COASTAL SCIENCE & ENGINEERING
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May 27, 2014

Ms Linda Tucker
City of Isle of Palms
PO Drawer 508
Isle of Palms SC 29451

RE: Breach Inlet Quarterly Survey — April 2014 (Amendment 2 – Task 8) [CSE 2386]

Dear Ms. Tucker:

Per Amendment #2 to the agreement between the City of Isle of Palms and Coastal Science & Engineering (CSE), CSE completed an assessment of the shoreline around Breach Inlet on 9 April 2014. The assessment was conducted in response to severe erosion occurring between 2011 and 2013 along the southwestern end of the Isle of Palms (monitoring stations 0+00–80+00 encompassing monitoring Reach 1 and Reach 2) (Fig 1). The purpose of the assessment is to provide quarterly updates on the magnitude of erosion and potential threats to private property so that the City may inform property owners and plan remedial action if necessary.

FIGURE 1. Monitoring baseline in Reach 1 (upper) and Reach 2 (lower). The highlighted areas show the reach limits.

The April 2014 survey included land-based survey work extending from landward of the frontal dune to (~)−5 feet (ft) NAVD (low-tide wading depth). The data allow for an analysis of dune recession or recovery and beach volume changes above low-tide wading depth. Beach volumes were calculated to −6 ft NAVD (which is approximately low-tide wading depth) for comparison with the previous quarterly surveys (October 2013 and January 2014).

Beach profiles are provided in Attachment 1 and volume changes are shown in Table 1. The Breach Inlet area (Reaches 1 and 2) gained ~24,000 cubic yards (cy) of sand between July and October 2013. This led to moderate recovery of the dry beach following the erosion that occurred between 2011 and July 2013 (details are provided in the letter report submitted in November 2013). Between October 2013 and January 2014, the area as a whole was stable, gaining only 116 cy (measured to −6 ft NAVD). Reach 1 (west of 6th Avenue) gained ~9,500 cy, while Reach 2 lost a similar volume. Between January and April 2014, the two reaches lost a total of 18,700 cy (2.3 cy/ft) with Reach 1 losing 26,000 cy (5.9 cy/ft) and Reach 2 gaining ~7,400 cy (2.0 cy/ft).

The most significant erosion was measured between stations 12+00 and 20+00 (2nd to 3rd Avenues), which lost an average of 25.3 cy/ft between January and April 2014. Figure 2 shows unit volumes for monitoring stations and is useful for visualizing how beach volume has changed over the past ~4.5 years. Despite net volume erosion at each station spanning lines 12+00 to 50+00, profiles show that the beach near the toe of the dune (or escarpment) was stable or accretional between stations 0+00 and 50+00 (inlet to ~7th Avenue). Erosion in these profiles was limited to the wet-sand and underwater profile, likely due to shifting of the northern bar of the Breach Inlet delta, which typically connects the inlet delta to the beach between stations 12+00 and 20+00. The escarpment continues to persist between stations 30+00 and 60+00 although only station 40+00 showed measurable landward retreat (~10 ft) of the escarpment between January and April 2014. There is also a fairly pronounced escarpment along the shoreline adjacent to the inlet (near the bridge), which has eroded since January.

Erosion in Reach 1 between January and April 2014 negates the recent accretion measured between July 2013 and January 2014, and yields a net loss of 4,600 cy since July 2013. Reach 2 has gained ~10,000 cy over the same time. Overall, the two monitoring reaches show a net gain of ~5,400 cy (0.68 cy/ft) since July 2013.

CSE updated a contour map showing the position of the +7 ft NAVD elevation contour (approximate base of the dune or escarpment line) in Reach 1 (Fig 3). The map shows little change between the January and April 2014 position, except accretion near station 4+00. The stability of the contour is a positive sign for the beach condition as portions of the area lost over 100 ft of dunes between 2011 and 2013.

TABLE 1. Volume calculations for recent surveys at Breach Inlet. Volumes were calculated to −6 ft NAVD within the boundaries shown in the profile plots (Attachment 1). Reach 1 encompasses stations 0+00 through OCRM 3115. Reach 2 encompasses the beach between stations OCRM 3115 and 80+00.

Station	Unit Volumes (cy/ft) to -6 ft NAVD						
	Sep-09	Jun-11	Jul-12	Jul-13	Oct-13	Jan-14	Apr-14
3100	129.1	68.3	175.9	110.4	112.7	110.9	124.6
0+00	54.7	138.6	135.8	59.1	83.1	80.0	80.0
4+00	179.2	185.3	167.1	129.7	131.7	130.3	145.2
8+00	203.3	202.2	168.8	146.1	144.1	142.5	144.9
12+00	239.8	211.4	174.4	187.8	181.6	178.9	149.8
3105	245.8	228.1	192.5	185.6	152.6	184.4	150.5
16+00	205.5	194.9	144.6	152.4	150.6	164.9	136.9
20+00	159.3	165.4	131.4	101.9	107.8	126.6	116.4
3110	145.8	155.7	128.4	103.4	111.4	119.4	111.9
30+00	104.7	121.2	105.5	88.0	88.3	88.2	86.7
40+00	104.9	106.1	102.0	88.0	93.5	90.0	82.1
3115	124.7	124.7	129.1	115.9	117.5	112.0	105.9
50+00	129.8	128.2	129.9	121.4	117.4	121.3	117.3
60+00	112.1	113.4	116.7	112.0	119.8	115.7	129.0
70+00	124.6	121.4	123.3	127.7	135.9	126.9	124.4
80+00	111.6	112.8	117.7	121.4	118.9	123.3	126.6

Station	Unit Volume Change Since Previous (cy/ft) to -6 ft NAVD					
	Jun-11	Jul-12	Jul-13	Oct-13	Jan-14	Apr-14
3100	-60.8	107.5	-65.5	2.3	-1.8	13.7
0+00	83.9	-2.8	-76.7	24.0	-3.1	0.0
4+00	6.1	-18.2	-37.3	2.0	-1.4	14.9
8+00	-1.0	-33.4	-22.8	-2.0	-1.6	2.4
12+00	-28.3	-37.0	13.4	-6.2	-2.7	-29.1
3105	-17.8	-35.5	-7.0	-32.9	31.8	-34.0
16+00	-10.6	-50.3	7.7	-1.7	14.2	-28.0
20+00	6.1	-34.0	-29.5	5.9	18.8	-10.2
3110	9.9	-27.4	-25.0	8.0	8.0	-7.5
30+00	16.6	-15.8	-17.5	0.3	-0.1	-1.4
40+00	1.2	-4.1	-14.0	5.5	-3.6	-7.9
3115	0.0	4.4	-13.2	1.5	-5.5	-6.1
50+00	-1.6	1.7	-8.5	-4.0	4.0	-4.0
60+00	1.3	3.3	-4.7	7.8	-4.1	13.3
70+00	-3.1	1.9	4.4	8.2	-9.0	-2.5
80+00	1.3	4.9	3.7	-2.5	4.4	3.3

Station	Total Volume to Next Station (cy) to -6 ft NAVD						
	Sep-09	Jun-11	Jul-12	Jul-13	Oct-13	Jan-14	Apr-14
0+00	46,793	64,787	60,569	37,764	42,958	42,061	49,988
4+00	76,501	77,508	67,182	55,161	55,164	54,552	58,012
8+00	88,605	82,728	68,647	66,771	65,142	64,270	58,929
12+00	89,052	81,260	63,802	68,031	66,453	68,758	57,342
16+00	72,962	72,054	55,200	50,852	51,684	58,303	50,663
20+00	41,194	43,349	35,067	27,710	29,583	33,207	30,813
3110	91,438	101,091	85,346	69,842	72,859	75,746	72,487
30+00	104,783	113,689	103,739	88,010	90,901	89,072	84,421
40+00	44,766	45,012	45,068	39,774	41,145	39,384	36,658
3115	77,632	77,141	78,992	72,376	71,617	71,160	68,070
50+00	120,962	120,797	123,271	116,668	118,558	118,511	123,141
60+00	118,322	117,411	119,986	119,827	127,826	121,291	126,700
70+00	118,060	117,147	120,522	124,535	127,385	125,076	125,504
80+00	0	0	0	0	0	0	0
Reach 1	656,095	681,479	584,620	503,914	515,888	525,353	499,314
Reach 2	434,976	432,496	442,771	433,406	445,387	436,038	443,414

Change Since Previous to -6 ft NAVD						
	Jun-11	Jul-12	Jul-13	Oct-13	Jan-14	Apr-14
Reach 1 (cy)	25,384	-96,859	-80,706	11,974	9,464	-26,039
Reach 2 (cy)	-2,480	10,275	-9,365	11,980	-9,349	7,376
Total (cy)	22,904	-86,584	-90,071	23,954	116	-18,663
Reach 1 (cy/ft)	5.8	-22.1	-18.4	2.7	2.2	-5.9
Reach 2 (cy/ft)	-0.7	2.8	-2.6	3.3	-2.6	2.0
Total (cy/ft)	2.9	-10.8	-11.3	3.0	0.0	-2.3

Annual Change Rate (cy/ft per yr) to -6 ft NAVD						
		Jun 11 - Jul 12	Jul 12 - Jul 13	Jul 13 - Oct 13	Oct 13 - Jan 14	Jan - Apr 14
Reach 1		-89,276	-80,706	40,846	40,641	-125,056
Reach 2		9,471	-9,365	40,868	-40,144	35,422
Total		-79,806	-90,071	81,714	497	-89,634

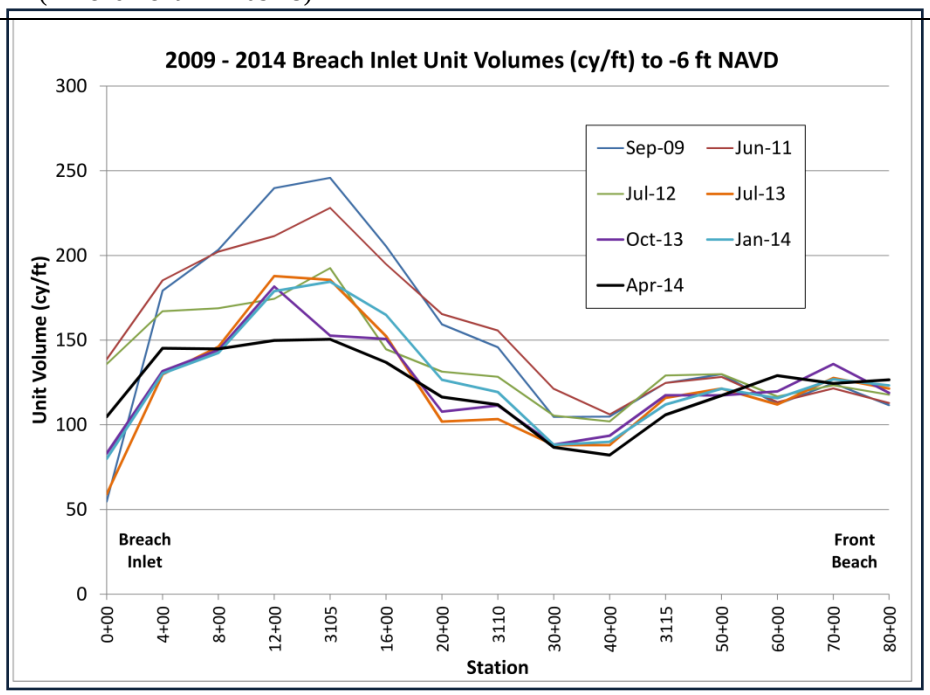

FIGURE 2. Beach unit volumes (in cy/ft to −6 ft NAVD) for monitoring stations in the Breach Inlet area.

FIGURE 3. Contour map showing the location of the +7 ft NAVD contour, which is approximately the toe of the dune or the escarpment line.

The April 2014 survey shows that Reach 1 continues to be highly dynamic with no consistent pattern of erosion or accretion. Generally, the erosion of the dune in Reaches 1 and 2, which had retreated severely from 2011 to 2013, has ceased (except for line 40+00) although measured volume losses along the wet-sand beach and wading depth portion of the profile occurred at several stations. The most critically eroded area continues to be the stretch between stations 4+00 and 16+00, as houses in this area presently have the narrowest buffer between the structure and the water. CSE continues to anticipate the area recovering naturally over time, although the area should continue to be monitored at least semi-annually until significant recovery can be documented.

This is the final quarterly survey under the present monitoring agreement. CSE will complete a comprehensive survey of the area as part of the regular island-wide monitoring effort in the summer of 2014 (July–August). If the City wishes to continue more frequent monitoring of Breach Inlet, CSE will provide a proposal for such services. Please contact me if you have any questions about this update.

Sincerely,

Coastal Science & Engineering (CSE)

Steven Traynum
Coastal Scientist

Enclosures: Photos and Attachment 1 — April 2014 Profiles

April 2014 images of the Breach Inlet shoreline (left, near the bridge) and station 0+00.

January 2014 (left) and April 2014 (right) images from station 8+00, looking toward the dune. The beach elevation increased in front of the escarpment between the two photo dates and no landward retreat was visible.

April 2014 images from station 20+00, looking west (left) and landward (right). Despite a net loss of 10 cy/ft at the station (January–April), the dry beach accreted and the old escarpment continues to heal.

April 2014 images of station 40+00 (left) and station 60+00 (right), looking west. The escarpment retreated ~10 ft at station 40+00 between January and April 2014, and remained fairly stable at station 60+00.