



Beach Management Funding Assistance Program
Local Government Funding Request
Fiscal Year 2025/2026
Beach Projects Application

PART I: GENERAL INFORMATION

Local Sponsor	Lee County		
Federal ID Number (FEID)	59-6000702		
Primary Contact Name	Mike Campbell	Title	Project Manager
Mailing Address Line 1	Natural Resources Division		
Mailing Address Line 2	1500 Monroe St.		
City	Fort Myers	Zip Code	33901
		Telephone Number	239-533-8133
Email Address	mcampbell@leegov.com		

Additional Contact Information

Alternate Contacts:
Debbie Paxton, Fiscal Manager
Steve Boutelle, Operations Manager
239-533-8109

PART II: CERTIFICATION

I hereby certify that all information provided with this application is true and complete to the best of my knowledge.

Signature of Local Sponsor	Michael Campbell	Digitally signed by Michael Campbell Date: 2024.07.31 10:38:22 -04'00'
----------------------------	------------------	---

Electronic or scanned signatures accepted.

Printed Name	Michael Campbell	Date	7/31/2024
--------------	------------------	------	-----------



Beach Management Funding Assistance Program
Local Government Funding Request
Fiscal Year 2025/2026
Beach Projects Application

PART III: EVALUATION CRITERIA

1. Project Name: (as listed in the Strategic Beach Management Plan)

Lovers Key, Lee County Nourishment

2. Project Description: Include county, location with reference to DEP range monuments, brief project history, and description of proposed activities.

The non-federal Lovers Key Restoration Project (R214.5-R220.5) was constructed in October 2004. The 1.1 mile beach and dune restoration project was completed on Lovers Key State Park and consisted of placing approximately 570,240 cy of material taken from a borrow site in Big Carlos Pass ebb shoal complex. Lee County is the local sponsor working in cooperation with FDEP's Division of Recreation and Parks.

Nourishment was completed in December 2014 in conjunction with the Bonita Beach project to the south. The project placed approximately 342,350 cy of material on Lover's Key from the Big Carlos Pass ebb shoal complex. Since construction, the project has been impacted by several tropical cyclones, most notably Hurricane Ian in 2022.

This funding request is to move the project into the next nourishment phase. Nourishment is planned for 2024/25. Coordination with Bonita Beach and South Bonita Beach is planned in order to ensure the project is cost effective.



Beach Management Funding Assistance Program
Local Government Funding Request
Fiscal Year 2025/2026
Beach Projects Application

3. Use of Requested Program Funds: Provide a brief description of tasks to be completed in each requested phase (Feasibility, Design, Construction, Monitoring, or USACE Multiphase). Indicate which tasks are cost reimbursement from previous fiscal years.

Construction - Completion of plans, specs, and construction drawings; bid services; implementation of nourishment with all permit required conditions and environmental monitoring and controls; construction inspection and completion certification; one year of post-construction monitoring (physical, turtle, bird).

4. Map: Provide as an attachment. The map(s) of the project area must be formatted at a minimum of 1" = 200' scale and include a compass rose and legend.

Map elements must include:

1. **Project boundary:** DEP reference monuments and shoreline designated as critically eroded
2. **Eligibility:** Indicate lengths of eligible shoreline based on criteria outlined in Chapter 62B-36.007, F.A.C.
 - a. Beach access locations: indicate primary or secondary access, and include the shoreline length, number and location of auto parking spaces, mass transit stops, bike parking spaces, and public restroom facilities within 1/4 mile walking distance of each access
 - b. Public lodging establishments: include the length fronting the project shoreline, and include the length of street-side frontage for lodging within 1/4 mile walking distance of a secondary beach access location
3. **Recreational benefits:** Comprehensive list of current land use designations of properties fronting the project shoreline
4. **Value of upland property:** Include one-quarter mile buffer and provide a comprehensive list of the values of properties (data from year 2023) that are enclosed or intersected by the buffer. The 2023 property value tax roll data and ArcGIS shapefiles can be obtained from the Department of Revenue website: https://floridarevenue.com/property/Pages/DataPortal_RequestAssessmentRollGISData.aspx. See Guidance Document for more information.

5. Project length: Total restored project length (in feet) of the critically eroded area (as listed in the Strategic Beach Management Plan).

5,900'



- **Location/Access Name:** Use the official name of the park or road that is associated with the public access.
- **DEP Reference Monument:** Use the DEP monument that is closest to the main public access location.
- **Type of Access:** Indicate Primary or Secondary beach access in accordance with the definitions in Chapter 62B-36, F.A.C.
- **Width of Access/Frontage:** The length of the legal boundary (in feet) of the public access or lodging along the beach project shoreline. For public lodging establishments that do not front the beach, indicate the street-side length of the legal property boundary (in feet) that is used as the main access to the establishment.
- **Number of Eligible Units:** A unit is defined as one automobile parking space, one rental unit in a public lodging establishment, one mass transit stop, or four bicycle parking spots.
- **Additional Width from Eligible Units:** Total distance (feet) added to the Width of Access/Frontage. If there are multiple types of eligibility units used for this calculation, show the calculation separately for each.
- **Total Eligible Shoreline:** Sum of the Width of Access/Frontage and Additional Width from Eligible Units columns. Eligible shorelines cannot overlap.
- **Website Link for DBPR License:** Provide the link to the Department of Business and Professional Regulation (DBPR) website for proof of licensure for any public lodging establishments used for eligibility or the Recreational Benefits ranking criteria.

[illegible]



Beach Management Funding Assistance Program
Local Government Funding Request
Fiscal Year 2025/2026
Beach Projects Application

7. Schedule and Budget: Provide as a separate attachment, if needed. Clearly indicate project phase: Feasibility (F), Design (D), Construction (C), Monitoring (M), or USACE Multiphase (USACE). Include the year of post-construction monitoring in the description.

8. Cost Reimbursement: Specify eligible costs incurred during the three years prior to the current application's fiscal year that are not in a current DEP agreement and have not been reimbursed (this includes fiscal years 22/23, 23/24, and 24/25).. Eligible costs will be added to the current funding request.

9. Current and Future Costs: Specify eligible costs for the current application's fiscal year that are not in a current DEP agreement and have not been reimbursed as well as the estimated costs for the next 4 years. Note: If Construction costs are requested in the current fiscal year, then the Year 1 Post-Construction Monitoring costs will be added to the current funding request

Fiscal Year	Project Phase	Description	Federal Cost	State Cost	Local Cost	Total Cost
22/23						
22/23						
22/23						
23/24						
23/24						
23/24						
24/25	Construction	Nourishment	0	35,370,500	4,823,250	40,193,750
24/25						
24/25						
25/26	Monitoring	Year 1 post-construction monitoring	0	30,000	30,000	60,000
25/26						
25/26						
26/27	Monitoring	Year 2 post-construction monitoring	0	30,000	30,000	60,000
26/27						
26/27						



Beach Management Funding Assistance Program
Local Government Funding Request
Fiscal Year 2025/2026
Beach Projects Application

Fiscal Year	Project Phase	Description	Federal Cost	State Cost	Local Cost	Total Cost
27/28	Monitoring	Year 3 post-construction monitoring	0	30,000	30,000	60,000
27/28						
27/28						
28/29	Monitoring	Year 4 post-construction monitoring	0	30,000	30,000	60,000
28/29						
28/29						
29/30	Monitoring	Year 5 post-construction monitoring	0	30,000	30,000	60,000
29/30						
29/30						

8. Tourism-related impacts: Criteria is calculated by the Department using 2023 data. For reference, tax data can be obtained from the Department of Revenue website: <https://floridarevenue.com/DataPortal/Pages/TaxResearch.aspx> See Guidance Document for more information.

- ☒ Current funding request includes construction and year one post-construction monitoring
☐ Project is managed by two or more counties

Additional comments

9. Federal involvement: The documentation to verify authorization, federal cost share percentage, and status of funding award must be provided with the application materials for the award of points.

Is the project Federally authorized by the USACE?

No

Authorization Year:

Expiration Year:

Does this project have a signed USACE Chief's report or Civil Works Congressional authorization for the requested phase?

No

USACE federal cost share percentage for this project (excluding FCCE):



Beach Management Funding Assistance Program
Local Government Funding Request
Fiscal Year 2025/2026
Beach Projects Application

Select all that apply for the requested project phase(s) and include documentation with application materials.

- ☐ Executed USACE project agreement
- ☐ Included in USACE work plan
- ☐ Approved FEMA Project Worksheet
- ☐ Included in Congressional Appropriations Act
- ☐ Other documentation:

10. Storm damage reduction benefits: Criteria is calculated by the Department.

What is the volume (cy) of advanced nourishment lost since the last sand placement event of a beach restoration or nourishment project as measured above the Mean High Water contour? Data should be consistent with the annual post-construction monitoring reports.

See attached Reports.

For restoration projects, what is the historical erosion rate?

11. Cost effectiveness: Criteria is calculated by the Department. A project design analysis and supporting documentation must be provided with the application materials for the award of points. See Guidance Document for more information.

What is the proposed sand placement volume (cy)?

582,500

What is the nourishment interval (years)?

10

Select all that apply for the current project funding request:

- ☒ Enhanced longevity: Propose structural or design components that could extend the beach nourishment interval
- ☒ Dune addition: Incorporate new or enhanced dune structures or new or existing dune restoration and revegetation projects
- ☐ Innovative technology: Propose innovative technologies designed to reduce project costs
- ☒ Regionalization: Two or more local sponsors manage projects together or projects propose regional sediment management strategies to conserve sand resources or reduce project costs

Additional comments
for storm damage
reduction benefits and
cost effectiveness

Enhanced design to extend beach nourishment interval.
Increased dune planting.

Lee County, the City of Bonita, and the Town of Fort Myers Beach have agreed to cooperate on the nourishment event to reduce project cost and conserve sand resources. The County is working with the Town of Fort Myers Beach to obtain State and Federal authorizations allowing the town to utilize the County's offshore sand source(see attached contract plans). The County has entered into an interlocal agreement with the City of Bonita Springs to combine the projects into one, sharing the cost of mobilization and demobilization, therefore reducing the project cost.

See attached assessment report.



Beach Management Funding Assistance Program
Local Government Funding Request
Fiscal Year 2025/2026
Beach Projects Application

12. Previous state commitment

Has the Department previously reviewed, approved, and cost-shared on a feasibility or design phase for this project?

Has the current proposed project phase(s) received a partial state appropriation within 3 years of phase completion?

Additional comments

13. Accessible beach area: Criteria is calculated by the Department. Provide additional information for consideration.

Describe the landward and seaward edge of the accessible beach width

Area bounded by ECL and +40' design profile. (236,000 sf)

Provide the project boundaries (R-monuments)

R-215-500' through R-220+500' (5900')

Provide citations of reference sources

0311811-001-JC, joint coastal permit

14. Recreational benefits: Provide the percentage of linear footage within the project boundaries which is zoned recreational or open space; for commercial use; or to allow for public lodging establishment, or the equivalent. Provide additional documentation and DBPR website link in a separate attachment, if needed.

100% within Lovers Key State Park

15. Mitigation of inlet effects: Criteria is calculated by the Department.

Additional comments

Project is within the AOI of Big Carlos Pass to the North and New Pass to the south, a regional inlet management study was just completed.

16. Successive unfunded requests

Is the current proposed project phase(s) a successive, unfunded request? If so, how many years of successive request(s) is the current application?

Does the successive request add the construction phase?



Beach Management Funding Assistance Program
Local Government Funding Request
Fiscal Year 2025/2026
Beach Projects Application

17. Environmental habitat enhancement: Criteria is calculated by the Department. See Guidance Document for more information.

Is the project within a designated critical habitat area for threatened or endangered species that is subject to extensive shoreline armoring?

No

Is the project within a non-designated area where extensive shoreline armoring threatens the habitat of threatened or endangered species?

No

If yes to either of the above, does the project exceed best management practices to incorporate turtle-friendly designs and management strategies to protect resources or benefit critical habitat preservation?

Provide an explanation and supporting documentation for the strategies which exceed best management practices

18. Readiness to construct

Does the project have an active state permit?

Yes

Does the project have an active federal permit?

Yes

Permit number

0311811-001-JC

Permit number

SAJ-2012-00198(IP-MJD)

Authorization date

June 24, 2013

Authorization date

Sept. 3, 2013

Expiration date

June 24, 2028

Expiration date

Sept. 3, 2028

Have all necessary easements been acquired for the upcoming or proposed construction phase?

Yes

Has the necessary local funding been secured for the proposed project? If so, provide a copy of the draft Resolution. The signed Resolution is due by September 23, 2024.

Yes

Is an Erosion Control Line established along the project length?

Yes

Additional comments for readiness to construct



Beach Management Funding Assistance Program
Local Government Funding Request
Fiscal Year 2025/2026
Beach Projects Application

Provide additional information and comments below or attach supporting documents.

4. Maps attached

10. Contract Plans attached. 2022 Monitoring Report and Post-Ian Assessment Report attached.

18. Draft Resolution attached.

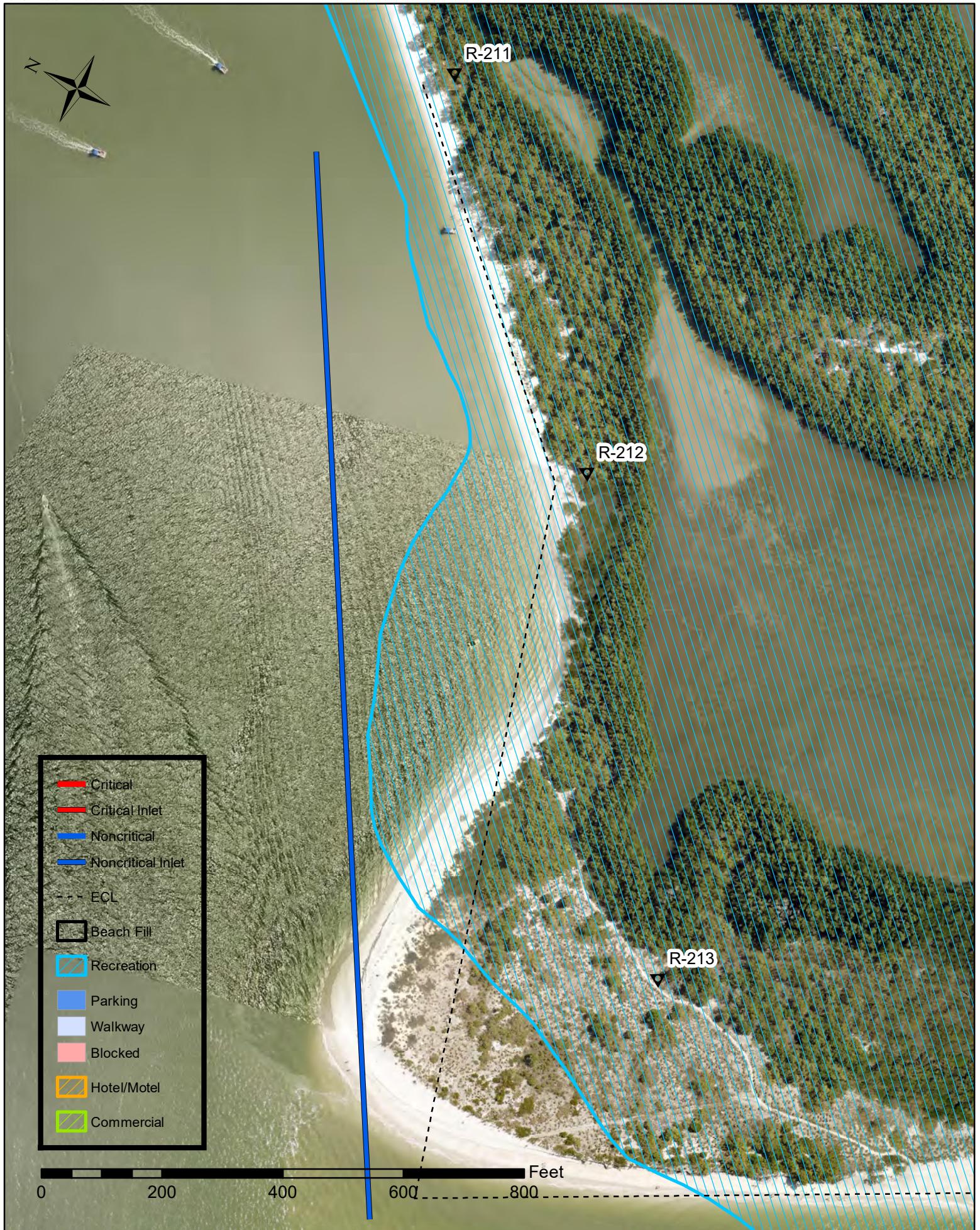
**LOVERS KEY NOURISHMENT
POST-IAN STORM IMPACT ASSESSMENT ON PERMITTED TEMPLATE
CEC FILE NO. 22.279
NOVEMBER 10, 2022**

	MON	AREA	AVG AREA	LENGTH	VOLUME	
		(CY/FT)	(CY/FT)	(FT)	(CY)	
Lovers Key Beach Fill	R-214.5	0.0				517,602
			39.1	434	16,973	
	R-215	78.2				
			87.3	559	48,820	
	R-215.5	96.4				
			86.6	506	43,817	
	R-216	76.8				
			98.0	535	52,421	
	R-216.5	119.1				
			111.7	542	60,565	
	R-217	104.3				
			103.6	467	48,438	
	R-217.5	102.9				
			70.2	560	39,310	
	R-218	37.5				
			69.6	504	35,091	
	R-218.5	101.7				
			105.1	463	48,675	
	R-219	108.6				
			94.5	489	46,256	
	R-219.5	80.4				
			69.4	442	30,678	
	R-220	58.3				
			61.1	500	30,565	
	R-220.5	64.0				
			32.0	500	15,991	
	R-221	0.0				

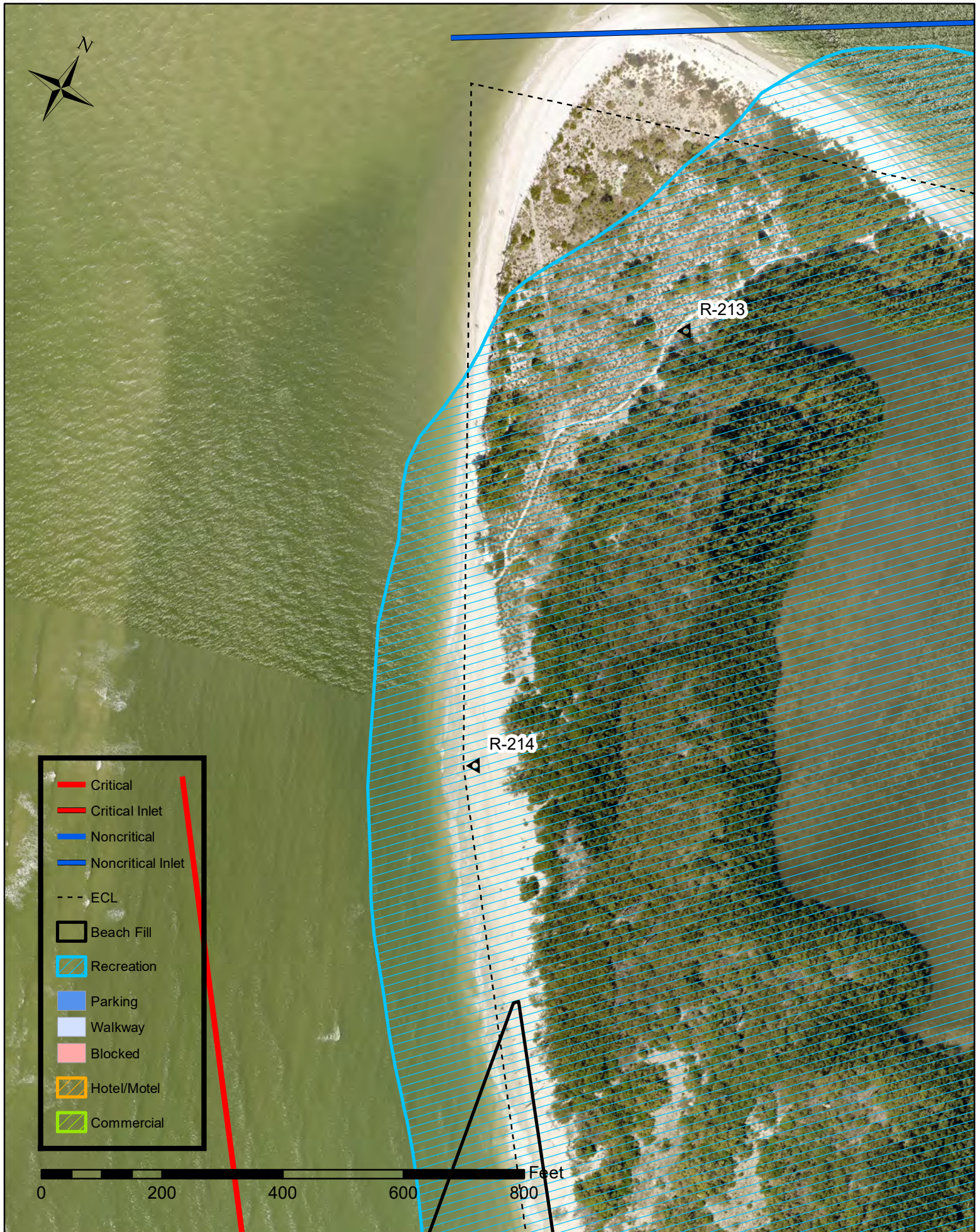
SCOUR / BREACH POST IAN ANALYSIS =	15,241
---	---------------

2021 DESIGN VOLUME (CY) = 485,000
BACKGROUND EROSION INCLUDED (CY) = 66,000
2022-23 PROPOSED VOLUME = 551,000
OCTOBER 2022 POST IAN VOLUME (CY) = 533,000
BACKGROUND EROSION (CY) = 49,500
PROPOSED 2023 NOURISHMENT VOLUME = 582,500
PERCENT DIFFERENCE FROM DESIGN = 5.7%

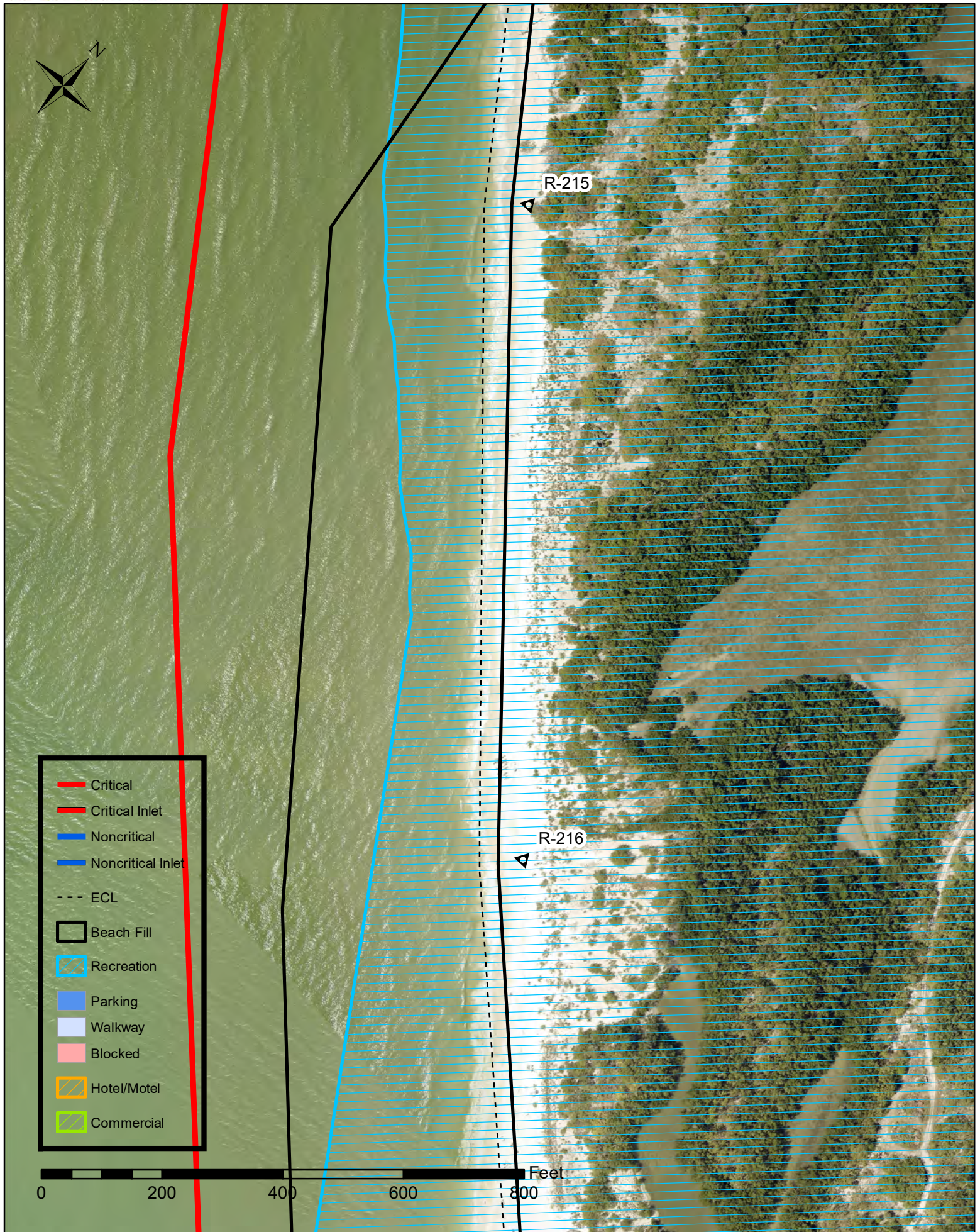
4A. Lovers Key - Project Details



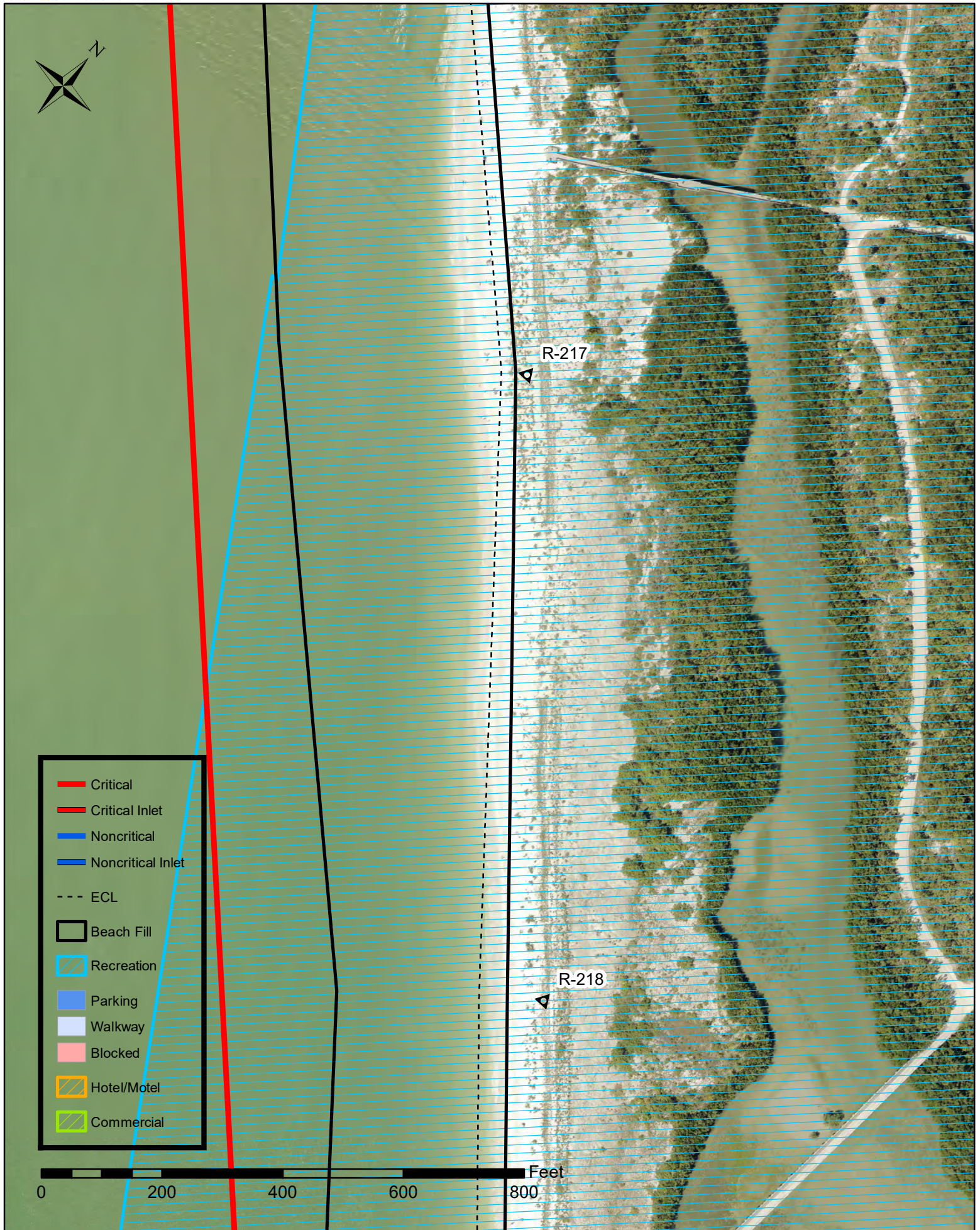
4A. Lovers Key - Project Details



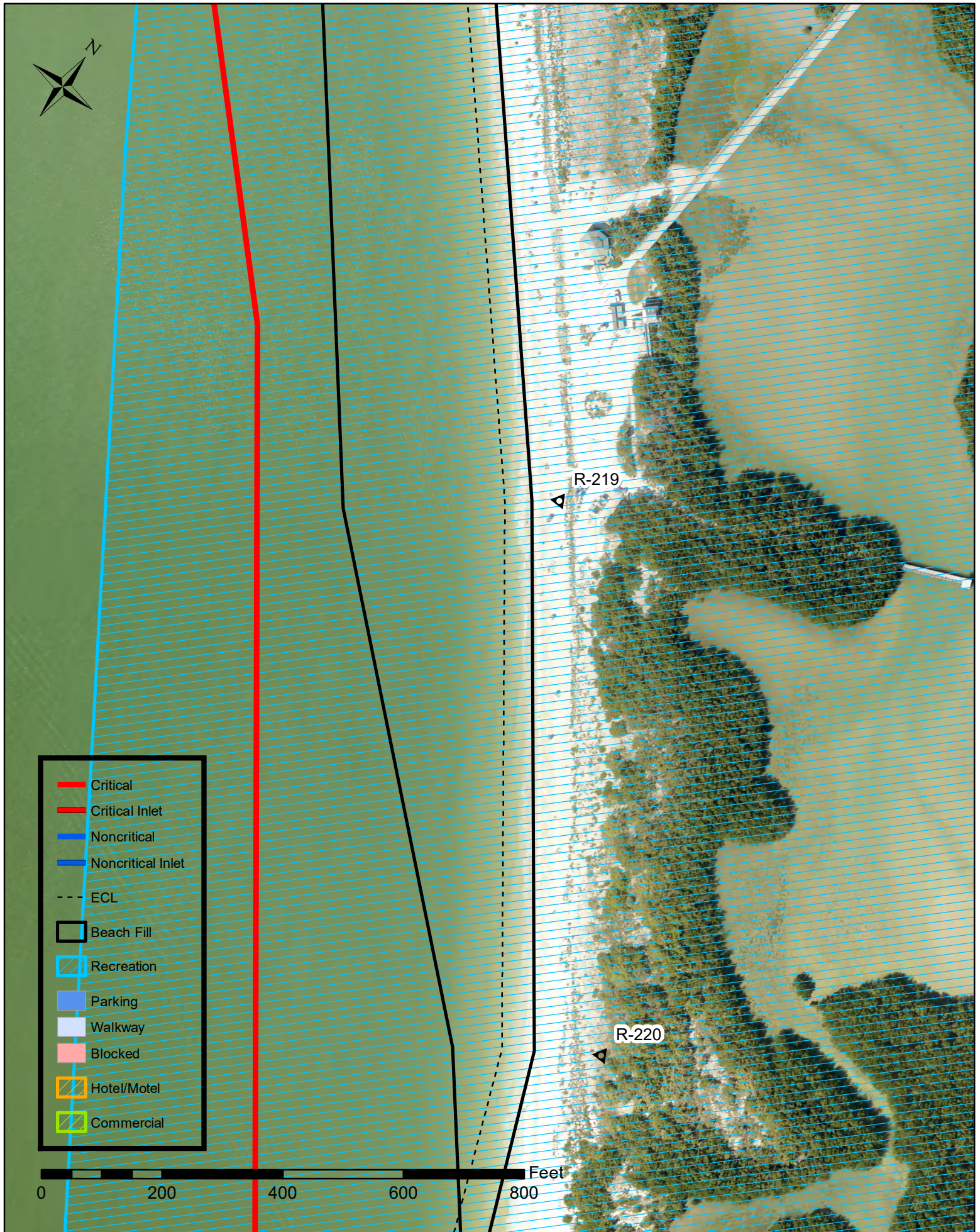
4A. Lovers Key - Project Details



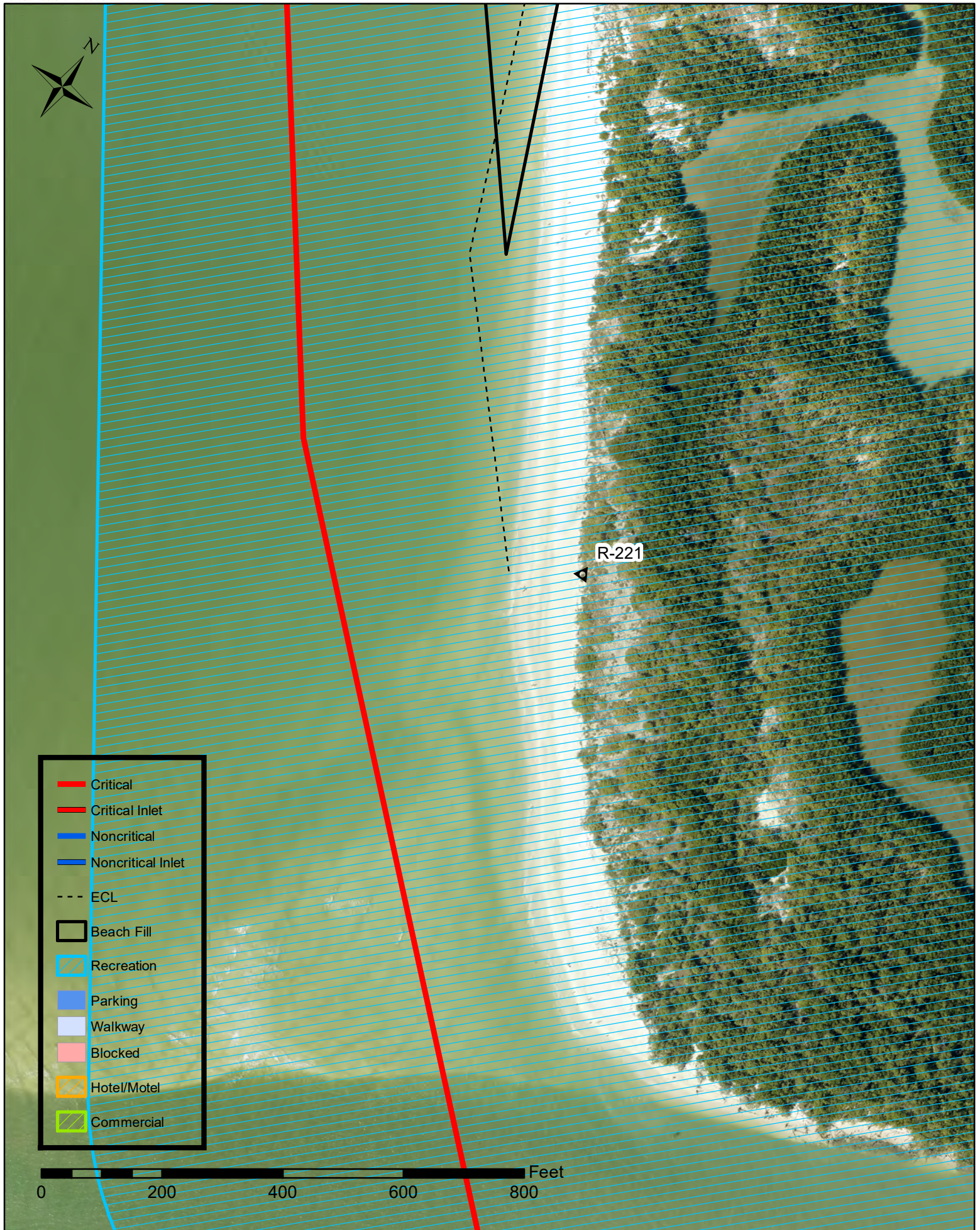
4A. Lovers Key - Project Details



4A. Lovers Key - Project Details



4A. Lovers Key - Project Details



4B. Lovers Key - Overview



4.4 Lovers Key - Value of Upland Property

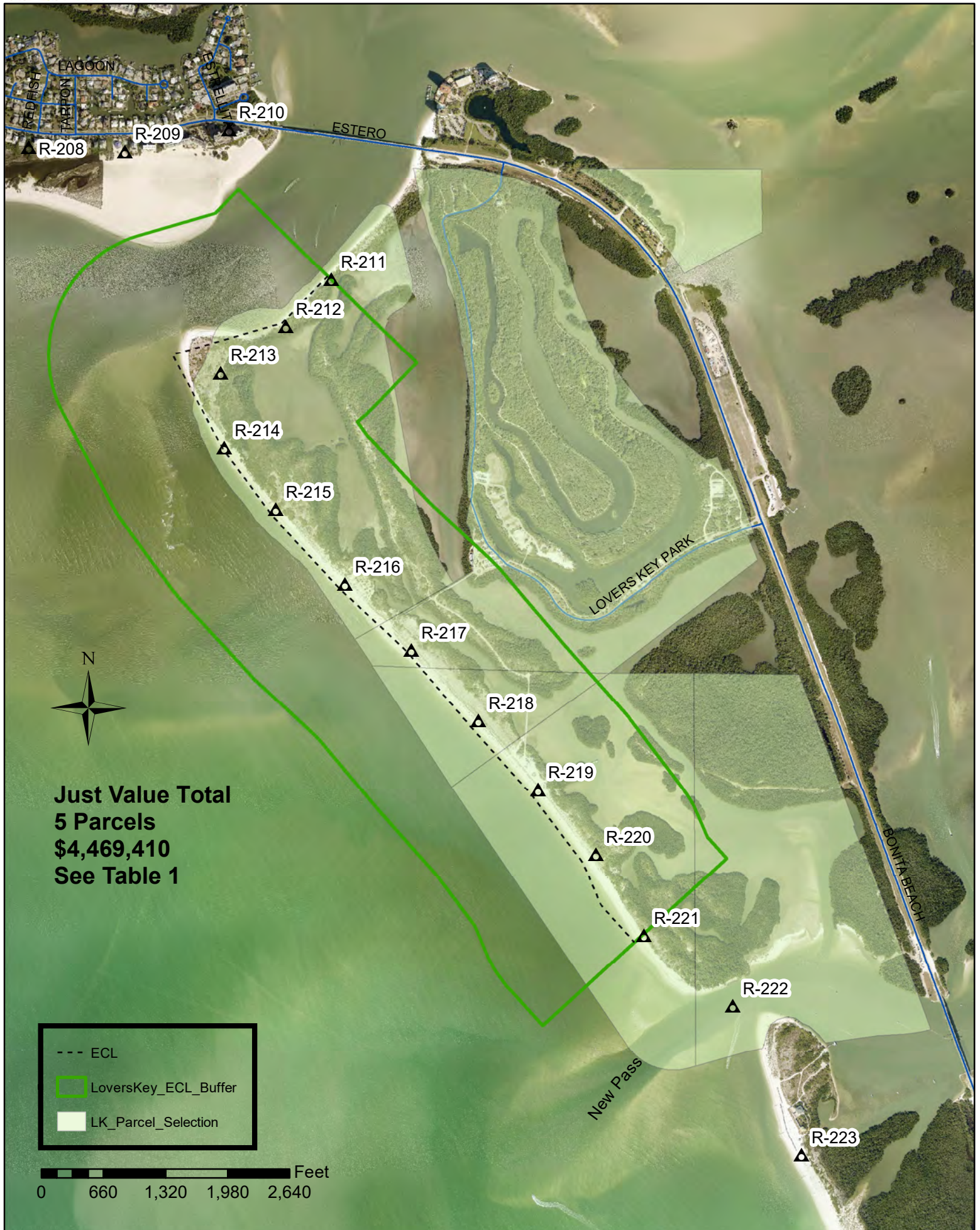


Table 1

PARCELNO	JV	OWN_NAME	PHY_ADDR1	PHY_CITY	PHY_ZIPCD
144724B2000040000	260,005	LEE COUNTY	BONITA BEACH CSWY	FORT MYERS BEACH	33931
144724B2000030010	58,952	TIITF/REC + PARKS	ACCESS UNDETERMINED	FORT MYERS BEACH	0
114724B40010A0000	171,695	TIITF/REC + PARKS	9000 ESTERO BLVD	FORT MYERS BEACH	33931
114724B3000020010	3,521,843	TIITF/REC + PARKS	9900/9950 ESTERO BLVD	FORT MYERS BEACH	33931
134724B1000030000	456,915	LEE COUNTY	14436 BONITA BEACH CSWY	BONITA SPRINGS	34134
TOTAL JV	4,469,410				

**BONITA BEACH AND LOVERS KEY BEACH RENOURISHMENT
2022 ANNUAL MONITORING REPORT**



DEP Permit 0311811-001-JC

Prepared for:

**Lee County Natural Resources Division
1500 Monroe Street
Ft. Myers, Florida 33901**

and

**Florida Department of Environmental Protection
3900 Commonwealth Boulevard
Tallahassee, FL 32399-3000**

November 30, 2022

CEC File No. 22.079

Prepared by:



TABLE OF CONTENTS

1	INTRODUCTION	1
1.1	Bonita Beach Project History and Design	3
1.2	Lovers Key Project History and Design	3
1.3	Adjacent Coastal Projects	4
2	SCOPE OF WORK	4
3	SURVEYS	5
4	PHYSICAL MONITORING	5
4.1	Depth of Closure	5
4.2	Beach Profiles	5
4.3	Big Hickory Pass Ebb Tidal Shoal	18
4.4	Morphologic Changes	20
4.4.1	Overall	20
4.4.2	New Pass Ebb Tidal Shoal	24
4.4.3	Big Hickory Pass Ebb Tidal Shoal	26
5	CONCLUSION	28
6	REFERENCES	28

LIST OF FIGURES

Figure 1. Location Map.....	2
Figure 2. MHW Shoreline Positions Relative to 2014 Pre-Construction MHW Positions.	8
Figure 3. 2021 – 2022 Annualized Volumetric Changes Above MHW.....	11
Figure 4. 2021 – 2022 Annualized Volumetric Changes Above Depth of Closure.	14
Figure 5. Big Hickory Pass Profile Lines.	19
Figure 6. 2021 Monitoring Survey Contour Map.	21
Figure 7. 2022 Monitoring Survey Contour Map.	22
Figure 8. Morphologic Changes between 2021 and 2022 Monitoring Surveys.	23
Figure 9. Morphologic Changes Within New Pass Ebb Shoal.	25
Figure 10. Morphologic Changes Within Big Hickory Pass Ebb Shoal.....	27

LIST OF TABLES

Table 1. Timing of Monitoring Activities.....	1
Table 2. 2021 – 2022 Shoreline Positions at MHW.	7
Table 3. 2021 – 2022 Volumetric Changes Above 2022 MHW.....	9
Table 4. 2021 – 2022 Volumetric Changes Above Depth of Closure.	12
Table 5. 2014 – 2015 Total Beach Fill Placed Landward of 2015 MHW.	15
Table 6. 2015 – 2022 Beach Fill Volume Changes Landward of 2015 MHW.	16

LIST OF APPENDICES

APPENDIX 1. SURVEY REPORT

APPENDIX 2. BEACH PROFILES

APPENDIX 3. BIG HICKORY PASS EBB TIDAL SHOAL CROSS SECTIONS

1 INTRODUCTION

In 2014, Lee County completed construction of the Bonita Beach and Lovers Key Beach Renourishment Project (Project). The contractor, Orion Marine Construction, Inc. (Orion), mobilized to the work site beginning June 4, 2014. Sand placement began at Bonita Beach on July 13, 2014, and was completed on September 30, 2014. Orion mobilized to Lovers Key and began sand placement on October 1, 2014. The Lovers Key beach fill was completed on December 2, 2014. Approximately 140,200 cubic yards and 342,400 cubic yards were excavated from the Borrow Areas and placed within the permitted limits of the Bonita Beach and Lovers Key beach fills, respectively. All work including final site clean-up and demobilization was completed on December 11, 2014. The post-construction survey was completed by Coastal Engineering Consultants, Inc. (CEC) on January 7, 2015 (CEC, 2015). The 1st annual monitoring survey was completed by CEC on July 1, 2016 (CEC, 2016). The 2nd annual monitoring survey was completed by CEC October 17-19, 2017 (CEC, 2018a). The 3rd annual monitoring survey was completed by CEC between June 28 and July 6, 2018 (CEC, 2018b). The 4th annual monitoring survey was completed by CEC July 17-18, 2019 (CEC, 2019). The 5th annual monitoring survey was completed by CEC June 11-12, 2020 (CEC 2020). The 6th annual monitoring survey was completed by CEC June 10-11, 2021 (CEC 2021). A location map is presented in Figure 1.

This report summarizes the Project performance and presents the results of the 7th annual physical monitoring survey completed by CEC June 13-21, 2022. The physical monitoring survey was completed in accordance with the Physical Monitoring Plan (PMP) dated May 2012 as outlined in the Florida Department of Environmental Protection (FDEP) Permit No. 0311811-001-JC. The timing of PMP activities is presented in Table 1 below.

Table 1. Timing of Monitoring Activities.

Monitoring Activity	Pre-Con	Post-Con	1 st Year Mon	2 nd Year Mon	3 rd Year Mon	4 th Year Mon	5 th Year Mon	6 th Year Mon*	7 th Year Mon
Beach Profiles	✓	✓	✓	✓	✓	✓	✓	✓	✓
Borrow Area Survey	✓	✓	✓	-	✓	-	✓	✓	✓
Big Hickory Pass Ebb Shoal	-	✓	✓	-	✓	✓	✓	✓	✓
Sediment Analysis	-	✓	-	-	-	-	-	-	-
Report	-	✓	✓	✓	✓	✓	✓	✓	✓

(-) Indicates data collection is not proposed for this time period

* 4th and 6th Year Monitoring not required by Permit

It should be noted that due to the 2017 construction of the Big Carlos Pass Dredging Project (Permit No. 0332643-003-JN) located within this Project's May 2012 PMP limits (R-205 to R-235), the Big Carlos Pass Project PMP was updated in November 2016 to include monitoring of the R-205 to R-210 segment. As a result, the shoreline change and beach volume change analyses between R-205 and R-210 are no longer included in the Lovers Key and Bonita Beach Monitoring Reports.

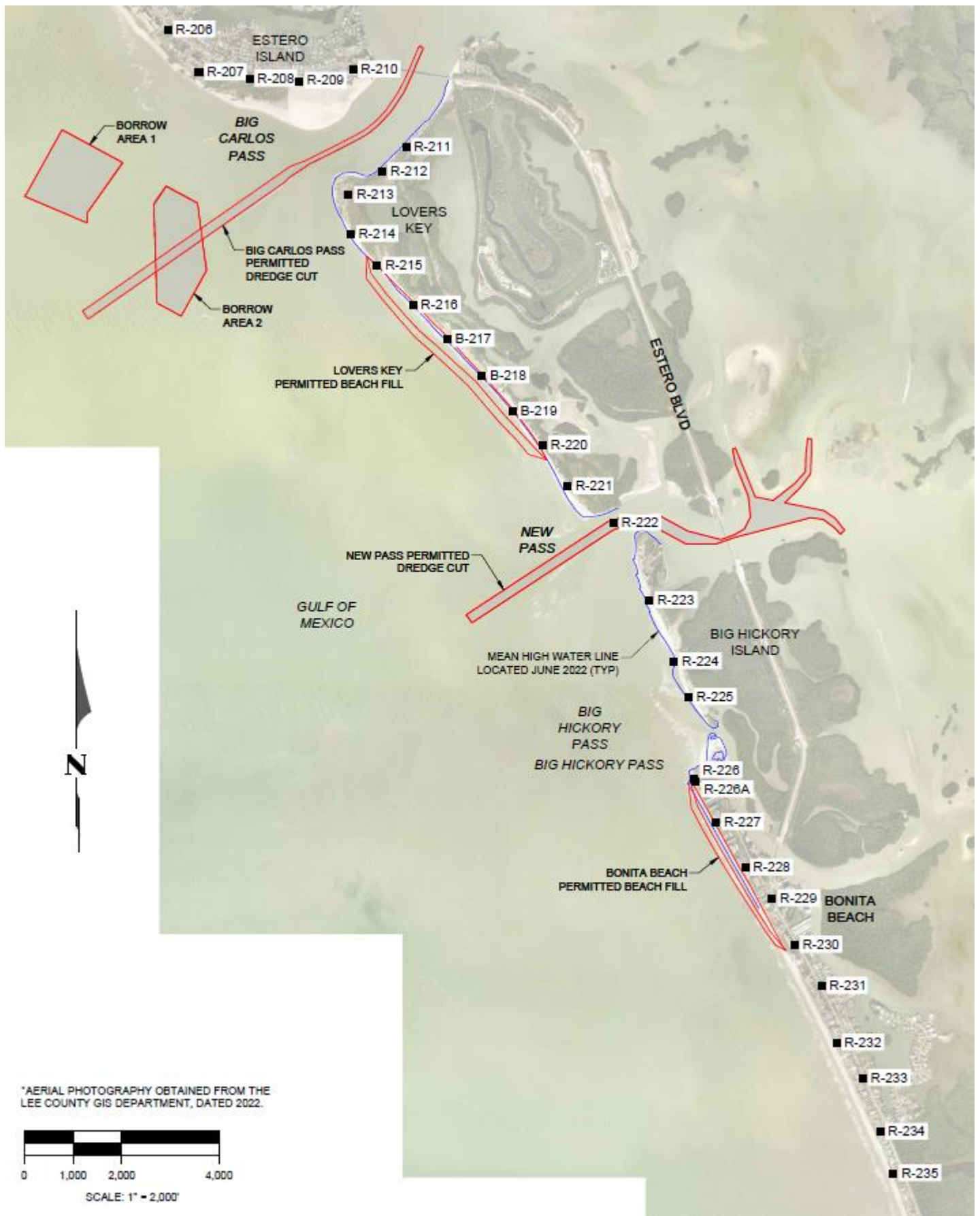


Figure 1. Location Map.

1.1 Bonita Beach Project History and Design

The original Bonita Beach restoration project took place in 1995 and the first maintenance nourishment was completed in May 2004. The 2004 maintenance design extended the shoreline seaward an average of 115 feet as measured from the surveyed 2001 shoreline with an anticipated design fill life of approximately 6 years. Design documentation from that effort did not indicate specific dimensions or fill quantities for a design minimum beach/berm or advance maintenance fill, although it is assumed that 115-foot width was based on some combination of a storm damage reduction berm buffered by sacrificial advanced maintenance. As part of the design of the Project, Coastal Technology Corporation (Coastal Tech) completed a review of the prior Bonita Beach project performance that indicated additional advanced fill was not warranted. Although there was a minor erosional ‘hotspot’ located at R-227, the previous maintenance project had generally performed as expected (Coastal Tech, 2012).

The Bonita Beach construction template proposed (Coastal Tech, 2012) generally consisted of:

- no separate dune feature
- a berm which ranges from 105 feet to 134 feet wide with
 - crest slope of 1 vertical to 200 horizontal (1V:200H)
 - seaward edge of top of berm crest elevation at +4.3 feet NAVD
 - seaward berm face slope of 15H:1V down to the existing profile (modified/flattened from prior 10H:1V design).

1.2 Lovers Key Project History and Design

The Lovers Key initial restoration project was completed in October 2004 as a construction contract extension of the first Bonita Beach maintenance project. The fill template included a 40-foot wide “design beach” width measured from the 2001 shoreline, a seaward slope of 15H:1V to the existing profile and advance maintenance fill placed seaward of the design beach intended to maintain the design beach for 8 years. The initial project generally performed as expected, except for an erosional ‘hotspot’ generally centered around R-216.5 where the shoreline had receded landward of the design beach (Coastal Tech, 2012).

The Lovers Key construction template proposed (Coastal Tech, 2012) generally consisted of:

- a small dune feature only at R-215 with an elevation of +4.9 feet NAVD
- berm design with:
 - varying width from 49 feet to 151 feet from pre-project MHW
 - crest slope of 1 vertical to 200 horizontal (1V:200H)
 - seaward edge of top of berm crest elevation at +2.9 feet NAVD
 - seaward berm face slope of 15H:1V down to the existing profile
 - additional “weighted” advanced maintenance volume centered roughly on R-217.

The Lovers Key full advanced maintenance volume was included in the Project design and in the required regulatory approvals, but the final volume placed was field adjusted at the time of construction based on actual pre-project beach conditions, the Project funds available following

receipt and evaluation of the construction bids, and the volume of sand available in the borrow areas.

1.3 Adjacent Coastal Projects

Between November 25 and December 18, 2020, on behalf of the West Coast Inland Navigation District (WCIND) and Lee County, Cavache Inc. dredged New Pass and placed approximately 21,270 cubic yards of fill on Lover's Key between R-216.5 and R-219.5.

2 SCOPE OF WORK

Beach Profiles: Establish temporary horizontal and vertical control, one-time, on the uplands within the Project. Conduct 7th year beach profile monitoring surveys of the active beach zone along the shoreline at each reference monument (R monument) from R-211 to R-235. Additional profiles at half monuments within the Lovers Key fill limits (R-214.5 to R-220.5) and within the Bonita Beach fill limits (R-226A to R-230) will be included to provide increased detail on Project performance. Perform analyses of shoreline and volumetric change within the surveyed area in accordance with the agency approved plan.

Big Hickory Pass Ebb Tidal Shoal: Use traditional hydrographic survey methods to collect profile data for the Big Hickory Pass Ebb Tidal Shoal in accordance with the agency approved plan.

Regional Inlet Management Study: Based upon Lee County's Regional Inlet Management Study (RIMS) recommendations, additional topographic and bathymetric data were collected to complement the annual monitoring survey.

Physical Monitoring Report: Prepare and submit to the agencies an annual Physical Monitoring Report within 90 days following completion of the 7th year monitoring survey. The report shall include:

- signed and sealed survey report,
- analysis for patterns, trends, or changes between surveys and for cumulative changes over time,
- evaluation of the erosion and accretion rates occurring between the initial post-construction survey and consecutive annual monitoring surveys; and an assessment of the volume of fill remaining within the Project area,
- comparative review of project performance to performance expectations and identification of adverse impacts attributable to the project.

It should be noted that the submittal of this Physical Monitoring Report was delayed past the 90-day window due to impacts of Hurricane Ian that occurred at the end of September 2022. The CEC office was without Internet for weeks. Once it was restored, the draft report was submitted to the County for review while they were dealing with high pressing post-Ian recovery efforts.

3 SURVEYS

CEC conducted the monitoring survey of Lovers Key, Big Hickory Island, and Bonita Beach June 13-21, 2022 at the beginning of the hurricane season while the County was making an effort to finish their regional beach surveys extending from South Estero Island to Bonita Beach prior to the first storm event. The remaining surveys of ebb shoals and inlets were performed later in the summer including the monitoring survey of Big Hickory Pass Ebb Tidal Shoal which was conducted by CEC on August 10, 2022. The survey report is presented in Appendix 1. All work activities and deliverables were conducted in accordance with the latest update of the FDEP Monitoring Standards for Beach Erosion Control Projects, Sections 01000, 01100, and 01200.

Bathymetric survey data collection was conducted in calm seas. Maximum wave heights during the data collection period were less than 3 feet. The data was collected at intervals not exceeding 25 feet and at all grade breaks along the profile sufficient to accurately describe the bathymetry at the profile locations.

Bathymetric survey data collection was performed as close in time as possible with the upland topographic survey data collection. This significantly increased the efficiency by conducting the work with the same base station set-up. Safety was also increased by having both crews visible to each other at all times.

The beach profile deliverables were produced by merging the upland and offshore survey data in Hypack 2017. The processed data was exported into AutoCAD and individual profiles/sections were plotted to the specified scale.

4 PHYSICAL MONITORING

4.1 Depth of Closure

The depth of closure for Big Hickory Island and Bonita Beach was determined to be -11.2 feet NAVD88. The Lovers Key beach profiles are shallower compared to those of Bonita Beach with much milder profile slopes due to the presence of the large Big Carlos Pass ebb shoal system sheltering these areas. From visual observations of the profiles, a distance of 500 feet seaward of MHW was previously established as the depth of closure for the purpose of computing volume changes for the monitoring requirements (CEC, 2016).

4.2 Beach Profiles

Appendix 2 presents the beach profiles measured at each R-monument for the 2014 pre-construction, 2015 post-construction, as well as the 2020, 2021, and 2022 monitoring surveys.

Table 2 presents the 2021 and 2022 monitoring survey shoreline positions at MHW (MHW = 0.3 feet NAVD88) and the shoreline changes that occurred between the surveys. The unweighted average shoreline change for individual beach segments was calculated based upon these changes. Figure 2 presents the permitted beach fill templates, 2015 post-construction, 2020 monitoring, 2021 monitoring, and 2022 monitoring surveys relative to the 2014 pre-construction survey. It

should be noted that the 2014 pre-construction survey was utilized as the baseline for comparative purposes. The design templates (without advanced maintenance) were specifically depicted for tracking fill diffusion and evolution over time in support of future funding requests and evaluating renourishment needs.

Table 3 presents the volumetric changes landward of MHW and Figure 3 presents the annualized volumetric change rate landward of MHW calculated by comparing the 2021 and 2022 monitoring surveys and annualizing the changes to be consistent with prior year monitoring reports. For the purpose of monitoring and reporting, the cell boundary was set equal to the 2022 MHW line. Table 4 presents the overall volumetric changes calculated to the depth of closure and Figure 4 presents the annualized volumetric change to the depth of closure for this period.

Table 5 presents the total beach fill placed landward of the post-construction MHW line utilizing the pre- and post-construction R-monument beach profile surveys. Table 6 presents the beach fill volume changes landward of the 2015 MHW line utilizing the post-construction and 2022 monitoring surveys. As this analysis was completed in support of the County's funding application to the Beach Management Funding Assistance Program, the cell boundary was set equal to the 2015 MHW line.

The Average End-Area method was used to compute volumetric changes. For parallel R-monument lines the perpendicular distance between R-the monument lines was used for the volumetric calculations. For non-parallel R-monument lines, the distance between the monument lines and their respective intersections with 2022 MHW was used for the volumetric calculations.

Additional half monuments were surveyed on Big Hickory Island (R-222.5, R-223.5, R-224.5), and Bonita Beach (R-225.5A, R-230.5) for future comparison and analysis. Additional monuments were also surveyed on Bonita Beach (R-236, R-237, R-238, R-239) for periodic monitoring and are not included in any calculations or analysis. Volumetric changes landward of MHW and to the depth of closure were not computed for these monuments in this monitoring report. These profiles are included in Appendix 2.

The RIMS survey included extensions to the north for twelve of the Big Carlos Pass ebb shoal lines and seven additional shore-parallel lines to the south that connected the Big Carlos Pass survey grid with the New Pass survey grid. Ten shore-perpendicular lines spaced at 200-foot intervals were added and surveyed on Big Hickory Island between R-222.5 and 225. This data was incorporated into the contour maps and morphologic change maps presented herein.

Table 2. 2021 – 2022 Shoreline Positions at MHW.

Mon.	2021 Position Monitoring (FT)	2022 Position Monitoring (FT)	Shoreline Change (FT)	Average** Change (FT)	Segment
R-211	71.2	72.5	1.3	0.1	Big Carlos Pass (South)
R-212	82.1	81.0	-1.1		
R-213	373.6	359.9	-13.7		
R-214	70.8	30.2	-40.6	-16.5	Lovers Key North Adjacent Shoreline
R-214.5	13.6	18.4	4.8		
R-215	8.9	5.4	-3.4		
R-215.5	61.1	34.1	-26.9	-21.0	Lovers Key Beach Fill
R-216	21.6	11.1	-10.4		
R-216.5	78.0	53.2	-24.8		
R-217	60.7	29.7	-31.0		
R-217.5	143.4	112.8	-30.6		
R-218	45.6	17.5	-28.1		
R-218.5	138.5	113.4	-25.1		
R-219	21.7	-0.7	-22.3		
R-219.5	73.9	57.2	-16.6		
R-220	93.5	82.0	-11.5		
R-220.5	115.0	119.6	4.7	0.1	Lovers Key South Adjacent Shoreline
R-221	117.4	112.9	-4.5		
R-222				N/D	New Pass
R-223	50.3	65.4	15.1	22.1	Big Hickory Island
R-224	-35.8	-40.7	-4.9		
R-225	-19.4	36.7	56.0		
R-226	96.3	98.5	2.2	2.2	Bonita Beach North Adjacent Shoreline
R-226A	180.5	168.2	-12.3	-5.8	Bonita Beach Fill
R-226.5	91.9	85.6	-6.3		
R-227	110.1	104.2	-5.9		
R-227.5	94.4	91.3	-3.2		
R-228	173.8	165.4	-8.5		
R-228.5	371.2	369.4	-1.8		
R-229	350.2	338.1	-12.1		
R-229.5	313.1	319.4	6.3		
R-230	300.2	292.1	-8.1		
R-231	391.8	388.0	-3.8	2.4	Bonita Beach South Adjacent Shoreline
R-232	139.8	143.8	4.0		
R-233	323.8	327.3	3.6		
R-234	200.3	200.5	0.2		
R-235	113.9	121.8	7.9		

*N/D = No data, profile does not cross MHW

**Average is unweighted

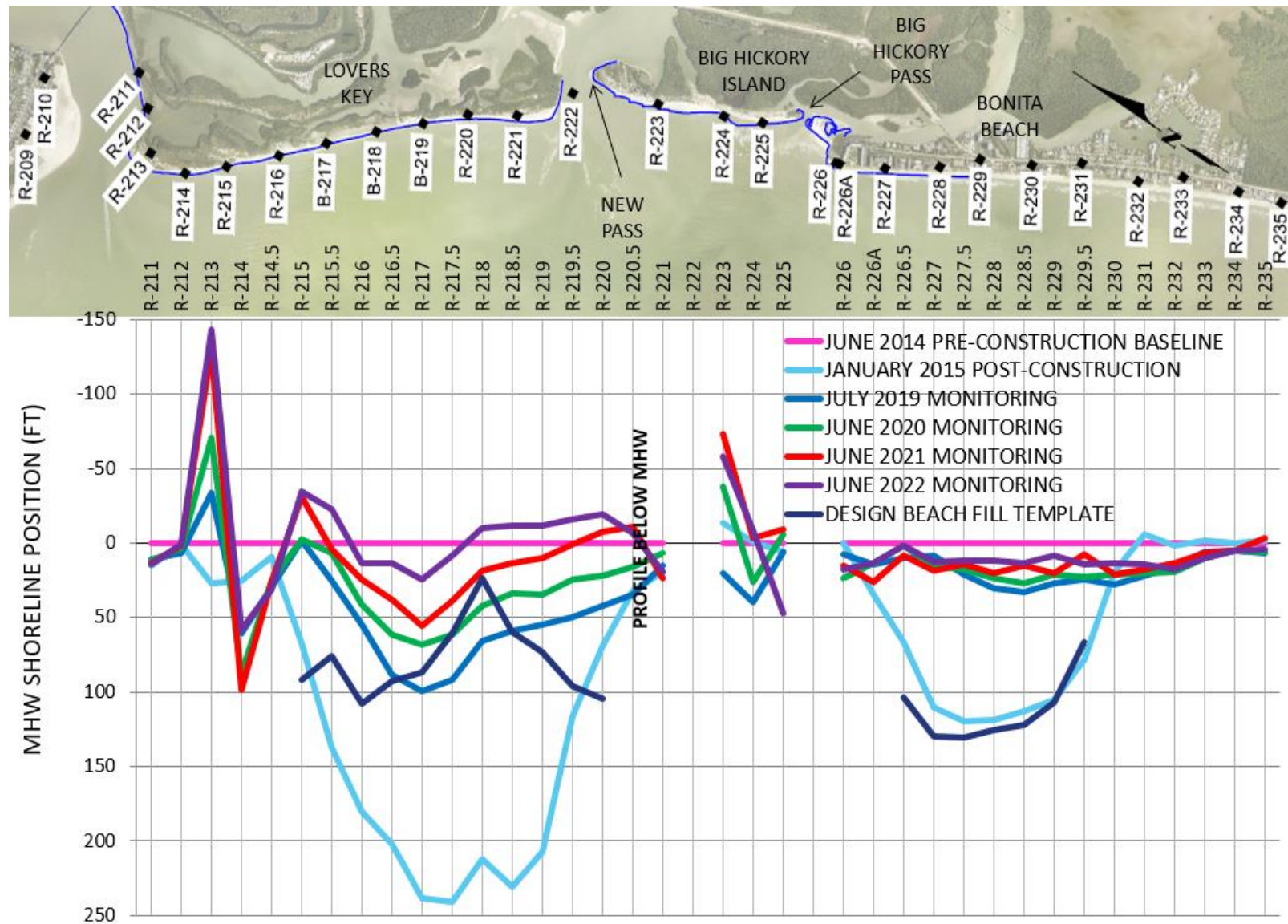


Figure 2. MHW Shoreline Positions Relative to 2014 Pre-Construction MHW Positions.

Table 3. 2021 – 2022 Volumetric Changes Above 2022 MHW.

	Monument	Area (YD³/FT)	Avg Area (YD³/FT)	Length (FT)	Volume (YD³)	Total Volume Change (YD³)
Big Carlos Pass (R-211 - R-212)						
LK North Adjacent Shoreline	R-213	-1.3				-75
			-0.6	1003	-649	
	R-214	0.0				
			0.6	407	228	
	R-214.5	1.2				
			0.8	451	346	
Lovers Key Beach Fill	R-215	0.4				-8,193
			-0.1	540	-79	
	R-215.5	-0.7				
			-0.1	547	-62	
	R-216	0.4				
			0.1	472	59	
	R-216.5	-0.2				
			-0.6	513	-310	
	R-217	-1.0				
			-2.4	497	-1,174	
	R-217.5	-3.7				
			-4.2	545	-2,285	
	R-218	-4.7				
			-3.6	519	-1,848	
	R-218.5	-2.4				
			-3.0	449	-1,340	
	R-219	-3.5				
			-1.9	506	-935	
	R-219.5	-0.2				
		-0.5	410	-219		
R-220	-0.9					
LK South Adjacent Shoreline			-0.2	501	-76	579
	R-220.5	0.6				
			1.3	505	655	
	R-221	2.0				
New Pass (R-222)						
Big Hickory Island						6,729
	R-223	0.4				
			-0.8	1376	-1,163	
	R-224	-2.1				
			3.9	782	3,026	
	R-225	9.9				
			9.0	200	1,798	
	BHP-3	8.1				
			8.8	200	1,755	
	BHP-4	9.4				
			5.6	200	1,128	
	BHP-5	1.8				
			0.9	200	185	
BHP-6	0.0					

Big Hickory Pass					
Bonita North Adjacent Shoreline	BHP-7	14.4			
			8.0	200	1,597
	BHP-8	1.6			
			-0.6	200	-126
	BHP-9	-2.9			
			-1.7	290	-493
	R-226	-0.5			
			-0.6	96	-55
Bonita Beach Fill	R-226A	-0.6			
			-0.4	451	-179
	R-226.5	-0.2			
			0.5	515	268
	R-227	1.2			
			0.8	520	434
	R-227.5	0.4			
			0.0	584	17
	R-228	-0.4			
			-0.5	327	-159
	R-228.5	-0.6			
			-0.2	478	-118
	R-229	0.1			
			0.4	521	209
	R-229.5	0.7			
			0.4	510	200
	R-230	0.1			
Bonita South Adjacent Shoreline			0.2	1030	228
	R-231	0.4			
			0.4	1190	472
	R-232	0.4			
			0.4	872	383
	R-233	0.4			
			0.3	1130	296
	R-234	0.1			
			0.2	910	220
	R-235	0.4			

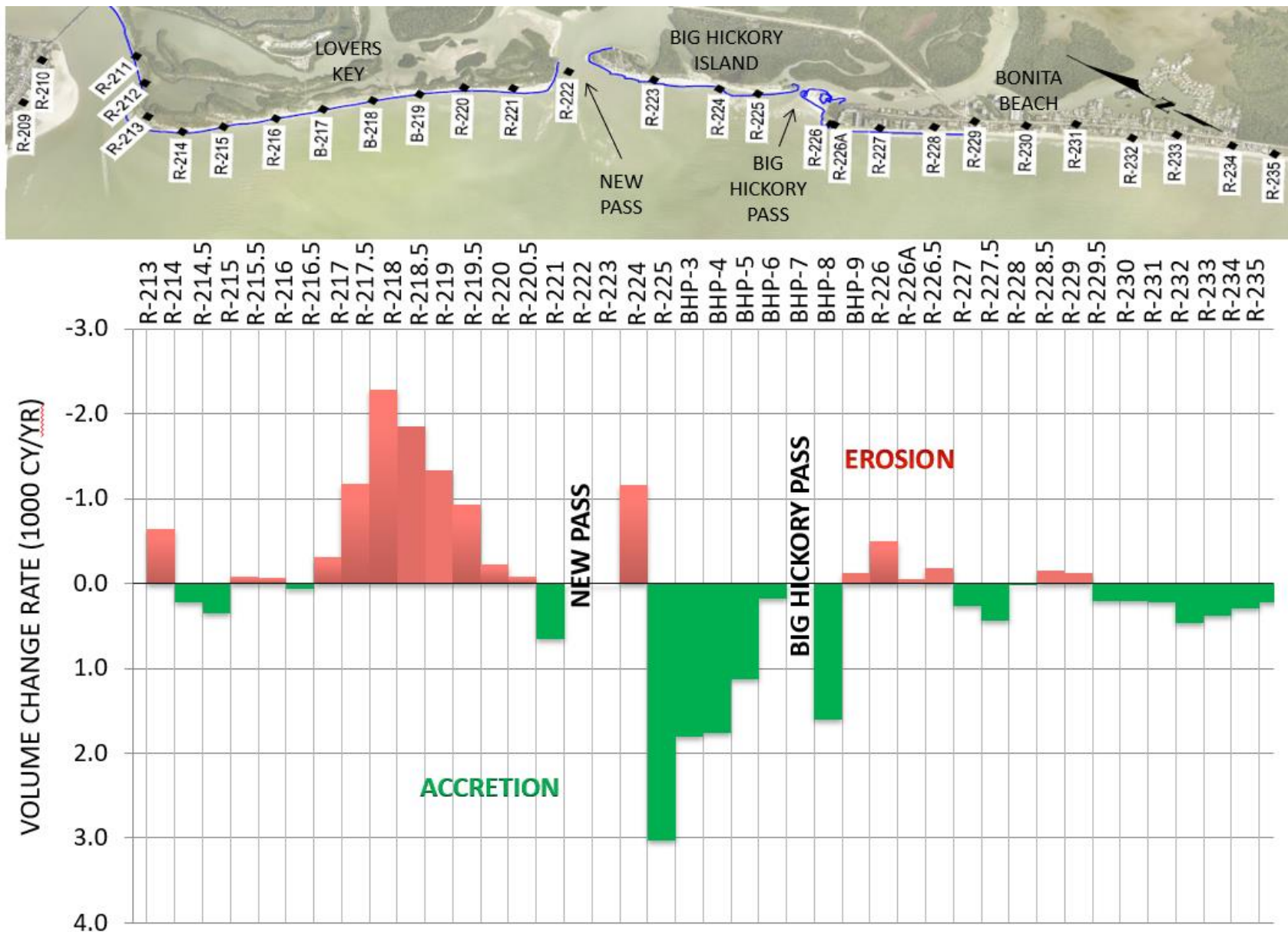


Figure 3. 2021 – 2022 Annualized Volumetric Changes Above MHW.

Table 4. 2021 – 2022 Volumetric Changes Above Depth of Closure.

	Monument	Area (YD³/FT)	Avg Area (YD³/FT)	Length (FT)	Volume (YD³)	Total Volume Change (YD3)
Big Carlos Pass (R-211 - R-212)						
LK North Adjacent Shoreline	R-213	-6.1				3,754
			-1.0	1003	-959	
	R-214	4.1				
			5.5	407	2,221	
	R-214.5	6.8				
			5.5	451	2,492	
Lovers Key Beach Fill	R-215	4.3				-26,008
			1.9	540	1,033	
	R-215.5	-0.5				
			1.3	547	703	
	R-216	3.0				
			0.1	472	33	
	R-216.5	-2.9				
			-5.1	513	-2,593	
	R-217	-7.2				
			-9.4	497	-4,669	
	R-217.5	-11.6				
			-12.3	545	-6,717	
	R-218	-13.1				
			-11.4	519	-5,938	
	R-218.5	-9.8				
			-9.4	449	-4,235	
	R-219	-9.1				
			-5.5	506	-2,772	
R-219.5	-1.9					
		-2.1	410	-855		
R-220	-2.3					
LK South Adjacent Shoreline			-0.2	501	-76	149
	R-220.5	2.0				
			0.4	505	225	
	R-221	-1.1				
New Pass (R-222)						
Big Hickory Island						30,736
	R-223	-8.4				
			10.2	1376	14,003	
	R-224	28.8				
			17.7	782	13,870	
	R-225	6.7				
			-2.8	200	-564	
	BHP-3	-12.3				
			1.4	200	277	
	BHP-4	15.1				
			5.4	200	1,085	
	BHP-5	-4.2				
		10.3	200	2,065		
BHP-6	24.9					
Big Hickory Pass						

Bonita North Adjacent Shoreline	BHP-7	0.8				-7,987
			-9.9	200	-1,987	
	BHP-8	-20.7				
			-16.9	200	-3,383	
	BHP-9	-13.2				
			-8.2	290	-2,388	
	R-226	-3.3				
Bonita Beach Fill			-2.4	96	-229	-4,676
	R-226A	-1.5				
			0.1	451	24	
	R-226.5	1.6				
			0.4	515	208	
	R-227	-0.8				
			-1.5	520	-783	
	R-227.5	-2.2				
			-2.6	584	-1,503	
	R-228	-2.9				
			-2.4	327	-771	
	R-228.5	-1.8				
			-2.5	478	-1,197	
	R-229	-3.2				
			-0.6	521	-322	
	R-229.5	2.0				
			-0.7	510	-332	
	R-230	-3.3				
Bonita South Adjacent Shoreline			-1.5	1030	-1,554	-661
	R-231	0.2				
			0.0	1190	49	
	R-232	-0.2				
			0.6	872	516	
	R-233	1.3				
			0.2	1130	239	
	R-234	-0.9				
			0.1	910	89	
	R-235	1.1				

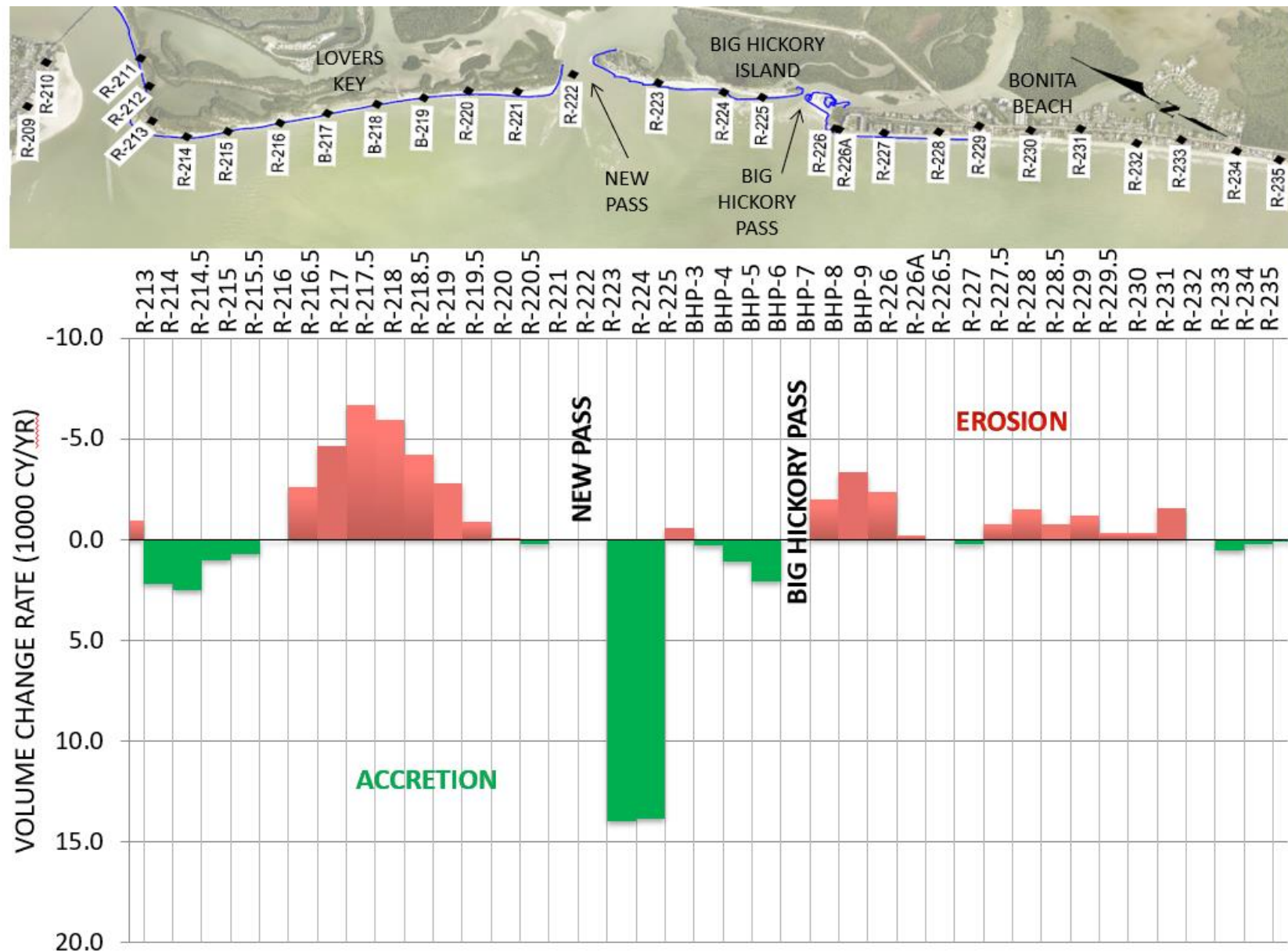


Figure 4. 2021 – 2022 Annualized Volumetric Changes Above Depth of Closure.

Table 5. 2014 – 2015 Total Beach Fill Placed Landward of 2015 MHW.

	Monument	Area (YD³/FT)	Avg Area (YD³/FT)	Length (FT)	Volume (YD³)	
Lovers Key Beach Fill	R-215	17.9				250,119
			24.8	540	13,379	
	R-215.5	31.7				
			39.3	567	22,285	
	R-216	46.9				
			49.5	452	22,386	
	R-216.5	52.1				
			62.7	489	30,642	
	R-217	73.3				
			72.4	520	37,688	
	R-217.5	71.6				
			66.8	532	35,548	
	R-218	62.0				
			65.1	531	34,614	
	R-218.5	68.2				
			62.2	436	27,125	
	R-219	56.1				
			38.9	514	20,002	
	R-219.5	21.7				
			16.4	392	6,449	
R-220	11.2					
Bonita Beach Fill	R-226A	4.7				98,380
			11.5	445	5,097	
	R-226.5	18.3				
			24.1	515	12,401	
	R-227	29.9				
			31.0	519	16,080	
	R-227.5	32.1				
			32.0	582	18,644	
	R-228	32.0				
			32.1	326	10,477	
	R-228.5	32.2				
			32.4	476	15,424	
	R-229	32.5				
			27.3	519	14,151	
	R-229.5	22.1				
			12.1	504	6,105	
	R-230	2.1				

Table 6. 2015 – 2022 Beach Fill Volume Changes Landward of 2015 MHW.

	Monument	Area (YD³/FT)	Avg Area (YD³/FT)	Length (FT)	Volume (YD³)	
Lovers Key Beach Fill	R-215	-21.5				-230,704
			-26.9	540	-14,534	
	R-215.5	-32.3				
			-30.5	547	-16,689	
	R-216	-28.7				
			-35.4	472	-16,726	
	R-216.5	-42.1				
			-48.5	513	-24,836	
	R-217	-54.8				
			-58.8	497	-29,190	
	R-217.5	-62.8				
			-63.2	545	-34,430	
	R-218	-63.7				
			-67.8	519	-35,165	
	R-218.5	-71.9				
			-66.4	449	-29,799	
	R-219	-61.0				
			-42.4	506	-21,447	
	R-219.5	-23.9				
			-19.2	410	-7,888	
R-220	-14.6					
Bonita Beach Fill	R-226A	0.2				-74,894
			-6.7	451	-3,031	
	R-226.5	-13.7				
			-18.9	515	-9,702	
	R-227	-24.1				
			-25.0	520	-13,038	
	R-227.5	-26.0				
			-26.8	584	-15,654	
	R-228	-27.5				
			-26.1	327	-8,538	
	R-228.5	-24.7				
			-24.7	478	-11,794	
	R-229	-24.7				
			-19.6	521	-10,223	
	R-229.5	-14.6				
			-5.7	510	-2,915	
	R-230	3.2				

A summary of the shoreline and volumetric changes based on the comparisons between the 2021 and 2022 monitoring surveys at the R-monuments is presented below. Several of the Big Hickory Pass ebb shoal lines, presented in detail in Section 4.3, were included in the volumetric change analysis.

Big Carlos Pass: The segment extending from R-211 to R-212 is within Big Carlos Pass on its south side and therefore no volumetric analysis was performed. The shoreline advanced on average 0.1 feet between the 2021 and 2022 monitoring surveys.

Lovers Key North Adjacent Shoreline: The beach segment extending from R-213 to R-214.5 receded on average approximately 16.5 feet between the 2021 and 2022 monitoring surveys. The range of shoreline change measured at MHW was approximately from 4.8 feet of advancement at R-214.5 to 40.6 feet of recession at R-214. The total volume change was approximately 3,750 cubic yards of accretion above the depth of closure and approximately 75 cubic yards of recession above MHW.

Lovers Key Beach Fill: The beach segment extending from R-214.5 to R-220 was constructed based upon the design template with the addition of advanced maintenance fill. The beach segment receded on average approximately 21 feet between the 2021 and 2022 monitoring surveys. The range of shoreline change measured at MHW was from approximately 3.4 feet of recession at R-215 to 31 feet of recession at R-217. The total volume change was approximately 26,010 cubic yards of erosion above the depth of closure and approximately 8,190 cubic yards of erosion above MHW. Of the 250,120 cubic yards of beach fill that were placed above MHW, approximately 230,700 cubic yards eroded between the 2015 post-construction and 2022 monitoring survey indicating approximately 8% of the original beach fill placed above MHW remains. WCIND and Lee County completed a beneficial use project, placing approximately 21,270 cubic yards within the original beach fill limits. Thus the net erosion rates would be higher and the percent remaining of the original fill would be less.

Lovers Key South Adjacent Shoreline: The beach segment extending from R-220 to R-221 advanced on average approximately 0.1 feet between the 2021 and 2022 monitoring surveys. The range of shoreline change measured at MHW was approximately from 4.7 feet of advancement at R-220.5 to 4.5 feet of recession at R-221. The total volume change was approximately 150 cubic yards of accretion above the depth of closure and approximately 580 cubic yards of accretion above MHW.

New Pass: The segment at R-222 is within New Pass and therefore no volumetric analysis was performed. The monument is located within the middle of the channel, so the profile does not reach MHW. Accordingly, shoreline change was not calculated.

Big Hickory Island Shoreline: The beach segment extending from R-223 to R-225 advanced on average approximately 22.1 feet between the 2021 and 2022 monitoring surveys. The range of shoreline change measured at MHW was approximately from 56 feet of advancement at R-225 to 4.9 feet of recession at R-224. The total volume change was approximately 30,740 cubic yards of

accretion above the depth of closure and approximately 6,730 cubic yards of accretion above MHW.

Bonita Beach North Adjacent Shoreline: The beach segment at R-226 advanced approximately 2.2 feet, when measured at MHW, between the 2021 and 2022 monitoring surveys. The total volume change from Big Hickory Pass to R-226 was approximately 7,990 cubic yards of erosion above the depth of closure and approximately 920 cubic yards of accretion above MHW.

Bonita Beach Fill: The beach segment extending from R-226 to R-230 was constructed based upon the design template. The beach segment receded on average approximately 5.8 feet between the 2021 and 2022 monitoring surveys. The range of shoreline change measured at MHW was approximately from 6.3 feet of advancement at R-229.5 to 12.3 feet of recession at R-226A. The total volume change was approximately 4,680 cubic yards of erosion above the depth of closure and approximately 670 cubic yards of accretion above MHW. Of the 98,380 cubic yards of beach fill that were placed above MHW, approximately 74,890 cubic yards eroded between the 2015 post-construction and 2022 monitoring survey indicating approximately 24% of the original beach fill placed above MHW remains.

Bonita Beach South Adjacent Shoreline: The beach segment extending from R-230 to R-235 advanced on average approximately 2.4 feet between the 2021 and 2022 monitoring surveys. The range of shoreline change measured at MHW was approximately from 7.9 feet of advancement at R-235 to 3.8 feet of recession at R-231. The total volume change was approximately 660 cubic yards of erosion above the depth of closure and approximately 1,600 cubic yards of accretion above MHW.

4.3 Big Hickory Pass Ebb Tidal Shoal

Appendix 3 presents the Big Hickory Pass Ebb Tidal Shoal cross-sections measured at the profile lines spaced 200 feet apart from R-225 to R-226 for the 2014 pre-construction, 2015 post-construction, and 2019, 2020, 2021 and 2022 monitoring surveys. The profile line locations are depicted in Figure 5.

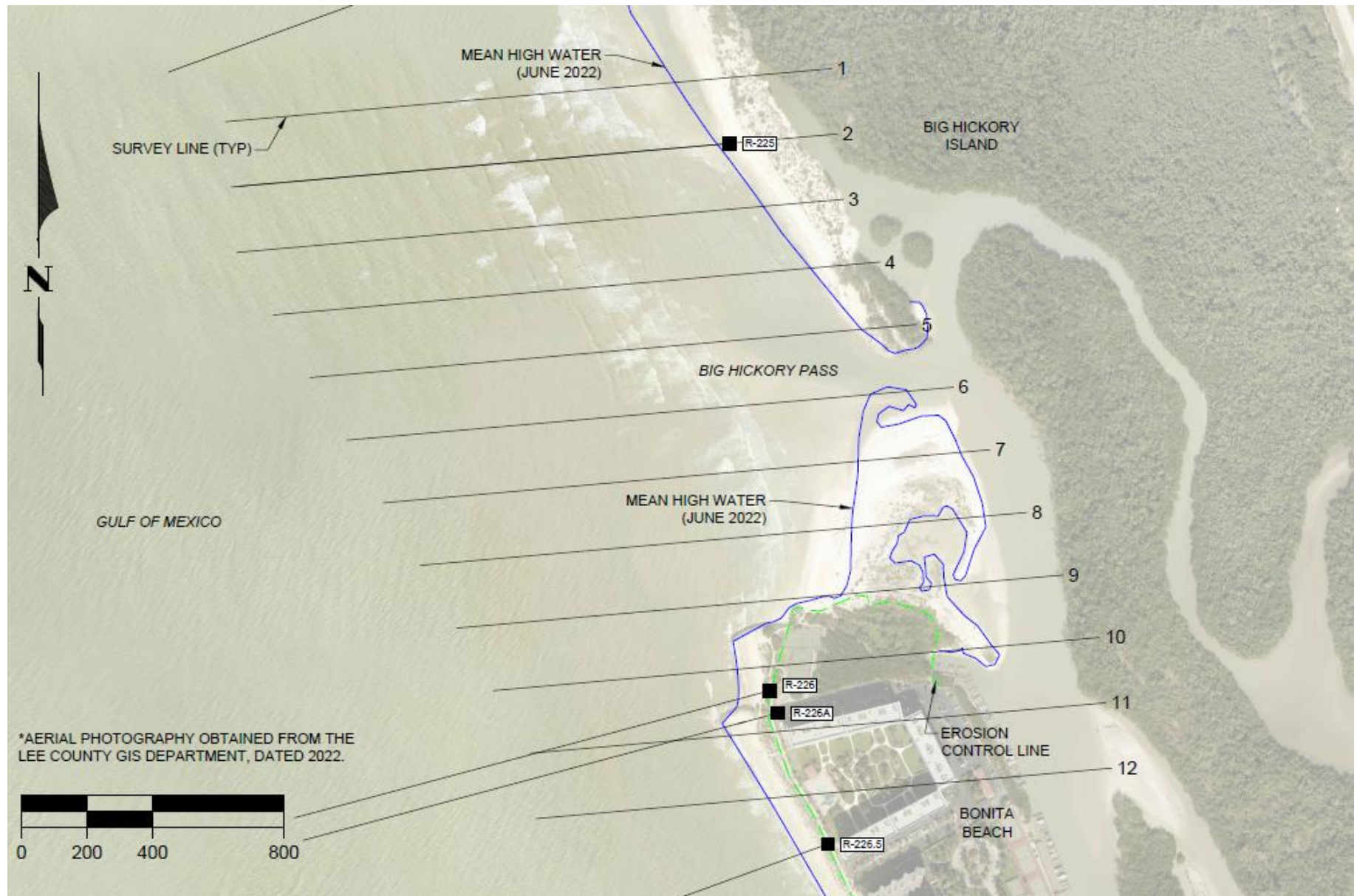


Figure 5. Big Hickory Pass Profile Lines.

4.4 Morphologic Changes

4.4.1 Overall

Figures 6 and 7 present elevation contour maps based on the 2021 and 2022 monitoring surveys, respectively, noting that the 2022 monitoring survey includes additional survey data at Big Carlos Pass and New Pass collected concurrently with this Project as part of the RIMS. The morphologic changes that occurred between the two surveys are presented in Figure 8.

Because the Big Carlos Pass ebb shoal was not surveyed in detail in 2021, the R-monument survey data were interpolated over the ebb shoal to create the contour map. The 2022 survey included the RIMS additional survey data. Because of this, portions of the 2021-2022 morphologic changes between the north end of the Big Carlos Pass system and R-225 may not be representative of actual changes. Future surveys will provide data to produce accurate morphologic change comparisons in this area. The 2021 and 2022 survey coverage was near identical between R-225 and R-235, therefore the morphologic changes over this shoreline segment are accurate.

The Lovers Key fill area experienced nearshore erosion of 1 to 2 feet between R-215.5 and R-220 and 1 to 2 feet of accretion on the north end of fill near R-215. Overwash was observed between R-215 to R-220. Big Hickory Island experienced 1 to 2 feet of nearshore erosion between R-223.5 and R-224, 1 to 4 feet of accretion from R-222.5 to R-223.5, and up to 5 feet of accretion from R-224 to R-225. The Bonita Beach fill area experienced nearshore erosion in the 1 to 2 foot range with the exception of about 1 foot of accretion around R-229.5.

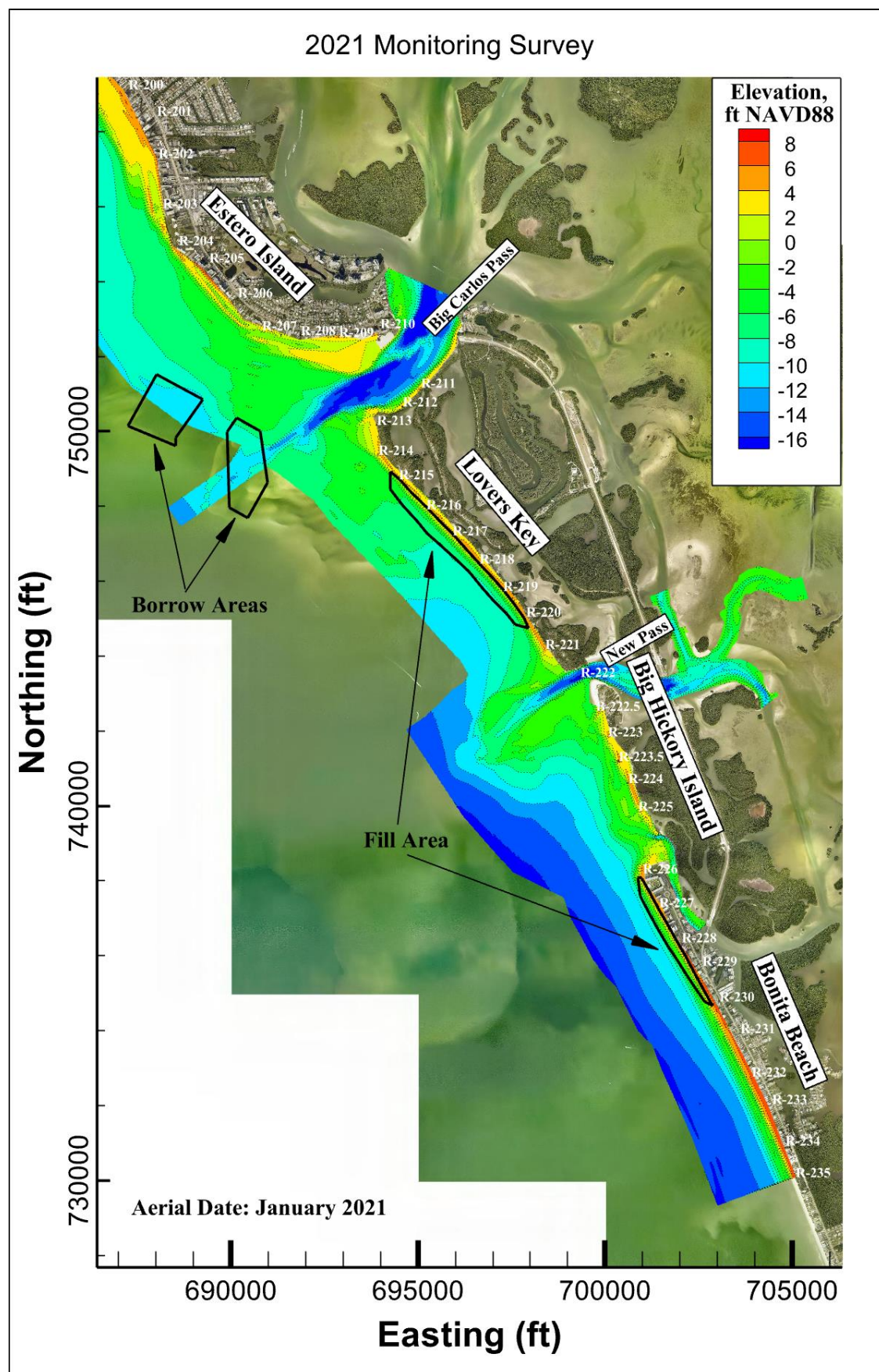


Figure 6. 2021 Monitoring Survey Contour Map.

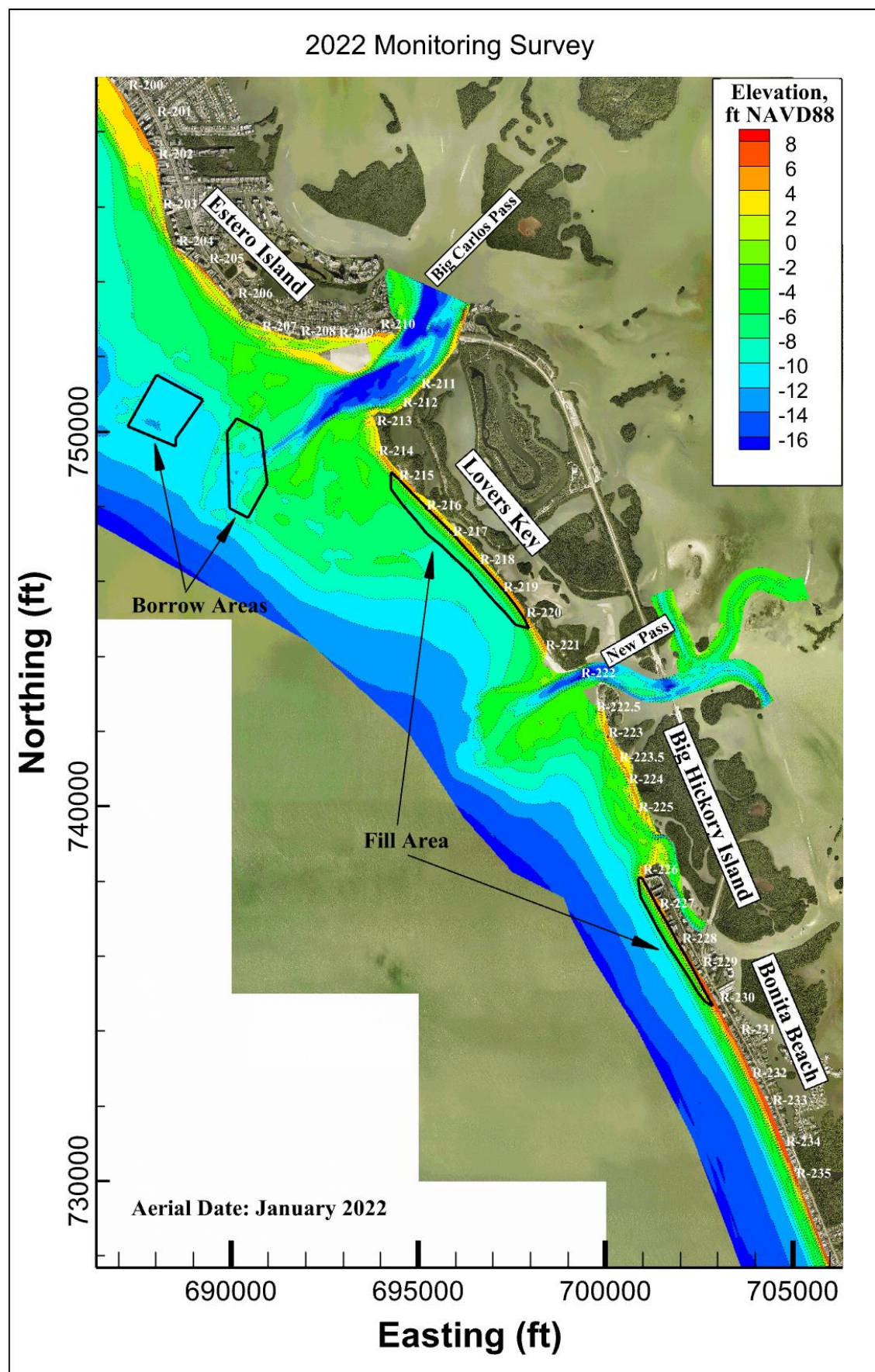


Figure 7. 2022 Monitoring Survey Contour Map.

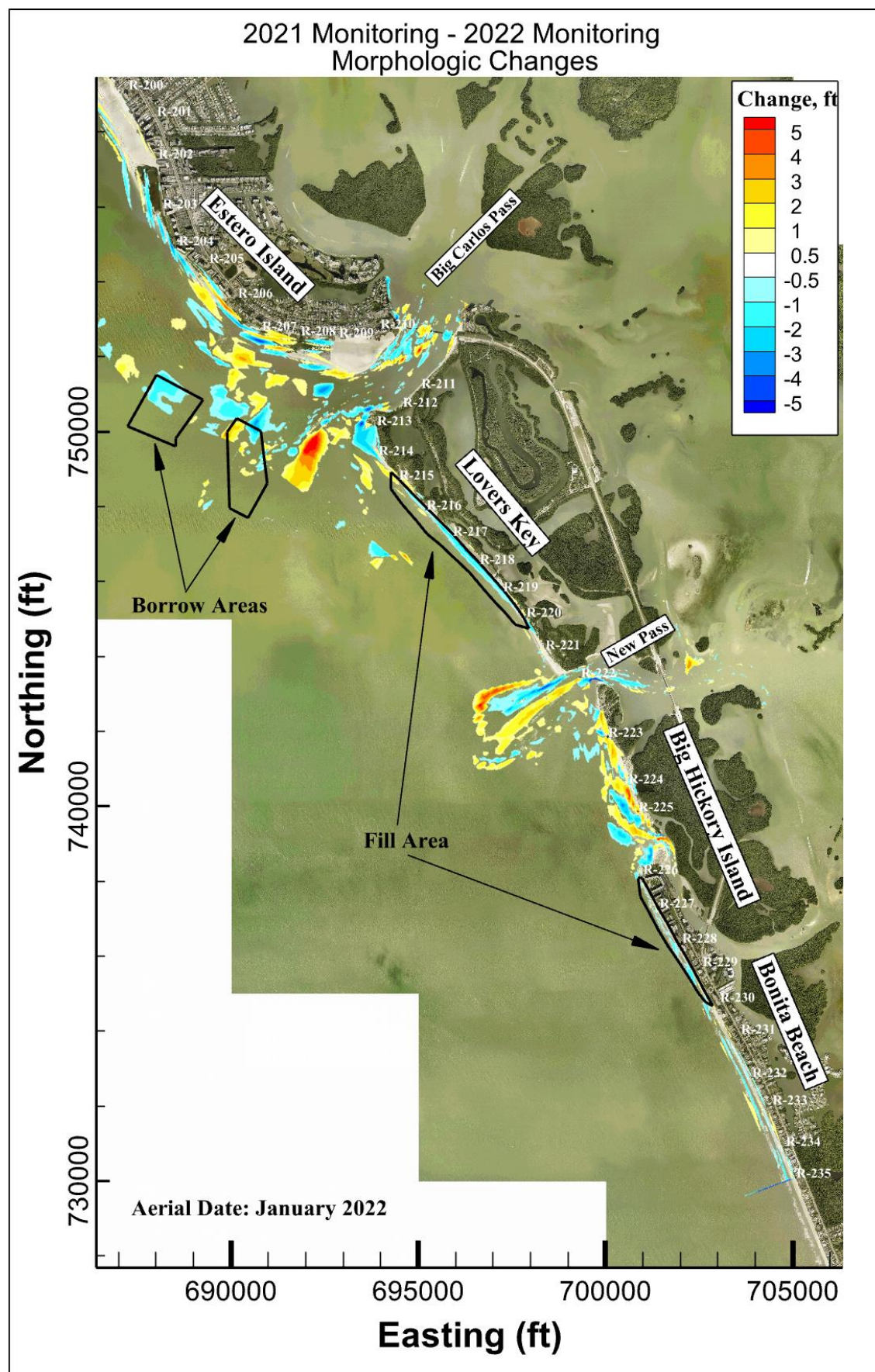


Figure 8. Morphologic Changes between 2021 and 2022 Monitoring Surveys.

4.4.2 New Pass Ebb Tidal Shoal

Morphologic changes within the New Pass ebb shoal are presented in Figure 9. The figure also depicts MHW positions and channel delineations based on the 2021 and 2022 surveys. The channel was delineated using the deepest path connecting the Gulf of Mexico and New Pass.

Comparing the 2021 and 2022 MHW positions, Big Hickory Island experienced shoreline recession ranging from 200 feet at the north end of the island to 15 feet at the northern most groin, noting that up to 5 feet of accretion took place just to the north of R-223. The changes over the ebb shoal and New Pass channel ranged from +4 feet to -5 feet. The shoreline at the south end of Lovers Key along the pass experienced advancement noting that the shoreline along the Gulf immediately north of the pass experienced shoreline recession. The morphologic changes indicated the channel alignment was fairly stable.

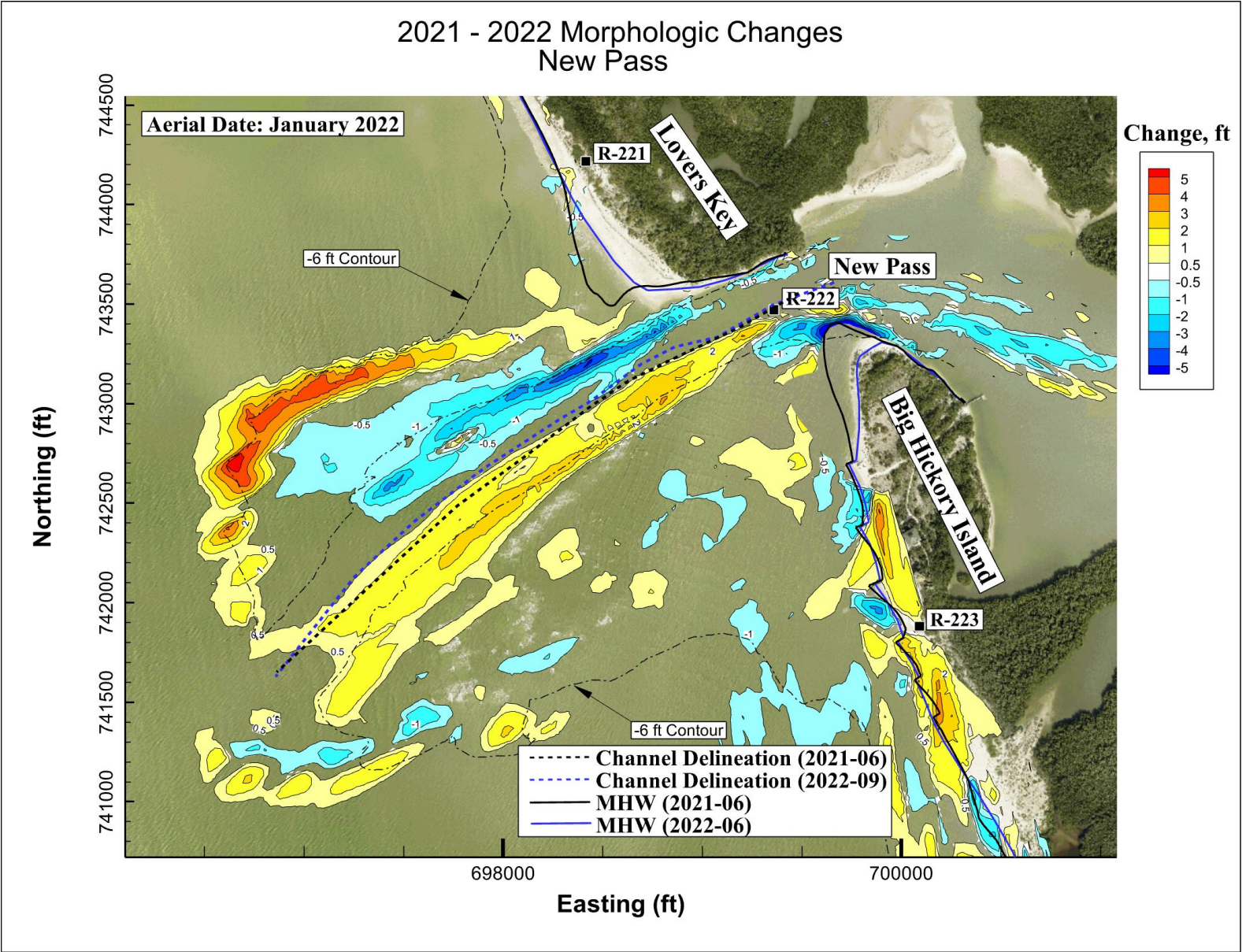


Figure 9. Morphologic Changes Within New Pass Ebb Shoal.

4.4.3 Big Hickory Pass Ebb Tidal Shoal

Morphologic changes within the Big Hickory Pass ebb shoal are presented in Figure 10. The figure also depicts MHW positions and channel delineations based on the 2021 and 2022 surveys. The channel was delineated using the deepest path connecting the Gulf of Mexico and Big Hickory Pass.

The south end of Big Hickory Island experienced shoreline advancement of up to 56 feet. The pass experienced scouring of up to 8 feet on the north side of the pass and shoaling of up to 8 feet inside the pass. Also, based on the MHW shoreline comparison between 2021 and 2022, the MHW line between the tip of the spit and the north groin on Bonita Beach experienced recession up to 100 feet. The entrance into the pass remained consistent with its 2021 width of approximately 100 feet. The changes over the ebb shoal were mixed within a ± 3 -foot range, with accretion up to 8 feet between R-224 and the south side of Big Hickory Island. The pattern of the changes indicates that during this monitoring period the net longshore sediment transport was from south to north moving material off Bonita Beach and depositing it in the channel and also on the Big Hickory Island shoreline between R-224 and the south tip of the island.

It should be noted that the survey limits were expanded in 2021 to include interior channel cross-sections of Big Hickory Pass at 100-foot intervals. The interior channel was surveyed in 2022 and will be surveyed again in future monitoring events. This will allow for a more comprehensive analysis of morphologic changes of the pass system.

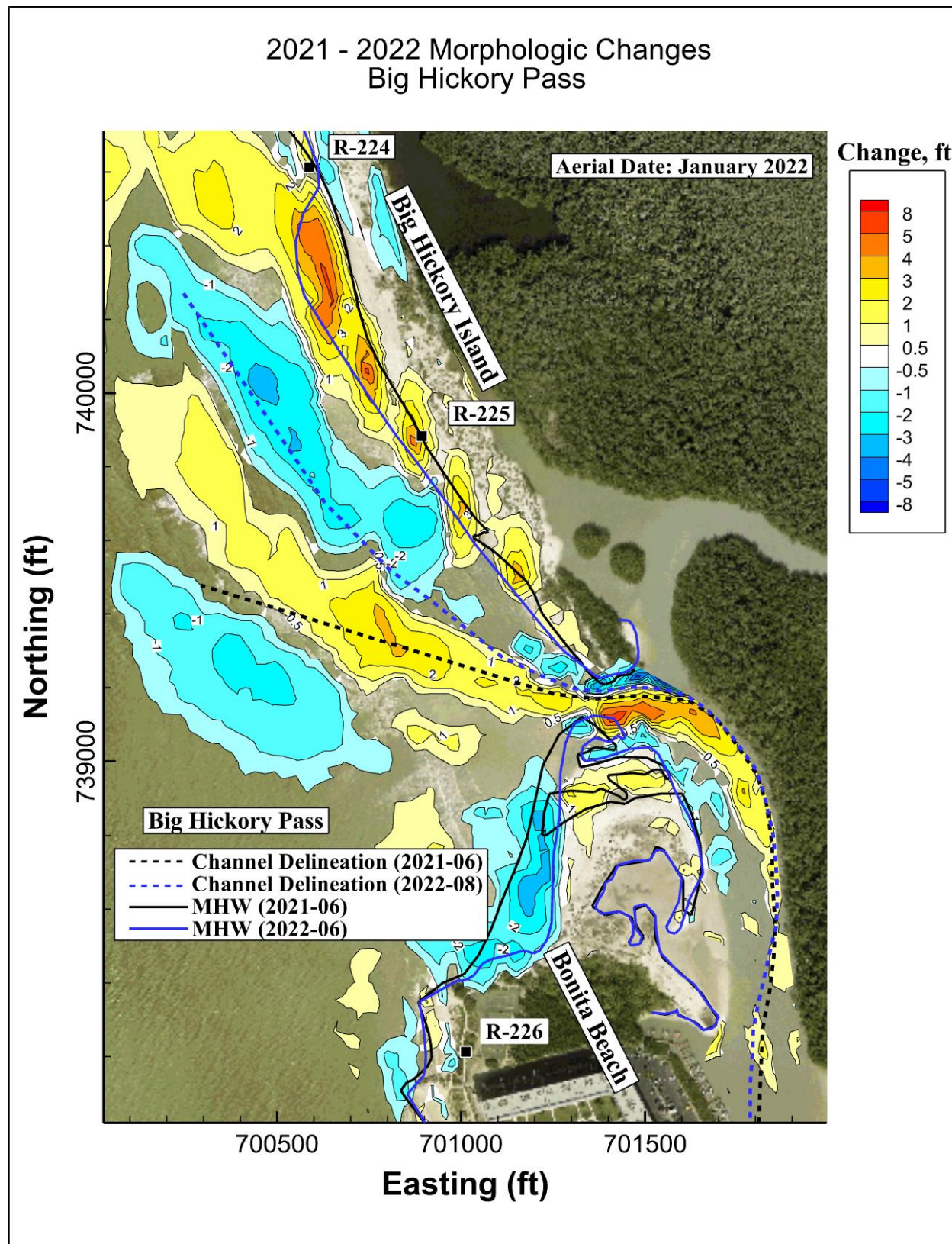


Figure 10. Morphologic Changes Within Big Hickory Pass Ebb Shoal.

5 CONCLUSION

This report describes the 7th-year annual monitoring results of the 2014 Bonita Beach and Lovers Key Beach Renourishment Project.

The information presented herein provides necessary data for both the County and FDEP to observe and assess, with quantitative measurements, the performance of the Project, any adverse effects which have occurred, and the need for any adjustments, modifications, or mitigative response to the Project. The monitoring process also provides the County and FDEP information necessary to plan, design, and optimize subsequent follow-up projects, potentially reducing the need for and costs of unnecessary work, as well as potentially reducing any environmental impacts that may have occurred or be expected. Based on the monitoring, there were no documented adverse impacts to the coastal system within the Project area.

Comparing the 2021 and 2022 monitoring surveys of the R-monuments, the monitoring area (R-213 to R-235) experienced a net loss, measured above the depth of closure, of approximately 4,690 cubic yards. Lovers Key lost approximately 22,100 cubic yards, Big Hickory Island gained approximately 30,740 cubic yards, and Bonita Beach lost approximately 13,320 cubic yards

Above MHW, the net change within the monitoring area was a gain of approximately 2,230 cubic yards. Lovers Key lost approximately 7,690 cubic yards, Big Hickory Island gained approximately 6,730 cubic yards, and Bonita Beach gained approximately 3,190 cubic yards.

Approximately 230,700 cubic yards eroded above MHW within the Lovers Key beach fill between the 2015 post-construction and 2022 monitoring surveys with approximately 8% of the original fill placed above MHW remaining on the beach compared to the 2021 survey equal to 19% remaining (CEC, 2021).

Approximately 74,890 cubic yards eroded above MHW within Bonita Beach fill between the 2015 post-construction and 2022 monitoring surveys with approximately 24% of the original fill placed above MHW remaining on the beach compared to the 2021 survey equal to 31% remaining (CEC, 2021).

6 REFERENCES

Coastal Engineering Consultants, Inc. (CEC) 2015. "Bonita Beach and Lovers Key Beach Renourishment 2015 Physical Monitoring / Post Construction Report."

Coastal Engineering Consultants, Inc. (CEC) 2016. "Bonita Beach and Lovers Key Beach Renourishment 2016 Annual Monitoring Report."

Coastal Technology Corporation. (CTC) 2012. "Preliminary Design Report: Bonita Beach & Lovers Key Beach Nourishment Projects."

Coastal Engineering Consultants, Inc. (CEC) 2018a. "Bonita Beach and Lovers Key Beach Renourishment 2017 Annual Monitoring Report."

Coastal Engineering Consultants, Inc. (CEC) 2018b. “Bonita Beach and Lovers Key Beach Renourishment 2018 Annual Monitoring Report.”

Coastal Engineering Consultants, Inc. (CEC) 2019. “Bonita Beach and Lovers Key Beach Renourishment 2019 Annual Monitoring Report.”

Coastal Engineering Consultants, Inc. (CEC) 2020. “Bonita Beach and Lovers Key Beach Renourishment 2020 Annual Monitoring Report.”

Coastal Engineering Consultants, Inc. (CEC) 2021. “Bonita Beach and Lovers Key Beach Renourishment 2021 Annual Monitoring Report.”

Birkemeier, W.A. 1985. “Field Data on Seaward Limit of Profile Change”, Journal of Waterway, Port, Coastal and Ocean Engineering, vol. 111, number 3, pp. 598-602.

Humiston and Moore Engineers. (HME) 2018. “Big Carlos Pass Channel Dredging Project. 2017 90-Day Post Construction Monitoring Report.”

Hubertz, J.M. 1992, “User’s Guide to the Wave Information Studies (WIS) Wave Model: Version 2.0”, WIS Report 27, US Army Corps of Engineers, Waterways Experiment Station, Vicksburg, MS, 41 pp.

APPENDIX 1

SURVEY REPORT

2022 BONITA BEACH / LOVERS KEY ANNUAL MONITORING SURVEY

SURVEY REPORT

CEC conducted the monitoring surveys of Lovers Key, Big Hickory Island, and Bonita Beach on June 13 and 21, 2022. CEC conducted the monitoring survey of Big Hickory Pass Ebb Tidal Shoal August 10, 2022. Surveys were conducted utilizing multiple Trimble Real Time Kinematic (RTK) Global Positioning Systems (GPS). All GPS control during this survey was referenced from previously established Florida Department of Environmental Protection (FDEP) Bureau of Beaches and Coastal Systems (BBCS) and meets or exceeds Geospatial Positioning Accuracy Standards, Range VIII.

All “R monument” and intermediate beach profiles were collected on the State Plane Coordinate System Grid, Florida West Zone and survey data was collected along FDEP established grid bearings as outlined in the project Scope of Work. The horizontal and vertical datums were North American Datum (NAD) of 1983/2011 Adjustment and North American Vertical Datum (NAVD) of 1988, Geoid 2012A, respectively.

All survey control was established as part of the upland topographic survey control work and conducted in accordance with the FDEP Monitoring Standards for Beach Erosion Control Projects. These surveys meet the requirements set forth in Chapter 5J-17 (F.A.C.) Florida Administrative Code. The following published FDEP vertical control was used during the surveys:

USGS E248 1965, PID No. AD1334
Northing: 742689.561’
Easting: 701857.275’
Elevation: 22.09’ NAVD 1988

USGS D248 1965, PID No. AD1312
Northing: 736847.789’
Easting: 702767.371’
Elevation: 11.95’ NAVD 1988

Equipment

Upland: CEC employed two Trimble Real Time Kinetic (RTK) GPS rover receivers with GLONASS capability systems for the upland surveys. These systems are capable of delivering RTK positions with coordinate accuracy of $\pm 10\text{mm} + 2\text{ppm}$. Wireless Bluetooth technology allows our surveyors to collect data seaward of the Mean High Water line in the “surf zone” up to 5 feet deep.

Offshore: The survey vessel used for this work was a 20-foot fiberglass hull powered by an outboard motor. A CEE ECHO single beam echo sounder was used with a side mounted transducer. A Trimble R8 GPS antenna with GLONASS capability was installed on the side mount bracket directly above the transducer. The Trimble R8 receiver was integrated with the on-board computer system. Hypack 2017 software package was the hydrographic guidance program utilized.

QA/QC Procedures

CEC employs an advanced QA/QC program to ensure work performed by us meets the FDEP accuracy standards. CEC upland field crews utilize RTK systems for data collection. CEC also incorporates the necessary equipment on the survey vessel to collect bathymetric survey data "Real-Time". To meet the specification calling for an approximate 50-foot overlap in data between the boat and the upland crew, CEC implements the following procedure. Utilizing "Real-Time" data collection, the boat crew immediately accounts for the tide correction, as well as the draft, and reports measured water depth in NAVD88 at each profile with the upland crew. This gives the upland crew, who simultaneously collects the upland and nearshore profile data, the necessary information to achieve the "overlap" specification.

Upland Data Collection: CEC mobilized one operator and GPS rover unit to collect survey data from the approximate MHW line landward while an additional operator and unit collected data just landward of MHW seaward to wading depth or approximately -5 feet NAVD88. The recorded data was maintained within tolerances of ± 3.00 feet horizontal and ± 0.16 feet vertical. QA/QC procedures were maintained by both comparison of values with higher accuracy and by repeat measurement.

An electronic list of R-monument coordinates and profile azimuths was loaded into the rover units and measurements were recorded along the azimuth line at intervals no greater than 25 feet or wherever geographical features dictated. The measurements were taken landward along the azimuth line to a minimum of 150 feet landward of the R-monument or to the edge of a building or road, whichever is the most seaward. When possible, a measurement was taken on the R-monument. The extent of the vegetation line and prominent features such as seawalls were also noted in the data collection. The measurements were taken seaward along the azimuth line to a minimum depth of -5 feet NAVD88 or as far as conditions dictated, to maintain a minimum of 50 feet of overlap with the data being collected by the offshore survey crew. This data was then compiled and merged with the offshore data to produce the profile drawings.

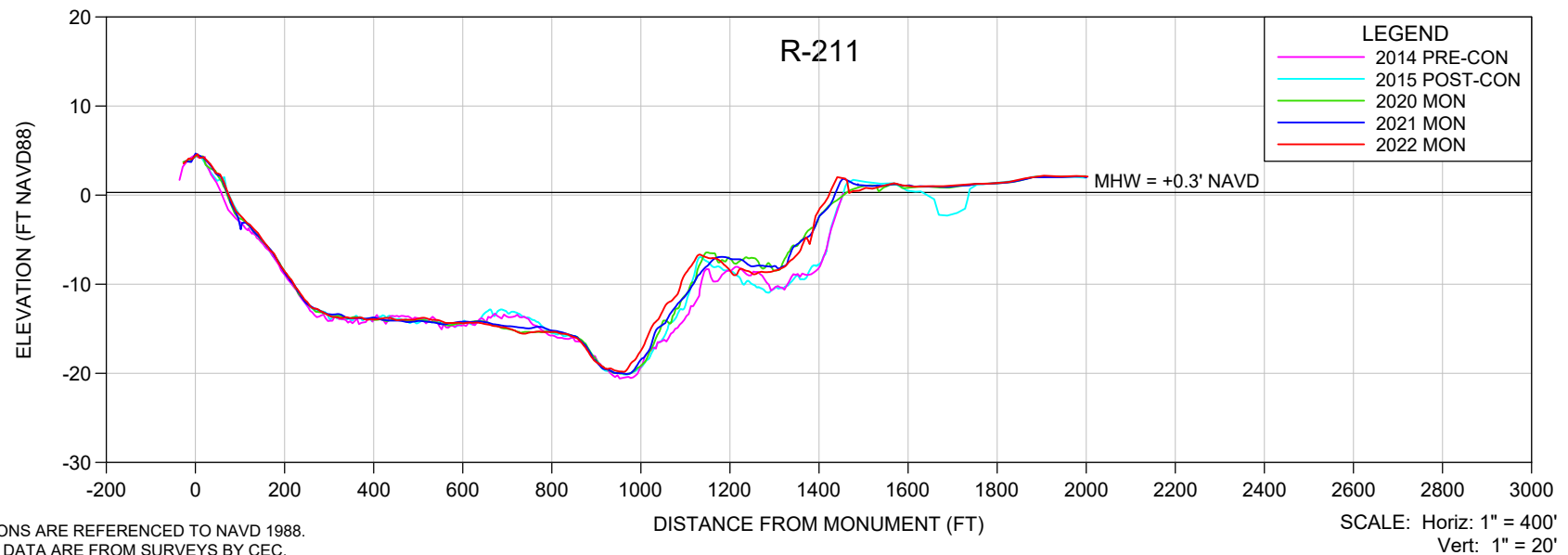
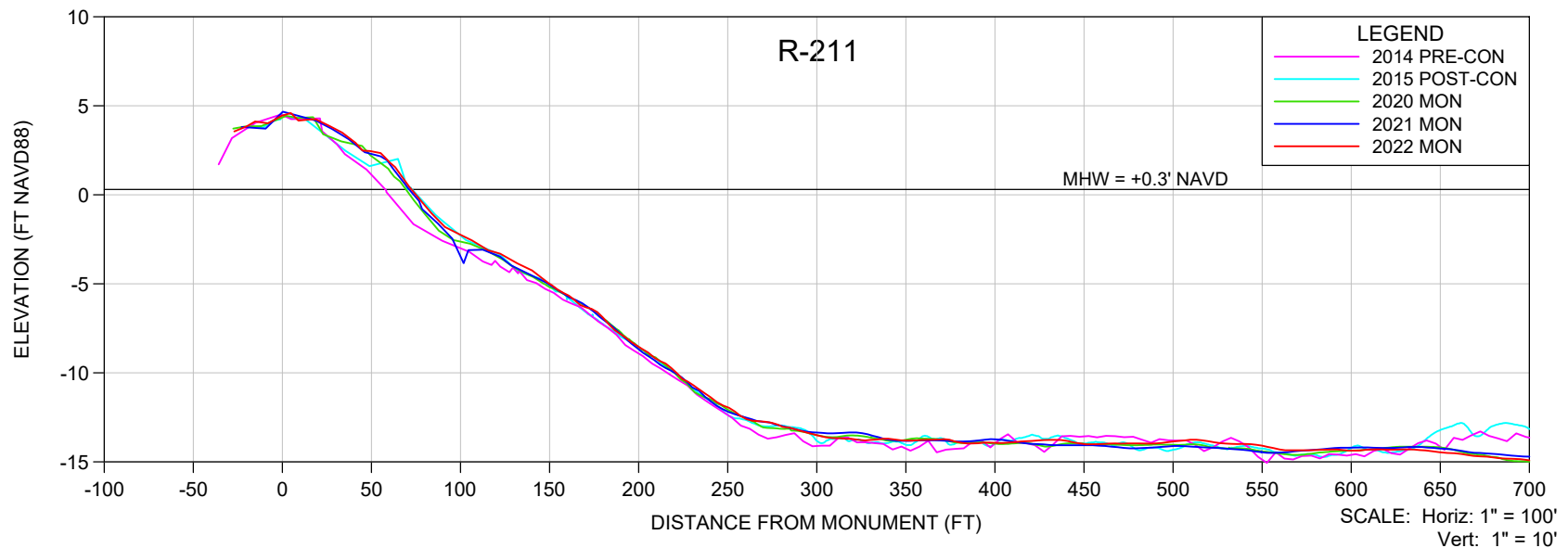
Offshore Data Collection: All survey equipment was properly calibrated and operated in accordance with FDEP standards. Bar checks to calibrate the fathometer were performed periodically throughout the survey. Bathymetric survey data collection was conducted in calm seas. Maximum wave heights during the data collection period were less than 3 feet. The data was collected at intervals not exceeding 25 feet and at all grade breaks along the profile sufficient to accurately describe the bathymetry at the profile locations. The beach profile survey extended seaward to a minimum of 3,000 feet from MHW.

COASTAL ENGINEERING CONSULTANTS, INC.
FLORIDA BUSINESS AUTHORIZATION NO. LB 2464

Richard J. Ewing, P.S.M.
Professional Surveyor and Mapper
Florida Certificate No. 5295
NOT VALID WITHOUT THE SIGNATURE AND
THE ORIGINAL RAISED SEAL OF A FLORIDA
LICENSED SURVEYOR AND MAPPER
CEC FILE NO. 22.079
DATE OF SIGNATURE:

APPENDIX 2

BEACH PROFILES



NOTES

- ELEVATIONS ARE REFERENCED TO NAVD 1988.
- PROFILE DATA ARE FROM SURVEYS BY CEC.
- UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 1
FILE NO.: 2209-R-211

**COASTAL
ENGINEERING
CONSULTANTS
INC.**
 Serving Florida Since 1977
 28421 BONITA CROSSINGS BLVD
 BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
 ENVIRONMENTAL & GEOLOGICAL SERVICES
 SURVEY & MAPPING
 ENGINEERING: CA 2464
 SURVEYING: LB 2464
 PHONE: (239)643-2324
 FAX: (239)643-1143
 www.coastalengineering.com
 E-Mail: info@ceciff.com

CLIENT:

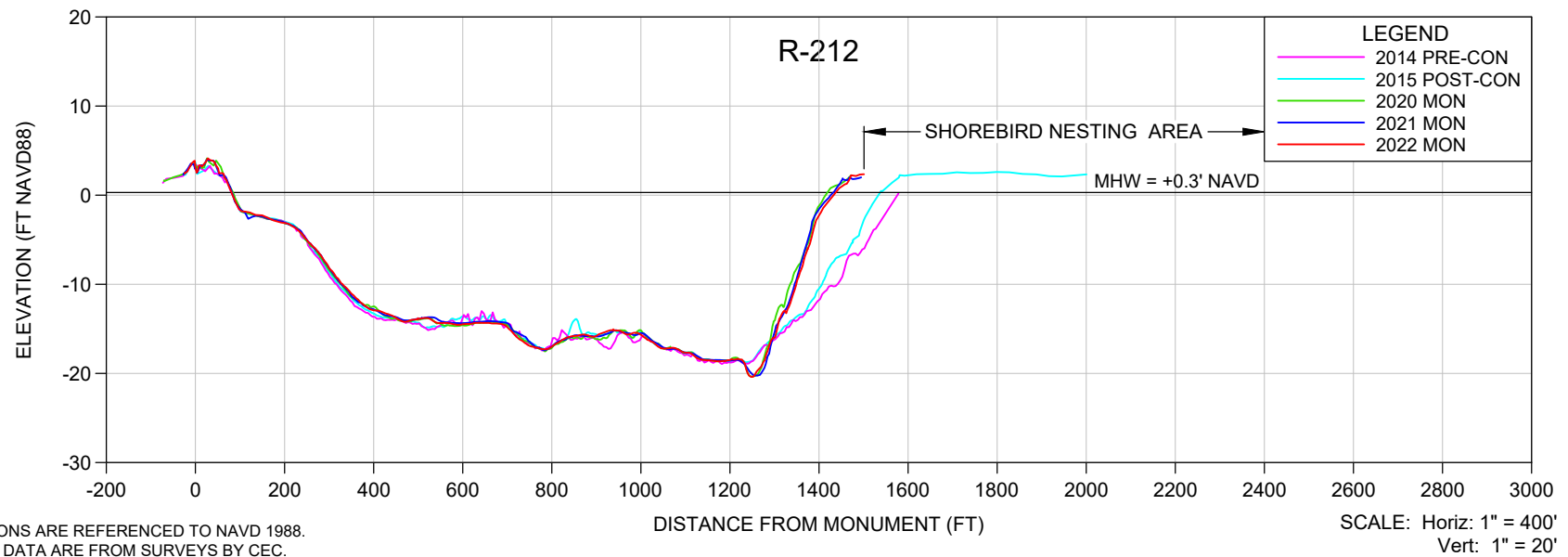
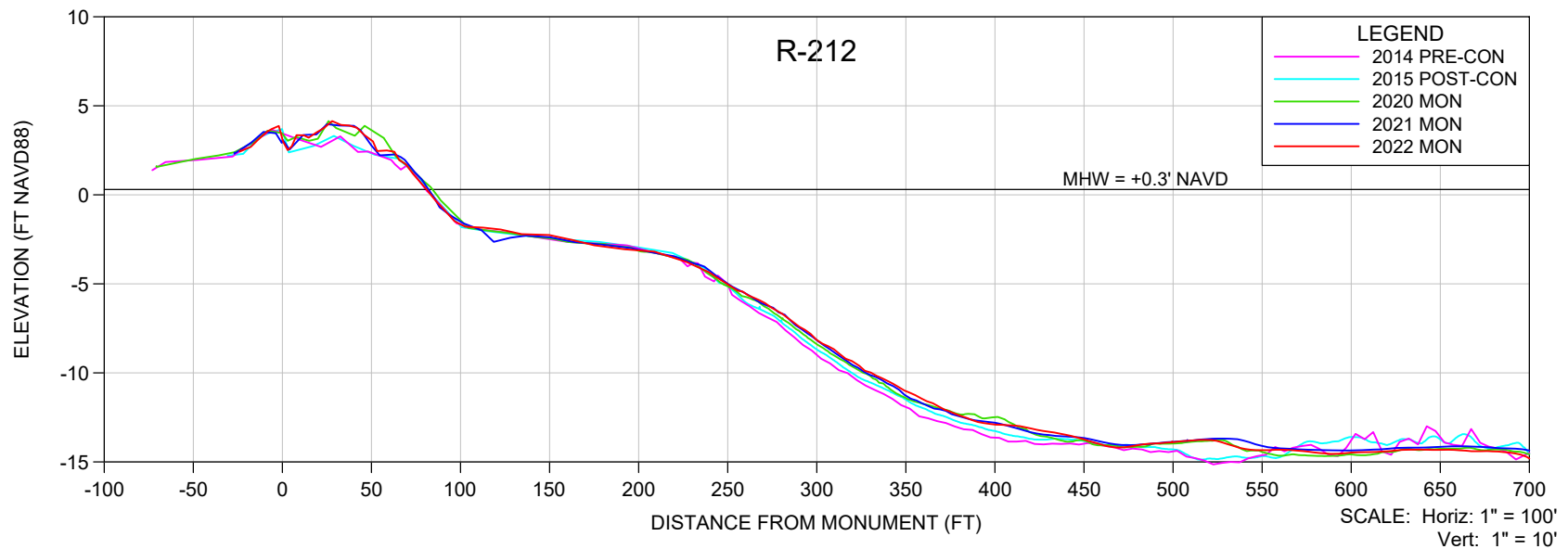
LEE COUNTY

TITLE:

**BONITA BEACH AND LOVERS KEY
R-211 MONITORING SURVEY**

DATE:	8/18/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	22079-Lovers Bonita Mon Profiles.dwg		
REF. NO.	22.079	NO.	DATE

NO.	DATE	BY	REVISION DESCRIPTION



NOTES

- ELEVATIONS ARE REFERENCED TO NAVD 1988.
- PROFILE DATA ARE FROM SURVEYS BY CEC.
- UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 2
FILE NO.: 22079-R-212

**COASTAL
ENGINEERING
CONSULTANTS
INC.**
 Serving Florida Since 1977
 28421 BONITA CROSSINGS BLVD
 BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
 ENVIRONMENTAL & GEOLOGICAL SERVICES
 SURVEY & MAPPING
 ENGINEERING: CA 2464
 SURVEYING: LB 2464
 PHONE: (239)643-2324
 FAX: (239)643-1143
 www.coastalengineering.com
 E-Mail: info@ceciff.com

CLIENT:

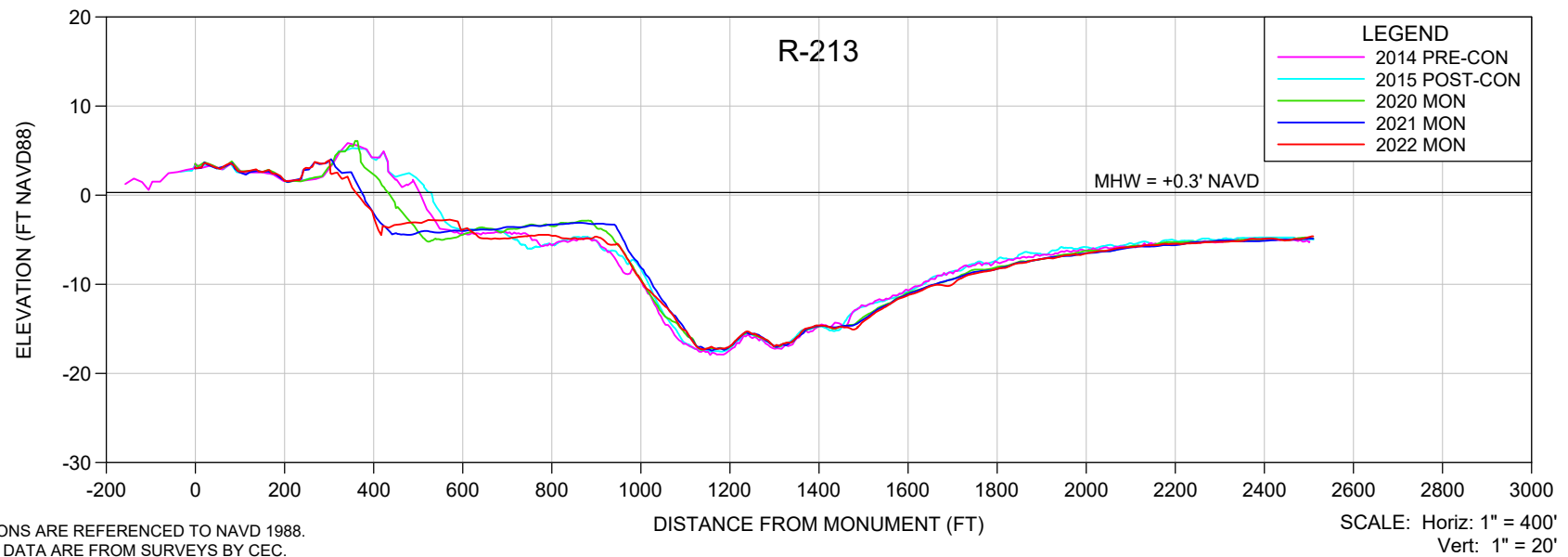
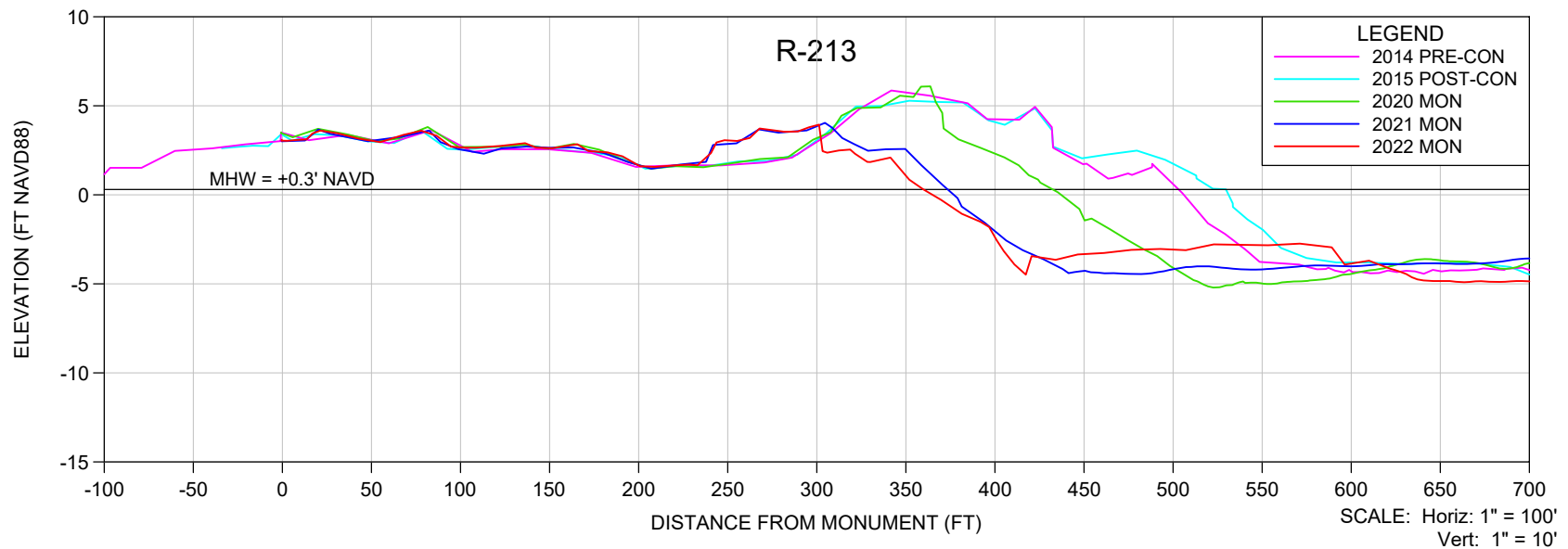
LEE COUNTY

TITLE:

**BONITA BEACH AND LOVERS KEY
R-212 MONITORING SURVEY**

DATE:	8/18/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	22079-Lovers Bonita Mon Profiles.dwg		
REF. NO.	22.079	NO.	DATE

NO.	DATE	BY	REVISION DESCRIPTION



NOTES

- ELEVATIONS ARE REFERENCED TO NAVD 1988.
- PROFILE DATA ARE FROM SURVEYS BY CEC.
- UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 3
FILE NO.: 22079-R-213

**COASTAL
ENGINEERING
CONSULTANTS
INC.**
Serving Florida Since 1977
28421 BONITA CROSSINGS BLVD
BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
ENVIRONMENTAL & GEOLOGICAL SERVICES
SURVEY & MAPPING
ENGINEERING: CA 2464
SURVEYING: LB 2464
PHONE: (239)643-2324
FAX: (239)643-1143
www.coastalengineering.com
E-Mail: info@ceciff.com

CLIENT:

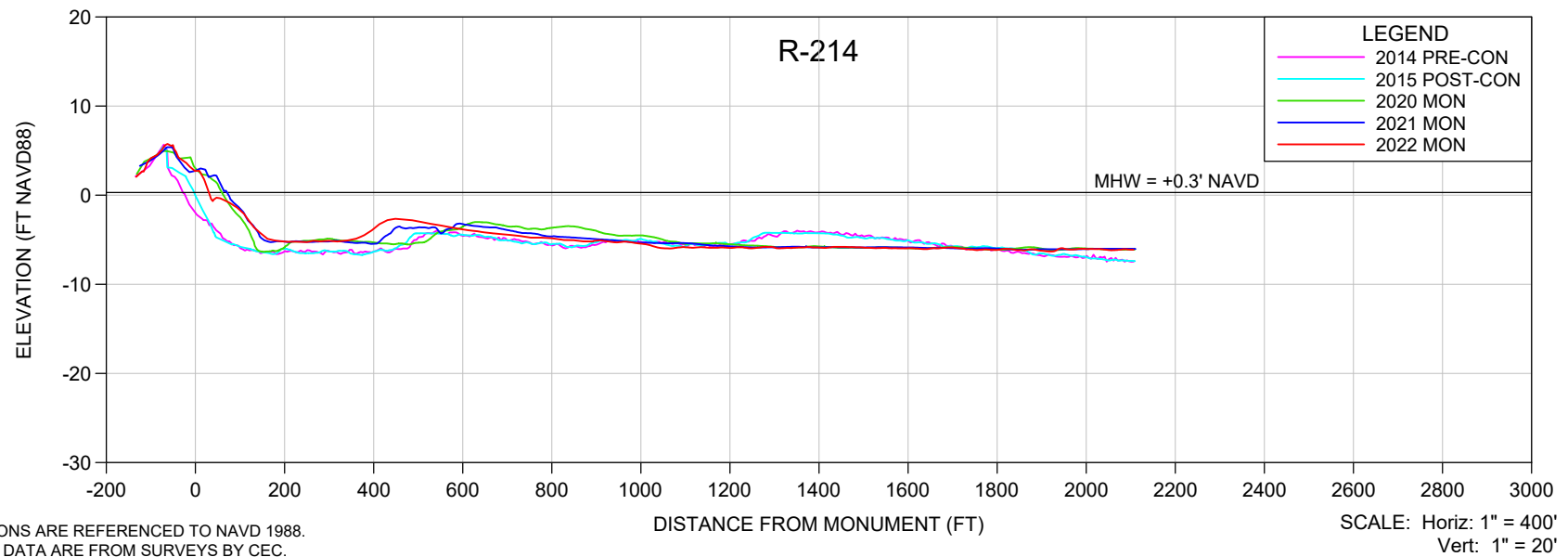
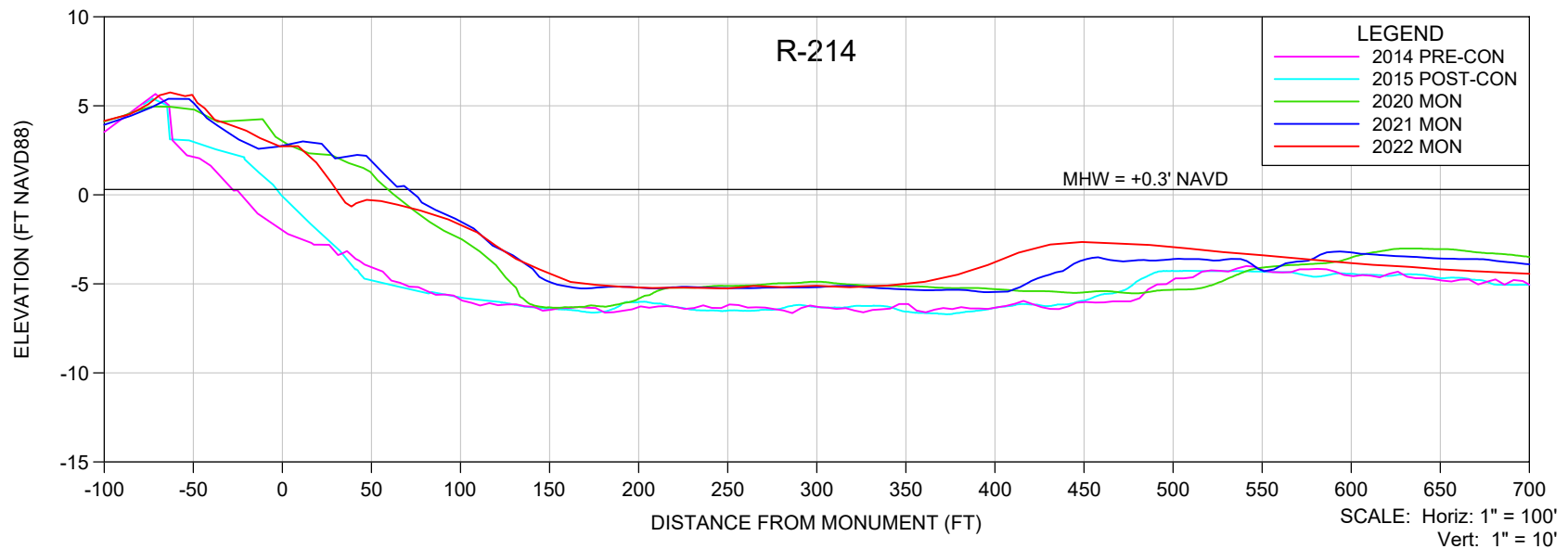
LEE COUNTY

TITLE:

**BONITA BEACH AND LOVERS KEY
R-213 MONITORING SURVEY**

DATE:	8/18/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	22079-Lovers Bonita Mon Profiles.dwg		
REF. NO.	22.079	NO.	DATE

NO.	DATE	BY	REVISION DESCRIPTION



NOTES

- ELEVATIONS ARE REFERENCED TO NAVD 1988.
- PROFILE DATA ARE FROM SURVEYS BY CEC.
- UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 4
FILE NO.: 22079-R-214

**COASTAL
ENGINEERING
CONSULTANTS
INC.**
 Serving Florida Since 1977
 28421 BONITA CROSSINGS BLVD
 BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
 ENVIRONMENTAL & GEOLOGICAL SERVICES
 SURVEY & MAPPING
 ENGINEERING: CA 2464
 SURVEYING: LB 2464
 PHONE: (239)643-2324
 FAX: (239)643-1143
 www.coastalengineering.com
 E-Mail: info@ceciff.com

CLIENT:

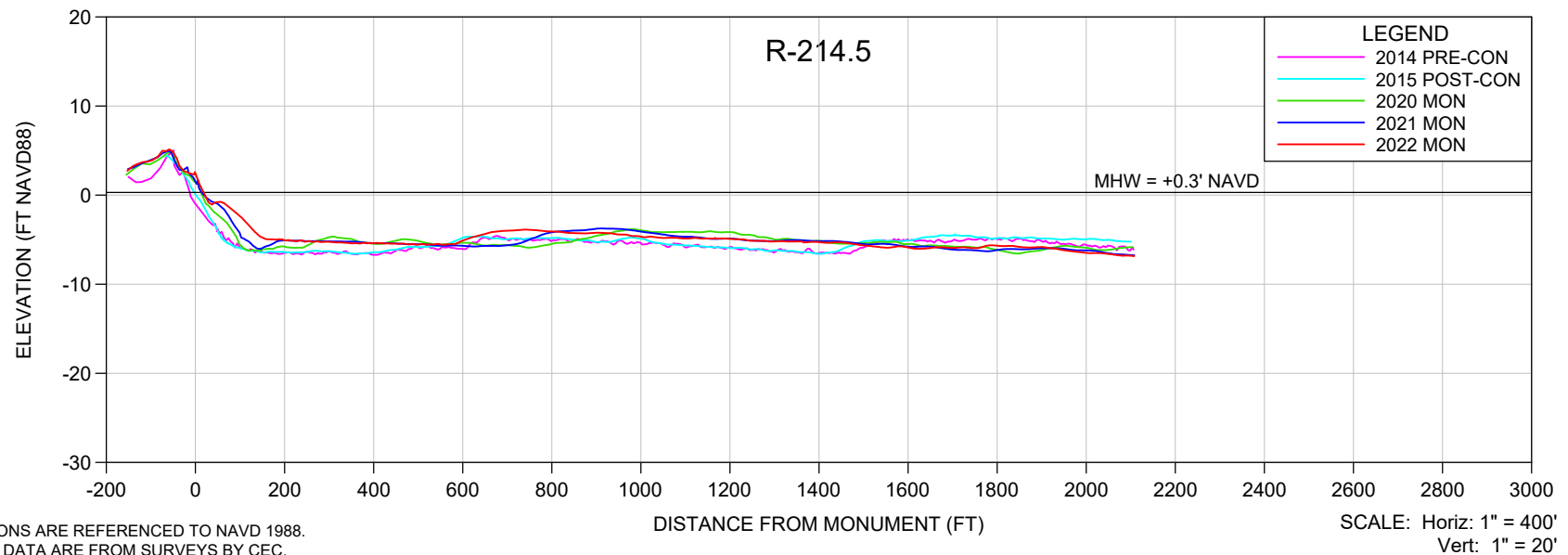
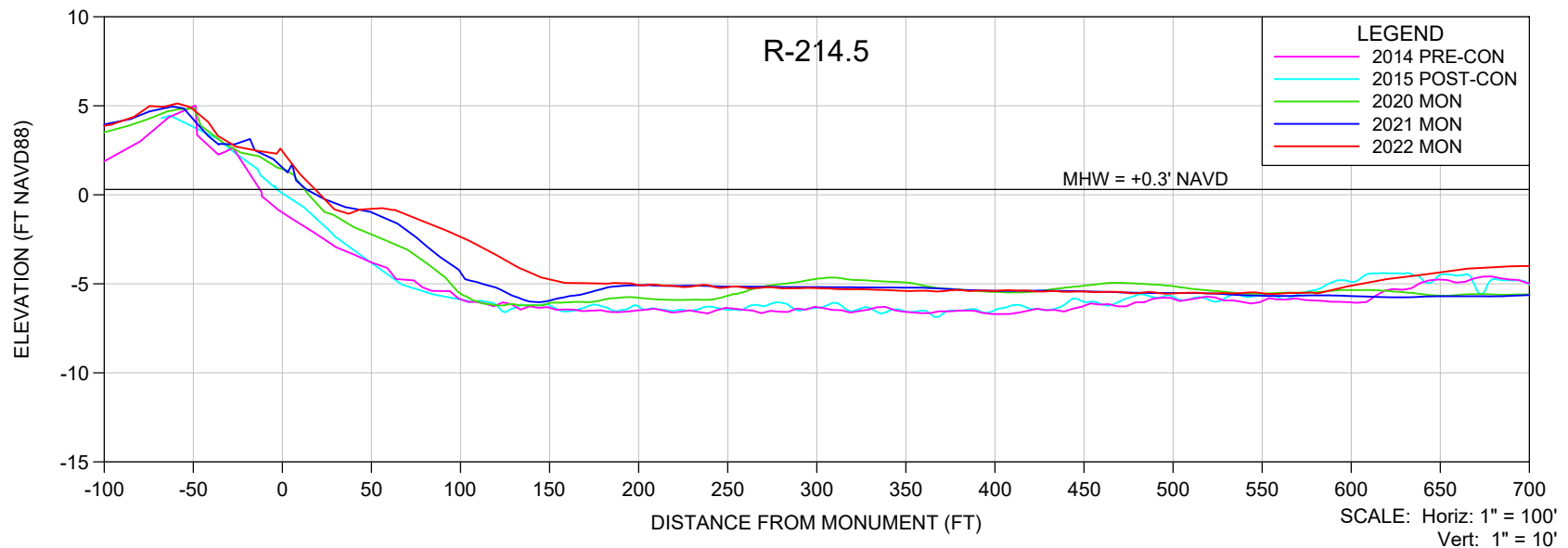
LEE COUNTY

TITLE:

**BONITA BEACH AND LOVERS KEY
R-214 MONITORING SURVEY**

DATE:	8/18/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	22079-Lovers Bonita Mon Profiles.dwg		
REF. NO.	22.079	NO.	DATE

BY	REVISION DESCRIPTION



NOTES

- ELEVATIONS ARE REFERENCED TO NAVD 1988.
- PROFILE DATA ARE FROM SURVEYS BY CEC.
- UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 5
FILE NO.: 22079-R-214.5

**COASTAL
ENGINEERING
CONSULTANTS
INC.**
 Serving Florida Since 1977
 28421 BONITA CROSSINGS BLVD
 BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
 ENVIRONMENTAL & GEOLOGICAL SERVICES
 SURVEY & MAPPING
 ENGINEERING: CA 2464
 SURVEYING: LB 2464
 PHONE: (239)643-2324
 FAX: (239)643-1143
 www.coastalengineering.com
 E-Mail: info@ceciff.com

CLIENT:

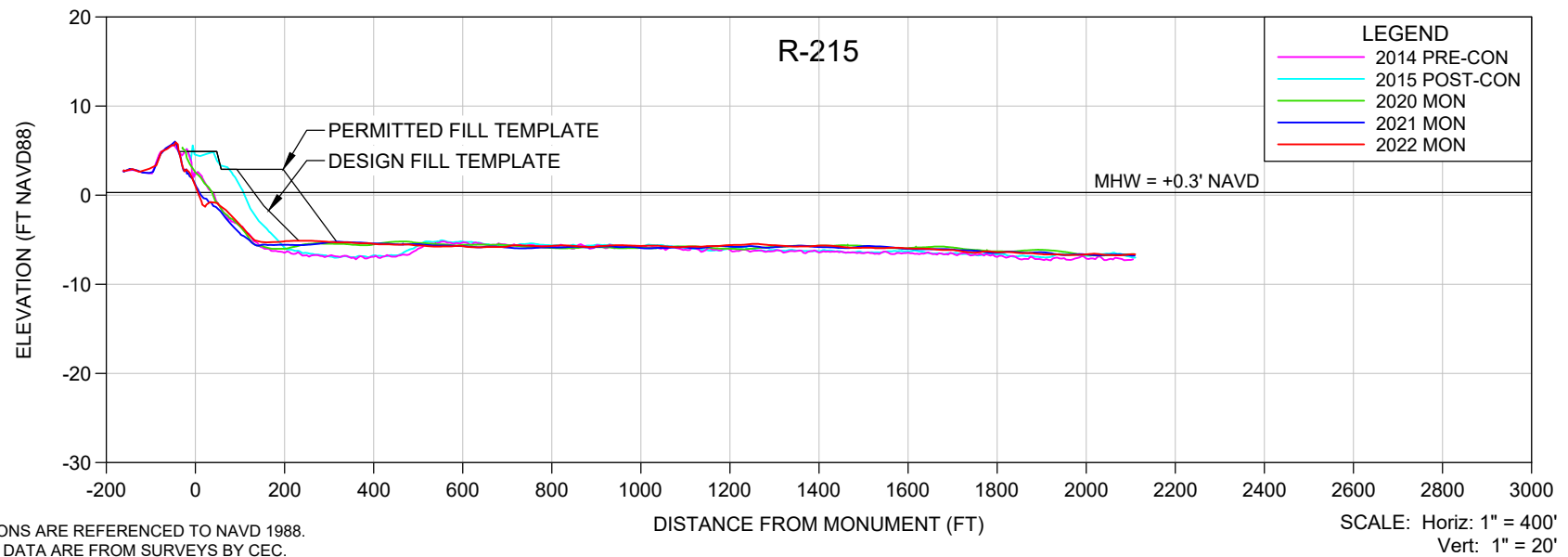
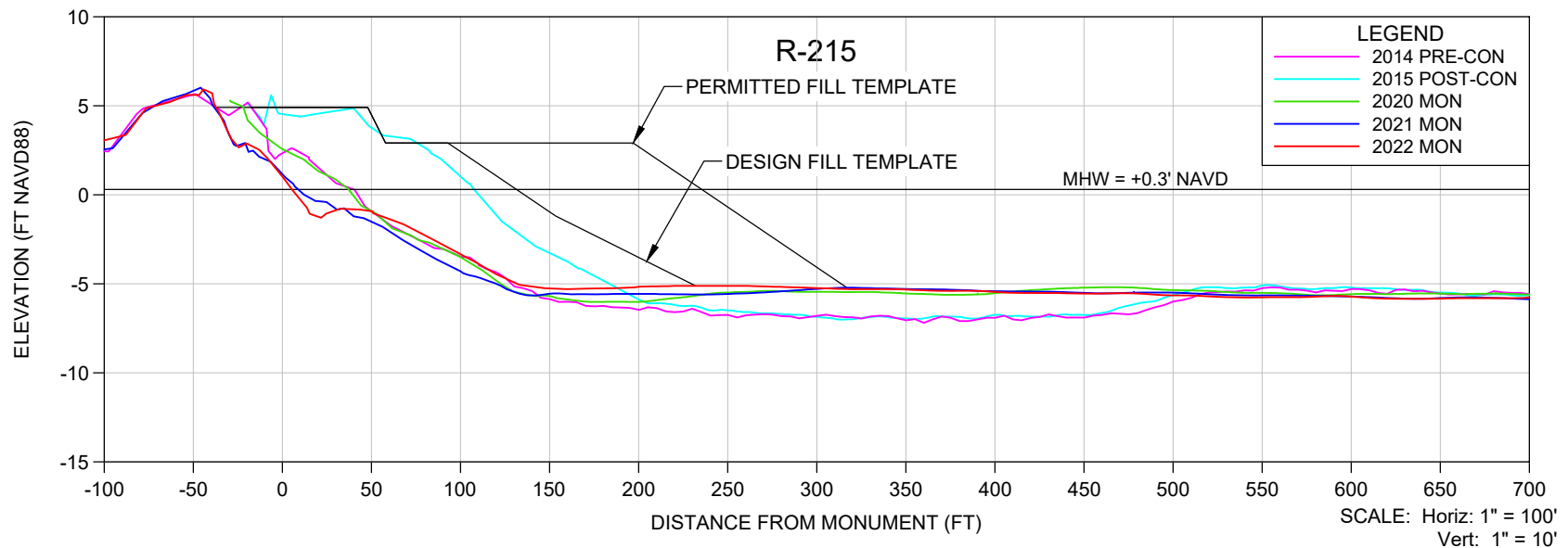
LEE COUNTY

TITLE:

**BONITA BEACH AND LOVERS KEY
R-214.5 MONITORING SURVEY**

DATE:	8/18/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	22079-Lovers Bonita Mon Profiles.dwg		
REF. NO.	22.079	NO.	DATE

BY	REVISION DESCRIPTION



NOTES

- ELEVATIONS ARE REFERENCED TO NAVD 1988.
- PROFILE DATA ARE FROM SURVEYS BY CEC.
- UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 6
FILE NO.: 22079-R-215

**COASTAL
ENGINEERING
CONSULTANTS
INC.**
Serving Florida Since 1977
28421 BONITA CROSSINGS BLVD
BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
ENVIRONMENTAL & GEOLOGICAL SERVICES
SURVEY & MAPPING
ENGINEERING: CA 2464
SURVEYING: LB 2464
PHONE: (239)643-2324
FAX: (239)643-1143
www.coastalengineering.com
E-Mail: info@ceciff.com

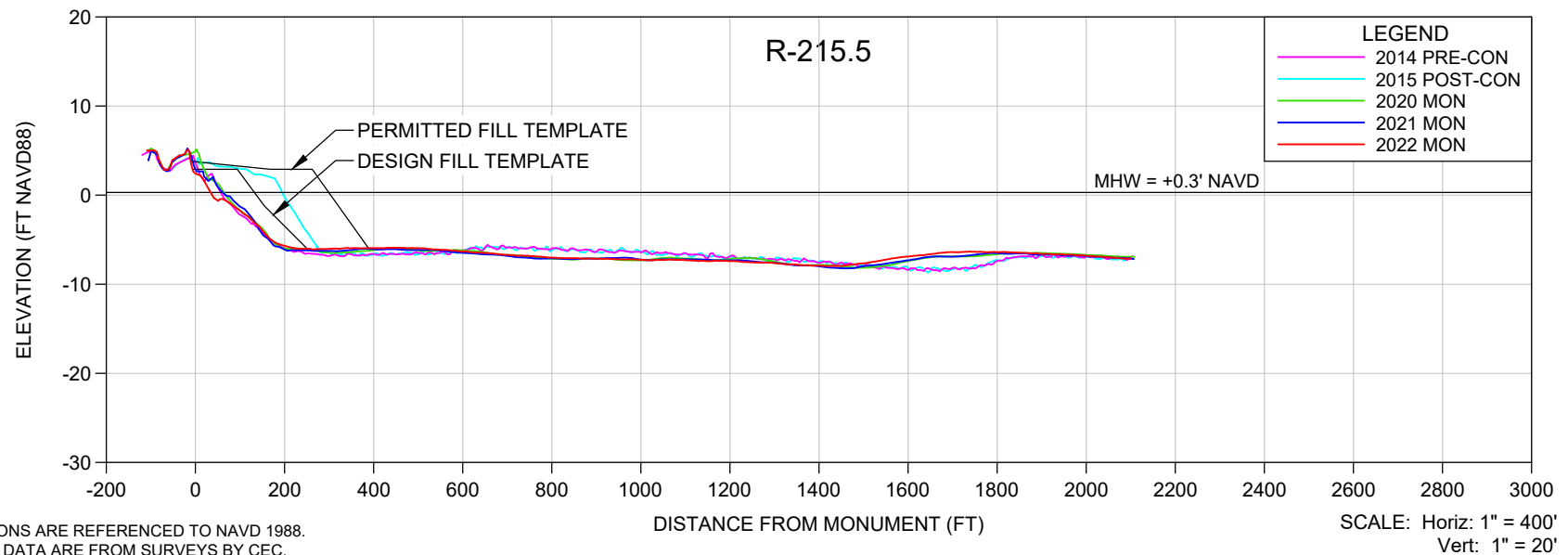
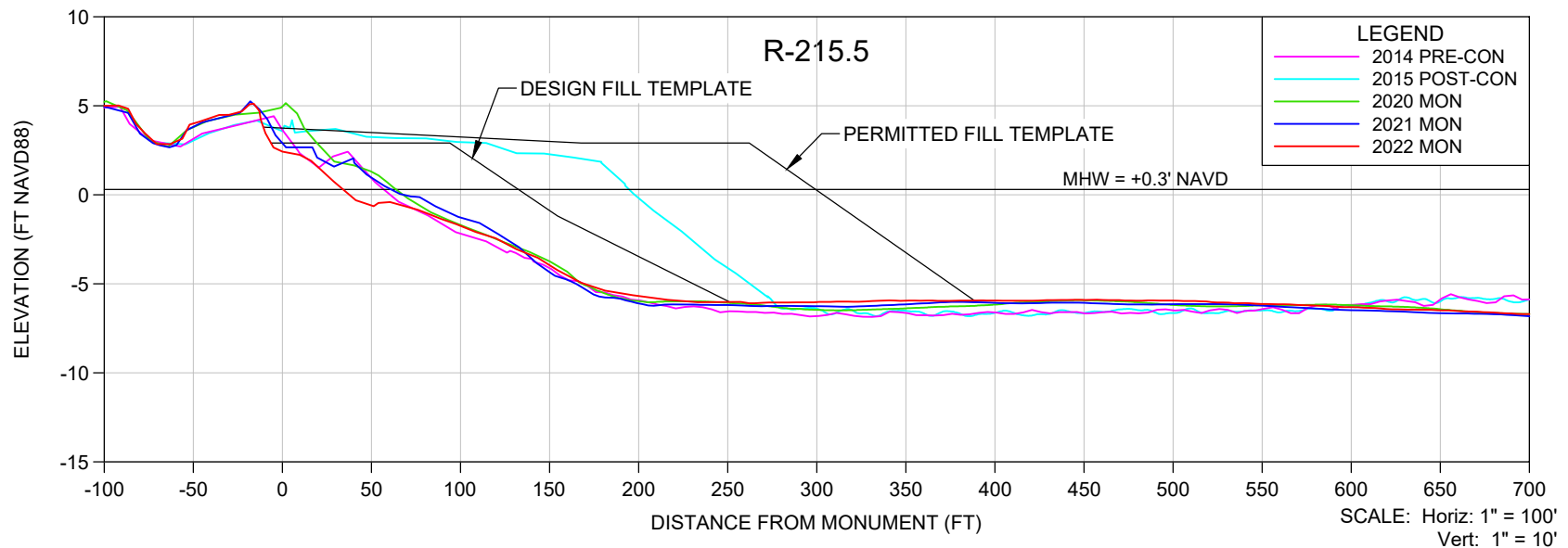
CLIENT:

LEE COUNTY

TITLE:

**BONITA BEACH AND LOVERS KEY
R-215 MONITORING SURVEY**

DATE:	8/18/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	22079-Lovers Bonita Mon Profiles.dwg		
REF. NO.	22.079	NO.	DATE
		BY	REVISION DESCRIPTION



NOTES

- ELEVATIONS ARE REFERENCED TO NAVD 1988.
- PROFILE DATA ARE FROM SURVEYS BY CEC.
- UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 7
FILE NO.: 22079-R-215.5

**COASTAL
ENGINEERING
CONSULTANTS
INC.**

Serving Florida Since 1977

28421 BONITA CROSSINGS BLVD
BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
ENVIRONMENTAL & GEOLOGICAL SERVICES
SURVEY & MAPPING
ENGINEERING: CA 2464
SURVEYING: LB 2464

PHONE: (239)643-2324
FAX: (239)643-1143
www.coastalengineering.com
E-Mail: info@ceciff.com

CLIENT:

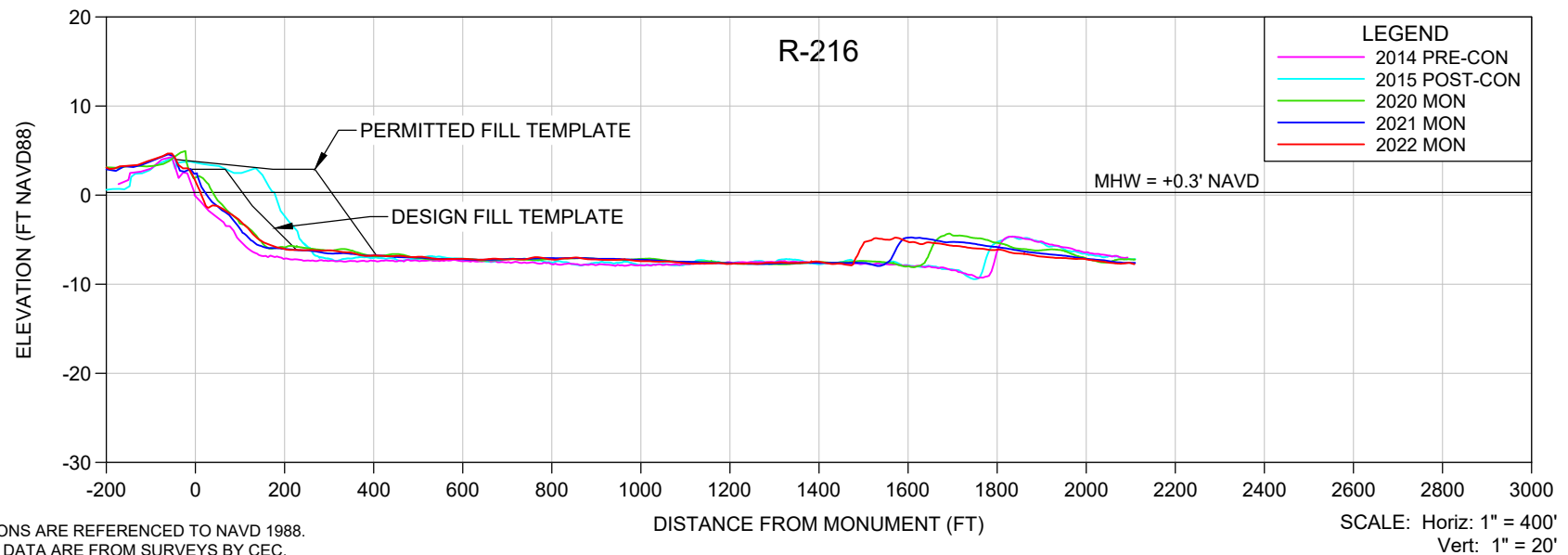
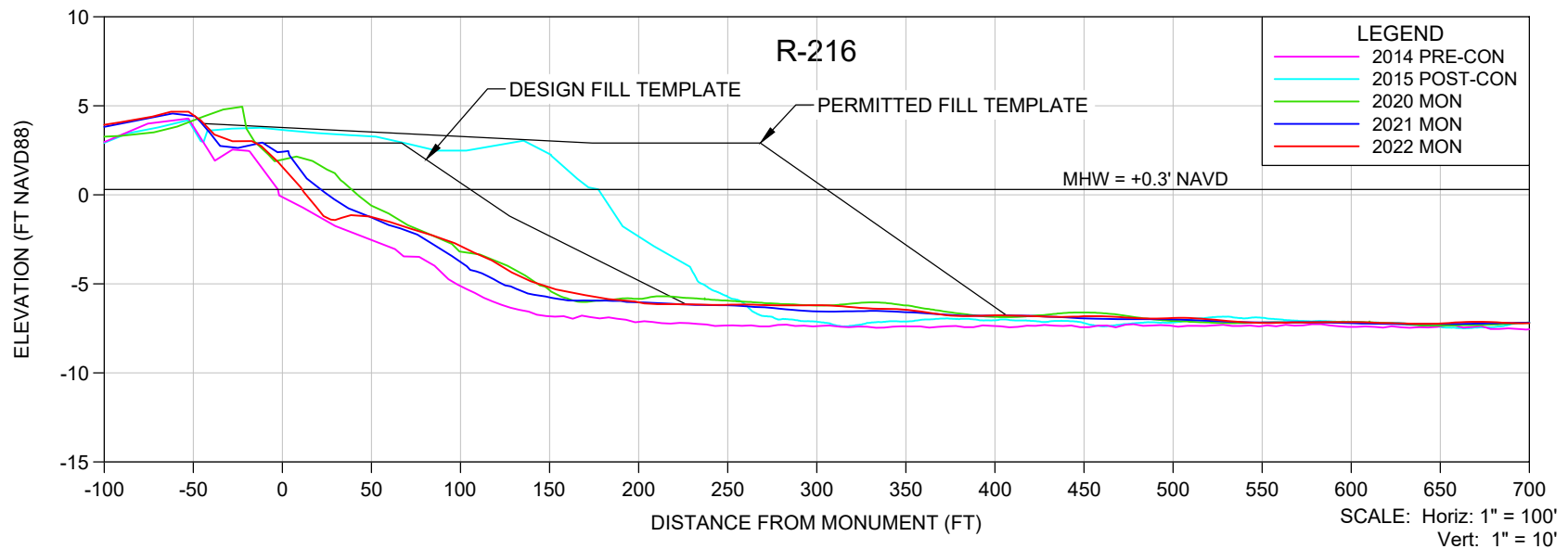
LEE COUNTY

TITLE:

**BONITA BEACH AND LOVERS KEY
R-215.5 MONITORING SURVEY**

DATE:	8/18/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	22079-Lovers Bonita Mon Profiles.dwg		
REF. NO.	22.079	NO.	DATE

NO.	DATE	BY	REVISION DESCRIPTION



NOTES

- ELEVATIONS ARE REFERENCED TO NAVD 1988.
- PROFILE DATA ARE FROM SURVEYS BY CEC.
- UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 8
FILE NO.: 22079-R-216

**COASTAL
ENGINEERING
CONSULTANTS
INC.**

Serving Florida Since 1977

28421 BONITA CROSSINGS BLVD
BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
ENVIRONMENTAL & GEOLOGICAL SERVICES
SURVEY & MAPPING
ENGINEERING: CA 2464
SURVEYING: LB 2464

PHONE: (239)643-2324
FAX: (239)643-1143
www.coastalengineering.com
E-Mail: info@ceciff.com

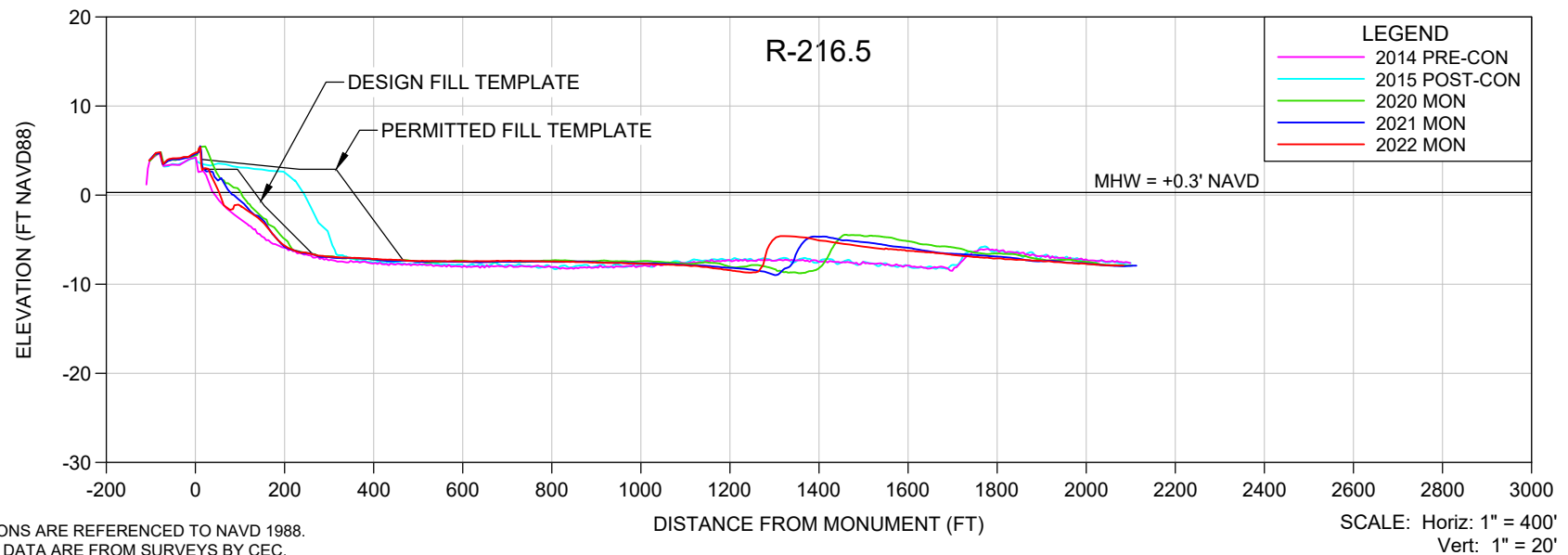
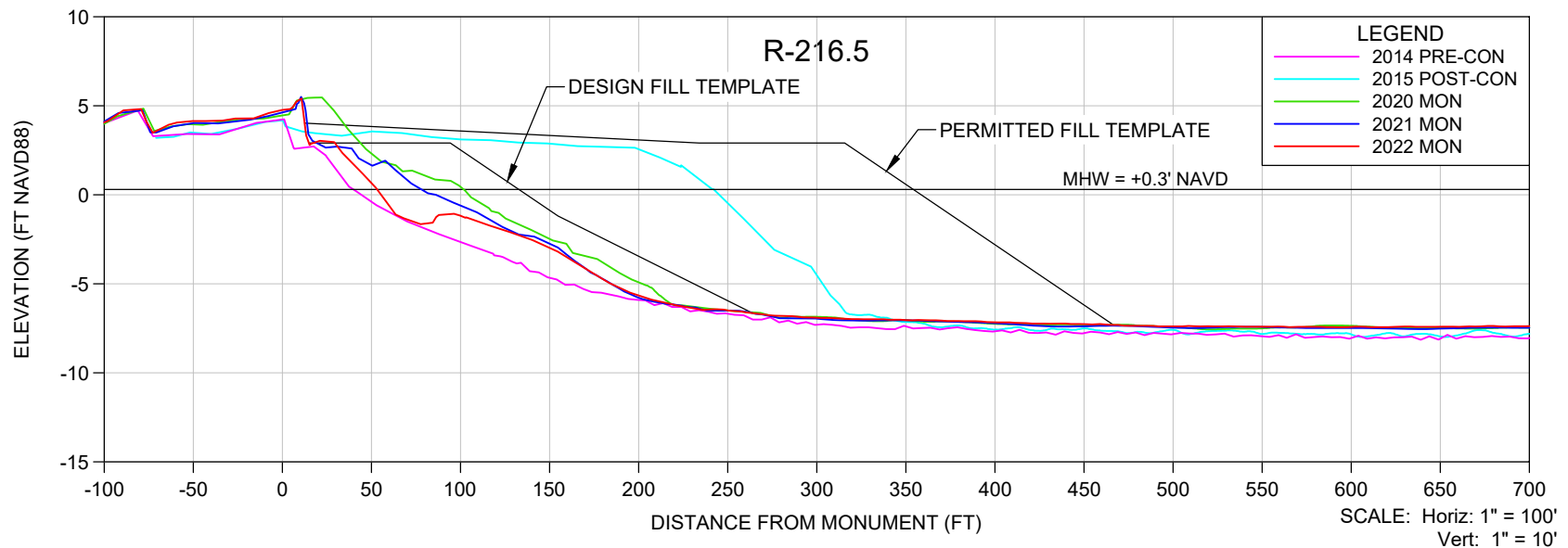
CLIENT:

LEE COUNTY

TITLE:

**BONITA BEACH AND LOVERS KEY
R-216 MONITORING SURVEY**

DATE:	8/18/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	22079-Lovers Bonita Mon Profiles.dwg		
REF. NO.	22.079	NO.	DATE
		BY	REVISION DESCRIPTION



NOTES

- ELEVATIONS ARE REFERENCED TO NAVD 1988.
- PROFILE DATA ARE FROM SURVEYS BY CEC.
- UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 9
FILE NO.: 22079-R-216.5

**COASTAL
ENGINEERING
CONSULTANTS
INC.**
Serving Florida Since 1977
28421 BONITA CROSSINGS BLVD
BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
ENVIRONMENTAL & GEOLOGICAL SERVICES
SURVEY & MAPPING
ENGINEERING: CA 2464
SURVEYING: LB 2464
PHONE: (239)643-2324
FAX: (239)643-1143
www.coastalengineering.com
E-Mail: info@ceciff.com

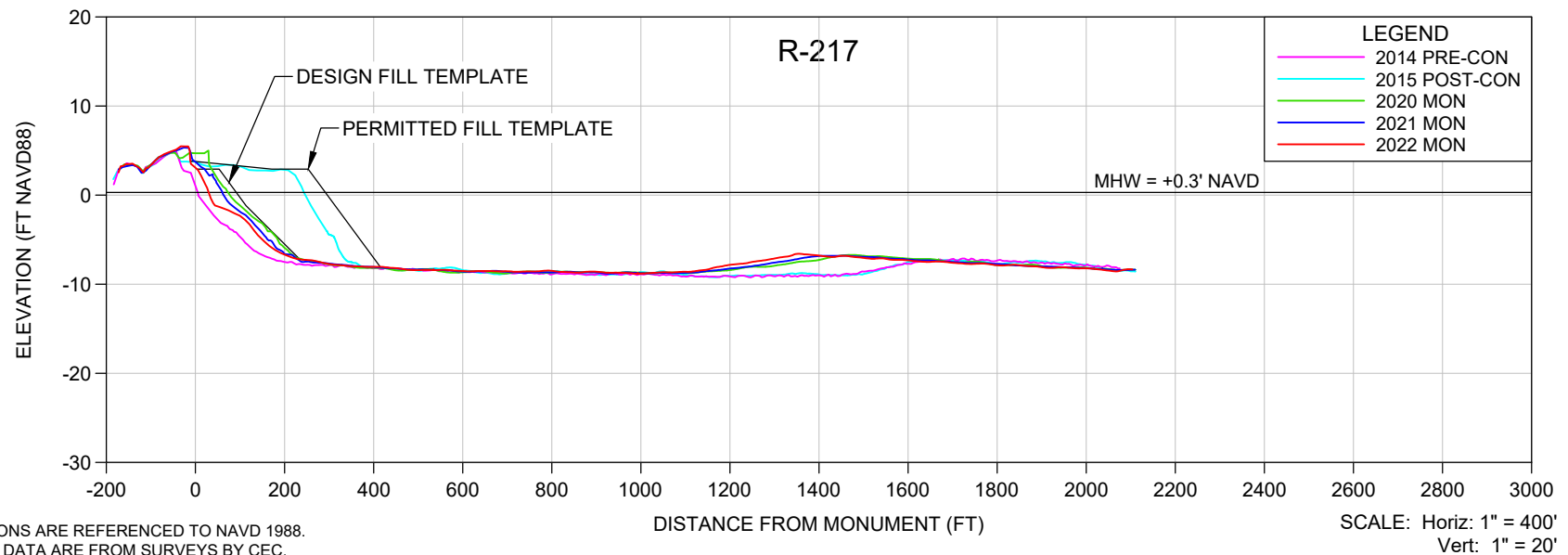
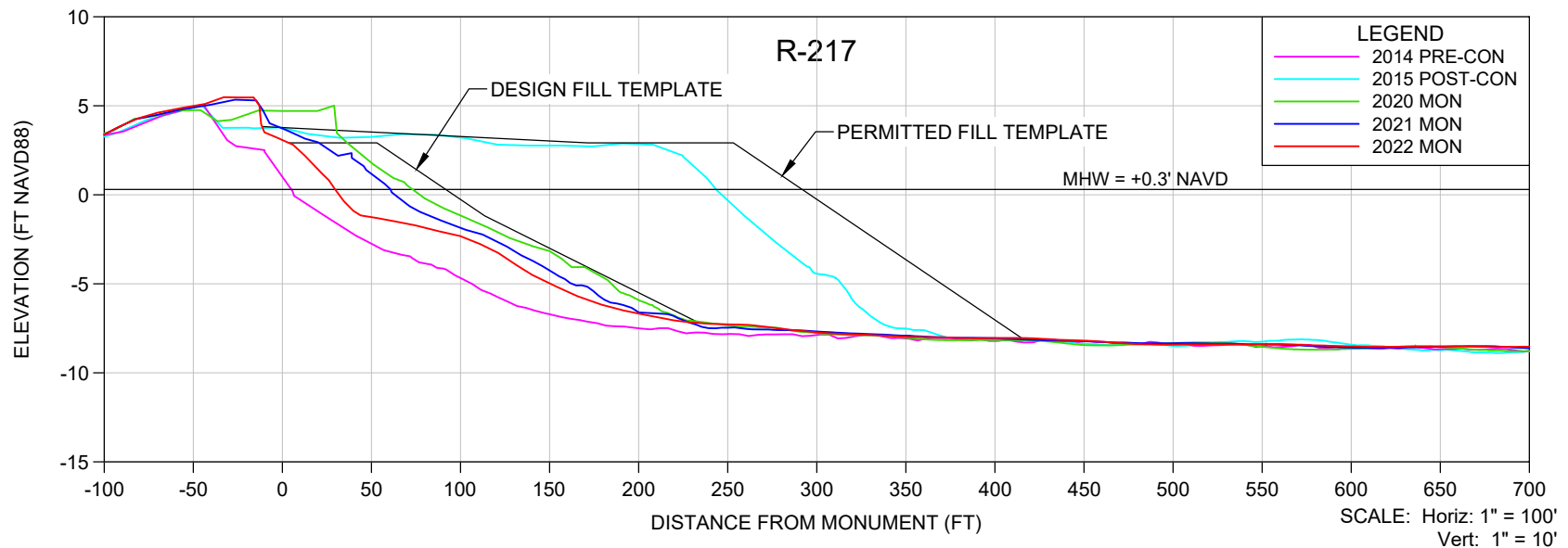
CLIENT:

LEE COUNTY

TITLE:

**BONITA BEACH AND LOVERS KEY
R-216.5 MONITORING SURVEY**

DATE:	8/18/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	22079-Lovers Bonita Mon Profiles.dwg		
REF. NO.	22.079	NO.	DATE
		BY	REVISION DESCRIPTION



NOTES

1. ELEVATIONS ARE REFERENCED TO NAVD 1988.
2. PROFILE DATA ARE FROM SURVEYS BY CEC.
3. UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 10
FILE NO.: 22079-R-217

**COASTAL
ENGINEERING
CONSULTANTS
INC.**
Serving Florida Since 1977
28421 BONITA CROSSINGS BLVD
BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
ENVIRONMENTAL & GEOLOGICAL SERVICES
SURVEY & MAPPING
ENGINEERING: CA 2464
SURVEYING: LB 2464
PHONE: (239)643-2324
FAX: (239)643-1143
www.coastalengineering.com
E-Mail: info@ceciff.com

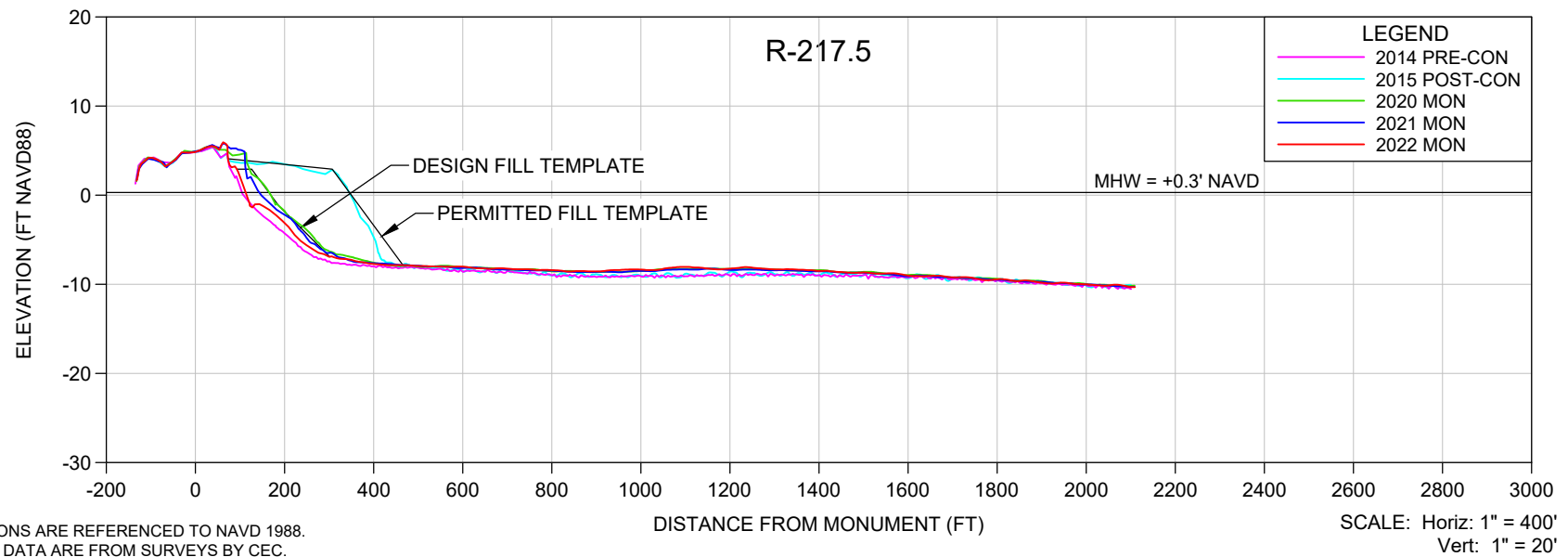
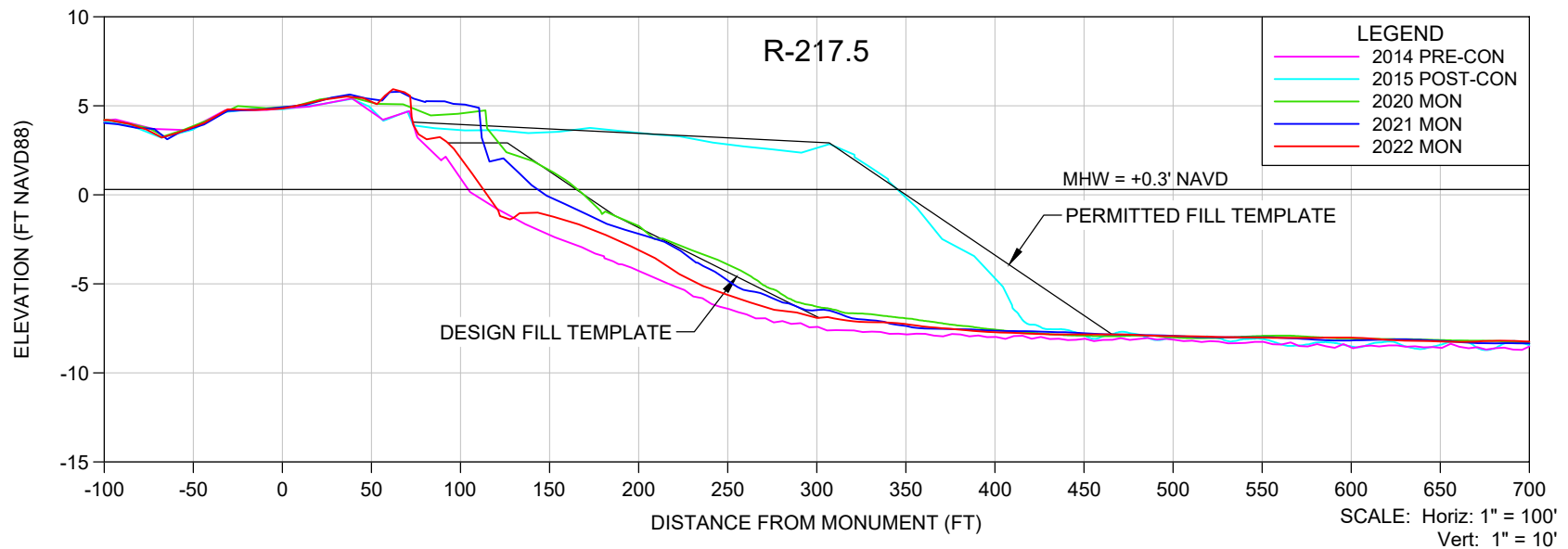
CLIENT:

LEE COUNTY

TITLE:

**BONITA BEACH AND LOVERS KEY
R-217 MONITORING SURVEY**

DATE:	8/18/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	22079-Lovers Bonita Mon Profiles.dwg		
REF. NO.	22.079	NO.	DATE
		BY	REVISION DESCRIPTION



NOTES

- ELEVATIONS ARE REFERENCED TO NAVD 1988.
- PROFILE DATA ARE FROM SURVEYS BY CEC.
- UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 11
FILE NO.: 22079-R-217.5

COASTAL ENGINEERING CONSULTANTS INC.
Serving Florida Since 1977
28421 BONITA CROSSINGS BLVD
BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
ENVIRONMENTAL & GEOLOGICAL SERVICES
SURVEY & MAPPING
ENGINEERING: CA 2464
SURVEYING: LB 2464
PHONE: (239)643-2324
FAX: (239)643-1143
www.coastalengineering.com
E-Mail: info@ceciff.com

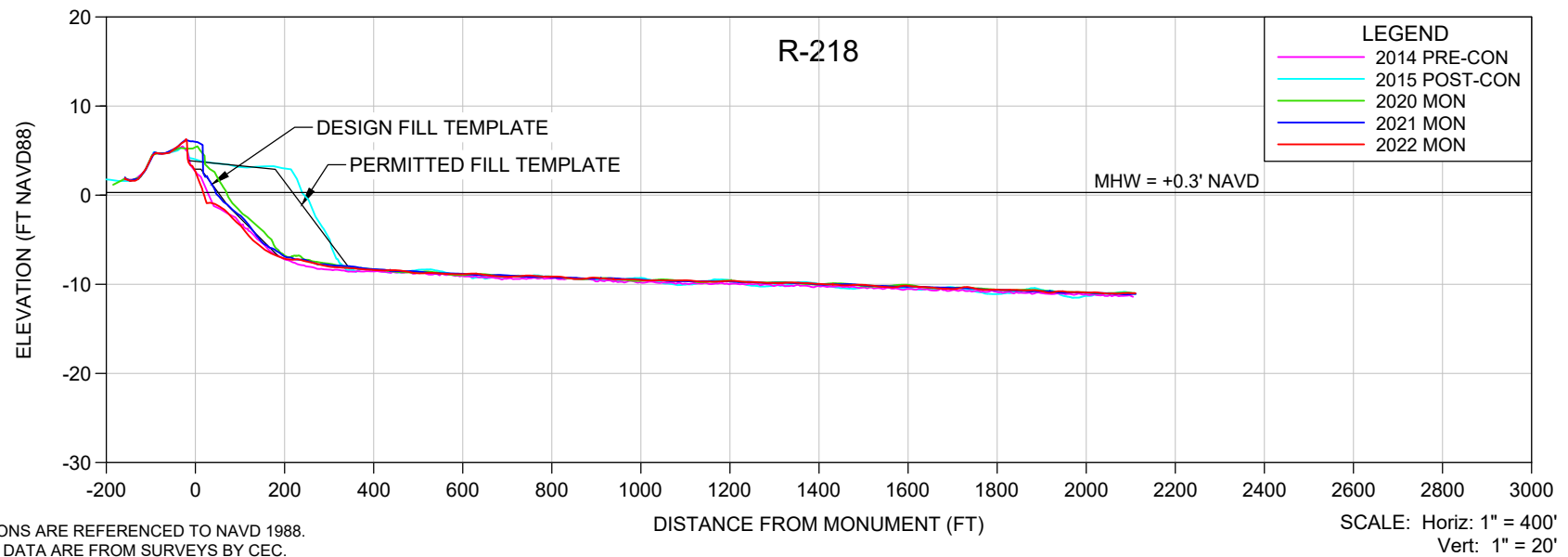
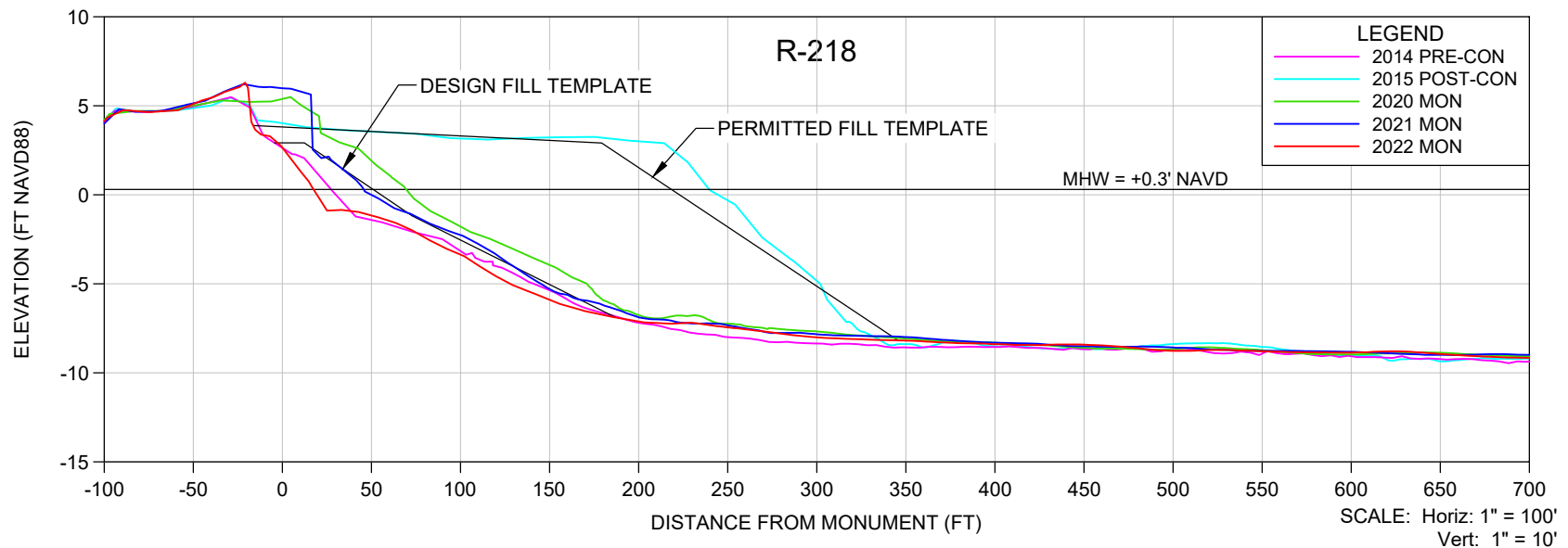
CLIENT:

LEE COUNTY

TITLE:

**BONITA BEACH AND LOVERS KEY
R-217.5 MONITORING SURVEY**

DATE:	8/18/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	22079-Lovers Bonita Mon Profiles.dwg		
REF. NO.	22.079	NO.	DATE
		BY	REVISION DESCRIPTION



NOTES

- ELEVATIONS ARE REFERENCED TO NAVD 1988.
- PROFILE DATA ARE FROM SURVEYS BY CEC.
- UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 12
FILE NO.: 22079-R-218

**COASTAL
ENGINEERING
CONSULTANTS
INC.**

Serving Florida Since 1977

28421 BONITA CROSSINGS BLVD
BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
ENVIRONMENTAL & GEOLOGICAL SERVICES
SURVEY & MAPPING
ENGINEERING: CA 2464
SURVEYING: LB 2464

PHONE: (239)643-2324
FAX: (239)643-1143
www.coastalengineering.com
E-Mail: info@ceciff.com

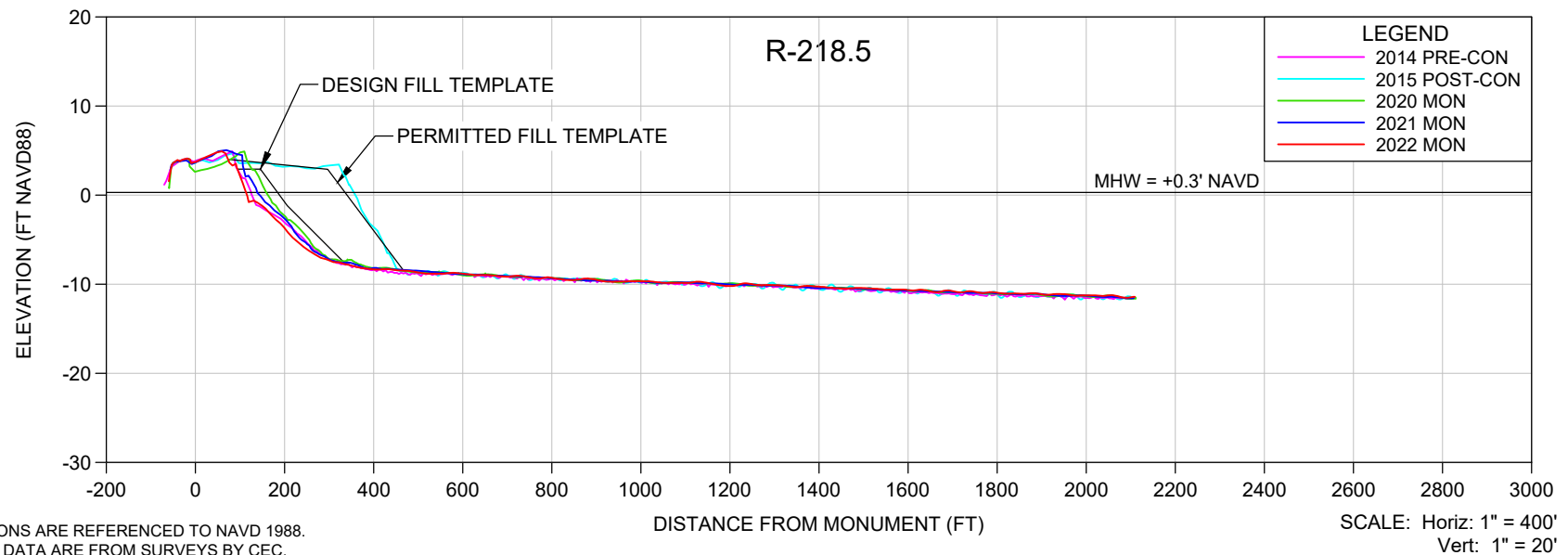
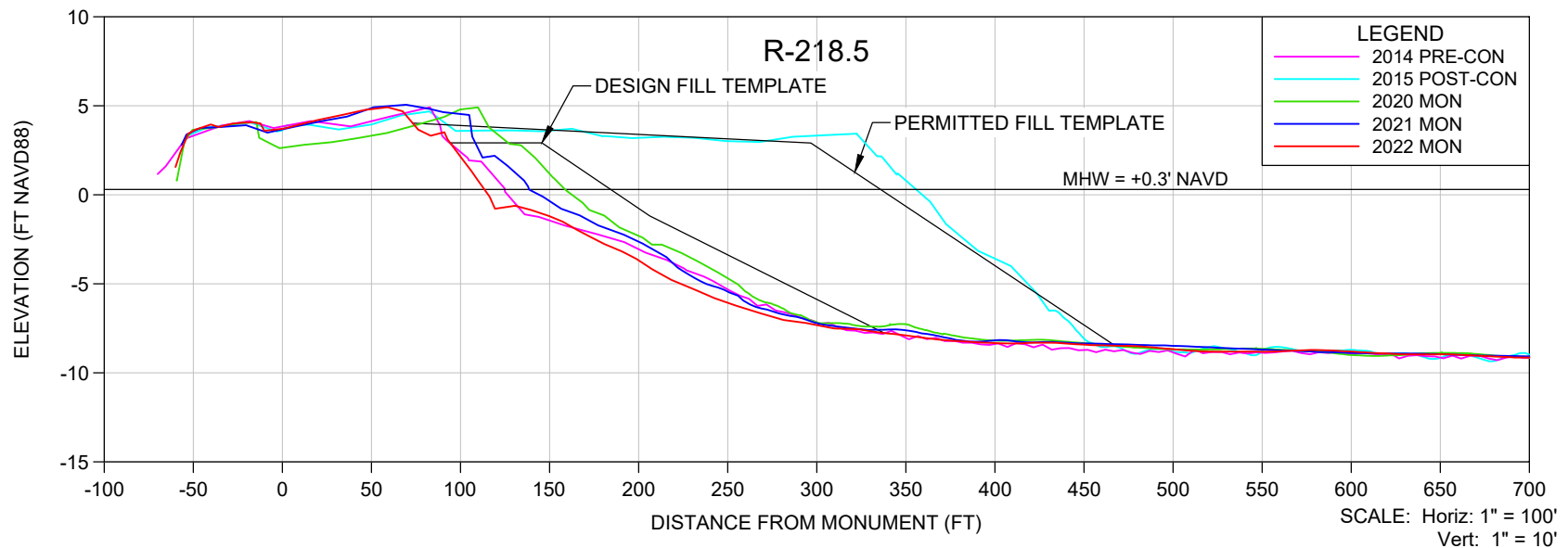
CLIENT:

LEE COUNTY

TITLE:

**BONITA BEACH AND LOVERS KEY
R-218 MONITORING SURVEY**

DATE:	8/18/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	22079-Lovers Bonita Mon Profiles.dwg		
REF. NO.	22.079	NO.	DATE
		BY	REVISION DESCRIPTION



NOTES

- ELEVATIONS ARE REFERENCED TO NAVD 1988.
- PROFILE DATA ARE FROM SURVEYS BY CEC.
- UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 13
FILE NO.: 22079-B-218.5

**COASTAL
ENGINEERING
CONSULTANTS
INC.**
 Serving Florida Since 1977
 28421 BONITA CROSSINGS BLVD
 BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
 ENVIRONMENTAL & GEOLOGICAL SERVICES
 SURVEY & MAPPING
 ENGINEERING: CA 2464
 SURVEYING: LB 2464
 PHONE: (239)643-2324
 FAX: (239)643-1143
 www.coastalengineering.com
 E-Mail: info@ceciff.com

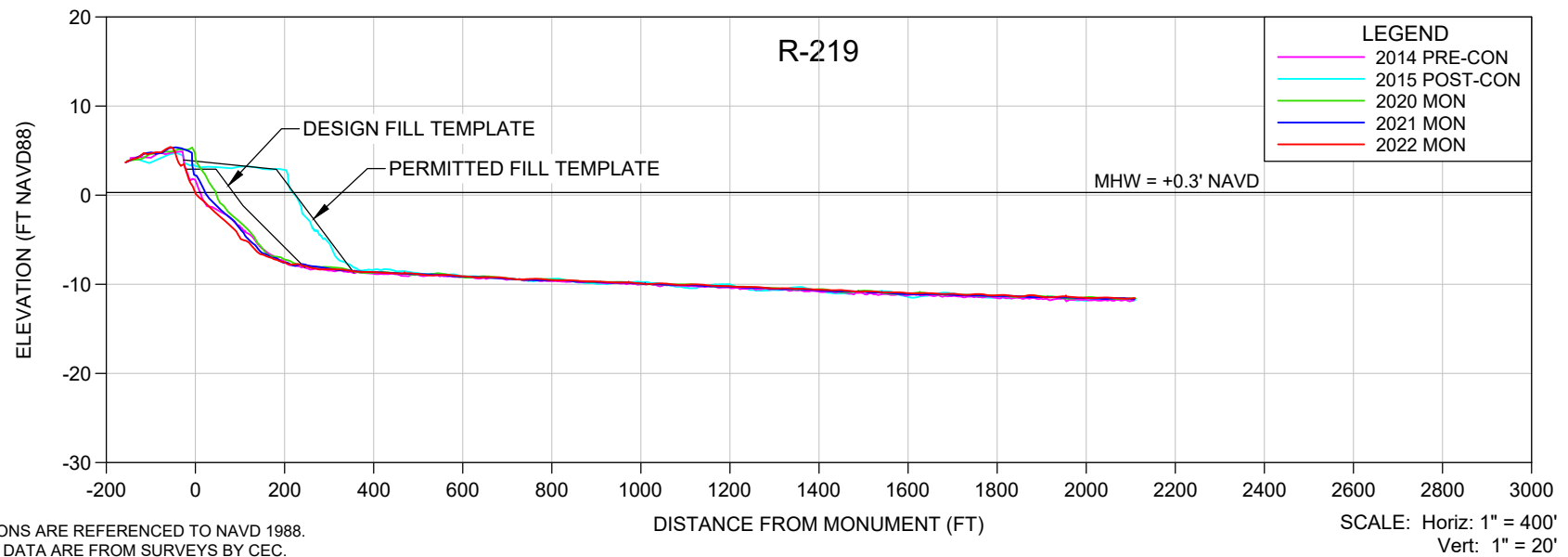
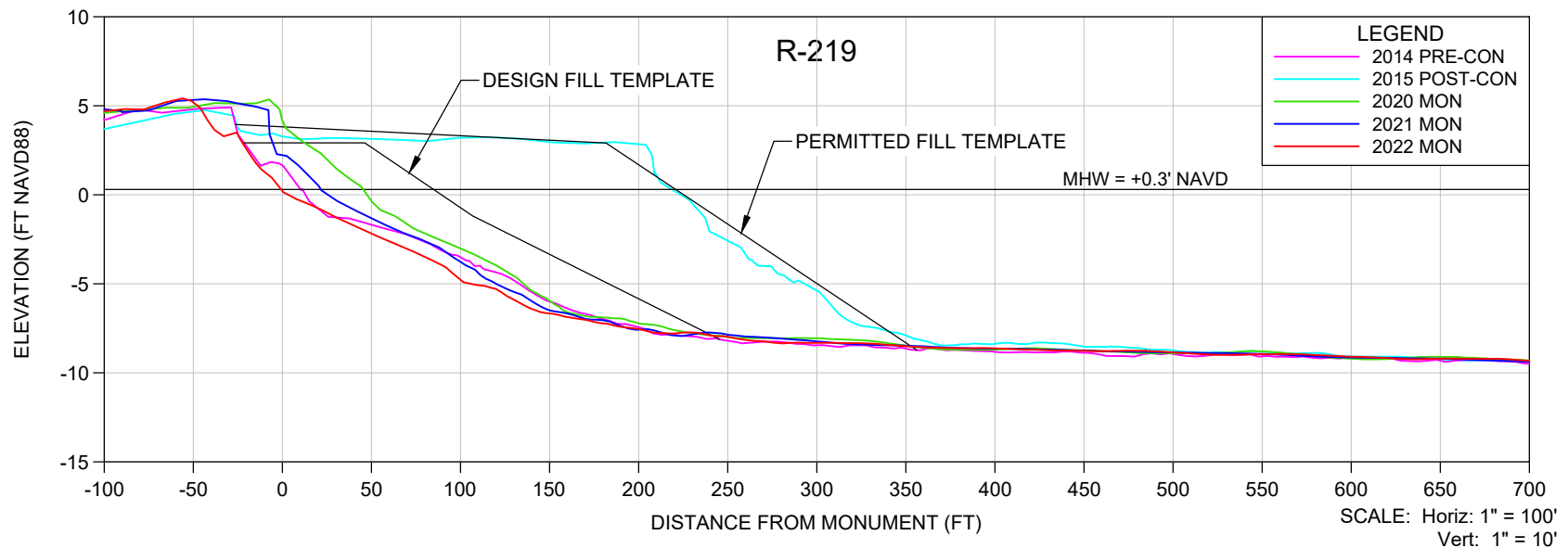
CLIENT:

LEE COUNTY

TITLE:

**BONITA BEACH AND LOVERS KEY
R-218.5 MONITORING SURVEY**

DATE:	8/18/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	22079-Lovers Bonita Mon Profiles.dwg		
REF. NO.	22.079	NO.	DATE
		BY	REVISION DESCRIPTION



NOTES

- ELEVATIONS ARE REFERENCED TO NAVD 1988.
- PROFILE DATA ARE FROM SURVEYS BY CEC.
- UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 14
FILE NO.: 22079-R-219

**COASTAL
ENGINEERING
CONSULTANTS
INC.**

Serving Florida Since 1977

28421 BONITA CROSSINGS BLVD
BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
ENVIRONMENTAL & GEOLOGICAL SERVICES
SURVEY & MAPPING
ENGINEERING: CA 2464
SURVEYING: LB 2464

PHONE: (239)643-2324
FAX: (239)643-1143
www.coastalengineering.com
E-Mail: info@ceciff.com

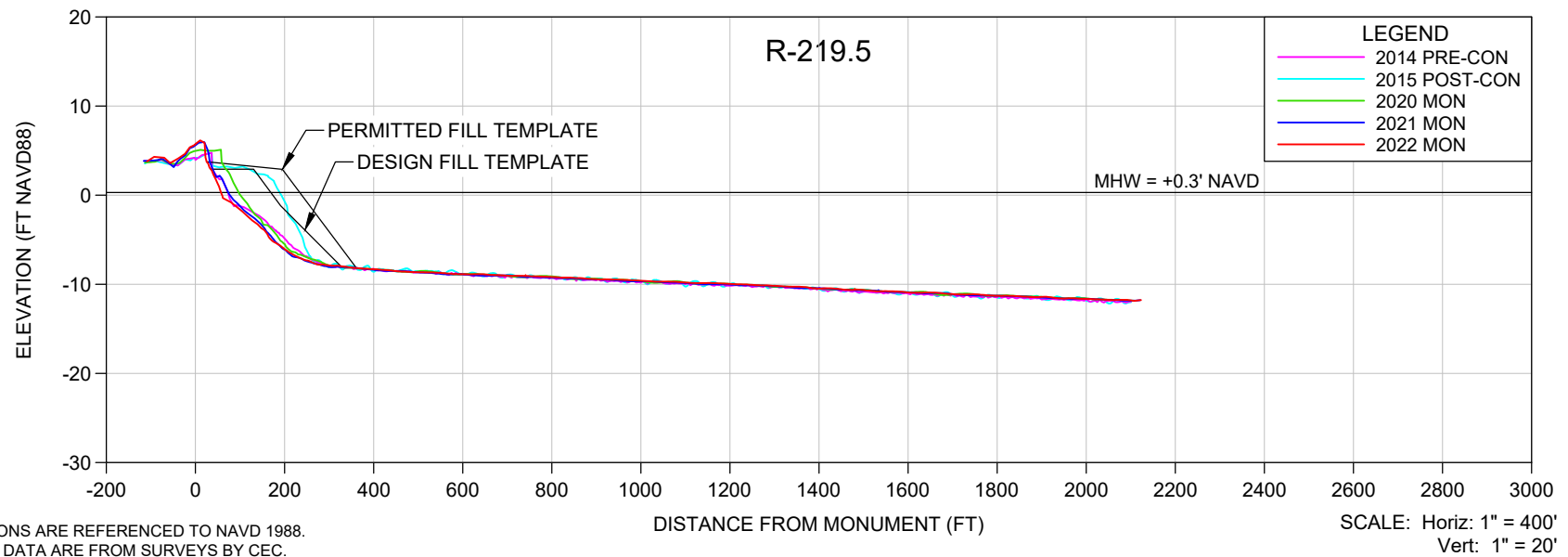
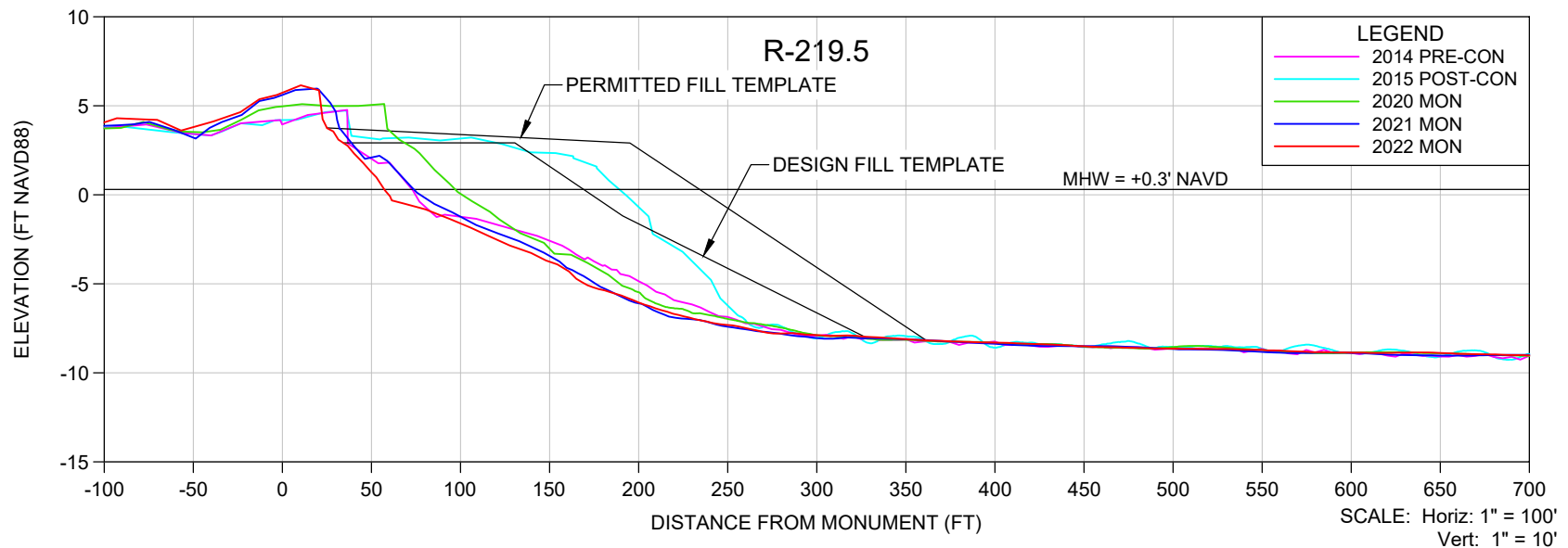
CLIENT:

LEE COUNTY

TITLE:

**BONITA BEACH AND LOVERS KEY
R-219 MONITORING SURVEY**

DATE:	8/18/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	22079-Lovers Bonita Mon Profiles.dwg		
REF. NO.	22.079	NO.	DATE
		BY	REVISION DESCRIPTION



NOTES

- ELEVATIONS ARE REFERENCED TO NAVD 1988.
- PROFILE DATA ARE FROM SURVEYS BY CEC.
- UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 15
FILE NO.: 22079-R-219.5

**COASTAL
ENGINEERING
CONSULTANTS
INC.**

Serving Florida Since 1977

28421 BONITA CROSSINGS BLVD
BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
ENVIRONMENTAL & GEOLOGICAL SERVICES
SURVEY & MAPPING
ENGINEERING: CA 2464
SURVEYING: LB 2464

PHONE: (239)643-2324
FAX: (239)643-1143
www.coastalengineering.com
E-Mail: info@ceciff.com

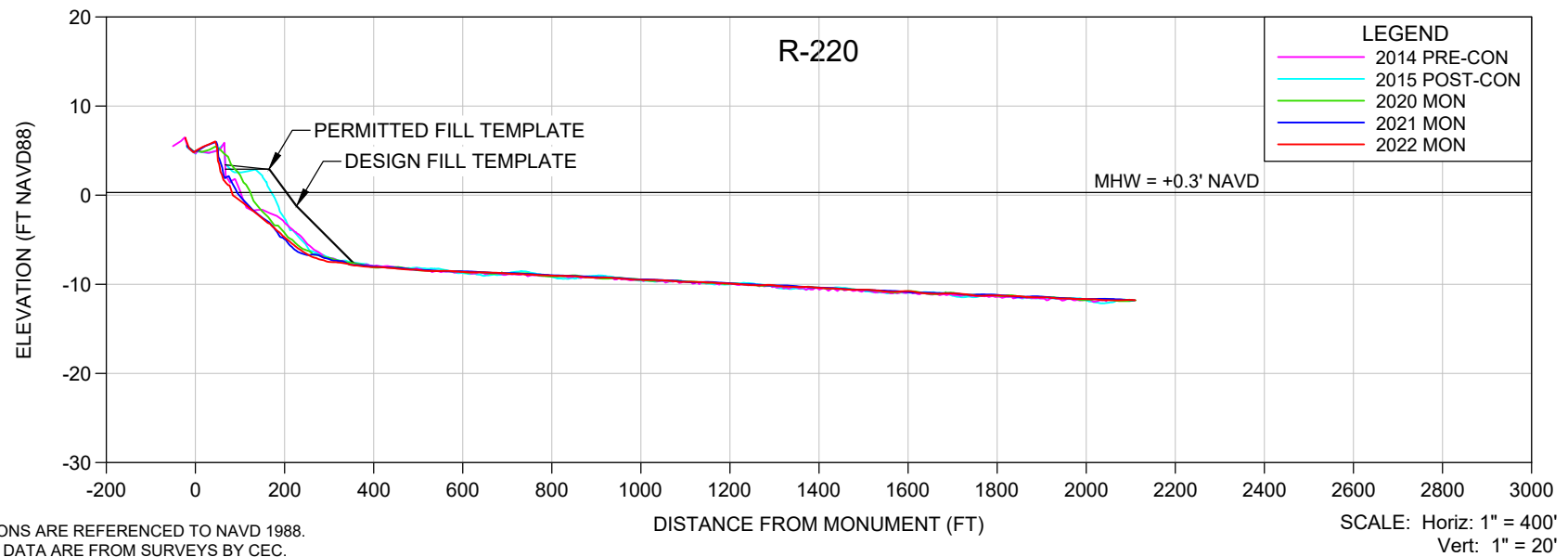
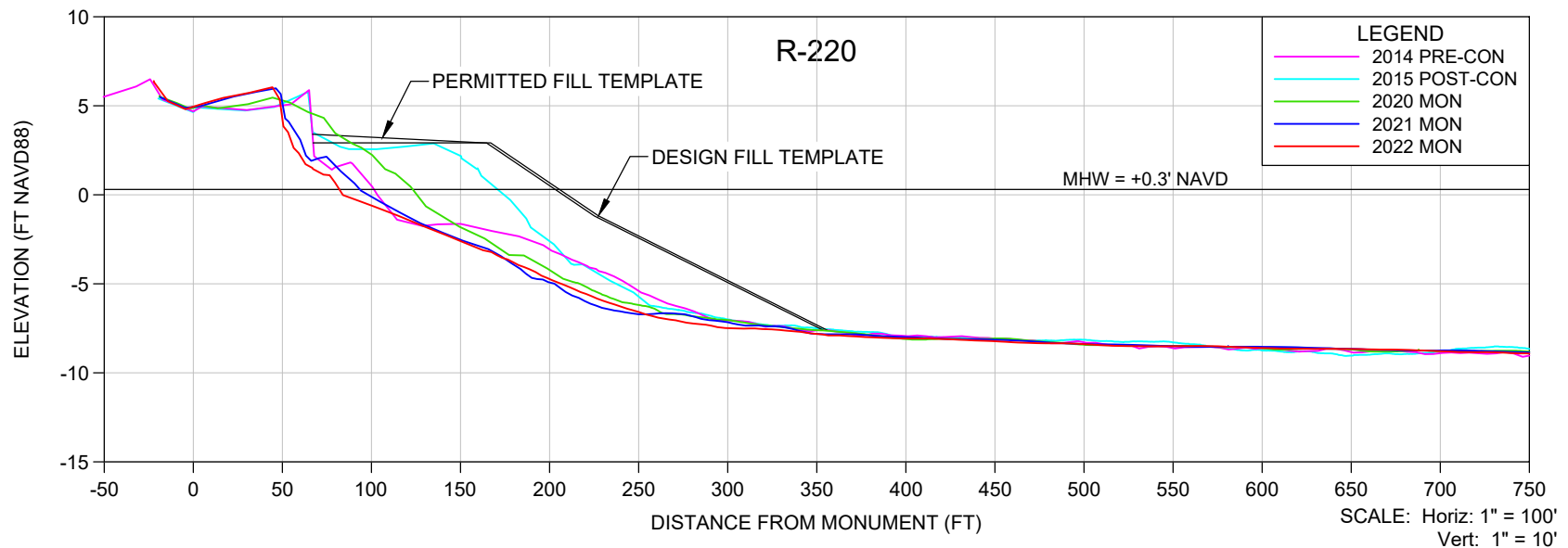
CLIENT:

LEE COUNTY

TITLE:

**BONITA BEACH AND LOVERS KEY
R-219.5 MONITORING SURVEY**

DATE:	8/18/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	22079-Lovers Bonita Mon Profiles.dwg		
REF. NO.	22.079	NO.	DATE
		BY	REVISION DESCRIPTION



NOTES

- ELEVATIONS ARE REFERENCED TO NAVD 1988.
- PROFILE DATA ARE FROM SURVEYS BY CEC.
- UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 16
FILE NO.: 22079-R-220

COASTAL ENGINEERING CONSULTANTS INC.
Serving Florida Since 1977
28421 BONITA CROSSINGS BLVD
BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
ENVIRONMENTAL & GEOLOGICAL SERVICES
SURVEY & MAPPING
ENGINEERING: CA 2464
SURVEYING: LB 2464
PHONE: (239)643-2324
FAX: (239)643-1143
www.coastalengineering.com
E-Mail: info@ceciff.com

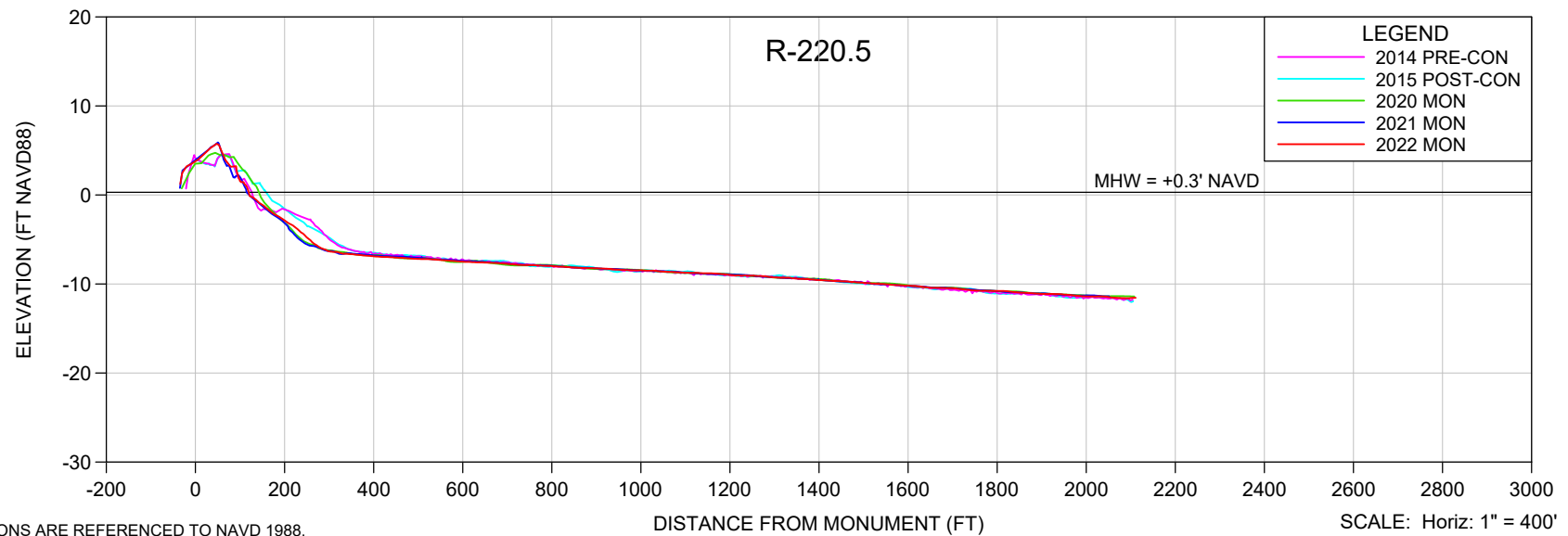
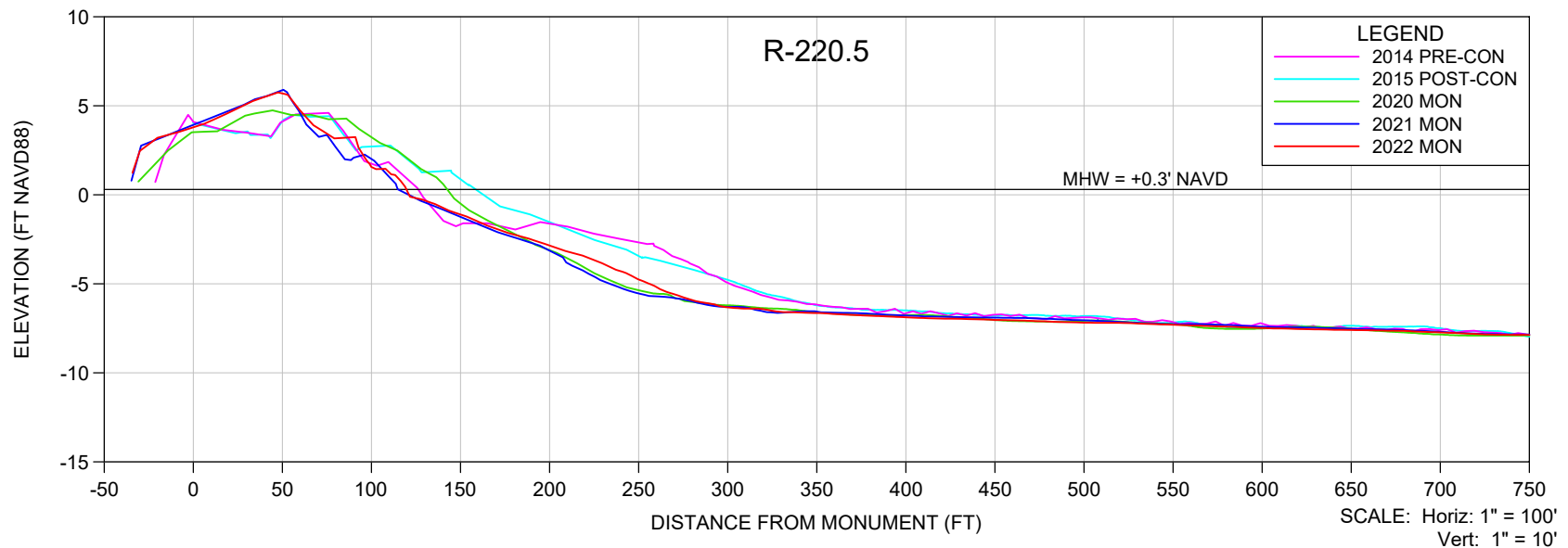
CLIENT:

LEE COUNTY

TITLE:

**BONITA BEACH AND LOVERS KEY
R-220 MONITORING SURVEY**

DATE:	8/18/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	22079-Lovers Bonita Mon Profiles.dwg		
REF. NO.	22.079	NO.	DATE
		BY	REVISION DESCRIPTION



NOTES

- ELEVATIONS ARE REFERENCED TO NAVD 1988.
- PROFILE DATA ARE FROM SURVEYS BY CEC.
- UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 17
 FILE NO.: 22079-R-220.5

**COASTAL
 ENGINEERING
 CONSULTANTS
 INC.**
 Serving Florida Since 1977
 28421 BONITA CROSSINGS BLVD
 BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
 ENVIRONMENTAL & GEOLOGICAL SERVICES
 SURVEY & MAPPING
 ENGINEERING: CA 2464
 SURVEYING: LB 2464
 PHONE: (239)643-2324
 FAX: (239)643-1143
 www.coastalengineering.com
 E-Mail: info@ceciff.com

CLIENT:

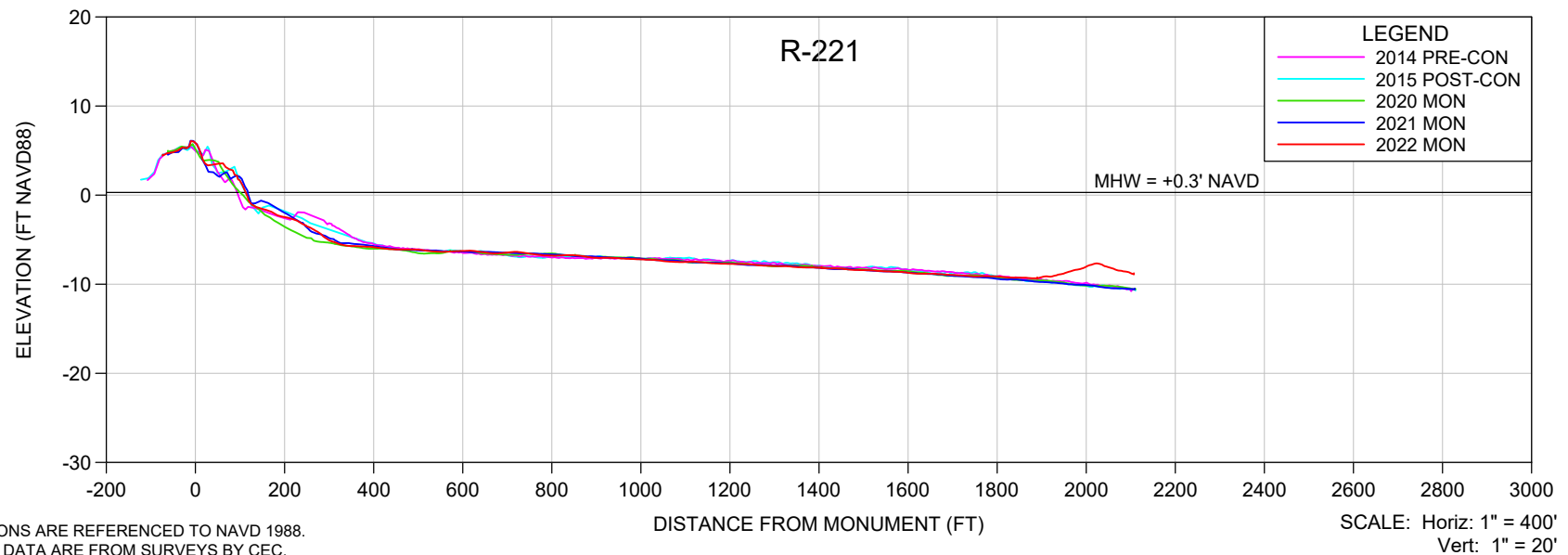
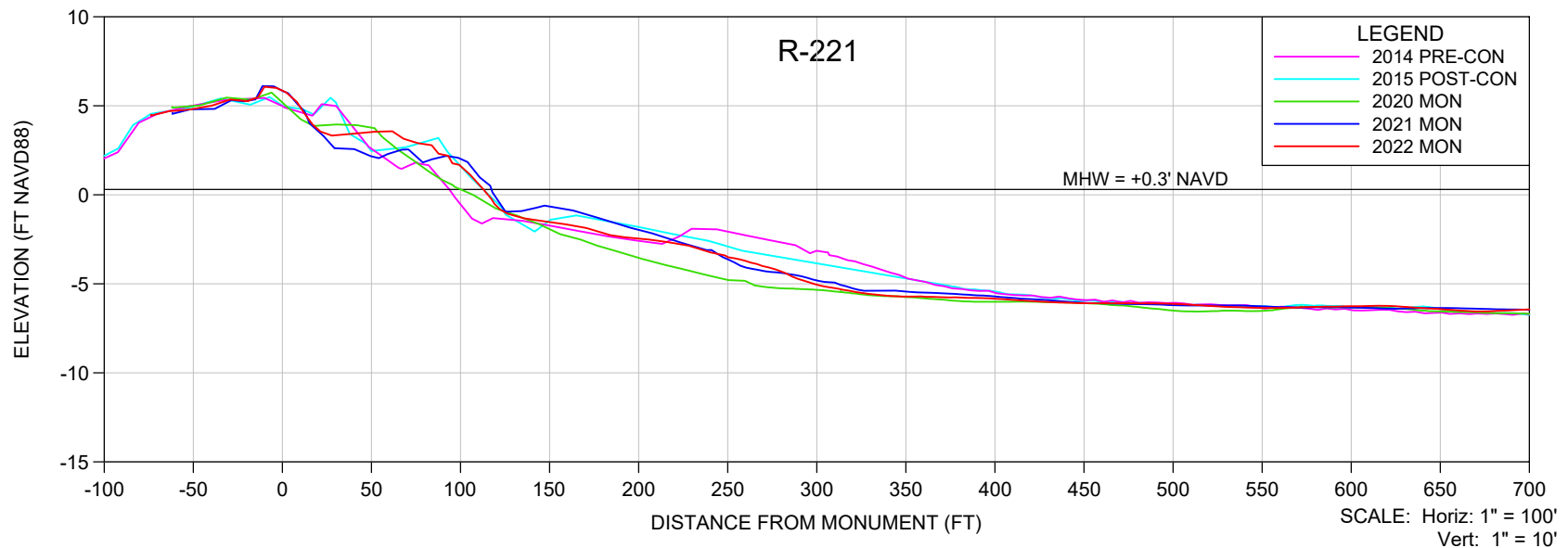
LEE COUNTY

TITLE:

**BONITA BEACH AND LOVERS KEY
 R-220.5 MONITORING SURVEY**

DATE:	8/18/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	22079-Lovers Bonita Mon Profiles.dwg		
REF. NO.	22.079	NO.	DATE

NO.	DATE	BY	REVISION DESCRIPTION



NOTES

- ELEVATIONS ARE REFERENCED TO NAVD 1988.
- PROFILE DATA ARE FROM SURVEYS BY CEC.
- UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 18
 FILE NO.: 22079-R-221

**COASTAL
 ENGINEERING
 CONSULTANTS
 INC.**
 Serving Florida Since 1977
 28421 BONITA CROSSINGS BLVD
 BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
 ENVIRONMENTAL & GEOLOGICAL SERVICES
 SURVEY & MAPPING
 ENGINEERING: CA 2464
 SURVEYING: LB 2464
 PHONE: (239)643-2324
 FAX: (239)643-1143
 www.coastalengineering.com
 E-Mail: info@ceciff.com

CLIENT:

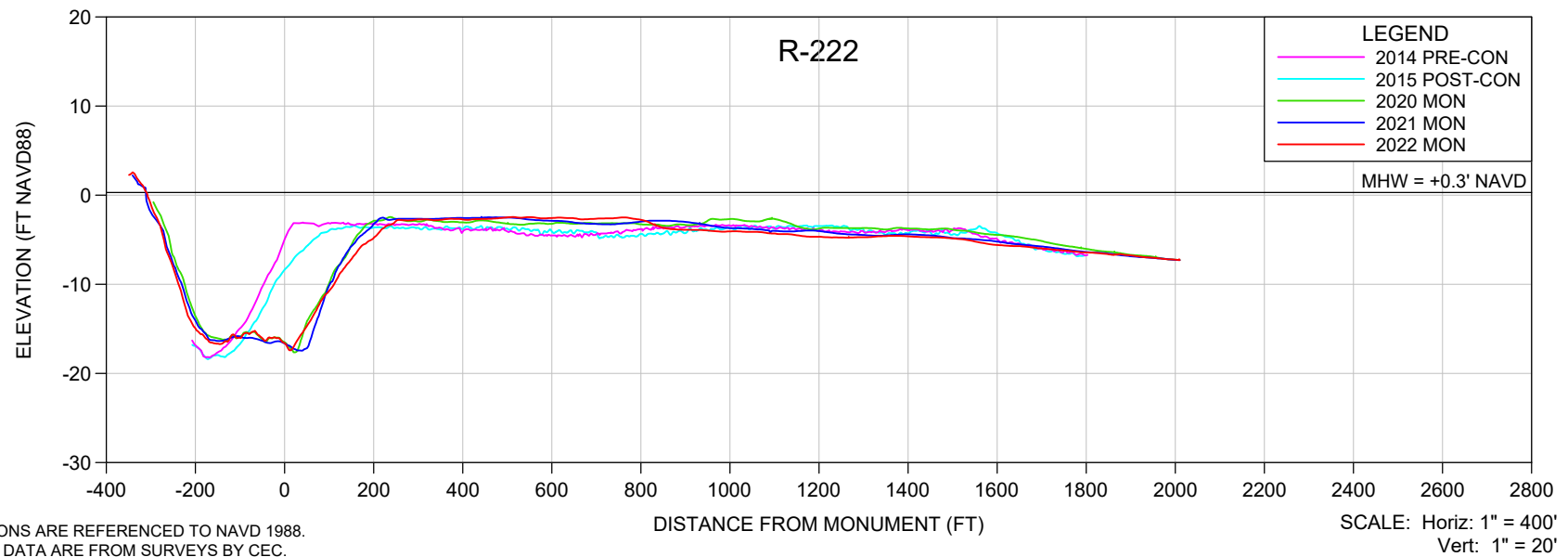
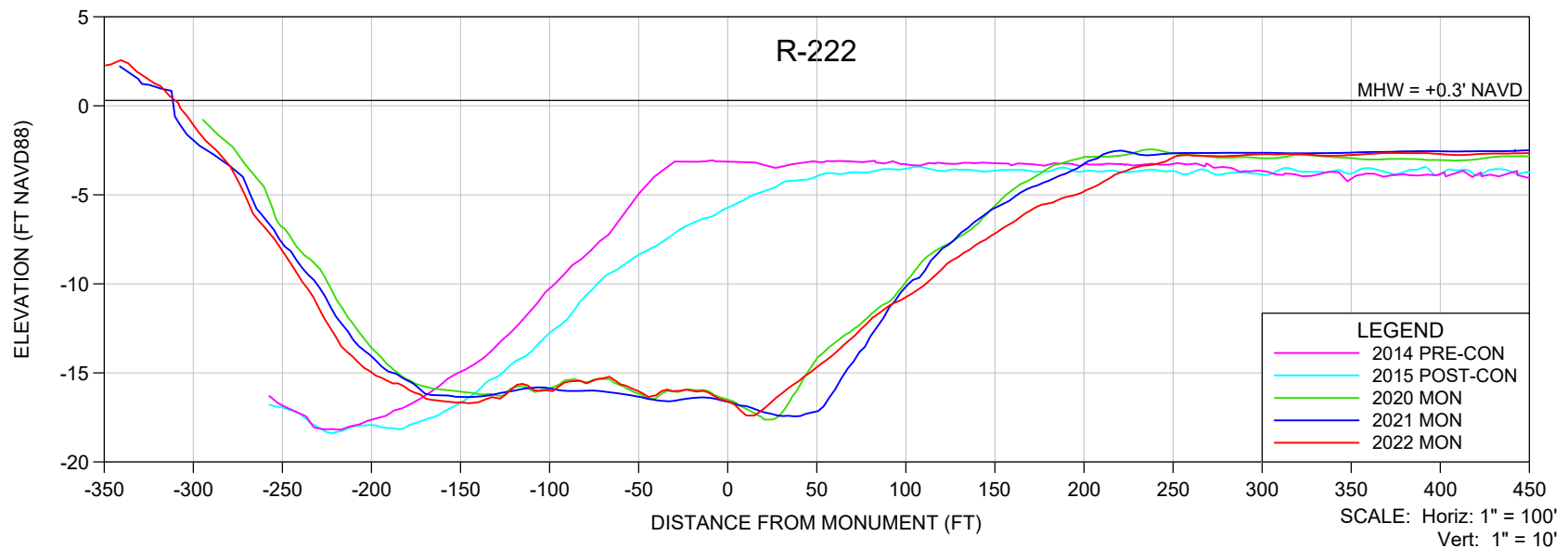
LEE COUNTY

TITLE:

**BONITA BEACH AND LOVERS KEY
 R-221 MONITORING SURVEY**

DATE:	8/18/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	22079-Lovers Bonita Mon Profiles.dwg		
REF. NO.	22.079	NO.	DATE

NO.	DATE	BY	REVISION DESCRIPTION



NOTES

- ELEVATIONS ARE REFERENCED TO NAVD 1988.
- PROFILE DATA ARE FROM SURVEYS BY CEC.
- UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 19
FILE NO.: 22079-R-222

**COASTAL
ENGINEERING
CONSULTANTS
INC.**
 Serving Florida Since 1977
 28421 BONITA CROSSINGS BLVD
 BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
 ENVIRONMENTAL & GEOLOGICAL SERVICES
 SURVEY & MAPPING
 ENGINEERING: CA 2464
 SURVEYING: LB 2464
 PHONE: (239)643-2324
 FAX: (239)643-1143
 www.coastalengineering.com
 E-Mail: info@ceciff.com

CLIENT:

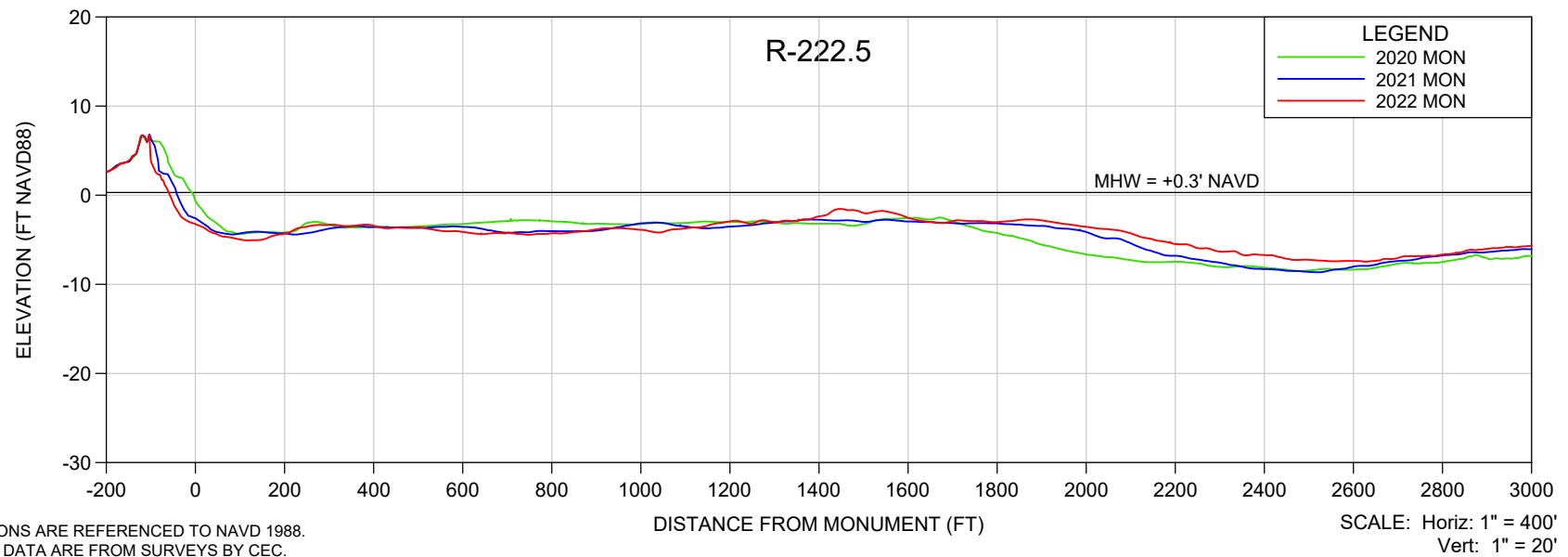
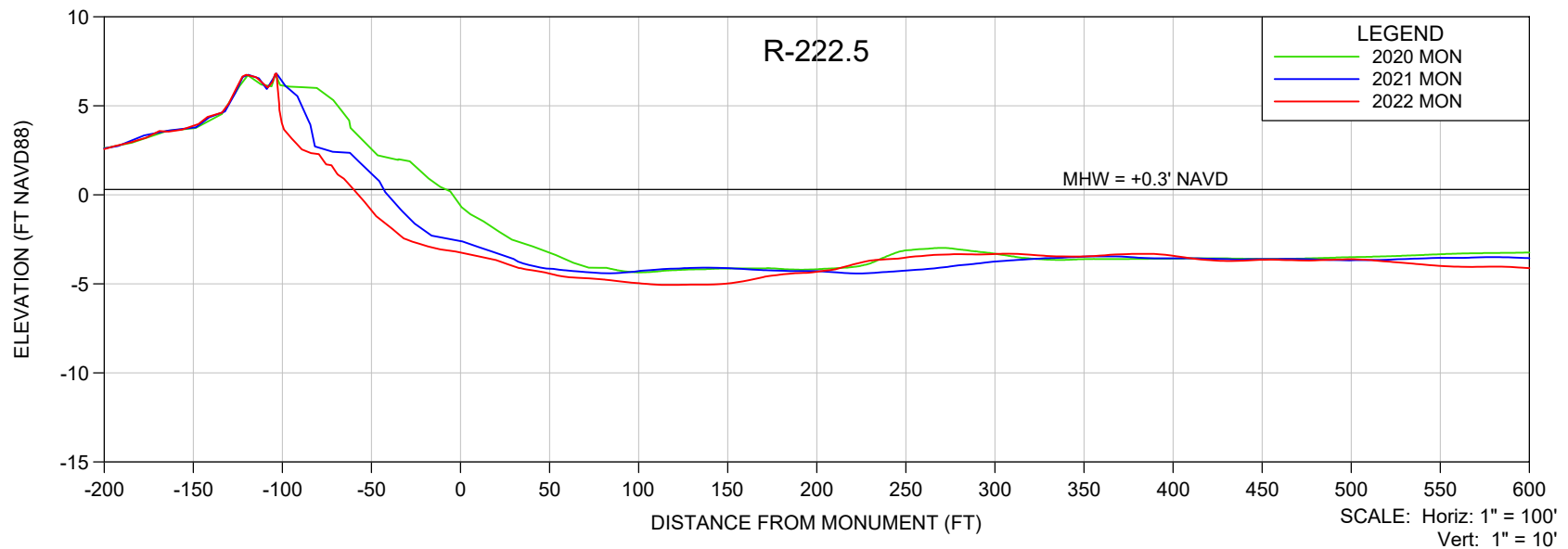
LEE COUNTY

TITLE:

**BONITA BEACH AND LOVERS KEY
R-222 MONITORING SURVEY**

DATE:	8/18/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	22079-Lovers Bonita Mon Profiles.dwg		
REF. NO.	22.079	NO.	DATE

NO.	DATE	BY	REVISION DESCRIPTION



NOTES

- ELEVATIONS ARE REFERENCED TO NAVD 1988.
- PROFILE DATA ARE FROM SURVEYS BY CEC.
- UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 20
FILE NO.: 22079-R-222.5

**COASTAL
ENGINEERING
CONSULTANTS
INC.**
 Serving Florida Since 1977
 28421 BONITA CROSSINGS BLVD
 BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
 ENVIRONMENTAL & GEOLOGICAL SERVICES
 SURVEY & MAPPING
 ENGINEERING: CA 2464
 SURVEYING: LB 2464
 PHONE: (239)643-2324
 FAX: (239)643-1143
 www.coastalengineering.com
 E-Mail: info@ceciff.com

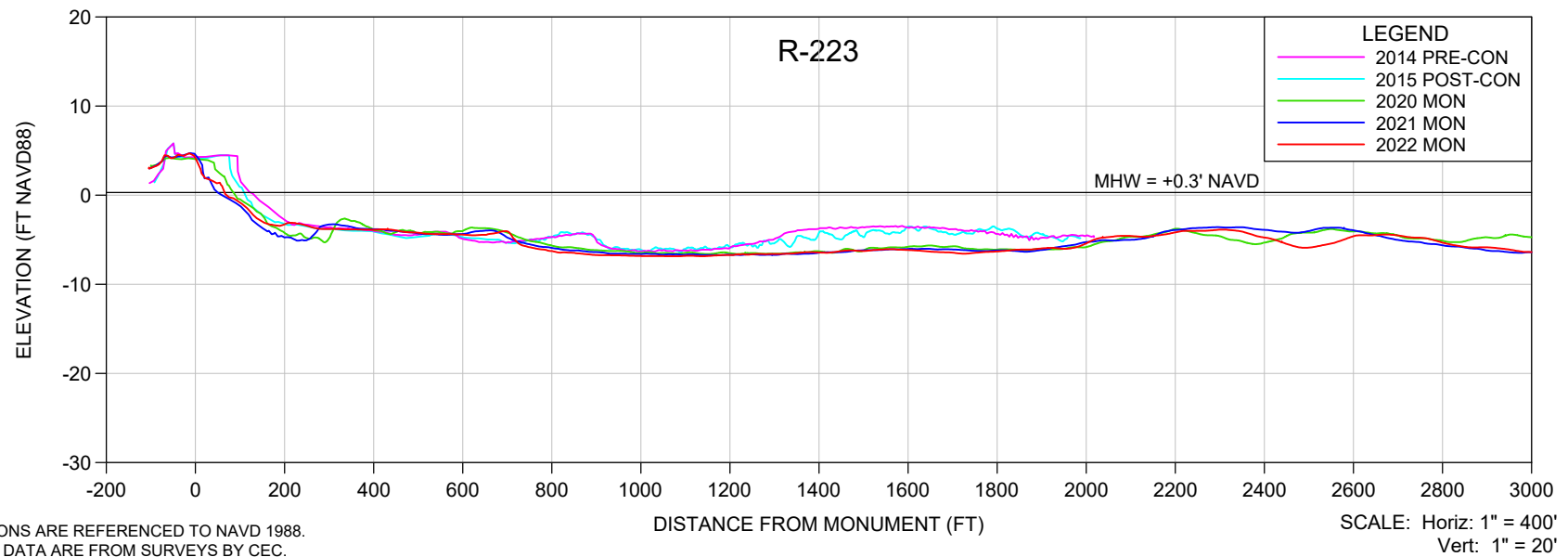
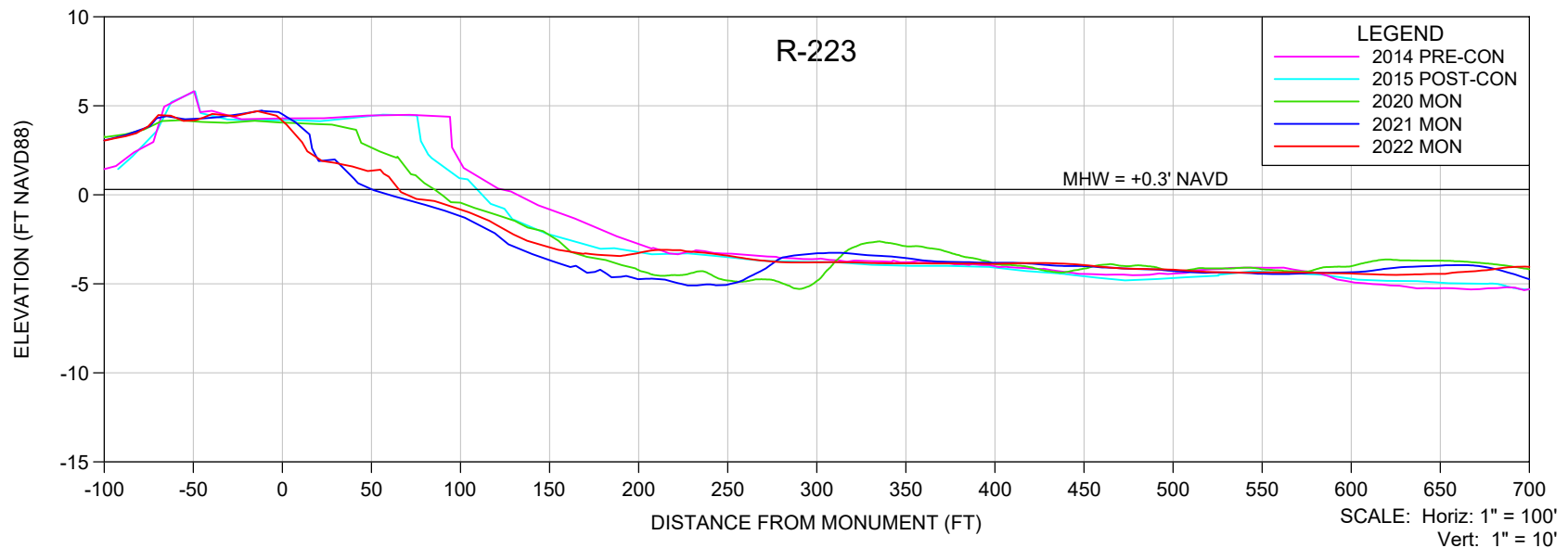
CLIENT:

LEE COUNTY

TITLE:

**BONITA BEACH AND LOVERS KEY
R-222.5 MONITORING SURVEY**

DATE:	8/18/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	22079-Lovers Bonita Mon Profiles.dwg		
REF. NO.	22.079	NO.	DATE
		BY	REVISION DESCRIPTION



NOTES

- ELEVATIONS ARE REFERENCED TO NAVD 1988.
- PROFILE DATA ARE FROM SURVEYS BY CEC.
- UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 21
FILE NO.: 22079-R-223

**COASTAL
ENGINEERING
CONSULTANTS
INC.**
 Serving Florida Since 1977
 28421 BONITA CROSSINGS BLVD
 BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
 ENVIRONMENTAL & GEOLOGICAL SERVICES
 SURVEY & MAPPING
 ENGINEERING: CA 2464
 SURVEYING: LB 2464
 PHONE: (239)643-2324
 FAX: (239)643-1143
 www.coastalengineering.com
 E-Mail: info@ceciff.com

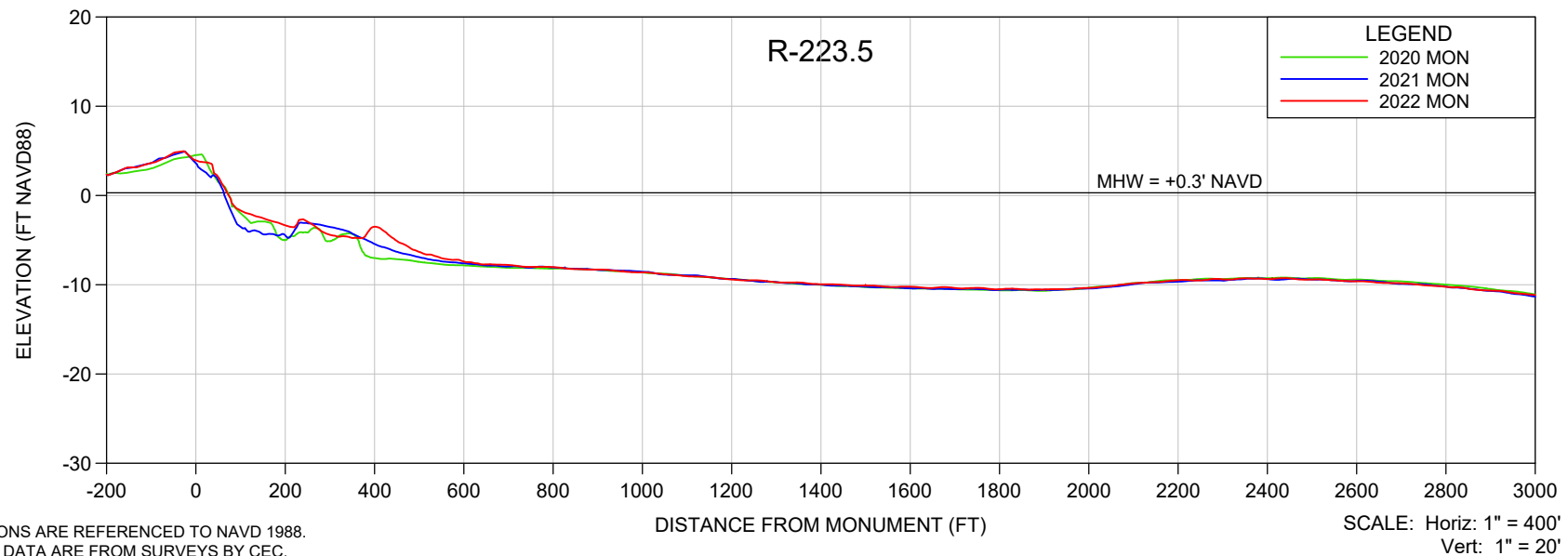
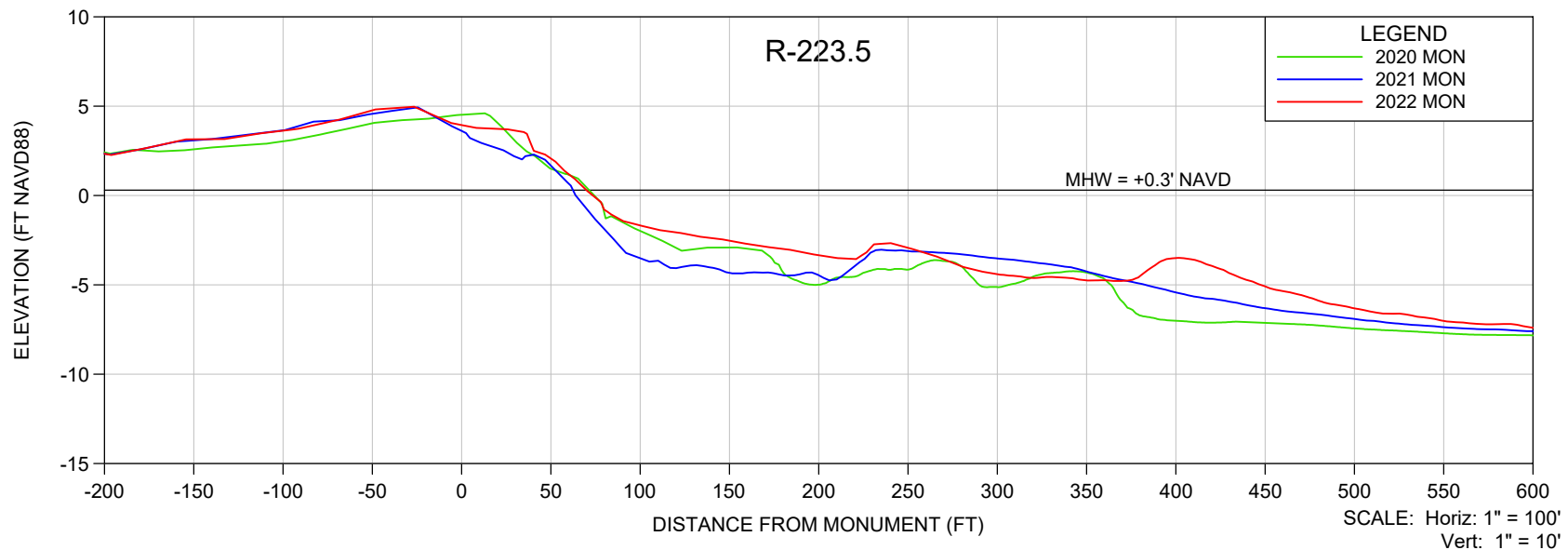
CLIENT:

LEE COUNTY

TITLE:

**BONITA BEACH AND LOVERS KEY
R-223 MONITORING SURVEY**

DATE:	8/18/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	22079-Lovers Bonita Mon Profiles.dwg		
REF. NO.	22.079	NO.	DATE
		BY	REVISION DESCRIPTION



NOTES

- ELEVATIONS ARE REFERENCED TO NAVD 1988.
- PROFILE DATA ARE FROM SURVEYS BY CEC.
- UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 22
FILE NO.: 22079-R-223

**COASTAL
ENGINEERING
CONSULTANTS
INC.**
 Serving Florida Since 1977
 28421 BONITA CROSSINGS BLVD
 BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
 ENVIRONMENTAL & GEOLOGICAL SERVICES
 SURVEY & MAPPING
 ENGINEERING: CA 2464
 SURVEYING: LB 2464
 PHONE: (239)643-2324
 FAX: (239)643-1143
 www.coastalengineering.com
 E-Mail: info@ceciff.com

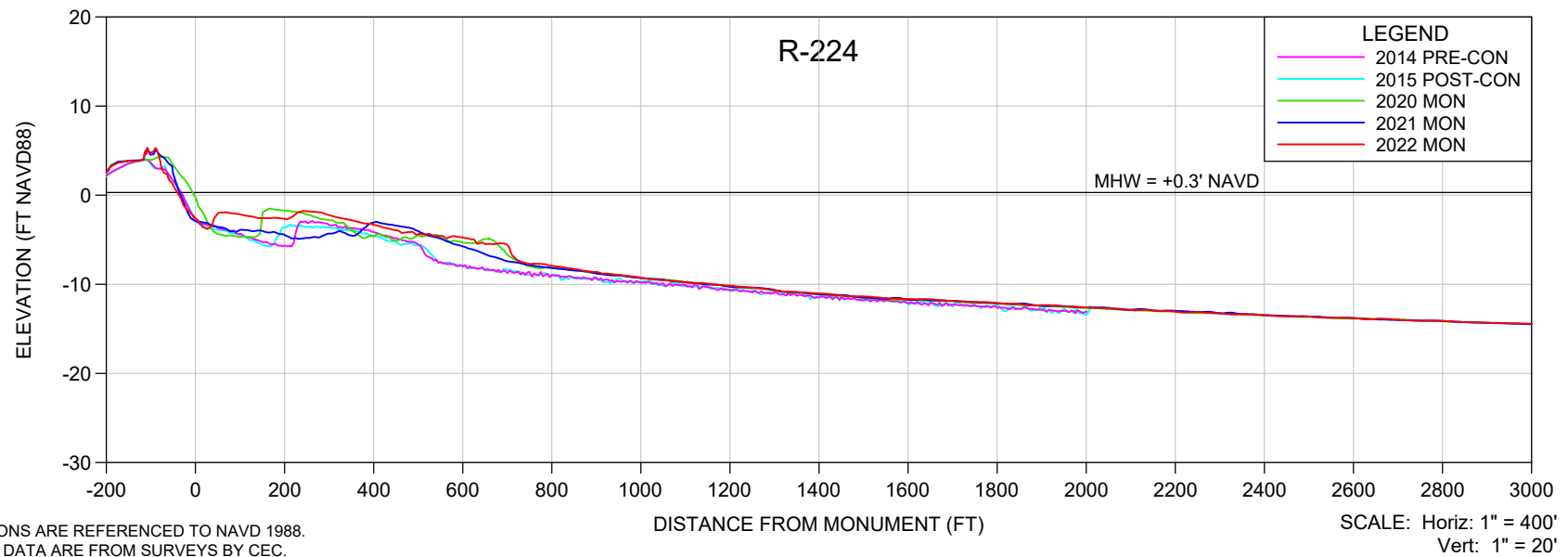
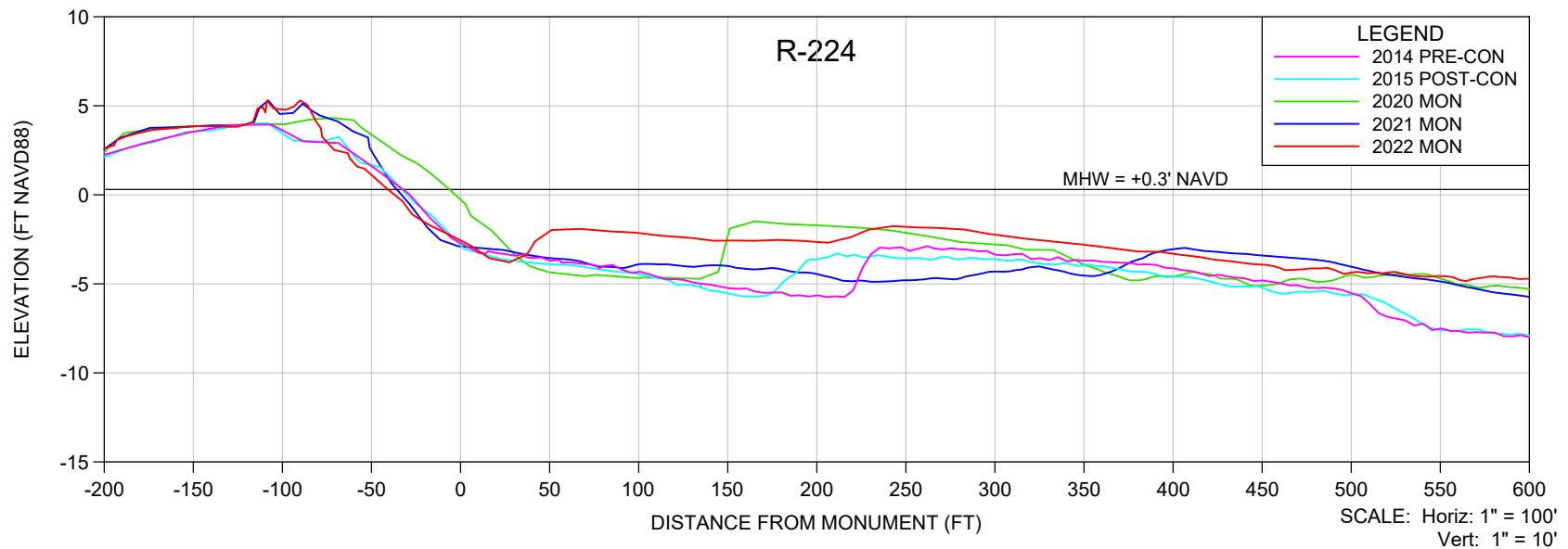
CLIENT:

LEE COUNTY

TITLE:

**BONITA BEACH AND LOVERS KEY
R-223.5 MONITORING SURVEY**

DATE:	8/18/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	22079-Lovers Bonita Mon Profiles.dwg		
REF. NO.	22.079	NO.	DATE
		BY	REVISION DESCRIPTION



NOTES

- ELEVATIONS ARE REFERENCED TO NAVD 1988.
- PROFILE DATA ARE FROM SURVEYS BY CEC.
- UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 23
FILE NO.: 22079-R-224

**COASTAL
ENGINEERING
CONSULTANTS
INC.**
 Serving Florida Since 1977
 28421 BONITA CROSSINGS BLVD
 BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
 ENVIRONMENTAL & GEOLOGICAL SERVICES
 SURVEY & MAPPING
 ENGINEERING: CA 2464
 SURVEYING: LB 2464
 PHONE: (239)643-2324
 FAX: (239)643-1143
 www.coastalengineering.com
 E-Mail: info@ceciff.com

CLIENT:

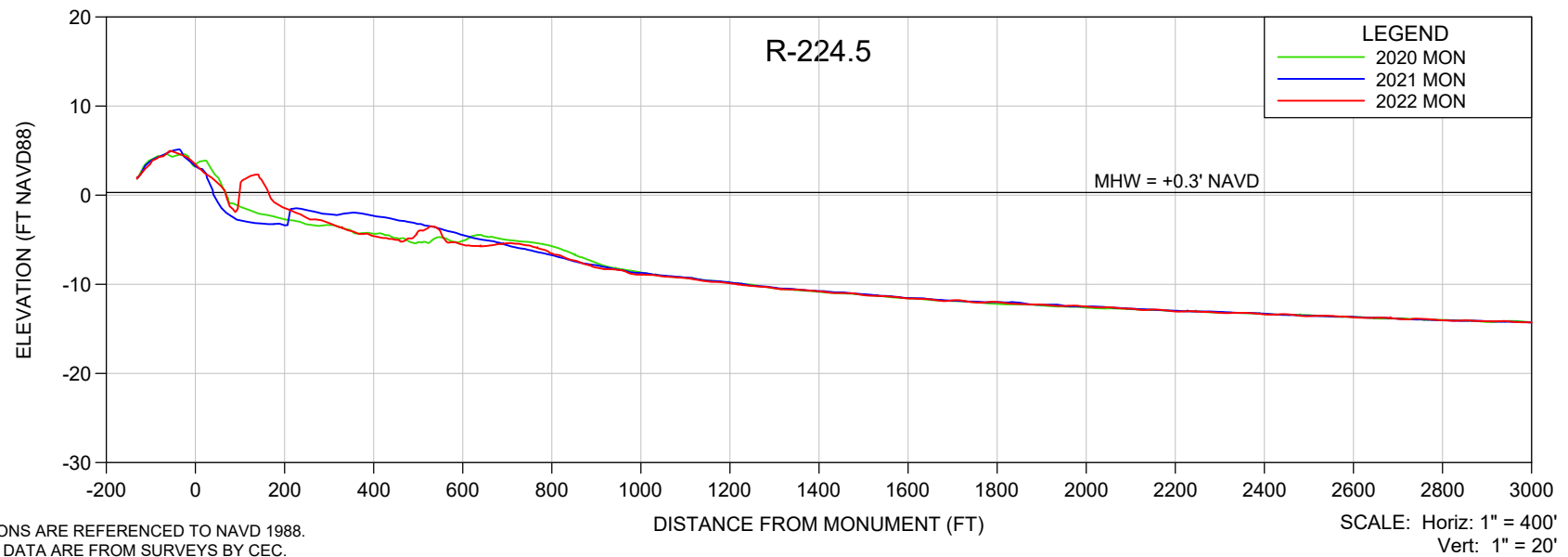
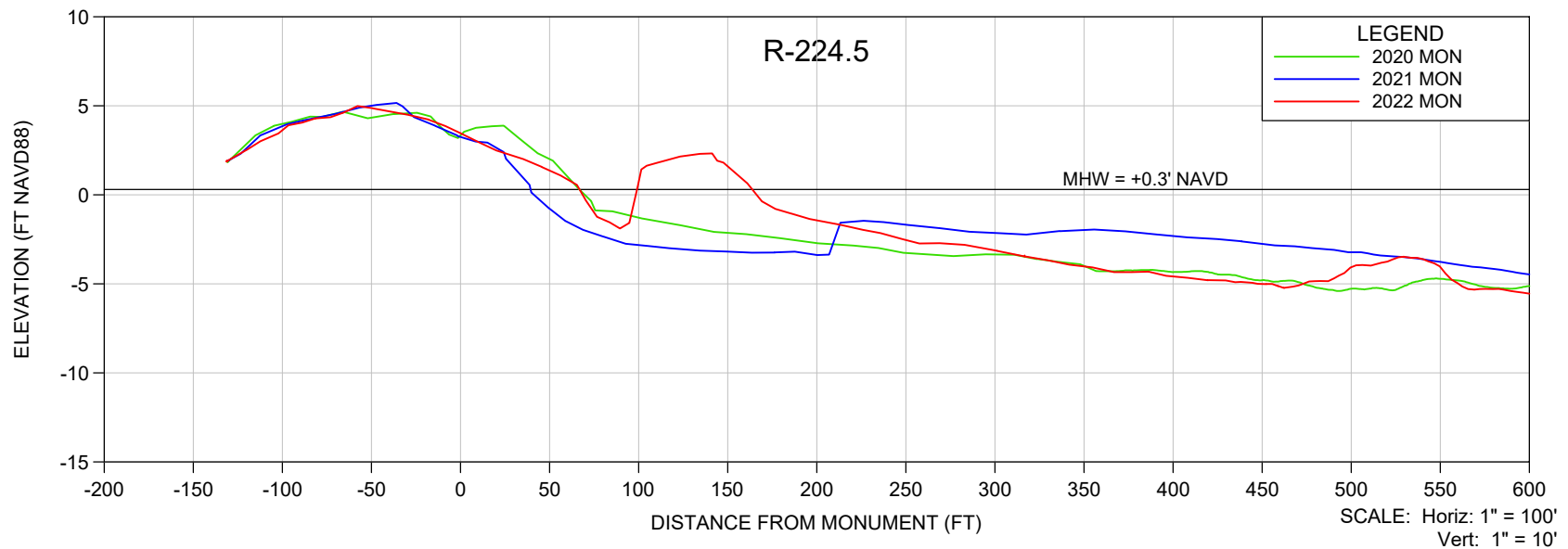
LEE COUNTY

TITLE:

**BONITA BEACH AND LOVERS KEY
R-224 MONITORING SURVEY**

DATE:	8/18/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	22079-Lovers Bonita Mon Profiles.dwg		
REF. NO.	22.079	NO.	DATE

NO.	DATE	BY	REVISION DESCRIPTION



NOTES

- ELEVATIONS ARE REFERENCED TO NAVD 1988.
- PROFILE DATA ARE FROM SURVEYS BY CEC.
- UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 24
FILE NO.: 22079-R-224.5

**COASTAL
ENGINEERING
CONSULTANTS
INC.**
 Serving Florida Since 1977
 28421 BONITA CROSSINGS BLVD
 BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
 ENVIRONMENTAL & GEOLOGICAL SERVICES
 SURVEY & MAPPING
 ENGINEERING: CA 2464
 SURVEYING: LB 2464
 PHONE: (239)643-2324
 FAX: (239)643-1143
 www.coastalengineering.com
 E-Mail: info@ceciff.com

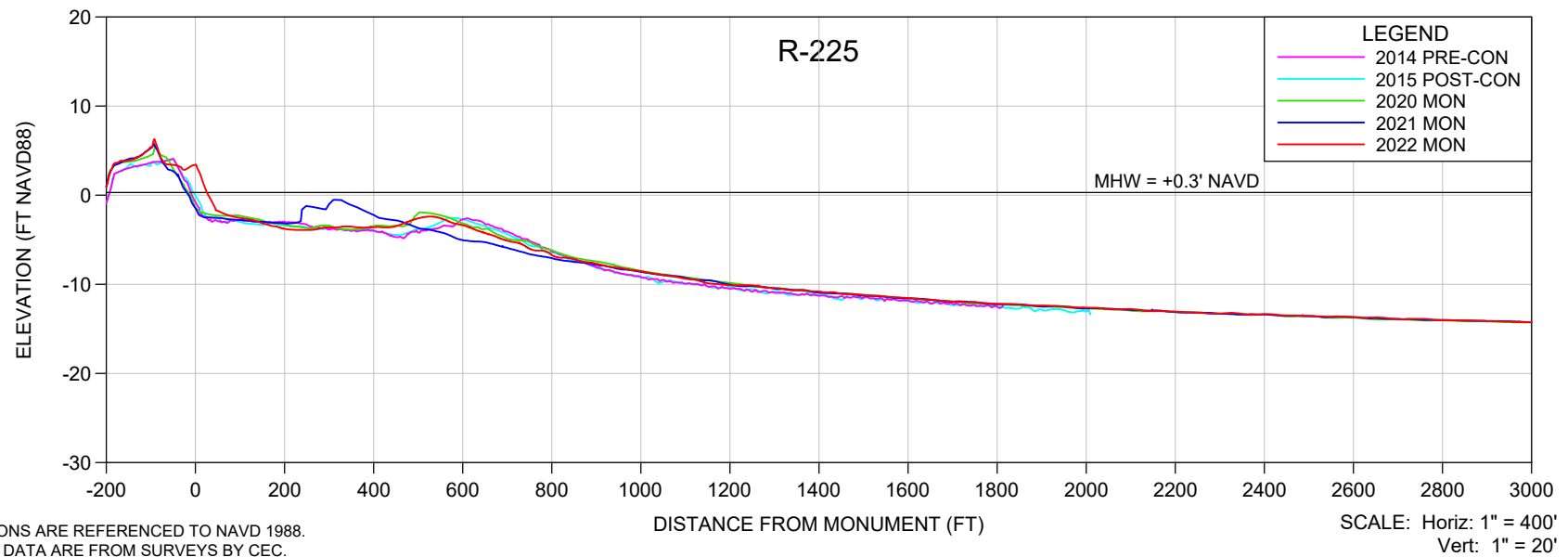
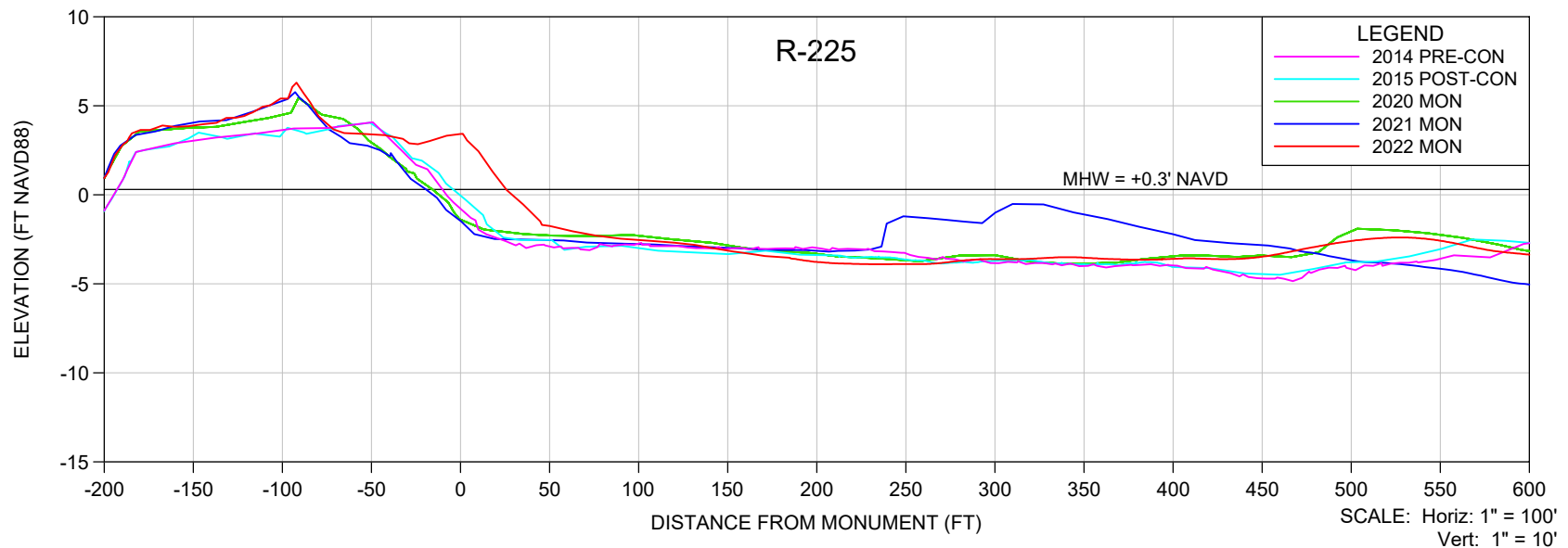
CLIENT:

LEE COUNTY

TITLE:

**BONITA BEACH AND LOVERS KEY
R-224.5 MONITORING SURVEY**

DATE:	8/18/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	22079-Lovers Bonita Mon Profiles.dwg		
REF. NO.	22.079	NO.	DATE
		BY	REVISION DESCRIPTION



NOTES

- ELEVATIONS ARE REFERENCED TO NAVD 1988.
- PROFILE DATA ARE FROM SURVEYS BY CEC.
- UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 25
FILE NO.: 22079-R-225

**COASTAL
ENGINEERING
CONSULTANTS
INC.**
 Serving Florida Since 1977
 28421 BONITA CROSSINGS BLVD
 BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
 ENVIRONMENTAL & GEOLOGICAL SERVICES
 SURVEY & MAPPING
 ENGINEERING: CA 2464
 SURVEYING: LB 2464
 PHONE: (239)643-2324
 FAX: (239)643-1143
 www.coastalengineering.com
 E-Mail: info@ceciff.com

CLIENT:

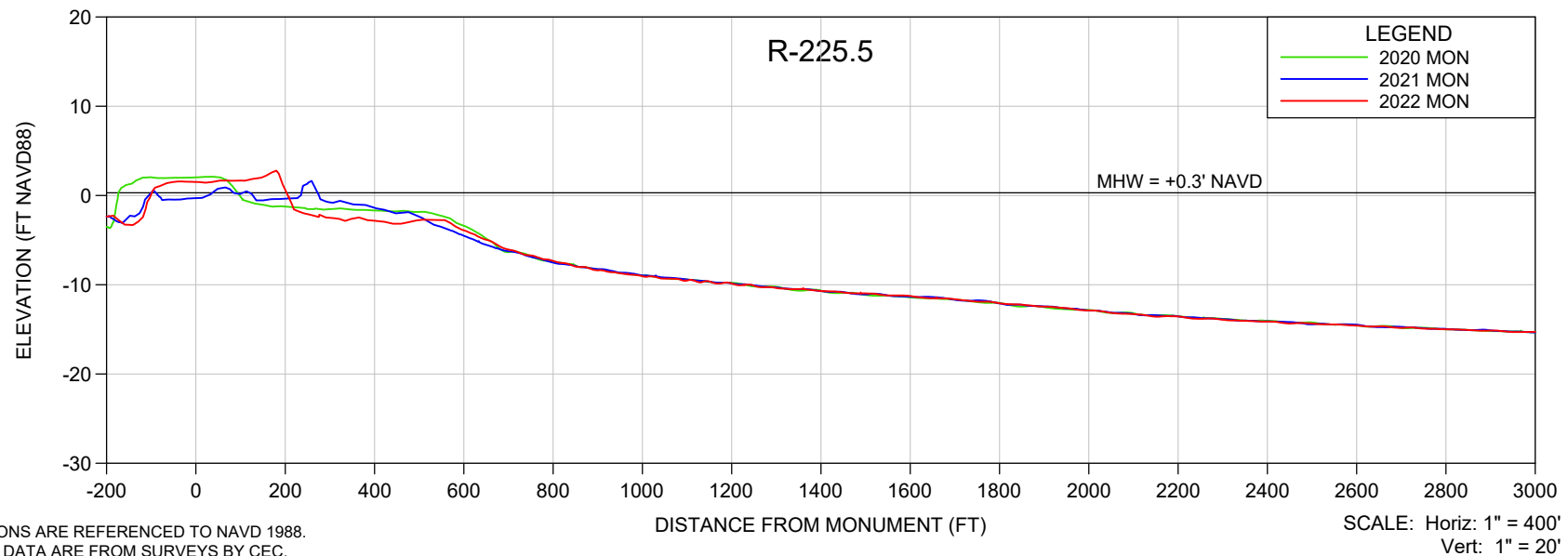
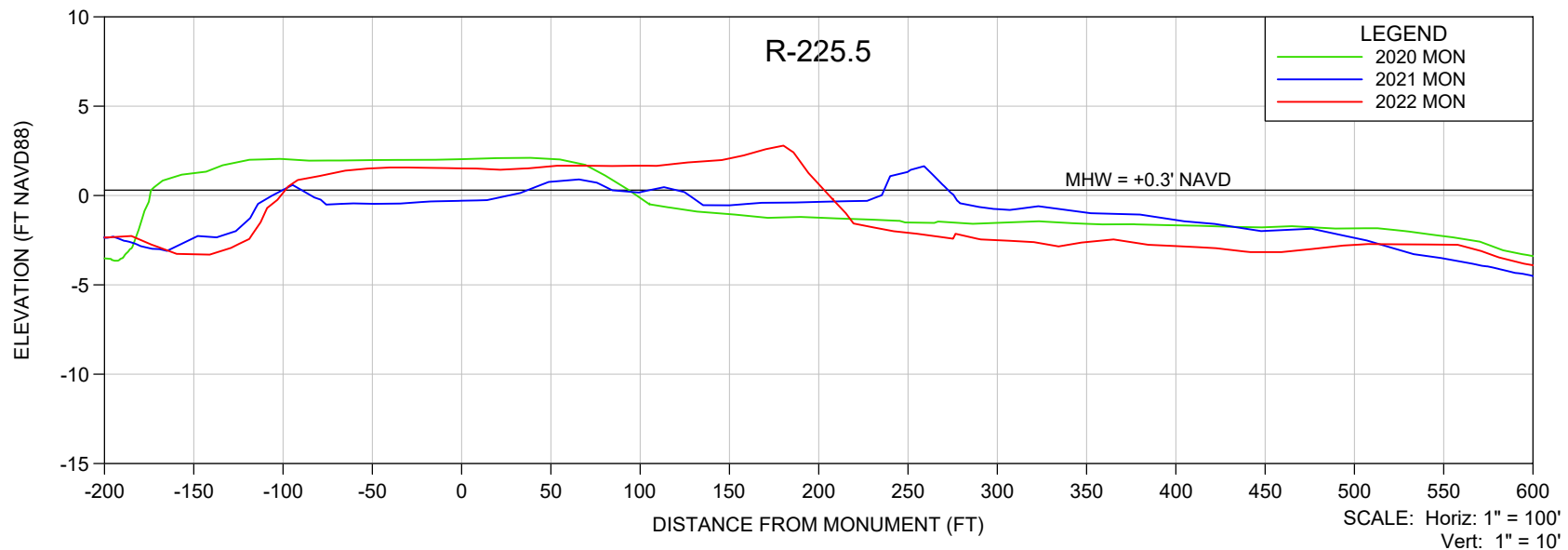
LEE COUNTY

TITLE:

**BONITA BEACH AND LOVERS KEY
R-225 MONITORING SURVEY**

DATE:	8/18/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	22079-Lovers Bonita Mon Profiles.dwg		
REF. NO.	22.079	NO.	DATE

BY	REVISION DESCRIPTION



NOTES

- ELEVATIONS ARE REFERENCED TO NAVD 1988.
- PROFILE DATA ARE FROM SURVEYS BY CEC.
- UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 26
FILE NO.: 22079-R-225.5

**COASTAL
ENGINEERING
CONSULTANTS
INC.**
 Serving Florida Since 1977
 28421 BONITA CROSSINGS BLVD
 BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
 ENVIRONMENTAL & GEOLOGICAL SERVICES
 SURVEY & MAPPING
 ENGINEERING: CA 2464
 SURVEYING: LB 2464
 PHONE: (239)643-2324
 FAX: (239)643-1143
 www.coastalengineering.com
 E-Mail: info@ceciff.com

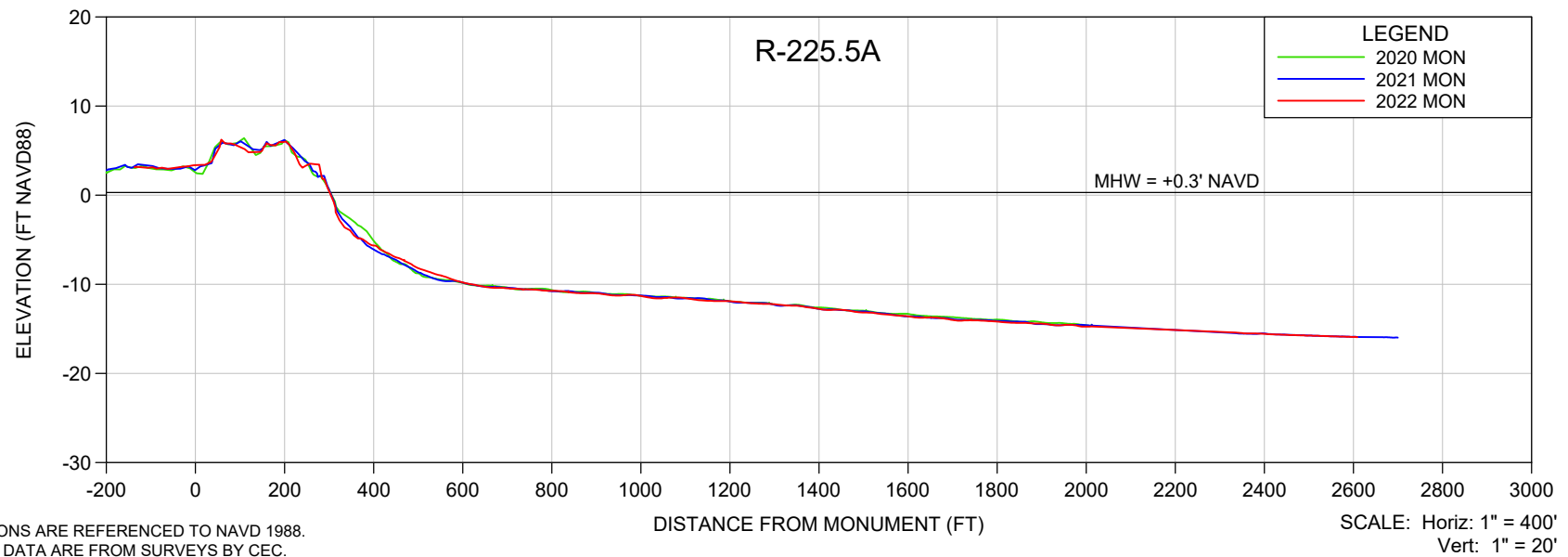
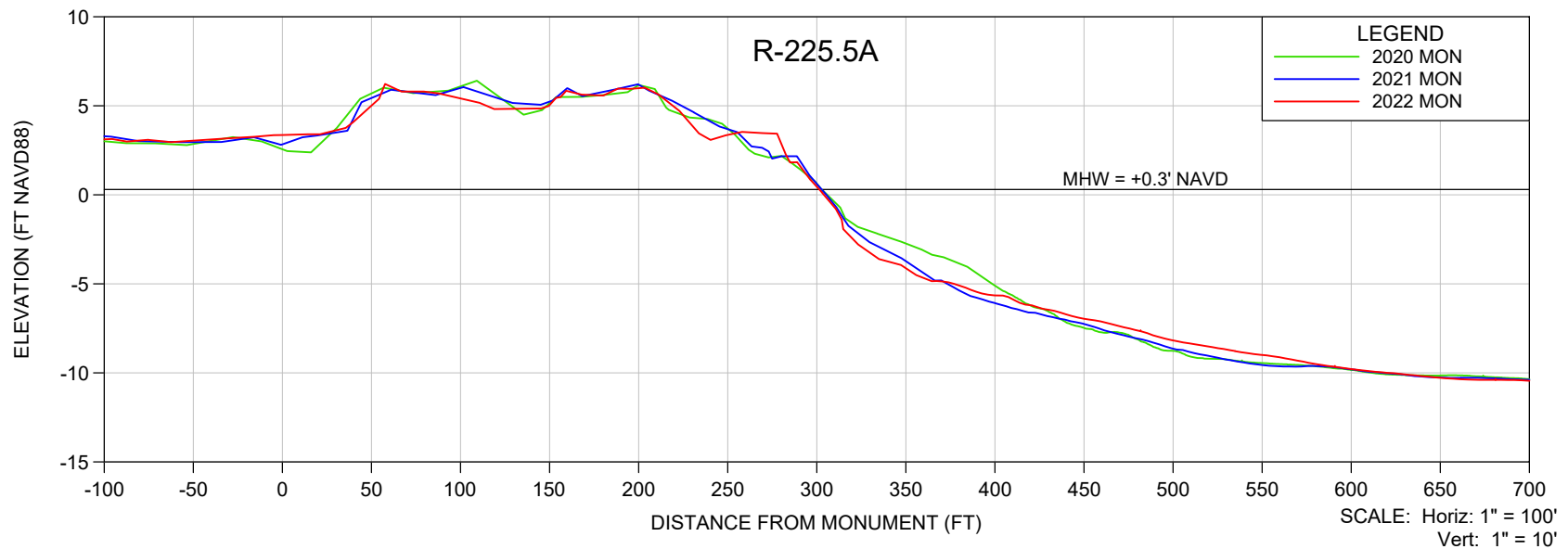
CLIENT:

LEE COUNTY

TITLE:

**BONITA BEACH AND LOVERS KEY
R-225.5 MONITORING SURVEY**

DATE:	8/18/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	22079-Lovers Bonita Mon Profiles.dwg		
REF. NO.	22.079	NO.	DATE
		BY	REVISION DESCRIPTION



NOTES

- ELEVATIONS ARE REFERENCED TO NAVD 1988.
- PROFILE DATA ARE FROM SURVEYS BY CEC.
- UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 27
 FILE NO.: 22079-R-225.5A

**COASTAL
 ENGINEERING
 CONSULTANTS
 INC.**
 Serving Florida Since 1977
 28421 BONITA CROSSINGS BLVD
 BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
 ENVIRONMENTAL & GEOLOGICAL SERVICES
 SURVEY & MAPPING
 ENGINEERING: CA 2464
 SURVEYING: LB 2464
 PHONE: (239)643-2324
 FAX: (239)643-1143
 www.coastalengineering.com
 E-Mail: info@ceciff.com

CLIENT:

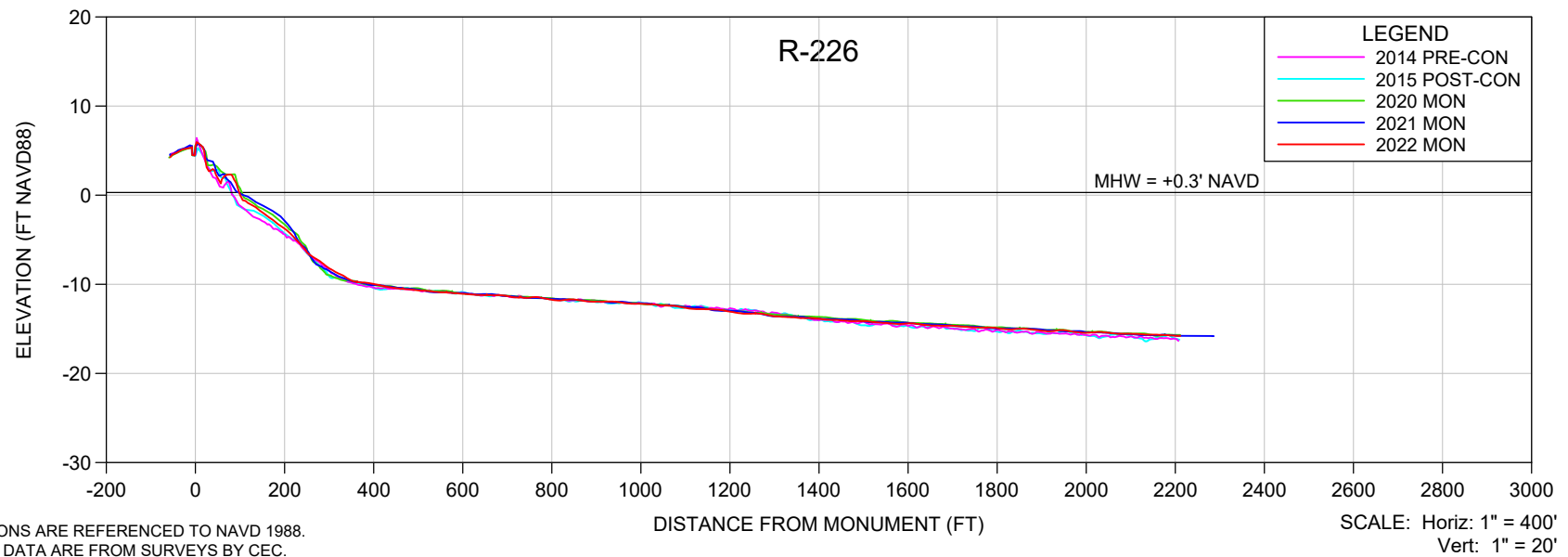
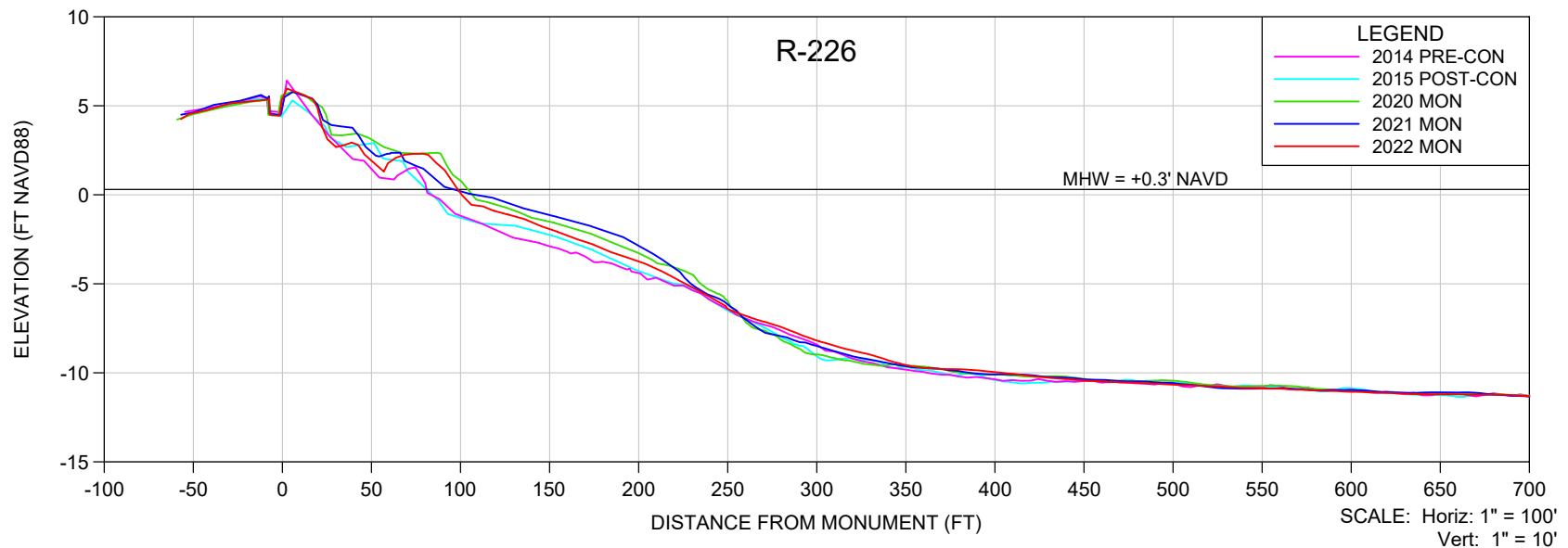
LEE COUNTY

TITLE:

**BONITA BEACH AND LOVERS KEY
 R-225.5A MONITORING SURVEY**

DATE:	8/18/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	22079-Lovers Bonita Mon Profiles.dwg		
REF. NO.	22.079	NO.	DATE

BY	REVISION DESCRIPTION



NOTES

- ELEVATIONS ARE REFERENCED TO NAVD 1988.
- PROFILE DATA ARE FROM SURVEYS BY CEC.
- UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 28
FILE NO.: 22079-R-226

**COASTAL
ENGINEERING
CONSULTANTS
INC.**
 Serving Florida Since 1977
 28421 BONITA CROSSINGS BLVD
 BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
 ENVIRONMENTAL & GEOLOGICAL SERVICES
 SURVEY & MAPPING
 ENGINEERING: CA 2464
 SURVEYING: LB 2464
 PHONE: (239)643-2324
 FAX: (239)643-1143
 www.coastalengineering.com
 E-Mail: info@ceciff.com

CLIENT:

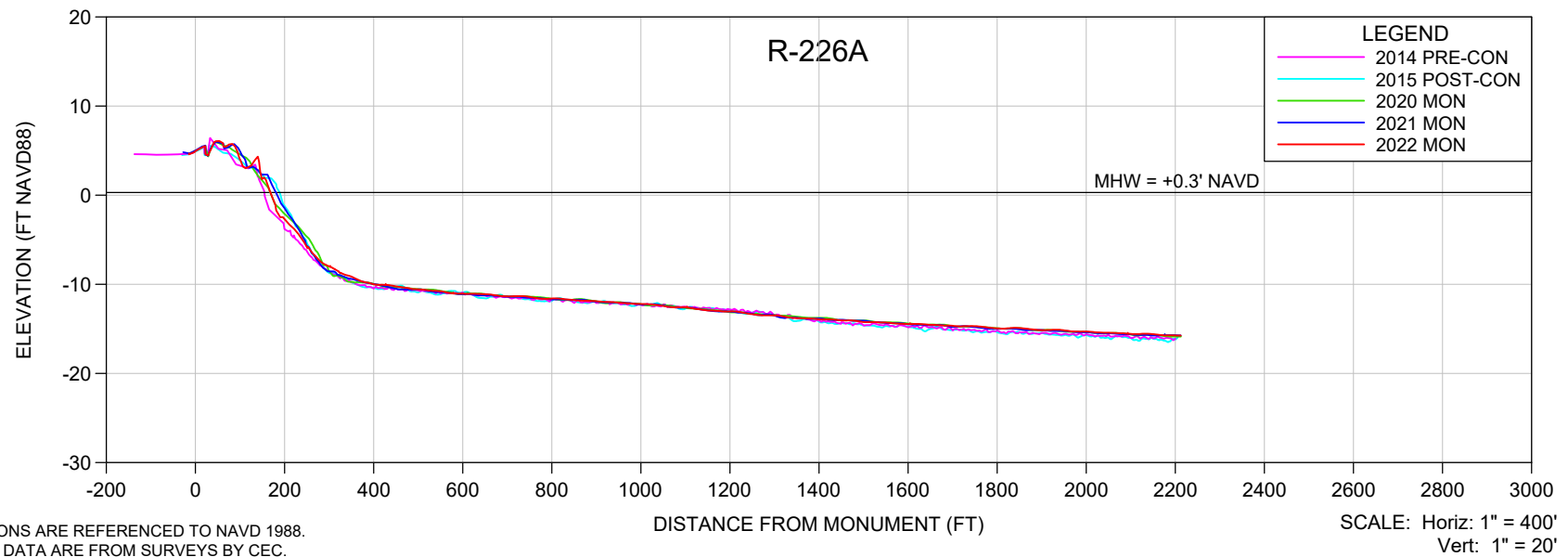
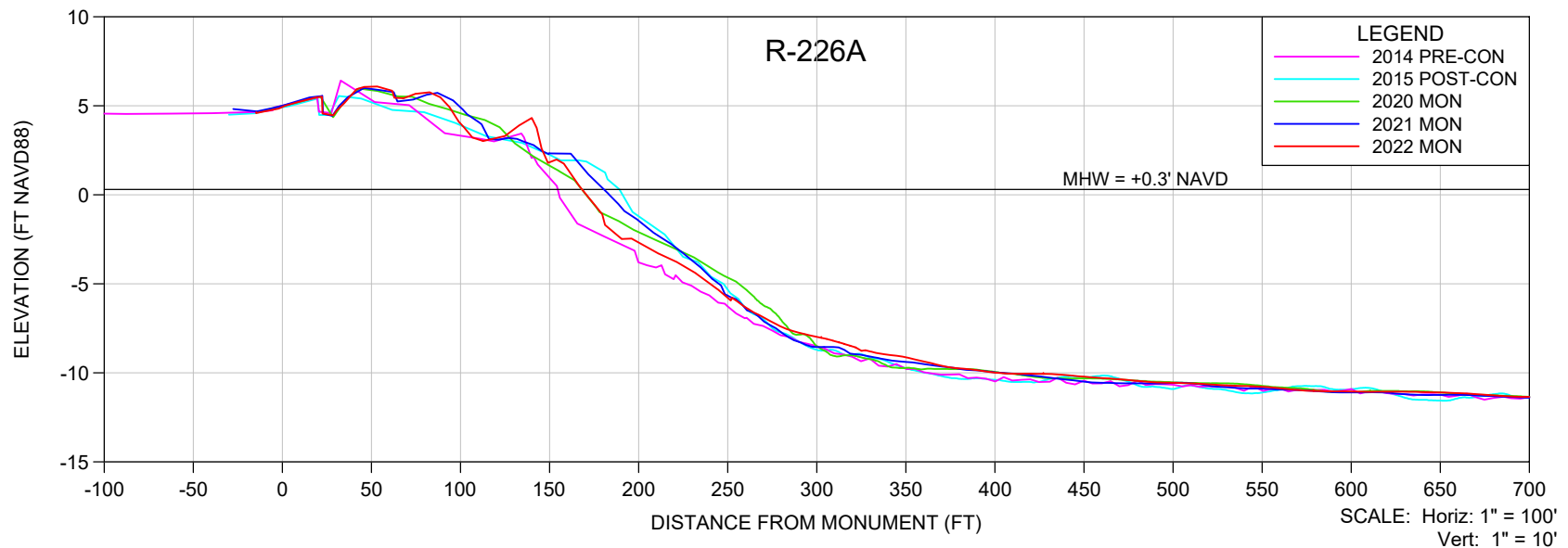
LEE COUNTY

TITLE:

**BONITA BEACH AND LOVERS KEY
R-226 MONITORING SURVEY**

DATE:	8/18/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	22079-Lovers Bonita Mon Profiles.dwg		
REF. NO.	22.079	NO.	DATE

NO.	DATE	BY	REVISION DESCRIPTION



NOTES

- ELEVATIONS ARE REFERENCED TO NAVD 1988.
- PROFILE DATA ARE FROM SURVEYS BY CEC.
- UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 29
 FILE NO.: 22079-R-226A

**COASTAL
 ENGINEERING
 CONSULTANTS
 INC.**
 Serving Florida Since 1977
 28421 BONITA CROSSINGS BLVD
 BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
 ENVIRONMENTAL & GEOLOGICAL SERVICES
 SURVEY & MAPPING
 ENGINEERING: CA 2464
 SURVEYING: LB 2464
 PHONE: (239)643-2324
 FAX: (239)643-1143
 www.coastalengineering.com
 E-Mail: info@ceciff.com

CLIENT:

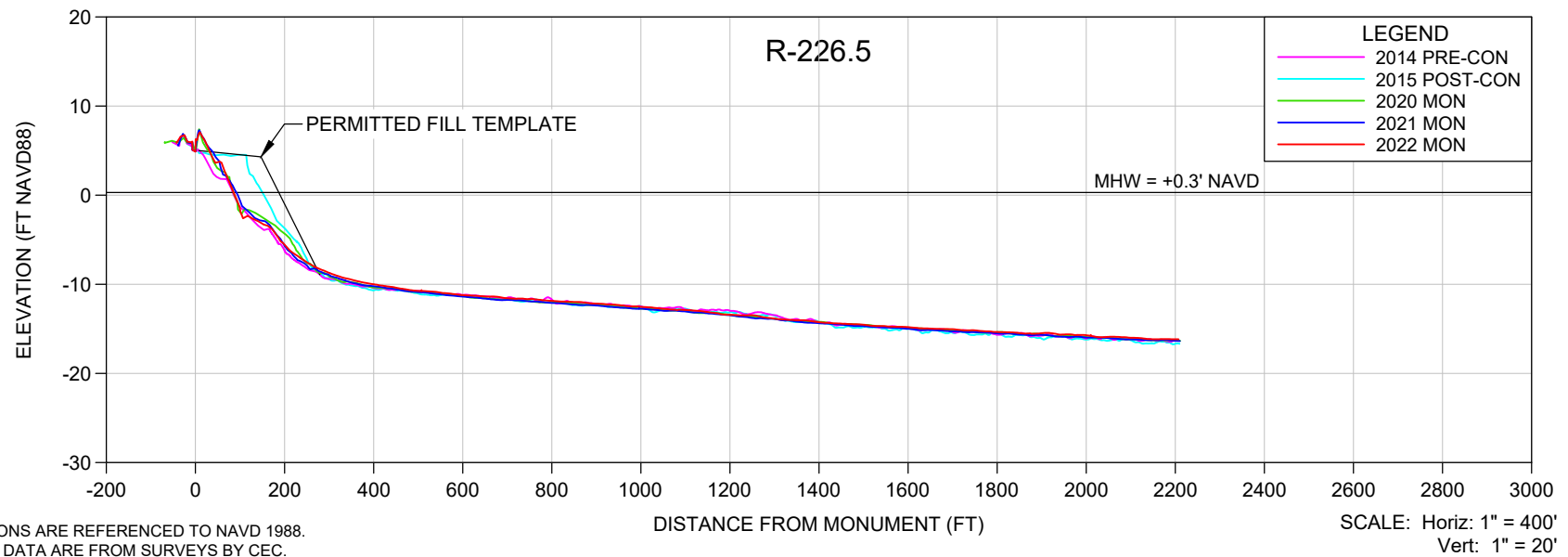
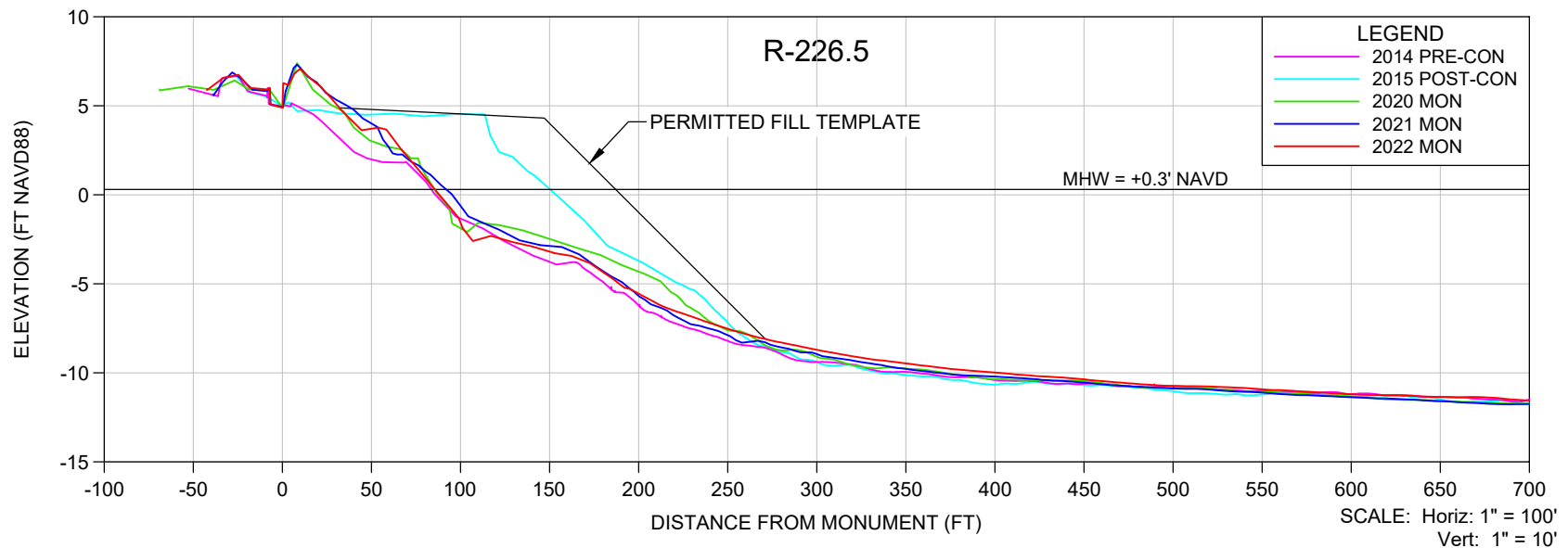
LEE COUNTY

TITLE:

**BONITA BEACH AND LOVERS KEY
 R-226A MONITORING SURVEY**

DATE:	8/18/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	22079-Lovers Bonita Mon Profiles.dwg		
REF. NO.	22.079	NO.	DATE

NO.	DATE	BY	REVISION DESCRIPTION



NOTES

- ELEVATIONS ARE REFERENCED TO NAVD 1988.
- PROFILE DATA ARE FROM SURVEYS BY CEC.
- UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 30
FILE NO.: 22079-R-226.5

**COASTAL
ENGINEERING
CONSULTANTS
INC.**

Serving Florida Since 1977

28421 BONITA CROSSINGS BLVD
BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
ENVIRONMENTAL & GEOLOGICAL SERVICES
SURVEY & MAPPING
ENGINEERING: CA 2464
SURVEYING: LB 2464

PHONE: (239)643-2324
FAX: (239)643-1143
www.coastalengineering.com
E-Mail: info@ceciff.com

CLIENT:

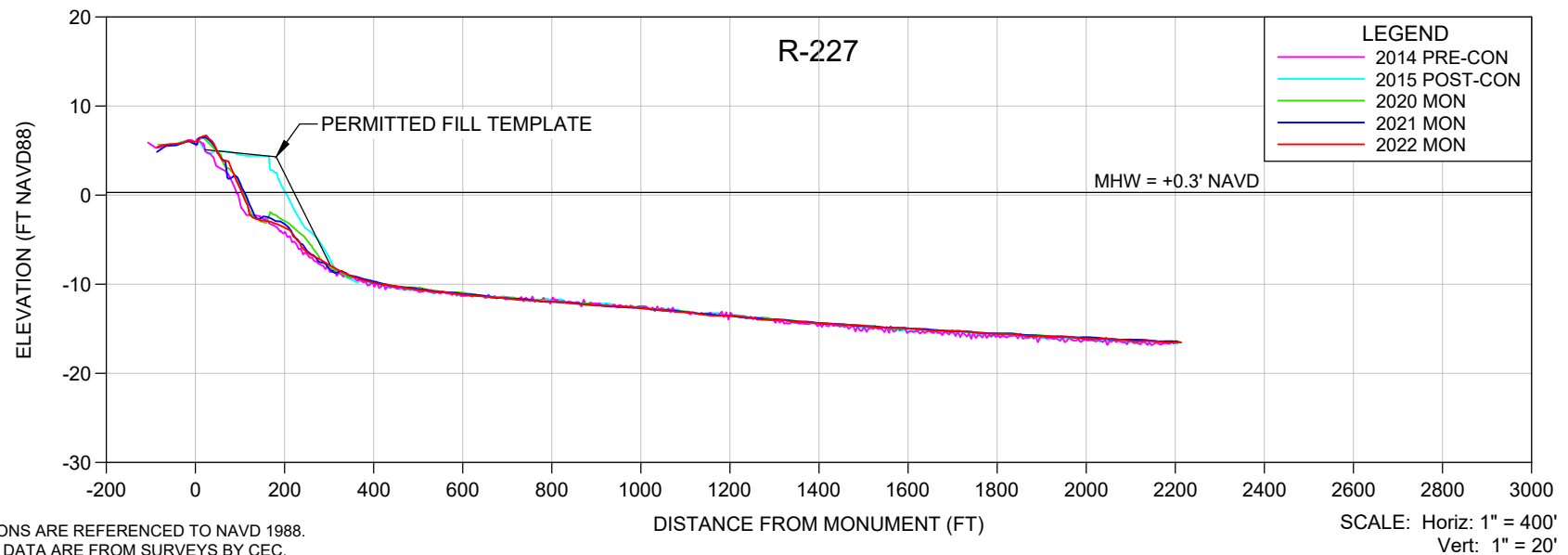
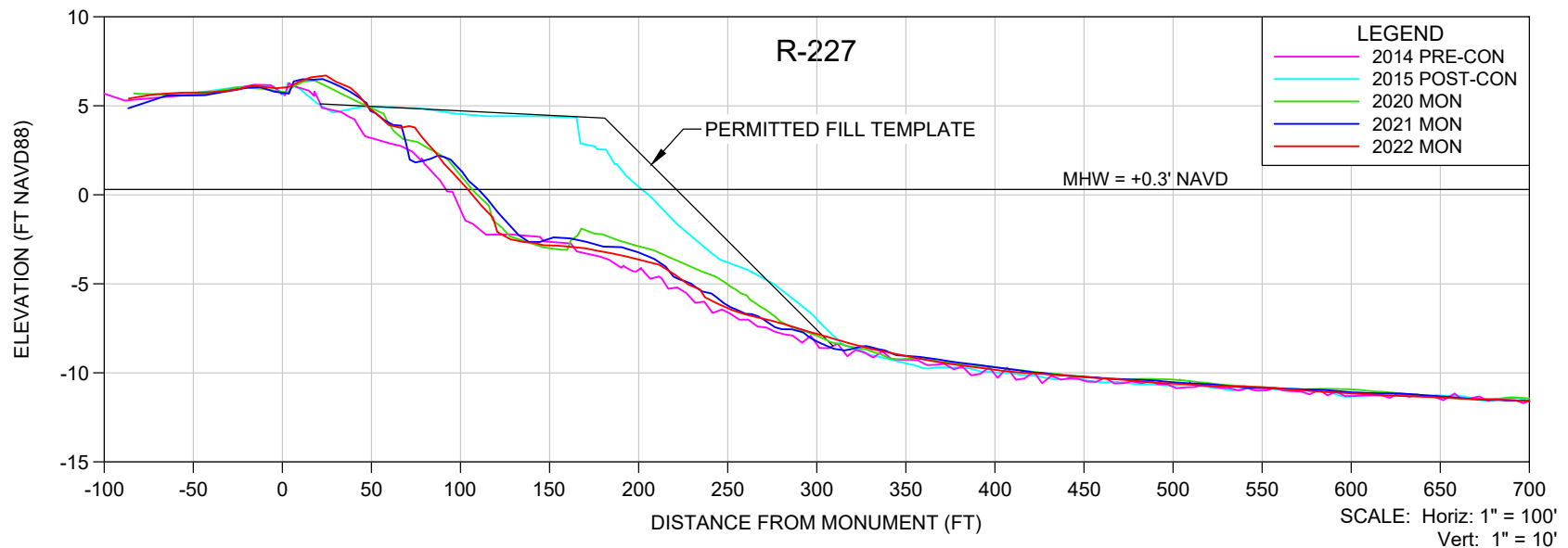
LEE COUNTY

TITLE:

**BONITA BEACH AND LOVERS KEY
R-226.5 MONITORING SURVEY**

DATE:	8/18/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	22079-Lovers Bonita Mon Profiles.dwg		
REF. NO.	22.079	NO.	DATE

NO.	DATE	BY	REVISION DESCRIPTION



NOTES

- ELEVATIONS ARE REFERENCED TO NAVD 1988.
- PROFILE DATA ARE FROM SURVEYS BY CEC.
- UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 31
FILE NO.: 22079-R-227

**COASTAL
ENGINEERING
CONSULTANTS
INC.**
Serving Florida Since 1977
28421 BONITA CROSSINGS BLVD
BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
ENVIRONMENTAL & GEOLOGICAL SERVICES
SURVEY & MAPPING
ENGINEERING: CA 2464
SURVEYING: LB 2464
PHONE: (239)643-2324
FAX: (239)643-1143
www.coastalengineering.com
E-Mail: info@ceciff.com

CLIENT:

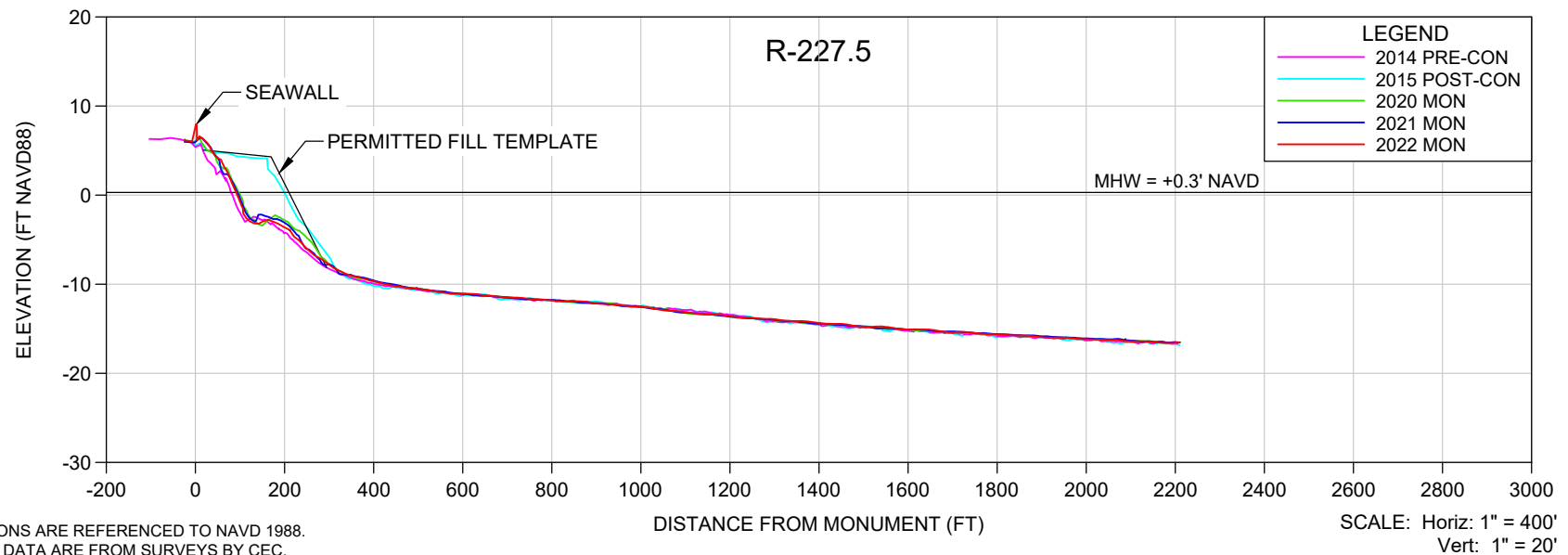
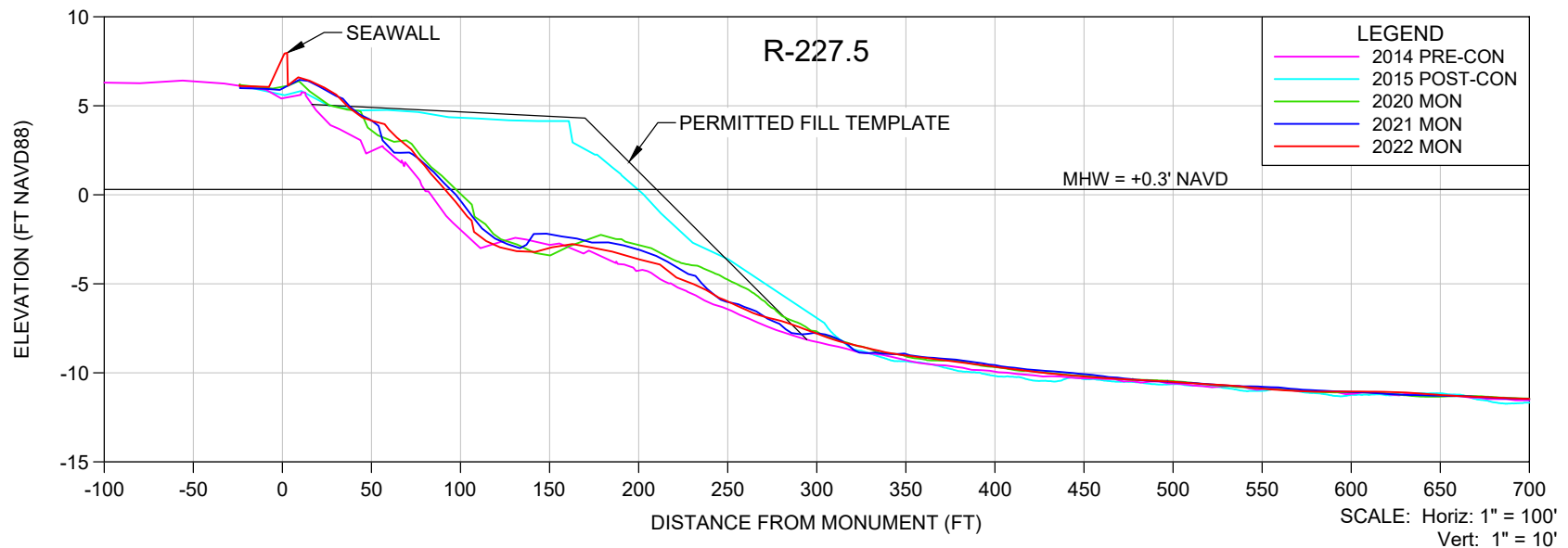
LEE COUNTY

TITLE:

**BONITA BEACH AND LOVERS KEY
R-227 MONITORING SURVEY**

DATE:	8/18/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	22079-Lovers Bonita Mon Profiles.dwg		
REF. NO.	22.079	NO.	DATE

NO.	DATE	BY	REVISION DESCRIPTION



NOTES

- ELEVATIONS ARE REFERENCED TO NAVD 1988.
- PROFILE DATA ARE FROM SURVEYS BY CEC.
- UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 32
FILE NO.: 22079-R-227.5

COASTAL ENGINEERING CONSULTANTS INC.
Serving Florida Since 1977
28421 BONITA CROSSINGS BLVD
BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
ENVIRONMENTAL & GEOLOGICAL SERVICES
SURVEY & MAPPING
ENGINEERING: CA 2464
SURVEYING: LB 2464
PHONE: (239)643-2324
FAX: (239)643-1143
www.coastalengineering.com
E-Mail: info@ceciff.com

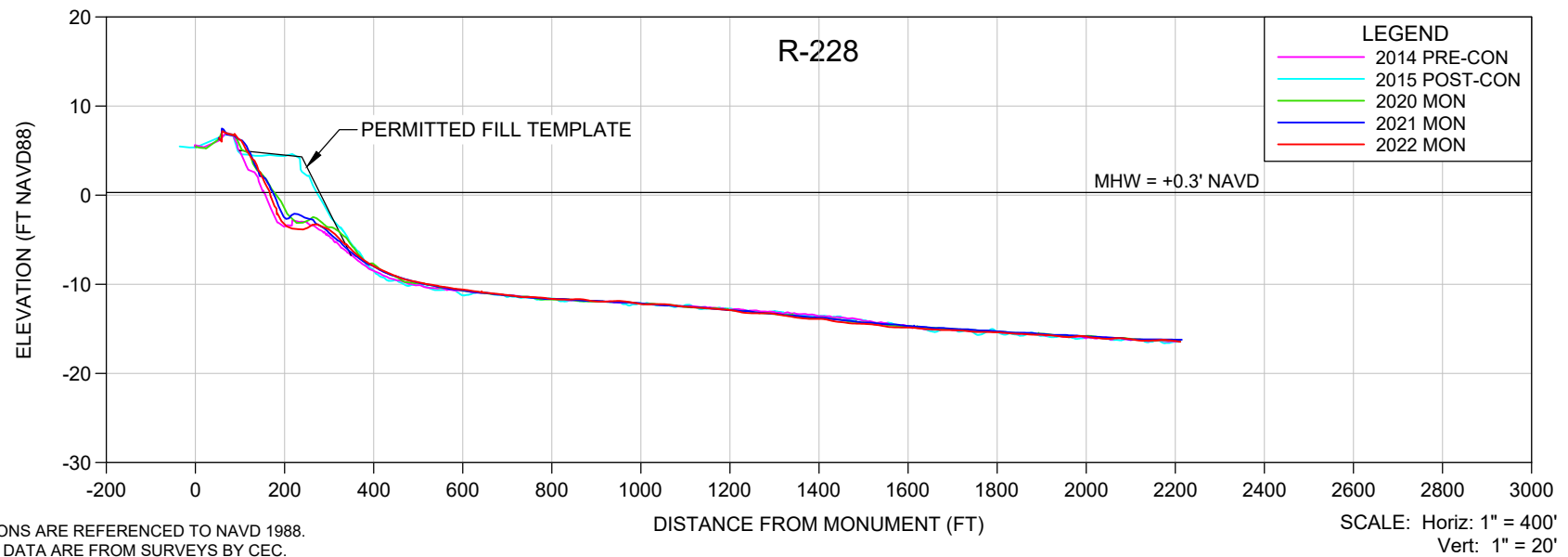
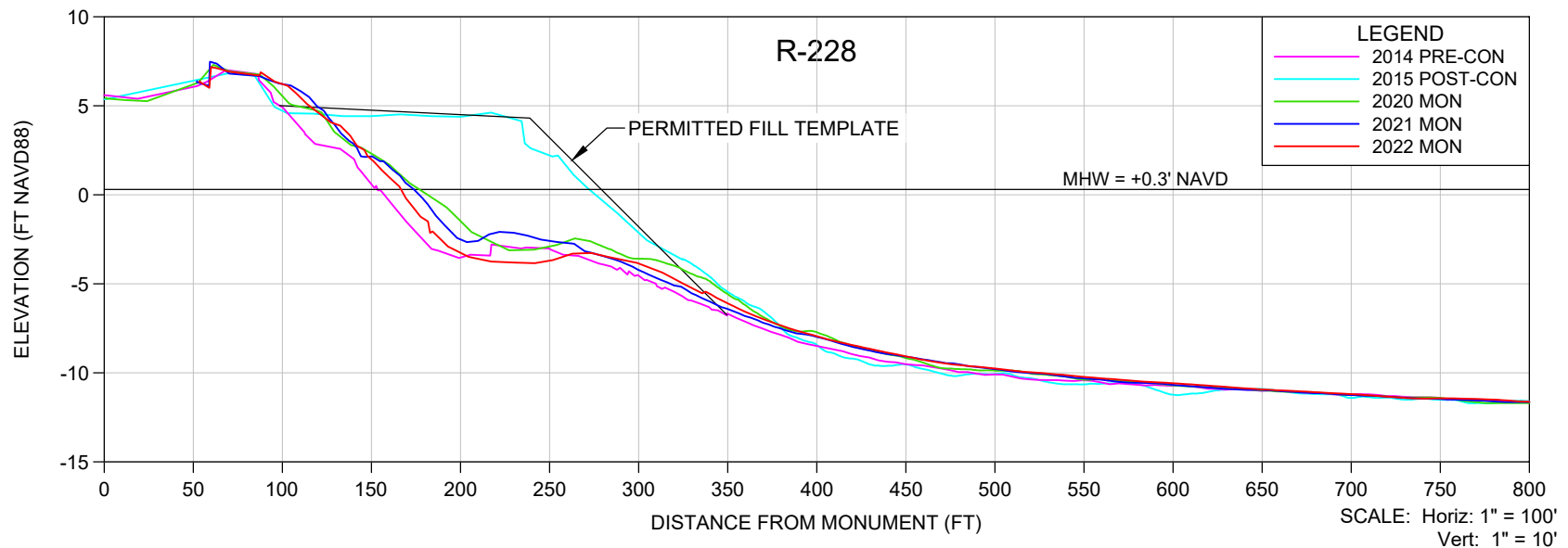
CLIENT:

LEE COUNTY

TITLE:

BONITA BEACH AND LOVERS KEY
R-227.5 MONITORING SURVEY

DATE:	8/18/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	22079-Lovers Bonita Mon Profiles.dwg		
REF. NO.	22.079	NO.	DATE
		BY	REVISION DESCRIPTION



NOTES

- ELEVATIONS ARE REFERENCED TO NAVD 1988.
- PROFILE DATA ARE FROM SURVEYS BY CEC.
- UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 33
FILE NO.: 22079-R-228

**COASTAL
ENGINEERING
CONSULTANTS
INC.**

Serving Florida Since 1977

28421 BONITA CROSSINGS BLVD
BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
ENVIRONMENTAL & GEOLOGICAL SERVICES
SURVEY & MAPPING
ENGINEERING: CA 2464
SURVEYING: LB 2464

PHONE: (239)643-2324
FAX: (239)643-1143
www.coastalengineering.com
E-Mail: info@ceciff.com

CLIENT:

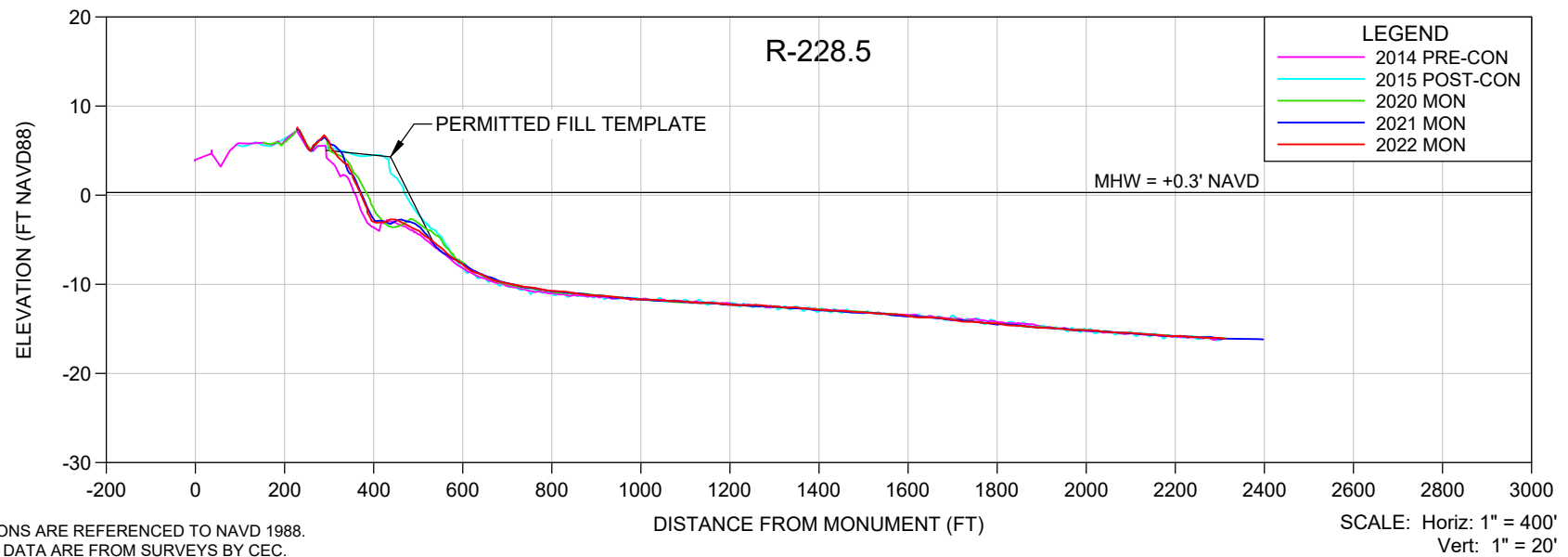
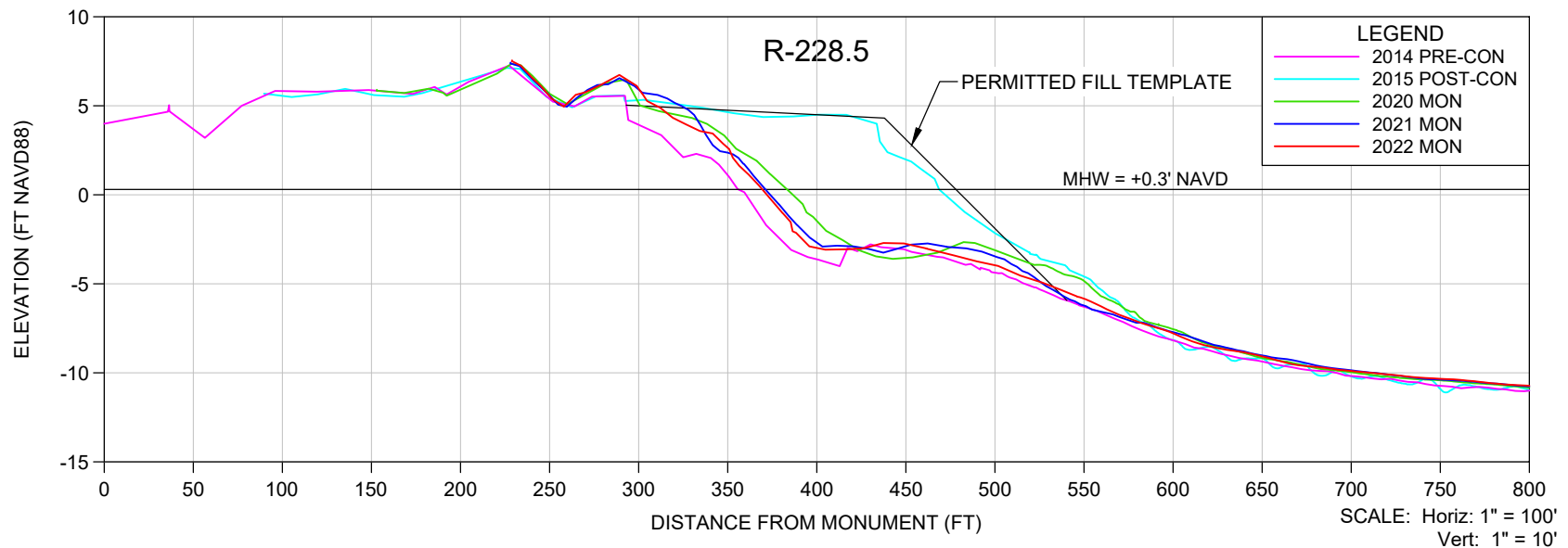
LEE COUNTY

TITLE:

**BONITA BEACH AND LOVERS KEY
R-228 MONITORING SURVEY**

DATE:	8/18/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	22079-Lovers Bonita Mon Profiles.dwg		
REF. NO.	22.079	NO.	DATE

NO.	DATE	BY	REVISION DESCRIPTION



NOTES

- ELEVATIONS ARE REFERENCED TO NAVD 1988.
- PROFILE DATA ARE FROM SURVEYS BY CEC.
- UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 34
FILE NO.: 22079-R-228.5

COASTAL ENGINEERING CONSULTANTS INC.
Serving Florida Since 1977
28421 BONITA CROSSINGS BLVD
BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
ENVIRONMENTAL & GEOLOGICAL SERVICES
SURVEY & MAPPING
ENGINEERING: CA 2464
SURVEYING: LB 2464
PHONE: (239)643-2324
FAX: (239)643-1143
www.coastalengineering.com
E-Mail: info@ceciff.com

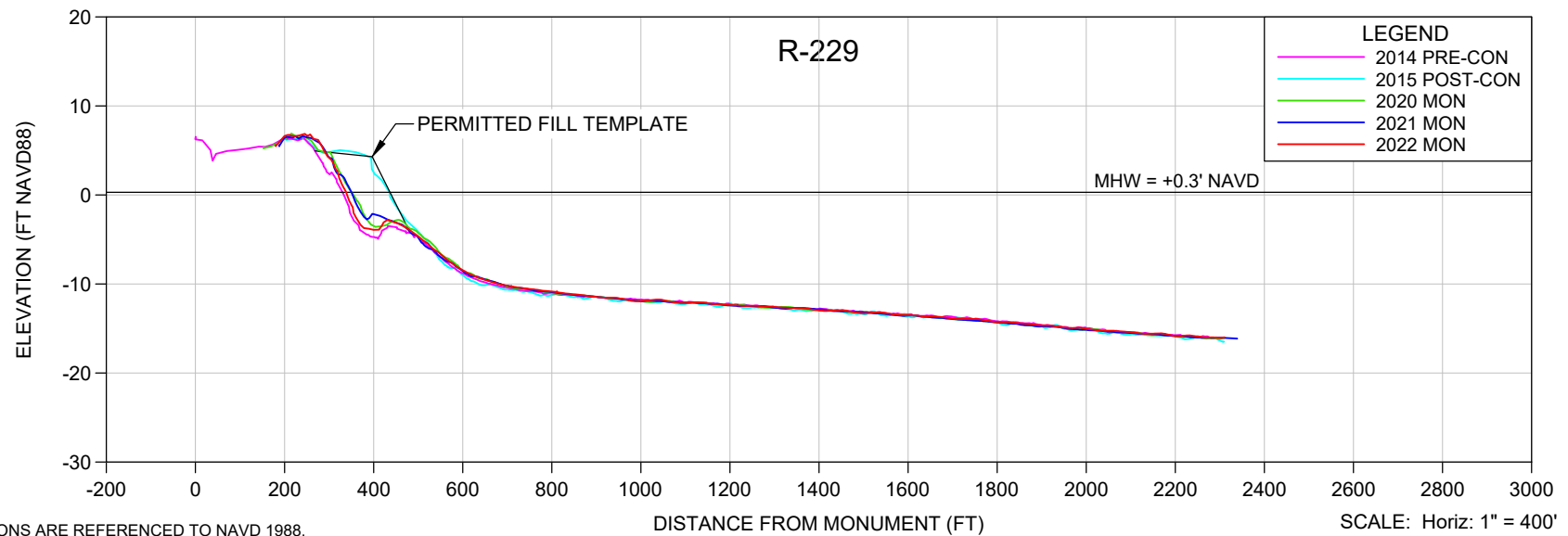
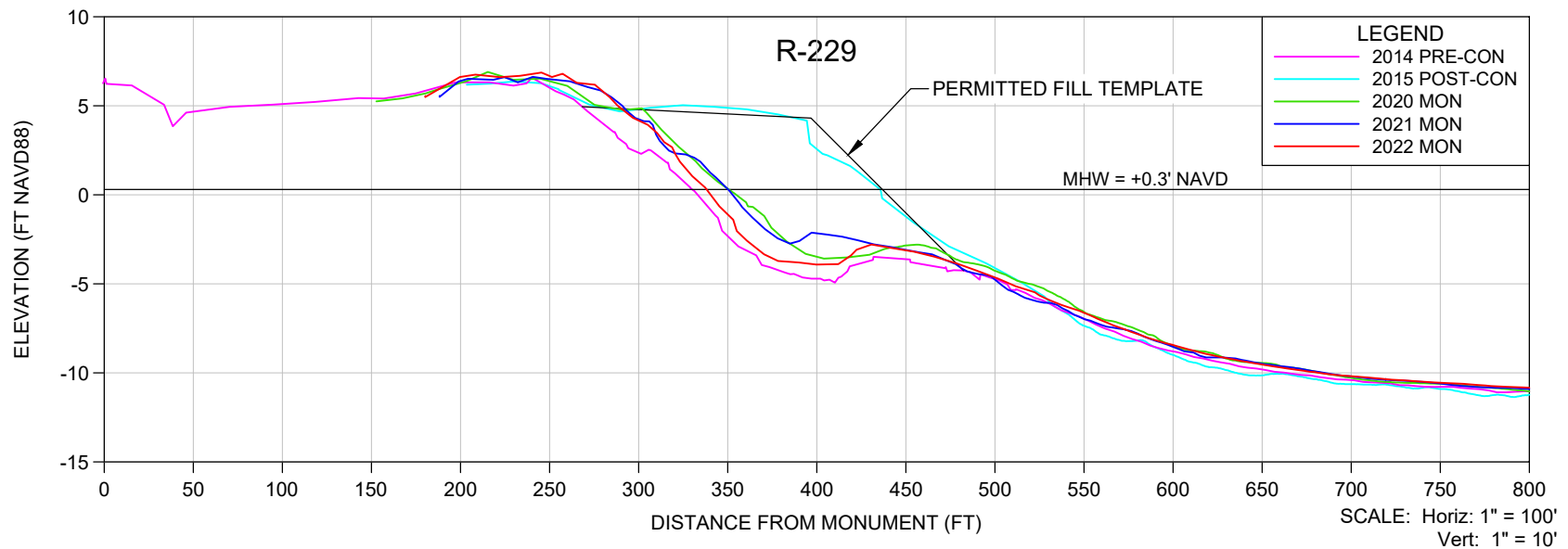
CLIENT:

LEE COUNTY

TITLE:

BONITA BEACH AND LOVERS KEY
R-228.5 MONITORING SURVEY

DATE:	8/18/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	22079-Lovers Bonita Mon Profiles.dwg		
REF. NO.	22.079	NO.	DATE
		BY	REVISION DESCRIPTION



NOTES

- ELEVATIONS ARE REFERENCED TO NAVD 1988.
- PROFILE DATA ARE FROM SURVEYS BY CEC.
- UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 35
FILE NO.: 22079-R-229

**COASTAL
ENGINEERING
CONSULTANTS
INC.**
 Serving Florida Since 1977
 28421 BONITA CROSSINGS BLVD
 BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
 ENVIRONMENTAL & GEOLOGICAL SERVICES
 SURVEY & MAPPING
 ENGINEERING: CA 2464
 SURVEYING: LB 2464
 PHONE: (239)643-2324
 FAX: (239)643-1143
 www.coastalengineering.com
 E-Mail: info@ceciff.com

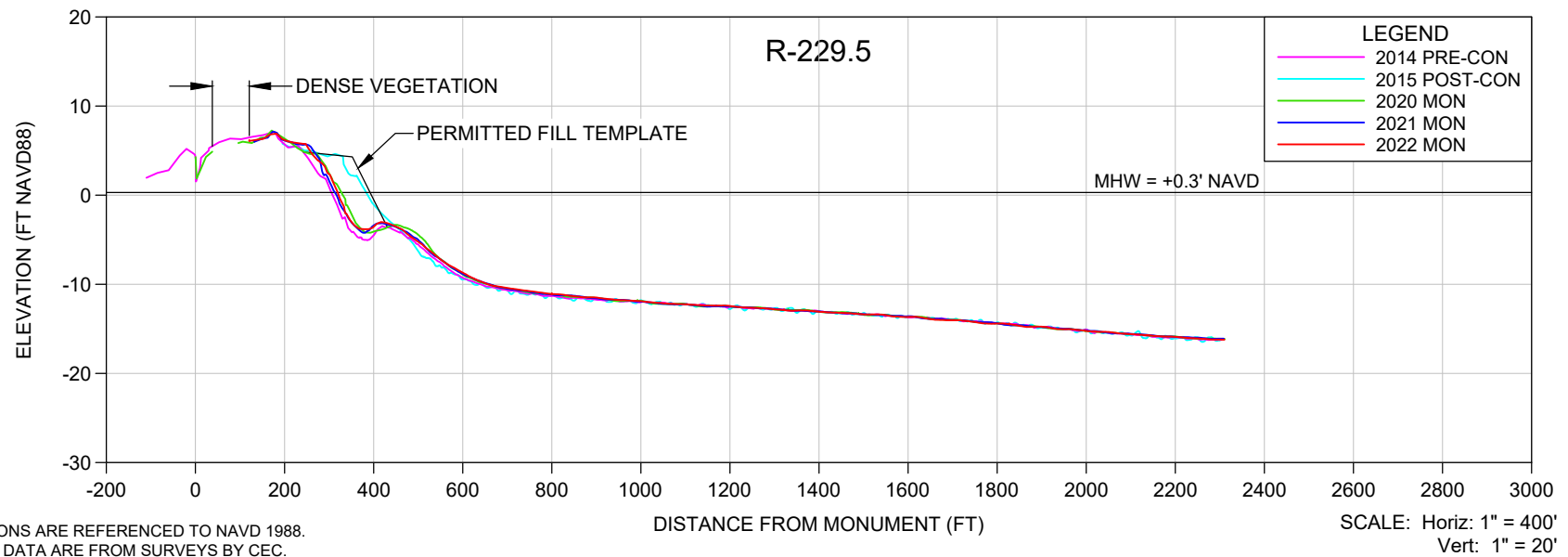
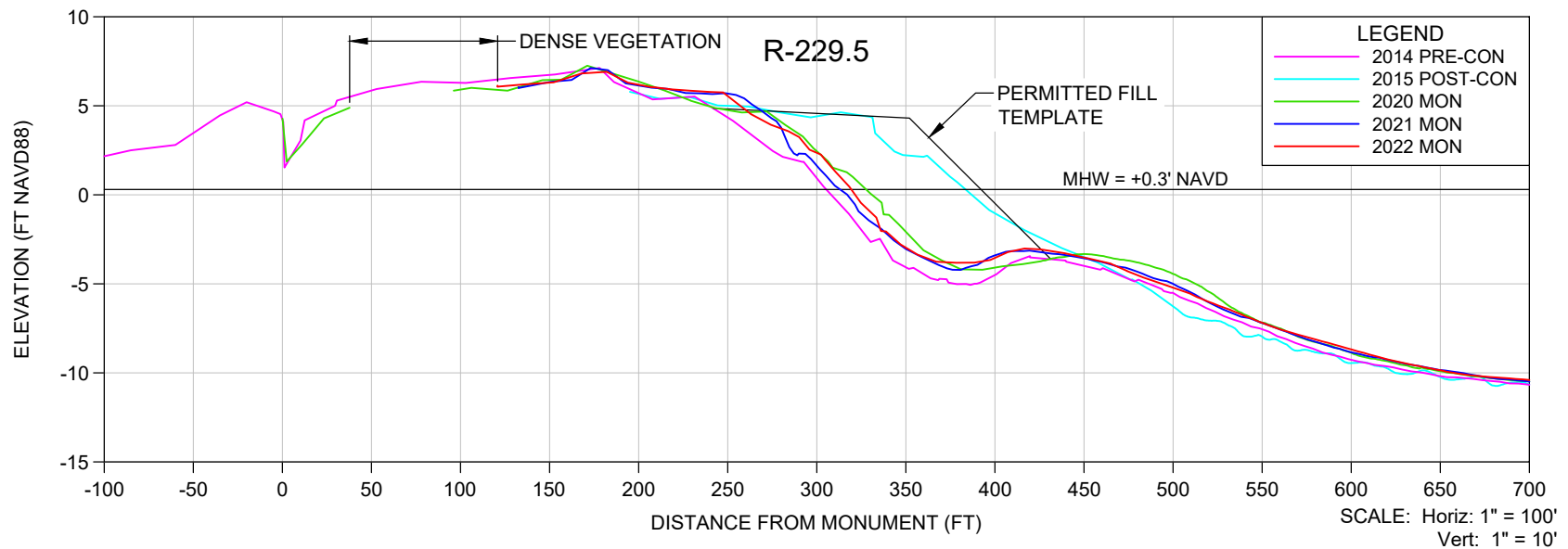
CLIENT:

LEE COUNTY

TITLE:

**BONITA BEACH AND LOVERS KEY
R-229 MONITORING SURVEY**

DATE:	8/18/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	22079-Lovers Bonita Mon Profiles.dwg		
REF. NO.	22.079	NO.	DATE
		BY	REVISION DESCRIPTION



NOTES

- ELEVATIONS ARE REFERENCED TO NAVD 1988.
- PROFILE DATA ARE FROM SURVEYS BY CEC.
- UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 36
FILE NO.: 22079-R-229.5

COASTAL ENGINEERING CONSULTANTS INC.
Serving Florida Since 1977
28421 BONITA CROSSINGS BLVD
BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
ENVIRONMENTAL & GEOLOGICAL SERVICES
SURVEY & MAPPING
ENGINEERING: CA 2464
SURVEYING: LB 2464
PHONE: (239)643-2324
FAX: (239)643-1143
www.coastalengineering.com
E-Mail: info@ceciff.com

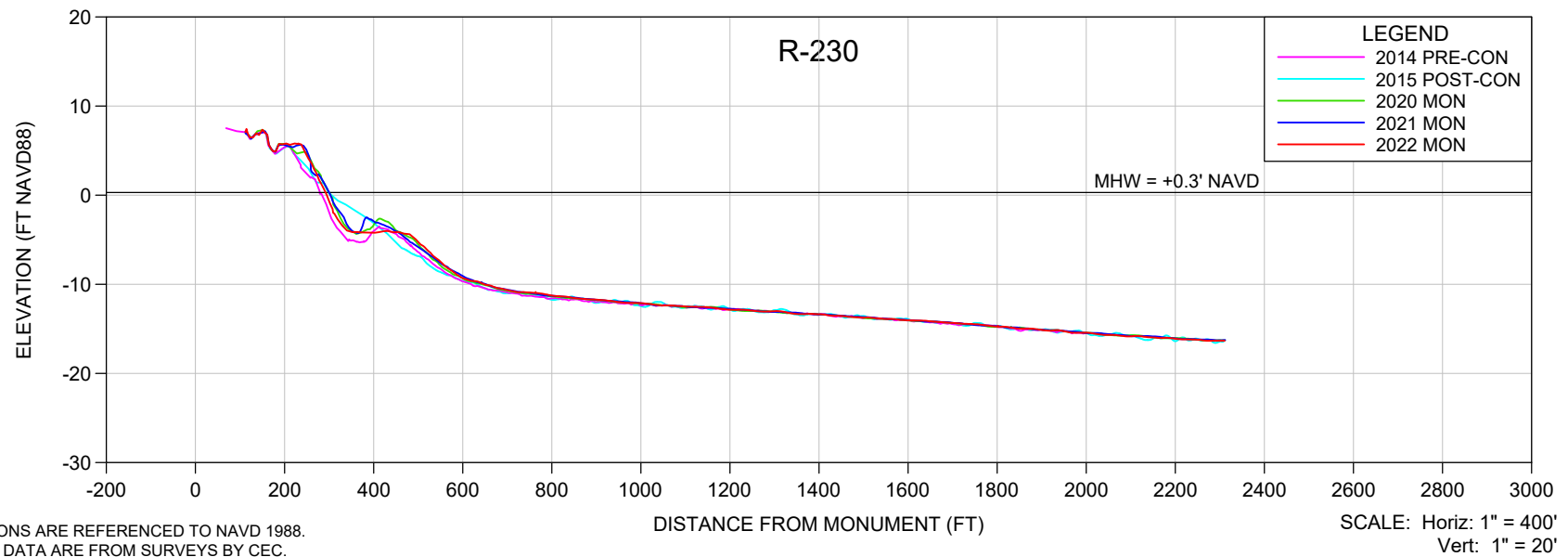
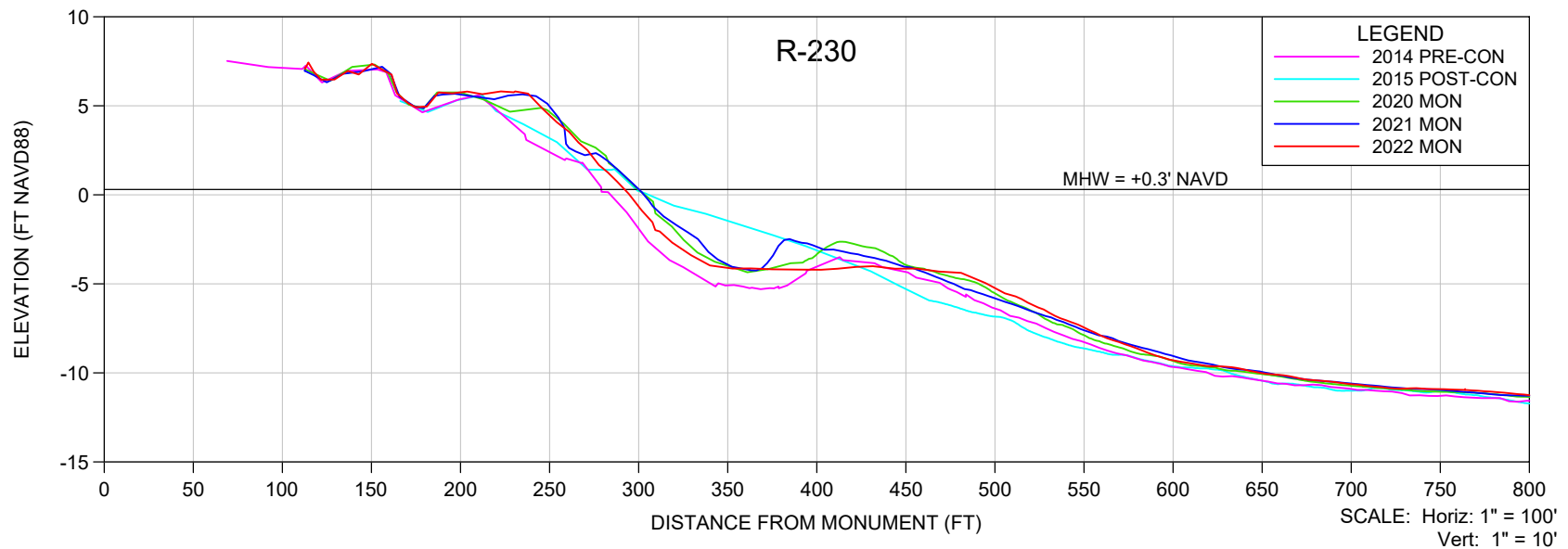
CLIENT:

LEE COUNTY

TITLE:

**BONITA BEACH AND LOVERS KEY
R-229.5 MONITORING SURVEY**

DATE:	8/18/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	22079-Lovers Bonita Mon Profiles.dwg		
REF. NO.	22.079	NO.	DATE
		BY	REVISION DESCRIPTION



NOTES

- ELEVATIONS ARE REFERENCED TO NAVD 1988.
- PROFILE DATA ARE FROM SURVEYS BY CEC.
- UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 37
 FILE NO.: 22079-R-230

**COASTAL
 ENGINEERING
 CONSULTANTS
 INC.**
 Serving Florida Since 1977
 28421 BONITA CROSSINGS BLVD
 BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
 ENVIRONMENTAL & GEOLOGICAL SERVICES
 SURVEY & MAPPING
 ENGINEERING: CA 2464
 SURVEYING: LB 2464
 PHONE: (239)643-2324
 FAX: (239)643-1143
 www.coastalengineering.com
 E-Mail: info@ceciff.com

CLIENT:

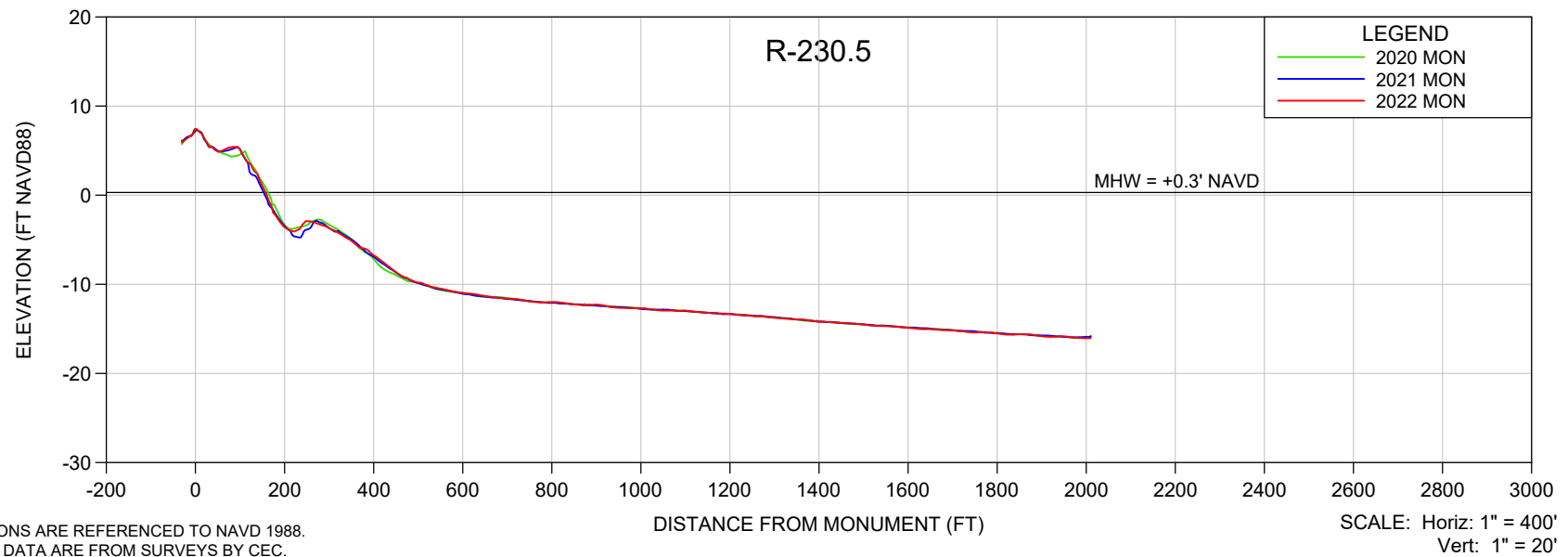
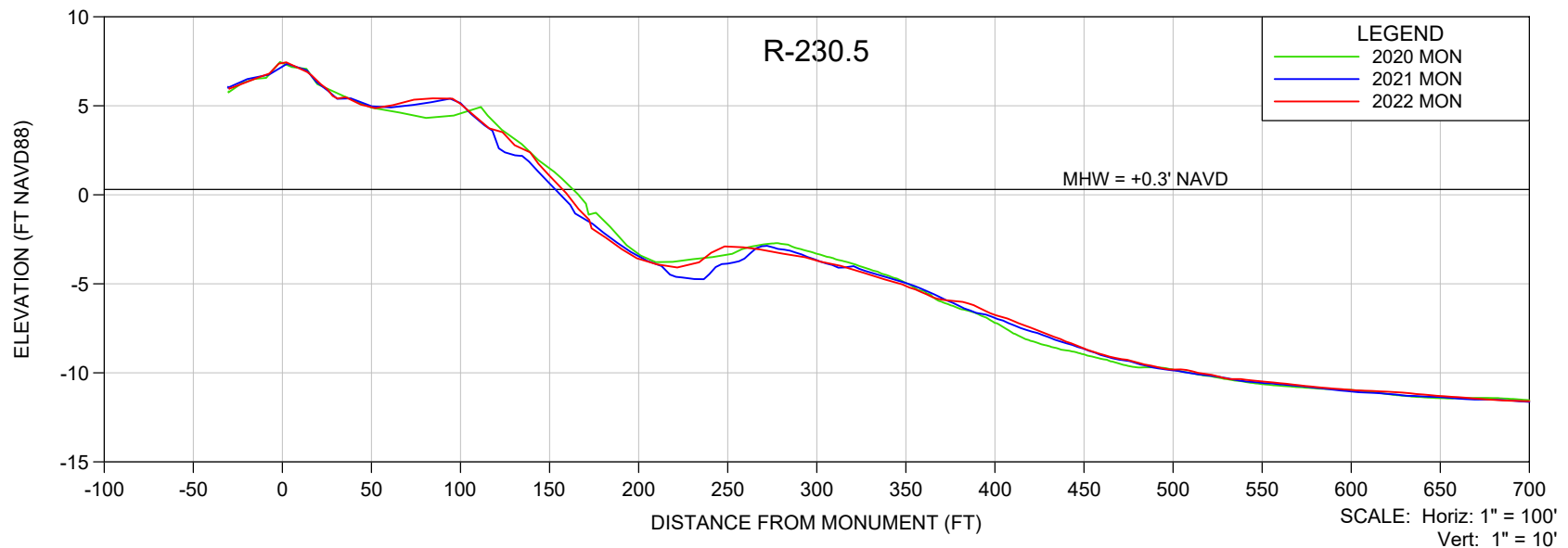
LEE COUNTY

TITLE:

**BONITA BEACH AND LOVERS KEY
 R-230 MONITORING SURVEY**

DATE:	8/18/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	22079-Lovers Bonita Mon Profiles.dwg		
REF. NO.	22.079	NO.	DATE

NO.	DATE	BY	REVISION DESCRIPTION



NOTES

- ELEVATIONS ARE REFERENCED TO NAVD 1988.
- PROFILE DATA ARE FROM SURVEYS BY CEC.
- UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 38
 FILE NO.: 22079-R-230.5

**COASTAL
 ENGINEERING
 CONSULTANTS
 INC.**
 Serving Florida Since 1977
 28421 BONITA CROSSINGS BLVD
 BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
 ENVIRONMENTAL & GEOLOGICAL SERVICES
 SURVEY & MAPPING
 ENGINEERING: CA 2464
 SURVEYING: LB 2464
 PHONE: (239)643-2324
 FAX: (239)643-1143
 www.coastalengineering.com
 E-Mail: info@ceciff.com

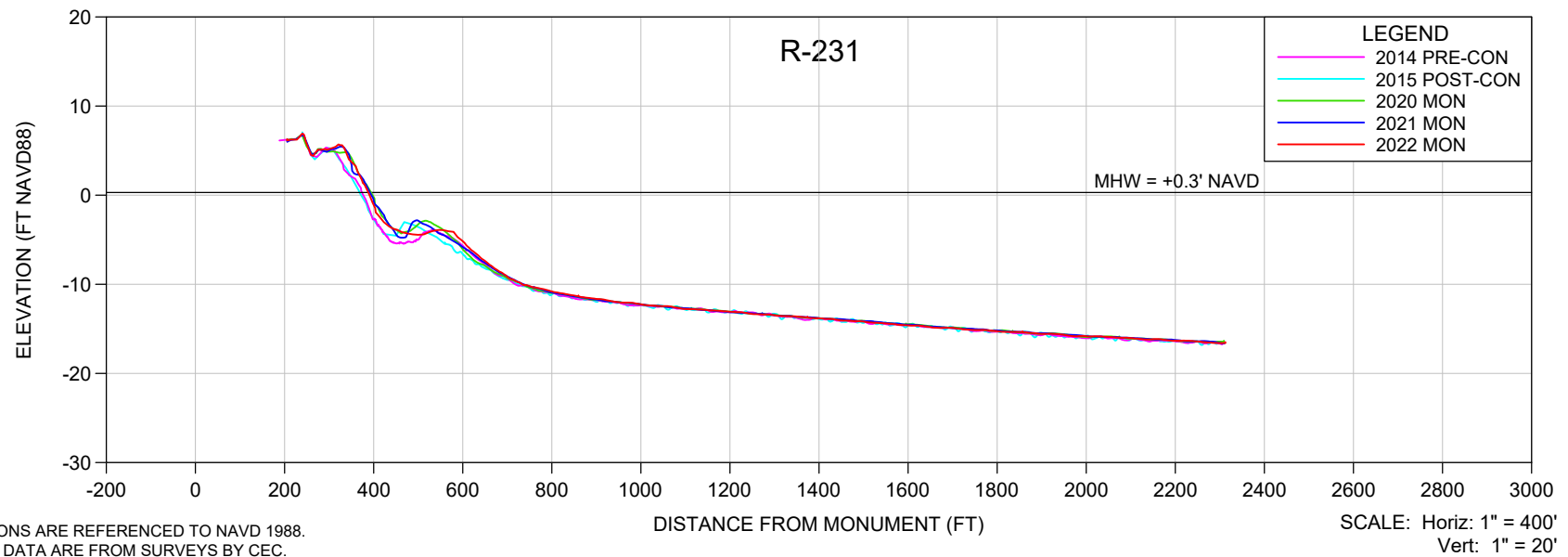
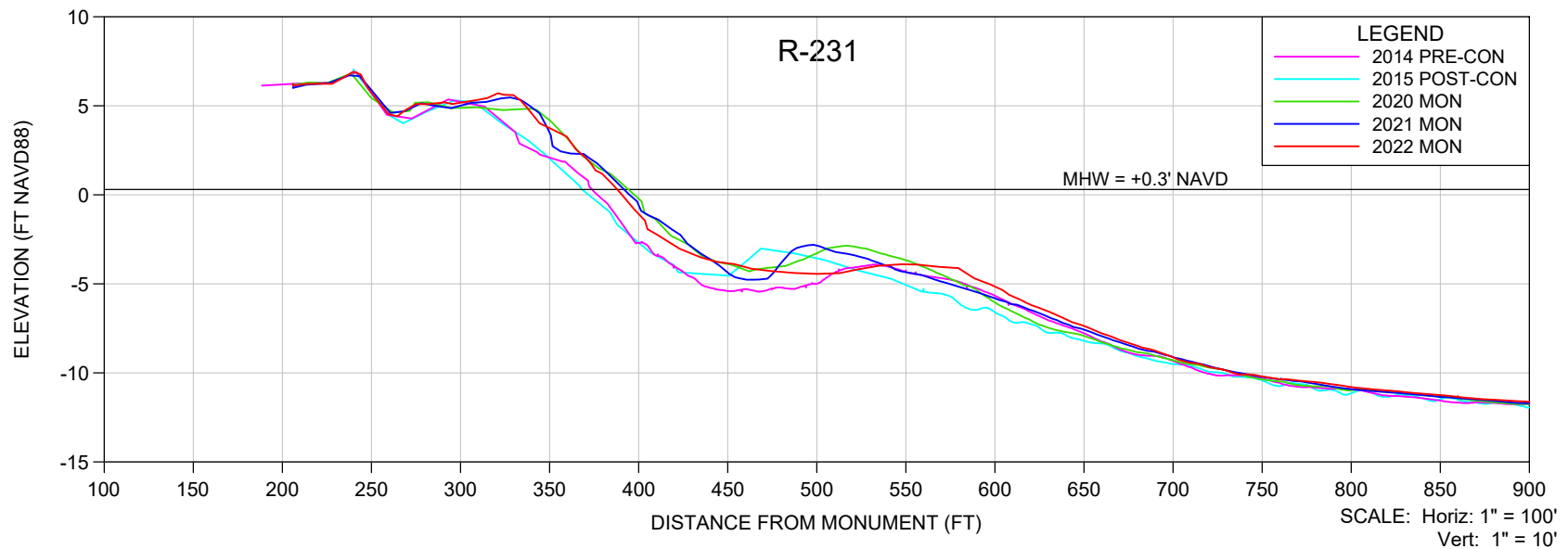
CLIENT:

LEE COUNTY

TITLE:

**BONITA BEACH AND LOVERS KEY
 R-230.5 MONITORING SURVEY**

DATE:	8/18/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	22079-Lovers Bonita Mon Profiles.dwg		
REF. NO.	22.079	NO.	DATE
		BY	REVISION DESCRIPTION



NOTES

- ELEVATIONS ARE REFERENCED TO NAVD 1988.
- PROFILE DATA ARE FROM SURVEYS BY CEC.
- UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 39
 FILE NO.: 22079-R-231

**COASTAL
 ENGINEERING
 CONSULTANTS
 INC.**
 Serving Florida Since 1977
 28421 BONITA CROSSINGS BLVD
 BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
 ENVIRONMENTAL & GEOLOGICAL SERVICES
 SURVEY & MAPPING
 ENGINEERING: CA 2464
 SURVEYING: LB 2464
 PHONE: (239)643-2324
 FAX: (239)643-1143
 www.coastalengineering.com
 E-Mail: info@ceciff.com

CLIENT:

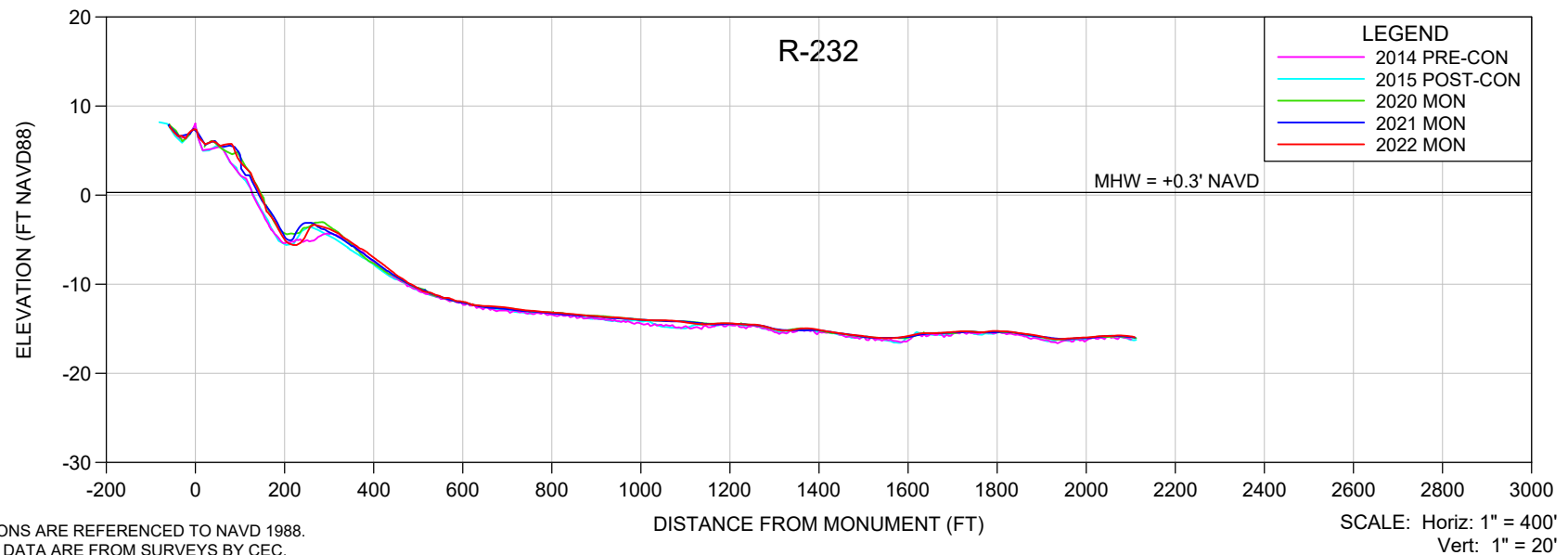
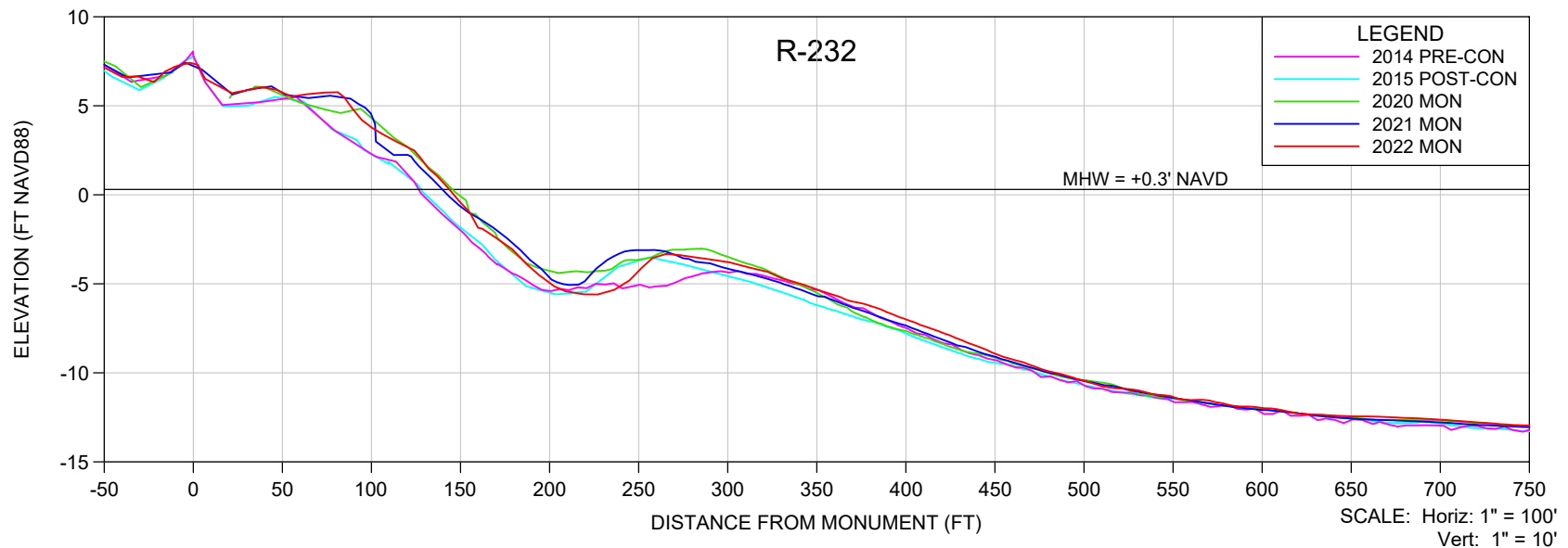
LEE COUNTY

TITLE:

**BONITA BEACH AND LOVERS KEY
 R-231 MONITORING SURVEY**

DATE:	8/18/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	22079-Lovers Bonita Mon Profiles.dwg		
REF. NO.	22.079	NO.	DATE

BY	REVISION DESCRIPTION



NOTES

- ELEVATIONS ARE REFERENCED TO NAVD 1988.
- PROFILE DATA ARE FROM SURVEYS BY CEC.
- UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 40
FILE NO.: 22079-R-232

**COASTAL
ENGINEERING
CONSULTANTS
INC.**
 Serving Florida Since 1977
 28421 BONITA CROSSINGS BLVD
 BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
 ENVIRONMENTAL & GEOLOGICAL SERVICES
 SURVEY & MAPPING
 ENGINEERING: CA 2464
 SURVEYING: LB 2464
 PHONE: (239)643-2324
 FAX: (239)643-1143
 www.coastalengineering.com
 E-Mail: info@ceciff.com

CLIENT:

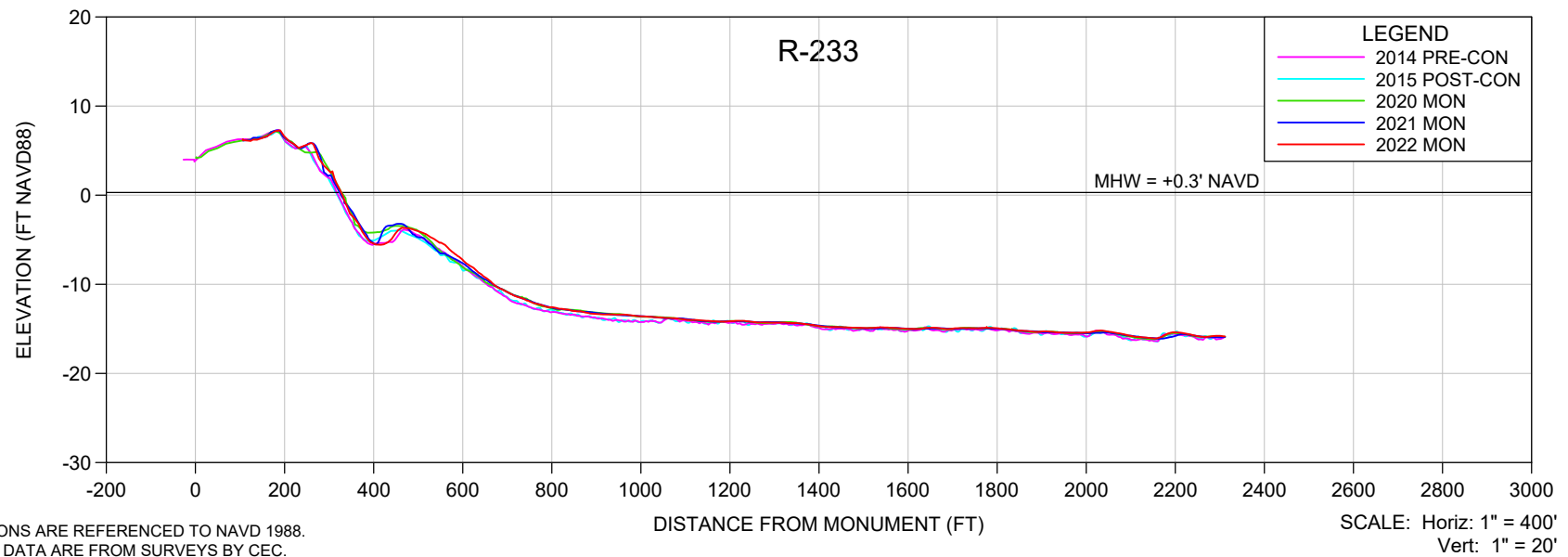
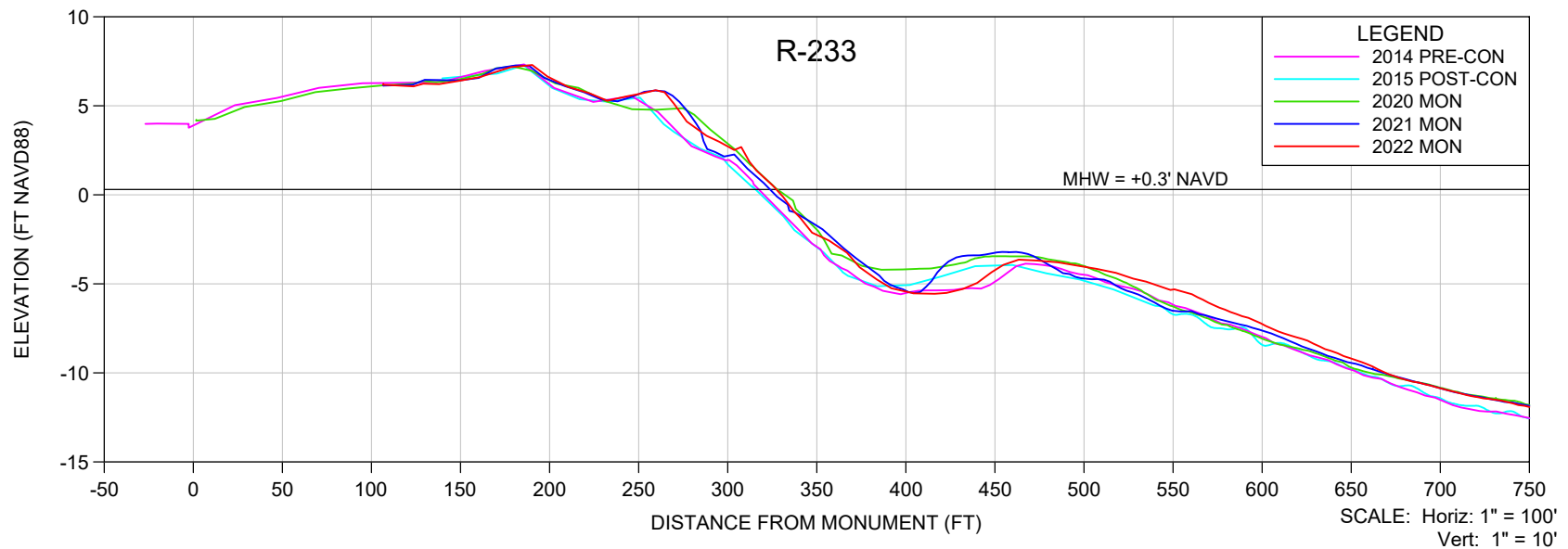
LEE COUNTY

TITLE:

**BONITA BEACH AND LOVERS KEY
R-232 MONITORING SURVEY**

DATE:	8/18/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	22079-Lovers Bonita Mon Profiles.dwg		
REF. NO.	22.079	NO.	DATE

NO.	DATE	BY	REVISION DESCRIPTION



NOTES

- ELEVATIONS ARE REFERENCED TO NAVD 1988.
- PROFILE DATA ARE FROM SURVEYS BY CEC.
- UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 41
 FILE NO.: 22079-R-233

**COASTAL
 ENGINEERING
 CONSULTANTS
 INC.**
 Serving Florida Since 1977
 28421 BONITA CROSSINGS BLVD
 BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
 ENVIRONMENTAL & GEOLOGICAL SERVICES
 SURVEY & MAPPING
 ENGINEERING: CA 2464
 SURVEYING: LB 2464
 PHONE: (239)643-2324
 FAX: (239)643-1143
 www.coastalengineering.com
 E-Mail: info@ceciff.com

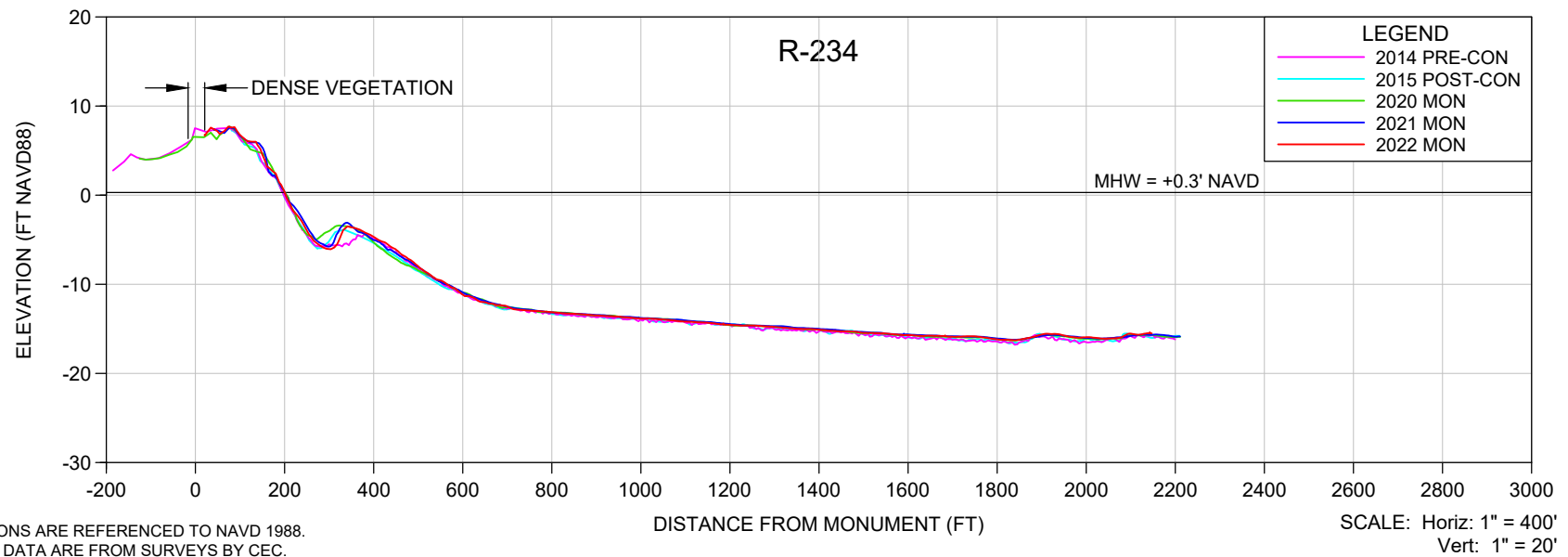
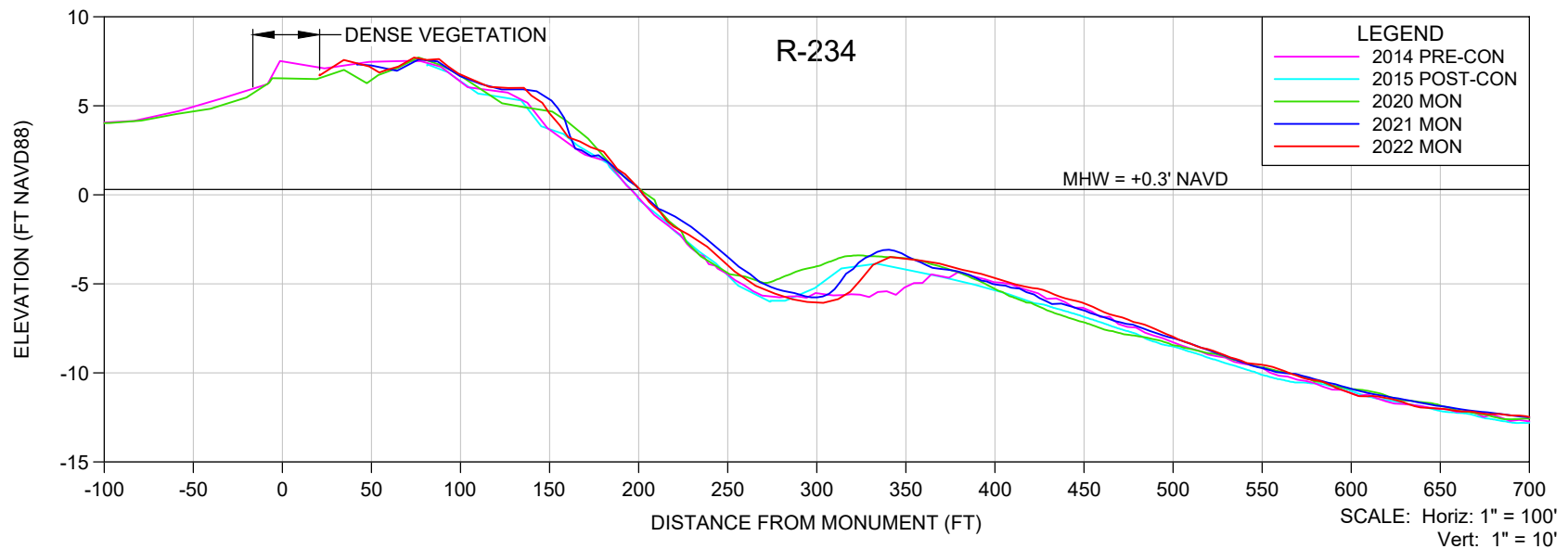
CLIENT:

LEE COUNTY

TITLE:

**BONITA BEACH AND LOVERS KEY
 R-233 MONITORING SURVEY**

DATE:	8/18/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	22079-Lovers Bonita Mon Profiles.dwg		
REF. NO.	22.079	NO.	DATE
		BY	REVISION DESCRIPTION



NOTES

- ELEVATIONS ARE REFERENCED TO NAVD 1988.
- PROFILE DATA ARE FROM SURVEYS BY CEC.
- UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 42
FILE NO.: 22079-R-234

**COASTAL
ENGINEERING
CONSULTANTS
INC.**
Serving Florida Since 1977
28421 BONITA CROSSINGS BLVD
BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
ENVIRONMENTAL & GEOLOGICAL SERVICES
SURVEY & MAPPING
ENGINEERING: CA 2464
SURVEYING: LB 2464
PHONE: (239)643-2324
FAX: (239)643-1143
www.coastalengineering.com
E-Mail: info@ceciff.com

CLIENT:

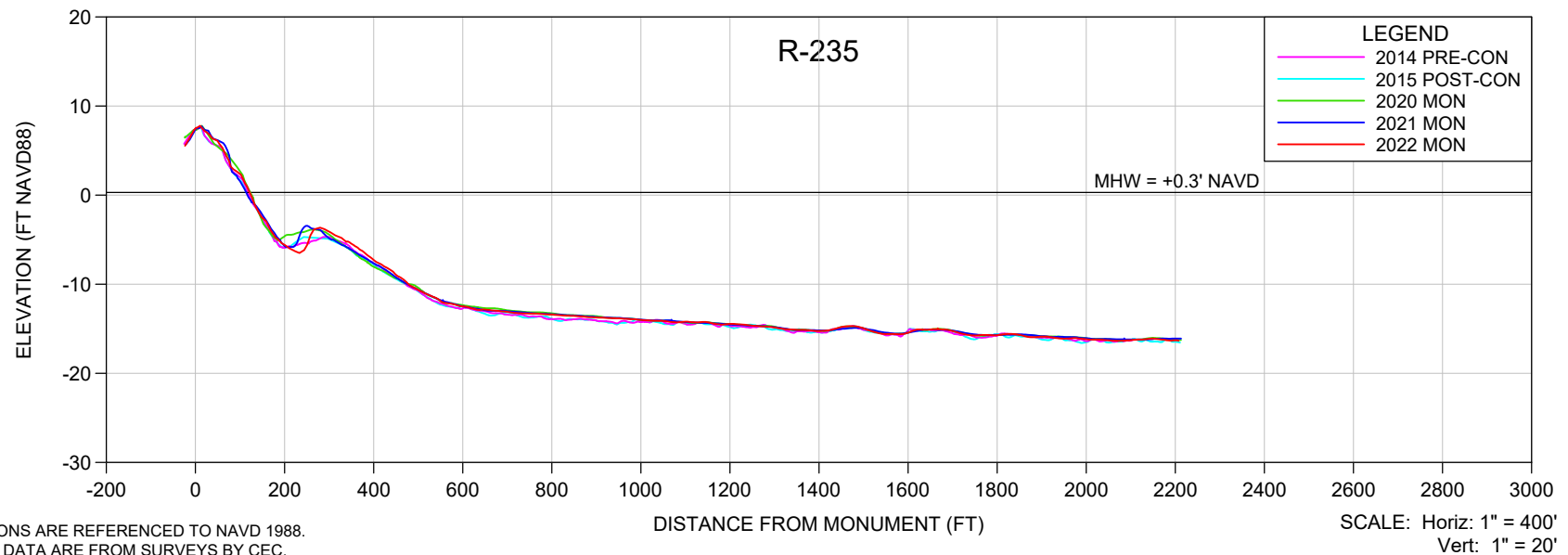
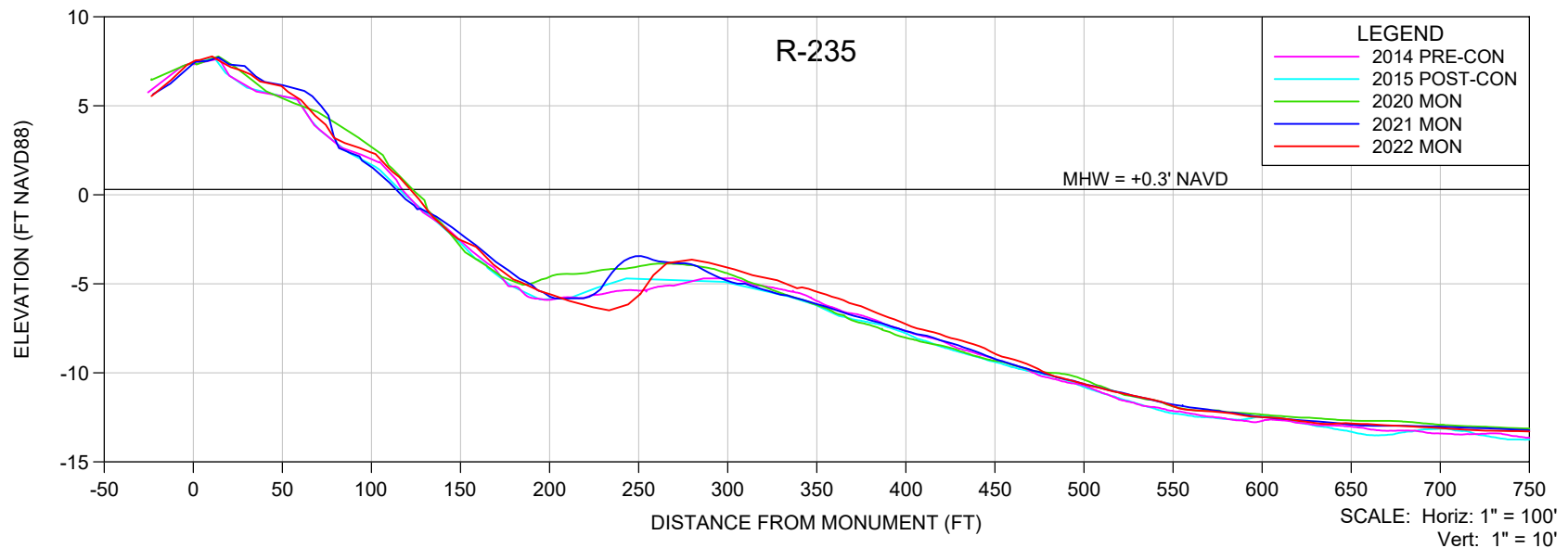
LEE COUNTY

TITLE:

**BONITA BEACH AND LOVERS KEY
R-234 MONITORING SURVEY**

DATE:	8/18/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	22079-Lovers Bonita Mon Profiles.dwg		
REF. NO.	22.079	NO.	DATE

BY	REVISION DESCRIPTION



NOTES

- ELEVATIONS ARE REFERENCED TO NAVD 1988.
- PROFILE DATA ARE FROM SURVEYS BY CEC.
- UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 43
FILE NO.: 22079-R-235

**COASTAL
ENGINEERING
CONSULTANTS
INC.**
 Serving Florida Since 1977
 28421 BONITA CROSSINGS BLVD
 BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
 ENVIRONMENTAL & GEOLOGICAL SERVICES
 SURVEY & MAPPING
 ENGINEERING: CA 2464
 SURVEYING: LB 2464
 PHONE: (239)643-2324
 FAX: (239)643-1143
 www.coastalengineering.com
 E-Mail: info@ceciff.com

CLIENT:

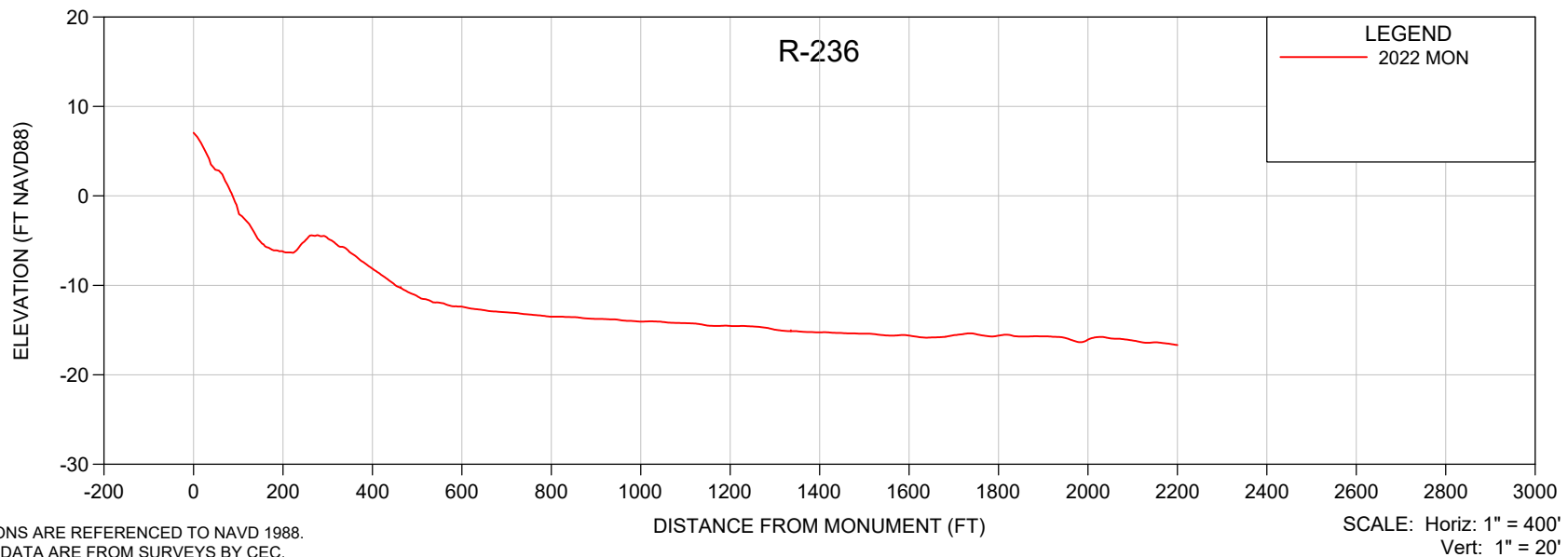
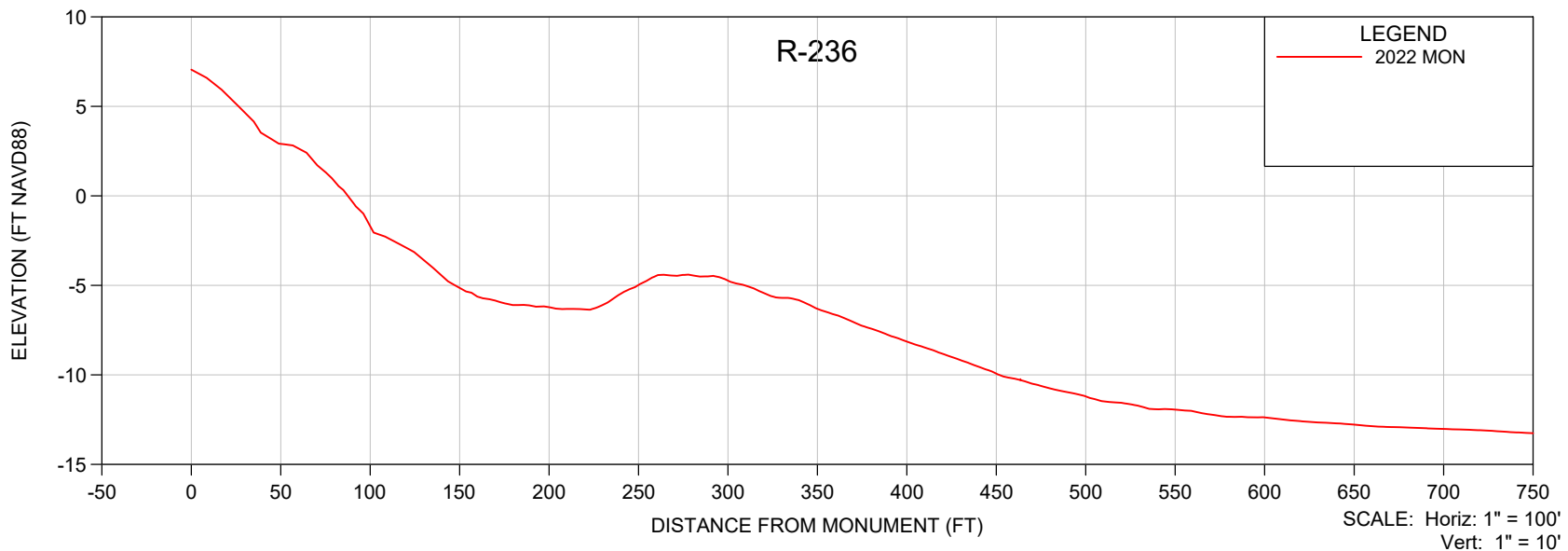
LEE COUNTY

TITLE:

**BONITA BEACH AND LOVERS KEY
R-235 MONITORING SURVEY**

DATE:	8/18/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	22079-Lovers Bonita Mon Profiles.dwg		
REF. NO.	22.079	NO.	DATE

NO.	DATE	BY	REVISION DESCRIPTION



NOTES

- ELEVATIONS ARE REFERENCED TO NAVD 1988.
- PROFILE DATA ARE FROM SURVEYS BY CEC.
- UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 44
FILE NO.: 22079-R-236

**COASTAL
ENGINEERING
CONSULTANTS
INC.**
Serving Florida Since 1977
28421 BONITA CROSSINGS BLVD
BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
ENVIRONMENTAL & GEOLOGICAL SERVICES
SURVEY & MAPPING
ENGINEERING: CA 2464
SURVEYING: LB 2464
PHONE: (239)643-2324
FAX: (239)643-1143
www.coastalengineering.com
E-Mail: info@ceciff.com

CLIENT:

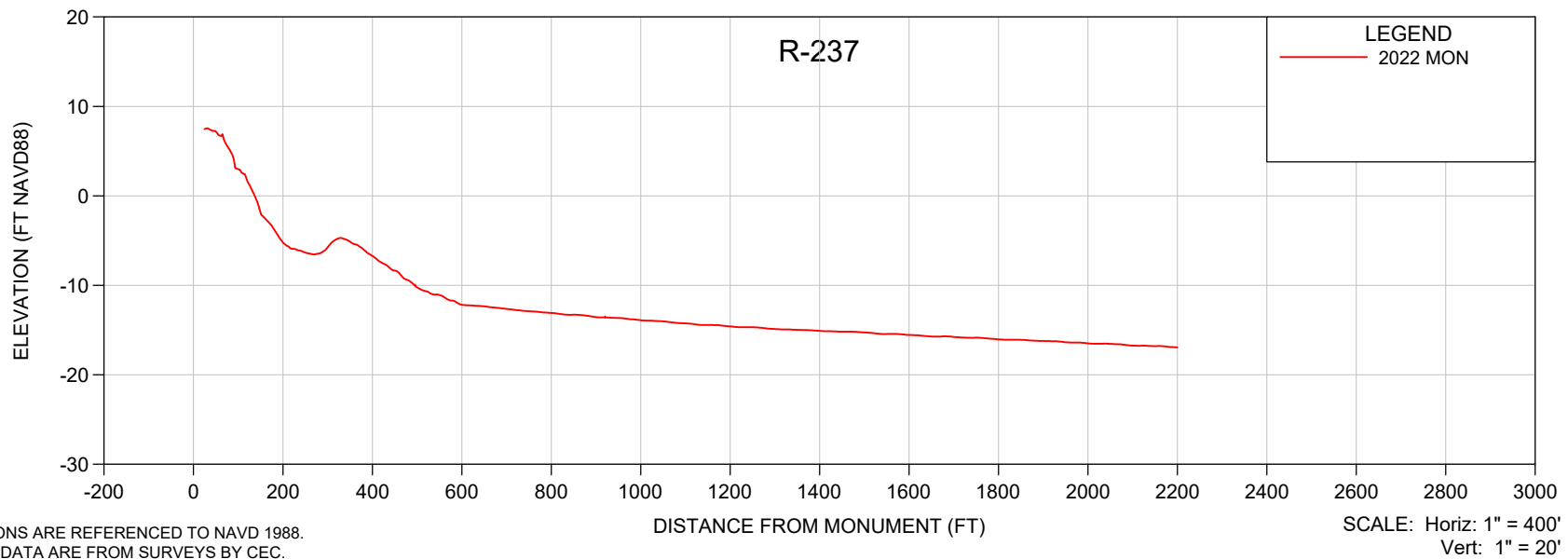
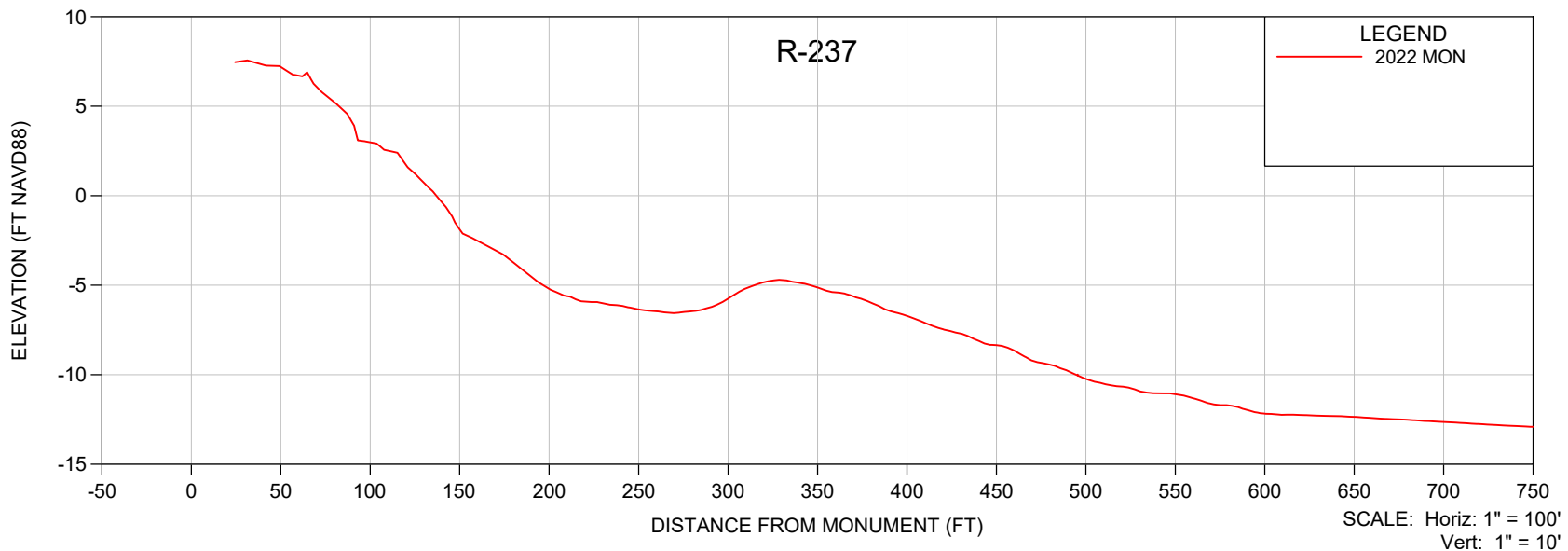
LEE COUNTY

TITLE:

**BONITA BEACH AND LOVERS KEY
R-236 MONITORING SURVEY**

DATE:	8/18/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	22079-Lovers Bonita Mon Profiles.dwg		
REF. NO.	22.079	NO.	DATE

NO.	DATE	BY	REVISION DESCRIPTION



NOTES

1. ELEVATIONS ARE REFERENCED TO NAVD 1988.
2. PROFILE DATA ARE FROM SURVEYS BY CEC.
3. UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 45
FILE NO.: 22079-R-237

**COASTAL
ENGINEERING
CONSULTANTS
INC.**
Serving Florida Since 1977
28421 BONITA CROSSINGS BLVD
BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
ENVIRONMENTAL & GEOLOGICAL SERVICES
SURVEY & MAPPING
ENGINEERING: CA 2464
SURVEYING: LB 2464
PHONE: (239)643-2324
FAX: (239)643-1143
www.coastalengineering.com
E-Mail: info@ceciff.com

CLIENT:

LEE COUNTY

TITLE:

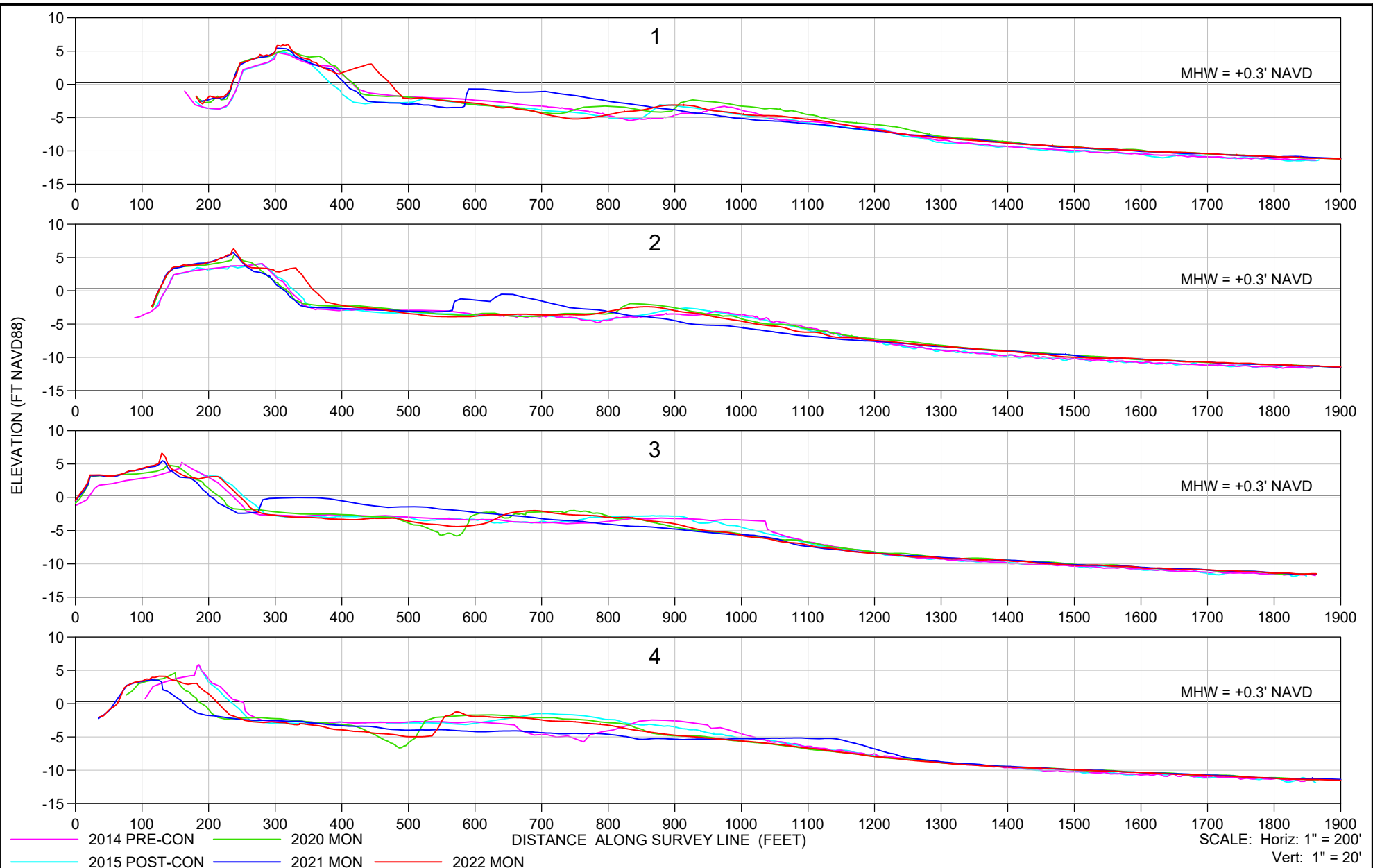
**BONITA BEACH AND LOVERS KEY
R-237 MONITORING SURVEY**

DATE:	8/18/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	22079-Lovers Bonita Mon Profiles.dwg		
REF. NO.	22.079	NO.	DATE

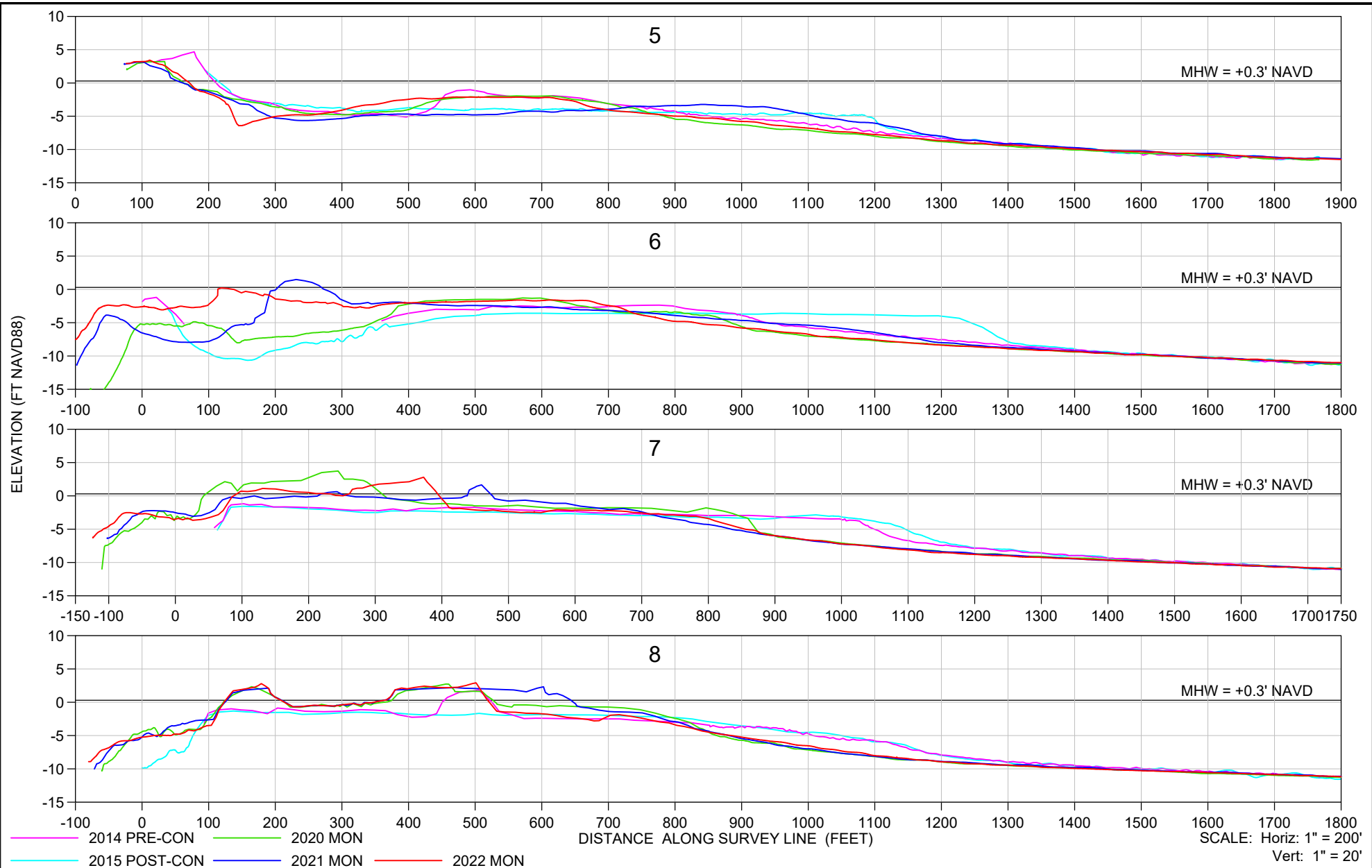
BY	REVISION DESCRIPTION

APPENDIX 3

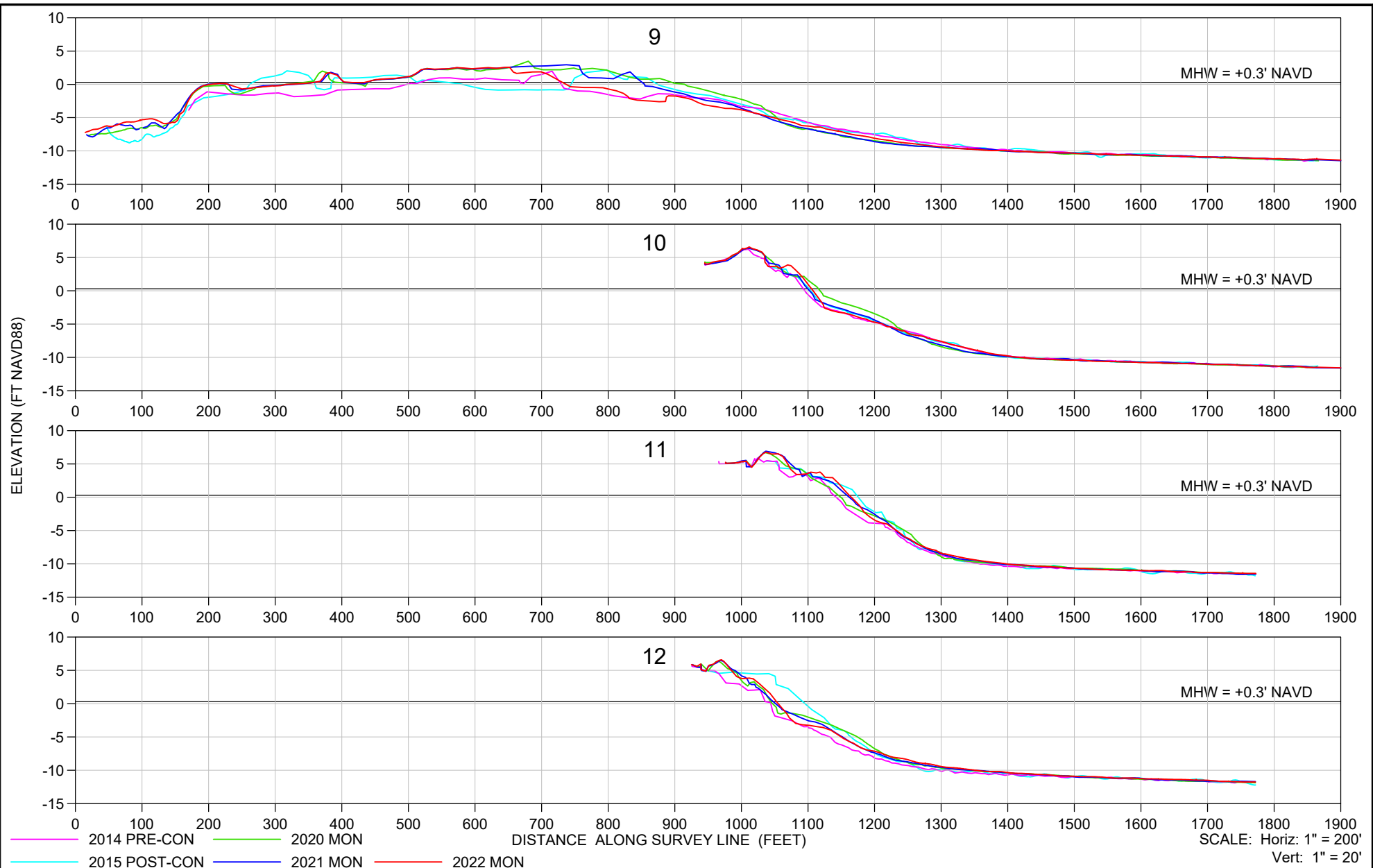
BIG HICKORY PASS EBB TIDAL SHOAL CROSS SECTIONS



SHEET 64 FILE NO.: 22079-BH-1  COASTAL ENGINEERING CONSULTANTS INC. Serving Florida Since 1977 28421 BONITA CROSSINGS BLVD BONITA SPRINGS, FLORIDA 34135	COASTAL & MARINE ENGINEERING ENVIRONMENTAL & GEOLOGICAL SERVICES SURVEY & MAPPING ENGINEERING: CA 2464 SURVEYING: LB 2464 PHONE: (239)643-2324 FAX: (239)643-1143 www.coastalengineering.com E-Mail: info@ceciff.com	CLIENT:	LEE COUNTY		DATE:	8/18/2022	SCALE:	AS SHOWN				
		TITLE:	BONITA BEACH AND LOVERS KEY BIG HICKORY PASS CROSS SECTIONS 1 - 4	DRAWN:	VVA	F.B.						
				CHECKED:	MTP	PG.						
				SEC.		TWP.		RNG.				
				ACAD NO.	22079-Lovers Bonita Mon Profiles.dwg							
				REF. NO.	22.079				NO.	DATE	BY	REVISION DESCRIPTION

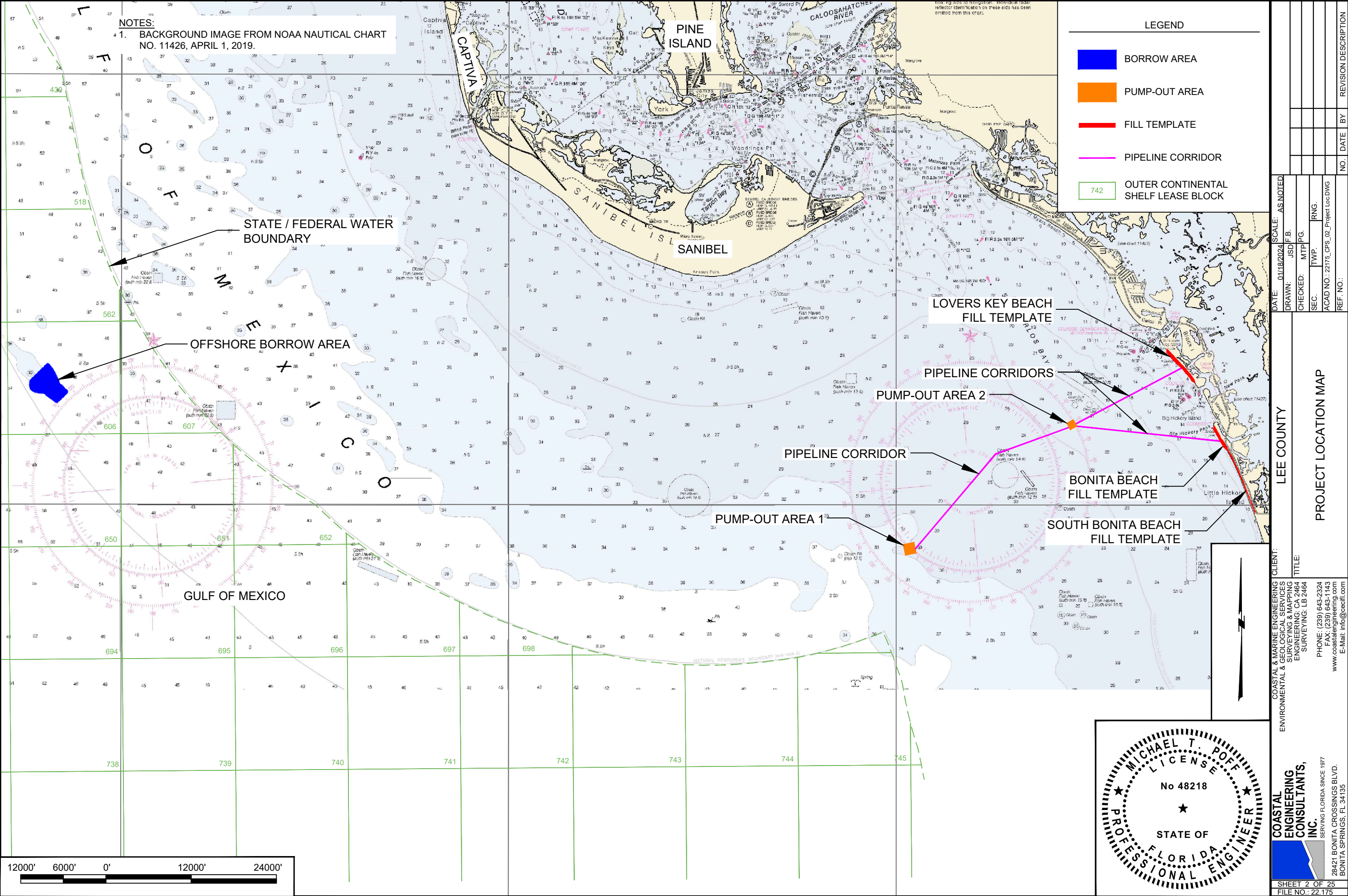


SHEET 55 COASTAL ENGINEERING CONSULTANTS INC. Serving Florida Since 1977 28421 BONITA CROSSINGS BLVD BONITA SPRINGS, FLORIDA 34135	COASTAL & MARINE ENGINEERING ENVIRONMENTAL & GEOLOGICAL SERVICES SURVEY & MAPPING ENGINEERING: CA 2464 SURVEYING: LB 2464 PHONE: (239)643-2324 FAX: (239)643-1143 www.coastalengineering.com E-Mail: info@ceciff.com		CLIENT: LEE COUNTY TITLE: BONITA BEACH AND LOVERS KEY BIG HICKORY PASS CROSS SECTIONS 5 - 8		DATE: 8/18/2022 DRAWN: VVA CHECKED: MTP SEC. TWP. RNG. ACAD NO. 22079-Lovers Bonita Mon Profiles.dwg REF. NO. 22.079	SCALE: AS SHOWN F.B. PG. NO. DATE BY REVISION DESCRIPTION



SHEET 56 FILE NO.: 22079-BH-3  COASTAL ENGINEERING CONSULTANTS INC. Serving Florida Since 1977 28421 BONITA CROSSINGS BLVD BONITA SPRINGS, FLORIDA 34135	COASTAL & MARINE ENGINEERING ENVIRONMENTAL & GEOLOGICAL SERVICES SURVEY & MAPPING ENGINEERING: CA 2464 SURVEYING: LB 2464 PHONE: (239)643-2324 FAX: (239)643-1143 www.coastalengineering.com E-Mail: info@ceciff.com	CLIENT:	LEE COUNTY			DATE:	8/18/2022	SCALE:	AS SHOWN				
		TITLE:	BONITA BEACH AND LOVERS KEY BIG HICKORY PASS CROSS SECTIONS 9 - 12			DRAWN:	VVA	F.B.					
						CHECKED:	MTP	PG.					
						SEC.		TWP.		RNG.			
						ACAD NO.	22079-Lovers Bonita Mon Profiles.dwg						
						REF. NO.	22.079					NO.	DATE

 COASTAL ENGINEERING CONSULTANTS, INC. SERVING FLORIDA SINCE 1977	ENVIRONMENTAL & MARINE ENGINEERING ENGINEERING & MAPPING ENGINEERING: CA 2464 SURVEYING: LB 2464 PHONE: (320) 643-2324 FAX: (320) 643-1143 www.coastalengineering.com E-Mail: info@cecfli.com	CLIENT: LEE COUNTY		DATE: 01/18/2024	SCALE: AS NOTED
		TITLE: COVER SHEET		DRAWN: JSD	F.B.
				CHECKED: MTP	P.G.
		SEC.	TWP.	RNG.	
		ACAD NO.: 22175_CP95_01 Cover-Notes DWG			
		REF. NO.:		NO.	DATE
				BY	REVISION DESCRIPTION



NOTES:
1. BACKGROUND IMAGE FROM NOAA POST-HURRICANE IAN EMERGENCY RESPONSE IMAGERY, SEPTEMBER 30, 2022.

LOVERS KEY REFERENCE MONUMENT TRANSECTS			
ALIGNMENT COORDINATE TABLE			
REFERENCE MONUMENT	NORTHING	EASTING	AZ
R-214	749,376.54	693,933.34	235
R-214.5	749,048.44	694,168.77	225
R-215	748,722.67	694,480.19	220
R-215.5	748,335.99	694,856.32	225
R-216	747,924.36	695,214.98	215
R-216.5	747,614.48	695,575.32	225
R-217	747,224.52	695,917.44	235
R-217.5	746,934.54	696,322.56	225
R-218	746,474.22	696,634.54	230
R-218.5	746,163.02	697,054.91	225
R-219	745,742.28	697,265.27	230
R-219.5	745,384.46	697,617.06	225
R-220	745,055.41	697,879.86	235
R-220.5	744,645.83	698,166.65	235
R-221	744,191.90	698,389.86	235



LEGEND

DUNE CREST

BEACH FILL BERM

R-216

DATE: 01/18/2024
DRAWN: JSD
CHECKED: MTP
SEC: TWP
22175_CPS_3-5_Survey_Octidwg

SCALE: AS NOTED
F.B.
PG.
RNG.
REF. NO.

NO. BY DATE

REVISION DESCRIPTION

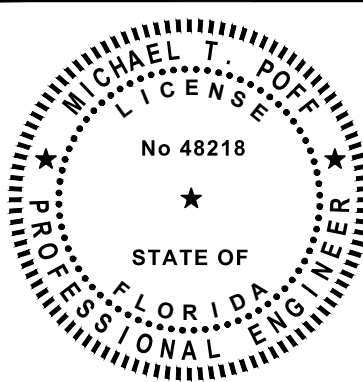
LEE COUNTY

LOVERS KEY SURVEY CONTROL

CLIENT: COASTAL & MARINE ENGINEERING ENVIRONMENTAL & GEOLOGICAL SERVICES SURVEYING & MAPPING ENGINEERING: CA 2464 SURVEYING: LB 2464
TITLE:
PHONE: (239) 643-2324
FAX: (239) 643-1143
www.coastalengineering.com
E-Mail: info@cecfi.com

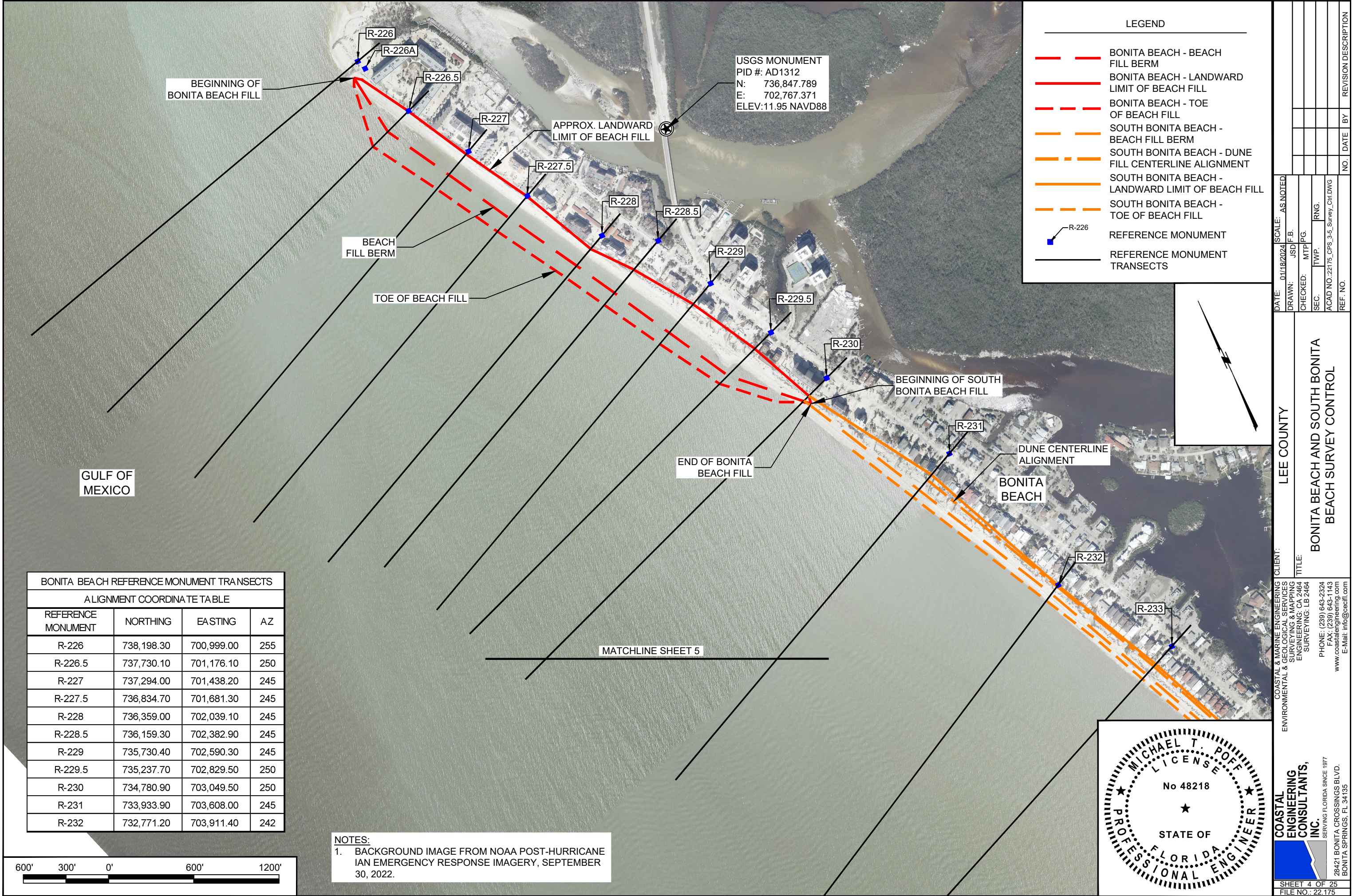
COASTAL ENGINEERING CONSULTANTS, INC.
SERVING FLORIDA SINCE 1977
28421 BONITA CROSSINGS BLVD.
BONITA SPRINGS, FL 34135

SHEET 3 OF 25
FILE NO.: 22.175



USGS MONUMENT
PID #:AD1334
N: 742,689.561
E: 701,857.275
ELEV: 22.09 NAVD88





LEGEND

BONITA BEACH - BEACH FILL BERM

BONITA BEACH - LANDWARD LIMIT OF BEACH FILL

BONITA BEACH - TOE OF BEACH FILL

SOUTH BONITA BEACH - BEACH FILL BERM

SOUTH BONITA BEACH - DUNE FILL CENTERLINE ALIGNMENT

SOUTH BONITA BEACH - LANDWARD LIMIT OF BEACH FILL

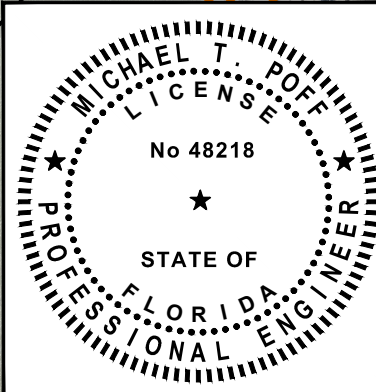
SOUTH BONITA BEACH - TOE OF BEACH FILL

REFERENCE MONUMENT

REFERENCE MONUMENT TRANSECTS

BONITA BEACH REFERENCE MONUMENT TRANSECTS			
ALIGNMENT COORDINATE TABLE			
REFERENCE MONUMENT	NORTHING	EASTING	AZ
R-226	738,198.30	700,999.00	255
R-226.5	737,730.10	701,176.10	250
R-227	737,294.00	701,438.20	245
R-227.5	736,834.70	701,681.30	245
R-228	736,359.00	702,039.10	245
R-228.5	736,159.30	702,382.90	245
R-229	735,730.40	702,590.30	245
R-229.5	735,237.70	702,829.50	250
R-230	734,780.90	703,049.50	250
R-231	733,933.90	703,608.00	245
R-232	732,771.20	703,911.40	242

NOTES:
1. BACKGROUND IMAGE FROM NOAA POST-HURRICANE IAN EMERGENCY RESPONSE IMAGERY, SEPTEMBER 30, 2022.



DATE: 01/18/2024
DRAWN: JSD
CHECKED: MTP
SEC: TWP
ACAD NO.: 22175
REF. NO.:
SCALE: AS NOTED
F.B.
PG.
RNG.
CPS 3-5 Survey, Ctr DWG

LEE COUNTY

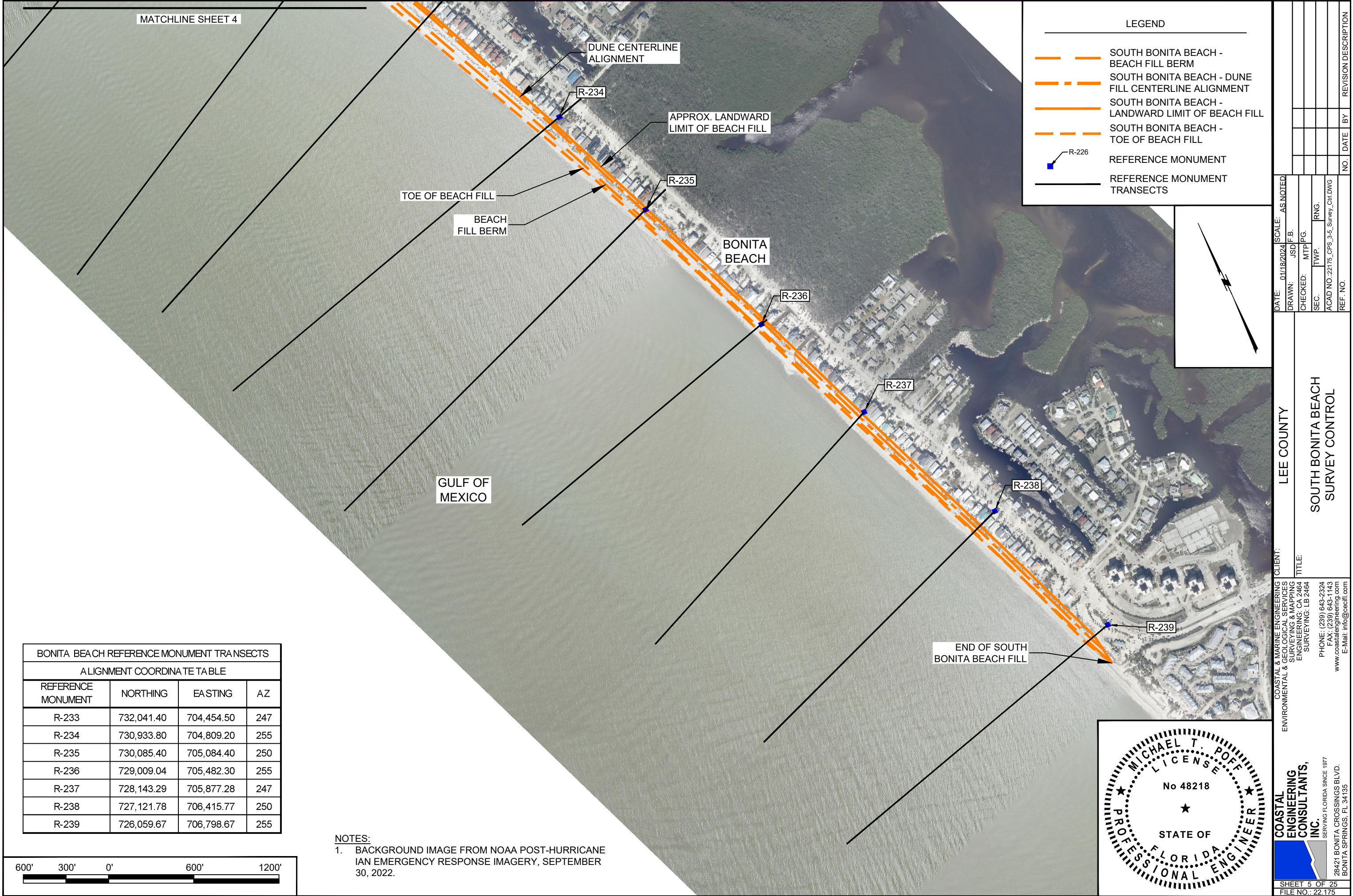
BONITA BEACH AND SOUTH BONITA BEACH SURVEY CONTROL

CLIENT: COASTAL & MARINE ENGINEERING ENVIRONMENTAL & GEOLOGICAL SERVICES SURVEYING & MAPPING ENGINEERING: CA 2464 SURVEYING: LB 2464
TITLE:
PHONE: (239) 643-2324
FAX: (239) 643-1143
www.coastalengineering.com
E-Mail: info@cecfl.com

COASTAL ENGINEERING CONSULTANTS, INC.
SERVING FLORIDA SINCE 1977
28421 BONITA CROSSINGS BLVD.
BONITA SPRINGS, FL 34135

SHEET 4 OF 25
FILE NO.: 22.175

NO. BY DATE REVISION DESCRIPTION



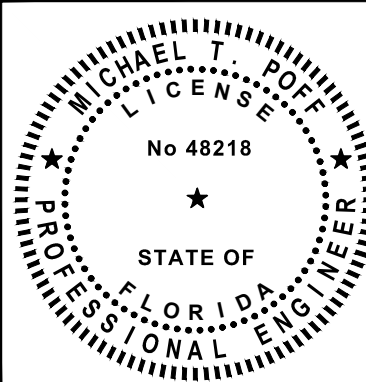
LEGEND

- SOUTH BONITA BEACH - BEACH FILL BERM
- SOUTH BONITA BEACH - DUNE FILL CENTERLINE ALIGNMENT
- SOUTH BONITA BEACH - LANDWARD LIMIT OF BEACH FILL
- SOUTH BONITA BEACH - TOE OF BEACH FILL
- REFERENCE MONUMENT
- REFERENCE MONUMENT TRANSECTS

DATE: 01/18/2024	SCALE: AS NOTED	CLIENT: LEE COUNTY	COASTAL & MARINE ENGINEERING ENVIRONMENTAL & GEOLOGICAL SERVICES SURVEYING & MAPPING ENGINEERING: CA 2464 SURVEYING: LB 2464
DRAWN: JSD	F.B.	TITLE: SOUTH BONITA BEACH SURVEY CONTROL	PHONE: (239) 643-2324 FAX: (239) 643-1143 www.coastalengineering.com E-Mail: info@cecfll.com
CHECKED: MTP	PG.		
SEC.	TWP.		
ACAD NO.: 22175	CPS: 3-5	Survey: Ctl DWG	
REF. NO.			
NO.	DATE	BY	REVISION DESCRIPTION

BONITA BEACH REFERENCE MONUMENT TRANSECTS			
ALIGNMENT COORDINATE TABLE			
REFERENCE MONUMENT	NORTHING	EASTING	AZ
R-233	732,041.40	704,454.50	247
R-234	730,933.80	704,809.20	255
R-235	730,085.40	705,084.40	250
R-236	729,009.04	705,482.30	255
R-237	728,143.29	705,877.28	247
R-238	727,121.78	706,415.77	250
R-239	726,059.67	706,798.67	255

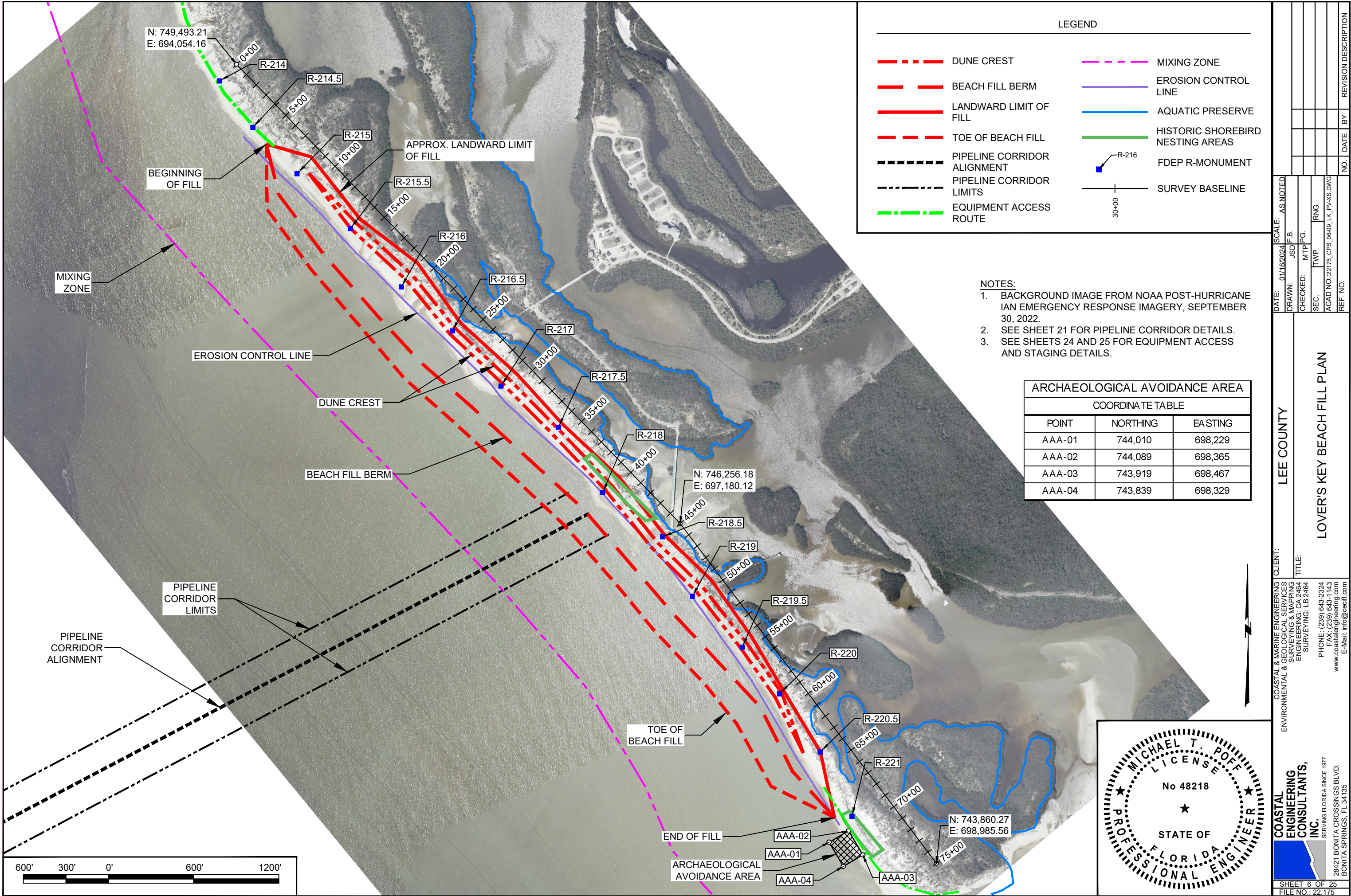
NOTES:
1. BACKGROUND IMAGE FROM NOAA POST-HURRICANE IAN EMERGENCY RESPONSE IMAGERY, SEPTEMBER 30, 2022.

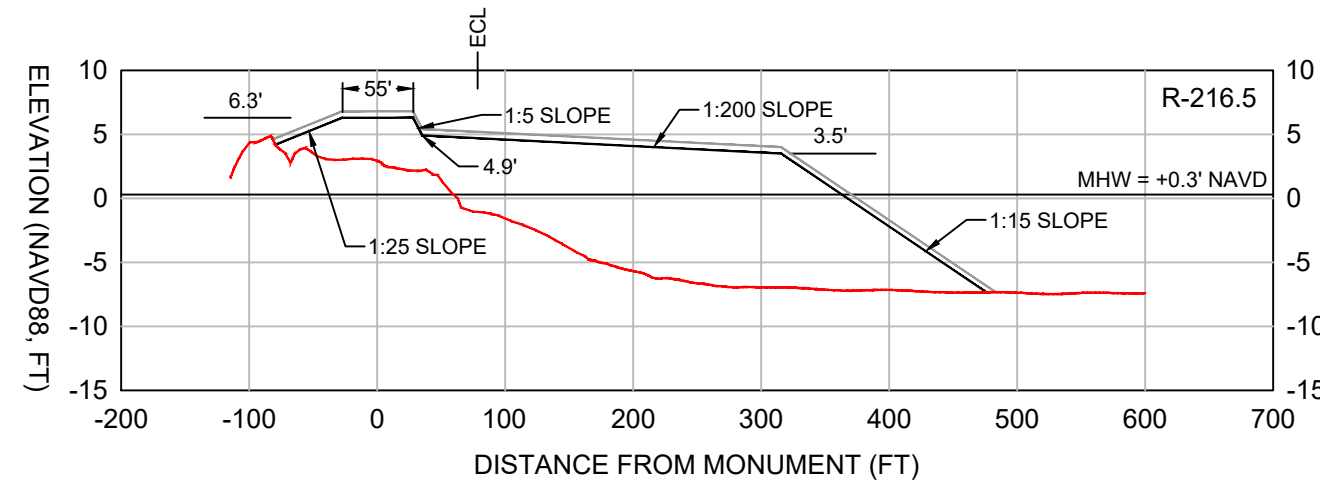
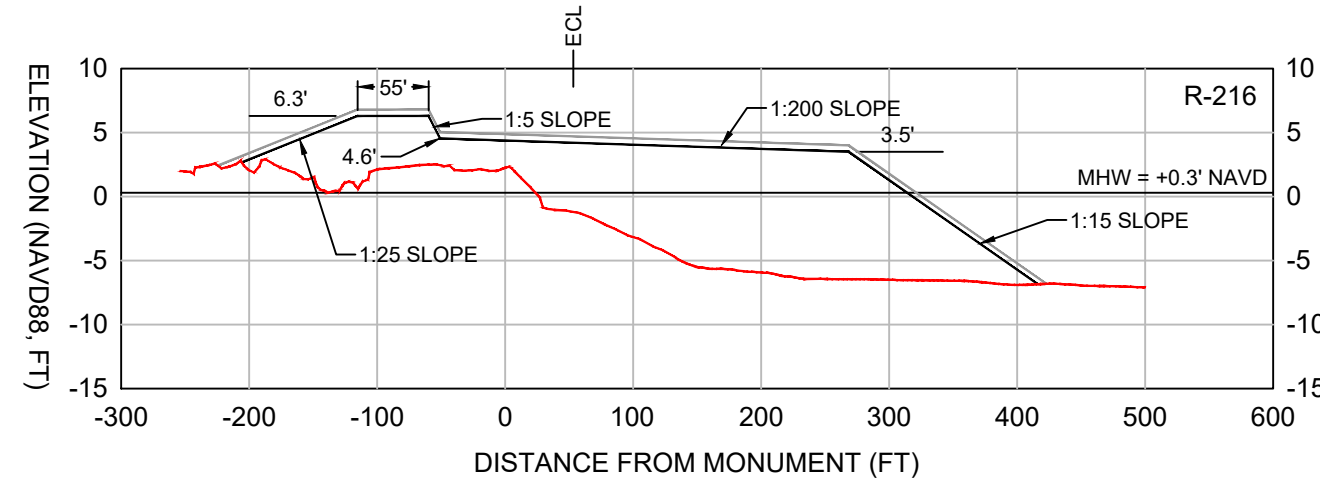
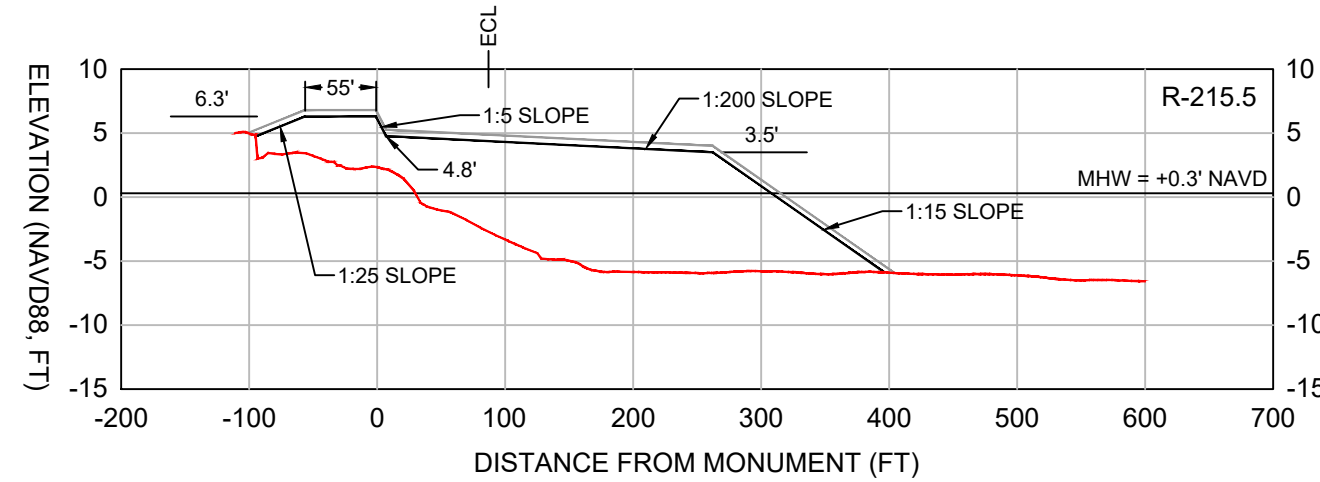
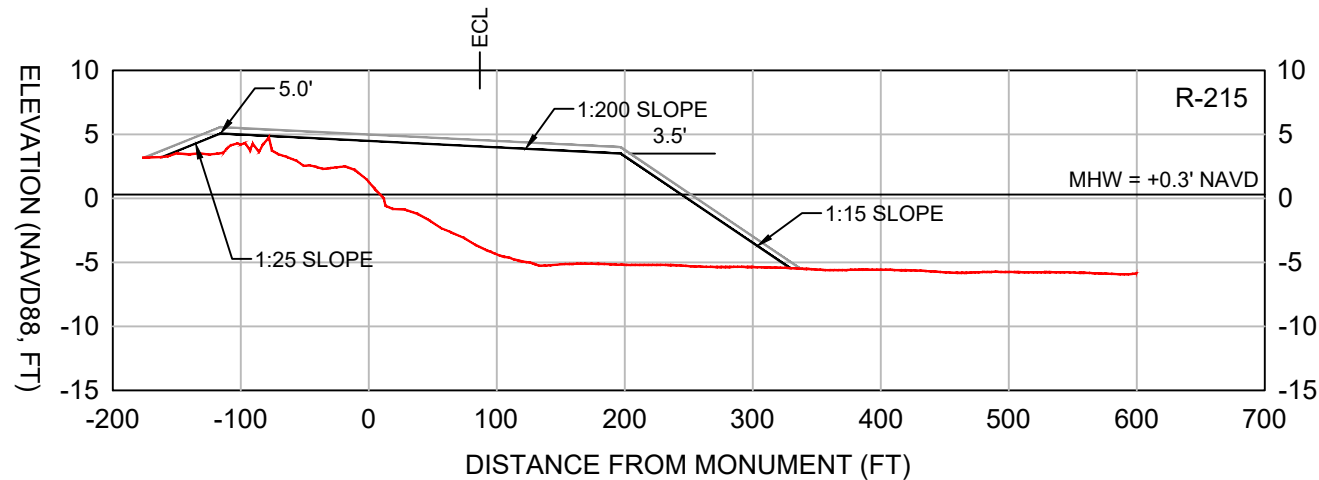
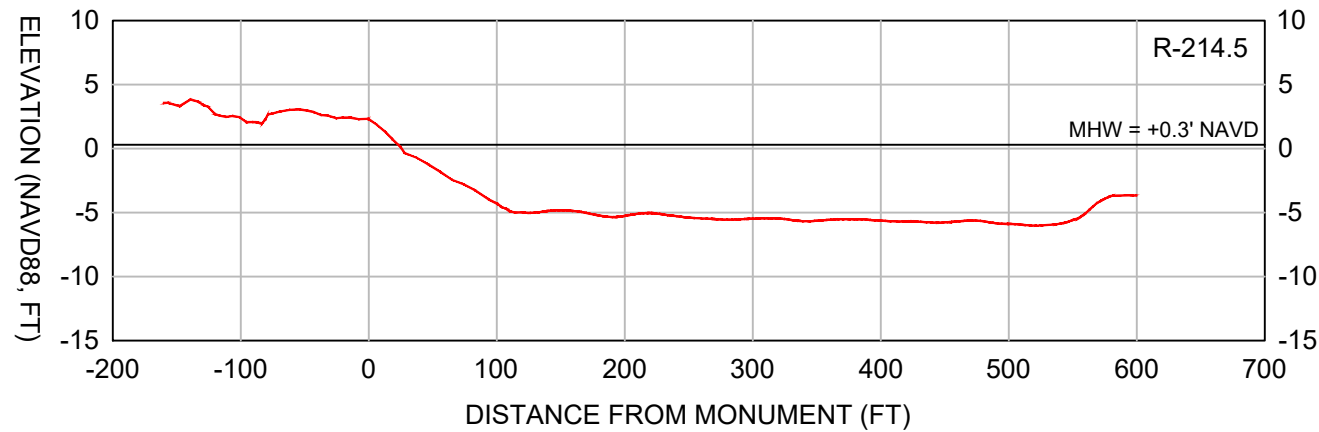
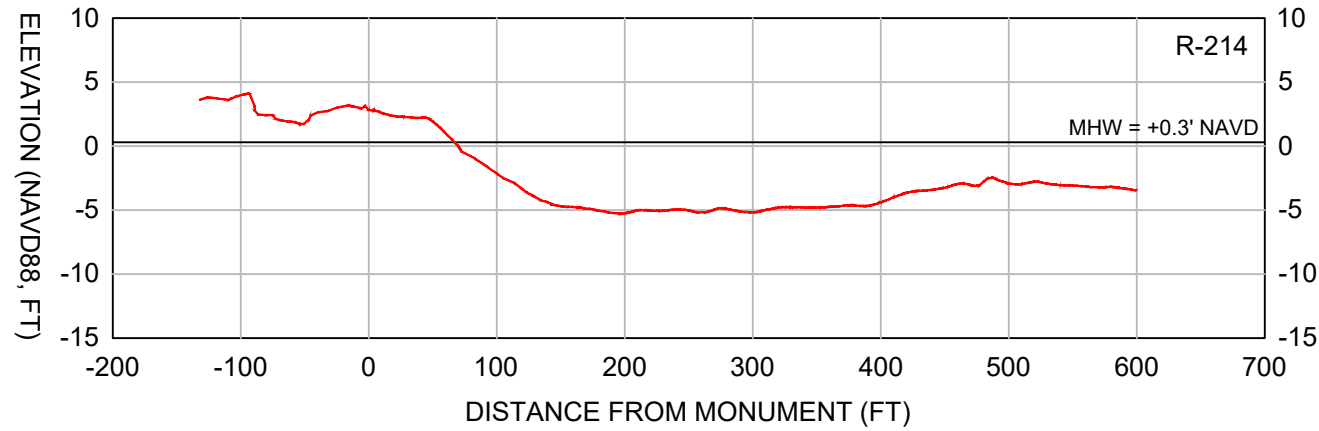


COASTAL ENGINEERING CONSULTANTS, INC.

28421 BONITA CROSSINGS BLVD.
BONITA SPRINGS, FL 34135

SHEET 5 OF 25
FILE NO.: 22.175





LEGEND:

— DESIGN

— CONSTRUCTION TOLERANCE

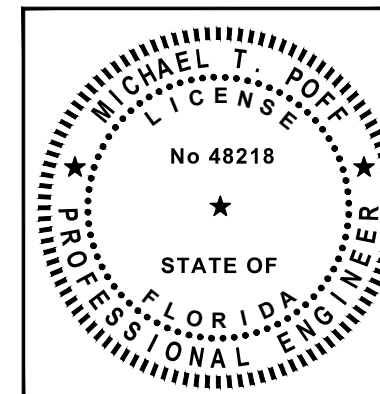
— EXISTING GRADE (2022)

SCALE:

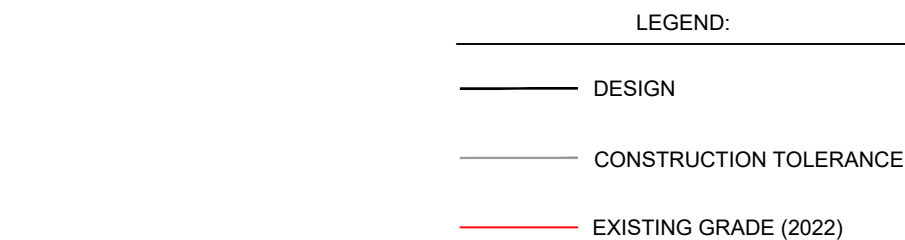
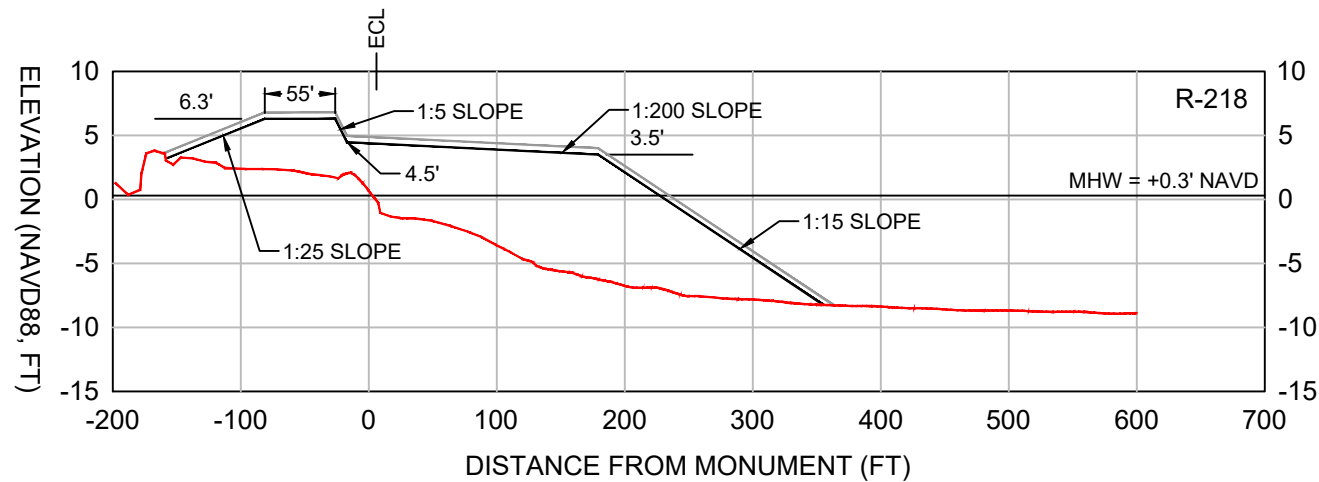
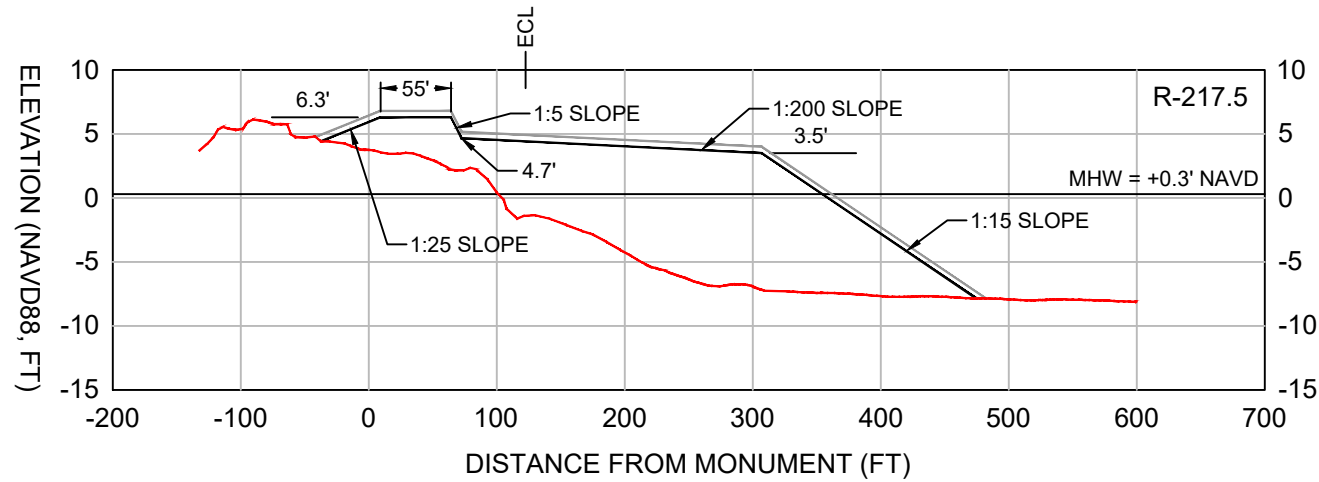
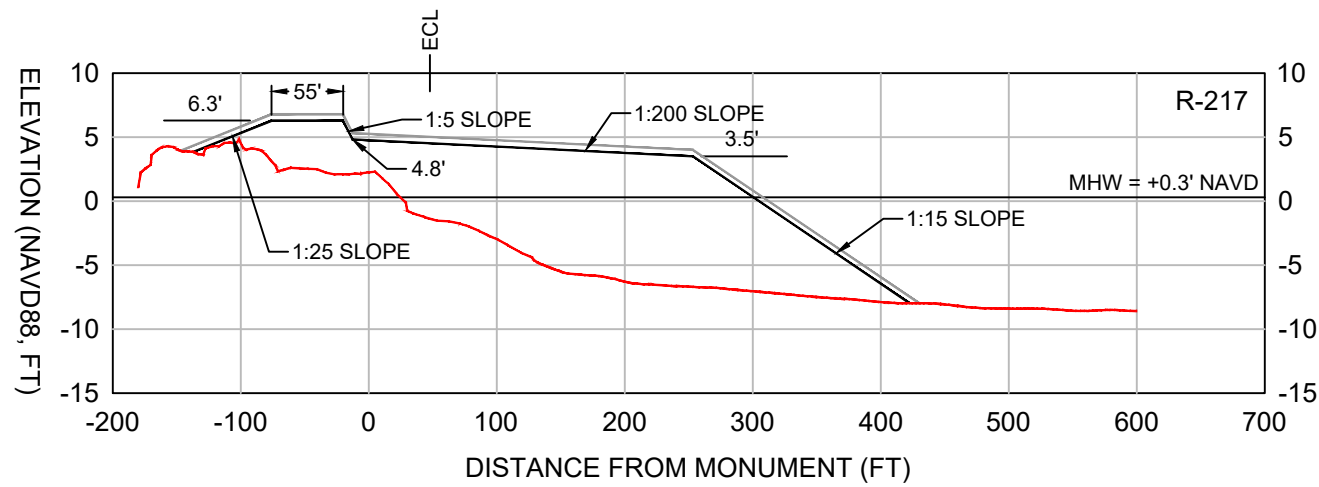
H: 1" = 150'

V: 1" = 15'

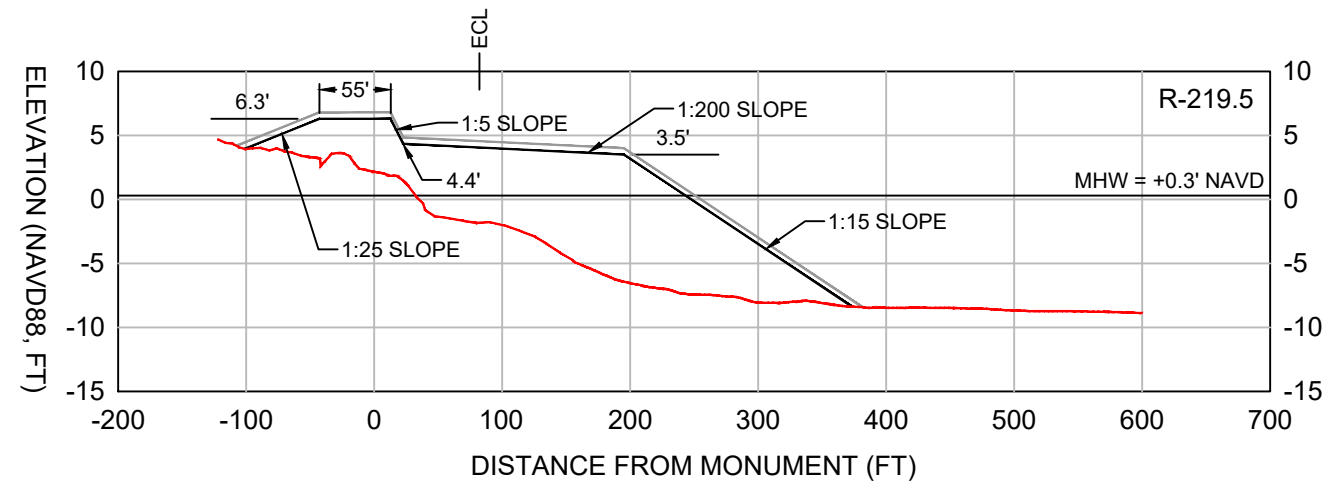
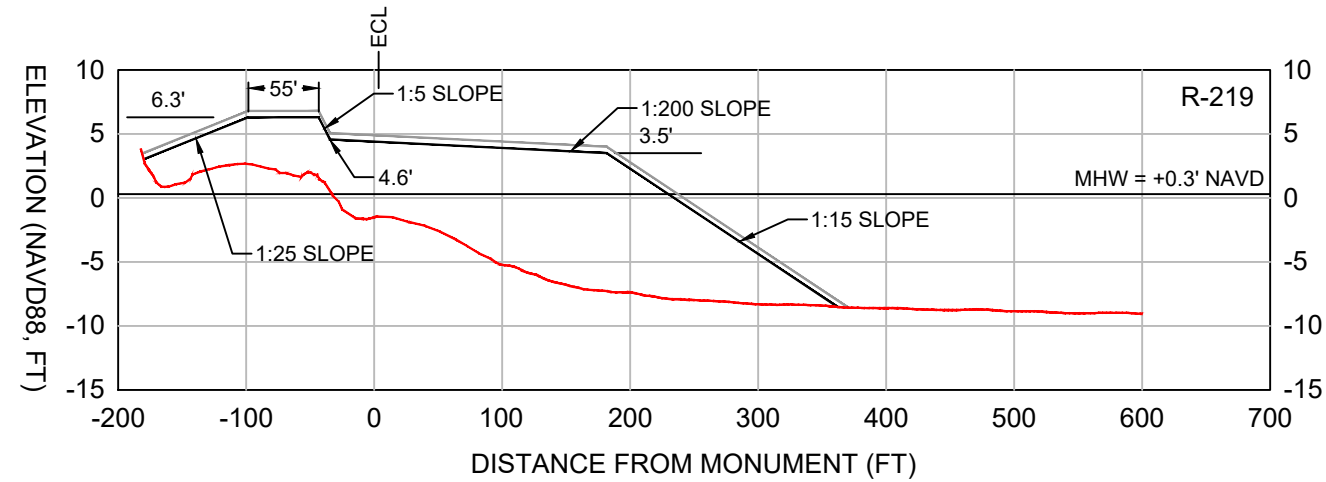
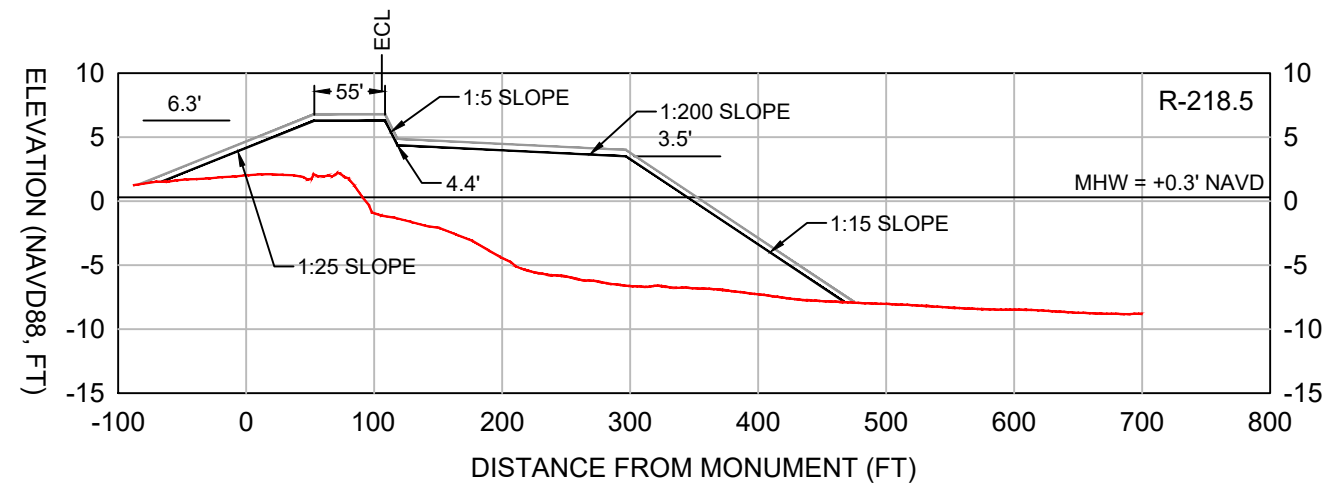
- NOTES:
1. TOPOGRAPHIC AND BATHYMETRIC DATA COLLECTED BY CEC, MAY 12, 2023.
 2. SEE SHEET 3 FOR SURVEY TRANSECT ALIGNMENT.
 3. A +0.5FT VERTICAL CONSTRUCTION TOLERANCE IS INCLUDED TO ACCOUNT FOR CONSTRUCTION METHODS AND CONSOLIDATION / SETTLEMENT OF THE FILL.



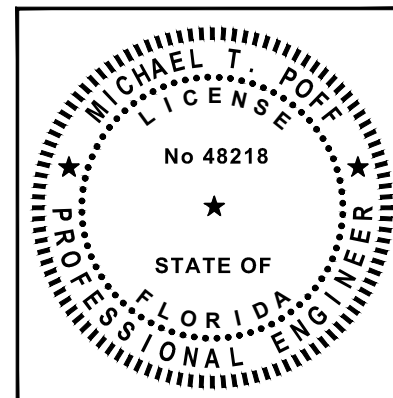
DATE: 01/18/2024	SCALE: AS NOTED	NO.	REVISION DESCRIPTION
DRAWN: JSD	F.B.	BY	
CHECKED: MTP	PG.	DATE	
SEC. TWP.	RNG.	NO.	
ACAD NO.: 22175	CPS 06-09_LK_PV-XS.DWG	BY	
REF. NO.		DATE	
LEE COUNTY			
LOVER'S KEY			
FILL TEMPLATE PROFILES			
CLIENT: COASTAL & MARINE ENGINEERING ENVIRONMENTAL & GEOLOGICAL SERVICES SURVEYING & MAPPING ENGINEERING: CA 2464 SURVEYING: LB 2464			
TITLE:			
PHONE: (239) 643-2324 FAX: (239) 643-1143 www.coastalengineering.com E-Mail: info@cecfl.com			
COASTAL ENGINEERING CONSULTANTS, INC. SERVING FLORIDA SINCE 1977 28421 BONITA CROSSINGS BLVD. BONITA SPRINGS, FL 34135			
SHEET 7 OF 25 FILE NO.: 22.175			



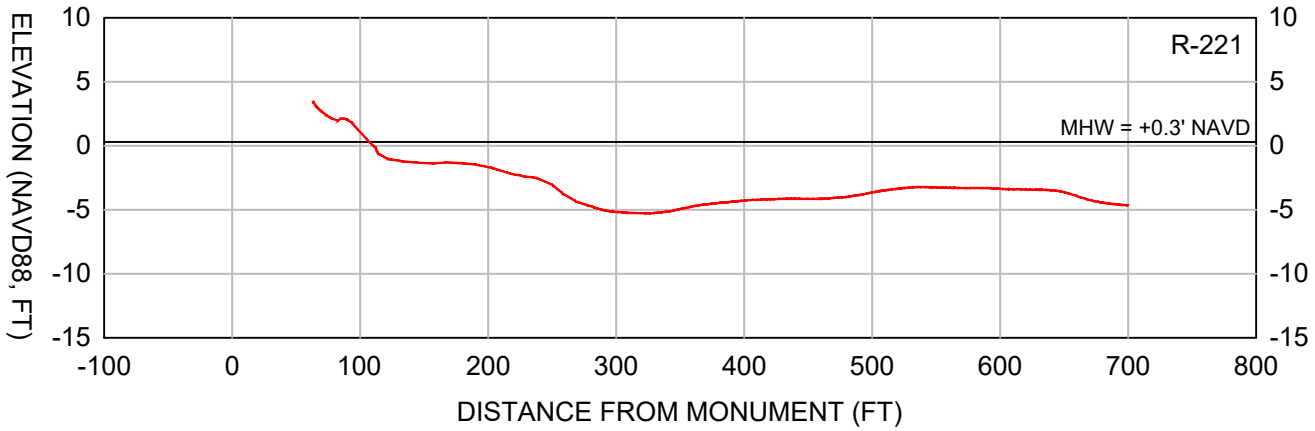
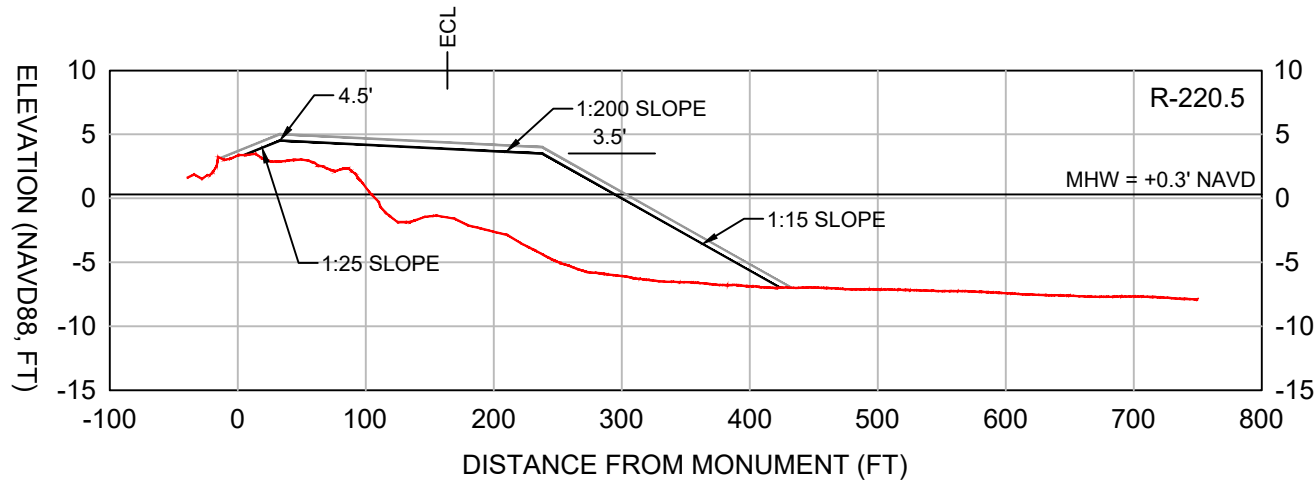
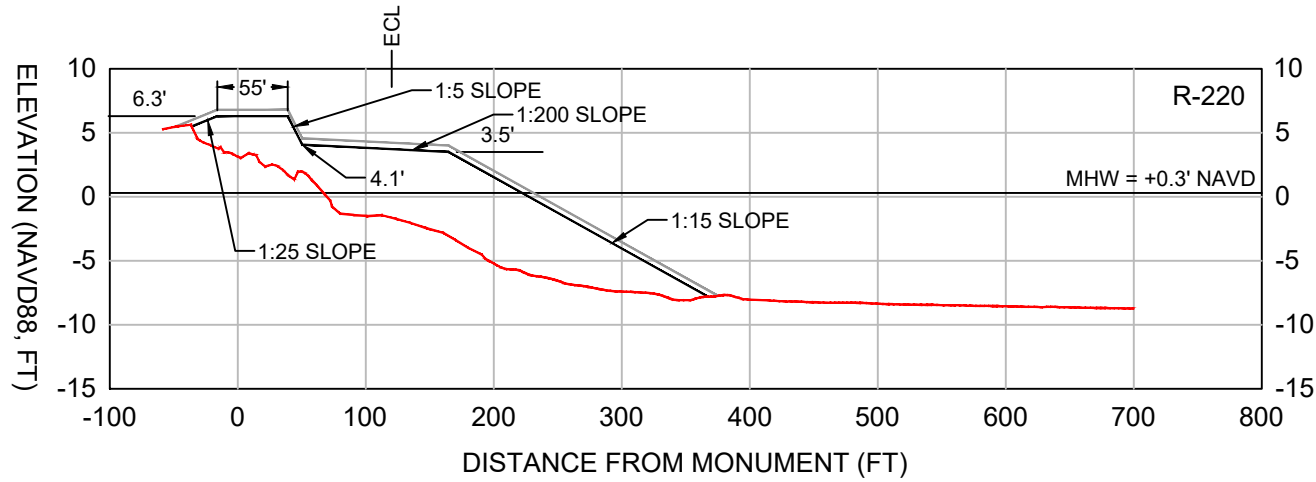
SCALE:
H: 1" = 150'
V: 1" = 15'



- NOTES:
1. TOPOGRAPHIC AND BATHYMETRIC DATA COLLECTED BY CEC, MAY 12, 2023.
 2. SEE SHEET 3 FOR SURVEY TRANSECT ALIGNMENT.
 3. A +0.5FT VERTICAL CONSTRUCTION TOLERANCE IS INCLUDED TO ACCOUNT FOR CONSTRUCTION METHODS AND CONSOLIDATION / SETTLEMENT OF THE FILL.



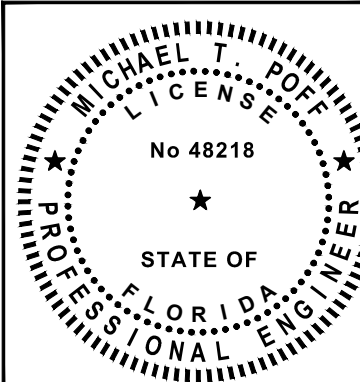
COASTAL & MARINE ENGINEERING ENVIRONMENTAL & GEOLOGICAL SERVICES SURVEYING & MAPPING ENGINEERING: CA 2464 SURVEYING: LB 2464		CLIENT: LEE COUNTY		DATE: 01/18/2024		SCALE: AS NOTED	
PHONE: (239) 643-2324 FAX: (239) 643-1143 www.coastalengineering.com E-Mail: info@cecfl.com		DRAWN: JSD		CHECKED: MTP		NO. DATE BY	
INC.		TITILE: LOVER'S KEY FILL TEMPLATE PROFILES		SEC. TWP. RANG.		ACAD NO.: 22175	
28421 BONITA CROSSINGS BLVD. BONITA SPRINGS, FL 34135		SHEET 8 OF 25		FILE NO.: 22.175		REVISION DESCRIPTION	



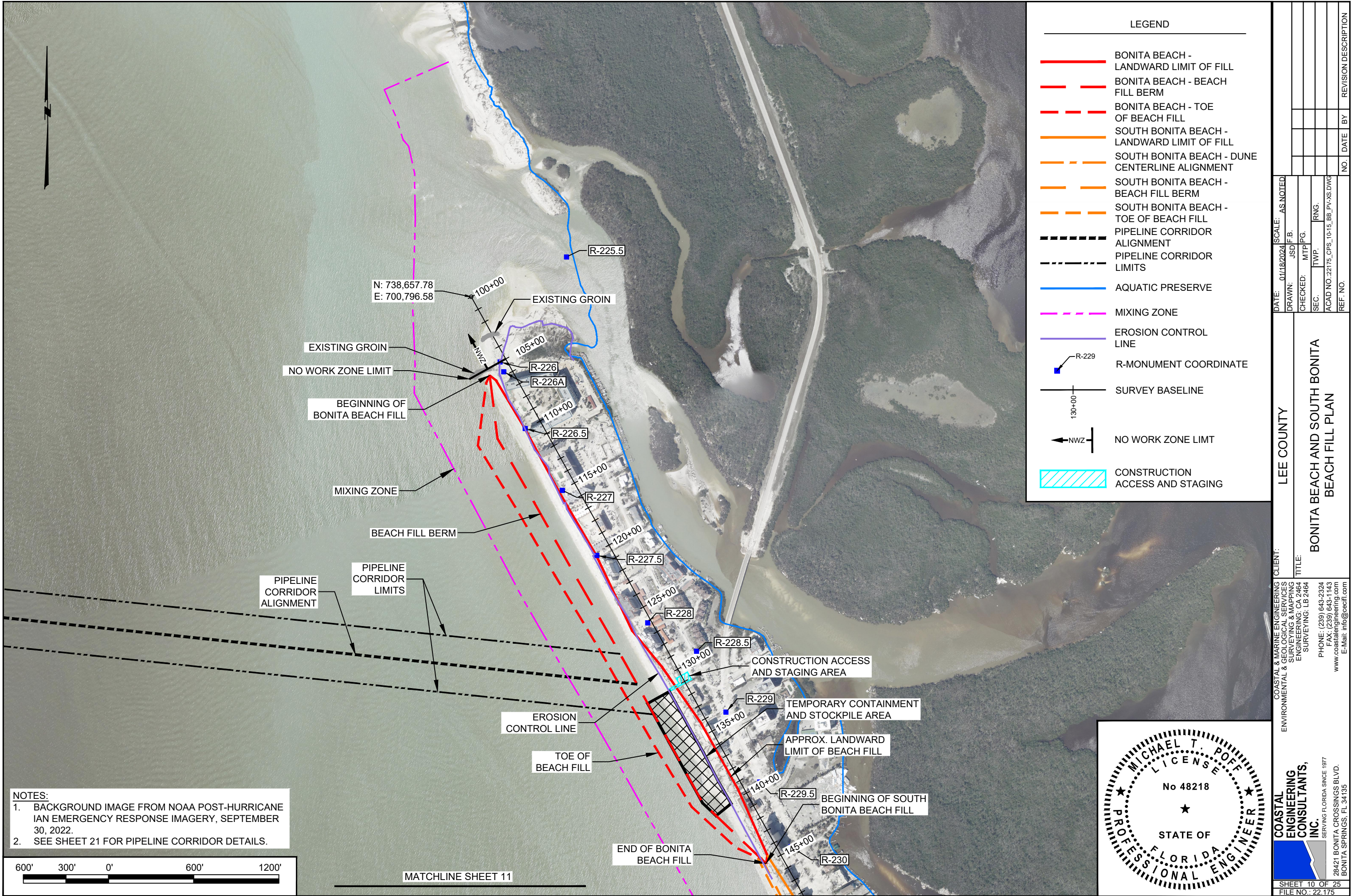
- LEGEND:
- DESIGN
 - CONSTRUCTION TOLERANCE
 - EXISTING GRADE (2022)

SCALE:
H: 1" = 150'
V: 1" = 15'

- NOTES:
- TOPOGRAPHIC AND BATHYMETRIC DATA COLLECTED BY CEC, MAY 12, 2023.
 - SEE SHEET 3 FOR SURVEY TRANSECT ALIGNMENT.
 - A +0.5FT VERTICAL CONSTRUCTION TOLERANCE IS INCLUDED TO ACCOUNT FOR CONSTRUCTION METHODS AND CONSOLIDATION / SETTLEMENT OF THE FILL.



COASTAL & MARINE ENGINEERING ENVIRONMENTAL & GEOLOGICAL SERVICES SURVEYING & MAPPING ENGINEERING: CA 2464 SURVEYING: LB 2464		CLIENT: LEE COUNTY		DATE: 01/18/2024	SCALE: AS NOTED
PHONE: (239) 643-2324 FAX: (239) 643-1143 www.coastalengineering.com E-Mail: info@cecfl.com		DRAWN: JSD F.B.		NO.	BY
28421 BONITA CROSSINGS BLVD. BONITA SPRINGS, FL 34135		CHECKED: MTP PG.		DATE	REVISION DESCRIPTION
INC. SERVING FLORIDA SINCE 1977		SEC. TWP. RING.			
SHEET 9 OF 25		ACAD NO.: 22175 CPS 06-09_LK_PV-XS.DWG			
FILE NO.: 22.175		REF. NO.			
LOVER'S KEY		FILL TEMPLATE PROFILES			



LEGEND

BONITA BEACH - LANDWARD LIMIT OF FILL

BONITA BEACH - BEACH FILL BERM

BONITA BEACH - TOE OF BEACH FILL

SOUTH BONITA BEACH - LANDWARD LIMIT OF FILL

SOUTH BONITA BEACH - DUNE CENTERLINE ALIGNMENT

SOUTH BONITA BEACH - BEACH FILL BERM

SOUTH BONITA BEACH - TOE OF BEACH FILL

PIPELINE CORRIDOR ALIGNMENT

PIPELINE CORRIDOR LIMITS

AQUATIC PRESERVE

MIXING ZONE

EROSION CONTROL LINE

R-MONUMENT COORDINATE

SURVEY BASELINE

NO WORK ZONE LIMIT

CONSTRUCTION ACCESS AND STAGING

DATE: 01/18/2024

SCALE: AS NOTED

DRAWN: JSD/F.B.

CHECKED: MTP/P.G.

SEC: TWP.

RNG.

ACAD NO.: 22175

CPS: 10-15

BB: PV-XS

DWG.

REF. NO.

NO.

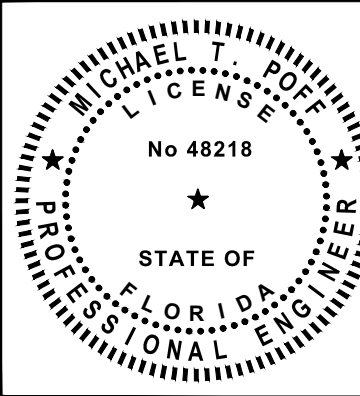
DATE

BY

REVISION DESCRIPTION

LEE COUNTY

BONITA BEACH AND SOUTH BONITA BEACH FILL PLAN



COASTAL & MARINE ENGINEERING ENVIRONMENTAL & GEOLOGICAL SERVICES SURVEYING & MAPPING ENGINEERING: CA 2464 SURVEYING: LB 2464

PHONE: (239) 643-2324 FAX: (239) 643-1143 www.coastalengineering.com E-Mail: info@cecfl.com

CLIENT:

LEE COUNTY

TITLE:

BONITA BEACH AND SOUTH BONITA BEACH FILL PLAN

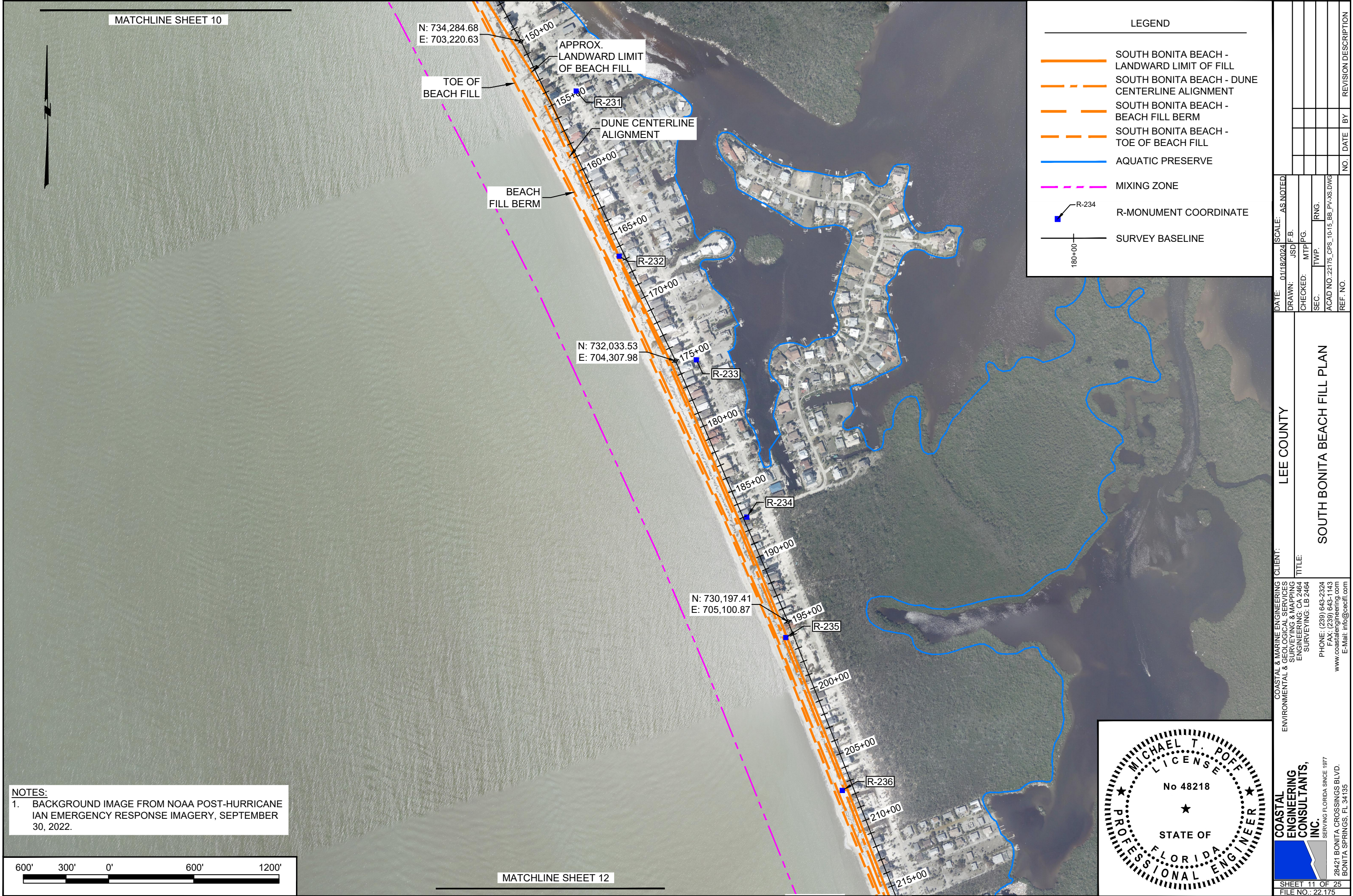
COASTAL ENGINEERING CONSULTANTS, INC.

SERVING FLORIDA SINCE 1977

28421 BONITA CROSSINGS BLVD. BONITA SPRINGS, FL 34135

SHEET 10 OF 25

FILE NO.: 22.175



MATCHLINE SHEET 10

N: 734,284.68
E: 703,220.63

TOE OF
BEACH FILL

APPROX.
LANDWARD LIMIT
OF BEACH FILL

DUNE CENTERLINE
ALIGNMENT

BEACH
FILL BERM

N: 732,033.53
E: 704,307.98

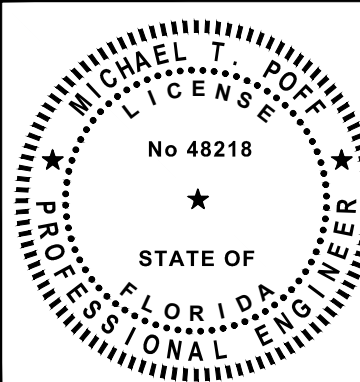
N: 730,197.41
E: 705,100.87

MATCHLINE SHEET 12

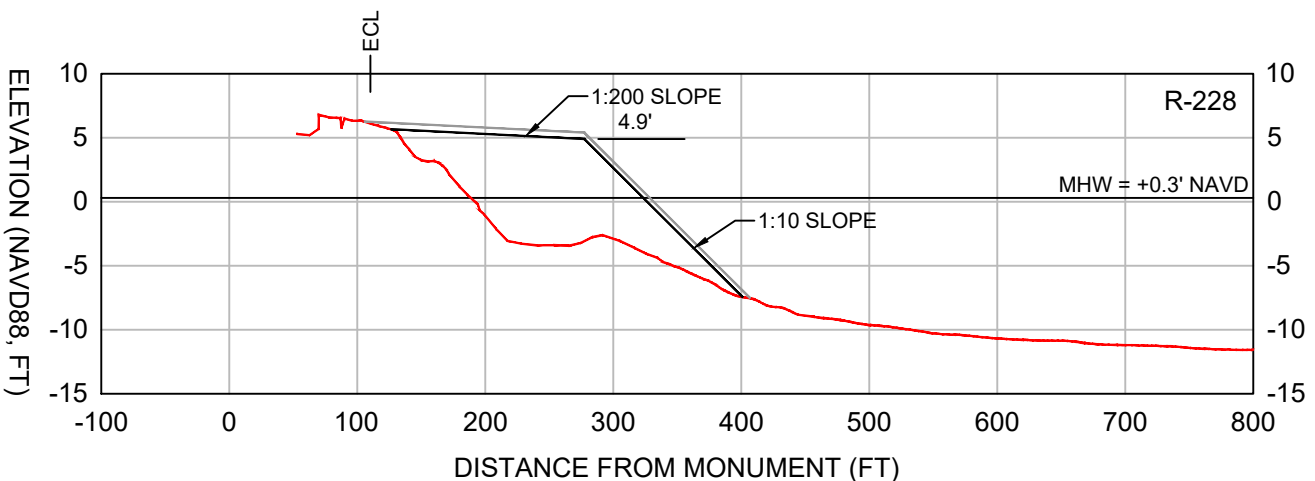
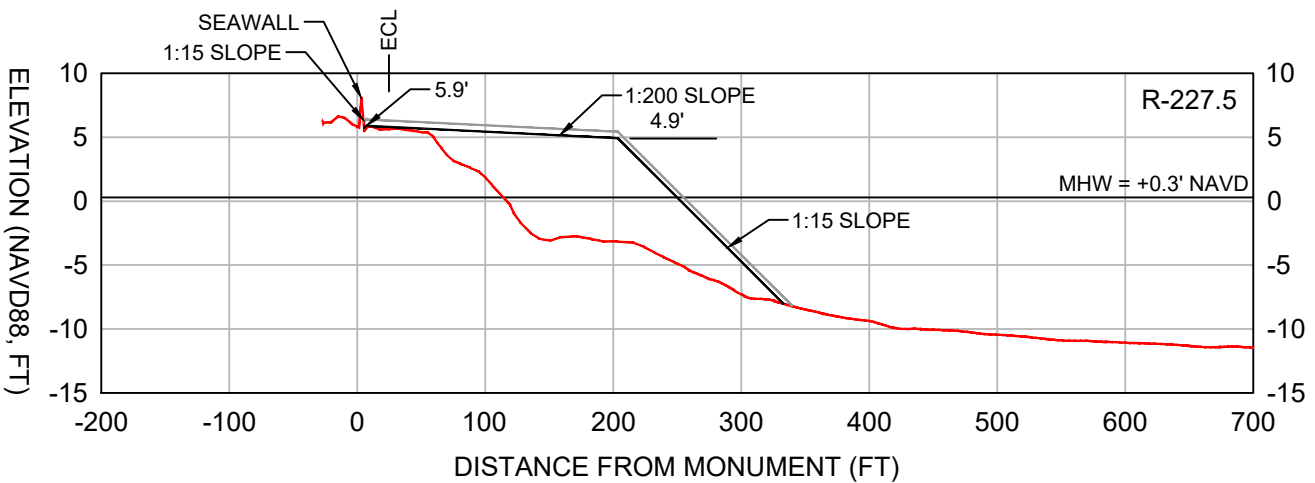
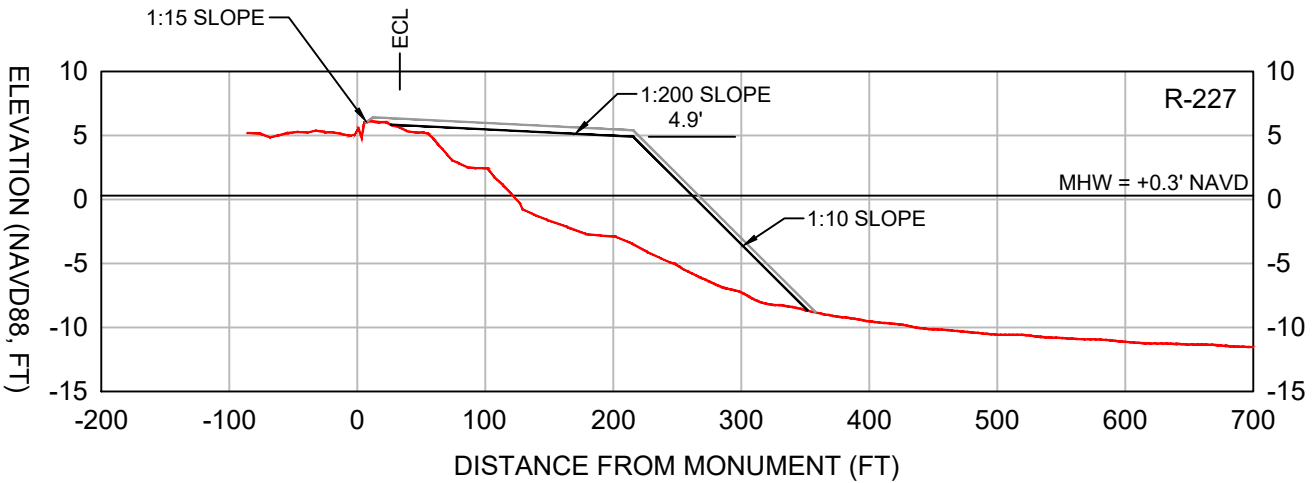
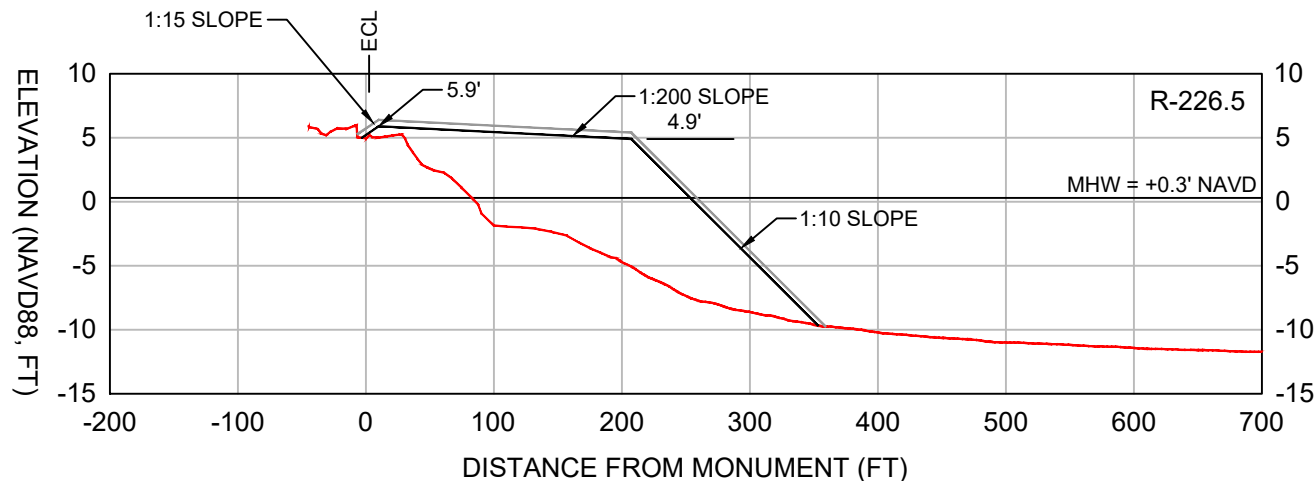
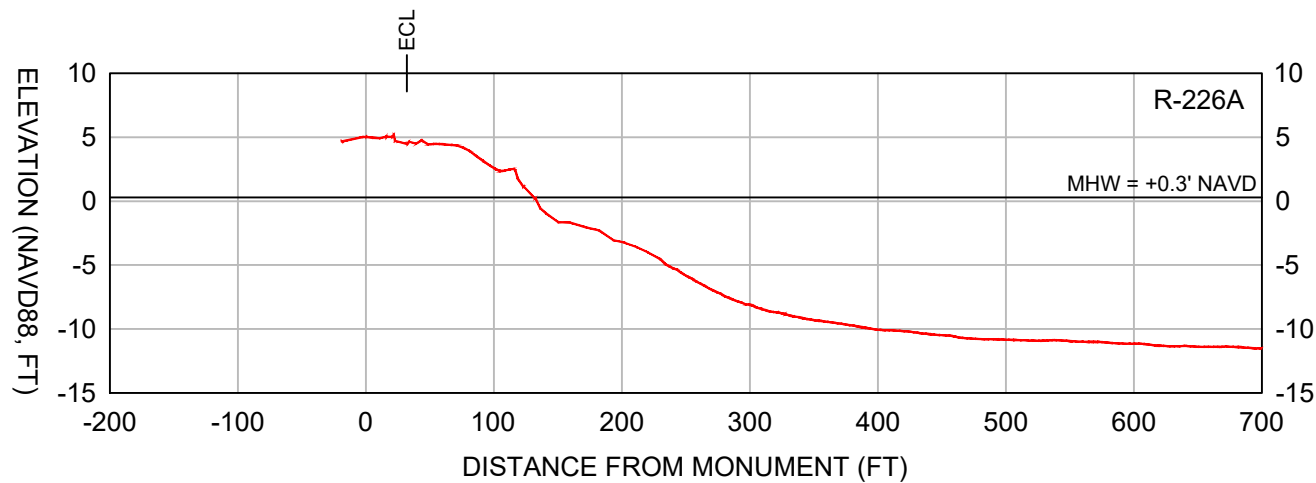
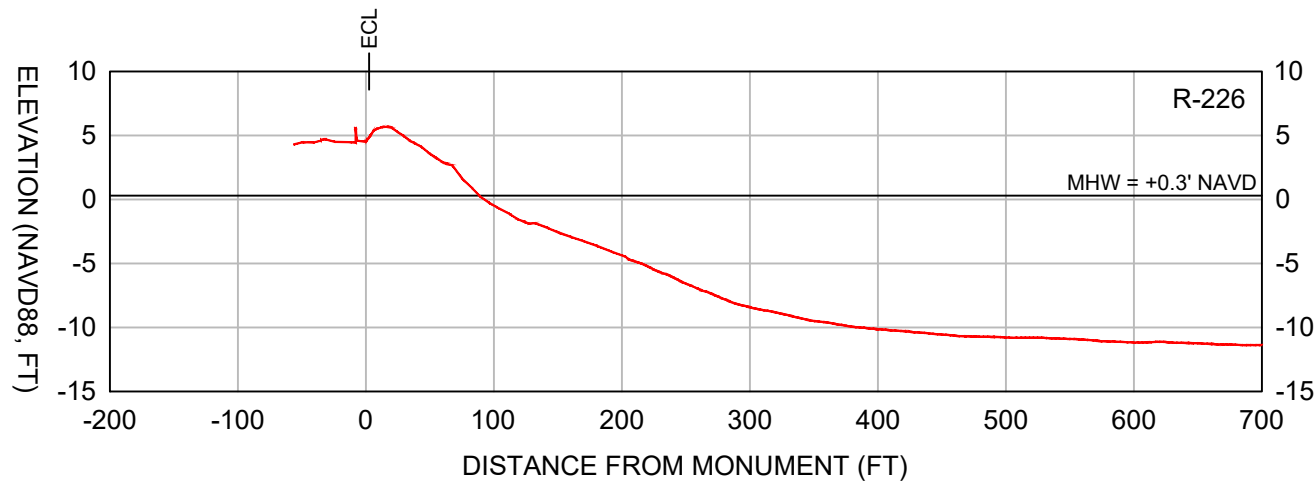
LEGEND

- SOUTH BONITA BEACH - LANDWARD LIMIT OF FILL
- SOUTH BONITA BEACH - DUNE CENTERLINE ALIGNMENT
- SOUTH BONITA BEACH - BEACH FILL BERM
- SOUTH BONITA BEACH - TOE OF BEACH FILL
- AQUATIC PRESERVE
- MIXING ZONE
- R-MONUMENT COORDINATE
- SURVEY BASELINE

NOTES:
1. BACKGROUND IMAGE FROM NOAA POST-HURRICANE IAN EMERGENCY RESPONSE IMAGERY, SEPTEMBER 30, 2022.



DATE: 01/18/2024		SCALE: AS NOTED		DRAWN: JSD/F.B.		CHECKED: MTP/PG.		SEC. TWP. RNG.		ACAD NO.: 22175 CPS, 10-15_BB_PV-XS.DWG		REF. NO.		NO.		DATE		BY		REVISION DESCRIPTION	
CLIENT: LEE COUNTY		TITLE: SOUTH BONITA BEACH FILL PLAN		COASTAL & MARINE ENGINEERING ENVIRONMENTAL & GEOLOGICAL SERVICES SURVEYING & MAPPING ENGINEERING: CA 2464 SURVEYING: LB 2464		PHONE: (239) 643-2324 FAX: (239) 643-1143 www.coastalengineering.com E-Mail: info@cecfl.com		INC. SERVING FLORIDA SINCE 1977		28421 BONITA CROSSINGS BLVD. BONITA SPRINGS, FL 34135		SHEET 11 OF 25		FILE NO.: 22.175							



LEGEND:

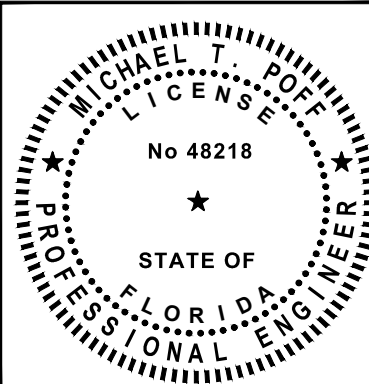
— DESIGN

— CONSTRUCTION TOLERANCE

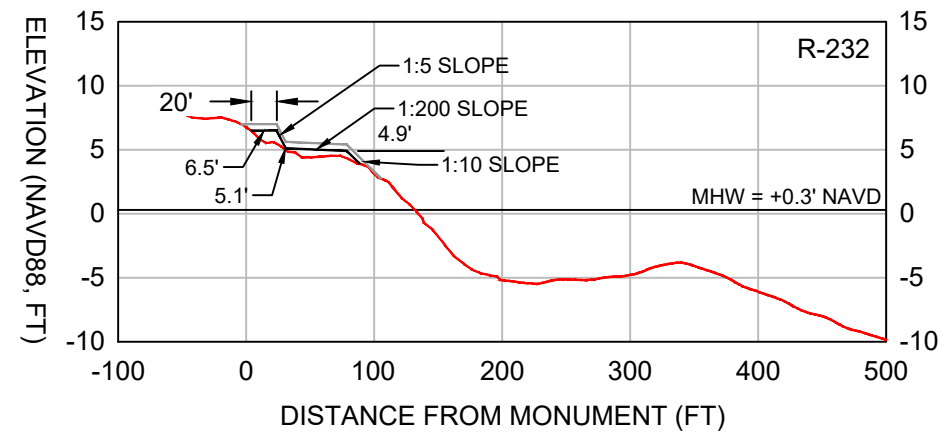
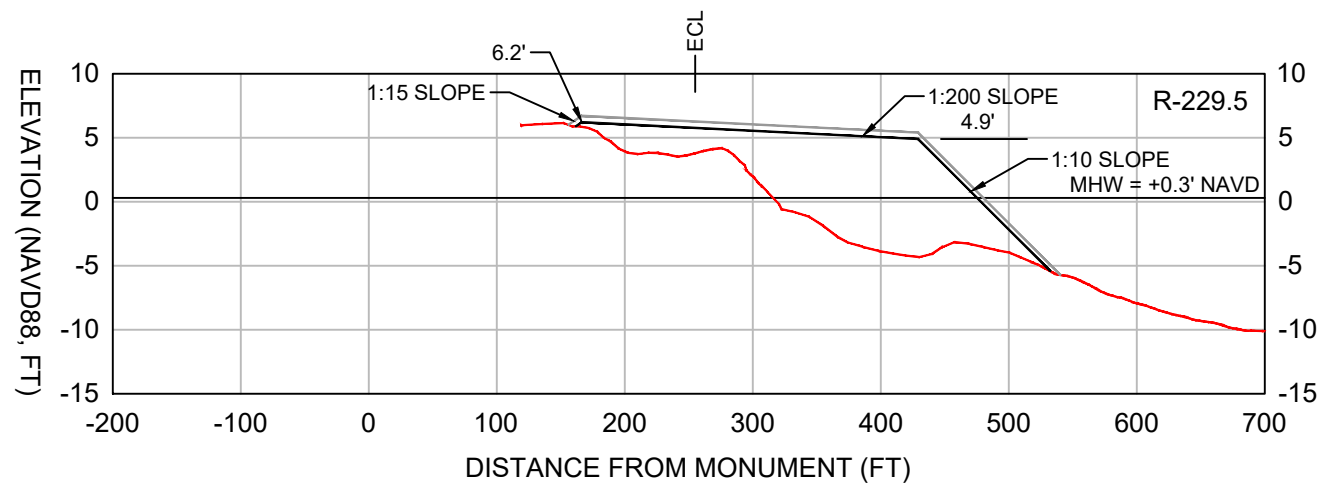
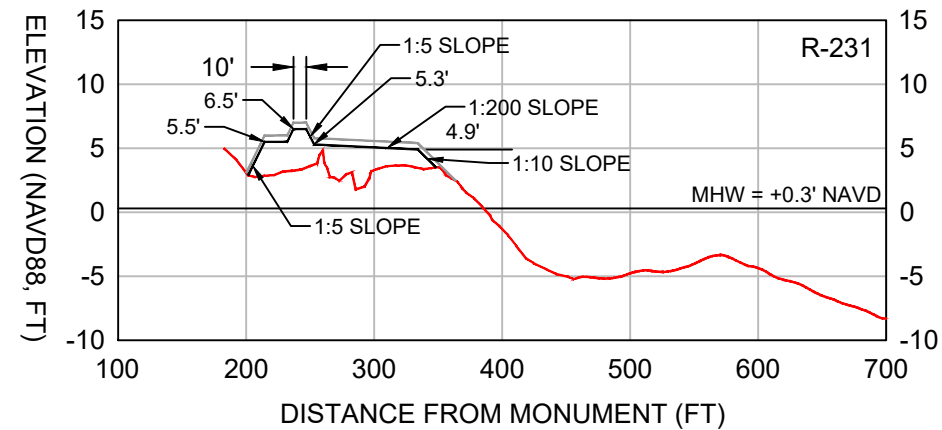
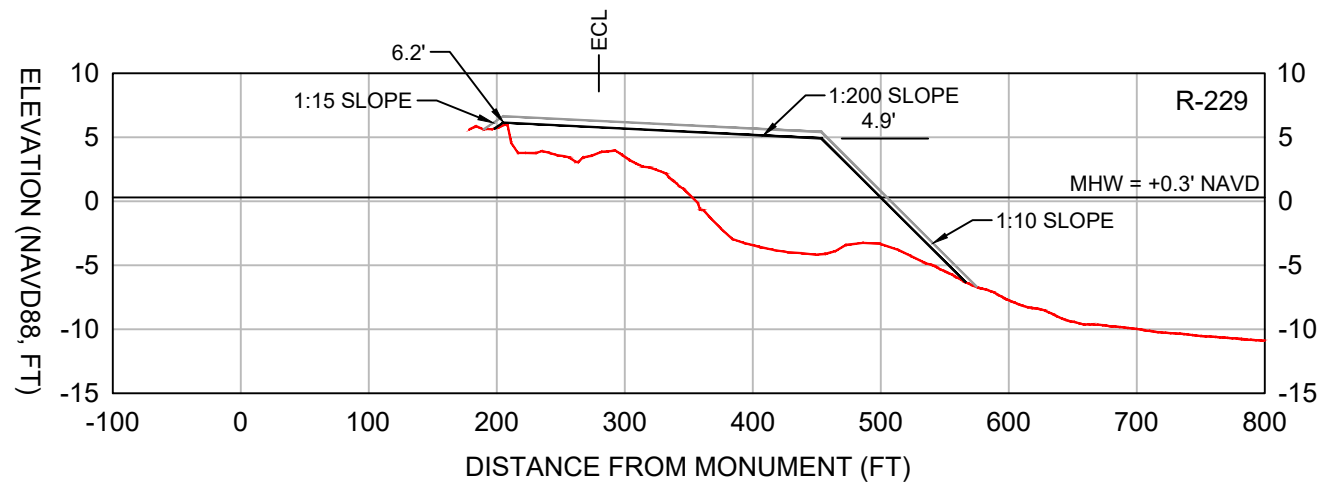
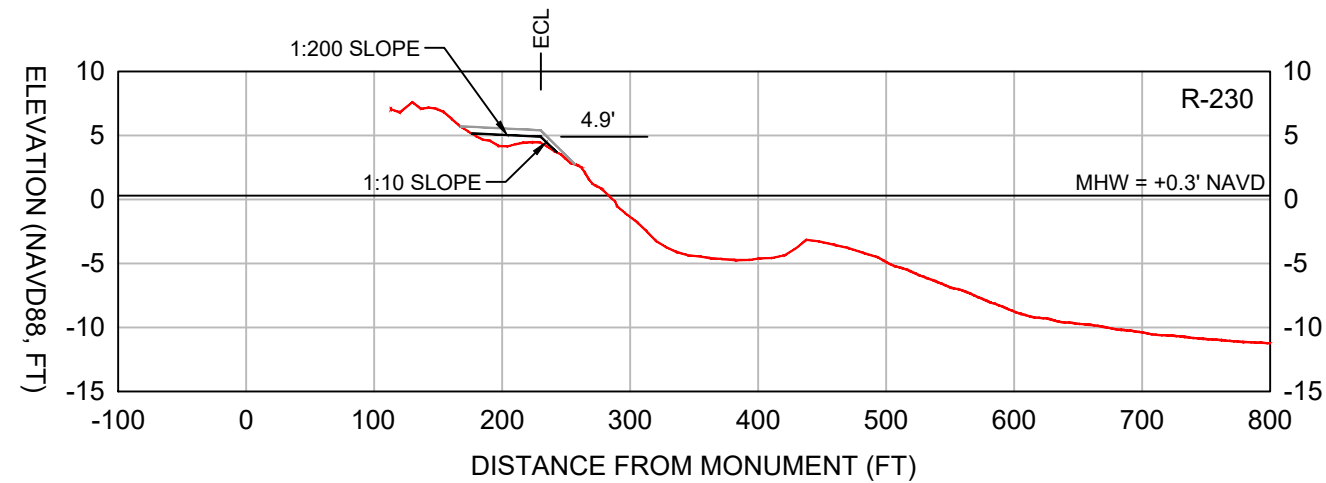
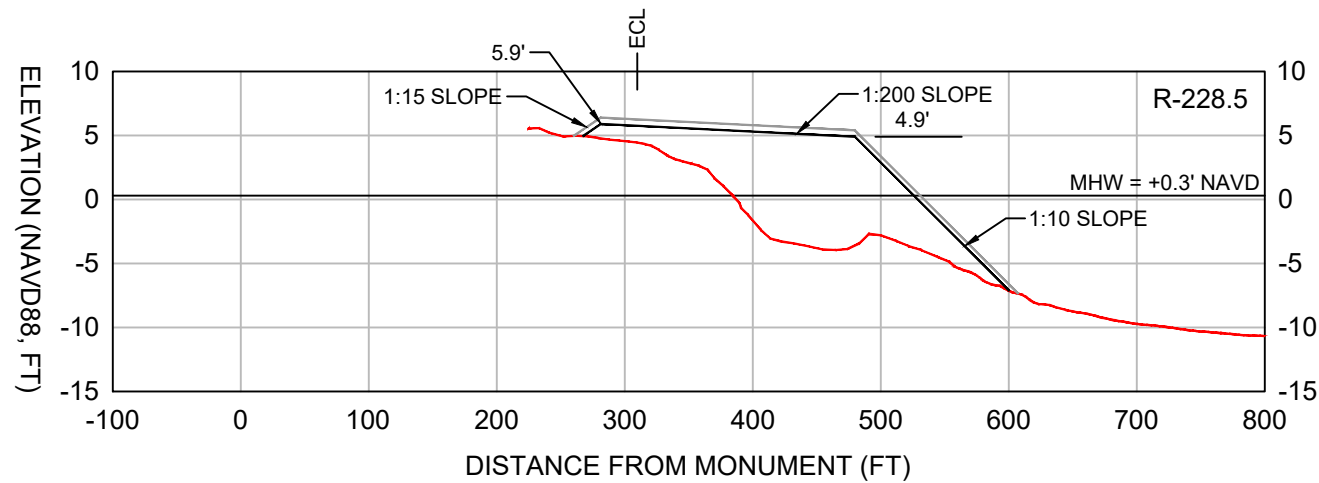
— EXISTING GRADE

SCALE:
H: 1" = 150'
V: 1" = 15'

- NOTES:
1. TOPOGRAPHIC AND BATHYMETRIC DATA COLLECTED BY CEC, MAY 11, 2023.
 2. SEE SHEET 4 FOR SURVEY TRANSECT ALIGNMENT.
 3. A +0.5 FT VERTICAL CONSTRUCTION TOLERANCE IS INCLUDED TO ACCOUNT FOR CONSTRUCTION METHODS AND CONSOLIDATION / SETTLEMENT OF THE FILL.



COASTAL & MARINE ENGINEERING ENVIRONMENTAL & GEOLOGICAL SERVICES SURVEYING & MAPPING ENGINEERING: CA 2464 SURVEYING: LB 2464		CLIENT: LEE COUNTY		DATE: 01/18/2024		SCALE: AS NOTED	
ENGINEERING CONSULTANTS, INC.		TITLE: BONITA BEACH FILL TEMPLATE PROFILES		DRAWN: JSD		F.B.	
SERVING FLORIDA SINCE 1977		CHECKED: MTP		PG.		RNG.	
28421 BONITA CROSSINGS BLVD. BONITA SPRINGS, FL 34135		SEC.		TWP.		ACAD NO.: 22175	
SHEET 13 OF 25		REF. NO.		NO.		BY	
FILE NO.: 22.175		ACAD NO.: 22175		DATE		REVISION DESCRIPTION	



LEGEND:

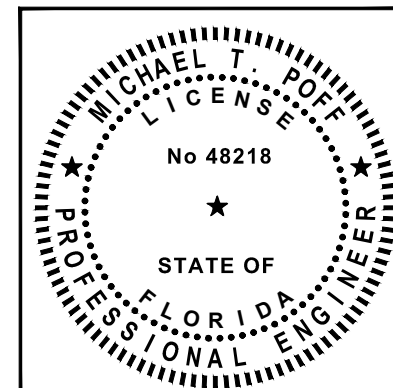
— DESIGN

— CONSTRUCTION TOLERANCE

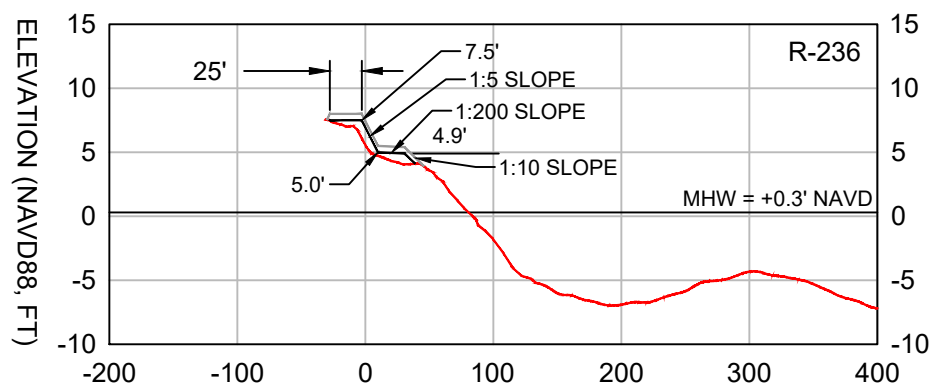
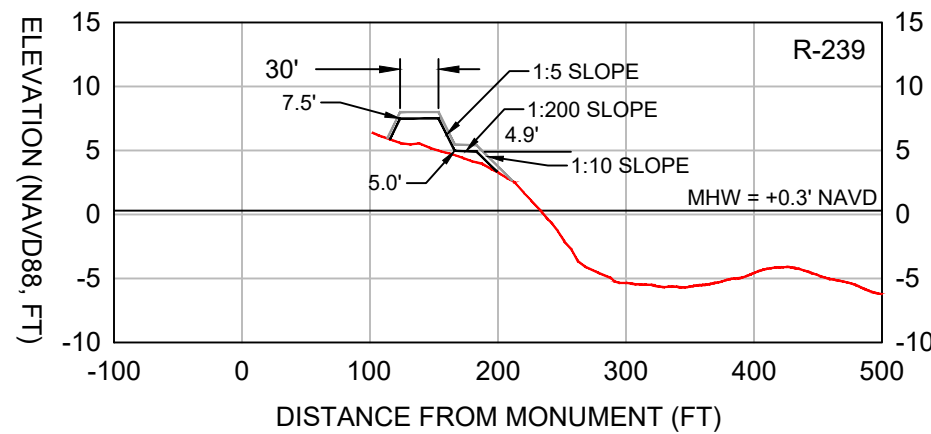
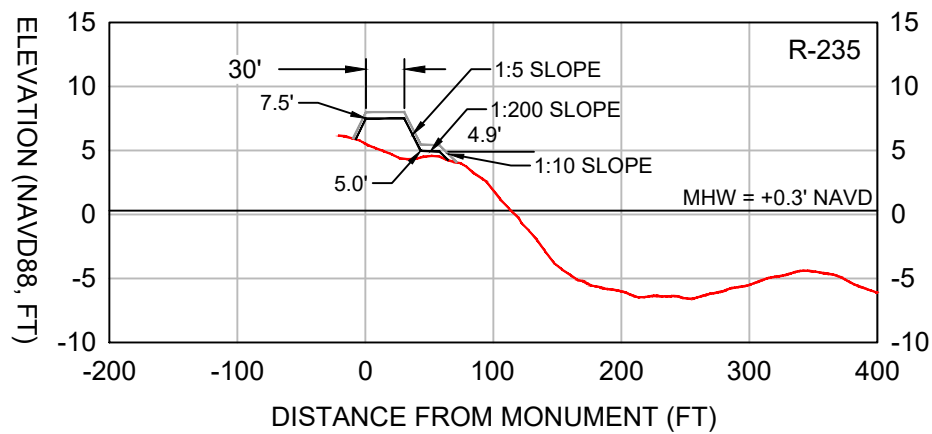
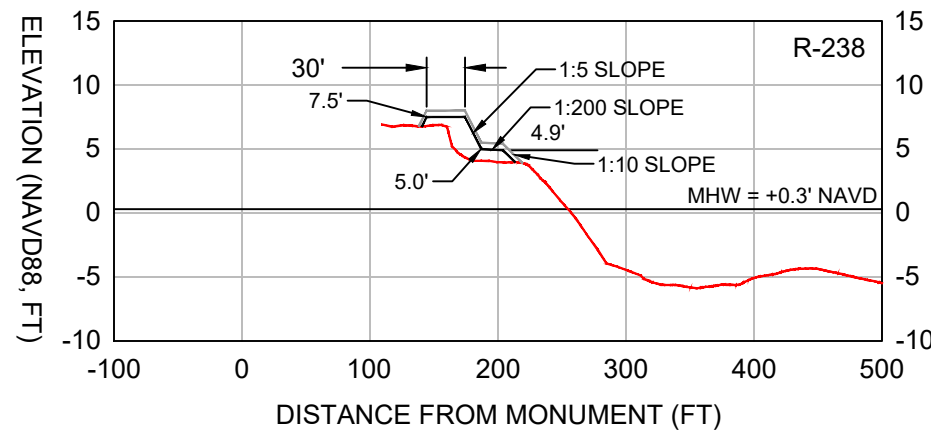
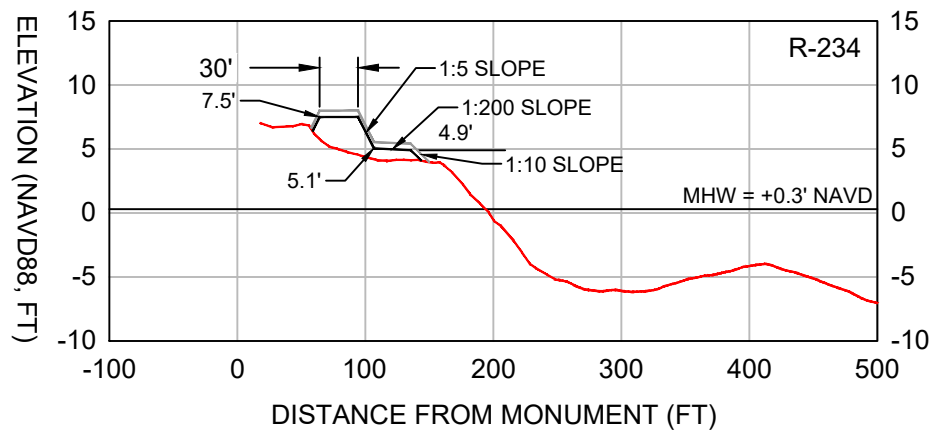
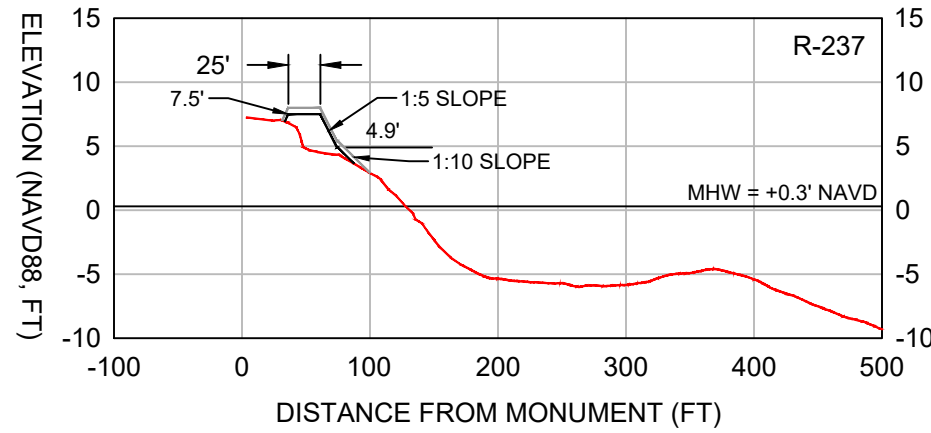
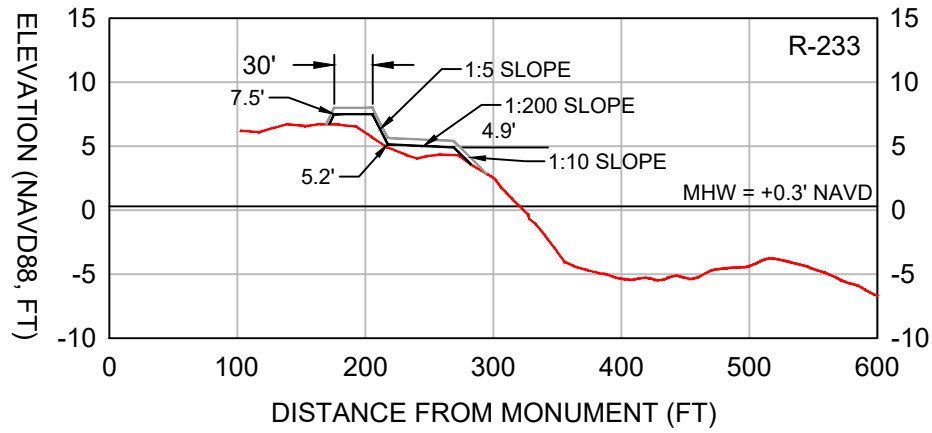
— EXISTING GRADE

SCALE:
H: 1" = 150'
V: 1" = 15'

- NOTES:
1. TOPOGRAPHIC AND BATHYMETRIC DATA COLLECTED BY CEC, MAY 11, 2023.
 2. SEE SHEET 4 FOR SURVEY TRANSECT ALIGNMENT.
 3. A +0.5 FT VERTICAL CONSTRUCTION TOLERANCE IS INCLUDED TO ACCOUNT FOR CONSTRUCTION METHODS AND CONSOLIDATION / SETTLEMENT OF THE FILL.



		COASTAL ENGINEERING CONSULTANTS, INC.		SERVING FLORIDA SINCE 1977	
28421 BONITA CROSSINGS BLVD. BONITA SPRINGS, FL 34135		PHONE: (239) 643-2324 FAX: (239) 643-1143 www.coastalengineering.com E-Mail: info@cecfl.com			
SHEET 14 OF 25		CLIENT: LEE COUNTY		DATE: 01/18/2024	
FILE NO.: 22-175		DRAWN: JSD		SCALE: AS NOTED	
		CHECKED: MTP		F.B.	
		SEC.		TWP.	
		RNG.			
		ACAD NO. 22175		CPS 10-15_BB_PV-XS.DWG	
		REF. NO.			
		NO.		DATE	
		BY		REVISION DESCRIPTION	



SCALE:
H: 1" = 150'
V: 1" = 15'

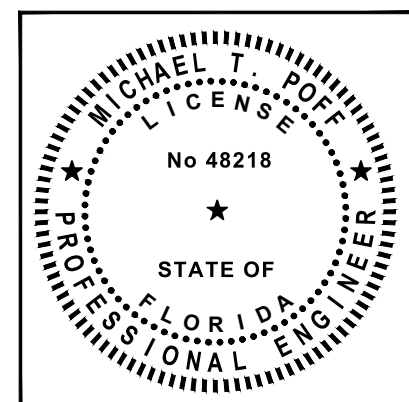
- NOTES:
1. TOPOGRAPHIC AND BATHYMETRIC DATA COLLECTED BY CEC, MAY 11, 2023.
 2. SEE SHEET 4 FOR SURVEY TRANSECT ALIGNMENT.
 3. A +0.5 FT VERTICAL CONSTRUCTION TOLERANCE IS INCLUDED TO ACCOUNT FOR CONSTRUCTION METHODS AND CONSOLIDATION / SETTLEMENT OF THE FILL.

LEGEND:

— DESIGN

— CONSTRUCTION TOLERANCE

— EXISTING GRADE



DATE: 01/18/2024		SCALE: AS NOTED	
DRAWN: JSD		F.B.	
CHECKED: MTP		PG.	
SEC.		TWP.	
ACAD NO.: 22175		CPS: 10-15, BB, PV-XS, DWG	
REF. NO.		NO.	
BY		DATE	
REVISION DESCRIPTION			

CLIENT: LEE COUNTY

TITLE: SOUTH BONITA BEACH FILL TEMPLATE PROFILES

COASTAL & MARINE ENGINEERING ENVIRONMENTAL & GEOLOGICAL SERVICES SURVEYING & MAPPING ENGINEERING: CA 2464 SURVEYING: LB 2464

PHONE: (239) 643-2324 FAX: (239) 643-1143 www.coastalengineering.com E-Mail: info@cecfl.com

COASTAL ENGINEERING CONSULTANTS, INC. SERVING FLORIDA SINCE 1977 28421 BONITA CROSSINGS BLVD. BONITA SPRINGS, FL 34135

SHEET 15 OF 25 FILE NO.: 22.175

NOTES:

- BATHYMETRIC CONTOURS FROM SURVEY CONDUCTED BY OSI IN JULY 2021.
- GEOTECHNICAL INVESTIGATION CONDUCTED BY GFA INTERNATIONAL AND AMDRILL, INC., 2020 AND 2021.
- ELEVATIONS ARE NAVD88, US SURVEY FEET.

N: 744,052.40
E: 532,777.20

BORROW AREA					
BOUNDARY COORDINATE TABLE					
POINT	NORTHING	EASTING	POINT	NORTHING	EASTING
BA-01	744,348	534,313	BA-12	742,399	536,602
BA-02	746,761	536,798	BA-13	742,604	536,319
BA-03	746,569	536,950	BA-14	742,666	536,130
BA-04	745,981	537,420	BA-15	742,927	534,844
BA-05	745,785	537,576	BA-16	743,330	534,330
BA-06	745,276	537,770	BA-17	744,016	534,319
BA-07	744,768	537,964	BA-18	744,153	535,537
BA-08	744,115	538,368	BA-19	743,615	536,059
BA-09	743,897	538,503	BA-20	744,346	536,813
BA-10	742,821	539,548	BA-21	742,718	536,930
BA-11	741,358	538,041	BA-22	743,449	537,683

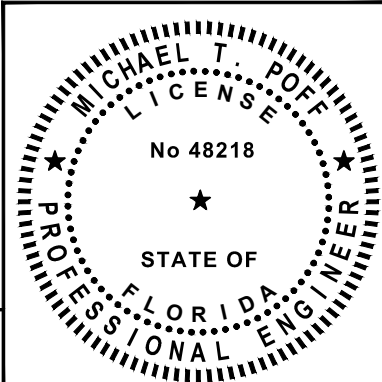
SURVEY BASELINE
N44° 09' 05.95"W
8,000'

N: 739,747.41
E: 536,956.56



LEGEND	
-55	DESIGN CUT TOE AND ELEVATION (FT)
-29	BATHYMETRIC CONTOUR (OSI, 2021)
VC-20_1-1	GEOTECHNICAL VIBRACORE (GFA, 2020)
VC-21_1-4	GEOTECHNICAL VIBRACORE (AMDRILL, 2020-2021)
AA	LIMITS OF ANCHORING
BA-01	BORROW AREA ALIGNMENT COORDINATE
60+00	SURVEY BASELINE

VIBRACORE		
COORDINATE TABLE		
POINT	NORTHING	EASTING
VC-20_1-1	745,857	534,664
VC-20_1-2	744,374	536,027
VC-20_1-3	742,901	537,375
VC-21_1-4	742,837	538,744
VC-21_1-5	742,847	538,027
VC-21_1-6	742,790	536,860
VC-21_1-7	743,545	537,361
VC-21_1-8	743,544	536,609
VC-21_1-9	743,893	535,617
VC-21_1-10	744,960	535,982
VC-21_1-11	743,893	534,890
VC-21_1-12	744,251	534,552
VC-21_1-13	744,956	535,260
VC-21_1-14	742,123	538,003
VC-21_1-15	742,152	537,304
VC-21_1-16	743,530	538,053
VC-21_1-17	744,588	537,700
VC-21_1-18	742,855	535,909
VC-21_1-19	744,334	536,873
VC-21_1-20	745,482	537,231
VC-21_1-21	743,280	534,986
VC-21_1-22	745,641	536,680
VC-21_1-23	745,641	535,989



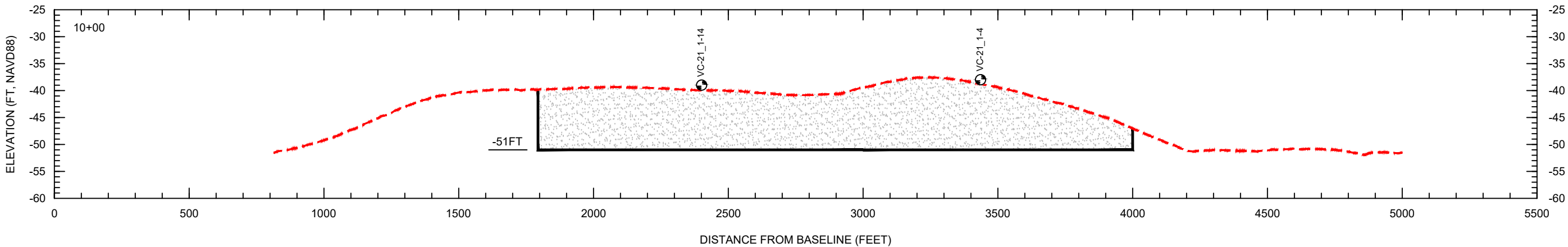
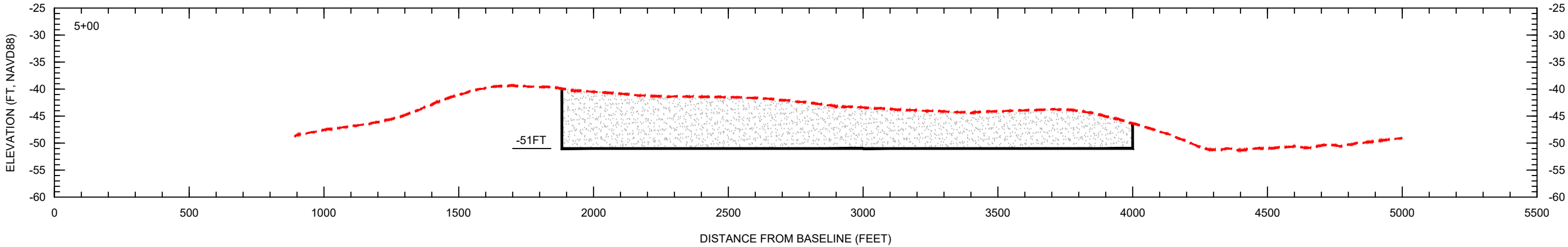
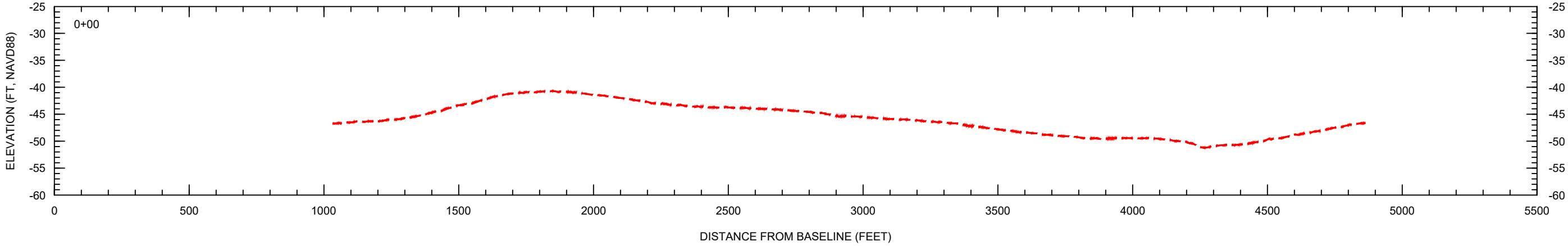
DATE: 01/18/2024
DRAWN: JSD
CHECKED: MTP
SEC: TWP
ACAD NO.: 22175_CPS_16-20_Borrow Area.DWG
REF. NO.

SCALE: AS NOTED
F.B.

CLIENT: LEE COUNTY
TITLE: OFFSHORE BORROW AREA PLAN VIEW

COASTAL & MARINE ENGINEERING
ENVIRONMENTAL & GEOLOGICAL SERVICES
SURVEYING & MAPPING
ENGINEERING: CA 2464
SURVEYING: LB 2464
PHONE: (239) 643-2324
FAX: (239) 643-1143
www.coastalengineering.com
E-Mail: info@cecfll.com

PROFESSIONAL ENGINEER
MICHAEL T. POFF
LICENSE NO. 48218
STATE OF FLORIDA
SHEET 16 OF 25
FILE NO.: 22.175



SCALE:
H: 1" = 400'
V: 1" = 20'

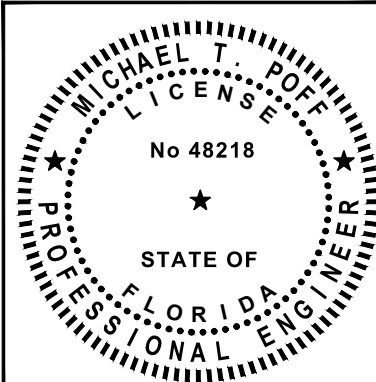
LEGEND:

--- EXISTING GRADE

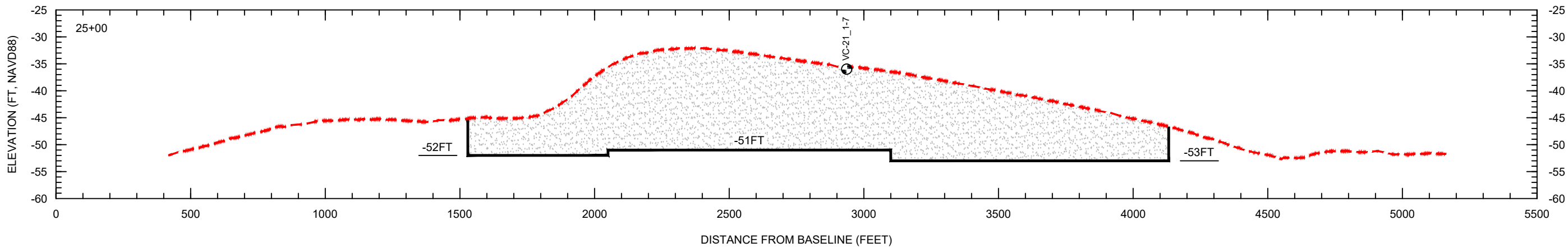
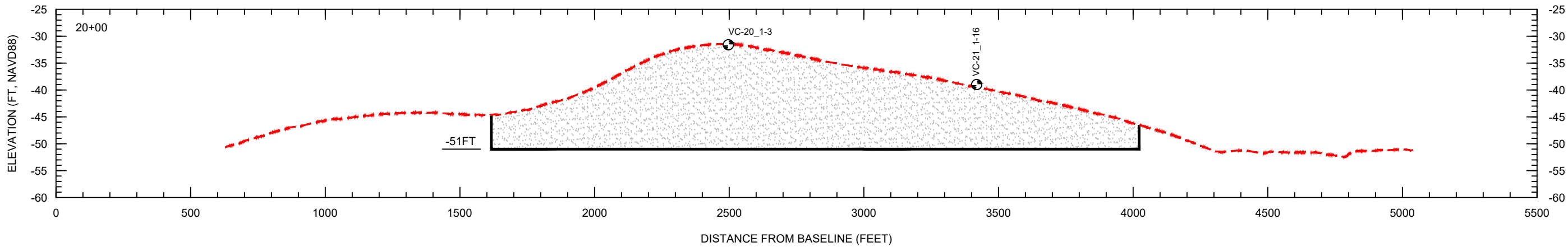
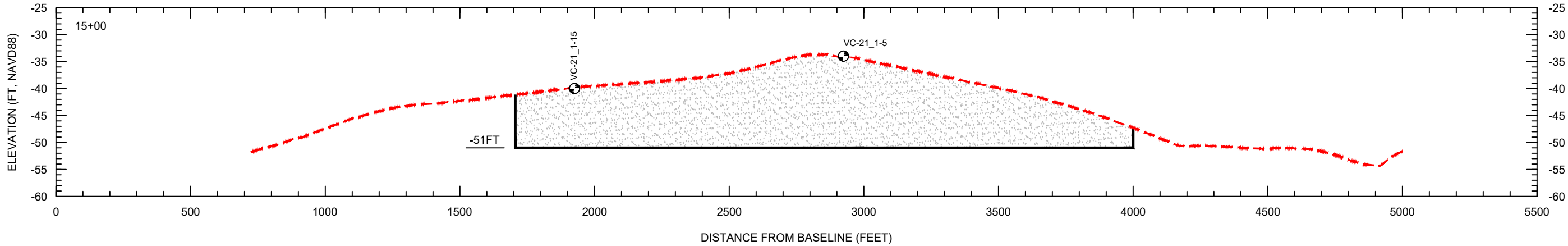
DESIGN DREDGE CUT

VC-21_1-4
VIBRACORE

- NOTES:
1. GEOPHYSICAL DATA FROM OSI, 2021.
 2. GEOTECHNICAL DATA FROM GFA INTERNATIONAL AND AMDRILL, INC. 2020 and 2021.
 3. ELEVATIONS ARE SHOWN IN NAVD88 U.S. SURVEY FEET.



COASTAL & MARINE ENGINEERING ENVIRONMENTAL & GEOLOGICAL SERVICES SURVEYING & MAPPING ENGINEERING: CA 2464 SURVEYING: LB 2464		CLIENT: LEE COUNTY		DATE: 01/18/2024		SCALE: AS NOTED	
COASTAL ENGINEERING CONSULTANTS, INC.		TITLE: BORROW AREA SECTIONS		DRAWN: JSD F.B.		CHECKED: MTP PG.	
28421 BONITA CROSSINGS BLVD. BONITA SPRINGS, FL 34135		SERVING FLORIDA SINCE 1977		SEC. TWP. RING.		ACAD NO.: 22175_CPS_16-20_Borrow Area DWG	
SHEET 17 OF 25 FILE NO.: 22.175		REF. NO.		NO.		REVISION DESCRIPTION	
				BY			
				DATE			



- NOTES:
1. GEOPHYSICAL DATA FROM OSI, 2021.
 2. GEOTECHNICAL DATA FROM GFA INTERNATIONAL AND AMDRILL, INC. 2020 and 2021.
 3. ELEVATIONS ARE SHOWN IN NAVD88 U.S. SURVEY FEET.

SCALE:
H: 1" = 400'
V: 1" = 20'

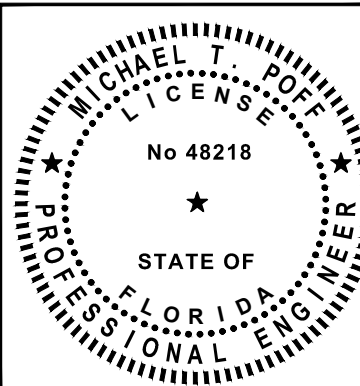
LEGEND:

EXISTING GRADE

DESIGN DREDGE CUT

VC-21_1-16

VIBRACORE



COASTAL & MARINE ENGINEERING
ENVIRONMENTAL & GEOLOGICAL SERVICES
SURVEYING & MAPPING
ENGINEERING: CA 2464
SURVEYING: LB 2464

COASTAL
ENGINEERING
CONSULTANTS,
INC.

28421 BONITA CROSSINGS BLVD.
BONITA SPRINGS, FL 34135

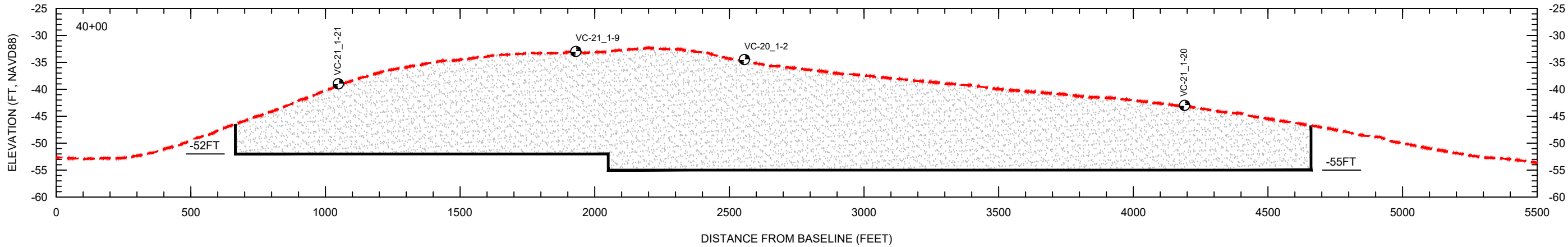
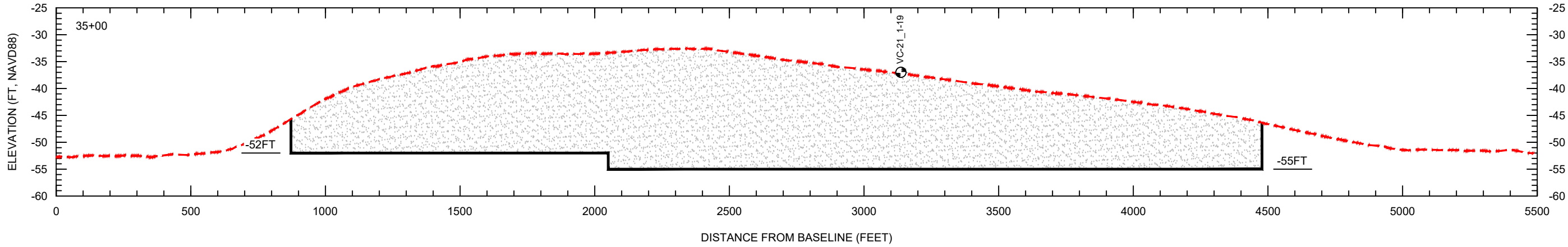
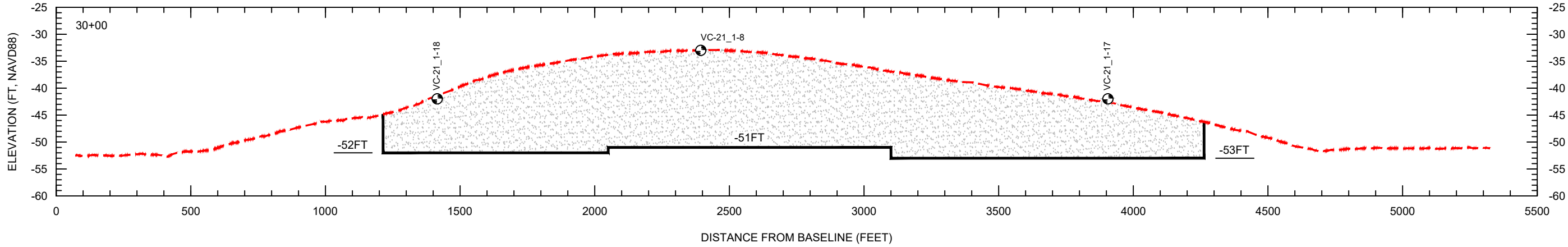
CLIENT: LEE COUNTY

TITLE: BORROW AREA SECTIONS

DATE: 01/18/2024
DRAWN: JSD
CHECKED: MTP
SEC: TWP
ACAD NO.: 22175_CPS_16-20_Borrow Area DWG
REF. NO.

SCALE: AS NOTED
F.B.
PG.
RNG.

NO. DATE BY REVISION DESCRIPTION



- NOTES:
1. GEOPHYSICAL DATA FROM OSI, 2021.
 2. GEOTECHNICAL DATA FROM GFA INTERNATIONAL AND AMDRILL, INC. 2020 and 2021.
 3. ELEVATIONS ARE SHOWN IN NAVD88 U.S. SURVEY FEET.

SCALE:
H: 1" = 400'
V: 1" = 20'

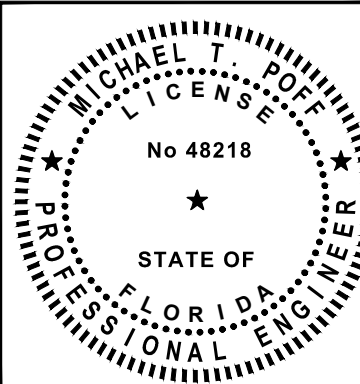
LEGEND:

EXISTING GRADE

DESIGN DREDGE CUT

VC-21_1-20

VIBRACORE



COASTAL & MARINE ENGINEERING
ENVIRONMENTAL & GEOLOGICAL SERVICES
SURVEYING & MAPPING
ENGINEERING: CA 2464
SURVEYING: LB 2464

ENGINEERING
CONSULTANTS,
INC.

28421 BONITA CROSSINGS BLVD.
BONITA SPRINGS, FL 34135

LEE COUNTY

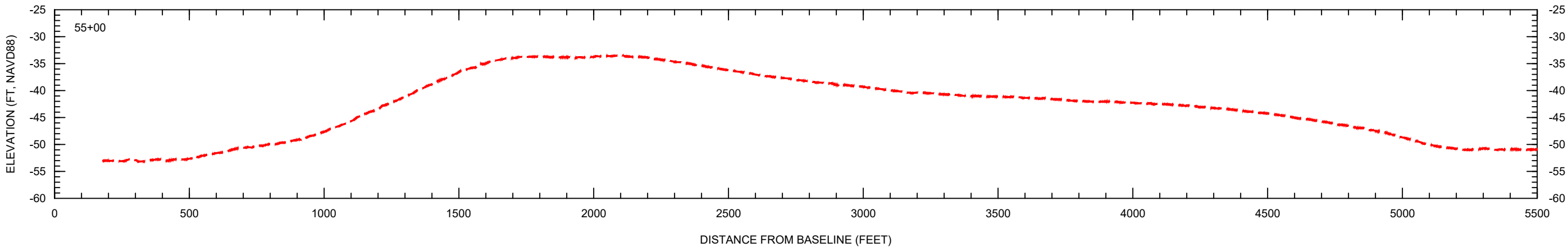
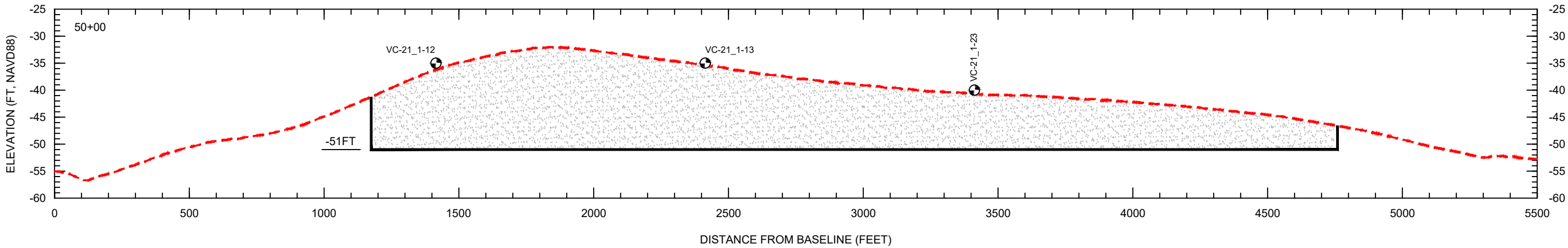
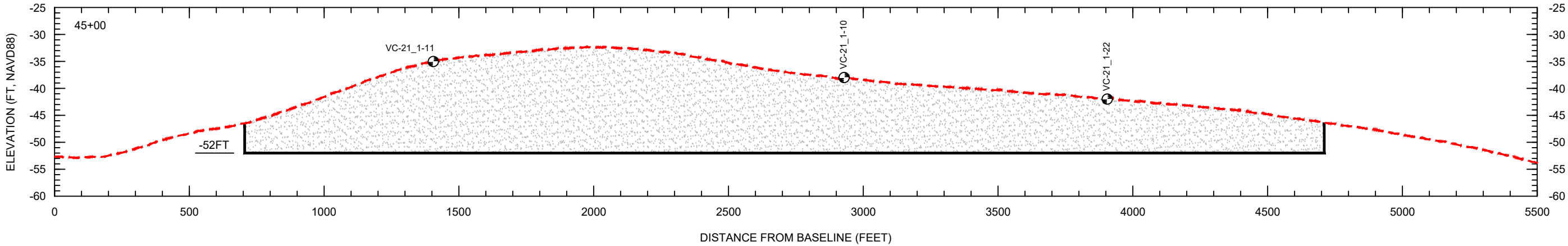
BORROW AREA SECTIONS

DATE: 01/18/2024
DRAWN: JSD
CHECKED: MTP
SEC: TWP
ACAD NO: 22175_CPS_16-20_Borrow Area DWG
REF. NO.

SCALE: AS NOTED
F.B.
PG.
RNG.

NO. DATE BY REVISION DESCRIPTION

SHEET 19 OF 25
FILE NO.: 22.175



- NOTES:
1. GEOPHYSICAL DATA FROM OSI, 2021.
 2. GEOTECHNICAL DATA FROM GFA INTERNATIONAL AND AMDRILL, INC. 2020 and 2021.
 3. ELEVATIONS ARE SHOWN IN NAVD88 U.S. SURVEY FEET.

SCALE:
H: 1" = 400'
V: 1" = 20'

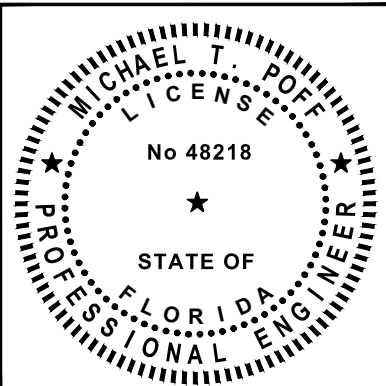
LEGEND:

EXISTING GRADE

DESIGN DREDGE CUT

VC-21_1-23

VIBRACORE



COASTAL & MARINE ENGINEERING
ENVIRONMENTAL & GEOLOGICAL SERVICES
SURVEYING & MAPPING
ENGINEERING: CA 2464
SURVEYING: LB 2464

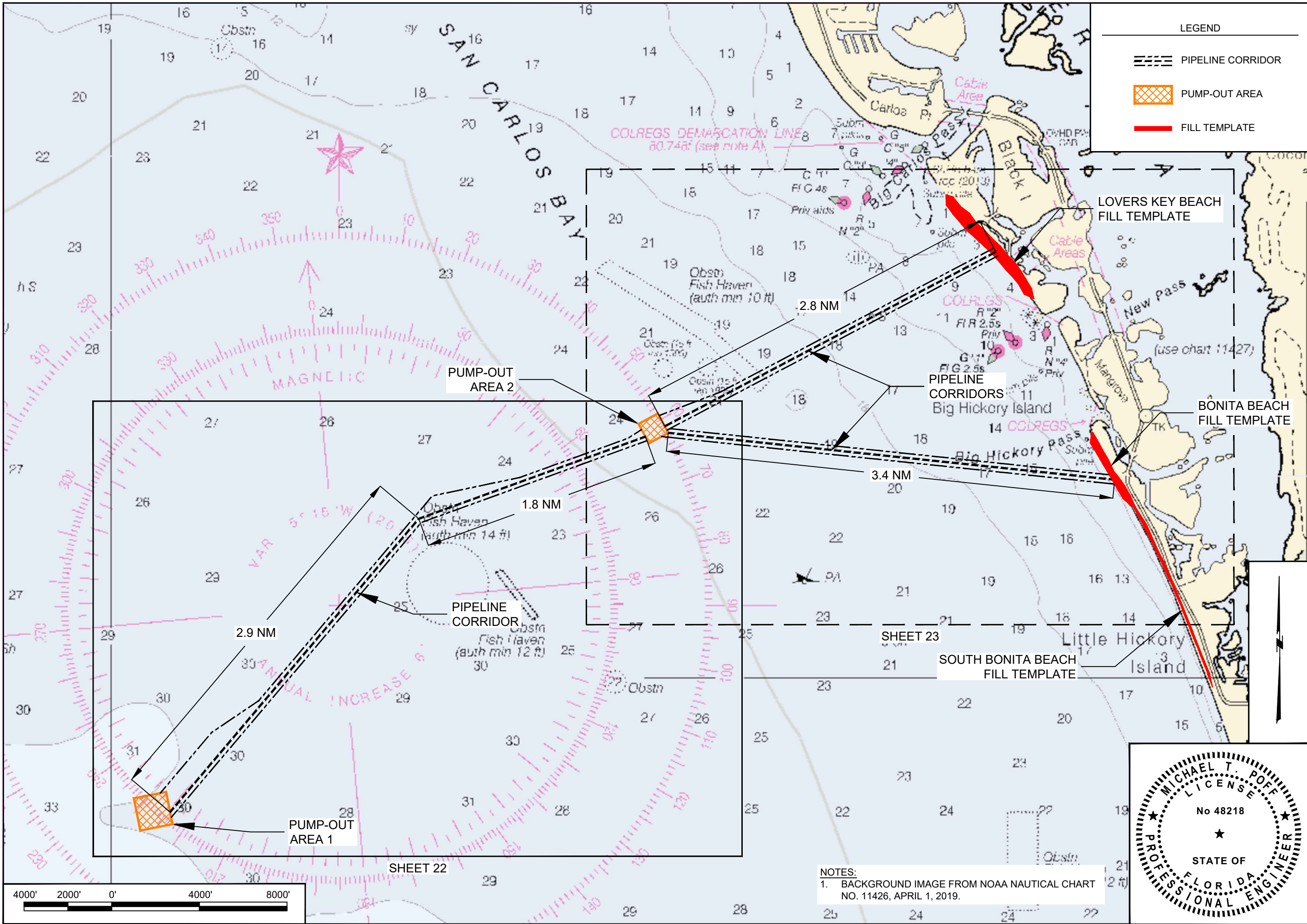
COASTAL
ENGINEERING
CONSULTANTS,
INC.
SERVING FLORIDA SINCE 1977
28421 BONITA CROSSINGS BLVD.
BONITA SPRINGS, FL 34135

CLIENT: LEE COUNTY
TITLE: BORROW AREA SECTIONS

DATE: 01/18/2024
DRAWN: JSD
CHECKED: MTP
SEC: TWP
ACAD NO.: 22175_CPS_16-20_Borrow Area.DWG
REF. NO.

SCALE: AS NOTED
F.B.
PG.
RNG.

NO. DATE BY REVISION DESCRIPTION

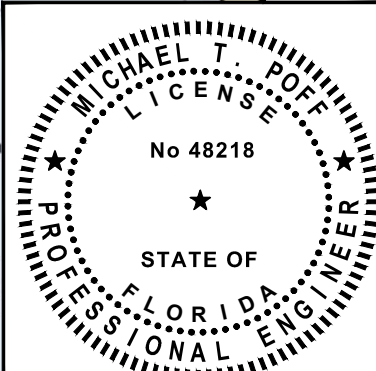


LEGEND

- PIPELINE CORRIDOR
- PUMP-OUT AREA
- FILL TEMPLATE

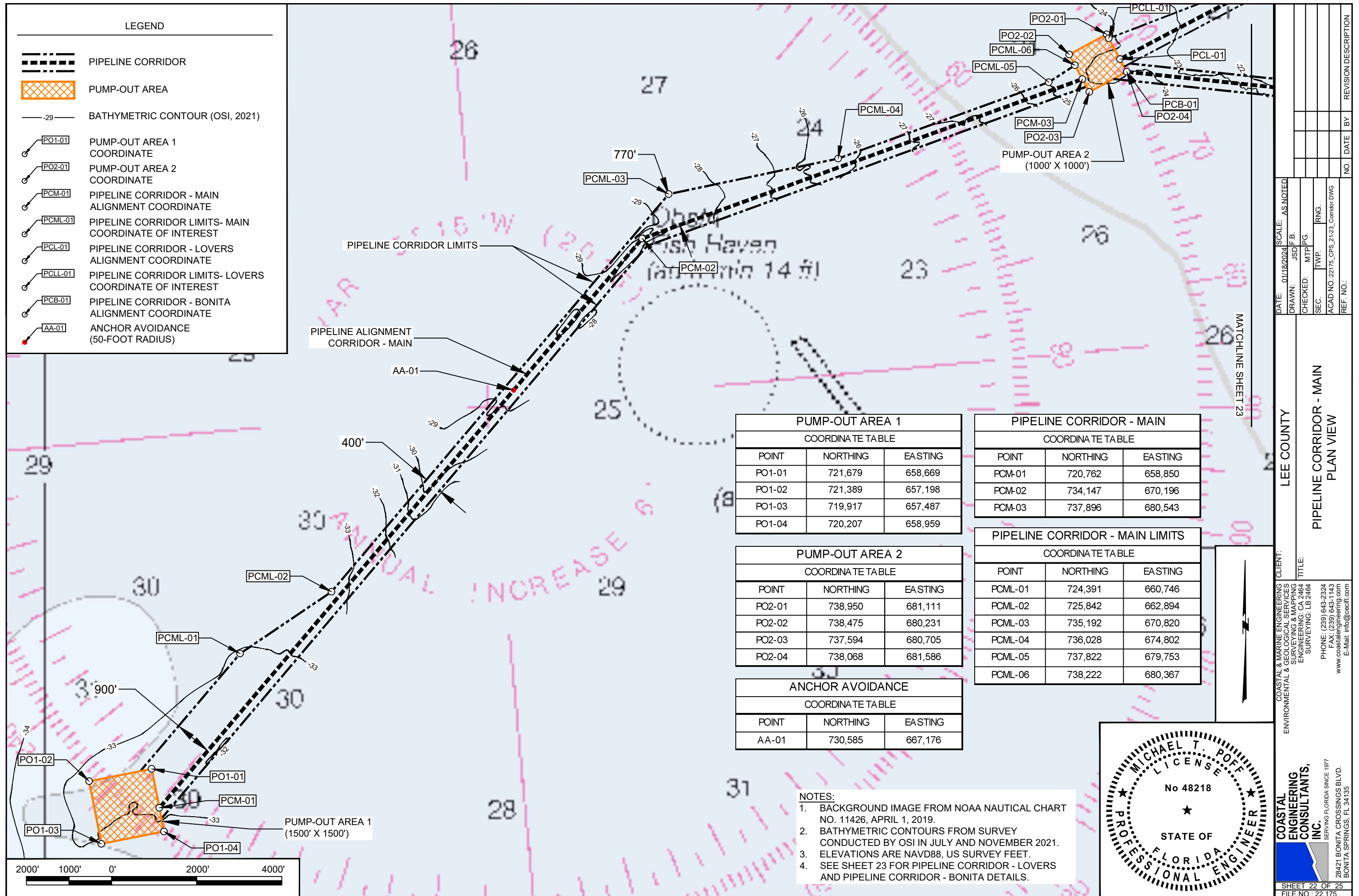
DATE: 01/18/2024		SCALE: AS NOTED	
DRAWN: JSD/F.B.		CHECKED: MTP/P.G.	
SEC.		TWP.	
ACAD NO.: 22175		CPS: 21x23	
REF. NO.:		BY	
LEE COUNTY			
PIPELINE CORRIDORS OVERVIEW			
CLIENT: COASTAL & MARINE ENGINEERING ENVIRONMENTAL & GEOLOGICAL SERVICES SURVEYING & MAPPING ENGINEERING: CA 2464 SURVEYING: LB 2464			
TITLE:			
PHONE: (239) 643-2324 FAX: (239) 643-1143 www.coastalengineering.com E-Mail: info@cecfl.com			
SHEET 21 OF 25 FILE NO.: 22.175			

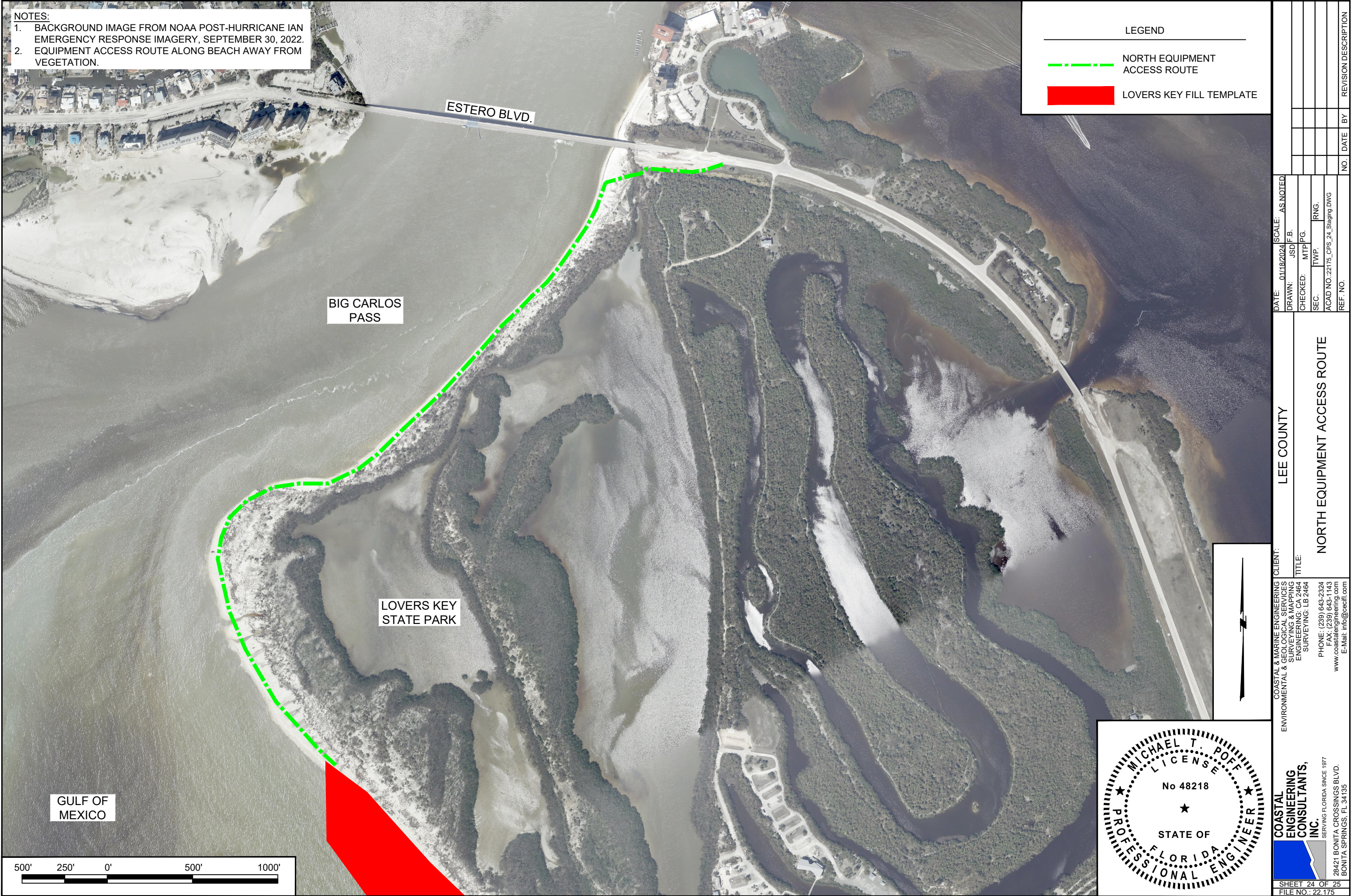
NOTES:
1. BACKGROUND IMAGE FROM NOAA NAUTICAL CHART NO. 11426, APRIL 1, 2019.



COASTAL ENGINEERING CONSULTANTS, INC.

28421 BONITA CROSSINGS BLVD.
BONITA SPRINGS, FL 34135



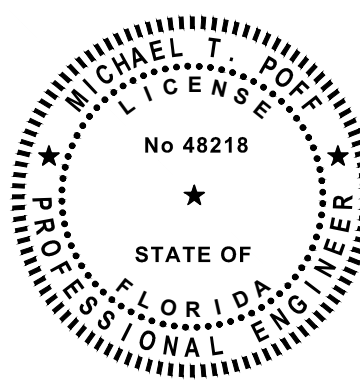
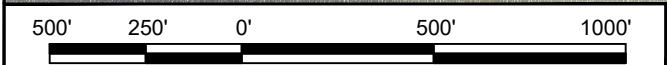


- NOTES:
- 1. BACKGROUND IMAGE FROM NOAA POST-HURRICANE IAN EMERGENCY RESPONSE IMAGERY, SEPTEMBER 30, 2022.
 - 2. EQUIPMENT ACCESS ROUTE ALONG BEACH AWAY FROM VEGETATION.

LEGEND

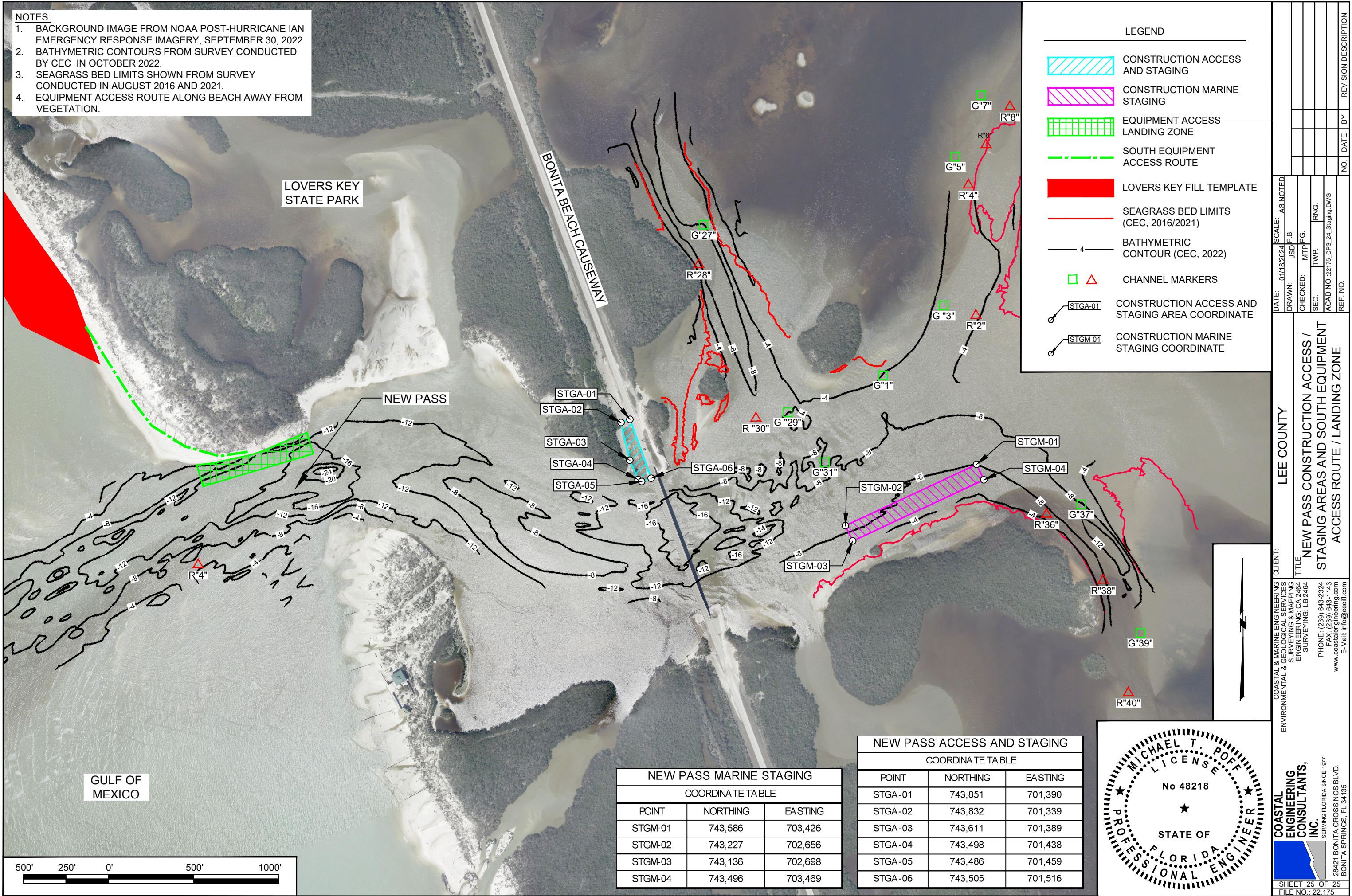
--- NORTH EQUIPMENT ACCESS ROUTE

LOVERS KEY FILL TEMPLATE



COASTAL & MARINE ENGINEERING ENVIRONMENTAL & GEOLOGICAL SERVICES SURVEYING & MAPPING ENGINEERING: CA 2464 SURVEYING: LB 2464		CLIENT: LEE COUNTY		DATE: 01/18/2024	SCALE: AS NOTED
PHONE: (239) 643-2324 FAX: (239) 643-1143 www.coastalengineering.com E-Mail: info@cecfl.com		TITLE: NORTH EQUIPMENT ACCESS ROUTE		DRAWN: JSD	F.B.
28421 BONITA CROSSINGS BLVD. BONITA SPRINGS, FL 34135		CHECKED: MTP		SEC. TWP.	RNG.
SHEET 24 OF 25 FILE NO.: 22.175		ACAD NO.: 22175 CPS 24 Staging DWG		NO.	DATE
BY		REVISION DESCRIPTION		NO.	DATE

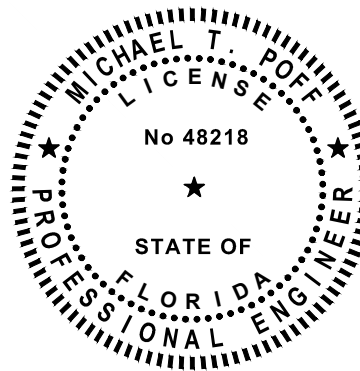
- NOTES:
1. BACKGROUND IMAGE FROM NOAA POST-HURRICANE IAN EMERGENCY RESPONSE IMAGERY, SEPTEMBER 30, 2022.
 2. BATHYMETRIC CONTOURS FROM SURVEY CONDUCTED BY CEC IN OCTOBER 2022.
 3. SEAGRASS BED LIMITS SHOWN FROM SURVEY CONDUCTED IN AUGUST 2016 AND 2021.
 4. EQUIPMENT ACCESS ROUTE ALONG BEACH AWAY FROM VEGETATION.



- LEGEND
- CONSTRUCTION ACCESS AND STAGING
 - CONSTRUCTION MARINE STAGING
 - EQUIPMENT ACCESS LANDING ZONE
 - SOUTH EQUIPMENT ACCESS ROUTE
 - LOVERS KEY FILL TEMPLATE
 - SEAGRASS BED LIMITS (CEC, 2016/2021)
 - BATHYMETRIC CONTOUR (CEC, 2022)
 - CHANNEL MARKERS
 - CONSTRUCTION ACCESS AND STAGING AREA COORDINATE
 - CONSTRUCTION MARINE STAGING COORDINATE

NEW PASS MARINE STAGING		
COORDINA TE TABLE		
POINT	NORTHING	EASTING
STGM-01	743,586	703,426
STGM-02	743,227	702,656
STGM-03	743,136	702,698
STGM-04	743,496	703,469

NEW PASS ACCESS AND STAGING		
COORDINA TE TABLE		
POINT	NORTHING	EASTING
STGA-01	743,851	701,390
STGA-02	743,832	701,339
STGA-03	743,611	701,389
STGA-04	743,498	701,438
STGA-05	743,486	701,459
STGA-06	743,505	701,516



DATE: 01/18/2024
DRAWN: JSD
CHECKED: MTP
SEC: TWP
ACAD NO.: 22175_CPS 24_Staging DWG
REF. NO.

SCALE: AS NOTED
F.B.

DATE: 01/18/2024
DRAWN: JSD
CHECKED: MTP
SEC: TWP
ACAD NO.: 22175_CPS 24_Staging DWG
REF. NO.

LEE COUNTY

NEW PASS CONSTRUCTION ACCESS / STAGING AREAS AND SOUTH EQUIPMENT ACCESS ROUTE / LANDING ZONE

COASTAL & MARINE ENGINEERING ENVIRONMENTAL & GEOLOGICAL SERVICES SURVEYING & MAPPING ENGINEERING: CA 2464 SURVEYING: LB 2464
PHONE: (239) 643-2324
FAX: (239) 643-1143
www.coastalengineering.com
E-Mail: info@ceciff.com

COASTAL ENGINEERING CONSULTANTS, INC.
SERVING FLORIDA SINCE 1977
28421 BONITA CROSSINGS BLVD.
BONITA SPRINGS, FL 34135

SHEET 25 OF 25
FILE NO.: 22.175

LOVERS KEY AND BONITA BEACH NOURISHMENT PROJECT POST-IAN ENGINEERING AND ASSESSMENT REPORT



January 6, 2023

CEC File No. 22.279

Prepared by:



TABLE OF CONTENTS

1	INTRODUCTION	1
2	PROJECT HISTORY	3
2.1	LOVERS KEY PROJECT HISTORY AND DESIGN	3
2.2	BONITA BEACH PROJECT HISTORY AND DESIGN	3
2.3	2021 PERMIT MODIFICATION	3
3	HURRICANE IAN IMPACT ASSESSMENT	13
3.1	HURRICANE IAN	13
3.2	PRE- AND POST-STORM PROFILE COMPARISON	17
3.3	STORM IMPACT ANALYSIS	17
4	POST-STORM RECOVERY PROJECT	19
4.1	RECOVERY PROJECT CONCURRENT WITH 2023 NOURISHMENT	19
4.1.1	Construction Budget	19
4.1.2	Construction Methods	20
4.1.3	Construction Schedule	20
4.1.4	Permit Status	21
4.2	RECOVERY PROJECT INDEPENDENT OF 2023 NOURISHMENT	21
4.2.1	Construction Budget	21
4.2.2	Construction Methods	22
4.2.3	Construction Schedule	22
4.2.4	Permit Status	23
5	CONCLUSION	24
6	REFERENCES	25

LIST OF FIGURES

Figure 1. Project Overview	2
Figure 2. 2004 Lovers Key Project (Lee County, 2008).	5
Figure 3. 2014 Lovers Key Project Plan View (Coastal Tech, 2012).	6
Figure 4. 2014 Lovers Key Project Typical Sections (Coastal Tech, 2012).	7
Figure 5. 2014 Lovers Key and Bonita Beach Project Borrow Areas	8
Figure 6. 1995 Bonita Beach Project (Olsen, 1996)	9
Figure 7. 2004 Bonita Beach Project (Lee County, 2007).	10
Figure 8. 2014 Bonita Beach Project Plan View (Coastal Tech, 2012).	11
Figure 9. 2014 Bonita Beach Project Typical Sections (Coastal Tech, 2012).	12
Figure 10. Hurricane Ian's Path of Destruction (source: NOAA).	14
Figure 11. Hurricane Ian Damage on Lovers Key.	14
Figure 12. Lovers Key Aerial View Before (left) and After (right) Hurricane Ian.	15
Figure 13. Bonita Beach Aerial View Before (left) and After (right) Hurricane Ian.	16

LIST OF TABLES

Table 1. Project Coordinates.	1
Table 2. Lovers Key and Bonita Beach Nourishment Project Preliminary Opinion of Probable Construction Costs.	19

Table 3. Lovers Key and Bonita Beach Category G Repairs via Truck Haul Preliminary Opinion of Probable Construction Costs.	21
--	----

LIST OF APPENDICES

Attachment 1	Storm Impact Profile Comparisons
Attachment 2	Storm Impact Volume Calculations

POST-IAN ENGINEERING ASSESSMENT AND REPORT

1 INTRODUCTION

The Lovers Key and Bonita Beach Restoration Project Area is located in Lee County, Florida, along the Gulf of Mexico shoreline (Figure 1). The County has a management agreement with the State of Florida to maintain the beach on the Lovers Key State Park, and an Interlocal Agreement with the City of Bonita Springs to maintain Bonita Beach.

The purpose of the Lovers Key and Bonita Beach Nourishment Project (Project) is consistent with the State's Strategic Beach Management Plan and includes restoring critically eroding beaches, maximizing the infusion of beach-quality sand into the coastal system, and implementing projects that contribute most significantly to addressing the State's beach erosion problems.

The coordinates for the north and south end of the Lovers Key and Bonita Beach fill segments and Offshore Borrow Area are presented in Table 1. The Lovers Key fill segment is approximately 6,200 feet long and the Bonita Beach fill segment is approximately 3,900 feet long. The coordinates presented for the Offshore Borrow Area represent the box that the polygon shaped dredge template fits within.

Table 1. Project Coordinates.

LOVERS KEY RMON COORDINATES		
R-214.5	26.394372222°	81.883908333°
R-221	26.381000000°	81.871027778°
BONITA BEACH RMON COORDINATES		
R-226A	26.364313889°	81.863000000°
R-230	26.354747222°	81.857619444°
OFFSHORE BORROW AREA COORDINATES		
BA A	26.388827778°	82.364825000°
BA B	26.378513889°	82.353647222°
BA C	26.369555556°	82.363836111°
BA D	26.379866667°	82.375013889°

This report presents the surveys and analysis of damages attributed to Hurricane Ian which severely impacted the area in September 2022. The report also presents the details of the future project to restore the Project Area and offset the losses resulting from the storm.

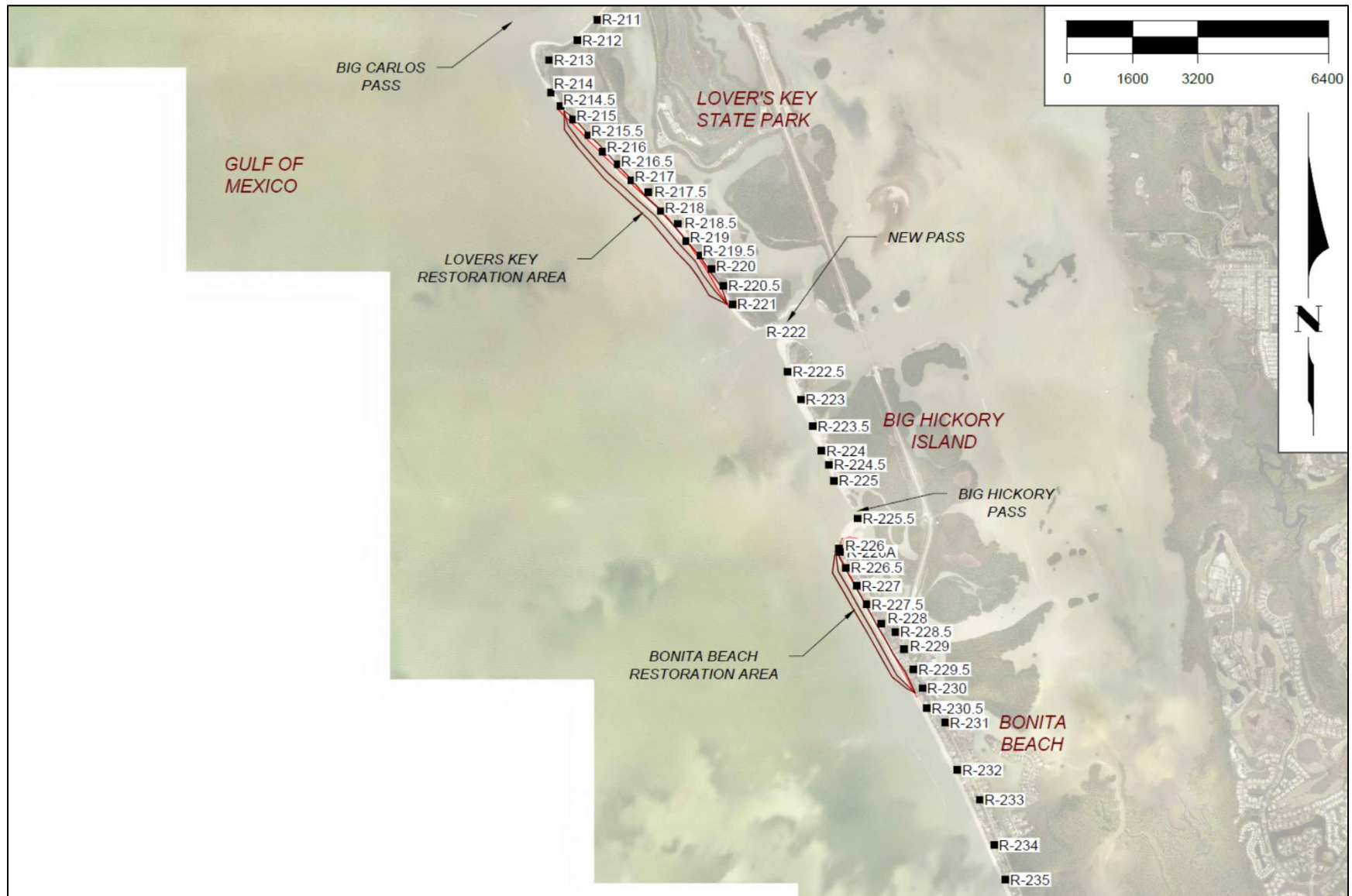


Figure 1. Project Overview.

2 PROJECT HISTORY

2.1 LOVERS KEY PROJECT HISTORY AND DESIGN

The Lovers Key initial construction project was completed in 2004 concurrent with the first Bonita Beach maintenance event (Figure 2; Lee County, 2008). The project placed 570,240 cubic yards to a design elevation of +2.9 feet NAVD88, crest slope of 1 vertical to 200 horizontal (1V:200H), and seaward berm face slope of 15H:1V. A small dune feature was also constructed only at R-215 to an elevation of +4.9 feet NAVD88. The first maintenance event was completed in 2014. The first maintenance event placed 342,400 cubic yards to the same design elevation and slopes. Plan view and typical sections are presented in Figures 3 and 4 (Coastal Tech, 2012). The 2014 borrow areas are presented in Figure 5. Coastal Tech determined the native beach mean grain size was 0.26 mm and borrow areas combined mean grain size was 0.27 mm and contained less than 1% fines (Coastal Tech, 2012).

2.2 BONITA BEACH PROJECT HISTORY AND DESIGN

The original Bonita Beach construction project was completed in 1995 (Figure 6; Olsen, 1996). The project placed 217,000 cubic yards to a design elevation of +4.3 feet NAVD88, crest slope of 1 vertical to 200 horizontal (1V:200H), and seaward berm face slope of 15H:1V. The first maintenance event was completed in 2004 (Figure 7; Lee County, 2007). The first maintenance event placed 150,000 cubic yards to the same design elevation and slopes. The second maintenance event was completed in 2014 and placed 140,200 cubic yards to the same design elevation and slopes. Plan view and typical sections are presented in Figures 8 and 9 (Coastal Tech, 2012). The 2014 borrow areas are presented in Figure 5. Coastal Tech determined the native beach mean grain size was 0.38 mm and borrow area mean grain size was 0.32 mm and contained less than 1% fines (Coastal Tech, 2012).

2.3 2021 PERMIT MODIFICATION

In 2021, the County submitted a major permit modification application to the Florida Department of Environmental Protection (FDEP) and United States Army Corps of Engineers (USACE) which proposed to continue their existing nourishment program for Lovers Key and Bonita Beach. The Project included the following features and changes from the prior permit.

- Lovers Key Beach Fill: Routine nourishment along the permitted fill limits; raise berm elevation to account for sea level change
- Bonita Beach Fill: Routine nourishment along the permitted fill limits; increase beach fill template width to sustain storm damage reduction benefits throughout nourishment cycle; raise berm elevation to account for sea level change
- Ebb Shoal Borrow Areas: Utilize permitted dredge limits for future nourishment events

- Offshore Borrow Area: Add new Offshore Borrow Area on Outer Continental Shelf; utilize for next nourishment event and subsequent nourishment events
- Sediment Pipeline Corridors and Pump-out Areas: Add new Sediment Pipeline Corridors from Offshore Borrow Area to Lovers Key and Bonita Beach; add new Pump-Out Areas
- Hopper Dredging and Cutterhead Dredge-Scow Barge Construction Methods: Add these construction methods for mining the Offshore Borrow Area
- Upland sand quarries: Add Department approved quarries for hot-spot maintenance and post-storm recovery.

The permit application included a new Offshore Borrow Area located over 30 nautical miles from Lovers Key on the Outer Continental Shelf and contains over 7.3 million cubic yards of beach compatible sand.

FDEP issued the permit modification on December 14, 2022. This authorization, 0311811-004-JM, expires June 24, 2028. As of December 2022, the USACE is working on consultation requests with the U.S. Fish and Wildlife Service and National Marine Fisheries Service. The USACE Permit #SAJ-2012-00198 (IP-MJD) expires September 3, 2028. The Project is scheduled for nourishment in 2023.

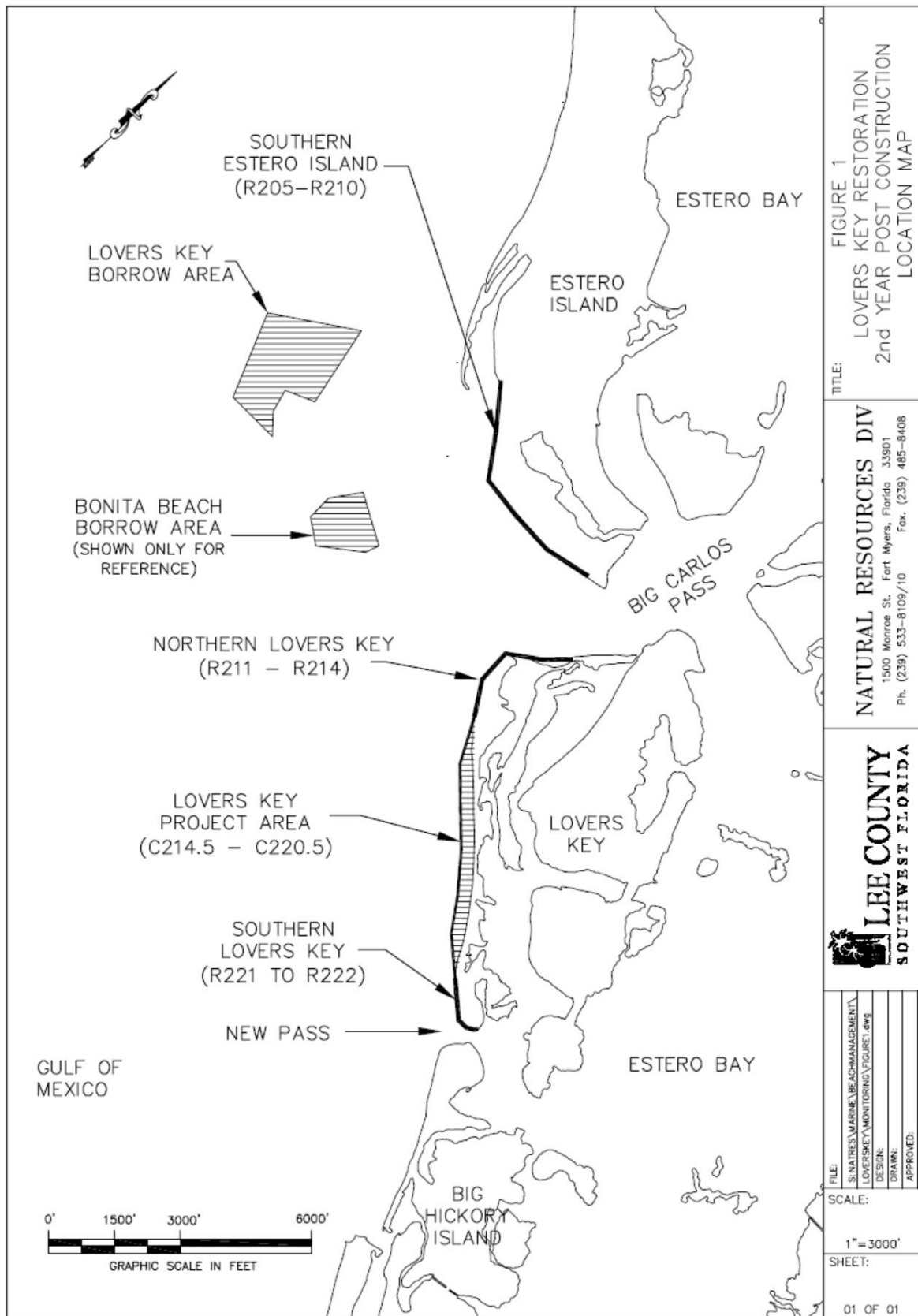


Figure 2. 2004 Lovers Key Project (Lee County, 2008).

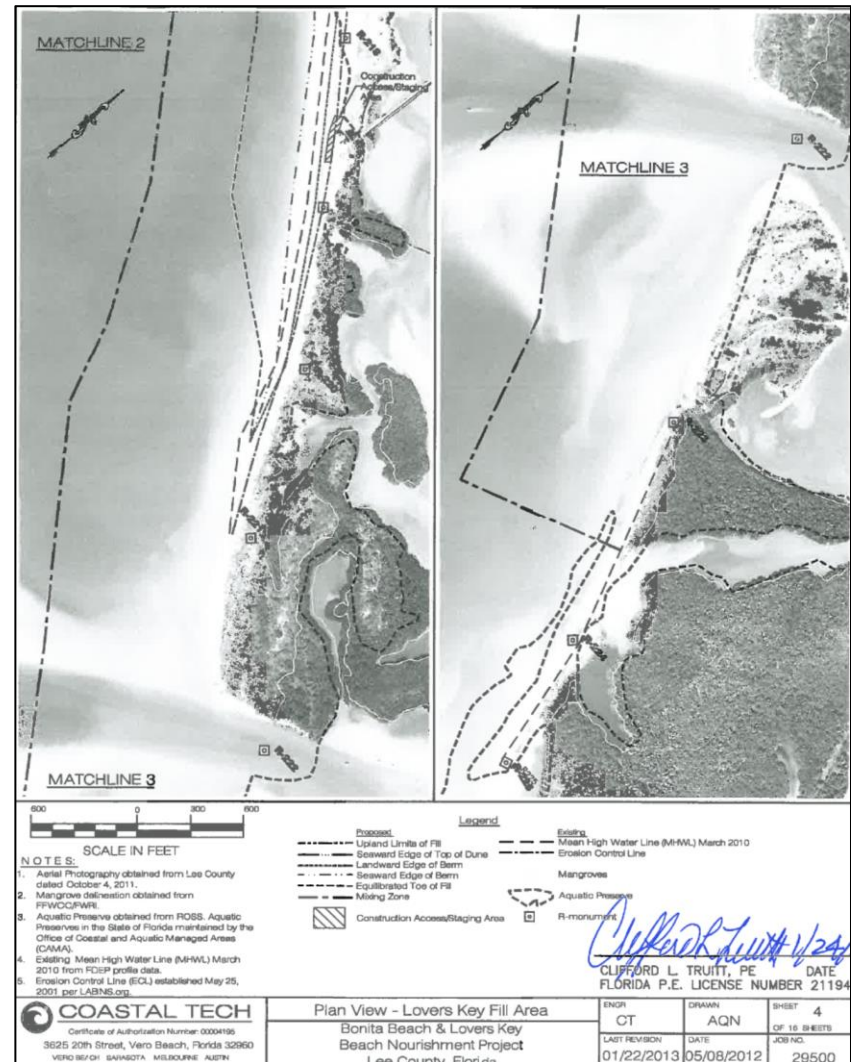
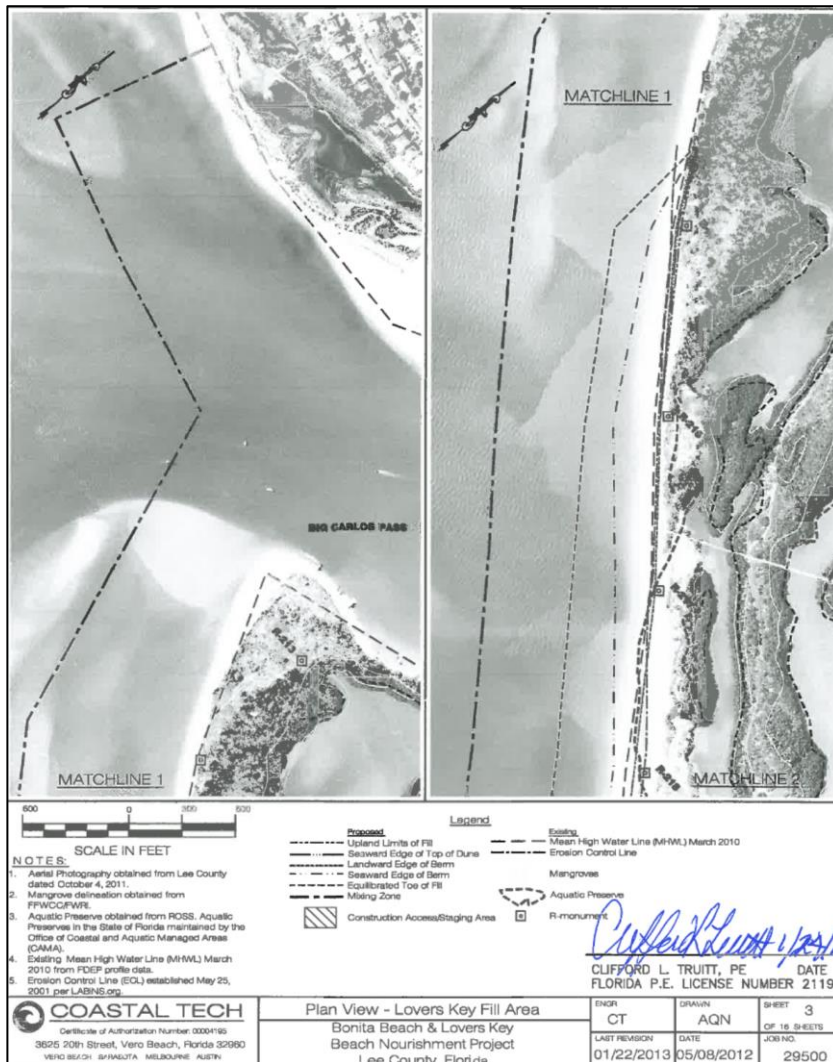


Figure 3. 2014 Lovers Key Project Plan View (Coastal Tech, 2012).

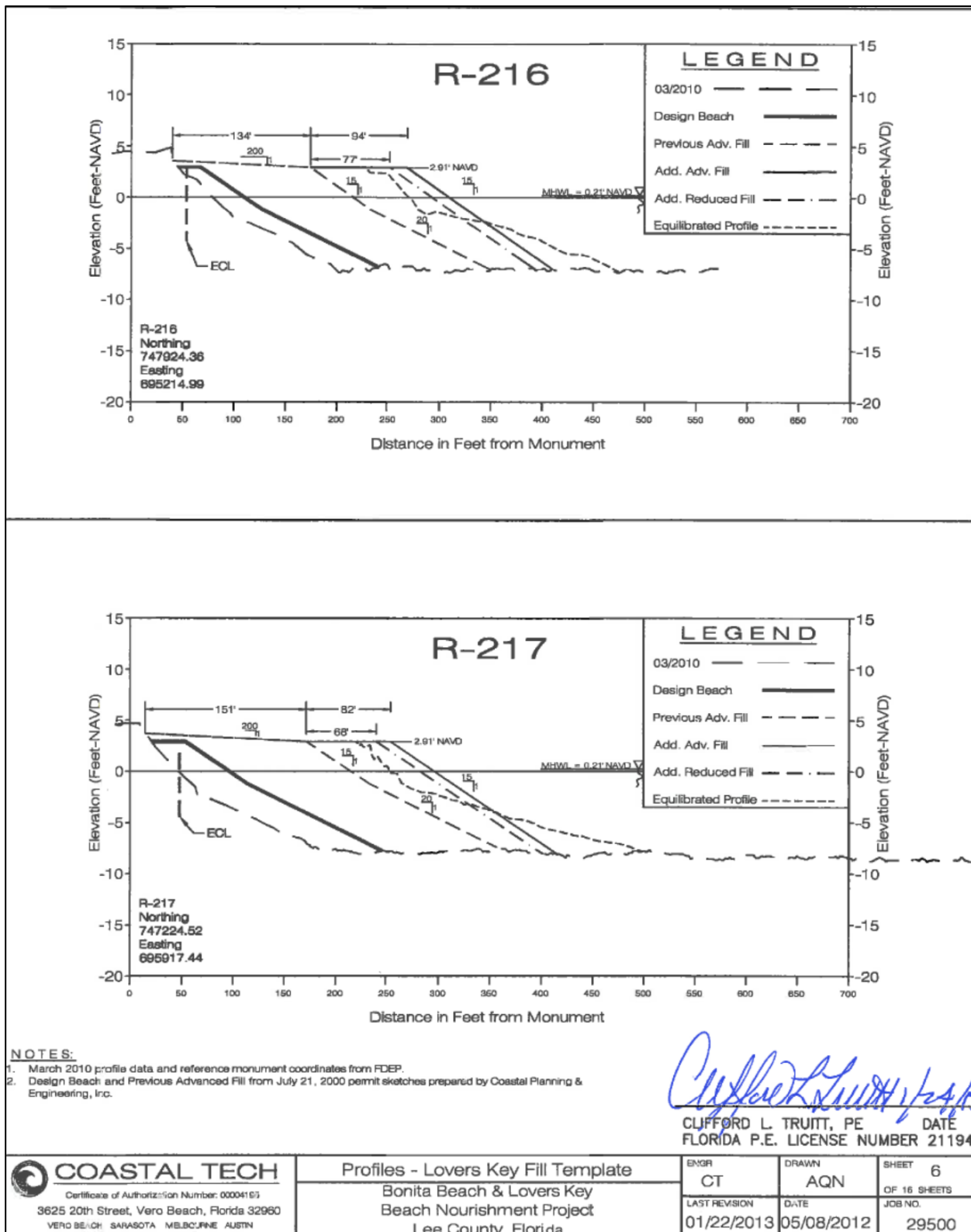


Figure 4. 2014 Lovers Key Project Typical Sections (Coastal Tech, 2012).

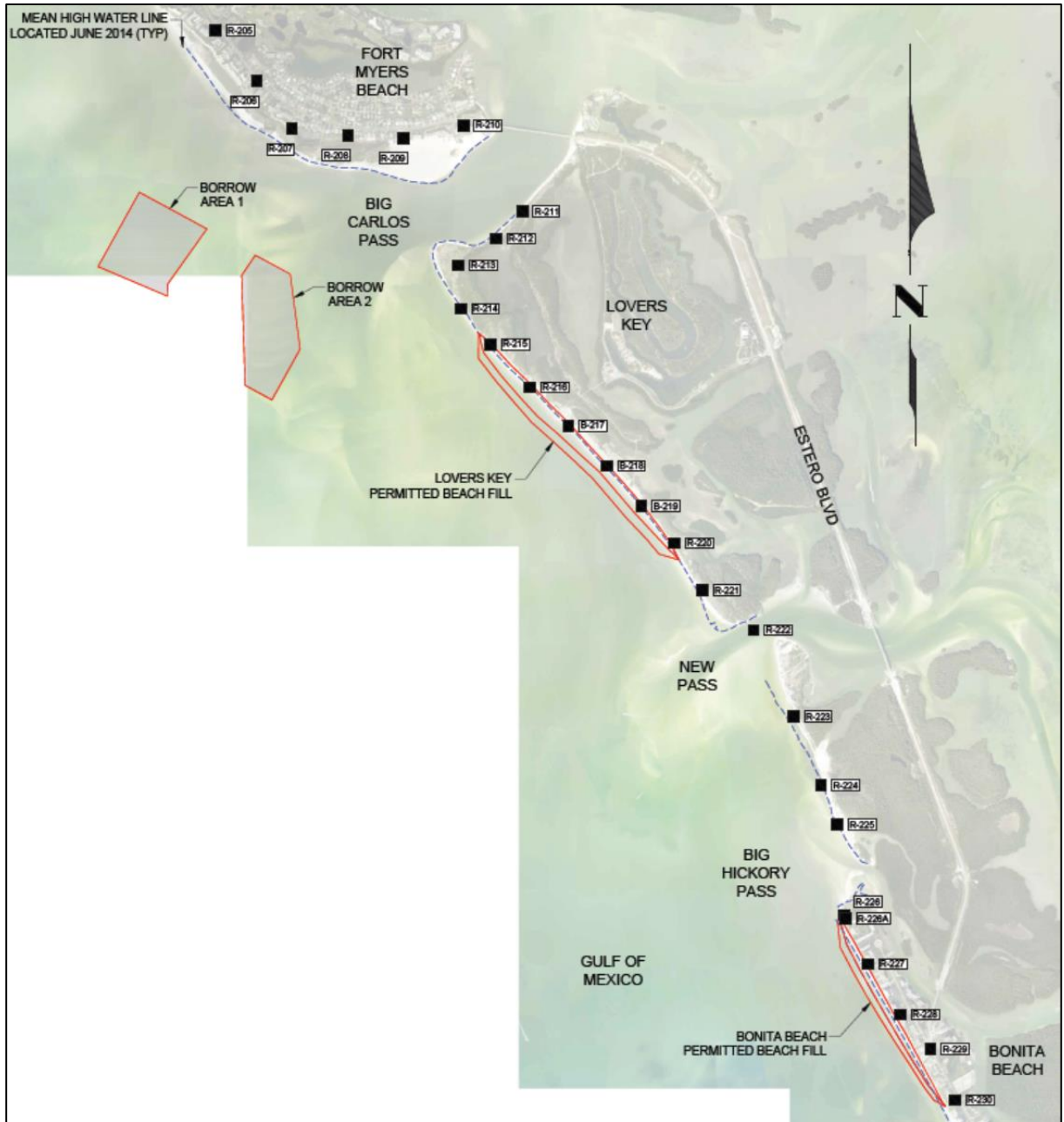


Figure 5. 2014 Lovers Key and Bonita Beach Project Borrow Areas.

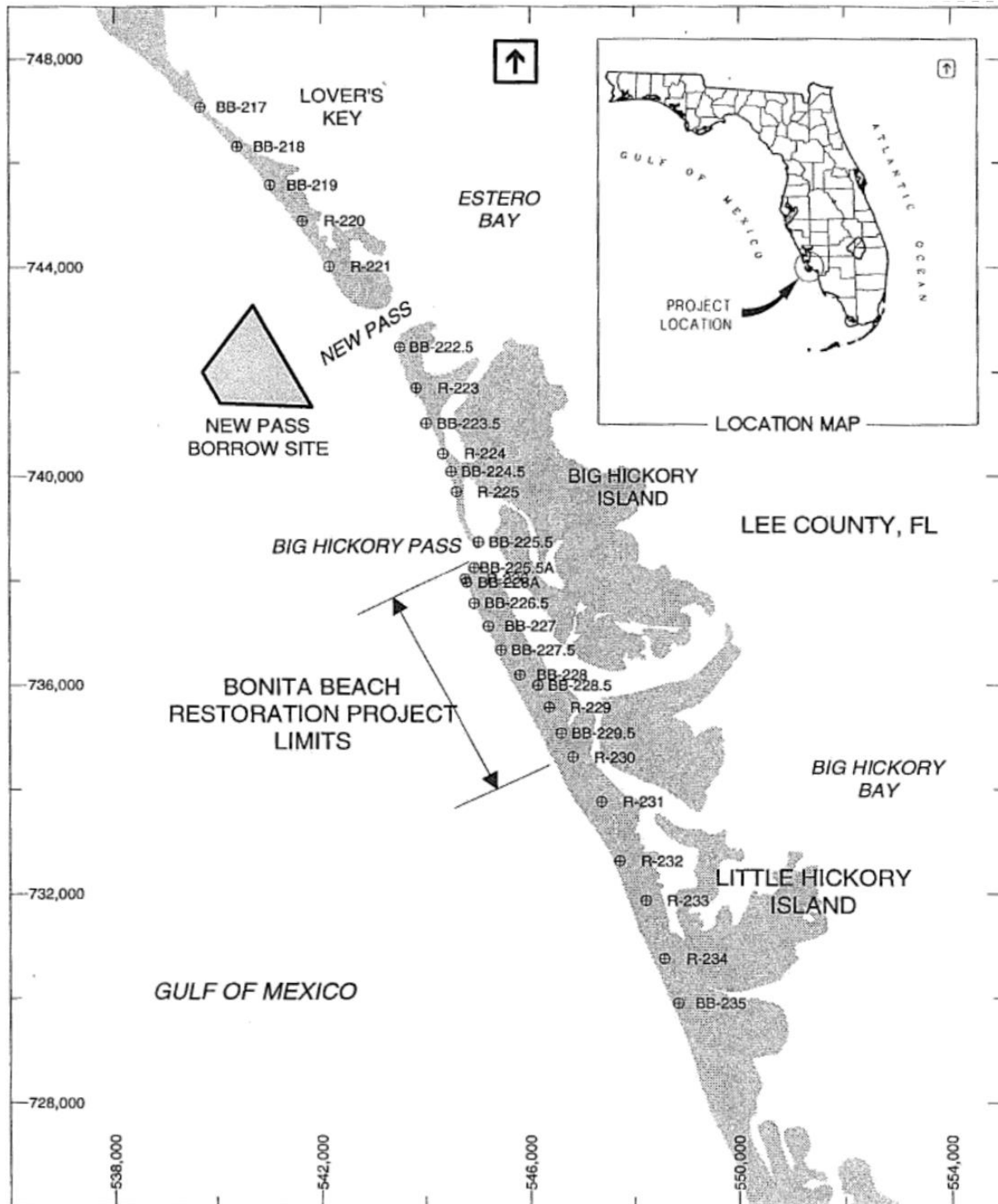


Figure 6. 1995 Bonita Beach Project (Olsen, 1996).

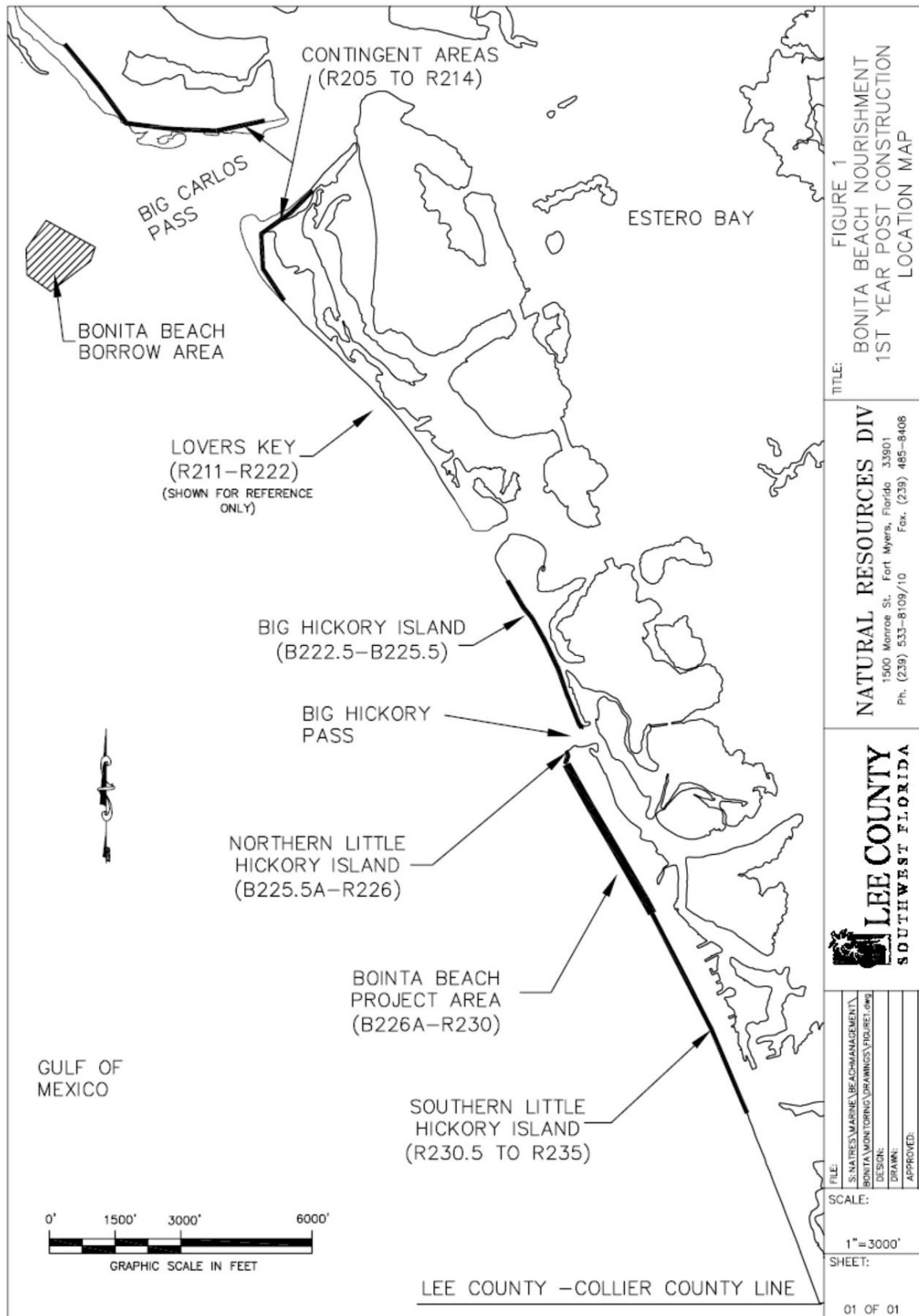


Figure 7. 2004 Bonita Beach Project (Lee County, 2007).

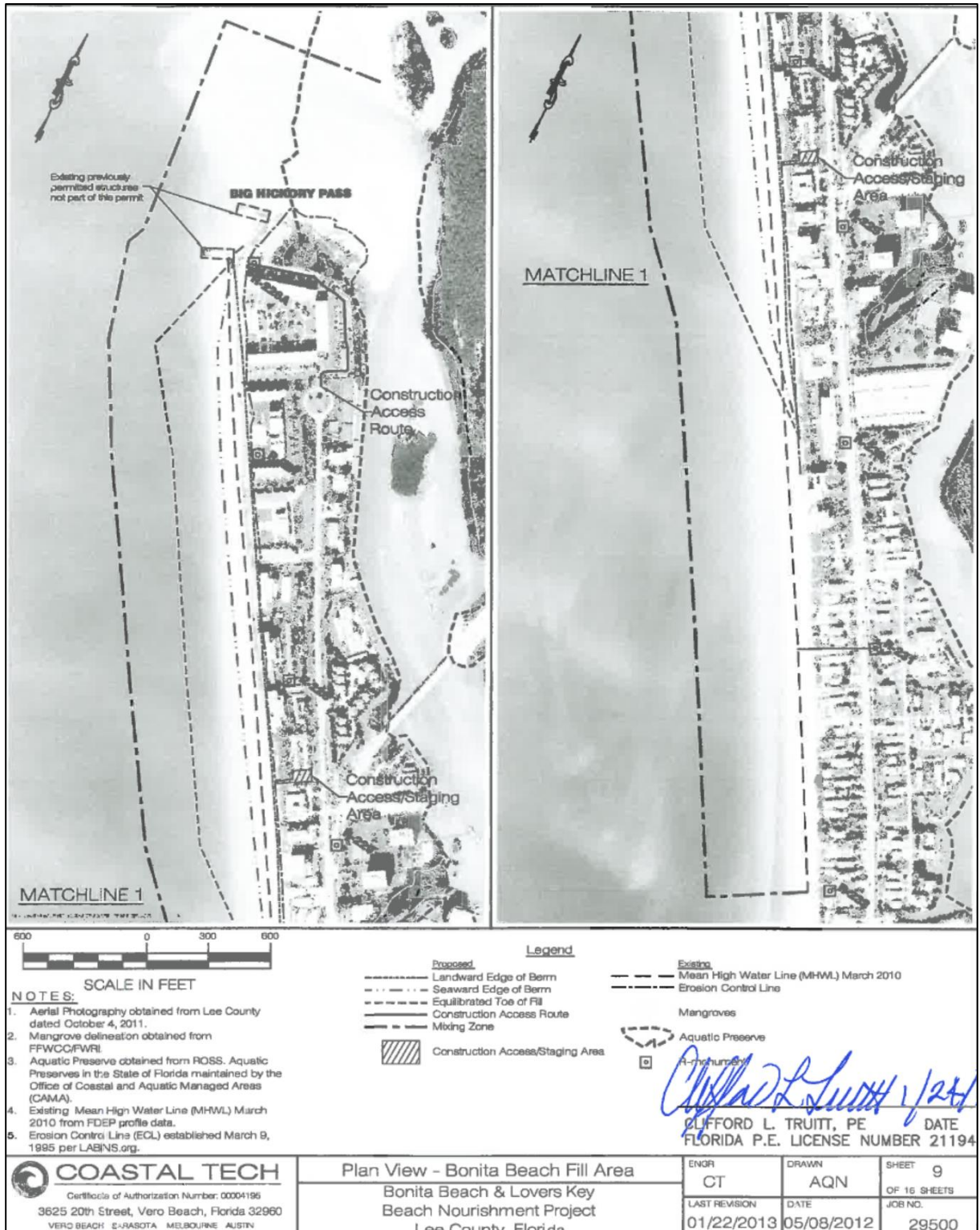


Figure 8. 2014 Bonita Beach Project Plan View (Coastal Tech, 2012).

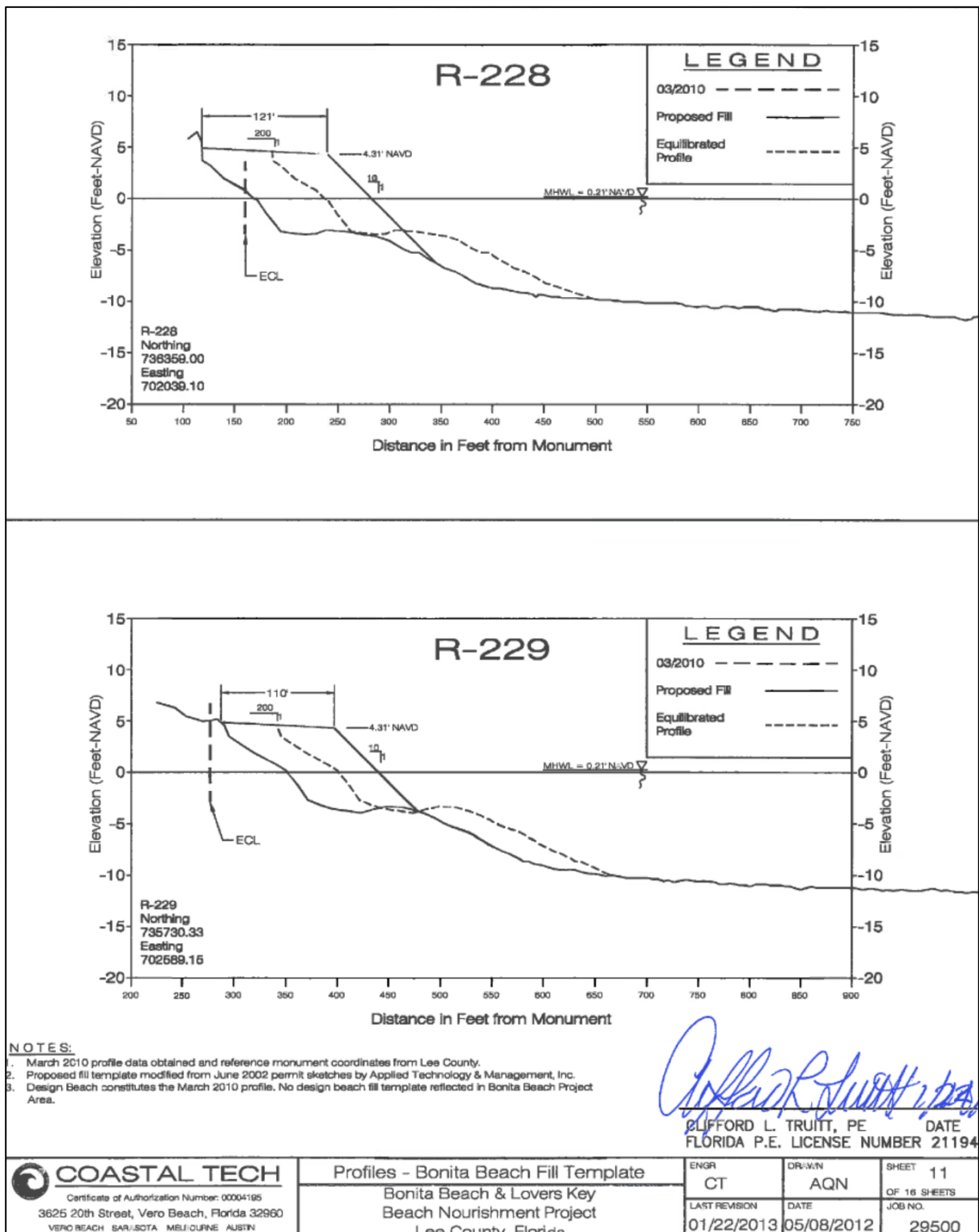


Figure 9. 2014 Bonita Beach Project Typical Sections (Coastal Tech, 2012).

3 HURRICANE IAN IMPACT ASSESSMENT

3.1 HURRICANE IAN

According to NOAA (<https://www.nesdis.noaa.gov/news/hurricane-ians-path-of-destruction>), after traveling a path of destruction throughout the Caribbean, Jamaica, the Cayman Islands, and western Cuba, on September 28, Hurricane Ian made first landfall in the United States near Cayo Costa in Southwest Florida as a Category 4 storm. After crossing over the Florida peninsula, Ian weakened to a tropical storm, then strengthened to a Category 1 hurricane and made a second landfall near Georgetown, South Carolina (Figure 10).

On the morning of September 28, Ian intensified into a Category 4 hurricane, with maximum sustained winds of 155 mph, just shy of a Category 5 storm. Ian came ashore near Cayo Costa, Florida, at 3:05 p.m. EDT with maximum sustained winds of 150 mph, tying the record for the fifth-strongest hurricane on record to strike the United States. It was the first Category 4 hurricane to impact Southwest Florida since Charley in 2004.

Ian thrashed parts of Florida's western coast including Lovers Key and Bonita Beach (Figures 11 through 13), bringing intense winds, heavy rainfall, and catastrophic storm surges. A storm surge with inundation of an unprecedented 12 to 18 feet above ground level was reported along the Southwest Florida coast.



Figure 10. Hurricane Ian's Path of Destruction (source: NOAA).

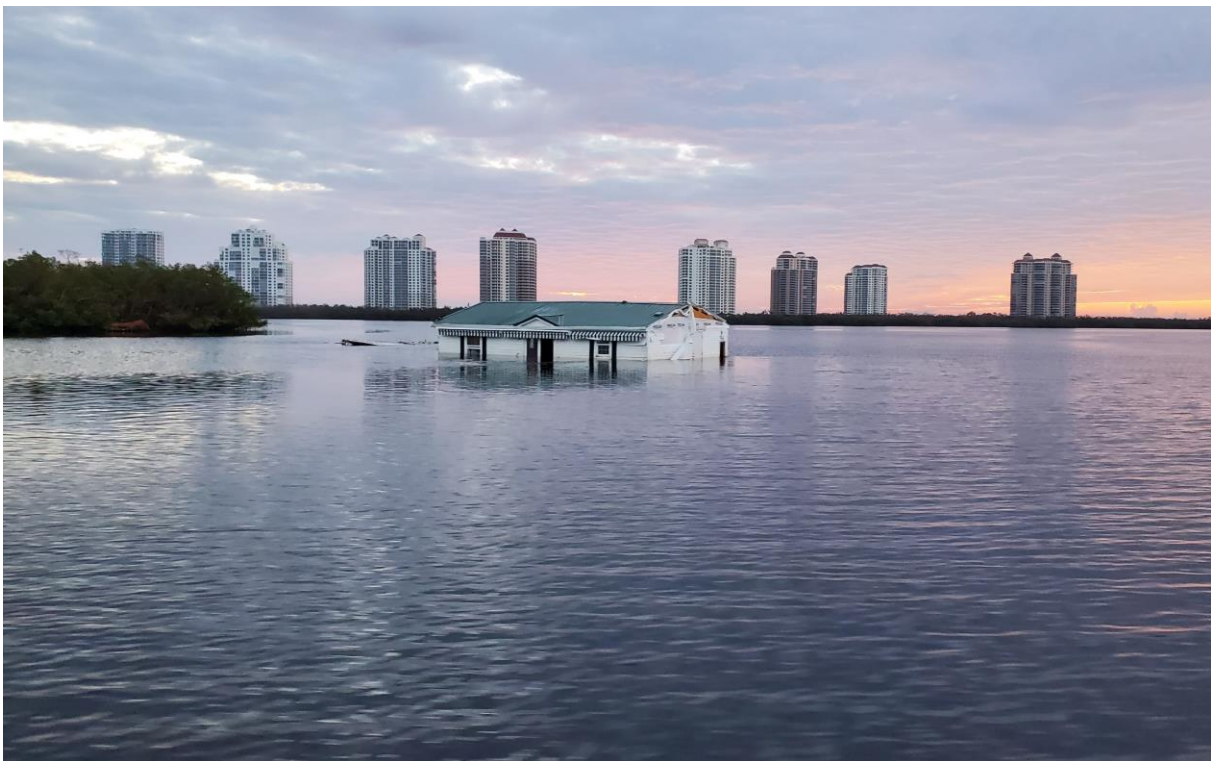


Figure 11. Hurricane Ian Damage on Lovers Key.



Figure 12. Lovers Key Aerial View Before (left) and After (right) Hurricane Ian.



Figure 13. Bonita Beach Aerial View Before (left) and After (right) Hurricane Ian.

3.2 PRE- AND POST-STORM PROFILE COMPARISON

The post-Ian beach survey of Lovers Key and Bonita Beach was conducted by CEC on October 12 and 14, 2022. The prior survey of Lovers Key and Bonita Beach was conducted by CEC on June 13 and 21, 2022. The beach profiles at each R-monument between R-211 and R-239 are presented in Appendix 1.

3.3 STORM IMPACT ANALYSIS

CEC performed a storm impact analysis by computing 1) volumetric changes of the Lovers Key and Bonita Beach Restoration Area that occurred between the June 2022 monitoring survey and October 2022 post-Ian survey, 2) background erosion from the June 2022 monitoring survey to Ian landfall, and 3) the incident related erosion directly attributed to Hurricane Ian for the engineered beaches.

Background erosion was computed as follows. The volume change between the 2021 and 2022 annual monitoring surveys was computed utilizing the depth of closure (DOC), which is described below, as the seaward boundary. The totals for each beach segment were annualized and then multiplied by the number of days from the 2022 annual monitoring survey to the date of landfall of the hurricane.

The offshore depth beyond which the net sediment transport does not result in significant changes in mean water depth is known as the DOC. According to Birkemeier (1985), DOC can be estimated as

$$h_c = 1.75H_e - 57.9 \left(\frac{H_e^2}{gT_e^2} \right)$$

where H_e is the effective wave height which is exceeded during only 12 hours per year, T_e is the associated period, and g is the acceleration due to gravity.

Wave data were obtained from the Wave Information Studies (WIS) project (Hubertz, 1992) which produces a high-quality online database of hindcast, nearshore wave conditions covering U.S. coastlines (<https://wisportal.erdc.dren.mil/>). The above calculation yielded a DOC of -11.2 feet NAVD88 for Bonita Beach. It is noted this DOC has been utilized for project monitoring and performance assessment since 2004 (Lee County, 2007).

The Lovers Key beach profiles are shallower compared to those of Bonita Beach with much milder profile slopes due to the presence of the large Big Carlos Pass ebb shoal system sheltering this shoreline. From visual observations of the historic profiles, a distance of 500 feet seaward of mean high water (MHW) was established as DOC for the purpose of computing

volume changes. It is noted the 500-ft distance seaward of MHW for DOC has been utilized for the project monitoring and performance assessment since 2014 (CEC, 2016).

The total damage for the two beach fills from the landward limit of erosion to the depth of closure equals 52,589 cubic yards. The details of the storm impact volume calculations including the volume changes and the application of background erosion are presented in Appendix 2. It is noted due to severe scouring and breaching additional data were collected between R-monuments to accurately measure the total incident related erosion.

Hurricane Ian damaged the existing dunes on Lovers Key and Bonita Beach. Using pre-storm aerials and the survey comparisons, approximately 20,600 square yards of dune plants were destroyed. Based on an average plant spacing of 18 inches on center, equivalent to 4 plants per square yard, the number of plants destroyed equals 82,400 plants.

4 POST-STORM RECOVERY PROJECT

There are two options for the post-storm recovery Project. The first is to combine the recovery Project with the County's planned nourishment project scheduled to begin summer 2023. This will require expedited FEMA processing. The second is to conduct a separate truck haul project.

4.1 RECOVERY PROJECT CONCURRENT WITH 2023 NOURISHMENT

4.1.1 Construction Budget

The County's budget for the 2023 nourishment event is \$22,819,239 inclusive of mobilization/demobilization, access and staging, surveying, beach fill, environmental protection, construction engineering and inspection, and biological monitoring; and exclusive of incident related erosion. The cost details are presented in Table 2. Construction phase services include bid process, construction administration, inspections, pay survey review, biweekly meetings, substantial and final completion, and certifications. This equates to an effective unit rate of \$27.58 per cubic yard. Lee County and the State of Florida are each providing a funding share to construct the Project.

Table 2. Lovers Key and Bonita Beach Nourishment Project Preliminary Opinion of Probable Construction Costs.

Item	Description	Unit	Quantity	Unit Price	Extended Price	Subtotals
E-1	Storm Impact Assessment	LS	1	\$49,738	\$49,738	\$49,738
C-1	Mobilization/Demobilization	LS	1	\$7,000,000	\$7,000,000	\$20,252,700
C-2	Beach Fill					
C-2A	Lovers Key	CY	593,500	\$15.60	\$9,258,600	
C-2B	Bonita Beach	CY	234,000	\$15.20	\$3,556,800	
C-3	Environmental Protection	Days	150	\$350	\$52,500	
C-4	Turbidity Monitoring	Days	150	\$600	\$90,000	
C-5	Shorebird Abatement	Days	60	\$450	\$27,000	
C-6	Dune Vegetation	SY	20,600	\$13	\$267,800	
B-1	Biological Monitoring	LS	1	\$29,000	\$29,000	\$29,000
D-1	Construction Engineering	LS	1	\$77,356	\$77,356	\$417,846
D-2	Surveys	LS	1	\$277,824	\$277,824	
D-3	Inspections	LS	1	\$62,666	\$62,666	
					Subtotal	\$20,749,284
					10% Cont.	\$2,069,955
					Grand Total	\$22,819,239

If FEMA can expedite the EHP process for the Category G request such that the sand placement to offset the incident related erosion of 52,589 cubic yards can occur concurrently with the County's renourishment, the preliminary opinion of probable construction costs equates to \$1,450,404 (52,589 cubic yards times \$27.58) subject to a competitive bid process.

4.1.2 Construction Methods

Construction methods to be employed include the following. Two construction methods for excavation of the Offshore Borrow Area are proposed including the hydraulic cutterhead dredge and scow barge method and the hopper dredge method. For the two methods (hopper, cutterhead-scow barge), the dredged sediment will be transported through the submerged sediment pipeline that rests on the bottom and will exit the Gulf and come onto the dry beach, then discharged into the fill template, where it will be graded using conventional earth moving equipment. Multiple booster pumps may be required for the process.

Sediment pipeline conveyance corridors and pump-out areas have been delineated to connect the Offshore Borrow Area to the fill templates. They have been thoroughly surveyed for depth, sonar targets, and magnetic anomalies, and sited to avoid potential targets. The corridors do not require any excavation for pipeline installation, as the weighted sediment discharge pipelines will be placed directly on the sea floor. Anchoring limits shall be confined to the areas that have been surveyed and culturally cleared.

The in-water work will be conducted using barge/vessel-based heavy equipment (vessel draft: 4 feet to 8 feet offshore, 3 feet to 4 feet inshore) with no blasting. The land-based work for beach fill construction, hot-spot maintenance, upland sand truck hauls, and maintenance grading would be conducted by bulldozers, excavators, front-end loaders, dump trucks, and off-road vehicles.

Work will be conducted 24 hours per day, seven days per week. Work is proposed to be conducted during sea turtle nesting season which is an allowable activity under the State of Florida's Programmatic Biological Opinion.

4.1.3 Construction Schedule

The County proposes the following schedule.

- Permitting/BOEM OCS Lease: December 2022 – April 2023
- Final Design: January – April 2023
- Bid Process: April – June 2023
- Construction: June – December 2023 (requires sea turtle nest relocations)

4.1.4 Permit Status

While the Project is currently permitted, FDEP Permit #0311811-001-JC (expiration June 24, 2028) and USACE Permit #SAJ-2012-00198(IP-MJD) (expiration Sept 3, 2028), the Offshore Borrow Area is being added in the modification application. The FDEP permit modification #0311811-004-JM was issued on December 14, 2022 (expires June 24, 2028). The USACE permit modification is still in process.

4.2 RECOVERY PROJECT INDEPENDENT OF 2023 NOURISHMENT

4.2.1 Construction Budget

If the EHP process cannot be expedited for the Category G request, a truck haul project would be proposed to construct the hurricane recovery project. The preliminary opinion of probable construction costs equates to \$5,568,871. The cost details are presented in Table 3.

Table 3. Lovers Key and Bonita Beach Category G Repairs via Truck Haul Preliminary Opinion of Probable Construction Costs.

Item	Description	Unit	Quantity	Unit Price	Extended Price	Subtotals
C-1	Mobilization/Demobilization	LS	1	\$100,000	\$100,000	\$4,954,610
C-2	Construction Access/Staging	LS	1	\$30,000	\$30,000	
C-3	Maintenance of Traffic	LS	1	\$20,000	\$20,000	
C-4	Sand (Production)					
	Lovers Key	CY	42,779	\$10	\$427,790	
	Bonita Beach	CY	9,810	\$10	\$98,100	
C-5	Sand (Delivery/Placement)					
	Lovers Key	CY	42,779	\$80	\$3,422,320	
	Bonita Beach	CY	9,810	\$60	\$588,600	
C-6	Dune Vegetation	SY	20,600	\$13	\$267,800	
D-1	Construction Engineering	LS	1	\$35,000	\$35,000	\$108,000
D-2	Surveys	LS	1	\$48,000	\$48,000	
D-3	Inspections/Independent Testing	LS	1	\$25,000	\$25,000	
					Subtotal	\$5,062,610
					10% Cont.	\$506,261
					Grand Total	\$5,568,871

4.2.2 Construction Methods

The County intends to use Contract Services to construct the Project using 52,589 cubic yards of beach compatible sand that will be obtained from a properly licensed, permitted, and qualified supplier of the material.

A truck haul construction method includes the following. The sand will be transported from a permitted upland source and offloaded at existing staging areas. On Lovers Key the staging area includes the existing tramway and bridge to the beach. At Bonita Beach the staging area includes the County owned beachfront park. A conveyor system will be used to transport sand to the beach. Sand will be delivered along the fill sections utilizing loaders, dozers, graders, and trucks.

To minimize impact to beach use, the fill placement work will begin at the staging area and construction access and work toward the fill segment end, then shift back to the access and work to the other end. Beach sections that are completed and accepted will be turned over for public use.

The following are the general description of the tasks associated with the project

- Mobilization/staging
- Set up MOT
- Temporary pedestrian access routes, temporary fencing at initial work zone
- Install protection for upland dunes
- Initial grade stake out
- Fill placement
- Grading
- Post fill survey
- Upland restoration of staging area
- Clean-up/de-mobilization of equipment
- Project and permit closeout

4.2.3 Construction Schedule

The County proposes the following schedule.

- Category G Engineering Report Submittal: December 31, 2022
- FEMA Requests for Information and Responses: January – April 2023
- Environmental and Historic Preservation Review: April – December 2023
- Project Worksheet and FEMA Approval: January – March 2024
- Final Design: April – June 2024
- Bid Process: July – September 2024
- Construction: November – December 2024 (avoids sea turtle nesting season)

4.2.4 Permit Status

While the Project is currently permitted, FDEP Permit #0311811-001-JC (expires June 24, 2028) and USACE Permit #SAJ-2012-00198(IP-MJD) (expires Sept 3, 2028), the upland sand sources are being added in the modification application. The FDEP permit modification #0311811-004-JM has been approved and issued on December 14, 2022 (expires June 24, 2028). The USACE permit modification is still in process.

5 CONCLUSION

The Lovers Key and Bonita Beach Project is located in Lee County, Florida, along the Gulf of Mexico shoreline. The Bonita Beach segment was initially constructed in 1995 utilizing an engineered design and subsequently maintained in 2004 and 2014 to the same engineered design. The Lovers Key segment was originally constructed in 2004 utilizing an engineered design and maintained in 2014 to the same engineered design.

Category 4 Hurricane Ian, with maximum sustained winds of 155 mph just shy of a Category 5 storm, made landfall near Cayo Costa, Florida on September 28, 2022 severely impacting parts of Florida's western coast including Lovers Key and Bonita Beach with intense winds, heavy rainfall, and catastrophic storm surge.

By utilizing monitoring and post-storm beach surveys, the total damage for the two beach fills from the landward limit of erosion to the depth of closure and scour holes and breaching equaled approximately 52,589 cubic yards.

The next Lovers Key and Bonita Beach Nourishment Project is scheduled for 2023. If FEMA can expedite the EHP process for the Category G request such that the sand placement to offset the incident related erosion of 52,589 cubic yards can occur concurrently with the 2023 renourishment, the cost equates to approximately \$1,450,404.

If the EHP process cannot be expedited for the Category G request, a subsequent truck haul project would be proposed to construct the hurricane recovery project with an approximate cost of \$5,568,871.

6 REFERENCES

Birkemeier, W.A. 1985. Field Data on Seaward Limit of Profile Change, *Journal of Waterway, Port, Coastal and Ocean Engineering*, vol. 111, number 3, pp. 598-602.

Coastal Technology Corporation (Coastal Tech). 2012. Bonita Beach and Lovers Key Joint Coastal Permit Application.

Coastal Engineering Consultants, Inc. (CEC). 2016. Bonita Beach and Lovers Key Beach Renourishment 2016 Annual Monitoring Report.

Hubertz, J.M. 1992. User's Guide to the Wave Information Studies (WIS) Wave Model: Version 2.0, WIS Report 27, US Army Corps of Engineers, Waterways Experiment Station, Vicksburg, MS, 41 pp.

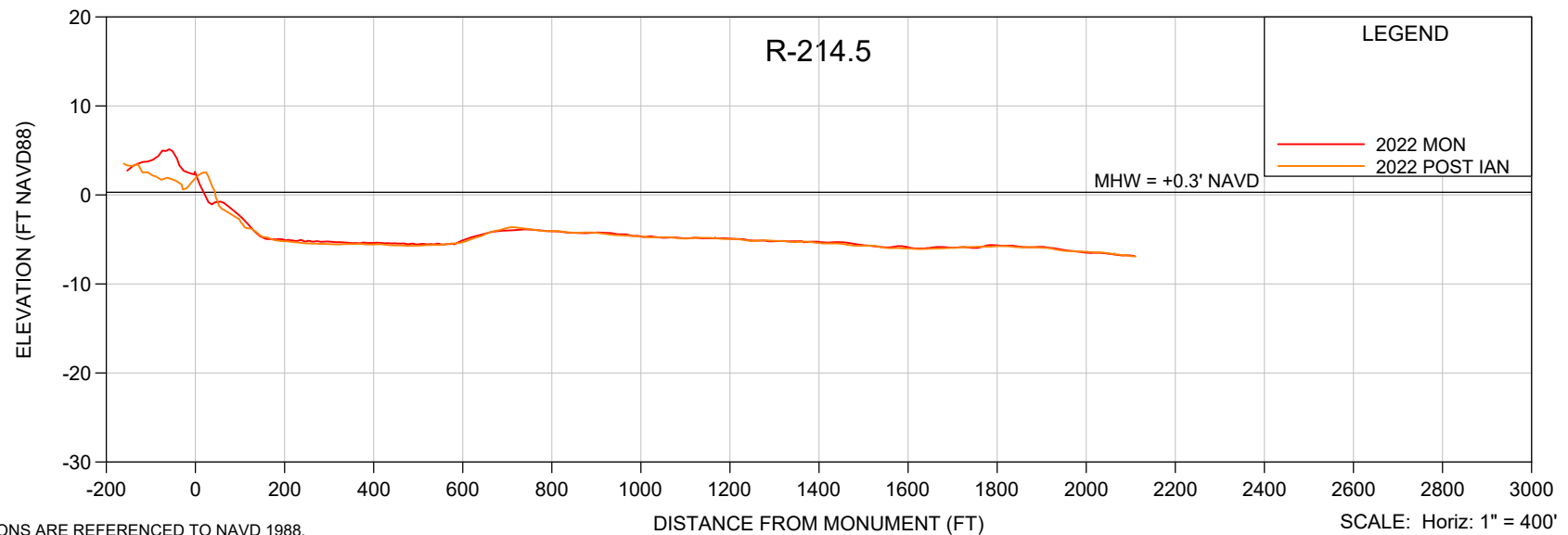
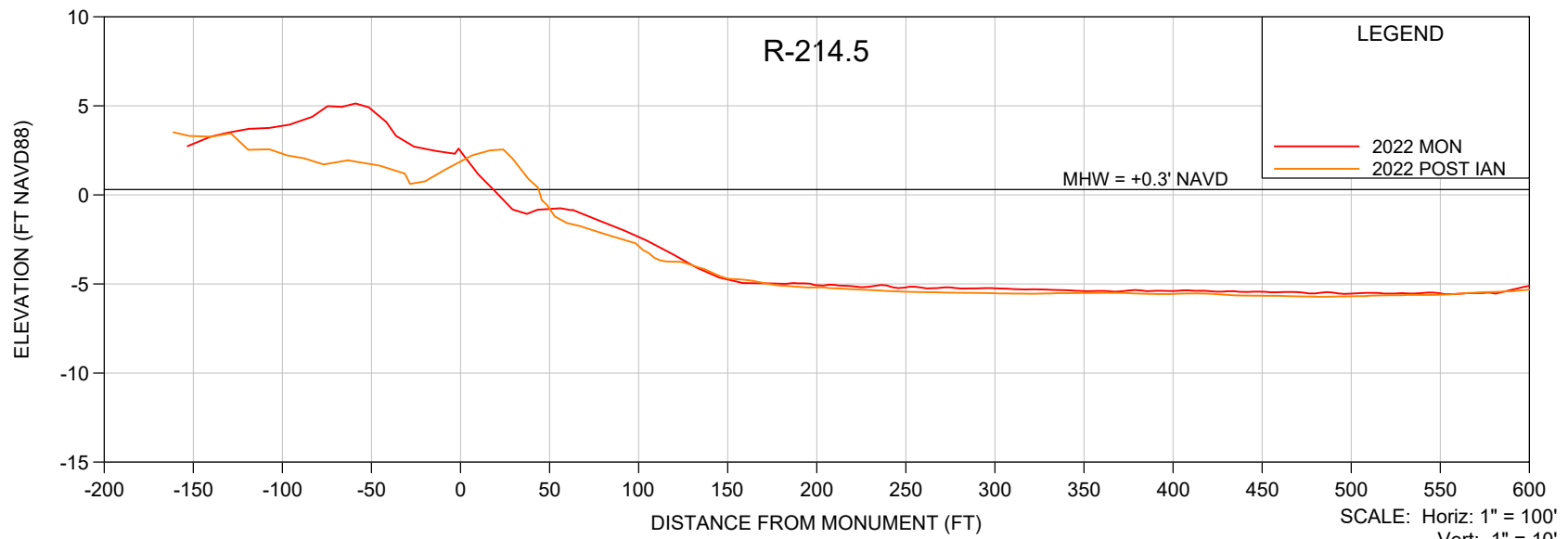
Lee County. 2007. Bonita Beach Nourishment 1st Year Post Construction Monitoring Report.

Lee County. 2008. Lovers Key Restoration 2nd Year Post Construction Monitoring Report.

Olsen Associates, Inc. (Olsen). 1996. Bonita Beach Beach Restoration Project Six-Month Post Construction Monitoring Report.

Attachment 1

Storm Impact Profile Comparisons



NOTES

- ELEVATIONS ARE REFERENCED TO NAVD 1988.
- PROFILE DATA ARE FROM SURVEYS BY CEC.
- UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 5
FILE NO.: 22279-R-214.5

**COASTAL
ENGINEERING
CONSULTANTS
INC.**
Serving Florida Since 1977
28421 BONITA CROSSINGS BLVD
BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
ENVIRONMENTAL & GEOLOGICAL SERVICES
SURVEY & MAPPING
ENGINEERING: CA 2464
SURVEYING: LB 2464
PHONE: (239)643-2324
FAX: (239)643-1143
www.coastalengineering.com
E-Mail: info@ceciff.com

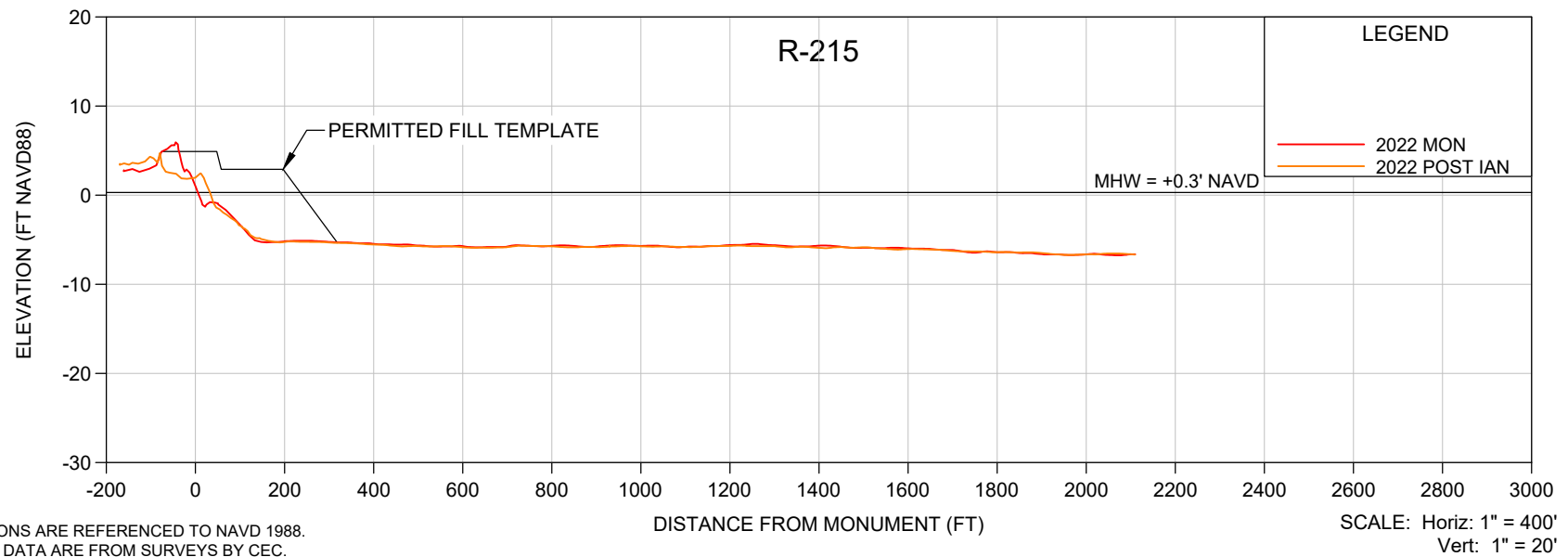
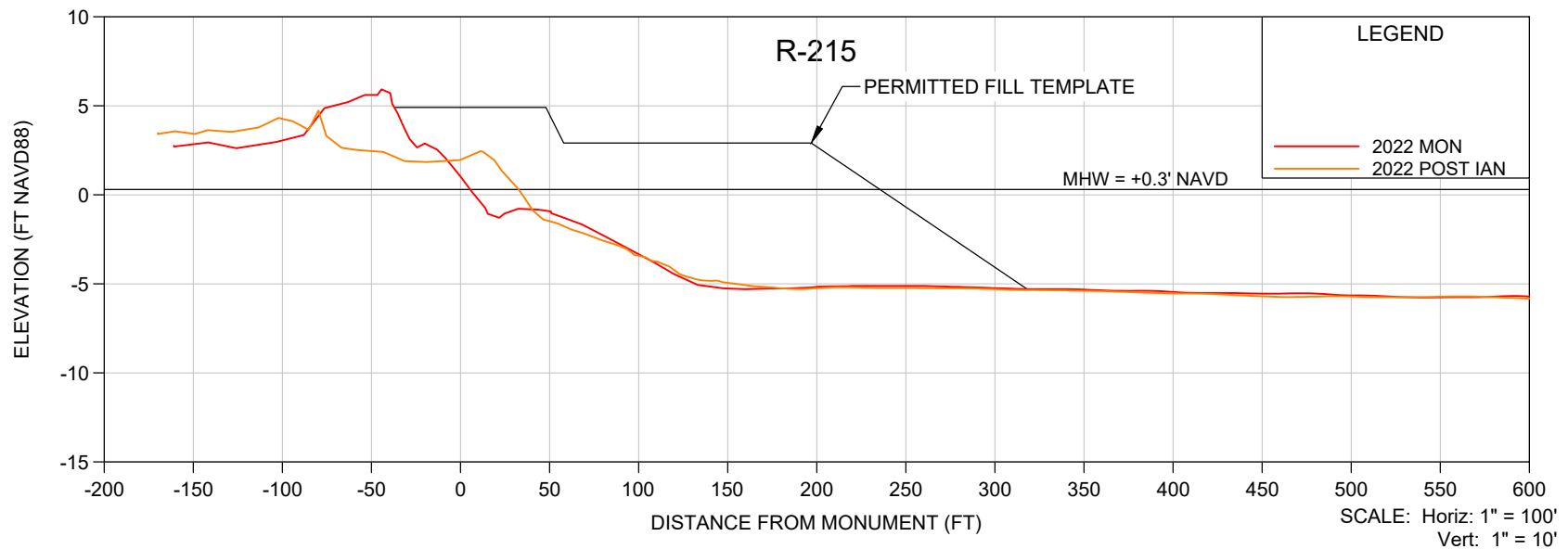
CLIENT:

LEE COUNTY

TITLE:

**BONITA BEACH AND LOVERS KEY
R-214.5 POST IAN SURVEY**

DATE:	10/17/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD. NO.	22279-Lovers Bonita Post Ian Profiles.dwg		
REF. NO.	22.279	NO.	DATE
		BY	REVISION DESCRIPTION



NOTES

- ELEVATIONS ARE REFERENCED TO NAVD 1988.
- PROFILE DATA ARE FROM SURVEYS BY CEC.
- UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 6
FILE NO.: 22279-R-215

COASTAL ENGINEERING CONSULTANTS INC.
Serving Florida Since 1977
28421 BONITA CROSSINGS BLVD
BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
ENVIRONMENTAL & GEOLOGICAL SERVICES
SURVEY & MAPPING
ENGINEERING: CA 2464
SURVEYING: LB 2464
PHONE: (239)643-2324
FAX: (239)643-1143
www.coastalengineering.com
E-Mail: info@ceciff.com

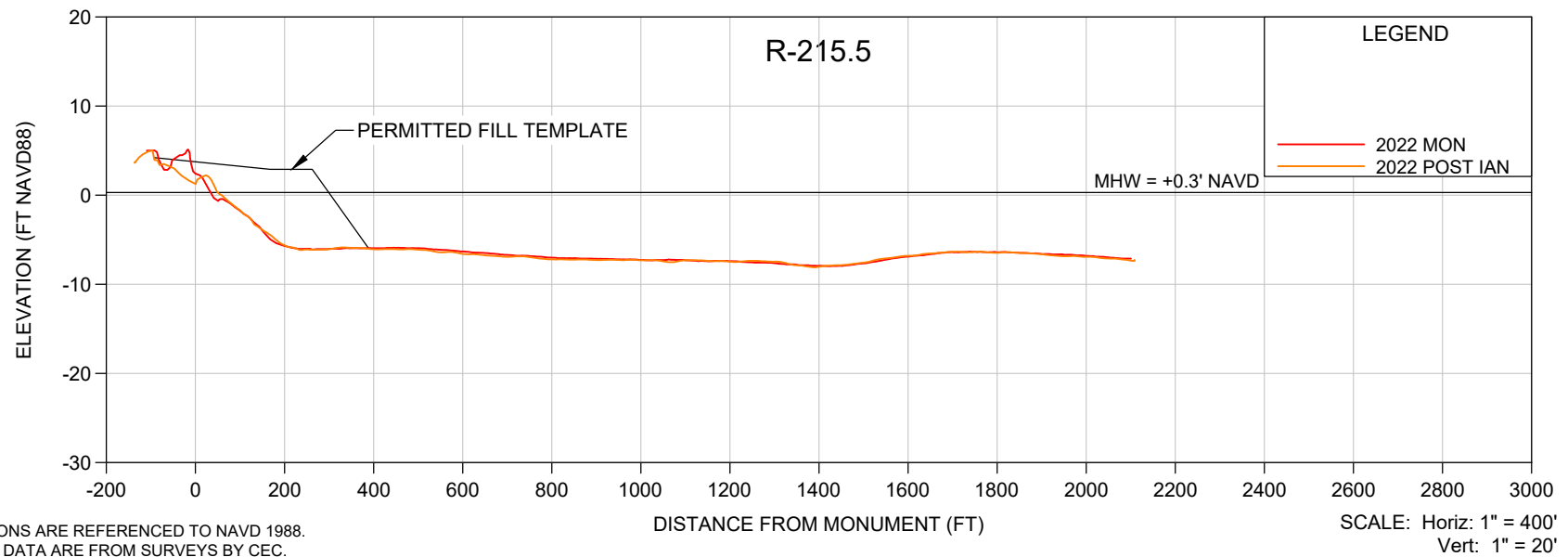
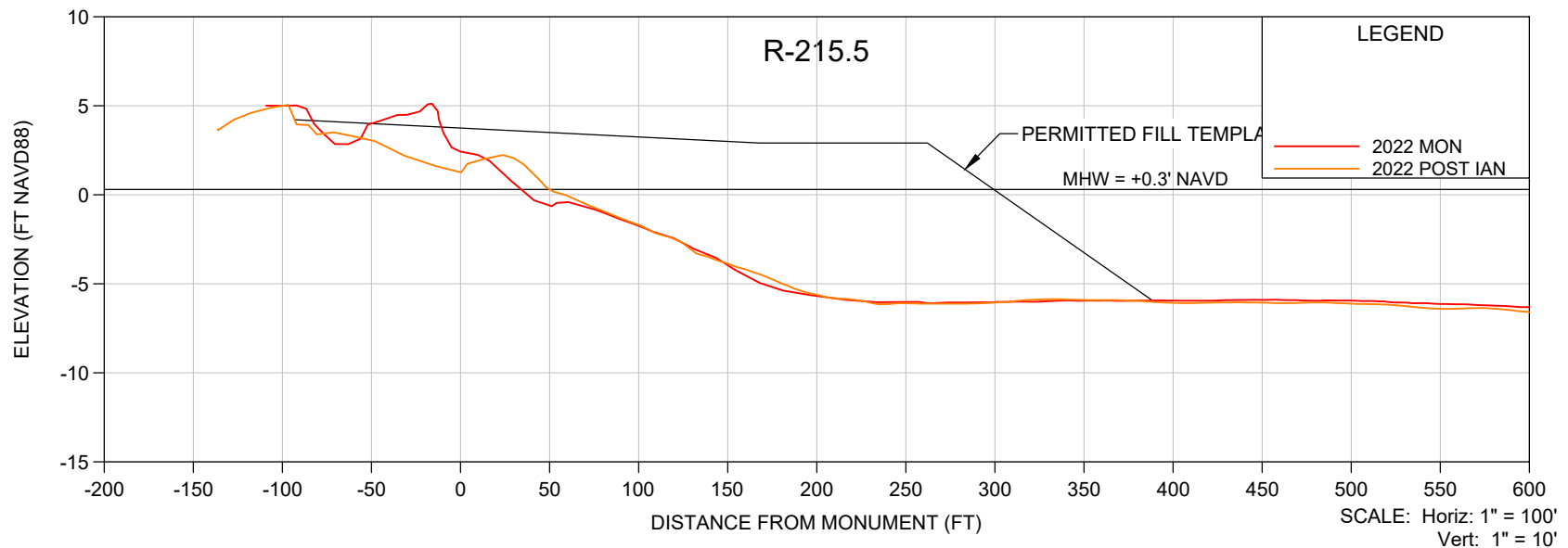
CLIENT:

LEE COUNTY

TITLE:

**BONITA BEACH AND LOVERS KEY
R-215 POST IAN SURVEY**

DATE:	10/17/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	22279-Lovers Bonita Post Ian Profiles.dwg		
REF. NO.	22.279	NO.	DATE
		BY	REVISION DESCRIPTION



NOTES

- ELEVATIONS ARE REFERENCED TO NAVD 1988.
- PROFILE DATA ARE FROM SURVEYS BY CEC.
- UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 7
FILE NO.: 22279-R-215.5

**COASTAL
ENGINEERING
CONSULTANTS
INC.**
Serving Florida Since 1977
28421 BONITA CROSSINGS BLVD
BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
ENVIRONMENTAL & GEOLOGICAL SERVICES
SURVEY & MAPPING
ENGINEERING: CA 2464
SURVEYING: LB 2464
PHONE: (239)643-2324
FAX: (239)643-1143
www.coastalengineering.com
E-Mail: info@ceciff.com

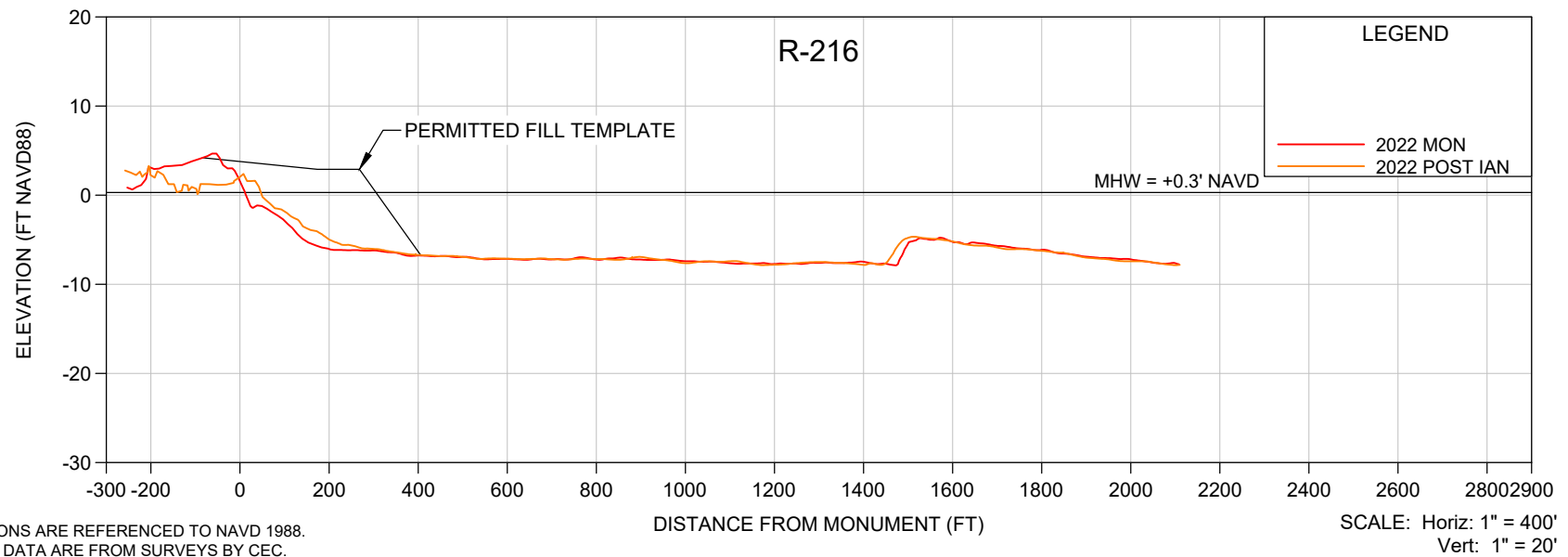
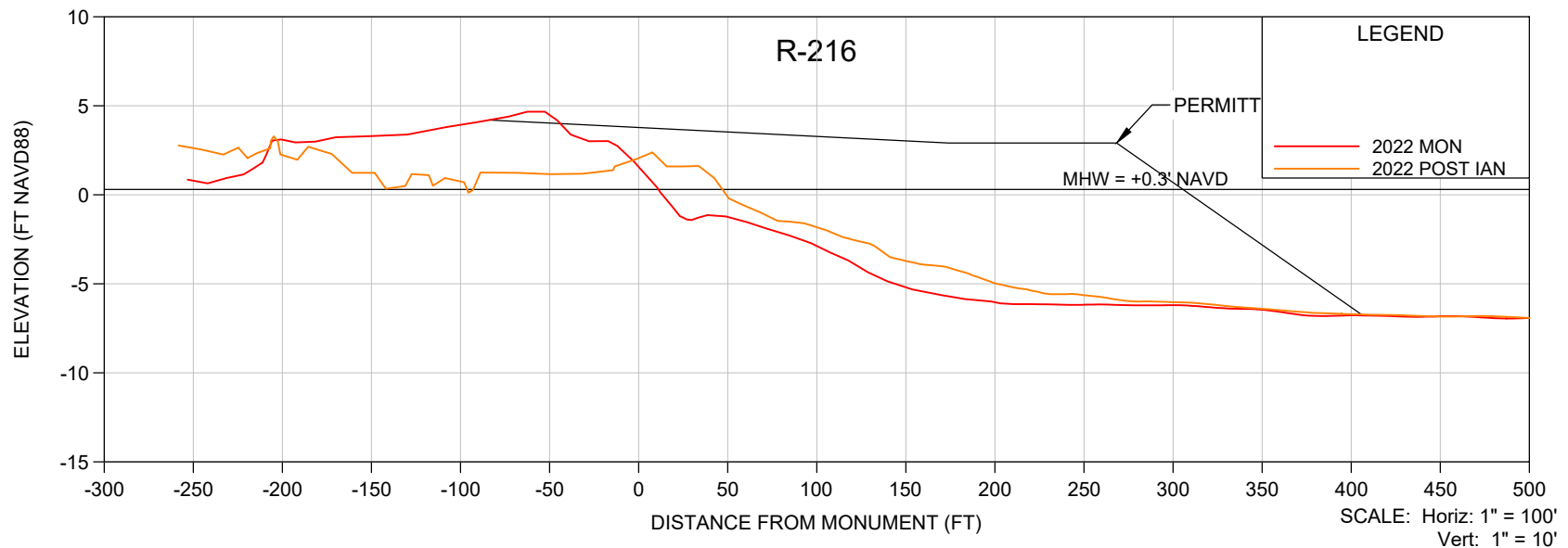
CLIENT:

LEE COUNTY

TITLE:

**BONITA BEACH AND LOVERS KEY
R-215.5 POST IAN SURVEY**

DATE:	10/17/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD. NO.	22279-Lovers Bonita Post Ian Profiles.dwg		
REF. NO.	22.279	NO.	DATE
		BY	REVISION DESCRIPTION



NOTES

1. ELEVATIONS ARE REFERENCED TO NAVD 1988.
2. PROFILE DATA ARE FROM SURVEYS BY CEC.
3. UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 8
FILE NO.: 22279-R-216

**COASTAL
ENGINEERING
CONSULTANTS
INC.**
Serving Florida Since 1977
28421 BONITA CROSSINGS BLVD
BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
ENVIRONMENTAL & GEOLOGICAL SERVICES
SURVEY & MAPPING
ENGINEERING: CA 2464
SURVEYING: LB 2464
PHONE: (239)643-2324
FAX: (239)643-1143
www.coastalengineering.com
E-Mail: info@ceciff.com

CLIENT:

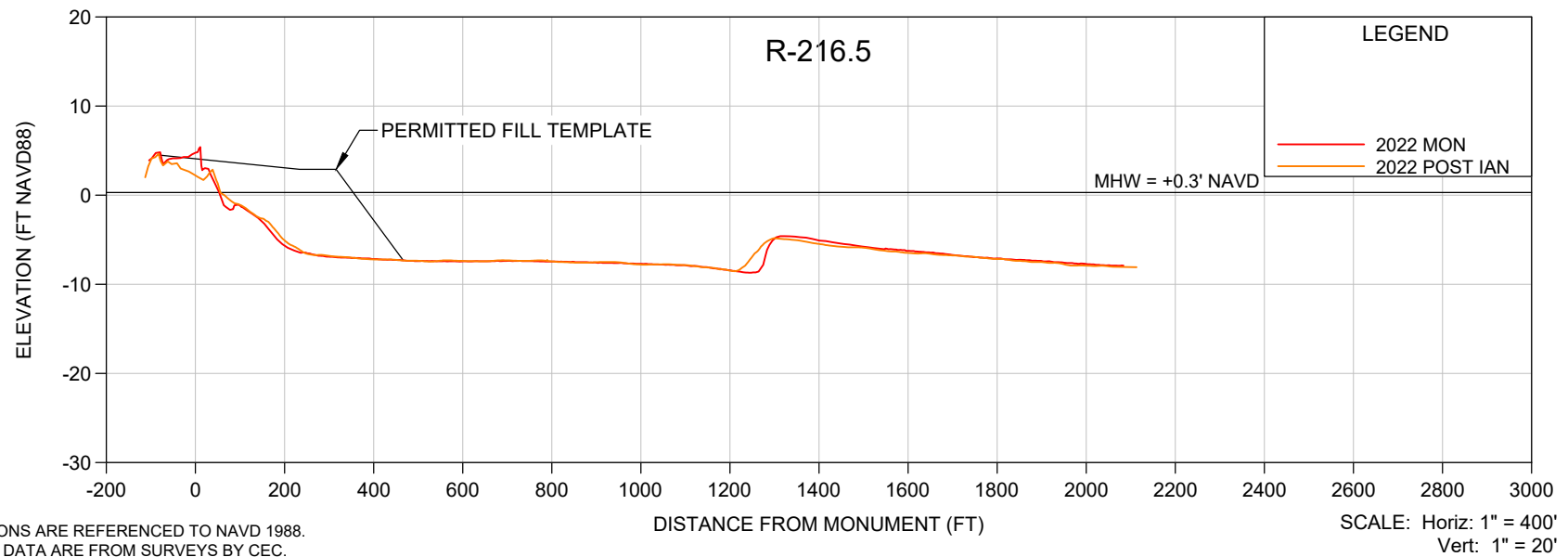
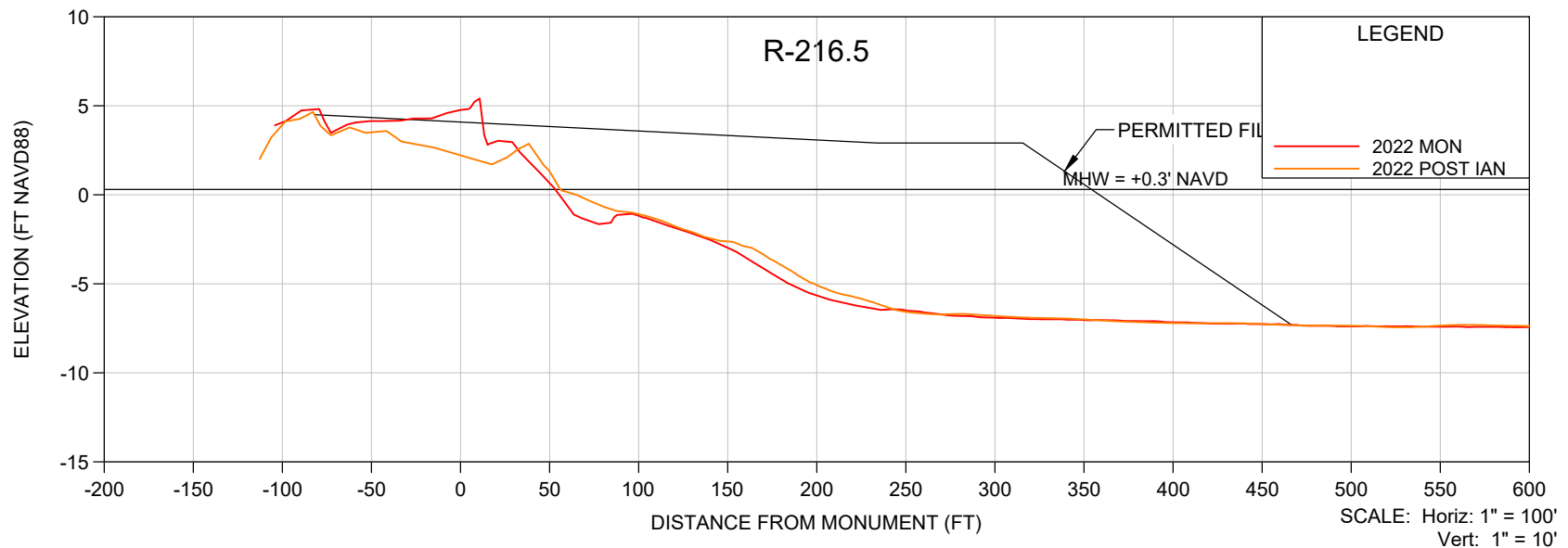
LEE COUNTY

TITLE:

**BONITA BEACH AND LOVERS KEY
R-216 POST IAN SURVEY**

DATE:	10/17/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	22279-Lovers Bonita Post Ian Profiles.dwg		
REF. NO.	22.279	NO.	DATE

BY	REVISION DESCRIPTION



NOTES

- ELEVATIONS ARE REFERENCED TO NAVD 1988.
- PROFILE DATA ARE FROM SURVEYS BY CEC.
- UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 9
FILE NO.: 22279-R-216.5

**COASTAL
ENGINEERING
CONSULTANTS
INC.**

Serving Florida Since 1977

28421 BONITA CROSSINGS BLVD
BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
ENVIRONMENTAL & GEOLOGICAL SERVICES
SURVEY & MAPPING
ENGINEERING: CA 2464
SURVEYING: LB 2464

PHONE: (239)643-2324
FAX: (239)643-1143
www.coastalengineering.com
E-Mail: info@ceciff.com

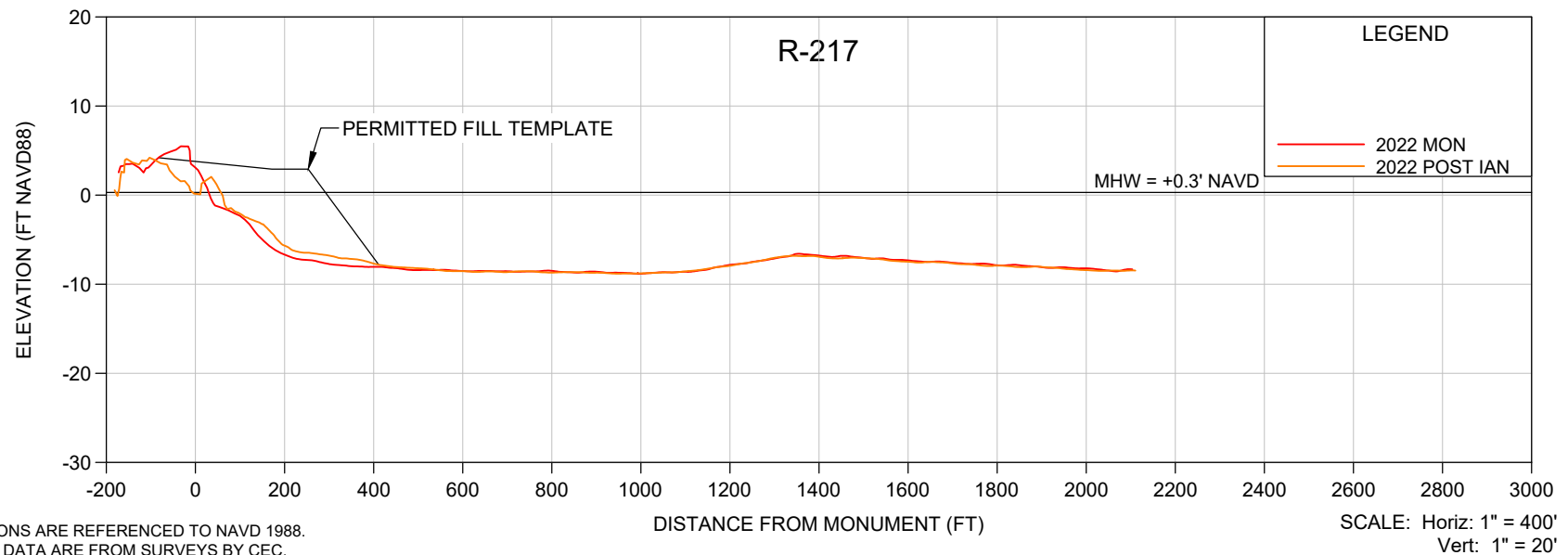
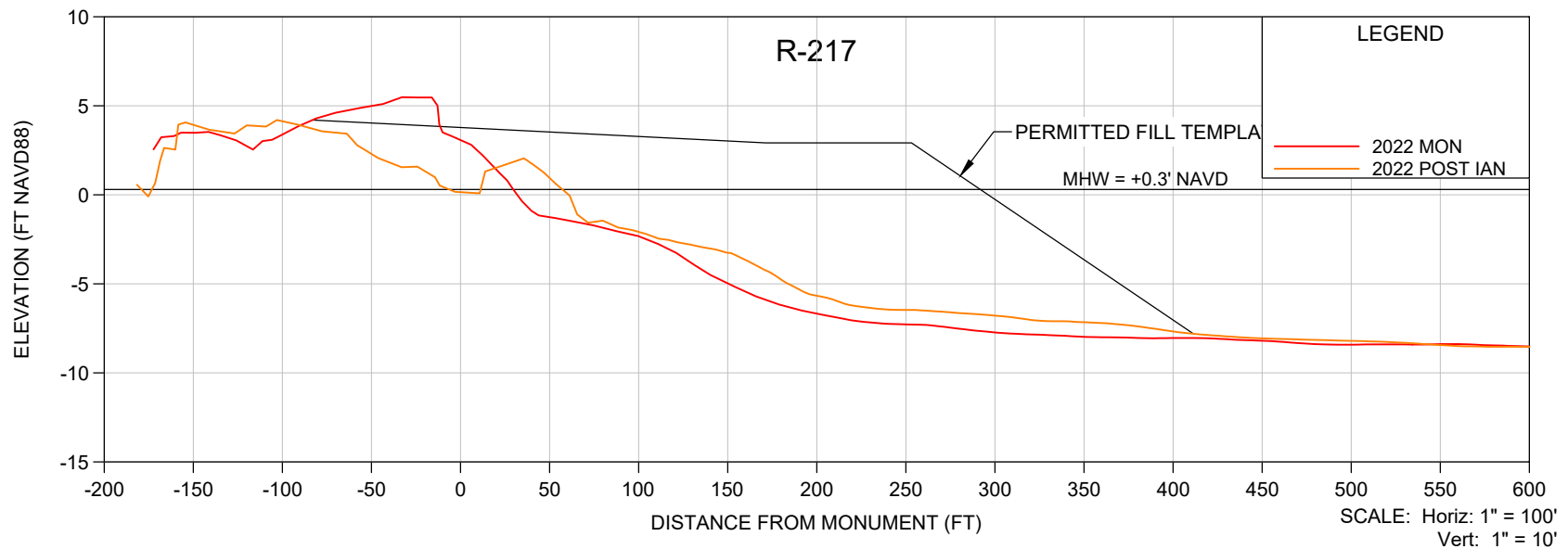
CLIENT:

LEE COUNTY

TITLE:

**BONITA BEACH AND LOVERS KEY
R-216.5 POST IAN SURVEY**

DATE:	10/17/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD. NO.	22279-Lovers Bonita Post Ian Profiles.dwg		
REF. NO.	22.279	NO.	DATE
		BY	REVISION DESCRIPTION



NOTES

1. ELEVATIONS ARE REFERENCED TO NAVD 1988.
2. PROFILE DATA ARE FROM SURVEYS BY CEC.
3. UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 10
FILE NO.: 22279-R-217

**COASTAL
ENGINEERING
CONSULTANTS
INC.**
Serving Florida Since 1977
28421 BONITA CROSSINGS BLVD
BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
ENVIRONMENTAL & GEOLOGICAL SERVICES
SURVEY & MAPPING
ENGINEERING: CA 2464
SURVEYING: LB 2464
PHONE: (239)643-2324
FAX: (239)643-1143
www.coastalengineering.com
E-Mail: info@ceciff.com

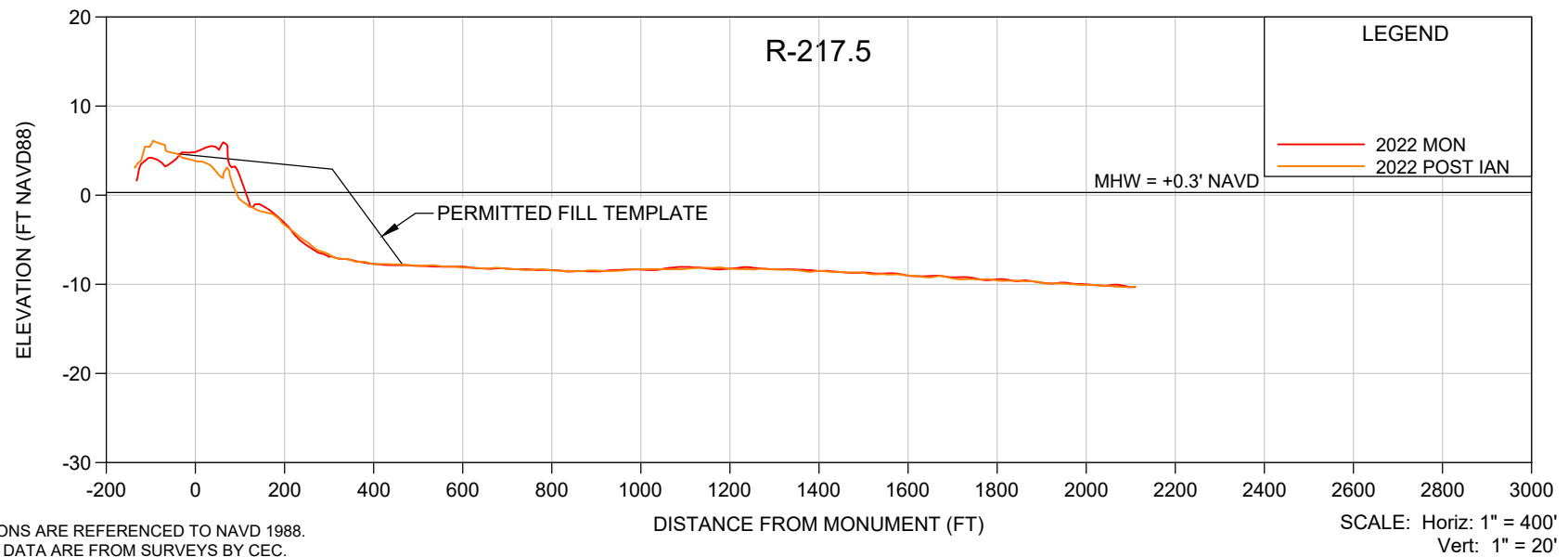
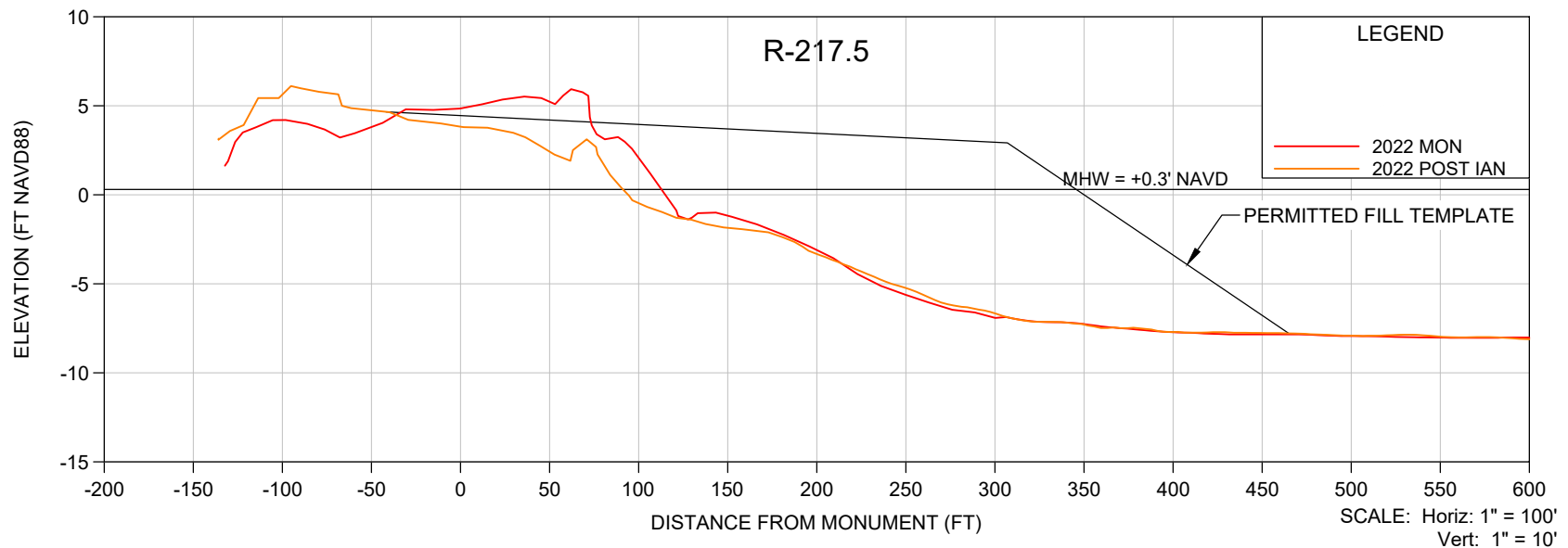
CLIENT:

LEE COUNTY

TITLE:

**BONITA BEACH AND LOVERS KEY
R-217 POST IAN SURVEY**

DATE:	10/17/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD. NO.	22279-Lovers Bonita Post Ian Profiles.dwg		
REF. NO.	22.279	NO.	DATE
		BY	REVISION DESCRIPTION



NOTES

1. ELEVATIONS ARE REFERENCED TO NAVD 1988.
2. PROFILE DATA ARE FROM SURVEYS BY CEC.
3. UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 11
FILE NO.: 22279-R-217.5

**COASTAL
ENGINEERING
CONSULTANTS
INC.**
Serving Florida Since 1977
28421 BONITA CROSSINGS BLVD
BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
ENVIRONMENTAL & GEOLOGICAL SERVICES
SURVEY & MAPPING
ENGINEERING: CA 2464
SURVEYING: LB 2464
PHONE: (239)643-2324
FAX: (239)643-1143
www.coastalengineering.com
E-Mail: info@ceciff.com

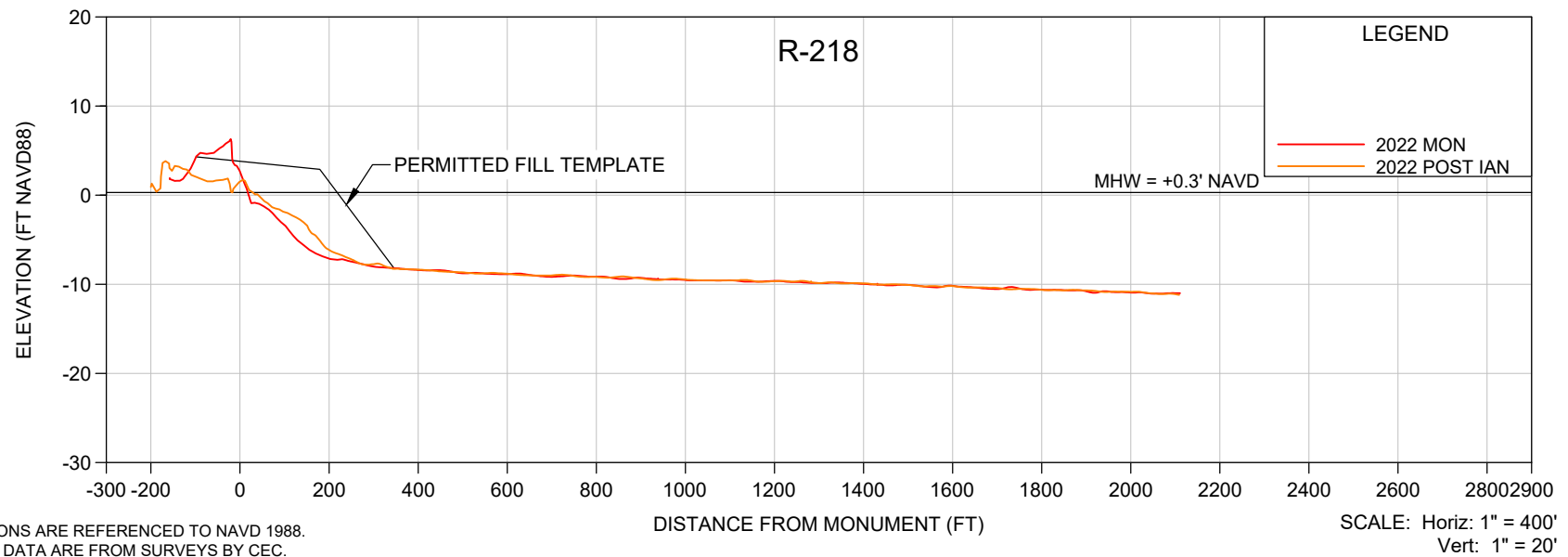
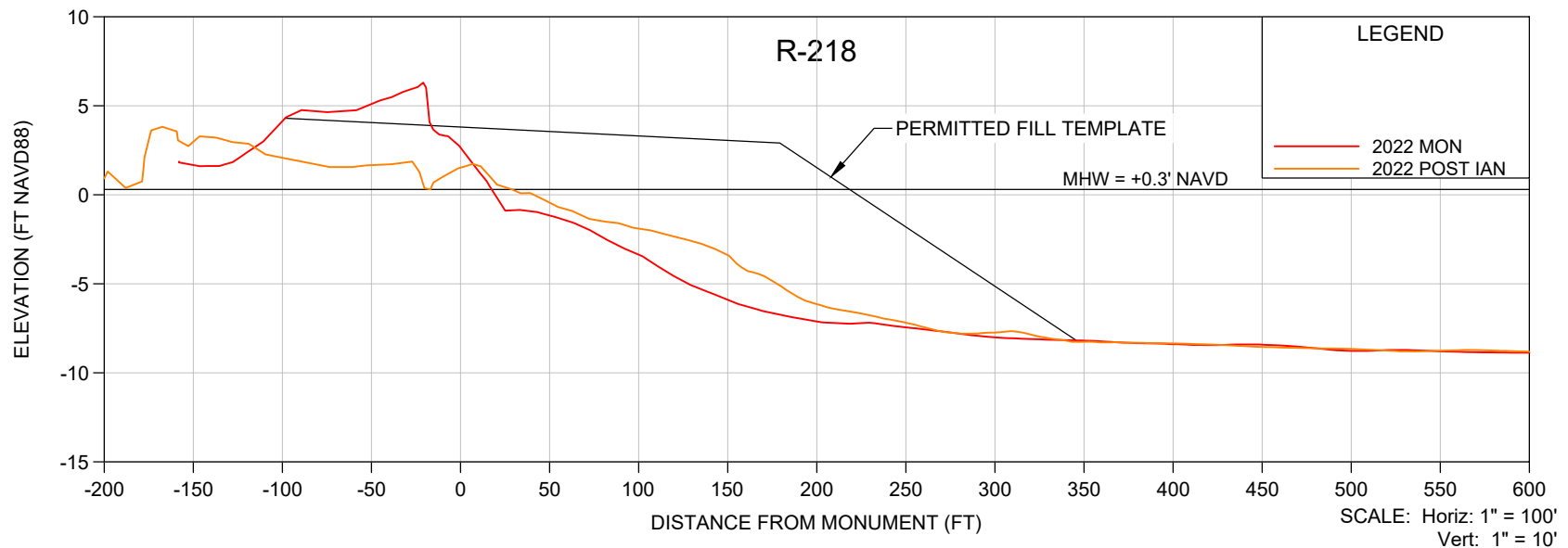
CLIENT:

LEE COUNTY

TITLE:

**BONITA BEACH AND LOVERS KEY
R-217.5 POST IAN SURVEY**

DATE:	10/17/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	22279-Lovers Bonita Post Ian Profiles.dwg		
REF. NO.	22.279	NO.	DATE
		BY	REVISION DESCRIPTION



NOTES

- ELEVATIONS ARE REFERENCED TO NAVD 1988.
- PROFILE DATA ARE FROM SURVEYS BY CEC.
- UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 12
FILE NO.: 22279-R-218

**COASTAL
ENGINEERING
CONSULTANTS
INC.**
Serving Florida Since 1977
28421 BONITA CROSSINGS BLVD
BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
ENVIRONMENTAL & GEOLOGICAL SERVICES
SURVEY & MAPPING
ENGINEERING: CA 2464
SURVEYING: LB 2464
PHONE: (239)643-2324
FAX: (239)643-1143
www.coastalengineering.com
E-Mail: info@ceciff.com

CLIENT:

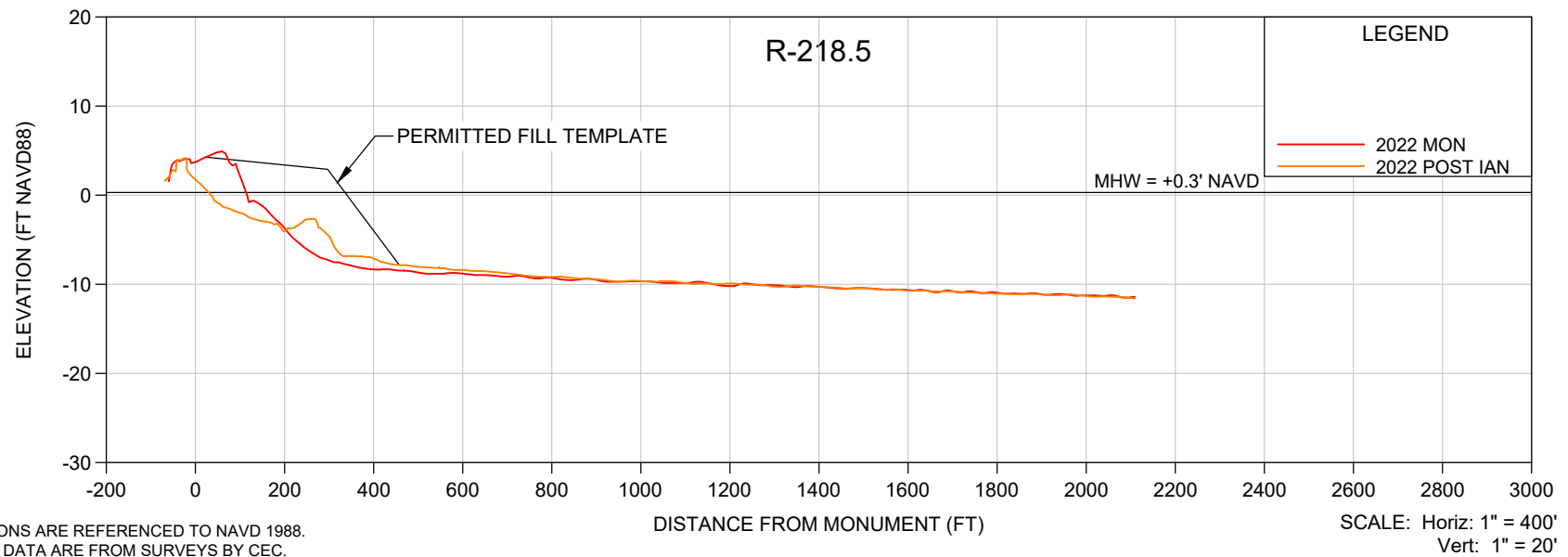
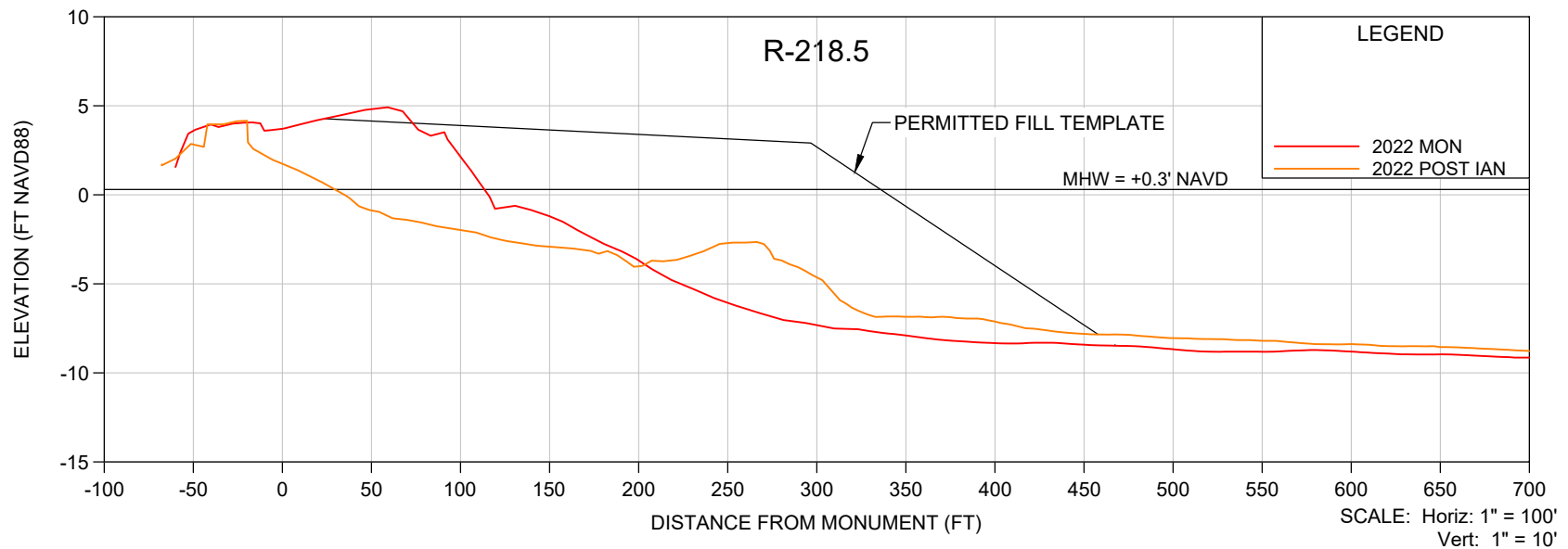
LEE COUNTY

TITLE:

**BONITA BEACH AND LOVERS KEY
R-218 POST IAN SURVEY**

DATE:	10/17/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	22279-Lovers Bonita Post Ian Profiles.dwg		
REF. NO.	22.279	NO.	DATE

BY	REVISION DESCRIPTION



NOTES

- ELEVATIONS ARE REFERENCED TO NAVD 1988.
- PROFILE DATA ARE FROM SURVEYS BY CEC.
- UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 13
FILE NO.: 22279-R-218.5

**COASTAL
ENGINEERING
CONSULTANTS
INC.**
Serving Florida Since 1977
28421 BONITA CROSSINGS BLVD
BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
ENVIRONMENTAL & GEOLOGICAL SERVICES
SURVEY & MAPPING
ENGINEERING: CA 2464
SURVEYING: LB 2464
PHONE: (239)643-2324
FAX: (239)643-1143
www.coastalengineering.com
E-Mail: info@ceciff.com

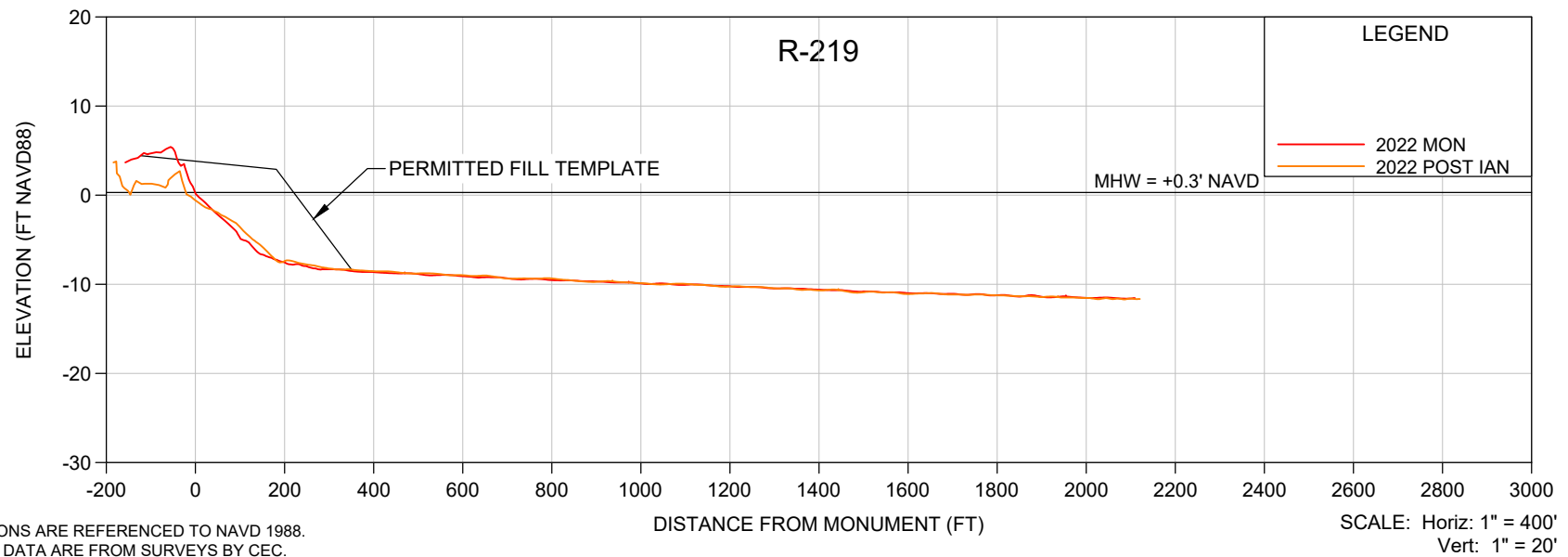
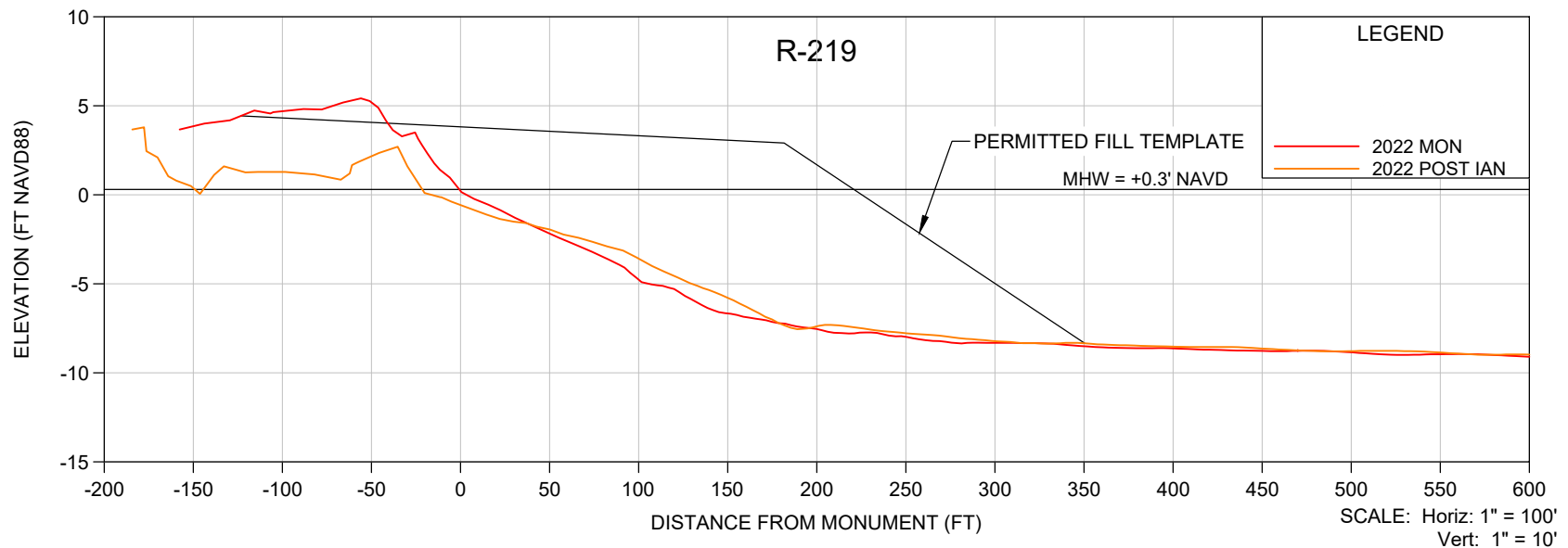
CLIENT:

LEE COUNTY

TITLE:

**BONITA BEACH AND LOVERS KEY
R-218.5 POST IAN SURVEY**

DATE:	10/17/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD. NO.	22279-Lovers Bonita Post Ian Profiles.dwg		
REF. NO.	22.279	NO.	DATE
		BY	REVISION DESCRIPTION



NOTES

- ELEVATIONS ARE REFERENCED TO NAVD 1988.
- PROFILE DATA ARE FROM SURVEYS BY CEC.
- UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 14
FILE NO.: 22279-R-219

**COASTAL
ENGINEERING
CONSULTANTS
INC.**

Serving Florida Since 1977

28421 BONITA CROSSINGS BLVD
BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
ENVIRONMENTAL & GEOLOGICAL SERVICES
SURVEY & MAPPING
ENGINEERING: CA 2464
SURVEYING: LB 2464

PHONE: (239)643-2324
FAX: (239)643-1143
www.coastalengineering.com
E-Mail: info@ceciff.com

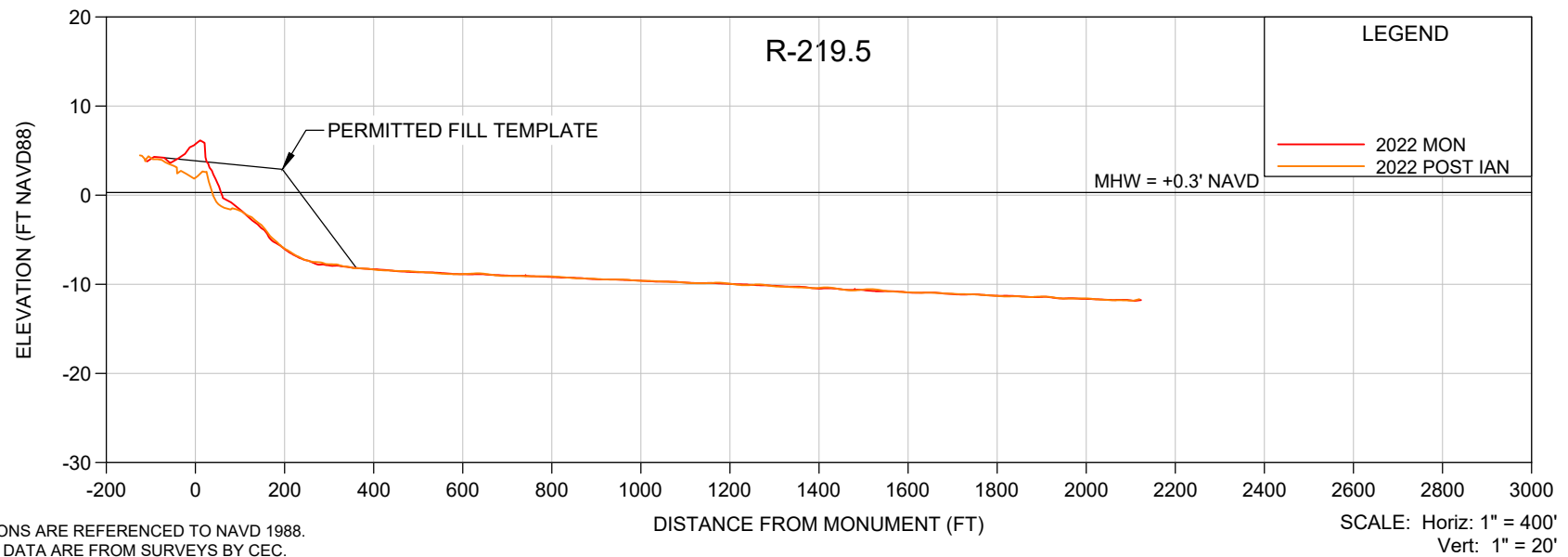
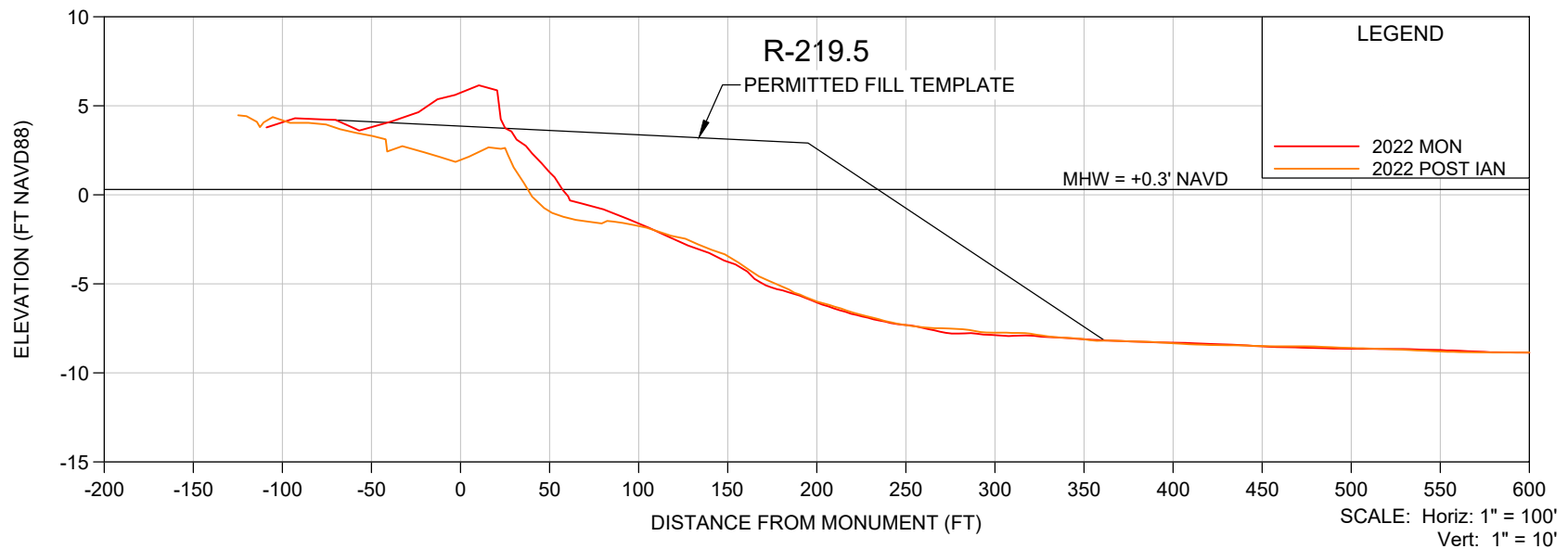
CLIENT:

LEE COUNTY

TITLE:

**BONITA BEACH AND LOVERS KEY
R-219 POST IAN SURVEY**

DATE:	10/17/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	22279-Lovers Bonita Post Ian Profiles.dwg		
REF. NO.	22.279	NO.	DATE
		BY	REVISION DESCRIPTION



NOTES

- ELEVATIONS ARE REFERENCED TO NAVD 1988.
- PROFILE DATA ARE FROM SURVEYS BY CEC.
- UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 15
FILE NO.: 22279-R-219.5

**COASTAL
ENGINEERING
CONSULTANTS
INC.**
 Serving Florida Since 1977
 28421 BONITA CROSSINGS BLVD
 BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
 ENVIRONMENTAL & GEOLOGICAL SERVICES
 SURVEY & MAPPING
 ENGINEERING: CA 2464
 SURVEYING: LB 2464
 PHONE: (239)643-2324
 FAX: (239)643-1143
 www.coastalengineering.com
 E-Mail: info@ceciff.com

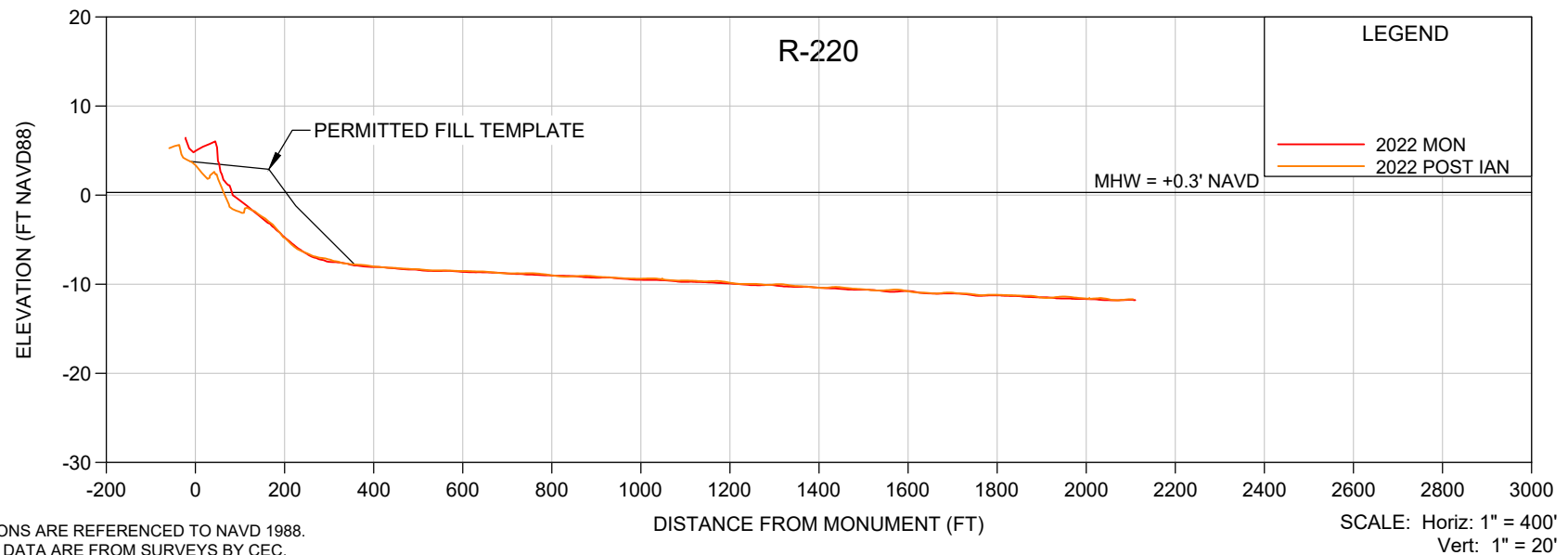
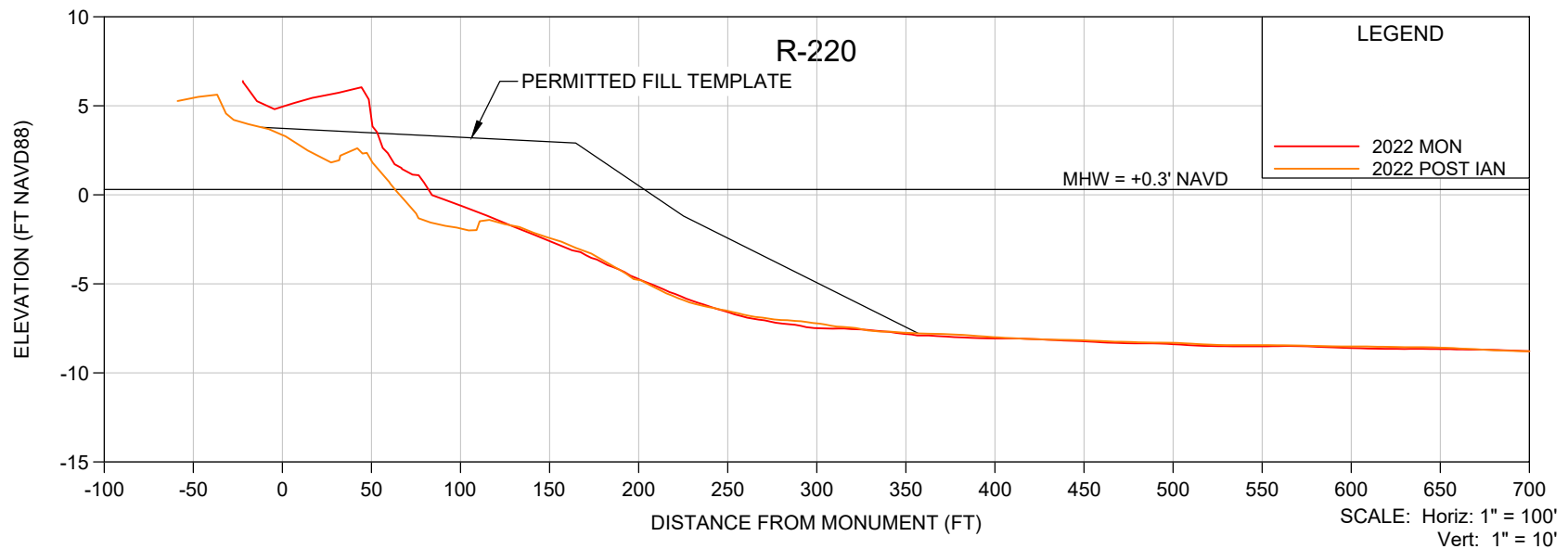
CLIENT:

LEE COUNTY

TITLE:

**BONITA BEACH AND LOVERS KEY
 R-219.5 POST IAN SURVEY**

DATE:	10/17/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD. NO.	22279-Lovers Bonita Post Ian Profiles.dwg		
REF. NO.	22.279	NO.	DATE
		BY	REVISION DESCRIPTION



NOTES

- ELEVATIONS ARE REFERENCED TO NAVD 1988.
- PROFILE DATA ARE FROM SURVEYS BY CEC.
- UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 16
FILE NO.: 22279-R-220

**COASTAL
ENGINEERING
CONSULTANTS
INC.**
Serving Florida Since 1977
28421 BONITA CROSSINGS BLVD
BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
ENVIRONMENTAL & GEOLOGICAL SERVICES
SURVEY & MAPPING
ENGINEERING: CA 2464
SURVEYING: LB 2464
PHONE: (239)643-2324
FAX: (239)643-1143
www.coastalengineering.com
E-Mail: info@ceciff.com

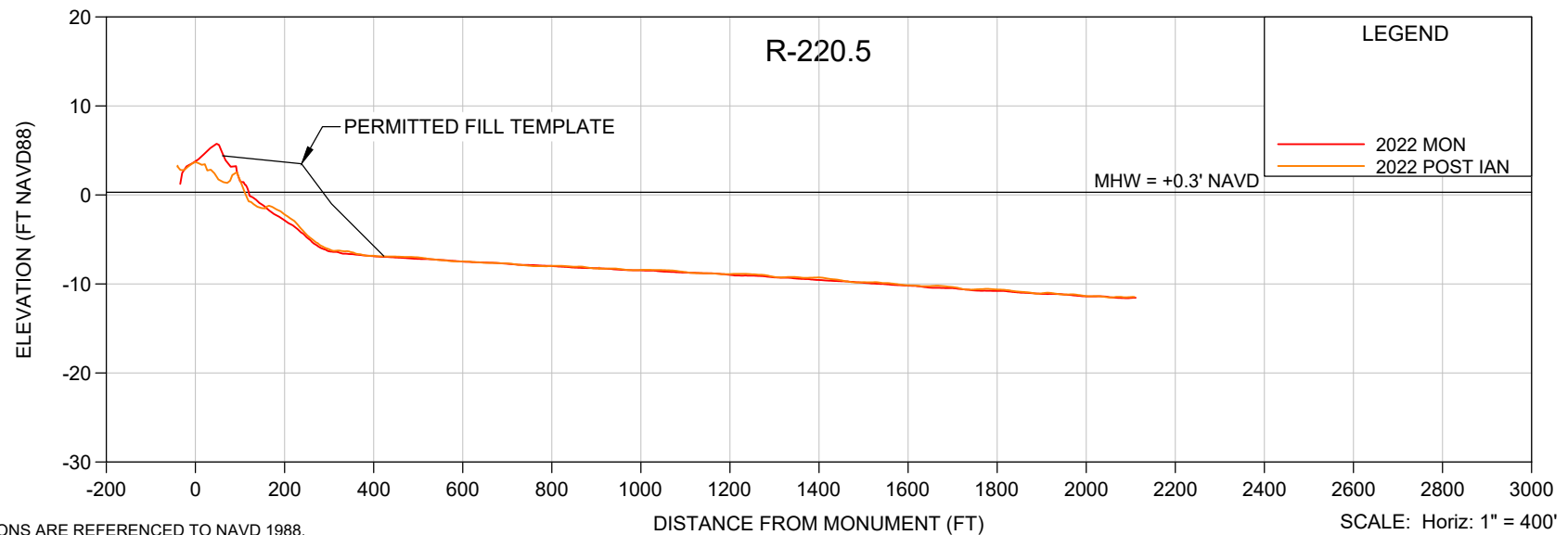
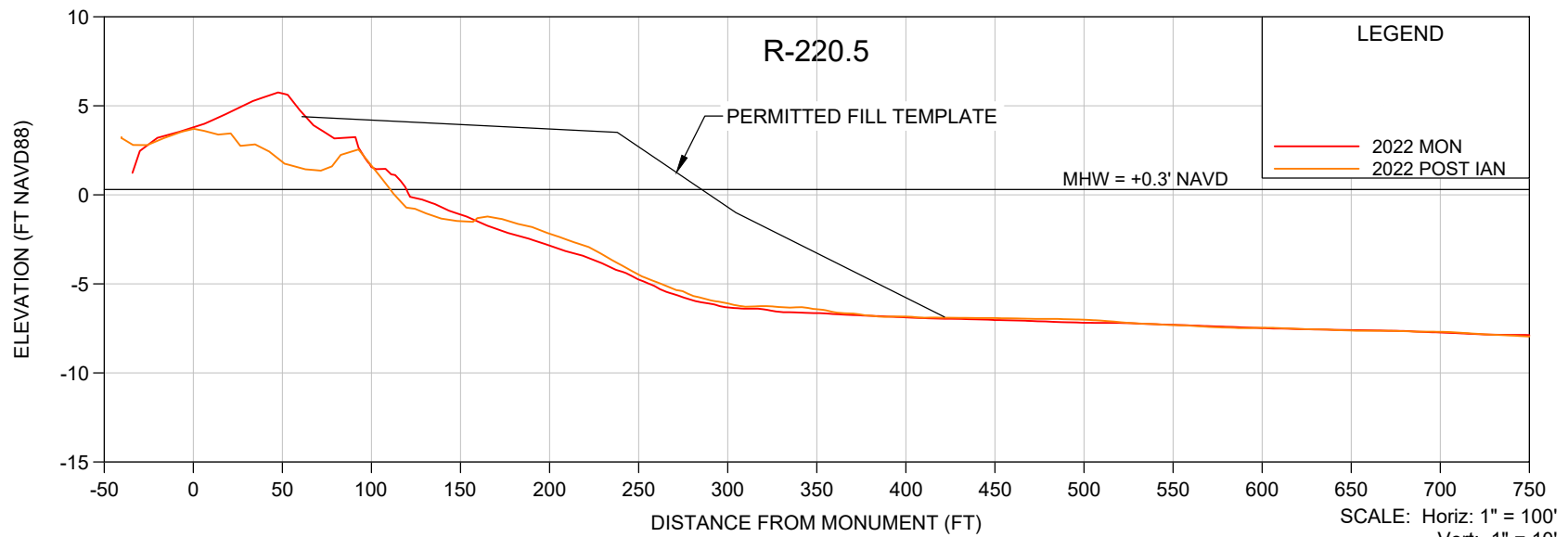
CLIENT:

LEE COUNTY

TITLE:

**BONITA BEACH AND LOVERS KEY
R-220 POST IAN SURVEY**

DATE:	10/17/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	22279-Lovers Bonita Post Ian Profiles.dwg		
REF. NO.	22.279	NO.	DATE
		BY	REVISION DESCRIPTION



NOTES

- ELEVATIONS ARE REFERENCED TO NAVD 1988.
- PROFILE DATA ARE FROM SURVEYS BY CEC.
- UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 17
FILE NO.: 22279-R-220.5

**COASTAL
ENGINEERING
CONSULTANTS
INC.**
Serving Florida Since 1977
28421 BONITA CROSSINGS BLVD
BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
ENVIRONMENTAL & GEOLOGICAL SERVICES
SURVEY & MAPPING
ENGINEERING: CA 2464
SURVEYING: LB 2464
PHONE: (239)643-2324
FAX: (239)643-1143
www.coastalengineering.com
E-Mail: info@ceciff.com

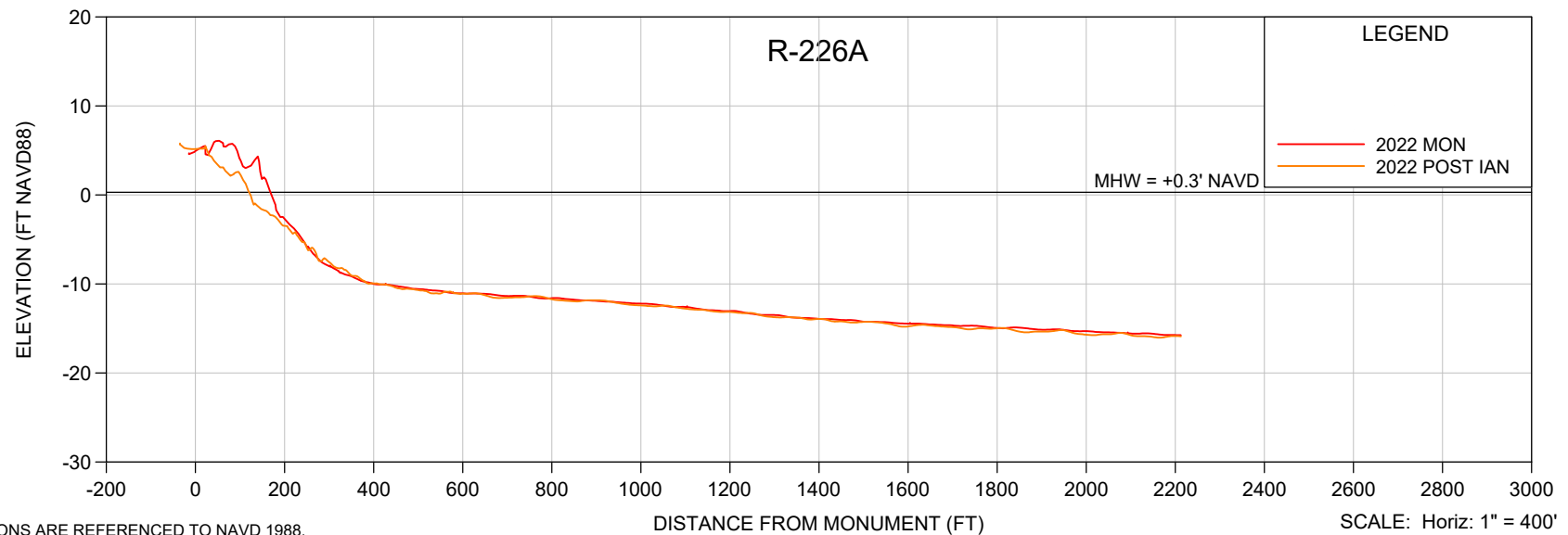
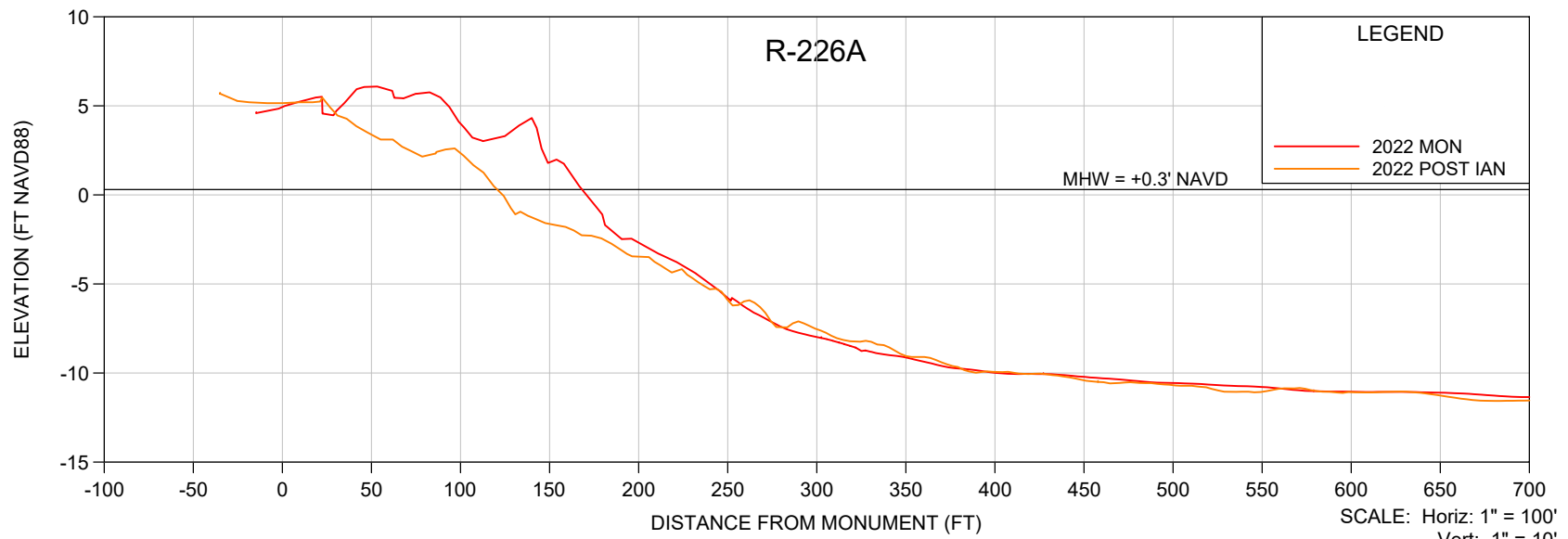
CLIENT:

LEE COUNTY

TITLE:

**BONITA BEACH AND LOVERS KEY
R-220.5 POST IAN SURVEY**

DATE:	10/17/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	22279-Lovers Bonita Post Ian Profiles.dwg		
REF. NO.	22.279	NO.	DATE
		BY	REVISION DESCRIPTION



NOTES

- ELEVATIONS ARE REFERENCED TO NAVD 1988.
- PROFILE DATA ARE FROM SURVEYS BY CEC.
- UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 29
FILE NO.: 22279-R-226A

**COASTAL
ENGINEERING
CONSULTANTS
INC.**
Serving Florida Since 1977
28421 BONITA CROSSINGS BLVD
BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
ENVIRONMENTAL & GEOLOGICAL SERVICES
SURVEY & MAPPING
ENGINEERING: CA 2464
SURVEYING: LB 2464
PHONE: (239)643-2324
FAX: (239)643-1143
www.coastalengineering.com
E-Mail: info@ceciff.com

CLIENT:

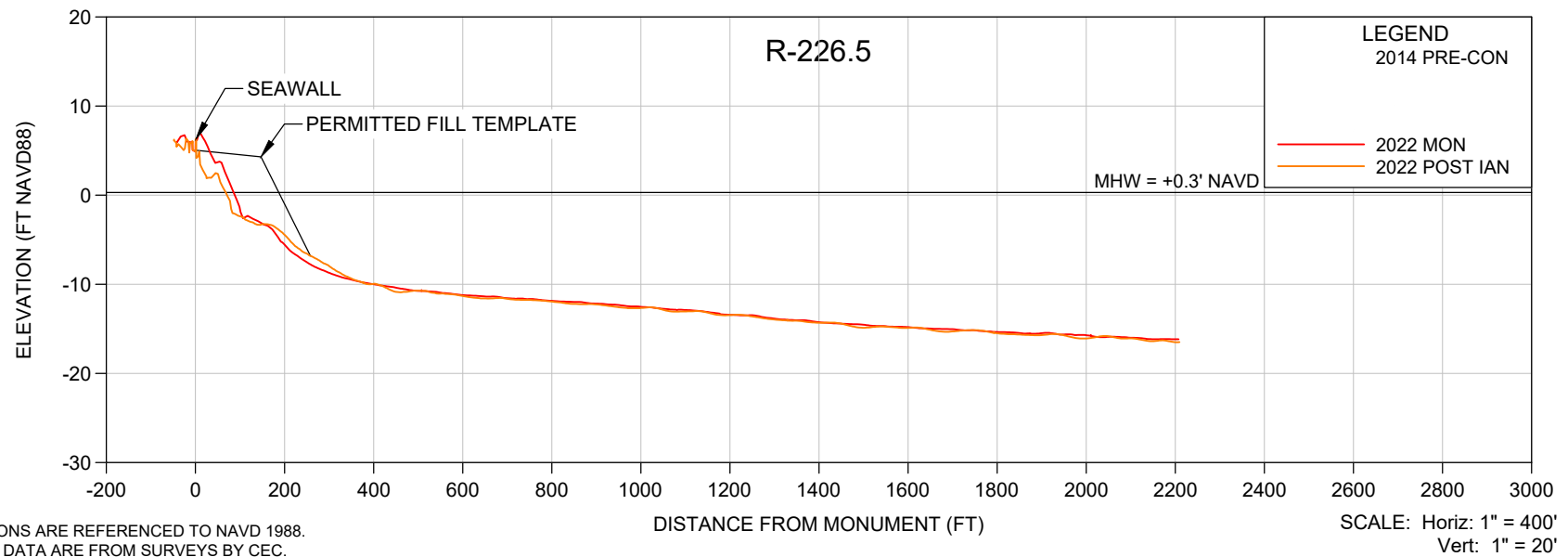
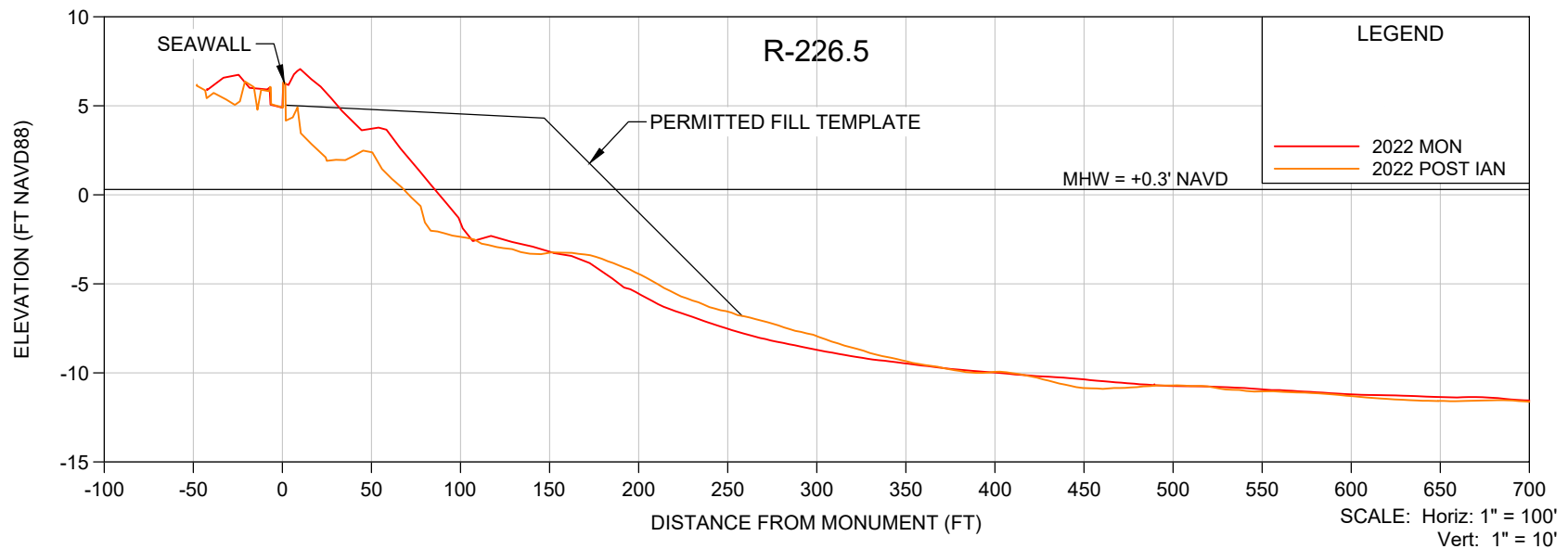
LEE COUNTY

TITLE:

**BONITA BEACH AND LOVERS KEY
R-226A POST IAN SURVEY**

DATE:	10/17/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	22279-Lovers Bonita Post Ian Profiles.dwg		
REF. NO.	22.279	NO.	DATE

BY	REVISION DESCRIPTION



NOTES

- ELEVATIONS ARE REFERENCED TO NAVD 1988.
- PROFILE DATA ARE FROM SURVEYS BY CEC.
- UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 30
FILE NO.: 22279-R-226.5

**COASTAL
ENGINEERING
CONSULTANTS
INC.**

Serving Florida Since 1977

28421 BONITA CROSSINGS BLVD
BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
ENVIRONMENTAL & GEOLOGICAL SERVICES
SURVEY & MAPPING
ENGINEERING: CA 2464
SURVEYING: LB 2464

PHONE: (239)643-2324
FAX: (239)643-1143
www.coastalengineering.com
E-Mail: info@ceciff.com

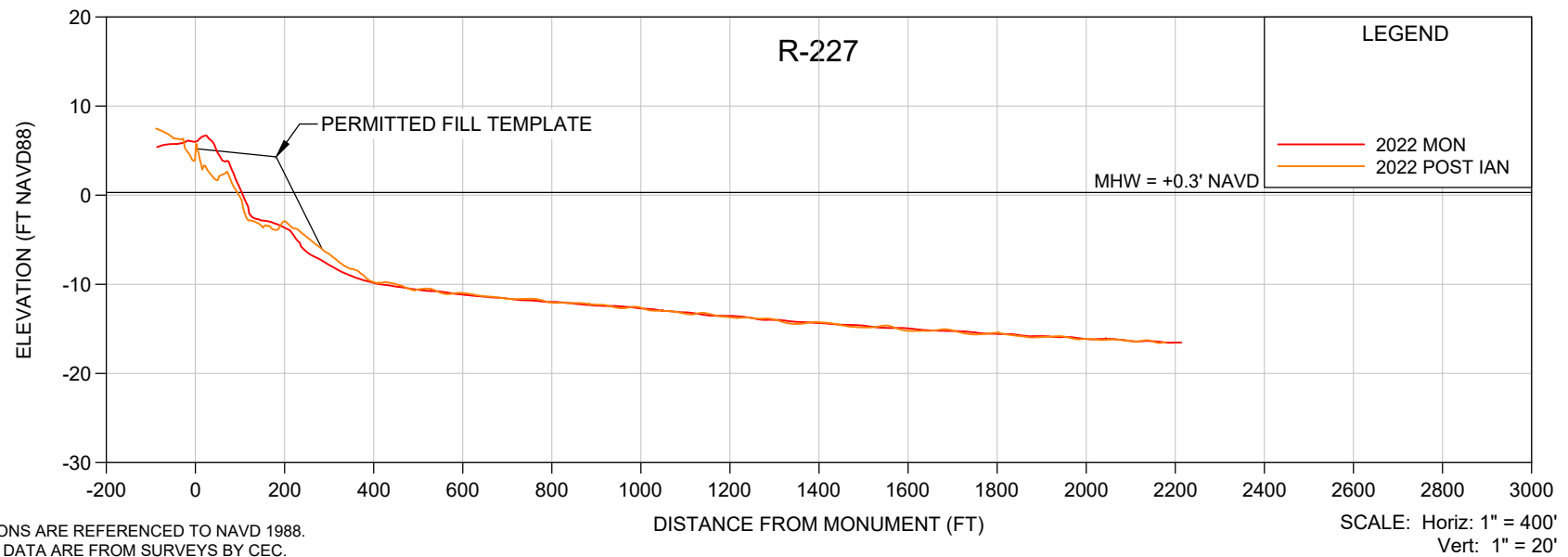
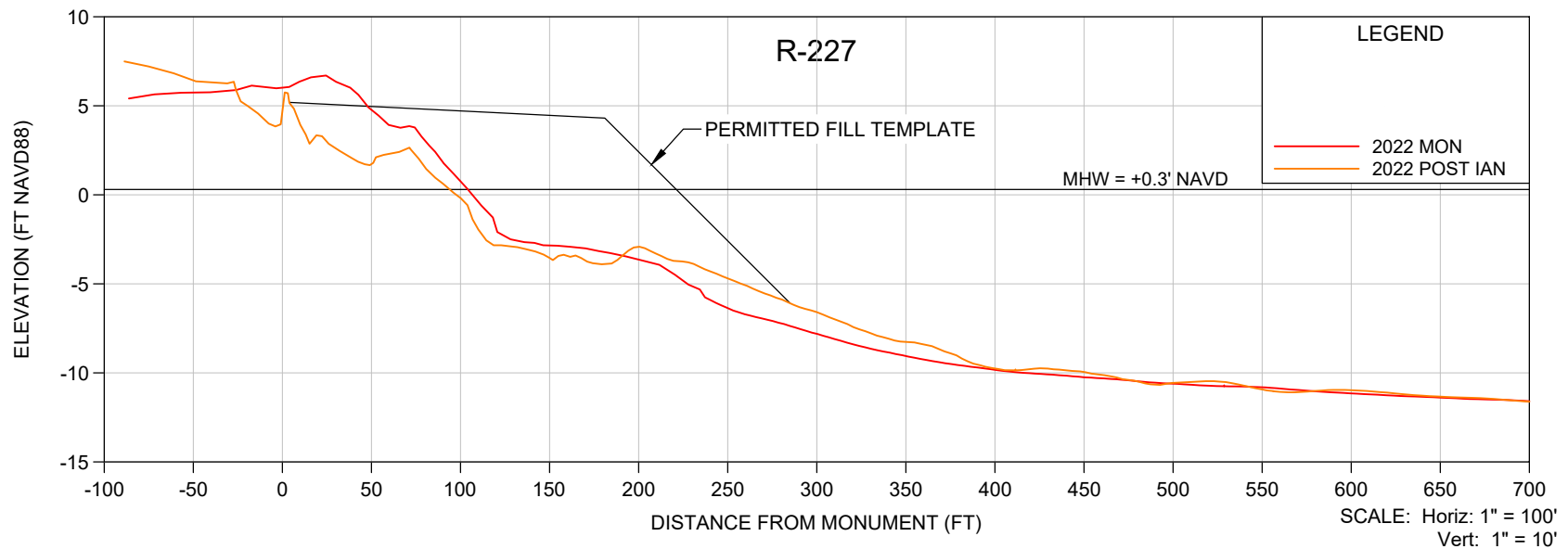
CLIENT:

LEE COUNTY

TITLE:

**BONITA BEACH AND LOVERS KEY
R-226.5 POST IAN SURVEY**

DATE:	10/17/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	22279-Lovers Bonita Post Ian Profiles.dwg		
REF. NO.	22.279	NO.	DATE
		BY	REVISION DESCRIPTION



NOTES

- ELEVATIONS ARE REFERENCED TO NAVD 1988.
- PROFILE DATA ARE FROM SURVEYS BY CEC.
- UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 31
FILE NO.: 22279-R-227

**COASTAL
ENGINEERING
CONSULTANTS
INC.**

Serving Florida Since 1977

28421 BONITA CROSSINGS BLVD
BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
ENVIRONMENTAL & GEOLOGICAL SERVICES
SURVEY & MAPPING
ENGINEERING: CA 2464
SURVEYING: LB 2464

PHONE: (239)643-2324
FAX: (239)643-1143
www.coastalengineering.com
E-Mail: info@ceciff.com

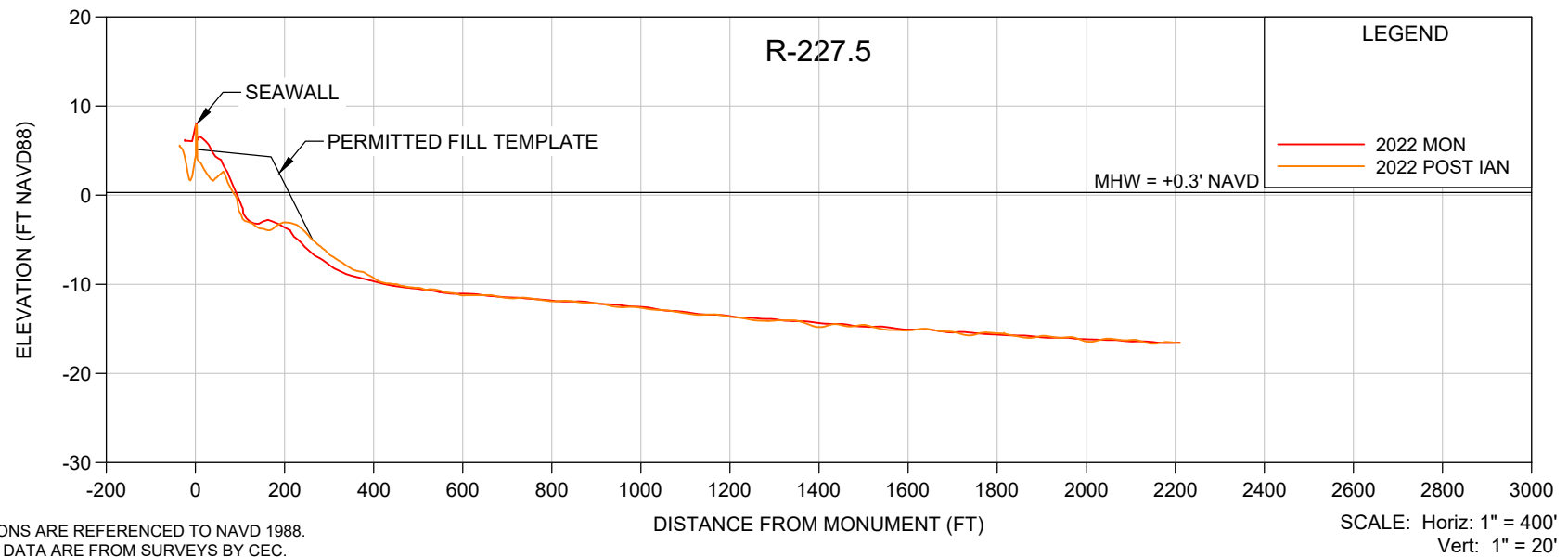
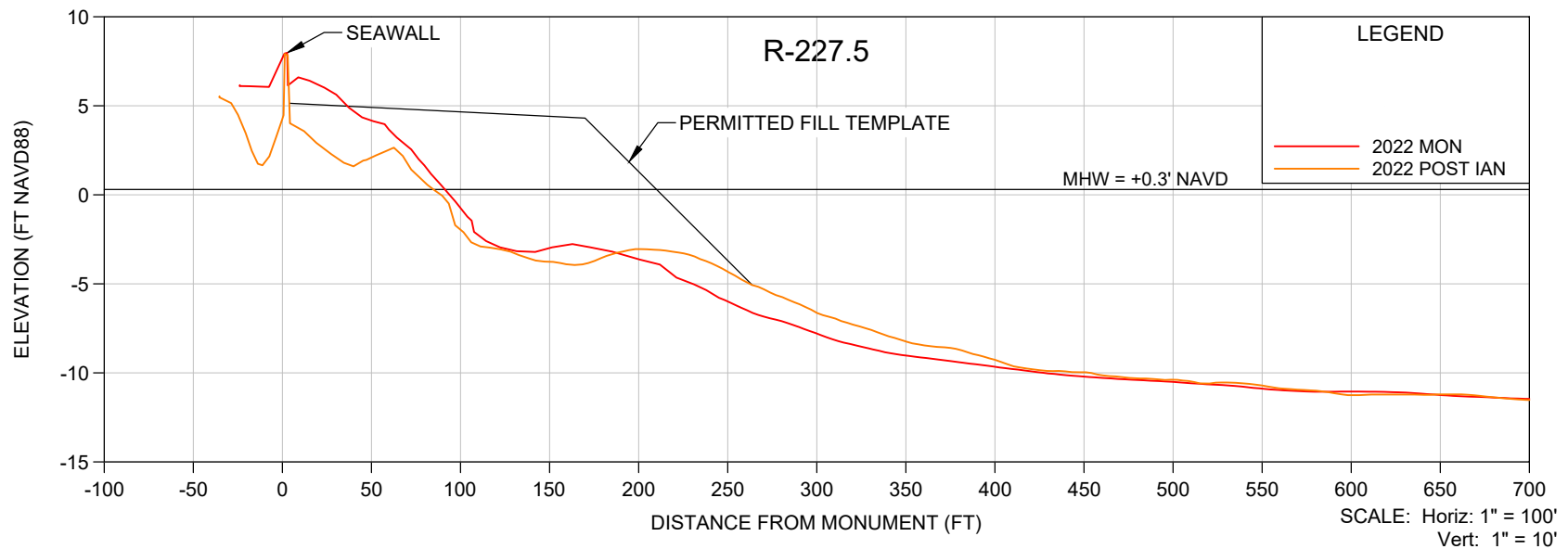
CLIENT:

LEE COUNTY

TITLE:

**BONITA BEACH AND LOVERS KEY
R-227 POST IAN SURVEY**

DATE:	10/17/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	22279-Lovers Bonita Post Ian Profiles.dwg		
REF. NO.	22.279	NO.	DATE
		BY	REVISION DESCRIPTION



NOTES

- ELEVATIONS ARE REFERENCED TO NAVD 1988.
- PROFILE DATA ARE FROM SURVEYS BY CEC.
- UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 32
FILE NO.: 22279-R-227.5

**COASTAL
ENGINEERING
CONSULTANTS
INC.**
Serving Florida Since 1977
28421 BONITA CROSSINGS BLVD
BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
ENVIRONMENTAL & GEOLOGICAL SERVICES
SURVEY & MAPPING
ENGINEERING: CA 2464
SURVEYING: LB 2464
PHONE: (239)643-2324
FAX: (239)643-1143
www.coastalengineering.com
E-Mail: info@ceciff.com

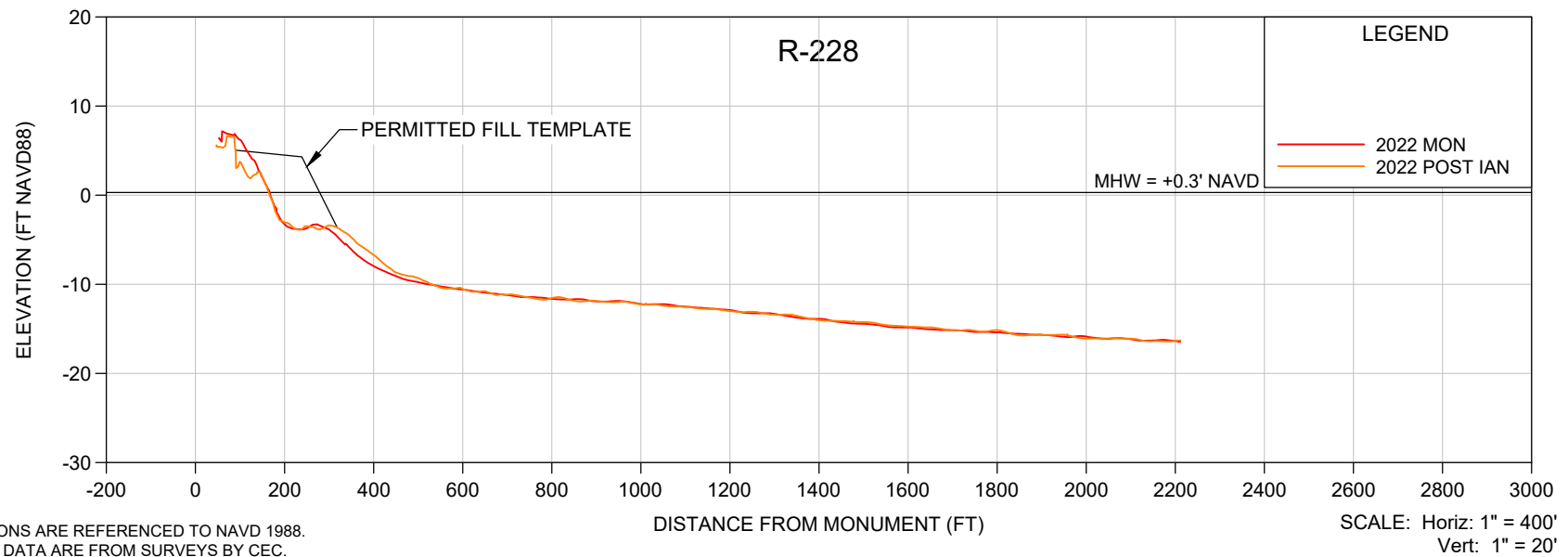
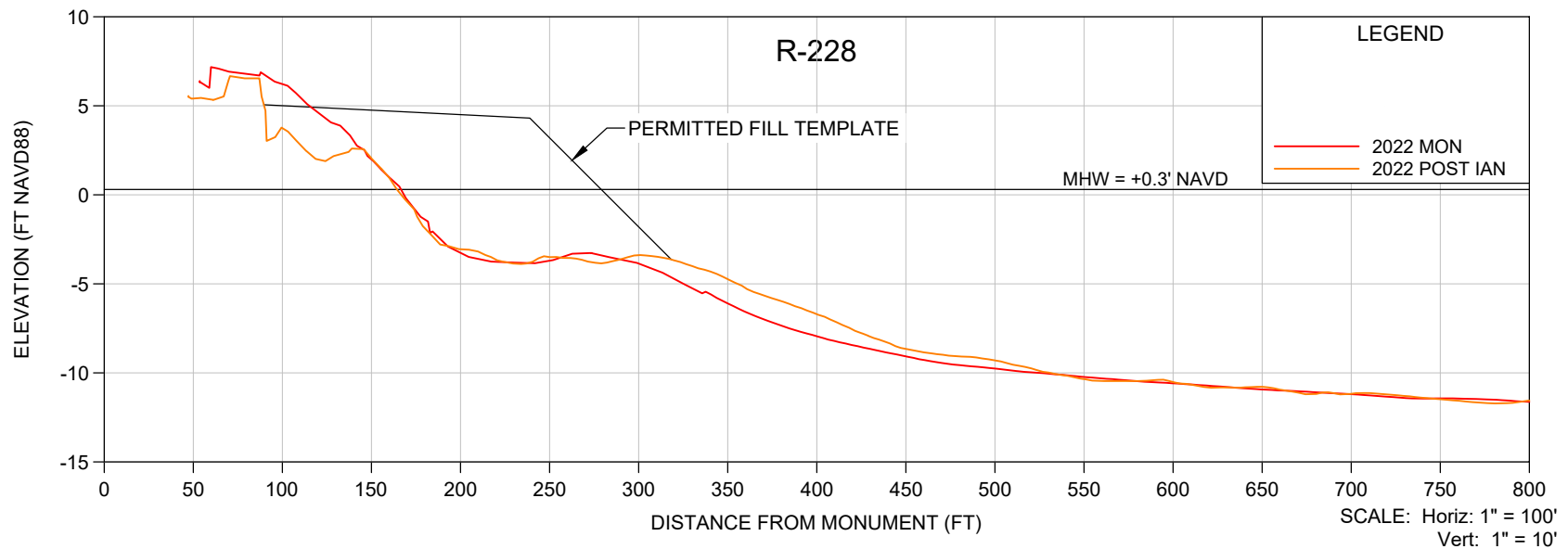
CLIENT:

LEE COUNTY

TITLE:

**BONITA BEACH AND LOVERS KEY
R-227.5 POST IAN SURVEY**

DATE:	10/17/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	22279-Lovers Bonita Post Ian Profiles.dwg		
REF. NO.	22.279	NO.	DATE
		BY	REVISION DESCRIPTION



NOTES

1. ELEVATIONS ARE REFERENCED TO NAVD 1988.
2. PROFILE DATA ARE FROM SURVEYS BY CEC.
3. UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 33
FILE NO.: 22279-R-228

**COASTAL
ENGINEERING
CONSULTANTS
INC.**

Serving Florida Since 1977

28421 BONITA CROSSINGS BLVD
BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
ENVIRONMENTAL & GEOLOGICAL SERVICES
SURVEY & MAPPING
ENGINEERING: CA 2464
SURVEYING: LB 2464

PHONE: (239)643-2324
FAX: (239)643-1143
www.coastalengineering.com
E-Mail: info@ceciff.com

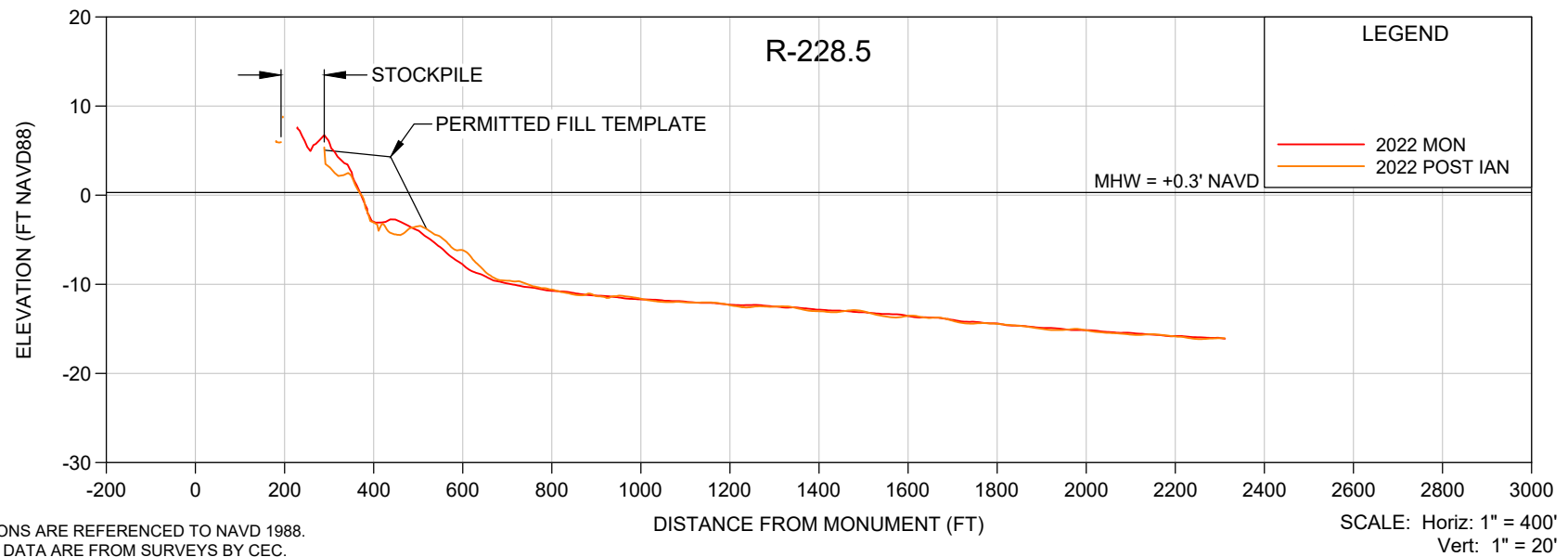
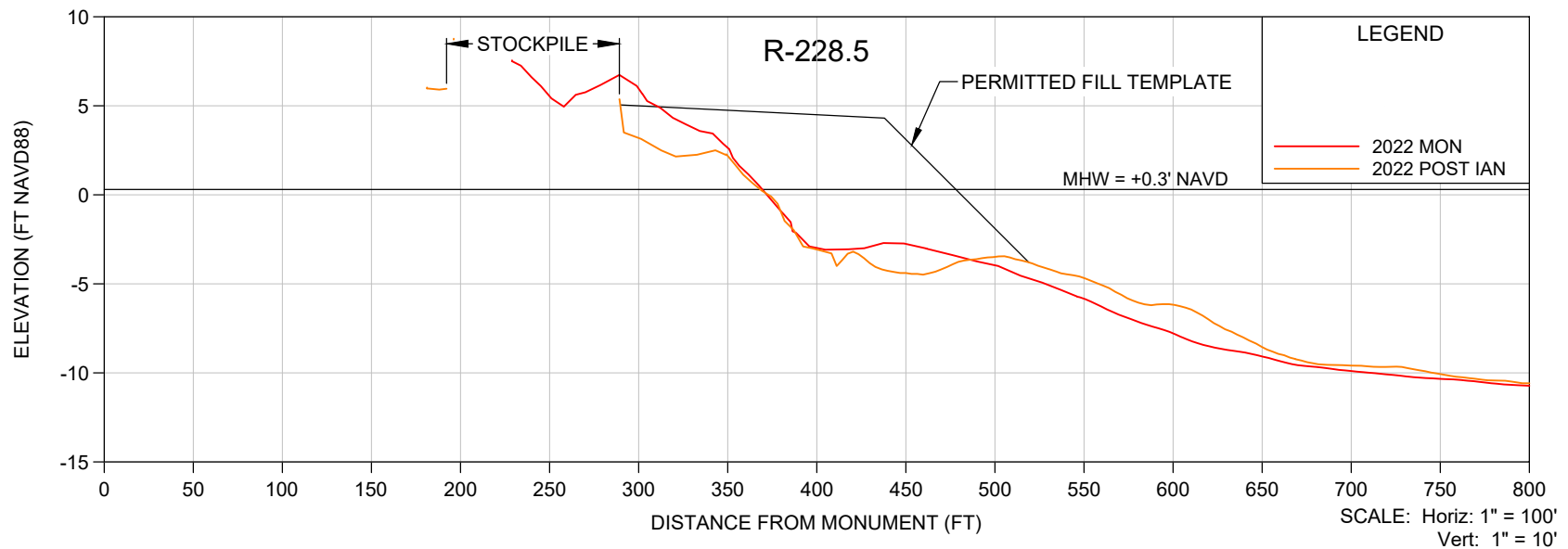
CLIENT:

LEE COUNTY

TITLE:

**BONITA BEACH AND LOVERS KEY
R-228 POST IAN SURVEY**

DATE:	10/17/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	22279-Lovers Bonita Post Ian Profiles.dwg		
REF. NO.	22.279	NO.	DATE
		BY	REVISION DESCRIPTION



NOTES

- ELEVATIONS ARE REFERENCED TO NAVD 1988.
- PROFILE DATA ARE FROM SURVEYS BY CEC.
- UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 34
FILE NO.: 22279-R-228.5

COASTAL ENGINEERING CONSULTANTS INC.
Serving Florida Since 1977
28421 BONITA CROSSINGS BLVD
BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
ENVIRONMENTAL & GEOLOGICAL SERVICES
SURVEY & MAPPING
ENGINEERING: CA 2464
SURVEYING: LB 2464
PHONE: (239)643-2324
FAX: (239)643-1143
www.coastalengineering.com
E-Mail: info@ceciff.com

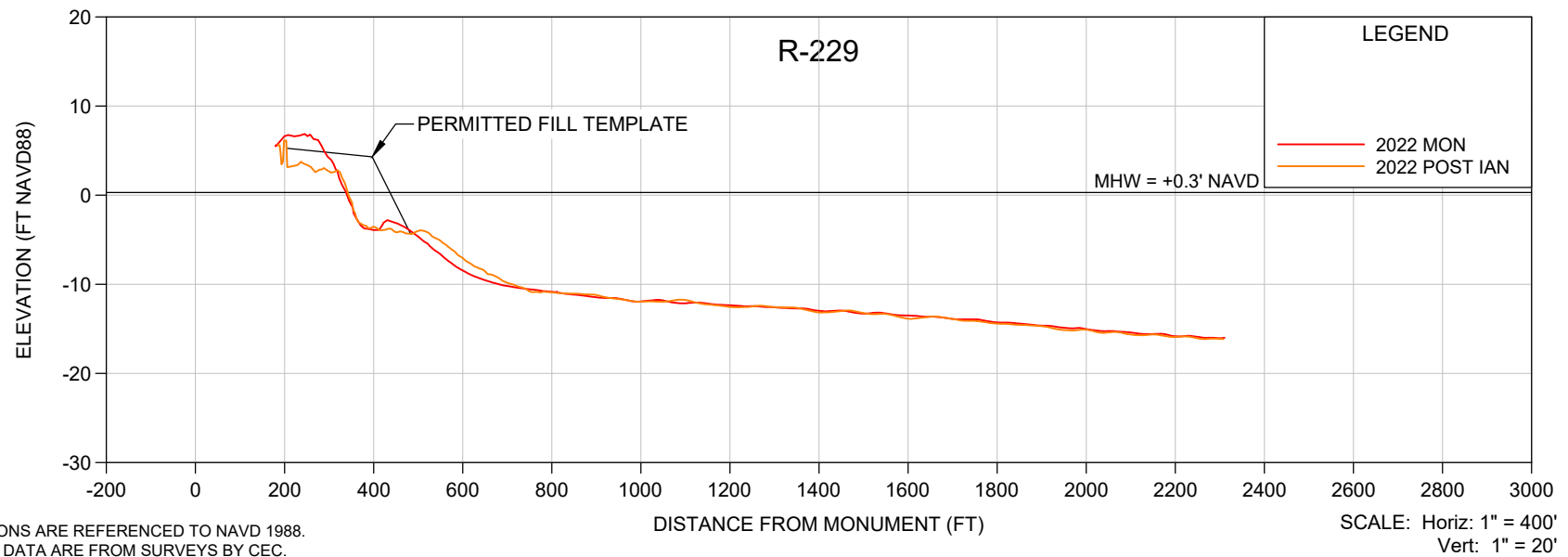
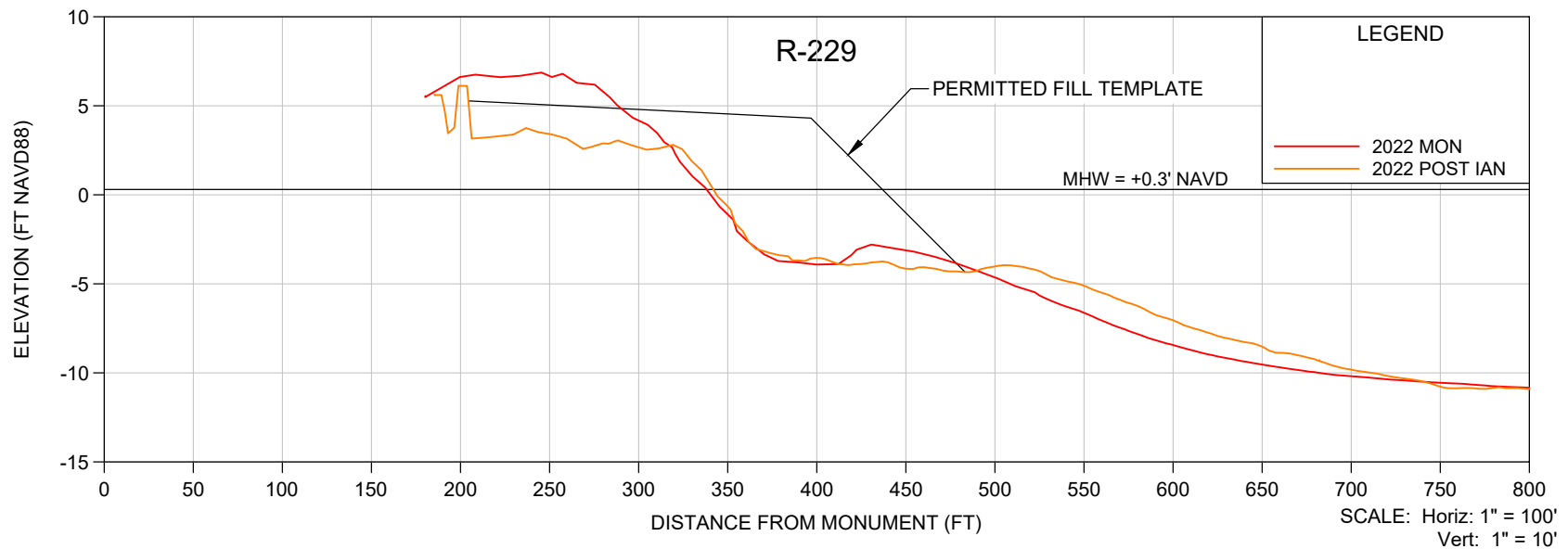
CLIENT:

LEE COUNTY

TITLE:

**BONITA BEACH AND LOVERS KEY
R-228.5 POST IAN SURVEY**

DATE:	10/17/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	22279-Lovers Bonita Post Ian Profiles.dwg		
REF. NO.	22.279	NO.	DATE
		BY	REVISION DESCRIPTION



NOTES

- ELEVATIONS ARE REFERENCED TO NAVD 1988.
- PROFILE DATA ARE FROM SURVEYS BY CEC.
- UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 35
FILE NO.: 22279-R-229

**COASTAL
ENGINEERING
CONSULTANTS
INC.**
Serving Florida Since 1977
28421 BONITA CROSSINGS BLVD
BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
ENVIRONMENTAL & GEOLOGICAL SERVICES
SURVEY & MAPPING
ENGINEERING: CA 2464
SURVEYING: LB 2464
PHONE: (239)643-2324
FAX: (239)643-1143
www.coastalengineering.com
E-Mail: info@ceciff.com

CLIENT:

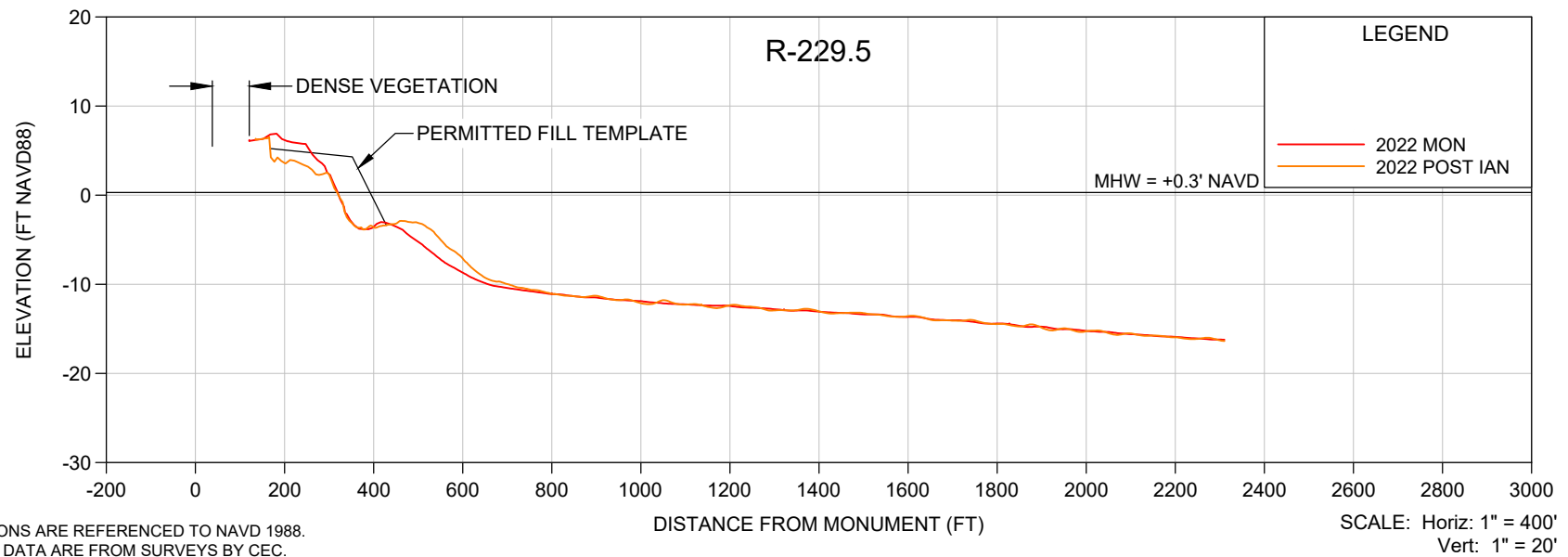
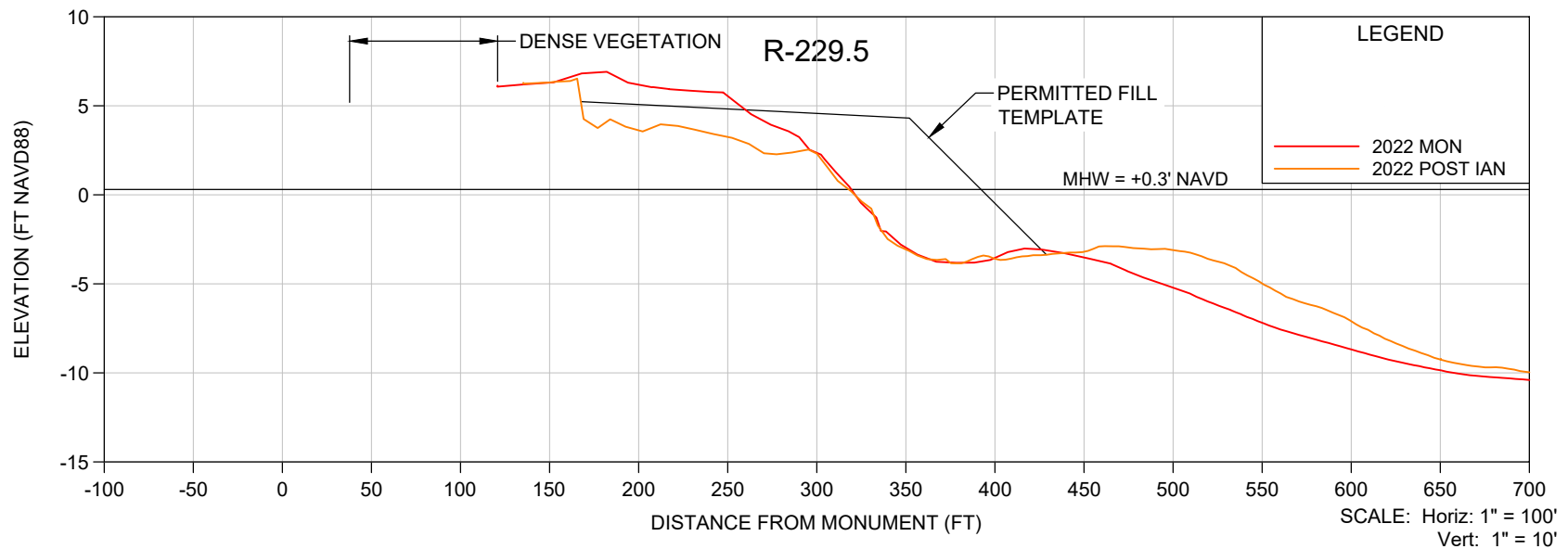
LEE COUNTY

TITLE:

**BONITA BEACH AND LOVERS KEY
R-229 POST IAN SURVEY**

DATE:	10/17/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	22279-Lovers Bonita Post Ian Profiles.dwg		
REF. NO.	22.279	NO.	DATE

NO.	DATE	BY	REVISION DESCRIPTION



NOTES

- ELEVATIONS ARE REFERENCED TO NAVD 1988.
- PROFILE DATA ARE FROM SURVEYS BY CEC.
- UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 36
FILE NO.: 22279-R-229.5

COASTAL ENGINEERING CONSULTANTS INC.
Serving Florida Since 1977
28421 BONITA CROSSINGS BLVD
BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
ENVIRONMENTAL & GEOLOGICAL SERVICES
SURVEY & MAPPING
ENGINEERING: CA 2464
SURVEYING: LB 2464
PHONE: (239)643-2324
FAX: (239)643-1143
www.coastalengineering.com
E-Mail: info@ceciff.com

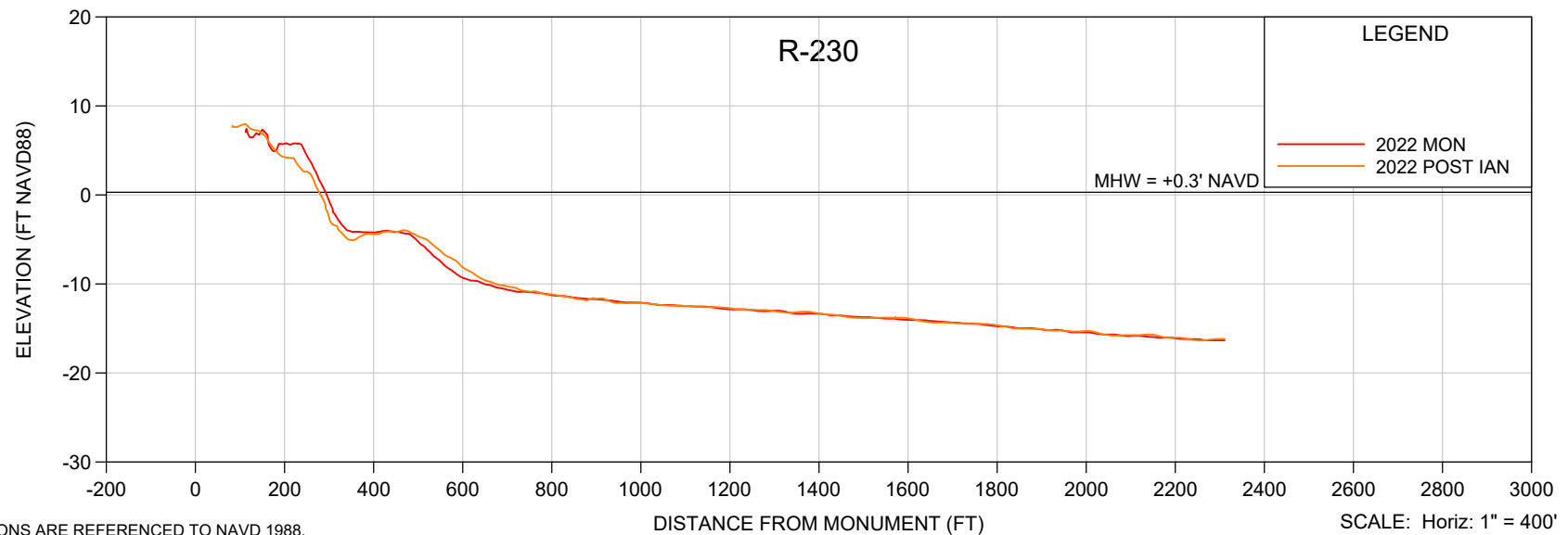
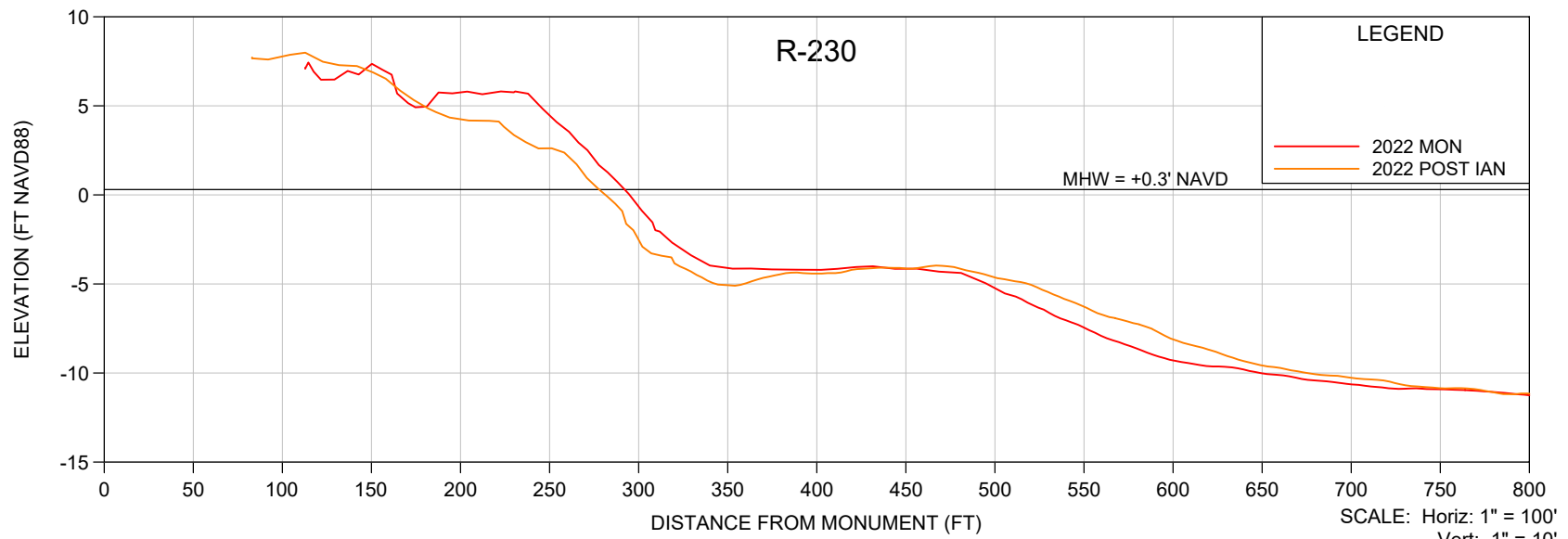
CLIENT:

LEE COUNTY

TITLE:

**BONITA BEACH AND LOVERS KEY
R-229.5 POST IAN SURVEY**

DATE:	10/17/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	22279-Lovers Bonita Post Ian Profiles.dwg		
REF. NO.	22.279	NO.	DATE
		BY	REVISION DESCRIPTION



NOTES

- ELEVATIONS ARE REFERENCED TO NAVD 1988.
- PROFILE DATA ARE FROM SURVEYS BY CEC.
- UPLAND DATA GAPS IN HISTORICAL PROFILES REFLECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 37
FILE NO.: 22279-R-230

**COASTAL
ENGINEERING
CONSULTANTS
INC.**
Serving Florida Since 1977
28421 BONITA CROSSINGS BLVD
BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
ENVIRONMENTAL & GEOLOGICAL SERVICES
SURVEY & MAPPING
ENGINEERING: CA 2464
SURVEYING: LB 2464
PHONE: (239)643-2324
FAX: (239)643-1143
www.coastalengineering.com
E-Mail: info@ceciff.com

CLIENT:

LEE COUNTY

TITLE:

**BONITA BEACH AND LOVERS KEY
R-230 POST IAN SURVEY**

DATE:	10/17/2022	SCALE:	AS SHOWN
DRAWN:	VVA	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	22279-Lovers Bonita Post Ian Profiles.dwg		
REF. NO.	22.279	NO.	DATE
		BY	REVISION DESCRIPTION

Attachment 2

Storm Impact Volume Calculations

LOVERS KEY POST-IAN STORM ASSESSMENT
STORM IMPACT AND BACKGROUND EROSION VOLUMETRIC CHANGES
DEPTH OF CLOSURE BOUNDARY
CEC FILE NO. 22.279
NOVEMBER 23, 2022

MON	JUN-OCT 2022 VOL CHANGE	JUN 2021 - JUN 2022 VOL CHANGE	JUN-OCT 2022 BACKGROUND EROSION	VOLUME CHANGE DUE TO HURRICANE IAN	TOTAL
R-214.5					-27,538
	-3,083	2,492	716	-3,798	
R-215					
	-1,834	1,033	297	-2,130	
R-215.5					
	-1,581	703	202	-1,783	
R-216					
	-1,253	33	9	-1,262	
R-216.5					
	942	-2,593	-745	1,686	
R-217					
	-1,210	-4,669	-1,341	132	
R-217.5					
	-3,083	-6,717	-1,930	-1,154	
R-218					
	-1,925	-5,938	-1,706	-219	
R-218.5					
	-4,810	-4,235	-1,217	-3,593	
R-219					
	-5,908	-2,772	-796	-5,112	
R-219.5					
	-4,687	-855	-246	-4,441	
R-220					
	-4,031	-76	-22	-4,010	
R-220.5					
	-1,789	225	65	-1,853	
R-221					

SCOUR EROSION VOLUME WITHIN ENGINEERED BEACH BETWEEN PROFILES

CEC collected additional data points to document scour volume between R-214.5 and R-221

that is not captured by the R-monument Average End Area Analysis presented above

Scour Volume (CY) = -15,241

TOTAL INCIDENT RELATED EROSION DIRECTLY ATTRIBUTED TO HURRICANE IAN = -42,779

BONITA BEACH POST-IAN STORM ASSESSMENT
STORM IMPACT AND BACKGROUND EROSION VOLUMETRIC CHANGES
DEPTH OF CLOSURE BOUNDARY
CEC FILE NO. 22.279
NOVEMBER 23, 2022

MON	JUN-OCT 2022 VOL CHANGE	JUN 2021 - JUN 2022 VOL CHANGE	JUN-OCT 2022 BACKGROUND EROSION	VOLUME CHANGE DUE TO HURRICANE IAN	TOTAL
R-226A					-9,178
	-4,835	24	7	-4,842	
R-226.5					
	-2,396	208	57	-2,453	
R-227					
	-1,799	-783	-215	-1,584	
R-227.5					
	-428	-1,503	-412	-16	
R-228					
	130	-771	-211	341	
R-228.5					
	-1,133	-1,197	-328	-805	
R-229					
	-127	-322	-88	-39	
R-229.5					
	128	-332	-91	219	
R-230					

SCOUR EROSION VOLUME WITHIN ENGINEERED BEACH BETWEEN PROFILES

CEC collected additional data points to document scour volume between R-226A and R-230
that is not captured by the R-monument Average End Area Analysis presented above

Scour Volume (CY) = -632

TOTAL INCIDENT RELATED EROSION DIRECTLY ATTRIBUTED TO HURRICANE IAN = -9,810

RESOLUTION NO. _____

A RESOLUTION OF THE BOARD OF COUNTY COMMISSIONERS OF LEE COUNTY, FLORIDA, APPROVING AND SUPPORTING THE PROPOSED ACTIVITIES AS OUTLINED IN THE 2025/26 LOCAL GOVERNMENT FUNDING REQUEST TO THE FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION AND AFFIRMING THE COUNTY'S COMMITMENT TO PROVIDE LOCAL FUNDING

WHEREAS, beaches provide vital economic, recreational, storm damage reduction, and environmental benefits, and

WHEREAS, Lee County has supported previous federal, state and local initiatives in correcting beach erosion problems throughout the County, and

WHEREAS, Lee County prepared and submitted a Long Range Beach Erosion Control Budget Plan (Budget Plan) in March 1997, and has annually submitted updated information in accordance with guidelines developed by the Florida Department of Environmental Protection, and

WHEREAS, Lee County seeks to update the Budget Plan for the next Florida Department of Environmental Protection Fixed Capital Outlay Legislative Budget Request, and

WHEREAS, Lee County supports the Florida Department of Environmental Protection's beach and coastal management programs in accordance with Section 161.101 and 161.161, Florida Statutes, and

WHEREAS, Lee County supports all components of the Budget Plan consistent with the Lee County Comprehensive Plan and agrees to fund the local government share of all County beach and inlet projects approved for funding by the Florida Legislature in Fiscal Year 2025-2026 through the existing dedicated tourism development tax revenues, special taxing units, or other funding resources as applicable, and

WHEREAS, Lee County agrees to serve as the local sponsor for all County projects identified in the Budget Plan.

NOW, THEREFORE, BE IT RESOLVED by the Board of County Commissioners, Lee County, Florida, that:

Section 1. Lee County is requesting state funding and providing its support for the Bonita Beach Nourishment, Bonita Beach Groin, and the Lovers Key Nourishment Projects, and affirms its ability to provide the local match as necessary to implement state-funded beach and inlet projects as requested.

Section 2. The County hereby supports Project regionalization where possible to conserve sand resources and/or reduce project costs and will work with the City of Bonita Springs to coordinate bidding and construction of the Lovers Key Nourishment, and Bonita Beach Nourishment where possible.

Section 3. The County Manager or Deputy County Manager of the Lee County Board of County Commissioners is hereby authorized to execute change orders and amendments for existing and future grant agreements as previously approved by the Florida Department of Environmental Protection and Lee County Board of County Commissioners under the State of Florida Beach Management Funding Assistance Program that do not result in a change to the local cost share percentage or require a budget amendment resolution.

Commissioner _____ made the motion to adopt the foregoing resolution, seconded by Commissioner _____. The vote was as follows:

Kevin Ruane	_____
Cecil L Pendergrass	_____
Ray Sandelli	_____
Brian Hamman	_____
Mike Greenwell	_____

DULY PASSED AND ADOPTED this ____ day of _____, 2024.

ATTEST:
KEVIN C. KARNES, CLERK

BOARD OF COUNTY COMMISSIONERS
LEE COUNTY,

BY: _____

Chairman

APPROVED AS TO FORM FOR THE
RELIANCE OF LEE COUNTY ONLY

BY: _____
Office of the County Attorney