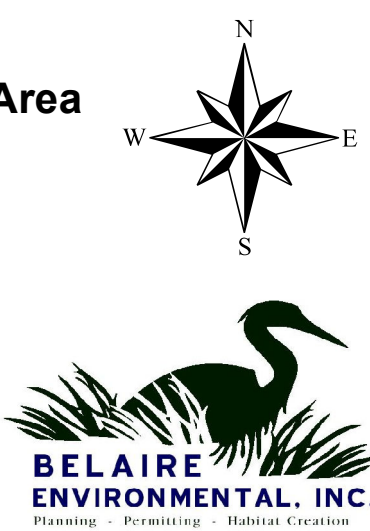


**Figure 5: 0.5 Ft Contour Map**  
**Approximate 300-Ac Seagrass Survey Area**  
**Corps of Engineers GIWW PA62,**  
**Galveston County, Texas**

Notes:  
 - Imagery obtained from TNRIS, Galveston, County.  
 - Image date: January 19, 2009.  
 - Prepared by Belaire Environmental, Inc. January, 5  
 2012 (RKW); revised January 6, 2012 (ANB).

0 150 300  
 Feet



**Legend**

- × Elevation (NAVD 88)
- 0.5-Ft Contours
- Edge of Seagrass
- Delineated Seagrass Boundary
- ▨ Approx. Dredge Material Boundary
- ▭ CE Placement Area 62 & 63

**Topographic Survey Notes:**

- Placement Area 62 boundary provided by the U.S. Army Corps of Engineers (M. Nelson).
- The seafloor of the survey area was mapped on a 100 ft. grid to obtain a 0.5-ft contour.
- Elevations were recorded in NAVD 88 Datum.
- Each sample location was recorded by RTK GPS.



Approx. 57 Ac Boundary  
 of Recent Dredge Material  
 Placement

Approx. 251.4 Ac  
 of Seagrass Delineated  
 by Edge of Seagrass

West Bay

## **Appendix B**

### Approved Sampling Plan

# *Belaire Environmental, Inc.*

*Planning • Permitting • Habitat Creation*

January 7, 2012  
Revised January 8, 2012

Mr. Randy Boyd  
RLB Contracting  
410 Broadway St.  
Port Lavaca, Texas 77979

Ms. Carolyn Murphy  
U.S. Army Corps of Engineers  
2000 Fort Point Rd.  
Galveston, Texas 77550

RE: Proposed Sampling Plan, Placement Area (PA) 62 Seagrass Survey; Corps of Engineers,  
GIWW, Galveston County, Texas

Dear Mr. Boyd and Ms. Murphy:

Per your request, I have prepared the sampling plan to describe the methods Belaire Environmental, Inc. (BEI) will employ at the subject site. The following includes 1. Seagrass Survey Plan, and 2. Seafloor Sampling Plan.

I. Seagrass Survey Plan:

- A. The seagrass survey will be conducted between January 9 and January 12, 2012. However, BEI will start the survey work at the east end of PA 62 so that work can continue beyond January 12, 2012, if necessary. It is our understanding that the disposal operation at PA 62 will occur in an east to west direction.
- B. The seagrass survey will be conducted using the Braun-Blanquet rapid visual assessment technique (Braun-Blanquet, 1972. *Plant Sociology: The Study of Plant Communities*. Hafner Publishing Company). Also refer to Pulich, et al (Pulich, Warren Jr., Hardegree, Beau, Kopecky, Andrea, Schwelling, Steve, Onuf, Christopher, Dunton, Kenneth. 2000. *Texas Seagrass Monitoring Program: 2000 Strategic Plan*. TPWD). In addition, the Fourqueane analytical technique utilizing a post-hole digger of 3 separate grabs to obtain a root sample every 10 meters (1,629 grabs). The root stems will be examined to determine the presence or absence of seagrass roots and species, if possible.
- C. The survey will be taken along the seagrass survey in the baseline as shown on Exhibit A. BEI will examine 13 survey transects ranging in length from 995 to 1,730 linear Ft. These transects are shown on Exhibit A. Prior to initiating field work, BEI will establish GPS coordinates every 10 meters along each transect. Once in the field, the ends of each transect will be marked with PVC pipe. A quadrat sample will be taken at 20-meter intervals on each transect and three post-hole digger samples will be taken at 10-meter intervals. A total of 272 sample quadrats at 20-meters along each transect, each measuring 0.25 square meters, will be located by submeter GPS. Within each quadrat,

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each seagrass species shall be visually identified, and a score based on the cover of the species in that quadrat shall be assigned according to the analytical techniques developed by Fourqurean et al. The table below summarizes the scoring methodology:

Braun-Blanquet abundance scores (S). Each seagrass species will be scored in each quadrat according to this scale (from Fourqurean et al., 2001). (Shoot density applies to *Thalassia* only).

S	Interpretation
0	Species absent from quadrat
0.1	Species represented by a solitary short shoot, <5% cover
0.5	Species represented by a few (<5%) short shoots, <5% cover
1	Species represented by many (>5%) short shoots, <5% cover
2	Species represented by many (>5%) short shoots, 5%-25% cover
3	Species represented by many (>5) short shoots, 25%-50% cover
4	Species represented by many (>5) short shoots, 50%-75% cover
5	Species represented by many (>5%) short shoots, 75%-100% cover

The data for each quadrat will be recorded and data will be analyzed to identify density, abundance and frequency by species for the seagrass bed (Fourqurean J.W., A. Willsie, C.D. Rose, and L.M. Rutten. 2001. Spatial and Temporal Patterns in Seagrass Community Composition and Productivity in South Florida. *Marine Biology Journal* 138:341-354.). Seagrass will not be removed or disturbed during the conduct of the rapid visual assessment.

The 1,629 post-hole digger samples at 10-meter intervals will be examined to determine if seagrass roots are present or absent and identify species present if possible.

Prior to the start of the survey BEI will determine the deep edge of seagrass at six of the 13 transects. Elevations at these deep edge points will be used to establish the bayward boundary of the survey. Sampling will stop three post-hole sample stations beyond the elevations of the deepest seagrass edge found.

- D. BEI personnel will travel to the site in outboard Skiffs (18 Ft, 21 Ft, or 26 Ft). Skiffs draw less than one foot of water. Prop-washing will be strictly avoided. Up to three 2 person crews will conduct the sampling according to methods described above. The seagrass survey will be conducted within the limits of the survey boundary shown on Exhibit A. BEI staff will include men and women with at least three years experience in conducting seagrass surveys in the bays of Texas. I will supervise the work as well as conduct sampling. I have more than 30 years experience in planning and conducting seagrass surveys.

## II. Seafloor Sampling Plan:

The seafloor sampling plan will be comprised of two components: (a) mapping elevations of the 300-acre area to establish 0.5 Ft contours; and (b) collecting 52 sediment samples to characterize sediments throughout the survey area. To estimate the site elevations on 0.5 Ft contours, BEI will obtain elevations on a 100 Ft grid throughout the sampling area on Exhibit A. This survey will include the seagrass bed and the submerged portion of PA

62. BEI will use RTK GPS (subcentimeter) for this work. BEI will tie elevations in to the USACE tide staff for control if such staff is available at the project site. Otherwise, results will be reported in NAVD 88. Experienced staff will perform this work utilizing accepted procedures. BEI does not employ registered professional engineers but our staff routinely conducts elevation surveys for habitat planning purposes. BEI will collect four, evenly spaced sediment samples per transect (52 total sediment samples). The samples will be taken to a depth of two feet. Each sample location shall be logged and visual classified in accordance with ASTM D 2487 (Unified Soil Classification System) and the location will be recorded by sub-meter GPS. We anticipate that a 1-1/2 inch diameter PVC core sampler with a core catcher will be used to collect each sediment sample. The core samples will be sized to minimize the impacts to the bay bottom. The entire sample will be placed in a container provided by the testing laboratory. All samples will be obtained, preserved and transported in accordance with ASTM D 1452 and ASTM D 4220. The samples will be tested for abbreviated mechanical analysis, Atterberg limits, void ratio and visual characteristic classification. The testing will be done within 30 days of completion of the seagrass survey, in an ERDC validated laboratory. BEI will use The Professional Services Industries, Inc. (PSI) laboratory in Corpus Christi, Texas to conduct the testing. Sampling and testing shall be completed prior to November 30, 2011 if the contract is awarded by October 12, 2011.

The above plan only covers the pre-construction sampling. Any post-construction plan will be prepared at a later date.

Please let me know if you need additional information.

Sincerely,



Charles E. Belaire

## **Appendix C**

Seagrass Survey Results, Data Analysis

Table 1: Transects 1-9, 12-13  
 CE PA 62 Seagrass Survey Statistics  
 February 15, 2012

Transect 1		
SPECIES	# OF QUADS PRESENT IN	TOTAL # OF QUADS IN TRANSECT
<i>Halodule wrightii</i>	4	32

DENSITY = SUM(B-B ABUNDANCE SCORES OF SPECIES IN EACH QUAD)/TOTAL NUMBER OF QUADS IN TRANSECT	
SPECIES	DENSITY
<i>Halodule wrightii</i>	0.04
<b>Total Density</b>	0.04

ABUNDANCE = SUM(B-B ABUNDANCE SCORES OF SPECIES IN EACH QUAD)/NUMBER OF QUADS SPECIES IS PRESENT IN	
SPECIES	ABUNDANCE
<i>Halodule wrightii</i>	0.30

INDIVIDUAL SEAGRASS SPECIES FREQUENCY = NUMBER OF QUADS SPECIES IS PRESENT IN/TOTAL NUMBER OF QUADS IN TRANSECT	
SPECIES	FREQUENCY
<i>Halodule wrightii</i>	0.13

OVERALL SEAGRASS FREQUENCY = THE NUMBER OF QUADS WITH SEAGRASS PRESENT/TOTAL NUMBER OF QUADS IN TRANSECT	
Overall Frequency	
	0.13

Transect 2		
SPECIES	# OF QUADS PRESENT IN	TOTAL # OF QUADS IN TRANSECT
<i>Halodule wrightii</i>	27	34
<i>Halophila engelmannii</i>	14	

DENSITY = SUM(B-B ABUNDANCE SCORES OF SPECIES IN EACH QUAD)/TOTAL NUMBER OF QUADS IN TRANSECT	
SPECIES	DENSITY
<i>Halodule wrightii</i>	2.91
<i>Halophila engelmannii</i>	0.75
<b>Total Density</b>	3.66

ABUNDANCE = SUM(B-B ABUNDANCE SCORES OF SPECIES IN EACH QUAD)/NUMBER OF QUADS SPECIES IS PRESENT IN	
SPECIES	ABUNDANCE
<i>Halodule wrightii</i>	3.67
<i>Halophila engelmannii</i>	1.82

INDIVIDUAL SEAGRASS SPECIES FREQUENCY = NUMBER OF QUADS SPECIES IS PRESENT IN/TOTAL NUMBER OF QUADS IN TRANSECT	
SPECIES	FREQUENCY
<i>Halodule wrightii</i>	0.79
<i>Halophila engelmannii</i>	0.41

OVERALL SEAGRASS FREQUENCY = THE NUMBER OF QUADS WITH SEAGRASS PRESENT/TOTAL NUMBER OF QUADS IN TRANSECT	
Overall Frequency	
	0.79