# Appendix L

# **ABREVIATED RISK ANALYSIS**

		Abbreviated Risk Analysis Houma Navigation Canal Deepening Pro	ject			Alternative	: 1A	15-Adjacent	
		Low Risk: Typical Construction, Simple				Meeting Date	:	11/2/2015	
	Т	otal Estimated Construction Contract Cost =	\$	507,730,622					
	CWWBS	Feature of Work	<u>C</u>	ontract Cost		% Contingency	47	Contingency	<u>Total</u>
	01 LANDS AND DAMAGES	Real Estate	\$	-		0.00%	\$	- \$	-
1	02 RELOCATIONS	Relocations	\$	-		0.00%	\$	- \$	-
2	12 NAVIGATION, PORTS AND HARBORS	Dredging	\$	507,730,622		25.22%	\$	128,069,627 \$	635,800,249
3			\$	-		0.00%	\$	- \$	-
4			\$			0.00%	\$	- \$	-
5			\$	-		0.00%	\$	- \$	-
6			\$	-		0.00%	\$	- \$	-
7						0.00%	\$	- \$	-
8			\$	-		0.00%	\$	- \$	-
9			\$			0.00%	\$	- \$	-
10			s			0.00%	\$	- \$	_
11			s			0.00%	\$	- \$	
	All Other	Remaining Construction Items	\$	_	0.0%	0.00%	\$	- \$	_
	30 PLANNING, ENGINEERING, AND DESIGN	Planning, Engineering, & Design	<u>پ</u> \$	50,773,062	0.070	7.00%	\$	3,554,114 \$	54,327,177
	31 CONSTRUCTION MANAGEMENT	Construction Management	<u>پ</u> ۲	40,618,450		7.00%	\$	2,843,291 \$	43,461,741
	FIXED DOLLAR RISK ADD (EQUALLY DISPERSED TO ALL, MUS		Ψ	40,010,430		1.00%	\$	2,0 <del>4</del> 3,231 ψ	43,401,741
~~	FIXED DOLLAR RISK ADD (EQUALLY DISPERSED TO ALL, MUS						φ		
		Totals Real Estate Total Construction Estimate Total Planning, Engineering & Design Total Construction Managemen	e\$ n\$	- 507,730,622 50,773,062 40,618,450		0.00% 25.22% 7.00% 7.00%	\$ \$ \$ \$	- \$ 128,069,627 \$ 3,554,114 \$ 2,843,291 \$	- 635,800,249 54,327,177 43,461,741
		Tota	l \$	599,122,134		22%	\$	134,467,033 \$	733,589,167
			Ra	ange Estimate (\$0	00's)	Base \$599,122	k	50% \$679,802k 50% based on base is at 5% CL.	<b>80</b> % \$733,589
	Fixed Dollar Risk Add: (Allows for additional risk to be added to the risk analsyis. Must include justification. Does not allocate to Real Estate.								

#### Houma Navigation Canal Deepening Project 1A 15-Adjacent

Feasibility (Alternatives) Abbreviated Risk Analysis

Meeting Date: 2-Nov-15



Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Impact	Likelihood	Risk Level
Project Sco	ope Growth			Maximum Proje	ct Growth	40%
PS-1	Relocations	Some utility elevations could not be determined. Relocation costs are 6 years old. Unidentified utilities or oil/gas infrastructure could be located during construction.	The need for additional relocations are a possability, which would increase the scope of the project and mpact cost/schedule.	Negligible	Unlikely	0
PS-2	Dredging	A full Dredged Material Disposal Plan has not been developed. Some depths and elevations for proposed disposal areas were assumed, without survey data. Disposal quantities could also be increased based on low maintenance activities and old survey information. It could be determined that foreshore protection and rock retention could be required in additional areas other than those recommended. This could lead to the need for additional rock retention, foreshore protection, and floatation channel dredging.	The proposed disposal locations will be revisted during the design phase, but some changes to the costs associated with the current plan is likely. Additional quantites could require changes to the proposed disposal areas and lead to increases in scope. Any changes to the rock requirements could increase the project scope, but it would have a minimal impact on overall costs.	Marginal	Possible	1
PS-3	0			Moderate	Possible	N/A
PS-4	0			Negligible	Unlikely	N/A
PS-5	0			Negligible	Unlikely	N/A
PS-6	0			Negligible	Unlikely	N/A
PS-7	0			Negligible	Unlikely	N/A
PS-8	0			Negligible	Unlikely	N/A
PS-9	0			Negligible	Unlikely	N/A
PS-10	0			Negligible	Unlikely	N/A
PS-11	0			Negligible	Unlikely	N/A
PS-12				Marginal	Possible	N/A

PS-13	Planning, Engineering, & Design			Negligible	Unlikely	0
PS-14	Construction Management			Negligible	Unlikely	0
<u>Acquisitio</u>	n Strategy			Maximum Project Growth		30%
AS-1	Relocations	Contract could require specialized work associated with environmental impacts of pipeline relocation and proper containment of material. The offshore nature of the work could limit the number of bids received to larger contracting companies.	A specialized pipeline relocation contractor could require a higher unit cost with a less competative bid. The overall cost ramifications of this would be minimal when compared to overall project costs.	Negligible	Unlikely	0
AS-2	Dredging	Dredging methodology for channel deepening would be widely available within south Louisiana, but offshore nature of the work could limit the number of bids.	A reduced number of bids could result in higher unit costs. However, based on the amount of ongoing dredging work within the channel over the past 20 years, it is believed the likihood of this occuring is minimal.	Marginal	Possible	1
AS-3	0			Moderate	Likely	N/A
AS-4	0			Negligible	Unlikely	N/A
AS-5	0			Negligible	Unlikely	N/A
AS-6	0			Negligible	Unlikely	N/A
AS-7	0			Negligible	Unlikely	N/A
AS-8	0			Negligible	Unlikely	N/A
AS-9	0			Negligible	Unlikely	N/A
AS-10	0			Negligible	Unlikely	N/A
AS-11	0			Negligible	Unlikely	N/A
AS-12				Negligible	Unlikely	N/A
AS-13	Planning, Engineering, & Design			Negligible	Unlikely	0
AS-14	Construction Management			Negligible	Unlikely	0
<b>Construct</b>	ion Elements			Maximum Proje	ct Growth	15%
CE-1	Relocations	Boat access would be required for relocations. Mobilization/Demobilization could take longer than anticipated. The potential exists for low-frequency weather events to delay work. Marine work could result in lower than anticipated productivity.	Impacts due to extended weather delays would be the most significant impact to cost and schedule, but the likelihood is low. With the amount of oil infrastructure existing in south Louisana, it is assumed a contractor familiar with the challenges of offshore pipeline relocation would be chosen. Therefore productivity issues would be minimal.	Negligible	Unlikely	0

CE-2	Dredging	Boat access would be required for survey crews and dredging equipment/crews. The potential exists for low-frequency weather events to delay work. Remote location of project could impact schedule if repairs are necessary to dredging equipment. Dredging methods would be fairly straight forward.	Dredging work is commonplace within the channel, so the risk of schedule delays or reduced productivity would center around the remote location or extreme weather events, not the dredging methods. The impact of a significant storm could be significant but liklihood is small.	Marginal	Possible	1
CE-3	0			Marginal	Possible	N/A
CE-4	0			Negligible	Unlikely	N/A
CE-5	0			Negligible	Unlikely	N/A
CE-6	0			Negligible	Unlikely	N/A
CE-7	0			Negligible	Unlikely	N/A
CE-8	0			Negligible	Unlikely	N/A
CE-9	0			Negligible	Unlikely	N/A
CE-10	0			Negligible	Unlikely	N/A
CE-11	0			Negligible	Unlikely	N/A
CE-12				Negligible	Unlikely	N/A
CE-13	Planning, Engineering, & Design			Negligible	Unlikely	0
CE-14	Construction Management			Negligible	Unlikely	0
<b>Quantities</b>	<u>s for Current Scope</u>			Maximum Proje	ct Growth	20%
Q-1	Relocations	The elevations of some pipelines are assumed or unkown. The potential exists for some unknown oil/gas infrastructure to be present. Shoaling rates utilized are based on past data, but the infrequency of maintenance dredging could result in pipelines found to be deeper than anticipated.	The potential exists for increased quantity requirements during the relocation phase of the project, but the cost impact would be small when compaed to the overall cost of the project.	Negligible	Unlikely	0
Q-2	Dredging	Disposal quantities could be underestimated based on the infrequent nature of maintenance dredging over the past 20 years. Pipeline distances may change is disposal areas are changed. Disposal area capacities are based on assumed depths without data from surveys.	Additional costs could be significant if additional dredging is required to achieve target depth. Dredging quantites required are based on dated survey information and assumed shoaling rates. Changes to the disposal plan during the design phase could increase costs.	Moderate	Possible	2
Q-3	0			Negligible	Likely	N/A
Q-4	0			Negligible	Unlikely	N/A

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$C_7$ $P$ $C_7$ $P$ $C_7$ $P$ $C_7$ $P$ $C_7$ $P$ $C_7$ $P$	Q-6	0			Negligible	Unlikely	N/A
0.980111111 $0.99$ 0011	Q-7	0			Negligible	Unlikely	N/A
0.90 $0$ $0$ $1$	Q-8	0			Negligible	Unlikely	N/A
Ch10     V     V       Ch10     V     V     V       Ch11     0     V     V     V       Ch12     V     V     V     V       Ch13     Planning, Engineering, & Design     V     V     V       Ch14     Construction Management     V     V     V     V       Ch14     Construction Management     V     V     V     V       Ch14     Construction Management     V     V     V     V       Percentality: Fubrication or Equipments     Fubrication or Equipment State or Equipm	Q-9	0			Negligible	Unlikely	N/A
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0-13         Planning, Engineering, & Design         Indication         Negligible         Unlikely         One           0-14         Construction Management         Indication         Indication         Negligible         Unlikely         One           5         Speciality Fabrication or Equipment         Transportation of oppend of relocation materials apprent managed unit costs and special costs.         Marginal         Unlikely         One           FE-1         Diedging         Renotes location of poped coal dimension of one-expectation and special costs and special costs.         Special table topped than anticipated dimension of one-expectation costs and special costs.         Marginal         Unlikely         One           FE-1         Diedging         Renotes location of poped coal dimension of one-expectation costs and special costs.         Transportation of poped coal dimension of one-expectation costs and special costs.         Marginal         Marginal         Voltikely         One           FE-2         Diedging         Renotes location of poped coal dimension of one-expectation.         Transportation of poped coal dimension of one-expectation of coal dimension of one-expectation.         Marginal         Marginal         NArginal         NArginal         NArginal	Q-11	0			Negligible	Unlikely	N/A
Construction Management         Construction Management         Negligible         Unlikely         O           C1-14         Construction Management         Negligible         Unlikely         O           Speciality Tabrication or Equipment         Terreportation of pipe and other relocation material-sequence to the construction of pipe and other relocation of and the renove boom of and. Equipment transport of failure would likely to mean expension, to adding in microared and cost and schedule of depy control transport of a barry would likely to mean expension, to add time would likely to add time would like to add the construction to add time would like to add the like to add the construction to add time would like to add the like to add the construction to add time would like to add the like to add the like to add the to beddet to the protect.         Marginal <td>Q-12</td> <td></td> <td></td> <td></td> <td>Negligible</td> <td>Unlikely</td> <td>N/A</td>	Q-12				Negligible	Unlikely	N/A
Specialty Fabrication or Equipment         Maximum Project Sorth         50%           FE-1         Transportation of pips and other relocation during length or the more location of work. Equipment transport of failure work differed work grade data the long and shelled differed data the difference of the more location of work. Equipment transport of failure work differed work grade data the long and work. Equipment transport of failure work grade data the long and work. Equipment transport of failure work grade data the long and work. Equipment transport of failure work grade data the long and work. Equipment transport of failure work grade data the long and work. Equipment transport of failure work grade data the long and work. Equipment transport of failure work grade data the long and work. Equipment transport of failure work grade data the long and work. Equipment transport of failure work grade data the long and work. Equipment transport of failure work grade data the long and work and shelled difference and the shelled. However, it is believed that the impacts of the brade base dufference and the shelled. However, it is believed that the impact and the brade data the long and	Q-13	Planning, Engineering, & Design			Negligible	Unlikely	0
Relocations         Transportation of pipe and other relocation materials/equipment could take bringer than anticipated due to remote location of work. Equipment repairs could take longer as well. An interessed linkood of equipment failure could casts from working in a marine environment.         Equipment transport of failure would likely be more expensive, resulting in increased unit costs and schedule debys during construction. However, thes costs would represent a small portion of the overall project cost.         Marginal         Unikely         0           FE-1         Dredging         Remote location of project could impact cost and schedule if repairs an necessary to dedging equipment. The transport of rews and equipment could take longer than anticipated, resulting in reduced productivity.         The decreased productivity resulting time impacts built to these issues would be minimal when compared to the overall cost of the project.         Marginal         Unikely         N/A           FE-3         0         Imagination of project could impact cost and schedule if repairs and necessary to dedging equipment. The transport of rews and equipment could take longer than anticipated, resulting in reduced productivity.         The decreased productivity resulting time impacts built to these issues would be minimal when compared to the overall cost of the project.         Marginal         Marginal         Unikely         N/A           FE-3         0         Imagination of project could impact cost and schedule if repairs and could take longer than anticipated.         N/A         N/A         N/A           FE-4         0         Imaginatimane deduced productivity<	Q-14	Construction Management			Negligible	Unlikely	0
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FE-2       Dedging       Remote location of project could ingraar cost and schedule if repairs are could make non-schedule. Interpairs are could take longer than anticipated, resulting in reduced productivity.       Image: mathemance and equipment/part delivery could increase both costs and the schedule. Interpairs are could take longer than anticipated, resulting in reduced productivity.       Marginal       Possible       1         FE-3       0 <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>							
FE-4Image: constraint of the sector of the sect	FE-1	Relocations	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small	Marginal	Unlikely	0
Image: constraint of the section of			longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the			
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FE-7     0     Comparison     Comparison     Comparison       FE-8     0     0     0     N/A       Negligible     Unlikely     N/A	FE-2 FE-3 FE-4	Dredging 0	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal Negligible Negligible	Possible Unlikely Unlikely	1 N/A N/A
FE-8 V N/A	FE-2 FE-3 FE-4 FE-5	Dredging 0	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal Negligible Negligible Negligible	Possible Unlikely Unlikely Unlikely	1 N/A N/A N/A
FE-9 0 Negligible Unlikely N/A	FE-2 FE-3 FE-4 FE-5 FE-6	Dredging 0	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal Negligible Negligible Negligible Negligible	Possible Unlikely Unlikely Unlikely Unlikely	1 N/A N/A N/A N/A
	FE-2 FE-3 FE-4 FE-5 FE-6 FE-7	Dredging 0	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal Negligible Negligible Negligible Negligible Negligible	Possible Unlikely Unlikely Unlikely Unlikely Unlikely	1 N/A N/A N/A N/A N/A

FE-10 0	)			Negligible	Unlikely	N/A
FE-11 0	)			Negligible	Unlikely	N/A
FE-12				Negligible	Unlikely	N/A
FE-13 P	Planning, Engineering, & Design			Negligible	Unlikely	0
FE-14 C	Construction Management			Negligible	Unlikely	0
Cost Estima	te Assumptions			Maximum Proje	ct Growth	25%
CT-1 R	Relocations	The unit prices for pipeline relocations are based on the 2009 estimate conducted by the Corps. Cost will be escilated to 2015 levels based on the Corps escalation indices. The elevation of some pipelines are unkown and need to be assumed for this phase of the project.	The potential exists for the unit costs of relaocations to be increased subsequent to the plannig phase of the project. This would result in marginally increased cost for the overall project.	Marginal	Unlikely	0
CT-2 E	Dredging	Shoaling rates are based on past data and the disposal plan used for development of dredging unit costs is based on assumptions associated with the existing disposal areas. Dredging quantities are also based on an assumed starting depth of the channel and could could be increased once a survey is conducted. Productivity rates were developed via CEDEP which is based on disposal plan assumptions as well.	It is possible that dredging quantities would increase during the design phase of the project, once more information in know about the existing depths of the channel. This would result in moderate increases to the project costs. It is also possible that the dredged material disposal plan would be modified based on new data, potentially increasing costs.	Moderate	Possible	2
СТ-3 0	)			Moderate	Possible	N/A
CT-4 0	)			Negligible	Unlikely	N/A
CT-5 0	)			Negligible	Unlikely	N/A
CT-6 0	)			Negligible	Unlikely	N/A
CT-7 0	)			Negligible	Unlikely	N/A
CT-8 0	)			Negligible	Unlikely	N/A
СТ-9 0	)			Negligible	Unlikely	N/A
CT-10 0	)			Negligible	Unlikely	N/A
CT-11 0	)			Negligible	Unlikely	N/A
CT-12				Negligible	Unlikely	N/A
CT-13 F	Planning, Engineering, & Design			Negligible	Unlikely	0

CT-14	Construction Management			Negligible	Unlikely	0
External I	Project Risks			Maximum Proje	ct Growth	20%
EX-1	Relocations	Fuel prices used for the estimate are near a two-year low, so the potential for increased fuel costs exiits. This would increase the cost of equipment operation and material/crew transport.	Increases in fuel prices are likely to impact costs. These impacts would be moderate due to the heavy reliance on fuel to operate equipment and transport material. Overall the impacts to cost would be moderate.	Marginal	Unlikely	0
EX-2	Dredging	Extreme weather events are a possibility in Coastal Louisiana, with the potential to delay the project significantly or damage construction equipment. Shoaling rates would also increase during such an event, potentially impacting dredging quantities. Fuel prices used for the estimate are near a two-year low, so the potential for increased fuel costs exilts.	Increases in fuel prices are likely and the cost impact would be moderate. Storm impacts could be significant, but the liklihood is small. The cost and schedule impacts would be marginal. Overall the impacts to cost would be moderate.	Moderate	Possible	2
EX-3	0			Marginal	Possible	N/A
EX-4	0			Negligible	Unlikely	N/A
EX-5	0			Negligible	Unlikely	N/A
EX-6	0			Negligible	Unlikely	N/A
EX-7	0			Negligible	Unlikely	N/A
EX-8	0			Negligible	Unlikely	N/A
EX-9	0			Negligible	Unlikely	N/A
EX-10	0			Negligible	Unlikely	N/A
EX-11	0			Negligible	Unlikely	N/A
EX-12				Negligible	Unlikely	N/A
EX-13	Planning, Engineering, & Design			Negligible	Unlikely	0
EX-14	Construction Management			Negligible	Unlikely	0

# Houma Navigation Canal Deepening Project 1A 15-Adjacent Feasibility (Alternatives)

Abbreviated Risk Analysis

<u>WBS</u>	Potential Risk Areas	Project Scope Growth	Acquisition Strategy	Construction Elements	Quantities for Current Scope	Specialty Fabrication or Equipment	Cost Estimate Assumptions	External Project Risks	Cost in Thousands
01 LANDS AND DAMAGES	Real Estate								\$0
02 RELOCATIONS	Relocations	0	0	0	0	0	0	0	\$0
12 NAVIGATION, PORTS AND HARBORS	Dredging	1	1	1	2	1	2	2	\$507,731
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
All Other	Remaining Construction Items	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
30 PLANNING, ENGINEERING, AND DESIGN	Planning, Engineering, & Design	0	0	0	0	0	0	0	\$50,773
31 CONSTRUCTION MANAGEMENT	Construction Management	0	0	0	0	0	0	0	\$40,618
					•				\$599,122
Risk		\$ 10,618	\$ 10,024	\$ 50,665	\$ 16,828	\$ 11,103	\$ 18,400	\$ 16,828	\$134,467
Fixed Dollar Risk Allocation		\$-	\$-	•		\$-		\$-	\$0
	Risk	\$ 10,618	\$ 10,024	\$ 50,665	\$ 16,828	\$ 11,103	\$ 18,400		\$134,467
								Total	\$733,589

	Project Development Stage/Alternative:	Abbreviated Risk Analysis : Houma Navigation Canal Deepening Proje Feasibility (Alternatives) : Low Risk: Typical Construction, Simple	ect			Alternative Meeting Date		18-Adjacent 11/2/2015	
	-	Total Estimated Construction Contract Cost =	\$	103,352,500					
	CWWBS	Feature of Work	<u>C</u>	ontract Cost		% Contingency	<u>\$</u>	Contingency	Total
	01 LANDS AND DAMAGES	Real Estate	\$	-		0.00%	\$	- \$	-
1	02 RELOCATIONS	Relocations	\$	14,201,300		23.25%	\$	3,301,121 \$	17,502,421
2	12 NAVIGATION, PORTS AND HARBORS	Dredging	\$	87,139,127		32.02%	\$	27,898,686 \$	115,037,813
3			\$	-		0.00%	\$	- \$	-
4			\$	-		0.00%	\$	- \$	-
5			\$	-		0.00%	\$	- \$	-
6			\$	-		0.00%	\$	- \$	-
7						0.00%	\$	- \$	-
8			\$	-		0.00%	\$	- \$	-
9			s			0.00%	\$	- \$	_
10			s	_		0.00%	\$	- \$	_
11			\$			0.00%	\$	- \$	
	All Other	Remaining Construction Items	\$	2,012,073	2.0%	0.00%	\$	- \$	2,012,073
	30 PLANNING, ENGINEERING, AND DESIGN	Planning, Engineering, & Design	\$	10,335,250	2.070	16.15%	\$	1,668,740 \$	12,003,990
	31 CONSTRUCTION MANAGEMENT	Construction Management	\$	8,268,200		16.15%	\$	1,334,992 \$	9,603,192
	FIXED DOLLAR RISK ADD (EQUALLY DISPERSED TO ALL, MU		<u> </u>	0,200,200		10.1070	\$	-	0,000,102
7/1	THE DOLLAR RIGRADD (EQUALLY DISPERSED TO ALL, MO.	·					Ψ		
		Totals Real Estate Total Construction Estimate Total Planning, Engineering & Design Total Construction Management	\$ \$	- 103,352,500 10,335,250 8,268,200		0.00% 30.19% 16.15% 16.15%	\$ \$ \$	- \$ 31,199,807 \$ 1,668,740 \$ 1,334,992 \$	- 134,552,307 12,003,990 9,603,192
		Total	\$	121,955,950		28%	\$	34,203,539 \$	156,159,489
			R	ange Estimate (\$0	000's)	Base \$121,956	<	50% \$142,478k	<b>80%</b> \$156,159k
	Fixed Dollar Risk Add: (Allows for additional risk to be added to the risk analsyis. Must include justification. Does not allocate to Real Estate.								

#### Houma Navigation Canal Deepening Project 1A 18-Adjacent

Feasibility (Alternatives) Abbreviated Risk Analysis

Meeting Date: 2-Nov-15



Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Impact	Likelihood	Risk Level
Project Sco	ope Growth			Maximum Proje	ct Growth	40%
PS-1	Relocations	Some utility elevations could not be determined. Relocation costs are 6 years old. Unidentified utilities or oil/gas infrastructure could be located during construction.	The need for additional relocations are a possability, which would increase the scope of the project and mpact cost/schedule.	Marginal	Possible	1
PS-2	Dredging	A full Dredged Material Disposal Plan has not been developed. Some depths and elevations for proposed disposal areas were assumed, without survey data. Disposal quantities could also be increased based on low maintenance activities and old survey information. It could be determined that foreshore protection and rock retention could be required in additional areas other than those recommended. This could lead to the need for additional rock retention, foreshore protection, and floatation channel dredging.	The proposed disposal locations will be revisted during the design phase, but some changes to the costs associated with the current plan is likely. Additional quantites could require changes to the proposed disposal areas and lead to increases in scope. Any changes to the rock requirements could increase the project scope, but it would have a minimal impact on overall costs.	Moderate	Possible	2
PS-3	0			Moderate	Possible	N/A
PS-4	0			Negligible	Unlikely	N/A
PS-5	0			Negligible	Unlikely	N/A
PS-6	0			Negligible	Unlikely	N/A
PS-7	0			Negligible	Unlikely	N/A
PS-8	0			Negligible	Unlikely	N/A
PS-9	0			Negligible	Unlikely	N/A
PS-10	0			Negligible	Unlikely	N/A
PS-11	0			Negligible	Unlikely	N/A
PS-12				Marginal	Possible	N/A

PS-13	Planning, Engineering, & Design			Moderate	Likely	3
PS-14	Construction Management			Significant	Possible	3
<u>Acquisitio</u>	n Strategy					30%
AS-1	Relocations	Contract could require specialized work associated with environmental impacts of pipeline relocation and proper containment of material. The offshore nature of the work could limit the number of bids received to larger contracting companies.	A specialized pipeline relocation contractor could require a higher unit cost with a less competative bid. The overall cost ramifications of this would be minimal when compared to overall project costs.	Marginal	Possible	1
AS-2	Dredging	Dredging methodology for channel deepening would be widely available within south Louisiana, but offshore nature of the work could limit the number of bids.	A reduced number of bids could result in higher unit costs. However, based on the amount of ongoing dredging work within the channel over the past 20 years, it is believed the likihood of this occuring is minimal.	Marginal	Possible	1
AS-3	0			Moderate	Likely	N/A
AS-4	0			Negligible	Unlikely	N/A
AS-5	0			Negligible	Unlikely	N/A
AS-6	0			Negligible	Unlikely	N/A
AS-7	0			Negligible	Unlikely	N/A
AS-8	0			Negligible	Unlikely	N/A
AS-9	0			Negligible	Unlikely	N/A
AS-10	0			Negligible	Unlikely	N/A
AS-11	0			Negligible	Unlikely	N/A
AS-12				Negligible	Unlikely	N/A
AS-13	Planning, Engineering, & Design			Negligible	Unlikely	0
AS-14	Construction Management			Negligible	Unlikely	0
Construct	ion Elements			Maximum Proje	ct Growth	15%
CE-1	Relocations	Boat access would be required for relocations. Mobilization/Demobilization could take longer than anticipated. The potential exists for low-frequency weather events to delay work. Marine work could result in lower than anticipated productivity.	Impacts due to extended weather delays would be the most significant impact to cost and schedule, but the likelihood is low. With the amount of oil infrastructure existing in south Louisana, it is assumed a contractor familiar with the challenges of offshore pipeline relocation would be chosen. Therefore productivity issues would be minimal.	Moderate	Possible	2

CE-2	Dredging	Boat access would be required for survey crews and dredging equipment/crews. The potential exists for low-frequency weather events to delay work. Remote location of project could impact schedule if repairs are necessary to dredging equipment. Dredging methods would be fairly straight forward.	Dredging work is commonplace within the channel, so the risk of schedule delays or reduced productivity would center around the remote location or extreme weather events, not the dredging methods. The impact of a significant storm could be significant but liklihood is small.	Moderate	Possible	2
CE-3	0			Marginal	Possible	N/A
CE-4	0			Negligible	Unlikely	N/A
CE-5	0			Negligible	Unlikely	N/A
CE-6	0			Negligible	Unlikely	N/A
CE-7	0			Negligible	Unlikely	N/A
CE-8	0			Negligible	Unlikely	N/A
CE-9	0			Negligible	Unlikely	N/A
CE-10	0			Negligible	Unlikely	N/A
CE-11	0			Negligible	Unlikely	N/A
CE-12				Negligible	Unlikely	N/A
CE-13	Planning, Engineering, & Design			Negligible	Unlikely	0
CE-14	Construction Management			Negligible	Unlikely	0
<b>Quantities</b>	<u>s for Current Scope</u>			Maximum Proje	ct Growth	20%
Q-1	Relocations	The elevations of some pipelines are assumed or unkown. The potential exists for some unknown oil/gas infrastructure to be present. Shoaling rates utilized are based on past data, but the infrequency of maintenance dredging could result in pipelines found to be deeper than anticipated.	The potential exists for increased quantity requirements during the relocation phase of the project, but the cost impact would be small when compaed to the overall cost of the project.	Marginal	Possible	1
Q-2	Dredging	Disposal quantities could be underestimated based on the infrequent nature of maintenance dredging over the past 20 years. Pipeline distances may change is disposal areas are changed. Disposal area capacities are based on assumed depths without data from surveys.	Additional costs could be significant if additional dredging is required to achieve target depth. Dredging quantites required are based on dated survey information and assumed shoaling rates. Changes to the disposal plan during the design phase could increase costs.	Moderate	Possible	2
Q-3	0			Negligible	Likely	N/A
Q-4	0			Negligible	Unlikely	N/A

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0.7     0     1     1     1     1     1       0.4     0     1     1     1     1     1     1     1       0.4     0     1 <t< td=""><td>Q-5</td><td>0</td><td></td><td></td><td>Negligible</td><td>Unlikely</td><td>N/A</td></t<>	Q-5	0			Negligible	Unlikely	N/A
0.77000 $0.87$ 01NegativeUnitedNA $0.9$ 011NANA $0.9$ 011NANA $0.9$ 011NANA $0.9$ 011NANA $0.10$ 011NANA $0.11$ 011NANA $0.12$ 111NANA $0.12$ 1111NA $0.12$ 1111NA $0.13$ Pening Engineentin1111 $0.14$ Construction Matigementic1111 $0.14$ Construction of Equipmentic1111 $0.14$ Pening Engineentin1111 $0.14$ Pening Engineentin1111 $0.14$ Pening Engineentin11111 $0.14$ Pening Engineentin11111 $0.14$	Q-6	0			Negligible	Unlikely	N/A
0.88 $0$ $0$ Image: second	Q-7	0			Negligible	Unlikely	N/A
0.900111 <td>Q-8</td> <td>0</td> <td></td> <td></td> <td>Negligible</td> <td>Unlikely</td> <td>N/A</td>	Q-8	0			Negligible	Unlikely	N/A
C-10       P	Q-9	0			Negligible	Unlikely	N/A
Ci-11       P       Image: Circle Cir	Q-10	0			Negligible	Unlikely	N/A
0-13         Planning, Engineering, & Design         Index         <	Q-11	0			Negligible	Unlikely	N/A
Q-14         Construction Management         Index	Q-12				Negligible	Unlikely	N/A
Specialty Fabrication or Equipment         Maximum Project Orwith         50%           FE-1         Transportation of pipe and other relocation materials(equipment could late increased unit costs and schedule dety, during costs from working in a marine environment.         Feedocations         Marginal         Possible         1           FE-2         Dredging         Remote location of pipe and other relocation of pipe and other relocation of upic cost.         Equipment transport of fabre would likely be more exponding thermal schedule dety, during costs.         Marginal         Possible         1           FE-1         Dredging         Remote location of pipe and other relocation of pipe and other relocation of project cost.         The decreased productivity resulting from tonger than anticipated exponent. The transport of revise and schedule dety monthant determined and equipment to the overall project cost.         Marginal         Possible         1           FE-2         Dredging         Remote location of pipe and other relocation of project cost.         The decreased productivity resulting from tonger than anticipated exponent.         Marginal         Possible         1           FE-3         0         Image: Cost on display equipment. The transport of revise and the project.         The decreased productivity resulting in mature anticipated exponent.         Marginal         N/A           FE-3         0         Image: Cost of the project.         Negligble         Unilkely         N/A	Q-13	Planning, Engineering, & Design			Negligible	Unlikely	0
Here         Transportation of pipe and other relocation materials/equipment could take longer than anticipated due to remote location of wrk. Equipment transport of failure would likely be more expensive, could take longer as well. An increased lithood of equipment failure could east from working in a marine environment.         Equipment transport of failure would likely be more expensive, could take longer as well. An increased lithood of equipment failure could east from working in a marine environment.         Equipment transport of failure would likely be more expensive, could take longer than anticipated due to remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment/part delivery could increase both costs and the schedule. However, tile belowed that the impacts due to these sections.         Marginal         Possible         1           FE-3         Dredging         Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment/part delivery could increase both costs and the schedule. However, tile belowed that the impacts due to these issues would be minima when compared to the overall cost of the project.         Marginal         Possible         1           FE-4         0         Image: transport of crews and equipment/part delivery could increase both costs and the schedule. However, tile belowed that the impacts due to these issues would be minima when compared to the overall cost of the project.         Marginal         Possible         1           FE-6         0         Image: transport of crews and equipment/partelivery could increase both costs and the schedule. However, th	Q-14	Construction Management			Negligible	Unlikely	0
Relocations         borget than anticipated due to remote locating in increased unit costs and schedule delays during         Marginal         Possible         1           FE-1         Dredging         Renote locating in a marine environment.         The decreased productivity resulting in increased unit costs and schedule delays during         Marginal         Possible         1           FE-2         Dredging         Renote locating opticat cost and schedule delays during costs and the coverall project cost.         The decreased productivity resulting in increased unit costs and schedule delays during         Marginal         Possible         1           FE-2         Dredging         Renote locating opticat cost and schedule delays during in a marine environment.         The decreased productivity resulting in increase brind delays during delays during         Marginal         Possible         1           FE-3         Dredging         Renote locating opticat cost and schedule delays during in reduced productivity.         The decreased productivity resulting in increase brind delays during delays dur	Specialty I	Fabrication or Equipment			Maximum Proje	ct Growth	<b>50%</b>
FE-2       Dedging       Remote location of project could ingreate are model dimped to stand de schedule if repairs are model dimeter and equipment, the transport of creas and equipment, the transport of creas and equipment, the transport of creas and equipment could take longer than anticipated, resulting in reduced productivity.       matternance and equipment/part delivery could increase both could take longer than anticipated, resulting in reduced productivity.       Marginal       Possible       1         FE-3       0        NA       NA       NA       NA         FE-4       0        NA       NA       NA         FE-5       0         NA       NA         FE-6       0         NA       NA         FE-7       o         NA       NA         FE-7       o         NA       NA         FE-7       o         NA       NA         FE-7       o         NA       NA         FE-8       o          NA         FE-7       o           NA         FE-8       o           NA         FE-8 <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>							
FE-4ooooN/AFE-5oNegligibleUnlikelyN/AFE-6oNegligibleUnlikelyN/AFE-7oNegligibleUnlikelyN/AFE-8oNegligibleUnlikelyN/AFE-8oNegligibleUnlikelyN/ANegligibleNegligibleUnlikelyN/ANENNegligibleUnlikelyN/ANENNEN/AN/ANENNEN/AN/ANENNEN/AN/ANENNEN/AN/ANENNEN/AN/ANENNN/AN/ANENNN/AN/ANENNN/AN/ANENNN/AN/ANENNN/AN/ANENNN/ANENNN/ANENNN/ANNNN/ANN	FE-1	Relocations	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small	Marginal	Possible	1
Image: constraint of the section of			longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the			
Image: constraint of the sector of the sec	FE-2	Dredging	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal	Possible	1
Image: constraint of the second se	FE-2 FE-3	Dredging 0	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal Negligible	Possible Unlikely	1 N/A
FE-7     0     Comparison     Comparison     Comparison       FE-8     0     0     0     N/A       Negligible     Unlikely     N/A	FE-2 FE-3 FE-4	Dredging 0	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal Negligible Negligible	Possible Unlikely Unlikely	1 N/A N/A
FE-8 V N/A	FE-2 FE-3 FE-4 FE-5	Dredging 0	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal Negligible Negligible Negligible	Possible Unlikely Unlikely Unlikely	1 N/A N/A N/A
FE-9 0 Negligible Unlikely N/A	FE-2 FE-3 FE-4 FE-5 FE-6	Dredging 0	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal Negligible Negligible Negligible Negligible	Possible Unlikely Unlikely Unlikely Unlikely	1 N/A N/A N/A N/A
	FE-2 FE-3 FE-4 FE-5 FE-6 FE-7	Dredging 0	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal Negligible Negligible Negligible Negligible Negligible	Possible Unlikely Unlikely Unlikely Unlikely Unlikely Unlikely Unlikely	1 N/A N/A N/A N/A N/A

FE-10	0			Negligible	Unlikely	N/A
FE-11	0			Negligible	Unlikely	N/A
FE-12				Negligible	Unlikely	N/A
FE-13	Planning, Engineering, & Design			Negligible	Unlikely	0
FE-14	Construction Management			Negligible	Unlikely	0
Cost Estim	ate Assumptions			Maximum Proje	ct Growth	25%
CT-1	Relocations	The unit prices for pipeline relocations are based on the 2009 estimate conducted by the Corps. Cost will be escilated to 2015 levels based on the Corps escalation indices. The elevation of some pipelines are unkown and need to be assumed for this phase of the project.	The potential exists for the unit costs of relaccations to be increased subsequent to the plannig phase of the project. This would result in marginally increased cost for the overall project.	Marginal	Possible	1
CT-2	Dredging	the existing disposal areas. Dredging quantities are also based on an assumed starting depth of the channel and could could be increased once a	about the existing depths of the channel. This would result in moderate increases to the project costs. It is also possible that	Moderate	Likely	3
CT-3	0			Moderate	Possible	N/A
CT-4	0			Negligible	Unlikely	N/A
CT-5	0			Negligible	Unlikely	N/A
CT-6	0			Negligible	Unlikely	N/A
CT-7	0			Negligible	Unlikely	N/A
CT-8	0			Negligible	Unlikely	N/A
CT-9	0			Negligible	Unlikely	N/A
CT-10	0			Negligible	Unlikely	N/A
CT-11	0			Negligible	Unlikely	N/A
CT-12				Negligible	Unlikely	N/A
CT-13	Planning, Engineering, & Design			Negligible	Unlikely	0
				_		

CT-14	Construction Management			Negligible	Unlikely	0
External F	Project Risks			Maximum Proje	ct Growth	20%
EX-1	Relocations	Fuel prices used for the estimate are near a two-year low, so the potential for increased fuel costs exiits. This would increase the cost of equipment operation and material/crew transport.	Increases in fuel prices are likely to impact costs. These impacts would be moderate due to the heavy reliance on fuel to operate equipment and transport material. Overall the impacts to cost would be moderate.	Moderate	Possible	2
EX-2	Dredging	Extreme weather events are a possibility in Coastal Louisiana, with the potential to delay the project significantly or damage construction equipment. Shoaling rates would also increase during such an event, potentially impacting dredging quantities. Fuel prices used for the estimate are near a two-year low, so the potential for increased fuel costs exitts.	Increases in fuel prices are likely and the cost impact would be moderate. Storm impacts could be significant, but the liklihood is small. The cost and schedule impacts would be marginal. Overall the impacts to cost would be moderate.	Moderate	Possible	2
EX-3	0			Marginal	Possible	N/A
EX-4	0			Negligible	Unlikely	N/A
EX-5	0			Negligible	Unlikely	N/A
EX-6	0			Negligible	Unlikely	N/A
EX-7	0			Negligible	Unlikely	N/A
EX-8	0			Negligible	Unlikely	N/A
EX-9	0			Negligible	Unlikely	N/A
EX-10	0			Negligible	Unlikely	N/A
EX-11	0			Negligible	Unlikely	N/A
EX-12				Negligible	Unlikely	N/A
EX-13	Planning, Engineering, & Design			Negligible	Unlikely	0
EX-14	Construction Management			Negligible	Unlikely	0

# Houma Navigation Canal Deepening Project 1A 18-Adjacent Feasibility (Alternatives)

Abbreviated Risk Analysis

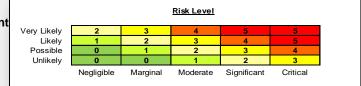
<u>WBS</u>	Potential Risk Areas	Project Scope Growth	Acquisition Strategy	Construction Elements	Quantities for Current Scope	Specialty Fabrication or Equipment	Cost Estimate Assumptions	External Project Risks	Cost in Thousands
01 LANDS AND DAMAGES	Real Estate								\$0
02 RELOCATIONS	Relocations	1	1	2	1	1	1	2	\$14,201
12 NAVIGATION, PORTS AND HARBORS	Dredging	2	1	2	2	1	3	2	\$87,139
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
All Other	Remaining Construction Items	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$2,012
30 PLANNING, ENGINEERING, AND DESIGN	Planning, Engineering, & Design	3	0	0	0	0	0	0	\$10,335
31 CONSTRUCTION MANAGEMENT	Construction Management	3	0	0	0	0	0	0	\$8,268
									\$121,956
Risk		\$ 5,809	\$ 2,001	\$ 11,390	\$ 3,147	\$ 2,216	\$ 6,282	\$ 3,359	\$34,204
Fixed Dollar Risk Allocation		\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$0
	Risk	\$ 5,809	\$ 2,001	\$ 11,390	\$ 3,147	\$ 2,216	\$ 6,282		\$34,204
								Total	\$156,159

		Abbreviated Risk Analysis Houma Navigation Canal Deepening Proje Feasibility (Alternatives)	ect			Alternative	: 1A	18-Adjacent	
		Low Risk: Typical Construction, Simple				Meeting Date	:	11/2/2015	
	Т	otal Estimated Construction Contract Cost =	\$	512,947,174					
	<u>CWWBS</u>	Feature of Work	<u>C</u>	ontract Cost		% Contingency	4	Contingency	<u>Total</u>
	01 LANDS AND DAMAGES	Real Estate	\$	-		0.00%	\$	- \$	_
1	02 RELOCATIONS	Relocations	\$			0.00%	\$	- \$	-
2	12 NAVIGATION, PORTS AND HARBORS	Dredging	\$	512,947,174		25.22%	\$	129,385,446 \$	642,332,620
3			\$	-		0.00%	\$	- \$	-
4			\$	-		0.00%	\$	- \$	-
5			\$	-		0.00%	\$	- \$	-
6			\$	-		0.00%	\$	- \$	-
7						0.00%	\$	- \$	-
8			\$	-		0.00%	\$	- \$	-
9			\$	-		0.00%	\$	- \$	-
0			\$			0.00%	\$	- \$	-
1			\$	-		0.00%	\$	- \$	-
	All Other	Remaining Construction Items	\$	-	0.0%	0.00%	\$	- \$	-
	30 PLANNING, ENGINEERING, AND DESIGN	Planning, Engineering, & Design	\$	51,294,717		7.00%	\$	3,590,630 \$	54,885,348
	31 CONSTRUCTION MANAGEMENT	Construction Management	\$	41,035,774		7.00%	\$	2,872,504 \$	43,908,278
	FIXED DOLLAR RISK ADD (EQUALLY DISPERSED TO ALL, MUS	-	•			110070	\$	-	1010001210
		-							
		Totals Real Estate Total Construction Estimate Total Planning, Engineering & Design Total Construction Management	\$ \$	- 512,947,174 51,294,717 41,035,774		0.00% 25.22% 7.00% 7.00%	\$ \$ \$	- \$ 129,385,446 \$ 3,590,630 \$ 2.872,504 \$	- 642,332,620 54,885,348 43,908,278
		Total	\$	605,277,665		22%	\$	135,848,581 \$	741,126,246
			Ra	ange Estimate (\$00	)0's)	<b>Base</b> \$605,278	<	50% \$686,787k 50% based on base is at 5% CL.	<b>80</b> % \$741,126
	<b>Fixed Dollar Risk Add:</b> (Allows for additional risk to be added to the risk analsyis. Must include justification. Does not allocate to Real Estate.								

#### Houma Navigation Canal Deepening Project 1A 18-Adjacent

Feasibility (Alternatives) Abbreviated Risk Analysis

Meeting Date: 2-Nov-15



Risk Element	Feature of Work		PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Impact	Likelihood	Risk Level
Project Sco	ope Growth			Maximum Proje	ct Growth	40%
PS-1	Relocations	Some utility elevations could not be determined. Relocation costs are 6 years old. Unidentified utilities or oil/gas infrastructure could be located during construction.	The need for additional relocations are a possability, which would increase the scope of the project and mpact cost/schedule.	Negligible	Unlikely	0
PS-2	Dredging	A full Dredged Material Disposal Plan has not been developed. Some depths and elevations for proposed disposal areas were assumed, without survey data. Disposal quantities could also be increased based on low maintenance activities and old survey information. It could be determined that foreshore protection and rock retention could be required in additional areas other than those recommended. This could lead to the need for additional rock retention, foreshore protection, and floatation channel dredging.	The proposed disposal locations will be revisted during the design phase, but some changes to the costs associated with the current plan is likely. Additional quantites could require changes to the proposed disposal areas and lead to increases in scope. Any changes to the rock requirements could increase the project scope, but it would have a minimal impact on overall costs.	Marginal	Possible	1
PS-3	0			Moderate	Possible	N/A
PS-4	0			Negligible	Unlikely	N/A
PS-5	0			Negligible	Unlikely	N/A
PS-6	0			Negligible	Unlikely	N/A
PS-7	0			Negligible	Unlikely	N/A
PS-8	0			Negligible	Unlikely	N/A
PS-9	0			Negligible	Unlikely	N/A
PS-10	0			Negligible	Unlikely	N/A
PS-11	0			Negligible	Unlikely	N/A
PS-12				Marginal	Possible	N/A

PS-13	Planning, Engineering, & Design			Negligible	Unlikely	0
PS-14	Construction Management			Negligible	Unlikely	0
<u>Acquisitio</u>	n Strategy			Maximum Proje	ct Growth	30%
AS-1	Relocations	Contract could require specialized work associated with environmental impacts of pipeline relocation and proper containment of material. The offshore nature of the work could limit the number of bids received to larger contracting companies.	A specialized pipeline relocation contractor could require a higher unit cost with a less competative bid. The overall cost ramifications of this would be minimal when compared to overall project costs.	Negligible	Unlikely	0
AS-2	Dredging	Dredging methodology for channel deepening would be widely available within south Louisiana, but offshore nature of the work could limit the number of bids.	A reduced number of bids could result in higher unit costs. However, based on the amount of ongoing dredging work within the channel over the past 20 years, it is believed the likihood of this occuring is minimal.	Marginal	Possible	1
AS-3	0			Moderate	Likely	N/A
AS-4	0			Negligible	Unlikely	N/A
AS-5	0			Negligible	Unlikely	N/A
AS-6	0			Negligible	Unlikely	N/A
AS-7	0			Negligible	Unlikely	N/A
AS-8	0			Negligible	Unlikely	N/A
AS-9	0			Negligible	Unlikely	N/A
AS-10	0			Negligible	Unlikely	N/A
AS-11	0			Negligible	Unlikely	N/A
AS-12				Negligible	Unlikely	N/A
AS-13	Planning, Engineering, & Design			Negligible	Unlikely	0
AS-14	Construction Management			Negligible	Unlikely	0
<b>Construct</b>	ion Elements			Maximum Proje	ct Growth	15%
CE-1	Relocations	Boat access would be required for relocations. Mobilization/Demobilization could take longer than anticipated. The potential exists for low-frequency weather events to delay work. Marine work could result in lower than anticipated productivity.	Impacts due to extended weather delays would be the most significant impact to cost and schedule, but the likelihood is low. With the amount of oil infrastructure existing in south Louisana, it is assumed a contractor familiar with the challenges of offshore pipeline relocation would be chosen. Therefore productivity issues would be minimal.	Negligible	Unlikely	0

		_				
CE-2	Dredging	Boat access would be required for survey crews and dredging equipment/crews. The potential exists for low-frequency weather events to delay work. Remote location of project could impact schedule if repairs are necessary to dredging equipment. Dredging methods would be fairly straight forward.	Dredging work is commonplace within the channel, so the risk of schedule delays or reduced productivity would center around the remote location or extreme weather events, not the dredging methods. The impact of a significant storm could be significant but liklihood is small.	Marginal	Possible	1
CE-3	0			Marginal	Possible	N/A
CE-4	0			Negligible	Unlikely	N/A
CE-5	0			Negligible	Unlikely	N/A
CE-6	0			Negligible	Unlikely	N/A
CE-7	0			Negligible	Unlikely	N/A
CE-8	0			Negligible	Unlikely	N/A
CE-9	0			Negligible	Unlikely	N/A
CE-10	0			Negligible	Unlikely	N/A
CE-11	0			Negligible	Unlikely	N/A
CE-12				Negligible	Unlikely	N/A
CE-13	Planning, Engineering, & Design			Negligible	Unlikely	0
CE-14	Construction Management			Negligible	Unlikely	0
<b>Quantities</b>	<u>s for Current Scope</u>			Maximum Proje	ct Growth	20%
Q-1	Relocations	The elevations of some pipelines are assumed or unkown. The potential exists for some unknown oil/gas infrastructure to be present. Shoaling rates utilized are based on past data, but the infrequency of maintenance dredging could result in pipelines found to be deeper than anticipated.	The potential exists for increased quantity requirements during the relocation phase of the project, but the cost impact would be small when compaed to the overall cost of the project.	Negligible	Unlikely	0
Q-2	Dredging	Disposal quantities could be underestimated based on the infrequent nature of maintenance dredging over the past 20 years. Pipeline distances may change is disposal areas are changed. Disposal area capacities are based on assumed depths without data from surveys.	Additional costs could be significant if additional dredging is required to achieve target depth. Dredging quantites required are based on dated survey information and assumed shoaling rates. Changes to the disposal plan during the design phase could increase costs.	Moderate	Possible	2
Q-3	0			Negligible	Likely	N/A
Q-4	0			Negligible	Unlikely	N/A

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0.7     0     1     1     1     1     1     1       0.4     0     0     0     0     0     0     0     0       0.4     0     0     0     0     0     0     0     0       0.10     0     0     0     0     0     0     0     0     0       0.11     0	Q-5	0			Negligible	Unlikely	N/A
$C_7$ $P$ $C_7$ $P$ $C_7$ $P$ $C_7$ $P$ $C_7$ $P$ $C_7$ $P$	Q-6	0			Negligible	Unlikely	N/A
0.980111111 $0.99$ 0011	Q-7	0			Negligible	Unlikely	N/A
0.90 $0$ $0$ $1$	Q-8	0			Negligible	Unlikely	N/A
Ch10     V     V       Ch10     V     V     V       Ch11     0     V     V     V       Ch12     V     V     V     V       Ch13     Planning, Engineering, & Design     V     V     V       Ch14     Construction Management     V     V     V     V       Ch14     Construction Management     V     V     V     V       Ch14     Construction Management     V     V     V     V       Percentality: Fubrication or Equipments     Fubrication or Equipment State or Equipm	Q-9	0			Negligible	Unlikely	N/A
0-11       0       1       0       1       0       1       0         Q-12       Panning, Engineering, A. Design       Include of the second of t	Q-10	0			Negligible	Unlikely	N/A
0-13         Planning, Engineering, & Design         Indication         Negligible         Unlikely         One           0-14         Construction Management         Indication         Indication         Negligible         Unlikely         One           5         Speciality Fabrication or Equipment         Transportation of oppend of relocation materials apprent managed unit costs and special costs.         Marginal         Unlikely         One           FE-1         Diedging         Renotes location of poped coal dimension of one-expectation and special costs and special costs.         Transportation of poped coal dimension of one-expectation costs and special costs.         Renotes location of poped coal dimension of one-expectation costs and special costs.         Marginal         Unlikely         One           FE-2         Diedging         Renotes location of poped coal dimension of one-expectation costs and special costs.         Transportation of poped coal dimension of one-expectation costs and special costs.         Marginal         Marginal         No.           FE-2         Diedging         Renotes location of poped coal dimension of one-expectation.         Transportation of poped coal dimension of one-expectation.         Nord and the costs of the projecto.         Nore	Q-11	0			Negligible	Unlikely	N/A
Construction Management         Construction Management         Negligible         Unlikely         O           C1-14         Construction Management         Negligible         Unlikely         O           Speciality Tabrication or Equipment         Terreportation of pipe and other relocation material-sequence to the construction of pipe and other relocation of and the renove boom of and. Equipment transport of failure would likely to mean expension, to adding in microared and cost and schedule of depy control transport of a barry would likely to mean expension, to add time would likely to add time would like to add the construction to add time would like to add the like to add the construction to add time would like to add the like to add the construction to add time would like to add the like to add the like to add the to bead to the to add time would like to add time woul	Q-12				Negligible	Unlikely	N/A
Specialty Fabrication or Equipment         Maximum Project Sorth         50%           FE-1         Transportation of pips and other relocation during length or the more location of work. Equipment transport of failure work differed work grade data the long and shelled differed data the longer than anticipated due to more location of work. Equipment transport of failure work differed work grade data the longer than anticipated due to temme the location of work. Equipment transport of failure work grade data the longer than anticipated due to more equipment. The anticipated due to more equipment at an and the working in a markine environment.         Marginal         Unikely         0           FE-1         Predging         Remote location of pips and dher relocation diverse and equipment the anticipated data the longer than antinci	Q-13	Planning, Engineering, & Design			Negligible	Unlikely	0
Relocations         Transportation of pipe and other relocation materials/equipment could take bringer than anticipated due to remote location of work. Equipment repairs could take longer as well. An interessed linkood of equipment failure could casts from working in a marine environment.         Equipment transport of failure would likely be more expensive, resulting in increased unit costs and schedule debys during construction. However, thes costs would represent a small portion of the overall project cost.         Marginal         Unikely         0           FE-1         Dredging         Remote location of project could impact cost and schedule if repairs an necessary to dedging equipment. The transport of rews and equipment could take longer than anticipated, resulting in reduced productivity.         The decreased productivity resulting time impacts built to these issues would be minimal when compared to the overall cost of the project.         Marginal         Unikely         N/A           FE-3         0         Imagination of project could impact cost and schedule if repairs and necessary to dedging equipment. The transport of rews and equipment could take longer than anticipated, resulting in reduced productivity.         The decreased productivity resulting time impacts built to these issues would be minimal when compared to the overall cost of the project.         Marginal         Marginal         Unikely         N/A           FE-3         0         Imagination of project could impact cost and schedule if repairs and could take longer than anticipated.         N/A         N/A         N/A           FE-4         0         Imaginatimane deduced productivity<	Q-14	Construction Management			Negligible	Unlikely	0
Relocations         longer than anticipated due to remote location of work. Equipment tepairs could take longer as well. An increased tillhood dequipment tepairs could take longer as well. An increased tillhood dequipment tepairs could take longer than anticipated resulting in necessary to decigning as well. An increased tillhood dequipment. The factor and equipment delivery could the increase both maintenance and equipment delivery could the increase both are to the schedule. However, it is believed that the increase due to the schedule deliver out increases both are to the schedule deliver out increases both are to the schedule. However, it is believed that the increase due to the schedule. However, it is believed that the increase due to the schedule deliver out increases both are to the schedule. However, it is believed that the increase due to the schedule deliver out increases both are to the schedule. However, it is believed that the increase due to the schedule deliver out increases both are to the schedule. However, it is believed that the increase due to the schedule deliver out increases both are to the schedule. However, it is believed that the increase due to the schedule deliver out increases both are to the schedule. However, it is believed that the increase due to the schedule. However, it is believed that the increase due to the schedule. However, it is believed that the increase due to the schedule deliver out increases both are to the schedule. However, it is believed that the increase due to the overall occit of the project.         Marginal         Marginal         Unikkey         N/A           FE-63         0         Increase both due to the overall occit of the project.         Negligble         Unikkey         N/A           FE-64         0         Increase both due to the overall produeto cost.	Specialty	Fabrication or Equipment			Maximum Proje	ct Growth	50%
FE-2       Dedging       Remote location of project could ingraar cost and schedule if repairs are could make non-schedule. Interpairs are could take longer than anticipated, resulting in reduced productivity.       Image: mathemance and equipment/part delivery could increase both costs and the schedule. Interpairs are could take longer than anticipated, resulting in reduced productivity.       Marginal       Possible       1         FE-3       0 <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>							
FE-4Image: constraint of the sector of the sect	FE-1	Relocations	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small	Marginal	Unlikely	0
Image: constraint of the section of			longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the			
Image: constraint of the sector of the sec	FE-2	Dredging	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal	Possible	1
Image: constraint of the second se	FE-2 FE-3	Dredging 0	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal Negligible	Possible Unlikely	1 N/A
FE-7     0     Comparison     Comparison     Comparison       FE-8     0     0     0     N/A       Negligible     Unlikely     N/A	FE-2 FE-3 FE-4	Dredging 0	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal Negligible Negligible	Possible Unlikely Unlikely	1 N/A N/A
FE-8 V N/A	FE-2 FE-3 FE-4 FE-5	Dredging 0	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal Negligible Negligible Negligible	Possible Unlikely Unlikely Unlikely	1 N/A N/A N/A
FE-9 0 Negligible Unlikely N/A	FE-2 FE-3 FE-4 FE-5 FE-6	Dredging 0	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal Negligible Negligible Negligible Negligible	Possible Unlikely Unlikely Unlikely Unlikely	1 N/A N/A N/A N/A
	FE-2 FE-3 FE-4 FE-5 FE-6 FE-7	Dredging 0	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal Negligible Negligible Negligible Negligible Negligible	Possible Unlikely Unlikely Unlikely Unlikely Unlikely	1 N/A N/A N/A N/A N/A

FE-10 0	)			Negligible	Unlikely	N/A
FE-11 0	)			Negligible	Unlikely	N/A
FE-12				Negligible	Unlikely	N/A
FE-13 P	Planning, Engineering, & Design			Negligible	Unlikely	0
FE-14 C	Construction Management			Negligible	Unlikely	0
Cost Estima	te Assumptions			Maximum Proje	ct Growth	25%
CT-1 R	Relocations	The unit prices for pipeline relocations are based on the 2009 estimate conducted by the Corps. Cost will be escilated to 2015 levels based on the Corps escalation indices. The elevation of some pipelines are unkown and need to be assumed for this phase of the project.	The potential exists for the unit costs of relaocations to be increased subsequent to the plannig phase of the project. This would result in marginally increased cost for the overall project.	Marginal	Unlikely	0
CT-2 E	Dredging	Shoaling rates are based on past data and the disposal plan used for development of dredging unit costs is based on assumptions associated with the existing disposal areas. Dredging quantities are also based on an assumed starting depth of the channel and could could be increased once a survey is conducted. Productivity rates were developed via CEDEP which is based on disposal plan assumptions as well.	It is possible that dredging quantities would increase during the design phase of the project, once more information in know about the existing depths of the channel. This would result in moderate increases to the project costs. It is also possible that the dredged material disposal plan would be modified based on new data, potentially increasing costs.	Moderate	Possible	2
СТ-3 0	)			Moderate	Possible	N/A
CT-4 0	)			Negligible	Unlikely	N/A
CT-5 0	)			Negligible	Unlikely	N/A
CT-6 0	)			Negligible	Unlikely	N/A
CT-7 0	)			Negligible	Unlikely	N/A
CT-8 0	)			Negligible	Unlikely	N/A
СТ-9 0	)			Negligible	Unlikely	N/A
CT-10 0	)			Negligible	Unlikely	N/A
CT-11 0	)			Negligible	Unlikely	N/A
CT-12				Negligible	Unlikely	N/A
CT-13 F	Planning, Engineering, & Design			Negligible	Unlikely	0

CT-14	Construction Management			Negligible	Unlikely	0
External I	Project Risks			Maximum Proje	ct Growth	20%
EX-1	Relocations	Fuel prices used for the estimate are near a two-year low, so the potential for increased fuel costs exiits. This would increase the cost of equipment operation and material/crew transport.	Increases in fuel prices are likely to impact costs. These impacts would be moderate due to the heavy reliance on fuel to operate equipment and transport material. Overall the impacts to cost would be moderate.	Marginal	Unlikely	0
EX-2	Dredging	Extreme weather events are a possibility in Coastal Louisiana, with the potential to delay the project significantly or damage construction equipment. Shoaling rates would also increase during such an event, potentially impacting dredging quantities. Fuel prices used for the estimate are near a two-year low, so the potential for increased fuel costs exilts.	Increases in fuel prices are likely and the cost impact would be moderate. Storm impacts could be significant, but the liklihood is small. The cost and schedule impacts would be marginal. Overall the impacts to cost would be moderate.	Moderate	Possible	2
EX-3	0			Marginal	Possible	N/A
EX-4	0			Negligible	Unlikely	N/A
EX-5	0			Negligible	Unlikely	N/A
EX-6	0			Negligible	Unlikely	N/A
EX-7	0			Negligible	Unlikely	N/A
EX-8	0			Negligible	Unlikely	N/A
EX-9	0			Negligible	Unlikely	N/A
EX-10	0			Negligible	Unlikely	N/A
EX-11	0			Negligible	Unlikely	N/A
EX-12				Negligible	Unlikely	N/A
EX-13	Planning, Engineering, & Design			Negligible	Unlikely	0
EX-14	Construction Management			Negligible	Unlikely	0

# Houma Navigation Canal Deepening Project 1A 18-Adjacent Feasibility (Alternatives)

Abbreviated Risk Analysis

<u>WBS</u>	Potential Risk Areas	Project Scope Growth	Acquisition Strategy	Construction Elements	Quantities for Current Scope	Specialty Fabrication or Equipment	Cost Estimate Assumptions	External Project Risks	Cost in Thousands
01 LANDS AND DAMAGES	Real Estate								\$0
02 RELOCATIONS	Relocations	0	0	0	0	0	0	0	\$0
12 NAVIGATION, PORTS AND HARBORS	Dredging	1	1	1	2	1	2	2	\$512,947
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
All Other	Remaining Construction Items	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
30 PLANNING, ENGINEERING, AND DESIGN	Planning, Engineering, & Design	0	0	0	0	0	0	0	\$51,295
31 CONSTRUCTION MANAGEMENT	Construction Management	0	0	0	0	0	0	0	\$41,036
									\$605,278
Risk		\$ 10,727	\$ 10,127	\$ 51,186	\$ 17,001	\$ 11,217	\$ 18,589	\$ 17,001	\$135,849
ixed Dollar Risk Allocation					•			\$-	\$0
	Risk	\$ 10,727	\$ 10,127	\$ 51,186	\$ 17,001	\$ 11,217	\$ 18,589		\$135,849
								Total	\$741,126

	Project (less than \$40M) Project Development Stage/Alternative:	Abbreviated Risk Analysis Houma Navigation Canal Deepening Pro Feasibility (Alternatives) Low Risk: Typical Construction, Simple	ect			Alternative Meeting Date			
	1	otal Estimated Construction Contract Cost =	\$	116,374,300					
	CWWBS	Feature of Work	<u>C</u>	ontract Cost		% Contingency		Scontingency	Total
	01 LANDS AND DAMAGES	Real Estate	\$	-		0.00%	\$	- \$	-
1	02 RELOCATIONS	Relocations	\$	14,201,300		23.25%	\$	3,301,121 \$	17,502,421
2	12 NAVIGATION, PORTS AND HARBORS	Dredging	\$	102,173,000		32.02%	\$	32,711,969 \$	134,884,969
3			\$	-		0.00%	\$	- \$	-
4			\$	-		0.00%	\$	- \$	-
5			\$	-		0.00%	\$	- \$	-
6			\$	-		0.00%	\$	- \$	-
7						0.00%	\$	- \$	-
8			\$	-		0.00%	\$	- \$	-
9			\$			0.00%	\$	- \$	-
10			s			0.00%	\$	- \$	_
11			\$			0.00%	\$	- \$	
	All Other	Remaining Construction Items	\$	-	0.0%	0.00%	\$	- \$	
	30 PLANNING, ENGINEERING, AND DESIGN	Planning, Engineering, & Design	\$ \$	11,637,430	0.070	16.15%	\$	1,878,991 \$	13,516,421
	31 CONSTRUCTION MANAGEMENT	Construction Management	\$ \$	9,309,944		16.15%	\$	1,503,193 \$	10,813,137
	FIXED DOLLAR RISK ADD (EQUALLY DISPERSED TO ALL, MUS	<b>-</b>	Ψ	3,003,344		10.1070	<u> </u>	-	10,010,107
	FIXED DOLLAR RISK ADD (EQUALL'I DISPERSED TO ALL, MO						Ψ		
		Totals Real Estate Total Construction Estimate Total Planning, Engineering & Design Total Construction Managemen	e \$ n \$	- 116,374,300 11,637,430 9,309,944		0.00% 30.95% 16.15% 16.15%	\$ \$ \$	- \$ 36,013,090 \$ 1,878,991 \$ 1,503,193 \$	- 152,387,390 13,516,421 10,813,137
		Tota	\$	137,321,674		29%	\$	39,395,275 \$ 50%	176,716,949
			Ra	ange Estimate (\$0	00's)	Base \$137,322	?k	\$0% \$160,959k	<b>80%</b> \$176,717k
	Fixed Dollar Risk Add: (Allows for additional risk to be added to the risk analsyis. Must include justification. Does not allocate to Real Estate.								

#### Houma Navigation Canal Deepening Project 1B 18-Earth

Feasibility (Alternatives) Abbreviated Risk Analysis Meeting Date: 2-Nov-15

<u>Risk Level</u> Very Likely Likely Possible 2 3 2 3 1 Δ 0 1 2 1 3 Unlikely 0 0 2 3 Negligible Marginal Moderate Significant Critical

Risk Element	Feature of Work		PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Impact	Likelihood	Risk Level
Project Sco	ope Growth			Maximum Proje	ct Growth	40%
PS-1	Relocations	Some utility elevations could not be determined. Relocation costs are 6 years old. Unidentified utilities or oil/gas infrastructure could be located during construction.	The need for additional relocations are a possability, which would increase the scope of the project and mpact cost/schedule.	Marginal	Possible	1
PS-2	Dredging	A full Dredged Material Disposal Plan has not been developed. Some depths and elevations for proposed disposal areas were assumed, without survey data. Disposal quantities could also be increased based on low maintenance activities and old survey information. It could be determined that foreshore protection and rock retention could be required in additional areas other than those recommended. This could lead to the need for additional rock retention, foreshore protection, and floatation channel dredging.	The proposed disposal locations will be revisted during the design phase, but some changes to the costs associated with the current plan is likely. Additional quantites could require changes to the proposed disposal areas and lead to increases in scope. Any changes to the rock requirements could increase the project scope, but it would have a minimal impact on overall costs.	Moderate	Possible	2
PS-3	0			Moderate	Possible	N/A
PS-4	0			Negligible	Unlikely	N/A
PS-5	0			Negligible	Unlikely	N/A
PS-6	0			Negligible	Unlikely	N/A
PS-7	0			Negligible	Unlikely	N/A
PS-8	0			Negligible	Unlikely	N/A
PS-9	0			Negligible	Unlikely	N/A
PS-10	0			Negligible	Unlikely	N/A
PS-11	0			Negligible	Unlikely	N/A
PS-12				Marginal	Possible	N/A

PS-13	Planning, Engineering, & Design			Moderate	Likely	3
PS-14	Construction Management			Significant	Possible	3
<u>Acquisitio</u>	n Strategy		•	Maximum Proje	ct Growth	30%
AS-1	Relocations	Contract could require specialized work associated with environmental impacts of pipeline relocation and proper containment of material. The offshore nature of the work could limit the number of bids received to larger contracting companies.	A specialized pipeline relocation contractor could require a higher unit cost with a less competative bid. The overall cost ramifications of this would be minimal when compared to overall project costs.	Marginal	Possible	1
AS-2	Dredging	Dredging methodology for channel deepening would be widely available within south Louisiana, but offshore nature of the work could limit the number of bids.	A reduced number of bids could result in higher unit costs. However, based on the amount of ongoing dredging work within the channel over the past 20 years, it is believed the likihood of this occuring is minimal.	Marginal	Possible	1
AS-3	0			Moderate	Likely	N/A
AS-4	0			Negligible	Unlikely	N/A
AS-5	0			Negligible	Unlikely	N/A
AS-6	0			Negligible	Unlikely	N/A
AS-7	0			Negligible	Unlikely	N/A
AS-8	0			Negligible	Unlikely	N/A
AS-9	0			Negligible	Unlikely	N/A
AS-10	0			Negligible	Unlikely	N/A
AS-11	0			Negligible	Unlikely	N/A
AS-12				Negligible	Unlikely	N/A
AS-13	Planning, Engineering, & Design			Negligible	Unlikely	0
AS-14	Construction Management			Negligible	Unlikely	0
<u>Construct</u>	ion Elements			Maximum Proje	ct Growth	15%
CE-1	Relocations	Boat access would be required for relocations. Mobilization/Demobilization could take longer than anticipated. The potential exists for low-frequency weather events to delay work. Marine work could result in lower than anticipated productivity.	Impacts due to extended weather delays would be the most significant impact to cost and schedule, but the likelihood is low. With the amount of oil infrastructure existing in south Louisana, it is assumed a contractor familiar with the challenges of offshore pipeline relocation would be chosen. Therefore productivity issues would be minimal.	Moderate	Possible	2

CE-2	Dredging	Boat access would be required for survey crews and dredging equipment/crews. The potential exists for low-frequency weather events to delay work. Remote location of project could impact schedule if repairs are necessary to dredging equipment. Dredging methods would be fairly straight forward.	Dredging work is commonplace within the channel, so the risk of schedule delays or reduced productivity would center around the remote location or extreme weather events, not the dredging methods. The impact of a significant storm could be significant but liklihood is small.	Moderate	Possible	2
CE-3	0			Marginal	Possible	N/A
CE-4	0			Negligible	Unlikely	N/A
CE-5	0			Negligible	Unlikely	N/A
CE-6	0			Negligible	Unlikely	N/A
CE-7	0			Negligible	Unlikely	N/A
CE-8	0			Negligible	Unlikely	N/A
CE-9	0			Negligible	Unlikely	N/A
CE-10	0			Negligible	Unlikely	N/A
CE-11	0			Negligible	Unlikely	N/A
CE-12				Negligible	Unlikely	N/A
CE-13	Planning, Engineering, & Design			Negligible	Unlikely	0
CE-14	Construction Management			Negligible	Unlikely	0
<b>Quantities</b>	<u>s for Current Scope</u>			Maximum Proje	ct Growth	20%
Q-1	Relocations	The elevations of some pipelines are assumed or unkown. The potential exists for some unknown oil/gas infrastructure to be present. Shoaling rates utilized are based on past data, but the infrequency of maintenance dredging could result in pipelines found to be deeper than anticipated.	The potential exists for increased quantity requirements during the relocation phase of the project, but the cost impact would be small when compaed to the overall cost of the project.	Marginal	Possible	1
Q-2	Dredging	Disposal quantities could be underestimated based on the infrequent nature of maintenance dredging over the past 20 years. Pipeline distances may change is disposal areas are changed. Disposal area capacities are based on assumed depths without data from surveys.	Additional costs could be significant if additional dredging is required to achieve target depth. Dredging quantites required are based on dated survey information and assumed shoaling rates. Changes to the disposal plan during the design phase could increase costs.	Moderate	Possible	2
Q-3	0			Negligible	Likely	N/A
Q-4	0			Negligible	Unlikely	N/A

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No.     No.       0.7     0     1 <t< td=""><td>Q-5</td><td>0</td><td></td><td></td><td>Negligible</td><td>Unlikely</td><td>N/A</td></t<>	Q-5	0			Negligible	Unlikely	N/A
0.70 $   0.3$ $0$ $   -$	Q-6	0			Negligible	Unlikely	N/A
0.880111 <td>Q-7</td> <td>0</td> <td></td> <td></td> <td>Negligible</td> <td>Unlikely</td> <td>N/A</td>	Q-7	0			Negligible	Unlikely	N/A
0.940111 <td>Q-8</td> <td>0</td> <td></td> <td></td> <td>Negligible</td> <td>Unlikely</td> <td>N/A</td>	Q-8	0			Negligible	Unlikely	N/A
C-100N/A $0.11$ 0Image: second	Q-9	0			Negligible	Unlikely	N/A
0-11       0       1       1         0-12       Image: Control of Control Contro Control Control Control Contro Control Contro Control C	Q-10	0			Negligible	Unlikely	N/A
0-13       Penning, Engineering, & Design       Indication       Negligible       Unlikely       0         0-14       Construction Management       Negligible       Unlikely       0         Speciality Fabrication or Equipment       National Projection       Speciality       Speciality       Speciality       Speciality       National Projection       Speciality       National Projection       Speciality       National Projection       National Projection       Speciality       National Projection	Q-11	0			Negligible	Unlikely	N/A
Q-14         Construction Management         Image in the image in t	Q-12				Negligible	Unlikely	N/A
Specialty Fabrication or Equipment         Maximum Project Sorth         50%           FE-1         Transportation of pipe and other relocation materials(equipment could late to more boation of upic, Equipment transport of failure would likely to more exponence, during in increased unit costs and schedule direg during environment.         Marginal         Possible         1           FE-1         Relocations         Transportation of pipe and other relocation materials(equipment failure could likely to more exponence) during environment.         Equipment transport of failure would likely to more exponence) during environment.         Marginal         Possible         1           FE-1         Relocations         Remote location of project could import for an activity environment.         The decreased productivity resulting from longer than anticipated environment.         Marginal         Possible         1           FE-2         Dredging         Remote location of project could import for and schedule if repairs are mecessary of decding equipment. The transport of crews and equipment during when compared to the lineages during environment.         Marginal         Possible         1           FE-3         0         Image: schedule if repairs are mecessary of decding equipment. The transport of crews and equipment and the more exponency of the overall project could import environment.         NA         N/A           FE-4         0         Image: schedule if repairs are more exponency of the overall project could import envice and schedule if repairs are more exponency of the ov	Q-13	Planning, Engineering, & Design			Negligible	Unlikely	0
Field         Transportation of pipe and other relocation materials/equipment could take longer than anticipated due to remote location of work. Equipment transport of failure would likely be more expensive, could take longer as well. An increased lithood of equipment failure could exist from working in a marine environment.         Equipment transport of failure would likely be more expensive, resulting in increased of no costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost.         Marginal         Possible         1           FE-1         Drodging         Remote location of project could impact cost and schedule if repairs are necessary to drodging equipment. The transport of crews and equipment delivery could increase both costs and the schedule. However, it is belowed that the impacts due to these science would be minima when compared to the overall cost of the project.         Marginal         Possible         1           FE-3         0         Image: cost of the project cost.         The decreased productivity: resulting from longer than anticipated due to these science would be minima when compared to the overall cost of the project.         Marginal         Possible         1           FE-4         0         Image: cost of the project cost.         Negligible         Unlikely         N/A           FE-5         0         Image: cost of the project.         Negligible         Unlikely         N/A           FE-6         0         Image: cost of the project.         Negligible         Unlikely         N/A <td>Q-14</td> <td>Construction Management</td> <td></td> <td></td> <td>Negligible</td> <td>Unlikely</td> <td>0</td>	Q-14	Construction Management			Negligible	Unlikely	0
Relocations         longer than anticipated due to remote location of work. Équipment failure could could take longer as well. A internessed linhood of equipment failure could costs from working in a marine environment.         Internessed linhood de quipment failure could contract from working in a marine environment.         Possible         Possible         Possible           FE-2         Dredging         Renote location of project could impact cost and schedule delays during costs from working in a marine environment.         The decreased productivity resulting to micrease during constructions and the schedule delays during the schedule delays during         Marginal         Possible         1           FE-2         Dredging         Renote location of project could impact cost and schedule delays during could take longer than anticipated, resulting in reduced productivity.         The decreased productivity resulting in increase during marinemence and equipment and delay count delays during due to these issues would be minimal when compared to the overall cost of the project.         Marginal         Marginal         N/A           FE-3         0         O         O         Unlikey         N/A           FE-4         0         O         Unlikey         N/A           FE-5         0         O         Unlikey         N/A           FE-6         0         Unlikey         N/A           FE-7         0         Unlikey         N/A           FE-8         0	Specialty I	Fabrication or Equipment			Maximum Proje	ct Growth	<b>50%</b>
FE-2       Dedging       Remote location of project could ingrast cost and schedule if repairs are could match and equipment. The transport of cress and dedgine could take longer than anticipated, resulting in reduced productivity.       match and equipment. The transport of cress and dedgine could take longer than anticipated, resulting in reduced productivity.       match and equipment. The transport of cress and dedgine could take longer than anticipated, resulting in reduced productivity.       match and equipment. The transport of cress and dedgine could take longer than anticipated, resulting in reduced productivity.       Marginal       Marginal       Possible       1         FE-3       0							
FE-4occoFE-5oNegligibleUnlikelyN/AFE-6oNegligibleUnlikelyN/AFE-7oNegligibleUnlikelyN/AFE-8oNegligibleUnlikelyN/AFE-8oNegligibleUnlikelyN/ANegligibleNegligibleUnlikelyN/ANENNNNNENNNNNENNNNNENNNNNENNNNNENNNNNENNNNNENNNNNENNNNNENNNNNENNNNNENNNNNENNN <td>FE-1</td> <td>Relocations</td> <td>longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could</td> <td>resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small</td> <td>Marginal</td> <td>Possible</td> <td>1</td>	FE-1	Relocations	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small	Marginal	Possible	1
Image: constraint of the second sec			longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the			
FE-6Image: constraint of the sector of the sect	FE-2	Dredging	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal	Possible	1
Image: constraint of the second se	FE-2 FE-3	Dredging 0	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal	Possible Unlikely	1 N/A
FE-7     0     Comparison     Comparison     Comparison       FE-8     0     0     0     N/A       Negligible     Unlikely     N/A	FE-2 FE-3 FE-4	Dredging 0	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal Negligible Negligible	Possible Unlikely Unlikely	1 N/A N/A
FE-8 V	FE-2 FE-3 FE-4 FE-5	Dredging 0	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal Negligible Negligible Negligible	Possible Unlikely Unlikely Unlikely	1 N/A N/A N/A
FE-9 0 Negligible Unlikely N/A	FE-2 FE-3 FE-4 FE-5 FE-6	Dredging 0	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal Negligible Negligible Negligible Negligible	Possible Unlikely Unlikely Unlikely Unlikely	1 N/A N/A N/A N/A
	FE-2 FE-3 FE-4 FE-5 FE-6 FE-7	Dredging 0	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal Negligible Negligible Negligible Negligible Negligible	Possible Unlikely Unlikely Unlikely Unlikely Unlikely	1 N/A N/A N/A N/A N/A

FE-10	0			Negligible	Unlikely	N/A
FE-11	0			Negligible	Unlikely	N/A
FE-12				Negligible	Unlikely	N/A
FE-13	Planning, Engineering, & Design			Negligible	Unlikely	0
FE-14	Construction Management			Negligible	Unlikely	0
Cost Estim	ate Assumptions			Maximum Proje	ct Growth	25%
CT-1	Relocations	The unit prices for pipeline relocations are based on the 2009 estimate conducted by the Corps. Cost will be escilated to 2015 levels based on the Corps escalation indices. The elevation of some pipelines are unkown and need to be assumed for this phase of the project.	The potential exists for the unit costs of relaocations to be increased subsequent to the plannig phase of the project. This would result in marginally increased cost for the overall project.	Marginal	Possible	1
CT-2	Dredging	the existing disposal areas. Dredging quantities are also based on an assumed starting depth of the channel and could could be increased once a	about the existing depths of the channel. This would result in moderate increases to the project costs. It is also possible that	Moderate	Likely	3
CT-3	0			Moderate	Possible	N/A
CT-4	0			Negligible	Unlikely	N/A
CT-5	0			Negligible	Unlikely	N/A
CT-6	0			Negligible	Unlikely	N/A
CT-7	0			Negligible	Unlikely	N/A
CT-8	0			Negligible	Unlikely	N/A
CT-9	0			Negligible	Unlikely	N/A
CT-10	0			Negligible	Unlikely	N/A
CT-11	0			Negligible	Unlikely	N/A
CT-12				Negligible	Unlikely	N/A
CT-13	Planning, Engineering, & Design			Negligible	Unlikely	0
				_		

CT-14	Construction Management			Negligible	Unlikely	0
External P	roject Risks		•	Maximum Proje	ct Growth	20%
EX-1	Relocations	Fuel prices used for the estimate are near a two-year low, so the potential for increased fuel costs exiits. This would increase the cost of equipment operation and material/crew transport.	Increases in fuel prices are likely to impact costs. These impacts would be moderate due to the heavy reliance on fuel to operate equipment and transport material. Overall the impacts to cost would be moderate.	Moderate	Possible	2
EX-2	Dredging	Extreme weather events are a possibility in Coastal Louisiana, with the potential to delay the project significantly or damage construction equipment. Shoaling rates would also increase during such an event, potentially impacting dredging quantities. Fuel prices used for the estimate are near a two-year low, so the potential for increased fuel costs exilts.	Increases in fuel prices are likely and the cost impact would be moderate. Storm impacts could be significant, but the liklihood is small. The cost and schedule impacts would be marginal. Overall the impacts to cost would be moderate.	Moderate	Possible	2
EX-3	0			Marginal	Possible	N/A
EX-4	0			Negligible	Unlikely	N/A
EX-5	0			Negligible	Unlikely	N/A
EX-6	0			Negligible	Unlikely	N/A
EX-7	0			Negligible	Unlikely	N/A
EX-8	0			Negligible	Unlikely	N/A
EX-9	0			Negligible	Unlikely	N/A
EX-10	0			Negligible	Unlikely	N/A
EX-11	0			Negligible	Unlikely	N/A
EX-12				Negligible	Unlikely	N/A
EX-13	Planning, Engineering, & Design			Negligible	Unlikely	0
EX-14	Construction Management			Negligible	Unlikely	0

# Houma Navigation Canal Deepening Project 1B 18-Earth Feasibility (Alternatives)

Abbreviated Risk Analysis

<u>WBS</u>	Potential Risk Areas	Project Scope Growth	Acquisition Strategy	Construction Elements	Quantities for Current Scope	Specialty Fabrication or Equipment	Cost Estimate Assumptions	External Project Risks	Cost in Thousands
01 LANDS AND DAMAGES	Real Estate								\$0
02 RELOCATIONS	Relocations	1	1	2	1	1	1	2	\$14,201
12 NAVIGATION, PORTS AND HARBORS	Dredging	2	1	2	2	1	3	2	\$102,173
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
All Other	Remaining Construction Items	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
30 PLANNING, ENGINEERING, AND DESIGN	Planning, Engineering, & Design	3	0	0	0	0	0	0	\$11,637
31 CONSTRUCTION MANAGEMENT	Construction Management	3	0	0	0	0	0	0	\$9,310
					•				\$137,322
Risk		\$ 6,681	\$ 2,298	\$ 13,050	\$ 3,645	\$ 2,545	\$ 7,319	\$ 3,857	\$39,395
Fixed Dollar Risk Allocation		\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$0
	Risk	\$ 6,681	\$ 2,298	\$ 13,050	\$ 3,645	\$ 2,545	\$ 7,319		\$39,395
								Total	\$176,717

		Abbreviated Risk Analysis Houma Navigation Canal Deepening Proje	ect			Alternative	1 <b>B</b> 1	18-Earth	
		Low Risk: Typical Construction, Simple				Meeting Date:		11/2/2015	
	Т	otal Estimated Construction Contract Cost =	\$	746,023,940					
	CWWBS	Feature of Work	<u>Co</u>	ontract Cost		% Contingency	<u>\$</u>	<u>Contingency</u>	<u>Total</u>
	01 LANDS AND DAMAGES	Real Estate	\$	-		0.00%	\$	- \$	-
1	02 RELOCATIONS	Relocations				0.00%	\$	- \$	-
2	12 NAVIGATION, PORTS AND HARBORS	Dredging	\$	746,023,940		25.22%	\$	188,176,571 \$	934,200,51
3			\$	-		0.00%	\$	- \$	-
4			\$	_		0.00%	\$	- \$	-
5			\$	-		0.00%	\$	- \$	-
6			\$			0.00%	\$	- \$	-
7						0.00%	\$	- \$	-
8			\$			0.00%	\$	- \$	-
9			\$			0.00%	\$	- \$	
0			\$			0.00%	\$	- \$	
1			\$ \$			0.00%	\$	- \$	-
		Demoising Construction Kome	<u>\$</u>	-	0.0%	0.00%	э \$	· · · · ·	-
	All Other	Remaining Construction Items	•	-	0.0%	9.09%		- \$	-
	30 PLANNING, ENGINEERING, AND DESIGN	Planning, Engineering, & Design	\$	74,602,394			\$	6,782,312 \$	81,384,70
	31 CONSTRUCTION MANAGEMENT	Construction Management	\$	59,681,915		9.09%	\$	5,425,849 \$	65,107,76
X	FIXED DOLLAR RISK ADD (EQUALLY DISPERSED TO ALL, MUS	T INCLUDE JUSTIFICATION SEE BELOW)					\$	-	
		Totals Real Estate	¢			0.00%	\$	- \$	
		Total Construction Estimate		746.023.940		25.22%	э \$	- ֆ 188,176,571 \$	- 934,200,5
		Total Planning, Engineering & Design		74,602,394		9.09%	\$	6,782,312 \$	81,384,70
		Total Construction Management		59,681,915		9.09%	\$	5,425,849 \$	65,107,7
		Total	\$	880,308,249		23%	\$	200,384,733 \$	1,080,692,98
						Base		50%	8
			Ra	nge Estimate (\$00	)0's)	\$880,308		\$1,000,539k	\$1,080,69
ſ	Fixed Dollar Risk Add: (Allows for additional risk to be added to the risk analsyis. Must include justification. Does not allocate to Real Estate.						* 50	0% based on base is at 5% CL.	

#### Houma Navigation Canal Deepening Project 1B 18-Earth

Feasibility (Alternatives) Abbreviated Risk Analysis Meeting Date: 2-Nov-15

<u>Risk Level</u> Very Likely Likely Possible 2 3 2 3 1 Δ 0 1 2 1 3 Unlikely 0 0 2 3 Negligible Marginal Moderate Significant Critical

Risk Element	Feature of Work		PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Impact	Likelihood	Risk Level
Project Sco	ope Growth			Maximum Proje	ct Growth	40%
PS-1	Relocations	Some utility elevations could not be determined. Relocation costs are 6 years old. Unidentified utilities or oil/gas infrastructure could be located during construction.	The need for additional relocations are a possability, which would increase the scope of the project and mpact cost/schedule.	Negligible	Unlikely	0
PS-2	Dredging	A full Dredged Material Disposal Plan has not been developed. Some depths and elevations for proposed disposal areas were assumed, without survey data. Disposal quantities could also be increased based on low maintenance activities and old survey information. It could be determined that foreshore protection and rock retention could be required in additional areas other than those recommended. This could lead to the need for additional rock retention, foreshore protection, and floatation channel dredging.	The proposed disposal locations will be revisted during the design phase, but some changes to the costs associated with the current plan is likely. Additional quantites could require changes to the proposed disposal areas and lead to increases in scope. Any changes to the rock requirements could increase the project scope, but it would have a minimal impact on overall costs.	Marginal	Possible	1
PS-3	0			Moderate	Possible	N/A
PS-4	0			Negligible	Unlikely	N/A
PS-5	0			Negligible	Unlikely	N/A
PS-6	0			Negligible	Unlikely	N/A
PS-7	0			Negligible	Unlikely	N/A
PS-8	0			Negligible	Unlikely	N/A
PS-9	0			Negligible	Unlikely	N/A
PS-10	0			Negligible	Unlikely	N/A
PS-11	0			Negligible	Unlikely	N/A
PS-12				Marginal	Possible	N/A

PS-13	Planning, Engineering, & Design			Marginal	Possible	1
PS-14	Construction Management			Marginal	Possible	1
<u>Acquisitio</u>	n Strategy		•	Maximum Proje	ct Growth	30%
AS-1	Relocations	Contract could require specialized work associated with environmental impacts of pipeline relocation and proper containment of material. The offshore nature of the work could limit the number of bids received to larger contracting companies.	A specialized pipeline relocation contractor could require a higher unit cost with a less competative bid. The overall cost ramifications of this would be minimal when compared to overall project costs.	Negligible	Unlikely	0
AS-2	Dredging	Dredging methodology for channel deepening would be widely available within south Louisiana, but offshore nature of the work could limit the number of bids.	A reduced number of bids could result in higher unit costs. However, based on the amount of ongoing dredging work within the channel over the past 20 years, it is believed the likihood of this occuring is minimal.	Marginal	Possible	1
AS-3	0			Moderate	Likely	N/A
AS-4	0			Negligible	Unlikely	N/A
AS-5	0			Negligible	Unlikely	N/A
AS-6	0			Negligible	Unlikely	N/A
AS-7	0			Negligible	Unlikely	N/A
AS-8	0			Negligible	Unlikely	N/A
AS-9	0			Negligible	Unlikely	N/A
AS-10	0			Negligible	Unlikely	N/A
AS-11	0			Negligible	Unlikely	N/A
AS-12				Negligible	Unlikely	N/A
AS-13	Planning, Engineering, & Design			Negligible	Unlikely	0
AS-14	Construction Management			Negligible	Unlikely	0
<u>Constructi</u>	ion Elements	•	·	Maximum Proje	ct Growth	15%
CE-1	Relocations	Boat access would be required for relocations. Mobilization/Demobilization could take longer than anticipated. The potential exists for low-frequency weather events to delay work. Marine work could result in lower than anticipated productivity.	Impacts due to extended weather delays would be the most significant impact to cost and schedule, but the likelihood is low. With the amount of oil infrastructure existing in south Louisana, it is assumed a contractor familiar with the challenges of offshore pipeline relocation would be chosen. Therefore productivity issues would be minimal.	Negligible	Unlikely	0

CE-2	Dredging	Boat access would be required for survey crews and dredging equipment/crews. The potential exists for low-frequency weather events to delay work. Remote location of project could impact schedule if repairs are necessary to dredging equipment. Dredging methods would be fairly straight forward.	Dredging work is commonplace within the channel, so the risk of schedule delays or reduced productivity would center around the remote location or extreme weather events, not the dredging methods. The impact of a significant storm could be significant but liklihood is small.	Marginal	Possible	1
CE-3	0			Marginal	Possible	N/A
CE-4	0			Negligible	Unlikely	N/A
CE-5	0			Negligible	Unlikely	N/A
CE-6	0			Negligible	Unlikely	N/A
CE-7	0			Negligible	Unlikely	N/A
CE-8	0			Negligible	Unlikely	N/A
CE-9	0			Negligible	Unlikely	N/A
CE-10	0			Negligible	Unlikely	N/A
CE-11	0			Negligible	Unlikely	N/A
CE-12				Negligible	Unlikely	N/A
CE-13	Planning, Engineering, & Design			Negligible	Unlikely	0
CE-14	Construction Management			Negligible	Unlikely	0
<b>Quantities</b>	<u>s for Current Scope</u>			Maximum Proje	ct Growth	20%
Q-1	Relocations	The elevations of some pipelines are assumed or unkown. The potential exists for some unknown oil/gas infrastructure to be present. Shoaling rates utilized are based on past data, but the infrequency of maintenance dredging could result in pipelines found to be deeper than anticipated.	The potential exists for increased quantity requirements during the relocation phase of the project, but the cost impact would be small when compaed to the overall cost of the project.	Negligible	Unlikely	0
Q-2	Dredging	Disposal quantities could be underestimated based on the infrequent nature of maintenance dredging over the past 20 years. Pipeline distances may change is disposal areas are changed. Disposal area capacities are based on assumed depths without data from surveys.	Additional costs could be significant if additional dredging is required to achieve target depth. Dredging quantites required are based on dated survey information and assumed shoaling rates. Changes to the disposal plan during the design phase could increase costs.	Moderate	Possible	2
Q-3	0			Negligible	Likely	N/A
Q-4	0			Negligible	Unlikely	N/A

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0.77 $0$ Interpretation of parameter of paramete	Q-5	0			Negligible	Unlikely	N/A
a 7 $a$ <th< td=""><td>Q-6</td><td>0</td><td></td><td></td><td>Negligible</td><td>Unlikely</td><td>N/A</td></th<>	Q-6	0			Negligible	Unlikely	N/A
0.48011111 $q.ad$ 000	Q-7	0			Negligible	Unlikely	N/A
$0 \circ 0$ $0$ $1$ <	Q-8	0			Negligible	Unlikely	N/A
a - b - 0 $b$ </td <td>Q-9</td> <td>0</td> <td></td> <td></td> <td>Negligible</td> <td>Unlikely</td> <td>N/A</td>	Q-9	0			Negligible	Unlikely	N/A
Actifier     0     0       Q-12     Include     Include     Include     Include     Include     Include       Q-13     Planning, Engineering, & Design     Include     Include     Include     Include     Include     Include       Q-14     Construction Management     Include     Include <td>Q-10</td> <td>0</td> <td></td> <td></td> <td>Negligible</td> <td>Unlikely</td> <td>N/A</td>	Q-10	0			Negligible	Unlikely	N/A
Q-13         Planning, Engineering & Design         Index         Index <t< td=""><td>Q-11</td><td>0</td><td></td><td></td><td>Negligible</td><td>Unlikely</td><td>N/A</td></t<>	Q-11	0			Negligible	Unlikely	N/A
C-14         Construction Management         Image is and image is a marked of the local of the part of the local of the	Q-12				Negligible	Unlikely	N/A
Specialty Fabrication or Equipment       Maximum Project or Maximum	Q-13	Planning, Engineering, & Design			Negligible	Unlikely	0
FE-1         Transportation of pipe and other relocation materials/equipment could take bringer than anticipated due to remote location of work. Equipment transport of failure would skely be more expensive. resulting in increased unit costs and schedule delays during construction. However, these cents would represent a small.         Negligible         Unikely         O           FE-1         Dredging         Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of rews and equipment could take longer than anticipated, resulting in necessed influe could ask from working in a marine environment.         The decreased productivity resulting from longer than anticipated portion of the overall project cost.         Marginal         Possible         1           FE-2         Dredging         Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of rews and equipment could take longer than anticipated, resulting in netword project.         The decreased productivity resulting from longer than anticipated take to the size secure bar marine environment.         Narginal         Possible         1           FE-3         0         Image: the impact bar marine environment.         The decreased productivity resulting from longer than anticipated take to the size secure bar marine environment.         NARginal         Possible         Unikely         N/A           FE-4         0         Image: the impact bar marine environment.         Negligible         Unikely         N/A           FE-5	Q-14	Construction Management			Negligible	Unlikely	0
Relocations         Imaging than anticipated due to remote location of work. Equipment tailer cool         resulting in increased unit costs and schedule delays during         Negligble         Unlikely         O           FE-1         Dredging         makine environment.         Imagine en	<b>Specialty</b>	Fabrication or Equipment			Maximum Proje	ct Growth	50%
FE-2       Dredging       Remote location of project coat and schedule if repairs are could make coats and schedule if repairs are could take longer than anticipated, resulting in reduced productivity.       Imatemance and equipment/part delivery could increase both costs and the schedule. Hower, it is believed that the impairs are to tots and the schedule. Hower, it is believed that the impairs are to tots and the schedule. Hower, it is believed that the impairs are to tots and the schedule. Hower, it is believed that the impairs are to tots and the schedule. Hower, it is believed that the impairs are to tots and the schedule. Hower, it is believed that the impairs are tots and the schedule. Hower, it is believed that the impairs are tots and schedule in the schedule. Hower, it is believed that the impairs are tots and schedule in the schedule. Hower, it is believed that the impairs are tots and the impairs are tots and the schedule. Hower, it is believed that the impairs are tots and the schedule. Hower, it is believed that the impairs are tots and the schedule. Hower, it is believed that the impairs are tots and the impairs are tots and the impairs are tots and the schedule. Hower, it is believed that the impairs are tots and the schedule. Hower, it is believed that the impairs are tots and the schedule. Hower, it is believed that the impairs are tots and the impairs are tots and the schedule. Hower, it is believed that the impairs are tots and the schedule. Hower, it is believed the tots and the schedule. Hower, it is believed that the impairs are tots and the impairs are tots and the schedule. Hower, it is believed the tots and the impairs are tots and the schedule. Hower, it is believed the tots and the impairs are tots and the schedule. Hower, it is believed the tots and the impairs are tots and the schedule. Hower, it is believed the tots and the tots and the impairs are tots and the tot are tots and the impairs are tots and the tot are tots and							
FE-40Image: Comparison of the symbolImage: Comparison of the symbolN/AFE-50Medical of the symbolMedical of the symbolMedical of the symbolM/AFE-60Medical of the symbolMedical of the symbolMedical of the symbolM/AFE-70Medical of the symbolMedical of the symbolMedical of the symbolM/AFE-80Medical of the symbolMedical of the symbolMedical of the symbolM/AFE-80Medical of the symbolMedical of the symbolMedical of the symbolM/AMedical of the symbolMedical of the symbolMedical of the symbolMedical of the symbolM/AMedical of the symbolMedical of the symbolMedical of the symbolMedical of the symbolM/AMedical of the symbolMedical of the symbolMedical of the symbolMedical of the symbolM/AMedical of the symbolMedical of the symbolMedical of the symbolMedical of the symbolM/AMedical of the symbolMedical of the symbolMedical of the symbolMedical of the symbolM/AMedical of the symbolMedical of the symbolMedical of the symbolMedical of the symbolM/AMedical of the symbolMedical of the symbolMedical of the symbolMedical of the symbolM/AMedical of the symbolMedical of the symbolMedical of the symbolMedical of the symbolM/AMedical of the symbolMedical of the symbolMedical of the symbolMedical of the sym	FE-1	Relocations	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small	Negligible	Unlikely	0
Image: A set of the set of t			longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the			
FE-60ComparisonComparisonN/AFE-70NegligibleUnlikelyN/AFE-80NegligibleUnlikelyN/AFE-80NegligibleUnlikelyN/A	FE-2	Dredging	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal	Possible	1
Image: Person	FE-2 FE-3	Dredging 0	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal Negligible	Possible Unlikely	1 N/A
FE-7     0     1     1       FE-8     0     Negligible     Unlikely     N/A	FE-2 FE-3 FE-4	Dredging 0 0	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal Negligible Negligible	Possible Unlikely Unlikely	1 N/A N/A
FE-8 0 Negliaible Unlikely N/A	FE-2 FE-3 FE-4 FE-5	Dredging 0 0 0 0	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal Negligible Negligible Negligible	Possible Unlikely Unlikely Unlikely	1 N/A N/A N/A
FE-9 0 Negligible Unlikely N/A	FE-2 FE-3 FE-4 FE-5 FE-6	Dredging 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal Negligible Negligible Negligible Negligible	Possible Unlikely Unlikely Unlikely Unlikely	1 N/A N/A N/A N/A
	FE-2 FE-3 FE-4 FE-5 FE-6 FE-7	Dredging       0       0       0       0       0       0       0       0	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal Negligible Negligible Negligible Negligible Negligible	Possible Unlikely Unlikely Unlikely Unlikely Unlikely	1 N/A N/A N/A N/A N/A

FE-10	0			Negligible	Unlikely	N/A
FE-11	0			Negligible	Unlikely	N/A
FE-12				Negligible	Unlikely	N/A
FE-13	Planning, Engineering, & Design			Negligible	Unlikely	0
FE-14	Construction Management			Negligible	Unlikely	0
Cost Estim	ate Assumptions		•	Maximum Proje	ct Growth	25%
CT-1	Relocations	The unit prices for pipeline relocations are based on the 2009 estimate conducted by the Corps. Cost will be escilated to 2015 levels based on the Corps escalation indices. The elevation of some pipelines are unkown and need to be assumed for this phase of the project.	The potential exists for the unit costs of relaocations to be increased subsequent to the plannig phase of the project. This would result in marginally increased cost for the overall project.	Negligible	Unlikely	0
CT-2	Dredging	Shoaling rates are based on past data and the disposal plan used for development of dredging unit costs is based on assumptions associated with the existing disposal areas. Dredging quantities are also based on an assumed starting depth of the channel and could could be increased once a survey is conducted. Productivity rates were developed via CEDEP which is based on disposal plan assumptions as well.	It is possible that dredging quantities would increase during the design phase of the project, once more information in know about the existing depths of the channel. This would result in moderate increases to the project costs. It is also possible that the dredged material disposal plan would be modified based on new data, potentially increasing costs.	Moderate	Possible	2
CT-3	0			Moderate	Possible	N/A
CT-4	0			Negligible	Unlikely	N/A
CT-5	0			Negligible	Unlikely	N/A
CT-6	0			Negligible	Unlikely	N/A
CT-7	0			Negligible	Unlikely	N/A
CT-8	0			Negligible	Unlikely	N/A
CT-9	0			Negligible	Unlikely	N/A
CT-10	0			Negligible	Unlikely	N/A
CT-11	0			Negligible	Unlikely	N/A
CT-12				Negligible	Unlikely	N/A
CT-13	Planning, Engineering, & Design			Negligible	Unlikely	0

CT-14	Construction Management			Negligible	Unlikely	0
<u>External P</u>	roject Risks			Maximum Proje	ct Growth	20%
EX-1	Relocations	Fuel prices used for the estimate are near a two-year low, so the potential for increased fuel costs exiits. This would increase the cost of equipment operation and material/crew transport.	Increases in fuel prices are likely to impact costs. These impacts would be moderate due to the heavy reliance on fuel to operate equipment and transport material. Overall the impacts to cost would be moderate.	Negligible	Unlikely	0
EX-2	Dredging	Extreme weather events are a possibility in Coastal Louisiana, with the potential to delay the project significantly or damage construction equipment. Shoaling rates would also increase during such an event, potentially impacting dredging quantities. Fuel prices used for the estimate are near a two-year low, so the potential for increased fuel costs exits.	Increases in fuel prices are likely and the cost impact would be moderate. Storm impacts could be significant, but the liklihood is small. The cost and schedule impacts would be marginal. Overall the impacts to cost would be moderate.	Moderate	Possible	2
EX-3	0			Marginal	Possible	N/A
EX-4	0			Negligible	Unlikely	N/A
EX-5	0			Negligible	Unlikely	N/A
EX-6	0			Negligible	Unlikely	N/A
EX-7	0			Negligible	Unlikely	N/A
EX-8	0			Negligible	Unlikely	N/A
EX-9	0			Negligible	Unlikely	N/A
EX-10	0			Negligible	Unlikely	N/A
EX-11	0			Negligible	Unlikely	N/A
EX-12				Negligible	Unlikely	N/A
EX-13	Planning, Engineering, & Design			Negligible	Unlikely	0
EX-14	Construction Management			Negligible	Unlikely	0

# Houma Navigation Canal Deepening Project 1B 18-Earth Feasibility (Alternatives)

Abbreviated Risk Analysis

<u>WBS</u>	Potential Risk Areas	Project Scope Growth	Acquisition Strategy	Construction Elements	Quantities for Current Scope	Specialty Fabrication or Equipment	Cost Estimate Assumptions	External Project Risks	Cost in Thousands
01 LANDS AND DAMAGES	Real Estate								\$0
02 RELOCATIONS	Relocations	0	0	0	0	0	0	0	\$0
12 NAVIGATION, PORTS AND HARBORS	Dredging	1	1	1	2	1	2	2	\$746,024
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
All Other	Remaining Construction Items	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
30 PLANNING, ENGINEERING, AND DESIGN	Planning, Engineering, & Design	1	0	0	0	0	0	0	\$74,602
31 CONSTRUCTION MANAGEMENT	Construction Management	1	0	0	0	0	0	0	\$59,682
				•		•			\$880,308
Risk		\$ 18,410							\$200,385
Fixed Dollar Risk Allocation			•	•		•		\$ -	\$0
	Risk	\$ 18,410	\$ 14,729	\$ 74,444	\$ 24,727	\$ 16,313	\$ 27,035		\$200,385
								Total	\$1,080,693

	Project (less than \$40M): Project Development Stage/Alternative:	Abbreviated Risk Analysis Houma Navigation Canal Deepening Proje Feasibility (Alternatives) Low Risk: Typical Construction, Simple	ct			rnative: g Date:		18-Rock 11/2/2015	
	Т	otal Estimated Construction Contract Cost = [	\$	141,456,800					
	<u>CWWBS</u>	Feature of Work	<u>Cc</u>	ontract Cost	<u>% Contir</u>	igency	<u>\$</u>	Contingency	Total
	01 LANDS AND DAMAGES	Real Estate	\$	-	0.00	%	\$	- \$	-
1	02 RELOCATIONS	Relocations	\$	14,201,300	23.25	i%	\$	3,301,121 \$	17,502,421
2	12 NAVIGATION, PORTS AND HARBORS	Dredging	\$	127,255,500	32.02	!%	\$	40,742,447 \$	167,997,947
3			\$		0.00	%	\$	- \$	-
4			\$	-	0.00	%	\$	- \$	-
5			\$	-	0.00	%	\$	- \$	-
6			\$		0.00		\$	- \$	-
7			•		0.00		\$	- \$	
8			\$		0.00		\$	- \$	
					0.00		\$ \$	*	-
9			\$					- \$	-
10			\$	-	0.00		\$	- \$	-
11			\$		0.00		\$	- \$	-
12	All Other	Remaining Construction Items	\$	-	0.0% 0.00		\$	- \$	-
13	30 PLANNING, ENGINEERING, AND DESIGN	Planning, Engineering, & Design	\$	14,145,680	16.15	6%	\$	2,283,976 \$	16,429,656
14	31 CONSTRUCTION MANAGEMENT	Construction Management	\$	11,316,544	16.15	%	\$	1,827,181 \$	13,143,725
XX	FIXED DOLLAR RISK ADD (EQUALLY DISPERSED TO ALL, MUS	T INCLUDE JUSTIFICATION SEE BELOW)					\$	-	
		Totals Real Estate Total Construction Estimate Total Planning, Engineering & Design Total Construction Management	\$ \$	- 141,456,800 14,145,680 11,316,544	0.00 31.14 16.15 16.15	.% %	\$ \$ \$ \$	- \$ 44,043,568 \$ 2,283,976 \$ 1,827,181 \$	- 185,500,368 16,429,656 13,143,725
		Total	\$	166,919,024	29%	-	\$	48,154,724 \$	215,073,748
			Ra	nge Estimate (\$000	)'s) \$	<b>Base</b> 166,919k		50% \$195,812k 0% based on base is at 5% CL.	<b>80%</b> \$215,074k
	Fixed Dollar Risk Add: (Allows for additional risk to be added to the risk analsyis. Must include justification. Does not allocate to Real Estate.								

## Houma Navigation Canal Deepening Project 1C 18-Rock

Feasibility (Alternatives) Abbreviated Risk Analysis Meeting Date: 2-Nov-15



Risk Element	Feature of Work		PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Impact	Likelihood	Risk Level
Project Sco	ope Growth			Maximum Proje	ct Growth	40%
PS-1	Relocations	Some utility elevations could not be determined. Relocation costs are 6 years old. Unidentified utilities or oil/gas infrastructure could be located during construction.	The need for additional relocations are a possability, which would increase the scope of the project and mpact cost/schedule.	Marginal	Possible	1
PS-2	Dredging	A full Dredged Material Disposal Plan has not been developed. Some depths and elevations for proposed disposal areas were assumed, without survey data. Disposal quantities could also be increased based on low maintenance activities and old survey information. It could be determined that foreshore protection and rock retention could be required in additional areas other than those recommended. This could lead to the need for additional rock retention, foreshore protection, and floatation channel dredging.	The proposed disposal locations will be revisted during the design phase, but some changes to the costs associated with the current plan is likely. Additional quantites could require changes to the proposed disposal areas and lead to increases in scope. Any changes to the rock requirements could increase the project scope, but it would have a minimal impact on overall costs.	Moderate	Possible	2
PS-3	0			Moderate	Possible	N/A
PS-4	0			Negligible	Unlikely	N/A
PS-5	0			Negligible	Unlikely	N/A
PS-6	0			Negligible	Unlikely	N/A
PS-7	0			Negligible	Unlikely	N/A
PS-8	0			Negligible	Unlikely	N/A
PS-9	0			Negligible	Unlikely	N/A
PS-10	0			Negligible	Unlikely	N/A
PS-11	0			Negligible	Unlikely	N/A
PS-12				Marginal	Possible	N/A

PS-13	Planning, Engineering, & Design			Moderate	Likely	3
PS-14	Construction Management			Significant	Possible	3
<u>Acquisitio</u>	n Strategy		•	Maximum Proje	ct Growth	30%
AS-1	Relocations	Contract could require specialized work associated with environmental impacts of pipeline relocation and proper containment of material. The offshore nature of the work could limit the number of bids received to larger contracting companies.	A specialized pipeline relocation contractor could require a higher unit cost with a less competative bid. The overall cost ramifications of this would be minimal when compared to overall project costs.	Marginal	Possible	1
AS-2	Dredging	Dredging methodology for channel deepening would be widely available within south Louisiana, but offshore nature of the work could limit the number of bids.	A reduced number of bids could result in higher unit costs. However, based on the amount of ongoing dredging work within the channel over the past 20 years, it is believed the likihood of this occuring is minimal.	Marginal	Possible	1
AS-3	0			Moderate	Likely	N/A
AS-4	0			Negligible	Unlikely	N/A
AS-5	0			Negligible	Unlikely	N/A
AS-6	0			Negligible	Unlikely	N/A
AS-7	0			Negligible	Unlikely	N/A
AS-8	0			Negligible	Unlikely	N/A
AS-9	0			Negligible	Unlikely	N/A
AS-10	0			Negligible	Unlikely	N/A
AS-11	0			Negligible	Unlikely	N/A
AS-12				Negligible	Unlikely	N/A
AS-13	Planning, Engineering, & Design			Negligible	Unlikely	0
AS-14	Construction Management			Negligible	Unlikely	0
<u>Construct</u>	ion Elements			Maximum Proje	ct Growth	15%
CE-1	Relocations	Boat access would be required for relocations. Mobilization/Demobilization could take longer than anticipated. The potential exists for low-frequency weather events to delay work. Marine work could result in lower than anticipated productivity.	Impacts due to extended weather delays would be the most significant impact to cost and schedule, but the likelihood is low. With the amount of oil infrastructure existing in south Louisana, it is assumed a contractor familiar with the challenges of offshore pipeline relocation would be chosen. Therefore productivity issues would be minimal.	Moderate	Possible	2

CE-2	Dredging	Boat access would be required for survey crews and dredging equipment/crews. The potential exists for low-frequency weather events to delay work. Remote location of project could impact schedule if repairs are necessary to dredging equipment. Dredging methods would be fairly straight forward.	Dredging work is commonplace within the channel, so the risk of schedule delays or reduced productivity would center around the remote location or extreme weather events, not the dredging methods. The impact of a significant storm could be significant but liklihood is small.	Moderate	Possible	2
CE-3	0			Marginal	Possible	N/A
CE-4	0			Negligible	Unlikely	N/A
CE-5	0			Negligible	Unlikely	N/A
CE-6	0			Negligible	Unlikely	N/A
CE-7	0			Negligible	Unlikely	N/A
CE-8	0			Negligible	Unlikely	N/A
CE-9	0			Negligible	Unlikely	N/A
CE-10	0			Negligible	Unlikely	N/A
CE-11	0			Negligible	Unlikely	N/A
CE-12				Negligible	Unlikely	N/A
CE-13	Planning, Engineering, & Design			Negligible	Unlikely	0
CE-14	Construction Management			Negligible	Unlikely	0
<b>Quantities</b>	<u>s for Current Scope</u>			Maximum Proje	ct Growth	20%
Q-1	Relocations	The elevations of some pipelines are assumed or unkown. The potential exists for some unknown oil/gas infrastructure to be present. Shoaling rates utilized are based on past data, but the infrequency of maintenance dredging could result in pipelines found to be deeper than anticipated.	The potential exists for increased quantity requirements during the relocation phase of the project, but the cost impact would be small when compaed to the overall cost of the project.	Marginal	Possible	1
Q-2	Dredging	Disposal quantities could be underestimated based on the infrequent nature of maintenance dredging over the past 20 years. Pipeline distances may change is disposal areas are changed. Disposal area capacities are based on assumed depths without data from surveys.	Additional costs could be significant if additional dredging is required to achieve target depth. Dredging quantites required are based on dated survey information and assumed shoaling rates. Changes to the disposal plan during the design phase could increase costs.	Moderate	Possible	2
Q-3	0			Negligible	Likely	N/A
Q-4	0			Negligible	Unlikely	N/A

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0.7     0     1     1     1     1     1       0.4     0     1     1     1     1     1     1     1       0.4     0     1 <t< td=""><td>Q-5</td><td>0</td><td></td><td></td><td>Negligible</td><td>Unlikely</td><td>N/A</td></t<>	Q-5	0			Negligible	Unlikely	N/A
0.77000 $0.87$ 01NegativeUnitedNA $0.9$ 011NANA $0.9$ 011NANA $0.9$ 011NANA $0.9$ 011NANA $0.10$ 011NANA $0.11$ 011NANA $0.12$ 111NANA $0.12$ 1111NA $0.12$ 1111NA $0.13$ Pening Engineentin1111 $0.14$ Construction Matigementic1111 $0.14$ Construction of Equipmentic1111 $0.14$ Pening Engineentin1111 $0.14$ Pening Engineentin1111 $0.14$ Pening Engineentin11111 $0.14$ Pening Engineentin11111 $0.14$	Q-6	0			Negligible	Unlikely	N/A
0.88 $0$ $0$ Image: second	Q-7	0			Negligible	Unlikely	N/A
0.900111 <td>Q-8</td> <td>0</td> <td></td> <td></td> <td>Negligible</td> <td>Unlikely</td> <td>N/A</td>	Q-8	0			Negligible	Unlikely	N/A
C-10       P	Q-9	0			Negligible	Unlikely	N/A
Ci-11       P       Image: Circle Cir	Q-10	0			Negligible	Unlikely	N/A
0-13         Planning, Engineering, & Design         Index         <	Q-11	0			Negligible	Unlikely	N/A
Q-14         Construction Management         Index	Q-12				Negligible	Unlikely	N/A
Specialty Fabrication or Equipment         Maximum Project Orwith         50%           FE-1         Transportation of pipe and other relocation materials(equipment could late increased unit costs and schedule dety, during costs from working in a marine environment.         Feedocations         Marginal         Possible         1           FE-2         Dredging         Remote location of pipe and other relocation of pipe and other relocation of upic cost.         Equipment transport of fabre would likely be more exponding thermal schedule dety, during costs.         Marginal         Possible         1           FE-1         Dredging         Remote location of pipe and other relocation of pipe and other relocation of project cost.         The decreased productivity resulting from tonger than anticipated exponent. The transport of revise and schedule dety monthant determined and equipment to the overall project cost.         Marginal         Possible         1           FE-2         Dredging         Remote location of pipe and other relocation of project cost.         The decreased productivity resulting from tonger than anticipated exponent.         Marginal         Possible         1           FE-3         0         Image: Cost on display equipment. The transport of revise and the project.         The decreased productivity resulting in mature anticipated exponent.         Marginal         Marginal         N/A           FE-4         0         Image: Cost of the project.         Negligble         Unlikely         N/A </td <td>Q-13</td> <td>Planning, Engineering, &amp; Design</td> <td></td> <td></td> <td>Negligible</td> <td>Unlikely</td> <td>0</td>	Q-13	Planning, Engineering, & Design			Negligible	Unlikely	0
Here         Transportation of pipe and other relocation materials/equipment could take longer than anticipated due to remote location of wrk. Equipment transport of failure would likely be more expensive, could take longer as well. An increased lithood of equipment failure could east from working in a marine environment.         Equipment transport of failure would likely be more expensive, could take longer as well. An increased lithood of equipment failure could east from working in a marine environment.         Equipment transport of failure would likely be more expensive, could take longer than anticipated due to remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment/part delivery could increase both costs and the schedule. However, tile belowed that the impacts due to these sections.         Marginal         Possible         1           FE-3         Dredging         Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment/part delivery could increase both costs and the schedule. However, tile belowed that the impacts due to these issues would be minima when compared to the overall cost of the project.         Marginal         Possible         1           FE-4         0         Image: transport of crews and equipment/part delivery could increase both costs and the schedule. However, tile belowed that the impacts due to these issues would be minima when compared to the overall cost of the project.         Marginal         Possible         1           FE-6         0         Image: transport of crews and equipment/partelivery could increase both costs and the schedule. However, th	Q-14	Construction Management			Negligible	Unlikely	0
Relocations         borget than anticipated due to remote locating in increased unit costs and schedule delays during         Marginal         Possible         1           FE-1         Dredging         Renote locating in a marine environment.         The decreased productivity resulting in increased unit costs and schedule delays during         Marginal         Possible         1           FE-2         Dredging         Renote locating opticat cost and schedule delays during costs and the coverall project cost.         The decreased productivity resulting in increased unit costs and schedule delays during         Marginal         Possible         1           FE-2         Dredging         Renote locating opticat cost and schedule delays during in a marine environment.         The decreased productivity resulting in increase brind delays during delays during         Marginal         Possible         1           FE-3         Dredging         Renote locating opticat cost and schedule delays during in reduced productivity.         The decreased productivity resulting in increase brind delays during delays dur	Specialty I	Fabrication or Equipment			Maximum Proje	ct Growth	<b>50%</b>
FE-2       Dedging       Remote location of project could ingreate are model dimped to stand de schedule if repairs are model dimeter and equipment, the transport of creas and equipment, the transport of creas and equipment, the transport of creas and equipment could take longer than anticipated, resulting in reduced productivity.       matternance and equipment/part delivery could increase both could take longer than anticipated, resulting in reduced productivity.       Marginal       Possible       1         FE-3       0        NA       NA       NA       NA         FE-4       0        NA       NA       NA         FE-5       0         NA       NA         FE-6       0         NA       NA         FE-7       o         NA       NA         FE-7       o         NA       NA         FE-7       o         NA       NA         FE-7       o         NA       NA         FE-8       o          NA         FE-7       o           NA         FE-8       o           NA         FE-8 <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>							
FE-4ooooN/AFE-5oNegligibleUnlikelyN/AFE-6oNegligibleUnlikelyN/AFE-7oNegligibleUnlikelyN/AFE-8oNegligibleUnlikelyN/AFE-8oNegligibleUnlikelyN/ANegligibleNegligibleUnlikelyN/ANENNegligibleUnlikelyN/ANENNEN/AN/ANENNEN/AN/ANENNEN/AN/ANENNEN/AN/ANENNEN/AN/ANENNN/AN/ANENNN/AN/ANENNN/AN/ANENNN/AN/ANENNN/AN/ANENNN/ANENNN/ANENNN/ANNNN/ANN	FE-1	Relocations	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small	Marginal	Possible	1
Image: constraint of the section of			longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the			
Image: constraint of the sector of the sec	FE-2	Dredging	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal	Possible	1
Image: constraint of the second se	FE-2 FE-3	Dredging 0	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal	Possible Unlikely	1 N/A
FE-7     0     Comparison     Comparison     Comparison       FE-8     0     0     0     N/A       Negligible     Unlikely     N/A	FE-2 FE-3 FE-4	Dredging 0	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal Negligible Negligible	Possible Unlikely Unlikely	1 N/A N/A
FE-8 V N/A	FE-2 FE-3 FE-4 FE-5	Dredging 0	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal Negligible Negligible Negligible	Possible Unlikely Unlikely Unlikely	1 N/A N/A N/A
FE-9 0 Negligible Unlikely N/A	FE-2 FE-3 FE-4 FE-5 FE-6	Dredging 0	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal Negligible Negligible Negligible Negligible	Possible Unlikely Unlikely Unlikely Unlikely	1 N/A N/A N/A N/A
	FE-2 FE-3 FE-4 FE-5 FE-6 FE-7	Dredging 0	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal Negligible Negligible Negligible Negligible Negligible	Possible Unlikely Unlikely Unlikely Unlikely Unlikely Unlikely Unlikely	1 N/A N/A N/A N/A N/A

FE-10	0			Negligible	Unlikely	N/A
FE-11	0			Negligible	Unlikely	N/A
FE-12				Negligible	Unlikely	N/A
FE-13	Planning, Engineering, & Design			Negligible	Unlikely	0
FE-14	Construction Management			Negligible	Unlikely	0
Cost Estim	ate Assumptions			Maximum Proje	ct Growth	25%
CT-1	Relocations	The unit prices for pipeline relocations are based on the 2009 estimate conducted by the Corps. Cost will be escilated to 2015 levels based on the Corps escalation indices. The elevation of some pipelines are unkown and need to be assumed for this phase of the project.	The potential exists for the unit costs of relaccations to be increased subsequent to the plannig phase of the project. This would result in marginally increased cost for the overall project.	Marginal	Possible	1
CT-2	Dredging	the existing disposal areas. Dredging quantities are also based on an assumed starting depth of the channel and could could be increased once a	about the existing depths of the channel. This would result in moderate increases to the project costs. It is also possible that	Moderate	Likely	3
CT-3	0			Moderate	Possible	N/A
CT-4	0			Negligible	Unlikely	N/A
CT-5	0			Negligible	Unlikely	N/A
CT-6	0			Negligible	Unlikely	N/A
CT-7	0			Negligible	Unlikely	N/A
CT-8	0			Negligible	Unlikely	N/A
CT-9	0			Negligible	Unlikely	N/A
CT-10	0			Negligible	Unlikely	N/A
CT-11	0			Negligible	Unlikely	N/A
CT-12				Negligible	Unlikely	N/A
CT-13	Planning, Engineering, & Design			Negligible	Unlikely	0
				_		

CT-14	Construction Management			Negligible	Unlikely	0
External P	roject Risks		•	Maximum Proje	ct Growth	20%
EX-1	Relocations	Fuel prices used for the estimate are near a two-year low, so the potential for increased fuel costs exiits. This would increase the cost of equipment operation and material/crew transport.	Increases in fuel prices are likely to impact costs. These impacts would be moderate due to the heavy reliance on fuel to operate equipment and transport material. Overall the impacts to cost would be moderate.	Moderate	Possible	2
EX-2	Dredging	Extreme weather events are a possibility in Coastal Louisiana, with the potential to delay the project significantly or damage construction equipment. Shoaling rates would also increase during such an event, potentially impacting dredging quantities. Fuel prices used for the estimate are near a two-year low, so the potential for increased fuel costs exilts.	Increases in fuel prices are likely and the cost impact would be moderate. Storm impacts could be significant, but the liklihood is small. The cost and schedule impacts would be marginal. Overall the impacts to cost would be moderate.	Moderate	Possible	2
EX-3	0			Marginal	Possible	N/A
EX-4	0			Negligible	Unlikely	N/A
EX-5	0			Negligible	Unlikely	N/A
EX-6	0			Negligible	Unlikely	N/A
EX-7	0			Negligible	Unlikely	N/A
EX-8	0			Negligible	Unlikely	N/A
EX-9	0			Negligible	Unlikely	N/A
EX-10	0			Negligible	Unlikely	N/A
EX-11	0			Negligible	Unlikely	N/A
EX-12				Negligible	Unlikely	N/A
EX-13	Planning, Engineering, & Design			Negligible	Unlikely	0
EX-14	Construction Management			Negligible	Unlikely	0

# Houma Navigation Canal Deepening Project 1C 18-Rock Feasibility (Alternatives)

Abbreviated Risk Analysis

<u>WBS</u>	Potential Risk Areas	Project Scope Growth	Acquisition Strategy	Construction Elements	Quantities for Current Scope	Specialty Fabrication or Equipment	Cost Estimate Assumptions	External Project Risks	Cost in Thousands
01 LANDS AND DAMAGES	Real Estate								\$0
02 RELOCATIONS	Relocations	1	1	2	1	1	1	2	\$14,201
12 NAVIGATION, PORTS AND HARBORS	Dredging	2	1	2	2	1	3	2	\$127,256
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
All Other	Remaining Construction Items	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
30 PLANNING, ENGINEERING, AND DESIGN	Planning, Engineering, & Design	3	0	0	0	0	0	0	\$14,146
31 CONSTRUCTION MANAGEMENT	Construction Management	3	0	0	0	0	0	0	\$11,317
					•				\$166,919
Risk		\$ 8,191	\$ 2,793	\$ 15,863	\$ 4,476	\$ 3,093	\$ 9,049	\$ 4,689	\$48,155
Fixed Dollar Risk Allocation		\$-	\$-		Ŧ	\$-	\$-	\$-	\$0
	Risk	\$ 8,191	\$ 2,793	\$ 15,863	\$ 4,476	\$ 3,093	\$ 9,049		\$48,155
								Total	\$215,074

		Abbreviated Risk Analysis Houma Navigation Canal Deepening Proje	ct			Alternative	1C	18-Rock	
		Low Risk: Typical Construction, Simple				Meeting Date:		11/2/2015	
	Т	otal Estimated Construction Contract Cost = [	\$	843,880,480					
	CWWBS	Feature of Work	C	ontract Cost		% Contingency	<u>\$</u>	Contingency	<u>Total</u>
	01 LANDS AND DAMAGES	Real Estate	\$	-		0.00%	\$	- \$	-
1	02 RELOCATIONS	Relocations				0.00%	\$	- \$	-
2	12 NAVIGATION, PORTS AND HARBORS	Dredging	\$	843,880,480		25.22%	\$	212,859,839 \$	1,056,740,319
3			\$	-		0.00%	\$	- \$	
4			\$	-		0.00%	\$	- \$	-
5			\$	-		0.00%	\$	- \$	-
6			\$			0.00%	\$	- \$	-
7						0.00%	\$	- \$	-
8			\$	-		0.00%	\$	- \$	-
9			\$	-		0.00%	\$	- \$	-
10			\$	-		0.00%	\$	- \$	-
11			\$	-		0.00%	\$	- \$	-
	All Other	Remaining Construction Items	\$	-	0.0%	0.00%	\$	- \$	-
	30 PLANNING, ENGINEERING, AND DESIGN	Planning, Engineering, & Design	\$	84,388,048		7.00%	\$	5,907,163 \$	90,295,211
	31 CONSTRUCTION MANAGEMENT	Construction Management	\$	67,510,438		7.00%	\$	4,725,731 \$	72,236,169
xx	FIXED DOLLAR RISK ADD (EQUALLY DISPERSED TO ALL, MUS		-				\$	-	
		Tetele							
		Totals Real Estate Total Construction Estimate Total Planning, Engineering & Design Total Construction Management	\$ \$	- 843,880,480 84,388,048 67,510,438		0.00% 25.22% 7.00% 7.00%	\$ \$ \$	- \$ 212,859,839 \$ 5,907,163 \$ 4,725,731 \$	- 1,056,740,31 90,295,21 72,236,16
		Total	\$	995,778,966		22%	\$	223,492,733 \$	1,219,271,699
		-	Ra	ange Estimate (\$0	00's)	Base \$995,779k		50% \$1,129,875k 50% based on base is at 5% CL.	<b>80</b> \$1,219,272
	Fixed Dollar Risk Add: (Allows for additional risk to be added to the risk analsyis. Must include justification. Does not allocate to Real Estate.								

## Houma Navigation Canal Deepening Project 1C 18-Rock

Feasibility (Alternatives) Abbreviated Risk Analysis Meeting Date: 2-Nov-15



Risk Element	Feature of Work		PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Impact	Likelihood	Risk Level
Project Sc	ope Growth			Maximum Proje	ct Growth	40%
PS-1	Relocations	Some utility elevations could not be determined. Relocation costs are 6 years old. Unidentified utilities or oil/gas infrastructure could be located during construction.	The need for additional relocations are a possability, which would increase the scope of the project and mpact cost/schedule.	Marginal	Unlikely	0
PS-2	Dredging	A full Dredged Material Disposal Plan has not been developed. Some depths and elevations for proposed disposal areas were assumed, without survey data. Disposal quantities could also be increased based on low maintenance activities and old survey information. It could be determined that foreshore protection and rock retention could be required in additional areas other than those recommended. This could lead to the need for additional rock retention, foreshore protection, and floatation channel dredging.	The proposed disposal locations will be revisted during the design phase, but some changes to the costs associated with the current plan is likely. Additional quantites could require changes to the proposed disposal areas and lead to increases in scope. Any changes to the rock requirements could increase the project scope, but it would have a minimal impact on overall costs.	Marginal	Possible	1
PS-3	0			Moderate	Possible	N/A
PS-4	0			Negligible	Unlikely	N/A
PS-5	0			Negligible	Unlikely	N/A
PS-6	0			Negligible	Unlikely	N/A
PS-7	0			Negligible	Unlikely	N/A
PS-8	0			Negligible	Unlikely	N/A
PS-9	0			Negligible	Unlikely	N/A
PS-10	0			Negligible	Unlikely	N/A
PS-11	0			Negligible	Unlikely	N/A
PS-12				Marginal	Possible	N/A

PS-13	Planning, Engineering, & Design			Marginal	Unlikely	0
PS-14	Construction Management			Marginal	Unlikely	0
<u>Acquisitio</u>	n Strategy			Maximum Proje	ct Growth	30%
AS-1	Relocations	Contract could require specialized work associated with environmental impacts of pipeline relocation and proper containment of material. The offshore nature of the work could limit the number of bids received to larger contracting companies.	A specialized pipeline relocation contractor could require a higher unit cost with a less competative bid. The overall cost ramifications of this would be minimal when compared to overall project costs.	Marginal	Unlikely	0
AS-2	Dredging	Dredging methodology for channel deepening would be widely available within south Louisiana, but offshore nature of the work could limit the number of bids.	A reduced number of bids could result in higher unit costs. However, based on the amount of ongoing dredging work within the channel over the past 20 years, it is believed the likihood of this occuring is minimal.	Marginal	Possible	1
AS-3	0			Moderate	Likely	N/A
AS-4	0			Negligible	Unlikely	N/A
AS-5	0			Negligible	Unlikely	N/A
AS-6	0			Negligible	Unlikely	N/A
AS-7	0			Negligible	Unlikely	N/A
AS-8	0			Negligible	Unlikely	N/A
AS-9	0			Negligible	Unlikely	N/A
AS-10	0			Negligible	Unlikely	N/A
AS-11	0			Negligible	Unlikely	N/A
AS-12				Negligible	Unlikely	N/A
AS-13	Planning, Engineering, & Design			Negligible	Unlikely	0
AS-14	Construction Management			Negligible	Unlikely	0
<u>Construct</u>	ion Elements			Maximum Proje	ct Growth	15%
CE-1	Relocations	Boat access would be required for relocations. Mobilization/Demobilization could take longer than anticipated. The potential exists for low-frequency weather events to delay work. Marine work could result in lower than anticipated productivity.	Impacts due to extended weather delays would be the most significant impact to cost and schedule, but the likelihood is low. With the amount of oil infrastructure existing in south Louisana, it is assumed a contractor familiar with the challenges of offshore pipeline relocation would be chosen. Therefore productivity issues would be minimal.	Marginal	Unlikely	0

CE-2	Dredging	Boat access would be required for survey crews and dredging equipment/crews. The potential exists for low-frequency weather events to delay work. Remote location of project could impact schedule if repairs are necessary to dredging equipment. Dredging methods would be fairly straight forward.	Dredging work is commonplace within the channel, so the risk of schedule delays or reduced productivity would center around the remote location or extreme weather events, not the dredging methods. The impact of a significant storm could be significant but liklihood is small.	Marginal	Possible	1
CE-3	0			Marginal	Possible	N/A
CE-4	0			Negligible	Unlikely	N/A
CE-5	0			Negligible	Unlikely	N/A
CE-6	0			Negligible	Unlikely	N/A
CE-7	0			Negligible	Unlikely	N/A
CE-8	0			Negligible	Unlikely	N/A
CE-9	0			Negligible	Unlikely	N/A
CE-10	0			Negligible	Unlikely	N/A
CE-11	0			Negligible	Unlikely	N/A
CE-12				Negligible	Unlikely	N/A
CE-13	Planning, Engineering, & Design			Negligible	Unlikely	0
CE-14	Construction Management			Negligible	Unlikely	0
<b>Quantities</b>	for Current Scope			Maximum Proje	ct Growth	20%
Q-1	Relocations	The elevations of some pipelines are assumed or unkown. The potential exists for some unknown oil/gas infrastructure to be present. Shoaling rates utilized are based on past data, but the infrequency of maintenance dredging could result in pipelines found to be deeper than anticipated.	The potential exists for increased quantity requirements during the relocation phase of the project, but the cost impact would be small when compaed to the overall cost of the project.	Marginal	Unlikely	0
Q-2	Dredging	Disposal quantities could be underestimated based on the infrequent nature of maintenance dredging over the past 20 years. Pipeline distances may change is disposal areas are changed. Disposal area capacities are based on assumed depths without data from surveys.	Additional costs could be significant if additional dredging is required to achieve target depth. Dredging quantites required are based on dated survey information and assumed shoaling rates. Changes to the disposal plan during the design phase could increase costs.	Moderate	Possible	2
Q-3	0			Negligible	Likely	N/A
Q-4	0			Negligible	Unlikely	N/A

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0.7     0     1     1     1     1     1     1       0.4     0     0     0     0     0     0     0     0       0.4     0     0     0     0     0     0     0     0       0.10     0     0     0     0     0     0     0     0     0       0.11     0	Q-5	0			Negligible	Unlikely	N/A
$C_7$ $P$ $C_7$ $P$ $C_7$ $P$ $C_7$ $P$ $C_7$ $P$ $C_7$ $P$	Q-6	0			Negligible	Unlikely	N/A
0.980111111 $0.99$ 0011	Q-7	0			Negligible	Unlikely	N/A
0.90 $0$ $0$ $1$	Q-8	0			Negligible	Unlikely	N/A
Ch10     V     V       Ch10     V     V     V       Ch11     0     V     V     V       Ch12     V     V     V     V       Ch13     Planning, Engineering, & Design     V     V     V       Ch14     Construction Management     V     V     V     V       Ch14     Construction Management     V     V     V     V       Ch14     Construction Management     V     V     V     V       Percentality: Fubrication or Equipments     Fubrication or Equipment State or Equipm	Q-9	0			Negligible	Unlikely	N/A
0-11       0       1       0       1       0       1       0         Q-12       Panning, Engineering, A. Design       Include of the second of t	Q-10	0			Negligible	Unlikely	N/A
0-13         Planning, Engineering, & Design         Indication         Negligible         Unlikely         One           0-14         Construction Management         Indication         Indication         Negligible         Unlikely         One           5         Speciality Fabrication or Equipment         Transportation of oppend of relocation materials apprent managed unit costs and special costs.         Marginal         Unlikely         One           FE-1         Diedging         Renotes location of poped coal dimension of one-expectation and special costs and special costs.         Transportation of poped coal dimension of one-expectation costs and special costs.         Renotes location of poped coal dimension of one-expectation costs and special costs.         Marginal         Marginal         Unlikely         One           FE-2         Diedging         Renotes location of poped coal dimension of one-expectation costs and special costs.         Renotes location of poped coal dimension of one-expectation costs and special costs.         Marginal         Marginal         No.           FE-2         Diedging         Renotes location of poped coal dimension of one-expectation.         Renotes location of poped coal dimension of one-expectation.         Noespipebb         Unlikely         N/A </td <td>Q-11</td> <td>0</td> <td></td> <td></td> <td>Negligible</td> <td>Unlikely</td> <td>N/A</td>	Q-11	0			Negligible	Unlikely	N/A
Construction Management         Construction Management         Negligible         Unlikely         O           C1-14         Construction Management         Negligible         Unlikely         O           Speciality Tabrication or Equipment         Terreportation of pipe and other relocation material-sequence to the construction of pipe and other relocation of and the renove boom of and. Equipment transport of failure would likely to mean expension, to adding in microared and cost and schedule of depy continue could table or and equipment transport of failure would likely to mean expension, to add table or and equipment transport of the overall project cost.         Marginal         Unlikely         O           FE-1         Redocations         Terreportation of project could inpact cost and schedule if repairs are necessary to dedging a quipment. The transport of reversal expension and equipment project cost.         Marginal         Unlikely         O           FE-2         Dredging         Renote location of project could inpact cost and schedule if repairs are necessary to dedging quipment. The transport of reversal expension and equipment project cost.         Marginal         Marginal         V/A           FE-3         0         Imaginal table conject cost and schedule if repairs are necessary to dedging quipment. The transport of reversal expension and equipment project cost.         Negligible         Unlikely         N/A           FE-4         0         Imaginal table conject cost and the conject cost.         Negligible         Unlikely <t< td=""><td>Q-12</td><td></td><td></td><td></td><td>Negligible</td><td>Unlikely</td><td>N/A</td></t<>	Q-12				Negligible	Unlikely	N/A
Specialty Fabrication or Equipment         Maximum Project Sorth         50%           FE-1         Transportation of pips and other relocation during length or the more location of work. Equipment transport of failure work differed work grade data the long and shelled differed data the difference of the more location of work. Equipment transport of failure work differed work grade data the long and work. Equipment transport of failure work grade data the long and work. Equipment transport of failure work grade data the long and work. Equipment transport of failure work grade data the long and work. Equipment transport of failure work grade data the long and work. Equipment transport of failure work grade data the long and work. Equipment transport of failure work grade data the long and work. Equipment transport of failure work grade data the long and work. Equipment transport of failure work grade data the long and work. Equipment transport of failure work grade data the long and work and shelled difference and the shelled. However, it is believed that the impacts of the brade base dufference and the shelled. However, it is believed that the impact and the brade data the long and	Q-13	Planning, Engineering, & Design			Negligible	Unlikely	0
Relocations         Transportation of pipe and other relocation materials/equipment could take bringer than anticipated due to remote location of work. Equipment repairs could take longer as well. An interessed linkood of equipment failure could casts from working in a marine environment.         Equipment transport of failure would likely be more expensive, resulting in increased unit costs and schedule debys during construction. However, thes costs would represent a small portion of the overall project cost.         Marginal         Unikely         0           FE-1         Dredging         Remote location of project could impact cost and schedule if repairs an necessary to dedging equipment. The transport of rews and equipment could take longer than anticipated, resulting in reduced productivity.         The decreased productivity resulting time impacts built to these issues would be minimal when compared to the overall cost of the project.         Marginal         Unikely         N/A           FE-3         0         Imagination of project could impact cost and schedule if repairs and necessary to dedging equipment. The transport of rews and equipment could take longer than anticipated, resulting in reduced productivity.         The decreased productivity resulting time impacts built to these issues would be minimal when compared to the overall cost of the project.         Marginal         Marginal         Unikely         N/A           FE-3         0         Imagination of project could impact cost and schedule if repairs and could take longer than anticipated.         N/A         N/A         N/A           FE-4         0         Imaginatimane deduced productivity<	Q-14	Construction Management			Negligible	Unlikely	0
Relocations         longer than anticipated due to remote location of work. Equipment tepairs could take longer as well. An increased tillhood dequipment tepairs could take longer as well. An increased tillhood dequipment tepairs could take longer than anticipated resulting in necessary to decigning as well. An increased tillhood dequipment. The factor and equipment delivery could the increase both maintenance and equipment delivery could the increase both are to the schedule. However, it is believed that the increase due to the schedule deliver out increases both are to the schedule. However, it is believed that the increase due to the schedule deliver out increases both are to the schedule. However, it is believed that the increase due to the schedule. However, it is believed that the increase due to the schedule. However, it is believed that the increase due to the schedule deliver out increases both are to the schedule. However, it is believed that the increase due to the schedule. However, it is believed that the increase due to the schedule. However, it is believed that the increase due to the schedule deliver out it is believed that the increase due to the schedule. However, it is believed that the increase due to the schedule. However, it is believed that the increase due to the schedule. However, it is believed that the increase due to the schedule. However, it is believed that the increase due to the schedule. However, it is believed that the increase due to the overall cost of the project.         Marginal         Marginal         Unikely         N/A           FE-3         0         0         0         0         N/A         N/A           FE-6         0         0         0         0         N/A         N/A           FE-7         0	Specialty	Fabrication or Equipment			Maximum Proje	ct Growth	50%
FE-2       Dedging       Remote location of project could ingraar cost and schedule if repairs are could make non-schedule. Interpairs are could take longer than anticipated, resulting in reduced productivity.       Image: mathemance and equipment/part delivery could increase both costs and the schedule. Interpairs are could take longer than anticipated, resulting in reduced productivity.       Marginal       Possible       1         FE-3       0 <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>							
FE-4Image: constraint of the sector of the sect	FE-1	Relocations	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small	Marginal	Unlikely	0
Image: constraint of the section of			longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the			
Image: constraint of the sector of the sec	FE-2	Dredging	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal	Possible	1
Image: constraint of the second se	FE-2 FE-3	Dredging 0	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal Negligible	Possible Unlikely	1 N/A
FE-7     0     Comparison     Comparison     Comparison       FE-8     0     0     0     N/A       Negligible     Unlikely     N/A	FE-2 FE-3 FE-4	Dredging 0	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal Negligible Negligible	Possible Unlikely Unlikely	1 N/A N/A
FE-8 V N/A	FE-2 FE-3 FE-4 FE-5	Dredging 0	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal Negligible Negligible Negligible	Possible Unlikely Unlikely Unlikely	1 N/A N/A N/A
FE-9 0 Negligible Unlikely N/A	FE-2 FE-3 FE-4 FE-5 FE-6	Dredging 0	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal Negligible Negligible Negligible Negligible	Possible Unlikely Unlikely Unlikely Unlikely	1 N/A N/A N/A N/A
	FE-2 FE-3 FE-4 FE-5 FE-6 FE-7	Dredging 0	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal Negligible Negligible Negligible Negligible Negligible	Possible Unlikely Unlikely Unlikely Unlikely Unlikely	1 N/A N/A N/A N/A N/A

FE-10 0	)			Negligible	Unlikely	N/A
FE-11 0	)			Negligible	Unlikely	N/A
FE-12				Negligible	Unlikely	N/A
FE-13 P	Planning, Engineering, & Design			Negligible	Unlikely	0
FE-14 C	Construction Management			Negligible	Unlikely	0
Cost Estima	te Assumptions			Maximum Proje	ct Growth	25%
CT-1 R	Relocations	The unit prices for pipeline relocations are based on the 2009 estimate conducted by the Corps. Cost will be escilated to 2015 levels based on the Corps escalation indices. The elevation of some pipelines are unkown and need to be assumed for this phase of the project.	The potential exists for the unit costs of relaocations to be increased subsequent to the plannig phase of the project. This would result in marginally increased cost for the overall project.	Marginal	Unlikely	0
CT-2 E	Dredging	Shoaling rates are based on past data and the disposal plan used for development of dredging unit costs is based on assumptions associated with the existing disposal areas. Dredging quantities are also based on an assumed starting depth of the channel and could could be increased once a survey is conducted. Productivity rates were developed via CEDEP which is based on disposal plan assumptions as well.	It is possible that dredging quantities would increase during the design phase of the project, once more information in know about the existing depths of the channel. This would result in moderate increases to the project costs. It is also possible that the dredged material disposal plan would be modified based on new data, potentially increasing costs.	Moderate	Possible	2
CT-3 0	)			Moderate	Possible	N/A
CT-4 0	)			Negligible	Unlikely	N/A
CT-5 0	)			Negligible	Unlikely	N/A
CT-6 0	)			Negligible	Unlikely	N/A
CT-7 0	)			Negligible	Unlikely	N/A
CT-8 0	)			Negligible	Unlikely	N/A
СТ-9 0	)			Negligible	Unlikely	N/A
CT-10 0	)			Negligible	Unlikely	N/A
CT-11 0	)			Negligible	Unlikely	N/A
CT-12				Negligible	Unlikely	N/A
CT-13 F	Planning, Engineering, & Design			Negligible	Unlikely	0

CT-14	Construction Management			Negligible	Unlikely	0
<u>External P</u>	roject Risks		• •	Maximum Proje	ct Growth	20%
EX-1	Relocations	Fuel prices used for the estimate are near a two-year low, so the potential for increased fuel costs exiits. This would increase the cost of equipment operation and material/crew transport.	Increases in fuel prices are likely to impact costs. These impacts would be moderate due to the heavy reliance on fuel to operate equipment and transport material. Overall the impacts to cost would be moderate.	Marginal	Unlikely	0
EX-2	Dredging	Extreme weather events are a possibility in Coastal Louisiana, with the potential to delay the project significantly or damage construction equipment. Shoaling rates would also increase during such an event, potentially impacting dredging quantities. Fuel prices used for the estimate are near a two-year low, so the potential for increased fuel costs exiits.	Increases in fuel prices are likely and the cost impact would be moderate. Storm impacts could be significant, but the liklihood is small. The cost and schedule impacts would be marginal. Overall the impacts to cost would be moderate.	Moderate	Possible	2
EX-3	0			Marginal	Possible	N/A
EX-4	0			Negligible	Unlikely	N/A
EX-5	0			Negligible	Unlikely	N/A
EX-6	0			Negligible	Unlikely	N/A
EX-7	0			Negligible	Unlikely	N/A
EX-8	0			Negligible	Unlikely	N/A
EX-9	0			Negligible	Unlikely	N/A
EX-10	0			Negligible	Unlikely	N/A
EX-11	0			Negligible	Unlikely	N/A
EX-12				Negligible	Unlikely	N/A
EX-13	Planning, Engineering, & Design			Negligible	Unlikely	0
EX-14	Construction Management			Negligible	Unlikely	0

# Houma Navigation Canal Deepening Project 1C 18-Rock Feasibility (Alternatives)

Abbreviated Risk Analysis

<u>WBS</u>	Potential Risk Areas	Project Scope Growth	Acquisition Strategy	Construction Elements	Quantities for Current Scope	Specialty Fabrication or Equipment	Cost Estimate Assumptions	External Project Risks	Cost in Thousands
01 LANDS AND DAMAGES	Real Estate								\$0
02 RELOCATIONS	Relocations	0	0	0	0	0	0	0	\$0
12 NAVIGATION, PORTS AND HARBORS	Dredging	1	1	1	2	1	2	2	\$843,880
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
All Other	Remaining Construction Items	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
30 PLANNING, ENGINEERING, AND DESIGN	Planning, Engineering, & Design	0	0	0	0	0	0	0	\$84,388
31 CONSTRUCTION MANAGEMENT	Construction Management	0	0	0	0	0	0	0	\$67,510
		·	•		•	•	•		\$995,779
Risk		\$ 17,648	\$ 16,661	\$ 84,209	\$ 27,970	\$ 18,453	\$ 30,581	\$ 27,970	\$223,493
Fixed Dollar Risk Allocation					•	\$-	\$-	\$-	\$0
	Risk	\$ 17,648	\$ 16,661	\$ 84,209	\$ 27,970	\$ 18,453	\$ 30,581	· · · · · · · · · · · · · · · · · · ·	\$223,493
								Total	\$1,219,272

	Project (less than \$40M) Project Development Stage/Alternative:	Abbreviated Risk Analysis Houma Navigation Canal Deepening Proje Feasibility (Alternatives) Low Risk: Typical Construction, Simple	ct			Alternative Meeting Date		20-Adjacent 11/2/2015	
	Т	otal Estimated Construction Contract Cost = [	\$	107,948,500					
	CWWBS	Feature of Work	<u>Co</u>	ontract Cost		% Contingency	<u>\$</u>	Contingency	Total
	01 LANDS AND DAMAGES	Real Estate	\$	-		0.00%	\$	- \$	-
1	02 RELOCATIONS	Relocations	\$	16,965,700		23.25%	\$	3,943,711 \$	20,909,411
2	12 NAVIGATION, PORTS AND HARBORS	Dredging	\$	90,982,800		32.02%	\$	29,129,286 \$	120,112,086
З			\$			0.00%	\$	- \$	-
4			\$	-		0.00%	\$	- \$	-
5			\$	-		0.00%	\$	- \$	-
6			s			0.00%	\$	- \$	-
7			•			0.00%	\$	- \$	
8			\$			0.00%	\$	- \$	_
9			\$ \$			0.00%	\$	- \$	
-			\$ \$			0.00%	\$	- \$	-
10								•	
11			\$	-	0.00/	0.00%	\$	- \$	-
	All Other	Remaining Construction Items	\$		0.0%	0.00%	\$	- \$	-
	30 PLANNING, ENGINEERING, AND DESIGN	Planning, Engineering, & Design	\$	10,794,850		16.15%	\$	1,742,947 \$	12,537,797
	31 CONSTRUCTION MANAGEMENT	Construction Management	\$	8,794		16.15%	\$	1,420 \$	10,214
XX	FIXED DOLLAR RISK ADD (EQUALLY DISPERSED TO ALL, MUS	T INCLUDE JUSTIFICATION SEE BELOW)					\$	-	
		Totals Real Estate Total Construction Estimate Total Planning, Engineering & Design Total Construction Management	\$ \$	- 107,948,500 10,794,850 8,794		0.00% 30.64% 16.15% 16.15%	\$ \$ \$	- \$ 33,072,998 \$ 1,742,947 \$ 1,420 \$	- 141,021,498 12,537,797 10,214
		Total	\$	118,752,144		29%	\$	34,817,365 \$	153,569,509
		-	Ra	ange Estimate (\$00	0's)	Base \$118,752	k	50% \$139,643k 50% based on base is at 5% CL.	<b>80%</b> \$153,570k
	Fixed Dollar Risk Add: (Allows for additional risk to be added to the risk analsyis. Must include justification. Does not allocate to Real Estate.								

#### Houma Navigation Canal Deepening Project 2A 20-Adjacent

Feasibility (Alternatives) Abbreviated Risk Analysis

Meeting Date: 2-Nov-15



Risk Element	Feature of Work		PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Impact	Likelihood	Risk Level
Project Sco	ope Growth			Maximum Proje	ct Growth	40%
PS-1	Relocations	Some utility elevations could not be determined. Relocation costs are 6 years old. Unidentified utilities or oil/gas infrastructure could be located during construction.	The need for additional relocations are a possability, which would increase the scope of the project and mpact cost/schedule.	Marginal	Possible	1
PS-2	Dredging	A full Dredged Material Disposal Plan has not been developed. Some depths and elevations for proposed disposal areas were assumed, without survey data. Disposal quantities could also be increased based on low maintenance activities and old survey information. It could be determined that foreshore protection and rock retention could be required in additional areas other than those recommended. This could lead to the need for additional rock retention, foreshore protection, and floatation channel dredging.	The proposed disposal locations will be revisted during the design phase, but some changes to the costs associated with the current plan is likely. Additional quantites could require changes to the proposed disposal areas and lead to increases in scope. Any changes to the rock requirements could increase the project scope, but it would have a minimal impact on overall costs.	Moderate	Possible	2
PS-3	0			Moderate	Possible	N/A
PS-4	0			Negligible	Unlikely	N/A
PS-5	0			Negligible	Unlikely	N/A
PS-6	0			Negligible	Unlikely	N/A
PS-7	0			Negligible	Unlikely	N/A
PS-8	0			Negligible	Unlikely	N/A
PS-9	0			Negligible	Unlikely	N/A
PS-10	0			Negligible	Unlikely	N/A
PS-11	0			Negligible	Unlikely	N/A
PS-12				Marginal	Possible	N/A

PS-13	Planning, Engineering, & Design			Moderate	Likely	3
PS-14	Construction Management			Significant	Possible	3
<u>Acquisitio</u>	n Strategy		•	Maximum Proje	ct Growth	30%
AS-1	Relocations	Contract could require specialized work associated with environmental impacts of pipeline relocation and proper containment of material. The offshore nature of the work could limit the number of bids received to larger contracting companies.	A specialized pipeline relocation contractor could require a higher unit cost with a less competative bid. The overall cost ramifications of this would be minimal when compared to overall project costs.	Marginal	Possible	1
AS-2	Dredging	Dredging methodology for channel deepening would be widely available within south Louisiana, but offshore nature of the work could limit the number of bids.	A reduced number of bids could result in higher unit costs. However, based on the amount of ongoing dredging work within the channel over the past 20 years, it is believed the likihood of this occuring is minimal.	Marginal	Possible	1
AS-3	0			Moderate	Likely	N/A
AS-4	0			Negligible	Unlikely	N/A
AS-5	0			Negligible	Unlikely	N/A
AS-6	0			Negligible	Unlikely	N/A
AS-7	0			Negligible	Unlikely	N/A
AS-8	0			Negligible	Unlikely	N/A
AS-9	0			Negligible	Unlikely	N/A
AS-10	0			Negligible	Unlikely	N/A
AS-11	0			Negligible	Unlikely	N/A
AS-12				Negligible	Unlikely	N/A
AS-13	Planning, Engineering, & Design			Negligible	Unlikely	0
AS-14	Construction Management			Negligible	Unlikely	0
<u>Construct</u>	ion Elements			Maximum Proje	ct Growth	15%
CE-1	Relocations	Boat access would be required for relocations. Mobilization/Demobilization could take longer than anticipated. The potential exists for low-frequency weather events to delay work. Marine work could result in lower than anticipated productivity.	Impacts due to extended weather delays would be the most significant impact to cost and schedule, but the likelihood is low. With the amount of oil infrastructure existing in south Louisana, it is assumed a contractor familiar with the challenges of offshore pipeline relocation would be chosen. Therefore productivity issues would be minimal.	Moderate	Possible	2

CE-2	Dredging	Boat access would be required for survey crews and dredging equipment/crews. The potential exists for low-frequency weather events to delay work. Remote location of project could impact schedule if repairs are necessary to dredging equipment. Dredging methods would be fairly straight forward.	Dredging work is commonplace within the channel, so the risk of schedule delays or reduced productivity would center around the remote location or extreme weather events, not the dredging methods. The impact of a significant storm could be significant but liklihood is small.	Moderate	Possible	2
CE-3	0			Marginal	Possible	N/A
CE-4	0			Negligible	Unlikely	N/A
CE-5	0			Negligible	Unlikely	N/A
CE-6	0			Negligible	Unlikely	N/A
CE-7	0			Negligible	Unlikely	N/A
CE-8	0			Negligible	Unlikely	N/A
CE-9	0			Negligible	Unlikely	N/A
CE-10	0			Negligible	Unlikely	N/A
CE-11	0			Negligible	Unlikely	N/A
CE-12				Negligible	Unlikely	N/A
CE-13	Planning, Engineering, & Design			Negligible	Unlikely	0
CE-14	Construction Management			Negligible	Unlikely	0
<b>Quantities</b>	<u>s for Current Scope</u>			Maximum Proje	ct Growth	20%
Q-1	Relocations	The elevations of some pipelines are assumed or unkown. The potential exists for some unknown oil/gas infrastructure to be present. Shoaling rates utilized are based on past data, but the infrequency of maintenance dredging could result in pipelines found to be deeper than anticipated.	The potential exists for increased quantity requirements during the relocation phase of the project, but the cost impact would be small when compaed to the overall cost of the project.	Marginal	Possible	1
Q-2	Dredging	Disposal quantities could be underestimated based on the infrequent nature of maintenance dredging over the past 20 years. Pipeline distances may change is disposal areas are changed. Disposal area capacities are based on assumed depths without data from surveys.	Additional costs could be significant if additional dredging is required to achieve target depth. Dredging quantites required are based on dated survey information and assumed shoaling rates. Changes to the disposal plan during the design phase could increase costs.	Moderate	Possible	2
Q-3	0			Negligible	Likely	N/A
Q-4	0			Negligible	Unlikely	N/A

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0.7     0     1     1     1     1     1       0.4     0     1     1     1     1     1     1     1       0.4     0     1 <t< td=""><td>Q-5</td><td>0</td><td></td><td></td><td>Negligible</td><td>Unlikely</td><td>N/A</td></t<>	Q-5	0			Negligible	Unlikely	N/A
0.77000 $0.87$ 01NegativeUnitedNA $0.9$ 011NANA $0.9$ 011NANA $0.9$ 011NANA $0.9$ 011NANA $0.10$ 011NANA $0.11$ 011NANA $0.12$ 111NANA $0.12$ 1111NA $0.12$ 1111NA $0.13$ Pening Engineentin1111 $0.14$ Construction Matigementic1111 $0.14$ Construction of Equipmentic1111 $0.14$ Pening Engineentin1111 $0.14$ Pening Engineentin1111 $0.14$ Pening Engineentin11111 $0.14$ Pening Engineentin11111 $0.14$	Q-6	0			Negligible	Unlikely	N/A
0.88 $0$ $0$ Image: second	Q-7	0			Negligible	Unlikely	N/A
0.900111 <td>Q-8</td> <td>0</td> <td></td> <td></td> <td>Negligible</td> <td>Unlikely</td> <td>N/A</td>	Q-8	0			Negligible	Unlikely	N/A
C-10       P	Q-9	0			Negligible	Unlikely	N/A
Ci-11       P       Image: Circle Cir	Q-10	0			Negligible	Unlikely	N/A
0-13         Planning, Engineering, & Design         Index         <	Q-11	0			Negligible	Unlikely	N/A
Q-14         Construction Management         Index	Q-12				Negligible	Unlikely	N/A
Specialty Fabrication or Equipment         Maximum Project Orwith         50%           FE-1         Transportation of pipe and other relocation materials(equipment could late increased unit costs and schedule dety, during costs from working in a marine environment.         Feedocations         Marginal         Possible         1           FE-2         Dredging         Remote location of pipe and other relocation of pipe and other relocation of upic cost.         Equipment transport of fabre would likely be more exponding thermal schedule dety, during costs.         Marginal         Possible         1           FE-1         Dredging         Remote location of pipe and other relocation of pipe and other relocation of project cost.         The decreased productivity resulting from tonger than anticipated exponent. The transport of revise and schedule dety monthant determined and equipment to the overall project cost.         Marginal         Possible         1           FE-2         Dredging         Remote location of pipe and other relocation of project cost.         The decreased productivity resulting from tonger than anticipated exponent.         Marginal         Possible         1           FE-3         0         Image: Cost on display equipment. The transport of revise and the project.         The decreased productivity resulting in mature anticipated exponent.         Marginal         Marginal         N/A           FE-4         0         Image: Cost of the project.         Negligble         Unlikely         N/A </td <td>Q-13</td> <td>Planning, Engineering, &amp; Design</td> <td></td> <td></td> <td>Negligible</td> <td>Unlikely</td> <td>0</td>	Q-13	Planning, Engineering, & Design			Negligible	Unlikely	0
Here         Transportation of pipe and other relocation materials/equipment could take longer than anticipated due to remote location of wrk. Equipment transport of failure would likely be more expensive, could take longer as well. An increased lithood of equipment failure could east from working in a marine environment.         Equipment transport of failure would likely be more expensive, could take longer as well. An increased lithood of equipment failure could east from working in a marine environment.         Equipment transport of failure would likely be more expensive, could take longer than anticipated due to remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment/part delivery could increase both costs and the schedule. However, tile belowed that the impacts due to these sections.         Marginal         Possible         1           FE-3         Dredging         Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment/part delivery could increase both costs and the schedule. However, tile belowed that the impacts due to these issues would be minima when compared to the overall cost of the project.         Marginal         Possible         1           FE-4         0         Image: transport of crews and equipment/part delivery could increase both costs and the schedule. However, tile belowed that the impacts due to these issues would be minima when compared to the overall cost of the project.         Marginal         Possible         1           FE-6         0         Image: transport of crews and equipment/partelivery could increase both costs and the schedule. However, th	Q-14	Construction Management			Negligible	Unlikely	0
Relocations         borget than anticipated due to remote locating in increased unit costs and schedule delays during         Marginal         Possible         1           FE-1         Dredging         Renote locating in a marine environment.         The decreased productivity resulting in increased unit costs and schedule delays during         Marginal         Possible         1           FE-2         Dredging         Renote locating opticat cost and schedule delays during costs and the coverall project cost.         The decreased productivity resulting in increased unit costs and schedule delays during         Marginal         Possible         1           FE-2         Dredging         Renote locating opticat cost and schedule delays during in a marine environment.         The decreased productivity resulting in increase brind delays during delays during         Marginal         Possible         1           FE-3         Dredging         Renote locating opticat cost and schedule delays during in reduced productivity.         The decreased productivity resulting in increase brind delays during delays dur	Specialty I	Fabrication or Equipment			Maximum Proje	ct Growth	<b>50%</b>
FE-2       Dedging       Remote location of project could ingreate are model dimped to stand de schedule if repairs are model dimeter and equipment, the transport of creas and equipment, the transport of creas and equipment, the transport of creas and equipment could take longer than anticipated, resulting in reduced productivity.       matternance and equipment/part delivery could increase both could take longer than anticipated, resulting in reduced productivity.       Marginal       Possible       1         FE-3       0        NA       NA       NA       NA         FE-4       0        NA       NA       NA         FE-5       0         NA       NA         FE-6       0         NA       NA         FE-7       o         NA       NA         FE-7       o         NA       NA         FE-7       o         NA       NA         FE-7       o         NA       NA         FE-8       o          NA         FE-7       o           NA         FE-8       o           NA         FE-8 <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>							
FE-4ooooN/AFE-5oNegligibleUnlikelyN/AFE-6oNegligibleUnlikelyN/AFE-7oNegligibleUnlikelyN/AFE-8oNegligibleUnlikelyN/AFE-8oNegligibleUnlikelyN/ANegligibleNegligibleUnlikelyN/ANENNegligibleUnlikelyN/ANENNEN/AN/ANENNEN/AN/ANENNEN/AN/ANENNEN/AN/ANENNEN/AN/ANENNN/AN/ANENNN/AN/ANENNN/AN/ANENNN/AN/ANENNN/AN/ANENNN/ANENNN/ANENNN/ANNNN/ANN	FE-1	Relocations	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small	Marginal	Possible	1
Image: constraint of the section of			longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the			
Image: constraint of the sector of the sec	FE-2	Dredging	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal	Possible	1
Image: constraint of the second se	FE-2 FE-3	Dredging 0	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal	Possible Unlikely	1 N/A
FE-7     0     Comparison     Comparison     Comparison       FE-8     0     0     0     N/A       Negligible     Unlikely     N/A	FE-2 FE-3 FE-4	Dredging 0	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal Negligible Negligible	Possible Unlikely Unlikely	1 N/A N/A
FE-8 V N/A	FE-2 FE-3 FE-4 FE-5	Dredging 0	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal Negligible Negligible Negligible	Possible Unlikely Unlikely Unlikely	1 N/A N/A N/A
FE-9 0 Negligible Unlikely N/A	FE-2 FE-3 FE-4 FE-5 FE-6	Dredging 0	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal Negligible Negligible Negligible Negligible	Possible Unlikely Unlikely Unlikely Unlikely	1 N/A N/A N/A N/A
	FE-2 FE-3 FE-4 FE-5 FE-6 FE-7	Dredging 0	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal Negligible Negligible Negligible Negligible Negligible	Possible Unlikely Unlikely Unlikely Unlikely Unlikely Unlikely Unlikely	1 N/A N/A N/A N/A N/A

FE-10	0			Negligible	Unlikely	N/A
FE-11	0			Negligible	Unlikely	N/A
FE-12				Negligible	Unlikely	N/A
FE-13	Planning, Engineering, & Design			Negligible	Unlikely	0
FE-14	Construction Management			Negligible	Unlikely	0
Cost Estim	ate Assumptions			Maximum Proje	ct Growth	25%
CT-1	Relocations	The unit prices for pipeline relocations are based on the 2009 estimate conducted by the Corps. Cost will be escilated to 2015 levels based on the Corps escalation indices. The elevation of some pipelines are unkown and need to be assumed for this phase of the project.	The potential exists for the unit costs of relaccations to be increased subsequent to the plannig phase of the project. This would result in marginally increased cost for the overall project.	Marginal	Possible	1
CT-2	Dredging	the existing disposal areas. Dredging quantities are also based on an assumed starting depth of the channel and could could be increased once a	about the existing depths of the channel. This would result in moderate increases to the project costs. It is also possible that	Moderate	Likely	3
CT-3	0			Moderate	Possible	N/A
CT-4	0			Negligible	Unlikely	N/A
CT-5	0			Negligible	Unlikely	N/A
CT-6	0			Negligible	Unlikely	N/A
CT-7	0			Negligible	Unlikely	N/A
CT-8	0			Negligible	Unlikely	N/A
CT-9	0			Negligible	Unlikely	N/A
CT-10	0			Negligible	Unlikely	N/A
CT-11	0			Negligible	Unlikely	N/A
CT-12				Negligible	Unlikely	N/A
CT-13	Planning, Engineering, & Design			Negligible	Unlikely	0
				_		

CT-14	Construction Management			Negligible	Unlikely	0
External P	roject Risks		•	Maximum Proje	ct Growth	20%
EX-1	Relocations	Fuel prices used for the estimate are near a two-year low, so the potential for increased fuel costs exiits. This would increase the cost of equipment operation and material/crew transport.	Increases in fuel prices are likely to impact costs. These impacts would be moderate due to the heavy reliance on fuel to operate equipment and transport material. Overall the impacts to cost would be moderate.	Moderate	Possible	2
EX-2	Dredging	Extreme weather events are a possibility in Coastal Louisiana, with the potential to delay the project significantly or damage construction equipment. Shoaling rates would also increase during such an event, potentially impacting dredging quantities. Fuel prices used for the estimate are near a two-year low, so the potential for increased fuel costs exilts.	Increases in fuel prices are likely and the cost impact would be moderate. Storm impacts could be significant, but the liklihood is small. The cost and schedule impacts would be marginal. Overall the impacts to cost would be moderate.	Moderate	Possible	2
EX-3	0			Marginal	Possible	N/A
EX-4	0			Negligible	Unlikely	N/A
EX-5	0			Negligible	Unlikely	N/A
EX-6	0			Negligible	Unlikely	N/A
EX-7	0			Negligible	Unlikely	N/A
EX-8	0			Negligible	Unlikely	N/A
EX-9	0			Negligible	Unlikely	N/A
EX-10	0			Negligible	Unlikely	N/A
EX-11	0			Negligible	Unlikely	N/A
EX-12				Negligible	Unlikely	N/A
EX-13	Planning, Engineering, & Design			Negligible	Unlikely	0
EX-14	Construction Management			Negligible	Unlikely	0

#### Houma Navigation Canal Deepening Project 2A 20-Adjacent Feasibility (Alternatives) Abbreviated Risk Analysis

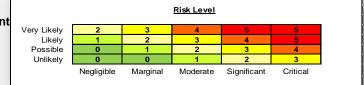
WBS	Potential Risk Areas	Project Scope Growth	Acquisition Strategy	Construction Elements	Quantities for Current Scope	Specialty Fabrication or Equipment	Cost Estimate Assumptions	External Project Risks	Cost in Thousands
01 LANDS AND DAMAGES	Real Estate								\$0
02 RELOCATIONS	Relocations	1	1	2	1	1	1	2	\$16,966
12 NAVIGATION, PORTS AND HARBORS	Dredging	2	1	2	2	1	3	2	\$90,983
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
All Other	Remaining Construction Items	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
30 PLANNING, ENGINEERING, AND DESIGN	Planning, Engineering, & Design	3	0	0	0	0	0	0	\$10,795
31 CONSTRUCTION MANAGEMENT	Construction Management	3	0	0	0	0	0	0	\$9
			•	•	•	•			\$118,752
Risk		\$ 5,322							\$34,817
ixed Dollar Risk Allocation		\$-	\$-	•	•	\$-	\$-	\$-	\$0
	Risk	\$ 5,322	\$ 2,131	\$ 11,502	\$ 3,324	\$ 2,361	\$ 6,600		\$34,817
								Total	\$153,570

		Abbreviated Risk Analysis Houma Navigation Canal Deepening Proje	ct			Alternative	: 2A 2	20-Adjacent	
		Low Risk: Typical Construction, Simple				Meeting Date		11/2/2015	
	Т	otal Estimated Construction Contract Cost = [	\$	530,504,456					
	CWWBS	Feature of Work	<u>Co</u>	ontract Cost		% Contingency	<u>\$</u>	Contingency	Total
	01 LANDS AND DAMAGES	Real Estate	\$	-		0.00%	\$	- \$	-
1	02 RELOCATIONS	Relocations				0.00%	\$	- \$	-
2	12 NAVIGATION, PORTS AND HARBORS	Dredging	\$	530,504,456		25.22%	\$	133,814,083 \$	664,318,5
3			\$			0.00%	\$	- \$	
4			\$	-		0.00%	\$	- \$	
5			\$	-		0.00%	\$	- \$	-
6			\$	-		0.00%	\$	- \$	-
,						0.00%	\$	- \$	-
3			\$	-		0.00%	\$	- \$	-
9			\$	-		0.00%	\$	- \$	-
0			\$	-		0.00%	\$	- \$	-
1			\$	-		0.00%	\$	- \$	-
2	All Other	Remaining Construction Items	\$	-	0.0%	0.00%	\$	- \$	-
3	30 PLANNING, ENGINEERING, AND DESIGN	Planning, Engineering, & Design	\$	53,050,446		7.00%	\$	3,713,531 \$	56,763,9
4	31 CONSTRUCTION MANAGEMENT	Construction Management	\$	8,794		7.00%	\$	616 \$	9,4
x	FIXED DOLLAR RISK ADD (EQUALLY DISPERSED TO ALL, MUS	T INCLUDE JUSTIFICATION SEE BELOW)					\$	-	
		Totals							
		Real Estate Total Construction Estimate		-		0.00% 25.22%	\$ \$	- \$	-
		Total Construction Estimate Total Planning, Engineering & Design		530,504,456 53,050,446		25.22% 7.00%	ծ Տ	133,814,083 \$ 3,713,531 \$	664,318,5 56,763,9
		Total Construction Management		8,794		7.00%	\$	616 \$	9,4
		Total	\$	583,563,696		24%	\$	137,528,230 \$	721,091,9
						Base		50%	8
		-	Ra	inge Estimate (\$000	0's)	\$583,564		\$666,081k	\$721,0
ſ	Fixed Dollar Risk Add: (Allows for additional risk to be added to the risk analsyis. Must include justification. Does not allocate to Real Estate.						50		

#### Houma Navigation Canal Deepening Project 2A 20-Adjacent

Feasibility (Alternatives) Abbreviated Risk Analysis

Meeting Date: 2-Nov-15



Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Impact	Likelihood	Risk Level
Project Sc	ope Growth			Maximum Proje	ct Growth	40%
PS-1	Relocations	Some utility elevations could not be determined. Relocation costs are 6 years old. Unidentified utilities or oil/gas infrastructure could be located during construction.	The need for additional relocations are a possability, which would increase the scope of the project and mpact cost/schedule.	Marginal	Unlikely	0
PS-2	Dredging	A full Dredged Material Disposal Plan has not been developed. Some depths and elevations for proposed disposal areas were assumed, without survey data. Disposal quantities could also be increased based on low maintenance activities and old survey information. It could be determined that foreshore protection and rock retention could be required in additional areas other than those recommended. This could lead to the need for additional rock retention, foreshore protection, and floatation channel dredging.	The proposed disposal locations will be revisted during the design phase, but some changes to the costs associated with the current plan is likely. Additional quantites could require changes to the proposed disposal areas and lead to increases in scope. Any changes to the rock requirements could increase the project scope, but it would have a minimal impact on overall costs.	Marginal	Possible	1
PS-3	0			Moderate	Possible	N/A
PS-4	0			Negligible	Unlikely	N/A
PS-5	0			Negligible	Unlikely	N/A
PS-6	0			Negligible	Unlikely	N/A
PS-7	0			Negligible	Unlikely	N/A
PS-8	0			Negligible	Unlikely	N/A
PS-9	0			Negligible	Unlikely	N/A
PS-10	0			Negligible	Unlikely	N/A
PS-11	0			Negligible	Unlikely	N/A
PS-12				Marginal	Possible	N/A

PS-13	Planning, Engineering, & Design			Marginal	Unlikely	0
PS-14	Construction Management			Marginal	Unlikely	0
<u>Acquisitio</u>	n Strategy			Maximum Proje	ct Growth	30%
AS-1	Relocations	Contract could require specialized work associated with environmental impacts of pipeline relocation and proper containment of material. The offshore nature of the work could limit the number of bids received to larger contracting companies.	A specialized pipeline relocation contractor could require a higher unit cost with a less competative bid. The overall cost ramifications of this would be minimal when compared to overall project costs.	Marginal	Unlikely	0
AS-2	Dredging	Dredging methodology for channel deepening would be widely available within south Louisiana, but offshore nature of the work could limit the number of bids.	A reduced number of bids could result in higher unit costs. However, based on the amount of ongoing dredging work within the channel over the past 20 years, it is believed the likihood of this occuring is minimal.	Marginal	Possible	1
AS-3	0			Moderate	Likely	N/A
AS-4	0			Negligible	Unlikely	N/A
AS-5	0			Negligible	Unlikely	N/A
AS-6	0			Negligible	Unlikely	N/A
AS-7	0			Negligible	Unlikely	N/A
AS-8	0			Negligible	Unlikely	N/A
AS-9	0			Negligible	Unlikely	N/A
AS-10	0			Negligible	Unlikely	N/A
AS-11	0			Negligible	Unlikely	N/A
AS-12				Negligible	Unlikely	N/A
AS-13	Planning, Engineering, & Design			Negligible	Unlikely	0
AS-14	Construction Management			Negligible	Unlikely	0
<u>Construct</u>	ion Elements			Maximum Proje	ct Growth	15%
CE-1	Relocations	Boat access would be required for relocations. Mobilization/Demobilization could take longer than anticipated. The potential exists for low-frequency weather events to delay work. Marine work could result in lower than anticipated productivity.	Impacts due to extended weather delays would be the most significant impact to cost and schedule, but the likelihood is low. With the amount of oil infrastructure existing in south Louisana, it is assumed a contractor familiar with the challenges of offshore pipeline relocation would be chosen. Therefore productivity issues would be minimal.	Marginal	Unlikely	0

CE-2	Dredging	Boat access would be required for survey crews and dredging equipment/crews. The potential exists for low-frequency weather events to delay work. Remote location of project could impact schedule if repairs are necessary to dredging equipment. Dredging methods would be fairly straight forward.	Dredging work is commonplace within the channel, so the risk of schedule delays or reduced productivity would center around the remote location or extreme weather events, not the dredging methods. The impact of a significant storm could be significant but liklihood is small.	Marginal	Possible	1
CE-3	0			Marginal	Possible	N/A
CE-4	0			Negligible	Unlikely	N/A
CE-5	0			Negligible	Unlikely	N/A
CE-6	0			Negligible	Unlikely	N/A
CE-7	0			Negligible	Unlikely	N/A
CE-8	0			Negligible	Unlikely	N/A
CE-9	0			Negligible	Unlikely	N/A
CE-10	0			Negligible	Unlikely	N/A
CE-11	0			Negligible	Unlikely	N/A
CE-12				Negligible	Unlikely	N/A
CE-13	Planning, Engineering, & Design			Negligible	Unlikely	0
CE-14	Construction Management			Negligible	Unlikely	0
<b>Quantities</b>	for Current Scope			Maximum Proje	ct Growth	20%
Q-1	Relocations	The elevations of some pipelines are assumed or unkown. The potential exists for some unknown oil/gas infrastructure to be present. Shoaling rates utilized are based on past data, but the infrequency of maintenance dredging could result in pipelines found to be deeper than anticipated.	The potential exists for increased quantity requirements during the relocation phase of the project, but the cost impact would be small when compaed to the overall cost of the project.	Marginal	Unlikely	0
Q-2	Dredging	Disposal quantities could be underestimated based on the infrequent nature of maintenance dredging over the past 20 years. Pipeline distances may change is disposal areas are changed. Disposal area capacities are based on assumed depths without data from surveys.	Additional costs could be significant if additional dredging is required to achieve target depth. Dredging quantites required are based on dated survey information and assumed shoaling rates. Changes to the disposal plan during the design phase could increase costs.	Moderate	Possible	2
Q-3	0			Negligible	Likely	N/A
Q-4	0			Negligible	Unlikely	N/A

A50111 <th< th=""><th></th><th></th><th></th><th></th><th>-</th><th></th><th>_</th></th<>					-		_
0.7     0     1     1     1     1     1     1       0.4     0     0     0     0     0     0     0     0       0.4     0     0     0     0     0     0     0     0       0.10     0     0     0     0     0     0     0     0     0       0.11     0	Q-5	0			Negligible	Unlikely	N/A
$C_7$ $P$ $C_7$ $P$ $C_7$ $P$ $C_7$ $P$ $C_7$ $P$ $C_7$ $P$	Q-6	0			Negligible	Unlikely	N/A
0.980111111 $0.99$ 0011	Q-7	0			Negligible	Unlikely	N/A
0.90 $0$ $0$ $1$	Q-8	0			Negligible	Unlikely	N/A
Ch10     V     V       Ch10     V     V     V       Ch11     0     V     V     V       Ch12     V     V     V     V       Ch13     Planning, Engineering, & Design     V     V     V       Ch14     Construction Management     V     V     V     V       Ch14     Construction Management     V     V     V     V       Ch14     Construction Management     V     V     V     V       Percentality: Fubrication or Equipments     Fubrication or Equipment State or Equipm	Q-9	0			Negligible	Unlikely	N/A
0-11       0       1       0       1       0       1       0         Q-12       Panning, Engineering, A. Design       Include of the second of t	Q-10	0			Negligible	Unlikely	N/A
0-13         Planning, Engineering, & Design         Indication         Negligible         Unlikely         One           0-14         Construction Management         Indication         Indication         Negligible         Unlikely         One           5         Speciality Fabrication or Equipment         Transportation of oppend of relocation materials apprent managed unit costs and special costs.         Marginal         Unlikely         One           FE-1         Diedging         Renotes location of poped coal dimension of one-expectation and special costs and special costs.         Transportation of poped coal dimension of one-expectation costs and special costs.         Renotes location of poped coal dimension of one-expectation costs and special costs.         Marginal         Marginal         Unlikely         One           FE-2         Diedging         Renotes location of poped coal dimension of one-expectation costs and special costs.         Renotes location of poped coal dimension of one-expectation costs and special costs.         Marginal         Marginal         No.           FE-2         Diedging         Renotes location of poped coal dimension of one-expectation.         Renotes location of poped coal dimension of one-expectation.         Noespipebb         Unlikely         N/A </td <td>Q-11</td> <td>0</td> <td></td> <td></td> <td>Negligible</td> <td>Unlikely</td> <td>N/A</td>	Q-11	0			Negligible	Unlikely	N/A
Construction Management         Construction Management         Negligible         Unlikely         O           C1-14         Construction Management         Negligible         Unlikely         O           Speciality Tabrication or Equipment         Terreportation of pipe and other relocation material-sequence to the construction of pipe and other relocation of and the renove boom of and. Equipment transport of failure would likely to mean expension, to adding in microared and cost and schedule of depy continue could table or and equipment transport of failure would likely to mean expension, to add table or and equipment transport of the overall project cost.         Marginal         Unlikely         O           FE-1         Redocations         Terreportation of project could inpact cost and schedule if repairs are necessary to dedging a quipment. The transport of reversal expension and equipment project cost.         Marginal         Unlikely         O           FE-2         Dredging         Renote location of project could inpact cost and schedule if repairs are necessary to dedging quipment. The transport of reversal expension and equipment project cost.         Marginal         Marginal         V/A           FE-3         0         Imaginal table conject cost and schedule if repairs are necessary to dedging quipment. The transport of reversal expension and equipment project cost.         Negligible         Unlikely         N/A           FE-4         0         Imaginal table conject cost and the conject cost.         Negligible         Unlikely <t< td=""><td>Q-12</td><td></td><td></td><td></td><td>Negligible</td><td>Unlikely</td><td>N/A</td></t<>	Q-12				Negligible	Unlikely	N/A
Specialty Fabrication or Equipment         Maximum Project Sorth         50%           FE-1         Transportation of pips and other relocation during length or the more location of work. Equipment transport of failure work differed work grade data the long and shelled differed data the difference of the more location of work. Equipment transport of failure work differed work grade data the long and work. Equipment transport of failure work grade data the long and work. Equipment transport of failure work grade data the long and work. Equipment transport of failure work grade data the long and work. Equipment transport of failure work grade data the long and work. Equipment transport of failure work grade data the long and work. Equipment transport of failure work grade data the long and work. Equipment transport of failure work grade data the long and work. Equipment transport of failure work grade data the long and work. Equipment transport of failure work grade data the long and work and shelled difference and the shelled. However, it is believed that the impacts of the brade base dufference and the shelled. However, it is believed that the impact and the brade data the long and	Q-13	Planning, Engineering, & Design			Negligible	Unlikely	0
Relocations         Transportation of pipe and other relocation materials/equipment could take bringer than anticipated due to remote location of work. Equipment repairs could take longer as well. An interessed linkood of equipment failure could casts from working in a marine environment.         Equipment transport of failure would likely be more expensive, resulting in increased unit costs and schedule debys during construction. However, thes costs would represent a small portion of the overall project cost.         Marginal         Unikely         0           FE-1         Dredging         Remote location of project could impact cost and schedule if repairs an necessary to dedging equipment. The transport of rews and equipment could take longer than anticipated, resulting in reduced productivity.         The decreased productivity resulting time impacts built to these issues would be minimal when compared to the overall cost of the project.         Marginal         Unikely         N/A           FE-3         0         Imagination of project could impact cost and schedule if repairs and necessary to dedging equipment. The transport of rews and equipment could take longer than anticipated, resulting in reduced productivity.         The decreased productivity resulting time impacts built to these issues would be minimal when compared to the overall cost of the project.         Marginal         Marginal         Unikely         N/A           FE-3         0         Imagination of project could impact cost and schedule if repairs and could take longer than anticipated.         N/A         N/A         N/A           FE-4         0         Imaginatimane deduced productivity<	Q-14	Construction Management			Negligible	Unlikely	0
Relocations         longer than anticipated due to remote location of work. Equipment tepairs could take longer as well. An increased tillhood dequipment tepairs could take longer as well. An increased tillhood dequipment tepairs could take longer than anticipated resulting in necessary to decigning as well. An increased tillhood dequipment. The factor and equipment delivery could the increase both maintenance and equipment delivery could the increase both are to the schedule. However, it is believed that the increase due to the schedule deliver out increases both are to the schedule. However, it is believed that the increase due to the schedule deliver out increases both are to the schedule. However, it is believed that the increase due to the schedule. However, it is believed that the increase due to the schedule. However, it is believed that the increase due to the schedule deliver out increases both are to the schedule. However, it is believed that the increase due to the schedule. However, it is believed that the increase due to the schedule. However, it is believed that the increase due to the schedule deliver out it is believed that the increase due to the schedule. However, it is believed that the increase due to the schedule. However, it is believed that the increase due to the schedule. However, it is believed that the increase due to the schedule. However, it is believed that the increase due to the schedule. However, it is believed that the increase due to the overall cost of the project.         Marginal         Marginal         Unikely         N/A           FE-3         0         0         0         0         N/A         N/A           FE-6         0         0         0         0         N/A         N/A           FE-7         0	Specialty	Fabrication or Equipment			Maximum Proje	ct Growth	50%
FE-2       Dedging       Remote location of project could ingraar cost and schedule if repairs are could make non-schedule. Interpairs are could take longer than anticipated, resulting in reduced productivity.       Image: mathemance and equipment/part delivery could increase both costs and the schedule. Interpairs are could take longer than anticipated, resulting in reduced productivity.       Marginal       Possible       1         FE-3       0 <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>							
FE-4Image: constraint of the sector of the sect	FE-1	Relocations	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small	Marginal	Unlikely	0
Image: constraint of the section of			longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the			
Image: constraint of the sector of the sec	FE-2	Dredging	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal	Possible	1
Image: constraint of the second se	FE-2 FE-3	Dredging 0	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal Negligible	Possible Unlikely	1 N/A
FE-7     0     Comparison     Comparison     Comparison       FE-8     0     0     0     N/A       Negligible     Unlikely     N/A	FE-2 FE-3 FE-4	Dredging 0	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal Negligible Negligible	Possible Unlikely Unlikely	1 N/A N/A
FE-8 V N/A	FE-2 FE-3 FE-4 FE-5	Dredging 0	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal Negligible Negligible Negligible	Possible Unlikely Unlikely Unlikely	1 N/A N/A N/A
FE-9 0 Negligible Unlikely N/A	FE-2 FE-3 FE-4 FE-5 FE-6	Dredging 0	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal Negligible Negligible Negligible Negligible	Possible Unlikely Unlikely Unlikely Unlikely	1 N/A N/A N/A N/A
	FE-2 FE-3 FE-4 FE-5 FE-6 FE-7	Dredging 0	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal Negligible Negligible Negligible Negligible Negligible	Possible Unlikely Unlikely Unlikely Unlikely Unlikely	1 N/A N/A N/A N/A N/A

FE-10 0	)			Negligible	Unlikely	N/A
FE-11 0	)			Negligible	Unlikely	N/A
FE-12				Negligible	Unlikely	N/A
FE-13 P	Planning, Engineering, & Design			Negligible	Unlikely	0
FE-14 C	Construction Management			Negligible	Unlikely	0
Cost Estima	te Assumptions			Maximum Proje	ct Growth	25%
CT-1 R	Relocations	The unit prices for pipeline relocations are based on the 2009 estimate conducted by the Corps. Cost will be escilated to 2015 levels based on the Corps escalation indices. The elevation of some pipelines are unkown and need to be assumed for this phase of the project.	The potential exists for the unit costs of relaocations to be increased subsequent to the plannig phase of the project. This would result in marginally increased cost for the overall project.	Marginal	Unlikely	0
CT-2 E	Dredging	Shoaling rates are based on past data and the disposal plan used for development of dredging unit costs is based on assumptions associated with the existing disposal areas. Dredging quantities are also based on an assumed starting depth of the channel and could could be increased once a survey is conducted. Productivity rates were developed via CEDEP which is based on disposal plan assumptions as well.	It is possible that dredging quantities would increase during the design phase of the project, once more information in know about the existing depths of the channel. This would result in moderate increases to the project costs. It is also possible that the dredged material disposal plan would be modified based on new data, potentially increasing costs.	Moderate	Possible	2
CT-3 0	)			Moderate	Possible	N/A
CT-4 0	)			Negligible	Unlikely	N/A
CT-5 0	)			Negligible	Unlikely	N/A
CT-6 0	)			Negligible	Unlikely	N/A
CT-7 0	)			Negligible	Unlikely	N/A
CT-8 0	)			Negligible	Unlikely	N/A
СТ-9 0	)			Negligible	Unlikely	N/A
CT-10 0	)			Negligible	Unlikely	N/A
CT-11 0	)			Negligible	Unlikely	N/A
CT-12				Negligible	Unlikely	N/A
CT-13 F	Planning, Engineering, & Design			Negligible	Unlikely	0

CT-14	Construction Management			Negligible	Unlikely	0
<u>External P</u>	roject Risks		* 	Maximum Proje	ct Growth	20%
EX-1	Relocations	Fuel prices used for the estimate are near a two-year low, so the potential for increased fuel costs exiits. This would increase the cost of equipment operation and material/crew transport.	Increases in fuel prices are likely to impact costs. These impacts would be moderate due to the heavy reliance on fuel to operate equipment and transport material. Overall the impacts to cost would be moderate.	Marginal	Unlikely	0
EX-2	Dredging	Extreme weather events are a possibility in Coastal Louisiana, with the potential to delay the project significantly or damage construction equipment. Shoaling rates would also increase during such an event, potentially impacting dredging quantities. Fuel prices used for the estimate are near a two-year low, so the potential for increased fuel costs exiits.	Increases in fuel prices are likely and the cost impact would be moderate. Storm impacts could be significant, but the liklihood is small. The cost and schedule impacts would be marginal. Overall the impacts to cost would be moderate.	Moderate	Possible	2
EX-3	0			Marginal	Possible	N/A
EX-4	0			Negligible	Unlikely	N/A
EX-5	0			Negligible	Unlikely	N/A
EX-6	0			Negligible	Unlikely	N/A
EX-7	0			Negligible	Unlikely	N/A
EX-8	0			Negligible	Unlikely	N/A
EX-9	0			Negligible	Unlikely	N/A
EX-10	0			Negligible	Unlikely	N/A
EX-11	0			Negligible	Unlikely	N/A
EX-12				Negligible	Unlikely	N/A
EX-13	Planning, Engineering, & Design			Negligible	Unlikely	0
EX-14	Construction Management			Negligible	Unlikely	0

#### Houma Navigation Canal Deepening Project 2A 20-Adjacent Feasibility (Alternatives) Abbreviated Risk Analysis

WBS	Potential Risk Areas	Project Scope Growth	Acquisition Strategy	Construction Elements	Quantities for Current Scope	Specialty Fabrication or Equipment	Cost Estimate Assumptions	External Project Risks	Cost in Thousands
01 LANDS AND DAMAGES	Real Estate								\$0
02 RELOCATIONS	Relocations	0	0	0	0	0	0	0	\$0
12 NAVIGATION, PORTS AND HARBORS	Dredging	1	1	1	2	1	2	2	\$530,504
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
All Other	Remaining Construction Items	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
30 PLANNING, ENGINEERING, AND DESIGN	Planning, Engineering, & Design	0	0	0	0	0	0	0	\$53,050
31 CONSTRUCTION MANAGEMENT	Construction Management	0	0	0	0	0	0	0	\$9
			•	•	•		•		\$583,564
Risk		\$ 11,094							\$137,528
Fixed Dollar Risk Allocation			\$-	•	•			\$-	\$0
	Risk	\$ 11,094	\$ 10,474	\$ 49,968	\$ 17,583	\$ 11,601	\$ 19,225		\$137,528
								Total	\$721,092

	Project (less than \$40M): Project Development Stage/Alternative:		ect			Alternative			
	Risk Category:	Low Risk: Typical Construction, Simple				Meeting Date	:	11/2/2015	
	Т	otal Estimated Construction Contract Cost =	\$	129,198,500					
	CWWBS	Feature of Work	<u>Co</u>	ontract Cost		% Contingency	0	\$ Contingency	Total
	01 LANDS AND DAMAGES	Real Estate	\$	-		0.00%	\$	- \$	-
1	02 RELOCATIONS	Relocations	\$	16,965,700		23.25%	\$	3,943,711 \$	20,909,411
2	12 NAVIGATION, PORTS AND HARBORS	Dredging	\$	112,232,800		32.02%	\$	35,932,741 \$	148,165,541
3			\$	-		0.00%	\$	- \$	-
4			\$	-		0.00%	\$	- \$	-
5			\$	-		0.00%	\$	- \$	-
6			\$	-		0.00%	\$	- \$	-
7						0.00%	\$	- \$	-
8			\$			0.00%	\$	- \$	_
9			\$			0.00%	\$	- \$	_
10			\$ \$			0.00%	\$	- \$	
11			\$ \$			0.00%	\$	- \$	
	All Other	Remaining Construction Items	\$ \$	-	0.0%	0.00%	ֆ \$	- \$	-
			•	-	0.0%			·	45 005 000
13	30 PLANNING, ENGINEERING, AND DESIGN	Planning, Engineering, & Design	\$	12,919,850		16.15%	\$	2,086,052 \$	15,005,902
	31 CONSTRUCTION MANAGEMENT	Construction Management	\$	10,335,880		16.15%	\$	1,668,842 \$	12,004,722
XX	FIXED DOLLAR RISK ADD (EQUALLY DISPERSED TO ALL, MUS	T INCLUDE JUSTIFICATION SEE BELOW)					\$	-	
		Totals Real Estate Total Construction Estimate Total Planning, Engineering & Design Total Construction Management	\$ \$	- 129,198,500 12,919,850 10,335,880		0.00% 30.86% 16.15% 16.15%	\$ \$ \$ \$	- \$ 39,876,452 \$ 2,086,052 \$ 1,668,842 \$	- 169,074,952 15,005,902 12,004,722
		Total	\$	152,454,230		29%	\$	43,631,346 \$	196,085,576
			Ra	inge Estimate (\$00	0's)	<b>Base</b> \$152,454	k	50% \$178,633k	<b>80%</b> \$196,086k
	Fixed Dollar Risk Add: (Allows for additional risk to be added to the risk analsyis. Must include justification. Does not allocate to Real Estate.								

### Houma Navigation Canal Deepening Project 2B 20-Earth

Feasibility (Alternatives) Abbreviated Risk Analysis Meeting Date: 2-Nov-15



Risk Element	Feature of Work		PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Impact	Likelihood	Risk Level
Project Sco	ope Growth			Maximum Proje	ct Growth	40%
PS-1	Relocations	Some utility elevations could not be determined. Relocation costs are 6 years old. Unidentified utilities or oil/gas infrastructure could be located during construction.	The need for additional relocations are a possability, which would increase the scope of the project and mpact cost/schedule.	Marginal	Possible	1
PS-2	Dredging	A full Dredged Material Disposal Plan has not been developed. Some depths and elevations for proposed disposal areas were assumed, without survey data. Disposal quantities could also be increased based on low maintenance activities and old survey information. It could be determined that foreshore protection and rock retention could be required in additional areas other than those recommended. This could lead to the need for additional rock retention, foreshore protection, and floatation channel dredging.	The proposed disposal locations will be revisted during the design phase, but some changes to the costs associated with the current plan is likely. Additional quantites could require changes to the proposed disposal areas and lead to increases in scope. Any changes to the rock requirements could increase the project scope, but it would have a minimal impact on overall costs.	Moderate	Possible	2
PS-3	0			Moderate	Possible	N/A
PS-4	0			Negligible	Unlikely	N/A
PS-5	0			Negligible	Unlikely	N/A
PS-6	0			Negligible	Unlikely	N/A
PS-7	0			Negligible	Unlikely	N/A
PS-8	0			Negligible	Unlikely	N/A
PS-9	0			Negligible	Unlikely	N/A
PS-10	0			Negligible	Unlikely	N/A
PS-11	0			Negligible	Unlikely	N/A
PS-12				Marginal	Possible	N/A

PS-13	Planning, Engineering, & Design			Moderate	Likely	3
PS-14	Construction Management			Significant	Possible	3
<u>Acquisitio</u>	n Strategy		•	Maximum Proje	ct Growth	30%
AS-1	Relocations	Contract could require specialized work associated with environmental impacts of pipeline relocation and proper containment of material. The offshore nature of the work could limit the number of bids received to larger contracting companies.	A specialized pipeline relocation contractor could require a higher unit cost with a less competative bid. The overall cost ramifications of this would be minimal when compared to overall project costs.	Marginal	Possible	1
AS-2	Dredging	Dredging methodology for channel deepening would be widely available within south Louisiana, but offshore nature of the work could limit the number of bids.	A reduced number of bids could result in higher unit costs. However, based on the amount of ongoing dredging work within the channel over the past 20 years, it is believed the likihood of this occuring is minimal.	Marginal	Possible	1
AS-3	0			Moderate	Likely	N/A
AS-4	0			Negligible	Unlikely	N/A
AS-5	0			Negligible	Unlikely	N/A
AS-6	0			Negligible	Unlikely	N/A
AS-7	0			Negligible	Unlikely	N/A
AS-8	0			Negligible	Unlikely	N/A
AS-9	0			Negligible	Unlikely	N/A
AS-10	0			Negligible	Unlikely	N/A
AS-11	0			Negligible	Unlikely	N/A
AS-12				Negligible	Unlikely	N/A
AS-13	Planning, Engineering, & Design			Negligible	Unlikely	0
AS-14	Construction Management			Negligible	Unlikely	0
<u>Construct</u>	ion Elements			Maximum Proje	ct Growth	15%
CE-1	Relocations	Boat access would be required for relocations. Mobilization/Demobilization could take longer than anticipated. The potential exists for low-frequency weather events to delay work. Marine work could result in lower than anticipated productivity.	Impacts due to extended weather delays would be the most significant impact to cost and schedule, but the likelihood is low. With the amount of oil infrastructure existing in south Louisana, it is assumed a contractor familiar with the challenges of offshore pipeline relocation would be chosen. Therefore productivity issues would be minimal.	Moderate	Possible	2

CE-2	Dredging	Boat access would be required for survey crews and dredging equipment/crews. The potential exists for low-frequency weather events to delay work. Remote location of project could impact schedule if repairs are necessary to dredging equipment. Dredging methods would be fairly straight forward.	Dredging work is commonplace within the channel, so the risk of schedule delays or reduced productivity would center around the remote location or extreme weather events, not the dredging methods. The impact of a significant storm could be significant but liklihood is small.	Moderate	Possible	2
CE-3	0			Marginal	Possible	N/A
CE-4	0			Negligible	Unlikely	N/A
CE-5	0			Negligible	Unlikely	N/A
CE-6	0			Negligible	Unlikely	N/A
CE-7	0			Negligible	Unlikely	N/A
CE-8	0			Negligible	Unlikely	N/A
CE-9	0			Negligible	Unlikely	N/A
CE-10	0			Negligible	Unlikely	N/A
CE-11	0			Negligible	Unlikely	N/A
CE-12				Negligible	Unlikely	N/A
CE-13	Planning, Engineering, & Design			Negligible	Unlikely	0
CE-14	Construction Management			Negligible	Unlikely	0
<b>Quantities</b>	<u>s for Current Scope</u>			Maximum Proje	ct Growth	20%
Q-1	Relocations	The elevations of some pipelines are assumed or unkown. The potential exists for some unknown oil/gas infrastructure to be present. Shoaling rates utilized are based on past data, but the infrequency of maintenance dredging could result in pipelines found to be deeper than anticipated.	The potential exists for increased quantity requirements during the relocation phase of the project, but the cost impact would be small when compaed to the overall cost of the project.	Marginal	Possible	1
Q-2	Dredging	Disposal quantities could be underestimated based on the infrequent nature of maintenance dredging over the past 20 years. Pipeline distances may change is disposal areas are changed. Disposal area capacities are based on assumed depths without data from surveys.	Additional costs could be significant if additional dredging is required to achieve target depth. Dredging quantites required are based on dated survey information and assumed shoaling rates. Changes to the disposal plan during the design phase could increase costs.	Moderate	Possible	2
Q-3	0			Negligible	Likely	N/A
Q-4	0			Negligible	Unlikely	N/A

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0.7     0     1     1     1     1     1       0.4     0     1     1     1     1     1     1     1       0.4     0     1 <t< td=""><td>Q-5</td><td>0</td><td></td><td></td><td>Negligible</td><td>Unlikely</td><td>N/A</td></t<>	Q-5	0			Negligible	Unlikely	N/A
0.77000 $0.87$ 01NegativeUnitedNA $0.9$ 011NANA $0.9$ 011NANA $0.9$ 011NANA $0.9$ 011NANA $0.10$ 011NANA $0.11$ 011NANA $0.12$ 111NANA $0.12$ 1111NA $0.12$ 1111NA $0.13$ Pening Engineentin1111 $0.14$ Construction Matigementic1111 $0.14$ Construction of Equipmentic1111 $0.14$ Pening Engineentin1111 $0.14$ Pening Engineentin1111 $0.14$ Pening Engineentin11111 $0.14$ Pening Engineentin11111 $0.14$	Q-6	0			Negligible	Unlikely	N/A
0.88 $0$ $0$ Image: second	Q-7	0			Negligible	Unlikely	N/A
0.900111 <td>Q-8</td> <td>0</td> <td></td> <td></td> <td>Negligible</td> <td>Unlikely</td> <td>N/A</td>	Q-8	0			Negligible	Unlikely	N/A
C-10       P	Q-9	0			Negligible	Unlikely	N/A
Ci-11       P       Image: Circle Cir	Q-10	0			Negligible	Unlikely	N/A
0-13         Planning, Engineering, & Design         Index         <	Q-11	0			Negligible	Unlikely	N/A
Q-14         Construction Management         Index	Q-12				Negligible	Unlikely	N/A
Specialty Fabrication or Equipment         Maximum Project Orwith         50%           FE-1         Transportation of pipe and other relocation materials(equipment could late increased unit costs and schedule dety, during costs from working in a marine environment.         Feedocations         Marginal         Possible         1           FE-2         Dredging         Remote location of pipe and other relocation of pipe and other relocation of upic cost.         Equipment transport of fabre would likely be more exponding thermal schedule dety, during costs.         Marginal         Possible         1           FE-1         Dredging         Remote location of pipe and other relocation of pipe and other relocation of project cost.         The decreased productivity resulting from tonger than anticipated exponent. The transport of revise and schedule dety monthant determined and equipment to the overall project cost.         Marginal         Possible         1           FE-2         Dredging         Remote location of pipe and other relocation of project cost.         The decreased productivity resulting from tonger than anticipated exponent.         Marginal         Possible         1           FE-3         0         Image: Cost on display equipment. The transport of revise and the project.         The decreased productivity resulting in mature anticipated exponent.         Marginal         Marginal         N/A           FE-4         0         Image: Cost of the project.         Negligble         Unlikely         N/A </td <td>Q-13</td> <td>Planning, Engineering, &amp; Design</td> <td></td> <td></td> <td>Negligible</td> <td>Unlikely</td> <td>0</td>	Q-13	Planning, Engineering, & Design			Negligible	Unlikely	0
Here         Transportation of pipe and other relocation materials/equipment could take longer than anticipated due to remote location of wrk. Equipment transport of failure would likely be more expensive, could take longer as well. An increased lithood of equipment failure could east from working in a marine environment.         Equipment transport of failure would likely be more expensive, could take longer as well. An increased lithood of equipment failure could east from working in a marine environment.         Equipment transport of failure would likely be more expensive, could take longer than anticipated due to remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment/part delivery could increase both costs and the schedule. However, tile belowed that the impacts due to these sections.         Marginal         Possible         1           FE-3         Dredging         Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment/part delivery could increase both costs and the schedule. However, tile belowed that the impacts due to these issues would be minima when compared to the overall cost of the project.         Marginal         Possible         1           FE-4         0         Image: transport of crews and equipment/part delivery could increase both costs and the schedule. However, tile belowed that the impacts due to these issues would be minima when compared to the overall cost of the project.         Marginal         Possible         1           FE-6         0         Image: transport of crews and equipment/partelivery could increase both costs and the schedule. However, th	Q-14	Construction Management			Negligible	Unlikely	0
Relocations         borget than anticipated due to remote locating in increased unit costs and schedule delays during         Marginal         Possible         1           FE-1         Dredging         Renote locating in a marine environment.         The decreased productivity resulting in increased unit costs and schedule delays during         Marginal         Possible         1           FE-2         Dredging         Renote locating opticat cost and schedule delays during costs and the coverall project cost.         The decreased productivity resulting in increased unit costs and schedule delays during         Marginal         Possible         1           FE-2         Dredging         Renote locating opticat cost and schedule delays during in a marine environment.         The decreased productivity resulting in increase brind delays during delays during         Marginal         Possible         1           FE-3         Dredging         Renote locating opticat cost and schedule delays during in reduced productivity.         The decreased productivity resulting in increase brind delays during delays dur	Specialty I	Fabrication or Equipment			Maximum Proje	ct Growth	<b>50%</b>
FE-2       Dedging       Remote location of project could ingreate are model dimped to stand de schedule if repairs are model dimeter and equipment, the transport of creas and equipment, the transport of creas and equipment, the transport of creas and equipment could take longer than anticipated, resulting in reduced productivity.       matternance and equipment/part delivery could increase both could take longer than anticipated, resulting in reduced productivity.       Marginal       Possible       1         FE-3       0        NA       NA       NA       NA         FE-4       0        NA       NA       NA         FE-5       0         NA       NA         FE-6       0         NA       NA         FE-7       o         NA       NA         FE-7       o         NA       NA         FE-7       o         NA       NA         FE-7       o         NA       NA         FE-8       o          NA         FE-7       o           NA         FE-8       o           NA         FE-8 <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>							
FE-4ooooN/AFE-5oNegligibleUnlikelyN/AFE-6oNegligibleUnlikelyN/AFE-7oNegligibleUnlikelyN/AFE-8oNegligibleUnlikelyN/AFE-8oNegligibleUnlikelyN/ANegligibleNegligibleUnlikelyN/ANENNegligibleUnlikelyN/ANENNEN/AN/ANENNEN/AN/ANENNEN/AN/ANENNEN/AN/ANENNEN/AN/ANENNN/AN/ANENNN/AN/ANENNN/AN/ANENNN/AN/ANENNN/AN/ANENNN/ANENNN/ANENNN/ANNNN/ANN	FE-1	Relocations	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small	Marginal	Possible	1
Image: constraint of the section of			longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the			
Image: constraint of the sector of the sec	FE-2	Dredging	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal	Possible	1
Image: constraint of the second se	FE-2 FE-3	Dredging 0	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal	Possible Unlikely	1 N/A
FE-7     0     Comparison     Comparison     Comparison       FE-8     0     0     0     N/A       Negligible     Unlikely     N/A	FE-2 FE-3 FE-4	Dredging 0	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal Negligible Negligible	Possible Unlikely Unlikely	1 N/A N/A
FE-8 V N/A	FE-2 FE-3 FE-4 FE-5	Dredging 0	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal Negligible Negligible Negligible	Possible Unlikely Unlikely Unlikely	1 N/A N/A N/A
FE-9 0 Negligible Unlikely N/A	FE-2 FE-3 FE-4 FE-5 FE-6	Dredging 0	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal Negligible Negligible Negligible Negligible	Possible Unlikely Unlikely Unlikely Unlikely	1 N/A N/A N/A N/A
	FE-2 FE-3 FE-4 FE-5 FE-6 FE-7	Dredging 0	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal Negligible Negligible Negligible Negligible Negligible	Possible Unlikely Unlikely Unlikely Unlikely Unlikely Unlikely Unlikely	1 N/A N/A N/A N/A N/A

FE-10	0			Negligible	Unlikely	N/A
FE-11	0			Negligible	Unlikely	N/A
FE-12				Negligible	Unlikely	N/A
FE-13	Planning, Engineering, & Design			Negligible	Unlikely	0
FE-14	Construction Management			Negligible	Unlikely	0
Cost Estim	ate Assumptions			Maximum Proje	ct Growth	25%
CT-1	Relocations	The unit prices for pipeline relocations are based on the 2009 estimate conducted by the Corps. Cost will be escilated to 2015 levels based on the Corps escalation indices. The elevation of some pipelines are unkown and need to be assumed for this phase of the project.	The potential exists for the unit costs of relaccations to be increased subsequent to the plannig phase of the project. This would result in marginally increased cost for the overall project.	Marginal	Possible	1
CT-2	Dredging	the existing disposal areas. Dredging quantities are also based on an assumed starting depth of the channel and could could be increased once a	about the existing depths of the channel. This would result in moderate increases to the project costs. It is also possible that	Moderate	Likely	3
CT-3	0			Moderate	Possible	N/A
CT-4	0			Negligible	Unlikely	N/A
CT-5	0			Negligible	Unlikely	N/A
CT-6	0			Negligible	Unlikely	N/A
CT-7	0			Negligible	Unlikely	N/A
CT-8	0			Negligible	Unlikely	N/A
CT-9	0			Negligible	Unlikely	N/A
CT-10	0			Negligible	Unlikely	N/A
CT-11	0			Negligible	Unlikely	N/A
CT-12				Negligible	Unlikely	N/A
CT-13	Planning, Engineering, & Design			Negligible	Unlikely	0
				_		

CT-14	Construction Management			Negligible	Unlikely	0
External P	roject Risks		•	Maximum Proje	ct Growth	20%
EX-1	Relocations	Fuel prices used for the estimate are near a two-year low, so the potential for increased fuel costs exiits. This would increase the cost of equipment operation and material/crew transport.	Increases in fuel prices are likely to impact costs. These impacts would be moderate due to the heavy reliance on fuel to operate equipment and transport material. Overall the impacts to cost would be moderate.	Moderate	Possible	2
EX-2	Dredging	Extreme weather events are a possibility in Coastal Louisiana, with the potential to delay the project significantly or damage construction equipment. Shoaling rates would also increase during such an event, potentially impacting dredging quantities. Fuel prices used for the estimate are near a two-year low, so the potential for increased fuel costs exilts.	Increases in fuel prices are likely and the cost impact would be moderate. Storm impacts could be significant, but the liklihood is small. The cost and schedule impacts would be marginal. Overall the impacts to cost would be moderate.	Moderate	Possible	2
EX-3	0			Marginal	Possible	N/A
EX-4	0			Negligible	Unlikely	N/A
EX-5	0			Negligible	Unlikely	N/A
EX-6	0			Negligible	Unlikely	N/A
EX-7	0			Negligible	Unlikely	N/A
EX-8	0			Negligible	Unlikely	N/A
EX-9	0			Negligible	Unlikely	N/A
EX-10	0			Negligible	Unlikely	N/A
EX-11	0			Negligible	Unlikely	N/A
EX-12				Negligible	Unlikely	N/A
EX-13	Planning, Engineering, & Design			Negligible	Unlikely	0
EX-14	Construction Management			Negligible	Unlikely	0

# Houma Navigation Canal Deepening Project 2B 20-Earth Feasibility (Alternatives)

Abbreviated Risk Analysis

<u>WBS</u>	Potential Risk Areas	Project Scope Growth	Acquisition Strategy	Construction Elements	Quantities for Current Scope	Specialty Fabrication or Equipment	Cost Estimate Assumptions	External Project Risks	Cost in Thousands
01 LANDS AND DAMAGES	Real Estate								\$0
02 RELOCATIONS	Relocations	1	1	2	1	1	1	2	\$16,966
12 NAVIGATION, PORTS AND HARBORS	Dredging	2	1	2	2	1	3	2	\$112,233
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
All Other	Remaining Construction Items	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
30 PLANNING, ENGINEERING, AND DESIGN	Planning, Engineering, & Design	3	0	0	0	0	0	0	\$12,920
31 CONSTRUCTION MANAGEMENT	Construction Management	3	0	0	0	0	0	0	\$10,336
				•			•		\$152,454
Risk		\$ 7,390	\$ 2,551	\$ 14,489	\$ 4,029	\$ 2,825	\$ 8,066	\$ 4,282	\$43,631
ixed Dollar Risk Allocation		\$-	\$-	•	Ť	\$-	•	\$-	\$0
	Risk	\$ 7,390	\$ 2,551	\$ 14,489	\$ 4,029	\$ 2,825	\$ 8,066		\$43,631
								Total	\$196,086

		Abbreviated Risk Analysis Houma Navigation Canal Deepening Proje	ct			Alternative	2B 2	20-Earth	
		Low Risk: Typical Construction, Simple				Meeting Date	:	11/2/2015	
	Т	otal Estimated Construction Contract Cost = [	\$	769,046,148					
	CWWBS	Feature of Work	<u>Cc</u>	ntract Cost		% Contingency	<u>\$</u>	<u>Contingency</u>	Total
	01 LANDS AND DAMAGES	Real Estate	\$	-		0.00%	\$	- \$	-
1	02 RELOCATIONS	Relocations				0.00%	\$	- \$	-
2	12 NAVIGATION, PORTS AND HARBORS	Dredging	\$	769,046,148		25.22%	\$	193,983,678 \$	963,029,82
3			\$	-		0.00%	\$	- \$	-
4			\$			0.00%	\$	- \$	-
5			\$	-		0.00%	\$	- \$	-
6			\$	-		0.00%	\$	- \$	-
7						0.00%	\$	- \$	-
8			\$			0.00%	\$	- \$	-
9			\$			0.00%	\$	- \$	
10			\$ \$			0.00%	\$	- \$	
11			\$ \$			0.00%	\$ \$	- \$	-
	All Other	Remaining Construction Items	\$ \$		0.0%	0.00%	\$ \$	- \$	-
	30 PLANNING, ENGINEERING, AND DESIGN	Planning, Engineering, & Design	<u>ֆ</u>	76,904,615	0.078	7.00%	\$	5,383,323 \$	82,287,938
			<del>ه</del> \$			7.00%	э \$	4,306,658 \$	· · ·
			\$	61,523,692		7.00%	ծ \$	4,300,058 \$	65,830,350
~	FIXED DOLLAR RISK ADD (EQUALLY DISPERSED TO ALL, MUS	TINCLUDE JUSTIFICATION SEE BELOW)					<u> </u>	-	
		Totals Real Estate	¢	_		0.00%	\$	- \$	_
		Total Construction Estimate		769,046,148		25.22%	\$	193,983,678 \$	963,029,82
		Total Planning, Engineering & Design	\$	76,904,615		7.00%	\$	5,383,323 \$	82,287,93
		Total Construction Management		61,523,692		7.00%	\$	4,306,658 \$	65,830,35
		Total	\$	907,474,455		22%	\$	203,673,659 \$	1,111,148,11
						Base		50%	80
			Ra	nge Estimate (\$0	00's)	\$907,474		\$1,029,678k	\$1,111,148
	Fixed Dollar Risk Add: (Allows for additional risk to be added to the risk analsyis. Must include justification. Does not allocate to Real Estate.						* 5	0% based on base is at 5% CL.	

### Houma Navigation Canal Deepening Project 2B 20-Earth

Feasibility (Alternatives) Abbreviated Risk Analysis Meeting Date: 2-Nov-15



Risk Element	Feature of Work		PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Impact	Likelihood	Risk Level
Project Sc	ope Growth			Maximum Proje	ct Growth	40%
PS-1	Relocations	Some utility elevations could not be determined. Relocation costs are 6 years old. Unidentified utilities or oil/gas infrastructure could be located during construction.	The need for additional relocations are a possability, which would increase the scope of the project and mpact cost/schedule.	Marginal	Unlikely	0
PS-2	Dredging	A full Dredged Material Disposal Plan has not been developed. Some depths and elevations for proposed disposal areas were assumed, without survey data. Disposal quantities could also be increased based on low maintenance activities and old survey information. It could be determined that foreshore protection and rock retention could be required in additional areas other than those recommended. This could lead to the need for additional rock retention, foreshore protection, and floatation channel dredging.	The proposed disposal locations will be revisted during the design phase, but some changes to the costs associated with the current plan is likely. Additional quantites could require changes to the proposed disposal areas and lead to increases in scope. Any changes to the rock requirements could increase the project scope, but it would have a minimal impact on overall costs.	Marginal	Possible	1
PS-3	0			Moderate	Possible	N/A
PS-4	0			Negligible	Unlikely	N/A
PS-5	0			Negligible	Unlikely	N/A
PS-6	0			Negligible	Unlikely	N/A
PS-7	0			Negligible	Unlikely	N/A
PS-8	0			Negligible	Unlikely	N/A
PS-9	0			Negligible	Unlikely	N/A
PS-10	0			Negligible	Unlikely	N/A
PS-11	0			Negligible	Unlikely	N/A
PS-12				Marginal	Possible	N/A

PS-13	Planning, Engineering, & Design			Marginal	Unlikely	0
PS-14	Construction Management			Marginal	Unlikely	0
<u>Acquisitio</u>	n Strategy			Maximum Proje	ct Growth	30%
AS-1	Relocations	Contract could require specialized work associated with environmental impacts of pipeline relocation and proper containment of material. The offshore nature of the work could limit the number of bids received to larger contracting companies.	A specialized pipeline relocation contractor could require a higher unit cost with a less competative bid. The overall cost ramifications of this would be minimal when compared to overall project costs.	Marginal	Unlikely	0
AS-2	Dredging	Dredging methodology for channel deepening would be widely available within south Louisiana, but offshore nature of the work could limit the number of bids.	A reduced number of bids could result in higher unit costs. However, based on the amount of ongoing dredging work within the channel over the past 20 years, it is believed the likihood of this occuring is minimal.	Marginal	Possible	1
AS-3	0			Moderate	Likely	N/A
AS-4	0			Negligible	Unlikely	N/A
AS-5	0			Negligible	Unlikely	N/A
AS-6	0			Negligible	Unlikely	N/A
AS-7	0			Negligible	Unlikely	N/A
AS-8	0			Negligible	Unlikely	N/A
AS-9	0			Negligible	Unlikely	N/A
AS-10	0			Negligible	Unlikely	N/A
AS-11	0			Negligible	Unlikely	N/A
AS-12				Negligible	Unlikely	N/A
AS-13	Planning, Engineering, & Design			Negligible	Unlikely	0
AS-14	Construction Management			Negligible	Unlikely	0
<u>Construct</u>	ion Elements			Maximum Proje	ct Growth	15%
CE-1	Relocations	Boat access would be required for relocations. Mobilization/Demobilization could take longer than anticipated. The potential exists for low-frequency weather events to delay work. Marine work could result in lower than anticipated productivity.	Impacts due to extended weather delays would be the most significant impact to cost and schedule, but the likelihood is low. With the amount of oil infrastructure existing in south Louisana, it is assumed a contractor familiar with the challenges of offshore pipeline relocation would be chosen. Therefore productivity issues would be minimal.	Marginal	Unlikely	0

		_				
CE-2	Dredging	Boat access would be required for survey crews and dredging equipment/crews. The potential exists for low-frequency weather events to delay work. Remote location of project could impact schedule if repairs are necessary to dredging equipment. Dredging methods would be fairly straight forward.	Dredging work is commonplace within the channel, so the risk of schedule delays or reduced productivity would center around the remote location or extreme weather events, not the dredging methods. The impact of a significant storm could be significant but liklihood is small.	Marginal	Possible	1
CE-3	0			Marginal	Possible	N/A
CE-4	0			Negligible	Unlikely	N/A
CE-5	0			Negligible	Unlikely	N/A
CE-6	0			Negligible	Unlikely	N/A
CE-7	0			Negligible	Unlikely	N/A
CE-8	0			Negligible	Unlikely	N/A
CE-9	0			Negligible	Unlikely	N/A
CE-10	0			Negligible	Unlikely	N/A
CE-11	0			Negligible	Unlikely	N/A
CE-12				Negligible	Unlikely	N/A
CE-13	Planning, Engineering, & Design			Negligible	Unlikely	0
CE-14	Construction Management			Negligible	Unlikely	0
<b>Quantities</b>	for Current Scope			Maximum Proje	ct Growth	20%
Q-1	Relocations	The elevations of some pipelines are assumed or unkown. The potential exists for some unknown oil/gas infrastructure to be present. Shoaling rates utilized are based on past data, but the infrequency of maintenance dredging could result in pipelines found to be deeper than anticipated.	The potential exists for increased quantity requirements during the relocation phase of the project, but the cost impact would be small when compaed to the overall cost of the project.	Marginal	Unlikely	0
Q-2	Dredging	Disposal quantities could be underestimated based on the infrequent nature of maintenance dredging over the past 20 years. Pipeline distances may change is disposal areas are changed. Disposal area capacities are based on assumed depths without data from surveys.	Additional costs could be significant if additional dredging is required to achieve target depth. Dredging quantites required are based on dated survey information and assumed shoaling rates. Changes to the disposal plan during the design phase could increase costs.	Moderate	Possible	2
Q-3	0			Negligible	Likely	N/A
Q-4	0			Negligible	Unlikely	N/A

A50111 <th< th=""><th></th><th></th><th></th><th></th><th>-</th><th></th><th>_</th></th<>					-		_
0.7     0     1     1     1     1     1     1       0.4     0     0     0     0     0     0     0     0       0.4     0     0     0     0     0     0     0     0       0.10     0     0     0     0     0     0     0     0     0       0.11     0	Q-5	0			Negligible	Unlikely	N/A
$C_7$ $P$ $C_7$ $P$ $C_7$ $P$ $C_7$ $P$ $C_7$ $P$ $C_7$ $P$	Q-6	0			Negligible	Unlikely	N/A
0.980111111 $0.99$ 0011	Q-7	0			Negligible	Unlikely	N/A
0.90 $0$ $0$ $1$	Q-8	0			Negligible	Unlikely	N/A
Ch10     V     V       Ch10     V     V     V       Ch11     0     V     V     V       Ch12     V     V     V     V       Ch13     Planning, Engineering, & Design     V     V     V       Ch14     Construction Management     V     V     V     V       Ch14     Construction Management     V     V     V     V       Ch14     Construction Management     V     V     V     V       Percentality: Fubrication or Equipments     Fubrication or Equipment State or Equipm	Q-9	0			Negligible	Unlikely	N/A
0-11       0       1       0       1       0       1       0         Q-12       Panning, Engineering, A. Design       Include of the second of t	Q-10	0			Negligible	Unlikely	N/A
0-13         Planning, Engineering, & Design         Indication         Negligible         Unlikely         One           0-14         Construction Management         Indication         Indication         Negligible         Unlikely         One           5         Speciality Fabrication or Equipment         Transportation of oppend of relocation materials apprent managed unit costs and special costs.         Marginal         Unlikely         One           FE-1         Diedging         Renotes location of poped coal dimension of one-expectation and special costs and special costs.         Transportation of poped coal dimension of one-expectation costs and special costs.         Renotes location of poped coal dimension of one-expectation costs and special costs.         Marginal         Marginal         Unlikely         One           FE-2         Diedging         Renotes location of poped coal dimension of one-expectation costs and special costs.         Renotes location of poped coal dimension of one-expectation costs and special costs.         Marginal         Marginal         No.           FE-2         Diedging         Renotes location of poped coal dimension of one-expectation.         Renotes location of poped coal dimension of one-expectation.         Noespipebb         Unlikely         N/A </td <td>Q-11</td> <td>0</td> <td></td> <td></td> <td>Negligible</td> <td>Unlikely</td> <td>N/A</td>	Q-11	0			Negligible	Unlikely	N/A
Construction Management         Construction Management         Negligible         Unlikely         O           C1-14         Construction Management         Negligible         Unlikely         O           Speciality Tabrication or Equipment         Terreportation of pipe and other relocation material-sequence to the construction of pipe and other relocation of and the renove boom of and. Equipment transport of failure would likely to mean expension, to adding in microared and cost and schedule of depy continue could table or and equipment transport of failure would likely to mean expension, to add table or and equipment transport of the overall project cost.         Marginal         Unlikely         O           FE-1         Redocations         Terreportation of project could inpact cost and schedule if repairs are necessary to dedging a quipment. The transport of reversal expension and equipment project cost.         Marginal         Unlikely         O           FE-2         Dredging         Renote location of project could inpact cost and schedule if repairs are necessary to dedging quipment. The transport of reversal expension and equipment project cost.         Marginal         Marginal         V/A           FE-3         0         Imaginal table conject cost and schedule if repairs are necessary to dedging quipment. The transport of reversal expension and equipment project cost.         Negligible         Unlikely         N/A           FE-4         0         Imaginal table conject cost and the conject cost.         Negligible         Unlikely <t< td=""><td>Q-12</td><td></td><td></td><td></td><td>Negligible</td><td>Unlikely</td><td>N/A</td></t<>	Q-12				Negligible	Unlikely	N/A
Specialty Fabrication or Equipment         Maximum Project Sorth         50%           FE-1         Transportation of pips and other relocation during length or the more location of work. Equipment transport of failure work differed work grade data the long and shelled differed data the difference of the more location of work. Equipment transport of failure work differed work grade data the long and work. Equipment transport of failure work grade data the long and work. Equipment transport of failure work grade data the long and work. Equipment transport of failure work grade data the long and work. Equipment transport of failure work grade data the long and work. Equipment transport of failure work grade data the long and work. Equipment transport of failure work grade data the long and work. Equipment transport of failure work grade data the long and work. Equipment transport of failure work grade data the long and work. Equipment transport of failure work grade data the long and work and shelled difference and the shelled. However, it is believed that the impacts of the brade base dufference and the shelled. However, it is believed that the impact and the brade data the long and	Q-13	Planning, Engineering, & Design			Negligible	Unlikely	0
Relocations         Transportation of pipe and other relocation materials/equipment could take bringer than anticipated due to remote location of work. Equipment repairs could take longer as well. An interessed linkood of equipment failure could casts from working in a marine environment.         Equipment transport of failure would likely be more expensive, resulting in increased unit costs and schedule debys during construction. However, thes costs would represent a small portion of the overall project cost.         Marginal         Unikely         0           FE-1         Dredging         Remote location of project could impact cost and schedule if repairs an necessary to dedging equipment. The transport of rews and equipment could take longer than anticipated, resulting in reduced productivity.         The decreased productivity resulting time impacts built to these issues would be minimal when compared to the overall cost of the project.         Marginal         Unikely         N/A           FE-3         0         Imagination of project could impact cost and schedule if repairs and necessary to dedging equipment. The transport of rews and equipment could take longer than anticipated, resulting in reduced productivity.         The decreased productivity resulting time impacts built to these issues would be minimal when compared to the overall cost of the project.         Marginal         Marginal         Unikely         N/A           FE-3         0         Imagination of project could impact cost and schedule if repairs and could take longer than anticipated.         N/A         N/A         N/A           FE-4         0         Imaginatimane deduced productivity<	Q-14	Construction Management			Negligible	Unlikely	0
Relocations         longer than anticipated due to remote location of work. Equipment tepairs could take longer as well. An increased tillhood dequipment tepairs could take longer as well. An increased tillhood dequipment tepairs could take longer than anticipated resulting in necessary to decigning as well. An increased tillhood dequipment. The factor and equipment delivery could the increase both maintenance and equipment delivery could the increase both are to the schedule. However, it is believed that the increase due to the schedule deliver out increases both are to the schedule. However, it is believed that the increase due to the schedule deliver out increases both are to the schedule. However, it is believed that the increase due to the schedule. However, it is believed that the increase due to the schedule. However, it is believed that the increase due to the schedule deliver out increases both are to the schedule. However, it is believed that the increase due to the schedule. However, it is believed that the increase due to the schedule. However, it is believed that the increase due to the schedule deliver out it is believed that the increase due to the schedule. However, it is believed that the increase due to the schedule. However, it is believed that the increase due to the schedule. However, it is believed that the increase due to the schedule. However, it is believed that the increase due to the schedule. However, it is believed that the increase due to the overall cost of the project.         Marginal         Marginal         Unikely         N/A           FE-3         0         0         0         0         N/A         N/A           FE-6         0         0         0         0         N/A         N/A           FE-7         0	Specialty	Fabrication or Equipment			Maximum Proje	ct Growth	50%
FE-2       Dedging       Remote location of project could ingraar cost and schedule if repairs are could make non-schedule. Interpairs are could take longer than anticipated, resulting in reduced productivity.       Image: mathemance and equipment/part delivery could increase both costs and the schedule. Interpairs are could take longer than anticipated, resulting in reduced productivity.       Marginal       Possible       1         FE-3       0 <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>							
FE-4Image: constraint of the sector of the sect	FE-1	Relocations	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small	Marginal	Unlikely	0
Image: constraint of the section of			longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the			
Image: constraint of the sector of the sec	FE-2	Dredging	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal	Possible	1
Image: constraint of the second se	FE-2 FE-3	Dredging 0	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal Negligible	Possible Unlikely	1 N/A
FE-7     0     Comparison     Comparison     Comparison       FE-8     0     0     0     N/A       Negligible     Unlikely     N/A	FE-2 FE-3 FE-4	Dredging 0	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal Negligible Negligible	Possible Unlikely Unlikely	1 N/A N/A
FE-8 V N/A	FE-2 FE-3 FE-4 FE-5	Dredging 0	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal Negligible Negligible Negligible	Possible Unlikely Unlikely Unlikely	1 N/A N/A N/A
FE-9 0 Negligible Unlikely N/A	FE-2 FE-3 FE-4 FE-5 FE-6	Dredging 0	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal Negligible Negligible Negligible Negligible	Possible Unlikely Unlikely Unlikely Unlikely	1 N/A N/A N/A N/A
	FE-2 FE-3 FE-4 FE-5 FE-6 FE-7	Dredging 0	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal Negligible Negligible Negligible Negligible Negligible	Possible Unlikely Unlikely Unlikely Unlikely Unlikely	1 N/A N/A N/A N/A N/A

FE-10 0	)			Negligible	Unlikely	N/A
FE-11 0	)			Negligible	Unlikely	N/A
FE-12				Negligible	Unlikely	N/A
FE-13 P	Planning, Engineering, & Design			Negligible	Unlikely	0
FE-14 C	Construction Management			Negligible	Unlikely	0
Cost Estima	te Assumptions			Maximum Proje	ct Growth	25%
CT-1 R	Relocations	The unit prices for pipeline relocations are based on the 2009 estimate conducted by the Corps. Cost will be escilated to 2015 levels based on the Corps escalation indices. The elevation of some pipelines are unkown and need to be assumed for this phase of the project.	The potential exists for the unit costs of relaocations to be increased subsequent to the plannig phase of the project. This would result in marginally increased cost for the overall project.	Marginal	Unlikely	0
CT-2 E	Dredging	Shoaling rates are based on past data and the disposal plan used for development of dredging unit costs is based on assumptions associated with the existing disposal areas. Dredging quantities are also based on an assumed starting depth of the channel and could could be increased once a survey is conducted. Productivity rates were developed via CEDEP which is based on disposal plan assumptions as well.	It is possible that dredging quantities would increase during the design phase of the project, once more information in know about the existing depths of the channel. This would result in moderate increases to the project costs. It is also possible that the dredged material disposal plan would be modified based on new data, potentially increasing costs.	Moderate	Possible	2
СТ-3 0	)			Moderate	Possible	N/A
CT-4 0	)			Negligible	Unlikely	N/A
CT-5 0	)			Negligible	Unlikely	N/A
CT-6 0	)			Negligible	Unlikely	N/A
CT-7 0	)			Negligible	Unlikely	N/A
CT-8 0	)			Negligible	Unlikely	N/A
СТ-9 0	)			Negligible	Unlikely	N/A
CT-10 0	)			Negligible	Unlikely	N/A
CT-11 0	)			Negligible	Unlikely	N/A
CT-12				Negligible	Unlikely	N/A
CT-13 F	Planning, Engineering, & Design			Negligible	Unlikely	0

CT-14	Construction Management			Negligible	Unlikely	0
<u>External P</u>	roject Risks		• •	Maximum Proje	ct Growth	20%
EX-1	Relocations	Fuel prices used for the estimate are near a two-year low, so the potential for increased fuel costs exiits. This would increase the cost of equipment operation and material/crew transport.	Increases in fuel prices are likely to impact costs. These impacts would be moderate due to the heavy reliance on fuel to operate equipment and transport material. Overall the impacts to cost would be moderate.	Marginal	Unlikely	0
EX-2	Dredging	Extreme weather events are a possibility in Coastal Louisiana, with the potential to delay the project significantly or damage construction equipment. Shoaling rates would also increase during such an event, potentially impacting dredging quantities. Fuel prices used for the estimate are near a two-year low, so the potential for increased fuel costs exiits.	Increases in fuel prices are likely and the cost impact would be moderate. Storm impacts could be significant, but the liklihood is small. The cost and schedule impacts would be marginal. Overall the impacts to cost would be moderate.	Moderate	Possible	2
EX-3	0			Marginal	Possible	N/A
EX-4	0			Negligible	Unlikely	N/A
EX-5	0			Negligible	Unlikely	N/A
EX-6	0			Negligible	Unlikely	N/A
EX-7	0			Negligible	Unlikely	N/A
EX-8	0			Negligible	Unlikely	N/A
EX-9	0			Negligible	Unlikely	N/A
EX-10	0			Negligible	Unlikely	N/A
EX-11	0			Negligible	Unlikely	N/A
EX-12				Negligible	Unlikely	N/A
EX-13	Planning, Engineering, & Design			Negligible	Unlikely	0
EX-14	Construction Management			Negligible	Unlikely	0

# Houma Navigation Canal Deepening Project 2B 20-Earth Feasibility (Alternatives)

Abbreviated Risk Analysis

WBS	Potential Risk Areas	Project Scope Growth	Acquisition Strategy	Construction Elements	Quantities for Current Scope	Specialty Fabrication or Equipment	Cost Estimate Assumptions	External Project Risks	Cost in Thousands
01 LANDS AND DAMAGES	Real Estate								\$0
02 RELOCATIONS	Relocations	0	0	0	0	0	0	0	\$0
12 NAVIGATION, PORTS AND HARBORS	Dredging	1	1	1	2	1	2	2	\$769,046
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
All Other	Remaining Construction Items	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
30 PLANNING, ENGINEERING, AND DESIGN	Planning, Engineering, & Design	0	0	0	0	0	0	0	\$76,905
31 CONSTRUCTION MANAGEMENT	Construction Management	0	0	0	0	0	0	0	\$61,524
			•	•		•	·		\$907,474
Risk		\$ 16,083	. ,		. ,		. ,		\$203,674
ixed Dollar Risk Allocation								\$ -	\$0
	Risk	\$ 16,083	\$ 15,184	\$ 76,741	\$ 25,490	\$ 16,817	\$ 27,869		\$203,674
								Total	\$1,111,148

	Project (less than \$40M) Project Development Stage/Alternative:	Abbreviated Risk Analysis Houma Navigation Canal Deepening Proj Feasibility (Alternatives) Low Risk: Typical Construction, Simple	ect			Alternative Meeting Date		20-Rock 11/2/2015	
	Т	otal Estimated Construction Contract Cost =	\$	156,295,500					
	CWWBS	Feature of Work	<u>Co</u>	ontract Cost		% Contingency	\$	Contingency	<u>Total</u>
	01 LANDS AND DAMAGES	Real Estate	\$	-		0.00%	\$	- \$	-
1	02 RELOCATIONS	Relocations	\$	16,965,700		23.25%	\$	3,943,711 \$	20,909,411
2	12 NAVIGATION, PORTS AND HARBORS	Dredging	\$	139,329,800		32.02%	\$	44,608,186 \$	183,937,986
3			\$	-		0.00%	\$	- \$	-
4			\$	-		0.00%	\$	- \$	-
5			\$	-		0.00%	\$	- \$	-
6			\$	-		0.00%	\$	- \$	-
7						0.00%	\$	- \$	_
8			\$	-		0.00%	\$	- \$	-
9			\$	-		0.00%	\$	- \$	-
10			s			0.00%	\$	- \$	
11			\$			0.00%	\$	- \$	
	All Other	Remaining Construction Items	\$		0.0%	0.00%	\$	- \$	
	30 PLANNING, ENGINEERING, AND DESIGN	Planning, Engineering, & Design	\$	15,629,550	0.070	16.15%	\$	2,523,563 \$	18,153,113
	31 CONSTRUCTION MANAGEMENT	Construction Management	\$	12,503,640		16.15%	\$	2,018,850 \$	14,522,490
	FIXED DOLLAR RISK ADD (EQUALLY DISPERSED TO ALL, MUS		<u> </u>	12,000,040		10.1070	\$		11,022,100
	TALE BOLLAR RIGK ADD (LOOALL'I DISI'LIGED TO ALL, MOL								
		Totals Real Estate Total Construction Estimate Total Planning, Engineering & Design Total Construction Management	\$ \$	- 156,295,500 15,629,550 12,503,640		0.00% 31.06% 16.15% 16.15%	\$\$	- \$ 48,551,897 \$ 2,523,563 \$ 2,018,850 \$	- 204,847,397 18,153,113 14,522,490
		Total	\$	184,428,690		29% Base	\$	53,094,310 \$ 50%	237,523,000 80%
			Ra	ange Estimate (\$0	00's)	\$184,429	k	\$216,285k	\$237,523k
	<b>Fixed Dollar Risk Add:</b> (Allows for additional risk to be added to the risk analsyis. Must include justification. Does not allocate to Real Estate.						*	50% based on base is at 5% CL.	

### Houma Navigation Canal Deepening Project 2C 20-Rock

Feasibility (Alternatives) Abbreviated Risk Analysis Meeting Date: 2-Nov-15



Risk Element	Feature of Work		PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Impact	Likelihood	Risk Level
Project Sco	ope Growth			Maximum Proje	ct Growth	40%
PS-1	Relocations	Some utility elevations could not be determined. Relocation costs are 6 years old. Unidentified utilities or oil/gas infrastructure could be located during construction.	The need for additional relocations are a possability, which would increase the scope of the project and mpact cost/schedule.	Marginal	Possible	1
PS-2	Dredging	A full Dredged Material Disposal Plan has not been developed. Some depths and elevations for proposed disposal areas were assumed, without survey data. Disposal quantities could also be increased based on low maintenance activities and old survey information. It could be determined that foreshore protection and rock retention could be required in additional areas other than those recommended. This could lead to the need for additional rock retention, foreshore protection, and floatation channel dredging.	The proposed disposal locations will be revisted during the design phase, but some changes to the costs associated with the current plan is likely. Additional quantites could require changes to the proposed disposal areas and lead to increases in scope. Any changes to the rock requirements could increase the project scope, but it would have a minimal impact on overall costs.	Moderate	Possible	2
PS-3	0			Moderate	Possible	N/A
PS-4	0			Negligible	Unlikely	N/A
PS-5	0			Negligible	Unlikely	N/A
PS-6	0			Negligible	Unlikely	N/A
PS-7	0			Negligible	Unlikely	N/A
PS-8	0			Negligible	Unlikely	N/A
PS-9	0			Negligible	Unlikely	N/A
PS-10	0			Negligible	Unlikely	N/A
PS-11	0			Negligible	Unlikely	N/A
PS-12				Marginal	Possible	N/A

PS-13	Planning, Engineering, & Design			Moderate	Likely	3
PS-14	Construction Management			Significant	Possible	3
<u>Acquisitio</u>	n Strategy		•	Maximum Proje	ct Growth	30%
AS-1	Relocations	Contract could require specialized work associated with environmental impacts of pipeline relocation and proper containment of material. The offshore nature of the work could limit the number of bids received to larger contracting companies.	A specialized pipeline relocation contractor could require a higher unit cost with a less competative bid. The overall cost ramifications of this would be minimal when compared to overall project costs.	Marginal	Possible	1
AS-2	Dredging	Dredging methodology for channel deepening would be widely available within south Louisiana, but offshore nature of the work could limit the number of bids.	A reduced number of bids could result in higher unit costs. However, based on the amount of ongoing dredging work within the channel over the past 20 years, it is believed the likihood of this occuring is minimal.	Marginal	Possible	1
AS-3	0			Moderate	Likely	N/A
AS-4	0			Negligible	Unlikely	N/A
AS-5	0			Negligible	Unlikely	N/A
AS-6	0			Negligible	Unlikely	N/A
AS-7	0			Negligible	Unlikely	N/A
AS-8	0			Negligible	Unlikely	N/A
AS-9	0			Negligible	Unlikely	N/A
AS-10	0			Negligible	Unlikely	N/A
AS-11	0			Negligible	Unlikely	N/A
AS-12				Negligible	Unlikely	N/A
AS-13	Planning, Engineering, & Design			Negligible	Unlikely	0
AS-14	Construction Management			Negligible	Unlikely	0
<u>Construct</u>	ion Elements			Maximum Proje	ct Growth	15%
CE-1	Relocations	Boat access would be required for relocations. Mobilization/Demobilization could take longer than anticipated. The potential exists for low-frequency weather events to delay work. Marine work could result in lower than anticipated productivity.	Impacts due to extended weather delays would be the most significant impact to cost and schedule, but the likelihood is low. With the amount of oil infrastructure existing in south Louisana, it is assumed a contractor familiar with the challenges of offshore pipeline relocation would be chosen. Therefore productivity issues would be minimal.	Moderate	Possible	2

CE-2	Dredging	Boat access would be required for survey crews and dredging equipment/crews. The potential exists for low-frequency weather events to delay work. Remote location of project could impact schedule if repairs are necessary to dredging equipment. Dredging methods would be fairly straight forward.	Dredging work is commonplace within the channel, so the risk of schedule delays or reduced productivity would center around the remote location or extreme weather events, not the dredging methods. The impact of a significant storm could be significant but liklihood is small.	Moderate	Possible	2
CE-3	0			Marginal	Possible	N/A
CE-4	0			Negligible	Unlikely	N/A
CE-5	0			Negligible	Unlikely	N/A
CE-6	0			Negligible	Unlikely	N/A
CE-7	0			Negligible	Unlikely	N/A
CE-8	0			Negligible	Unlikely	N/A
CE-9	0			Negligible	Unlikely	N/A
CE-10	0			Negligible	Unlikely	N/A
CE-11	0			Negligible	Unlikely	N/A
CE-12				Negligible	Unlikely	N/A
CE-13	Planning, Engineering, & Design			Negligible	Unlikely	0
CE-14	Construction Management			Negligible	Unlikely	0
<b>Quantities</b>	<u>s for Current Scope</u>			Maximum Proje	ct Growth	20%
Q-1	Relocations	The elevations of some pipelines are assumed or unkown. The potential exists for some unknown oil/gas infrastructure to be present. Shoaling rates utilized are based on past data, but the infrequency of maintenance dredging could result in pipelines found to be deeper than anticipated.	The potential exists for increased quantity requirements during the relocation phase of the project, but the cost impact would be small when compaed to the overall cost of the project.	Marginal	Possible	1
Q-2	Dredging	Disposal quantities could be underestimated based on the infrequent nature of maintenance dredging over the past 20 years. Pipeline distances may change is disposal areas are changed. Disposal area capacities are based on assumed depths without data from surveys.	Additional costs could be significant if additional dredging is required to achieve target depth. Dredging quantites required are based on dated survey information and assumed shoaling rates. Changes to the disposal plan during the design phase could increase costs.	Moderate	Possible	2
Q-3	0			Negligible	Likely	N/A
Q-4	0			Negligible	Unlikely	N/A

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0.7     0     1     1     1     1     1       0.4     0     1     1     1     1     1     1     1       0.4     0     1 <t< td=""><td>Q-5</td><td>0</td><td></td><td></td><td>Negligible</td><td>Unlikely</td><td>N/A</td></t<>	Q-5	0			Negligible	Unlikely	N/A
0.77000 $0.87$ 01NegativeUnitedNA $0.9$ 011NANA $0.9$ 011NANA $0.9$ 011NANA $0.9$ 011NANA $0.10$ 011NANA $0.11$ 011NANA $0.12$ 111NANA $0.12$ 1111NA $0.12$ 1111NA $0.13$ Pening Engineentin1111 $0.14$ Construction Matigementic1111 $0.14$ Construction of Equipmentic1111 $0.14$ Pening Engineentin1111 $0.14$ Pening Engineentin1111 $0.14$ Pening Engineentin11111 $0.14$ Pening Engineentin11111 $0.14$	Q-6	0			Negligible	Unlikely	N/A
0.88 $0$ $0$ Image: second	Q-7	0			Negligible	Unlikely	N/A
0.900111 <td>Q-8</td> <td>0</td> <td></td> <td></td> <td>Negligible</td> <td>Unlikely</td> <td>N/A</td>	Q-8	0			Negligible	Unlikely	N/A
C-10       P	Q-9	0			Negligible	Unlikely	N/A
Ci-11       P       Image: Circle Cir	Q-10	0			Negligible	Unlikely	N/A
0-13         Planning, Engineering, & Design         Index         <	Q-11	0			Negligible	Unlikely	N/A
Q-14         Construction Management         Index	Q-12				Negligible	Unlikely	N/A
Specialty Fabrication or Equipment         Maximum Project Orwith         50%           FE-1         Transportation of pipe and other relocation materials(equipment could late increased unit costs and schedule dety, during costs from working in a marine environment.         Feedocations         Marginal         Possible         1           FE-2         Dredging         Remote location of pipe and other relocation of pipe and other relocation of upic cost.         Equipment transport of fabre would likely be more exponding thermal schedule dety, during costs.         Marginal         Possible         1           FE-1         Dredging         Remote location of pipe and other relocation of pipe and other relocation of project cost.         The decreased productivity resulting from tonger than anticipated exponent. The transport of revise and schedule dety monthant determined and equipment to the overall project cost.         Marginal         Possible         1           FE-2         Dredging         Remote location of pipe and other relocation of project cost.         The decreased productivity resulting from tonger than anticipated exponent.         Marginal         Possible         1           FE-3         0         Image: Cost on display equipment. The transport of revise and the project.         The decreased productivity resulting in mature anticipated exponent.         Marginal         Marginal         N/A           FE-4         0         Image: Cost of the project.         Negligble         Unlikely         N/A </td <td>Q-13</td> <td>Planning, Engineering, &amp; Design</td> <td></td> <td></td> <td>Negligible</td> <td>Unlikely</td> <td>0</td>	Q-13	Planning, Engineering, & Design			Negligible	Unlikely	0
Here         Transportation of pipe and other relocation materials/equipment could take longer than anticipated due to remote location of wrk. Equipment transport of failure would likely be more expensive, could take longer as well. An increased lithood of equipment failure could east from working in a marine environment.         Equipment transport of failure would likely be more expensive, could take longer as well. An increased lithood of equipment failure could east from working in a marine environment.         Equipment transport of failure would likely be more expensive, could take longer than anticipated due to remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment/part delivery could increase both costs and the schedule. However, tile belowed that the impacts due to these sections.         Marginal         Possible         1           FE-3         Dredging         Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment/part delivery could increase both costs and the schedule. However, tile belowed that the impacts due to these issues would be minima when compared to the overall cost of the project.         Marginal         Possible         1           FE-4         0         Image: transport of crews and equipment/part delivery could increase both costs and the schedule. However, tile belowed that the impacts due to these issues would be minima when compared to the overall cost of the project.         Marginal         Possible         1           FE-6         0         Image: transport of crews and equipment/partelivery could increase both costs and the schedule. However, th	Q-14	Construction Management			Negligible	Unlikely	0
Relocations         borget than anticipated due to remote locating in increased unit costs and schedule delays during         Marginal         Possible         1           FE-1         Dredging         Renote locating in a marine environment.         The decreased productivity resulting in increased unit costs and schedule delays during         Marginal         Possible         1           FE-2         Dredging         Renote locating opticat cost and schedule delays during costs and the coverall project cost.         The decreased productivity resulting in increased unit costs and schedule delays during         Marginal         Possible         1           FE-2         Dredging         Renote locating opticat cost and schedule delays during in a marine environment.         The decreased productivity resulting in increase brind delays during delays during         Marginal         Possible         1           FE-3         Dredging         Renote locating opticat cost and schedule delays during in reduced productivity.         The decreased productivity resulting in increase brind delays during delays dur	Specialty I	Fabrication or Equipment			Maximum Proje	ct Growth	<b>50%</b>
FE-2       Dedging       Remote location of project could ingreate are model dimped to stand de schedule if repairs are model dimeter and equipment, the transport of creas and equipment, the transport of creas and equipment, the transport of creas and equipment could take longer than anticipated, resulting in reduced productivity.       matternance and equipment/part delivery could increase both could take longer than anticipated, resulting in reduced productivity.       Marginal       Possible       1         FE-3       0        NA       NA       NA       NA         FE-4       0        NA       NA       NA         FE-5       0         NA       NA         FE-6       0         NA       NA         FE-7       o         NA       NA         FE-7       o         NA       NA         FE-7       o         NA       NA         FE-7       o         NA       NA         FE-8       o          NA         FE-7       o           NA         FE-8       o           NA         FE-8 <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>							
FE-4ooooN/AFE-5oNegligibleUnlikelyN/AFE-6oNegligibleUnlikelyN/AFE-7oNegligibleUnlikelyN/AFE-8oNegligibleUnlikelyN/AFE-8oNegligibleUnlikelyN/ANegligibleNegligibleUnlikelyN/ANENNegligibleUnlikelyN/ANENNEN/AN/ANENNEN/AN/ANENNEN/AN/ANENNEN/AN/ANENNEN/AN/ANENNN/AN/ANENNN/AN/ANENNN/AN/ANENNN/AN/ANENNN/AN/ANENNN/ANENNN/ANENNN/ANNNN/ANN	FE-1	Relocations	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small	Marginal	Possible	1
Image: constraint of the section of			longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the			
Image: constraint of the sector of the sec	FE-2	Dredging	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal	Possible	1
Image: constraint of the second se	FE-2 FE-3	Dredging 0	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal	Possible Unlikely	1 N/A
FE-7     0     Comparison     Comparison     Comparison       FE-8     0     0     0     N/A       Negligible     Unlikely     N/A	FE-2 FE-3 FE-4	Dredging 0	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal Negligible Negligible	Possible Unlikely Unlikely	1 N/A N/A
FE-8 V N/A	FE-2 FE-3 FE-4 FE-5	Dredging 0	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal Negligible Negligible Negligible	Possible Unlikely Unlikely Unlikely	1 N/A N/A N/A
FE-9 0 Negligible Unlikely N/A	FE-2 FE-3 FE-4 FE-5 FE-6	Dredging 0	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal Negligible Negligible Negligible Negligible	Possible Unlikely Unlikely Unlikely Unlikely	1 N/A N/A N/A N/A
	FE-2 FE-3 FE-4 FE-5 FE-6 FE-7	Dredging 0	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal Negligible Negligible Negligible Negligible Negligible	Possible Unlikely Unlikely Unlikely Unlikely Unlikely Unlikely Unlikely	1 N/A N/A N/A N/A N/A

FE-10	0			Negligible	Unlikely	N/A
FE-11	0			Negligible	Unlikely	N/A
FE-12				Negligible	Unlikely	N/A
FE-13	Planning, Engineering, & Design			Negligible	Unlikely	0
FE-14	Construction Management			Negligible	Unlikely	0
Cost Estim	ate Assumptions			Maximum Proje	ct Growth	25%
CT-1	Relocations	The unit prices for pipeline relocations are based on the 2009 estimate conducted by the Corps. Cost will be escilated to 2015 levels based on the Corps escalation indices. The elevation of some pipelines are unkown and need to be assumed for this phase of the project.	The potential exists for the unit costs of relaccations to be increased subsequent to the plannig phase of the project. This would result in marginally increased cost for the overall project.	Marginal	Possible	1
CT-2	Dredging	the existing disposal areas. Dredging quantities are also based on an assumed starting depth of the channel and could could be increased once a	about the existing depths of the channel. This would result in moderate increases to the project costs. It is also possible that	Moderate	Likely	3
CT-3	0			Moderate	Possible	N/A
CT-4	0			Negligible	Unlikely	N/A
CT-5	0			Negligible	Unlikely	N/A
CT-6	0			Negligible	Unlikely	N/A
CT-7	0			Negligible	Unlikely	N/A
CT-8	0			Negligible	Unlikely	N/A
CT-9	0			Negligible	Unlikely	N/A
CT-10	0			Negligible	Unlikely	N/A
CT-11	0			Negligible	Unlikely	N/A
CT-12				Negligible	Unlikely	N/A
CT-13	Planning, Engineering, & Design			Negligible	Unlikely	0
				_		

CT-14	Construction Management			Negligible	Unlikely	0
External P	roject Risks		•	Maximum Proje	ct Growth	20%
EX-1	Relocations	Fuel prices used for the estimate are near a two-year low, so the potential for increased fuel costs exiits. This would increase the cost of equipment operation and material/crew transport.	Increases in fuel prices are likely to impact costs. These impacts would be moderate due to the heavy reliance on fuel to operate equipment and transport material. Overall the impacts to cost would be moderate.	Moderate	Possible	2
EX-2	Dredging	Extreme weather events are a possibility in Coastal Louisiana, with the potential to delay the project significantly or damage construction equipment. Shoaling rates would also increase during such an event, potentially impacting dredging quantities. Fuel prices used for the estimate are near a two-year low, so the potential for increased fuel costs exilts.	Increases in fuel prices are likely and the cost impact would be moderate. Storm impacts could be significant, but the liklihood is small. The cost and schedule impacts would be marginal. Overall the impacts to cost would be moderate.	Moderate	Possible	2
EX-3	0			Marginal	Possible	N/A
EX-4	0			Negligible	Unlikely	N/A
EX-5	0			Negligible	Unlikely	N/A
EX-6	0			Negligible	Unlikely	N/A
EX-7	0			Negligible	Unlikely	N/A
EX-8	0			Negligible	Unlikely	N/A
EX-9	0			Negligible	Unlikely	N/A
EX-10	0			Negligible	Unlikely	N/A
EX-11	0			Negligible	Unlikely	N/A
EX-12				Negligible	Unlikely	N/A
EX-13	Planning, Engineering, & Design			Negligible	Unlikely	0
EX-14	Construction Management			Negligible	Unlikely	0

# Houma Navigation Canal Deepening Project 2C 20-Rock Feasibility (Alternatives)

Abbreviated Risk Analysis

WBS	Potential Risk Areas	Project Scope Growth	Acquisition Strategy	Construction Elements	Quantities for Current Scope	Specialty Fabrication or Equipment	Cost Estimate Assumptions	External Project Risks	Cost in Thousands
01 LANDS AND DAMAGES	Real Estate								\$0
02 RELOCATIONS	Relocations	1	1	2	1	1	1	2	\$16,966
12 NAVIGATION, PORTS AND HARBORS	Dredging	2	1	2	2	1	3	2	\$139,330
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
All Other	Remaining Construction Items	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
30 PLANNING, ENGINEERING, AND DESIGN	Planning, Engineering, & Design	3	0	0	0	0	0	0	\$15,630
31 CONSTRUCTION MANAGEMENT	Construction Management	3	0	0	0	0	0	0	\$12,504
									\$184,429
Risk		\$ 9,021	\$ 3,086	\$ 17,527	\$ 4,927	\$ 3,418	\$ 9,935	\$ 5,180	\$53,094
ixed Dollar Risk Allocation		\$-	\$-		Ŧ	\$-	\$-	\$-	\$0
	Risk	\$ 9,021	\$ 3,086	\$ 17,527	\$ 4,927	\$ 3,418	\$ 9,935		\$53,094
								Total	\$237,523

		Abbreviated Risk Analysis Houma Navigation Canal Deepening Project	ct			Alternative	2C 2	20-Rock	
		Low Risk: Typical Construction, Simple				Meeting Date:		11/2/2015	
	Т	otal Estimated Construction Contract Cost =	\$	881,596,248					
	CWWBS	Feature of Work	<u>C</u>	ontract Cost		% Contingency	<u>\$</u>	Contingency	Total
	01 LANDS AND DAMAGES	Real Estate	\$	_		0.00%	\$	- \$	_
1	02 RELOCATIONS	Relocations				0.00%	\$	- \$	-
2	12 NAVIGATION, PORTS AND HARBORS	Dredging	\$	881,596,248		25.22%	\$	222,373,238 \$	1,103,969,48
3			\$			0.00%	\$	- \$	-
4			\$	-		0.00%	\$	- \$	-
5			\$	-		0.00%	\$	- \$	-
6			\$			0.00%	\$	- \$	_
7			•			0.00%	\$	- \$	_
8			\$			0.00%	\$	- \$	
			\$ \$				\$	- \$	-
9			·			0.00%	Ŧ	•	-
0			\$	-		0.00%	\$	- \$	-
1			<u>\$</u>	-		0.00%	\$	- \$	-
	All Other		\$	-	0.0%	0.00%	\$	- \$	-
	30 PLANNING, ENGINEERING, AND DESIGN		\$	88,159,625		7.00%	\$	6,171,174 \$	94,330,79
4	31 CONSTRUCTION MANAGEMENT	Construction Management	\$	70,527,700		7.00%	\$	4,936,939 \$	75,464,63
X	FIXED DOLLAR RISK ADD (EQUALLY DISPERSED TO ALL, MUS	FINCLUDE JUSTIFICATION SEE BELOW)					\$	-	
		Totals	ŕ			0.00%	¢	¢	
		Real Estate Total Construction Estimate		- 881,596,248		0.00% 25.22%	\$ \$	- \$ 222,373,238 \$	- 1,103,969,48
		Total Planning, Engineering & Design		88,159,625		7.00%	\$	6,171,174 \$	94,330,79
		Total Construction Management		70,527,700		7.00%	\$	4,936,939 \$	75,464,63
		Total	\$	1,040,283,573		22%	\$	233,481,351 \$	1,273,764,92
						Base		50%	80
		-	Ra	ange Estimate (\$0	00's)	\$1,040,284		\$1,180,373k	\$1,273,76
	Fixed Dollar Risk Add: (Allows for additional risk to be added to the risk analsyis. Must include justification. Does not allocate to Real Estate.						. 5	u na udaletu Uli Udale îs di 37% UL.	

### Houma Navigation Canal Deepening Project 2C 20-Rock

Feasibility (Alternatives) Abbreviated Risk Analysis Meeting Date: 2-Nov-15



Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Impact	Likelihood	Risk Level
Project Sc	ope Growth			Maximum Proje	ct Growth	<b>40%</b>
PS-1	Relocations	Some utility elevations could not be determined. Relocation costs are 6 years old. Unidentified utilities or oil/gas infrastructure could be located during construction.	The need for additional relocations are a possability, which would increase the scope of the project and mpact cost/schedule.	Marginal	Unlikely	0
PS-2	Dredging	A full Dredged Material Disposal Plan has not been developed. Some depths and elevations for proposed disposal areas were assumed, without survey data. Disposal quantities could also be increased based on low maintenance activities and old survey information. It could be determined that foreshore protection and rock retention could be required in additional areas other than those recommended. This could lead to the need for additional rock retention, foreshore protection, and floatation channel dredging.	The proposed disposal locations will be revisted during the design phase, but some changes to the costs associated with the current plan is likely. Additional quantites could require changes to the proposed disposal areas and lead to increases in scope. Any changes to the rock requirements could increase the project scope, but it would have a minimal impact on overall costs.	Marginal	Possible	1
PS-3	0			Moderate	Possible	N/A
PS-4	0			Negligible	Unlikely	N/A
PS-5	0			Negligible	Unlikely	N/A
PS-6	0			Negligible	Unlikely	N/A
PS-7	0			Negligible	Unlikely	N/A
PS-8	0			Negligible	Unlikely	N/A
PS-9	0			Negligible	Unlikely	N/A
PS-10	0			Negligible	Unlikely	N/A
PS-11	0			Negligible	Unlikely	N/A
PS-12				Marginal	Possible	N/A

PS-13	Planning, Engineering, & Design			Marginal	Unlikely	0
PS-14	Construction Management			Marginal	Unlikely	0
<u>Acquisitio</u>	n Strategy			Maximum Proje	ct Growth	30%
AS-1	Relocations	Contract could require specialized work associated with environmental impacts of pipeline relocation and proper containment of material. The offshore nature of the work could limit the number of bids received to larger contracting companies.	A specialized pipeline relocation contractor could require a higher unit cost with a less competative bid. The overall cost ramifications of this would be minimal when compared to overall project costs.	Marginal	Unlikely	0
AS-2	Dredging	Dredging methodology for channel deepening would be widely available within south Louisiana, but offshore nature of the work could limit the number of bids.	A reduced number of bids could result in higher unit costs. However, based on the amount of ongoing dredging work within the channel over the past 20 years, it is believed the likihood of this occuring is minimal.	Marginal	Possible	1
AS-3	0			Moderate	Likely	N/A
AS-4	0			Negligible	Unlikely	N/A
AS-5	0			Negligible	Unlikely	N/A
AS-6	0			Negligible	Unlikely	N/A
AS-7	0			Negligible	Unlikely	N/A
AS-8	0			Negligible	Unlikely	N/A
AS-9	0			Negligible	Unlikely	N/A
AS-10	0			Negligible	Unlikely	N/A
AS-11	0			Negligible	Unlikely	N/A
AS-12				Negligible	Unlikely	N/A
AS-13	Planning, Engineering, & Design			Negligible	Unlikely	0
AS-14	Construction Management			Negligible	Unlikely	0
<u>Construct</u>	ion Elements			Maximum Proje	ct Growth	15%
CE-1	Relocations	Boat access would be required for relocations. Mobilization/Demobilization could take longer than anticipated. The potential exists for low-frequency weather events to delay work. Marine work could result in lower than anticipated productivity.	Impacts due to extended weather delays would be the most significant impact to cost and schedule, but the likelihood is low. With the amount of oil infrastructure existing in south Louisana, it is assumed a contractor familiar with the challenges of offshore pipeline relocation would be chosen. Therefore productivity issues would be minimal.	Marginal	Unlikely	0

		_				
CE-2	Dredging	Boat access would be required for survey crews and dredging equipment/crews. The potential exists for low-frequency weather events to delay work. Remote location of project could impact schedule if repairs are necessary to dredging equipment. Dredging methods would be fairly straight forward.	Dredging work is commonplace within the channel, so the risk of schedule delays or reduced productivity would center around the remote location or extreme weather events, not the dredging methods. The impact of a significant storm could be significant but liklihood is small.	Marginal	Possible	1
CE-3	0			Marginal	Possible	N/A
CE-4	0			Negligible	Unlikely	N/A
CE-5	0			Negligible	Unlikely	N/A
CE-6	0			Negligible	Unlikely	N/A
CE-7	0			Negligible	Unlikely	N/A
CE-8	0			Negligible	Unlikely	N/A
CE-9	0			Negligible	Unlikely	N/A
CE-10	0			Negligible	Unlikely	N/A
CE-11	0			Negligible	Unlikely	N/A
CE-12				Negligible	Unlikely	N/A
CE-13	Planning, Engineering, & Design			Negligible	Unlikely	0
CE-14	Construction Management			Negligible	Unlikely	0
<b>Quantities</b>	<u>s for Current Scope</u>			Maximum Proje	ct Growth	20%
Q-1	Relocations	The elevations of some pipelines are assumed or unkown. The potential exists for some unknown oil/gas infrastructure to be present. Shoaling rates utilized are based on past data, but the infrequency of maintenance dredging could result in pipelines found to be deeper than anticipated.	The potential exists for increased quantity requirements during the relocation phase of the project, but the cost impact would be small when compaed to the overall cost of the project.	Marginal	Unlikely	0
Q-2	Dredging	Disposal quantities could be underestimated based on the infrequent nature of maintenance dredging over the past 20 years. Pipeline distances may change is disposal areas are changed. Disposal area capacities are based on assumed depths without data from surveys.	Additional costs could be significant if additional dredging is required to achieve target depth. Dredging quantites required are based on dated survey information and assumed shoaling rates. Changes to the disposal plan during the design phase could increase costs.	Moderate	Possible	2
Q-3	0			Negligible	Likely	N/A
Q-4	0			Negligible	Unlikely	N/A

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00111	Q-5	0			Negligible	Unlikely	N/A
$\overline{Orr}$ $\overline{O}$ $\overline{Orr}$	Q-6	0			Negligible	Unlikely	N/A
0380111111 $048$ 00111<	Q-7	0			Negligible	Unlikely	N/A
0.9900000 $0.10$ 0111	Q-8	0			Negligible	Unlikely	N/A
C3-10     O     O     N/A       G-11     0     Image: Califor and	Q-9	0			Negligible	Unlikely	N/A
C-11       P       C <thc< th=""> <thc< th=""></thc<></thc<>	Q-10	0			Negligible	Unlikely	N/A
Q-13         Planning, Engineering, & Design         Indication         Indication         Negligible         Unlikely         One           Q-14         Construction Management         Indication         Indication         Negligible         Unlikely         One           Speciality Fabrication or Equipment         Transportation of ppe and other relocation material-sequepment tables code and sequence than antiopated due to remote location of transportation of one experience code due to monow and equipment fabric code due to remote location of transportation of one experience code due to monow and equipment fabric code due to remote location of transportation of production, However, Hase code would represent a small code of the production, However, Hase code would represent a small code of the production, However, Hase code would represent a small code of the production, However, Hase code would represent a small code of the production, However, Hase code would represent a small code of the production, However, Hase code would represent a small code of the production, However, Hase code would represent a small code of the production, However, Hase code would represent a small code of the production, However, Hase code would represent a small code of the production, However, Hase code would represent a small code of the production, However, Hase code would represent a small code of the production, However, Hase code would represent a small code of the production, However, Hase code would represent a small code of the production, However, Hase code would represent a small code of the production, However, Hase code would represent a small code of the production, However, Hase code would represent a small code of the production, However, Hase code would represent a smalle code due to the productid to the production, However,	Q-11	0			Negligible	Unlikely	N/A
Control         Control <t< td=""><td>Q-12</td><td></td><td></td><td></td><td>Negligible</td><td>Unlikely</td><td>N/A</td></t<>	Q-12				Negligible	Unlikely	N/A
Specialty Fabrication or Equipment         Maximum Project Sork         50%           Specialty Fabrication or Equipment         Transportation of pipe and other relocation dury fabrication of spipe and other relocation dury fabrication of spipe and ther relocation dury fabrication of spipe and there spine and schedule diry spine transport of fabric would grows at a schedule diry during from tooger than antispet during on matrice service dury of the overall project cost.         Marginal         Unikely         0           FE-1         Dredging         Remote location of pipe and other relocation dury fabric cost.         The decreased productivity resulting from tooger than antispet during on motoring the antispet during on the overall project cost.         Marginal         Unikely         1           FE-2         Dredging         Remote location of pipe and other relocation of project cost and schedule if repairs as menessary to dredging equipment. The transport of rews and equipment dury of the schedule. However, is believed that the impacts cost and the schedule. However, is believed that the impacts cost and the schedule. However, is believed that the impact cost and the schedule is the project.         N/A           FE-3         0         Instance and equipment dury of the project.         N/A           FE-6         0         Instance and equipment due to minice and the schedule. However, is believed that the impact schedule is motor to rever and equipment.         N/A           FE-6         0	Q-13	Planning, Engineering, & Design			Negligible	Unlikely	0
Relocations         Transportation of pipe and other relocation materials/equipment could take bringer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lithiood of equipment failure could exist from working in a matine environment.         Equipment transport of failure would likely be more expensive, resulting in increased would represent a small portion of the overall project cost.         Marginal         Unlikely         O           FE-1         Dredging         Remote location of project could impact cost and schedule if repairs an necessary to dedging equipment. The transport of crews and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would periment delivery could increase both costs and the schedule. However, it is believed that the impacts out take longer than anticipated. If we would have compared to the overall cost of the project.         Marginal         Unlikely         N/A           FE-3         0         Negligible         Unlikely         N/A         N/A           FE-4         0         Negligible         Unlikely         N/A           FE-5         0         Negligible         Unlikely         N/A           FE-6         0         Negligible         Unlikely         N/A           FE-7         0         Negligible         Unlikely         N/A           FE-7         0         Negligible         Unlikely         N/A	Q-14	Construction Management			Negligible	Unlikely	0
Relocations         longer than anticipated due to remote location of work. Equipment trepatra could take longer swell, in increased illihood of equipment tailure could exist from working in a marine environment.         marginal         Marginal         Unlikely         O           FE-1         Dredging         Renote location of project could impact cost and schedule frequis are could take longer swell, in intereased productivity resulting from longer than anticipated mathematicated due to remote location of project could impact cost and schedule frequis are mathematicated due to remote location of project could impact cost and schedule frequis are could take longer than anticipated, resulting in reduced productivity.         The dormased productivity resulting from longer than anticipated anticipate cost and the schedule delaws during anticipate to the schedule delaws during take longer than anticipated, resulting in reduced productivity.         Marginal         Marginal         Unlikely         O           FE-3         0         O         Indexerse to the cost and the schedule delaws during anticipated to the overall cost of the project.         Negligible         Unlikely         N/A           FE-4         0         O         Indexerse to the overall cost of the project.         Negligible         Unlikely         N/A           FE-5         0         Indexerse to the cost and the schedule delaws during anticipated to the overall cost of the project.         Negligible         Unlikely         N/A           FE-6         0         Indexerse to the cost and the schedule delaws during	Specialty	Fabrication or Equipment			Maximum Proje	ct Growth	50%
FE-2       Dredging       Remote location of project could ingract cost and schedule if repairs are could make schedule. Hower, it is believer, it is believer, it is believer, it is believer, it is believer it is believer, it is believer it i			Transportation of pipe and other relocation materials/equipment could take	Equipment transport of foilure would likely be more expensive			
FE4Image: constraint of the section of th	FE-1	Relocations	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small	Marginal	Unlikely	0
Image: constraint of the section of			longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the			
FE-6       0       Image: Comparison of the compariso	FE-2	Dredging	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal	Possible	1
Image: constraint of the state of the st	FE-2 FE-3	Dredging 0	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal Negligible	Possible	1 N/A
FE-7     0     Image: Comparison of the second seco	FE-2 FE-3 FE-4	Dredging 0	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal Negligible Negligible	Possible Unlikely Unlikely	1 N/A N/A
FE-8 0 Negligible Unlikely N/A	FE-2 FE-3 FE-4 FE-5	Dredging 0	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal Negligible Negligible Negligible	Possible Unlikely Unlikely Unlikely	1 N/A N/A N/A
FE-9 0 Negligible Unlikely N/A	FE-2 FE-3 FE-4 FE-5 FE-6	Dredging 0	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal Negligible Negligible Negligible Negligible	Possible Unlikely Unlikely Unlikely Unlikely Unlikely	1 N/A N/A N/A N/A
	FE-2 FE-3 FE-4 FE-5 FE-6 FE-7	Dredging 0	longer than anticipated due to remote location of work. Equipment repairs could take longer as well. An increased lilihood of equipment failure could exist from working in a marine environment. Remote location of project could impact cost and schedule if repairs are necessary to dredging equipment. The transport of crews and equipment	resulting in increased unit costs and schedule delays during construction. However, these costs would represent a small portion of the overall project cost. The decreased productivity resulting from longer than anticipated maintenance and equipment/part delivery could increase both costs and the schedule. However, it is believed that the impacts due to these issues would be minimal when compared to the	Marginal Negligible Negligible Negligible Negligible Negligible	Possible Unlikely Unlikely Unlikely Unlikely Unlikely Unlikely Unlikely	1 N/A N/A N/A N/A N/A

FE-10 0	)			Negligible	Unlikely	N/A
FE-11 0	)			Negligible	Unlikely	N/A
FE-12				Negligible	Unlikely	N/A
FE-13 P	Planning, Engineering, & Design			Negligible	Unlikely	0
FE-14 C	Construction Management			Negligible	Unlikely	0
Cost Estima	te Assumptions		•	Maximum Proje	ct Growth	25%
CT-1 R	Relocations	The unit prices for pipeline relocations are based on the 2009 estimate conducted by the Corps. Cost will be escilated to 2015 levels based on the Corps escalation indices. The elevation of some pipelines are unkown and need to be assumed for this phase of the project.	The potential exists for the unit costs of relaocations to be increased subsequent to the plannig phase of the project. This would result in marginally increased cost for the overall project.	Marginal	Unlikely	0
CT-2 E	Dredging	Shoaling rates are based on past data and the disposal plan used for development of dredging unit costs is based on assumptions associated with the existing disposal areas. Dredging quantities are also based on an assumed starting depth of the channel and could could be increased once a survey is conducted. Productivity rates were developed via CEDEP which is based on disposal plan assumptions as well.	It is possible that dredging quantities would increase during the design phase of the project, once more information in know about the existing depths of the channel. This would result in moderate increases to the project costs. It is also possible that the dredged material disposal plan would be modified based on new data, potentially increasing costs.	Moderate	Possible	2
СТ-3 0	)			Moderate	Possible	N/A
CT-4 0	)			Negligible	Unlikely	N/A
CT-5 0	)			Negligible	Unlikely	N/A
CT-6 0	)			Negligible	Unlikely	N/A
CT-7 0	)			Negligible	Unlikely	N/A
CT-8 0	)			Negligible	Unlikely	N/A
СТ-9 0	)			Negligible	Unlikely	N/A
CT-10 0	)			Negligible	Unlikely	N/A
CT-11 0	)			Negligible	Unlikely	N/A
CT-12				Negligible	Unlikely	N/A
CT-13 F	Planning, Engineering, & Design			Negligible	Unlikely	0

CT-14	Construction Management			Negligible	Unlikely	0
<u>External P</u>	roject Risks			Maximum Proje	ct Growth	20%
EX-1	Relocations	Fuel prices used for the estimate are near a two-year low, so the potential for increased fuel costs exiits. This would increase the cost of equipment operation and material/crew transport.	Increases in fuel prices are likely to impact costs. These impacts would be moderate due to the heavy reliance on fuel to operate equipment and transport material. Overall the impacts to cost would be moderate.	Marginal	Unlikely	0
EX-2	Dredging	Extreme weather events are a possibility in Coastal Louisiana, with the potential to delay the project significantly or damage construction equipment. Shoaling rates would also increase during such an event, potentially impacting dredging quantities. Fuel prices used for the estimate are near a two-year low, so the potential for increased fuel costs exiits.	Increases in fuel prices are likely and the cost impact would be moderate. Storm impacts could be significant, but the liklihood is small. The cost and schedule impacts would be marginal. Overall the impacts to cost would be moderate.	Moderate	Possible	2
EX-3	0			Marginal	Possible	N/A
EX-4	0			Negligible	Unlikely	N/A
EX-5	0			Negligible	Unlikely	N/A
EX-6	0			Negligible	Unlikely	N/A
EX-7	0			Negligible	Unlikely	N/A
EX-8	0			Negligible	Unlikely	N/A
EX-9	0			Negligible	Unlikely	N/A
EX-10	0			Negligible	Unlikely	N/A
EX-11	0			Negligible	Unlikely	N/A
EX-12				Negligible	Unlikely	N/A
EX-13	Planning, Engineering, & Design			Negligible	Unlikely	0
EX-14	Construction Management			Negligible	Unlikely	0

# Houma Navigation Canal Deepening Project 2C 20-Rock Feasibility (Alternatives)

Abbreviated Risk Analysis

<u>WBS</u>	Potential Risk Areas	Project Scope Growth	Acquisition Strategy	Construction Elements	Quantities for Current Scope	Specialty Fabrication or Equipment	Cost Estimate Assumptions	External Project Risks	Cost in Thousands
01 LANDS AND DAMAGES	Real Estate								\$0
02 RELOCATIONS	Relocations	0	0	0	0	0	0	0	\$0
12 NAVIGATION, PORTS AND HARBORS	Dredging	1	1	1	2	1	2	2	\$881,596
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
All Other	Remaining Construction Items	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$0
30 PLANNING, ENGINEERING, AND DESIGN	Planning, Engineering, & Design	0	0	0	0	0	0	0	\$88,160
31 CONSTRUCTION MANAGEMENT	Construction Management	0	0	0	0	0	0	0	\$70,528
			•	•	•	•			\$1,040,284
Risk		\$ 18,437			. ,		. ,	. ,	\$233,481
Fixed Dollar Risk Allocation			•			•		\$ -	\$0
	Risk	\$ 18,437	\$ 17,406	\$ 87,972	\$ 29,220	\$ 19,278	\$ 31,948		\$233,481
								Total	\$1,273,765