



TAYLOR ENGINEERING, INC.

In search of resiliency Martin County's Journey toward Increased Berm Elevation



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RESILIENCE

“the ability to prepare and plan for, absorb, recover from, and more successfully adapt to adverse events.”

National Academies of Science 2012

- Resistance
- Recovery
- Adaptation

The Quest



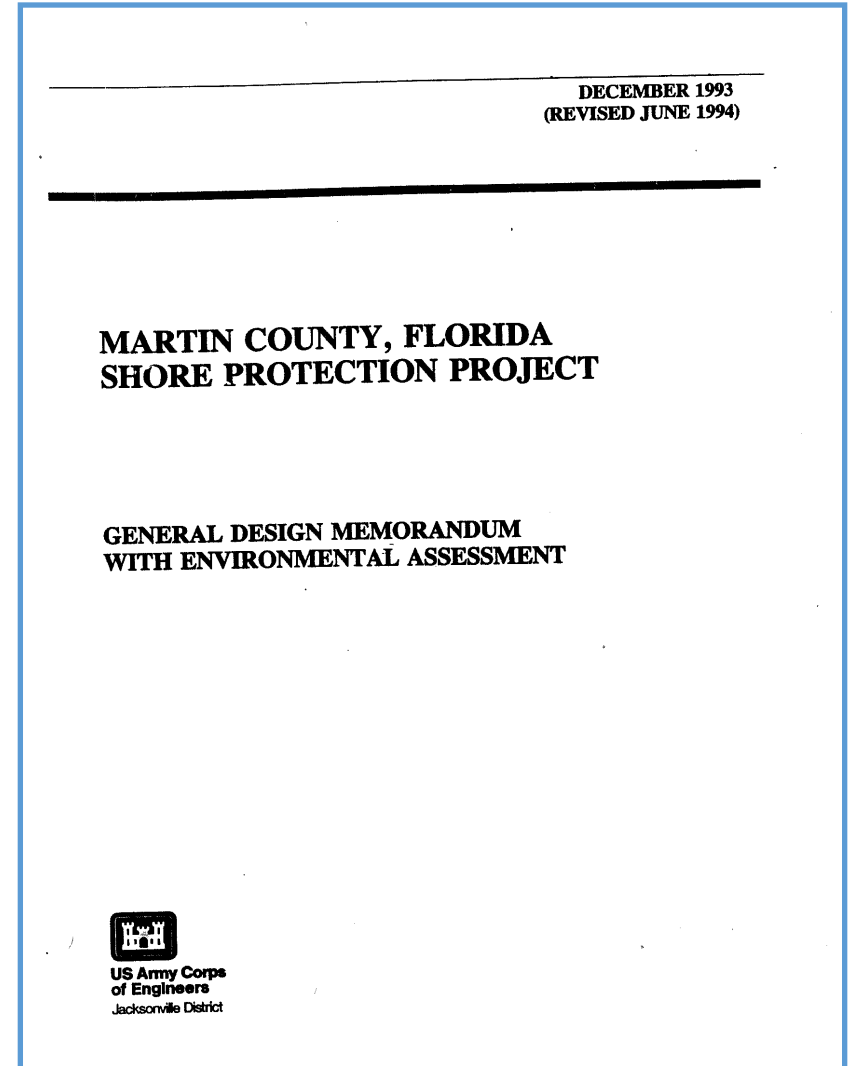
The Quest



*Jensen Beach looking south
(October 2015)*

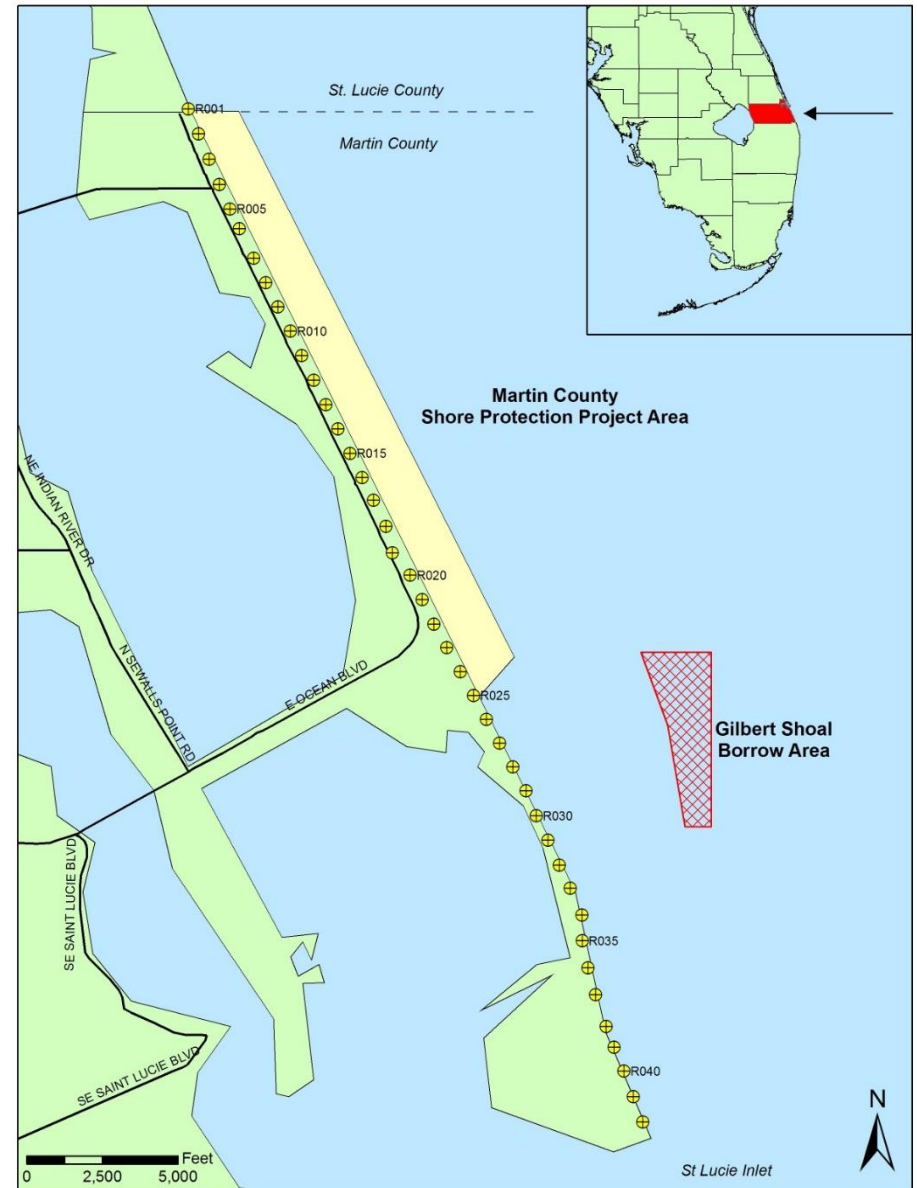
Project basics

- Northern Martin County on Hutchinson Island
- Authorized by WRDA 1990
- General Design Memorandum
 - Dec 1993
 - June 1994 revision



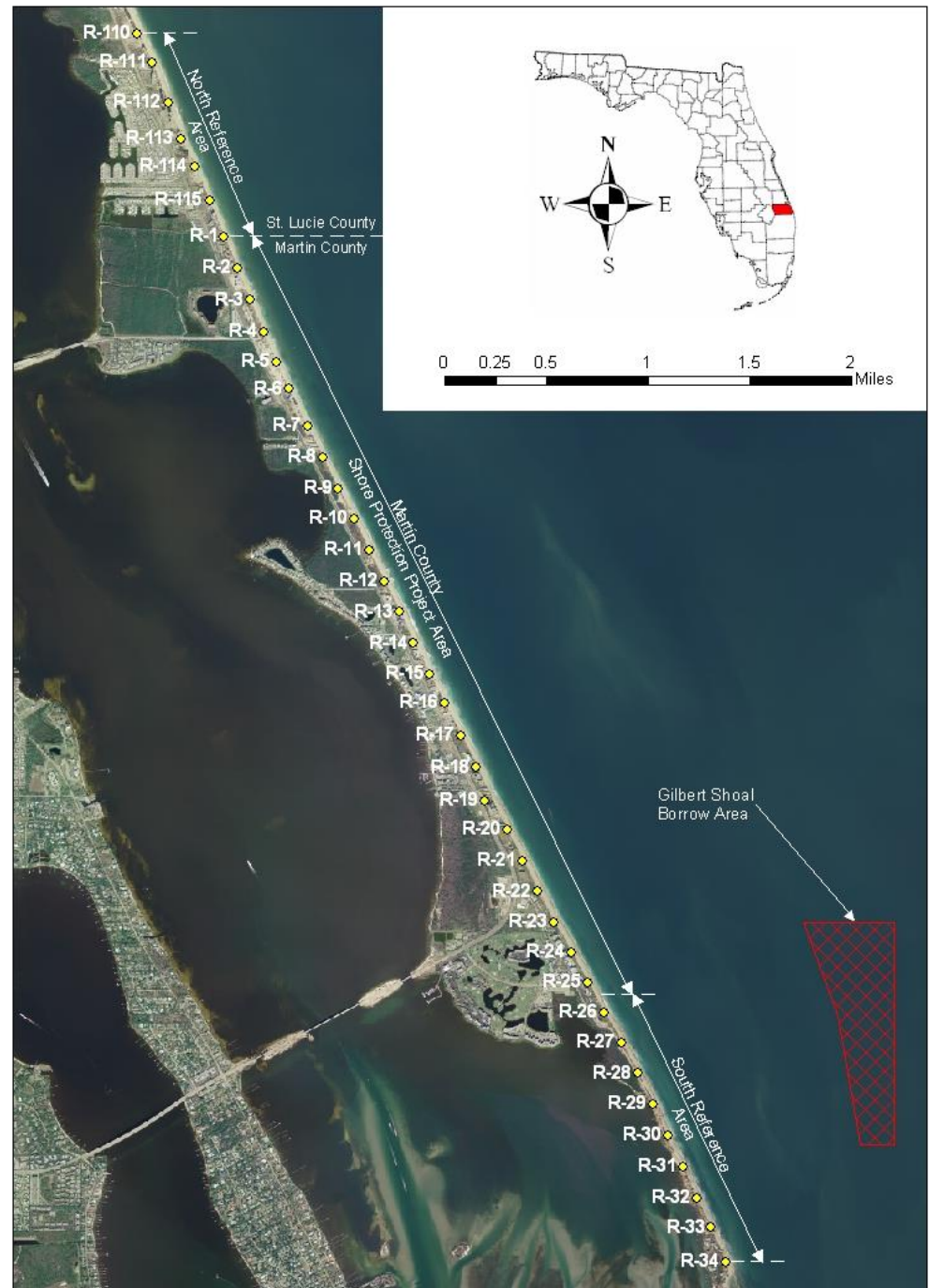
Project basics

- Initial construction
- Periodic maintenance
- Performance monitoring
- Gilbert Shoal



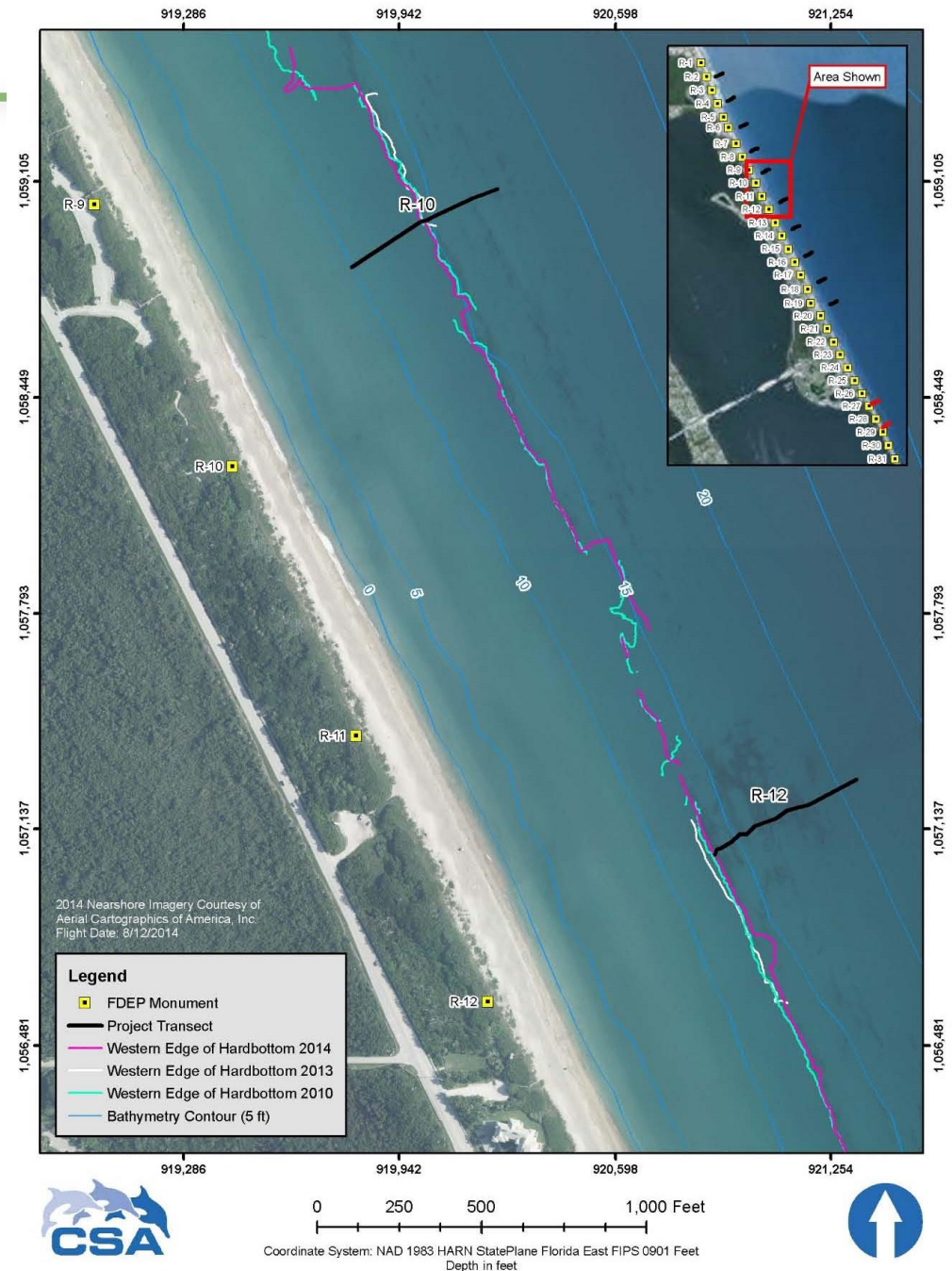
Project basics

- R-1 to R-25
- ~4 miles (21,630 ft)



Project basics

- Extensive, high quality offshore hardbottom



Datums

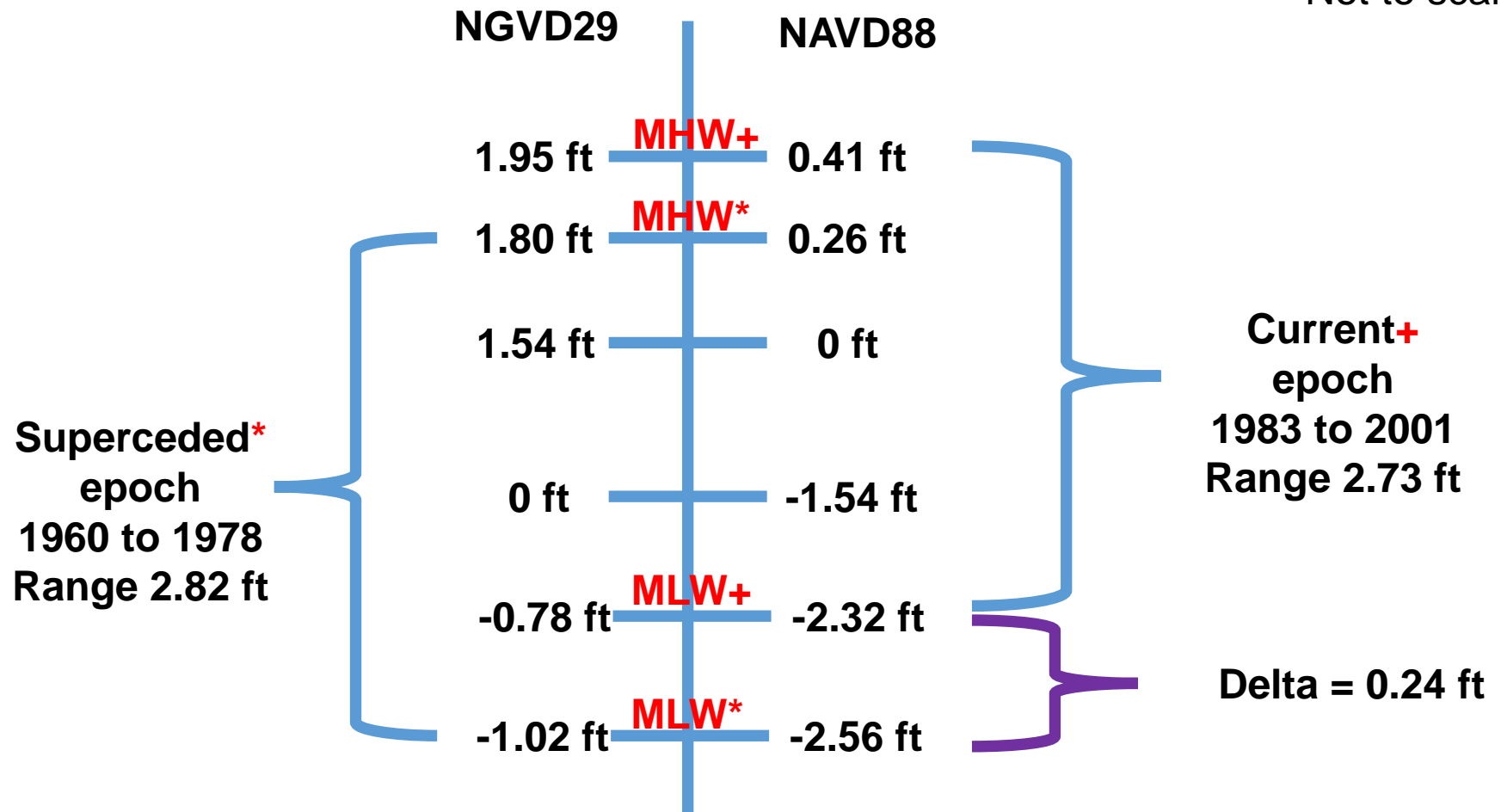
- Tidal datums (MSL, MHW, MLW, etc) vary
 - 19 year epochs
 - Reviewed annually for possible revision
 - Revised every 20-25 years
 - Current NTDE is 1983 to 2001
 - Previous NTDE is 1960 to 1978 (1941 to 1959, 1924 to 1942)
- Geodetic Datums (NGVD29, NAVD88)
 - Fixed reference elevations, calculated

Datums, datums, datums

- Mean Sea Level (MSL) adopted in original GDM
 - +12.5 ft-MSL dune, +8.0 ft-MSL berm
- Mean Low Water (MLW) adopted in GDM revision
 - +13.6 ft-MLW dune, +9.1 ft-MLW berm
- NGVD29 adopted in early 2000's
 - +12.5 ft-NGVD dune, +8.0 ft-NGVD berm
- NAVD88 adopted for 2013 project
 - +11.0 ft-NAVD dune, +6.5 ft-NAVD berm

Datums – Lake Worth Pier

Not to scale



Projects

Name	Start Date	Volume	Contractor
Initial Construction	12/13/1995 to 4/10/1996	1,340,000 cy	GLDD
2001 Project	January 2001 to Spring 2001	178,000 cy (R16.2 – R22.3)	Weeks
2002 Project	February 2002 to Spring 2002	126,000 cy (R13.5 – R16.2)	Weeks
2005 Project	Spring 2005	885,000 cy (R1 – R25.6)	GLDD
2013 Project	March 2013 to May 2013	613,017 cy (R1 – R25)	GLDD

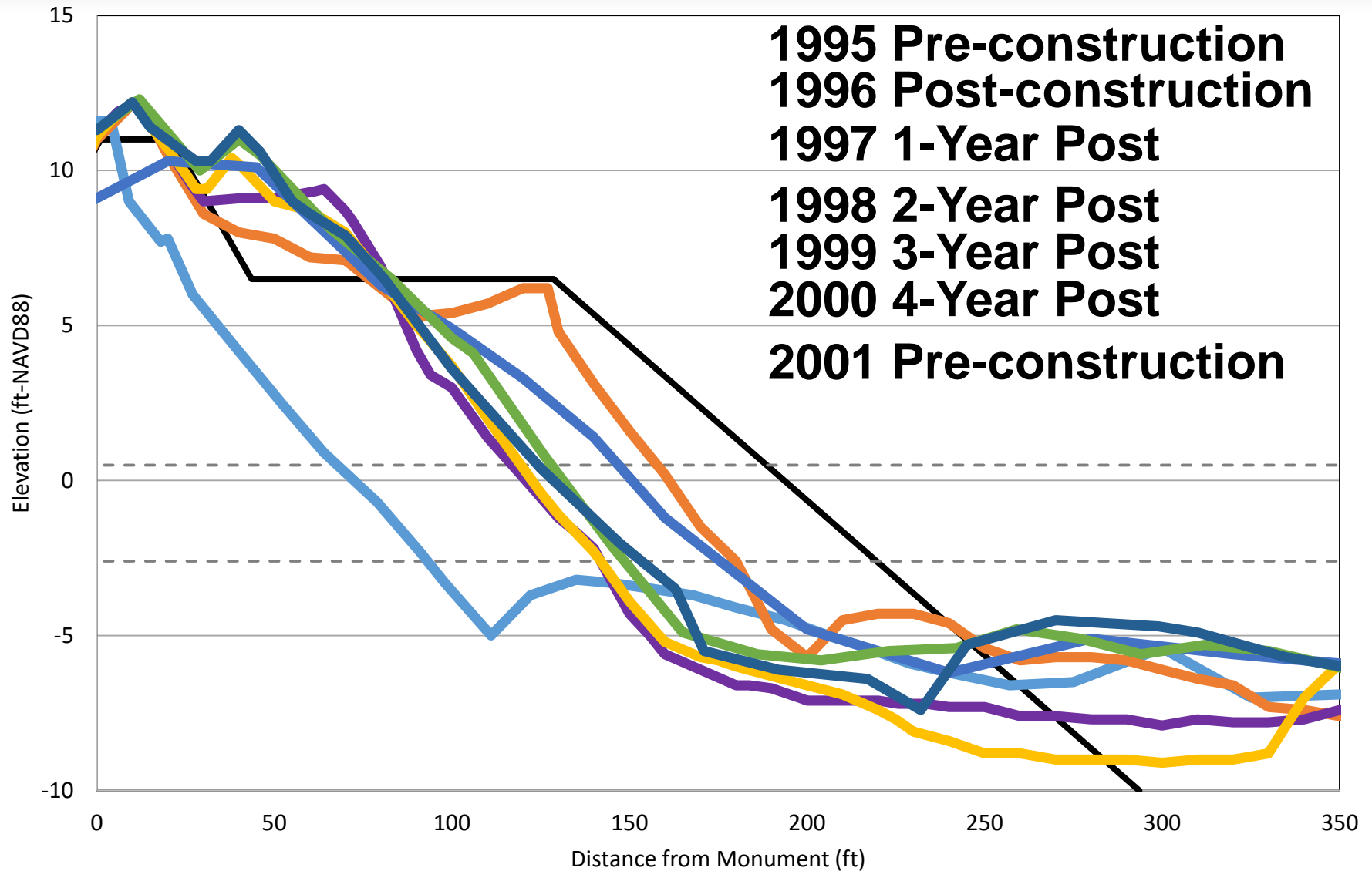
Storms of note

Date	Type/Name	Hso.max / Tmax / Surge
March 11-13, 1996	Nor'easter	22.5 ft / 10 sec / ~
October 4-8, 1996	Nor'easter	16.4 ft / 8 sec / ~
November 15-18, 1996	Nor'easter	16.5 ft / 10 sec / ~
February 2-6, 1997	Nor'easter	16.6 ft / 8 sec / ~
August 23-31, 1999	Hurricane Dennis (cat 2)	16.1 ft / 12 sec / ~
September 14-16, 1999	Hurricane Floyd (cat 4)	32 ft / 9 sec / ~
October 15-17, 1999	Hurricane Irene (cat 1)	23 ft / 8 sec / ~
September 2004	Hurricane Frances (cat 2)	25.8 ft / ~ / 12 ft-NGVD
September 2004	Hurricane Jeanne (cat 3)	25.8 ft / ~ / 12 ft-NGVD
October 25-29, 2012	Hurricane Sandy (cat 1)	18 ft / ~ / ~

Initial Construction Details

- R-2 to R-24 + 900 ft north and south tapers
- Construction December 13, 1995 to April 10, 1996
- 1,340,000 cy
- 90 ft wide construction berm @ +9.1 ft-MLW (35 ft authorized project + advance)
- Dune: 20 ft wide @ +13.6 ft-MLW, vegetated
- Borrow area – Gilbert Shoal 1.2 mi offshore to south

R-10 Initial Construction thru 2001



2001 Project

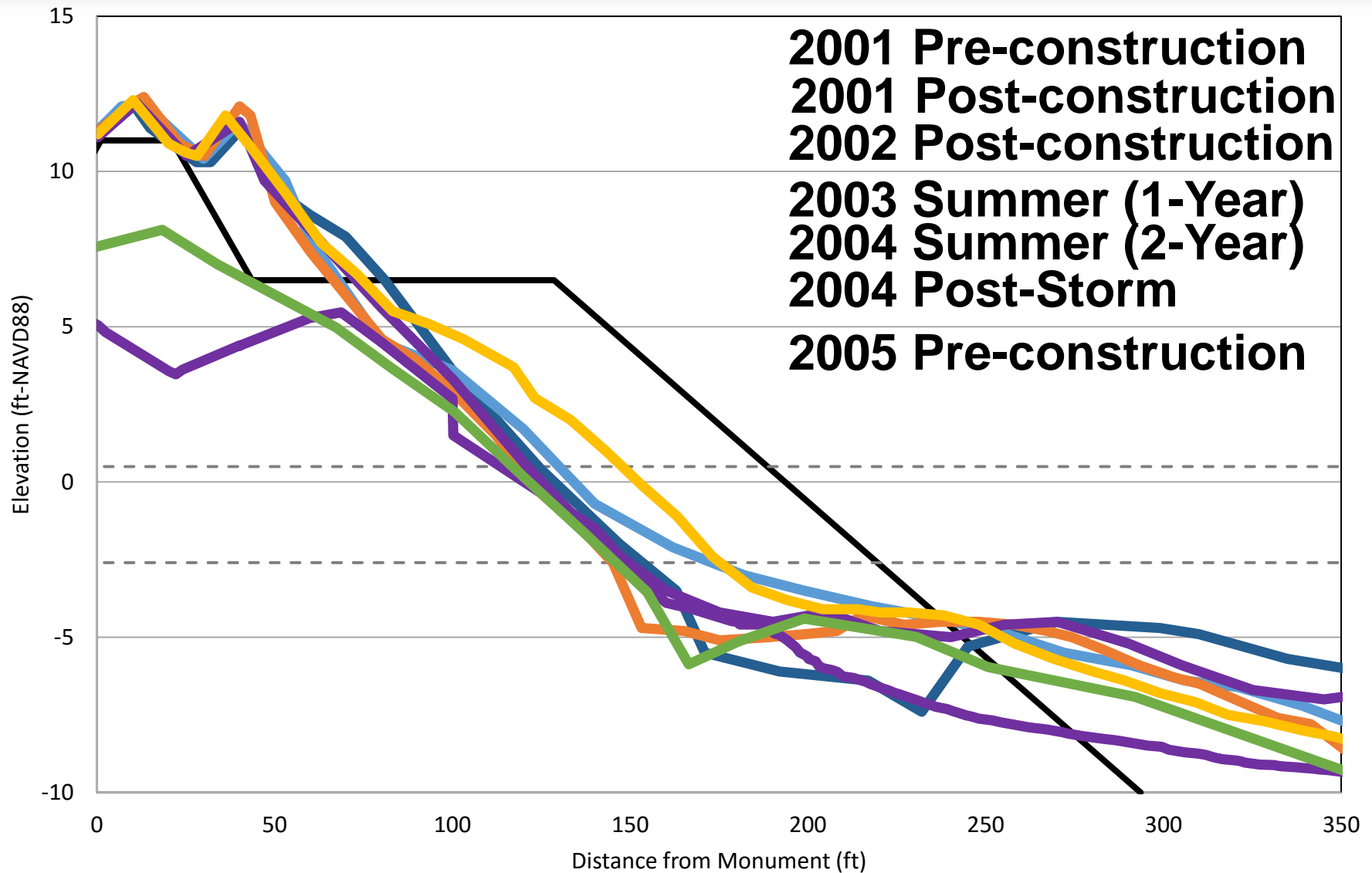
- Contractor: Weeks Marine
- Federal funding issues
- Project halted after placing 178,000 cy
- R16.2 to R22.3

2002 Project

- Funding straightened out
- Weeks Marine – resume from 2001 project
- Restarted February 2002
- 126,000 cy between R13.5 and R16.2

- In total 2001/2002 Project
- 304,000 cy
- R13.5 to R22.3
- Gilbert Shoal

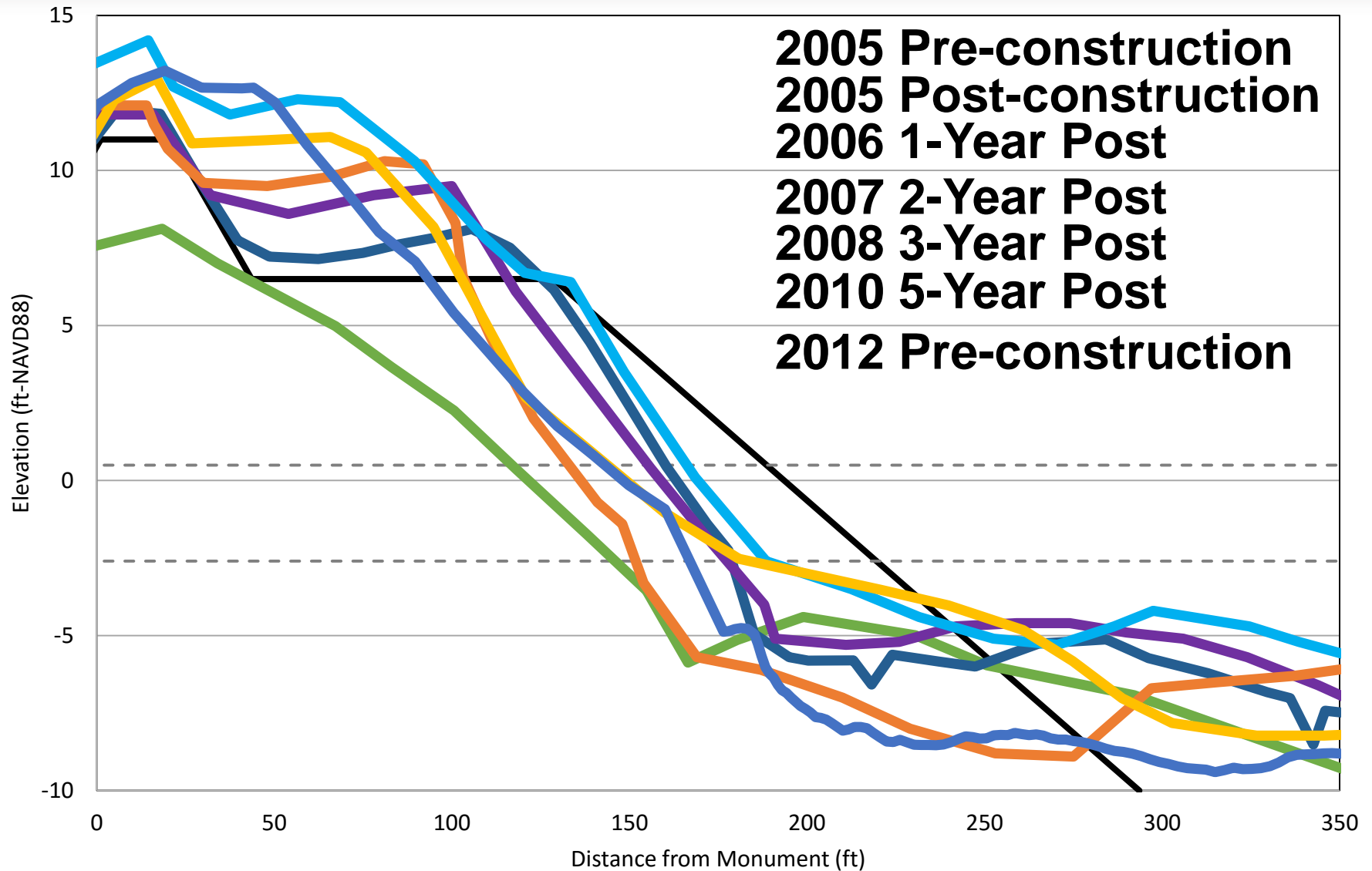
R-10 2001 thru 2005



2005 Project

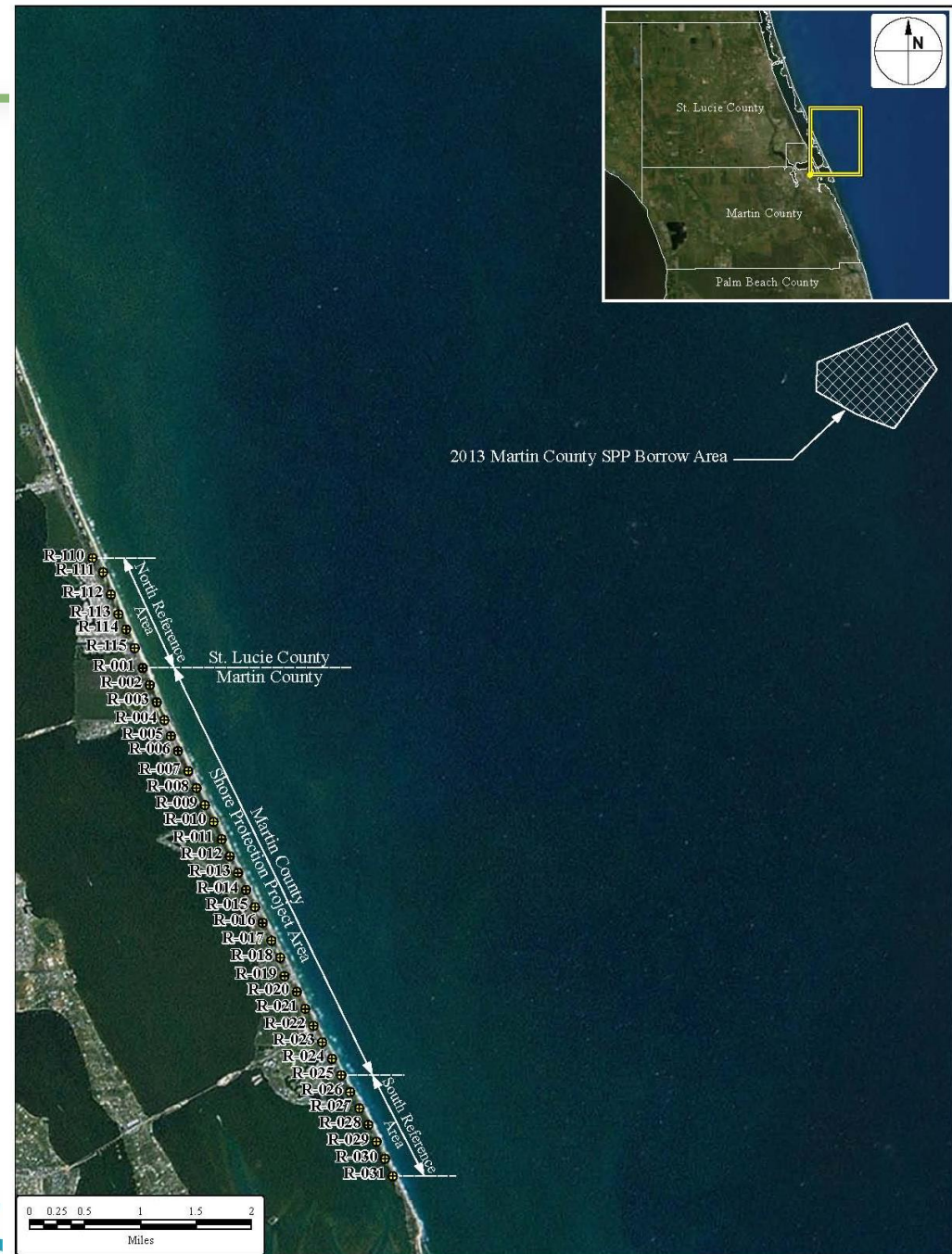
- Repair hurricane damage (Frances, Jeanne, etc, etc.)
- R-1 to R-25 berm/dune
- R25 to R-25.6 dune only
- 885,000 cy
- Gilbert Shoal exhausted

R-10 2005 thru 2012



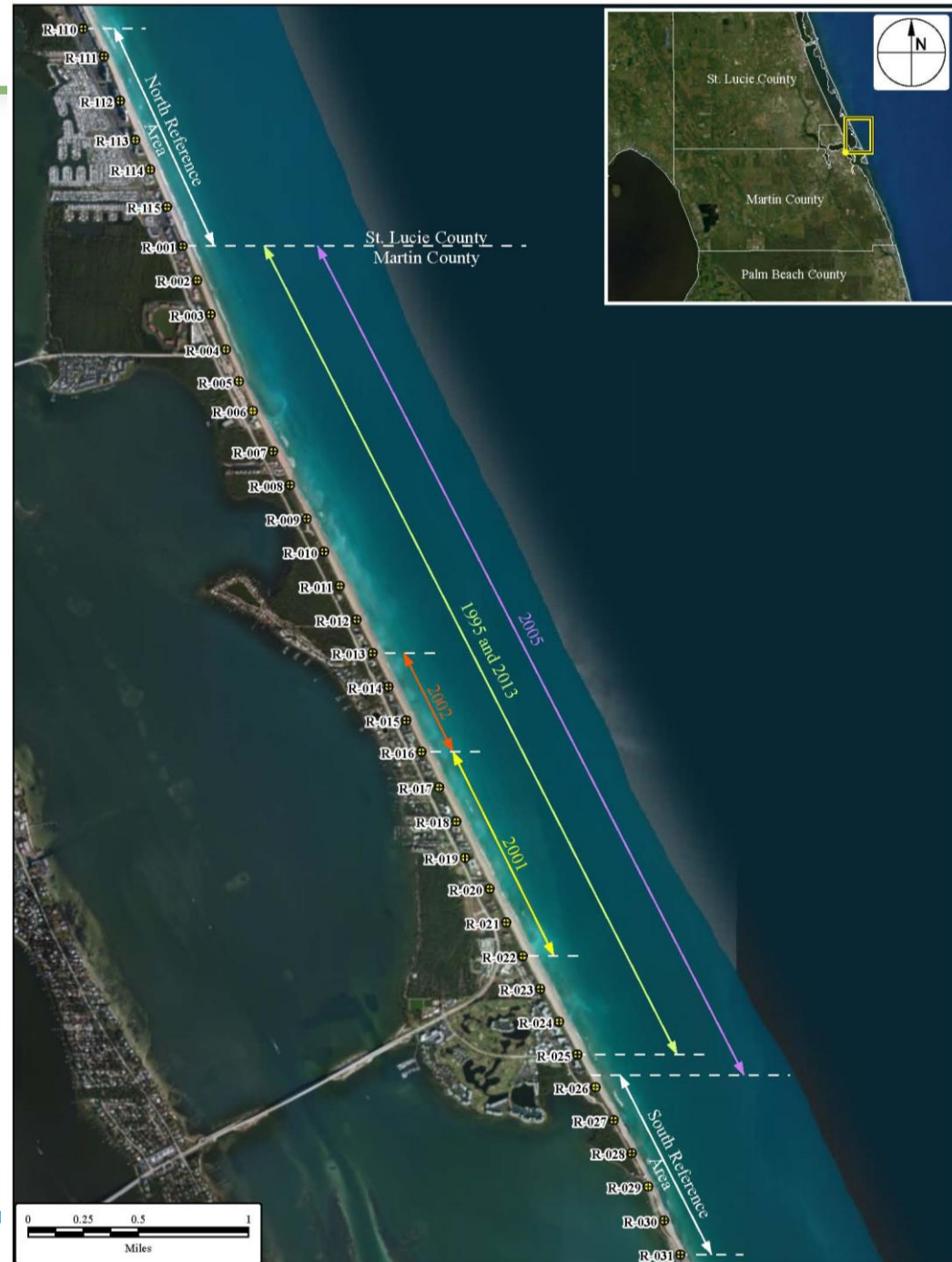
2013 Project

- St. Lucie Shoal Borrow Area
- 613,017 cy

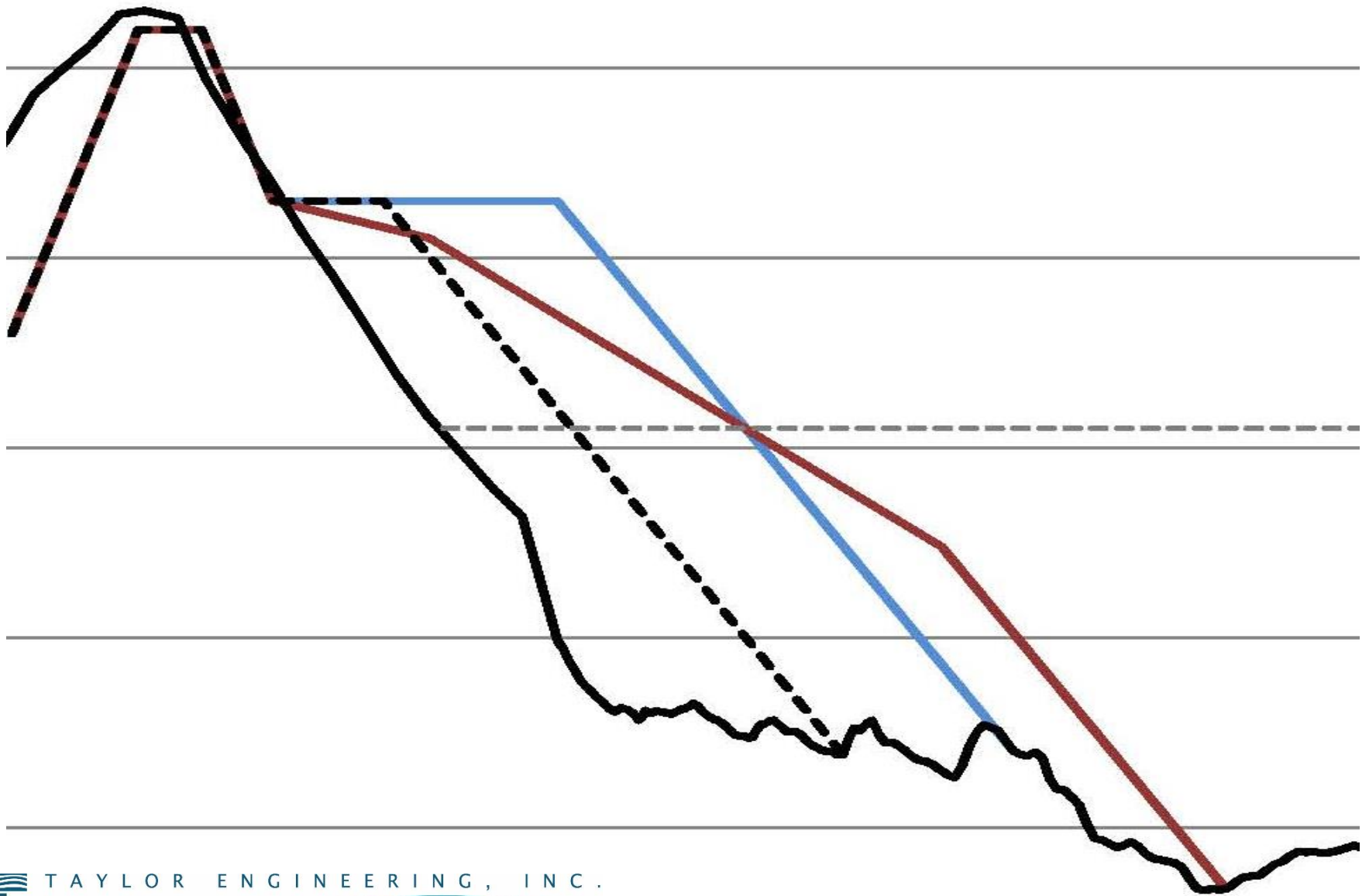


2013 Project

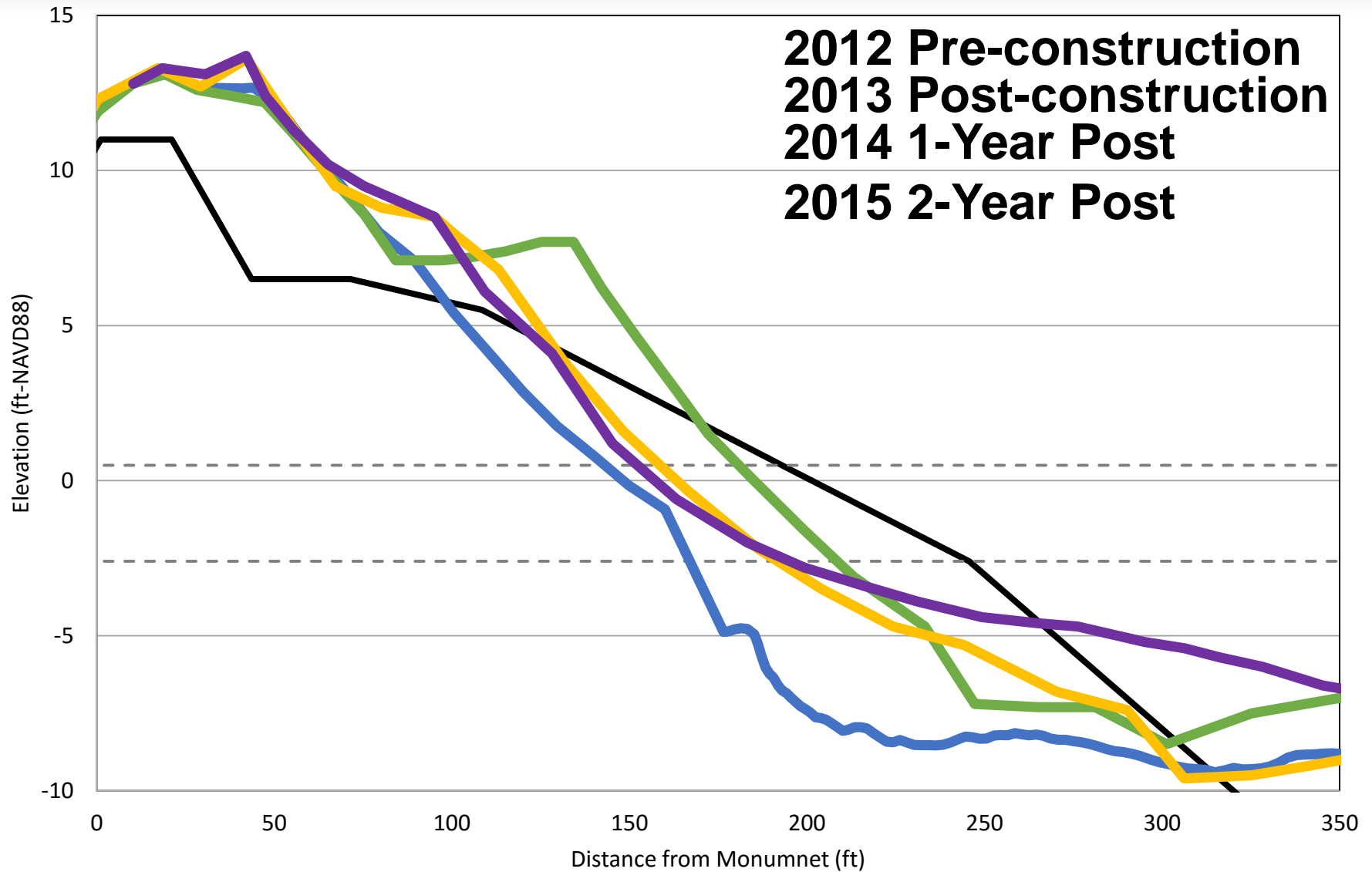
- R-1 to R-25 berm/dune
- North control area in St. Lucie County South Beach Restoration Project – constructed spring 2013
- Turtle-friendly template



Turtle Friendly Template



R-10 2012 thru 2015



Next Steps

- Numerical modeling to examine berm elevations & configurations
- Quantify added storm protection
- Coordination with USACE and FDEP
- Potential LRR or GRR
- Stay tuned ... more to come in the fall



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THANK YOU