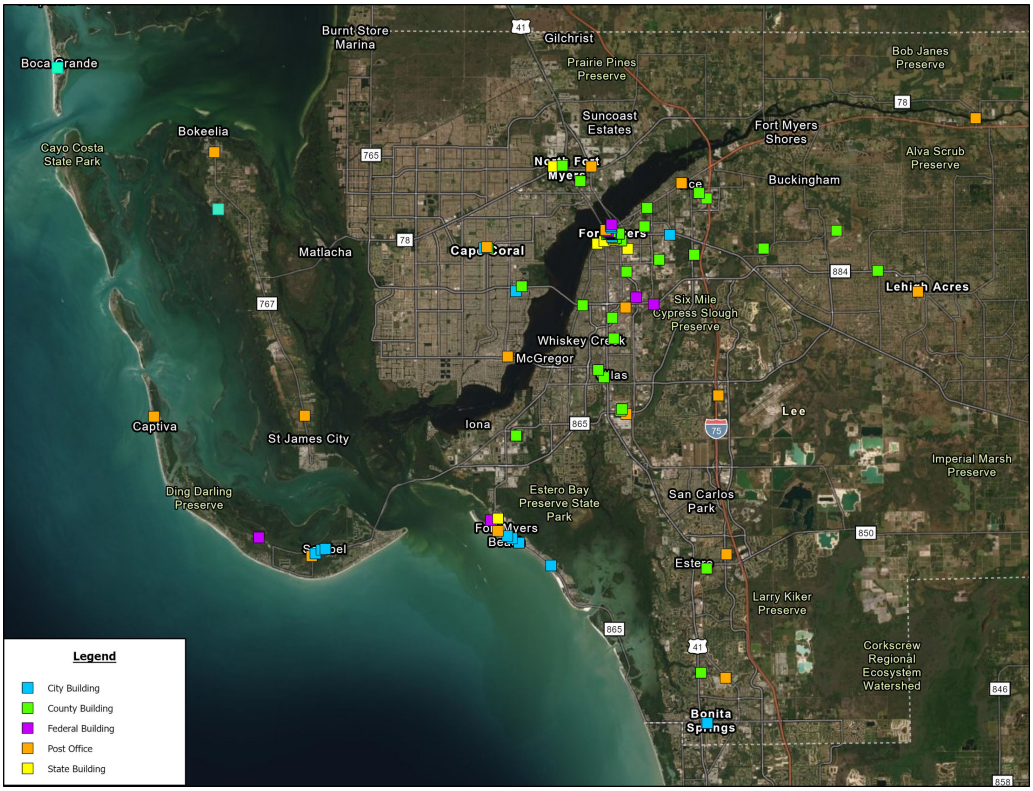
Lee County Fire Stations



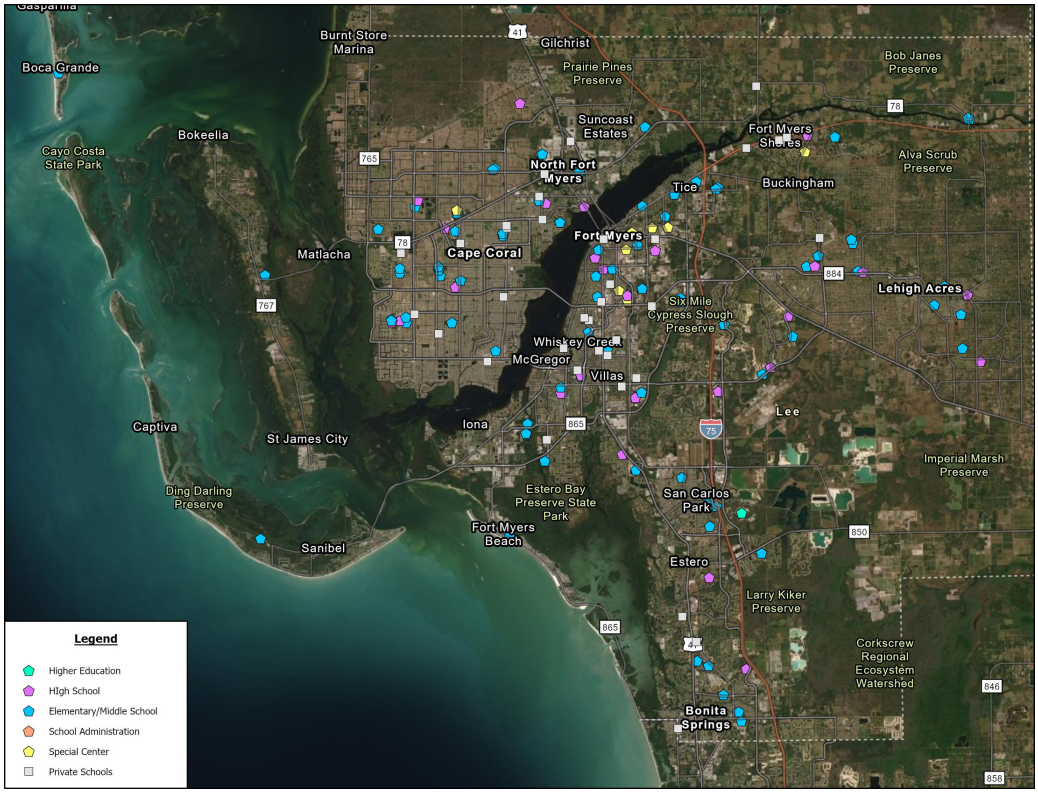
Lee County Medical Facilities



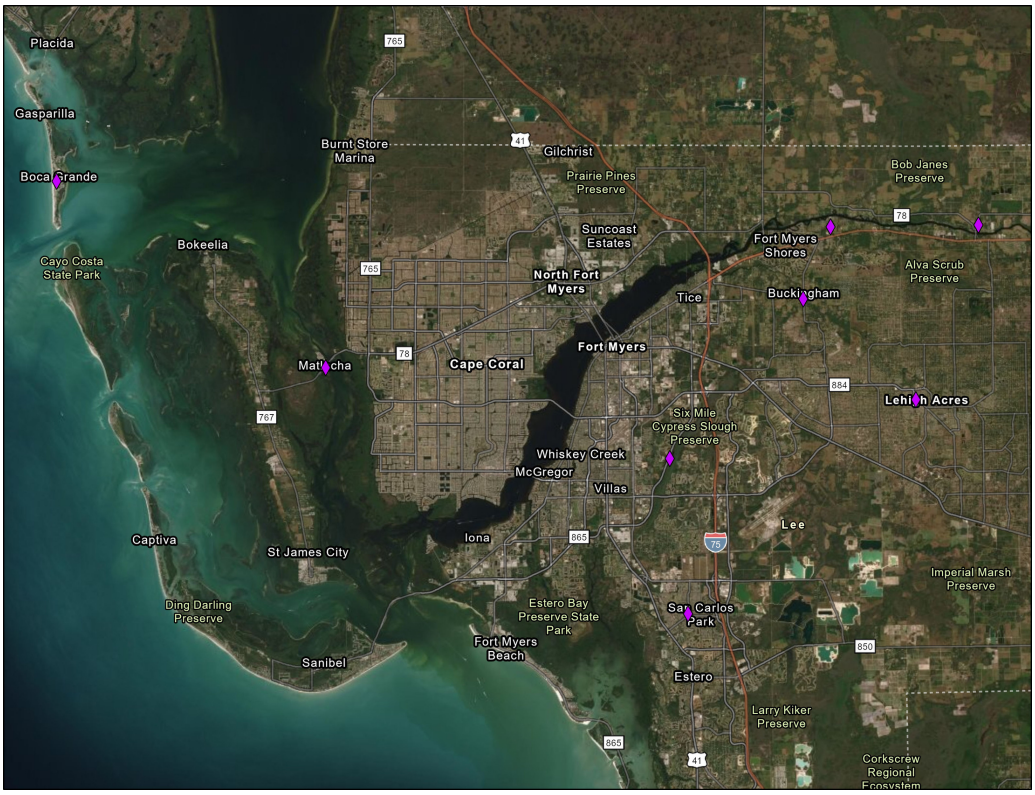
Lee County Local Government.



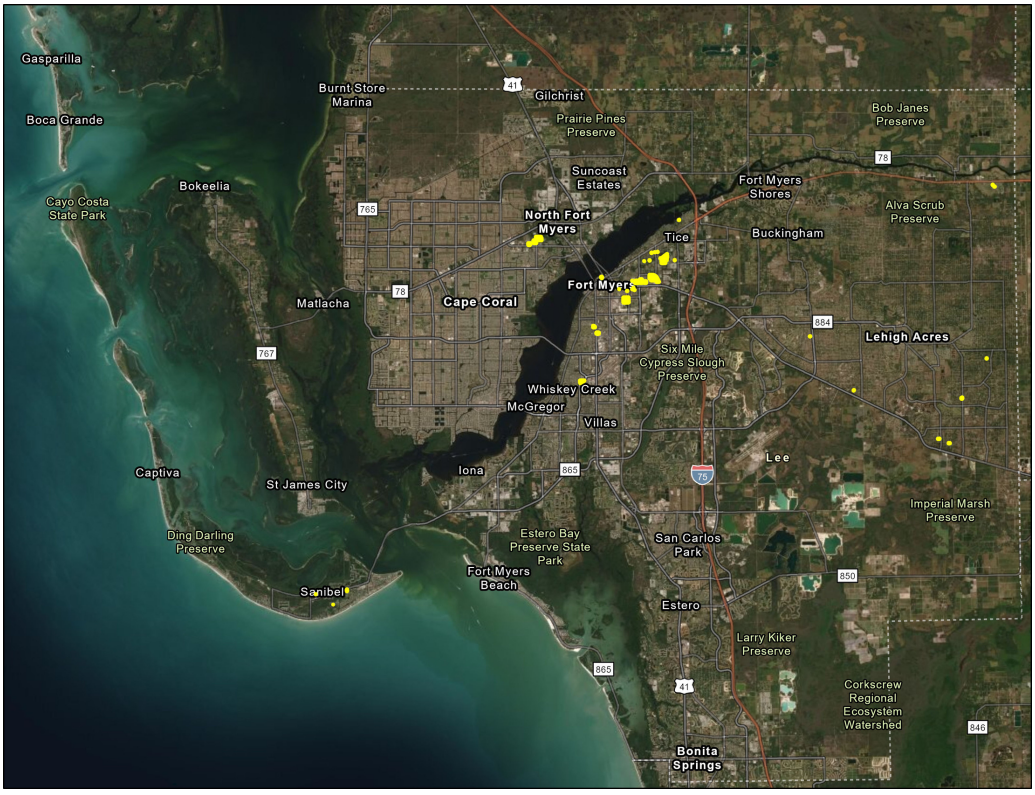
Lee County Schools



Lee County Community Centers

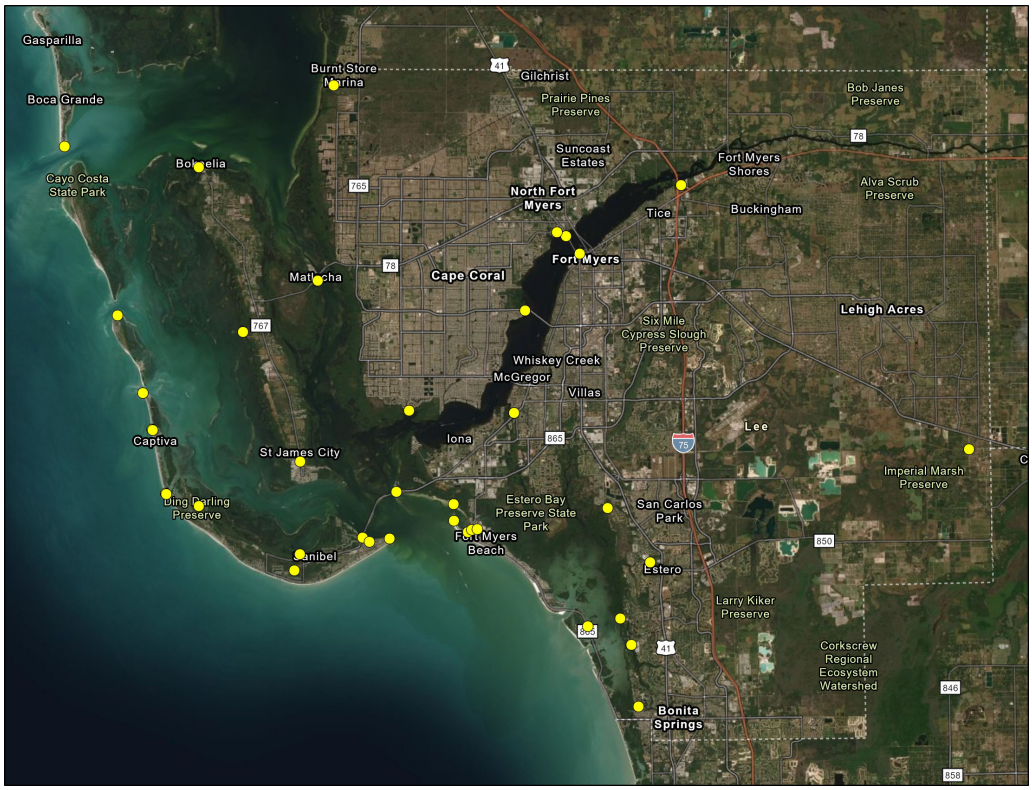


Lee County Affordable Housing



Lee County Communication Facilities

Logistical Staging Areas



Appendix II: Parcel and Building Impacts for all Scenarios

Parcels					
		# Impacted	Nuisance Flooding <1 ft)	Disturbance (1-2 ft)	Impact (> 2ft)
NOAA SLR Impact	NOAA 2040 Intermediate Low	133	50	83	-
	NOAA 2040 Intermediate High	227	137	90	-
	NOAA 2070 Intermediate High	1,005	585	419	1
Tidal Flooding Inundation Impact	Existing (~+2ft slr)	753	753	-	-
	2040 (~ Existing 10 YR surge)	1033	907	126	-
	2070	1100	-	231	869
Storm Surge Inundation Impact	2040 10 YR Surge (~+4 ft slr)	1090	1	1088	1
	2070 10 YR Surge	1105	-	-	1105
Integral Scenarios Inundation Impact	(+1ft slr)	282	282	-	-
	(+7ft slr)	1106	-	-	1106
Flood Event Impact	100 Yr Flood	1099	-	-	1099
	500 Yr Flood	1113	-	-	1113

Buildings					
		# Impacted	Nuisance Flooding <1 ft)	Disturbance (1-2 ft)	Impact (> 2ft)
NOAA SLR Impact	NOAA 2040 Intermediate Low	15	13	1	1
	NOAA 2040 Intermediate High	62	62	-	-
	NOAA 2070 Intermediate High	528	160	367	1
Tidal Flooding Inundation Impact	Existing (~+2ft slr)	278	278	-	-
	2040 (~ Existing 10 YR surge)	370	266	104	
	2070	651	-	243	408
Storm Surge Inundation Impact	2040 10 YR Surge (~+4 ft slr)	602	90	507	5
	2070 10 YR Surge	691	-	-	691
Integral Scenarios Inundation Impact	(+1ft slr)	53	53	-	-
	(+7ft slr)	720	-	-	720
Flood Event Impact	100 Yr Flood	710	-	-	710
	500 Yr Flood	746	-	-	746

Appendix III: Parcel Impacts, Inundation Depths, and Estimated Values for all Scenarios

	NOAA 2040 Intermediate Low			NOAA 2040 Intermediate High			NOAA 2070 Intermediate High			MMHW 1.28			MMHW 2.28			MMHW 4.28			MHHW 7.28		
Decade	Number of Parcels	Average Depth (ft)	Just Value	Number of Parcels	Average Depth (ft)	Just Value	Number of Parcels	Average Depth (ft)	Just Value	Number of Parcels	Average Depth (ft)	Estimated Value	Number of Parcels	Average Depth (ft)	Estimated Value	Number of Parcels	Average Depth (ft)	Estimated Value	Number of Parcels	Average Depth (ft)	Estimated Value
N/A	46	1	$29,068,134	59	1.1	$34,038,077	108	1.6	$81,408,531	74	0.55	$45,081,879	107	0.7	$61,626,843	118	1.76	$89,474,865	122	4.312058928	$91,074,865
1900	1	1.1	$15,617,220	1	0.4	$15,617,220	1	2.2	$15,617,220	1	0.11	$15,617,220	1	0.7	$15,617,220	1	2.6	$15,617,220	1	5.59863318	$15,617,220
1910	-	-	-	-	-	-	1	0.7	$995,772	-	-	-	-	-	-	1	1.28	$995,772	1	4.276079504	$995,772
1920	2	0.7	$30,676,252	4	0.4	$36,351,098	5	1.5	$37,152,100	4	0.33	$36,351,098	5	0.48	$37,152,100	5	1.94	$37,152,100	5	3.85059183	$37,152,100
1930	1	0.9	$2,965,497	1	1.3	$2,965,497	4	1.3	$7,574,339	4	0.29	$7,574,339	4	0.71	$7,574,339	4	1.69	$7,574,339	6	2.467011403	$11,870,586
1940	2	0.5	$4,119,682	9	0.4	$18,850,891	16	1.2	$32,750,494	9	0.22	$19,165,016	15	0.41	$31,508,855	17	1.36	$34,396,177	20	3.067861622	$38,676,655
1950	1	0.3	$2,541,832	4	0.4	$10,680,977	16	1	$34,023,897	4	0.3	$10,680,977	16	0.27	$35,641,979	20	1.13	$44,519,678	20	3.223568023	$44,519,678
1960	4	0.4	$17,379,795	16	0.3	$53,662,508	30	1.2	$74,928,377	18	0.21	$60,162,089	28	0.39	$73,767,143	30	1.64	$74,928,377	30	4.27927891	$74,928,377
1970	20	0.9	$48,867,379	38	0.7	$81,732,678	500	1	$409,098,771	39	0.41	$92,133,396	321	0.18	$293,831,915	505	1.43	$427,702,294	505	4.349126193	$427,702,294
1980	20	0.8	$54,430,432	46	0.6	$91,596,807	163	1.1	$204,786,700	49	0.29	$105,404,044	114	0.39	$170,423,678	207	1.26	$274,597,523	210	3.926074846	$277,635,346
1990	10	1	$26,742,615	19	0.7	$51,229,525	67	1	$173,997,581	32	0.37	$100,072,790	58	0.38	$146,145,457	71	1.24	$188,919,503	75	3.474572591	$200,649,481
2000	21	1.2	$92,794,755	24	1.3	$105,431,315	69	1.1	$207,849,124	32	0.48	$139,920,832	62	0.55	$205,756,249	80	1.23	$266,911,791	82	3.316771703	$273,285,515
2010	5	1.3	$16,361,955	6	1.4	$19,520,171	24	1.2	$66,971,214	16	0.62	$56,123,601	22	0.59	$65,805,345	30	1.31	$97,335,438	31	3.526568126	$105,992,942
2020	-	-	-	-	-	-	1	0.4	$1,381,563	-	-	-	-	-	-	1	0.86	$1,381,563	1	3.627939537	$1,381,563
Total	**133**		**$341,565,548**	**227**		**$521,676,764**	**1,005**		**$1,348,535,683**	**282**		**$688,287,281**	**753**		**$1,144,851,123**	**1,090**		**$1,561,506,640**	**1,106**		**$1,598,053,841**

	Tidal Fooding, 2040			Tidal Fooding, 2070			10 Year Surge, 2070			1 percent			.2 percent		
	Number of Parcels	Average Depth (ft)	Estimated Value	Number of Parcels	Average Depth (ft)	Estimated Value	Number of Parcels	Average Depth (ft)	Estimated Value	Number of Parcels	Average Depth (ft)	Estimated Value	Number of Parcels	Average Depth (ft)	Estimated Value
N/A	116	1.14	$82,846,065	120	2.53	$91,074,865	122	3.56	$91,074,865	122	4.81	$91,074,865	122	8.25	$91,074,865
1900	1	1.65	$15,617,220	1	3.56	$15,617,220	1	4.76	$15,617,220	1	6.00	$15,617,220	1	10.00	$15,617,220
1910	1	0.37	$995,772	1	2.24	$995,772	1	3.44	$995,772	1	4.00	$995,772	1	8.00	$995,772
1920	5	1.22	$37,152,100	5	2.69	$37,152,100	5	3.48	$37,152,100	5	4.60	$37,152,100	5	7.20	$37,152,100
1930	4	1.26	$7,574,339	5	1.89	$10,168,568	5	2.59	$10,168,568	5	3.80	$10,168,568	7	5.29	$13,747,776
1940	17	0.83	$34,396,177	20	1.74	$38,676,655	20	2.53	$38,676,655	20	3.75	$38,676,655	20	6.90	$38,676,655
1950	18	0.74	$39,545,580	20	1.78	$44,519,678	20	2.61	$44,519,678	20	3.65	$44,519,678	20	6.80	$44,519,678
1960	30	0.93	$74,928,377	30	2.46	$74,928,377	30	3.52	$74,928,377	30	4.60	$74,928,377	30	7.83	$74,928,377
1970	501	0.63	$415,519,708	505	2.36	$427,702,294	505	3.53	$427,702,294	505	4.70	$427,702,294	505	8.17	$427,702,294
1980	164	0.78	$207,713,247	207	2.09	$274,597,523	207	3.21	$274,597,523	202	4.30	$272,206,354	209	7.65	$278,934,277
1990	68	0.74	$178,108,227	74	1.88	$198,133,024	75	2.8	$200,649,481	74	3.74	$198,133,024	79	6.78	$206,861,779
2000	79	0.75	$262,224,378	80	1.87	$266,911,791	82	2.72	$273,285,515	82	3.84	$273,285,515	82	7.00	$273,285,515
2010	28	0.77	$84,804,962	31	1.9	$105,992,942	31	2.83	$105,992,942	31	4.26	$105,992,942	31	7.68	$105,992,942
2020	1	0.17	$1,381,563	1	1.75	$1,381,563	1	2.79	$1,381,563	1	5.00	$1,381,563	1	8.00	$1,381,563
Total	**1,033**		**$1,442,807,715**	**1,100**		**$1,587,852,372**	**1,105**		**$1,596,742,553**	**1,099**		**$1,591,834,927**	**1,113**		**$1,610,870,813**

Appendix IV: Building Impacts, Inundation Depths, and Estimated Values for all

	NOAA 2040 Intermediate Low			NOAA 2040 Intermediate High			NOAA 2070 Intermediate High			MMHW 1.28			MMHW 2.28			MMHW 4.28			MHHW 7.28		
Decade	**Number of Buildings**	**Average Depth (ft)**	**Estimated Value**	**Number of Buildings**	**Average Depth (ft)**	**Estimated Value**	**Number of Buildings**	**Average Depth (ft)**	**Estimated Value**	**Number of Buildings**	**Average Depth (ft)**	**Estimated Value**	**Number of Buildings**	**Average Depth (ft)**	**Estimated Value**	**Number of Buildings**	**Average Depth (ft)**	**Estimated Value**	**Number of Buildings**	**Average Depth (ft)**	**Estimated Value**
N/A	-	-	-	-	-	-	14	0.4	$25,295,530	-	-	-	1	0.06	$832,760	16	0.77	$33,485,450	16	3.73	$33,485,450
1900	-	-	-	1	0.2	$66,886	1	2.1	$66,886	1	0.08	$66,886	1	0.64	$66,886	1	2.64	$66,886	1	5.64	$66,886
1910	-	-	-	-	-	-	1	0.6	$314,020	-	-	-	-	-	-	1	1.21	$314,020	2	2.57	$349,425
1920	-	-	-	-	-	-	4	1.4	$346,044	1	0.45	$155,030	4	0.43	$346,044	4	2.01	$346,044	9	2.2	$1,688,614
1930	-	-	-	-	-	-	3	1.1	$2,010,915	1	0.64	$34,429	4	0.45	$2,045,344	5	1.49	$2,131,090	6	3.77	$2,440,127
1940	1	2.2	$59,098	4	0.4	$437,274	17	1.4	$1,704,824	3	0.46	$344,545	11	0.43	$1,180,144	18	1.81	$1,905,457	29	3.23	$3,765,123
1950	1	1.3	$96,790	3	0.8	$165,450	25	1.1	$2,170,080	1	0.55	$96,790	14	0.28	$1,348,623	28	1.4	$3,206,825	42	3.16	$5,042,273
1960	1	0.8	$105,839	4	0.3	$686,361	30	1.1	$6,591,120	3	0.28	$1,063,754	23	0.24	$4,995,622	33	1.46	$6,915,668	37	3.91	$7,349,919
1970	5	0.5	$2,674,620	13	0.3	$4,859,456	169	1	$223,708,608	10	0.25	$4,010,152	97	0.2	$139,280,792	180	1.43	$225,448,143	195	4.08	$229,516,696
1980	4	0.8	$1,980,882	23	0.4	$13,233,907	119	1.1	$81,843,587	19	0.18	$9,011,111	74	0.34	$49,472,502	146	1.35	$162,168,689	165	3.92	$180,050,531
1990	1	0.2	$688,365	5	0.2	$3,984,540	54	0.7	$41,059,242	5	0.16	$3,125,100	21	0.22	$17,555,368	63	1	$56,956,707	77	3.37	$72,601,942
2000	1	0.5	$737,299	4	0.3	$2,697,766	62	0.7	$57,664,971	4	0.2	$1,714,076	19	0.3	$20,350,624	74	0.97	$75,739,084	98	3.1	$119,169,829
2010	1	0.7	$861,262	4	0.4	$2,477,630	26	0.8	$24,113,332	5	0.19	$4,525,637	8	0.44	$6,495,738	30	1.14	$27,616,215	40	3.32	$44,423,218
2020	-	-	-	1	0	$3,483,206	3	0.5	$4,620,373	-	-	-	1	0.36	$3,483,206	3	1.01	$4,620,373	3	3.98	$4,620,373
Total	**15**		**$7,204,155**	**62**		**$32,092,476**	**528**		**$471,509,532**	**53**		**$24,147,510**	**278**		**$247,453,653**	**602**		**$600,920,651**	**720**		**$704,570,406**

	Tidal Fooding, 2040			Tidal Fooding, 2070			10 Year Surge, 2070			Cat 1			Cat 2		
Decade	**Number of Buildings**	**Average Depth (ft)**	**Estimated Value**	**Number of Buildings**	**Average Depth (ft)**	**Estimated Value**	**Number of Buildings**	**Average Depth (ft)**	**Estimated Value**	**Number of Buildings**	**Average Depth (ft)**	**Estimated Value**	**Number of Buildings**	**Average Depth (ft)**	**Estimated Value**
N/A	5	0.2	$8,874,830	16	1.7	$33,485,450	16	2.89	$33,485,450	16	4.44	$33,485,450	16	8.00	$33,485,450
1900	1	1.69	$66,886	1	3.6	$66,886	1	4.8	$66,886	1	6.00	$66,886	1	10.00	$66,886
1910	1	0.26	$314,020	2	1.15	$349,425	2	2.07	$349,425	2	2.50	$349,425	2	6.00	$349,425
1920	4	0.87	$346,044	4	2.78	$346,044	5	3.1	$366,959	9	3.11	$503,452	17	4.65	$2,062,673
1930	4	0.89	$2,045,344	5	2.36	$2,131,090	6	2.98	$2,440,127	6	4.33	$2,440,127	9	6.11	$2,683,604
1940	14	1.17	$1,519,875	22	2.3	$2,671,636	27	2.78	$3,257,302	28	3.89	$3,469,990	30	7.23	$4,016,365
1950	18	0.93	$1,696,163	34	1.93	$4,233,252	40	2.58	$4,931,181	42	3.62	$5,042,273	43	6.91	$5,187,004
1960	24	0.79	$4,239,849	35	2.17	$7,025,622	37	3.1	$7,349,919	37	4.19	$7,349,919	38	7.68	$7,375,435
1970	132	0.78	$173,996,963	186	2.27	$226,872,002	191	3.34	$228,823,072	191	4.50	$228,862,176	196	7.94	$229,594,350
1980	89	1.01	$66,413,450	155	2.13	$174,768,574	159	3.24	$175,182,555	162	4.40	$176,478,453	168	7.67	$183,740,631
1990	27	0.73	$21,800,024	71	1.68	$65,971,345	73	2.74	$68,311,983	77	3.84	$70,550,330	84	6.89	$82,143,586
2000	31	0.61	$22,749,124	83	1.67	$89,972,248	92	2.53	$113,998,878	96	3.69	$116,047,174	99	7.09	$120,475,611
2010	19	0.54	$18,250,450	34	1.81	$32,525,759	39	2.61	$43,577,368	40	4.18	$44,423,218	40	7.73	$44,423,218
2020	1	0.26	$3,483,206	3	1.94	$4,620,373	3	3.14	$4,620,373	3	4.33	$4,620,373	3	8.33	$4,620,373
Total	**370**		**$325,796,228**	**651**		**$645,039,706**	**691**		**$686,761,478**	**710**		**$693,689,246**	**746**		**$720,224,611**

Appendix V: Evacuation Route Inundation for all Scenarios

		Average Depth (Ft)	Min Depth (Ft)	Max Depth (Ft)
NOAA SLR Impact	NOAA 2040 Intermediate Low	Doesn't intersect	Doesn't intersect	Doesn't intersect
	NOAA 2040 Intermediate High	0.01	0	0.4
	NOAA 2070 Intermediate High	2.1	1.6	2.4
Tidal Flooding Inundation Impact	Existing (~+2ft slr)	0.32	0.01	0.88
	2040 (~ Existing 10 YR surge)	1	0.01	1.93
	2070	2.2	0.01	3.84
Storm Surge Inundation Impact	2040 10 YR Surge (~+4 ft slr)	1.5	0.01	2.9
	2070 10 YR Surge	3.26	0.01	5
Integral Scenarios Inundation Impact	(+1ft slr)	Doesn't intersect	Doesn't intersect	Doesn't intersect
	(+7ft slr)	3.9	0.01	5.9
Rainfall Impact	100 Yr Flood	4.5	0.02	7.4
	500 Yr Flood	6.8	2	9.2

Appendix VI: On Island Singular Asset Inundation Depths and Risk Scores for all Scenarios

			2040 NOAA Int Low			2040 NOAA Int High/ 2070 NOAA Int Low/ + 1 ft SLR			Existing Tidal Flooding / + 2 ft SLR			2070 NOAA Int High/ Existing 10 YR Surge/ 2040 Tidal Flooding			2040
			4.345			1.873			0.534			0.143			
Asset Type	Number on Captiva	Name of Asset(s)	Inundation Depth	Impact Score	RISK	Inundation Depth	Impact Score	RISK	Inundation Depth	Impact Score	RISK	Inundation Depth	Impact Score	RISK	Inundation Depth
Community centers	1	Captiva Civic Association, Inc. (11550 Chapin Lane, Captiva, FL 33924)	0	0	0.00	0	0	0	0.73	1	0.534	0.7	1.0	0.1	1.19
Fire stations	1	Captiva Fire - Station #181 (14981 Captiva Dr, Captiva, FL 33924)	0	0	0.00	0	0	0	0.15	1	0.534	0.9	1.0	0.1	1.15
Federal government facilities	1	U S. Postal Service Captiva (14812 Captiva Dr SW, Captiva, FL 33924)	0	0	0.00	0	0	0	0.05	1	0.534	0.3	1.0	0.1	0.36
Disaster recovery centers	1	Chadwick's at South Seas Plantation (5400 Plantation Rd, Captiva, FL 33924)	1.0	33.0	143.39	0.0	0.0	0	0.0	0	0	2.8	66.0	9.4	1.92
Heliport	1	CAPTIVA	1.1	33.0	143.39	1.7	33	61.809	1.8	33	17.622	3.6	66.0	9.4	3.8
Wastewater treatment facilities	4	South Seas Plantation	0.9	1.0	4.35	1.5	33	61.809	0.25	1	0.534	3.4	66.0	9.4	2.25
		Tween Waters Inn WWTP	0.9	1.0	4.35	0.9	1.0	1.873	0	0	0	0.0	0.0	0.0	0
		Captiva Shores Condominium WWTP	0.4	1.0	4.35	0.5	1	1.873	0	0	0	1.5	33	4.7	1.58
		Sunset Captiva WWTP	0	0.0	0.00	0	0	0	0	0	0	0.7	1.0	0.1	0.28
lift stations	5	Lift station #1	0	0.0	0.00	0	0	0	0	0	0	0.9	1.0	0.1	1.39
		Lift station #2	0	0.0	0.00	0	0	0	0	0	0	1.0	33.0	4.7	0.93
		Lift station #3	0	0.0	0.00	0	0	0	0.58	1	0.534	2.0	33.0	4.7	2.58
		Lift station #4	0	0.0	0.00	0	0	0	0	0	0	0.0	0.0	0.0	0.76
		Turner Beach Lift Station	0	0.0	0.00	0	0	0	0	0	0	0.0	0.0	0.0	0
Communications facilities	2	EAST SIDE OF CHADWICK'S SQUARE SHOPPING CENTER	0	0.0	0.00	0	0	0	0	0	0	1	33	4.7	1.57
		Communication Tower at north end near Wastewater Treatment	0	0.0	0.00	0	0	0	0	0	0	0.8	1.0	0.1	1.45
Marinas	7	1057-1900 SOUTH SEAS PLANTATION RD	1.6	33	143.39	1.9	33	61.809	0.7	1	0.534	1.6	33	4.7	1.22
		11401 ANDY ROSSE LN	0	0	0.00	0	0	0	0.24	1	0.534	1.7	33	4.7	2.23
		15107 CAPTIVA DR	0	0	0.00	0.2	1	1.873	0.32	1	0.534	1.7	33	4.7	2.2
		15183 CAPTIVA DR	0	0	0.00	0.1	1	1.873	0.23	1	0.534	1.5	33	4.7	2.04
		15903 CAPTIVA DR	1.9	33	143.39	2.1	66	123.618	0.74	1	0.534	2.4	66	9.4	0.93
		15951 CAPTIVA DR	0.9	1	4.35	0.9	1	1.873	0.94	1	0.534	1.8	33	4.7	2.12
		2800-5640 SOUTH SEAS PLANTATION RD	1	33	143.39	1.6	33	61.809	1.55	33	17.622	2.8	66	9.4	1.83
Historical and cultural assets****	2	Tween Waters Inn Historic District	0	0	0.00	0	0	0	0	0	0	0	0	0.0	0
		Captiva School and Chapel-by-the-Sea Historic District	0	0	0	0	0	0	0	0	0	0	0	0	0.33
Conservation lands/ wetlands	146.85	Mangrove Swamp North	1.17	33	143.385	1.67	33	61.809	1.54	33	17.622	3.58	66	9.438	3.41
	354.13	Mangrove Swamp South	0.92	1	4.345	1.42	33	61.809	1.47	33	17.622	2.83	66	9.438	2.92
	43.46	J. N. Ding Darling National Wildlife Refuge 1	1.08	33	143.385	1.67	33	61.809	1.84	33	17.622	3.58	66	9.438	3.76
	27.05	J. N. Ding Darling National Wildlife Refuge 2	1.17	33	143.385	1.75	33	61.809	1.90	33	17.622	3.75	66	9.438	3.90
	283.00	J. N. Ding Darling National Wildlife Refuge 3	0.83	1	4.345	1.33	33	61.809	1.40	33	17.622	2.67	66	9.438	2.79
	1.59	J. N. Ding Darling National Wildlife Refuge 4	1.42	33	143.385	2.00	66	123.618	2.08	66	35.244	4.00	66	9.438	4.08
	13.14	Sanibel-Captiva Conservation Foundation Conservation Lands 1	0.92	1	4.345	1.33	33	61.809	1.18	33	17.622	3.00	66	9.438	3.04
	48.79	Sanibel-Captiva Conservation Foundation Conservation Lands 2	1	33	143.385	1.58	33	61.809	1.90	33	17.622	3.58	66	9.438	3.90
Parks (acres)*	1.18	Turner Beach	0	0	0	0	0	0	0.40	1	0.534	0	0	0	1.26
	0.13	Andy Rosse Lane Kayak Launch	0	0	0	0	0	0	0.47	1	0.534	1.5	33	4.719	2.30
	0.23	Andy Rosse Lane Beach Access	0	0	0	0	0	0	0.00	1	0.534	0.25	1	0.143	0.64
	0.58	Alison Hagerup Beach Park 1	0	0	0	0	0	0	1.20	33	17.622	0	0	0	1.48
	0.23	Alison Hagerup Beach Park 2	0	0	0	0	0	0	0.00	0	0	0.33	1	0.143	0.60
Logistical staging areas	3.01	South Seas Island Resort	0.0	0.0	0	0	0.0	0	1.07	33	17.622	0.00	0.0	0.0	0.71
	0.70	Allison Hangerup Beach Park A	0.0	0.0	0	0	0.0	0	1.13	33	17.622	0.00	0.0	0.0	1.48
	0.29	Allison Hangerup Beach Park B	0.0	0.0	0	0	0.0	0	0	0	0	0.08	1.0	0.1	0.70
	0.98	Turner Beach A	0.0	0.0	0	0	0.0	0	0.14	1	0.534	0.08	1.0	0.1	0.78
	0.28	Turner Beach B	0	0.0	0	0	0.0	0	0	0	0	0.0	0.0	0.0	0.07
Stormwater treatment facilities and pump stations	3 (Catch Basin Pipes)	SSPGCCB1	0	0	0	0	0	0	0	0	0	0.42	1	0.143	0.75
		SSPGCCB2	0	0	0	0	0	0	0	0	0	1.33	33	4.719	1.61
		SSPGCCB3	0	0	0	0	0	0	0	0	0	0.00	0	0	0
	1 (Swales and Retention Pond)	Swale11	0	0	0	0	0	0		1	0.534	1.92	33	4.719	
	6 (Standing Water Areas)	Swale10	0	0	0	0	0	0	0.52						2.52
		Swale19	0	0	0	0	0	0	0.00	0	0	0.00	0	0	0.00
		Swale20	0	0	0	0	0	0	0.00	0	0	0.00	0	0	0.00
		Swale21	0	0	0	0	0	0	0.00	0	0	0.00	0	0	0.00
		Swale23	0	0	0	0	0	0	0.33	1	0.534	2.08	66	9.438	2.33
	2 (Sewers)	ST62	0	0	0	0	0	0	0	0	0	0.33	1	0.143	0.56
		Influent at Sunset Captiva WWTP	0	0	0	0	0	0	0.01	1	0.534	1.42	33	4.719	2.01
	2** (Outfalls)	AROUT	0	0	0	0	0	0	0.00	0	0	0.00	0	0	0
		SSPOutFall1	0	0	0	0	0	0	2.29	66	35.244	0.08	1	0.143	4.29
									1.25	33	17.622	0.92	1	0.143	3.25

10 YR Surge/ + 4 ft SLR		2070 Tidal Flooding			2070 10 YR Surge			+ 7 ft SLR			Category 1			Category 2		
0.075			0.053			0.031			0.021			0.01			0.002	
Impact Score	RISK	Inundation Depth	Impact Score	RISK	Inundation Depth	Impact Score	RISK	Inundation Depth	Impact Score	RISK	Inundation Depth	Impact Score	RISK	Inundation Depth	Impact Score	RISK
33	2.475	2.15	66	3.498	3.35	66	2.046	4.19	66	1.386	5	66	0.66	8	100	0.2
33	2.475	1.64	33	1.749	2.45	66	2.046	3.29	66	1.386	3.56	66	0.66	7.4	100	0.2
1	0.075	0.71	1	0.053	1.42	33	1.023	1.91	33	0.693	3	66	0.66	6	100	0.2
33	2.475	2.88	66	3.498	4.08	66	2.046	4.92	66	1.386	5	66	0.66	8	100	0.2
66	4.95	4.78	66	3.498	5.61	100	3.1	6.34	100	2.1	7	100	1	11	100	0.2
66	4.95	3.21	66	3.498	4.41	66	2.046	5.25	100	2.1	6	100	1	10	100	0.2
0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	66.0	0.132
33	2.475	2.54	66	3.498	3.74	66	2.046	4.58	66	1.386	4	66	0.66	8	100	0.2
1	0.075	1.24	33	1.749	2.44	66	2.046	3.28	66	1.386	3	66	0.66	7	100	0.2
33	2.475	2.35	66	3.498	3.55	66	2.046	4.39	66	1.386	4	66	0.66	7	100	0.2
1	0.075	1.89	33	1.749	3.09	66	2.046	3.93	66	1.386	4	66	0.66	8	100	0.2
66	4.95	3.54	66	3.498	4.74	66	2.046	5.58	100	2.1	5	66	0.66	9	100	0.2
1	0.075	1.72	33	1.749	2.92	66	2.046	3.76	66	1.386	4	66	0.66	7	100	0.2
0	0	0.37	1	0.053	1.57	33	1.023	2.41	66	1.386	3	66	0.66	6	100	0.2
33	2.475	2.53	66	3.498	3.73	66	2.046	4.57	66	1.386	5	66	0.66	9	100	0.2
33	2.475	2.41	66	3.498	3.61	66	2.046	4.45	66	1.386	6	100	1	10	100	0.2
33	2.475	1.74	33	1.749	2.54	66	2.046	3.14	66	1.386	4	66	0.66	7	100	0.2
66	4.95	3.19	66	3.498	4.39	66	2.046	5.23	100	2.1	6	100	1	9	100	0.2
66	4.95	3.16	66	3.498	4.36	66	2.046	5.2	100	2.1	6	100	1	9	100	0.2
66	4.95	2.95	66	3.498	4.01	66	2.046	4.65	66	1.386	5	66	0.66	9	100	0.2
1	0.075	1.54	33	1.749	1.98	33	1.023	1.09	33	0.693	3	66	0.66	4	66	0.132
66	4.95	2.8	66	3.498	2.75	66	2.046	2.13	66	1.386	3	66	0.66	5	66	0.132
3	0.225	2.7	66	3.498	3.88	66	2.046	4.72	66	1.386	6	100	1	10	100	0.2
0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	66	0.132
1	0.075	1.29	33	1.749	2.49	66	2.046	3.33	66	1.386	4	66	0.66	7	100	0.2
66	4.95	4.32	66	3.498	5.47	100	3.1	6.27	100	2.1	7	100	1	11	100	0.2
66	4.95	3.77	66	3.498	4.90	66	2.046	5.73	100	2.1	6	100	1	9	100	0.2
66	4.95	3.76	66	3.498	5.58	100	3.1	6.32	100	2.1	7	100	1	11	100	0.2
66	4.95	4.97	66	3.498	6.06	100	3.1	6.90	100	2.1	7	100	1	11	100	0.2
66	4.95	3.38	66	3.498	4.75	66	2.046	5.58	100	2.1	6	100	1	9	100	0.2
66	4.95	5.01	100	5.3	6.24	100	3.1	7.08	100	2.1	7	100	1	10	100	0.2
66	4.95	3.88	66	3.498	5.20	100	3.1	6.04	100	2.1	6	100	1	10	100	0.2
66	4.95	5.27	100	5.3	6.06	100	3.1	6.90	100	2.1	6	100	1	10	100	0.2
33	2.475	0.98	1	0.053	1.77	33	1.023	2.42	66	1.386	3	66	0.66	6	100	0.2
66	4.95	3.26	66	3.498	4.46	66	2.046	5.30	100	2.1	6	100	1	9	100	0.2
1	0.075	1.16	33	1.749	1.93	33	1.023	2.69	66	1.386	2	33	0.33	5	66	0.132
33	2.475	1.88	33	1.749	2.89	66	2.046	3.57	66	1.386	5	66	0.66	8	100	0.2
1	0.075	1.49	33	1.749	2.69	66	2.046	3.53	66	1.386	4	66	0.66	8	100	0.2
1	0.075	1.11	33	1.749	1.91	33	1.023	2.66	66	1.386	5	100	1	9	100.0	0.2
33	2.475	1.74	33	1.749	2.89	66	2.046	3.71	66	1.386	5	100	1	8	100.0	0.2
1	0.075	1.58	33	1.749	2.78	66	2.046	3.62	66	1.386	4	66	0.66	8	100.0	0.2
1	0.075	1.56	33	1.749	2.43	66	2.046	3.21	66	1.386	4	66	0.66	6	100.0	0.2
1	0.075	0.46	1	0.053	1.65	33	1.023	2.49	66	1.386	2	66	0.66	6	100	0.2
1	0.075	1.71	33	1.749	2.91	66	2.046	3.75	66	1.386	4	66	0.66	7	100	0.2
33	2.475	2.57	66	3.498	3.77	66	2.046	4.61	66	1.386	5	100	1	9	100	0.2
0	0	0	0	0	0.34	1	0.031	1.18	33	0.693	2	66	0.66	6	100	0.2
66	4.95		66	3.498		66	2.046		100	2.1	5	100	1	9	100	0.2
		3.48			4.68			5.52								
0	0	0.80	1	0.053	2.00	66	2.046	2.84	66	1.386	3	66	0.66	7	100	0.2
0	0	0.00	0	0	0.24	1	0.031	1.08	33	0.693	2	66	0.66	6	100	0.2
0	0	0.00	0	0	0.00	0	0	0.60	1	0.021	1	33	0.33	5	100	0.2
66	4.95	3.29	66	3.498	4.49	66	2.046	5.33	100	2.1	5	100	1	9	100	0.2
1	0.075	1.52	33	1.749	2.72	66	2.046	3.56	66	1.386	5	100	1	8	100	0.2
66	4.95	2.97	66	3.498	4.17	66	2.046	5.01	100	2.1	5	100	1	8	100	0.2
0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	66	0.132
66	4.95	5.25	100	5.3	6.45	100	3.1	7.29	100	2.1	7	100	1	11	100	0.2
66	4.95	4.21	66	3.498	5.41	100	3.1	6.25	100	2.1	5	100	1	9	100	0.2

Appendix VII: Risk Rank Counts for Grouped Island Assets for all Scenarios

	Total	Risk (L, M, H)	2040 NOAA Int Low	2040 NOAA Int High/ 2070 NOAA Int Low/ + 1 ft SLR	Existing Tidal Flooding / + 2 ft SLR	2070 NOAA Int High/ Existing 10 YR Surge/ 2040 Tidal Flooding	2040 10 YR Surge/ + 4 ft SLR	2070 Tidal Flooding	2070 10 YR Surge	+ 7 ft SLR	Category 1	Category 2
Parcels	1,118	No Forseable Risk	987	904	378	891	32	18	13	9	240	97
		Low	67	127	682	16	942	1099	1105	1109	878	1021
		Medium	0	0	57	211	144	1	0	0	0	0
		High	64	87	1	0	0	0	0	0	0	0
Buildings	747	No Forseable Risk	732	697	469	228	145	96	56	27	253	119
		Low	10	44	272	268	482	651	691	720	494	628
		Medium	0	0	6	251	120	0	0	0	0	0
		High	5	6	0	0	0	0	0	0	0	0
Roadways	108,579	No Forseable Risk	108,519	107,008	96,607	78,542	71,978	68,360	66,788	65,385	66,435	60,595
		Low	49	1521	11799	9421	24629	40181	41791	43194	42144	47984
		Medium	0	0	0	20616	11972	38	0	0	0	0
		High	11	50	173	0	0	0	0	0	0	0
Shorelines	25,823	No Forseable Risk	25,823	25,823	25,810	25,618	24,900	21,847	16,719	9,789	7,143	1
		Low	0	0	5	156	910	3,973	9,104	16,034	18,680	25,822
		Medium	0	0	5	49	13	3	0	0	0	0
		High	0	0	3		0	0	0	0	0	0
Surface waters	40.4	No Forseable Risk	30.4	30.4	30.4	30.4	30.4	30.4	30.4	30.4	28.4	28.4
		Low	0	0	0	0	0	10	10	10	12	12
		Medium	0	0	0	10	10	0	0	0	0	0
		High	10	10	10	0	0	0	0	0	0	0

FLOOD VULNERABILITY AND FUTURE CONDITIONS

Captiva, FL

APTIM

AGENDA

Background and Data Collection

Flooding- Causes and Scenarios for Captiva

Critical Asset inventory and Data Collection

Flood Exposure Analysis

Extent of Potential Inundation Under Various Flood Scenarios

(SLR, tidal flooding, storm surge, 100- and 500-Year Flood Events)

Critical Asset Sensitivity Analysis

Impact of inundation for each inundation tipping point scenario

Risk Matrix

Risk determination for assets based on likelihood and impact

Adaptation Action Areas

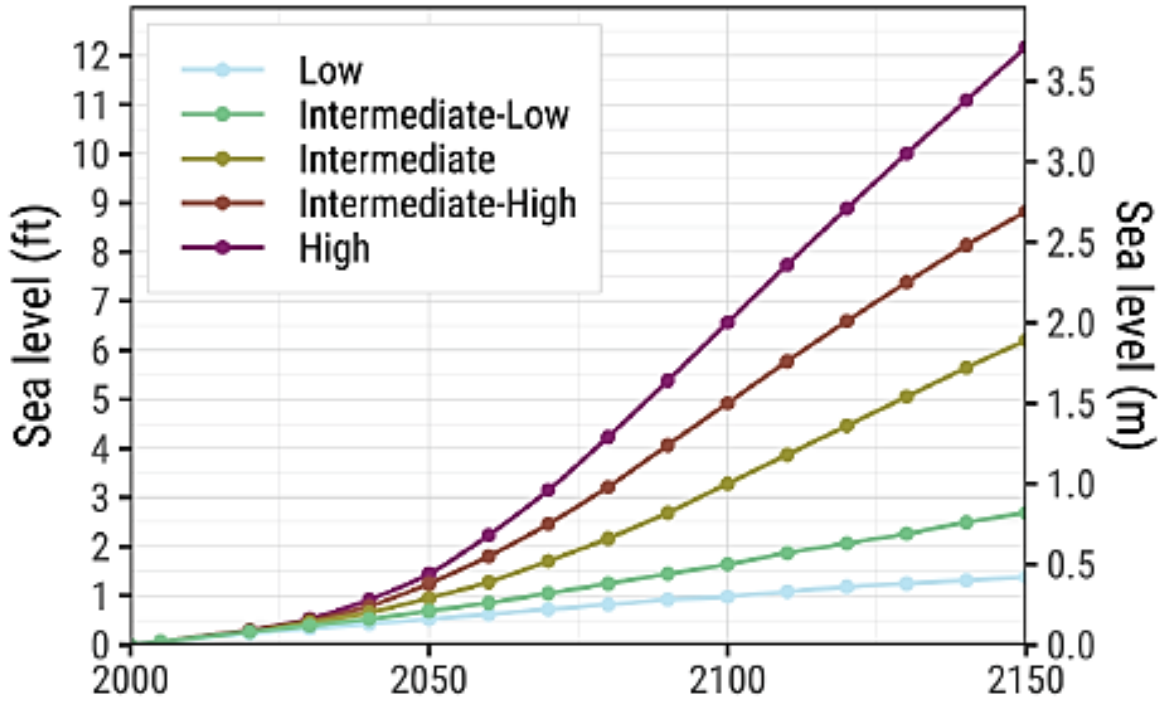
Areas and assets most at risk for inundation

BACKGROUND

SEA LEVEL RISE

- Global warming is causing global mean sea level to rise in two ways.
  - Thermal expansion caused by warming of the ocean (water expands as it warms)
  - Increased melting of land-based ice (glaciers and ice sheets)
- The ocean is absorbing more than 90 percent of the increased atmospheric heat associated with emissions from human activity.
- Sea level plays a role in flooding, shoreline erosion, and hazards from storms.
- Higher sea level also means more frequent high-tide flooding or “nuisance flooding”

THE GLOBAL PICTURE

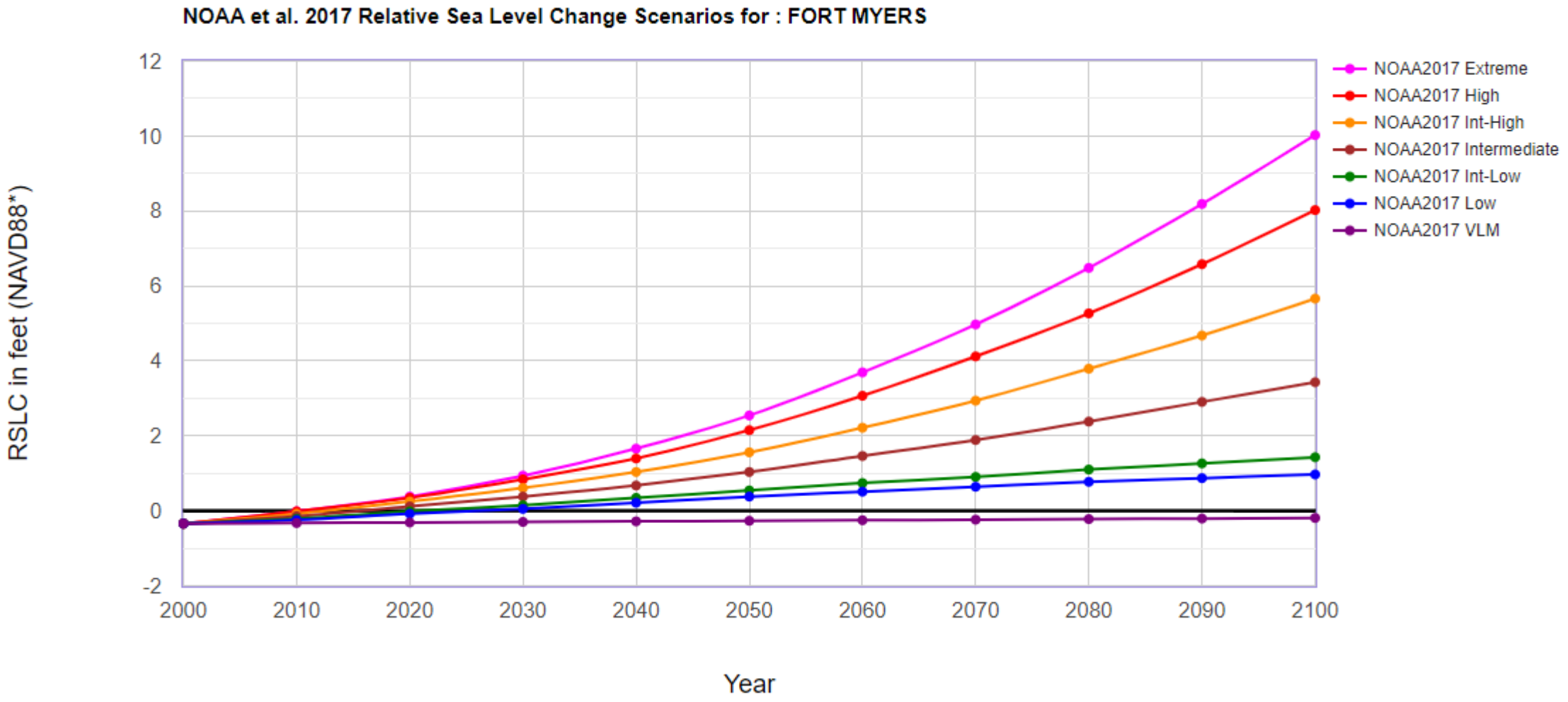


	Year		
Scenario	**2050**	**2100**	**2150**
Low	0.5	1.0	1.4
Intermediate-Low	0.7	1.6	2.7
Intermediate	1.0	3.3	6.2
Intermediate-High	1.2	4.9	8.8
High	1.4	6.6	12.2

Units in feet relative to year 2000

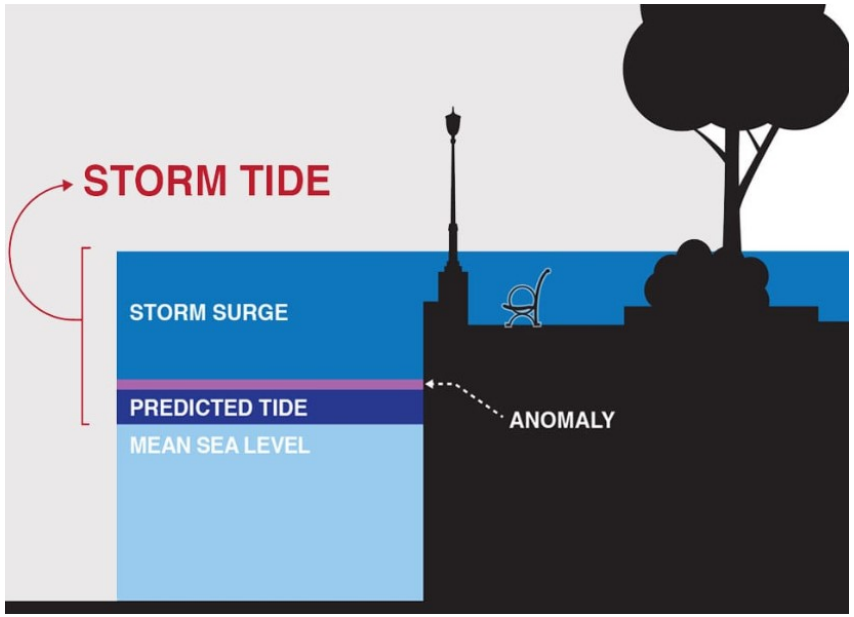
Global sea level rise scenarios from the 2022 Sea Level Rise Technical Report, including projected values for the years 2050, 2100, and 2150. All values are referenced to a year 2000 baseline.

THE LOCAL PICTURE



STORM SURGE

- Storm surge is the rise in seawater level caused solely by a storm.
- The surge is caused primarily by a storm's winds pushing water onshore.
- Higher sea levels mean that storm surges push farther inland than they once did.



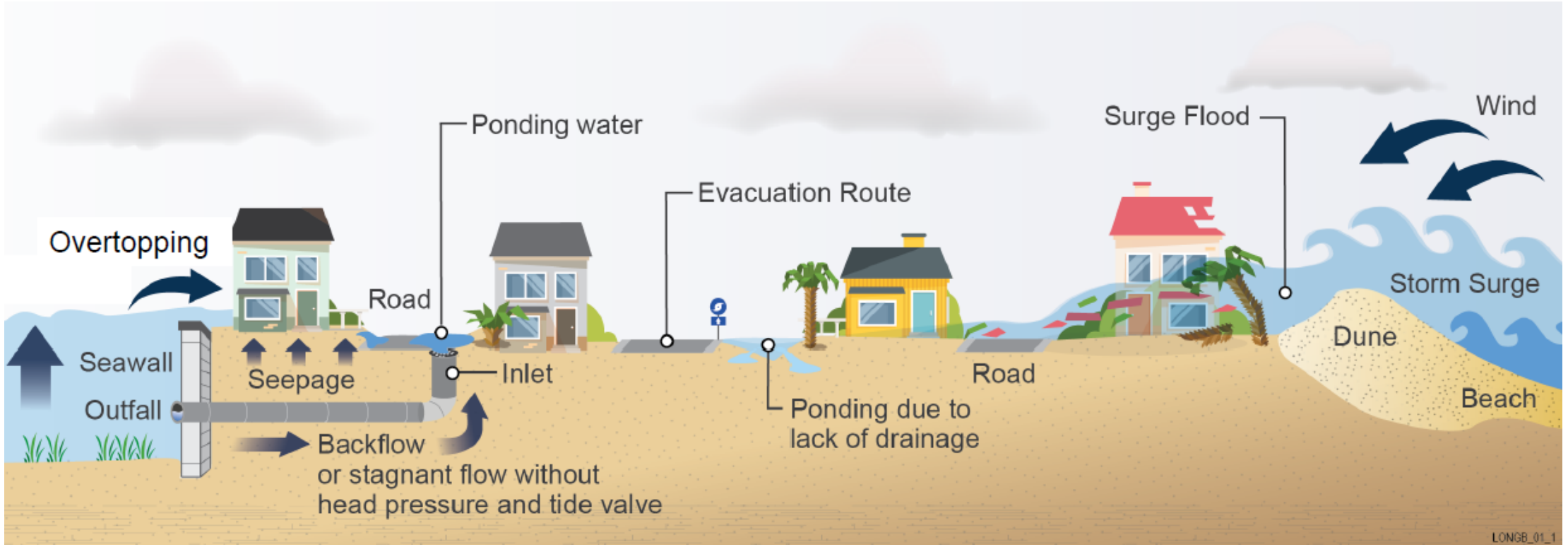
RAINFALL

- Inland flooding caused by rainfall occurs as the result of:
  - Steady rainfall over several days.
  - A short and intense period of rainfall, often associated with a storm or hurricane.

COMPOUND FLOODING

- Compound flooding results from **two or more flooding sources** occurring simultaneously or subsequently within a short period of time.
- The combination of flood sources (storm surge, sea level rise, and heavy rainfall) can lead to higher inundation levels.
- Often the result of major storms or hurricanes.

CAPTIVA VULNERABILITY



VULNERABILITY ASSESSMENT TO PREDICT AND BETTER PLAN FOR IMPACTS

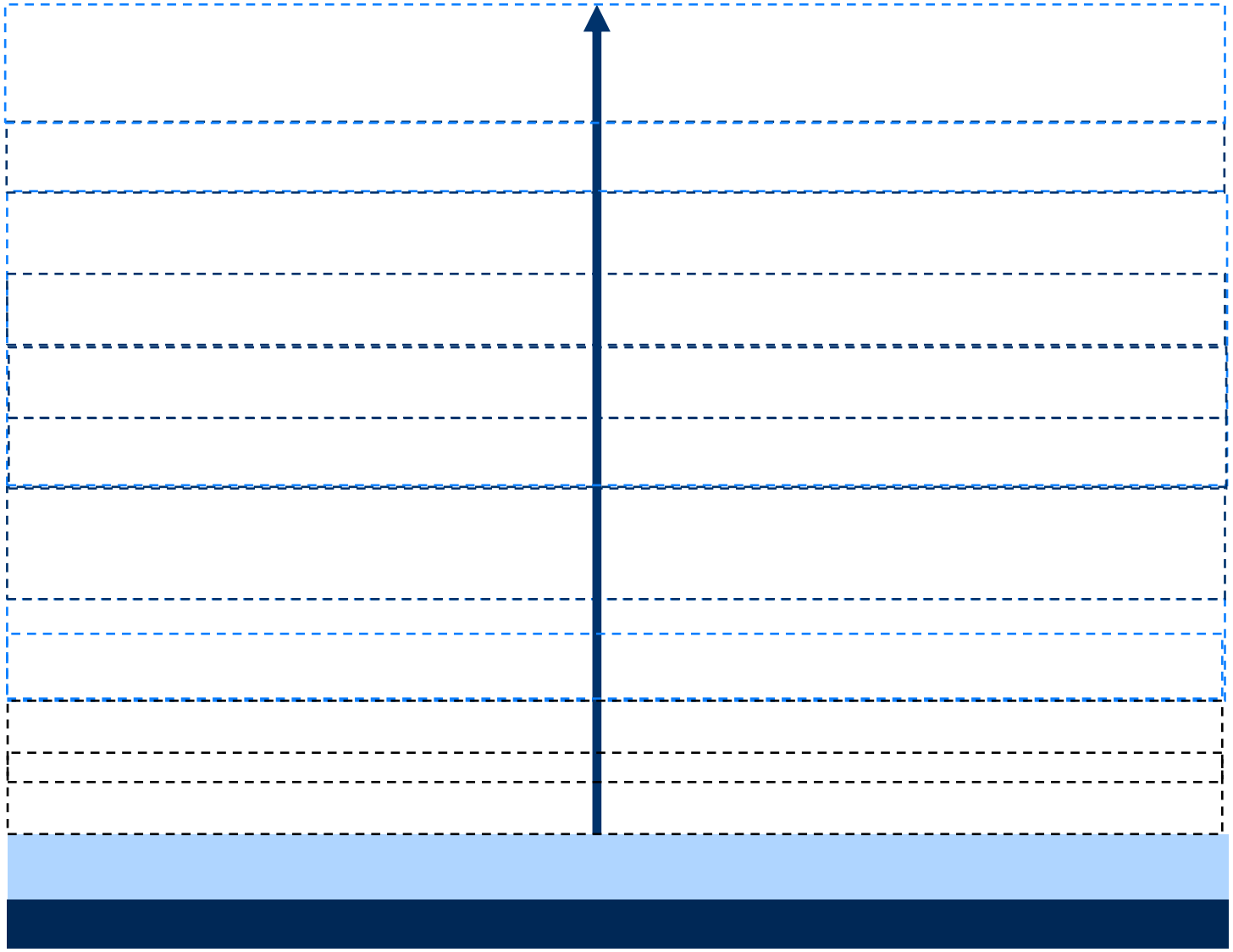
- **Funding:** Florida Department of Environmental Protection (FDEP) Resilient Florida Planning Grant
  - CEPD received funding assistance to analyze and plan for flood and sea level rise vulnerabilities, as well as implement projects for adaptation and mitigation.

- **Vulnerability Assessment General Requirements:**
  - Include entire city or county and all critical assets.
  - Assess flooding using, at least, Intermediate Low and Intermediate High scenarios from NOAA 2017 for at least 2040 and 2070.
  - Address tidal flooding, including future high tide flooding, current and future storm surge flooding, rain-fall induced flooding to the extent practicable and compound flooding.

DATA COLLECTION AND INUNDATION TIPPING POINTS DETERMINATION

FLOOD VULNERABILITY SCENARIOS AND WATER LEVELS FOR CAPTIVA

Scenarios	Feet NAVD
2040 NOAA Int Low	0.63
2040 NOAA Int High/ 2070 NOAA Int Low/ + 1 ft SLR	1.31
Existing Tidal Flooding / + 2 ft SLR	2.28
2070 NOAA Int High/ Existing 10 YR Surge/ 2040 Tidal Flooding	3.22
2040 10 YR Surge/ + 4 ft SLR	4.28
2070 Tidal Flooding	5.24
2070 10 YR Surge	6.44
+ 7 ft SLR	7.28
100 Year Flood	8.8
500 Year Flood	11.1



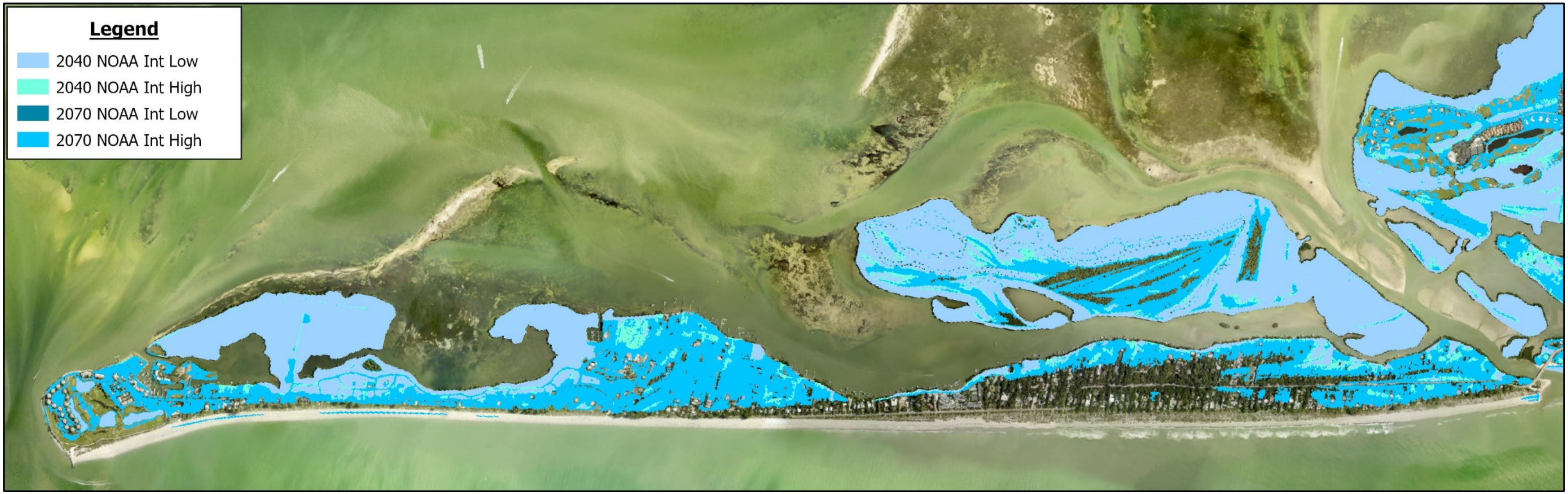
11.1 ft	Existing 500 Year Flood
8.8 ft	Existing 100 Year Flood
7.3 ft	+ 7 ft SLR
6.4 ft	2070 10 YR Surge
5.2 ft	2070 Tidal Flooding
4.3 ft	2040 10 YR Surge/ + 4 ft SLR
3.2 ft	2070 NOAA Int High/ Existing 10 YR Surge/ 2040 Tidal Flooding
2.3 ft	2017 Tidal Flooding / + 2 ft SLR
1.3 ft	2040 NOAA Int High/ 2070 NOAA Int Low/ + 1 ft SLR
0.6 ft	2040 State Required Low
0.28 ft	Mean High High Water (MHHW)
0.06 ft	Mean High Water (MHW)
-0.41 ft	Mean Sea Level (MSL)
-0.89 ft	Mean Low Water (MLW)

Feet Relative to NAVD

Flood Scenarios

Existing Tidal/ Water Levels @ Fort Myers

NOAA SCENARIO CONSOLIDATION



INUNDATION TIPPING POINT SCENARIOS

1. Existing Tidal Flooding/ +2 ft SLR
2. 2070 NOAA State Required High/ Existing 10 YR Surge/ 2040 Tidal Flooding
3. 100 Year Flood Event

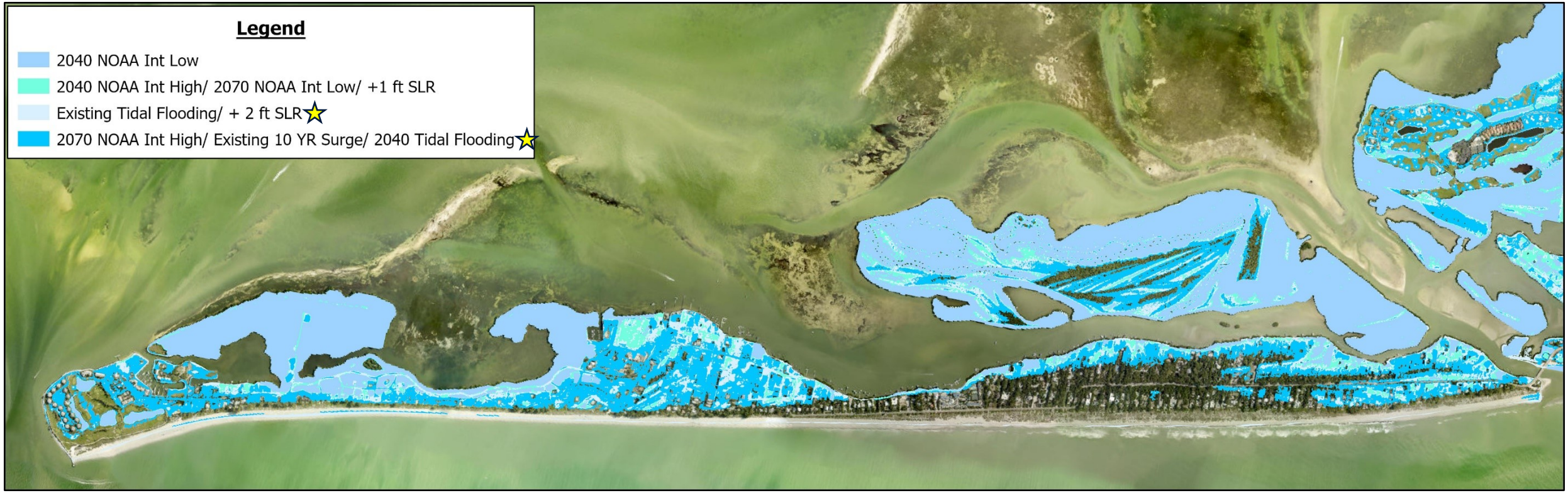
CRITICAL/REGIONALLY SIGNIFICANT ASSETS INVENTORY

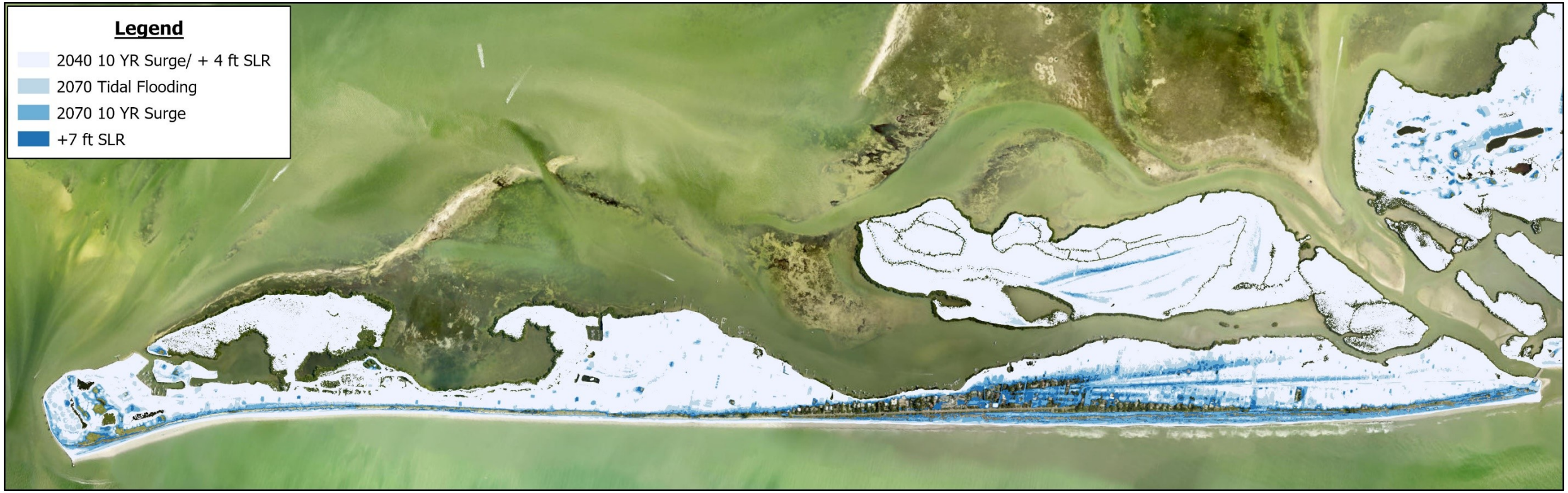
Asset Group	Assets
Critical Infrastructure	Parcels Buildings Seawalls Wastewater treatment facilities and lift stations Stormwater treatment facilities and pump stations Solid and hazardous waste facilities Drinking water facilities Communications facilities Disaster debris management sites
Transportation Assets and Evacuation Routes Sensitivity Analysis	Roadways and bridges Evacuation routes Marinas Airports, Ports, and Bases

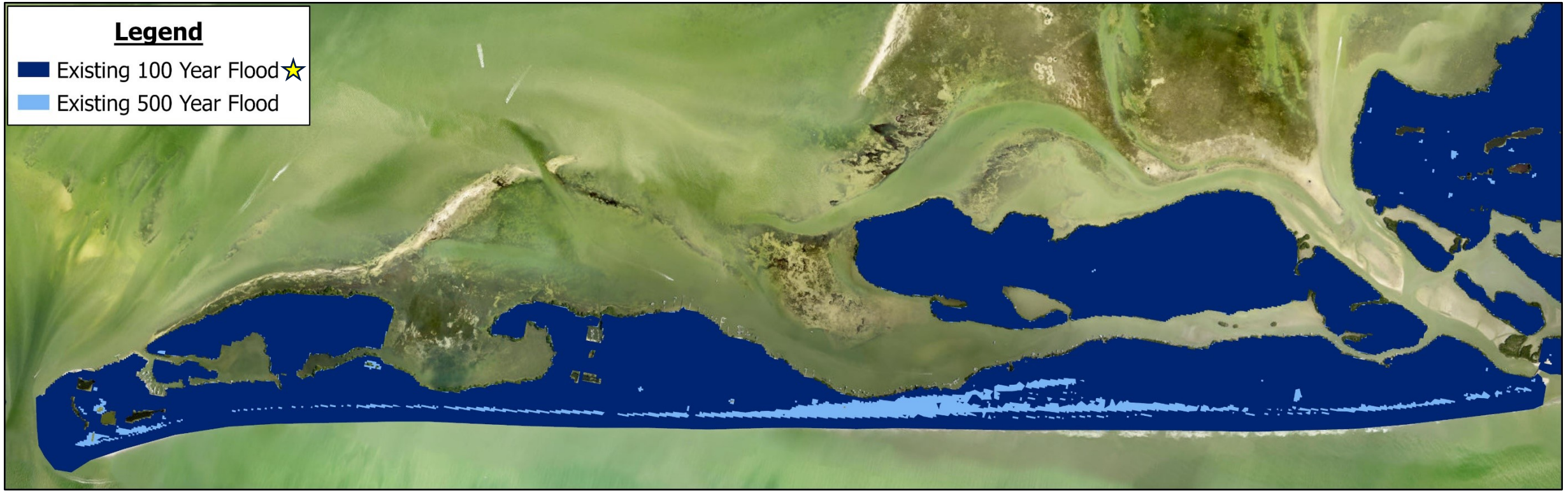
CRITICAL/REGIONALLY SIGNIFICANT ASSETS INVENTORY

Asset Group	Assets
Critical Community Facilities	Schools and colleges Community centers Correctional facilities Fire and police stations Health care facilities and hospitals Local and state government facilities Affordable public housing
Emergency Facilities	Disaster recovery centers Emergency medical service facilities Emergency operation centers Logistical staging areas Risk shelter inventory
Natural, Cultural, and Historical Resources	Conservation lands Wetlands Parks Shorelines and surface waters Historical and cultural assets

FLOOD EXPOSURE ANALYSIS

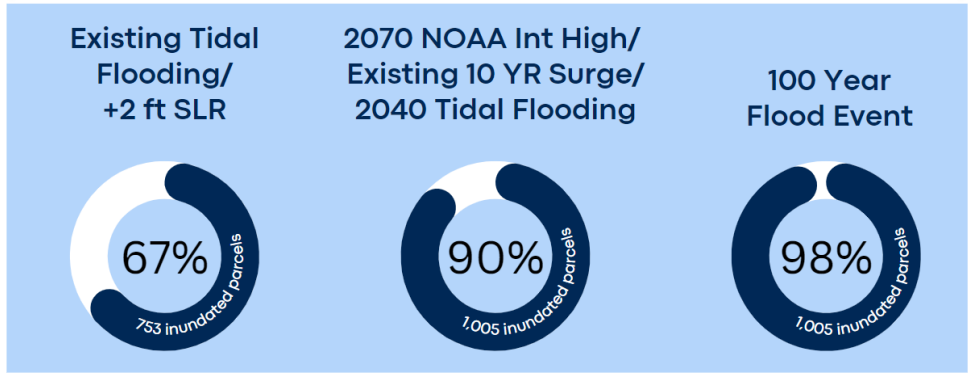


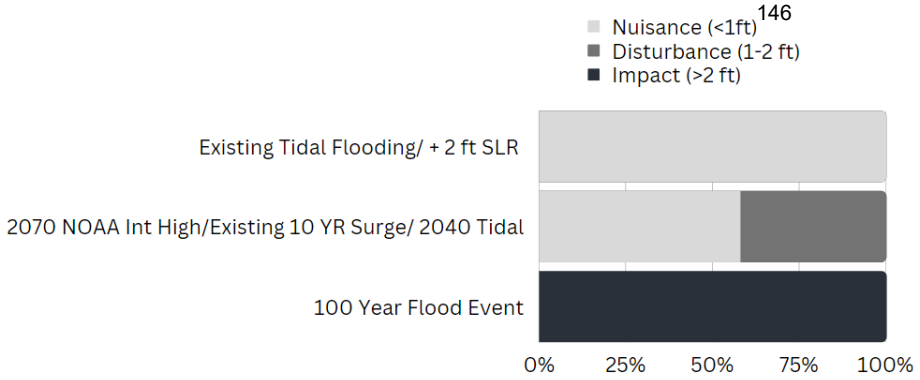


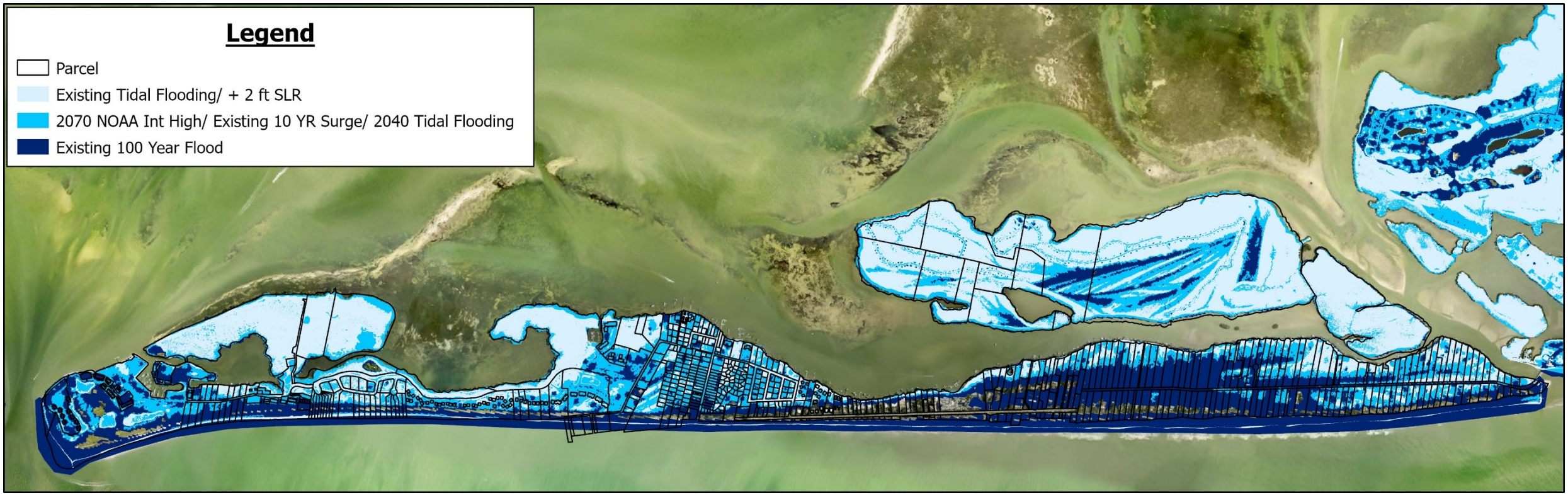


CRITICAL INFRASTRUCTURE SENSITIVITY ANALYSIS

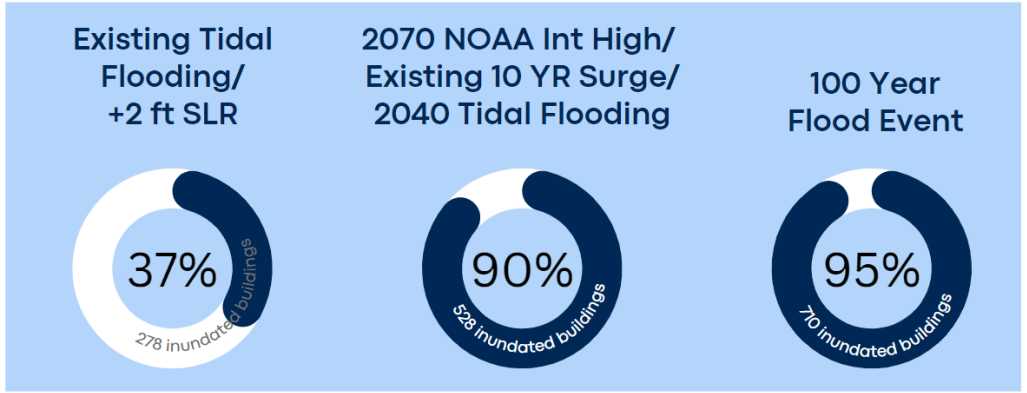
PARCELS

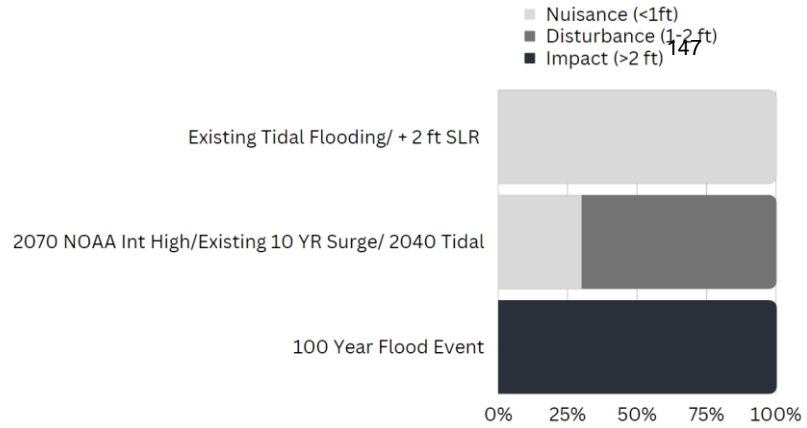


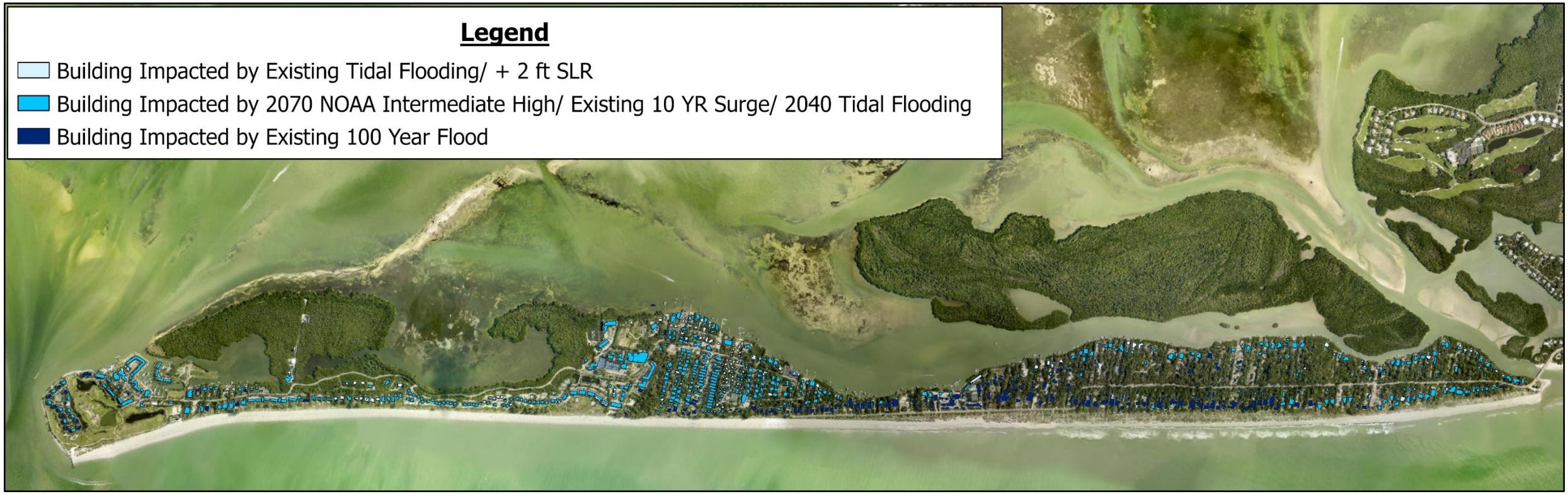




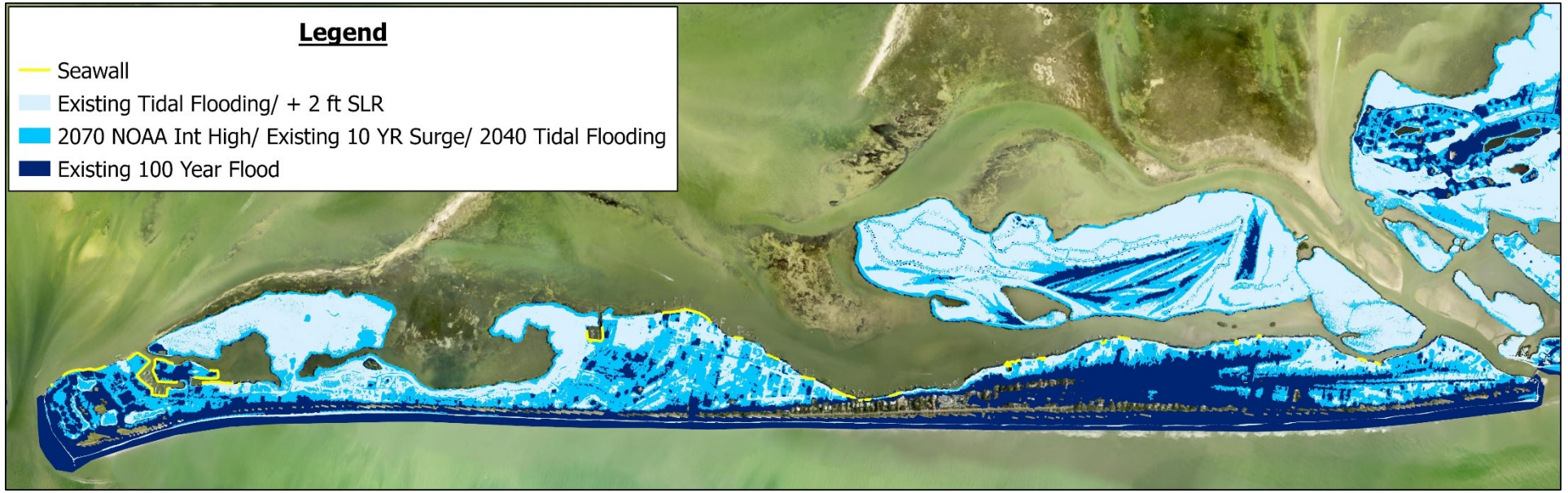
BUILDINGS







SEAWALLS



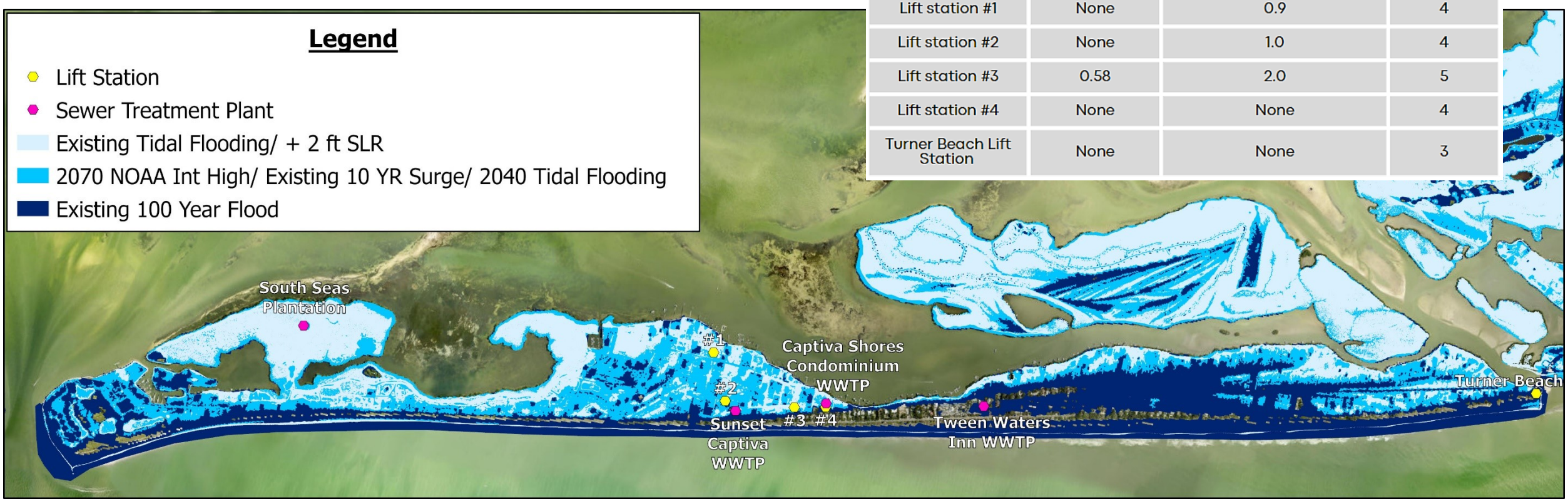
Existing Tidal Flooding/ +2 ft SLR

2070 NOAA Int High/ Existing 10 YR Surge/ 2040 Tidal Flooding

100 Year Flood Event

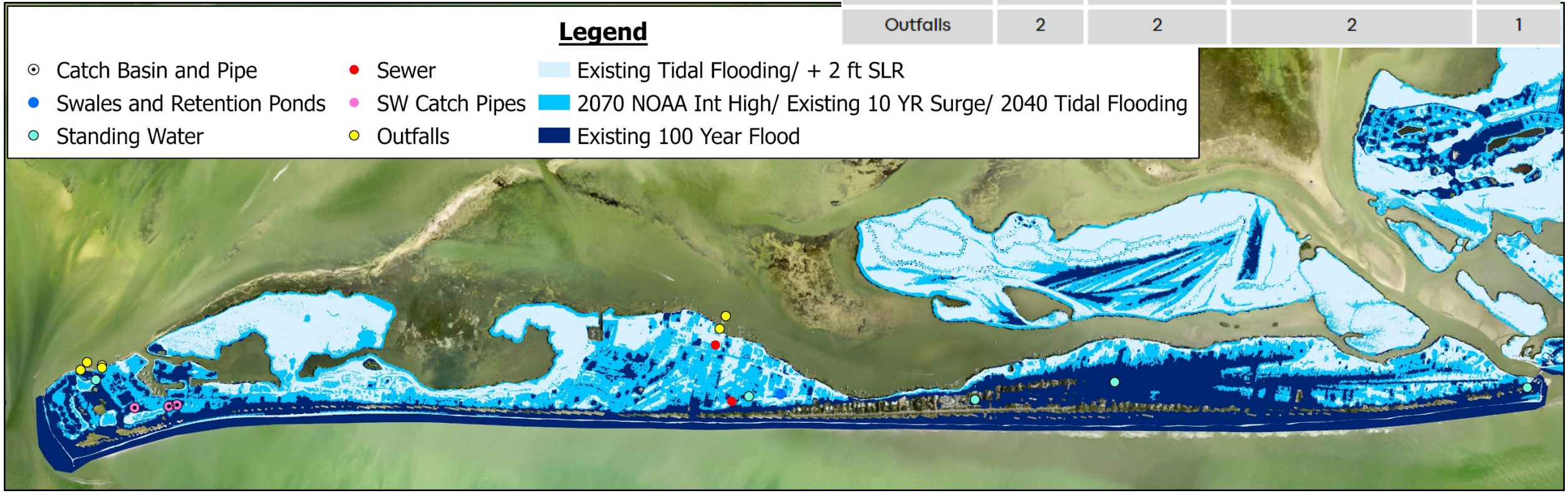
WASTEWATER TREATMENT FACILITIES AND LIFT STATIONS

Asset Location	Existing Tidal Flooding/ +2 ft SLR	2070 NOAA Int High/ Existing 10 YR Surge/ 2040 Tidal Flooding	100 Year Flood Event
South Seas Plantation	0.25	3.4	6
Tween Waters Inn	None	1.8	None
Captiva Shores Condominium	None	1.5	4
Sunset Captiva	None	0.7	3
Lift station #1	None	0.9	4
Lift station #2	None	1.0	4
Lift station #3	0.58	2.0	5
Lift station #4	None	None	4
Turner Beach Lift Station	None	None	3



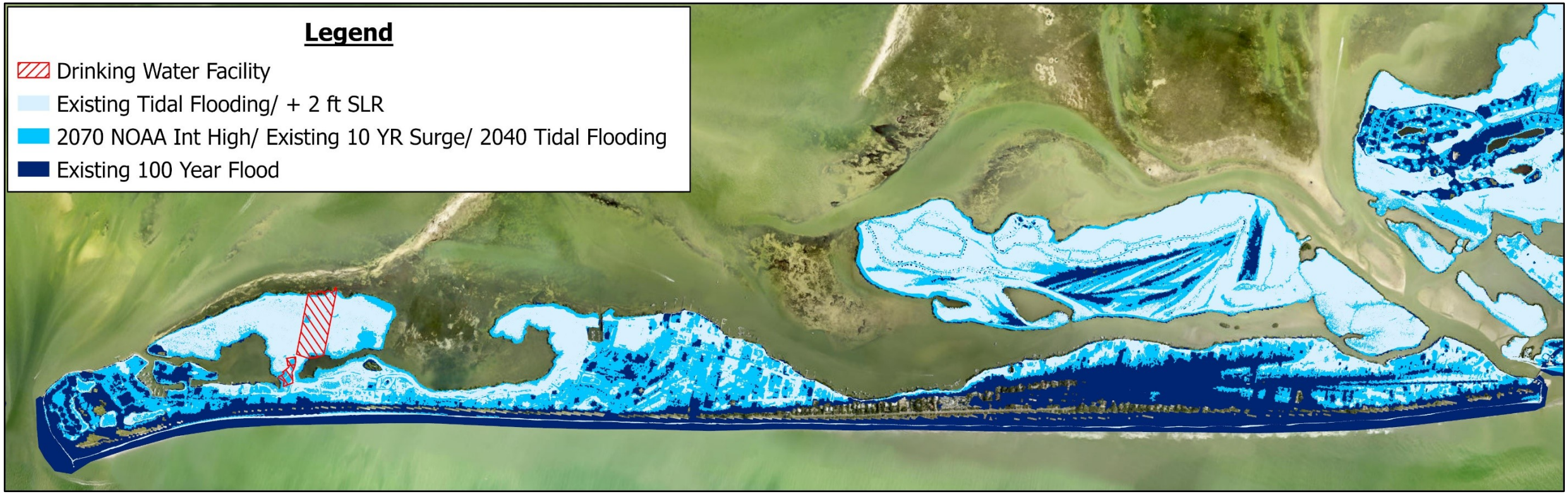
STORMWATER TREATMENT FACILITIES AND PUMP STATIONS

Type	Total Number	Existing Tidal Flooding/ +2 ft SLR	2070 NOAA Intermediate High/ Existing 10 Year Surge/ 2040 Tidal Flooding	100 Year Flood Event
Catch Basin Pipe	3	0	2	3
Swales and Retention Pond	1	1	1	1
Standing Water	6	2	2	5
Sewer	2	1	1	1
SW Catch Pipes	4	1	3	4
Outfalls	2	2	2	1



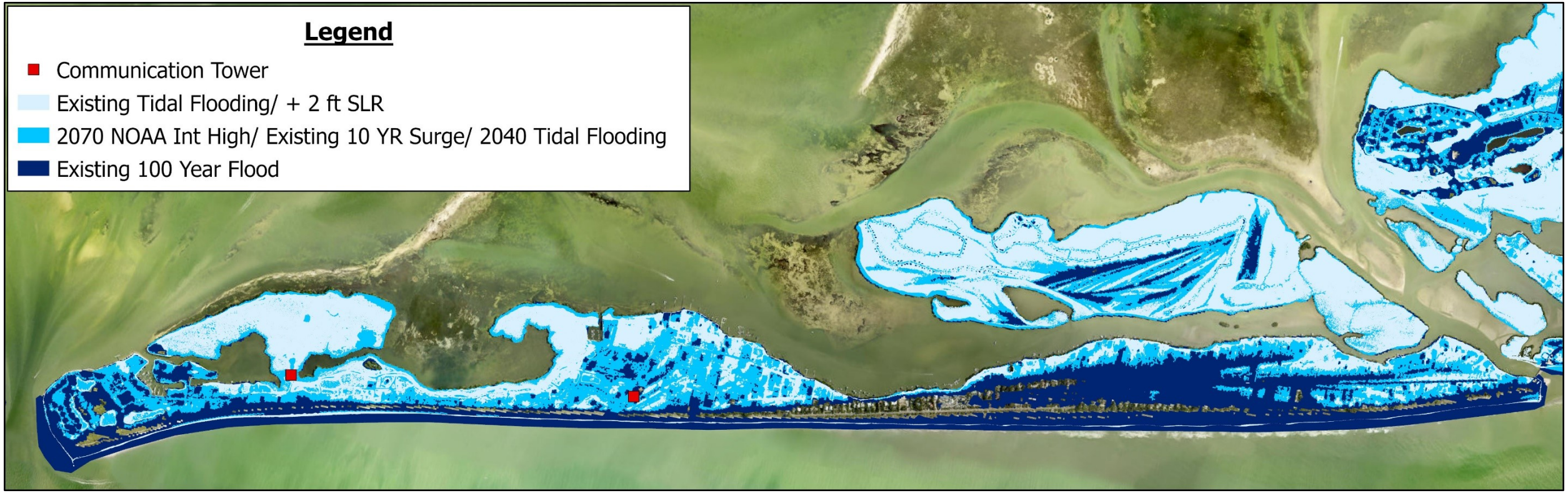
DRINKING WATER FACILITIES

1. Existing Tidal Flooding/ +2ft SLR: 1.08 feet
2. 2070 NOAA State Required High/ Existing 10 YR Surge/ 2040 Tidal Flooding: 2.25 feet
3. 100 Year Flood Event: 6.7 feet



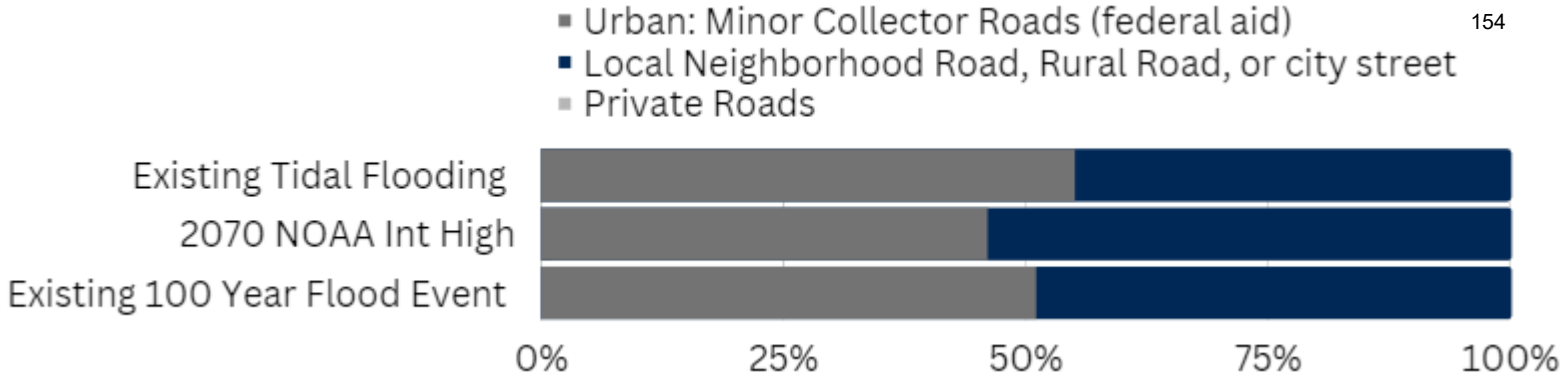
COMMUNICATIONS FACILITIES

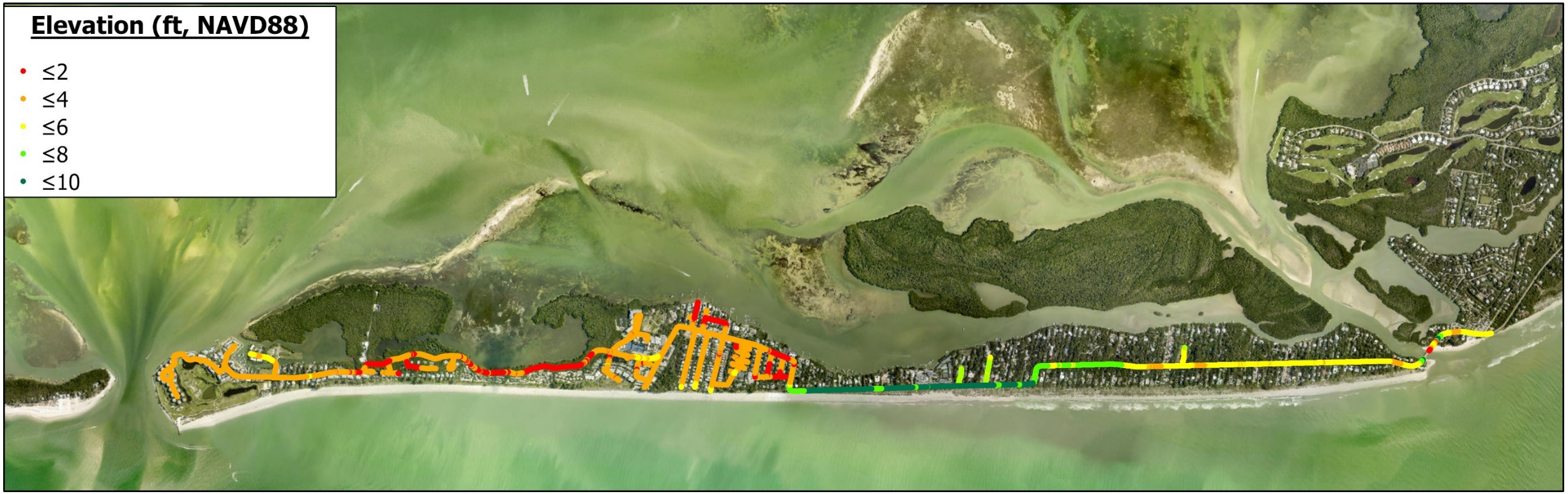
1. Existing Tidal Flooding/ +2ft SLR: 1.08 feet
2. 2070 NOAA State Required High/ Existing 10 YR Surge/ 2040 Tidal Flooding: 2.25 feet
3. 100 Year Flood Event: 6.7 feet



TRANSPORTATION ASSETS AND EVACUATION ROUTES SENSITIVITY ANALYSIS

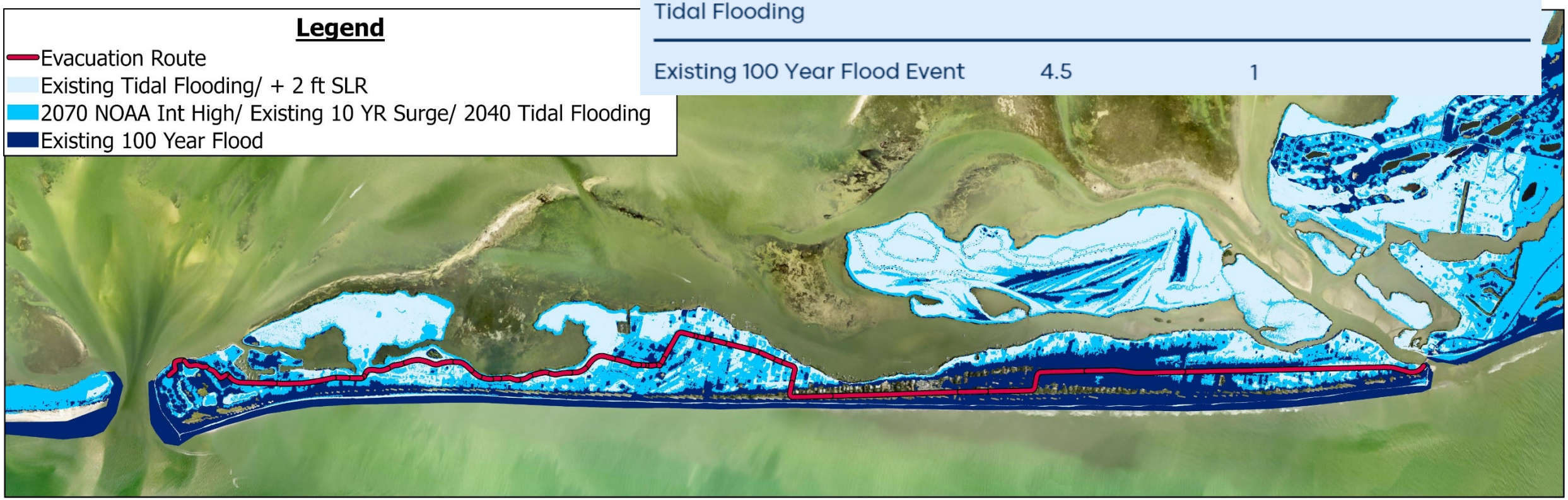
ROADWAYS



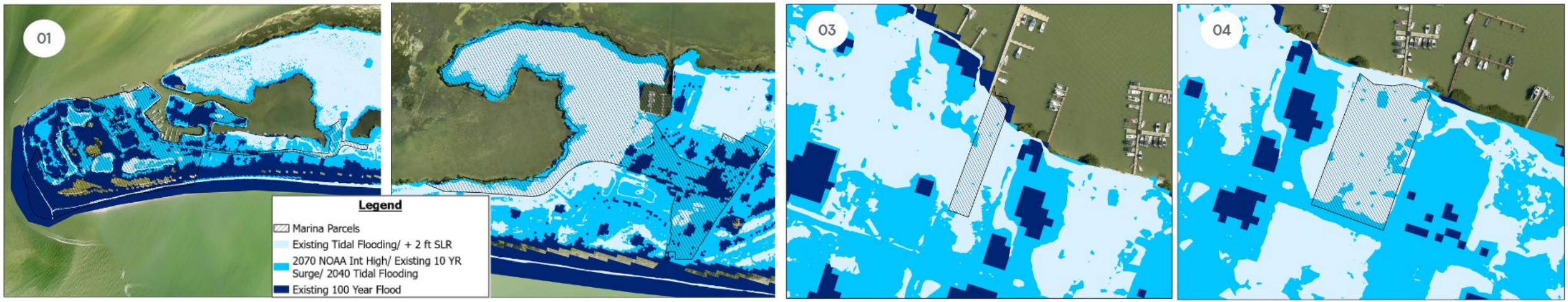


EVACUATION ROUTES

	Inundation Depth (feet)		
	Average	Minimum	Maximum
Existing Tidal Flooding	0.32	0.01	
2070 NOAA Int High/ Existing 10 YR Surge/ 2040 Tidal Flooding	1.3	0	
Existing 100 Year Flood Event	4.5	1	

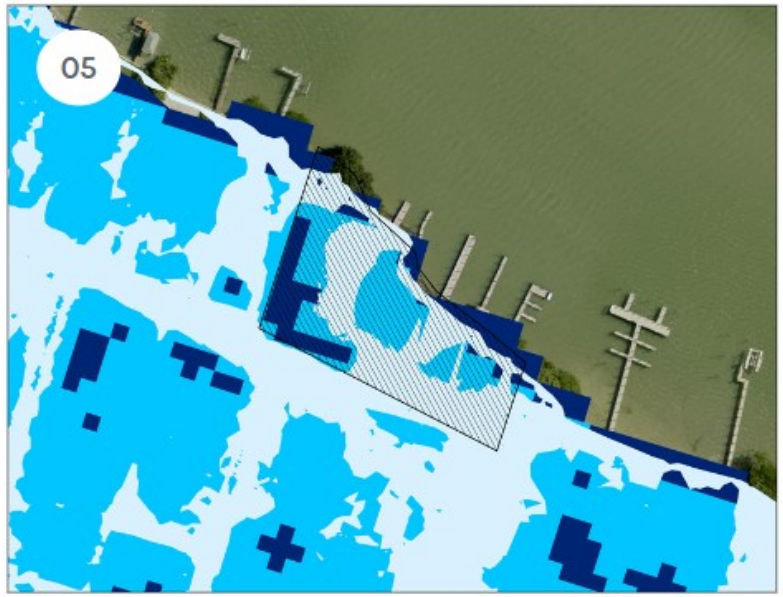


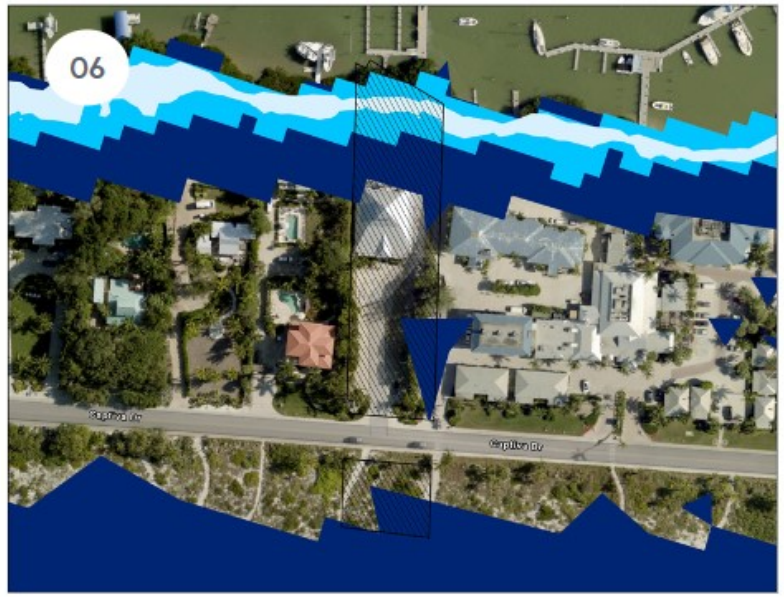
MARINAS

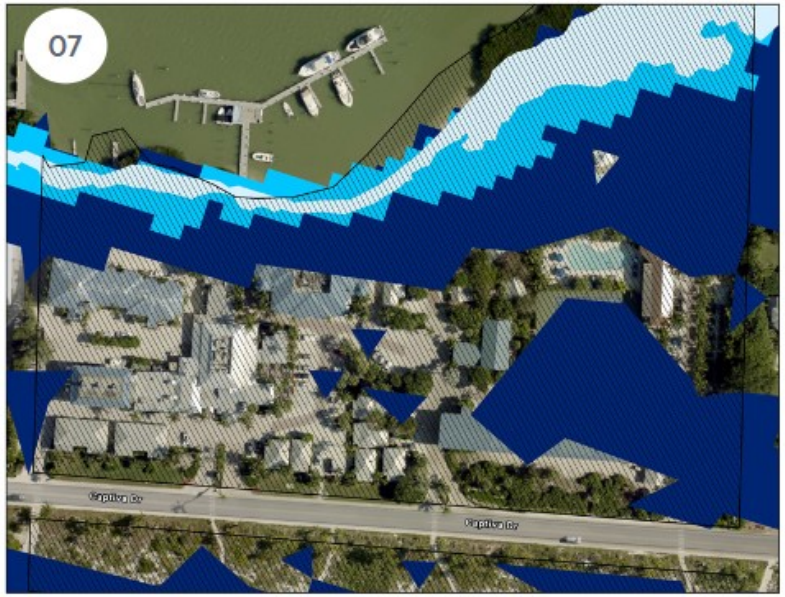


	Marina Address	Average Inundation Depth (feet)		
		Existing Tidal Flooding	2070 NOAA State Required High/ Existing 10 YR Surge/ 2040 Tidal Flooding	100 Year Flood Event
01	1057-1900 South Seas Plantation Road	0.70	1.6	4
02	2800-5640 South Seas Plantation Road	1.55	2.8	6
03	11401 Andy Rosse Lane	0.24	1.7	6
04	15107 Captiva Drive	0.32	1.7	6

MARINAS (CONTINUED)





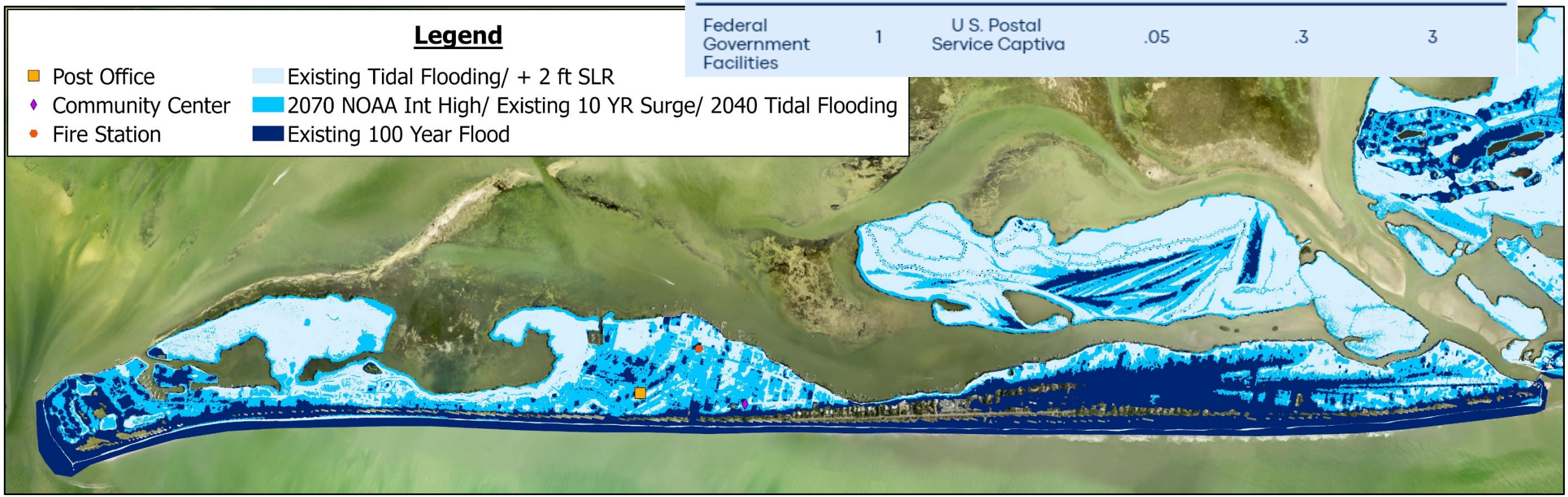


		Average Inundation Depth (feet)		
	Marina Address	Existing Tidal Flooding	2070 NOAA State Required High/ Existing 10 YR Surge/ 2040 Tidal Flooding	100 Year Flood Event
05	15183 Captiva Drive	0.23	1.5	5
06	15903 Captiva Drive	0.74	2.4	3
07	15951 Captiva Road	0.94	1.8	3

CRITICAL COMMUNITY AND EMERGENCY FACILITIES SENSITIVITY ANALYSIS

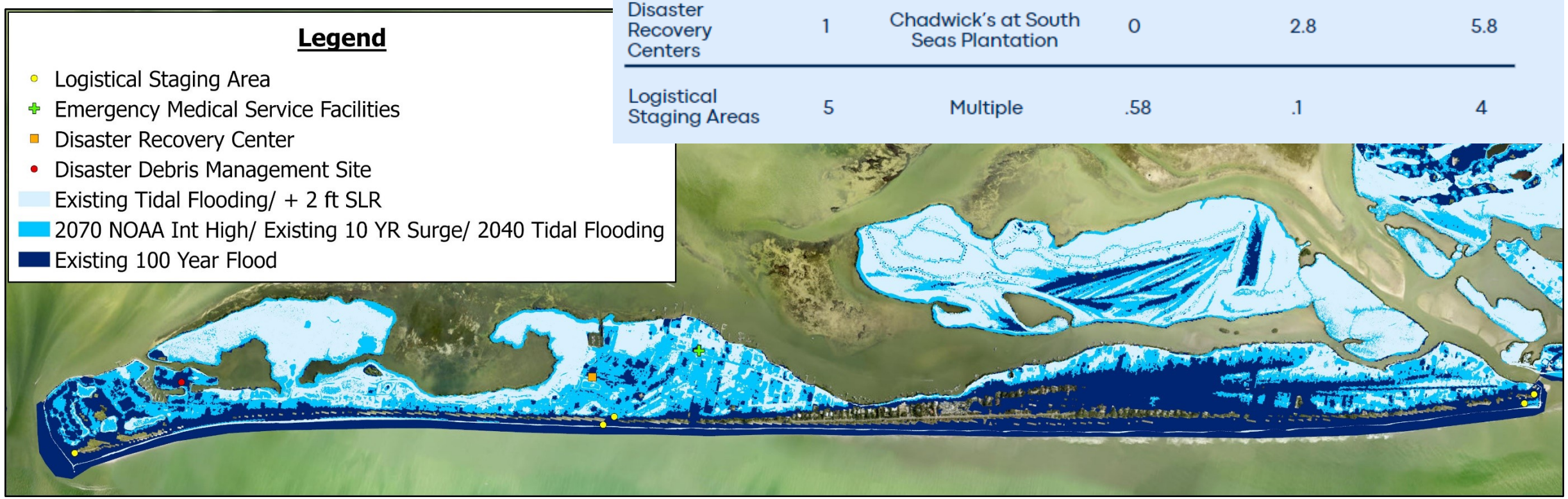
CRITICAL COMMUNITY FACILITIES

Facility Type	Island Total	Facility Name	Inundation Depth (feet) Existing Tidal Flooding/ +2 ft SLR	2070 NOAA Intermediate High/ Existing 10 Year Surge/ 2040 Tidal Flooding	100 Year Flood Event
Community Centers	1	Captiva Civic Association, Inc	.7	.7	5
Fire Stations	1	Captiva Fire -Station #181	.15	.9	3.56
Federal Government Facilities	1	U S. Postal Service Captiva	.05	.3	3



EMERGENCY FACILITIES

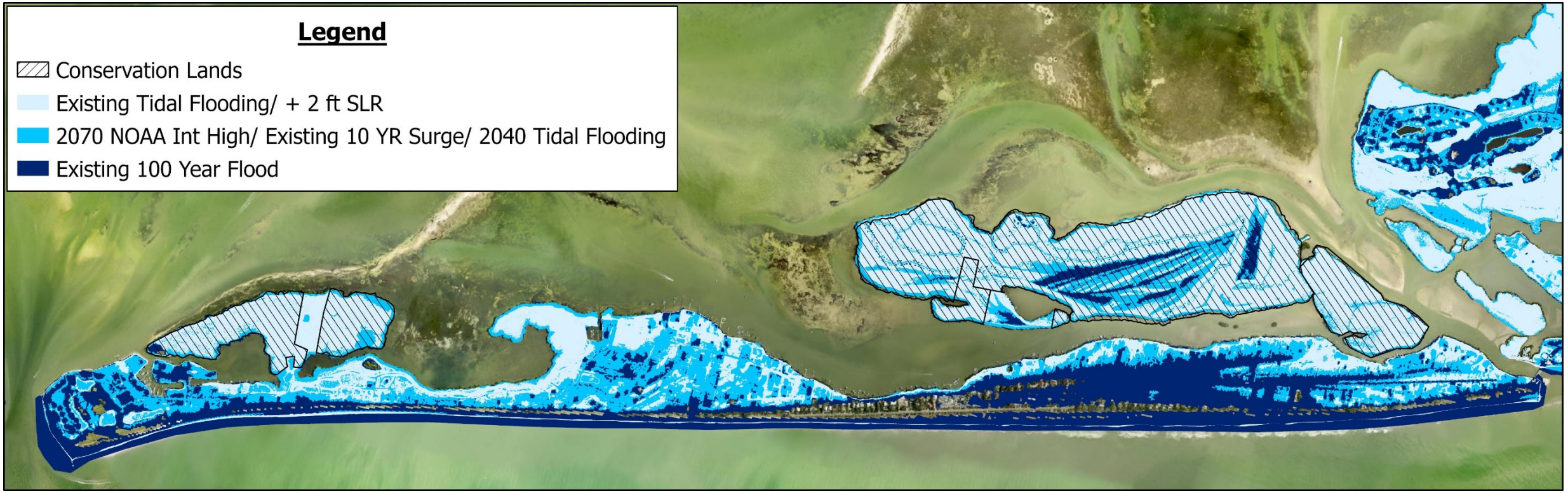
Facility Type	Island Total	Facility Name	Inundation Depth (feet) Existing Tidal Flooding/ +2 ft SLR	2070 NOAA Intermediate High/ Existing 10 Year Surge/ 2040 Tidal Flooding	100 Year Flood Event
Emergency Medical Service Facilities	1	Captiva Fire -Station #181	,15	.9	3.56
Disaster Recovery Centers	1	Chadwick's at South Seas Plantation	0	2.8	5.8
Logistical Staging Areas	5	Multiple	.58	.1	4



NATURAL, CULTURAL, AND HISTORICAL RESOURCES SENSITIVITY ANALYSIS

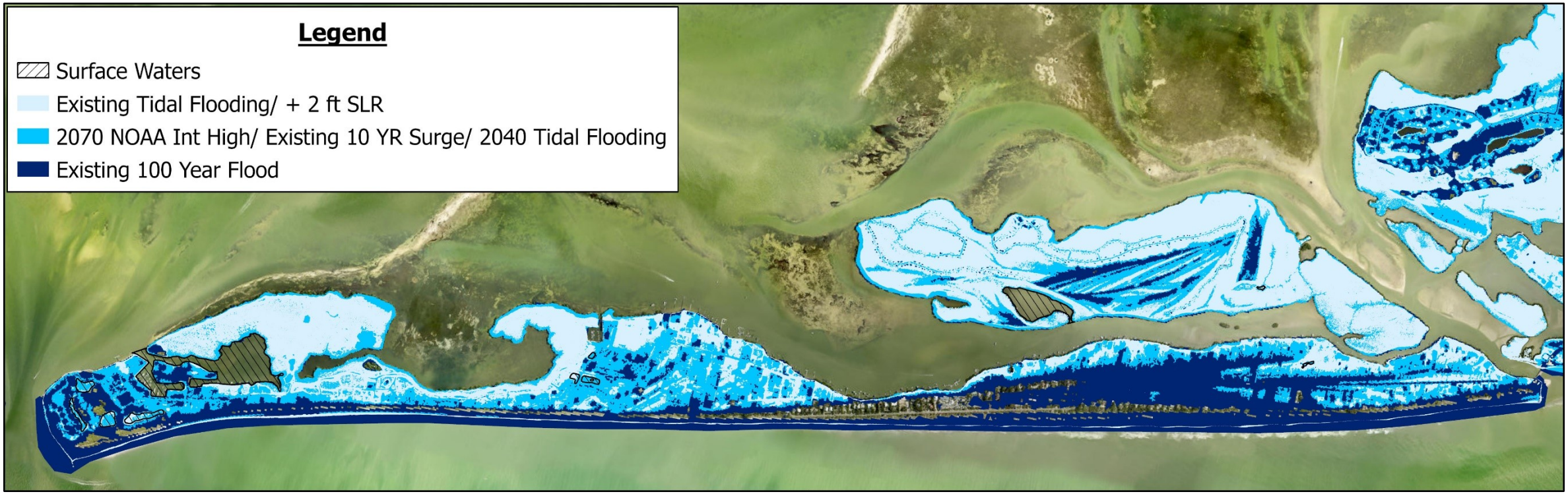
CONSERVATION LANDS

Existing Tidal Flooding/ +2ft SLR	2070 NOAA Int High/ Existing 10 YR Surge/ 2040 Tidal Flooding	Existing 100 Year Flood Event
68%	93%	100%
283.8 inundated acres	378 inundated acres	417 inundated acres

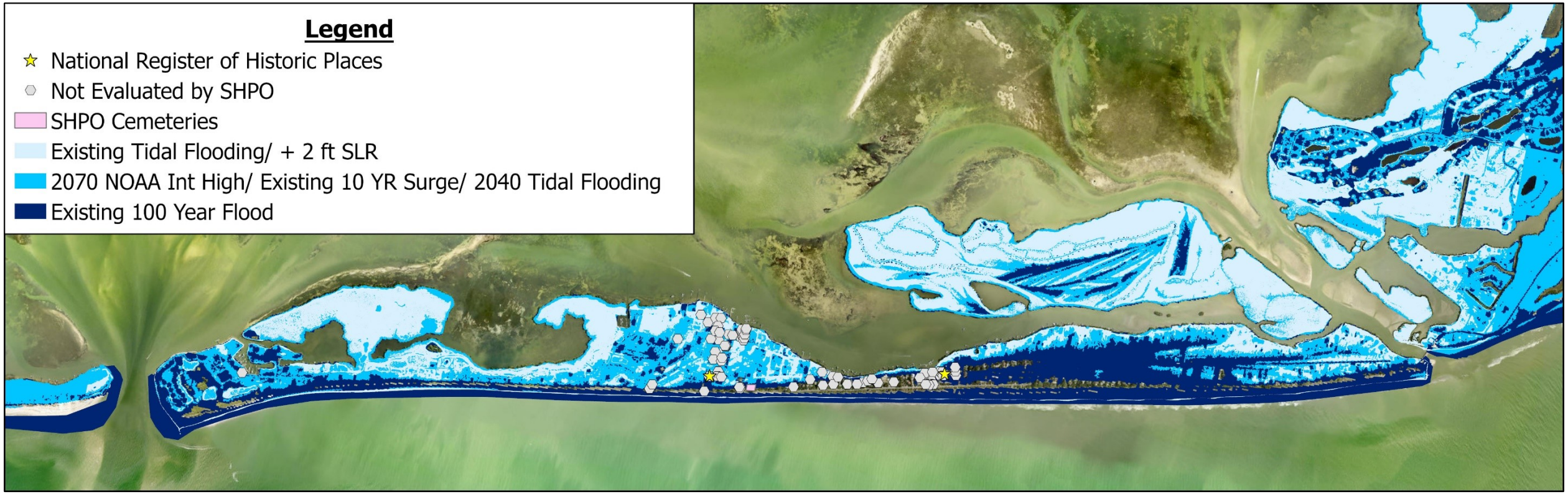


SHORELINES

SURFACE WATERS



SURFACE WATERS



RISK

METHODOLOGY

Likelihood (or probability) of a given flood scenario occurring in a year **X** **Impact Score** (based on the anticipated depth) of the asset under the given flood scenario **=** **Risk Score**

Scenario	Likelihood/ Probability
2040 NOAA Int Low	4.345
2040 NOAA Int High/ 2070 NOAA Int Low/ + 1 ft SLR	1.873
Existing Tidal Flooding/ +2ft SLR	.53
2070 NOAA Int High/ Existing 10 YR Surge/ 2040 Tidal Flooding	.143
2040 10 YR Surge/ +4 ft SLR	.075
2070 Tidal Flooding	.053
2070 10 YR Surge	.031
+ 7 ft SLR	.021
Existing 100 Year Flood	.01
Existing 500 Year Flood	.002

Inundation Depth (feet)	Impact Score
0	0
0-1 foot	1
1-2 feet	33
2-5 feet	66
>5 feet	100

Risk Score	Risk Rank
0	No Foreseeable Risk
0 -4.5	Low Risk
4.5 -20	Medium Risk
> 20	High Risk

FINDINGS

- All conservation lands and Captiva marinas prove to be at risk across all inundation tipping point scenarios, all of which are at medium risk under Scenario 2.
- The Marina located at 2800-5640 South Seas Plantation Road and the J. N. Ding Darling National Wildlife Refuge 4 are most at risk under existing tidal conditions.
- The Captiva Civic Association, Fire Station, U.S Postal Service, Captiva Heliport, South Seas Plantation WWTP, and Lift Station # 3, prove to be at risk across all tipping point scenarios
- It is important to note the assets that are under no risk across the topping point scenarios- Tween Waters Inn WWTP, Tween Waters Inn Historic District, and Sewer #2.
- Aside from these assets, all individual assets are at low risk under the inundation tipping point Scenarios 3.

FINDINGS (CONTINUED)

1 Existing Tidal Flooding/ +2 ft SLR

70% of parcels at risk (92% at ow risk)
37% of buildings at risk (98% at low risk)
11% of linear ft of roads at risk (99% at low risk)

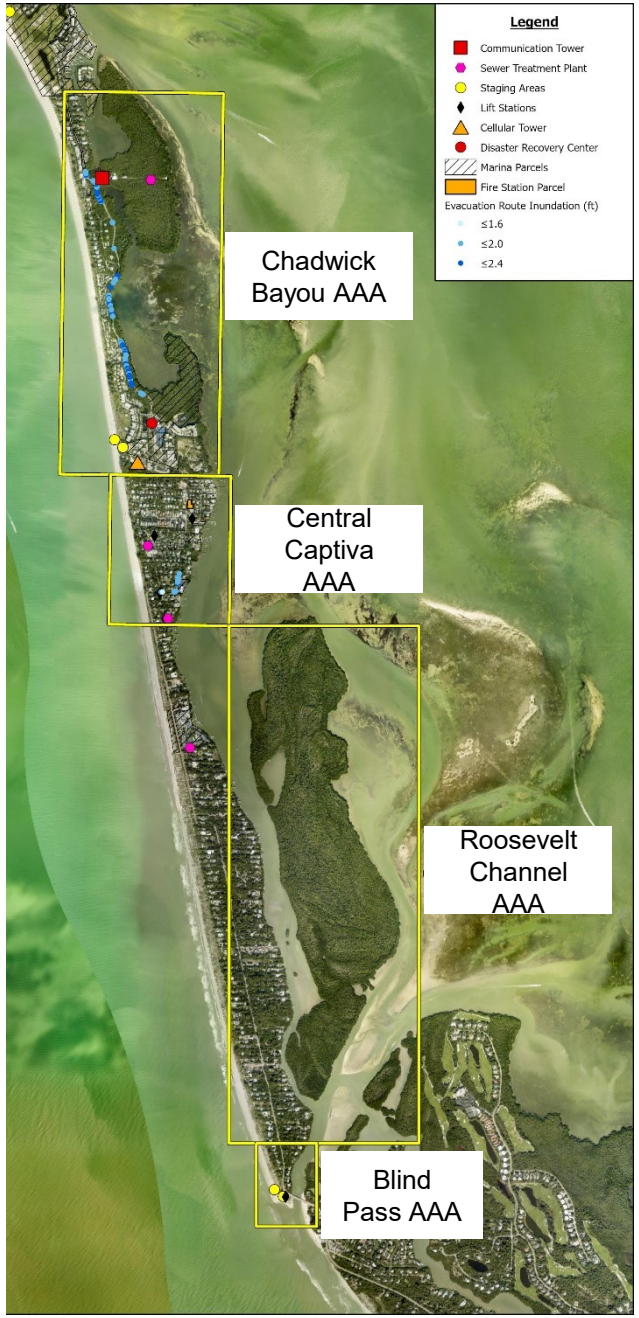
2 2070 NOAA State Required High/ Existing 10 YR Surge/ 2040 Tidal Flooding

20% of parcels at risk (7% at ow risk)
36% of buildings at risk (52% at low risk)
3% of linear ft of roads at risk (31% at low risk)

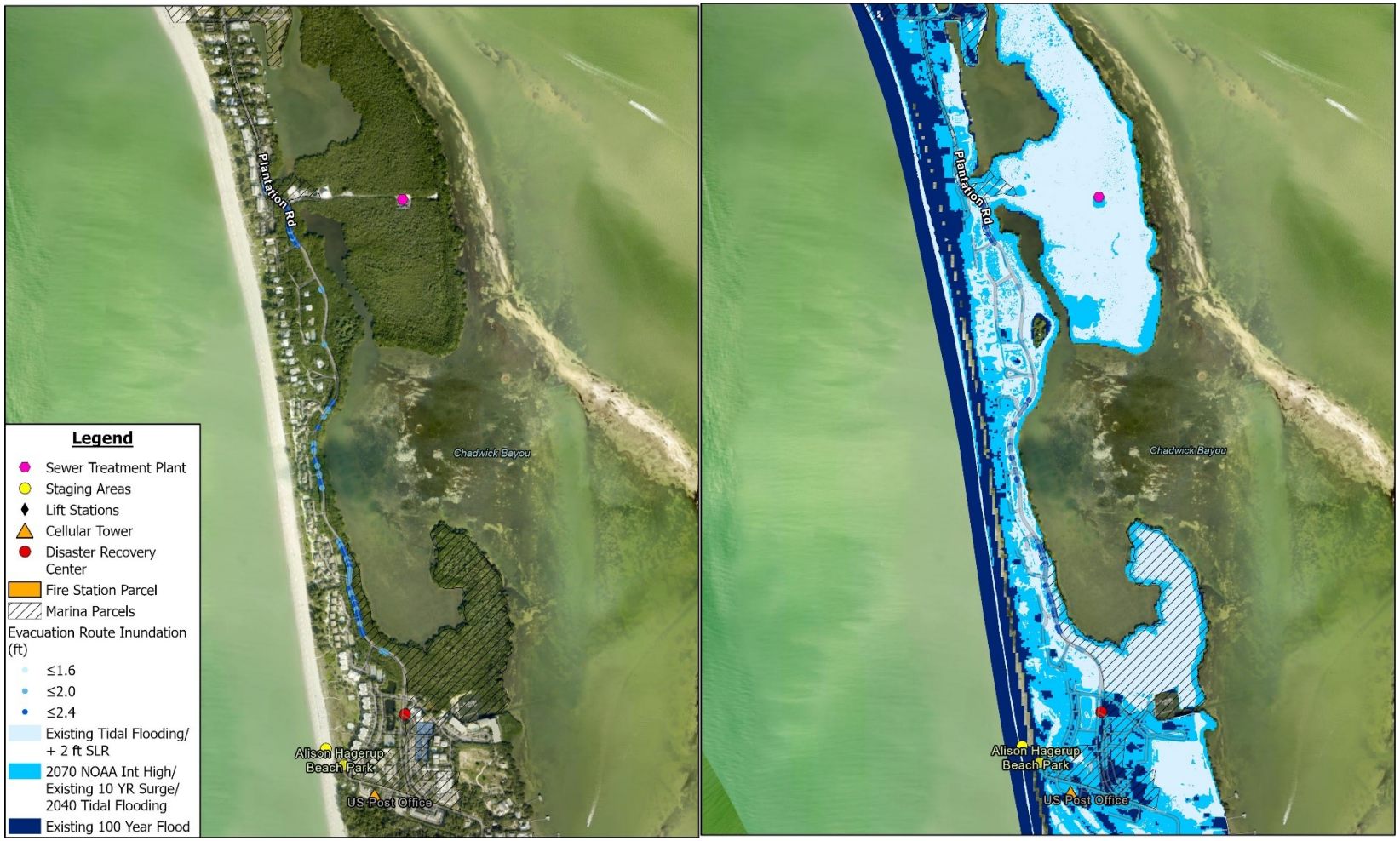
3 Existing 100 Year Flood Event

79% of parcels at risk (100% at ow risk)
66% of buildings at risk (100% at low risk)
39% of linear ft of roads at risk (100% at low risk)

ADAPTATION ACTION AREAS



CHADWICK BAYOU AAA

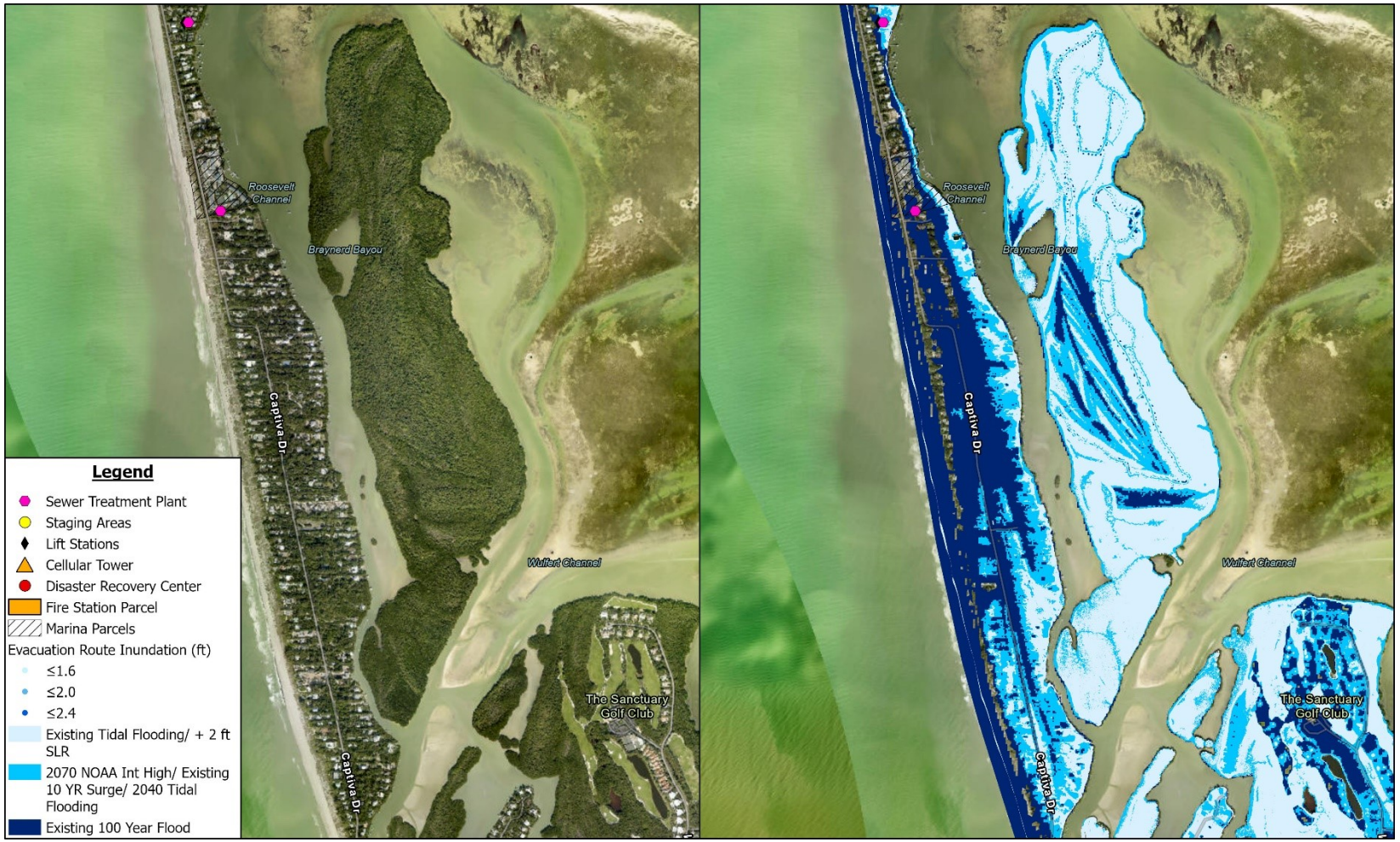


- Mangrove enhancement area
  - Sediment supply for mangroves coupled with shoreline protection (long term adaptation strategy)
- Connect mangroves or design something to allow flushing at high tide level that can be adapted over the years
- Enhance seagrass to stabilize the narrow island portion
- Elevate or protect vulnerable low-lying road segments

CENTRAL CAPTIVA AAA

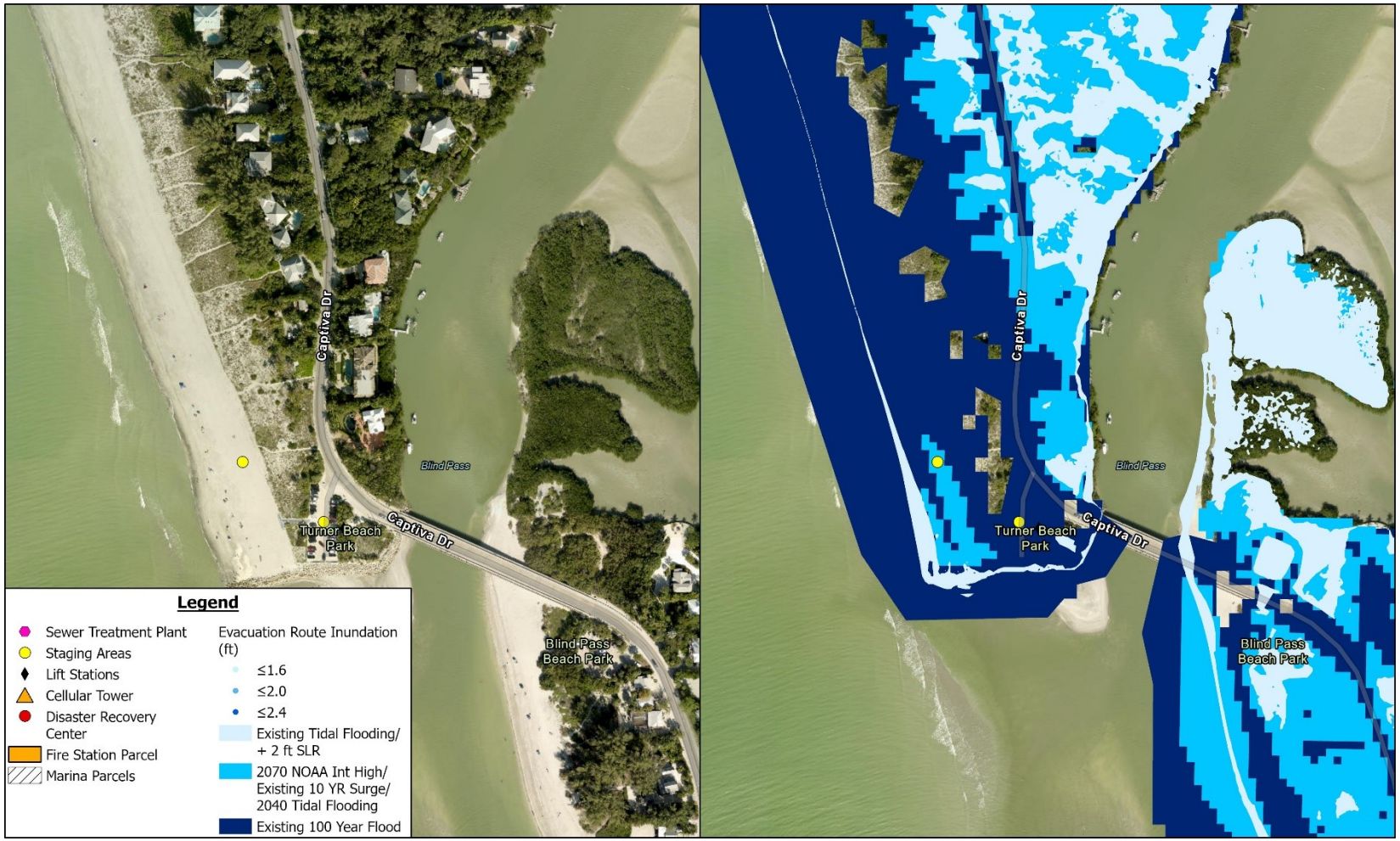
- Introduce sill or encourage seagrass between sandbars to reduce surge, wave action, and erosion at the narrowest point of the island on the backside
- Seal up vulnerable bayside area with seawalls or berms to prevent flow across property onto main road (policy)
- Harden fire station and tide valves
- Establish sill to slow surge around this area

ROOSEVELT CHANNEL AAA



- Install flood gates at North and South end of channel or focus on flood
- Elevate buildings along shoreline
- Seawalls (policy)

BLIND PASS AAA



- Seal up vulnerable bayside area with seawalls or berms to prevent flow across property onto main road (policy)

QUESTIONS

SAMANTHA DANCHUK, PHD, PE
Samantha.Danchuk@aptim.com
561 361 3199

Expect the Extraordinary.

Contact us.

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November 21, 2022

Daniel Munt, Executive Director
Captiva Erosion Prevention District
11513 Andy Rosse Lane, Unit 4
Captiva, FL 33924

Re: Proposal for Comprehensive Beach and Shore Preservation Program Resiliency Strategy & Implementation

Dear Daniel:

This letter is in response to your request for a proposal for Aptim Coastal Planning & Engineering, LLC (APTIM) to assist the Captiva Erosion Prevention District (CEPD) with development and implementation of a resilience strategy as part of the Comprehensive Beach & Shore Protection Program. Tasks will include the evaluation of shoreline adaptation strategies and pathways for implementation, policy development and coordination for seawall adaptation, modeling of bayfront shoreline alternatives to support decision-making and permitting, pre-application support for permitting the bayfront living shoreline adaptation project, development of a mangrove adaptation plan and pre-construction services for a comprehensive resilient dune project.

Scope of Work

The Sea Level Rise Vulnerability Analysis for CEPD produced in Phase 1 identified the risk of tidal flooding and storm surge along the bayfront shoreline of Captiva Island and four specific geographic areas where adaptation action would protect critical infrastructure. Results of this analysis revealed that higher frequency storm surge and mid-term sea level rise pose medium level risk to the island's assets and resources. Extreme storms and sea level rise in 2070 pose less risk comparatively given their lower likelihood of severe impacts.

Based on the findings of the analysis, APTIM has recommended that coastal infrastructure be adapted to resist flood elevations of at least 3.5 feet NAVD. Without this level of protection, evacuation routes, 27% of roads, the fire station, two water treatment facilities, the post office, the library and up to 70% of building footprints are at risk of some flooding in the near to mid-term. Adaptation is primarily the responsibility of private owners on Captiva; however, there are funding partnership opportunities that would likely assist in addressing the vulnerabilities of the evacuation route, the oceanfront shorelines and recurrent flood risks in the floodplain. In order to guide private adaptation and increase the likelihood that the community has systemic resilience to flooding, a new policy regarding tidal flood barriers along shorelines and enhancement of green infrastructure along the waterfront is recommended.

The legal authority of CEPD as researched in Phase 1 allows CEPD to pursue such projects and policy implementation as suggested. Findings demonstrate that CEPD has broad authority to implement projects to prevent erosion on beaches and shorelines with a territorial scope that encompasses the entirety of Captiva including some nearshore resources. Funding awarded to CEPD from the Florida Department of Environmental Protection (FDEP) can be used to accomplish the tasks and complete the adaptation projects presented within this proposal.

Task 1 Add Resilience Strategy to the Beach and Shore Preservation Program

Adaptation strategies concerning beach and shore restoration and erosion control will be recommended for incorporation within the Comprehensive Beach and Shore Program to provide to an appropriate extent for other aspects of beach and shore preservation. APTIM will hold sufficient public outreach opportunities to ascertain the views and feelings of affected property owners in the various parts of the District regarding the needs to be served and the manner in which they shall best be served.

Task 1a. Adaptation strategies will be evaluated based on previous analyses, existing data and coordination with the CEPD. Adaptation strategies will address tidal flooding and high frequency surge events, potential overwash along the low-lying Gulf of Mexico and bayfront shorelines, sea level rise inundation and future drainage restrictions associated with sea level rise and future environmental conditions. If feasible, adaptation strategies will be developed to derive co-benefits for community resilience including water quality improvements. Costs of various adaptation strategies will be estimated based on libraries developed as part of the U.S. Army Corps of Engineers South Atlantic Coastal Study or recent project costs. Strategies will target the identified vulnerabilities from Phase 1 which include the evacuation route, the oceanfront shorelines and recurrent flood risks in the floodplain. In addition, based on need for an alternate supply route identified after Hurricane Ian, a resilient ferry landing will be added to the list of measures for evaluation.

Task 1b. APTIM will maintain active public engagement via community outreach events and mailers, which will serve to inform the public as well as to request feedback. Potential strategies will be presented to the CEPD and public in one workshop. Direction and feedback will be incorporated into the strategies to ensure fit with the goals of the jurisdictional authorities and stakeholder community. In addition, a project dashboard/ virtual room for on demand engagement will be created for continuous project tracking and updates.

Task 1c. APTIM will develop a draft resilience strategy for the Comprehensive Beach and Shore Preservation Program, which will combine engineering protection measures, policy initiatives, and land use management strategies. Through discussion, water level elevation thresholds will be established for when regional solutions may be necessary to address inadequacies in individual/ property-scale adaptation efforts. APTIM will prepare a presentation and attend one workshop to transfer the final adaptation strategies to the public and the CEPD.

Short- and medium-term resilient capital improvement plans will be developed based on recommended beach and shore preservation adaptation strategies that CEPD would implement, the optimized sequencing of measures and anticipated funding sources. For example, adaptation strategies for areas at risk of inundation under 2-year extreme water levels would be integrated into a 5-year capital improvement plan. Similarly, strategies for adaptation to flooding that could occur under 5-year extreme water levels would be integrated into a 10-year capital improvement plan.

Task 2 Coordination for resilient tidal flood barrier/ minimum seawall elevation policy

A total of 8,557 linear feet of seawalls exists along Captiva Island, 23% of which are predicted to be impacted by existing tidal flooding conditions. The implementation of a minimum seawall elevation policy

for bayfront properties would set construction standards that ensure that seawalls contribute to coastal resilience and mitigate the effects of tidal flooding and sea level rise by preventing flood trespassing onto roads and across properties. The implementation of such a policy requires a partnership with private property owners and community engagement.

Task 2a. For the purpose of the sea level rise assessment from Phase 1, seawalls along Captiva were digitized from 2021 aerial imagery and available ground elevation data for parcels was utilized to preliminary estimate vulnerable locations along the shoreline. To determine actual seawall heights along the island, the APTIM ELEVATE tool will be employed and more accurate elevations will be extracted. This cost-effective method precludes the need for mobile LiDAR or land surveys of individual seawalls for planning purposes, allows for historic analysis and provides a baseline map for future tracking of policy implementation and remaining vulnerabilities. A dataset of seawall elevations will better inform decisions and strategies moving forward.

Task 2b. APTIM will coordinate with Lee County regarding a seawall ordinance/ land use plan amendment to establish a minimum seawall elevation for private property along tidally influenced waterways, in accordance with sea level rise predicted through 2070. APTIM will spearhead all governmental coordination, public outreach, and policy development.

Task 2c. APTIM will prepare minimum seawall elevation policy language and will provide supporting materials for review processes. Community outreach will be incorporated into the policy drafting process to assure community feedback and support is received. All community feedback will be properly documented.

Task 3 Modeling of Bayfront Living Shoreline and Existing Bayfront Erosion Protection

Storm surge that typically occurs every 10 years may cause flooding and damage to as much as 71% of building footprints along Captiva Island. The implementation of a living shoreline with resilient engineered features would mitigate some of the identified risks and provide benefits to bayfront properties and shared community infrastructure. More specifically, a vegetated shoreline habitat would reduce wave damage to infrastructure and mitigate erosion along bayfront properties while providing ecosystem services. Over time, a bayfront living shoreline would also help improve the water quality in the relevant area. A resilient living shoreline may also incorporate impermeable barriers to mitigate tidal flooding where feasible. Since the bayfront shoreline is privately owned, visualization of options of a bayfront living shoreline and assessment of its performance, potential impacts and benefits would support outreach to obtain shoreline owners' support for implementation prior to advancing the permitting process. Additionally, modeling would likely be a requirement for permitting.

Task 3a. APTIM will perform hydrodynamic modeling using DELFT3D+SWAN to evaluate the performance, benefits and impacts of two bayfront living shoreline alternatives on adjacent upland, shorelines and wetlands. Model results will assist in the refinement of strategy, provide additional detail related to the risks of future high frequency flooding, provide justification for funding applications and partnerships and support the permitting process for initial adaptation projects. Simulations will include future flood scenarios based on water levels representing annual tidal flooding event and a 10 year storm surge scenario in the future under the NOAA Intermediate High scenario (or alternative scenario). A report documenting the model setup, scenario development and results will be delivered.

Task 3b. Model mangrove sustainability and shoreline erosion with sea level rise will be performed utilizing NOAA's Sea Level Affecting Marshes Model (SLAMM). This modeling will simulate potential impacts

of long-term sea level rise on mangrove wetlands and shorelines. Modeling results will be discussed in a report.

Task 4 Mangrove adaptation plan

Mangroves located near Captiva provide various ecosystem services to the island including shoreline protection from storm and hurricane winds, waves, and floods and erosion prevention. The tangled root systems of the mangroves stabilize sediments, and their filtration system helps to improve water quality and clarity. APTIM recommends that CEPD create and implement a Mangrove Adaptation Plan to protect and sustain the mangroves in close proximity to the island in order to secure these services support the island in the future.

Task 4a. Results from the Task 3 modeling will be utilized to forecast trends of mangrove growth and/ or deterioration in response to sea level rise. If applicable, additional factors that affect mangrove sustainability will be considered. APTIM will generate maps from the modeling results that depict a visual sequence of mangrove evolution in response to future increased water levels in order to inform the context and locations of current mangrove adaptation strategies and priorities.

Task 4b. APTIM will identify and evaluate various metrics typically used to sustain mangroves and assess their application to Captiva.

Task 4c. APTIM will consult with academic mangrove experts to draw conclusions from Tasks 4a and 4b and generate recommended strategies to comprise the Mangrove Adaptation Plan. APTIM will meet with the Florida Department of Protection (FDEP) to vet and finalize the drafted strategies and assess potential secondary impacts from strategies. The concern is that the state does not currently have a plan for mangrove loss, adaptation or the potential submerged lands the state will acquire through land loss. CEPD has an opportunity to proactively manage the mangrove areas with state support and retain the risk mitigating benefits of vegetated shorelines as long as feasible.

Task 5 Strategy Implementation & Pilot Bayfront Shoreline Adaptation Pre-construction Activities

APTIM will provide a clear implementation plan for phased adaptation or post-disaster recovery projects. The implementation plan will outline a process for the CEPD to move their plan into action.

Task 5a. APTIM will hold community engagement and CEPD meetings as needed to provide education on strategy and implementation and to garner support for resilience initiatives and adoption of the resilience strategy. Up to two virtual public meetings will be organized and hosted. An additional in person presentation to the CEPD will be provided.

Task 5b. In support of the pilot bayfront living shoreline project, APTIM would work with private property owners along the bayside of the island to collect easements. APTIM will explore private implementation and associated permitting.

Task 5c. In order to assist with the preparation of a request for permit to the FDEP for the pilot bayfront living shoreline project, APTIM will prepare cost estimates and conceptual designs for implementation to present at pre-application meetings with FDEP. A meeting will be scheduled in preparation for submission.

Task 5d. APTIM will prepare a request for permit to the FDEP and USACE for the pilot bayfront living shoreline adaptation project. The request will utilize information delivered from the modeling task to

support the proposed design. A benefit cost assessment will be prepared per FEMA guidelines for the selected project. APTIM will assemble sketches and supporting documentation sufficient to support pre-application meetings with the regulatory agencies. Based on feedback from the agencies, a separate proposal for permitting services will be provided at CEPD's discretion.

Task 6 Permitting and Pre-construction Services for Resilient Dune Strategy

The implementation of a Resilient Dune Strategy will help protect landward property from damage and flooding, increase coastal storm protection, help minimize the effect of sea level rise, and provide erosion control. The strategy may include filling gaps in existing dunes, increasing the elevations of low dunes or adding walkovers or other features to mitigate storm surge and flood risk through dunes. APTIM will coordinate with local, State, and Federal permitting agencies to obtain Coastal Construction Control Line (CCCL) and Joint Coastal Permits (JCP) from FDEP and ERP permits from Lee County for dune strategy implementation. A comprehensive set of construction plans and specifications will be generated to define expectations, identify risks, resolve discrepancies, and ensure permit compliance. CEPD's purchasing department will manage the bidding process with assistance from APTIM. APTIM will attend a pre-bid conference which will provide an opportunity to describe the project and solicit questions from potential contractors. During the bidding process, APTIM will assist CEPD in answering technical questions, if needed. APTIM will review the bids for capability of the contractor in constructing the project, cost factors, technical completeness, contractor experience, work plan, schedule, and other parameters deemed of importance. APTIM will make a final recommendation to CEPD concerning the selection of the contractor.

Assumptions

Adaptation strategies to be evaluated will include projects with benefits to areas under CEPD jurisdiction and private property to build holistic resilience and program sustainability.

Existing and publicly available information plus deliverables from this scope will be sufficient for permitting the dune project.

Fee Proposal

The proposed work will be performed by APTIM as a Task Order under the terms and conditions of our Master Services Agreement dated October 17, 2012, (the "Agreement") (Exhibit A). The work proposed herein will be performed on an hourly basis as detailed in Exhibit B for a not-to-exceed (NTE) cost of $443,165. Although this proposal is detailed by separable items and estimated by specific staff and categories, staff of APTIM will be used as needed to support the CEPD up to the NTE amount. The work is anticipated to be completed within 15 months of the notice to proceed.

If you have any questions, please feel free to call or email. Thank you for the opportunity to serve the CEPD.

Sincerely,

Nicole S. Sharp, P.E.
Coastal Restoration & Modeling Program Manager
Aptim Coastal Planning & Engineering, LLC

cc: Samantha Danchuk, PhD, PE, APTIM
Bridget Huston, APTIM

CLIENT: Captiva Erosion Prevention District

Acknowledgement and Acceptance

_____
Authorized Representative Signature

_____
Printed Name

_____
Title

_____
Date

FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION
BOB MARTINEZ CENTER
2600 BLAIRSTONE ROAD
TALLAHASSEE, FLORIDA 32399-2400

RICK SCOTT
GOVERNOR

CARLOS LOPEZ-CANTERA
LT. GOVERNOR

CLIFFORD D. WILSON III
INTERIM SECRETARY

CONSOLIDATED JOINT COASTAL PERMIT AND SOVEREIGN SUBMERGED LANDS AUTHORIZATION

PERMITTEE:
Captiva Erosion Prevention District
c/o Kathleen Rooker
11513 Andy Rosse Lane, Unit 4
Captiva Island, Florida 33924

AGENT:
Michelle Pfeiffer
Coastal Planning and Engineering, Inc.
2481 N. W. Boca Raton Blvd.
Boca Raton, Florida 33431

PERMIT INFORMATION:
Permit Number: 0200269-009-JC

Project Name: Captiva and Sanibel Island Beach Nourishment

County: Lee

Issuance Date: December 11, 2014

Expiration Date: December 11, 2029

REGULATORY AUTHORIZATION:

This permit is issued under the authority of Chapter 161 and Part IV of Chapter 373, Florida Statutes (F.S.), and Title 62, Florida Administrative Code (F.A.C.). Pursuant to Operating Agreements executed between the Department of Environmental Protection (Department) and the water management districts, as referenced in Chapter 62-113, F.A.C., the Department is responsible for reviewing and taking final agency action on this activity.

PROJECT DESCRIPTION:

The activity is to periodically nourish the beach at the Captiva Island segment of the federally-authorized Lee County Shore Protection project, to restore the northern tip of Captiva Island and to nourish the northern portion of Sanibel Island. Two previously-permitted borrow areas (III-B and VI-E), will be utilized as sand sources for this project. The elevation of the design beach berm inclines from +6.5 feet North American Vertical Datum (NAVD) at the dune line to +4.5 feet NAVD at the crest of the foreshore face of the berm, where it has a seaward slope of 1:10 vertical:horizontal (V:H) to the existing profile.

Phase I includes routine nourishment events at 8-10 year intervals using Borrow Areas III-B and VI-E. Phase II will address emergency nourishment (including larger hot spots) in response to any major storm erosion. Phase III will handle the smaller hot spot nourishment

using upland sand sources (Stewart – Immokalee, Vulcan – Witherspoon, and CEMEX – Lake Wales and Davenport). Dune repair work is also authorized, in the event of a severe storm. The project may involve the temporary placement, and subsequent dredging, of sand within an offshore sand stockpile/rehandling area.

The activity includes consideration of an application for renewal of a 15-year sovereign submerged lands public easement (Instrument No. 40410, BOT File No. 360229615) containing 149.75 acres or 6,523,288 square feet, more or less, for Borrow Area III-B; and 348.71 acres or 15, 190,094 square feet, more or less, for Borrow Area VI-E.

The Permittee has also requested a variance that will be acted upon separately as File No. 0200269-010-BV**.** The variance is from the provisions of Rule 62-4.244(5)(c), F.A.C., to establish a temporary mixing zone that extends up to 200 meters offshore and up to 1,500 meters alongshore from the point where water discharged from the dredge pipeline (at the beach placement site) reenters the Gulf of Mexico. The variance does not apply to discharges within 1,500 meters of Redfish Pass or Blind Pass.

PROJECT LOCATION:

The Project is located in Lee County and extends into the Gulf of Mexico, Class III Waters. The Beach Restoration site is located on the northern end of Captiva Island, between Department Reference Monuments R-83 and R-84, at Redfish Pass. The Beach Nourishment sites are located on Captiva Island, between R-84 and R-109, Sections 15, 22, 26, 27 and 35, Township 45 South, Range 21 East; and on Sanibel Island, between R-110 to R118, Sections 2, 3, 11, 13 and 14, Township 46 South, Range 21 East.

Borrow Area III-B is located approximately 8.7 nautical miles offshore from the center of Captiva Island. Borrow Area VI-E is located approximately 8.3 nautical miles offshore of the center of Captiva Island. The sand stockpile/rehandling area is located offshore of the project area, located approximately from R-84 to R-118.

PROPRIETARY AUTHORIZATION:

This activity also requires a proprietary authorization, as the activity is located on sovereign submerged lands held in trust by the Board of Trustees of the Internal Improvement Trust Fund (Board of Trustees), pursuant to Article X, Section 11 of the Florida Constitution, and Sections 253.002 and 253.77, F.S. The activity is not exempt from the need to obtain a proprietary authorization. The Board of Trustees delegated, to the Department, the responsibility to review and take final action on this request for proprietary authorization in accordance with Section 18-21.0051, F.A.C., and the Operating Agreements executed between the Department and the water management districts, as referenced in Chapter 62-113, F.A.C. This proprietary authorization has been reviewed in accordance with Chapter 253, F.S., Chapter 18-21 and Section 62-330.075, F.A.C., and the policies of the Board of Trustees.

As staff to the Board of Trustees, the Department has reviewed the project described above, and has determined that the placement of sand on the beach qualifies for a Letter of Consent to use sovereign, submerged lands, as long as the work performed is located within the boundaries as described herein and is consistent with the terms and conditions herein. Therefore, consent is hereby granted, pursuant to Chapter 253.77, F.S., to perform the activity on the specified sovereign submerged lands.

As staff to the Board of Trustees, the Department has also determined that the borrow areas for the beach nourishment activity require a renewal of the public easement that was previously granted for the use of those lands, pursuant to Chapter 253.77, F.S. The Department intends to grant the public easement renewal, subject to the conditions outlined in the previously issued *Consolidated Intent to Issue* and in the Recommended Proprietary Action (entitled *Delegation of Authority*).

The final documents required to execute the easement renewal will be sent to the Department's Division of State Lands. The Department intends to issue the easement upon satisfactory execution of those documents. **You may not begin construction of this activity on state-owned, sovereign submerged lands until the easement renewal has been executed to the satisfaction of the Department.**

COASTAL ZONE MANAGEMENT:

This permit constitutes a finding of consistency with Florida's Coastal Zone Management Program, as required by Section 307 of the Coastal Zone Management Act.

WATER QUALITY CERTIFICATION:

This permit constitutes certification of compliance with state water quality standards pursuant to Section 401 of the Clean Water Act, 33 U.S.C. 1341.

OTHER PERMITS:

Authorization from the Department does not relieve you from the responsibility of obtaining other permits (Federal, State or local) that may be required for the project. When the Department received your permit application, a copy was sent to the U.S. Army Corps of Engineers (Corps) for review. The Corps will issue their authorization directly to you, or contact you if additional information is needed. If you have not heard from the Corps within 30 days from the date that your application was received by the Department, contact the nearest Corps regulatory office for status and further information. Failure to obtain Corps authorization prior to construction could subject you to federal enforcement action by that agency.

AGENCY ACTION:

The above named Permittee is hereby authorized to construct the work that is outlined in the project description and project location of this permit and as shown on the approved permit drawings, plans and other documents attached hereto. This agency action is based on the information submitted to the Department as part of the permit application, and adherence with

the final details of that proposal shall be a requirement of the permit. **This permit and authorization to use sovereign submerged lands are subject to the General Conditions, General Consent Conditions and Specific Conditions, which are a binding part of this permit and authorization.** Both the Permittee and their Contractor are responsible for reading and understanding this permit (including the permit conditions and the approved permit drawings) prior to commencing the authorized activities, and for ensuring that the work is conducted in conformance with all the terms, conditions and drawings.

GENERAL CONDITIONS:

1. All activities authorized by this permit shall be implemented as set forth in the plans and specifications approved as a part of this permit, and all conditions and requirements of this permit. The Permittee shall notify the Department in writing of any anticipated deviation from the permit prior to implementation so that the Department can determine whether a modification of the permit is required pursuant to section 62B-49.008, Florida Administrative Code.

2. If, for any reason, the Permittee does not comply with any condition or limitation specified in this permit, the Permittee shall immediately provide the Bureau of Beaches and Coastal Systems and the appropriate District office of the Department with a written report containing the following information: a description of and cause of noncompliance; and the period of noncompliance, including dates and times; or, if not corrected, the anticipated time the noncompliance is expected to continue, and steps being taken to reduce, eliminate, and prevent recurrence of the noncompliance.

3. This permit does not eliminate the necessity to obtain any other applicable licenses or permits that may be required by federal, state, local, special district laws and regulations. This permit is not a waiver or approval of any other Department permit or authorization that may be required for other aspects of the total project that are not addressed in this permit.

4. This permit conveys no title to land or water, does not constitute State recognition or acknowledgment of title, and does not constitute authority for the use of sovereignty land of Florida seaward of the mean high-water line, or, if established, the erosion control line, unless herein provided and the necessary title, lease, easement, or other form of consent authorizing the proposed use has been obtained from the State. The Permittee is responsible for obtaining any necessary authorizations from the Board of Trustees of the Internal Improvement Trust Fund prior to commencing activity on sovereign lands or other state-owned lands.

5. Any delineation of the extent of a wetland or other surface water submitted as part of the permit application, including plans or other supporting documentation, shall not be considered specifically approved unless a specific condition of this permit or a formal determination under section 373.421(2), F.S., provides otherwise.

6. This permit does not convey to the Permittee or create in the Permittee any property right, or any interest in real property, nor does it authorize any entrance upon or activities on property which is not owned or controlled by the Permittee. The issuance of this permit does not convey any vested rights or any exclusive privileges.

7. This permit or a copy thereof, complete with all conditions, attachments, plans and specifications, modifications, and time extensions shall be kept at the work site of the permitted activity. The Permittee shall require the contractor to review the complete permit prior to commencement of the activity authorized by this permit.

8. The Permittee, by accepting this permit, specifically agrees to allow authorized Department personnel with proper identification and at reasonable times, access to the premises where the permitted activity is located or conducted for the purpose of ascertaining compliance with the terms of the permit and with the rules of the Department and to have access to and copy any records that must be kept under conditions of the permit; to inspect the facility, equipment, practices, or operations regulated or required under this permit; and to sample or monitor any substances or parameters at any location reasonably necessary to assure compliance with this permit or Department rules. Reasonable time may depend on the nature of the concern being investigated.

9. At least forty-eight (48) hours prior to commencement of activity authorized by this permit, the Permittee shall submit to the Bureau of Beaches and Coastal Systems (JCP Compliance Officer) and the appropriate District office of the Department a written notice of commencement of construction indicating the actual start date and the expected completion date and an affirmative statement that the Permittee and the contractor, if one is to be used, have read the General and Specific Conditions of the permit and understand them.

10. If historic or archaeological artifacts, such as, but not limited to, Indian canoes, arrow heads, pottery or physical remains, are discovered at any time on the project site, the Permittee shall immediately stop all activities in the immediate area that disturb the soil in the immediate locale and notify the State Historic Preservation Officer and Bureau of Beaches and Coastal Systems (JCP Compliance Officer). In the event that unmarked human remains are encountered during permitted activities, all work shall stop in the immediate area and the proper authorities notified in accordance with Section 872.02, F.S.

11. Within 30 days after completion of construction or completion of a subsequent maintenance event authorized by this permit, the Permittee shall submit to the Bureau of Beaches and Coastal Systems (JCP Compliance Officer) and the appropriate District office of the Department a written statement of completion and certification by a registered professional engineer. This certification shall state that all locations and

elevations specified by the permit have been verified; the activities authorized by the permit have been performed in compliance with the plans and specifications approved as a part of the permit, and all conditions of the permit; or shall describe any deviations from the plans and specifications, and all conditions of the permit. When the completed activity differs substantially from the permitted plans, any substantial deviations shall be noted and explained on two paper copies and one electronic copy of as-built drawings submitted to the Bureau of Beaches and Coastal Systems (JCP Compliance Officer).

GENERAL CONSENT CONDITIONS:

1. Authorizations are valid only for the specified activity or use. Any unauthorized deviation from the specified activity or use and the conditions for undertaking that activity or use shall constitute a violation. Violation of the authorization shall result in suspension or revocation of the grantee's use of the sovereignty submerged land unless cured to the satisfaction of the Board.

2. Authorizations convey no title to sovereignty submerged land or water column, nor do they constitute recognition or acknowledgment of any other person's title to such land or water.

3. Authorizations may be modified, suspended or revoked in accordance with their terms or the remedies provided in Sections 253.04 and 258.46, F.S., or Chapter 18-14, F.A.C.

4. Structures or activities shall be constructed and used to avoid or minimize adverse impacts to sovereignty submerged lands and resources.

5. Construction, use or operation of the structure or activity shall not adversely affect any species that is endangered, threatened or of special concern, as listed in Rules 68A-27.003, 68A-27.004 and 68A-27.005, F.A.C.

6. Structures or activities shall not unreasonably interfere with riparian rights. When a court of competent jurisdiction determines that riparian rights have been unlawfully affected, the structure or activity shall be modified in accordance with the court's decision.

7. Structures or activities shall not create a navigational hazard.

8. Structures shall be maintained in a functional condition and shall be repaired or removed if they become dilapidated to such an extent that they are no longer functional. This shall not be construed to prohibit the repair or replacement subject to the provisions of Rule 18-21.005, F.A.C., within one year, of a structure damaged in a discrete event such as a storm, flood, accident or fire.

9. Structures or activities shall be constructed, operated and maintained solely for water dependent purposes, or for non-water dependent activities authorized under paragraph 18-21.004(1)(f), F.A.C., or any other applicable law.

SPECIFIC CONDITIONS:

1. No beach nourishment shall be conducted under this permit until and unless the Department issues a Final Order of Variance (File No. 0200269-010-BV) from Rule 62-4.244(5)(c), F.A.C., to establish an expanded mixing zone for this project.

2. All reports or notices relating to this permit shall be electronically submitted to the Department's JCP Compliance Officer (e-mail address: JCP Compliance@dep.state.fl.us) unless otherwise specified in the specific conditions of this permit.

3. The Permittee shall not store or stockpile tools, equipment, materials, etc., within littoral zones or elsewhere within surface waters of the state without prior written approval from the Department. Storage, stockpiling or access of equipment on, in, over or through beds of submerged aquatic vegetation, wetlands or hardbottom is prohibited unless it occurs within a work area or ingress/egress corridor that is specifically approved by this permit. Anchoring or spudding of vessels and barges within beds of aquatic vegetation or hardbottom is also prohibited.

4. The Permittee shall not conduct project operations or store project-related equipment in, on or over dunes, or otherwise impact dune vegetation, outside the approved staging, beach access and dune restoration areas designated in the permit drawings.

5. ***Notice to Proceed Requirements.*** No work shall be conducted under this permit until the Permittee has received a written notice to proceed from the Department for each event. At least 30 days prior to the requested date of issuance of the notice to proceed, the Permittee shall submit a written request for a Notice to Proceed and the following items for review and approval by the Department:

   a. An electronic copy of detailed ***final construction plans and specifications*** for all authorized activities. The plans and specifications must be consistent with the project description of this permit and the attached permit drawings, and shall also be certified by a professional engineer (P.E.), who is registered in the State of Florida. The plans and specifications shall include a description of the dredging and construction methods to be utilized and drawings and surveys that show all biological resources and work spaces (e.g., anchoring areas, pipeline corridors, staging areas, boat access corridors, etc.) to be used for this project;

   b. ***Biological Opinion.*** In accordance with Section 161.041(5), F.S., no construction that could result in take of threatened and marine turtles shall begin until the federal

incidental take authorization is issued in accordance with the federal Endangered Species Act. All terms and conditions and conservation measures in the applicable federal incidental take authorization shall be incorporated into this permit through modification if not addressed in the existing conditions listed below;

c. Documentation that the new ***Erosion Control Line*** for segment R-83 to R-84 has been executed and recorded in the County Records;

d. ***Public Easement.*** Documentation that the renewal and modification of the Public Easement has been executed and recorded to the satisfaction of the Department;

e. ***Turbidity monitoring qualifications.*** Construction at the project site shall be monitored closely by an experienced, independent third party to assure that turbidity levels do not exceed the compliance standards established in this permit. Also, an individual familiar with beach construction techniques and turbidity monitoring shall be present at all times when fill material is discharged on the beach. This individual shall have authority to alter construction techniques or shut down the dredging or beach construction operations if turbidity levels exceed the compliance standards established in this permit. The names and qualifications of those individuals performing these functions, along with 24-hour contact information, shall be submitted for approval;

f. ***Biological monitoring qualifications***: Biological monitoring qualifications shall be submitted to the JCP Compliance Officer for review. If additional monitoring team(s) are subcontracted, or new staff is added to the monitoring team, proposed changes and qualifications shall be submitted to JCP Compliance Officer for review at least 30 days prior to the sampling event. The Permittee's agent is fully responsible for training of new staff members and subcontractors as well as the QA/QC verification of their work;

g. A detailed ***Physical Monitoring Plan*** subject to review and approval by the Department; and

h. Prior to the second event authorized under this permit, and for each subsequent event, the results of the ***intermediate turbidity monitoring*** shall be evaluated and provided to the Department's JCP Compliance Officer. If the results indicate that the project can be built using a smaller mixing zone, this adjustment shall be made through a modification to the permit prior to commencement of subsequent construction events.

6. ***Pre-Construction Conference.*** The Permittee shall conduct a pre-construction conference to review the specific conditions and monitoring requirements of this permit with Permittee's contractors, the engineer of record, those responsible for turbidity monitoring and the JCP Compliance Officer (or designated alternate). In order to ensure

that appropriate representatives are available, at least twenty-one (21) days prior to the intended commencement date for the permitted construction, the Permittee is advised to contact the Department, and the other agency representatives listed below:

JCP Compliance Officer
e-mail: JCPCompliance@dep.state.fl.us

Imperiled Species Management Section
Florida Fish & Wildlife Conservation Commission
620 South Meridian Street
Tallahassee, Florida 32399-1600
phone: (850) 922-4330
fax: (850) 921-4369 or email: marineturtle@myfwc.com

The Permittee is also advised to schedule the pre-construction conference at least a week prior to the intended commencement date. At least seven (7) days in advance of the pre-construction conference, the Permittee shall provide written notification, advising the participants (listed above) of the **agreed-upon** date, time and location of the meeting, and also provide a meeting agenda and a teleconference number.

7. When discharging slurried sand onto the beach from a pipeline, the Permittee shall employ best management practices (BMPs) to reduce turbidity. At a minimum, these BMPs shall include the following:

   a. Use of shore-parallel sand dike to promote settlement of suspended sediment on the beach before return water from the dredged discharge reenters the Gulf of Mexico; and

   b. A minimum set-back of 50 feet from open water, or at the landward end of the beach berm (without disturbing the dune), whichever is less, for the pipeline discharge location.

8. A 750-foot (approximately 230-meter) buffer shall be established around hardbottom resources surrounding the borrow areas. No dredging within this 750-foot buffer zone is authorized at this time. This 750-foot buffer provides the Department with reasonable assurance that hardbottom resources will not be impacted by the dredging activities; therefore, if no dredging occurs within this 750-foot buffer zone, biological monitoring of hardbottom resources shall not be required.

9. If the Permittee wishes to dredge within 750 feet of a hardbottom area, then a permit modification would be required. The application for the permit modification must include a biological monitoring plan and revised borrow area drawings delineating the proposed expanded dredging area(s) and all hardbottom within 750 feet (230 meters) of the borrow area(s), based on a quantitative baseline survey of hardbottom resources in the

project area. Even if authorization is granted for dredging within 750 feet of hardbottom areas, no dredging shall occur within 600 feet of hardbottom resources. Additional specific conditions may be included with the modification if as applicable.

10. During construction, weekly reports shall be submitted to the Department's JCP Compliance Officer to provide assurance that dredging activities have not occurred within the buffer surrounding hardbottom resources. Weekly reports shall include figures that show the position of dredging activities in borrow areas relative to the hardbottom resources surrounding the borrow areas. Reports shall include a table with information on the distance of dredging activities from the hardbottom resources surrounding the borrow areas.

11. Measures shall be taken to minimize turbidity in Redfish Pass during placement of sand between R-83 and R-84. Rather than directly pumping the sediment slurry to this site, which is adjacent to OFWs and seagrass beds within Pine Island Sound Aquatic Preserve, drained sediment shall be transported to this site via truck or mechanical means. Sand shall be pumped to the shore south of the Redfish Pass groin, near R-84, then off-road trucks or conveyors shall deliver the dewatered sand to the eroded shoreline of Redfish Pass, between R-83 and R-84. To further reduce the potential for turbidity plumes entering the OFW, sand shall only be placed water ward of the mean high water (MHW) line in this area during outgoing tides.

12. Composite values for the offshore borrow areas shall be updated after each nourishment event, and compatibility calculations shall be updated and provided to the Department's JCP Compliance Officer prior to the next nourishment event.

13. Sediment quality shall be assessed as outlined in the Sediment QA/QC Plan dated February 26, 2014 (received on May 24, 2014). Any placement of material not in compliance with the Plan shall be handled according to the protocols set forth in the Sediment QA/QC plans. The sediment testing result shall be submitted to the JCP Compliance Officer within 90 days following the completion of beach construction. The Sediment QA/QC plans include the following:

    a. If during construction, the Permittee or Engineer determines that the beach fill material does not comply with the sediment compliance specifications, measures shall be taken to avoid further placement of noncompliant fill, and the sediment inspection results shall be reported to the Department's JCP Compliance Officer.

    b. The Permittee shall submit post-construction sediment testing results and an analysis report as outlined in the Sediment QA/QC plan to the Department's JCP Compliance Officer within 90 days following beach construction. The sediment testing results shall be certified by a P.E. or professional geologist (P.G.) from the testing laboratory. A summary table of the sediment samples and test results for the

sediment compliance parameters as outlined in Table 1 of the Sediment QA/QC plan shall accompany the complete set of laboratory testing results. A statement of how the placed fill material compares to the sediment analysis and volume calculations from the geotechnical investigation shall be included in the sediment testing results report.

c. A post-remediation report containing the site map, sediment analysis, and volume of noncompliant fill material removed and replaced shall be submitted to the Department's JCP Compliance Officer within 7 days following completion of remediation activities.

Fish and Wildlife Protection Conditions

14. **Manatee, Marine Turtle, and Shorebird Protection Conditions.** During all construction authorized by this permit, and subsequent to authorization of incidental take by the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (FWS) in accordance with Sections 161.041 (5) and 379.2431 (1), F.S., the Permittee shall comply with the following conditions intended to protect manatees, marine turtles and shorebirds from direct project effects:

a. All personnel associated with the project shall be instructed about the presence of marine turtles, manatees and manatee speed zones, and the need to avoid collisions with (and injury to) these protected marine species. The Permittee shall advise all construction personnel that there are civil and criminal penalties for harming, harassing or killing manatees, which are protected under the Marine Mammal Protection Act, the Endangered Species Act and the Florida Manatee Sanctuary Act, and for killing marine turtles, which are protected under the Endangered Species Act and the Florida Marine Turtle Protection Act.

b. All vessels associated with the construction project shall operate at "Idle Speed/No Wake" at all times while in the immediate area and while in water where the draft of the vessel provides less than a four-foot clearance from the bottom. All vessels shall follow routes of deep water whenever possible.

c. Siltation or turbidity barriers, if used, shall be made of material in which manatees and marine turtles cannot become entangled, shall be properly secured and shall be regularly monitored to avoid entanglement or entrapment. Barriers must not impede manatee or marine turtle movement.

d. All on-site project personnel are responsible for observing water-related activities for the presence of marine turtles and manatees. All in-water operations, including vessels, shall be shut down if a marine turtle or manatee comes within 50 feet of the operation. Activities shall not resume until the animal(s) has moved beyond the 50-

foot radius of the project operation, or until 30 minutes elapses if the animal(s) has not reappeared within 50 feet of the operation. Animals shall not be herded away or harassed into leaving.

e. Any collision with or injury to a marine turtle or manatee shall be reported immediately to the Florida Fish and Wildlife Conservation Commission (FWC) Hotline at 1-888-404-3922, and to FWC at ImperiledSpecies@myFWC.com.

f. Temporary signs concerning manatees shall be posted prior to and during all in-water project activities. All signs shall be removed by the Permittee upon completion of the project. Temporary signs that have already been approved for this use by the FWC shall be used. One sign which reads "Caution Boaters, Watch for Manatees" shall be posted. A second sign measuring at least 8 ½" by 11" explaining the requirements for "Idle Speed/No Wake" and the shutdown of in-water operations shall be posted in a location prominently visible to all personnel engaged in water-related activities. Signs already approved by the FWC can be viewed at MyFWC.com/manatee. Questions concerning these signs can be sent to the email address listed above.

g. All personnel associated with the project shall be instructed about the potential presence of nesting shorebirds and the need to avoid Take of (including disturbance to) these protected species.

h. All vehicles shall be operated in accordance with the FWC's Best Management Practices for Operating Vehicles on the Beach (http://myfwc.com/conservation/you-conserve/wildlife/beach-driving/). Specifically, the vehicle shall be operated at a speed <6 mph and run at or below the high-tide line.

15. **Hopper Dredging**. In the event a hopper dredge is utilized, the following requirements shall be met in addition to the Terms and Conditions of the applicable NMFS Regional Biological Opinion for Hopper Dredging (Gulf of Mexico):

a. Handling of captured sea turtles or sea turtle shall be conducted only by persons with prior experience and training in these activities and who are duly authorized to conduct such activities through a valid Marine Turtle Permit issued by the FWC, pursuant to Chapter 68E-1, F.A.C.

b. Dredging pumps shall be disengaged by the operator, or the draghead bypass value shall be open and in use when the dragheads are not firmly on the bottom to minimize impingement or entrainment of sea turtles within the water column. This precaution is especially important during the cleanup phase of dredging operations.

c. A state-of-the-art rigid deflector draghead shall be used on all hopper dredges, in all channels, at all times of the year.

d. The Sea Turtle Stranding and Salvage Network (STSSN) Coordinator shall be notified at Allen.Foley@myfwc.com at the start-up and completion of hopper dredging operations. In the event of capturing or recovering sea turtles or sea turtle parts, the STSSN shall be contacted at SeaTurtleStranding@myfwc.com.

e. Relocation trawling or non-capture trawling shall be implemented in accordance with the applicable NMFS Biological Opinion and Incidental Take authorization. Any activity involving the use of nets to harass and/or to capture and handle marine turtles in Florida waters requires a Marine Turtle Permit from FWC.

i. The Permittee or their contractor shall e-mail (MTP@MyFWC.com) weekly reports to the Imperiled Species Management section on Friday of each week that trawling is conducted in Florida waters. These weekly reports shall include: the species and number of turtles captured in Florida waters, general health and release information. A summary (FWC provided Excel spreadsheet) of all trawling activity, including non-capture trawling and all turtles captured in Florida waters, including all measurements, the latitude and longitude (in decimal degrees) of captures and tow start-stop points and times for the start-stop points of the tows, including those tows on which no turtles are captured, shall be submitted to MTP@myfwc.com by January 15 of the following year or at the end of the project.

16. Beach Maintenance. All derelict concrete, metal, coastal armoring material and other debris shall be removed from the beach prior to any material placement to the maximum extent practicable. If debris removal activities will take place during shorebird breeding or sea turtle nesting seasons, the work shall be conducted during daylight hours only and shall not commence until completion of daily seabird, shorebird or sea turtle surveys each day. All excavations and temporary alterations of the beach topography shall be filled or leveled to the natural beach profile prior to 9 p.m. each day unless otherwise authorized.

17. Pre-Construction Meeting. A meeting between representatives of the contractor, the FWC, the permitted sea turtle surveyor and Bird Monitors, as appropriate, shall be held prior to commencement of work on projects. At least 10-business days advance notice shall be provided prior to conducting this meeting. The meeting will provide an opportunity for explanation and/or clarification of the protection measures, as well as additional guidelines when construction occurs during nesting season, such as staging equipment and reporting within the work area and follow up meetings during construction. This meeting may be combined with the Pre-construction meeting required in Specific Condition 6 above.

18. **Nesting Seabird and Shorebird Protection Conditions**. Nesting seabird and shorebird (i.e. shorebird) surveys shall be conducted by trained, dedicated individuals (Bird

Monitor) with proven shorebird identification skills and avian survey experience. A list of candidate Bird Monitors with their contact information, summary of qualifications, including bird identification skills, and avian survey experience shall be provided to FWC. This information shall be submitted to the FWC regional biologist (contact information attached) prior to any construction or hiring for shorebird surveys for revision and consultation. Bird Monitors shall use the following survey protocols:

a. Bird Monitors shall review and become familiar with the general information, employ the data collection protocol and implement data entry procedures outlined on the FWC's Florida Shorebird Database (FSD) website (www.FLShorebirdDatabase.org<http://www.FLShorebirdDatabase.org>). An outline of data to be collected, including downloadable field data sheets, is available on the website.

b. Breeding season varies by species. Most species have completed the breeding cycle by September 1, but flightless young may be present through September. The following date range is based on the best available information regarding habitat ranges and use by species around the state:

   All Gulf Coast counties: February 15 – September 1.

   Breeding season surveys shall begin on the first day of the breeding season or 10 days prior to project commencement (including surveying activities and other pre-construction presence on the beach), whichever is later. Surveys shall be conducted through August 31st or until all breeding activity has concluded, whichever is later.

c. Breeding season surveys shall be conducted in all potential beach-nesting bird habitats within the project boundaries that may be impacted by construction or pre-construction activities. Portions of the project in which there is no potential for project-related activity during the nesting season may be excluded. One or more shorebird survey routes shall be established in the FSD website to cover these areas.

d. During the pre-construction and construction phases of the project, surveys for detecting breeding activity and the presence of flightless chicks shall be completed on a daily basis prior to movement of equipment, operation of vehicles or other activities that could potentially disrupt breeding behavior or cause harm to the birds or their eggs or young.

e. Surveys shall be conducted by walking the length of the project area and visually surveying for the presence of shorebirds exhibiting breeding behavior, shorebird/seabird chicks or shorebird/seabird juveniles as outlined in the FSD Breeding Bird Protocol for Shorebirds and Seabirds. Use of binoculars is required.

i. If an ATV or other vehicle is needed to cover large project areas, operators shall adhere to the FWC's Best Management Practices for Operating Vehicles on the Beach (http://myfwc.com/conservation/you-conserve/wildlife/beach-driving/). Specifically, the vehicle shall be operated at a speed <6 mph and run at or below the high-tide line. The Bird Monitor shall stop at no greater than 200 meter intervals to visually inspect for breeding activity.

f. Once breeding is confirmed by the presence of a scrape, eggs or young, the Bird Monitor shall notify the FWC Regional Species Conservation Biologist (contact information attached) within 24 hours. All breeding activity shall be reported to the FSD website within one week of data collection.

19. **Seabird and Shorebird Buffer Zones and Travel Corridors**. Within the project area, the Permittee shall establish a disturbance-free buffer zone around any location where shorebirds have been engaged in breeding behavior, including territory defense. A 300-foot-wide buffer is considered adequate based on published studies. However, a smaller, site-specific buffer may be implemented upon approval by the FWC Regional Species Conservation Biologist (contact information attached) as needed. All sources of human disturbance (including pedestrians, pets and vehicles) shall be prohibited in the buffer zone.

a. The Bird Monitor shall keep breeding sites under sufficient surveillance to determine if birds appear agitated or disturbed by construction or other activities in adjacent areas. If birds do appear to be agitated or disturbed by these activities, then the width of the buffer zone shall be increased immediately to a sufficient size to protect breeding birds.

b. Reasonable and traditional pedestrian access shall not be blocked where breeding birds will tolerate pedestrian traffic. This is generally the case with lateral movement of beach-goers walking parallel to the beach at or below the highest tide line. Pedestrian traffic may also be tolerated when breeding was initiated within 300 feet of an established beach access pathway. The Permittee shall work with the FWC Regional Species Biologist to determine if pedestrian access can be accommodated without compromising nesting success.

c. Designated buffer zones shall be marked with posts, twine and signs stating "Do Not Enter, Important Nesting Area" or similar language around the perimeter that includes the name and a phone number of the entity responsible for posting. Posts shall not exceed 3 feet in height once installed. Symbolic fencing (twine, string or rope) shall be placed between all posts at least 2.5 feet above the ground and rendered clearly visible to pedestrians. If pedestrian pathways are approved by the FWC Regional Species Conservation Biologist within the 300-foot buffer zone, these shall be clearly marked. The posting shall be maintained in good repair until breeding is completed

or terminated. Although solitary nesters may leave the buffer zone with their chicks, the posted area continues to provide a potential refuge for the family until breeding is complete. Breeding is not considered to be completed until all chicks have fledged.

d. No construction activities, pedestrians, movement of vehicles or stockpiling of equipment shall be allowed within the buffer area.

e. Travel corridors shall be designated and marked outside the buffer areas so as not to cause disturbance to breeding birds. Heavy equipment, other vehicles, or pedestrians may transit past breeding areas in these corridors. However, other activities such as stopping or turning shall be prohibited within the designated travel corridors adjacent to the breeding site. When flightless chicks are present within or adjacent to travel corridors, movement of vehicles shall be accompanied by the Bird Monitor who shall ensure no chicks are in the path of the moving vehicle and no tracks capable of trapping flightless chicks result.

f. To discourage nesting within the travel corridor, it is recommended that the Permittee should maintain some activity within these corridors on a daily basis, without disturbing any nesting shorebirds documented on site or interfering with sea turtle nesting, especially when those corridors are established prior to commencement of construction.

20. **Notification**. If shorebird breeding occurs within the project area, a bulletin board shall be placed and maintained in the construction staging area with the location map of the construction site showing the bird breeding areas and a warning, clearly visible, stating that "NESTING BIRDS ARE PROTECTED BY LAW INCLUDING THE FLORIDA ENDANGERED AND THREATENED SPECIES ACT AND THE STATE and FEDERAL MIGRATORY BIRD ACTS".

21. **Marine Turtle Nest Surveys and Relocation**. Sand placement may occur during the marine turtle nesting season, May 1 through October 31, provided the following marine turtle protection conditions are met except where such work is prohibited by the managing agency or under applicable local land use codes.

22. In accordance with Section 161.041 (5), F.S., no construction that could result in Take of threatened and marine turtles shall begin until the federal incidental take authorization is issued in accordance with the federal Endangered Species Act. In the event that additional or different requirements from the permit conditions are specified in the FWS Incidental Take Authorization and Biological Opinion, construction shall not begin until the permit has been modified to include those additional marine turtle protection conditions. No relocation of marine turtle nests shall occur unless specifically authorized by FWC in a permit issued pursuant to Section 379.2431(1), F.S., and Chapter 68E-1, F.A.C.

23. For sand placement projects that occur during the period from April 15 through October 31, daily early morning (before 9 a.m.) surveys shall be conducted as follows. Upon receipt of incidental take from the FWS, eggs shall be relocated per the requirements below (a. to c.). Sea turtle monitors shall not enter posted shorebird buffer areas to conduct monitoring or to relocate nests.

    Marine turtle nesting surveys shall be initiated by April 15, shall continue through September 30 and shall comply with the following requirements:

    a. Nesting surveys and nest marking shall only be conducted by persons with prior experience and training in these activities and who are authorized to conduct such activities through a valid permit issued by FWC, pursuant to Chapter 68E-1, F.A.C. Please contact FWC's Marine Turtle Management Program in Tequesta at MTP@myfwc.com for information on the permit holder in the project area. Nesting surveys shall be conducted daily between sunrise and 9 a.m. The contractor shall not initiate work each day until daily notice has been received from the marine turtle permit holder that the morning survey has been completed. Surveys shall be performed in such a manner so as to ensure that construction activity does not occur in any location prior to completion of the necessary marine turtle protection measures.

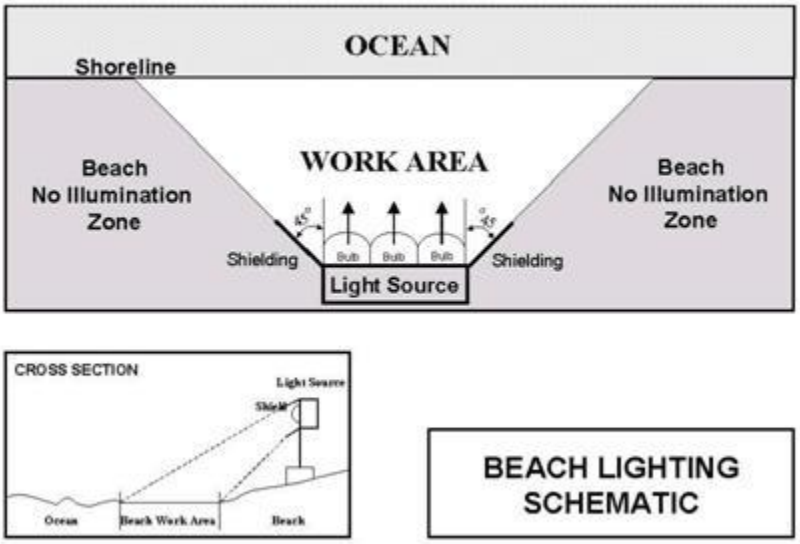
    b. Only those nests in the area where sand placement occurs shall be relocated. Nest relocation shall not occur upon completion of sand placement. Nests requiring relocation shall be moved no later than 9 a.m. the morning following deposition to a nearby self-release beach site in a secure setting where artificial lighting does not interfere with hatchling orientation. Relocated nests shall not be placed in organized groupings. Relocated nests shall be randomly staggered along the length and width of the beach in settings that are not expected to experience daily inundation by high tides or known to routinely experience severe erosion and egg loss or that are subject to artificial lighting. Nest relocations in association with construction activities shall cease when sand placement activities no longer threaten nests.

    c. Nests deposited within areas where construction activities have ceased or will not occur for 65 days, or nests laid in the nourished berm prior to tilling, shall be marked and left in place unless other factors threaten the success of the nest. The turtle permit holder shall install an on-beach marker at the nest site and/or a secondary marker at a point as far landward as possible to assure that future location of the nest will be possible should the on-beach marker be lost. No activity shall occur within this area nor shall any activities occur that could result in impacts to the nest. Nest sites shall be inspected daily to assure that nest markers remain in place and the nest has not been disturbed by the project activity.

24. **Marine Turtle or Nest Encounters**. Upon locating a dead or injured sea turtle adult, hatchling or egg that may have been harmed or destroyed as a direct or indirect result of the project, the Permittee shall be responsible for notifying STSSN at SeaTurtleStranding@myfwc.com. Care shall be taken in handling injured sea turtles or eggs to ensure effective treatment or disposition, and in handling dead specimens to preserve biological materials in the best possible state for later analysis. In the event a sea turtle nest is excavated during construction activities, the permitted person responsible for egg relocation for the project shall be notified immediately so the eggs can be moved to a suitable relocation site.

25. **Equipment Storage and Placement**. All construction pipes that are placed on the beach shall be located as far landward as possible without compromising the integrity of the existing or reconstructed dune system. Pipes placed parallel to the dune, outside the active construction zone, shall be no farther seaward than 5 to 10 feet away from the toe of the dune. Temporary storage of pipes shall be off the beach to the maximum extent possible. If it will be necessary to extend construction pipes past a known shorebird nesting site or over-wintering area for piping plovers then, whenever possible, those pipes shall be placed landward of the site before birds are active in that area. No pipe or sand shall be placed seaward of a shorebird nesting site during the shorebird nesting season.

26. **Project Lighting**. Direct lighting of the beach and nearshore waters shall be limited to the immediate construction area during the sea turtle nesting season and shall comply with safety requirements. Lighting on offshore or onshore equipment shall be minimized through reduction, shielding, lowering and appropriate placement to avoid excessive illumination of the water's surface and nesting beach while meeting all Coast Guard, EM 385-1-1 and OSHA requirements. Light intensity of lighting equipment shall be reduced to the minimum standard required by OSHA for General Construction areas, in order to avoid misdirection of sea turtles. Shields shall be affixed to the light housing and be large enough to block light from all lamps from being transmitted outside the construction area (Figure below).



27. **Fill Restrictions**. During the sea turtle nesting season, the contractor shall not extend the beach fill more than 500 feet along the shoreline between dusk and the following day until the daily nesting survey has been completed and the beach cleared for fill advancement. An exception to this may occur if there is a permitted sea turtle surveyor present on-site to ensure no nesting and hatching sea turtles are present within the extended work area. If the 500 feet is not feasible for the project, the Permittee may submit a request for an alternate distance to FWC, and FWC shall decide if that distance is acceptable during the preconstruction meeting. Once the beach has been cleared and the necessary nest relocations have been completed, the contractor shall be allowed to proceed with the placement of fill during daylight hours until dusk, at which time the 500-foot length limitation shall apply.

28. **Compaction Sampling**. Sand compaction shall be monitored in the area of sand placement immediately after completion of the project and prior to April 15th for three (3) subsequent years. Compaction shall be monitored in accordance with a protocol agreed to by FWC and the Permittee. The requirement for compaction monitoring can be eliminated if the decision is made to till regardless of post-construction compaction levels. Out-year compaction monitoring and remediation are not required if placed material no longer remains on the beach.

    At a minimum, the protocol provided below shall be followed. If the average value for any depth exceeds 500 pounds per square inch (psi) for any two or more adjacent stations, then that area shall be tilled immediately prior to April 15th. If values exceeding 500 psi are distributed throughout the project area but in no case do those values exist at two adjacent stations at the same depth, then consultation with the FWC shall be required

to determine if tilling is required. If a few values exceeding 500 psi are present randomly within the project area, tilling will not be required.

a. Compaction sampling stations shall be located at 500-foot intervals along the project area. One station shall be at the seaward edge of the dune/bulkhead line (when material is placed in this area), and one station shall be midway between the dune line and the high water line (normal wrack line).

b. At each station, the cone penetrometer shall be pushed to a depth of 6, 12 and 18 inches, three times at each depth (three replicates). Material may be removed from the hole if necessary to ensure accurate readings of successive levels of sediment. The penetrometer may need to be reset between pushes, especially if sediment layering exists. Layers of highly compact material may lie over less compact layers. Replicates shall be located as close to each other as possible, without interacting with the previous hole and/or disturbed sediments. The three replicate compaction values for each depth shall be averaged to produce final values for each depth at each station. Reports shall include all 18 values for each transect line, and the final 6 averaged compaction values.

c. No compaction sampling shall occur within 300 feet of any shorebird nest.

d. Any vehicles operated on the beach in association with compaction surveys shall operate in accordance with the FWC's Best Management Practices for Operating Vehicles on the Beach (http://myfwc.com/conservation/you-conserve/wildlife/beach-driving/).

29. **Tilling Requirements**. If tilling is required as specified above, the area shall be tilled to a depth of 36 inches. All tilling activity shall be completed prior to the marine turtle nesting season. If tilling occurs during shorebird nesting season (See Specific Condition 18.b above), shorebird surveys shall be required prior to tilling per the Shorebird Conditions included within this document. It is the responsibility of the contractors to avoid tilling, scarp removal or dune vegetation planting in areas where nesting birds are present. Each pass of the tilling equipment shall be overlapped to allow thorough and even tilling. If the project is completed during the marine turtle nesting season, tilling shall not be performed in areas where nests have been left in place or relocated. If compaction measurements are taken, a report on the results of the compaction monitoring shall be submitted electronically to FWC at marineturtle@myfwc.com prior to any tilling actions being taken.

a. No tilling shall occur within 300 feet of any shorebird nest.

b. If flightless shorebird young are observed within the work zone or equipment travel corridor, a Shorebird Monitor shall be present during the operation to ensure that equipment does not operate within 300 feet of the flightless young.

c. A relatively even surface, with no deep ruts or furrows, shall be created during tilling. To do this, chain-linked fencing or other material shall be dragged over those areas as necessary after tilling.

d. Tilling shall occur landward of the wrack line and avoid all vegetated areas 3 square feet or greater with a 3-foot buffer around the vegetated areas. The slope between the mean high water line (MHWL) and the mean low water line shall be maintained in such a manner as to approximate natural slopes.

e. Any vehicles operated on the beach in association with tilling shall operate in accordance with the FWC's Best Management Practices for Operating Vehicles on the Beach (http://myfwc.com/conservation/you-conserve/wildlife/beach-driving/).

30. **Escarpment Surveys**. Visual surveys for escarpments along the project area shall be made immediately after completion of the sand placement project, weekly during sea turtle nesting season and once between March 15 and April 15 for three (3) subsequent years if sand from the project still remains on the beach. Weekly reports shall be submitted by Friday of each week to marineturtle@myfwc.com.

Escarpments that interfere with sea turtle nesting or that exceed 18 inches in height for a distance of at least 100 feet shall be leveled and the beach profile shall be reconfigured to minimize scarp formation by April 15. Any escarpment removal shall be reported to FWC by location. If the project is completed during the sea turtle nesting and hatching season, escarpments may be required to be leveled immediately, while protecting nests that have been relocated or left in place. If, during the nesting and hatching season, there is any subsequent reformation of escarpments that interfere with sea turtle nesting or that exceed 18 inches in height for a distance of 100 feet, the Permittee shall immediately contact FWC to determine the appropriate action to be taken. If it is determined that escarpment leveling is required during the nesting or hatching season, the FWC shall provide a brief written authorization that describes methods to be used to reduce the likelihood of impacting existing nests. An annual summary of escarpment surveys and actions taken shall be submitted electronically to marineturtle@myfwc.com along with the annual summary as described below. If escarpment removal occurs during shorebird breeding season (See Specific Condition 18.b above), shorebirds surveys shall be required per the Shorebird Conditions included within this document prior to removal. (NOTE: Out-year escarpment monitoring and remediation are not required if placed material no longer remains on the dry beach).

a. No heavy equipment shall operate within 300 feet of any shorebird nest.

b. If flightless shorebird young are observed within the work zone or equipment travel corridor, a Shorebird Monitor shall be present during the operation to ensure that equipment does not operate within 300 feet of the flightless young.

c. Any vehicles operated on the beach in association with escarpment surveys or removal shall operate in accordance with the FWC's Best Management Practices for Operating Vehicles on the Beach (http://myfwc.com/conservation/you-conserve/wildlife/beach-driving/).

31. **Post-construction Shorebird Protection Conditions.** If beach cleaning will occur on the nourished beach, a minimum of 30% of the biotic material within the wrack line shall be left on the beach post-cleaning at the strand line in a natural configuration to ensure that the nourished beach re-establishes its function as foraging habitat for shorebirds. This shall occur for as long as the placed sand remains on the beach.

32. **Post-construction Monitoring and Reporting Marine Turtle Protection Conditions.** Reports on all marine turtle nesting activity shall be provided for the initial marine turtle nesting (May 1 through September 15) and hatching (through October 31) season and for up to three additional nesting seasons as follows:

a. For the initial nesting season and the following year, the number and type of emergences (nests or false crawls) shall be reported per species in accordance with the Table below. An additional year of nesting surveys may be required if nesting success for any species on the nourished beach is less than 40%.

b. For the initial nesting season, reproductive success shall be reported per species in accordance with the Table below. Reproductive success shall be reported for all sea turtle nests if possible. Otherwise a statistically significant number of nests for each species shall be reported.

c. In the event that the reproductive success documented by species meets or exceeds required criteria (outlined in Table below) for each species, monitoring for reproductive success shall be recommended, but not required, for the second year post-construction.

d. Monitoring of nesting activity in the seasons following construction shall include daily surveys and any additional measures authorized by the FWC. Summaries shall include all crawl activity, nesting success rates, hatching success of all relocated nests, hatching success of a representative sampling of nests left in place (if any) by species, project name, applicable project permit numbers and dates of construction. Data shall be reported for the nourished areas in accordance with the Table below and shall include the number of nests lost to erosion or washed out. Summaries of nesting

activity shall be submitted in electronic format (Excel spreadsheets) to the FWC Imperiled Species Management section at MTP@myfwc.com. All summaries shall be submitted by January 15 of the following year. The FWC Excel spreadsheet is available upon request from MTP@myfwc.com.

33. Two lighting surveys shall be conducted of all artificial lighting visible from the nourished berm. The first survey shall be conducted between May 1 and May 15 of the first nesting season following construction or immediately after placement if construction is not completed until after May 15, and a second survey between July 15 and August 1. The survey shall be conducted by the Permittee and shall be conducted to include a landward view from the seaward most extent of the new beach profile. The survey shall follow standard techniques for such a survey and include the number and type of visible lights, location of lights and photo documentation. For each light source visible, the Permittee shall document that the property owner(s) have been notified of the problem light and have been provided with recommendations for correcting the light. Recommendations must be in accordance with the Florida Model Lighting Ordinance for Marine Turtle Protection (Chapter 62B-55, F.A.C.) and local lighting restrictions. A report summarizing all lights visible shall be submitted to FWC Imperiled Species Management Section at marineturtle@myfwc.com by the 1st of the month following the survey. A summary report documenting what corrective actions have been taken shall also be submitted by December 15 of that year. After the annual report is completed, a meeting shall be set up with the Permittee or local sponsor, county or municipality, FWC and/or any other pertinent agencies to discuss the survey report as well as any documented sea turtle disorientations in or adjacent to the project area.

Table. Marine Turtle Monitoring:

Metric	Duration	Variable	Criterion
Nesting Success	Year of construction, one year to two or three years post construction if variable does not meet criterion based on previous year	Number of nests and non-nesting emergences by day by species	40% or greater
Hatching Success	Year of construction and one to three years post construction if variable does not meet criterion based on previous year	Number of hatchlings by species to completely escape egg	Average of 60% or greater (data must include washed out nests)
Emergence Success	Year of construction and one to three years post construction if variable does not meet success criterion based on previous year	Number of hatchlings by species to emerge from nest onto beach	Average must not be significantly different than the average hatching success
Disorientation	Year of construction and one to three years post construction	Number of nests and individuals that misorient or disorient	

Lighting Surveys	Two surveys the year following construction , one survey between May 1 and May 15 and second survey between July 15 and August 1	Number, location and photographs of lights visible from the project area, corrective actions and notifications made	100% reduction in lights visible from nourished berm within one to two month period
Compaction	Not required if the beach is tilled prior to nesting season each year placed sand remains on beach	Shear resistance	Less than 500 psi
Escarpment Surveys	Weekly during nesting season for up to three years	Number of scarps 18 inches or greater extending for more than 100 feet that persist for more than 2 weeks	Successful remediation of all persistent scarps as needed

MONITORING REQUIRED:

34. **Physical monitoring.** The approved Monitoring Plan can be revised at any later time by written request of the Permittee and with the written approval of the Department. If subsequent to approval of the Monitoring Plan there is a request for modification of the permit, the Department may require revised or additional monitoring requirements as a condition of approval of the permit modification.

As guidance for obtaining Department approval, the plan shall generally contain the following items:

a. Topographic and bathymetric profile surveys of the beach and offshore shall be conducted within 90 days prior to commencement of construction, and within 60 days following completion of construction of the project. Thereafter, monitoring surveys shall be conducted annually for a period of three (3) years, then biennially until the next beach nourishment event or the expiration of the project design life, whichever occurs first. The monitoring surveys shall be conducted during a spring or summer month and repeated as close as practicable during that same month of the year. If the time period between the immediate post-construction survey and the first annual monitoring survey is less than six months, then the Permittee may request a postponement of the first monitoring survey until the following spring/summer. The request shall be submitted as part of the cover letter for the post-construction report. A prior design survey of the beach and offshore may be submitted for the pre-construction survey if consistent with the other requirements of this condition.

The monitoring area shall include profile surveys at each of the Department's reference monuments within the bounds of the beach fill area and along at least 5,000 feet of the adjacent shoreline on both sides of the beach fill area. For those project

areas that contain erosion control structures, such as groins or breakwaters, additional profile lines shall be surveyed at a sufficient number of intermediate locations to accurately identify patterns of erosion and accretion within this subarea. All work activities and deliverables shall be conducted in accordance with the latest update of the Department's *Monitoring Standards for Beach Erosion Control Projects, Sections 01000 and 01100*.

b. Bathymetric surveys of the borrow areas shall be conducted within 90 days prior to commencement of construction, and within 60 days following completion of construction of the project concurrently with the beach and offshore surveys required above. Thereafter, monitoring surveys of the borrow areas shall be dependent on their location. Borrow sites located in tidal inlet shoals or in nearshore waters above the depth of closure for littoral transport processes shall be at two (2) year intervals concurrently with the beach and offshore surveys required above. These biennially monitoring surveys are not required for borrow sites located below the depth of closure for littoral transport processes. A prior design survey of the borrow area may be submitted for the pre-construction survey if consistent with the other requirements of this condition.

   Survey grid lines across the borrow areas shall be spaced to provide sufficient detail for accurate volumetric calculations but spaced not more than a maximum of 500 feet apart, and shall extend a minimum of 500 feet beyond the boundaries of the borrow site. For borrow sites located in tidal inlet shoals, bathymetric surveys of the entire shoal complex, including any attachment bars, shall be conducted unless otherwise specified by the Department based upon the size of the shoal and the potential effects of the dredging on inlet processes. In all other aspects, work activities and deliverables shall be consistent with the Department's *Monitoring Standards for Beach Erosion Control Projects, Section 01200.*

c. The Permittee shall submit an engineering report and the monitoring data to the JCP Compliance Officer within 90 days following completion of the post-construction survey and each annual or biennial monitoring survey.

   The report shall summarize and discuss the data, the performance of the beach fill project, and identify erosion and accretion patterns within the monitored area. Results shall be analyzed for patterns, trends, or changes between annual surveys and cumulatively since project construction. In addition, the report shall include a comparative review of project performance to performance expectations and identification of adverse effects attributable to the project. The report shall specifically include:

   i. The volume and percentage of advance nourishment lost since the last beach

nourishment project as measured landward of the MHWL of the most recent survey;

ii. The most recent MHW shoreline positions (feet) in comparison with the design profile at each individual monument location;

iii. The MHW shoreline position changes (feet) relative to the pre-construction survey at each individual monument location for all the monitoring periods;

iv. The total measured remaining volume (cubic yards) in comparison with the total predicted remaining volume (cubic yards) above the MHWL and above the Depth of Closure for the entire project area over the successive monitoring periods; and,

v. Other shoreline position and volumetric analysis the Permittee or engineer deem useful in assessing, with quantitative measurements, the performance of the project.

The report shall include computations, tables and graphic illustrations of volumetric and shoreline position changes for the monitoring area. An appendix shall include superimposed plots of the two most recent beach profile surveys, the design profile, and pre- and post-construction beach profile at each individual monument location.

d. A digital copy of the monitoring report and a digital file of the survey data shall be submitted to the JCP Compliance Officer in Tallahassee. Failure to submit reports and data in a timely manner constitutes grounds for revocation of the permit. When submitting any monitoring information to the Department's JCP Compliance Officer, please include a transmittal cover letter clearly labeled with the following at the top of each page: **"This monitoring information is submitted in accordance with the approved Monitoring Plan for Permit No. [0200269-009-JC] for the monitoring period [XX].**

35. **Water Quality Monitoring.** Turbidity shall be monitored as follows:

Units: Nephelometric Turbidity Units (NTUs).

Frequency: Three times daily at least four (4) hours apart during all dredging and filling operations. Sampling shall be conducted **while the highest project-related turbidity levels are crossing the edge of the mixing zone**. Since turbidity levels can be related to pumping rates, the dredge pumping rates shall be recorded, and provided to the Department upon request. The compliance samples and the corresponding background samples shall be collected at approximately the same time, i.e., one shall immediately follow the other.

Location:

A. Borrow Sites:

Background: Samples shall be collected at surface and mid-depth, at least 500 meters upcurrent from the dredge site and clearly outside the influence of any turbidity generated by the project.

Compliance: Samples shall be collected at surface and mid-depth, not more than 150 meters downcurrent from the source of turbidity generated by the dredge, in the densest portion of the turbidly plume. If no plume is visible, follow the likely direction of flow.

B. Beach/Discharge Site when working more than 1,500 meters from Redfish Pass and Blind Pass:

Background: Samples shall be collected at surface and mid-depth, at a point approximately 500 meters upcurrent from any portion of the beach that has been, or is being, filled during the current construction event, at the same distance offshore as the compliance station, clearly outside of any turbidity plume generated by the project.

Compliance: Samples shall be collected where the densest portion of the turbidity plume crosses the edge of the mixing zone polygon, which measures up to 200 meters offshore and up to 1,500 meters alongshore from the point where the return water from the dredged discharge reenters the Gulf of Mexico. Samples shall be collected from the surface and mid-depth. *Note: If the plume flows parallel to the shoreline, the densest portion of the plume may be close to shore, in shallow water, and may cross the edge of the mixing zone polygon less than 200 meters offshore. In that case, it may be necessary to access the sampling location from the shore, in water that is too shallow for a boat.*

Intermediate: Required when using a mixing zone that exceeds 150 meters in size. Within the approved mixing zone, samples shall be collected along the densest portion of the turbidity plume (or in the direction of flow if no plume is visible), at 150 meters, 500 meters, 1,000 meters and 1,250 meters downcurrent from the point of discharge into the Gulf of Mexico (if those points are located inside the mixing zone), at surface and mid-depth. The

data generated by this intermediate monitoring shall be used to adjust the size of the mixing zone for future events, not for compliance.

C. Beach/Discharge Site when working within 1,500 meters from Redfish Pass and Blind Pass:

Background: Samples shall be collected at surface and mid-depth, at a point approximately 500 meters upcurrent from any portion of the beach that has been, or is being, filled during the current construction event, at the same distance offshore as the compliance station, clearly outside of any turbidity plume generated by the project.

Compliance: Samples shall be collected where the densest portion of the turbidity plume crosses the edge of the mixing zone, which measures 150 meters in radius from the point where the return water from the dredged discharge reenters the Gulf of Mexico. Samples shall be collected from the surface and mid-depth.

D. Sand stockpile/rehandling area (if utilized during project construction):

Background: Samples shall be collected at surface and mid-depth, at least 500 meters upcurrent from the dredge or offloading sites and clearly outside the influence of any turbidity generated by the project.

Compliance: Samples shall be collected from the surface and mid-depth, not more than 1,500 meters downcurrent from the source of turbidity generated by the dredge or offloading activities, in the densest portion of the turbidly plume. If no plume is visible, follow the likely direction of flow.

Intermediate: Required when using a mixing zone that exceeds 150 meters in size. Within the approved mixing zone, samples shall be collected along the densest portion of the turbidity plume (or in the direction of flow if no plume is visible), at 150 meters, 500 meters, 1,000 meters and 1,250 meters downcurrent from the source of turbidity generated by the dredge or offloading activities, at surface and mid-depth. The data generated by this intermediate monitoring shall be used to adjust the size of the mixing zone for future events, not for compliance.

E. Truck haul beach placement (R-83 to R-84):

Background: Samples shall be collected at surface and mid-depth, at a point approximately 300 meters upcurrent from the discharge point, at the same distance offshore as the associated compliance sample, and clearly outside the influence of any turbidity generated by the project.

Compliance: Samples shall be collected at a point approximately 150 meters downcurrent from the point of discharge into State waters, within the densest portion any visible turbidity plume. Samples shall be collected from the surface and mid-depth.

Calibration: The instruments used to measure turbidity shall be fully calibrated with primary standards within one month of the commencement of the project, and at least once a month throughout the project. Calibration with secondary standards shall be verified each morning prior to use, after each time the instrument is turned on, and after field sampling using two secondary turbidity "standards" that that bracket the anticipated turbidity samples. If the post-sampling calibration value deviates more than 8% from the previous calibration value, results shall be reported as estimated and a description of the problem shall be included in the field notes.

The monitoring requirements for the type of activity and location of the sampling site shall be reflected on the monitoring report forms.

Analysis of turbidity samples shall be performed in compliance with DEP-SOP-001/01 FT 1600 Field Measurement of Turbidity:
http://publicfiles.dep.state.fl.us/dear/sas/sopdoc/2008sops/ft1600.pdf

If the turbidity monitoring protocol specified above prevents the collection of accurate data, the person in charge of the turbidity monitoring shall contact the JCP Compliance Officer to establish a more appropriate protocol. Once approved in writing by the Department, the new protocol shall be implemented through an administrative permit modification.

36. The compliance locations given above shall be considered the limits of the temporary mixing zone for turbidity allowed during construction. If monitoring reveals turbidity levels at the compliance sites that are greater than 29 NTUs above the corresponding background turbidity levels, or zero (0) NTUs above background within OFW, construction activities shall **cease immediately** and not resume until corrective measures have been taken and turbidity has returned to acceptable levels.

Any project-associated turbidity source other than dredging or fill placement for beach nourishment (e.g., scow or pipeline leakage) shall be monitored as close to the source as possible. If the turbidity level exceeds 29 NTUs above background, or zero (0) NTU's above background within OFW, the construction activities related to the exceedance shall **cease immediately** and not resume until corrective measures have been taken and turbidity has returned to acceptable levels. This turbidity monitoring shall continue every hour until background turbidity levels are restored or until otherwise directed by the Department. The Permittee shall notify the Department's JCP Compliance Officer, by separate email to the JCP Compliance Officer, of such an event within 24 hours of the time the Permittee first becomes aware of the discharge. The subject line of the email shall state "OTHER PROJECT-ASSOCIATED DISCHARGE, TURBIDITY EXCEEDANCE".

When reporting a turbidity exceedance, the following information shall also be included:

a. the Project Name;

b. the Permit Number;

c. location and level (NTUs above background) of the turbidity exceedance;

d. the time and date that the exceedance occurred; and

e. the time and date that construction ceased.

Prior to re-commencing the construction, a report shall be emailed to the Department's JCP Compliance Officer with the same information that was included in the "Exceedance Report", plus the following information:

a. turbidity monitoring data collected during the shutdown documenting the decline in turbidity levels and achievement of acceptable levels;

b. corrective measures that were taken; and

c. cause of the exceedance.

37. **Turbidity Reports:** All turbidity monitoring data shall be submitted within one week of analysis. The data shall be presented in tabular format, indicating the measured turbidity levels at the compliance sites for each depth, the corresponding background levels at each depth and the number of NTUs over background at each depth. Any exceedances of the turbidity standard (29 NTUs above background, or zero (0) NTU's above background within OFW) shall be highlighted in the table. In addition to the raw and processed data, the reports shall also contain the following information:

a. time of day samples were taken;

b. dates of sampling and analysis;

c. GPS location of sample;

d. depth of water body;

e. depth of each sample;

f. antecedent weather conditions, including wind direction and velocity;

g. tidal stage and direction of flow;

h. water temperature;

i. a map, overlaid on an aerial photograph, indicating the sampling locations, dredging and discharge locations, and direction of flow. A sample map shall reviewed and approved by the Department prior to construction;

j. a statement describing the methods used in collection, handling, storage and analysis of the samples;

k. a statement by the individual responsible for implementation of the sampling program concerning the authenticity, precision, limits of detection, calibration of the meter, accuracy of the data and precision of the GPS measurements;

l. When samples cannot be collected, an explanation shall be included in the report. If unable to collect samples due to severe weather conditions, include a copy of a current report from a reliable, independent source, such as an online weather service.

Monitoring reports shall be submitted by email to the Division in Tallahassee (attn: JCP Compliance Officer) and to the Department's Southeast District office. In the subject line of the reports, include the Project Name, Permit Number and the dates of the monitoring interval. Failure to submit reports in a timely manner constitutes grounds for revocation of the permit. When submitting this information to the Department's JCP Compliance Officer, on the cover page to the submittal and at the top of each page, please state: "This information is provided in partial fulfillment of the monitoring requirements in Permit No. 0200269-009-JC, for the Captiva and Sanibel Island Beach Nourishment Project."

38. If the Permittee is unable to complete two maintenance events within the 15-year life of the permit, the Permittee may request (prior to the expiration date of the permit), and the Department shall grant, an extension of the permit expiration date in order to allow completion of the second maintenance event. The extension would be documented through an administrative modification.

39. **Planting of Dune Vegetation**. In the event of a major storm, dune and vegetation loses will be replaced to the greatest extent practical. Only Florida native plant species shall be planted, and plant species shall consist predominantly of sea oats (*Uniola paniculata*), dune panic grass (*Panicum amarum*), railroad vine (*Ipomea pes-caprae*) and dune sunflower (*Helianthus debilis*). A dune planting plan, which outlines the plant species, spacing of planting units, and monitoring, shall be submitted to the Department's JCP Compliance Officer for approval at least 30 days prior to planting unit installation. The planted vegetation shall be monitored monthly for 90 days to ensure survivability of the plants. Remedial planting shall occur if mortality is in excess of 50% during any of the three monthly monitoring events. Planting of dune vegetation is authorized to occur during the marine turtle nesting (May 1 through October 31) under the following conditions:

    a. It is the responsibility of the Permittee to ensure that the project area and access sites are surveyed for marine turtle nesting activity. All nest surveys, nest relocations screening or caging activities shall be conducted only by persons with prior experience and training in these activities and is duly authorized to conduct such activities through a valid permit issued by the FWC, pursuant to Rule 68-E, F.A.C.

    b. Marine turtle nest surveys shall be initiated at the beginning of the nesting season, or 65 days prior to installation of plants (whichever is later). Surveys shall continue until completion of the project, or through September 15 (whichever is earliest). Surveys shall be conducted throughout the project area and all beach access sites.

    c. Any nests deposited in an area not requiring relocation for conservation purposes (as determined by the marine turtle permit holder) shall be left in situ. The marine turtle permit holder shall install an on beach marker at any nest site and a secondary marker located at a point as far landward as possible to ensure that future location of the nest will be possible should the on-beach marker be lost. A series of stakes and survey ribbon or string shall be installed to establish an area of 3 feet radius surrounding the nest. No planting or other activity shall occur within this area nor shall any activity occur, which might cause indirect impacts within this area. Nest sites shall be inspected daily to ensure nest markers have not been removed.

    d. The use of heavy equipment (including trucks) for dune construction, planting and maintenance shall not occur seaward of the dune crest or armoring structure. Only a lightweight (ATV style) vehicle, with tire pressures of 10 p.s.i. or less shall operate on the beach.

e. Any vegetation planting or placement of irrigation materials shall be installed by hand labor/tools.

f. Irrigation (if proposed) shall be entrenched 1 to 3 inches below grade so as not to pose a barrier to hatchlings and to allow for easy removal. The irrigation system shall be designed and maintained so that watering of the unplanted sandy beach does not occur. In the event a marine turtle nest is deposited within the newly established dune planting area, the Permittee shall modify the irrigation system so that watering within 10 feet of the nest does not occur. Daily inspection of the irrigation system shall be accomplished by the Permittee to ensure compliance with this condition.

g. All activity shall be confined to daylight hours and shall not occur prior to the completion of all necessary marine turtle surveys and conservation activities within the project area. Nighttime storage of equipment or materials shall be off the beach (landward of the dune crest, existing seawalls or bulkheads).

h. If a nest is disturbed or uncovered during planting activity, the Permittee shall cease all work and immediately contact the person(s) responsible for marine turtle conservation measures within the project area. If a nest(s) cannot be safely avoided during construction, all activity within the affected project area shall be delayed until complete hatching and emergence of the nest.

40. A 1,000-foot buffer shall be established around the hardbottom resources within the sand stockpile/rehandling area. If this sand stockpile/rehandling area is utilized, no material shall be placed or dredged within 1,000 feet of the hardbottom resources.

Executed in Tallahassee, Florida.

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL PROTECTION

Martin K Seeling

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Martin Seeling, Program Administrator
Beaches, Inlets and Ports Program

FILING AND ACKNOWLEDGMENT

FILED, on this date, pursuant to Section 120.52, Florida Statutes, with the designated Department Clerk, receipt of which is hereby acknowledged.

Megan Stirk

Deputy Clerk

12/11/2014
Date

Prepared by Chiu Cheng.

Attachments: Approved Permit Drawings (27 pages)
FWC Regional Biologists Contact Information
Offshore sand source QA/QC Plan (approved July 14, 2014)
Upland sand source QA/QC Plan (approved July 14, 2014)