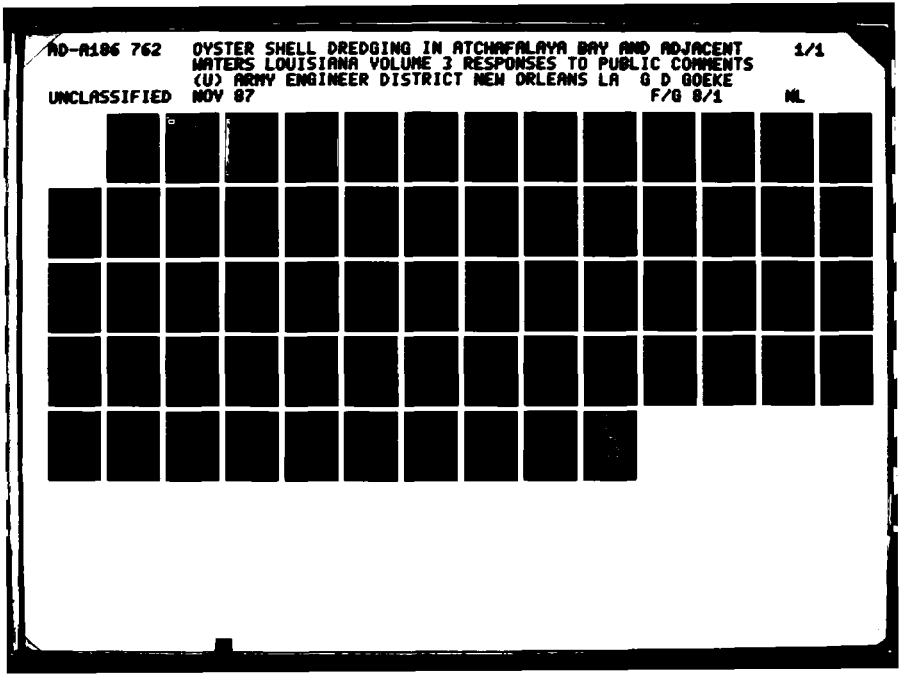
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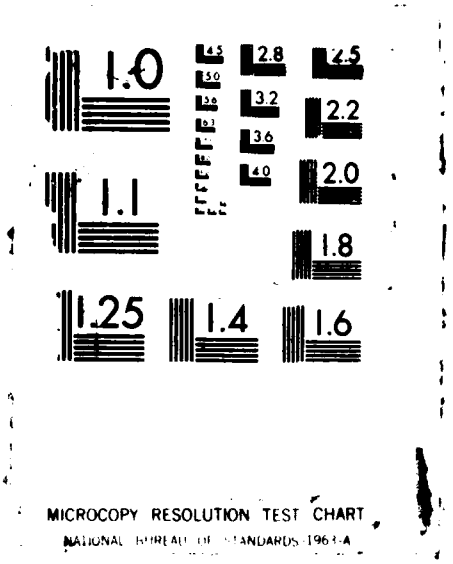
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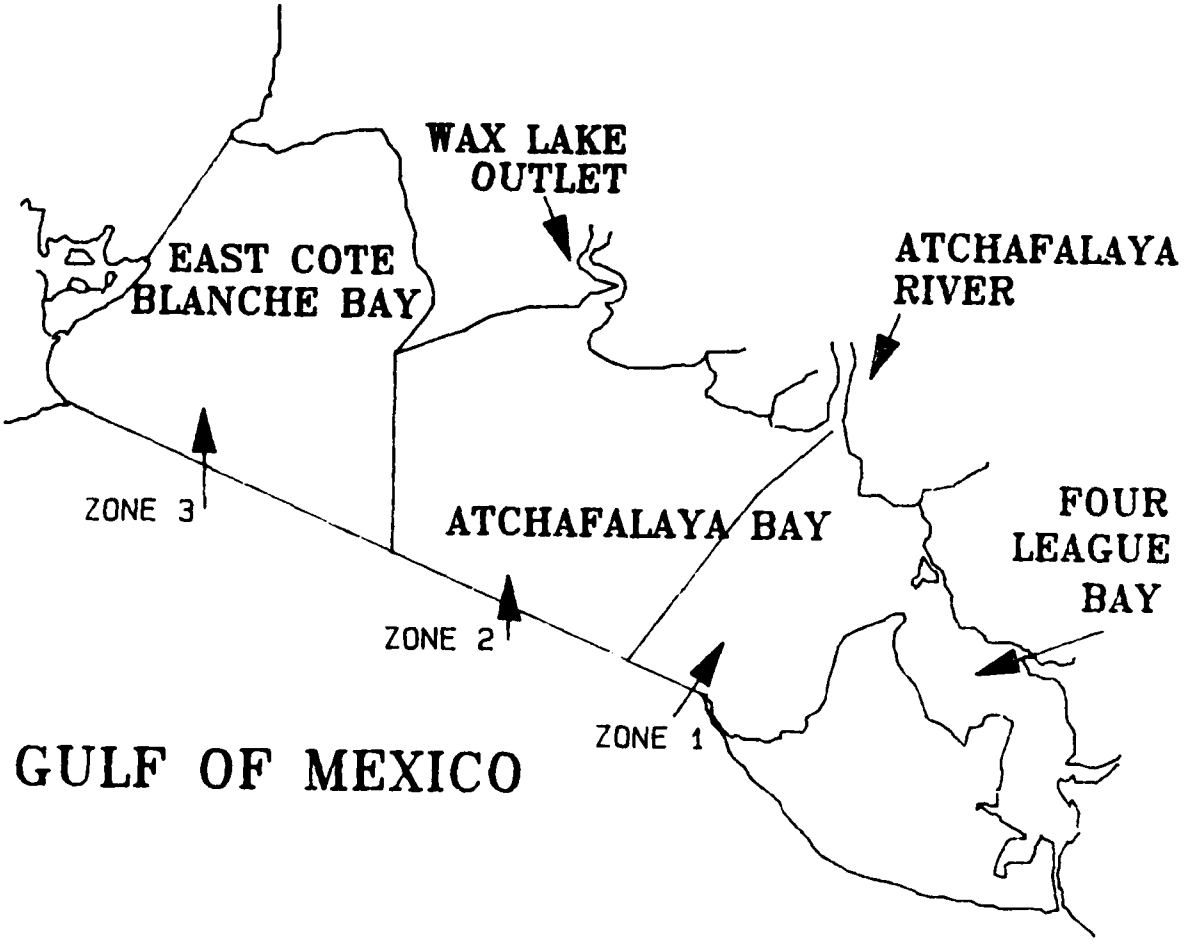

Volume 3 November 1987

Responses to Public Comments

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

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3. RECIPIENT'S CATALOG NUMBER	
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AUTHOR(s): Goeke, Gary, D.	8. CONTRACT OR GRANT NUMBER(s)
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Approved for Public Release, Distribution is Unlimited.

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SUPPLEMENTARY NOTES

KEY WORDS (Continue on reverse side if necessary and identify by block number)

Alternatives	Fisheries	Sediments
Benthos	Hydrological Resources	Shell Dredging
Cultural Resources	Oyster Reefs	Social Environment
Economic Environment	Pollution	Turbidity
Endangered Species	Refuges	Water Quality

ABSTRACT (Continue on reverse side if necessary and identify by block number)

Oyster shells have been removed by means of hydraulic cutter-head dredges from the waters of coastal Louisiana since 1917. The shells have been harvested primarily for use in construction activities, although a variety of other uses are common. There has been considerable controversy over the impacts of shell dredging. This Final Environmental Impact Statement has has been prepared to assess the impacts of oyster shell dredging in East Cote Blanche Bay, Atchafalaya Bay, and Four League Bay, Louisiana as (over)

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permitted under 5-year permits issued in 1982 that will expire in December 1987. The document also assesses the impacts of applications for 10-year permit extensions that would allow continuation of dredging under the same conditions. These permit actions are being considered under the authority of the Section 10 of the River and Harbor Act and Section 404 of the Clean Water Act. Numerous alternatives have been discussed and evaluated in the document.

VOLUME 3

RESPONSES TO PUBLIC COMMENTS

This volume contains responses to the comment letters on the Draft Environmental Impact Statement received from Federal and state agencies and other interested parties. Copies of the comment letters are provided in Volume 2. The letters contained in Volume 2 are bracketed into specific comments. This volume provides responses to each specific comment provided in Volume 2. The comments and responses are contained in separate volumes so they can be viewed side-by-side for ease of the reviewing public.

TABLE OF CONTENTS
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Federal Agencies

State Agencies

Others

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RESPONSE A.1.1. Comment noted.

RESPONSE A.2.1. Comment noted.

RESPONSE A.3.1. Comments expressed in this general comment are addressed below in responses to specific comments.

RESPONSE A.3.2. Comments expressed in this general comment are addressed below in responses to specific comments.

RESPONSE A.3.3. Shell reserves extracted from the coastal regions generally are below 3-8 feet of overburden and usually less than 20 feet below the waterbottom. Problems associated with shell removal range from personnel absenteeism to mechanical failure and are not entirely relevant to the EIS.

RESPONSE A.3.4. Indirect impacts associated with shell dredging are addressed in the body of the text, and are summarized in this section.

RESPONSE A.3.5. This summary paragraph already indicates that a temporary increase in turbidity is a result of shell dredging. Information regarding your second concern may be found in Appendix D.

RESPONSE A.3.6. Impacts regarding increased turbidity to phytoplankton and marine organisms are discussed in sections relating to the Biological Impacts of shell dredging (Sections 3.5.1.2., 3.5.2.1., and 3.5.2.2.), not Water Quality Impacts.

RESPONSE A.3.7. Information regarding the potential loss of equipment is already present in the document. Please refer to Section 3.7.6.2.

RESPONSE A.3.8. This paragraph is a Summary of Cumulative Impacts. The detailed information you request is located in Section 3.8. of the document.

RESPONSE A.3.9. There are currently no monitoring studies being conducted, nor is there information available concerning colonization by oyster spat on the single reef that was constructed.

RESPONSE A.3.10. Comment noted.

RESPONSE A.3.11. "Economically retrievable" cannot be defined solely in terms of depth and density of shell. Market conditions at any point in time may change the depth and density of shell considered to be economically retrievable.

RESPONSE A.3.12. "Fluid mud" is more appropriately discussed in sections dealing with impacts of shell dredging, not in the shell dredging techniques section.

RESPONSE A.3.13. Information regarding the percentage use of shell in density-dependent situations is not available. Additional information addressing your latter concern has been incorporated into Section 2.2.1.1. of the EIS.

RESPONSE A.3.14. Comment noted.

RESPONSE A.3.15. It is anticipated that there would be very little if any environmental effect, either positive or negative, to limiting the depth of the shell to be recovered. The overburden is still redirected back into the holes to the maximum extent possible.

RESPONSE A.3.16. Appropriate labels have been added to the figures.

RESPONSE A.3.17. As noted in the EIS, current permit procedures allow for the redefinition of buffer zones surrounding the developing deltas at any time and the permits for which the shell dredging industry has applied has been somewhat expanded. The most recent bathymetric surveys accomplished by the USACE will be used, as they become available, to review and, if necessary, redefine the buffer zones.

RESPONSE A.3.18. The widely varying riverine and tidal current conditions in the permitted areas do not favor the deployment of silt screens in general. Although they may be feasible under relatively quiescent conditions in some locations, the shallow depths of six feet or less that occur in the project area would dictate very short screen depths, which would need to provide for about 0.5 m in clearance at the bottom to allow for the tide range. This gap may be difficult to maintain in very shallow water (Barnard, 1978). The screens' effectiveness in controlling turbidity outside the dredged areas may be further limited by the frequent resuspensions of the bottom material by wind and wave action, and the concomitant flexing, bending, and submergence of the short screens by waves and turbulence. It is far outside the scope and purpose of the EIS to "discuss methods to improve (silt) screen efficiency."

RESPONSE A.3.19. See Response A.3.9.

RESPONSE A.3.20. The most current available data were used in the preparation of the EIS.

RESPONSE A.3.21. The statement about the amount of material necessary to replace the volume of shell removed is just a statement showing the difference between the volume of material removed by the shell dredgers and the amount of sediment conveyed by the Atchafalaya Basin Floodway System as measured at Simmesport. Permit denial will not necessarily have a positive impact on delta growth; delta growth is dependent on more variables than just the bathymetry of the bay. These variables include river discharges, sediment yield, sediment type, location in bay, and center of mass of the delta as well as depth at the location in the bay. Subsidence must also be taken into account. A delta will lose sediment mass only if resuspension and offshore sediment loss exceed the supply to the delta. The U. S. Army Corps of Engineers Waterway Experiment Station concluded in Technical Report HL-82-15, The Atchafalaya River Delta, Report 6, Interim Summary Report of Growth Predictions, that this

condition is very unlikely to occur in the Atchafalaya Bay in the next 50 years, short of substantial diversion of the river to another location.

Delta volume is the volume of sediment above an arbitrary datum plane. A delta will decrease in volume of deposits only if the average rate of deposition is less than the average rate of depth increase, primarily due to apparent subsidence. Such an imbalance could be caused by reduction in sediment supply, reduction in trap efficiency, increase in length of the delta front that causes the sediment to be spread over a larger area, and/or a change in the subsidence rate. Based on a subsidence rate of 1 cm/year and an Atchafalaya Bay area of 200 square miles, it is conceivable that the rate of deposition must offset a loss of at least 302 million cubic yards over the next 50 years to show delta "growth." The loss in volume is due to subsidence. Proven shell reserves in the Atchafalaya Bay are estimated to be approximately 6-10 million cubic yards. When viewed with other factors affecting delta growth, such as subsidence, the removal of 6-10 million cubic yards of shell is insignificant. Conversely, the non-removal of this material is insignificant.

RESPONSE A.3.22. Information addressing your concern has been incorporated into Section 3.4.1.4. of the EIS.

RESPONSE A.3.23. Information addressing your concern has been added to Appendix C of the EIS.

RESPONSE A.3.24. These data are given and discussed in Appendix C. The ultimate ranges of flow of that minor portion of the fluid mud beyond the dredged cuts would be dependent on the hydrodynamic conditions of the project area. These conditions are often quite variable in time and space, and the ultimate flow of the fluid mud will depend in part on the tendencies of each type of sediment to densify and become resistant to further movement by the prevailing currents. The impacts associated with the minor amounts of fluid mud generated outside the dredge cuts are insignificant.

RESPONSE A.3.25. It is concluded, on the basis of results of the field investigations at dredging sites, prevailing background turbidity levels in the study area, and the small percentage of the area affected at any one time, that dredge-generated turbidity effects are practically limited to temporary and localized increases in the vicinity of the dredges. Hydrometerological factors are far more influential on turbidity levels in general.

RESPONSE A.3.26. It should be noted here that areas of sustained high turbidity are not normally areas of high primary productivity because of decreased light penetration or increased settling rates of phytoplankton. The effects of increased turbidity in highly turbid systems are discussed in Section 3.5.1.2. and Appendix D.

RESPONSE A.3.27. The size of the cutterhead and the amount of water pumped from the environment are very small when compared to the total watermasses of the project area. We concur that if a dredge were to operate near a tidal pass during the peak migration of larval stages, an undetermined number of larval marine organisms would be impacted. However, because of the extremely small areas impacted and water pumped, the impacts to the fishery resources of the region would be insignificant.

RESPONSE A.3.28. Information regarding the impact to fish during the entire year is contained in Section 3.5.2.2.2. and Appendix D.

RESPONSE A.3.29. The requested information may be found in Appendix C. It should be noted that although the areas of waterbottom that are directly affected by fluid mud are unknown, the nature of the dredging operation strongly suggests that the thickness of fluid mud that escapes the dredged holes would be insufficient to cause widespread destruction of benthic communities.

RESPONSE A.3.30. The range of benthic recovery rates has been stated as "within months" to "2 years." It is not necessary to discuss specific bottom types, "various environmental conditions" or to perform a "worst-case analysis" to have a complete and adequate assessment of recovery rates.

RESPONSE A.3.31. Additional information regarding the value of exposed oyster reefs to fishery resources is included in Appendix D.

RESPONSE A.3.32. Information which generally addresses this concern is found in Appendix C.

RESPONSE A.3.33. The Oyster Reef section of Appendix D discusses the likelihood of any remaining significant oyster reefs or the development of oyster reefs in the coastal region. The highly ephemeral nature of the short-lived reefs which may form in years of low flow makes their mapping an excercise which would have to be done annually. The possibility of inadvertent dredging of such reefs is acknowledged in Section 3.5.2.3 of the FEIS.

RESPONSE A.3.34. According to industry sources, shell dredging has not occurred in other gulf states since 1983.

RESPONSE A.3.35. There are no quantifiable data specific to sport fishing use exclusive to the bays.

RESPONSE A.3.36. The areas of the bays affected by the shell dredging operations have been discussed in numerous places throughout the EIS. The concentration of fish and shrimp near operating dredges has been scientifically validated by three separate authors as discussed in Appendix D of the EIS. In addition, numerous first-hand accounts of local fishermen lead credence to the findings of these authors. There are no specific economic data available regarding the loss of commercial or recreational fishing gear in the project area.

RESPONSE A.3.37. It is acknowledged that few studies have managed to quantify impacts associated with trawling. However, the conclusion that dragging a heavily-weighted trawl through soft, unconsolidated bottoms disturbs the benthos is not speculative.

RESPONSE A.3.38. The referenced study by Schubel, et al., (1979), used suspended sediments generated by maintenance dredging for a comparison with trawl-generated turbidity. That study is included in the EIS for comparative purposes in order to give an idea of the magnitude of the impacts. A detailed examination of the specifics of the cited study is not necessary or pertinent for the comparison.

RESPONSE A.3.39. Comment noted.

RESPONSE A.3.40. Information addressing your concern has been incorporated into Section 3.8.5. of the EIS.

RESPONSE A.3.41. See our comment A.3.8.

RESPONSE A.4.1. Comments noted.

RESPONSE A.5.1. Estimates detailing reserves and the approximate duration of impacts for each bay system are contained in Section 3.1. As noted, these estimates are based on proven reserves.

RESPONSE A.5.2. The existing write-up indicates "each working dredge... each day." This indicates that impacts are considered to be continuous. Information addressing your latter concern has been incorporated into Section S.3.3. of the EIS.

RESPONSE A.5.3. There is a likelihood that some shell reefs exposed above the mudline exist outside the restricted zones. However, dredging of these isolated reefs is specifically prohibited under currently existing restraints. The possibility of inadvertent dredging of such reefs is acknowledged. See also Response A.3.33.

RESPONSE A.5.4. The impacts of shell dredging to the developing deltas are discussed in detail in Section 3.4.1.3. and Appendix C of the EIS. Pages S-1 through S-10 contain only a summary of the proposed action, major alternatives, environmental impacts, mitigation measures, and judicial requirements. The permit restrictions minimize adverse impacts by prohibiting dredging in the region of the deltas. Without specifics on the location of the dredged holes and channels referred to here as causing the alteration of natural circulation and sedimentation patterns, it is impossible to respond to this comment. Alteration of circulation and sedimentation patterns may retard delta development, or it can be beneficial. As a part of the Atchafalaya Basin Water and Land Resources Study - Delta Development, the USACE is currently investigating alternatives which would help nourish parts of the delta by altering the natural circulation and sedimentation patterns.

RESPONSE A.5.5. We have not stated that minimal recreational use occurs, but that impacts to recreation are minimal. The DEIS states that the potential use of the area is for over 26,000 fishermen in over 17,000 boats. We recognize the recreational value of the region, and state in Section 3.7.6.2. the danger of possible gear loss resulting in the trawling across recently-dredged areas.

RESPONSE A.5.6. Comment noted.

RESPONSE A.5.7. As noted in Section 2.2.3.1., paragraph 3, a reevaluation of the boundaries based on the most current hydrographic data may be accomplished at any time as a part of the permit-review process. A new hydrographic survey of the developing deltas by the USACE is being developed at this time. A reevaluation of the protective zones surrounding the developing deltas will be made at that time.

RESPONSE A.5.8. The effects of the removal of buried oyster shell reefs on shoreline erosion was examined in great detail, as shown in Section 3.4.1.2.2. and Appendix C. It was concluded that a 1,500-foot buffer is adequate for shoreline protection. Currently, the restriction of 1,500 feet from the shoreline is incorporated in the permits of the USACE and the leases of Louisiana Department of Wildlife and Fisheries. The one-half mile restriction from shore is that of the Coastal Management Division of the Department of Natural Resources.

RESPONSE A.5.9. The Comparative Impacts Table is an abbreviated discussion of the impacts associated with shell dredging. Because of the format and restraints inherent with the tabular format, discussions of existing conditions and impacts must be telegraphic. Detailed discussions of the issues expressed by your concern are contained within Appendix D.

RESPONSE A.5.10. Appendix C contains data indicating that a considerable amount (1.5 feet) of "highly fragmented shell and shell fragments" are located as the top/bottom of freshly dredged (within 8-10 hours old) cuts. The data indicate a 67% refilling of the cut within 8-10 hours, with material containing varying amounts of shell detritus and exhibiting physical parameters similar to the surrounding undredged material. These facts indicate conditions that are at least equal to the foundation conditions immediately adjacent to the cuts, in undredged areas.

RESPONSE A.5.11. The concerns expressed by your statements are already noted in the referenced section.

RESPONSE A.5.12. Information addressing your concern has been incorporated into Section 3.4.1.4. of the EIS.

RESPONSE A.5.13. Information addressing your concern has been incorporated into Section 3.4.1.4. of the EIS.

RESPONSE A.5.14. Information regarding erosion is presented in Appendix C. We concur that an erosion problem exists regarding Marsh Island, however, shell dredging has been shown to have no effect on coastal erosion at Marsh Island.

RESPONSE A.5.15. As noted previously, the EIS deals with assessing impacts under existing restrictions and within the foreseeable future. The referenced statement reflects this fact.

RESPONSE A.5.16. Information which generally addresses your concern has been incorporated into Section 3.5.2.1.1. of the EIS.

RESPONSE A.5.17. The conclusion that shell dredging has minimal and transient impacts on the fishery resources of the region is based on a certain set of conditions. Among these is the fact that the EIS addresses impacts to the environment based on existing restrictions. We concur that the removal of massive portions of the Point au Fer reef and other exposed reefs has in the past had considerable impact on the project area. These impacts date back many years and are discussed in Section 1.2. of the EIS. However, the purpose of the EIS is to assess the environmental impacts of shell dredging under existing conditions. It is beyond the scope of the document to address past impacts in detail.

The EIS acknowledges that significant fisheries exist in the project area. However, a discussion of specific habitat requirements for every

fish and shellfish species of the area is beyond the scope of the document. Conflicts over potential use of the region should be minimal, as the primary sites for recreational fishing within the project area are within protected areas. A discussion of the possible loss of fishing gear in the resultant trenches is presented in Section 3.7.6.2.

RESPONSE A.5.18. The EIS is not self-contradictory when it is kept in mind the very small region of the project area impacted by shell dredging activities. We concur that there may be some exposed oyster reefs outside the prohibited regions. However, dredging of these reefs is restricted under current restrictions. The possibility of inadvertent dredging of such reefs is acknowledged. See also Response A.3.33.

RESPONSE A.5.19. Comment noted.

RESPONSE A.5.20. Information which generally addresses your concern is presented in Appendix D.

RESPONSE A.5.21. Exposed oyster reefs outside the prohibited zones are protected by a buffer zone of 1,000 feet. The EIS has acknowledged that there may be a few, scattered reefs outside the prohibited regions and that it is possible that these may be dredged inadvertently. As noted in the EIS, there are no current maps to these reefs and the assumption that the shell dredging companies abide by the rules and restrictions of the leases and permits must be made.

RESPONSE A.5.22. See Response A.5.21.

RESPONSE A.5.23. The EIS contains information in the body of the text and the appendices which address all of these concerns.

RESPONSE A.5.24. Data gathered from the USACE Recreational Use and Valuation study are preliminary and not appropriate for use at this time.

RESPONSE A.5.25. The requested information has been added to Section 3.7.6.1. of the EIS.

RESPONSE A.5.26. Information which generally addresses your concern has been incorporated into Section 3.7.6.2. of the EIS.

RESPONSE A.5.27. The direct impacts of shell dredging (the digging of cuts and troughs) cover a very small percentage of the open water bottoms of the project area in any year, the cuts have been shown to generally fill within a few years, the physical characteristics of the sediment are generally unchanged by passage of a dredge, and reconsolidation of the sediment appears to happen fairly quickly. It is concluded the impacts of shell dredging on the overall recreational and commercial shrimpers are minimal. However, during the time that it takes for the sides of the dredged cut to slump and the hole to refill, commercial and recreational shrimpers may lose or damage gear.

RESPONSE A.5.28. Commercial landings data have been added to Section 3.5.2.2.1. of the EIS. Also see responses A.5.1., A.5.4., A.5.7., A.5.16., and A.5.20.

RESPONSE A.6.1. Comment noted.

RESPONSE A.6.2. Reference 33 CFR Part 230, Appendix B, Environmental Operating Procedures and Documents for Regulatory Functions, (11)(7)(c) - "Except for Federal projects meeting the requirements of 404(r) of the Clean Water Act, the Section 404(b)(1) analysis under the Clean Water Act may, but need not necessarily, be included in the EIS at the discretion of the district engineer. The information required by the 404(b)(1) guidelines, when included, will be integrated into the text of the EIS."

RESPONSE A.6.3. Comment noted.

RESPONSE A.6.4. Eleven years in a geologic framework is not a significant period of time, especially when evaluating the chemical characteristics of a core sample. The quality of core sediments are considered constant when chemical migration from fresh sediment is limited to the top centimeters. Verification would be required of the results and accuracy of the elutriate testing only if proper quality control measures were not implemented; however, considering that testing was performed by the US Geological Survey lab which implements good quality assurance/quality control procedures, verification is not required.

Additional information regarding elutriate testing of more recent sediment samples from the project areas has been incorporated into Appendix C.

RESPONSE A.6.5. The regulation cited states that substantial treatment be given to each alternative considered in detail. The EIS does afford substantial treatment to each alternative considered in detail. Additional information regarding alternative materials has been incorporated within Section 2.2.1.1.

RESPONSE A.6.6. As noted in the EIS in Sections S.3.1.2, 3.5.2.3.1., and Appendix D (Oyster Reefs), detailed maps of oyster reefs of the project area do not exist. Reefs exposed above the mudline are protected by a

1,000-foot buffer zone. However, the possibility of inadvertent dredging of some unmapped reefs is acknowledged. See also Response A.3.33. It is also currently beyond the state-of-the-art to quantify the volume of shell in reefs buried by a significant overburden of silt and clay. "Best Estimates" provided by industry geologists have been noted in the above-listed sections. However, detailed knowledge of the exact location or volume of shell deposits are not mandatory for analysis of impacts associated with shell dredging, formulation of protective measures, or the making of informed decisions.

RESPONSE A.6.7. Reference 33 CFR Part 230, Appendix B, Environmental Operating Procedures and Documents for Regulatory Functions, 1502.14(d) - "For regulatory permit actions, the Corps takes an impartial position whether to issue or deny a particular application until the public interest review is complete. At no time is the Corps a proponent of any action. It simply determines whether or not certain actions proposed by applicants are in the public interest and under what circumstances such proposals, if modified, would be in the public interest. The Corps' decision that is made by the final decisionmaker will be stated in the "Record of Decision." A permit EIS is a document which discloses and addresses the environmental impacts of the proposed action and reasonable alternatives. There is no "preferred alternative" course of action identified.

RESPONSE A.6.8. In the section cited by your concern, the 2.1 years refers only to East Cote Blanche Bay reserves. Additional proven reserves in Atchafalaya (5.875 MCY) and Four League Bays (3.15 MCY) lead to greater shell reserves, and thus, longer active extraction times. Implementation of Alternative 4 (Reduce shoreline restrictions in upper Four League Bay) would add an additional year of operating time. This totals to approximately 6 years, and is an estimate, with unproven reserves thought to be significant. An analysis based on a 10-year proposed extension does not seem unreasonable.

RESPONSE A.6.9. The numerous regulations and restrictions that have been imposed on the shell dredging industry by the USACE, the Louisiana Department of Wildlife and Fisheries (LDWF), Louisiana Department of Natural Resources (DNR), and the Louisiana Department of Environmental Quality (DEQ) have been considered by these agencies to be appropriate mitigation measures. In 1982, as part of the DNR permits, it was made a permit condition that the permittee shall at its expense undertake offsite restoration by constructiong reefs when recommended by the Secretary of the LDWF. This is partial compensation for disturbance of water bottoms during dredging. Although no such action has ever been recommended by LDWF, a shell reef was built in the project area by the applicants.

RESPONSE A.6.10. The operational constraints under which the shell dredging industry functions is the result of years of coordination with various regulatory agencies. These restrictions are the result of plans which monitor the industry, reduce user conflicts, and minimize adverse impacts to the environmental resources of the region.

RESPONSE A.6.11. The purpose of the EIS is to analyze environmental impacts under current operating conditions and within the foreseeable future. Shell dredging in the coastal region began in 1914. It is not the purpose of the EIS, nor is it appropriate herein, to review 73 years of history for permit violations.

RESPONSE B.1.1. Comment noted.

RESPONSE B.1.2. Comment noted.

RESPONSE B.2.1. It has been determined that shell dredging activities will not be managed under the New Orleans District Underwater Cultural Resources Management Plan. However, data generated for the plan will be used as a reference tool. Any Department of the Army Permits, if issued or extended, would contain special and general conditions requiring the permittee to notify the Corps if any previously unknown historic or archeological remains are discovered while accomplishing the activity authorized by the permit. The Corps would then initiate the Federal and state coordination required by 33 CFR Part 325, Processing of Department of the Army Permits; Procedures for the Protection of Cultural Resources.

RESPONSE B.3.1. Information which generally addresses your comment has been incorporated into Section 2 of the EIS.

RESPONSE B.3.2. Changes incorporating your comment have been made in Section 2.4. of the EIS.

RESPONSE B.3.3. Changes incorporating your comment have been made in Section 3.2. of the EIS.

RESPONSE B.3.4. Comment noted.

RESPONSE B.4.1. Comment noted.

RESPONSE B.4.2. Comment noted.

RESPONSE B.4.3. Section 2.2.1.1 has been revised to present a more reasoned discussion of alternative materials. Although the new information does not provide an exhaustive discussion of alternative materials, we feel it is adequate and puts the issue of alternative materials in perspective from both an engineering and economic standpoint.

RESPONSE B.4.4. The Corps is well aware of the serious nature of the shell dredging issue and did consider Judge McNamara's suggestions very seriously. In preparing the EIS, vast amounts of information, both published in the scientific literature and gathered specifically for the document, has been utilized. The Corps believes the information presented in the EIS is adequate to permit informed decision-making.

RESPONSE B.5.1. The "site-specific" alternative is a procedural matter and would add very little or no additional information to the body of knowledge regarding the actual impacts of shell dredging. A more detailed analysis of the site-specific alternative may be found in the Alternatives Considered Section of the EIS.

The USACE concurs that there are some questions regarding the impacts of shell dredging which are currently beyond the state-of-the-art or would be exorbitantly expensive to answer. However, these issues have been identified as such and are not critical to the formulation of an informed decision.

RESPONSE B.5.2. The data presented do not, in our opinion, present a severe bias due to the fact of the small sample size for the following reasons: 1) Completeness of sample coverage is based on conditions in the project area, including the hydrologic complexity of the area and the extent to which water and sediments of inferior quality are known or believed to behave. The aim of the investigation is not to evaluate water and sediment as resources, but to evaluate the likelihood of contamination from these resources as a result of shell dredging. This is not a characterization of a waste stream where variability is a function of process efficiency.

However, five more stations were recently sampled and the results are presented in Appendix C.

RESPONSE B.5.3. The data presented in Appendix C of this document indicate that holes do refill. See Response A.5.10.

RESPONSE B.5.4. The excavations referred to here are indeed shell dredging cuts. As described in Appendix C, dredge cuts in this area were surveyed in 1986 at the request of the Corps of Engineers. The maximum bottom elevations for these cuts in 1981 and 1986 are shown on Table 12. These cuts are refilling with sediment, albeit slower than other cuts in the bay. Also, distributary channels of the delta north of this area are apparently filling with sediment, reducing the supply of sediment to this

area. This reduction of available material affects the rate of fill of these cuts. When the U.S. Army Corps of Engineers Waterways Experiment Station developed the mathematical model of the Atchafalaya Bay, the 1981 Corps survey was not used. The model was calibrated from data through 1977. Preliminary results from this model show limited future development of the delta in the area of the dredge cuts. From this model, it can be concluded that the dredge cuts did not cause the lack of delta development in this area. In addition, data presented in Appendix C of the EIS show the "...primary source of the sediments which refill the holes/troughs resulting from dredging activities is the surrounding bay bottom, marine, and prodelta sediments of the dredged area," filling does not occur primarily from delta sediments.

RESPONSE B.5.5. It is not appropriate to compare the highly concentrated, vibratory load of a heavy drill barge to the slow build up of a continually depositing sediment load. While it is true that in isolated areas where shell reefs exist/existed, some compression of the sediments immediately above the reef may be lessened. However, this reduced compression would be the result of several factors including, but not limited to: reduced sedimentation over a reef "high";reduced thickness of soft sediments and hence less porewater pressure to be reduced for consolidation; and deposition of more granular material over the reef "high." In addition, the added weight of the shell reef can induce accelerated consolidation of the immediately underlying sediments. The compression/subsidence of the Holocene deposits in Atchafalaya Bay is a natural ongoing phenomenon, recognized by most coastal experts as due primarily to a reduction in pore pressure with subsequent consolidation as the sediments compress in response to gravity and continual sediment loading. This naturally occuring phenomenon- with or without the continual sediment buildup to replenish the land area as it consolidates and sinks below the surface- is one of the prime reasons for the subsidence and subsequent land loss in coastal Louisiana, including areas where no shell reefs exist/existed.

RESPONSE B.5.6. The Literature Cited section of the EIS represents complete bibliographic citations for the scientific papers and technical reports which have been used in the preparation of the document. This section is not a complete index of papers and reports which address any aspect of Atchafalaya Bay.

RESPONSE B.5.7. See Response C.6.5.

RESPONSE B.5.8. The fact that fish use various parts of the estuarine system for different stages of the life-cycle is acknowledged. The movement of fish within the region is generally addressed within the Fisheries Section of Appendix D. However, the movement of fish is not a cumulative impact.

RESPONSE B.5.9. Changes have been made in Section 3.5.2.1.2. of the EIS reflecting your concern. Again, it should be noted that the EIS addresses only the impacts under existing conditions and various alternatives within the foreseeable future. Any impacts which may have occurred in the past are not the subject of this report.

RESPONSE B.5.10. We concur with the statements made. However, there are no data to indicate that this scenario has happened in the project area.

RESPONSE B.5.11. The research of Thompson and Deegan (1983) dealt only with deep channels in the Acthafalaya Delta, and did not address dredge cuts. Their research does nothing to refute the well-established fact that deeper holes (not channels) may provide a refuge for fish.

RESPONSE B.5.12. There is no "Cumulative Impacts of Alternatives" table. We must assume these comments address the "Comparative Impacts of Alternatives" table.

RESPONSE B.5.13. The table does address projected environmental gains under the "permit denial" alternative. Nowhere in this table is the lack of dredge holes considered a loss of benefits.

RESPONSE B.5.14. The presentation of tabular material is necessarily abbreviated. The impacts of dredging on fishing is discussed in Section 3.7.6.2. The impacts are considered to be minimal.

RESPONSE B.5.15. We concur that shell dredging has potential negative impacts on a variety of resources. It is the potential impacts that are minimized by strong regulation of the industry. Dredging is prohibited in the areas of most importance to fishermen: grassbeds, exposed reefs, developing deltas, and shallow water close to shore. The potential impacts of shell dredging on fishing has been assessed as minor or insignificant because of the scope of the regulated activity. The maximum possible area of waterbody affected at any one time is no more than 2%.

RESPONSE B.5.16. The statement that shell dredging causes a temporary increase in turbidity is based on the extensive analysis presented in Appendix C.

RESPONSE B.5.17. The contention that "shell dredging will disrupt" the use of the estuaries as nursery areas is untrue and not supported by the facts. Shell dredging does not significantly affect the resuspension of bottom materials or the formation of haloclines throughout the bays.

RESPONSE C.1.1. Comment noted.

RESPONSE C.1.2. The potential and actual removal of shell in Four League Bay has been a part of the existing conditions of the region since 1960. The proposed action is not new and the scientific studies which have been accomplished have been during the period of active shell dredging.

RESPONSE C.1.3. We do not concur with this assumption. As discussed in Section 3.5.2.2.2., impacts to fisheries resources are minor.

RESPONSE C.1.4. In general, we concur with the information presented in this comment. However, the implications contained therein regarding the importance of the discontinuities may be overstated. The statement that "Preliminary results indicate that, at certain times, these fronts may be responsible for the majority of organic production in the bay" is misleading. Primary organic production is centered in the marshes of the surrounding regions and the phytoplankton of the entire bay. We concur that the regions are most likely centers of high biological activity.

RESPONSE C.1.5. Admittedly, there is a lack of site-specific information regarding turbidity in Four League Bay. However, considerable amounts of information are available through the Dredged Material Research Program of the USACE which will allow for generalizations to be made. There is no reason to believe that the clayey silts of Four League Bay would behave in a manner contrary to the trends which have been so well documented elsewhere.

RESPONSE C.1.6. The analysis of turbidity levels and the duration of suspension is based on sound scientific data generally accepted by the scientific community. This analysis adequately represents the fate and impacts of these materials. The one-half mile buffer zone around the shorelines (the most restrictive limit currently in place) is certainly adequate to keep the larger particles resuspended by shell dredging (which do the most harm to oysters) from fouling the oysters. Contrary to the statement made by the reviewer, oysters have been shown by Lunz

(1938), Wilson (1950), and Mackin (1956) to be tolerant of high turbidity levels. The latter author has shown oysters to feed in turbidity levels to 700 parts per million without apparent damages.

We concur that the oyster reefs of Oyster Bayou are healthy and economically exploited. However, they are well within the protective zone.

RESPONSE C.1.7. The impacts detailed in Appendix D of the EIS relate hazards of increased turbidity to fish. The term minor relates to the small areas of the total waterbody, and relatively small numbers of fish, that may be affected at any one time. The area of very high turbidity is in the region immediately surrounding the dredges. Research has shown that most of the larger, more harmful particles resuspended by shell dredging settle out within a very short radius of the dredge. The finer, less-harmful particles may travel farther from the dredge. However, even this latter group of particles covers a very small area of the bay. Four League Bay covers approximately 20,500 acres, with less than 2% of the waterbody impacted by significantly elevated turbidity levels. Turbidity is simply too localized and phytoplankton and fish population levels are too variable and fluctuating to significantly impact overall productivity in the bay.

RESPONSE C.1.8. It is true that for a while a fluid mud mound will persist in the vicinity of a dredging operation, although most of it would remain confined within the dredge cut. It has been shown under the Dredged Material Research Program investigations, however, that considerable densification of the newly deposited sediments occurs within minutes to hours. This process largely stabilizes the material against further lateral movement except by moderately strong bottom currents and/or turbulence. Although the time required for eventual reconsolidation of the uppermost layers to their natural condition is unknown, it is noted that the shallow bathymetry of the bay and its normal tidal regime assure that none of the surface sediments remain undisturbed by hydrodynamic forces for long periods. These prevailing conditions should promote relatively rapid reduction rates of the initial

density differences that would exist between the dredged and undredged sediments. Therefore, it would not be expected that significantly altered resuspendability of sediments would persist for extended periods of time or long distances from the dredging activity.

A USACE study in 1986 indicates only a small decrease in density between dredged material replaced into the dredged scar, and the undisturbed material located directly beneath the dredge scar (1.51 to 1.64 versus 1.61 to 1.74). Since this redensification occurred within 8 to 10 hours after dredging and subsequent replacement, densification and consolidation will continue until predredge densities and compaction have been reattained. In further support of this, an area dredged in 1978 yielded densities ranging from 1.50 to 1.85; an area dredged in 1980 yielded densities ranging from 1.56 to 1.73; and three areas where no dredging has occurred but where active deposition from the Atchafalaya River is occurring yielded densities ranging from 1.52 to 1.59. The referenced Sikora et al 1981 study in Lake Pontchartrain, when compared to the GSRI 1974 and Dravo/Eustis 1985 studies, indicates little difference between densities (a measure of the recompactness/ reconsolidation of disturbed sediment) of disturbed (1.27 to 1.29) and undisturbed (1.25 to 1.29) material.

RESPONSE C.1.9. The first sentence of this statement assumes a long-term elevation in suspended sediments, supposedly resulting from shell dredging. There are no data to suggest this would be the case. Nor are there data to suggest any significant adverse changes in aquatic primary productivity, nutrient recycling, benthic uptake of nutrients, or any severe "change in the light-nutrient balance required for maintaining the high production of Four League Bay."

RESPONSE C.1.10. It is acknowledged that the dredging process causes some release of sediment-bound nutrients into the water column, and that these increased concentrations may be significantly above background levels. The measurable effects, however, will be primarily limited to short distances from the dredging site and temporary, as the small

percentage of fine particles constituting the turbidity plume becomes rapidly dispersed into the water column. In comparison to the total nutrient supplies potentially available for biological productivity, these small releases are negligible. When considering the small percentage of water bottoms that would be affected by dredging at any one time, there should be no measurable effect on the overall plankton production in Four League Bay.

We concur that the release of nutrients into the water column at certain periods of the year may be more critical than at others. However, "unscheduled" perturbations and release of nutrients are regularly occurring events with winter storms and summer squalls. These "out-of-phase" events are commonplace.

RESPONSE C.1.11. It is acknowledged that shell dredging does destroy sessile epibenthic and benthic organisms in the direct path of the dredge and in a region to each side of the cut. However, the very high fecundity of the benthic organisms which have evolved in turbid estuarine systems allow for the repopulation of the region within a short time. In addition, it has been shown that the high flows of the Atchafalaya River flood the region periodically (which drives out or destroys estuarine animals) and bring in a suite of freshwater organisms which then repopulate the region. The comparison of this cyclic phenomenon with the relatively stable estuarine system found in Lake Pontchartrain is weak. Direct comparisons of recovery rates between the two systems cannot be made.

RESPONSE C.1.12. There are no data available to support the contention that shell dredging will substantially disrupt nutrient cycling or reduce primary and secondary productivity. Nor is it possible to determine the number of organisms destroyed by shell dredging. The dredging will impact a small area (about 2% of Four League Bay, the smallest area, on an annual basis) and that region will be less suitable for a short period of time.

RESPONSE C.1.13. The USACE acknowledges that a great deal of information has been acquired through the research efforts of many individuals over the past few years. However, the conclusion that future "research would be rendered much less valid by extensive dredging in the area" is inaccurate, since shell dredging has been a part of the existing conditions in the region since 1960. Shell dredging in the region has not invalidated all of the research done over the past 27 years. Through cooperation between industry and academia, and with proper design of experimental procedures, shell dredging should not invalidate future research.

RESPONSE C.1.14. There are no data to support the contention that continued shell dredging in Four League Bay or any other part of the project area will lower natural resource productivity or lead to economic losses.

RESPONSE C.2.1. A history and summary of the all of the previous public hearings relating to shell dredging could not be contained in the introductory remarks. A summary of those meetings which pertain to the EIS is included in the Public Involvement section of this document.

RESPONSE C.2.2. Requested information has been added to the Economic Environment section (3.6.) of the EIS.

RESPONSE C.2.3. Comment noted.

RESPONSE C.2.4. The correction in Section S.3.3. of the EIS has been made.

RESPONSE C.2.5. Mitigation is the term used in formulation of plans to avoid, minimize, and/or compensate for impacts attributable to an action. In the case of shell dredging, the primary methods of mitigation are avoidance of impacts (by defining no-dredge protective zones) and by minimizing impacts (no more than 2 dredges per company, etc...). Compensation, or off-site mitigation, constitutes a third method and was imposed by the Louisiana Department of Natural Resources in the 1982 renewal of permits. That requirement states off-site mitigation would be implemented at the cost of the shell dredgers if mandated by the Secretary of the Louisiana Department of Wildlife and Fisheries. It has not been required by that agency, and is a part of the permit which was last renewed by the state in 1982. Mitigation requirements (in all of its' forms) are an integral part of shell dredging, are pertinent to the proposed action, and should be discussed within the EIS. The USACE, at this time, requires no off-site compensation. However, the positions of both agencies on mitigation are subject to change as deemed necessary.

RESPONSE C.2.6. Comment noted. Changes incorporating your concern into Section 1.3. of the EIS have been made.

RESPONSE C.2.7. Comment noted. Changes incorporating your concern into Section 2.2.3.1. of the EIS have been made.

RESPONSE C.2.8. Comment noted. Changes incorporating your concern into Section 2.2.3.3. of the EIS have been made.

RESPONSE C.2.9. Comment noted.

RESPONSE C.2.10. The correction to Section 2.4. of the EIS has been made.

RESPONSE C.2.11. The map and volumes of shell were the basis for the information presented in the EIS.

RESPONSE C.2.12. Comment noted. Information addressing your concern has been incorporated into Section 3.2. of the EIS.

RESPONSE C.2.13. The correction has been made.

RESPONSE C.2.14. The correction has been made.

RESPONSE C.2.15. Comment noted.

RESPONSE C.2.16. National Marine Fisheries landings data for 1986 have been added to Section 3.5.2.1.1. of the EIS.

RESPONSE C.3.1. Although the USACE does not monitor the shell dredging industry, it does regulate its operations. See Appendix B for the listing of USACE regulations and restrictions.

RESPONSE C.3.2. The EIS acknowledges that the Louisiana Department of Wildlife and Fisheries receives royalties from the shell dredging operations. See Section 3.6.1.

RESPONSE C.3.3. Reference 33 CFR Part 325, Processing of Department of the Army Permits - Data supplied by applicants and their consultants regarding a proposed action is allowed under the above-cited regulation. During the preparation of the shell dredging EIS, data supplied by the applicants and their consultants were used. All major sources of information have been cited, However, the data presented in the document, as well as the arguments and conclusions, are the sole responsibility of the USACE.

RESPONSE C.3.4. As noted in several locations in the text, the exact location and volume of shell in the coastal region is unknown. It is beyond the current state-of-the-art to volumetrically analyze buried shell deposits. Additional information regarding missing or incomplete information has been added to Section 3.5.2.3.1. of the EIS. Also, refer to Response A.3.33.

RESPONSE C.3.5. The purpose of the EIS is to examine the impacts of the shell dredging industry and the proposed permit renewal on the environment. Information of the type you request is not generally available, beyond the scope of the document, and not critical to the formulation of an informed decision.

RESPONSE C.3.6. Shell dredging in the coastal waters of Louisiana began in 1914, and has involved several different companies over the years. Detailed information of the type you request is not available, beyond the scope of the document, and is not critical to the formulation of an informed decision.

RESPONSE C.3.7. The comment that the USACE should analyze use of the project area waters by people if conditions were safe and were not turbid implies that these conditions are related solely to shell dredging. This is not true, most of these same conditions would exist in the absence of shell dredging operations.

RESPONSE C.3.8. The information requested is not relevant to the shell dredging issue, as no significant impact on these industries is expected under any alternative considered in the EIS.

RESPONSE C.3.9. There have been no state-mandated mitigation projects required by the Secretary of the Louisisana Department of Natural Resources since imposition of the off-site compensation clause in the 1982 permits. To date, the USACE has not implemented an off-site compensation requirement.

RESPONSE C.3.10. The detailed information requested is not relevant to the shell dredging issue.

RESPONSE C.3.11. The detailed information requested is not relevant to the shell dredging issue. A summary of these types of projects is presented in section 3.8.

RESPONSE C.3.12. It is well beyond the scope of this document to present specific references to each exceedance of the Louisiana Water Quality Criteria. However, the data presented in the pertinent sections of the EIS fairly and accurately represent the impacts of the shell dredging operations on water quality.

RESPONSE C.3.13. Impacts to other economic entities have been discussed throughout the document where appropriate. No precluded activities of significance have been identified; the adverse impacts to the environment from shell dredging are not significant or measurable in terms of impacts on other economic activities.

RESPONSE C.3.14. Additional information which generally addresses your comment has been added to Section 2 of the EIS.

RESPONSE C.3.15. Comment noted.

RESPONSE C.3.16. Additional information which generally addresses your comment has been added to Section 2 of the EIS.

RESPONSE C.3.17. Comment noted.

RESPONSE C.3.18. Concur, however, "examining" all possible substitution combinations is beyond the scope of this report. Table 1 in Section 2 presents several possible (not proven and accepted) combinations.

RESPONSE C.3.19. Paragraph 3.6.3.2. (Alternative 2) states that "To some extent, losses locally could be offset by increased employment in other industries which supply alternate materials, or in other areas of the United States."

RESPONSE C.3.20. If it is assumed that current operations are at or near the optimal short run level of output or the optimal long run scale of plant, then forced reduction in production has the effect of driving up the average cost of production as resources are used less efficiently and the economies of scale are lost. In the short run, for example, a 25% reduction in permitted output would not likely be accompanied by a perfectly proportionate reduction in variable costs for several reasons; while pumping costs would decline, the fuel required to propel the dredges and tugs would tend to fall to a lesser degree, depending on the method of reduction selected; employees could not be laid off proportionately since minimum manning staffs would have to be retained; vessel maintenance and insurance costs would continue to remain relatively high; increased unemployment compensation would partially negate initial labor savings; etc... To the extent a 1:1 reduction in variable costs does not occur, a greater increase in product price would be necessary to offset revenue losses. The tolerance of product

purchasers (demand elasticity) to such increases is not known and beyond the scope of the analysis. As an example, however, if variable costs rose by 25% due to the factors named above, the unit price increase needed to maintain at least the breakeven point would be about $2.35/ cu. yd., which results in a price 20% higher than the current price. It is speculation to assume that this or any significant increase would be wholly or partially absorbed by shell users. At the least, marginal construction and maintenance projects requiring substantial amounts of shell would be abandoned due to the increase in material costs, while the costs of all other projects would rise.

RESPONSE C.3.21. The first sentence of this comment is misleading. The shell resources removed from the waterbottoms of the Louisiana coast are the result of estuarine organisms which do not grow in most of the 50 states. The reasons other coastal states do or do not allow shell dredging is well outside the scope and purpose of this document. The ultimate fate of the material (whether it is exported out of the state or not), has no bearing on the environmental impacts of shell dredging. The private companies that dredge in the coast area are clearly identified on the title page of the EIS.

RESPONSE C.3.22. Estimates of shell reserves change as new deposits are found, mapped, and verified. It is not surprising that current estimates differ from those previously reported. Estimates are based on years of detailed, hand-made measurements over very large geographic regions. Estimates of shell recovery rates are based on an average of the production over the past few years.

RESPONSE C.3.23. As noted in the EIS, buried shell deposits left <u>in place</u> have no value from an ecological, geological, hydrological, or economic viewpoint. Value can only be ascribed to these deposits after they have been removed and are of some use to which a value can be given.

RESPONSE C.3.24. We concur, and believe that the EIS is clear and explicit in its expression of facts, assumptions, and conclusions. The specific instances referred to in this comment are summaries and references where the more complete discussions are found.

RESPONSE C.3.25. Information addressing your concern has been incorporated into Section 1.2. of the EIS. However, it should be noted that the decision of the state court in no way affects the preparation of the EIS mandated by the Federal court.

RESPONSE C.3.26. Comment noted.

RESPONSE C.4.1. Comment noted.

RESPONSE C.4.2. As noted in several locations in the text, the exact location and volume of shell in the coastal region is unknown. It is beyond the current state-of-the-art to volumetrically analyze buried shell deposits. Additional information regarding missing or incomplete information has been added to Section 3.5.2.3.1. of the EIS. However, it is not critical to the formulation of an informed decision to know precise volumes of shell to be removed. See Response A.6.6.

RESPONSE C.4.3. Information addressing your concern has been incorporated into Sections 3.5.2.1.2, 3.5.2.3.1, and 3.5.2.3.2.

RESPONSE C.4.4. We concur that recreational use of project area waters is moderate. However, in comparison with other waterbodies closer to larger population centers, the use is relatively low.

RESPONSE C.4.5. Commercial landings data have been added to Section 3.5.2.2.1. of the EIS.

RESPONSE C.4.6. Information which generally addresses your concern has been added to page S-6 of the EIS.

RESPONSE C.4.7. The correction has been made.

RESPONSE C.4.8. The shell dredging industry must conform with the most stringent of the restrictions from the three regulatory agencies. The statement regarding the restrictions of LDWF and DNR are correct. However, the USACE's current regulations prohibit dredging of any exposed reef (not covered by sand or mud, above or below the waterline) and imposes a 1,000-foot buffer zone surrounding them. However, the possibility of inadvertent dredging of some unmapped exposed reefs is acknowledged. See also Response A.3.33. The destruction of large portions of the Point au Fer reef occurred many years in the past and would not be allowed under current permits.

RESPONSE C.4.9. Your comments have been noted and changes in the referenced section made. However, it should be noted that the purpose of the EIS is to determine the environmental impacts of shell dredging under the existing conditions and the foreseeable future. A detailed analysis of impacts which have occurred in the past is not the purpose of this document.

RESPONSE C.4.10. The contention that fishermen will be crowded onto smaller reefs in the future may in fact be true. However, this would more likely be the natural result of the expanding deltas of the Atchafalaya River and the Wax Lake Outlet than the result of shell dredging. It is projected that the growth of the above-mentioned deltas will convert from 37,000 to 83,300 acres of waterbottom to exposed land by the year 2030. With the exception of portions of the Point au Fer reef, this natural growth of the deltas will cover most of the remaining exposed oyster reefs, regardless of the actions of the shell dredging industry. Additional information regarding the projected expansion of the developing deltas within the project area has been added to Appendix C.

RESPONSE C.4.11. Your assertion that barrier reefs and land-building (the result of delta formation) dampen storm energy is correct. However, the impact of shell dredging on barrier reefs and land formation has been shown in the EIS to be insignificant. The only reefs assumed to be dredged are submerged reefs, which have no significant value in the dampening of storm events.

RESPONSE C.4.12. The EIS clearly states that the figures given for proven shell reserves are estimates and that the actual volumes of shell resources are very likely to be much greater. It has also been clearly stated that it is currently beyond the state-of-the-art to give exact measurments of total shell reserves. The proven estimates used in the EIS are based on years of tedious exploration by hand-probing.

RESPONSE C.4.13. As stated in Section 2.2.4.1. of the EIS, this document addresses the impacts of shell dredging in 167,300 acres of waterbottom, not the 600,000 acres mentioned in the comment. In addition, there are 60,000 acres in the project area where no shell dredging is allowed. The Army Corps of Engineers is one of three agencies which regulate shell dredging in coastal Louisiana. Two agencies of the State of Louisiana are involved in regulatory capacities, each of which has also permitted shell dredging for numerous years and has primary responsibilities in the management of the industry. The current management plan (with its various regulations and prohibited regions) is one that has evolved over many years of active review of the industry. Some feel a conflict of use exists between dredgers and fishermen. However, many shrimpers purposely shrimp in the dredge plume. Therefore, if fishermen and shrimpers are seeking to occupy the same areas where dredges are operating, then there must be a supply of fish and shrimp there.

RESPONSE C.4.14. The current protective zones surrounding the developing deltas were implemented after review of the subaerial delta in 1982. Permits given for shell dredging allow for a redefinition of these protective zones at any time. The current zones were established after consultation with U. S. Fish and Wildlife Service, the Coastal Management Division of the Department of Natural Resources, and Wildlife and Fisheries for the State of Louisiana. Detailed hydrographic surveys of the project area are being planned and conducted now. If warranted, a revision of these boundaries can be accomplished at any time.

RESPONSE C.4.15. Comment noted.

RESPONSE C.5.1. Comment noted.

RESPONSE C.5.2. Comment noted.

RESPONSE C.5.3. Comment noted.

RESPONSE C.5.4. No limitation is placed on the size of the disposal sites in the applicable 404 Guidelines.

RESPONSE C.5.5. At the meeting cited in your comment, New Orleans District representatives did not indicate that it is impossible to locate submerged or buried deposits of shells. We concur that the technology does exist. However, the conversation centered around the applicability of electronic or technological means for giving the detailed information required for assessments of the buried shell prior to removal. Although not specifically stated at the meeting, the information needed for the applicants' purposes is as follows: 1) detection of buried shell deposits under as little as two or as much as 15 feet of overburden, 2) precise definition of the perimeter of the reef, 3) precise information regarding the depth of the shell deposit and the thickness of the shell over the entire surface of the reef, and 4) information regarding any additional deposits below a shallower deposit. At the meeting, it was indicated that we knew of no electronic means which could satisfy all of the requirements for the detailed information listed.

The shell dredging industry has a vested interest in locating and using such equipment if it exists, and many efforts have been made to identify and test such technology. To date, no sufficiently flexible system has been tested. John Chance and Associates has been contacted by the shell dredging industry regarding this matter. The price of maintaining survey boats and several crew members year round to tediously and continuously probe the substrata by hand is a considerable investment. If suitable technology existed, it would be in use.

RESPONSE C.5.6. It is not necessary to permit disposal on a reef-by-reef basis to comply with the technical requirements of Section 230.11.

RESPONSE C.5.7. Your statement that the "disposal (of dredged material) must be permitted on a reef-by-reef basis" is your interpretation of the applicable guidelines. The required information on the various parameters mandated for inclusion in the Section 404(b)(1) evaluation may easily be obtained without a site-specific examination of the many buried reefs in the coastal project. The 404 evaluation is a procedural element which has no direct bearing on the determination of the environmental impacts of shell dredging.

Applicable regulations and guidelines have no prohibitions on the sizes of the disposal sites and mixing zones. The interpretation of a larger geographic zone than a reef is not contrary to guidance and certainly not mandated by 404 Guidelines.

RESPONSE C.5.8. The contention of the reviewer that the EPA Guidelines for the preparation of the 404(b)(1) Evaluation and/or NEPA require reef-by-reef permits is incorrect. No such language exists in the guidelines or the law.

RESPONSE C.6.1. Comment noted.

RESPONSE C.6.2. Comment noted.

RESPONSE C.6.3. Comment noted.

RESPONSE C.6.4. The decision to bifurcate the coastal EIS was an administrative decision, and public comment was not required. This action was done in response to a request by the applicants. The USACE is not attempting "to isolate geographic areas that are physically, hydrologically and ecologically linked."

RESPONSE C.6.5. Additional information concerning the applicability of the Cumulative Impacts Section has been added to the EIS. The entire rationale for the reviewer's arguments regarding the cumulative impacts are that they address only Four League, Atchafalaya, and East Cote Blanche Bays. This is not true. The cumulative impacts discussion is based on information derived from the entire bay system, not just zones 1-3. This fact is indicated in Section 3.8.4., where it is indicated that "the following list of activities permitted by the USACE ...occur in the project area or adjacent waters." The listing of 961 permitted activities ranges from the Isles Dernieres area, westward along the shoreline to Oyster Bayou, north along the eastern-most shoreline of Four League Bay, north along the eastern bank of the Atchafalaya River to the Intracoastal Waterway, west to Freshwater Bayou, and out to the three-mile limit.

There was no effort "to intentionally obscure cumulative impacts", since the cumulative impacts of shell dredging in zones 1-3 have been discussed in relation to the entire bay region.

RESPONSE C.6.6. The general issue of reef-specific permits is addressed in Comment C.5.7. However, it should be noted that the issuance of reef-specific, bay-by-bay, or general permits for shell dredging is an administrative procedure. The issuance of permits, regardless of the

size of the permitted area, does not materially affect the assessment of environmental impacts of shell dredging.

RESPONSE C.6.7. Comment noted.

RESPONSE C.6.8. Each of the factors listed in this comment have been discussed in relation to the impacts of the removal of shell and the various alternatives considered in detail in the EIS.

RESPONSE C.6.9. The Cumulative Impacts section of the EIS is a comprehensive and accurate reflection of those activities which may act in a cumulative manner with the impacts associated with shell dredging. The USACE is fully aware of NEPA Guidelines and has disclosed the pertinent activities which may act in a cumulative manner with the shell dredging impacts.

RESPONSE C.7.1. Comment noted.

RESPONSE C.7.2. Section 404 of the Clean Water Act does not mandate issuance of reef-by-reef permits. However, information regarding this alternative has been added to the alternatives section, Section 2.2.5. See Responses C.5.4. and C.5.7.

RESPONSE C.7.3. The U.S. Environmental Protection Agency (EPA) treats shell, sand, and gravel dredging as it does maintenance dredging operations, i.e., if the activity is conducted under a Section 404 permit, then it is exempt from 402 discharge permit requirements. The shell industry has correspondence from EPA confirming that an NPDES permit is not required.

RESPONSE C.7.4. The decision to bifurcate the coastal EIS was made at the request of the applicants when it became obvious that the originally planned EIS (covering the entire region) could not be accomplished before expiration of the current permits. This decision is in consonance with Corps regulations that all permit applicants deserve a timely decision regarding their proposed actions.

The USACE concurs that Four League, Atchafalaya, and East Cote Blanche Bays are hydrologically linked to West Cote Blanche Bay, Vermilion Bay, and the Gulf of Mexico. The acknowledged linkage of natural waterbodies, however, does not preclude their treatment as separate entities if proper caution is used. This has been done in the EIS. The cumulative impacts of the EIS addresses the impacts to the entire region, not just the defined project area.

The USACE is fully aware of the court-mandated treatment of the coastal region. The court order specifically stated the permits can be neither extended nor renewed until EIS's have been accomplished on all of the permitted areas. This order will be complied with.

RESPONSE C.7.5. Although the Section 404(b)(1) analysis is generally included in draft EIS's for Corps civil works projects, this is normally not the case with regulatory EIS's. There is no legal requirement that a

404(b) (1) analysis be included in either the Draft or the Final EIS. See the response to comment A.6.2.

RESPONSE C.7.6. 40 CFR sections 230.10 and 230.11 do not identify the EIS as the source of information to determine compliance, although we acknowledge that the EIS can serve as a major source of information in 404(b)(1) preparation. If the information in the EIS is not deemed sufficient to determine compliance, data will be gathered from other sources.

RESPONSE C.7.7. Any comparison of Lake Maurepas with Four League Bay is very tenuous. Turbidity problems within the former system are not solely due to the shallowness of the system, as indicated in this comment. Four League Bay is shallow (average depth + 3 feet), however, the tidal-forced circulation and salinities within the bay is considerable (as is not the case in Lake Maurepas). The alternative to close the bottom half of Four League Bay to dredging is being seriously considered, as are all of the alternatives considered in detail.

RESPONSE C.7.8. As required by the Endangered Species Act, the USACE coordinated with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service regarding potential impacts to endangered species as a result of shell dredging. These agencies have jurisdiction over endangered species and are the acknowledged experts regarding these species. The potential impacts to the threatened and endangered species have been assessed and found to be insignificant.

RESPONSE C.7.9. The potential for bioconcentration of toxic substances has been adequately assessed in Appendix C of the EIS. There are no data to support the implication that resuspension of Atchafalaya Bay sediments may concentrate "up the marine food chain to the pelican."

RESPONSE C.7.10. It is true that coastal erosion is occurring throughout much of the project area, and that wave attack is a contributing factor to this erosion. However, the primary cause of coastal erosion is

subsidence, which makes the entire coastal area susceptible to increased wave attack. We concur that the dredging of shell in waters very close to shore may accelerate coastal erosion. However, the EIS has shown that the current half-mile buffer and proposed 1,500 foot buffer is adequate to prevent coastal erosion.

RESPONSE C.7.11. A site-specific analysis would be needed for accurate results due to the number of factors involved. Some of the factors involved are depth of hole, distance from shore, orientation, size, and shape of the hole, periodicity of the waves, length of fetch, and waves direction. In a generic analysis, representative drege holes were positioned parallel to the shoreline at distances of 1,500 and 2,500 feet, and at depths below the bottom surface at 4 feet, and 16 feet. Analysis shows that the shallow holes have a minimal effect on the refraction of the orthogonal (in the order of 1x), whereas the deeper holes have more of an impact (on the order of several degrees). The effects of holes located 1,500 feet from shore vary little with respect to the wave orthogonal from holes located 2,500 feet from shore. In summary, holes with depths of 4 feet or less from the bottom surface do not significantly modify the refraction of wave orthagonals so as to concentrate wave energy at a particular location on the shoreline for a typical wave climate.

RESPONSE C.7.12. The bay would enlarge at the rate of increase of the tidal prism. If the mouth of Fourleague Bay is enlarged, the amount of water passing through it will increase. The time that it takes for the water to be exchanged will reduce, allowing the water level within the bay to approach the level of water outside the bay. However, it is not anticipated that this would result from any shell dredging activities.

RESPONSE C.7.13. No discrepancy exists. From a coastal engineering viewpoint, the 1,500-foot buffer zone would not cause erosion. However, the geological implications must be considered separately. Changes have been made in Section 3 of the EIS which generally address your concern.

RESPONSE C.7.14. Figures C-11 and C-13 also show the depths to be 0 to 4 feet 2 years after the example in the comment. The large depths are not of long duration. See Table 11 of Appendix C.

RESPONSE C.7.15. A delta will lose sediment mass only if resuspension and offshore sediment loss exceed the supply to the delta. WES concluded in the Technical Report HL-82-15, The Atchafalaya River Delta, Report 6, Interim Summary Report of Growth Predictions, that this condition is very unlikely to occur in the Atchafalaya in the next 50 years short of a substantial diversion of the river to another location.

A delta can lose subaerial land if volume loss occurs or if the combination of reduction of sediment supply to the subaerial zone, resuspension and redistribution of sediments from land to water, and loss of elevation due to apparent subsidence exceeds the rate of subaerial accretion. For example, increasing channelization of a delta's distributaries tends to confine coarse sediments to the deeper channels. Subaerial repletion by principally fine sediments will be less effective in maintaining land because they will be more readily resuspended. As another example, a reduction in the height of flood crests by upstream retention can reduce the frequency and extent of delta land submergence. These are two cases in which the total sediment supply need not decrease, only the supply to the subaerial zone.

Dredging is not permitted in the subaerial zone of the two deltas in the Atchafalaya Bay. Consequently, volume loss as a result of removing material does not occur. The concern Rodney Adams voiced in his affidavits is that dredging close to the emerging deltas increases the tidal prism, increasing the resuspension and redistribution of sediments from land to water. As noted in Appendix C, tidal currents are possibly a less significant source of energy for suspending sediments than river discharge and winds. Tidal currents play an important role in transporting and flushing sediments suspended by other mechanisms. Also, in Section 3.4.1.3.2 on page EIS-29, it was concluded that the overall impacts of dredge holes 2,500 feet from shore on average wave heights and storm surge heights, including hurricanes, are negligible. The dredge cuts made in advance of the developing Wax Lake Outlet delta do not

appear to have significantly affected that Delta's development as the area in which dredging occurred is not subaerial land. It appears that delta growth is retarded only when the supply of sediment to the delta is reduced.

RESPONSE C.7.16. As presented in Appendix C, the USACE data from 1986 do not support Mr. Adams opinion concerning the effects of dredging outside the -2 NGVD limit on the emerging delta. The primary source of sediment which refills dredge cuts is not from the active subaqueous or subaerial delta.

RESPONSE C.7.17. Comment noted.

RESPONSE C.7.18. We concur that erosion is impacting Marsh Island and many shoreline features of coastal Louisiana. This is a natural phenomenon and and has been covered very thoroughly in the EIS and the above comments and responses. The relation between shell dredging operations and coastal erosion and land loss has been examined.

RESPONSE C.7.19. EPA criteria have been added to the Sediment Quality-Contaminants section in Appendix C. Detection limits for some parameters are indicated in Tables 4, 5, and 6 of Appendix C. A concentration of 0 ug/l reported in a chemical analysis is interpreted as meaning the amount present was less than 0.5 ug/l. A concentration of 0.0 ug/l means the amount present was less than 0.05 ug/l, and the procedure used would not detect concentrations less than 0.05 ug/l. A concentration of 0.00 ug/l means the amount present was less than 0.005 ug/l and the procedure used could not detect concentrations less than 0.005 ug/l.

RESPONSE C.7.20. Additional data which generally address your concern have been incorporated into Appendix C.

RESPONSE C.7.21. Additional data which generally addresses your concern have been added to Appendix C of the EIS. The statement cited by the comment is true and supported by these data.

RESPONSE C.7.22. The discussion in the main body of the EIS generally characterizes the nature of the turbidity plume with respect to the background conditions. Since the individual plume densities are so variable, it was believed best to place the entire description of ranges of turbidity levels that have been observed at monitored locations into Appendix C. The influences of low salinity and other pertinent factors (including water hardness) on turbidity levels are discussed in Section 3 of the EIS and Appendix C.

The thickness of the fluid mud layer resulting from dredging that would occur beyond the dredged cut is unknown, but it is not believed to be sufficiently great to cause significant physical changes to the affected water bottoms. This topic has been addressed briefly in the EIS, and in moderate but sufficient detail in Appendix C, to permit a rational conclusion regarding its impacts. The fact that the great majority of the discharged sediments falls back into and remains confined within the dredged cut is of considerable importance in assessing the extent of the fluid mud impacts. In the Mobile Bay study, the sediments were dumped into two more or less flat disposal areas, which permitted the fluid mud to move laterally without any such physical barriers as the walls of the dredge cuts in the project area.

RESPONSE C.7.23. Since the only water bottoms that are significantly disturbed by shell dredging are the dredge cut areas, it logically follows that cumulative effects, such as a long-term turbidity increase, would be considerably less than if the dredging had produced large fluid-mud mounds extending hundreds of feet beyond the dredged areas. Although it is true the thin layers of dredged sediments will, for a brief time, be more subject to occasional resuspension, the relative influence of this phenomenon upon turbidity levels occurring long after a dredging activity is considered negligible compared to that of the natural processes of suspended sediment transport by streamflows, tidal action, and wind wave turbulence. It is not thought that dredge-generated turbidity levels significantly affect long-term turbidity levels. It is currently beyond the state-of-the-art, or would be exorbitantly expensive, to isolate and measure the incremental effect

of oyster shell dredging upon long-term turbidity levels in Atchafalaya Bay and the neighboring waterbodies.

RESPONSE C.7.24. The statement that numerous activities in the coastal zone have similar impacts as shell dredging is true. However, the statement that shell dredging impacts wetlands by causing coastal erosion is false. As noted previously and discussed in the EIS, shell dredging does not contribute to coastal erosion or loss of wetlands. Because the extensive wetlands of the regions are protected by buffer zones and are not impacted, they have not been mapped in this document.

RESPONSE C.7.25. Under existing conditions, approximately 600 acres of shallow waterbottoms are directly impacted annually, not 1,138 acres. The loss of any waterbottoms associated with the maintenance of navigable waterways has been addressed in other documents.

RESPONSE C.7.26. As noted previously, the potential impact of shell dredging on the Atchafalaya Delta is not significant, due to the fact that no shell dredging is allowed within the active delta. The Avoca Island Levee Extension is only one alternative under consideration by the Corps to alleviate increased backwater flooding to the east of the Atchafalaya Basin Floodway. The other alternatives would not directly impact the delta. The Corps has not yet prepared an Environmental Impact Statement covering these alternatives. When the EIS is prepared, the effects of each alternative on delta development will be addressed.

RESPONSE C.7.27. Much of the information requested in this comment is unavailable or outside the scope of the project. There is no compelling need to map cities, wetlands, or grassbeds, as these are not impacted by shell dredging. Wildlife refuges are discussed in the document. It is also currently beyond the state-of-the-art to map subaqueous shell resources. Information regarding salinity is presented in Appendix C,

and detailed information concerning circulation patterns is not mandatory for informed decision-making.

RESPONSE C.7.28. The USACE feels that the document conforms to both the spirit and the letter of the law. Comments received from your office previously have been given due consideration, as have comments and concerns received from the general public.

RESPONSE C.8.1. Comment noted.

RESPONSE C.9.1. To the best of our knowledge, Florolite is a graded florogypsum. Information regarding florogypsum is presented in Table 1 and Section 2.2.1.1. of the EIS.

RESPONSE C.10.1. Comment noted.

RESPONSE C.11.1: It is acknowledged that the exposed shell reefs do provide valuable substrate for aquatic organisms. As you are aware, oyster shell dredging in the coast area is regulated by several agencies. In certain cases, including the restrictions on dredging of exposed reefs, the restrictions are different. However, it must be emphasized that in such cases, the strictest restriction applies. In this particular case, the Louisiana Department of Natural Resources restrictions currently state that no dredging shall occur within 1,000 feet of exposed subaerial reefs, that the permittee shall avoid subaqueous shell reefs to the maximum extent practicable and shall not dredge any reefs exceeding 1.0 acre in size. Subaqueous shell reefs are defined as those reefs which are above the water bottom but beneath the water surface at mean low tide. However, Corps of Engineers restrictions state that no dredging operations may be performed within 1,000 feet of exposed oyster reefs (any reef not covered by mud or sand). With the Corps restriction in place, these reefs are afforded some degree of protection. It must be acknowledged, however, that since the locations of all of the small exposed oyster reefs are not known, and the locations of these reefs in this dynamic area may change on an annual basis, small exposed reefs may be inadvertently dredged from time to time.

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