Nags Head Shoreline Management Committee Meeting

7 November 2016

High Value Services
Sustainable Solutions

COASTAL SCIENCE & ENGINEERING

Project Schedule for the 2018 Re-Nourishment

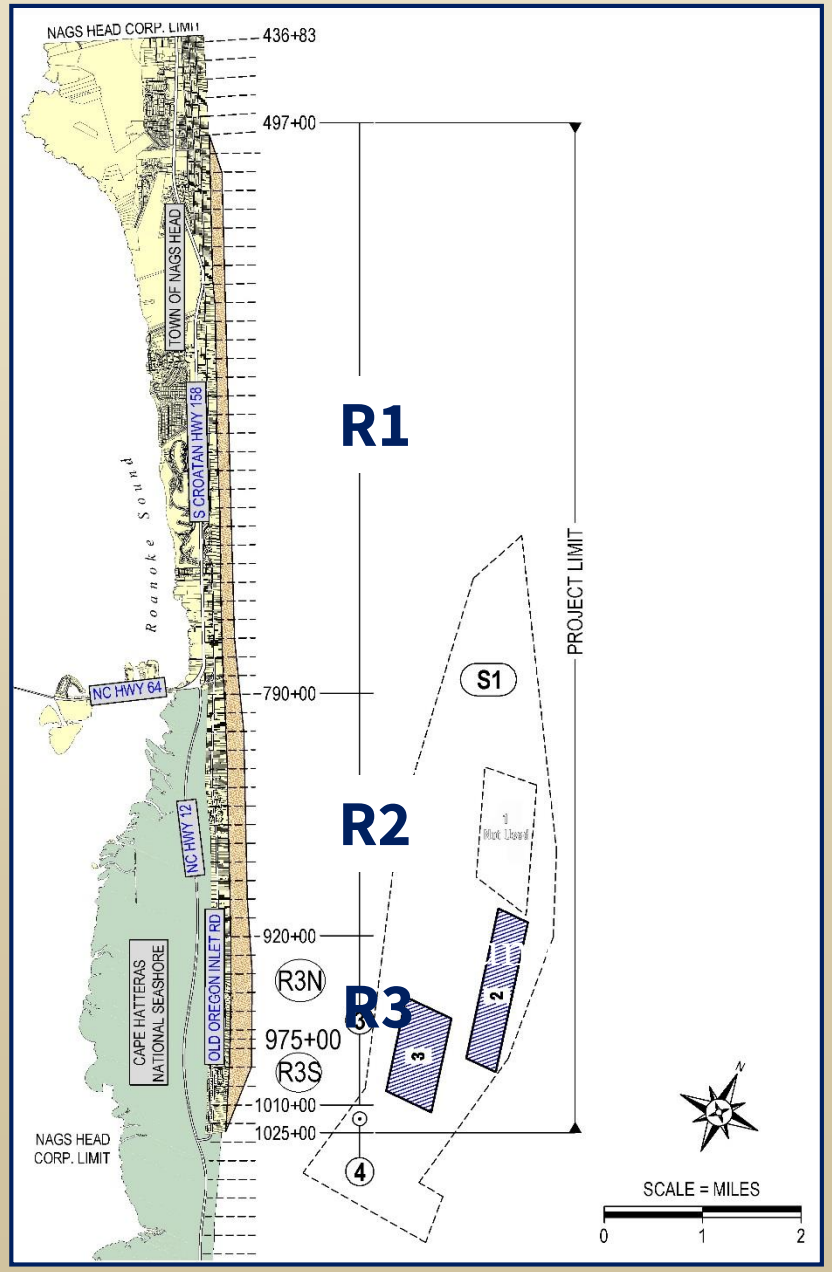
2016		
Month 1	May	Initiate work
Mon 2–5	Jun-Sept	(1) Define the ideal (target) beach condition (2) Conduct borrow area survey & obtain borings (3) Develop renourishment requirements, dune stabilization alternatives, and initiate engineering studies
Mon 6-8	Oct-Dec	Design, cost estimates, field work, initiate permit liaison
2017		
Mon 9–13	Jan-May	(1) Prepare supporting environmental documents (2) Complete preliminary design (3) Pre-application meetings with regulatory & resource agencies
Mon 14	Jun	Submit permit applications with supporting documents
Mon 15–20	Jul-Dec	Permit liaison to secure permits in time
2018		
Mon 21–24	Jan-Apr	Receive permits / prepare plans and specifications, request bids, receive bids, select contractor, construction preparation
Mon 25–28	May-Aug	Construction and construction administration

Planning Goal of the 2018 Re-Nourishment

–To Define a "Target" Beach Condition

- Provide higher level of storm protection
- Provide wider recreational beach
- Address south end of Nags Head erosion issue
- Integrate dune management plan into the renourishment design
- Replenish sand deficit in the "sand box"

Project Reaches and Subreaches



- Reach 1 – MP 11 to 16.8

  497+00 to 790+00
- Reach 2 – MP 16.8 to 19.2

  790+00 to 920+00
- Reach 3 – MP 19.2 to 20.8

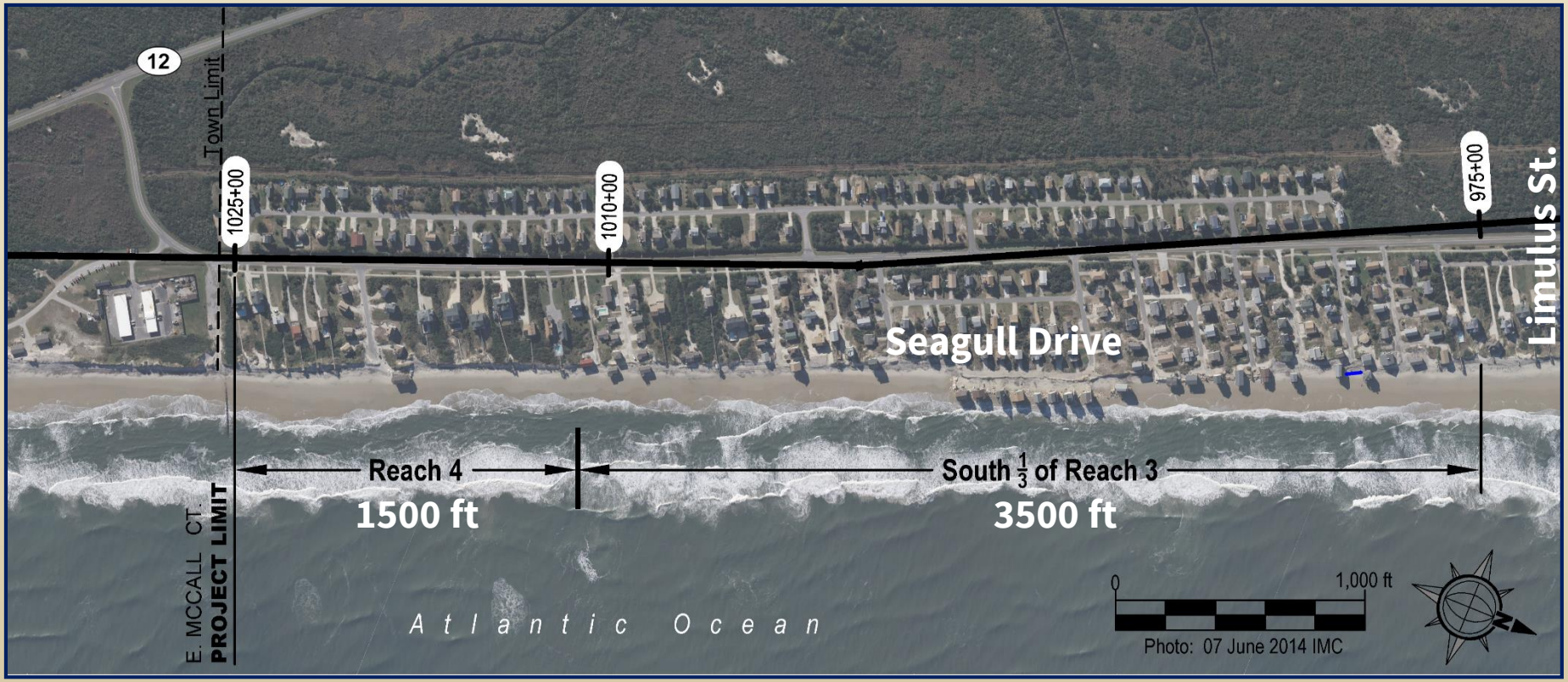
  920+00 to 1010+00
  - R3N – MP 19.2 to 20.2

    920+00 to 975+00
  - R3S – MP 20.2 to 20.8

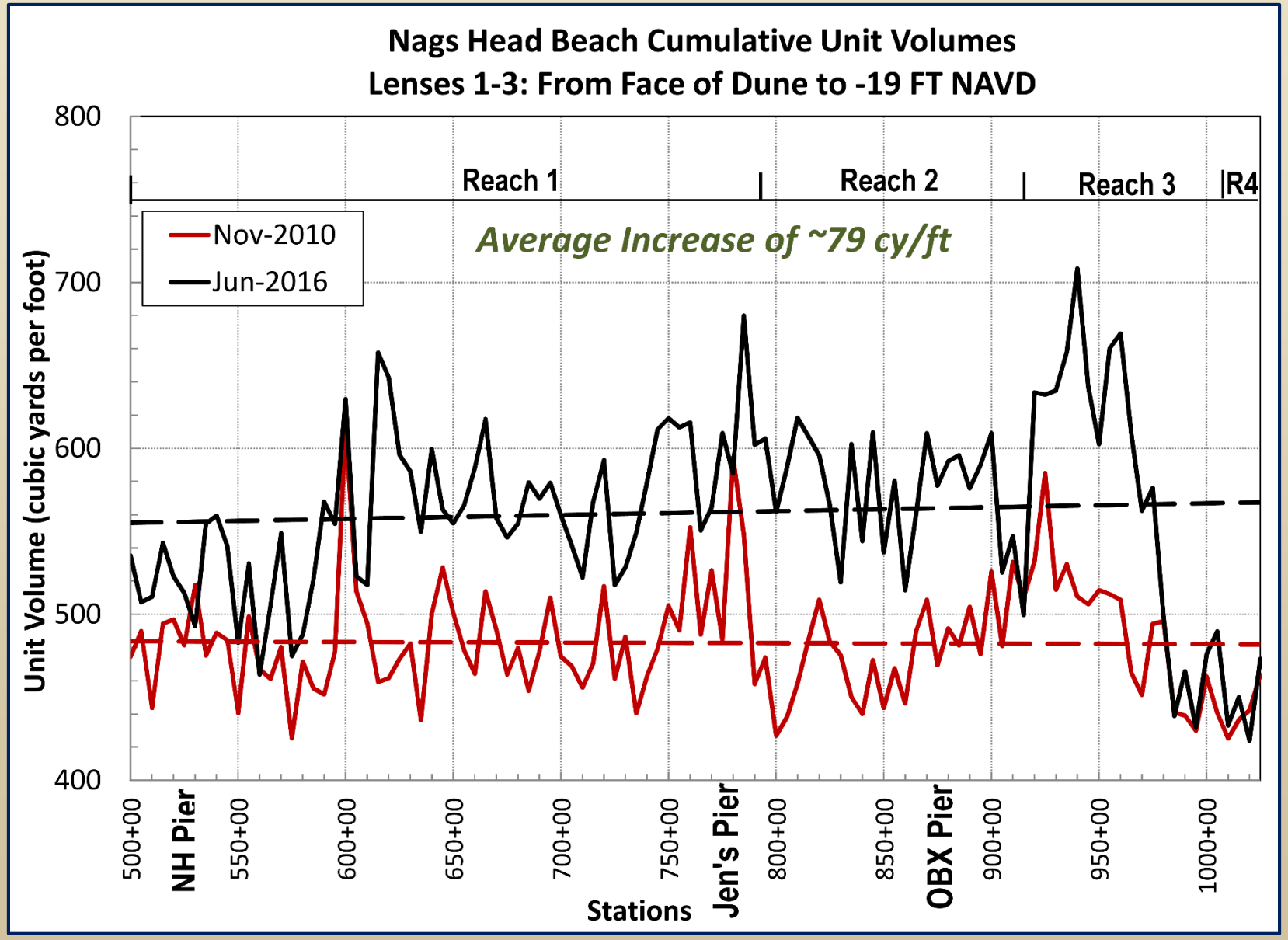
    975+00 to 1010+00
- Reach 4 – MP 20.8 to 21

  1010+00 to 1025+00

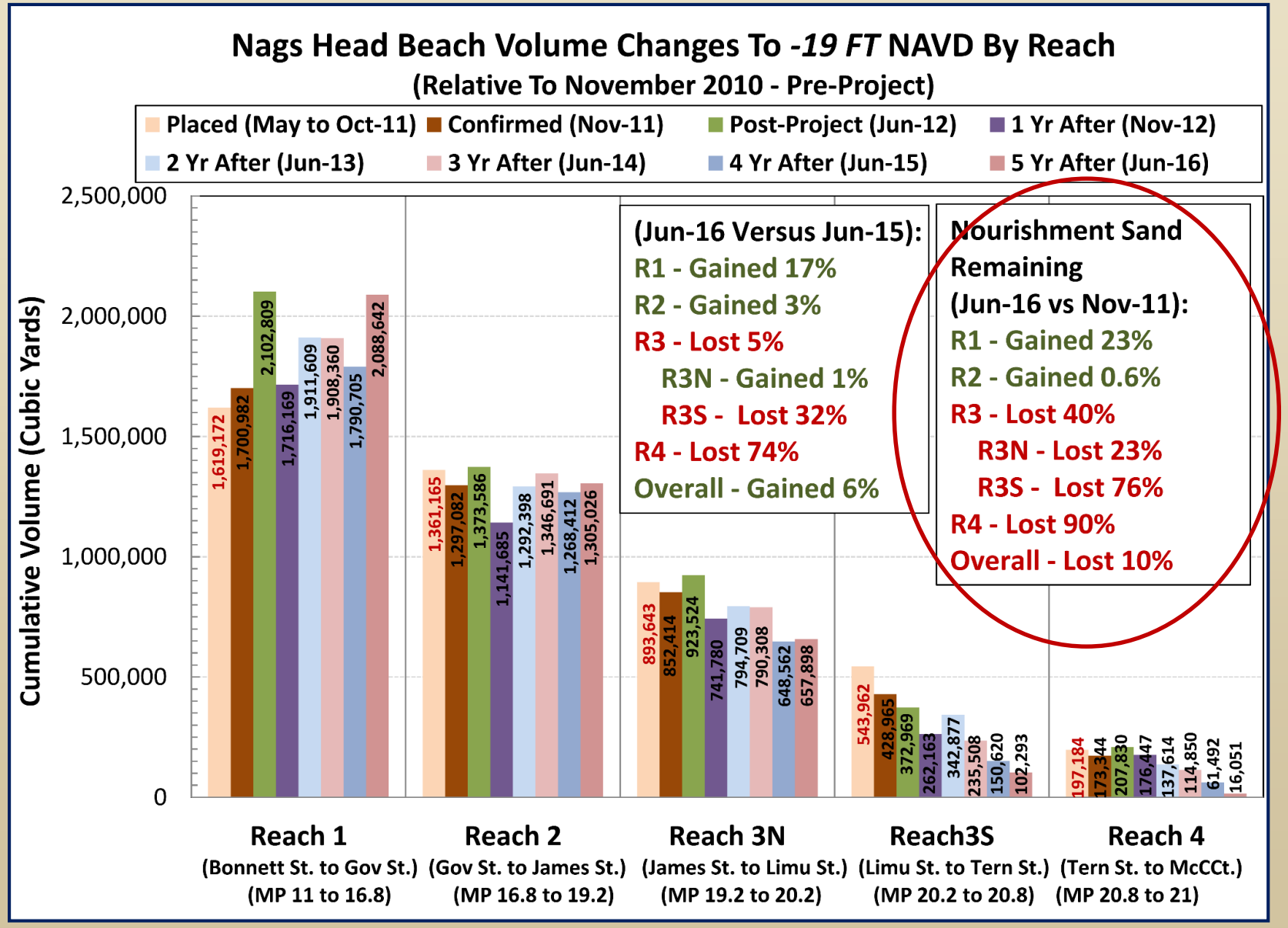
Subreaches in Reach 3



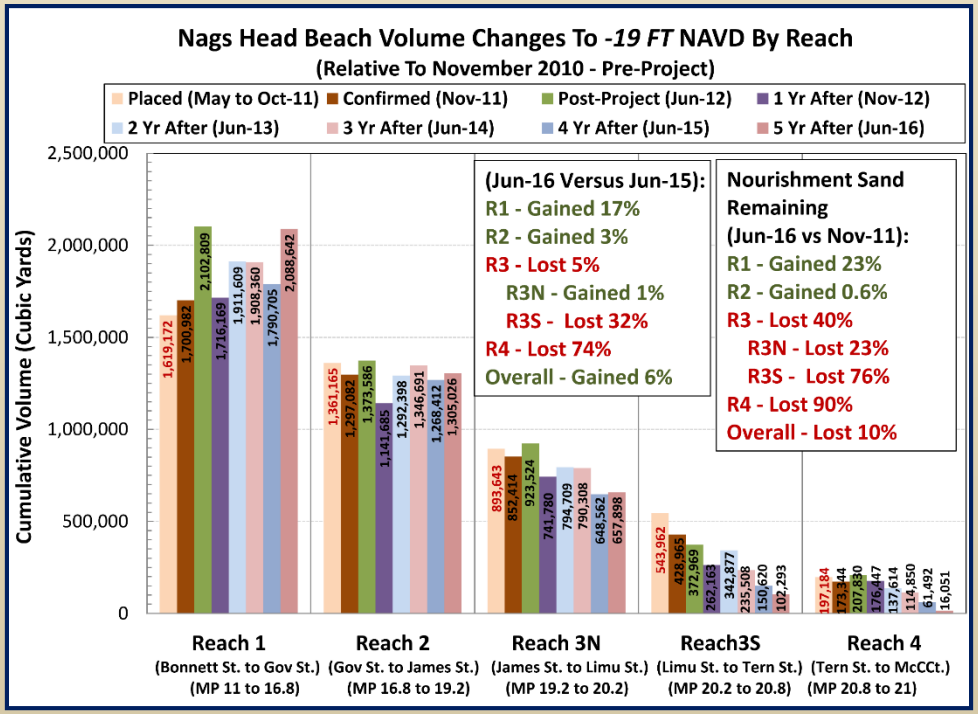
Results –Sand Volumes by Station along Nags Head



2011 Nourishment Project 5 Year Summary



Volume Loss along South Nags Head
(June 2016 vs. Project Completion in Nov 2011)



- Reach 1 – Gained
  ~390,000 cy (2.8 cy/ft/yr)
- Reach 2 – Stable
- Reach 3N – Lost
  ~200,000 cy (8 cy/ft/yr)
- Reach 3S – Lost
  ~320,000 cy (20 cy/ft/yr)
- Reach 4 – Lost
  ~160,000 cy (23 cy/ft/yr)

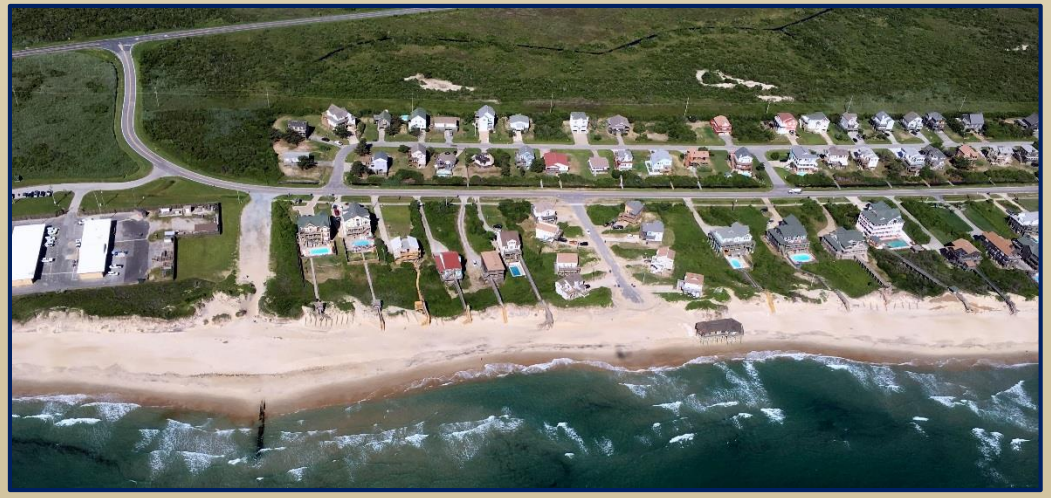
Reaches 3&4 lost ***~680,000 cy*** in 5 years

(~950,000 cy by 2018)

Project Scale for the 2018 Re-Nourishment

- 10-mile from MP 11 to 21
- Four reaches and two subreaches in Reach 3
- Low range fill quantity = ***1.8 MCY*** (~34 cy/ft)
- Mid range fill quantity = ***2.4 MCY*** (~45 cy/ft)
- High range fill quantity = ***3 MCY*** (~57 cy/ft)
- Fill density (# of cy per ft) varies from north to south

North Boundary near Bonnett St. (MP 11)



South Boundary near McCall Court (MP 21)

2018 Renourishment Formulation – *LOW* Fill Scenario
(Restore most of the lost volume since 2011 in R3&4 plus min fill in R1&2)

- Reach 1 (29,300 ft) – Gained ~390,000 cy (2.8 cy/ft/yr)
  Minimum fill = 20 cy/ft 590,000 cy
- Reach 2 (13,000 ft) – Stable
  Minimum fill = 30 cy/ft 390,000 cy
- Reach 3N (5,500 ft) – Lost ~300,000 cy (8 cy/ft/yr)
  Restoration fill = 55 cy/ft 300,000 cy
- Reach 3S (3,500 ft) – Lost ~490,000 cy (20 cy/ft/yr)
  Restoration fill = 120 cy/ft 420,000 cy
- Reach 4 (1,500 ft) – Lost ~250,000 cy (23 cy/ft/yr)
  Restoration fill = 67 cy/ft 100,000 cy

Subtotal Fill = 1,800,000 cy
Advance Fill = 0 cy
Total Fill = 1,800,000 cy

2018 Renourishment Formulation – *MID* Fill Scenario
(Restore the lost volume since 2011 in R3&4 plus economic fill in R1&2)

- Reach 1 (29,300 ft) – Gained ~390,000 cy (2.8 cy/ft/yr)
  Economic fill = 30 cy/ft 880,000 cy
- Reach 2 (13,000 ft) – Stable
  Economic fill = 35 cy/ft 480,000 cy
- Reach 3N (5,500 ft) – Lost ~300,000 cy (8 cy/ft/yr)
  Restoration fill = 55 cy/ft 300,000 cy
- Reach 3S (3,500 ft) – Lost ~490,000 cy (20 cy/ft/yr)
  Restoration fill = 140 cy/ft 490,000 cy
- Reach 4 (1,500 ft) – Lost ~250,000 cy (23 cy/ft/yr)
  Restoration fill = 167 cy/ft 250,000 cy

Subtotal Fill = 2,400,000 cy
Advance Fill = 0 cy
Total Fill = 2,400,000 cy

2018 Renourishment Formulation – *HIGH* Fill Scenario
(Restore the lost volume since 2011 in R3&4 plus advance fill in most reaches)

- Reach 1 (29,300 ft) – Gained ~390,000 cy (2.8 cy/ft/yr)
  - Average fill = 40 cy/ft 1,150,000 cy
- Reach 2 (13,000 ft) – Stable
  - Average fill = 45 cy/ft 600,000 cy
- Reach 3N (5,500 ft) – Lost ~300,000 cy (8 cy/ft/yr)
  - Restoration fill = 90 cy/ft 500,000 cy
- Reach 3S (3,500 ft) – Lost ~490,000 cy (20 cy/ft/yr)
  - Restoration fill = 143 cy/ft 500,000 cy
- Reach 4 (1,500 ft) – Lost ~250,000 cy (23 cy/ft/yr)
  - Restoration fill = 167 cy/ft 250,000 cy

Subtotal Fill = 2,400,000 cy
Advance Fill = 600,000 cy
Total Fill = 3,000,000 cy

Advance Fill – Annual Erosion Rate for Renourishment Design

- Estimated annual erosion rate (USACE*): ***900,000 cy/yr***
- Adopted annual erosion rate by CSE**: ***275,000 cy/yr***
- Actual annual erosion rates since project completion have **<u>varied</u>**

Max erosion rate: ~500,000 cy/yr (2012 to 2013)

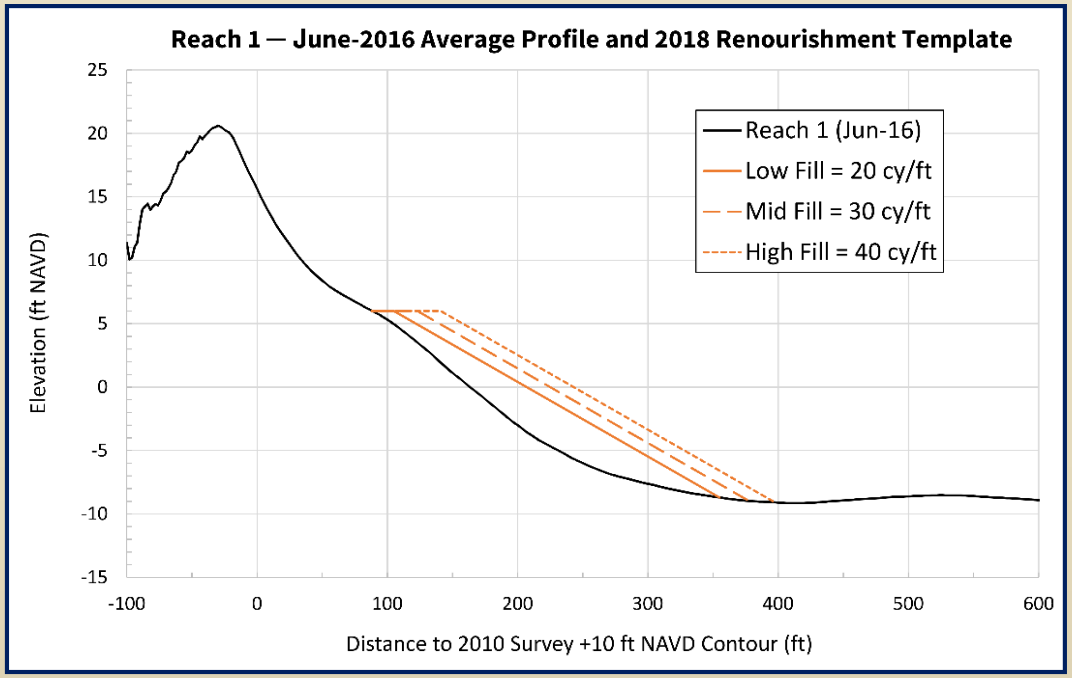
Max accretion rate: ~250,000 cy/yr (2015 to 2016)

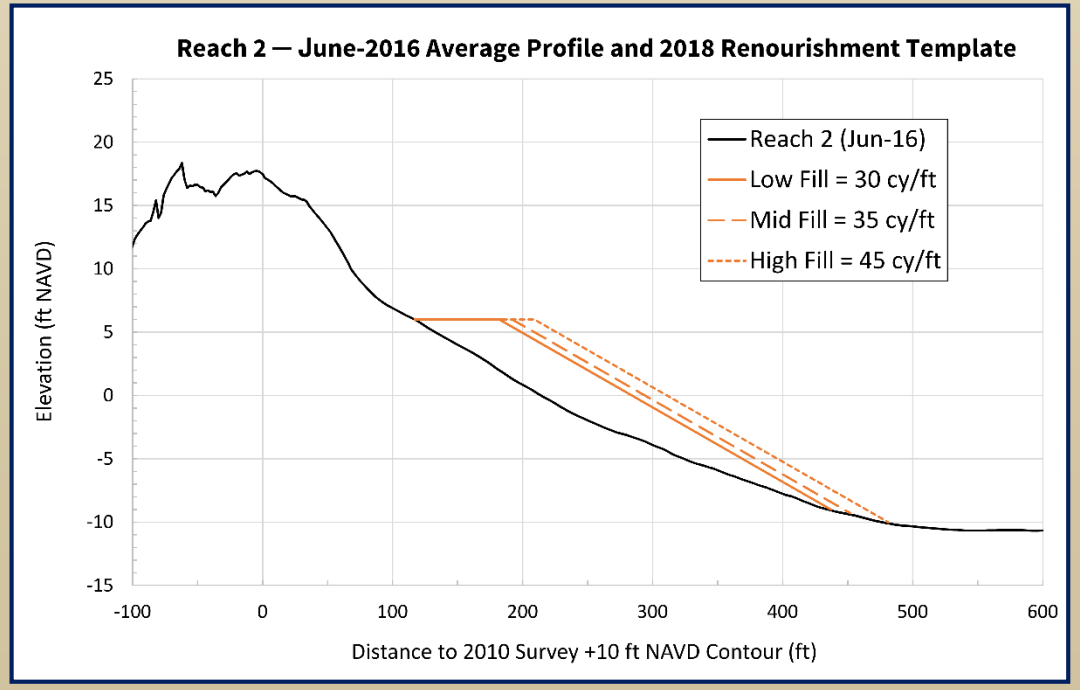
<u>Average</u> change erosion at ***100,000 cy/yr****

**USACE 2000. Final feasibility report and environmental impact statement: Dare County beaches.*

*** CSE 2005 & 2011. Preliminary and final design reports for beach nourishment at Nags Head.*

**** As of June 2016 before Hurricane Matthew*





Preliminary Design for Average Profile By Reach/Subreach

- **Reach 1** (29,300 ft)

Low Fill = 590,000 cy

Mid Fill = 880,000 cy

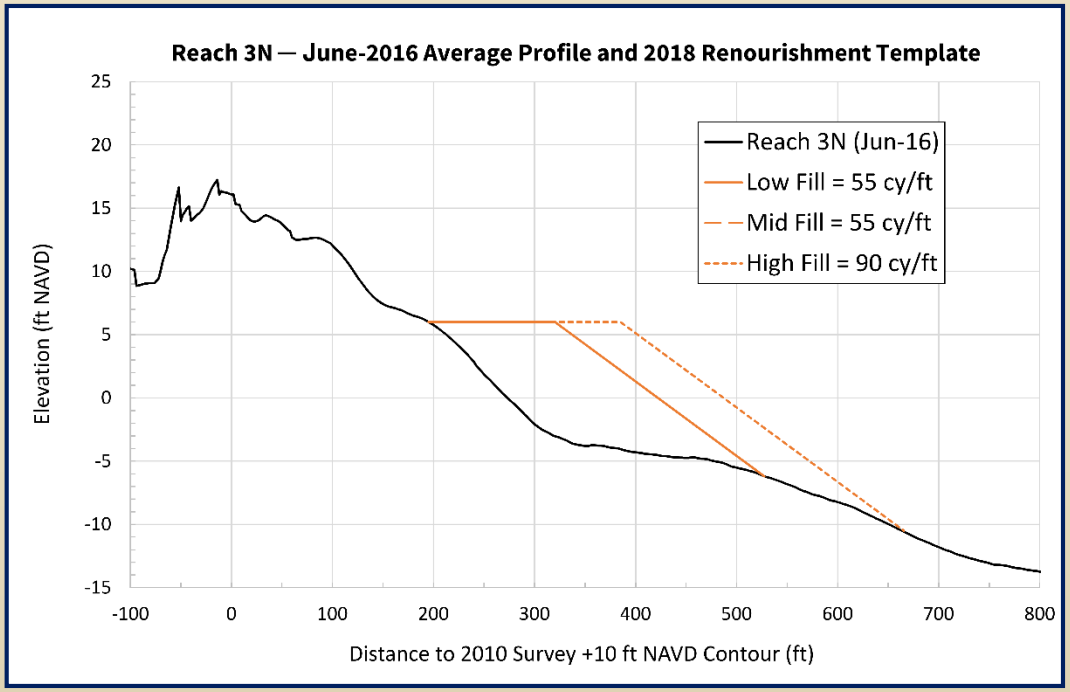
High Fill = 1,150,000 cy

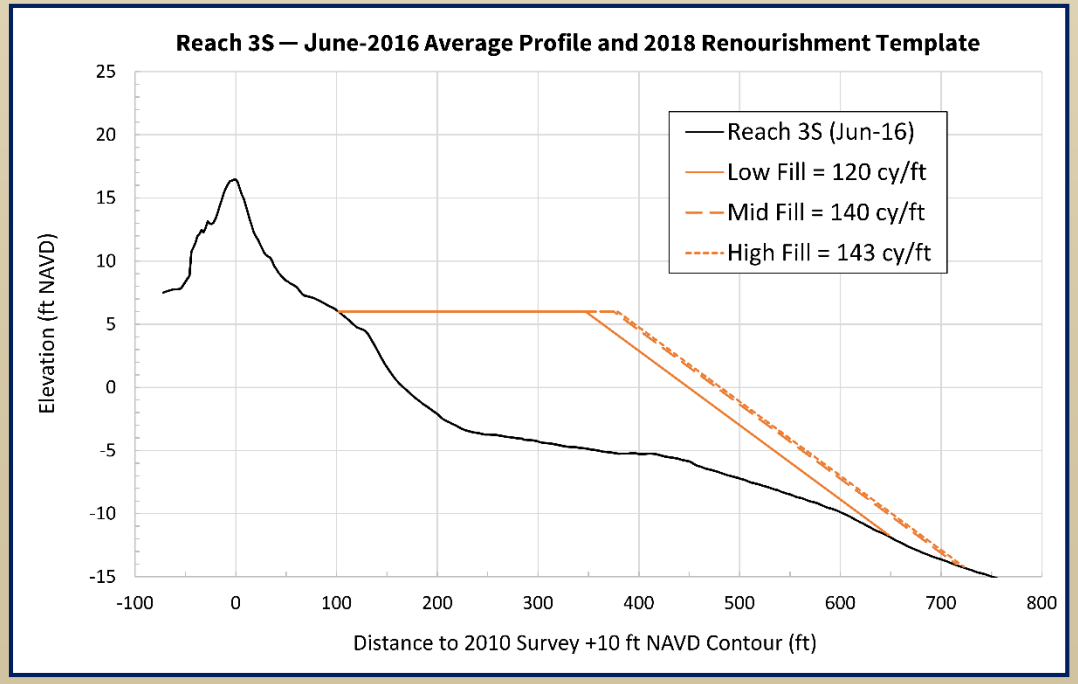
- **Reach 2** (13,000 ft)

Low Fill = 390,000 cy

Mid Fill = 480,000 cy

High Fill = 600,000 cy





Preliminary Design for Average Profile By Reach/Subreach

- **Reach 3N** (5,500 ft)

Low Fill = 300,000 cy

Mid Fill = 300,000 cy

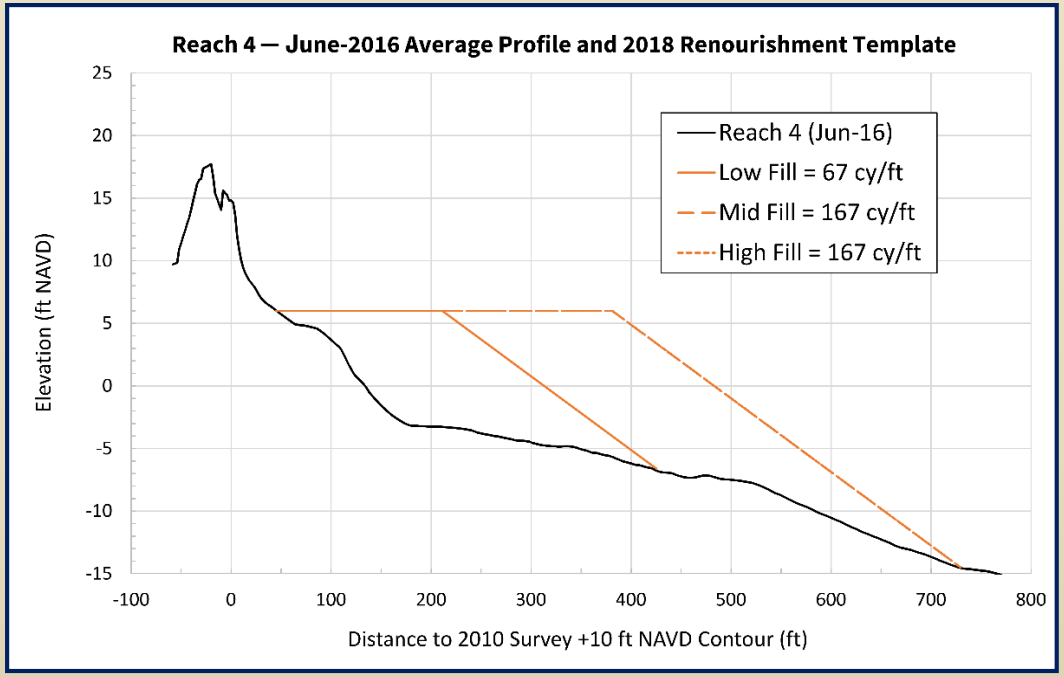
High Fill = 500,000 cy

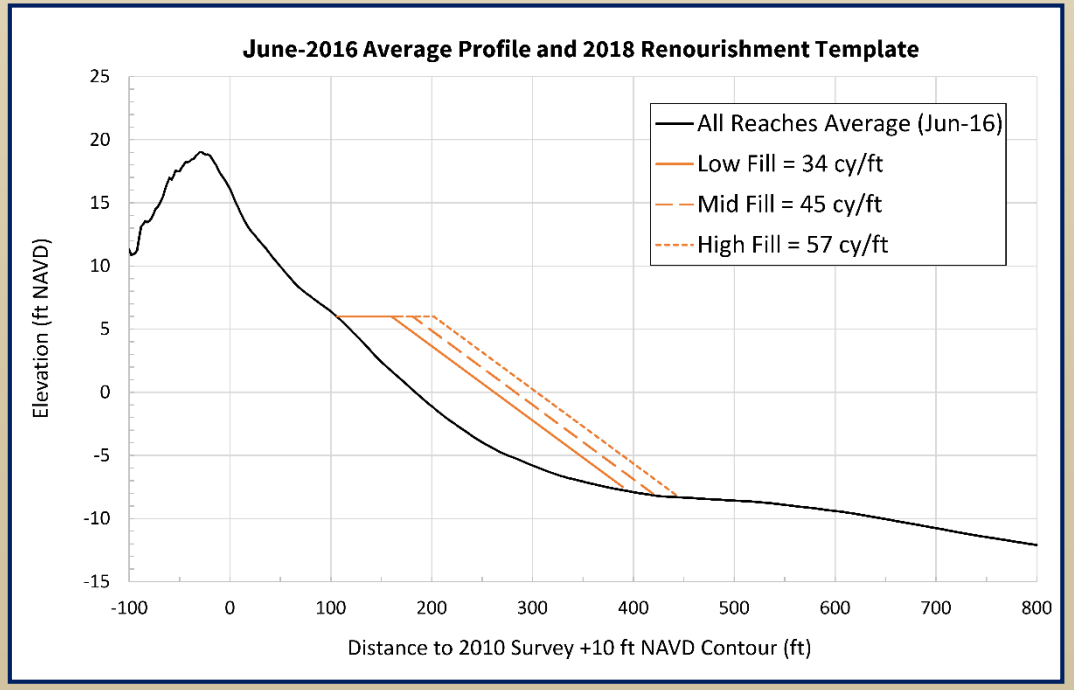
- **Reach 3S** (3,500 ft)

Low Fill = 420,000 cy

Mid Fill = 490,000 cy

High Fill = 500,000 cy





Preliminary Design for Average Profile By Reach/Subreach

- **Reach 4** (1,500 ft)

Low Fill = 100,000 cy

Mid Fill = 250,000 cy

High Fill = 250,000 cy

- **Total** (52,800 ft)

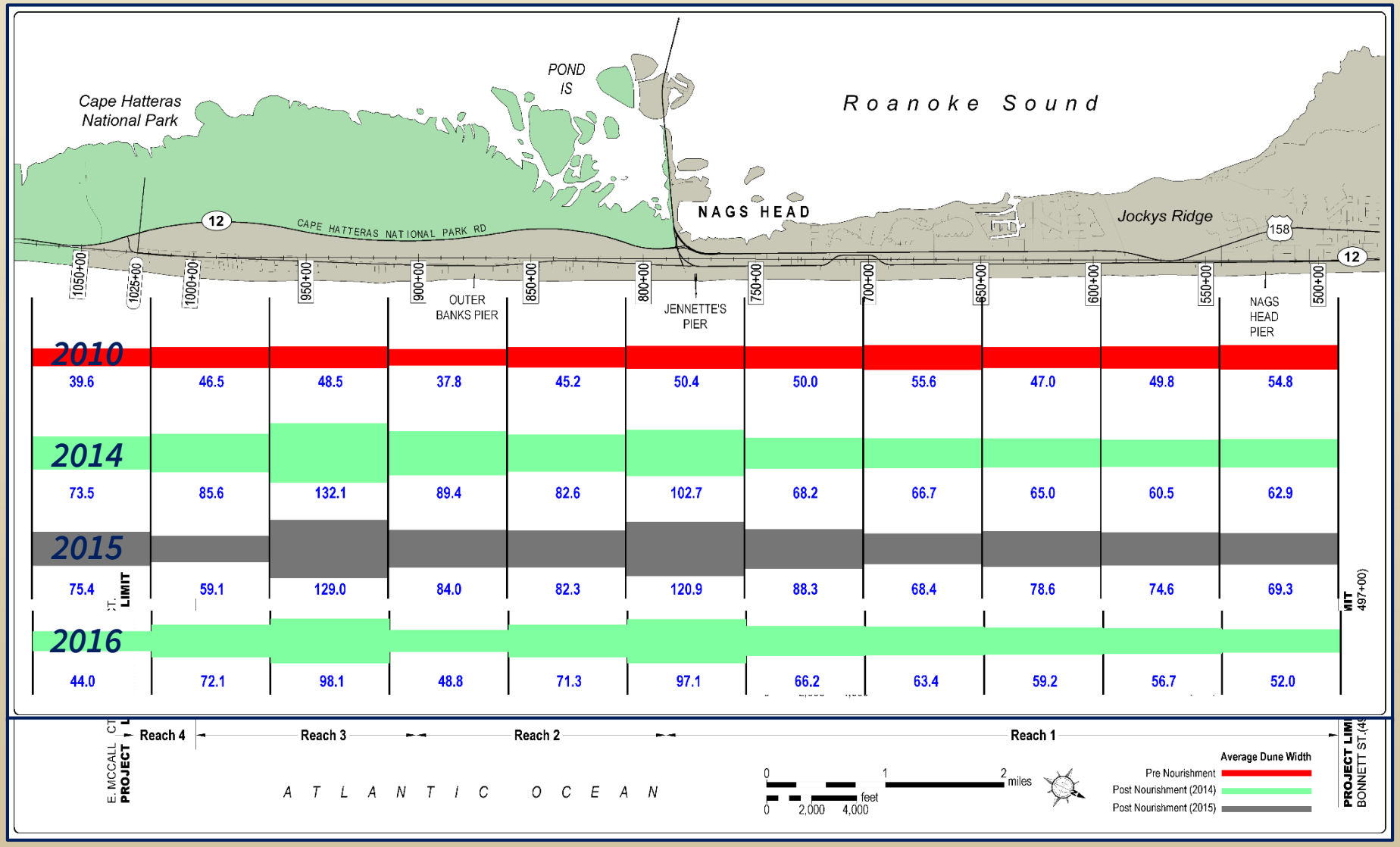
Low Fill = 1,800,000 cy

Mid Fill = 2,400,000 cy

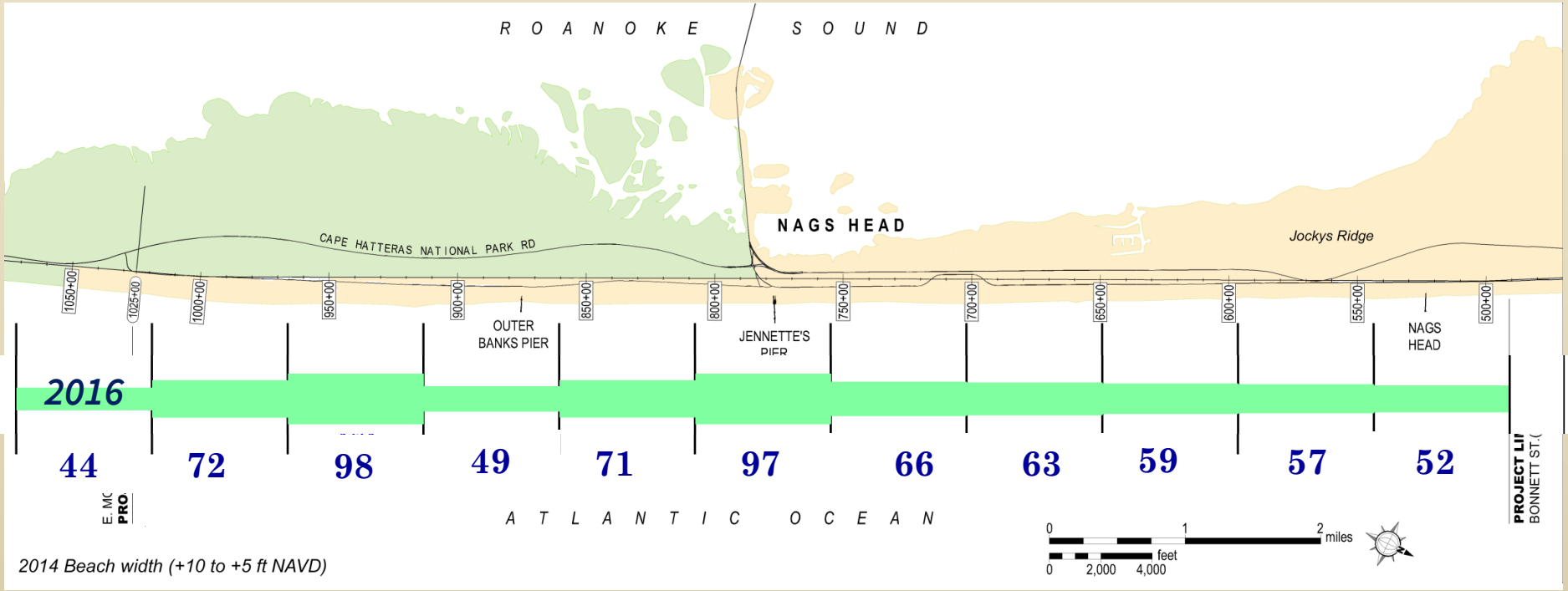
High Fill = 3,000,000 cy

Nags Head Beach Width Before/After 2011 Project

From CSE 2014 to 2016 Monitoring Reports



Projected Beach Width Increase After Renourishment

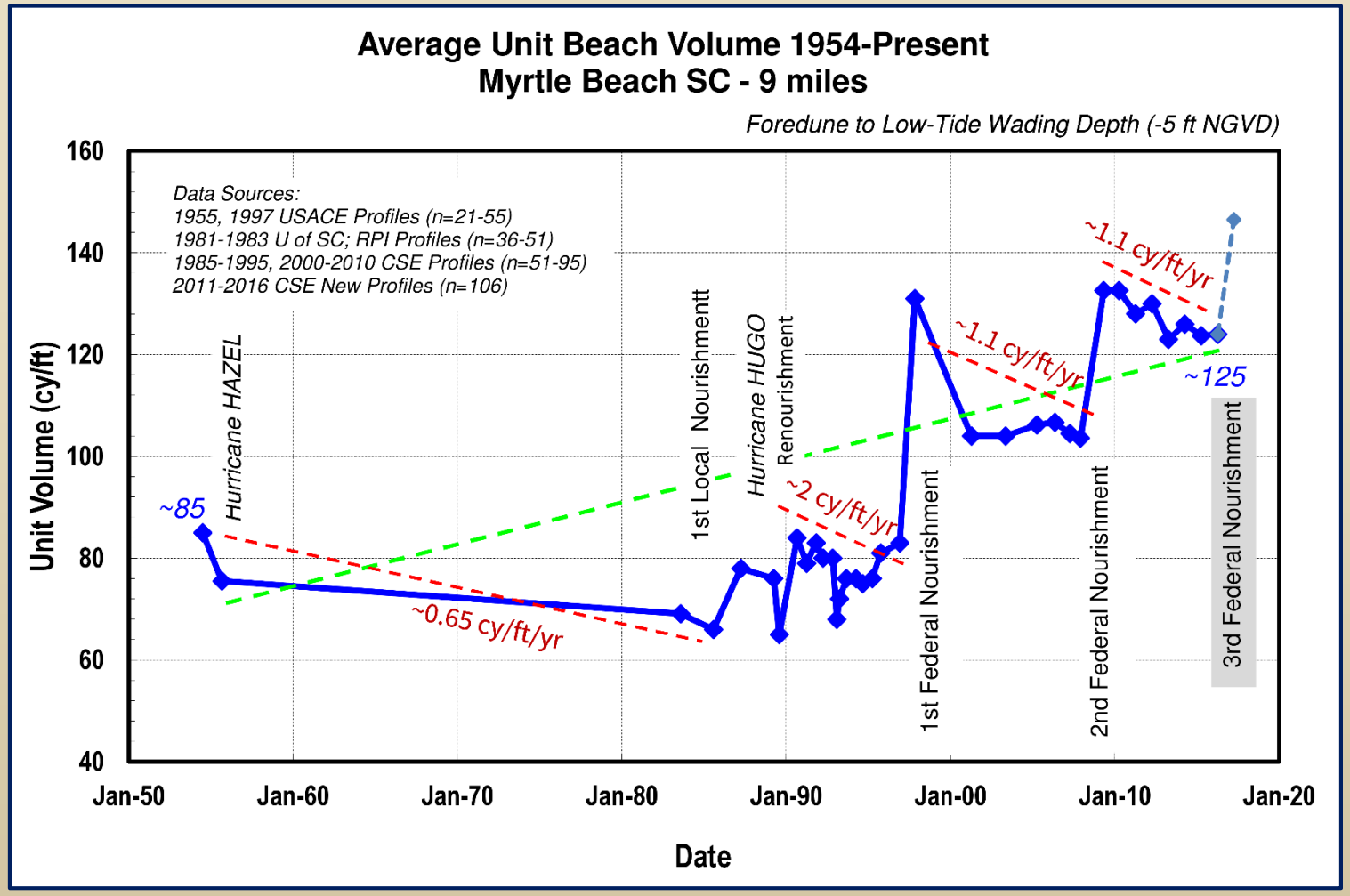


R1 = 17 – 34 ft; R2 = 25 – 38 ft;

R3N = 45 – 90 ft; R3S = 100 – 120 ft

R4 = 55 – 140 ft; Average = 28 – 48 ft

Long-Term Shoreline Management Example – Myrtle Beach (SC)

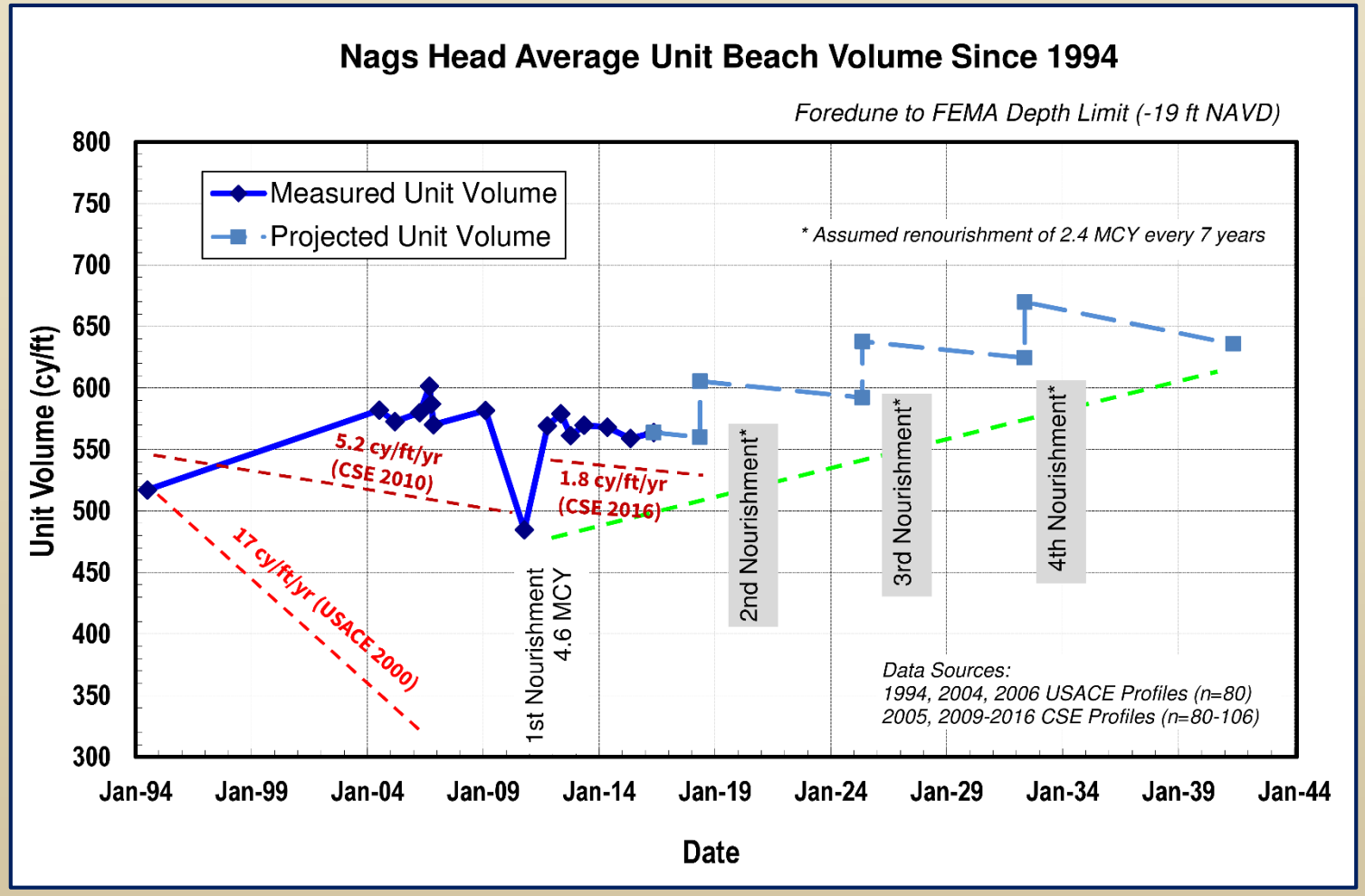


Total Nourishment Volume since 1986: 5 MCY

Scheduled Re-nourishment in 2017: 1.7 MCY (cost estimate $26 M)

Average Erosion Rate since 1997 : 50,000 cy/yr (1.1 cy/ft/yr)

Long-Term Shoreline Management for Nags Head



1st Nourishment Volume (2011): 4.6 MCY

Average Erosion Rate since 2011 : 100,000 cy/yr (1.8 cy/ft/yr)

Discussion