Appendix B

PA 62 Approved Sampling Plan

PA 63 Approved Sampling Plan

Belaire Environmental, Inc.
Planning · Permitting · Habitat Creation

October 31, 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 Post-Construction 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 the Seagrass Survey Plan.

I. <u>Seagrass Survey Plan</u>:

    A. The seagrass survey will be conducted between November 5 and November 30, 2012. The schedule may be affected by winds, water turbidity, frontal passages, the depth of dredge material with the survey area (currently unknown) and other factors. BEI will make every effort to complete the field survey by November 27, 2012.

    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). At 20 meter intervals on 13 transects BEI will observe seagrass within a 0.25 m^2 quadrat (272 quadrat samples). In addition, the Fourqueane analytical technique utilizing a post-hole digger of 3 separate grabs to obtain root samples 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, spaced 1,000 Ft apart, 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, 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 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. Additional crews may be used if factors mentioned in "A" above cause delays in the sampling effort. 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.

The above plan describes the post-construction sampling. Please let me know if you need additional information.

Sincerely,

Charles E. Belaire

**Exhibit A: Post-Construction Seagrass Survey Area
Corps of Engineers GIWW PA62,
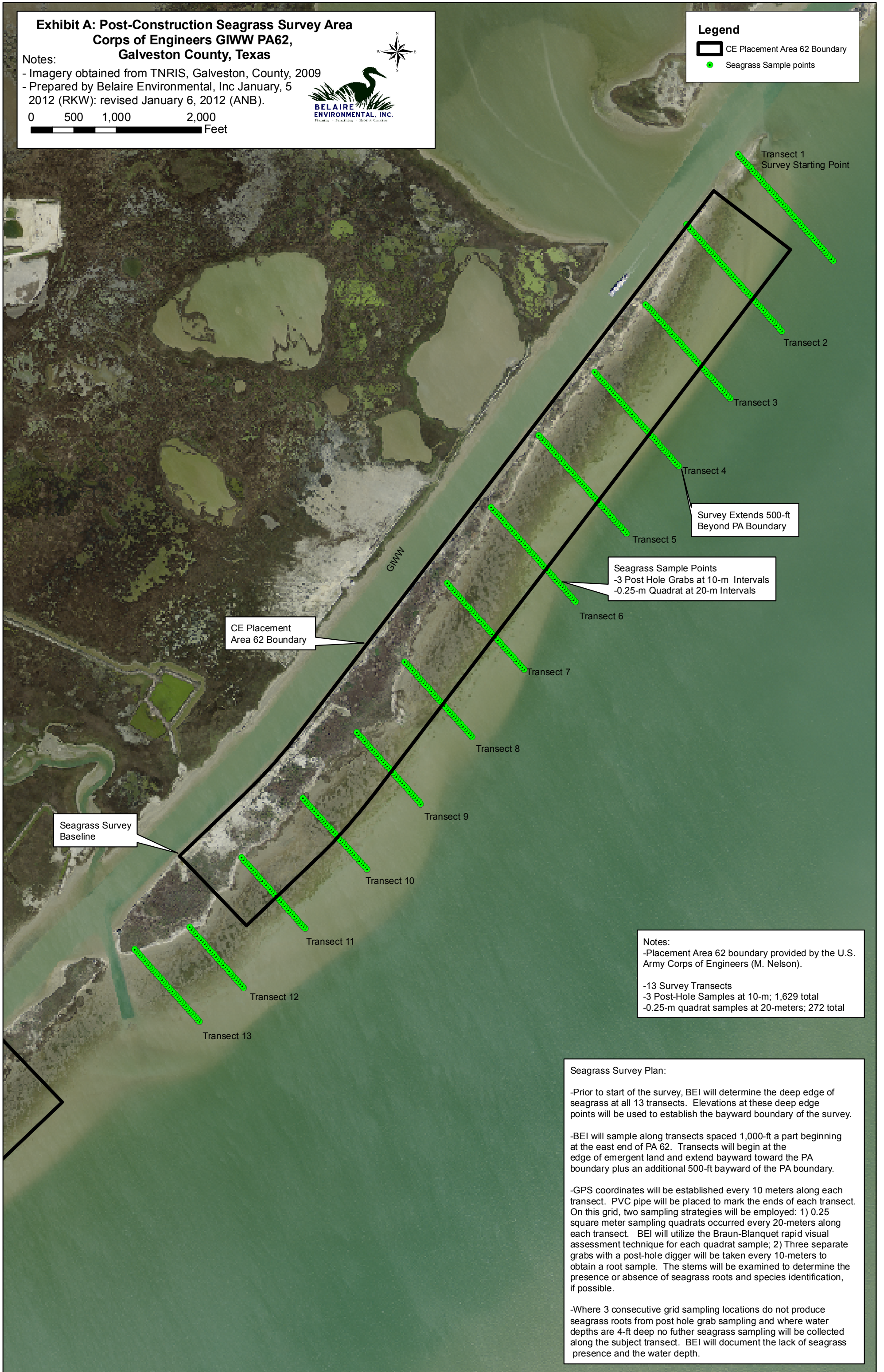Galveston County, Texas**

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

0   500   1,000   2,000
                               Feet

BELAIRE
ENVIRONMENTAL, INC.

Legend

☐ CE Placement Area 62 Boundary
● Seagrass Sample points

Transect 1
Survey Starting Point

Transect 2

Transect 3

Transect 4

Survey Extends 500-ft
Beyond PA Boundary

Transect 5

Seagrass Sample Points
-3 Post Hole Grabs at 10-m Intervals
-0.25-m Quadrat at 20-m Intervals

Transect 6

CE Placement
Area 62 Boundary

GIWW

Transect 7

Transect 8

Transect 9

Seagrass Survey
Baseline

Transect 10

Transect 11

Transect 12

Transect 13

Notes:
-Placement Area 62 boundary provided by the U.S.
Army Corps of Engineers (M. Nelson).

-13 Survey Transects
-3 Post-Hole Samples at 10-m; 1,629 total
-0.25-m quadrat samples at 20-meters; 272 total

Seagrass Survey Plan:

-Prior to start of the survey, BEI will determine the deep edge of
seagrass at all 13 transects. Elevations at these deep edge
points will be used to establish the bayward boundary of the survey.

-BEI will sample along transects spaced 1,000-ft a part beginning
at the east end of PA 62. Transects will begin at the
edge of emergent land and extend bayward toward the PA
boundary plus an additional 500-ft bayward of the PA boundary.

-GPS coordinates will be established every 10 meters along each
transect. PVC pipe will be placed to mark the ends of each transect.
On this grid, two sampling strategies will be employed: 1) 0.25
square meter sampling quadrats occurred every 20-meters along
each transect.   BEI will utilize the Braun-Blanquet rapid visual
assessment technique for each quadrat sample; 2) Three separate
grabs with a post-hole digger will be taken every 10-meters to
obtain a root sample. The stems will be examined to determine the
presence or absence of seagrass roots and species identification,
if possible.

-Where 3 consecutive grid sampling locations do not produce
seagrass roots from post hole grab sampling and where water
depths are 4-ft deep no futher seagrass sampling will be collected
along the subject transect. BEI will document the lack of seagrass
 presence and the water depth.

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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 the Seagrass Survey Plan.

   I.   <u>Seagrass Survey Plan</u>:

      A. The seagrass survey will be conducted between November 5 and November 30, 2012. The schedule may be affected by winds, water turbidity, frontal passages, the depth of dredged material within the survey area (currently unknown) and other factors. BEI will make every effort to complete the field survey by November 27, 2012.

      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). At 20 meter intervals on 9 transects BEI will observe seagrass within a 0.25 meter^2 quadrat (194 samples). In addition, the Fourqueane analytical technique utilizing a post-hole digger of 3 separate grabs to obtain root samples every 10 meters (1,164 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 B. BEI will examine 9 survey transects, spaced 1,000 Ft apart, ranging in length from 956 to 1,500 linear Ft. These transects are shown on Exhibit B. 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 194 sample quadrats at 20-meters along each transect, each measuring 0.25 square meters, will be located by submeter GPS. Within each quadrat, 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).

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0	Species absent from quadrat
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2	Species represented by many (>5%) short shoots, 5%-25% cover
3	Species represented by many (>5) short shoots, 25%-50% cover
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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 1,164 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 the 9 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. Additional crews may be used if factors mentioned in "A" above cause delays in the sampling effort. The seagrass survey will be conducted within the limits of the survey boundary shown on Exhibit B. 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.

The above plan describes the post-construction sampling of PA 63. Please let me know if you need additional information.

Sincerely,

Charles E. Belaire

Exhibit B: Seagrass Survey Plan
Three Dredge Material Areas Placed on
Corps of Engineers GIWW PA 63
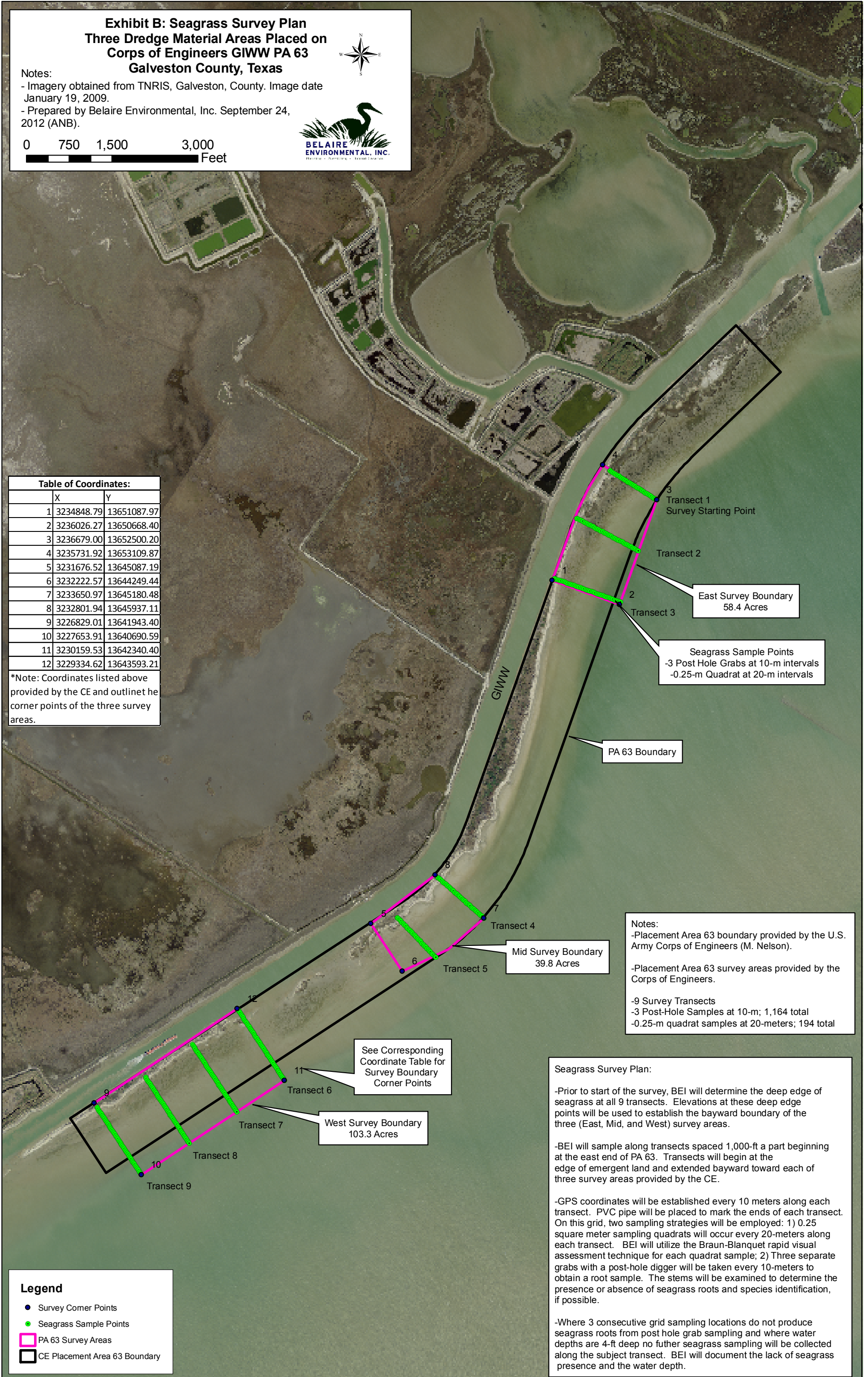**Galveston County, Texas**

Notes:
- Imagery obtained from TNRIS, Galveston, County. Image date January 19, 2009.
- Prepared by Belaire Environmental, Inc. September 24, 2012 (ANB).

0   750   1,500   3,000
————————————————— Feet

Table of Coordinates:

	X	Y
1	3234848.79	13651087.97
2	3236026.27	13650668.40
3	3236679.00	13652500.20
4	3235731.92	13653109.87
5	3231676.52	13645087.19
6	3232222.57	13644249.44
7	3233650.97	13645180.48
8	3232801.94	13645937.11
9	3226829.01	13641943.40
10	3227653.91	13640690.59
11	3230159.53	13642340.40
12	3229334.62	13643593.21

*Note: Coordinates listed above provided by the CE and outlinet he corner points of the three survey areas.

Transect 1
Survey Starting Point

Transect 2

East Survey Boundary
58.4 Acres

Seagrass Sample Points
-3 Post Hole Grabs at 10-m intervals
-0.25-m Quadrat at 20-m intervals

Transect 3

PA 63 Boundary

GIWW

Transect 4

Mid Survey Boundary
39.8 Acres

Transect 5

Notes:
-Placement Area 63 boundary provided by the U.S. Army Corps of Engineers (M. Nelson).

-Placement Area 63 survey areas provided by the Corps of Engineers.

-9 Survey Transects
-3 Post-Hole Samples at 10-m; 1,164 total
-0.25-m quadrat samples at 20-meters; 194 total

See Corresponding Coordinate Table for Survey Boundary Corner Points

Transect 6

West Survey Boundary
103.3 Acres

Transect 7

Transect 8

Transect 9

Seagrass Survey Plan:

-Prior to start of the survey, BEI will determine the deep edge of seagrass at all 9 transects. Elevations at these deep edge points will be used to establish the bayward boundary of the three (East, Mid, and West) survey areas.

-BEI will sample along transects spaced 1,000-ft a part beginning at the east end of PA 63. Transects will begin at the edge of emergent land and extended bayward toward each of three survey areas provided by the CE.

-GPS coordinates will be established every 10 meters along each transect. PVC pipe will be placed to mark the ends of each transect. On this grid, two sampling strategies will be employed: 1) 0.25 square meter sampling quadrats will occur every 20-meters along each transect. BEI will utilize the Braun-Blanquet rapid visual assessment technique for each quadrat sample; 2) Three separate grabs with a post-hole digger will be taken every 10-meters to obtain a root sample. The stems will be examined to determine the presence or absence of seagrass roots and species identification, if possible.

-Where 3 consecutive grid sampling locations do not produce seagrass roots from post hole grab sampling and where water depths are 4-ft deep no futher seagrass sampling will be collected along the subject transect. BEI will document the lack of seagrass presence and the water depth.

Legend

• Survey Corner Points
• Seagrass Sample Points
—— PA 63 Survey Areas
☐ CE Placement Area 63 Boundary

Appendix C

Table 1: PA 62 Transects 1-13 Seagrass Survey Results, Data Analysis

Table 2: PA 63 Transects 1-9 Seagrass Survey Results, Data Analysis

Table 1: Transects 1-13 Survey Statistics
PA 62 Seagrass Survey

Transect 1

SPECIES	# OF STATIONS PRESENT IN	TOTAL # OF STATIONS IN TRANSECT	# OF BRAUN-BLANQUET QUADS IN TRANSECT
Halodule wrightii	0	29	15

DENSITY = SUM(B-B ABUNDANCE SCORES OF SPECIES IN EACH QUAD)/TOTAL NUMBER OF QUADS IN TRANSECT

SPECIES	DENSITY
Halodule wrightii	0.00
Total Density	0.00

ABUNDANCE = SUM(B-B ABUNDANCE SCORES OF SPECIES IN EACH QUAD)/NUMBER OF QUADS SPECIES IS PRESENT IN

SPECIES	ABUNDANCE
Halodule wrightii	0.00

INDIVIDUAL SEAGRASS SPECIES FREQUENCY = NUMBER OF QUADS SPECIES IS PRESENT IN/TOTAL NUMBER OF QUADS IN TRANSECT

SPECIES	FREQUENCY
Halodule wrightii	0.00

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

Overall Frequency	0

Transect 5

SPECIES	# OF STATIONS PRESENT IN	TOTAL # OF STATIONS IN TRANSECT	# OF BRAUN-BLANQUET QUADS IN TRANSECT
Halodule wrightii	31	34	18
Halophila engelmannii	1		

DENSITY = SUM(B-B ABUNDANCE SCORES OF SPECIES IN EACH QUAD)/TOTAL NUMBER OF QUADS IN TRANSECT

SPECIES	DENSITY
Halodule wrightii	4.24
Halophila engelmannii	0.00
Total Density	4.24

ABUNDANCE = SUM(B-B ABUNDANCE SCORES OF SPECIES IN EACH QUAD)/NUMBER OF QUADS SPECIES IS PRESENT IN

SPECIES	ABUNDANCE
Halodule wrightii	4.80
Halophila engelmannii	0.00

INDIVIDUAL SEAGRASS SPECIES FREQUENCY = NUMBER OF QUADS SPECIES IS PRESENT IN/TOTAL NUMBER OF QUADS IN TRANSECT

SPECIES	FREQUENCY	Post-Hole Occurrence
Halodule wrightii	0.88	90

Halophila engelmannii	0.01	1
Combined	0.89	91

OVERALL SEAGRASS FREQUENCY = THE NUMBER OF QUADS WITH SEAGRASS PRESENT/TOTAL NUMBER OF QUADS IN TRANSECT	
Overall Frequency	0.89

Transect 6

SPECIES	# OF STATIONS PRESENT IN	TOTAL # OF STATIONS IN TRANSECT	# OF BRAUN-BLANQUET QUADS IN TRANSECT
Halodule wrightii	34	39	20
Halophila engelmannii	6		

DENSITY = SUM(B-B ABUNDANCE SCORES OF SPECIES IN EACH QUAD)/TOTAL NUMBER OF QUADS IN TRANSECT	
SPECIES	DENSITY
Halodule wrightii	3.95
Halophila engelmannii	0.75
Total Density	4.70

ABUNDANCE = SUM(B-B ABUNDANCE SCORES OF SPECIES IN EACH QUAD)/NUMBER OF QUADS SPECIES IS PRESENT IN	
SPECIES	ABUNDANCE
Halodule wrightii	4.65
Halophila engelmannii	0.88

INDIVIDUAL SEAGRASS SPECIES FREQUENCY = NUMBER OF QUADS SPECIES IS PRESENT IN/TOTAL NUMBER OF QUADS IN TRANSECT		
SPECIES	FREQUENCY	Post-Hole Occurrence
Halodule wrightii	0.75	88
Halophila engelmannii	0.05	6
Combined	0.80	94

OVERALL SEAGRASS FREQUENCY = THE NUMBER OF QUADS WITH SEAGRASS PRESENT/TOTAL NUMBER OF QUADS IN TRANSECT	
Overall Frequency	0.80

Transect 7

SPECIES	# OF STATIONS PRESENT IN	TOTAL # OF STATIONS IN TRANSECT	# OF BRAUN-BLANQUET QUADS IN TRANSECT
Halodule wrightii	34	41	23
Halophila engelmannii	3		

DENSITY = SUM(B-B ABUNDANCE SCORES OF SPECIES IN EACH QUAD)/TOTAL NUMBER OF QUADS IN TRANSECT	
SPECIES	DENSITY

Halodule wrightii	3.39
Halophila engelmannii	0.00
Total Density	3.39

ABUNDANCE = SUM(B-B ABUNDANCE SCORES OF SPECIES IN EACH QUAD)/NUMBER OF QUADS SPECIES IS PRESENT IN

SPECIES	ABUNDANCE
Halodule wrightii	4.59
Halophila engelmannii	0.00

INDIVIDUAL SEAGRASS SPECIES FREQUENCY = NUMBER OF QUADS SPECIES IS PRESENT IN/TOTAL NUMBER OF QUADS IN TRANSECT

SPECIES	FREQUENCY	Post-Hole Occurrence
Halodule wrightii	0.77	95
Halophila engelmannii	0.04	95
Combined	0.81	100

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

Overall Frequency	0.81

Transect 8

SPECIES	# OF STATIONS PRESENT IN	TOTAL # OF STATIONS IN TRANSECT	# OF BRAUN-BLANQUET QUADS IN TRANSECT
Halodule wrightii	31	36	19
Halophila engelmannii	1		

DENSITY = SUM(B-B ABUNDANCE SCORES OF SPECIES IN EACH QUAD)/TOTAL NUMBER OF QUADS IN TRANSECT

SPECIES	DENSITY
Halodule wrightii	4.22
Halophila engelmannii	0.28
Total Density	4.50

ABUNDANCE = SUM(B-B ABUNDANCE SCORES OF SPECIES IN EACH QUAD)/NUMBER OF QUADS SPECIES IS PRESENT IN

SPECIES	ABUNDANCE
Halodule wrightii	4.75
Halophila engelmannii	0.31

INDIVIDUAL SEAGRASS SPECIES FREQUENCY = NUMBER OF QUADS SPECIES IS PRESENT IN/TOTAL NUMBER OF QUADS IN TRANSECT

SPECIES	FREQUENCY	Post-Hole Occurrence
Halodule wrightii	0.84	91
Halophila engelmannii	0.01	1
Combined	0.85	92

OVERALL SEAGRASS FREQUENCY = THE NUMBER OF QUADS WITH SEAGRASS PRESENT/TOTAL NUMBER OF QUADS IN TRANSECT	
Overall Frequency	0.85

Transect 9

SPECIES	# OF STATIONS PRESENT IN	TOTAL # OF STATIONS IN TRANSECT	# OF BRAUN-BLANQUET QUADS IN TRANSECT
Halodule wrightii	29	33	20
Halophila engelmannii	0		

DENSITY = SUM(B-B ABUNDANCE SCORES OF SPECIES IN EACH QUAD)/TOTAL NUMBER OF QUADS IN TRANSECT	
SPECIES	DENSITY
Halodule wrightii	3.10
Halophila engelmannii	0.00
Total Density	3.10

ABUNDANCE = SUM(B-B ABUNDANCE SCORES OF SPECIES IN EACH QUAD)/NUMBER OF QUADS SPECIES IS PRESENT IN	
SPECIES	ABUNDANCE
Halodule wrightii	4.13
Halophila engelmannii	0.00

INDIVIDUAL SEAGRASS SPECIES FREQUENCY = NUMBER OF QUADS SPECIES IS PRESENT IN/TOTAL NUMBER OF QUADS IN TRANSECT		
SPECIES	FREQUENCY	Post-Hole Occurrence
Halodule wrightii	0.85	84
Halophila engelmannii	0.00	0
Combined	0.85	84

OVERALL SEAGRASS FREQUENCY = THE NUMBER OF QUADS WITH SEAGRASS PRESENT/TOTAL NUMBER OF QUADS IN TRANSECT	
Overall Frequency	0.85

Transect 12

SPECIES	# OF STATIONS PRESENT IN	TOTAL # OF STATIONS IN TRANSECT	# OF BRAUN-BLANQUET QUADS IN TRANSECT
Halodule wrightii	33	38	20
Halophila engelmannii	4		

DENSITY = SUM(B-B ABUNDANCE SCORES OF SPECIES IN EACH QUAD)/TOTAL NUMBER OF QUADS IN TRANSECT	
SPECIES	DENSITY
Halodule wrightii	3.63
Halophila engelmannii	0.37
Total Density	4.00

ABUNDANCE = SUM(B-B ABUNDANCE SCORES OF SPECIES IN EACH QUAD)/NUMBER OF QUADS SPECIES IS PRESENT IN

SPECIES	ABUNDANCE
Halodule wrightii	4.31
Halophila engelmannii	0.44

INDIVIDUAL SEAGRASS SPECIES FREQUENCY = NUMBER OF QUADS SPECIES IS PRESENT IN/TOTAL NUMBER OF QUADS IN TRANSECT

SPECIES	FREQUENCY	Post-Hole Occurrence
Halodule wrightii	0.79	90
Halophila engelmannii	0.05	6
Combined	0.84	96

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

Overall Frequency	0.84

Transect 13

SPECIES	# OF STATIONS PRESENT IN	TOTAL # OF STATIONS IN TRANSECT	# OF BRAUN-BLANQUET QUADS IN TRANSECT
Halodule wrightii	42	51	27
Halophila engelmannii	8		

DENSITY = SUM(B-B ABUNDANCE SCORES OF SPECIES IN EACH QUAD)/TOTAL NUMBER OF QUADS IN TRANSECT

SPECIES	DENSITY
Halodule wrightii	2.11
Halophila engelmannii	0.33
Total Density	2.44

ABUNDANCE = SUM(B-B ABUNDANCE SCORES OF SPECIES IN EACH QUAD)/NUMBER OF QUADS SPECIES IS PRESENT IN

SPECIES	ABUNDANCE
Halodule wrightii	2.71
Halophila engelmannii	0.43

INDIVIDUAL SEAGRASS SPECIES FREQUENCY = NUMBER OF QUADS SPECIES IS PRESENT IN/TOTAL NUMBER OF QUADS IN TRANSECT

SPECIES	FREQUENCY	Post-Hole Occurrence
Halodule wrightii	0.73	112
Halophila engelmannii	0.05	8
Combined	0.78	120

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

Overall Frequency	0.78

OVERALL SEAGRASS TRANSECT(NON-DREDGE MATERIAL) DATA

Totals	Species	Occurrence	Frequency	Braun-Blanquet Score	B-B Samples	Density	B-B Samples	Abundance
	Halodule wrightii	650	0.71982281	493		3.0432099		4.2136752
	Halophila engelmannii	27	0.02990033	36		0.222222		0.3076923
	Combined	**677**	**0.74972315**	**499**	**162**	**3.0802469**	**117**	**4.2649573**

Post-Hole Sample Total	903

DREDGE MATERIAL PORTIONS OF TRANSECTS

Transect 2

Stations:	Total	Braun-Blanquet	Post-Hole Grabs
	26	0	78

SPECIES	# OF STATIONS PRESENT IN	DENSITY	ABUNDANCE	FREQUENCY
Halodule wrightii	0	0	0	0
Halophila engelmannii	0	0	0	0
Species Totals:		0	0	0

# OF POST-HOLE SAMPLES IN DREDGE MATERIAL	# OF DREDGE MATERIAL POST-HOLE SAMPLES W/NO SEAGRASS ROOT PRESENCE	# OF DREDGE MATERIAL POST-HOLE SAMPLES W/LIVE SEAGRASS ROOT PRESENCE	# OF DREDGE MATERIAL POST-HOLE SAMPLES W/DEAD SEAGRASS ROOT PRESENCE
78	26	0	52
Percentage (%)	0.29	0	0.71

Avg Depth (Ft)	Dredge Material	Buried Seagrass Roots
	0.55	0.896

Portion of Transect 2 OUTSIDE of Dredge Material:

Stations:	Total	Braun-Blanquet	Post-Hole Grabs
	12	6	36

SPECIES	# OF STATIONS PRESENT IN	DENSITY	ABUNDANCE	FREQUENCY
Halodule wrightii	1	0.83	4.00	0.08
Halophila engelmannii	0	0.00	0.00	0.00
Species Totals:		0.83	4.00	0.08

Transect 3

Stations:	Total	Braun-Blanquet	Post-Hole Grabs
	23	0	69

SPECIES	# OF STATIONS PRESENT IN	DENSITY	ABUNDANCE	FREQUENCY
Halodule wrightii	0	0	0	0
Halophila engelmannii	0	0	0	0
Species Totals:		0	0	0

# OF POST-HOLE SAMPLES IN DREDGE MATERIAL	# OF DREDGE MATERIAL POST-HOLE SAMPLES W/NO SEAGRASS ROOT PRESENCE	# OF DREDGE MATERIAL POST-HOLE SAMPLES W/LIVE SEAGRASS ROOT PRESENCE	# OF DREDGE MATERIAL POST-HOLE SAMPLES W/DEAD SEAGRASS ROOT
69	14	0	55
Percentage (%)	0.20	0	0.8

Avg Depth (Ft)	Dredge Material	Buried Seagrass Roots
	0.59	1.05

Portion of Transect 3 OUTSIDE of Dredge Material:

Stations:	Total	Braun-Blanquet	Post-Hole Grabs
	11	5	33

SPECIES	# OF STATIONS PRESENT IN	DENSITY	ABUNDANCE	FREQUENCY
Halodule wrightii	3	1.8	4.50	0.18
Halophila engelmannii	0	0.00	0.00	0.00
Species Totals:		1.8	4.50	0.18

Transect 4

Stations:	Total	Braun-Blanquet	Post-Hole Grabs
	25	0	75

SPECIES	# OF STATIONS PRESENT IN	DENSITY	ABUNDANCE	FREQUENCY
Halodule wrightii	0	0	0	0
Halophila engelmannii	0	0	0	0
Species Totals:		0	0	0

# OF POST-HOLE	# OF DREDGE MATERIAL	# OF DREDGE MATERIAL POST-	# OF DREDGE MATERIAL

Table 1: Transects 1-13 Survey Statistics
PA 62 Seagrass Survey

SAMPLES IN DREDGE MATERIAL	POST-HOLE SAMPLES W/NO SEAGRASS ROOT PRESENCE	HOLE SAMPLES W/LIVE SEAGRASS ROOT PRESENCE	POST-HOLE SAMPLES W/DEAD SEAGRASS ROOT
75	18	0	55
Percentage (%)	0.27	0	0.73

Avg Depth (Ft)	Dredge Material	Buried Seagrass Roots
	0.33	1.05

Portion of Transect 4 OUTSIDE of Dredge Material:

Stations:	Total	Braun-Blanquet	Post-Hole Grabs
	10	5	30

SPECIES	# OF STATIONS PRESENT IN	DENSITY	ABUNDANCE	FREQUENCY
Halodule wrightii	5	1.8	3.00	0.5
Halophila engelmannii	0	0.00	0.00	0.00
Species Totals:		1.8	3.00	0.5

Transect 10

Stations:	Total	Braun-Blanquet	Post-Hole Grabs
	21	1	63

SPECIES	# OF STATIONS PRESENT IN	DENSITY	ABUNDANCE	FREQUENCY
Halodule wrightii	1	0.31	1.67	0.11
Halophila engelmannii	g	0.06	1	0.01
Species Totals:		0.37	2.67	0.13

# OF POST-HOLE SAMPLES IN DREDGE MATERIAL	# OF DREDGE MATERIAL POST-HOLE SAMPLES W/NO SEAGRASS ROOT PRESENCE	# OF DREDGE MATERIAL POST-HOLE SAMPLES W/LIVE SEAGRASS ROOT PRESENCE	# OF DREDGE MATERIAL POST-HOLE SAMPLES W/DEAD SEAGRASS ROOT
63	12	1	23
Percentage (%)	0.30	0.27	0.41

Avg Depth (Ft)	Dredge Material	Buried Seagrass Roots
	0.32	0.95

Portion of Transect 10 OUTSIDE of Dredge Material:

Stations:	Total	Braun-Blanquet	Post-Hole Grabs
	23	7	69

SPECIES	# OF STATIONS PRESENT IN	DENSITY	ABUNDANCE	FREQUENCY
Halodule wrightii	8	2.14	5.00	0.2
Halophila engelmannii	0	0.00	0.00	0.00
Species Totals:		2.14	5.00	0.2

Transect 11

Stations:	Total	Braun-Blanquet	Post-Hole Grabs
	31	0	93

SPECIES	# OF STATIONS PRESENT IN	DENSITY	ABUNDANCE	FREQUENCY
Halodule wrightii	9	3.00	3.00	0.87
Halophila engelmannii	1	0.00	0.00	0.03
Species Totals:		3.00	3.00	0.9

# OF POST-HOLE SAMPLES IN DREDGE MATERIAL	# OF DREDGE MATERIAL POST-HOLE SAMPLES W/NO SEAGRASS ROOT PRESENCE	# OF DREDGE MATERIAL POST-HOLE SAMPLES W/LIVE SEAGRASS ROOT PRESENCE	# OF DREDGE MATERIAL POST-HOLE SAMPLES W/DEAD SEAGRASS ROOT
93	41	0	31
Percentage (%)	0.51	0	0.51

Avg Depth (Ft)	Dredge Material	Buried Seagrass Roots
	0.4	0.36

Portion of Transect 11 OUTSIDE of Dredge Material:

Stations:	Total	Braun-Blanquet	Post-Hole Grabs
	17	11	51

SPECIES	# OF STATIONS PRESENT IN	DENSITY	ABUNDANCE	FREQUENCY
Halodule wrightii	5	0.45	2.50	0.2

Table 1: Transects 1-13 Survey Statistics

PA 62 Seagrass Survey

Halophila engelmannii	0	0.00	0.00	0.00
Species Totals:		0.45	2.50	0.2

<div style="background-color:yellow">OVERALL DREDGE MATERIAL TRANSECT DATA</div>

Totals	Species	Occurrence	Frequency	Density	Abundance
	Halodule wrightii	8	0.05	0.12	2.70
	Halophila engelmannii	0	0.00	0.00	0.00
	Combined	**8**	**0.045**	**0.12**	**2.7**

Transect Portions with Live Roots	0.27	0.71
	0	0
Combined	**0.27**	**0.71**

Total Stations: 126

B-B Stations: 14

Overall Avg of Dredge: 0.44

Overall Avg of Deepest Seagrass Root: 0.86

Note: Buried seagrass roots were assumed to be *Halodule wrightii.*   Live seagrass was found to be recolonizing over dredge disposal at Transect 10. One post-hole "hit" on Transect 12 also contained live shoalgrass over dredge material.

Transect 1

SPECIES	# OF STATIONS PRESENT IN	TOTAL # OF STATIONS IN TRANSECT	# OF BRAUN-BLANQUET QUADS IN TRANSECT
Halodule wrightii	22	31	17
Halophila engelmannii	0		

DENSITY = SUM(B-B ABUNDANCE SCORES OF SPECIES IN EACH QUAD)/TOTAL NUMBER OF QUADS IN TRANSECT

SPECIES	DENSITY
Halodule wrightii	1.88
Halophila engelmannii	0
Total Density	1.88

ABUNDANCE = SUM(B-B ABUNDANCE SCORES OF SPECIES IN EACH QUAD)/NUMBER OF QUADS SPECIES IS PRESENT IN

SPECIES	ABUNDANCE
Halodule wrightii	3.56
Halophila engelmannii	0.00

INDIVIDUAL SEAGRASS SPECIES FREQUENCY = NUMBER OF QUADS SPECIES IS PRESENT IN/TOTAL NUMBER OF QUADS IN TRANSECT

SPECIES	FREQUENCY	Post-Hole Occurrence
Halodule wrightii	0.62	58
Halophila engelmannii	0.00	0
Combined	0.62	58

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

Overall Frequency	0.62

Transect 3

SPECIES	# OF STATIONS PRESENT IN	TOTAL # OF STATIONS IN TRANSECT	# OF BRAUN-BLANQUET QUADS IN TRANSECT
Halodule wrightii	8	40	20
Halophila engelmannii	0		

DENSITY = SUM(B-B ABUNDANCE SCORES OF SPECIES IN EACH QUAD)/TOTAL NUMBER OF QUADS IN TRANSECT

SPECIES	DENSITY
Halodule wrightii	0.65
Halophila engelmannii	0
Total Density	0.65

ABUNDANCE = SUM(B-B ABUNDANCE SCORES OF SPECIES IN EACH QUAD)/NUMBER OF QUADS SPECIES IS PRESENT IN

SPECIES	ABUNDANCE
Halodule wrightii	3.25
Halophila engelmannii	0

INDIVIDUAL SEAGRASS SPECIES FREQUENCY = NUMBER OF QUADS SPECIES IS PRESENT IN/TOTAL NUMBER OF QUADS IN TRANSECT

SPECIES	FREQUENCY	Post-Hole Occurrence
Halodule wrightii	0.18	22
Halophila engelmannii	0	0
Combined	0.18	22

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

Overall Frequency	0.18

Transect 4

SPECIES	# OF STATIONS PRESENT IN	TOTAL # OF STATIONS IN TRANSECT	# OF BRAUN-BLANQUET QUADS IN TRANSECT
Halodule wrightii	5	36	19
Halophila engelmannii	0		

DENSITY = SUM(B-B ABUNDANCE SCORES OF SPECIES IN EACH QUAD)/TOTAL NUMBER OF QUADS IN TRANSECT

SPECIES	DENSITY
Halodule wrightii	0.42
Halophila engelmannii	0.00
Total Density	0.42

ABUNDANCE = SUM(B-B ABUNDANCE SCORES OF SPECIES IN EACH QUAD)/NUMBER OF QUADS SPECIES IS PRESENT IN

SPECIES	ABUNDANCE
Halodule wrightii	4.00
Halophila engelmannii	0.00

INDIVIDUAL SEAGRASS SPECIES FREQUENCY = NUMBER OF QUADS SPECIES IS PRESENT IN/TOTAL NUMBER OF QUADS IN TRANSECT

SPECIES	FREQUENCY	Post-Hole Occurrence
Halodule wrightii	0.14	15
Halophila engelmannii	0.00	0
Combined	0.14	15

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

Overall Frequency	0.14

Transect 6

SPECIES	# OF STATIONS PRESENT IN	TOTAL # OF STATIONS IN TRANSECT	# OF BRAUN-BLANQUET QUADS IN TRANSECT
Halodule wrightii	29	51	26
Halophila engelmannii	9		

DENSITY = SUM(B-B ABUNDANCE SCORES OF SPECIES IN EACH QUAD)/TOTAL NUMBER OF QUADS IN TRANSECT

SPECIES	DENSITY
Halodule wrightii	2.69
Halophila engelmannii	0.12
Total Density	2.81

ABUNDANCE = SUM(B-B ABUNDANCE SCORES OF SPECIES IN EACH QUAD)/NUMBER OF QUADS SPECIES IS PRESENT IN

SPECIES	ABUNDANCE
Halodule wrightii	4.47
Halophila engelmannii	1.50

INDIVIDUAL SEAGRASS SPECIES FREQUENCY = NUMBER OF QUADS SPECIES IS PRESENT IN/TOTAL NUMBER OF QUADS IN TRANSECT

SPECIES	FREQUENCY	Post-Hole Occurrence
Halodule wrightii	0.54	82
Halophila engelmannii	0.09	14
Combined	0.63	96

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

Overall Frequency	0.63

Transect 9

SPECIES	# OF STATIONS PRESENT IN	TOTAL # OF STATIONS IN TRANSECT	# OF BRAUN-BLANQUET QUADS IN TRANSECT
Halodule wrightii	34	40	20
Halophila engelmannii	1		

DENSITY = SUM(B-B ABUNDANCE SCORES OF SPECIES IN EACH QUAD)/TOTAL NUMBER OF QUADS IN TRANSECT

SPECIES	DENSITY

Halodule wrightii	2.75
Halophila engelmannii	0.00
Total Density	2.75

ABUNDANCE = SUM(B-B ABUNDANCE SCORES OF SPECIES IN EACH QUAD)/NUMBER OF QUADS SPECIES IS PRESENT IN

SPECIES	ABUNDANCE
Halodule wrightii	3.24
Halophila engelmannii	0.00

INDIVIDUAL SEAGRASS SPECIES FREQUENCY = NUMBER OF QUADS SPECIES IS PRESENT IN/TOTAL NUMBER OF QUADS IN TRANSECT

SPECIES	FREQUENCY	Post-Hole Occurrence
Halodule wrightii	0.83	100
Halophila engelmannii	0.01	1
Combined	0.84	101

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

Overall Frequency	0.84

Totals	Species	Occurrence	Frequency	Braun-Blanquet Score	B-B Samples	Density	B-B Samples	Abundance
	OVERALL SEAGRASS TRANSECT (NON-DREDGE MATERIAL) DATA							
	Halodule wrightii	277	0.46632997	178		1.745098		3.787234
	Halophila engelmannii	15	0.02525253	3		0.029412		0.0638298
	Combined	**292**	**0.49158249**	**178**	**102**	**1.745098**	**47**	**3.787234**
	Post-Hole Sample Total	594						

Dredge Material Portions of Transects

Transect 2

Stations:	Total	Braun-Blanquet	Post-Hole Grabs
	40	0	120

SPECIES	# OF STATIONS PRESENT IN	DENSITY	ABUNDANCE	FREQUENCY
Halodule wrightii	0	0	0	0
Halophila engelmannii	0	0	0	0
Species Totals:		0	0	0

# OF POST-HOLE SAMPLES IN DREDGE MATERIAL	# OF DREDGE MATERIAL POST-HOLE SAMPLES W/NO SEAGRASS ROOT PRESENCE	# OF DREDGE MATERIAL POST-HOLE SAMPLES W/LIVE SEAGRASS ROOT PRESENCE	# OF DREDGE MATERIAL POST-HOLE SAMPLES W/DEAD SEAGRASS ROOT PRESENCE
120	102	0	17
Percentage (%)	0.85	0	0.15

Depth (Ft)	Dredge Material	Buried Seagrass Roots
	1.11	1.27

Transect 5

Stations:	Total	Braun-Blanquet	Post-Hole Grabs
	27	0	81

SPECIES	# OF STATIONS PRESENT IN	DENSITY	ABUNDANCE	FREQUENCY
Halodule wrightii	1	0	0	0
Halophila engelmannii	1	0	0	0
Species Totals:		0	0	0

# OF POST-HOLE SAMPLES IN DREDGE MATERIAL	# OF DREDGE MATERIAL POST-HOLE SAMPLES W/NO SEAGRASS ROOT PRESENCE	# OF DREDGE MATERIAL POST-HOLE SAMPLES W/LIVE SEAGRASS ROOT PRESENCE	# OF DREDGE MATERIAL POST-HOLE SAMPLES W/DEAD SEAGRASS ROOT
81	42	1 (Halodule)	35
Percentage (%)	0.54	0.02	0.43

Avg Depth (Ft)	Dredge Material	Buried Seagrass Roots
	0.62	0.63

Transect 7

Stations:	Total	Braun-Blanquet	Post-Hole Grabs
	36	0	108

SPECIES	# OF STATIONS PRESENT IN	DENSITY	ABUNDANCE	FREQUENCY
Halodule wrightii	0	0	0	0
Halophila engelmannii	0	0	0	0
Species Totals:		0	0	0

# OF POST-HOLE SAMPLES IN DREDGE MATERIAL	# OF DREDGE MATERIAL POST-HOLE SAMPLES W/NO SEAGRASS ROOT PRESENCE	# OF DREDGE MATERIAL POST-HOLE SAMPLES W/LIVE SEAGRASS ROOT PRESENCE	# OF DREDGE MATERIAL POST-HOLE SAMPLES W/DEAD SEAGRASS ROOT
108	59	0	48
Percentage (%)	0.55	0	0.45

Avg Depth (Ft)	Dredge Material	Buried Seagrass Roots
	1.15	1.16

Transect 8

Stations:	Total	Braun-Blanquet	Post-Hole Grabs
	31	16	93

SPECIES	# OF STATIONS PRESENT IN	DENSITY	ABUNDANCE	FREQUENCY
Halodule wrightii	7	0.31	1.67	0.11
Halophila engelmannii	1	0.06	1	0.01
Species Totals:		0.37	2.67	0.13

# OF POST-HOLE SAMPLES IN DREDGE MATERIAL	# OF DREDGE MATERIAL POST-HOLE SAMPLES W/NO SEAGRASS ROOT PRESENCE	# OF DREDGE MATERIAL POST-HOLE SAMPLES W/LIVE SEAGRASS ROOT PRESENCE	# OF DREDGE MATERIAL POST-HOLE SAMPLES W/DEAD SEAGRASS ROOT
93	21	5	59
Percentage (%)	0.20	0.19	0.61

Avg Depth (Ft)	Dredge Material	Buried Seagrass Roots
	1.07	1.04

Transect 9

Stations:	Total	Braun-Blanquet	Post-Hole Grabs
	10	5	30

SPECIES	# OF STATIONS PRESENT IN	DENSITY	ABUNDANCE	FREQUENCY
Halodule wrightii	9	3.00	3.00	0.87
Halophila engelmannii	1	0.00	0.00	0.03
Species Totals:		3.00	3.00	0.9

# OF POST-HOLE SAMPLES IN DREDGE MATERIAL	# OF DREDGE MATERIAL POST-HOLE SAMPLES W/NO SEAGRASS ROOT PRESENCE	# OF DREDGE MATERIAL POST-HOLE SAMPLES W/LIVE SEAGRASS ROOT PRESENCE	# OF DREDGE MATERIAL POST-HOLE SAMPLES W/DEAD SEAGRASS ROOT
30	1	29 (Halodule)	0
Percentage (%)	0.03	0.93	0

Avg Depth (Ft)	Dredge Material	Buried Seagrass Roots
	0.31	0.87

Note: Buried seagrass roots were assumed to be *Halodule wrightii*. Transects 5, 8, and 9 contained live seagrass recolonizing on top of Mid- and West disposal areas.

OVERALL DREDGE MATERIAL TRANSECT DATA

Totals	Species	Occurrence	Frequency	Density	Abundance
	Halodule wrightii	17	0.08	0.28	1.99
	Halophila engelmannii	3	0.00	0.01	1.00
	Combined	**20**	**0.08**	**0.29**	**2.99**

	Transect Portions with Live Roots		0.95	0.71
			0.05	0
	Combined		**1.00**	**0.71**

Total Stations: 144

B-B Stations: 21

Overall Avg of Dredge: 0.85

Overall Avg of Deepest Seagrass Root: 0.99