
INDIAN RIVER COUNTY SECTOR 7 BEACH RESTORATION PROJECT 1-YEAR MONITORING REPORT

PREPARED BY:



PREPARED FOR:

INDIAN RIVER COUNTY



SUBMITTED TO:

**FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF BEACHES AND COASTAL SYSTEMS
(PERMIT No. 0215960-001-JC)**

**U.S. ARMY CORPS OF ENGINEERS
(PERMIT No. SAJ-2003-6106 (IP-IS))**

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**INDIAN RIVER COUNTY SECTOR 7
BEACH RESTORATION PROJECT
1-YEAR MONITORING REPORT**

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INDIAN RIVER COUNTY SECTOR 7 BEACH RESTORATION PROJECT 1-YEAR MONITORING REPORT

1. INTRODUCTION

The Indian River County Sector 7 Project is located along the Atlantic Ocean shoreline of southern Indian River County (Figure 1). The Sector 7 project is located south of Vero Beach and the project's shoreline is fronted primarily with single-family residences. This DEP designated beach is primarily used for recreational activities, and it is heavily used throughout the year by homeowners, seasonal residents, and vacationers.

Construction of the Indian River County Sector 7 Project took place between March and May of 2007, inclusive. The contractor, Great Lakes Dredge and Dock, LLC (GLDD) mobilized equipment to the project site in March and sand placement occurred from April 9 through May 16. Dune vegetation was planted on May 21st. The beach was tilled to a depth of 36 inches on May 11th and 12th. This project is the first nourishment effort for Sector 7, and this project placed approximately 363,600 cubic yards of sand along approximately 11,730 feet of shorefront along the southern portion of Indian River County. The project (including tapered sections) extends from Florida Department of Environmental Protection (FDEP) Reference Monuments R-97.5 to R-108. The project area is shown in Figure 1. This report presents the results of the 1-year post-construction monitoring period as required by FDEP permit 0215960-001-JC and U.S. Army Corps of Engineers (USACE) permit SAJ-2003-6106 (IP-IS).

2. AUTHORIZATION

The Indian River Sector 7 Beach Restoration Project Post-Construction Monitoring Report was prepared for Indian River County and the FDEP Bureau of Beaches and



Figure 1
Location Map
Indian River County Sector 7
1-Year Post Construction Monitoring Report

Coastal Systems in compliance with the monitoring requirements of the FDEP permit (No. 0215960-001-JC) and USACE permit (No. SAJ-2003-6106(IP-IS)) issued for the project. The Indian River County Board of County Commissioners authorized Applied Technology & Management (ATM) to complete the work described and presented herein under Work Order 12.

3. PURPOSE AND SCOPE

The purpose of this report is to present the findings of the first annual monitoring survey of Sector 7 to Indian River County. Assessing the condition of the beach on a yearly basis provides vital information pertaining to the performance of the project design and the stability of the project. The 1-year monitoring data are compared to the baseline conditions established in the post-construction monitoring report, and the data are used to evaluate the performance of the project during this 1-year monitoring period. The primary objectives of this report are to summarize the monitoring data as compared to baseline conditions, determine the volume of material remaining in the project area, determine the change in shoreline and berm positions as compared to baseline conditions, and provide post-project aerial photography. In addition, a section of this report will also discuss the project toe of fill, how the construction toe of fill relates to the equilibrium toe of fill, and the movement of the toe of fill as it relates to changes in shoreline position. The scope of this report is limited to the reporting requirements described in the project permits and the FDEP-approved Physical Monitoring Plan for the project.

4. BEACH MONITORING PROGRAM

The implementation and execution of the annual monitoring plan is required to comply with the conditions of the FDEP and USACE project permits. A Physical Monitoring Plan specific to this project was prepared as part of the FDEP permit. The FDEP reviewed and approved the submitted Physical Monitoring Plan. The performance of this nourishment project is based on the data acquired and analyzed during the project monitoring period following the construction of the nourishment project. Primary components of the monitoring program include the following:

- Beach profile surveys between FDEP reference monuments R-94 through R-112, inclusive;
- Aerial photography;

- Volumetric comparisons of material remaining;
- Shoreline and berm position comparisons.

4.1 Beach Profile and Hydrographic Surveys

The 1-year post-construction onshore and offshore beach profile surveys of the project and adjacent shorelines were performed by Morgan & Eklund, Inc. under contract with ATM. The onshore beach profile survey was performed on July 30, 2008 and the offshore beach profile survey was conducted on July 25, 2008.

The beach and offshore profile surveys were collected from FDEP reference monuments R-94 through R-112. Between FDEP reference monuments R-99 and R-108, intermediate beach profile lines were included, and additionally, between R-100 and R-106, quarter monuments were established and included in the monitoring surveys. Table 1 presents the beach profile control data.

The 1-year post-construction monitoring data was reduced and furnished to the FDEP in both ASCII XYZ format and FDEP format and are provided with this report on DVD. The vertical datum is North American Vertical Datum of 1988 (NAVD 88) and the horizontal datum is State Plane Coordinate System, Florida East Zone, North American Datum of 1983 (NAD 83). All survey work performed was consistent with the *FDEP Statewide Coastal Monitoring Program, Regional Data Collection and Processing Plan*.

The 1-year post-construction beach profile survey is compliant with the Physical Monitoring Plan and the *FDEP Statewide Coastal Monitoring Program, Regional Data Collection and Processing Plan*. The survey lines are parallel to each other and generally perpendicular to the shoreline, and extend offshore 2,000 feet or to an elevation of -30.0 feet NAVD, whichever is further offshore. The intermediate profile lines for the immediate post-construction survey were not used in the calculation of volumes above the depth of closure (DOC); however, these profiles were used in the volume calculation of volumes above the DOC for the 1-year post-construction survey. The immediate post-construction and 1-year post-construction beach profile surveys are provided as Appendix A and the survey data are included on the DVD accompanying this report.

Table 1. Beach and Offshore Profile Survey Control

FDEP Monument	Northing¹	Easting¹	Azimuth	Elevation²
R-94	1,195,631.60	867,335.38	70°	10.85
R-95	1,194,821.96	867,835.92	70°	12.71
R-96	1,193,897.42	868,192.85	70°	12.42
R-97	1,193,071.85	868,809.00	70°	11.02
R-98	1,192,297.94	869,175.63	70°	7.79
R-99	1,191,500.84	869,989.35	70°	12.15
R-99.5	1,191,045.98	870,323.49	70°	12.37
T-100	1,190,504.03	870,415.77	70°	12.98
T-100.5	1,190,206.52	870,944.59	70°	12.43
R-101	1,189,858.25	871,192.85	70°	14.09
R-101.25	1,189,643.40	871,327.38	70°	12.14
R-101.5	1,189,431.14	871,469.00	70°	9.13
R-101.75	1,189,216.61	871,604.39	70°	8.77
R-102	1,188,932.22	871,548.02	70°	10.06
R-102.25	1,188,793.30	871,809.55	70°	11.43
R-102.5	1,188,588.29	871,889.61	70°	10.82
R-102.75	1,188,408.10	872,005.03	70°	9.32
R-103	1,188,150.32	871,973.00	70°	11.05
R-103.25	1,187,936.38	872,197.56	70°	9.91
R-103.5	1,187,727.38	872,348.24	70°	9.68
R-103.75	1,187,414.17	872,387.63	70°	9.7
R-104	1,187,153.12	872,481.99	70°	10.6
R-104.25	1,186,971.98	872,654.46	70°	8.82
R-104.5	1,186,728.92	872,655.94	70°	10.09
R-104.75	1,186,494.63	872,787.89	70°	10.22
R-105	1,186,248.01	872,674.30	70°	9.4
R-105.25	1,186,013.92	872,915.01	70°	9.58
R-105.5	1,185,717.02	872,984.24	70°	10.29
R-105.75	1,185,418.83	873,012.24	70°	10.67
R-106	1,185,052.30	872,928.22	70°	8.42
R-106.5	1,184,759.38	873,208.66	70°	12.7
R-107	1,184,271.20	872,953.30	70°	8.72
R-107.5	1,183,978.56	873,364.04	70°	10.07
R-108	1,183,454.99	873,138.32	70°	8.75
R-109	1,182,559.66	873,407.66	70°	10.52
R-110	1,181,753.81	873,747.24	70°	9.26
R-111	1,180,684.57	873,988.51	70°	9.99
R-112	1,179,691.15	874,044.55	70°	11.42

1) Florida State Plane Coordinate System, East Zone, North American Datum (NAD) 83.

2) North American Vertical Datum (NAVD) of 1988

4.2 Vertical Aerial Photography

The 1-year project monitoring requires aerial photography of the project area. Aerial photographs were acquired per FDEP protocol, and details of the aerial photography are addressed in Section 8 of this report.

5. PROJECT HISTORY

This section of shoreline, while listed as critically eroded by FDEP, has not been nourished prior to this project. The coastline of Indian River County was severely impacted before construction during the Florida hurricane season of 1999 with the passing of Hurricanes Hugo and Irene and then again in 2004 by Hurricanes Frances and Jeanne. Recently, after construction, Tropical Storm Fay and Hurricanes Hanna, Ike, and Kyle in the 2008 season have also affected the shoreline in Indian River County. The Sector 7 region defined by the Beach Preservation Plan extends from R-94 to R-113. The 1998 Beach Preservation Plan Update recommended a beach restoration project for the central portion of Sector 7. The 2002 Beach Condition Analysis Report indicated that the Sector 7 beach remains erosional between R-100 and R-109. To optimize sand placement and project performance and avoid impacts to nearshore hardbottom, a No-Impact Design beach was constructed that placed sand from R-97.5 through R-108 (including tapers). The project length was reduced approximately 500 feet at the north end, from R-97 to R-97.5, because of unsigned project easements.

6. BEACH PERFORMANCE

The primary concern following any beach project is the redistribution of the placed sand, as the nourished beach is shaped in response to localized waves, tides, currents, and winds. The volumetric and shoreline position data presented herein for the 1-year post-construction conditions were compared to the baseline conditions for this project.

6.1 Volume

Volumetric changes are based on beach and offshore profile survey data as compared to the baseline conditions. The beach profile survey data are provided graphically in Appendix A. Each plot shows the immediate post-construction data and 12 month post-construction data. Table 2 presents the baseline volume changes (immediate post-construction compared to 1-year post-construction) above the DOC (-19.3 feet

Table 2
IRC Sector 7 Volumetric Changes

Beach Segment	Alongshore Distance	Oct. 2006 to May 2007		May 2007 to July 2008	
		Volumetric Change ¹ (c.y.)		Volumetric Change ¹ (c.y.)	
		Above MHW ²	Above DOC ³	Above MHW ²	Above DOC ³
R-94 to R-96	1,951	-6,146	-693	19,150	18,635
R-96 to R-97	1,002	-1,453	16,733	7,475	-6,355
R-97 to R-98	878	7,024	28,122	2,034	-14,830
R-98 to R-99	1,048	20,913	48,292	-5,983	-34,159
R-99 to R-99.5	560	11,780	27,773	-4,541	-20,240
R-99.5 to T-100	567	10,920	20,622	-3,634	-9,403
T-100 to T-100.5	482	10,990	19,116	-4,097	-9,291
T-100.5 to R-101	421	10,651	23,294	-5,384	-14,853
R-101 to R-101.25	253	6,976	13,945	-3,415	-8,334
R-101.25 to R-101.5	250	6,938	12,265	-2,749	-5,996
R-101.5 to R-101.75	249	5,951	11,255	-2,123	-5,012
R-101.75 to R-102	250	5,229	8,868	-1,733	-3,103
R-102 to R-102.25	221	4,585	7,341	-1,444	-2,647
R-102.25 to R-102.5	222	4,352	7,428	-1,060	-2,150
R-102.5 to R102.75	210	3,876	6,338	-285	-12
R-102.75 to R-103	232	3,898	6,052	363	2,050
R-103 to R103.25	279	4,103	6,061	329	2,926
R-103.25 to R-103.5	249	3,352	4,860	404	2,261
R-103.5 to R103.75	308	4,103	5,207	1,001	4,353
R-103.75 to R-104	278	3,636	4,242	1,013	4,540
R-104 to R-104.25	229	2,773	3,673	426	2,110
R-104.25 to R-104.5	229	2,615	3,452	232	1,006
R-104.5 to R-104.75	266	2,298	2,837	722	1,744
R-104.75 to R-105	193	1,709	2,270	629	1,574
R-105 to R-105.25	303	3,189	4,274	861	2,241
R-105.25 to R-105.5	305	2,776	3,549	923	2,132
R-105.5 to R-105.75	293	2,369	4,018	1,116	2,123
R-105.75 to R-106	319	2,562	4,868	988	2,243
R-106 to R-106.5	374	3,056	5,834	369	835
R-106.5 to R-107	376	2,922	5,952	-193	-2,027
R-107 to R-107.5	419	3,203	6,327	-853	-3,773
R-107.5 to R-108	418	3,426	6,379	-956	-2,264
R-108 to R-109	941	9,382	8,337	799	7,385
R-109 to R-110	879	6,021	3,222	3,843	9,911
R-110 to R-111	1,099	4,154	4,704	5,005	3,803
R-111 to R-112	961	2,042	-3,296	2,777	3,887
North of Project Area (R-94 to R-97.5)	3392	-575	44,163	27,642	4,865
Within Project Area (R-97.5 to R-108)	10242	155,147	286,391	-27,258	-91,156
South of Project Area (R-108 to R112)	3,880	21,599	12,966	11,625	17,601
Total Monitored Shoreline	17514	176,172	343,521	12,009	-68,690

Notes:

1. The volume density is calculated using the average end method.
2. The Mean High Water (MHW) elevation used for this analysis is +0.7 feet NAVD.
3. The Depth of Closure (DOC) elevation used for this analysis is -19.3 feet NAVD.
4. Profiles that do not reach the DOC are calculated to 1000 feet seaward of the monument.

NAVD) and mean high water (MHW) line (+0.7 feet NAVD) contour of the constructed beach and the monitored adjacent shorelines. The volumetric changes above the MHW line and DOC are shown graphically in Figures 2 and 3, respectively. The bars shown in red on Figures 2 and 3 represent the volume changes at the intermediate station, and the bars shown in blue represent the cumulative volume between the whole station monuments. Volumes were calculated using the average end-area method. The alongshore distance between monuments is calculated as the distance between profile lines for the 2006 MHW line, which is the pre-construction shoreline. Many of the profiles do not reach the DOC until well after the offshore reef. The volume is calculated to 1000 ft offshore for those profiles which do not reach the DOC.

North of Project Area – The area north of the project experienced overall volumetric gains in both the nearshore and within the dry beach areas of the profile. Above MHW there was a gain of 27,640 c.y. of material (Table 2). This is likely due to the onshore movement of a sand bar adding to the beach face. The gain above the MHW is offset by an almost equal loss below the MHW to bring the net volume increase to approximately 4,870 c.y. of material (Table 2). Note, due to an error in the data pertaining to R-95, this monument is not used in the volume calculations.

Project Area (R-97.5 to R-108) – The project area experienced an average loss of approximately 28,000 c.y. of material above MHW and an additional loss of 64,000 c.y. above the DOC (Table 2). The northern half of the project area is where most of the loss was experienced. From R-98 to R-102.5, there was an average loss of 115,000 c.y. of material above the DOC (36,000 c.y. loss above MHW). The southern half of the project area gained material. From R-102.5 to R-106.5, an average gain of 32,100 c.y. was calculated above the DOC (9,400 c.y. gain above the MHW). The overall loss is an expected result of project spreading, longshore drift, and overall effects of a headland. The beaches south of the project area, as discussed in the next section, will benefit from this process.

The project design incorporated a "feeder beach" concept. The northern portion of the project was designed to be wider where there is less nearshore hardbottom. The wider section would feed sand to the southern portion of the project where a narrower beach was constructed due to nearshore hardbottom. Based on the monitoring data, the littoral

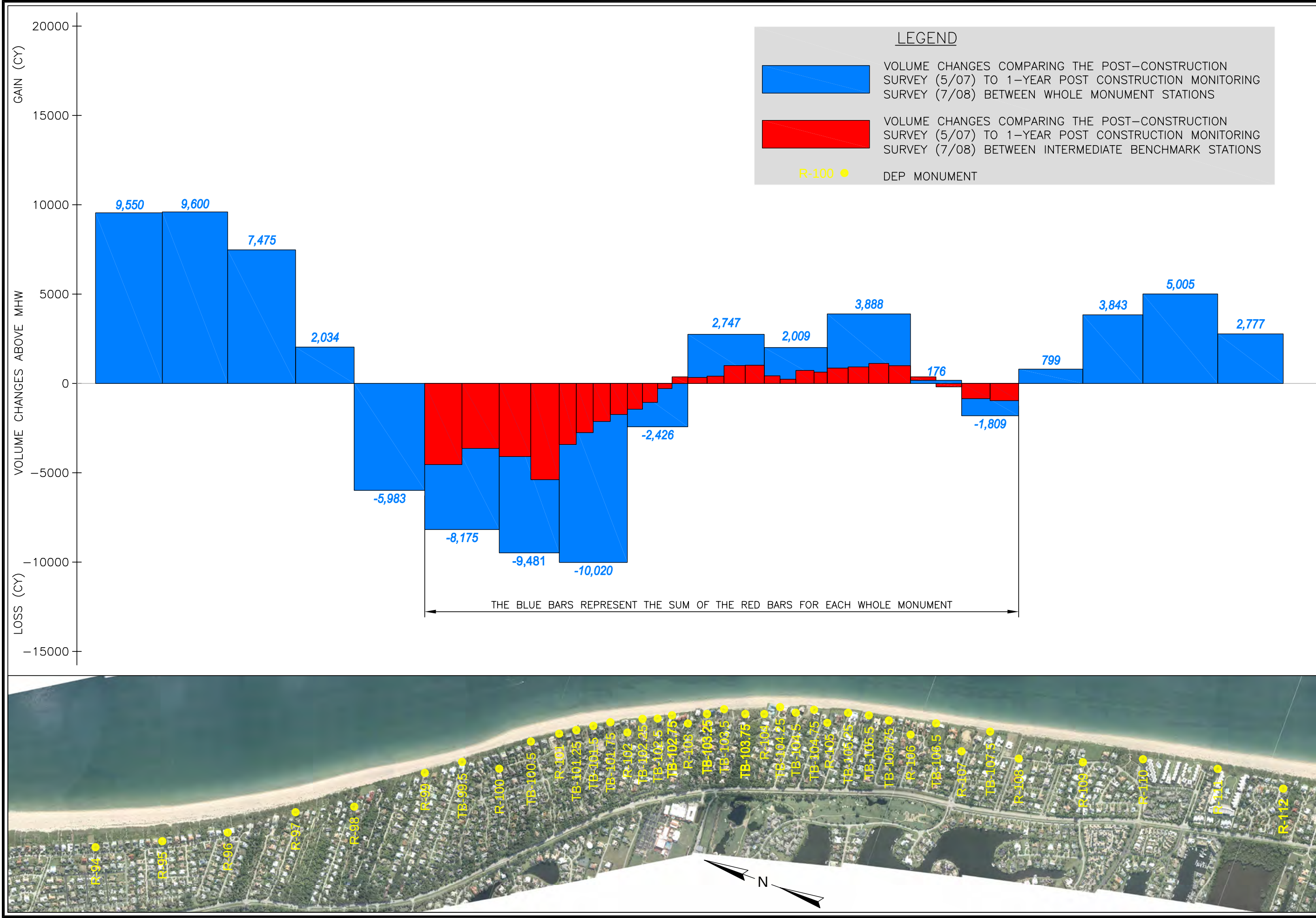


Figure 2
Volume Changes Above Mean High Water (MHW)
Indian River County Sector 7
1-Year Post Construction Monitoring Report

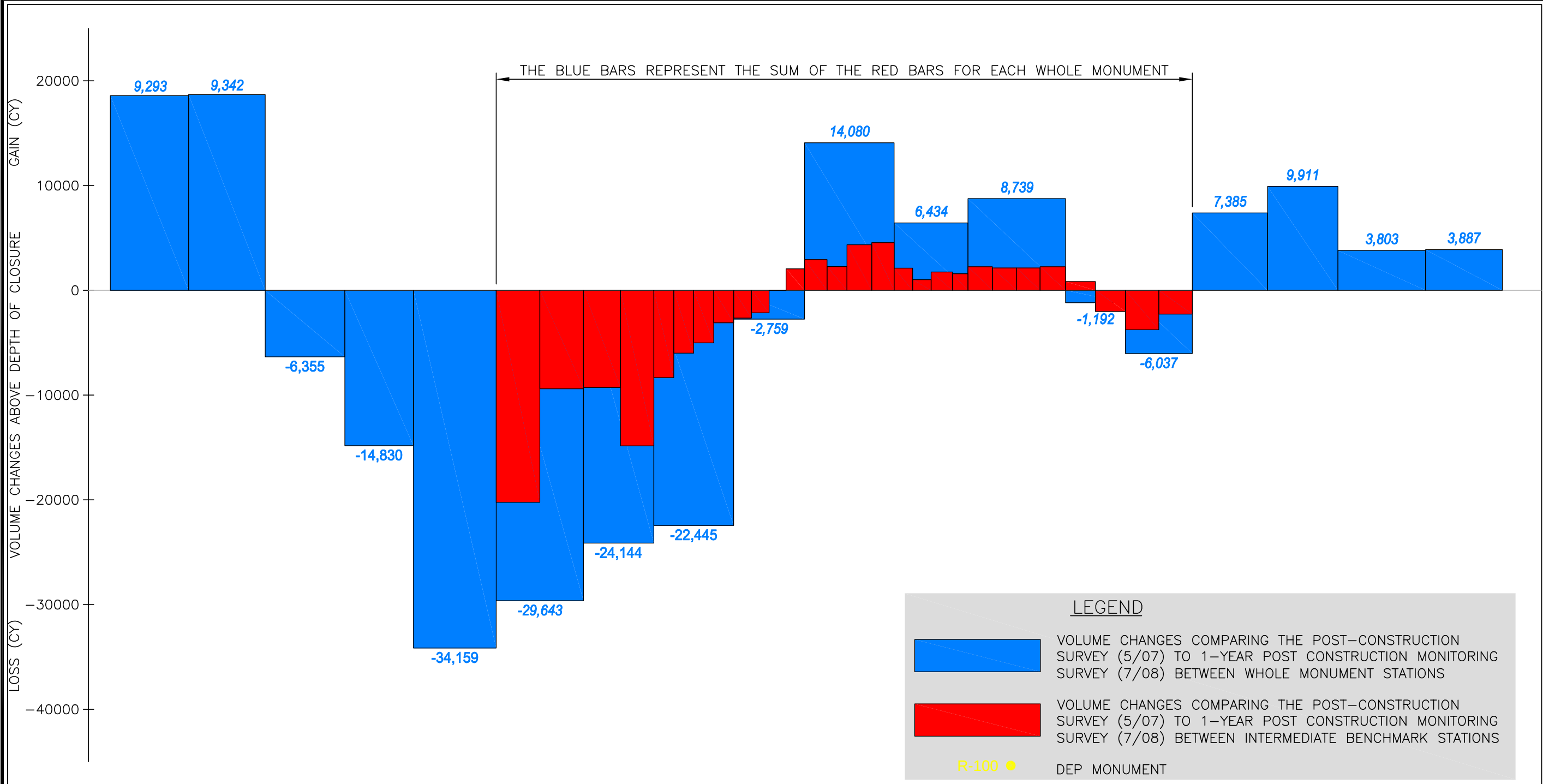


Figure 3
Volume Changes Above Depth of Closure
Indian River County Sector 7
1-Year Post Construction Monitoring Report

drift (from north to south in this area) is transporting sand from the northern portion of the project area to the southern portion of the project area. Overall, the project appears to be functioning as designed.

South of Project Area – The beach profile data depicts a gain of material both above MHW and below MHW. The beach profiles gained a net of approximately 17,600 c.y. in the active profile (above DOC, Table 2) and experienced increases of 11,630 c.y. above MHW. This gain is the expected result of longshore drift as material from the project area is spread to the south in the direction of the net longshore sediment transport.

Overall, the monitored area experienced a net volume loss of 68,700 c.y. between the 2007 post-construction and 1-year monitoring period. Approximately 78% of the placed volume remains within the project limits and 94% remains within the entire surveyed area from R-94 through R-112. This demonstrates that the project experienced spreading and cross-shore equilibration since the material was initially placed.

6.2 Beach Profile Shoreline Position

The MHW contour (0.7 feet NAVD) is used as the representative shoreline. The immediate post-construction shoreline position has been compared to the 1-year post-construction shoreline position. The change in position is used in this analysis as an indicator of project performance.

Berm position is indicative of the level of storm protection the beach can provide to the upland structures. The design berm elevation is 7.7 feet NAVD at the toe of the dune. The berm was constructed with a 1V:100H slope and the distance from the dune toe to the berm crest varies for each beach profile. For the analysis in this report an elevation of 5.9 feet NAVD was used to determine the changes in berm location, and is based on the representative elevation of the existing berm break. Using this elevation to evaluate change to the berm accounts for any depressions in the berm and allows for a more consistent elevation contour throughout the project and area adjacent to the project.

The immediate post-construction MHW and berm positions are used as the baseline conditions for comparison to the annual monitoring surveys. The berm and shoreline positions for the project area and the adjacent shoreline to the north and south of the project are discussed in the following sections.

North of Project Area - The shoreline immediately north of the project area (R-94 to R-97.5) experienced overall shoreline accretion. Immediately after the nourishment project, this stretch of shoreline receded approximately 30 feet (Table 3, Figure 4). Over the past year, the shoreline accretion is consistent with the onshore movement of sand from the nearshore. In the 1-year period following construction of the beach, the shoreline position between R-97.5 and R-94 has advanced. The average shoreline gain for this area is 40.6 feet based on the MHW shoreline position (Table 3, Figure 4). The berm location gained an average of 27.3 feet over the 1-year monitoring period.

Project Area (R-97.5 to R-108) – The project shoreline receded between R-97.5 and R-108 by an average of 11.1 feet (Table 3, Figure 4). However, there is a substantial loss north of R-102.5 with an average loss of 26.8 feet, while south of R-102.5 (to R-108) the shoreline experienced an average gain of 2.8 feet. The berm position also showed similar changes both north and south of R-102.5. The berm position receded an average of 33.4 feet to the north of R-102.5 and experienced an average gain of 3.6 feet to the south of R-102.5 (to R-108). Overall, there was an average loss of 13.8 feet to the berm position within the project area. This change is likely the result of the material in the northern part of the project area spreading to other areas and further cross-shore equilibration of the construction beach profile. The overall performance is consistent with the "feeder beach" design concept.

South of Project Area – The shoreline south of R-108 experienced a gain to both the MHW shoreline and the location of the berm. The MHW shoreline position gained an average of 14.1 feet and the berm width increased an average of 15.5 feet during the 1-year monitoring period (Table 3, Figure 4).

Table 3
Indian River County, Sector 7
Shoreline Position and Shoreline Change

Profile Line	Shoreline length between adjacent profile lines (ft.)	Pre-Construction to Post-Construction		Post-construction to 12-Month Post-Construction	
		Mean High Water Pre-Construction to to Post-Construction Gain/Loss	Berm Location Pre-Construction to to Post-Construction Gain/Loss	Mean High Water Pre-Construction to to Post-Construction Gain/Loss	Berm Location Pre-Construction to to Post-Construction Gain/Loss
R-94	975.5	-40.9	8.5	38.2	34.0
R-96	1,476.5	-37.7	-39.8	53.6	27.9
R-97	940.0	-8.8	47.8	22.8	19.3
North of the Project Area - Weighted Average		-30.6	-2.3	40.6	27.3
R-98	963.0	9.4	20.1	1.9	-7.4
R-99	804.0	59.1	75.4	-42.7	-43.9
R-99.5	563.5	52.3	38.0	-30.3	-28.0
T-100	524.5	76.1	59.9	-17.4	-41.9
T-100.5	451.5	77.9	58.2	-36.5	-30.4
R-101	337.0	85.3	93.3	-46.8	-65.0
R-101.25	251.5	85.9	99.2	-40.4	-47.9
R-101.5	249.5	89.7	112.4	-43.3	-42.7
R-101.75	249.5	78.7	89.9	-32.1	-35.0
R-102	235.5	69.9	80.4	-27	-35.1
R-102.25	221.5	72.5	73.2	-19.6	-27.2
R-102.5	216.0	64.8	65.6	-10.6	-19.4
R-102.75	221.0	63.2	70.4	-1.5	-9.7
R-103	255.5	56.6	58.5	0.5	2.3
R-103.25	264.0	52.2	49.4	9.8	-0.5
R-103.5	278.5	50.3	54.7	11.8	-3.1
R-103.75	293.0	52.8	58.7	9.6	7.0
R-104	253.5	46.7	60.9	0.6	2.9
R-104.25	229.0	75.8	57.6	1.4	-8.4
R-104.5	247.5	40.4	46.4	2.6	12.2
R-104.75	229.5	37.1	4.2	6.2	37.3
R-105	248.0	41.0	53.6	11.8	4.5
R-105.25	304.0	40.5	36.7	1.9	16.3
R-105.5	299.0	36.6	24.2	5.3	12.6
R-105.75	306.0	30.4	15.6	12.3	15.5
R-106	346.5	33.8	24.9	6.8	4.7
R-106.5	375.0	31.0	20.4	3.3	6.2
R-107	397.5	33.7	25.7	-8.9	-3.8
R-107.5	418.5	32.1	31.7	-5.4	-8.5
R-108	679.5	25.6	33.0	-5	-7.6
Project Area - Weighted Average		49.4	49.6	-11.1	-13.8
R-109	910.0	17.0	8.1	14.7	11.1
R-110	989.0	15.6	12.6	10.7	21.8
R-111	1,030.0	12.2	24.2	14.2	14.9
R-112	480.5	-9.0	6.4	20	12.5
South of the Project Area - Weighted Average		11.5	14.0	14.1	15.5

Notes:

1. R-95 is not included in the calculation of shoreline as there is an apparent survey error in this profile.
2. MHW elevation is +0.66 feet NAVD (+1.93 feet NGVD)
3. Berm elevation is +5.93 feet NAVD (+7.2 feet NGVD) determined by the minimum berm crest elevation of template.

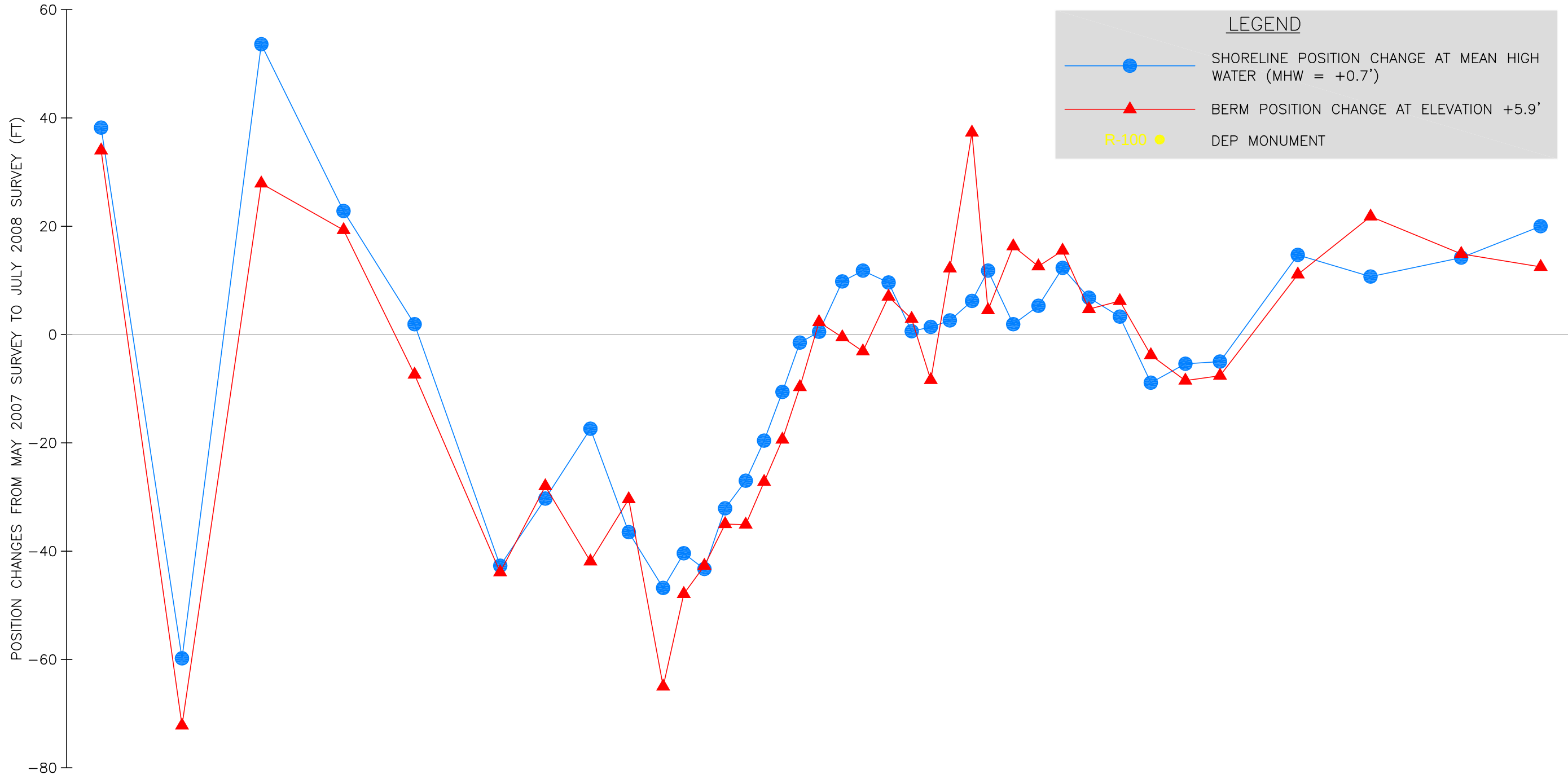


Figure 4
Shoreline Position Changes
Indian River County Sector 7
1-Year Post Construction Monitoring Report

7. TOE OF FILL POSITION

The project was designed with the intent of no direct impacts to the nearshore hardbottom. The GENESIS shoreline model was utilized to predict the project toe of fill throughout the project life, and the model was used as a design tool in the development of a no-impact project. The toe of fill for the 1-year monitoring period is based on an analysis of the beach profile survey data. To assess the performance of the project, the observed toe of fill is compared to diver-mapped landward edges of hardbottom and model-predicted toe of fill.

Figure 5 presents the 1-year post-construction observed toe of fill overlaid on the 2008 aerial photography showing the diver-mapped landward edges of hardbottom and the GENESIS model-predicted toe of fill for the 1-year post-construction monitoring period. The observed toe of fill is in general agreement with the model prediction. At R-97 the observed toe of fill is significantly seaward of the model prediction; however, this area historically gains sand and there is not any adjacent hardbottom in this area. From R-98 to approximately R-103.5, the observed toe of fill generally occurs long the -5 ft. NAVD contour (Appendix A), and is landward of the model-predicted toe of fill. Overall, the observed toe of fill for this monitoring period is landward of the diver-mapped edge of hardbottom.

8. VERTICAL AERIAL PHOTOGRAPHY

The vertical aerial photographs were acquired for the monitored shoreline (R-94 – R-112) on June 22, 2008. The aerial photography presented in this report and provided on the report DVD is rectified, geo-referenced, and meets DEP protocol. The aerial photography is compliant with the Physical Monitoring Plan. The aerial photographs are provided to FDEP on DVD in Tagged Image Format (TIF) (uncompressed), included with this report.. Appendix B shows the 2008 aerial photography and corresponding R-monument locations, which are also included in the report DVD.



R-100 ●

DEP MONUMENT

1-YEAR POST CONSTRUCTION TOE OF FILL

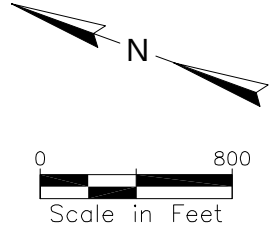
1-YEAR MODEL PREDICTED TOE OF FILL

PRE CONSTRUCTION EDGE OF HARDBOTTOM (2006)

POST CONSTRUCTION EDGE OF HARDBOTTOM (2007)

1-YEAR POST CONSTRUCTION EDGE OF HARDBOTTOM (2008)

Figure 5a
 Equilibrium Toe of Fill Changes
 Indian River County Sector 7
 1-Year Post Construction Monitoring Report



LEGEND

- R-100 ● DEP MONUMENT
- 1-YEAR POST CONSTRUCTION TOE OF FILL
- - - - 1-YEAR MODEL PREDICTED TOE OF FILL
- PRE CONSTRUCTION EDGE OF HARDBOTTOM (2006)
- POST CONSTRUCTION EDGE OF HARDBOTTOM (2007)
- 1-YEAR POST CONSTRUCTION EDGE OF HARDBOTTOM (2008)

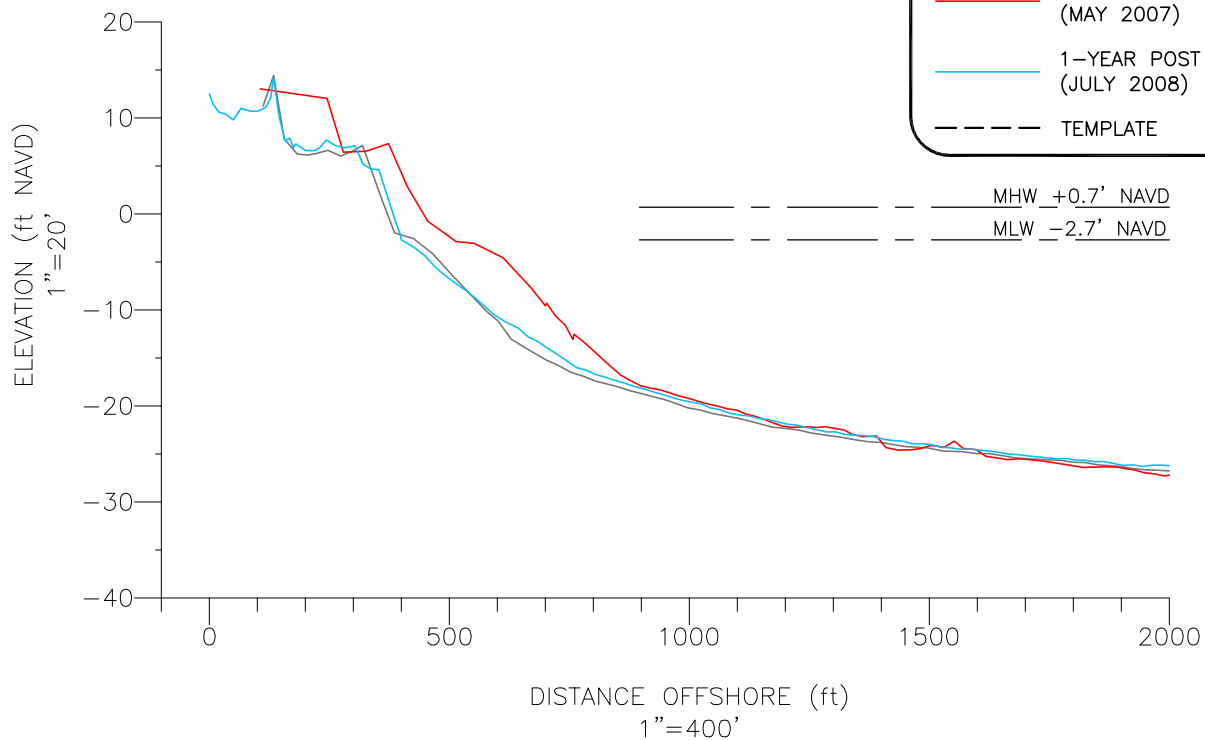
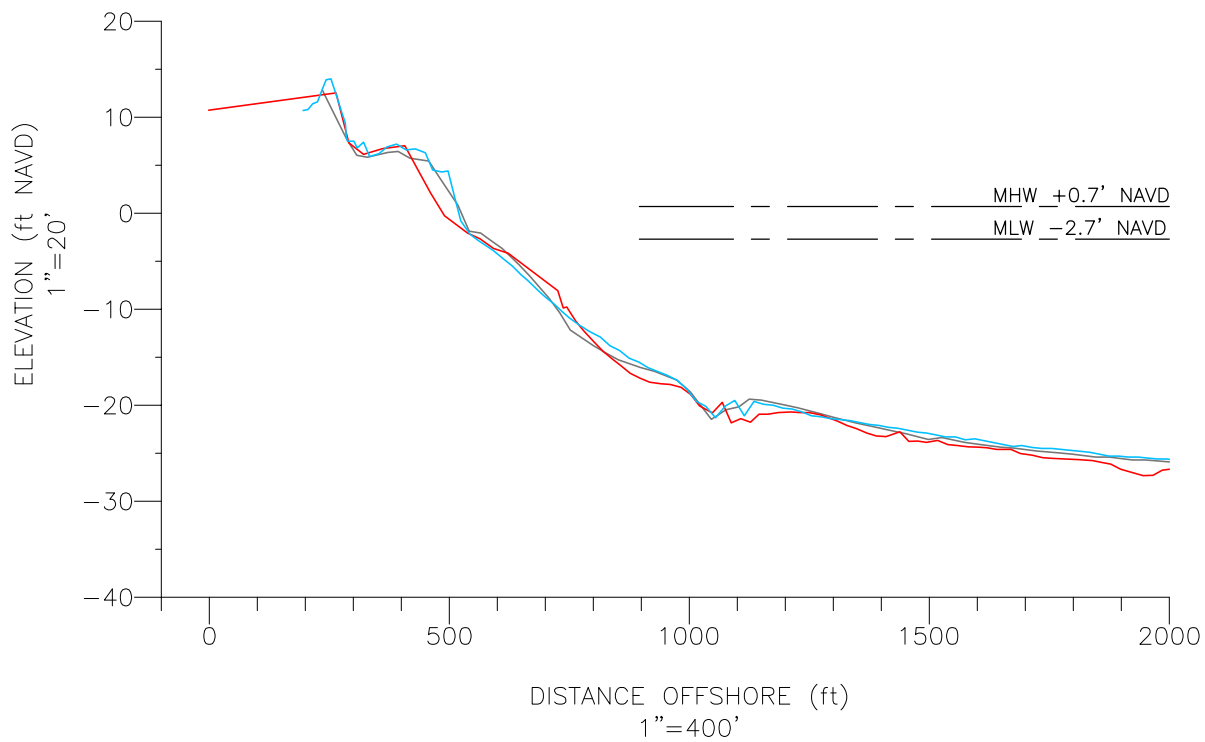
Figure 5b
Equilibrium Toe of Fill Changes
Indian River County Sector 7
1-Year Post Construction Monitoring Report

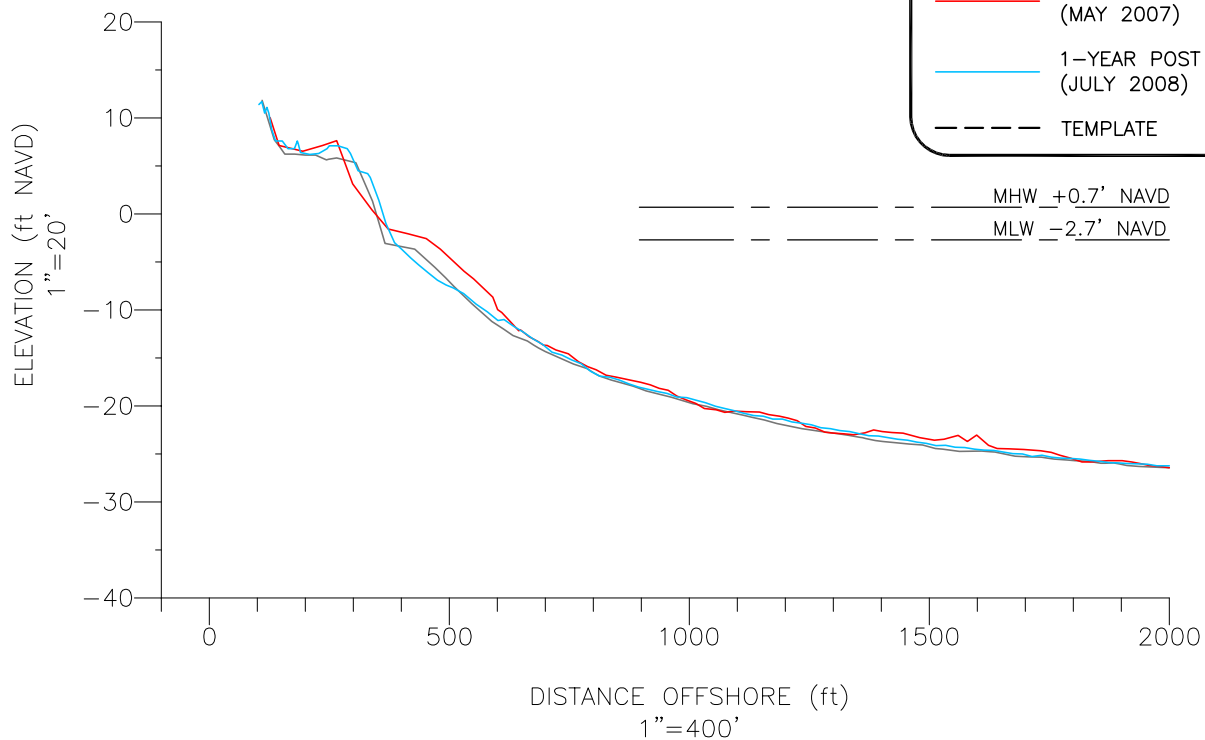
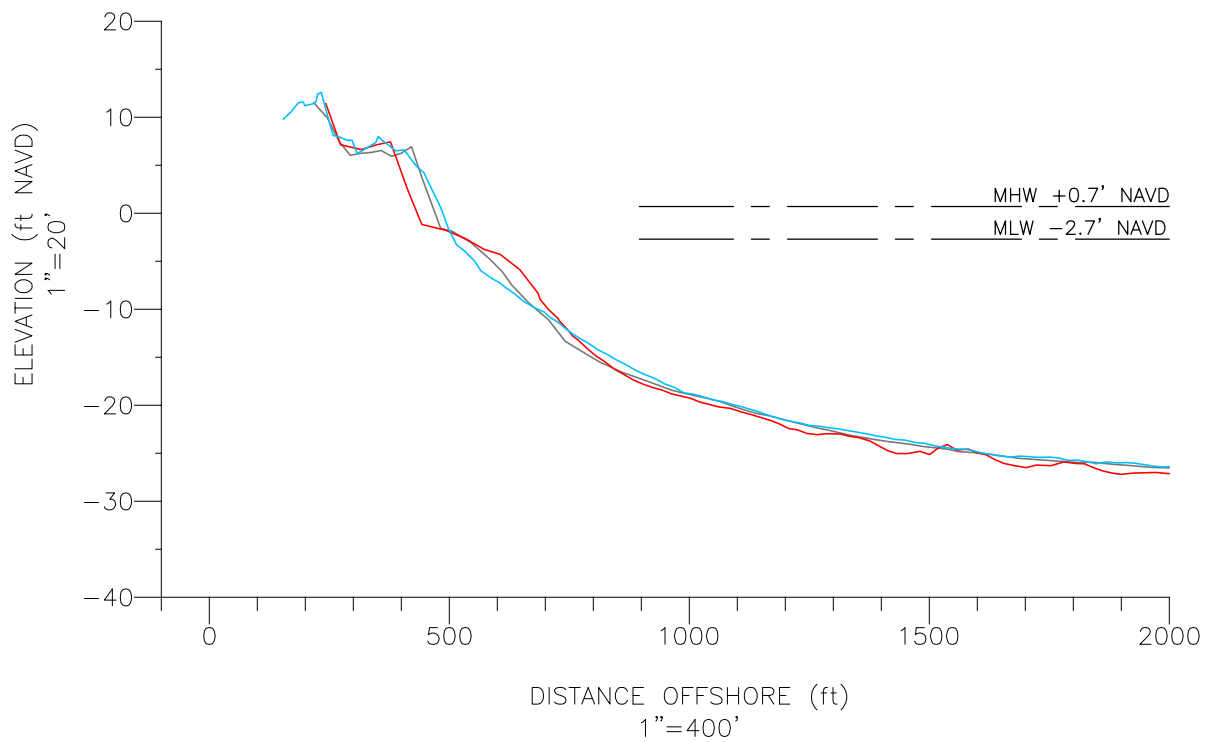
9. CONCLUSIONS

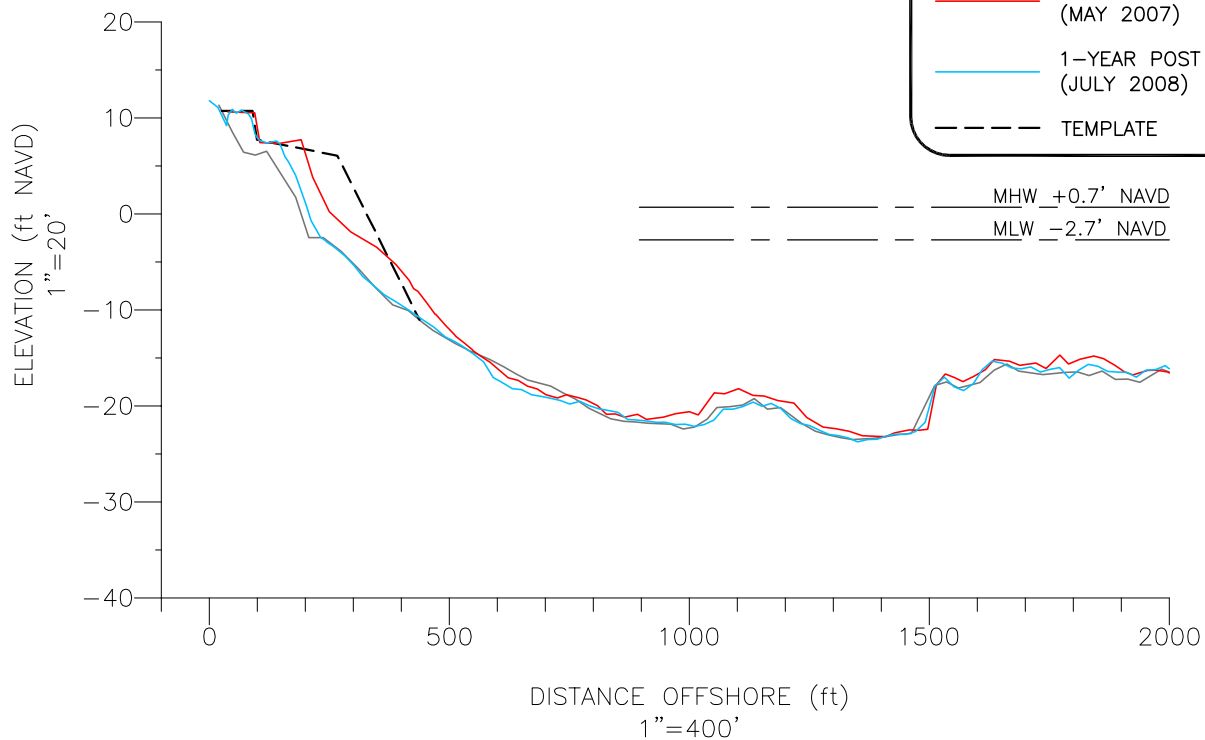
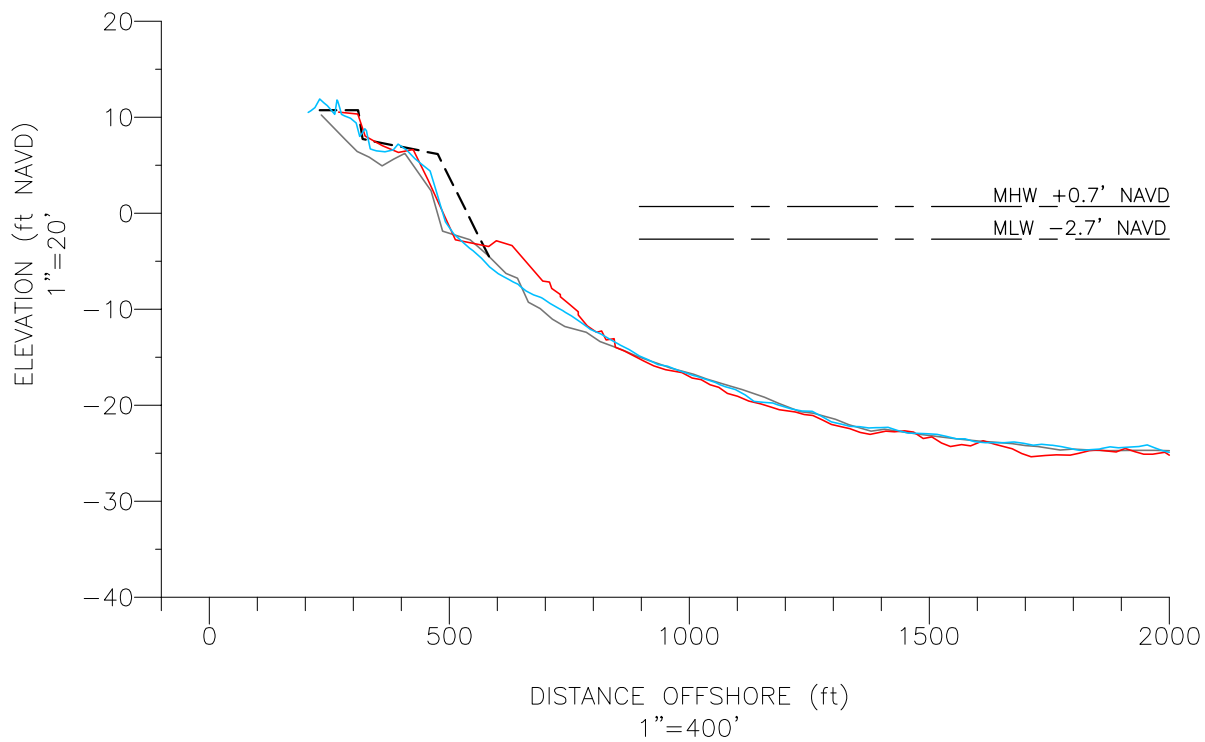
Subsequent to the acquisition and analysis of the pre- and post-construction surveys conducted as a part of this monitoring effort, the following conclusions are offered:

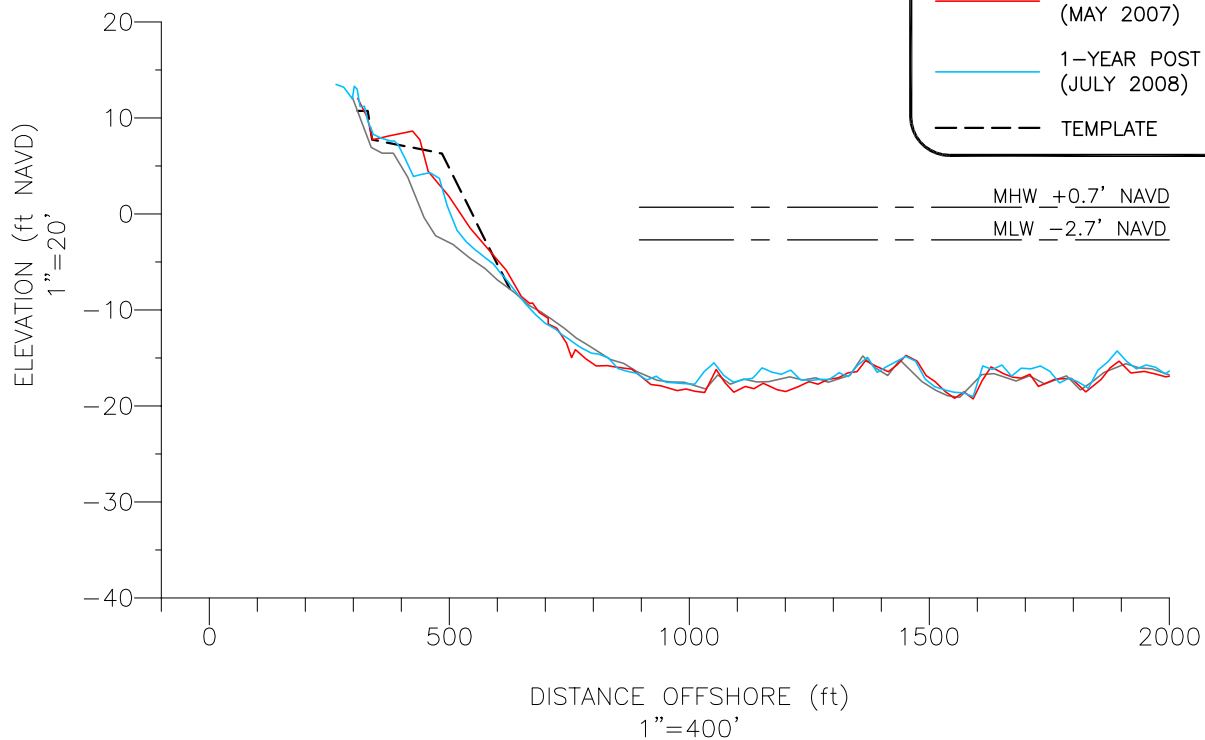
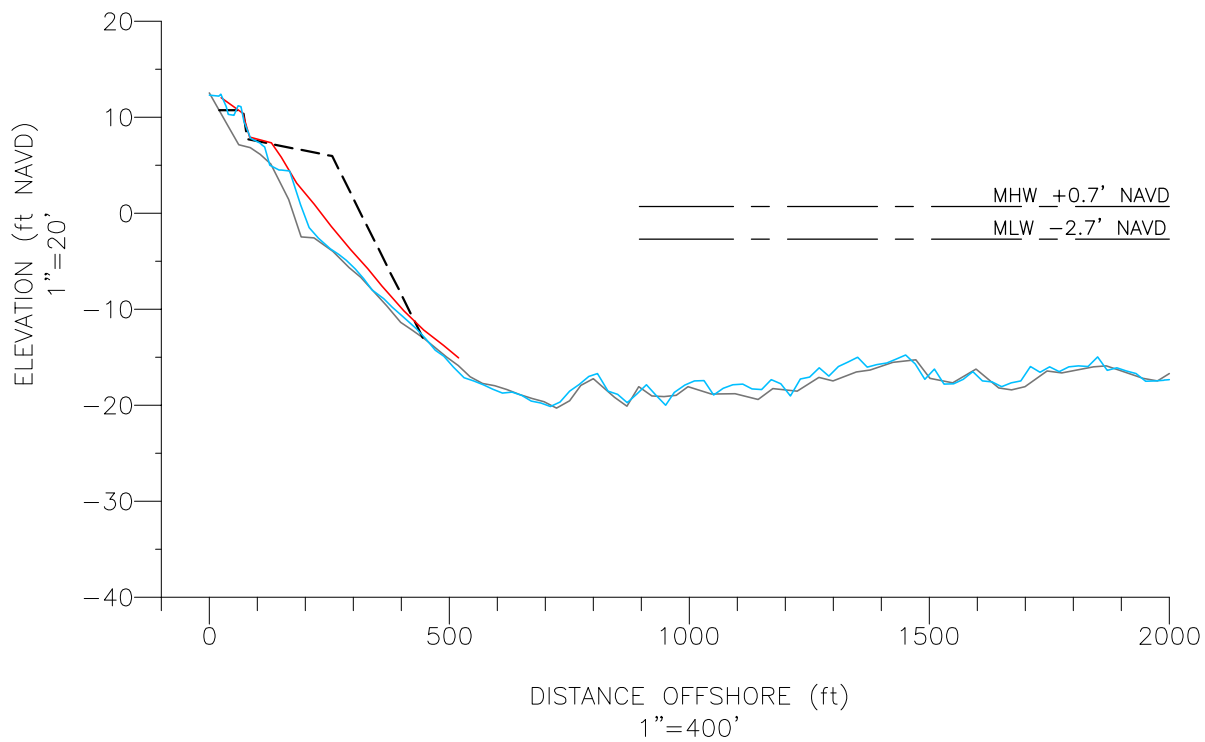
- Approximately 274,800 cubic yards of the 362,200 cubic yards placed during the renourishment remains within the monitored shoreline;
- The adjacent area to the north gained an average of 27,600 cubic yards of material above the MHW but only experienced an overall gain of approximately 4,900 cubic yards in the active beach profile. The area to the south experienced a gain of 12,000 cubic yards above MHW and an overall gain of 17,600 cubic yards in the active beach profile;
- The project is performing as anticipated by feeding sand from the northern portion of the project to the southern portion of the project. The northern portion of the project experienced loss while the southern portion of the project experienced sediment gains (from R-102.5 to R-106.5).
- Approximately 94% of the placed volume is within the monitored shoreline and 78% of the placed volume is within the project limits;
- Based on the 2007 post-construction survey and the 2008 1-year post-construction survey comparisons, the project area berm receded an average of approximately 13.8 feet and shoreline receded an average of approximately 11.1 feet, while the berm in the adjacent area to the north advanced an average of approximately 40.6 feet and the shoreline advanced an average of approximately 27.3 feet. The adjacent area to the south showed a berm advancement of 15.5 feet and a shoreline advancement of 14.1 feet;
- The berm recessions and shoreline advancements in the project area and adjacent areas are indicative of expected cross-shore equilibration of the construction template;
- The observed toe of fill has not impacted the diver-mapped landward edge of hardbottom.

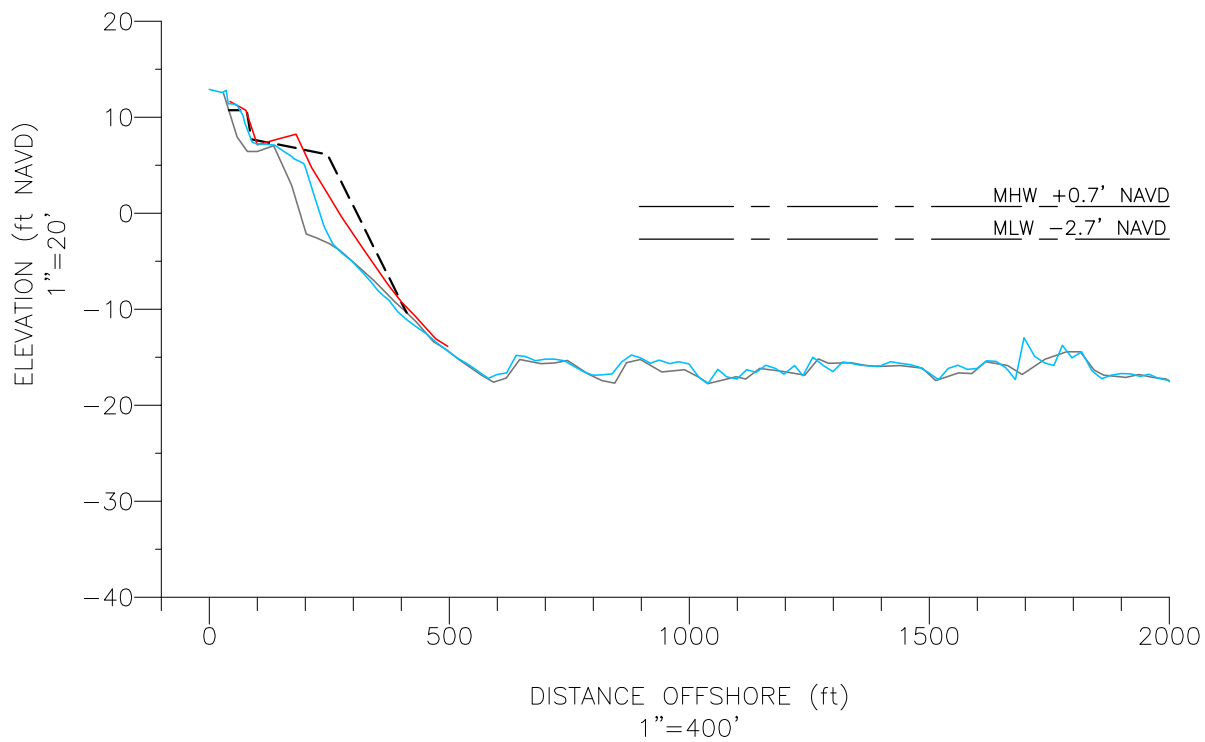
APPENDIX A
PROFILE SURVEY DATA



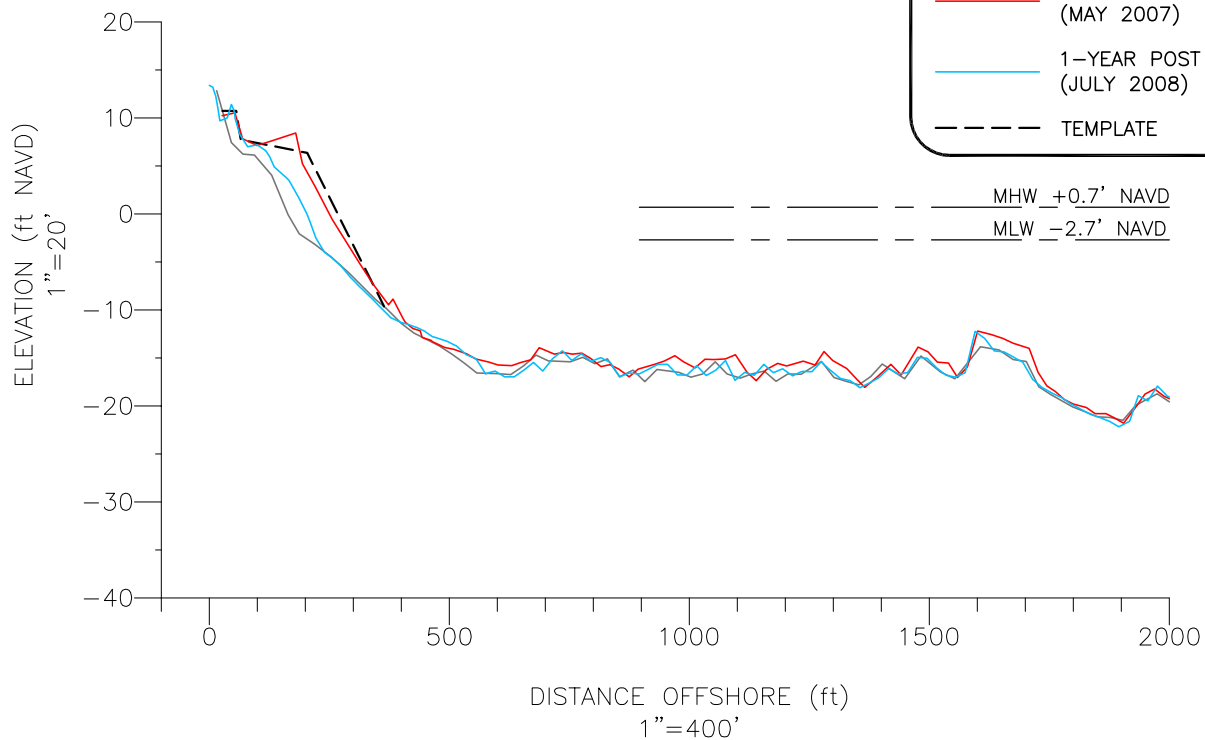








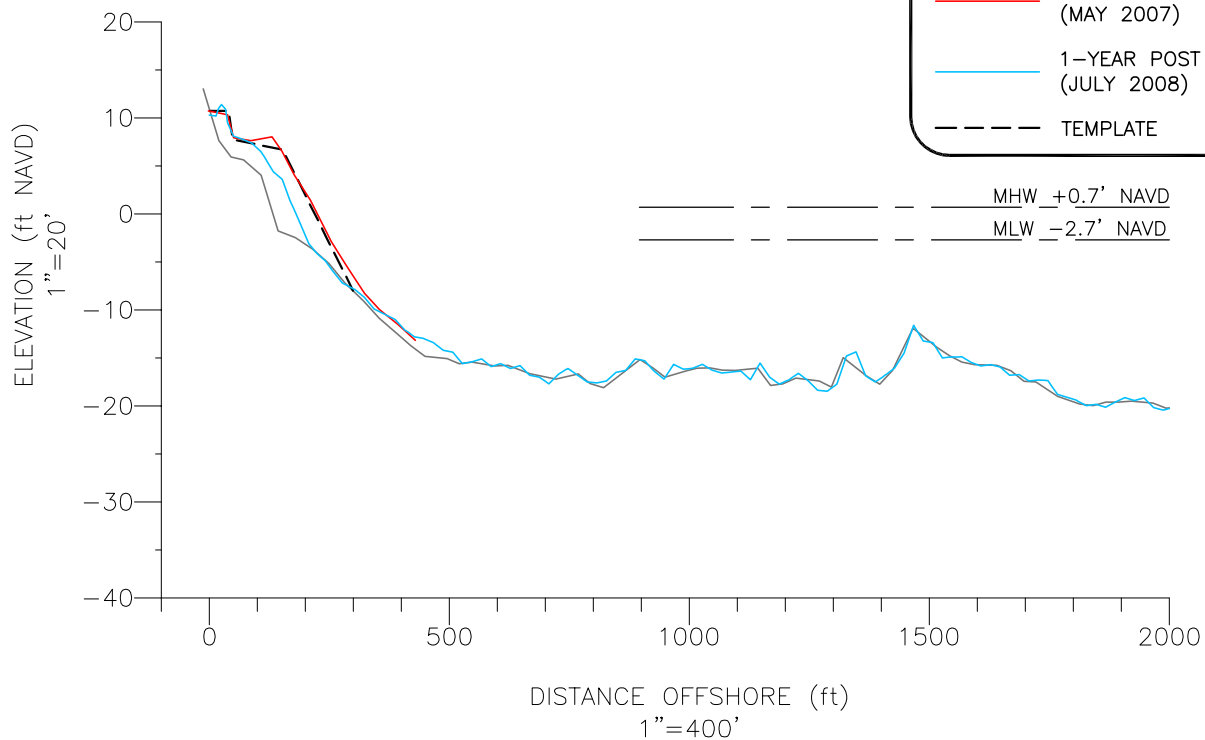
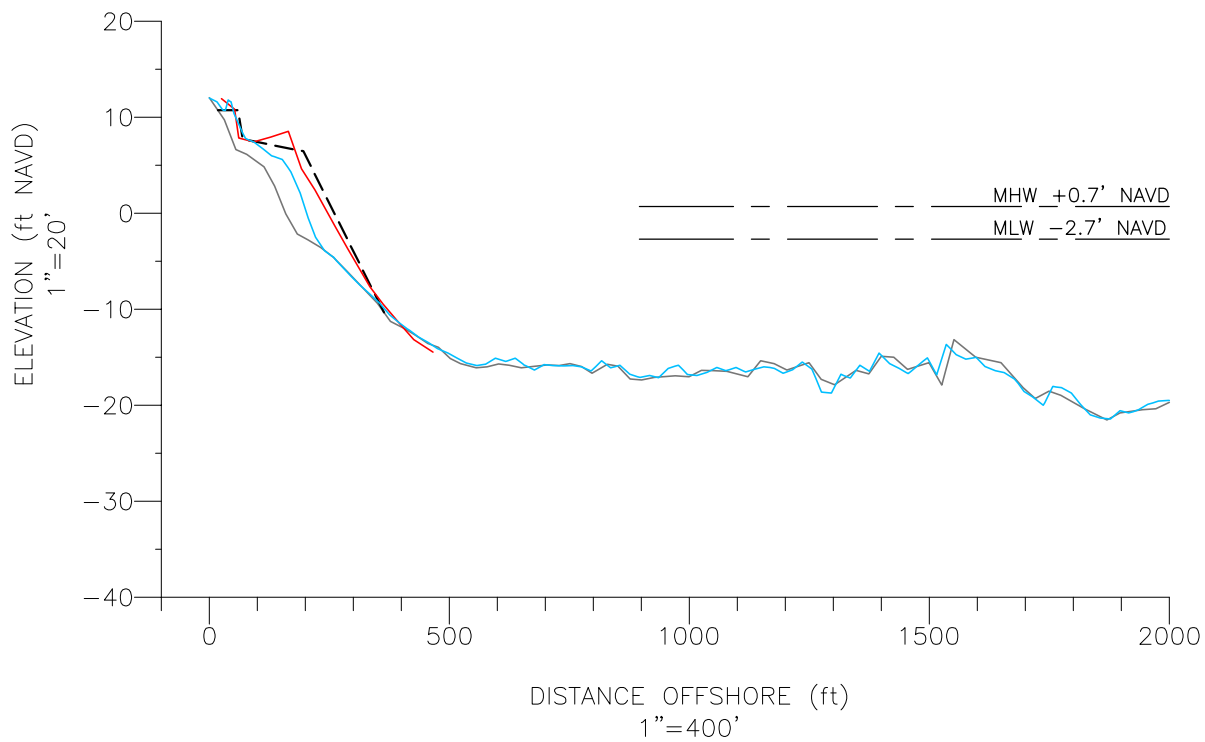
MONUMENT T-100.5



MONUMENT R-101

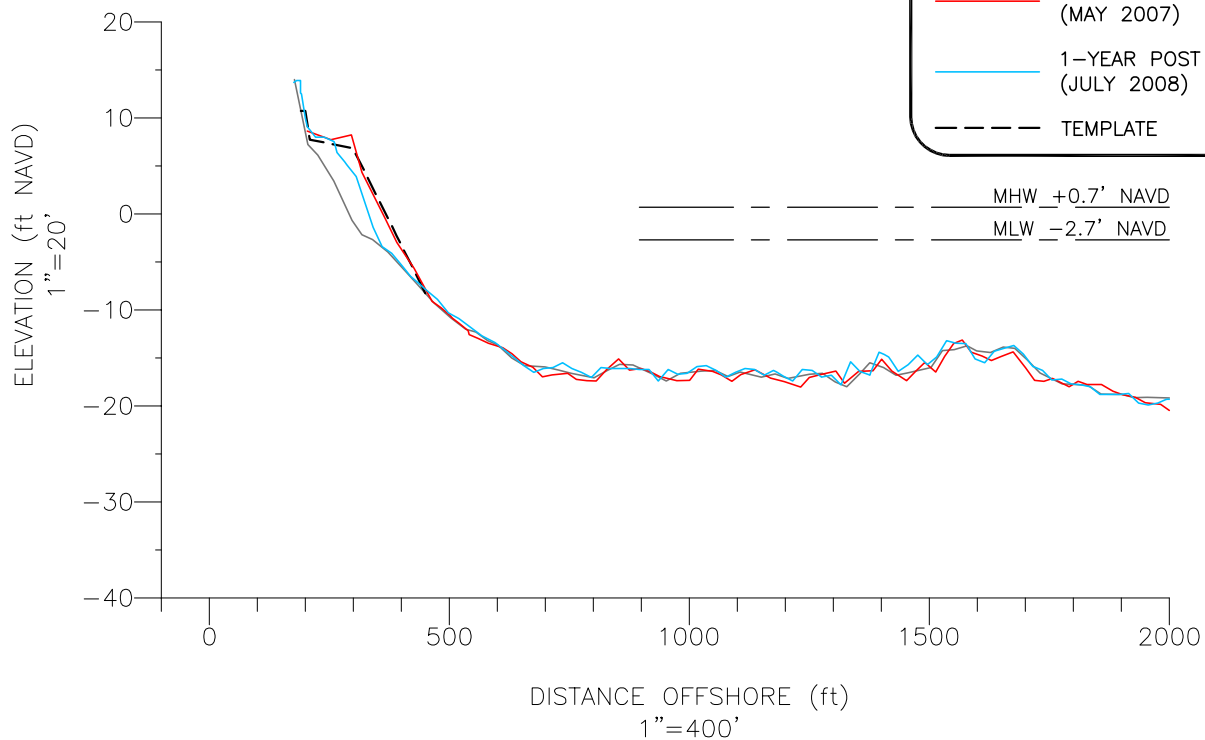
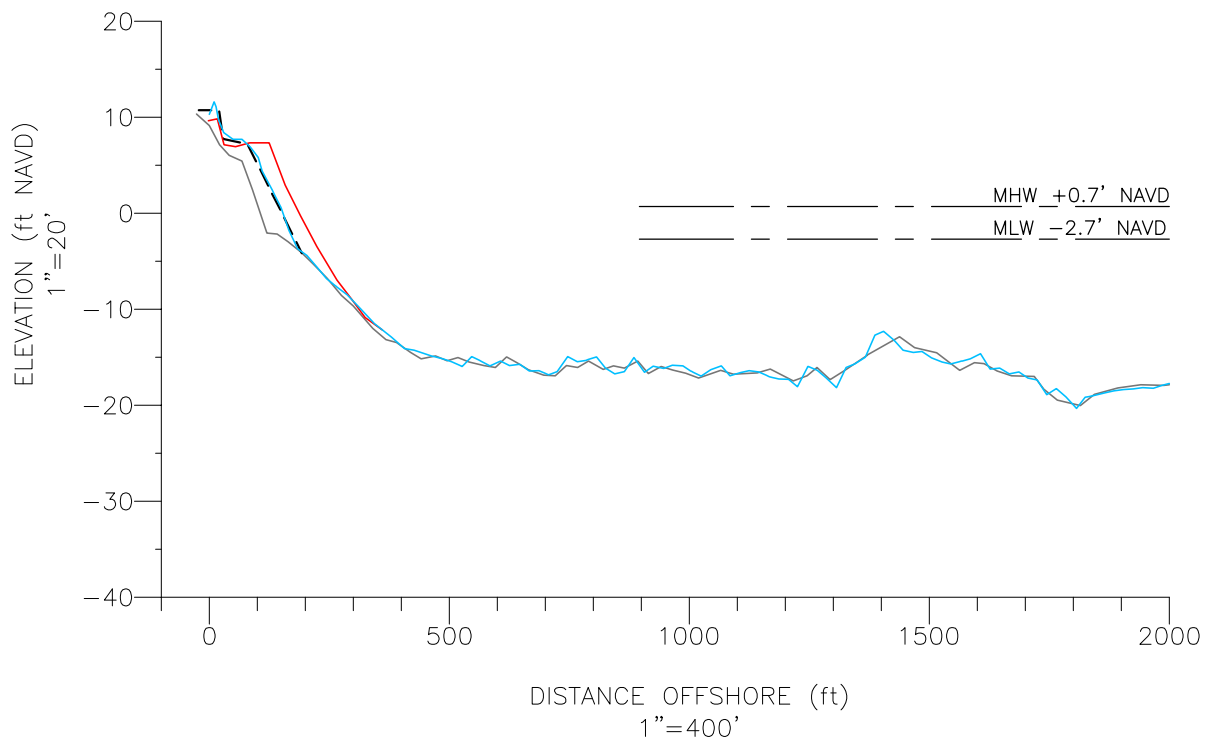
Appendix A-5
Profile Surveys for T-100.5 & R-101
Indian River County Sector 7
1-Year Post Construction Monitoring Report





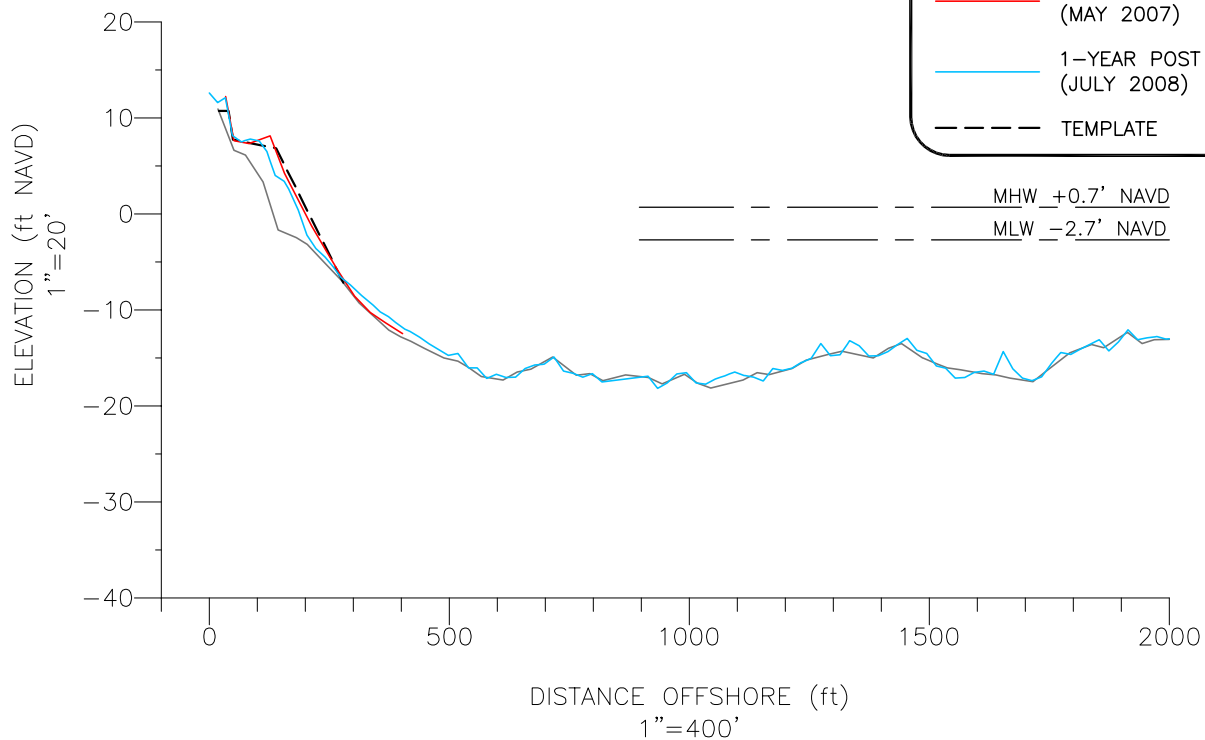
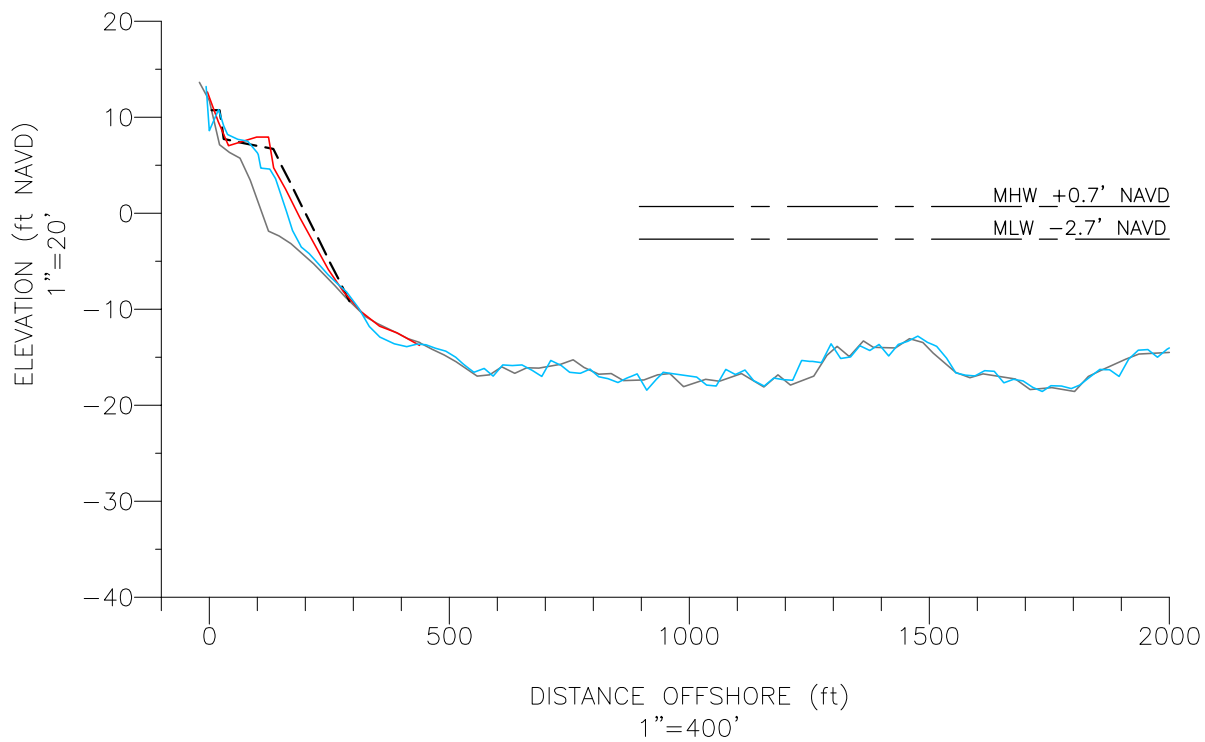
Appendix A-6
 Profile Surveys for R-101.25 & R-101.5
 Indian River County Sector 7
 1-Year Post Construction Monitoring Report





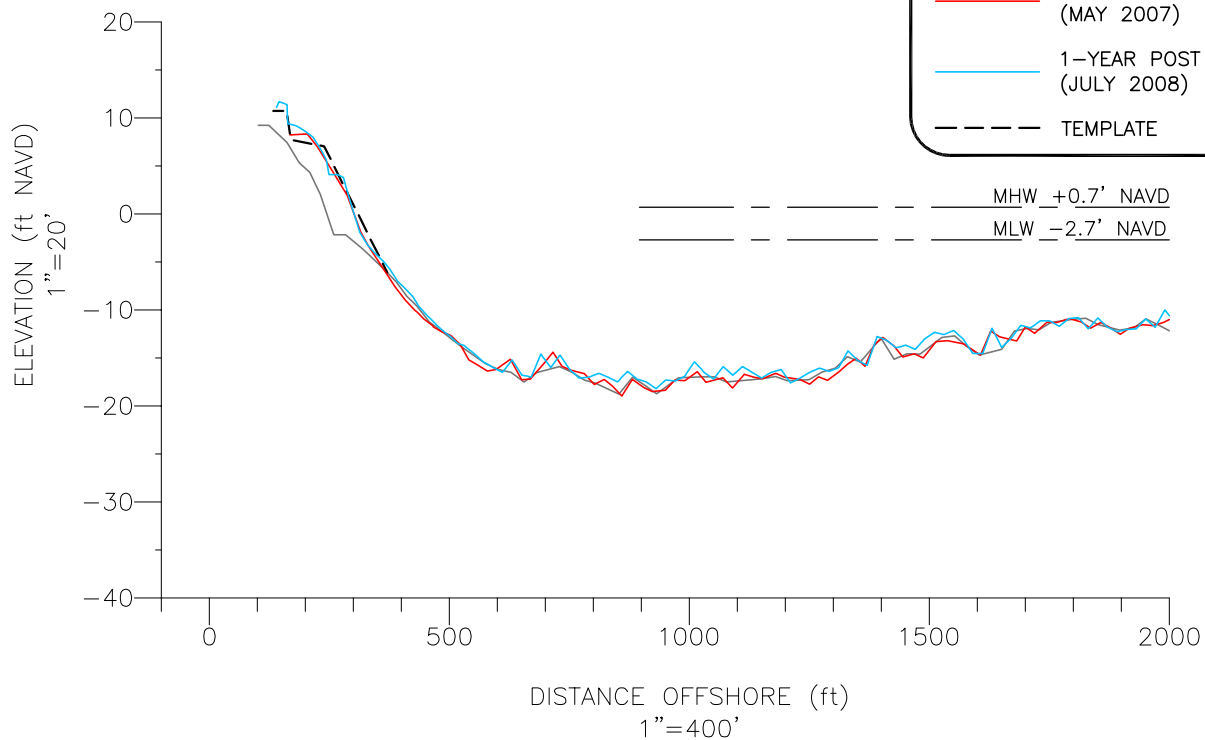
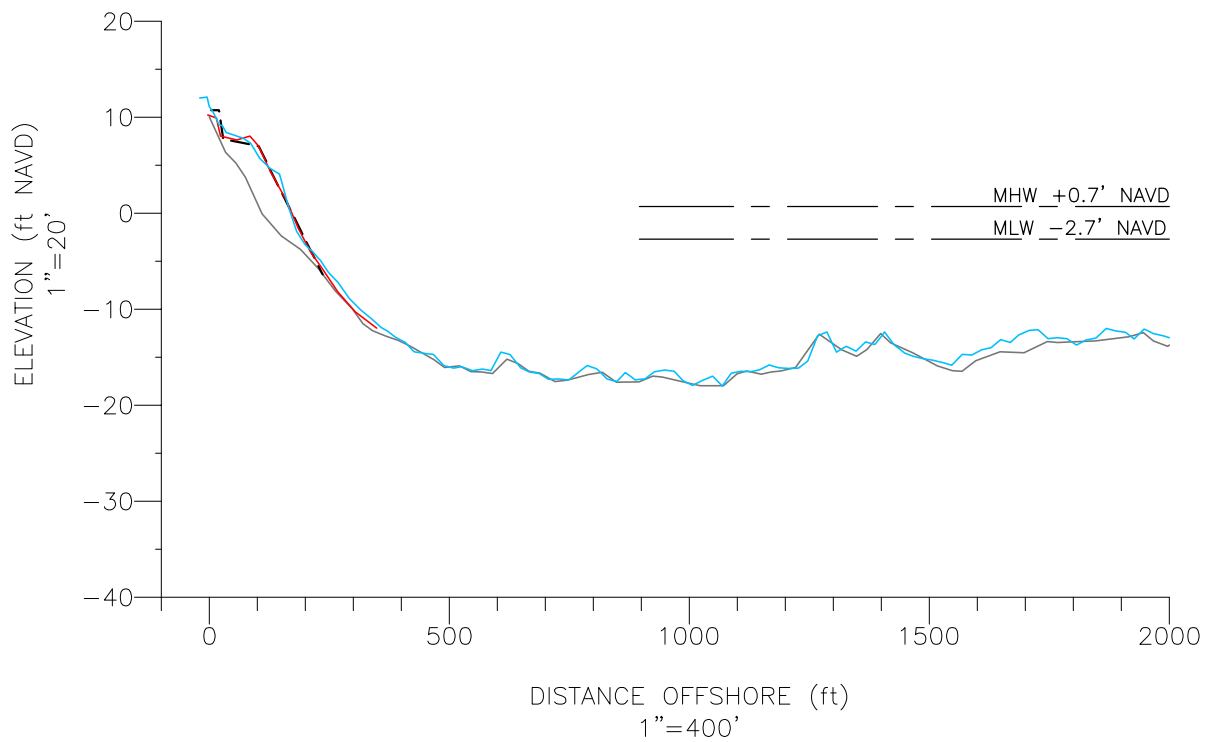
Appendix A-7
 Profile Surveys for R-101.75 & R-102
 Indian River County Sector 7
 1-Year Post Construction Monitoring Report





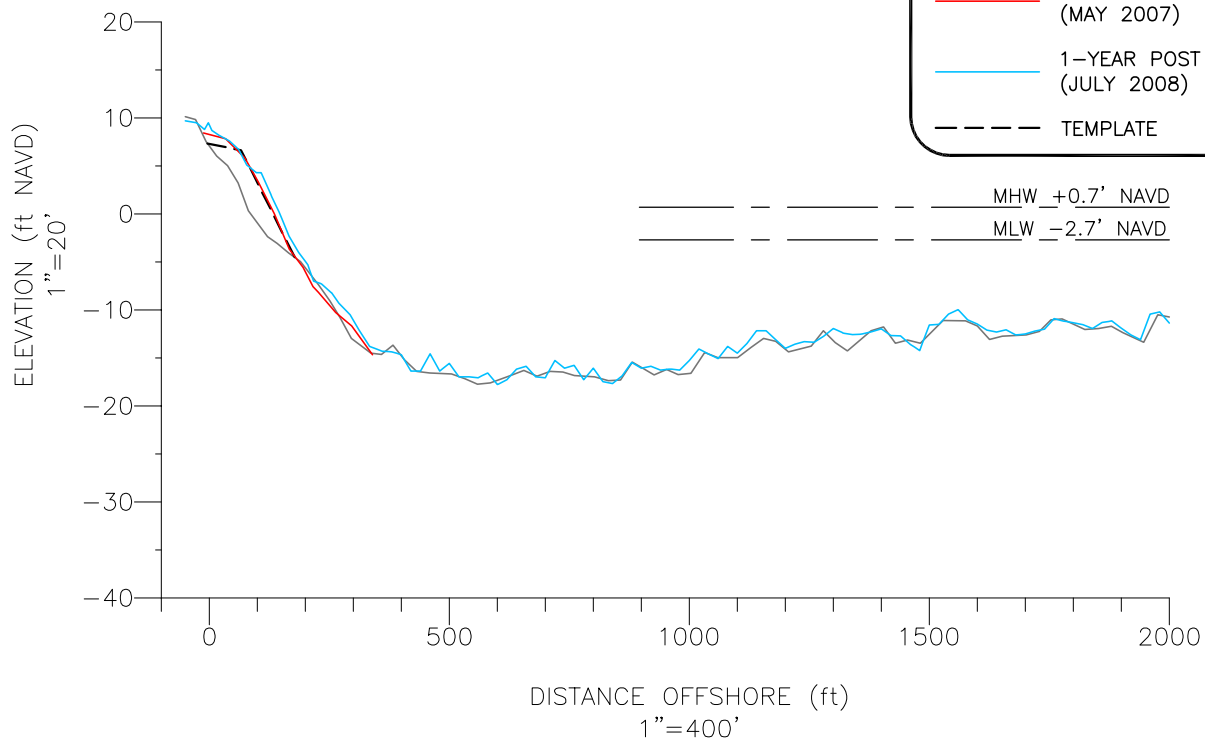
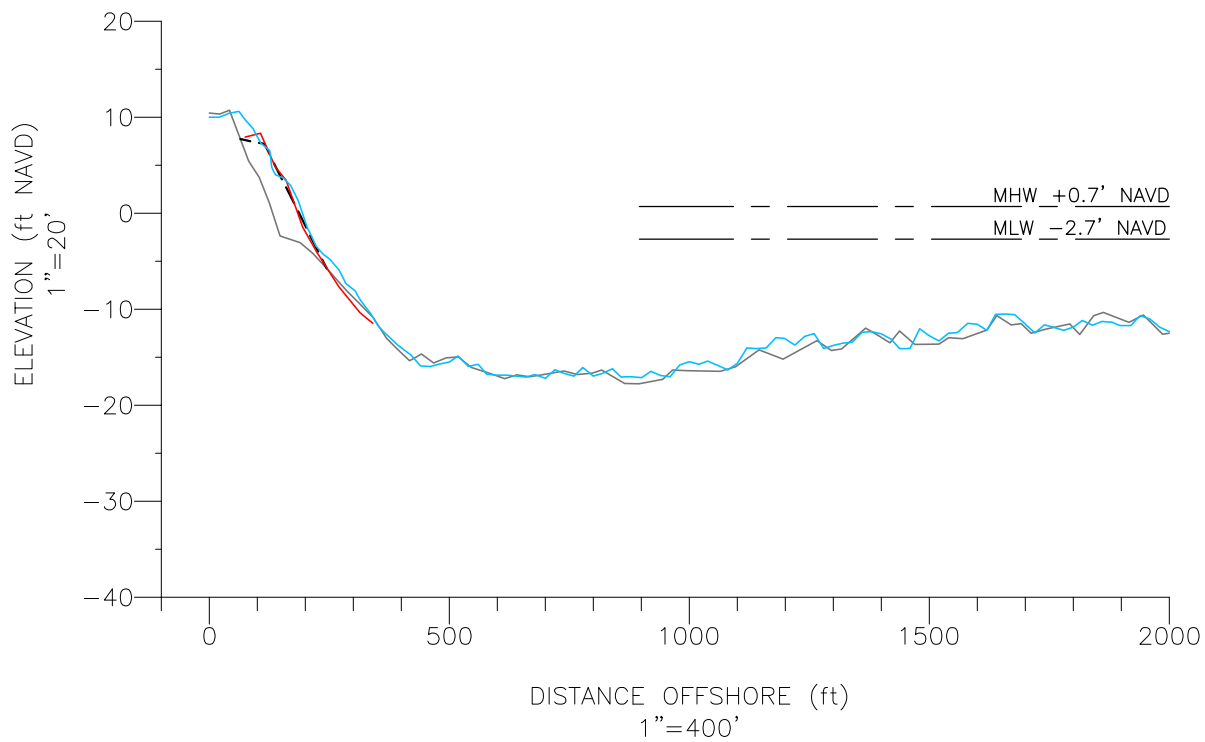
Appendix A-8
 Profile Surveys for R-102.25 & R-102.5
 Indian River County Sector 7
 1-Year Post Construction Monitoring Report

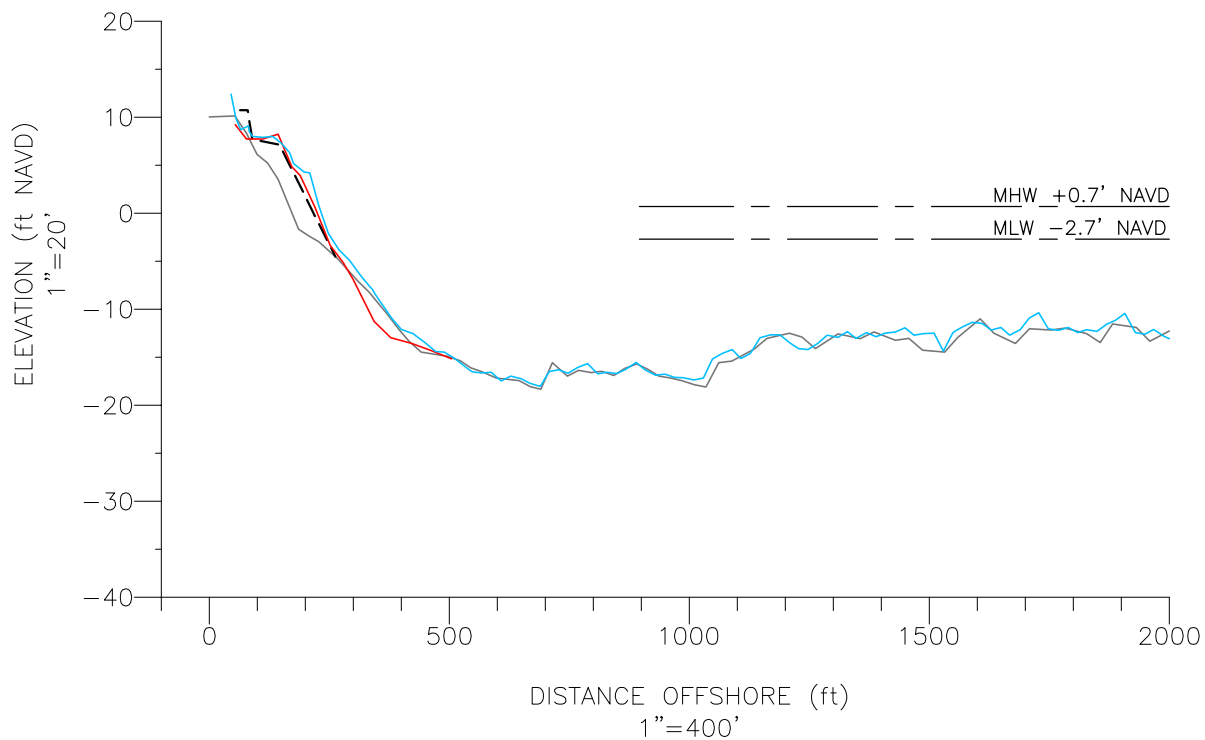




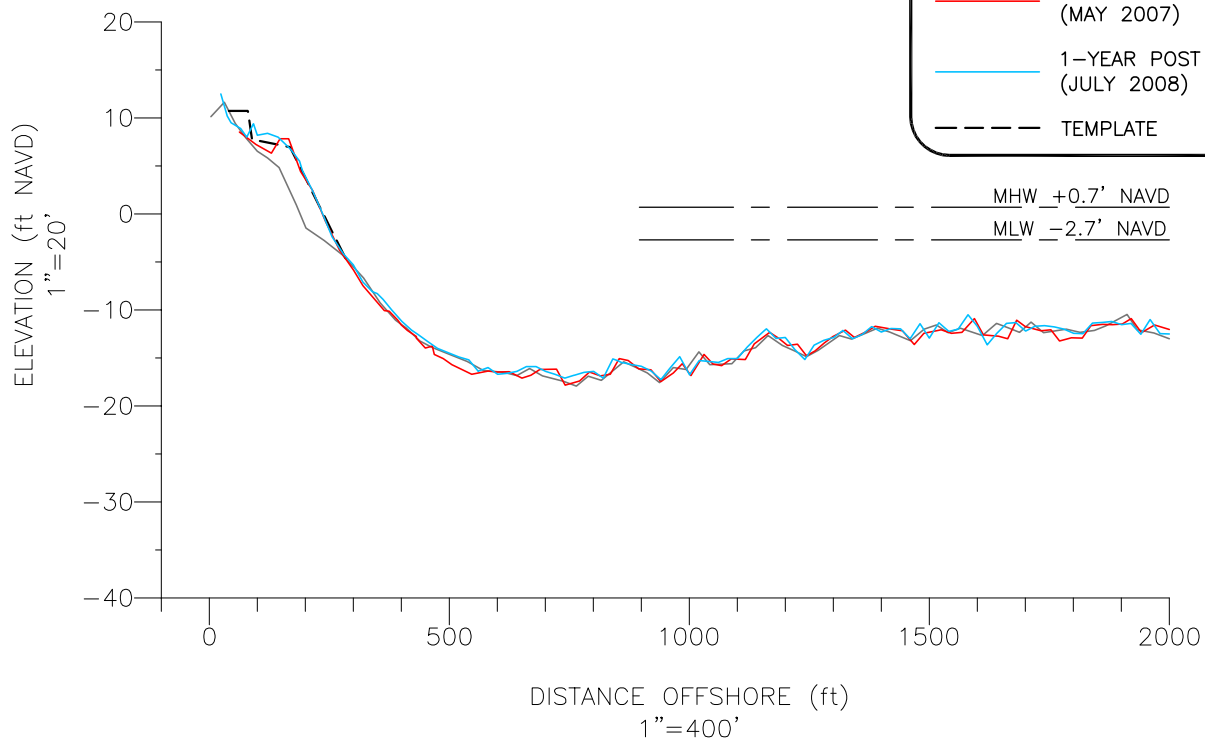
Appendix A-9
 Profile Surveys for R-102.75 & R-103
 Indian River County Sector 7
 1-Year Post Construction Monitoring Report



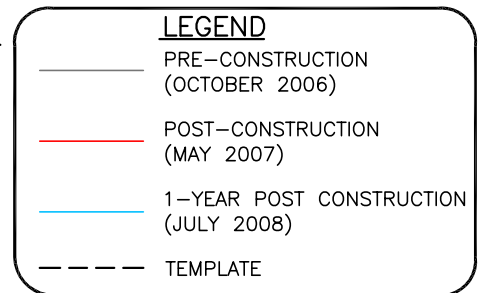


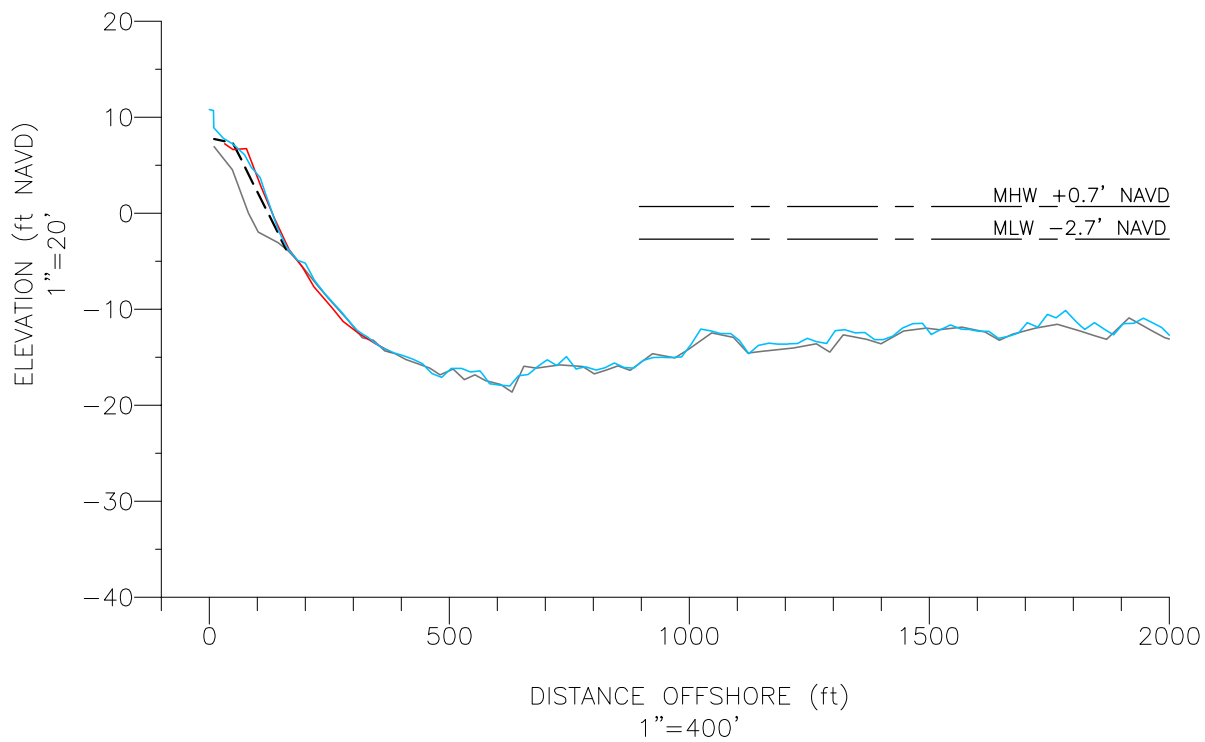


MONUMENT R-103.75

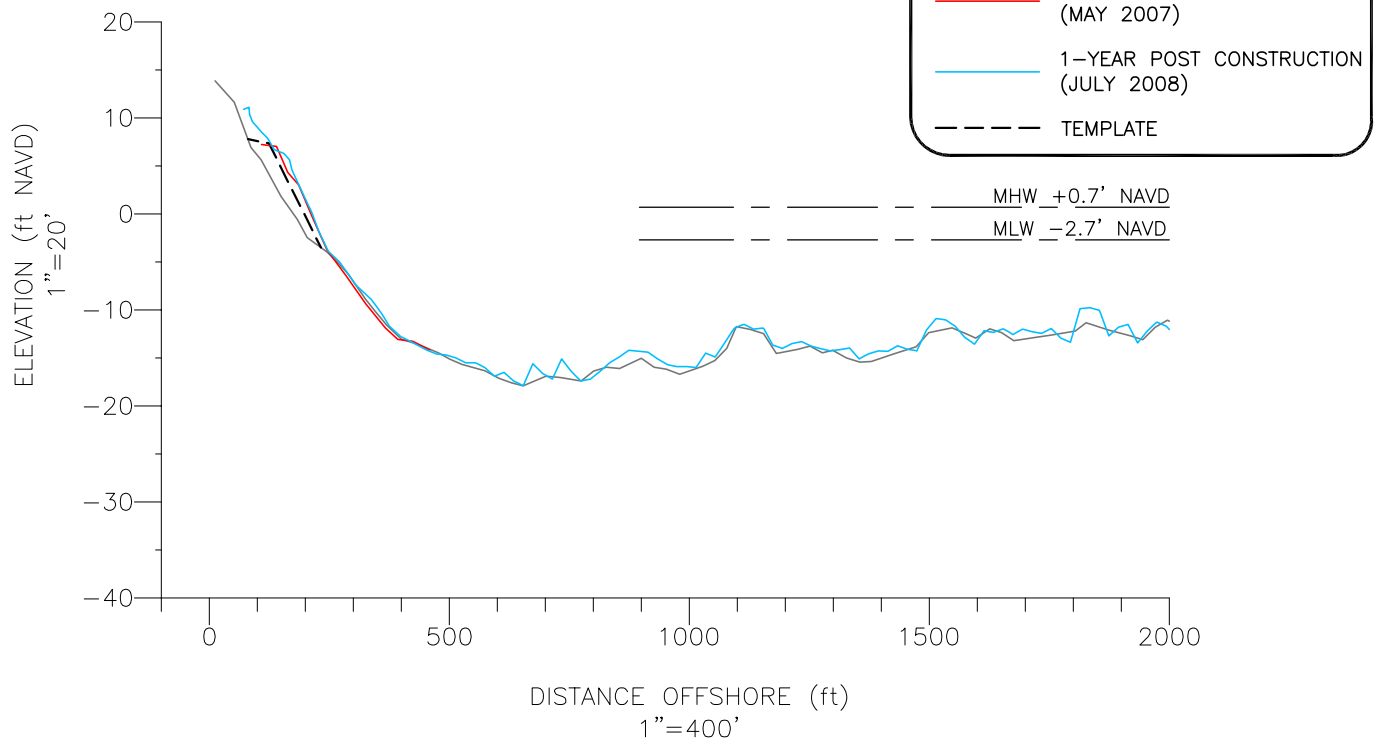


MONUMENT R-104

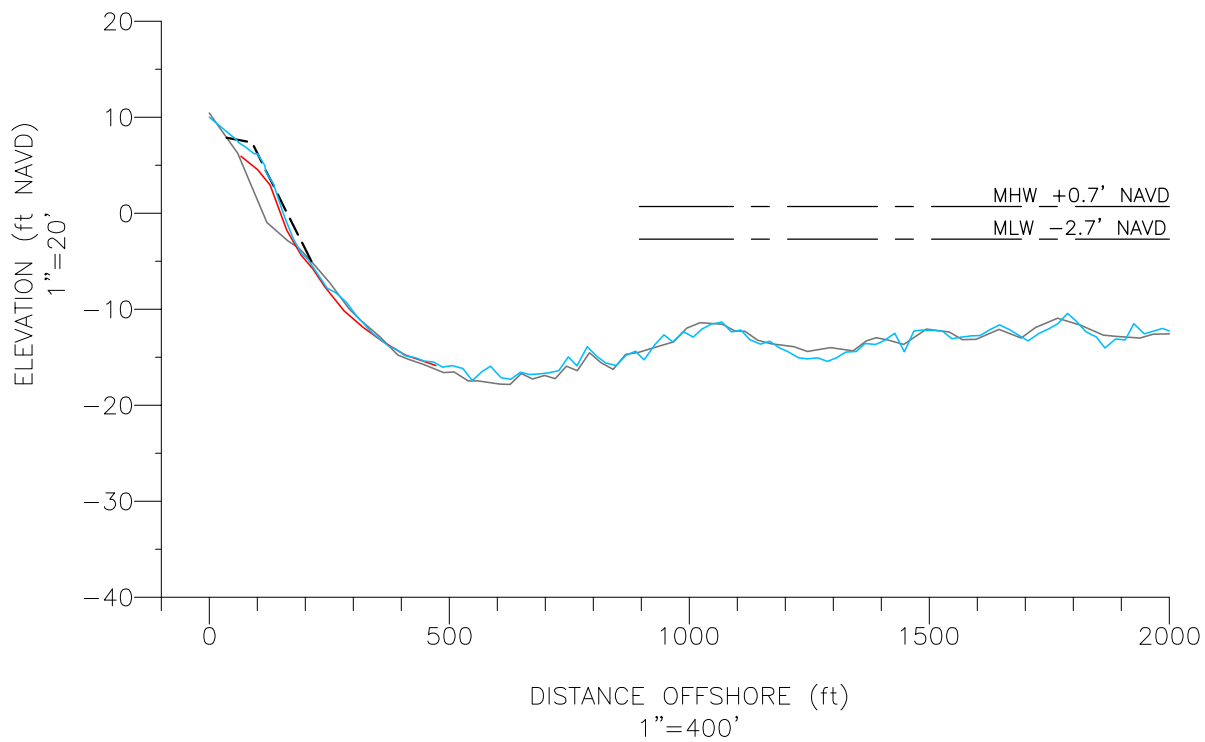




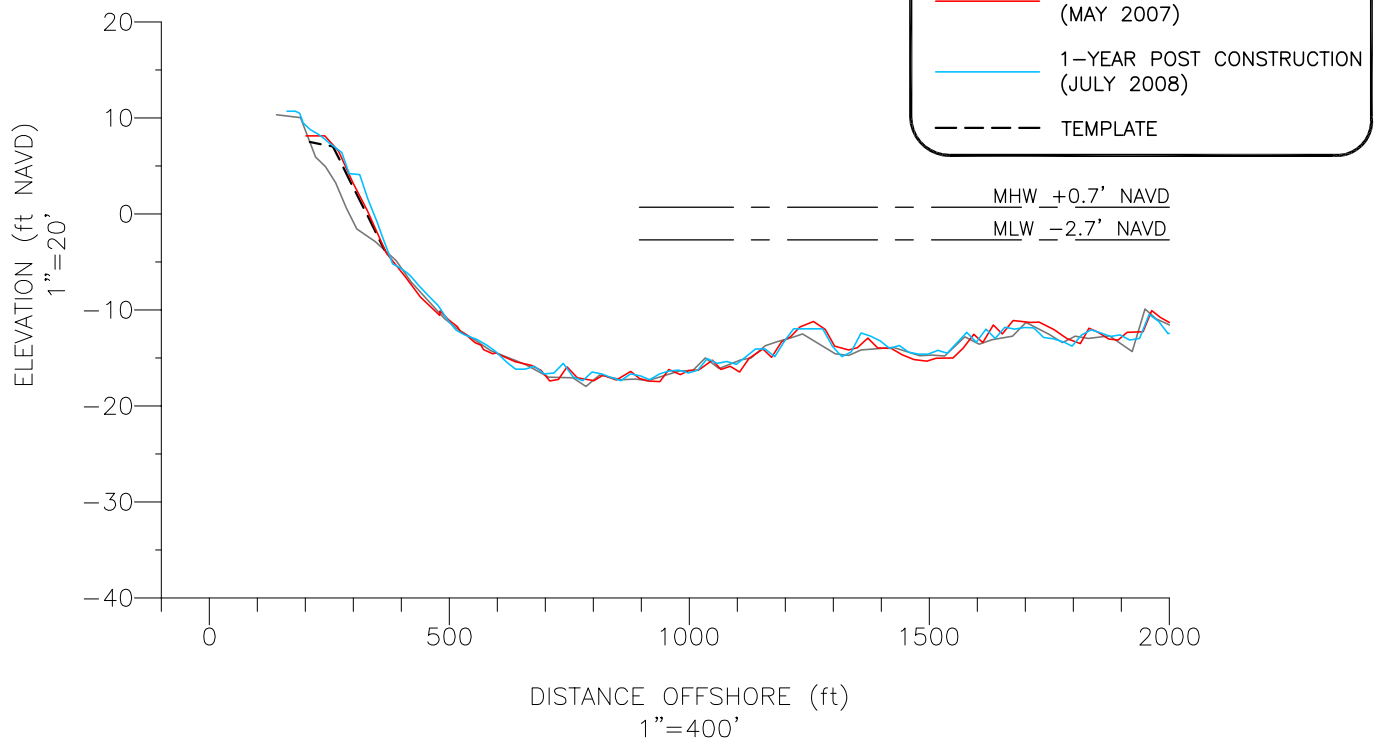
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MONUMENT R-104.5



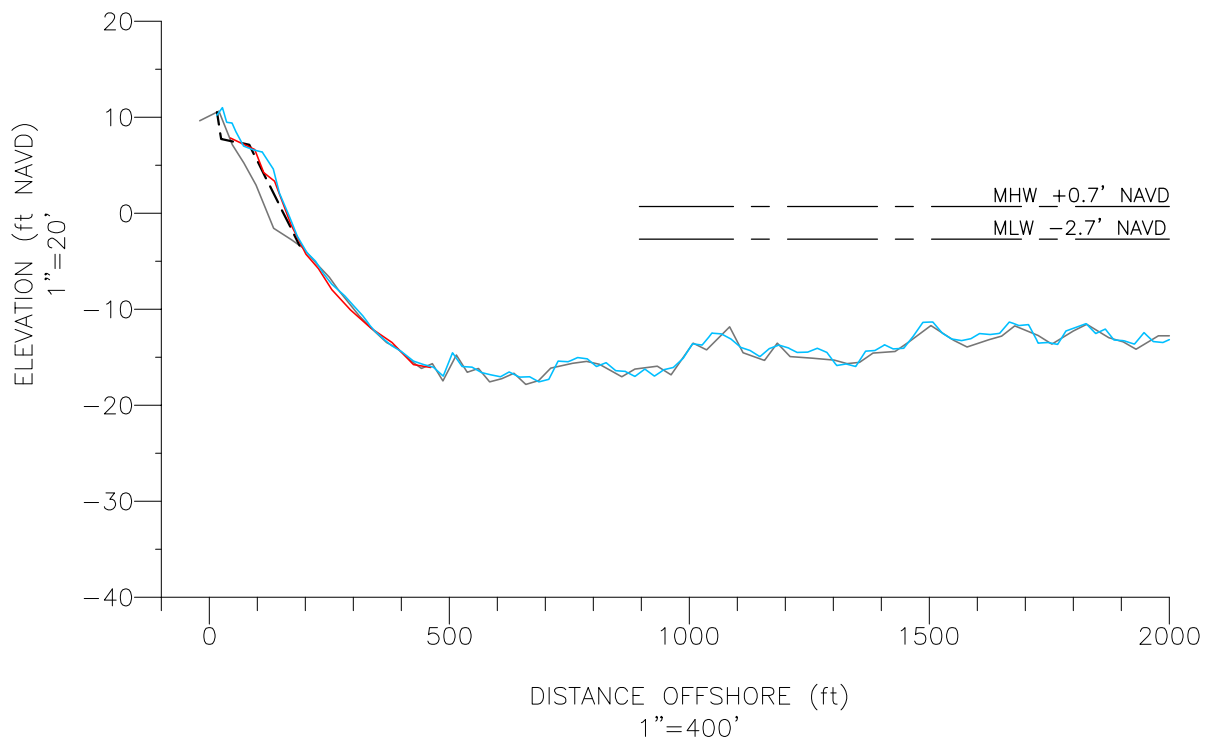
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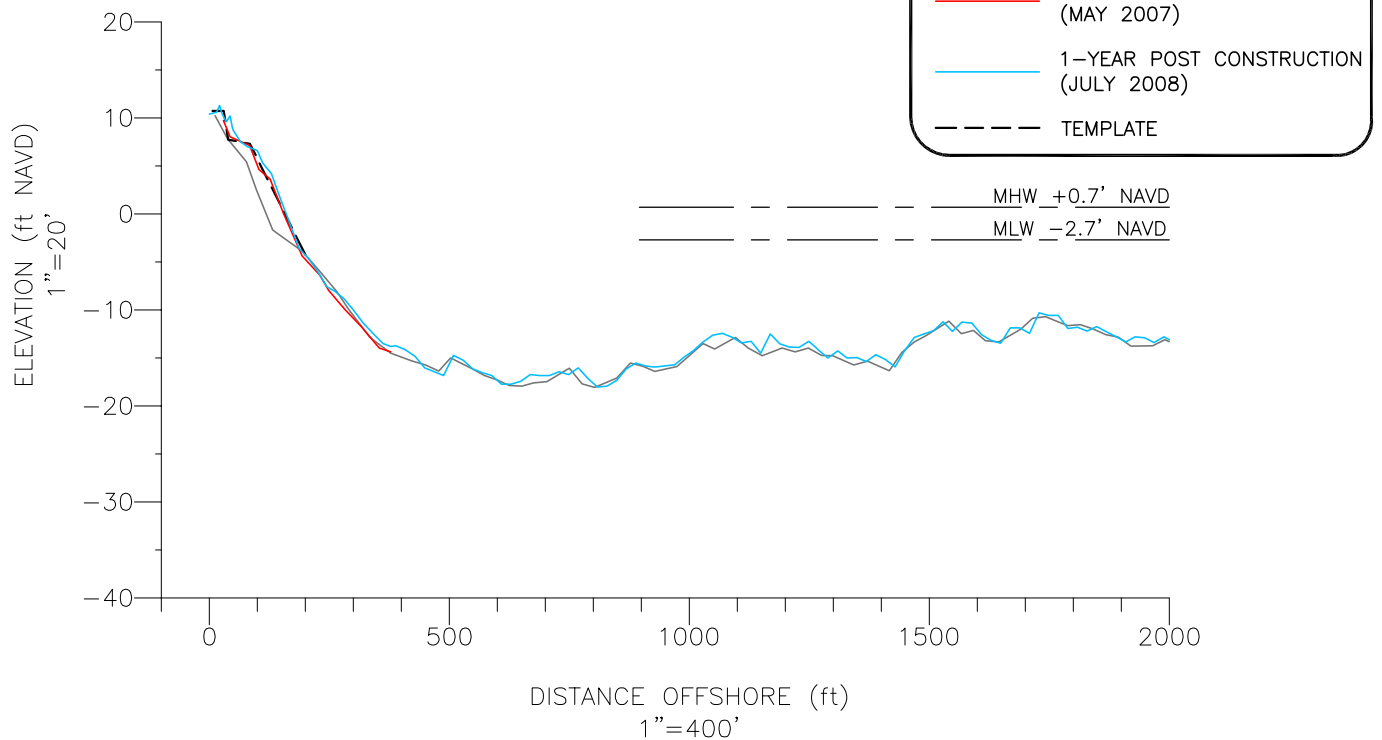
MONUMENT R-105

Appendix A-13
 Profile Surveys for R-104.75 & R-105
 Indian River County Sector 7
 1-Year Post Construction Monitoring Report





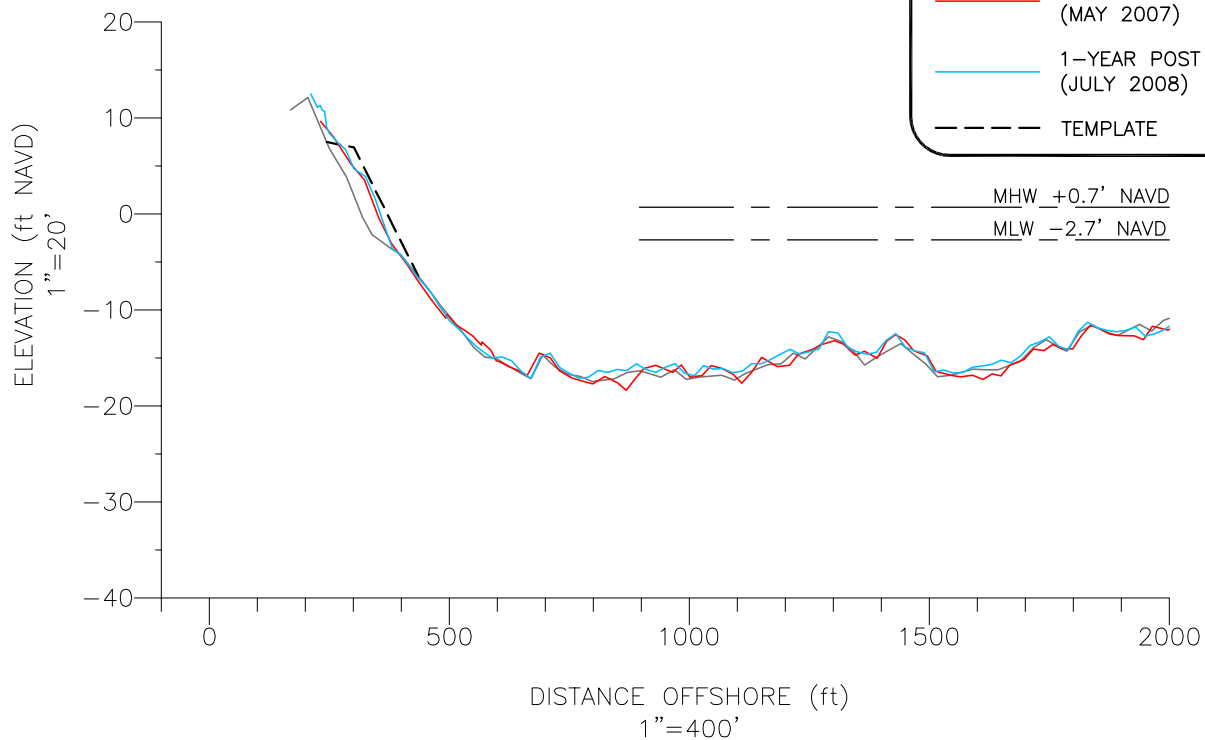
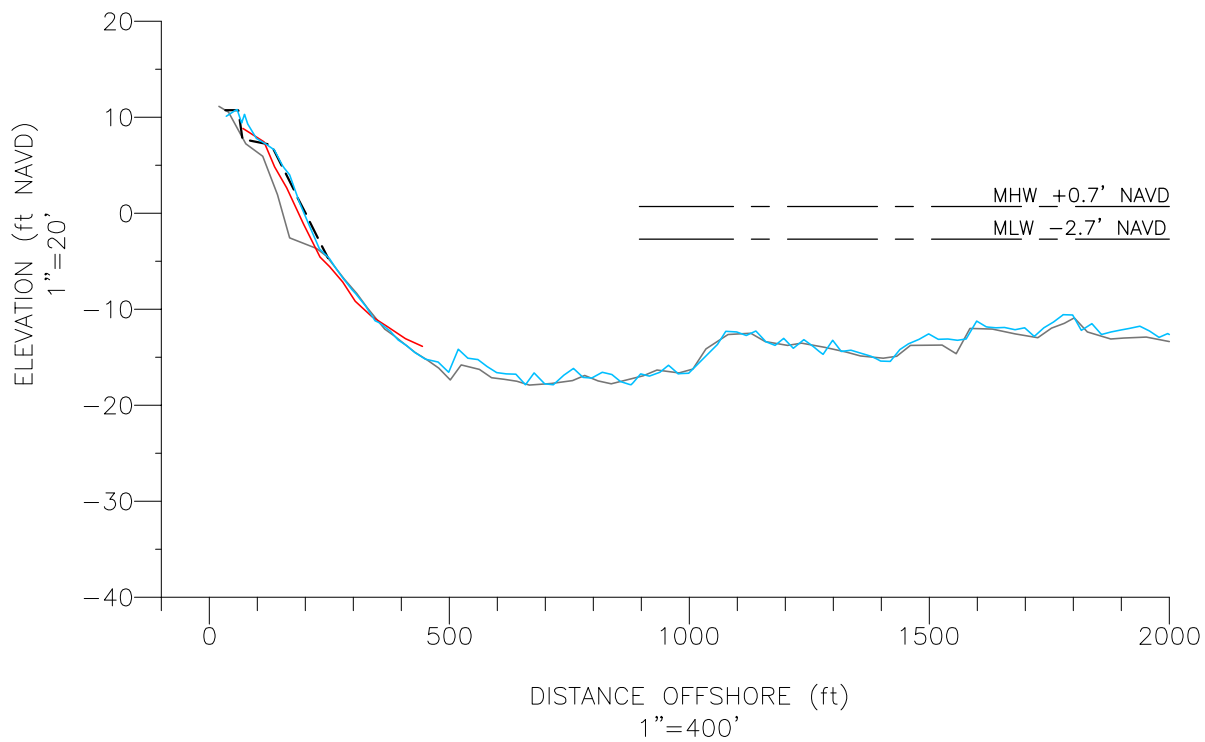
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MONUMENT R-105.5

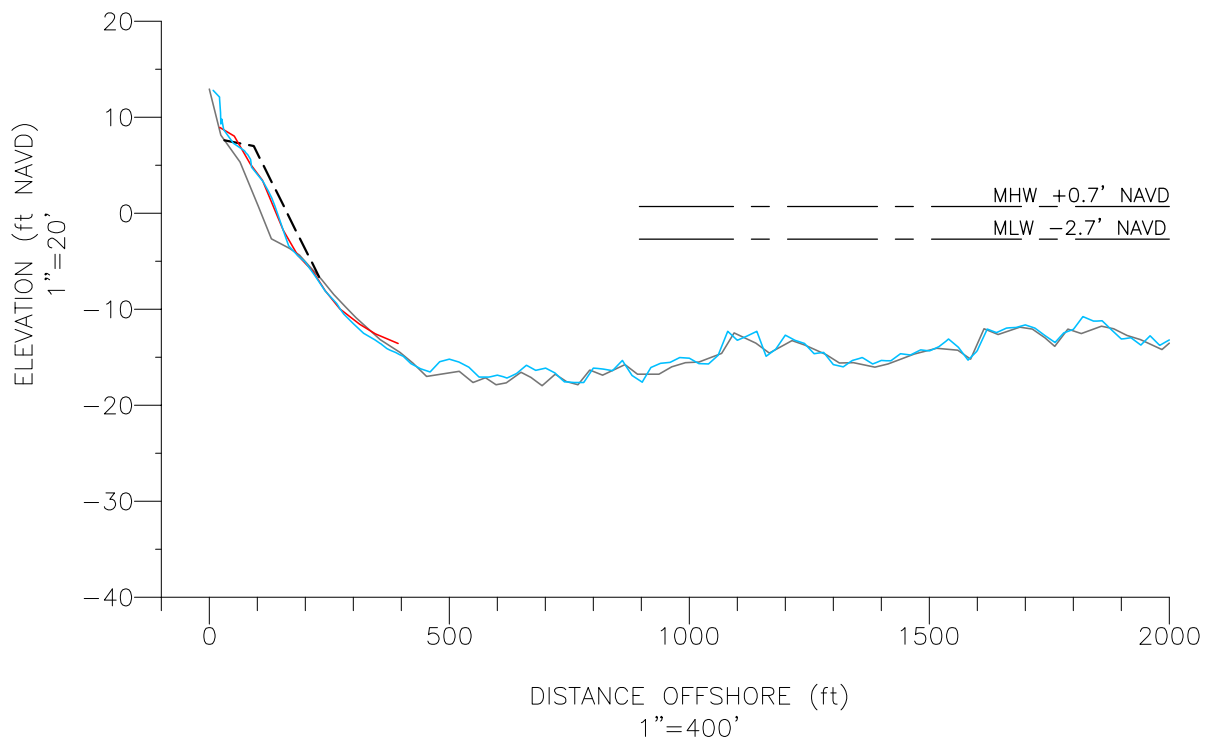
Appendix A-14
 Profile Surveys for R-105.25 & R-105.5
 Indian River County Sector 7
 1-Year Post Construction Monitoring Report



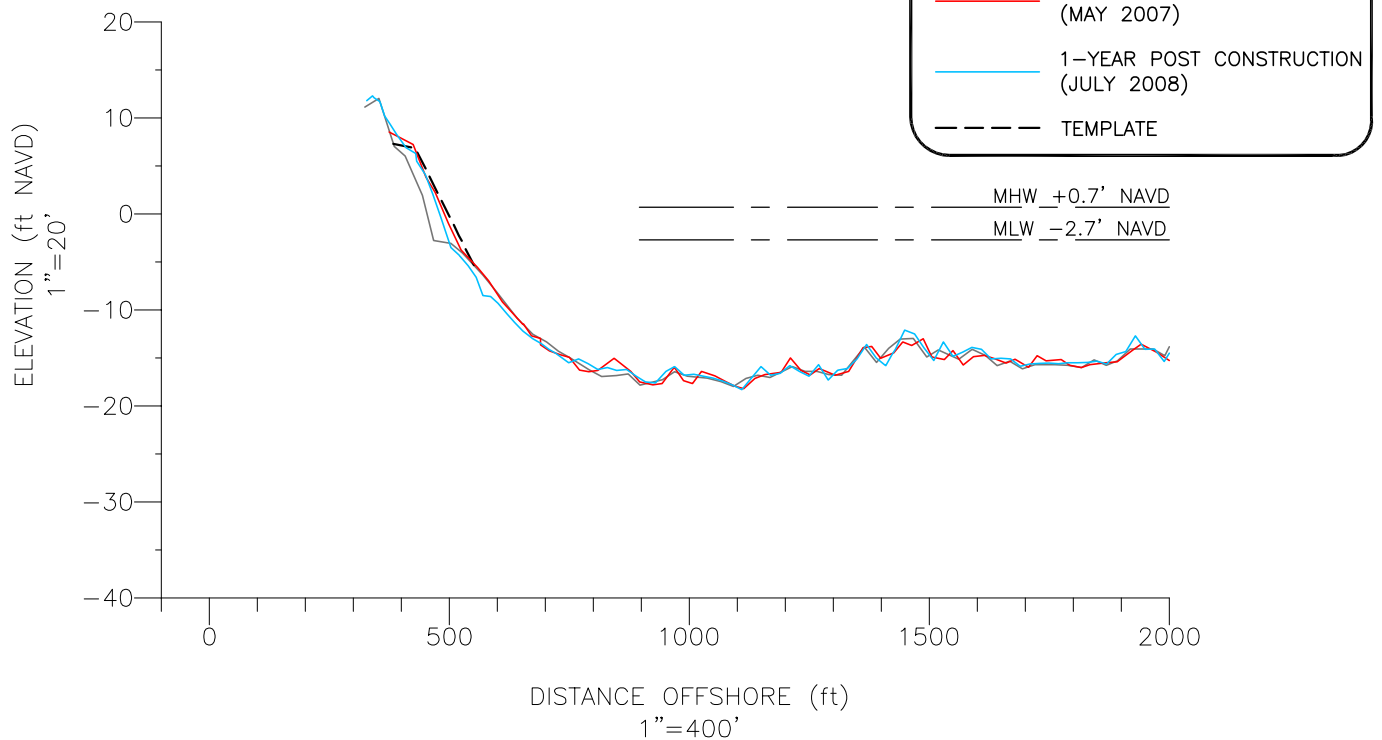


Appendix A-15
Profile Surveys for R-105.75 & R-106
Indian River County Sector 7
1-Year Post Construction Monitoring Report

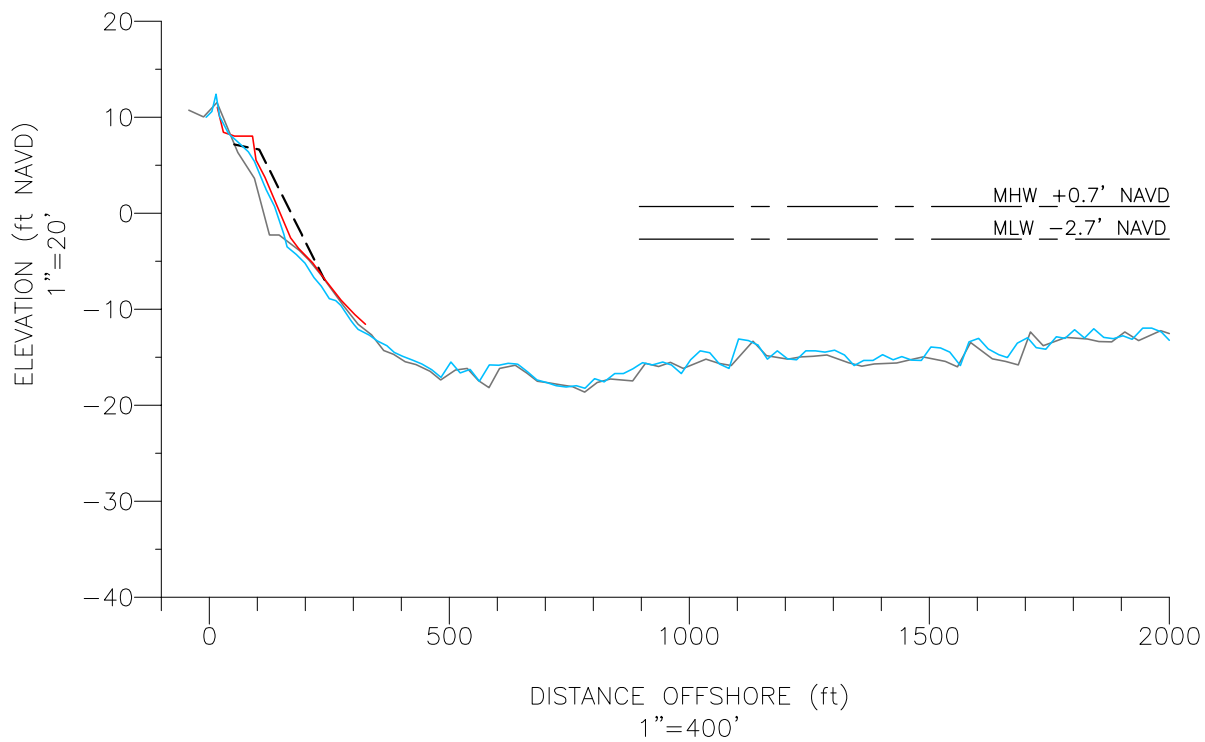




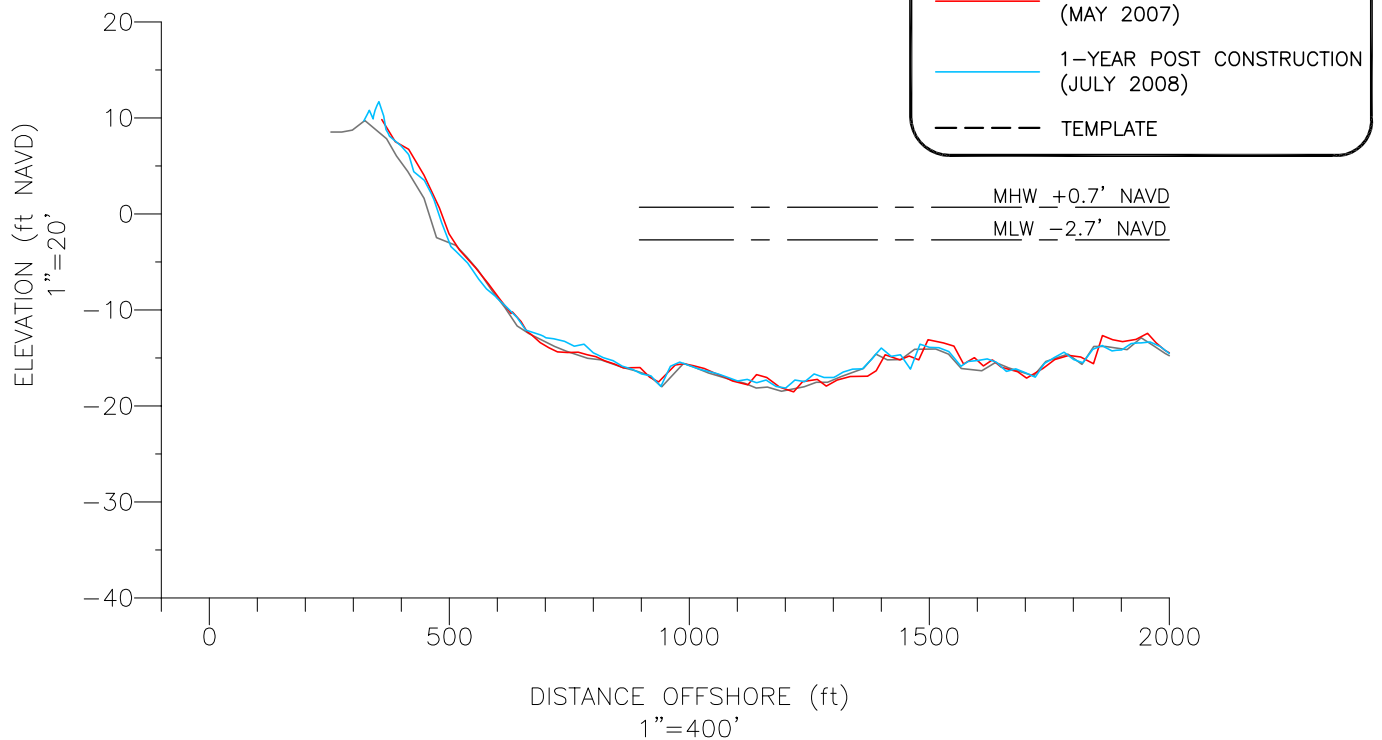
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MONUMENT R-107



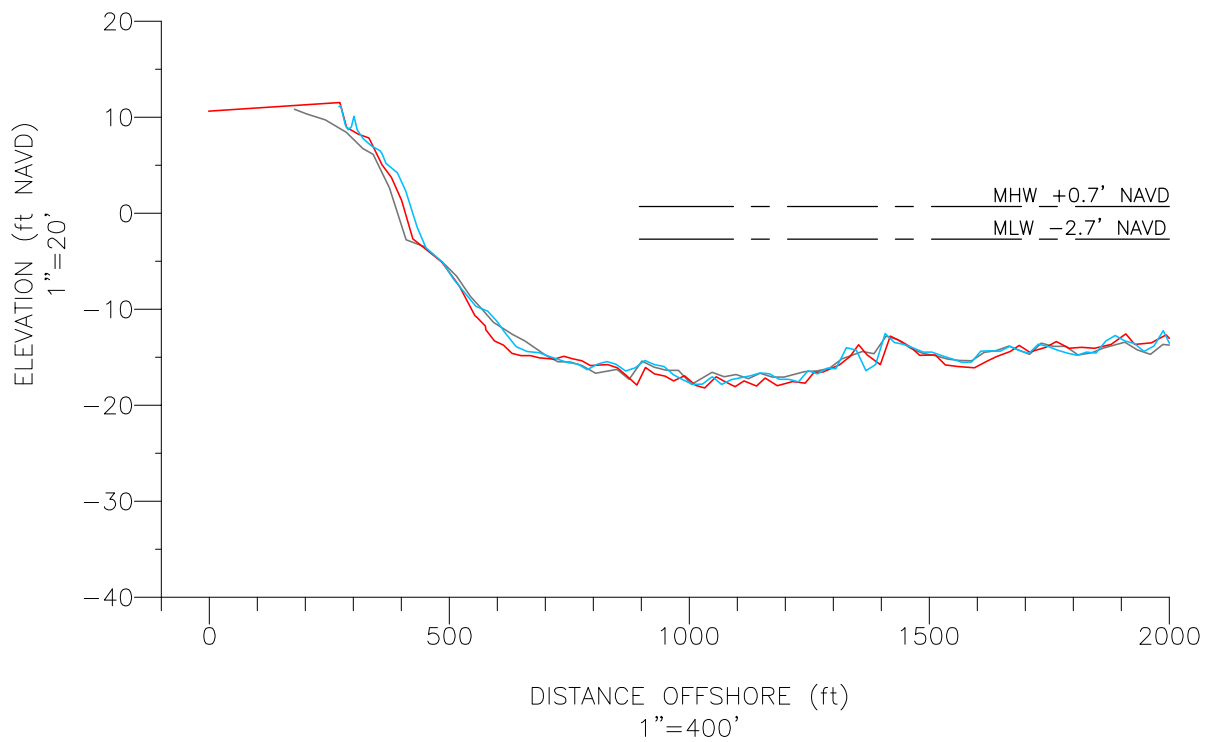
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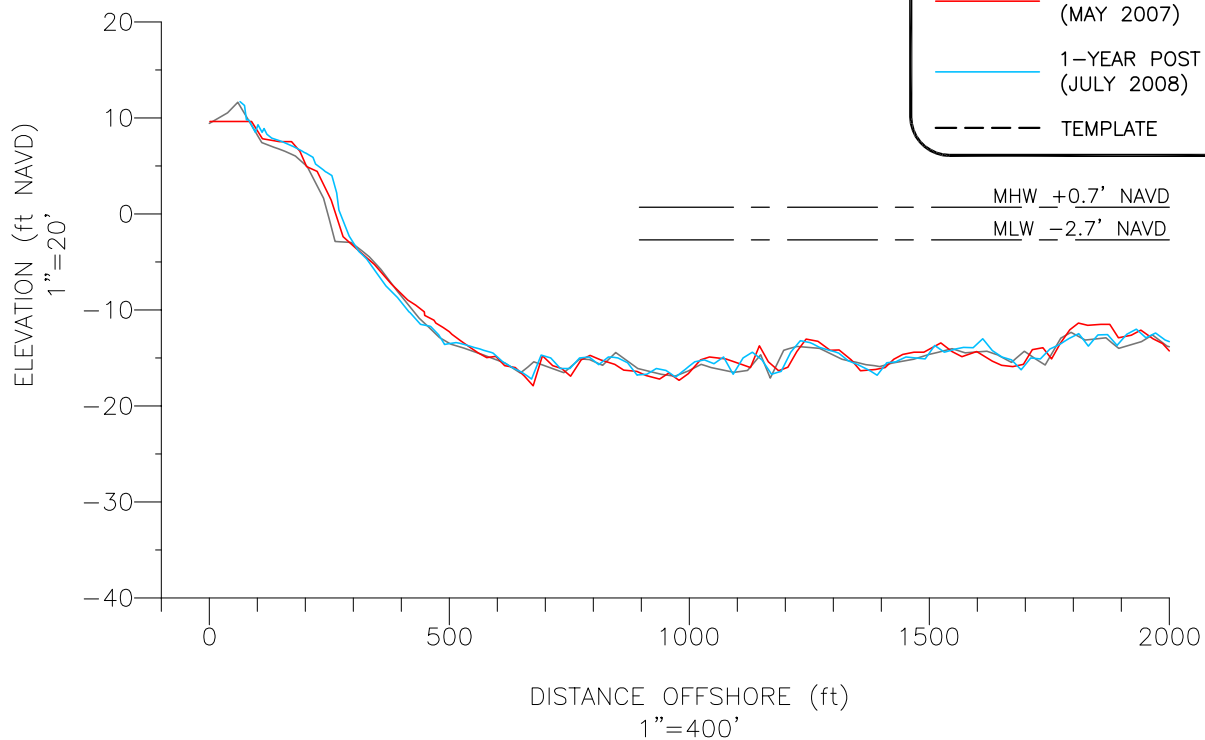
MONUMENT R-108

Appendix A-17
Profile Surveys for R-107.5 & R-108
Indian River County Sector 7
1-Year Post Construction Monitoring Report

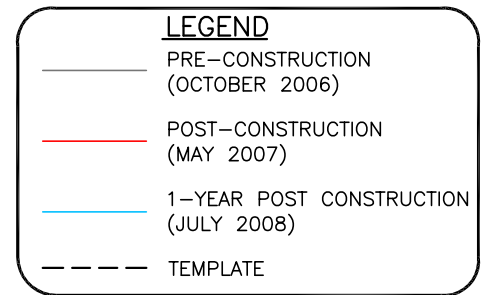


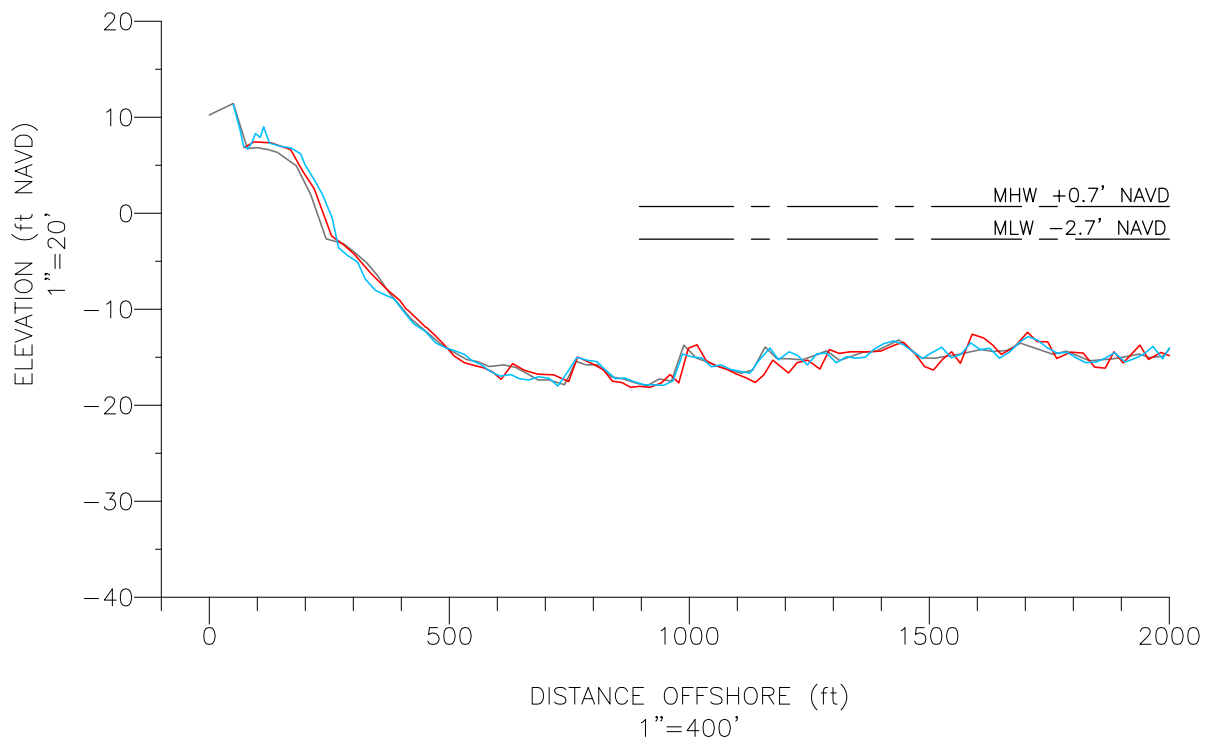


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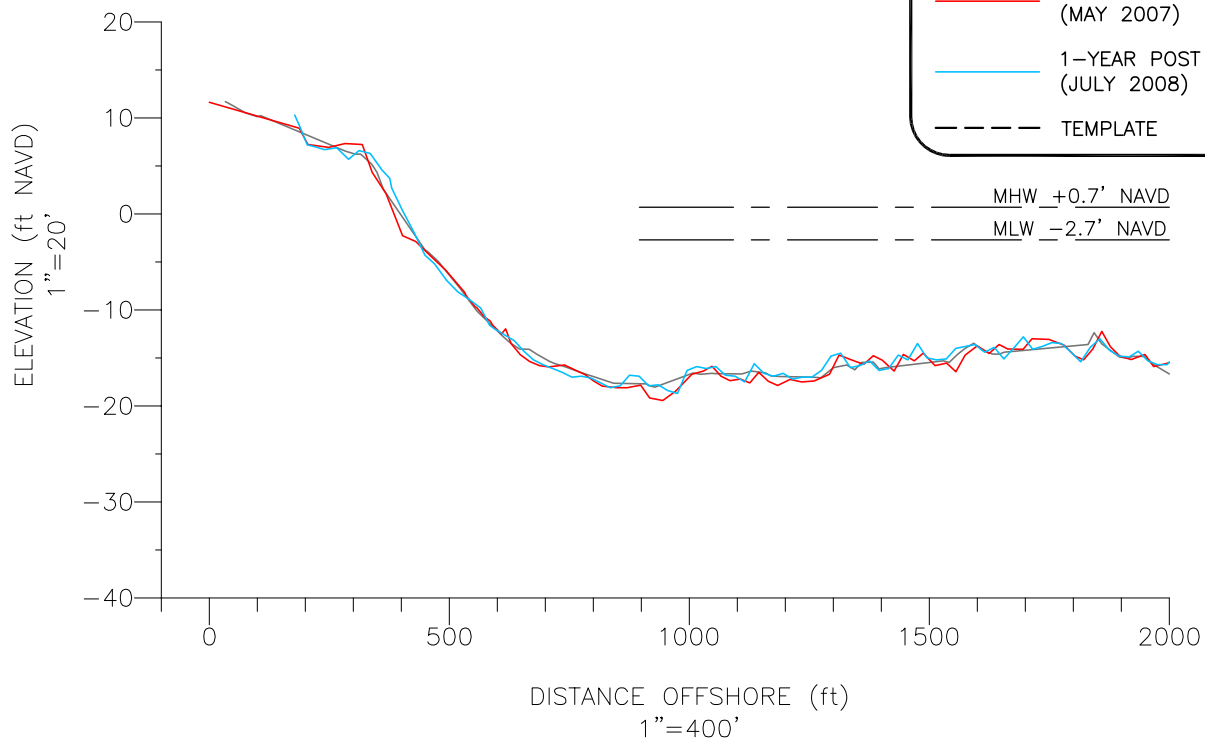


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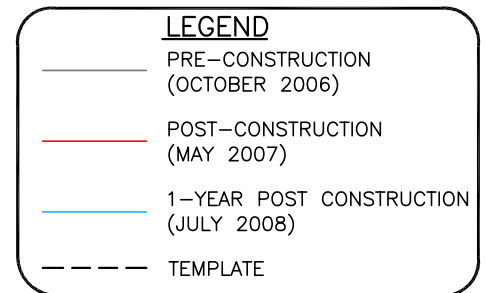




MONUMENT R-111



MONUMENT R-112



APPENDIX B

1 YEAR POST-CONSTRUCTION AERIAL PHOTOGRAPHY

