Project Information Sheet for Wetland Value Assessment

Revised as per the October 3, 2000 EnvWG Meeting

Project Name: Delta Management at Fort St. Philip (BS-11)

Sponsoring Agency: U.S. Fish and Wildlife Service
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Project Area: The project area consists of 2 subareas. Area 1 is the westernmost area and consists of 174 acres of emergent marsh and 678 acres of open water. Area 2 contains the three triangular-shaped areas and consists of 126 acres of emergent marsh and 327 acres of open water.

Problem: This area has experienced tremendous loss of emergent wetlands since 1974. COE land loss data indicates a 1974 to 1990 loss rate of 4.10 %/yr for Area 1 and 1.61 %/yr for Area 2. That data also indicates 1983 to 1990 loss rates of 8.52 %/yr and 3.62 %/yr for Areas 1 and 2, respectively. Examination of aerial photographs for 1974, 1978, 1983, 1990, and 1995 also confirms this loss. Although COE data indicates tremendous loss in this area, that data does not reflect the accretion of new marsh which has occurred. USGS data does indicate some gain in emergent marsh, but an overall net loss of emergent marsh from 1978 to 1990.

The causes of marsh loss appear to be from subsidence, wind/wave erosion, and possibly scouring of highly organic marshes when river water was introduced in the early 1970s, possibly during the 1973 flood. Subsidence rates indicated for this area in the Coast 2050 Plan are 2.1 to 3.5 ft/century. Those rates are considered high along the Louisiana coast although the Mississippi River Delta experiences subsidence rates over 3.5 ft/century. The fringing marsh in this area borders Breton Sound where wave energy has caused extensive loss of shoreline marsh.

This area has undergone an interesting transition since the early 1970s. Habitat data from 1956 indicates that this area was almost solid, unbroken marsh with scattered bayous and ponds and a few pipeline canals. Quadrangle maps from 1971 indicate slightly more open water throughout the general area. October 1974 aerial photography indicates marsh break-up beginning to occur between Areas 1 and 2 in the vicinity of the crevasse which apparently formed between 1971 and 1974. The 1971 quad map did not indicate a crevasse or deteriorating marsh in the area. Between 1974 and 1978, considerably more marsh break-up occurred in the immediate outfall of the crevasse and to the west toward Bay Denesse. From examination of aerial photographs and COE and USGS land loss data, that trend appears to have continued through 1990.

A comparison of 1990, 1995, and 1998 aerial photography indicates that marsh loss has decreased considerably and marsh building now occurs over a substantial portion of the area. Many areas of historic marsh loss are now becoming shallower with the introduction of river sediments and emergent marsh is forming throughout the area on the newly-accreted mineral soils. The introduction of river water resulted in tremendous loss in the historic brackish and saline marshes. An NRCS soil scientist who conducted soils mapping in this area explained one mechanism of loss as “soil loading”. As river sediments accumulate on the surface of organic soils, the organics compact and subside, unable to bear the weight of mineral sediments on the surface. The organic layers continue to subside and the marsh

vegetation dies from inundation. Those areas typically do not revegetate until the mineral sediments reach an elevation suitable for plant colonization. Some of the loss could also be attributed to erosion by the scouring effect of the river water. Increased water levels may have also contributed to the loss of marshes dominated by marshhay cordgrass which is intolerant of flooded conditions.

Goals: 1) Increase the flow of fresh water and sediments into shallow, open-water habitat.
2) Increase sedimentation and marsh building by means of artificial crevasses.

Objectives: 1) Create 30 acres of emergent marsh through the construction of linear terraces and vegetative plantings.
2) Create 251 acres of emergent marsh by enhancing the natural processes of delta growth in the project area.

Project Features: The project will include the construction and maintenance of 6 crevasses into open water habitat. Crevasse dimensions (W)(L)(D) are as follows:

Crevasse 1a: 75 ft x 1,000 ft x 8 ft
Crevasse 1b: 75 ft x 350 ft x 6 ft
Crevasse 1c: 75 ft x 350 ft x 6 ft
Crevasse 2a: 75 ft x 500 ft x 8 ft
Crevasse 2b: 75 ft x 900 ft x 8 ft
Crevasse 2c: 75 ft x 900 ft x 8 ft

Crevasse dimensions are based on monitoring data from the Small Sediment Diversions Project (MR-01) which suggests that crevasses constructed at relatively greater initial depths may have a higher potential for creating a well-developed, efficient channel than those constructed at shallower depths (<6 ft) where the channel fills prematurely. Also, crevasses will be constructed at a 60-degree angle from the parent pass. Monitoring data indicates that crevasses constructed at a 60-degree angle from the parent pass appear to provide optimal conditions for sediment capture and marsh growth. Crevasses will be constructed with a barge-mounted, bucket dredge and material will be sidecast to create marsh. All crevasses are assumed to be maintained at TY5.

A total of 156 terraces (31,200 linear feet) will be constructed in nine staggered rows across the northern half of Area 1 and oriented northeast-southwest. The terraces will be 200 ft. long with 50 ft. gaps between terraces and the rows will be 200 feet apart. Terraces will be constructed with a 10 ft. top width, 3:1 side slopes, and a final settled elevation of 4 feet (see attached drawing). The terraces will be constructed in 1.5 to 2.0 feet of water. Borrow areas will parallel each row. Terraces will be planted with two rows of seashore paspalum on the top and two rows of smooth cordgrass will be planted on each side of the terrace. Plantings will be on 5-foot centers. No maintenance is proposed for the terraces as very little erosion is anticipated due to shallow water depths (1.5 to 2.0 feet deep), reduced fetch, and little evidence of erosion along adjacent marsh shorelines.

Monitoring Information:

Small Sediment Diversions (MR-01)

- Measured the growth of 13 uncontrolled river diversions constructed along several distributary passes within the Mississippi River Delta between 1986 and 1993.

- Average growth rate was 11 ac/yr for crevasses constructed on first-order channels.
- Average growth rate was 2.3 ac/yr for crevasses constructed on second-order channels.
- Visible splay growth can occur within the first two years after construction where the receiving bay is relatively shallow.

Small Sediment Diversions (MR-01)							
Parent Width	**Parent Pass**	**Channel Order**	**Construction Date**	**Crevasse Dimensions (W)(L)(D)**	**Depth Receiving Area**	**Receiving Area**	**Growth Rate (ac/yr)**
125	(8) N. Octave Pass	2	1992	(100)(175)(6)		167	1.1
215	(13)Raphael Pass	1	1993	(40)(250)(8)	0.8	790	11.7
2750	(14)Pass-a-loutre	1	1986	(390)(780)(8)	0.7	406	15.6
1000	(15)Pass-a-loutre	1	1993	(75)(858)(6)	1.3	137	5.2
2125	(16)Pass-a-loutre	1	1990	(300)(1400)(6)	1.7	314	11
560	(17)Dennis Pass	2	1993	(50)(340)(6)	0.8	331	3.9
435	(18)Dennis Pass	2	1993	(50)(400)(6)	0.9	228	4.0
1690	Main Pass (mp1)	1	1992	(90)(317)(10)		419	14.1
440	Octave Pass (op1)	1	1992	(50)(275)(8)		184	8.9
300	Delta Pass (usfws2)	2	1993	(50)(275)(6)		64	2.3
260	Delta Pass (usfws3)	2	1993	(100)(575)(6)		42	2.2
190	Bienvenue Pass (usfws4)	2	1993	(100)(250)(6)		143	0.2
125	Cheniere Pass (ldwf)	3	1993	(50)(75)(6)		192	0.5

Boyer, Mark E. 1996. Thesis: Constructed Crevasses as a Technique for Land Gain in the Mississippi River Delta. 110pp.

- Measured growth rates of crevasses constructed on Delta National Wildlife Refuge from 1983 to 1995 by the use of aerial photography (1978, 1986, 1988, 1990, 1993, and 1995). The table below only includes data for those crevasses for which growth rates could be determined.
- Important crevasse elements include parent pass characteristics (size and channel order), receiving bay characteristics (depth, size, outflow capabilities), and crevasse characteristics (angle, depth, width, length, location).
- Average growth rates for artificial crevasses off of first-order channels was 6 ac/yr and 3.5 ac/yr for crevasses off of second-order channels.

Boyer, 1996							
Parent Width	**Parent Pass**	**Channel Order**	**Construction Date**	**Dimensions (W)(L)(D)**	**Crevasse Angle**	**Receiving Area**	**Growth Rate (ac/yr)**

(ft)				(ft)	(degrees)	(ac)	
873	Octave Pass (S. bank)	1	1983	(100)(1600)(6)	60	2520.4	10.5
341	Raphael Pass (n. bank)	2	1983	(100)(750)(6)	60	2520.4	1.5
1732	Main Pass (w. bank)	1	1985	(100)(925)(6)	60	1828.5	8.2
269	Romere Pass (w. bank)	2	1986	(100)(689)(6)	60	560.6	8.6
262	Romere Pass (w. bank)	2	1986	(100)(722)(6)	60	560.6	5.7
262	Romere Pass (e. bank)	2	1986	(100)(823)(6)	60	343.4	6.7
272	Romere Pass (e. bank)	2	1986	(100)(500)(6)	60	343.4	4.6
1732	Main Pass (e. bank)	1	1987	(100)(1498)(6)	60	2108	24.6
305	Delta Pass (n. bank)	2	1992	(100)(1000)(6)	60	42.5	0.16
266	Delta Pass (s. bank)	2	1992	(100)(1000)(6)	60	59.5	0.16
213	Bienvenue Pass (n. bank)	1	1992	(100)(1000)(6)	60	308.6	0
440	Octave Pass (n. bank)	1	1991	(100)(1307)(6)	60	530	1.6
223	Octave Pass (e. bank)	4	1992	(100)(1000)(6)	60	114.1	0
262	Buoy Pass (n. bank)	3	1992	(100)(1000)(6)	60	173.9	1.5
217	Raphael Pass (s. bank)	2	1991	(100)(1282)(6)	60	4324.2	3.7
1693	Main Pass (e. bank)	1	1991	(100)(1540)(6)	60	530	3.0
167	Raphael Pass (s. bank)	2	1993	(100)(1130)(6)	60	4324.2	0.6
545	Brant Bayou (n. bank)	1	1993	(100)(1000)(6)	60	160.1	0
1749	Main Pass (e. bank)	1	1993	(100)(1000)(6)	90	243.3	0

Using growth rate as the dependent variable, linear regressions were performed using the above data for parent width, parent order, receiving area size, and receiving area depth to determine an approximate growth rate for the crevasses proposed for this project. The projected growth rates based on those regressions for each variable are shown in the tables below. However, it should be noted that those regressions were only performed to provide another means of approximating a growth rate for the proposed crevasses. A strong linear relationship was not expected between growth rate and any one particular variable as growth rate is obviously dependent on the combined effect of all the variables.

The NMFS presented calculations on splay growth in their Project Information Sheet for the Myrtle Grove Sediment Diversion. From monitoring information for the Small Sediment Diversions Project (discussed above) and engineering and field information gathered for the Delta-wide Crevasses Project, they determined that crevasses create 0.1516 acres/year per square yard of constructed cross-sectional area. Based on that figure, growth rates for the six crevasses proposed are presented below.

Crevasse	Cross-sectional Area (yd^2)	Growth Rate (ac/yr)
1A	67	10
1B	50	7.6
1C	50	7.6
2A	67	10
2B	67	10
2C	67	10

Summary of Monitoring Information

- Mean growth rate for all **first-order** crevasses from MR-01 and Boyer is ..... **8.2 ac/yr**
- Mean growth rate for all **second-order** crevasses from MR-01

and Boyer is ..... **3.0 ac/yr**

- The **initial growth rate** (first five years) from MR-01 and Boyer for first-order crevasses was ..... **4.9 ac/yr**
  and for second-order crevasses was ..... **1.8 ac/yr**
- Boyer provides more long-term data than MR-01. The average growth rate for s**econd-order** crevasses was ..... **3.5 ac/yr**
- **NMFS** calculations yield ..... **8 to 10 ac/yr**
- **Linear regressions** on MR-01 and Boyer data yield ..... **5 to 9 ac/yr**

V1 - Emergent Vegetation

Historical and Present Vegetative Communities - The 1949 Vegetative Type Map by O'Neil classified the marshes around Fort St. Philip as brackish, along the river, and saline out to Breton Sound. The 1968 Vegetative Type Map classified this entire area as saline marsh. The crevasse which allows river water to enter this area formed in the early 1970s and the 1978 Vegetative Type Map indicates a lobe of intermediate marsh at that location. The remainder of the area was classified as brackish and saline marsh. The 1988 Vegetative Type Map indicates a significant band of fresh/intermediate marsh adjacent to the river, particularly at the location of the crevasse, with the remainder of the area classified as brackish and saline. The zone of fresh and intermediate marsh expanded considerably since the 1978 vegetative survey. The 1997 Vegetative Type Map indicates this entire area is fresh and intermediate marsh.

At present, vegetative communities are very diverse throughout the project area with fresh and intermediate marsh along the river and in the vicinity of the crevasse. Areas under less influence from the river are classified as brackish transitioning to saline closer to Breton Sound. In many areas, the vegetative community contains species common to all four marsh types. Common species noted in the project area include elephant-ear, roseau cane, bulltongue, alligatorweed, delta duckpotato, softrush, black needlerush, smartweed, Walter's millet, marshhay cordgrass, smooth cordgrass, freshwater threesquare, three-cornered grass, leafy three-square, torpedograss, giant cutgrass, rattlebox, deerpea, and cattail. The diverse plant community is undoubtedly due to the large salinity range experienced in the project area. During late winter and spring, when river stages are high, salinities are probably within the fresh to intermediate range of 0 to 3 ppt. As river flow decreases in early summer, salinities probably approach the range of brackish and saline wetlands.

Based on the existing vegetative community and classification of habitat in newly-accreted areas, it is suggested that the intermediate model be utilized to evaluate this project.

Soil Types - From the Plaquemines Parish Soil Survey, the majority of the soils in the project area are mapped as Clovelly muck. That series appears to be mapped in the historic brackish and saline marshes. However, the newly-accreted marsh in the vicinity of the crevasse and areas adjacent to the river were mapped as Convent, Commerce, and Sharkey soils, frequently flooded. Those soils were deposited by the crevasse and are mineral soils unlike the Clovelly muck.

Land Loss Data - COE land loss data indicates a 1983 to 1990 loss rate of 8.52 %/yr and 3.62 %/yr for Areas 1 and 2, respectively.

Area 1

Marsh: 174 acres Water: 678 acres Total: 852 acres

FWOP

Assumptions: Although COE land loss data indicates a high loss rate for this area, a comparison of 1990 and 1995 aerial photography and 1998 DOQQs indicates little or no loss throughout this area and infilling of shallow water areas. Suggestion is to apply no loss FWOP as loss of emergent marsh may be offset by infilling and gains in emergent marsh. An alternative is to apply the projected loss rate (0.5 %/yr) for the American Bay mapping unit from the Coast 2050 Plan.

Presently, there are four shallow crevasses which provide fresh water and sediments to this area. Assume a growth rate of 1.8 ac/yr per crevasse for FWOP. That growth rate equals the initial (5 years from construction) average growth rate of 2nd order crevasses from monitoring data. An increased growth rate is not assumed over time as these crevasses will likely begin to shoal in and flows will be reduced.

TY0 174 acres - 20%
TY1 181 acres - 21% (1.8)(4) = 7 7 + 174 = 181
TY20 318 acres - 37% (1.8)(4)(20) = 144 144 + 174 = 318

FWP

Assumptions: Crevasse 1A gains 1.8 ac/yr for the first five years and increases (after maintenance) to 3.5 ac/yr at TY5. Crevasse 1A is constructed into a very shallow receiving area (0.5 ft increasing to 2 ft. to the northwest), contains numerous outflow channels, and the terraces will allow the capture of greater amounts of sediment.

Crevasses 1B and 1C will result in much slower growth as they are smaller than 1A, the receiving areas are smaller, outflow channels are smaller, and infilling will occur before emergent growth begins. Those crevasses will gradually fill in their receiving areas (1B-10 acres; 1C-17 acres) by TY20.

Crevasse construction will result in the destruction of approximately 1 acre of marsh. Sidecasting of dredged material will result in the creation of 11 acres of emergent marsh for a net of 10 acres at TY1.

Terraces will result in 16 acres of emergent marsh at TY1 because of plantings and rapid colonization under fresh/intermediate conditions. No loss is assumed for the terraces based on evidence of little or no loss of emergent marsh in the project area over the last 10 years. The vegetative plantings on each terrace side will expand by 5 ft. (7 ac) by TY5. No other gains in emergent marsh between the terrace rows are assumed.

TY1 209 acres - 25% 174 + 1.8 + 16 + 10 + 7 (growth from existing crevasses) = 209
TY5 252 acres - 30% 209 +7 + 7 + 29 (growth from existing crevasses) = 252
TY20 440 acres - 52% 252 + 53 + 10 + 17 + 108 = 440

V2 - Submerged Aquatic Vegetation

Submerged aquatic vegetation includes Eurasian watermilfoil, southern naiad, coontail, sago pondweed, curley-leaf pondweed, big pondweed, and water stargrass.

FWOP
Assumptions: FWOP - Baseline conditions are 40% coverage based on field investigations and video. Assume an increase to 50% by TY20 as area infills and more emergent marsh forms creating better conditions for SAV establishment.

TY0: 40%
TY1: 40%
TY20: 50%

FWP
Assumptions: SAV coverage increases to 70% by TY20 based on field observations in the area. Open water between the terraces will account for 35% of the open water in the project area and should have near 80% coverage by aquatics. The remainder of the open water is assumed to have 60% coverage.

TY1: 45%
TY5: 60%
TY20: 70%

V3 - Interspersion

FWOP

TY0: 15%-Class 3; 85%-Class 4
TY1: 15%-Class 3; 85%-Class 4
TY20: 35%-Class 3; 65%-Class 4

FWP

Assumptions: The terraces will convert approximately 30% of the area to Class 3 at TY1 and the rest of the area will remain the same.

TY1: 45%-Class 3; 55%-Class 4
TY5: 50%-Class 3; 50%-Class 4
TY20: 30%-Class 2; 40%-Class 3; 30%-Class 4

V4 - Shallow Open Water Habitat

FWOP
Assumptions: From field trip and video, estimated that approximately 60% of the area is $\leq$ 1.5 feet. Infilling from crevasses will continue and shallow water will gradually increase over the project life.

TY0: 60%

TY1: 60%
TY20: 70%

FWP
Assumptions: At TY1, terraces will add 6 acres of shallow water habitat. Borrow areas for the terraces were constructed in water >1.5 feet deep, therefore, the borrow areas add no additional deep water habitat to the area.

TY1: 60%
TY5: 65%
TY20: 80%

V5 - Salinity

FWOP
Assumptions: The only salinity data located was for stations in Breton Sound and adjacent bays. Means for those stations are above 10 ppt which is much higher than salinities in the project area which receives continuous flow from the Mississippi River. It is suggested that mean high during the growing season is approximately **3 ppt** which corresponds to the vegetative community in the area.

FWP
3 ppt

V6 - Fish Access

FWOP
Access value is 1.0

FWP
Access value is 1.0

Area 2

Marsh: 126 acres Water: 327 acres Total: 453 acres

FWOP
Assumptions: Same assumptions for land loss as applied to Area 1.

Presently, there are only a few shallow cuts off of the main channel leading into each unit but no well-defined crevasses as in Area 1. Assume a growth rate for each unit of 0.5 ac/yr as aerial photos do not indicate much growth over the last 10 years.

TY0 126 acres - 28%
TY1 128 acres - 28% (0.5)(3) = 1.5 1.5 + 126 = 128
TY20 156 acres - 34% (0.5)(3)(20) = 30 30 + 126 = 156

FWP
Assumptions: Each crevasse gains 1.8 ac/yr for first five years and increases (after maintenance) to 3.0 ac/yr at TY5. At that growth rate, each unit will gain 54 acres of marsh over the project life. A lower growth rate than crevasse 1A is proposed because these channels are assumed to receive less flow from the river because of the shallower depth of the breach through the rock dike.

Crevasse construction will result in the destruction of approximately 2 acres of marsh. Sidecasting of dredged material will result in the creation of 15 acres of emergent marsh for a net of 13 acres at TY1.

TY1 144 acres - 32% 126 + 5 (splay growth) + 13 (dredged material) = 144
TY5 166 acres - 37% 144 + 22 (splay growth) = 166
TY20 301 acres - 66% 166 + 135 (splay growth) = 301

V2 - Submerged Aquatic Vegetation

Submerged aquatic vegetation includes Eurasian watermilfoil, southern naiad, coontail, sago pondweed, curley-leaf pondweed, big pondweed, and water stargrass.

FWOP
Assumptions: FWOP - Baseline conditions are 40% coverage based on field investigations and video. Assume an increase to 50% by TY20 as area infills and more emergent marsh forms creating better conditions for SAV establishment.

TY0: 45%
TY1: 45%
TY20: 55%

FWP
Assumptions: SAV coverage increases to 70% by TY20 based on field observations in the project area. At TY20, Unit 2A contains approximately 18 acres of open water which is assumed to have 80% SAV coverage. At TY20, Unit 2B contains only 4 acres of open water and is also assumed to have 80% SAV coverage. At TY20, Unit 2C contains 130 acres of open water which is assumed to have 70% SAV coverage. Weighted average at TY20 is 71%.

TY1: 50%
TY5: 60%
TY20: 75%

V3 - Interspersion

FWOP

TY0: 15%-Class 3; 85%-Class 4
TY1: 15%-Class 3; 85%-Class 4
TY20: 20%-Class 3; 80%-Class 4

FWP

TY1: 15%-Class 3; 85%-Class 4
TY5: 20%-Class 3; 80%-Class 4
TY20: 40%-Class 2; 60%-Class 3

V4 - Shallow Open Water Habitat

FWOP
Assumptions: From field trip and video, estimated that all of the open water in 2A and 2B is shallow and 50% of the open water in Unit 2C resulting in a baseline value of 70%. Infilling will continue and shallow water will gradually increase over the project life.

TY0: 70%
TY1: 70%
TY20: 80%

FWP
Assumptions: The only shallow water at TY20 is found in the crevasses, bayous, and canals.

TY1: 70%
TY5: 80%
TY20: 90%

V5 - Salinity

FWOP
Assumptions: The only salinity data located was for stations in Breton Sound and adjacent bays. Means for those stations are above 10 ppt which is much higher than salinities in the project area which receives continuous flow from the Mississippi River. It is suggested that mean high during the growing season is approximately **3 ppt** which corresponds to the vegetative community in the area.

FWP
3 ppt

V6 - Fish Access

FWOP
Access value is 1.0

FWP
Access value is 1.0

WETLAND VALUE ASSESSMENT COMMUNITY MODEL

Fresh/Intermediate Marsh

Project: Delta Management at Fort St. Philip
Area 1

Condition: Future Without Project

Project Area:
Fresh.....
Intermediate. 852

Variable		TY 0 Value	TY 0 SI	TY 1 Value	TY 1 SI	TY 20 Value	TY 20 SI			
V1	% Emergent	20	0.28	21	0.29	37	0.43			
V2	% Aquatic	40	0.46	40	0.46	50	0.55			
V3	Interspersion	%		%		%				
	Class 1		0.23		0.23		0.27	0	0	0
	Class 2							0	0	0
	Class 3	15		15		35		0.4	0.4	0.4
	Class 4	85		85		65		0.2	0.2	0.2
	Class 5									
V4	%OW <= 1.5ft	60	0.78	60	0.78	70	0.89			
V5	Salinity (ppt)									
	fresh		1.00		1.00		1.00			
	intermediate	3		3		3		1.00	1.00	1.00
V6	Access Value									
	fresh		1.00		1.00		1.00			
	intermediate	1.00		1.00		1.00		1.00	1.00	1.00
	Emergent Marsh HSI =		**0.41**	**EM HSI =**	**0.41**	**EM HSI =**	**0.53**			
	Open Water HSI =		**0.58**	**OW HSI =**	**0.58**	**OW HSI =**	**0.66**			

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Fresh/Intermediate Marsh

Project: Delta Management at Fort St. Philip
Area 1
Condition: Future With Project

Project Area:
Fresh.....
Intermediate. 852

Variable		TY 0 Value	TY 0 SI	TY 1 Value	TY 1 SI	TY 5 Value	TY 5 SI			
V1	% Emergent	20	0.28	25	0.33	30	0.37			
V2	% Aquatic	40	0.46	45	0.51	60	0.64			
V3	Interspersion	%		%		%				
	Class 1		0.23		0.29		0.30	0	0	0
	Class 2							0	0	0
	Class 3	15		45		50		0.4	0.4	0.4
	Class 4	85		55		50		0.2	0.2	0.2
	Class 5									
V4	%OW <= 1.5ft	60	0.78	60	0.78	65	0.83			
V5	Salinity (ppt)									
	fresh		1.00		1.00		1.00			
	intermediate	3		3		3		1.00	1.00	1.00
V6	Access Value									
	fresh		1.00		1.00		1.00			
	intermediate	1.00		1.00		1.00		1.00	1.00	1.00
	Emergent Marsh HSI =		**0.41**	**EM HSI =**	**0.45**	**EM HSI =**	**0.48**			
	Open Water HSI =		**0.58**	**OW HSI =**	**0.62**	**OW HSI =**	**0.71**			

Project: Delta Management at Fort St. Philip
FWP

Variable		TY 20 Value	TY 20 SI							
V1	% Emergent	52	0.57							
V2	% Aquatic	70	0.73							
V3	Interspersion	%		%		%				
	Class 1		0.40					0	0	0
	Class 2	30						0.6	0	0
	Class 3	40						0.4	0	0
	Class 4	30						0.2	0	0
	Class 5									
V4	%OW <= 1.5ft	80	1.00							
V5	Salinity (ppt)									
	fresh		1.00							
	intermediate	3						1.00		
V6	Access Value									
	fresh		1.00							
	intermediate	1.00						1.00		
	EM HSI =		**0.64**	**EM HSI =**		**EM HSI =**				
	OW HSI =		**0.79**	**OW HSI =**		**OW HSI =**				

AAHU CALCULATION - EMERGENT MARSH

Project: Delta Management at Fort St. Philip
Area 1

Future Without Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	174	0.41	70.63	
1	181	0.41	74.77	72.69
20	318	0.53	168.00	2256.37
			AAHUs =	116.45

Future With Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	174	0.41	70.63	
1	209	0.45	93.67	81.90
5	252	0.48	121.99	430.29
20	440	0.64	282.04	2956.50
			AAHUs	173.43

NET CHANGE IN AAHUs DUE TO PROJECT		
A. Future With Project Emergent Marsh AAHUs	=	173.43
B. Future Without Project Emergent Marsh AAHUs	=	116.45
Net Change (FWP - FWOP) =		**56.98**

AAHU CALCULATION - OPEN WATER

Project: Delta Management at Fort St. Philip
Area 1

Future Without Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	678	0.58	395.24	
1	671	0.58	391.16	393.20
20	534	0.66	350.60	7078.66
			AAHUs =	373.59

Future With Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	678	0.58	395.24	
1	643	0.62	397.95	396.81
5	600	0.71	428.64	1655.92
20	412	0.79	326.32	5698.67
			AAHUs	387.57

NET CHANGE IN AAHUs DUE TO PROJECT		
A. Future With Project Open Water AAHUs	=	387.57
B. Future Without Project Open Water AAHUs	=	373.59
Net Change (FWP - FWOP) =		**13.98**

TOTAL BENEFITS IN AAHUs DUE TO PROJECT		
A. Emergent Marsh Habitat Net AAHUs	=	56.98
B. Open Water Habitat Net AAHUs	=	13.98
Net Benefits=(2.1xEMAAHUs+OWAAHUs)/3.1		**43.11**

WETLAND VALUE ASSESSMENT COMMUNITY MODEL

Fresh/Intermediate Marsh

Project: Delta Management at Fort St. Philip
Area 2

Condition: Future Without Project

Project Area:
Fresh.....
Intermediate. 453

Variable		TY 0 Value	TY 0 SI	TY 1 Value	TY 1 SI	TY 20 Value	TY 20 SI			
V1	% Emergent	28	0.35	28	0.35	34	0.41			
V2	% Aquatic	45	0.51	45	0.51	55	0.60			
V3	Interspersion	%		%		%				
	Class 1		0.23		0.23		0.24	0	0	0
	Class 2							0	0	0
	Class 3	15		15		20		0.4	0.4	0.4
	Class 4	85		85		80		0.2	0.2	0.2
	Class 5									
V4	%OW <= 1.5ft	70	0.89	70	0.89	80	1.00			
V5	Salinity (ppt)									
	fresh		1.00		1.00		1.00			
	intermediate	3		3		3		1.00	1.00	1.00
V6	Access Value									
	fresh		1.00		1.00		1.00			
	intermediate	1.00		1.00		1.00		1.00	1.00	1.00
	Emergent Marsh HSI =		**0.46**	**EM HSI =**	**0.46**	**EM HSI =**	**0.50**			
	Open Water HSI =		**0.62**	**OW HSI =**	**0.62**	**OW HSI =**	**0.69**			

WETLAND VALUE ASSESSMENT COMMUNITY MODEL

Fresh/Intermediate Marsh

Project: Delta Management at Fort St. Philip Area 2

Condition: Future With Project

Project Area:
Fresh.....
Intermediate. 453

Variable		TY 0 Value	TY 0 SI	TY 1 Value	TY 1 SI	TY 5 Value	TY 5 SI			
V1	% Emergent	28	0.35	32	0.39	37	0.43			
V2	% Aquatic	45	0.51	50	0.55	60	0.64			
V3	Interspersion	%		%		%				
	Class 1		0.23		0.23		0.24	0	0	0
	Class 2							0	0	0
	Class 3	15		15		20		0.4	0.4	0.4
	Class 4	85		85		80		0.2	0.2	0.2
	Class 5									
V4	%OW <= 1.5ft	70	0.89	70	0.89	80	1.00			
V5	Salinity (ppt)									
	fresh		1.00		1.00		1.00			
	intermediate	3		3		3		1.00	1.00	1.00
V6	Access Value									
	fresh		1.00		1.00		1.00			
	intermediate	1.00		1.00		1.00		1.00	1.00	1.00
	Emergent Marsh HSI =		**0.46**	**EM HSI =**	**0.49**	**EM HSI =**	**0.52**			
	Open Water HSI =		**0.62**	**OW HSI =**	**0.65**	**OW HSI =**	**0.72**			

Project: Delta Management at Fort St. Philip
FWP

Variable		TY 20 Value	TY 20 SI							
V1	% Emergent	66	0.69							
V2	% Aquatic	75	0.78							
V3	Interspersion	%		%		%				
	Class 1		0.48					0	0	0
	Class 2	40						0.6	0	0
	Class 3	60						0.4	0	0
	Class 4							0	0	0
	Class 5									
V4	%OW <= 1.5ft	90	1.00							
V5	Salinity (ppt)									
	fresh		1.00							
	intermediate	3						1.00		
V6	Access Value									
	fresh		1.00							
	intermediate	1.00						1.00		
	EM HSI =		**0.74**	**EM HSI =**		**EM HSI =**				
	OW HSI =		**0.83**	**OW HSI =**		**OW HSI =**				

AAHU CALCULATION - EMERGENT MARSH

Project: Delta Management at Fort St. Philip
Area 2

Future Without Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	126	0.46	58.27	
1	128	0.46	59.20	58.74
20	156	0.50	78.74	1306.67
			AAHUs =	68.27

Future With Project			Total	Cummulative
TY	Marsh Acres	x HSI	HUs	HUs
0	126	0.46	58.27	
1	144	0.49	70.56	64.34
5	166	0.52	87.15	314.91
20	301	0.74	222.17	2247.93
			AAHUs	131.36

NET CHANGE IN AAHUs DUE TO PROJECT		
A. Future With Project Emergent Marsh AAHUs	=	131.36
B. Future Without Project Emergent Marsh AAHUs	=	68.27
Net Change (FWP - FWOP) =		**63.09**

AAHU CALCULATION - OPEN WATER

Project: Delta Management at Fort St. Philip
Area 2

Future Without Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	327	0.62	203.65	
1	325	0.62	202.41	203.03
20	297	0.69	205.77	3883.92
			AAHUs =	204.35

Future With Project			Total	Cummulative
TY	Water Acres	x HSI	HUs	HUs
0	327	0.62	203.65	
1	309	0.65	201.96	202.90
5	287	0.72	207.35	819.62
20	152	0.83	125.57	2531.89
			AAHUs	177.72

NET CHANGE IN AAHUs DUE TO PROJECT		
A. Future With Project Open Water AAHUs	=	177.72
B. Future Without Project Open Water AAHUs	=	204.35
Net Change (FWP - FWOP) =		**-26.63**

TOTAL BENEFITS IN AAHUs DUE TO PROJECT		
A. Emergent Marsh Habitat Net AAHUs	=	63.09
B. Open Water Habitat Net AAHUs	=	-26.63
Net Benefits=(2.1xEMAAHUs+OWAAHUs)/3.1		**34.15**