Attachment D

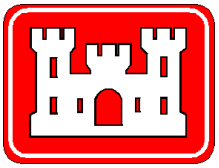
ENVIRONMENTAL IMPACT STATEMENT

SEPTEMBER 2002

Final Report

ENVIRONMENTAL IMPACT STATEMENT

RIVER SEDIMENTS DREDGING AND DISPOSAL MAINTENANCE DREDGING OF MIAMI RIVER, MIAMI-DADE COUNTY, FLORIDA



US Army Corps of Engineers
Jacksonville District

FINAL
ENVIRONMENTAL IMPACT STATEMENT
SEPTEMBER 2002

RIVER SEDIMENTS DREDGING AND DISPOSAL
MAINTENANCE DREDGING OF MIAMI RIVER
MIAMI-DADE COUNTY, FLORIDA

LEAD AGENCY: Jacksonville District, U.S. Army Corps of Engineers

COOPERATING AGENCY: NONE

The Miami River is extremely important to the City of Miami, Dade County, and South Florida as an economic center, recreational vessel route, and an environmental focal point. The river has never been dredged since its construction in the early 1930s and has become silted to a point that is impeding ocean-going vessel traffic. The U.S. Coast Guard has stated that if the current rate of shoaling continues, Miami River will present an unacceptable navigation safety risk over the next five years. This would have profoundly adverse impacts on the businesses developed along the river, which employ thousands of Miami-Dade residents. In addition, the Miami River bottom sediments have been determined to contain heavy metal contaminants that are being flushed out to Biscayne Bay by tidal actions and storm events. The U.S. Army Corps of Engineers, Jacksonville District, and the local sponsor, Miami-Dade County, has proposed to dredge the Miami River to its authorized navigation depth; and thus, remove the contaminated sediments. This Environmental Impact Statement analyzes the effects, beneficial and adverse, of that proposed action.

For more information, contact Mr. Kenneth R. Dugger, U.S. Army Corps of Engineers, Planning Division, P.O. Box 4970, Jacksonville, Florida 32232-0019, phone (904) 232-1686 or facsimile 232-3442. Additional comments must be received by 13 May 2002.

U.S. Army Corps of Engineers
Jacksonville District

SUMMARY

ENVIRONMENTAL IMPACT STATEMENT
ON MAINTENANCE DREDGING OF THE MIAMI RIVER
DADE COUNTY, FLORIDA

NEED OR OPPORTUNITY

The Miami River has two needs that are addressed in this Environmental Impact Statement (EIS). The first concerns navigation. The accumulation of sediments in the main shipping channel makes it narrower and shallower which will force the large vessels to cease operation on the river within the next five to 10 years, jeopardizing the economic feasibility of the river's shipping industry (Miami River Master Plan, City of Miami Department of Planning, Building and Zoning, 1992).

The U.S. Coast Guard had stated that an unacceptable navigational safety risk would exist on the River if the current shoaling rate is observed over the next five years. The navigation problems could stimulate shipping interests to relocate activities to the competing ports of Dania, Palm Beach, and Manatee (Tampa).

Accomplishment of sediment removal from Miami River is a maintenance responsibility under the authorized Federal navigation project.

The second need is for the removal of the river sediments containing trace metals, petroleum hydrocarbons, and synthetic organic chemicals that originated from various point and non-point sources. Concern has been expressed by numerous Federal, State, and local agencies relative to the introduction of sediments into Biscayne Bay that would adversely affect sensitive estuarine habitats.

Removal of sediments beyond that removed for navigation (Federal interest) is of local interest and is to be done at non-Federal expense.

MAJOR FINDINGS AND CONCLUSIONS

The major beneficial impacts of the project include improved access to commercial facilities by vessels, increased vessel capacities resulting from improvements to the channel, improved safety, and the decreased likelihood of the loss of shipping activities to competing ports. The removal of contaminated sediments would improve overall long-term water and sediment quality of the Miami River, fish and wildlife habitat and eliminate the continuing movement of contaminated sediments into Biscayne Bay.

The major adverse impacts include the short-term effects of dredging actions on water quality, increased river traffic consisting of dredges, deck barges, towboats, and crew boats, and the increased possibility of vessel-manatee collisions. Additional adverse impacts may result from the disposal of dredged sediments from the Miami River containing low levels of contamination. Temporary socioeconomic impacts include disruptions to navigation, waterborne commerce, and recreation due to space constraints within the Miami River. Limited impacts on aesthetic value and short-term increases in noise will occur in the vicinity of dredging operations. Some temporary (and probably

intermittent) odors will likely be created by the handling of dredged materials in the immediate vicinity of the project. These issues and mitigation measures are summarized below.

The greatest potential for impact on water quality from implementing the project involves the introduction of sediments from the bottom into the water column. Chemical contaminants present in suspended sediments have a potential for entering the food web and becoming concentrated in higher predators such as birds, sharks, or dolphins. Float-suspended silt curtains will be required in an attempt to reduce turbidity impacts. Project performance specifications will require the contractor to meet water quality standards imposed by regulatory agencies regardless of the type dredge plan utilized to construct the project. However, resuspension of sediments into the water column and the spreading of contaminated sediments into Biscayne Bay currently exist; this will continue to occur under the without-project scenario.

Sediment quality impacts associated with the various alternatives involve the spread of contaminated sediments to regions of Biscayne Bay. Dredging equipment agitates the bottom deposits. Suspended sediments are subject to transport by currents to Biscayne Bay. Mechanical removal of debris will be used in conjunction with either mechanical dredging or in advance of hydraulic dredging.

The primary potential impact on threatened and endangered species stems from the use of watercraft and their collisions with manatees. To minimize the occurrence of vessel-manatee collisions, the Corps will include standard USFWS manatee protection provisions in the construction specifications provided to contractors.

There are many environmental considerations associated with placement of dredged materials in a temporary or permanent repository location. A major environmental consideration is the effect that dewatering and rainwater passing through deposited materials will have on ground and surface waters. The most recent TCLP (Toxicity Characteristics Leaching Procedure) tests made on sediments from the Miami River indicate that the sediments are not hazardous, but do not meet local criteria for unrestricted disposal as clean fill. Because the material dredged from the Miami River must be treated as solid waste, its disposal would be required to meet all applicable federal, state, and local solid waste disposal requirements.

Without the project, contaminated sediments would continue to be discharged into Biscayne Bay, an Outstanding Florida Water, an aquatic preserve, a National Park (at the southern reach), and a significant environmental resource. The EIS and its accompanying Fish and Wildlife Coordination Act Report document adverse effects of the Miami River sediments on the Biscayne Bay ecosystem. It appears reasonable to conclude that the State of Florida and the Federal Government would not continue to allow the unabated discharge of contaminated sediments from the Miami River. If the contaminated sediments are not removed from the river, closure of the Miami River as a port facility may be the only recourse for protecting the integrity of the Biscayne Bay ecosystem.

ALTERNATIVES

No-Action and the proposed action alternatives are considered. No Federal action would mean that the Miami River channel widths and depths would continue to be reduced resulting in further degradation in navigation safety, shipping being relocated to competing ports, the transportation of sediments to Biscayne Bay, and adverse effects on Biscayne Bay ecosystem.

The recommended plan is to issue a Request for Proposals (RFP) from private industry to determine a selected Contractor, working in partnership with the Jacksonville District of the U.S. Army Corps of Engineers (USACE), to dredge the Miami River in Miami, Florida in an effort to remove polluted bottom sediments from the river and restore the river to its Federally authorized dimensions. The RFP solicitation is being used more effectively to ensure the use of innovative technology for disposal of contaminated sediments and to capture possible cost and time savings.

DREDGING/HANDLING/DISPOSAL OPTIONS

Options for dredging of the Miami River include:

1. A mechanical operation to remove debris and dredged material from the river.

2. A mechanical operation to remove debris from the river followed by a hydraulic operation to remove sediments.

3. A combination of the above.

Transportation/disposal options include:

1. Move materials removed from the Miami River by barge to a disposal or handling site.

2. Move materials removed by hydraulic pump to disposal or handling site.

3. Dispose of materials at a site directly accessible by barge or pipeline from Miami River.

4. Dispose of materials at a site away from the project area, requiring shipment of dredged materials overland by truck and/or rail.

5. Treat materials for beneficial use or unrestricted dumping at a site accessible by barge or pipeline from Miami River.

6. Treat materials for beneficial use at a remote site, requiring shipment of dredged materials overland by truck and/or rail.

Permanent disposal sites include:

1. Previously dredged navigation (berthing) slips in the project area.

2. Existing “holes” in Biscayne Bay; i.e., areas of deeper water in the bay where dredged material could be dumped.

3. New manmade “islands” to be created in Biscayne Bay.

4. Ocean disposal in a designated ocean dredged material disposal site (ODMDS).

5. Upland sites approved for accepting the removed sediments.

6. Virginia Key, an island in Biscayne Bay, where an old landfill exists that could be modified to accept the dredged materials.

Should treatment of dredged materials be utilized, the following treatment techniques have been considered to render the dredged sediments a beneficial use material or acceptable for unrestricted disposal in a permitted landfill or designated dredged material disposal area:

1. Dewater and dry dredged materials near the Miami River where decant waters can be easily returned to the river.

2. Send dredged materials to a municipal wastewater treatment facility (WWTF) where wastewater would be treated and solids removed.

3. Dredged materials would be incinerated to remove organic materials and volatile metals (such as mercury).

4. Pozzolanic solidification and stabilization (PSS) of the dredged material, where the sediments are mixed with a cement to form a concrete-like substance.

Temporary or interim disposal sites include:

1. Lands adjoining Palmer Lake, near the Miami River, could handle all dredged materials from the project during dewatering.

2. Virginia Key was also considered for interim disposal utilizing, areas near the old landfill for dewatering.

3. Miami City Parks, three city parks near the project were identified that could be temporarily used for dewatering.

4. The Miami-Dade Jai-Alai Stadium parking lot, located near the Miami River.

Of the above four interim disposal sites, only the Miami-Dade Jai-Alai Stadium parking lot has been studied in detail.

ISSUES RAISED BY THE PUBLIC AND AGENCIES

Concerns have been expressed by citizens and agency personnel over the degradation of water quality in the Miami River and Biscayne Bay caused by the resuspension of contaminated bottom sediments and increased turbidity, possible harm to marine life (especially the West Indian manatee) in the Miami River, possible contaminated runoff and leachate from the disposed dredged materials, and impacts to seagrass beds in receiving waters downstream. The public has also expressed concerns for odor problems emanating from the drying dredged materials, noise, increased truck traffic on streets surrounding the interim disposal site, aesthetics of the interim confined disposal facility, the possibility of providing breeding water for mosquitoes, and attraction of scavenging birds to the interim disposal site.

AREAS OF CONTROVERSY

There are no known remaining areas of environmental controversy.

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ENVIRONMENTAL IMPACT STATEMENT
ON MAINTENANCE DREDGING OF THE MIAMI RIVER
MIAMI-DADE COUNTY, FLORIDA

1.0 PROJECT PURPOSE AND NEED

1.1 PROJECT AUTHORITY

1.1.1 Initial Authorization

The United States Congress has shown a continuing interest in improvements to the Miami River for navigation, pollution abatement, and other allied water purposes. With near concurrent resolutions, the Committee on Public Works of the United States Senate on March 24, 1972, and the Committee on Public Works of the United States House of Representatives on June 14, 1972, adopted authorizations to address those concerns. Those resolutions provided the means for the U.S. Army Corps of Engineers (USACE) to investigate the water and land related resource problems and opportunities along the Miami River.

> ***RESOLVED BY THE COMMITTEE ON PUBLIC WORKS OF THE UNITED STATES SENATE,*** *That the Board of Engineers for Rivers and Harbors, created under the provisions of Section 3 of the River and Harbor Act, approved June 13, 1902, be, and is hereby, requested to review the reports of the Chief of Engineers on Miami Harbor, Florida, published as Senate Document Numbered 93, Ninetieth Congress, and other pertinent reports, with a view to determining whether any modifications of the recommendations contained therein are advisable at the present time, in the interest of navigation, pollution abatement, and other allied water purposes.*
>
> ***RESOLVED BY THE COMMITTEE ON PUBLIC WORKS OF THE HOUSE OF REPRESENTATIVES, UNITED STATES,*** *That the Board of Engineers for Rivers and Harbors is hereby requested to review the reports of the Chief of Engineers on Miami Harbor, Florida, published as Senate Document Numbered 93, Ninetieth Congress, and other pertinent reports, with a view to determining whether any modification of the recommendations contained therein are advisable at the present time, with particular reference to Miami River, in the interest of navigation, pollution abatement, and other allied water purposes.*

In the Water Resources Development Act (WRDA) of 1974, Congress reaffirmed its continuing interest in the Miami River Watershed by authorizing a feasibility study. The applicable paragraph of Section 11 of the WRDA of 1974 is cited below. The term "surveys" mean feasibility studies.

> *SECTION 11. (b) The Secretary of the Army is hereby authorized and directed to cause surveys to be made at the following locations and subject to all applicable provisions of Section 110 of the River and Harbor Act of 1950:*
>
> *Miami River, Florida, with a view to determine the feasibility and advisability of dredging the Miami River in the interest of water quality.*

In the Water Resources Development Act of 1986, Congress again reaffirmed its interest for water resource improvement in the Miami River watershed by authorizing the removal of river sediments from the Miami River and Seybold Canal, removal of abandoned vessels under the control of the United States from the Miami River, and participation in the establishment of the Miami River Water Quality Commission. The texts of the applicable sections are cited:

SEC. 1162. MIAMI RIVER SEDIMENTS.

Subject to Section 903(a) of this Act, the Secretary is authorized and directed to remove polluted bottom sediments from the Miami River and Seybold Canal in Miami, Florida, between the mouth of the Miami River and the salinity control structure at 36th Street. Local interests shall furnish all lands (including dredge disposal areas), easements, rights-of-way, relocations and alterations necessary for initial dredging and subsequent maintenance before the Secretary removes any such sediments. The non-Federal share of the cost of carrying out this section (including the contribution under the preceding sentence) shall be 25 percent.

SEC. 115. ABANDONED AND WRECKED VESSELS

The Secretary shall - (1) remove from the Miami River and Seybold Canal in Miami, Florida, between the mouth of the Miami River and the salinity control structure of 36th Street, any abandoned vessels and any vessels under the control of the United States by reason of their seizure or forfeiture; (2) remove derelict vessels from the western shore of Hempstead Harbor, New York; and (3) remove from waters off Mona Island, Puerto Rico, the abandoned vessel "A. Regina."

The Secretary shall enter into an interagency agreement to facilitate the removal of any such vessel under the control of the United States with the head of any Federal department, agency or instrumentality, which has control of such vessel. The non-Federal share of work authorized by this section shall be one-third, except that work authorized by paragraph (3) shall be at full Federal expense.

SEC. 1157. MIAMI RIVER WATER QUALITY COMMISSION

(a) The Secretary shall make a grant of $50,000, subject to an appropriation for that purpose, to the Governor of the State of Florida for the establishment of a Miami River Management Commission to develop a comprehensive plan for improving the water quality of the Miami River, Florida, and its tributaries and managing all activities which affect the water quality and use of such river and tributaries. The commission shall be composed of seven members appointed by the Governor. A grant may be made under this section only after the State of Florida agrees to provide amount equal to the amount of the grant to carry out this section. (b) There is authorized to appropriate to carry out this section $50,000 for fiscal years beginning after September 30, 1986.

The original USACE Feasibility Study, initiated in 1974, concluded that the removal of contaminated sediments must be accompanied by non-Federal actions to control the introduction of pollutants into the Miami River to achieve the objectives of improving water and sediment quality. The study was

placed in abeyance in 1977 pending those non-Federal actions. Upon initiation of regulatory and enforcement actions and completion of facility modifications, the study was resumed in 1985.

A Draft Feasibility Report, prepared and circulated in May 1986, concluded that no quantifiable National Economic Development Benefits could be identified for the Miami River sediment removal, and, therefore, USACE could not recommend that dredging be accomplished. All local, state, and Federal agencies, except one, objected to the conclusions of the study. Proponent agencies stated that there is a need to remove sediments to improve water quality conditions within the area of the Miami River and Biscayne Bay and to avoid adverse economic impacts resulting from vessel draft restrictions.

In response to extensive public comments and to the new planning capabilities legislated in the WRDA of 1986, a new feasibility report was prepared and completed in 1990. The 1990 Feasibility Report concluded that there was no apparent justification for sediment removal for water quality. However, the report noted an apparent justification for maintenance dredging, which would enable deep draft vessels to use the Miami River in a more efficient manner.

1.2 PROJECT LOCATION

The study area, the "Miami River," is located between Biscayne Bay and the salinity control structure, within the City of Miami, Miami-Dade County, on the southeastern coast of Florida (Figure 1).

The mouth of the Miami River is located at the northwestern shore of Biscayne Bay. Across the bay, and approximately 2.5 miles from the mouth of the river, are the southern end of Miami Beach, Fisher Island, and Virginia Key. Biscayne Bay is an inlet of the Atlantic Ocean, and is partially separated from the ocean by a series of barrier islands. The southern region of Biscayne Bay is managed by the U.S. National Park Service as Biscayne National Park. The northern end constitutes the Biscayne Bay Aquatic Preserve, which is managed by the State of Florida.

1.3 PROJECT NEED OR OPPORTUNITY

The Miami River has two needs that are addressed in this Environmental Impact Statement (EIS). The first concerns navigation. As stated in the *Miami River Master Plan* (City of Miami Department of Planning, Building and Zoning, 1992):

> *A binding constraint on the expansion of trade on the Miami River is the sediments that have accumulated in the main shipping channel, making it narrower and shallower. Large vessels can pass only at high tide, limiting the number of trips per day and the amount of cargo that may be loaded to about 80 percent capacity. More alarming is the U.S. Army Corps of Engineers calculation that vessel maneuvering width will continue to decrease an average of one foot per year throughout the length of the Miami River. Without dredging, larger cargo vessels will be forced to cease operation on the river within the next five to ten years, jeopardizing the economic feasibility of the river's shipping industry.*

The U.S. Coast Guard had stated that an unacceptable navigational safety risk would exist on the River if the current shoaling rate were observed over the next five years. Under present conditions, existing vessels run aground and collide with bridges because of reduced channel widths resulting from shoaling. There is a concern that navigation problems could stimulate shipping interests to relocate activities to the competing ports of Dania, Palm Beach, and Manatee (Tampa).

Accomplishment of sediment removal from Miami River is a maintenance responsibility under the authorized Federal navigation project.

The second need is for the removal of the river sediments containing trace metals, petroleum hydrocarbons, and synthetic organic chemicals that originated from various point and non-point sources. Concern has been expressed by numerous Federal, State, and local agencies relative to the introduction of sediments into Biscayne Bay through the resuspension of Miami River sediments due to vessel traffic or severe storms. Removal of Miami River sediments has been identified by Miami-Dade County, the Florida Department of Environmental Protection (FDEP), and other city, county, State, and Federal agencies as being essential to any actions to improve the quality of the Miami River and eliminate the continued discharge of sediments into Biscayne Bay.

Seal *et al.* (1994) stated:

> *In the FDEP and NOAA surveys, the Miami River contains the most contaminated sediments in the state. Every site in the river (canal) system has at least one metal enriched more than ten times the expected background value. Two sites have two metals over ten times the expected background, seven sites have three metals over ten times background and two sites have four metals over ten times background. One site has a lead enrichment factor of over 110 times the expected background value. Lead and zinc are commonly ten times above expected background in Miami River sediments, but cadmium, chromium, copper, and mercury are also enriched to concentrations ten times above background. PAHs and PCBs are present at every Miami River site, and pesticides were detected at two sites. The FDEP survey detected metal and organic compound contamination at sites south and east of Claughton Island and near the Port of Miami, as well as in open areas of Biscayne Bay. Although there are numerous potential sources of contaminants in this area, the FDEP sites appear to show a sediment contaminant "plume" in Biscayne Bay stemming from the Miami River. These findings are significant because these data indicate areas in the Bay well removed from sources of contaminants (e.g., stormwater outfalls) are experiencing encroachment of contaminants.*

Biscayne Bay has been designated as an Aquatic Preserve and Outstanding Florida Waters, and the National Park Service has expressed concern that sediment transfer would adversely affect the Biscayne National Park.

The "State-of-the-Coast" index maintained by the National Oceanic and Atmospheric Administration (NOAA) noted that slightly or moderate amphipod (a test organism) toxicity was evident in sediments of much of Biscayne Bay. Severe amphipod toxicity was present in the Miami River Sediments and at the northern end of the Bay.

Removal of sediments beyond that removed for navigation (Federal interest) is of local interest and is to be done at non-Federal expense.

1.4 AGENCY GOAL OR OBJECTIVE

The objective of the proposed project is to remove contaminated sediments and restore the necessary operating depth of the navigable water channel in the portion of the Miami River serving the Port of Miami in Miami-Dade County, Florida; and, by the removal of these sediments containing trace contaminants, prevent them from being carried into Biscayne Bay.

The USACE proposes to dredge the accumulated sediments from the project area of the Miami River in a manner that best benefits navigation needs of the Port of Miami while minimizing adverse impacts to the natural, cultural, and economic resources of the area. This will be accomplished by dredging bottom sediments from the Miami River by methods that create the least adverse impacts to the flora and fauna of the river, as well as Biscayne Bay, while most effectively removing the sediments of concern, and, result in minimal disruption to navigational interests utilizing the river.

1.5 RELATED ENVIRONMENTAL DOCUMENTS

An Environmental Assessment was conducted for this project by the USACE, Jacksonville District, in 1990.

1.6 DECISIONS TO BE MADE

This EIS will aid in the decision whether to dredge the Miami River for the removal of accumulated sediments and, if the decision is made to dredge the river, the document will aid in the decision of the recommended plans for dredging and handling methods and disposal options. It is the intent that this document is somewhat programmatic in nature. That is, the final method of dredging and disposing of sediments from the Miami River has not yet been selected. This document has attempted to address all the likely scenarios for dredging, handling, and disposal options for the sediments from the Miami River. However, if following the receipt of responses to the Request for Proposal (RFP) that is to be issued, a method of dredging and/or disposal is selected whose actions have not been covered in this EIS, the appropriate NEPA documentation (supplemental or additional) will be completed prior to project commencement.

1.7 SCOPING AND ISSUES

Scoping for the proposed project was initiated by Public Scoping Meeting held in the project area in September 1990.

1.7.1 Issues Evaluated in Detail

The following issues were identified during scoping and by the preparers of this EIS as relevant to the proposed project and appropriate for detailed evaluation:

1. Turbidity and resuspension of sediments in the vicinity of dredging operations

2. Potential vessel-manatee collisions due to increased river traffic during dredging

3. Disruptions to water-borne commerce and recreational navigation

4. Impacts to aesthetics in the project area

5. Short-term increases in noise in the vicinity of dredging and interim disposal operations

6. Offensive odors emanating from the interim disposal site.

7. Increased street traffic in the area of the interim disposal or staging site.

8. Bird and mosquito control.

1.7.2 Impact Measurement

Bases for impact measurement and comparison are stated more specifically in Section 4.0 ENVIRONMENTAL EFFECTS and other sections of this document and appendices.

1.7.3 Issues Eliminated From Detail Analysis

No pertinent issues have been eliminated from detail analysis.

1.8 PERMITS, LICENSES, AND ENTITLEMENTS

The proposed project is subject to the Coastal Zone Management Act, Section 10 of the Rivers and Harbors Act, Section 401 of the Clean Water Act, and Section 404 of the Clean Water Act. With respect to Section 404 of the Clean Water Act, USACE does issue itself a permit, but does comply with the procedural and substantive requirements of the Act (33 CFR 335.2). In addition, coordination with the State Historic Preservation Officer (SHPO) on possible impacts to cultural resources by the proposed project is required.

1.9 COMPLIANCE WITH FEDERAL DIRECTIVES

Table 1 summarizes compliance of the proposed project with applicable Federal directives.

2.0 ALTERNATIVES

2.1 DESCRIPTION OF ALTERNATIVES

2.1.1 Dredging

Dredging needs and equipment requirements are tied to technologies and are driven by treatment and/or disposal decisions. Treatment/disposal options typically have high costs and are more controversial from a social, political, and regulatory perspective. Another concern during the removal and transport of Miami River sediments is the danger of introducing pollutants into previously uncontaminated areas. This occurs primarily from the resuspension of sediments during dredging and from spills and leaks during transport. Accordingly, the decision to dredge must be

made only after consideration of any available non-dredging remedial options, including no action and *in situ* containment or remediation.

2.1.2 Project Requirements

The existing Federal project for Miami River provides for a navigation channel 15 feet deep throughout its 5.5-mile length. The project was authorized in July 1930. There has never been a maintenance-dredging project conducted on the Miami River. Therefore, there is not a dredging history or a historically used disposal site available. In 1993, a USACE report specifically addressed alternatives for the dredging and disposal of sediment from the Miami River.

Depths and widths along the river are shown in a typical cross section (Figure 2). This cross-section shows that the shoaled sediments lie above a rock layer and that the majority of those sediments are within the dredging template for the existing Federal project.

Preliminary estimates of sediment quantities are tabulated in Table 2. For purposes of this report it is assumed that the Federal navigation channel will result in approximately 600,000 cy of material dredged.

As shown in Figure 3 the reduced project dimensions are generally located along the outer edges of the main channel at the riverbanks. The depth and width near the channel center provide marginal clearance for the current vessel fleet operating at the port. However, those vessels require special handling in navigating the river because deposited river sediments have reduced the effective channel dimensions, which in turn limits the vessel maneuvering area. Furthermore, additional horsepower is needed to overcome the higher friction or drag effects between the vessel's hull and the bottom and side sediments.

Channel shoaling also contributes to the mixing actions that resuspend river sediments. Channel shoaling compounds the mixing action by confining the displaced water moving around an underway ship's hull to a smaller area thereby generating higher velocities and increasing turbulence. Additionally, terminal operators load ships to their deeper drafts for the export of outbound commodities; these transits have to take advantage of the high tides. It has been observed that it is on the outgoing tides and riverine flood flows that the resuspended sediments are transported from Miami River to Biscayne Bay.

Commercial vessels presently transiting the Federal project have drafts ranging from eight to 15 feet and beams varying from 30 to 45 feet. Current project channel widths are capable of handling those vessels safely and efficiently if the channel dimensions are maintained to the authorized dimensions.

It has been estimated that approximately 600,000 cy of sediments lie on the bottom of the lower 5.5 miles of the Miami River within the Federal navigation channel. The thickness of the sediment varies from one to three feet in the deeper parts of the river and as thick as five to 10 feet along the channel sides as shown in Figures 3 and 4. The sediments in some areas have high silt-clay content, ranging from 61 to 82 percent. The unwanted sediments are the materials that have settled on the top of the rock layer.

Recent surveys indicate that approximately 200,000 CY of additional sediment exists in the Miami River in the areas outside the Federal navigation project. The "non-Federal" dredge material may be removed during the Miami River dredging project, but is a 100 percent local cost (no Federal cost

share). Further, the 200,000 cy non-Federal quantity of dredge material does not include tributary channels to the Miami River. This 200,000 cy of sediment is expected to be removed at the expense of the local sponsor.

2.1.3 Special Dredging Considerations

Dredging of the Miami River is confined by existing physical conditions. Existing conditions influencing dredging operations include bridge crossings and traffic congestion. Enlargement of horizontal dimensions for more channel width would require modification to existing channel banks and result in a subsequent loss of property. Such widening must be supported with sufficient economic benefits to justify the relocation of existing facilities and loss of expensive real estate adjacent to the river. Vertical dimensions are constrained by an underlying rock layer that is the approximate lower boundary of the existing Federal project. The rock layer would be expensive to dredge and the impacts of any significant deepening on the Biscayne Aquifer would be difficult to ascertain. Additionally, local shipping interests have not requested any channel improvements, other than channel maintenance, to service their existing and projected vessel fleets.

The amount of unclassified and miscellaneous debris expected to be found in the River will require the use of a mechanical overwater crane to handle the debris before initiating actual dredging. Current bathymetric surveys do not sufficiently identify miscellaneous debris in the Miami River. Miscellaneous debris must be classified, removed, and disposed of before dredging the River. Dredging contractors indicated that the river might be "dragged" to locate and remove the debris for disposal. However, removal of all debris before dredging is unlikely as the methods for locating it are imperfect. It will be necessary for mechanical dredges to be used for miscellaneous debris removal and dredging in tight confines (docks, bulkheads, etc.), regardless of the equipment selected for the main removal effort.

The dredging is projected to take approximately 12-18 months to complete dredging and sediment disposal because of the complexity of the operation. One factor affecting the time required to complete the dredging activity is the shallow project depths, which will limit construction equipment access.

Types of dredges available for use, the advantages and disadvantages of each, and criteria for dredge selection are discussed in detail in Section 3.4 of the accompanying Dredged Material Management Plan.

2.1.4 Evaluation of Dredging Alternatives

The dredging of the Federal project to the dimensions of 90 to 150 feet wide and 15 feet deep will require the removal of 242,912 cy of dredged material. To compensate for sloughing of the channel sides and other sources of material that may enter the channel following dredging, the USACE will specify that the channel be initially dredged to 16 feet (where accessible and not limited by limestone rock – no rock is to be removed as part of maintenance dredging) as “advanced maintenance dredging.” The USACE contracts for up to one additional foot of “overdepth dredging” to account for dredge positioning irregularities. The extra foot of depth associated with “advance maintenance” to 16 feet will require removal of an additional 119,235 cy of material and an additional foot of depth associated with “overdepth” to 17 feet will require removal of an additional 151,419 cy of material for a Federal channel to total at 513,566 cy. Assuming a bulking factor of 15-20 percent, the total quantity of material to be dredged is approximately 600,000 cy.

Two action alternatives and the no-action alternative were evaluated for the study area and are discussed below.

Base Plan. The Base Plan, a requirement for all DMMPs (EC-1165-2-200), identifies the least costly, environmentally acceptable plan. It identifies the base cost for meeting a given objective (in this case, managing dredging material to keep the navigation channel in the Miami River open). This alternative is to dredge the Miami River to the authorized federal channel dimensions and dispose of the dredged material in an environmentally acceptable manner in accordance with county, state, and federal regulations. The base plan for the Miami River dredging project is modeled after a conventional USACE dredging project. Plans and specifications would be prepared, the project advertised, and an award would be made to the lowest bidder. Sediments would be excavated be a mechanical dredge in phases over approximately five years.

The local sponsor would provide an upland interim staging area for unloading of dredged materials and dewatering or drying of material in a confined manner. Dried material would be hauled to and disposed at an appropriate upland landfill. Upon project completion, the interim site would be restored to its preexisting condition. At the request of the local sponsor, the interim site cannot be used for convention diking with open-air drying. Any plan that proposes to use the interim staging area must include confining or covering the material during the drying process. Open-air drying would not be allowed.

Additional details on the Base Plan are located in the DMMP document.

Preferred Alternative. The Preferred Alternative is to issue a Request for Proposal (RFP). The USACE would select a contractor to work in partnership with the Jacksonville District to dredge the Miami river in an effort to remove contaminated sediments and restore the river channel to its Federally authorized dimensions. The issuance of an RFP would promote the use of innovative technologies for the disposal of contaminated sediments, for reducing impacts to the surrounding communities, and to capture possible cost and time savings.

Dredging would be performed by mechanical dredge, hydraulic dredge, or a combination thereof.

Under this alternative, the local sponsor would provide an interim upland staging area and interim berthing station adjacent to the river. Land easements and rights-of-way for the dredging project would be the full responsibility of the local sponsor, Miami-Dade County, which is pursuing the use of property near the Jai-Alai fronton. As mentioned,, the interim disposal site cannot be used for conventional diking with open-air drying. Therefore, any plan that uses the interim upland staging area must confine the material (e.g., geotubes, etc.) However conventional diking and open-air can be used in the contractor provides another upland staging site acceptable to Federal, state, and local authorities.

Additional details of the Preferred Alternative are located in the DMMP document.

No-Action Alternative. No Federal action would mean that the Miami River channel widths and depths would continue to be reduced because of shoaling, particularly near bridges. Reduced channel widths would continue to result in collisions with bridges and other vessels, and in vessels running aground. No action would exacerbate the problem as silt continues to accumulate in the

River. There is concern by commercial interests that further degradation in navigation safety, as the result of no action would result in shipping being relocated to competing ports.

This scenario is not a comprehensive management plan for dredged material and is not regionally supported. However, analysis of this scenario is procedurally required under NEPA and is useful for comparison purposes. Without a comprehensive and regionally supported DMMP, dredging and disposal would continue on a project-by-project basis, so long as funding and privately developed placement options allow. This type of approach does not take advantage of the economies-of-scale or the reliability inherent in any other alternative; hence, the overall cost would likely be high. This project-by-project approach would also increase concerns by Miami River businesses about the long-term reliability of maintaining their channels and berths. Concerns such as these are likely to deter investment in the region, adversely affecting the expected increase that is currently projected for Miami River's commerce. This in turn would reduce the dredging required to maintain commerce and for navigational safety, further reducing the reliability and economic viability for Miami River users. Eventually businesses would likely move out of the region, with a negative long-term effect on the economy.

If the project is not implemented, the transportation of sediments through the mouth of the Miami River and into Biscayne Bay will continue. Adverse effects on the Biscayne Bay ecosystem would continue, if not worsen. There is no known plan for local interests to undertake the maintenance dredging of the Federal Project in absence of Federal involvement.

It appears reasonable to conclude that the State of Florida and the Federal Government would not continue to allow the unabated discharge of contaminated sediments from the Miami River. If the contaminated sediments are not removed from the river, the closure of the Miami River as a port facility may be the only recourse for protecting the integrity of the Biscayne Bay ecosystem.

2.1.5 Transportation and Disposal Options

Optional methods for transporting and disposing materials dredged from the Miami River are discussed in detail in the DMMP.

2.1.6 Treatment/Disposal Options

2.1.6.1 Municipal Sewerage Facilities. Some local interests suggested considering the use of existing sanitary sewers along the Miami River and routing the dredged material, in limited doses, to the Central Wastewater Treatment Plant located on Virginia Key to be processed with the city's sewage.

A 1988 analysis of sediment samples dredged from the Miami River indicates average composition is about 14 percent gravel, 59 percent sand, and 17 percent silt and clay. Gravel cannot flow with the liquid in a typical municipal sewer, and would rapidly cause sewer clogging. Sand damages sewerage system pumps, and in such large amounts would very promptly cause a system failure. Sand and gravel that reaches a sewage treatment plant is extracted in a "grit" removal unit at the inlet of the plant. If all of the sand and gravel now in the Miami River sediment, over a half million cy in volume, made its way through the sewers to the sewage treatment plant, the grit removal system would be overwhelmed and a very large material handling and disposal problem created.

The silt and clay portions of the Miami River sediment also include a small amount of organic matter that might benefit from "sewage treatment." The remainder of the silt and clay fraction would merely add bulk to the sewage solids that must be treated, although the metals present in the sediment may inhibit some biological processes at the plant. If all of the silt and clay now in Miami River sediments were fed gradually to the sewer system over a two-year period, approximately 8,000 cy per day of the material could arrive at the sewage treatment plant. This material would increase the volume of dry biotreated sludge produced at the plant by the equivalent of that from 1,600,000 persons served by the sewer system. Further, the introduction of salt water into a treatment facility has a potential for interfering with bacterial degradation of wastes and causing a plant upset.

USACE comments regarding this option suggest, "the concept of using any municipal sewerage facility needs to be dropped from consideration unless the local sponsor holds and saves the Government and its contractor harmless from any damage to pipelines, equipment, pumps, and/or processes at the treatment facility." Because of the potential for damage to the transmission system and the wastewater treatment process, this option is removed from further consideration.

2.1.6.2 Maximum Density Separator (MDS) – Hydrocyclone. The hydrocyclone alternative would involve a process to separate the fines from coarse-grained material. Separating the fines concentrates the unsuitable material in those sediments leaving the coarser grained material potentially suitable for fill. However, small-scale tests have indicted that coarse material would not be suitable for unrestricted fill. The hydrocyclone would be located at the interim disposal site. Dredge material would be moved from a barge through a pipeline to the hydrocyclone. Fine and coarse materials would be separated and go to separate areas. Excess water from the process would be collected and returned to the barge, forming a closed loop system for moving the sediments with no discharge into adjacent waters.

The sediments from the Miami River require an area large enough to hold an estimated bulked volume of about 900,000 cy. To hold this material, a temporary area equivalent in size to the interim disposal area is required.

Dewatering the hydrocyclone sediments is proposed to be accomplished by a pipe connecting the interim site with the sanitary sewer system. A pump would move the excess water into the sanitary sewer system to drain the area. The sewer system would carry the water to the wastewater treatment plant. The operation would occur at night to minimize the impact on plant operations by introducing the excess water for treatment during a non-peak period.

Because the material would not be suitable for unrestricted fill, there would be no apparent advantage for using a hydrocyclone. Further, as previously discussed, the sanitary sewage system would not be available for use. For these reasons, the use of the hydrocyclone is removed from further consideration.

2.1.6.3 Incineration. Incineration refers to heat treatment of dredged materials by raising temperature in a furnace or kiln to a level high enough to destroy organic matter and breakdown hazardous organic compounds. The treatment is effective in removing organic contaminants such as PCBs, hydrocarbons, and pesticides. With carefully controlled kiln temperatures, heavy metal contaminants, such as lead and mercury, may be fused into rock-like aggregate that is more stable and less susceptible to leaching when exposed to mildly acidic waters, as is some rainwater.

Incineration would reduce the volume of solids to be disposed of by removing organic matter and moisture. However, there is very little organic matter in the study area sediments, and outdoor

stockpiling of dredged solids could achieve sufficient drying to accommodate truck or rail transport to a permanent repository or disposal site.

Although dredge material scooped from transport barges could be fed directly to an incinerator system equipped to handle slightly watery soils, much of the fuel for heat would be expended in evaporating moisture. It would probably be necessary to unload barges rapidly and stockpile (and air dry) dredge materials in order to operate an incinerator system at a constant and efficient rate. Barge deliveries, however, are necessarily intermittent, and delays in unloading involve costly demurrage. Because stockpiling and open air drying of dredge materials probably cannot be avoided, and air dried material can easily be transported to a repository/disposal site, incineration would be advantageous only if incinerated soils could be used directly as aggregate for concrete, road fill, cinder block manufacture, etc.

Incinerators for treatment purpose are a matter of concern in air quality maintenance. High temperatures produce significant nitrogen oxide and other pollutant emissions. Incinerator units must be equipped with scrubber systems to remove toxic organics and acidic decomposition products, and hazardous metals such as mercury and lead. It would be difficult to obtain permits to operate such a facility in a densely populated urban area. Cost is a major drawback for incineration treatment. Estimated costs for rotary kiln incineration of large volumes of dredged materials range from $135 to $540 per cy. For incinerating 600,000 cy of sediment, the cost would exceed $100,000,000. Natural aggregate materials are available in the Miami area for about $5 per cy, and thus the sale of incineration aggregate would not significantly reduce incineration cost. Disposal costs would be reduced, however, if a large amount of "aggregate" could be sold as fast as produced. Sale of all incinerator output produced by a Miami River project is doubtful. If incinerated materials must be transported to a disposal site, there is no significant advantage in using the expensive incineration process. Furthermore, existing metals concentrations measured in the sediment exceed state criteria for incineration of contaminated soils.

Because of these potential difficulties, the use of incineration is removed from further consideration.

2.1.6.4 Pozzolanic Solidification and Stabilization (PSS). This treatment process would involve solidification of the dredged material with cement. The process binds soil and pollutant materials that may be present in the river sediments into a concrete-like substance. The solidification process increases the bulk volume of dredged solids.

If pozzolanic treatment is used, it would be necessary to unload barge loads of the dredgings at a suitable site along the Miami River, and to transfer the materials either to a stockpile for decant and partial drying or directly to a processing plant. The processed material can be cast into thin slabs for easy fracture and handling by bulk loaders or cast into convenient size cobbles for storage, conveyance, and use.

Pozzolanic solidification and stabilization is not a final disposal process in itself and the process is expensive (costs are estimated at $75 per cy of materials processed). The solidified materials must be relocated for final disposal at additional cost. If a suitable disposal site is not in the immediate vicinity of the processing plant, additional material transfer and transportation costs are involved.

The regulatory status of pozzolanic solidified and stabilized material is uncertain. It is unlikely that the treated materials can be considered as "dredge material" and thus be eligible for dumping at a designated ocean disposal site. Furthermore, there has been no demonstration that a pozzolanic

solidification process will eliminate the sediment characteristics that now preclude an ocean disposal option. In addition, the concrete-like castings or rubble produced would become "solid waste" if not used for some beneficial purpose, such as construction material. Florida Solid Waste Disposal Regulation 17-701.040 prohibits the use of solid waste (including clean debris and stabilized material) from being used as backfill in sinkholes abandoned limestone quarries or gravel pits.

The cost for solidifying 600,000 cy of sediment would exceed $60,000,000. A small part of this cost could be offset if a valuable product, such as concrete construction blocks, could be produced and sold. The possibility of selling a significant percentage of the huge volume of "concrete" that would be produced is uncertain. Most of the produced material would have to be disposed as solid waste (clean debris or stabilized material).

Because of the expense and the disadvantages of pozzolanic solidification, its use is eliminated from further consideration.

2.1.6.5 Confined Ocean Disposal. This disposal option would involve the use of geotextile fabric containers (GFCs) (slightly different from the geo-bags discussed for dewatering dredged materials at the interim disposal site) for open water placement of dredged material at the Miami Ocean Dredged Material Disposal Site (ODMDS). In general, the confined operation consists of placement of dredged material into a split-hull barge lined with appropriate geotextiles. The geotextile fabric is closed over the dredged material and sealed forming a GFC. The GFC would then be released from the barge at the Miami ODMDS.

The ODMDS is located on the continental slope. Depths at the site range from 427 to 785 feet. The depth at the center of the site is approximately 625 feet. The average declivity of the slope is approximately 325 feet per nautical mile. The surficial sediments were examined by Conservation Consultants, Inc. (1995), who reported that the sediments were predominantly fine sands and coarse silt. Sediment composition was reported as being generally uniform and well sorted throughout most of the site.

The Miami River sediments have been defined as material that is unsuitable for conventional unconfined open water placement at the Miami ODMDS. Potential water column and benthic impacts are areas of concern for unconfined placement of the Miami River sediments at the ODMDS.

Use of GFCs for the Miami River sediments may act as a control measure to reduce water column impacts and the GFCs may reduce the degree of spread of material on the bottom. This can be advantageous for subsequent capping. Capping, the covering of the unsuitable material with a layer of suitable material, may be considered as a control measure for potential benthic impacts. Spreading would be limited to the elliptical configuration of the bag, with the fabric effectively preventing any larger spread and any formation of a thin apron. This could have a benefit for capping applications in that the footprint of the mound to be capped would be reduced, with a corresponding reduction in the volume of capping material required.

The use of GFCs may reduce the dispersion of dredged material fines to the water column and reduce the volume of water entrained during descent at the Miami ODMDS. The presence of the fabric essentially acts as a filter cloth in containing suspended solids. The reduction in entrained water would result in a reduced volume of dredged material fluid fraction discharged to the water column. Use of GFCs would therefore potentially aid in meeting water quality standards or water column biological criteria for projects with stringent standards or small allowable mixing zones.

Theoretical and model studies as well as field data were evaluated to determine the suitability of confined ocean disposal for the Miami River sediments at an ODMDS. The confined sediments within the GFCs have been characterized in accordance with the "Green Book," *Evaluation of Dredged Material Proposed for Ocean Disposal* (EPA 503/8-91/001). Preliminary results indicated that the Miami River sediments contained within GFCs do not meet EPA criteria for disposal at the ODMDS. Costs of placing material using GFCs is substantially higher than conventional mechanical dredging and bottom dump barge disposal due to the cost of containers, labor, additional facilities, and barge modifications. Estimates generated by the GFC manufacturer have been in the range of $25-$35 per cy over normal dredging and disposal cost. It is estimated that this alternative for dredging and disposal of the Miami River sediments at the ODMDS using GFCs will cost between $39 million and $48 million.

Because of high costs and the likelihood that confined sediments do not to meet EPA ocean disposal criteria, this alternative is removed from further consideration.

2.1.6.6 Unconfined Ocean Disposal. In assessing the need for ocean dumping, the EPA/USACE "Green Book" states that no disposal alternative is considered more desirable than any other and that the evaluations are to be made on case-by-case bases. That is, confined or upland disposal cannot be considered environmentally preferable to ocean disposal unless an evaluation of potential environmental impact (e.g., groundwater contamination, leachate, runoff impact, permanent alteration of the site, etc.) shows it to be so. Similarly, ocean disposal cannot automatically be considered the more desirable alternative. (Reference: *Evaluation of Dredged Material Proposed for Ocean Disposal*, EPA 503/8-91/001.)

Disposal of dredge material at a designated ocean site is a method frequently used for maintenance dredging. The operating cost of ocean disposal is low in comparison to other disposal methods because of the short distance from the Miami River to the nearest designated ocean dumping site, and the convenience and economy of unloading hopper bottom barges at sea. It is less costly to transport the dredge material offshore than to transport and place it in a landfill. In the absence of a suitable fill site, dredge materials can, under favorable conditions, be placed at a designated offshore ODMDS. However, the 1991 bioassay tests on dredge material from Miami River indicate the material is not suitable for disposal at the Miami ODMDS.

USACE has reported that sediments showed high levels of mortality in the amphipod *Ampelisca* sp. exposed to solid-phase sediments from all stations tested. Significant mortality also occurred in other test organisms exposed to solid-phase sediments from some, but not all, stations. Mortality among test organisms in suspended particulate bioassays was not considered to exceed criteria, considering dilution in the mixing zone. Results of these bioassays, however, generally indicate that Miami River sediment is not suitable for unconfined ocean disposal at the ODMDS. (Reference: *Miami River Water Quality Plan-Draft Report*, DERM, 1993.) Excerpts from DERM's sediment characterization, *Miami River Water Quality Plan-Draft Report* are attached as Appendix A.

Unconfined ocean disposal could be proposed on a one-time basis if a suitable upland disposal site is not identified. In order for "one-time" unconfined ocean disposal of Miami River sediments to be pursued, potential alternatives for upland and nearshore disposal must be exhausted. It must be shown that there are no other economically feasible alternatives for sediment disposal. In general, the process for "one-time" unconfined ocean disposal would involve several steps. Permitting for transport and disposal of dredge material would be initiated by USACE. The application for dredge material disposal

would include a determination of the need for ocean disposal. The sediments would have to be characterized by sampling and analysis according to the Green Book, (EPA/USACE, 1991), which uses a tiered approach to the testing process for evaluating sediment suitability for ocean disposal. After testing is complete, the application for ocean disposal would be submitted for concurrence by the EPA. If the EPA does not concur with the suitability of the Miami River sediments for ocean disposal, an exception for a waiver could be requested. The recommendation for a waiver would originate from the District Engineer for the USACE Jacksonville District. The recommendation would have to be reviewed and concurred with at each step in the military chain-of-command until it reached the Secretary of the Army. If the Secretary of the Army concurred with the waiver recommendation, it would be forwarded to the Administrator of EPA for a similar review and concurrence. There has been no precedent for a waiver request.

If the waiver option is requested by the Secretary of the Army and approved by the EPA Administrator, a specific site for "one-time" ocean disposal must be designated and approved. The designation of a "one-time" ocean disposal site for the Miami River sediments would require extensive study and sampling to assure that no adverse impacts would occur. This would involve documentation of existing bathymetry, geological characterizations, ocean currents, fisheries resources, etc., at the designated site. An environmental impact statement will likely be necessary for the "one-time" site designation. It should be noted that the designated ODMDS for approved sediments in the Miami area remains designated an "interim" site because of environmental impact concerns.

Because the sediments do not meet EPA ocean disposal criteria, and because of the anticipated difficulties in obtaining a waiver for one-time disposal of sediments, this alternative is eliminated from further consideration.

2.1.6.7 Inshore Disposal. This alternative involves depositing the dredge materials in Biscayne Bay. While transportation and placement of dredged materials from the study area to Biscayne Bay and placing the materials in a suitable repository may have some environmental consequences, there are at least two methods of depositing dredged soils in the Bay. However, there would be difficulties in acquiring permits because state laws generally prohibit disposal of dredged materials within the Biscayne Bay Aquatic Preserve. In addition, high costs associated with providing adequate environmental protection would favor other dredge material disposal alternatives.

1. The first method of inshore disposal is to use dredge materials to fill deep "holes" (borrow areas) from which fill materials were previously removed to build uplands or create islands. The river sediments would be transported directly from the dredge site to the disposal site by barge, and deposited in the holes. Turbidity would be controlled by float-suspended silt curtains around the work areas. The objective would be to raise bottom depth to the optimum for establishment or re-establishment of sea grass beds. Because of concerns about possible toxicity of dredge material to certain organisms, it would be necessary to confine the material during deposition and cover deposited dredge materials with a one-meter thick layer of "clean" sand or other suitable material. None of the existing borrow area holes is sufficiently large to receive all the sediment now accumulated in the project area and many are not directly accessible by loaded transport barges. Transport barges loaded with dredged materials draw 10 feet or more of water. The original water depth at many of the "holes" was considerably less than 10 feet. Barge transported soils would be scooped or pumped from the barges, transported some distance, and carefully placed into the borrow areas. These operations are expensive, and there is no way to avoid

temporarily raising water turbidity and/or contaminant levels in the vicinity, although surrounding the work area with floating silt curtains could minimize the problem. Because Biscayne Bay is a State Aquatic Preserve and Outstanding Florida Water, regulations pertaining to dredge and fill activities are restrictive and prohibit degradation of water quality.

The cost of procuring, transporting and placing "clean" cover materials to cap the bay holes filled with dredge material would be very large. Providing a one-meter thick cover or cap over the disposed sediments would require over 300,000 cy of material similar to that of the natural bay sediments. The total cost of disposing materials dredged from the study area would likely exceed the cost of dewatering, transporting by truck, and disposing of the dredged solids at an upland disposal site.

2. If there is any new "island" construction to occur in Biscayne Bay, such as expansion of Port of Miami facilities, dredged materials from the project area could be used in place of other fill materials. Costs over and above those for ordinary ocean disposal would include those for removing dredge materials from barges, placing the materials in the fill, and controlling or removing turbidity from any decanted waters. There would be significant logistical problems in matching a need for such fill, if a need for additional "islands" occurs, with a requirement for prompt emptying and return of transport barges to the project area. There are too many uncertainties to be able to estimate costs for comparing this alternative to other dredge material disposal options. No known projects requiring new "island" construction are planned in the vicinity of the Miami River.

   Obtaining permits for the construction of new “islands” in Biscayne Bay is unlikely. Furthermore, the sediment characterization of dredged material indicates substantial silt content, indicating that the dredged material is not structurally compatible for use as fill. This alternative is removed from further consideration.

2.1.6.8 Upland Disposal.

This disposal option involves placing dry or solidified and stabilized dredged materials in an existing or newly developed site meeting all state and local criteria. Material dredged from Miami River could become "solid waste" if it cannot remain in an approved dredge spoil containment area as authorized by a dredge and fill permit, and cannot be beneficially used in construction, concrete block manufacture, or for some other useful purpose.

Recent tests on Miami River sediment indicate the materials are not "hazardous" according to Federal and state quality criteria for solid waste. However, the material does not meet state and local soil remediation criteria, and thus cannot be used as unrestricted fill. It would be necessary to dispose of the material at a permitted sanitary landfill.

2.2 RECOMMENDED PLAN

The Recommended Plan//Preferred Alternative, is to issue a Request for Proposal (RFP) from private industry to determine a selected Contractor, working in partnership with the USACE Jacksonville District, to dredge the Miami River in Miami, Florida in an effort to remove polluted bottom sediments from the river and restore the river to its Federally authorized dimensions. The RFP

solicitation is being used to promote the use of innovative technology for disposal of contaminated sediments and to capture possible cost and time savings.

2.3 COMPARISON OF ALTERNATIVES

Table 3 is a summary comparison of the environmental impacts of the alternatives. Section 4.0, Environmental Effects of Alternatives, contains a more detailed discussion and the scientific basis for this comparison.

2.4 MITIGATION

Mitigation generally involves three actions: avoidance, minimization, and compensation. For this project, the main mitigation elements will involve the avoidance of impacts. The following sections summarize measures to be taken in the mitigation of concerns expressed by involved agencies, organizations and citizens.

2.4.1 Surface Water

Water quality certification for the project will stipulate allowable turbidity levels, water quality criteria, and mixing zone size. These requirements are subsequently included in the contract between USACE and the dredging contractor. Specific control methods are generally not specified in order to allow competitive bidding and not restrict competition. The contractor will be contractually obligated to take whatever turbidity control actions are necessary to meet water quality criteria.

The effluent generated from dewatering of dredge material in an upland diked disposal area ("decant water") is discharged after varying lengths of retention time. Should the effluent not meet criteria or standards specified in water quality certification, additional treatment would be necessary. This treatment may include additional settling time in basins or placement of a temporary wastewater treatment facility located at the disposal area. The amount of wastewater generated will be minimized by reusing the decant water for hydraulic transport of dredge materials from barges to the disposal area.

2.4.2 Groundwater

Liners will be necessary within diked/leveed containment areas to provide protection for soil and groundwater resources. This requirement is necessary due to the sediment characterization failing to meet the regulatory standards for "unrestricted fill," requiring the handling of dredge material as solid waste. The dredge material containment area will be constructed and operated with controls in a manner similar to that of industrial solid waste landfills. These controls include liners, leachate collection systems, and groundwater monitoring wells.

2.4.3 Wildlife

Manatee watches will be required to be posted by the contractor during dredging operations. This condition is specified in the construction contract. A log of sightings and notification of appropriate regulatory agencies is required. Standard manatee protection requirements, as developed by the U.S. Fish and Wildlife Service, will be included in the plans and specifications issued to the Contractor.

2.4.4 Odors

Odors have been expressed as a concern by businesses and citizens living near potential interim disposal areas. The Contractor will be required to monitor odors emanating from the drying dredged materials. The Contractor will also be required to be responsive to citizen complaints and take immediate action to abate odor problems. Controls to be utilized may include spraying a deodorant into the air around the facility, spraying the dredge spoil with a deodorant or bactericide, covering the dredged materials to prevent the release of odors, or other means of controlling odors.

2.4.5 Noise

The potential for excessive noise has also been expressed as a concern by businesses and citizens living near a potential disposal or treatment site. The contractor will be required to be responsive to citizen complaints about noise created by their activities. It is anticipated that dredged sediment storage, treatment, and handling can be accomplished without obtrusive noise that would disturb nearby residents and tenants. However, should this become a problem, the Contractor will be required to alter equipment, locations of equipment, methods of operations and/or times of operations to abate the noise.

2.4.6 Traffic

Concerns have been expressed by citizens and city and county officials over the additional traffic on streets and highways near the project site generated by the handling of the large amount of sediments to be dredged from the Miami River. The Contractor will be required to be responsive to complaints about traffic problems created by their activities. Should this become a problem, the Contractor will have to alter numbers of vehicles, sizes of vehicles and/or times of vehicles on the road to satisfy officials.

2.4.7 Aesthetics

There has been some concern expressed over the appearance of a large operation such as treatment or interim disposal at sites within view of residents and tenants. The Contractor will be required to provide some type of covering or sight shield (i.e., solid fencing) to hide the operation from public view, to the practical extent possible.

2.4.8 Attraction of Pests

Concern has been expressed over the breeding of mosquitoes near residential areas or businesses in standing water at an interim disposal site where dewatering is taking place and the attraction of birds to these facilities looking for food in the sediments. The Contractor will be required to provide mosquito control by eliminating standing water, spraying or otherwise treating standing water with insecticide, or any other means of control should this become a problem. Likewise, should birds become a pest in the area, the Contractor will be required to take steps to control or eliminate the problem using scaring methods, covering the materials, or other bird control options.

3.0 AFFECTED ENVIRONMENT

The Affected Environment section succinctly describes the existing environmental resources of the areas that would be affected if any of the alternatives were implemented. This section describes only those environmental resources that are relevant to the decision to be made. It does not describe the entire existing environment, but only those environmental resources that would affect or that would be affected by the alternatives if they were implemented. This section, in conjunction with the description of the "no-action" alternative forms the base line conditions for determining the environmental impacts of the proposed action and reasonable alternatives.

3.1 GENERAL ENVIRONMENTAL SETTING

3.1.1 Background

The original, natural channel of the Miami River was located entirely within Miami-Dade County, Florida. The north fork of the Miami River originated at the "Miami River Rapids," a depression in the Atlantic Coastal Ridge, which allowed impounded water of the Everglades to flow southeasterly approximately 4.5 miles to the mouth of the Miami River at Biscayne Bay. The south fork of the River originated in a similar manner approximately one-half mile to the south of the Miami River Rapids. In 1909, a new channel was cut through the Atlantic Coastal Ridge approximately 100 feet north of the Miami River Rapids as part of the Everglades drainage program, and the Miami River/Miami Canal was extended northward to Lake Okeechobee. The Miami River-Miami Canal is approximately 80 miles long.

From 1931 through 1933, USACE dredged the Miami River to create a navigation channel that extends from the mouth of the Miami River approximately 5.5 miles to a salinity control structure near NW 36th Street. The Miami River navigation channel is 150 feet wide and 14 to 16 feet deep from the mouth of the Miami River to the South Fork, 125 feet wide and 14 to 16 feet deep from the South Fork to the Tamiami Canal, and 90 feet wide and 10 to 14 feet deep from the Tamiami Canal to the Seaboard Railroad Bridge near the salinity structure (Metropolitan Dade County Planning Department, 1962).

3.1.2 The Study Area

The study area, the "Miami River," is located between Biscayne Bay and the salinity control structure, within the City of Miami, Miami-Dade County, on the southeastern coast of Florida (see Figure 1).

The Miami Canal is a major drainage from the Everglades Agricultural Area. The portion of the canal immediately upstream from the salinity control structure receives drainage from industrial, commercial, residential, and some agricultural areas. Downstream from the salinity control structure there is extensive commercial, industrial, and residential development. Water-dependent and water-related commercial and industrial operations along the Miami River include commercial shipping, marinas, ship and boat yards, marine sales, boat manufacturing, and maritime services.

The mouth of the Miami River is located at the northwestern shore of Biscayne Bay. Across the bay, and approximately 2.5 miles from the mouth of the river, are the southern end of Miami Beach, Fisher Island, and Virginia Key. Biscayne Bay is an inlet of the Atlantic Ocean, and is partially separated from the ocean by a series of barrier islands. The southern region of Biscayne Bay is managed by the

U.S. National Park Service as Biscayne National Park. The northern end constitutes the Biscayne Bay Aquatic Preserve, which is managed by the State of Florida.

3.2 AIR QUALITY

The project area lies within the Southeast Florida Intrastate Air Quality Region, as established by 40 CFR Part 81.49. Miami-Dade County has been designated by the EPA as lying within a nonattainment area (moderate) for ozone. The county is an attainment area for carbon monoxide. The air quality of Miami-Dade County contains nitrogen dioxide, sulfur dioxide, and total suspended particulates at concentrations that are better than national standards. EPA has not made a designation for airborne lead in southeastern Florida.

The Florida Department of Environmental Protection (DEP) does not require air emission permits for mobile sources such as construction equipment and does not regulate any marine equipment. Therefore, no air emission permits will be required for conventional dredging and disposal actions.

3.3 GEOLOGY

The headwaters of the Miami River originated in the Atlantic Coastal Ridge, which formed a broad natural dam impounding the waters of the eastern edge of the Everglades. A small depression in the ridge allowed the freshwater to escape through natural falls, known as the "Miami River Rapids." These rapids formed the beginning of the north fork of the Miami River, located west of the NW 27th Avenue Bridge. The south fork of the Miami River originated from the ridge in a similar, but less conspicuous manner, about one-half mile to the south of the rapids. The Miami River was also fed by numerous underground freshwater artesian springs that emerged from the porous limerock. From the ridge, the Miami River meandered in a southeasterly direction approximately 4.5 miles to Biscayne Bay.

3.4 VEGETATION

Seagrasses do not occur in the Miami River or at the mouth of the river in Biscayne Bay.

Seagrasses are, however, an integral component of the Biscayne Bay environment. Spatially, seagrass communities comprise the major portion of the bay bottom. Four species of sea grasses were reported to occur within the soft bottom areas of the bay: turtle grass (*Thalassia testudinum*), manatee grass (*Syringodium filiforme*), shoal grass (*Halodule wrightii*), and halophila (*Halophila baillonis*) (USACE, 1990). In addition, *Halophila johnsonii* is now known to occur in northern Biscayne Bay. Seagrasses function to provide a vertical substrate for the attachment of estuarine organisms and, by providing cover, function as a nursery area for fishes important to the commercial and sport fishing industry. Further, seagrasses serve as forage for manatees.

An introduction of sediments from the Miami River has reportedly changed large areas of the northern bay from a *T. testudinum* climax community to an early successional stage with *H. baillonis* and *H. wrightii* as the predominant species. The nearest seagrass beds are approximately one-fourth mile away from the mouth of the river. It has been reported that the sizes of seagrass beds in this area of the bay are shrinking away from the mouth of the river because of the deleterious effects of Miami River sediments transported into the Bay (USFWS, 1989). The U.S. Department of the Interior, National Park Service (NPS) (1986) reported that pollutants from the Miami River have caused the loss of large areas of seagrasses adjacent to the Biscayne National Park.

3.5 THREATENED AND ENDANGERED SPECIES

The only threatened or endangered species known to inhabit the Miami River is the West Indian manatee, *Trichechus manatus*, an endangered species. Manatees have been observed throughout the length of the river downstream from the salinity control structure, and in all associated tributaries. Manatees are particularly abundant in the Miami River during winter, when they are attracted by warmer, fresh waters and by aquatic vegetation on which they feed. Because of the utilization of the river by manatees, the Miami River is designated critical habitat for this species. Reduced boat speeds are required in much of the area because of the potential for manatee collisions.

Threatened or endangered species potentially occurring in the area of the Miami River are listed in Table 3.

3.5.1 Sea Turtles

Although sea turtles do occur in Biscayne Bay, they are not known to inhabit Miami River.

3.5.2 Right Whale

Right whales are typically found in the open ocean and are not expected to be encountered in the proposed project area. However, depending upon the location of dredge equipment when a contract is awarded, the movement of the dredging equipment to and from the project area may affect right whales in their ocean habitat.

3.6 BENTHIC RESOURCES

Biscayne Bay is a shallow, subtropical lagoon. The shoreline of the northern portion of the Bay has residential and commercial development along its entire length, with most of the vegetation removed and the natural shoreline replaced by vertical bulkheads. The bottom habitats of Biscayne Bay support a variety of organisms important to the coastal zone ecosystem. Based on substrate, the bay can be broadly classified into hard-bottom and soft-bottom habitats. The hard bottom habitat is characterized by a thin layer of sediment overlying the limestone bedrock. The soft-bottom habitat is typified by sand or mud accumulations greater than five inches. The hard-bottom habitats are dominated by plants and animals that have developed adaptation for attachment to firm substrates. The most prominent attached animals in many areas of hard bottoms are the soft corals (e.g., sea whips and sea plumes) and sponges. Other areas of the hard bottom are dominated by burrowing animals, such as bivalves, and shrimp. The predominant plants of the soft-bottom habitats are sea grasses, anchored to the bottom through extensive networks of roots and rhizomes (DERM, 1983).

The biological resources of the ODMDS were reported in detail by EPA (1995). Communities at the site consist of benthic macrofauna, benthic meiofauna, epibenthic benthic invertebrates, and fish, with benthic communities of primary concern.

Polychaete worms and amphipod crustaceans comprised approximately 70 percent of the benthic macroinvertebrates collected, with molluscs and nematodes accounting for most of the remainder (Conservation Consultants, Inc., 1995). The macrobenthic communities were found to be of similar composition throughout the site. The meiofauna was composed primarily of nematodes (94 percent) with copepods, larval polychaetes, and flatworms common, but not abundant (EPA, 1995).

The most abundant epibenthic invertebrates collected in trawl samples were decapod crustaceans, with squids also present. The most abundant fish at the site was the largescale tonguefish (*Symphurus minor*); a variety of other species was represented in samples. Fish density was highest in shallower areas, and decreased with depth (EPA, 1995).

A video survey of the site showed that the bottom of the entire area is covered by a fine, silty material. No evidence of hard bottom habitats was recorded, and no plant life was evident. The energy basis for the communities was concluded to be sedimentation (EPA, 1995).

3.7 FISH AND WILDLIFE RESOURCES

The Miami River is not utilized for fishing by the sport or commercial fishing industry. Because of the reported occurrence of tarpon in Palmer Lake, it is likely that other important fishery species could be found there. However, Palmer Lake is not used extensively for recreational fishing.

An extensive recreational fishery and a commercial pink shrimp fishery exist at Biscayne Bay. Additionally, a large number of pink shrimp (*Penaeus duorarum*) collected in samples at the ODMDS site (Conservation Consultants, Inc. (1995), indicating that the area may serve as a nursery area for that species. Pink shrimp have been reported to occur in greatest abundance in waters shallower than the ODMDS (EPA, 1995).

Palmer Lake, a less impacted borrow lake connected to the Miami River, is of more importance to wildlife; USFWS reported the occurrence of such birds as osprey, double-crested cormorant, kingfisher, green-backed heron, and great heron.

The West Indian manatee, the only protected species of national significance in the study area, is present year-round throughout the length of the river and in Palmer Lake. The Atlantic bottlenose dolphin is an occasional resident.

3.8 ESSENTIAL FISH HABITAT

The Magnuson-Stevens Fishery Conservation and Management Act of 1996 set forth a mandate for the National Marine Fisheries Service (NMFS), Regional Fishery Management Councils (FMCs), and other Federal agencies to identify and protect “essential fish habitat” (EFH) for important marine and anadromous fish species managed under fishery management plans (FMPs). The NMFS defines EFH as those *waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity*. The estuarine and marine waters of Miami-Dade County, including Biscayne Bay, are designated as EFH (South Atlantic Fishery Management Council, 1998). The South Atlantic Fishery Management Council (SAFMC) defines estuarine inshore habitats as: *emergent vegetation (salt and brackish marsh), estuarine shrub/scrub (mangroves), seagrass, oyster reefs and shell banks, intertidal flats, palustrine emergent and forested (freshwater wetlands), and the estuarine water column*. Because detritus-rich waters drain from much of the Everglades into Biscayne Bay, a large portion of the Everglades as well as the Miami Canal and the Miami River have been designated the Biscayne Bay Coastal Wetlands Estuarine Drainage Area by the SAFMC, one of 18 such areas defined along the South Atlantic Coast. This drainage area consists of the following:

Habitat Type	Acres
Salt marsh	104,000
Fresh marsh	1,556,000
Forest and scrub	2,059,000
Tidal flats	49,000
Total	3,769,000

Marine habitat areas included in the South Atlantic Fishery Management Plan that may be affected by the proposed action include live and hard bottoms, artificial and man-made reefs, coral and coral reefs, pelagic *Sargassum*, and the marine water column.

Species managed under the Plan include certain members of 10 families of fishes under the Snapper-Grouper Fishery Management Plan; six species of fish under the Coastal Migratory Pelagics Fishery management Plan; six species of shrimp under the Shrimp Fishery Management Plan (including the pink shrimp); coral belonging to two classes of coral, a seafan, coral reefs, and live and hard bottom habitats under the Coral, Coral Reefs, and Live/Hard Bottom Habitat Fishery Management Plan; and the spiny lobster, the golden crab, the red drum, the calico scallop, and *Sargassum* habitat under their own separate fishery management plans.

Commercial and recreational fishing in the waters off Miami-Dade County is concentrated inshore or at offshore natural and artificial reefs. Bait shrimp and mullet are the principal commercial species taken from inshore waters (Heald, 1970). Major species taken in offshore waters are red snapper, yellowtail snapper, groupers, king mackerel, Spanish mackerel, and spiny lobster. In addition, the inshore waters of Biscayne Bay have been identified as a nursery area for pink shrimp (Bielsa *et al*., 1983), and the State of Florida has established a spiny lobster sanctuary encompassing extensive portions of southern Biscayne Bay.

3.9 COASTAL BARRIER RESOURCES

A review of Coastal Barrier Resource units in the Miami-Dade County area indicates that the Miami River is outside the impact area.

3.10 WATER QUALITY

3.10.1 General

The Miami River flows naturally in a southeasterly direction and discharges into Biscayne Bay near the Port of Miami. The river is about 20 miles long and lies entirely within Miami-Dade County. The primary study area is located within the first 5.5 miles of the Miami River along the existing Federal channel. The Miami River Project was built during the mid-1930s, when over 1,000,000 cy of dredged material were removed at a cost of approximately $600,000. The river bottom was deepened to 15 feet, creating a Federal navigable waterway. The navigable portion of the river is limited by a salinity dam located 5.5 miles upstream near NW 36th Street. In 1945, the Miami River Project became part of the Miami Harbor Project through congressional authorization.

As with many urban waterways, the Miami River has been used as a receptacle and conduit for waste materials. For many years, the City of Miami discharged untreated sewage into the river. This

practice ended in the mid 1950s when regional sewage treatment facilities were constructed. However, some sewage still enters from sanitary sewer overflows, sewer leaks, and improper sewer connections to storm sewers, and vessels using the river. Industrial activities, particularly metalworking, cleaning, painting, and salvage associated with marine industries, have contributed a substantial amount of contaminants to the river. Pesticides, fuels, and other contaminants spilled within the watershed have become deposited in the river through stormwater runoff.

Significant progress has been made in pollution abatement in the Miami River in recent years. Storm and sanitary sewer systems have been improved and new construction is regulated. Marine and industrial facilities are inspected and pollution control regulations are enforced. Some of the pollutants deposited over the years have decayed or been resuspended and removed from the river channel by vessel traffic as well as river and tidal currents. The pollutants of major concern, according to previous investigations, are metals content in the sediments and sanitary hazards associated with sewage pollution.

3.10.2 Groundwater

The surficial aquifer system underlying Miami-Dade County, the Biscayne Aquifer, is the sole source of freshwater supply for the county. It is composed of limestone, sandstone, sand, shell, and silt from the land surface to the top of the intermediate confining system, which separates the surficial aquifer system from the Floridan aquifer system.

The surficial aquifer system consists of materials that have a wide range of permeability, and locally may be divided into one or more aquifers with intervening zones of sands and silts having low permeability. Due to the interfingering of these materials, some permeable units (aquifers or small sections of aquifers) may exhibit confined characteristics. In general, the surficial aquifer system has hydraulically interconnected groundwater flow with fluid potentials at all depths closely related to the water table.

The Biscayne Aquifer is the best-known part of the surficial aquifer system. It is a highly permeable nonartesian limestone aquifer, and consists primarily of oolite and other cavernous cavity-riddled limestones.

In the project area the generalized hydrogeologic cross section of the surficial aquifer system is as follows: Biscayne aquifer 0' to 60' below sea level; limestone, sandstone, and sand unit of the Tamiami Formation 60' to 165' below sea level; lower clastic unit of the Tamiami Formation 165' to 235' below sea level; and the base of the surficial aquifer system and beginning of the intermediate confining system at approximately 235' below sea level.

3.10.3 Surface Water

The State of Florida has developed and implemented state water quality standards in conjunction with USEPA guidelines. The state regulates its water bodies through a classification system that relates the water resource to its intended use. The major classes for Florida waters as originally formulated are listed below:

Class I- Public Water Supply

Class II- Shellfish Propagation and Harvesting

Class III- Recreation/Propagation and Management of Fish and Wildlife

Class IV- Agricultural Water Supplies

Class V- Navigation, Utility, and Industrial Use

The Miami River was originally classified as a Class IV water body. In 1989, the river's classification was changed from Class IV to Class III because it is a part of the Biscayne Bay Aquatic Preserve. Class III water bodies can support recreation and a healthy and well-balanced population of fish and wildlife. The Miami River does not presently meet all Class III standards; however, local interests have stated that the classification change was made so that the river could ultimately be regulated to meet those standards.

3.10.3.1 Biscayne Bay Aquatic Preserve. The downstream portion of the Miami River, from the salinity dam near NW 36th Street to the river mouth, lies within the Biscayne Bay Aquatic Preserve. The preserve, designated in 1974 by the Florida Legislature, includes all waters north of Biscayne National Park, as well as state-submerged lands and islands. Those submerged lands within the preserve boundaries that are privately owned or leased or which have been deeded to the County or municipalities are also part of the preserve. Waters over privately owned or municipally owned lands within the Preserve boundaries area also considered part of the preserve. All waters within the preserve are classified as Outstanding Florida Waters, Class III.

3.10.3.2 Outstanding Florida Water. An Outstanding Florida Water (OFW) is a water body deemed worthy of special protection due to its natural attributes. The designation OFW is given to certain water bodies in the interest of maintaining the ambient (extant) water quality.

The majority of OFWs are found in parks managed by the state or federal government. Examples of OFWs include wildlife refuges, marine sanctuaries, estuarine research reserves, aquatic preserves, scenic and wild rivers, and certain waters within state or national forests. Water bodies are generally classified as OFWs because the managing agency has requested special protection to protect ambient water quality. Water bodies not within a state or federal managed area may be designated as "special water" OFWs if certain requirements are met, including a public process of designation.

An OFW designation affects activities that require a DEP permit and have the potential to lower ambient water quality. OFWs are subject to narrative "antidegradation" standards, which prohibit activities that degrade water quality. Activities such as fishing, boating, diving, and river setback ordinances are not affected by this designation.

3.10.3.3 Surface Water Improvement and Management Plan. Biscayne Bay was designated a priority water body by the Florida legislature in 1987 as part of the Surface Water Improvement and management (SWIM) Act. . The SFWMD prepared the Biscayne Bay SWIM Plan, which was adopted in 1988 and updated in 1995 to maintain and improve water quality and to protect and restore natural ecosystems and compatible human uses of Biscayne Bay.

SWIM develops improvement and management plans for at-risk water bodies and directs the work needed to restore damaged ecosystems, prevent pollution from runoff and other sources, and educate the public. SWIM plans are used by the state and other agencies to help make management decisions.

The Biscayne Bay SWIM Plan contains a priority list that emphasizes geographic areas where the most serious problems exist. Water bodies within the priority list may be subjected to additional research, investigation, enforcement, or construction activities, according to their needs as assessed by the SWIM Plan. The Miami River/Canal is included in the Biscayne Bay SWIM Plan's Priority List.

3.10.4 Sediment

It has been estimated that approximately 600,000 cy of shoaled sediments lie within the Federal navigation template along the lower 6-mile reach of the Miami River. Sediment thickness varies from one to 3 feet in the deeper parts of the river and as thick as 5 to 10 feet along the channel edges. The bulk of this sediment consists of surficial soils eroded and transported from a large watershed area that includes Miami-Dade, Broward, and Palm Beach Counties. Other components of river sediment include soils abraded from the riverbank and materials not of soil origin such as vegetation fragments, marine organisms and skeletal remains, and man-made pollutants.

Surficial soils in the Miami area are primarily composed of limestone, sandstone, sand, and shells, and are typically covered with a moderate-to-thin layer of topsoil. The publication *Element Concentrations in Soils and Other Surficial Materials of the Coterminous United States, U.S. Geological Survey Professional Paper 1270* (1984) reports that surficial soils in the Miami area have high concentrations of silicon and calcium and comparatively low concentrations of other metals except tin, strontium, antimony, and lead. Antimony and lead concentrations in Miami area surficial soils are among the highest in the United States.

Excerpts from the DERM Draft Miami River Water Quality Plan (March 1993) on sediment quality and related monitoring (i.e., sediment analysis, elutriate tests, and bioassays) are presented in Appendix B to the EIS.

Vessels navigating the Miami River engage in a *de facto* form of dredging of shoals and shallow reaches of the waterway. Prop-wash agitation and bottom dragging suspend sediments and enable the channel to retain a depth that minimally enables navigation to continue.

Ongoing navigation in the river promotes continued re-suspension of sediments. River discharge and tidal currents promote the transfer of suspended materials into Biscayne Bay. A turbidity plume at the mouth of the Miami River can be readily identified in virtually all aerial photographs of the area; the plume is also visible from vantage points at Brickell Point, particularly during ebb tide. Studies of Biscayne Bay have concluded that the Miami River sediments are a significant source of contamination to Biscayne Bay (e.g., Long *et al.*, 1999).

3.10.5 Pollution Sources

Until the late 1950s, local governments discharged wastewater directly into the Miami River. However, overflows and illegal connections intermittently discharge material into the river. Consequently, the river is periodically contaminated and water quality is further impaired.

Storm sewer outfalls are the greatest source of pollutants to the Miami River. In recent years, efforts have been made to abate stormwater discharges. The Clean Water Act requires certain industrial facilities and municipal drainage systems to obtain NPDES permits. All new developments are

required to contain 100 percent of all on-site stormwater whenever feasible. Any work involving replacement or new construction of stormwater collection systems must have French drains or another suitable method that employs infiltration. Local governments, with assistance from the SFWMD have upgraded many drainage basins to comply with requirements for retention and treatment.

Abandoned vessels are a significant source of river pollution. At one time, U.S. Customs had docked as many as 170 vessels along the river. Miscellaneous abandoned boats have also been a recurring problem. State and local interests have taken measures to prevent these abandonments by policing the river and citing violators.

Construction site dewatering, coastal construction, and industrial waste discharges are also prominent sources of pollution. Miami-Dade County has enacted local rules to regulate these activities by requiring operating permits. The county also has dedicated pollution control inspectors to increase local enforcement capacities and assure compliance with the permit program.

3.10.6 Previous Studies

The Miami River has been contaminated from a variety of urban and rural pollution sources through time. Contamination testing for the river and its sediment has been ongoing for the past two decades.

Early testing of the Miami River revealed levels of mercury and silver exceeding state water quality standards. Water within the river was characterized as turbid and oxygen-poor.

Sediments in the Miami River were deemed acceptable for ocean disposal in an EPA-approved area. Although these sediments were determined to be acceptable for ocean disposal, they were determined to be marginally polluted. Bioassay results indicated that river sediment did not significant impact the organisms exposed to it. No significant levels of bioaccumulation were noted.

Chronic and acute coliform bacterial contamination has been repeatedly noted in the Seybold Canal tributary of the Miami River. Contamination is believed to result from sewage overflows and industrial waste discharges.

Analyses by SLES indicated high levels of heavy metals, PCBs, PAHs, oil, and grease in Miami River sediments. Elevated mercury levels in the river were determined to result primarily from sediment suspension caused by vessel traffic.

Studies conducted by PPB in 1991, 1995, and 1999 revealed the continued presence of metals contamination in river sediments. Iron, aluminum, chromium, copper, lead, mercury, nickel, silver, and zinc were noted in the various studies. Organic contaminants were either absent or present in trace amounts. Bioassay studies revealed that standard test organisms were impacted by exposure to river sediments. Bioaccumulation studies indicated an increase in metals concentration in the tissue of exposed organisms. The use of Geobags™ appeared to be partially effective in reducing toxicity levels for some organisms.

A study conducted by NOAA (1999) detected high concentrations of metals, DDTs, and PCBs in sediments of the Biscayne Bay area, including the Miami River. Concentrations of these contaminants were observed to cause high toxicity in bioassay tests.

The studies confirm that the Miami River sediments, while contaminated, are not considered hazardous.

Detailed discussions of water and sediment contamination studies of the Miami River are contained in the DMMP.

3.11 HAZARDOUS, TOXIC AND RADIOACTIVE WASTE

An eight-acre parking area near the Miami Jai-Alai Facility has been identified by the local sponsor as an interim drying site for Miami River sediments. The interim staging area is located between NW 33rd and NW 36th and NW 36th and NW 37th Avenue within Section 28, T53S R41E. The site lies approximately 150 feet south of NW 36th Street and approximately 400 to 500 feet southwest of the Miami River. It is rectangular and contains no permanent structures; asphalt pavement covers the majority of the property. A small out parcel is located on the southern portion of the facility.

The site is 5 to 10 feet above mean sea level. Surface water should infiltrate to the surficial aquifer, and surface runoff from adjacent properties should be minimal due to the lack of significant topographic relief. The surficial aquifer near the site is approximately 210-feet thick and lies 5-15 feet below land surface (BLS). Regional groundwater flow trends to the southeast, although local topography and subsurface structures can influence local trends. The Miami River likely affects groundwater flow at the site.

A Phase I Environmental Site Assessment (ESA) was initiated at the site in 1999 by Ecology & Environment, Inc. (E&E). A site walk through was performed as part of the ESA. The site walk through revealed the presence of the following features: several clogged stormwater catch basins causing ponding across the site; several solid waste dumping areas containing trash, garbage, bottles, waste tires, drums, and other containers; several empty and/or broken 55-gallon drums (plastic and metal), two of which were open to rain water but emitting no odors; seven to eight 5-gallon pails of hydraulic oil (apparently empty), a one-gallon container half-full of waste oil, and one empty 5-gallon gasoline can; an open excavation, approximately 27’ x 7’ x 6’, near the center of the property with an adjacent vegetated soil pile; a concrete area approximately 105’ x 32’ on the south portion on the northern one-third of the site containing several areas that had been resurfaced with asphalt (apparently indicating the removal of above- or below-ground items), one of which leads to a round area containing a pipe in the center and four drains on the western perimeter; and a monitoring well on the western portion of the northern one-third of the site, located at the southwestern corner of a discrete 12’ x 36’ area.

Based on the findings of the site walk through, E&E made the following recommendations: clean and rehabilitate stormwater catch basins and properly dispose of any material removed from the catch basins; remove and properly dispose of all waste tires drums, containers, and other solid/waste debris; investigate the origin of the excavation and associated soil pile to determine the method of disposal for the soil and if the excavation can be backfilled; install monitoring wells on the perimeter of the site to determine the current status of groundwater; and sample the existing monitoring well.

A Phase II Subsurface Assessment (SA) was conducted at the site in 2000 by ATC Associates, Inc. (ATC) to investigate the potential for soil or groundwater contamination resulting from possible prior property uses and to document these findings pending future utilization of the site. The following procedures were performed as part of the SA: excavation of 15 test pits for visual inspection of subsurface soils, soil vapor headspace screening, and collection of soil samples for laboratory

analysis of Petroleum Range Organics (PROs); installation of 17 monitoring wells (16 shallow wells and one intermediate-depth well) to assess potential surficial and intermediate-depth groundwater impacts to the site; and collection of groundwater samples from the installed monitoring wells for laboratory analysis of Priority Pollutant Volatiles (VOCs), Priority Pollutant Semivolatiles (SVOCs), PROs, the eight RCRA Primarily metals (silver, arsenic, barium, cadmium, chromium, mercury, lead, and selenium), and Polychlorinated Biphenyls (PCBs).

Prior to the initiation of subsurface activities, a utility clearance was performed to identify and locate existing underground utilities in the proposed assessment area. Major utilities identified included an underground natural gas pipeline and water main that bisect the northern and southern portions of the site and an underground electrical conduit that partially bisects the southern portion of the site.

Five of the 15 test pits were performed at the location of the former vehicle maintenance building. These five test pits revealed a steel waste oil underground storage tank (UST) (275-550 gallon capacity) containing several feet of petroleum sludge and connected to an underground vehicle service well and an OWS through single-wall underground steel piping; an area approximately 15' x 15' containing a former excavation backfilled with concrete blocks and debris apparently generated from demolition of the vehicle maintenance building; a vehicle alignment rack with the elevated steel support ramps removed; an underground vehicle service well constructed of concrete and connected to the waste oil UST by a steel product line; and a 1½-inch diameter cut steel line.

No evidence of soil staining or petroleum contamination was encountered while exposing the UST surface, the underground vehicle service well, or the associated product lines. Further excavation revealed three parallel runs of 1½-inch diameter piping in the subsurface. The three piping runs were found to angle 90 degrees up through a concrete floor slab corresponding to a location along the inside of a former exterior building wall. ATC interpreted that the three product lines may have been initially connected to USTs and transferred products to an overhead distribution system. Although only one UST was found at the site, two rectangular concrete patches large enough to accommodate USTs were observed in the area.

The remaining 10 test pits were excavated spatially throughout the site. The surface of the water table was encountered at an average depth of approximately 3 feet BLS. The soil column at each test pit location typically consists of approximately one foot of black medium-grained quartz sand that grades into a tan quartz sand intermixed with limestone fragments. These unconsolidated sand layers are underlain by limestone at a uniform depth of approximately 2 feet BLS. No evidence of buried materials or petroleum contamination was identified in these test pits.

The subsurface geology of the site as observed in the test pit excavations is remarkably similar to the subsurface geology of the Miami River as determined from six soil test borings drilled in the river bottom by Law Engineering and Environmental Services, Inc. (refer to DMMP Section 3.4.5.1). The uniformity of the sediments from both areas indicate that they were deposited simultaneously in similar or identical environments, and the possibility of lithologic and/or hydrologic connectivity between the two areas, not accounting for topographic and/or structural barriers, is high.

Select soil samples were collected for field soil vapor screening purposes during excavation of the test pits. No detectable organic vapor concentrations were identified during the investigation. Soil samples were also collected for analysis of PROs. Of the 15 samples collected for this purpose, only one was found to exceed the Florida Administrative Code (FAC) Chapter 62-777, Table II, Residential Exposure Soil Cleanup Target Level (SCTL) of 340 mg/kg and the FAC Chapter 62-777,

Table II, Groundwater Leachability SCTL of 340 mg/kg. The sample in question was collected from backfill material near the vehicle alignment rack discussed previously.

An area of visibly oil-stained soil, encompassing a total area of approximately 570 ft^2, was observed on either side of a roadway in the southern portion of the site. An unlabeled 55-gallon drum missing a sealing bung was observed near the discharge area. Soil excavation and disposal activities were performed on both areas of noticeably impacted soil. The soil was excavated to a depth of approximately 2.5 feet BLS. A composite soil sample was collected from the accumulated stockpile and submitted for non-virgin waste characterization analyses. Results of these analyses indicated a total PRO concentration of 1,700 mg/kg. No additional compounds were detected above applicable SCTLs. The stockpiled soil was transported to the Rinker Materials Facility of South Miami-Dade for treatment through thermal incineration. Confirmation samples taken at the excavation revealed PRO samples below the applicable SCTLs. The excavation was subsequently backfilled with crushed lime rock and compacted.

Four orphan 55-gallon drums were identified on the subject property. Three of the drums appeared to contain mixtures of petroleum-based product and sludge; the fourth drum appeared to be empty. Markings on the drums suggested that they might have been on the site since 1995. As previously mentioned, one of the drums appeared to have discharged waste oil into the surficial soil. The contents of the orphan drums were transferred to two new FDOT-approved 55-gallon drums. Disposal of the full drums and decontamination and disposal of the empty drums was performed by IPC/Magnum.

Groundwater samples were collected for VOC analyses from 17 monitoring well locations. Results of these analyses revealed the presence of 10 individual VOCs. Of the 10 detected VOCs, only three, Benzene, Isopropyl Benzene, and 1,3,5-Trimethylbenzene, were present in concentrations exceeding FAC Chapter 62-777, Table I, Groundwater Cleanup Target Levels (GCTLs). All three compound concentrations were below FAC Chapter 62-777, Table V, Natural Attenuation Levels (NALs). Nine of the 10 VOCs were present in the monitoring well located by the waste oil UST. The remaining VOC was detected in the monitoring well located next to the site of the vehicle maintenance building.

Groundwater samples collected for SVOC analyses revealed the presence of three individual SVOCs. Of the three SVOCs, one, 1-Methylnapthalene, was present in concentrations potentially exceeding applicable GCTLs. The detected concentration was below applicable NALs. The detected SVOCs were detected in wells adjacent to the former vehicle maintenance building.

Of the 17-groundwater samples collected for PRO analyses, only one contained PRO concentrations above the laboratory detection limit. This sample, taken from a well near the waste oil UST, contained PRO concentrations exceeding the maximum GCTL but within the limits of the appropriate NAL.

Groundwater samples were collected from each monitoring well for analysis of the eight RCRA Primary Metals. Four metals, arsenic, barium, chromium, and lead, were found in detectable concentrations. None of the metals was present in concentrations exceeding applicable GCTLs. Of the four metals, only barium was geographically widespread within the samples.

Groundwater samples were taken from wells near the waste oil UST and the waste oil discharge area for analyses of PCBs. No PCBs were present in concentrations above the laboratory detection limit.

ATC concluded from the analyses that only one area of concern was present at the site. This area coincided with the location of the former vehicle maintenance building. Features of note in this area include a waste oil UST, an OWS vault, an underground vehicle service well, a relict product piping, two unidentified underground structures, and an area of impacted soil and demolition debris.

Groundwater sampling near the building site indicates a limited discharge of contaminants to groundwater closely associated with the existing waste oil UST. The discharge was delineated both horizontally and vertically by sampling downgradient-monitoring wells. No additional areas of soil or groundwater impacts were identified on the remaining portion of the facility.

Recommendations proposed by ATC include closure and removal of the waste oil UST and associated OWS in the northern one-third of the property; excavation and disposal of impacted burial construction debris at the former vehicle maintenance building site; and the performance of a GPR survey to detect any remaining USTs in the area.

The site of the proposed staging area was the exclusive subject of both the Phase I and Phase II assessments. If the contractor requires a different or an additional interim disposal site, an HTRW investigation will be performed at the time of determination of the utilization of the aforementioned site.

3.12 NOISE

Both the river where the dredging will take place and the interim disposal site are located within extensive industrial/heavy commercial areas. Additionally, the Miami International Airport is located within 0.5 mile from the north end of the proposed project and less than 5 miles from the farthest point of the project, at the mouth of the river. Airplanes departing and arriving Miami International, river vessel traffic signaling to bridges to open and close, high level industrial activity along most of both river banks, high volumes of truck and other vehicular traffic along most of both river banks, and a train track paralleling the north river bank in the northern portion of the proposed project, as well as other noise sources, all contribute to a high level of ambient noise in the project area.

A noise environment characterization was attempted in March 2001 at the property line of a residence approximately 250 feet east of the eastern boundary of the staging area. This was the residence closest to the interim staging area. Measurements taken indicate average background A-weighted hourly equivalents (Laeq1) of 64.5 dBA and 66.8 dBA, with maximum-recorded levels of 85.8 dBA and 102 dBA for the two days on which the survey was conducted. It should be noted that 60-66 dBA is a sound level roughly equivalent to that of an occupied business office during working hours, 85 dBA is a level roughly equivalent to that of a street with average traffic, and 102 dBA is a level roughly equivalent to a pneumatic chipper.

3.13 AESTHETIC RESOURCES

The Miami River has a general lack of aesthetic resources along most of its extent, owing largely to the urbanized and/or industrialized natural of the area surrounding the river. The area surrounding the proposed staging area is also a highly industrialized area with few aesthetic resources.

3.14 RECREATION RESOURCES

Recreation opportunities associated with the Miami River include the use of parks and marinas, and access to nearby fishing and boating waters. There are numerous public parks and public access areas adjacent to or near the river. Public transportation and walkways, including segments of the Miami River Walk, connect the Bayfront Park and adjacent Bayside shopping area on Biscayne Bay to Fort Dallas Park on the River. The walk allows pedestrian access to the river and to restaurants and hotels in the area. Brickell Park, a green space with water frontage on Biscayne Bay, is a small public access area south of the river adjacent to hotels and office buildings. West of I-95, on opposite banks of the river, are Jose Marti and Lummus parks. These parks are primarily used by East Little Havana and Lummus Park neighborhood residents, respectively. North of Highway 836 there are two parks; Sewell Park adjacent to the southern bank of the river and Fern Isle Park located on the South Fork of the river. The largest park along the river is Curtis Park, which is bisected by NW North River Drive. The park, which is located on the north shore of the river's edge, includes ball fields, a boat ramp, and a senior citizens' center. This park is located near the Melrose and Allapattah neighborhoods, but because of amenities available at the park, it serves a much larger area. At the head of the North Fork of the river is the Miami Rapids Park. The North Fork of the Miami River originally started just south of the park, but after construction of the Miami Canal drainage project in 1912, the rapids were lost.

The major source of recreation associated with the Miami River are boating and fishing. Although little boating and no fishing take place on the river, there are numerous boat slips at marinas, condominium complexes, and in residential backyards. These provide safe harbor for small pleasure craft and allow access through the river to boating and fishing waters in Biscayne Bay and the Atlantic Ocean.

The marinas on the Miami River have approximately 749 wet slips and 147 dry slips dispersed at recreational marinas, repair facilities, and residential developments. In addition, there are numerous small vessels docked in backyards of residences with river or tributary access. Single-family marinas and recreational marinas that contain less than 10 slips are not required to obtain a marina operating permit (Personal Communication, DERM).

Water related activity is an important aspect of recreation in south Florida. This is illustrated by the number of pleasure craft registered in Miami-Dade County. In 2000, there were 55,871 pleasure craft registered in the county, accounting for six percent of the state total, more than any other county in the state. A great number of the state's large pleasure craft is registered to county residents. In 2000 Miami-Dade County accounted for 7,862 registered pleasure craft over 26 feet registered in the state (Personal communication, Florida Fish and Wildlife Conservation Commission, Law Enforcement). These larger craft are more difficult to trailer and are typically stored at wet slips in marinas or at private docking facilities.

Coastal waters in the Miami area are used for a variety of recreational activities, including fishing, boating, swimming, skiing, diving, and sailing. Few of these activities occur near the ODMDS (EPA, 1995).

3.15 NAVIGATION

The Miami River is navigable from the mouth of the river at Biscayne Bay to a point 5.5 miles upstream. In addition to the main channel, the Seybold Canal, South Fork, North Fork, and Tamiami Canal, which drain into the Miami River, are navigable by small pleasure and fishing vessels. The

navigable portion of the Miami River includes a channel from the mouth of the river 15 feet deep by 250 feet wide, tapering down to 170 feet wide at Brickell Point, 1,400 feet from the mouth of the river. The channel is then 15 feet deep under flood conditions and 150 feet wide for three miles, thence 12.5 feet deep and 125 feet wide for 1.1 miles and thence 90 feet wide for 1.4 miles. There is no turning basin at the head of the river, therefore all vessels must arrive and depart the river under tow, with the bow facing upstream (Miami River Marine Group, 1991).

The width and depth of the Miami River, the bridges that span the river, the tidal ranges, and operations at the Port of Miami place many restrictions on navigation of large vessels on the Miami River. The width of the river, 125 feet wide south of NW 27th Avenue and 90 feet wide north of NW 27th Avenue, restricts maritime traffic to the movement of one vessel on the river at a time. Furthermore, the winding nature of the river east of NW 27th Avenue requires vessels to traverse the river under tow, with the vessel being maneuvered by tugboats fore and aft of the vessel. There are 13 bridges that span the river, 11 of which are drawbridges that must be raised to allow large vessels to pass. In order to reduce street traffic congestion on thoroughfares crossing the river during rush hour (7:30 a.m. to 9:00 a.m. and 4:30 p.m. to 6:00 p.m.), the bridges remain lowered, open to street traffic. This causes maritime traffic to cease. Additional restrictions are placed on vessels utilizing the Miami River due to cruise ships arriving and departing at the Port of Miami. Since vessels utilizing the Miami River must pass through channels in Biscayne Bay that are utilized by cruise ships, outbound Miami River traffic is restricted from traversing Biscayne Bay from 3:30 a.m. to 7:00 a.m., and inbound traffic is restricted from traversing the bay from 4:00 p.m. to 6:00 p.m. from Friday to Monday. Further restricting navigation are the tidal ranges and the depth of the river's navigation channel. Due to the depth of the channel, loaded outbound vessels often need to traverse the river during high tide. It requires approximately two hours for large vessels to traverse the river from NW 27th Avenue, the area north of which approximately 95 percent of large vessel traffic originates. Therefore, only two or three vessels can traverse the river with each ebb tide. Presently 175 to 200 one-way vessel transits or 85 to 100 round trips are made on the river each month.

The Miami River is one of the few ports in the U.S. that does not govern navigation and commerce by a public port authority (City of Miami Department of Planning, Building, & Zoning, 1992). Unlike most ports, all terminals on the Miami River are owned and operated as private enterprises; no land or dock space is owned or operated by a public entity. Presently, 30 local, state, and federal agencies have some control over different aspects of the river.

The Miami River Marine Group (MRMG), a private cooperative trade association and non-profit corporation, is made up of representatives of some 36 private enterprises plus a board of directors and an executive director. The MRMG has taken the initiative to organize private industry along the Miami River to improve and protect the river and maritime commerce.

The MRMG is also part of the Miami River Commission (MRC), which was created by the Florida State Legislature in 1998. The MRC has been assigned the coordination of public policy related to the Miami River as well as the development of plans, priorities, programs, and budgets to improve the Miami River area substantially. This will be done through environmental enhancement, facilitating water related commerce, inspiring downtown waterfront development, and beautifying the river shorelines. Members of the MRC include the Governor of Florida, representatives of the Florida House, other elected officials, and official appointees. While serving as a clearinghouse for Miami River issues, a major focus of the MRC is the dredging of the Miami River.

Another important entity involved in governing the Miami River port is the U.S. Coast Guard's Quality Action Team (QAT) organized approximately three years ago. The primary focus of the QAT is on navigation safety issues, bridge operations, environmental protection, and marine safety on vessels and facilities. The QAT is a large organization of a wide spectrum of participants; including representatives of private industry; municipal, city-county, state, and Federal offices and organizations (including all 30 agencies having enforcement or oversight control over the river); public and private boards, commissions, and other groups (including the MRC and MRMG); as well as representatives of various other offices and interests.

A Memorandum of Understanding and Agreement has recently been signed by QAT members, formalizing its organization, cooperative working relationship, and goals.

3.16 HISTORIC PROPERTIES

This section describes the historic and archaeological resources within or adjacent to the project area. Studies for historic and archaeological resources were conducted in compliance with regulations set forth in Section 106 of the National Historic Preservation Act of 1966, as amended and as implemented by 36 CFR 800 (Protection of Historic Resources) and Chapter 267 FS; Section 4(f) of the Department of Transportation Act of 1966, as amended (49 USC 303, Section 101b), and Chapter 267 of the Florida Historical Resources Act. The studies conform to the Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation (48 FR 44716). The objective of the surveys was to assess all cultural resources within the project's area of potential effects for listing in the *National Register of Historic Places (NRHP)* according to the criteria set forth in 36 CFR 60.4.

The Miami River constitutes one of the oldest natural landmarks in southeastern Florida (City of Miami Department of Planning, Building & Zoning, 1992). Aboriginal habitation and use of the area dates back to perhaps as early as 2000 B.C. The Tequesta Indians inhabited much of southeastern Florida until the 17th century when diseases brought by Spanish explorers severely reduced their population. The Seminoles inhabited the area during the 18th and 19th centuries, but were driven out of the Everglades to southwest Florida because of the Seminole Wars in the mid-1800s.

Indian, Spanish, English, Bahamian, and North American peoples established settlements on the Miami River, in part because of its usefulness in connecting Biscayne Bay with the Everglades. In their history of the Miami River, the Miami River Management Committee (1984) related that historic use of the area dates from the 16th century when the Spanish temporarily established a mission on the north shore of the river. In the 18th and 19th centuries, European settlements became established in the area.

3.16.1 Methods

In December 2000, architectural historians and archaeologists conducted a literature search and a preliminary reconnaissance survey in order to identify impacts of the project on *NRHP*-listed or eligible resources within the project area.

The literature search consisted of a review of the Florida Master Site Files, the City of Miami Multiple Property Listing, the list of historic resources designated by the Metro-Dade County Historic Preservation Board, and the Miami-Dade County Historic Survey. Preliminary field reconnaissance in the project area consisted of an archaeological and historic resources survey within

the area of potential effects. The archaeological survey consisted of a pedestrian survey of the project area to determine if the proposed project will have any subsurface impacts. As the project area is currently paved, and the proposed project includes the storing of dredge spoil on this pavement, no subsurface impacts are scheduled. The historic resources survey consisted of a visual reconnaissance, photographic documentation, and mapping of significant historic resources.

Figure 5 presents locations of historic resources in the vicinity of the Miami River.

3.16.2 NRHP - Listed or Potentially Eligible Resources

Following the reconnaissance survey and literature search, no previously recorded *NRHP*-listed or potentially eligible historic resources were identified within the project's area of potential effects. The circa-1926 Miami Jai Alai building (8DA5983) is located outside the immediate project area, but within the area of potential effects. This building, which was previously recorded by Janus Research during a cultural resource assessment survey for the Miami Intermodal Center (March 1995), is considered ineligible for listing in the *NRHP* due to the substantial modifications to its original design. Every window opening throughout the building has been enclosed, its Mediterranean Revival detailing has been removed or obscured, and numerous substantial additions have been appended to the building. In October of 1995, the State Historic Preservation Office (SHPO) concurred with the opinion that the Miami Jai Alai is ineligible for listing in the *NRHP*.

No previously recorded *NRHP*-listed or eligible archaeological resources were identified within or adjacent to the portion of the project area located at the Miami Jai-Alai parking facility for storage of dredge spoil. Five sites (8DA11, 8DA13, 8DA98, 8DA1655, and 8DA3220) along the Miami River where the dredging will occur were identified as listed or eligible for listing in the *NRHP*. Of the five sites, one (8DA11) is potentially eligible for listing and four (8DA13, 8DA98, 8DA1655, and 8DA3220) are eligible for listing in the *NRHP*.

Site 8DA11, the Granada site, is a midden site that represents the Native American village of Tequesta during the sixteenth through eighteenth centuries. It is located along the northern bank of the Miami River in Section 37, Township 54 South, Range 41 East on the South Miami USGS Quadrangle. Site 8DA11 is considered eligible for listing in the *NRHP*.

Site 8DA13, Miami Sand Mound 4, is a precontact sand mound located on the southern bank at the mouth of the Miami River in Section 38, Township 54 South, Range 42 East on the South Miami USGS Quadrangle. Artifacts recovered include human bone fragments, pottery, and midden material. Although this site was reportedly leveled, it is possible that some sub-surface burial features remain within Brickell Park. It was recommended that a professional archaeologist monitor any subsurface maintenance or construction in Brickell Park. Site 8DA13 is considered potentially eligible for listing in the *NRHP*.

Site 8DA98 (also known as 8DA12), named Brickell Point or Miami Midden #2, is a Glades I-II period black dirt midden located on the southern bank at the mouth of the Miami River in Section 38, Township 54 South, Range 42 East on the South Miami USGS Quadrangle. A newly discovered portion of this site is known as the Miami Circle, which is the footprint of a large prehistoric structure cut into the limestone bedrock and an associated midden. Two radiocarbon dates were obtained that date the site to approximately AD 100. Site 8DA98 is considered eligible for listing in the *NRHP*.

Site 8DA1655, Miami River Rapids/Ferguson Mill, is a black dirt midden and a coontie mill site situated on the North Fork of the Miami River. The prehistoric midden site dates to the Glades II culture, whereas the mill site dates to ca. 1830-1860. It is located in Section 33, Township 53 South, Range 41 East on the South Miami USGS Quadrangle. Site 8DA1655 is considered eligible for listing in the *NRHP*.

Site 8DA3220, the Jose' Marti site, is a precontact shell midden and cemetery from the Glades I culture located in Section 38, Township 54 South, Range 41 East on the South Miami USGS Quadrangle. Site 8DA3220 has not yet been evaluated, and therefore, its eligibility for listing in the *NRHP* is unknown.

A recent discovery of what may be an archaeological site at the mouth of the Miami River has become known as the Miami Circle. A 38-foot-wide circle of cut and constructed stones was unearthed during excavations in preparation of a $100 million residential and commercial complex. It is widely believed to have been constructed by Tequesta tribe between 500 and 2,000 years ago. Excavation of this site is currently ongoing.

4.0 ENVIRONMENTAL EFFECTS

This section is the scientific and analytic basis for the comparisons of the alternatives. See Table 3 for a summary of direct and indirect impacts of alternatives considered. The following includes anticipated changes to the existing environment including direct, indirect, and cumulative effects.

4.1 GENERAL ENVIRONMENTAL EFFECTS

In general, removal of the contaminated sediment material from Miami River will improve long-term water quality by reducing continuous resuspension. The removal of the shoal material will return the Federal channel to its design project depth and restore safe underkeel clearances for navigation.

4.2 VEGETATION

4.2.1 Maintenance Dredging of the Miami River

The navigation channel contains very little aquatic vegetation. Vegetation along the banks of the river should not be disturbed along the project corridor. Seagrass communities in the adjoining portions of Biscayne Bay should experience long-term benefits through reduced siltation and contaminant exposure.

4.2.2 Disposal of Dredged Material

Disposal of sediments removed from Miami River will occur at a site where it can be beneficially used (i.e., if it is treated) or at an approved dumpsite, such as a landfill or other final disposal facility. No adverse effects on vegetation are expected.

4.2.3 No-Action Alternative (Status Quo)

Vegetation would likely remain as it is currently in the short-term, with little or no change under the no-action alternative. With the continued shoaling of the river, bottom sediments will be increasingly stirred by navigation traffic, thus decreasing the likelihood that submergent vegetation may take root.

4.3 THREATENED AND ENDANGERED SPECIES

4.3.1 Maintenance Dredging of the Miami River

The primary potential impact on threatened and endangered species stems from the use of watercraft and their collisions with manatees. To minimize the occurrence of vessel-manatee collisions, USACE will include standard USFWS manatee protection provisions in the construction specifications provided to contractors. Implementation of these specifications will be required of the contractor. The USFWS Coordination Act Report is provided in Appendix C.

Manatee watches will be required to be posted by the contractor during dredging operations. This condition is specified in the construction contract. A log of sightings and notification of appropriate regulatory agencies is required. A physical control that helps to exclude manatees from the dredging area is a silt curtain. Floating baffles of the silt curtains help avoid undetected intrusions of manatees into work areas.

Although sea turtles occur within Biscayne Bay, no records exist of sea turtles entering the Miami River. Consequently, the USACE has made a determination that maintenance dredging of the Miami River will have no effect on threatened and endangered sea turtles protected by Section 7 of the ESA.

The USACE also finds that maintenance dredging of the Miami River will have no effect on threatened Johnson's seagrass or its designated critical habitat under Section 7 of the ESA. The USACE believes that dredging will have no effect on the species because of the current condition of the water exiting the Miami River. This belief is based on the findings of the Draft CAR, specifically the comments made by the National Park Service in a 1986 letter to the District Engineer.

4.3.2 Disposal of Dredged Material

Any site chosen for disposal (interim or final) that is in a natural area will be assessed for its value as threatened or endangered species habitat. If such a site is selected for disposal, the Contractor will be required to coordinate with the U.S. Fish and Wildlife Service (USFWS) and/or the NMFS (depending upon the location of the site) to ensure that such species or their habitat will not be impacted. Coordination with the Florida Fish and Wildlife Conservation Commission will also be required of the Contractor, under these circumstances. However, it is anticipated that no disposal site will be selected where there is a potential for adverse impacts to threatened or endangered species.

4.3.3 No-Action Alternative (Status Quo)

Under current conditions, the only protected species likely to be impacted is the manatee. Because no major change in current navigation traffic is anticipated under this alternative, the current rate of boat-manatee collisions is expected to continue. However, if river shoaling continues to a point that it diminishes navigation traffic, boat-manatee collisions may decrease.

4.4 HARDGROUNDS

4.4.1 Maintenance Dredging of the Miami River

Hardgrounds in the project area are not anticipated to be impacted directly. However, they may benefit indirectly by the removal of contaminated sediments from the river that are continually flushed into Biscayne Bay by tidal actions and river flow.

4.4.2 Disposal of Dredged Material

Should a disposal site be selected where hardgrounds may be impacted, the Contractor will be required to assess those impacts and coordinate with the appropriate agencies prior to the commencement of project activities.

4.4.3 No-Action Alternative (Status Quo)

Hardgrounds would remain as they are currently, potentially decreasing in quality as benthic habitat with the continued movement of contaminated sediments from Miami River.

4.5 FISH AND WILDLIFE RESOURCES

4.5.1 Maintenance Dredging of the Miami River

The fauna of the Miami River is both impoverished and tolerant of extreme conditions. Although dredging activities would kill individual benthic organisms present in materials dredged from the river, it is unlikely that solids suspended by dredging operations would have any measurable impacts on any of the biological communities of the river. It is anticipated that the biological communities of the river would improve by reducing contaminated sediments, reducing agitation of bottom sediments, and improving the overall health of the river.

4.5.2 Disposal of Dredged Material

It is anticipated that interim and final disposal of dredged sediments will be in an area that is of minimal value as fish and wildlife habitat, such as an approved landfill or other dumping site. As mentioned under threatened and endangered species, should the interim or final disposal take place near wildlife habitat, the Contractor will be required to coordinate with Federal and state fish and wildlife agencies in order to exclude or minimize impacts to these areas and species.

4.5.3 No-Action Alternative (Status Quo)

The biological communities of the Miami River would continue to be adversely impacted by the contaminated sediments present in the river. Numerous studies have identified sediments in Biscayne Bay that were transported by currents from Miami River. Concern has been expressed that continued entry of contaminated Miami River sediments into Biscayne Bay could result in bioaccumulation of heavy metals and other substances, thereby adversely affecting the ecosystem.

4.6 ESSENTIAL FISH HABITAT

4.6.1 Maintenance Dredging of the Miami River

The Miami River does not support significant commercial or recreational fishery resources. The removal of contaminated sediments from the river that may be transported to Biscayne Bay would be a beneficial impact to the ecosystem and essential fish habitat in that area.

4.6.2 Disposal of Dredged Material

It is anticipated that interim or final disposal of dredged materials will not be undertaken in an area where essential fish habitat would be adversely impacted. Should a disposal area be chosen in close proximity to EFH, the Contractor will be required to coordinate with NMFS in order to eliminate or minimize impacts to EFH.

4.6.3 No-Action Alternative (Status Quo)

It has been reported that sediments from the Miami River have altered the seagrass communities of Biscayne Bay. Turtle grass climax communities have been replaced by communities dominated by shoal grass and halophila. The seagrass beds in areas of Biscayne Bay near the mouth of the Miami River have been reportedly retreated due to the adverse effects of Miami River sediments. If the project is not implemented, the transportation of sediments through the mouth of the river into Biscayne Bay will continue. Adverse effects on the Biscayne Bay ecosystem resulting from Miami River sediments will continue, and possibly worsen. The catastrophic discharge of sediments due to flooding caused by a hurricane or other severe storms could create a long-term negative impact on Biscayne Bay (NPS, 1986).

4.7 HISTORIC PROPERTIES

4.7.1 Maintenance Dredging of the Miami River

By letter of June 27, 1986, the Florida State Historic Preservation Officer (SHPO), in his review of the Draft Feasibility Report stated,

> *In those locales where dredging is to be confined to extant channels and go no deeper than previously excavated areas, this project may proceed without any further involvement of this office. If existing channels, however, are to be widened or dredged deeper than they have been in the past, then these dredging operations need to be carefully monitored for the presence of cultural materials in order to locate sites which may be eligible for listing in the National Register.*

There are no known *NRHP*-listed or potentially eligible archaeological resources within the project area. Five *NRHP*-eligible or potentially eligible archaeological resources (8DA11, 8DA13, 8DA98, 8DA1655, and 8DA3220) are located adjacent to the Miami River, but will not be impacted by the proposed dredging. However, the Miami-Dade Historic Preservation Division expressed concern that the dredging could impact unrecorded archaeological resources on the Miami River bottom. Therefore, monitoring by a professional archaeologist is recommended for any dredging activities that affect the Miami River.

4.7.2 Disposal of Dredged Material

It is anticipated that final disposal of dredged sediments will be in an area approved for acceptance of such materials and will not affect historic properties or cultural resources. For interim disposal sites, the Contractor will be required to coordinate with SHPO on any site(s) planned for use in this project that have not been previously cleared with that office. One interim site near the Miami-Dade Jai-Alai Arena parking lot has been investigated. A request was made to SHPO for the existence of any known historical or archaeological sites on this property. A reply from SHPO has been received. Correspondence with SHPO is presented in Appendix D.

The circa-1926 Miami Jai-Alai building (8DA5983) is located within the area of potential effects. However, this previously recorded building has been determined ineligible for listing in the *NRHP* by the SHPO due to the substantial modifications and additions to its original design. Therefore, this project would have no impacts to known historic resources in the immediate project area or directly adjacent to the project area.

4.7.3 No-Action Alternative (Status Quo)

No impact to historic properties is expected from this alternative.

4.8 SOCIOECONOMICS

The dredging of the Miami River will have a temporary adverse impact on the socioeconomic characteristics of neighborhoods adjacent to the river. These impacts will be short lived and only persist while the river is being dredged. These impacts will result from the disruption of waterborne commerce, a hindrance of the navigation of fishing and pleasure vessels, the physical operation of the dredge, and temporary changes in land uses on the river's banks. The magnitude of these impacts will depend on various factors including the type and size of dredge equipment used, the turbidity screen setup employed, operational procedures, and hours of dredge operation.

Because of the winding and narrow nature of the Miami River, dredging will present unique impacts not typically experienced during dredging operations on larger navigable waterways. The use of a dredge encircled by a turbidity screen, with a dredge material disposal barge moored at its side, will physically occupy a significant portion of the river's width. Further complicating matters will be the period needed to dredge the river. Dredging of the Miami River could take up to two years because of conditions on the river and the need to use smaller equipment than is used in typical dredge operations. The longer the period of dredging, the greater will be the adverse impact to the region.

4.8.1 Navigation

4.8.1.1 Maintenance Dredging of the Miami River. Navigation on the Miami River will be affected while the river is being dredged. The physical presence of the dredge and the use of turbidity screens around the dredge will disrupt waterborne commerce and may hinder fishing and pleasure vessels from traversing certain sections of the river while the dredge is operational. The physical setup of a dredge and barge on the Miami River would block a significant portion of the river's narrow width. Near the mouth of the river, where the width is 250 feet, tapering to 170 feet, the impact to navigation because of the dredging operation should be minimal. Upstream, the river narrows to 150 feet, then to 125 feet. As the river narrows, continual navigation for all vessels during dredging will become more difficult, until reaching the point that only fishing and pleasure

vessels will be able to navigate the river while the dredge is operational. Above NW 27th Avenue, the area where most waterborne commerce vessels dock, the river narrows to 90 feet. Continuous dredging will block traffic at this section of the river. To allow operation of waterborne commerce in this area, dredging will have to be halted periodically and the dredge equipment moved from the navigation channel to allow vessels to pass.

Dredging of small tributaries along the river will result in temporary inconvenience to owners of small fishing and pleasure vessels, the only types of vessels that can use these waters. During dredging operations, nearby pleasure and fishing vessels will have to be relocated, and navigation on the waters halted. Transportation of dredge material by barges will increase waterborne traffic on the Miami River, thereby resulting in some delays.

4.8.1.2 Disposal of Dredged Material. Once dredging of the sediments is complete, the disposal of dredged material is not anticipated to affect navigation adversely.

4.8.1.3 No-Action Alternative (Status Quo). Navigation is currently being adversely affected by the shoaling of the Miami River. If the proposed maintenance dredging is not completed, navigation will be seriously curtailed, possibly resulting in a significant adverse impact to local and regional businesses.

It appears reasonable to conclude that the State of Florida and the Federal Government would not continue to allow the unabated discharge of contaminated sediments from the Miami River into Biscayne Bay. If the contaminated sediments are not removed from the river, the closure of the Miami River as a port facility may be the only recourse for protecting the integrity of the Biscayne Bay ecosystem.

4.8.2 Water Related Industries

4.8.2.1 Maintenance Dredging of the Miami River. Water related industries, such as ship repair and construction commercial marinas and seafood wholesalers and processors, should not be severely impacted by the dredging operation. These enterprises typically do not require extensive use of the Miami River, instead using the river for incoming arriving and departing vessels. The major impacts to these industries would result from the dredge operating directly in front of their business and hindering the arrival and departure of vessels.

4.8.2.2 Disposal of Dredged Material. Disposal of the dredged sediments should have little or no effect upon water related industries.

4.8.2.3 No-Action Alternative (Status Quo). Without the proposed maintenance dredging, water related industries could see a significant decrease in the number of vessels that can reach their facilities due to the shoaling taking place in the river.

It appears reasonable to conclude that the State of Florida and the Federal Government will not continue to allow the unabated discharge of contaminated sediments from the Miami River into Biscayne Bay. If the contaminated sediments are not removed from the river, the closure of the Miami River as a port facility may be the only recourse for protecting the integrity of the Biscayne Bay ecosystem.

4.8.3 Waterborne Commerce

4.8.3.1 Maintenance Dredging of the Miami River. As stated above, waterborne commerce on the Miami River could be adversely impacted by the dredging of the upper reaches of the river. The narrow width of the channel prevents two vessels from passing on the river under normal conditions. The presence of the dredge and the dredge material disposal barge on the river, which essentially occupy the width of two vessels, will block the movement of larger vessels. Because of the narrow nature of the river north of NW 27th Avenue, the docks on at least one side of the River will have to be vacated to allow the dredge and dredge material disposal barge to operate. This will prevent terminal operators from using their docks for two to three days while the river is dredged in front of their dock. Further impacting waterborne commerce on the river will be the physical location of the dredge in front of docking facilities. During certain hours, the dredge will have to be idled and moved from the navigation channel to allow vessels to use the river.

Below NW 27th Avenue, there are fewer terminals and the river is wider; therefore, impacts because of dredging will be less. The major impact will result from the mooring of the dredge in front of loading docks and the disruption of navigation in narrow or winding areas of the river or near bridge support structures that extend into the river.

4.8.3.2 Disposal of Dredged Material. As discussed in Navigation, should a disposal site be chosen in the ocean or bay, minor inconveniences to waterborne commerce may result.

4.8.3.3 No-Action Alternative (Status Quo). Without the proposed maintenance dredging of the Miami River, long-term disruptions to waterborne commerce will likely result due to the limitations on the size, number, and times of day that vessels can move up and down the river.

It appears reasonable to conclude that the State of Florida and the Federal Government would not continue to allow the unabated discharge of contaminated sediments from the Miami River into Biscayne Bay. If the contaminated sediments are not removed from the river, the closure of the Miami River as a port facility may be the only recourse for protecting the integrity of the Biscayne Bay ecosystem.

4.8.4 Economic Impact

4.8.4.1 Maintenance Dredging of the Miami River. The major adverse economic impact on the Miami River resulting from the dredging will be from the disruption of waterborne commerce. Beneficial impacts include improved access to commercial facilities by vessels, increased vessel capacities resulting from improvements to the channel, improved safety, and the decreased likelihood of the loss of shipping activities to competing ports.

4.8.4.2 Disposal of Dredged Material. Some citizens and local officials have expressed concern over business interruptions that may be caused if an interim disposal facility in close proximity to businesses is utilized. The Contractor will be required to conduct operations in a manner that will not impose hardships on any local businesses or cause any significant interruptions to their normal activities.

4.8.4.3 No-Action Alternative (Status Quo). Local and regional economic impacts could result if the proposed project is not completed due to the curtailed commercial activity on the river by shipping interests.

It appears reasonable to conclude that the State of Florida and the Federal Government would not continue to allow the unabated discharge of contaminated sediments from the Miami River into Biscayne Bay. If the contaminated sediments are not removed from the river, the closure of the Miami River as a port facility may be the only recourse for protecting the integrity of the Biscayne Bay ecosystem. The economic assets discussed in this document would be severely curtailed.

4.8.5 Land Use

4.8.5.1 Maintenance Dredging of the Miami River. The dredging of the Miami River should not impact long-term land use along the river, although short-term impacts may result depending on the dredge disposal alternative utilized.

4.8.5.2 Disposal of Dredged Material. The use of an interim disposal site would likely mean a temporary charge in land use for approximately 10 acres of land during the dredging and disposal activities of the project. If a site were chosen for final disposal that has been previously utilized for dredged material disposal or if it is an approved landfill or other disposal facility, a change in land use would not result.

One method of dredge material disposal, upland disposal, will require the dewatering of dredge material at a site near the river. This would require the use of one or several parcels of vacant land adjacent to or near the river where dredge material could be dewatered and loaded on trucks for transport to upland disposal sites. This would require the use of vacant land located near the river and may require changes in present land zoning use.

4.8.5.3 No-Action Alternative (Status Quo). No short-term impacts to land use are expected to result from the no-action alternative. Long-term impacts to land use could result if commercial interests that currently depend on waterborne traffic are forced to close or move from the area due to limitations on navigation resulting from the shoaling of the river.

4.8.6 Air Traffic

4.8.6.1 Maintenance Dredging of the Miami River. Dredging activities would have no effect on air traffic.

4.8.6.2 Disposal of Dredged Material. The interim staging site is within the clear zone of a primary runway of the Miami International Airport. The glide-slope height restriction extends from approximately 100 feet near the Miami River to approximately 50 feet near Lejeune Road. At this interim disposal site the restriction on height is approximately 80 feet. None of the construction activity required to construct the containment dikes or any of the dredging activities will penetrate the clear zone associated with the runway glide slope.

Because dredge material from the Miami River contains a low percentage of organic matter, it is unlikely that it will attract birds. Stockpiling of dredge material associated with the dredging of private docks has not been observed to attract birds. Therefore, it is anticipated that there will be no increase in bird activity at the interim disposal site, which is near the Miami International Airport.

4.8.6.3 No-Action Alternative (Status Quo). The no-action alternative is not expected to have an impact on air traffic.

4.9 AESTHETICS

Biscayne Bay, located at the mouth of the Miami River and the downstream end of the project, is generally considered aesthetically pleasing. The industrial reaches of the Miami River, by contrast, are areas of rather low aesthetic value, owing to large amounts of rusted ships and debris within the river and the extensive industrialization of much of the real estate along the riverbank.

4.9.1 Maintenance Dredging of the Miami River

It is believed that removal of sediments from the Miami River will remove the source of the majority of the adverse effects from the Biscayne Bay ecosystem and subsequently improve the system's water quality and aesthetics.

4.9.2 Disposal of Dredged Material

Aesthetics of the immediate area of an interim site would likely be adversely impacted during the storage and handling operations. Upon termination of interim disposal activities, original aesthetics of the area would be restored to the degree practical. Aesthetics of the final disposal site should not be adversely impacted, as it is anticipated that this will occur in an area that is already similarly affected.

4.9.3 No-Action Alternative (Status Quo)

No changes in the aesthetics of the Miami River would occur.

4.10 RECREATION

4.10.1 Maintenance Dredging of the Miami River

Impacts to recreational activity on the Miami River should be limited to disrupted navigation of recreational fishing and pleasure vessels during dredging and barging operations. As previously stated, navigation of all vessels on the river will likely be affected. These impacts should be minimal since most recreational fishing and pleasure boat activities take place south of NW 27th Avenue where the river is wider and where impacts to navigation due to dredging should be minimal. Land-based recreation will be locally affected if any public parks or recreation facilities are used for staging areas, equipment storage, or other similar activities. These effects will be temporary, and land uses will revert to recreation upon completion of the project. Other minor effects include increased noise and decreased aesthetic value at recreational facilities located near the dredge operation, but this will be a temporary condition.

4.10.2 Disposal of Dredged Material

Neither interim nor final disposal of dredged sediments from the Miami River should have any effect on recreation, as disposal would take place in an area or approved facility where no recreational activities should occur. Should an interim disposal site be chosen that is not currently a commercial/industrial site, as is the Miami-Dade Jai-Alai parking facility, where there is a potential for recreation to be impacted, these issues will be addressed in supplemental NEPA documentation that will be required of the Contractor to complete.

4.10.3 No-Action Alternative (Status Quo)

No short-term adverse impacts are expected to recreational resources under this alternative. However, long-term continued shoaling of the river could lead to reduced water depths, which may restrict the movements of larger recreational vessels. Additionally, continued deposition of contaminated sediments in Biscayne Bay could impact water quality that could lead to restrictions on human contact and recreational fishing.

4.11 WATER QUALITY

4.11.1 Maintenance Dredging of the Miami River

The greatest potential for impact on water quality from implementing the dredging action involves the introduction of sediments from the bottom into the water column. There are two aspects of resuspension to be considered: (1) resuspension creates turbidity that has a potential for shading seagrasses and algae, thereby decreasing primary productivity; (2) sedimentation following resuspension could bury nearby benthic biological communities. Chemical contaminants present in resuspended sediments have a potential for transport into sensitive Biscayne Bay habitats or entering the food web and becoming concentrated in higher predators such as birds, sharks, or dolphins.

To meet State standards, water quality in the project area may not be lowered, except on a temporary basis during construction in a mixing zone approved by FDEP. Mixing zones in Class III waters must not average less than 4.0 mg/l dissolved oxygen or exceed 41 Nephelometric Turbidity Units (NTU) of turbidity. Compliance with other numeric standards would also be required. Outside mixing zones, turbidity may not exceed 29 NTU above natural background. Project performance specifications will require the contractor to meet water quality standards imposed by regulatory agencies regardless of the type dredge plan utilized to construct the project. However, short-term impacts should be offset by the long-term benefits associated with removing contaminated sediments.

4.11.2 Disposal of Dredged Material

Because of the high metals content of Miami River sediment, the recommended interim disposal site should be constructed with an impermeable liner to facilitate the containment of runoff that could contaminate surface waters and to prevent the leaching of river sediment constituents into the underlying soils and, potentially, groundwater. If an interim disposal site is utilized, it is assumed it will be located in close proximity to the river, so that slurry water and decant water from the pumped dredged material can be easily returned to the river. This water will be high in suspended solids and turbidity and when introduced, therefore, the same project performance specifications imposed upon the Contractor for dredging operations will apply for the return of dredge water to the river. If dewatering is not implemented at an interim disposal site, the Contractor will be required to assess any impacts that might occur to waters receiving seepage and runoff from the dredged materials and comply with all Federal, state, and local applicable regulations.

A major environmental consideration of upland disposal is the effect rainwater infiltrating and passing through deposited materials will have on ground and surface waters. Much depends on the physical and chemical characteristics of the soils used in constructing a fill. Materials dredged from the Miami River would be somewhat different from other local soils because of the typical scarcity of clay particles in river silt. Materials dredged from the Miami River are much higher in metals content than native soils, apparently because of pollutants that entered the river.

4.11.3 No-Action Alternative (Status Quo)

No immediate adverse impacts would result from this alternative; however, long-term effects of the continued sedimentation will likely lead to degradation of water quality through increased turbidity due to resuspension from prop wash, the dissolution of contaminants from the sediments, and the potential for adverse impacts on the ecosystem of Biscayne Bay.

If the contaminated sediments are not removed from the river, the closure of the Miami River as a port facility may be the only recourse for protecting the integrity of the Biscayne Bay ecosystem.

4.12 HAZARDOUS, TOXIC, AND RADIOACTIVE WASTE (HTRW)

4.12.1 Maintenance Dredging of the Miami River

HTRW issues most likely affected by the dredging activities will be those related to the effects on water quality. These effects are discussed in detail in the section on water quality.

4.12.2 Disposal of Dredged Material

Upon removal of the contaminated sediments from the river, whether the sediments are transported to a final or interim disposal facility, the Contractor will be required to monitor sediment quality to ensure disposal in a facility designated for that type material and, at any interim disposal site utilized, take all necessary precautions to prevent adverse impacts to surface and/or ground water leachate from the materials.

The only interim site studied in detail, thus far, has been the proposed staging area. It was determined that although USTs for petroleum products have existed there in the past, no significant contamination was found there that could be caused to migrate from that site or impact the dredged materials on the site. Should the selected contractor wish to use a different interim disposal site or use a final disposal site not previously designated for the type material to be disposed, additional studies will be required prior to the utilization of that site(s) to determine the presence or absence of HTRW materials.

4.12.3 No-Action Alternative (Status Quo)

Other than effects discussed in other sections of leaving the contaminated sediments in place on the natural resources of the project area, no other effects on HTRW issues are expected under this alternative.

4.13 AIR QUALITY

4.13.1 Maintenance Dredging of the Miami River

The expenditure of fuels by waterborne traffic engaged in the dredging of the project (dredges, tugs, crewboats), as well as any increase of shipping after completion of the navigation improvements, would result in exhaust gases known to impair air quality. However, because of the relatively small increase in exhaust gases produced, it is highly unlikely that any significant degradation of regional air quality would occur. The project would have no impact on traffic-related air emissions. No additional

traffic congestion would occur from opening and closing drawbridges. Because of the relatively low concentration of putrescible organic matter in the sediments, no objectionable odors are anticipated from the exposure of dredge material to the air.

4.13.2 Disposal of Dredged Material

Other than the potential for odors from the dredged materials, which is considered low due to the low organic content of the dredged materials from Miami River, this alternative should have no effect on air quality. However, should the contractor propose to use a thermal treatment method, an air quality permit would be required, and the contractor would be required to comply with applicable state and federal air emissions standards.

4.13.3 No-Action Alternative (Status Quo)

No impact to air quality is anticipated to result from this alternative.

4.14 NOISE

4.14.1 Maintenance Dredging of the Miami River

Adverse effects of the dredging activities on the noise environment of the area are not anticipated. It is unlikely that any engine noise generated by the dredges and associated watercraft would create noise levels that significantly exceed those levels produced by recreational, commercial, and shipping activities that currently take place. The temporary nature of the construction and the attenuation of noise by distances from residential centers should minimize adverse impacts of the project.

4.14.2 Disposal of Dredged Material

The creation of noise by equipment used for storage and handling is anticipated during the interim and/or final disposal of the dredged material. The selected contractor will be required to be responsive to any complaints received from surrounding residents or tenants and take necessary action to abate the noise to an acceptable level.

4.14.3 No-Action Alternative (Status Quo)

No impacts to the noise environment are expected under the No-Action alternative.

4.15 PUBLIC SAFETY

Although during the dredging operations there will be a small risk to public safety should someone accidentally venture into the restricted work zone around the dredge, the proposed project will be beneficial in that it will reduce the potential for ship groundings due to insufficient depths for navigation traffic.

4.16 ENERGY REQUIREMENTS AND CONSERVATION

Restoring the Federal channel to its design depth will allow vessels to load deeper and carry larger cargoes resulting in more efficient transportation that yields energy savings from fewer trips required to transport the same amount of cargo.

4.17 NATURAL OR DEPLETABLE RESOURCES

Energy and natural resources used for the proposed action would not materially affect available supplies. Implementation of sediment removal actions may result in increased energy usage by vessels in the Miami River. Sufficient fuel supplies are available, and no shortages in fuel are anticipated.

4.18 SCIENTIFIC RESOURCES

USACE is not aware of any impacts to scientific resources that may be caused by the proposed project.

4.19 NATIVE AMERICANS

USACE is not aware of any impacts to Native Americans that may be caused by the proposed project.

4.20 REUSE AND CONSERVATION POTENTIAL

Generally, dredged material is not reusable and it is especially doubtful in the case of the proposed project since the Miami River sediments are contaminated with low levels of hazardous constituents.

4.21 URBAN QUALITY

No change to urban quality is expected to result from the proposed project.

4.22 SOLID WASTE

Dredged materials will be temporarily stored at the interim disposal site before being transported to a permanent disposal site in compliance with state and Federal regulations on such materials. Solid waste products generated by the dredging and sediment-handling operations will be disposed of in accordance with local, state, and Federal laws and ordinances. All solid waste materials generated that meet the criteria for recycling will be recycled if that option is prudent and practical within the budgetary and engineering confines of the proposed project.

4.23 DRINKING WATER

The proposed project is not expected to result in impacts to any drinking water sources or supplies within the project area.

4.24 CUMULATIVE IMPACTS

Cumulative impacts are defined as the impacts on the environment that result from the incremental impact of the proposed action when added to other past, present, and reasonably foreseeable future actions. Because maintenance dredging of the Miami River has not been previously performed within the Federal project, a full assessment of cumulative impacts is unknown. Maintenance dredging would not increase the size of the authorized project, but restore it to its original dimensions. Subsequent maintenance dredging would take place at an unknown interval on an as-needed basis. Outfall controls and stormwater management plans that are in-place or are planned for implementation are likely to

result in a reduced rate of sediment deposition and associated shoaling within the channel. Under a worst-case condition, future sedimentation would create impacts no worse than those currently in existence.

4.25 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

4.25.1 Irreversible

An irreversible commitment of resources is one in which the ability to use and/or enjoy the resource is lost forever. One example of an irreversible commitment might be the mining of a mineral resource. Dredging and disposal operations would involve the irreversible commitment of energy and construction materials required to remove, transport, store, and dispose sediments.

4.25.2 Irretrievable

An irretrievable commitment of resources is one in which, due to decisions to manage the resource for another purpose, opportunities to use or enjoy the resource, as they presently exist are lost for a period. An example of an irretrievable loss might be a plant community permanently lost due to road construction. Interim disposal requires the temporary loss of vegetation that will be smothered during disposal operations.

4.26 UNAVOIDABLE ADVERSE ENVIRONMENTAL EFFECTS

Implementation of the proposed action is anticipated to produce no unavoidable adverse environmental impacts to significant resources. However, because of the dredging associated with the navigation maintenance project and comments from USACE regarding the uncertainty of no unavoidable adverse environmental impacts, the potential exists for short-term release of contaminants from dredging, transport, and/or disposal operations and the potential exists for temporary increases in boat-manatee collisions.

4.27 LOCAL SHORT-TERM USES AND MAINTENANCE/ ENHANCEMENT OF LONG-TERM PRODUCTIVITY

Short-term uses represented by the project include construction resources, monetary expenditures, and labor expended during the dredging, transport, and disposal operations. They also include the short-term impacts discussed in this document. Long-term enhancements in productivity relate to the decreased likelihood of contaminated sediments damaging the Biscayne Bay ecosystem. The project would result in improved navigation safety and improved operational efficiency, potentially allowing more productive use of the human resources represented by the regional labor pool.

4.28 INDIRECT EFFECTS

Indirect impacts involve effects linked to the project but subsequent to construction such as may result from increased shipping or larger ships, different commodity movements, new industry attracted to the area, greater development pressure, etc. Future commodity movements are expected to be of a similar nature to those existing now. No new shipping-related industry of substantial magnitude is expected. Development pressure is expected to increase in the future regardless of navigation improvement. Vessel traffic in the channel would not increase from present levels. The assessment of secondary

impacts is made based on present conditions and could change if economic trade embargoes with Cuba and Haiti are lifted.

4.29 COMPATIBILITY WITH FEDERAL, STATE, AND LOCAL OBJECTIVES

Compatibility with Federal, state and local objectives will be assured through coordination with government and organization agencies and offices and through the dissemination of this document.

4.30 CONFLICTS AND CONTROVERSY

There are currently no known areas or subjects of conflict or controversy related to the proposed project.

4.31 UNCERTAIN, UNIQUE, OR UNKNOWN RISKS

The potential exists for leakage of contaminated sediment from dredging operations, such as from pipelines or spillage. Leakage from the interim and final disposal sites is also a possibility.

4.32 PRECEDENT AND PRINCIPLE FOR FUTURE ACTIONS

Handling of dredged material from the Miami River is somewhat different from the normal approach. Clean dredged material might be reused for some beneficial use, such as fill for construction or beach renourishment. The contaminated sediment from the Miami River Federal channel will be dewatered and then taken to a suitable landfill instead of reused.

4.33 ENVIRONMENTAL COMMITMENTS

USACE and contractors commit to avoiding, minimizing, or mitigating for adverse effects during construction activities by including the following commitments in the contract specifications:

1. Requirement for Water Quality Certification
2. Essential Fish Habitat Coordination
3. Manatee protection measures
4. Regional Biological Opinion if a hopper dredge is used

4.34 COMPLIANCE WITH ENVIRONMENTAL REQUIREMENTS

4.34.1 National Environmental Policy Act of 1969

The project complies with the National Environmental Policy Act of 1969, as amended, 42 U.S.C. 4321, *et seq.* P.L. 91-190.

4.34.2 Endangered Species Act of 1973

This project complies with the Endangered Species Act of 1973, as amended, 16 U.S.C. 1531, *et seq.* P.L. 93-205. Coordination Federal and state wildlife officials will continue throughout the planning stage of the proposed project.

4.34.3 Fish and Wildlife Coordination Act of 1958

This project is currently being coordinated with the U.S. Fish and Wildlife Service (USFWS). A Coordination Act Report (CAR) is in development by the USFWS.

4.34.4 National Historic Preservation Act of 1966 (Inter Alia)

Consultation with the Florida State Historic Preservation Officer (SHPO) has been initiated in accordance with the National Historic Preservation Act, as amended, 16 U.S.C. 470a, *et seq.* P.L. 89-655; the Archeological and Historic Preservation Act, as amended, and Executive Order 11593.

4.34.5 Clean Water Act of 1972

The project complies with the Clean Water Act, as amended, (Federal Water Pollution Control Act) 33 U.S.C. 1251, *et seq.* P.L. 92-500.

4.34.6 Clean Air Act of 1972

This project complies with Section 309 of the Clean Air Act of 1972, as amended, 42 U.S.C. 1857h-7, *et seq.* P.L. 91-604.

4.34.7 Coastal Zone Management Act of 1972

This project is consistent with the Florida Coastal Zone Management Program (see Appendix E) and complies with the Coastal Zone Management Act of 1972, as amended, 16 U.S.C. 1451, *et seq.* P.L. 92-583.

4.34.8 Farmland Protection Policy Act of 1981

No prime or unique farmland would be impacted by implementation of this project. The Farmland Protection Policy Act of 1980 and 1995, P.L. 97-98 is not applicable.

4.34.9 Wild and Scenic River Act of 1968

No designated Wild and Scenic river reaches would be affected by project related activities. The Wild and Scenic River Act of 1968, as amended, 16 U.S.C. 1271, *et seq.* P.L. 90-542 is not applicable.

4.34.10 Marine Mammal Protection Act of 1972

Incorporation of the safe guards used to protect threatened or endangered species during dredging and disposal operations would also protect any marine mammals in the area, therefore, this project is in compliance with the Marine Mammal Protection Act of 1968, as amended, 16 U.S.C. 1361, *et seq.* P.L. 92-522.

4.34.11 Estuary Protection Act of 1968

No designated estuary would be affected by project activities. The Estuary Protection Act of 1968, 16 U.S.C. 1221, *et seq.* P.L. 90-454 is not applicable.

4.34.12 Federal Water Project Recreation Act

The principles of the Federal Water Project Recreation Act, as amended, 16 U.S.C 460-1 (12), *et seq.* P.L. 89-72, do not apply to this project.

4.34.13 Submerged Lands Act of 1953

This project is in compliance with the State Sovereignty and Submerged Lands program and the Submerged Lands Act of 1953, 43 U.S.C. 1301, *et seq.*

4.34.14 Coastal Barrier Resources Act and Coastal Barrier Improvement Act of 1990

There are no designated coastal barrier resources in the project area that would be affected by this project. The Coastal Barrier Resources Act, 16 U.S.C. 3501, *et seq.* P.L. 97-348, and Coastal Barrier Improvement Act of 1990 are not applicable.

4.34.15 Rivers and Harbors Act of 1899

The proposed work would not obstruct navigable waters of the United States. The proposed action has been subject to the public notice, public hearing, and other evaluations normally conducted for activities subject to the Rivers and Harbors Act of 1899, as amended, 33 U.S.C. 401, *et seq.* The project is in full compliance.

4.34.16 Anadromous Fish Conservation Act

As defined in the Anadromous Fish Conservation Act, 16 U.S.C. 757a-g, 79 Stat. 1125, as amended by P.L. 89-304, anadromous fish species would not be affected.

4.34.17 Migratory Bird Treaty Act and Migratory Bird Conservation Act

No migratory birds would be affected by project activities. The project is in compliance with the Migratory Bird Conservation Act, 16 U.S.C. 715-715d, 715e, 715f-715r; 45 Stat. 1222 and the Migratory Bird Treaties and other international agreements listed in the Endangered Species Act of 1973, as amended, Section 2(a)(4).

4.34.18 Marine Protection, Research and Sanctuaries Act

The Marine Protection, Research and Sanctuaries Act, 33 U.S.C. 1401, *et seq.* P.L. 92-532 (3[33 U.S.C. 1402](f)) does not apply to this project.

4.34.19 Magnuson-Stevens Fishery Conservation and Management Act

Coordination with NMFS regarding EFH, in accordance with the Magnuson-Stevens Fishery Conservation Act, as amended in 1996, 16 U.S.C. 1801, *et seq.* P.L. 94-265, has been initiated by the Jacksonville District USACE.

4.34.20 E.O. 11990, Protection of Wetlands

No wetlands would be affected by project activities. This project complies with the goals of this Executive Order.

4.34.21 E.O. 11988, Flood Plain Management

The project is in the base flood plain (100-year flood) and has been evaluated in accordance with this Executive Order. This project complies with the goals of this Executive Order.

4.34.22 E.O. 12898, Environmental Justice

On February 11, 1994, the President of the United States issued Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations.* The Executive Order mandates that each Federal agency make environmental justice part of the agency mission and to address, as appropriate, disproportionately high and adverse human health or environmental effects of the programs and policies on minority and low-income populations.

According to U.S. Census Bureau 2000 population estimates, Miami-Dade County has a total population of 2,253,362. Based on this census data, minorities compose about 30.3 percent of this population, compared to about 22.0 percent for the State of Florida and 24.9 percent for the nation.

The low-income household data is composed of median household money income statistics from the U.S. Census Bureau 1997 model-based estimates. The average median household money income for the Miami-Dade County was about $30,000, compared to about $32,877 for the State of Florida and $37,005 for the nation.

No minority or low-income populations would be affected by project activities. This project complies with the goals of this Executive Order.

4.34.23 Disparate Risks Involving Children

On April 21, 1997, the President of the United States issued Executive Order 13045, *Protection of Children from Environmental Health Risks and Safety Risks*. The Executive Order mandates that each Federal agency make a high priority to identify and assess environmental health risks and safety risks that may disproportionately affect children and ensure that its policies, programs, activities, and standards address disproportionate risks to children that result from environmental health risks or safety risks.

According to U.S. Census Bureau 2000 population estimates, Miami-Dade County has an average percent population of 39.0 for persons under the age of 18, compared to 31.3 percent for the state of Florida and 35.0 percent for the nation.

4.34.24 E.O. 13112, Invasive Species

This executive order requires Federal agencies to consider the potential for proposed actions to promote the spread of invasive species. In southern Florida, invasive species such as Australian pine, Brazilian pepper, and Melaleuca are typically found to colonize disturbed sites. Site disturbance associated with this project would involve the establishment of a staging area. However, because this

project would be of short duration followed by restoration of the staging area, there would be limited opportunity for invasive species to become established.

4.34.25 E.O. 13089, Coral Reef Protection

The nearest known coral reef area to the proposed project is located offshore of Government Cut, approximately four miles from the mouth of the Miami River. It is currently anticipated that the proposed project will not adversely impact that area, as under normal conditions river discharge velocities do not appear to be great enough to carry sediment that far.

5.0 LIST OF PREPARERS

5.1 PREPARERS

The following people prepared or provided information for the preparation of this Environmental Impact Statement.

Name	Discipline	Agency	Role
Michael S. Loden, Ph.D.	Biologist	G.E.C., Inc.	EIS Project Manager
Cade E. Carter, P.E.	Engineer	G.E.C., Inc.	Engineering
James F. Coerver, P.E.	Engineer	G.E.C., Inc.	Engineering
Patrick S. MacDanel	Biologist	G.E.C., Inc.	NEPA Specialist
Daniel Maher	Economist	G.E.C., Inc.	Socioeconomics
Rea Boothby	Ecologist	U.S. Army Corps of Engineers	EIS Coordinator
Kenneth Dugger	Biologist	U.S. Army Corps of Engineers	First Level Supervision
Hanley K. Smith, Ph.D.	Biologist	U.S. Army Corps of Engineers	Second Level Supervision

5.2 REVIEWERS

The following people reviewed this Environmental Impact Statement.

Name	Discipline	Agency	Reviewer Role
Donald W. Ator	Economist	G.E.C., Inc.	Economics
Rachel A. Keane	Biologist	G.E.C., Inc.	Aquatic Biology/NEPA
Senda Ozkan	Engineer	G.E.C., Inc.	Engineering
Joseph C. Wyble	Geologist	G.E.C., Inc.	Sediment Quality/NEPA
Jerry W. Scarborough, P.E.	Engineer	U.S. Army Corps of Engineers	Project Management
Richard B. Powell	Biologist	U.S. Army Corps of Engineers	Coastal and Navigation
John W. Bearce	Engineer	U.S. Army Corps of Engineers	Engineering
Eric Raasch	Economist	U.S. Army Corps of Engineers	Economics
James J. McAdams	Engineer	U.S. Army Corps of Engineers	NEPA
Ted C. Cook	Engineer	U.S. Army Corps of Engineers	Operations
Glenn R. Schuster	Engineer/ Biologist	U.S. Army Corps of Engineers	Water Quality

6.0 PUBLIC INVOLVEMENT

6.1 SCOPING AND DRAFT EIS

A Notice of Intent (NOI) to prepare a draft of this EIS was published in the Federal Register prior to report preparation. The public was invited to attend a Scoping Workshop in Miami on 05 September 1991. Approximately 13 members of the public and representatives of state and private organizations along with several USACE and contractor representatives attended. Agencies, individuals, and organizations were sent a notice of alternatives and issues proposed at the Scoping Workshop for evaluation in the EIS. Comment was invited.

6.2 AGENCY COORDINATION

The USFWS has the responsibility under Section 7 of the Endangered Species Act to determine if any action considered in this EIS is likely to jeopardize the continued existence of any species listed under the Act.

6.3 LIST OF STATEMENT RECIPIENTS (DRAFT EIS)

Copies of the DEIS will be sent out for comment to all Federal, state and local agencies that have jurisdiction by law or special expertise with respect to any environmental impact involved, or that are authorized to develop and enforce environmental standards, or any agency or organization that has requested that it receive statements on actions of the kind proposed. Copies will also be sent to all persons and organizations that participated or commented during scoping, and, on request, to any other interested person or organization. To help us be more constructively responsive, comments should be as specific as possible and referenced to particular paragraph numbers in the statement. They may address the adequacy of the statement and/or the merits of the alternatives discussed. Any information presented as fact rather than opinion should be documented by reference or substantiated by data. An agency that is critical of a presented predictive methodology should describe the alternative methodology that it prefers and why.

The following agencies, organizations, and individuals are being sent copies of this Draft EIS:

U.S. Environmental Protection Agency
U.S. Department of the Interior, Biscayne National Park
U.S. Fish and Wildlife Service
U.S. Department of Commerce, National Oceanographic and Atmospheric Administration
National Marine Fisheries Service
U.S. Geological Survey
U.S. Department of Agriculture
U.S. Department of Energy
U.S. Public Health Service
U.S. Department of Housing and Urban Development
Federal Maritime Commission
Federal Emergency Management Administration
Federal Highway Administration
Seventh Coast Guard District
South Atlantic Fishery Management Council

Advisory Council on Historic Preservation
Florida State Clearinghouse
Florida Inland Navigation District
Florida Department of Environmental Protection
Florida Fish and Wildlife Conservation Commission
South Florida Water Management District
Florida State Representatives
Miami-Dade County Administrator
Miami-Dade County Commissioners
Miami-Dade County - Department of Environmental Resources Management
City of Miami
Miami River Commission
Miami River Marine Group
University of Miami - Rosenstiel School of Marine and Atmospheric Science
Tropical Audubon Society
Friends of the Everglades
Sierra Club
G.E.C., Inc.
The Miami Herald
Miami Today

6.4 COMMENTS RECEIVED AND RESPONSE

Comments received during the public coordination process and their responses are included as Attachment K of the DMMP.

6.5 CIRCULATION OF FINAL EIS

Circulation of the final EIS is planned for the fourth quarter of 2002.

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