



DEPARTMENT OF THE ARMY
NEW ORLEANS DISTRICT, CORPS OF ENGINEERS
P. O. BOX 60267
NEW ORLEANS, LOUISIANA 70160-0267

REPLY TO
ATTENTION OF

Planning, Programs, and Project Management Division
Environmental Planning and Compliance Branch

MAR 26 2009

Mr. Lawrence E. Starfield
Acting Regional Administrator
Environmental Protection Agency
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202-2733

Dear Mr. Starfield:

The purpose of this letter is to respond to questions raised by members of the Environmental Protection Agency (EPA) and some Non-Governmental Organizations (NGO) during the EPA Bayou aux Carpes 404(c) modification request comment period regarding the Gulf Intracoastal Waterway (GIWW) West Closure Complex (WCC) project and the US Army Corps of Engineers' (USACE) request for a modification to the 1985 Bayou aux Carpes Clean Water Act Section 404(c) final determination. The USACE requested a modification to the 1985 Bayou aux Carpes 404(c) final determination to enable construction of the GIWW WCC project, a part of the Greater New Orleans Hurricane and Storm Damage Risk Reduction System (HSDRRS). Some of the comments received questioned the necessity of building a floodwall on the previously impacted spoil bank on the edge of the Bayou aux Carpes 404(c) area and stated that the floodwall could be moved into the waters of the GIWW without consequence. Enclosed is the USACE's response to these comments.

As shown in the enclosed response, four alternatives for the Bayou aux Carpes 404(c) floodwall / levee system were considered during the government's evaluation process. Alternative 1 is the proposed action presented in Individual Environmental Report (IER) # 12. Alternatives 2 and 3 are floodwall variations located within the GIWW channel. The final alternative, Alternative 4, considered construction of an earthen levee within the Bayou aux Carpes 404(c) area along the eastern bank line. Alternative 4 was dismissed in the initial screening without further analysis due to the large footprint required for the levee section and the negative environmental impacts to the Bayou aux Carpes 404(c) area associated with it. Each of the floodwall alternatives was evaluated on providing reliable risk reduction against hurricane storm surge by 2011, impacts to the natural and human environment, maintaining a safe channel for navigation, construction complexities, costs, and associated long-term maintenance.

The constriction of the GIWW posed by alternatives 2 and 3 would adversely impact the ability of navigation traffic to reliably and safely pass through this area. Given the proximity of the proposed floodwall to the navigation channel, the high volume of marine traffic in this reach, and the types of commodities being transported, the risk of damage to the HSDRRS would be

too great and the danger that a damaged floodwall places on the people of the west bank for these alternatives was determined unacceptable. Furthermore, the increased risk of a catastrophic environmental event given the hazardous nature of some of the commodities being transported daily on the GIWW is unacceptable. A marine mishap along this segment of the channel with a floodwall in the GIWW channel poses a greater risk of environmental damage to the Bayou aux Carpes 404(c) site than does the WCC alternative (Alternative 1). Just last year, a barge accident occurred on the Mississippi River that released over 400,000 gallons of fuel oil. Much of this oil ended up in downstream marshes and National Wildlife Refuges. The effects of that oil spill on the environment will be seen for the next decade. If a similar accident were to occur in the proximity of the GIWW WCC floodwall and the floodwall were damaged, the potential impacts to the people of the west bank, the Bayou aux Carpes 404(c) area, the Jean Lafitte National and Historical Park, and other environmentally sensitive areas would be catastrophic. The US Coast Guard agrees with the Corps assessment that constructing a floodwall in the waterway would increase hazards to navigation and the possibility of a major marine accident. In a letter to the EPA, dated February 23, 2009, the US Coast Guard stated that it objects to the construction of any segment of the GIWW WCC floodwall in the GIWW channel.

Based on the risks associated with floodwall systems constructed in the GIWW channel, it is my determination that the safest and most reliable location to build the GIWW WCC floodwall is along the 100 ft by 4,200 ft previously impacted spoil bank identified as the proposed action for WCC in IER #12.

The EPA, USACE, and our other resource agency partners have closely collaborated on this issue for over a year and a half and have proposed a solution that provides the safest and most reliable system for the people of the area while still preserving the integrity and beauty of the Bayou aux Carpes 404(c) area. The proposed action would be constructed on the previously impacted spoil bank along the eastern edge of the Bayou aux Carpes 404(c) area, would minimize the impacts to the 3,000 acre Bayou aux Carpes 404(c) area and would result in less than 10 acres of unavoidable impacts to the area. The less than 10 acres impacted by the proposed project will be fully mitigated for as discussed in the final Individual Environmental Report that I approved on February 18, 2009. Because of the national significance of the Bayou aux Carpes 404(c) area, the team took additional steps to incorporate project features that will further improve the hydrology of the entire Bayou aux Carpes 404(c) area. Upon completion of the ongoing study and in coordination with the EPA and other resource agencies staff, those augmentations will be constructed.

The USACE recognizes the significance of this issue and greatly appreciates the cooperation the EPA has shown in working with the USACE in our efforts to construct the most reliable hurricane risk reduction system possible. The team's efforts to date have been nothing short of remarkable and truly reflect the partnership the EPA and the USACE have fostered.

As the EPA understands, there is tremendous urgency to minimize the risk to the public by completing the New Orleans HSDRRS by hurricane season 2011. I am requesting that the EPA evaluate the information provided in this letter and move forward to approve the USACE request to modify the 1985 Bayou aux Carpes CWA Section 404(c) final determination.

If you have any questions or concerns please contact Mr. Gib Owen at: US Army Corps of Engineers, CEMVN PM-R, Attn: Mr. Gib Owen, P.O. Box 60267, New Orleans, Louisiana, 70160-0267. Mr. Owen can be contacted by E-mail: gib.a.owen@usace.army.mil or by phone at (504) 862-1337.

Sincerely,



Alvin B. Lee
Colonel, US Army
District Commander

Enclosure
See page four for copies furnished.

Copies Furnished:

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Commander, Sector New Orleans
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Mr. Garret Graves
Chairman
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Authority of Louisiana
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Baton Rouge, Louisiana 70802

US Army Corps of Engineers, New Orleans District

Comparison of Alternatives: Floodwall on shoreline of the Bayou aux Carpes 404(c) site versus a floodwall in the GIWW channel.

INTRODUCTION:

At the February 11, 2009 joint Environmental Protection Agency (EPA)/U.S. Army Corps of Engineers (Corps) hearing on the Corps' request for modification to the Bayou aux Carpes Clean Water Act Section 404(c) Final Determination, several individuals and environmental groups requested that the EPA deny the Corps' request based on the assumption that the proposed floodwall could be constructed outside of the Bayou aux Carpes 404(c) area and in the Gulf Intracoastal Waterway (GIWW) with comparable risk reduction. Some of the speakers questioned whether the Corps had performed adequate studies on the possibility of placing a floodwall into the waterway. Additional comments were received by the EPA during the 404(c) modification public comment period urging that the EPA deny the Corps' request based upon the idea that moving the floodwall into the GIWW channel was a reasonable alternative.

In response to these comments, the Corps maintains that the construction of the floodwall in the GIWW channel is not a reasonable or practicable alternative as discussed in Individual Environmental Report (IER) #12. Although technically possible, issues of public safety, navigation safety, increased risk to the Hurricane and Storm Damage Risk Reduction System (HSDRRS) and substantial increases in cost and schedule all make the placement of the wall into the waterway impractical. The purpose of this response is to demonstrate that all reasonable alternatives were fully considered and evaluated and to document the data and rationale used by the Corps to make the determination that the placement of the floodwall within waters of the GIWW is not a viable alternative.

BACKGROUND:

Comments received at the public hearing suggested that construction of a floodwall in the GIWW channel could be accomplished because the navigable waterway is authorized as a 125 ft wide by 12 ft deep channel while the bank-to-bank width adjacent to 404(c) area is at least 500 ft wide on the surface. The GIWW for the purposes of discussion in this report is defined as the entire waterway (bank-to-bank) as it exists today. Within the GIWW is a federally maintained navigation channel with authorized channel bottom dimensions of 125 ft width by 12 ft depth. At the water surface, the channel has a 350 ft wide required "structure free zone" defined by the "structure limit lines" which extend 175 ft on either side of the channel center.

While the authorized channel dimensions and corresponding required "structure free zones" are defined, it is important to note that these boundaries typically have no physical constraints in regards to navigable channels - similar to the interstate highway system which has defined lanes with markers and boundaries, but often no physical constraints. On the interstate, vehicles controlled by humans for various reasons lose control and move beyond these boundaries, often with catastrophic results. The same is true for marine traffic on navigable waterways. One of the Corps' primary missions is to ensure that the nation's navigation industry has viable means

of commerce that meets the needs of the nation. A critical feature of this mission is to ensure the safety of the users of the channel as well as the general public, their property, and the infrastructure in the vicinity of any federally maintained navigation channel.

The GIWW is a heavily traveled inland commercial waterway that links over 30 ports along the Gulf Coast from Texas to Florida with connections to the Mississippi River via 3 navigation locks in the New Orleans area: Harvey, Algiers and Inner Harbor Navigation Canal. This section of the waterway services the critical transportation needs of the petrochemical and other industries vital to the United States economy, defense and infrastructure. Over 25 million tons of cargo and 35,000 vessel bottoms travel this section of the waterway yearly. Nearly 70% of the 25 million tons are volatile products of the petrochemical industry: benzene, crude oil, gasoline, jet fuel, organic solvents, propane, butane, naphtha, fertilizers and poisons. On average, 30 commercial barge tows navigate through the project area of the GIWW each day, all under the control of humans operating and piloting the vessels in all types of weather conditions.

In addition to the critical navigation function of this waterway, the Algiers and Harvey canals also serve as the main drainage conduit for the highly urbanized areas of the west bank collecting the discharge of nine interior drainage pumping stations with a total discharge capacity of over 28,000 cubic feet per second (cfs) . These discharges are directed through the GIWW and into the surrounding lakes and coastal marshes. Recreational boaters and commercial interests also use the waterway to access a variety of water bodies in the area. All of these factors were considered in the evaluation and development of the proposed alternatives.

ALTERNATIVES:

Four alternatives for the Bayou aux Carpes 404(c) floodwall / levee system were considered during the government's evaluation process. Three of the alternatives were screened out as not being reasonable or practicable at various stages of the plan formulation phase due to reasons discussed below. The first alternative is the proposed action presented in the IER #12 where the floodwall is placed within a 100 ft by 4,200 ft previously impacted spoil bank on the eastern edge of the Bayou aux Carpes 404(c) area. The second alternative was placement of a floodwall in the GIWW 50 ft from the edge of the bank of the Bayou aux Carpes 404(c) area protected to the maximum extent practical with a series of pipe pile dolphins that would extend into the GIWW approximately 50 ft beyond the floodwall. The third alternative follows the same alignment as Alternative 2 but would be a constructed earthen embankment in the GIWW in lieu of pipe pile dolphins. The final alternative considered was to construct an earthen levee within the Bayou aux Carpes 404(c) area along the eastern bank line. This alternative was dismissed without further evaluation due to the large footprint required for the levee section and the negative environmental impacts associated with it. All of the alternatives were initially screened for:

- The ability of the completed wall to provide reliable surge protection.
- Environmental impacts to the Bayou aux Carpes 404(c) area.
- Impacts to the natural and human environment.
- Impacts and concerns to navigation, especially in light of the fact that the structure would be constructed where 3 navigable waterways converge.
- Construction complexity and construction safety.

- Construction schedule
- Construction costs
- Long term maintenance

Hurricanes Katrina and Rita in 2005 and Gustav and Ike in 2008 emphasized the importance and urgency for considering all reasonable scenarios and investigating the most reliable, environmentally acceptable and constructible plan to reduce the risk to the residents and businesses for the West Bank area.

Each alternative was developed in sufficient detail to identify its relative strengths and weaknesses. Schematic typical sections presented herein are developed to a level of detail sufficient to generate preliminary quantities and costs. Detailed hydraulic modeling has not been performed and is not necessary for this analysis of potential wall locations. It is commonly understood any alternative that reduces the cross-sectional area of the channel will necessarily negatively impact the storm drainage function of the canals with higher stages upstream. Thus the comparison and selection of alternatives here is based on the preliminary design of each alternative to date as is common and acceptable practice in the field of engineering.

Safety is paramount in selecting an alternative for final design and construction. First and foremost, the selected plan must reliably reduce risk to the people of the United States who live and work behind the HSDRRS. Safe navigation for commercial and recreational craft is included in that mandate. Other factors considered include impacts to environmental integrity, construction costs, operational and maintenance costs, and construction duration.

DESCRIPTION AND DISCUSSION OF THE ALTERNATIVES:

Floodwall Alternative 1: Floodwall constructed on the previously impacted spoil bank within the 100 ft by 4,200 ft corridor along the eastern edge of the Bayou aux Carpes 404(c) area.

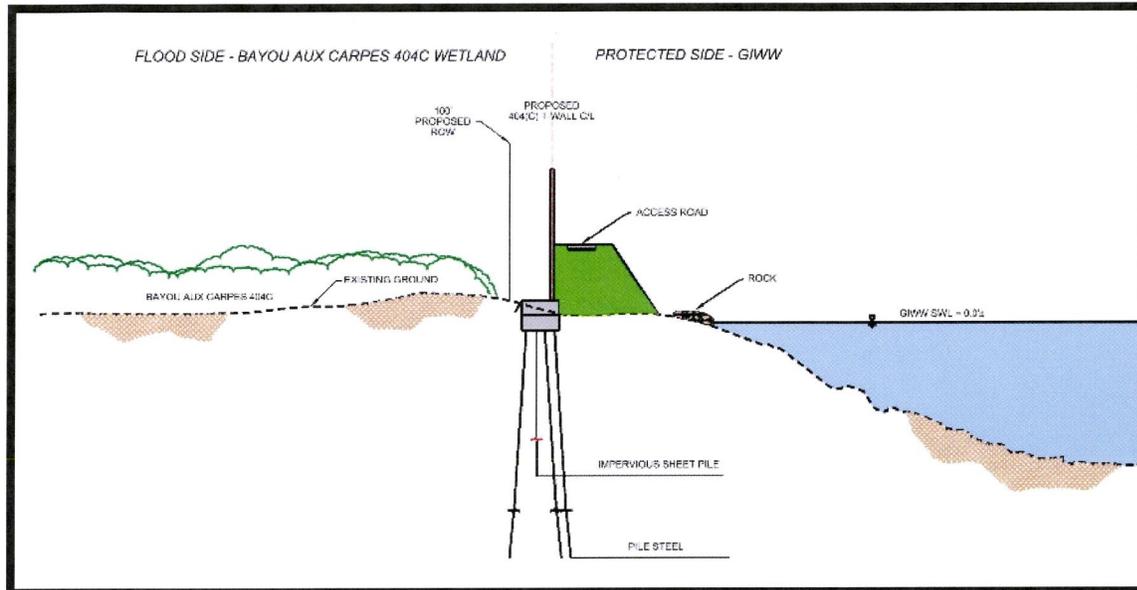


Diagram 1

Alternative 1 is the recommended proposed action (see Diagram 1). Under this alternative, the floodwall would be constructed on the previously impacted spoil bank within the Bayou aux Carpes 404(c) area. The design would consist of a T-wall design to minimize the footprint of the structure in the Bayou aux Carpes 404(c) area and foreshore protection using 650 lb stone in the GIWW adjacent to the Bayou aux Carpes 404(c) area. The T-wall would tie into the proposed flow control structure at the end of the Old Estelle Outfall Canal to the north and the closure and pump station complex that would cross the GIWW to the south. The T-wall would be constructed within the 100 ft by 4,200 ft corridor along the eastern edge of the Bayou aux Carpes 404(c) and include an earthen berm with an access road for maintenance and inspection purposes. The floodwall would be a cast-in-place reinforced concrete T-wall designed to elevation +16.0 ft (NAVD 88 2004.65) founded on three rows of steel H-piles. Preliminary design calculations indicate the concrete stem would be 14 ft tall and 2 to 3 ft thick, while the concrete slab would be 3 to 5 ft thick and 20 to 25 ft wide. A continuous steel sheet pile wall will be provided beneath the base slab for seepage cutoff purposes. Construction of the proposed action would impact no more than 9.6 acres within the Bayou aux Carpes 404(c) boundary. The Corps is committed to further reducing this footprint to the greatest extent practicable during the final design phase of this project.

With this proposed action, protection of the wall from potential barge impacts would be provided by the earthen berm and access road along the existing bank line constructed to elevation +8 ft (NAVD 88 2004.65) on the protected side of the floodwall. The location of the wall away from the waterway's edge increases the safety of the wall against potential

catastrophic barge tow impacts by absorbing the energy of the impact in the embankment, thus stopping the tow before it contacts the wall. Placement of the protected earthen berm outside the channel results in no constriction of the waterway as a storm water evacuation route. The reliability of the HSDRRS is highest for this alternative and the potential for damage to the protected side of the floodwall by the daily commercial marine traffic is lessened.

The placement of the wall within the 100 ft by 4,200 ft corridor on the previously impacted area of the Bayou aux Carpes 404(c) area, along with the commitment by the Corps to augment the design as necessary to enhance the hydrology of the Bayou aux Carpes 404(c) area to offset any potential impacts due to construction, provides the most practical approach from an environmental perspective while ensuring the 100-yr level of risk reduction is accomplished and completed expeditiously. Potential augmentation as discussed in IER #12 includes efforts to gap the existing spoil banks along the Old Estelle Outfall Canal and at the southern terminus of Bayou aux Carpes are under study by the Corps in cooperation with the EPA and other stakeholders to ensure that the unavoidable impacts to the 404(c) area are minimized to the greatest extent practicable.

Of the alternatives considered, Alternative 1 provides the greatest navigation safety because it provides greater distance between the floodwall structure and the typical path traveled by barge tows without encroachment or narrowing of the GIWW. It also eliminates the need for other appurtenant structures along the bank which could result in catastrophic impacts including environmental damages to people and the surrounding marsh system should an errant barge tow collide with the pipe pile dolphin protection system.

Floodwall Alternative 2: Floodwall constructed in the water along the eastern edge of the Bayou aux Carpes 404 (c) areas. Pipe pile dolphins added for protection.

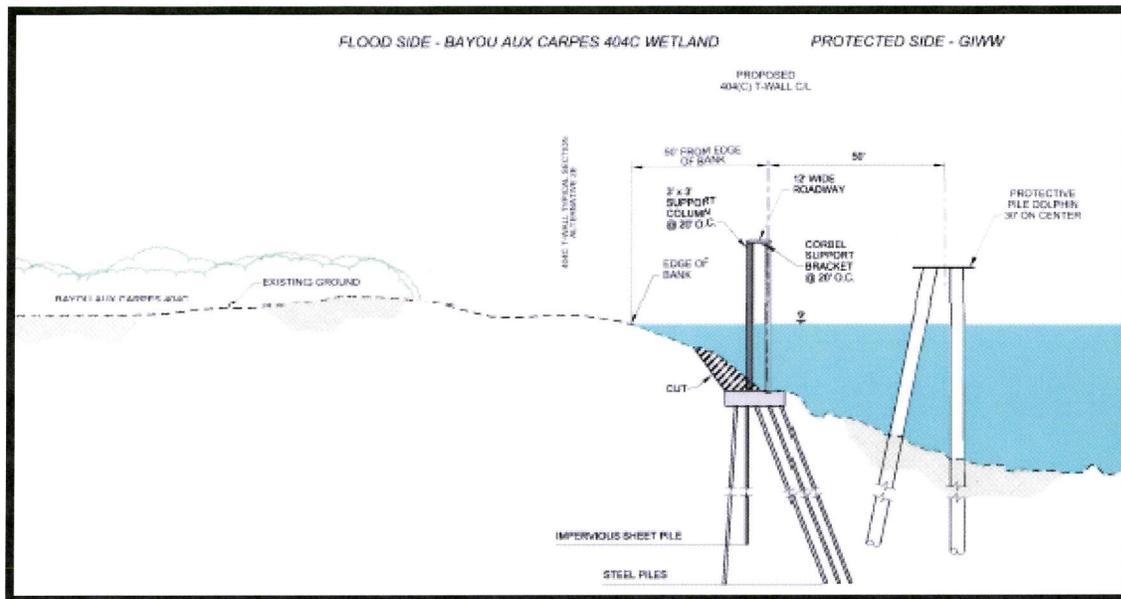


Diagram 2

In Alternative 2, the floodwall would be constructed in the water of the GIWW without affecting the surface of the previously impacted spoil bank of the Bayou aux Carpes 404(c) area (see Diagram 2). Preliminary analysis shows that the floodwall would be a cast in-place T-wall designed to elevation +16.0 ft (NAVD 88 2004.65) founded on four rows of steel H-piles. The concrete stem would be 26 ft tall and 3 to 5 ft thick, while the concrete slab would be 4 to 6 ft thick and 25 to 35 ft wide. A continuous steel sheet pile wall would be provided beneath the base slab for seepage cutoff purposes and extended 5 ft past the critical failure plane (elevation -30 ft (NAVD 88 2004.65)) per the latest HSDRRS Design Guidelines. A 12-ft-wide roadway supported by brackets and columns placed approximately 20 ft on center would be incorporated into the design for maintenance access and inspection purposes. The floodwall would be placed in the water of the GIWW 50 ft from the edge of the bank of the Bayou aux Carpes 404(c) area.

A system of pipe pile dolphins would be required to provide a substantial degree of protection to the protected side of the floodwall from daily commercial marine traffic. Based on a preliminary analysis and in accordance with the minimum requirements of the HSDRRS Design Guidelines, a row of about 140 pipe pile dolphins spaced at intervals of no more than 30 ft would be necessary to block vessels from impacting the floodwall. These protective dolphins would be located approximately 50 ft toward the channel from the wall to allow for underground pile clearances. It is important to note, however, that this is only a cursory analysis of required protection based on minimum requirements. Data obtained from the Algiers and Harvey Locks show that vessels traveling through the area weigh as much as 7,800 tons and may be traveling at 8 mph (per Gulf Intracoastal Canal Association). Impact forces calculated from the American Association of State Highway and Transportation Officials (AASHTO) Commentary for Vessel Collision Design show that impacts on the dolphins required in Alternative 2 could be significantly higher than those specified by the minimum design criteria. As a result, the

appropriate design loads and features necessary to provide an acceptable level of safety comparable to the protection offered by Alternative 1 remain undetermined. For the purposes of this analysis, it is sufficient to note that the resulting additional cost and design complexity further diminishes this alternative when compared to others.

Direct environmental impacts to the previously impacted spoil bank of the Bayou aux Carpes 404(c) area under this alternative would be eliminated. Project feature augmentations in the Bayou aux Carpes 404(c) area would not be required since there are no impacts to the 404(c) area. Surface hydrology would be maintained by a small channel between the bank and the floodwall on the flood side of the floodwall. This small channel would remain connected to the Old Estelle Outfall Canal to the north and the GIWW just south of the gate structures.

Alternative 2 does have the greatest potential for catastrophic human and environmental impacts from a spill that could be caused by a barge tow impacting the dolphin system and floodwall. Safety is of particular concern with this alternative which has been determined to be unacceptable to the US Coast Guard (USCG). The pipe pile dolphins constructed in the GIWW to provide floodwall protection would be exposed to the frequent barge tows that travel the waterway on a daily basis. The contents of navigation traffic in this area consist of many hazardous materials, and a collision impacting the wall and its protective structure creates the potential for severe negative environmental impacts on the sensitive 404(c) ecosystem, and surrounding businesses and residents. Both, the USCG, the federal agency responsible for navigation waterway safety, and the Gulf Intracoastal Canal Association representing the waterway users have expressed serious concerns on the severe navigation safety hazard presented by this alternative. As stated by Mr. Raymond Butler of the Gulf Intracoastal Canal Association in an e-mail to EPA, dated February 18, 2009, "This portion of the GIWW is one of the highest traveled reaches of the waterway, moving over half the total tonnage of the entire 1,300 mile long waterway. Nearly 70 million tons per year of petroleum, petrochemicals, chemical products and other bulk freight are moved on the waterway here. Most of this cargo is hazardous in nature and would pose significant environmental risk to this area should a barge incident be incited by the presence of this floodwall and its associated restrictive structures. Risks to navigation safety, the environment, and the public would be unnecessarily increased due to the presence of the supporting structures required by the proposed design change."

Construction of the floodwall in the channel under this alternative is more complex than the other alternatives considered. The proposed construction would be accomplished by means of an extensive internally-braced cofferdam system requiring unwatering of the cofferdam to provide a dry working area for the construction of the T-wall. Additionally, because the cofferdam would be in the proximity of the navigation channel, a barge protection system would be necessary to ensure the safety of the workers. This protection system would consist of the permanent dolphin system or a flexi-float barge system equipped with energy absorption devices. The protection system would need to be constructed prior to commencing work on the T-wall construction within the cofferdam, pushing out the construction schedule significantly. Also, even with a substantial protection system in place, there will remain some risk of a major barge impact into the cofferdam causing a catastrophic loss of life of those working within the cofferdam. Construction within the cofferdam would be staged from floating plants, greatly increasing the construction duration. The cofferdam would be removed upon completion of the floodwall.

Floodwall Alternative 3: Floodwall constructed in the water along the eastern edge of the Bayou aux Carpes 404(c) area. Man-made bank line and berm added for protection.

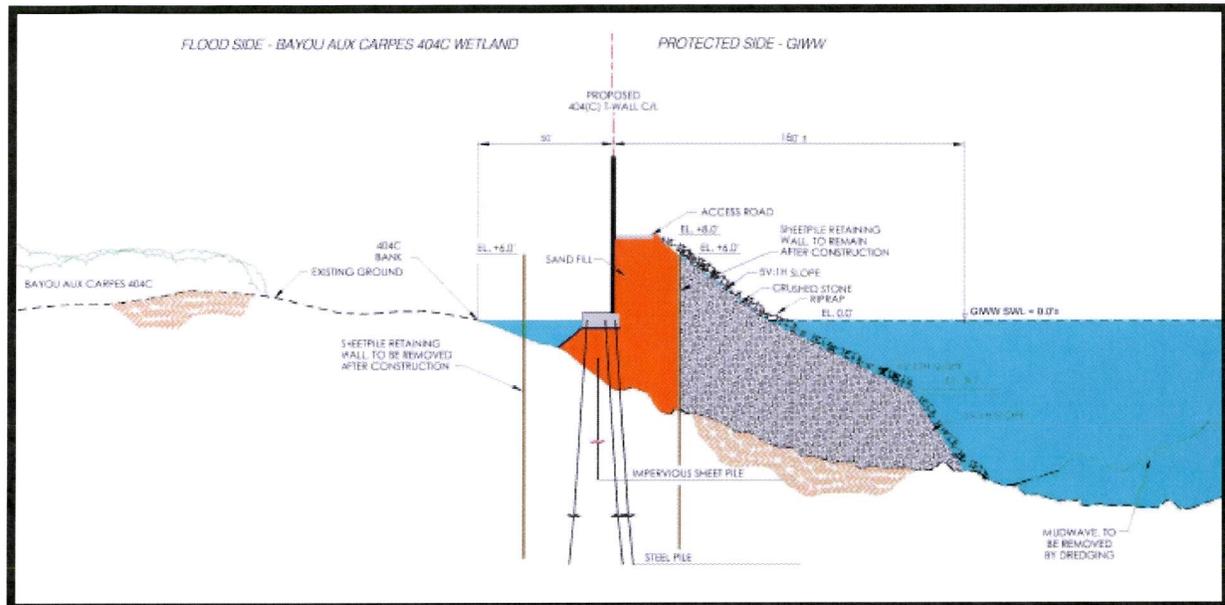


Diagram 3

Alternative 3 would be constructed on a man-made sand/stone embankment constructed in the GIWW along the eastern edge of the Bayou aux Carpes 404(c) area without affecting the surface of the previously impacted spoil bank of the Bayou aux Carpes 404(c) area (see Diagram 3). Like Alternative 1, a floodwall would be continuously protected from potential barge impacts by the man-made embankment. The floodwall would utilize a similar design as Alternative 1 and be a cast in-place T-wall designed to elevation +16.0 ft (NAVD 88 2004.65) founded on three rows of steel H-piles. Additional forces imposed on the piling from the embankment placed in the water will require that the steel H-piling be substantially increased in length from Alternative 1 for each of the piling driven. The concrete monolith would be similar to Alternative 1. A continuous steel sheet pile wall would be provided beneath the base slab for seepage cutoff purposes. The man-made embankment on the channel side of the wall would consist of sand fill placed between the T-wall and a separate sheet pile retaining wall, while a "67" type gradation of stone would be used for the embankment on the channel side of the sheet pile retaining wall. A minimum 2,200 lb stone cover would be placed over the "67" type gradation stone and sand to prevent erosion. Once the structure is complete, additional lifts of the 2,200 lb stone would be necessary to maintain the embankment design elevation. Because of the substantial amount of fill being placed in the channel, additional engineering analysis and modeling would be needed to quantify the potential for long term settlement, differential settlement, and lateral movement of the soil. Experience and knowledge in working in similar geomorphologic conditions indicates that the potential movement and/or settlement of materials could jeopardize the integrity, stability, and safety of the HSDRRS, and poses an unacceptable risk to the reliability of the project.

While this alternative would remove the direct impacts to the 100 ft wide by 4,200 ft long construction corridor located on the previously impacted spoil bank of the Bayou aux Carpes

404(c) area, it does have additional environmental impacts not present in Alternative 1. Construction of the man-made embankment in the GIWW would require the relocation of the channel further to the east from the Old Estelle Outfall Canal approximately 2,000 ft south towards the intersection with the Algiers Canal. This shift would be necessary for navigation as well as to maintain the cross section of the existing channel. The relocation of the channel would require the dredging of the Hero Cut. This dredging would have direct and permanent impacts on the island at the intersection of the Algiers and Harvey canals. Additionally, the material dredged from this area would be suspect due to the proximity of a barge cleaning and painting operation just across the canal. Based upon preliminary investigations by the Corps, this island is considered to pose a high risk of containing contaminated or hazardous substances due to the industrial complexes that have been operated in the area for years. Additionally, there are a number of abandoned barges in this area that are likely to pose a risk of contamination if disturbed. It is the policy of the United States Government to avoid areas that contain Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (formerly known as Superfund) regulated substances. Furthermore, the clean up of any hazardous substances would be the responsibility of the State of Louisiana acting as the non-Federal sponsor for this project. The disturbance of this site would likely lead to an extended delay in the construction of the project, thus delaying hurricane and storm damage risk reduction for the people of the West Bank for many more years. Augmentations in the Bayou aux Carpes 404(c) area would not be required for Alternative 3 since no impacts the 404(c) area would occur.

Impacts and concerns for the navigation industry under this alternative would be those associated with the construction and not the permanent feature since the channel would be modified as necessary to allow for safe navigation passage and drainage.

Construction of the floodwall in the channel under this alternative is more complex than Alternative 1, but has fewer complexities than Alternative 2. Construction would begin with the dredging necessary to establish the new navigation and drainage channel. This would be contingent upon environmental soil sampling and a determination that the material would be suitable for normal dredge material disposal. Construction of a cofferdam approximately 100 ft from the existing bank line of the 404(c) area would closely follow the relocation of the channel. The cofferdam would be similar to the cofferdam proposed for Alternative 1. Sand would be placed in the interior of the cofferdam to elevation+2.0 ft (NAVD88 2004.65) while small stone would be placed on the exterior of the cofferdam to elevation+2.0 ft (NAVD88 2004.65) to stabilize the cofferdam wall. Because of the weight of sand and stone that would be placed, a considerable amount of consolidation and lateral spread of the underlying soft, organic soils would occur, creating a "mud wave" within the GIWW. Additional dredging will be necessary to remove this "mud wave" during placement of the sand and stone material to maintain the authorized navigation channel. Because of the consolidation and lateral spread, multiple additional lifts of sand and stone would be necessary to stabilize the material at elevation+2.0 ft (NAVD88 2004.65) so that construction of the T-wall could commence. As with Alternative 2, because the cofferdam would be in the navigation channel, a barge protection system would be necessary to ensure the safety of the workers. This protection system would consist of a protective dolphin system or a flexi-float barge system equipped with energy absorption devices. The protection system would need to be constructed prior to commencing work on the T-wall

construction within the cofferdam, pushing out the construction schedule significantly. Also, even with a substantial protection system in place, there will remain some risk of a major barge impact into the cofferdam causing a catastrophic loss of life of those working within the cofferdam. Construction within the cofferdam would be staged from floating plants, greatly increasing the construction duration. The cofferdam will be removed upon completion of the floodwall.

Earthen Levee Alternative 4: Earthen levee constructed within the Bayou aux Carpes 404(c) along the eastern edge.

Alternative 4 would involve the construction of an earthen levee within the Bayou aux Carpes 404(c) area in lieu of the floodwall. The required footprint of the levee and berms within the Bayou aux Carpes 404(c) area was estimated to be over 300 ft wide by 4200 ft long and would require placement of material outside of the previously impacted spoil bank and on the floatant marsh itself. Because Alternatives 1, 2 and 3 involved less environmental impacts to the 404(c) area, Alternative 4 was eliminated from consideration without further analysis.

COSTS, CONSTRUCTION DURATION AND OPERATION AND MAINTENANCE COSTS:

Preliminary costs, construction durations and operation and maintenance (O&M) costs are provided for comparison purposes.

| Alternative | 1 | 2 | 3 | 4 |
|-------------------------------------|----------|-----------|-----------|------------|
| Estimated Initial Construction Cost | \$87 Mil | \$251 Mil | \$215 Mil | Eliminated |
| Construction Duration (months) | 18 | 24 | 28 | |
| Estimated Annual O&M Costs: | | | | |
| Floodwall | \$7,000 | \$7,000 | \$7,000 | |
| Maintenance Road | \$2,750 | | | |
| Foreshore Dike | \$21,000 | | | |
| Roadway, Bracket & Columns | | \$20,000 | | |
| Pipe Pile Dolphins | | \$100,000 | | |
| Rock Berm & Maintenance Access | | | \$200,000 | |
| TOTAL ANNUAL O&M: | \$30,750 | \$127,000 | \$207,000 | |

SUMMARY:

The Corps evaluated a number of alternatives for the Bayou aux Carpes 404(c) area. Three alternatives for the construction of a floodwall along the eastern edge of the Bayou aux Carpes 404(c) area were considered in sufficient detail to determine their viability. Alternative 1 is the proposed action presented in the Individual Environmental Report #12 where the floodwall is placed within a 100 ft by 4,200 ft corridor of the Bayou aux Carpes 404(c) area. The second alternative was placement of a floodwall in the GIWW 50 ft from the edge of the bank of the Bayou aux Carpes 404(c) area protected to the maximum extent practical with a series of pipe pile dolphins located in the GIWW approximately 50 ft beyond the floodwall. The third alternative follows the same alignment as alternative 2 but would be protected by a constructed embankment in the GIWW. All three of the floodwall alternatives were fully evaluated considering the following:

- The ability of the completed wall to provide reliable surge protection.
- Environmental impacts to the Bayou aux Carpes 404(c) area.
- Impacts to the human environment.
- Impacts and concerns to navigation, especially in light of the fact that the structure would be constructed where 3 navigable waterways converge.
- Construction complexity and construction safety.
- Construction schedule
- Construction costs
- Long term maintenance

The discussion of alternatives describes the relative strength and weaknesses associated with each. After review of all aspects and effects of the alternatives considered, Alternative 1 was selected as the recommended proposed action because it was determined to be the safest and most reliable location to build a floodwall. This alternative has minimal impacts to the Bayou aux Carpes 404(c) area (which would be fully mitigated), offers project augmentation features that would further improve the hydrology of the entire Bayou aux Carpes 404(c) area, is the most cost effective, practical alternative for the GIWW West Closure Complex, and has the shortest construction schedule.

Alternatives 2 and 3, which include construction of a floodwall system in the GIWW, have inherent risk and safety issues that are unacceptable to the Corps. These alternatives pose long-term risk of catastrophic failures and a hazardous condition given the probability for vessel collisions with the floodwall due to its placement in close proximity to a Federal navigation channel. The USCG also objects to the construction of any floodwall in the GIWW channel because of the increased hazards of vessels hitting the floodwall and causing a major marine incident.

The risks of damage to the HSDRRS would be so great as to be unacceptable with Alternatives 2 and 3 given the proximity of the floodwall to the Federal navigation channel, the high level of marine traffic utilizing the channel, and the types of commodities being transported. Furthermore, the increased risk of a catastrophic environmental event given the hazardous nature of some of the commodities being transported daily on the GIWW is unacceptable. A marine

mishap along this segment of the channel with a floodwall in the GIWW channel poses a significant risk to the people living in the area and of environmental damage to the Bayou aux Carpes 404(c) site than does the Alternative 1. Construction associated with either of these two alternatives would be extremely challenging and costly, would take longer and poses unacceptable risks to the Federal government.