

BEACH NOURISHMENT PUBLIC FORUM



TOWN OF SOUTHERN SHORES NORTH CAROLINA

17 January 2017

Essential Data Collection Monitoring & Design Elements for Beach Maintenance & Planning

Tim Kana

www.coastalscience.com



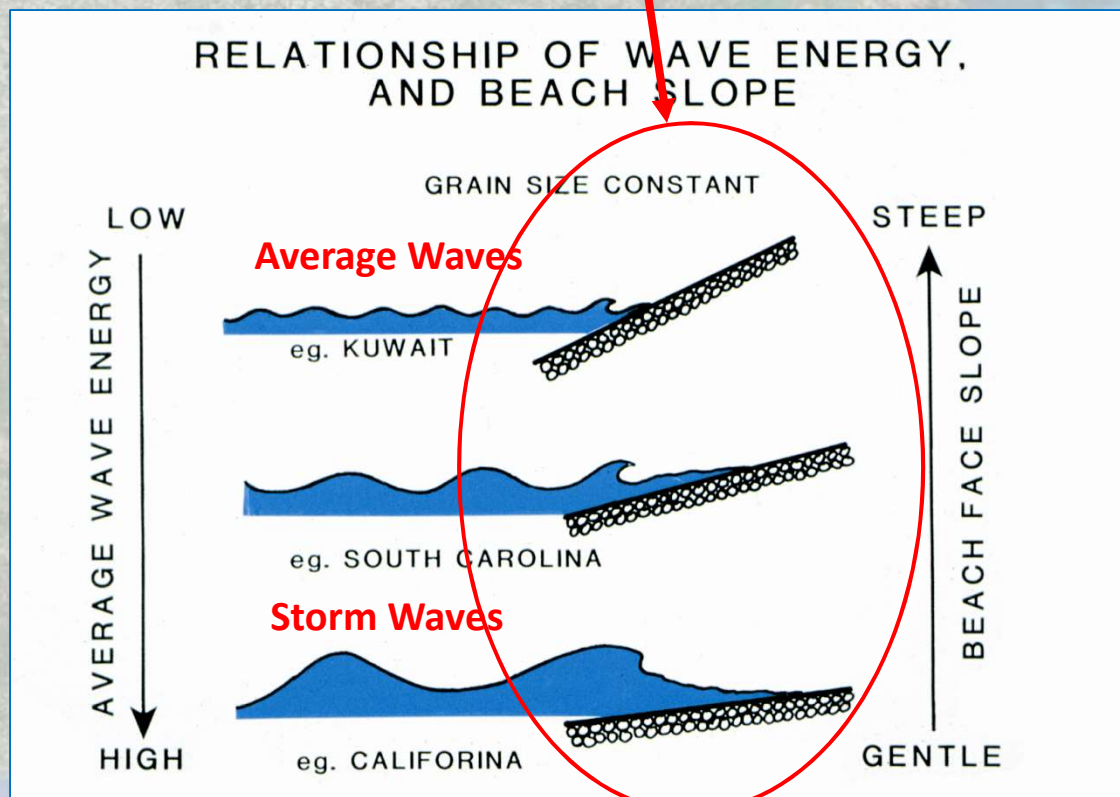
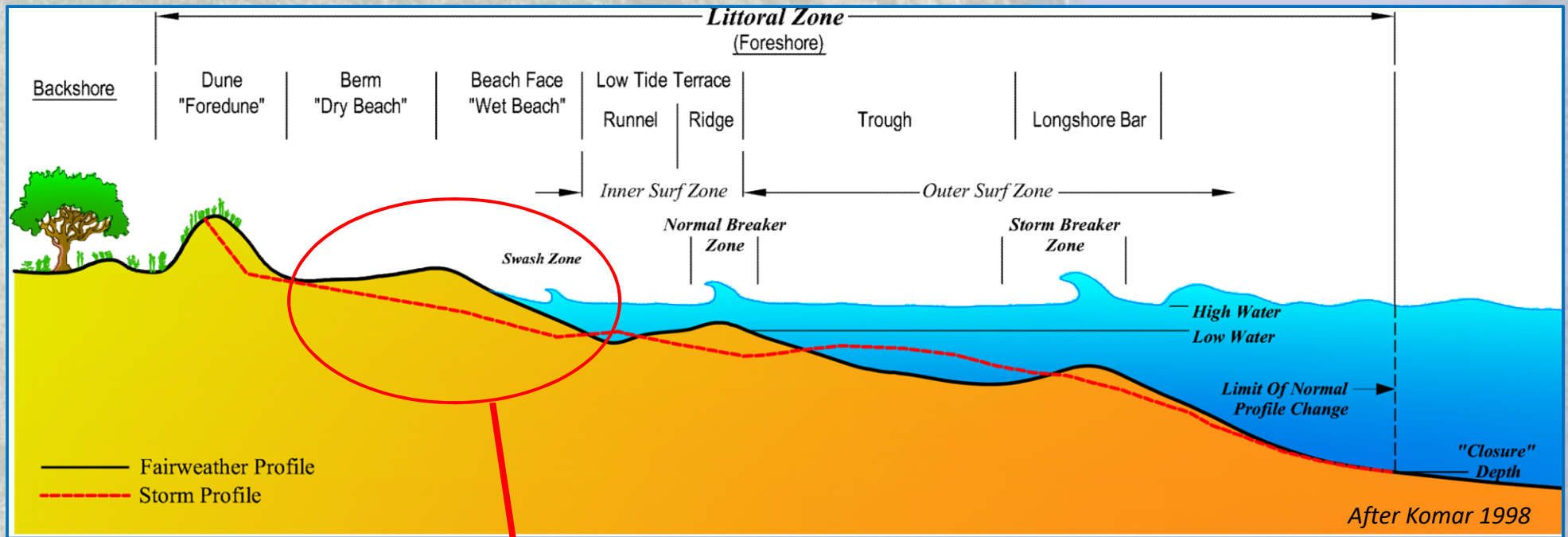
COASTAL SCIENCE & ENGINEERING

CSE's Beach Management Approach

- Determine The Causes and Rates of Erosion
- Find The Nearest Source of Sand
- Move It The Cheapest Way
- Cover Your Tracks

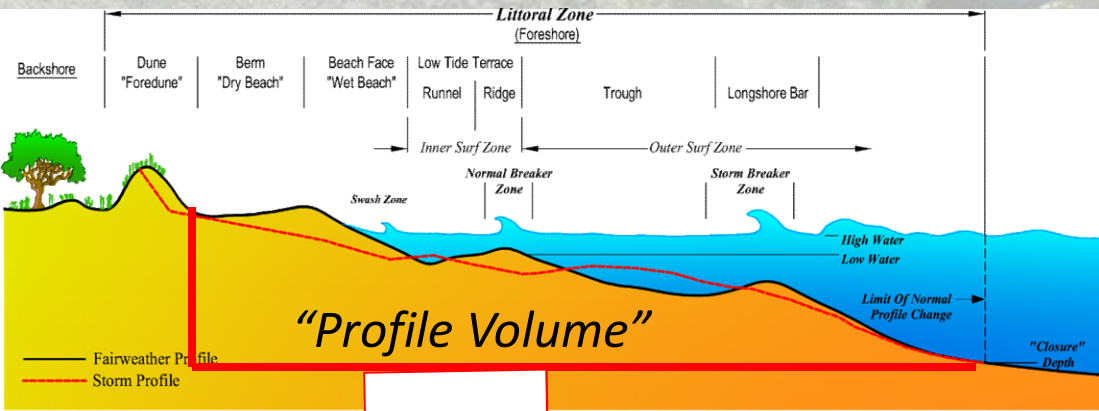
Measure – Measure - Measure

Beach Profile – The Shore Zone That Absorbs Breaking Waves

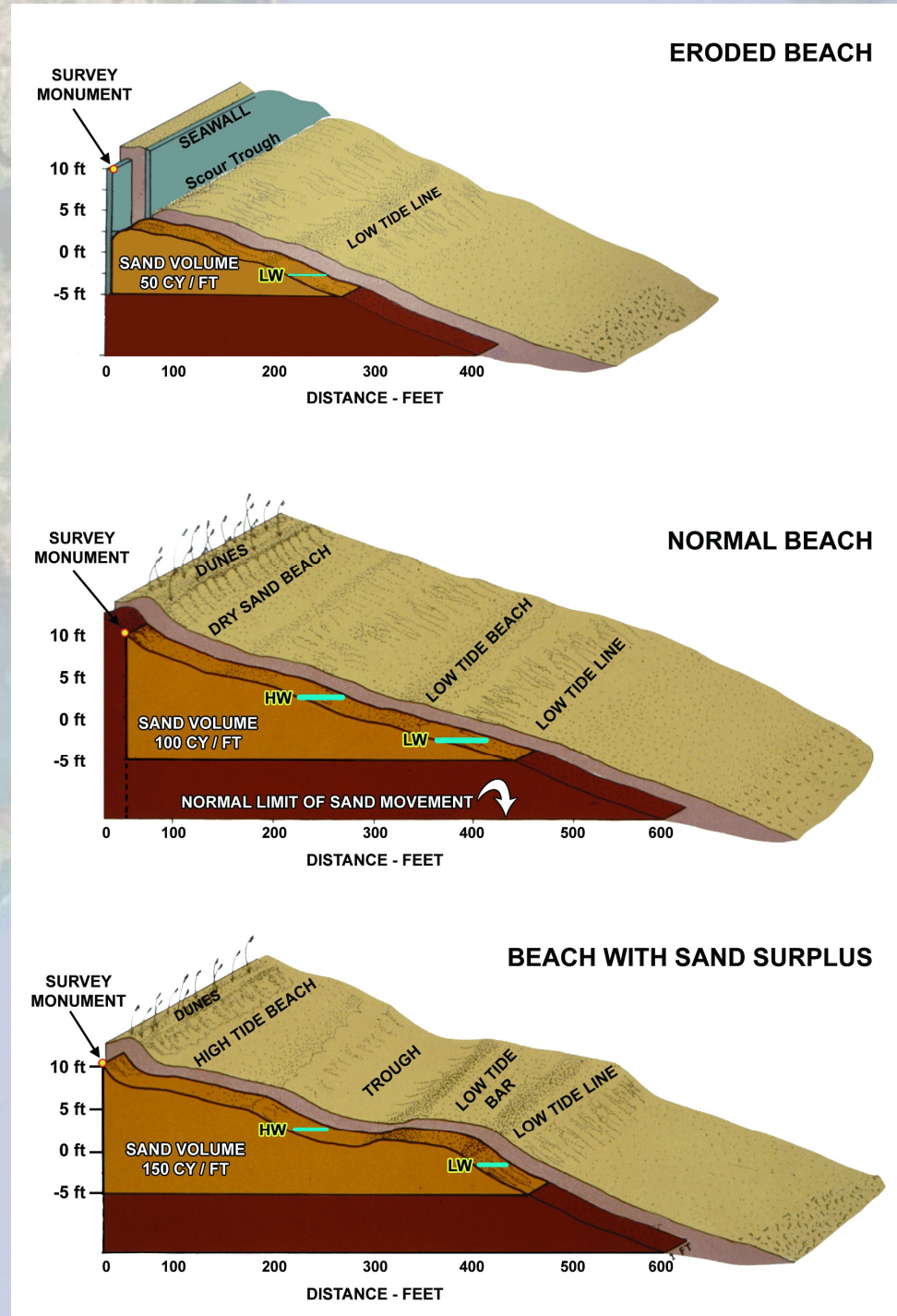


Why does the underwater zone matter?

Equilibrium Profiles

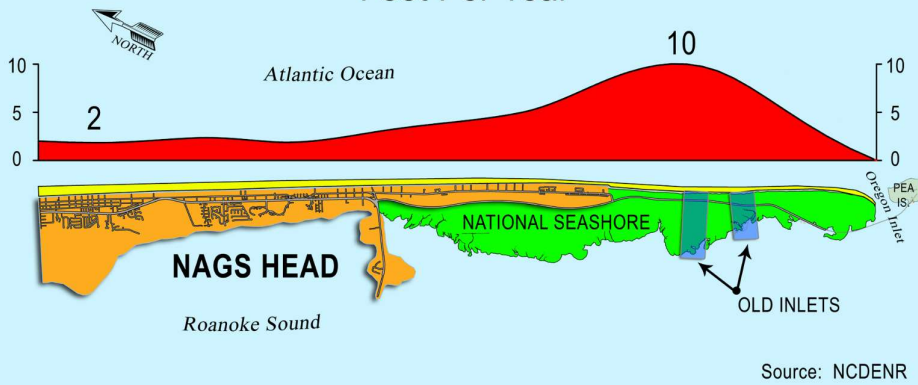


Profile Shape and Beach Width Will Change Frequently. But If the Profile Volume Remains Constant, The Beach Is In Equilibrium



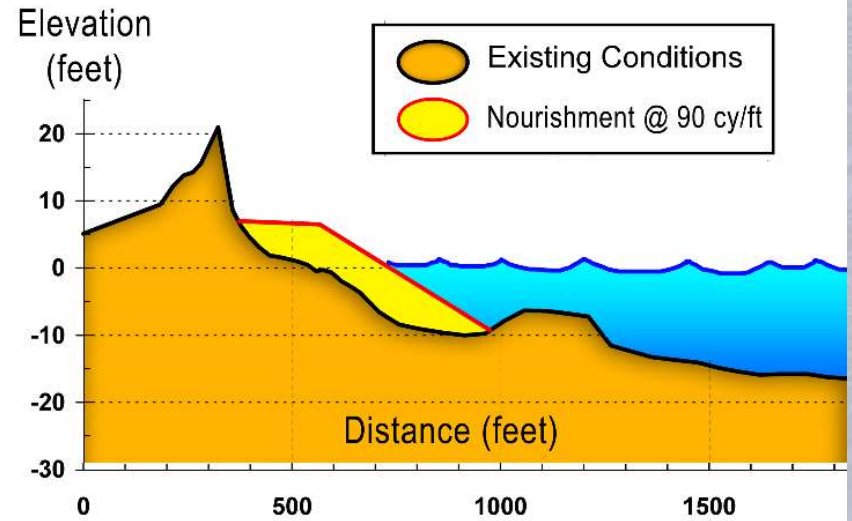
After Kana 1990

50 Year Erosion Rate Feet Per Year



Nags Head Project - 2011

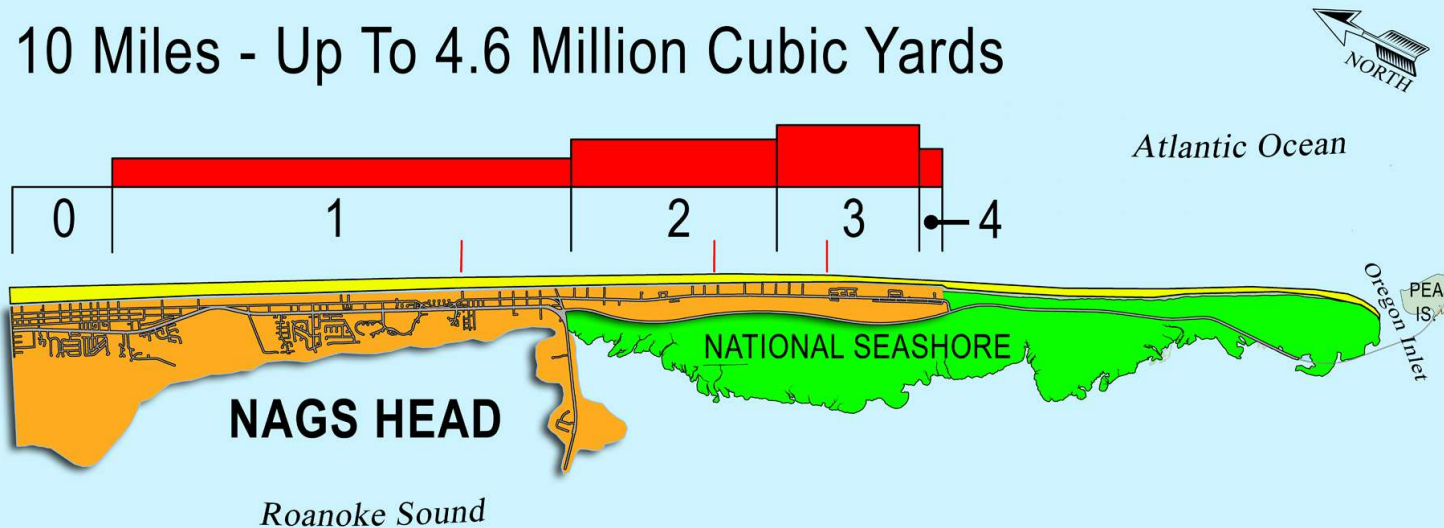
Reach 2 - Near Islington Street



Beach Nourishment –
The addition of sand from a non-littoral source to replace losses due to erosion

Beach Nourishment Plan

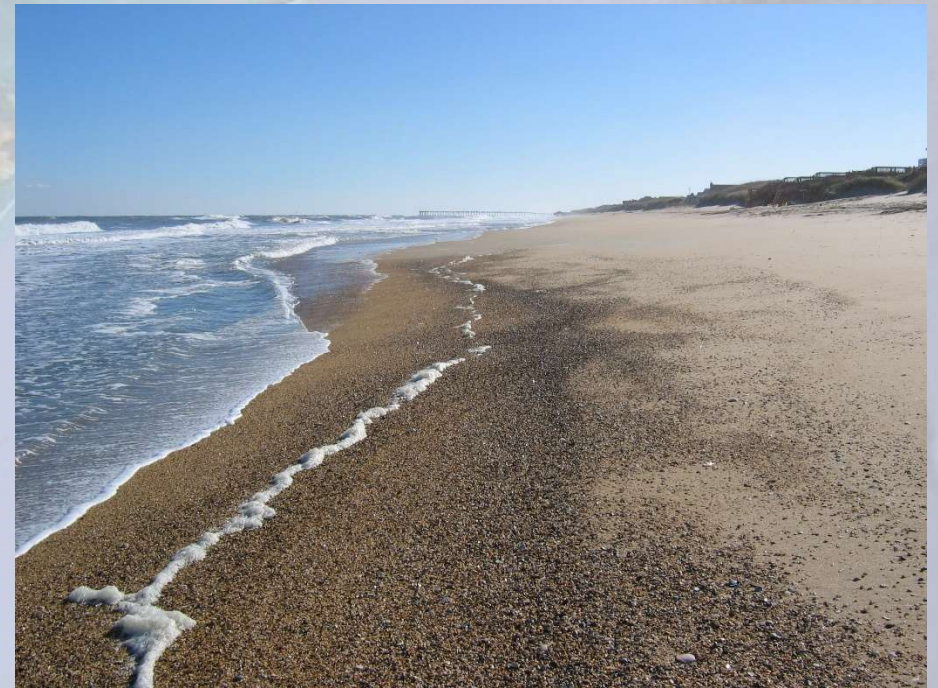
10 Miles - Up To 4.6 Million Cubic Yards

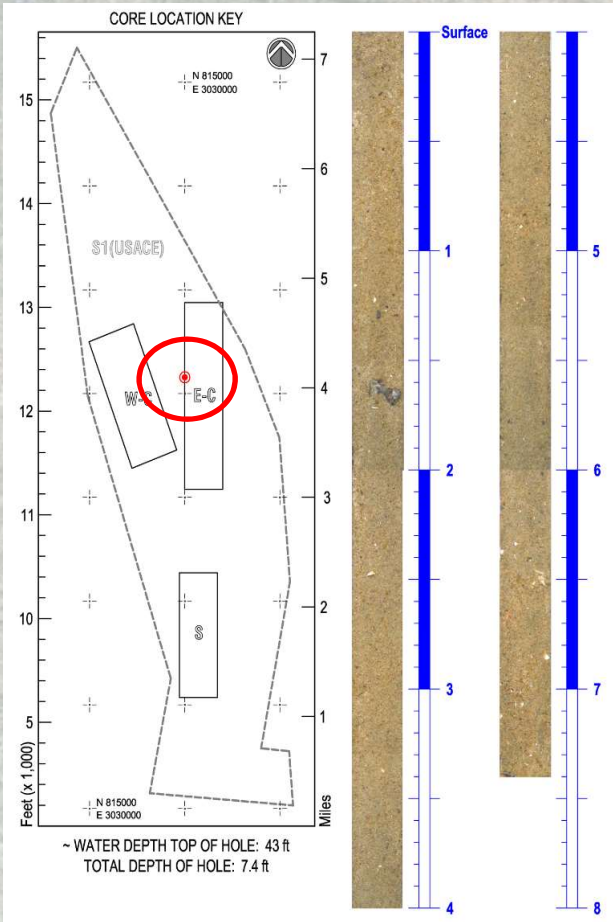


Defining Native Beach Sand Quality

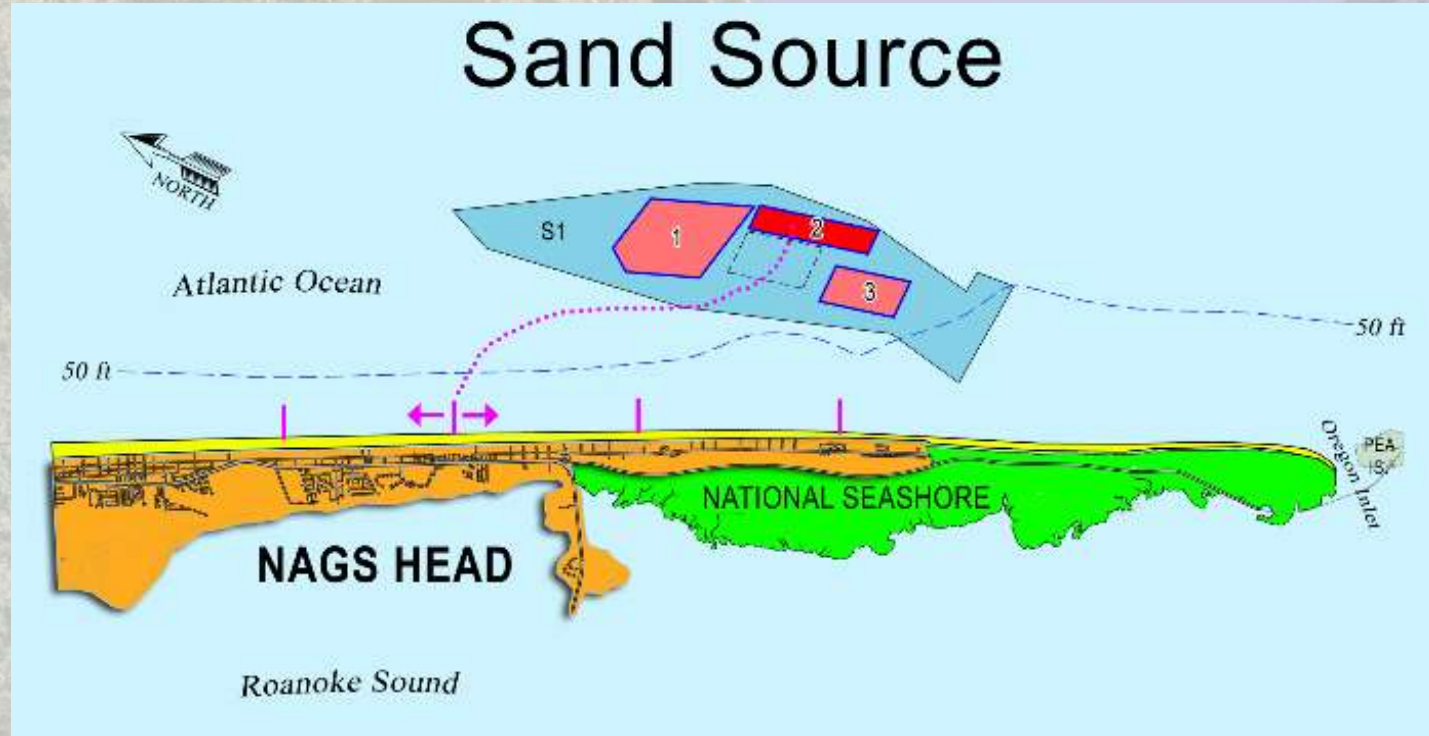


Sand – Pebbles - Shells!





Sand Source



Offshore Borings To Confirm Sand Quality



Dunes & Outer Bar



Visible Beach



Inner Surf Zone



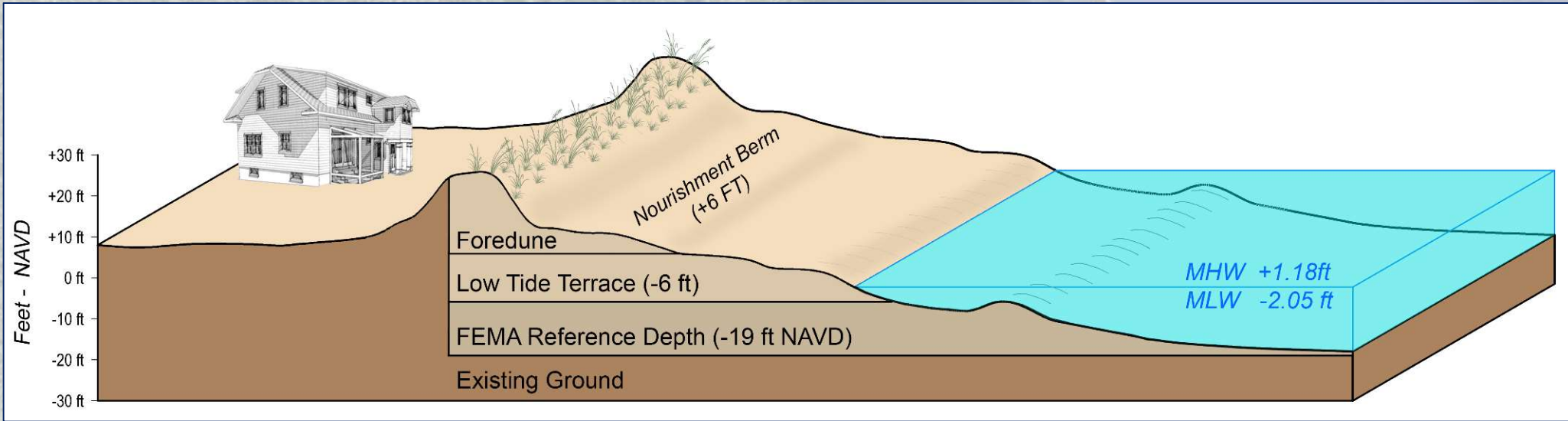
Dredge photos -
Courtesy GLDD

Nags Head Project Facts

The largest locally funded beach nourishment accomplished to date in the United States.

- 4.6 million cubic yards
- Along 10 miles
- Over 100 borings to confirm offshore borrow source
- Combination of 3 hopper dredges and 1 cutterhead dredge
- Construction cost ~\$31 million
Great Lakes Dredge & Dock Co.
- 5 years of environmental reviews & permitting
- 5 months of summer construction between 24 May and 27 Oct 2011
- Hurricane IRENE impacted when the project 85% completed

Beach Condition Analysis – “The Littoral Sand Box”



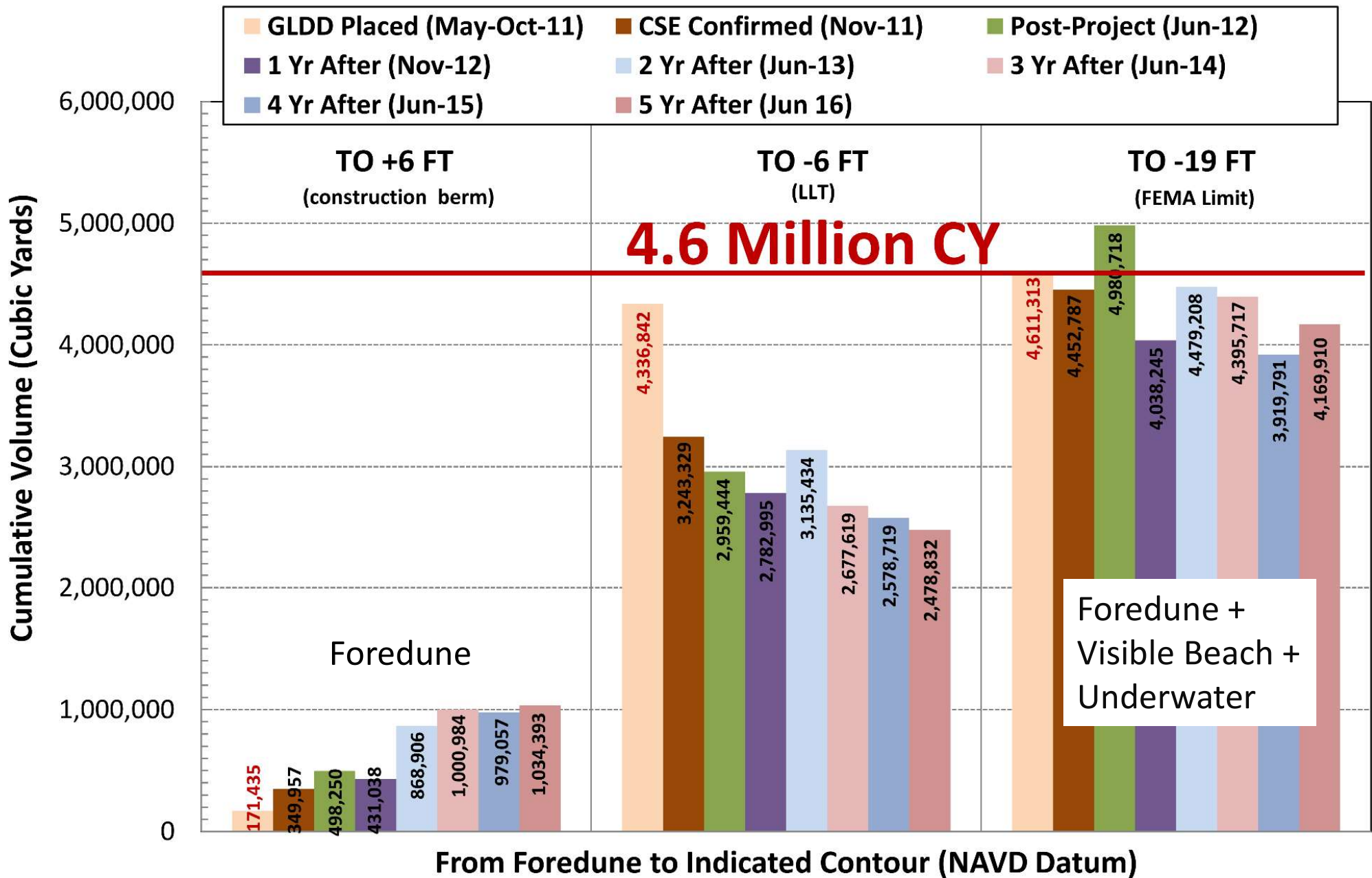
Lens 1 – *Foredune* – From the ~crest of dune to +6 ft NAVD*

Lens 2 – *Beach* – Between +6 ft and -6 ft NAVD

Lens 3 – *Underwater* – Between -6 ft and -19 ft NAVD

*NAVD-North American Vertical Datum of 1988 = ~mean sea level

Nags Head Cumulative Beach Volume Changes (Relative To November 2010 - Pre-Project)



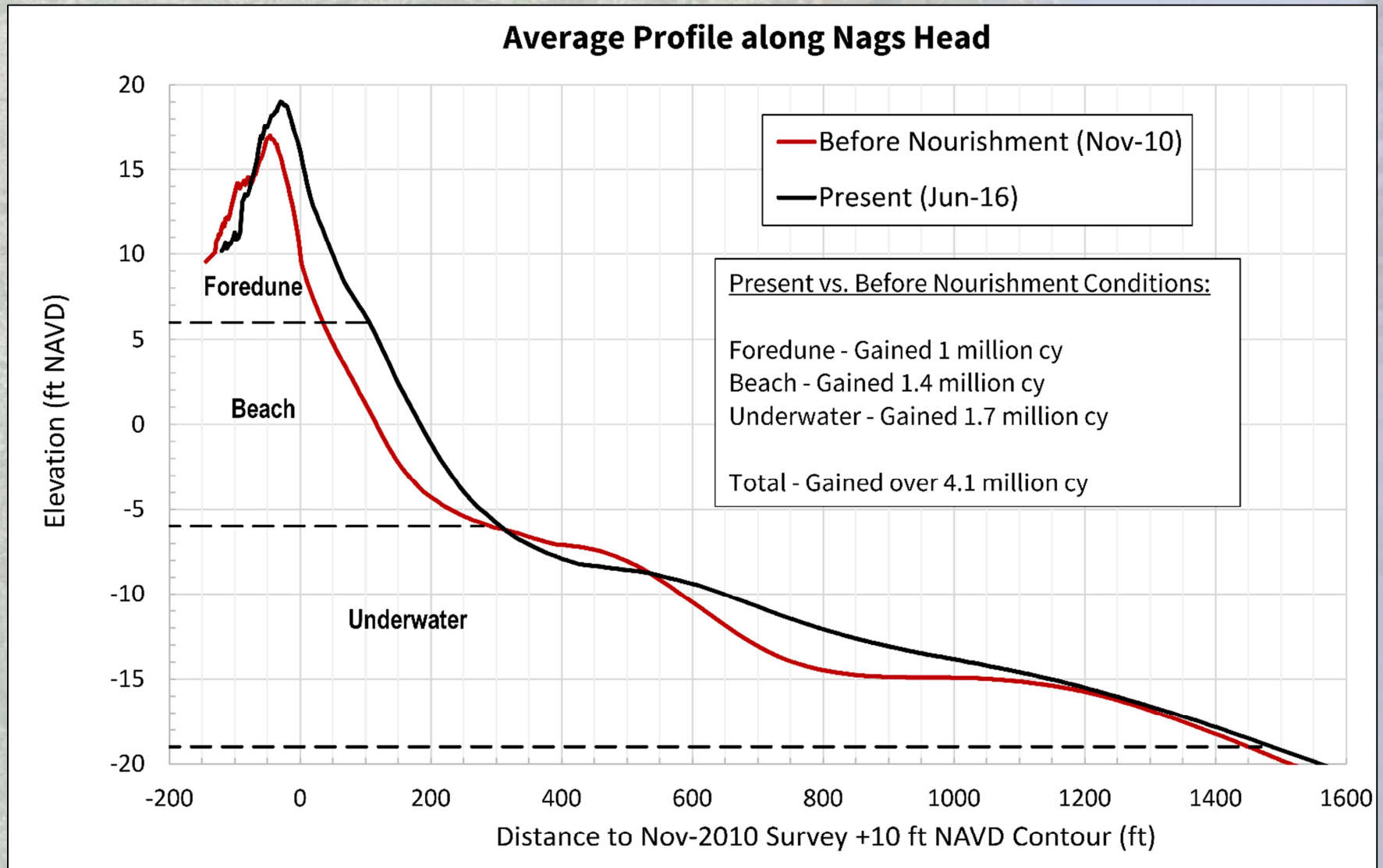
Net Losses

November 2011
through June 2016

~10%

Nags Head Average* Profile Evolution

- Higher & Wider Foredune
- Greater Underwater Volume
- Similar Dry Beach Width



*Calculated from the +10 ft NAVD contour (n= 104)

Nags Head

Natural Dune Growth

After 4 years – Over twice the volume that FEMA typically approves for emergency repairs after storms



18 Feb 2013



*Fence
placed after
nourishment*

Critically Eroding Areas:

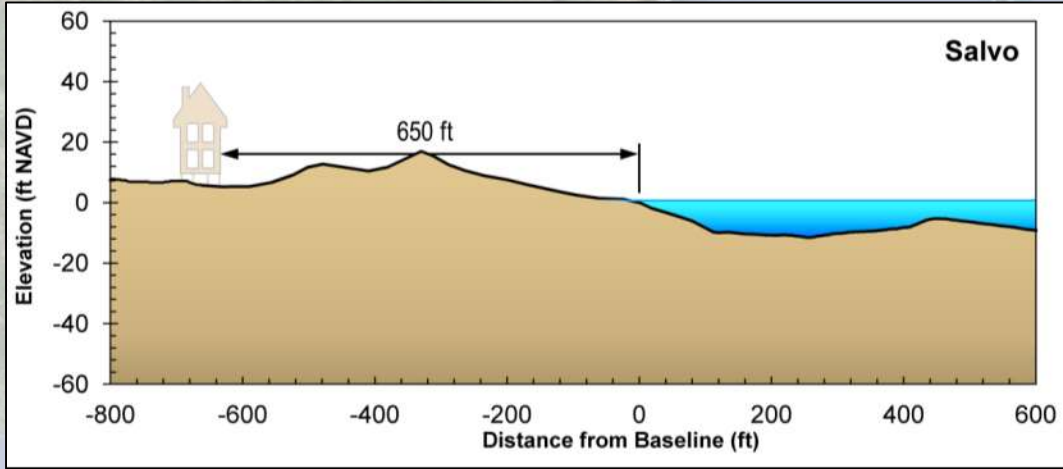
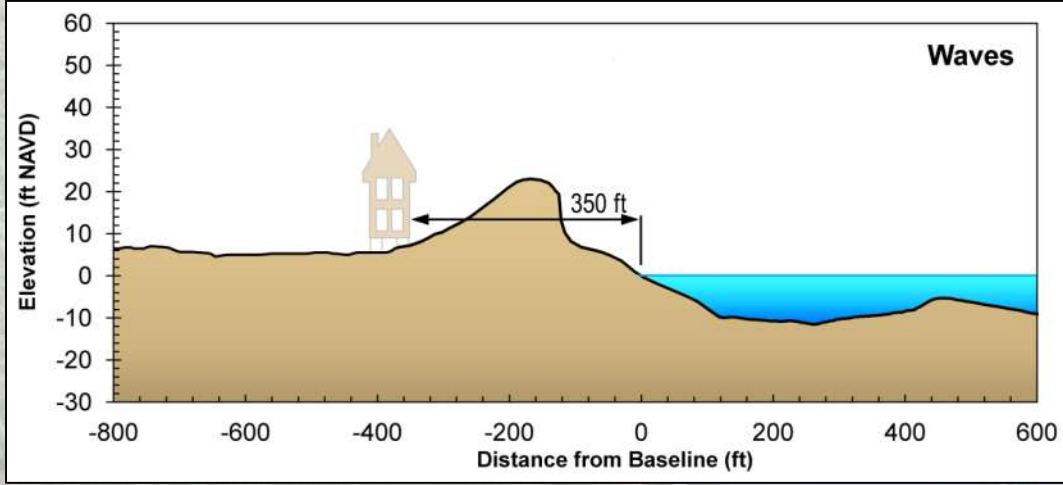
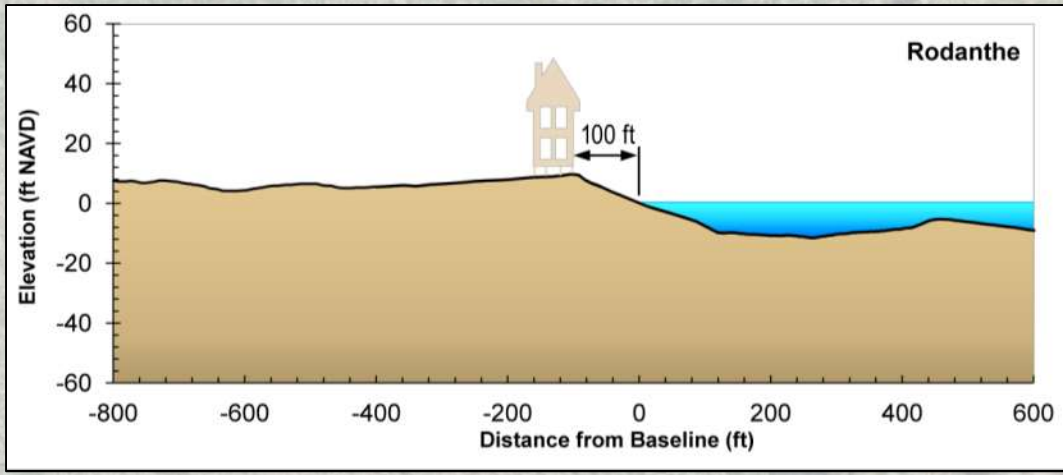
- 1) Were not damaged during IRENE or SANDY
- 2) There was no overwash into roads
- 3) Nourishment losses were <10% of the volume placed

Post-IRENE (2 Sep 2011)



Rodanthe, Waves & Salvo Relative Beach Conditions

3 November 2012



CSE's Beach Management Approach

- Determine The Causes and Rates of Erosion
- Find The Nearest Source of Sand
- Move It The Cheapest Way
- Cover Your Tracks – *Nags Head Spent >\$1 million for Environmental Protection and Monitoring in Accordance with Special Conditions of the Permit*

Site-specific measurements of the active littoral zone are the only way communities can truly know the condition of their beach.

