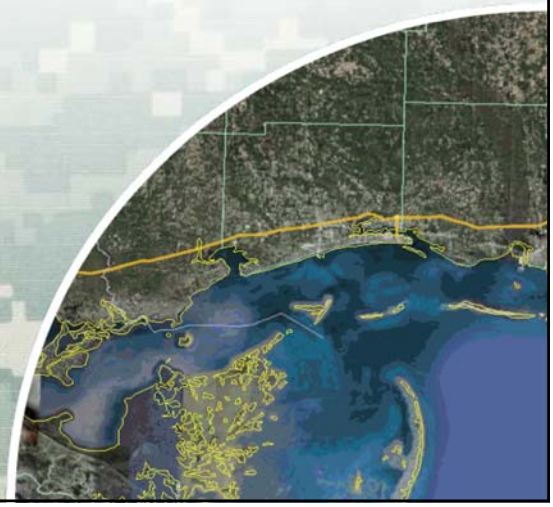
Appendix L
Camille Cut Closure Desktop Analysis

Camille Cut Closure

A desk-top analysis of closure options

MsCIP Multi-Agency Meeting
January 13, 2011



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Presentation Outline

- Assumptions in the Desktop Study Analysis
- Orientation to the Camille Cut Study Area
  - Proposed Restoration
  - Identified Sand Sources
- Overview of Closure Options
- Sediment Budget with the Study Area
- Cross-Shore Equilibrium of the Fill
- Volume Estimates
- Longevity Estimates
- Cost Comparison
- Closing Points
- Open Discussion

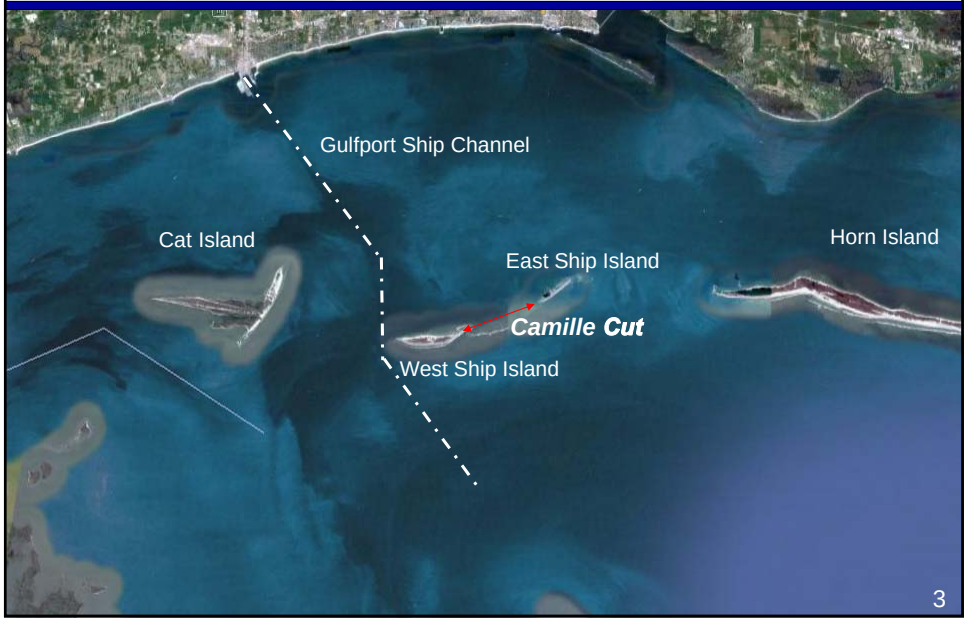
1

Assumptions in Desk-Top Analysis

- The analysis is meant to provide relative comparisons between borrow sources and is intended as a screening tool
  - Modeling and further analysis will be required for a subset of selected alternatives
- Assumed that historical processes (as inferred from sediment budget) will continue through time
- Severe, catastrophic storms (*Camille; Katrina*) are not incorporated into analysis
- An island width greater than 500-700 ft will be less likely to breach
  - This width is termed “critical width”
  - Critical width defined from historical width of Ship Island
  - Better fill alternatives are those that maintain critical width or greater over a specified life time
- Native sand has a median grain size, D50=0.30 mm
  - The most compatible fill sands could range from D50≥0.28 mm
  - Sand greater than native, D50>0.30 mm, will be more stable
  - Sand finer than native, D50<0.30 mm, will erode faster
- Assumed that East Ship remains an integral part of the restored Ship Island and continues to provide a source of sand to Camille Cut Fill
- This analysis does not include the potential effect of littoral zone placement or offshore borrow sources.

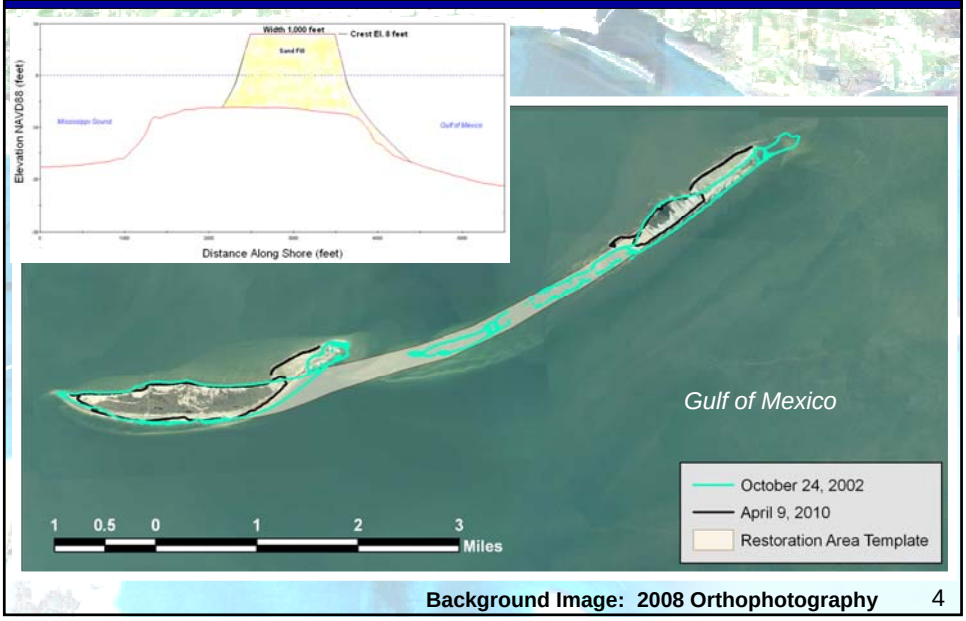
2

Orientation to Study Area



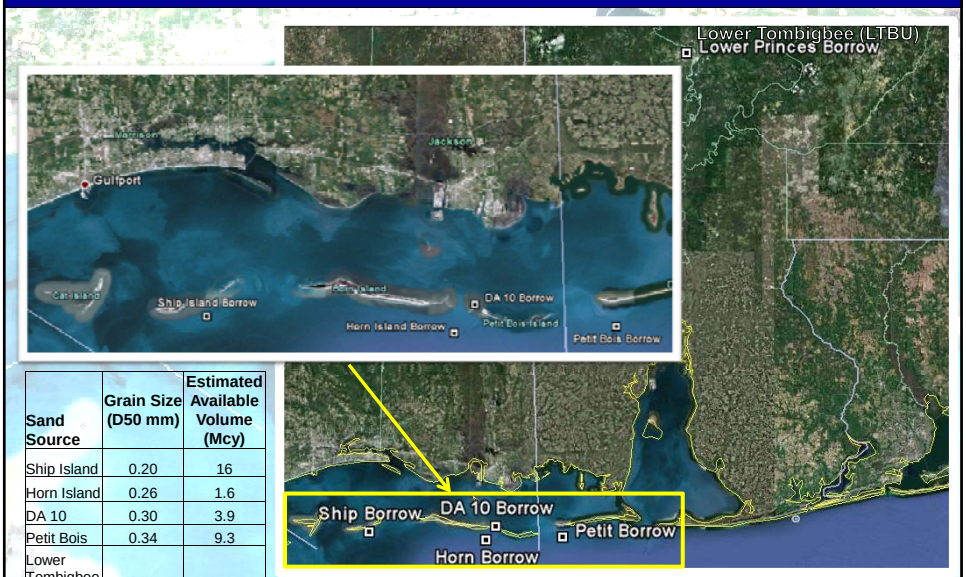
3

Proposed Island Restoration



Background Image: 2008 Orthophotography 4

Identified Sand Source Options



Sand Source	Grain Size (D50 mm)	Estimated Available Volume (Mcy)
Ship Island	0.20	16
Horn Island	0.26	1.6
DA 10	0.30	3.9
Petit Bois	0.34	9.3
Lower Tombigbee (LTBU)	0.30	8.4

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Overview of Closure Options

Identifier and Slide Number associated with Closure Options					
Alternative	**Ship** D50 = 0.20 mm	**Horn or Borrow Combo** D50 = 0.26mm	**Borrow combo** D50 = 0.28 mm	**DA-10, LTBU or Borrow Combo** D50 = 0.30 mm	**Petiti** D50 = 0.34 mm
Fill	**1S**	**1H**	**1C**	**1T**	**1P**
Fill + Vegetation	**2S**	**2H**	**2C**	**2T**	**2P**
Fill + Terminal Groin	**3S**	**3H**	**3C**	**3T**	**3P**
Fill + Term. Groin + Vegetation	**4S**	**4H**	**4C**	**4T**	**4P**

Note: Borrow Area Combo is a combination of 2 or more of the 5 identified borrow area sources which make up the specified grain size
LTBU = Lower Tombigbee Upland Sites

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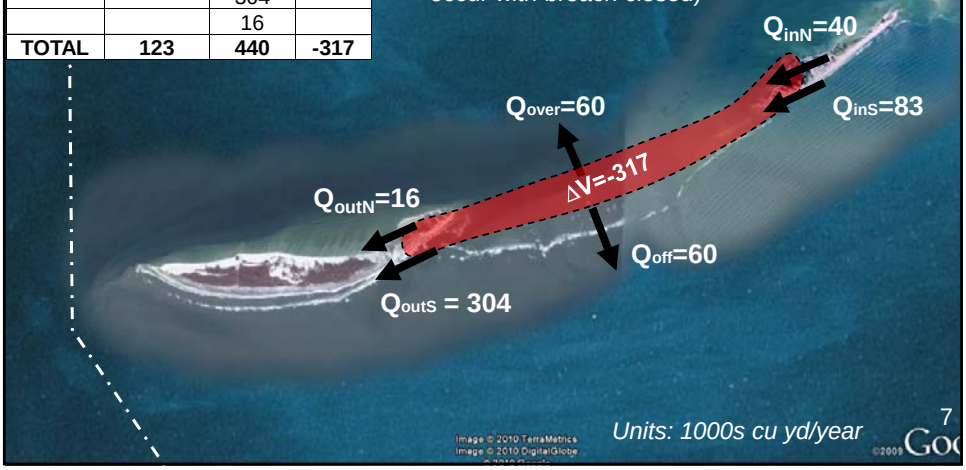
Historical Sediment Budget as applied to Camille Cut Closure Area

Sum	Sources +	Sinks -	ΔV
	83	60	
	40	60	
		304	
		16	
TOTAL	**123**	**440**	**-317**

Notes:
- Assumes sediment = native sediment size
- Incorporates inlet processes (which wouldn't occur with breach closed)



Units: 1000s cu yd/year

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Overview of Closure Options

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Fill	**1S**	**1H**	**1C**	**1T**	**1P**
Fill + Vegetation	2S	2H	2C	2T	2P
Fill + Terminal Groin	3S	3H	3C	3T	3P
Fill + Term. Groin + Vegetation	4S	4H	4C	4T	4P

Note: Borrow Area Combo is a combination of 2 or more of the 5 identified borrow area sources which make up the specified grain size
LTBU = Lower Tombigbee Upland Sites

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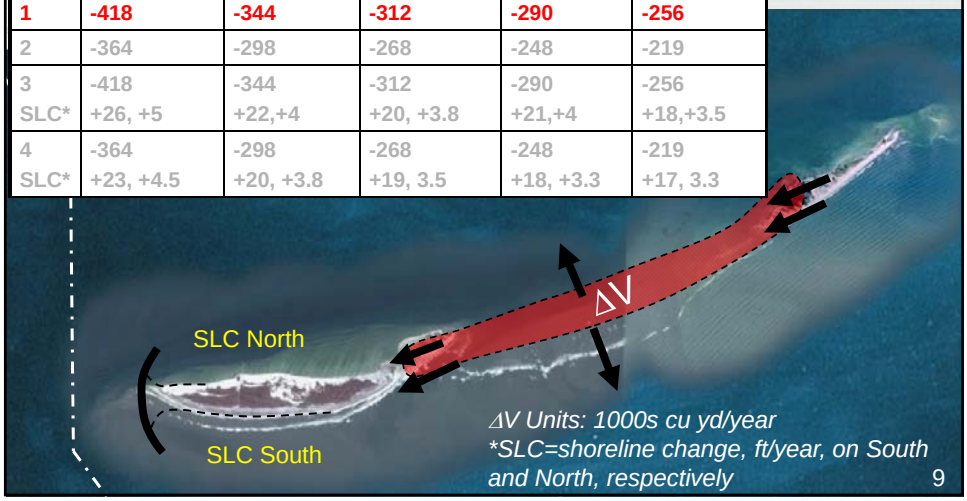
Summary of Fill Alternatives

Alt	S- Ship D50 = 0.20 mm	H- Horn D50 = 0.26mm	C- Combo D50 = 0.28 mm	T- LTBU D50 = 0.30 mm	P- Petit D50 = 0.34 mm
	ΔV, 1000s cu yd/year				
1	**-418**	**-344**	**-312**	**-290**	**-256**
2	-364	-298	-268	-248	-219
3 SLC*	-418 +26, +5	-344 +22,+4	-312 +20, +3.8	-290 +21,+4	-256 +18,+3.5
4 SLC*	-364 +23, +4.5	-298 +20, +3.8	-268 +19, 3.5	-248 +18, +3.3	-219 +17, 3.3



ΔV Units: 1000s cu yd/year
**SLC=shoreline change, ft/year, on South and North, respectively*

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Overview of Closure Options

Identifier and Slide Number associated with Closure Options					
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Fill	1S	1H	1C	1T	1P
Fill + Vegetation	**2S**	**2H**	**2C**	**2T**	**2P**
Fill + Terminal Groin	3S	3H	3C	3T	3P
Fill + Term. Groin + Vegetation	4S	4H	4C	4T	4P

Note: Borrow Area Combo is a combination of 2 or more of the 5 identified borrow area sources which make up the specified grain size
LTBU = Lower Tombigbee Upland Sites

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Summary of Fill + Vegetation Alternatives

Alt	S- Ship D50 = 0.20 mm	H- Horn D50 = 0.26mm	C- Combo D50 = 0.28 mm	T- LTBU D50 = 0.30 mm	P- Petit D50 = 0.34 mm
	ΔV, 1000s cu yd/year				
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2	**-364**	**-298**	**-268**	**-248**	**-219**
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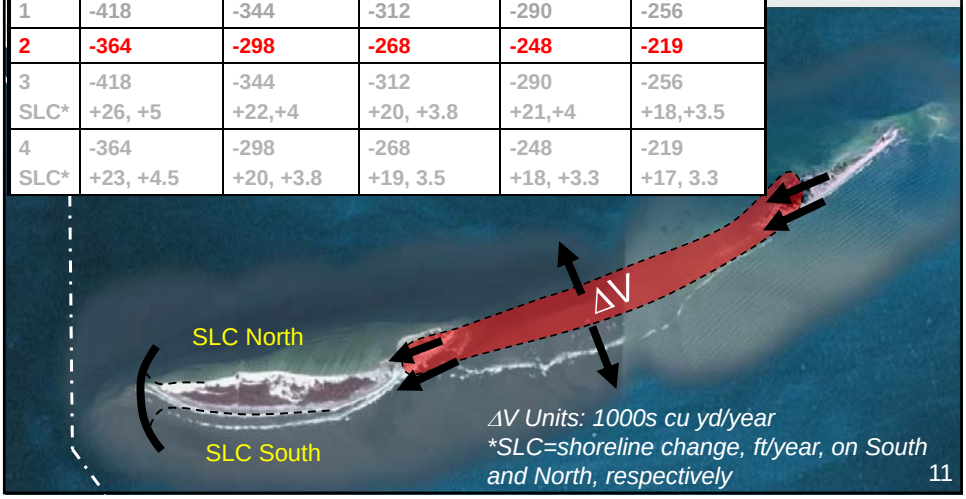

ΔV Units: 1000s cu yd/year
**SLC=shoreline change, ft/year, on South and North, respectively*

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Overview of Closure Options

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Fill + Vegetation	2S	2H	2C	2T	2P
Fill + Terminal Groin	**3S**	**3H**	**3C**	**3T**	**3P**
Fill + Term. Groin + Vegetation	4S	4H	4C	4T	4P

Note: Borrow Area Combo is a combination of 2 or more of the 5 identified borrow area sources which make up the specified grain size
LTBU = Lower Tombigbee Upland Sites

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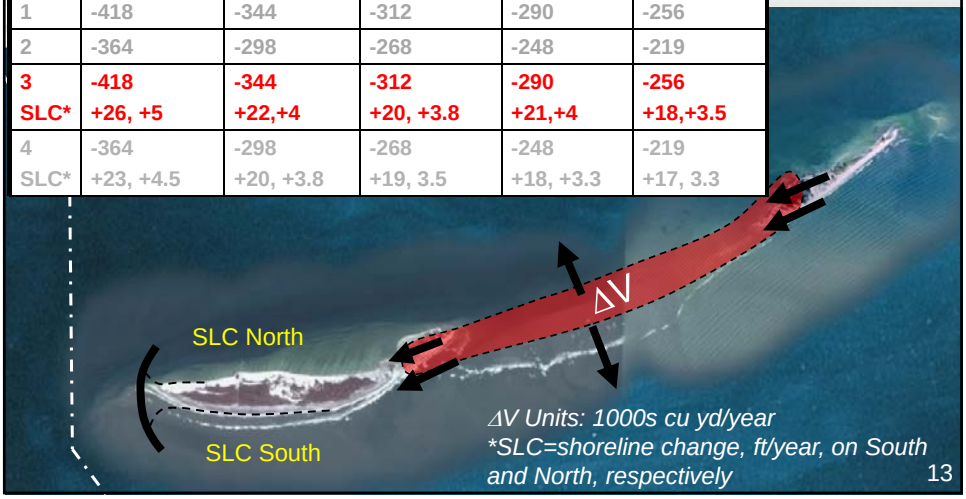
Summary of Fill + Terminal Groin Alternatives

Alt	S- Ship D50 = 0.20 mm	H- Horn D50 = 0.26mm	C- Combo D50 = 0.28 mm	T- LTBU D50 = 0.30 mm	P- Petit D50 = 0.34 mm
	ΔV, 1000s cu yd/year				
1	-418	-344	-312	-290	-256
2	-364	-298	-268	-248	-219
3 SLC*	**-418 +26, +5**	**-344 +22,+4**	**-312 +20, +3.8**	**-290 +21,+4**	**-256 +18,+3.5**
4 SLC*	-364 +23, +4.5	-298 +20, +3.8	-268 +19, 3.5	-248 +18, +3.3	-219 +17, 3.3



ΔV Units: 1000s cu yd/year
**SLC=shoreline change, ft/year, on South and North, respectively*

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Overview of Closure Options

Identifier and Slide Number associated with Closure Options					
Alternative	**Ship** D50 = 0.20 mm	**Horn or Borrow Combo** D50 = 0.26mm	**Borrow combo** D50 = 0.28 mm	**DA-10, LTB or Borrow Combo** D50 = 0.30 mm	**Petiti** D50 = 0.34 mm
Fill	1S	1H	1C	1T	1P
Fill + Vegetation	2S	2H	2C	2T	2P
Fill + Terminal Groin	3S	3H	3C	3T	3P
Fill + Term. Groin + Vegetation	**4S**	**4H**	**4C**	**4T**	**4P**

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Summary of Fill + Vegetation + Terminal Groin Alternatives

Alt	S- Ship D50 = 0.20 mm	H- Horn D50 = 0.26mm	C- Combo D50 = 0.28 mm	T- LTBU D50 = 0.30 mm	P- Petit D50 = 0.34 mm
	ΔV, 1000s cu yd/year				
1	-418	-344	-312	-290	-256
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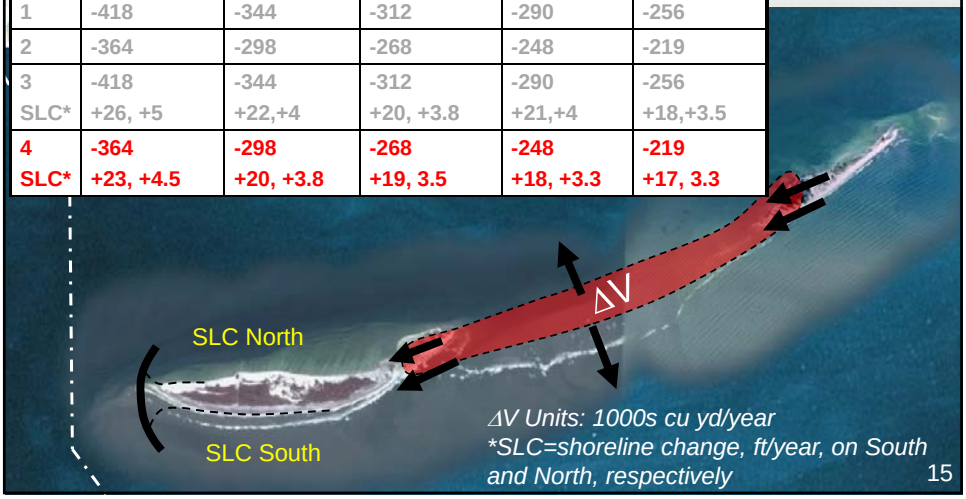

ΔV Units: 1000s cu yd/year
**SLC=shoreline change, ft/year, on South and North, respectively*

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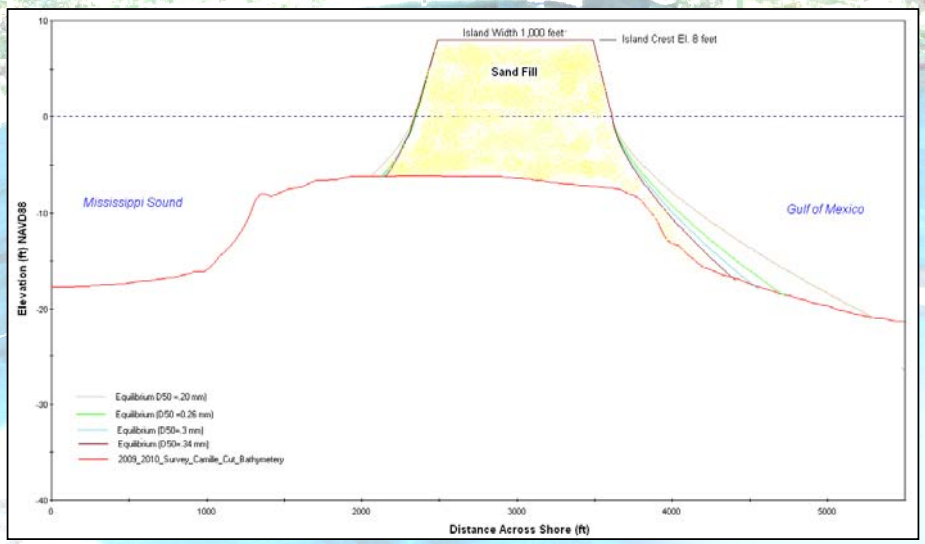
Camille Cut Cross-Shore Equilibrium



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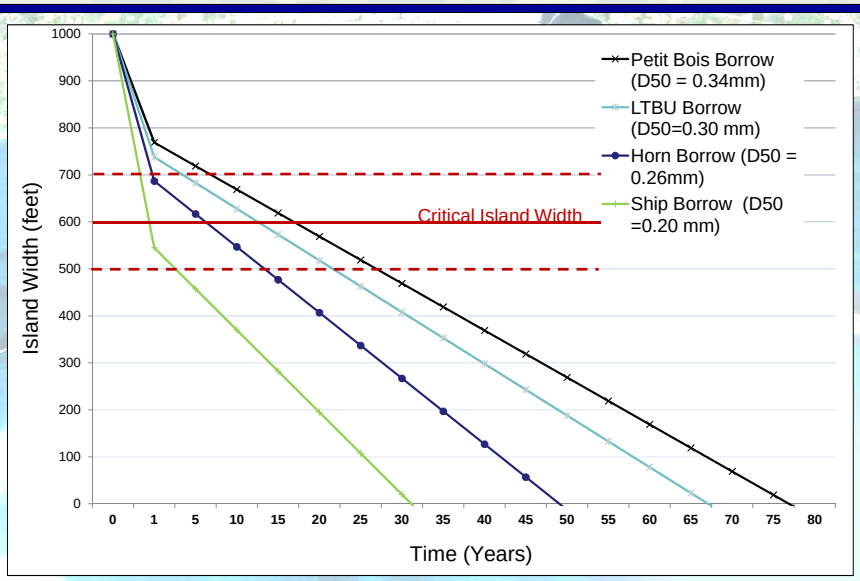
Change in Restored Island Width (Fill)



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Is There Enough Fill?

Camille Cut Fill Volume Estimates

Initial Equilibrium Island Width(EL. 8 ft NAVD88)	Sand Sources				
	Ship Island Borrow (0.20mm)	Horn Island (0.26mm)	DA 10 (0.30 mm)	LTBU (0.30 mm)	Petit Bois (0.34mm)
(ft)	(Mcy)	(Mcy)	(Mcy)	(Mcy)	(Mcy)
1000	30.0	24.9	22.9	22.9	21.2
900	27.1	22.2	20.3	20.3	18.7
800	24.4	19.5	17.7	17.7	16.3
700	21.6	17.0	15.3	15.3	13.9
600	18.9	14.2	12.9	12.9	11.6
500	15.7	12.0	10.5	10.5	9.4

Notes: Volumes are estimates based on Equilibrium Profile Concepts [CEM Equations: V-4-5 to V-4-8]
An additional 10-20% was added for estimated loses during closure operation
Volumes are for screening purposes only and should not be used for final design

Insufficient Volumes
Sufficient Volumes

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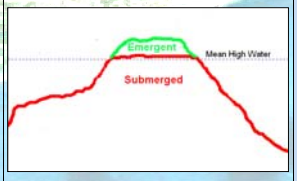
Camille Cut Fill Longevity Estimates (Fill + Vegetation)



Initial Equilibrium Island Width(EL. 8 ft NAVD88)	Potential Sand Sources				
	Ship Island Borrow (0.20mm)	Horn Island (0.26mm)	DA 10 (0.30 mm)	LTBU (0.30 mm)	Petit Bois (0.34mm)
(ft)	(yr)	(yr)	(yr)	(yr)	(yr)
1000					
900					
800					
700					
600					27
500	23				17

Notes: Fill longevity was estimated from cross-shore and longshore transport rates detailed in desktop study sediment study slides
Longevity estimates assumes a constant averaged rate of change in the fill volume through time after initial equilibrium.
Assumes longevity to the point of a submerged island profile

Does Not Exceed 30 years
Exceeds 30 years

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Camille Cut Fill Volume Estimates (Fill +Vegetation)

Initial Equilibrium Island Width(EL. 8 ft NAVD88)	Potential Sand Source Combinations									
	(60%) LTBU, (28%) DA 10, (12%) Horn (0.30 mm)	(50%) LTBU, (23%) DA 10, (7%) Horn, (20%) Ship, (0.28 mm)	(35%) LTBU, (16%) DA 10 (7%) Horn, (40%) Ship, (0.26 mm)	(30%) Ship plus (70%) Petit Bois (0.30 mm)	(40%) Ship plus (60%) Petit Bois (0.28 mm)	(55%) Ship plus (45%) Petit Bois (0.26 mm)	(22%) Ship, (60%) Peiti, (13%) DA 10, (5%) Horn (0.30mm)	(37%) Ship, (45%) Peiti, (13%) DA 10, (5%) Horn (0.28mm)	(52%) Ship, (30%) Peiti, (13%) DA 10, (5%) Horn (0.26mm)	(40%) Ship, (49%) DA 10, (11%) Horn (0.26 mm)
(ft)	(Mcy)	(Mcy)	(Mcy)	(Mcy)	(Mcy)	(Mcy)	(Mcy)	(Mcy)	(Mcy)	(Mcy)
1000	22.9	23.6	24.9	22.9	23.6	24.9	22.9	23.6	24.9	24.9
900	20.2	21.0	22.2	20.2	21.0	22.2	20.2	21.0	22.2	22.2
800	17.7	18.4	19.5	17.7	18.4	19.5	17.7	18.4	19.5	19.5
700	15.3	15.9	17.0	15.3	15.9	17.0	15.3	15.9	17.0	17.0
600	12.9	13.5	14.2	12.9	13.5	14.2	12.9	13.5	14.2	14.2
500	10.5	11.1	12.0	10.5	11.1	12.0	10.5	11.1	12.0	12.0

Notes: Volumes are estimates based on Equilibrium Profile Concepts [CEM Equations: V-4-5 to V-4-8]
An additional 10-20% was added for estimated loses during closure operation
Volumes are for screening purposes only and should not be used for final design

Insufficient Volumes

Sufficient Volumes

20

Camille Cut Fill Longevity Estimates (Fill +Vegetation)

Initial Equilibrium Island Width(EL. 8 ft NAVD88)	Potential Sand Source Combinations									
	(60%) LTBU, (28%) DA 10, (12%) Horn (0.30 mm)	(50%) LTBU, (23%) DA 10, (7%) Horn, (20%) Ship, (0.28 mm)	(35%) LTBU, (16%) DA 10 (7%) Horn, (40%) Ship, (0.26 mm)	(30%) Ship plus (70%) Petit Bois (0.30 mm)	(40%) Ship plus (60%) Petit Bois (0.28 mm)	(55%) Ship plus (45%) Petit Bois (0.26 mm)	(22%) Ship, (60%) Peiti, (13%) DA 10, (5%) Horn 0.30mm)	(37%) Ship, (45%) Peiti, (13%) DA 10, (5%) Horn (0.28mm)	(52%) Ship, (30%) Peiti, (13%) DA 10, (5%) Horn (0.26mm)	(40%) Ship, (49%) DA 10, (11%) Horn (0.26 mm)
(ft)	(yr)/(feet)	(yr)/(feet)	(yr)/(feet)	(yr)/(feet)	(yr)/(feet)	(yr)/(feet)	(yr)/(feet)	(yr)/(feet)	(yr)/(feet)	(yr)/(feet)
1000									*60 (695)	
900			*52 (595)						*52 (595)	
800			43 (495)			43 (495)		*46 (545)	43 (495)	
700		37 (450)	35 (400)			35 (400)	38 (460)	37 (450)	35 (400)	
600	29 (0)	28 (0)	27 (0)	29 (0)	28 (0)	27 (0)	29 (0)	28 (0)	27 (0)	
500	23 (0)	20 (0)	17 (0)	23 (0)	20 (0)	17 (0)	23 (0)	20 (0)	17 (0)	

Notes: longevity was estimated from sediment transport rates detailed in the sediment budget slides
Longevity estimates assumes a constant averaged rate of change in the fill volume through time after initial equilibrium of the fill
Assumes longevity to the point of a submerged island profile
(feet) = the potential emergent island width remaining at 30 years

Does Not Exceed 30 years

Exceeds 30 years /
* Minimum of 500 ft. Critical Width or greater at 30 years

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Camille Cut Fill Cost Comparison

Sand Source	Excavation and Haul Cost per Cubic Yard $
Ship	5
Horn	12
Petit	15
DA 10	20
LTBU	40

Notes: Costs are rough order of magnitude costs for alternative screening purposes only.

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Camille Cut Fill Cost Comparison

Camille Cut - Equilibrium Berm (EL. 8 ft NAVD88) Island Width	Potential Sand Source Combinations									
	(60%) LTBU, (28%) DA 10, (12%) Horn (0.30 mm)	(50%) LTBU, (23%) DA 10, (7%) Horn, (20%) Ship, (0.28 mm)	(35%) LTBU, (16%) DA 10, (7%) Horn, (40%) Ship, (0.26 mm)	(30%) Ship plus (70%) Petit Bois (0.30 mm)	(40%) Ship plus (60%) Petit Bois (0.28 mm)	(55%) Ship plus (45%) Petit Bois (0.26 mm)	(22%) Ship, (60%) Peiti, (13%) DA 10, (5%) Horn (0.30mm)	(37%) Ship, (45%) Peiti, (13%) DA 10, (5%) Horn (0.28mm)	(52%) Ship, (30%) Peiti, (13%) DA 10, (5%) Horn (0.26mm)	(40%) Ship, (49%) DA 10, (11%) Horn (0.26 mm)
(ft)	$ (1,000,000)	$ (1,000,000)	$ (1,000,000)	$ (1,000,000)	$ (1,000,000)	$ (1,000,000)	$ (1,000,000)	$ (1,000,000)	$ (1,000,000)	$ (1,000,000)
1000									*274	
900			*444						*245	
800			391			186		*230	217	
700		421	340			161	212	200	190	
600										
500										

Notes: Costs are rough order of magnitude costs for alternative screening purposes only.
* Alternative is estimated to maintain a minimum critical island width of 500 ft. or greater at 30 years.

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Closing Points

- The borrow source alternatives with the most compatible grain sizes and sufficient volumes to restore Camille Cut come from a combination of sources.
- Vegetation would encourage the deposition of windblown sand, promote dune growth and reduce loss of sand from the island.
- A terminal groin could provide a positive effect to the shoreline several miles up drift by retaining sand and providing control of large-scale fluctuations of the shoreline.
- A terminal groin is not expected to have a direct effect on Camille Cut without the implementation of backpassing.
- Modeling and further analysis will be required for a subset of selected alternatives.

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