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July 13, 2012

Ms. Kelly de Schaun  
Park Board of Trustees of the City of Galveston  
601 Tremont Street  
Galveston, Texas 77550



**RE: GALVESTON SEAWALL BEACH NOURISHMENT MONITORING  
PROGRAM (2012)**

Dear Ms. de Schaun:

We appreciate the opportunity to continue to assist the Park Board of Trustees of the City of Galveston (Park Board) with monitoring of the beach nourishment projects performed along the Galveston Seawall in 2008 and 2009. Enclosed are two sealed sets of 11x17 survey drawings and a compact disc containing PDF copies of this letter, survey drawings, and aerial photograph for the beach survey performed in June 2012.

Using the June 2012 monitoring survey in conjunction with the previous beach surveys, a brief analysis of the performance of the beach was performed. The analysis included three overall tasks to assess past performance and aid in future performance assessments. These were:

- 1) Shoreline Delineation
- 2) Calculation of Shoreline Advance/Retreat
- 3) Calculation of Upper Beach Volume Gain/Loss

Previous surveys included in the analysis were:

- 1) The 2011 beach monitoring survey
- 2) The 2010 acceptance survey for the 2009 beach nourishment (i.e., the FEMA Beach Nourishment Project)
- 3) The 2009 acceptance survey for the 2008 beach nourishment (i.e., the Emergency Beach Nourishment Project)

Beach Nourishment History:

In September 2008, Hurricane Ike made landfall near the Galveston Entrance Channel causing damage along the Texas and Louisiana coast. The beach fronting the Galveston Seawall experienced significant erosion and shoreline retreat during the storm with portions of the shoreline retreating all the way to the toe of the seawall. The Park Board, in a joint effort with the Texas General Land Office, commenced construction of the Galveston Seawall Emergency

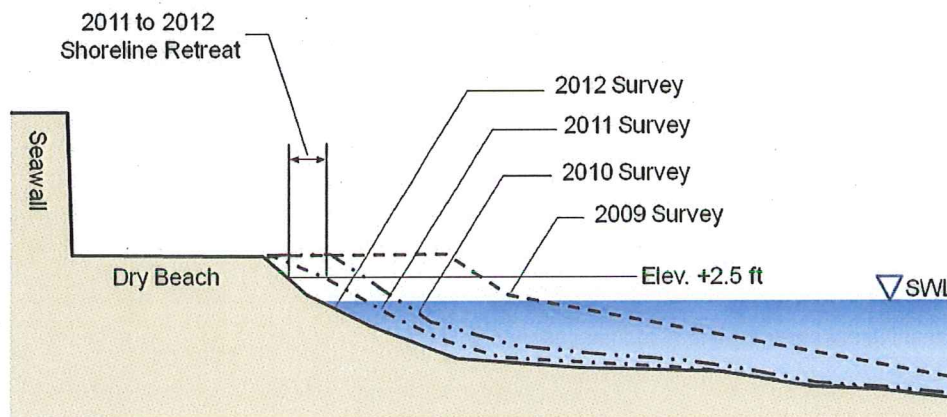
Beach Nourishment in fall 2008. During this project, approximately 490,500 cubic yards (CY) of sand was placed along the seawall. However, due to a short construction window prior to turtle nesting season, the entire length of the seawall was unable to be nourished. To address this, in 2009 the Park Board commenced construction of the Galveston Seawall FEMA Beach Nourishment which placed approximately 61,300 CY of additional sand in areas that were not nourished the previous year.

#### Shoreline Delineation:

For the purpose of this analysis, the shoreline was delineated as the +2.5 ft NAVD contour with the upper beach consisting of areas above this contour. The +2.5 ft NAVD contour is defined as a representative limit between the wet and dry beach along the upper Texas coast based on Gibeaut et al. (2003)<sup>1</sup>. This is shown visually in the survey drawings on Sheets V-01 through V-04. The contour line was developed by identifying and then connecting the +2.5 ft elevation of each transect along with additional survey data outside the transects (the additional survey data were not shown on the survey drawings for clarity). If a storm occurs, this process can be repeated to document shoreline retreat caused by the storm. In addition to the 2012 shoreline contour, the 2011 shoreline contour was also plotted on the survey drawings as a reference to observe shoreline change over the past year.

#### Calculation of Shoreline Advance/Retreat:

The horizontal distance between the shoreline positions shown in the 2012 monitoring survey and 2011 monitoring survey was calculated at an elevation of +2.5 ft. This provides a quantitative value of shoreline advance and retreat over the past year. This is shown schematically in Figure 1.



**Figure 1 Schematic cross-section of beach monitoring surveys.**

<sup>1</sup> Gibeaut, J.C., Hepner, T.L., Waldinger, R., Andrews, J.R., Smyth, R.C., and Gutierrez, R. 2003. Geotextile Tubes Along the Upper Texas Gulf Coast: May 200 to March 2003. Austin, TX: University of Texas, Bureau of Economic Geology.



Table 1 shows the shoreline change from 2011 to 2012, positive indicating advance and negative indicating retreat. Transects were grouped by beach segments within a groin<sup>2</sup> compartment.

<b>TABLE 1. 2011 - 2012 GALVESTON SEAWALL BEACH MONITORING SHORELINE CHANGE</b>		
<b>LOCATION</b>	<b>TRANSECT STATION</b>	<b>DISTANCE (FT) (+) GAIN (-) RETREAT</b>
Station 162+00 to 171+00	163+51	28.6
	169+52	5.3
Station 171+00 to 186+00	176+52	-3.0
	183+03	-1.8
Station 186+00 to 200+00	188+03	-23.7
	196+05	-4.2
Station 200+00 to 214+00	205+39	-10.3
	212+91	1.8
Station 214+00 to 230+00	219+92	33.7
	226+92	-8.7
Station 230+00 to 241+50	233+49	-2.5
	239+49	-4.5
Station 241+50 to 253+50	243+49	-22.0
	250+50	-3.1
Station 253+50 to 268+00	258+08	53.7
	266+09	-8.7
Station 268+00 to 282+00	273+09	17.6
	278+76	12.1
Station 282+00 to 290+50	284+94	-0.2
	288+94	34.8
Station 290+50 to 306+00	292+94	18.3
	301+83	-15.1
Station 306+00 to 320+50	307+35	-14.7
	313+36	1.1
	319+39	-5.4
Station 320+50 to 337+00	326+42	17.1
	333+45	11.5
Station 337+00 to 364+00	340+48	-6.6
	347+12	-1.7
	354+18	-6.4
	361+54	7.0

<sup>2</sup> "Groin" refers to a shoreline protection structure that is situated perpendicular to the shoreline to disrupt longshore (parallel to the beach) sediment transport. There are 15 groins along the Galveston seawall which are made with quarry-stone and granite armor units.

The average shoreline change that occurred between 2011 and 2012 was an **advance** of approximately 3 ft. Notable gains in the shoreline occurred at station 163+51 (near 61<sup>st</sup> Street), station 219+92 (Fort Crockett area), station 258+08 (near 35<sup>th</sup> Street), and at station 288+94 (near 28<sup>th</sup> Street). Notable retreat in the shoreline occurred at station 188+03 (near 53<sup>rd</sup> street) and at station 243+49 (near Mike Gaido Road).

Calculation of Upper Beach Volume Gain/Loss:

Volume gains and losses to the upper beach were estimated by calculating the difference in area between the 2012 and 2011 surveys above the +2.5 ft contour. Net area refers to incorporating both gains and losses. Volumes were calculated per groin compartment. This provides a quantitative value of volume gained (accretion) and loss (erosion) of the upper beach. Table 2 shows the volume change from 2011 to 2012, with positive values indicating gain and negative values indicating a loss.

The average change in volume of the upper beach was a **gain** of approximately 11,150 CY. With the exception of 3 areas, the upper beach as whole experienced accretion. The three areas that experienced notable losses (greater than 1,000 CY per groin compartment) included the area between station 171+00 and 186+00 (near the Galveston Convention Center), area between station 186+00 and 200+00 (near the San Luis Resort), and the area between station 282+00 and 290+50 (near 29<sup>th</sup> street). These areas experienced accretion between 2010 and 2011.

TABLE 2. 2011 - 2012 GALVESTON SEAWALL BEACH MONITORING UPPER BEACH VOLUME			
GROIN COMPARTMENT	TRANSECT STATION	UPPER BEACH CROSS-SECTIONAL AREA (SF)	ESTIMATED VOLUME (CY) (+) ACCRETION (-) EROSION
Station 162+00 to 171+00	163+51	39.0	999.4
	169+52	20.9	
Station 171+00 to 186+00	176+52	-25.7	-1,632.3
	183+03	-34.6	
Station 186+00 to 200+00	188+03	-50.1	-1,238.5
	196+05	-3.8	
Station 200+00 to 214+00	205+39	-24.6	-546.9
	212+91	16.3	
Station 214+00 to 230+00	219+92	41.0	1,556.3
	226+92	5.1	
Station 230+00 to 241+50	233+49	1.4	-245.4
	239+49	-15.0	
Station 241+50 to 253+50	243+49	86.5	2,270.8
	250+50	20.9	
Station 253+50 to 268+00	258+08	65.4	1,926.4
	266+09	-7.2	
Station 268+00 to 282+00	273+09	14.2	414.2
	278+76	0.0	
Station 282+00 to 290+50	284+94	-175.9	-5,890.1
	288+94	-202.8	
Station 290+50 to 306+00	292+94	-35.3	4,323.4
	301+83	167.1	
Station 306+00 to 320+50	307+35	-7.8	1,585.0
	313+36	74.4	
	319+39	0.8	
Station 320+50 to 337+00	326+42	21.5	3,635.4
	333+45	110.3	
Station 337+00 to 364+00	340+48	15.2	3,999.5
	347+12	-8.0	
	354+18	-2.2	
	361+54	170.6	
		<b>Total Volume</b>	<b>11,157.2</b>

Recommendations:

Based on a qualitative comparison of the 2012 and 2011 shorelines (as shown on the survey drawings), an average shoreline advance, and an average gain in volume, the project appears to have been **well maintained** between 2011 and 2012. It is recommended that the current beach maintenance activities continue. The three areas identified in the "Upper Beach Volume" section that experienced loss should be given priority when providing maintenance material; however, it will be important that other areas of the beach also continue to be maintained.

Thank you for providing HDR the opportunity to continue to assist the Park Board with the Galveston Seawall beach nourishment project. We look forward to continue working with you on this important project. Please feel free to contact me if you have any questions or comments.

Sincerely,  
HDR ENGINEERING, INC.



Ronald L McPherson, P.E.  
Coastal Engineer

Enclosures: Drawings (2 sets)  
CD (Letter, Drawings (PDF), Aerial Photograph)