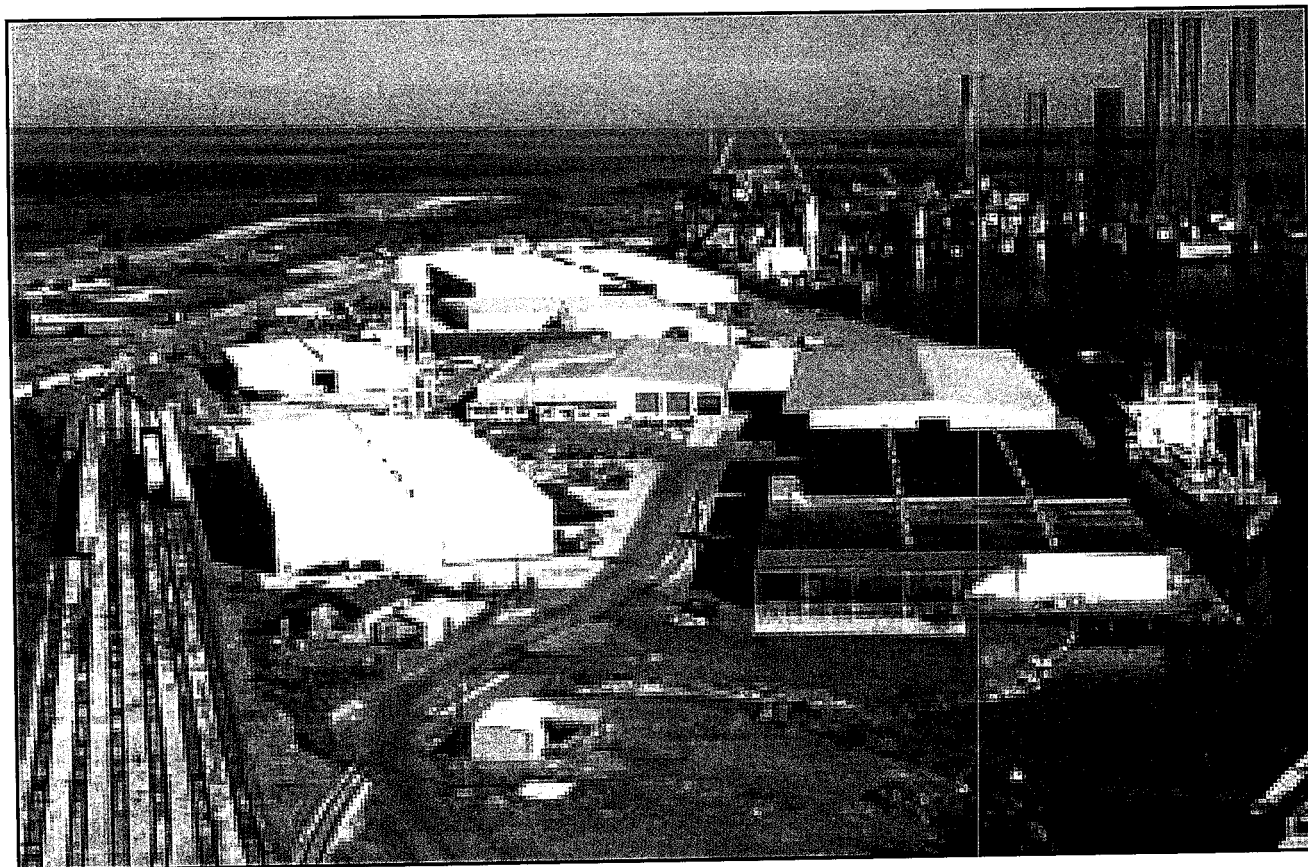


**SECTION 404(b)(1) EVALUATION REPORT  
FOR THE  
FEDERALLY AUTHORIZED PASCAGOULA HARBOR NAVIGATION PROJECT  
CONTINUED OPERATIONS AND MAINTENANCE**

**CITY OF PASCAGOULA, JACKSON COUNTY, MISSISSIPPI**

**I. PROJECT DESCRIPTION:**

A. **Location.** The Federally authorized Pascagoula navigation project is located in the City of Pascagoula, Jackson County, Mississippi (Figure 1). The navigation project is approximately 40 miles west of Mobile, Alabama and 100 miles east of New Orleans, Louisiana. Mississippi Sound is 81 miles long, 7 to 15 miles wide and averages 9.9 feet in depth (Eleuterius 1976). Its seaward limit is formed by five barrier islands, and on the southwest, between Half Moon (Grand) Island and Isle au Pitre, by marsh island remnants of the St. Bernard subdelta. The five barrier island system is comprised of Cat, East and West Ship, Horn, Petit Bois and Dauphin Islands. The Pascagoula Channel passes between Horn and Petit Bois Islands up into the Ports of Bayou Casotte and Pascagoula.



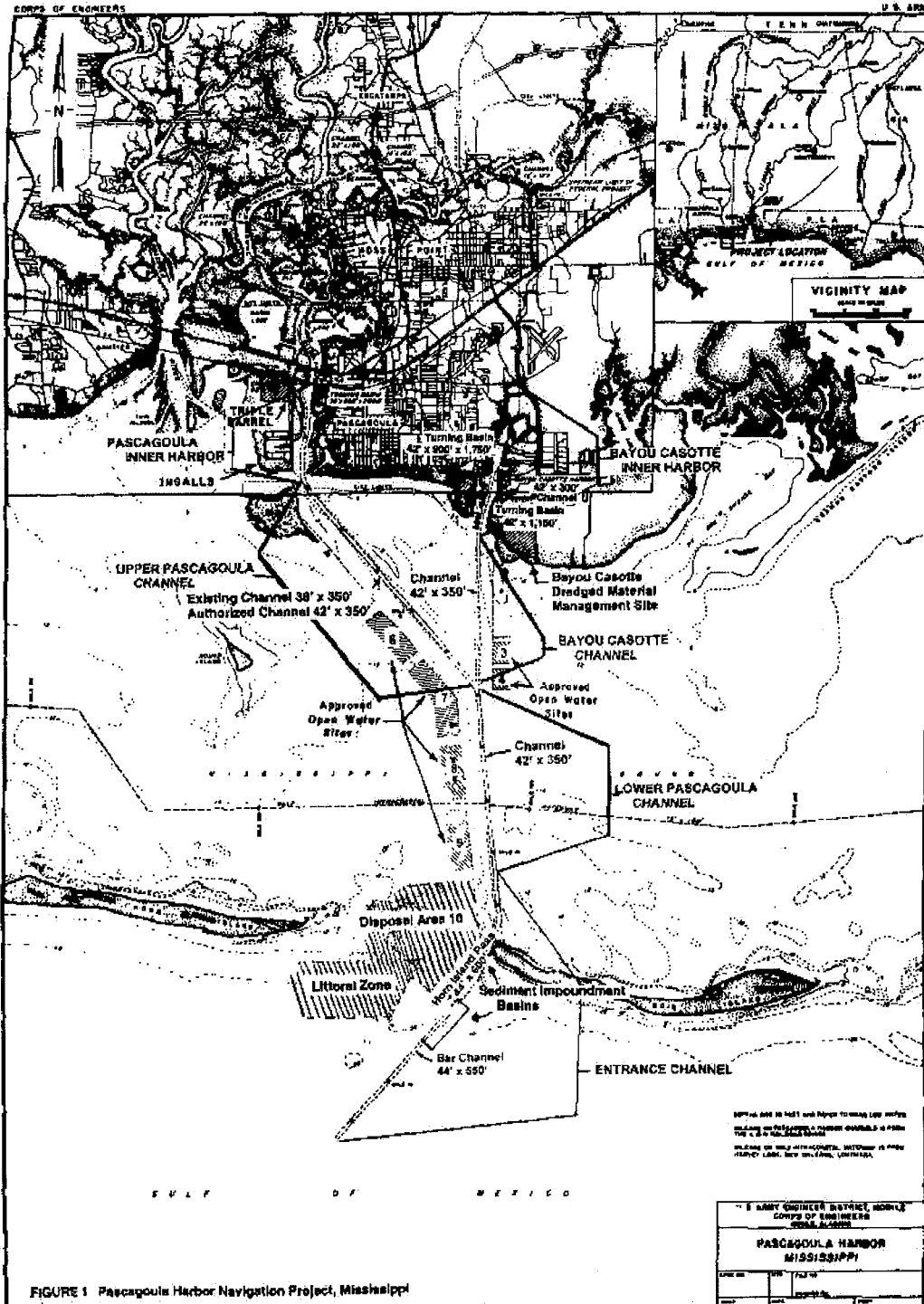
Photograph 1: Port of Pascagoula, Mississippi

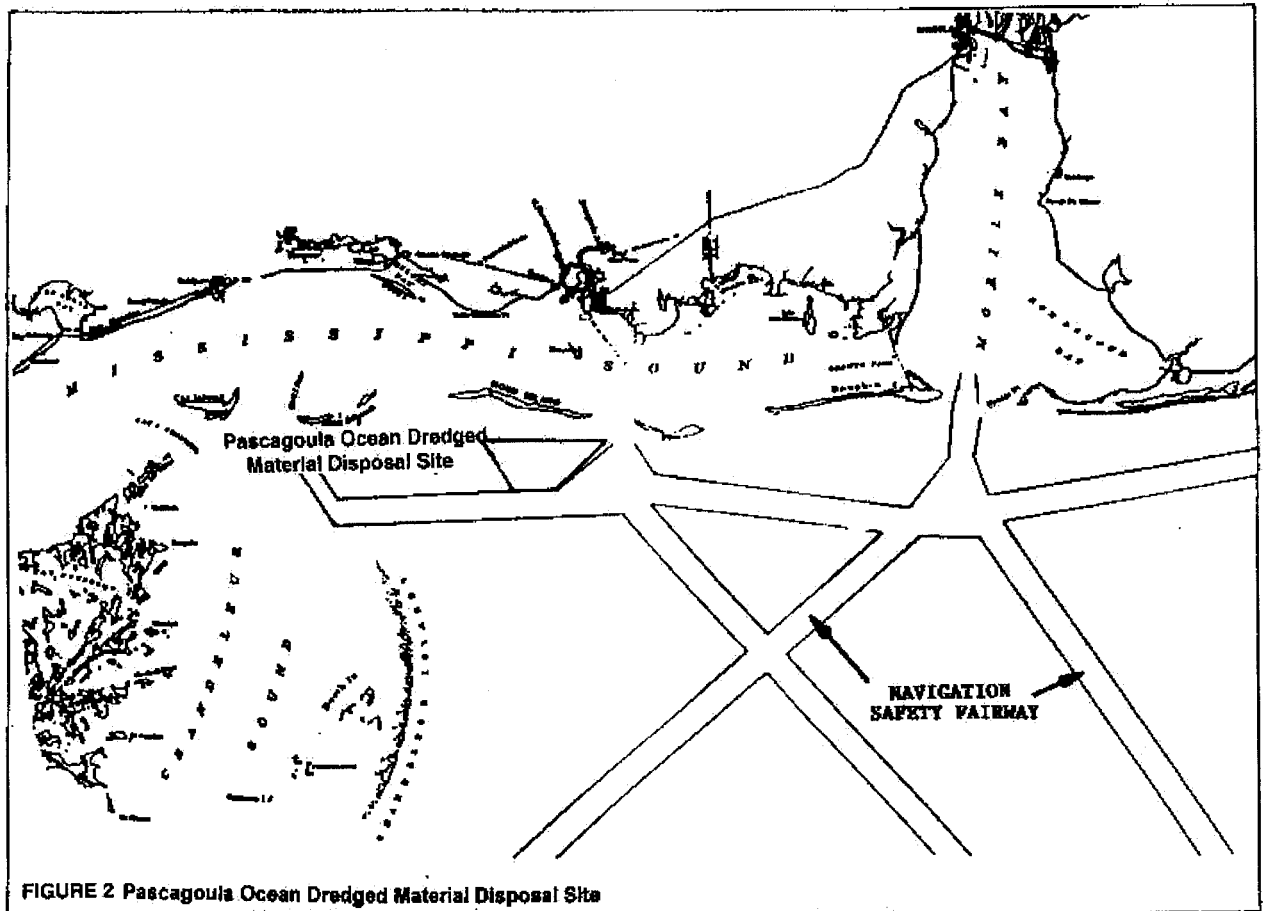
B. **General Description.** The proposed action addressed in this Section 404(b)(1) Evaluation is operations and maintenance (O&M) of the Federally authorized Pascagoula Harbor navigation project. The Congressionally authorized Pascagoula Harbor, Mississippi navigation project provides for:

- I. An entrance channel 44 feet deep and 550 feet wide from the Gulf of Mexico to Horn Island Pass, including a 2,200-foot long by 200-foot wide sediment trap situated on the east side of the channel, a channel 44 feet deep and 600 feet wide through Horn Island Pass, including a 4,700-foot long sediment trap situated on the east side of the channel 44 feet and 175 feet wide;
- II. A channel 42 feet deep and 350 feet wide in Mississippi Sound and the Pascagoula River to the railroad bridge at Pascagoula, including a turning basin 2,000 feet long and 950 feet wide (including the channel area) on the west side of the river below the railroad bridge;
- III. A channel 42 feet deep throughout and 350 feet wide from the ship channel in Mississippi Sound to the 1,150-foot turning basin at the mouth of Bayou Casotte, then 350 feet wide for about one mile to the northern turning basin, 900 feet wide, and 1,750 feet long;
- IV. A channel 22 feet deep and 150 feet wide up the Pascagoula River from the railroad bridge to the mouth of the Escatawpa River (Dog River), then up the Escatawpa River to the Highway 613 Bridge;
- V. A channel 12 feet deep and 125 feet wide from the Highway 613 Bridge, via Robertson and Bound Lakes, to Mile 6.0 on the Escatawpa River; and
- VI. A channel 12 feet deep by 80 feet by 80 feet extending from deep water in the Pascagoula River to a turning basin in Krebs Lake a distance of about 1,500 feet, then along the south bank of the lake a channel 10 feet deep and 60 feet wide, terminating at a second turning basin, a distance of 2,700 feet from the first.

Project segments described in paragraphs IV, V, and VI are maintained separately from the Harbor portion and are not included in this Section 404(b)(1) Evaluation. Existing and authorized depths may vary in the Pascagoula Harbor Federal project. In order to maintain channel dimensions of the Pascagoula Harbor navigation project, maintenance dredging would be performed on an as needed basis with average dredging cycles occurring every 18 to 24 months. Approximately 2,000,000 gross cubic yards of material would be removed from the channels every dredging cycle. However, not all segments require maintenance dredging every dredging cycle. Therefore, both the location and quantity of materials to be dredged are dependent upon where shoaling occurs. Typically, a hopper dredge is used to maintain the outer portion of the entrance channel with material placement in the Pascagoula Ocean Dredged Material Disposal Site (ODMDS) while a hydraulic pipeline dredge is used to maintain the remainder of the project utilizing open-water,

littoral, and upland disposal sites. Previously certified disposal sites include upland sites in proximity to the Upper Pascagoula and Bayou Casotte channels, open-water sites adjacent to the channel within the Mississippi Sound, and two beneficial use sites including disposal area 10 in Horn Island Pass and a nearshore littoral zone disposal area between the -14 and -22-foot depth contours southeast of the east end of Horn Island. The Pascagoula ODMDS is an approximately 18.5 square nautical mile area located south of Horn Island in the Gulf of Mexico. Although the scenario described above is typical for the project, adjustments to the placement of material are reviewed annually as part of the dredged material management plan. If adjustments are made they typically involve the transportation of materials from the Mississippi Sound, Pascagoula River, and Bayou Casotte channels to the ODMDS. This helps preserve the long-term maintenance ability of the project. The proposed maintenance dredging and placement sites were most currently certified as described in Mississippi Department of Environmental Quality, Office of Pollution Control – Mississippi Department of Marine Resources – U.S. Army Corps of Engineers, Mobile District Joint Public Notice number FP97-PA07-06.





**Pascagoula Harbor Entrance Channel and Horn Island Pass:**

Material dredged from the entrance channel and Horn Island Pass would be placed in previously approved and utilized, disposal area 10 located adjacent to the channel, the littoral zone disposal area between -14 and -22-foot depth contours southeast of the east end of Horn Island, and in the U.S. Environmental Protection Agency (EPA) designated ODMDS (Figures 1 and 2).

**Mississippi Sound:**

Maintenance dredging and placement activities are proposed for the Lower Pascagoula, Bayou Casotte, and Upper Pascagoula channels of the Pascagoula Harbor navigation project (Figure 1). The Lower Pascagoula channel segment commences north of Horn Island Pass and concludes at the Y-junction. Material dredged from the Lower Pascagoula channel segment is placed in the previously

certified open-water disposal areas 6, 7, 8, and 9 located west of the channel. Bayou Casotte channel segments begins at the Y-junction continuing north to the Bayou Casotte Inner Harbor. Open-water disposal areas 3 and 4, located east of the channel, are utilized for material dredged from the Bayou Casotte channel. Material dredged from the Upper Pascagoula channel, extending from the Y-junction north to the Pascagoula Inner Harbor, is disposed of in disposal area 6 and the upland placement area Triple Barrel. Adjustments to the dredged material management plan to preserve long-term management of these upland and open-water sites could include disposing of material dredged from Mississippi Sound at the Pascagoula ODMDS (Figure 2).

#### **Pascagoula Inner Harbor:**

Maintenance dredging and placement activities are proposed for the Pascagoula River channel segment of the Pascagoula Harbor navigation project (Figure 1). The river portion channel segment is located below the CSX railroad bridge situated at the north end of the Pascagoula Harbor navigation project. Maintenance material to be dredged from the Pascagoula River channel portion of the Pascagoula Harbor navigation project would be placed in the previously utilized and approved upland placement area known as Triple Barrel. Dredged material could also be placed in the open-water disposal area 6 and the Pascagoula ODMDS in order to preserve long-term management of the upland site (Figure 2).

#### **Bayou Casotte Inner Harbor**

Material dredged during maintenance of the Bayou Casotte channel and the southern and northern turning basins would be placed in the upland placement area known as the Bayou Casotte Dredged Material Management Site (BCDMMS) or the Pascagoula ODMDS (Figures 1 and 2).

C. **Authority and Purpose.** The Pascagoula Harbor navigation project was Federally authorized by Congress through the River and Harbor Acts of 4 March 1913, 4 March 1915, 17 May 1950, 3 September 1954, 3 July 1958, 14 July 1960, 23 October 1962, 23 September 1965, 10 February 1971, and 23 June 1971. Section 202 (a) of the Water Resources Development Act (WRDA) of 1986 authorized modifications to the Federal navigation project.

#### **D. General Description of Dredged or Fill Material.**

(1) **General Characteristics of Material.** Bottom sediments along the navigation channel range from silt and clay to fine to medium sands.

Pascagoula Harbor and Entrance Channel. The Entrance and Pass channel sediment consists primarily of sands containing traces of shells (Figure 1).

Mississippi Sound. The Bayou Casotte channel is primarily in a silt and clay/mud region, while the Pascagoula Channel immediately south of the harbor transitions to fine and very fine sands. About two miles south of the harbor mouth the channel transitions back to silt and clay and then near the Y-junction with Bayou Casotte channel returns to sandy material. Medium and coarse sands lie along the mainland beaches west of Pascagoula River as well as along the barrier islands. East of the Pascagoula River to Mobile Bay, fine sands, silts, and clays dominate the mainland borders.

Pascagoula Inner Harbor. Material to be dredged from the Pascagoula channel within the Inner Harbor consists of soft, fine-grained, organic silts and clays.

Bayou Casotte Inner Harbor. Within the turning basins and harbor of Bayou Casotte the side slopes and bottom of the existing channel are covered with a few feet of very soft, fine-grained organic silts and organic clays, of medium to high plasticity.

(2) **Quantity of Material.** Approximately 2,000,000 cubic yards of material will be dredged from the Pascagoula Harbor navigation project every 18 to 24 months.

(3) **Source of Material.** The material is being dredged from the Pascagoula Harbor Federal navigation project, Mississippi, which extends from the mainland shoreline to south of the Horn Island and Petit Bois Pass (Figure 1). The dredging cycle is dependent upon where shoaling occurs.

E. **Description of the Proposed Discharge Site.**

(1) **Location.** Previously certified disposal sites include upland sites in proximity to the Upper Pascagoula and Bayou Casotte channels, open-water sites adjacent to the channel within the Mississippi Sound, and two beneficial use sites including disposal area 10 in Horn Island Pass and a nearshore littoral zone disposal area between the -14 and -22-foot depth contours southeast of the east end of Horn Island. The two upland placement sites, BCDMMS and Triple Barrel, are located east of the Bayou Casotte Inner Harbor channel and west of the Pascagoula Inner Harbor channel, respectively. Open-water disposal sites adjacent to the channel are shown on Figure 2. Open-water disposal sites, 6, 7, 8, and 9, are located west of the Pascagoula channel while sites 3 and 4 are east of the Bayou Casotte channel. The littoral zone site is located west of the Horn Island Pass and east of Horn Island. Disposal area 10 is located west of the channel in the Horn Island Pass.

(2) **Size.** Triple Barrel and BCDMMS consists of 92 acres and 175 acres, respectively. The open-water and littoral zone disposal areas range in acres with the portion farthest from the channel being 'open'.

(3) **Type of Site.** The disposal site types utilized for maintenance of the project

are contained upland, beneficial use, and open-water areas.

(4) **Type of Habitat.** BCDMMS and Triple Barrel are contained upland disposal sites. The open-water and beneficial use areas are marine open-water habitats. All of these sites have been historically used for disposal of dredged material.

(5) **Timing and Duration of Discharge.** Timing and duration of the proposed action are dependent upon where shoaling occurs in the navigation project.

F. **Description of Disposal Method.** A hydraulic pipeline dredge is used to maintain the project, excluding the outer portion, utilizing open-water, beneficial use, and upland disposal sites. A hopper dredge is used to maintain the outer portion of the project.

## II. Factual Determinations (Section 230.11):

### A. **Physical Substrate Determinations.**

(1) **Substrate Elevation and Slope.** A dike that has a 24-foot elevation surrounds the Triple Barrel upland disposal site. The slope of that dike ranges from 1 to 2 feet (1V:2H) to 1 to 3 feet (1V:3H). A dike is proposed for construction to an elevation of 15-foot with a slope of 1 to 3 feet (1V:3H) at BCDMMS. The littoral zone area is located between the -14 and -22-foot depth contours southeast of the east end of Horn Island. Disposal area 10 is located west of the Horn Island Pass. The littoral drift transports material placed in these beneficial use sites towards Horn Island. Open-water disposal areas adjacent to the Pascagoula and Bayou Casotte channels are maintained not to exceed -4-foot mean low water.

(2) **Sediment Type.** Dredged material proposed for disposal ranges from silt and clay/muds (less than 62 microns) to fine to medium sands with some oyster shells.

(3) **Dredged/Fill Material Movement.** Disposal of dredged material at BCDMMS and Triple Barrel would be confined to within the diked areas. The residence times of the return water within the material placement sites would be such that no impacts would result from the movement of materials. Currents are anticipated to transport material out of the open-water and beneficial use sites. Transport material from the littoral zone and disposal area 10 would benefit the coastal shoreline.

(4) **Physical Effects on Benthos.** The return water from the proposed upland sites would have no impact on benthos. Non-motile benthic fauna within the open-water and beneficial use disposal sites may be destroyed by the proposed operations, but should repopulate within several months after completion. Some of the motile benthic and pelagic fauna, such as crabs, shrimp, and fishes, are able to avoid the disturbed area and should return shortly after the activity is completed.

Studies on fisheries resources both adult, pre-adult and juvenile form indicate that most species are able to avoid the area of disposal or are unaffected. Larval and juvenile stages of these forms may not be able to avoid the activity due to limited mobility. Impacts of open-water disposal on benthic communities and fisheries resources have been undertaken nationwide for the last 30 years. Most recently the impacts of thin-layer disposal have been undertaken in the Mississippi Sound area. Pre- and post-monitoring of water quality suggests turbidity and total suspended solids are temporarily affected by disposal operations. However, the magnitude of the increases with disposal operations is consistent with those caused by frontal storms. In addition, total suspended solids were shown to be elevated in bottom waters of disposal areas; however, this limitation to the bottom waters suggests rapid settling rates of the material or low wave and current energy unable to re-suspend sediments. No adverse impacts are anticipated as a result of disposal at the upland sites. The overall impact to these organisms is expected to be minimal.

(5) **Other effects.** No other effects are anticipated.

(6) **Actions Taken to Minimize Impacts (Subpart H).** No other actions to minimize impacts to the physical substrate are deemed appropriate for this project.

#### **B. Water Column Determinations.**

(1) **Salinity.** Salinity would not be impacted as a result of the operations at Pascagoula Harbor.

(2) **Water Chemistry (pH, etc.).** Chemical testing of the Pascagoula Inner Harbor and Upper Pascagoula channels was determined to be necessary due to the type of industrial development surrounding the area. EA Engineering, Science, and Technology, Inc. accomplished testing of this area by examining sediment, water column, and tissue chemistry in 2001. Site water chemistry indicated that few chemical constituents were detected in the site water from the Upper Pascagoula and Pascagoula River channels. Of the 151 tested constituents, only 9 (6 percent) were detected and none exceeded applicable EPA water quality criterion (EA 2001). Based on the results of the standard and modified elutriate tests and the high silt/clay fraction of the sediment, the inorganic and organic constituents that were detected in the sediments would likely remain bound to particles and not be released into the water column in dissolved form if placed in open-water. Concentrations of detected chemical constituents would be quickly diluted to concentrations below the EPA saltwater criterion.

Based on the nature of the sediments to be dredged and the presence of only heavy metal contaminants of concern in the Bayou Casotte portion of the project, additional water column determinations were not warranted. The heavy metal contaminants were electronically bound within the clay lattice and are not released during the

physical disturbance caused by dredging and disposal. Based on this there will be no impact to the water column or organisms within the water column at the open-water disposal sites from the heavy metal contaminants, which are present within the sediments to be dredged and transported for disposal. No additional evaluations were deemed necessary.

(3) **Clarity.** Minor increases in turbidity may be experienced in the immediate vicinity of the project area during disposal operations. However, these increases will be temporary and would return to pre-project conditions shortly after completion.

(4) **Color.** No effect.

(5) **Odor.** No effect.

(6) **Taste.** No effect.

(7) **Dissolved Gas Levels.** Temporary decreases in dissolved oxygen will likely result from the disposal operations in open-water and beneficial use sites, but this will only be of a short duration. No long-term effect to the water column is anticipated. The return water from the upland sites is not anticipated to adversely impact dissolved gas levels.

(8) **Nutrients.** Slight increases in nutrient concentrations may occur from disposal operations; however, these concentrations would rapidly dispersed. These described increases would have no significant effect to the water column.

(9) **Eutrophication.** No effect.

**C. Water Circulation, Fluctuation, and Salinity Gradient Determinations:**

**(1) Current Patterns and Circulation.**

(a) **Current Patterns and Flow.** Placement of dredged material into a confined diked area located at BCDMMS or Triple Barrel is not anticipated to affect flows due to the upland location of these sites. The subsequent return water flows are not anticipated to affect current patterns and flow in the vicinity of the project area. The USACE, Mobile District maintains a -4-foot depth at the open-water disposal sites to preclude any adverse impacts. In addition, no adverse impacts are anticipated to occur to current patterns and flow at the beneficial use sites due to the depths being greater than -14-foot.

(b) **Velocity.** No effect.

(2) **Stratification.** No effect.

(3) **Hydrologic Regime.** No effect.

(4) **Normal Water Level Fluctuations.** No effect.

(5) **Salinity Gradient.** No effect.

**D. Suspended Particulate/Turbidity Determination:**

(1) **Expected Changes in Suspended Particulates and Turbidity Levels in Vicinity of Placement Site.** No significant effect.

(2) **Effects on Chemical and Physical Properties of the Water Column.**

(a) **Light Penetration.** Light penetration through the water column at the beneficial use and open-water disposal sites may be temporarily affected but is anticipated to return to previous conditions upon completion of operation activities. The return water from the upland sites is not anticipated to adversely impact light penetration.

(b) **Dissolved Oxygen.** No effect.

(c) **Toxic Metals and Organics.** Standard elutriate testing simulates the potential release of dissolved chemical constituents during open-water placement. During the standard elutriate testing of sediment collected from Upper Pascagoula, metals were the most frequently detected (33 percent), while dioxins/furan congeners and polychlorinated biphenyl (PCB) congeners were both detected infrequently (< 20 percent). No semivolatile organic compounds (SVOCs), chlorinated pesticides, organophosphorus pesticides, polynuclear aromatic hydrocarbons (PAHs) or butyltins were detected in the standard elutriate samples. Modified elutriate testing simulates the potential release of dissolved chemical constituents from a confined disposal facility. During three modified elutriate samples of sediment collected from Upper Pascagoula, metals, chlorinated pesticides, dioxin/furan congeners, PCB congeners, and PAHs were detected infrequently (< 7 percent). No SVOCs, organophosphorus pesticides, or butyltins were detected in the modified elutriate samples.

Based on the results of the standard and modified elutriate tests and the high silt/clay fractions of the sediment, the inorganic and organic constituents that were detected in the sediments would likely remain bound to particles and not be released into the water column in a dissolved form if placed in open-water. Concentrations of detected chemical constituents would be quickly diluted to concentrations below the EPA saltwater criterion. Although these described impacts will likely occur in the project vicinity, the impact will be typically minor and of short duration.

Site water samples collected from the Bayou Casotte portion of the project were relatively clean and had measurable heavy metal concentrations of aluminum, antimony, arsenic, and zinc. Ammonia and total organic concentrations were very low. Sulfide and total Kjeldahl nitrogen (TKN) concentrations were below detection levels. Elutriates of test sediments were similar to site water samples with the exception of ammonia and TKN which were roughly 10 times higher in the elutriate than in the site water. Based on these results as well as previous studies from the area of the Bayou Casotte channel south of the extension in which there was no statistical difference in bioaccumulation between the test sediments and the Grand Bay reference area the sediments to be dredged at Bayou Casotte channel would not cause unacceptable impacts to the environs to the area.

(d) **Pathogens.** No effect.

(e) **Esthetics.** No effect.

(3) **Effects on Biota.**

(a) **Primary Production Photosynthesis.** No effect.

(b) **Suspension/Filter Feeders.** No effect.

(c) **Sight Feeders.** Shorebirds tend to be attracted to disposal sites and placement activities due to the presence of food items in the dredged material. The impact of these operations at the upland, beneficial use, and open-water on sight feeders is expected to be a beneficial, short-term impact.

(4) **Actions Taken to Minimize Impacts (Subpart H).** No further actions are deemed appropriate.

E. **Contaminant Determinations.** The material dredged from the Gulf entrance and Horn Island Pass meets one of the three exclusionary criteria identified in paragraph 227.13(b)(1), (2), or (3) of Code of Federal Regulations, Parts 220-228. The Entrance and Pass channel sediment consists primarily of sands containing traces of shells. This material is placed in the littoral zone and disposal area 10 for beneficial use. Material placed at these sites replenishes Sand Island, Horn Island, and other Mississippi coastal beaches. Paragraph 227.13(b)(1) categorically excludes dredged material composed predominantly of sand, gravel, rock, or any other naturally occurring bottom material with particle sizes larger than silt that are found in areas of high currents or wave energy such as streams with large bed loads or coastal areas with shifting bars and channels. This material is predominantly composed of sand and is positioned in a high-energy area between Horn and Petit Bois Island. The Lower Pascagoula channel is removed from the northern industries

of Pascagoula Harbor and composed of mostly sands. No known historical or existing sources of pollution have been identified in this area. Thus, there is no reason to believe that this material would be unsuitable for disposal in adjacent open-water sites in Mississippi Sound.

Results of previous testing of the sediments to be dredged from the Bayou Casotte channel in 1985 and 1994 and Mississippi Sound channel in 1985 indicated that the material was suitable for unrestricted placement in the ocean disposal site. Testing which occurred in 1985 included a preliminary chemical scan of sediments from the entire Pascagoula Harbor Project (GeoScience 1985). In addition bioassay and bioaccumulation analyses were performed on these sediments by the EPA Laboratory at Gulf Breeze, Florida (USEPA 1988). The 1994 testing involved samples removed from the top 4 feet of sediment in the new Bayou Casotte turning basin location (EA Engineering Science and Technology 1994). In addition to the chemical scan, bioassay and bioaccumulation analyses were performed utilizing organisms agreed to by the EPA and USACE as being appropriately sensitive for use. Testing protocols followed those outlined in the "Green Book" as updated by more recent laboratory procedures, which were being included, by the EPA and USACE in the developing Inland Testing Manual. As described above, the results of these analyses indicated that the material was suitable for unrestricted ocean placement. Additional testing was conducted due to the type of industrial development along the side of the channel and the presence of lead contamination within the former Greenwood Island disposal area. Those results from the Bayou Casotte portion of Pascagoula Harbor also indicated that the material was suitable for ocean disposal.

Based on the 1994 Bayou Casotte analysis, total organic carbon in the samples ranged from 3,100 parts per million (ppm) to 24,000 ppm. Total solids ranged between 23% and 68% with specific gravity varying between 1.05 and 1.75. The sediments were free of cyanide compounds at the detection limit of 0.2 ppm. Ammonia nitrogen was highly variable, ranging between 5.8 and 140 ppm. With the exception of antimony, mercury, selenium, thallium, total tin, and tributyl tin, all recommended Method Detection Limits (MDLs) were achieved. With the exception of selenium, the variation from the MDL is due to variation in the percent moisture for each sample. The high selenium detection limits are due to matrix interference. Direct interpretation of environmental metals data is made difficult by the fact that absolute metal concentrations in coastal sediments are influenced by a variety of factors, including sediment mineralogy, grain size, organic content, and anthropogenic enrichment. To overcome this difficulty, the data were analyzed by comparing the metal concentration to the concentration of aluminum in each sampling following the procedure of Schropp and Windom (1988) and Schropp *et al.* Based on this evaluation, it appeared that the sediments of the proposed Bayou Casotte extension were enriched in lead, copper, and zinc. Based on these elevated levels, it was decided that a Tier III analysis of the sediments was

appropriate. The Tier III analysis was restricted to the solid phase because of the unlikelihood that metals would be released during the physical process of dredging. Studies by Isphording and Flowers (1990) indicate that the clay sediments of the northern Gulf Coast have a high binding affinity for metals and that under normal physical disturbance metals are not released from the clay matrix. Analysis of the sediments for PAHs showed that all PAH compounds were at less than attained detection limit with the exception of fluoranthene which was detected at 110 parts per billion (ppb) from a sample collected at the northeastern bank of the Bayou Casotte Inner Harbor channel. Analysis of sediments for PCBs indicated that all congeners were not detected at a reporting limit of 4 ppb at all sampling stations with the exception of a sample collected from the mid-section of Bayou Casotte Inner Harbor channel along the western bank. In general, chlorinated pesticides were not detected at a reporting limit of 4 ppb, which is less than the recommended MDL. No organophosphorus pesticide compounds were reported for the sediments. Based on the Tier I analysis it was determined that the solid phase bioassay and bioaccumulation evaluation at Tier III was required but would be restricted to heavy metals.

The sediment from the Upper Pascagoula River channels proposed for placement is primarily comprised of fine silt and clay particles (60-81 percent). Sediments from the channel reach south of Singing River Island had higher proportions of sand (47-62 percent). The sediment near the southern portion of the project consists primarily of sands. Reference sediment sampled from Grand Bay was comprised of approximately 60 percent silt-clay and 40 percent sand. Inorganic nutrient concentrations of sediments sampled from the Upper Pascagoula channel were comparable to the concentrations detected at the reference site. Concentrations of the total organic carbon, ammonia-nitrogen, TKN, total phosphorus, and total sulfide were generally higher in samples from the upper part of the Upper Pascagoula and Pascagoula River channels.

Dioxin/furan congeners, metals, and PCB congeners were the most frequently detected constituents in the sediments (>50 percent). However, many of the metals are naturally occurring, and most of the detected organic constituents were measured at low concentrations. Chlorinated pesticides and SVOCs were infrequently detected (< 5 percent), and no butyltins or organophosphorus pesticides were detected in any of the sediment samples.

Of the 151 chemical constituents tested in the sediments, 76 were not detected in the Upper Pascagoula and Pascagoula River Channel (50 percent). Only 29 of the 151 tested constituents were detected in the Grand Bay reference sediment (19 percent). Generally, more constituents and higher concentrations of the organic (PAHs, PCB congeners, and dioxin congeners) were detected in the samples from the upper part of the Upper Pascagoula and Pascagoula River channels.

Comparisons to appropriate marine Sediment Quality Guidelines (SQGs) indicated that few organic contaminants are present in the sediment in concentrations that would be expected to adversely affect aquatic organisms. Nine constituents, mercury, arsenic, 4,4'-DDE, 4,4'-DDT, 2-methylnaphthalene, acenaphthene, fluoranthene, fluorene, and total PCBs, exceeded threshold effects level (TEL) values in at least one sample. Two constituents, mercury and acenaphthene, exceeded probable effects level (PEL) values.

Comparisons of Theoretical Bioaccumulation Potential (TBP) values calculated for the tested non-polar organic chemical constituents (chlorinated and organophosphorus pesticides, PAHs, PCB congeners, and dioxin and furan congeners) indicated that many of these chemical constituents have the potential to bioaccumulate to higher levels in tissues exposed to sediment from the Pascagoula River channels when compared to tissues exposed to sediment from the reference location. Although a chemical constituent may have the potential to bioaccumulate and cause an adverse effect, the actual likelihood of an adverse effect is a function of: (1) the physical and chemical properties of constituent, (2) actual concentration in the tissue, and (3) the period of exposure.

**F. Aquatic Ecosystem and Organism Determinations.** No effect.

(1) **Effects on Plankton.** No significant effects.

(2) **Effects on Benthos.** Temporary disruption of the aquatic community is anticipated in the beneficial use and open-water disposal sites. Non-motile benthic fauna within the area may be destroyed by the proposed dredging operations, but should repopulated within several months after completion. Due to the dredging cycle occurring every 18 to 24 months, repopulation of non-motile benthic fauna should not be adversely impacted. Some of the motile benthic and pelagic fauna, such as crabs, shrimp, and fishes, are able to avoid the disturbed area and should return shortly after the activity is completed. Larval and juvenile stages of these forms may not be able to avoid the activity due to limited mobility. Based on the Tier I analysis of the sediment sampled from the Bayou Casotte portion of the project, it was determined that the solid phase bioassay and bioaccumulation evaluation at Tier III was required but would be restricted to heavy metals. The overall impact to these organisms is expected to be minimal. Return water from the upland disposal sites is anticipated to have no significant effects to the benthos.

Ten-day whole-sediment and bioaccumulation bioassays were run on the sediments from three locations within the Bayou Casotte utilizing the infaunal amphipod *Leptocheirus plumulosus*, the polychaete *Nereis arenaceodentata* and the bivalve *Macoma nasuta* and the polychaete *Nereis virens*. Similar bioassays were performed utilizing control sediments and sediments from the Mobile District sediment testing reference site in Grand Bay, Alabama. No significant differences in

*N. arenaceodentata* survival were found in the control sediments and any of the other sediments. *L. plumulosus* survival was significantly lower in sediment collected at the northwest portion of the channel than either in the control or reference. *N. virens* exhibited 100% survival in the control sediment and the test sediments and 96% in the reference sediment. With the exception of sediment collected at the northwest portion of the Bayou Casotte channel, all sediments are considered to pass the toxicity test. Survival of *N. arenaceodentata* at that northwest site of Bayou Casotte sediments was 100%, however survival of *L. plumulosus* was 69% and is considered as failure of the toxicity test for this species. Survival of *L. plumulosus* within the 5 replicates of sediment from this site was highly variable. Of the 20 organisms utilized in each replicate 16, 17, 11, 17, and 8 remained alive following the 10-day test. The source of the effect was not apparent in the chemical composition of the sediment, since the concentrations of heavy metals were similar to those in the other test sediments. Acid volatile sulfides (AVS) concentrations were also similar in the three test sediments, and did not appear to be responsible for the amphipod mortality. Previous tests of sediments from the turning basin region of the Bayou Casotte (EA Engineering, 1994) utilizing the amphipod *Ampelisca abdita* showed survival rates of 94, 95, and 100%. Survival of *N. virens* in this test was 99, 99, and 98%. Results of a separate toxicity test utilizing *L. plumulosus* in a dredged slip off the Bayou Casotte channel in the vicinity of the proposed extension indicated 93% survivability (B.A. Vittor, personal communication). Utilizing this additional information it is not unreasonable to determine that the sediments from the extension area as a whole would not cause unacceptable impacts at the Pascagoula area following disposal. Based on these results as well as previous studies from the area of the Bayou Casotte channel south of the extension in which there was no statistical difference in bioaccumulation between the test sediments and the Grand Bay reference area the sediments to be dredged at Bayou Casotte channel would not cause unacceptable impacts to the environs of the area.

Three water column species, *Arbacia punctulata* (purple sea urchin), *Mysidopsis bahia* (opossum shrimp) and *Cyprinodon variegatus* (sheepshead minnow), were exposed to elutriates for the project sediments and reference site from the Upper Pascagoula and Pascagoula River channels. The sea urchin tests measured developmental effects to embryos and the opossum shrimp and minnow tests measured effects to organism survival. In the water column tests, *A. punctulata* was the most sensitive species to the project sediments. In the water column tests, *A. punctulata* was the most sensitive species to the project sediments. Of the seven prepared test elutriates, five were acutely toxic to *A. punctulata*. Of the seven prepared elutriate samples, two were acutely toxic to *M. bahia*. Two of the seven prepared test elutriates were acutely toxic to *C. variegatus*. Two benthic species, *Neanthes arenaceodentata* (marine polychaete) and *Leptocheirus plumulosus* (amphipod), were exposed to the project sediments and reference site for 10 days. The tests measured survival in the project sediments as compared to survival in the

reference sediments. There was no significant reduction in survival in any of the whole-sediment samples when compared to the control or the reference, indicating that none of the whole sediments were acutely toxic to *L. plumulosus*. All of the samples had a percent survival greater than 90 percent. The reference sediment had 93 percent survival, which was not significantly lower than the 99 percent survival observed in the control sediment. After 10 days of exposure, there was no significant reduction in survival in any of the whole sediments when compared to the control or reference sediment, indicating that none of the whole sediments were acutely toxic to *N. arenaceodentata*. As a whole, the dredged material that will be placed at the disposal sites will be combined/mixed material from the entire dredging area. Therefore, the material would be considered acceptable for placement.

(3) **Effects on Nekton.** No significant effects.

(4) **Effects on Aquatic Food Web.** Survival results from the bioaccumulation tests with *N. virens* and *M. nasuta* ranged from 95 to 99 percent in the Upper Pascagoula and Pascagoula River channel sediments. None of the test sediments exhibited survival values that were statistically different than the reference, which had 98 percent survival. Clam survival ranged from 96 to 99 percent in the Upper Pascagoula and Pascagoula River channel sediments. None of the test sediments exhibited survival values that were statistically different than the reference, which had 99 percent survival.

In the worm tissue, PCB congeners had the greatest number of mean concentrations that statistically exceeded the reference concentration, while PAHs and pesticides had the fewest number of significant exceedances in the worm tissue. In the clam tissue, PAHs and PCB congeners had the greatest number of mean concentrations that statistically exceeded the reference concentration. None of the metals statistically exceeded the reference concentration in the clam tissue.

Chlorinated pesticide exceedances were similar in worm and clam tissue. In the 308 total chlorinated pesticide tests that were conducted, there were only 10 mean concentrations (3.2 percent) that statistically exceeded the concentration detected in the organisms exposed to the reference sediment. Four chlorinated pesticides (dachtal, endosulfan I, endosulfan II, and endrin aldehyde) had significant exceedances in worm tissue, and 5 chlorinated pesticides (aldrin, 4-4-DDE, alpha-BHC, beta-BHC, and heptachlor) had significant exceedances in clam tissue.

None of the worm or clam tissue exposed to the Upper Pascagoula and Pascagoula River channel sediments statistically exceeded the reference site concentration of PCB aroclors.

In the 364 analytical tests that were conducted to determine the concentrations of individual PCB congeners in tissues exposed to Upper Pascagoula and Pascagoula

River channel sediments, there were 33 significant exceedances in worm tissue and 13 significant exceedances in clam tissue. The only concentrations of total PCBs that statistically exceeded reference site concentrations were clam tissue at three sites located in Pascagoula River channel.

PAHs statistically exceeded the reference site concentration in total of 13 of 252 cases (5.2 percent) for both species combined. One PAH (acenaphthylene) exceeded the reference site concentration at one location in the worm tissue, and six PAHs [anthracene, benzo(b)fluoranthene, chrysene, fluoranthene, phenanthrene, and pyrene] statistically exceeded reference site concentrations in clam tissue.

Mean metal concentrations exceeded reference site concentrations in a total of 6 of 196 cases (3.1 percent). Lead concentrations statistically exceeded the reference site concentration at six locations in worm tissue. None of the metals had concentrations that statistically exceeded the reference site concentration in clam tissue.

USFDA Action Levels or EPA Guidance Levels exist for methyl mercury, total PCBs, aldrin+dieldrin, chlordane, DDD+DDE+DDT, mirex, total heptachlor, arsenic, cadmium, chromium, lead, and nickel. Results from the tissue contaminant analyses show that tissue-residue concentrations in worms and clams exposed to Upper Pascagoula and Pascagoula River channel sediments are substantially lower than the USFDA Action Levels and EPA Guidance Levels.

(5) **Effects on Special Aquatic Sites.** Not applicable.

(a) **Sanctuaries and Refuges.** Not applicable.

(b) **Wetlands.** No effect.

(c) **Mud Flats.** Not applicable.

(d) **Vegetated Shallows.** Not applicable.

(e) **Coral Reefs.** Not applicable.

(f) **Riffle and Pool Complexes.** Not applicable.

(6) **Effects on Threatened and Endangered Species.** Under Section 7 coordination of the Endangered Species Act (ESA) and the Marine Mammal Protection Act, the Mobile District requested concurrence from the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service on the proposed threatened and endangered species in the project vicinity. In the letter dated 17 June 2002, the USFWS concurred with the Mobile District's determination

of no adverse impacts provided that certain conservation measures were incorporated into the navigation project. The Mobile District sent a letter dated 16 August 2002 addressing the conservation measures.

(7) **Effects on Other Wildlife.** No significant effects.

(8) **Actions to Minimize Impacts.** No other actions to minimize impacts on the aquatic ecosystem are deemed appropriate.

**G. Proposed Disposal Site Determinations:**

(1) **Mixing Zone Determination.** The State of Mississippi will specify a mixing zone not to exceed ambient turbidity by more than 50 nephelometric turbidity units at the outer limits of 750-foot for turbidity compliance. Material placed at the open-water and beneficial use disposal areas is anticipated to quickly settle out of the water column. Pre- and post-monitoring of water quality suggests turbidity and total suspended solids are temporarily affected by disposal operations. However, the magnitude of the increases with disposal operations is consistent with those caused by frontal storms. Disposal of material at the beneficial use and open-water areas are not anticipated to exceed the proposed turbidity compliance issued. No adverse impacts are anticipated from disposing of material at the upland sites due to the fact that the proposed action places material in diked upland areas, and that sufficient retention time would be provided for the return water. Thus, no mixing violations are expected.

(2) **Determination of Compliance with Applicable Water Quality Standards.** The proposed activity has been determined to be in compliance with all applicable water quality standards.

(3) **Potential Effects on Human Use Characteristics.**

(a) **Municipal and Private Water Supply.** No applicable.

(b) **Recreational and Commercial Fisheries.** No significant effects.

(c) **Water Related Recreation.** No effect.

(d) **Esthetics.** No significant effects.

(e) **Parks, National and Historical Monuments, National Seashores, Wilderness Areas, Research Sites, and Similar Preserves.** The entrance channel into the Pascagoula Harbor passes between Horn and Petit Bois Islands. This area is located in the Gulf Island National Seashore Park. Littoral drift of sand placed at disposal area 10 and the littoral zone will benefit Horn Island.

(f) **Other Effects.** No effect.

H. **Determination of Cumulative Effects on the Aquatic Ecosystem.** The proposed action is not expected to have significant cumulative adverse impacts.

I. **Determination of Secondary Effects of the Aquatic Ecosystem.** The proposed action is not expected to have any significant secondary adverse effects on the aquatic ecosystem.

III. **Finding of Compliance With the Restrictions on Discharge.**

A. No significant adaptations of the Section 404(b)(1) guidelines were made relative to this evaluation.

B. The proposed discharge represents the least environmentally damaging practicable alternative.

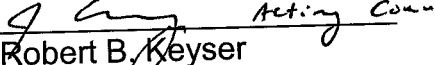
C. The planned placement of dredged materials would not violate any applicable State water quality standards; nor will it violate the Toxic Effluent Standard of Section 307 of the Clean Water Act (CWA). Appropriate evaluation of analytical and ecotoxicological testing of sediments, site water, and elutriates results revealed that no adverse impacts would result from the proposed disposal actions.

D. Use of the proposed disposal sites will not jeopardize the continued existence of any Federally-listed endangered or threatened species or their critical habitat.

E. The proposed placement of dredged material will not contribute to significant degradation of waters of the United States. Nor will it result in significant adverse effects on human health and welfare, including municipal and private water supplies; recreation and commercial fishing; life stages of organisms dependent upon the aquatic ecosystem; ecosystem diversity, productivity and stability; or recreational, aesthetic or economic values.

F. Appropriate and practicable steps will be taken to minimize potential adverse impacts of the discharge on the aquatic ecosystem.

DATE 11/27/02

  
Robert B. Keyser  
Colonel, Corps of Engineers  
District Engineer