US Army Corps of Engineers
Savannah District
South Atlantic Division

APPENDIX

SAVANNAH HARBOR
LONG TERM MANAGEMENT STRATEGY

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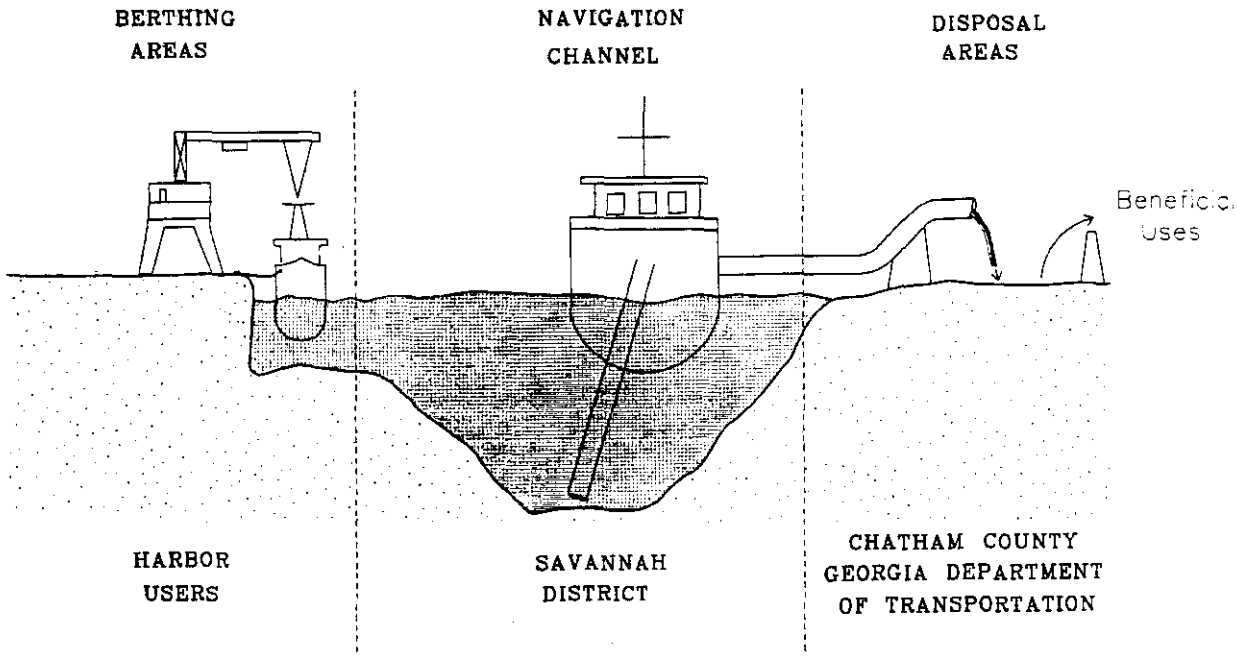

APPENDIX A

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RESOURCE MANAGEMENT MEASURES AVAILABLE

A.1.00 Overview. Operation of Savannah Harbor is very complex, with many activities being conducted by a variety of organizations. There are a number of ways in which each resource of the harbor could be managed. This section of the EIS describes the different options which are available for management of those resources. Each of the many activities which are performed are intended to attain a specific goal. The discussion centers around the following goals:

* Minimizing Federal Dredging Costs
* Minimizing Non-Federal Dredging Costs
* Minimizing Total Dredging Costs
* Minimizing Disposal Area Costs
* Minimizing Environmental Impacts
* Maximizing Beneficial Uses of Dredged Material

A.1.01 Minimizing Federal Dredging Costs. Several options are available for reducing the Federal dredging costs. Most can be grouped into just a few categories, each of which are discussed in the following paragraphs.

A.1.02 A. Maintenance Material Volume. The volume of dredged material required to be removed to maintain authorized depths in the Navigation Project is relatively fixed. The volume of required maintenance dredging is primarily a factor of the sedimentation load from upriver and the size of the navigation channel. A larger channel cross-section generally results in a slower water velocity and, subsequently, a higher sedimentation rate. This tendency is no longer true when the existing channel captures all of the sediment passing through or across it. The only method of reducing the volume of material to be dredged would be to reduce the size of the channel which is maintained, something which would produce unacceptable economic costs. The volume of dredging required does vary somewhat from year to year, depending mainly on the amount of rainfall experienced upriver. However, the overall volume does not vary widely from the relatively predictable average of 7.2 million cubic yards (MCY) per year.

A.1.03 Material which accumulates in the Navigation Project originates from a variety of sources. Sediment which washes off uplands in the river basin constitutes the majority of the material. Although the drainage basin extends up the entire Georgia/South Carolina border, even into North Carolina, the majority of the sediment which reaches the estuary originates below the J. Strom Thurmond Dam. The major impoundments located above that point effectively trap sediments which are suspended upstream of those points. Most of the suspended materials transported down the river originate from agricultural fields and construction sites. EPA has recognized this situation and has begun to institute programs to reduce the volume of sediments which enter streams from what are typically considered non-point sources. Much more progress must be made before the effects of non-point sources are considered to be at acceptable levels. Both Georgia and South Carolina are implementing stricter standards on runoff from construction sites through the Stormwater Pollution Prevention Program. Those programs are reducing the sediment load on streams and further compliance would make them even more effective. The sediment load transported down the river consists of both coarse-grained particles, which deposit at the upper end of the harbor, and fine-grained particles which deposit in the middle of the harbor after mixing with the salt water. The coarse-grained particles are generally too heavy to significantly affect the continued functioning of wetlands located along the river. The other main origin of suspended material is the large intertidal estuarine wetland which serves as the primary source of detritus to the intertidal and nearshore area. Those materials are fine-grained and do significantly aid the continued functioning of the estuarine wetlands. No effective method is available to reduce this natural source of suspended materials which enter the water column of the harbor. Regulatory changes in the upper drainage basin which could reduce the amount of suspended sediments which enter the harbor from upstream sources are beyond the scope of the LTMS Study and this EIS.

A.1.04 B. Advance Maintenance. Advance maintenance sections extend the length of time during which the authorized channel depths are available. Advance maintenance also reduces annual maintenance costs by concentrating the sediment to be removed, thereby allowing the maintenance dredges to operate at a higher efficiency. The increased dredging efficiency results in lower unit costs and subsequently lower total Federal dredging costs.

A.1.05 One method of further reducing Federal dredging costs would be to increase the use of advance maintenance sections where they are warranted in the harbor. The District does monitor the shoaling distribution in the harbor and periodically evaluates the feasibility of additional advance maintenance sections. The environmental impacts of additional advance maintenance expected to be necessary in the near future were evaluated in the LTMS study and are considered in this EIS.

A.1.06 C. Sediment Basin. The Sediment Basin in Back River was designed to concentrate the fine-grained sediment at one location rather than it being spread out along the shipping channel. This concentration has two results; (1) it increases the depth of sediment to be removed from one location, thereby allowing a dredge to operate more efficiently, and (2) the location at which the material settles is close to the disposal areas. Those two factors both lead to a lower unit dredging cost and subsequently lower Federal dredging costs. If the trapping efficiency of the Sediment Basin were increased so that it could trap a larger proportion of the harbor's sediments, the Federal dredging costs would be reduced.

A.1.07 One method of increasing the basin's trapping efficiency would be to resume operation of the Tidegate. The Tidegate was constructed to work in partnership with the Sediment Basin to have a large percentage of the inner harbor sediment shoal outside the navigation channel. One result of the 1990 suspension of the Tidegate's operation was a reduction in the trapping efficiency of the Sediment Basin since still water would no longer exist behind the Tidegate during ebb tides. This resulted in a 2.0 MCY per year reduction in shoaling in the Sediment Basin.

A.1.08 Another method of increasing the efficiency of the basin would be to remove material from the basin more frequently to maintain a deeper average depth in that location. Material has typically been removed from the basin every 9 months. Shortening the dredging interval to every 6 months should increase the trapping efficiency by roughly a third.

A.1.09 Another method of increasing the efficiency of the basin would be to enlarge the size of the basin. However, increases in the width of the basin would be likely to have associated real estate costs. Increases in the depth of the basin would produce concerns about low dissolved oxygen, which could impact aquatic life in the vicinity. The Sediment Basin was originally authorized and constructed with its bottom elevation 2 feet deeper than the channel depth. No changes were made to the basin's depth in the 1993 harbor Deepening Project, so the bottom elevation of the basin is now 2 feet shallower than that of the

channel. Restoring the original 2-foot depth offset would restore some of the efficiency which the basin lost when operation of the Tidegate was ceased in 1990.

A.1.10 D. Tidegate. As expressed previously, the Tidegate was constructed to work in partnership with the Sediment Basin to have a large percentage of the inner harbor sediment shoal outside the navigation channel. Discontinuation of the Tidegate's operation has resulted in an increase in Federal cost to maintain the navigation channel. One method of reducing those costs would be to resume operation of the Tidegate. A resumption of the Tidegate's operation would increase the salinity levels in Back River and its adjacent marshes. Salinity impacts to those marshes was the primary reason the Tidegate was taken out of service. Restoring operation of the Tidegate would require approval from the Corps' Washington Offices.

A.1.11 E. Disposal Area Location. Eight confined disposal areas are available for use by the Corps for disposal of material removed from the Savannah Harbor Navigation Project. Those areas are distributed along the length of the navigation channel. The location of a disposal area impacts the cost of disposal as a result of the distance which the material has to be transported to the site. A shorter transportation distance would normally translate into a reduction in dredging cost. This is one of the important factors in the low cost of removing material from the Sediment Basin; the availability of a disposal area immediately adjacent to the dredging. Having disposal areas located closer to where the sediment accumulates could further reduce dredging costs. At Savannah, the two locations with the greatest distance between disposal areas are (1) on the Bar Channel where disposal sites are basically located at both ends of the 60,000 foot reach, and (2) in the upper harbor between Stations 60+000 and 93+000. Pumping distance normally does not present a significant problem in the inner harbor area since the large hydraulic dredges which typically work in the harbor can pump close to 10,000 feet without a significant reduction in production. At distances beyond 10,000 feet a booster pump, with its associated costs, is often required. Development of other disposal areas along the Bar Channel could reduce dredging costs if pipeline dredges were to be used to maintain that reach. Otherwise, the shallowness of the nearshore bars make sites adjacent to that reach inaccessible to hopper dredges.

A.1.12 F. Environmental Windows. Environmental windows and other restrictions limit dredging operations to ensure that environmental resources receive appropriate protection. Those limitations often increase the cost of dredging. Careful, thorough planning can reduce the impacts of those limitations, but if the restrictions were lifted or reduced, lower dredging costs would result. The restrictions which typically have the most impact on the cost of dredging or disposal operations are as follows:

* Window excluding dredging above R.M. 5 from March 15 to June 1 for protection of striped bass.
* Window excluding hopper dredging from December 1 to April 1 for protection of sea turtles.
* SC DHEC-OCRM requirement for confined disposal facilities to limit wetland impacts.
* Requirements for chemical/biological testing of sediments to ensure acceptability of material for dredging.

A.2.00 Minimizing Non-Federal Dredging Costs. Non-Federal interests maintain adequate depths in the berthing areas located along the navigation channel. Those areas are used to dock the vessels during cargo loading/unloading operations. The individual dock owners have typically obtained a Section 404 Dredge and Fill Permit and state Water Quality Certification for dredging and disposal of material from their berths.

A.2.01 Agitation Dredging is typically used by the dock owners to remove shoaled material from the berth. Two types of agitation dredging have been permitted. One consists of dragging a device through the sediment to resuspend the material, allowing the ebbing tide to remove the material from the berth and redistribute it elsewhere along the riverbed. The second consists of using a hydraulic dredge to remove the material from the berth, with disposal being in the navigation channel where it is spread out by tidal currents. Dock owners are subsequently billed by the Corps for the costs of removing material which has redeposited in the navigation channel.

A.2.02 Agitation dredging is a relatively low cost method for removing material from berthing areas. No disposal area costs are directly involved and equipment can be relatively simple and, therefore, inexpensive to operate. Methods to further reduce the costs of maintaining depths in the berths would include increasing the permitted depth of dredging allowed at berths. A greater depth should allow a longer time period between agitation dredging events as the material would have more depth to

accumulate before impacting vessels. The larger volume of material removed at one time should increase the efficiency of the dredging process, thereby reducing the unit cost.

A.3.00 Minimizing Total Dredging Costs. Total dredging costs would be minimized when the sum of the Federal and non-Federal dredging costs are lowest. One method of producing this may be to eliminate the costs associated with moving the same sediment more than once. Typically dock owners use agitation dredging to remove deposited sediments from their berths, with subsequent redeposition of those sediments in other portions of the harbor. The Corps believes that the majority of those sediments settle in the navigation channel, where it is subsequently removed by the Corps during its channel maintenance dredging. Dock owners pay the Corps a fee to fund removal of their sediments from the navigation channel. Under this scenario, dock owners pay twice for movement of material deposited in their berths. Their initial cost for removing the material from their berths is combined with the payment made to the Corps. If non-Federal interests were to excavate the material from their berths and deposit those sediments directly in a confined disposal area, only one removal cost would be incurred. Depending on the cost of that removal, this may reduce the total cost incurred by the dock owners and, therefore, reduce the total dredging costs for the harbor.

A.3.01 Another possible method of minimizing total dredging costs would be to combine the Federal and non-Federal dredging. Under certain circumstances, it may be possible for non-Federal interests to contract for removal of berth sediments with the dredging contractor employed by the Corps to maintain the navigation channel. If such an arrangement could be reached, the total costs for maintenance of the channel and berths would likely be minimized as separate mobilization costs would be eliminated. The Corps would have to be certain that its dredging contractor could perform the work required of it within the time frame allowed, before it would release the dredge to work on projects outside its contract with the Corps.

A.4.00 Minimizing Disposal Area Costs. The non-Federal sponsor of the Navigation Project expends considerable money each year maintaining and making capital improvements to the confined dredged material disposal areas.

A.4.01 A. Dike Raising. A confined disposal area is generally useable as long as its dikes can contain the dredged material intended to be deposited in it, as well as the water which transports the material to the site. When dredged material is placed into a site, it uses up some of the site's disposal capacity. Dikes are raised periodically to produce additional

storage capacity within the disposal area. The higher dikes allow more material to be placed in the site, thereby extending its useful life. When an area becomes full and the dikes cannot be raised further due to concerns about their structural stability, a new disposal site would have to be obtained. Since the costs of obtaining a new site can be quite substantial, raising the height of dikes at existing sites is generally the best way to minimize disposal area construction/improvement costs.

A.4.02 B. Underdrains. Increasing the drainage through a soil matrix will result in faster consolidation of the material. Thus, adequate drainage will result in a given mass of soil taking up less space. Underdrains can be used in a disposal area to remove subsurface water from the deposited dredged material. Their use would reduce the storage volume used by a given mass of deposited material, thereby extending the period of time until the next dike raising is needed. This would lower the annualized cost of the disposal area improvements.

A.4.03 C. Rotation. The planned rotational use of multiple disposal areas would allow more time for the deposited material to dry and, thereby consolidate. If the use of areas can be alternated, then the drying time can be extended to over a year. The additional consolidation would extend the period of time until the next dike raising is needed, thereby lowering the annualized cost of the disposal area improvements and extending the useful lives of those sites.

A.5.00 Minimizing Environmental Impacts. One of the goals of harbor operation is to minimize impacts of operational activities on the environment. This goal is in recognition that there are multiple interests related to operation of a harbor, and that coexistence of the navigation channel and the harbor's environmental resources is required.

A.5.01 A. Dredging. Dredging can produce environmental impacts in a variety of ways. Minimizing those impacts is one goal of harbor operations. The major areas where dredging impacts the environment are described in the following paragraphs.

A.5.02 1. Sea Turtle Window. If hopper dredges are used, there is a potential for impacting endangered sea turtles. To minimize the impact of using this type of equipment, the National Marine Fisheries Service established a window where hopper dredges can only be used in Southeastern ports from December 1 to

April 1. Research has demonstrated a low occurrence of turtles in the harbors at that time. Impacts to sea turtles could be further reduced from any of the following measures:

* Disallowing use of hopper dredges completely.
* Narrowing the window of allowable hopper dredge use to times when no turtles are present at a harbor.
* Developing and using a drag head which would not allow sea turtles to be impacted.

A.5.03 2. Striped Bass Window. Striped bass populations in the Savannah River have declined recent years. The turbidity produced by an operating cutterhead dredge has the potential for impacting Striped bass eggs and young. Those life stages are more sensitive to environmental factors such as turbidity. An exclusion window has been established so that no dredging will occur above R.M. 5 from March 15 to May 31.

A.5.04 Impacts to sensitive striped bass life stages could be further reduced by (1) extending the beginning of the exclusion window to a date just before spawning begins, and (2) extending the end of the exclusion window to ensure that the fry of even late spawning fish would have sufficient time to develop to the point where they have much more resistance to the effects of turbidity.

A.5.05 A three-year study was begun by Savannah District in 1994 to determine the geographic distribution of Striped bass in Savannah Harbor during the Spring and when the eggs and young and present. That study was recently extended by the Corps for a fourth year. The data will provide information on where the eggs and young are located in the harbor so that protection measures can be applied appropriately.

A.5.06 3. Right Whales. Right whales transit the nearshore area off the Georgia coast in the winter months as part of their journey to the calving grounds located off the northern Florida coast. Any motor-powered vessel could injure these whales if a collision occurred. Since hopper dredges are only allowed to work during those months as a result of operating restrictions placed to ensure protection of sea turtles, potential impacts on right whales exist from the use of this equipment. Potential impacts are presently reduced by a combination of actions which include worker training, onboard observers, aerial observers and speed restrictions.

A.5.07 Impacts to right whales could be further reduced from any of the following measures:

* Disallowing use of hopper dredges completely.
* Further restrictions in dredge operating speeds.
* Dredge operating restrictions during adverse weather conditions.
* Radio tagging of all right whales to allow complete knowledge of their locations at all times.

A.5.08 4. Impacts to Dissolved Oxygen in Savannah River. Dissolved oxygen (DO) is required by nearly all forms of aquatic life. The turbidity produced when a dredge resuspends deposited sediment can result in a reduction in the DO in the water column. Materials attached to the fine-grained sediment particles serve as food sources to oxygen consuming bacteria. Although with a hydraulic dredge most of the turbidity is removed from the site, some turbidity does escape to the surrounding water. The passage of large vessels which draw most of the depth in the channel also produce turbidity in the river when the force of their propellers resuspends sediments off the bottom.

A.5.09 Sediments can accumulate for short periods in naturally-deep holes in the riverbed. As these sediments accumulate, the respiration of the organisms present consume the available DO, producing a low DO condition on the riverbed at that location. The depth in those holes may be restored during other periods of the year when higher flow rates occur. The Sediment Basin was constructed as a spot where fine-grained sediments could accumulate and low DO conditions do occur there. Advance maintenance sections could produce similar conditions if they are constructed so that currents do not readily pass through them to bring additional oxygen-laden close to the sediments.

A.5.10 Impacts to DO could be further reduced from any of the following measures:

* Disallowing dredging completely during the summer months when DO is naturally low in the harbor.
* Reducing the speed of the rotating cutterhead so that less turbidity escapes from the cutterhead.
* Reducing the speed of vessels whose bottom approaches the channel floor.
* Performing channel maintenance dredging more frequently so that sediment does not accumulate so thickly that anaerobic conditions are produced.
* Designing advance maintenance sections so that some current does pass through the section.

A.5.11 5. Turbidity. The suspension of fine-grained particles also causes environmental problems in other ways. Suspended solids can coat fish gills and membranes of other aquatic species across which those organisms obtain oxygen from the water. As those membranes become clogged, respiration increases in an attempt to compensate for the lower transfer efficiency. This higher respiration stresses the organism and can result in larger quantities of other contaminants being absorbed. Smothering of organisms which live on the bottom can also occur as sediments with high turbidity levels redeposit out of suspension. Impacts from turbidity could be reduced from any of the following measures:

* Disallowing dredging completely during the summer months when DO is naturally low in the harbor.
* Disallowing agitation dredging completely during the summer months.
* Disallowing the hydraulic form of agitation dredging where the resuspended material is discharged back into the river channel.
* Decreasing the speed of vessel transiting the harbor.

A.5.12 6. Sediment Quality. Sediments which are removed from the channel are comprised of many materials. Basic inorganic substances such as sand constitute a majority of the upper harbor and Bar Channel sediment. Organic and fine-grained materials make up the majority of the material which settles in the middle reaches of the harbor. Many substances are adsorbed onto organic and fine-grained particles, so chemicals dissolved or suspended in the water tend to accumulate in fine-grained sediments.

A.5.13 Dredging essentially relocates material from one site to another. The process of dredging does not "contaminate" the sediments which are being moved. Since there is a potential for release of compounds back into the water column where they would generally be more available for aquatic life, the environmental impacts from dredging would be reduced if the sediments contained fewer chemical compounds.

A.5.14 Evaluations of dredging usually include consideration of the quality of the sediment. The judgement of quality usually is based on the levels of various toxic chemical compounds in the material. Materials are considered "contaminated" when they contain "unacceptable" levels of certain compounds. These levels are established primarily through laboratory studies which evaluate the concentrations at which the survival, growth or reproduction of aquatic organisms are affected. When this occurs with sediments to be dredged, then excavation of those sediments becomes more difficult and expensive as tests must be performed

to ensure that unacceptable concentrations are not released into the water column. Should concentrations reach certain levels, additional procedures would be required at the disposal areas.

A.5.15 The primary chemical compounds which are found in Savannah Harbor sediments include heavy metals and hydrocarbons. Pesticides, which are often of concern in other areas of the country, are generally not found in the sediments of the Savannah River. The timber industry, which predominates land usage in the watershed, uses relatively few pesticides when compared to other more intensive agricultural practices. The hydrocarbons found in the harbor are primarily a byproduct of the burning of fuels. Those compounds would be expected where motor-powered vessels are used. The heavy metals are both a component of the region's natural soils and components of industrial discharges. Those discharges, which also contain a variety of other chemical compounds, are permitted by the states through the National Pollution Discharge Elimination System (NPDES). The NPDES permit program was established by the Clean Water Act of 1972 and is administered by the states for EPA. As industrial development along the river increases and Georgia and South Carolina permit discharges of more pollutants into the Savannah River, the river's sediments will contain more of those compounds. That will increase the concentrations of those materials in the sediments to levels where the sediment could possibly be considered contaminated. Therefore, one mechanism of reducing both the potential environmental impacts of dredging and the cost of dredging would be for the states to reduce the total volume of pollutants which they allow to be discharged into the Savannah River watershed.

A.5.16 B. Disposal Areas. Operation of the disposal areas can produce environmental impacts in a variety of ways. Minimizing those impacts is one goal of harbor operations. The major areas where operation of the disposal areas impacts the environment are described in the following paragraphs.

A.5.17 1. Weir Discharge Quality. Water which transports the sediment from the riverbed to the confined disposal area is discharged back to the environment through the weirs. The weirs allow the detention time and discharge rate to be controlled. As detention time increases, more finer-grained particles which settle slower are retained within the disposal area. Sometimes actions which occur within the disposal area can degrade the quality of the water passing through it. The initial filling of an area which contained extensive vegetative growth on the disposal area floor can result in a reduction in the DO in the water as the decomposing vegetation withdraws oxygen out of the water column. When this occurs, the DO in the water being discharged may be less than that of the water from the dredge pipe.

A.5.18 Impacts from the weir discharge quality could be reduced from any of the following measures:

* Equalize flow across the weirs so that flow is not concentrated along one pathway.
* Discontinue discharges when state water quality standards are not being met.
* Discharge a level of suspended solids which causes no harm to aquatic life.
* Pond the water within the area as high as the dike height will allow to maximize the settling time and, thereby the solids retention within the area.
* Remove excessive growths of vegetation within an area before disposal operations flood the area.

A.5.19 2. Timing of Dike Improvements. Dike improvements can result in environmental impacts if performed at the wrong time. As stated previously, migratory birds do nest on the dikes and Federal law requires that those nesting birds be protected. Impacts on migratory birds from dike improvements could be further reduced only from the following measures:

* Better compliance with the existing laws.
* Schedule and perform dike improvements outside the bird nesting season.

A.5.20 3. Extent of Dike Improvements. Dike improvements can result in environmental impacts if performed improperly. All dike raisings are now designed with the outer toe of the existing dike remaining fixed. In this way, all construction occurs inside the footprint of the existing disposal area, with no impacts to additional wetlands. Impacts on wetlands from dike improvements could be reduced from any of the following measures:

* Strict adherence in the field to the dike raising design where all fill is placed within the boundary of an area's existing footprint.
* Continued raising of existing dikes so that no new disposal areas would need to be developed.

A.5.21 4. Timing of Disposal Activities. Disposal operations can result in environmental impacts if performed at the wrong time. As stated previously, migratory birds do nest in the disposal areas. Impacts on migratory birds from disposal activities could be reduced from the following measures:

* Better inspection of the areas to ensure that nesting birds are not present when disposal activities begin.
* Schedule and perform disposal activities outside the bird nesting season.

A.5.22 C. Increasing Fish and Wildlife Value. Not only can operation of a harbor result in adverse environmental impacts, but it can also produce benefits for fish and wildlife. Increasing the beneficial aspects of harbor operations on fish and wildlife is another goal of harbor operations. The major areas where harbor operations could benefit the environment are described in the following paragraphs, with potential benefits to fish being described first, then potential benefits to wildlife.

A.5.23 1. Shortnose Sturgeon Habitat. Shortnose sturgeon are considered endangered under the terms of the Endangered Species Act and, as such, have been designated as worthy of special considerations due to their low population levels. This species of fish is found in the upper reaches of the harbor, generally near the salt water interface. The sturgeon are found in deep areas of the harbor during the summer months where somewhat cooler water exists. Dredging could be used to create and maintain additional deep-water areas for this species. For these areas to serve as refuge areas for these fish, the areas should be either located outside the shipping channel, or extend below the normal depth of the channel. Periodic maintenance of these areas would be necessary as the normal sediment load would otherwise refill those holes. Since dredging has not been linked with direct adverse impacts on this species, the required periodic maintenance would not be expected to produce adverse impacts. This species is known to be quite tolerant of low DO, so development of low DO in the refuge areas would not decrease their value to this species.

A.5.24 2. Fishermen Access. Much of the shoreline of Savannah Harbor is developed for industrial or commercial purposes. Little public access is available to the water. Some fishermen do presently cross existing fences to gain access to the shoreline, especially around the Tidegate. That facility and the shoreline of the diked disposal areas could be opened to provide access for fishermen. This would allow more use and benefit from the fishery resource located in the immediate project area. Concerns about property owner liability, safety, vandalism and ensuring the integrity of the dikes would have to

be fully addressed. It is likely that only pedestrian access would be acceptable, since even that would increase the use of the fishery resource. Development and maintenance of an adequate parking area would be needed to significantly increase fishermen access, and the concerns about liability, safety and vandalism would also have to be addressed for a parking facility.

A.5.25 3. Wildlife Habitat. The diked disposal areas constitute relatively isolated high ground which stands in marked contrast to the expansive wetlands and residentially- or industrially-developed high ground which surround those sites. The isolated high ground provides a rare habitat in this area. Shrubs exist along the entire perimeter of the dikes where the wetlands adjoin the constructed dikes. Wildlife use of the areas is somewhat limited by the lack of trees on the sites, but some trees do exist where the dikes are set back from the shoreline leaving an unused elongated tract of land. The wildlife habitat value of the disposal areas could be increased by having trees on more acreage. It is recognized that trees are generally not allowed on embankments because of (1) the way in which tree roots weaken the stability of the embankment, and (2) the difficulties the tree stems cause in inspection and repair of the embankment. Benefits to birds can be obtained more easily within the confines of the designed use of these tracts (dredged material disposal). The following paragraphs address those possibilities.

A.5.26 4. Bird Nesting Habitat. The disposal areas are used extensively by birds for nesting habitat. The value of these sites for these activities can be improved through either of three ways; creating new nesting areas, maintaining existing upland sites or increasing the nesting value of existing sites.

A.5.27 a. Creating New Areas. New nesting sites could be obtained within existing disposal areas through the following methods:

* Shaping the deposited material into mounds so that dry areas would exist even when disposal operations are occurring.
* Maintaining a water level within an area during the nesting season such that dry areas exist within the flooded site.
* Holding water in an area until the nesting season.

A.5.28 New nesting sites could also be created through the construction and maintenance of an island in the nearshore area. One site with potential for this purpose is north of the north jetty at the harbor entrance.

A.5.29 b. Maintaining Existing Upland Sites. Construction activities are sometimes necessary to maintain the present habitat value of a site. Colonial nesting birds prefer sandy sites which are essentially free of vegetation. At most sites, vegetation will increase over the years if no further

onsite activity occurs after initial placement of the material. Such is the case at the Jones/Oysterbed Island disposal area where dike raising is performed quite infrequently. Bird nesting can be improved by periodically removing the vegetation of a site which would otherwise be attractive. This could consist of simply back-dragging a bulldozer over the site to scrape off existing vegetation. An alternate method of producing a vegetation-free surface would be the deposition of more material on that site. If the new deposition completely covered the old vegetation, the value of the site to colonial nesting birds would be completely restored.

A.5.30 c. Increasing the Value of Existing Sites. The value of existing nesting sites within the disposal areas could be increased through the following methods:

* Placing the dredged material away from the edge of the dike to produce a more isolated nesting site.
* Restricting access by vehicles, pedestrians and land-based predators (raccoons) to a site used for nesting, to produce a more isolated nesting site.

A.5.31 5. Bird Feeding And Resting Areas. Birds also use the diked disposal areas as resting and feeding habitat.

A.5.32 a. Migrating Waterfowl. Migratory waterfowl use flooded disposal areas during both the Spring and Fall migrations. The value of the Savannah Harbor sites to these species is tied directly to whether a site is flooded. If disposal operations are underway or have only recently stopped so that water is still present in an area, the site will be used by waterfowl. The sites could provide more habitat for waterfowl if (1)disposal operations could be scheduled and performed during the times when the birds were passing through this region, or (2)water was held over until the birds passed through.

A.5.33 b. Shorebirds. Various shorebirds use the disposal areas during non-nesting seasons. Since these species are so dependent on shallow areas and shorelines, their use of the sites is primarily tied to the flooding associated with disposal operations. Expansive dry areas provide little habitat for these species. The value of a confined disposal area to shorebirds could be increased if a mixture of shallow/emergent areas was available throughout the non-nesting seasons.

A.5.34 c. Water Level Management. The value of a confined disposal area to shorebirds and waterfowl for feeding and resting is highly dependent on the existence and depth of water at the site. As expressed previously, shallow areas are generally best. Therefore, the value of a site for these activities would be maximized with a slowly falling water

surface. A drop of 2 to 3 inches every couple of weeks would probably be ideal, as it would continue to make new food sources available and expose new sites for resting.

A.5.35 6. Bird Watching. As mentioned previously, the diked disposal areas along Savannah Harbor receive extensive use by birds. Access to the sites is generally granted for researchers who are counting or otherwise studying bird use of the sites. Expanding the access to bird watching would result in an increase in an appreciation of the wildlife value which of these sites provide. This is not specifically a method of increasing the sites' wildlife value, but it would increase the human benefit of the wildlife using sites and the wildlife habitat which the sites presently provide.

A.6.00 Maximizing Beneficial Uses of Dredged Material. Dredged material can often be much more than an item requiring a place for disposal. Several beneficial uses are available for this material. Generally, these uses are to be encouraged as they result in a reduction in the volume of material placed in the confined disposal sites, thereby extending the useful life of those sites.

A.6.01 A. Construction Material. Often the sediment removed from a river can be used as a construction material. In some areas the river is mined to obtain sand for sale for construction purposes. The construction of roadbeds and building foundations often requires the addition of fill material to increase the elevation of a site or replace native soil which would not provide the required stability. Maintenance material removed from the upper reaches of Savannah Harbor is generally good sand and could be used as a construction material. Silty material is generally not as good for construction purposes as it has undesirable characteristics when wet.

A.6.02 1. Onsite. All of the dike construction and improvement projects which have been performed to date for the Savannah Harbor Navigation Project have used dredged material. This has had the combined effect of (1) removing material from a disposal site, thereby restoring previously used storage capacity, and (2) reducing transportation costs to get needed material to a construction site. Future use of this technique is dependent on the availability of suitable material. Higher percentages of silt exist in maintenance material excavated from the middle harbor.

A.6.03 2. Offsite. As expressed previously, maintenance material removed from the upper reaches of Savannah Harbor is generally good sand. The disposal area used for much of that material is Site 1N (Onslow Island North). Material placed on that site is removed by Chatham County and the GA DOT for construction purposes.

A.6.04 Harbor interests are presently investigating the feasibility of reusing sediments which have been removed from the middle reaches of the harbor. Those sediments are predominately fine-grained silts and may be useful in the construction of bricks. Initial testing indicates that the deposited material could be used to form a variety of quality bricks. More detailed testing is under consideration to determine the material variability and energy requirements for brick production. Subsequent studies would determine the economic viability of such an operation, including the potential siting of a production plant at the disposal areas. If the operation is found to be economically feasible, it could provide an effective means of beneficially using dredged sediments. The operation would reduce the volume of deposited material stored at the confined disposal facilities, thereby extending the useful life of those sites.

A.6.05 B. Beach Disposal. Dredged material which contains a very high percentage of sand and is located close to a beach can be placed on the beach to serve as a source of erodible material for waves and currents. This substitute fill material therefore protects the high ground against which it is placed from being lost to erosion. The value of this technique depends primarily on the quality of the dredged material, the type of equipment used, the cost of placing it on the beach and the length of time the material stays on the beach. The use of pipeline dredges requires excavation of a deep layer of material to ensure a high solids content in the deposited dredge slurry. If the solids content is too low, the large volume of water pumped by the dredge may move the deposited material off the upper beach slope into the lower submerged portion of the slope. This decreases the value of this procedure when expansion of the high beach is desired. However, when the goals are clearly defined and understood, and the design and construction parameters indicate that such placement would be successful, beach disposal is a very beneficial use of a material which would otherwise be discarded.

A.6.06 C. Wetland Creation. Wetlands have been recognized as having multiple valuable characteristics. The acreage of these habitats has been greatly reduced as the result of filling, draining and salinity changes. Dredged material can be used to raise the elevation of a submerged site to the point that the site is suitable for the growth of wetland vegetation. Where the design parameters indicate that such placement and subsequent

vegetative growth would be successful, deposition of dredged material to create wetlands is a very beneficial use of material and a way of stemming the loss of this valuable habitat.

A.6.07 D. Bird Islands. Isolated shorelines which provide nesting, resting and feeding habitat to shorebirds have become increasingly rare as man's development increases adjacent to water. Dredged material can be used to raise the elevation of a submerged site to the point that an isolated island can be created for use by shorebirds. Where the design parameters indicate that such placement would be successful, deposition of dredged material to create bird islands is a very beneficial use of material and a way of stemming the tide of the loss of this valuable habitat.

A.6.08 E. New Islands. Creation of isolated offshore islands can also be beneficial for other purposes. If the conditions are right, the newly created site may provide good nesting habitat for endangered sea turtles. Offshore islands would also provide a degree of storm protection from the adjacent coastline by reducing the wave impact which reaches the coast. Small offshore islands may be viewed as being aesthetically pleasing, thereby providing a visual benefit to one's view from the coast.

A.6.09 F. Nearshore Berms. Placement of dredged material in the nearshore area could also be designed to construct and/or maintain nearshore berms. These submerged mounds of material can be designed to be either stable or unstable. An unstable berm would be one that erodes and serves as a source of material for waves and currents in the nearshore sand sharing system. A stable berm is one that generally does not erode, but maintains is shape except in response to large infrequent storms. Either design provides a variation on bottom topography, which can serve as a valuable habitat for fish.

A.6.10 G. Within Disposal Areas. Dredged material can be used beneficially within the disposal areas to provide valuable wildlife habitat. This aspect was described previously, but use of the deposited material in this manner is considered a beneficial use of material.

APPENDIX B

BIOLOGICAL ASSESSMENT
OF
THREATENED AND ENDANGERED SPECIES

BIOLOGICAL ASSESSMENT
OF
THREATENED AND ENDANGERED SPECIES

SAVANNAH HARBOR LONG TERM MANAGEMENT STRATEGY (LTMS)
CHATHAM COUNTY, GEORGIA AND JASPER COUNTY, SOUTH CAROLINA
SEPTEMBER 1995

B.1.00 Project Description. Development of a Long Term Management Strategy (LTMS) for the dredging and dredged material disposal for the Savannah Harbor Navigation Project located in Chatham County, Georgia and Jasper County, South Carolina. The selected management plan would seek to maximize the use of disposal areas and identify efficient dredging schemes. Extensive engineering, economic and environmental analyses were conducted on the following three alternatives; (1) the Federal least cost dredging plan; (2) the Federal least cost dredging plan with diking of Disposal Area 14A; (3) a crust construction/rotation method with diking of Disposal Area 14A. A Mitigation Plan was developed to replace the functional values of wetlands which would be lost by the construction of dikes at Disposal Area 14A and miscellaneous disposal area operations in South Carolina. Additional alternatives were considered to allow incremental evaluation of new dredging or disposal techniques. Those alternatives included (4) installing underdrains which drain to either Savannah or Back River, (5) construction of nearshore submerged berms, (6) construction of a feeder berm off Tybee Island, (7) use of a hydraulic dredge to maintain berthing areas with direct deposition of the excavated sediments in a confined disposal facility, (8) sediment control features consisting of advance maintenance deepening the Sediment Basin and turning basins, and deepening the advance maintenance section near the Kings Island Turning Basin to provide off-channel storage of sediment, and (9) disposal of suitable material on Tybee and Daufuskie Islands. Alternative 8 consisted of the combination of the crust construction/rotation method, the diking of Disposal Area 14A, and the new dredging and disposal techniques and options.

B.1.01 The Federal least cost dredging plan involves the use of the closest acceptable disposal area. Material would be pumped the shortest distance possible and all existing inner harbor disposal areas would be used. The crust construction/rotation method involves the use of dried material from within the disposal areas to raise the dikes, thus avoiding the need to haul construction fill material for long distances to the sites to increase the capacity of the disposal areas. The disposal area must be taken out of use for 18 months to allow for extensive ditching and windrowing of the disposal area for proper drying.

Thus, the use of disposal areas must be rotated. To allow an efficient rotation between disposal areas, the crust construction/rotation alternative included the diking and use of Disposal Area 14A, a currently undiked but previously used disposal site.

B.1.02 The nearshore/offshore disposal location to be used for a specific dredging contract would be decided during project design and award based on identification of the least cost, environmentally-acceptable disposal option. If disposal at a different location is found to be more desirable for environmental or other reasons but would be more costly than the one designated as the least cost, environmentally-acceptable, it could be pursued using appropriate cost sharing authorities.

B.2.00 Environmental Setting. The project area is located mostly in Chatham County, Georgia, and Jasper County, South Carolina. These counties lie in the Coastal Plains physiographic province. The area is roughly bisected by the Savannah River which, including certain of its tributary channels, constitutes the boundary between the states of Georgia and South Carolina. The river enters the study area flowing in a generally southerly direction, then bends in the vicinity of Savannah to flow in a generally easterly direction to the Atlantic Ocean. Mainland areas are separated from the ocean by a line of barrier islands and intervening salt marshes and tidal rivers. The mouth of the Savannah River is located just north of Tybee Island.

B.2.01 The mainland of Chatham County, Georgia, is dominated by the City of Savannah. The city center is located on the southern bluff of the Savannah River approximately 18 miles above the river's mouth. The lands south of the city center and west of the coastal marshes are primarily devoted to urban development. Urban and industrial development extends northwestward along the Georgia side of the river, gradually giving way to natural woodlands and agricultural areas in the western part of the county.

B.2.02 The mainland of Jasper County, South Carolina, is predominately rural. Lands opposite the city of Savannah are characterized by a system of dikes, canals, and former rice fields constructed in the 18th and 19th centuries. The South Carolina side of the Savannah River is dominated by a brackish/salt marsh system.

B.2.03 Tidal fluctuations within Savannah Harbor are semi-diurnal, averaging 6.8 feet at the mouth of the harbor and 7.9 feet at the upstream limit of the harbor. The tidal influence extends upriver approximately 45 miles to Ebenezer Landing, Georgia. The project area enjoys a temperate climate characterized by warm, humid summers and mild winters. The

seasonal mean temperatures are 51 degrees in Winter, 64 degrees in Spring, 80 degrees in Summer, and 66 degrees in Autumn. Precipitation averages 48.9 inches per year, with about one-half falling during summer thunder showers. Snow is rare. The frost-free season averages approximately 270 days. Hurricanes pose an occasional threat, mainly in September and October.

B.2.04 The Savannah area is rich with natural resources associated with a coastal environment. The Savannah River, other coastal streams, sounds, and adjacent Atlantic Ocean waters contain an abundance of marine life, some of which has great commercial value, such as shrimp, blue crabs, and oysters. The barrier islands and marshlands support many species of plants and animals, all part of the highly productive biomass of an estuarine system.

B.2.05 South Carolina, by amendment dated May 28, 1993, to its Water Classifications and Standards, Regulation 61-68, has classified the portion of Savannah Harbor within its boundaries upstream from Fort Pulaski to the Seaboard Coastline RR as Class SB* and the portion oceanward as Class SA waters. Class SB is defined as tidal saltwaters suitable for primary and secondary contact recreation, crabbing, and fishing, except harvesting of clams, mussels, or oysters for market purposes or human consumption. Also suitable for the survival and propagation of a balanced indigenous aquatic community of marine fauna and flora. Class SA is defined as tidal saltwaters suitable for primary and secondary contact recreation. Suitable also for uses listed in Class SB, with the same exception. The State of Georgia, through its Rules and Regulations for Water Quality Control, Chapter 391-3-6, Revised May 29, 1994, has classified the Savannah River from mile 0 at Fort Pulaski to the open sea (including the littoral waters of Tybee Island) as recreation waters. From Fort Pulaski to Mile 27.4 (Seaboard Coastline RR Bridge), the river is classified as Coastal Fishing. The latter stretch of the Savannah River used to be classified as Industrial/Navigation. However, studies were conducted by the Georgia Department of Natural Resources during the fall of 1985 which resulted in the reclassification of that stretch of the river to Coastal Fishing.

B.2.06 In 1927, the U.S. Fish and Wildlife Service established the Savannah National Wildlife Refuge which encompasses 26,000 acres of lowlands and marshes along the eastern bank of the Savannah River beginning near river mile 18.5. The southern end of the Refuge lies adjacent to the upper three miles of Savannah Harbor. The refuge is located on the Atlantic flyway of migratory waterfowl. Approximately 3,000 acres of old rice fields and 18 freshwater impoundments have been developed into suitable resting and breeding areas for thousands of waterfowl that winter there each year. The Refuge is an important nesting area for the wood duck and provides excellent habitat for many

other species of birds, mammals, reptiles, and amphibians. The Refuge helps serve the recreational needs of the area through its fishing, hunting, and wildlife observation opportunities.

B.3.00 Threatened and Endangered Species. Table 1 is a list of the threatened or endangered species that might be in the project area. The list contains Threatened and Endangered Species which may be found in the Savannah Harbor Area, Chatham County, Georgia. These species were excerpted from a list provided by FWS, dated 5/31/89. In accordance with Section 7 of the Endangered Species Act of 1973, we have evaluated the impacts the proposed action could have on any threatened or endangered species potentially occurring in the project area.

B.4.00 Discussion of Potential Impacts. Savannah District has reviewed information concerning each of these species and evaluated the potential for the proposed action to impact these species. The results of our evaluation are contained in the following paragraphs:

B.4.01 Manatees (Trichechus manatus). Manatees inhabit sluggish rivers, sheltered marine bays, and shallow estuaries, eating most aquatic plants and any terrestrial plants they can reach. Records in Georgia are primarily random sightings and carcass finds and are not the result of systematic research. Systematic aerial surveys were initiated in 1976, and sight records have been increasing in south Georgia in recent years. The U.S. Fish and Wildlife Service has reported that several were observed in the harbor in the summer of 1987. The Georgia population is primarily migratory in nature and, therefore, fluctuates with season. The majority are sighted southward along the Georgia coast from Chatham County toward Florida. Manatees have been observed infrequently in the Savannah River as far upstream as the King's Island Turning Basin (Rathburn et al., 1981); however, their occurrence is rare. Manatees are found in Georgia and South Carolina mainly during the warmer months of the year. If all work on harbor maintenance were conducted during the winter, there would be less likelihood of harming these mammals. However, when dredging occurs during the summer, precautions to avoid injuring any animal present will need to be implemented. Such precautions will include but may not be limited to; instruction of personnel associated with dredging of the possible presence of manatees and the need to avoid the animals; operation of the vessels associated with the project at "no-wake" speeds at all times when in waters providing vessel drafts less than 4 feet from the bottom; boats used to transport personnel will be shallow-draft vessels, where navigation safety permits and will follow routes of deep water to the extent possible; designated endangered species watchers will be posted in each boat; and

TABLE 1

FEDERALLY LISTED THREATENED AND ENDANGERED SPECIES

SPECIES	STATUS	DISTRIBUTION IN GA
MAMMALS		
West Indian Manatee, Trichechus manatus	E	Coastal Waters
Florida Panther, Felis concolor coryi	E	Entire state
Finback Whale, Balaenoptera physalus	E	Coastal waters
Humpback Whale, Megaptera novaeangliae	E	Coastal waters
Right Whale, Eubalaena glacialis	E	Coastal waters
Sei Whale, Balaenoptera borealis	E	Coastal waters
Sperm Whale Physeter catodon	E	Coastal waters
BIRDS		
Peregrine Falcon, Falco peregrinus	E,T(S/A)**	Entire State
Bald Eagle, Haliaeetus leucocephalus	E	Entire State
Piping plover, Charadrius melodus	T	Coast
Wood Stork, Mycteria americana	E	Southeastern swamps
Bachman's Warbler, Vermivora bachmanii	E	Entire State
Kirtland's Warbler, Dendroica kirtlandii	E	Coast
Red-cockaded Woodpecker, Picoides borealis	E	Entire State
REPTILES		
American Alligator, Alligator mississippiensis	T(S/A)*	Coastal plain
Eastern Indigo Snake, Drymarchon corais	T	Southeast
Kemp's ridley (Atlantic) Turtle, Lepidochelys kempii	E	Coastal waters
Green Turtle, Chelonia mydas	T	Coastal waters
Hawksbill Turtle, Eretomochelys imbricata	E	Coastal waters
Leatherback Turtle, Dermochelys coriacea	E	Coastal waters
Loggerhead Turtle, Caretta caretta	T	Coastal waters
FISHES		
Shortnose Sturgeon, Acipenser brevirostrum	E	Coastal rivers

NOTE:* Alligators are biologically neither endangered nor threatened. For law enforcement purposes they are classified as "Threatened due to similarity of appearance". Alligator hunting is regulated in accordance with State law.

** The US FWS has proposed that this subspecies be removed from the Federal List of Threatened and Endangered Species, see the Federal Register, 30 June 1995, pp. 34406-34409.

contractors will keep a log detailing all manatee sightings, collisions, deaths or injuries during the contract period. Any sighting or collision will be reported to the Fish and Wildlife Service. Provided the above conditions are placed on all dredging contracts in the warmer months, the proposed management plan would not jeopardize the continued existence of this species nor will habitat determined to be critical be destroyed or modified.

B.4.02 Whales. There are six species of whales listed as endangered in the State of Georgia: Right whale (Balaena glacialis), Sei whale (Balenoptera borealis), Blue Whale (Balaena musculus), Sperm Whale (Physeter macrocephalus), Finback whale (Balaenoptera physalus), and Humpback whale (Megaptera novaeangliae). These species could be found in transit through the area during migrations.

B.4.03 Right whale. Right whales visit the coasts of Georgia and Florida to calve in shallow coastal water. The winter calving season for the right whale appears to begin as early as September and can end as late as April. The peak of whale abundance and calving appears to be from December through March. The right whale is of particular concern in Savannah in that it is expected to occasionally be found off shore as individuals transit the coast towards their wintering/ calving grounds.

B.4.04 The National Recovery Plan for the Northern right whale, dated December, 1991 (NMFS, 1991), defines the coastal waters of the southeastern United States and, especially, the shallow waters from Savannah, Georgia, south to Cape Canaveral, Florida, as the wintering ground for a small but significant part of the Atlantic right whale population. According to the recovery plan, most records of sighting involve adult females, many of them accompanied by very young calves, although a few juveniles and males have been sighted in the region. The area surrounding Savannah Harbor which could be affected by commercial ships visiting the harbor or dredges used to maintain channel depths in the Navigation Project is not within the critical habitat defined by the NMFS for this species.

B.4.05 A more recent study than the recovery plan (Kraus et al., 1993) has found the area around the Florida/Georgia border and Jacksonville, Florida, in the widest area of the shallow-water shelf in the Georgia Bight, to be the primary and probably only calving ground for western North Atlantic right whales. They found cow/calf pairs to be primarily limited to the coastal waters between latitudes 27 degrees 30 minutes N and 32 degrees N. They also report right whales to be concentrated between Daytona Beach, Florida and Brunswick Georgia. Highest densities are around Jacksonville, Florida, and the Florida/Georgia border. Most whales occur between December and February within 15 miles

of shore (but can be seen between November and late March). A few sightings have been reported as early as September and as late as June. This study documents six right whale sightings between Brunswick and Savannah. They quote an earlier estimate that no more than 350 right whales survive in the western North Atlantic and state that there have been 272 sightings of 87 identified non-calf right whales and 66 calves between 1980 and 1992. They further state that 74 percent of the known reproducing females have been documented off the southeast coast for the period 1980 to 1992.

B.4.06 Recent known occurrences of right whales in the Savannah area.

a. 1992 (Dec 1992 to Mar 1993). Aerial surveys for right whales have been conducted for the past two years by the Savannah District during Savannah Harbor bar channel dredging. During the December 1992 bar channel dredging, aerial surveys were conducted by Christopher Slay, New England Aquarium, from November 30 to December 20, 1992. Surveys were flown on all but one day, December 19, 1992. One right whale was spotted during the survey (December 8, 1992). These data indicate that 5 percent of the survey days resulted in detection of a right whale.

b. 1993 (Dec 1993 to Mar 1994). Two right whales were spotted by a pilot boat and the pre-dredge turtle survey crew on December 4, 1993. Aerial surveys were flown every day that weather permitted from 12/12/93 to 2/22/94 (58 days flown out of 73 possible). Whales were spotted on 12/12/93 (3 subadults), 12/18/93 (cow/calf pair), 1/23/94 (cow/calf pair). These data indicate that 5 percent of the survey days resulted in detection of right whales. However, 2 out of 19 survey days in December (11 percent) resulted in detection of right whales.

c. 1994 (Dec 1994 to Mar 1995). Aerial surveys were conducted as weather allowed between December 1 and 31, 1994. Twenty complete surveys were flown and one whale was spotted on December 5, 1994 (5 percent of survey days).

d. 1995 (Dec 1995). No aerial survey was conducted. No whales were sighted from the dredge during the Bar Channel dredging performed from December 5 to 26, 1995.

e. Analyses by Kraus et al., 1993, on the mean latitude of whale sightings by week, indicate that areas at or north of Savannah fall within one standard deviation of the mean for December 1 to January 4. This is also true for the weeks of March 16 through April 5.

B.4.07 Human activities, including pollution, ship traffic, fisheries activities, and habitat loss, have been suggested to be significantly affecting the species (Kraus et al., 1993). Ship strikes are known to be a major cause of mortality in the right whale (NMFS, 1991), although there are apparently no documented strikes by ships associated with any southeastern dredging project (NMFS, 1991). Most right whales spotted in the southeast are found from 1 to 15 nautical miles from shore (Kraus et al., 1993, Ellis et al., 1993). Kraus et al. 1993, found that swimming speeds of cow-calf pairs averaged 0.41 km/hr and whales not accompanied by calves averaged 0.51 km/hr. Movements of individual cow-calf pairs ranged from less than 1 km/day to 38.8 km/day. One statistical test found that non-cow right whales travel significantly farther and faster than right whales accompanied by a calf. They also found that cows with calves are more active at the surface than other classes of right whales in the region. It appears that the behavior of this species, including its swimming speed, makes it particularly susceptible to impact from collisions with ships.

B.4.08 Available data indicate that right whales can be expected to transit the Savannah bar primarily during the month of December for the fall migration and for the spring migration to begin transit in mid-March. Impacts from hydraulic dredging associated with maintenance dredging of Savannah inner harbor are expected to be minimal. Some Bar Channel dredging operations, such as hopper dredging and vessel traffic associated with offshore hydraulic dredging, could potentially impact this species unless protective provisions are in place to avoid collisions.

B.4.09 To ensure that the proposed work does not impact the right whale, the District would abide by the conditions set by the NMFS in its extant Biological Opinion. The District has also established precautionary collision avoidance measures to be implemented during dredging operations that take place during the time right whales are present in waters off Savannah harbor. These measures are not limited to hopper dredging but are also applied to any dredging activity that requires transporting of dredged material through waters that might contain right whales to an offshore or nearshore disposal site. These measures apply to the dredge and any attendant vessel associated with the dredging activity with a length of over 20 feet.

B.4.10 Each dredging contract for the Savannah Harbor Bar Channel will contain the following provisions. Each contractor will be required to instruct all personnel associated with the dredging/construction project about the possible presence of endangered right whales in the area and the need to avoid collisions. Each contractor will also be required to brief his personnel concerning the civil and criminal penalties for

harming, harassing or killing species that are protected under the Endangered Species Act of 1973 and the Marine Mammal Protection Act of 1972. Dredges and all other disposal and attendant vessels are required to stop, alter course, or otherwise maneuver to avoid approaching the known location of a right whale. The contractor will be required to submit an endangered species watch plan that is adequate to protect right whales from the impacts of the proposed work. The conditions in the current regional opinion, which the District would also abide by as long as the opinion is in effect, include the following: Monitoring by endangered species observers with at-sea large whale identification experience to conduct daytime observations for whales between December 1 and March 31. During daylight hours, the dredge operator must take necessary precautions to avoid whales. During evening hours or when there is limited visibility due to fog or sea states of greater than Beaufort 3, the dredge must slow down to 5 knots or less when transiting between areas if whales have been spotted within 15 nm of the vessel's path within the previous 24 hours. (Contractors will be required to use daily available information on the presence of right whales in the project area.) One hundred percent dedicated daytime whale observer coverage is required between December 1 and March 31. Monitoring by sea turtle observers is allowed between April 1 and November 30. If a Right Whale Early Warning System (RWEW) is in place, it will be deemed to provide adequate information on the presence of whales during dredging operations. The District agrees to abide by and incorporate into its dredging contracts within the critical habitat area all mutually agreed upon operating rules emanating from this RWEW system.

B.4.11 Other whales. Dredging activities are not expected to affect other species of whales for two reasons. One, no other species of whales are expected to occur with regularity in nearshore waters where dredging would occur. Second, other whales are not known to exhibit behaviors that would make them susceptible to ship collisions as is known to be the case for the right whale.

B.4.12 Eastern Cougars (Felis concolor cougar). There have been no confirmed sightings of eastern cougars in the area of Savannah harbor in recent years. The proposed management plan would not include substantial land-use changes that would provide or degrade any habitat suitable for these cats. Neither would the management plan destroy or modify any habitat determined critical for the species' survival.

B.4.13 Wood Stork (Mycteria americana). Wood storks are known to frequent the more protected estuarine areas of the region for both feeding and nesting. Wood stork rookeries are located on hammocks and along the edges of the marsh behind the barrier islands. This species has been observed in the Savannah Harbor area, particularly at the Savannah National Wildlife Refuge and in the Wright River adjacent to the dredged material disposal areas. They occasionally rest within the disposal areas and feed there when conditions are right. A recent high number of 55 individuals were observed feeding in the disposal areas on 23 September 1995. These birds have a unique feeding technique and require higher prey concentrations than other wading birds. Optimal water regimes for the wood stork involve periods of flooding, during which prey (fish) populations increase, alternating with dryer periods during which receding water levels concentrate fish at high densities. Fish trapped in the dredged material disposal areas during maintenance dredging may provide a source of food for wood storks once dewatering of the disposal areas are near completion. Continued use of upland disposal sites could be considered a minor enhancement of wood stork feeding habitat. Finally, the proposed plan would not destroy or modify any habitat determined critical for the species' survival.

B.4.14 Bald Eagle (Haliaeetus leucocephalus). Bald eagles are found in the Savannah Harbor area. They have been observed resting and hunting in the dredged material disposal areas north of Savannah. A recent high number of 4 individuals were seen flying over the disposal areas on 23 November 1994. Two active nests are located at the Savannah National Wildlife Refuge and several eaglets have been fledged from these nests in recent years. Bald eagles have also nested along the Wright River north of the disposal areas. The proposed management plan would not affect the existing nest sites or areas immediately adjacent to them. The proposed plan may enhance the disposal areas for eagles by attracting migrating birds to the diked disposal areas. Standing water in these disposal areas is known to be used by waterfowl in winter and during their migrations, and eagles will feed on waterfowl. The proposed management plan would also not destroy or modify any habitat determined critical for the species' survival.

B.4.15 Peregrine Falcon (Falco peregrinus). The American peregrine falcon (F.p. anatum) was listed as endangered in 1970 under the Endangered Species Conservation Act of 1969, and was listed as endangered under the Endangered Species Act of 1973. Other races were listed as threatened or endangered due to similarity of appearance in 1984. The US FWS now proposes (FR 30 June 1995, pp. 34406-34409 to remove the species from the endangered species list. This is a large, rapid flying falcon

that feeds on other birds. It occurs throughout much of North America, with few nesting birds in the plains or southeast. Birds that nest in subarctic areas generally winter in South America, while those that nest at lower latitudes exhibit variable migratory behavior. Peregrine falcons declined precipitously in North America following World War II. Research implicated DDT as causing egg shell thinning, resulting in nesting failures. Following restrictions on DDT, the population size of the species has increased. In the fall and spring, small numbers of this species -- usually 1 or 2 individuals -- can sometimes be seen feeding on shorebirds in the disposal areas. The proposed management plan should maintain or increase the numbers of shorebirds using the disposal areas. That should be beneficial to this species.

B.4.16 Piping Plover (Charadrius melodus). This species is a small, stocky shorebird that resembles sandpipers. Preferred habitats for the species are sandy beaches along the ocean and inland lakes, bare areas in dredge disposal sites, and natural alluvial islands in rivers. Shorelines with little vegetation are preferred for both nesting and feeding. These plovers feed primarily on fly larvae, beetles, crustaceans, mollusks, and other invertebrates that they pluck from the sand (Bent, 1929). Breeding grounds along the Atlantic Coast range from Newfoundland to North Carolina. Wintering areas on the Atlantic Coast are from North Carolina southward through Florida and in the Bahamas and West Indies. The piping plover departs for wintering habitats by early September and returns to the breeding grounds in late March or early April. This species has been observed in the past on Tybee Island during the winter months (Steve Calver, personal observation) and could be expected at that time on other shorelines near the coast. A January 1991 survey by the GA DNR located 27 individuals on the Georgia barrier islands (information from Dwight Harley, 4/30/91). A January 15, 1996 survey found 124 individuals along the Georgia coast (Mike Harris (GA DNR), personal communication). The primary threats to the piping plover are modification and destruction of habitat and disturbance of nesting adults and chicks (US FWS, 1985). This specie's occasional use of the dredged material disposal areas would not be impacted by the proposed management plan. The bird island construction proposed as part of the mitigation plan for diking Disposal Area 14A is expected to provide additional wintering habitat for this species. Proposed disposal operations on Daufuskie and Tybee Islands could provide additional wintering habitat by increasing the amount of both high tide and intertidal beach. The proposed plan would not destroy or modify any habitat determined critical for the species' survival.

B.4.17 Red-cockaded Woodpecker (Picoides borealis). This species requires forested habitat of at least 50 percent pine 30 years or older. No habitat that could potentially be used by this species would be impacted by the project. No known colony of these woodpeckers is located along the Savannah Harbor or on adjacent properties. The project would not destroy or modify any habitat determined critical for the species' survival.

B.4.18 Bachman's warbler (Vermivora bachmanii). The present distribution of Bachman's warbler is unknown. Some authors consider it to probably be extinct (Post & Gauthreaux, 1989). Sightings in the mid 70's came from Charleston County, South Carolina; several Louisiana locations; Kentucky; Maryland; and near the Long/McIntosh County line in Georgia. This species formerly bred mostly in swamps with an understory of cane. It is currently extremely rare with very few recent sightings. Most authorities agree that if the Bachman's warbler still exists it is most likely in the I'on Swamp area in Charleston and Berkeley Counties, South Carolina. No habitat used by this species would be impacted by the project. The proposed management plan would also not destroy or modify any habitat determined critical for the species' survival.

B.4.19 Kirtland's warbler (Dendroica Kirtlandii). This very rare warbler breeds in Michigan and winters in the Bahamas. It is a rare transient along the Southern Atlantic Coast, including Georgia and South Carolina. We are aware of no estimate of the number of individuals migrating through the state. It would be expected to occur as a very rare migrant in coastal scrub and forest land, especially after storms. No habitat would be impacted by this project that this species might use. Moreover, the proposed management plan would not destroy or modify any habitat determined critical for the species' survival.

B.4.20 Eastern Indigo Snake (Drymarchon corais couperi). The eastern indigo seems to prefer high, dry, well-drained sandy soils, closely paralleling the sandhill habitat preferred by the gopher tortoise. However, especially during the warmer months, indigos also frequent streams and swamps, and individuals are occasionally found in flat woods. The proposed plan would not destroy or modify any habitat determined critical for the species' survival.

B.4.21 Sea Turtles. Five species of sea turtles are found along the Georgia and South Carolina coast which are listed as endangered or threatened. These are the Kemp's (Atlantic) Ridley turtle (Lepidochelys kempii), green turtle (Chelonia mydas), Leatherback turtle (Dermochelys coriacea), Loggerhead turtle (Caretta caretta), and Hawksbill turtle (Eretomochelys imbricata). All species of marine turtles listed previously are presently classified as Federally endangered, except the green sea turtle and the loggerhead turtle, which are listed as threatened. The loggerhead turtle is known to nest on Tybee Island. The Kemp's ridley, leatherback, hawksbill, and green sea turtles also inhabit Georgia waters, but nest in other areas. (Schroeder, 1987; Schroeder and Warner, 1988; and Teas and Martinez, 1989; The U. of Georgia Cooperative Extension Service, 1992; US FWS, 1993). Green turtles and leatherback turtles have been known to nest in Georgia on rare occasions (US FWS, 1993). The stranding records for Chatham County, Georgia indicate that 4 turtles were stranded in the county from January 1 to June 30, 1989 and 212 stranding occurred in the State of Georgia during 1989. Approximately 95 percent of these stranding occurred from May to November.

B.4.22 Since the turtles are known to occur in the vicinity of the Bar Channel, there is a potential that they may be directly impacted by certain dredging operations within the bar channel. Recent research by WES and historic data indicate that hopper dredges in a given situation are much more likely to cause adverse impacts to sea turtles than stationary dredges (hydraulic pipeline, clamshell, bucket). Those impacts are apparently the result of the speed at which the equipment moves across the bottom of the channel. The high speed of hopper dredges does not allow sufficient time for turtles to recognize the danger and avoid entrainment. Because of the potential impacts to sea turtles, use of stationary dredges would be preferred. However, due to the high cost of stationary dredges, hopper dredges are still used, and their use is environmentally acceptable, provided restrictions to minimize their environmental impact are included in their operation. The Corps (WES, 1994) has conducted research on the distribution and abundance of sea turtles in order to develop restrictions on hopper dredging which would minimize its impact on sea turtles. They have found that turtles are usually either missing or present in only very low numbers in Savannah from December through March. The WES study states that caution should be taken when using absolute dates for arrival and departure of sea turtles. Other factors such as seasonal differences in temporal movements and water temperature effects (relatively low abundance was found in the winter months when surface water temperatures were less than or equal to 16 degrees C.) may be at play. Restrictions on hopper dredge operation have been developed and agreed upon by NMFS and the Corps which minimize those impacts. Those restrictions are being refined as

research in this area continues. Current restrictions are listed at paragraph 7.00 below. These may change with increased knowledge of sea turtle distribution and abundance and as new hopper dredging equipment and techniques are developed. If, in a specific dredging operation, costs for equipment types are identical, use of a stationary dredge would be preferred since it would be expected to have less impact on sea turtles. To ensure that dredging operations are not likely to adversely impact sea turtles, all dredging operations would be done in compliance with the appropriate Biological Opinion for navigation channels in the southeast issued by the NMFS.

B.4.23 Disposal Operations on Tybee and or Daufuskie Islands may affect nesting loggerhead turtles, by impacting nesting areas. The nesting season for loggerheads in this area extends from May 1 through August 30 and the hatching season extends to October 31 (US FWS, 1993). Tybee Island beach represents approximately 3 percent of the Georgia beaches available for nesting turtles. However, only about 7 turtles are known to have nested on Tybee Island in recent years (7 in 1989, 3 in 1990, 7 in 1992, GA DNR, 1992). A recent communique with Georgia DNR indicates that 20 nests were located on Sea Island the year nourishment occurred (1990) with an additional 31 nests in the unnourished area. In 1991, 56 nests were found in the nourished area and 55 nests in the unnourished area. It thus appears that nourishment can be beneficial to turtles. Loss of sea turtles would not be expected from the proposed disposal on Tybee or Daufuskie Islands because of the conditions in the contract that would be in place to protect nesting turtles. Disposal in these areas would be expected to enhance the area for turtle nesting by creating more beach area suitable for nesting.

B.4.24 If the project is constructed during the turtle nesting season, a turtle nest monitoring program would be conducted to insure protection of any turtles that may try to nest on the existing beach or the newly formed beach. The District has developed a monitoring program which has been used at Tybee Island. A copy is attached. Any agreements concerning renourishment would include a requirement that appropriate nest relocation procedures be followed, if necessary, to prevent impacts to nesting turtles. Our nest relocation guidelines are also attached.

B.4.25 Loss of turtles could also occur by means of broken eggs resulting from sand compaction after beach nourishment. Such an event is expected to be unlikely because the dredged material grain sizes are expected to match existing beach sand sufficiently to avoid major compaction problems. However, if post dredging examination of the nourished beach finds sand compaction to be greater than 500 cone penetrometer index units (cpu) and agreement is reached with US FWS that plowing could enhance the area for turtle nesting, the compacted area would be

plowed to a depth of at least 36 inches. Also, any escarpments in excess of 18 inches extending for more than 100 feet and exceeding 500 cpu would be mechanically leveled to the natural beach contour. If leveling is needed, appropriate nest relocation procedures would be followed. Artificial beachfront lighting in known to cause hatchling disorientation and misorientation (US FWS, 1993). To ensure protection to nesting sea turtles the following conditions would be adhered to:

a. If the project is constructed during the turtle nesting season, a turtle nest monitoring program should be conducted to ensure protection of turtles that try to nest on the existing or newly formed beach. See the attached Turtle Monitoring Plan and nest relocation procedures.

b. The beach would be monitored during the first and second winter/spring following completion of construction to determine post-nourishment compaction. This would be performed to ensure that the newly constructed beach provides suitable nesting material for endangered sea turtles. If the examination finds sand compaction within 50 feet of the toe of the dune to be greater than 500 cone penetrometer units (cpu), and the US FWS confirms that plowing is necessary, the compacted area will be plowed to a depth of at least 36 inches. Areas on which vegetation has been established would not be plowed.

c. The beach would be monitored each year for escarpments. Any escarpments in excess of 18 inches high, extending more than 100 feet in length and exceeding 500 cpu would be mechanically leveled to the natural beach contour.

d. Prior to any agreement with Tybee Island to utilize the beach as a disposal area, a guarantee will be obtained from the City of Tybee Island that their lighting ordinance for protection of the nesting habitat of se turtles (Sec. 8-4-58 through Sec. 8-4-60) will be implemented and enforced from May 1 through October 31 for three years following the disposal operation. The District believes that lighting controls on Daufuskie Island would not be necessary at this time since the shoreline is not highly developed.

B.4.26 With implementation of the project as stated above, this project is not likely to adversely impact sea turtles. In fact, certain proposed actions in the plan have the potential to increase quality of existing nesting habitat (the proposed nearshore berms off Tybee Island) or produce new nesting habitat (the proposed bird island on the north side of the north jetty and direct nourishment on Tybee and/or Daufuskie Islands).

B.4.27 Shortnose sturgeon (Acipenser brevirostrum). The shortnose sturgeon is an anadromous species restricted to the east coast of North America. They have been recorded from New Brunswick to Florida. Throughout its range, shortnose sturgeon occur in rivers, estuaries, and the sea. The majority of populations have their greatest abundance and are found throughout most of the year in the lower portions of the estuary of their respective river (NMFS, 1984). It is considered to be more abundant now than previously thought (NMFS, 1984). This species is known to occur in the Savannah River (Hall et al., 1991). The shortnose sturgeon is a suctorial feeder. The preferred prey is small gastropods (NMFS, 1984). Hall et al., 1991, mention the small clam Corbicula as being a possible prey item in the lower Savannah River. Three sites just upstream of the project upper limit were identified as feeding areas (rkm 39.6, rkm 36, and rkm 35.7).

B.4.28 The species' general pattern of seasonal movement appears to involve an upstream migration from late January through March when water temperatures range from 9 C to 12 C. Post-spawning fish begin moving back downstream in March and leave the freshwater reaches of the river in May. Juvenile and adult sturgeon use the area located 1 to 3 miles from the freshwater/saltwater interface throughout the year as a feeding ground. During the summer, this species tends to use deep holes at or just above the freshwater/saltwater boundary (Flournoy et al., 1992, Rogers and Weber, 1994, Hall et al., 1991). This boundary was thought to occur in the Savannah River between river miles 20.5 and 23.6 in 1987 (Hall et al., 1991). We are not aware of any determination on how removal of the Tidegate from operation and the Deepening Project has affected its location. Available data also indicates that Kings Island Turning Basin at about river mile 19.3 is used as a nursery area for juvenile sturgeon (Hall et al., 1991). Our current best estimate is that sturgeon can be expected throughout the year somewhere within the area from about river mile 17.5 to 26.6.

B.4.29 Shortnose sturgeon may be present in Savannah Harbor during routine maintenance dredging. The channel and turning basin down to about River Mile 17 may function as a resting area for this species. It is not known how extensively the channels and turning basins are used as feeding areas. Since these areas

are dredged every year, they are not expected to be used extensively for feeding after a dredging operation. The species has apparently adapted to the yearly dredging routine. The fact that individuals of this species apparently seek out the Kings Island Turning Basin during the summer indicates that the maintenance of deep basins through the dredging program may actually be beneficial to the species' survival. This project is, therefore, not expected to impact feeding areas. Possible impacts due to normal maintenance dredging program would center around the potential for physical contact with the dredge or the plume created by its operation. Possible impacts to this species from maintenance dredging are discussed below.

a. Impacts from the dredge. Adult and juvenile sturgeons are believed to be very mobile, even when occupying resting areas during the summer months (deep holes and other deep areas such as the Kings Island Turning Basin). The potential for the adult and juvenile fish being hit by the cutterhead is very low. The eggs and larval sturgeons are not as mobile. Therefore, there is a potential for them being impacted either by being entrained by the dredge or being smothered/physically damaged by the materials in the dredge plume. However, the proposed dredging activity will be limited to the area below River Mile 21.3 and a 1991 study conducted indicates that two probable spawning sites for sturgeon are from River Mile 112 to 119 and from River Mile 172 to 174 (Hall et al., 1991). This should negate the possibility of sturgeon eggs or larvae being impacted by the dredging.

b. Impacts due to the dredge plume. Since spawning occurs far upstream of the dredging project, impacts to eggs and larvae are not expected. However, there is a potential for impacts to juvenile and adult fish feeding in the area or migrating through the area to spawn. Fish feeding in the area, being mobile, could easily avoid the dredge plume and likely would since a dredge creates a great deal of noise while operating. A widely held opinion among fishery biologists is that some anadromous fish immigrate to their upstream spawning grounds via dredged or natural channel corridors. These biologists believe that occurrence of a dredging project within or adjacent to these channels might interfere with these migrations. However, to our knowledge no technical information has been generated to support this argument. It is our contention that the presence of a hydraulic dredge working in the Savannah Harbor channel would have no adverse impact on this species or its migration upstream in late winter. Our reason for stating this is based on the following factors:

(1) The Savannah Harbor Channel has a top width of approximately 700 feet and a bottom width of 400 to 500 feet. The channel is from 42 to 44 feet deep at low water.

(2) Studies performed by Dr. D.F. Hayes in 1986 on a hydraulic cutterhead dredge operating in Savannah Harbor indicated that average suspended sediment concentrations within 1,600 feet of the dredge were generally raised less than 200 mg/l in the lower water column and less than 100 mg/l and 50 mg/l in the middle and upper water column, respectively.

(3) The Savannah River has a naturally high suspended sediment load which during storm events is expected to increase well beyond the 200 mg/l increase created by a hydraulic dredge. Also during storm events the higher suspended sediment loads would likely be more uniform throughout the water column due to mixing as the plume proceeds down stream. Therefore, the sturgeon would not be able to move up in the water column to avoid the increased sediment load as it would be able to do in a dredge induced situation.

B.4.30 Based on the above, it is highly likely that the sturgeons using the Savannah River have experienced frequent natural increased sediment loads well above those created by a hydraulic dredge. Also, in view of the width and depth of the channel it is likely that adult sturgeon migrating upstream to spawn could easily avoid the highest concentrations of suspended solids by moving laterally or vertically in the water column. Once dredging in an area is completed, the shortnose sturgeon would be expected to return to their resting areas. Once the benthos reestablishes itself, the channel and turning areas could again be used for feeding. As stated above, shortnose sturgeon have been documented in areas such as the Kings Island Turning Basin that are currently subject to periodic maintenance dredging (Hall et al., 1991). Based on the above the proposed management plan for the Savannah Harbor is not expected to have more than minimal adverse impact on this species. The plan would also not destroy or modify any habitat determined critical for the species' survival.

B.5.00 Quality of Dredged Material. Disposal of dredged material in the ocean is regulated by the Marine Protection Research and Sanctuaries Act of 1972. Section 103 of the Act provides for transport of dredged material for the purpose of disposing of it in the ocean only after the material is evaluated using criteria established pursuant to Section 102 of the Act. Criteria for determining suitability of dredged material for ocean disposal based upon the biological testing requirements of the 1977 Ocean Dumping Regulations (40 CFR 220-228) are contained in the EPA/Corps jointly developed 1991 "Evaluation of Dredged Material Proposed For Ocean Disposal - Testing Manual," commonly referred to as the "Green Book." Dredged material from the subject navigation channel is placed in an ocean disposal area only after it is found suitable for ocean disposal by the Corps,

with concurrence obtained from EPA. Disposal of the relatively clean sandy material from the bar channel at the disposal site should have no impact on any endangered species.

B.5.01 Inner harbor sediments are deposited in confined disposal areas. Effluent from these areas is defined as a discharge subject to Section 404 of the Clean Water Act. A Section 404(b)(1) Evaluation has been performed and this discharge has been found to meet the criteria in the Section 404(b)(1) guidelines.

B.5.02 Expected contaminant levels within the disposal areas have been evaluated for possible effects to wildlife, and are judged to be minimal. This evaluation is contained in Appendix F of the LTMS EIS.

B.6.00 Project Timing. Since the dredging program is constrained by several laws and regulations, delays in resolution of various issues may force projects beyond agreed upon windows.

B.7.00 Coordination. A BATES was included in the Draft EIS submitted to resource agencies in December 1994. In August 1995, the NMFS released a Regional Biological Opinion covering dredging for navigation channels. This BATES incorporates the conditions included in that opinion.

B.8.00 Determination. Based on the above evaluation, I find that operation of the Savannah Harbor as proposed in the Environmental Impact Statement portion of the Long Term Management Strategy and as outlined in this document will not have significant adverse impacts on these species provided the conditions listed below for the protection of Manatees, Sea Turtles, and Right Whales are made a part of the dredging contracts:

a. The contractor will instruct all personnel associated with the dredging of the presence of manatees and the need to avoid collisions with the manatees.

b. All personnel associated with the dredging will be advised that there are civil and criminal penalties for harming, harassing, or killing manatees which are protected under the Endangered Species Act of 1973 and the Marine Mammal Protection Act of 1972.

c. Any collision with a manatee will be immediately reported to the Corps of Engineers' Contracting Officer's Representative (912) 652-5958, the Charleston Ecological Services Office of the US Fish and Wildlife Service (803) 724-4707, and the Georgia Department of Natural Resources (weekdays 8:00 a.m. - 4:30 p.m.; (912)2647218 or 1-800-272-8363; nights and weekends: 1-800-241-4113.

d. All construction activities in open water will cease upon sighting of manatees within 100 yards of the project area. Construction activities will not resume until the manatee has not been seen in the project area for at least 30 minutes.

e. The contractor will keep a log detailing sightings, collisions, or injury to manatees which occur during the dredging operations.

f. A report summarizing-the above incidents will be provided to the Savannah District for coordination with the U.S. Fish and Wildlife Service, Charleston Ecological Services Office.

g. All vessels associated with the project will operate at "no-wake" speeds at all times while in the water where the draft of the vessel provides less than four feet of clearance from the bottom and that vessels will follow routes of deep water to the extent possible.

h. The contractor will instruct all personnel associated with the dredging of the presence of Right Whales and the need to avoid collisions with these mammals. The contractor shall also brief all personnel on the habits and behavior of the right whale.

i. The contractor shall restrict vessel speeds during the high risk season of December to March of each year such that collisions with adult or juvenile whales can be avoided.

j. That the contractor shall he required to post a whale watch and submit a whale watch plan prior to conducting any dredging activities at the site. These measures apply to the dredge and any attendant vessel associated with the dredging activity with a length of over 20 feet.

k. If the project is constructed during the turtle nesting season, a turtle nest monitoring program should be conducted to ensure protection of turtles that try to nest on the existing or newly formed beach. See the attached Turtle Monitoring Plan and nest relocation procedures.

l. The beach would be monitored during the first and second winter/spring following completion of construction to determine post-nourishment compaction. This would be performed to ensure that the newly constructed beach provides suitable nesting material for endangered sea turtles. If the examination finds sand compaction within 50 feet of the toe of the dune to be greater than 500 cone penetrometer units (cpu), and the US FWS confirms that plowing is necessary, the compacted area will be plowed to a depth of at least 36 inches. Areas on which vegetation has been established would not be plowed.

m. The beach would be monitored each year for escarpments. Any escarpments in excess of 18 inches high, extending more than 100 feet in length and exceeding 500 cpu would be mechanically leveled to the natural beach contour.

n. Prior to any agreement with Tybee Island to use the beach as a disposal area, a guarantee will be obtained from the City of Tybee Island that their lighting ordinance for protection of the nesting habitat of se turtles (Sec. 8-4-58 through Sec. 8-4-60) will be implemented and enforced from May 1 through October 31 for three years following the disposal operation. A determination on the need for lighting controls on Daufuskie Island, should it be chosen as a disposal site, is requested from responsible agencies.

o. Each dredging contract for the Savannah Harbor Bar Channel will contain the following provisions:

    1. Each contractor will be required to instruct all personnel associated with the dredging/construction project about the possible presence of endangered right whales in the area and the need to avoid collisions. Each contractor will also be required to brief his personnel concerning the civil and criminal penalties for harming, harassing or killing species that are protected under the Endangered Species Act of 1973 and the Marine Mammal Protection Act of 1972.

2. Dredges and all other disposal and attendant vessels are required to stop, alter course, or otherwise maneuver to avoid approaching the known location of a right whale.

3. The contractor will be required to submit an endangered species watch plan that is adequate to protect right whales from the impacts of the proposed work. This plan will include provision on board the dredge and all attendant vessels of trained observers (in accordance with the NMFS Regional Opinion) to watch for right whales at all times the vessel is in motion. Observers would be required during those months when whales may be expected to be present in the area.

4. Contractors will be required to use daily available information on the presence of right whales in the project area. NMFS requires monitoring by endangered species observes with at-sea large whale identification experience to conduct daytime observations for whales between December 1 and March 31, when humpback and right whales occur in the vicinity of channels and borrow areas, north of Cape Canaveral. Monitoring by the sea turtle observers is acceptable between April 1 and November 30. Monitoring will be 100 percent for the first year of the biological opinion, unless subsequently altered upon authorization from NMFS. During daylight hours, the dredge operator must take necessary precautions to avoid whales. During evening hours or when there is limited visibility due to fog or sea states of greater than Beaufort 3, the dredge must slow down to 5 knots or less when transiting between areas if whales have been spotted within 15 nm of he vessel's path within the previous 24 hours. South of Cape Canaveral, surveys for whales should be conducted by endangered species observers during the intervals between dredge spoil monitoring. If a right whale is known to be within 15 nautical miles of the project area on a given day, hopper dredges and any attendant vessels 20 feet or greater in length will be required to limit speeds that night to 5 knots or less when in the project area. The project area is defined as the Bar Channel, Savannah ODMDS, and routes travelled between the two.

5. If a right Whale Early Warning System (RWEW), is in place, will be deemed to provide adequate information on the presence of whales during dredging operations. The District agrees to abide by and incorporate into its dredging contracts within the critical habitat area all mutually agreed upon operating rules emanating from this RWEW system.

p. All hopper dredging will be generally be scheduled for December through March, and the following conditions will apply*:

1. One hundred percent inflow screening is required, and 100 percent overflow screening is recommended when sea turtle observers are required on hopper dredges in areas and seasons when sea turtles may be present. If conditions disallow 100 percent inflow screening, inflow screening can be reduced, but 100 percent overflow screening is required, and an explanation must be included in the preliminary dredging report.

2. The sea turtle deflecting draghead is required for all hopper dredging during the months that turtles may be present, unless a waiver is granted by the COE SAD in consultation with NMFS.

3. To prevent impingement of sea turtles within the water column, every effort should be made to keep the dredge pumps disengaged when the dragheads are not firmly on the bottom.

4. A trained turtle observer will be placed on the hopper dredges to monitor for sea turtles for 100 percent of the period from November 1 to November 30 and April 1 to May 31. No sea turtle monitoring is required between December 1 and March 31.

5. The water intake ports on the top of the draghead shall be screened with metal elliptical cages, or other suitable means to exclude sea turtles from entering the drag arm. No dredging shall be performed by a hopper dredge without a turtle deflector device in place.

6. Dredging shall be suspended upon the taking of more than one turtle in any day, the taking of one hawksbill turtle, or once five or more turtles are taken. Dredging operations will not commence, again, until coordination with South Atlantic Division and the NMFS has taken place and any remediation requirements are implemented, such as relocation trawling with a shrimp boat, to ensure compliance with the Endangered Species Act.

7. A report summarizing the take of sea turtles will be submitted to the National Marine Fisheries Service (NMFS) immediately following completion of the project.

NOTE: * These are the conditions currently being followed in accordance with the NMFS 1995 Biological Opinion for Navigation Channels in the Southeast, and additional guidance provided by South Atlantic Division. Should a new Biological Opinion be issued, the District would consider the conditions listed here void, and would abide by the conditions as stated in that opinion and any further guidance provided by South Atlantic Division.

APPENDIX C

SECTION 404 (B)(1) EVALUATION

SECTION 404 (B)(1) EVALUATION
FOR THE SAVANNAH HARBOR
LTMS STUDY
BY
THE SAVANNAH DISTRICT CORPS OF ENGINEERS

C.1.00 INTRODUCTION. Section 404(b)(1) of the Clean Water Act of 1972 requires that any proposed discharge of dredged or fill material into waters of the United States must be evaluated using the guidelines developed by the Administrator of the U.S. Environmental Protection Agency (EPA) in conjunction with the Secretary of the Army. These guidelines can be found in Title 40, Part 230 of the Code of Federal Regulations. The following evaluation is prepared in accordance with the guidelines and follows the recommended format contained in ER 1105-2-100, dated December 28, 1990.

C.2.00 SECTION 404(b)(1) EVALUATION.

C.2.01 Project Description.

C.2.02 Location. Savannah Harbor is a deep-draft harbor on the South Atlantic U.S. coast 75 statute miles south of Charleston Harbor, South Carolina, and 120 miles north of Jacksonville Harbor, Florida. The harbor comprises the lower 21.3 miles of the Savannah River (which, with certain of its tributaries, forms the boundary between Georgia and South Carolina along its entire length of 313 miles) and 11.17 miles of channel across the bar to the Atlantic Ocean.

C.2.03 General Description. This evaluation covers both maintenance of the existing Savannah Harbor Navigation Project and changes to that project proposed as a result of the Harbor's Long Term Management Strategy (LTMS). That study was conducted to develop a strategy which would maximize the efficient, effective and timely operation of the harbor, while providing appropriate safeguards for the harbor's environmental and cultural resources. Proposed changes identified in the LTMS Study consist of modifications to the present operation of the harbor.

C.2.04 Proposed changes to the authorized project consist of the following:

A) Diking of Disposal Area 14A to allow rotational use of the middle and lower harbor confined disposal areas, thereby extending their useful life;

B) A Mitigation Plan to compensate for the wetland losses resulting from the diking of Disposal Area 14A and miscellaneous disposal area operations in South Carolina. This plan has certain features that will result in Section 404 discharges: (1) construction and maintenance of a Bird Island in the nearshore area off Jones/Oysterbed Island for use by shorebirds and colonial nesting birds; (2) clearing and maintenance (possibly through unconfined disposal of dredged material) of high ground outside the dike at Jones/Oysterbed Island for use by colonial nesting birds; and (3) installation of a water control structure at the Savannah National Wildlife Refuge to increase fisheries values of an existing impoundment.

C) Construction and use of an access road to Disposal Area 2A to allow deposited sediments to be removed, thereby extending the useful life of that site;

D) A commitment to mitigate for the wetland losses resulting from the construction of the access road to Disposal Area 2A and other minor wetland impacts from maintenance activities at existing disposal areas (replacement of weirs and construction/enlargement of pipe ramps) in Georgia;

E) Installation of underdrains which would drain to either the Savannah or Back Rivers to allow faster drying of deposited sediments; thereby enhancing the removal of those sediments and extending the useful life of the confined disposal areas;

F) Beneficial uses of nearshore sediments, consisting of construction and maintenance of submerged berms south of the Bar Channel, construction and maintenance of a feeder berm off Tybee Island, and placement directly on the Tybee and/or Daufuskie Island beaches. The nearshore/offshore disposal location to be used for a specific dredging contract would be decided during project design and award based on identification of the least cost, environmentally-acceptable disposal option. If disposal at a different location is found to be more desirable for environmental or other reasons but would be more costly than the one designated as the least cost, environmentally-acceptable, it could be pursued using appropriate cost sharing authorities;

G) Maintenance of berths by private interests through hydraulic dredging, with placement of excavated material directly in confined disposal facilities;

H) Improvements in the sediment control features, consisting of advance maintenance deepening of the Sediment Basin and turning basins, and deepening of the advance maintenance area at the Kings Island Turning Basin, with the intent of creating additional off-channel storage for deposition of sediments prior to the periodic Federal maintenance dredging; and

I) Miscellaneous disposal area operations consisting of the following: new pipe ramps, expansions of existing pipe ramps, installation of new weir/discharge pipes, replacement of existing weir/discharge pipes, additional bank protection in non-wetland eroded front dike areas, and bank protection along the Jones/Oysterbed Island Disposal Area.

C.2.05 This document includes an evaluation of the suitability of Bar Channel and other suitable maintenance material from the channel adjacent to Jones/Oysterbed Island for placement in the nearshore area and on nearby barrier islands beaches.

C.2.06 Authority and Purpose. In recognition of the benefits of long-term planning for the efficient use of resources, Congress authorized the development of a Long Term Management Strategy (LTMS) for the Savannah Harbor. The Savannah Harbor LTMS was conducted in response to House Report 102-555, submitted on June 11, 1992, by the House of Representatives' Committee on Appropriations, and Senate Report 102-344, submitted on July 27, 1992, by the Senate Committee on Appropriations. Both those reports refer to the Energy And Water Development Appropriation Bill of 1993. Funds were included in the FY 93 Federal budget to begin this work. Savannah District received funds and initiated work on this LTMS in December 1992.

C.2.07 The Savannah Harbor LTMS Study addresses the continued operation and maintenance of the Savannah Harbor Federal Project. Discharges from the dredging itself are considered de minimis and are not regulated under Section 404 of the Clean Water Act. This Evaluation does address weir discharges of effluent from high ground disposal of the harbor maintenance sediments. Ocean disposal of dredged material is covered under Section 102 and 103 of the Marine Protection, Research, and Sanctuaries Act of 1972, as amended. Discharge of dredged material both onto the eastern tip of Jones/Oysterbed Island, into the nearshore area off Jones/Oysterbed Island to construct and maintain a Bird Island, onto the beaches of nearby barrier islands, discharges to construct nearshore berms/feeder berms off Tybee Island, and stormwater runoff from dike construction would be considered discharges into waters of the U.S. and are under Section 404 jurisdiction.

C.2.08 General Description of Dredged or Fill Material. On May 8, 1992, 24 reconnaissance grab samples were taken of Bar Channel maintenance material. Analysis of these samples revealed six stations with over 15 percent fines by weight. Thirteen of the original samples were below 5 percent fines. Samples ranged from 1 to 53 percent fines, with an average of 12.6 percent fines.

Six resamples from the high fines areas underwent extensive testing. The average for all 30 samples is 13.4 percent fines. The District has determined, with the concurrence of EPA, that the Bar Channel material is suitable for ocean disposal. Results of the testing are discussed in the Revised Section 103 Evaluation for this project.

C.2.09 In 1982, 30 sediment samples were taken in the inner harbor. Those samples revealed that inner harbor sediments were comprised of an average of 64.2 percent sand. Samples taken downstream of Station 50+000 averaged 88 percent sand, with only 2 samples (80 and 74 percent) below a 90 percent sand level.

C.2.10 Description of the Proposed Discharge Sites. Inner harbor material (Station 0+000 and upstream) would be disposed of in the existing confined disposal facilities (CDFs): Disposal Areas 1N, 2A, 12A, 12B, 13A, 13B, 14B and Jones/Oysterbed Island, the proposed confined Disposal Area 14A, or other authorized open water disposal area (such as New Cut). Area 1S is an unconfined area and currently not used. Suitable material from the inner harbor adjacent to Jones/Oysterbed Island (upstream as far as Station 50+000) would also be used for beneficial uses. Material from the Bar Channel (Station 0+000 and oceanward) would be placed in the Savannah Harbor ODMDS, an upland CDF, or used beneficially on a barrier island shoreline or in the nearshore area. Some minor excavation and filling of wetlands and riprapping (less than 0.1 acres) may result from installation of the water control structure at the Savannah NWR. Six acres of wetlands may be impacted through various disposal area operations in South Carolina during the life of the project, including bank protection features along Jones/Oysterbed Island which will require impacts to 2.6 acres of wetlands. In addition, fill may be placed along other front dike areas where no wetlands exist and erosion is taking place. Suitable material from the project may be used for the following proposed beneficial uses: bird island construction and maintenance, beach placement at Tybee or Daufuskie Islands, nearshore submerged berm construction and maintenance, feeder berm construction and maintenance, and unconfined discharges within the Tybee NWR at the eastern end of Jones Island for construction and maintenance of bird nesting mounds. Shell hash or other inert material may be placed along portions of the nearshore bird island to reduce erosion and/or enhance fisheries habitat.

C.2.11 Description of Disposal Method. Hopper dredging is generally performed for removal of Bar Channel material oceanward of Station 0+000. Hydraulic cutterhead dredging is proposed to be available for the complete project. Other means of mechanical dredging, including or similar to backhoe and clamshell, are also proposed as available options for the whole project. Agitation dredging is considered to have greater environmental impacts than

the other listed dredging methods and is not a preferred method. Debris would be excavated by a clamshell or other mechanical dredge and placed in a diked disposal area. Where suitable riprap materials are uncovered during debris removal, they may be redeposited in a suitable location along the bank or side slope where riprap is desirable.

C.2.12 Factual Determinations.

C.2.13 Physical Substrate Determinations. This section considers factors described in Sections 230.11(a) and 230.20.

C.2.14 (1) *Substrate Elevation And Slope.* Maintenance dredging would maintain authorized depths and slopes in the navigation channel, turning basin, Sediment Basin and berthing areas. Local interests are responsible for maintaining berthing areas. Where beneficial uses are employed, elevations may be changed to produce beneficial results (bird nesting on a nearshore island, wave attenuation associated with the nearshore submerged and feeder berms' reduction of erosion damage to barrier island shorelines, and direct protection of barrier island shores).

C.2.15 (2) *Sediment Type.* Since the substrate is common to the area and has been disturbed in the past, the proposed activities are not expected to have an adverse effect on the physical substrate of the region. In addition, only materials of grain sizes suitable for a beneficial use would be so employed.

C.2.16 (3) *Dredged / Fill Material Movement.* Normally, inner harbor dredged material would be confined within diked disposal areas. Sediments with low fines from both the inner harbor and Bar Channel may be employed in beneficial uses. Bird islands would be located and constructed to minimize movement of fill material. Migration of material from underwater berms would be expected during storm events. Sands employed in nourishment of Daufuskie or Tybee Islands, or employed in the construction of berms would be expected to enter the nearshore sand transport system. Losses from these beneficial uses would be replenished as appropriate during future dredging events.

C.2.17 (4) *Effect On Current Patterns, Water Circulation, Wind And Wave Action.* Deepening turning basins and berthing areas would likely reduce flow velocities in the immediate vicinity. However, this impact is not expected to adversely affect water quality or surrounding lands. Deepening the Sediment Basin is expected to have no measurable impact on flow patterns, since velocities are already slow through that specific site. No effect is expected from disposal into the CDFs. However, such impacts are possible for the proposed beneficial uses. The nearshore berms are expected to attenuate waves

approaching Tybee Island from the northeast, especially higher amplitude waves. The orientation of the berms is designed to minimize the effects on tidal currents. No significant changes in current patterns and water circulation are expected. Construction of the bird island on the north side of the jetties may cause minor changes in current patterns and water circulation. However, the site proposed for island construction is presently shallow with deeper channels located on each side -- but outside the impact area, so no major currents are expected to presently occur in the area or be altered by construction of an island. Construction of the feeder berm off Tybee Island may cause minor changes in current patterns and water circulation. However, much of the existing water depth would still be present at the site, so currents are not expected to be significantly changed by construction of the berm. Placement of channel sediments on Tybee or Daufuskie Islands is not expected to affect current patterns or water circulation. It would be expected to lessen wave impacts to those beaches.

C.2.18 (5) *Physical Effects On Benthos.* Discharges from the CDFs are expected to have little impact on benthos. A study of effluent releases from the District's CDFs (Palermo, 1988) showed that the CDFs retain 99.67 percent of dredged solids. The released solids are expected to exist in such low concentrations as to have minimal impact on benthos. Discharges associated with beneficial uses would impact benthos in those areas. However, all areas proposed for beneficial uses are subject to shifting sands and are not expected to have either live hard bottom communities or other large benthos communities. Features requiring open-water discharges will have side scan sonar and benthic surveys completed during the final design process so that specific sites are selected to minimize impacts to benthos.

C.2.19 (6) *Physical Effects On Wetlands.* Effluent from the CDFs may continue to be discharged into wetlands of primarily the Wright and Back Rivers. The District has found no evidence that recent effluent discharges have destroyed wetlands at the outfall locations through burial of vegetation. The amount of solids discharged are expected to continue to be so minor as to cause little or no burial of wetland vegetation. Maintenance of the disposal areas is not expected to have more than minimal impact to wetlands. Dike raisings would take place towards the interior of the disposal areas, so wetlands adjacent to the disposal areas would not be impacted. Future disposal area operations would result in the loss of wetlands and their associated wildlife habitat values. Areas located adjacent to the confined disposal

facilities would be the sites affected. The wetland impacts of those disposal site management operations are described in detail in the paragraphs in Section 7 on Wetlands, but they are summarized as follows:

ACTION	WETLANDS LOST (ACRES) SOUTH CAROLINA		GEORGIA	
Access Road to Area 2A	----		2.89	
New Pipe Ramps	1.70		----	
Pipe Ramp Expansions	0.67		0.14	
Weir/Discharge Pipe Installations	0.10		----	
Weir/Discharge Pipe Replacements	0.43		0.04	
J/O Island Bank Protection	2.63		----	
Underdrain Installations	0.21		----	
	5.74	Total	3.07	Total
	6.00	Use	3.20	Use

Approximately 305 acres of wetlands will be impacted by the diking and use of Disposal Area 14A. A total of about 314 acres of wetlands would be impacted through the diking and use of Disposal Area 14A and miscellaneous disposal area operations. The functional values of these wetlands would be lost as a result of their use for the Navigation Project. Mitigation for these losses includes operation of the disposal areas after a dredging project is completed (and during the disposal area's designated use times) to benefit wildlife, construction of a nesting island on the north side of the jetties, establishment of a bird nesting area on Jones Island, establishment of an escrow account with the SC DHEC-OCRM for in-kind mitigation, and construction of a water control structure at the Savannah NWR. Certain of these mitigation features themselves will result in Section 404 discharges, which are also covered in this evaluation. Some discharges into wetlands may result from construction and maintenance of the Jones/Oysterbed Island nesting area. The head section location will be chosen to minimize runback to wetlands. A complete discussion of the Mitigation Plan can be found in Appendix G.

C.2.20 (7) *Actions Taken To Minimize Impacts.* Turbidity and suspended solids in effluent from the CDFs will be measured periodically to ensure that those facilities are managed and functioning properly. A suspended solids standard of 500 mg/l will be used as the standard of acceptability of weir discharges. For other features requiring a Section 404 discharge, the most suitable materials for the particular project feature will be chosen.

C.2.21 Water Circulation, Fluctuations and Salinity Determinations. This Section considers factors described in Sections 230.11(b), 230.22, and 230.23. The proposed work is not expected to result in any adverse effects on water circulation, fluctuations, salinity, or water quality degradation.

C.2.22 (1) *Water*. Savannah District recently completed testing of maintenance material in the Bar Channel. The material was found to be suitable for placement in the ocean and/or for beach nourishment. Material to be removed from the channel adjacent to Jones/Oysterbed Island may be used for beach nourishment, other beneficially purposes in the nearshore area, or in an unconfined manner on Jones/Oysterbed Island to create/maintain wildlife habitat. Material to be removed from the inner harbor would be placed in existing diked confined disposal facilities. Discharge of the effluent from those sites would meet applicable State water quality standards.

C.2.23 (a) *Salinity*. Dredged material would be pumped from an estuarine river of varying salinity and discharged into estuarine rivers (either the Back, Savannah, or Wright Rivers). No components of the proposed project would measurably alter the harbor's salinity regime.

C.2.24 (b) *Water Chemistry / Dissolved Gases (pH and Dissolved Oxygen)*. Past monitoring of effluent discharges has indicated that pH is normally within water quality standards. The pH of the effluent from CDFs was occasionally observed to violate Georgia and South Carolina water quality criteria at the weir, but with minimal mixing was judged to result in no impacts. From October 1992 to April 1994, eight weir samples were taken where the pH ranged from 8.6 to 10.2 and one sample from Disposal Area 12B in July 1993 was recorded at 12.7. One sample from Disposal Area 2A had a pH of 5.3 (March 23, 1994). All other samples (229), which comprised 96 percent of the total observations, were within water quality standards.

C.2.25 The dissolved oxygen (D.O.) of weir effluent, measured at the weir, was measured to be below water quality criteria 51 times from October 1992 to April 1994. A total of 32 of those samples were from weirs with underdrains and 3 were from the private Colonial Oil disposal area that was used for part of the 1993/1994 Deepening Project. Only 19 samples were from normal CDF overflow weirs, and all of those were at Disposal Area 14B. Again, because of mixing, these discharges were not expected to cause more than minimal impact. Sampling of the Wright River during the low D.O. discharges from Disposal Area 14B did not detect any D.O. levels below state water quality standards. All underdrain weirs to the Wright River will be closed by the end of 1994. New underdrains would be installed to discharge to the Savannah or Back Rivers. It is expected that mixing with the

higher flows in those rivers would produce no impact from low D.O. weir discharges. Since the oxygen demand of the sediment material is not dependent on the location of the material, the total oxygen demand which harbor sediments place upon the river would not be affected by O&M work. In areas where sediment accumulates rapidly, that sediment which becomes buried and turns anoxic is outside of the influence of oxygen dissolved in the water and no longer places a demand on that critical water quality component. Therefore, construction of additional sediment holding capacity in the river allows settling of a volume of sediment in a deep storage area. This would remove that volume from the portion of the water column with ready exchange, thereby reducing the oxygen demand of the total sediment volume. The District has no evidence that any significant level of BOD/COD demand exists in the effluent or has ever caused a D.O. problem in receiving waters.

C.2.26 (c) *Clarity / Color / Odor / Taste / Nutrients / Eutrophication.* Savannah District has not identified any significant impact from any of these factors. Effluent from the CDFs primarily originated -- except for rain water -- in the Savannah River as bottom sediments and overlying river water. It was not involved directly in any industrial process.

C.2.27 (2) *Current Patterns And Circulation.*

C.2.28 (a) *Current Patterns / Flow / Velocity.* Normal maintenance of the Navigation Project is not expected to appreciably impact these factors, although current rates would theoretically decrease after a dredging event due to the increased cross-sectional area of the channel. Deepening turning basins and berthing areas would likely reduce flow velocities in the immediate vicinity. However, this impact is not expected to adversely affect water quality. Deepening the Sediment Basin is expected to have no measurable impact on flow patterns, since velocities are already slow through that specific site. Construction of the bird island proposed in the nearshore off Turtle Island could cause local changes in these factors. However, the site selected for that structure is a shallow water area with deeper channels to either side. No major currents are expected to exist within the site of the proposed island area itself. The bird island would also be expected to protect inland areas from the erosive action of wind-generated waves. The proposed offshore berms are expected to attenuate high amplitude northeasterly wind-generated waves. These berms would be oriented to minimize their impact on both ebb and flood tidal currents. The proposed feeder berm would also attenuate high amplitude northeasterly wind-generated waves which result in erosion of Tybee beach. Sediments which are deposited to

construct the feeder berm are expected to be moved by currents toward the adjacent barrier island shore. However, the feeder berm is not expected to significantly disrupt current patterns in that nearshore area.

C.2.29 (b) *Stratification / Hydrologic Regime.* Minimal impacts on these factors is expected.

C.2.30 (3) *Normal Water Fluctuations.* Tidal levels would theoretically be affected after completion of a dredging event, but the effects would be expected to be minimal.

C.2.31 (4) *Salinity Gradients.* No impact expected.

C.2.32 (5) *Actions That Will Be Taken To Minimize Impacts.* Nearshore berms will be oriented to minimize impact to tidal currents. Vegetation control will be implemented in the CDFs to minimize the impact of subsequent flooding on D.O. CDFs will be operated to maintain highest effluent quality in light of safety and biological concerns.

C.2.33 Suspended Particulate / Turbidity Determinations.

C.2.34 (1) *Expected Changes In Suspended Particulates And Turbidity Levels In Vicinity Of Disposal Site.* The kinds and concentrations of particulate matter in the vicinity of the weirs is not expected to differ greatly as a result of continued operation this project. Normal effluent turbidity is expected to be less than river turbidity during rain events. At other times, mixing with the receiving waters is expected to reduce turbidity rapidly to background levels. A test of one Savannah CDF found a solids retention rate of over 99.93 percent (Palermo, 1988). According to data collected from 1988 to March 1994, the average suspended solid level in the effluent from Disposal Area 2A was about 200 mg/L. In the remainder of the regular O&M disposal areas, the average suspended solid level was about 100 mg/l. This level is comparable to the background level of the Savannah River (20 to 50 mg/l). Discharges from the CDFs are expected to meet readily water quality standards with a minimal mixing zone.

C.2.35 Discharge of dredged sediment material into the subtidal habitat of the ocean, the Jones Island nesting area, or onto the beach is expected to result in a temporary increase in turbidity. Sediments that would be deposited in the open water nearshore environment or on Jones/Oysterbed Island would come from the Bar Channel or inner harbor areas near Jones/Oysterbed Island where

the composition of the sediment is primarily sand. Therefore, turbidity impacts would be expected to be temporary in nature as the sediments should settle out quickly and the minor amounts of fines in the sediments should quickly disperse.

C.2.36 (2) *Effects On Chemical And Physical Properties Of The Water Column.*

C.2.37 (a) *Light Penetration.* During weir releases, there may be a minor temporary reduction in light transmission due to increased turbidity in the area of the weir discharges. These effects would be localized, and limited to only a few weirs at any one time. Moreover, these effects would be minimized by proper management of the weir releases. Effects on the water column are primarily those associated with a reduction in light transmission, aesthetic values, and direct destructive effects on nektonic and planktonic populations.

C.2.38 During open water disposal operations at the ODMDS, there would be temporary reductions in light transmission due to increased turbidity in the area of the discharge. The temporary effects on the water column are primarily those associated with a reduction in light transmission, aesthetic values, and direct destructive effects on nektonic and planktonic populations.

C.2.39 Agitation dredging presently conducted by dock owners results in a temporary reductions in light transmission due to increased turbidity near the berth. Effects on the water column from those operations are primarily those associated with a reduction in light transmission, aesthetic values, and direct destructive effects on nektonic and planktonic populations. The proposed hydraulic dredging of berths with direct placement of excavated sediments into confined disposal areas would reduce the number of agitation dredging events performed in the harbor each year, thereby, reducing their adverse effects on light penetration. The proposed deepening of berths by dock owners would increase the efficiency of hydraulic dredging operation at those sites and reduce the number of dredging events required per year to maintain adequate depths at those facilities. Such changes would also decrease adverse effects of berth maintenance dredging on suspended solids and light transmission.

C.2.40 Open water disposal at the bird island site, Jones/ Oysterbed Island nesting area, nearshore submerged berm and feeder berm sites, and at the beaches will lead to elevations in suspended solids along the shore until the fines in the discharge are swept offshore by tidal action. This will be a temporary condition, with the suspended solids in the water column returning to pre-discharge levels. The temporary effects on the water column are primarily those associated with a reduction in light transmission, aesthetic values, and direct destructive

effects on nektonic and planktonic populations, and are expected to be minor. The discharge is expected to have little impact on dissolved oxygen because of the rapid aeration in the surf zone.

C.2.41 (b) Suspended particulate matter is not expected to significantly affect dissolved oxygen levels of the receiving waters.

C.2.42 (c) *Toxic Metals And Organics*. The major concern for the effect of toxics associated with suspended particles would be associated with overflow effluent from the CDFs. Effluent from the CDFs recently underwent both chemical and biological testing (NMFS, 1994). This study found no concern for effluent from the overflow weirs. Arsenic was found in effluent from the underdrains. See discussion in "Contaminant Determinations" below.

C.2.43 (d) *Pathogens*. Since effluent originates from the Savannah River and no biological organisms are added during the dredging operation, no new pathogens are expected as a result of the dredging.

C.2.44 (e) *Aesthetics*. Some visual impacts from turbidity would be expected from the open water discharges. However, they area expected to be temporal in nature, and diluted by shore currents. Weir releases may also have some visual impacts, but such impacts are expected to be local and not as severe as experienced during a heavy rain event. Use of a hydraulic dredge with direct placement of excavated sediments in a confined disposal area would reduce ongoing adverse visual impacts from turbidity stemming from agitation dredging of berths.

C.2.45 (3) *Effects On Biota*. Suspended particulates may be expected to have some adverse impact on filter feeders, but those impacts are expected to be temporary. Open water disposal would occur infrequently, for relatively short durations, and would be subject to large mixing forces. Where appropriate, open water disposal would be timed so that possible turbidity impacts to larval estuarine fish and shellfish would be minimized. To minimize these impacts, it is the intent of the District that, if possible, no nearshore open water disposal operations would take place during the biologically critical reproductive season for area estuarine fish and shellfish. This critical time period is presently known to be March 1 to June 1. Should additional information modifying that time period come to the District's attention prior to a dredging event, it would be taken into consideration in scheduling the work. Overall impacts from open water disposal are expected to be minimal. To further reduce impacts to fish, endangered species, birds, and benthic communities, the District would follow the recommendations of the US FWS, which were included in their Section 2(b) Report on the

Tybee Island disposal portion of the Savannah Harbor Deepening Project, that whenever possible, open water disposal would be conducted in the early winter months. At the present time, review of current information does not reveal a necessity for conducting biological monitoring of the proposed open water sites.

C.2.46 CDF effluent would occur over a longer period of time and thus there is a greater potential for impacts. The NMFS 1994 weir study found that turbidity levels of 100 to 500 mg/l may be stressful to estuarine organisms. The CDFs would be managed to minimize effluent suspended particulates in the context of safe operation and mitigation goals. Effluent to the Savannah River would undergo rapid mixing with impacts restricted to areas close to the outfalls. At the outfalls to the Wright River, effluent would dominate the discharge areas (small tidal creeks) for larger distances than on the Savannah River side. However, the above referenced 1994 NMFS study of the Wright River outfalls found little impact associated with the overflow weirs.

C.2.47 Although benthic and side scan sonar surveys will be performed at the proposed open water sites and actual sites will be selected to minimize benthic impacts, a substantial loss of the benthic community at the open water disposal sites would be expected as a result of burial by dredged material. Some organisms, capable of upward burrowing, should survive. Since the material deposited in the open water disposal sites is expected to be generally similar to the native sediments in the nearshore area, rapid recolonization of the subtidal areas and intertidal shoreline should occur. No lasting changes in community structure is expected. Long term beneficial impacts from the open water disposal actions are expected at the bird island and beach nourishment sites for nesting birds, sea turtles and intertidal shorelife, since the intertidal zone is expected to be increased. Turbidity impacts would be minimized by scheduling disposal operations outside critical biological periods to minimize impacts to estuarine and larval fish.

C.2.48 Suspended particulates resulting from agitation dredging performed by dock owners could be expected to have some adverse impact on filter feeders and larval estuarine fish. The critical time period for these species is the reproductive season presently known to be March 1 to June 1.

C.2.49 (4) *Actions Taken To Minimize Impacts.* As stated above, only sediments containing predominantly sand would be used for open water discharges. Timing of open water discharges would be planned to include months of lowest impact to fishery resources. The CDFs would be managed to minimize effluent suspended particulates in the context of safe operation and wetland mitigation goals. To ascertain the effectiveness of management of the CDFs, the water quality monitoring plan

described in Section 7 of the EIS will be followed. Use of a hydraulic dredge with direct placement of excavated sediments in a confined disposal area would reduce ongoing adverse impacts stemming from agitation dredging of berths.

C.2.50 Contaminant Determinations. Two main questions focus this issue, the nature of the material to be dredged, and the nature of the material to be discharged. Three general types of material are proposed to be dredged, fines from slips outside the main channel, fines from within the main channel, and predominantly sands from within the main channel (inner channel and Bar Channel). Available information on sediments within slips shows that some slips do contain elevated levels of metals and organics (see discussion in the EIS). Averages of samples taken within the main channel show little concern for contaminants, although some metals such as chrome and zinc approach levels of lowest known effects (see discussion in the EIS). Bar Channel materials, consisting of predominantly sand, have been found suitable for ocean disposal. During normal harbor operations, sediments in the slips, with their potentially elevated levels of chemical compounds, are moved by agitation dredging from the berths and slips and are mixed with/diluted by the more natural river sediment levels before they redeposit in the main navigation channel. In addition, the nature of disposal operations in the CDFs tend to mix the deposited sediments to some degree.

C.2.51 The Section 404 guidelines require that a determination be made of the degree to which the material proposed for discharge will introduce, relocate, or increase contaminants. This determination is to consider the material to be discharged, the aquatic environment at the proposed disposal site, and the availability of contaminants. Seven general types of Section 404 discharges are proposed: (1) small miscellaneous fills associated with maintenance of weirs and construction of pipe access ramps, (2) small excavations, fill, and riprap associated with construction of the water control structure at the Savannah NWR, (3) excavation, fill, and riprap associated with installation of bank protection along the Savannah River shoreline of Jones/Oysterbed Island, (4) fill associated with construction of the dikes for Disposal Area 14A, (5) fill associated with construction of the access road to Disposal Area 2A, (6) CDF overflow effluent to the Savannah, Back, and Wright Rivers, (7) CDF underdrain effluent to the Savannah and Back Rivers, (8) open water discharges associated with construction of a bird island, nearshore submerged berms, nearshore feeder berm, Tybee Island nourishment, and Daufuskie Island nourishment, and (9) unconfined disposal on uplands at Jones/Oysterbed Island to maintain open bird nesting mounds.

C.2.52 (1) *Weir Replacements, Pipe Ramp Construction And Enlargements, Disposal Area 14A Dike Construction, And Disposal Area 2A Access Road Construction.* These fills would consist of predominantly sand material from within existing disposal areas. Sands are generally accepted to have little possibility for contamination.

C.2.53 (2) *CDF Overflow Effluent.* The normal harbor CDFs retain a very high percentage of heavy metals and other contaminants. A study of Disposal Area 12 (Palermo, 1988) found that 99.9 percent of solids and 99.6 percent of heavy metals were retained within the CDF. A recent study of CDF effluent (NMFS, 1994) found little concern for overflow effluent from the CDFs to the Wright River.

C.2.54 (3) *CDF Underdrain Effluent.* Underdrains were originally constructed in Disposal Areas 12B (weirs 1 and 2) and 13A (weirs 2 and 3). The 1994 NMFS study found that arsenic was being released to the Wright River through those underdrains at levels that violated water quality criteria. Arsenic levels in the Disposal Area 12B weir 1 underdrain effluent ranged from 117 to 147 micrograms/liter and in the Disposal Area 13A weir 2 effluent (which included both underdrain and overflow effluent) ranged from 14.9 to 298 micrograms/liter. The underdrain effluent was found to be toxic to test organisms. This toxicity was attributed primarily to arsenic, although other factors were also implicated (elevated manganese, low salinity, low dissolved oxygen and high turbidity). In agreement with the South Carolina Office of Ocean and Coastal Resource Management, the District has elected to close the underdrains to the Wright River. As of October 1994, the underdrains in Disposal Area 12B were sealed. The other underdrains were closed later in 1994. It is proposed that the underdrains be reinstalled to discharge to the Savannah or Back Rivers, where a suitable mixing zone would bring the arsenic levels within water quality criteria. Recent calculations predict that a 10- to 25-foot mixing zone would bring these levels within water quality criteria.

C.2.55 (4) *Open Water Discharges.* Predominantly sand materials from the Bar Channel and the Jones/Oysterbed Island portion of the inner harbor are proposed for open water discharge. Similar materials were sampled and tested in August 1992 (Skidaway, 1992) and found suitable for ocean disposal (Revised Deepening Project Section 103 Evaluation, November 1992).

C.2.56 (5) *Unconfined Disposal On Uplands At Jones/Oysterbed Island To Create/Maintain Bird Nesting Habitat.* These fills would consist of predominantly sand material from the navigation channel adjacent to the site. Sands are generally accepted to have little possibility for contamination.

C.2.57 (6) *Small excavations and fill for the water control structure at the Savannah NWR.* Less than 0.1 acre of wetlands is expected to be excavated. Fill will consist primarily of riprap to protect the structure from subsequent erosion.

C.2.58 (7) *Excavation, fill, and riprap associated with installation of bank protection along the Savannah River shoreline of Jones/Oysterbed Island.* Approximately 2.63 acres of wetlands are expected to be impacted. Fill will consist primarily of riprap to protect the shoreline from ongoing and expected future erosion.

C.2.59 Aquatic Ecosystem and Organism Determinations.

C.2.60 (1) *Effects On Plankton And Nekton.* Impacts from open water discharges would be primarily due to increases in turbidity during the discharge itself and subsequent erosion of any incompatibly sized material. Similar impacts could be produced by both the runoff during unconfined disposal events operations on Jones/Oysterbed Island and agitation dredging of berths by dock owners. Such impacts include a decrease in phytoplankton growth from decreased light availability due to absorption or reflection of light by suspended particulates. A decrease in feeding by nekton could result from reduced phytoplankton availability, limited visibility of prey or interference in feeding behavior from increased particulates. These impacts are expected to be temporary and subside following erosion of incompatibly sized material. No significant impacts on plankton or nekton are expected due to effluent from the CDFs.

C.2.61 (2) *Effects On Benthos.* The proposed dredging will result in a temporary disruption in benthic communities at the dredging sites. However, recolonization occurs relatively rapidly. There will be a temporary impact on benthic communities at the open water disposal sites as some organisms will be lost by covering. Some organisms which inhabit the underwater sites are capable of upward burrowing and should survive. Benthic organisms at the proposed nearshore and beach disposal sites are typically subject to changes associated with daily shifts in their habitat substrate. In addition, those organisms commonly recolonize nourished beaches. Turbidity effects may be produced by the proposed unconfined nearshore disposal, but they are expected to be temporary and minor. Fine-grained sediment will be washed off the proposed nearshore island, submerged berms, feeder berm, and nourished beaches and settle in adjacent subtidal areas, but this should not have more than a minor adverse effect on benthic populations because the fines are expected to accumulate in -- at most -- a very thin layer. Some benthic habitat will be lost from construction of the nearshore

island. However, it will be replaced by intertidal areas and valuable high ground nesting habitat. Placement of riprap along the Savannah River shoreline of Jones/Oysterbed Island would establish valuable stable rock intertidal habitat for benthos.

C.2.62 (3) *Effects On Aquatic Food Web.* No appreciable effects identified. Minor effects on benthic organisms should, for the most part, be temporary. Increased intertidal substrate at the island site should result in increased intertidal communities. It is hoped that the nearshore berms and feeder berm would provide a more stable environment on the shore of Tybee Island, extending the time between renourishments. This would allow further development of complex food webs between beach renourishment events.

C.2.63 (4) *Effects On Special Aquatic Sites (Including Wetlands).* The proposed bird island is adjacent to the Turtle Island Wildlife Management Area and near the Tybee Island National Wildlife Refuge. No other special aquatic sites have been identified at the proposed open water discharge sites. However, the actions listed below which are associated with the navigation project have been identified as having wetland impacts. The amount of wetland impact identified with each action is also listed.

(a) Diking of Disposal Area 14A: 305 acres.
(b) Construction of access road for Disposal Area 2A: 2.9 acres.
(c) Construction of new pipe ramps: 1.70 acres.
(d) Expansion of existing pipe ramps: 0.81 acres.
(e) Installation of new weirs and discharge pipes: 0.10 acres.
(f) Periodic maintenance and relocation of weirs and discharge pipes: 0.47 acres.
(g) Construction of bank protection along Jones/Oysterbed Island Disposal Area: 2.63 acres.
(h) Installation of underdrains: 0.21 acres.
(i) Construction/maintenance of contractor lay down areas: less than 1 acre.
(j) Less than 0.1 acre for the Savannah NWR water control structure (mitigation plan feature).

C.2.64 A Mitigation Plan was developed to offset the losses from the diking of Disposal Area 14A and miscellaneous disposal area operations in South Carolina. That Plan is included as Appendix G to the EIS. Separate mitigation would be performed to offset wetland losses in Georgia. That mitigation would consist of the restoration/creation of salt water wetlands within the Savannah Harbor area. The mitigation would be performed in conjunction with other projects conducted by Chatham County and/or the Georgia Department of Transportation at a 2:1 replacement level.

A detailed plan for that mitigation would be prepared by Savannah District and submitted to the US FWS and Coastal Resources Division of the Georgia Department of Natural Resources for approval.

C.2.65 (5) *Threatened And Endangered Species.* A Biological Assessment of Threatened and Endangered Species (BATES) has been prepared for continued operation and maintenance of the Savannah Harbor Navigation Project and is contained in Appendix B of the EIS. The BATES determined that the Project would not jeopardize any threatened or endangered species, provided the conditions outlined in that document are made a part of the dredging and construction contracts. The proposed increased management of the disposal areas for wildlife benefits should provide additional feeding opportunities for the endangered wood stork. Construction of the bird island should provide additional feeding and resting sites for the endangered piping plover, as well as nesting habitat for endangered sea turtles.

C.2.66 (6) *Other Wildlife.* Construction of the bird island, nesting islands within the disposal areas, and increased management of the disposal areas for wildlife benefits should provide additional benefits to a variety of shorebirds and other beach and intertidal area organisms. Nesting houses would be constructed at the CDFs for purple martins and bats as a biological control measure for mosquitoes originating from the CDFs.

C.2.67 (7) *Actions To Minimize Impacts.* Only material of compatible grain sizes is proposed for open water discharge. The size of the proposed diked area at Disposal Area 14A has been designed to minimize wetland impacts and still have an efficient area. A wetland mitigation plan to compensate for unavoidable impacts to South Carolina marsh vegetation is contained in Appendix G of the EIS. A separate wetland mitigation plan would be prepared to compensate for unavoidable impacts to Georgia marsh vegetation. The proposed hydraulic dredging of berths with direct placement of excavated sediments in confined disposal areas would reduce ongoing adverse impacts to the aquatic organisms and aquatic ecosystem resulting from agitation dredging.

C.2.68 <u>Proposed Disposal Site Determinations.</u>

C.2.69 (1) *Mixing Zone Determinations.* Proposed mixing zones are confined to the smallest practicable zone at each specified disposal site that are consistent with appropriate dispersion. The District believes that arsenic in the proposed underdrain effluent and low D.O. in both underdrain and overflow effluents mixes rapidly with receiving waters and has no impact on the aquatic environment. Calculations indicate that arsenic levels

in discharges from underdrains would reach acceptable levels within 10 to 25 feet of the discharge point when discharged into the Savannah River. Appropriate mixing zones will allow compliance with water quality criteria.

C.2.70 (2) *Determination Of Compliance With Applicable Water Quality Standards.* Water Quality Certifications are in place from both the State of Georgia and the State of South Carolina for operation and maintenance of the Savannah Harbor Navigation Project. The District requested each state evaluate the Project as currently proposed and determine if additional water quality certification is required. Certification was received from the State of Georgia in a letter dated September 5, 1995, with modifications dated February 6 and 28, 1996. Certification was received from the State of South Carolina in a letter dated May 10, 1996.

C.2.71 (3) *Stormwater Runoff Determinations.* No separate Stormwater Discharge Permits have been obtained for the dike improvement actions which are required for continued operation of the CDFs. During the 20-year period of analysis, multiple dike raising projects will need to be performed to increase the storage capacity of the CDFs. Those actions would each constitute a construction event covering more than 5 acres, which normally requires a state Stormwater Discharge Permit. However, since original construction and continued maintenance of a CDF in a wetland requires a Section 404 Evaluation, the evaluation requirements of Section 402 for a permit for the discharge from the site would be fulfilled. It is Corps policy to follow the evaluation procedures of the Section 402 permit process even though the Corps does not specifically request a Stormwater Discharge Permit from the state.

C.2.72 Guidance from Corps Headquarters titled "NPDES Storm Water Discharge Permit Requirements," contained in a memorandum dated June 23, 1992 states that discharges of dredged or fill material into waters of the US that are regulated under Section 404 are exempt from stormwater regulations. This guidance states "The construction, maintenance and operation of a CDF built in waters of the United States, and thus regulated under Section 404 of the Clean Water Act, would not require a permit under the storm water rule." Since all Project CDFs are built in wetlands, their operation and maintenance -- including stormwater runoff -- would be considered Section 404 discharges under that interpretation. Stormwater discharges from CDFs are, therefore, covered in this Evaluation. When stormwater has ponded behind the weirs and is released through a water control structure by removing weir boards, the District will monitor the discharge's water quality to ensure compliance with state water quality criteria. Where stormwater releases are intermittent and uncontrolled, water quality impacts are expected to be minimal and no monitoring is proposed.

C.2.73 Since dike construction and raising projects would occur in areas that were originally wetlands, the runoff which occurs during those construction events would also be considered under this Section 404 Evaluation. Erosion control plans would be implemented during those construction events to ensure maintenance of water quality. The location and size of the CDFs are described in the main EIS. With implementation of the proposed project, fill material for the dike improvement projects would typically be obtained onsite. Otherwise, offsite fill from other disposal areas would be required due to the limited period of time during which heavy equipment can work on the floor of a CDF before the next disposal operation occurs. The material used as fill for dike raising is typically comprised of sands, silty sands, and silts. The construction process which typically occurs when a dike is raised is described in Appendix H Local Sponsor's Work of the EIS. "Best Management Practices," as defined in the Manual For Erosion And Sediment Control In Georgia or the South Carolina Stormwater Management And Sediment Control Handbook For Land Disturbance Activities, are used for determining the appropriate erosion control measures which will be implemented during the dike raising process. Appendix N of the EIS, titled Erosion And Sediment Control Plan, describes the measures which are taken to control the potential for non-point source pollution stemming from the dike raising process. Those same procedures would effectively control stormwater runoff from the outside of the disposal area dikes during dike construction. No changes in a dike's runoff coefficient would occur as a result of a dike raising project. The raising would result in a decrease in a dike's impervious area since the total surface area of the dike would increase when it's height is increased. Stormwater runoff from the CDFs is discharged to either the Savannah, Middle, Back, or Wright Rivers, depending on the specific disposal site. Industrial chemicals are not stored at the CDFs, so suspended sediments would be the only pollutant expected in the stormwater runoff from the dikes. Washouts of the dikes are uncommon events, so the quality of the stormwater runoff is considered to be good.

C.2.74 (4) *Potential Effects Of Human Use Characteristic.*

C.2.75 (a) *Municipal And Private Water Supply.* No wells or other water supply inlets would be affected by the proposed discharges.

C.2.76 (b) *Recreational And Commercial Fisheries.* No more than very minor impacts are expected. No inner harbor dredging above River Mile 5 is conducted from March 16 to May 31 of each year to comply with conditions in state Water Quality Certifications intended to protect spawning Striped bass. If future research indicates that additional dredging may occur without threatening Striped bass, the District will follow

provisions contained in the state Water Quality Certifications. If possible, open water discharges would scheduled to avoid the most critical time period for larval and estuarine fish and shellfish of March 1 to June 1. The nearshore submerged berms and feeder berm would interfere with large fishing boats as the berm crest would extend to a depth of 5 feet MLW.

C.2.77 (c) *Water Related Recreation / Aesthetics.* The proposed work would not impact the designated uses of area waters.

C.2.78 (d) *Parks, Etc.* Part of the Tybee Island National Wildlife Refuge is within the Jones/Oysterbed Island Disposal Area. Portions of Disposal Areas 1N, 1S, and 2A are within the Savannah National Wildlife Refuge. The District enters into agreements with the US FWS concerning disposal activities on their lands. Issuance by the FWS of a Special Use Permit would be required prior to construction occurring on FWS-managed sites. Construction of the bird island is expected to benefit the Tybee Island NWR through sheltering it from offshore waves. The bird island would also shelter the Turtle Island Wildlife Management Area, which is operated by the South Carolina Department of Wildlife And Marine Resources. As part of the Mitigation Plan, a water control structure would be constructed to increase water flow through an existing impoundment within the Savannah NWR, thereby increasing the value of that impoundment to fish. Unconfined disposal or clearing of the 26-acre upland nesting area on the Tybee Island NWR would increase the value of the site to colonial nesting birds.

C.2.79 Determination Of Cumulative Effects On The Aquatic Ecosystem. The original construction and continued operation of this project has resulted in the loss of considerable wetland acreage. This loss has taken place over many years. Recent impacts have been mitigated. Much of the wetland impacts occurred at the areas set aside for confined disposal facilities. Since construction of the diked disposal areas, impacts to wetlands have been minimized, with only minor accumulation of sediment directly adjacent to the CDF outfalls. Other historic impacts resulted from a widening of the trapezoidal channel prism as authorized depths were increased. In some areas, that widening resulted in the loss of wetlands located along the channel bank. Some loss of wetlands along the channel bank has occurred over time, even though their loss was predicted and mitigated during specific channel improvement projects. The proposed project would result in the loss of additional wetlands, but that loss is the minimum necessary to continue operation of the Navigation Project. Without the proposed project, the Project's CDFs would have a shorter life, requiring more wetlands to be lost to continue operation of the Navigation Project.

C.2.80 Determination Of Secondary Effects On The Aquatic Ecosystem. No more than minimal secondary impacts have been identified. Those impacts, stemming mainly from construction of landside facilities, receive separate environmental reviews prior to the projects receiving approval for construction. Implementation of the proposed hydraulic dredging of berths with direct deposition of sediments into CDFs would have a secondary benefit of reducing the number of agitation dredging events conducted in the harbor. The water control structure to be constructed within an existing impoundment in the Savannah NWR would increase tidal water exchange, thereby increasing the aquatic value of that impoundment.

C.2.81 Findings Of Compliance Or Non-Compliance With the Restrictions On Discharge.

C.2.82 Determinations.

C.2.83 (a) An ecological evaluation of discharges of dredged material associated with (1) the continued operation and maintenance, and (2) proposed changes to the Savannah Harbor Navigation Project, has been made following the evaluation guidance in 40 CFR 230.6, in conjunction with the evaluation considerations in 40 CFR 230.5.

C.2.84 (b) There are no less environmentally damaging practicable alternatives to the project that would accomplish project goals and objectives. Rotational use of the CDFs should maximize the useful life of those sites, thereby postponing environmental impacts which would result from the creation of new disposal areas in wetlands. Likewise, installation of underdrains at the CDFs would reduce adverse environmental impacts by extending the useful life of those sites. The maximum use of economically justified and environmentally acceptable advance maintenance sections minimizes the number of dredging events, thereby also minimizing adverse impacts from dredging and disposal operations. In the same manner, the proposed improvements to the Project's sediment control features would also minimize adverse impacts from dredging and disposal operations. The proposed hydraulic dredging of berths with direct deposition of sediments into CDFs would reduce the number of agitation dredging events conducted in the harbor, and the adverse impacts stemming from those events.

C.2.85 (c) The work will be conducted in accordance with state Water Quality Certifications to the extent practicable. A water quality monitoring program will be implemented to ensure the CDFs are functioning properly. Should it become apparent that operation of the project is resulting in a violation of state Water Quality Standards, coordination with the appropriate

state will be initiated to determine the appropriate course of action. The disposal operation will not violate the Toxic Effluent Standards of Section 307 of the Clean Water Act.

C.2.86 (d) Operation of the project will not jeopardize the continued existence of any Federally listed threatened or endangered species or its designated critical habitat. The Project will follow the provisions which the US FWS and NMFS state, through the Section 7 consultation process, are necessary.

C.2.87 (e) The project will be operated in accordance with the Marine Protection, Research, and Sanctuaries Act of 1972. A Section 103 Evaluation has been conducted and is contained in Appendix D to the EIS.

C.2.88 (f) The proposed discharges will not result in significant degradation of the Waters of the United States. There will be no significant adverse effects on human health and welfare, municipal and private water supplies, recreation and commercial fisheries, plankton, fish, shellfish, wildlife, special aquatic sites, life stages of aquatic life and other wildlife dependent on aquatic ecosystems, aquatic ecosystem diversity, productivity and stability, or recreational, aesthetic and economic values.

C.2.89 (g) The discharges will include all practicable and appropriate measures to minimize potential harm to the aquatic ecosystem, including mitigation for possible wetland losses as a result of the project.

C.2.90 Findings. Based on the determinations made in this Section 404 (b)(1) Evaluation, the finding is made that with the conditions enumerated in both the BATES for this project and this document, implementation of the Mitigation Plan for the loss of wetlands at Disposal Area 14A and through miscellaneous disposal area operations in South Carolina, and development and implementation of an acceptable mitigation plan for loss of wetlands in Georgia, the proposed discharges comply with the Section 404 (b)(1) Guidelines.

APPENDIX D

SECTION 103 EVALUATION

OF OCEAN DISPOSAL

FOR THE

SAVANNAH HARBOR NAVIGATION PROJECT

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SAVANNAH HARBOR NAVIGATION PROJECT

D.1.00 PROJECT LOCATION. Savannah Harbor is a deep-draft harbor located on the South Atlantic U.S. coast 75 statute miles south of Charleston Harbor, South Carolina, and 120 miles north of Jacksonville Harbor, Florida. The harbor comprises the lower 21.3 miles of the Savannah River and 11.17 miles of channel across the ocean bar to the Atlantic Ocean. An ocean dredged material disposal site (ODMDS) is located south of the entrance channel and approximately 3.7 nautical miles offshore.

D.2.00 DESCRIPTION OF PROPOSED OCEAN DISPOSAL. Savannah District proposes to continue placing maintenance material excavated from the Savannah Harbor Bar Channel in the Environmental Protection Agency (EPA)-approved ODMDS.

D.3.00 NEED FOR EVALUATION. Federal projects involving the transportation of dredged material for the purpose of placing it in ocean waters for disposal must be evaluated to determine whether the proposed placement would unreasonably degrade or endanger human health, welfare or amenities, or the marine environment, ecological systems or economic potentialities. In making this evaluation, criteria established by the U.S. Environmental Protection Agency (EPA), pursuant to Section 102 of the Marine Protection, Research and Sanctuaries Act of 1972 (MPRSA), as amended (40 CFR Parts 220 to 228), are applied, including an evaluation of the need for the ocean disposal and the availability of alternatives to ocean disposal.

D.3.01 Transport for ocean disposal of materials excavated during Operations and Maintenance dredging of the Bar Channel for the Savannah Harbor Navigation Project has recently been reviewed under Section 103 of the MPRSA. Concurrence that the material is suitable for ocean disposal was received from EPA by letter dated October 22, 1992. That letter did not mention an expiration date, but EPA concurrences for ocean disposal are typically valid for three years.

D.3.02 This Evaluation was prepared as part of the Savannah Harbor Long Term Management Strategy. That study was intended to provide a long term assessment of the multi-faceted operation of the harbor. One component of that operation was the continued use of the Savannah ODMDS for placement of material dredged during maintenance of the Bar Channel. Therefore, a review of

the existing Section 103 Evaluation for Bar Channel maintenance was made to determine if any changes are warranted. The conclusions of this review resulted in an update of the Savannah Harbor Section 103 Evaluation for three (3) years from EPA's March 23, 1995 letter. During that time period, no further evaluation or coordination under Section 103 of the MPRSA would be necessary unless significant changes are observed in the harbor which would alter the findings of this Evaluation.

D.4.00 STATUS OF EXISTING OCEAN DISPOSAL SITE. The Savannah Ocean Dredged Material Disposal Site (ODMDS) was designated by EPA on August 3, 1987, as part of a Consent Decree. The offshore site is centered at 31 56'54"N and 80 45'34"W and is restricted to disposal of dredged material from the Savannah Harbor area. In the past, the site has been used for the disposal of both maintenance and new work material from the Bar Channel of the Savannah Harbor Navigation Project.

D.4.01 A Management Plan for the Savannah ODMDS is being developed jointly with Region IV of EPA. That document is included as Appendix I of the Savannah Harbor LTMS EIS. This Evaluation is also a component of that EIS.

D.5.00 DESCRIPTION OF SAVANNAH HARBOR NAVIGATION PROJECT. The Savannah Harbor Navigation Project consists primarily of a deep-draft navigation channel and associated dredged material disposal areas. The navigation channel has an authorized depth of -44 feet Mean Low Water (MLW) across the Bar Channel to Station -14+000B. The authorized depth from Stations 103+000 to -14+000B is -42 feet MLW. The Navigation Project was last improved to those depths in 1993/1994. Material from the outer portion of that improvement project (Savannah Harbor Deepening) was placed in the Savannah ODMDS.

D.6.00 PREVIOUS EVALUATIONS OF OCEAN DISPOSAL. As part of the Savannah Harbor Deepening Project, Savannah District completed a Section 103 Evaluation in 1991, of the disposal of new work and maintenance material to be excavated from the harbor's Bar Channel and placed in the Savannah ODMDS. EPA's review of the Evaluation resulted in their February 27, 1992, concurrence that the new work material to be dredged during that project was suitable for ocean disposal.

D.6.01 The District maintained in that evaluation and continues to maintain that Savannah Harbor Bar Channel maintenance material meets the exclusion at 40 CFR 227.13(b)(1). This position is based on the fact that the material normally averages about 15% fines and is found in areas of high current or wave energy (the nearshore ocean bar). The District also believes the material

meets the alternate criteria listed at 40 CFR 227.13(b)(3) since it is essentially similar to material found at the ocean disposal site, and is geographically removed from known existing and historic sources of pollution such that its location provides reasonable assurance that the material to be removed has not been contaminated by such sources. EPA's February 1992 position was that additional information, including comprehensive chemical and biological testing of the material, was necessary before they could concur in the suitability of maintenance material for ocean disposal.

D.6.02 Savannah District conducted the necessary chemical and biological testing of maintenance material, including Tier III testing, and in November 1992, completed a Section 103 Evaluation for the disposal of that material. The Evaluation addressed maintenance material to be excavated from the Bar Channel portion (Stations -60+000B to 0) of the Savannah Harbor Navigation Project. Through that Evaluation, the District found that maintenance material from the Bar Channel was suitable for ocean disposal and would not unduly degrade or endanger the marine environment. That conclusion received concurrence from EPA on October 22, 1992.

D.6.03 Savannah District performed an evaluation of the ocean disposal of new work and operations & maintenance material to be excavated from Stations 0 to 11+000 during the Savannah Harbor Deepening Project. After reviewing the sediment characteristics from that reach, the District determined that the material met the exemption set forth at 40 CFR 227.13(b) and was acceptable for ocean disposal without the need for further testing. EPA concurred with that determination in a letter dated February 25, 1994, for the Deepening Project only.

D.7.00 TIER 1 EVALUATION OVERVIEW. Savannah District conducted an in-house Tier I review in accordance with the Dredged Material Testing Manual to determine if any new conditions have occurred in the harbor that might alter the conclusions of the previous Section 103 Evaluation. The Evaluation included the following components, each of which will be described separately:

* A review of the volume and channel stations of dredged material that would be placed at the ODMDS.
* A reassessment of new and previously evaluated physical and chemical data relative to any regulatory changes.
* A review of changes in sediment composition or deposition.
* A review of information pertaining to chemicals which have been identified as potential contaminants of concern.
* A review of spill records.

* A review of new or revised NPDES permits from GA DNR for the potential contaminants of concern.
* A determination whether water quality conditions have changed in the harbor that might indicate the need for further evaluation of plans to place Bar Channel maintenance material in the ocean.

D.7.01 Planned Ocean Disposal. Approximately 1 million cubic yards of material are removed each year from the Bar Channel with hopper dredges and deposited in the Savannah ODMDS. That estimated quantity and project area have not changed from that contained in the previously approved Section 103 Evaluation.

D.7.02 Changes In Physical Or Chemical Data. There are no known changes in the composition of the maintenance material which would be removed. No changes have been made to the length, width or orientation of the Bar Channel since the previous Evaluation. No significant changes are known to have occurred in the watershed which could markedly alter the composition of the material which shoals in the Bar Channel.

D.7.03 Information On Potential Contaminants Of Concern. When the Tier II and Tier III testing was performed in 1992, no contaminants of concern were identified. The results of that program were used in the 1992 Evaluation which concluded that Bar Channel maintenance material was suitable for ocean disposal.

D.7.04 Since that time, no additional information has become available which would indicate that the low dioxin levels which were previously identified in Bar Channel maintenance material would now be considered unsafe. In the 1992 study, two samples were found to contain no detectable levels of 2,3,7,8-TCDD or 2,3,7,8-TCDF (the most toxic dioxin congeners). Moreover, the TEQ (toxic equivalence), calculated using 1/2 detection limit values), was found to be 0.96 to 1.07 pptr. In addition, some additional degree of uncertainty has developed on the threshold for impacts as the U.S. Food and Drug Administration deleted its criteria of 25 pptr (parts per trillion) as the cutoff for acceptable levels of dioxin in fish for human consumption.

D.7.05 Improvements are being made in laboratory instrumentation, resulting in a lower detection limit for dioxins. However, uncertainties still remain on how to handle test results which do not reach the detection limits. A national EPA/Corps task force evaluated this issue and a standard protocol has been established whereby test results are evaluated using zero, half the detection limit and the full detection limit when

the test result is reported as "Non-Detect". That protocol had no impact on the previous decision concerning the acceptability of the level of dioxin found in the maintenance material.

D.7.06 Previous sediment investigations performed on inner harbor sediments contained individual samples where levels of the following metals approached or slightly exceeded concentrations where concern should be expressed: Chromium (Cr), Copper (Cu), Lead (Pb), Nickel (Ni), Silver (Ag), and Zinc (Zn). In recognition of the large variability which is common between sediment samples, analyses of the acceptability of dredging and disposal operations use an average of the individual test results as a better representation of the material to be removed by an entire dredging project. Those analyses have consistently determined that dredging and disposal of Savannah Harbor sediments could be conducted in an environmentally responsible manner. However, the metals which were previously found to be elevated in individual cases were considered in this analysis.

D.7.07 Spill Records. The District has no records of any large chemical or material spill comprised of compounds containing those heavy metals.

D.7.08 Georgia DNR NPDES Permits For Potential Contaminants Of Concern. The Environmental Protection Division (EPD) of Georgia Department of Natural Resources was consulted to determine if any changes had occurred since 1992 in the NPDES permits for dioxin and the identified heavy metals for Savannah industries. EPD indicated that since 1989/1990, it has made no changes in the permitted discharge of dioxins or the identified heavy metals in Savannah.

D.7.09 Changes In Water Quality Conditions. No significant changes are known to have occurred which would alter the water quality conditions upon which the previous Evaluation was made.

D.8.00 MONITORING. No information was found which would alter the previous position that monitoring of water quality and impacts to marine organisms due to the chemical properties of the sediments is not necessary. Since there is potential for mounding at the site, bathymetric surveys should continue to be conducted periodically to determine (1) the direction the deposited material is migrating, and (2) ensure that continued use of the Savannah ODMDS is not creating any hazards to navigation.

D.9.00 DETERMINATION AND FINDINGS. Based on the Tier I assessment performed for this Evaluation, no changes were identified which would alter the determination made in previous Section 103 Evaluations that the maintenance material to be excavated from the Savannah Harbor Bar Channel is suitable for ocean disposal and will not unduly degrade or endanger the marine environment.

D.10.00 EPA CONCURRENCE. This current evaluation was coordinated with EPA and concurrence for 3 years received in a letter dated March 23, 1995. The District's Savannah Harbor 103 Evaluation will expire on March 23, 1998.

APPENDIX E

RESULTS OF WRIGHT RIVER
WEIR EFFLUENT AND SEDIMENT TESTING

APPENDIX E

RESULTS OF WRIGHT RIVER WEIR EFFLUENT AND SEDIMENT TESTING

E.1.00 In late 1993 and early 1994, tests were conducted to determine the environmental impacts of the release of effluent to Wright River from the confined dredged material disposal facilities which are operated for the Savannah Harbor Navigation Project. A testing program was jointly developed by Savannah District, the South Carolina Coastal Council, and the Southeast Fisheries Science Center of the National Marine Fisheries Service (NMFS). The plan was approved by Region IV of the U.S. Environmental Protection Agency prior to implementation. The NMFS Charleston Laboratory was responsible for performance of the testing program. The NMFS performed most of the work, with assistance from the Marine Resources Institute of the South Carolina Wildlife and Marine Resources Department and independent testing laboratories.

E.1.01 The following pages contain the Executive Summary, Discussion, and Conclusions sections of the July 1994 report prepared by the NMFS which documents the investigation. The report is entitled "Ecotoxicological Assessment Of Dredge Disposal Operations In The US Army Dredge Material Disposal Area In The Wright River Estuary Of South Carolina."

E.1.02 As a result of the findings obtained from this investigation, Chatham County has agreed to close the underdrains located in Disposal Areas 12B and 13A which discharge into the marshes adjacent to Wright River. One underdrain has been closed, while discharge from the others will be shut off by the end of 1994 to allow completion of ongoing engineering field investigations.

E.103 The study results found that discharges from the overflow weirs did not result in acute effects to aquatic life. It did note that discharges from overflow weirs sometimes exhibited low dissolved oxygen and high turbidity. The District will evaluate additional management measures to reduce possible adverse effects from those items. Based on the study findings, relocation of the overflow weirs does not appear to be warranted.

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EXECUTIVE SUMMARY

In May 1993, the U.S. Army Corp of Engineers (COE), Savannah District, began a major dredging project in the Savannah River to deepen the harbor near the port of Savannah, Georgia. Disposal of sediments for this project were designated for the state/county owned confined dredged material disposal facility on the Wright River estuary in South Carolina. To assess potential impacts of dredge disposal operations in the Wright River estuary, an integrated field and laboratory ecotoxicological study was undertaken by the U.S. National Marine Fisheries Service (NMFS), Southeast Fisheries Science Center, Charleston Laboratory and the South Carolina Wildlife and Marine Resources Department, Marine Resources Research Institute at the request of the COE and the South Carolina Coastal Council.

The purpose of this study was to determine the acute and chronic toxicity of effluents from and sediments outside the Wright River dredge disposal areas (Figures 1-2, pages 10 & 11) on sensitive estuarine juvenile fish (*Cyprinodon variegatus*), adult grass shrimp (*Palaemonetes pugio*), oyster embryos (*Crassostrea virginica*) and amphipods (*Ampelisca virrilli*) using established Environmental Protection Agency (EPA) and COE protocols. Additionally, adult oysters (*Crassostrea virginica*) were collected from a pristine reference site on Leadenwah Creek and deployed downstream of each disposal area (12-B, 13-A, 13-B, and 14-B) and monitored for bioconcentration of trace metals and polycyclic aromatic hydrocarbons (PAHs), adult survival, potential yield (grams of oyster meat/bushel of oysters) and larval spat settlement.

Sediments, deployed oysters, and effluent were analyzed for a variety of chemical contaminants including:

Contaminant Type	Contaminant	
Trace Metals	Aluminum (Al)	Lead (Pb)
	Arsenic (As)	Manganese (Mn)
	Cadmium (Cd)	Mercury (Hg)
	Chromium (Cr)	Nickel (Ni)
	Copper (Cu)	Silver (Ag)
	Iron (Fe)	Zinc (Zn)
Polycyclic Aromatic Hydrocarbons (PAHs)	Acenaphthene (Ace)	Indeno(1,2,3-Cd)perylene (I(1,2,3)P)
	Acenaphthylene (Acy)	Benzo(b)fluoranthene (BbF)
	Anthracene (Ant)	Naphthalene (Nphl)
	Benzo(a)anthracene (BaA)	Phenathrene (Phe)
	Benzo(k)fluoranthene (BkF)	Pyrene (Pyr)
	Chrysene (Chy)	2-methyl Naphthalene (2mNphl)
	Dibenzo(a,h)anthracene (D(a,h)A)	1-methyl Naphthalene (1mNphl)
	Fluoranthene (Fla)	Fluorene (Fle)
Other Parameters	% Oil and Grease	% Moisture Content
	Total Organic Carbons (TOC)	Grain Size
	Turbidity	Total Lipids
	Total Suspended Solids (TSS)	
	Biological Oxygen Demand (TOD).	

The following established EPA protocols were used for the analyses: trace metals = graphite furnace atomic absorption, and intracoupled plasma spectroscopy; PAHs = high performance liquid chromatography (oysters and sediments) and gas chromatography-mass spectrometry (effluent only). Results are reported in mg/L or μg/L-effluent, μg/Kg-sediment and μg/Kg oysters.

Monitoring of effluents indicated toxicologically significant (greater than Water Quality Criteria (WQC)) concentrations of As in effluent from areas 12-B Weir 1 and 13-A Weir 3 outfall underdrains. Elevated concentrations of Mn which were greater than WQC based on bioaccumulation but less than levels considered toxic in marine organisms were also observed, along with reduced salinities (<15 ppt) and high turbidity. Significant toxicity to embryo oysters, grass shrimp, and sheepshead minnows was observed at area 12-B. At areas 13-A and 13-B toxicity was only observed in oyster embryos. High survival ($>90\%$) was observed in all reference site and controls except low salinity oyster embryo controls ($<2\%$ survival).

Monitoring of sediments indicated elevated [greater than Effects Range Low (ERL) and greater than Effects Range Median (ERM) described by Long and Morgan, 1989] concentrations of As at area 12-B and Acy at area 14-B. Toxicity tests with amphipods and grass shrimp resulted in high survival ($>90\%$) at areas 13-A, 13-B, and 14-B. High survival ($>90\%$) was also observed in all controls and reference site sediments. Sediments toxicity tests were not conducted at area 12-B, since sediment concentrations of As exceeded ERLs and ERMs and earlier effluent tests indicated toxicity in all species tested at this site.

High adult oyster mortality and reduced potential yield and spat settlement were observed in oysters deployed outside weirs for areas 12-B and 13-A and as a result, no uptake of chemical contaminants in oysters was measurable. The cause of death in oysters at these sites may have resulted from elevated As levels in sediments and effluent, low salinity, reduced dissolved oxygen concentrations and high turbidity levels measured at these sites. No significant uptake of chemical contaminants was observed in deployed oysters at any other sites (13-B and 14-B). Reduced spat settlement was also observed at area 13-B. High adult oyster survival, potential yield and spat settlement rates were observed at the New River reference site and the Leadenwah Creek collection site.

These results clearly indicated that the dredge disposal operations in areas 12-B and 13-A ([underdrains]) discharged effluent containing As which was toxic to a variety of estuarine organisms (fish, crustaceans, and mollusc). This has also resulted in toxicologically significant (greater than ERLs and ERMs) As concentration of sediments outside area 12-B. Other co-factors of As toxicity include Mn (which may enhance As precipitation into marine sediments),

low salinity (which favors arsenite [more toxic] over arsenate [less toxic] production) and high turbidity. Another factor which must be considered was low dissolved oxygen levels measured at these sites. Low dissolved oxygen concentrations (< 1mg/L) have been routinely found during studies at the headwaters of small tidal creeks in South Carolina. Generally, these low dissolved oxygen conditions only occur naturally during early morning ebb tides due to high nocturnal respiration rates (Scott, et al, 1993). Results from daily monitoring of outfalls suggest sustained periods of low dissolved oxygen concentrations. Results of deployed oyster studies at areas 12-B and 13-A did not indicate evidence of hypoxia (i.e., oyster shell blackened due to hydrogen sulfide associated with hypoxia) among dead adult oysters at this site. Rather an orange discoloration similar to that of the effluent was observed among shells and internal tissues. Other species such as grass shrimp and sheepshead minnow can survive low dissolved oxygen levels indefinitely, as much of their ecology is predicated on survival of low dissolved oxygen conditions. Low dissolved oxygen and high turbidity conditions may also enhance potential exposure of oysters to As and other contaminants due to that species' increased ventilation/pumping response to these conditions.

Results for outfall 13-B only indicated toxicity to oyster embryos and larvae. Only elevated concentrations of Mn which were greater than WQC for bioaccumulation but less than levels considered toxic, low salinity and high turbidity conditions were observed. Much of the toxicity at this site may have been related to low salinity conditions, although the elevated turbidity and Mn concentrations may be co-factors of low salinity effects. The absence of toxicity in euryhaline fish, grass shrimp and adult oysters supports the conclusion that low salinity (which would be toxic to oyster larvae and embryos) was the primary cause of toxicity at area 13-B.

Results for area 14-B and Jones/Oysterbed Island did not indicate any significant impact from dredge disposal operations at these sites. Although elevated levels of acenaphthene (greater than ERL) were observed in sediments outside area 14-B, no sediment toxicity was observed in sediment toxicity tests.

Mitigation/environmental management options for reducing impacts from dredge disposal operations in areas 12-B and 13-A should be considered. Modification or the removal underdrains at these sites would be an obvious first step in reducing As levels and other observed water and sediment quality impacts at these sites. Additional monitoring of any mitigation/management steps would be useful in assessing the success of any mitigation strategy implemented.

DISCUSSION

Results for chemical analysis of sediments, effluent and oysters along with field bioaccumulation bioassays in oysters and laboratory toxicity tests with oysters larvae, grass shrimp, sheepshead minnow and amphipods exposed to effluent and sediments have indicated that several sites within the Wright River dredge disposal area may be potentially toxic to living marine resources. Table 32 summarizes the results of laboratory toxicity tests, field bioaccumulation bioassays, and contaminant chemistry results for each site by formulating a holistic ecotoxicological assessment for the Wright River estuary.

Results from **laboratory toxicity tests** indicated:

1) Significant ($p \leq 0.05$) toxicity (multiple species at multiple effluent dilutions) was only observed at area 12-B Weir 1.

2) Some toxicity (one species at one dilution) was also observed at areas 13-A Weir 3 and 13-B Weir 5.

3) In areas 13-A and 13-B, the lack of toxicity in multiple species at subsequent dilutions suggests that impacts would be confined to the area of the outfall specifically to oysters and possibly other mollusc species.

Results from **oyster field bioaccumulation** studies indicated:

1) No significant uptake of chemical contaminants in oysters at any site assayed.

2) Significant adult oyster mortality at areas 12-B Weir 1 - outfall and mid sites 13-A Weir 3 - outfall site.

3) Significant reductions in potential yield (g of meat/bushel) at areas 12-B Weir 1 - outfall and mid stations and 13-A Weir 3 - outfall and mid sites.

4) Significant reductions in larval settlement at areas 12-B Weir 1 - outfall and mid stations, 13-A Weir 3 - outfall, and 13-B Weir 5 -outfall sites.

Effluent contaminant chemistry results indicated:

1) Significant (> water quality criteria) concentrations of As and Mn found in underdrains in areas 12-B Weir 1 and 13-A Weir 3.

2) Significant (> water quality criteria) concentrations of Mn found at area 13-B Weir 5 - outfall.

Table 32. Summary of laboratory toxicity tests, oyster bioaccummulation assays, and chemical contaminant characterization of effluent, sediments, and oysters from the Wright River estuary.

Site	Laboratory Toxicity Tests: Effluent[1]			Laboratory Toxicity Test: Sediments		Field Oyster Bioaccumulation Assay				Contaminant Chemistry		Cumulative Ecotoxicological Assessment
	Sheeps-head	Grass Shrimp	Oyster Larvae	Amphipods	Grass Shrimp	Bioaccumulation Effects	Adult Mortality	Potential Yield	Larval Settlement	Effluent: Water Quality Criteria	Sediment: Quality Guidelines	
12-B Weir 1												Evidence of significant As effects, and/or possible Mn effects. High turbidity and low salinity conditions were also observed at this site. Zone of impact from outfall to mid station. Low dissolved oxygen (< 1 mg/L) observed at outfall.
Outfall	**	**	**	NM	NM	?	**	**	**	** (As, Mn > WQC)	* (As > ERL and ERM)	
Mid	*	*	**	NM	NM	?	**	**	**	-	-	
Outer	-	-	-	NM	NM	-	-	-	-	-	-	
12-B Weir 3												Sediment concentrations of trace metals and PAHs < ERL
Old-Outfall	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	-	
Outer	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	-	
				NM	NM							
12-B Weir 3												Sediment concentrations of trace metals and PAHs < ERL
New Outfall	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	-	
Outer	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	-	
				NM	NM							
13-A Weir 3												Elevated concentrations of As found in underdrain. Mn concentrations > WQC (bioaccumulation effects) but < concentration considered toxic to marine organism. High turbidity and low salinity conditions. Impact zone defined at outfall but may extend outward towards mid station. Low dissolved oxygen (< 1 mg/L) observed at outfall.
Outfall	-	-	*	-	-	?	**	**	**	* (As,Mn > WQC)	-	
Mid	-	-	-	-	-	-	-	**	?	-	-	
Outer	-	-	-	-	-	-	-	-	-	-	-	
13-B Weir 5												Mn concentration > WQC (bioaccumulation effects) but < concentration considered toxic to marine organisms. High turbidity and low salinity conditions. Impact zone confined to area around outfall.
Outfall	-	-	*	-	-	-	-	-	**	* (Mn > WQC)	-	
Mid	-	-	-	-	-	-	?	?	-	-	-	
Outer	-	-	-	-	-	-	-	-	-	-	-	
14-B Weir 5												High PAHs concentration of Acy which was > ERL. Otherwise site was considered non impacted by dredging operations.
Outfall	NM	NM	NM	-	-	-	-	-	-	-	-	
Mid	NM	NM	NM	-	-	-	-	-	-	-	* (Acy > ERL)	
Outer	NM	NM	NM	-	-	-	-	-	-	-	-	
Jones Island												No evidence of dredging impacts.
Mid	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	-	
Outer	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	-	
Reference Site												Reference site conditions were similar to other reference site conditions at North Inlet and Leadenwah Creek High survival rate in all bioassays.
Inner	-	-	-	-	-	-	-	-	-	-	-	
Mid	-	-	-	-	-	-	-	-	-	-	-	
Outer	-	-	-	-	-	-	-	-	-	-	-	

Legend follows on next page.

** = very significant toxic effect (> 90% mortality)

* = significant toxic effect (partial mortality <90%)

? = results are uncertain as to toxic effect

- = No effect

[1] = In Laboratory toxicity test, the assumption was made that 50% effluent ≈ mid stations and 10% effluent ≈ the outer station.

NM = Not Measured

3) Low salinity (< 10 ppt) and high (> 400 NTU) turbidity levels were observed in area 12-B Weir 1 and 13-A Weir 3.

Results from **sediment contaminant chemistry** analysis indicated:

1) Potentially toxic (> ERL and ERM values) concentrations of As in sediments at area 12-B Weir 1 outfall stations; and

2) Potentially toxic (> ERL value < ERM) concentrations of Ace in sediments at area 14-B Weir 5 - mid site.

Laboratory sediment toxicity test results indicated that none of the sediments from areas 13-A, 13-B, and 14-B were toxic to amphipods and grass shrimp. These results suggest that only sediments from area 12-B outfall area would be potentially toxic to living marine resources.

These laboratory and field results generally indicated:

1) Sediments and effluents from area 12-B Weir 1 underdrain - outfall may be toxic to a variety of organisms in the estuarine ecosystem (fish, crustaceans, and mollusc);

2) Effluent from area 13-A Weir 3 underdrain and overflow may be toxic to oysters (adults and embryos);

3) Effluent from area 13-B Weir 5 overflow may be toxic to oysters (embryos only).

Table 33 summarizes ecotoxicological results at sites potentially impacted by dredging operations. Also listed are the possible stressors at each site which may adversely affect living marine resources. These include As, Mn, low salinity, prolonged periods of low (< 1 mg/L) dissolved oxygen concentrations and high turbidity.

Arsenic is a member of Group Vb of the periodic classification, which may undergo multiple electron transfer reactions to form a variety of inorganic and organic compounds of different toxicity to aquatic organisms. Arsenic may exist as As (+5), As (+3), As (0) and As (-3). In the marine environment the most abundant forms of As are arsenate (As +5) and arsenite (As +3). In surface waters As species include As (+5), As (+3) and methylated As (Moore and Ramamoorthy, 1984). It is now well understood that bioaccumulation and toxicity in marine species is a function of the chemical behavior and speciation of As in surface waters and sediments (Sadiq, 1992). Biological activity may also affect both the chemical speciation and cycling of As in marine ecosystems.

Table 33. **Summary of sampling sites with evidence of ecological impact and possible stressors affecting living marine resources at each site.**

Ecologically Impacted Area	Ecotoxciological Assessment	Possible Stressors
12-B Weir 1 Outfall-Mid	Impacts to fish, crustaceans and mollusc at the outfall extending to the mid station	As, Mn, high turbidity, low salinity, and prolonged periods of low dissolved oxygen concentrations
13-A Weir 3 Outfall	Impacts to adult and larval mollusc at the outfall possibly extending beyond towards the mid station	As, Mn, high turbidity, low salinity and prolonged period of low dissolved oxygen concentrations
13-B Weir 5 Outfall	Impacts to larval mollusc confined to the outfall	Mn and low salinity

The biogeochemical cycle of As in estuaries and marine waters include As uptake by plankton, conversion of As to organic arsenicals, release of arsenite and methylated forms of As, and oxidation and reduction of As to arsenate (Sadiq, 1992). The reduction of arsenite to arsenate in marine environments is generally considered a biological process (Andrae, 1983; Johnson, 1972; Wood, 1974; and Wrench and Addison, 1981) although Cherry et al. (1979) demonstrated that H_2S was very effective in converting arsenate to arsenite.

Salinity may also play a significant role in arsenite/arsenate kinetics. Klump and Peterson (1979) reported that in seawater arsenate predominates while in freshwater arsenite prevails. Generally, arsenite concentration decreased along an increasing estuarine salinity gradient. For example, in a 0.4 Km distance arsenite concentrations decreased by almost 50% (Klump and Peterson, 1979). Similar declines in As concentrations were observed downstream of effluent outfalls at areas 12-B Weir 1 and 13-A Weir 3. Penrose et al (1975) reported that removal (98%) of As from seawater into sediments downstream of a point source of pollution occurred within 100m of the point source. Klump and Peterson (1979) also reported that the ratio of arsenite to arsenate varied with tidal stage, as arsenite dominated at ebb tide and arsenate at flood tide. Pristine river waters generally have As concentration of <1 μg/L where as pristine marine waters have As concentrations ranging from 2-3 μg/L. In this study, As concentrations in area 13-B, the New River reference site and Leadenwah Creek had As concentrations <10 μg/L. Arsenic water concentrations are much higher around point sources of pollution such as mine waste (500 - 5000 μg/L), agricultural runoff of arsenical pesticides (10 - 33 μg/L) and downstream of industrial point source pollution (1 -20 μg/L) (Aston et al., 1975; Richardson et al, 1978; Van der Veen and Huizenga, 1980; and Waslenchuk, 1979). Arsenic concentrations in areas 12-B Weir 1 (117 -147 μg/L) and 13-A Weir 3 (14.9 - 298 μg/L) outfalls were elevated relative to levels reported for pristine marine water ($<$ 3 μg/L) and concentrations found in other sites during this study ($<$ 10 μg/L).

Arsenic in seawater will combine with clay, organic matter, and Fe or Mn oxides to form precipitant solids, which settle out in sediments (Crecelius, 1975; Sadiq, 1992). The high Mn concentrations (19,800 μg/L) observed in effluent during this study would favor complexation with As to enhance sedimentation. Arsenic concentrations in pristine sediments are approximately 10 mg/Kg but concentrations as high as 10,000 mg/Kg have been reported around known sources of pollution (Crecelius, 1975; Sadiq, 1992). Elevated As concentrations ($>$ 10 - $>$ 80 mg/Kg) were reported for area 12-B Weir 1 underdrain and mid stations and area 13-A Weir 3 underdrain and overflow site. Arsenic concentrations for all other stations were generally $<$ 10 mg/Kg. Penrose et al (1975) reported that removal of Arsenic from seawater

downstream of a point source of pollution occurred within 100m of the point source. Results from area 12-B Weir 1 (Figure 16) support these results as As sediment concentrations declined by > 70% within 0.5 Km of the effluent discharge outfall (mid station) and by > 90% at greater distances downstream (outer station).

Arsenic is generally considered an environmental pollutant associated with anthropogenic activities (Sadiq, 1992). Primary anthropogenic sources of As pollution include mine waste, pesticide formulations, industrial uses, chromated copper arsenate wood preservatives, cement production, poultry feed additives, pharmaceuticals, detergents, petroleum and coal combustion, metal ore smelters, and plant desiccants (Moore and Ramamoorthy, 1984; Sadiq, 1992). Erosion, weathering of bedrock and vulcanism are the primary natural biogenic sources of As. The total discharge of As from anthropogenic sources is 110,000 tons/year which is 2.5 times the contribution due to natural sources (Moore and Ramamoorthy 1984). Urban air may also be enriched in As, particularly in highly industrialized areas and resulting atmospheric deposition may occur.

The toxicity of As to living marine resources is dependent upon valence state and complexation with organic molecules (Sadiq, 1992). Arsenite is more toxic than arsenate; therefore, any factor or mechanism which increases arsenite production over arsenate will increase As toxicity. At the outfalls in areas 12-B Weir 1 and 13-A Weir 3, lower salinity conditions would favor arsenite production over arsenate. Thus greater toxicity would be expected at the outfall, where lowest salinities and highest As concentrations were observed. McLusky et al (1985) reviewed the effect of temperature and salinity on As toxicity and found that salinity had no significant effect in a limited study of three marine species.

Sadiq (1992) reports that As is acutely toxic to aquatic organism (fish and crustaceans) at concentrations ranging from 1,000 - 50,000 μg/L. The threshold toxicity of As in marine organisms is dependent upon species type and stage of development (Sadiq, 1992). Generally larval stage and benthic bottom feeders are more sensitive than fish. Scott et al (1984) in a review of heavy metal toxicity reported that the most sensitive species among edible shellfish species were crab larvae (*Cancer magister*) and oyster embryos (*Crassostrea gigas*) with 96h and 48 LC50s respectively of 232 and 326 μg/L as arsenite (AsO_3) (Martin et al, 1981). Arsenic concentrations found as arsenite may be more toxic than arsenate. Total As concentrations of 117 - 147 μg/L were measured in effluent from outfall 12-B Weir 1 and concentration of 14.9 - 298 μg/L were measured in effluents from outfall 13-A Weir 3. Effluents from 12-B Weir 1 were toxic to all species tested (fish, crustaceans, and mollusc)

while effluents from 13-A Weir 3 were only toxic to oyster larvae. Generally oyster embryos appeared to be the ecotoxicological end point most affected by dredge effluent and oyster embryos are among the most sensitive species tested in terms of As toxicity. While toxicity was observed in outfall effluents at As concentration < levels reported toxic to oyster embryos, the apparent potential for arsenite production rather than arsenate due to low salinity conditions would favor greater toxicity at outfalls which would decrease dramatically with increasing distance from the source as salinities increase and arsenite/arsenate concentrations decrease. Sediment Arsenic results from area 12-B clearly support this hypothesis. Another factor to consider is that *Crassostrea virginica* may have different sensitivities than *Crassostrea gigas* to As exposure.

Arsenic is only moderately bioconcentrated by marine organisms with a bioconcentration factor (BCF) of 85.4 in *Crassostrea virginica* (Scott et al, 1984). Arsenic is not progressively bioaccumulated in food chains (EPA, 1976). Of particular interest is the fact that while arsenite is more toxic than arsenate, arsenate has greater bioaccumulation potential than arsenite (Sadiq, 1992). This suggests that the preferential uptake of arsenate provides a physiological protective mechanism to reduce potential arsenite toxicity when both compounds co-occur as would be the case in estuarine waters.

The salt water quality criteria for As (+5) is 69.0 μg/L for acute effects and 36 μg/L for chronic effects and for As (+3) the acute effects level is 2,319 μg/L and 13 μg/L for chronic effects. Effluent concentration in areas 12-B Weir 1 and 13-A Weir 3 exceeded these concentrations. The ERL and ERM values (Long and Morgan, 1989) for As sediment concentrations are 33 mg/Kg and 85 mg/Kg, respectively. MacDonald (1993) reported a No Observable Effects Level (NOEL) of 8 mg/Kg and a Probable Effects Level (PEL) of 64 mg/Kg for As in sediments. Only sediments from area 12-B Weir 1 outfall contained As concentrations > ERL and ERMs and > PEL. Sediment As concentrations at other sites were generally at or below the NOEL.

Arsenic is also considered a carcinogen (EPA, 1980). Fish action levels are lacking for the US but international standards range from 1 - 10 mg/Kg. No significant uptake of As was observed in field deployed oysters, although significant adult oysters mortality occurred at areas 12-B Weir 1 - outfall and 13-A Weir 3 - outfall.

Disturbance of sediments containing As may enhance the toxicity and bioaccumulation potential of As (Sadiq, 1992). Cherry and Gutherie (1977) studied the deposition of coal ash in

the Savannah River and found that dredging of As containing sediments resulted in a 3 fold increase in As bioaccumulation in marine invertebrates. Accumulated As is rapidly depurated with estimated half lives in marine mollusc of 4 - 13 days (Klamp, 1980). Low salinity may also decrease the bioconcentration of As from water exposure (Klamp, 1980; Moore and Ramamoorthy, 1984).

In addition to As, potential toxicity of Mn in effluents from outfalls in areas 12-B, 13-A, and 13-B must be considered. Manganese does not occur naturally as a pure metal but rather is found as a salt and mineral usually found in association with Fe (EPA, 1976). The primary forms of Mn are manganese dioxide (MnO_2), pyrolusite, manganese carbonate (rhodocrisite), and manganese silicate (rhodonite) (EPA, 1976). The oxides are the only mineral form of Mn mined, generally in iron ore used to form ferro-manganese alloys. Manganese is used in metal alloys, dry cell batteries, micro-nutrients in fertilizers, organic compounds in paint driers and chemical reagents (EPA, 1976). Manganese is a vital micro-nutrient for both plants and animals in micro quantities with an average daily intake in the diet of humans of 10 mg/day.

The average ambient concentration in surface waters is 2 μg/L and concentration > 1,000 μg/L are rare (EPA, 1976). Very little toxicity data exist on Mn. The EPA water quality criteria is 100 μg/L which is based upon the potential for bioaccumulation as BCFs of > 12,000 have been reported (EPA, 1976; NAS, 1974). Scott et al (1984) reported that Eisler (1977) found a 96h LC50 value of 50,000 μg/L for Mn in adult *Mya arenaria*, which were the most sensitive estuaries/marine species of edible shellfish.

The concentrations of Mn found in effluent from areas 12-B Weir 1 (18.3 - 19,800 μg/L), 13-A Weir 3 (13 - 2,300 μg/L), and 13-B (1,210 μg/L) exceeded the EPA saltwater WQC of 100 μg/L based on bioaccumulation effects but were less than the 50,000 μg/L 96h LC50 value reported for clams by Eisler (1977). Manganese concentration at the New River reference site and Leadenwah Creek control site range from <30 - 97.5 μg/L, well above the 2 μg/L concentration reported by EPA (1976). These results suggest that while Mn occurred in high concentration in effluents in areas 12-B, 13-A, and 13-B, measured concentrations would not have been directly toxic **per se** to fish, crustaceans and molluscs.

The presence of elevated Mn concentrations may have potentially affected the toxicity of As in effluent by providing an oxide for complexation with As to enhance As deposition from the water column into marine sediments. This As-Mn interaction would probably reduce the As toxicity in effluent at these outfalls sites in the Wright River, but would do so by increasing the toxicity potential in sediments.

Reduced salinities (< 10 ppt) may be another factor which must be considered in evaluating toxicity results from effluent and sediment toxicity tests. Low salinity (< 10 ppt) would be toxic to embryo and larval oysters but would not be toxic to adult oysters, adult sheepshead minnows, and adult grass shrimp. The toxicity observed in larval and adult oysters and adult grass shrimp and mummichogs at area 12-B Weir 1 in effluents and field deployed oysters was primarily related to As exposure although effects from low salinity in part may have affected oyster embryos. Adult oysters can survive low salinity exposure indefinitely (> 60 days) (Scott et al, 1982) as can grass shrimp and sheepshead minnows (Scott et al, 1993). Survival of embryo oyster, low salinity (13 ppt) controls was < 2%, suggesting oyster embryo toxicity may be related in a large part to low salinity. At outfall 13-A Weir 3, toxicity was confined to embryo and adult oysters in field and laboratory studies where salinities of 12.5-19 ppt were measured. This suggests that toxic factors other than low salinity would be responsible for observed effects, possibly elevated As concentrations. In area 13-B Weir 5 outfall, toxicity was confined to larval and embryo oyster, respectively, in both field and laboratory exposures where low salinity of 11-22 ppt were observed. Davis and Calabreese (1964) studied the survival of oysters eggs and larvae at a variety of temperature (17.5 - 32.5°C) and salinity (7.5 - 27.0 ppt) conditions. Optimum embryo survival (58 - 98%) was at salinities of 20 - 27 ppt. Embryo survival at 17.5 ppt salinity ranged from 10 - 89% and at 15 ppt salinity from 0 - 39 % at different temperatures. Embryo survival at salinities of 12.5 ppt and below was 0%. Davis and Calabreese (1964) further reported oyster larvae were better able to survive low salinity. At 10 ppt salinity larval survival ranged from 49 - 71% at a variety of temperature conditions. Field studies of oyster larval settlement in North Carolina estuaries indicated that oyster recruitment was decreased at low salinity sites when compared to high salinity areas (Ortega and Sutherland, 1992). Davis (1958) also noted that the salinity tolerance of oyster embryos is in large part determined by the salinity adults are reared in, prior to spawning. These results suggest that the survival of oyster embryo and larvae (not adults) exposed to effluent at outfalls 12-B Weir 1, 13-A Weir 3, and 13-B Weir 5 may in part be influenced by low salinity conditions.

A final factor which must be considered is the high turbidity conditions in effluent discharges from outfalls in areas 12-B, 13-A, and 13-B. Galtsoff (1964) reported that rapid settlement of suspended material maybe highly destructive to any oyster bed community. If sedimentation rates exceed oyster growth rates, the oysters will perish due to siltation effects (Galtsoff, 1964). Oysters exposed to high sedimentation loads may be invaded by parasites, such as the mud worm *Polydora websteri*, which invade the oyster shell causing mud to accumulate. The oyster responds by calcification over the invading parasite to form a blister.

This diverts energy away from the adult oyster for growth and reproduction. In addition to adult oyster effects, heavy siltation may also affect the ability of larval oysters to settle on adult oyster shell (Galtsoff, 1964). A 1 - 2 mm deposit of sediments is sufficient to cause a failure of larval oysters to settle (Galtsoff, 1964). Ortega and Sutherland (1992) reported that increased sedimentation, greatly reduced oyster spat settlement in North Carolina estuaries and sounds. The combination of low salinity sediment characteristic and algal turfs was particularly inhibitory to larval settlement. Increased turbidity may also reduce photosynthetic activity of phytoplankton important to the diet of oysters.

LaSalle et al., (1991) reported that acceptable ranges of turbidity for survival of aquatic organisms was $\geq$ 500 - 1,000 mg/L. Results from this present study indicated that turbidity levels $>$ 400 mg/L may be harmful and/or potentially toxic to oysters, grass shrimp and sheepshead minnow. At the New River reference site, the Leadenwah Creek oyster collection site, and overflow weirs in areas 13-B and 14-B, turbidity levels were $<$ 100 mg/L. Generally, no significant ecological effects were observed in these areas. LaSalle et al., (1991) reported that the most sensitve fish species (alewife) had reduced survival at turbidity levels of $\leq$ 100 mg/L and other fish species (striped bass, yellow perch) had significant effects on survival at $\leq$ 500 mg/L. Our results are in general agreement with these finding. Sites with turbidity levels $>$ 400 mg/L (areas 12-B and 13-A) had high mortality, elevated contaminant levels of As and Mn, low salinity, and low dissolved oxygen levels. Turbidity levels $>$ 100 - $\leq$ 500 mg/L, would be stressful (i.e., reduced assimilation efficiencies, increased metabolic rates) to estuarine organisms as the energetic cost of maintenance metabolism would be increased.

Heavy turbidity loads adversely affect adult oysters by clogging gill mucous, requiring hypersecretion of mucous during feeding. Scott et al (1980) reported that increased mucous production in oysters induced by high levels of coliform bacteria, decreased oyster condition index due to hypersecretion of mucous thus reducing oyster assimilation efficiencies. Increased turbidity may also cause clogged gills in fish and invertebrates (EPA, 1976).

As this discussion suggests high turbidity may in part be a factor in observed toxicity in oyster larvae in the laboratory and the field. Turbidity effects on adult oysters, fish, and grass shrimp are less evident but certainly possible.

CONCLUSIONS

Based upon results from their study, the following conclusions were made:

1) Area 12-B Weir 1 underdrains contained effluent which had elevated (>WQC) concentrations of As and Mn and sediments with elevated levels of AS (>ERL and ERMs) which were toxic to fish, crustaceans and mollusc in laboratory and field toxicity tests. Impacts were observed at the outfall extending to the mid-station. No impacts were observed at the outer (Wright River) station.

2) Toxicity observed in grass shrimp and sheepshead minnow at area 12B Weir 1 underdrains was attributed primarily to As, although elevated concentrations of Mn, low salinity conditions, prolonged period of low dissolved oxygen concentrations and high turbidity were potential co-factors of As toxicity.

3) Toxicity in field deployed adult oysters, reduced field spat settlement, and high mortality in laboratory, oyster embryo toxicity tests was observed at area 12-B Weir 1. While toxicity in the field, oyster larval settlement and laboratory oyster embryo bioassays may have in part been related to low salinity conditions, mortality in adult oysters was clearly related to other factors such as elevated As concentrations and high turbidity levels at this site.

4) At area 12B Weir 3 Old and New combined underdrain and overflow weir, no elevated concentrations of trace metals or PAHs were observed in sediments from that site. No sediment or effluent toxicity tests or oyster bioaccumulations studies were conducted at this site.

5) At area 13A Weir 3 underdrains, elevated concentrations of As and Mn (>WQC) were observed in effluent samples along with low salinity, low dissolved oxygen concentrations and high turbidity conditions which were acutely toxic to oyster embryos in laboratory toxicity tests and in the field, reduced oyster spat settlement, adult oyster potential yield and adult oyster survival was observed. Measured effects were observed at the outfall and extended outward to the mid-station.

6) Toxicity to embryo, larval, and adult oysters at area 13A was related in part to As toxicity. Elevated effluent concentrations of Mn, low salinity and high turbidity were potential co-factors of As toxicity. No toxicity was observed from sediments at this site in grass shrimp and amphipods.

7) At area 13B Weir 5 overflow weir, elevated concentrations of Mn (>WQC) were observed along with low salinity and high turbidity conditions which were acutely toxic to oyster embryos in the laboratory and oyster larvae in the field. No toxicity was observed in sediments at this site during exposures to grass shrimp and amphipods. Effects were confined to the areas around the outfall only.

8) The elevated levels of Mn at area 13B weir 5 were >WQC based upon bioaccumulation effects but were < concentrations considered acutely toxic to marine organisms. Low salinity and elevated turbidity concentrations may be co-factors of toxicity at this site.

9) At area 14B Weir 5 and 6 overflow weirs, only elevated (>ERL) concentrations of Ace were observed in sediments. No significant laboratory or field toxicity was observed in fish, grass shrimp, amphipods and oysters tested. Generally, this site was considered non-impacted by dredging operations.

10) At Jones/Oysterbed Island, there was no evidence of dredging impacts observed, based on chemical analysis of sediments at this site. No laboratory or field toxicity tests were conducted at this site.

11) At the New River reference site, no significant contaminants levels were observed in effluent or sediments nor was there evidence of contaminants uptake by oysters.

12) High survival (>90%) was observed in all laboratory toxicity tests with effluents and sediments at the New River reference site. Similarly high adult oyster survival, potential yield and larval settlement rates were observed in field deployments.

13) The role of other factors such as low dissolved oxygen should also be considered when reviewing results from this study. Periodic (< 6hr) low dissolved oxygen concentration (<1mg/L) are quite common in estuarine tidal creeks of South Carolina. Grass shrimp, oysters and sheepshead minnows have physiological adaptations which allow them to survive in the rigors of a dynamic estuarine environment which includes brief daily excursions of low dissolved oxygen, usually at early morning ebb tibes during the summer. Prolonged periods of low dissolved oxygen concentrations may be acutely toxic to estuarine organisms and generally caused by the discharge of oxygen demanding waste into the ecosystem. Low dissolved oxygen conditions may also be a co-factor of toxicity as enhanced uptake of chemical contaminants would occur due to increased ventilation/pumping rates in marine organisms (fish, crustaceans, and mollusc).

14) Environmental mitigation to reduce toxicity outside areas 12-B Weir 1 and 13-A Weir 3 should be focused on the underdrains located at these sites. The removal of the underdrains there would certainly result in reduced contaminant levels in both effluent and sediments at this sites. This would result in the improvement of the environmental quality at these sites. Additionally, the impacts of materials discharged from the underdrains would be greatly reduced and minimized if the discharges were directed into a receiving water body with a larger volume and greater assimilative capacity where concentrations would be diluted faster than the Wright River. Discharge of effluents at other sites (areas 13-B and 14-B) with overflow weirs were clearly less toxic to living marine resources than underdrains.

15) Potential mitigation at area 13-B could be further studied since there was no clear cut, definitive cause identified which was related specifically to contaminants for the observed toxicity. Rather low salinity must be considered a potential major cause of observed oyster embryo toxicity at this site.

APPENDIX F

SEDIMENT QUALITY EVALUATION

SEDIMENT QUALITY EVALUATION
FOR THE
SAVANNAH HARBOR NAVIGATION PROJECT

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SEDIMENT QUALITY EVALUATION

F.1.00 OVERVIEW OF SEDIMENT QUALITY EVALUATION.

F.1.01 An extensive evaluation was made of past sediment quality tests and scientific literature pertaining to the field of sediment quality / sediment contamination. The information presented in this appendix pertains to the quality of sediments in the inner harbor. A review of the quality of sediments found at the Bar Channel are included in the Section 103 Evaluation for ocean disposal which is contained in Appendix D of the EIS. The evaluation described in this appendix is divided into two sections. the first examines the acute, or short term, impacts from exposure to the inner harbor sediments. The subsequent section examines the chronic, or long term, impacts from exposure to those sediments. The analysis of chronic impacts is much more difficult as the concern is for less visible, but equally critical, biological responses to chemical stimuli. Significantly less basic scientific research has been done on chronic impacts, and the examination of these impacts is often confounded by the presence of other adverse stimuli simultaneously affecting the organisms being evaluated.

F.2.00 ACUTE (SHORT TERM) CONTAMINANT IMPACTS.

F.2.01 Introduction. Savannah District is aware of no accepted standards of sediment quality or accepted method for conclusively determining sediment quality. There is a lack of national sediment quality criteria and biological assessment consists largely of acute bioassays (EPA, 1992). In addition, "Realistic prediction of the impact of trace metals in sediments upon aquatic organisms requires an understanding on how physical and chemical factors affect metal uptake by organisms. These factors are not completely understood, and simple relationships are seldom found in natural systems between trace metal levels in the organisms and total metal concentrations in either the sediment or the water to which the organisms are exposed (Luoma, 1989)" (cited in Bourgoin et al., 1991).

F.2.02 Numerous standards or thresholds have been reviewed during the conduct of this evaluation. The various levels are quoted throughout this document. No single reference contains conclusive and widely-accepted standards which can be directly applied to the analysis of harbor sediments. This analysis must include 3 aspects of the sediments: (1) their insitu concentrations, (2) potential impacts from the dredging operation, and (3) potential impacts from the disposal operation, including discharges from confined disposal facilities. The insitu concentrations also allow a direct assessment of

concentration in the sediment at the disposal site, since no chemicals are added to the material during the dredging or disposal processes and sediment constituents should be at equilibrium with the river water used to transport the sediment during hydraulic dredging.

F.2.03 One set of standards which may have a better application to insitu concentrations than most are those standards set by EPA for the land application of sewage sludge when the land is not used to grow crops for human consumption. Such a process is fairly similar to the Project's confined disposal facilities (CDFs) where material is applied to land that is not used to produce crops for human consumption. No edible crop is grown at the CDFs, and the growth of vegetation is actually discouraged within the CDF. As such, there are no direct avenues for chemicals within the deposited sediments to affect humans. Those particular EPA standards were established in recognition that wildlife may use the land application site, and the levels were set to protect such use. A somewhat higher set of standards set by EPA governs the land application of sewage sludge on gardens, where crops for human consumption are expected. These standards may be useful for those concerned about the potential for chemical uptake by wildlife which use the disposal areas. The District's evaluation of sediment quality also used this set of sediment criteria in the analysis.

F.2.04 There is some question as to how well sediment contaminant levels can be related to biological effects. "Previous efforts to relate sediment chemical concentrations to biological effects have been only partially successful (Giesy et al., 1988) because sediment contaminants are not generally bioavailable in the same sense that contaminants in water are" (Tatem, 1990). Analyzing the total concentrations of contaminants in sediments may well overstate the sediment's toxicity to biota. "Considerable published data indicate that total metal concentrations in sediments are not good estimators of the 'free' and bioavailable fraction of the total chemical present ... Different sediments can differ by a factor of 10 or more in toxicity for the same total metal concentration" (Burton, 1992). There have been two attempts to address possible acute toxicity of sediments, one by Long and Morgan (Long and Morgan, 1990), and one by MacDonald (MacDonald, 1993). The efforts of these investigators has since been merged into one evaluation (Long et al., 1993). These studies are part of an effort to identify contaminant levels that might constitute a concern for environmental impacts. It should be recognized that these studies do not address bioavailability nor do they consider changes that the sediments might undergo once they are placed in an upland disposal area. Neither of these studies were designed to be regulatory in nature, however they may be used to estimate whether or not a possible concern may exist, especially for inundated or saturated dredged material within a CDF. Known

information on the composition of Savannah Harbor sediments will be compared to these and other studies in the following discussions.

F.2.05 Ranking of Savannah Harbor on the EPA Region 4 Coastal Sediment Quality Inventory. Savannah Harbor's ranking on this inventory should be an overall indication of how it compares to other harbors in the southeast with respect to concern for contaminants. The EPA draft report lists Savannah Harbor as a site "with effects indices for metals exceeding one" (EPA, 1992). Savannah is not included on their list of harbors where organics may be of concern. That inventory shows Savannah Harbor as having a sediment "effects index for metals" of 2.4. This index value was derived by summing the ratios of all toxic metals to their TEL's (threshold effects level). Savannah had one of the lowest indices of all southeast harbors studied, ranking 12th out of 14 harbors studied. This study cited chromium as the primary contaminant. Since the 1992 EPA report was only a draft, it represented only EPA's contractor's evaluation of data which they obtained on the region's harbors and did not represent EPA's evaluation. EPA states that conclusions drawn from the contractor's evaluation are to be considered preliminary and subject to change. However, EPA has not finalized the 1992 report, so the District believes that document represents the best broad assessment and comparison of the harbor's sediment quality available.

F.2.06 Organic Contaminants.

F.2.07 Past sediment analyses have not found a concern for organic contaminants. The 1982 study by Environmental Protection Systems (EPS, 1982) of 30 sediment samples taken in the harbor area detected only one organic compound, the PAH naphthalene, and only at 3 of their stations in the harbor (two within the channel at 1.27 ppm and 1.96 ppm, and one in a slip at 1.65 ppm). They recommended that further sediment testing be restricted to heavy metals. A potential problem with most of the contaminant studies within the harbor is that the detection limits are higher than the ER-L's of Long and Morgan, 1990, and Long et al., 1993. Recent studies using detection limits in the range of the ER-Ls have had a specialized purpose and have investigated a particular set of chemicals. A selected group of chemicals, study source, and the detection limit used, are shown in Table 1. As can be seen from this table, some of the more recent studies have employed suitably low detection limits. These studies have been used in assessing the overall probability of environmental impacts from project dredged material. As is discussed below, available data show little concern for organic contaminants of project dredged material.

TABLE 1

DETECTION LIMITS (PPB)
FOR SELECTED ORGANIC CHEMICALS
FROM TESTS OF SAVANNAH HARBOR SEDIMENTS

	EPS*1	EMC*2	SKID*3	SL*4	NMFS *5	ER-L
	1982	1993	1993		1994	
PAHs						
Acenapthene	500	500	80	480-4200	25-320	16
Benzo(a)anthracene	500	750	130	480-4200	5-64	261
Benzo(a)pyrene	500	1000	170	480-4200	5-64	430
Flourene	500	1000	90	480-4200	11-160	19
Flouranthene	500	---	110	480-4200	11-160	600
Phenanthrene	500	1000	90	480-4200	5-85	240
Naphthalene	500	1000	70	480-4200	25-320	160
Pesticides						
Chlordane	25	5000	.5	25-44	---	.5
Dieldren	25	2500	.1	4.8-8.5	---	.02
Endosulfan	25	5000	---	2.5-4.4	---	---
Endrin	25	5000	1.0	4.8-8.5	---	.02
Heptachlor-epoxide	25	1000	.1	2.5-8.4	---	---
4,4'DDD	25	1000	1.0	5.2-8.5	---	2
4,4'DDT	25	5000	.1	5.2-8.5	---	2

NOTE: The references for these evaluations are as follows:
*1 EPS. Environmental Protection Systems, Inc., 1982.
*2 EMC. EMC, 1993.
*3 SKID. Skidaway Institute of Oceanography, 1993.
*4 SL. Savannah Labs study for CITCO, May 1994.
*5 NMFS. National Marine Fisheries Service, 1994.

F.2.08 Polynuclear Aromatic Hydrocarbons (PAH's). Some studies have found organic contaminants in Savannah Harbor sediments, primarily PAH's. In the 1982 study cited above, naphthalene was detected in three samples (of 26) samples from the main river area. The levels (1.27, 1.96, and 1.65 ppm) were above the ER-L of 340 ppb but below the ER-M of 2.1 ppm. In a study of two berths in the harbor (Skidaway, 1993), Skidaway Institute detected the following PAH's at levels at or above the ER-L but below the ER-M, using detection limits ranging from 0.07 to 0.23 ppm: fluorene, phenanthrene, anthoracene(sic, anthracene?), fluoranthene, pyrene, benz(a)anthracene, chrysene, benzo(b)(k)-fluor, benzo(e)-pyrene (no ER-L), benzo(a)-pyrene (no ER-L), prylene (no ER-L), Indo(1,2,3-Cd)pyrene, benzo(g,h,i)perylene (no ER-L), and dibenz(a,h)anthracene. A recent study by the NMFS (NMFS, 1994) looked at PAH concentrations in a large number of sediment samples taken below the CDF weir outfalls to the Wright River. Only one of three sediment samples taken midway out from 13B weir #5 had a PAH (acenapthene) concentration greater than the ER-L. The study identified no impacts from PAH's due to dredging discharges. A recent study of the Stone Container berths using low detection limits (EMC, 1995), found only one PAH above reference values or ER-L's, acenaphthylene. In this case, three replicate samples showed <14 ppb and the two duplicates exhibited 46 and <14 ppb. Therefore, only one of five replicate samples showed a value above the ER-L of 44 ppb. This is not thought to be of concern. A study of Georgia Container Berth 7 by S&ME (S&ME, 1995) had detection limits too high to judge whether PAH's were present above reference levels or ER-L's. One of their four samples did find the following PAH's above the reference, ER-M or ER-L: acenaphthylene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, flouranthene, indeno(1,2,3-cd)pyrene, and pyrene. These data show the possibility of increased PAH's and other organics in off channel sediments in parts of the harbor. Additional evaluation may be necessary where such sediments may predominate in a dredging operation.

F.2.09 Specific Polynuclear Aromatic Hydrocarbons (PAH's). Reference values cited below are from the Savannah Harbor reference in the 1994 Wright River Weir Study conducted by the NMFS. Sample values are from the Stone Container Study, where suitably low detection limits were employed.

F.2.10 Acenaphthene. The three replicate samples and two duplicates of <14 ppb. The reference values are all non-detect at <11 to <120 ppb. The reference values are all non-detect at <11 to <120 ppb. Alexander et al. (1994) studied sediments dated from the present to 1900 in three cores from Savannah Harbor and

did not detect this PAH in recent sediments (10 ppb detection limit). Earlier sediments contained up to 66 ppb (1962). Sediments from the last 10 years showed a high of 10 ppb. Since the ER-L is 16 ppb, the there is no concern for this substance.

F.2.11 Acenaphthylene. The three replicate samples of <14 ppb and the two duplicates of 46 and <14 ppb. The reference values are non-detects at <38 to <120 ppb. The ER-L is 44 ppb and the ER-M is 640 ppb. Alexander et al. (1994) studied sediments dated from the present to 1900 in three cores from Savannah Harbor and detected some of this PAH in sediments of various ages. Highest concentrations (105 and 146 ppb) were found in sediments from the 1950's and 1960's. Sediments from the last 10 years showed no detection at 10 ppb. The overall low levels show there is no reason for concern.

F.2.12 Anthracene. The three replicate samples and two duplicates of <5.7 ppb. The reference values are all non-detect at <7.7 to <24 ppb. Alexander et al. (1994) studied sediments dated from the present to 1900 in three cores from Savannah Harbor and detected some of this PAH in sediments of various ages. Highest concentrations (172 to 189 ppb) were found in sediments from 1954 to 1962. Sediments from the last 10 years showed a high of 40 ppb. Since the ER-L is 85 ppb, there is no concern for this compound.

F.2.13 Benzo(a)anthracene. The three replicate values of 8.1, 7.0, and 6.0 ppb and the two duplicates of 7.6 and 6 ppb. All reference values < 22 ppb. Alexander et al. (1994) studied sediments dated from the present to 1900 in three cores from Savannah Harbor and detected some of this PAH in sediments of various ages. Highest concentrations (347 to 702 ppb) were found in sediments from 1900 and 1954 to 1962. Sediments from the last 10 years showed a high of 58 ppb. Since the ER-L value (Long and Morgan, 1990) is 230 ppb, there is no concern for this compound.

F.2.14 Benzo(a)pyrene. The three replicate values of 6.9, 6.2, and 7.3 ppb and the two duplicates of 6.0 and 6.1 ppb. The reference values are < 77 ppb. One sample from the GPA Berth 7 study showed 2200 ppb, above the ER-M of 1600 ppb. Alexander et al. (1994) studied sediments dated from the present to 1900 in three cores from Savannah Harbor and detected some of this PAH in sediments of various ages. Highest concentrations (154 to 464 ppb) were found in sediments from 1900 and 1954 to 1962. Sediments from the last 10 years showed a high of 36 ppb. Because the ER-L is 400 ppb, there is no reason for concern for channel sediments. Where sediments outside the channel predominate a dredging project, occurrence of this compound should be considered.

F.2.15 Benzo(b)fluoranthene. The three replicate values of 29, 26, and 34 ppb and the two duplicates of 29 and 30 ppb. The GPA Berth 7 study found one sample at 2400 ppb. The reference values are <41 ppb. Alexander et al. (1994) studied sediments dated from the present to 1900 in three cores from Savannah Harbor and detected some of this PAH in sediments of various ages. Highest concentrations (314 to 684 ppb) were found in sediments from 1900 and 1954 to 1962. Sediments from the last 10 years showed a range of 25 to 74 ppb. There is no ER-L for this compound. However, existing data for recent sediments indicate that there should be no concern for this compound in project O&M sediments. The possible occurrence of this compound should be investigated when evaluating other sediments.

F.2.16 Benzo(g,h,i)perylene. The three replicate values of <14, 21, 17 ppb and the two duplicate of 16 and <14 ppb. The reference values are < 63 ppb. Alexander et al. (1994) studied sediments dated from the present to 1900 in three cores from Savannah Harbor and detected some of this PAH in sediments of various ages. Highest concentrations (153 and 321 ppb) were found in sediments from 1900 and 1954. Sediments from the last 10 years showed a high of 39 ppb. These data indicate that in channel O&M sediments should be expected to occur in the range of the reference sediments. Therefore, there should be no concern for environmental impacts from this compound in project O&M sediments. The possible occurrence of this compound should be investigated when evaluating other sediments.

F.2.17 Benzo(k) Fluoranthene. The three replicate samples and two duplicates of <14 ppb. The reference values are all <19 to 170 ppb. One sample from the GPA Berth 7 study was found to contain a concentration of 2330. Alexander et al. (1994) studied sediments dated from the present to 1900 in three cores from Savannah Harbor and detected some of this PAH in sediments of various ages. Highest concentrations (207 to 426 ppb) were found in sediments from 1900 and 1954 to 1962. Sediments from the last 10 years showed a high of 47 ppb. Since the observed values for recent sediments are less than the reference, there is no reason for concern with respect to project O&M sediments. Other sediments may require additional evaluation.

F.2.18 Chrysene. The three replicate values are 14, 12, and 17 ppb and the two duplicates of 13 and 15 ppb. The GPA Berth 7 study found one sample with a concentration of 2970 ppb. Alexander et al. (1994) studied sediments dated from the present to 1900 in three cores from Savannah Harbor and detected some of this PAH in sediments of various ages. Highest concentrations (271 to 866 ppb) were found in sediments from 1900 and 1954 to

1962. Sediments from the last 10 years showed a range of 18 to 66 ppb. The reference values are <57 ppb. Since the ER-L is 384 ppb, there is no concern for recent project O&M sediments. Other sediments may require additional evaluation.

F.2.19 Dibenzo(a,h)anthracene. The three replicate samples and two reference samples of < 14 ppb. The reference values are <45 to <120 (with one observed value of 90 ppb). The ER-L is 63.4 ppb and the ER-M is 260 ppb, with an incidence of effect of 54.5 percent (12 of 22 studies showed effects where levels of this compound fell between the ER-L and ER-M. Alexander et al. (1994) studied sediments dated from the present to 1900 in three cores from Savannah Harbor and detected some of this PAH in sediments of various ages. Highest concentration (992 ppb) was found in sediments from 1954. Sediments from the last 10 years showed a high of 15 ppb. The data indicate no concern for recent project O&M sediments. However, other sediments may require additional evaluation.

F.2.20 2,6 dimethylnaphthalene. Alexander et al. (1994) studied sediments dated from the present to 1900 in three cores from Savannah Harbor and did not detect this PAH in recent sediments at a detection limit of 10 ppb. Earlier sediments contained up to 44 ppb. Sediments from the last 10 years showed no detection at 10 ppb. No reference values or ER-L/ER-M values exist for this compound. Existing data do not demonstrate a concern for this compound.

F.2.21 Flouranthene. The three replicate values are 43, 41, and 75 ppb and two duplicates of 46 and 35 ppb. The GPA Berth 7 study found 1770 ppb in one of their four samples. Alexander et al. (1994) studied sediments dated from the present to 1900 in three cores from Savannah Harbor and detected some of this PAH in sediments of various ages. Highest concentrations (340 to 1932 ppb) were found in sediments from 1900 and 1954 to 1967. Sediments from the last 10 years showed a range of 55 to 144 ppb. The reference values are 7 to <61 ppb, the ER-L is 600, and the ER-M is 3600 ppb. Existing data indicate no concern for recent project O&M sediments. However, other sediments may require additional evaluation.

F.2.22 Flourene. The three replicate samples and two duplicates of < 14 ppb. Reference samples are <11 to <61 ppb. The ER-L is 35 ppb and the ER-M is 640 ppb with an 36.5 percent incidence of effect for studies in which the fluorene concentration was between the ER-L and ER-M. Alexander et al. (1994) studied sediments dated from the present to 1900 in three cores from Savannah Harbor and detected some of this PAH in sediments of various ages. Highest concentrations (144 to 206 ppb) were found in sediments from 1954 to 1962 and 1993. Sediments from the last 10 years showed a high of 16 ppb except one sample with a high of 206 ppb. Observed highs, even though above the ER-L, are closer

to the ER-L than ER-M. Given the low probability that the observed highs would even cause effects, there is no concern for this compound.

F.2.23 Indeno(1,2,3-cd)pyrene. The three replicate values of <14, 22, <14 ppb and the two duplicates of <14 ppb. The GPA Berth 7 study found one sample with a concentration of 1070 ppb. The reference values are <61 ppb (there is no ER-L). Alexander et al. (1994) studied sediments dated from the present to 1900 in three cores from Savannah Harbor and detected some of this PAH in sediments of various ages. Highest concentrations (106 to 395 ppb) were found in sediments from 1900 and 1954 to 1962. Sediments from the last 10 years showed a high of 39 ppb. The concentration in recent sediments appears to be in the range of the reference levels, indicating no concern for recent project O&M sediments. Other sediments may have higher levels which may warrant further investigation.

F.2.24 2-methylnapthalene. No reference values or an ER-L are listed. Alexander et al. (1994) studied sediments dated from the present to 1900 in three cores from Savannah Harbor and detected small amounts of this PAH in sediments of various ages. Highest concentration (46 ppb) was found in sediment from 1962. Sediments from the last 10 years showed a high of 13 ppb. Available data do not indicate a concern for this compound.

F.2.25 1-methylnapthalene. Not tested, but no ER-L is listed, nor do any reference values exist. Alexander et al. (1994) studied sediments dated from the present to 1900 in three cores from Savannah Harbor and detected small amounts of this PAH in sediments scattered throughout this time period. Detection limit was 10 ppb. The highest concentration (30 ppb) was found in sediment from 1985. Sediments from the last 10 years thus showed a high of 30 ppb. Available data do not indicate a concern for this compound.

F.2.26 Naphthalene. The three replicate values are <14, 18, and <14 ppb and the two duplicates of 19 and 25 ppb. The reference values <120 ppb and the ER-L of 160 ppb. Alexander et al. (1994) studied sediments dated from the present to 1900 in three cores from Savannah Harbor and detected only small amounts of this PAH in sediments of various ages. Highest concentration (28 ppb) was found in sediments from 1962. Sediments from the last 10 years showed a high of 12 ppb. All available data show concentrations below the ER-L, indicating no concern for this compound.

F.2.27 Perylene. No ER-L/ER-M or reference data exist for this compound. Alexander et al. (1994) studied sediments dated from the present to 1900 in three cores from Savannah Harbor and detected some of this PAH in sediments of various ages. Highest concentrations (339 to 812 ppb) were found in sediments from 1900

to 1958. Sediments from the last 10 years showed a high of 165 ppb. No toxicity data are available to indicate that observed concentrations of this compound would cause environmental effects.

F.2.28 Phenanthrene. The three replicate samples of 21, 11, and 32 ppb and the two duplicates of 21 and 9.8 ppb. Alexander et al. (1994) studied sediments dated from the present to 1900 in three cores from Savannah Harbor and detected some of this PAH in sediments of various ages. Highest concentrations (180 to 518 ppb) were found in some sediments from 1954 to 1967. Sediments from the last 10 years showed a high of 59 ppb. The reference values are < 57 ppb, with an ER-L of 240 ppb and ER-M of 1500. Existing data do not indicate a concern for this compound.

F.2.29 Pyrene. The three replicate values of 43, 37, and 60 ppb and the two duplicates of 42 and 28 ppb. The GPA Berth 7 study found one sample to contain a concentration of 2200 ppb. Alexander et al. (1994) studied sediments dated from the present to 1900 in three cores from Savannah Harbor and detected some of this PAH in sediments of various ages. Highest concentrations (985 to 1701 ppb) were found in some sediments from 1954 to 1958. Sediments from the last 10 years showed a high of 163 ppb. The reference values are <60 ppb, the ER-L of 665 ppb, and the ER-M of 2600 ppb. Existing data for recent sediments do not indicate a concern for project O&M sediments. However, other sediments may require additional evaluation.

F.2.30 Pesticides. The CITCO study (Savannah Labs, 1994) reported no detects for surface sediments, with detection limits of 3.5 to 8.5 ppb for most pesticides except chlordane (35 to 44 ppb), methoxychlor (35 to 44 ppb) and Toxaphene (350 to 440 ppb). The Stone Container study (EMC, 1995) reported no detects, with detection limits of 4.8 to 12 ppb for most pesticides except chlordane (10 to 25 ppb), methoxychlor (10 to 26 ppb), and toxaphene (97 to 240 ppb). The GPA Berth 7 study reported no detects, with detection limits of 1.7 to 3.3 ppb for most pesticides except Toxaphene (167 ppb). However, two site specific studies of off-channel sediments did detect some

pesticides. These studies are the Skidaway Agitation Dredging study (SKID) (Skidaway, 1993) and the CITCO Study, where only the deeper sediments from the three cores showed detects (SL) (Savannah Laboratories, 1994). These results are shown below.

alpha-chlordane.	SKID: 2.3, 5.5, 8.9 ppb
4,4'DDD.	SKID: 1.5, 15.5 ppb; SL: 13 ppb.
2,4'DDE.	SKID: 4.4, 19.6 ppb
4,4'DDE.	SL: 12 ppb (ER-L = 2.2 ppb, ER-M = 27 ppb).
2,4'DDT.	SKID: 0.2, 4.2 ppb
4,4'DDT.	SKID: 3.2, 9.9, 29.6 ppb; SL: 40 ppb. (ER-L = 1.58 ppb, ER-M = 46.1 ppb).
dieldrin & 4,4'DDE.	SKID: 22.9, 3.7 ppb.
endosulfan sulfate.	SL: 100 ppb.
Endrin.	SKID: 2.0, 5.8, 11.4 ppb
heptachlor epoxide.	SKID: 0.3, 0.7 ppb
hexachlorobenzene.	SKID: 2.7, 3.9 ppb
methoxychlor.	SL: 44 ppb.
trans-nonachlor.	SKID: 0.7, 3.0, 3.7 ppb.

F.2.31 Pesticide Summary. Since detection limits are considered adequate, there is no concern for most pesticides in project O&M dredged material. For DDE and DDT, ER-L's are available, with some off channel samples approaching the ER-M. Detection was not widespread, indicating some question as to how widespread these substances are in the harbor. However, if off-channel sediments are to predominate in a dredging project, consideration should be given to further investigation of the levels of these pesticides.

F.2.32 Dioxins. The only available harbor data is from the Stone Container Study (EMC, 1993). TEQ for this data has been calculated, using 1/2 the detection limit for non-detects, as 2.08 pptr. Theoretical bioaccumulation potential (TBP) using 1.5 percent lipid content is 4.56 pptr. In comparison, mean TEQ for 13 Brunswick bar channel samples (I.T., 1992, USACOE, 1993) was 5.06 pptr and the TBP was 7.04 pptr. Since the Brunswick sediments were found suitable for ocean disposal with concurrence by EPA, dioxin levels in the Stone sediments show no reason for concern. The three dioxin congeners detected were at levels less than the mean Brunswick levels. The two detected furan congeners were at higher levels than found in Brunswick. The OCDF levels were significantly higher than in Brunswick, but are not at a level of concern.

F.2.33 Oil & Grease. The Stone Container study (EMC, 1993) found oil & grease in three replicate samples to equal 160, 110, and 89 ppm and in two duplicates to equal 140 and 100 ppm. These values are within the reference value range of 4.94 to 180 ppm, indicating no reason for concern.

F.2.34 Petroleum Hydrocarbons. The Stone Container study (EMC, 1993) found three replicate samples to contain 46, 73, and 210 ppm and the two duplicates were 53 and 70 ppm. The CITCO study (Savannah Labs, 1994) found surface values of 59, 20, and 73 ppm. These values are similar to the reference oil and grease values above, indicating no reason for concern.

F.2.35 Polychlorinated Biphenyls (PCB's). Most studies have detected no PCB's (as Aroclors). Detection limits in the Stone Container study ranged from 0.013 to 0.110 ppm. The sum of all the Aroclor detection limits in the Stone Container study equals 277 ppb. No PCB's were detected in the GPA Berth 7 Study, where detection limits of 0.033 ppm for all aroclors except 1221 which was 0.067 ppm. The sum of all the Aroclor detection limits in the GPA study of 267 ppb. Total PCB's would therefore be expected to be less than this number. Skidaway, using detection limits of 0.1 to 1.0 ppb, detected total PCB's ranging from 36.7 to 160.7 ppb. Since for total PCB's the ER-L is 50 ppb and the ER-M is 400 ppb, there is no real reason for concern.

F.2.36 Phenols and substituted phenols. The Stone Container and GPA Berth 7 studies had the lowest detection limits of recent harbor studies. None were detected, with detection limits in the GPA Berth 7 study ranging from 0.33 to 0.83 ppm and in the Stone study ranging from 0.470 to 2.4 ppm. These detection limits are considered adequate, therefore there is no reason for concern for these compounds.

F.2.37 Organotins. See discussion under metals, tin.

F.2.38 Other Organics.

F.2.39 The GPA Berth-7 study (S&ME, 1995) found trichloroethene in two of its four samples (16 (#1), 6 (#2), <5, and <5 ppb). No ER-L or reference values exist for this chemical. However, this is a volatile chemical which would not be expected to remain at detectable levels in the disposal area.

F.2.40 In a study of several harbor berths, EMC (EMC, 1993) found the following organic chemicals (for which no ER-Ls have been set) in an abandoned slip: acetone, carbon disulfide, 1,2 dichloroethane, 0-dichlorobenzene, m-dichlorobenzene, and p-dichlorobenzene.

F.2.41 Organics Summary. It appears probable that a number of organic compounds exist at low levels in the sediments dredged from the Savannah River. However, a review of existing information reveals little overall concern for organic contaminants within the harbor. Winger and Lasier (1994) found that "concentrations of organic contaminants (polycyclic aromatic hydrocarbons (PAHs), PCBs, and DDT) were well below the ER-Ls provided by Long and Morgan (1990) for these compounds: ER-L for total PAHs of 4000 micrograms/gram, PCBs of 50 micrograms/g, and DDT of 1 microgram/gram." They also found that organic contaminants in the Savannah River were comparatively low, although elevated levels of PAH's and PCB's were found at a few sites. The Skidaway study of two Savannah Harbor berthing facilities (Skidaway, 1993) found several PAH's and pesticides at levels above the ER-Ls. They state that in only one of their samples, which contained 2 compounds that exceed the ER-Ms (DDE and dibenz(a,h)anthracene), did contaminants occur "where there is a significant probability of biological effects." They concluded "the organic contaminants observed in these sediments probably represent the general condition of Savannah Inner Harbor sediments" but made no conclusions as to the effect dredging these sediments has on possible organic contaminant impacts. Since this was a study of environmental impact, one must conclude that they viewed these possible impacts as inconsequential. As cited above, EPA does not show a concern for organic contaminants in the harbor. It is concluded from a review of available information, that organic contaminants do not pose a significant potential for detrimental environmental impacts due to project O&M dredging and disposal operations.

F.2.42 Heavy Metals.

F.2.43 The list below shows the chemical symbols for heavy metals which are included in this discussion of harbor sediments.

CHEMICAL	SYMBOL
Silver	Ag
Arsenic	As
Chromium	Cr
Copper	Cu
Nickel	Ni
Lead	Pb
Zinc	Zn

F.2.44 Results of heavy metal analyses are shown in Table 2. Table 3 displays the various guidance levels found for metal concentrations in sediment. The data show that some individual sediment samples from the channel and suspended in the river exceed ER-L's (Long et al., 1993) for Cr, Cd, Cu, Ni, Ag, As, and Zn. A few of the highest channel readings (Ag: 13 ppm, and Zn: 530 ppm) exceed ER-M values of 3.7 ppm for Ag and 410 ppm for Zn. Highest Sediment Basin samples (Ag: 33 ppm) exceed the ER-M values of 3.7 ppm for Ag. Some sediment samples from the Sediment Basin also exceed ER-L's for Cd, Cr, Cu, Pb, Ni, Ag, As, and Zn. However, as a 48-hour study of Disposal Area 12A influent metal levels showed (Savannah Lab., 1983), sediment samples from even the same area can provide widely varied values (26 to 183.3 ppm) for Cr, (20 to 196 ppm) for Cu, (4.1 to 86.7 ppm) for Pb, (1.8 to 32.8) for Ni, (0.1 to 4.97) for Ag, and (57.1 to 219.2) for Zn. Therefore, all channel and suspended river sample data have been averaged as a means of estimating the overall quality of material recently placed in the disposal areas. The average value is believed to provide a more realistic assessment of the composition of the harbor's sediments.

F.2.45 Inner Harbor Channel Sediments And Suspended River Sediments. Only two averages, those of Ag and Cd, are high enough to warrant further consideration here. As shown in Table 2, only the average data for Ag (channel of 2.0 ppm, Sediment Basin of 1.1 ppm and outside channel of 1.4 ppm) exceed, but only slightly, the Long et al. ER-L of 1 ppm. Only the channel average value of 2.0 ppm is above the Overall Apparent Effects Thresholds (Long and Morgan, 1990) of 1.7 ppm for Ag. None of the averages approach the ER-M of 3.7 ppm. In only 1/3 of the studies, were effects shown for sediments with a silver level between the ER-L and ER-M. The likelihood of silver causing the observed effects is therefore not high. The Ag level of 2 ppm does equal the cutoff value set by the Georgia DNR as posing no significant risk (GA DNR, 1995). However, this value does not exceed the natural range for Western U.S. soils (Conner and Shacklette, 1975). Those authors list naturally occurring levels of Ag as less than 0.5 to 5 ppm. The only other heavy metal to show an average above the ER-L is cadmium. The channel cadmium average of 1.5 ppm is above the ER-L of 1.2 ppm but not close to the ER-M of 9 ppm. Long et al. (1993) report that 32/87 studies showed sediment effects where the cadmium level was between the ER-L and ER-M (37 percent). Since the channel value is so close to the ER-L, it is not likely that cadmium would cause any contaminant effects. Although this value is above naturally occurring levels for the eastern U.S. (Conner & Shacklette, 1975), and slightly above the 99 percent for agricultural soils (Holmgren et al., 1993) it is below the level (2 ppm) set by the Georgia DNR as posing no significant risk (GA DNR, 1995). Available evidence, therefore, indicates there is no concern for the levels of heavy metals in the channel sediments and suspended river sediments.

TABLE 2

SAVANNAH HARBOR SEDIMENT DATA
(IN PPM)
(VARIOUS SOURCES)

	Site	Cr	Cd	Cu	Pb	Ni	Ag	Zn	As
Ave	Riv	42.3	1.5	13.4	14.3	13	2.0	77.8	4.1
"n"	Riv	27	27	27	33	23	23	33	45
Ave	SB	87.3	1.1	55.1	27.4	16.4	1.1	118	18.0
"n"	SB	56	8	56	57	56	53	57	5
Ave	Out	57.2	2.4	29.6	44.2	23.8	1.4	123	10.2
"n"	Out	73	73	73	73	73	51	73	54
High	Riv	100	4	56	46	36	13	530	24.3
High	SB	183	2.8	196	86.7	32.8	33	219	22.6
High	Out	130	7.5	141	189	89.6	14	424	33.3

NOTE:
* "Riv" refers to samples from the main channel bottom sediment and suspended sediment
* "SB" refers to Sediment Basin samples
* "n" refers to the number of samples available
* "out" refers to samples taken in the main river, but outside the navigation channel
* Changes in "Riv" data from the Draft EIS version of this table are primarily due to removal of Agitation Dredging Study "plume" data, and use of 1/2 the detection limit for data below detection.
* Changes in "Out" data from the Draft EIS version of this table are due primarily to additional data available from recent berth studies and use of 1/2 the detection limit for data below detection.

TABLE 3

GUIDANCE LEVELS FOR METAL CONCENTRATIONS IN SEDIMENTS

SOURCE		ELEM						
	Cr	Cd	Cu	Pb	Ni	Ag	Zn	As
HOL-95*7		.78	95	23	57		126	
HOL-99*7		1.3	216	36	154		170	
SF-Inner*8	561	.09	19	11	63	.1	59	5.1
SF-Outer*8	286	.31	37	27	93	.3	107	9
SF-Ref*8	195	.24	51	28	98	.6	118	11
ER-L*9	81	1.2	34	46.7	20.9	1	150	8.2
ER-M*9	370	9.6	270	218	51.6	3.7	410	70
OAET*1		5	300	300		1.7	260	50
EPA*2	1200	39	1500	300	420		2800	41
C&S,high*3a	100		100	70	70		100	
C&S,high*3b		1	150	300	700	5	400	73
C&S,mean*3c	36	<1	14	14	13	<.5	36	5.4
L&C*4			125		62		250	
Conner*5	230	1.3	87	87		1.2	280	
TEL*6	66	2	56	42		1	136	16
PEL*6	240	7.5	170	160		2.5	300	64
GA DNR*11	100	2	100	75	50	2	100	20
Ave.*9	100	.06	30	10	40	.05	50	5
com.high*10	1000	.7	100	200	500	5	300	50

TABLE 3 (CONT.)

GUIDANCE LEVELS FOR METAL CONCENTRATIONS IN SEDIMENTS

SOURCE:

*1 Long & Morgan, 1990. ER-L: Effects-Range Low, ER-M: Effects-Range Median, OAET: Overall Apparent Effects Threshold

*2 EPA concentration limits from sewage application to gardens (40 CFR 503.13). These standards are more stringent than those for application of sewage sludge to land where no food crops are grown. The potential toxicity and dispersal pathways for contaminants existing at the confined disposal areas would be most approximated by the application of sludge to land for non-food crop purposes.

*3 Conner & Shacklette, 1975. Maximum level in GA and eastern U.S. soils (Ag data is from western U.S.)
a. High limit for range for Georgia uncultivated a horizon soils
b. High limit for range for Eastern U.S. (Western U.S. for Ag) uncultivated soils
c. Mean for Eastern U.S. uncultivated soils

*4 Logan & Chaney, 1983. Minimum phytotoxicity levels.

*5 O'Conner, T.P. 1990. High values for sediments that are 100% silt and clay.

*6 MacDonald, 1993. TEL: threshold effects level, PEL: probable effects level.

*7 Holmgren et al., 1993. Uncontaminated agricultural soil, 95th and 99th percentile.

*8 McFarland et al., 1994. Mean metals concentrations in Oakland inner and outer sediments and Berkeley Flats reference sediment.

*9 Long et al., 1993. Incidence of Adverse Biological Effects within Ranges of Chemical Concentrations in Marine and Estuarine Sediments. Submitted to Environmental Management.

*10 Lindsay, W.L., 1979. Chemical Equilibria in Soils. John Wiley and Sons.

*11 Georgia DNR, 1995. Rules of the Georgia Department of Natural Resources Environmental Protection Division. Chapter 391-3-19. Hazardous Site Response. 22 February, 1995. 82 pp.

F.2.46 Sediment Basin Sediments. Sediments which accumulate in the Sediment Basin typically have a finer grain size than do sediments which settle in the navigation channel. Since finer grained sediments have a greater potential for adsorption of chemical compounds, there is a higher likelihood of contamination of sediments which accumulate in that location. Therefore, higher concentrations of contaminants at that site would not necessarily indicate that a source of any observed contamination would be located nearby.

F.2.47 For the average values from samples of Sediment Basin sediments, ER-L's are exceeded for Cr (ave. of 87.3 ppm, ER-L of 81 ppm), Cu (ave. of 55 ppm, ER-L of 34 ppm), As (ave. of 18 ppm, ER-L of 8.2 ppm) , and Ag (ave. of 1.1 ppm, ER-L of 1.0 ppm). These concentrations are within the lowest ranges at which effects have been observed in some sediments containing these concentrations metals (however, the observed effects were not directly attributable to a particular concentration of a particular metal). A large fraction of the sediment level of each of these elements is not expected to be bioavailable (see discussion in the conclusions section below). Furthermore, the incidence of effect (Long et al., 1993), which is the percentage of studies of sediment exhibiting concentrations between the ER-L and ER-M that showed effects, is not large. For the metals in question, the percentages are: As: 11.1 percent, Cr: 21.1 percent, Cu: 29.1 percent, and Ag: 32.3 percent. It is therefore not likely that sediment with levels of these metals between the ER-L and ER-M would exhibit environmental effects. It is even further unlikely that the identified concentration of a metal would cause an environmental effect. The As average of 18 ppm is approaching the Georgia DNR value (20 ppm) posing no significant risk (GA DNR, 1995). Furthermore, none of the average concentrations are above the range for uncultivated Georgia soils (Conner & Shacklette, 1975). Because the average copper concentration is much closer to the ER-L than the ER-M, and only 29.1 percent of studies with copper concentrations between the ER-L and ER-M showed effects, the likelihood of the observed copper concentrations causing environmental effects is not high. Furthermore, the average copper concentration (55 ppm) is below the level (100 ppm) set by the Georgia DNR as posing no significant risk (GA DNR, 1995). Therefore, no concern exists for metal concentrations in the Sediment Basin sediments.

F.2.48 Sediment Samples Taken Outside The Navigation Channel And Sediment Basin. The following metals exhibit averages requiring further evaluation here: Cd, Ni, Pb, Ag, As. The average Pb value of 44.2 ppm approaches the ER-L of 46.7 ppm. The average is also above the 99th percentile for agricultural soils of 36 ppm (Holmgren et al., 1993). However, it is far below the Georgia DNR ceiling value (75 ppm) posing no significant risk and within the range of naturally-occurring concentrations for

Georgia (High of 70 ppm, Conner & Shacklette, 1975). The averages for Ag and As are below those found for either in channel or Sediment Basin sediments. Therefore, the discussions above apply. The out-channel average shows a cadmium concentration (2.4 ppm) exceeding the cadmium ER-L of 1.2 ppm and a Ni concentration (23.8 ppm) exceeding the nickel ER-L of 20.9 ppm. With regards to Ni, the incidence of effects for sediments containing Ni concentrations between the ER-L and ER-M is only 16.7 percent. Furthermore, the average is well within the upper limit for uncultivated A horizon soils in Georgia of 70 ppm (Conner & Shacklette, 1975), below the 95th percentile for agricultural soils of 57 ppm (Holmgren et al., 1993), and below the Georgia DNR ceiling value posing no significant health risk, also 50 ppm (GA DNR, 1995). The cadmium average, although exceeding the ER-L, does not approach the ER-M. The incidence of effects for sediments containing cadmium concentrations between the ER-L and ER-M is 36.6 percent. It is, therefore, unlikely that the observed average would cause effects in an aquatic system. However, the average cadmium value is also above the Georgia DNR ceiling value posing no significant risk (GA DNR, 1995). It is also above the high end of the range for eastern U.S. soils of 1 ppm (Conner & Shacklette, 1975) and above the 99th percentile of U.S. agricultural soils of 1.3 ppm (Holmgren et al., 1993). Cadmium values in off-channel sediments are, therefore, of some concern. However, this concern does not extend to project O&M sediments, for two reasons. The first is that these materials are normally relocated to the channel through agitation dredging, and their effect is already accounted for in the sediment samples taken from the main channel and Sediment Basin. The second factor is that these values represent only a fraction of material annually dredged from the harbor and placed in the disposal areas. The vast majority of the sediments annually removed by dredging are in the navigation channel and Sediment Basin. Where off-channel sediments would predominate in a dredging project, further investigation of cadmium concentrations in the sediments should be made.

F.2.49 Summary Of Metal Concentrations By Element.

F.2.50 Chromium (Cr). Alexander et al. (1994) found evidence of enrichment in the upper parts of most of their cores from the Savannah Harbor. Their data indicate a potential concern for this metal. The highest recorded value for Savannah Harbor is from the Sediment Basin (183.3 ppm). This value exceeds the maximum recorded value for A horizon Georgia soils (100 ppm, Conner & Shacklette, 1975), but is below the ER-M (370 ppm, Long et al., 1993). The highest main channel value exceeds the ER-L (81 ppm, Long et al., 1993) and the maximum recorded value for GA/eastern U.S. soils. However, the average main channel value (42.3 ppm) is below the ER-L. In addition, the only average value that exceeds the ER-L of 81 ppm is the Sediment Basin

average of 87.3 ppm. Moreover, all observed values do not approach EPA's acceptable concentration level for sewage sludge application to gardens (1200 ppm). Naturally-occurring levels in uncultivated soils in Georgia range from 3 to 100 ppm (Conner and Shacklette, 1975). Table 2 of the February, 1995, GA DNR Hazardous Site Response document lists a soil concentration that poses no significant risk of 100 ppm (GA DNR, 1995). Savannah Harbor reference values range from 9.0 to 17.6 ppm. Observed levels are compatible with expected naturally-occurring values.

F.2.51 Cadmium (Cd). Alexander et al. (1994) found evidence in two of their cores from the Savannah Harbor of enrichment towards the surface. All average and highest observed sediment values are greater than the concentrations recorded for A horizon eastern U.S. soils (1 ppm, Conner & Shacklette, 1975). The inner channel average value of 1.5 ppm exceeds the ER-L. However, none of the within channel sediment values or any of the average sediment values exceed the ER-M of 9.6 ppm (Long et al., 1993), and none approach EPA's acceptable level for sewage sludge application to gardens. The expected overall concentration of sediments deposited within the disposal area would be expected to be slightly above the channel and Sediment Basin averages of 1.5 and 1.1 ppm. The expectation of a slightly higher average level is due to the outside channel average of 2.4 ppm and the fact that the highest recorded value for a sediment sample taken outside the channel is 7.5 ppm (equal to the probable effects level of MacDonald (1990)). It should be noted that the average value for sediments outside the channel is much closer to the ER-L than the ER-M. As stated above, Long et al. (1993) report that 32/87 studies showed sediment effects where the cadmium level was between the ER-L and ER-M (37 percent). The likelihood of these effects being caused by the silver concentration is not high. This again indicates that there is no real cause for concern for project O&M sediments. The highest harbor value does not approach the EPA acceptable level for sewage sludge application to gardens (39 ppm). These data indicate that one could expect isolated pockets of sediment from outside the channel, if they could be isolated, to pose a possible concern for aquatic disposal. Lee (1995) reviewed a preliminary compilation of Savannah Harbor sediment data and concluded there should be some reason for concern for the potential bioaccumulation of arsenic and to a lesser extent, lead and cadmium in foodchains associated with waterfowl or shorebirds. The District believes these sediments would be mixed in the dredging process so that concentrations within the disposal areas would be expected to more closely approximate the average sample levels. Naturally-occurring levels in the eastern U.S. range up to 1 ppm (Conner and Shacklette, 1975; Korte, 1983). Table 2 of the February, 1995, GA DNR Hazardous Site Response document lists a soil concentration that poses no significant risk of 2 ppm (GA DNR, 1995). Since we expect the overall sediment average to be about 1.5 ppm, a level below DNR concerns, project dredged material

should pose no cause for concern. Since the off channel average (2.4 ppm) is above the DNR level and is well above the 99th percentile for agricultural soils (1.3 ppm, Holmgren et al., 1993), there is some concern for cadmium levels in outside channel sediments. Large amounts of outside channel materials, where they might be expected to predominate in a disposal operation, would require further evaluation (see discussion under out-channel sediments, above).

F.2.52 Copper (Cu). The highest recorded value from the Sediment Basin exceeds the ER-L and the level observed to cause phytotoxicity. The highest values recorded from main channel sediments and the Sediment Basin, as well as the average Sediment Basin value, exceed the ER-L and the maximum level recorded for Georgia soils. However, neither the average values for the main channel or outside channel exceed the ER-L, nor do any of the recorded values equal the ER-M of 270 ppm (Long et al., 1993). The average of available channel sediment test data (13.4 ppm) is below the ER-L (34 ppm). Although the average of Sediment Basin data is slightly above the ER-L at 55.1, the incidence of effects for copper values between the ER-L and ER-M was found to be 28 percent (32/110). Since the Sediment Basin average is only slightly above the ER-L, the likelihood of this level causing environmental effects is considered small. In addition, because of the mixing of sediments during dredge disposal operations, the overall average of sediment deposited in the disposal areas, including sediment from outside the channel, would be expected to be less than the ER-L. Moreover, none of the recorded sediment values approach EPA's concentration level for sewage sludge application to gardens. Naturally-occurring levels in Georgia soils range from 3 to 100 ppm (Conner and Shacklette, 1975). Table 2 of the February, 1995, GA DNR Hazardous Site Response document lists a soil concentration that poses no significant risk of 100 ppm (GA DNR, 1995). All averages are also well below the 95th percentile for agricultural soils of 95 ppm (Holmgren et al., 1993). Savannah Harbor reference values are much lower and range from 1.90 to 4.34 ppm. However, Alexander et al. (1994) found no evidence of anthropogenic enrichment in the harbor. Expected average copper levels in project dredged material are compatible with expected naturally-occurring values.

F.2.53 Lead (Pb). Alexander et al. (1994) found evidence of anthropogenic enrichment in the upper portions of all cores taken in Savannah Harbor. This finding indicates the potential for concern for this metal. The highest value recorded for sediments outside the main channel is 188.9 ppm, above the maximum recorded level for GA/eastern U.S. soils, and approaching the ER-M of 218 ppm. The highest recorded value for the Sediment Basin (86.7 ppm) exceeds the ER-L (46.7 ppm, Long et al., 1993) and the maximum level recorded for the A horizon in Georgia (70 ppm, Conner & Shacklette, 1975). The highest value recorded for the main channel (46.0 ppm) approaches (but is less than) the ER-L.

However, the only average value that exceeds the ER-L is that for sediments outside the channel (188.9 ppm). Since the vast majority of material dredged at one time would come from the channel itself, the average level in sediments deposited in the disposal area is not expected to exceed the ER-L. Moreover, none of the observed sediment values exceed the ER-M (218 ppm, Long et al., 1993) or EPA's acceptable concentration level for sewage sludge application to gardens (300 ppm). In addition, the observed levels are also much smaller than the maximum allowable soil content (511 ppm of Pb) calculated in a study of contaminant mobility at the Naval Weapons Air Station, Concord California (Lee et al., 1986). Lee (1995) reviewed a preliminary compilation of Savannah Harbor sediment data and concluded there should be some reason for concern for the potential bioaccumulation of arsenic and to a lesser extent, lead and cadmium in foodchains associated with waterfowl or shorebirds. We believe these sediments would be mixed in the dredging process so that concentrations within the disposal areas would be expected to more closely approximate the average sample levels. Naturally-occurring levels in Georgia and the eastern U.S. soils range from <10 to 70 ppm (Conner and Shacklette, 1975). Savannah Harbor reference values fall on the low end of that scale and range from 4.34 to 9.31 ppm. Lead in deep ocean sediments can vary from <10 to more than 80 ppm dry weight, with near shore sediments averaging 20 ppm (Demayo et al., 1982) and lead concentrations have been recorded at 110 ppm dry weight in a reference lake in Sweden (Haux et al., 1986). Table 2 of the February, 1995, GA DNR Hazardous Site Response document lists a soil concentration that poses no significant risk of 75 ppm (GA DNR, 1995). Since average lead concentrations in project dredged material are expected to be below 46.7 ppm (the ER-L), no impacts are expected. Since the out-channel average (44.2 ppm approaches the ER-L and is well above the 98th percentile for agricultural soils (36 ppm), there is some concern for lead levels within out-channel sediments. Large amounts of outside channel materials, where they might be expected to predominate in a disposal operation, may require further evaluation.

F.2.54 Mercury (Hg). Alexander et al. (1994) found evidence of anthropogenic enrichment in the upper portions of two cores (of six) taken in the Savannah River. This finding indicates the possibility of concern for this metal. The ER-M is 0.71 ppm and the ER-L is 0.15 ppm (Long et al., 1993). Naturally-occurring levels in the B horizon of soils in the eastern U.S. range from 10 to 3,400 ppb (Conner and Shacklette, 1975). As reported by NAS (1978), uncontaminated sediment usually had concentrations of <1,000 ppb. Table 2 of the February, 1995, GA DNR Hazardous Site Response document lists a soil concentration that poses no significant risk of 0.5 ppm (GA DNR, 1995). Average observed

mercury levels for 28 samples of in channel sediments is 0.35 ppm. The average of four Sediment Basin samples is 0.4 ppm (400 ppb) and the average for 20 samples taken outside the channel is 0.22 ppm (220 ppb). Observed levels are compatible with expected naturally-occurring values.

F.2.55 Nickel (Ni). Alexander et al. (1994) found evidence of anthropogenic enrichment in the upper portions of two cores (of six) taken in the Savannah River. This evidence indicates possible concern for concentrations of this metal in the harbor. The highest recorded values for the main channel (36 ppm), outside main channel (89.6 ppm), and Sediment Basin sediments (32.8 ppm) exceed the ER-L (20.90 ppm, Long et al., 1993), but only the outside channel highest value exceeds the ER-M (51.6 ppm, Long et al., 1993). Moreover, none of the average values (13.0 ppm in channel, 23.8 ppm out channel, 16.4 ppm Sediment Basin) exceed the ER-L. In addition, none of the recorded values exceeds the maximum level recorded for GA/eastern U.S. soils or observed levels of phytotoxicity. Only the highest recorded sample for sediments outside the channel (89.6 ppm) exceeded the maximum allowable soil content (MASC)(82 ppm of Ni) calculated by Lee (Lee et al., 1986). Moreover, none of the recorded levels approach EPA's acceptable concentration level for sewage sludge application to gardens. Lindsay ((1979) reported the average natural abundance of nickel to be 40 ppm with a common range of 5 to 500 ppm. Naturally-occurring levels in soils in Georgia range from <3 to 70 ppm (Conner and Shacklette, 1975). As reported by NAS (1978) uncontaminated sediment usually had concentrations of <1,000 ppb. Table 2 of the February, 1995, GA DNR Hazardous Site Response document lists a soil concentration that poses no significant risk of 50 ppm (GA DNR, 1994). Furthermore, the 95th percentile for agricultural soils is 57 ppm. Observed levels are compatible with expected naturally-occurring values.

F.2.56 Selenium (Se). Alexander et al. (1994) found evidence of anthropogenic enrichment in the surface portions of three cores, although concentrations were found to be less than 1 ppm. Other available sediment data shows all measurements <1 ppm. Concentrations in the B horizon uncultivated eastern U.S. soils range from <0.1 to 1.4 ppm (Conner & Shacklette, 1975). Table 2 of the February, 1995, GA DNR Hazardous Site Response document lists a soil concentration that poses no significant risk of 2 ppm (GA DNR, 1994). Therefore, there should be no concern for this metal.

F.2.57 Silver (Ag). Alexander et al. (1994) studied six cores from the Savannah Harbor and found they showed evidence of anthropogenic enrichment from 1900 to the present. The highest recorded main channel, outside channel, and Sediment Basin sediments exceed the ER-M (3.7 ppm, Long et al, 1993). Average data from both the main channel (2.0 ppm), outside channel river data (1.4 ppm), and the Sediment Basin (1.1 ppm) exceed the ER-L

(1.0 ppm, Long et al., 1993). None of the average values exceed the ER-M of 3.7 ppm. The incidence of observed effects for data between the ER-L and ER-M is 32.3 percent. Since the average data are all closer to the ER-L than the ER-M, the probability of environmental effects due to silver in the project dredged material is not high. In addition, the average values do not exceed the highest recorded values for western U.S. soils (no eastern U.S. values). Naturally-occurring levels in B horizon of western U.S. soils range from <0.5 to 5 ppm (Conner and Shacklette, 1975). Table 2 of the February, 1995, GA DNR Hazardous Site Response document lists a soil concentration that poses no significant risk of 2 ppm (GA DNR, 1995). Observed levels are compatible with expected naturally-occurring values.

F.2.58 Tin (Sn). Alexander et al. (1994) found evidence of anthropogenic enrichment in the upper portions of most of the six cores they studied from Savannah Harbor (0.1 to 6.04 ppm). In the B horizon of eastern U.S. soils, concentrations range from <10 to 15 ppm (Conner & Shacklette, 1975). No toxicity data for metallic tin was located during this study. In addition, tin is not listed in the GA DNR Hazardous Response document (GA DNR, 1995). However, organotins are known to be toxic to some organisms.

F.2.59 Harbor organotin data is available only from the Stone Container Study (EMC, 1995). Four measurements for monobutyltin (MBT) were 2.9, 2.3, 2.7, and 6.0 ppb. Four measurements for dibutyltin (DBT) were 11, 17, 21, and 26 ppb. Four measurements for tributyltin (TBT) were 11, 26, 80, and 90 ppb.

F.2.60 TBT compounds have a broad range of applications, including use as fungicides, bactericides, insecticides and wood preservatives, but TBT degrades into less toxic DBT and MBT (Dowson et al., 1993). TBT has been reported to be acutely toxic to aquatic organisms at water concentrations of 1 ppb (Dowson et al., 1993). In 1988, an environmental quality standard for TBT of 2 ng/l in seawater was set in Great Britain (Dowson et al., 1993). Organotin concentrations in 22 sites in Great Britain were followed for 6 seasons. This study considered 3 to 20 ppb TBT to be light contamination and 20 to 100 ppb TBT to be moderate contamination. Sediment concentrations in Great Britain were found to range from <3 ppb to 4207 ppb (Dowson et al., 1993). Since the dredged material would be placed in a high ground disposal area retaining most fines, and in which this material should decompose, dredging this material is not expected to impact aquatic resources.

F.2.61 Manganese (Mn). The normal range of values shown by the reference stations is 63.6 to 240 ppm (1994 Savannah Harbor Disposal Area Wright River Weir Effluent Study), with one value of 3430 ppm. Manganese levels in overflow weir effluent have been found to be of no concern (Scott et al., 1994). Manganese

levels in the A horizon of uncultivated Georgia soils were found to range from 50 to 700 ppm and eastern U.S. B horizon soils from <2 to 7000 ppm (mean 290 ppm)(Conner & Shacklette, 1975). Moreover, manganese is not listed in the GA DNR Hazardous Response document (GA DNR, 1995). There is no reason to believe that project dredged material manganese levels would be of concern.

F.2.62 Iron (Fe). Savannah Harbor reference values range from 7500 to 16400 ppm. B horizon eastern U.S. soils were found to have much lower ranges, from <0.01 to >10 ppm, with a mean of 2.76 ppm. Alexander et al. (1994) found no evidence of anthropogenic enrichment in Savannah Harbor. Moreover, iron is not listed in the GA DNR Hazardous Response document (GA DNR, 1995).

F.2.63 Zinc (Zn). Alexander et al. (1994) found evidence of anthropogenic enrichment in most of their cores taken in Savannah Harbor. This finding indicates the possibility of concern for this metal. The highest main channel sediment value (530 ppm) and the highest outside channel sediment value (424.5 ppm) exceed the ER-M (410 ppm, Long et al., 1993), observed phytotoxicity level, and the MASC value (Lee et al., 1986) of 304 ppm, the highest values recorded for uncultivated A horizon soils in Georgia (100 ppm, Conner & Shacklette), and the 98th percentile (170 ppm) for U.S. agricultural soils (Holmgren et al., 1993). However, all average values (in channel: 77.8 ppm, out channel: 123.5 ppm, Sediment Basin: 118.5 ppm) are below, although approaching, the ER-L (150 ppm, Long et al., 1993). No recorded sediment value exceeds EPA's acceptable concentration level for sewage sludge application to gardens. All average values are below the ER-L of 150 ppm, and the 95th percentile for agricultural soils (126 ppm). In addition, the in channel sediment average is within the recorded range for A horizon uncultivated Georgia soils of <25 to 100 ppm (Conner and Shacklette, 1975). Table 2 of the February, 1995, GA DNR Hazardous Site Response document lists a soil concentration that poses no significant risk of 100 ppm (GA DNR, 1995). Although sediment and out channel averages are above the DNR value, they are within the 95th percentile for agricultural soils and below the ER-L for zinc. Expected levels are, therefore, below that at which environmental impacts would be expected.

F.2.64 Arsenic (As). No recorded sediment values exceed ER-M of 70 ppm, although they do exceed the ER-L value of 8.2 ppm. The in channel sediment average is 4.1 ppm, well below the ER-L. However, the Sediment Basin average (18 ppm) and the out channel average (10.2 ppm) do exceed the ER-L. The incidence of effects of 11.1 percent (8/73 studies) for concentrations between the ER-L and ER-M indicates that the likelihood of effects for the observed averages is low. Lee (1995) reviewed a preliminary compilation of Savannah Harbor sediment data and concluded there

should be some reason for concern for the potential bioaccumulation of arsenic in foodchains associated with waterfowl or shorebirds. However, the data he reviewed erroneously showed average in-channel sediment levels of 9 ppm (rather than the corrected 4.1 ppm). The District believes the sediments with higher levels in spots would be mixed in the dredging process so that concentrations within the disposal areas would be expected to closely approximate the levels shown by the average sample data (4 to 18 ppm). Alexander et al. (1994) found in some cores possible small anthropogenic inputs into Savannah harbor (no sediment concentrations given). Levels found in B horizon eastern U.S. soils range from 0.2 to 73 ppm with a mean of 5.4 ppm (Conner and Shacklette, 1975). Table 2 of the February, 1995, GA DNR Hazardous Site Response document lists a soil concentration that poses no significant risk of 20 ppm (GA DNR, 1995). All average values are below this figure. Savannah Harbor reference values range from 3.18 to 17.8 ppm. Average project sediment values all also fall within the range of naturally-occurring values. The District believes this indicates no concern for arsenic levels within project dredged material. Elevated levels of arsenic have been observed in disposal area underdrain effluent (NMFS, 1994). This is thought to be a product of leaching processes. The District agreed to have the underdrains to the Wright River closed. New underdrains are to be directed to the Savannah River, where released arsenic is expected to have no impacts.

F.2.65 Summary Of Acute Effects. Average values of samples from Savannah Harbor channel sediments, outside channel sediments and Sediment Basin sediments show that ER-L's are exceeded in at least one of those cases for chrome, cadmium, copper, nickel, silver, and arsenic. However, only the cadmium, copper, and zinc averages exceed recorded naturally-occurring levels for Georgia and eastern U.S. soils. Finally, only the cadmium average for out channel sediments is above the Georgia DNR ceiling for no significant risk. As discussed above, the cadmium out-channel average is not expected to significantly affect environmental impacts of project O&M dredging. There are no minimum sediment contaminant concentrations for dredged material. However, EPA has set maximum allowable contaminant concentrations for sewage sludge application to gardens. None of the average values or even any maximum single sample concentration observed in Savannah Harbor sediments approach those concentrations. Maximum concentrations observed in the harbor as a percentage of the maximum allowable garden soil concentrations for sewage sludge application range from 13.1 percent (Cu) to 21 percent (Ni) for all but lead (63 percent), arsenic (81.2 percent), and silver (no standard).

F.3.00 CHRONIC (LONG TERM) CONTAMINANT IMPACTS.

F.3.01 "Heavy metals and organic contaminants added to water containing sediments will rapidly become associated with the sediment" (references in Brannon et al., 1990). This is the result of the adsorption of those compounds to the fine-grained (silt, clay, and organic) components of a sediment. Available data indicate no concern for any organics in Savannah Harbor sediments since these components are not found in significant concentrations in the sediments. The metal contaminants that have the highest likelihood of posing a possible problem are silver, lead, chrome, and zinc. These elements have sediment average concentrations all near the ER-L's and TEL's, indicating that although they are below levels which produce acute toxicity, an evaluation of their chronic toxicity should be considered.

F.3.02 A large series of tests were run on sediments from San Francisco Bay to determine their suitability for open water disposal (McFarland et al, 1994). It was concluded that the results of the bioaccumulation study suggest that disposal of the "inner" and "outer" sediments "is unlikely to increase contaminant bioaccumulation above that which already occurs from naturally resuspended sediments" (at the reference area). The average metals concentrations from this work are shown in Table 3. As can be seen, the concentrations of chrome and nickel greatly exceed the averages of Savannah Harbor data. Average concentrations of copper, lead, and zinc are similar for both areas, with averages for cadmium, silver, and arsenic being somewhat lower in San Francisco. Overall, results of the San Francisco study indicate there should be little concern for Savannah Harbor sediments.

F.3.03 The extent of movement of contaminants within a CDF depends on the extent of drying and oxidation that the sediments undergo. Brannon (1978) concluded that most naturally-occurring metals in aquatic sediments are tightly bound to sediment particles and are relatively immobile and unavailable (Tatem, 1990). Brannon also concluded that contaminants associated with sediments containing silt and clay and organic carbon are generally not readily available to aquatic organisms. He further found that the most mobile and potentially available sediment contaminants are those found in the sediment interstitial water, those adsorbed to the cation exchange complex, or those associated with amorphous iron and manganese oxides. In seawater and most estuarine environments, soluble sulfate ions are reduced to sulfides in sediments under anaerobic conditions; metals in the sediments will thus be in the form of highly insoluble metallic sulfides (Tatem, 1990).

F.3.04 When these anaerobic sediments are dredged and deposited at a site with aerobic (oxidizing) conditions, more soluble oxidized metallic compounds such as carbonates and hydroxides may be formed (Tatem, 1990). The extent of mobilization of potentially toxic contaminants through changes in physicochemical conditions at the disposal site may depend on the disposal method and properties of the dredged sediments (Gambrell, Khalid, and Patrick, 1978, cited in Tatem, 1990). Whether a particular contaminant is released or held in a sediment also depends on its state of drying and what oxidation/reduction reactions are taking place. It should be noted that a particular contaminant may be present in a sediment but not be bioavailable.

F.3.05 CDF sediments are expected to exist as either (1) anaerobic saturated sediments which are exposed or under ponded water, or as (2) oxidized drying sediments. The same sediment is likely to exist in each state over various times in its existence at the CDF. Movement and bioavailability of metals would be expected to differ in the two cases. In the saturated state, the sediments would be expected to resemble other aquatic sediments. As discussed above, the harbor sediment metal concentrations are not of concern because they are at levels which, in the worst cases, are only at the lowest levels where effects have been found under certain prescribed conditions. The expected lack of bioavailability is expected to preclude impacts from these metals in saturated sediments. As the sediments dry and oxidize, they would be expected to take on the characteristics of normal upland soils. The expected metal levels have thus been compared to levels of metals found in naturally-occurring soils of Georgia and the southeast. Since the expected sediment levels fall within the range of naturally-occurring soils, no impact from metals is expected.

F.3.06 Contaminant Pathways Within The Disposal Areas. Even though it appears that sediment metals levels are at low levels which preclude either acute or chronic impacts, some movement of metals could take place. Once placed within the disposal area, contaminants could remain within the site or move offsite through one of the following pathways (Lee et al., 1986): effluent during the disposal operation, dust, volatilization, soil invertebrate uptake, plant uptake, leachate to groundwater, and surface runoff. Tidal inundation could also occur in the lower end of Disposal Area 14B. Each of these theoretical pathways is discussed separately in the following sections.

F.3.07 Effluent (movement off-site through effluent during disposal operations). Previous studies at Savannah Harbor (Palermo, 1988) have shown that the disposal areas retain 99.93 percent of suspended solids and 99.67 percent of total metals. In addition, a recent study of Savannah Harbor CDF weir effluent by the NMFS (NMFS, 1994), revealed no concerns for possible contaminants discharged through the weir effluents.

F.3.08 In two of the Savannah Harbor CDF's, effluent has also come from underdrains designed to drain water from deep within the disposal sites. These underdrains have been closed in Disposal Area 12B and plans are in place to close those in Area 13A. The underdrains have produced the only Savannah Harbor effluent which has violated water quality criteria for a contaminant. Arsenic concentrations of up to 298 micrograms/liter have been observed (NMFS, 1994). Arsenic can be found in forms of different toxicity, and the percentage occurrence of the different forms in the underdrain effluent is unknown, although some conditions at the weirs are said to favor the formation of the more toxic arsenite (As+3) form (NMFS, 1994). A discussion of arsenic toxicity can be found in NMFS (1994). Measured levels of underdrain arsenic concentrations exceed the acute level for As(+5) of 69 micrograms/liter (but not the acute level for As(+3) of 2,319 micrograms/liter). The measured levels also exceed the chronic salt water criteria concentrations of 36 micrograms/liter for As(+5) and 13 micrograms/liter for As(+3). It is expected that with an appropriate mixing zone, discharge of underdrain effluent to the Savannah River would meet water quality criteria.

F.3.09 Using arsenic as the critical chemical parameter, mixing zone calculations were made using standard engineering procedures which are generally followed by state water quality authorities. Those calculations revealed that a maximum mixing zone of 10 feet would be required before the discharge from the new underdrains would meet acceptable water quality standards for all parameters. The 10-foot mixing distance is judged to be acceptable, as it is much less than the mixing zones of hundreds of feet which are typical for permitted industrial point discharges along the Savannah River.

F.3.10 Additional calculations were made using the procedures contained in the June 1994 draft EPA/Corps Inland Testing Manual. Appendix C to that document contains a section (C4) which describes formulas to use for mixing zones from confined disposal facilities which discharge in riverine conditions. Using those procedures, a discharge of 0.7 CFS into the shallow waters along the channel bank (average depth of 5 feet and a flow of 1 FPS) which contains 298 ug/l of arsenic would take 24 feet to reduce to a level of 13 ug/l. Section C6 of that Appendix describes other formulas to use for mixing zones from confined disposal

facilities. Using those procedures and parameter values for discharge in estuarine conditions, the same discharge and receiving water conditions would require a 13-foot mixing zone to reduce the arsenic level to 13 ug/l. Those calculations reveal that mixing of underdrain effluents would occur within very short distances, much shorter than that typically given for industrial point source discharges.

F.3.11 Dust. Since all metal concentrations have been found to be within levels observed in natural soils found in Georgia or below risk criteria, no increased impact from this pathway is expected.

F.3.12 Volatilization. Modeling of this pathway has not been perfected, but previous research has not considered volatilization of metals to be important (Brannon et al., 1990).

F.3.13 Plant and Soil Invertebrate Uptake. Lead (Pb) (and other heavy metals such as cadmium and mercury) may occur in ionized forms that are soluble in water, but they can also bind with organism tissues and, thus, are actively bioaccumulated (Clarke and McFarland, 1991). Zinc, chrome, lead, and cadmium, among others, seem to be effectively immobilized in CDF's during early stages of filling, thereby reducing the transfer of these metals to vegetation (Brannon et al, 1990, p. 40). However, their bioavailability may be changed as the sediment oxidizes (Brannon et al., 1990, p. 40). Mobility of Zn, Cd, and Pb is generally observed to be greater under drier upland soil conditions than under flooded wet soil conditions (Lee et al., 1986). Zinc, copper, and lead pose much less risk to water quality, even though they are mobilized by plants, than cadmium and mercury, and studies of plant uptake of chrome are limited (Brannon et al., 1990, p. 40). A study of the response of contaminated sediment from a brackish marsh in New Jersey to changes in pH and redox potential found that Ni, Cd, and Zn were released. A possible release of Cu was found, but no release of Cr or Pb was observed (Gambrell et al., 1991). These studies indicate that zinc is the most likely element to become available during drying. Lead is less likely to be released during the drying of a soil substrate, but may be expected to exceed chromium. No studies are known that predicted the fate of silver.

F.3.14 Plant uptake. Plants may serve as an avenue for contamination of higher organisms through the passing of compounds up the food chain. They may also make a significant contribution to other contaminant mobility pathways within a CDF, such as surface runoff, volatilization, and microbial degradation. For example, some metals such as cadmium and zinc may concentrate in the surface litter layer (from studies cited in Brannon et al., 1990, p. 46). Zinc might be expected to

accumulate in plant matter within the disposal area. However, zinc is not considered very toxic and, because of the low average levels found in Savannah sediments, is not expected to pose a problem.

F.3.15 Some research has been done on the long term effects of contaminants, including metals, and the potential for their bioaccumulation. Brandon et al. (1991), performed a long term evaluation of the potential for mobility of metals in plants and animals which colonize contaminated estuarine dredged material placed in both wetland and upland environments (Brandon, et al., 1991). As the tested material placed on an upland site oxidized it became more acidic and did not support vegetation after 6 years. Laboratory tests with the same sediments found that plants growing in these sediments had elevated zinc, cadmium, chromium, nickel, and lead. Earthworms were not able to survive in the sediments under upland conditions. Sediments placed in a wetland environment contained possibly elevated levels of only copper and chromium. Plants grown in the sediment under upland conditions showed metal concentrations up to the following: Zn:66.0 ppm, Cr: 8.64 ppm, and Pb: 1.56 ppm. Observed zinc levels in plants were within the normal range for agricultural crops of 15-150 ppm. The concentrations of metals in the sediments studied were as follows: Zn:1,307 ppm, Cr: 1,651 ppm, and Pb: 397.8 ppm. These levels are approximately 10 times higher than observed average concentrations of the metals in Savannah Harbor sediments. Using that relationship, one could predict metal concentrations in plant tissue from the Savannah Harbor disposal areas to be the following: Zn: 6.6 ppm, Cr: 0.86 ppm, and Pb: 0.16 ppm. These levels are all at or below normal levels (Chaney (1983) cited in Brandon et al. (1991)).

F.3.16 Soil lead can be absorbed and accumulated by plants and invertebrates (Lee et al., 1986). In a study of minespoil reclaimed with sewage sludge, sludge was applied with a mean Pb loading rate of 5.5 grams per square meter. After 1 to 2 years, surface soils (0 to 15 cm) generally had a Pb concentration of less than 10 ppm. Ninety-six percent of vegetation samples had less than 10 ppm of Pb. It was concluded that metals in forage species grown with the sludge for reclamation posed no threat to the food chain or animal health (Sneaker, 1991). Lead uptake has also been investigated by studies more closely resembling the Savannah Harbor situation. A study of sewage application to a dredge spoil site along the Chesapeake and Delaware Canal in Delaware near Chesapeake City, MD, found surface (0 to 20 cm) soil total Pb levels of 129 ppm after 2 years and 61 ppm after 4 years. At the same time, vegetation levels were found to be 0.2 ppm after 2 years and 5.7 ppm after 4 years (Palazzo and Reynolds, 1991). Lee et al. (1986) also looked at uptake of lead by Typha (cattails). Their data (Figures 2-83 and 2-86) indicate the following relationship: lead concentration in Typha (ppm) = (soil lead concentration/1220 + 1.4) ppm. Using their data and a

Savannah Harbor estimate of 32 ppm soil lead concentration, it can be predicted that plants would have a tissue level of 1.4 ppm (dry wt). This level is the same as would be predicted by the Palazzo study (5.7 ppm/4=1.4 ppm) since it investigated soil levels four times higher than estimated for Savannah and found a plant tissue level of 5.7 ppm. Green-winged teal weights range from about 275 g to 375 g (Baldassarre, 1986). They would be expected to consume about 10 percent of their body weight per day (Fredrickson, 1994, personal communication). For a 325 g (11.4 oz) green-winged teal consuming vegetation with a Pb concentration of about 1.42 micrograms/g dry weight (0.142 micrograms Pb/g wet weight, assuming plants are 90 percent water), this would mean 32.5 grams of plant matter containing 4.6 micrograms of lead would be consumed daily (the estimated intake corresponds well with Baldassarre (1986), where it was found that teal in Texas consumed about 30 g of corn per day). This equates to a body burden of 0.01 micrograms Pb/g body weight/day. Japanese quail reduce egg production with a dietary intake of 10 micrograms/g body weight (Edens et al., 1976, cited in Lee et al. 1986). Predicted body burdens in birds consuming plant material in the Savannah disposal areas would be much less than this.

F.3.17 Plants grown in contaminated sediments (Zn: 1307 ppm, Cr: 1651 ppm, and Pb: 398 ppm) under flooded conditions showed levels up to the following: Zn: 21.1 ppm, Cr: 10.4 ppm, and Pb: 3.8 ppm and under upland conditions : Zn:6.3 ppm, Cr: 8.64 ppm, and Pb: 1.56 ppm (Brandon et al., 1991). Since the original sediment contaminant levels int that study were 10 times higher than have been found in Savannah Harbor sediments, expected plant tissue chrome levels for Savannah CDFs should be in the 1 ppm range, at the upper bound of the normal range cited by Lee et al. (Table 7, Lee et al., 1991).

F.3.18 Animal uptake. Studies of the Times Beach CDF (Buffalo, NY) found that carnivores and detritivores accumulated greater concentrations of heavy metals than herbivores. They also found that lead, nickel and chromium moved through the food web within the upland ecosystem more than zinc, copper, and cadmium (Brannon et al., 1990, p.48). Operating conditions at the CDF are extremely important variables affecting contaminant migration, cycling, and mobilization pathways (Brannon et al, 1990, p. 6). More information is needed to precisely determine the importance of animal uptake to internal cycling of contaminants within CDFs (Brannon et al., 1990). Lead and chromium might be expected to accumulate in the food web of the disposal areas and are discussed further below. As stated above, little information exists discussing impacts of silver on higher organisms.

F.3.19 Animal Uptake of Lead. A study of oxic sediments along the shore near a lead smelter in New Brunswick, Canada, found that the Pb content of mussel tissue correlates best with certain Pb extraction fractions. The sulfur content of the sediments was found to play an important role in Pb accumulation in mussel tissue, with Pb bound to sulfur appearing to be less available. For the most part, an appreciable rise in tissue levels occurred when total sediment Pb levels were near or above 400 ppm (Bourgoin et al., 1991). Savannah Harbor sediment lead levels are much lower than this, averaging 20 to 60 ppm in different parts of the harbor. Lee et al. (1986) also found that elevated soil concentrations of Pb would result in increased lead in earthworm tissue. They compared soil and earthworm tissue lead levels and found a significant correlation. An estimate of the equation of the regression line shown in their figure 2-83 is: tissue Pb (ppm) = (3.5 + Soil Pb/500)ppm. Using the predicted average Savannah Harbor average sediment lead content of 32 ppm, this equation would predict invertebrate tissue levels of about 3.6 ppm (dry weight). Shovelers, a species that winters in the disposal areas, weigh about 1.5 lbs (3.3 kg)(US FWS, 1978) and black ducks, similar to Mottled ducks, weigh about 2.75 lb (US FWS, 1978). Lee et al., state that the dunlin (110 g) and black rail (100 g) eat 8.5 percent and 8 percent of their body weight per day. Ducks are thought to consume about 10 percent of their body weight per day (Frederickson, 1994, personal comment). Assuming animal prey are 77 percent water (earthworms, Lee et al, 1986), ducks would be expected to consume prey with a concentration of about 3.6 ppm lead dry weight or 0.83 ppm wet weight. This would be 0.83 micrograms Pb per gram of worm tissue. A 1.5 lb shoveler weighs about 3300 grams and consumes about 330 grams of food per day. This would equate to 0.08 micrograms Pb/gram body weight/day body burden. A 110 g dunlin, a species of shorebird that sometimes winters in the disposal areas, would be expected to eat 9.35 g of animal matter containing 7.76 micrograms of lead. This would equate to 0.07 micrograms Pb/gram body weight/day body burden.

F.3.20 Other studies have shown bioconcentration factors (BCFs) for lead in organisms exposed to marine sediments of 0.014 to 0.58 using wet tissue weights (Scott et al., 1994). Using these ranges, organisms feeding in Savannah Harbor sediments would be expected to have wet weight lead concentrations ranging from 0.45 to 18.6 ppm lead. Lead body burdens of shovelers feeding on these organisms would be expected to range from 0.045 to 1.86 micrograms Pb/gram body weight/day body burden. Dunlin body burdens would be expected to range from 0.038 to 1.58 micrograms Pb/gram body weight/day.

F.3.21 The effect of lead body burdens has been studied in the Japanese quail (Coturnix coturnix) where egg production was reduced with an intake of 10 micrograms/g dietary lead daily (Edens et al., 1976, cited in Lee et al., 1986, p. 454). This was calculated to be a daily body burden of 0.75 micrograms Pb exposure/gram body weight. Scanlon (1979) reported that carnivorous short-tailed shrews trapped along roadsides with lead concentrations of 19.9 to 109.7 ppm lead (a control area had 7.8 ppm Pb) had mean Pb body concentrations up to 34.8 ppm (dry wt.)(Lee et al, 1986). That would equate to approximately 11 micrograms/gram wet body weight. Lee et al. (1986) cite reports that Pb body levels in rats of 0.4 to 1.0 microgram/gram can cause physiological changes in rats. The high end of the calculated range of Pb exposure levels from Savannah Harbor sediments falls within the lower range of possible effects to birds and mammals. If most of the sediment lead were bioavailable, and the higher observed bioaccumulation factors were at work here, then one could expect some degree of physiological impact to birds feeding within the disposal areas from lead ingestion. However, as discussed elsewhere, the majority of lead in those sediments is not believed to be bioavailable, so lead exposure to birds feeding within the disposal areas is not believed to be of sufficient concern to take further action. As stated elsewhere in this analysis, no vegetation or wildlife have been observed in a stressed condition at or surrounding the disposal areas which would indicate a potential toxicity problem within the disposal areas.

F.3.22 Animal Uptake of Chromium. The degree of toxicity of Cr is related to its chemical form. Cr (VI) is the predominant species in sea water, and is readily taken up by marine organisms and is more toxic than Cr(III)(Sanders & Riedel, 1987, cited in Weiss et al, 1993). Mussels (Mytilus edulis) exposed to sediment concentrations of 195 to 561 ppm for 28 days have been shown to bioaccumulate Cr to tissue levels of 0.615 to 4.02 ppm (dry wt.) (McFarland et al., 1994). Clams (Macoma nasuta) exposed to the same sediments for 28 days have been shown to bioaccumulate chrome to 3.82 to 16 ppm (dry wt.). Areas of the Arabian Sea with sediments averaging 24.3 to 39.1 ppm Cr (dry wt.) were found to contain a fish with 8.51 ppm Cr (wet wt), a shrimp with 5.9 ppm Cr (wet wt.) and a seaweed with 9.1 ppm Cr (wet wt.)(Tariq et al., 1993). These reports show a wide range in expected tissue levels that do not correlate well with sediment levels, possibly due to differences in bioavailability (which could be due to the chemical form the substance is in or other environmental factors). A literature review of studies on organisms feeding in marine sediments found bioconcentration factors for chromium to range from 0.04 to 0.35 (Scott et al., 1994, draft). Using a predicted average Savannah Harbor sediment concentration of 69 ppm chrome, organisms feeding in those sediments would be

expected to have tissue chrome levels of 2.8 to 24 ppm wet weight. The District was unable to locate any study on the effect of low levels of chrome body burdens on birds.

F.3.23 Animal Uptake of Silver. A literature review of studies on organisms feeding in marine sediments found bioconcentration factors for silver to range from 0.18 to 19.7 (Scott et al., draft). Using the predicted average Savannah Harbor sediment concentration for silver of 1.3 ppm, organisms feeding in those sediments would be expected to have wet weight body concentrations of 0.2 to 26 ppm silver. The District was unable to locate any study on the effect of low levels of silver body burdens on birds.

F.3.24 Leachate to groundwater. A recent weir study (NMFS, 1994) found underdrain arsenic concentrations of up to 298 micrograms/l. District monitoring of underdrain effluent has found the pH mostly in the 6.4 to 6.8 range, but a pH of 12 has been recorded. These are underdrain weir effluent releases that would not impact wildlife within the disposal areas. The underdrains are being closed, but it is proposed that new underdrains be constructed to outfall to the Savannah and Back Rivers. Underdrain releases would divert water that would be expected to enter groundwater.

F.3.25 Surface runoff. Once disposal has ceased, drying and oxidation of the sediments will take place. Salt accumulates on the surface of the dredged material where rainfall can dissolve and mobilize the salts in surface runoff. If the dredged material is high in sulfide and low in carbonate, oxidation may result in formation of highly acidic conditions in surficial sediments (Brannon et al. 1990). Modeling of suspended solids within ponded waters, such as occur within a CDF (looking at pathways such as resuspension of deposited sediments and surface runoff from emergent sediment) may be important in predicting contaminant impacts within a CDF; however, predicting such pathways through modeling of suspended solids with ponded water has not been well refined (Brannon et al., 1990). Due to the correspondence of predicted overall metal levels to those occurring in natural soils, no significant impacts are expected. Further prediction beyond the discussions above are not possible.

F.4.00 CONCLUSIONS.

F.4.01 As discussed above, the only contaminants identified to be of possible concern in the confined disposal areas are heavy metals. Metals may exert direct acute effects on organisms by affecting their growth and survivability. When looking at the overall composition of Savannah Harbor sediments, no contaminants have been identified which exist at levels that would indicate a concern for probable acute impacts. The average of cadmium in the in-channel sediments, the average levels of chrome, copper, and arsenic in sediments within the Sediment Basin, and average levels of silver within both in-channel and Sediment Basin sediments are above the ER-L's of Long and Morgan (1993). Average levels of cadmium, silver, and arsenic in sediments outside the channel are also above the ER-L's. The ER-L is the lowest 10 percentile of data or predictions associated with biological effects under some set of conditions. None of the average values approach the ER-M's. As discussed above, some concern remains for metal concentrations in out-channel sediments, especially cadmium. Since sediments outside the channel constitute only a small fraction of total O&M sediment that would be placed in the disposal areas, any possible effects by cadmium would be diluted below any level of concern. Moreover, since agitation dredging has been taking place throughout the time in which the sediment data discussed here was taken, the channel and Sediment Basin sediment data should include the effects of agitation dredging and sediments outside the channel. In addition, this discussion does not take into account the extent to which the observed bulk total concentrations of metals in the Savannah Harbor sediments may not be bioavailable.

F.4.02 The likelihood that a significant proportion of these metals would be bioavailable or exert chronic effects through bioconcentration is small. An earlier investigation of Savannah Harbor sediments (Savannah Labs, 1983) found that most (66 to 90 percent) of the chrome, lead, and silver occurred in the moderately-reducible or residual fractions that tend to be immobile. The District believes that sufficiently high metals concentrations are not bioavailable in concentrations that would exert chronic effects on organisms that accumulate metals in their tissues or feed on organisms that have accumulated metals.

F.5.00 RECOMMENDATIONS. Adequate data are available to conclude that current O&M sediments from the Navigation Project do not contain either metals or organic compounds at levels of concern. There is evidence that sediments outside the main channel may contain PAH's at levels of concern. There is also evidence that the sediments outside the main channel may contain metals at levels of concern. Non-O&M dredging projects should, therefore, include a sediment evaluation for metals and PAH's.

APPENDIX G

MITIGATION PLAN
FOR THE DIKING AND USE OF
DISPOSAL AREA 14A
AND MISCELLANEOUS DISPOSAL OPERATIONS
IN SOUTH CAROLINA

MITIGATION PLAN
FOR THE DIKING AND USE OF
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G.1.00 ACTIONS REQUIRING MITIGATION.

G.1.01 Alternatives 2, 3, and the Selected Plan (Alternative 8) have a component that would lead to the loss of significant wetlands -- that being the diking and use of Disposal Area 14A. Miscellaneous operations at the confined disposal facilities (CDFs) would also result in the loss of wetlands. Federal policy requires mitigation for the loss of wetlands.

G.2.00 OVERVIEW OF MITIGATION PROCESS.

G.2.01 Several steps were followed in the development of a mitigation plan. Those steps consist of the following:

A) Selection of the dike alignment which would minimize wetland impacts yet serve the purposes of the project. This action would define the extent of the site which would be impacted.
B) Identification of the types of vegetation present at the site.
C) Identification of the wetland jurisdiction line.
D) Identification of the functional values provided by the wetland existing at the site.
E) Identification of alternate means of replacing those functional values at other sites.
F) Selection of the best action to replace the lost functional values and the scope of the replacement necessary.
G) Detailed design of the mitigation plan.

The following paragraphs describe the rationale supporting each of the decisions which were made as the District followed the steps listed above.

G.2.02 Selection Of The Dike Alignment. Dikes exist of two sides and part of a third side (road) of Disposal Area 14A as a result of previous construction of a road and dikes for adjacent CDFs. Only the north side of the site remains undiked. The selected alignment for the north dike was approved by the South Carolina Coastal Council in July 1984. That alignment was based on a review of vegetation at the site and the location of areas which had previously been impacted by unconfined deposition of dredged material. Such deposition increased the ground elevation

of some areas to the point that they are no longer considered wetlands. At other areas, the ground elevation was raised to the point that only vegetation that is generally considered lower quality wetland species exists. The approved dike alignment minimizes the acreage of high quality wetlands that would be destroyed, while still allowing construction of a technically viable settlement basin. Approximately 815 acres would be enclosed by the approved alignment.

G.2.03 Identification Of Vegetation Present. A two-step process was followed to identify the vegetation existing at the site of the proposed CDF; (1)delineation of vegetation from aerial photography, and (2)field verification of vegetation types.

G.2.04 Using 1991 aerial photographs taken for the Georgia Department of Transportation (GA DOT), vegetation types in the area to be impacted were delineated by a Biologist from the District's Planning Division. The vegetation and wetland delineations were field verified from March to May 1994 by that Biologist and another Biologist from the District's Regulatory Branch. Figure 1 shows the locations and extent of the various vegetation types existing at the site. A summary of the habitat which would be impacted by development of the 815-acre site as a CDF is shown below. A detailed description of the habitat types is included in Table 1.

HABITAT TYPE		# ACRES
Wetland		
Low/moderate value within old dike		33
Low/moderate value outside old dike		85
High value outside old dike		187
	Subtotal	305
Upland		
High value wildlife		43
Low value wildlife		467
	Subtotal	510
	Total	815

G.2.05 High functional value wetlands at the site consist primarily of (1) Distichilis spp. and Juncus roemerianus marsh, which primarily functions as wildlife habitat, (2) Spartina cynosuroides marsh, which primarily functions as wildlife habitat and a source of detritus, and (3) Scirpus spp. marsh, which primarily functions as wildlife habitat and as a wildlife food source. Savannah District developed a Mitigation Plan to replace the functional value of the wetlands which would be lost.

DISPOSAL AREA 14B

DISPOSAL AREA 13B

SAVANNAH RIVER

HABITAT TYPES

1 OPEN SHALLOW WATER, MAY INCLUDE SCATTERED VEGETATION
2 SPARTINA CYNOSUROIDES
3 VERY WET, MOSTLY SEDGES, INCLUDES MIXED GRASSES/COMPOSITES, MAY INCLUDE SCATTERED BACCHARI
4 PRIMARILY VERY WET BACCHARIS HALIMIFOLIA WITH SOLIDAGO, ETC., UNDERSTORY
5 MIXED INUNDATED VEGETATION
6 PRIMARILY MYRICA CERIFERA
7 DISTICHILIS SPICATA AND JUNCUS ROEMERIANUS
8 MIXED BACCHARIS HALIMIFOLIA, SAPIUM SEBIFERUM (CHINESE TALLOW TREE) AND MULBERRIES (MORUS ALBA AND M. RUBRA)
9 SPARTINA ALTERNIFLORA
10 BACCHARIS HALIMIFOLIA WITH LITTLE UNDERSTORY, UPLAND
11 INUNDATED BORROW AREA
12 WET AREA WITH MIXED GRASSES/COMPOSITES AND SOME OTHER HERBACEOUS
13 OPEN HIGH GROUND WITH MIXED GRASSES AND OTHER HERBACEOUS VEGETATION
14 BACCHARIS HALIMIFOLIA WITH LITTLE UNDERSTORY, WETLANDS

SCALE 1000'

NOTE:

FROM AERIAL PHOTOGRAPHS, JANUARY 22, 1991

EXISTING VEGETATION

DISPOSAL AREA 14A

TABLE 1

VEGETATION TYPES
CURRENTLY AT
DISPOSAL AREA 14A

VEGETATIVE TYPE	VEGETATIVE CLASSIFICATION	ACREAGE
WETLANDS		
High value outside the old dike		
Open water	1	2.3
Spartina alterniflora	9	1.0
Spartina cynosuroides	2	49.9
Distichilis/Juncus	7	86.1
Sedges (Scirpus spp.)	3	10.6
Mixed inundated vegetation	5	36.6
SUBTOTAL		186.7
Moderate value outside the old dike		
Primarily Baccharis spp.	4	24.4
Low value outside the old dike		
Baccharis spp. (wet)	14	60.5
Mixed grasses/herbs	12	0.1
SUBTOTAL		60.6
Low/moderate value inside the old dike		
Spartina cynosuroides	2	1.6
Sedges (Scirpus spp.)	3	2.0
Mixed grasses/herbs	12	10.6
Primarily Baccharis spp.	4	19.0
SUBTOTAL		33.2
TOTAL WETLANDS ACREAGE		304.7
UPLANDS		
High value inundated borrow area	11	42.9
Moderate value mixed trees	8	76.1
Moderate value Myrica cerifera	6	71.5
Low value Baccharis spp.	10	228.7
Low value mixed grasses/herbs	13	91.1
TOTAL UPLANDS ACREAGE		510.3
TOTAL ACREAGE OF SITE		815.0

G.2.06 Identification Of The Wetland Jurisdiction Line. The wetland jurisdiction line was delineated by a Biologist in the District's Planning Division at the same time as he described the site's vegetation types. The jurisdiction line was field verified from March to May 1994 by that Biologist and another Biologist from the District's Regulatory Branch.

G.2.07 Identification Of The Functional Values Provided By The Site's Wetlands. The proposed site of this CDF has been impacted by previous dredged material disposal operations. Those historic disposal events impacted the existing wetland vegetation and raised the elevation of a significant portion of the site. The extent of the impacted marsh is approximately 815 acres. Within that area, 510 acres have been raised to the extent that they now fall outside the wetland jurisdictional line and are considered uplands. The disposal operations were located along the Savannah River side of the site, so that portion of the site experienced the most impact and contains the highest ground elevations. Part of that high ground has since been used as a source of borrow material for the construction of dikes for nearby disposal areas. The entire portion of the site along the river is now high ground. Therefore, no tidal exchange occurs at the site from the Savannah River. In addition, dikes which define CDFs located adjacent to Area 14A further restrict tidal exchange. Disposal Area 14A presently has three sides which are either diked or high ground. Tidal exchange for the remaining wetlands at the site must occur through the length of the rectangular-shaped site. This lack of good tidal exchange, coupled with the increase in marsh elevation stemming from previous unconfined disposal operations, has resulted in significantly reducing the traditional functional values of the salt marsh at this site.

G.2.08 The District attempted to follow the traditional approach to mitigating for lost or damaged wetlands; replacing the lost wetland vegetation with similar vegetation at another site. However, most high ground around the harbor is already developed and would be very expensive to purchase and then excavate to create a wetland. No single high ground tract or combination of smaller tracts could be identified where sufficient acreage of wetlands could be created. The District queried staff of resource agencies and environmental groups about potential wetland restoration sites; none were identified. Since a site or combination of sites could not be identified, excavation of high ground property was deleted from consideration as a method of wetland creation. Shallow water estuarine areas often contain features which have significant environmental value. Since suitable shallow areas are not extensive in the harbor area and deposition of material to fill the site could produce significant adverse impacts to benthic and aquatic resources, filling those areas to build up the elevation of the site so that marsh

vegetation could flourish was judged to be unacceptable. Therefore, the filling of shallow areas was deleted from consideration as a method of wetland creation. The infeasibility of these two approaches to wetland creation led to a conclusion that creation of a similar wetland within the immediate project vicinity to replace the functional values which would be lost at Disposal Area 14A was an unimplementable alternative for this project.

G.2.09 Identification Of Alternatives To Replace The Lost Functional Values. Early coordination with resource agencies revealed a degree of agreement on the functional values which would be lost and that should be replaced. Although salt marsh has many values and serves many functions, the value of the wetlands at this site is somewhat unusual, as described in the previous paragraphs. The site's location in a tidal estuary effectively eliminates any flood control function. The high ground at the site on the Savannah River side eliminates any water purification function which a site downriver of an industrialized city would normally possess. The restricted tidal exchange and raised elevations greatly reduced the value of the salt marsh located on the site. Therefore, the Distichilis spp. and Juncus roemerianus vegetation was judged to primarily function as wildlife habitat. The Spartina cynosuroides vegetation primarily functions as wildlife habitat and a source of detritus, while the Scirpus spp. marsh primarily functions as wildlife habitat and as a wildlife food source. The resource agencies recognized that traditional wetland mitigation procedures should be pursued first to attempt to replace the functional values which would be lost at a site, but they agreed that the traditional wetland mitigation procedures had not worked effectively for the proposed impact.

G.2.10 The next step was a review of what resources were most important in the function of the Disposal Area 14A site within the harbor. This was an attempt to view development of Disposal Area 14A in the larger context of the harbor's estuarine ecosystem. Agreement was reached between the agencies on the value of the site for wildlife habitat and the critical importance which the Project's adjacent CDFs provide shorebird and waterfowl populations in the harbor area. The District then developed the concept for mitigating wetland functional values lost at Disposal Area 14A through the creation of critically needed wildlife habitats; particularly habitats for migratory and endemic waterfowl and shorebirds. Mitigation efforts would be prioritized toward increasing wildlife values at the Project's confined disposal facilities. If sufficient habitat values could not be created at those disposal sites, off-site actions would then be investigated, but at sites within the Project area.

G.2.11 Selection Of The Best Replacement Method And Scope Of The Replacement Needed. Migratory birds were identified as the target group of wildlife species which could most benefit from increases in habitat availability in the Project area. These birds include least terns, Wilson's plovers, black-necked stilts, and mottled ducks, as well as large numbers of other migratory shorebird and waterfowl species. Many land bird species also use the areas at times, especially the shrub habitat found along and adjacent to the dikes. The confined disposal areas provide valuable habitat for those species due to the availability of food and the isolated and open nature of the sites. Although a number of bird species reside in the project area throughout the year, habitat for migratory shorebird species appears to be especially critical since those species regularly occur in the spring and fall in the CDFs in large numbers. Ten basic management techniques were identified which would benefit those migratory birds which rely on the Project area for an important period of their lives. Those techniques are described in paragraphs G.2.12 through G.2.21.

G.2.12 Creating Nesting Islands. Nesting islands could be provided within each disposal area. These areas would be covered with sand and scattered wood debris and have a gentle slope to make them suitable for least terns and Wilson's plovers. Other criteria for proper nesting habitat may be developed. These areas should be available and undisturbed from April 14 to August 6 (unless Wilson's plovers are present, in which case the areas should remain undisturbed until August 28). Areas could be disturbed earlier, if nesting species are not present. At least two 1- to 3-acre nesting islands could be provided within each disposal area. These islands could be located in each disposal area so that they would be surrounded by water or mud. Each island would be covered with coarse sand if the construction materials were not suitably sandy. This would result in 42 acres of wildlife benefit (two 3-acre islands in each of seven disposal areas). Vegetation would be controlled annually. Islands would also serve as year round roosting areas (would be similar to the natural high marsh panne roosting sites cited by Howe, 1989).

G.2.13 Creating Upland Nesting Areas. Bare ground nesting areas could be provided on high ground outside the diked perimeter of a confined disposal area. These areas would be cleared of existing vegetation and possibly covered with dredged material to provide a sandy nesting substrate. As in the previous paragraph, the site would be graded to produce a gentle slope to make them suitable for least terns and Wilson's

plovers. Other criteria for proper nesting habitat may be developed. These areas would generally remain undisturbed from April 14 to August 6 (unless Wilson's plovers are present, in which case the areas should remain undisturbed until August 28). These areas would not provide as high a quality nesting habitat as the islands described in the previous paragraph since the nests would be accessible to terrestrial predators.

G.2.14 Holding Ponded Water. At least 50 acres of water could be held in one of the disposal areas (Area 12A, 12B, 13A, 13B, 14A, 14B or Jones/Oysterbed Island) so that at least one 50-acre wet area would be present at any time during the year. This would result in at least 50 acres of wildlife benefit. Only a minimal depth of water would be needed, as the ponded area would primarily serve as a resting site for migratory waterfowl. For Disposal Area 14B, this would be in addition to the area currently inundated by tidal flow into the weirs. Maintenance of a constant water level would depend on rainfall to counter the effects of evaporation and infiltration, which lower the water surface.

G.2.15 Slow Release of Ponded Water. If sufficient rainfall is obtained, a constant water level could be maintained in the summer and winter and then slowly lowered through the spring and fall. The wet area would result in 50 to 100 acres of beneficial wildlife habitat.

G.2.16 Mowing of Dike Slopes. Mowing of dike slopes could be halted during the nesting season (March 1 to July 14) to provide additional vegetated upland habitat. The dike crest could continue to be mowed to allow needed access around the Disposal Areas.

G.2.17 Construction of an Offshore Bird Island. Construction and maintenance of a bird island north of the north harbor entrance jetty was identified as a valuable habitat enhancement feature. The island should be 3 to 10 feet above highest water level to prevent wave overtopping and should be at least 0.3 km from mainland to prevent predators from swimming to the site. A 1-acre island at 14' above MLW would produce an 11-acre surface area above MLW (assuming a 1:35 slope). A 5-acre island with the same side slope would produce a 14-acre surface area above MLW.

G.2.18 Monitoring of Bird Nesting. Monitoring of bird nesting at the confined disposal areas could be performed on a regular basis by District Biologists. This would provide information on bird use of the sites which could be used for future management decisions.

G.2.19 Manage Existing Areas for Optimum Bird Habitat After Each Disposal Operation. Ideal beneficial management strategies were identified for the following four different groups of birds:

(a) For spring migrants, there should be fall flooding (1 month before heavy freeze) and a spring draw down at a rate of 2 to 3 cm per week (Helmers, 1992). The draw down should begin in late March to provide optimal foraging opportunities for late migratory dabbling ducks (Howe, 1989).

(b) For fall migrants, two schemes are available. A disposal area could remain flooded through the spring and early summer, with either slow draw down or natural evaporation during the fall. For areas that are dry, shallow disking followed by shallow flooding 2 to 3 weeks before summer/fall migration begins (Helmers, 1992) would optimize the site's habitat value. Howe (1989) suggests reflooding to 5 to 76 cm.

(c) For waterfowl, the ponded water in the disposal area would be drawn down in the spring to firm the substrate and initiate germination of widgeon grass. Pool levels would then be drawn down in April through early June. After plants germinate, the area would be gradually reflooded to 35 to 45 cm to allow plants to grow. During late fall and early winter, water depths would be decreased approximately 10 cm per month (Helmers, 1992). Irrigation at 10 cm per month would increase plant growth, but would be quite expensive.

(d) For nesting birds, a constant water level in the late spring and early summer would be maintained. This would be followed by a slowly dropping water level in the late summer. The wet area would be expected to cover a minimum of 50 to 100 acres.

G.2.20 Maintaining High Marsh Pannes. Natural high marsh pannes could be maintained to provide roosting and feeding sites (Howe, 1989).

results of that study are contained in Appendix E of this EIS. In summary, the District evaluates the sediments prior to their excavation from the riverbed and evaluates the discharges leaving the CDFs.

G.2.25 However, the District does not typically evaluate the quality of sediments once they are placed inside the CDFs. Up to this point, technical justification for such expenditures did not exist since those sites were only used for dredged material disposal purposes. With the advent of managing the CDFs for the production of wildlife habitat as a component of overall CDF operations, it is prudent to ensure that the habitat being created is not harmful to wildlife. Therefore, the District will conduct chemical testing of sediments in the CDFs.

G.2.26 Sampling will be performed of soil material within the first 1 foot of the surface. It is within this 1-foot zone that invertebrates exist which are available to wildlife and most plant roots exist (annuals and pioneer species). Since fluctuating water levels within the areas greatly change the type of habitat which a specific location provides over time -- sometimes inundated and other times dry -- samples from within each CDF will be combined. The testing protocol to be followed on the soil samples would be coordinated with the South Carolina Department of Natural Resources and approved by the US Fish and Wildlife Service prior to the sampling being conducted. The District could participate with other interests to expand the scope of this sediment testing, but the testing strategy outlined in this paragraph would be the minimum effort that would be performed.

G.2.27 Selection of Specific Management Strategy. The specific management strategies were evaluated for both their expected benefits for birds, their impacts on expected disposal operations and their impacts on disposal site management activities. Strategy 1 reflects present operational practices. Certain disposal areas provide no suitable nesting habitat during some years. Other years, the areas may contain little or no water during the winter months when waterfowl often use the sites. Depredation Permits are sometimes required from the US FWS to allow contracted dredging operations to proceed without expensive delay costs (up to $25,000 per day). The ability to obtain those permits is not guaranteed, so uncertainty exists about the ability to perform disposal or disposal area improvement actions during the nesting season. The large uncertainty which arises concerning the availability of a specific disposal site for either disposal or regular management activities greatly hinders effective management of all the confined disposal facilities. Strategies 2 and 3 would provide significant improvements of the confined disposal facilities for bird habitat over that which is presently available. Strategy 2 maximizes bird use of the areas

G.2.21 Creating Roosting Islands. Islands could be created in managed non-tidal wetlands for use by birds as roosting sites. Vegetation at the sites would be controlled to optimize the suitability of the vegetation for roosting.

G.2.22 Development of Specific Management Strategies. Using the ten basic management techniques just described, three potential specific management strategies were identified to increase wildlife (migratory bird) habitat in the CDFs. These strategies were analyzed for both their impacts to dredged material disposal operations and the benefits they are likely to produce when applied at these CDF sites. Before describing the strategies and their impacts, the issue of dredged material testing should be addressed.

G.2.23 Dredged Material Testing. Although the CDFs currently provide valuable habitat for migratory birds, this use of the sites is a byproduct of conditions resulting from dredged material disposal operations conducted at those sites. These CDFs are not specifically managed to produce wildlife habitat. The management strategies described in the previous paragraphs would change that situation. If those strategies are implemented, a component of the Savannah Harbor Navigation Project would be the creation and maintenance of wildlife habitat with the intention of increasing wildlife usage of the CDFs. With such a purpose, it is prudent to ensure that the habitat being created is beneficial to wildlife. As with nearly all dredged material disposal areas across the world, the toxicity of the deposited sediments is questioned.

G.2.24 Savannah District regularly evaluates sediments in the Savannah Harbor prior to dredging operations to ensure that the excavation and disposal activities can be conducted in an environmentally acceptable manner. This review has included chemical testing of the river sediments. (Appendix F of this EIS contains a summary of the sediment testing data which is available for Savannah Harbor.) The District also considers spills which are reported to have occurred along the river to determine if those new inputs are likely to have significantly altered the quality of the sediments since they were last analyzed in detail. The District also monitors the effluent from the CDFs to ensure (1) its compliance with the state Water Quality Certification, and (2) that the discharges are not causing any unexpected and unacceptable environmental impact. In addition, the District recently conducted a study of the impacts of the CDF discharges into the marshes along Wright River. The

at the expense of disposal and regular disposal site maintenance activities. The procedure would result in repeated choices having to be made between using a site for disposal operations and having sufficient drying time of that site to conduct necessary disposal site management activities. This was judged to be unacceptable and causes that strategy to be infeasible since sufficient times are needed to both conduct necessary disposal activities and perform required disposal site maintenance activities. Therefore, Strategy 3 (2-year rotational use of disposal areas with modifications for bird use) was selected for use. That strategy maximizes the benefits of the confined disposal facilities to birds while allowing sufficient periods for disposal operations and drying time through the rotational use of the sites.

G.2.28 Scope of The Replacement Needed. With traditional wetland mitigation actions consisting of the creation or restoration of similar vegetation at another site, there is a degree of uncertainty on the true success of the action in replacing the functional values of the original wetland vegetation. Although the same vegetation species can be made to grow at another site, there is still the question of whether all the original site's functional values are replaced at the new site. Therefore, some multiplier, typically 2:1, is applied to the wetland acreage to be created to provide more assurance that the true value of the original wetland site has been replaced.

G.2.29 With the mitigation scheme to be used for this site, a higher degree of certainty can be obtained in actually producing the agreed upon product. The view of the Corps and resource agencies' staffs is that the present value of Disposal Area 14A is primarily reflected in the site's provision of wildlife habitat. Based on that position, an agreement on the target species, and an analysis of the value of that habitat for the agreed upon target species, a mitigation plan can be developed which would result in similar levels of habitat for those species. Since the mitigation goal is then defined as habitat for specific wildlife species, a mitigation plan can be developed to produce the required amount of habitat. The bulk of the mitigation plan which the District developed uses adjacent CDFs under management control of the Corps and the sponsor (Chatham County). With the goal being a specific amount of habitat production on land which is under one's direct management control, a high degree of certainty can be obtained that the mitigation goal will actually be met. Because of that degree of certainty, this mitigation plan will require only an overall 1:1 replacement of the site's identified functional values.

G.2.30 One component of the Mitigation Plan is the restoration or creation of wetlands as in-kind mitigation. During the course of the study, neither the Corps nor regulatory agencies were able to identify specific sites where a significant amount of wetlands could be created in the harbor area in a reasonable manner. Never-the-less, during public review of the Draft EIS, the SC Department of Health and Environmental Control, Office of Ocean and Coastal Resource Management (SC DHEC-OCRM) stated that some form of in-kind mitigation would be required as part of an acceptable comprehensive mitigation package for this proposed Project. After reviewing Table 1 with its detailed information on vegetative types which would be impacted, the SC DHEC-OCRM stated that a minimum of 25 acres of in-kind mitigation would be necessary. The District and local sponsor agreed to include such a component in the final Mitigation Plan. During subsequent discussions with the SC DHEC-OCRM, they stated that they periodically become aware of sites where opportunity exists to restore or create wetlands, or purchase valuable habitats to protect them from development. The SC DHEC-OCRM indicated it would be willing to select sites for future wetland mitigation actions and oversee accomplishment of necessary mitigation actions. To accomplish this, Chatham County as the project sponsor -- or GA DOT as its designee -- will establish an escrow account which the SC DHEC-OCRM will administer to perform wetland restoration/creation or protection measures as it deems most appropriate as sites become available in the future.

G.2.31 Another component of the Mitigation Plan is the enhancement of fishery habitat within existing impoundments in the harbor area. Upon review of the Draft EIS, the NMFS stated it felt that wetland functional values which are beneficial to fishery resources were not being adequately compensated. The revised Mitigation Plan was still approximately 200 Habitat Units short of compensating for Project-induced wetland impacts. Various methods were considered to benefit fishery habitat in the project vicinity. These included deposition of shell on the intertidal banks of tidal creeks, deposition of shell on the ocean face of the nearshore bird island, construction and placement of concrete pads with PVC-pipes extending outward to create habitat for fish and shellfish, placement of concrete shells with holes in them for fish to use as shelter, and increasing fishery access or fish habitat quality at existing confined sites. Savannah District consulted the resource agencies to identify potential sites for these measures and assist in estimating the cost of construction. The final method, increasing fishery access or fish habitat quality at existing confined sites, proved to be the most cost-effective way of producing the needed 200 HUs of fishery habitat. Biologists with the Savannah National Wildlife Refuge identified an existing 228-acre impoundment at the Refuge where fishery habitat could be greatly increased. Other impoundments were identified, but the

228-acre site best matched the Habitat Unit need the proposed Project was facing. The impoundment selected is presently operated without having a daily connection with adjacent tidal waters. The impoundment currently has one water control structure with stop logs which maintain a constant water surface elevation. Once tidal flows enter the impoundment through the control structure, stop logs are placed across the opening to block further daily flows. This procedure traps the water --and any fish present -- within the impoundment until a decision is made sometime later to drain the impoundment either partially or completely. The proposed action consists of installation of a second water control structure which would generally be open to all tidal flows. This would provide a constant connection between the impounded water and adjacent tidal waters. Establishing this connection would result in a daily flushing of the impoundment, thereby substantially improving its water quality and making available the shallow areas to fish for feeding and spawning. The entire aquatic ecosystem at the impoundment would benefit from the increased flow and the action would directly benefit fishery resources.

G.3.00 DEVELOPMENT OF THE MITIGATION PLAN.

G.3.01 Summary of the Mitigation Plan. The Plan consists primarily of constructing additional wildlife habitat within existing diked disposal areas used by the Savannah Harbor Navigation Project and operating those areas for increased use by wildlife. As rainfall permits, water levels would be maintained in one area over the Winter and Spring each year to provide resting and feeding habitat for migrating waterfowl. Water levels would also be managed in one area with a slowly dropping surface during the Summer, rainfall permitting, for the benefit of resident shorebirds. One disposal area from each rotational pair would be available throughout the approximately 2-year rotation period for disposal/wildlife management purposes. Drying and construction activities would be occurring in the other disposal area in the rotational pair, so that second area would provide no wildlife habitat during that period. Nesting mounds would be created within the areas for migratory shorebirds. An offshore island would be established for use by bare ground nesting migratory birds. The island would be located in the nearshore area east of the Turtle Island Wildlife Management Area. An upland nesting area outside the dikes at the eastern end of the Jones/Oysterbed Island disposal area would also be established for use by bare ground nesting migratory birds. Restoration or protection of 25 acres of tidal wetlands

would be performed in South Carolina at sites identified by the SC DHEC-OCRM. Construction of a water control structure at an existing 228-acre impoundment within the Savannah National Wildlife Refuge would allow tidal flows to be established in the impoundment, thereby benefitting fishery resources.

G.3.02 The proposed Mitigation Plan replaces the habitat values which would be lost through the diking and use of Disposal Area 14A, and through miscellaneous disposal area operations in South Carolina. Loss of 3.2 acres of wetlands would also occur in Georgia as a result of miscellaneous disposal area operations at existing CDFs (Disposal Areas 1N and 2A) located in that state. Mitigation for those wetland impacts would occur at a 2:1 rate through actions which have yet to be determined, but which would be implemented prior to use of the improvement causing the wetland impact. Savannah District would submit a plan to mitigate the losses of Georgia wetlands to both the Coastal Resources Division of the Georgia Department of Natural Resources and the US Fish and Wildlife Service for approval. Those two agencies would need to approve the Mitigation Plan prior to its implementation.

G.3.03 Development of the Mitigation Plan. Habitat benefits were quantified for four general areas: (1) those presently produced at Disposal Area 14A, (2) those currently produced at CDFs in the middle and lower harbor (Management Strategy #1), (3) those impacted by management operations conducted outside the CDFs, and (4) those which would be produced inside the CDFs through the use of Management Strategy #3. A number of steps were necessary to quantify the habitat value of each site. Four categories were used to describe bird habitats; bare ground nesting, wetland nesting, shorebird feeding and wintering waterfowl. An additional category was included to address the detrital export function of wetlands. A final category was established to address the wetland functional values which directly benefit fishery resources.

G.3.04 Savannah District applied a variety of factors to calculate the value of sites for specific wildlife purposes. Based on past operational experience, the percentage of each area was identified that is normally inundated during a disposal operation. That factor led to a determination of the maximum acreage within each site which would be available at some period of the year for various wildlife uses. The sites were then examined to determine what wildlife habitat functions would exist at each tract (acres of disposal area floor). The normal duration of a disposal operation and subsequent drying period was then taken into account. The addition of that factor introduced the duration over which a tract would be available for use by wildlife for a given habitat function. The calculations were performed for those functional values which would be produced

both (1) during and immediately subsequent to disposal operations, and (2) after the initial draw-down of the area is complete. The following factors were then used to recognize the quality of a habitat or the scarcity of that habitat within the region:

* A factor of 1.0 was applied for typical bare ground nesting, wetland nesting, shorebird feeding and waterfowl feeding habitats.

* A factor of 2.0 was applied to the detrital function of Spartina marshes to reflect the importance of that function as the base of the estuarine and nearshore food webs. The sites affected are those in Disposal Area 14A and those adjacent to the existing confined disposal facilities.

* A factor of 0.5 was applied in recognition of the lower quality of 78 acres of existing previously impacted (lower value) wetlands (Baccharis halimifolia dominated) at Disposal Area 14A. This habitat provides a variety of minor benefits such as shorebird feeding, waterfowl nesting and waterfowl feeding. To simplify calculations, these functions were combined and expressed as shorebird feeding.

* A factor of 1.0 was applied to Spartina and other high value wetlands to reflect the importance of that vegetation to fishery resources.

* A factor of 0.5 was applied to moderate and low value wetlands to reflect the reduced value of that vegetation to fishery resources.

G.3.05 Table 2 shows a sample calculation. The culmination of these analyses are numbers which express the value of a particular disposal site for a certain wildlife function. That number is called a Habitat Unit (HU) since it represents the amount of a certain habitat which a site produces. The different categories of functional values can be combined into a single number to represent all wildlife values of that disposal area. Table 3 displays the functional habitat values which the various disposal areas have under the Without Project Condition.

G.3.06 The analysis of habitat units revealed that the diking and use of Disposal Area 14A would result in a decrease in the site's wildlife functional value from a level of 1018 HUs to a level of 177 HUs, for a loss of 841 HUs. Miscellaneous disposal area management operations would result in an additional loss of 18 HUs in South Carolina and 9 HUs in Georgia. Replacement of

TABLE 2

SAMPLE CALCULATION OF HABITAT VALUE

AREA 12B
WITHOUT PROJECT CONDITIONS
SHOREBIRD FEEDING HABITAT

ITEM	GIVEN/ FACTOR	CALCULATED VALUE
DISPOSAL AREA	12B	
TOTAL SIZE (ACRES)	710	
AREA WITHIN DIKES (ACRES)	692	
PERCENTAGE INUNDATED	90	
AVAILABLE ACRES (692 * 0.90)		623
ACRES USED FOR SHOREBIRD FEEDING - DRYING	98	
ACRES USED FOR WATERFOWL FEEDING - DRYING	0	
ACRES USED FOR SHOREBIRD FEEDING DURING DREDGING (623 - 98 - 0)		525
AVAILABILITY OF FEEDING HABITAT DURING DREDGING EVENTS (MONTHS)	1	
ACRES USED FOR SHOREBIRD FEEDING - DREDGING (525 * 1/12)		44
AVAILABILITY OF FEEDING HABITAT DURING DRYING (MONTHS)	2	
ACRES USED FOR SHOREBIRD FEEDING - DRYING (98 * 2/12)		16
DISPOSAL EVENTS/YEAR	1.5	
ACRES USED FOR SHOREBIRD FEEDING/YEAR ((44 + 16) * 1.5)		90
DURATION OF SHOREBIRD FEEDING NON-DREDGING (MONTHS)	3	
ACRES USED FOR SHOREBIRD FEEDING - NON-DREDGING (98 * 3/12)		25
TOTAL ACRES OF SHOREBIRD FEEDING HABITAT (90 + 25)		115
HABITAT SUITABILITY FACTOR	1.0	
TOTAL SHOREBIRD FEEDING HABITAT UNITS (115 * 1.0)		115

TABLE 3

EVALUATION OF HABITAT FUNCTIONAL VALUES
AT
SOUTH CAROLINA
CONFINED DISPOSAL FACILITIES
UNDER WITHOUT PROJECT CONDITIONS
(IN HABITAT UNITS)

DISPOSAL AREA	BARE GROUND NESTING	WETLAND NESTING	SHOREBIRD FEEDING	WATERFOWL FEEDING	DETRITAL EXPORT/ FISHERIES	TOTAL
12A	13	59	150	47	---	268
12B	2	24	115	12	---	154
13A	--	--	75	6	---	81
13B	--	68	72	65	---	205
14A	--	153	127	263	229/246	1,018
14B	--	26	68	27	---	121
J/O	--	53	96	18	---	166
TOTAL	15	383	702	438	229/246	2,012

those losses (865 HUs in South Carolina comprised of 197 acres of high value wetlands and 118 acres of low/moderate value wetlands; and 9 HUs in Georgia comprised of 3 acres of high value wetlands) is, therefore, the mitigation goal.

G.3.07 Strategy 3 alone was found to produce insufficient environmental benefits to adequately restore the habitat values which would be lost by diking Disposal Area 14A and the miscellaneous disposal area operations, as a total of only 1,614 HUs would be produced from the entire middle harbor disposal area complex. That amount is 422 HUs below that experienced in the Without Project Conditions. Designs were then developed using the most highly valuable general management options for inclusion as additional mitigation features. Various design options were evaluated for those general management options and those designs are described elsewhere in this EIS. The best designs consisted of the following features:

a. Clearing of upland areas adjacent to diked disposal sites for use by bare ground nesting species. A 26-acre site located oceanward of the dikes at the Jones/Oysterbed Island Disposal Area was selected. Maintenance of the site may include unconfined disposal of dredged material to ensure suitable material for nesting exists on the surface of the site.

b. Construction and maintenance of isolated nesting mounds within the confined disposal areas. A design was selected for two islands in each of the following CDFs: Disposal Area 12A, 12B, 13A, 13B, 14A, 14B, and Jones/Oysterbed Island. The islands would have a 1-acre crest, which would be located at the same elevation as the surrounding dikes. The islands would be located near, but separated from the disposal area dikes. The exact location of the mounds would be determined by the Corps.

c. Construction and maintenance of a nearshore island located oceanward of the Turtle Island Wildlife Management Area. The area would be constructed using open water placement of dredged material obtained from or adjacent to the alignment of the navigation channel. The island would have at least a 2.0 acre crest located at +14 feet MLW. Due to the island's sloping sides, at elevation +10 feet MLW the island would be 6.8 acres.

d. Restoration/creation or protection of 25 acres of tidal wetlands in South Carolina. The SC DHEC-OCRM would select feasible sites in the future and identify either (1) construction actions necessary to improve/create wetlands at the site, or (2) measures which would be necessary to adequately protect the site from future development. The SC DHEC-OCRM would administer an escrow account established by the local sponsor or its designee to accomplish the necessary construction and acquisition.

e. Construction of a second water control structure at an existing 228-acre impoundment within the Savannah National Wildlife Refuge. The second structure would generally be open to all tidal flows, thereby providing a constant connection between the impounded water and the adjacent tidal waters. Establishing this connection would result in a continual flushing of the impoundment, thereby substantially improving its water quality and making available the shallow areas to fish for feeding and spawning. The entire aquatic ecosystem at the impoundment would benefit from the increased flow and the action would directly benefit fishery resources.

G.3.08 The following factors were applied in the development of those new management options to recognize the quality of the habitat produced and/or the scarcity of that habitat within the region:

* A factor of 1.0 was applied to bare upland areas connected to diked disposal areas for their value to bare ground nesting species. A site would produce valuable habitat, but their accessibility to terrestrial predators would keep such an area from being considered "prime" nesting habitat.

* A factor of 2.5 was applied to small isolated islands within the disposal areas for bare ground nesting in recognition of their scarcity and high habitat value due to their traditionally high nesting success ratios. These islands would produce prime nesting habitat for those migratory species, something not readily found in this region.

* A factor of 4.0 was applied to high areas at offshore bird islands for use in shorebird (bare ground) nesting. This factor is in recognition of the scarcity and high habitat value of such areas due to the isolated nature of the sites, which traditionally lead to high nesting success ratios. These islands would provide prime nesting habitat -- which is rarely found in this region -- for a number of migratory bird species.

* A factor of 3.0 was applied to intertidal portions of offshore bird islands for shorebird feeding in recognition of the scarcity and high value of such habitat due to the isolated nature of the sites.

* A factor of 4.0 was applied to intertidal portions of offshore bird islands for shorebird feeding in recognition of the expected winter use of such areas by the endangered piping plover. That species winters in the area, and such isolated feeding and resting sites have become increasingly rare. Suitable habitat is one of the factors identified as limiting the recovery of that species.

* A factor of 1.0 was applied to wetlands restored/created or protected to account for the detrital function of those marshes and to reflect the importance of that function as the base of the estuarine and nearshore food webs.

* A factor of 1.0 was applied to wetlands restored/created or protected to account for wetland functions which would directly benefit fishery resources.

* A factor of 0.95 was applied to impounded waters where tidal flushing and daily access with adjacent water bodies would be established for their value to fishery resources. These improvements would significantly enhance the site's value for fisheries. However, the factor was set at <1 to reflect the unavailability of a small portion of the site to fishery resources.

G.3.09 When Strategy 3 is combined with the five most valuable general management options, a Mitigation Plan is produced which adequately replaces the habitat values which would be lost through the diking of Disposal Area 14A and miscellaneous disposal area operations in South Carolina. Table 4 shows the habitat values at Disposal Area 14A and those which would be lost in South Carolina. Table 5 shows the habitat values which would be produced by the various components of the Mitigation Plan.

G.4.00 DETAILS OF MITIGATION PLAN.

G.4.01 Plan Description. The plan is based on Strategy 3; employing rotating disposal area use schedules of 2 years, with modifications for bird use. In this scenario, each disposal area would be available for use in disposal operations for two years, followed by two years of drying. A 26-acre bare ground nesting area would be cleared and maintained on high ground outside the dike at the Jones/Oysterbed Island Disposal Area for use by colonial nesting birds (Figure 2). Maintenance activities would include devegetation and possible additional placement of dredged material through unconfined disposal on the upland site. Two

TABLE 4

HABITAT VALUES AT DISPOSAL AREA 14A
AND
LOSSES AT OTHER SC DISPOSAL AREAS
(IN HABITAT UNITS)

OPTION	BARE GROUND NESTING	WETLAND NESTING	SHOREBIRD FEEDING	WATERFOWL FEEDING	DETRITAL EXPORT/ FISHERIES	TOTAL
CURRENT IN AREA 14A	--	153	127	263	229/246	1018
AREA 14A DIKED	--	43	106	27	---	177
LOSS AT AREA 14A	--	110	21	236	229/246	841
OTHER LOSSES AT SC AREAS	--	---	---	---	12/6	18

NOTE: The habitat functional values currently in Disposal Area 14A (1018 HUs) and the losses at other Project disposal areas in South Carolina (18 HUs) are included in Strategy 1: Without Project Condition at CDF's.

TABLE 5

ENVIRONMENTAL BENEFITS
FOR ALTERNATE MITIGATION ACTIONS
IN SOUTH CAROLINA
(IN HABITAT UNITS)

OPTION	BARE GROUND NESTING	WETLAND NESTING	SHOREBIRD FEEDING	WATERFOWL FEEDING	DETRITAL EXPORT/ FISHERY	TOTAL
STRATEGY 1 W/O PROJECT AT CDF'S	15	383	702	438	229/246 12/6	2,031
STRATEGY 3	--	450	659	505	---	1,614
UPLAND NESTING SITE	26	---	---	---	---	26
NESTING ISLANDS	28	---	---	---	---	28
NEARSHORE BIRD ISLAND	20	---	81	---	---	101
RESTORATION /CREATION	--	---	---	---	25/25	50
FISHERIES ENHANCEMENT	--	---	---	---	0/217	217
MITIGATION TOTAL	74	450	740	505	25/242	2,036
TOTAL HABITAT CHANGES	59	67	38	67	-216/-10	5

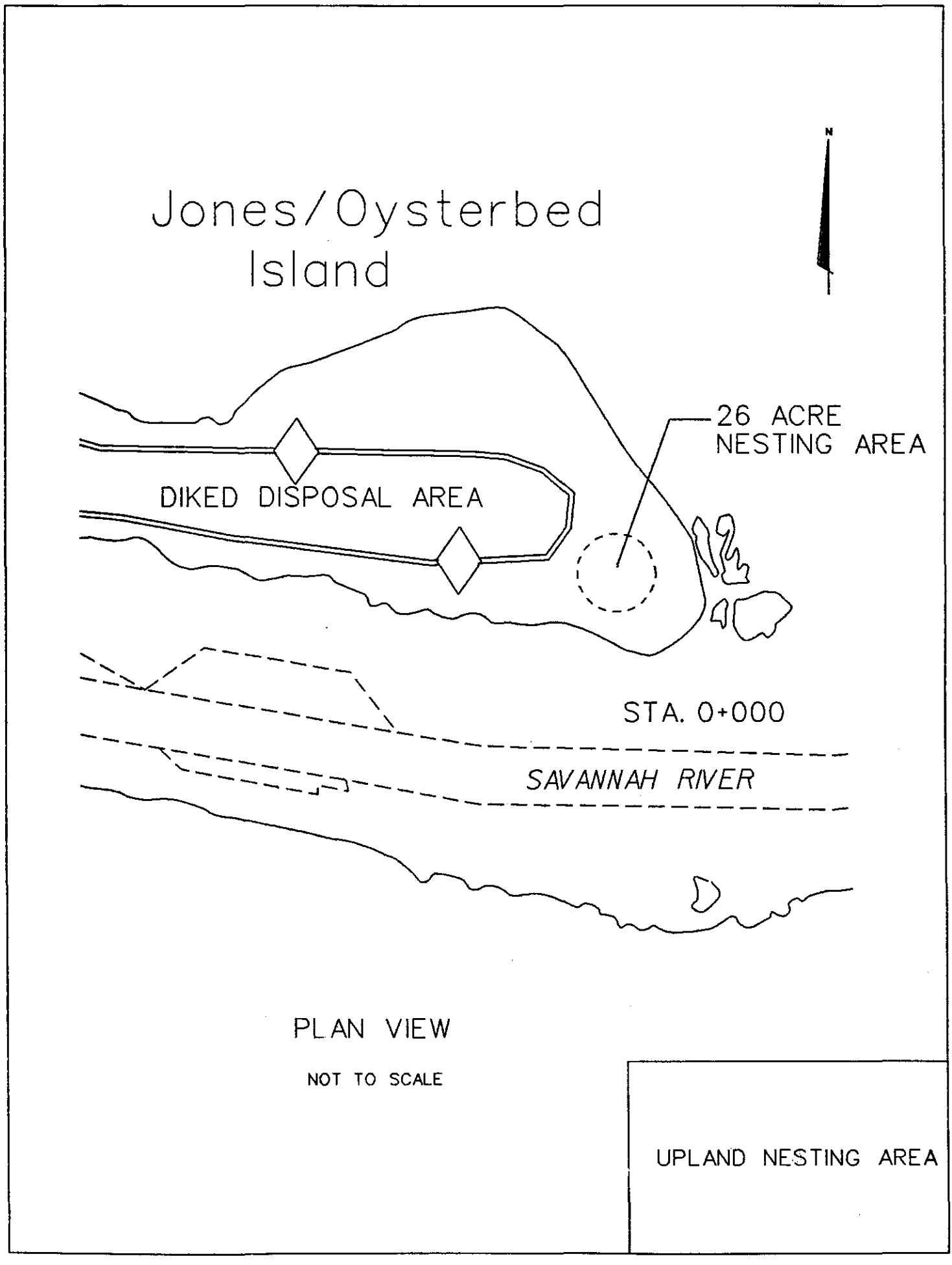
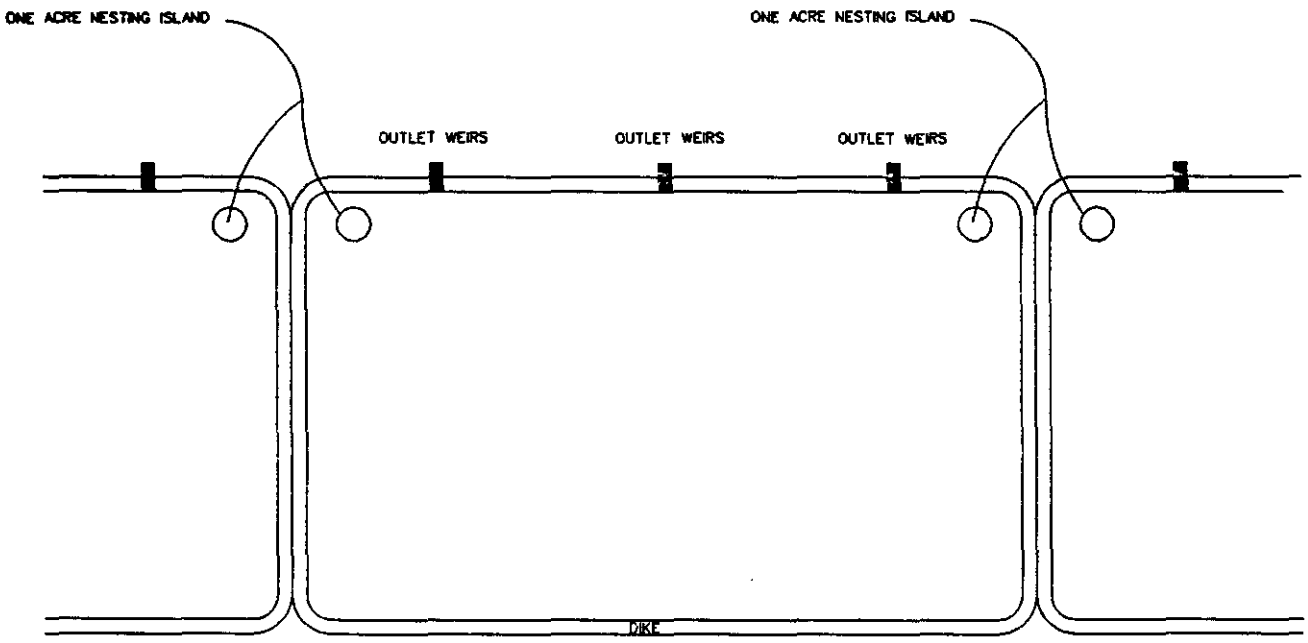

Jones/Oysterbed Island
N
26 ACRE NESTING AREA
DIKED DISPOSAL AREA
STA. 0+000
SAVANNAH RIVER
PLAN VIEW
NOT TO SCALE
UPLAND NESTING AREA

FIGURE 2

1.0-acre isolated nesting islands would be constructed and maintained in each disposal area in the rotation program for use by nesting migratory shorebirds (Figure 3). The islands would be constructed at the height of the surrounding dikes. The island crest would be raised when the adjacent dikes are raised to ensure the nesting area cannot be flooded during disposal operations. An island would be constructed and maintained offshore of the Turtle Island Wildlife Management Area (Figure 4). Benthic surveys would be performed during the final design to ensure that no rare benthic communities exist at the proposed site. The island would be maintained in a manner so that it continued isolated from Turtle Island and the north jetty. This bare ground bird nesting area would be constructed using open water placement of dredged material obtained from within, below, or adjacent to the navigation channel. The island's crown would be located at Elevation +14 feet MLW +/- 1 foot and have a minimum size of 2.0 acres at that elevation. Additional dredged material would be placed on the island when the area above EL 10 MLW has been reduced in size by 50 percent. Twenty-five acres of tidal wetlands would be restored/created/ protected in South Carolina. The SC DHEC-OCRM would select feasible sites in the future and identify either (1) construction actions necessary to improve/create wetlands at the site, and/or (2) measures which would be necessary to adequately protect the site from future development. The SC DHEC-OCRM would administer an escrow account established by the local sponsor or its designee to accomplish the necessary construction and acquisition. A second water control structure would be constructed at an existing 228-acre impoundment within the Savannah National Wildlife Refuge. The second structure would allow water exchange generally throughout the tidal cycle, thereby providing a constant connection between the impounded water and the adjacent tidal waters.

G.4.02 Confined disposal areas would be managed during each scheduled 2-year use period for the most environmentally appropriate outcome following each disposal operation. Dredging needs would have top priority concerning the scheduling of disposal events, while management of the disposal areas for wildlife would be a secondary consideration. The goal would be to have at least one disposal area each year functioning for each of the following four major categories of bird use: (1) spring migrants, (2) summer nesting shorebirds, (3) fall migrants, and (4) wintering shorebirds and waterfowl. Note that a disposal area may provide more than one function within a given year. For example, an area held wet for wintering shorebirds and waterfowl could be slowly dried during the spring for spring migrants.



SAVANNAH RIVER

PLAN VIEW

NOT TO SCALE

TYPICAL NESTING ISLANDS WITHIN A CDF

FIGURE 3

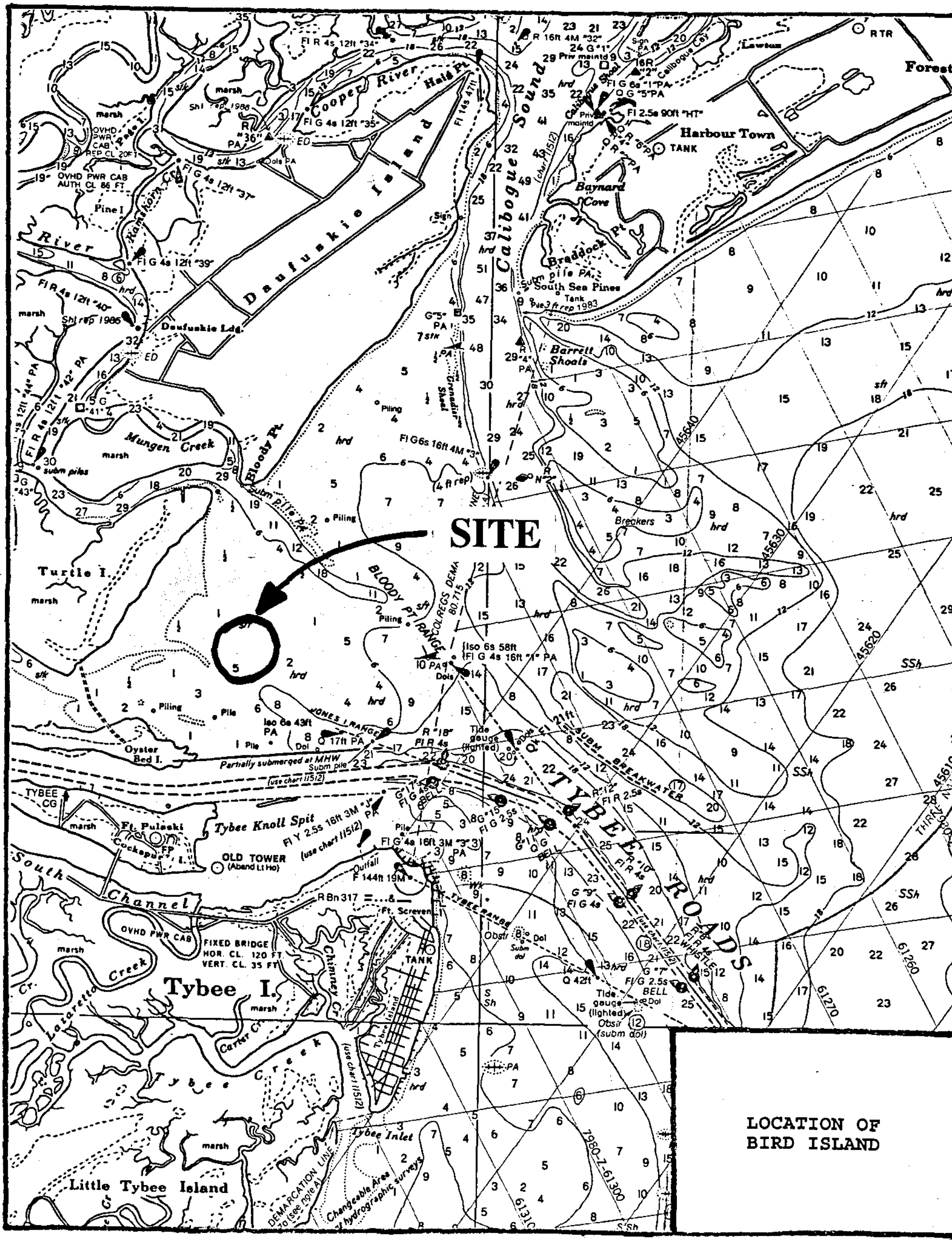

SITE
LOCATION OF
BIRD ISLAND
Daufuskie Island
Calibogue Sound
Cooper River
Harbour Town
Forest
Baynard Cove
Braddock Pt
South Sea Pines
Barrett Shoals
Daufuskie Ldg.
Mungen Creek
Bloody Pt.
Turtle I.
Pine I
Oyster Bed I.
Tybee Knoll Spit
Ft. Pulaski
Cockspur I.
OLD TOWER
South Channel
TYBEE ROADS
Tybee I.
Lazaretto Creek
Chimney Cr.
Tybee Creek
Tybee Inlet
Little Tybee Island
Ft. Screven
TANK
FIXED BRIDGE
HOR. CL. 120 FT.
VERT. CL. 35 FT.
SUBM BREAKWATER

FIGURE 4

G.4.03 Nesting season constraints. Special considerations would apply to disposal operations taking place during the nesting season. Sand mounds would be constructed inside confined disposal areas for use by nesting birds such as least terns, Wilson's plovers, killdeer and nighthawks. Portions of these or other mounds would be constructed for use by black-necked stilts. Two bird nesting mounds would be constructed and maintained in the following CDFs in the rotational program: Disposal Areas 12A, 12B, 13A, 13B, 14A, and 14B. Each mound would have an area above the potential flood height of 1 acre. The crest of the mounds would be constructed above the height of the flooded pool to avoid inundation during disposal operations. Once these mounds are in place, it would be judged beneficial to flood the surrounding areas in the spring and early summer for both protection of the mounds from predators and stimulation of invertebrate prey populations.

G.4.04 Compliance with the Migratory Bird Treaty Act (MBTA). The middle and lower harbor (South Carolina) CDFs would be managed to produce habitat for endemic and migratory waterfowl and shorebirds. Development and maintenance of wildlife habitat at the CDFs, including interior nesting mounds, would be integrated into normal use of the sites for disposal of dredged materials. This integration would occur throughout the year to include the spring nesting season, the summer rearing season, and the fall and winter migratory periods. Additional habitat would be created through the establishment of a nearshore island off Turtle Island. This habitat would be maintained through the periodic placement of additional dredged materials on the island. Wildlife habitat would also result from the creation and maintenance of an upland nesting area outside the dike at the Jones/Oysterbed Disposal Area.

G.4.05 Multiple use of the sites (dredged material disposal and wildlife habitat purposes) could result in both beneficial and adverse impacts to migratory birds. The flooding of a disposal site as part of disposal operations would provide isolation to the internal nesting mounds, while also possibly destroying nests, eggs, or young that have nested on the floor and lower portions of the disposal site. The loss of these birds may occur incidental to the disposal operations which increase the site's overall wildlife habitat value. The "take" provisions of the MBTA are based on the "net" impact for a given action. Since the purpose of the wildlife habitat production component of the Mitigation Plan is to create habitat for endemic and migratory waterfowl and shorebirds, the beneficial aspects of the integrated use and management of the CDFs far outweigh the adverse impacts on possible nesting migratory bird species. Implementation of the Mitigation Plan as described in this EIS -- and concurrence in the Plan by the South Carolina Department of

Natural Resources and the US Fish and Wildlife Service -- would be deemed compliance with the MBTA and similar South Carolina laws, and no further clearances related to migratory birds would be necessary to implement the actions described in this EIS.

G.4.06 Application of the Plan. Management of a disposal area for birds would depend on the month in which the disposal operation is scheduled to end. Management options available after a disposal operation ended would be chosen based on the situation in other disposal areas and the availability of habitat for each major category of bird use (spring migrants, summer nesting shorebirds, fall migrants, and wintering shorebirds and waterfowl). Maintenance of a constant water level within a disposal area may not be possible for extended periods due to the natural effects of evaporation and infiltration. However, discharges from the site through the weirs and underdrains could be stopped to retain as much water as possible. The disposal operation would be managed to ensure the successful attainment of the scheduled management scenario. This would include management of weir discharges to ensure a full pool upon completion of the disposal operation. Since water would be held in the disposal areas for longer periods than presently occurs, there is a potential for increased mosquito breeding. To address that possibility, purple martin nesting houses and bat houses would be installed at each of the disposal areas included in the rotation program to provide a biological control for that situation. Table 6 displays the actions which would be taken after completion of disposal operations. The critical factor used to decide which management technique would be implemented is the date when disposal operations are complete. If District biologists believe it would be beneficial to use a management technique which is different than that prescribed in Table 6, approval from the US FWS would be required prior to implementation.

TABLE 6

MIDDLE AND LOWER HARBOR
(SOUTH CAROLINA)
CONFINED DISPOSAL FACILITY
MANAGEMENT TECHNIQUE

Date Disposal Operation Ends	Proposed Management Technique
1 Jan - 15 Mar	Hold water level as high as possible. Beneficial to waterfowl and wintering shorebirds. Draw down in the spring for migrating shorebirds.
15 Mar - 15 Jul	Option 1. Hold water as protection for nesting terns, plovers, nighthawks, and in preparation for fall draw down for fall migrating shorebirds. Option 2. Draw water down slowly for spring migrating shorebirds and nesting black-necked stilts and vegetation growth if flooded later for wintering waterfowl.
15 Jul - 15 Nov	Option 1. Draw down slowly for fall migrating shorebirds. Option 2. Hold for wintering waterfowl and shorebirds.
15 Nov - 31 Dec	Hold water level as high as possible for wintering waterfowl and shorebirds, and in preparation for spring draw down for spring migrating shorebirds.

APPENDIX H

DESCRIPTION OF WORK PERFORMED AT THE CONFINED DISPOSAL FACILITIES BY THE LOCAL SPONSOR FOR THE SAVANNAH HARBOR NAVIGATION PROJECT

DESCRIPTION OF WORK PERFORMED
AT THE CONFINED DISPOSAL FACILITIES
BY THE LOCAL SPONSOR
FOR THE
SAVANNAH HARBOR NAVIGATION PROJECT

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DESCRIPTION OF WORK PERFORMED
AT THE CONFINED DISPOSAL FACILITIES
BY THE LOCAL SPONSOR
FOR THE
SAVANNAH HARBOR NAVIGATION PROJECT

H.1.00 **INTRODUCTION.**

H.1.01 The laws which govern the establishment and continued operation of Federally authorized navigation projects require a non-Federal sponsor to share in the responsibilities of those projects. Cost sharing is required during the evaluation of the feasibility of those projects and in their construction. The non-Federal sponsor also has responsibilities during the operational phase of those projects. One of the sponsor's major responsibilities during that period is the provision of adequate disposal areas for the deposition of material dredged from the navigation channel. Many non-Federal sponsors across the country have the Corps to perform the local sponsor work on a reimbursable basis. Chatham County, the local sponsor for the Savannah Harbor Navigation Project, currently performs all local sponsor responsibilities itself and views its relationship with the Corps as a partnership. The Georgia Department of Transportation (GA DOT) assists Chatham County as they fulfill their responsibilities.

H.2.00 **DIKE RAISING.**

H.2.01 Design. The dikes surrounding the Savannah Harbor disposal areas periodically require raising to higher elevations to continue to contain dredged materials. The top two feet of dike are typically reserved for a freeboard zone, serving as a margin of safety to accommodate contingencies which may develop during use of a site. The next two feet are reserved for temporary storage of the water which is used to transport the dredged material to the disposal site. Water is ponded in the disposal area to allow time for the dredged material to settle out of the slurry which is pumped to the site. The storage volume below the ponded water zone is used to contain dredged material. Dikes are to be designed to allow retention of ponded water for extended periods of time. This allows water to be held to within two feet of the dike crest for the duration of a disposal operation plus additional time for draining. The large ponding volume and long retention time may be required to meet suspended solids and/or dissolved oxygen restrictions in the weir discharges. The dikes may also be required to hold ponded water for extended periods after disposal operations cease in a particular disposal area to meet wildlife-related mitigation commitments.

H.2.02 Approximately every 5 years, the disposal areas are mapped and the available capacity is computed from cross-sections generated from the contour maps. Savannah District's Operations Division provides the local sponsor with information concerning the quantity of material to be deposited in each disposal area in the near future. This data is used in a simple modeling technique which includes the swelling of the insitu material (sand and/or silt) and compensates for drying. The available capacity is simply accounted for by subtracting the volume consumed by each dredging event. Likewise, capacity is added when the dikes are raised. A sample of the computations is shown on the following page. When the ponded water zone is forecast to invade the freeboard zone, the need for raising the dikes is triggered. The design process can be lengthy, so the process is begun prior to the actual need of the dike raising.

H.2.03 The dikes forming the disposal areas are built over very soft soils. Early dike construction consisted more or less of a trial and error method. Soil was piled up with a dragline or hauled in to form a dike. The soft marsh soils were often used to form the initial embankment. If the dike failed or collapsed, more soil was piled up until the desired dike height was reached.

H.2.04 Incorporation of high strength geosynthetics, such as plastic fabrics and geogrids, into the embankment as reinforcement has allowed the design and construction of significantly higher dikes. These materials provide strength to the embankment similar to the way reinforcing steel increases the strength of concrete. They also increase the strength of the underlying soil so that they can then support the use of trucks to haul borrow material over soft soils.

H.2.05 When dikes are raised only two to four feet, as required for some dredging events, the design process does not include an in-depth geotechnical analysis and fabric is not used. However, when dikes are raised four to six feet, a geotechnical analysis is performed. If adequate soil boring records are not on file, new borings are taken. A topographical survey is made to identify the existing dike cross-sections around the perimeter of the area. This data is used to design the new dike cross-section and compute the volume of fill which will be required.

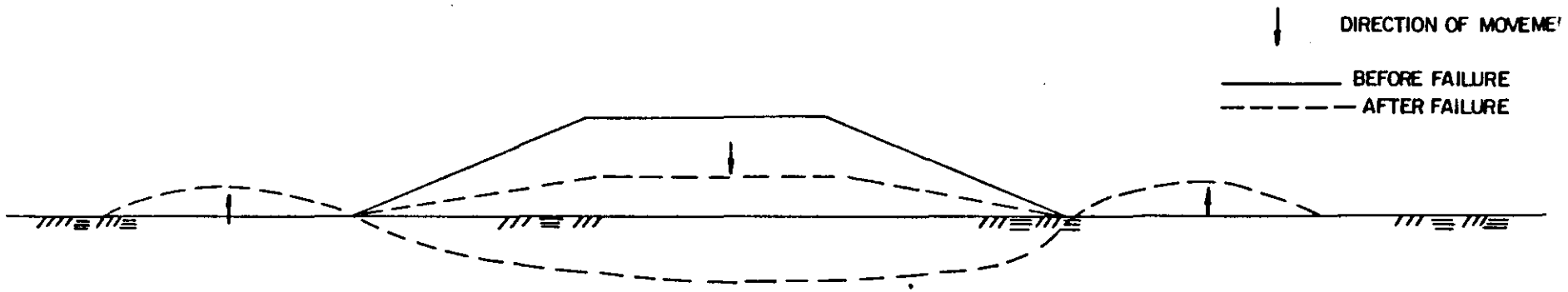
SAMPLE OF AREA CAPACITY COMPUTATIONS

AREA 12A AREA = 958 ACRES PERIMETER = 28,420 FEET

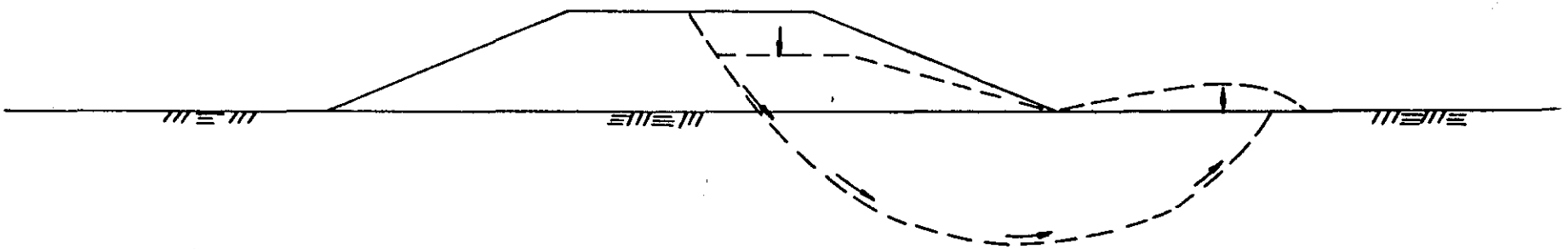
NOTES;1) ALL VOLUMES IN CUBIC YARDS
2)* VOLUMES IN THE AREA ARE IN ADDITION TO 2' FREEBOARD (3,091,147 CUBIC YARDS FOR AREA 12A)
3)# CONSOLIDATION DUE TO UNDERDRAINS & DITCHING OFFSET THE SWELL FACTOR (COL4=COL1-COL2)
4)@REQUIRED VOLUME IN AREA INCLUDES THE DREDGED MATERIAL WITH APPLIED SWELL FACTOR(S) AND PONDED WATER (2' MAXIMUM)
COL3=[COL2 X (1-COL5)]1.5 + [COL2 X COL5]1.2 + COL2/0.1 (WHERE COL2/0.1=PONDED WATER WHICH IS 3,091,147 MAXIMUM)

DATE BEG	DATE END	DESCRIPTION OF OPERATION	STATION	STATION	COL1 PRE DREDGE AVAILABLE VOL IN AREA*	COL2 IN SITU VOL DREDGED	COL3 REQ. VOLUME IN AREA*@	COL4 POST DREDGING AVAIL VOL.*#	COL5 EST % SAND	CONTRACTOR	COST PER C.Y. $	COMMENTS
6/79		COUNTY PURCHASES 2 REAR PARCELS IN AREA 12 FROM HASKELL & TAYLOR WITH DOT FUNDS										
6/80		MAINT DREDGING	70+000	79+000		4,055,959			5	MERRITT		
7/81		DOT PURCHASES 2 FRONT PARCELS IN AREA 12 FROM HASKELL & TAYLOR;COUNTY DEEDS REAR PARCELS TO DOT										
4/82		DIKE CONSTRUCTION								ANSLEY&SUT	$87,598	
6/82	11/82	MAINT DREDGING SB	0+500	13+300		4,038,456				SOUTHERN		
10/83	10/84	MAINT DREDGING	70+000	112+500		4,598,594				SOUTHERN		
1/84		DIKE CONSTRUCTION	RAISE SCREVEN FERRY RD TO ELEV 32'MLW							HIGG/BUCH	$110,065	
9/84		DIKE CONSTRUCTION	RAISE REAR DIKE TO ELEV 26'MLW							HIGG/BUCH	$708,627	
10/85	2/86	MAINT DREDGING SB	0+500	13+300		3,630,109				PROSPERITY		
8/86		DIKE CONSTRUCTION	RAISE FRONT TO 36'MLW;LT 34'MLW;REAR 32'MLW;HYDRAULIC FILL FROM 2A							BEAN	$3,428,000	
1/87	3/87	MAINT DREDGING SB	0+983	9+000		886,287				BEAN		
6/87		DIKE CONSTRUCTION	BUILD SUBCOMPARTMENT FOR WIDENER PROJECT							MC ANDERSO	$23,803	
8/87	12/87	MAINT DREDGING SB	0+500	8+500		1,946,791				ATKINSON		
6/88		DIKE CONSTRUCTION	RAISE SCREVEN FERRY RD TO ELEV 36'MLW							MC ANDERSO	$57,275	
10/88	12/88	DEVEGETATION								AFFOLTER	$183,360	
12/88	3/89	MAINT DREDGING SB	0+500	13+300	10,246,250	3,264,924	7,988,533	6,981,326	0	ATKINSON		
11/89	3/90	MAINT DREDGING	30+000	66+000	6,981,326	1,198,248	4,852,572	5,783,078	10	PROSPERITY	0.91	
1/90	3/90	MAINT DREDGING SB	0+500	13+300	5,783,078	855,155	4,373,880	4,927,923	0	PROSPERITY	0.22	
6/90	8/90	MAINT DREDGING SB	6+000	7+300	4,927,923	262,310	3,016,565	4,665,613	0	PROSPERITY	0.22	
11/90	12/90	MAINT DREDGING	55+000	79+000	4,665,613	494,025	3,817,364	4,171,588	10	ATKINSON	1.09	
11/90	12/90	MAINT DRDG FIGITB	67+500	70+000	4,171,588	233,359	2,683,629	3,938,229	0	ATKINSON	0.66	
2/91	2/91	MAINT DREDGING	58+150	60+000	3,938,229	20,063	230,123	3,918,166	10	ATKINSON	1.09	
9/91	3/92	WIDENER PROJ	69+310	79+015	3,918,166	1,186,324			90	AMERICAN	2.08	IN SUBAREA

FIGURE 1



BEARING CAPACITY FAILURE



ROTATIONAL SHEAR FAILURE

FIGURE 2

CRITICAL FAILURE MODES FOR ANALYSIS OF EMBANKMENTS OVER SOFT SOILS

H.2.06 The design of embankments over soft soils is complex. Incorporation of the geosynthetics into an embankment requires evaluation of several failure modes of the embankment/ geosynthetic/foundation soil system. The two failure modes which affect the design most are shown in the drawing on the following pages. These failure modes are summarized as follows:

(1) Bearing Capacity - Prevention of the embankment from sinking into the soft soils.

(2) Rotational Stability - Prevention of a rotational shear through the embankment and foundation soils.

H.2.07 Analysis of the failure modes determines the combination of side slopes, berms and reinforcements possible for a particular site. An economic analysis is then performed to determine the optimum combination of embankment configuration and reinforcement.

H.2.08 Dike Construction. Contract plans and specifications for dike improvements are advertised by Chatham County, who then usually awards the contract to the lowest responsive bidder. GA DOT assists Chatham County with materials testing, construction supervision, settling disputes, supplemental agreements and other actions which may be required to ensure completion of the specific construction project.

H.2.09 Dike construction usually incorporates the use of geosynthetic fabrics. Installation of the fabric involves the use of pickup trucks, semi-trucks which deliver the fabric, four-wheel all-terrain vehicles, generators, field sewing machines and several people. Each layer of fabric is covered with a foot of earth, which is delivered from a borrow site by truck or self-loading pans and then spread to a uniform thickness with a small bulldozer. The embankment is raised in one-foot increments until the final elevation is reached. There are no compaction requirements. Observations made during previous construction projects at the disposal areas indicate that continual movement of equipment compacts the material to a 95 percent level. The material is mostly sand, with the top 18 inches consisting of a mixture of 75 percent sand and 25 percent silt. A higher percentage of silt in the riding surface allows vehicles to move in both wet and dry conditions.

H.2.10 Borrow sites for dike construction work have, to date, been found within the diked disposal areas. Deposits of sand near the dredge discharge head locations are identified in the project plans as being available for use by the contractor. The recently completed Savannah Harbor Deepening Project provided

large quantities of sand suitable for dike construction. Dump trucks and self-loading pans have, historically, been used to transport the sand to the construction sites. However, the limited period during which that equipment can presently operate within a disposal site before its next scheduled use severely restricts the use of those sites. A lengthy drying period is typically required after a disposal operation is complete before the sediments deposited on the floor of the disposal area have the bearing capacity to support heavy earth-moving equipment. With no change in disposal practices or disposal area management strategies, offsite material will likely be required in the future to provide the fill material needed for these dike improvements. Rotational use of the confined disposal areas and installation of underdrains would significantly increase the availability of the onsite material.

H.2.11 A method of obtaining onsite borrow material, called the Crust Method, involves reclamation of silty material from within the disposal area. After a disposal area's top 8 to 12 inches has dried, a small bulldozer can push up windrows along which small self-loading pans can travel and pick up the dried material which is then transported to the site of the new dike construction. The drying of the area is critical and is accomplished through ditching and/or installation of underdrain pipes. The Crust Method has been successfully implemented in Areas 12B and 13A. Future use of this process would increase the beneficial uses of materials deposited in the disposal areas.

H.2.12 The disposal areas are located on the property of several different landowners. Some property owners have questioned whether material which has been deposited on their land can or should be removed to other properties. If one views the activities performed at a specific disposal site in a very narrow context, it is clear that material will be removed from specific tracts at some point in time. However, if one views those same actions over time and in the larger context of activities performed at the adjacent disposal areas as a group, one concludes that (1) the material which is removed from a tract is still used to support the purpose of the easement obtained on the property, i.e. dredged material disposal, and (2) material which is removed will be replaced during subsequent disposal operations. Material used to raise dikes may be obtained from three sources, (1) the disposal area which is actually being improved, (2) an adjacent disposal area, or (3) brought in from offsite if suitable borrow material is not readily available within the disposal areas at the time it is needed. When there is a need for construction material at one of the disposal areas, the preference is to use readily available material from one of the areas. To minimize transportation costs, obtaining material from the closest source is preferable. Over time, the effect of new dike improvements on the properties produces a net gain of dredged materials to the property owner.

H.3.00 **MAINTENANCE.**

H.3.01 Overview. The diked disposal areas are to be maintained in a manner so that they will be suitable for dredged material disposal operations. This includes having the weirs in working order, roadways around the dike passable and well maintained, and sufficient capacity within the site for efficient placement of dredged material and settlement of suspended solids, and maintenance of the stability of the dikes through erosion control measures. Prior to commencement of deposition of dredged material, the dredge contractor will inspect the site and agree to the suitability of the dikes for his use. After that certification, the responsibility for the condition of the dikes rests with the dredge contractor for the period of the disposal operation. Many tasks are performed in an effort to maintain the diked disposal areas in a safe and usable manner. The following paragraphs describe the purpose, frequency and type of equipment which is commonly used to perform each maintenance item.

H.3.02 Weir Replacements. Weirs are used during dredging events to remove the water which has transported the sediment through the pipeline to the disposal site. The water is discharged through the weirs after it has settled sufficiently to meet water quality guidelines. Between dredging events, the weirs are used to remove rain water and water drained from the area through ditches. Logically, weirs are placed at the lowest elevations of the floor of the disposal area. The settling patterns of the solids in the dredged slurry result in the formation of a sloped surface, with the highest point being at the location of the discharge head.

H.3.03 The weirs are generally 16 to 20 feet tall. The top of the weir is near the elevation of the top of the adjacent dike. The weir is accessed via a wooden catwalk elevated to the same height as the top of the weir and is connected to the dike directly behind the weir.

H.3.04 Weirs are replaced as needed, but the work is usually done at the same time as a dike raising contract. The weirs are installed with the inlet invert approximately four feet below the elevation of the adjacent floor of the disposal area. This allows most ditches to drain through the weirs. This criteria is not always possible, especially, when the floor of the disposal area is not more than four feet higher than the elevation of the natural ground at the outlet end of the discharge pipe behind the weir.

H.3.05 New weirs are bolted to concrete footings supported by four 12-inch diameter timber piles. The friction bearing that develops along the length of the pile is more effective than the end bearing in supporting the weir. This foundation aides in maintaining the weir in a plumb position. Previous use of swamp anchor screws proved to be inadequate.

H.3.06 Water flowing into the weir is transported through the dike in a pipe; typically a 48-inch diameter plastic pipe. The plastic pipe is thermally butt-fused at the joints along its length. Chatham County had previously used corrugated metal pipe joined by bands, but the bands had a repeated history of failure, resulting in cave-ins of the dike. The plastic pipe has experienced very few failures at the joints. The 48-inch diameter pipe is much larger than needed for hydraulic purposes to remove the discharged water. However, the additional size provides a margin of safety desirable for this type of drainage application. The outlet end of the discharge pipe terminates near the toe of the dike's outside slope. The invert elevation of the pipe outlet is either at the same elevation as the marsh or elevated on a support system, such as that shown in the drawing on the following page. A small amount of riprap is placed at the outlet end to dissipate the erosive energy of the discharged water.

H.3.07 In the past, the height of weirs was sometimes increased by simply bolting new sections on the existing weir, thereby allowing continued use of the existing structure and outfall pipe. Recent experience indicates that the wooden stop logs in the face of the weir can fail relatively quickly, resulting in the weir and pipe filling with dredged material. This event prevents removal of the weir. Weirs with inlet inverts more than 8 feet below the elevation of the disposal area floor of the area are nearly impossible to remove due to the excavation through the dredged material which is required to allow personnel to disconnect the weir from the outfall pipe. Outfall pipes at this depth are also difficult to remove due to the large volume of excavation required through the cross-section of the dike. Experience has led to a policy that weirs be replaced when 8 feet of sediment has accumulated at the weir, with the old discharge pipes being plugged and buried. The new replacement weirs and pipes are located in the vicinity of the old weir, usually within 50 feet. Some wetlands (less than 0.1 acres per weir) may be lost during installation of the new discharge pipe, but this loss is compensated for by the natural redevelopment of wetland vegetation at the location of the old discharge pipe.

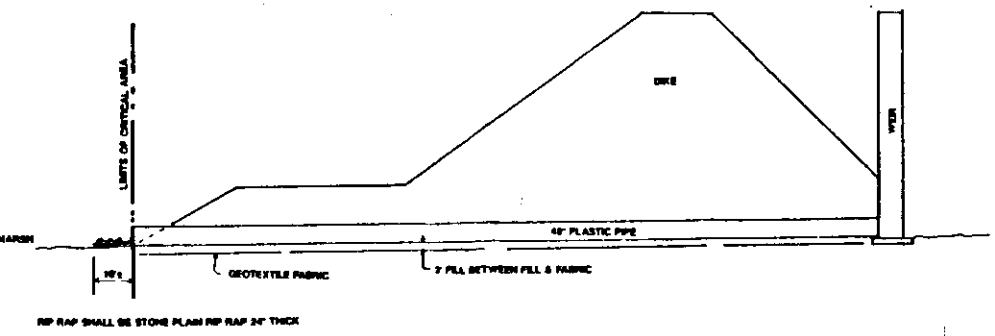
H.3.08 Equipment used to remove old weirs, plug old pipes and install new weirs and pipes includes long reach excavators, bulldozers, small cranes, and support equipment. The piles are generally driven into the ground with a small pile driver.

STATE	PROJECT NUMBER
GA	

WEIR DETAILS

OUTLET END

TYPE 1



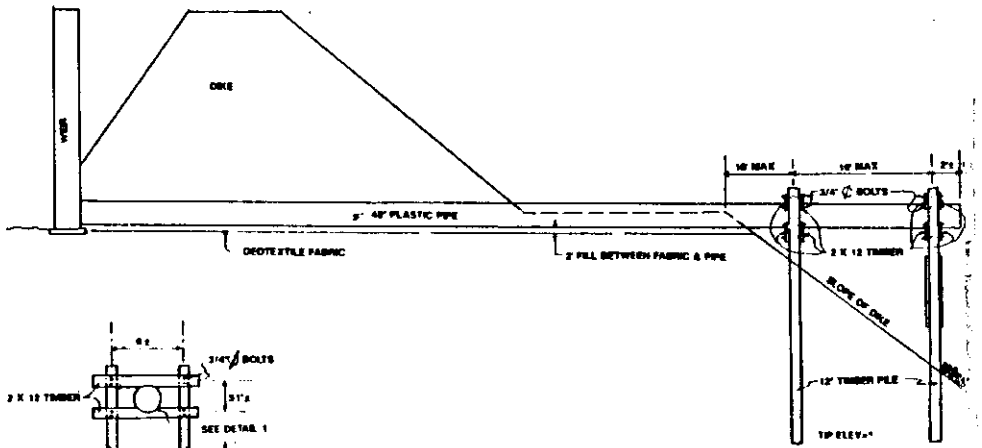
RIP RAP SHALL BE STONE PLAIN RIP RAP 24" THICK

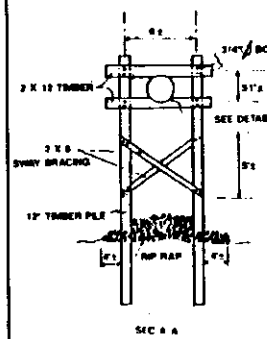
NOT TO SCALE

TYPE 2

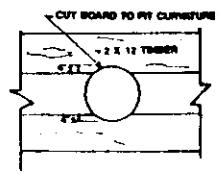
GENERAL NOTES

1. ALL LUMBER USED IN PIPE SUPPORT SHALL BE PRESSURE TREATED IN ACCORDANCE WITH THE REQUIREMENTS OF SECTION 643 OF GA DOT STANDARD SPECIFICATIONS
2. ALL BOLTS, SCREWS, NAILS, ETC. SHALL BE GALVANIZED
3. PILES SHALL BE DRIVEN TO A RESISTANCE OF 5 TONS AFTER ACHIEVING A MINIMUM PENETRATION OF 1'





SEC A-A



DETAIL 1

NOT TO SCALE

RIP RAP SHALL BE STONE PLAIN RIP RAP 24" THICK

RIP RAP SHALL BE PLACED AS DIRECTED BY THE ENGINEER TO PREVENT SCOURING AROUND PILES

FIGURE 3

H.3.09 Routine Maintenance. Routine maintenance of the disposal area dikes includes scraping the crest of the dike to improve the riding surface, filling washouts on the slopes of the dikes to maintain the integrity of the dike, excavating drainage ditches along the travelways to direct water away from the roadways, and other actions required to maintain a stable dike. This work is performed on an as needed basis, and is initiated primarily as the result of observations made during field inspections.

H.3.10 Equipment used for these operations include dump trucks, motor graders, bulldozers, excavators and support equipment.

H.3.11 Ditching. The dredge material enters the disposal area in a slurry consisting of 10 to 20 percent solids, with the remainder being water. If the material placed in the disposal areas were dry, maintenance of the areas would be extremely simple. Unfortunately, that is not the case and the water accompanying the solids must also be managed. At the completion of a dredging event, the dredged water is decanted through the weirs at a rate which ensures compliance with the water quality criteria. At that point in time, the floor of the disposal area would be super saturated with water. Removal of the water contained within the deposited sediment is desirable for two reasons: (1) it removes the breeding grounds for salt marsh mosquitoes and (2) it allows a more complete consolidation of the material.

H.3.12 The Chatham County Mosquito Control Commission (CCMCC) excavates shallow (2 feet deep) ditches within the disposal area to drain water near the surface of the area to control the mosquito population. Their work is not part of the local sponsor's responsibility. In the past, CCMCC has been reimbursed by the Corps for this work. However, recent Corps policy changes will result in no further Federal payments to CCMCC for mosquito control beginning in FY97 (October 1996). The local sponsor does benefit from the CCMCC ditching as the improved drainage assists in the material consolidation process.

H.3.13 Chatham County attempts to dry the interior of the disposal areas by ditching and/or installation of perforated underdrain pipes. These ditches are deeper than the one the CCMCC places. All ditches are sloped toward the weirs to allow water to flow to a discharge point. Sump holes are also excavated in the front of each weir following dredging events to initiate the flow of water toward the weir. Excavation of the sumps is usually the first step in the dewatering process.

H.3.14 In previous years, the County has hired a contractor to dig the deeper (6 to 7 feet deep) ditches. The County operates equipment owned by the State to maintain the ditches after those ditches are initially constructed. Prior to the next dredging event, the ditches are filled with dried crust material. This filling prevents deep zones of dredged material from concentrating in the full depth of the ditches.

H.3.15 Equipment used consists primarily of hydraulic rotary ditchers with amphibious undercarriages. Depending on the diameter of the rotary cutter installed on the ditcher, the equipment is able to excavate ditches to 40 inches deep. Deeper ditches are constructed by long reach excavators mounted on amphibious undercarriages or conventional excavators using wooden mats for support.

H.3.16 Underdrains. Chatham County and GA DOT believe that the best way to increase the usable life of the disposal areas is to remove all the water as soon as possible and keep the areas dry. Removal of water from a soil matrix aids in the consolidation process and allows the deposited material to be used as a source of borrow in the crust construction method. The ditching process is the primary tool used to dewater an area. The sponsor has successfully demonstrated that underdrain pipes function as deep ditches in the continual removal of water from the site. The advantage of underdrains is that there their placement results in only a one-time excavation and backfilling cost for a certain drainage capability. The one-time cost of installing the pipe is more economical than multiple (from 3 to 5) cycles of deep ditch excavation and backfilling. Observations conclude that the underdrains drain continuously, with the pipes appearing to run constantly from half to three-fourths full. Flows appear to increase following heavy rains and dredged material disposal operations. The lowest foot of ponded water at the rear of the areas has been observed to exit the area in as little as 2 weeks time. The following two factors lead one to quickly conclude that this drainage is the result of the underdrains since (1) the ponded water is not passing over the weir boards, since the boards are not removed to an elevation which would allow such drainage to occur, and (2) drainage ditches have not yet been constructed since the material is still too soft to support the equipment required for such excavation.

H.3.17 The underdrains accelerate the drying process, thereby enabling machinery to work sooner on the floor of the disposal area to reclaim the dredged material for dike construction. Removal of the deposited material extends the life of the areas by restoring some of the site's previously used storage capacity.

H.3.18 At Savannah, underdrains had been installed in Disposal Areas 12B and 13A. Problems subsequently experienced with the underdrain pipes were primarily associated with the quality of the water discharged into the environment. Records indicate that past discharges were sometimes below state water quality standards for dissolved oxygen at the end of the outfall pipes. State resource agencies have not allowed the use of mixing zones to this point in time. Further analysis of the underdrain water quality was a component of this LTMS. Those investigations are described in Appendix E. Due to concerns about the quality of the discharges, the underdrains in Disposal Areas 12B and 13A which discharge to small tidal creeks draining to Wright River were plugged by the end of 1994.

H.3.19 The local sponsor desires to continue the use of underdrain pipes. Their contribution is deemed essential for extending the useful life of the disposal areas. Currently, the realistic implementation of underdrains is limited to Disposal Areas 2A, 12A, 12B and 13A. Area 13B will be a candidate in the near future. The other areas do not contain enough material yet to place the pipes at elevations for the system to function properly.

H.3.20 The local sponsor has found the following design to be the most effective and intends to use this design in future application of these drainage devices. Pipes are placed at a depth so that there is a minimum of 4 feet of soil coverage at the pipe's highest point. The pipe is sloped at 1 foot of fall per 1000 lineal feet (0.1 percent slope). A main manifold is used consisting of 12-inch diameter pipes fed by a system of 8-inch diameter pipes spaced at 500-foot intervals. The pipes are perforated plastic enclosed inside a fabric sock. The outfalls of the underdrain pipes would be separate from the weirs used to drain the ponded water in the disposal areas. The underdrain pipe would extend through the dike and have a shutoff valve along the outside dike slope which would be easily accessible. This design would allow the flow to be regulated. Riprap would be placed at the invert of the discharge pipe to prevent erosion of the outside dike slope. The local sponsor prefers the outfalls be located along the same dike as the weir structures. This would allow the contractors to take advantage of the flow patterns created in the areas as a result of historical disposal events. A constant depth can be excavated below the grade of the sloping floor of the disposal area. It has been suggested that the underdrain outfalls be directed away from Wright River which is where the weirs currently outfall. It is possible to drain the underdrains in the opposite direction, but it will be more expensive. Disposal Area 12A currently drains toward Back River via a ditch paralleling the west dike which is the location of the weir structures. The proposal in the EIS consists of installing the underdrains so that they discharge to either the

Savannah or Back Rivers. The local sponsor will be responsible for abiding by the underdrain design features required in the South Carolina Water Quality Certification.

H.3.21 The useful life of the disposal areas should be maximized to avoid the need for additional sites to be used for dredged material disposal. Underdrains have proven they aid in the drying of the disposal areas and have been successfully implemented in other harbors. They are beneficial to the material consolidation process and to reclamation of dredged material. The local sponsor supports the use of underdrains in Savannah to assist in maximizing the use of the existing disposal areas.

H.3.22 Erosion Control. The local sponsor recognizes a need to prevent the erosion of the soil. If allowed to erode, the material could make its way to the navigation channel where it would be dredged and placed into the disposal areas, consuming valuable capacity. Eroded material can also make its way to the marsh causing undesirable environmental impacts. Erosion of the dikes affects the dike integrity and produces new work for the local sponsor. The local sponsor follows "Best Management Practices" in this work. These practices currently consist of silt fences and grassing. Erosion of the front dikes along the Savannah River is a higher magnitude. Various forms of bank protection will be installed by the local sponsor at the edge of the Savannah River along the eroded sides of the front dikes, including Jones/Oysterbed Island, with the goal being to establish the most efficient and cost effective system of bank protection.

H.3.23 Silt fence is installed during construction at the boundary of the marsh near new weir discharge pipe outfalls. It is effective in holding eroded soils until grass is established. It has been found that it is better to remove the silt fence in areas that will be mowed to minimize the down-time of mowing equipment.

H.3.24 Grassing the dikes is usually an integral part of the dike construction contracts. The current grass mixture used is 50 pounds of Pensacola Bahia grass, 4 pounds of hulled common Bermuda grass and 4 pounds of unhulled common Bermuda grass, all on a per acre basis. The ground is prepared, then fertilizer, lime and grass seeds are applied at specified rates. After the grass is at a proper height, nitrogen is added.

H.3.25 The erosion of the outside slope of the front dikes along the Savannah River is a significant problem. A dump truck has fallen into the river due to the eroded roadway sub-base. Fortunately, the tide was low and no one was seriously injured. The apparent major cause of the erosion is the wakes and propwash

produced by the large container ships. The Corps has produced an Environmental Assessment for the initial project by the local sponsor to determine which method of slope protection will be the most feasible for continued use along the dikes adjacent to the Savannah River. When the results of that project become available, the selected form/forms of bank protection will then be used along all dike faces where erosion is taking place. The local sponsor will also place bank protection along the Jones/Oysterbed Island portion of the river bank where the District has estimated that 2.6 acres of wetlands would be impacted.

H.3.26 Mowing. Vegetation on the dikes must be periodically cut to a height so inspection for washouts and possible dike failures can be observed. Uncontrolled vegetation can obscure the view of inspectors. Mowing the roadway located on top of the dikes ensures the safety of trips for inspection and disposal operation purposes.

H.3.27 Chatham County has used its own public works employees for mowing, but has recently determined it is better to contract the work to private business. Mowing contractors are required to mow the vegetation across the width of the dike and 6 feet down each shoulder. Areas along slopes between dikes are also mowed. The dikes are mowed usually twice each year, sometimes more pending available funds and rainfall. No mowing of the dike slopes or other non-traveled areas would be performed from March 1 to July 15 to protect nesting migratory birds. The traveling surface (roadway) on the dike crest would continue to be mowed when necessary to allow safe movement around the dikes. Mowing of dike side slopes would only be performed outside the March 1 to July 15 period.

H.3.28 Equipment used by mowing contractors include medium to large tractors equipped with bushhogs, side mowers, boom axe and bat wing mowers. Support equipment such as pickup trucks, fueling trucks, low boy (for delivery of equipment), etc. are also used.

H.3.29 Devegetation. The floor of the confined disposal facilities should be relatively clean of vegetation at the beginning of disposal operations since a reduction in dissolved oxygen concentrations occurs in the ponded water as a result of decaying vegetation. Minimizing the growth of vegetation within a disposal site also assists in drying the material deposited in the site. This allows the evaporative forces of the sun and wind to act on the floor of the disposal area. Clearing the area also allows the dredged slurry waters to uniformly distribute over a disposal site, rather than channeling through the vegetation. To date, the sponsor has used mechanical means to remove vegetation.

Plans are being made to coordinate a controlled onsite burn with the US Fish and Wildlife Service. The primary plant growth in the disposal areas is the salt cedar. Herbicides do not have a noticeable impact on this plant. It has been observed that use of underdrain pipes seem to deter salt cedar growth and encourage the establishment of volunteer grasses.

H.3.30 Two types of mechanical devegetation are used in the areas; (1) mowing and (2) clearing and grubbing. Both have been successful, but the longest lasting benefits are obtained using the clearing and grubbing method. Each area should be devegetated every three years.

H.3.31 Equipment typically used for devegetation includes large tractors pulling bushhogs or harrows and discs.

H.3.32 Pipe Ramps. Earthen pipe ramps are located outside the front dikes adjacent to the Savannah River. These structures allow the Corps' dredging contractors to lay the dredge pipe on a gradual slope up from the river over the crest of the disposal area dikes. Borrow material for this work is the dredged material located inside the disposal areas. The ramps are grassed in the same manner as the dikes. There are presently 36 pipe ramps existing along Savannah River (5 in GA and 33 in SC). Two ramps would be constructed to allow use of Disposal Area 14A. One other ramp is expected to be needed over the 20-year study period. Approximately 1.7 acres of wetlands would be lost in South Carolina as a result of these operations. Expansion of ramps would be necessary as the height of dikes is increased. This is expected to result in the loss of 0.67 acres of wetlands in South Carolina and 0.14 acres of wetlands in Georgia. No relocation of ramps is anticipated.

H.4.00 **ENVIRONMENTAL CONSIDERATIONS.**

H.4.01 Outer Toe Of Dikes. All dike improvements (raisings) are to be performed inside the existing alignment of the outer toe of the dikes. Improvements within the existing toe would result in those actions having no permanent adverse impacts to wetlands.

H.4.02 Number/Location Of Pipe Ramps. Two additional pipe ramps would be needed for use of Disposal Area 14A. One other pipe ramp is expected to be needed during the 20-year period of analysis. No enlargements of ramps are expected which would result in additional losses of wetlands. Each new ramp is expected to result in the loss of wetlands in an area approximately 100 feet by 150 feet. The combined permanent wetland losses from these 3 ramps would be 1.70 acres.

Mitigation for these impacts in South Carolina is included in the approved Mitigation Plan. Expansion of ramps is expected to result in the loss of 0.67 acres of wetlands in South Carolina and 0.14 acres of wetlands in Georgia. Mitigation for the South Carolina impacts is included in the approved Mitigation Plan. Mitigation for the impacts in Georgia would be at a 2:1 rate and would be through the mitigation plan which has yet to be developed. No relocation of ramps is anticipated.

H.4.03 Weir Installation. Installation of new weirs is required during the initial diking of Disposal Area 14A. Approximately 0.1 acres of wetlands are expected to be lost during this construction. Mitigation for these wetland losses in South Carolina are included in the approved Mitigation Plan.

H.4.04 Weir Replacement. Minor temporary losses of wetlands are expected on an infrequent basis when weirs are replaced and new discharge pipes are installed. Weirs are normally replaced when dikes are raised. Usually this occurs about every 5 years. When replacement occurs, a small area of wetlands (about 30 feet by 50 feet) could be lost at each new discharge pipe. However, ending the discharge and associated activities at the original discharge pipe would allow some wetlands to reestablish at that location. Loss of 0.43 acres of wetlands in South Carolina and 0.04 acres in Georgia are expected. Mitigation for the South Carolina impacts is included in the approved Mitigation Plan. Mitigation for the impacts in Georgia would be at a 2:1 rate and would be through the mitigation plan which has yet to be developed.

H.4.05 Timing Of Work. The disposal areas would continue to be managed around the potential for work stoppage during the migratory bird nesting season to ensure compliance with the laws which protect the nesting of those species. Activities which are commonly used to maintain the disposal areas could result in impacts to those nesting birds if the activities were performed while the birds were nesting. Due to the lead time resulting from required contracting procedures, precise timing of field work is generally not available. Therefore, some degree of uncertainty will exist when construction activities are scheduled for inside the disposal areas during the March through August nesting season. Any work proposed for the nesting season must be coordinated with Savannah District (PD-E) to ensure compliance with the Migratory Bird Treaty Act.

H.4.06 Dike Mowing. The mowing of dikes is a component of normal dike maintenance practices. Some species of migratory birds do nest on the Savannah Harbor disposal area dikes and could be impacted by dike maintenance activities, particularly mowing. To ensure that these birds receive the protection required while nesting, the dike side slopes and other non-traveled portions of the dikes would not be mowed from March 1 to July 15. The traveling surface (roadway) on the dike crest would continue to be mowed when necessary to allow safe movement around the dikes for inspection and disposal area use purposes. Mowing of dike side slopes would only be performed outside the March 1 to July 15 period.

H.4.07 Underdrain Installation. Wetlands are expected to be lost when underdrain discharge pipes are installed. The loss is not expected to occur simultaneously, as sufficient depths of material may not exist for 10 years at Disposal Areas 14A and 14B to warrant installation at those sites. For each pipe installed, an area about 30 feet by 50 feet could be temporarily impacted during construction and a permanent loss of an area about 20 feet by 20 feet due to riprap installed below the pipe to prevent bank erosion. Since wetlands do not exist along the entire north bank of the Savannah River, not every underdrain discharge pipe would result in a loss of wetlands. At this time, it is estimated that 70 percent of the discharge pipes would result in a wetland loss, for a total loss of about 0.21 acres based on a general design with underdrains discharge pipes located roughly every 2,000 feet along a dike. For that design, a total of 32 underdrain discharge pipes would be needed over time in the confined disposal facilities.

H.4.08 The proposed SC Water Quality Certification contains a condition that underdrains be constructed with flap gates to restrict discharge during low flow conditions. This feature would be included in the final design of these structures.

H.4.09 Construction of underdrains could potentially impact cultural resources located along the pipe alignment. Prior to excavation, archival information would be reviewed to determine if any proposed underdrain alignment had the potential for impacting any known cultural resource sites in the confined disposal areas. If there was a significant potential for adverse impact to a known site, a cultural resource survey would be performed of the underdrain alignments and approval of the study's findings from the SHPO would be obtained prior to excavation.

H.4.10 Savannah River Bank/Front Dikes Erosion Control. No overall wetland impacts or other environmental impacts are expected from construction of bank protection systems along eroding banks. As sediment from eroding banks enters the river, it can smother benthic organisms and cause other turbidity impacts. If bank protection is not constructed, ongoing erosion is expected to continue, destroying wetland vegetation adjacent to sites where the vegetation has already been lost. The proposed erosion controls should minimize such impacts. Installation of erosion control features on Jones/Oysterbed Island is expected to impact 2.6 acres of wetlands. Mitigation for these impacts are included in the approved wetland Mitigation Plan.

H.4.11 Testing Of Underdrain Effluent. Design calculations indicate that a maximum mixing zone of just under 30 feet would be required before the discharge from the new underdrains would meet acceptable water quality standards for all parameters. This mixing distance is judged to be acceptable, as it is much less than the mixing zones of hundreds of feet which are typical for permitted industrial point discharges along the Savannah River. A chemical evaluation would be performed of the underdrain discharges every three years to ensure that all state water quality standards are being met in the receiving water at the edge of a 100-foot mixing zone.

H.4.12 Mitigation For Loss Of Wetlands. The non-Federal sponsor is responsible for mitigating wetland losses stemming from actions associated with the provision of disposal areas. Such actions would include the diking of Disposal Area 14A, construction of the access road to Disposal Area 2A, and what are referred to in the EIS as miscellaneous disposal area operations. Implementation of the approved Mitigation Plan for wetland losses in South Carolina -- Appendix G -- is one such responsibility. The sponsor will also be responsible for implementation of the mitigation plan -- as yet undeveloped -- for wetland losses in Georgia resulting from miscellaneous disposal area operations in that state.

H.4.13 The Disposal Area 14A Mitigation Plan is described in detail in Appendix G. The Plan consists primarily of constructing additional wildlife habitat within existing diked disposal areas and operating those areas for increased use by wildlife. Water levels would be managed in Disposal Areas 12A, 12B, 13A, 13B, 14A, 14B and Jones/Oysterbed Island after

completion of a disposal event to maximize use by shorebirds and waterfowl. The sponsor is responsible for implementing and maintaining several construction-type features of the Plan. These include the following:

(1) A 25-acre bare ground nesting area outside the dike at the Jones/Oysterbed Island Disposal Area.
(2) Two 1-acre nesting islands within the seven CDFs involved in the rotation program.
(3) An island in the nearshore area off Turtle Island. The island would have a 2.0-acre crown located at +14 feet MLW.
(4) Restoration/creation/protection of 25 acres of tidal wetlands in South Carolina. SC DHEC-OCRM would select feasible sites and identify either (1) construction actions necessary to improve/create wetlands at the site, and/or (2) measures which would be necessary to adequately protect the site from future development. The SC DHEC-OCRM would administer a $300,000 escrow account established by the local sponsor or its designee to accomplish the necessary actions.
(5) A second water control structure at an existing 228-acre impoundment within the Savannah National Wildlife Refuge.
(6) Purple martin nesting houses and bat houses at the CDFs in the rotation program.

H.4.14 Prior to implementing several of these construction items, additional environmental work is needed to ensure the final design would not unacceptably impact environmental resources. The following actions are needed before construction can proceed:

(1) At the bare ground nesting area on Jones/Oysterbed Island: A Special Use Permit has been requested from the US FWS to conduct this work and vegetative clearing has begun.

(2) For the bird nesting island offshore of Turtle Island:
a). Performance of a side scan sonar investigation and magnetometer survey to ensure no significant cultural resource would be impacted. The conclusions and the results of these investigations would be provided to the SHPO for approval.
b). Performance of a benthic survey to ensure critical benthic species would not be lost. The conclusions and results of this survey would be provided to the US FWS, NMFS and the SC DHEC-OCRM for approval.

c). Permission from the SC DHEC-OCRM for construction and maintenance of the island. (Through the EIS, the SC DHEC-OCRM has approved the concept of the island and awaits detailed design information prior to providing the necessary real estate easement.)

(3) Detailed designs of riprap to be placed on the shoreline of Jones/Oysterbed Island to protect that eroding bank must be submitted for approval to the SC DHEC-OCRM. The SC DHEC-OCRM will make a field inspection to confirm that the design minimizes the loss of wetlands along that shoreline. Mitigation for the loss of 2.6 acres of wetlands resulting from this activity was included in the approved Mitigation Plan for the LTMS Project.

H.4.15 The mitigation plan for the losses of other wetlands in Georgia consists of the restoration of 6.4 acres of tidal marsh in the harbor area. The plan would replace 3.2 acres of wetlands which would be permanently lost at a 2:1 rate. The Plan will be coordinated with the GA DNR Coastal Resource Division and the US FWS for approval. In light of the relatively small number of acres involved, it is expected that a site can be identified in the general Savannah Harbor area where the sponsor or the GA DOT can restore previously impacted marsh as a component of another construction project. The acreage lost consists of that which would be impacted during construction of an access road to Disposal Area 2A, including approximately 2.9 acres of tidal marsh and other wetlands would be permanently impacted by construction, and another 1.0 acre which would be impacted only during the actual construction period and is expected to recover quickly once construction activities cease. An additional 0.14 acres would be lost during expansions of existing pipe ramps. Implementation of this wetland mitigation plan would occur before the access road is placed in service. Approximately 0.04 acres would be lost in Georgia as a result of the weir/discharge pipe replacements.

H.4.16 Mosquito Control. As stated in Section H.3.12, the Chatham County Mosquito Control Commission (CCMCC) performs actions to control the mosquito population at the confined disposal facilities. The CCMCC applies mosquito-control chemicals in CDFs, usually by aerial spraying, after disposal operations have ceased and the sites are drying. The chemical they typically use is effective for 3 to 5 days and is designed to specifically target mosquitos. The chemical is an insect growth regulator (juvenile hormone mimic) that disrupts mosquito pupation by preventing emergence of mosquito larvae to the adult stage. These chemicals have been shown to have no effect on other aquatic or shellfish populations.

H.4.17 Since the mosquito control chemicals are applied when the CDFs are dry or nearly dry, no effluent discharges are occurring on a regular basis. At those times, discharges would only occur in an uncontrolled manner as stormwater runoff after rainfall events. The CCMCC generally does not apply these chemicals immediately before rainfall events, as the rainfall would dilute the strength of the chemicals making them less effective. Since the travel time across a dry CDF is much larger than the half-life of the chemicals applied, the concentrations leaving a CDF would be too small to have a significant effect on the receiving waters. The combination of the application timing, travel time across a CDF, half-life of the applied chemicals, and relatively low toxicity of these chemicals on estuarine biota result in the runoff of mosquito control chemicals not being a significant environmental issue at the Savannah Harbor CDFs.

H.4.18 As stated in Section H.4.13, purple martin nesting houses and bat houses would be constructed and maintained at the CDFs in the rotation program. These items would provide a measure of biological control for additional mosquitos which may develop as a result of implementing the water control management program in the SC wetland Mitigation Plan.

H.4.19 Erosion Control And Sedimentation Plan. The District prepared an Erosion and Sediment Control Plan, which is contained in Appendix N. That plan described actions which would be taken to minimize adverse impacts resulting from non-point source pollution from construction projects at the dikes at the confined disposal facilities (dike raising projects). In that document, the District committed the sponsor to use "Best Management Practices", as defined in the Manual For Erosion And Sediment Control In Georgia or the South Carolina Stormwater Management And Sediment Control Handbook For Land Disturbance Activities, whichever is appropriate, during those construction events. The local sponsor will prepare and submit documents to the SC DHEC-OCRM to obtain a Stormwater Management Permit for initial construction of the Disposal Area 14A dikes. The documents will describe actions to be taken to minimize adverse impacts resulting from non-point source pollution during that construction project. Implementing the procedures described in the Erosion and Sediment Control Plan prepared by the District will provide environmental clearance for subsequent Project dike raising activities in South Carolina.

APPENDIX I

SITE MANAGEMENT PLAN

SAVANNAH HARBOR OCEAN DREDGED MATERIAL DISPOSAL SITE (ODMDS)

SITE MANAGEMENT PLAN

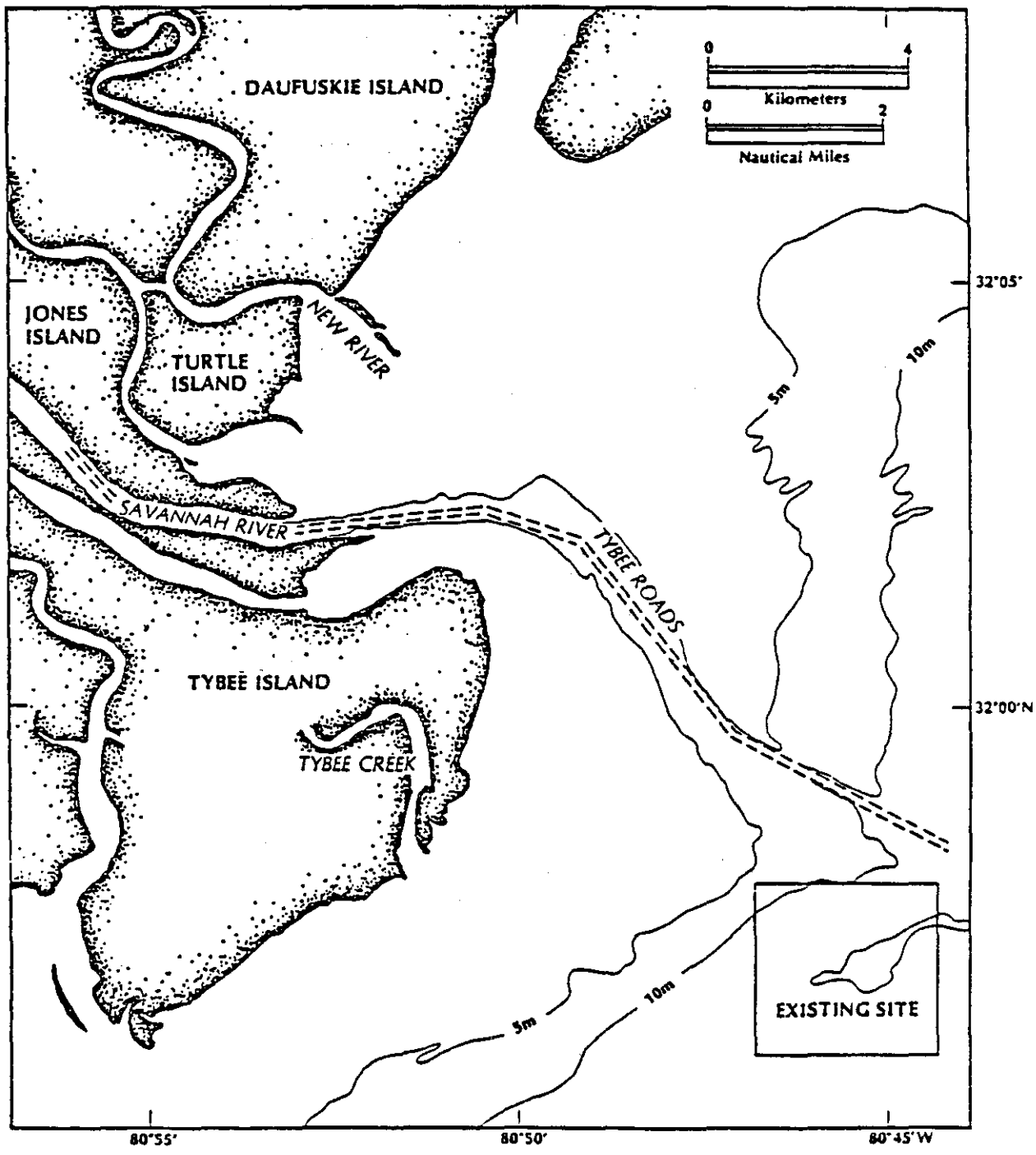
SAVANNAH HARBOR ODMDS

I.1.00 INTRODUCTION. The Environmental Protection Agency (EPA) formally designated the Savannah Harbor Ocean Dredged Material Disposal Site (ODMDS) in August 1987. The location of that site is shown in Figure 1. It is the responsibility of the EPA under the Marine Protection, Research, and Sanctuaries Act (MPRSA) of 1972 to manage and monitor ODMDSs designated by the EPA pursuant to Section 102 of MPRSA. As part of this responsibility, EPA/Region IV in conjunction with the Savannah District, U.S. Army Corps of Engineers (COE) developed a management and monitoring plan to specifically address deposition of dredged material into the Savannah Harbor ODMDS.

I.2.00 SITE MANAGEMENT AND MONITORING TEAM. An interagency Site Management and Monitoring Plan (SMMP) team, consisting of representatives of EPA, COE, Georgia Department of Natural Resources (GA DNR), and Chatham County has been established to review and comment on all Savannah Harbor ODMDS management and monitoring activities. Other agencies will be asked to participate when appropriate. This SMMP Team will coordinate annually to discuss upcoming disposal activities, suitable management practices, and monitoring efforts for the Savannah Harbor ODMDS.

I.3.00 SITE MANAGEMENT

I.3.01 Section 228.3 of the Ocean Dumping Regulations (40 CFR 220 to 229) states: "Management of a site consists of regulating times, rates, and methods of disposal and quantities and types of materials disposed of, developing and maintaining effective ambient monitoring programs for the site; conducting disposal site evaluation studies; and recommending modifications in site use and/or designation." The plan may be modified if it is determined that such changes are warranted as a result of information obtained during the monitoring process.



SAVANNAH OCEAN
DREDGED MATERIAL
DISPOSAL SITE

FIGURE 1

I.3.02 Management Objectives. There are three primary objectives in the management of an ODMDS. These are:

* Protection of the marine environment;
* Beneficial use of dredged material whenever practical; and
* Documentation of disposal activities at the ODMDS.

The following sections provide the framework for meeting these objectives to the extent possible.

I.3.03 Material volumes. To this point in time, the Savannah ODMDS has only received materials excavated from the entrance channel of the Savannah Harbor Navigation Project. Those sediments average about 15 percent fines and are located in areas of high current and wave energy. The sediments are typically removed from that channel on an annual basis. COE records indicate that annual removal has averaged 934,000 cubic yards over the 16-year period from 1976 to 1992. EPA's Final EIS for designation of the ODMDS stated that approximately 1,000,000 cubic yards per year are excavated from the entrance channel and deposited at the site. Over 1993 and 1994, the entrance channel was deepened by the COE and annual deposition at the ODMDS averaged 3,000,000 cubic yards for those two years. Future deposition is expected to return to the long term average and approximate 1,000,000 cubic yards per year. That quantity may decrease if beneficial uses, such as beach placement or construction of nearshore berms or islands, are implemented for the entrance channel sediments.

I.3.04 The 1983 Final EIS for designation of the Savannah ODMDS placed no restrictions on disposal volumes. Disposal of unrestricted volumes is dependent upon results from future monitoring surveys.

I.3.05 Material suitability. There is no general restriction regarding the type of material that may be placed at the site at this time. However, the suitability of dredged material for ocean disposal must be verified by the COE and agreed to by EPA prior to disposal activities. Verification will be valid for three years from the date last verified. Verification will involve: (1)a case-specific evaluation against the exclusion criteria (40 CFR 227.13(b)), (2)a determination of the necessity for bioassay (toxicity and bioaccumulation) testing for non-excluded material based on the potential for contamination of the sediment since last tested, and (3)implementing testing and determining that the non-excluded, tested material is suitable for ocean disposal.

I.3.06 Documentation of verification will be completed prior to use of the site. Documentation for material suitability for dredging events proposed for ocean disposal more than 5 years since last verified will consist of a new Section 103 Evaluation and Public Notice. Documentation for material suitability for dredging events proposed for ocean disposal less than 5 years, but more than 3 years, since last verified will consist of a review through an exchange of letters between the COE and EPA.

I.3.07 Should EPA conclude that reasonable potential exists for contamination to have occurred, testing acceptable to EPA will be completed prior to use of the site. Testing procedures to be used will be those delineated in the EPA/Corps testing manual (Green Book) and the Regional Implementation Manual. Only material determined to be suitable through the verification process by the COE and EPA will be placed at the designated ocean disposal site.

I.3.08 Time of disposal. At present, no restrictions related to seasonal variations in ocean current or biotic activity have been determined to be necessary. As monitoring results are compiled, should any such restrictions appear necessary, disposal activities will be scheduled to avoid adverse impacts. Additionally, if new information indicates that an endangered or threatened species is being adversely impacted, restrictions for protection of that species may be instituted.

I.3.09 Disposal Technique. No specific disposal technique is required for this site. However, it is the intent of this plan to maximize any advantages of strategic placement of materials and minimize off-site migration of deposited materials.

I.3.10 Previous disposal has generally occurred in the northeast quadrant of the site. This has apparently resulted in the formation of a mound of deposited sediments (see Figure 2). Future deposition would be managed to limit excessive mounding and minimize impacts to nearby benthic communities. Materials should be placed in a manner such that the resulting top elevation does not interfere with navigation.

I.3.11 Use of any beach-compatible dredged material for beach nourishment or other beneficial use is encouraged by both the Corps and EPA where economically feasible and environmentally sound. Expected environmental benefits should be included in the evaluation of the the feasibility of placement alternatives. Disposal of coarser material should be planned to allow placement within or accessible to the littoral zone, to the maximum extent practical and following the provisions of the Clean Water Act.

I.3.12 Placement of Materials. Prior to any disposal of dredged materials other than normal Bar Channel maintenance sediments, an agreement between EPA and the COE will be reached concerning the exact placement of these materials. Permits/contracts will specify locations for the disposal of any material from the project. Until monitoring results necessitate the need for any alterations, materials will be placed within the ODMDS according to paragraphs I.3.8 through I.3.10. Predominantly coarse-grained material may be used for beach nourishment or another beneficial purpose (i.e. submerged berms, feeder berms or nearshore islands).

I.3.13 Disposal Monitoring. For all disposal activities, the dredging contractor will be required to prepare and operate under an approved electronic verification plan for all disposal operations. As part of this plan, the contractor will use an automated system that will continuously track the horizontal location and draft condition (vertical) of the disposal vessel from the point of dredging to the disposal area, and return to the point of dredging. Accuracy and precision of the locational system will be at least as good as provided by Loran C. Required digital data are as follows:.

(a) Date;
(b) Time;
(c) Vessel Name;
(d) Dump Number;
(e) Map Number on which dump is plotted;
(f) Beginning and ending coordinates of the dredging area for each load, and the beginning and ending coordinates for each dump and the compass heading at the beginning of each dump;
(g) Channel stations from which dredged material came; and
(h) Volume and brief description of material disposed.

I.3.14 Prior to commencement of disposal operations, a baseline bathymetric survey will be conducted of the disposal area and adjacent areas by the site user. The survey will be taken along lines spaced on 500-foot intervals and be of sufficient length to adequately cover the area. Accuracy will be +/- 1.0 feet. The survey will be referenced to MLW and corrected for tide conditions at the time of the survey. The Savannah District ARTIS tide gauge will be used for tidal corrections. As a follow-up to the baseline bathymetric survey, the site user will conduct a similar survey after disposal. The number of transects and accuracy required will be the same as in the baseline survey.

I.3.15 The user will be required to prepare and submit to the COE daily reports of operations and a monthly report of operations for each month or partial month's work. The information contained in items (a) through (h) above will be provided in IBM-compatible computer format.

I.3.16 When disposal operations are complete, the contractor will provide to the COE two scatter plots showing where each load was deposited (beginning and end of each dump). One plot would be on a scale of 1 inch equals 2,400 feet (fit an 8 1/2 by 11 inch paper), and the other plot would be a scale of 1 inch equals 500 feet (fit a full size blue line drawing). The plots would also show the boundaries of the ODMDS.

I.4.00 SITE MONITORING

I.4.01 Part 228 of the Ocean Dumping Regulations establishes the need for evaluating the impacts of disposal on the marine environment. Section 228.9 indicates that the primary purpose of this monitoring program is to evaluate the impact of disposal on the marine environment by referencing the monitoring results to a set of baseline conditions. Section 228.10(b) states that in addition to other necessary or appropriate considerations, the following types of effects will be considered in determining to what extent the marine environment has been impacted by materials disposed at an ocean site (excerpted):

1. Movement of materials into estuaries or marine sanctuaries, or onto oceanfront beaches, or shorelines;

2. Movement of materials toward productive fishery and shellfishery areas;

3. Absence from the disposal site of pollution-sensitive biota characteristic of the general area;

4. Progressive, non-seasonal, changes in water quality or sediment composition at the disposal site, when these changes are attributable to materials disposed of at the site;

5. Progressive, non-seasonal, changes in composition or numbers of pelagic, demersal, or benthic biota at or near the disposal site, when these changes can be attributed to the effects of materials disposed at the site; and

6. Accumulation of material constituents (including without limitation, human pathogens) in marine biota at or near the site.

I.4.02 Part 228.10(c) states: "The determination of the overall severity of disposal at the site on the marine environment, including without limitation, the disposal site and adjacent areas, will be based on the evaluation of the entire body of pertinent data using appropriate methods of data analysis for the quantity and type of data available.

I.4.03 Impacts will be classified according to the overall condition of the environment of the disposal site and adjacent areas based on the determination by the EPA management authority assessing the nature and extent of the effects identified in paragraph (b) of this section in addition to other necessary or appropriate considerations."

I.4.04 The Monitoring Plan for the Savannah Harbor ODMDS is described in Attachment A. The Monitoring Plan will be implemented subject to the availability of funding. Should shortfalls in funding occur, the SMMP team will recommend which aspects of the Monitoring Plan should receive priority. Results of monitoring will be reviewed by the SMMP team and recommendations made to the Corps and EPA on appropriateness and detail of future monitoring efforts.

I.5.00 MODIFICATION OF THE SITE MANAGEMENT PLAN.

I.5.01 Should the results of monitoring surveys indicate that continuing use of the Savannah ODMDS would lead to unacceptable impacts, then either the Savannah ODMDS Site Management Plan will be modified to alleviate the impacts, or the location of the ODMDS will be modified.

I.5.02 This Site Management Plan may be modified at any time by joint agreement of the signatory parties to the reflect the views of the SMMP team.

ATTACHMENT A

SITE MONITORING PLAN

FOR THE

SAVANNAH HARBOR ODMDS

ATTACHMENT A

SITE MONITORING PLAN
FOR THE
SAVANNAH HARBOR ODMDS

A.1.00 INTRODUCTION

A.1.01 The Savannah Harbor Ocean Dredged Material Disposal Site (ODMDS) is an active, frequently used site in the South Atlantic Bight (part of EPA's Region IV area of responsibility). This is the first Site Management Plan which has been developed for the Savannah ODMDS.

A.1.02 The Savannah ODMDS encompasses an area of 4.26 nautical miles (NM) (approximately 2.1 by 2.0 NM) and is located about 3.7 NM east of the coastline and about 0.25 NM (1,500 feet) south of the Navigation Channel. The site's center is located at 31 56'54"N and 80 45'34"W. The site was formally designated by EPA as an ODMDS on August 2, 1987. To date, the site has only been used for placement of material obtained from the Savannah Harbor Navigation Project. The site has received both new work and maintenance dredged material from the harbor's Bar Channel (entrance channel), which is located oceanward of Station 0+000. No disposal activities are known to have occurred outside the boundaries of the site.

A.1.03 Monitoring activities were initially conducted by Savannah District in 1994 to assess the fate of dredged material placed within the ODMDS during the early 1994 disposal activities. At that time, both new work material from the Savannah Harbor Deepening Project and maintenance material were placed at the site. The primary objectives of these bathymetric surveys were to: (1) document the bathymetry of the site prior to the 1994 disposal activities, (2) document the location and configuration of mounds created at the site with dredged material during the 1994 disposal activities, (3) determine whether any material deposited is moving offsite, and (4) attempt to determine the rate and/or direction of material migration.

A.1.04 The Monitoring Plan is a component of the initial Site Management Plan for the Savannah Harbor ODMDS. The Monitoring Plan should be regarded as a flexible strategy with the various task and techniques applied as appropriate and as dictated by disposal activities and observed effects. The following sections describe the objectives and methods for the site monitoring.

A.2.00 OBJECTIVES

A.2.01 Major objectives of the Savannah ODMDS Monitoring Plan are to:

(1) Determine the fate of dredged material placed at the site, and
(2) Assess the impact of dredged material through the early detection of changes in sediment characteristics (physical and chemical), and biological communities which may be deemed as adverse and chronic.

A.2.02 Since several different ecological components are susceptible to perturbation by dredged material disposal, and an alteration to one component may have a resultant impact on another, a comprehensive monitoring approach is proposed with several specific objectives. These objectives are to:

(1) Continue bathymetric mapping of the ODMDS and surrounding area, and relate findings to plotted coordinates of disposal events.

(2) Using sediment mapping techniques, periodically review the direction and rate of migration of deposited dredged material.

(3) Evaluate the effects of disposal and subsequent movement of dredged material on the physical and chemical characteristics of the sediments and benthic infaunal communities in and adjacent to the ODMDS.

(4) If determined necessary, determine the areal distribution of turbidity plumes generated during a major disposal operation and compare the turbidity data with the ambient turbidity plume emanating from Savannah River.

(5) Select and characterize a sediment testing "reference site" meeting Green Book criteria, for use by public and private dredging projects, in conducting sediment toxicity and bioaccumulation test for ocean dumping evaluation.

A.2.03 Responsible Party. The activities described above in Section A.2.02 will be implemented by various agencies and parties. The site user will implement activities to accomplish objectives 1 and 5. EPA will implement activities to accomplish objectives 2 and 3. Should implementation of objective 4 become necessary, the SMMP team will advise its members which agency should be responsible and could best perform the necessary work.

A.3.00 MONITORING APPROACH AND RATIONALE

A.3.01 Sediment Mapping and Site Bathymetry.

A.3.02 An essential initial requirement for effective implementation of site monitoring activities at the Savannah ODMDS is accurate placement, recording, and plotting of disposal events. The Savannah District, USACOE, will require such information from all dredging contractors and will compile and continuously update computer plots depicting placement of dredged material. Plotted coordinates will be in GPS-corrected latitude/longitude to enhance use by all associated monitoring agencies.

A.3.03 Using the above information as a basis, close grid bathymetry will be conducted at least annually. The sediment mapping effort should encompass the entire area of the ODMDS designated for maintenance disposal and a 0.25 NM buffer zone around that site (Figure 1). The spacing of the grid may be expanded on the southern half of the ODMDS if disposal activities occur only in the northern half of the site. While the scheduling of these surveys is complicated by the frequency and quantity of dredged material disposal at the site, it is expected that sediment mapping will occur at least twice annually; before and after annual winter disposal operations. Experience with these techniques at the Savannah ODMDS thus far indicates that this frequency is the minimum necessary to effectively detect gross changes in dredge material redistribution. Due to the apparent highly dynamic nature of sediment transport at the site, detection of more discrete migration patterns may require mapping at a greater frequency, possibly targeting a specific disposal mound. In addition to bathymetric sediment mapping, areal mapping of sediment chemistry may be employed to differentiate and track native sediments and dredged material migration. Baseline studies were conducted in August 1991 to develop a complete isotopic, elemental, and physical (particle size) history for this location. The 1991 study indicated higher concentrations of fine sediments in the western half of the ODMDS.

A.3.04 Two existing bathymetric surveys conducted at the Savannah ODMDS sites (late 1993 and 1994) clearly depict the location of mounds within the ODMDS. These surveys indicate that significant off-site migration of deposited material is occurring, as the post-construction survey revealed a smaller total volume than did the pre-construction survey, even with deposition of 2.3 million cubic yards of sediments at the site as part of the 1993/1994 Savannah Harbor Deepening Project.

A.3.05 Biological Impact Assessments.

A.3.06 The primary intent of these sampling efforts will be to assess whether ocean disposal of dredged material at the Savannah ODMDS results in unacceptable adverse impacts to the biological communities adjacent to the ODMDS.

A.3.07 Benthic organisms are the resident community at the disposal site and do not have an ability to avoid increased sedimentation resulting from sediment disposal and movement. They also serve as a primary food source for the fisheries associated with the nearshore zone off the Georgia coast. Their sessile life cycle subjects them to both the physical and chemical perturbations on the seafloor generated by disposal activities. Because of their importance in food web dynamics, assessment of the benthic community structure should be a primary focus for detection of biological impact.

A.3.08 A limited benthic assessment consisting of one station within and one station southeast of the ODMDS was conducted by EPA in March and December 1979 prior to its official designation of the site as an ODMDS. A more comprehensive benthic survey of the ODMDS was conducted in May 1992. Six benthic monitoring stations were located within the disposal area and six stations were located just outside this area. The latter survey indicated the presence of two main species assemblages, based on apparent habitat type; a gravelly sand assemblage, and a silty sand assemblage. The gravelly-sand stations occurred in the eastern portion of the study area, and the silty-sand stations in the western half of the disposal site. The 1992 study will be used to direct subsequent benthic monitoring efforts.

A.3.09 In order to expand the benthic database and allow evaluations to be made on the impacts which disposal operations at this site have on benthic communities, benthic surveys will be conducted both in the ODMDS and in the area immediately surrounding the site. The benthic data will allow determinations to be made concerning whether benthic resources outside the ODMDS are being affected by disposal of fine-grained materials, and determine whether these changes are detrimental. The primary focus of this monitoring effort will be to determine whether disposal operations cause a major change in the faunal composition of benthos (which could affect trophic functions) and/or whether there are significant alterations in species numbers or biomass. Changes in other biological metrics, similar to those currently being evaluated in EPA's EMAP program will also be considered based on their applicability to this survey area.

A.3.10 After the bathymetric surveys, sediment mapping, and current studies conclusively determine the direction(s) of sediment migration, benthic surveys would be conducted. The benthic monitoring would be concentrated in those areas where sediment transport was expected or documented to occur. The benthic surveys will involve collecting benthic samples in and around the ODMDS using an appropriate stratified sampling design based on available information, such as areal mapping of sediment chemistry. The general zones (strata) will include areas both within the ODMDS and adjacent to all boundaries of the ODMDS. The zones within the ODMDS would be used to document changes in the benthic communities following disposal operations for comparison with zones outside the ODMDS.

A.3.11 The number of samples obtained per zone will be sufficient to adequately represent the benthic community composition (based on species saturation curves) and detect moderate changes in faunal densities, biomass, and species numbers (based on power analyses). At least one sample will be taken within the area of steepest slope in the south-central portion of the ODMDS. Each benthic sample obtained for faunal assessment will be subsampled to determine sediment characteristics of the sample (eg, grain size, percent silt, clay, sand, CaCO, etc.). The sediment samples will be used to (1)further characterize the composition of surficial sediments in and around the ODMDS, and (2)aid in interpreting changes in benthic infaunal composition.

A.3.12 Disposal Plume Dispersion.

A.3.13 At infrequently used disposal sites, the turbidity plume generated during ocean disposal of dredged material is generally viewed as an episodic event with impacts being limited and temporary. However, at frequently used ODMDS's, consideration of the potentially chronic effects of the turbidity plume should be considered. Sessile live bottom organisms such as octocorals and sponges may be particularly susceptible to suspended solids concentrations chronically above ambient. While no live bottom communities are known to be associated with the Savannah ODMDS, such communities, when present, are an important habitat for productivity and fish use. Should any significant benthic communities be identified in the area, an evaluation would be conducted to determine if they would be impacted by turbidity plumes. At that time, a typical turbidity plume generated by a major disposal event should be delineated and its areal distribution plotted. A ship-mounted transmissometer could be used to profile light attenuation at grid points encompassing the plume. The outer boundaries of the grid could be determined using an aircraft mounted GPS during an aerial reconnaissance of

the disposal operation prior to initiating the grid profiling. Information gleaned during this effort could be compared to plume turbidity/suspended solids concentrations for consideration of plume impact.

A.3.14 Sediment Turbidity Transport Studies.

A.3.15 An overall southerly movement of littoral material occurs in the general vicinity. That trend is interrupted, somewhat, by flows leaving the Savannah River. It is believed that the tidal inlet at Savannah tends to shift the overall southerly littoral drift pattern seaward to some degree. Shoaling patterns along the Bar Channel support the position that the littoral drift movement is from north to south.

A.3.16 There is no known existing data on ocean currents specifically at the Savannah ODMDS. However, predictions can be made based on the overall direction of waves which are recorded nearby. Review of the Hindcast Wave Information for the U.S. Atlantic Coast (WIS Report 30) prepared in March 1993 by the Corps of Engineers, Waterways Experiment Station (WES) reveal the predominant wave directions are from the E-SE. Those directions also produce both the largest and longest period waves. July and August are the months of lowest wind strength, while the period of November through March produce winds of the greatest strength (over 40 miles per hour).

A.3.17 Based upon these limited findings, present management strategies involve placement of dredged material and construction of submerged berms down the eastern side of the ODMDS. Actual current data over an annual cycle would (1) add confidence to this management strategy, and (2) help clarify sediment redistribution patterns revealed by bathymetric surveys.

A.3.18 The primary task required for current data collection would be the deployment and retrieval of continuously recording current meters. Ideally, a long-term continuous data base obtained over a two-year period should be obtained to evaluate both seasonal and yearly variability in current patterns. Deployment of a Acoustic Doppler Current Profiler (ADCP) placed within or adjacent to the ODMDS would provide the best data base for this effort. Quarterly or semiannual retrieval of the data record would provide timely information on prevailing current patterns. Collection of such data should be coincident with a major disposal project during which sediment mapping, plume dispersion, and sediment sampling occurs. This would allow integration of current data into these programs, thus enhancing interpretation of plume dispersion, sediment transport and sedimentation.

A.4.00 CONTAMINANT STUDIES

A.4.01 Sediment Contaminant Monitoring.

A.4.02 Previous sampling of sediments in and around the ODMDS conducted by EPA prior to their official designation of the site as an ODMDS did not detect significant elevations of sediment contamination. A critical component of the proposed monitoring plan will be to periodically sample sediments in and adjacent to the ODMDS to monitor for changes in sediment contaminant levels. This sampling would be conducted using a tiered approach, where sites outside the ODMDS are not monitored until elevated levels are detected inside the ODMDS. A Tier I evaluation of the need for sediment chemical testing would be conducted every 3 years to coincide with a similar evaluation of sediments in the Bar Channel. More frequent sampling of the sediments may be warranted if elevated levels of certain contaminants are found, but the analysis could be restricted to only those constituents which are above acceptable levels.

A.4.03 Reference Site Assessment.

A.4.04 Testing of sediments for ocean disposal in conformance with the "Green Book" requires comparison of the project sediments with that from sediments outside the influence of the project. Questionable results can arise if low survival is experienced in the reference sediment. Concern for the acceptability of the reference sediment is also generated when the survival in both the reference and test sediments is low and there are similar percentages for survival or mortality. As defined in the testing guidance, a reference sediment should (1) be substantially free of contaminants, (2) be as similar to the grain size of the dredged material and sediment at the disposal site as practical, and (3) reflect conditions that would exist in the vicinity of the disposal site had no dredged material disposal ever occurred, but had all other influences on sediment conditions taken place. These are the optimum conditions for evaluation of toxicity and bioaccumulation and, quite often, are not attainable. If it is not possible to fully meet these conditions, test organisms should be selected that are not sensitive to grain size differences among the reference, control, and test sediments.

A.4.05 Satisfaction of the above requirements is often complicated because the disposal activity often does not involve the disposal of "like" material. The grain-size of sediments removed from the Bar Channel may be different than that found several miles offshore where the ODMDS is located. Sediments in the Bar Channel would be expected to be somewhat finer since that channel carries ebbing tidal water which have just flooded extensive salt marshes known for their detrital export functions.

A.4.06 Finding a reference sediment which is uncontaminated and similar to the grain size of the Bar Channel sediments, and yet represents conditions which would exist at the disposal site, which is primarily sand, is difficult. However, to aid in the long-term analysis of disposal at the Savannah Harbor ODMDS, selection of a single location for a suitable reference sediment which can be used for repeated sediment analyses would (1) ease the process of developing a sampling plan, and (2) allow comparison of the dredged material with similar material outside the influence of the project in accordance with the "Green Book".

A.4.07 Test Organism Assessment.

A.4.08 Selection of test organisms appropriate for the Savannah area, yet consistent with recommended national and regional "Green Book" species should be a part of this assessment. Information developed from this effort could then be used by the Corps both in-house and as instruction to any other organization which may be considering use of the Savannah Harbor ODMDS.

The following Site Management Plan for the Savannah Harbor Ocean Dredged Material Disposal Site (ODMDS) has been developed and agreed to pursuant to the Marine Protection, Research, and Sanctuaries Act of 1972, as amended, for the management and monitoring of ocean disposal activities, as resources allow, by the U.S. Environmental Protection Agency (EPA) and the U.S. Army Corps of Engineers (Corps).

Grant W. Smith Colonel, U.S. Army District Engineer Savannah District U.S. Army Corps of Engineers Savannah, Georgia	Date	Robert F. McGhee Acting Director Water Management Division U.S. EPA, Region IV Atlanta, Georgia	Date

This plan is effective from the date of the last signature and shall be reviewed and revised as necessary.

APPENDIX J

CULTURAL RESOURCES MANAGEMENT PLAN

SAVANNAH HARBOR NAVIGATION PROJECT
SAVANNAH RIVER
CHATHAM COUNTY, GEORGIA, AND JASPER COUNTY, SOUTH CAROLINA

HISTORIC PROPERTIES MANAGEMENT PLAN

Prepared by

The Environmental Resources Branch
Planning Division
Savannah District
U.S. Army Corps of Engineers

FY 1995

HISTORIC PROPERTIES MANAGEMENT PLAN
FOR THE
SAVANNAH HARBOR NAVIGATION PROJECT

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J.1.00 EXECUTIVE SUMMARY

J.1.01 This document details the Historic Preservation Management Plan (HPMP) for the Savannah Harbor Navigation Project. Corps of Engineers regulation ER 1130-2-438, Project Construction and Operation, Historic Preservation Program, governed its preparation.

J.1.02 Historic resource surveys completed during and after construction of the Savannah Harbor Navigation Project identified historic properties on fee-owned Government land and adjoining project lands. A number of these sites are either listed on the National Register of Historic Places, possess sufficient integrity to be eligible for listing on the National Register, or are potentially eligible for the National Register. The impact of the Navigation Project on each of these resources or potential resources is addressed, needed investigations are described, and recommendations for avoidance/protection activities are provided. The staff liaison for historic resources within or near the Savannah Harbor Navigation Project is Ms. Judy Wood, PD-EI.

J.2.00 AUTHORITY

J.2.01 The Corps of Engineers is responsible for all aspects of protection of historic properties located on fee-owned lands. This includes protection from project efforts, permitted and licensed efforts by others, easements, vandalism, and natural deterioration. For sites located on tracts with less than fee simple ownership, the Corps is responsible only for project induced effects.

J.2.02 Savannah Harbor has had a very dynamic history, undergoing some type of Savannah District affiliated modification/ improvement in every decade since the 1850's. These improvements have included construction of wing dams, closing dams, training walls, disposal area dikes, a Sediment Basin and Tidegate, turning basins, deeper wider and longer channels, and a LASH facility. It is reasonable to assume that such changes will continue to occur.

J.2.03 The Savannah Harbor Navigation Project is part of the Port of Savannah. Public entities (e.g. the City of Savannah, the Georgia Ports Authority, a United States Navy Reserve Unit, and the United States Coast Guard) and private corporations construct and maintain facilities that make use of the Federal navigation channel and turning basins. These facilities are located on the banks of Savannah River within 200 feet of the Federal navigation channel. Construction, maintenance, and modification of these facilities often requires Section 10 and/or

404 Regulatory permits and a review of the effect of the project upon navigation servitude. Between 1972 and September 1994, 188 regulatory permits were issued within and in the immediate vicinity of Savannah Harbor.

J.2.04 Studies conducted as part of the 1989/1990/1991 Savannah Harbor Widening Project, 1992 New Cut Closure Project, 1993/1994 Savannah Harbor Deepening Project, and the 1993-1995 Savannah Harbor Long Term Management Strategy (LTMS) Study have revealed a number of significant and potentially significant cultural resources that abut the Savannah Harbor Navigation Project. Because of their proximity to the navigation channel, it is likely that one or more of these sites could be impacted by changes in operating procedures or harbor improvement projects, issuance of Section 10 and/or 404 permits, or navigation servitude clearances.

J.2.05 Under the authority and requirements of the following laws, regulations, and guidelines, the Savannah District, U.S. Army Corps of Engineers has the responsibility to inventory, manage, and take into account the effects of its actions on historic properties meeting criteria of eligibility for inclusion in the National Register of Historic Places within and in the vicinity of the Savannah Harbor Navigation Project.

* The Antiquities Act of 1906, PL 59-209 (16 U.S.C. 431, 432, 433)
* The Historic Sites Act of 1935, PL 74-292 (16 U.S.C. 461 et seq.)
* The Reservoir Salvage Act of 1960, PL 86-523 as amended by the Archeological and Historical Preservation Act of 1974
* The National Historic Preservation Act of 1966, PL 89-655 as amended including the National Historic Preservation Act Amendments of 1980 and 1992 (16 U.S.C. 470 et seq.)
* National Environmental Policy Act of 1969, PL 91-190 (42 U.S.C. 4371 et seq.)
* The Archaeological and Historic Preservation Act of 1974, PL 93-291 (16 U.S.C. 469-469c)
* The Archaeological Resources Protection Act of 1979, PL 96-95 (16 U.S.C. 470aa-470mm)
* American Indian Religious Freedom Act, PL 95-341 (42 U.S.C. 1986)
* Abandoned Shipwreck Act of 1987, PL 100-298 (43 U.S.C. 2101 et seq.)
* Native American Graves Protection and Repatriation Act, PL 101-601 (25 U.S.C. 3001-3013)
* River and Harbor Act of 1899
* Clean Water Act of 1974
* Executive Order 11593

* Abandoned Shipwreck Act; Final Guidelines, Department of the Interior. Federal Register, Tuesday, December 4, 1990, Pages 50116-50145
* Dredging Guidance Letter No. 909-01, Policy and Procedures for the Conduct of Underwater Historic Resource Surveys for Maintenance Dredging and Disposal Activities. March 13, 1989
* 32 CFR 229, Archaeological Resources Protection Act of 1979; Final Uniform Regulations
* 33 CFR 325, Processing of Department of the Army Permits: Appendix C., Procedures for the Protection of Historic Properties, dated November 13, 1987.
* 36 CFR 327, Shoreline Management at Civil Works Projects, dated May 1986
* EC 405-1-71, Implementation of Archaeological Resources Protection Act Uniform Regulations
* ER 200-2-2, Policy and Procedures for Implementing NEPA
* ER 1130-2-433, Project Operations, Collections Management and Curation of Archeological and Historical Data
* ER 1130-2-438, Project Construction and Operation, Historic Preservation Procedures

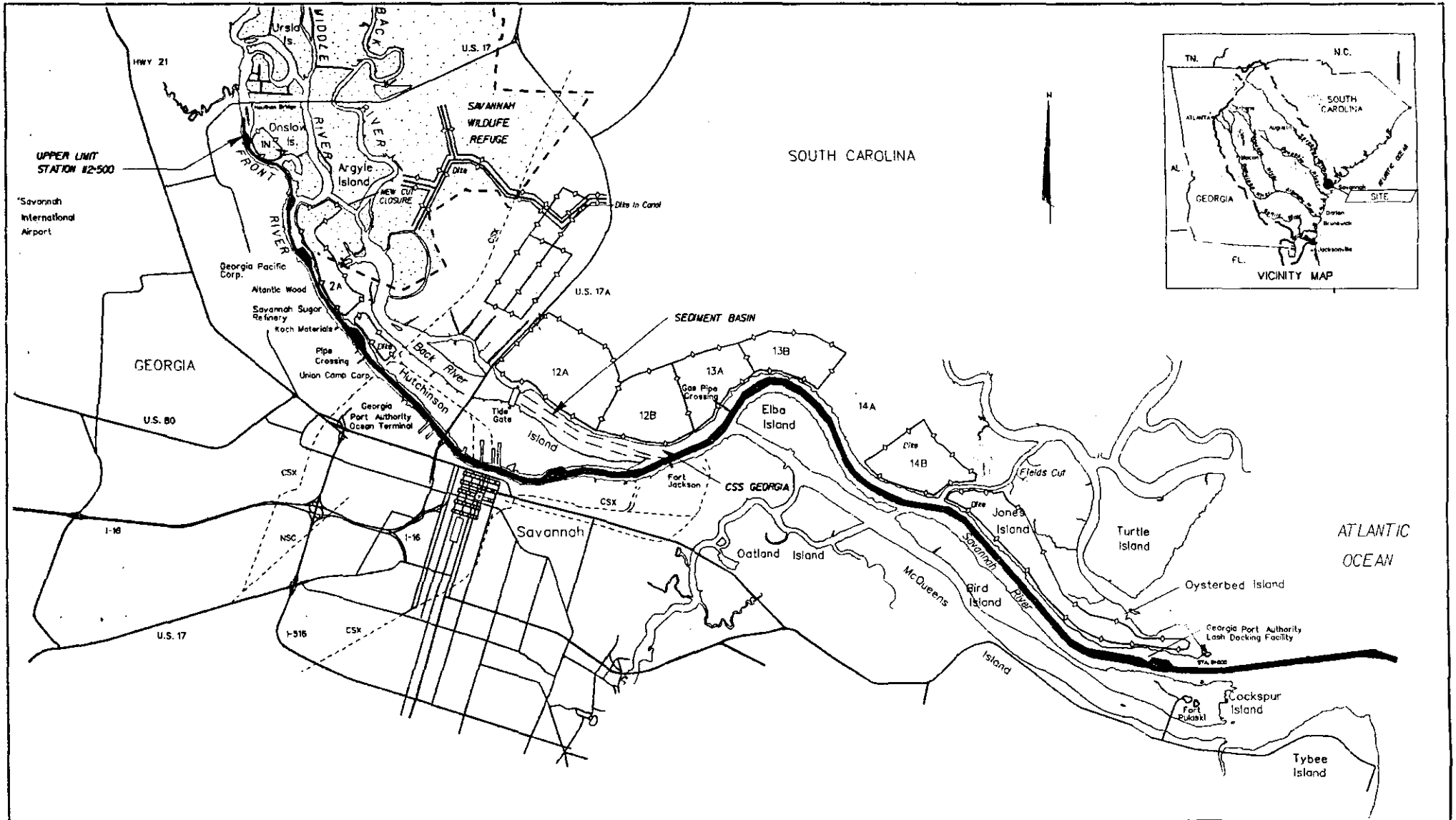
J.3.00 PROJECT DESCRIPTION

J.3.01 The Savannah Harbor Navigation Project consists of a dredged navigation channel, turning basins, disposal areas, berthing areas, an Engineer Depot, a Sediment Basin, a Tidegate, and a Tidegate access area (Figure 1).

J.3.02 Navigation Channel.

J.3.03 The navigation channel is 44-feet deep and 600 to 800-feet wide from ocean station -60+000 to station -14+000 between the jetties. It is 42-feet deep and 500-feet wide from station -14+000 to the upstream end of the Kings Island Turning Basin at station 101+500. The channel is 36-feet deep and 400-feet wide from station 101+500 to the upstream end of the Argyle Island Turning Basin at station 104+250. From station 104+250 to the harbor's upstream limit at station 112+500, the channel is maintained to a depth of 30 feet and is 200-feet wide.

J.3.04 In order to maintain harbor depths more efficiently, Savannah District has been authorized to conduct advance maintenance dredging in certain channel segments. Two feet of advance maintenance dredging has been approved for ranges 0+000 to 24+000, 70+000 to 79+000, and 100+000 to 112+000. Four feet of advance maintenance dredging has been approved for the channel between stations 24+000 to 70+000.

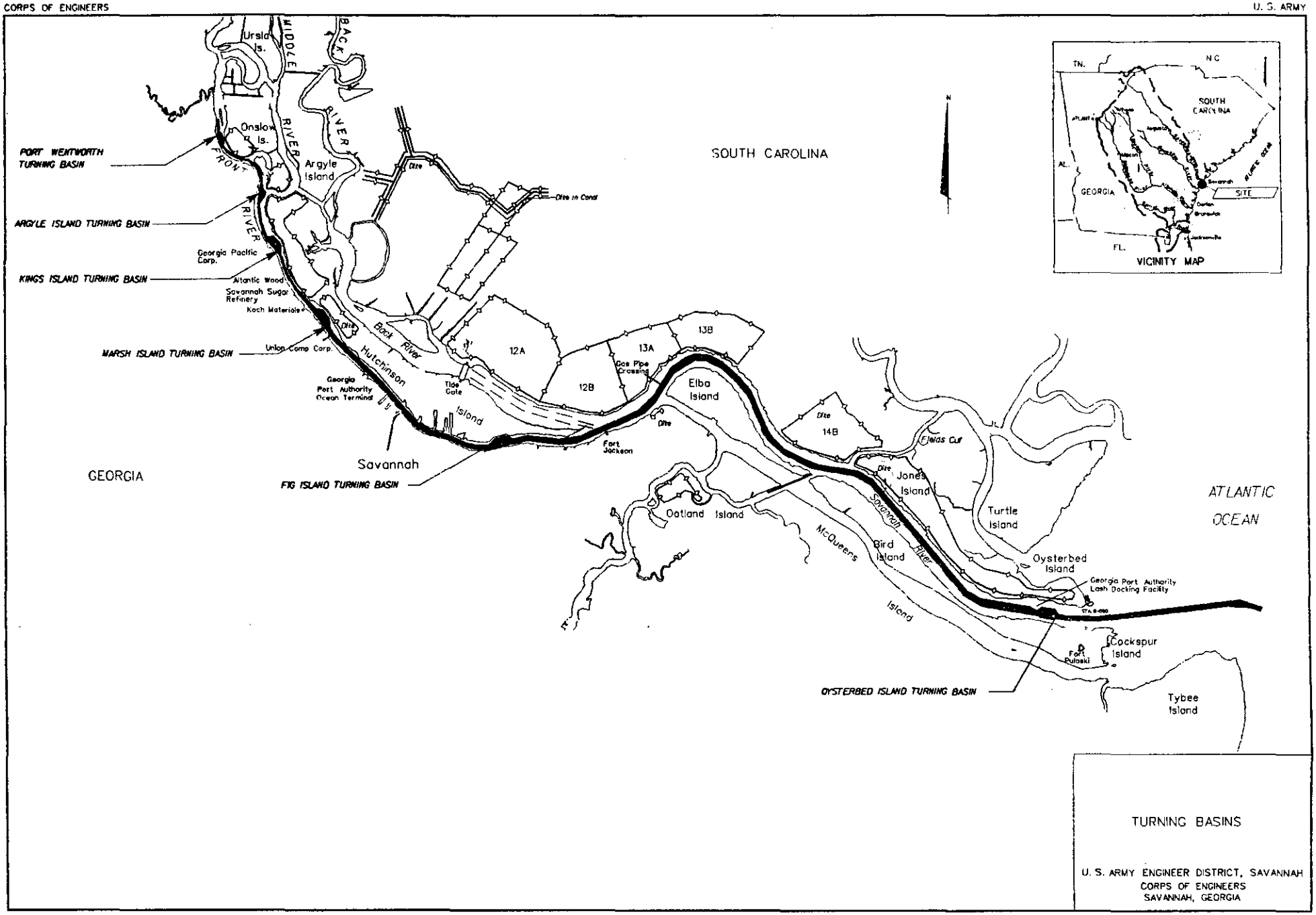


SAVANNAH RIVER , GEORGIA AND SOUTH CAROLINA

SAVANNAH HARBOR NAVIGATION PROJECT

U. S. ARMY ENGINEER DISTRICT, SAVANNAH
CORPS OF ENGINEERS
SAVANNAH, GEORGIA

FIGURE 1



TURNING BASINS

U. S. ARMY ENGINEER DISTRICT, SAVANNAH
CORPS OF ENGINEERS
SAVANNAH, GEORGIA

J.3.05 Turning Basins.

J.3.06 Savannah District maintains six turning basins in the harbor. Oysterbed Island Turning Basin is located on the north and south side of the channel between stations 2+250 and 4+250. It is maintained to a depth of 38 feet. The portion on the north side of the channel is 450 feet wide. The south side portion is 100 feet wide. Fig Island Turning Basin is located on the north side of the channel between stations 67+500 and 69+750. It is maintained at a depth of 38 feet and has a width of 400 feet. Marsh Island Turning Basin is located on the northeast side of the channel between stations 89+350 and 91+750. It is maintained to a depth of 38 feet with a width of 400 feet. Kings Island Turning Basin is located on the northeast side of the channel between stations 92+750 and 102+000. It is maintained at a depth of 42 feet and averages about 1230 feet wide. Argyle Island Turning Basin is located on the east side of the channel between stations 102+000 and 104+250. It varies from 100 to 200 feet in width and is maintained at a depth of 30 feet. Port Wentworth Turning Basin is located between stations 109+150 and 112+250 on the east side of the channel. It has a maximum width of 500 feet and is maintained at a depth of 30 feet.

J.3.07 Sediment Control Works.

J.3.08 Authorized sediment control works in Savannah Harbor include a Tidegate structure across Back River and a sediment basin immediately downstream of the tidegate. The Sediment Basin is dredged to a 40-foot depth and 600-foot width, and is approximately 2 miles long. Its 38-foot-deep and 300-foot-wide entrance channel joins the navigation channel at station 59+000. Savannah District holds fee title to lands located on either end of the tidegate. The Hutchinson Island tract contains approximately 11.91 acres of land owned in fee simple and 4.52 acres under easement (access road). This area was filled and the shoreline riprapped as part of Tidegate construction. The area is used for accessing the Tidegate and as an equipment staging and parking area. Floating docks for some Savannah District vessels are located along the shoreline. The South Carolina tract contains 14.72 acres owned in fee title; some of which was removed during tide gate construction and 6.47 acres under easement (access road). This area is used for access to that end of the Tide gate. The area has been filled and the shoreline has been riprapped.

J.3.09 U.S. Army Corps of Engineers Depot.

J.3.10 The U.S. Army Corps of Engineers Depot consists of a 7.75-acre parcel of land located on the south shore of what is now known as Hutchinson Island at Savannah Harbor Station 72+250. The facility includes offices, storage space, equipment and vehicular parking areas for various Savannah District offices (LM, IM, EN-GG, EN-S), boat and automobile fueling stations, a wharf, floating docks, and a boat ramp. The area is also used by the U.S. Coast Guard's Captain of the Port (office, maintenance area, and wharf space) and a U.S. Navy Reserve Unit (office and boat storage).

J.3.11 Disposal Areas.

J.3.12 Disposal areas for Savannah Harbor dredged material are provided by local sponsors. There are nine diked disposal areas and one off-shore disposal area for the Savannah Harbor Navigation Project. The off-shore area covers an area of 4.26 nautical square miles and is located 3.7 nautical miles from shore, south of the Savannah Harbor navigation channel.

J.3.13 Six of the diked disposal areas are located in South Carolina and three are located in Georgia. The areas are owned by the Georgia Ports Authority, Georgia Department of Transportation, Chatham County, the U.S. Fish and Wildlife Service, and private individuals.

J.3.14 Private, State, and Federally Owned Wharf Facilities. Numerous private, state, and Federally owned wharves line the navigation channel. These facilities were constructed and are maintained in accordance with permits issued by Savannah District under the authority of Section 10 of the River and Harbor Act of 1899 and Section 404 of the Clean Water Act of 1974.

J.4.00 PREVIOUS CULTURAL RESOURCES INVESTIGATIONS

J.4.01 Numerous cultural resources investigations have been conducted within and in the vicinity of the Savannah Harbor Navigation Project. Only the more important surveys are described here.

J.4.02 In 1973, the University of Georgia conducted a survey of portions of the areas to be affected by the construction of the sediment control works. This survey area was to include the tide gate construction area and proposed new disposal areas. At the time of the survey, construction of the tide gate had already

been initiated and only the disposal areas could be surveyed. Two prehistoric archaeological sites were located in judged potentially eligible for inclusion in the National Register of Historic Places.

J.4.03 In 1984, Southeastern Archeological Services, Inc., conducted a survey of the southern shoreline of Hutchinson Island preparatory to construction of the Savannah Harbor Navigation Project. The survey identified two sites that were believed eligible for inclusion in the National Register of Historic Places, Willink's Marine Railway and the Fig Island Channel Site. Willink's Marine Railway was later determined eligible for inclusion in the National Register and documented as part of a Section 10 and 404 permit for P.D. Oil and Gas Company wharf and slip construction. The work was carried out by Armstrong State College. Two vessels contained within the Fig Island Channel Site were recorded as part of the harbor widening project. The work was carried out by Tidewater Atlantic Research and S.S.I.

J.4.04 In 1987, a derelict vessel was noted eroded from the south shore of Hutchinson Island near station 76+000. The vessel was subsequently determined eligible for the National Register and was the subject of a data recovery effort by O.S.M. Archaeological Consultants in 1988.

J.4.05 In 1992, Tidewater Atlantic Research, Inc. (TAR), conducted a survey of the areas to be affected by the proposed Savannah Harbor Deepening Project. The survey included archival research, remote sensing, and shoreline inspection. The archival research concentrated on the existing disposal areas, the harbor navigation channel from stations -60+000 to +103+000, and the harbor in general. Remote sensing investigations included proton magnetometer, sidescan sonar, and sub-bottom profiler studies of the toes, sideslopes, and top of sideslopes of the navigation channel and the King's Island Turning Basin.

J.4.06 All but one of the anomalies identified by TAR were investigated by Savannah District and contract archaeological divers. None were found to represent significant cultural resources. The remaining anomaly was determined to be just outside the area of effect for the deepening project. In consultation with the Georgia State Historic Preservation Officer, it was agreed that before and after deepening hydrographic surveys would be conducted in the anomaly vicinity to determine if there was some effect. The surveys were accomplished and no change in bottom profile was noted.

J.4.07 Only one shoreline site, the Fig Island Channel Site, was recommended for data recovery as part of the deepening project. From September 1993 to January 1994, nine data recovery contracts were carried out. Over 20 historic vessels and vessel remnants and a marine railway were excavated and documented by TAR, Mid-Atlantic Technology, and Panamerican Consultants.

J.4.08 In 1992, TAR conducted a survey of the areas to be affected by the Section 1135 project to remove the Tide Gate from operation and close New Cut. The survey included archival research, remote sensing, and shoreline inspection of Back River from its mouth at the eastern end of Hutchinson Island to New Cut. The remote sensing survey included proton magnetometer, sidescan sonar, and sub-bottom profiler investigations of all submerged areas above the Tide Gate and the toe, sideslope, and area between the top of sideslope and the high water mark below the tide gate. Seven magnetic and sonar targets and seven shoreline sites were identified and recommended for further evaluation. The area above the Tide Gate is no longer part of the Savannah Harbor Navigation Project and has been addressed as part of the Section 1135 Project.

J.4.09 In 1993, Savannah District inspected the shoreline below the tide gate and found that the sites were unaffected by the New Cut Closure Project. The District also inspected each of the anomalies using sidescan sonar and found no evidence for erosion and no effect from the New Cut Closure Project.

J.4.10 Also in 1993, Mid-Atlantic Technology, Inc. (MAT) conducted a survey of the remaining portions of the Savannah Harbor Navigation Project that had not been investigated as part of the New Cut Closure Project and Savannah Harbor Deepening Project. The survey area included the toes, sideslopes, and tops of slopes for all remaining turning basins (e.g. all but King's Island) and the navigation channel from stations 103+000 to 112+500.

J.5.00 IDENTIFIED HISTORIC PROPERTIES

J.5.01 Federal Lands Owned or Administered by Savannah District.

J.5.02 U.S. Army Corps of Engineers Depot.

J.5.03 The Depot is located on a portion of the Fig Island Channel Site. The site consists of the former mouth of Fig Island Channel, a channel that once separated Fig Island from Hutchinson Island. Beginning as early as 1804, local interests attempted to close this channel by placing derelict shipwrecks in its mouth. This practice continued until the first quarter of the 20th century. Savannah District constructed a pile dam

across the mouth in 1854, wing dams in the 1870's and 1880's, and a training wall in the 1890's. The area behind the training wall was backfilled with dredged material, completely blocking the old channel and creating high ground suitable for development. The archaeological site stretches for about 1,750 along the south shore of what is now known as Hutchinson Island. The extent of the site inland has not been determined. The Engineer Depot occupies the eastern 750 feet of the site. The shoreline portion of the site within the Depot area is protected by a bulkhead.

J.5.04 The Fig Island Channel Site was determined eligible for inclusion in the National Register of Historic Places. The site is significant at the local level under National Register criterium d. for its ability to provide information important in history. The channel contains the stripped and derelict remains of a large number of watercraft that once navigated Savannah Harbor. Studies of these poorly documented craft can provide new information on vessel types used historically in the harbor, vessel repair techniques, and on vessel abandonment. Questions about how long various vessels were in use, the uses to which various vessel designs were put, reuse of vessels over time, and reasons and procedures for abandonment can be addressed. Additional research questions concerning the methods that were used to prepare vessels for use as obstructions can also be addressed.

J.5.05 Excavations were carried out in 1991 and 1994 on non-Depot portions of this site as part of the mitigation of impacts associated with the Savannah Harbor Widening Project and Savannah Harbor Deepening Projects. In the Engineer Depot portion of the site, with the exception of the boat ramp area, archaeological deposits are buried from 10 to 20 feet beneath dredge material. Present operation and maintenance practices at the Depot have no effect upon the site. However, any proposal to modify the bulkhead wall or boat ramp, or to construct facilities requiring ground disturbance to a depth of more than 10 feet will need to be evaluated for their effect upon this site.

J.5.06 Tidegate and Access Areas.

J.5.07 Since the Tide Gate was already under construction at the time of the 1973 University of Georgia survey, this area was not surveyed prior to construction disturbance and backfilling to create a higher land surface. Archival research has revealed that the Hutchinson Island Tide Gate access area was the site of Spaulding Plantation. An 1812 map indicates that main plantation village was located in the access area. It is not known if the archaeological remains of this occupation were destroyed during Tide Gate construction. This area has been covered with fill material and the shoreline is riprapped. Present uses of the access area are surficial in nature and do not affect any remaining buried archaeological deposits. If any new

construction or use of the area is proposed involving excavations below +9 feet MLW, deep archaeological testing would need to be conducted to determine the existence and significance of remaining archaeological deposits.

J.5.08 Disposal Areas.

J.5.09 Only one Disposal Area, 12A, was surveyed prior to use. Two resources, site 38 JA 23 and 38 JA 24 were identified as a result of this survey. Site 38 JA 23 was described as a shell midden approximately 5 feet high and 80 feet wide and 180 feet long. Observed ceramics indicated an occupation spanning 800 B.C. and A.D. 1100. This site was located along the proposed north dike alignment. Impact was avoided during construction by realigning the dike away from the site. In 1981 information was received that unauthorized individuals were using the dike road to enter the area and loot the site. Inspection revealed that, while the dike missed the site, mosquito control ditches now ringed and bisected it. The mosquito control activity was stopped and the gate providing access to the area was locked.

J.5.10 A second, higher dike has been built inside the disposal area adjacent and parallel to the old dike. It is this dike that is now maintained and is used as an access road. A 1994 inspection revealed that the site is not being impacted by dike modifications and maintenance.

J.5.11 This site is potentially eligible for inclusion in the National Register of Historic Places. It is not being impacted by Savannah Harbor Navigation Project activities. The gate providing access to the area is kept locked. Savannah District and Georgia Department of Transportation personnel monitor the area for trespassing and looting.

J.5.12 Site 38 JA 24 was identified as a sand mound 2 feet high, 200 feet long, and 60 feet wide. The site was believed to be a small burial mound dating sometime between A.D. 0 and the historic period. The site was subsequently buried by disposal activities.

J.5.13 Archival research was conducted by TAR on the existing land disposal areas as part of the Savannah Harbor Deepening Project. The research concentrated on old maps and documents that might indicate occupation and use of the areas. The draft report of this research has not been submitted.

J.5.14 The Ferry Wharf was located on the South Carolina bank of Back River near what is now the Tidegate. The Union/Screven Ferry Road ran north from the wharf site to uplands in South Carolina. This wharf was a center of activity from the 1770's until the early 20th century. There, individuals caught the

ferry to Georgia to visit and conduct business in the city. The remains of small craft could be located in the river bottom in this area. Upland portions of the wharf were destroyed during construction of the Tidegate and disposal area dikes. The Union/Screven Ferry Road was incorporated into the dike system for the disposal areas, effectively burying the roadbed under many feet of fill. This location is not currently being affected by the Savannah Harbor Navigation Project. However, any future enlargements of the Sediment Basin could adversely affect any vessel remains lying near the wharf site.

J.5.15 All of the prehistoric and most of the historic resources that were located within the disposal area tracts will exist as archaeological deposits below elevation +10 feet MLW. The known exceptions are the Oysterbed Light Structure in the Jones/Oysterbed Disposal Area and the Civil War earthwork once located on Barnwell Island in Disposal Area 12B. When the draft TAR report is submitted, Savannah District will work with the Georgia and South Carolina State Historic Preservation Officers to determine avoidance depths for each potential resource area to insure that they are not borrowed for dike raising and other purposes.

J.5.16 Sites Adjoining the Federal Navigation Channel.

J.5.17 National Monuments.

J.5.18 Fort Pulaski National Monument is located on the south shore of the navigation channel between Savannah Harbor Stations -2+000 and +8+000. The site is significant at the national level for its architecture, association with events and people, and for archaeological potential. The site is administered by the National Park Service. It contains a lighthouse, the fort, and archaeological deposits associated with the fort and a quarantine station constructed in 1893. The Savannah Harbor Pilots Association and United States Coast Guard maintain structures and wharf facilities at Savannah Harbor station +5+000. The site is not being affected by the Savannah Harbor Navigation Project. Any modifications to the Coast Guard and Pilot Association wharves would require a Section 10 or 404 permit from Savannah District and trigger Section 106 of the National Historic Preservation Act. Close coordination with the Superintendent of Fort Pulaski will be maintained regarding any Savannah District actions in the fort vicinity. The superintendent can be contacted at (912) 786-5787.

J.5.19 National Historic Landmarks.

J.5.20 The Savannah, Georgia, National Historic Landmark District abuts the navigation channel between stations +72+000 and +77+000 (between Randolph Street and Martin Luther King Boulevard). The District is significant at the national level for its architecture, landscape architecture, and archaeology. New wharves and bulkheads were constructed for the district's entire length along the navigation project as part of a 1970's redevelopment project. It is not known if any remaining historic wharves were completely destroyed at that time, were cut down, or were built over. The district is not being affected by the Savannah Harbor Navigation Project. Ms. Elizabeth Reiter, Historic Preservation Officer with the Savannah/Chatham County Metropolitan Planning Commission, is the initial contact person for the administration of the district (912) 236-9523.

J.5.21 National Register Listed Sites.

J.5.22 Old Fort Jackson Historic Site is owned by the State of Georgia and administered by the Coastal Heritage Society. The site consists of a brick fort, moat, and surrounding, buried archaeological deposits. It is significant for its architecture and archaeology. It is located about 3 miles east of the city of Savannah at station 58+500. The site is being impacted by bank erosion and is in danger of falling into the navigation channel. Savannah District is preparing a Memorandum of Agreement with the State of Georgia to identify procedures for determining the causes of the erosion problem, any possible Federal involvement with the problem, potential solutions, and funding sources. A copy of the preliminary draft of the agreement if Attachment 1.

J.5.23 The C.S.S. GEORGIA is the wreck of a Confederate ironclad constructed in Savannah in 1862 and scuttled to prevent capture in December 1864. The wreck site is significant at the national level for its architecture, associations with events and people, and for its archaeology. The site was first located in 1968 when it was impacted by a harbor widening project. The site has been the subject of a number of Savannah District sponsored investigations to determine its geographic limits and condition. Savannah District is preparing a Memorandum of Agreement with the states of Georgia and South Carolina to identify impacts to the site, the Federal interest in mitigating these impacts, mitigation alternatives, and funding sources.

J.5.24 National Register Eligible Sites.

J.5.25 The Venus Point Light Structure was located in South Carolina near Savannah Harbor station 15+000. It was located on the river shore in front of the south dike for the Jones/Oysterbed Island Disposal Area. It had been undermined and was in danger of collapse as a result of harbor deepening activities and operation and maintenance dredging. The site was determined eligible for inclusion in the National Register of Historic Places in 1994. It was significant at the local level for its architecture and history. It was to be documented to Historic American Engineering Standards. The site collapsed into the river shortly before the contractor arrived on site. The contractor is gathering historical documentation, photographs, and drawings, and is using measurements taken in 1993 by Savannah District archaeologists to document the site. No further cultural studies are proposed for this site.

J.5.26 The Fig Island Channel Site is located on privately owned and Savannah District lands. The site consists of the former mouth of Fig Island Channel, a channel that once separated Fig Island from Hutchinson Island. Beginning as early as 1804, local interests attempted to close this channel by placing derelict shipwrecks in its mouth. This practice continued until the first quarter of the 20th century. Savannah District constructed a pile dam across the mouth in 1854, wing dams in the 1870's and 1880's, and a training wall in the 1890's. The area behind the training wall was backfilled with dredged material, completely blocking the old channel and creating high ground suitable for development. The archaeological site stretches for about 1,750 along the south shore of what is now known as Hutchinson Island. The extent of the site inland has not been determined. The portion of the site located beneath the Engineer Depot has been discussed previously.

J.5.27 The Fig Island Channel Site was determined eligible for inclusion in the National Register of Historic Places. The site is significant at the local level under National Register criterium d. for its ability to provide information important in history. The channel contains the stripped and derelict remains of a large number of watercraft that once navigated Savannah Harbor. Studies of these poorly documented craft can provide new information on vessel types used historically in the harbor, vessel repair techniques, and on vessel abandonment. Questions about how long various vessels were in use, the uses to which various vessel designs were put, reuse of vessels over time, and reasons and procedures for abandonment can be addressed. Additional research questions concerning the methods that were used to prepare vessels for use as obstructions can also be addressed.

J.5.28 Excavations were carried out in 1991 and 1994 on portions of this site as part of the mitigation of impacts associated with the Savannah Harbor Widening Project and Savannah Harbor Deepening Projects. The data recovery efforts were sufficient to document all wrecks and other features that would be impacted by slope destabilization resulting from the harbor deepening project. The private and state owned portions of the site have not been bulkheaded. The present navigation channel spans the entire river channel between the Savannah National Historic Landmark District. Any change in harbor maintenance procedures or any channel modification will impact this site.

J.5.29 Potentially Significant Sites.

J.5.30 The Irene Mound Site, a Mississippian Period ceremonial center, was once located at the juncture of Pipe Maker's Canal and the Savannah River. The site area was severely impacted by 1960's period non-Federal port development activities. It is not known if any intact portions remain beneath existing structures. This site is not being impacted by Savannah District activities. This site will need to be taken into account if there is any change in Savannah District activities that might impact the area or if a change in land use is proposed that triggers a Section 10 or 404 permit.

J.5.31 Battery Lee is a Confederate earthwork located on the edge of the Savannah Harbor navigation channel. It is being impacted by dredging associated with a privately owned wharf. A determination of National Register eligibility and a determination of effect need to be made when the agitation Sections 10 and 404 regulatory permits are proposed for renewal.

J.5.32 Turnbull's Tavern Site is the archaeological remains of a late 18th/early 19th century tavern and wharf located on the river shore. Any modifications to the navigation channel may undermine this site.

J.5.33 Southeastern Shipyard is a World War II period shipyard that produced commercial ocean-going vessels. The buildings have all been removed or razed. The launching rails are still visible at low water. The site is not being impacted by the present navigation project.

J.5.34 Miller's Iron Foundry Site is the archaeological remains of an antebellum and bellum iron foundry. The foundry was a major supplier of local steam plants prior to the war. During the war, it also produced ordnance. It was burned in December 1864 to keep it out of Union hands. For a brief period after the war it was used by Union troops. The site is not being affected by the navigation project.

J.5.35 Willink's antebellum and bellum shipyard was the largest shipbuilding facility in Georgia from 1840 to 1865. It produced intracoastal and river steamers, sailing pilot boats, and other craft. During the war it completed one ironclad and nearly completed two others. It was burned in December 1864 to keep it out of Union hands. The site is not being affected by the navigation project.

J.5.36 Eleven potentially significant stripped and derelict vessels are eroding from the harbor shoreline. They appear to be the remains of a late 18th/early 19th century sloop or schooner, a late 18th/early 19th century pole boat, an intracoastal steamer, a late 19th/early 20th century steel lifeboat(?), a mid to late 19th century steam powered, propeller driven vessel, two 19th century sailing vessels, and four late 19th/early 20th century wooden barges. While none are being affected by the Savannah Harbor Navigation Project, streambank erosion is slowly destroying all of them.

J.5.37 Terry Shipyard is a World War I period shipyard that was apparently built tugboats for the war effort. No buildings have been preserved, however, the remains of at least three slipways and access wharves are present. The site is not being affected by the navigation project, however, streambank erosion is impacting the shoreline portions of the site.

J.5.38 The Krenson and Hawkes Shipyard was active from about 1840 to 1875. It constructed intracoastal steamers and tugboats during the antebellum period. During the war it constructed one Maury Gunboat for the Confederate Navy and had an ironclad on the stocks when it was burned to prevent its capture in 1864. The yard was at least partially rebuilt after the war. At least one sailing pilot boat was constructed during this period. In the latter part of the 19th century, this was the site of a large steamship wharf. It is not known if any archaeological deposits are preserved beneath the present wharf facility.

J.5.39 The Ferry Wharf was located on the shore of Savannah Harbor at the foot of East Broad Street. This was a center of activity from the 1770's until the early 20th century. There, individuals caught the ferry to South Carolina and more their sailing and rowing small craft when visiting the city. The remains of numerous small craft may be clustered in the river bottom in this area. This location is not being affected by the Savannah Harbor Navigation Project, however, any future channel widening or deepening, dredging for mooring vessels, or bulkheading could adversely affect this potential resource.

J.5.40 Federal Batteries were once located along the south shore of South Channel from the northeast tip of Tybee Island to Lazaretto Creek. The archaeological remains of these batteries may be preserved. Live ordnance may also be located in the river channel. If the remains of these batteries exist, they are of National Landmark significance due to their association with Fort Pulaski National Monument. Since these resources are located along South Channel, they are not being affected by the Savannah Harbor Navigation Project. Any development in this area should consider the area's archaeological potential and aesthetic effects upon the National Monument.

J.5.41 The archaeological remains of the 18th century Savannah quarantine station may still be at least partially extant. Portions of the associated cemetery exist. This site is not being affected by the Savannah Harbor Navigation Project.

J.5.42 Two possible 19th century crib wharves are located along the harbor shoreline. The wharves are not being affected by the Savannah Harbor Navigation Project but are being impacted by streambank erosion.

J.5.43 Submerged Anomalies. Sixteen uninvestigated submerged magnetic and/or sonar targets have been identified in the vicinity of the navigation channel or sediment basin. Only are potentially being affected by the Savannah Harbor Navigation Project or other harbor related activities. These five anomalies are located in the upper harbor on or near the channel side slope. Diver investigations are planned to determine their identity and potential significance.

J.6.00 SUMMARY OF IMPACTS

J.6.01 Federally Owned or Managed Properties.

J.6.02 The National Register eligible Fig Island Channel Site and the potential site of the Spaulding Plantation complex are located on fee owned lands. Both sites are deeply buried and the shorelines have been riprapped or bulkheaded. Neither site is being affected by present land uses.

J.6.03 Navigation Channel and Turning Basins.

J.6.04 Two significant resources may be undergoing impacts from channel maintenance dredging, Old Fort Jackson and the C.S.S. GEORGIA. Savannah District is preparing a Memorandum of Agreement (MOA) for each site. Under the terms of the MOAs, the District will identify impacts to the sites, any Federal involvement in the impacts, alternatives for mitigation, and

funding methods. Signatory parties for the MOA for Old Fort Jackson will include Savannah District, the Georgia State Historic Preservation Officer, the Coastal Heritage Society, and the Advisory Council for Historic Preservation. Signatory parties on the MOA for the C.S.S. GEORGIA will include Savannah District, the Georgia and South Carolina State Historic Preservation Officers, and the Advisory Council for Historic Preservation.

J.6.05 Five magnetic and/or sonar anomalies have been identified in the upper harbor that may be located within the area of effect for operation and maintenance dredging. Future investigations as to the source of these anomalies is planned.

J.6.06 Disposal Areas.

J.6.07 Under the terms of a Savannah District contract, Tidewater Atlantic Research is conducting archival research to determine the locations of historic period resources that may be buried beneath the disposal areas. Their report will be coordinated with the Georgia and South Carolina State Historic Preservation Officers and preservation and/or avoidance procedures will be determined. Site 38 JA 23 is located immediately adjacent to Disposal Area 12A. The access gate to this area will be kept locked and District and GADOT personnel area will monitor the area for trespass and vandalism.

J.6.08 Other Shoreline and Submerged Resources.

J.6.09 Many areas of Savannah Harbor are lined with historic properties. While these resources are not being affected by the Savannah Harbor Navigation Project, they need to be taken into account when processing Section 10 and 404 regulatory permits.

J.7.00 VIEWS OF THE STATE HISTORIC PRESERVATION OFFICERS

J.7.01 This plan was reviewed by the Georgia and South Carolina State Historic Preservation Officers. Comments of the GA SHPO have been incorporated/addressed in the final document. The SC SHPO furnished no comments.

J.8.00 STATEWIDE COMPREHENSIVE HISTORIC PRESERVATION PLANS

J.8.01 The States of Georgia and South Carolina's plans call for the preservation of sites within all cultural and time periods, and develops historic contexts for each. Historic preservation activities at the project within Georgia will be conducted in coordination with the Georgia State Historic Preservation Officer.

J.9.00 MASTER AND OPERATIONAL MANAGEMENT PLANS

J.9.01 There are no Master or Operational Management Plans for Savannah Harbor Navigation Project. Information from the this Historic Preservation Plan will be incorporated into the Savannah Harbor Navigation Project's Long Term Management Strategy (LTMS) Study. Exact locations and dispositions of historic properties on project fee and easement lands and privately and publicly owned lands adjoining the project will not be identified in the LTMS study.

J.10.00 CONSULTATION WITH AFFECTED INDIAN TRIBES

J.10.01 Federally Owned or Managed Lands.

J.10.02 All future studies of historic properties on fee owned or easement lands on Savannah District projects will include appropriate provisions to insure full compliance with the Native American Graves and Repatriation Act of 1990 (NAGPRA).

J.10.03 NAGPRA addresses the recovery, treatment, and repatriation of Native American and Native Hawaiian cultural items by Federal agencies on Federally owned or controlled lands and Indian Reservations. It also applies to museums receiving Federal funding or containing Federally owned collections. Cultural items include human skeletal remains, associated funerary objects, unassociated funerary objects, sacred objects, and objects of cultural patrimony.

J.10.04 There are many data gathering, reporting, consulting, and permitting provisions in the law that will have some degree of impact on the historic resources program for the Savannah District. The Department of the Interior is developing Federal regulations that will aid in carrying our NAGPRA. Meanwhile, the Savannah District has begun implementation of NAGPRA.

J.10.05 There are no known Native American sites located on Savannah District's fee owned or easement lands. The Engineer Depot is located entirely upon a river channel that was filled in the late 19th and early 20th centuries. The Tide Gate access

tracts were formerly marsh areas that were covered by several feet of modern fill in 1968. The shorelines are riprapped or bulkheaded. If any Native American archaeological sites are present, they are deeply buried and are not being affected by present and proposed future District activities.

J.10.06 Native American Resources on Non-Federal Lands.

J.10.07 NAGPRA does not apply directly to Native American cultural objects located on non-Federal or Indian Reservation lands. However, it does apply to the collections if they are curated at a Federally funded museum or other facility.

J.10.08 Native American graves and associated materials on non-Federal lands located in Georgia are covered under various State laws. The following information is taken directly from a brochure distributed by the Council on American Indian Concerns.

* Indian burials and burial grounds are protected by law in the same manner as any grave without an appropriate permit. It is also illegal to know about, and fail to report, the disturbance of a grave. Important points of the law are:

* It is illegal to disturb Indian burials (unless part of an authorized excavation by an archeologist).

* If human remains or burial goods are accidentally exposed, it should be immediately reported to the local law enforcement agency (usually the sheriff).

* Any activity likely to further disturb the burial must cease until local or state authorities permit activity to continue.

* The local law enforcement agency must work with the local coroner or medical examiner to determine if accidentally discovered human remains are a crime event or archeological site.

J.10.09 Georgia Code Section 12-3-621 makes it illegal to dig, disturb, or harm an archaeological, aboriginal, prehistoric or historic site without first receiving written permission from the landowner. Anyone wishing to excavate a site must notify the Georgia Department of Natural resources, in writing, five business days before the excavations are scheduled to begin.

J.10.10 Georgia Code Section 12-3-622 makes it illegal to knowingly buy, sell, trade, import, or export for profit American Indian burial objects or sacred objects. Georgia Code Section 31-21-45 makes it illegal to display the bodily remains of Native Americans.

J.10.11 Only one Native American site has been identified in the immediate vicinity of the navigation channel in Georgia. The Irene Mound Site, a Mississippian Period ceremonial center, was once located at the juncture of Pipe Maker's Canal and the Savannah River. The site appears to have been abandoned by A.D. 1450. Archaeological investigations revealed that the site contained human remains and ceremonial objects. The National Park Service is complying with NAGPRA for these remains and objects.

J.10.12 The Irene Mound Site area was severely impacted by 1960's period non-Federal port development activities. It is not known if any intact portions of the site remain beneath existing structures. This site is not being impacted by Savannah District activities. This site will need to be taken into account if there is any change in Savannah District activities that might impact the area or if a change in land use is proposed that triggers a Section 10 or 404 permit.

J.10.13 Two Native American sites are known to be associated with disposal areas. Site 38 JA 23 is located outside Disposal Area 12A. It may contain human remains and grave goods. No NAGPRA artifacts have been recovered by Savannah District. It is not being affected by dike construction and maintenance. The access gate to the dike road is kept locked and the area is monitored by Savannah District and Georgia Department of Transportation (GADOT) personnel to preclude vandalism. Any future impacts to this site associated with dike maintenance, disposal area enlargement, or other activities would be the responsibility of GADOT personnel in coordination with the South Carolina State Historic Preservation Officer, Savannah District, Native American representatives, and the Advisory Council on Historic Preservation.

J.10.14 Site 38 JA 24 is buried beneath Disposal Area 12A. It is a small sand mound that may contain human remains. No archaeological materials of any kind have been recovered from it. This mound was only 2 feet high and is now covered by 10 or more feet of dredged disposal material. Both the mound and the disposal material are composed of sand. It is not known if this mound survived various dike raisings and repairs that have occurred since 1973. No sand borrowing for dike construction or other activities will be allowed in the vicinity of this mound location. Any future impacts to this site associated with dike maintenance, disposal area enlargement, or other activities would

be the responsibility of GADOT personnel in coordination with the South Carolina State Historic Preservation Officer, Savannah District, Native American representatives, and the Advisory Council on Historic Preservation.

J.11.00 PUBLIC INTERPRETATION

J.11.01 Several times each year, Savannah District archaeologists present slide shows to civic groups, schools, and clubs. Over the last few years, these groups have included the May Howard Elementary School 5th Grade Search Class (a yearly event), other school groups, Rotary Clubs, Optimist Clubs, the Coastal Georgia Archaeological Society, the Society for Georgia Archaeology, the Conference on Historical and Underwater Archaeology, the Savannah Maritime Festival, etc.

J.12.00 REQUIRED ACTIONS

J.12.01 Federally Owned or Administered Lands.

J.12.02 Present management practices and uses at the Engineer Depot are not affecting the deeply buried cultural resources located on these tracts. Any modification of these areas or changes in land use that involves subsurfaces impacts to an elevation at or below +10 feet above mean low water should be reviewed for potential impacts to these resources.

J.12.03 Since the proposed installation of underdrains at the confined disposal areas would require excavation below a +13 MLW elevation (less than 6 feet above MHW), there is a potential for adverse impacts to cultural resources located on those sites. A review will be performed of historic maps and archival records of sites known to be located on the disposal areas. If proposed underdrain alignments conflict with known or suspected cultural resource sites, a cultural resources survey would be conducted along the proposed underdrain alignments. If a cultural resource is found, either the underdrain alignment would be shifted to avoid the site or a mitigation plan would be prepared to determine the appropriate action. This procedure would be performed to ensure no significant cultural resources would be impacted. Approval from the SC SHPO of the survey's findings and proposed actions would be obtained prior to construction (underdrain installation) being initiated at the site.

J.12.04 Navigation Channel and Turning Basins.

J.12.05 Two resources may be undergoing impacts from harbor maintenance dredging, the C.S.S. GEORGIA and Old Fort Jackson. The Memorandums of Agreement need to be completed and signed by the consulting parties, and their terms implemented.

J.12.06 Other Shoreline and Submerged Resources.

J.12.07 Significant and potentially significant cultural resources line portions of the navigation channel and sediment basin. These resources need to be considered if any changes are made in harbor maintenance, channel modifications are proposed, or activities subject to Section 10 or 404 regulatory permits are proposed. Open communication needs to be maintained with the superintendent of Fort Pulaski National Monument, the Savannah/Chatham County Historic Preservation Officer, the Coastal Heritage Society, and other preservation organizations.

J.12.08 ARPA Permits.

J.12.09 Anyone conducting archaeological investigations on Savannah District owned portions of the project requires an ARPA permit. A contract for cultural resource work awarded by Savannah District constitutes a permit. All others must apply to Savannah District for the permit. This includes archaeological work generated by another task, such as pipeline and electrical easements, construction easements, etc. and independent archaeological research. The Savannah District contact for technical archaeological information on such permits is the Environmental Resources Branch of Planning Division. For further information, call (912) 652-5325 or FAX at (912) 652-5787. The permits are administered and issued through the Real Estate Division (CESAS-RE-MC). Information can be obtained at 912-652-5013.

J.12.10 Curation.

J.12.11 ER 1130-2433, Project Operations, Storage and Curation of Archaeological and Historic Data, dated 30 April 1991, describes curation needs and procedures. Planning Division (PD-E) is developing an overall district curation program for archaeological and historical collections from operational and planning projects. Collections from previous investigations associated with the construction and operation of Savannah Harbor Navigation Project are stored at Savannah District, Savannah

History Museum, Armstrong State College, and various contractor offices. As contracts are closed out, collections held by contractors are being returned to Savannah District for interim storage until a curation program has been put in place.

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APPENDIX K

MEMORANDUM OF AGREEMENT

CONCERNING

OLD FORT JACKSON

MEMORANDUM OF AGREEMENT
BETWEEN
THE U.S. ARMY ENGINEER DISTRICT, SAVANNAH,
THE COASTAL HERITAGE SOCIETY,
THE GEORGIA STATE HISTORIC PRESERVATION OFFICER, AND
THE ADVISORY COUNCIL ON HISTORIC PRESERVATION
CONCERNING
OLD FORT JACKSON, SAVANNAH, GEORGIA

WHEREAS, the U.S. Army Engineer District, Savannah (Savannah District) operates and maintains the Savannah Harbor Navigation Project, as authorized by various public laws, and

WHEREAS, Savannah District recognizes that the existing Savannah Harbor Navigation Project may have an effect upon Old Fort Jackson, a property owned by the State of Georgia and included on the National Register of Historic Places, and has consulted with the Advisory Council on Historic Preservation (Council) and the Georgia State Historic Preservation Officer (GASHPO) pursuant to Section 800.13 of the regulation (36 CFR Part 800) implementing Section 106 of the National Historic Preservation Act (16 U.S.C. 470h-2(f)), and

WHEREAS, the definitions given in Appendix A are applicable throughout this Memorandum of Agreement (Agreement);

NOW THEREFORE, Savannah District, the Council, and the GASHPO agree that the following stipulations will satisfy Savannah District's Section 106 responsibilities for identifying, evaluating, and mitigating any effects of the Savannah Harbor Navigation Project upon Old Fort Jackson.

STIPULATIONS

The Savannah District, U.S. Army Corps of Engineers shall ensure that the following measures are carried out:

1. Savannah District shall conduct such studies as are necessary to determine the nature, extent, and cause(s) of the streambank erosion problem at Old Fort Jackson.

2. Savannah District shall determine the contributing effect of the construction and/or maintenance of the Savannah Harbor Navigation Project on bank erosion at the Old Fort Jackson Historic site, in accordance with 36 CFR Parts 800.5 and 800.9.

3. If the conclusion from studies conducted under Stipulations #1 and #2 is that construction and/or maintenance of the Savannah Harbor Navigation Project contributes to the bank erosion problem at the Old Fort Jackson Historic Site, then Savannah District will implement Stipulations #4 through #12.

4. Savannah District shall identify and evaluate alternatives to eliminate, minimize, and retard the contribution to bank erosion problem at the Old Fort Jackson Historic site, caused by the construction and/or maintenance of the Savannah Harbor Navigation Project.

5. Savannah District shall develop a mitigation plan to minimize the adverse effects of streambank erosion on Old Fort Jackson, resulting from the construction and/or maintenance of the Savannah Harbor Navigation Project, in accordance with 36 CFR Part 800.5.

6. The District's studies, study results, evaluations and determinations shall be documented in a report. The report will include a discussion of various erosion control alternatives, the merits, efficacy, and projected costs of each alternative, and make recommendations as to the optimal erosion control alternative(s). The optimal erosion control plan shall be incorporated into a draft mitigation plan for mitigating the adverse effects to the Old Fort Jackson Historic site resulting from the Savannah Harbor Navigation Project.

7. The draft mitigation plan shall be provided to the GASHPO, the Council, the Coastal Heritage Society, and interested local historical groups for comment. A review by managers of historic sites which have experienced similar problems will also be pursued. A final mitigation plan, including mitigation recommendations and projected costs of implementation, shall be developed following receipt and consideration of all comments.

8. Savannah District shall, in consultation with the property owner, the State of Georgia, and the property lessee and operator, the Coastal Heritage Society, develop a cost-sharing program by which the mitigation measures recommended as the optimal solution to the bank erosion problem at the Old Fort Jackson Historic Site may be implemented.

9. Savannah District, in conjunction with the GASHPO and the Coastal Heritage Society, shall implement the recommended plan subject to the availability of funds. Savannah District shall function as the lead party in coordinating and implementing the work necessary to implement the mitigation plan.

10. Should the mitigation plan entail the alteration or destruction of any features associated with the Old Fort Jackson Historic Site, such that data recovery of buried archeological deposits/artifacts might be recovered, a research design for the

necessary data recovery shall be developed by the Savannah District and coordinated with the GASHPO and the Coastal Heritage Society, who shall have the opportunity to review and comment on the proposed data recovery plan.

11. The final mitigation plan shall be submitted by Savannah District to the GASHPO and the Council for a 45-day review period. Unless the GASHPO or the Council objects during the review period, the mitigation plan shall be considered approved.

12. Savannah District shall ensure that any archeological data recovery carried out pursuant to this Agreement is carried out by, or under, the direct supervision of an individual meeting, at a minimum, the standards for an archeologist as set forth in the Department of the Interior's Archeological and Historic Preservation: Secretary of the Interior's Standards and Guidelines (48 FR 44716-42) for a historic archeologist.

13. Savannah District shall ensure that any and all materials and records resulting from any investigations (data recovery) conducted as part of Stipulation #12 are curated in accordance with 36 CFR Part 79. Curation facilities at the following locations will be considered for these materials and records: (1)University of Georgia, (2)South Carolina Institute of Archaeology and Anthropology, and (3)University of Alabama. Other facilities may be considered, but the facility selected for use must be able to fulfill the Federal curation requirements. Short or long term loans of "exhibit quality" artifacts will be considered to reputable museums or historic sites which can address these special needs.

14. Savannah District shall ensure that all final reports resulting from actions pursuant to this Agreement will be provided to the GASHPO and the Council, and to the National Park Service, Southeast Regional Office for possible peer review and submission to the National Technical Information Service (NTIS). Savannah District shall ensure that all such reports are responsive to the contemporary professional standards, and to the Department of Interior's "Format Standards for Final Reports of Data Recovery Programs" (42 FR 5377-5379).

15. Any party to this Agreement may request that it be amended, whereupon the parties will consult in accordance with 36 CFR 800.5(e)(5) to consider such amendment.

16. Should the GASHPO or the Council object within 45 days to any actions proposed pursuant to the Agreement, Savannah District shall consult with the objecting party to resolve the objection. If Savannah District determines that the objection cannot be resolved, Savannah District shall request the further comments of

the Council pursuant to 36 CFR Part 800.4 to 800.6. Any Council comment provided in response to such a request will be taken into account by Savannah District in accordance with 36 CFR Part 800.6(c)(2) with reference only to the subject of the dispute; Savannah District's responsibility to carry out all actions under this Agreement that are not the subjects of the dispute will remain unchanged.

17. At any time during implementation of the measures stipulated in this Agreement, should an objection to any such measure be raised by a member of the public, Savannah District shall take the objection into account and consult, as needed, with the objecting party, the GASHPO or the Council to resolve the objection.

Execution of this Memorandum of Agreement and implementation of its terms evidences that the Savannah District, U.S. Army Corps of Engineers has afforded the Council an opportunity to comment on the Savannah Harbor Navigation Project and its effects on the Old Fort Jackson Historic Site and that the Savannah District has taken into account the effects of the undertaking on that historic property.

U.S. ARMY ENGINEER DISTRICT, SAVANNAH

BY: _____ DATE: _____
GRANT M. SMITH
COLONEL, U.S. ARMY
DISTRICT ENGINEER

COASTAL HERITAGE SOCIETY, INC.

BY: _____ DATE: _____
SCOTT SMITH
DIRECTOR

GEORGIA DEPARTMENT OF NATURAL RESOURCES
GEORGIA STATE HISTORIC PRESERVATION OFFICER

BY: _____ DATE: _____
MARC R. EDWARDS
DIRECTOR, HISTORIC SITES DIVISION AND GASHPO

ADVISORY COUNCIL ON HISTORIC PRESERVATION

BY: _____ DATE: _____
ROBERT D. BUSH
EXECUTIVE DIRECTOR

MEMORANDUM OF AGREEMENT
BETWEEN
THE U.S ARMY ENGINEER DISTRICT, SAVANNAH,
THE COASTAL HERITAGE SOCIETY,
THE GEORGIA STATE HISTORIC PRESERVATION OFFICER, AND
THE ADVISORY COUNCIL ON HISTORIC PRESERVATION
CONCERNING
OLD FORT JACKSON, SAVANNAH, GEORGIA

APPENDIX A

DEFINITIONS:

Savannah Harbor Navigation Project:

The Federal Navigation Project (Project) consists of those features authorized by the U.S. Congress, or authorized under authorities delegated by the U.S. Congress, to provide safe and efficient navigation through Savannah Harbor or to reduce adverse impacts of those features. The Project includes both the physical features constructed in conformance with prior authorizations, and subsequent maintenance activities associated with continued operation of those features. The physical features include the navigation channel, advance maintenance sections, bend wideners, turning basins, berthing areas, sediment control works, freshwater control works, and dredged material disposal areas.

Old Fort Jackson:

Old Fort Jackson consists of a brick fortification, moat, and surrounding, buried archaeological deposits. It is significant for its architecture and archaeology.

The property is owned by the state of Georgia and is included on the National Register of Historic Places. The site is administered by the Coastal Heritage Society.

The site is located at approximately Station 58+400 (River Mile 11.1) on the south bank of the Savannah River across from the mouth of Back River. The Fort is situated on a 7.8-acre tract bounded by the Savannah River on the northwest, with adjacent lands on the east, south, and southwest consisting of undeveloped lowlands owned by the American Cyanamid Corporation.

APPENDIX L

MEMORANDUM OF AGREEMENT

CONCERNING

THE C.S.S. GEORGIA

MEMORANDUM OF AGREEMENT
BETWEEN
THE U.S. ARMY ENGINEER DISTRICT, SAVANNAH,
THE GEORGIA STATE HISTORIC PRESERVATION OFFICER, AND
THE SOUTH CAROLINA STATE HISTORIC PRESERVATION OFFICER, AND
THE ADVISORY COUNCIL ON HISTORIC PRESERVATION
CONCERNING
THE CONFEDERATE IRONCLAD, CSS GEORGIA

WHEREAS, the U.S. Army Engineer District, Savannah (Savannah District) operates and maintains the Savannah Harbor Navigation Project, as authorized by various public laws, and

WHEREAS, Savannah District recognizes that the Savannah Harbor Navigation Project may contribute to the effect upon the CSS Georgia, a Confederate ironclad which is listed on the National Register of Historic Places, and has consulted with the Advisory Council on Historic Preservation (Council), the Georgia State Historic Preservation Officer (GASHPO), and the South Carolina State Historic Preservation Officer (SCSHPO) pursuant to Section 800.13 of the regulation (36 CFR Part 800) implementing Section 106 of the National Historic Preservation Act (16 U.S.C. 470h-2(f)), and

WHEREAS, the definitions given in Appendix A are applicable throughout this Memorandum of Agreement (Agreement);

NOW THEREFORE, Savannah District, the Council, the GASHPO, and the SCSHPO agree that the following stipulations will satisfy Savannah District's Section 106 responsibilities for identifying, evaluating, and mitigating effects of the Savannah Harbor Navigation Project upon the CSS Georgia.

STIPULATIONS

The Savannah District, U.S. Army Corps of Engineers shall ensure that the following measures are carried out:

1. Savannah District shall conduct such studies as are necessary to determine the present condition of the vessel, its stability as a historic site/object, any factors which may threaten its present condition or stability, and restrictions which the vessel places on present harbor operations.

2. Savannah District shall determine the contributing effect of the construction and/or maintenance of the Savannah Harbor Navigation Project on the CSS Georgia, in accordance with 36 CFR Parts 800.5 through 800.9.

3. A draft report documenting the studies conducted under Stipulations #1 and #2, as well as the resulting findings and determinations shall be complete within three years of the signature of the last party to this agreement. If the conclusion from the studies is that construction and/or maintenance of the Savannah Harbor Navigation Project contributes to the degradation or reduced stability of the CSS Georgia, then the Savannah District will implement Stipulations #4 through #12.

4. The Savannah District shall identify and evaluate alternatives to eliminate, minimize, and retard the Savannah Harbor Navigation Project contribution to factors which may threaten the vessel's present condition or stability. If the vessel is restricting present harbor operations, alternatives shall be evaluated which would allow those restrictions to be eliminated or minimized.

5. Savannah District shall develop a mitigation plan to minimize the adverse effects on the CSS Georgia resulting from the construction or maintenance of the Savannah Harbor Navigation Project, in accordance with 36 CFR Part 800.5. The mitigation plan will document alternatives which were evaluated to eliminate or minimize restrictions which the CSS Georgia causes on the Savannah Harbor Navigation Project.

6. The District's studies, study results, evaluations and determinations shall be documented in a report. The report will include a discussion of the present condition of the vessel, factors which may threaten the vessel's present condition, adverse effects which construction and/or maintenance of the Project has had on the vessel, and restrictions which the vessel has on present harbor operations, the merits, efficacy, and projected costs of each alternative, and make recommendations as to the optimal alternative(s). The plan shall be incorporated into a draft mitigation plan for mitigating the adverse effects to the CSS Georgia resulting from the Savannah Harbor Navigation Project.

7. The draft mitigation plan shall be provided to the GASHPO, the SCSHPO, the Council, and interested local historical groups for comment. A peer review will also be pursued. A final mitigation plan, including mitigation recommendations and projected costs of its implementation shall be developed following receipt and consideration of all comments.

8. Savannah District shall implement the recommended plan, subject to the availability of funds. If funds do not appear to be available to implement all components of the recommended plan specified for a given year, the District will consult the parties to this agreement within 30 days of such a finding to determine what actions the District will need to perform to remain in compliance with Section 106 of the National Historic Preservation Act.

9. Should the mitigation plan entail the alteration or destruction of any features associated with the CSS Georgia, such that data recovery of buried archeological deposits/artifacts might be recovered, a research design for the necessary data recovery shall be developed by the Savannah District and coordinated with the GASHPO and the SCSHPO, who shall have the opportunity to review and comment on the proposed data recovery plan.

10. The final mitigation plan shall be submitted by Savannah District to the GASHPO, the SCSHPO, and the Council for a 45-day review period. Unless the GASHPO, the SCSHPO, or the Council objects during the review period, the mitigation plan shall be considered approved.

11. Savannah District shall ensure that any archeological data recovery carried out pursuant to this Agreement is carried out by, or under the direct supervision of, an individual meeting, at a minimum, the standards for an archeologist as set forth in the Department of the Interior's Archeological and Historic Preservation: Secretary of the Interior's Standards and Guidelines (48 FR 44716-42) for a historic archeologist.

12. Savannah District shall ensure that any and all materials and records resulting from any investigations (data recovery) conducted as part of Stipulation #11 are curated in accordance with 36 CFR Part 79. Curation facilities at the following locations will be considered for these materials and records: (1)University of Georgia, (2)South Carolina Institute of Archaeology and Anthropology, and (3)University of Alabama. Other facilities may be considered, but the facility selected for use must be able to fulfill the Federal curation requirements. Short or long term loans of "exhibit quality" artifacts will be considered to reputable museums or historic sites which can address these special needs.

13. Savannah District shall ensure that all final reports resulting from actions pursuant to this Agreement will be provided to the GASHPO, the SCSHPO, and Council, and to the National Park Service for possible peer review and submission to the National Technical Information Service (NTIS). Savannah District shall ensure that all such reports are responsive to the contemporary professional standards, and to the Department of Interior's "Format Standards for Final Reports of Data Recovery Programs" (42 FR 5377-5379).

14. Any party to this Agreement may request that it be amended, whereupon the parties will consult in accordance with 36 CFR 800.5(e)(5) to consider such amendment.

15. Should the GASHPO, the SCSHPO, or Council object within 45 days to any actions proposed pursuant to the Agreement, Savannah District shall consult with the objecting party to resolve the objection. If Savannah District determines that the objection cannot be resolved, Savannah District shall request the further comments of the Council pursuant to 36 CFR Part 800.4 to 800.6. Any Council comment provided in response to such a request will be taken into account by Savannah District in accordance with 36 CFR Part 800.6(c)(2) with reference only to the subject of the dispute; Savannah District's responsibility to carry out all actions under this Agreement that are not the subjects of the dispute will remain unchanged.

16. At any time during implementation of the measures stipulated in this Agreement, should an objection to any such measure be raised by a member of the public, Savannah District shall take the objection into account and consult, as needed, with the objecting party, the GASHPO, the SCSHPO, or the Council to resolve the objection.

Execution of this Memorandum of Agreement and implementation of its terms evidences that the Savannah District, U.S. Army Corps of Engineers has afforded the Council an opportunity to comment on the Savannah Harbor Navigation Project and its effects on the Confederate ironclad, CSS Georgia and that the Savannah District has taken into account the effects of the undertaking on that historic property.

U.S. ARMY ENGINEER DISTRICT, SAVANNAH

BY: _____ DATE: _____
GRANT M. SMITH
COLONEL, U.S. ARMY
DISTRICT ENGINEER

GEORGIA DEPARTMENT OF NATURAL RESOURCES
GEORGIA STATE HISTORIC PRESERVATION OFFICER

BY: _____ DATE: _____
MARC R. EDWARDS
DIRECTOR, HISTORIC SITES DIVISION AND GASHPO

SOUTH CAROLINA STATE HISTORIC PRESERVATION OFFICER

BY: _____ DATE: _____
GEORGE L. VOGT, PhD.
DIRECTOR, DEPARTMENT OF ARCHIVES AND HISTORY AND SCSHPO

ADVISORY COUNCIL ON HISTORIC PRESERVATION

BY: _____ DATE: _____
ROBERT D. BUSH
EXECUTIVE DIRECTOR

MEMORANDUM OF AGREEMENT
BETWEEN
THE U.S ARMY ENGINEER DISTRICT, SAVANNAH,
THE GEORGIA STATE HISTORIC PRESERVATION OFFICER, AND
THE SOUTH CAROLINA STATE HISTORIC PRESERVATION OFFICER, AND
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THE CONFEDERATE IRONCLAD, CSS GEORGIA

APPENDIX A

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CSS Georgia:

The CSS Georgia is a Confederate ironclad vessel which is located in Savannah Harbor at approximately Station 58+500 (River Mile 11.1). The vessel was constructed in Savannah in 1862 and was scuttled by Confederate forces in December 1864 to prevent her capture. The CSS Georgia is the only ironclad known to have been built in Savannah.

The property is owned by the state of Georgia and was included on the National Register of Historic Places in February 1987. The site is significant at the national level for its architecture, associations with events and people, and for its archaeology.

APPENDIX M

FEDERAL CONSISTENCY DETERMINATION

Federal Consistency Determination
for
Operation and Maintenance
of the
Savannah Harbor Navigation Project

M.1.00 PROPOSED ACTIVITY. To operate and maintain the authorized Savannah Harbor Navigation Project. The Project is located along the South Carolina/Georgia border near Savannah, Georgia. The Project includes a navigation channel beginning in the ocean and extending shoreward about 11 miles to the Savannah River entrance (Station 0+000), then 21.3 River Miles (R.M.) to just below the U.S. Highway 17 bridge (Station 112+500). Other components of the Project include turning basins, berthing areas, confined disposal facilities (CDFs), unconfined disposal areas, advance maintenance sections, sediment control works, and freshwater control works. The Project includes the dredging and disposal of sediments, and management of disposal areas for those sediments.

M.1.01 Operation and maintenance of the Savannah Harbor Navigation Project is a Federal activity which would be performed in the coastal zone. As such, Savannah District, as the Federal agency responsible for the activity, must determine the extent to which the proposed activity is consistent with the Coastal Management Programs of the affected states.

M.2.00 CONSISTENCY DETERMINATION STATEMENT. This activity is consistent to the maximum extent practicable with the South Carolina and Georgia Coastal Management Programs. Section M.3. describes the proposed project, while Section M.4. describes the evaluation factors which were considered prior to reaching this determination.

M.3.00 DETAILED DESCRIPTION OF THE ACTIVITY. The selected plan, Alternative 8, involves the continued maintenance of the Savannah Harbor Navigation Project from R.M. 21.3 to deep water in the ocean. The authorized Project depth is -44 feet Mean Low Water (MLW) from the ocean to Station -14B+000. The depth is then -42 feet MLW to Station 103+000 (R.M. 19.5), where it changes to -36 feet MLW until reaching Station 105.5 (R.M. 20.0). A -30 feet MLW depth is then maintained from that point to Station 112+500 (R.M. 21.3), the upstream end of the Project. Five turning basins are included to allow the safe turning of vessels in the harbor. Berthing areas for the loading/unloading of vessels are also included. Other components include sediment control works

(Tidegate and Sediment Basin) and freshwater control works near the Savannah Wildlife Refuge. CDFs consist of Areas 1N, 2A, 12A, 12B, 13A, 13B, 14B, and the Jones/Oysterbed Island. Areas presently undiked include New Cut, 1S, 14A and the EPA-approved Savannah Harbor Ocean Dredged Material Disposal Site (ODMDS).

M.3.01 Proposed changes to the authorized project consist of the following:

A) Diking of Disposal Area 14A to allow rotational use of the middle and lower harbor confined disposal areas, thereby extending their useful life;

B) A Mitigation Plan to compensate for the wetland losses resulting from the diking of Disposal Area 14A and miscellaneous disposal area operations in South Carolina, with the following features:

1) Operation of disposal areas during their use phase for the benefit of migratory birds;
2) Construction of nesting islands within each disposal area;
3) Maintenance of a bird nesting area on US FWS property at the east end of Jones island through clearing and unconfined disposal of sandy sediments;
4) Construction and maintenance of a bird nesting island north of the Savannah Harbor north jetty;
5) Establishment of a escrow account with the SC DHEC-OCRM to restore or otherwise benefit wetlands as in-kind mitigation for project wetland losses;
6) Construction of a water control structure on a 228-acre impoundment at the Savannah National Wildlife Refuge to establish fisheries function/value to the impoundment.

C) Construction and use of an access road to Disposal Area 2A to allow deposited sediments to be removed, thereby extending the useful life of that site;

D) A commitment to mitigate for the wetland losses in Georgia resulting from the construction of the access road to Disposal Area 2A and other minor wetland impacts from maintenance activities (replacement of weirs and construction/enlargement of pipe ramps);

E) Installation of underdrains which would drain to either the Savannah or Back Rivers to allow faster drying of deposited sediments; thereby enhancing the removal of those sediments and extending the useful life of the confined disposal areas;

F) Beneficial uses of nearshore sediments, consisting of construction and maintenance of submerged berms south of the Bar Channel, construction and maintenance of a feeder berm off Tybee Island, and placement directly on the Tybee and/or Daufuskie Island beaches. The nearshore/offshore disposal location to be used for a specific dredging contract would be decided during project design and award based on identification of the least cost, environmentally-acceptable disposal option. If disposal at a different location is found to be more desirable for environmental or other reasons but would be more costly than the one designated as the least cost, environmentally-acceptable, it could be pursued using appropriate cost sharing authorities;

G) Maintenance of berths by dock owners with a hydraulic dredge with placement of the excavated material directly in CDFs; and

H) Improvements in the sediment control features, consisting of advance maintenance deepening of the Sediment Basin and turning basins, and deepening the advance maintenance area at the Kings Island Turning Basin with the intent of creating additional off-channel storage for deposition of sediments prior to the periodic Federal maintenance dredging.

M.3.02 The diking of Disposal Area 14A would follow the dike alignment approved by the South Carolina Coastal Council in July 1984.

M.3.03 Rotational use of the middle and lower harbor CDFs would allow reuse of deposited sediments to the maximum extent practicable by enabling the deposited material to be removed and reused as construction fill for future dike raising projects.

M.3.04 CDFs would be used for sediments excavated from the inner harbor, except for completion of the previously authorized filling of New Cut. No disposal is proposed on Disposal Area 1S. Unconfined disposal would be used for sediments dredged from the Bar (Entrance) Channel and primarily sand material removed from the Project near the Jones/Oysterbed Island Disposal Area. This unconfined disposal would occur either at the EPA-approved ODMDS centered at 31 56'54"N and 80 45'34"W, at nearshore areas where the material could be more beneficially used, or in fulfillment of the Mitigation Plan for Disposal Area 14A. Such locations would consist of an area south of the Bar Channel where submerged berms and/or a feeder berm would be constructed, and the shorelines of Tybee and/or Daufuskie Island where deposition would occur for erosion control. Mitigation features comprised of unconfined disposal are construction and maintenance of the bird island north of the Savannah Harbor jetties and maintenance of a bird nesting area at the east tip of Jones/Oysterbed Island.

M.3.05 Maintenance of the Project would require excavation of about 7.2 million cubic yards of sediments per year. Excavation of the Bar Channel would be performed primarily by hopper dredges, although hydraulic dredges may be used where special placement needs occur, such as the beneficial use options. Excavation in the inner harbor would primarily be performed by hydraulic dredges. Clamshell dredges may be used for removal of debris or for maintenance of berthing areas. Agitation dredging of berths by private interests would continue to be allowed under separate environmental approvals.

M.3.06 The plan retains the present authorized depths for the navigation channel depths and overdepth criteria. Advance maintenance sections remain the same for most of the navigation channel. The area at the Kings Island Turning Basin is the only channel reach where the advance maintenance section would be deepened. Establishment of an advance maintenance section at the Sediment Basin is proposed. The other changes in the harbor's sediment control features are a form of lateral advance maintenance, where areas along the side of the navigation channel would be deepened to provide off-channel storage for deposition of sediments. This is expected to reduce the frequency of dredging events. Berths to be maintained by hydraulic dredging with placement of the excavated material directly in CDFs could be deepened to a depth of 6 feet below the authorized channel depth to increase the efficiency of hydraulic dredging and minimize the number of annual dredging events required to maintain adequate depths.

M.4.00 CONSISTENCY EVALUATION. Savannah District performed an evaluation of the proposal's consistency with the Coastal Management Programs of both Georgia and South Carolina. This document addresses each of the major policy issue outlined in the manual titled, South Carolina Coastal Council Guidelines and Policies of the South Carolina Management Program which applies to this project. Similar policies exist in the Georgia Coastal Management Program. In the following paragraphs, the section from the South Carolina manual is indicated in italics and quotes, followed by the District's response.

M.4.01 *"GENERAL GUIDELINES FOR EVALUATION OF ALL PROJECTS (Permitting and Certification of Other Permits) (Chapter III.D.3. pg.III-14)*

I. In review and certification of permit applications in the coastal zone, the Coastal Council will be guided by the following general considerations (apply to erosion control and energy facility projects, as well as activities covered under Activities Subject to Management):

(1) The extent to which the project will further the policies of the South Carolina General Assembly which are mandated for the Coastal Council in implementation of its management program, these being:

(a) To promote the economic and social improvement of the citizens of this State and to encourage development of coastal resources in order to achieve such improvement with due consideration for the environment and within the framework of a coastal planning program that is designed to protect the sensitive and fragile areas from inappropriate development and provide adequate environmental safeguards with respect to the construction of facilities in the critical areas of the coastal zone."

M.4.02 This project will allow the continued maintenance of the Savannah Harbor Navigation Project, with its beneficial effects on commercial deep-draft navigation and the national economy. Industries located in the region and workers residing in the immediate area would have the most direct economic benefit. Since the project is located on the State boundary, industries and/or persons located close to the port, but residing in either state can equally benefit from the harbor, even though most of the shipping currently crosses docks located in Georgia. Therefore, the port does provide economic opportunities for residents of the State of South Carolina.

M.4.03 Environmental safeguards are incorporated into all phases of harbor operations. Use of the CDFs includes provisions to ensure that applicable state water quality standards are met by discharges from those facilities. Dike raising actions would be performed using Best Management Practices to maximize erosion control during the construction process. An Erosion and Sedimentation Control Plan for the dike raising activities has been prepared and is included in Appendix N of the EIS.

M.4.04 *"(b) To protect and, where possible, to restore or enhance the resources of the State's coastal zone for this and succeeding generations."*

M.4.05 As expressed in the previous section, many environmental safeguards are incorporated into harbor maintenance activities to protect the coastal resources. These provisions deal with water quality, endangered species, and fisheries, among others.

M.4.06 One component of the proposed project would directly restore coastal resources. That is the beneficial use of nearshore sediments through the direct placement of dredged material on the beaches of Daufuskie and Tybee Islands to restore eroded shorelines.

M.4.07 Another component of the proposed project would directly enhance coastal resources. The Mitigation Plan developed for use of Disposal Area 14A includes components which would create rare isolated nesting habitat for shorebirds and colonial nesting birds. Nesting islands would be created inside some CDFs, a bird nesting area re-established at the east end of Jones/Oysterbed Island, and a new shorebird nesting area island established by construction of an island immediately offshore of Turtle Island. Nesting habitat for those bird species has diminished over time as the coastline has become more developed. The isolated nesting habitat which would be created is becoming increasingly rare in this region. The proposed nesting areas counter a long-term trend of habitat loss and are expected to enhance shorebird nesting in South Carolina through the addition of additional critical nesting habitat. The existence of such habitat could be critical to the survival of such species as the least tern, which now nest mainly on rooftops, the design of which may in the future not be conducive to successful nesting.

M.4.08 *"(2) The extent to which the project will have adverse impacts on the "critical areas" (beaches, primary ocean-front sand dunes, coastal waters, tidelands)."*

M.4.09 Continued operation and maintenance of the Savannah Harbor Navigation Project is not expected to have significant adverse impacts on these factors. Adverse impacts stemming from the project would consist of temporary increases in turbidity in the nearshore area and at the ODMDS resulting from open water disposal operations.

M.4.10 Beneficial impacts produced by the project include (1) the protection which beach placement of sediments on Daufuskie and Tybee Islands would provide to those eroding barrier island shorelines, (2) the protection from the erosive nature of wind-generated waves which the proposed bird island would provide to

the ocean shore of the adjacent Turtle Island Wildlife Management Area, (3) the protection which the submerged berms would provide to Tybee Island from northeasterly waves, especially ones of high amplitude, and (4) the protection which the feeder berm would provide to the Tybee Island beach from northeasterly waves.

M.4.11 *"(3) The extent to which the project will protect, maintain, or improve water quality, particularly in coastal aquatic areas of special resource value, for example, spawning areas or productive oyster beds."*

M.4.12 Implementation of the weir effluent monitoring described in the main EIS would adequately protect the water quality of the receiving body. Effluent from underdrains which drain to the Savannah or Back Rivers would meet water quality standards with only small mixing zones. No impacts are anticipated to striped bass spawning areas in Back River. Implementation of the proposed hydraulic dredging of berths with direct deposition of excavated sediments into CDFs would reduce the need for ongoing agitation dredging operations and its multiple handling of berth sediments. Temporary increases in turbidity in nearshore areas would occur as a result of the beneficial uses of nearshore sediments but are not expected to have long-term environmental impacts. Moreover, no hard bottom communities or submerged vegetation beds are known to exist in the project impact area. Side scan sonar and benthic surveys would be conducted prior to initial placement at the proposed nearshore sites to ensure significant benthic communities would not be adversely affected.

M.4.13 *"(4) The extent to which the project will meet existing State and Federal requirements for waste discharges, specifically point sources of air and water discharge, and for protection of inland wetlands."*

M.4.14 Past studies of weir releases at Savannah (Palermo, 1988) indicate that the CDFs are very effective in removing suspended solids, metals, and other nutrients prior to effluent releases. Effluent from the CDFs is expected to meet state water quality standards. To ensure that unacceptable water quality impacts do not occur from the weir releases, a water quality monitoring plan will be implemented. The Project will abide by the conditions of its State Water Quality Certification.

M.4.15 Wetlands would be protected to the extent practicable. Improvements to existing dikes would be made inside the disposal areas so that no additional wetlands would be impacted. The diking of Disposal Area 14A is proposed as a means of employing a

rotational use of all middle and lower harbor CDFs. Rotational use of the sites is necessary to maximize the useful life of those sites. By extending the life of existing sites, impacts to other wetlands would be postponed.

M.4.16 *"(5) The extent to which the project includes consideration for the maintenance or improvement of the economic stability of coastal communities."*

M.4.17 Continued operation and maintenance of the Savannah Harbor Navigation Project would have no negative impacts on the coastal economy. In fact, increasing the efficiency of harbor operations would make the port more competitive, possibly encouraging further use of the port facilities, thereby creating more jobs in the region.

M.4.18 *"(6) The extent to which the project is in compliance with local zoning and/or comprehensive plans."*

M.4.19 The feature of the proposed Project possibly subject to a question concerning local zoning would be the diking of Disposal Area 14A. However, since that site has been used in the past for disposal of dredged material, no change in land use would occur with the proposed diking and subsequent use as a CDF. The Special Area Management Plan (SAMP) prepared by the SCCC in October 1987 investigated environmental, regulatory and management options which might affect the development of the Lower Savannah River. That area was defined as being bounded on the west by the Savannah National Wildlife Refuge, on the north by Wright River, on the east by the Atlantic Ocean, and on the south by the City of Savannah. In speaking of Disposal Area 14A, the SAMP stated that "These dikes are expected to be constructed in later years as the areas presently under use are filled to capacity." In July 1984, the SCCC did approve an alignment so that Area 14A could be diked. The currently proposed diking follows that previously approved alignment.

M.4.20 *"(7) The possible long-range, cumulative effects of the project, when reviewed in the context of other possible development and general character of the area."*

M.4.21 Development and operation of the harbor has resulted in adverse impacts to the environment. After implementation of environmental laws in the 1970's, those impacts have predominantly been compensated for through some form of mitigation. The region has a long history tied to shipping as the original settlement of Savannah was as a seaport. Much of the original economy was dependent upon the export of locally produced goods through the harbor. Continued growth of the region's economy is expected to

increase the need for movement of goods in an economical manner. As the price of that movement increases or decreases, an inverse effect is felt on the competitiveness of industries in the area. Continued operation of the harbor may lead to further development along the harbor as industries seek to minimize transportation costs and their access to the export market. However, the environmental impacts of developing sites are dependent on the manner of that development and the specific site in question. Therefore, no precise determinations can directly be made on future cumulative impacts of harbor operation. Plans which organizations may have for future expansion of the harbor are not defined sufficiently at this time to allow their serious consideration in this document.

M.4.22 Rotational use of the middle and lower harbor CDFs will maximize the useful life of those existing facilities. This will delay the need for adverse impacts resulting from the need for new dredged material disposal areas. Under current operational procedures, a CDF in the middle harbor is expect to reach its useful life in year 6 of the project. After that time, the site (Disposal Area 2A) would only be available on a reduced basis, with the remaining sediments being shifted to the complex of Disposal Areas 12A/12B/13A. With the proposed project, the CDF system would be adequate for the entire 20-year period of evaluation.

M.4.23 *"(8) The extent and significance of negative impacts on Geographic Areas of Particular Concern (GAPCs). The determination of negative impacts will be made by the Coastal Council in each case with reference to the priorities of use for the particular GAPC. Applications which would significantly impact a GAPC will not be approved or certified unless there are no feasible alternatives or an overriding public interest can be demonstrated, and any substantial environmental impact is minimized."*

M.4.24 The proposed project would not significantly impact any Geographic Area of Particular Concern.

M.4.25 *"(9) The extent and significance of impact on the following aspects of quality or quantity of these valuable coastal resources:*

i. unique natural areas - destruction of endangered wildlife or vegetation or of significant marine species, degradation of existing water quality standards;"

M.4.26 Both of these issues are addressed in detail in the main EIS. Conditions have been placed on harbor maintenance activities to protect threatened or endangered species in the project area. A water quality monitoring plan will be implemented to ensure water quality standards are maintained.

M.4.27 *"ii. public recreational lands - conversion of these lands to other uses without adequate replacement or compensation, interruption of existing public access, or degradation of environmental quality in these areas;"*

M.4.28 Diking of Disposal Area 14A to allow continued use of the site would result in the loss of wetlands and their conversion to high ground. A Mitigation Plan is included in the project to compensate for those losses.

M.4.29 Other potential impacts of the project which could possibly affect public recreation lands would stem from any degradation of water quality associated with the project. Adverse impacts to water quality from the proposed project would be minimal.

M.4.30 *"iii. Historic or archeological resources - irretrievable loss of sites identified as significant by the S.C. Institute of Archeology and Anthropology or the S.C. Department of Archives and History without reasonable opportunity for professional examination and/or excavation, or preservation."*

M.4.31 The project's impacts on cultural resources are addressed in the main EIS. Extensive cultural resources investigations were conducted as part of the LTMS Study. These included archival research, land and water surveys. The findings of the investigations are summarized in the EIS. Where appropriate, data recovery efforts were conducted at specific sites after consultation with the State Historic Preservation Officer (SHPO). At nearshore sites which have not been investigated, cultural resource surveys would be conducted prior to construction to ensure no significant resource is located in the impact area. The results of all surveys would be coordinated with the appropriate SHPO before the site is impacted. A Cultural Resource Management Plan has been prepared to describe the procedures which would be

followed to protect known cultural resources within the management authority of the Corps. That Plan is contained in Appendix J to this EIS. A copy of the draft EIS was provided to both the South Carolina and Georgia SHPO for review and comment. Comments provided by the GA SHPO were incorporated in the Final EIS. No written comments were received from the SC SHPO, although conversations with the SC SHPO centered on the same topics discussed by the GA SHPO.

M.4.32 *"(10) The extent to which the project is in the national interest."*

M.4.33 Savannah Harbor is important to the national economy and to our nation's defense. Continued maintenance of the harbor will support both of these nationally important factors. The economic benefits have been weighted against the predicted adverse environmental impacts of the project and Savannah District has determined that the Savannah Harbor Navigation Project is in the public interest.

M.4.34 *"Specific South Carolina Management Program Policy Applicable to the review of these documents.*

M.4.35 VII. WILDLIFE AND FISHERIES MANAGEMENT (Chapter III, Policy Section III, p. III-51)

A. Wildlife and Fisheries Management Policies:

The following policies were developed by the South Carolina Coastal Council in conjunction with the South Carolina Wildlife and Marine Resources Department for inclusion in the S.C. Coastal Program.

(1) In the coastal zone, Council issuance or review and certification of permit applications which would impact wildlife and fisheries resources will be based on the following policies:

(a) Activities deemed, by the South Carolina Coastal Council in consultation with the South Carolina Wildlife and Marine Resources Department, to have a significant negative impact on wildlife and fisheries resources, whether it be on the stocks themselves or their habitat, will not be approved unless overriding socio-economic considerations are involved. In reviewing permit applications relative to wildlife and fisheries resources, social and economic impacts as well as biological impacts will be considered.

(b) Wildlife and fisheries stocks and populations should be maintained in a healthy and viable condition and these resources should be enhanced to the maximum extent possible.

(c) Critical wildlife and fisheries habitat should be protected and enhanced to the extent possible."

M.4.36 Impacts to fish and wildlife resources are addressed in the main EIS. No significant adverse impacts are anticipated.

M.4.37 *"VIII. DREDGING (Chapter III, Policy Section VIII, pg. III-55)*

A. Dredging Policies:

(1) In the coastal zone, Council review and certification of permit applications for dredging projects will be based on the following policies:

(b) Suspended sediments must be kept to a minimum. The use of structures such as weirs and silt curtains to minimize water quality degradation is encouraged. Where highly toxic sediments are encountered, dredging will be prohibited unless the activity is consistent with other dredging policies, as well as those for manufacturing or other industrial activities."

M.4.38 Previous studies (Palermo 1988) have shown the Savannah Harbor CDFs be very effective traps of suspended sediments, removing over 99 per cent of the solids. The CDFs do have weirs to allow regulation of the effluent. A water quality monitoring program is included to ensure the areas are functioning properly and performing in accordance with all applicable water quality standards. That plan is described in detail in Section 7 of the main EIS. A review of all existing sediment testing data indicates that harbor sediments contain no toxic substances at hazardous levels. A silt curtain would be used when the previously approved open water disposal occurs at the western side of New Cut. Other unconfined disposal operations would employ sediments with a high sand content. This is expected to minimize turbidity and suspended sediment effects.

M.4.39 *"(c) Dredging should not reduce water circulation, water currents, mixing, flushing or salinity in the immediate area."*

M.4.40 Normal maintenance of the navigation channel is not expected to impact these factors appreciably, although current velocities would theoretically decrease after a dredging event due to the increase in cross-sectional area of the channel. Proposed sediment control features and deepening at berths would decrease current velocities at those immediate sites, but are not expected to adversely impact mixing or flushing. No proposed dredging is expected to increase salinity intrusion in the harbor. The bird island proposed for the nearshore area off Turtle Island could cause local changes in these factors. However, the site selected

for this structure is a shallow water area with deeper channels to either side. No major currents are expected to exist within the footprint of the proposed island. The bird island would be expected to protect inland areas (Turtle Island Wildlife Management Area) from the erosion action of wind-generated waves. The proposed offshore berms are expected to attenuate high amplitude northeasterly wind-generated waves. These berms would be oriented to minimize their impact on both ebb and flood tidal currents. The proposed feeder berm is expected to attenuate high amplitude northeasterly wind-generated waves and protect the adjacent barrier island shoreline of Tybee Island. This berm is not expected to result in significant effects on current patterns or water circulation. Placement of channel sediments on Tybee and/or Daufuskie Islands is not expected to result in significant effects on current patterns or water circulation. Such placement is expected to lessen wave impacts to those beaches.

M.4.41 *"(2) In critical areas of the coastal zone, it is Council policy that:*

(c) To the maximum extent feasible, dredging and filling activities should be restricted in nursery areas and shellfish grounds and during periods of migration, spawning and early development of important sport and commercial species;"

M.4.42 In order to comply with existing state water quality certifications which contained stipulations to avoid potential impacts to the striped bass during their spawning run in the Savannah River, no dredging will be conducted from March 16 to May 31 of each year in the upper harbor (above River Mile 5.0). This policy could be curtailed when no longer required by state water quality certifications. In addition, the deposition of sediments in the nearshore area during the spring would be avoided to the extent practicable to minimize impacts to larval and young finfish and shellfish residing in those shallow areas.

M.4.43 *"(d) Dredging and excavation shall not create stagnant water conditions, lethal fish entrapments, or deposit sumps or otherwise contribute to water quality degradation;"*

M.4.44 The proposed project will not create such problems. Proposed changes in the Project's sediment control features and deepening of berths would produce larger areas for temporary storage of sediments. Since the oxygen demand of the sediment material is not dependent on the location of the material, the total oxygen demand which harbor sediments place upon the river would not be affected. In areas where sediment accumulates rapidly, that sediment which becomes buried and turns anoxic is outside of the influence of oxygen dissolved in the water and no longer places a demand on that critical water quality component.

Thus, the placement of a volume of sediment in a deep storage area removes that volume from the area of ready exchange with the water column, thereby reducing the oxygen demand of the total sediment volume.

M.4.45 *"(e) Designs for dredging and excavation projects shall, where feasible, include protective measures such as silt curtains, diapers and weirs to protect water quality in adjacent areas during construction by preventing the dispersal of silt materials;*

(f) Dredged materials shall be deposited and contained in such a manner so as to prevent dispersal into adjacent wetland areas."

M.4.46 All material excavated from the upper inner harbor would be placed in diked high ground disposal areas, except for completion of the previously authorized filling of New Cut. The proposed hydraulic dredging of berth sediments with direct deposition of the excavated sediments in CDFs would reduce the adverse impacts resulting from the present double handling of those sediments when they are initially removed from berths through agitation dredging. Sandy sediments from the outer portions of the inner harbor may be employed in maintenance of the upland Jones/Oysterbed Island nesting area or the nearshore bird island as part of the Mitigation Plan. The weir releases from the CDFs will be managed to minimize the potential for impact to water quality. A water quality monitoring plan will be implemented to observe the effectiveness of the disposal area operations. That plan is described in detail in Section 7 of the main EIS.

M.4.47 Materials excavated from the Bar Channel and possibly along the Jones/Oysterbed Island Disposal Area would be deposited in open water disposal areas or used in maintaining commitments under the Mitigation Plan. Commitments in the Mitigation Plan include construction and maintenance of the bird island off Turtle Island and maintenance of the unconfined upland Jones/Oysterbed Island nesting area. The majority of disposal actions are expected to be to the EPA-approved ODMDS. Beneficial uses of those sediments would involve their placement on the beaches of Daufuskie and/or Tybee Island, as well as the construction and maintenance of submerged berms and a feeder berm in the nearshore area. No open water placement would result in permanent adverse impacts to vegetated wetlands.

M.4.48 *"(i) Wetlands shall not be utilized as depositories for waste materials except as discussed in R.30-12(I)."*

M.4.49 Materials dredged from the inner harbor would be placed in high ground confined disposal areas, except for completion of the previously approved filling of New Cut and possible placement on the Jones/Oysterbed island nesting area. To maximize the useful life of the CDFs, a rotational program would be implemented. The effects of the rotational program are described in detail in the main EIS. The diking and use of Disposal Area 14A are required for effective use of that rotational program.

M.4.50 *"(j) In all cases, dredging activities shall not be approved until satisfactory disposal sites have been acquired. (R. 30-12(G))."*

M.4.51 No acquisition of new disposal sites is required for this proposed project. Disposal Area 14A has been used previously for placement of dredged material. The site was purchased in the 1980's by the Georgia Department of Transportation for use as a disposal site for the Savannah Harbor Navigation Project. With implementation of the proposed project, existing disposal sites would have sufficient capacity for the entire 20-year period of analysis.

M.4.52 *"B. Dredged Material Disposal Policies:*

(2) In critical areas of the coastal zone, it is Council policy that:

(a) Upland disposal of dredged material shall always be sought in preference to disposal in wetlands. Vegetated wetlands and mudflats shall not be utilized for disposal of dredged materials unless there are no feasible alternatives. Any other wetlands should not be utilized for disposal of dredged materials when other alternatives exist."

M.4.53 Upland disposal of dredged material is used as much as practicable. The diking and use of Disposal Area 14A will result in the loss of wetlands, but has already been found to be consistent with South Carolina Coastal Management Programs. A Mitigation Plan would be implemented to compensate for the loss of wetlands from the diking of Disposal Area 14A. In addition, the use of that area would allow a rotational program to be instituted in the middle and lower harbor CDFs so that their useful life could be maximized. Beneficial use and planned use of dredged materials under the Mitigation Plan would involve deposition on beaches and in subtidal nearshore areas. The adverse impacts

which such placement would produce are judged to be outweighed by the beneficial impacts which such placement would produce, including protection of eroding barrier island beaches, creation of rare isolated nesting sites for colonial nesting birds, and placement of dredged sediments in the immediate nearshore sand sharing system.

M.4.54 *"(b) Open water and deep water disposal should be considered as an alternative if highland alternatives are not feasible. However, open and deep water disposal sites should be seriously considered only after careful consultation with the Council and other relevant State and Federal agencies."*

M.4.55 Only sediments removed from the Bar Channel and possibly the channel near the Jones/Oysterbed Island Disposal Area are considered for placement in open water. The normal site for placement of sediments removed from the channel near the Jones/Oysterbed Island Disposal Area is the Jones/Oysterbed Island Disposal Area. Those sediments would not be placed in the CDF only if the beneficial use of those sediments in the nearshore area is pursued. The normal site for placement of Bar Channel materials would be at the EPA-approved ODMDS. Ocean disposal recently received approval from EPA through their concurrence of the Section 103 Evaluation in 1993. This EIS contains an update of that analysis for EPA's approval. Open water disposal would occur to complete the previously authorized filling of New Cut.

M.4.56 *"(c) Dredged materials containing hazardous levels of toxic material must be disposed of with extraordinary caution. These materials shall never be disposed of in wetland areas and only in highland areas which are lined and diked with impervious materials. These materials will only be disposed in open water ocean dumping sites when maximum safety has been demonstrated after thorough review by the Coastal Council and other appropriate state and Federal agencies."*

M.4.57 The District has reviewed all sediment testing data which is available to assess the quality of the sediments which settle in the harbor. The findings of that evaluation are contained in Appendix E in the EIS. In summary, the dredged materials do not contain hazardous levels of any toxic material. Specific chemicals have been identified in particular samples at levels which have produced adverse impacts to some aquatic species under certain conditions. No chemicals were found at levels which would produce adverse impacts to humans. The acceptability of ocean disposal of Bar Channel sediments has been reviewed and approved by EPA in 1993. Appendix D of the EIS contains an update of that evaluation. That Section 103 Evaluation was approved by EPA in a letter dated March 23, 1995.

M.4.58 *"(e) Future disposal sites shall be reviewed on a case-by-case basis."*

M.4.59 With implementation of the proposed project, no additional disposal sites would be needed for the 20-year period of analysis.

M.4.60 *"(f) Wherever feasible, existing disposal areas shall be utilized to the fullest extent possible; this would include raising the height of embankments to increase the holding capacity of the disposal area."*

M.4.61 The proposed project includes the use of existing CDFs and the raising of their dikes to increase their holding capacity. Implementation of the proposed project includes the use of a rotation program which would allow material from inside the CDFs to be used to raise the dikes. Thus, capacity of the sites would be increased in two ways; (1) removal of sediments previously deposited within an area, and (2) raising of the dikes to allow sediments to be deposited higher at that site.

M.4.62 *"(9) Consideration must be given to the temporal aspects of spoil deposition, for example, impacts on spawning, fish migrations, shellfish harvesting, waterfowl nesting and wintering areas, and mosquito control. Attention must be given to possible adverse impacts of various alternative sites on the public health and welfare as well as on critical fish and wildlife areas."*

M.4.63 Deposition of dredged material would have little impact on fish spawning and migration, shellfish harvesting, and waterfowl nesting. The Mitigation Plan developed for Disposal Area 14A would have beneficial effects on waterfowl wintering areas through the beneficial management of water levels within the CDFs. One of the management goals of that program is to provide flooded areas for migrating waterfowl to use for resting. Another component of that Mitigation Plan is the installation of purple martin houses and bat houses for biological control of any additional mosquitos which may result from the holding of ponded water at the CDFs for longer periods. Chatham County would continue to perform extensive work at the disposal areas to control mosquito populations. Construction and operation of an additional water control structure in an existing impoundment within the Savannah NWR, as part of the Mitigation Plan, would increase the fishery value of that impoundment by increasing the site's tidal exchange.

M.4.64 *"(h) In all cases, dredging activities shall not be approved until satisfactory disposal sites have been acquired."*

M.4.65 As stated previously, no acquisition of new disposal sites is required for this proposed project. Disposal Area 14A has been used previously for placement of dredged material. The site was purchased in the 1980's by the Georgia Department of Transportation for use as a disposal site for the Savannah Harbor Navigation Project. With implementation of the proposed project, existing disposal sites would have sufficient capacity for the entire 20-year period of analysis.

M.4.66 *"D. Public Open Space Policies:*

The Coastal Council will apply the following policies in review and certification of permit applications located in or which would directly affect public open space areas:

(1) Project proposals which would restrict or limit the continued use of a recreational open area or disrupt the character of such a natural area (aesthetically or environmentally) will not be certified where other alternatives exist."

M.4.67 The proposed project would have no adverse impacts on the Savannah National Wildlife Refuge. Implementation of the Disposal Area 14A Mitigation Plan would result in beneficial impacts to the Tybee National Wildlife Refuge through the periodic clearing of high areas within that Refuge. The cleared areas would be available for use by colonial nesting birds which greatly prefer cleared sandy areas for nesting. The areas would be maintained through subsequent clearing and possibly unconfined placement of dredged materials. The construction and maintenance of the bird island offshore of the South Carolina Turtle Island Wildlife Management Area would shield the shoreline of that barrier island from erosive storm waves, thereby increasing the stability of that shoreline. Construction and operation of the additional water control structure in an existing impoundment within the Savannah National Wildlife Refuge would increase the fishery value of that impoundment by increasing the site's tidal exchange. The construction and maintenance of the submerged berms and feeder berm off Tybee beach would shield the shoreline of that barrier island from erosive storm waves, thereby increasing the stability of that shoreline.

M.4.68 Placement of dredged material on the beaches of Daufuskie and/or Tybee Islands would generally be expected to increase the ease of walking on those beaches and their aesthetic appeal. The creation and maintenance of the submerged berms and feeder berm are not expected to significantly impact recreational use of the

area as the height of the berm would be restricted to -5 feet Mean Low Water, a depth which would not impact recreational boats. The berms are expected to have an overall beneficial impact on the nearshore environment.

M.5.00 DATE OF AGENCY'S FINAL DECISION. The Corps' South Atlantic Division is scheduled to make its final decisions by October 30, 1996 concerning completion of the Environmental Impact Statement for the Savannah Harbor Long Term Management Strategy Study (harbor operation and maintenance).

APPENDIX N

SAVANNAH HARBOR

CONFINED DISPOSAL FACILITIES

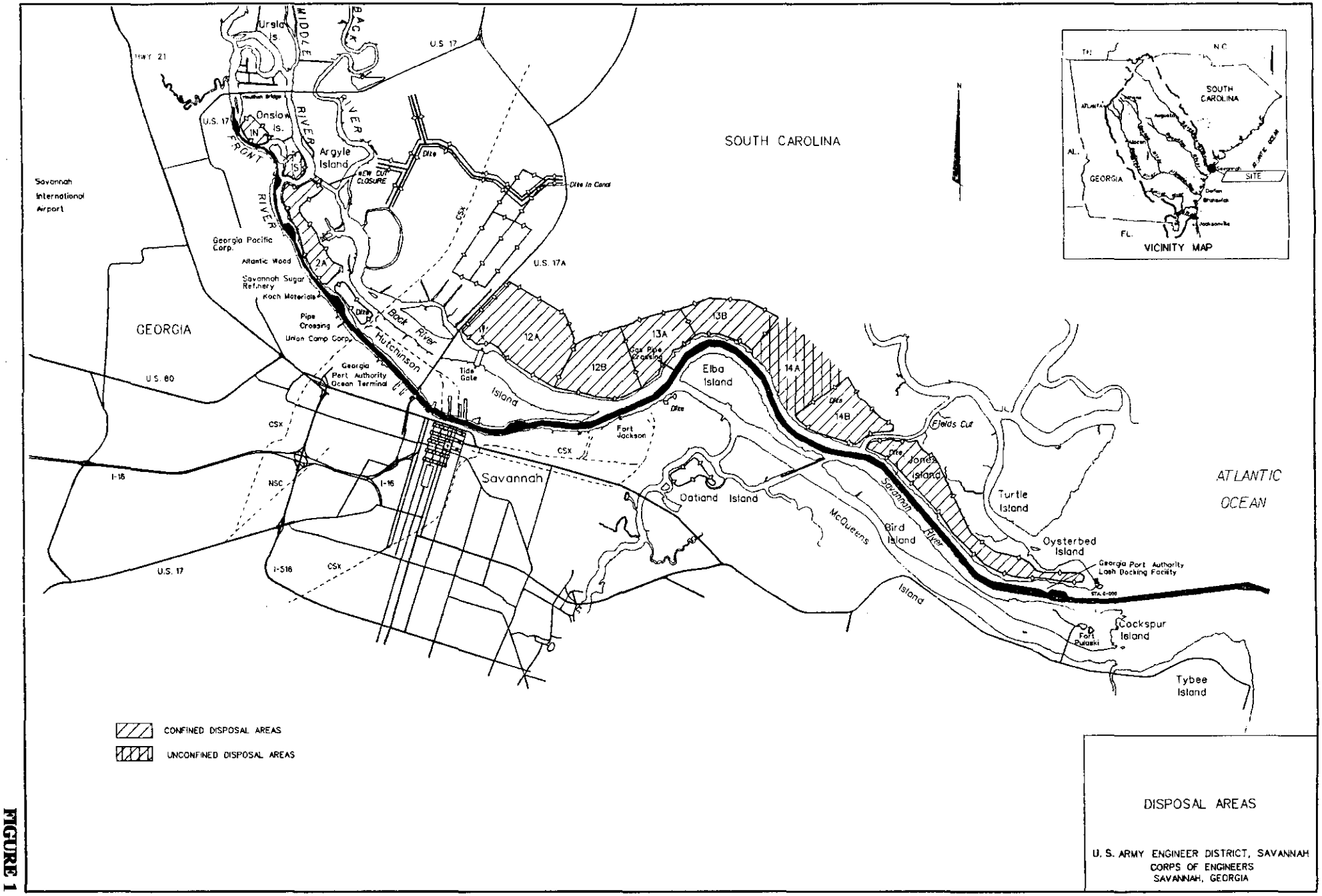
EROSION AND SEDIMENTATION CONTROL PLAN

SAVANNAH HARBOR
CONFINED DISPOSAL FACILITIES
EROSION AND SEDIMENTATION CONTROL PLAN

N.1.00 BACKGROUND. Section 319 of the Clean Water Act (P.L. 92-500) requires states to develop programs to control pollution from non-point sources to navigable waters within the state and improving the quality of such waters. Both Georgia and South Carolina have established such programs. The continued maintenance and periodic improvements to the dikes at the Savannah Harbor Navigation Project's confined disposal facilities (CDFs) must comply with those programs. To ensure such compliance, an Erosion And Sedimentation Control Plan has been developed. Dredging and disposal activities do not fall within the authorities of Section 319. Stormwater runoff is normally regulated under Section 402 of P.L. 92-500. However, an NPDES permit is not required for stormwater runoff from the confined disposal facilities since the effects and control of such runoff are included in the Section 404(b)(1) Evaluation for the Project, which is contained in Appendix C of the Environmental Impact Statement.

N.2.00 EROSION AND SEDIMENTATION CONTROL PLAN.

N.2.01 Location Information. The upland confined disposal facilities (CDFs) for the Project are located in Chatham County, Georgia and Jasper County, South Carolina. The sites are shown in Figure 1.



DISPOSAL AREAS

U. S. ARMY ENGINEER DISTRICT, SAVANNAH
CORPS OF ENGINEERS
SAVANNAH, GEORGIA

FIGURE 1

N.2.02 General Site Features. The non-Federal sponsor has provided nine CDFs for use for the Savannah Harbor Project. Those areas are as follows:

AREA NUMBER	AREA NAME	LOCATION (CHANNEL STATIONS)	SIZE (ACRES)
	Jones/Oysterbed	0+000 - 27+000	754
14B	--------	28+000 - 37+000	765
14A	--------	37+000 - 43+000	815
13B	--------	43+000 - 47+800	628
13A	--------	47+800 - 57+000 (-2+000BR)	690
12B	--------	57+000 - 6+600BR (-2+000BR)	710
12A	--------	6+500BR- 10+100BR	1123
2A	Argyle-Hutchinson	93+000 - 103+000	185
1N	Onslow - North	107+500 - 112+600	130

NOTE: "BR" indicates the stationing up Back River as shown on the Savannah Harbor, Georgia, Annual Survey.

N.2.03 Disposal Area 14B receives dredged material from both the Savannah Harbor Navigation Project and the Atlantic Intracoastal Waterway (AIWW), another waterway managed by the Corps of Engineers. The non-Federal sponsor for the AIWW project in Georgia is the Georgia Department of Transportation, and in South Carolina it is the South Carolina Department of Health and Environmental Control, Office of Ocean and Coastal Resource Management. The other confined disposal areas only receive material from the Savannah Harbor Navigation Project, including the navigation channel, turning basins, Sediment Basin, and berthing areas.

N.2.04 A proposal to dike and use Disposal Area 14A is included in the proposed project. The other sites listed are already used on a regular basis for deposition of harbor sediments.

N.2.05 The dikes which confine the disposal areas are of various heights, depending primarily on the age of the particular site and the amount of deposition which has occurred at the site. The dikes are generally constructed on a 3 horizontal to 1 vertical side slope, with a 24-foot wide crest. The dikes are maintained in a grassed state to minimize erosion. Mowing is performed on an as-needed basis. Typically, stormwater collection ditches are not found at the outer toe of the dikes. On the Wright River side of Disposal Areas 12A, 12B, 13A and 13B the toe of the fill joins an unpaved 1-lane roadway which adjoins the diked area. Wetlands typically lie outside the roadway.

N.2.06 No enclosed buildings are located within the CDFs, nor are any planned. Surrounding properties are generally undeveloped and consist of open water areas and marshes. Therefore, wetlands surround the CDFs. Adjacent or nearby open water areas include the Savannah River, Middle River, Back River, Wright River, Atlantic Intracoastal Waterway, and the Atlantic Ocean. An aeration lagoon which is operated by the Union Camp Corporation is located on Hutchinson Island adjacent to Disposal Area 2A.

N.2.07 The CDFs are typically provided by Chatham County for use by the Federal Navigation Project. This use is generally provided through a disposal easement to the site, or portion of the site.

N.2.08 Borrow And Waste Areas. Dike improvement (raising) projects are performed periodically to increase the capacity of the CDFs. Fill material for those construction projects is typically obtained from sediments deposited within the disposal area which is being improved or another of the Project's CDFs. Therefore, no borrow sites are used, other than the CDFs themselves.

N.2.09 Site Drainage Features. The drainage features of the CDFs are fairly simple and uniform. Drainage from the exterior of the dikes typically flows down the slope, across an unpaved access road which borders many of the sites, to the adjacent wetlands. No collection devices exist or are proposed at the outer toe of the dikes. Drainage from the interior of the dikes typically flows down the side slope, across the floor of the CDF to weirs, where the drainage is discharged to the adjacent river or tidal creek. Drainage ditches are used inside the diked area to speed drying of the deposited sediments. Those ditches flow to the weir outlets. There are multiple overflow weirs at each CDF which typically drain to a tidal creek. Underdrains are also proposed for installation and use in most CDFs to speed drying of the deposited sediments. The underdrains would flow to either the Savannah or Back Rivers. The discharge from the underdrains would be separate from the weirs. There are no off-site areas which drain through the CDFs.

N.2.10 Erosion Control Measures. The need to prevent the erosion of soil is well established. Erosion of the dikes affects the dike integrity and produces additional work for the local sponsor. If allowed to erode, the dike fill material could make its way to the marsh, causing undesirable environmental impacts, or to the navigation channel where it would restrict navigation and require excavation and placement into the disposal areas, consuming valuable capacity. The local sponsor is

responsible for managing the CDFs and implementing appropriate erosion control measures. Those measures typically consist of the "Best Management Practices", as defined in either the Manual For Erosion And Sediment Control In Georgia, the South Carolina Stormwater Management And Sediment Control Handbook For Land Disturbance Activities, or A Guide To Site Development And Best Management Practices For Stormwater Management And Sediment Control, whichever is applicable for the location of the construction.

N.2.11 Silt fence is installed during construction at the boundary of the marsh near new weir discharge pipe outfalls. It is effective in holding eroded soils until grass is established. Experience at the CDFs indicate that it is better to remove the silt fences in areas that will be mowed to minimize down time of mowing equipment.

N.2.12 Since the CDFs are a component of the Savannah Harbor Federal Navigation Project and the District is responsible for ensuring use of environmentally acceptable methods to maintain that project in conformance with its environmental clearances, the Savannah District Engineer is ultimately responsible for maintenance activities at the CDFs. Correspondence dealing with the environmental clearances and permits for activities conducted at the CDFs should be addressed to that office. Day-to-day operations of the CDFs are managed by Chatham County's Engineering Department. That Department manages the CDFs and administers dike improvement contracts and dike maintenance work.

N.2.13 Vegetative Stabilization. Grassing the dikes is an integral component of the dike construction contracts. The current grass mixture used is 50 pounds of Pensacola Bahia grass, 4 pounds of hulled common Bermuda grass and 4 pounds of unhulled common Bermuda grass, all on a per acre basis. The ground is prepared, then fertilizer, lime and grass seeds are applied at specified rates. After the grass is at a proper height, nitrogen is added.

N.2.14 Vegetation on the dikes must be periodically mowed to a height so inspection for washouts, which would be the precursors to possible dike failures, can be observed. Uncontrolled vegetation can obscure the view of inspectors. Mowing the roadway located on top of the dikes ensures the safety of trips for inspection and disposal operation purposes. The dikes are typically mowed twice each year, sometimes more, pending available funds and rainfall. No mowing would be performed on the dike side slopes during the period from March 1 to July 15 to ensure nesting migratory birds which may nest on the side slopes are protected.

N.2.15 Other Requirements. The local sponsor will prepare and submit documents to the SC DHEC-OCRM for the purpose of obtaining a Stormwater Permit for initial construction of the Disposal Area 14A dikes. Implementing the procedures described in the Erosion and Sediment Control Plan prepared by the District will provide environmental clearance for subsequent Project dike raising activities in South Carolina. Application for a separate Stormwater Permit from the SC DHEC-OCRM will only be required with the construction of new dikes, not for the periodic raising of existing dikes.

N.2.16 Near the end of the design process for a periodic dike improvement (raising) contract, detailed design drawings which show the intended stormwater management and sediment control features will be provided to either the SC DHEC-OCRM or the GA DNR-EPD. Any design changes required by that agency to remain in compliance with their current regulations will be implemented.

N.2.17 The following paragraphs describe the typical construction process which occurs periodically at the CDFs. Dike improvements (raisings) are performed to increase the storage capacity of the confined CDFs. This is accomplished by raising the height of the dike which surrounds the disposal area. A widening of the dike's base in usually also included to maintain the same side slopes on the earth structure.

N.2.18 When a dike improvement contract is initiated, silt fences are installed along the exterior of the construction area to retain any soil material which erodes off the exposed face of the dike. The fences are placed at the edge of the construction area and wetlands. Existing vegetation on the dike is cleared to allow proper compaction of soil material which will be placed on the structure. If necessary for stability, geotextile fabric is then installed on the exposed soil substrate. The fabric strengthens the earth structure by distributing the load of the earth fill across a wider surface. The fabric is then quickly covered by about a foot of soil to avoid adverse effects of exposure to the sun. Soil is placed to increase the height of the dike in approximately 1-foot layers. Subsequent movement of construction equipment across the dike surface serves to compact previously deposited soil material. After the desired profile is produced, the exposed dike surface is treated with a grass seed/fertilizer/straw mixture. Silt fences are maintained throughout the construction period to ensure they continue to function as intended. Soil material removed from the fences are deposited on the inner side of the dikes or at the top of the dike slope to minimize its escape to the wetlands surrounding the CDFs. After vegetation is well established on the side slopes, the silt fences are removed to allow mowing operations to be conducted efficiently.

APPENDIX O

ENVIRONMENTAL CLEARANCES

FOR THE

SAVANNAH HARBOR NAVIGATION PROJECT

ENVIRONMENTAL CLEARANCES
FOR THE
SAVANNAH HARBOR NAVIGATION PROJECT

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ENVIRONMENTAL CLEARANCES
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0.1.00 PURPOSE. The appendix is intended to be a single source for review of the environmental commitments made by Savannah District and the clearances obtained from regulatory agencies for operation and maintenance of the Savannah Harbor Navigation Project.

0.2.00 ENVIRONMENTAL REVIEWS AND APPROVALS NEEDED. The following list summarizes the environmental reviews and approvals which are required for operation and maintenance of this project:

1. Threatened And Endangered Species
   - Approval from US FWS through Section 7 consultation
   - Approval from US NMFS through Section 7 consultation
2. Migratory Birds
   - Evaluation performed by Savannah District
   - Approval from US FWS for specific actions
3. Coastal Barrier Resources Act
   - Certification by the US FWS
4. Consistency With State Coastal Zone Management Program
   - Evaluation performed by Savannah District
   - Certification from the SC DHEC-OCRM
5. Ocean Disposal
   - Evaluation performed by Savannah District
   - Approval by the US EPA
6. Management of the Savannah ODMDS
   - Agreement with the US EPA
7. Section 404 Evaluation For Dredge And Fill Actions (CWA)
   - Evaluation performed by Savannah District
8. Water Quality Certification (Section 401 of CWA)
   - Certification from the SC DHEC
   - Certification from the GA DNR-EPD
9. Stormwater Runoff (Section 402 of CWA)
   - Evaluation performed by Savannah District
10. Erosion Control And Sedimentation Plan (Section 319 of CWA)
    - Approval from South Carolina DHEC/OCRM
    - Approval from Georgia DNR/EPD

11. Section 106 Compliance (Cultural Resources)
    - Approval from the SC SHPO
    - Approval from the GA SHPO
    - Approval from the Advisory Council on Historic Preservation
12. Wetland Mitigation Plan
    - Approval from US EPA
    - Approval from US FWS (FWS Coordination Act)
    - Approval from GA DNR or SC DNR
13. Environmental Review/Consideration (NEPA)
    - Evaluation/consideration performed by Savannah District
    - Public review of document

0.2.01 Actions which are taken outside the Base Plan (Federal Standard) described at the end of Section 5 of the main EIS would have to receive separate environmental approvals, very similar to those shown above. The organization proposing such actions would be responsible for obtaining the required permits and approvals.

0.3.00 SAVANNAH DISTRICT'S COMMITMENTS.

0.3.01 Threatened And Endangered Species. Savannah District prepared a Biological Assessment of Threatened and Endangered Species (BATES) to determine both (1) the impacts which the Project was likely to have on threatened and endangered species, and (2) what measures were appropriate to minimize the risk of impact to those species. That evaluation is contained in Appendix B. The US FWS provided Section 7 clearance in a letter dated November 29, 1995 and the NMFS provided Section 7 clearance in a letter August 23, 1995. On August 25, 1995, the NMFS issued a Regional Biological Opinion on hopper dredging of channels and beach nourishment activities in the Southeastern United States from North Carolina through Florida East Coast. That document also covered clamshell and pipeline dredging. The District will comply with the conditions in that document. The District will require each dredging contractor implement an Endangered Species Watch Plan to ensure the dredging contractor is aware of endangered species which he could encounter and precautions which would be taken to protect those species.

O.3.02 Sea Turtles. The District committed to the following measures to protect sea turtles:

a. Hopper Dredges. All hopper dredging will be generally be scheduled for November through May, and the following conditions will apply*:

1. One hundred percent inflow screening is required, and 100 percent overflow screening is recommended when sea turtle observers are required on hopper dredges in areas and seasons in which sea turtles may be present. If conditions disallow 100 percent inflow screening, inflow screening can be reduced but 100 percent overflow screening is required, and an explanation must be included in the preliminary dredging report.

2. The sea turtle deflecting draghead is required for all hopper dredging during the months that turtles may be present, unless waiver is granted by the COE SAD in consultation with NMFS.

3. To prevent impingement of sea turtles within the water column, every effort should be made to keep the dredge pumps disengaged when the dragheads are not firmly on the bottom.

4. Reporting: A preliminary report summarizing the results of he dredging and the sea turtle take must be submitted to the COE and NMFS within 30 working days of completion of any given dredging project. An annual report (Based on either calendar or fiscal year) must be submitted to NMFS summarizing hopper dredging projects, documented sea turtle and sturgeon incidental takes, and whale sightings.

5. Dredging may be conducted between 1 Nov and 31 May. One hundred percent observer monitoring is required from 1 Nov- 30 Nov and 1 Apr - 31 May.

6. Dredging must be suspended if more than one turtle is taken in any day, or once five or more turtles are taken. Dredging must also be suspended upon the taking of 1 hawksbill turtle. Dredging will not recommence until coordination with SAD and the NMFS is completed to determine the need for developing further mitigation measures or to terminate the remaining dredging activity.

NOTE: * These are the conditions in the NMFS 1995 Biological Opinion for Navigation Channels in the Southeast, and additional guidance provided by South Atlantic Division. Should a new Biological Opinion be issued, the District would consider the conditions listed here void, and would instead abide by the conditions as stated in that Opinion and any further guidance provided by South Atlantic Division.

b. Beach Nourishment. To ensure protection to nesting sea turtles the following conditions would be adhered to:

I. Overview.

1. If the project is constructed during the turtle nesting season, a turtle nest monitoring program should be conducted to ensure protection of turtles that try to nest on the existing or newly formed beach.

2. The beach would be monitored during the first winter/spring following completion of construction to determine post-nourishment compaction. This would be performed to ensure that the newly constructed beach provides suitable nesting material for endangered sea turtles. If the examination finds sand compaction within 50 feet of the toe of the dune to be greater than 500 cone penetrometer units (cpu), and the US FWS confirms that plowing is necessary, the compacted area will be plowed to a depth of at least 36 inches.

3. The beach would be monitored for three nesting seasons after beach placement for escarpments. Any escarpments in excess of 18 inches high, extending more than 100 feet in length and exceeding 500 cpu would be mechanically leveled to the natural beach contour.

4. When dredged materials are placed on Tybee Island, the city's light ordinance for protection of sea turtles would be enforced.

II. Turtle Nest Monitoring Program. The following work would be implemented when dredged materials are placed on the Tybee Island (or Daufuskie Island with appropriate changes) beach during the sea turtle nesting season. The work would include monitoring the beach for nesting sea turtles and relocation of nests found in the disposal areas or within 500 feet of the limits of the disposal area which are likely to be impacted by future disposal and/or related construction activities.

SCOPE OF WORK
FOR
MONITORING LOGGERHEAD SEA TURTLE NESTING
TYBEE ISLAND

1. PURPOSE: The City of Tybee Island, in cooperation with the Georgia Department of Natural Resources, will monitor loggerhead sea turtle nesting efforts on Tybee Island. Such a monitoring program is necessary due to disposal of dredged material obtained from the Savannah Harbor Navigation Project along the beach during the sea turtle nesting season. The entire construction area on the island will be monitored. All nests, false crawls and strandings will be recorded and nest relocations, if necessary, will be performed within 6 hours of the completion of the daily patrol. Monitoring under this work activity will commence on May 1 and will continue on a daily basis through the end of the nesting season (August 15). Any unhatched nests remaining on the beach after August 15 will continue to be monitored to determine hatching success and orientation of emerging hatchlings.

2. WORK EFFORTS: The following work efforts will be undertaken as a part of this activity:

a. Patrol of the survey area will be made at sunrise each morning from 1 May through August 15. The survey area incorporates all the ocean beach construction area. It will be the responsibility of the surveyor to clear the use of survey vehicles with applicable State agencies and local authorities.

b. A daily log sheet (obtained from GA DNR Marine Resources Division) will be filled out for each day. All applicable parts of the log sheet should be completed.

c. Should a stranded sea turtle be encountered on the beach, a stranding form (obtained from GA DNR Marine Resources Division) will be completed. If a stranded Kemp's ridley, Green, Hawksbill or Leatherback is encountered, the GA DNR, Marine Resources Division sea turtle coordinator will be contacted at (912/264-7218) on the day of discovery. Dead loggerhead turtles should be buried on the beach after all measurements are taken. Other species should not be buried until clearance is obtained from the sea turtle coordinator.

d. A turtle nest data sheet (obtained from GA DNR Marine Resources Division) will be completed for all turtle nests found. The locations of all nests discovered during the beach monitoring program will be carefully described and recorded in relation to existing structures. A wooden stake, marked with the nest number and date, will be placed a known distance landward of the nest. A map showing the nest location will be sketched on the back of the nest data sheet.

e. All nests which are located in the disposal area or within 500 feet of the limits of the disposal area which are likely to be impacted by future disposal and/or related construction activities will be relocated to an undeveloped portion of the beach north of the disposal site. This includes nests which are laid in the disposal area and are located so that the nest is likely to be destroyed by erosion prior to hatching. All relocated nests will be staked as described in paragraph "d" above. Relocations will be conducted in accordance with the attached guidelines.

f. Efforts should be made to obscure evidence of loggerhead nesting where desirable and practicable. Tracks of crawls leading to a nest are best erased by sweeping or kicking sand. If questioned by onlookers, the nesting surveyor will state that he is performing environmental surveys associated with beach disposal operations.

g. Nests will be observed daily to monitor disturbance and predation. When nests show signs of emergence, the sand around the nests will be smoothed to improve observations of hatchling tracks. For those nests where hatchling tracks can be distinguished, the number and orientation of hatchlings which emerged from the nest will be determined and enumerated. If hatchlings are disoriented, an effort will be made to identify lights which appear to have caused disorientation.

h. Nests will be excavated 3 days following signs of emergence or 65 days following deposition to determine hatchling success. The number of unhatched eggs, egg shells, and dead hatchlings will be determined and recorded.

3. REPORTING: In addition to the reporting requirements mentioned above, a report of findings which incorporates the daily log sheets, stranding forms, turtle nest data sheets and other pertinent field data will be prepared and furnished to the Savannah District within 4 weeks of the completion of beach nourishment. If necessary, a revised report will be furnished to the Savannah District within 2 weeks of receipt of any District comments on the original report.

4. SCHEDULE: The City of Tybee Island would be on site at sunrise on or about May 1 and will monitor daily through August 15 for each year of disposal. Relocation of nests within the impact areas will continue until the nesting season is completed or on August 15. Nest monitoring would continue until all nests have been hatched or until 65 days after the last nest was laid.

GUIDELINES FOR
SEA TURTLE NEST RELOCATION

Nests which are located in the disposal areas or within 500 feet of the limits of the disposal area which are likely to be impacted by future disposal and/or related construction activities must be relocated to the designated relocation area. Also, nests which are laid in the newly created beach in areas where they are likely to be destroyed by erosion before incubation is complete will be relocated. The following guidelines should be used:

1. Loggerhead eggs are frequently located on the seaward side of the nest, approximately one-half meter beneath the surface of the sand. Extreme care must be used in attempting to locate eggs. Eggs should be located by hand excavation whenever possible. A probe should be used only by experienced personnel and only after extensive digging by hand has failed to locate the nest (probe should be a wood

or metal rod about 0.75 centimeters in diameter and about 1 to 1 1/2 meters in length). If a probe is used, any broken eggs and spilled contents should be removed and discarded to prevent the clutch from rotting.

2. Once the eggs are located excavate them by hand quickly and carefully. The size (depth, width, etc) of the nest chamber and its location in relation to the primary dune and high tide line should be recorded. Eggs should be placed in a rigid container, such as a Styrofoam or wooden box or a plastic bucket on a layer of moist sand from the nest. The container should be large enough to allow for a sand "buffer" between the eggs and the side of the container to prevent physical damage to the eggs during transportation. Eggs should be shaded from the heat of the sun during relocation. Do not allow the eggs to become dry.

3. The hatching success of nests relocated within 6 hours of laying is higher than that for older nests. Efforts should be made to relocate nests as soon as possible after laying, and care should be used in moving nests to maintain the axial orientation of the egg.

4. The relocation site should be located at a site which closely resembles the natural nest site (i.e. beach profile, relationship to the high tide line and primary dune, etc.). A nest chamber should be excavated with shape and dimensions similar to that of the natural nest. (The pear-shaped configuration of a natural nest can be most easily achieved by using posthole diggers to excavate the "neck" and then scraping out the egg chamber with a sea shell or other small digging implement). Once the eggs have been carefully placed in the chamber and the sand from the original nest put on top, the neck of the chamber should be filled and packed firmly.

5. A turtle nest data sheet should be completed for all relocated turtle nests. The locations of all original and relocated nest sites should be recorded by the method(s) described in the Scope of Work. The street addresses of residences structures used to describe the nest location should be recorded and used in the location map for each nest (the map can be drawn on the back of the nest data sheet). A wooden stake, marked with nest number and date, will be placed a known distance landward of the nest.

O.3.03 Right Whales. The District committed to the following measures to protect Right whales:

a. Each contractor will be required to instruct all personnel associated with the dredging/construction project about the possible presence of endangered right whales in the area and the need to avoid collisions. Each contractor will also be required to brief his personnel concerning the civil and criminal penalties for harming, harassing or killing species that are protected under the Endangered Species Act of 1973 and the Marine Mammal Protection Act of 1972. Dredges and all other disposal and attendant vessels are required to stop, alter course, or otherwise maneuver to avoid approaching the known location of a right whale. The contractor will be required to submit an endangered species watch plan that is adequate to protect right whales from the impacts of the proposed work.

b. The conditions in the current regional opinion, applicable to hopper dredging and which the District would also abide by as long as the opinion is in effect, include the following: Monitoring by endangered species observers with at-sea large whale identification experience to conduct daytime observations for whales between December 1 and March 31. During daylight hours, the dredge operator must take necessary precautions to avoid whales. During evening hours or when there is limited visibility due to fog or sea states of greater than Beaufort 3, the dredge must slow down to 5 knots or less when transiting between areas if whales have been spotted within 15 nm of the vessel's path within the previous 24 hours. (Contractors will be required to use daily available information on the presence of right whales in the project area.) One hundred percent dedicated daytime whale observer coverage is required between December 1 and March 31. Monitoring by sea turtle observers is allowed between April 1 and November 30. At the present time, no aerial surveys are required for the Savannah Harbor area. If a Right Whale Early Warning System (RWEW) is put in place in the future, contractors would be required to use it during dredging operations in acquiring information on the daily presence of whales.

NOTE: * These are the conditions in the NMFS 1995 Biological Opinion for Navigation Channels in the Southeast, and additional guidance provided by South Atlantic Division. Should a new Biological Opinion be issued, the District would consider the conditions listed here void, and would instead abide by the conditions as stated in that Opinion and any further guidance provided by South Atlantic Division.

O.3.04 Manatees. The District committed to the following measures to protect manatees:

a. The contractor will instruct all personnel associated with the dredging of the presence of manatees and the need to avoid collisions with the manatees.

b. All personnel associated with the dredging will be advised that there are civil and criminal penalties for harming, harassing, or killing manatees which are protected under the Endangered Species Act of 1973 and the Marine Mammal Protection Act of 1972.

c. Any collision with a manatee will be immediately reported to the Corps of Engineers' Contracting Officer's Representative (912) 652-5958, The Charleston Ecological Services Office of the Fish and Wildlife Service (803) 724-4707, and the Georgia Department of Natural Resources (weekdays 8:00 a.m. - 4:30 p.m.; (912)2647218 or 1-800-272-8363; nights and weekends: 1-800-241-4113.

d. All construction activities in open water will cease upon sighting of manatees within 100 yards of the project area. Construction activities will not resume until the manatee has not been seen in the project area for at least 30 minutes.

e. The contractor will keep a log detailing sightings, collisions, or injury to manatees which occur during the dredging operations.

f. A report summarizing the above incidents will be provided to the Savannah District for coordination with the U.S. Fish and Wildlife Service, Charleston Ecological Services Office.

g. All vessels associated with the project will operate at "no-wake" speeds at all times while in the water where the draft of the vessel provides less than four feet of clearance from the bottom and that vessels will follow routes of deep water to the extent possible.

O.3.05 Fisheries. In recent years, Striped bass have experienced significant declines in their population level. This species is known to be sensitive to particular environmental parameters, especially salinity. Savannah District is funding studies to determine the timing, distribution and numbers of Striped bass eggs and larvae in the harbor. Those studies began in 1994 and will be complete in 1998. Until those field studies

are complete and the results fully analyzed, questions will still remain about potential impacts to Striped bass eggs and larvae from dredging operations. Therefore, to remain in compliance with the Georgia Water Quality Certification and address concerns about impacts to the Striped bass population of the Savannah River, dredging will continue to be restricted to the lower harbor (River Mile 5.0 to 0.0) and the Bar Channel during the period from March 15 to May 31 of each year, until this condition in the state water quality certifications is altered. Case-by-case exceptions to that condition require prior approval from GA DNR and the SC DHEC-OCRM. Should future research indicate that this restriction is unnecessary to protect Striped bass, the District would follow procedures agreed to by the state resource agencies.

O.3.06 Migratory Birds. Nesting migratory birds receive protection under the Migratory Bird Treaty Act. Under that Act, nests, eggs, or individual birds cannot be destroyed unless a depredation permit is obtained from the US FWS. Some species of migratory birds do nest on the Savannah Harbor disposal area dikes and could be impacted by dike maintenance activities, particularly mowing. To ensure that these birds receive the protection required while nesting, a change in the maintenance procedures will be instituted in 1995. This change calls for the dike side slopes and other non-travelled surfaces to not be mowed from March 1 to July 15. The traveling surface (roadway) on the dike crest would continue to be mowed when necessary to allow safe movement around the dikes for inspection and disposal area use purposes. Mowing of dike side slopes would only be performed outside the March 1 to July 15 period.

O.3.07 At the present time, strict compliance with the Migratory Bird Treaty Act requires an assessment of each dredging project to determine if the project would impact nesting migratory birds. This includes an assessment of whether head section and subsequent discharge of dredged material will take nesting migratory birds, their nests, eggs, or young. If impacts to nesting birds appear unavoidable, the District must secure a Depradation Permit from the US FWS (Atlanta Regional Office) before construction activities could occur. The District has requested an opinion from the US FWS that, with implementation of the wildlife management mitigation strategy to enhance bird habitat, overall management of the disposal areas would have a net positive impact on nesting migratory birds, with no requirement that particular minor takes associated with dredging operations would require separate authorization.

0.3.08 Ocean Disposal. This EIS contains an update of the Section 103 Evaluation which Savannah District prepared to determine the acceptability of channel sediments for ocean disposal. That evaluation concluded that bar channel sediments are suitable for placement at the Ocean Dredged Material Disposal Site (ODMDS). The District has received concurrence from EPA in that determination by letter dated March 23, 1995.

0.3.09 One commitment included in that document consisted of the time period before another Section 103 Evaluation would be conducted. That duration was 3 years.

0.3.10 That document included a commitment concerning the source (channel stationing) from which the sediments would be dredged that would be transported and placed in the ODMDS. The Section 103 Evaluation stated that Bar Channel (oceanward of Station 0+000) sediments would normally be excavated and placed at the ODMDS.

0.3.11 Management of the Savannah ODMDS. Several commitments were included in the Site Management Plan for the Savannah Harbor ODMDS, which is found in Appendix I. Those commitments are described in the following paragraphs.

0.3.12 Material Suitability. The District would document the material suitability for dredging events proposed for ocean disposal when more than 3 years have passed since the last verification. The Section 103 Evaluation in this EIS contains an assessment of the material suitability. An exchange of letters between the Corps and EPA would suffice for that verification. If more than 5 years have passed since the last verification, the District would perform a new Section 103 Evaluation and issue a Public Notice concerning the action.

0.3.13 Disposal Technique. When normal Bar Channel maintenance material or other suitable material is available, the District agreed to have that material placed so that the mound existing in the northeast quadrant of the site will be continued to the south to provide a barrier to large northeasterly waves. Should predominantly fine-grained dredged materials need to be disposed in the site, they would be placed within just west of the mound, where they would be more sheltered from large storm waves.

0.3.14 Placement of Materials. The District agreed to consult with EPA prior to placing dredged material at the site other than the normal Bar Channel maintenance sediments.

0.3.15 Disposal Monitoring. The District agreed that the dredging contractor would prepare and operate under an approved electronic verification plan for all disposal operations. As

part of this plan, the contractor will use an automated system that will continuously track the horizontal location and draft condition (vertical) of the disposal vessel from the point of dredging to the disposal area, and return to the point of dredging. Accuracy and precision of the locational system will be at least as good as provided by Loran C. Required digital data are as follows:.

(a) Date;
(b) Time;
(c) Vessel Name;
(d) Dump Number;
(e) Map Number on which dump is plotted;
(f) Horizontal location and draft of disposal vessel each 30 minutes;
(g) Beginning and ending coordinates of the dredging area for each load, and the beginning and ending coordinates for each dump and the compass heading at the beginning of each dump;
(h) Channel stations from which dredged material came; and
(i) Volume and brief description of material disposed.

0.3.16 Savannah District will require such information in digital form from all dredging contractors and will compile and continuously update computer plots depicting placement of dredged material. Plotted coordinates will be in GPS-corrected latitude/longitude to enhance use by all associated monitoring agencies.

0.3.17 Prior to commencement of disposal operations, a baseline bathymetric survey will be conducted of the disposal area and adjacent areas by the site user. The survey will be taken along lines spaced on 500-foot intervals and be of sufficient length to adequately cover the area. Accuracy will be +/- 1.0 feet. The survey will be referenced to MLW and corrected for tide conditions at the time of the survey. The Savannah District ARTIS tide gauge will be used for tidal corrections. As a follow-up to the baseline bathymetric survey, the District will conduct a similar survey after disposal. The number of transects and accuracy required will be the same as in the baseline survey.

0.3.18 Sediment Mapping and Site Bathymetry. Close grid hydrographic surveys will be conducted at least annually to monitor the site's bathymetry. The sediment mapping effort should encompass the entire area of the ODMDS designated for maintenance disposal and a 0.25 NM buffer zone around that site. The spacing of the grid may be increased on the southern half of the ODMDS if disposal activities occur only in the northern half of the site. After more detailed surveys are performed which

confirm the overall direction of movement, the positioning of benthic sampling stations can be determined for a revised baseline assessment of benthic infaunal communities in the area (see next section).

0.3.19 Biological Impact Assessments. EPA will conduct benthic surveys both in the ODMDS and in the area immediately surrounding the site. The benthic data will allow determinations to be made concerning whether benthic resources outside the ODMDS are being affected by disposal of fine-grained materials, and determine whether these changes are detrimental. The primary focus of this monitoring effort will be to determine whether disposal operations cause a major change in the faunal composition of benthos (which could affect trophic functions) and/or whether there are significant alterations in species numbers or biomass. The benthic surveys will involve collecting benthic samples in and around the ODMDS using a stratified random sampling design. The general zones (strata) will include areas both within the ODMDS and adjacent to all boundaries of the ODMDS (Figure 3). The zones within the ODMDS would be used to document changes in the benthic communities following disposal operations for comparison with zones outside the ODMDS. The initial survey will involve sampling all of the zones, with several grab samples collected randomly in each zone. The number of samples obtained per zone will be determined from preliminary sampling or historical data, but will be sufficient to adequately represent the benthic community composition (based on species saturation curves) and detect moderate changes in faunal densities, biomass, and species numbers (based on power analyses). At least one sample will be taken within the area of steepest slope in the south-central portion of the ODMDS. Each benthic sample obtained for faunal assessment will be subsampled to determine sediment characteristics of the sample (eg, grain size, percent silt, clay, sand, CaCO, etc.). The sediment samples will be used to (1) further characterize the composition of surficial sediments in and around the ODMDS, and (2) aid in interpreting changes in benthic infaunal composition.

0.3.20 Disposal Plume Dispersion. While no live bottom communities are known to be associated with the Savannah ODMDS, such communities, when present, are an important habitat for productivity and fish use. Should any significant benthic communities be identified in the area, an evaluation would be conducted to determine if they would be impacted by turbidity plumes. At that time, a typical turbidity plume generated by a major disposal event should be delineated and its areal distribution plotted. A ship-mounted transmissometer could be used to profile light attenuation at grid points encompassing the plume. The outer boundaries of the grid could be determined using an aircraft mounted GPS during an aerial reconnaissance of

the disposal operation prior to initiating the grid profiling. Information gleaned during this effort could be compared to plume turbidity/suspended solids concentrations for consideration of plume impact.

0.3.21 Sediment Turbidity Transport Studies. The primary task required for current data collection would be the deployment and retrieval of continuously recording current meters. Ideally, a long-term continuous data base obtained over a two-year period should be obtained to evaluate both seasonal and yearly variability in current patterns. Deployment of a Acoustic Doppler Current Profiler (ACDP) placed within or adjacent to the ODMDS would provide the best data base for this effort. Quarterly or semiannual retrieval of the data record would provide timely information on prevailing current patterns. Collection of such data should be coincident with a major disposal project during which sediment mapping, plume dispersion, and sediment sampling occurs. This would allow integration of current data into these programs, thus enhancing interpretation of plume dispersion, sediment transport and sedimentation.

0.3.22 Sediment Contaminant Monitoring. A critical component of the Site Monitoring Plan will be to periodically sample sediments in and adjacent to the ODMDS to monitor for changes in sediment contaminant levels. This sampling would be conducted by EPA using a tiered approach, where sites outside the ODMDS are not monitored until elevated levels are detected inside the ODMDS. A Tier I evaluation of the need for sediment chemical testing would be conducted every 3 years to coincide with a similar evaluation of sediments in the Bar Channel. More frequent sampling of the sediments may be warranted if elevated levels of certain contaminants are found, but the analysis could be restricted to only those constituents which are above acceptable levels.

0.3.23 Section 404 Evaluation For Dredge And Fill Actions.

0.3.24 Wetland impacts in South Carolina from diking of Disposal Area 14A and other proposed work described in the EIS, as well as wetland impacts in Georgia resulting from miscellaneous disposal area operations and construction of an access road to Disposal Area 2A, are all addressed in the Section 404(b)(1) Evaluation for this project. A Mitigation Plan for South Carolina wetland impacts has been completed. The District agrees to develop a mitigation plan for wetland impacts in Georgia. The mitigation plans are discussed below.

0.3.25 Stormwater Runoff. As a component of the Section 404 Evaluation, the District considered the potential for adverse impacts resulting from the stormwater runoff from dikes at the confined disposal facilities during their periodic improvement

(raising) projects. In that evaluation, the District committed the sponsor to use "Best Management Practices", as defined in the Manual For Erosion And Sediment Control In Georgia or the South Carolina Stormwater And Sediment Control Handbook For Land Disturbance Activities, whichever is appropriate, during those construction events. Uncontrolled discharges associated with stormwater runoff from within the CDFs are considered transient events for which regular monitoring is not possible. Controlled discharges associated with dredge disposal management operations and wildlife management would be regularly controlled and monitored.

O.3.26 The District's monitoring program would include weekly monitoring of the level of suspended solids in the effluent. The District will use a standard for acceptability of its weir effluents of 500 mg/l. That standard would be used for the weir discharge, with no consideration of a mixing zone, to make monitoring easier to perform. The suspended solids level at the edge of a normal mixing zone is likely to be much lower than that measured at the weir. Water levels would be managed within the confined disposal facilities to obtain the settling time necessary to produce an effluent with suspended solids less than the standard of 500 mg/L. The maximum design height at which water can be held, in conformance with present dike construction practices, is 2 feet below the dike crest. Water held at those levels would result in maximum retention time of the sediment/water slurry, and thereby, maximum removal of the suspended solids.

O.3.27 Erosion Control And Sedimentation Plan. The District prepared an Erosion and Sediment Control Plan, which can be found in Appendix N. That plan described actions which would be taken to minimize adverse impacts resulting from non-point source pollution from construction projects at the dikes at the confined disposal facilities (dike raising projects). In that document, the District committed the sponsor to use "Best Management Practices", as defined in the Manual For Erosion And Sediment Control In Georgia or the South Carolina Stormwater Management And Sediment Control Handbook For Land Disturbance Activities, whichever is appropriate, during those construction events. The local sponsor will prepare and submit documents to the SC OCRM for the purpose of obtaining a Stormwater Permit for the initial construction of the Disposal Area 14A dikes. Implementing the procedures described in the Erosion and Sediment Control Plan contained in Appendix N of this EIS will provide environmental clearance for subsequent Project dike raising activities in South Carolina.

0.3.28 Section 106 Compliance (Cultural Resources). The District made four sets of commitments concerning cultural resources. Two concern significant cultural resources -- the CSS GEORGIA and Old Fort Jackson -- and are included in separate appendices in this EIS. The third set of commitments concern additional evaluations which must be conducted prior to construction at specific sites to ensure significant cultural resources would not be impacted. The fourth set of commitments concern the Cultural Resource Management Plan prepared as part of the EIS, and also contained in a separate appendix. These commitments are summarized in paragraphs 0.3.29 through 0.3.35.

0.3.29 Old Fort Jackson. In the Memorandum of Agreement (MOA), the District agreed to (1) study the streambank erosion problem at Old Fort Jackson to determine the nature, extent, and cause(s) of the problem, and (2) determine the contributing effect of the construction and/or maintenance of the Savannah Harbor Navigation Project on bank erosion. If the conclusion from those studies is that construction and/or maintenance of the Savannah Harbor Navigation Project contributes to the bank erosion problem at the Old Fort Jackson Historic Site, then Savannah District will implement the following further actions.

a. Savannah District shall identify and evaluate alternatives to eliminate, minimize, and retard the contribution to bank erosion problem at the Old Fort Jackson Historic site, caused by the construction and/or maintenance of the Savannah Harbor Navigation Project.

b. Savannah District shall develop a mitigation plan to minimize the adverse effects of streambank erosion on Old Fort Jackson, resulting from the construction and/or maintenance of the Savannah Harbor Navigation Project, in accordance with 36 CFR Part 800.5.

c. The District's studies, study results, evaluations and determinations shall be documented in a report. The report will include a discussion of various erosion control alternatives, the merits, efficacy, and projected costs of each alternative, and make recommendations as to the optimal erosion control alternative(s). The optimal erosion control plan shall be incorporated into a draft mitigation plan for mitigating the adverse effects to the Old Fort Jackson Historic site resulting from the Savannah Harbor Navigation Project.

d. The draft mitigation plan shall be provided to the GA SHPO, the Council, the Coastal Heritage Society, and interested local historical groups for comment. A final mitigation plan, including mitigation recommendations and projected costs of implementation, shall be developed following receipt and consideration of all comments.

e. Savannah District shall, in consultation with the property owner, the State of Georgia, and the property lessee and operator, the Coastal Heritage Society, develop a cost-sharing program by which the mitigation measures recommended as the optimal solution to the bank erosion problem at the Old Fort Jackson Historic Site may be implemented.

f. Savannah District, in conjunction with the GA SHPO and the Coastal Heritage Society, shall implement the recommended plan subject to the availability of funds. Savannah District shall function as the lead party in coordinating and implementing the work necessary to implement the mitigation plan.

g. Should the mitigation plan entail the alteration or destruction of any features associated with the Old Fort Jackson Historic Site, such that data recovery of buried archeological deposits/artifacts might be recovered, a research design for the necessary data recovery shall be developed by the Savannah District and coordinated with the GA SHPO and the Coastal Heritage Society, who shall have the opportunity to review and comment on the proposed data recovery plan.

h. The final mitigation plan shall be submitted by Savannah District to the GA SHPO and the Council for a 45-day review period. Unless the GA SHPO or the Council objects during the review period, the mitigation plan shall be considered approved.

i. Savannah District shall ensure that any archeological data recovery carried out pursuant to this Agreement is carried out by, or under, the direct supervision of an individual meeting, at a minimum, the standards for an archeologist as set forth in the Department of the Interior's Archeological and Historic Preservation: Secretary of the Interior's Standards and Guidelines (48 FR 44716-42) for a historic archeologist. Any and all materials and records resulting from any such data recovery are curated in accordance with 36 CFR Part 79.

O.3.30 Savannah District will also ensure that all final reports resulting from the MOA will be provided to the GA SHPO and the Council, and to the National Park Service, Southeast Regional Office for possible peer review and submission to the National Technical Information Service (NTIS). The District shall ensure that all such reports are responsive to the contemporary professional standards, and to the Department of Interior's "Format Standards for Final Reports of Data Recovery Programs" (42 FR 5377-5379).

O.3.31 CSS GEORGIA. In the Memorandum of Agreement (MOA), the District made the following commitments:

1. Conduct such studies as are necessary to determine the present condition of the vessel, its stability as a historic site/object, any factors which may threaten its present condition or stability, and restrictions which the vessel places on present harbor operations.

2. Determine the contributing effect of the construction and/or maintenance of the Savannah Harbor Navigation Project on the CSS GEORGIA, in accordance with 36 CFR Parts 800.5 through 800.9.

3. If the conclusion from the studies is that construction and/or maintenance of the Savannah Harbor Navigation Project contributes to the degradation or reduced stability of the CSS GEORGIA, then the District would take the following actions:

    a. Identify and evaluate alternatives to eliminate, minimize, and retard the Savannah Harbor Navigation Project contribution to factors which may threaten the vessel's present condition or stability. If the vessel is restricting present harbor operations, alternatives shall be evaluated which would allow those restrictions to be eliminated or minimized.

    b. Develop a mitigation plan to minimize the adverse effects on the CSS GEORGIA resulting from the construction or maintenance of the Savannah Harbor Navigation Project, in accordance with 36 CFR Part 800.5.

    c. Document the District's studies, study results, evaluations and determinations in a report. The report will include a discussion of the present condition of the vessel, factors which may threaten the vessel's

present condition, adverse effects which construction and/or maintenance of the Project has had on the vessel, and restrictions which the vessel has on present harbor operations, the merits, efficacy, and projected costs of each alternative, and make recommendations as to the optimal alternative(s). The plan shall be incorporated into a draft mitigation plan for mitigating the adverse effects to the CSS GEORGIA resulting from the Savannah Harbor Navigation Project.

d. The draft mitigation plan shall be provided to the GA SHPO, the SC SHPO, the Council, and interested local historical groups for comment. A final mitigation plan, including mitigation recommendations and projected costs of its implementation shall be developed following receipt and consideration of all comments.

e. Implement the recommended plan, subject to the availability of funds.

f. Should the mitigation plan entail the alteration or destruction of any features associated with the CSS GEORGIA, such that data recovery of buried archeological deposits/artifacts might be recovered, a research design for the necessary data recovery shall be developed by the Savannah District and coordinated with the GA SHPO and the SC SHPO, who shall have the opportunity to review and comment on the proposed data recovery plan.

g. Submit the final mitigation plan to the GA SHPO, the SC SHPO, and the Council for a 45-day review period. Unless the GA SHPO, the SC SHPO, or the Council objects during the review period, the mitigation plan shall be considered approved.

h. Ensure that any archeological data recovery carried out pursuant to this Agreement is carried out by, or under the direct supervision of, an individual meeting, at a minimum, the standards for an archeologist as set forth in the Department of the Interior's Archeological and Historic Preservation: Secretary of the Interior's Standards and

Guidelines (48 FR 44716-42) for a historic archeologist. Curate in accordance with 36 CFR Part 79 any and all materials and records resulting from any data recovery investigations

O.3.32 The District will also ensure that all final reports resulting from the MOA will be provided to the GA SHPO, the SC SHPO, and Council, and to the National Park Service for possible peer review and submission to the National Technical Information Service (NTIS). Savannah District shall ensure that all such reports are responsive to the contemporary professional standards, and to the Department of Interior's "Format Standards for Final Reports of Data Recovery Programs" (42 FR 5377-5379).

O.3.33 Cultural resource surveys (side scan and magnetometer surveys) would be conducted at each new disposal area located in the nearshore area. This includes the island to be constructed off Turtle Island, the submerged berms, and the feeder berm. The District's evaluation and findings would be provided to the SHPO for approval prior to initial sediment deposition at each site.

O.3.34 Construction of underdrains could potentially impact cultural resources located along the pipe alignment. Prior to installation, archival information would be reviewed to determine if any proposed underdrain alignment had the potential for impacting any known cultural resource sites in the confined disposal areas. If there was a significant potential for adverse impact to a known site, a cultural resource survey would be performed of the underdrain alignments and approval of the study's findings from the SHPO would be obtained prior to excavation.

O.3.35 Cultural Resource Management Plan. The District also prepared a plan which describes how future actions related to other cultural resources will be addressed. This includes both (1) sites which are currently known, but which are not expected to be impacted by harbor operations, and (2) sites whose existence is not currently known, but becomes evident in the future. As part of that Plan, the District will study the cumulative impacts which harbor operations and issuance of Department of the Army permits has had upon cultural resources in the harbor.

O.3.36 South Carolina Wetland Mitigation Plan. Wetland impacts in SC would result from the diking of Disposal Area 14A (305 acres) and miscellaneous disposal area operations (6.0 acres). The District will maintain records of the actual acreage of wetlands impacted as those impacts occur over the project life. Commitments made in the LTMS Mitigation Plan for addressing those

impacts include several items: water level management for bird use, clearing and maintenance of a bird nesting area on Jones/Oysterbed Island, construction of nesting islands within disposal areas, construction of a bird nesting island offshore of Turtle Island, establishment of an escrow account with the SC OCRM for in-kind mitigation, and construction of a water control structure at the Savannah NWR for fisheries benefits. The plan employs a rotating disposal area use schedule of about 2 years, with modifications for bird use. In this scenario, each disposal area would be available for use in disposal operations for two years, followed by two years of drying. The rotation period may vary from 2 years, but one CDF from each pair must be available at all times for disposal/wildlife management purposes. A 26-acre bare ground nesting area would be cleared and maintained on high ground outside the dike at the Jones/Oysterbed Island Disposal Area for use by colonial nesting birds. Two 1.0-acre isolated nesting islands would be constructed and maintained in each area for use by nesting migratory shorebirds. An island would be established offshore of the South Carolina Turtle Island Wildlife Management Area. This bare ground bird nesting area would be constructed using open water placement of dredged material obtained from within, below, or adjacent to the navigation channel. The island would have a 2.0-acre crown located at +14 feet MLW. Disposal areas would be managed during each scheduled 2-year use period for the most environmentally appropriate outcome following each disposal operation. Dredging needs would have top priority concerning the scheduling of disposal events, while management of the disposal areas for wildlife would be a secondary consideration. The goal would be to have at least one disposal area each year functioning for each of the following four major categories of bird use: (1) spring migrants, (2) summer nesting shorebirds, (3) fall migrants, and (4) wintering shorebirds and waterfowl. Note that a disposal area may provide more than one function within a given year. For example, an area held wet for wintering shorebirds and waterfowl could be slowly dried during the spring for spring migrants. An escrow account would be established by the non-Federal sponsor or his agent to restore/create/protect 25 acres of tidal wetlands in South Carolina. The account would be administered by the SC DHEC-OCRM. The water control structure would be constructed at a 228-acre impoundment on the Savannah National Wildlife Refuge. Currently, a daily connection with the Savannah River is not maintained at the impoundment. This structure would allow a continuous connection with the river, thus establishing the impoundment as fish feeding, spawning, and nursery habitat.

0.3.37 Special considerations would apply to disposal operations taking place during the nesting season. Sand mounds would be constructed in each confined disposal area for use by nesting birds such as least terns, Wilson's plovers, killdeer and nighthawks. Portions of these or other mounds would be constructed for use by black-necked stilts. Two bird nesting

mounds would be constructed and maintained in each of the confined disposal areas in the rotational program (Disposal Areas 12A, 12B, 13A, 13B, 14A, 14B, and Jones/Oysterbed Island) Each mound would have an area above the potential flood height of 1 acre. The crest of the mounds would be constructed above the height of the flooded pool to avoid inundation during disposal operations. Once these mounds are in place, it would be judged beneficial to flood the surrounding areas in the spring and early summer for both protection of the mounds from predators and stimulation of invertebrate prey populations. A disposal operation could proceed early in a nesting season where impacts to nesting individuals are judged to be minor in comparison to the later benefits expected to accrue to the species involved.

O.3.38 Management of a disposal area for birds would depend on the month in which the disposal operation is scheduled to end. Management options available after a disposal operation ended would be chosen based on the situation in other disposal areas and the availability of habitat for each major category of bird use (spring migrants, summer nesting shorebirds, fall migrants, and wintering shorebirds and waterfowl). Maintenance of a constant water level within a disposal area may not be possible for extended periods due to the natural effects of evaporation and infiltration. However, discharges from the site through the weirs and underdrains could be stopped to retain as much water as possible. The disposal operation would be managed to ensure the successful attainment of the scheduled management scenario. This would include management of weir discharges to ensure a full pool upon completion of the disposal operation. Since water would be held in the disposal areas for longer periods than presently occurs, there is a potential for increased mosquito breeding. To address that possibility, purple martin nesting houses and bat houses would be installed at each of the disposal areas included in the rotation program to provide a biological control for that situation. Table 1 displays the actions which would be taken after completion of disposal operations. The critical factor used to decide which management technique would be implemented is the date when disposal operations are complete.

O.3.39 Mitigation for Other Wetland Losses. Other wetlands would be lost in the State of Georgia as a result of the construction of an access road to Disposal Area 2A and miscellaneous disposal area operations. Mitigation for those losses consists of the restoration of 6.4 acres of tidal marsh in the harbor area. The plan would replace 3.2 acres of wetlands which would be permanently lost at a 2:1 rate. The Plan will be coordinated with the GA DNR Coastal Resource Division and the US FWS for approval. In light of the relatively small number of acres involved, it is expected that a site can be identified in the general Savannah Harbor area where the sponsor or the GA DOT can restore previously impacted marsh as a component of another

TABLE 1

CONFINED DISPOSAL AREA MANAGEMENT TECHNIQUE

Date Disposal Operation Ends	Proposed Management Technique
1 Jan - 15 Mar	Hold water level as high as possible. Beneficial to waterfowl and wintering shorebirds. Draw down in the spring for migrating shorebirds.
15 Mar - 15 Jul	Option 1. Hold water as protection for nesting terns, plovers, nighthawks, and in preparation for fall draw down for fall migrating shorebirds. Option 2. Draw water down slowly for spring migrating shorebirds and nesting black-necked stilts and vegetation growth if flooded later for wintering waterfowl.
15 Jul - 15 Nov	Option 1. Draw down slowly for fall migrating shorebirds. Option 2. Hold for wintering waterfowl and shorebirds.
15 Nov - 31 Dec	Hold water level as high as possible for wintering waterfowl and shorebirds, and in preparation for spring draw down for spring migrating shorebirds.

construction project. Construction of the access road to Disposal Area 2A would result in the permanent loss of approximately 2.9 acres of tidal wetlands. Approximately 0.14 acres would be lost as a result of pipe ramp expansions and an additional 0.04 acres would be lost from weir/discharge pipe replacements. Implementation of this wetland mitigation plan would occur before the access road is placed in service.

0.3.40 Tidegate Construction and Deepening. In 1965, improvements to the Savannah Harbor Navigation Project were authorized by Congress. Those improvements included deepening of the shipping channel, as well as construction of the Tidegate and freshwater control features. The freshwater control features were constructed to reduce salinity impacts to the Savannah National Wildlife Refuge expected from the combined harbor deepening and Tidegate construction project. The District Engineer's report, dated October 24, 1964, included the following conclusion:

> "The most feasible plan for preventing damage to the refuge operations would be the construction of channels for fresh water diversion from Front River to Middle and Little Back Rivers through McCoombs Cut and the construction of a fresh water canal and control structures to supply fresh water to refuge lands."

0.3.41 The freshwater supply system had the following five components:

(1) a 5,500-foot long canal through McCoombs Cut to provide freshwater to the Savannah NWR (Figure 4). The canal was constructed with a 200-foot bottom width at EL -7' MLW and 2H:1V side slopes. The design flow through McCoombs Cut was 4,000 CFS.
(2) a channel in Middle River with a 90-foot bottom width at EL -6' MLW and 2H:1V side slopes. The design flow in Middle River was 1,500 CFS.
(3) a channel in Little Back River with a 200-foot bottom width at EL -5.1' MLW and 2H:1V side slopes. The design flow in Little Back River was 2,500 CFS.
(4) a 28,000-foot long freshwater supply canal with a 28-foot bottom width at EL -4' MLW, 2H:1V side slopes, and water control structures.
(5) a 3,700-foot long connecting canal with a 6-foot bottom width at EL -4' MLW, 2H:1V side slopes.

0.3.42 A canal to provide freshwater to private lands located adjacent to and downstream of the Refuge was determined by the District Engineer to not be economically justified, but was added to the project by Congress. That canal was designed with a 6-foot bottom width at EL -4' MLW and 2H:1V side slopes.

0.3.43 The Federal government is responsible for maintenance of the Diversion Canal, the channels in Little Back River and Middle River, and the canals and control works for the Refuge. Maintenance of the canal to reduce salinity impacts to adjacent private lands is the responsibility of the non-Federal sponsor. Since the Tidegate is not currently in use, no maintenance of those canals by the sponsor is necessary.

0.3.44 Tidegate/New Cut Project. Several commitments were made in the 1991 Section 1135 Feasibility Report and Environmental Assessment for the filling of New Cut. Most of those commitments concerned how the dredging and disposal operations would be conducted to minimize impacts to water quality during the construction of that project. Other commitments were related to cultural resources. Investigations were to be conducted to assess and document any impacts to cultural resources in Back River. Those investigations were conducted and a report was completed by Savannah District in August 1994 which documented those studies. The report, titled "Archival Research, Archaeological Survey, and Site Monitoring; Back River, Chatham County, Georgia and Jasper County, South Carolina", was coordinated with both the Georgia and South Carolina SHPO.

0.3.45 The 1991 Feasibility Study also identified the potential for impacts to Old Fort Jackson and the CSS GEORGIA from changes in river hydraulics resulting from project implementation. The report stated that "Since these resources have been, and continue to be, impacted by maintenance dredging under the Savannah District's Operations and Maintenance (O&M) Program, studies of the impacts to these resources will be funded with O&M funds as part of our proposed development of a Long Term Management Strategy for the Savannah Harbor. Any mitigation needs for these resources identified in the study of these sites would also be completed with O&M funds." A Programmatic Agreement was signed by the District in January 1992 to document what studies would be conducted. Summaries of pertinent sections of that agreement are as follows:

a. Savannah District shall ensure that an archeological survey of the areas of primary and secondary effect is conducted. The survey shall be conducted in

consultation with the GA SHPO and the SC SHPO, and reports of the survey, meeting the standards of the GA SHPO and the SC SHPO, shall be submitted to the GA SHPO and the SC SHPO for review and approval.

b. Savannah District shall determine the effect of the Section 1135 Project upon properties determined eligible for inclusion in the National Register of Historic Places.

c. Savannah District shall identify and evaluate alternatives to avoid and/or mitigate adverse effects to properties determined eligible for inclusion in the National Register of Historic Places.

d. Savannah District shall ensure that data recovery plans are developed in consultation with the GA SHPO and SC SHPO for the recovery of archeological data from properties determined eligible for inclusion in the National Register of Historic Places. The plans shall specify, at a minimum:

    a. the property, properties, or portions of properties where data recovery is to be carried out;

    b. any property, properties, or portions of properties that will be destroyed without data recovery;

    c. the research questions to be addressed through the data recovery, with an explanation of their relevance and importance;

    d. the methods to be used, with an explanation of their relevance to the research questions;

    e. the methods to be used in analysis, data management, and dissemination of data, including a schedule;

    f. the proposed disposition of recovered materials and records;

    g. proposed methods for involving the interested public in the data recovery;

    h. proposed methods for disseminating results of the work to the interested public;

i. proposed methods by which local historic sites and historic preservation agencies and individuals will be kept informed of the work and afforded the opportunity to participate;

j. a proposed schedule for the submission of progress reports to Savannah District, the GA SHPO, SC SHPO, and Council, and

e. The data recovery plans shall be submitted by the Savannah District to the GA SHPO, SC SHPO, and Council for 45 days review. Unless the GA SHPO, SC SHPO, or the Council objects within 45 days after receipt of a data recovery plan, the Savannah District shall ensure that it is implemented.

f. Savannah District shall ensure that all archeological survey, testing, and data recovery work carried out pursuant to this Programmatic Agreement is carried out by or under the direct supervision of a person or persons meeting at a minimum the standards for archeologist set forth in the Secretary of the Interior's Standards and Guidelines for Archeological Documentation (48 FR 44716-42);

g. Savannah District shall ensure that all materials and records resulting from survey, testing, and data recovery are curated in accordance with 36 CFR Part 79;

h. Savannah District shall ensure that all final archeological reports resulting from actions pursuant to this agreement will be provided to the GA SHPO, the SC SHPO, and Council, and to the National Park Service for possible peer review and submission to the National Technical Information Service (NTIS). The Savannah District shall ensure that all such reports are responsive to the contemporary professional standards, and to the Department of Interior's "Format Standards for Final Reports of Data Recovery Programs" (42 FR 5377-79).

i. The Savannah District will ensure that information resulting from the archeological surveys, testing, and data recovery efforts provided for in this agreement are provided to the Georgia and South Carolina State Site Files for inclusion in the State site file systems.

j. In consultation with the Council and the GASHPO, Savannah District will prepare a Memorandum of Agreement to outline procedures for identifying, evaluating, and mitigating and/or removing adverse effects of the Savannah Harbor Navigation Project upon Old Fort Jackson, a property listed in the National Register of Historic Places;

k. In consultation with the Council, the GA SHPO, and the SC SHPO, Savannah District will prepare a Memorandum of Agreement to outline procedures for identifying, evaluating, and mitigating and or removing adverse effects of the Savannah Harbor Navigation Project upon the CSS GEORGIA, a property listed in the National Register of Historic Places;

0.3.46 1993/1994 Deepening Project. Several commitments were made in the 1991 Feasibility Report and EIS for the Deepening Project. Many of those commitments concerns how the dredging and disposal operations would be conducted to minimize impacts to water quality during the construction of that project. A standard water quality monitoring plan was established. Other commitments, related to cultural resources, are described in the following paragraphs. The commitments center around two significant cultural resources, Old Fort Jackson and the CSS GEORGIA. Concerning the CSS GEORGIA, paragraph 5.79 of the EIS stated that "Impacts to the wreck could be mitigated by mapping, recovery, and conservation of the wreckage on the channel bottom and the 100-foot stand-off restrictions to dredging in this area. Deepening to 42 feet would require archaeological excavation of the wreck site. Excavation of the site has an estimated cost in excess of five million dollars. One alternative being considered in lieu of excavation would be to narrow the channel in this area and allow one-way harbor navigation in the wreck vicinity. Mitigation alternatives are being developed and will be coordinated with proper State and Federal agencies". Concerning Old Fort Jackson, paragraph 5.84 of the EIS stated that "The river bank at Old Fort Jackson has been riprapped; however, erosion has continued. Narrowing of the north side of the channel and allowing only one-way traffic in this vicinity is being considered to avoid impacts to the CSS Georgia. Additional narrowing may be needed on the south side of the channel to reduce impacts to Old Fort Jackson. The exact amount of channel narrowing that would be needed will be the subject of future studies".

O.3.47 A Programmatic Agreement was prepared between Savannah District, the Georgia State Historic Preservation Officer (GA SHPO), the South Carolina State Historic Preservation Officer (SC SHPO), and the Advisory Council on Historic Preservation (ACHP) as signatory partners. The PMOA stipulated that Savannah District will fulfill the requirements of 36 CFR Part 800 by implementing the following actions:

a. Conduct archival and literature research of the deepening impact areas (including disposal areas);

b. Conduct underwater remote sensing (magnetometer, fathometer, side scan sonar, and sub-bottom profiler) surveys;

c. Conduct a low-water shoreline survey;

d. Map the side slopes and channel bottom in the areas of Old Fort Jackson and the CSS GEORGIA;

e. Test and recover ordnance from the portions of the CSS GEORGIA wreck located within the new authorized channel prism;

f. Coordinate all survey and testing results with the GA SHPO, SC SHPO, and ACHP in order to make definitive determinations of eligibility for inclusion in the National Register of Historic Places and determine the effect of the deepening project upon each resource;

g. In coordination with the GA SHPO, SC SHPO, ACHP, and other interested parties identify and evaluate alternatives for avoiding and/or mitigating impacts to significant resources;

h. Implement the avoidance/mitigation program; and

i. Conduct a study of the long and short term impacts of the Federal operation and maintenance activities, removal of the Tidegate from operation, and issuance of Department of the Army permits within the harbor on cultural resources.

O.3.48 All cultural resources studies were to be coordinated with the Georgia and South Carolina State Historic Preservation Officers, and, when appropriate, with the Advisory Council on Historic Preservation. An attempt was to be made to complete all of this work prior to construction of the project; however, if construction of the project was authorized and could be accomplished prior to completion of the above described studies

and coordination, initial construction of the project would proceed, but would be limited to construction of a project with a bottom width which would not result in side slope sloughing. This would avoid impact to all cultural resources which could potentially be impacted by full project construction. Construction of the remaining portions of the project would be completed once the above described process is completed and all resources have been mitigated.

0.3.49 A 100-foot standoff is to be used at the site of the CSS GEORGIA. That restriction was implemented during the project construction through a total restriction on dredging for the 1,000 foot channel reach (Stations 58+000 to 59+000) which encompass the wreck.

0.3.50 A significant amount of work has been accomplished on these items. Extensive data recovery efforts were performed as part of the Deepening Project. Additional studies were performed at that same time which were funded by the LTMS Study. Item a. has yet to be completed, but will soon be performed using funds from the Deepening Project. Items b. and c. have been completed and the results have been coordinated in accordance with items f and g. Remaining work items will be accomplished and are included in the separate Memorandums of Agreement for Old Fort Jackson and the CSS GEORGIA, and the Cultural Resource Management Plan.

0.4.00 APPROVALS AND CERTIFICATIONS RECEIVED.

0.4.01 Introduction. This section of the document contains all the environmental approvals and certifications for the Savannah Harbor Navigation Project which were received as a result of review of the draft EIS.

0.4.02 Water Quality Certification, State of Georgia. In a letter dated September 5, 1995, the State of Georgia, Department of Natural Resources, Environmental Protection Division (GA DNR-EPD) issued a Section 401 Water Quality Certification for the Long Term Management Strategy. Conditions in the certification are listed below. The District received clarification from the State by letters dated February 6 and 28, 1996, on three of the

conditions and has requested a modification on one condition. The conditions below reflect those which have been clarified by the State. Further discussions with GA DNR staff confirm that conditions 5 and 6 apply only to hopper dredges.

O.4.03 The Georgia certification was issued contingent on the following conditions:

1. All work performed during construction will be done in a manner so as not to violate applicable water quality standards.

2. No oils, grease, materials or other pollutants will be discharged from the construction activities which reach public waters.

3. No dredging operations will be conducted during the striped bass spawning period from March 16 to May 31.

4. Prior to initiation of dredging activity between July 1 and September 30, the dredge operator must establish the following procedures. Dissolved oxygen levels in the Savannah River contiguous with the immediate dredging activity will be determined at a depth of one meter above the hard bottom or 2 to 3 meters above an indeterminate bottom. This determination must be made within 24 hours prior to the commencement of dredging activity. If dissolved oxygen levels are less than 3.0 mg/l dredging activity will not be permitted.

   Monitoring of the dredging activity will be conducted within 4 hours of the commencement of dredging, but no earlier than 2 hours after the commencement of dredging. In the event of 24 hour operation (around the clock) of the dredge, dissolved oxygen will be determined daily. The monitoring station will be located at mid-channel, 500 feet downstream of the ongoing dredging activity. Dissolved oxygen levels will be determined at a depth of one meter above a hard bottom or 2 to 3 meters above an indeterminate bottom. If dissolved oxygen levels fall below 3.0 mg/l dredging will be suspended until dissolved oxygen levels are 3.0 mg/l or greater.

   Results of this monitoring must be submitted to the Georgia Environmental Protection Division, the Georgia Wildlife Resources Division, and the Georgia Coastal Resources Division within 30 days of he completion of each dredging operation. Failure to maintain

satisfactory compliance with these conditions may result in prohibition of dredging operations in the Savannah River during the period of July 1 to September 30 upon written notice to the applicant.

5. Dredging should be conducted during December through March. These are the times when sea turtles are least abundant in the area of the Savannah Ship Channel. Dredging outside these months should be coordinated with the Georgia Department of Natural Resources (DNR) Nongame Wildlife Program. Dredging in May will require the implementation of a conservation plan approved by the Georgia DNR. This plan should include trawling to remove turtles from the path of the dredge.

6. During December through March, dredge and support vessels should have a trained whale observer on watch during daylight hours. At night, or when visibility is reduced by fog or sea states greater than Beaufort 3, dredges must slow to 5 knots or less if whales have been spotted within 15 nm of the vessel's path within the previous 48 hours. Normal operational speeds can be resumed after 48 hours if visibility has not improved and no whales have been observed by dredge observers. These procedures are consistent with the "Recommended Safe Operating Procedures for Large Vessels Transiting the Right Whale Calving Area Critical Habitat Off Georgia and Florida During March-December" that have been developed by the Southeastern U.S. Implementation Team for the Recovery of the Northern Right Whale.

O.4.04 Water Quality Certification, State of South Carolina. In a letter dated May 10, 1996, the State of South Carolina, Department of Health and Environmental Control (SC DHEC) issued a Section 401 Water Quality Certification for the Savannah Harbor Long Term Management Strategy (LTMS) Project. Conditions in the certification are listed below.

O.4.05 The South Carolina certification was issued contingent on the following conditions:

1. To insure water quality standards are maintained, the Division of Water Quality and Shellfish Sanitation must be notified and any alternate disposal site must be reviewed and approved prior to its use if the proposed disposal areas can not be utilized by the COE or the GA DOT.

2. The applicant must implement a water quality monitoring plan to insure that the effluent is in compliance with state water quality standards and to coordinate with the Department if any discharge is violating any state water quality criteria, as proposed. The applicant must conduct monitoring in accordance with an approved sampling plan specifying the location of sampling stations, parameters sampled, when samples will be collected, and how the sampling data will be reported. Appropriate ambient data from the Wright River must also be submitted.

3. The applicant must install flap gates at underdrain discharge points so that no effluent is discharged during low flow periods in receiving waters.

4. The applicant must monitor water quality 100 feet downstream of underdrain discharges to test for water quality standards compliance, as proposed. In addition, the applicant must conduct monitoring in accordance with an approved sampling plan specifying the location of sampling stations, parameters sampled, when samples will be collected, and how the sampling data will be reported.

5. The applicant must adhere/comply with recommendations of the SC DNR regarding the timing of placing dredged material for beach nourishment to insure continued protection of various species of sea turtles.

6. The applicant must provide compensatory mitigation for wetlands impacts associated with the proposed work. All wetlands impacts must be compensated for on at least a 1:1 basis. If mitigation includes creation, restoration, or enhancement, the plan must include monitoring. This mitigation plan must be submitted to the Water Quality Division for review and approval within 6 months of Section 404 permit issuance.

0.4.06 Compliance With Section 401 Water Quality Certifications

0.4.07 A Water Quality Monitoring Program would be implemented to ensure the confined disposal facilities (CDFs) are functioning properly and discharges conform to the state water quality standards. To monitor the dissolved oxygen levels and pH in discharges from the CDFs, weekly monitoring of controlled releases associated with dredge disposal management operations or

wildlife management would continue to be performed. To address potential impacts to aquatic species from the release of effluent with low dissolved oxygen levels or adverse pH, the following water quality monitoring program would be followed:

WATER QUALITY MONITORING PLAN

SAVANNAH HARBOR OPERATION & MAINTENANCE PROJECT

I. MONITORING OF CDF DISCHARGES

Water quality data will be taken on a weekly basis when controlled releases occur from dredged disposal management operations or wildlife mitigation operations. Sampling would be performed in accordance with the schedule indicated below by a qualified independent laboratory or Savannah District employee. If a laboratory is used, the contractor will be responsible for providing this data to the Contracting Officer's Representative (COR). The laboratory selected must be approved by the South Atlantic Division Laboratory of the Corps of Engineers. Testing and sampling shall be in accordance with "Standard Methods of the Examination of Water and Waste Water," 16th Editicn, published by APHA-AWWA-WPCF. Test results indicating a violation of State Water Quality Standards shall be reported immediately to the COR. All other available test results should be sent telephonically on the day the samples are taken. Written confirmation of all the test results shall be provided to the COR within 7 days of the sampling.

The data collection will be for the following water quality parameters: salinity (ppt), pH, dissolved oxygen (mg/l & salinity corrected), and total suspended solids (mg/l). The following general information will be recorded when each sample is taken:

(1) Date, time, location, tidal stage, and current direction.
(2) Depth of water over the weir boards and ponding depth at the weir.

The above data will be collected at the outfall of each weir from which there is a discharge. In Disposal Areas 2A and 12A where the weirs empty into a drainage ditch, the data will be collected where the discharge leaves the ditch and enters the receiving water body.

If, during sampling, any of the tests reveal a violation of the state water quality standards listed below, the investigator will complete the testing at that station in accordance with this monitoring plan. Data would also be collected of the ambient condition in the receiving water near the discharge point. The investigator or the Contractor shall then immediately, within the hour, contact the COR and report the test results. The standard criteria in the State of Georgia for dissolved oxygen is a minimum instantaneous concentration and applies throughout the water column. The dissolved oxygen values in the State of South Carolina can be averaged, but no one value can be lower than 4.0 mg/l. The standards are as follows.

State	Parameter	Standard	Month
Georgia	dissolved oxygen	3.0 mg/l	Jun - Oct
Georgia	dissolved oxygen	3.5 mg/l	May & Nov
Georgia	dissolved oxygen	4.0 mg/l	Dec - Apr
Georgia	pH	6.0 - 8.5	All year
South Carolina	dissolved oxygen	daily ave. of 5.0 mg/l with minimum of 4.0 mg/l	
South Carolina	pH	6.0 - 8.5	All year

The following procedures would be followed should violation of a state water quality standard be detected:

(1) If a measurement at a weir indicates potential violation of a state water quality standard, another measurement would be taken where the discharge enters the receiving water. The value found where the discharge enters the receiving water would be used to determine compliance with the state standard.

(2) Should low dissolved oxygen levels (below state water quality standards) or adverse pH (outside state water quality standards) be observed during the weekly monitoring of weir effluent overflows, daily monitoring would begin.

(3) Should sustained low dissolved oxygen levels or adverse pH (three consecutive days outside state water quality standards) be observed in weir effluent overflows, the pool elevation would be raised to the maximum height allowed by the condition of the dike (designed for full pool to be 2 feet below the dike crest).

(4) The pool elevation would be held at that height until the effluent dissolved oxygen and pH levels conform to state water quality standards for three consecutive days.

(5) The pool elevation may then be reduced as long as state water quality standards are maintained in the effluent.

(6) If the dissolved oxygen or pH levels continue to remain outside state water quality standards even with full pool conditions, the appropriate state water quality office would be notified by telephone (by District Environmental staff) and in writing (from the District Engineer or Contracting Officer's Representative) of the situation and what further actions were being taken to bring the Project back into compliance with its Water Quality Certification.

(7) After dissolved oxygen and pH levels conforming to state water quality standards are recorded for 14 consecutive days, the monitoring frequency would be shifted back to a weekly basis.

II. MONITORING DISSOLVED OXYGEN IN THE SAVANNAH RIVER

Prior to initiating dredging between July 1 and September 30, dissolved oxygen (D.O.) levels would be monitored in the Savannah River. Monitoring would be performed when dredging is conducted during that period. Measurements would be taken at mid-channel, 500 feet downstream of the ongoing dredging activity. D.O. levels will be determined at a depth of one meter above a hard bottom or 2 to 3 meters above an indeterminate bottom.

Sampling would be conducted within 24 hours prior to the commencement of dredging. If D.O. levels are less than 3.0 mg/l, dredging activity will not be permitted. During continuous dredging operations, sampling would occur on a weekly basis as long as the river D.O. remains above 3.5 mg/l. Should the D.O. at the bottom drop below 3.5 mg/l, the District would initiate daily monitoring until the river D.O. again reaches 3.5 mg/l for three consecutive days.

Sampling would be performed by a qualified independent laboratory or Savannah District employee. If a laboratory is used, the contractor will be responsible for providing this data to the COR. The laboratory selected must be approved by the South Atlantic Division Laboratory of the Corps of Engineers. Testing and sampling shall be in accordance with "Standard

Methods of the Examination of Water and Waste Water," 16th Edition, published by APHA-AWWA-WPCF. Test results indicating a violation of State Water Quality Standards shall be reported immediately to the COR. Written confirmation of all the test results shall be provided to the COR within 7 days of the sampling.

If, during sampling, any of the tests reveal a violation of the state water quality standards listed below, the investigator will repeat the sampling at that station. Data would then be collected of the ambient -- upcurrent -- condition outside the influence of the dredging operation. When those two stations have been sampled, the investigator or the Contractor shall immediately, within the hour, contact the COR and report the test results. The standard criteria in the State of Georgia for D.O. is a minimum instantaneous concentration.

Within 15 days of the conclusion of the monitoring, a written report consisting of all D.O. data obtained during performance of that dredging contract would be provided to the COR. The District would provide that information to the Georgia DNR - Environmental Protection Division, Georgia DNR - Wildlife Resources Division, and Georgia DNR - Coastal Resources Division within 30 days of the completion of the dredging operation.

O.4.08 The Water Quality Monitoring Program described above will be recoordinated with SC DHEC to ensure that this program fulfills the monitoring requirements stated in their certification. Although this coordination has not yet occurred, the District believes it can reach a satisfactory agreement with the SC DHEC on water quality monitoring.

O.4.09 The Mitigation Plan contained in Appendix G will be recoordinated with SC DHEC to ensure that this plan fulfills the mitigation requirements included in their certification. The SC DHEC-OCRM has approved the Mitigation Plan through their CZM certification of the LTMS Project.

O.4.10 An Underdrain Effluent Monitoring Program would be implemented to ensure those discharges are not adversely effecting aquatic species in the receiving water. A Monitoring Plan would be developed and submitted to SC DHEC for approval prior to initiating use of underdrains. A chemical evaluation would be performed of the underdrain discharges every three years to ensure that all state water quality standards are being met in the receiving water at the edge of a 100-foot mixing zone.

0.4.11 South Carolina Coastal Zone Management Certification. In a letter dated January 8, 1996, the State of South Carolina, Department of Health and Environmental Control, Office of Ocean and Coastal Resource Management (SC DHEC-OCRM) found the LTMS Project consistent with the policies of the South Carolina Coastal Zone Management Program. No conditions were explicitly stated in the letter, but the finding was based on revisions and clarifications made to the draft EIS that are contained in the Final EIS.

0.5.00 REQUIRED TIMING OF NON-ANNUAL ACTIONS.

0.5.01 Introduction. This section of the document contains the non-annual actions required for the Savannah Harbor Navigation Project to remain in environmental compliance.

0.5.02 Threatened And Endangered Species. The Biological Assessment of Threatened and Endangered Species (BATES) determined both (1) the impacts which the Project was likely to have on threatened and endangered species, and (2) what measures were appropriate to minimize the risk of impact to those species.

Sea Turtles. To ensure protection to nesting sea turtles as a result of beach disposal operations, the following conditions would be adhered to:

1. A turtle nest monitoring program would be implemented when dredged materials are placed on the Tybee or Daufuskie Island beach during the sea turtle nesting season to ensure protection of turtles that try to nest on the existing or newly formed beach. The work would include monitoring the beach for nesting sea turtles and relocation of nests found in the disposal areas or within 500 feet of the limits of the disposal area which are likely to be impacted by future disposal and/or related construction activities.

2. The beach would be monitored during the first winter/spring following completion of material deposition to determine post-nourishment compaction. This would be performed to ensure that the newly constructed beach provides suitable nesting material for endangered sea turtles. If the examination finds sand compaction within 50 feet of the tce of the dune to be greater than 500 cone penetrometer units (cpu), and the US FWS confirms that plowing is necessary, the compacted area will be plowed to a depth of at least 36 inches.

3. The beach would be monitored for three nesting seasons after beach placement for escarpments. Any escarpments in excess of 18 inches high, extending more than 100 feet in length and exceeding 500 cpu would be mechanically leveled to the natural beach contour.

4. When dredged materials are placed on Tybee Island, the city's light ordinance for protection of sea turtles would be enforced.

0.5.03 Ocean Disposal. The Section 103 Evaluation which received concurrence from EPA in a letter dated March 23, 1995, is valid for a period of three (3) years. The District will need to perform another Evaluation prior to that time. That evaluation would include at least a Tier 1 assessment of the quality of the maintenance sediments proposed for deposition at the ODMDS. If information indicates there is a "reason to believe" the sediments are contaminated, the District would need to perform sediment testing. The District would likely issue a Public Notice as part of its Section 103 Evaluation.

0.5.04 Section 404 Evaluation For Dredge And Fill Actions. The Section 404 Evaluation documents several commitments which were included to minimize impacts to wetlands and the aquatic environment. Those commitments consist of the following:

(1) Perform a side scan sonar investigation, magnetometer survey and benthic survey prior to the initial use of each new nearshore disposal site. This includes the island to be constructed off Turtle Island as a wetland mitigation feature. The side scan sonar investigation and magnetometer survey would be performed to ensure no significant cultural resources would be impacted by the proposed sediment deposition. The District's conclusions and the results of those investigations would be provided to the SHPO for approval. The District's conclusions and results of the benthic surveys would be provided to the US FWS and the NMFS, and the SC DHEC-OCRM in the case of the nearshore bird island, for approval. Approval from these regulatory agencies must be received prior to deposition of dredged material on those sites.

(2) Detailed designs of riprap to be placed on the shoreline of Jones/Oysterbed Island to protect that eroding bank must be submitted for approval to the SC DHEC-OCRM. The SC DHEC-OCRM will make a field inspection to confirm that the design minimizes the loss of wetlands along that shoreline. Mitigation for

the loss of 2.6 acres of wetlands resulting from this activity was included in the approved Mitigation Plan for the LTMS Project.

(3) Vegetation would be controlled inside the CDFs. Extensive vegetation existing on the floor of a CDF is to be removed prior to the site's flooding for disposal use. Removal of the vegetation is required to ensure that degradation of the vegetation within the CDF would not produce a large dissolved oxygen demand resulting in poor water quality in the effluent. Burning of the vegetation is allowed.

(4) To minimize impacts to fishery resources, nearshore placement of dredged sediments in open water is to be conducted during early winter, if possible. There would be no nearshore placement of dredged sediments in open water during the period of 1 March to 1 June, if possible.

(5) Dredged sediments to be deposited at open water sites must be excavated from the Bar Channel and upstream to Station 28+000. The average fines content of sediments from the inner harbor (Stations 0+000 to 28+000) to be deposited at such sites must not exceed 15 percent.

(6) Deposition on beaches would be monitored to document the volume of sediments dredged, the volume deposited on the beach, and the volume retained on the beach. This information would be compared with the physical characteristics of the dredged sediments (percent fines) to allow a better prediction of the impacts and success of future beach placement activities. If sediments upriver of Station 0+000 are to be deposited on a beach, the average fines content of those sediments must not exceed 15 percent. The retention of deposited sediments on a beach must exceed 50 percent when construction is complete.

0.5.05 Erosion Control And Sedimentation Plan. Prior to initiating construction of the dikes at Disposal Area 14A, the local sponsor will prepare and submit to the SC DHEC-OCRM an Erosion Control And Sedimentation Plan to obtain a Stormwater Management Permit. That plan will describe actions to be taken to minimize adverse impacts resulting from non-point source pollution during that construction project.

0.5.06 Cultural Resources (Section 106 Compliance). The District made three sets of commitments concerning significant cultural resources. Each is contained in a separate appendix in this EIS, but two are also summarized in the following paragraphs. The third set of commitments stem from the Cultural Resources Management Plan (Appendix J), which describe procedures which would be followed on a continual basis. Another set of commitments concerns additional studies which would be conducted after additional design information is available to ensure that significant cultural resources are not impacted. Those commitments are included in Sections 0.5.09 and 0.5.10.

0.5.07 Old Fort Jackson. In the Memorandum of Agreement (MOA), the District agreed to (1) study the streambank erosion problem at Old Fort Jackson to determine the nature, extent, and cause(s) of the problem, and (2) determine the contributing effect of the construction and/or maintenance of the Savannah Harbor Navigation Project on bank erosion. If the conclusion from those studies is that construction and/or maintenance of the Savannah Harbor Navigation Project contributes to the bank erosion problem at the Old Fort Jackson Historic Site, then Savannah District will implement further actions, as summarized in the following paragraphs:

a. Identify and evaluate alternatives to eliminate, minimize, and retard the Navigation Project's contribution to bank erosion problem at the Old Fort Jackson Historic site.

b. Develop a mitigation plan to minimize the adverse effects of streambank erosion on Old Fort Jackson, caused by the Navigation Project.

c. Prepare a report which documents the District's studies, study results, evaluations and determinations. Identify the optimal erosion control plan, including a draft mitigation plan for mitigating the Project's adverse effects to the Old Fort Jackson.

d. Obtain public review of the draft mitigation plan. Consider all comments in development of the final mitigation plan. The final mitigation plan must be approved by the GASHPO and the Advisory Council.

e. Develop a cost-sharing program to implement the mitigation plan.

f. Implement the recommended plan subject to the availability of funds. Function as the lead party in coordinating and implementing the work necessary to implement the mitigation plan.

O.5.08 CSS GEORGIA. In the Memorandum of Agreement (MOA), the District agreed to the certain actions, as summarized in the following paragraphs:

1. Conduct studies to determine the present condition of the vessel, its stability as a historic site/object, any factors which may threaten its present condition or stability, and restrictions which the vessel places on present harbor operations.

2. Determine the effects of the Savannah Harbor Navigation Project on the CSS GEORGIA.

3. If the conclusion from the studies is that the Navigation Project contributes to the degradation or reduced stability of the CSS GEORGIA, then the District would take the following actions:

    a. Identify and evaluate alternatives to eliminate, minimize, and retard the Project's adverse impacts. If the vessel is restricting present harbor operations, alternatives would be evaluated to allow those restrictions to be eliminated or minimized.

    b. Develop a mitigation plan to minimize the Project's adverse effects on the CSS GEORGIA.

    c. Prepare a report documenting the District's studies, evaluations and determinations, including recommendations as to the optimal alternative(s). The District would prepare a draft mitigation plan for mitigating the Project's adverse effects to the CSS GEORGIA. That plan would be available for public review.

    d. Implement the recommended plan, subject to the availability of funds.

    e. Develop a proposed data recovery plan if the mitigation plan entails the alteration or destruction of any features associated with the CSS GEORGIA, such that data recovery of buried archeological deposits/artifacts might be recovered. A research design would be developed by the District and coordinated with the GA SHPO and the SC SHPO for comment.

f. Submit the final mitigation plan to the GA SHPO, the SC SHPO, and the Council for review.

g. Curate any and all materials and records resulting from any data recovery investigations.

0.5.09 Cultural resource surveys (side scan and magnetometer surveys) would be conducted at each new disposal area located in the nearshore area. This includes the island to be constructed off Turtle Island, the submerged berms, and the feeder berm. The District's evaluation and findings would be provided to the SHPO for approval prior to initial sediment deposition at each site.

0.5.10 Construction of underdrains could potentially impact cultural resources located along the pipe alignments. Prior to excavation, archival information would be reviewed to determine if any proposed underdrain alignment had the potential for impacting any known cultural resource sites in the confined disposal areas. If there was a significant potential for adverse impact to a known site, a cultural resource survey would be performed of the underdrain alignments and approval of the study's findings from the SHPO would be obtained prior to excavation.

0.5.11 South Carolina Wetland Mitigation Plan. The Mitigation Plan for impacts to wetlands in South Carolina include several items, some of which require action only periodically. Those recurring -- but not annual -- requirements consist of the following construction-type items: (1) maintenance of the bare ground bird nesting area on Jones/Oysterbed Island, (2) maintenance of nesting islands within disposal areas, (3) maintenance of the bird nesting island offshore of Turtle Island.

0.5.12 Maintenance on the 26-acre bare ground nesting area outside the dike at the Jones/Oysterbed Island Disposal Area would be performed when site inspections reveal that emergent vegetation has covered substantial portions of the site, rendering it unusable for colonial nesting birds.

0.5.13 The 1.0-acre isolated nesting islands inside the confined disposal areas would be maintained when dike raising occurs to ensure the crown of each island remains above the height of the surrounding dikes. Should emergent vegetation cover substantial portions of the site, actions would be taken to re-establish bare ground to restore the usefulness of the site to nesting migratory birds and shorebirds. Those actions would include removal of the vegetation or deposition of additional dredged material.

O.5.14 The design dimensions of the nearshore island off Turtle Island would be restored when the island has been reduced by 50 percent below the specified design size. This restoration would be accomplished by deposition of additional dredged material. Should emergent vegetation cover substantial portions of the site, actions would be taken to re-establish bare ground to restore the usefulness of the site to migratory birds and shorebirds.

O.5.15 Periodic replacement of the purple martin nesting houses and bat houses would be needed at the disposal areas in the rotation program to continually provide a measure of biological control for potential increased mosquito breeding.

O.5.16 Mitigation for Other Wetland Losses. A detailed mitigation plan has not been developed for wetlands that would be lost in the State of Georgia as a result of the Project. As detailed designs become available on the items which will destroy wetlands in Georgia, actions must also be taken to mitigate for those new construction features. Those items consist of the following: (1) construction of an access road to Disposal Area 2A, (2) pipe ramp expansions, and (3) weir/ discharge pipe replacements. Mitigation would occur at a 2:1 rate for wetlands which would be permanently lost. The mitigation plan will be coordinated with the GA DNR Coastal Resource Division and the US FWS for approval. Implementation of the wetland mitigation plan would occur before the construction feature causing the wetland loss is placed in service.

O.5.17 Tidegate Construction and Deepening. Improvements to the Savannah Harbor Navigation Project were authorized by Congress in 1965. Those improvements included construction of the Tidegate and fresh water control features, as well as deepening of the shipping channel. The fresh water control features were constructed to reduce salinity impacts to the Savannah National Wildlife Refuge from the combined harbor deepening and Tidegate construction project. The freshwater control system included the following components:

(1) a 5,500-foot long canal through McCoombs Cut to provide freshwater to the Savannah NWR (Figure 4). The canal was constructed with a 200-foot bottom width at EL -7' MLW and 2H:1V side slopes. The design flow through McCoombs Cut was 4,000 CFS.
(2) a channel in Middle River with a 90-foot bottom width at EL -6' MLW and 2H:1V side slopes. The design flow in Middle River was 1,500 CFS.
(3) a channel in Little Back River with a 200-foot bottom width at EL -5.1' MLW and 2H:1V side slopes. The design flow in Little Back River was 2,500 CFS.

0.5.18 The Federal government is responsible for maintenance of the Diversion Canal, the channels in Little Back River and Middle Rivers, and the control works to the Refuge. The non-Federal sponsor has maintained the freshwater canals in the Refuge and on private lands outside the Refuge.

0.5.19 1993/1994 Deepening Project. Several commitments were made in the 1991 Feasibility Report/EIS for the Deepening Project and the Programmatic Agreement signed by the District in January 1992. The remaining non-annual commitments center around two significant cultural resources; Old Fort Jackson and the CSS GEORGIA. Specific studies include: (1) mapping the side slopes and channel bottom in the areas of Old Fort Jackson and the CSS GEORGIA, and (2) testing and recovering ordnance from the portions of the CSS GEORGIA wreck located within the new authorized channel prism. The studies were to determine the effect of the Deepening Project upon each resource, identify and evaluate alternatives for avoiding and/or mitigating impacts to significant resources. An avoidance/mitigation program was also to be implemented. The 1992 PMOA also called for development of individual Memorandums of Agreement (MOAs) for Old Fort Jackson and the CSS GEORGIA. Those documents are contained in this EIS and will be signed after the EIS is finalized.

0.5.20 Compliance With Section 401 Water Quality Certifications. Non-annual water quality monitoring activities would consist of a chemical evaluation every three (3) years of underdrain discharges to ensure that all state water quality standards are being met in the receiving water at the edge of a 100-foot mixing zone.

APPENDIX P

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REFERENCES

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APPENDIX Q

COMMENTS RECEIVED FROM PUBLIC REVIEW OF THE DRAFT EIS AND DISTRICT RESPONSES TO THOSE COMMENTS

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IV

345 COURTLAND STREET, N.E.
ATLANTA, GEORGIA 30365

JAN 20 1995

Savannah District, Corps of Engineers
P.O. Box 889
Savannah, GA 31402-0889

ATTN: Dr. Willian Bailey
Planning Division

Subject: Draft Environmental Impact Statement (EIS) for Long-term Management Strategy (LTMS) for the Savannah Harbor Navigation Project Chatham County, Georgia and Jasper County, South Carolina

Dear Sir:

Pursuant to Section 309 of the Clean Air Act and Section 102 (2)(C) of the National Environmental Policy Act, EPA, Region 4 has reviewed the subject document which describes the measures and methods being implemented to make the harbor operation more efficient and presumably less damaging environmentally. While not characterized as an upgrade, the management measures effectively yield this result by increasing the total capabilities of the Savannah facility. Seven action management strategies were eventually developed and serve as a basis to compare and contrast with the current operational procedures.

The tentatively selected option, Alternative 8, is essentially a composite of the individual numbered management strategies. Nearly all of the proposed modifications to the present operational procedures are very comprehensive in scope; nonetheless, the former are uniformly forecasted to have nominal adverse environmental ramifications. Notwithstanding this depiction, we have a degree of concern about how all the elements of this very involved plan will actually function. The details of these concerns are expressed in the attached comments.

While the future can not be known with precision, certain broad principles form the basis for this proposal. Foremost among these tenets is the proposition that shipping volumes will increase and the trade will be plied with ever larger, deep-draft vessels. Hence, the need for increasing navigation and berthing depths along with more disposal sites and the management thereof to accommodate the material excavated to secure the enlarged bottom profiles. We have no reason to doubt this premise, but observe that there is an immediate correlation between these

facility upgrades and the attendant environmental costs necessary for their implementation.

While there are a multitude of future scenarios as to how the federal and local sponsor partnership will proceed in the future, there is the distinct and increasing probability that the local sponsor will have to assume a larger role. This would be particularly true in terms of funding capital improvements as well as the administrative costs of administering the management plan. Given this potential, it is important that all the elements of Alternative 8 have independent utility in the event the local sponsor elects not to fund its increased share of the plan and a smaller or modified plan becomes necessary. From our perspective this potentiality requires that the mitigation elements of the plan occur before or concurrently with any of the construction necessary for the proposed structural measures. It has been our experience that this sequence makes it more likely that proposed mitigation would not be substantively modified/deferred by funding constraints.

Adding to the difficulties in this regard is the fact that there are a number of studies which will be factored into the operation of the subject long-term plan. For example, the effect of weir discharges into the Wright River and specialized measures to insure dike stability are not available for immediate evaluation. Hence, there are some important data gaps associated with this proposal which add to our uncertainty about the plan's environmental costs and the mitigation necessary to compensate for the losses.

On the basis of our review a rating of EC-2 has been assigned. That is, we have some reservations regarding the long-term consequences of how all of the proposed elements of the management plan will mesh and subsequently function. Further, additional information necessary to more precisely define the uncertainties associated with proposed management/operational changes needs to be acquired. To the extent practicable these unknowns should be assessed in the final document.

Thank you for the opportunity to comment. If we can be of further assistance in the meanwhile, Dr. Gerald Miller (404-347-3776) will serve as initial staff contact.

Sincerely,

Heinz J. Mueller, Chief
Environmental Policy Section
Federal Activities Branch

SPECIFIC COMMENTS

Alternative disposal ("beneficial") uses, viz., construction of feeder berms and beach renourishment, are proposed for material excavated from the bar channel and other source areas. We generally have no pronounced objections to these activities, if biologically sensitive resources are not adversely affected in either a direct or indirect fashion. However, you will recall that a recent episode of beach renourishment on Tybee Island resulted in large amounts of fines being placed on the shore rather than good quality sand as had been portrayed in the environmental documentation.

While this material has subsequently dispersed, its fate and consequences remain unknown. Construction of feeder berms should be undertaken with even more caution since the quality of the sediments involved would be less apparent than the materail used for beach nourishment. Use of sediments from the inner harbor near Jones/Oysterbed Islands could also be problematic from a contaminant standpoint. While no hard bottom communities are known to exist within the berm construction site, care must be taken during the side scan sonar investigation to insure that this is in fact the case.

There should be a formalized procedure to address unexpected incidents such as the Tybee Island beach nourishment situation. To this end a mechanism needs to be implemented that will more precisely obtain and characterize pertinent data, e.g., sediment classes, and allow cessation of construction activities without delay when unanticipated events which could have significant adverse environmental consequences occur. This issue needs to be discussed and resolved in the final document.

In a related matter "Bird Island" will not be stabilized; hence, in the absence of renourishment its longevity will be relatively short. This and other elements of the long-term plan will potentially result in a great deal of sediment movement in the system. The text does not project any adverse long-term repercussions from these measures. However, because of the magnitude of this construction, we suggest that some modelling be accomplished prior to plan implementation and a carefully developed monitoring plan started afterward to ascertain if indeed there were only minor consequences.

The present method of maintaining operational depths in many of the berthing areas through the use of agitation has been a matter of contention for a number of reasons, e.g,, water quality degradation. The results of several recent studies examining this excavation technique stated that its effects were minor and short-lived. However, since dredging must occur so routinely, we

remain unconvinced that agitation dredging is so benign. Hence, the proposal to replace agitation with hydraulic dredging appears to have merit. While the latter technique might appear to immediately increase the volume of material (ca. 800,000 cy) added to the confined disposal cells, this addition is actually just material which must be moved (dredged) twice under current procedures. Nonetheless, we agree that the berth sediments should be analyzed on an annual basis especially during the initial excavation when the overall depths will be maximized.

The wetland and upland habitats which will be sacrificed to dike disposal area 14A exceed 800 acres. While some variability was noted in the functional value(s) of the different habitats which comprise this total, this loss will still have some important localized effects. We have no quarrel with the major mitigation element, viz., 2-year rotational use of disposal areas with management options/modifications to benefit birds (composite strategy 3). It appears to be a satisfactory approach to benefit targeted avian populations.

Staff is not as familiar with the relationship of the subject mitigation sites to adjacent habitat as other agency representatives, but it appears that the nesting areas which are within the disposal cells (Figure 1, Appendix G) could be at risk from ground predators unless care is taken to maintain a water barrier between the dike wall and island. Unfortunately, all the nesting areas may be the targets of vandalism and/or trespass unless there is some means to enforce relative isolation during critical nesting phases.

This value of enhancing nesting success notwithstanding, we believe that some in-kind mitigation should be included in the long-term plan for the wetlands lost to dike and road construction. In concept, we favor restoration of previously degraded wetlands to compensate for functional values lost from fill activities. Unfortunately, for a number of reasons this tact does not have an outstanding degree of long-term success. Alternatively while some existing wetlands and fringe uplands remain in the estuary system and can be purchased at a reasonable price, they should be bought and preserved. The accelerating developmental pressures in this immediate area and, in fact, the entire coastal plain is devastating to the natural environment. Hence, there is an urgency to acquiring these habitat types before they are converted to residential/commercial/industrial sites. We would like to see this issue assessed in the final EIS.

There are two unconfined upland disposal areas (1S on Onslow Island and 14A on Elba Island) with at least the potential for use. Regardless of whether or not dikes could be constructed at these locations, we believe that their habitat value is such that their future use should be precluded. The preservation of these two features could be made part of the in-kind mitigation efforts for the habitat lost in the upgrade of disposal sites and

associated access features.

The use of underdrains to facilitate dewatering of the maintenance material is an important part of the management strategy. The effluent from the underdrains will be directed to either the Savannah or Back River. While these water bodies have a large dilution capacity compared to Wright River, we are concerned about localized water quality degradation. The potential for problems is an obvious function of the composition of the material being drained. However, a determination of the potential for water quality degradation and how contaminant problems could be addressed is not so apparent, but needs to be discussed in the final EIS.

In a related matter effluent data (Appendix C, page 9) collected from the CDFs reveal that outflow suspended solid levels are between 2 and 10 times background levels of the Savannah River. However, it was indicated that water quality standards could readily be met with a minimal mixing zone. The basis for this statement and why turbidity does not adversely affect local water use designation should be given in the final EIS.

While we have no interest in economics, per se, economic justifications are used as the basis for proposals of this nature. Therefore, we wondered why if the hinterlands served by containerized cargo are much more extensive due to the effects of intermodal containerized rail rates, how can there be an economic justification for deepening ports such as Jacksonville, Savannah, and Charleston which are so proximate to one another from a shipping (origin distance) perspective? The idea of bulk cargo being captive to Savannah as opposed to nearby ports is also perplexing unless it were demonstrated that this material is essentially consumed within the Savannah economic area.

As a result of interagency coordination, a number of measures (cessation of tide gate operation and closure of New Cut) were recently implemented to improve water quality and fisheries with the harbor environs. It is important that the proposed structural/operational measures in this strategic plan do not lessen the long-term benefits of these improvement efforts. This plan should have sufficient flexibility such that if an element proves problematic to another priority interest, the former can be deleted or modified. For example, deepening of the berthing areas, turning basins, etc. to serve as storage for sediment has an obvious appeal, but should be monitored to determine whether there will be unintended consequences.

Section 2.25 (Page 17) as regards the Savannah River Basin Watershed Project would be more accurately characterized as follows: EPA is currently facilitating a study of the Savannah River basin watershed (from the headwaters in North Carolina and Georgia to the Atlantic Ocean). It will examine environmental impacts to the river and its tributaries as well as develop an

interagency action plan to address significant impacts. Participants in the project include a broad spectrum of federal, state, and local agencies and interest groups. With state assistance EPA is developing and will implement a monitoring plan for the basin that will assess the condition of basin resources with a known statistical confidence. A geographical information system is also being developed with project participants to serve as a basin-wide data management tool. A baseline assessment of six basin resource areas is being developed by project participants which will serve as the basis of a Watershed Assessment and Prioritization Plan (WAPP). The WAPP will identify and prioritize watershed impairments and recommend appropriate solutions. The total study is in its initial stages; however, the WAPP is expected to be complete by mid-1995.

Comments on the Section 103 evaluation of ocean disposal as well as the site management monitoring plan will be sent directly from our Coastal Regulatory Unit. Mr. Doug Johnson (404-347-1740) will serve as initial staff contact.

RESPONSE -- Environmental Protection Agency;
Environmental Policy Section,
Federal Activities Branch,
January 20, 1995.

FUTURE WITHOUT PROJECT CONDITIONS. The Without Project Condition in the Savannah Harbor LTMS Study is based on a continuation of existing navigation, dredging, and disposal practices. The analyses are not based on future increases in vessel size or channel/berth dimensions. The study makes no assumptions on "facility upgrades and the attendant environmental costs necessary for their implementation."

TIMING OF MITIGATION ACTIONS. Mitigation actions would be performed before or concurrently with any of the construction necessary for the proposed measures. The project/construction feature requiring mitigation would not be placed in operation until the mitigation was completed, or underway if long-term operational procedures were used as mitigation.

BENEFICIAL DISPOSAL USES IN NEARSHORE AREA. The proposed nearshore disposal alternatives are not expected to have a significant adverse impact on biological resources. The material removed from the Bar Channel is believed to be similar to that which moves along the ocean floor in that area. Therefore, exposure of nearshore biota to those sediments is not expected to be markedly different from what they experience on a daily or periodic basis. Investigations will be performed prior to construction to ensure that no highly sensitive hard bottom communities exist within the impact area. The District typically has an inspector on-site on a continuous or daily basis to observe, among other things, the results of the contractor's actions. The inspector is aware of conditions, including environmental limitations, that the construction must meet to be acceptable. That inspector provides the District with an observer who continuously monitors on-site conditions. The District believes that such observation, combined with the coordination it performs and good working relationships it maintains with resource agencies is adequate to address unexpected incidents. Prior to deposition in the nearshore area, the sediments will be sampled to ensure they are predominantly sands or shell. Contracts for removal of sediments which are predominantly fine-grained materials would not allow deposition in nearshore areas.

NEARSHORE BIRD ISLAND. The Bird Island will be maintained when its size has been reduced by 50 percent. Use of the alternate sites proposed for placement of sediments in the nearshore area is expected to result in the retention of more sediments in the nearshore area, rather than their present deposition further from

the coastline at the Savannah ODMDS. The District does not believe that modelling would add significant information required to assess the impacts of nearshore placement. Since there are no known hard bottom communities within the immediate vicinity of the proposed nearshore dredged material placement sites, the District does not believe that post-construction monitoring is necessary to document the minor level of impacts which are expected.

AGITATION DREDGING. Placement of berth sediments directly into the confined disposal facilities would not substantially increase the total volume deposited in those sites since berth sediments already comprise a portion of the sediments removed from the navigation channel.

LOSS OF HABITATS AT DISPOSAL AREA 14A. We concur that the loss of 305 acres of wetland habitat and 510 acres of upland habitats which would be lost as a result of diking and use of this site would have some localized effects. The proposed Mitigation Plan was designed to compensate within the immediate vicinity for the functional values which would be lost.

INTERIOR NESTING MOUNDS. Care would be taken to maintain a flooded area around the mounds while they are in use to maintain a water barrier between the dike wall and the nesting site. The water barrier would also provide protection from vandalism and/or trespass during the critical nesting phases.

IN-KIND MITIGATION. Mitigation for wetland impacts in Georgia will be accomplished by restoration of degraded wetlands or creation of new salt marsh. The Mitigation Plan for losses of South Carolina wetlands consists of several features. The final Mitigation Plan does include in-kind mitigation for 25 acres of saltwater wetlands through an agreement with the SC DHEC-OCRM. That agency will administer an escrow account established by Chatham County -- or the GA DOT as its designee -- to fund wetland restoration, creation, or protection projects in South Carolina.

UNCONFINED DISPOSAL SITES. The District's development of mitigation actions is complicated by the states' position that impacts occurring in their state must be compensated for through actions implemented in their state. Since mitigation for wetland impacts in Georgia will be accomplished by restoration of degraded wetlands or creation of new salt marsh in Georgia, protection of Disposal Area 1S -- located in Georgia -- is not warranted at this time. The remaining unconfined upland disposal area -- Disposal Area 14A -- is proposed for diking and use for the Navigation Project in the LTMS Management Plan and EIS.

UNDERDRAIN DISCHARGES. The potential for water quality degradation from underdrains was addressed in the draft EIS in Sections 7.31 through 7.35 and Appendix E, RESULTS OF WRIGHT RIVER WEIR AND SEDIMENT TESTING. The potential for contaminant problems after underdrain installation was addressed in the draft EIS in Section 7.34. The SC DHEC has provided water quality certification for the proposed project -- including releases from the underdrains. The Draft EIS stated that monitoring of the underdrain effluent would be performed every 5 years to ensure that water quality standards are being met. The interval between chemical evaluations of underdrain effluents has been revised to every 3 years in the Final EIS.

OVERFLOW WEIR DISCHARGES. Suspended solids in overflow weir effluents was addressed in the draft EIS in Sections 7.21 through 7.26. As stated in Section 7.26, research indicates that water with suspended solids levels of 500 mg/l or less would not produce impacts to estuarine-dependent and anadromous fish. The District will use a 500 mg/l threshold at the weir as its measure of acceptability of suspended solids in its weir overflows. Mixing zones are commonly accepted for discharges from confined dredged material disposal areas (reference June 1994 draft EPA/Corps Inland Testing Manual). At the edge of a reasonable mixing zone, the suspended solids level would be lower -- with less potential aquatic impacts -- than that discharged at the weir.

CARGO MOVEMENT. The LTMS does not propose any improvements to the navigation channel which are dependent on additional cargos moving through the port. The EIS only assumes that funds will be available when needed to both maintain the Navigation Project and operate and improve the confined disposal facilities. The concepts of port competition and captive cargos are beyond the scope of this EIS. Improvements to the Navigation Project, both landside and channel maintenance-related, which are proposed in the LTMS are designed to improve the operational or economic efficiency of actions which have already been authorized by Congress.

FLEXIBILITY OF NEW MEASURES. The sediment control measures and nearshore disposal options proposed in the Management Plan and EIS would be implemented where economically justified and environmentally acceptable. After further studies indicate a specific measure would be effective in a certain location, the measure would be implemented at that location, then the actual effectiveness and resulting impacts would be evaluated by the District to ensure continued maintenance of that application would be both economically warranted and environmentally acceptable.

SECTION 2.25 (Page 17) - SAVANNAH RIVER BASIN WATERSHED PROJECT. Concur. Suggested changes to better describe this study have been incorporated in the Final EIS.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IV
345 COURTLAND STREET, N.E.
ATLANTA, GEORGIA 30365

MAR 2 3 1995

4WM-WOW

Mr. Richard A. Hill
Acting Chief, Planning Division
Department of the Army
Savannah District, Corps of Engineers
P.O. Box 889
Savannah, GA 31402-0889

Dear Mr. Hill:

We have completed our review of the Draft EIS for the Savannah Harbor Long Term Management Strategy (LTMS) Study, dated November 1994. We are providing comments on the 103 Evaluation, the Site Management and Monitoring Plan, and the Sediment Quality Evaluation.

We agree with your determination that maintenance material to be excavated from the Savannah Harbor Bar Channel is suitable for ocean disposal. We are granting a three-year concurrence from the date of this letter for the placement of dredged maintenance material from the Savannah Harbor Bar Channel in the Savannah Ocean Dredged Material Disposal Site (ODMDS).

Appendix D Comments

Please note that on Page 2 of Appendix D, "Section 103 Evaluation of Ocean Disposal for the Savannah Harbor Navigation Project," the update of 103 Evaluation will be for three (3) years only, not five (5) years.

Paragraph D.4.01, Appendix I (not H). We consider this management and monitoring plan to be a draft document, open to future discussions and development. A likely approach would be to develop an Implementation manual that will be flexible and open to modification as necessary.

Appendix F Comments

Paragraph F.2.01, line 5, What is "(EPA, 1992)" referencing?

Paragraph F.2.05-F.2.08, the "Evaluation of the Region 4 Coastal Sediment Quality Inventory" was prepared under contract by SAIC for EPA. It represents the contractor's evaluation of the data according to their interpretation of the work assignment. This document has not undergone a rigorous review or critique by the Agency and, therefore, does not reflect the

opinions or conclusions of the EPA. The document should not have been released without such a disclaimer, and all copies dated December 3, 1992 should be considered as a "DRAFT" document. Conclusions drawn from this evaluation are to be considered preliminary and subject to revision. In its present form the document has limitations on its use as a predictive tool, particularly in assessing areas as "clean." The major limitation is a lack of synoptic data. This document, therefore, cannot be used to establish a "lack of concern."

Appendix I Comments

WRDA requires that the Site Management and Monitoring Plan (SMMP) be reviewed and revised not less frequently than every ten (10) years. We agree that five (5) years is a more prudent time frame, but would like the SMMP to be open to revisions and modifications as deemed appropriate by the Site Management and Monitoring Team (SMMT).

We would like to schedule a meeting to review and discuss this Site Management and Monitoring Plan before it is finalized, since we have not previously seen this document. WRDA establishes the EPA, in consultation with the ACOE, as the responsible Agency for the development and implementation of Site Management and Monitoring Plans for ODMDSs. Our main concern is to develop SMMPs for all ODMDSs that are consistent in content and approach, meet the requirements of WRDA, reflect the details of EPA's "Managing Ocean Disposal of Dredged Material - Ocean Dredged Material Disposal Site Designation, Management, and Monitoring Manual," and are effective in protecting our coastal environment.

Should you have any questions concerning this letter, please contact Douglas K. Johnson of my staff at (404) 347-1740, extension 4297.

Sincerely,

E. Stallings Howell

E. Stallings Howell, Chief
Wetlands, Oceans and Watersheds
Branch

RESPONSE -- Environmental Protection Agency;
Wetlands, Oceans and Watersheds Branch,
March 23, 1995.

SUITABILITY OF BAR CHANNEL MATERIAL FOR OCEAN DISPOSAL. EPA concurs in the suitability of Bar Channel sediments for ocean disposal and extends their approval of ocean disposal for three years from the date of their letter.

APPENDIX D

Section D.3.01. Concur. This section has been revised to show that the Section 103 Evaluation would be reevaluated every three years, rather than every five years.

Section D.4.01. Concur. The Site Management Plan has been revised as a result of further discussions between the Corps and EPA. The final signed Site Management Plan can be modified over time as both parties agree that revisions are appropriate to better manage the site.

APPENDIX F

Section F.2.01. Appendix P REFERENCES includes a reference to "U.S. Environmental Protection Agency, 1992. Draft Evaluation of the Region 4 Coastal Sediment Quality Inventory. Prepared by Science Applications International Corporation for EPA, 3 December 1992."

Sections F.2.05 to F.2.08. This section has been revised to state that the 1992 report was only a draft and that conclusions drawn from the contractor's evaluation are to be considered preliminary and subject to change.

APPENDIX I

Revision/Modification of the SMMP. A section has been added to state that the Site Management Plan may be modified by joint agreement of the signatory parties to the reflect the views of the SMMP team.

Meeting to Discuss the SMMP. A meeting was held between the District and EPA Region IV on July 12, 1995. That meeting resulted in revisions to the SMMP which have been incorporated into the SMMP included in the Final EIS.

United States Department of the Interior

OFFICE OF THE SECRETARY
OFFICE OF ENVIRONMENTAL POLICY AND COMPLIANCE
Richard B. Russell Federal Building
75 Spring Street, S.W.
Atlanta, Georgia 30303

February 23, 1995

ER-95/14

Mr. William Bailey
U.S. Army Engineer District, Savannah
P.O. Box 889, Attn: CESAS-PD-EI
Savannah, Georgia 31402-0889

Dear Mr. Bailey:

The Department of the Interior has completed its review of the Draft Environmental Impact Statement (DEIS) for the Savannah Harbor Long Term Management Study, Chatham County, Georgia and Jasper County, South Carolina. We have the following general and specific comments.

General Comments

The DEIS contains a comprehensive review of the Savannah Harbor operation and a plan for future operation and maintenance of the project. We are pleased that the Corps of Engineers has addressed many of our concerns and interests in the Savannah Harbor study area. However, some of the alternatives discussed below need further study or refinement before being implemented.

The Department is particularly supportive of the plan to use off-channel storage of sediments to reduce the amount of agitation dredging in Savannah Harbor. We believe that this alternative is preferable to the use of agitation dredging for maintaining berthing areas in the harbor. The plan proposed in the DEIS should substantially reduce the amount of agitation dredging and therefore improve fish and wildlife resources in Savannah Harbor.

The Department also supports the concept of managing the dredged material disposal areas for shorebirds and waterfowl. We have had discussions with the Corps over many years exploring this management concept. However, before we can fully support this alternative, the dredged material should be sampled to insure that the birds would not be subject to increased contaminant exposure. While we are hopeful that contaminants in the disposal areas are not a threat, we believe that attraction of additional birds without this precaution would be imprudent. Further, we believe that testing could be completed in a cost effective manner with cooperative support from the Fish and Wildlife Service (Service) and other agencies.

We also support the creation of a new bird nesting island and creation of a nesting area on Tybee National Wildlife Refuge. We recommend that the number one priority for dredged material be for environmental benefits, primarily bird habitat management. This use should take priority over such uses as beach nourishment or berm creation. Also of concern to the Department is the proposal to deepen the Back River sediment basin. The removal of the tide gate from operation and closure of New Cut has improved salinity levels and tidal freshwater marsh. However, recovery of the striped bass population is not evident. Modifications of the Back River due to shoaling upstream of the tide gate and the current deep water sediment basin could be contributing factors hindering striped bass recovery. An on-going striped bass study, to be completed within three years, will provide information to help evaluate the problem. We recommend that a decision on deepening the sediment basin be deferred until the study is completed and an assessment can be made.

The DEIS failed to discuss the feasibility of recovering the heavy mineral and phosphate fractions of the dredged material. The Department has no objection to the proposed project in this regard. However, we suggest that subsequent reports and other documents prepared describing this project discuss all mineral resources and impacts to them.

Specific Comments

Paragraph 2.08. These comments in response to the DEIS do not constitute a Fish and Wildlife Coordination Act report as stated in the document. This response is made under authority of the National Environmental Policy Act (NEPA).

Paragraph 5.08. The mitigation plan for loss of wetlands associated with diking of disposal area 14A is proposed to include increased management of disposal areas for shorebirds and waterfowl and creation of an offshore bird nesting island. Although this is not "in-kind" mitigation, shorebird nesting and feeding habitat is extremely limited and under increasing threat due to coastal development. The disposal areas and nesting island have the potential to provide significant habitat for these species.

The plan should include a long term, binding, management commitment. Management decisions should be made by qualified biologists and be flexible in nature. The Department has no objection to the plan provided that it is further coordinated with the Service to clarify and/or refine details prior to implementation.

Paragraph 5.36 and 5.40. The Department is concerned with the direct placement of maintenance material on Tybee Beach and Daufuskie Island. It is our understanding that during harbor deepening, several extensive pockets of fine sediments were dredged, resulting in high turbidity levels and unsuitable material

on Tybee beach. Placement of such incompatible material on the beach has the potential to impact fishery resources. These concerns need to be addressed in the DEIS. A monitoring plan to document the level of impact would also be appropriate.

Paragraph 5.42. The Department strongly supports coordinating dredging of the berthing areas with the navigation channel to reduce the amount of agitation dredging.

Paragraph 5.46. The Department supports the need to test berthing areas for contaminants before dredging.

Paragraph 5.48. Recovery of the striped bass population after removal of the tide gate from operation has not been documented. Configuration changes in the Back River such as the tide gate structure, shoaling upstream of the gate, and shoaling in the sediment basin may be impacting striped bass recovery. We recommend that a decision on deepening of the sediment basin be deferred until current striped bass studies are completed.

Paragraph 5.69 (Table 5). The proposed management techniques should be modified and stated as general guidelines. There needs to be flexibility of management depending on weather conditions and status of bird populations. For example, in some winters the shorebird population is high and the waterfowl population is low. Under these conditions it would be best to draw down the disposal area for shorebirds. Therefore, the techniques for January 1 - March 15 and November 15 - December 31 should be changed to: "Optimum water level will be determined by qualified biologists and coordinated with the Service. At a minimum, a water depth of one (1) inch will be maintained in the area."

Paragraph 6.31. Studies by the State of South Carolina have documented low dissolved oxygen levels in the Back River sediment basin during the summer. These studies and the implications for harbor management should be discussed.

Paragraph 6.40. There is only one active eagle nest on Savannah National Wildlife Refuge. Another active nest is located on private land near the refuge in South Carolina.

Paragraph 6.59. The Tybee National Wildlife Refuge is about 400 acres in size rather than 100 acres as stated in the document.

Paragraph 6.157. The Tybee National Wildlife Refuge is about 400 acres in size.

Paragraph 7.34. The Department concurs with relocation of the underdrains to the Back River, provided that the discharge is adequately monitored. We believe that discharges should be monitored every three (3) years rather than every five (5) years.

We understand that you are proposing a 10-foot mixing zone, not a 100-foot mixing zone.

Paragraph 7.57. The striped bass in the Savannah system spawned primarily in the Back River prior to tide gate construction. However, recent studies found very few eggs in the Back River with most eggs being collected in the Front River. The present status of striped bass recovery and habitat use in the lower Savannah are unclear.

Paragraph 7.146. An offshore bird nesting island would also require adequate posting and law enforcement to prevent disturbance of nesting birds by people and/or their pets. An agreement with the South Carolina Department of Natural Resources or the Service may be appropriate to accomplish this protection.

Paragraph 7.151. We believe that the proposed nesting island and 26-acre nesting area on Tybee National Wildlife Refuge have the potential to provide valuable habitat for nesting shorebirds. However, we are concerned that the proposed 2-acre crown on the nesting island will be too small. We recommend at least a 5-acre crown to provide sufficient habitat and protection from erosion. Provision also needs to be made for periodic sand nourishment to control vegetation succession and replace habitat lost to erosion. Use of dredged material to create and maintain bird nesting areas should be a higher priority than beach nourishment or berm creation.

Summary Comments

The Corps of Engineers is to be commended for preparing a comprehensive statement that attempts to address the major environmental problems associated with operation and maintenance of Savannah Harbor. The Department does not fully concur with the selected alternative, but would support the selected alternative if modified in accordance with the following changes.

(1) The mitigation plan will be further coordinated with the Service to clarify details such as disposal area water depth and draw down rates.

(2) In cooperation with the Service, a contaminant survey of disposal materials to be managed for birds will be accomplished.

(3) The crown area of the offshore bird nesting area will be increased to five (5) acres and provisions for periodic renourishment will be added.

(4) The plan to deepen the sediment basin will be deferred until current striped bass studies are complete in two years.

(5) The underdrain discharge will be monitored every three years rather than every five years.

If you have any questions pertaining to Fish and Wildlife aspects of this project, please contact Jon Andrew, Fish and Wildlife Service, at (404) 679-7123, or Mr. Ed Eudaly at (803) 727-4707. Please feel free to contact Mr. Robert Wood of the Bureau of Mines if you have any questions concerning mineral resources. Mr. Wood can be reached at (303) 236-0428, ext. 294.

Thank you for the opportunity to comment.

Sincerely,

James H. Lee

James H. Lee
Regional Environmental Officer

RESPONSE -- US Department of Interior,
Office of Environmental Policy And Compliance,
February 23, 1995.

AGITATION DREDGING. The District concurs that the proposed use of off-channel storage of sediments should reduce the amount of agitation dredging in Savannah Harbor, thereby improving fish and wildlife resources.

TESTING OF DISPOSAL AREA SEDIMENTS. The District has agreed to test sediments in the confined disposal areas which will be used in the rotational program to ensure that increased use of the sites by migratory birds would not result in adverse impacts to those species.

BENEFICIAL USE OF DREDGED MATERIAL. An evaluation is made prior to each dredging contract to determine the best location for disposal of the sediments. Three steps are generally followed in this evaluation:

(1) Identify a need for dredged sediments,
(2) Evaluate the suitability of the specific sediments to be dredged for that need,
(3) Identify sources and obtain funding for incremental costs.

The District does not anticipate conflicts to commonly occur when multiple uses for sediments obtained during a particular contract would successfully complete each of the steps listed above.

SEDIMENT BASIN DEEPENING. The District had initially concurred that construction of an advance maintenance deepening section at the Sediment Basin would not be performed until an ongoing striped bass egg and larval study was completed. However, the 3-year study which the District was conducting has been concluded. Since preliminary results from that study were inconclusive, the District recently funded an additional 1-year of effort on that study.

Using data obtained during the 3-year study as well as other available information on the species, the environmental impacts of deepening the Sediment Basin are adequately identified and evaluated in this FEIS, and delaying the decision on the acceptability of those impacts is unwarranted. The 1-year extension to the striped bass egg and larval study may provide new information on the status of striped bass in the estuary, but the evaluation contained in the FEIS of potential impacts of deepening the Sediment Basin assumes that striped bass are present in the estuary and using Back River to spawn. This is a conservative position from which to assess potential project impacts to striped bass. If adverse impacts to that species were to result from deepening the Sediment Basin, they would occur primarily from increases in salinity in Back River. The Tidegate

structure which crosses Back River acts as a sill, limiting the movement of salinity upstream of that location. Since the proposed action is the creation of a localized hole downstream of the Tidegate, the hydraulic impacts of such construction are not expected to extend upstream of that structure or increase salinity upstream of that location. Based on those physical restrictions, the proposed advance maintenance deepening of the Sediment Basin is not expected to adversely affect striped bass using Back River. Therefore, the District believes that an evaluation of potential environmental impacts of the proposed Sediment Basin deepening would not be substantively altered by waiting for the results of the extended striped bass study. The data obtained during the 1-year extension of that study could be as inconclusive as that obtained during the foundational 3 years of the study.

Although the FEIS obtains environmental clearances for the proposed advance maintenance at the Sediment Basin, authorization from higher headquarters for such construction has not yet been sought by the District. This project feature could not be implemented until such authorization has been received.

RECOVERY OF CONSTITUENTS FROM DEPOSITED SEDIMENTS. There are presently no proposals to recovery any constituents from deposited sediments. Current proposals include beneficial use of sediments through alternate placement strategies and use of bulk sediment to make construction aggregate. The EIS contains and evaluation of those proposals, as much as possible given the design information available at the time. Should proposals be made to recover specific fractions of the sediments, future environmental documents would include evaluations of those proposals when the decision being made could be affected.

Paragraph 2.08. Concur. This paragraph has been revised to state that the FWS comments are made under authority of the National Environmental Policy Act (NEPA).

Paragraph 5.08. - MITIGATION PLAN. Concur. The Mitigation Plan would be a long term, binding, management commitment. Specific water level management decisions would generally follow Table 6, but could be adjusted on a case-by-case basis if the District's biologist believed a variation would be more beneficial and concurrence was obtained from the US FWS prior to implementation. The Mitigation Plan has been revised and coordinated with the Service to clarify and/or refine specific details.

Paragraph 5.36 and 5.40. DIRECT PLACEMENT ON BEACHES. A mixture of sediments are typically encountered in all dredging contracts. The environmental evaluations conducted as part of this EIS consider a dredging contract as a whole. There would be times during a contract when more fines are encountered than the average, and times when fewer fines would be experienced. To define the sediment characteristics of small segments of a

dredging area with the goal of placing different material types in different disposal areas would not be efficient or cost effective. The time required to shift to an alternate disposal area would sometimes equal the time to dredge the volume of sediment of specific concern. This would increase the dredging unit cost to unacceptable levels. Monitoring would be performed to document the volume of sediments dredged and the volume retained on the beach. This would be compared with the physical characteristics of the dredged sediments (percent fines) to allow a better prediction of the impacts and success of future beach placement activities.

Paragraph 5.42. Concur.

Paragraph 5.46. Concur.

Paragraph 5.48. Deepening of the Sediment Basin was deferred until the foundational 3-years of the Corps striped bass studies were completed. Based on physical restrictions at the site, as well as other available information on the species, the proposed advance maintenance deepening of the Sediment Basin is not expected to adversely affect striped bass using Back River. Therefore, the District believes that an evaluation of potential environmental impacts of the proposed Sediment Basin deepening would not be substantively altered by waiting for the results of the extended striped bass study and that delaying until ongoing or yet-to-be-initiated studies concerning the disposition of the Tidegate structure are completed is not warranted.

Paragraph 5.69 (Table 5). As suggested, the proposed management techniques have been revised to add flexibility. The following sentence has been added to the Mitigation Plan: "If District biologists believe it would be beneficial to use a management technique which is different than that prescribed in Table 6, approval from the US FWS would be required prior to implementation."

Paragraph 6.31. Another paragraph has been added to include this information.

Paragraph 6.40. This paragraph has been revised as suggested.

Paragraph 6.59. This paragraph has been revised as suggested.

Paragraph 6.157. This paragraph has been revised as suggested.

Paragraph 7.34. The District agrees to perform a chemical evaluation of underdrain effluents every three years rather than every five years. The District will use the mixing zone distance specified by the SC DHEC in their Water Quality Certification.

Paragraph 7.57. This paragraph has been revised as suggested.

Paragraph 7.146. NEARSHORE NESTING ISLAND. Concur. The District expects the state of South Carolina to be the owner of the created nearshore island, since such land is claimed by the state. Restrictions to limit human access and disturbance would support the purposes for which the island would be created and maintained.

Paragraph 7.151. NEARSHORE NESTING ISLAND. The proposed nearshore island would have a 2-acre crown at EL 14 MLW. Due to the sloping sides, 11 acres are expected to be present at EL 8 MLW, the elevation above which nesting should successfully occur. The proposed Mitigation Plan also includes maintenance of both the nearshore island and upland nesting area through periodic sand nourishment and/or scraping to remove vegetation. The use of suitable dredged material for beneficial purposes will be made based on the physical site needs at the time and availability of needed funding.

SUMMARY COMMENTS. The Corps has performed, or agrees to perform the following actions:

(1) A revised Mitigation Plan has been coordinated with the FWS.

(2) Sediment testing would be performed of surface material at the confined disposal areas to be managed for birds.

(3) While the island crown at the proposed nearshore bird island would be two acres, the area above high water available for nesting would be eleven acres. Periodic maintenance through placement of additional dredged material and/or scraping of vegetation are included.

(4) The striped bass study which the Corps was conducting has been extended and the evaluation contained in the FEIS of potential impacts of deepening the Sediment Basin identified no substantive adverse impact on that species. Therefore, the Corps believes that delaying a decision on the acceptability of such deepening until the extended Corps striped bass study is complete is not warranted.

(5) Underdrain discharges would be chemically evaluated every three years.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
P.O. Box 12559
217 Fort Johnson Road
Charleston, South Carolina 29422-2559

November 29, 1995

Colonel Grant M. Smith
District Engineer
U.S. Army Corps of Engineers
Post Office Box 889
Savannah, Georgia 31402-0889

Dear Colonel Smith:

Please reference the revised draft Mitigation Plan for Diking and Use of Disposal Area 14A provided to our office from Mr. Bill Bailey of your staff. The mitigation plan was revised by the Corps based on concerns and recommendations provided by various resource agencies. The revised mitigation plan will become part of the Long Term Management strategy Study for Savannah Harbor, Chatham County, Georgia and Jasper County South Carolina. The Fish and Wildlife Service (Service) has reviewed the revised mitigation plan and offers the following comments.

The revised mitigation plan is generally acceptable to the Fish and Wildlife Service. However, we have some specific comments and concerns on the revised plan. The following comments are referenced to paragraph designations used in the revised mitigation plan.

Paragraph G.2.26. We are pleased that the Corps has agreed to perform contaminant sampling in the disposal areas and agree that most sampling should be performed on soil material within one foot of the surface. We recommend that a limited number of water samples also be tested. Some shorebirds use water carried by the breast feathers to cool eggs during incubation and this is a potential source of fetal bird contamination.

Paragraph G.3.07 b. If the nesting mounds are located near the dikes they need to be surrounded by water or mud during the nesting season. We recommend that you determine the location of the mounds in consultation with the Fish and Wildlife Service.

Paragraph G.3.07 d. We concur with the plan to have the South Carolina Office of Coastal Resource Management (OCRM) implement restoration or creation of a minimum of 25 acres of tidal wetlands in South Carolina. We recommend that OCRM coordinate the restoration or

creation plans with interested resource agencies (Service, National Marine Fisheries Service, South Carolina Department of Natural Resources) as the plans become available.

Paragraph G.3.07e. We concur with the plan to add a water control structure on the 228 acre impoundment at Savannah National Wildlife Refuge. The structure will improve water circulation through the impoundment and enhance fish habitat.

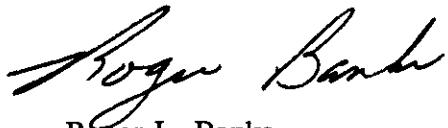
Paragraph G.4.01. Part of this section discusses the creation of the near shore bird nesting island and states that benthic surveys will be conducted on the site prior to construction. Part or all of the proposed bird nesting island site may be located within unit SC-10P of the Coastal Barrier Resources System. Therefore, a determination is needed from the Service that the project is consistent with purposes of the Coastal Barrier Improvement Act (CBIA). Our preliminary determination is that the project, as a conservation measure for the enhancement of wildlife habitat, would be an exception to the act, and would be consistent with purposes of the CBIA. When benthic surveys are completed and the project design is finalized the Corps should consult with the Service for our final determination.

Paragraph G.4.05. The revised plan states that, because beneficial migratory bird impacts of the plan will outweigh any negative impacts on these birds, that the plan would be in compliance with the Migratory Bird Treaty Act (MBTA) and that no further clearances would be necessary to implement the actions described in the plan. We concur that the mitigation plan, as proposed, is in compliance with the MBTA. However, this concurrence does not extend to specific management or disposal actions that may be implemented in accordance with the plan. Issuance of blanket permission to take birds, nests or eggs under the MBTA would not be appropriate. If a potential take situation develops during use of the disposal areas, the Service will work closely with the Corps to obtain any needed permits under the MBTA. We recommend that you coordinate, on a continuing basis, management of the disposal areas with the Service to avoid any unnecessary delays.

Based on the biological assessment of threatened and endangered species (BATES) provided by the Savannah District in February 1994, we will concur with your determination that the project is not likely to adversely affect the species listed in your BATES which are under our jurisdiction. In view of this, we believe that the requirements of Section 7 of the Endangered Species Act have been satisfied with regard to these species. However, obligations under Section 7 of the Act must be reconsidered if (1) new information reveals impacts of this identified action that may affect listed species or critical habitat in a manner not previously considered, (2) this action is subsequently modified in a manner which was not considered in this assessment, or (3) a new species is listed or critical habitat determined that may be affected by the identified action. Further consultation under the Endangered Species Act may be necessary if significant levels of contaminants are found in the disposal areas. We will review the planned contaminant test data, when available, and advise you as to any potential impacts to threatened or endangered species.

We appreciate the cooperation of your staff during planning efforts for the Long Term Management Strategy Study. We request that you continue close coordination with the Service throughout development of detailed construction and management plans, contracting and construction.

Sincerely yours,



Roger L. Banks
Field Supervisor

RLB/EE/km

cc:
Savannah Coastal Refuge, Savannah, GA (John Robinette)
NMFS, Charleston, SC (David Rackley)
SCDNR, Charleston, SC (Ed Duncan)
OCRM, Charleston, SC (Rob Mikell)

RESPONSE -- US Department of Interior,
Ecological Services Office,
November 29, 1995.

ACCEPTABILITY OF REVISED MITIGATION PLAN. Concur.

Paragraph G.2.26. CONTAMINANT TESTING. Concur.

Paragraph G.3.07b. NESTING MOUNDS. Concur.

Paragraph G.3.07d. SC DHEC-OCRM IMPLEMENTATION OF WETLAND RESTORATION. Concur.

Paragraph G.3.07e. WATER CONTROL STRUCTURE. Concur.

Paragraph G.4.01. NEARSHORE BIRD ISLAND. Coordination between the District and the FWS after this letter has resulted in clarification that the proposed location of the nearshore bird island is not under the oversight of the FWS under the Coastal Barrier Improvement Act. Instead, control of that area rests with the State of South Carolina as it is (1) adjacent to a state wildlife management area, and (2) in subtidal coastal waters within the three-mile state jurisdiction line.

Paragraph G.4.05. COMPLIANCE WITH THE MIGRATORY BIRD TREATY ACT. The District concurs that the Mitigation Plan is in compliance with the Migratory Bird Treaty Act (MBTA). Subsequent to this letter, the District has written to the FWS Regional Office in Atlanta which administers permitting for incidental takes of migratory birds to further discuss this issue. The District continues to believe that the large-scale valuable benefits for migratory birds which biologists uniformly expect to be produced through implementation of the Mitigation Plan should outweigh the take of a limited number of individuals which may occur as a result of scheduled disposal operations.

IMPACT TO THREATENED AND ENDANGERED SPECIES. The District concurs that the project is not likely to adversely impact these species.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
9721 Executive Center Drive N.
St. Petersburg, Florida 33702

January 13, 1995

Colonel Wayne W. Boy
District Engineer, Savannah District
Department of the Army, Corps of Engineers
P.O. Box 889
Savannah, Georgia 31402-0889

Dear Colonel Boy:

The National Marine Fisheries Service (NMFS) has reviewed the Draft Environmental Impact Statement (DEIS) for the Savannah Harbor Long Term Management Strategy (LTMS) Study. The DEIS was conveyed by cover letter dated November 20, 1994, from Mr. M.J. Yuschishin of your staff and is advertised by a November 30, 1994, unnumbered Public Notice.

Overall, we find that the document is well written and parts of the proposed mitigation are good. Unfortunately, several significant deficiencies exist in the analysis and data presented as well as parts of the mitigation package. Key components of the project for which the environmental consequences are insufficiently documented and remediation is insufficient include the conversion and elimination of shallow water habitat for building the "bird island" and creating nearshore berms near the entrance channel. The NMFS also believes that the planned mitigation for eliminating 260 acres of estuarine habitat is inadequate because it does not address the loss of living marine resource habitat and functions that will result from enclosing Disposal Site 14A.

The shallow depth and relatively protected nature of submerged bottoms near the proposed "bird island" are characteristic of areas suitable for colonization by invertebrates and demersal fish that are of ecological, recreational, and commercial importance. Because of this, confirmation is needed on the status of the benthos and whether the area can be filled without harm to important living marine resources. Confirmation is possible through analysis of recent sample data from the site, if available, or through a specific sampling effort. Creation of the nearshore berms is also of concern. Recent investigations in other areas of the South Atlantic show that bottom configuration and currents in the immediate seaward zone of ocean inlets are major determinants for ingress, into estuarine waters, of planktonic fish and invertebrates that are spawned offshore. Consequently, the modification of nearshore currents through berm creation could affect finfish and shellfish abundance.

The elimination of agitation dredging, as proposed in conjunction with the selected alternative, could have a substantial net benefit with regard to protection of living marine resources. The study results presented in the DEIS pertaining to the environmental consequences of agitation dredging, are inconclusive in that they examined only a fraction of the total amount of agitation dredging occurring in Savannah Harbor. For example, the EMC study cited in the DEIS examined the effects of resuspending less than 14,000 cubic yards of material, yet annual dispersion of over one million cubic yards of material was authorized for work proposed by the Georgia Ports Authority and other dock operators. The NMFS has consistently maintained that the cumulative effect of annually resuspending and redepositing in excess of one million cubic yards of bottom sediments has not been determined and could be adverse. Accordingly, we conclude that the benefits related to this aspect of the project may be understated in the DEIS.

In the absence of full disclosure of impacts associated with filling submerged bottoms and constructing offshore berms; and in the absence of suitable mitigation for eliminating 260 acres of estuarine emergent, scrub, and submerged bottoms resulting from diking Disposal Site 14A, the DEIS is seriously inadequate. More importantly, the undescribed impacts are potentially significant in their effect on the long-term health and survival of living marine resources that utilize the project area. The NMFS believes strongly that these deficiencies warrant remedy through preparation of a supplemental DEIS. Absent suitable disclosure of impacts associated with these aspects of the project, construction should not be implemented.

Specific Comments:

1.00 Areas of Controversy

Page 9, para. 1.27. This section should be modified to note that the mitigation plan provides no replacement for wetland functions that are of benefit to living marine resources.

2.00 Need for and Objectives of Action

Page 12, Section 2.08. This section should be modified to include the National Marine Fisheries Service and the heads of the state fish and wildlife agencies for South Carolina and Georgia as contact points for coordination required under the Fish and Wildlife Coordination Act.

Page 17, Section 2.23. As noted in the preceding general comments, studies on the effects of agitation dredging were extremely limited in scope and did not examine the effects of the large-scale maintenance dredging that actually occurs in Savannah Harbor. This section should be modified to state that the studies were extremely limited when compared to the total amount of agitation dredging that actually occurs and that the effect of this dredging is undetermined and potentially significant and adverse.

5.00 Alternatives

Page 56, Section 5.08. This section should be modified to note that the mitigation plan provides no replacement for wetland functions that benefit living marine resources. The planned mitigation should be highly beneficial to birds and possibly sea turtles if the proposed "bird island" is relatively stable and suitable for use as a nesting site for sea turtles.

Pages 56 and 57, Section 5.09. The NMFS should be contacted with regard to development of a mitigation plan for wetland losses in Disposal Area 2A. A plan to offset wetland losses using a 2:1 (minimum) replacement to loss rate and in-kind replacement should be evaluated.

Page 71, Section 5.27. Evidence of the determination that variation in bottom contours will increase the habitat value of the site is needed. It is also possible that modification of bottom contours could affect local currents that affect ingress of sub-adult fish through the inlet and into estuarine waters. In this regard, hydrographic studies are needed to determine probable effects of the proposed berms.

Pages 90 and 91, Section 5.69. This section should be modified to include mitigation for lost wetland functions beneficial to living marine resources. The determination that such mitigation is too costly to allow remediation is unacceptable. At a minimum, off-site but in-kind habitat replacement should be provided. The NMFS should be added to the list of agencies to be consulted regarding wetland mitigation for "other wetland impacts."

7.00 Environmental Consequences

Page 169, Section 7.56; Page 171, Section 7.59. The determination that the numbers of fish entrained through dredges "has no measurable impact on population levels" needs documentation and further explanation with regard to the meaning of "population." No measurable impact on certain populations could represent a significant number of organisms. This also fails to address the affect of such take on endangered species such as the shortnose sturgeon.

Pages 175 and 176, Section 7.73. The absence of suitable mitigation sites in the immediate vicinity of Disposal Site 14A does not preclude responsibility for offsetting the loss of fishery resource functions and benefits provided by the 280 acres of wetlands to be filled. Creation or restoration of estuarine emergent wetlands at other locations is acceptable and should be implemented.

Page 178, Section 7.81. Although creation of an island for use by colonial nesting waterbirds and other avian species could be environmentally innocuous, the shallow water and protected nature of the site are indicative of locations that support diverse and highly productive benthic communities. Consequently, a survey of the existing benthic community is needed before it can be concluded that this aspect of the project can be undertaken without causing further environmental damage. Eliminating or converting one habitat to create another is usually unacceptable except in situations where the functional value of the affected site for desirable flora and fauna is exceptionally low.

Page 198, Section 7.106. This section should be modified to state that wetland functions of significant benefit to living marine resources will be lost if Disposal Site 14A is diked and filled; especially if a similar quality and amount of in-kind habitat is not created or restored.

Page 210, Section 7.138. Significant differences may exist in the substrate and depth of submerged bottoms that would be filled versus those created along the edges of the bird island. Consequently, the newly established benthos may differ from that presently found on site. While this change would be insignificant if the existing benthos is ecologically unimportant, the status of the existing benthos must be determined before the environmental effects are known. Accordingly, and as previously stated, a survey is needed of the benthos inhabiting submerged bottoms to be filled.

Page 217, Section 7.153. The disposal of dredged material in the nearshore zone could have a substantial effect on larval fish and invertebrates. This area is an important staging site for larval organisms that must traverse the inlet to reach estuarine waters where development and maturation takes place. This section should be modified to acknowledge the importance of nearshore areas in the vicinity of ocean inlets as locations where subadult fish and invertebrates congregate. It should also be noted that activities causing significant elevation of turbidity levels and modification of local currents could adversely affect recruitment of aquatic organisms into estuarine waters.

Pages 217 and 218, Section 7.154. Plans to conduct side-scan sonar surveys to confirm the presence or absence of hard bottoms is highly desirable and should be implemented. As noted previously, the status of soft bottom infauna and epifauna should also be determined in the vicinity of the proposed bird island. We question the determination that the proposed berms will stabilize the ocean shoreline enough to increase the stability of benthic communities occupying this zone. Documentation is needed.

Page 218, Section 7.156. The assertion that the berms will increase fishery habitat values should be documented.

8.00 Public Involvement

Page 239, Section 8.01. Delete "U.S." from in front of National Marine Fisheries Service.

Appendix C

Page 10, Section C.2.44. The decision to deposit dredged materials in the nearshore environment in early winter is based on the fact that overall biological activity is relatively low during this period. As noted previously, waters near ocean inlets are important staging sites for estuarine-dependent organisms that are spawned offshore. Since spawning of many of these species occurs in early winter, the assumption that disposal during this time of year is desirable may not be valid. To address this, we recommend that the Savannah District examine relevant

literature or data regarding larval migration into Georgia estuaries. In the absence of this information, investigations (sampling) should be performed to determine the occurrence and abundance of sub-adult fish and invertebrates during disposal operations.

Page 11, Section C.2.46. The assessment provided is essentially a "best case" scenario. Since the composition of the benthos is unknown, it cannot be assumed that lasting changes in the benthic community will not occur. Considering the size of the disposal area and volume of material to be deposited, we also question the determination that burrowing organisms "should survive." As noted previously, a benthic survey is needed before the effects of filling the area are known.

Pages 13 and 14, Sections C.2.56 and C.2.57. All previous comments pertaining to effects on plankton (sub-adult fish and invertebrates) and benthos apply. As presented, the analysis is flawed since the determination that the work will not significantly and adversely affect those resources is unsubstantiated.

Pages 14, Section C.2.60. This section states that separate mitigation ("restoration and creation of saltwater wetlands") would be performed in the Savannah Harbor area to offset wetland losses other than those associated with diking and filling Disposal Site 14A. Assuming that "saltwater wetlands" are estuarine intertidal emergent wetlands, we support this concept and encourage similar action for wetland losses associated with Disposal Site 14A. As previously noted, we acknowledge the limited availability of wetland creation and restoration sites in the vicinity of Disposal Site 14A. This, however, does not preclude the use of other locations. The detailed mitigation plan to be submitted in for this aspect of the project also should be coordinated with the NMFS.

Appendix G.

Page 3, Section G.2.08. Explanation should be given for the apparent discrepancy or differences with respect to the effect of filling shallow water habitat for creation of bird habitat and marsh. Specifically, how was it determined that filling submerged estuarine bottom for marsh creation is unacceptable, yet filling to create bird habitat is acceptable.

Pages 3 and 4, Sections G.2.09 and G.2.10. The NMFS was not consulted regarding determination of functional values associated with Disposal Site 14A. We do not support the apparent determination that the site is unimportant and essentially valueless with regard to fishery resource functions. We also question the determination that the 260 acres of wetlands found on the site are unimportant as sites for floodwater storage since this area is subject to inundation by flood waters. As previously noted, consideration of mitigation options such as offsite marsh creation is needed. Another possible mitigation alternative is creation of oyster reefs in locations that are void of important benthic communities.

Finally, in accordance with the Endangered Species Act of 1973, as amended, it is the responsibility of the appropriate federal regulatory agency to review its activities and programs and to identify any activity or programs that may affect endangered or threatened species or their habitat. If it is determined that these activities may adversely affect any species listed as endangered or threatened, formal consultation with our Protected Species Management Branch must be initiated. The appropriate contact person for matters pertaining to protected species is Mr. Charles Oravetz who may be contacted at the letterhead address or at (813) 570-5312. Mr. David Rackley of our Charleston Branch Office should be contacted regarding technical aspects of the comments we have provided. He is also prepared to assist the Savannah District in efforts to develop a mitigation plan for lost fishery functions and values associated with the project.

We appreciate the opportunity to provide these comments.

Sincerely,

Andreas Mager, Jr.
Assistant Regional Director
Habitat Conservation Division

RESPONSE -- NOAA, National Marine Fisheries Service,
Southeast Regional Office,
Habitat Conservation Division,
January 13, 1995.

GENERAL COMMENTS:

1. A revised Mitigation Plan was prepared and provided to the NMFS for review. The District met with the NMFS and other resource agencies on July 11, 1995 to discuss the revised Plan. At that meeting, the NMFS stated they felt some form of mitigation specifically for fishery resources was required. The Final Mitigation Plan includes two actions which enhance fishery habitat at 228 acres. The District believes this adequately compensates for the wetland functional values related to fishery resources which would be lost as a result of project implementation.

2. A side scan sonar investigation and benthic survey will be performed at all new nearshore areas prior to initial placement of dredged material to ensure that significant impact will not occur to important living marine resources.

3. Savannah District recognizes the possibility of adversely modifying nearshore currents through berm or island creation. That possibility formed the basis of the location and design criteria for those proposed nearshore structures. The bird island was sited in shallow water between two deeper channels which allow tidal exchange to marshes north and south of Turtle Island. The footprint of the island would not extend into the channels, so we do not expect the island to interfere with flows through those creeks. The underwater berms would be oriented at a sharp angle to the channel, rather than parallel, to minimize changes to flood tides approaching the channel. The 2,000-foot spacing between berms was specified to further reduce impacts to tidal currents. The District believes these design criteria ensure that finfish and shellfish abundance would not be adversely impacted by changes in nearshore currents resulting from the proposed actions.

4. Agitation dredging is not proposed for elimination in the Management Plan or this EIS. The EIS does recognize that the double handling of sediments caused by the initial agitation dredging at a berth and the subsequent hydraulic dredging from the channel results in more environmental impacts than does direct placement of berth sediments into a confined disposal facility.

5. This Final EIS contains a revised Mitigation Plan which was substantially provided to the NMFS in July 1995 for review. The NMFS provided verbal comments on that revision related to adding some component to mitigate specifically for fishery resources. The District subsequently included actions in the Mitigation Plan to more clearly compensate for impacts to fishery resources. With the final Mitigation Plan and other minor changes and clarifications made to the EIS, Savannah District believes that the Final EIS adequately documents the impacts associated with the proposed actions and that preparation of a supplemental Draft EIS is not warranted.

SPECIFIC COMMENTS:

1.00 Areas of Controversy

Page 9. para. 1.27. The revised Mitigation Plan has a component -- restoration/creation/protection of 25 acres of tidal marsh in South Carolina -- which would ensure the continued protection of an acreage of Spartina marsh, thereby benefiting living marine resources. Mitigation for adverse impacts to Georgia wetlands would be provided through restoration/creation of wetlands in the harbor area at a 2:1 ratio.

2.00 Need for and Objectives of Action

Page 12, Section 2.08. This section has been modified to include the state fish and wildlife agencies for South Carolina and Georgia as contact points for coordination required under the Fish and Wildlife Coordination Act.

Page 17, Section 2.23. Savannah District believes that the studies of agitation dredging adequately examined the impacts of those dredging events.

5.00 Alternatives

Page 56, Section 5.08. The revised Mitigation Plan has a component -- the restoration/creation/protection of 25 acres of tidal marsh in South Carolina -- which would ensure the continued protection of an acreage of Spartina marsh, thereby benefiting living marine resources. Another component of the Mitigation Plan -- the water control structure at the Savannah National Wildlife Refuge -- was included to provide benefits to fishery resources. The proposed "bird island" is expected to be relatively stable and suitable for use as a nesting site for sea turtles.

Pages 56 and 57, Section 5.09. The Mitigation Plan for wetland losses in Georgia will use a 2:1 (minimum) replacement ratio and in-kind replacement (marsh creation/restoration). The Mitigation Plan will be coordinated with the NMFS.

Page 71, Section 5.27. Data recently gathered in Mobile Harbor on submerged berms constructed by the Corps revealed higher densities of fish around the berms than at adjacent ocean sites. The structures proposed for the nearshore environment are designed to minimize effects on tidal currents and, thereby, effects on the ingress of sub-adult fish through the inlet and into estuarine waters. The District believes that hydrographic studies would not provide additional information on the likely effects of the proposed berms.

Pages 90 and 91, Section 5.69. Resource agencies, including the NMFS, were reconsulted to identify sites within the project area which could be used for wetland restoration/creation purposes. As before, no sites of sufficient size could be identified at this time. Funds will be placed in escrow for the SC OCRM to restore/create protect 25 acres of tidal wetlands as in-kind mitigation.

7.00 Environmental Consequences

Page 169, Section 7.56: Page 171, Section 7.59. The statement that fish entrainment through dredges has no measurable impact on population levels was taken from information contained in Technical Report D-91-1 published in July 1991 by the Waterways Experiment Station titled "A Framework For Assessing The Need For Seasonal Restrictions On Dredging And Disposal Operations." The District has not previously observed, nor do we anticipate future dredging will produce a measurable impact on either fish populations or significant numbers of individual fish. The District is aware of no known documented adverse impact of dredging in Savannah Harbor on Shortnose sturgeon. Impacts to endangered species are described in more detail in Appendix B BIOLOGICAL ASSESSMENT OF THREATENED AND ENDANGERED SPECIES (BATES).

Pages 175 and 176, Section 7.73. The revised Mitigation Plan includes two components -- the 25 acres of in-kind mitigation administered by the SC OCRM and the water control structure for the 228-acre impoundment at the Savannah National Wildlife Refuge -- which would benefit fishery and other living marine resources.

Page 178, Section 7.81. A side scan sonar investigation and a benthic survey would be conducted at all new nearshore areas prior to placement of dredged material to ensure that hard-bottom communities or other highly productive and ecologically valuable benthic communities are not eliminated.

Page 198, Section 7.106. The EIS has been revised as suggested.

Page 210, Section 7.138. A side scan sonar investigation and a benthic survey would be conducted at all new nearshore areas prior to initial placement of dredged material to ensure that hard-bottom communities or other highly productive and ecologically valuable benthic communities are not eliminated.

Page 217, Section 7.153. Concur.

Pages 217 and 218, Section 7.154. Concur, a benthic survey would be conducted at all new nearshore areas prior to initial placement of dredged material to ensure that highly productive and ecologically valuable benthic communities are not eliminated. Any decrease in the wave climate at the ocean shoreline would stabilize the benthic communities residing at the shorelines to some degree.

Page 218, Section 7.156. Data recently gathered in Mobile Harbor on submerged berms constructed by the Corps revealed higher densities of fish around the berms than at adjacent ocean sites. The berms provided a variation in bottom contours that was not present in the immediate vicinity. Such should be the case with the proposed berms in the nearshore area off Tybee Island.

8.00 Public Involvement

Page 239, Section 8.01. Concur.

Appendix C

Page 10, Section C.2.44. Sediments are presently dredged from the Bar Channel during the winter and deposited at the Savannah ODMDS. The District believes that deposition in shallower nearshore waters, which are naturally turbid, would not create conditions which would cause significant impacts to the movement of estuarine-dependent organisms that are spawned offshore. Therefore, the District believes that investigations (sampling) to document the occurrence and abundance of sub-adult fish and invertebrates during disposal operations is not warranted.

Page 11. Section C.2.46. Neither the Corps nor resource agencies are aware of any hard-bottom communities existing in the nearshore areas proposed for deposition. However, a side-scan sonar investigation and a benthic survey would be conducted at all new nearshore areas prior to initial placement of dredged material to ensure that highly productive and ecologically valuable benthic communities are not eliminated.

Pages 13 and 14, Sections C.2.56 and C.2.57. The District continues to believe that the proposed work will not significantly and adversely affect benthic resources. That determination is based on a "reason to believe" rather than being "proven" through documentation and evaluation of previous actions at the same location. The District is aware of no information which indicates either (1) that unique or sensitive benthic resources are present in the potential impact area, or (2) that impacts likely to occur from open-water placement would significantly affect those resources beyond the local and temporary levels. Neither the Corps nor Georgia Department of Natural Resources is aware of any hard-bottom communities existing in the nearshore areas proposed for deposition. However, a side-scan sonar investigation and a benthic survey would be conducted at all new nearshore areas prior to initial placement of dredged material to ensure that highly productive and ecologically valuable benthic communities are not eliminated.

Pages 14, Section C.2.60. Resource agencies, including the NMFS, were reconsulted to identify sites within the project area which could be used for wetland restoration/creation purposes. As before, no sites of sufficient size could be identified in the project vicinity. The SC OCRM will restore/create/protect 25 acres of tidal wetlands as in-kind mitigation.

Appendix G

Page 3. Section G.2.08. Creation of an isolated island in the nearshore area would establish a habitat that is very rare in the project vicinity. Such habitat would be valuable for migratory birds, threatened and endangered species (piping plover and loggerhead sea turtles, and resident shorebirds. The US FWS and State resource agencies agreed that filling submerged estuarine bottom to create such habitat was desirable.

Pages 3 and 4. Sections G.2.09 and G.2.10. The NMFS was informed by the Corps and the US FWS of the plans the District was developing to mitigate for losses which would occur when Disposal Area 14A is used. The revised Mitigation Plan has two components -- the 25 acres of restoration/creation/protection of tidal wetlands to be administered by the SC OCRM and the water control structure for the 228-acre impoundment at the Savannah National Wildlife Refuge -- which would benefit fishery and other living marine resources.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
9721 Executive Center Drive N.
St. Petersburg, Florida 33702

October 18, 1995

Colonel Grant M. Smith
District Engineer, Savannah District
Department of the Army, Corps of Engineers
P.O. Box 889
Savannah, Georgia 31402-0889

Dear Colonel Smith:

The National Marine Fisheries Service (NMFS) has reviewed the revised draft Mitigation Plan for Diking and Use of Disposal Area 14A (Plan). The Plan was provided to our Charleston Branch Office via facsimile dated September 25, 1995, from Mr. Bill Bailey of your staff. When finalized, it will become a component of the Savannah District's Long Term Maintenance Strategy Study for Lower Savannah Harbor, Chatham County, Georgia and Jasper County, South Carolina.

The Plan adequately addresses issues raised by the NMFS for mitigating adverse impacts to living marine resources. If implemented, fishery-related provisions would result in restoration of periodic (daily) tidal flow within a 228-acre impoundment located on the Savannah National Wildlife Refuge. The impoundment is presently managed so that periodic hydrologic connections with adjacent tidal waters are largely non-existent. Water management is limited to operation of a single control structure and management includes occasional flooding of impounded wetlands, extended water retention, and limited or complete drawdown prior to reflooding. Under the proposed plan of action, a second water control structure would be added and this structure would be operated to allow daily tidal exchange.

As discussed with Mr. Bailey, the Plan has considerable merit and its suitability for mitigation purposes will depend on the design and operation of the new water control structure. Accordingly, we are in general agreement with the proposed action. However, agreement regarding its technical and operational components are needed for conclusive determination that adverse impacts involving our trust resources will be sufficiently offset. In this regard, and in consideration of the fast track for completion of the Final Environmental Impact Statement for the project, I encourage prompt agreement on these key issues. To attain this, I request that the Savannah District initiate timely dialogue with my Charleston Branch Office, the U.S. Fish and Wildlife Service, and representatives from the South Carolina and Georgia natural resource agencies. With satisfactory progress, we can support the Savannah District's positive assessment regarding project related-fishery impacts.

With regard to other fishery-related components of the Plan, we are withholding judgement concerning proposed establishment of an escrow account to be used for tidal wetland restoration in South Carolina. Based on a cursory discussion with South Carolina Department of Health and Environmental Control personnel, it appears that general agreement regarding this matter has been reached and we look forward to reviewing the details of this agreement. We also maintain our desire to coordinate with Georgia State Ports Authority (GASPA) concerning possible fishery enhancement efforts in conjunction with shoreline stabilization work in the vicinity of existing disposal sites. This matter was discussed in considerable detail at a recent project meeting which included the GASPA and State and Federal agency representatives.

We appreciate the excellent work by your by your staff in addressing matters pertaining to fishery resource conservation. Please direct related questions or comments to the attention of David Rackley at our Charleston Branch Office. He may be reached at (803) 762-8574.

Sincerely,

Andreas Mager, Jr.
Assistant Regional Director
Habitat Conservation Division

RESPONSE -- NOAA, National Marine Fisheries Service,
Southeast Regional Office,
Habitat Conservation Division,
October 18, 1995.

ACCEPTABILITY OF REVISED MITIGATION PLAN. The District concurs that the revised Plan adequately addresses adverse impacts to marine resources.

ESCROW ACCOUNT FOR TIDAL WETLAND RESTORATION. The District will provide the NMFS with a copy of the agreement with the SC DHEC-OCRM for review when it is available.

SHORELINE STABILIZATION WORK. The District will coordinate with the NMFS when designs have been prepared for proposed shoreline stabilization work along the dike on Jones/Oysterbed Island.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
9721 Executive Center Drive
St. Petersburg, FL 33702

AUG 2 3 1995

F/SEO13:JEB

Mr. William Bailey
Savannah District
U.S. Army Corps of Engineers
P. O. Box 889, Attn: CESAS-PD-EI
Savannah, GA 31402-0889

Dear Mr. Bailey:

This responds to your request for comments on the November 1994 draft environmental impact statement (DEIS) for the Savannah Harbor Long Term Management Study. You also requested that the National Marine Fisheries Service concur with your determination that the long term management plan would not adversely affect threatened or endangered species under our jurisdiction. A biological assessment (BA), in the form of the DEIS was submitted pursuant to Section 7 of the Endangered Species Act of 1993 (ESA).

We have reviewed the BA and the information on pipeline dredge suction field strength supplied in your July 26, 1995 facsimile transmission. We concur with your determination that populations of threatened or endangered species under our purview would not be adversely affected by the proposed action. This concurrence assumes that the Corps of Engineers will carry out activities in accordance with the existing biological opinion addressing dredging activities along the southeast coast of the United States and any other applicable biological opinions that may be issued in the future.

This concludes consultation responsibilities under Section 7 of the ESA. However, consultation should be reinitiated if new information reveals impacts of the identified activity that may affect listed species or their critical habitat, a new species is listed, the identified activity is subsequently modified, or critical habitat is determined that may be affected by the proposed activity.

If you have any questions please contact Jeffrey Brown, Fishery Biologist, at (813) 570-5312.

Sincerely,

Andrew J. Kemmerer
Regional Director

cc: F/PR8
F/SEO2

RESPONSE -- NOAA, National Marine Fisheries Service,
Southeast Regional Office,
Protected Species Management Branch,
August 23, 1995.

No response necessary to NMFS concurrence with Savannah District's determination that the proposed LTMS actions would not adversely affect threatened or endangered species under the jurisdiction of the NMFS.

South Carolina
DHEC
Department of Health and Environmental Control

4130 Faber Place, Suite 300
Charleston, SC 29405

Office of Ocean and Coastal Resource Management
H. Wayne Beam, Ph.D., Deputy Commissioner *Christopher L. Brooks, Assistant Deputy Commissioner*

(803) 744-5838 ***(803) 744-5847***

January 20, 1995

Mr. Myron J. Yuschishin
Chief, Planning Division
U. S. Army Corps of Engineers
Savannah District
Post Office Box 889
Savannah, Georgia 31402-0889

Dear Mr. Yuschishin:

This letter is written in response to your request for consistency determination regarding the proposed Savannah Harbor Long Term Maintenance Strategy (LTMS). Under the Authority of 15:CFR 930.39, the staff of the Office of Ocean and Coastal Resource Management (OCRM) has received the document and determined that it is not consistent with the South Carolina Coastal Zone Management Program. The strategy does make several improvements which are needed; and while the OCRM applauds the District's efforts to resolve these issues, we continue to have problems with several of the plan's recommendations. We approve of the comprehensive planning methods that have been used to prepare the study and think that the plan well documents the problems and proposes some good solutions for the management of the harbor. There are specifically several individual elements which are not consistent with our management program. These could be made consistent with the provision of additional information or revising the management considerations listed in the study. These items are:

A) The mitigation plan submitted for the diking of area 14A is inadequate, as proposed. In 1982 the S.C. Coastal Council designated a line where the dike could be placed. However, the final construction design and permitting issues were not resolved at that time. The LTMS does not adequately address the wetland habitat resources and functional values that will be lost by this diking. While the Council has approved an alignment, this mitigation issue must be addressed. The report fully describes a wetland creation mitigation package for area 2A but fails to recognize or replace wetlands lost in the constructing and the diking of area 14A . Instead, the plan proposes as mitigation a wildlife management scheme for all of the dike disposal areas. Partial mitigation credit for wildlife management activities can be awarded; however, the acreage of wetlands lost by the dike must be replaced by a form of mitigation approved by the OCRM. In 1993 the OCRM (formerly the S. C. Coastal Council) amended the Coastal Zone Management

Program to specify acceptable forms of mitigation and the procedures for constructing these mitigation efforts. The mitigation plan does not meet these requirements. (A copy of these regulations is provided.)

B) The creation of an offshore bird island as a mitigation measure is at this time inconsistent with the Coastal Zone Management Program. The OCRM might be able to approve creation of this type of habitat if a need is documented by the U. S. Fish and Wildlife Service and the S.C. Department of Natural Resources based upon the thorough and complete evaluation. This finding of need must be fully documented and the island sized to accommodate the affected wildlife population, and only large enough to accommodate that population. Replacement of one type of habitat (uplands) for another (open water bottoms) must be thoroughly considered and evaluated when a project is designed. The S. C. Coastal Zone Management Program policies concerning dredged material disposal presently discourage the use of open water spoil disposal. Those policies are listed below:

"VIII. Dredging

B. Dredged Material Disposal

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2) In critical areas of the coastal zone, it is Council policy that:

a) Upland disposal of dredged material should always be sought in preference to disposal in wetlands. Where upland disposal is not possible, areas of relatively low productivity above mean high water mark should be utilized. Highly productive wetland areas or bottoms situated below the mean high water mark should not be utilized for disposal of dredged materials when other alternatives exist;

b) Open water and deep water disposal should be considered as an alternative if highland alternatives are not feasible. However, open and deep water disposal sites should be seriously considered only after careful consultation with the Council and other relevant State and Federal agencies;

c) Toxic and highly organic materials should be disposed of in highland areas behind impervious dikes;

d) Dikes surrounding disposal areas should be shaped and vegetated immediately to minimize erosion, with outfalls positioned to empty into non-wetland areas;

e) Future disposal sites shall be reviewed on a case-by-case basis;

f) Existing disposal areas should be utilized to the fullest extent possible; this utilization would include raising the height of the embankment to increase the holding capacity of the disposal area;

g) In evaluating potential sites for dredged material disposal, attention must be given to possible adverse impacts on public health

and welfare as well as on critical fish and wildlife areas such as endangered species habitats, waterfowl wintering areas, and shellfish harvesting areas." [R. 30-12(l)]

The Council also recommends that the following policies be considered in planning for dredged material disposal:

a) Consideration for future maintenance of the spoil area, for example, development of spoil islands which have been found to be beneficial for terrestrial habitat and migratory waterfowl.

b) Abandoned sand or gravel pits in proximity to a dredge site, where spoil can be more adequately contained, should be used for disposal areas."

(S.C. Coastal Management Program, p. III-57)

C) With regard to the relocation of the underdrains to the Savannah/Back River side of the disposal areas, the OCRM supports this action. However, the report states that a mixing zone will be used to dilute levels of arsenic which do not meet South Carolina water quality standards. While South Carolina standards allow mixing zones, there must be a demonstration of no adverse effects on existing water uses. Because, in this situation, arsenic violates the human health standard which is based on the consumption of aquatic organisms, we recommend that the level of arsenic be reduced inside of the disposal site before release.

D) The report also notes that dissolved oxygen (D. O.) levels can be a problem, particularly in small creeks. As noted in the report many of the outfalls from the spoil areas do discharge into small creeks. The report proposes monitoring and management measures as a solution to this problem. We feel management measures are a solution but feel that the use of monitoring should be used to determine if a release should be allowed rather than use a weekly monitoring report to determine if the discharge should be allowed to continue. A release should not be allowed to begin if D. O. readings are below state water quality standards. The plan should be amended to reflect this management procedure.

E) The OCRM supports the efforts by the District to reduce the agitation dredging from the waters adjacent to private piers. However, we feel that with the provision of hydraulic dredging and disposal in the dike-contained areas, the practice of allowing agitation dredging should be completely prohibited. Several previous studies cited in the LTMS have documented D. O., turbidity and other problems with agitation dredging. It has long been our stated opinion that this practice should be prohibited. The LTMS seems to support this position but fails to address the problem. Agitation should be stopped rather than allowed to continue under a litany of unenforceable permit conditions.

F) The report indicates that one option for dredged material disposal would be to renourish Daufuskie Island beaches. We support this concept provided that all material

is of beach compatible grain size and the disposal is based upon a sound engineering plan to renourish the beach face rather than to simply remove the spoil material. However, please be aware that in order to use state funds for beachfront activities the entire beach receiving renourishment must be accessible to the public. Only a section of Daufuskie presently meets this definition (approximately 1/2 mile). The state participation in any funding arrangement for this project may be limited by this restriction.

The OCRM appreciates being able to provide these comments. In this letter I have tried to be specific as to what steps can be taken to make the LTMS consistent with our management program. We have enjoyed our working relationship with the District staff in the past and feel that these issues can be resolved with cooperation by all parties. Pursuant to **15 C.F.R. 930.110**, secretarial mediation through the Secretary of Commerce may be utilized to resolve conflicting issues. If you desire to pursue mediation please contact me so that we may coordinate. We will be glad to pursue a resolution through either formal or informal mediation.

Sincerely,

Robert D. Mikell

Robert D. Mikell
Director of Planning
and Federal Certification

RDM:uscomit2:g:jk

cc: Dr. H. Wayne Beam
Mr. Christopher L. Brooks
Mr. H. Stephen Snyder
Ms. Sally Knowles
Ms. Jane Settle
Ms. Joelle Gore

RESPONSE -- SC Department of Health and Environmental Control, Office of Ocean and Coastal Resource Management, January 20, 1995.

MITIGATION PLAN FOR DISPOSAL AREA 14A. A revised Mitigation Plan was prepared and provided to the SC OCRM in July 1995. After a meeting with SC DHEC-OCRM staff in September 1995, the Plan was revised to include 25 acres of wetland restoration or creation as in-kind mitigation to address their concerns. As a result of the recent coordination, the District believes the Mitigation Plan contained in the Final EIS satisfies all mitigation concerns of the SC DHEC-OCRM.

NEARSHORE BIRD ISLAND. As in the Draft EIS, the Final EIS contains a nearshore bird island as a mitigation feature. The need for such habitat was documented in the EIS and is supported by the US FWS and the SC DNR. Isolated islands along the coast have become increasingly rare as development has occurred. As the SC DHEC-OCRM policies acknowledge, such islands have been found to be beneficial to shorebirds and migratory waterfowl. The island's size was selected based on a combination of the mitigation need and the technical aspects of the value of such habitats when constructed at other locations. The District will perform a benthic survey of the site where the island would be constructed to ensure highly productive hard bottom communities are not present. Recent coordination with SC DHEC-OCRM staff indicates that SC DHEC-OCRM now approves of this mitigation feature.

UNDERDRAINS. Savannah District met with the South Carolina DHEC and discussed this issue. The District will abide by the mixing zone and/or design parameters specified for the underdrains in the Water Quality Certification provided by the South Carolina DHEC.

DISSOLVED OXYGEN IN WEIR DISCHARGES. The District met with the South Carolina DHEC and discussed this issue. Data previously taken by Savannah District was provided to SC DHEC which documented that previous discharges which were below state water quality standards did not adversely affect the use of Wright River, the major receiving water. Savannah District will abide by the Water Quality Certification provided by the South Carolina DHEC.

AGITATION DREDGING. Implementation of the rotational use of the CDFs will result in a disposal area being available within a reasonable distance for use by berth owners. This will increase the economic feasibility of deposition of berth sediments in confined disposal areas. The deepening of berth areas to create off-channel sediment storage would reduce the need for agitation

dredging since adequate depths would be available at the berths for longer durations. Due to the high shoaling rate at the berths, circumstances may still arise where a hydraulic dredge cannot be used -- such as the March to June striped bass window -- when removal of sediments is necessary. Agitation dredging may serve as a viable option for those instances.

DIRECT PLACEMENT ON DAUFUSKIE ISLAND. Savannah District will consider direct placement of channel sediments on Daufuskie Island if (1) the material is determined suitable, and (2) an organization paid the additional incremental cost for such placement. The District will continue to work with the SC DHEC-OCRM to identify when such placement may be appropriate.

South Carolina
DHEC
Department of Health and Environmental Control
4130 Faber Place, Suite 300
Charleston, SC 29405

9 JG11 PD

Office of Ocean and Coastal Resource Management
H. Wayne Beam, Ph.D., Deputy Commissioner *Christopher L. Brooks, Assistant Deputy Commissioner*

(803) 744-5838 ***(803) 744-5847 (fax)***

January 8, 1996

Mr. M. J. Yuschishin
Chief, Planning Division
U. S. Department of the Army
Savannah District, Corps of Engineers
Post Office Box 889
Savannah, Georgia 31402-0889

Re: Savannah Harbor Long Term
Management Strategy (LTMS)
Final Certification

Dear Mr. Yuschishin:

As you are aware, we have been working with your staff on the consistency determination for this document for several years. As a result of the revisions and clarifications made to the final draft document, our remaining concerns have been addressed. DHEC OCRM is now prepared to find this project consistent with the policies of the South Carolina Coastal Zone Management Program.

Should you have any questions on this matter please contact me.

Sincerely,

Robert D. Mikell
Director of Planning
and Federal Certification

cc: Dr. H. Wayne Beam
Mr. Christopher L. Brooks
Mr. H. Stephen Snyder
Mr. Tom Bolin
Ms. Rheta Geddings

RESPONSE -- SC Department of Health and Environmental Control, Office of Ocean and Coastal Resource Management, January 8, 1996.

CONSISTENCY DETERMINATION. The District is pleased that the proposed project was found fully consistent with the policies of the SC Coastal Zone Management Program.

South Carolina
DHEC
Department of Health and Environmental Control
2600 Bull Street, Columbia, SC 29201

January 4, 1995

Department of the Army
Savannah District, Corps of Engineers
Attn: Richard A. Hill, Acting Chief
Planning Division
P.O. Box 889
Savannah, GA 31402-0889

Dear Mr. Hill:

I am writing in response to your letter dated November 30, 1994, in which you requested comments regarding the Long Term Management Strategy (LTMS) Study for the Savannah Harbor Navigation Project, Chatham County Georgia, and Jasper County, South Carolina. You requested that our review of the enclosed Draft Environmental Impact Statement for this project include compliance of the tentatively selected plan with Section 401 of the Clean Water Act.

The Bureau of Water Pollution Control is currently evaluating the above referenced project as part of the technical review process for Water Quality Certification in accordance with Section 401 of the Clean Water Act, as amended. We will provide all comments to you in the Water Quality Certification and not comment separately on the Draft Environmental Impact Statement.

The Water Quality Certification process is governed by State Regulation 61-101. This process requires preparation of a written staff assessment evaluating potential effects of the proposed work on water quality. Written comments by interested parties will be considered in the review. This project will be certified if it is determined that there is a reasonable assurance that the proposed project will be conducted in a manner consistent with the Certification requirements, and is consistent with applicable provisions of Section 303 of the Federal Clean Water Act, as amended. It must also be determined that there are no applicable effluent limitations under Sections 301(b) and 302, and that there are no applicable standards under Sections 306 and 307.

Since the public comment period for this project has passed, we will complete our staff assessment as soon as possible. After the project review is complete, a Notice of Proposed Decision will be issued, including any proposed conditions. All aggrieved parties shall have rights to appeal the proposed decision by submitting a written request for an adjudicatory hearing before the Department within 15 days of notification of proposed certification.

If you have any questions please feel free to call Mark Giffin at (803)-734-5302.

Sincerely,

Sally C. Knowles

Sally C. Knowles, Director
Water Quality Division

RESPONSE -- SC Department of Natural Resources,
Bureau of Water Pollution Control,
Water Quality Division,
January 4, 1995.

No response necessary.

South Carolina
DHEC
Department of Health and Environmental Control
2600 Bull Street, Columbia, SC 29201-1708

May 10, 1996

Department of the Army, Savannah District, Corps of Engineers
Attn: Mr. William G. Bailey
P.O. Box 889
Savannah, GA 31402-0889

Re: Certification in Accordance with Section 401 of the
Clean Water Act, as amended.

Department of the Army, Savannah District, Corps of Engineers
Savannah Harbor Long Term Management Strategy
Savannah River, Back River, and Wright River
Jasper County
DHEC-94-C-SAV

Dear Mr. Bailey:

The Department issued a Notice Of Proposed Decision to issue a 401 Water Quality Certification for the project on October 27, 1995. James F. Missroon appealed this decision on November 7, 1995. The Department received an Order of Dismissal from Alison Renee Lee, Administrative Law Judge, on May 6, 1996, stating that Mr. Missroon has withdrawn his request for a hearing.

We have reviewed plans for this project and determined there is a reasonable assurance that the proposed project will be conducted in a manner consistent with the Certification requirements of Section 401 of the Federal Clean Water Act, as amended. In accordance with the provisions of Section 401, we certify that this project, subject to the indicated conditions, is consistent with applicable provisions of Section 303 of the Federal Clean Water Act, as amended. We also hereby certify that there are no applicable effluent limitations under Sections 301(b) and 302, and that there are no applicable standards under Sections 306 and 307.

This certification is subject to the following conditions:

1. To insure water quality standards are maintained, the Division of Water Quality and Shellfish Sanitation must be notified and any alternate disposal site must be reviewed and approved prior to its use if the proposed disposal areas can not be utilized by the COE or the GDOT.

2. The applicant must implement a water quality monitoring plan to insure that the effluent is in compliance with state water quality standards and to coordinate with the Department if any discharge is violating any state water quality criteria, as proposed. The applicant must conduct monitoring in accordance with an approved sampling plan specifying the location of sampling stations, parameters sampled, when samples will be collected, and how the sampling data will be reported.

Appropriate ambient data from the Wright River must also be submitted.

3. The applicant must install flap gates at underdrain discharge points so that so that no effluent is discharged during low flow periods in receiving waters.

4. The applicant must monitor water quality 100 feet downstream of underdrain discharges to test for water quality standards compliance, as proposed. In addition, the applicant must conduct monitoring in accordance with an approved sampling plan specifying the location of sampling stations, parameters sampled, when samples will be collected, and how the sampling data will be reported.

5. The applicant must adhere/comply with recommendations of the SCDNR regarding the timing of placing dredged material for beach nourishment to insure continued protection of various species of sea turtles.

6. The applicant must provide compensatory mitigation for wetlands impacts associated with the proposed work. All wetlands impacts must be compensated for on at least a 1:1 basis. If the mitigation includes creation, restoration, or enhancement, the plan must include monitoring. This mitigation plan must be submitted to the Water Quality Division for review and approval within 6 months of 404 permit issuance.

The S. C. Department of Health and Environmental Control reserves the right to impose additional conditions on this Certification to respond to unforeseen, specific problems that might arise and to take any enforcement action necessary to ensure compliance with State water quality standards.

Sincerely,

Sally C. Knowles

Sally C. Knowles, Director
Division of Water Quality
and Shellfish Sanitation
Bureau of Water Pollution Control

SCK:MAG
cc: Army Corps of Engineers,
Charleston District
Low Country District Office

RESPONSE -- SC Department of Natural Resources,
Bureau of Water Pollution Control,
Water Quality Division,
May 10, 1996.

WATER QUALITY CERTIFICATION.

This letter provides Water Quality Certification from the State of South Carolina for the Savannah Harbor LTMS. Savannah District intends to fully comply with all conditions contained in this certification. Condition 2 requires a water quality monitoring plan be submitted to the SC DHEC for approval within 6 months. The District believes it can reach agreement with the SC DHEC on an appropriate monitoring plan. Condition 6 requires a mitigation plan be submitted to the SC DHEC for approval within 6 months. The District intends to resumbit the Mitigation Plan contained in this EIS to the SC DHEC. The SC DHEC-OCRM, which is responsible for management of all South Carolina coastal resources, has approved the Mitigation Plan.

South Carolina Department of
Natural Resources

James A. Timmerman, Jr., Ph.D.
Director

January 20, 1995

Mr. William Bailey
U.S. Army Engineer District, Savannah
P.O. Box 889, ATTN: CESAS-PD-EI
Savannah, GA 31402-0889

RE: Draft Environmental Impact Statement (EIS), Savannah Harbor Long Term Maintenance Strategy (LTMS)

Dear Mr. Bailey:

Personnel of the S.C. Department of Natural Resources have reviewed the above referenced EIS and offer the following comments.

In general, it appears that the Long Term Maintenance Strategy (LTMS) has been thoroughly researched and addresses some of the problems which have been identified in the past in the Savannah Harbor system. Aspects of the strategy such as the removal of underdrains from the Wright River, the diking of Area 14A, and the proposals for better management of the Confined Disposal Facilities (CDF's) to enhance various aspects of bird use represent very positive considerations for the S.C. Department of Natural Resources (SCDNR). There are, however, some concerns which remain. These are addressed below in the order in which they appear in the Draft EIS.

Paragraph 2.05 (p. 13) identifies the natural resources of the Savannah Harbor. In our opinion, the listing presented is quite limited. Other natural resources which should be included are birds, threatened species, estuarine species of commercial and recreational importance.

Paragraph 3.10 (p.22) - The last statement regarding the increased cost of maintaining adequate depths in the Harbor as a result of the closure of New Cut and the removal of the Tide Gate from operation should have some documentation.

In paragraph 3.34 (p. 36), the "environmental documents which have already been prepared" to which the local sponsor will be required to adhere should be specified.

Paragraph 3.38 (p. 38) - The Wright River study summary is located in Appendix E, not Appendix N.

Paragraph 4.31 (p. 50) - Both of the assumptions included herein regarding threatened or endangered species may be appropriate. However, it is neither a foregone conclusion that no additional species will be listed as threatened or endangered or that no additional protective restrictive would be placed on actions which may impact species which are presently listed and, therefore, are already receiving protection. Additional information on the status of stocks of a given species is always a condition under which Section 7 consultations and negotiations can be reopened and would be the case here as well. This must be recognized.

Paragraphs 5.27 and 5.35 (pp. 71 and 73) - While side-scan sonar is an appropriate technology to determine the likelihood of the presence of hard-bottom communities, additional confirmation by underwater television provides a much more accurate portrayal of the bottom conditions. This technology should be incorporated as well, if possible, for these efforts.

Paragraph 5.48 (p. 78) - While the proposed deepening of the Sediment Basin is desirable from the standpoint of increasing its sediment detention capacity, it is of some concern to us given the data which has been generated regarding dissolved oxygen (DO) conditions at and near the bottom of it in its current configuration. A primary species of concern here is the striped bass (Morone saxitilis). Input from the U.S. Fish and Wildlife Service (FWS) and the Georgia Department of Natural Resources (GADNR) should be utilized in the determining the appropriateness of this aspect of the LTMS.

Paragraph 5.69 (p. 90) and other locations - Mitigation actions. Personnel of our Wildlife Diversity Division (formerly the Nongame and Endangered Species Division) were consulted in the development of the avian aspects of the mitigation plan for input. While the overall plan certainly represents a great enhancement of habitat for bird use in the Savannah Harbor area, there are several concerns which must be resolved. Of primary importance is an issue which has been discussed previously, that of contaminant levels in these confined disposal facilities (CDF's) and their potential impacts on avian life. Our review of Appendix F - Sediment Quality Evaluation does indicate that the likelihood of impacts to biota is limited. However, the proposed management techniques of enhancing avian feeding in these CDF's or the construction of bird islands in them, modified mowing of dike slopes, etc., to enhance the nesting of several species in and adjacent to them does raise the concern what is actually occurring or may occur at a particular location. Some bioassay work with avian species already utilizing these areas would better enable these uncertainties to be resolved. We would like to discuss this further to determine the details of what is needed to address this concern. Also, a monitoring program to evaluate various aspects of the success of this management technique should accompany this part of the proposed mitigation.

Paragraph 6.23 (p. 110) - Mitigation Areas and paragraph 7.73 (p. 175). The first assumption in paragraph 6.23 and the discussion in paragraph 7.73 relates to the unavailability of sites which could be used for wetland mitigation, i.e., in-kind mitigation for lost wetland habitat values from dike placement, warrants further documentation. While this is likely to be the case, if there are any areas available which could be used for even partial mitigation for wetland losses, they should be considered. Even though the need exists for the enhancement of avian feeding and nesting habitat, it is our policy to seek in-kind replacement of habitat whenever possible. The values lost by the filling of wetlands are not replaced by the enhancement of bird use of these CDF's. We do agree that the filling of shallow subtidal areas to create intertidal wetlands is not an option which should be considered.

Paragraph 6.27 (p. 111) - Hazardous and Toxic Wastes. The Amazon Venture oil spill occurred on December 4, 1986.

Paragraph 6.28 (p. 111) - Water Quality. The information regarding South Carolina's classification of the Savannah River is incomplete. While that portion from Fort Pulaski to the Atlantic Ocean is classified as Class SA, the portion from the Seaboard Coastline RR to Fort Pulaski is classified as Class SB, and that portion from the headwaters of Lake Russell to the Seaboard Coastline RR is Class FW. The classification system was modified in 1991 and 1992 and this information is included in the manual published by SCDHEC entitled Water Classifications and Standards, Regulation 61-68 (includes all amendments through April 24, 1992).

Paragraph 7.05 (p. 153) - The statement that "Since the precautions to be observed in each of the detailed alternatives would result in construction occurring which does not harm either individual protected animals, fish etc., or their habitat, no plan would produce unacceptable adverse environmental impacts to threatened or endangered species," is not necessarily completely correct. As one example, it is entirely possible that a shortnose sturgeon (Acipenser brevirostris) could be harmed by dredging activities in turning basins as radio-tagged individuals have been documented to utilize these areas. Also, given this, the habitat which these individuals used would certainly be at least temporarily modified by dredging operations. While we understand that all possible precautions to avoid and/or minimize such impacts will be taken, it must be considered that some may occur.

Paragraph 7.30 (p. 161) - The DO problems in weir effluents which have been documented in the past should not be allowed to continue. We do not feel that the management measures which are proposed are adequate to address this issue. DO monitoring which is sufficient to prevent a release which would contravene either South Carolina or Georgia Water Quality Standards should be incorporated into the LTMS rather that management measures to determine whether a release should be allowed to continue.

Paragraph 7.34 (p. 163) - The proposal to incorporate a 100-foot mixing zone at each of the underdrains from CDF's to enable arsenic levels to come into compliance with Water Quality Standards is unacceptable. Given that acute toxicity to estuarine organisms from these discharges has been demonstrated, other means of reducing this toxicity must be developed.

Paragraph 7.76 (p. 176) - Creating Nesting Islands. If the contaminants issues are satisfactorily resolved, these islands should be sized to provide 3 acres of area suitable for nesting to increase their likelihood of success.

Paragraph 7.79 (p. 177) - Slow Release of Ponded Water. This proposed management technique is dependent on rainfall and is, therefore, not a "sure thing". Limited credit for habitat enhancement can be given here.

Paragraph 7.81 (p. 178) - Construction of an Offshore Bird Island. It is our understanding that the need for this aspect of the proposed LTMS is based upon loss of similar habitat for shorebird nesting when the diking of Jones/Oysterbed Island enable predator access to a former shorebird nesting area, which was thus eliminated (Tom Murphy, personal communication). This needs to be documented better in the LTMS. Also, if this management technique is implemented, there is some concern regarding the high percentage of fine-grained sediments (50%) which is assumed to be lost during the construction process. This is not consistent with the higher percentages of sands indicated elsewhere in the LTMS to comprise the proposed source areas for this work.

Paragraph 7.150 (p.214) - The last portion of this paragraph addresses the means by which success of the proposed offshore nesting island would be measured. While we agree that predictions of the number of birds expected to nest on the island in different years would be speculative, this is, nonetheless, one of the measures of success. Additionally, with information regarding size, vegetation type, etc., it can be done with a greater degree of certainty than is indicated here. This should be done and included in the document.

Paragraph 7.152 (p. 215) through 7.166 (p.220) - berms and direct beach placement of sediments. While the specific locations of the proposed berms are in coastal Georgia waters, the quality of coastal South Carolina waters could be affected by this proposed activity. Related to both berm placement and direct beach placement is the aspect of turbidity. Only the locations with the highest percentages of coarse sediments should be used as sources for these proposed activities. Also, timing restrictions should be included for the protection of the various species of sea turtles known to inhabit the coastal waters of Georgia and South Carolina during the months of May through October.

It was not possible for us to adequately evaluate and provide input regarding the scoring process for the various alternatives which was used in the LTMS. No criteria were indicated on which the scores were based. Without these, the scheme seems to be very subjective and one which would result in very different scores for the same alternative when evaluated by different individuals. Therefore, its use is questionable.

Appendix E. Results of Wright River Weir Effluent and Sediment Testing. It would be helpful to the reviewer to have a map of sampling locations included.

We appreciate the opportunity to provide input into this planning process. We look forward to discussing our concerns and working toward their resolution. Please contact the SCDNR Project Manager for this project, Jane Settle (803-762-5068) for further information.

Sincerely,

Robert E. Duncan
Environmental Programs Director

cc: Jane Settle, SCDNR
Tom Murphy, SCDNR
Rob Mikell, OCRM
Sally Knowles, SCDHEC
Ed EuDaly, USFWS

RESPONSE -- SC Department of Natural Resources,
January 20, 1995.

Paragraph 2.05 (p. 13). Concur.

Paragraph 3.10 (p. 22). Savannah District has published no formal report on the increased cost of maintaining adequate depths in the Harbor as a result of the closure of New Cut and the removal of the Tidegate from operation. The documentation consists of internal District documents and information used for budget defense. However, the Operations & Maintenance budget now has a separate line item titled "Additional Dredging Cost Due To Keeping The Tidegate Open."

Paragraph 3.34 (p. 36). The Federal "environmental documents which have already been prepared" were listed in Section 2.15 and 2.19. Other documents would consist of those prepared as part of the permit process for non-federal construction actions.

Paragraph 3.38 (p. 38). Concur.

Paragraph 4.31 (p. 50). Concur.

Paragraphs 5.27 and 5.35 (pp. 71 and 73). Savannah District believes that underwater television would not be a useful technique to document the bottom conditions in this project area due to the highly turbid water which restrict visual observations to just a few feet. The District will conduct benthic sampling to document benthic communities in the affected areas.

Paragraph 5.48 (p. 78). The views of the US FWS and the Georgia Department of Natural Resources will be used in the determining the appropriateness of the proposed advance maintenance of the Sediment Basin.

Paragraph 5.69 (p. 90) and other locations - Mitigation actions. Chemical testing will be performed of sediments within the CDFs to confirm that contaminants do not exist at levels which would produce adverse impacts on wildlife using the sites. Monitoring of the District's compliance with its commitments and applicable laws is a normal part of daily operations. Since the basis of the proposed Mitigation Plan is the provision of certain types and amounts of various habitats, rather than development of certain types and amounts of various fish and wildlife usage, the success of the proposed Plan will be determined by the successful construction and subsequent maintenance of the habitats specified in the Plan.

Paragraph 6.23 (p. 110) - Mitigation Areas and paragraph 7.73 (p. 175). Resource agencies were reconsulted for identification of sites which could be used for wetland mitigation, i.e., in-kind mitigation. No agency suggested any potential sites of suitable size within the project area. The revised Mitigation Plan includes in-kind mitigation through the restoration/creation/ protection of 25 acres of tidal wetlands, through an escrow account administered by the SC DHEC-OCRM.

Paragraph 6.27 (p. 111) - Hazardous and Toxic Wastes. Concur.

Paragraph 6.28 (p. 111) - Water Quality. Concur. This section of the EIS was revised.

Paragraph 7.05 (p. 153). Concur. The Biological Assessment of Threatened and Endangered Species (BATES) evaluates the effects of the proposed actions on protected species and their habitat. This section was revised to incorporate the SC DNR comment.

Paragraph 7.30 (p. 161). - Dissolved Oxygen Levels In Weir Discharges. The District met with the South Carolina DHEC and discussed this issue. Data previously taken by Savannah District was provided to SC DHEC which documented that previous discharges which were below state water quality standards did not adversely affect the use of Wright River, the major receiving water. Savannah District will abide by the Water Quality Certification provided by the South Carolina DHEC.

Paragraph 7.34 (p. 163) - Mixing Zone. Savannah District met with the South Carolina DHEC and discussed this issue. The District will abide by the mixing zone or design parameters specified for the underdrains in the Water Quality Certification provided by the South Carolina DHEC.

Paragraph 7.76 (p. 176) - Creating Nesting Islands. Nesting can be successful on small tracts of suitable land. The District does not believe that increasing the size of the proposed islands to 3 acres would significantly improve the quality of the nesting habitat produced, i.e increase the nesting success ratio.

Paragraph 7.79 (p. 177) - Slow Release of Ponded Water. The CDFs have historically held water for extended periods when discharges were not allowed through the overflow weirs. The District believes that natural rainfall will be adequate to counter evaporative losses.

Paragraph 7.81 (p. 178) - Construction of an Offshore Bird Island. The need for isolated nesting shorebird habitat in the region is the primarily the result of increased development of barrier island beaches by man. The proposed bird island is not intended to compensate for the loss of any particular previous

nesting area. The percentage of fine-grained sediments (50 percent) which is assumed to be lost during construction is a design parameter. The percentage of fines in the sediments is lower (13 percent) and use of the higher value was (1) based on previous experience with retention of deposited dredged material on ocean beaches, and (2) intended to be a conservative feature in the analysis of dredged material needs, construction costs, and turbidity impacts.

Paragraph 7.150 (p.214) - Success of Nearshore Bird Island. The proposed Mitigation Plan is based on production of certain habitats. While the basis for producing an offshore bird nesting habitat is ultimately for use by birds, the District believes that the variables inherent in predicting the amount of bird use for such a unique area would indeed render a calculation of such use not much more than a speculation. The District believes that high use of the proposed island by nesting birds would likely make it an environmental success, but we believe the number and range of the variables are too great to predict with any confidence the number of birds which may nest there.

Paragraph 7.152 through 7.166 (p. 215 - 220) - Berms and direct beach placement of sediments. The Bar Channel sediments have been shown to be predominantly coarse-grained. Some fines are included and would be deposited with the coarser materials, as they are now at the Savannah ODMDS. The District recognizes the desirability of placing very high quality materials on public beaches and would try to reach that goal. However, use of only specific or intermittent locations could significantly increase the cost of dredging and could make these placement options economically impractical. Measures are incorporated in all dredging projects to protect threatened and endangered sea turtles.

The scoring process was intended to provide only a general method of comparison. Different evaluators may well produce different scores for specific impacts. However, the general ranking between the alternatives when all the impact types are included are expected to be similar. Therefore, the District believes the scoring process was adequate for the general evaluation purpose for which it was intended.

Appendix E. Results of Wright River Weir Effluent and Sediment Testing. The EIS does contain maps showing the location of the CDFs whose effluent was sampled. Maps of sampling locations are contained in the full report on this study and may be obtained from Savannah District. We believe that including maps of sampling locations in the Appendix would not provide information necessary to interpret the study results.

OFFICE OF PLANNING AND BUDGET

ZELL MILLER
GOVERNOR

HENRY M. HUCKABY
DIRECTOR

GEORGIA STATE CLEARINGHOUSE MEMORANDUM

TO: Mr. Nicholas Ogden, Chief
Regulatory Branch
Savannah District, Corps of Engineers
P.O. Box 889
Savannah, Georgia 31402

FROM: Charles H. Badger, Administrator
Georgia State Clearinghouse
Office of Planning and Budget

DATE: January 5, 1995

SUBJECT: RESULTS OF STATE LEVEL REVIEW

APPLICANT: Cops of Engineers

PROJECT: DEIS/Savannah Harbor LTM

STATE APPLICATION IDENTIFIER: GA 94 12 05-004

PUBLIC NOTICE REFERENCE NUMBER:

The State level review of the above referenced Public Notice/Permit Request has been completed. As a result of that review process, the issuance of this permit is approved with the following recommendation(s) for improving the proposed activity.

The Corps of Engineers is advised of the comments in the enclosure to this memorandum especially those clarifications from the State of Georgia DOT and th Georgia Ports Authority.

TR/blm

ENCL: DOT/Public Highways, December 8, 1994
DNR/Flood Plain Management, December 16, 1994
DOT/Office of Intermodal Programs, December 19, 1994
Georgia Ports Authority, December 27, 1994

GEORGIA STATE CLEARINGHOUSE MEMORANDUM

TO: State Clearinghouse
Office of Planning and Budget
254 Washington St., S.W.
Atlanta, Georgia 30334

FROM: BOB BOWLING
DEPT OF TRANSPORTATION, PUBLIC HIGHWAYS

SUBJECT: RESULTS OF REVIEW

STATE APPLICATION IDENTIFIER: GA 94 12 05-004

DATE: 12-8-94

This notice is considered to be consistent with those State ~~(goals), (policies), (objectives)~~, (plans), ~~(programs), and (fiscal resources)~~ with which this organization is concerned. (Line through inappropriate word or words). X

This notice is recommended for further development with the following recommendations for strengthening the project (additional pages may be used for outlining the recommendations). _____

This notice is not recommended for further development (accompanied by detail comments which explains the organization's rationale for this decision). _____

This notice does not impact upon the activities of this organization. _____

Form SC-3
March 1987

GEORGIA STATE CLEARINGHOUSE MEMORANDUM

TO: State Clearinghouse
Office of Planning and Budget
254 Washington St., S.W.
Atlanta, Georgia 30334

FROM: ALEXIS HARRIS
DEPT OF NATURAL RESOURCES, EPD, FLOOD PLAIN MANAGEMENT

SUBJECT: RESULTS OF REVIEW

STATE APPLICATION IDENTIFIER: GA 94 12 05-004

DATE: 12-16-94

This notice is considered to be consistent with those State (goals), (policies), (objectives), (plans), (programs), and (fiscal resources) with which this organization is concerned. (Line through inappropriate word or words). AH

This notice is recommended for further development with the following recommendations for strengthening the project (additional pages may be used for outlining the recommendations). _____

This notice is not recommended for further development (accompanied by detail comments which explains the organization's rationale for this decision). _____

This notice does not impact upon the activities of this organization. _____

Form SC-3
March 1987

GEORGIA STATE CLEARINGHOUSE MEMORANDUM

TO: State Clearinghouse
Office of Planning and Budget
254 Washington St., S.W.
Atlanta, Georgia 30334

FROM: LUKE COUSINS, ADMINISTRATOR
DEPT OF TRANSPORTATION, OFFICE OF INTERMODAL PROGRAMS

SUBJECT: RESULTS OF REVIEW

STATE APPLICATION IDENTIFIER: GA 94 12 05-004

DATE:

This notice is considered to be consistent with those State (goals), (policies), (objectives), (plans), (programs), and (fiscal resources) with which this organization is concerned. (Line through inappropriate word or words). √ (See attached)

This notice is recommended for further development with the following recommendations for strengthening the project (additional pages may be used for outlining the recommendations). _____

This notice is not recommended for further development (accompanied by detail comments which explains the organization's rationale for this decision). _____

This notice does not impact upon the activities of this organization. _____

Form SC-3
March 1987

Comments attached

WAYNE SHACKELFORD
COMMISSIONER

FRANK DANCHETZ
CHIEF ENGINEER

Department of Transportation

State of Georgia
#2 Capitol Square, S.W.
Atlanta, Georgia 30334-1002

G. CHARLES LEWIS
DEPUTY COMMISSIONER

ARTHUR A. VAUGHN
TREASURER

December 19, 1994

Mr. William Bailey
U.S. Army Corps of Engineers
P. O. Box 889
Savannah, GA 31402

Dear Mr. Bailey:

My office has reviewed the Draft Environmental Impact Statement for the Savannah Harbor Long Term Management Strategy Study. The document appears to follow the outline the Corps initiated 2 years ago which we were allowed to participate in.

The management strategy recommended in the report should improve the long term environmental impact of harbor activities due to the potentially extended useful life of the disposal areas and reduced frequency of maintenance dredging. We support this strategy and the projects associated with it.

Our review of the document resulted in the following comments:

1. Page 16; Section 2.22. Ga. DOT owns approximately 60% of the acres in the disposal areas. DOT is not the sole "owner/operator of confined . ..".

2. Page 29; Section 3.20. A berthing area is defined as "the area between a dock and the navigation channel". This can be a large area if the docks are distant from the navigation channel. Is the definition accurate?

3. Page 79; Section 5.49. It is stated that the throat to the sediment basin would not be modified. It is our understanding that a clean deep throat is a main criteria to an efficient sediment trap. To deepen the basin and not the throat would not be as beneficial as deepening both. Also a more efficient basin reduces dredging in the main channel and berths therefore reducing agitation dredging frequency.

4. Page 97; Table 6.
   a) Should the 233,000 for 2A* be 244,000?
   b) The total of the volumes (accounting for use of one area in each pair or group) is 8,666,000. This exceeds the 7.2 million referenced in section 4.14 as the volume to be used throughout the 20 year period of analysis.
   c) Area 2A may not be available for the annual 233,000 cubic yards due to the inability to separate the sand shoals from the silt shoals during dredging.

5. Page 98; Section 5.72. There needs to be a continued effort of partnership between the sponsor and the Corps. The harbor is dynamic and can be unpredictable at times; emergencies can happen. Some flexibility needs to be incorporated so neither the Corps nor the Sponsor has to suffer needlessly.

   There should be an annual meeting where the Corps and sponsor discuss the upcoming needs and discuss the dredging plans, dike raising plans and bird use plans.

6. Page 187; Section 7.95 A. The sponsor may choose to reclear the 26 acre site as opposed to pay incremental dredging costs, depending on which is cheapest to maintain the site.

7. Page 193; Table 14. It appears there may be some minor arithmatical errors. Are these due to rounding?

8. Page 206; Section 7.127. The sponsor will need adequate time to obtain funds for maintenance of the island.

9. Appendix A; page 9; Section A.5.11. We support speed limits of ships to reduce the erosive effects of their wakes on the dikes.

10. Appendix A; page 13; Section A.5.24 and page 15; Section A.5.35. DOT does not allow any persons on DOT property unless they are government employees or contractors, on official business associated with harbor dredging/disposal activities. Since DOT owns most of Area 12A and the general public is not allowed to cross DOT property, the fishermen and birdwatchers do not have land access to the disposal areas on the S. C. side.

11. Appendix C; page 6; Section C.2.19; and page 14; Section C.2.59. Both sections indicate there will be dike ramp construction. This does not agree with Section 7.102, page 196 of the main report.

12. Appendix F; Section F.3.08. The underdrains have been closed in 12"B", not 12"A".

Please accept these comments in the spirit of parterning as they are offered to strengthen the document. If you have any questions please call John Phillips at (404) 651-9213.

Sincerely,

Luke Cousins, Administrator
Office of Intermodal Programs

LC:JP:jsd

cc: George Lyons
David Studstill

GEORGIA STATE CLEARINGHOUSE MEMORANDUM

TO: State Clearinghouse
Office of Planning and Budget
254 Washington St., S.W.
Atlanta, Georgia 30334

FROM: MR. C. GRIFFIN
GEORGIA PORTS AUTHORITY

SUBJECT: RESULTS OF REVIEW

STATE APPLICATION IDENTIFIER: GA 94 12 05-004

DATE: 12/27/94

This notice is considered to be consistent with those State (goals), (policies), (objectives), (plans), (programs), and (fiscal resources) with which this organization is concerned. (Line through inappropriate word or words).

This notice is recommended for further development with the following recommendations for strengthening the project (additional pages may be used for outlining the recommendations).

Charles F Griffin
See Attached Pages.

This notice is not recommended for further development (accompanied by detail comments which explains the organization's rationale for this decision).

This notice does not impact upon the activities of this organization.

Form SC-3
March 1987

State Application Identifier: GA 94 12 05-004

- It appears to be unclear as to the applicability of the DEIS. The proposed action relative to this DEIS is, as we understand it, to address specific and defined dredging activities proposed for the Savannah River / Harbor area. However, the DEIS is titled and abstracted to address the LTMS which will be much broader in scope than the dredging program.

- The alternate management strategies (Chapter 5.0) appear to extend in scope beyond specific dredging alternatives into a broader range of management concerns.

- The DEIS is a large document; however, it is unclear as to how much of the appended environmental material is actually applicable to the proposed dredging. Likewise, the text of the DEIS presents a great deal of general environmental material, but is not focused on the environmental issues of the defined, proposed action.

- It appears the DEIS may not be completely accurate and current. For example, on page 111, the portion of the river system regulated by the state of South Carolina is discussed in terms of Class SA (saltwater) / Class B (fresh water) classification. The Class B designation for fresh waters was replaced by the FW (fresh water) designation in the last reauthorization of the State regulations 61-68 and 61-69 in 1993.

- Overall, the DEIS does not focus the environmental analysis of the proposed action of dredging. The DEIS does not appear to be applicable to the LTMS and, consequently, strays into areas and issues outside of its intended scope. While a great deal of material is presented, what would be more appropriate would be a cogent and focused analysis, per NEPA/DEIS protocol, of the proposed action. As such, much of the material may not be germane to the environmental aspects of the properly scoped, proposed action.

- Finally, given the general nature of uncertainty regarding the applicability of this DEIS to the actual proposed action, additional review time from the Agencies for all parties involved would be useful and judicious.

mm\dsl\mem\gpaltms

RESPONSE -- GEORGIA STATE CLEARINGHOUSE MEMORANDUM;
December 8, 1994.

No comment necessary.

RESPONSE -- GEORGIA STATE CLEARINGHOUSE MEMORANDUM;
GA Department of Transportation,
Public Highways,
December 8, 1994.

No comment necessary.

RESPONSE -- GEORGIA STATE CLEARINGHOUSE MEMORANDUM;
GA Department of Natural Resources,
Environmental Protection Division,
Flood Plain Management,
December 16, 1994.

No comment necessary.

RESPONSE -- GEORGIA STATE CLEARINGHOUSE MEMORANDUM;
GA Department of Transportation,
Office of Intermodal Programs,
December 1994.

No comment necessary on overall results of review. Specific comments are addressed after the letter provided directly to the District.

RESPONSE -- GEORGIA STATE CLEARINGHOUSE MEMORANDUM;
Georgia Ports Authority,
December 27, 1994.

SCOPE OF EIS. The EIS addresses activities considered in the LTMS Management Plan. This includes both dredging and disposal activities required to maintain the Federal Navigation Project. Also included are the activities required to manage the disposal sites required for deposition of sediments removed from the Project.

SCOPE OF ALTERNATIVES. The alternatives do indeed extend beyond dredging activities to also include disposal and disposal area operation and management actions.

ENVIRONMENTAL SETTING. The EIS does contain information which is not project specific, but provides information on the environmental setting of the project. This background information is intended to provide a framework for evaluations and decisions on an impact's importance in the project vicinity.

STATE WATER USE CLASSIFICATIONS. The EIS has been revised as suggested.

FOCUS OF ENVIRONMENTAL ANALYSIS. The EIS provides information necessary to perform an environmental analysis of the proposed action. That action includes dredging and disposal actions, and the activities required to manage the disposal sites required for deposition of sediments removed from the Project.

REVIEW TIME. An extension was granted to the Georgia Ports Authority, and everyone else who requested it, to provide comments on the draft EIS.

RESPONSE -- GEORGIA STATE CLEARINGHOUSE MEMORANDUM;
GA Department of Natural Resources,
Historic Preservation Division,
December 1994.

No comment necessary. The Historic Preservation Division commented directly to Savannah District in letters dated January 4 and 19, 1995. Responses to those comments are included after the letters.

Georgia Department of Natural Resources

Joe D. Tanner, Commissioner

Historic Preservation Division

Mark R. Edwards, Director and State Historic Preservation Officer
205 Butler Street, Suite 1462, Atlanta, Georgia 30334
Telephone (404) 656-2840
Fax (404) 651-8739

January 4, 1995

Mr. M.J. Yuschishin, Chief
Planning Division
Department of the Army
Savannah District, Corps of Engineers
P.O. Box 889
Savannah, Georgia 31402-0889

RE: Memorandums of Agreement--Ft. Jackson, C.S.S. Georgia
Savannah Harbor--Remove Tide Gate and New Cut Closure
Chatham County, Georgia
HP911114-001

Dear Mr. Yuschishin:

The Historic Preservation Division (HPD) has reviewed the draft Memorandums of Agreement (MOAs) outlining procedures for complying with Section 106 requirements concerning the removal of a tide gate and New Cut Closure in Savannah Harbor, Chatham County, Georgia. These MOAs seek to address the effects of this undertaking to Fort Jackson and the C.S.S. Georgia, historic resources located within the project's area of potential effects. Our comments for these draft MOAs are outlined as follows:

For the C.S.S. Georgia MOA:

1. Stipulation Two: A reasonable time frame should be included for the completion of these studies. HPD suggests two to three years; however, the Corps of Engineers may wish to allow for additional consultation time.

2. Stipulation Five: Any consideration of alternatives for minimizing the possible restrictions of the C.S.S. Georgia on harbor navigation should be specifically included in the overall mitigation plan.

3. Stipulation Six: If possible, a draft of the mitigation plan should be submitted to archaeologists with the National Park Service, university anthropology departments, and neighboring state Marine Archaeology programs for peer review. HPD has no in-house expertise for evaluating the specifics of the mitigation plan at this time, and peer review would be very valuable in selecting the most efficient and cost-effective mitigation for this complex resource.

4. Stipulation Eight: Some clarification is needed for this stipulation. If funds are not available within a given year, some contingency plans will be needed.

5. Stipulation Twelve: Our office requests a list of the curation facilities being considered to fulfill this stipulation.

For the Fort Jackson MOA:

1. Stipulation Seven: The review by the Coastal Heritage Society and interested local historic groups is especially important for this project. Additionally, review by managers in other historic sites which may have experienced this problem may be considered.

2. Stipulation Thirteen: A list of potential curation facilities considered for this stipulation is needed.

If we may be of further assistance, please contact Jeffrey L. Durbin, Environmental Review Coordinator, at (404) 656-2840.

Sincerely,

Richard Cloues

Richard Cloues
Deputy State Historic Preservation Officer

RC:drm

cc: Advisory Council on Historic Preservation
Kirk Schlemmer, Coastal Georgia RDC
Scott Smith, Coastal Heritage Society

RESPONSE -- GA Department of Natural Resources,
Historic Preservation Division,
January 4, 1995.

COMMENTS ON THE CSS GEORGIA MOA:

1. TIME FRAME FOR COMPLETION OF STUDIES. Stipulation #3 of the MOA has been revised to state that a draft report documenting the studies conducted under Stipulations #1 and #2, as well as the resulting findings and determinations would be complete within three years of the signature of the last party to the MOA.

2. ALTERNATIVES. Stipulation #5 has been revised to state that the mitigation plan will document the alternatives evaluated to eliminate or minimize restrictions which the CSS Georgia causes on the Savannah Harbor Navigation Project.

3. REVIEW OF THE DRAFT MITIGATION PLAN: Stipulation #7 has been revised to state that peer review of the draft mitigation plan will be pursued.

4. AVAILABILITY OF FUNDS: Stipulation #8 has been revised to state that should it appear that funds would not be available to implement all components of the recommended plan specified for a given year, the District would consult the parties to the MOA to determine what actions the District would need to perform to remain in compliance with Section 106 of the NHPA.

5. POTENTIAL CURATION FACILITIES: Stipulation #12 has been revised to include this information.

COMMENTS ON THE FORT JACKSON MOA:

1. REVIEW BY OTHERS: Stipulation #17 of the MOA has been revised to state that a review by managers of historic sites which have experienced similar problems would be pursued.

2. POTENTIAL CURATION FACILITIES: Stipulation #13 has been revised to include this information.

Joe D. Tanner, Commissioner

Georgia Department of Natural Resources

Historic Preservation Division

Mark R. Edwards, Director and State Historic Preservation Officer
205 Butler Street, Suite 1462, Atlanta, Georgia 30334
Telephone (404) 656-2840
Fax (404) 651-8739

January 19, 1995

Richard A. Hill
Acting Chief, Planning Division
Department of the Army
Savannah District, Corps of Engineers
P.O. Box 889
Savannah, Georgia 31402-0889

RE: Savannah Harbor Navigation Project
Long Term Management Strategy
Chatham County, Georgia
GA941205-004

Dear Mr. Hill:

The Historic Preservation Division (HPD) has reviewed the Environmental Impact Statement and Long Term Management Strategy for the Savannah Harbor Navigation Project, Chatham County, Georgia. HPD has been consulting with the Savannah District of the Corps of Engineers throughout the development of this project; therefore, we have no comments concerning the Environmental Impact Statement at this time.

However, we do offer the following minor technical comments regarding the final draft of the Long Term Management Strategy, as follows:

1. A few additions would make the management plan more useful to individuals who are not familiar with the overall project. These suggested additions are:

   a. A map showing the location of the major components of the project, and

   b. A bibliography of the major cultural resource surveys, testing, and data recovery reports generated as part of the consultation process.

If we may be of further assistance, please contact Jeffrey L. Durbin, Environmental Review Coordinator, at (404) 656-2840.

Sincerely,

Richard Cloues

Richard Cloues
Deputy State Historic Preservation Officer

RC:drm

cc: Tripp Reid, State Clearinghouse
Kirk Schlemmer, Coastal Georgia RDC

RESPONSE -- GA Department of Natural Resources,
Historic Preservation Division,
January 19, 1995.

SUGGESTED ADDITIONS TO MANAGEMENT PLAN:

1. MAP. An overall site map has been added.

2. BIBLIOGRAPHY. A bibliography has been added.

Georgia Department of Natural Resources
One Conservation Way, Brunswick, Georgia 31523-8600
Joe D. Tanner, Commissioner
Duane Harris, Director
Coastal Resources Division
912/264-7218
FAX 912/262-3143

January 31, 1995

William Bailey
US Army Engineer District, Savannah
P. O. Box 889, ATTN: CESAS-PD-EI
Savannah, GA 31402-0889

Dear Mr. Bailey:

Coastal Resources Division has reviewed the Savannah Harbor Long Term Management Strategy Study (LTMS). In addition, I asked staff of the Wildlife Resources Division's Non-Game Program to review the LTMS.

We support the conclusion of the LTMS in that alternative 8 is the best solution to long range management of the harbor. This provides the flexibility needed to maximize the use of disposal areas while providing maximum protection of the natural resources. The Division stands ready to assist the Corps with projects to be implemented under this alternative.

Georgia is developing a Coastal Management Plan under authority of the Federal Coastal Zone Management Act. This plan is expected to be adopted by early 1997 and, as you state in the LTMS, will have similar policies to the South Carolina Coastal Management Plan. Any federal activity associated with the Savannah Harbor would be reviewed for consistency with the Georgia plan. Alternative 8 provides the flexibility to meet this consistency test.

If you require further information please contact me. Thank you for the opportunity to review this important study.

Sincerely,

Stuart Stevens

Dr. Stuart A. Stevens, Chief
Ecological Services and
Research Coordinator SINERR

cc: Duane Harris
Mike Harris, Non-Game Program
Tiffany Lutterman, Coastal Zone Management Program

RESPONSE -- GA Department of Natural Resources,
Coastal Resources Division,
January 31, 1995.

No response necessary.

Savannah District hopes that the products of the Savannah Harbor LTMS Study -- the Management Plan and the EIS -- would be reviewed by the Coastal Resources Division and adopted as a Special Area Management Plan if/when the Georgia Coastal Management Program is implemented.

Georgia Department of Natural Resources
One Conservation Way, Brunswick, Georgia 31523-8600
Lonice C. Barrett, Commissioner
Duane Harris, Director
Coastal Resources Division
912/264-7218
FAX 912/262-3143

May 19, 1995

William Bailey
US Army Corps of Engineers
CESAS-PD-EI
P. O. Box 889
Savannah, GA 31402-0889

RE: Savannah Harbor LTMS Study.

Dear Mr. Bailey:

Please note my letter to you dated 31 January 1995 regarding the referenced project. After futher evaluation of the LTMS Study and the potential impacts to the environment and the local socio-econmic system, I recommend the Corps strongly consider placement of any suitable harbor dredged material onto adjacent beaches of Tybee Island. Tybee Island is suffering from beach erosion and suitable material must not be lost from the sand sharing system. Please consider the economic benefits of placement of dredged material onto Tybee's beaches similiar to the recent Savannah Harbor deepening project.

If you have questions please contact me.

Sincerely,

Stuart Stevens

Dr. Stuart A. Stevens, Chief
Ecological Services and
Research Coordinator SINERR

RESPONSE -- GA Department of Natural Resources,
Coastal Resources Division,
May 19, 1995.

ECONOMIC BENEFITS OF BEACH PLACEMENT.

During the 1993/1994 Savannah Harbor Deepening Project, beach placement was a lower cost disposal option than placement of excavated sediments at the ODMDS during the period when use of hopper dredges is excluded. To protect endangered sea turtles, maintenance dredging is performed by hopper dredges only during the winter months (December through March). If maintenance dredging is needed during other periods (April through November), some form of nearshore placement -- which includes direct beach placement -- would likely be the lowest cost disposal option for some of the Bar Channel sediments. The Draft EIS stated in Section 7.164 that "if the savings which would be experienced by the Shore Protection Project were included, the effective cost of placement directly on Tybee Island would be less than the normal cost for placing channel maintenance sediments at the Savannah ODMDS and such placement would, therefore, be a wise investment."

Under current procedures, if beach placement is more expensive than the original disposal location, the incremental cost of beach placement would be cost shared between the Corps and the local sponsor of the Shore Protection Project at the rate specified for the Shore Protection Project. The District could pursue such placement any time the maintenance material is determined to be of sufficient quality, the local sponsor for the Shore Protection Project requests such beneficial placement, and both the sponsor and the Corps can obtain funds to finance the incremental costs.

Georgia Department of Natural Resources

205 Butler Street, S.E., Suite 1152 East Floyd Tower, Atlanta, Georgia 30334
Lonice C. Barrett, Commissioner
Harold F. Reheis, Director
David Word, Assistant Director
Environmental Protection Division
404/656-4713

September 5, 1995

Colonel Grant W. Smith
Savannah District, Corps of Engineers
P. O. Box 889
Savannah, Georgia 31402-0889

RE: Water Quality Certification
Public Notice DRAFT EIS
Long Term Management Strategy
Savannah Harbor - Chatham County

Dear Colonel Smith:

Pursuant to Section 401 of the Federal Clean Water Act, the State of Georgia issues this certification to the Savannah District, Corps of Engineers, an applicant for a Federal permit or license to conduct an activity in, on or adjacent to the waters of the State of Georgia.

The State of Georgia certifies that there is no applicable provision of Section 301; no limitation under Section 302; no standard under Section 306; and no standard under Section 307, for the applicant's activity. The State of Georgia certifies that the applicant's activity will comply with all applicable provisions of Section 303.

This certification is contingent upon the following conditions:

1. All work performed during construction will be done in a manner so as not to violate applicable water quality standards.

2. No oils, grease, materials or other pollutants will be discharged from the construction activities which reach public waters.

3. No dredging will be conducted during the striped bass spawning period from March 16 to May 31.

4. Prior to initiation of dredging activity between July 1 and September 30, the applicant must establish the following procedures. Dissolved oxygen levels in the Savannah River will be obtained within 24 hours prior to the initiation of dredging. Three sampling locations will be established in the Savannah River to determine existing conditions. These sampling locations will be placed: 1) 1,000 feet upstream from the site of the dredging activity; 2) 1,000 feet downstream from the site of dredging activity; and 3) adjacent to the proposed dredging activity. All locations will be approximately at the mid-channel centerline. At each sample location, three depths will be sampled during low slack water or high slack water, when possible, as follows: 1) one meter below the surface; 2) one meter above a hard bottom or 2-3 meters above an indeterminate bottom; and, 3) at mid-depth. If dissolved oxygen levels are less than 4.0 mg/l at depths of one meter above a hard bottom or 2-3 meters above a soft or indeterminate bottom at any of the three established monitoring stations, dredging will not be permitted.

Monitoring of the dredging activity will consist of the same sampling regime to be conducted daily within 4 hours of the commencement of dredging, but no earlier than 2 hours after the commencement of dredging. If dissolved oxygen levels fall below 3.0 mg/l at depths of one meter above a hard bottom or 2-3 meters above a soft or indeterminate bottom at any station, dredging will be suspended until dissolved oxygen levels are 4.0 mg/l or greater. Results of this monitoring must be submitted to the Georgia Environmental Protection Division, the Georgia Wildlife Resources Division, and the Georgia Coastal Resources Division within 30 days of the completion of each dredging operation. If the applicant does not maintain a satisfactory record of compliance with these conditions, the Georgia Environmental Protection Division may prohibit all dredging during the period of July 1 to September 30 upon written notice to the applicant.

5. Dredging should be conducted during December through March. These are the times when sea turtles are least abundant in the area of the Savannah Ship Channel. Dredging should not be conducted outside these months without implementation of a conservation plan approved by Georgia Department of Natural Resources. This plan should include trawling to remove turtles from the path of the dredge.

6. During December through March, dredge and support vessel speeds should be limited to less than 5 knots during nighttime operations. A trained whale observer should be on watch during daylight hours. If daily aerial surveys are conducted for right whales, the nighttime vessel speed limitation would only need to be enforced when a whale was spotted within 15 miles of the project area during the previous daily survey.

It is your responsibility to submit this certification to the appropriate Federal agency.

Sincerely,

Harold F. Reheis
Director

HFR:kpr
cc: Mr. Nick Ogden
Dr. Stuart Stevens
Mr. Thomas Welborn
Mr. Mike Gennings

RESPONSE -- GA Department of Natural Resources,
Environmental Protection Division,
September 5, 1995.

WATER QUALITY CERTIFICATION.

This letter provides Water Quality Certification from the State of Georgia for the Savannah Harbor LTMS. Savannah District has requested clarification on conditions 4, 5 and 6.

Georgia Department of Natural Resources
205 Butler Street, S.E., Suite 1152 East Floyd Tower, Atlanta, Georgia 30334
Lonice C. Barrett, Commissioner
Harold F. Reheis, Director
David Word, Assistant Director
Environmental Protection Division
404/656-4713

February 6, 1996

Colonel Grant W. Smith
Savannah District Corps of Engineers
P.O.Box 889
Savannah, Georgia 31402-0889
Attn: Mr. Bill Bailey

Re: Modification - Water Quality Certification
Public Notice DRAFT EIS
Long Term Management Strategy
Savannah Harbor - Chatham County

Dear Colonel Smith:

The Georgia Environmental Protection Division (EPD) issued Water Quality Certification under Section 401 of the Federal Clean Water to the above referenced project on September 5, 1995. The State intends to modify the certification to wit:

Condition 5 shall be struck and replaced to read:

5. Dredging should be conducted December through March. These are the times when sea turtles are least abundant in the area of the Savannah Ship Channel. Dredging outside these months should be coordinated with the Georgia Department of Natural Resources (DNR) Nongame Wildlife Program. Dredging in May will require the implementation of a conservation plan approved by the Georgia DNR. This plan should include trawling to remove turtles from the path of the dredge.

Condition 6 shall be struck and replaced with:

6. During December through March, dredge and support vessels should have a trained whale observer on watch during daylight hours. At night, or when visibility is reduced by fog or sea states greater than Beaufort 3, dredges must slow to 5 knots or less if whales have been spotted within 15 nm of the vessel's path within the previous 48 hours. Normal operational speeds can be resumed after 48 hours if visibility has not improved and no whales have been observed by dredge observers. These procedures are consistent with the "Recommended Safe Operating Procedures for Large Vessels Transiting the Right Whale Calving Area Critical Habitat Off Georgia and Florida During March-December" that have been developed by the Southeastern U.S. Implementation Team for the Recovery of the Northern Right Whale.

These changes update the Water Quality Certification conditions to reflect the best information available on turtles and right whales. It is your responsibility to submit these modifications to the appropriate Federal agencies.

Sincerely,

Keith A. Parsons
Environmental Specialist

KP/

cc: Mr. Thomas Welborn
Dr. Stuart Stevens
Mr. Mike Gennings

RESPONSE -- GA Department of Natural Resources,
Environmental Protection Division,
February 6, 1996.

MODIFICATIONS TO WATER QUALITY CERTIFICATION.

Savannah District agrees to abide by the modifications to conditions 5 and 6 contained in this letter. Subsequent discussions with GA DNR staff reveal that the dredging to which these conditions apply is hopper dredging.

Georgia Department of Natural Resources

205 Butler Street, S.E., Suite 1152 East Floyd Tower, Atlanta, Georgia 30334
Lonice C. Barrett, Commissioner
Harold F. Reheis, Director
David Word, Assistant Director
Environmental Protection Division
404/656-4713

February 28, 1996

Colonel Grant W. Smith
Savannah District Corps of Engineers
P.O. Box 889
Savannah, Georgia 31402-0889

Attn: Mr. Bill Bailey

Re: Modification - Water Quality Certification
Public Notice-DRAFT EIS
Long Term Management Strategy
Savannah Harbor - Chatham County

Dear Colonel Smith:

The Georgia Environmental Protection Division (EPD) issued Water Quality Certification under Section 401 of the Federal Clean Water Act for the above referenced project on September 5, 1995. The EPD intends to modify the certification to wit:

Condition 4 will be struck and replaced to read:

4. Prior to the initiation of dredging activity between July 1 and September 30 the dredge operator must establish the following procedures. Dissolved oxygen levels in the Savannah River contiguous with the immediate dredging activity will be determined at a depth of one meter above a hard bottom or 2-3 meters above a indeterminate bottom. This determination must be made within 24 hours prior to the commencement of dredging activity. If dissolved oxygen levels are less than 3.0 mg/l dredging activity will not be permitted.

   Monitoring of the dredging activity will be conducted within 4 hours of the commencement of dredging, but no earlier than 2 hours after the commencement of dredging. In the event of 24 hour operation (around the clock) of the dredge, dissolved oxygen will be determined daily. The monitoring station will be located at mid-channel, 500 ft. downstream of the ongoing dredging activity. Dissolved oxygen levels will be determined at a depth of one meter above a hard bottom or 2-3 meters above an indeterminate bottom. If dissolved oxygen level fall below 3.0 mg/l dredging will be suspended until dissolved oxygen levels are 3.0 mg/l or greater.

Results of the monitoring must be submitted to the Georgia Environmental Protection Division, the Georgia Wildlife Resource Division, and the Georgia Coastal Resources Division within 30 days of the completion of each dredging operation. Failure to maintain satisfactory compliance with these conditions may result in the prohibition of dredging operations in the Savannah River Harbor during the period of July 1 through September 30 upon written notice to the applicant.

These changes update the Water Quality Certification conditions to reflect the best information available on dissolved oxygen dynamics in the Savannah River Harbor. It is your responsibility to submit these modification to the appropriate Federal agencies.

Sincerely,

Keith A. Parsons
Environmental Specialist

KP/

cc: Mr. Thomas Welborn
Mr. Mike Gennings
Dr. Stuart Stevens

RESPONSE -- GA Department of Natural Resources,
Environmental Protection Division,
February 28, 1996.

MODIFICATIONS TO WATER QUALITY CERTIFICATION.

Savannah District agrees to abide by the modifications to conditions 4 contained in this letter. The District wrote GA DNR requesting further refinement of this condition. The Corps believes that since previous monitoring data revealed that on average, hydraulic cutterhead dredges working in the channel had no discernible adverse impact on dissolved oxygen in the river, weekly monitoring until dissolved oxygen levels reach 3.5 mg/l -- rather than daily -- would be sufficient to protect aquatic resources. The District proposed weekly monitoring as long as river bottom dissolved oxygen levels exceeded 3.5 mg/l. Daily monitoring would be performed when river bottom dissolved oxygen levels dropped below 3.5 mg/l. GA DNR responded by stating that although the historic data does appear to support the Corps' position on minimal impact to riverine dissolved oxygen, that data is based on dredging which occurred in only a single calendar year. Therefore, the GA DNR would continue to require daily monitoring until a more comprehensive historic database was developed.

WAYNE SHACKELFORD
COMMISSIONER

FRANK DANCHETZ
CHIEF ENGINEER

Department of Transportation
State of Georgia
2 Capitol Square, S.W.
Atlanta, Georgia 30334-1002

G. CHARLES LEWIS
DEPUTY COMMISSIONER

ARTHUR A. VAUGHN
TREASURER

December 19, 1994

Mr. William Bailey
U.S. Army Corps of Engineers
P. O. Box 889
Savannah, GA 31402

Dear Mr. Bailey:

My office has reviewed the Draft Environmental Impact Statement for the Savannah Harbor Long Term Management Strategy Study. The document appears to follow the outline the Corps initiated 2 years ago which we were allowed to participate in.

The management strategy recommended in the report should improve the long term environmental impact of harbor activities due to the potentially extended useful life of the disposal areas and reduced frequency of maintenance dredging. We support this strategy and the projects associated with it.

Our review of the document resulted in the following comments:

1. Page 16; Section 2.22. Ga. DOT owns approximately 60% of the acres in the disposal areas. DOT is not the sole "owner/operator of confined . ..".

2. Page 29; Section 3.20. A berthing area is defined as "the area between a dock and the navigation channel". This can be a large area if the docks are distant from the navigation channel. Is the definition accurate?

3. Page 79; Section 5.49. It is stated that the throat to the sediment basin would not be modified. It is our understanding that a clean deep throat is a main criteria to an efficient sediment trap. To deepen the basin and not the throat would not be as beneficial as deepening both. Also a more efficient basin reduces dredging in the main channel and berths therefore reducing agitation dredging frequency.

4. Page 97; Table 6.
   a) Should the 233,000 for 2A* be 244,000?
   b) The total of the volumes (accounting for use of one area in each pair or group) is 8,666,000. This exceeds the 7.2 million referenced in section 4.14 as the volume to be used throughout the 20 year period of analysis.
   c) Area 2A may not be available for the annual 233,000 cubic yards due to the inability to separate the sand shoals from the silt shoals during dredging.

5. Page 98; Section 5.72. There needs to be a continued effort of partnership between the sponsor and the Corps. The harbor is dynamic and can be unpredictable at times; emergencies can happen. Some flexibility needs to be incorporated so neither the Corps nor the Sponsor has to suffer needlessly.

   There should be an annual meeting where the Corps and sponsor discuss the upcoming needs and discuss the dredging plans, dike raising plans and bird use plans.

6. Page 187; Section 7.95 A. The sponsor may choose to reclear the 26 acre site as opposed to pay incremental dredging costs, depending on which is cheapest to maintain the site.

7. Page 193; Table 14. It appears there may be some minor arithmatical errors. Are these due to rounding?

8. Page 206; Section 7.127. The sponsor will need adequate time to obtain funds for maintenance of the island.

9. Appendix A; page 9; Section A.5.11. We support speed limits of ships to reduce the erosive effects of their wakes on the dikes.

10. Appendix A; page 13; Section A.5.24 and page 15; Section A.5.35. DOT does not allow any persons on DOT property unless they are government employees or contractors, on official business associated with harbor dredging/disposal activities. Since DOT owns most of Area 12A and the general public is not allowed to cross DOT property, the fishermen and birdwatchers do not have land access to the disposal areas on the S. C. side.

11. Appendix C; page 6; Section C.2.19; and page 14; Section C.2.59. Both sections indicate there will be dike ramp construction. This does not agree with Section 7.102, page 196 of the main report.

12. Appendix F; Section F.3.08. The underdrains have been closed in 12"B", not 12"A".

Please accept these comments in the spirit of parterning as they are offered to strengthen the document. If you have any questions please call John Phillips at (404) 651-9213.

Sincerely,

Luke Cousins, Administrator
Office of Intermodal Programs

LC:JP:jsd

cc: George Lyons
David Studstill

RESPONSE -- GA Department of Transportation,
Office of Intermodal Programs,
December 19, 1994.

1. Page 16; Section 2.22. Concur.

2. Page 29; Section 3.20. A berthing area is defined as "the area between a dock and the navigation channel" since the total area is needed to safely berth and moor a vessel at the dock.

3. Page 79; Section 5.49 - Sediment Basin Throat. The proposed design, with the throat shallower than the basin, is not intended to trap additional heavy sediments which are transported along the floor of the channel. The increase in sediment trapping efficiency would result from the basin's improved retention and additional storage of finer-grained particles which are suspended higher in the water column.

4. Page 97; Table 6.
   a) The 233,000 cubic yards is correct. This volume reflects the bulking which would occur during an excavation process.
   b) This volume represents deposition volumes, rather than dredging or in-place volumes. The larger quantity reflects the bulking which would occur during an excavation process.
   c) The engineering calculations are approximate and assume that Disposal Area 2A would receive 233,000 cubic yards on an average annual basis.

5. Page 98; Section 5.72. Continued coordination between the sponsor and the Corps is encouraged as it should increase the effectiveness and efficiency of harbor decision-making and management operations. An annual meeting between these two parties may be appropriate. However, specification of the form or times of coordination are not necessary in an EIS as they would not guarantee any level of environmental impact.

6. Page 187; Section 7.95 A. Maintenance of the upland nesting area may be accomplished by either placement of additional dredged material or removing existing vegetation.

7. Page 193; Table 14. This table has been revised,

8. Page 206; Section 7.127. The sponsor will be periodically made aware of the size of the island so that it can schedule funding for maintenance of the island.

9. Appendix A; page 9; Section A.5.11. Limits on vessel speeds are beyond the authority of the Corps of Engineers to implement.

10. Appendix A; page 13; Section A.5.24 and page 15; Section A.5.35. The actions included in Appendix A are not necessarily proposed for implementation, but were included only for information and background purposes.

11. Appendix C; page 6; Section C.2.19; and page 14; Section C.2.59. Concur. Revisions have been made to include dike ramp construction.

12. Appendix F; Section F.3.08. Concur. Revisions have been made.

Adding the dredging of berths to the annual maintenance dredging of the harbor is proposed. Even with the proposed 4' over depth of the berths, annual dredging may be insufficient to maintain adequate depths. The changes in the river associated with the closing of new cut, opening of the tide gates, widening and deepening of the channel have not yet been fully realized. Dragging between annual dredging by the Corps may be inadequate to maintain the depths. However, agitation dredging must continue to be protected. Users of the channel should be assured that non-federal hydraulic dredging is protected. We also question if maintenance of the harbor and private berths can be accomplished within the limited time span now imposed by environmental restrictions and issues. Hydraulic dredging of the berths could be impractical, if not impossible, to accomplish on an annual basis given a limited number of suitable dredges, or a single dredge.

The Draft EIS states that the dredging of the berths would be bid as a separate cost item. This could result in higher costs for the dredging of the berths relative to the per yard cost for channel dredging. You would select a contractor which provided the overall lowest cost for the project, not necessarily the lowest berth dredging cost to the private owners. Some method of allowing private owners to participate in the final contract award decision should be made.

The Draft EIS states that testing will be accomplished by the Corps for berths which are deepened. It is not clear what responsibility for testing private owners have if deepening does not take place at their berth. Further, depths of berths are proposed to be increased to 4' below the adjacent channel depth. This will have to be coordinated with the Corps to maintain the structural stability of the dock. A definitive plan from the Corps should be established and reviewed.

The project sponsor or private dock owners are responsible for dredging between the Corps annual maintenance dredging. Separate permits would be required for this operation. Permitting of hydraulic dredging could become almost impossible due to the rotation of dredge disposal areas and the increased emphasis on maintaining the capacity or the existing disposal areas. A partial solution would be that the Corps dispose of all material practical in off-shore disposals, such as the berms proposed off Tybee and the off-shore disposal area. This would maintain more volume within the upland dredge disposal areas. It is noted that there are no proposals contained in the draft EIS to locate and establish new dredge disposal sites. However a more complete analysis of long term capacity requirements should be accomplished.

Actions are presently in effect to minimize the environmental impact of maintaining the harbor. These actions have proven most effective. However, the draft EIS gives further alternatives such as, further restrictions when dredging can be performed, disallowing the use of hopper dredges, further restrictions on dredge operating speeds, disallowing dredging completely during summer months, reducing speed of vessels, etc. These alternatives need to more comprehensively analyzed before being addressed in an EIS

Regarding the right whale, the Georgia Ports Authority is a member of the implementation team for the recovery of this species. Successful actions as to sightings, avoidance, etc. are in effect. We do wish to point out that Savannah's harbor is not located within the critical habitat of this mammal

To conclude, it is recommended that the LTMS be more completely developed and a final EIS reflect factual information and define strategies for maintaining the Savannah Harbor Project. Further, the LTMS should document environmental resource agency approval of the management strategy with agreements in place to ensure the appropriate dredging permits can be secured by the Corps, Public and Private Terminals.

We would be very happy to discuss these issues further and look forward to hearing from you.

Sincerely,

Charles

Charles F. Griffen, P.E.
Director of Port Planning &
Harbor Development

MH/cv
cc: Mr. Doug Marchand
Mr. B. Richard Field
Mr. Jim Bradshaw

RESPONSE -- Georgia Ports Authority,
February 27, 1995.

TIMING AND CONTENTS OF DRAFT EIS. The Draft EIS was prepared in consort with the LTMS Management Plan. No items were included in the Draft EIS that were not in the Management Plan. The Management Plan includes environmental considerations as an integral component of harbor operations. A delay in releasing the Draft EIS for public and agency comment until after completion of the Management Plan could have seriously compromised the integration of environmental considerations into the other engineering and economic considerations.

REWRITING THE EIS. The LTMS was designed to be a comprehensive review of harbor operations. Separating the diking and use of Disposal Area 14A would have undermined the broad and comprehensive view of harbor operations which the LTMS was intended to provide.

ALTERNATING USE OF CDFS. Although alternating use of confined disposal areas would increase the cost of some individual disposal operations, the total long term cost of disposal operations and disposal area management would be reduced.

SEDIMENT QUALITY. Precise actions cannot be specified at this time for materials which may not comply with sediment criteria. The nature and extent of non-compliance will determine what actions are appropriate for that particular material.

BERTH DREDGING. Excavation of berth sediments by dock owners using hydraulic cutterhead dredges with subsequent placement of excavated sediments in confined disposal facilities is included in the Base Plan (Federal Standard) for the harbor. This means that the environmnetal aspects of such excavation and deposition has been evaluated, received public review and comment, and obtained the acceptance of regulatory agencies. When dock owners desire to implement that feature, Savannah District would be able to conduct an expedited permit application review process as long as the proposal follows the procedures described in the EIS. Since the total annual volume of harbor sediment is relatively constant, placement of berth sediments directly into confined disposal facilities should improve the Corps' ability to maintain authorized depths in the navigation channel. The multiple bidders which have typically responded to proposed maintenance dredging contracts indicates that there is currently no shortage of equipment available to perform this work. The District does not believe that the availability of hydraulic dredges will be a constraint to effective maintenance of the harbor.

COST OF BERTH DREDGING. The Corps cannot allow private dock owners to influence the final contract award decision. The award decision must follow procedures established prior to advertisement to ensure fairness to all parties who bid on the work. Discussions can continue on the evaluation criteria until work is advertised.

TESTING OF BERTH SEDIMENTS. If the berths are not used for off-channel storage for the Federal Navigation Project, the berth owners would have to complete a sediment testing program designed by the Corps prior to excavation and deposition of those sediments in a confined disposal facility under the auspices of this EIS.

DEEPENING OF BERTHS. Individual dock owners who desire to deepen their berths would receive an expedited permit application review if they propose to follow the procedures described in this EIS. That procedure includes the use of hydraulic cutterhead dredges to excavate the sediments, direct deposition of the new work and maintenance sediments in confined disposal areas, and fulfillment of the environmental criteria operative upon the Corps as a result of this EIS. Dock owners which choose to implement that alternative would be responsible for all costs associated from such implementation.

DISPOSAL SITE CAPACITY. With implementation of rotational use of the disposal areas, including the use of Disposal Area 14A, placement of berth sediments into a CDF is expected to become much easier. The District would follow an expedited permit application review procedure on proposals for hydraulic dredging of berths when the sediments are placed in CDFs. The engineering analyses performed during the LTMS determined that sufficient capacity is present at the existing CDFs, when Disposal Area 14A and dike raising are included, to contain all sediments from the inner harbor for the 20-year project life.

ADDITIONAL ALTERNATIVES. Appendix A - RESOURCE MANAGEMENT MEASURES AVAILABLE lists actions which could be taken if certain goals were established for the harbor. Many agencies and individuals have interests in the operation of Savannah Harbor. The goals of those groups are not the same, and in some cases conflict with the goals of others. The actions were included in that Appendix to describe the range of actions available to accomplish different goals and were listed without analysis of impacts which their implementation may have on other goals. The listing of an action was not intended to indicate support for that action by the Corps.

RIGHT WHALE. Appendix B, BIOLOGICAL ASSESSMENT OF THREATENED AND ENDANGERED SPECIES, has been revised to state that Savannah Harbor is not located within the critical habitat for this species.

FINAL EIS. The Final EIS does document environmental resource agency approval of the EIS and its various components.

The Georgia Conservancy

COASTAL OFFICE: 711 Sandtown Road, Savannah, Georgia 31410 • 912-897-6462 • Fax: 912-897-6470

March 3, 1995

Col. Wayne W. Boy
District Commander
U.S. Army Corps of Engineers
P.O. Box 889
Savannah, GA 31402-0889

Dear Col. Boy:

Reference: Draft Environmental Impact Statement (EIS) for the Savannah Harbor Long Term Management Strategy (LTMS) Study

As determined in the above referenced Draft EIS and announced in the Joint Public Notice the Savannah District, U.S. Army Corps of Engineers proposes to discharge fill into navigable waters of the U.S. for diking Disposal Area 14A, construction of an access road, replacing weirs and pipe ramps. The Corps also proposes to continue discharging weir effluent from confined disposal areas into waters of the U.S., and transport dredged material from the bar channel for placement in the ocean during maintenance operations of the Savannah Harbor Navigation Project, located in Chatham County, Georgia, and Jasper County, South Carolina.

The Georgia Conservancy is a nonprofit organization of almost 10,000 people dedicated to the responsible stewardship of Georgia's vital natural resources. We strive to balance the demands of social and economic progress with our commitment to protect the environment. We appreciate the opportunity to provide the following comments.

1. Generally, The Conservancy supports the preferred alternative (Alternative 8). The Draft EIS is thorough and seems to address all pertinent issues that impact the environment. In addition, we believe that the EIS goes beyond the usual scope of work to suggest solutions to some long-standing issues.

2. The Conservancy supports the proposal to annually excavate and deepen berthing areas for off-channel storage of sediments. While the proposed alternative does not completely eliminate the practice of agitation dredging, it will have the beneficial effect of reducing that practice, thus, minimizing the negative impacts on the estuarine environment.

3. The Savannah District is funding a three-year study of striped bass in the Savannah Harbor. Deepening of the Sediment Basin should be delayed until the results of the striped bass study can be evaluated in terms of the role the Back River plays in restoration of that population.

4. We understand the proposed mitigation plan for loss of wetlands in Area 14A to be replacement of wildlife habitat function through manipulation of water levels within the disposal areas for maximum wildlife benefits, construction of a bird nesting island and construction of bird nesting mounds. The Georgia Conservancy supports the mitigation plan. However, alternative plans, such as acquisition and protection of Mulberry Grove Plantation by purchase and transfer to the U.S. Fish & Wildlife Service, should be considered. Protected as part of the Savannah National Wildlife Refuge Mulberry Grove would provide significant value as wildlife habitat to offset the losses in disposal area 14A. We request that this alternative be included in the EIS.

5. If the proposed mitigation plan for wetlands loss in Area 14A proceeds in the direction of managed and created nesting areas, a management strategy must be developed with the U.S. Fish & Wildlife Service in order to provide perpetual protection for the nesting areas.

6. Due to the rapid decline in nesting habitat for shorebirds, priority should be given to the use of dredged material for the creation of nesting areas prior to the use of materials for beach renourishment. This should be clarified in Alternative 8.

7. All sediment materials from the channel, berthing areas or other sediment basins should be tested for contaminants. Particularly those materials that will be utilized in areas where bird nesting will or does occur. This should be clarified in Alternative 8.

8. The Georgia Conservancy also believes that there is still a need to test the existing sediments in the disposal areas for contaminants. The fact that levels of arsenic were detected in underdrain discharges from two disposal sites suggests the potential for other contaminants in those sediments and potential leaching.

Thank you for your consideration of these comments.

Sincerely,

Rebecca R. Shortland
Vice President for Coastal Programs

RESPONSE -- The Georgia Conservancy,
March 3, 1995.

AGITATION DREDGING. Concur. Some of the proposed sediment control features, particularly hydraulic dredging of berths with direct deposition of excavated sediments in confined disposal areas, and deepening of berthing areas should reduce the need for agitation dredging, thereby minimizing negative impacts on the estuarine environment.

DEEPENING OF THE SEDIMENT BASIN. Deepening of the Sediment Basin was deferred until the foundational 3-years of the Corps striped bass studies were completed. Based on physical restrictions at the site, the proposed advance maintenance deepening of the Sediment Basin is not expected to adversely affect striped bass using Back River. Therefore, the District believes that an evaluation of potential environmental impacts of the proposed Sediment Basin deepening would not be substantively altered by waiting for the results of the extended striped bass study and that delaying until ongoing or yet-to-be-initiated studies concerning the disposition of the Tidegate structure are completed is not warranted.

MITIGATION PLAN. The District agrees that Mulberry Grove provides significant value as wildlife habitat. However, when the District initiated efforts to design a mitigation plan based on habitat values, state and Federal resource agencies agreed that there was a critical need for migratory and shorebird habitat in this region and that efforts should center around developing habitats for those species. The Mulberry Grove site does not provide a sufficient amount of such habitat. In addition, the present owner of the Mulberry Grove has long-term development plans for the site and would not voluntarily provide the site for use as a mitigation site.

MANAGEMENT STRATEGY. The Draft EIS contained a management strategy which includes management of water levels within the confined disposal areas and providing certain habitat features. That management strategy remains essentially the same in the Final EIS. The District does not believe that an additional management strategy developed with the FWS is needed.

BENEFICIAL USE OF DREDGED MATERIAL. An evaluation is made prior to each dredging contract to determine the best location for disposal of the sediments. Three steps are generally followed in this evaluation:

(1) Identify a need for dredged sediments,
(2) Evaluate the suitability of the specific sediments to be dredged for that need,
(3) Identify sources and obtain funding for incremental costs.

The District does not anticipate conflicts to commonly occur when multiple uses for sediments obtained during a particular contract would successfully complete each of the steps listed above.

TESTING OF SEDIMENTS. A review of the quality of river sediments was documented in Appendix F SEDIMENT QUALITY EVALUATION. That evaluation concluded that the harbor sediments reflect soils of the region, as no chemical parameters within the average harbor sediments exceed values recorded in naturally-occurring soils in Georgia and the southeastern US. The District agrees that before disposal into the Project's confined disposal facilities occurs from a site that has not undergone a previous sediment evaluation by the District, both new work and maintenance sediments from that site would be evaluated.

TESTING OF DISPOSAL AREA SEDIMENTS. The District has agreed to test sediments in the confined disposal areas which will be used in the rotational program to ensure that increased use of the sites by migratory birds would not result in adverse impacts to those species.

Ogeechee Audubon Society

Ogeechee Audubon Society
4405 Paulsen Street
Savannah, GA 31405

October 25, 1995

Richard A. Hill,
Acting Chief, Planning Division,
Savannah District, Corps of Engineers,
P. O. Box 889,
Savannah, Ga 31402-0889.

Dear Mr. Hill:

Thank you for your letter dated December 2, 1994 enclosing a copy of the Draft Environmental Impact Statement for the LTMS Study for the Savannah Harbor Navigation Project.

Due to this document being mislaid in the Science Museum mail area (despite its size), we did not receive it until October 17 last. Although we appear to have passed the deadline for comments we would appreciate your keeping us informed of future developments which may have environmental impact.

Sincerely,

John R. H. Stafford,
President, Ogeechee Audubon Society

PS. I understand that the Sierra Club had the same experience with their copy.

RESPONSE -- Ogeechee Audubon Society,
October 25, 1995.

No comment necessary.

SAFE BERTH MAINTENANCE, INC.
ENVIRONMENTALLY SOUND SEDIMENT RECOVERY SYSTEMS

January 17, 1995

Mr. M. J. Yuschishin
Chief, Planning Division
Department of the Army
Savannah District, COE
P.O. Box 889
Savannah, Georgia 31402-0889

Dear Mr. Yuschishin:

I appreciated the opportunity to review the draft LTMS for the Savannah Harbor Navigation Project. It contains a great deal of information that is well developed. I commend the preparers for a job well done. This step towards achieving a management plan to secure the long term operational needs for the Savannah Harbor is important for the City of Savannah, the State of Georgia, as well as the Nation as a whole.

I support your conclusion to use Alternate 8 as the best suited plan for achieving both the NED, EQ and LED. However, the proposal to maintain the adequate depths in the berthing areas through annual channel maintenance may not be realistic. First, the current data supplied by the O&M Division clearly illustrates our collective ignorance as to where the shoaling is occurring. Secondly, we do not know what the shoaling rates are. Therefore, the spirit of maintaining the berthing areas through the use of the annual maintenance cycles may mislead both the environmental and terminal operator communities.

Your draft LTMS failed to point out the Terminal Management Corporation Agitation Study was the "preferred" method for agitation dredging (3.22 of Summary Section). This statement was made in review of the two agitation studies by both the State of Georgia DOT and DNR . I suggest this method be preferred as an alternate to perform maintenance dredging in the event the annual upland system fails to maintain the required deep drafts in the berthing areas. This method was proven to be more efficient and less environmentally damaging than the I-beam method in moving sediment away from berths. This will be necessary since not all docks in the Savannah Harbor are capable of allowing the water at the face of their docks to be deepened to the projected over-dredge or project depths. This is due to lack of engineering data to confirm existing dock piling depths. We must also look at the coordination requirements that will be necessary to review the existing soil sediment analysis and berth utilization.

P.O. BOX 2253 * SAVANNAH, GEORGIA 31402 * (912)236-1865 * FAX: (912)238-5524

I would like to focus on Section 3.04 of the Summary and clarify that non-GPA docks also can and do serve any individual or company which has an agreement with the vessel to transport its goods in the Savannah Harbor. The non-GPA docks are responsible for 45 to 50% of the annual income for services for the Savannah Harbor. The non-GPA docks are a significant portion of the active berthing facilities in the Savannah Harbor.

Southern Bulk Industries located at Mile 18 on the Savannah Harbor is one of the few dock owners mentioned in Section 3.23 of the LTMS Summary (page 31) who does have a permitted upland disposal site for dredged material. This site is small (less than 30 acres) and has a finite life as well as restricted availability for other users.

The summary is Section 4 is correct that ocean carriers and railroads compete aggressively and seek the most efficient ports to conduct their business. However, it is not just port authorities but all port users (including port authority, private and public operators) goal to provide better harbor services to accommodate and attract customers.

Sincerely,

Fred N. Beason, Jr.
Vice President

FNBjr:efa

RESPONSE -- Safe Berth Maintenance, Inc.,
January 17, 1995.

DREDGING OF BERTHING AREAS. The use of a hydraulic cutterhead dredge with direct deposition of the excavated sediments in a confined disposal area is an efficient and effective method of removing sediments which have deposited in berths. Use of the Corps' contracted hydraulic dredge would be efficient from a dock owner's perspective. However, temporary release of the Corps-contracted would only be feasible when the berth dredging would not impact the scheduled completion of the Corps' previously contracted work. The District concurs that annual dredging of berths would be insufficient to maintain depths in most berths for the entire year. The Draft EIS stated this position. Coordination with resource agencies reveals they are aware of that situation.

PREFERRED METHOD OF BERTH DREDGING. The EIS states that removal of sediments from berths through the use of a hydraulic dredge, with placement of the dredged sediments in confined disposal facilities, is the preferred method since it would minimize adverse environmental impacts.

SEDIMENT ANALYSIS. There are no specific coordination requirements for either the sediment analysis or berth utilization review which the District would perform.

USE OF PRIVATE DOCKS. Concur. Section 3.04 has been revised.

PORT COMPETITION. Concur. Section 4.03 has been revised.

COLONIAL TERMINALS, INC.

NORTH LATHROP AVENUE
POST OFFICE BOX 576
SAVANNAH, GEORGIA 31402-0576

PHONE 912-236-1331
TELEX 80-4729
FAX 912-235-3873

January 23, 1995

Myron J. Yuschishin, Chief
Planning Division
U.S. Army Corps of Engineers
Savannah District
P. O. Box 889
Savannah, GA 31402-0889

Re: Long-term Management Strategy Study

Dear Mr. Yuschishin:

Thank you for including Colonial Terminals, Inc. in the Long-Term Management Strategy review process. Colonial's three deep water berths have become key contributors to the total intermodal operation of the Port of Savannah. Modifying present harbor management practices will help reduce the maintenance expense of the various terminal operators and improve the economic benefits they provide to the community, the state and the nation.

We agree that the "base plan," alternative 8, offers the best overall possibility for effective, efficient harbor operations. Any implemented plan, however, should afford terminal operators the ability to dredge their berths concurrently with dredging the navigational channel. Material dredged from berth areas would be placed in the disposal areas provided for channel dredging. Terminal operators must also retain the option of "agitation dredging." Documented siltation rates in the harbor are such that annual hydraulic dredging alone may not be sufficient to maintain authorized depths at the various berths. Further attention should be given to the system of fee assessment for dredging based on the redistribution of material that has been moved by agitation dredging.

The origin and ownership of silt material which is deposited at the various berths has been "cussed" and discussed for quite some time. Terminal operators have participated in several testing programs in the past and found that berth sediment is similar in composition to that found in the navigational channel. Test requirements for the various terminal berths mentioned in alternative 6 should, therefore, be no different than the test requirements for sediments of the contiguous navigation channel bottom. The listing of materials handled at the various terminals has traditionally remained proprietary and the reporting of any dredging events is required by 404 permits. Because of the closeness of the various terminals within the harbor, any sediment quality review required should consequently be performed on the harbor as a whole.

Colonial appreciates the effort of the Corps of Engineers team and their recognition of the need for a comprehensive harbor management plan. This strategy allows both the private and the public terminals equal access to the benefits of a well-managed harbor operation. Thank you again for the opportunity to comment.

Sincerely,

Andrew P. Calhoun, Jr.

APC,Jr/rbf

RESPONSE -- Colonial Terminals, Inc.,
January 23, 1995.

BASE PLAN. The Base Plan does include hydraulic dredging of berths with direct deposition of excavated sediments in confined disposal areas. This could include use of the Corps' contracted hydraulic cutterhead dredge with placement of the sediments in the Federal Project's confined disposal facilities. Use of the Corps' contracted dredge would be efficient from a dock owner's perspective. However, temporary release of the Corps-contracted would only be feasible when the berth dredging would not impact the scheduled completion of the Corps' previously contracted work. Approval from the disposal site's fee owner would have to be obtained by the dock owner prior to the deposition occurring. The District would follow an expedited permit application review procedure when dock owners desire to maintain their berths as proposed in the EIS, as long as the conditions described in the EIS are met. Terminal operators retain the option of seeking individual permits to perform agitation dredging.

BERTH SEDIMENTS. Berth sediments are generally finer-grained than that which settles in the navigation channel. Once new work and maintenance sediments from a berth are tested and found to be uncontaminated, subsequent testing would be performed in the same manner and timeframes as that for channel sediments. The Corps disagrees that the close spacing of terminals within the harbor demonstrate that any sediment quality review should be performed on the harbor as a whole. The quality of sediment in one berth is not necessarily indicative of the quality of sediments in other portions of the harbor. Variations in grain size exist between berth and channel sediments. The existence of the salinity wedge also introduces variation in sediment quality along the length of the harbor.

D.A. MISSROON
10 SOUTH LANCASTER ROAD
SAVANNAH, GA 31410

January 16, 1995

Colonel Wayne W. Boy
District Engineer
U.S. Army Engineer District, Savannah
P. O. Box 889
Savannah, GA 31402-0889

Dear Colonel Boy:

I am requesting a public hearing on the "Savannah Long Term Management Strategy (LTMS)", EIS for the following reasons.

Private properties will be contaminated, eroded, and made available for use of private birth owners.

Private industries will be given free use of property owned and maintained by the government without compensation to tax payers.

Sincerely,

David A Missroon

David A. Missroon

RESPONSE -- David A. Missroon,
January 16, 1995.

Savannah District does not believe that additional information, of which it is not already aware, would be gained through the conduct of a public hearing.

Box 372666
Satellite Beach, FL 32937
18 January 1995

Colonel Wayne N. Boy
District Engineer
U.S. Army Corps of Engineers
Savannah District
P.O. Box 889
Savannah, Georgia 31402-0889

Subj: COMMENTS ON ENVIRONMENTAL IMPACT STATEMENT
SAVANNAH HARBOR LONG TERM MANAGEMENT STRATEGY
(LTMS) STUDY

This is to oppose implementation of the referenced management strategy because it violates private property rights in several respects and fails to properly mitigate destruction of wetlands.

Allowing private companies to use the spoil areas without compensation to the underlying property owners is a clearcut violation of private property rights guaranteed by state and federal constitutions. No claims of overall economic benefit to the Port justifies giving to a private entity the use of property that was confiscated from other private individuals.

Moreover, the stated plan to dredge the private berths is a thinly disguised equivalent of the old-time practice of using public road-building equipment to maintain local big-wigs' driveways. The so-called dredging fees don't correct the situation.

The plan provides no protection to the underlying property owners from the arsenic and other pollutants known to be pumped onto their property in the spoil. In fact measures are taken to be sure that the pollutants pumped there stay there and therefore get concentrated year after year. Paragraph C.2.51 CDF Overflow Effluent states: "The normal harbor CDFs retain a very high percentage of heavy metals and other contaminants." The plan prescribes measures calculated to protect fish and birds in the marshes and rivers, but makes a toxic dump of citizens' property on which the Government has only an easement.

The plan proposes to mitigate destruction of wetlands by saying that dry land birds can use the dry disposal areas and water birds can use whatever disposal area happens to be under water from having been recently pumped on. These are the same disposal areas known to "retain a high percentage of heavy metals and other contaminants." What kind of nesting and feeding area is that? And how can the Government mitigate a new destruction with existing areas? Isn't the requirement to CREATE new mitigation areas to compensate for new destructions? Could a citizen meet his mitigation requirements by saying that mitigation land was hard to find and too expensive and the destroyed wetlands were not very good wetlands anyway? And, doesn't the Corps need whatever mitigation there is within the existing dikes to compensate for wetlands and creeks that lie under the spoil they have put there in the last 50 years?

I request that the strategy not be implemented until these deficiencies are corrected or a public hearing is held to discuss them.

Yours very truly,

Carolyn Allmon

RESPONSE -- Carolyn Allmon,
January 18, 1995.

VIOLATION OF PRIVATE PROPERTY RIGHTS. The EIS has been revised to clarify that private individuals or corporations are required to obtain the permission of a confined disposal area's fee owner, Chatham County, and the Corps before depositing sediments excavated from berths.

FEDERAL DREDGING OF BERTHING AREAS. Alternative 6 has been revised in the Final EIS and is now composed of privately contracted and funded dredging of those areas.

SEDIMENT QUALITY. The review of the quality of river sediments was documented in Appendix F SEDIMENT QUALITY EVALUATION. That evaluation concluded that the harbor sediments reflect soils of the region, as no chemical parameters within the average harbor sediments exceed values recorded in naturally-occurring soils in Georgia and the southeastern US.

MITIGATION PLAN. Savannah District will perform sediment testing on materials within the confined disposal areas to ensure that the habitat created in those areas is beneficial to wildlife. Creation of new areas is not a requirement for a beneficial or acceptable mitigation plan. All applicable Federal and state resource agencies have approved the Mitigation Plan contained in the Final EIS. Prior to this EIS, there were no requirements or commitments to operate existing confined disposal areas in a certain manner to compensate for creation of those sites.

PUBLIC HEARING. Savannah District does not believe that the proposed strategy is deficient or that additional information of which it is not already aware would be gained through the conduct of a public hearing.

W.C. SIMPSON, INC.

REAL ESTATE

EIGHTEEN BROAD STREET
CHARLESTON, SOUTH CAROLINA

TELEPHONE (803) 577-5449

MAILING ADDRESS
POST OFFICE BOX 802
CHARLESTON, SOUTH CAROLINA 29402

January 18, 1995

Mr. William G. Bailey
Environmental Resource Branch, Planning Division
Savannah District, Corps of Engineers
PO Box 889
Savannah, GA 31402-0889

Reference: Properties in Jasper County owned by William C. S. Simpson, ETAL numbered TMS 036-00-02-010 and TMS 074-00-00-001

Dear Mr. Bailey:

The owners of reference properties which are partially in disposal area 14B and disposal area 12B, respectively, submit comments as follows on the draft environmental impact statement for the Savannah Harbor Long Term Management Strategy dated November 1994.

CONTAMINATION: Should liability for the quality of deposited material rest with the owner of the site where the material is deposited (par. 5.46), then the site should be:

a) Diked along the owner's property line.

b) Tested for contaminated disposal material within the site periodically as well as prior to and during dredging of material for disposal in the site.

EASEMENTS: The purpose for which easements were obtained from private property owners, dredged material disposal (H.2.12), is exceeded by such usage of private sites as: removal of dredged materials (A.6.02); disposal of materials dredged from privately owned berths (5.46); creation of wildlife nesting areas and resting ponds (G.4.01); establishment of production plants for construction of bricks (A.6.04) - to name a few. Further consideration or implementation of such excesses should be terminated without delay.

DISPOSAL AREA 14B (N.2.03): South Carolina lands placed under easement to provide for deposit of spoil excavated from the Savannah River did not include 480 acres along Fields Cut. This acreage, included in reference tract TMS 036-00-02-010 and partially included in Disposal Area 14B, was placed under easement as a spoil disposal area for the Intracoastal Waterway only. Hence, there is no authority for deposit of dredged material from Savannah Harbor Navigation Project on this 480 acre tract and the

practice should be terminated without delay.

DIKING OF DISPOSAL AREA 14A (M.4.19): Specifications for design of the new Disposal Area 14A dike as well all dikes in Jasper County should include the maximum height desired to assure compliance with county zoning code's now and in the future. Any raising of dike elevations should be subject to Jasper County review.

CULTURAL RESOURCES (APPD. J): Consideration has not been given to safeguarding or preserving the ferry wharf site on South Carolina's banks of the Savannah River. Nor has the old Union/Screven Ferry Road been considered. These historic landmarks were the pillars of transportation between Georgia and South Carolina from late 18th Century through the early 20th Century.

In review of the above, it is respectfully requested that the District Engineer schedule a public hearing on this project.

Sincerely,

William C.S. Simpson

cc: Mr. Henry Moss, Administrator Jasper County
Mr. Rob Mikell, OCRM, SCDHEC
Ms. Nancy Brock, SCSHPO

RESPONSE -- William C.S. Simpson,
January 18, 1995.

CONTAMINATION (PARA. 5.46): This paragraph has been revised to clarify that the liability for the quality of sediments at a berth is with the owner of the berth. That paragraph and the next one address the evaluations that must be performed to demonstrate that the material is safe for dredging and placement in the Project's confined disposal areas.

EASEMENTS: The District is reviewing its existing easements to ensure it has sufficient interests in the disposal area properties to conduct the proposed activities. Removal of deposited sediments as part of an operation to produce bricks or aggregate may require additional real estate interests to be acquired, depending on the wording of existing easements. Should additional interests be determined to be necessary, the local sponsor will be responsible for obtaining those interests. Consideration of new beneficial uses of harbor sediments will continue, as both the District and the local sponsor seek to maximize the useful life of the existing disposal areas.

DISPOSAL AREA 14B (N.2.03): Savannah District is reviewing its existing easements to ensure it has sufficient interests in the disposal area properties to conduct the proposed activities. Should additional interests be determined to be necessary, the local sponsor will be responsible for obtaining those interests.

DIKING OF DISPOSAL AREA 14A (M.4.19): Dikes would be constructed in compliance with all applicable laws and ordinances. Jasper County was provided a copy of the Draft EIS for review.

CULTURAL RESOURCES (APPD. J): The historic ferry wharf on South Carolina's banks of the Savannah River no longer exists. The upland portion of the site has been cleared and is now used as an access ramp to Back River for construction equipment. Dikes have been constructed over the location of the Union/Screven Ferry Road. The elevation of the dikes have been raised several times since the 1960's, effectively burying the old road bed under many feet of dredged material. The Final EIS has been revised to include these historic landmarks.

REQUEST FOR PUBLIC HEARING. Savannah District does not believe that additional information, of which it is not already aware, would be gained through the conduct of a public hearing.

W.C. SIMPSON, INC.

REAL ESTATE

EIGHTEEN BROAD STREET
CHARLESTON, SOUTH CAROLINA

TELEPHONE (803) 577-5449

MAILING ADDRESS
POST OFFICE BOX 802
CHARLESTON, SOUTH CAROLINA 29402

April 3, 1995

Colonel Wayne W. Boy
Savannah District Engineer
U.S. Army Corps of Engineers
P.O. Box 889
Savannah, Georgia 31402-0889

Re: Draft Enviromental Impact Statement (EIS),for the Savannah Harbor Long Term Management Strategy (LTMS) Study dated November 1994.

Dear Colonel Boy:

Pursuant to Public Notice dated 30 November 1994 concerning reference study, I submitted comments to your office by letter dated 18 January 1995 (copy enclosed). As of this date, I have received no information from your office pertaining to my comments, scheduling of a public hearing or the status of the study.

Hence, I would appreciate hearing from you regarding the above at your earliest convenience.

With every best wish.

Sincerely,

William C.S. Simpson
Colonel, U.S. Army, Retired

Encl. a/s

RESPONSE -- William C.S. Simpson,
April 3, 1995.

Responses to all comments received on the Draft EIS, including Mr. Simpson's letters, are included in this Final EIS. Savannah District did respond directly to Mr. Simpson on May 12, 1995 to inform him that we did not plan to conduct a public hearing on this proposal.

JAMES F. MISSROON
2861 PLAYERS DRIVE
LAKE SPIVEY COUNTRY CLUB
JONESBORO, GEORGIA 30236

Subject: Request for a public hearing on Savannah Harbor Long Range Management Strategy (LTMS) and Draft Environmental Impact Study (EIS)

THIS LETTER WILL PROVE:

(1) DISTRICT ENGINEER COLONEL WAYNE W. BOY LIED IN ANSWER TO INQUIRES CONCERNING FOIA VIOLATIONS. (5c, Page 9)

(2) ALTERNATIVES 6, 7, & 8 OF THE EIS ARE NOT ACHIEVABLE AS PROPOSED. (1d, page 6)

(3) THE DISTRICT HAS A LONG HISTORY OF PUBLISHING AND THEN BREAKING GLOWING ENVIRONMENTAL PROMISES. (Sect 5, pgs. 8-10)

January 19, 1995

Colonel Wayne W. Boy, District Engineer
U.S. Army Corps of Engineers
P.O. Box 889
Savannah, Georgia 30236

Dear Colonel Boy:

This is in request of a public hearing on the Savannah Harbor LTMS. My objections to the LTMS include the following list:

1. CONSIDERATIONS OF PROPERTY OWNERSHIP

Although listed in the Public Notice as an "evaluation factor", the EIS presents no analysis of property ownership considerations in regard to the confined disposal areas (CDFs).

Large tracts of the CDFs are privately owned property under perpetual easements imposed by the Corps. The owners hold fee simple title and continue to pay property taxes, already in excess of any compensation received for the imposed perpetual easements. All use of the CDF property has been completely taken by the Corps for the benefit and direct use of the Savannah shipping industry.

The CDFs are being contaminated, eroded and robbed of sand, which is then replaced by silt. The LTMS implies only two general alternatives for the owners: (1) Continue to pay property taxes while the Corps and the shipping industry maintain total and perpetual use of the land, or (2) continue to pay property taxes

until some time after the 20 year life of the LTMS, at which time the Corps may walk away from any responsibility for the contaminated and eroded CDFs. (EIS 5.46: "...liability for the quality of deposited material rests with the owner of the site where the material is deposited,...")

The EIS is not in compliance with the Federal Register unless considerations of property ownership are analyzed with specific regard to (1a) contamination, (1b) erosion, (1c) sand ownership and (1d) unauthorized disposal of spoil from non-federal berths.

1(a). Contamination of private CDF tracts.
The CDFs are diked settling ponds, carefully designed to contain any contaminants in the dredge spoil. Adjustable flood gates allow only the upper water level to overflow as the sediments settle out. This method of containment would tend to accumulate and concentrate any contaminants into the silt which is continuously being dredged from the upper surface of the river bottom. There is ample evidence of the likelihood of contamination of the soil and shallow groundwater of the CDFs.

The LTMS should insure against the almost certain contamination of the CDFs for property ownership considerations and for long term environmental reasons. The Corps has a responsibility to look beyond the useful spoil containment life of the CDFs. The only sure protection is to test the sediments within the dikes. There has never been any testing within the dikes.

- The 1994 Wright River Weir Effluent Study found elevated levels of arsenic and manganese and high marine life mortality in runoff waters from the CDFs. South Carolina banned further discharges of the runoff water into the Wright River. Again, Contaminants are generally trapped within the dikes and would not appear in runoff water.
- Sediments from the private berths in the Harbor have not been tested (EIS 5.47). For years, the corps has allowed the untested private berths to be dredged by agitation into the channel for re-dredging into the CDFs.
- The last Harbor-wide testing of sediments was in 1982. Those tests showed arsenic, cadmium, lead, mercury and silver well above the levels listed as toxic in the Federal Code of Regulations.
- The EIS relies heavily on two recent environmental studies paid for by agitation dredgers: "The Skidaway Study" and "The EMC Engineering Services, Inc. Study". U.S. Fish and Wildlife Services (FWS) and National Marine Fisheries Service (NMFS) interpreted the studies as verifying harbor contaminants at levels detrimental to marine life and as generally inadequate and inconclusive. Both agencies and USEPA have notified the Corps of the need for further testing, site specific testing, and testing in particular for dioxins and furans.

- From EIS 6.05: "Introduction of water into the upper Floridian Aquifer would require contact with a fissure, fault, or ancient stream channel which would lead to this strata. This is possible, but not likely." Tests should be conducted within the dikes to preclude all possibility of metals, dioxins or other contaminants leaking into the aquifer.

  EIS 6.06 further outlines the likelihood of water migration through soil layers above the aquifer and the resulting contamination of shallow ground water. Contamination of even shallow groundwater would be a violation of property rights of CDF landowners. Again, environmental concerns and considerations of property rights mandate testing within the dikes.

1(b) Erosion of Private CDFs

Shoreline erosion is listed in the Public Notice as an Evaluation Factor. The Corps recently demolished erosion protection in the form of a training wall, increased the lateral slope of the channel, and moved the channel 200 feet closer to CDF 13A. Shoreline erosion from ship wakes is now uprooting trees, washing out old dikes, and washing sediment and contaminated ooze back into the river. (See photos, next two pages, #s 4 & 5).

The CDF owners pay taxes while the Corps claims total perpetual use of the property. District Engineer Colonel Boy has arrogantly suggested that the owners also put up protection against the erosion of Corps projects. His letter to Senator Strom Thurmond, August 16, 1993: "The Government's easement does not prevent Mr. Missroon from protecting his property from erosion using methods such as rip-rap." The CDF river banks are littered with remains of the Corps' old failed rip-rap plans. The EIS should set up corrective steps.

1(c) Ownership of Sand in the Privately-owned CDFs

The LTMS proposes moving sand from one CDF tract to another for dike construction (EIS Appendix H.2.12). Sand deposited onto a private CDF, either as dredge spoil or for road or dike construction, becomes part of the property or a mineral component of the property. The easement grants to the Corps only the right to use the property for dredge spoil disposal and for other harbor maintenance activities (dike and road construction) on the property. The easement does not grant a mineral lease or the right to remove part of the property for use on another property.

The Georgia Department of Transportation (GDOT) has become a dealer in sediment sand for various local construction projects. Ownership of the sand is conferred through mineral leases from GDOT. GDOT has no mineral lease or other claim to sand on privately-owned CDFs for any type of construction, dikes or otherwise.

EROSION OF S.C. SHORELINE

The Corps removed the "training wall" erosion protection, increased the lateral slope and moved the channel 200 feet closer to this shoreline of CDF 13A.

The erosion seen here is clearly from ship wake surges with forces perpendicular to the channel. Natural erosion forces are generally parallel to the stream and do not create washouts deep into the creeks and low soft areas of the bank.

Erosion is now washing into the old contaminated dikes from the 50's and 60's. A few years ago, the marsh in the upper part of the bottom photo extended downward in a straight, marshy bank across what is now shallow water in the photo.

This not the same area where a dump truck fell into the erosion, as described in EIS Appendix H.3.25.

CONTAMINATED EROSION

These photos from the S.C. shoreline near CDF 12B/13A show deep orange liquid seeping into the river from old eroded dikes from the 50's and 60's.

GDOT determined in the 1989 "Waterways Dredged Material Containment Areas Study", page 40, that sand could not be moved across property line of the private CDFs: "Obtaining ownership in these lands will insure absolute dedication of them for disposal areas and eliminate access rights to them for hunting and other recreational activities. .... Additionally, GDOT ownership would improve security for the county's and contractor's equipment and remove doubt as to ownership of dredged material placed on these lands, which would, as an example, make material in 13A available for use in Area 14B."

1(d) Unauthorized Use of CDFs By Private Berth Owners.
The LTMS proposes dredging private berths into the CDFs along with scheduled channel dredging. This proposal is achievable only upon negotiations with the CDF landowners. The CDFs were condemned to easements for disposal of spoil from the Federal channel only, exclusive of any use by non-federal parties without the consent of the landowner. Constitutional law prohibits condemnation of private property for private use. The Corps has repeatedly cited the exclusion of private dredge spoil from CDFs without the owner's permission:

- EIS 3.23: "Dock owners do obtain separate approvals from both the owner of the disposal site and the Corps prior to the disposal operation."
- District Engineer Colonel D.R. Holzwarth's letter to me, June 23, 1993: "The Corps of Engineers does not have the authority to authorize the dredging of private berths onto private tracts in a disposal area without proof that the private applicant has obtained the right to do so from the disposal area landowner." ; "If a private berth owner wishes to dispose into one of these disposal areas, the private berth owner must first obtain the right to do so from the landowner." ; and " The Corps of Engineers cannot grant third party use of a Federal easement area, as this could only be given by the fee simple owner with the concurrence of the local assurer."
- District Engineer Colonel Wayne W. Boy's letter to Senator Strom Thurmond, August 16, 1993: "When a permittee proposes to undertake dredge disposal activities onto privately owned lands, the permittee is legally required to acquire rights or permission from the underlying fee owner."
- Mr. Thomas W. Yourk, Chief, Permits Section, letter to South Carolina Coastal Council, May 4, 1993: "Our Real Estate Division, from which our lease transactions have been formulated, advised us that unless Mr. Missroon grants approval to Chevron, or any other private user, this disposal area cannot be used for private use."

The Corps clearly recognizes a legal requirement for the landowner's approval prior to any private use of a CDF. The EIS should address the use of CDFs for both, (i) hydraulic dredging

and (ii) agitation dredging, in order to comply with the Federal Register requirement to evaluate considerations of property ownership.

(i) Hydraulic Dredging of Private Berths into the CDFs. Alternatives 6, 7, & 8 (EIS 5.00) for dredging private berths into the CDFs are clearly illegal and unattainable without the consent of the landowners. A major portion of the LTMS is not achievable as proposed.

(ii) Agitation Dredging of Private Berths, Re-dredging into CDFs.

Agitation dredging is a two-step dredging process (EIS 3.21) designed to illegally move sediment from private berths into the CDFs without the landowner's approval. The private berth owners agitate sediment from their berths into the channel and then pay private hydraulic dredgers, through the Corps, to re-dredge the sediment into the CDFs. Agitation dredging in the Savannah Harbor moves about 1/4 of the volume of material that is removed from the harbor by hydraulic dredging (EIS 7.16). Agitation dredging violates the requirement for landowner approval prior to private use of the CDFs. The EIS should address agitation dredging in consideration of the property ownership of the CDFs.

2. ILLEGAL FREE USE OF PUBLIC FACILITIES BY PRIVATE INDUSTRY

The LTMS proposes dredging the private berths into the CDFs. The only proposed fee would go to the private dredge operators. No fee is proposed for use of the CDFs. The Corps cannot legally give selected private industries the use of CDFs without reimbursement of the public cost of owning, leasing, and maintaining the CDFs.

3. SITE SPECIFIC TESTING OF PRIVATE BERTHS

EIS 5.46: "...some of the material deposited in the berths has never been tested for chemical contamination...". Site specific sediment testing of any ship berth should be required prior to any dredging regardless of disposal site (public or private) and regardless of dredging method (hydraulic, agitation or otherwise).

4. ENVIRONMENTAL OBJECTIONS TO AGITATION DREDGING

Agitation dredging is performed by towing an underwater device through private ship berths to mix thousands of cubic yards of untested sediment into the outgoing tide. The process is environmentally and operationally inefficient.

Environmentally, the process puts silt and known contaminants into tidal suspension. The resulting turbidity and reduced

dissolved oxygen levels are a major obstacle to recovery of the striped bass population.

Operationally, the same sediments must be successively re-agitated from each upstream berth to the next downstream berth before final hydraulic re-dredging into the CDFs. Agitation dredging goes on as a disgrace to Savannah and the Corps long after being banned in other U.S. ports for environmental reasons.

5. PRIOR MANAGEMENT STRATEGIES - A HISTORY OF DECEIT

The Savannah District has a history of formulating unsound management strategies in sole response to shipping industry needs and in total disregard to input from environmental organizations and the general public. The policies are then published with glowing environmental assurances and protective regulations. The published regulations are soon ignored and the District then lies to conceal the violations. I will give examples of disastrous policies, violations of published environmental regulations and lies to conceal the violations. The current LTMS promises more of the same.

(5a) The tidegate. When the District errs in favor of the shipping industry the costs to the tax payers and to the environment are usually severe. In 1977 the District installed a tidegate in Back River, dug a canal, and put in an extensive freshwater control system, primarily to alleviate natural sedimentation in shipping berths (EIS 3.10). Thirteen years later, the predictably unacceptable system had to be dismantled.

The taxpayers suffered the construction and removal of the Tidegate, digging and filling of the canal, cost of the freshwater control system, and continuing studies in hopes of reversing the damages. The environment suffered a 95 percent reduction in striped bass, a loss of 4,000 acres of freshwater tidal wetlands (EIS 7.184) and salinity increases in the Savannah National Wildlife Refuge.

(5b) Agitation dredging. Agitation dredging is another example of an environmentally damaging concession to the shipping industry. When federal environmental agencies opposed renewal of expiring agitation dredging permits several years ago, the District simply extended the old permits for three years in direct violation of a Federal Register regulation that maintenance dredging permits cannot be extended.

During the illegal three year extension, the agitation dredgers paid for two studies of agitation dredging. Three federal environmental agencies (USEPA, FWS and NMFS) rejected the studies and recommended denial of new permits. The District granted the permits, at the same time denying numerous requests for a public hearing, in violation of Federal Register guidelines for public

hearings. The District Engineer also failed to send out his written reasons for ignoring the request of each requester as required by the Federal Register.

The District announced the renewal of agitation dredging in late 1993, again, with glowing environmental assurances and protective regulations. Many of those same regulations are repeated in the current EIS-LTMS. I will show below that the District is aware of gross violations of the published regulations and is actively at work as a cover up agency for the shipping industry.

(5c) Sediment Testing in General

The EIS is vague concerning planned sediment testing during the 20-year LTMS. The EIS also fails to respond to recent criticism by three federal environmental agencies in regard to sediment testing by the Corps. USEPA, U. S. Fish and Wildlife (FWS), and National Marine Fisheries Service (NMFS) have all found sediment testing to be unsatisfactory.

The District has violated the Freedom of Information Act (FOIA) as a means of concealing from the public the inadequacy of Harbor sediment testing. I will show positively that District Engineer Colonel Wayne W. Boy lied in response to inquiries concerning FOIA violations by his staff.

Both FWS and USEPA have notified the District as recently as April 28, 1994 of the need to test Harbor sediments for dioxins and furans. On October 13, 1993 I asked Mr. William Bailey, prepare of the EIS-LTMS, whether there had ever been any dioxin tests of the river bottom or the CDFs. In early November, Mr. Bailey told me that he had written a response to my request. When his answer had not been received by late November, I submitted a FOIA for Mr. Bailey's response. I then received a response letter from Colonel Boy and a FOIA notification that Colonel Boy had destroyed Mr. Bailey's "draft" letter. Colonel Boy did not address dioxin testing.

I then sent the dioxin question to Washington. Later, the Office of Counsel in Atlanta advised that I must first agree to pay for a 3-day file search for the District to determine whether there had ever been a dioxin test in the Harbor. Soon afterward, Mr. Charles Samz of the Sierra Club of Georgia submitted a FOIA for results of all Savannah Harbor dioxin tests. His FOIA response was free, with search and production costs below the $15.00 minimum.

The following paragraph is copied directly from Colonel Boy's letter to me December 9, 1994:

- You asked why it would take three days to give a yes or no answer concerning dioxin tests for the Savannah Harbor. A search would have to be conducted of every test to determine if a test was run for dioxins. You stated that Mr. Samz received the information for less than $15.00 while you were informed that it

Colonel Boy's letter continued:

would take approximately three days to answer a yes or no question. In Mr. Samz' request letter of September 7, 1994, he asked for any and all studies or tests the Corps may have on record in regard to dioxin or furan levels in the Savannah Harbor as related to agitation dredging. Operations Division provided Mr. Samz with a copy of the test for agitation dredging. In your letter of May 4, 1994, to Colonel Boy, you asked "DOES THE CORPS HAVE ANY RECORD OF THE SAVANNAH HARBOR BOTTOM SEDIMENTS EVER BEING TESTED FOR DIOXINS?" Your request did not limit the search to agitation dredging; therefore, in order to provide you with the information that you were seeking, a search would have to be conducted of every project (past and present).

Colonel Boy lied to cover up FOIA violations. Mr. Samz's request was not limited to agitation dredging. The following is copied directly from his FOIA request:

Please send the following information on any and all studies or tests the Corps may have on record in regard to dioxin or furan levels in the Savannah Harbor.

1. A title page showing date, area tested, client, and testing facility.
2. A summary of the measured levels of contaminants listed by contaminant and test locations.
3. A list of conclusions, not to exceed 2 pages per report, if included in the test report.

The FOIA response to Mr. Samz reported only three soil samples taken July 28, 1992 by EMC Engineering under contract to agitation dredging permittees. All three of the reviewing agencies have found the EMC studies to be unsatisfactory. The following two sample pages (#s 11 & 12) are from seventeen pages rejecting the studies, opposing agitation dredging, and urging valid sediment testing.

(5d) Sediment Tests of Private Berths Prior to Dredging into CDFs
EIS 5.46 promises chemical testing of the private berths. That is an old promise from the Regulatory Branch (see "Guidelines", page 13). The Guidelines were only a public relations ploy to mislead the public. No private berths have ever been tested under the guidelines.

The 404 (b)(1) Guidelines, Part 230.11 state that "The permitting authority shall determine in writing the potential short-term or long-term effects of a proposed discharge of dredged or fill material on the physical, chemical, and biological components of the aquatic environment ..." . The Agency requests that the agitation dredging proposal submit site specific analytical data including sediment analysis and bioassay/bioaccumulation studies as required in Part 230.11 (a) through (h). Dioxins and furans should be included in the analytical studies.

In summary, we continue to be opposed to the agitation dredging projects. We approve of the provisions of the Georgia Water Quality Certification which limits the time of year when the dredging operations can occur. However, we feel that although these provisions should lessen the impacts on aquatic life, there will still be significant adverse impacts. The Agency is also concerned with the cumulative impacts from the numerous ongoing agitation dredging projects. We recommend that the Corps coordinate these operations so that they are not proceeding concurrently.

We ask that the Corps fully consider the points raised above when evaluating this application and that the permit not be granted until these conditions are addressed. We also request that the applicant be required to comprehensively investigate innovative dredging alternatives so that we will not be facing these same issues in five years.

Previous discussions and correspondence with the Corps have not resolved the agitation dredging issue. We are not exercising our authority under Section 404(q) of the Clean Water Act, Memorandum of Agreement between EPA and the Department of the Army (8-11-92), Part III.2 to elevate this as a policy issue at this time. However, the Agency is planning to further research this issue and we are seriously considering initiating a policy elevation regarding the permitting of agitation dredging at a later data.

If there are questions regarding these comments, please contact Becky Fox of my Wetlands Regulatory North Unit staff at (404) 347-4015.

Sincerely,

Thomas C. Welborn, Chief
Wetlands Protection Section

cc: List enclosed

Dredging during the spawning season would likely disrupt spawning and destroy eggs and larvae carried downstream to the project area by tidal action. The adverse impact on striped bass reproduction would reduce population levels and affect recreational fishing.

In addition, dredging may impact other fishery resources as well as striped bass by reducing dissolved oxygen to concentrations that cause stress or mortality ($\leq$ 3.0 mg/l), particularly during July, August, and September when dissolved oxygen levels are naturally low.

In addition to high turbidity and low dissolved oxygen, data from the Skidaway Institute of Oceanography study (1993)[1] (Skidaway) indicates that contaminants are also a problem in the Savannah Harbor. Even though the berths in the Skidaway study (East Coast Terminals and Southern Bulk Industries) are not likely to receive significant contaminant inputs from onsite activities which involve only the onloading and offloading of cargo, the reported levels for metals were at a concentration known to cause adverse effects on aquatic organisms. The Skidaway study also found DDT and its metabolites in the slips at East Coast Terminals and Southern Bulk Industries at levels known to exhibit deleterious biological effects on aquatic organisms. Polyaromatic hydrocarbons were found in levels above "Effects-Range Low"[2] in the slips which are not likely to receive significant input of this contaminant from onsite activities. It is therefore likely that the petroleum based companies in this public notice, which produce and/or transport these chemicals, will have significantly higher levels of polyaromatic hydrocarbons in their slips. Skidaway did not test for all organics known to occur in the general vicinity (eg. dioxins and furans); therefore we don't know at what levels these contaminants, which are included on EPA's list of priority pollutants, occur in the Harbor.

The EMC Engineering Services, Inc. study (1993)[3] (EMC) also reported levels of metals known to have adverse effects on aquatic organisms. Their data on organics, however, are unusable because the detection limits cited for their laboratory procedures are several magnitudes above levels known to cause adverse effects to organisms.

In conclusion, at a minimum, both the Skidaway and EMC studies have indicated that contaminant levels in Savannah Harbor sediments are high enough to cause detrimental effects to organisms if resuspended by agitation dredging. Data on some contaminants is insufficient to allow us to fully understand potential impacts to aquatic resources. Neither study addressed the cumulative effects on aquatic organisms downstream.

Note: The Regulatory Branch mailed these Guidelines with an announced renewal of an agitation and hydraulic dredging permit. No testing has been done under the Guidelines.

GUIDELINES FOR PRIVATE DREDGING WITH DREDGED MATERIAL PLACEMENT IN GOVERNMENT CONTAINMENT AREAS

The special conditions to be added to special conditions of all future applicable permits are:

a. At least 30 calendar days before private dredging is to begin, the following information should be furnished to the U.S. Army Corps of Engineers, Project Operations Branch, with a request to conduct the dredging:

(1) A copy of the Local Assurer-Private Concern agreement allowing use of specified containment area(s). The Private Concern should be required to comply with all applicable Federal, State, County, and Municipal laws, regulations, and any special conditions in the Department of the Army Permit.

(2) Results of priority pollutant sediment tests - EPA 301 including petroleum hydrocarbons. Sampling and testing should be required to be conducted by an independent laboratory. Sampling should be done within 90 days prior to scheduled dredging. The private concern should provide evidence that his actions have not caused pollution at the proposed dredging area during the time between sampling and dredging. Sample locations should be provided on a sketch. One test set per 500 feet of berth should be required. Results of all tests shall be provided to the Government and Local Assurer. The Savannah District Engineer will consider requests to modify the test scheme when presented with factual data indicating a modified test scheme would be more appropriate.

(3) A plan for placement of the pipeline outfall head section and monitoring of dredge, weirs, and dikes including repair of any dike or weir failures occurring during the time the dredge is released to dredge for private concerns. There should not be a required format for the plan. A simple statement of actions to be taken is adequate. Any property damaged or destroyed by the private concern, including dikes and weirs incident to the exercise of the privileges granted, should be required to be promptly repaired by the Private Concern to the satisfaction of the Local Assurer in concurrence with the Savannah District Engineer.

(4) A rough estimate of quantity of material to be dredged.

(5) A plan for conducting water quality tests (salinity, conductivity, turbidity, dissolved oxygen, ph, total suspended solids) at the containment area weirs if the dredging for the Private Concern is to take more than five calendar days. One set of water quality tests should be required for every five calendar days of dredging at a private concern.

The Corps issued Georgia Ports Authority (GPA) permits for dredging its berths into CDF 2a in 1994. GPA did so without testing. Colonel Boy responded that the EIS for the Deepening Project exempted GPA from the required testing. The EIS did not meet the sediment testing requirements of the Guidelines. The District simply wrote the test requirement out of the Deepening EIS in a continuing policy to excuse the shipping industry from all testing requirements.

The LTMS EIS states that the private berths have not been tested and should be tested prior to dredging into the CDFs. In contrast, the District has for years allowed agitation dredging of untested private berths with final disposal into the CDFs.

(5e) Dredging during the striped bass spawning period.
EIS 6.54 reads, in part: "Therefore, to remain in compliance with the Georgia Quality Certification and avoid possible impacts to the striped bass population of the Savannah River, dredging continues to be restricted to the lower harbor and the Bar Channel during the period from March 15 to May 31 of each year." There is no reference to exceptions.

That is another old broken promise from the Regulatory Branch. The Branch will grant any dredge permittee an exception for "urgent" dredging. The records for 1992 - 1994 show no denials. The only requirement is a little paperwork. The records show seven separate approvals, usually for one week each, during the 1992 spawning period. Five similar approvals were granted in 1994. Many more requests for exceptions can be expected with the deepened channel.

(5f) Dredging During Months of Low Dissolved Oxygen.
EIS 7.37 outlines procedures for the monitoring and restriction of agitation dredging during summer months when dissolved oxygen (DO) levels are reduced. That is another old broken promise from the Regulatory Branch.

The next page, #15, was distributed by the Regulatory Branch to assure the public that the Branch would monitor DO testing during summer months. The Branch also distributed the following "special condition" promising to "avoid" dredging during summer months.

7. That dredging will be avoided from June 1 through September 30. If justification for dredging during this period is adequate, the permittee will determine oxygen levels in the project area immediately before dredging. No dredging will be allowed if dissolved oxygen levels are 3.0 mg/1 or less. If dissolved oxygen is less than 4.0 mg/1, the permittee will monitor dissolved oxygen during dredging and ceased when the dissolved oxygen drops to 3.0 mg/1 or less. The permittee will provide the U. S. Army Corps of Engineers with all monitoring data.

July 11, 1989

DISSOLVED OXYGEN TESTING PROCEDURES
IN CONJUNCTION WITH SPECIAL CONDITIONS
FOR AGITATION DREDGING PERMITS

The following water quality procedures will be implemented as a procedural requirement of the special conditions as contained in all permits for agitation dredging as issued by the Savannah District.

The determination of existing DO levels prior to dredging is the first decision point to allow dredging during the time period 1 July - 30 September. Dissolved Oxygen levels in the Savannah River will be obtained no later than 3 days prior to initiation of dredging. Three sample locations will be established in the Savannah River to determine existing conditions. These three sample locations will be placed: 1) 1,000 ft. upstream from permittee's slip, 2) 1,000 ft. downstream from permittee's slip and 3) adjacent to permittee's slip, all approximately at or on a mid river center line. At each sample location, three depths will be sampled during low water slack or high water slack, when possible, as follows: 1) one meter below the surface, 2) one meter above a hard bottom or 2-3 meters above a soft or indeterminate bottom, and 3) at mid depth. If greater than 50% (5 of 9) of the readings are below the 3mgO /liter standard, dredging will not be permitted. A retest can be repeated in two weeks.

If 5 of 9 samples are above the standard, dredging will be permitted to commence within three days of existing condition sampling. Monitoring will consist of the same sampling regime to be conducted every second day of consecutive dredging. Should any 5 of 9 readings fall below the 3mgO /liter standards, dredging will be suspended for two weeks at which time existing condition sampling can be repeated. All test results for all locations and depths will be reported to the Chief, Regulatory Branch of the Savannah District within one week after the completion of dredging. The Savannah District reserves the right to conduct additional sampling for DO in the Savannah River and on the basis of this information may require the suspension of dredging activities. A Dissolved Oxygen meter or other methods as approved by EPA for the measurement of Dissolved Oxygen in Estuarine or fresh waters is required. A location map, date of sampling, tide condition (flood or ebb) depth in meters and DO will be reported. Instruments (manufacturer's make and model) and/or methods used for DO measurment along with calibration technique and results should be reported as well.

To the contrary, DO testing by the permittees is not monitored and agitation dredging is not avoided during summer. The level of agitation dredging is highest during summer months.

Open Records requests and FOIA requests confirm that none of the permittees sent DO test results to the Corps or to any state environmental agency for 1993 or 1994. No inquiries were made for 1992. The Corps is aware that DO testing is not being monitored and has taken no action.

A summary of agitation dredging activity for FY '91 to Fy '93:

Quarter	Average per quarter hrs.	cubic yds. (@ 2,100 CY/hr., EIS 7.18)	
Jan, Feb, Mar	205	430,530	(spawning Mar 15 - Mar 31)
Apr, May, Jun	183	384,300	(spawning Apr 1 - May 31)
Jul, Aug, Sep	260	546,000	(Low dissolved oxygen)
Oct, Nov, Dec	156	327,600	

Once again, the regulations in regard to the spawning season, DO test monitoring, and dredging restrictions during low DO months were all published to mislead the public without restricting the environmentally damaging activities of the shipping industry.

(5g) Violations of Corps' Policy for Disposal onto Private CDFs
Consider the published policy on third party use of the CDFs. EIS 3.23 reads: "Dock owners do obtain separate approvals from both the owner of the disposal site and the Corps prior to the disposal operation." District Engineer Colonel D.R. Holzwarth's letter to me, June 23, 1993: " The Corps of Engineers cannot grant third party use of a Federal easement area, as this could only be given by the fee simple owner with the concurrence of the local assurer."

To the contrary, the next page (#17) is from a Corps permit granting GPA permission to dredge onto CDF 2a. Under this permit, GPA dredged untested sediment onto property owned by Fish and Wildlife in CDF 2a without FWS approval and without concurrence of the local assurer. The GPA berths were also dredged without the tests as required by the "Guidelines" on page 13.

DEPARTMENT OF THE ARMY PERMIT

Permittee: Georgia Ports Authority
Permit Number: 199200090

ISSUING OFFICE:

Savannah District
U. S. Army Corps of Engineers
Post Office Box 889
Savannah, GA 31402-0889

NOTE: The term "you" and its derivatives, as used in this permit, means the permittee or any future transferee. The term "this office" refers to the appropriate district or division office of the U. S. Army Corps of Engineers having jurisdiction over the permitted activity or the appropriate official of that office acting under the authority of the commanding officer.

You are authorized to perform work in accordance with the terms and conditions specified below.

PROJECT DESCRIPTION: To excavate by dredging at two areas.
a. Berth - An area approximately 5,075' long, 100' wide from the face of the fenders to the channel line to a depth of -42' mean low water (mlw). Excavation at this site will require initial removal of approximately 35,000 cubic yards of accumulated sand, silt, clay and debris material and periodic maintenance dredging of approximately 80,000 cubic yards annually.

b. Slip - An area approximately 1,100' long, 300' wide, between the face of the fenders to a depth of -40' mean low water (mlw). Excavation at this site will require initial removal of approximately 80,000 cubic yards of accumulated sand, silt, clay and debris material and periodic maintenance dredging of approximately 80,000 cubic yards of material annually.

The permittee, in conjunction with the proposed hydraulic dredging, will place a temporary submerged pipeline from the sites across the river to dispose of the dredged material in the diked area of Disposal Area 2 A on Hutchinson Island. Dredging is necessary to provide adequate depth for deeper draft vessels using the facilities.

The site is currently authorized by Department of the Army Permit to perform agitation maintenance dredging. The Savannah River is a Federal Project maintained by the Savannah District, U. S. Army Corps of Engineers.

PROJECT LOCATION: The site is located in Savannah River, at the Ocean Terminal berths, Savannah Harbor River Mile 14.7 to 15.6 (Sta. 77+500 to 82+500), Lat. 32°07'00"N, Long. 81°07'00"W, Savannah, Chatham County, Georgia.

6. PLEASE PROCESS THIS LETTER IN ACCORDANCE TO EIS 8.05 AND THE FEDERAL REGISTER.

(6a) EIS 8.05
Please address each of my comments, listed below, in the comment/response section of the final EIS as specified in the Draft EIS 8.05

- considerations of property ownership (privately owned CDFs)
  - contamination
  - erosion
  - ownership of sand, in terms of laws and regulations, rather than vague rationalizations (EIS H.2.12)
  - unauthorized disposal for private hydraulic dredging
  - unauthorized disposal for agitation dredging
- Free private access to publicly owned and maintained CDFs.
  -for proposed hydraulic dredging
  -for agitation dredging.
- Site specific testing of private berths prior to dredging
  -for hydraulic and agitation dredging
  -with disposal onto government and privately owned areas

(6b) Please schedule a public hearing in accordance to the Federal Register, Part 327.4(b)

(6b) If no public hearing is scheduled please communicate to me the reasons why you have determined the issues I have raised are insubstantial, as required in Part 327.4(b).

Sincerely,

James F. Missroon

James F. Missroon

cc: Senator Sam Nunn
Senator Paul Coverdale
Lieutenant General Arthur E. Williams, Chief of Engineers
Mr. John Hankinson, USEPA
Dr. Gregory Madison, U.S. Fish and Wildlife Service
Mr. Andreas Mager, Jr., National Marine Fisheries Service
Mr. Charles Samz, Sierra Club of Georgia
Mr. Harold F. Reheis, Ga. DNR
Mr. Thomas E. McCutchen, Columbia, S.C.
Mr. William C. Simpson, Charleston S.C.
Ms. Becky Shortland, Georgia Conservancy
Mr. L. J. Thomas, Hardeeville, S.C.
Students for Environmental Awareness, University of Georgia
Mr. Rich Whitt, Atlanta Journal- Constitution
Mr. Brad Swope, Savannah News Press

RESPONSE -- James F. Missroon,
January 19, 1995.

REQUEST FOR PUBLIC HEARING. Savannah District does not believe that additional information, of which it is not already aware, would be gained through the conduct of a public hearing.

CONSIDERATIONS OF PROPERTY OWNERSHIP.

A. Contamination.

A review of the quality of river sediments was documented in Appendix F SEDIMENT QUALITY EVALUATION. That evaluation concluded that the harbor sediments reflect soils of the region, as no chemical parameters within the average harbor sediments exceed values recorded in naturally-occurring soils in Georgia and the southeastern US.

Paragraph 5.46 in the Draft EIS has been revised to clarify that the liability for the quality of sediments while deposited at a berth rests with the owner of the berth. That paragraph and the next one address the evaluations that must be performed to demonstrate that the material is safe for dredging and placement in the Project's confined disposal areas.

The District has agreed to test sediments in the confined disposal areas which will be used in the rotation program to ensure that increased use of the sites by migratory birds would not result in adverse impacts to those species.

If/when the Federal government decides that it no longer needs an easement for the Navigation Project, it would release its easement ownership. Under current procedures a Preliminary Assessment Screening would be performed to determine the condition of the property, including an evaluation of the potential for chemical contamination, prior to release of the easement. If the Preliminary Assessment Screening determines the site contains unacceptable levels of some chemicals, liability for that condition would be determined in accordance with the laws and regulations in effect at the time of the release. Under present laws, the landowner -- because of his ownership status -- would be considered a potentially responsible party. However, a party or combination of parties involved in the Navigation Project may choose to assume responsibility if they had maintained sole restrictive use of the site since the project easement was obtained. If contamination was discovered and a party or combination of parties involved in the Navigation Project chose to assume responsibility, under present clean-up standards the site would be cleaned prior to release of the

easement to the point where the chemicals would no longer be present at levels which constitute a health or safety hazard. It should be noted that this current site clean-up standard may not represent the standard or laws in effect at the time of the easement release.

B. Erosion.

Training walls placed in a river are intended to shift underwater river currents, not protect a shoreline from eroding. The training walls placed in Savannah Harbor were not intended to reduce erosion, but to concentrate the river low so that (1) the channel alignment would be more stable and (2) a deeper channel depth would be maintained by river currents.

As mentioned in Section H.3.25 of the Draft EIS, erosion of the outside slope of the front dikes along the Savannah River is a problem. The apparent major cause of the erosion is the wakes and propwash produced by the large container ships. Erosion from such sources is not the responsibility of the Corps, but the vessel owner/operator.

Chatham County, acting as the local sponsor, or the GA Department of Transportation (GA DOT), acting in behalf of the County, have received approvals to place shore protection measures along portions of the Savannah River shoreline of the dikes. A portion of the approved project, approximately 800 to 1,000 feet, would be placed to protect Mr. Missroon's property. GA DOT intends to place the shore protection measures along highly eroded portions of the riverbank to protect the dikes which extend along the shore. GA DOT will place the majority of the shore protection on property which it owns in fee, an action which any landowner has the option of pursuing. The Final EIS includes an evaluation of placing additional shore protection measures along portions of the Jones/Oysterbed Island shoreline. That shoreline is also eroding severely and GA DOT intends to protect both its property and the adjacent dike through that action.

C. Ownership of Deposited Sediments. The State of Georgia claims ownership of all lands within the state up to the Mean High Water elevation. Materials resting on the river bottoms are included. Excavation of sediments from Georgia river bottoms require approval from the state for the disposition of those state properties. Sometimes the state charges a fee for excavation and private use of those state resources. The state has given the Corps approval to excavate river sediments and place them in the confined disposal facilities. State approval has been provided contingent upon use of the sediments for the purposes of the Federal Navigation Project. The Georgia GA DOT currently administers the use of the state bottoms in Savannah Harbor. Should GA DOT decide that it needs some of the deposited

sediments for uses other than harbor purposes, such use is within its authority for materials deposited on land it owns. If/when the Federal government decides that it no longer needs to use a disposal area for the Navigation Project, the Government would release its interest in the property.

D. Disposal for Private Hydraulic Dredging.

When private individuals or firms perform dredging in the harbor, that individual or firm is responsible for obtaining a site to deposit the excavated sediments. If those individuals are dredging under authority obtained through a Section 404 permit administered by the Corps, a condition of the permit is typically that they must obtain permission from the underlying fee owner of the CDF.

Such a condition would also be in effect if/when a dock owner wishes to use a hydraulic dredge to excavate berth sediments and place them directly in a Project CDF. In that case, approval from the site's underlying fee owner, Chatham County, and the Corps would be required.

The EIS for the LTMS Study evaluated the excavation of berth sediments and their deposition in the CDFs used for the Navigation Project. Environmental clearance for the specific dredging and disposal techniques approved in the EIS would be obtained through this EIS for such actions, whether Savannah District or its designee implemented the action. When a dock owner desires to implement the berth dredging features proposed in the EIS, the District would follow an an expedited review of the permit application since the environmental impacts of that action have already been evaluated in this EIS, received public review and comment, and received approval from other regulatory agencies. Approval would be required from the disposal sites's underlying fee owner before the deposition could occur.

E. Disposal for Private Agitation Dredging. When berth owners perform agitation dredging, the sediments are distributed by river currents to other portions of the harbor. Savannah District believes that a majority of those sediments resettle in the Federal Navigation Project. Some redeposit just downstream of the berth being dredged, while finer-grained materials are likely to move further from the dredging area. A precise identification cannot be made of the locations where all the berth sediments redeposit. The Corps presently removes all sediments which settled in the Navigation Project and deposits those materials in its approved dredged material disposal areas. Removal of harbor sediments which had once been located in a berth, but have since been relocated into the Navigation Project as a result of either agitation dredging or normal tidal or river currents, becomes a responsibility of Corps under the terms of the cost sharing agreement for the Savannah Harbor Navigation Project.

FREE PRIVATE ACCESS TO FEDERAL PROJECT CDFS.

A. Hydraulic Dredging.

Berthing areas are important to the Federal Navigation Project as they provide areas for vessels to dock outside the navigation channel while loading/unloading cargo. Adequate depths are required in the berths, as well as the navigation channel, before ships can move their goods through the port. Before sediments excavated from berths by private interests could be placed in an upland confined disposal site, the dock owner must obtain approval from the disposal site's underlying fee owner.

The provision and maintenance of suitable CDFs for the Federal Navigation Project is the responsibility of the local sponsor, Chatham County. The County is responsible for developing and providing to the Corps sufficient storage capacity at the CDFs for use by the Federal Navigation Project. The sponsor can allow use of the CDFs which it owns in fee simple for placement of materials from sources other than the Navigation Project. A decision to charge private individuals for using storage capacity of the site is a decision of the County.

B. Agitation Dredging. In agitation dredging, sediments are lifted from the floor of the berth by physical agitation and subsequently moved off-site by river currents. The District estimates that eighty percent of the sediments removed from the berths redeposits in the Navigation Project. The Corps presently removes all sediments which have settled in the Navigation Project and deposits those materials in its approved dredged material disposal areas. Removal of harbor sediments which had once been located in a berth but have since been relocated through agitation dredging into the Navigation Project becomes a responsibility of Corps under the terms of the cost sharing agreement for the Savannah Harbor Navigation Project.

TESTING OF SEDIMENTS AT BERTHS.

A. For Hydraulic and Agitation Dredging.

A sediment evaluation is required to complete the Section 404(b)(1) Evaluation for any dredging and disposal activity. Appendix F SEDIMENT QUALITY EVALUATION contained a review of the quality of river sediments. That evaluation concluded that the harbor sediments reflect soils of the region, as no chemical parameters within the average harbor sediments exceed values recorded in naturally-occurring soils in Georgia and the southeastern US.

CHRONOLOGY OF DELAYED FOIA RESPONSE

December 28, 1994: I submitted a FOIA request for any easements which would allow disposal of Harbor spoil onto CDF 14B. I related the request to EIS-LTMS public response.

January 6, 1995: The Corps responded: "Please be advised that our project Management Division does not have any records that fulfill your request because the Corps does not have the environmental clearance to use CDF 14B." I called back and asked specifically for any easement allowing disposal of Harbor spoil onto the Simpson tract in 14B.

January 13,1995 The Corps mailed a cancellation of the earlier response and two easements for disposal onto two tracts owned by GDOT, one in 13B and one in 14B. I called back and again specified the Simpson tract, CDF 14B and Savannah Harbor dredge disposal.

January 25, 1995: The Corps Fedex'ed an easement allowing only for disposal of dredge spoil from the Inland Waterway onto the simpson tract. I called again and was informed by Mr. Warren G. Swartz that the Corps has no other easement on the Simpson tract, i.e. no easement for disposal of Harbor dredge spoil.

Please advise me as to whether these comments will be considered with my earlier comments..

Sincerely,

James F. Missroon

James F. Missroon

cc: Senator Sam Nunn
Senator Paul Coverdell
Lieutenant General Arthur E. Williams, Chief of Engineers
Mr. John Hankinson, USEPA
Dr. Gregory Madison, U.S. Fish and Wildlife Service
Mr. Andreas Mager, Jr., National Marine Fisheries Service
Mr. Mark Musaus, U.S. Fish and Wildlife Service
Mr. Charles Samz, Sierra Club of Georgia
Mr. Harold F. Reheis, Ga. DNR
Mr. Thomas E. McCutchen, Columbia, S.C.
Mr. William C. Simpson, Charleston S.C.
Ms. Carolyn Boyd Hatcher, CEO, Georgia Conservancy
Ms. Becky Shortland, Georgia Conservancy
Mr. L. J. Thomas, Hardeeville, S.C.
Students for Environmental Awareness, University of Georgia
Ms. Debra Hasan, Citizens for Environmental Justice
Mr. Rob Mikell, OCRM, SCDHEC
Mr. Henry Moss, Administrator, Jasper County
Mr. Rich Whitt, Atlanta Journal- Constitution
Mr. Brad Swope, Savannah News Press

RESPONSE -- James F. Missroon,
January 27, 1995.

REQUEST FOR PUBLIC HEARING. Savannah District does not believe that additional information, of which it is not already aware, would be gained through the conduct of a public hearing.

DEPOSITION OF DREDGED MATERIAL ONTO DISPOSAL AREA 14B. Savannah District is reviewing its existing easements to ensure it has sufficient interests in the disposal area properties to conduct the proposed activities. Should additional interests be determined to be necessary, the local sponsor will be responsible for obtaining those interests.

DEPOSITION OF BERTHING AREA SEDIMENTS ONTO PRIVATELY-OWNED LANDS. Berthing areas are important to the Federal Navigation Project as they provide areas for vessels to dock outside the navigation channel while loading/unloading cargo. Adequate depths are required in the berths, as well as the navigation channel, before ships can move their goods through the port. As stated in the EIS, before sediments excavated from berths by private interests could be placed in an upland confined disposal site, the dock owner must obtain approval from the disposal site's underlying fee owner.

MITIGATION PLAN. The additional wildlife habitat described in the Mitigation Plan is based on a 2-year rotational use of the disposal areas. Disposal Areas 12A, 12B, 13A, 13B, 14A, 14B, and Jones/Oysterbed Island are included in the rotation plan.

Rt. 2, Box 324
Hardeeville, SC 29927

February 21, 1995

Colonel Wayne W. Boy
District Engineer
U.S. Army Corps of Engineers
P.O. Box 889
Savannah, GA 31402-0889

Dear Colonel Boy:

I am a long time resident of Jasper County, South Carolina, and own land in the Savannah River spoilage site area.

In the mid 50's, the Corps of Engineers (COE) imposed, much to our dissatisfaction, a perpetual easement on our land for the purpose of dredging silt from the Savannah River harbor. The government paid my husband (who passed away in 1964) approximately $22,000 for the easement. The COE has pumped spoilage on my land since that date. At the time of the comdemnation we were verbally led to believe that we should expect to have our land returned in less than 30 years. In the 40 years that the COE has now been pumping on my land, it has cost me more than $25,000 in annual property taxes.

During these 40 years I have never complained about the above actions, nor objected when me or my family were not allowed access to this property. It could be said that I have been the model landowner as far as your purposes were concerned. However, it has came to my attention on February 13 of this year the COE held a public hearing in January concerning pumping on my land for another 20 years. I have since received a document concerning this public hearing and an environmental study that accompanied it.

I notice several things in this document entitled the Savannah Harbor Long Term Management Strategy (SHLTMS) published by the COE. First, it appears that your agency went to a lot of trouble to notify many people and agencies about this study. I am disturbed that you could not place my name and a 29 cent stamp on one of the notices since it is my land you are studying and using.

Second, and of more importance is that the document reflects a study by the S.C. Coastal Council, S.C. Department of Health, and S.C. Marine Resources noting high/elevated levels of arsenic coming from the runoff of the spoilage area into the adjacent S.C. rivers. Furthermore, the arsenic and other chemicals, which are killing marine life in those rivers, were of such concern to those S.C. agencies that they ordered your agency to reroute the runoff where it cannot enter S.C. waters. It is my understanding you you have agreed to route this contaminated runoff into the Savannah River at the city of Savannah by January of 1995.

FEB 2 3 1995

Since I have been inquiring into this problem, I have also been advised of other studies that have been conducted regarding my land by other agencies. I have requested and received copies of studies from the COE, and the NOAA-Marine Fisheries Laboratory at Charleston, S.C. I have been informed of and requested other studies that have been completed by the U.S. Fish & Wildlife Service the University of Georgia. I have further been advised of other studies of which I have requested. Of all the studies conducted, each seem to reveal a high level of dangerous chemicals which have been and are currently being pumped onto my land.

To add insult to injury, I have been advised that your agency holds the opinion that I am liable for any chemicals which exist on my property. Since that is your opinion, I am demanding that you stop dredging on my property as I am not able to accept that liability.

I realize that the government had the authority in the 1950's to condemn this land for an spoilage easement, but I do not think the government can place toxic chemicals on this or any other personal property. The pristine quality of my property has been destroyed and you expect me to assume the liability.

I am disgusted that your agency has destroyed my property as well as that of adjacent landowners, but am grateful that the state of South Carolina responded and stopped your agency from contaminating our rivers. However, I am concerned that you continue pumping this poisonous waste into the Savannah River.

Many people in the low country of Jasper and Beaufort counties as well as those of the city of Savannah and Chatham County enjoy boating and fishing in the Savannah River, you should not be allowed to expose them to increased levels of dangerous chemicals caused by dredging operations. Additionally, numerous fish and wildlife have suffered detrimental effects from this contamination.

What effects will these chemical findings now have on the Olympics that are scheduled to come to Savannah for water sports in and around the Savannah harbor? The people of the Olympics certainly need to be made aware of all the chemicals now being stirred up and pumped into the Savannah River due to the dredging operation.

I understand that the Georgia Ports Authority needs deep channels to run ships. However, other ports have faced this problem and have chosen to take their spoilage out to sea. Since we have this option, it should be exercised to reduce the polution in this area.

I guess I should not place all the responsibility for this problem on your agency as your study reflects that Chatham County, Georgia is responsible for maintaining the spoilage area facilities in Jasper County, South Carolina. Additionaly, the Georgia Department of Transportation (GA DOT) serves as the owner/operator of the spoilage area. Just because they have been using this land improperly for 40 years, gives them no right to call themselves the owner.

Approximately 5 years ago the GA DOT offered me $300 per acre for my land in the spoilage area on the Savannah River, which I refused. At the same time, they did purchase several hundred acres adjacent to me for approximately $900 per acre. At the time I did not understand the difference in the price, but now I firmly believe they knew they had already contaminated my land through the COE dredging operation.

The environmental impact on Jasper County and the city of Savannah is criminal. Many residents of Jasper, Beaufort and Chatham Counties either work in the fishing industry or simply enjoy the waterways. With the documented findings of the above mentioned studies, we now know that marine life cannot survive in the contaminated waters adjacent to the spoilage area; and we also know by these studies that the contamination will get worse before it gets better.

We host the largest waterfowl area (at the spoilage site) of any location near this area. We have ducks by the thousands on my property. It is sad to know the quality of water in which they feed and swim. I would like to go out and put up a sign stating POLLUTED WATER, DO NOT NEST, DRINK OR FEED IN THIS AREA, but it will not be that easy to save our dying duck populations. I wonder how long they can live after being exposed to high levels of ARSENIC, CADMIUM, COPPER, LEAD, MERCURY, NICKEL, SILVER, ZINC and MANGANESE as well as POLYCYCLIC AROMATIC HYDROCARBONS. Additionally, what is the effect on humans who consume fish, shellfish and wildlife from these contaminated areas.

A study should now be done on the amount of pollutants in the air in the city of Savannah less than a mile south of the spoilage area when a north wind blows across the dry, loose polluted sand. There is very little vegetation in the spoilage area and this could cause a threat to the entire city of Savannah. My belief is based on the findings in the strategy study of the COE and the study conducted by NOAA at the Charleston, S.C. laboratory.

Three years ago I leased an old abandoned service station site to the U.S. Postal Service in Hardeeville, S.C. During the excavation of the land, the S.C. Health Department discovered an old underground gas tank. I had to pay $20,000 to have the old tank and nearby dirt removed and burned in Charleston, S.C., in order to comply with EPA regulations.

I must question if your agency would be responsible for removing the contaminated dirt from the spoilage area to have it properly disposed. I welcome EPA involvement to enforce their regulations in having your agency return this land to the pristine condition that existed prior to dredging.

I have several reports from federal and state studies that document the contamination you have pumped on my property. I demand you stop the pumping of contaminated spoilage onto my property in Jasper County, South Carolina.

Please reply to me within 10 days, as I believe that would be sufficient time. I request all replies be sent to my daughter and son-in-law, Bonnie and Duane Swygert who live next door on our farm. Their home number is 803-784-2699 and work is 803-784-2844. The mailing address is P.O. Box 486, Hardeeville, SC 29927.

Sincerely,

Louise M. Thomas

Louise M. Thomas

RESPONSE -- Louise M. Thomas,
February 21, 1995.

Savannah District provided a response to Ms. Thomas in a letter dated March 19, 1995. The environmental issues raised in her letter are addressed individually in the following paragraphs:

PUBLIC HEARING. No public hearing was held in January for the Savannah Harbor LTMS Study.

WEIR EFFLUENT STUDY/UNDERDRAINS. As a result of information which became available through the weir effluent study conducted by Savannah District, the District volunteered to close underdrains which discharge to the small tidal creeks in South Carolina. Those small creeks had insufficient flow capacity to accept those discharges without impacts which the District determined to be unacceptable to the aquatic resources in those creeks. One component of the LTMS was an evaluation of the installation and operation of new underdrains which would drain the other direction from that previously in use so that they would discharge to the Savannah River or Back River.

SEDIMENT QUALITY. The review of the quality of river sediments was documented in Appendix F SEDIMENT QUALITY EVALUATION. That evaluation concluded that the harbor sediments reflect soils of the region, as no chemical parameters within the average harbor sediments exceed values recorded in naturally-occurring soils in Georgia and the southeastern US. The concentration of chemicals found in the sediments were below levels which would cause adverse impacts to humans who consume fish, shellfish or wildlife that may use the disposal areas or the receiving waters. The District is aware of no information which supports Ms. Thomas's statement concerning the quality of materials being deposited on her property. Therefore, the District disagrees with Ms. Thomas's statement concerning the quality of the deposited sediments.

LIABILITY. The paragraph in the EIS mentioning this issue (Section 5.46 in the Draft EIS) has been revised to clarify that the liability for the quality of sediments while at a berth rests with the owner of the berth. That paragraph and the next one address the evaluations that must be performed to demonstrate that the material is safe for dredging and placement in the Project's confined disposal areas. If/when the Federal government decides that it no longer needs to use an easement for the Navigation Project, it would release the disposal easement. Under current procedures a Preliminary Assessment Screening would be performed to determine the condition of the property, including an evaluation of the potential for chemical

contamination, prior to release of the easement. If the Preliminary Assessment Screening determines the site contains unacceptable levels of some chemicals, liability for that condition would be determined in accordance with the laws and regulations in effect at that time of the release. Although under present laws the landowner, because of his ownership status, is considered a potentially responsible party, a party or combination of parties involved in the Navigation Project may choose to assume responsibility if they had maintained sole restrictive use of the site since the easement was obtained. If contamination were discovered and a party or parties involved in the Navigation Project chose to assume responsibility, under present clean-up standards, prior to release of the easement the site would be cleaned to the point where the chemicals would no longer be present at levels which constitute a health or safety hazard. It should be noted that this is the site clean-up standard at the present time and does not represent the standard or laws, if any, in effect at the time of a future easement release.

CONTAMINATION OF OFF-SITE RESOURCES. The District disagrees that weir discharges from the confined disposal facilities are contaminating off-site aquatic resources. Impacts of weir discharges on the receiving waters were evaluated in the EIS and found to be acceptable. Appendix E of the EIS, titled WRIGHT RIVER WEIR EFFLUENT STUDY RESULTS, contained a summary of the study performed of weir effluent and sediments near the South Carolina discharges. The study found that discharges from the overflow weirs did not result in acute effects to aquatic life. Based on the study findings, the District determined that relocation of the overflow weirs was not warranted. The South Carolina Department of Health and Environmental Control (DHEC) Office of Oceans and Coastal Resource Management (OCRM) concurred.

OCEAN DISPOSAL. Sediments deposited in the Bar Channel (entrance channel) are presently deposited at the Savannah Ocean Dredged Material Disposal Site (ODMDS). Such disposal is the lowest cost, environmentally acceptable procedure for sediments excavated from that portion of the navigation channel. Due to the large distance from the inner harbor to the ODMDS, a high transportation cost would be incurred should inner harbor sediments be placed at that site. However, should upland sites become unavailable for inner harbor sediments, placement at the ODMDS would be evaluated.

IMPACTS TO ON-SITE WILDLIFE RESOURCES. The review of the quality of materials placed in the confined disposal facilities was documented in Appendix F SEDIMENT QUALITY EVALUATION. That evaluation concluded that the harbor sediments reflect soils of the region, as no chemical parameters within the average harbor sediments exceed values recorded in naturally-occurring soils in Georgia and the southeastern US. No chemicals are found in the river sediments at levels which would be harmful to ducks using the disposal areas.

AIR-BORNE POLLUTION. Although air is a potential pathway for the movement of materials off the confined disposal facilities (CDFs), the District does not believe there is a reasonable likelihood of adverse impacts to adjacent areas from dust leaving the CDFs.

APPENDIX Q

COMMENTS RECEIVED FROM REVIEW OF THE DRAFT EIS AND DISTRICT RESPONSES TO THOSE COMMENTS

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