Dade County, Florida

Beach Erosion Control and Hurricane Protection Project

Limited Reevaluation Report

March 2016

US Army Corps of Engineers

JACKSONVILLE DISTRICT

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DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, SOUTH ATLANTIC DIVISION
60 FORSYTH STREET SW, ROOM 10M15
ATLANTA GA 30303-8801

CESAD-CG

24 MAR 2016

MEMORANDUM FOR COMMANDER, US Army Corps of Engineers, Jacksonville District (ATTN: Eric Summa) 701 San Marco Blvd, Jacksonville FL 32207-8175

SUBJECT: Dade County, Florida, Beach Erosion Control and Hurricane Protection (BEC&HP) Project Final Limited Reevaluation Report and Environmental Assessment

1. Reference: Memorandum, CESAJ-PD, 25 January 2016, subject as above.

2. The South Atlantic Division (SAD) has reviewed the Dade County LRR and agrees with the recommendations for borrow sources for future nourishment actions for the remaining period of federal participation on the Dade County Beach Erosion Control and Hurricane Protection projects. The Limited Reevaluation Report and Environmental Assessment are approved.

3. The point of contact for this action is Mr. Terry Stratton at (404) 562-5228.

DONALD L. WALKER
Colonel, EN
Acting Commander

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Limited Reevaluation Report and Environmental Assessment

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Limited Reevaluation Report and Environmental Assessment

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1.0 INTRODUCTION

The purpose of this Limited Reevaluation Report (LRR) and Environmental Assessment (EA) is to evaluate potential sand sources for future renourishments throughout the remaining period of Federal participation in the Dade County, FL, Beach Erosion Control (BEC) and Hurricane Protection (HP) Project. The report will also confirm the economic justification and environmental acceptability of the project.

There are two segments in the Dade County, FL BEC&HP Project. The Main Segment has ten years left in the current period of Federal participation, beginning in 2015 and ending in 2025. The Sunny Isles Segment has twenty three years left, beginning in 2015 and ending in 2038.

This report concludes that the project remains economically justified given the use of multiple sand sources to meet renourishment needs over the remaining period of Federal participation. Economic justification is based on the Total Benefit to Cost Ratio (BCR) with recreation capped at 50%, per current policy. Accordingly, the BCR for the Main Segment is 1.7. The BCR for Sunny Isles is 2.8. Thus, this report recommends that multiple sand sources be approved for use by the project in order to meet renourishment needs.

Table 1 summarizes features of the authorized project compared with those recommended by this report. The sand sources and cost sharing percentages are recommended changes resulting in an updated total BCR. The project segment lengths and renourishment intervals remain the same as authorized.

Table 1: Features of the authorized project compared to those recommended by this report.

Dade County BEC&HP Project: Features authorized and recommended by this report													
Segment	**Original authorization**							**Recommended by this report**					
	Total BCR	Length (miles)	Renourishment interval	Sand source	Federal Cost Share	Non-federal Cost Share		Total BCR	Length (miles)	Renourishment interval	Sand source	Federal Cost Share	Non-federal Cost Share
Main Segment	6.5	10.5	As needed	Offshore sources	51.7%	48.3%		1.7	10.5	As needed	Offshore, upland, and local sources	56.6%	43.4%
Sunny Isles	2.1	2.5	10 years	Offshore sources	48.0%	52.0%		2.8	2.5	10 years	Offshore, upland, and local sources	62.7%	37.3%

2.0 BACKGROUND

2.1 Project Location

Miami-Dade County, commonly referred to as "Dade County", is located along the southeast coast of Florida, and contains the city of Miami. Dade County lies between Broward County (north of Dade) and Monroe County (south of Dade). The Dade County shoreline extends along two barrier island segments separated from the mainland by Biscayne Bay. The barrier islands vary in width from about 0.2 to 1.5 miles, with an average width of about 0.5 miles. Elevations along the entire coastal region (and much of the mainland) are low, as they are generally less than 10 feet; whereas elevations along the barrier islands are generally the highest along the Atlantic Ocean shorefront, and slope gradually downward toward the bay. All distances referenced within this report are in statute miles.

The authorized project contains two segments – the Sunny Isles Segment and the Main Segment – each with differing periods of Federal participation. **Figure 1** provides a map of the project. The Sunny Isles Segment is comprised of the 2.5 miles of shore extending north from Haulover Beach Park. The segment was initially constructed in 1988, and covers the area between Florida Department of Environmental Protection (FDEP) Range monuments R-7 to R-19.3. The Main Segment is 10.5 miles in length. This segment includes the stretch of beach from Government Cut to Bakers Haulover Inlet (9.3 miles) and Haulover Beach Park (1.2 miles). This segment stretches from FDEP monument R-19.3 to R-74. Initial construction of this segment began in 1975.

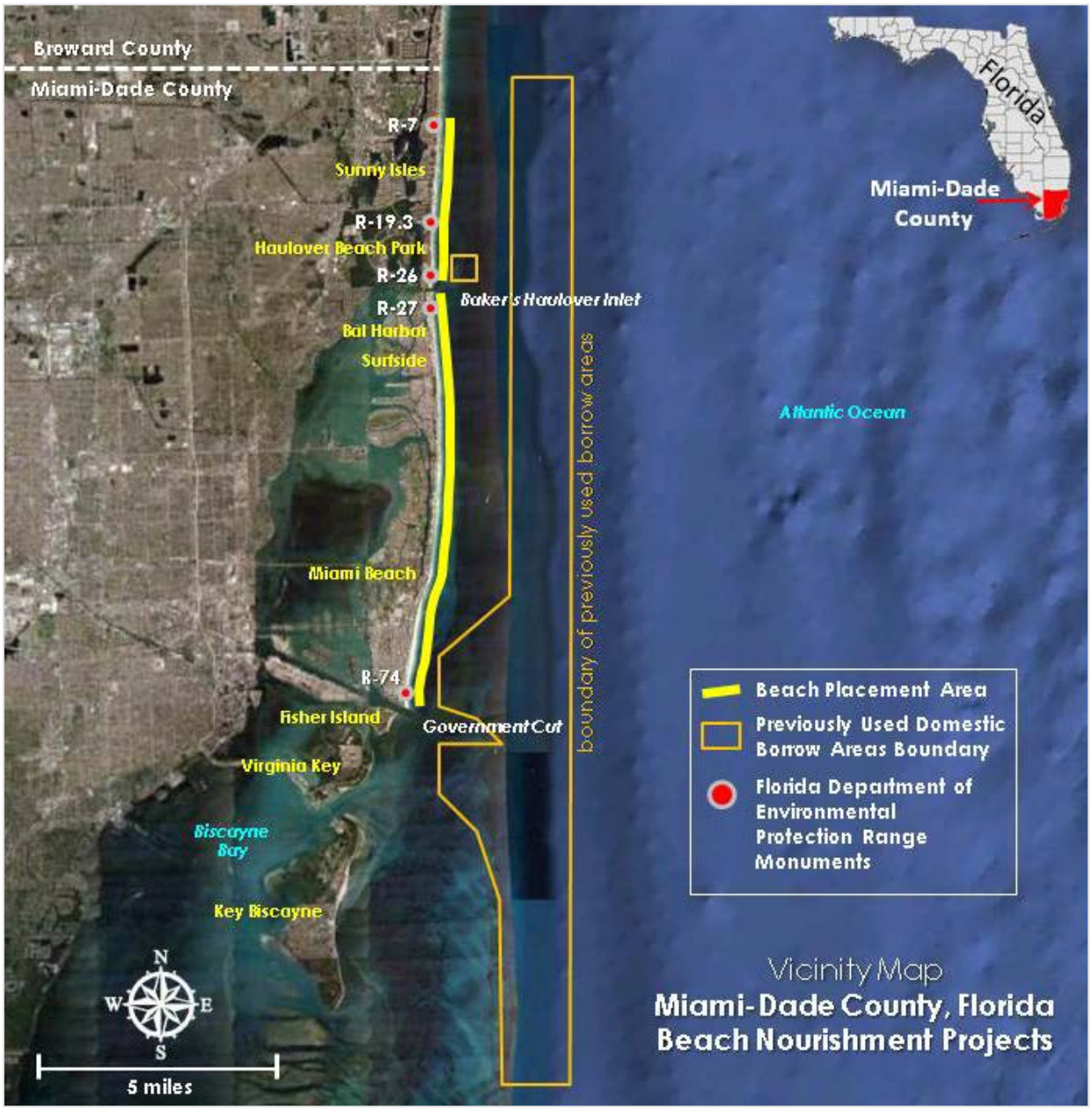


Figure 1: Dade County BEC&HP Project Map

2.2 Purpose and Scope

Miami-Dade County's traditional offshore sand sources for beach renourishment have been depleted. **Figure 1** depicts the limits of previously used domestic offshore sand sources (borrow areas). Approximately 3,600,000 cubic yards (cy) of sand will need to be placed for renourishment of the Dade County BEC&HP Project for the remaining period of Federal participation (10 years for the Main Segment and 23 years for the Sunny Isles Segment).

The purpose of this LRR and accompanying EA is to recommend sand sources for future renourishments throughout the remaining period of Federal participation in the Dade County, FL, BEC and HP Project. The report will also confirm the economic justification and environmental acceptability of the sand sources.

2.3 Project and Authorization History

2.3.1 Authorization History

The original Beach Erosion Control and Hurricane Protection report for Miami-Dade County, Florida was authorized by the Rivers and Harbors Act on July 3, 1930. An extension of restudy to include all of the Miami-Dade County north of Government Cut was approved by the Chief of Engineers in January 1961 (USACE 1965).

The Beach Erosion Control and Hurricane Protection Project for Dade County, Florida was authorized by the Flood Control Act of 1968. In addition, Section 69 of the 1974 Water Resources Development Act (Public Law 93-251) included the authorization for initial construction by non-Federal interests of the 0.85-mile segment along Bal Harbour Village, immediately south of Bakers Haulover Inlet. The authorized project, as described in the 1968 Chief's Report for the project, provided for the construction of a protective and recreational beach and a protective dune for 9.3 miles of shoreline between Government Cut and Bakers Haulover Inlet (encompassing Miami Beach, Surfside, and Bal Harbour) and for the construction of a protective and recreational beach along 1.2 miles of shoreline at Haulover Beach Park (**Figure 1**).

The Sunny Isles portion of the project was added in 1985. Specifically, the BEC&HP Project for Dade County, Florida, North of Haulover Beach Park was authorized by the Supplemental Appropriations Act of 1985 and the Water Resources Development Act (WRDA) of 1986 (Public Law 99-662). However, only the authority of the Supplemental Appropriations Act of 1985 has been implemented through the execution of a local cost sharing agreement. This authorization provides for modification of the authorized 1968 Beach Erosion Control and Hurricane Protection Project for Dade County, Florida, to provide for the following:

a) The construction of a protective beach along a reach of shore extending 2.5 miles through Sunny Isles, and for periodic nourishment of this area.

b) The extension of the period of Federal participation in the cost of nourishing the existing Dade County Beach Erosion Control and Hurricane Protection Project from 10 years to the life of the project.

The Chief of Engineers' Report from December 1983 ("Dade County, North of Haulover Beach Park, Florida") provides more details on the Sunny Isles segment of the project.

Although the 1985 Supplemental Appropriations Act which authorized the Sunny Isles segment and extended the period of Federal participation of the existing Dade County (BEC & HP) Project did not specify a time limit for Federal participation, Section 156 of WRDA 1976, as amended by Section 934 of WRDA 1986, limits the period of Federal participation to 50 years from the date of initiation of construction.

2.3.2 Description of Authorized Project

Different design beach fill cross-sections are provided along the project corresponding to different levels of protection along different reaches of the project shoreline. The primary purpose of the project is to provide coastal storm risk management.

2.3.2.1 *Main Segment*

The Dade County BEC&HP Project as originally authorized provided for the placement of beach fill along the 9.3-mile reach of shoreline extending from Bakers Haulover Inlet to Government Cut and along the 1.2-mile length of Haulover Beach Park located immediately north of Bakers Haulover Inlet. This document refers to this segment as the "Main Segment." Work on the project (as originally authorized) was begun in 1975 and completed in January 1982 at a total contract cost of about $48 million. Due to the length of shoreline involved, the project was constructed in several phases, with each phase being administered under a separate contract. These phases of the initial construction of the project are shown in

Figure 2**,** with volumes shown in **Table 2**. Further description of these phases can be found in the *Dade County, Florida Beach Erosion Control and Hurricane Protection Project Evaluation Report* (USACE 2001).

The project as authorized provides for beach erosion control and hurricane surge protection by initial placement of sand to form a protective and recreational beach and protective dune for 9.3 miles of shore between Government Cut and Bakers Haulover Inlet (encompassing Miami Beach, Surfside, and Bal Harbour) and for beach erosion control by initial placement of sand to form a protective and recreational beach along 1.2 miles of shore at Haulover Beach Park. Between Government Cut and Bakers Haulover Inlet, the plan would provide a dune 20 feet wide at 11.5 feet above mean low water and a level berm 50 feet wide at elevation 9 feet with natural slopes as shaped by wave action. At Haulover Beach Park, the plan would provide a level berm 50 feet wide at elevation 9 and natural slopes. As authorized, the Main Segment did not have a recommended renourishment interval, but the project was intended to be nourished periodically as needed to compensate for erosion losses throughout the 50-year period of Federal participation. The average annual nourishment requirements were estimated at 191,000 and 20,000 cubic yards of material for Government Cut to Bakers Haulover Inlet and Haulover Beach Park, respectively. Sand for initial construction and periodic nourishments was intended to be obtained from offshore borrow areas.

2.3.2.2 *Sunny Isles Segment*

The 2.5 mile length of Sunny Isles was added to the project in 1985 under a separate authorization. Construction of Sunny Isles was initiated in 1988.

The authorized project for the Sunny Isles Segment of the Dade County BEC&HP Project provides for the construction of a 20 foot berm seaward of the Erosion Control Line (ECL), with front slopes of 1 vertical to 10 horizontal from berm crest to mean low water (mlw), then 1 vertical on 25 horizontal to the existing bottom. The beach fill extends along the 2.5 mile length of Sunny Isles, and is bordered on the south end by the Main Segment (50 foot berm width), and to the north by the town of Golden Beach, which is not a part of the Dade County BEC&HP. The authorized renourishment volume was 715,000 cubic yards every 10 years. Sand for initial construction and periodic nourishments was intended to be obtained from offshore borrow areas.

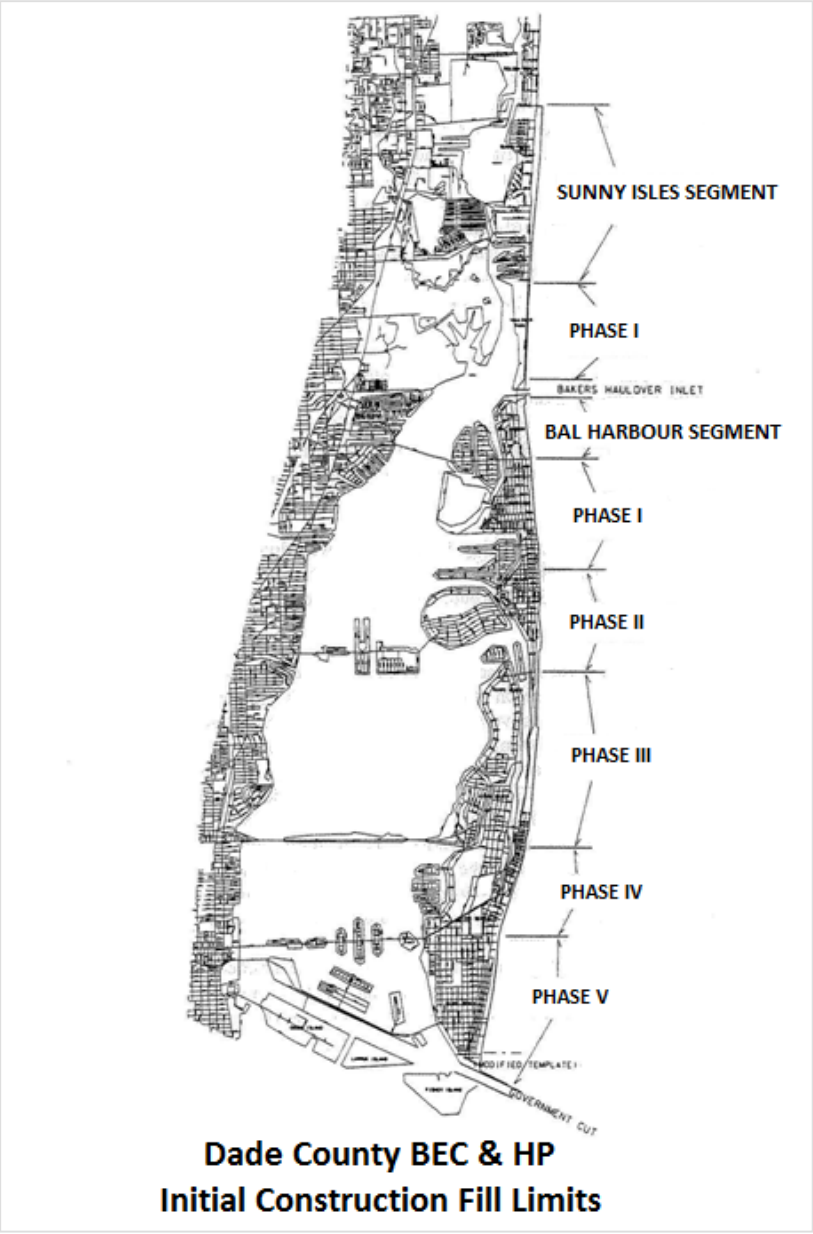


Figure 2: Initial Construction of the Dade County BEC&HP Project

Other project-related construction has occurred such as modifications to the adjacent navigation jetties at Bakers Haulover Inlet and Government Cut, construction of a series of detached breakwaters at Sunny Isles and shore-connected breakwaters at Miami Beach. Initial construction volumes are given in **Table 2.**

Table 2: Initial Construction Data

Segment	Length* (miles)	Initial Construction Date	Initial Construction Volume (cubic yards)
Sunny Isles	2.5	1988	1,320,000
Phase 1 (north section)	1.1	1978	300,000
Bal Harbour	0.85	1975	1,625,000
Phase 1 (south section)	1.5	1978	2,640,000
Phase 2	1.5	1979	1,530,000
Phase 3	2.4	1980	3,177,100
Phase 4	1.4	1981	2,200,000
Phase 5	1.9	1982	2,400,000
*Note: Any excess length is due to the slight overlap of adjacent beach fills.			

2.3.3 Periodic Nourishment History

Several periodic beach nourishments have been performed under the authority of the BEC&HP project since initial construction. Several beneficial-use placements of beach-quality material dredged from adjacent Federal navigation projects have also taken place along reaches of the BEC&HP project. **Table 3** summarizes these nourishment events. Details of these activities can be found in the Dade County, Florida BEC&HP Project Evaluation Report (USACE 2001). All of the sand sources shown in **Table 3** have been depleted except for Bakers Haulover ebb shoal and Lummus Park.

Table 3: Periodic Nourishment History of the Dade County BEC&HP Project

Action	Sand Source	Volume (cubic yards)
1980 maintenance disposal at Haulover Park	Bakers Haulover Inlet flood shoal	43,163
1984 maintenance disposal at Haulover Park	Bakers Haulover Inlet flood shoal	35,000
1985 renourishment of Miami Beach	Offshore borrow areas	160,000
1987 renourishment of Haulover Beach Park	Offshore borrow areas	235,000
1990 renourishment of Bal Harbor	Offshore borrow areas	225,000
1990 renourishment of Sunny Isles	Bakers Haulover Inlet and Intracoastal Waterway	32,000
1994 renourishment of Haulover Park	Bakers Haulover Inlet	24,560
1994 renourishment of Miami Beach	Offshore borrow areas	122,096
1994 renourishment of Miami Beach (truck haul)	Upland source	30,000
1996 renourishment of Miami Beach (truck haul)	Southern project area: South Beach/Lummus Park	8,000
1997 renourishment of Sunny Isles (truck haul)	Upland source	9,000
1997 renourishment of Miami Beach (truck haul)	Upland source	50,000
1997 renourishment of Miami Beach (truck haul)	Upland source	35,000
1997 renourishment of Sunny Isles and Miami Beach (Contract #1)	Offshore borrow area #1	559,069
1998 Maintenance disposal - Bal Harbor	Bakers Haulover Inlet channel/ flood shoal and Intracoastal Waterway	282,852
1998 Miami Beach renourishment (truck haul)	Upland source	18,000
1999 renourishments of Surfside and South Miami Beach (Contract #2)	South of Government Cut (SGC) borrow area	722,000
2001/2002 renourishments of Sunny Isles and Miami Beach	SGC borrow area	874,814
2002 construction of 32nd Street breakwaters (truck haul)	Southern project area: South Beach/Lummus Park	125,000
2003 renourishment of Bal Harbour	Bakers Haulover Inlet ebb shoal	188,000
2007 maintenance disposal at Bal Harbour	Intracoastal Waterway	30,000
2007 renourishment of Miami Beach	Backpassed area/Lummus Park	
2009 renourishment of Bal Harbor	Upland source (Ortona mine)	15,000
2009 renourishment of Sunny Isles	Upland source (Ortona mine)	10,000
2009 renourishment of Miami Beach (65th St.)	Upland source (Ortona mine)	10,000
2010 renourishment of Bal Harbour	Maintenance dredging of the adjacent IWW	33,080
2012 renourishment of Miami Beach (Contract E)	SGC-Ext-1-South (Segment A)	206,042
2012 renourishment of Miami Beach (Contract E)	Backpassed area/Lummus Park (Segments B & C)	141,159
2014 renourishment of Bal Harbour (Contract G)	Bakers Haulover Inlet ebb shoal	235,733

2.3.4 Chronology of Sand Search

The following chronological information relates to Miami-Dade County's efforts to locate an alternative sand source.

1986: Language in the Water Resources Development Act of 1986 allowed for the use of non-domestic sand sources with stipulations according to the following language from PL 99-662, Section 935 100 Stat. 4197- 1986: "*Notwithstanding any other provision of law, in any case in which the use of fill material for beach erosion and beach nourishment is authorized as a purpose of an authorized water resource project, the Secretary is authorized to acquire by purchase, exchange, or otherwise from nondomestic sources and utilize such material for such purposes if such materials are not available from domestic sources for environmental or economic reasons*."

1987: High economic costs and potential environmental impacts to the offshore reef from utilizing offshore sand sources in Miami-Dade County warranted investigation into the use of nondomestic Bahamian aragonite as presented in *Beach Erosion Control and Hurricane Protection, Dade County, Florida North of Haulover Beach Park Design Memorandum, Addendum 1 and EIS Supplement* (May 1987). The EIS Supplemental Information Report included in this document stated that "utilizing aragonite [non-domestic sand] for initial and periodic nourishment of the project beach would eliminate the potential adverse impacts on the offshore reef system…."

1996 – 1998: A series of workshops sought industry and agency input on potential sand sources and nourishment methodologies for future nourishment of Miami-Dade County. Work was initiated on Plans and Specifications (P&S) for acquisition of Bahamian aragonite to be used as fill along an 8,000 foot section of north Miami Beach.

1999: As development of Plans &Specs for the 500,000 cubic-yard renourishment were underway, all work was terminated at the beginning of FY 99 per directive language from H8842, the Conference Report on HR 4060 (Energy and Water Appropriations Bill for the FY ending 9/30/99); 1998 WestLaw 657308 p. 57; 144 Congressional Record H8842-02, H8849 which stated: "*The conferees direct that none of the funds provided for the Dade County, Florida project shall be used for the acquisition of foreign source materials for the project unless the Secretary of the Army provides written certification to the Committees on Appropriations that domestic sources of material are not available*."

2000: Deep-water explorations for sand sources along the edge of the continental shelf off of Miami-Dade County (performed for The Coast of Florida Study (USACE 1996)) prompted Miami-Dade County to pursue the use of deep water borrow sources. The resulting report, *Deep Water Geotechnical Investigation of Offshore Sand Deposits for Beach Renourishment in Dade County, Florida* (2000) estimated that beach compatible sand could potentially be contained within these deep water sand sources. At the time of the report, the Florida Department of Environmental Protection (FDEP) considered a material percentage of 10-12% fines to be acceptable as beach quality material. Currently a maximum of 5% fines is allowable which eliminates the potential quantity estimated in the 2000 report.

2001: Information describing Miami-Dade County's lack of sufficient quantity and quality of sand in traditional offshore borrow sources as well as descriptions of all known sand sources was presented in the *Dade County, Florida Beach Erosion Control and Hurricane Protection Project Evaluation Report* (USACE 2001).

2002: A solicitation for bids to construct the north Miami Beach renourishment using an upland sand source was sent out.

2003: Due to a shortage of funds requiring a wide-scale re-examination of construction priorities and re-programming of funds throughout the U.S. Army Corps of Engineers (Corps), the solicitation for upland sourced north Miami Beach renourishment construction was cancelled.

2005: As a result of a solicitation to contractors to locate a potential sand source, a source within the St. Lucie Shoal was submitted for use in Miami-Dade County. The site was located in Federal waters offshore of the border between St. Lucie and Martin Counties, approximately 110 miles from the Miami-Dade County project site.

2006: Potential use of the sand source offshore of St. Lucie and Martin Counties met nearly 100% opposition, outside of Miami-Dade County, expressed during the public scoping period from Federal, state and local agencies and officials as well as the general public in St. Lucie and Martin counties.

The use of shoals within state waters offshore of Palm Beach County, approximately 45 miles from the Miami-Dade County project site was explored. Palm Beach County and the Town of Palm Beach documented the future need of this source for their own projects as well as potential sources further offshore.

2007: The Corps (Jacksonville District) completed a letter report to document a lack of economical or environmentally viable domestic sand, per Section 935 of the WRDA of 1986, and need to pursue use of a foreign source material.

The ASA (CW) responded to the November 2007 letter report submission with a three-tiered approach to resolve Miami-Dade County's immediate need for sand and to propose a longer-term plan for future sand replenishment needs:

- Tier-1 requested placement of all 500,000 cubic yards from Miami-Dade's last large offshore sand source, SGC-Ext-1-South, and any additional material from nearby smaller borrow sources offshore of Miami-Dade County.
- Tier-2 directed an examination of the viability of non-domestic sand sources for intermediate and longer-term renourishment needs. This examination would include all necessary National Environmental Policy Act (NEPA) coordination and completion of an appropriate NEPA document.
- Tier-3 directed that, in addition to non-domestic sand sources, the remaining Florida coastal domestic sand sources should be evaluated through a comprehensive regional management plan to address the longer term renourishment needs along the Atlantic coast of Florida.

2009: The Southeast Atlantic Regional Sediment Management Plan for Florida (2009 RSM Plan) was completed to meet the ASA (CW)'s Tier-2 (excluding completion of a NEPA document) and Tier-3 directives.

2012 - 2014: In accordance with Tier-1, all remaining material offshore of Miami-Dade County, including the permittable sand volume remaining in SGC-EXT-1-South, were dredged and placed for a combined placement volume of 582,934 cubic yards.

2014: The Sediment Assessment and Needs Determination (SAND) Study was completed to update the 2009 RSM Plan. NEPA scoping meetings were held in St. Lucie, Martin, Palm Beach, Broward, and

Miami-Dade Counties. Less opposition to "sharing" sand across perceived county boundaries (all offshore sand sources are in state or Federal waters) was met during these meetings as opposed to those held in 2006, largely due to coordination efforts in the SAND Study stakeholder group.

2.4 Related Studies and Reports

Several reports have detailed the depletion of offshore sand sources and the need for an alternative sand source. These reports document the investigation of alternative sand source options including: upland sand sources, deep-water borrow areas off the Miami-Dade County shoreline, sources located offshore of other counties, relocation of sand from accretionary areas to erosive areas within the Federal project, and use of non-domestic sand from Caribbean sources.

Several of these reports mentioned use of Bahamian aragonite (a non-domestic source) as a good alternative sand source for the Dade BEC&HP project. Large quantities of this sand are available approximately 60 miles east of Miami Beach along the Great Bahama Bank. The sand has been used on private beach nourishment projects in the southeast region of Florida and is attainable and transportable with current methods. However, due to the presence of economically and environmentally viable domestic sand sources at this time, the US Army Corps of Engineers (Corps) lacks the authority to acquire non-domestic sand sources per Section 935 of the Water Resources Development Act of 1986 which states:

> Section 935 of WRDA '86: "*Notwithstanding any other provision of law, in any case in which the use of fill material for beach erosion and beach nourishment is authorized as a purpose of an authorized water resource project, the Secretary is authorized to acquire by purchase, exchange, or otherwise from non-domestic sources and utilize such material for such purposes if such materials are not available from domestic sources for environmental or economic reasons*."

As stated, it has been determined that there are environmentally viable domestic sources available and recent analysis indicates that these sources are also economical. This LRR will determine if the project remains justified with use of these domestic sources throughout the remaining period of Federal participation. Due to these facts, the cost of non-domestic sources is irrelevant and will not be provided in this report.

This section of the report presents some related studies and reports that are useful to obtain a more thorough understanding of the Dade County BEC&HP Project.

2.4.1 General Design Memorandum, September 1975

This report presented an updated detailed design for initial construction of the Federal project through the communities of Miami Beach, Surfside, and Bal Harbour. This document provides the most recent benefit analysis for the Main Segment of the project which includes Government Cut through Bakers Haulover Inlet, and Haulover Beach Park.

2.4.2 Design Memorandum (CP&E), April 1985

This report provided a detailed update of the cost of constructing the recommended plan presented in the June 1982 Survey Report, and presented a basis for cost-sharing agreements, preparation of plans and specifications, acquisition of lands, negotiation of relocation agreements and the scheduling of funding for construction of the project.

2.4.3 General Design Memorandum, Addendum III, September 1986

The purpose of this third addendum to the 1975 GDM was to examine the performance of the Federal project in the vicinity of 20th to 38th streets (corresponding to Florida Department of Environmental Protection (FDEP) monuments R-58 through R-64) in Miami Beach, and to develop an effective plan for renourishment of this area.

2.4.4 Design Memorandum, Addendum I and Supplemental EIS, May 1987

This report supplemented the April 1985 report. This addendum evaluated the feasibility of utilizing Bahamian aragonite as a source of material for the initial construction and periodic renourishment of the project beach at Sunny Isles. The use of Bahamian aragonite was recommended due to the high cost and potential environmental impacts of utilizing the limited number of remaining offshore borrow sources.

2.4.5 Coast of Florida Erosion and Storm Effects Study: Region III, 1996

This report summarizes a cooperative cost shared feasibility study of the beach erosion and storm damage problems of the Atlantic Ocean shoreline of the lower southeast coast of Florida, including Palm Beach, Broward and Dade counties. Included in this report are the results of planning, engineering, environmental, economic, and real estate studies of the area and its shoreline erosion problems over 88 miles of shoreline; and recommendations for modifications of the existing beach erosion control and shore protection projects. The selected plan contains elements of the Sunny Isles segment and Bal Harbour/Surfside/Miami Beach segments of Dade County.

2.4.6 Evaluation Report, October 2001

With Miami-Dade County's traditional offshore borrow sources running out of accessible sand, this report evaluated all known potential sand sources (domestic and non-domestic) that could be used to renourish the Federal project. Detailed cost estimates were developed for each source to provide sand for a 500,000 cubic yard renourishment.

2.4.7 Southeast Atlantic Regional Sediment Source Study for Florida, March 2008

This analysis evaluated all known borrow sources for Miami-Dade County excluding those considered not implementable for environmental, economic, or other social effect considerations. It then estimated the volume of material retrievable over the remaining period of Federal participation from remaining sources and compared this volume to the project need. The project's need equaled 11,800,000 cubic yards with only 4,000,000 cubic yards available, leaving a deficit of approximately 8,000,000 cubic yards. The report identified non-domestic material as a viable source to meet the project's deficit. Since this report, the 4,000,000 cubic yards potentially available was reduced due to incompatibility with color and percent of fine material allowed per the Dade Sand Specification (a Federal specification) discussed later in this report. All remaining sand has been used for renourishment.

2.4.8 Southeast Atlantic Regional Sediment Management (RSM) Plan for Florida, July 2009

This report was directed by the ASA (CW) in a December 2007 memo, which outlined a three-tiered approach for southeast Florida's sand needs. The approach directed that in addition to non-domestic sand sources, the remaining Florida coastal domestic sand sources should be evaluated through a comprehensive regional management plan to address the longer term renourishment needs along the Atlantic coast of Florida. The Southeast Atlantic Regional Sediment Management Plan for Florida (2009

RSM Plan) was completed in July 2009 to meet this directive. The 2009 analysis evaluated the sustainability of current beach nourishment practices for a region encompassing St. Lucie, Martin, Palm Beach, Broward, and Miami-Dade Counties which was the region through which the 2001 evaluation report had searched for possible Miami-Dade County sources. The 2009 RSM Plan then used several management alternatives to evaluate how sand could be distributed throughout the region in order to meet beach nourishment demands and minimize costs, which were considered a proxy for national and regional benefits, while recognizing constraints from Other Social Effects, Environmental Quality, and proper Regional Sediment Management practices. Concerning Miami-Dade County's needs relative to non-domestic material, the 2009 RSM Plan recommended that investigation of non-domestic material should begin.

2.4.9 Southeast Florida Sediment Assessment and Needs Determination Study, September 2014

The Southeast Florida Sediment Assessment and Needs Determination (SAND) Study quantifies domestic sand resources to support placement of planned, full-sized Federal and non-federal beach nourishment projects over 50 years (until year 2062) for St. Lucie, Martin, Palm Beach, Broward, and Miami–Dade Counties. This report was an update, and refinement of the 2009 RSM Plan. Sediment needs for each county were established based on project performance, accounting for storms, construction losses, and sea-level change. Sediment-source volume calculations considered new and existing offshore sediment sources in State and Federal jurisdictional waters. The final result was that a volume in excess of 100,000,000 cubic yards of domestic sand meeting the Florida Department of Environmental Protection's (FDEP) "Sand Rule" (F.A.C. 62B-41.007) was available offshore of the region. This does not indicate that all 100,000,000 cubic yards is available for use on all beaches throughout the region, but that the volume meets the basic requirements for beach nourishment. This volume is in excess of projected sand needs over the next 50 years (from 2012 to 2062) including contingencies for project performance and sea level rise. The report is available as a Corps Engineer Research and Development Center (ERDC) technical report, ERDC/CHL TR-14-10, and also as an FDEP report dated May 2013.

3.0 CHANGES IN PROJECT CONDITIONS

Details on changed project conditions are provided in relevant appendices, as discussed below. Significant changes in the structural and damage element inventory have occurred since original authorization, as discussed in the Economics section and Economics Appendix. A large number of the structures in the original inventory have been replaced with more expensive structures. For the purposes of this document it is assumed that the damages prevented by the project would be at least equal to those documented in the 1975 report, which is a conservative estimate. Evaluation of benefits provided by protecting this expanded inventory are beyond the scope of this report, as determined by SAD in a Memorandum For the Record (MFR) dated December 20, 2013 (see Pertinent Correspondence Appendix).

Changed environmental conditions include additional listed coral species covered by the Environmental Assessment (EA). New species include: Boulder star coral, Mountainous star coral, Star coral, Pillar coral, and Rough cactus coral.

Coastal processes have not significantly changed since authorization as discussed in the Engineering Appendix.

The most significant change is the depletion of all traditional offshore sand sources previously available to the project. Due to this fact, alternate sand sources must be identified to nourish the project and maintain storm damage reduction benefits through the remainder of the existing period of Federal participation.

3.1 Potential Sand Sources

The Dade County BEC&HP Project has been actively investigating alternative sand sources since 2001 as it became apparent that offshore sources would be depleted prior to the end of Federal participation. The most recent effort was part of a broader undertaking led by the Florida Department of Environmental Protection (FDEP) to quantify the sand needs of southeast Florida as sand sources began to be depleted throughout the region, particularly in the southernmost counties of Broward and Miami-Dade. This effort unified Federal, state, county and project stakeholders for the completion of the comprehensive sand assessment, known as the Southeast Florida Sediment Assessment and Needs Determination (SAND) Study (FDEP 2013).

The SAND Study quantifies sand resources needed to support construction of planned, full-sized beach nourishment projects through the next 50 years (year 2062) for St. Lucie, Martin, Palm Beach, Broward, and Miami–Dade Counties. The FDEP led the report effort with the Corps providing technical support, data collection and analysis. A working group of Federal, state, and local stakeholders was assembled to complete the study and work together to address southeast Florida's diminishing sand supply issue. Sand needs over a 50 year planning horizon for each county were established based on project performance accounting for storms, construction losses, and sea-level change. Available sand source volume calculations considered new and existing offshore sediment sources in state and Federal jurisdictional waters. The final result was that a volume in excess of 100,000,000 cubic yards of domestic sand was available offshore of the region meeting the Florida Department of Environmental Protection's (FDEP) "Sand Rule" (F.A.C. 62B-41.007). This does not indicate that all 100,000,000 cubic yards are available for use on all beaches throughout the region, but that the volume meets the basic requirements for beach nourishment. Some individual projects, such as the Dade BEC&HP, have more stringent sand requirements. This volume is in excess of the region's projected sand need over a 50 year planning horizon, from 2012 to 2062. The report is also available as a Corps' Engineer Research and Development Center (ERDC) technical report, ERDC/CHL TR-14-10**.**

Table 4 lists sources that the Corps evaluated for potential use on the Dade County BEC&HP Project with full coordination with the SAND stakeholder group. The table lists various reasons for screening out sources. The most common reasons were:

- Sand grain size and/or color were not compatible with the Dade BEC&HP project.
- The source was identified for use on another project in Southeast Florida.
- The Corps lacks authority, under Section 935 of WRDA'86, to acquire the source if domestic sources are economically/environmentally available (applies to non-domestic sources).

The sources were evaluated based on considerations inherent in a sand search for any nourishment project: distance from the project, potential volume, existing surveys of cultural and environmental resources, distance from the shoreline, etc. An additional consideration for the Dade BEC&HP Project sand search is the fact that the majority of available sand sources containing substantial volumes are located offshore of other counties in southeast Florida. This fact necessitates increased sensitivity to

potential adverse impacts of offshore dredging on the shoreline. The act of dredging changes bathymetric contours, potentially influencing the size and direction of waves eventually breaking on the shoreline. Therefore, a sand source's proximity to the shoreline can be a major consideration when determining if dredging will cause erosion along the shore. To address this risk and uncertainty, sand sources less than three miles from the shoreline were considered too high risk to dredge if they were located offshore of other counties. Wave impact analyses can determine potential effects of dredging, but the risk and uncertainty in model results was deemed too great when considering sources within this three mile limit given that sources farther offshore are available.

While it is a fact that offshore sources within 3 miles are dredged for beach nourishment purposes, they are typically being dredged for use on beaches inshore of, or nearby, their location. Heightened sensitivity must be taken when dredging sand offshore of one location that may have vulnerable coastal infrastructure and using it for beach nourishment in a distant location. This consideration eliminates several sources that are within one mile of the shoreline.

The following describes information provided in **Table 4**:

Column 1 – Sand Source Category: Sources are grouped by offshore zone, upland, or non-domestic. Offshore Zones were based on distance from the project area, with a new zone roughly every 45 miles. Sources within Zone A are a maximum of 45 miles from the project, Zone B – 90 miles, and Zone C – 135 miles.

Column 2 – Source Name: Names given to sources in the SAND Study. In general, names refer to the geographic area of a sand source, i.e. PB3-R8 signifies that the source is offshore of Palm Beach County (PB), located approximately 3 miles offshore (3), and the source is roughly offshore of the FDEP land-based Range Monument #8 in Palm Beach County (R8). Range monuments are located roughly every 1,000 feet along county shorelines, beginning with R-1 at the northern boundary of each county. Similarly, "M2-R83" indicates that the source is located 2 miles offshore of Martin County's R-83 range monument.

Column 3 – SAND Study Category: The SAND Study categorized sources as Proven, Potential, Unverified, and Depleted, depending on the density and quality of geological data. Based on the category, confidence levels of 90%, 70%, and 30% were applied in the volume assessment to the Proven, Potential and Unverified categories, respectively.

Column 4 – Previous Nomenclature: Many sources in the SAND Study had been previously evaluated and named. The study renamed sources with common nomenclature (i.e. PB3-R8) but referenced the original names with which stakeholders were familiar.

Column 5 – Can Source Be Acquired Under Federal Authority: This criteria refers to Section 935 of WRDA'86, which authorizes the Corps to acquire non-domestic sand only if domestic sources are not economically or environmentally available.

Column 6 – Identified by county for their use in SAND Study: The SAND Study listed sources that counties were currently using or planned to use in the near future. Such sources were eliminated from consideration.

Column 7 – Independent? (No significant investment/permits by other project(s)): If another county outside of Miami-Dade County had permitted or made a significant investment in a source for use (resource, bathymetric, cultural surveys, etc.), the source was eliminated from consideration.

Column 8 - Estimated Beach Quality Volume per FDEP Sand Rule (F.A.C. 62B-41.007): This represents the volume of sand estimated to be in compliance with the FDEP's Sand Rule. The Sand Rule limits the color, grain size, and other characteristics of sand that can be placed on beaches. Compliance with this rule is required in order to gain a permit from the state to place sand on state lands (all Federal beach nourishment projects in Florida.) Beginning with a total estimated volume for the source, confidence levels of 90%, 70%, and 30% were applied according to the category: Proven, Potential and Unverified categories, respectively. The resulting volume, after confidence levels were applied, is the volume shown in Column 8.

Column 9 - Portion of Volume has grain size compatible with Dade Sand Specification: The FDEP Sand Rule is broad, and some Florida beaches such as those of the Dade BEC&HP Project have more strict sand specifications. The Dade Sand Specification (Spec) was created by the Corps to characterize the type of sand that is compatible with the project beaches. A "yes" in this column indicates that the source has a grain size compatible with the Dade Sand Spec. Details on the Dade Sand Spec are given in the Geotechnical Appendix.

Column 10 - Portion of Volume has color compatible with Dade Sand Specification: Similar to Column 9, a "yes" in this column indicates that the source has a color compatible with the Dade Sand Spec.

Column 11 - Estimated Beach Quality Volume meeting the Dade Sand Specification: Only those sources selected for further evaluation (highlighted in green) have a value for this column. This value is the portion of sand from Column 8 that meets the more stringent Dade Sand Specification (Spec.)

Column 12 – Production Rate: Only those sources that are accretional (Bakers Haulover Inlet ebb shoal, and Lummus Park) and upland sources have a value for this column. Accretional areas are highly dependent on coastal processes moving sand to the accretional area over a period of time. Therefore dredging is not feasible and/or economical at all times.

Column 13 - Located in state or Federal waters: The delineation between state and Federal waters is three miles offshore of Florida in the Atlantic Ocean. If a source is located in Federal waters, coordination with the Bureau of Ocean Energy Management (BOEM) is required.

Column 14 - Distance from Dade BEC&HP Project center: This criteria measures distance, in miles, from the sand source to the Dade BEC&HP Project. Straight line distances are given for offshore sources. Distances along road networks are given for upland sources.

Column 15 - Environmental resource conflicts non-existent or resolvable: This criteria highlights any potential environmental resource conflicts involved in the use of a source. The majority of sources did not have any known conflicts, signified by a "Yes". Additional information is provided in the EA.

Column 16 - Cultural resource conflicts non-existent or resolvable: This criteria highlights cultural resource conflicts. A "-" signifies that data is not available. Additional information is provided in the EA.

Column 17 - Cultural resource notes: This criteria describes available cultural resource information. Additional information is provided in the EA.

Column 18 - Carried Forward At This Time: A "Yes" indicates that the source was carried forward in the formulation process and preliminary cost and logistics information was gathered. Seven sources, highlighted in green, were carried forward.

Column 19 - Reason(s) For Screening Out: Describes reasoning for screening source out of the selection process.

Table 4: Sand source matrix resulting from the SAND study with screening criteria applied for the Dade BEC&HP Project.

Sand Sources: Dade County BEC&HP - LRR and EA

	= Source is screened out
	= Source is not feasible at this time
	= Selected for further evaluation

Sand Source Category	Source Name	SAND Study Category	Previous Nomenclature	Screening Criteria													Carried Forward At This Time? (Yes/No)	Reason(s) For Screening Out
				Can source be acquired under Federal authority? (Yes/No) *Does not indicate NEPA coverage	Identified by county for their use in SAND Study	Independent? (No significant investment/permit by other project(s))* (Yes/No)	Estimated Beach Quality Volume per FDEP Sand Rule (F.A.C. 62B-41.007) (cy)	Portion of Volume has grain size compatible with Dade Sand Specification? (Yes/No)	Portion of Volume has color compatible with Dade Sand Specification? (Yes/No)	Estimated Beach Quality Volume meeting the Dade Sand Specification (cy)	Production Rate	Located in state or Federal waters	Distance from Dade BEC&HP Project center (miles)	Environmental resource conflicts non-existent or resolvable?	Cultural resource conflicts non-existent or resolvable? (Yes/No)	Cultural resource notes		
Miami-Dade County Sand Source	Lummus Park	Proven	Lummus Park	Yes		Yes	see production rate	Yes	Yes	see production rate	50,000 cy/yr	state	5.5	Yes	Yes		Yes	
	Bakers Haulover Ebb Shoal		Bakers Haulover Ebb Shoal	Yes		Yes	see production rate	Yes	Yes	see production rate	30,000 cy/yr	state	2.5	Yes	Yes		Yes	
	Bakers Haulover Flood Shoal	NA	Bakers Haulover Flood Shoal	Yes		Yes	-	Yes	Yes		-	state	3.5	Thin veneer of sand over limestone. Seagrass and other benthic resources in close proximity.	-		No	Thin veneer of sand over limestone. Seagrass and other benthic resources in close proximity.
	Nearshore backpass (Government Cut)	NA	Nearshore backpass (Government Cut)	Yes		Yes	-	-	-		-	state	5.5	Thin veneer of sand over hardbottom. Potential hardbottom impacts.			No	Thin veneer of sand over hardbottom. Potential hardbottom impacts.
Offshore Zone A	Zone 3 (Deep water, offshore)	NA	Zone 3	Yes		Yes	NA	No	NA		NA	federal	NA	NA	NA	NA	No	grain size not compatible
	8	Proven	8	Yes		No	735,000	No	Yes		NA	state	30	Yes	-		No	grain size not compatible
	9		9	Yes		No	570,000	Yes	Yes		NA	state	30	Yes	-		No	significant investment by Broward Co.
	10 / 11		10 / 11	Yes		No	1,184,000	Yes	Yes		NA	state	30	Yes	-		No	significant investment by Broward Co.
	12		12	Yes		No	801,000	Yes	Yes		NA	state	30	Yes	-		No	significant investment by Broward Co.
	13		13	Yes		No	150,000	Yes	Yes		NA	state	30	Yes	-		No	significant investment by Broward Co.

Table 4 (continued)

Sand Source Category	Source Name	SAND Report Category	Previous Nomenclature	Screening Criteria													Carried Forward At This Time? (Yes/No)	Reason(s) For Screening Out
				Primary Screening (Eliminating Criteria)			Secondary Screening (Subjective Criteria)											
				Can source be aquired under Federal authority? (Yes/No)	Identified by county for their use in SAND Report	Independent? (No significant investment/permit by other project(s))* (Yes/No)	Estimated Beach Quality Volume per FDEP Sand Rule (F.A.C. 62B-41.007) (cy)	Portion of Volume has grain size compatible with Dade Sand Specification? (Yes/No)	Portion of Volume has color compatible with Dade Sand Specification? (Yes/No)	Estimated Beach Quality Volume meeting the Dade Sand Specification (cy)	Production Rate	Located in state or federal waters	Distance from Dade BEC&HP Project center (miles)	Environmental resource conflicts non-existent or resolvable? (Yes/No)	Cultural resource conflicts non-existent or resolvable? (Yes/No)	Cultural resource notes		
Offshore Zone B	PB2-R2	Proven	Jupiter/Carlin A	Yes		Yes	9,289,050	Yes	No		NA	state	80	Yes	-	not surveyed	No	color not compatible
	PB3-R8		Jupiter/Carlin B	Yes		Yes	2,492,551	Yes	No		NA	state	75	Yes	-	not surveyed	No	color not compatible
	PB0-R59		Singer Island	Yes	Palm Beach County	No	13,407,336	Yes	Yes		NA	state	70	Yes	-	partially surveyed	No	identified for use in SAND Report
	PB0-R71		Singer Island /Lake Worth Inlet North	Yes		Yes	3,495,105	Yes	Yes		NA	state	65	Yes	Yes	surveyed, no resources	No	Risk and uncertainty of shoreline impacts due to source being located within 1 mile of shoreline.
	PB0-R86		Lake Worth Inlet South/ ROSS Area-10/PB North	Yes		Yes	16,874,623	Yes	Yes		NA	state	60	Yes	-	partially surveyed	No	Risk and uncertainty of shoreline impacts due to source being located within 1 mile of shoreline.
	PB0-R111		Palm Beach South	Yes	Palm Beach County	No	28,890,159	Yes	Yes		NA	state	55	Yes	-	partially surveyed	No	identified for use in SAND Report
	PB0-R160		ROSS Proposed Area-12, 17 / Ocean Ridge	Yes	Palm Beach County	No	9,098,372	Yes	Yes		NA	state	45	Yes	-	partial survey shipwreck reported adjacent. modern refuge dump recorded	No	identified for use in SAND Report
	PB0-R170		Briny Breezes	Yes		Yes	12,164,818	Yes	Yes		NA	state	45	Yes	-	not surveyed shipwrecks reported adjacent	No	Risk and uncertainty of shoreline impacts due to source being located within 1 mile of shoreline.
	PB0-R182		Delray Beach/ ROSS Proposed Area-44, 36	Yes	Palm Beach County	No	5,293,665	Yes	Yes		NA	state	40	Yes	Yes	surveyed, no resources	No	identified for use in SAND Report
	PB0-R197		Highland Beach	Yes		Yes	12,227,143	Yes	Yes		NA	state	40	Yes	-	partial survey shipwreck recorded adjacent	No	Risk and uncertainty of shoreline impacts due to source being located within 1 mile of shoreline.
	PB0-T205		ROSS Proposed Area - 54	Yes		Yes	760,858	Yes	Yes		NA	state	35	Yes	-	not surveyed	No	Risk and uncertainty of shoreline impacts due to source being located within 1 mile of shoreline.
	PB0-R212		Boca Raton/ ROSS Proposed Area-59	Yes	Palm Beach County	No	2,432,840	Yes	Yes		NA	state	35	Yes	-	not surveyed shipwrecks reported adjacent	No	identified for use in SAND Report
	PB0-R216		Previously Un-delineated	Yes	Palm Beach County	No	1,743,790	Yes	Yes		NA	state	35	Yes	-	partial survey? Shipwreck reported adjacent	No	identified for use in SAND Report
	PB0-R221		ROSS Proposed Area - 73	Yes	Palm Beach County	No	1,100,905	No	Yes		NA	state	35	Yes	-	partial survey	No	identified for use in SAND Report
	PB0-R2	Potential	Part of ROSS Proposed Area-1	Yes		Yes	3,785,739	No	Yes		NA	state	80	Yes	-	not surveyed	No	grain size not compatible
	PB0-R15			Yes		Yes	7,152,400	No	Yes		NA	state	75	Yes	-	not surveyed	No	grain size not compatible
	PB1-R21		Part of Palm Beach (Juno to Jupiter)	Yes		Yes	18,521,690	No	Yes		NA	state	75	Yes	-	not surveyed shipwreck reported adjacent	No	grain size not compatible
	PB0-R39		Part of ROSS Proposed Area-1	Yes		Yes	13,242,260	No	Yes		NA	state	75	Yes	-	not surveyed	No	grain size not compatible
	PB0-R49		Part of Palm Beach (Juno to Jupiter)	Yes		Yes	2,477,306	No	Yes		NA	state	70	Yes	-	not surveyed	No	grain size not compatible
	PB0-R127		Palm Beach Area III	Yes	Palm Beach County	No	9,719,320	No	Yes		NA	state	50	Yes	-	partial survey	No	identified for use in SAND Report and grain size not compatible
	PB0-R142		PB-3	Yes	Palm Beach County	No	11,737,090	No	Yes		NA	state	50	Yes	-	not surveyed shipwreck reported adjacent	No	identified for use in SAND Report and grain size not compatible
	PB0-R150		Previously Un-delineated	Yes		Yes	2,744,563	Unknown	Yes		NA	state	50	Yes	-	not surveyed	No	Risk and uncertainty of shoreline impacts due to source being located within 1 mile of shoreline.
	PB0-R52	Unverified	Previously Un-delineated	Yes		Yes	Unknown	Unknown	Unknown		NA	state	70	Yes	-	not surveyed	No	Risk and uncertainty of shoreline impacts due to source being located within 1 mile of shoreline.
	PB0-R96		PB-2	Yes		Yes	2,828,135	No	Yes		NA	state	60	Yes	-	partially surveyed	No	grain size not compatible
	PB0-R183		Previously Un-delineated	Yes		Yes	Unknown	Unknown	Unknown		NA	state	40	Yes	Yes	surveyed, no resources	No	Risk and uncertainty of shoreline impacts due to source being located within 1 mile of shoreline.
	PB0-R226		ROSS Proposed Area-79	Yes		Yes	342,520	Yes	Yes		NA	state	30	Yes	-	not surveyed shipwreck reported adjacent	No	Risk and uncertainty of shoreline impacts due to source being located within 1 mile of shoreline.

Table 4 (continued)

Sand Source Category	Source Name	SAND Report Category	Previous Nomenclature	Screening Criteria													Carried Forward At This Time? (Yes/No)	Reason(s) For Screening Out
				Primary Screening (Eliminating Criteria)			Secondary Screening (Subjective Criteria)											
				Can source be aquired under Federal authority? (Yes/No)	Identified by county for their use in SAND Report	Independent? (No significant investment/permit by other project(s))* (Yes/No)	Estimated Beach Quality Volume per FDEP Sand Rule (F.A.C. 62B-41.007) (cy)	Portion of Volume has grain size compatible with Dade Sand Specification? (Yes/No)	Portion of Volume has color compatible with Dade Sand Specification? (Yes/No)	Estimated Beach Quality Volume meeting the Dade Sand Specification (cy)	Production Rate	Located in state or federal waters	Distance from Dade BEC&HP Project center (miles)	Environmental resource conflicts non-existent or resolvable? (Yes/No)	Cultural resource conflicts non-existent or resolvable? (Yes/No)	Cultural resource notes		
Offshore Zone C	M2-R83	Proven	Site A	Yes	Martin County	No		Yes	Yes		NA	state	85	Yes	-	not surveyed	No	identified for use in SAND Report
	M2-R110		Site B	Yes	Martin County	No	10,022,235	Yes	Yes		NA	state	80	Yes	-	not surveyed shipwreck reported adjacent	No	identified for use in SAND Report
	M3-R125		Area 4	Yes		Yes	628,845	Yes	No		NA	state	80	Yes	-	not surveyed	No	
	M3-R45	Potential	MI-6	Yes		Yes	7362648	Yes	No		NA	state/fed	90	Yes	-	not surveyed	No	No borings meet the color spec
	M2-R58		MI-3	Yes		Yes	4,787,615	No	No		NA	state/fed	90	Yes	-	not surveyed shipwreck reported adjacent	No	grain size/color not compatible
	M2-R66			Yes		No	3,198,892	Yes	Yes		NA	state	90	Yes	-	not surveyed	No	See Martin 1/14/14 letter to SAJ.
	M3-R108		Previously Un-delineated	Yes		Yes	18,564,851	No	No		NA	state/fed	80	Yes	-	not surveyed recorded shipwreck 8MT24	No	grain size/color not compatible
	M7-R2	Unverified	Part of MMS-7	Yes		Yes	Unknown	Unknown	Unknown		NA	federal	100	Yes	-	not surveyed	No	Lack of volume data.
	M6-R5		Part of MMS-7	Yes		Yes	17,988,705	No	No		NA	federal	100	Yes		not surveyed	No	grain size/color not compatible
	M0-R36		Gilbert Shoal South	Yes		No	2,603,315	Yes	Yes		NA	state	95	Yes	-	not surveyed	No	See Martin 1/14/14 letter to SAJ.
	M7-R45		Previously Un-delineated	Yes		Yes	118,585	No	No		NA	federal	90	Yes	-	not surveyed	No	grain size/color not compatible
	M2-R76A			Yes		Yes	7,279,301	No	No		NA	state	85	Yes	-	not surveyed	No	grain size/color not compatible
	M3-R91		Previously Un-delineated	Yes		Yes	Unknown	Unknown	Unknown		NA	state	85	Yes	-	not surveyed shipwreck reported adjacent	No	Lack of volume data. Risk and uncertainty of shoreline impacts due to source being located within 4 miles of shoreline.
	M1-R93			Yes		Yes	Unknown	Unknown	Unknown		NA	state	85	Yes	-	not surveyed	No	Potentially poor material. Early cores indicate very fine, silty sand. Lack of volume data. Risk and uncertainty of shoreline impacts due to source being located within 2 miles of shoreline.
	M1-R95		Previously Un-delineated	Yes		Yes	20,137,717	No	No		NA	state	85	Yes	-	not surveyed shipwreck reported adjacent	No	grain size/color not compatible
	M2-R105			Yes		No	206,466	Yes	Unknown		NA	state	80	Yes	-	not surveyed	No	See Martin 1/14/14 letter to SAJ.
	M4-R105		Part of MMS-7	Yes		Yes	12,677,680	Yes	Yes	600,000	NA	federal	80	Yes	-	surveyed, no resources	Yes	
	M2-R117		Previously Un-delineated	Yes		Yes	11,302,599	Yes	No		NA	state/fed	80	Yes	-	not surveyed	No	color not compatible
	SL2-R9	Proven	Ft. Pierce SPP AREA D	Yes		No	3,299,963	Yes	Yes		NA	state	120	Yes	-	not surveyed	No	identified for use by St. Lucie Co.
	SL4-R10		Ft. Pierce SPP AREA E	Yes		No	592,436	Yes	Yes		NA	federal	120	Yes	-	not surveyed	No	identified for use by St. Lucie Co.
	SL1-R22		Ft. Pierce SPP AREA F	Yes		No	1,189,029	Yes	Yes		NA	state	120	Yes	-	not surveyed	No	identified for use by St. Lucie Co.
	SL3-R33		Ft. Pierce SPP AREA AB	Yes	Ft Pierce SPP	No	1,298,012	Yes	Yes		NA	federal	115	Yes	-	not surveyed	No	identified for use by St. Lucie Co.
	SL3-R44		Ft. Pierce SPP Area C	Yes	Ft Pierce SPP	No	9,327,810	Yes	Yes		NA	state/fed	110	Yes	-	not surveyed shipwreck reported	No	identified for use by St. Lucie Co.
	SL2-R56		Ft. Pierce SPP Area C	Yes	Ft Pierce SPP	No	2,715,122	Yes	Yes		NA	state	110	Yes	-	not surveyed	No	identified for use by St. Lucie Co.
	SL6-R67		Borrow Area D/ St. Lucie #4	Yes		No	464,400	Yes	Yes		NA	state/fed	110	Yes	-	not surveyed	No	SeeSt.Lucie 1/8/14 letter to SAJ.
	SL6-R73		Borrow Area C / St. Lucie #3/MMS BA A	Yes	St Lucie (South Co)	No	6,726,000	Yes	Yes		NA	federal	105	Yes	Yes	surveyed, no resources	No	identified for use in SAND Report
	SL5-R84		Borrow Area B/ MMS BA A	Yes	St Lucie (South Co)	No	1,912,000	Yes	Yes		NA	federal	105	Yes	Yes	surveyed, no resources	No	identified for use in SAND Report
	SL1-R87		CPE BA-2	Yes		No	1,177,579	Yes	Yes		NA	state	105	Yes	Yes	surveyed, no resources	No	identified for use by St. Lucie Co.
	SL1-R92		CPE BA-3	Yes		No	1,036,547	Yes	Yes		NA	state	105	Yes	-	not surveyed	No	identified for use by St. Lucie Co.
	SL0-R98		CPE BA-4	Yes		No	1,357,119	Yes	Yes		NA	state	105	Yes	-	not surveyed	No	identified for use by St. Lucie Co.
	SL4-R98		Borrow Area A	Yes	St Lucie (South Co)	No	2,344,000	Yes	Yes		NA	federal	100	Yes	-	partially surveyed recorded target	No	identified for use in SAND Report
	SL7-R104		Martin County Borrow Area B	Yes	Martin County	No	12,692,415	Yes	Yes		NA	federal	100	Yes	Yes	surveyed, no resources	No	identified for use in SAND Report
	SL3-R107		CPE BA-5	Yes	St Lucie (South Co)	No	5,203,805	Yes	Yes		NA	state/fed	100	Yes	-	partially surveyed	No	identified for use in SAND Report

Table 4 (continued)

Sand Source Category	Source Name	SAND Report Category	Previous Nomenclature	Screening Criteria													Carried Forward At This Time? (Yes/No)	Reason(s) For Screening Out
				Primary Screening (Eliminating Criteria)			Secondary Screening (Subjective Criteria)											
				Can source be aquired under Federal authority? (Yes/No)	Identified by county for their use in SAND Report	Independent? (No significant investment/permit by other project(s))* (Yes/No)	Estimated Beach Quality Volume per FDEP Sand Rule (F.A.C. 62B-41.007) (cy)	Portion of Volume has grain size compatible with Dade Sand Specification? (Yes/No)	Portion of Volume has color compatible with Dade Sand Specification? (Yes/No)	Estimated Beach Quality Volume meeting the Dade Sand Specification (cy)	Production Rate	Located in state or federal waters	Distance from Dade BEC&HP Project center (miles)	Environmental resource conflicts non-existent or resolvable? (Yes/No)	Cultural resource conflicts non-existent or resolvable? (Yes/No)	Cultural resource notes		
Offshore Zone C	SL3-R12	Potential	Part of Shoal A and Unnamed Shoal #1	Yes		Yes	14,897,069	Yes	No		NA	state/fed	120	Yes	-	not surveyed	No	color not compatible
	SL10-R16		Previously Un-delineated	Yes		Yes	2,908,472	Yes	No		NA	federal	115	Yes	-	not surveyed	No	color not compatible
	SL10-R27			Yes		Yes	11,455,722	Yes	No		NA	federal	115	Yes	-	not surveyed	No	color not compatible
	SL1-R35		Part of Shoal A	Yes		Yes	1,831,783	No	Yes		NA	state	115	Yes	-	not surveyed near shipwrecks Shipwreck reported	No	grain size not compatible
	SL10-T41		Previously Un-delineated	Yes		Yes	17,770,262	Yes	Yes	4,600,000	NA	federal	110	Yes	-	surveyed, no resources	Yes	
	SL2-R76		Previously Un-delineated / CPE BA-1	Yes		No	7,378,819	Yes	Yes		NA	state	105	Yes	-	partially surveyed	No	investment by St. Lucie Co.
	SL7-R9	Unverified	Previously Un-delineated	Yes		Yes	4,707,682	Yes	No		NA	federal	120	Yes	-	not surveyed	No	color not compatible
	SL6-R10			Yes		Yes	1,249,713	Yes	No		NA	federal	120	Yes	-	not surveyed	No	color not compatible
	SL7-R12			Yes		Yes	4,475,221	Yes	No		NA	federal	120	Yes	-	not surveyed shipwreck reported adjacent	No	color not compatible
	SL11-R16			Yes		Yes	2,767,388	Yes	No		NA	federal	115	Yes	-	not surveyed	No	color not compatible
	SL4-R22			Yes		Yes	4,405,651	Yes	No		NA	federal	115	Yes	-	not surveyed	No	color not compatible
	SL9-R22			Yes		Yes	576,767	Yes	No		NA	federal	115	Yes	-	not surveyed	No	color not compatible
	SL5-R29		Previously Un-delineated	Yes		Yes	Unknown	Unknown	Unknown		NA	federal	115	Yes	-	not surveyed	No	Lack of volume data.
	SL1-R32		Part of Shoal A	Yes		Yes	Unknown	Unknown	Unknown		NA	state	115	Yes	-	not surveyed near shipwrecks	No	Lack of volume data.
	SL10-R35		Previously Un-delineated	Yes		Yes	Unknown	Unknown	Unknown		NA	federal	110	Yes	-	not surveyed	No	Lack of volume data.
	SL4-R39		Previously Un-delineated	Yes		No	Unknown	Unknown	Unknown		NA	federal	115	Yes	-	not surveyed	No	part of Capron Shoal
	SL11-T41		Previously Un-delineated	Yes		Yes	Unknown	Unknown	Unknown		NA	federal	110	Yes	-	not surveyed	No	Lack of volume data.
	SL8-R42		Part of MMS-6	Yes		Yes	3,604,538	Yes	No		NA	federal	110	Yes	-	not surveyed	No	color not compatible
	SL11-R64		Previously Un-delineated	Yes		Yes	Unknown	Unknown	Unknown		NA	federal	105	Yes	-	not surveyed shipwreck reported adjacent	No	Lack of volume data.
	SL3-R66			Yes		Yes	1,318,623	Unknown	Unknown		NA	state/fed	110	Yes	-	not surveyed	No	Low volume.
	SL3-R67			Yes		Yes	Unknown	Unknown	Unknown		NA	state/fed	110	Yes	-	not surveyed	No	Lack of volume data.
	SL5-R70		Part of St. Lucie #4/ MMS-6	Yes		No	6,383,292	Yes	Yes		NA	federal	105	Yes	-	partially surveyed	No	See St. Lucie 1/8/14 letter to SAJ.
	SL10-R77		Previously Un-delineated	Yes		Yes	20,070,899	Yes	No		NA	federal	105	Yes	-	not surveyed	No	
	SL3-R81		Previously Un-delineated	Yes		Yes	Unknown	Unknown	Unknown		NA	state/fed	105	Yes	-	not surveyed	No	Lack of volume data.
	SL4-R90		Previously Un-delineated	Yes		No	Unknown	Unknown	Unknown		NA	federal	105	Yes	-	not surveyed	No	In middle of St. Lucie Shoal, a designated sand source for St. Lucie Co.
	SL6-R91		Previously Un-delineated/ MMS-7	Yes		No	5,375,073	Yes	No		NA	federal	100	Yes	-	not surveyed	No	See Martin 1/14/14 letter to SAJ. Color not compatible.
	SL8-R93			Yes		No	13,211,685	Unknown	Unknown		NA	federal	100	Yes	-	not surveyed	No	See Martin 1/14/14 letter to SAJ.
	SL8-R97A			Yes		No	Unknown	Unknown	Unknown		NA	federal	100	Yes	-	not surveyed shipwreck reported adjacent	No	See Martin 1/14/14 letter to SAJ.

Table 4 (continued)

Sand Source Category	Source Name	SAND Report Category	Previous Nomenclature	Screening Criteria														Carried Forward At This Time? (Yes/No)	Reason(s) For Screening Out
				Primary Screening (Eliminating Criteria)			Secondary Screening (Subjective Criteria)												
				Can source be aquired under Federal authority?	Identified by county for their use in SAND Report	Independent? (No significant investment/permit by other project(s))*	Estimated Beach Quality Volume per FDEP Sand Rule (F.A.C. 62B-41.007) (cy)	Portion of Volume has grain size compatible with	Portion of Volume has color compatible with	Estimated Beach Quality Volume meeting the Dade Sand Specification (cy)	Production Rate	Located in state or federal waters	Distance from Dade BEC&HP Project center (miles)	Environmental resource conflicts non-existent or resolvable?	Cultural resource conflicts non-existent or resolvable? (Yes/No)	Cultural resource notes		
Upland Sand Source	Stewart Mine (Indrio Pit)	NA	Stewart Mine (Indrio Pit)	Yes	NA	Yes	No practical limit	Yes	Yes		7,000 - 8,000 cy/day	NA	130	-	-	no cultural resource survey on record	No	no cultural resource survey on record
	Dickerson's Indrio Pit	NA	Dickerson's Indrio Pit	Yes	NA	Yes	-	-	-		-	NA	130	-	-	no cultural resource survey on record	No	no cultural resource survey on record. Color/grain size data not available.
	Witherspoon Sand Plant	NA	Witherspoon Sand Plant	Yes	NA	Yes	No practical limit	Yes	Yes	No practical limit	5,000 cy/day	NA	120	Yes	Yes	surveyed sites avoided	Yes	
	Ortona	NA	Ortona	Yes	NA	Yes	No practical limit	Yes	Yes	No practical limit	-	NA	120	Yes	Yes	surveyed sites avoided	Yes	
	Davenport	NA	Davenport	Yes	NA	Yes	7,311,634	Yes	Yes		8,000 cy/day	NA	235[2]	-	Yes	surveyed sites avoided old survey	No	closer adequate upland source(s) available
	ACI Homestead	NA	ACI Homestead	Yes	NA	Yes	No practical limit	Yes	Yes	No practical limit	-	NA	35	Yes	Yes	-	Yes	
	Blue Lake Quarry - Palestine, TX	NA	Blue Lake Quarry - Palestine, TX	Yes	NA	Yes	-	-	-		-	NA	-	-	-	-	No	closer adequate upland source(s) available
	Utuado, Puerto Rico	NA	Utuado, Puerto Rico	Yes	NA	Yes	-	-	-		-	NA	1,000[3]	-	-	no cultural resource survey on record	No	closer adequate upland source(s) available
	Puerto Rico source #2	NA	Puerto Rico source #2	Yes	NA	Yes	-	-	-		-	NA	1,000[3]	-	-	no cultural resource survey on record	No	closer adequate upland source(s) available
Non-domestic Sand Source	Ocean Cay (Bahamas)	NA	Ocean Cay (Bahamas)	No		NA	NA	NA	NA		NA	NA	65	NA	NA	Sec. 402 consult required	No	Corps lacks authority, under Section 935 of WRDA'86, to aquire if domestic sources are economically/environmentally available.
	Turks & Caicos	NA	Turks & Caicos	No		NA	NA	NA	NA		NA	NA	530	NA	NA	Sec. 402 consult required	No	Corps lacks authority, under Section 935 of WRDA'86, to aquire if domestic sources are economically/environmentally available.
	Jamaica	NA	Jamaica	No		NA	NA	NA	NA		NA	NA	550	NA	NA	Sec. 402 consult required	No	Corps lacks authority, under Section 935 of WRDA'86, to aquire if domestic sources are economically/environmentally available.
	Dominican Republic	NA	Dominican Republic	No		NA	NA	NA	NA		NA	NA	770	NA	NA	Sec. 402 consult required	No	Corps lacks authority, under Section 935 of WRDA'86, to aquire if domestic sources are economically/environmentally available.
	Belize	NA	Belize	No		NA	NA	NA	NA		NA	NA	800	NA	NA	Sec. 402 consult required	No	Corps lacks authority, under Section 935 of WRDA'86, to aquire if domestic sources are economically/environmentally available.

Notes:
[2]Distance shown is via roadway. Rail transport also available from this location.
[3]Distance shown as as straight line from the project center to Puerto Rico. Material transport would likely be via barge.

3.2 Selected Sand Sources

Seven sources, highlighted in green in Table 4, were carried forward. These sources include:

Miami-Dade County Sand Sources within the project area

- **Lummus Park** – renewable source every 5 years (50,000 cy/yr), located within the project area
- **Bakers Haulover Inlet Ebb Shoal** – renewable source every 10 years (30,000 cy/yr), located within the project area

Offshore Sand Sources – Zone C

- **M4-R105** – contains approximately 600,000 cubic yards, 80 miles from project area
- **SL10-T41** – contains approximately 4,600,000 cubic yards, 120 miles from project area

Upland Sand Sources

- **Witherspoon Sand Plant** – adequate volume for project needs, 120 miles from project area
- **Ortona Sand Plant** – adequate volume for project needs, 120 miles from project area
- **ACI Homestead** – adequate volume for project needs, 35 miles from project area

The location of these sources relative to the Dade BEC&HP Project are shown in **Figure** 3.

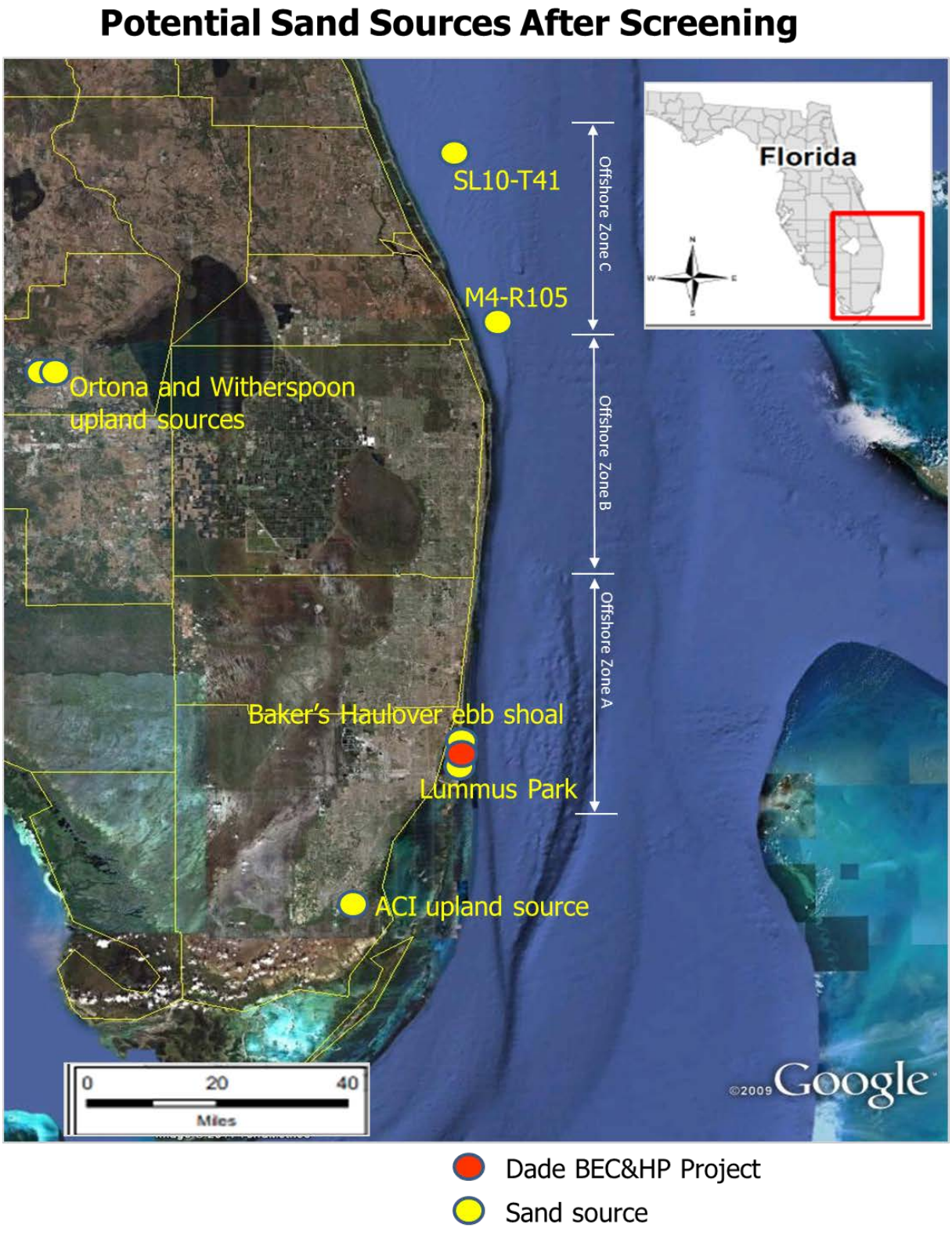


Figure 3: Potential sand sources after screening.

3.2.1 Lummus Park

Lummus Park is an accretionary beach extending along 1.5 miles of the south end of the project, commonly referred to as "South Beach". Since Lummus Park is accretionary, beach berm widths continue to increase with time. This area has been used four times as a source of material for backpassing operations (see **Table 3**), meaning the accreting, wide beach is used as a sand source to fill narrower, eroding areas to the north. There is no net gain in sand volume for the project when this source is used, as material is simply relocated from one area of the project to another.

Lummus Park accretes approximately 50,000 cy of beach quality material per year, as material is naturally transported southward along the coast by wave action. Although a constant supply of sand feeds into this area each year from the north, the Lummus Park area has not been used as a steady large-scale source of sand due to the logistical difficulties of construction. Lummus Park (South Beach) is one of the most heavily-used tourist beaches in the world and has proven to be a difficult area to conduct backpassing operations. Difficulties include accessibility, safety issues, disruptions of tourist activity and businesses, noise, aesthetic degradation, etc. These issues apply not only at the Lummus Park borrow site, but at the northern placement sites and along the transit area as well.

Material will continue to shoal in the Lummus Park area and it may be desirable to conduct backpassing operations at some point in the future. Due to the difficulties and uncertainties over accessing this material with respect to significant issues relating to permitting, contracting, safety, logistics, and local opposition from some interests, this source is not guaranteed for future use. Therefore, to be conservative, this source was not included in the plausible renourishment scenario used for cost estimates, discussed later in this report. However, the source should be considered by the sponsor or Corps for future events whenever possible.

3.2.2 Bakers Haulover Ebb Shoal

Bakers Haulover ebb shoal is located approximately 4.5 miles south of the northern limit of the project. The shoal accretes approximately 30,000 cubic yards of beach quality material per year and can therefore be used as an occasional source of borrow material. It is within the project area and is located within state waters.

The ebb shoal forms a 'pathway' that allows sand to naturally bypass Bakers Haulover Inlet as it flows southward along the coast. Sand flows from the beaches of Haulover Beach Park to the ebb shoal and then southward to Bal Harbor. In general, use of the shoal's sand should be limited to these nearby beaches to minimize cost and maintain the bypassing process.

3.2.3 M4-R105

The potential sand source site M4-R105 is located in Offshore Zone C, approximately 80 miles north of the center of the Dade BEC&HP project. This site has approximately 600,000 cy of compatible beach quality material available. It is located in Federal waters between four and five miles from shore. A wave impact analysis was conducted to determine if dredging this source could affect the wave climate and cause impacts to the shoreline, such as unwanted erosion or accretion. The Engineering Appendix presents the details of the analysis, the results of which indicate that no shoreline impacts are expected.

3.2.4 SL10-T41

The potential sand source site SL10-T41 is located in Offshore Zone C, approximately 110 miles north of the center of the Dade BEC&HP project. This site has approximately 4,600,000 cy of compatible beach quality material available. It is located in Federal waters between ten and eleven miles from shore. A wave impact analysis was conducted to determine if dredging this source could affect the wave climate and cause impacts to the shoreline, such as unwanted erosion or accretion. The Engineering Appendix presents the details of the analysis, the results of which indicate that no shoreline impacts are expected.

3.2.5 Vulcan Materials – Witherspoon

The Vulcan Witherspoon mine is located in southern Glades County, near the city of LaBelle, approximately 120 miles from the project area. The sand is extracted from the lake pit by hydraulic dredge and pumped to a sand processing plant. The processing plant first removes larger material using vibrating screens. The remaining grains are separated using water and gravity. The sand is then mixed, based on the desired specifications, and fed into dewatering screws to remove the fine-grained material. The resulting material is then stockpiled on site.

3.2.6 E.R. Jahana - Ortona

The E.R. Jahna Ortona mine is also located in southern Glades County, adjacent to the Witherspoon mine and approximately 120 miles from the project area. Sand from the Ortona mine has been used extensively for beach fill projects throughout southeast Florida. Sand is extracted from the mine pit using one of two cutter-head dredges and pumped to a central processing plant. The processing plant first removes larger material using vibrating screens with spray bars. The remaining material is sent through a gravity classifier and remixed to match the desired specifications, then fed into dewatering screws to remove the remaining fine-grained material. The resulting material is then stockpiled on site.

3.2.7 Atlantic Civil Inc. (ACI) - Homestead

The ACI mine is located in southern Miami-Dade County, in the city of Homestead and approximately 35 miles from the project area. The ACI mine has not been used previously to produce fill material for beach nourishment. Sand would be extracted using either a dragline or gantry dredge. The material would be screened to remove the oversized material using a mobile vibrating screen. The sand would then be transported to the central wash facility, screened and washed through sand classifying screws and cyclone(s). The material would then be stockpiled on-site.

3.2.8 Logistical Optimization

Typical studies for beach nourishment projects plan to use one sand source relatively close to the project site. Economic optimization is achieved by determining the number of years between renourishments (renourishment period) that result in the maximum net benefits. As authorized, the average annual renourishment volume of the Main Segment was estimated to be 211,000 cy to be placed “as needed” (there was no established renourishment interval, but an interval of 5 years was used for cost purposes). For Sunny Isles, the authorized renourishment volume was 715,000 cy with a renourishment interval of 10 years. For the current project, the sand sources are so distant that large renourishments requiring millions of cubic yards, typical of some other Florida projects, cannot be planned, as will be discussed later. Instead of optimizing the renourishment interval, this project must optimize the use of the only sand sources available within the logistical constraints of building a project

on the busiest beach in the nation. The following limitations were used to determine a plausible renourishment scenario for economic optimization.

3.2.8.1 *Truck Haul Volume Limitations*

Upland sources have the volume available to provide the project with sand through the end of the period of Federal participation. However, a very important factor when considering an upland source is the logistics of delivering the material to the project and building the construction template.

As shown in **Table** 3, several upland source renourishments have been completed. Each of these renourishments was relatively small in scope varying from 9,000 to 50,000 cubic yards per project. The mined sand was loaded into standard dump trucks and hauled through the city to the project site, often requiring the trucks to transit along the beaches. Material was dumped in the fill area and spread using bulldozers and front-end loaders. Upland sources have yet to be used to provide large quantities of sand for beach nourishment projects along Miami-Dade County due primarily to logistical difficulties of construction.

Problems cited with truck hauls include traffic congestion, road damage, spilled sand along roadways, noise, and numerous safety and aesthetic concerns at the beach fill site where dump trucks must drive along the year-round heavily visited beach. Since a tri-axle dump truck, commonly associated with hauling directly from a mine, carries about 18 cubic yards of material, approximately 560 truck-loads must be hauled to the site for every 10,000 cubic yards placed.

Production could be increased by adding crew, however additional access points would need to be used which increases exposure of beach-goers and associated safety risks and increases the number of trucks on the road.

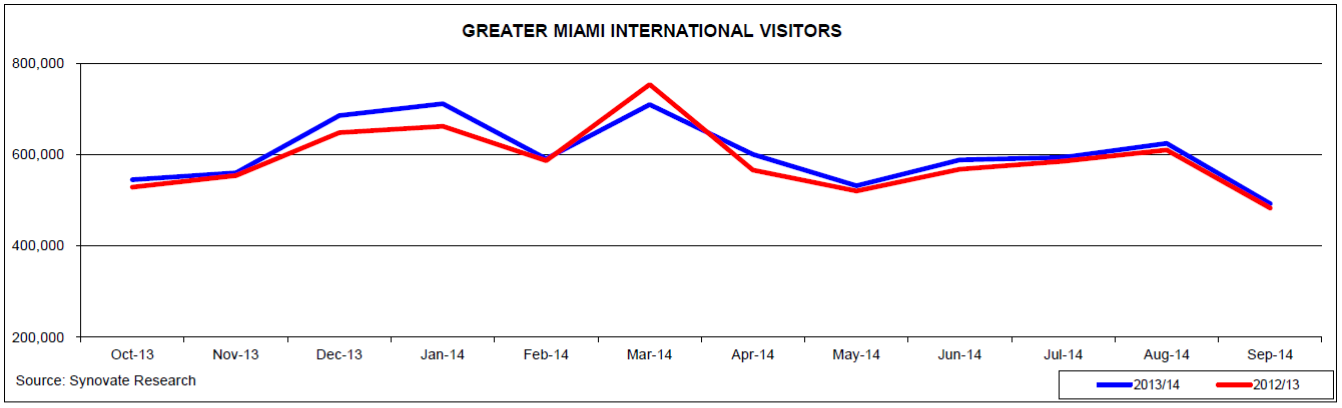
With this information in mind, a maximum fill limit of 200,000 cubic yards was established for any upland source, truck haul renourishment. This volume is significantly greater than any truck haul completed to date. Several factors established this limit:

1. Based on the production assumptions, a 200,000 cy truck haul of upland sand would take approximately 115 working days, or 135 calendar days, to complete. Logistics involved with a 200,000 cy truck haul would require approximately 11,100 truck-loads, or roughly 100 trucks a day. The contract duration for this operation would be 179 calendar days (5 months) total including mobilization, demobilization and prep work. Additionally, the sand would be transferred to off-road trucks to transit up and down the year-round heavily visited recreational beach for up to one mile each way, creating a life safety risk.

2. Typically it is ideal to build projects during low tourist seasons to minimize safety concerns and impacts to the local economy which means contract durations of one year or greater are undesirable. The beaches of Miami-Dade are unique in that they are the most utilized tourist beaches in the nation and there is no “off-season” as is typical during some months on other beaches. Miami-Dade beaches maintain a significant number of beach-goers year-round. As shown in **Figure 4**, there are generally three tourist peaks throughout the year. Although the data in the figure is for greater Miami, the peaks in visitation would also apply to the beaches. Peaks in visitation occur in December/January, March, and the summer season. Contracts greater than 200,000 cy could have increased safety concerns and negative economic impact.

3. Off the beach, the road network is made of small, mostly two to four-lane roads. These roads accommodate local traffic as well as typical year-round tourist traffic. Adding more than 11,100 trucks over 115 days to this environment would present significant challenges.

4. It was determined that 200,000 cy was the most practical limit. Even if the maximum fill limit were increased to 300,000 cy the plausible renourishment scenario shown in Table 5 would not be impacted. This is due to the fact that the lowest volume future renourishment event not using an upland, or cheaper, source is 500,000 cy in the year 2026.



	Oct-13	Nov-13	Dec-13	Jan-14	Feb-14	Mar-14	Apr-14	May-14	Jun-14	Jul-14	Aug-14	Sep-14	Rolling 12 Months	Fiscal Year 2013/2014	Calendar YTD
2013/14	545,500	560,600	686,200	711,700	591,200	710,200	600,900	531,900	588,800	594,100	625,100	493,100	7,239,300	7,239,300	5,447,000
2012/13	528,900	554,200	648,500	662,700	587,200	754,400	566,600	520,700	568,400	585,900	610,300	483,200	7,071,000	7,071,000	5,339,400
% change	3.1%	1.2%	5.8%	7.4%	0.7%	-5.9%	6.1%	2.2%	3.6%	1.4%	2.4%	2.0%	2.4%	2.4%	2.0%

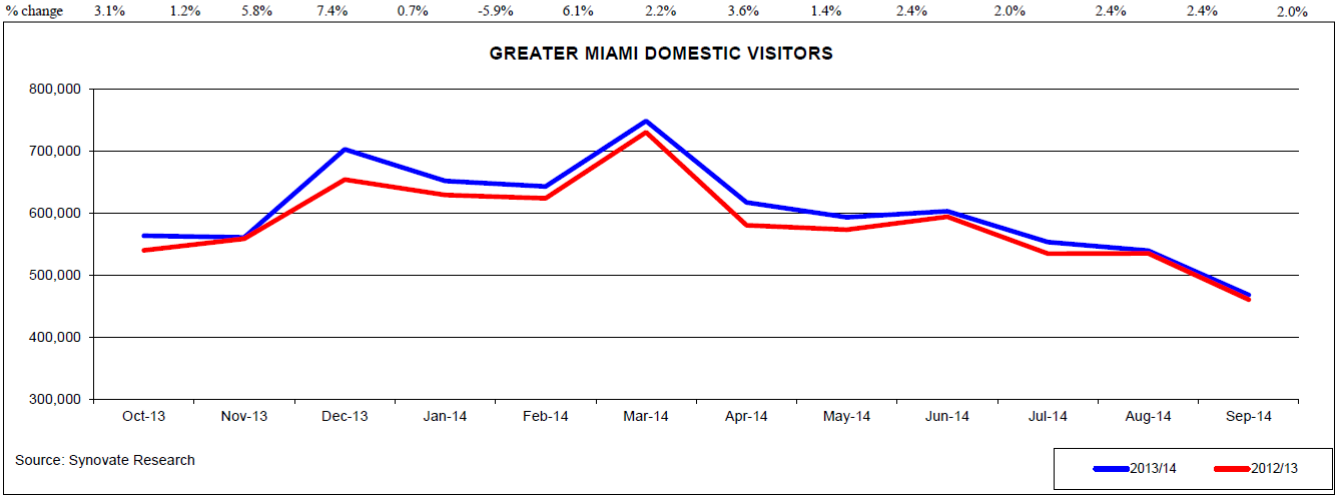


Figure 4: Greater Miami international and domestic visitors for 2012/2013/2014.

3.2.8.2 *SL10-T41 Offshore Zone C Source Limitations*

SL10-T41 has a significant amount of sand. However the source is approximately 120 miles from the project area. Cost and production estimates were based on use of one large hopper dredge with a maximum safe load of 4,500 cubic yards being used and production data for previous Dade projects. This assumption was made to maintain a competitive bidding climate. In order for companies with one large dredge to bid, the work would need to be complete within one year. For a transit distance of 120

miles, approximately 1,000,000 cubic yards could be placed in one year. Therefore, this volume was used as a cap on what can be transported from an offshore source under one contract.

Typical beach nourishment projects are constructed during low tourist seasons to minimize safety concerns and impacts to the local economy which means contract durations of one year or greater are undesirable. The beaches of Miami-Dade are unique in that they are the most utilized tourist beaches in the nation and there is no "off-season" as is typical during some months on other beaches. Miami-Dade beaches maintain a significant number of beach-goers year-round. Public safety and economic impact concerns with contract durations over one year would be significant concerns for nourishments using offshore sources since placed sand would need to be shaped into the design template by pipelines, bulldozers, and other heavy machinery on the beach.

3.2.8.3 *Sand Source Selection Protocol*

The above limitations, among others in the following list, represent constraints on sand source selection leading to a protocol when determining what sources would be used to meet the future sand needs of the project.

- Ideally, multiple source contracts would not be used for one nourishment. To do so would incur significant additional cost.
- Bakers Haulover ebb shoal would be used whenever it has accreted a sufficient volume of sand, typically every 10 years or more.
- Ideally, M4-R105 would be used at the first renourishment requiring a volume less than or equal to its volume.
- Upland sand sources would be used for any renourishment of 200,000 cy or less.
- SL10-T41 would be used for renourishments in excess of 200,000 cy up to a volume of 1,000,000 cy.

3.2.9 Plausible Renourishment Scenario

The project is currently in a depleted state, and a significant volume of sand is needed to reestablish the construction template. Typically, two or three million cubic yards of sand would be brought in under one contract to rebuild the construction template. Given the logistical constraints above, this is not possible for the Dade BEC&HP Project. Rather, several renourishments will be needed over consecutive years to rebuild the construction template in a phased approach, much like initial construction of the original project.

Additionally, project performance has demonstrated that the project does not erode on a consistent basis (which would allow the entire project length to be renourished at the same time). Rather, once the construction template is in place, segments of the project erode at individual rates, requiring small scale renourishments.

Table 5 shows a plausible renourishment scenario following the source selection protocol. This scenario was used to determine project costs and the benefit to cost ratio. The actual sources for future renourishments will be determined, according to the protocol, at the time of need.

Table 5: Plausible renourishment scenario.

Dade County, Florida BEC&HP Project Plausible Renourishment Scenario									
Year	Sand Source	Volume to be placed (cubic yards) per Project Segment						Totals, by Year (cubic yards)	Notes
		Haulover Park	Bal Harbour	Surfside	Miami Beach - (Hotspots)	Miami Beach - (Non-Hotspots)	Sunny Isles		
2014								0	
2015								0	
2016	SL10-T41				556,730		547,330	1,104,060	M4-R105 is least expensive source but does not have volume to meet this renourishment need.
2017	M4-R105			560,460				560,460	M4-R105 currently known volume is depleted after this renourishment
2018								0	
2019	Witherspoon/Ortona	90,000						90,000	Upland source used for any renourishment under 200,000 cy.
	SL10-T41		330,000			606,100		936,100	
2020								0	
2021	Witherspoon/Ortona				200,000			200,000	Upland source used for any renourishment under 200,000 cy.
2022	Bakers Haulover Ebb Shoal			135,000				135,000	In this case, the ebb shoal is more economical to use than an upland source.
2023								0	
2024								0	
2025								0	End of current Federal participation period for the "Main" Segment
2026	SL10-T41						500,000	500,000	
2027								0	
2028								0	
2029								0	
2030								0	
2031								0	
2032								0	
2033								0	
2034								0	
2035								0	
2036	Witherspoon/Ortona						100,000	100,000	Upland source used for any renourishment under 200,000 cy.
2037								0	
2038								0	End of current Federal participation period for the Sunny Isles Segment
		90,000	**330,000**	**695,460**	**756,730**	**606,100**	**1,147,330**		**TOTALS by Segment (cy)**
								3,625,620	**GRAND TOTAL (cy)**

3.2.9.1 *Optimize use by cost*

Cost per cubic yard is dependent on the cubic yardage moved. A higher volume moved typically results in a lower cost per cubic yard. For the costs shown in Table 6, a volume of approximately 3.63 million cubic yards (total project need through remainder of Federal participation) was assumed to be moved from single sources and, in the far right columns, from a plausible combination of sources over the remaining period of Federal participation. This gives an idea of how the plausible renourishment scenario (Table 5), using the selection protocol, compares cost-wise to use of other sources. Costs are shown in Table 6 with a planning level contingency applied based on past projects. **Costs are in FY15**

price levels. These costs were used to select the plausible renourishment scenario and should not be compared to more developed costs presented later in this report or in the Cost Appendix.

Table 6 shows that attaining 3.63 million cubic yards of sand from the ACI upland mine and constructing the project would equate to $280,300,000 (present worth). Using Ortona or Witherspoon upland mines (O/W) would cost $264,200,000. The offshore source, M4-R105 is relatively inexpensive, but the source contains only 600,000 cy of the necessary 3.63 million cy and should be reserved for a smaller renourishment project needing that volume. In the table, the source was assumed to be used for all nourishments (a total volume greater than 600,000 cy) for comparison purposes only. To use M4-R105's 600,000 cy in combination with additional sand from another source to complete a larger renourishment under one contract would incur additional expense. Using the offshore source, SL10-T41, would cost $282,500,000. The Bakers Haulover ebb shoal is the least expensive source to use. However it does not contain a large volume, and its use is limited to approximately every 10 years, or when enough sand has accreted. For efficiency, and to mimic the natural movement of sand, its use should be limited to downdrift beaches (Bal Harbor, Surfside, etc.) to the extent practicable. Using the selection protocol outlined above, the plausible renourishment scenario would cost $258,700,000.

Table 6: Sand source costs and contract durations. Values are construction costs with planning level contingency applied and should not be compared to more developed costs presented later in this report or in the Cost Appendix. (FY15 price levels).

	Year	Reach	Quantity (CY)	ACI Cost	ACI Contract Duration	Ortona / Witherspoon Cost	Ortona / Witherspoon Contract Duration	M4-R105 Cost	M4-R105 Contract Duration	SL10-T41 Cost	SL10-T41 Contract Duration	Bakers Haulover Ebb Shoal Cost	Bakers Haulover Ebb Shoal Contract Duration	Plausible Renourishment Scenario	
														Source	Cost
Sunny Isles Segment															
	2016	Sunny Isles	547,330	$ 40,900,000	400	$ 37,700,000	400	$ 30,700,000	192	$ 37,500,000	237			SL10-T41	$ 37,500,000
	2026	Sunny Isles	500,000	$ 37,500,000	353	$ 34,600,000	353	$ 28,100,000	178	$ 34,400,000	219			SL10-T41	$ 34,400,000
	2036	Sunny Isles	100,000	$ 9,100,000	95	$ 8,600,000	95	$ 10,300,000	60	$ 11,500,000	68			Ortona/Witherspoon	$ 8,600,000
			1,147,330	**$ 87,500,000**		**$ 80,900,000**		**$ 69,100,000**		**$ 83,400,000**					**$ 80,500,000**
Main Segment															
	2016	Hot Spots	556,730	$ 42,300,000	390	$ 40,100,000	390	$ 34,000,000	207	$ 41,400,000	252			SL10-T41	$ 41,400,000
	2017	Surfside	560,460	$ 42,200,000	392	$ 40,000,000	392	$ 33,900,000	208	$ 41,100,000	253			M4-R105	$ 33,900,000
	2019	Haulover	90,000	$ 8,400,000	105	$ 8,000,000	105	$ 10,500,000	59	$ 11,700,000	66			Ortona/Witherspoon	$ 8,000,000
	2019	Bal Harbor	330,000	$ 25,500,000	243	$ 24,300,000	243	$ 22,500,000	135	$ 26,700,000	162	$ 8,800,000	61	SL10-T41	$ 26,700,000
	2019	Non-Hot Spots	606,100	$ 46,000,000	422	$ 43,700,000	422	$ 36,600,000	223	$ 44,700,000	272			SL10-T41	$ 44,700,000
	2021	Hot Spots	200,000	$ 16,700,000	179	$ 16,000,000	179	$ 16,300,000	94	$ 19,000,000	110			Ortona/Witherspoon	$ 16,000,000
	2022	Surfside	135,000	$ 11,700,000	117	$ 11,200,000	117	$ 12,800,000	73	$ 14,500,000	84	$ 7,500,000	47	Haulover Ebb Shoal	$ 7,500,000
			2,478,290	**$192,800,000**		**$ 183,300,000**		**$166,600,000**		**$199,100,000**					**$ 178,200,000**
		All Project:	**3,625,620**	**$280,300,000**		**$ 264,200,000**		**$235,700,000**		**$282,500,000**					**$ 258,700,000**

4.0 ENGINEERING

Engineering analysis of coastal processes, erosion rates and volumetric sand need, as well as potential shoreline impacts resulting from dredging proposed offshore sand sources are included in the Engineering Appendix A. Effects resulting from Sea Level Rise (SLR) and the volumetric sand need over the remaining period of Federal participation will be summarized here.

4.1 Volumetric Sand Need

4.1.1 Present Renourishment Requirements

The most recent monitoring survey of the Federal project was performed in January 2014. This survey was used as a basis for defining the current condition of the project and was also used as a baseline for future volumetric projections.

The 2014 survey was first analyzed to determine the volumes of fill required to restore the construction template along the length of the project. A summary of the volumes required to fully restore the project to its full construction template are provided in Table 7.

From this table, the total volume required to restore the project to its fully-renourished condition is 1,881,140 cubic yards, based on January 2014 conditions. No fill placement is currently required in Haulover Park, and no fill is currently required in Bal Harbour because it was fully renourished in early 2014. Additional details of this analysis are provided in Engineering Appendix A.

Table 7: Volumes to rebuild construction template, 2014

Table 7 Volumes to Rebuild Construction Template, 2014		
Project Reach	Monuments	Volume
Sunny Isles	7 - 19.5	447,330
Haulover Park	19.5 - 26.5	-
Bal Harbour	27 - 31.5	-
Surfside	31.5 - 36.5	425,460
Miami Beach (hotspots)	misc.	402,250
Miami Beach (non-HS)	36.5 - 74.5	606,100
Total	7 - 74.5	1,881,140

4.1.2 Future Volumetric Projections - Dade County BEC & HP Project.

A primary feature of this LRR is the projection of volumetric needs of renourishment material throughout the remaining period of Federal participation for cost shared renourishment. This was accomplished by first calculating the volume required to restore the eroded areas of the project to a fully renourished condition. This analysis was described in the previous section, and the results are presented in Table 7.

The second step in this analysis was to project future renourishment needs through the remaining years of Federal participation. Details of an analysis to project future renourishment needs are given in Engineering Appendix A and are summarized in Table 8. The results were used for the plausible renourishment scenario shown in Table 5.

Each projected future renourishment event is shown in Table 8, throughout the remaining years of Federal participation in each of the two project segments (Main Segment and Sunny Isles Segment). As seen at the bottom of the table, the total volume of fill required is 3,625,620 cubic yards. The values presented in Table 8 include all of the present renourishment needs as shown in Table 7.

It is important to note that this volume represents the amount of fill required on the beach. For beach nourishments using an offshore sand source requiring dredging, an additional 30% is typically added due to normal dredging losses, so the required volume of sand would be 1.3 x 3,625,620 cy = 4,713,310 cy at the source if offshore sand sources provided the entire volume. No additional percentage is added if upland sources are used.

Table 8: Summary of projected renourishment events.

Table 8
SUMMARY OF PROJECTED RENOURISHMENT EVENTS
Dade County BEC & HP

Year	Renourishment Event	Placement Area	Volume, cy
2016	Sunny Isles, Miami Beach Hotspots	R7-R26; R41-46; R50-55; R60-64	1,104,060
2017	Surfside	R32-R36	560,460
2019	Haulover, Bal Harbour, Miami Bch (non-HS)	R27-R31	1,026,100
2021	Miami Beach (HS)	R41-46; R50-55; R60-64	200,000
2022	Surfside	R32-R36	135,000
2025	----- End of period of authorization, Main Project segment ---		
2026	Sunny Isles	R7-R26	500,000
2036	Sunny Isles	R7-R26	100,000
2038	----- End of period of authorization, Sunny Isles segment ---		
		TOTAL :	**3,625,620**

Figure 5 graphically shows each individual renourishment event past and through the remaining years of Federal participation following the plausible renourishment scenario discussed previously. Development of the quantities and construction schedules that are summarized in Table 8 and Figure 5 are provided in greater detail in Engineering Appendix A.

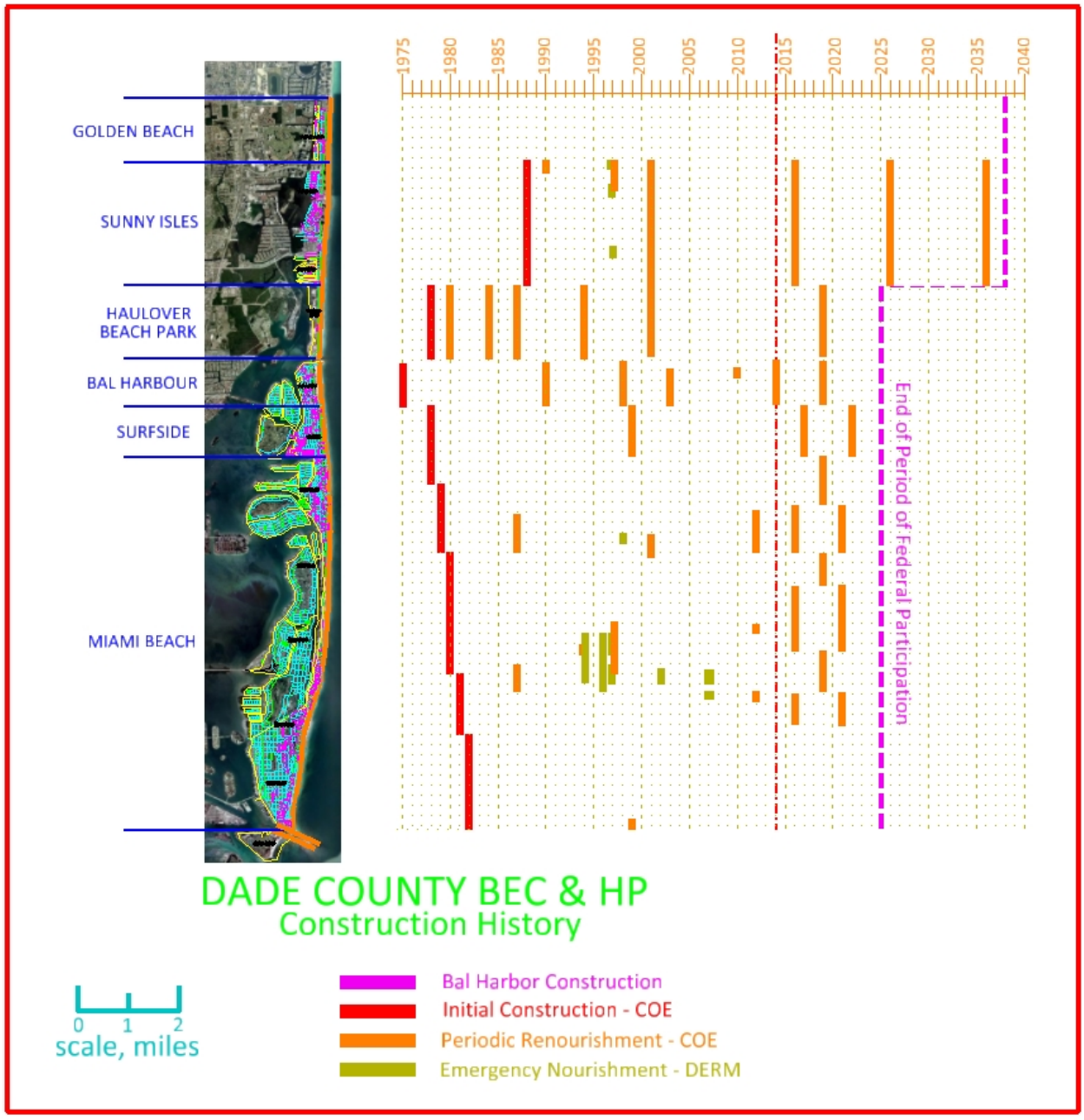


Figure 5: Past and projected nourishment events.

4.2 Sea Level Rise

Engineering Technical Letter (ETL) 1100-2-1 recommends beginning a sea level rise evaluation by first understanding the strategic decision context, or "what's the decision to be made and how will a potential acceleration in sea level rise impact that decision." Although Miami-Dade County's infrastructure is indeed vulnerable to sea level rise, the Dade BEC&HP is an already authorized project well into its 50 year period of Federal participation. The decision to be made by this report is the

economic and environmental viability of alternate sand sources for the remainder of the current period of Federal participation which is less than a 50 year period of analysis.

The Dade County BEC&HP Project protects infrastructure on the Atlantic Ocean side of barrier islands susceptible to sea level rise. Counterintuitively, this oceanfront infrastructure is some of the most resilient to sea level rise on the islands, given that the highest elevations on the islands are on the ocean side. The backside, or bay-side, of the barrier islands is not within the project area, but some portions currently experience flooding during extreme high tides due to their low elevations. These effects on the bay-side are expected to increase as sea level rises. Additionally, some critical infrastructure that populations within the project area may rely on, such as a hospital, is located on the bay-side of the islands.

This report deals only with the oceanfront side of the islands and the Dade BEC&HP Project as authorized, over the remaining period of Federal participation (10 years for the Main Segment and 23 years for the Sunny Isles Segment).

4.2.1 Calculation of Sea Level Rise (SLR) Rates

Sea levels have been rising gradually throughout the study area during the entire period of record. The longest water-level record in the Miami Beach area was measured by NOAA gage #8723170. Recorded water levels from this gage span 50 years, extending from 1931 to 1981. During this period the average annual rate of sea level rise was 2.39mm per year, +/- 0.43 mm/yr. It is generally accepted that sea level will continue to rise, and the rate of rise may accelerate due to climatic changes.

The Corps of Engineers provides guidance on the calculation of sea level rise and on its application to the design process. Engineering Regulation (ER) 1100-2-8162 was issued in December 2013 to establish procedures for projecting sea level rise into the future based on global sea level change rates, local historic sea level change rate, base year of project analysis, and number of years in the period of analysis. This ER requires that three scenarios be examined, which result in low, intermediate, and high predictions of sea level rise. The low value is based on an extrapolation of the local historic sea level rise rate. The intermediate and high values are based on the National Research Council (NRC) sea level rise predictive Curves I and III, respectively.

The Southeast Florida Regional Climate Change Compact was executed by Broward, Miami-Dade, Monroe, and Palm Beach Counties in January 2010 to coordinate mitigation and adaptation activities across county lines. At the time of writing of this document, the compact group was using sea level rise estimates based on the Corps' three scenarios.

In Figure 6 the extrapolated historic rate is represented by the green line; the NRC Curves I and III predicted rates are represented by the blue and red lines, respectively. These three curves correspond to the low, intermediate, and high predictions of sea level rise required by ER 1100-2-8162.

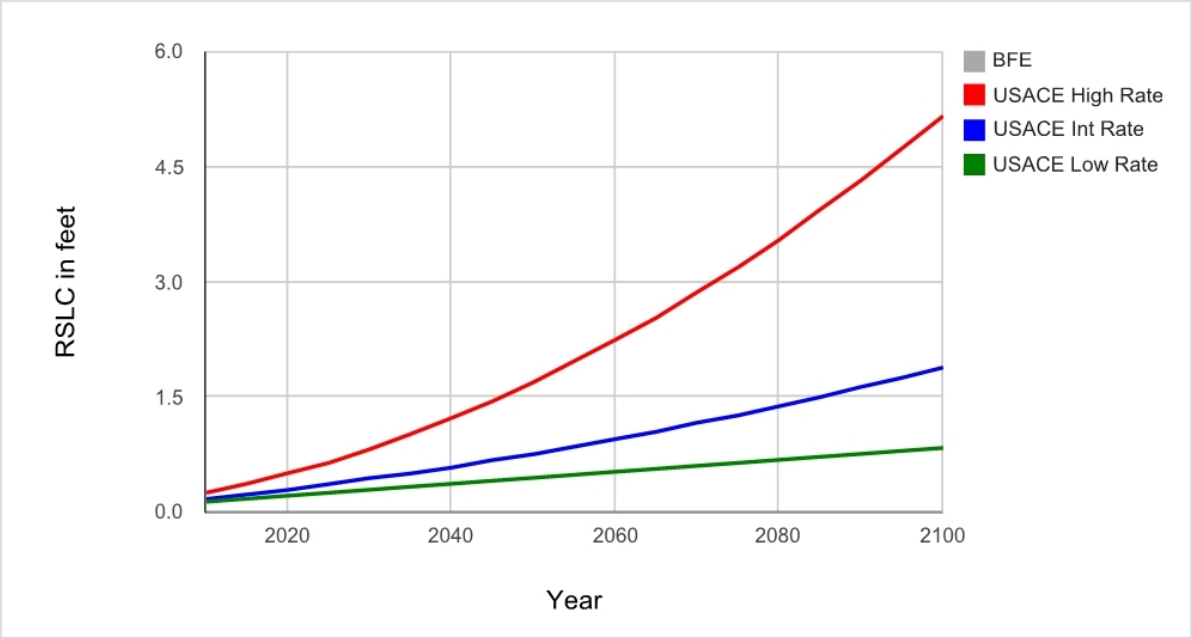


Figure 6: Summary of Predicted Sea Level Rise in Miami Beach by Year 2100.

As seen in Table 9, the range of predicted values of sea level rise by year 2025 (the end of the current period of Federal participation in the Main Segment) varies from 0.26 to 0.66 feet. The range of predicted values of sea level rise by year 2038 (the end of the current period of Federal participation in the Sunny Isles Segment) varies from 0.36 to 1.15 feet.

Under the High SLR scenario, sea level would increase by 1.15 feet by 2038. Current sea level is at -0.86 NAVD88. The 50-year storm surge ranges from approximately 7-8 ft NAVD88. Therefore water elevations plus the 50-year surge could reach between 8-9 feet NAVD88 by 2038. A decent threshold for SLR impacts is State Road A1A, which is the main north south thoroughfare and evacuation route in the project area. Most ground floor elevations of structures within the project area are at the level of State Road A1A or higher. Elevations of A1A vary between 12.5 - 15.5 NAVD88 throughout the project area. Therefore A1A, and most ground floor elevations, remain elevated above the effects of sea level rise within this time period, even with addition of storm surge. However, feeder roads to A1A, particularly those from the backside of the barrier islands could be affected by this increase.

Table 9: Water levels corresponding to future years resulting from the three SLR curves.

Table 2 **USACE SLR Curves - ER 1100-2-8162**								
SLR Curve	2010	2015	2020	2025	2030	2035	2038	2040
USACE - Low	0.14	0.18	0.22	0.26	0.30	0.34	0.36	0.38
USACE - Intermediate	0.17	0.23	0.29	0.36	0.43	0.50	0.55	0.58
USACE - High	0.26	0.38	0.51	0.66	0.83	1.02	1.15	1.23

4.2.2 Project Area Vulnerability to SLR

Table 10 describes the project area vulnerability to sea level rise. "Resources" and "Risk Rating" in the table were taken from the Corps' Coastal Systems Portfolio Initiative (CSPI). "Project Area Description of Resource Vulnerability to SLR" corresponds to each resource's degree of vulnerability to the High sea level rise rate (1.15 foot increase by 2038) assuming continued renourishment over the remaining period of Federal participation.

Table 10: Project area vulnerability to sea level rise over the remaining period of Federal participation.

	Resource	Risk Rating from CSPI - Value or density of resource or dependent population (3=high, 2=med., 1=low, X=none present)	CSPI Rating Definition	Project Area Description of Resource	Vulnerability from SLR (3=high, 2=med., 1=low, X=none present)	Project Area Description of Resource Vulnerability to SLR
Resources and Risk Rating taken from **Coastal Systems Portfolio Initiative - Technical Review of Coastal Projects: Shore Protection, Navigation and Ecosystem Restoration for the Nation's Coastlines (USACE Spring 2012)**	Residential/commercial structures	3	High : High density population; urban	Dense development consisting mostly of commercial, apartments, and high-rise residential/commercial structures. Most ground floor elevations of structures are at the level of State Road A1A or higher (12.5 - 15.5 NAVD88.)	1	By 2038, a 1.15 foot increase in sea level is predicted by the High curve. Added to this, the 50-year surge could reach between 8-9 feet NAVD88 by 2038. With an adequate supply of sand, the protective berm and dune heights will be maintained. Thus, structures within the project area are not highly vulnerable to sea level rise from the Atlantic ocean side of the islands over the remaining period of Federal participation.
	Environment and Habitat	3	High : Critical or highly valued natural habitat	Beach/dune habitat are used extensively.	1	With an adequate supply of sand, the berm and dune can be maintained to provide environment and habitat throught the remaining period of Federal participation.
	Infrastructure (roads, water/sewer lines, boardwalks, navigation structures)	3	High : Roads, water, sewer serving high population density	Water/sewer lines, boardwalks, dune walkovers exist. State Highway A1A is located approximately 12.5 - 15.5 feet above NAVD88. Most infrastructure would not be impacted until water level, including storm surge, reached above this point.	2	With an adequate supply of sand, the berm and dune heights can be maintained and protect this infrastructure from the ocean side. However, infrastructure on the bay-side may become susceptible to damage if sea level rise accelerates. Project area populations may be reliant on some of this infrastructure such as water and sewer lines.
	Critical Facilities (police, fire, schools, hospitals, and nursing homes)	2	Medium : Medium density of facilities	Medium density of critical facilities	2	No critical facilities exist directly within the project area. However, populations within the project area rely on critical facilities located on the bay-side of the barrier islands which could become susceptible to damage if sea level rise accelerates.
	Evacuation Routes	3	High : Routes serving high population density	State Road A1A is the main north/south evacuation route serving bridges for evacuees to reach the mainland from the barrier islands.	1	Elevations of A1A vary between 12.5 - 15.5 NAVD88 throughout the project area. By 2038, State Road A1A remains adequately elevated above sea level under any SLC scenario.
	Recreation	3	High : High use recreation area	Extensive, year-round recreational use of beaches and beach-front infrastructure (boardwalks, concessions, etc.)	1	Recreational use of beach is high. As long as an adequate volume of sand is provided, the berm height can be maintained relative to sea level at least through 2038. Additionally, the berm will protect recreational boardwalks and parks within the project area.
				average =	**1.3**	**Low/Medium Vulnerability**

4.2.3 Volumetric Response to SLR

As sea levels rise and the beach profile adjusts, the volume of material in the beach berm will adjust accordingly. Guidance on this topic is provided by Corps of Engineers' Engineering Manual (EM) 1110-2-3301. The calculated volumetric changes (in cubic yards per linear foot of shoreline) due to sea level rise are summarized in Table 11.

Table 11: Additional volumetric change resulting from sea level rise.

Table 4 **Volumetric Changes - EM 1110-2-3301** (units of cy/lf)								
SLR Curve	2010	2015	2020	2025	2030	2035	2038	2040
USACE - Low	6.2	8.0	9.8	11.6	13.3	15.1	16.0	16.9
USACE - Intermediate	7.6	10.2	12.9	16.0	19.1	22.2	24.4	25.8
USACE - High	11.6	16.9	22.7	29.3	36.9	45.3	51.1	54.7

Extrapolating these volumetric losses across the length of the Main Segment (57,000 feet in length) and the Sunny Isles Segment (13,200 feet in length) yield total potential volumetric losses that vary between 250,800 and 1,008,900 cubic yards for the Main Segment, and between 110,880 and 463,320 cubic yards for the Sunny Isles Segment. This means that roughly 1,000,000 million cubic yards of additional sand could be needed to renourish the Main Segment and an additional 463,000 cubic yards for the Sunny Isles Segment if SLR were to accelerate to the high rate relatively soon. Based on the annual renourishment rate of 190,000 cy/yr for the main segment and 50,000 cy/yr for the Sunny Isles segment, these values equate to increases in annual renourishment volumes of 13.2 to 53.1 percent for the main segment, and 9.6 to 40.3 percent for the Sunny Isles segment.

Renourishment of various segments of the Dade County project will be required several more times before the end of the current period of Federal participation in 2025 and 2038. Monitoring of sea levels over the past few decades indicates that sea level changes during this period have occurred very slowly, and have most closely followed the low curve as presented above. At this point in time no acceleration in the rate of water level rise has been observed from any of the relevant gage data. Based on the global SLR rate of +1.7 mm/yr the changes in sea levels since initial project construction are about 2.3 inches for the Main Segment of the project and about 1.8 inches for Sunny Isles. These values are believed to be insignificant to the functioning of the project, and project adjustments are unnecessary at this time. Accordingly, none of the additional losses due to SLR were added to the volumetric projections contained in **Tables 7 and 8**; those values were based entirely upon analysis of current survey data to establish present needs, and analysis of historic survey data to establish renourishment rates for projection of future renourishment needs. Upon expiration of this period of Federal participation a detailed re-analysis of all project economics will be performed prior to seeking re-authorization of the project; this analysis will incorporate SLR volumes.

Due to the minimal change in water levels since project construction there has been no significant impact on the overall management of this project, or any other shore protection projects in the region. However, a re-evaluation of the project should be conducted if significant changes in sea levels occur. Due to the relatively short timeframes remaining in the periods of Federal participation for both project segments and based on past project experience, any profile changes due to sea level rise are likely to be minimal, and the values presented in the preceding analysis represent a 'worse-case scenario'. Simple measures such as slight adjustments in construction berm elevation may be adequate to address sea level changes in all but the most extreme cases. If additional sand is needed as a result of accelerated SLR, the volume would be available from upland sand sources.

5.0 ECONOMIC EVALUATION

A Memorandum For the Record (MFR) dated December 20, 2013 details how the economic evaluation for this report should be conducted. In summary:

1. The Limited Reevaluation and Environmental Assessment (LRR/EA) will be justified on total benefit to cost ratio and will report both total and remaining benefit to cost ratio.

2. For the justification, recreation benefits will be capped at 50% of the total benefits. However, both total and remaining benefit to cost ratios will be shown using all recreation benefits.

3. Regarding the significant changes in Miami-Dade County's structural inventory and the impact that it could have on benefits, USACE South Atlantic Division (SAD) stated that the evaluation of how a changed inventory would impact project justification is more appropriate for evaluation in a new 50- year study (such as a feasibility study), not in the LRR. The LRR will not update the structure inventory but will use benefits as described in the last authorizing document.

The following excerpt from *The Economic Value of Beaches – a 2013 update* (Houston 2013) summarizes the economic impact of the Miami Beach portion of the Dade BEC&HP project on the regional and national economy. "Miami Beach is a good example of the economic benefits of beach restoration. Miami Beach had virtually no beach by mid-1970. As a result, facilities were run down, and Miami Beach was not the place to visit. By 1977, *Time* magazine (1977) reported: "So rapidly has the seven-mile-long island degenerated that it can be fairly described as a seedy backwater of debt-ridden hotels." Beach nourishment in the late 1970s rejuvenated Miami Beach and opened its beaches to the public. Beach attendance, based on lifeguard counts and aerial surveys, soared from 8 million in 1978 to 21 million in 1983 (Wiegel 1992). …In 2011 tourists contributed $13 billion to the Greater Miami economy with 44% of these tourists staying at Miami Beach and accounting for a proportionate $5.7 billion to the Miami Beach economy (Greater Miami and the Beaches, 2012). International tourists make up 48% of all overnight visitors, and, since they spend more than domestic tourists, contribute at least $2.9 billion to the Miami economy (Greater Miami and the Beaches 2012). Thus, international tourists alone make an annual contribution to the economy of Miami Beach that is over 50 times the cost of the $51 million Miami Beach nourishment project and over 1,000 times its annual cost. In addition, the U.S. receives over $1,800 in foreign exchange ($2.9 billion) annually at Miami Beach for every $1 of its share of the annual cost of the beach nourishment ($1.6 million)."

5.1 Main Segment Economic Evaluation

Previously-Approved Benefits

Storm damage reduction benefits, which are considered primary benefits, combined with incidental recreation benefits make up the total benefits for the segment. Table 12 displays the benefits from the last authorizing document which was a General Design Memorandum (GDM) completed in 1975, at 3.25% and 1974 price levels. The Miami Beach area has greatly increased in development since the 1975 report and continues to be visited by domestic and international tourists as well as catering to permanent and seasonal residents.

Table 12: Main Segment benefits from last authorizing document (1975 GDM). 3.25% discount rate, 1974 price levels.

Benefit Category	Average Annual Benefits at 3.25% 1974 Price Levels per 1975 GDM	Average Annual Benefits with Recreation Benefits capped at 50%
Storm Damage Reduction	$1,675,000	$1,675,000
Recreation	$16,349,000	$1,675,000
Total Annual Benefits	$18,024,000	$3,350,000
Note: The authorized project was approved with all the recreation benefits as reported in the 1975 GDM. The cap at 50% is for LRR to comply with policy guidance for capping recreation at 50% of total benefits per Section E-47 of ER 1105-2-100, April 2000.		

Project Cost Summaries

Project costs were developed for the total project since initial construction, and remaining project, for time frame 1974 through 2025. The current cost estimate for total project was developed using data from historic PB3 costs from Fiscal Year (FY) 1974 through FY2015 and the remaining project cost from FY2016 through FY2025. The total remaining cost for the remaining period of Federal participation, FY2016 through FY2025, for the Miami Beach to Haulover Park Segment, including contingencies (rounded to nearest thousand), is $176,602,000; the average annual cost for the ten year period is $3,871,000. The undiscounted total project cost (that includes cost-throughs documented in PB3 reports) is $310,795,000. The project cost summaries for the amortization of total project cost and remaining project costs can be found the Economic Appendix.

Main Segment Updated BCR and RBRCR

A total current benefit to cost ratio was computed at the FY16 discount rate of 3.125%. The benefits are based on the last approved report, the 1975 GDM. The costs are based on total project costs (per PB3 historic costs and MCACES level for remaining costs) for 50 years from start of initial construction, 1975 and last year of federal participation 2025. The Total Project BCR with recreation benefits, as authorized, and with recreation benefits capped at 50% of total benefits is shown it Table 13. **The Total Project BCR with full recreation benefits is 9.08. The Total Project BCR with recreation benefits capped at 50% is 1.7.**

Table 13: Main Segment Total Project BCR. 3.125% discount rate, FY15 price levels.

	BCR with all of Recreation Benefits	BCR with Recreation Benefits capped at 50% of total benefits
Total Present Value of Cost:	**$ 49,870,053**	**$ 49,870,053**
Amortized Cost:	**$ 1,984,477**	**$ 1,984,477**
AAEQ Benefits	**$ 18,024,000**	**$ 3,350,000**
Total BCR	**9.08**	**1.69**

The remaining benefits to remaining cost ratio (RBRCR) was also computed at the FY16 discount rate of 3.125% starting at 2016 and extending through the end of Federal participation, 2025, for a remaining (amortization) period of 10 years. The benefits from the last approved report were sunk for 40 years, and the remaining benefits for 10 years (of the remaining 50 years of federal participation) was used to compute the RBRCR. Table 14 displays the RBRCR. The RBRCR is 4.69 under the scenario of retaining the full recreation benefits of the last approved report, and 0.87 when the remaining benefits is capped at 50% of total benefits.

Table 14: Main Segment Remaining Benefits to Remaining Cost Ratio. 3.125% discount rate, FY15 price levels.

	RBRCR with all of Recreation Benefits	RBRCR with Recreation Benefits capped at 50% of total benefits
Total Present Value of Cost:	**$ 32,562,308**	**$ 32,562,308**
Amortized Cost:	**$ 3,841,687**	**$ 3,841,687**
AAEQ Benefits	**$ 18,024,000**	**$ 3,350,000**
RBRCR	4.69	.87

5.2 Sunny Isles Economic Analysis

Previously-Approved Benefits

Storm damage reduction benefits, which are considered primary benefits, combined with incidental recreation benefits make up the total benefits for the project. Table 15 displays the benefits from the last authorizing document, 1995 Design Memorandum (DM) Addendum III, at 7.75% and 1994 price levels. Although the Sunny Isles segment has considerable recreation benefits, no recreation benefits were

included in the computation of a BCR in the 1995 DM. Therefore, BCRs with recreation capped at 50% are not shown as they were for the Main Segment.

Table 15: Sunny Isles Segment Benefits from last authorizing document (1995 DM). 7.75% discount rate, 1994 price levels.

Benefit Category	Average Annual Benefits at 7.75% 1994 price levels
Storm Damage Reduction	$4,487,100
Loss of Land Benefits	$4,685,500
Recreation Benefits	$0
Total Annual Benefits	$4,955,600
Total Annual Costs	$2,325,800
Total Annual Net Benefits	$2,629,800
Benefit Cost Ratio	**2.1**

Project Cost Summary

Project costs were developed for total project since initial construction, and remaining project for time frame 1988 through 2038. The current cost estimate for total project was developed using data from historic PB3 costs from FY1988 through FY2015 and the remaining project cost from FY2016 through FY2038. The total remaining cost for the remaining period of Federal participation, FY2016 through FY2038, for the Sunny Isles Segment, including contingencies (rounded to nearest thousand), is $83,727,000; the average annual cost is $2,344,000 at a 3.375% discount rate. The undiscounted total project cost (that includes cost-throughs documented in PB3 reports) is $118,694,000, with an average annual cost of $1,804,000. The project cost summaries for amortization of total project cost and remaining project costs can be found in the Economic Appendix.

Sunny Isles Segment Updated BCR and RBRCR

A total current benefit to cost ratio was computed at the FY16 discount rate of 3.125%. The benefits are based on the last authorizing document, 1995 Design Memorandum (DM) Addendum III. The costs are based on total project costs (per PB3 historic costs and MCACES level for remaining costs) for 50 years from start of initial construction, 1995 and last year of Federal participation 2038. Table 16 displays the summary of the amortized cost for the BCR computation. **The Total Project BCR is 2.8. This BCR includes no (0%) recreation benefits since they were not included in the 1995 DM.**

Table 16: Sunny Isles Segment Total Project BCR. 3.125% discount rate, FY15 price levels.

Total Present Value of Cost:	**$44,878,537**
Amortized Cost:	**$1,785,850**
AAEQ Benefits	**$4,955,600**
Total BCR	**2.77**

The remaining benefits to remaining cost ratio (RBRCR) was also computed at the FY16 discount rate of 3.125% starting at 2016 and extending through the end of Federal participation, 2038, for a remaining (amortization) period of 23 years. The benefits from the last approved report were sunk for 27 years, and the remaining benefits for 23 years (of the remaining 50 years of Federal participation) was used to compute the RBRCR. Table 17 displays the RBRCR. The RBRCR is 2.15.

Table 17: Sunny Isles Segment Remaining Project BCR. 3.125% discount rate, FY15 price levels.

Total Present Value of Cost:	**$37,415,468**
Amortized Cost:	**$2,305,055**
AAEQ Benefits	**$4,955,600**
RBRCR	**2.15**

6.0 ADMINISTRATIVE SECTION 902 LIMIT ANALYSIS

Section 902 applies to any project that was authorized in or after WRDA 1986. Although the project was authorized by WRDA 1986, that authority has not been implemented. Rather, the current project is implemented under the authority of the 1985 Appropriations Act. As such, the authority for the project pre-dates the application of Section 902 of WRDA 1986. Therefore, there is no Section 902 maximum cost limit for initial construction or periodic nourishment applicable to any segment of the authorized Dade County, Florida Project. However, administrative 902 analyses were completed for the FY16 budget submission for both the Main and Sunny Isles Segments. Neither of these analyses resulted in project cost estimates, inflated through construction, exceeding authorized costs inflated through construction as shown in the following tables.

For the Main Segment, the project cost estimate inflated through construction does not exceed the authorized cost inflated through construction as shown in Table 18.

Table 18: Administrative 902 analysis completed for the FY16 Main Segment budget submission using FY16 OMB inflation factors and certified costs dated March 26, 2014.

Table G-4 (ER 1105-2-100 Appendix G)		
MAXIMUM COST INCLUDING INFLATION THROUGH CONSTRUCTION		
FY 14 - Thousands Dollars (000's)		
Line 1		
a.	Current Project estimate at current price levels:	$231,039
b.	Current project estimate, inflated through construction:	$246,154
c.	Ratio: Line 1b / line 1a	1.0654
d.	Authorized cost at current price levels:	$567,949
	(Column (h) plus (i) from table G-3)	
e.	Authorized cost, inflated through construction:	$605,106
	(Line c x Line d)	
Line 2	Cost of modifications required by law:	$0
Line 3	20 percent of authorized cost:	$26,650
	.20 x (table G-3, columns (f) + (g)	
Line 4	Maximum cost limited by section 902:	$631,756
	Line 1e + line 2 + line 3	

For the Sunny Isles Segment, the project estimate inflated through construction does not exceed the authorized cost inflated through construction shown in Table 19.

Table 19: Administrative 902 analysis completed for the Sunny Isles Segment FY16 budget submission using FY16 OMB inflation factors and certified costs dated March 21, 2014.

Table G-4 (ER 1105-2-100 Appendix G)		
MAXIMUM COST INCLUDING INFLATION THROUGH CONSTRUCTION		
FY 14 - Thousands Dollars (000's)		
Line 1		
a.	Current Project estimate at current price levels:	$128,665
b.	Current project estimate, inflated through construction:	$156,245
c.	Ratio: Line 1b / line 1a	1.2144
d.	Authorized cost at current price levels:	$170,477
	(Column (h) plus (i) from table G-3)	
e.	Authorized cost, inflated through construction:	$207,020
	(Line c x Line d)	
Line 2	Cost of modifications required by law:	$0
Line 3	20 percent of authorized cost:	$19,072
	.20 x (table G-3, columns (f) + (g)	
Line 4	Maximum cost limited by section 902:	$226,091
	Line 1e + line 2 + line 3	

7.0 NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) DOCUMENTATION SUMMARY

A separate Environmental Assessment (EA) has been completed for the actions recommended by this LRR: continued nourishment of the existing project for the remaining period of Federal participation (ten years for the Main Segment and twenty three years for the Sunny Isles Segment) using a combination of offshore, upland, and local sand sources. The EA is included as a separate document in this report.

7.1 Cooperating Agencies

The Bureau of Ocean Energy Management (BOEM) and the Department of the Interior (DOI) will serve as a cooperating agency under the National Environmental Policy Act (NEPA), with the Corps of Engineers (Corps) as the lead agency due to the potential use of up to two offshore sand sources located within Outer Continental Shelf (OCS) waters (greater than three miles offshore the Atlantic coast) referred to as SL10-T141 and M4-R105. The BOEM is authorized under Public Law 103-426 [43 United States Code (U.S.C.) 1337(k)(2)] to negotiate on a non-competitive basis the rights to Outer Continental Shelf (OCS) sand resources for shore protection projects. BOEM may undertake a connected action (i.e., authorize use of the OCS borrow areas) that is related to, but unique from the Corps' proposed action.

BOEM's proposed action is to issue a negotiated agreement authorizing use of the sand source areas at the request of Miami-Dade County and the Corps.

Reference Section 5.0 of the EA for details on environmental compliance.

7.2 Mitigation

Mitigation includes those measures and features that avoid, minimize and/or compensate for unavoidable environmental impacts. Under NEPA, USACE and BOEM first work to avoid impacts, then minimize remaining impact and lastly provide compensatory mitigation for unavoidable impacts.

For this project, there are two types of mitigation – first are those actions which avoid or minimize impacts and second is compensatory mitigation.

7.2.1 Avoid/Minimize

The actions being required as part of the contract plans and specifications for all actions with in-water dredging include:

1. Following FWC/USFWS Manatee Protection Protocols found in Section 4.28.

2. Following NMFS Sea Turtle/Smalltooth Sawfish Protection Protocols.

3. Relocation of threatened and endangered corals, as well as large stony corals, from within the pipeline corridor prior to placement of the pipe to minimize the overall effect of the pipeline on hardbottom and reef resources in the pipeline corridor.

4. Marking of pipeline corridors by divers prior to the deployment of pipeline to ensure the pipeline is placed within the boundaries of the marked corridor.

5. Use of pipeline "lifters" on hardbottom and reef areas to elevate the pipeline off the bottom and limit the amount of contact between the bottom and the pipeline, thereby minimizing the impact of the pipeline (See Figure 19 through Figure 23).

6. Pipeline corridor width narrowed from permitted 50 feet to 25 feet.

7. Conduct triage of hardbottom resources impacted by the pipeline corridor immediately after removal of the pipeline. By reattaching organisms impacted by the pipeline, this lessens the potential loss of the organism and its functions.

For beach placement activities, required avoidance and minimization efforts include

1. Shorebirds – Daily monitoring during the nesting season of nesting birds and setting up buffers and construction corridors, if necessary, to minimize impacts to nesting and fledging shorebirds.

2. Sea Turtles – Daily monitoring during the nesting season of nesting sea turtles. Marking of nests, establishment of corridors to avoid the nest or relocation of the nest, if necessary, to minimize impacts to nesting and newly hatched sea turtles.

7.2.2 Monitoring

In addition to required avoidance and minimization efforts, during construction monitoring will include:

1. Monitoring of the hardbottom edge offshore of the placement area.

2. Swimming the pipeline no less than two times a week to check for leakage of the pipe, thus preventing or minimizing the effects of sand leaking from the pipe on surrounding resources.

3. Turbidity monitoring to ensure that the amount of sediment entering the waters surrounding the dredging and placement sites does not exceed state water quality standards.

7.2.3 Compensatory

After reviewing historic pipeline corridor locations and usage, it was determined that five of the six corridors have been previously used and this usage required compensatory mitigation for four of the five.

- R-9 (Sunny Isles)
    - Contract 1 (1997) - Mitigated with 28m2 of modules at Sunny Isles artificial reef built in 1996 (also called Haulover Mitigation Site). FDEP permit #132344829
    - 2001/2002 Mitigated with 95m2 at Sunny Isles artificial reef built in 1996
- R-20 (Haulover Beach)
    - Conflicting information. However, cannot verify. This pipeline will not be used for at least the next five years (2016-2021).
- R-31 (Bal Harbour/Surfside)
    - Contract 2 - Mitigated with 3300m2 at Sunny Isles artificial reef built in 1996
- R-43 (Miami Beach North/Test Beach)
    - 2001/2002 - Mitigated with 127m2 at Sunny Isles artificial reef built in 1996
- R-55 (Miami Beach Central)
    - Contract 1 – 106m2 of impact, mitigation modules at Sunny Isles artificial reef built in 1996.
- R-74 (Miami Beach South)
    - Contract 2 - Reports say no impact (per DERM) - thus no required mitigation

Due to incorporation of pipeline lifters and minimization of the corridor width, the potential impacts to the hardbottom in the corridors has been significantly reduced below what was previously mitigated for, and as a result, loss of functions associated with those impacts has previously been mitigated for. No additional compensatory mitigation is planned for R-9; R-31; R-43; R-55 or R-74 if they are used to construct any of the proposed nourishment events.

Should an unexpected impact occur, like a pipeline breach which allows sand to cover the hardbottom below the pipeline, USACE, consistent with Federal law, shall conduct surveys and develop a response plan to include compensatory mitigation actions for those impacts using models approved by the USACE ECO-PCS, if appropriate and if in accordance with existing USACE authority. Survey methods shall include standard impact assessment methods included in “Rapid Response and Restoration for Coral Reef Injuries in Southeast Florida” (DEP, 2007).

8.0 USACE CAMPAIGN PLAN GOALS AND ENVIRONMENTAL OPERATING PRINCIPLES

The plan for continued renourishment of the project presented in this report is consistent with the USACE Campaign Plan Goals (CPGs) and Environmental Operating Principles (EOPs). Consistency with the USACE CPGs and EOPs also demonstrates consistency with the Chief of Engineers Twelve Actions for Change for Applying Lessons Learned during Hurricanes Katrina and Rita issued 24 August 2006 as the CPGs and EOPs include the same content as, and overlap with, the Twelve Actions for Change.

8.1 USACE Campaign Plan Goals

The USACE Campaign Goal themes are as follows:

USACE Vision: Engineering solutions for the Nation's Toughest Challenges.

USACE Mission: Deliver vital engineering solutions in collaboration with our partners, to secure our Nation, energize our economy, and reduce our risk from disaster.

Commander's Intent: The U.S. Army Corps of Engineers is marching forward with a new Campaign Plan to transform the way we do business. These are historic times in our Nation and in the world, and the Corps will play a pivotal role in helping shape America's future.

The Corps will grow stronger and become a great organization by delivering superior performance, setting the standard for our profession, making a positive impact on the Nation and other nations and building to last, as evidenced by the strength of our team – educated, trained, experienced, and certified professionals.

We will deliver superior performance every time through disciplined people, thought, and action. We will use the Campaign Plan to establish our priorities, focus our transformation initiatives, measure and guide our progress, and adapt to the needs of the future.

My intent is for the Corps to be one disciplined team – in thought, word, and action – and to meet our commitments by saying what we will do, and doing what we say.

***Goal 1:** Deliver innovative, resilient, and sustainable solutions to DoD and the Nation.*

***Goal 2:** Deliver enduring and essential water resource solutions, utilizing effective transformation strategies.*

***Goal 3:** Deliver support that responds to, recovers from, and mitigates disaster impacts to the Nation.*

***Goal 4:** Build resilient People, Teams, Systems and Processes to sustain a diverse culture of collaboration, innovation and participation to shape and deliver strategic solutions.*

The plan for continued renourishment of the project presented in this report is consistent with these themes. The project team took the latest policy and planning guidance and worked with professionals familiar with the project to make a recommendation that will provide efficient coastal storm damage reduction benefits and recreation opportunities while protecting the environment. Extensive reviews were performed to ensure quality and consistency.

8.2 Environmental Operating Principles (EOP's)

Consistent with the NEPA, the Corps has reaffirmed its commitment to the environment by formalizing a set of "Environmental Operating Principles" applicable to all its decision making and programs. These principles foster unity of purpose regarding environmental issues and ensure that conservation, environmental preservation, and restoration are considered in all USACE activities.

These principles help the USACE define its role in that endeavor. The USACE Environmental Operating Principles are:

• Foster sustainability as a way of life throughout the organization.

• Proactively consider environmental consequences of all Corps activities and act accordingly.

• Create mutually supporting economic and environmentally sustainable solutions.

• Continue to meet our corporate responsibility and accountability under the law for activities undertaken by the Corps, which may impact human and natural environments.

• Consider the environment in employing a risk management and systems approach throughout the life cycles of projects and programs.

• Leverage scientific, economic and social knowledge to understand the environmental context and effects of Corps actions in a collaborative manner.

• Employ an open, transparent process that respects views of individuals and groups interested in Corps activities.

In coordination with other agencies and stakeholders, USACE proactively coordinated the environmental consequences of actions proposed in this report. The project would be constructed in compliance with all applicable laws. In addition, USACE coordinated with all stakeholders to gather scientific, economic, and social information. This coordination was conducted in a manner that encouraged all groups to express their views.

9.0 COST SHARING ANALYSIS

9.1 Cost Sharing Overview

Boundaries for each segment are as follows: the Sunny Isles Segment extends from FDEP monument R-7 to R-19.3, and the Main Segment extends from R-19.3 to R-74. The Main Segment spans from Haulover Beach Park at its northernmost point to Government Cut at its southernmost point. The total project length is approximately 13 miles (2.5 miles attributed to the Sunny Isles segment and 10.5 miles attributed to the main segment).

Federal participation in projects such as the Dade Co. BEC & HP Project is limited to shorelines open and accessible to public use. Public access must be provided every ½ mile. Adequate parking must be provided on a free or reasonable basis within a practical walking distance of the access. Public transportation may be used to augment parking. Federal participation in project costs is further defined by project purpose as either hurricane and storm damage reduction (HSDR) or recreation, and by

shoreline ownership. Shoreline ownership is separated into lands that are Federally owned, publicly and privately owned, and privately owned with limited use.

In the past, the cost sharing for the Sunny Isles portion of the project was determined to be 48.0% Federal, 52.0% non-federal (page 6, 1995 Dade County SPP Design Memorandum, Addendum III). The cost sharing for the Main Segment of the project was determined to be 51.7% Federal, 48.3% non-federal (page 75, 1975 Dade County Hurricane BEC and Hurricane Surge Protection Project GDM). Table 20 shows the past and updated cost sharing estimates. The changes in cost sharing from these past analyses stem from changes in the development of the project area and changes in shoreline ownership and use. Analysis and maps detailing public access, parking, and public bus stops are presented in the Cost Sharing Appendix F.

Table 20: Cost Sharing Summary

	Previous Federal Share	Previous Non-Federal Share	Updated Federal Share	Updated Non-Federal Share
Sunny Isles Segment	48.0%	52.0%	62.7%	37.3%
Main Segment	51.7%	48.3%	56.6%	43.4%

The current cost share estimates are based on the policy guidance provided by ER 1105-2-100 Appendix E. The Water Resources Development Act (WRDA) of 1999 changed the cost sharing policy previously provided by WRDA 1986 by setting a maximum Federal share of periodic nourishment carried out after 1 January 2003 to 50% for projects authorized for construction after 31 December 1999. However, because a Chief's report for the Dade County Shore Protection Project was signed prior to 1996, that policy does not apply to this project. Costs assigned to developed lands (publicly or privately owned) are cost shared 65% Federal and 35% non-federal. Costs assigned to undeveloped, publicly owned lands are cost shared 50% Federal and 50% non-federal. Costs assigned to undeveloped, privately owned lands are not Federally cost shared (100% non-federal). Note that, for the purposes of this report, "developed" indicates the presence of buildings and/or other infrastructure such as street ends or other transportation facilities. If lands are not within ¼ mile of public access and either public parking or a bus stop, then the associated costs will be 100% non-federal.

9.2 Sunny Isles Segment Cost Share

The total shoreline length of the Sunny Isles segment is 12,940 feet (or 2.5 miles). Public access within ¼ mile of a public bus stop is provided every ½ mile throughout the segment (see figures in Appendix F.) Paragraph 6.h.(2) of ER 1165-2-130 states, "...public transportation facilities may substitute for or complement parking facilities." Therefore, all properties in this segment are eligible to be considered for Federal cost sharing. Additional to the public bus stops, metered public parking is located within the reach. Public bus stops, beach access, and parking are shown in Appendix F.

There are no Federally owned lands in the Sunny Isles segment. There are only two properties that are privately owned and undeveloped. The combined shorefront length of these two properties is 405 feet. The costs associated with these areas are covered 100% by the non-federal sponsor. There is one non-federal area used for parks/recreation in this segment: Samson Oceanfront Park. This park covers 209 feet of shoreline. This area is cost-shared 50% Federal, 50% non-federal. The rest of the properties in the Sunny

Isles Segment are developed lands, and the cost share for these lands is covered 65% Federal, 35% non-federal. Appendix E of ER 1105-2-100 was used as a reference to determine these shares.

Overall, the cost share for this segment is estimated to be 62.7% Federal, and 37.3% non-federal (Table 21). This is an increase in the Federal share from the last cost sharing estimate used for this segment. In the 1995 Dade County Shore Protection Project Design Memorandum (Addendum III), the cost-share estimate for this segment was 48.0% Federal, 52.0% non-federal. The change in cost-share since the 1995 report stems from increased development of the shoreline.

Table 21: Sunny Isles Segment cost sharing percentages

SUNNY ISLES SEGMENT				
Shore Ownership and Project Purpose (as defined in EC 1105-2-100)	**Maximum Level of Federal Participation in Construction* Costs**	**Shoreline Length (feet)**	**Federal Participation (feet)**	**non-Federal Participation (feet)**
I. Federally Owned	100%	0	0	0
II. Publically and Privately Owned, Protection Results in Public Benefits				
A. Hurricane and Storm Damage Reduction (HSDR) on	65%	12,326	8,012	4,314
B. HSDR on Undeveloped Public Lands**	50%	209	104	104
C. Separable Recreation	50%	0	0	0
III. Privately Owned, Developed, Use Limited to Private Interests (No public access within 1/4 mile)	0%	0	0	0
IV. Privately Owned, Undeveloped	0%	405	0	405
	Total Distance:	**12,940**	**8,116**	**4,824**
		Cost Shares:	**62.7%**	**37.3%**

*Periodic nourishment is considered "construction."
**Non-Federal public shores dedicated to recreation or fish and wildlife purposes.

Further detail and shoreline images are provided in the Cost Sharing Appendix F. **Table 22** shows cost sharing for the total project cost through the remaining period of Federal participation in the Sunny Isles Segment. Costs are "Project First Costs" which have been escalated to FY16 price levels.

Table 22: Sunny Isles Segment cost sharing through remaining period of Federal participation (FY16 price levels).

Future Cost Apportionment Summary Dade County BEC&HP Project Sunny Isles Segment				
Item	**Total Item Cost**	**Federal Share**	**Federal Cost**	**Non-federal Cost**
Mob/Demob	$7,381,000	62.7%	$4,628,000	$2,753,000
Beach Fill	$54,704,000	62.7%	$34,300,000	$20,405,000
Mitigation	Included in contingency due to uncertain need.			
Associated General Items	$1,195,000	62.7%	$749,000	$446,000
Subtotal	$63,280,000		$39,677,000	$23,604,000
Lands and Damages				
- lands and damages		0%	$0	$0
- administrative	$92,000	0%	$0	$92,000
PED	$7,473,000	62.7%	$4,686,000	$2,787,000
Construction Management	$1,272,000	62.7%	$798,000	$475,000
Post-Project Monitoring	$300,000	62.7%	$188,000	$112,000
Subtotal	$9,137,000		$5,672,000	$3,466,000
Contingency (18%)	$13,035,000	62.7%	$8,173,000	$4,862,000
Total Project Cost (2016 - end of period of Federal participation)	$85,452,000		$53,522,000	$31,932,000

9.3 Main Segment Cost Share

The total shoreline length of the Main Segment is 55,179 feet (or 10.5 miles). Public access is provided through the entire segment except for 3,481 feet (0.66 miles). All properties except for those not within ¼ mile of public access are eligible to be considered for Federal cost sharing. All public accesses are within ¼ mile of a public bus stop throughout the segment allowing adequate public access for cost sharing purposes. Public bus stops, beach access, and parking are shown in Appendix F.

Paragraph 6h(2) of ER 1165-2-130 states, "...public transportation facilities may substitute for or complement parking facilities." Additional to the public bus stops, metered public parking is located within the reach as shown in Appendix F.

There are no Federally owned lands in the Main Segment. There are only three parcels that are privately owned and undeveloped. The combined shorefront length of these properties is 182 feet. Costs associated with these areas are covered 100% by the non-federal sponsor. 15,153 feet of the shoreline in the Main Segment is composed of undeveloped public lands (mainly public parks). This area is cost-shared 50% Federal, 50% non-federal. The rest of the properties in the main segment are developed lands including transportation facilities comprised of street ends, and the cost share for these lands is therefore covered 65% Federal, 35% non-federal. Appendix E of ER 1105-2-100 and ER 1165-2-130 were used as references to determine these shares.

Overall, the cost share for this segment is estimated to be 56.6% Federal, and 43.4% non-federal (Table 23). This is an increase from the last cost sharing estimate used for this segment. In the 1975 General Design Memorandum the cost-share estimate for this segment was 51.7% Federal, 48.3% non-federal. The change in cost-share since the 1975 report stems from increased development of the project area and changes in shoreline ownership and use.

Table 23: Main Segment cost sharing percentages

MAIN SEGMENT				
Shore Ownership and Project Purpose (as defined in EC 1105-2-100)	Maximum Level of Federal Participation in Construction* Costs	Shoreline Length (feet)	Federal Participation (feet)	non-Federal Participation (feet)
I. Federally Owned	100%	0	0	0
II. Publically and Privately Owned, Protection Results in Public Benefits				
A. Hurricane and Storm Damage Reduction (HSDR) on Developed Lands	65%	36,364	23,637	12,727
B. HSDR on Undeveloped Public Lands**	50%	15,153	7,577	7,577
C. Separable Recreation	50%	0	0	0
III. Privately Owned, Developed, Use Limited to Private Interests (No public access within 1/4 mile)	0%	3,480	0	3,480
IV. Privately Owned, Undeveloped	0%	182	0	182
	Total Distance:	55,179	31,213	23,966
		Cost Shares:	56.6%	43.4%

*Periodic nourishment is considered “construction.”
**Non-Federal public shores dedicated to recreation or fish and wildlife purposes.

Shoreline images for the project area and corresponding cost sharing designations are provided in the Cost Sharing Appendix F. **Table 24** shows cost sharing for the total project cost through the remaining period of Federal participation in the Main Segment. Costs are “Project First Costs” which have been escalated to FY16 price levels.

Table 24: Main Segment cost sharing through remaining period of Federal participation (FY16 price levels).

Future Cost Apportionment Summary Dade County BEC&HP Project Main Segment (Government Cut through Haulover Beach Park)				
Item	**Total Item Cost**	**Federal Share**	**Federal Cost**	**Non-federal Cost**
Mob/Demob	$19,993,000	56.6%	$11,316,000	$8,677,000
Beach Fill	$113,886,000	56.6%	$64,459,000	$49,427,000
Mitigation	Included in contingency due to uncertain need.			
Associated General Items	$2,470,000	56.6%	$1,398,000	$1,072,000
Subtotal	$136,349,000		$77,173,000	$59,176,000
Lands and Damages				
- lands and damages		0%	$0	$0
- administrative	$214,000	0%	$0	$214,000
PED	$8,635,000	56.6%	$4,887,000	$3,748,000
Construction	$2,969,000	56.6%	$1,680,000	$1,288,000
Post-Project Monitoring	$700,000	56.6%	$396,000	$304,000
Subtotal	$12,518,000		$6,963,000	$5,554,000
Contingency (21%)	$31,262,000	56.6%	$17,694,000	$13,568,000
Total Project Cost (2016 - end of period of Federal participation)	$180,129,000		$101,830,000	$78,298,000

10.0 FEDERAL AND NON-FEDERAL RESPONSIBILITIES

The Corps is responsible for budgeting for the Federal share of future Federal construction projects. Federal funding is subject to budgetary constraints inherent in the formation of the national civil works budget in a given fiscal year. The Corps would perform the necessary preconstruction, engineering, and design needed prior to construction. The Corps would meet requirements for the use of Federal lands at any offshore borrow area, obtain water quality certification, coordinate with the state as required by the Coastal Zone Management Act, and construct the project. Cost sharing of planning, engineering, and design and periodic nourishment will be reevaluated and determined at the time of construction,

dependent on shoreline ownership and use, and subject to the availability of appropriations. Information provided in this report is reflective of conditions at the time of writing.

The non-federal sponsor for the shore protection project will be Miami-Dade County. The non-federal project sponsor would provide an up-front cash contribution for construction costs of the proposed project. The non-federal sponsor shall provide the entire cost of all material placed on or seaward of undeveloped lands and developed private lands (which are inaccessible to the public). The non-federal sponsor shall provide lands, easements, and rights-of-way and bear a portion of the administrative costs associated with land requirements. Other general non-federal responsibilities, such as continuing public use of the project beach for which benefits are claimed in the economic justification of the project, and controlling water pollution to safeguard the health of bathers, must also be assumed by the non-federal sponsor before future renourishments. The non-federal project sponsor will be responsible for all costs of operation, maintenance, repair, rehabilitation and replacement of project features. Section 402 of the 1986 Water Resources Development Act (33 USC 701b-12) as amended by Section 14 of the 1988 Water Resources Development Act states, "Before construction of any project for local flood protection, or any project for hurricane or storm damage reduction, that involves Federal assistance from the Secretary, the non-Federal interest shall agree to participate in and comply with applicable Federal floodplain management and flood insurance programs." The non-federal sponsor and communities must be enrolled in and in compliance with the National Flood Insurance Program (NFIP) to receive Federal funding for a recommended storm damage reduction project. Miami-Dade County is enrolled in and in compliance with the NFIP.

11.0 REAL ESTATE REQUIREMENTS

In 1961, Florida enacted the Shore and Beach Preservation Act to restore and maintain critically eroded beaches within the State. Florida Law Chapter 61-246, as later codified by Florida Statute Sections 161.011 – 161.45, established the procedures for beach restoration allowing government entities to deposit sand on eroded beaches and maintain the deposited sand. The Act authorized the Board of Trustees of the Internal Improvement Trust Fund to establish a fixed erosion control line (ECL) to replace the fluctuating mean high water line. The ECL became the fixed property line between public and private lands.

As a result, the lands within the 13 miles of the beach placement area located between FDEP monuments R-7 and R-74 are seaward of the ECL and are publicly owned by the State of Florida. Therefore, there will be no placement of sand on private lands and no easements are required.

An Interagency Cooperation Agreement between the Corps and the Florida Department of Environmental Protection (FDEP) states that the FDEP will provide authorization to use sovereign submerged lands to the sponsor. Such permits are issued in ten year increments. Costs associated with obtaining the permit from the State are administrative.

Public access to the beach is addressed in other sections of this report.

Temporary work area easements between two to five years are required for construction access, staging, and stockpile areas. The sponsor owns the street ends required for constructor access as well as the staging area at Haulover Beach Park. Lummus Public Park is owned by the City of Miami and will provide the sponsor a temporary easement for project use. The sponsor will certify the lands prior to

contract advertisement. The same areas have been used for prior construction projects. See the Real Estate Appendix for maps showing the locations.

A Memorandum of Agreement between the Bureau of Ocean Energy Management (BOEM), the Corps , and the project sponsor will be executed pursuant to 43 United States Code, Section 1337(k)(2) for use of the borrow areas located in the Ocean Continental Shelf in Offshore Zone C.

Real Estate acquisition will not be required for the upland borrow areas as the material will be purchased from commercial sand mines and hauled by truck to the nourishment sites.

12.0 DESCRIPTION OF PROJECT AGREEMENTS

No changes to the existing project agreements are anticipated for implementation of recommendations of this document.

Two separate agreements and three supplements have been executed between the United States and Miami Dade County, Florida for the authorized project.

The original project agreement for local cooperation at Dade County beaches was executed on 12 October 1972. The County agreed that if the Government commences construction of the Beach Erosion and Hurricane Protection, Dade County, Florida, in accordance with Section 203 of the River and Harbor Act of 1968 (Public Law 90-483), they would fulfill the following non-federal cooperation requirements as listed in Paragraph 1 of the Agreement between the United States of America and Dade County, Florida for local cooperation at Dade County Beaches:

a. Contribute in cash for the first costs of the work between Government Cut and Bakers Haulover Inlet:

(1) Amounts ranging from 60.2 percent of the cost of the fill within the project limit, with existing shorefront ownership, estimated at $17,005,000.00 at the time of authorization to 39.3 percent of the cost of this fill with public shorefront ownership, estimated at $11,109,000.00 at the time of authorization, all excluding costs and including credits for lands, easements, rights-of-way, relocations, and pre-project work, the final apportionment of costs to be determined on the basis of actual costs, cost allocations, shore ownership, and use at the time of construction; and

(2) One hundred percent for the cost of the fill required landward of the project limit, estimated at $1,050,000 at the time of authorization and for the work at Haulover Beach Park, contribute 21.3 percent of the entire first cost excluding costs for lands, easement, rights-of-way, relocations, and pre-project work, but including credit for pre-project work, an amount estimated at $147,000 at this time of authorization; such contributions to be paid in a lump sum prior to start of construction, or in installments prior to start of pertinent work items in accordance with construction schedules as required by the Chief of Engineers, the final allocation and apportionment of costs to be made after the actual costs have been determined;

b. contribute in cash for the first 10 years of project life, amounts ranging from 88.9 percent of the nourishment cost for the beach, with ownership existing at the time of preparation of the survey report to 60.7 with public ownership, and the entire maintenance cost for the dune, all between Government Cut and Bakers Haulover Inlet, estimated at the time of authorization from $378,000 to $258,000 and $17,000 annually respectively the final apportionment of costs to be determined on the basis of actual costs, cost allocations, shore ownership and use at the time of construction, and 30

percent of the nourishment cost for Haulover Beach park, estimated at the time of authorization at $14,000 annually, such contribution to be prior to each nourishment operation;

c. provide at their own expense all necessary lands, easements, rights-of-way, and relocations required for construction and subsequent maintenance of the project, estimated at the time of authorization at $190,000 for the combined beach erosion control hurricane protection project between Government cut and Bakers Haulover Inlet, and $10,000 for the beach erosion control project at Haulover Beach Park…..

e. assure continued public ownership and use of the shore upon which the amount of Federal participation is based and its administration for public use during the economic life of the project;

f. assure maintenance of the groin, and after the first 10 years of project life, periodic nourishment of the protective beach and maintenance of the dune during the economic life of the project, as required to serve the intended purpose…..

h. prevent removal or relocation by man of fill from the beach, berm, and dune, thereby insuring proper dimensions and elevations as called for by the plan of improvement;

i. prevent the erection of barriers to the littoral movement of material that would interfere with the nourishment of the beach;

j. maintain throughout the project life, at the parks qualifying for 70 percent Federal participation, a zone that excludes permanent human habitation and are that include but are not limited to recreational beaches, that satisfy criteria for conservation and development of the natural resources, that extend landward a sufficient distance to protect the uplands from damage, and that provide essentially full park facilities for public use all of which shall meet the approval of the Chief of Engineers;

k. At least annually inform interests affected that the project will not provide complete protection from a hurricane to the level equal to or higher in elevation than that of the hurricane of September 1926 and will not reduce flooding resulting from tides generated in the bay;

l. establish in public ownership for public use the beaches within project limits as a requirement for Federal participation in the allocated beach erosion control costs of improvement of shores presently in private ownership, with acceptable access and other facilities necessary for public use.

Supplemental Agreement No. 1 to the original agreement was executed on 5 December 1975. The agreement provided Miami Dade County the approval to perform the initial construction of the Bal Harbour 0.85 mile segment and defined the reimbursement percentages.

Supplemental Agreement, unnumbered, executed on 29 April 1976 changed reimbursement amounts in the engineering, design, supervision, and inspection reimbursable items on Supplemental Agreement No. 1.

Sunny Isles Beach Segment was added to the project pursuant to Supplemental Appropriations Act of 1985, Public Law 99-88. A project agreement was executed on 20 June 1986 and outlined the conditions for renourishment of the additional 2.5 miles of beach north of Haulover Beach Park. The County agreed that if the Government commences construction of the North of Haulover Beach Park Beach Erosion and Hurricane Protection, Dade County, Florida, they would fulfill the following non-Federal cooperation requirements as listed in Article II of the Agreement between the Department of the Army and

Metropolitan Dade County, Florida for the beach erosion control project north of Haulover Beach Park, Dade County, Florida:

a. as further specified in Article IIIa. hereof, provide without cost to the Government all necessary lands, easements, rights-of-way, relocations, including suitable borrow and disposal areas for excavated materials as determined by the Chief of Engineers to be required for implementation of the project, including that required for periodic nourishment.....

c. Assure continued conditions of public ownership and public use of the shore upon which the amount of Federal participation is based during the project.....

e. as required to realize the benefits upon which Federal participation is based, as stated in the General Design Memorandum of April, 1985, provide and maintain clearly marked beach access, nearby parking areas, and other public use facilities, open and available to all on equal terms.....

g. provide a cash contribution for periodic nourishment of the Project, such contribution to be made prior to each nourishment, with the actual amount to be based on then prevailing law and conditions of ownership and use at the time of each periodic nourishment. Periodic nourishment of privately owned shorefront will be one hundred percent non-Federal. Periodic nourishment of public shorefront will be cost-shared according to Article IIf, above.

h. provide 100% of the cost of the fill required landward of the project limit as defined by erosion control line.

Supplemental Agreement No. 2 dated 6 June 1989 modified the terms of the 1972 agreement and the 1976 unnumbered agreement associated with the 0.85 mile Bal Harbour Segment. The agreement changed the project from a 50-foot wide berm at elevation 9.0 and then sloping approximately 1 on 20 to mean low water and 1 on 40 from mean low water to intersection with existing bottom to creating a 240-foot berm at elevation 9.0 and then sloping 1 on 15 foot grade into the ocean.

13.0 CONCLUSION AND RECOMMENDATIONS

This report concludes that the project remains economically justified given the use of multiple sand sources to meet renourishment needs over the remaining period of Federal participation, ten years for the Main Segment and twenty three years for the Sunny Isles Segment. Economic justification is based on the Total Benefit to Cost Ratio (BCR) with recreation capped at 50%, per current policy. Accordingly, the BCR for the Main Segment is 1.7. The BCR for the Sunny Isles Segment is 2.8. Thus, this report recommends that multiple sand sources be approved for use by the project in order to meet renourishment needs over the remaining period of Federal participation.

Jason A. Kirk, P.E.
Colonel, U. S. Army
District Commander

14.0 REFERENCES

Additional references not identified in the “Related Studies and Reports” section include:

- Coastal Systems Portfolio Initiative - Technical Review of Coastal Projects: Shore Protection, Navigation and Ecosystem Restoration for the Nation’s Coastlines (USACE Spring 2012)

- The economic value of beaches – a 2013 update (Houston 2013)