Storm Damage Reduction Project
Town of Duck, North Carolina

Coastal Planning & Engineering of North Carolina

February 20, 2014

Ken Willson

Schedule and Progress Update

- Engineering & Design:
  - Beach Profile Surveys – September 2013 (Completer)
  - Update Shoreline Change Rates – January 2014 (Complete)
  - SBEACH Analysis – April 2014 (In Progress)

Vulnerability Analysis

Return Period	H_S (ft.)	T_p (s)	Water Level (ft. NAVD)
1	17.6	9.9	4
5	21.2	12.9	4.2
10	22.7	14.2	4.8
20	24.3	15.5	5.7
25	24.8	16	5.8
50	26.3	17.3	6.2

Storm	Date	Measured Data			Approximate Return Period (years)		
		H_S (ft)	T_p (s)	Water Level (ft. NAVD)	H_S	T_p	Water Level
Perfect Storm	Oct-91	15.1	22.5	4	< 1	> 50	1
Hurricane Isabel	Sep-03	27.3	15.6	5.6	>50	20	10 to 20
Hurricane Irene	Aug-11	24.8	13.6	3	25	5 to 10	< 1
Hurricane Sandy	Oct-12	17.3	13.3	4.5	~ 1	5 to 10	5 to 10

Vulnerability Analysis

Segment	Structures Impacted during Storm Event under Existing Conditions					
	1-Year	5-Year	10-Year	20-Year	25-Year	50-Year
1	-	-	-	-	-	-
2	-	-	-	-	2	2
3	-	-	-	1	1	2
4	-	-	-	1	1	8
5	-	-	-	-	-	-
6	-	-	-	-	-	-
7	15	19	23	27	32	36
8	2	6	14	20	22	23
9	-	-	-	-	-	-
10	-	-	-	-	-	-

Vulnerability Analysis

Design	Storm Dune			Berm		Depth of Closure (ft, NAVD)	Fill Density (CY/ft)
	Width[1] (ft)	Crest (ft, NAVD)	Side Slope	Width[2] (ft)	Crest (ft, NAVD)		
1	-	-	-	50	6	-24	55.6
2	-	-	-	100	6	-24	111.1
3	-	-	-	100	8	-24	118.5
4	-	-	-	100	12	-24	133.4
5	20	15	1V:10H	100	6	-24	124.3
6	35	15	1V:10H	100	6	-24	129.3
7	20	15	1V:10H	75	6	-24	96.5
8	20	15	Variable[3]	100	6	-24	120.8
9	20	15	Variable[3]	75	6	-24	93.0

[1]Width of the storm dune was measured as the horizontal distance from the crest to the intersection of the existing profiles at the +15.0 feet, NAVD contour.

[2]Width of the berm was measured as the horizontal distance from the crest to the intersection of the existing profiles at the +6.0 feet, NAVD contour.

[3]The toe of the storm dune extended 20 feet seaward from the +6.0 feet, NAVD contour of the existing profile. Thus, the side slope of the dune was a function of the existing profile.

Table 8. Beach fill designs modeled with SBEACH

Vulnerability Analysis

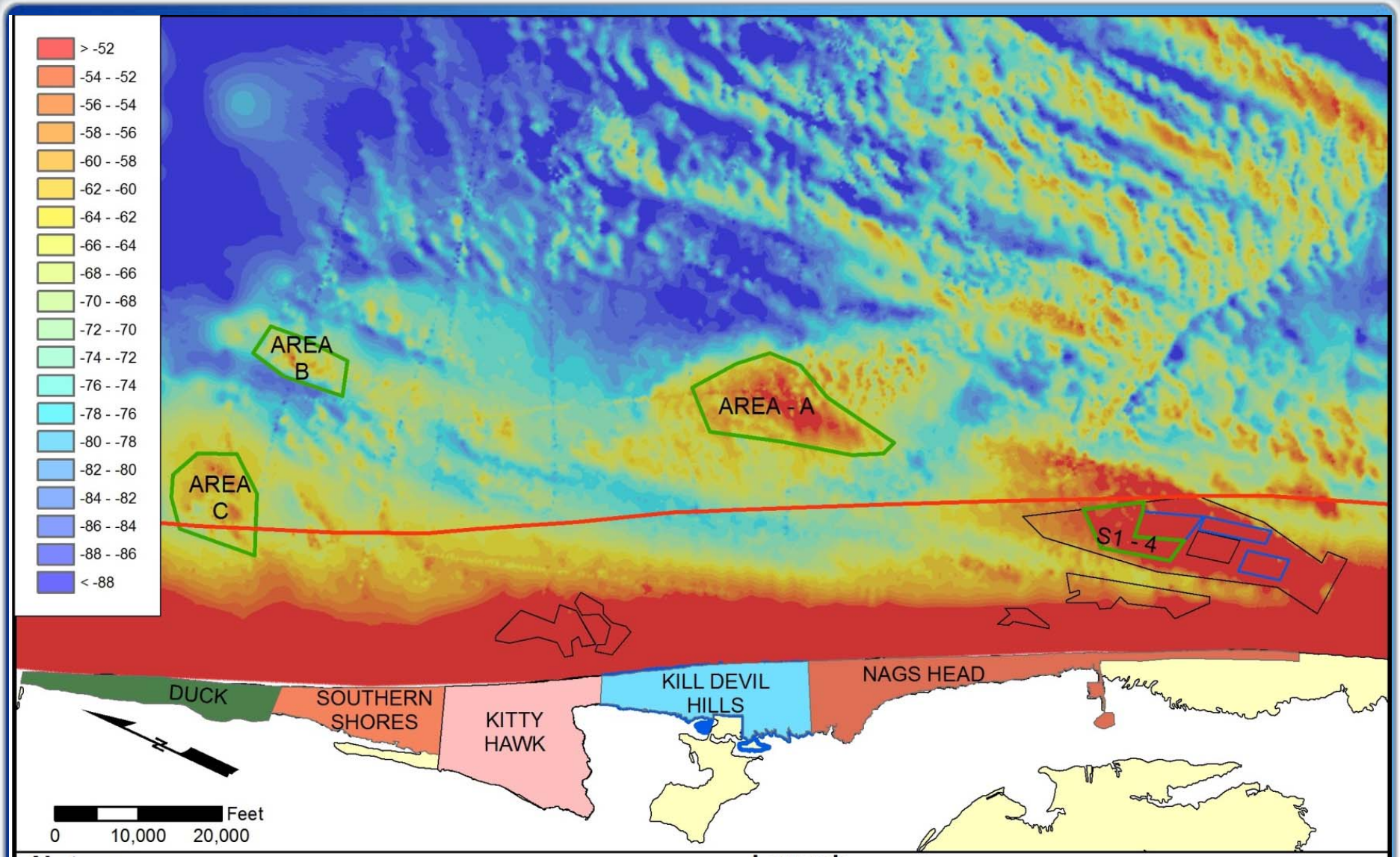
Segment	Minumum Design Required for Storm Event					
	1-Year	5-Year	10-Year	20-Year	25-Year	50-Year
1	-	-	-	-	-	-
2	-	-	-	-	1	1
3	-	-	-	1	1	7
4	-	-	-	1	1	1
5	-	-	-	-	-	-
6	-	-	-	-	-	-
7	1	9	9	7	7	5
8	1	1	1	7	5	6
9	-	-	-	-	-	-
10	-	-	-	-	-	-

Vulnerability Analysis

h (ft)	Construction Volume Required for Storm Event (CY)					
	1-Year	5-Year	10-Year	20-Year	25-Year	50-Year
8,000	-	-	-	-	-	-
6,000	-	-	-	-	508,000	508,000
2,000	-	-	-	363,800	116,700	198,500
4,000	-	-	-	443,600	443,600	443,600
2,000	-	-	-	-	-	-
1,000	-	-	-	-	-	-
5,000	651,400	1,000,800	1,000,800	1,018,300	1,018,300	1,157,300
8,000	609,400	609,400	609,400	1,072,500	1,294,900	1,334,900
2,000	-	-	-	-	-	-
14,000	-	-	-	-	-	-
Total:	**1,260,800**	**1,610,200**	**1,610,200**	**2,898,200**	**3,381,500**	**3,642,300**
Total (7 & 8):	**1,260,800**	**1,610,200**	**1,610,200**	**2,090,800**	**2,313,200**	**2,492,200**

Schedule and Progress Update

- Engineering & Design:
  - Beach Profile Surveys – September 2013 (Completer)
  - Update Shoreline Change Rates – January 2014 (Complete)
  - SBEACH Analysis – April 2014 (In Progress)
  - GENESIS Analysis – May 2014
  - Develop and Finalize Design Alternatives – June 2014 (In Progress)
  - Development of Engineering Report – July 2014 (In Progress)



Notes:

1. Bathymetry data based on historical NOS bathymetry (assume MLW ft).

Legend:

- STATE/FEDERAL BOUNDARY
- PROPOSED SURVEY AREAS
- NAGS HEAD BORROW AREAS
- USACE BORROW AREAS

Tracking No. 00.00.2011

Schedule and Progress Update

- Borrow Area Investigations and Design:
  - Planning & Permitting – March 2014 (In Progress)
  - Preliminary Geophysical Survey and Data Reduction – April 2014
  - Vibracore Sampling and Analysis – June 2014
  - Design Survey and Cultural Resource Survey – June 2014
  - Compatibility Analysis and Borrow Area Design – September 2014 (In Progress)

Schedule and Progress Update

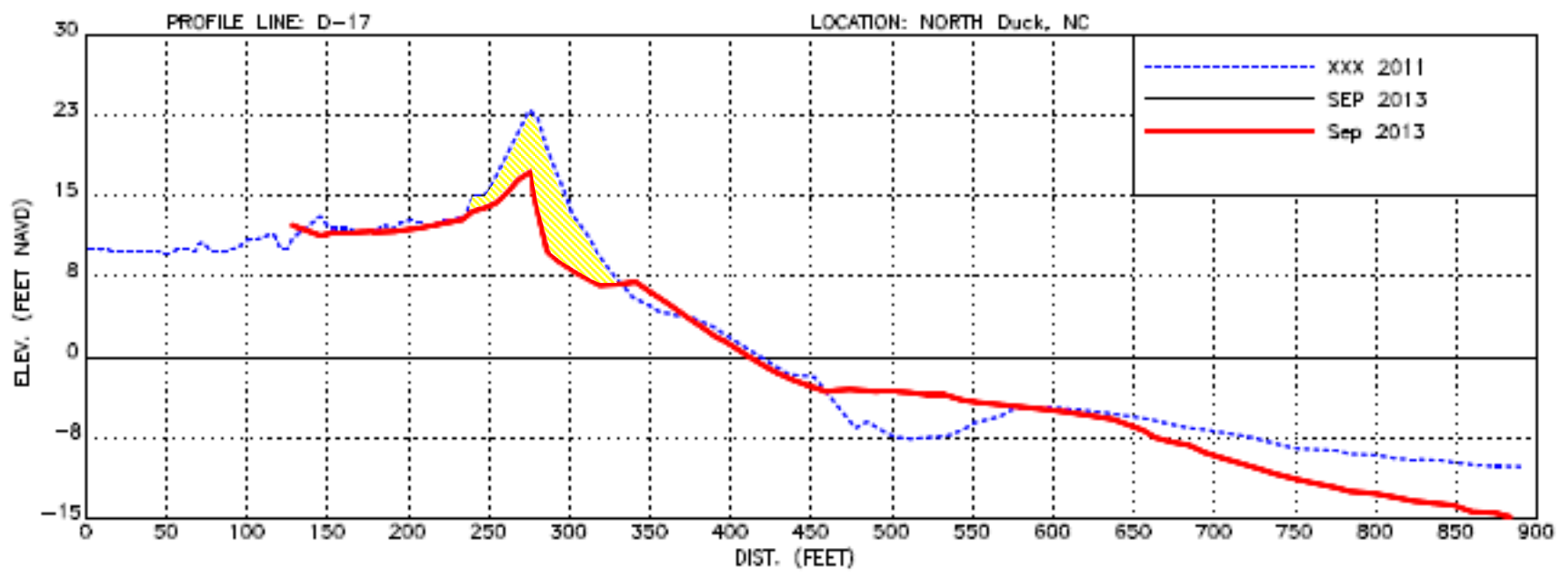
- Environmental Permitting and Documentation:
  - Development of Preliminary Draft EA – July 2014 (In Progress)
  - USACE Review of Preliminary Draft EA – August 2014
  - Submit Draft EA for Publishing in Federal Registry – September 2014
  - Public Comments – October 2014
  - Address Comments and Develop Final EA – January 2015
  - USACE Review of Final EA and Development of FONSI – June 2015
  - Permits Issued – October 2015

Schedule and Progress Update

- Permits Issued – October 2015
- Advertise for Construction Bids – November 2, 2015
- Open Bids – December 2, 2015
- Review Bids and Seek Approval from LGC
- Award Contract – January 2016
- Construction – February 2016 – February 2017

Volume Changes: 2011 - 2013

- Volume Change Analysis conducted for upper berm and dune portion of the beach



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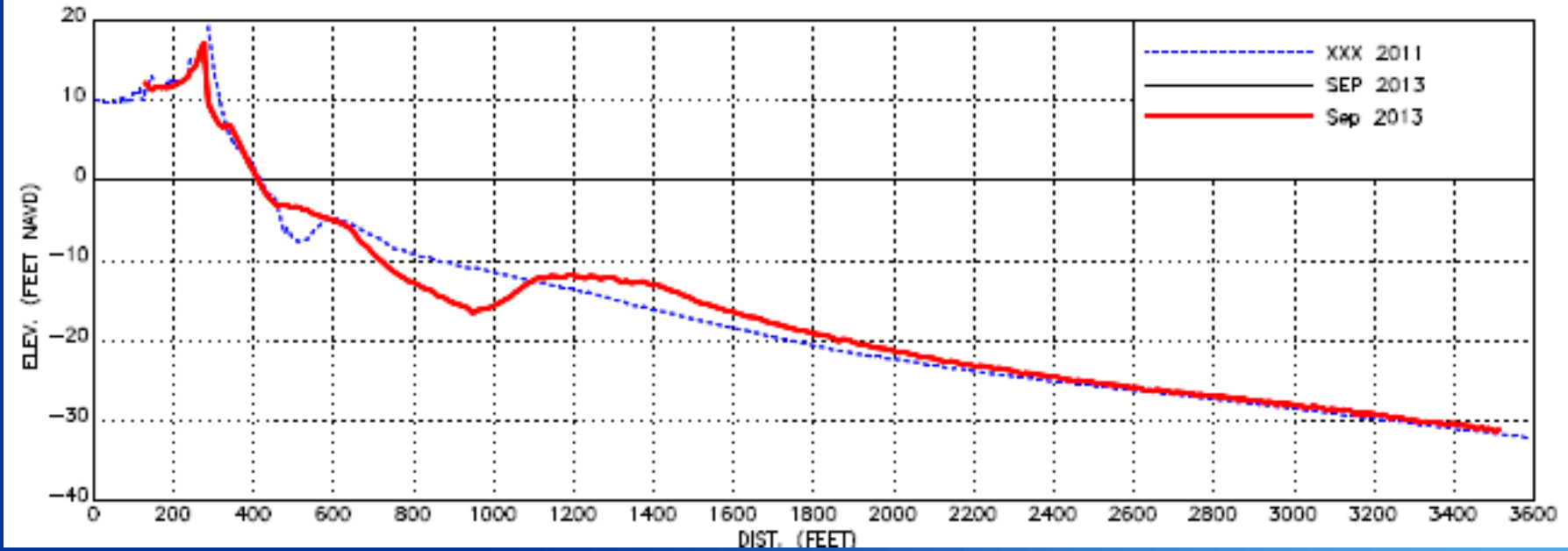

Tracking No. 00.00.2011

Volume Changes: 2011 - 2013

- Volume Change Analysis conducted for upper berm and dune portion of the beach

Profile Elevation	Volume Change (CY/Ft.) at 9.0 ft.	Volume Change (CY/Ft.) at 10.0 ft.	Volume Change (CY/Ft.) at 11.0 ft.	Volume Change (CY/Ft.) at 12.0 ft.
Segment 10	-1.3	-1.8	-2.1	-2.3
Segment 9	-5.2	-4.4	-3.7	-3.7
Segment 8	-2.9	-3.3	-3.5	-3.6
Segment 7	-8.4	-8.2	-7.8	-7.3
Segment 6	-13.2	-13.0	-12.7	-12.3
Segment 5	-3.8	-3.3	-3.3	-3.5
Segment 4	-0.2	-0.2	-0.3	-0.5
Segment 3	-0.6	-0.5	-0.5	-0.6
Segment 2	-3.8	-4.0	-4.2	-4.3

Thank You!

Questions?

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