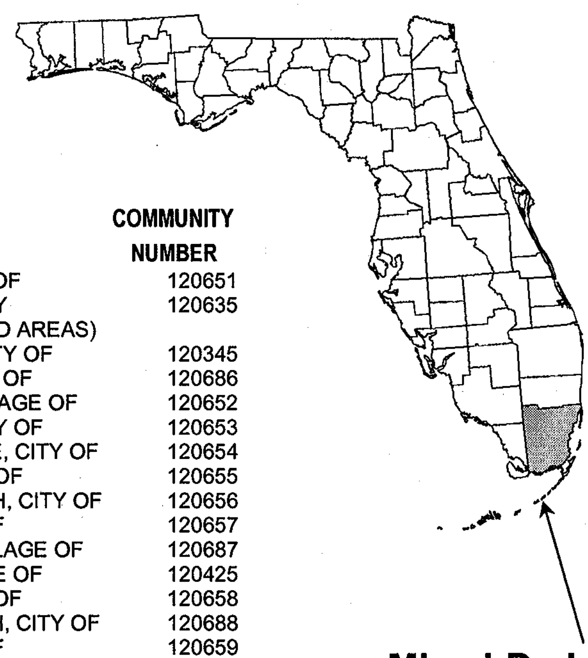
FLOOD INSURANCE STUDY

MIAMI-DADE COUNTY, FLORIDA

AND INCORPORATED AREAS



COMMUNITY NAME	COMMUNITY NUMBER
AVENTURA, CITY OF	120676
BAL HARBOUR VILLAGE, TOWN OF	120636
BAY HARBOR ISLANDS, TOWN OF	120637
BISCAYNE PARK, VILLAGE OF	120638
CORAL GABLES, CITY OF	120639
CUTLER BAY, TOWN OF	120218
DORAL, CITY OF	120041
EL PORTAL, VILLAGE OF	120640
FLORIDA CITY, CITY OF	120641
GOLDEN BEACH, TOWN OF	120642
HIALEAH, CITY OF	120643
HIALEAH GARDENS, CITY OF	120644
HOMESTEAD, CITY OF	120645
INDIAN CREEK VILLAGE, VILLAGE OF	120646
ISLANDIA, CITY OF	120647
KEY BISCAYNE, VILLAGE OF	120648
MEDLEY, TOWN OF	120649
MIAMI, CITY OF	120650

COMMUNITY NAME	COMMUNITY NUMBER
MIAMI BEACH, CITY OF	120651
MIAMI-DADE COUNTY (UNINCORPORATED AREAS)	120635
MIAMI GARDENS, CITY OF	120345
MIAMI LAKES, TOWN OF	120686
MIAMI SHORES, VILLAGE OF	120652
MIAMI SPRINGS, CITY OF	120653
NORTH BAY VILLAGE, CITY OF	120654
NORTH MIAMI, CITY OF	120655
NORTH MIAMI BEACH, CITY OF	120656
OPA-LOCKA, CITY OF	120657
PALMETTO BAY, VILLAGE OF	120687
PINECREST, VILLAGE OF	120425
SOUTH MIAMI, CITY OF	120658
SUNNY ISLES BEACH, CITY OF	120688
SURFSIDE, TOWN OF	120659
SWEETWATER, CITY OF	120660
VIRGINIA GARDENS, VILLAGE OF	120661
[1]WEST MIAMI, CITY OF	120662

[1]Non-Floodprone Community

REVISED:
SEPTEMBER 11, 2009

Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER
12086CV000A

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program (NFIP) have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study (FIS) may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

Part or all of this FIS may be revised and republished at any time. In addition, part of this FIS may be revised by the Letter of Map Revision (LOMR) process, which does not involve republication or redistribution of the FIS. It is, therefore, the responsibility of the user to consult with community officials and to check the community repository to obtain the most current FIS components.

Initial Countywide FIS Effective Date:	January 20, 1993
Revised Countywide FIS Date:	March 2, 1994 – to change Special Flood Hazard Areas, to update map format, and to change Base Flood Elevations May 16, 1994 (Flood Insurance Rate Map only) – to add Flood Hazard Zone Elevation boundary July 17, 1995 (Flood Insurance Rate Map only) – to modify Coastal Barrier Resources System units September 11, 2009

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FLOOD INSURANCE STUDY
MIAMI-DADE COUNTY AND INCORPORATED AREAS, FLORIDA

1.0 INTRODUCTION

1.1 Purpose of Study

This countywide format Flood Insurance Study (FIS) revises and updates a previous FIS/Flood Insurance Rate Map (FIRM) for the geographic area of Miami-Dade County, Florida, including: the Cities of Aventura, Coral Gables, Doral, Florida City, Hialeah, Hialeah Gardens, Homestead, Islandia, Miami, Miami Beach, Miami Gardens, Miami Springs, North Bay Village, North Miami, North Miami Beach, Opa-Locka, South Miami, Sunny Isles Beach, and Sweetwater; the Towns of Bal Harbour Village, Bay Harbor Islands, Cutler Bay, Golden Beach, Medley, Miami Lakes, and Surfside; the Villages of Biscayne Park, El Portal, Indian Creek Village, Key Biscayne, Miami Shores, Palmetto Bay, Pinecrest, and Virginia Gardens; and the unincorporated areas of Miami-Dade County (hereinafter referred to collectively as Miami-Dade County). The City of West Miami is non-floodprone.

This FIS aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood risk data for various areas of the community that will be used to establish actuarial flood insurance rates. This information will also be used by Miami-Dade County to update existing floodplain regulations as part of the Regular Phase of the National Flood Insurance Program (NFIP), and by local and regional planners to further promote sound land use and floodplain development. Minimum floodplain management requirements for participation in the NFIP are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

In some States or communities, floodplain management criteria or regulations may exist that are most restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the State (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

The sources of authority for this FIS are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

For the January 20, 1993, initial countywide FIS, the hydrologic and hydraulic analyses for the area of Miami-Dade County were performed by Gee & Jenson Engineers-Architects-Planners, Inc., for the Federal Emergency Management Agency (FEMA), under Contract No. EMW-C-0159. This work was completed in February 1985.

For the March 2, 1994, FIS, a computer-generated digital base map of Miami-Dade County was provided to FEMA by the Metro-Dade County Office of

Computer Services and Information Systems (Metro-Dade County, 1992). The coastal hydraulic analyses for the area covered by Transect 24 (refer to Section 3.2 of this report) was revised by Dewberry & Davis for FEMA, under Contract No. EMW-92C-3846. This work was completed in February 1993.

For this revision, revised hydrologic and hydraulic analyses and digital floodplain mapping for C-1, C-100, C-102, C-103, C-2, C-3, C-4, C-5, C-6, C-7, Florida City, Goulds, and North Canal basins were prepared by Miami-Dade County Department of Environmental Resources Management (DERM). This work was completed in August 2007.

For this revision, digital base mapping files of Miami-Dade County were provided to FEMA by the Miami-Dade County Information Technology Department. This data was compiled at a scale of 1:3,600 from digital orthophotography dated 2001.

Additional base map information was provided by the following communities: the Cities of Aventura, Coral Gables, and Homestead; and the Town of Cutler Bay.

The projection used in the preparation of this map was Florida State Plane, East Zone (FIPSZONE 0901). The horizontal datum was NAD 83, GRS80 spheroid.

1.3 Coordination

The purpose of an initial Consultation Coordination Officer's (CCO) meeting is to discuss the scope of the FIS. A final CCO meeting is held to review the results of the study.

For the January 20, 1993, FIS the initial CCO meeting for Dade County was held on June 25, 1982, and a final CCO meeting was held on September 10, 1986. Both of these meetings were attended by representatives of FEMA, the county, Gee & Jenson Engineers-Architects-Planners, Inc.

For this revision, the following CCO meetings were held:

- An initial CCO meeting was held via telephone-conference on July 19, 2002, and was attended by representatives of FEMA, the county, and Dewberry & Davis.

- An intermediate CCO meeting was held on September 18, 2002, and was attended by representatives of FEMA, the county, and Dewberry & Davis.

- An intermediate CCO meeting was held on April 11, 2003, and was attended by representatives of FEMA, the county, the City of Miami, the City of West Miami, the South Florida Water Management District (SFWMD), U.S. Army Corps of Engineers, PBS&J, M.J. Ross and Associates, and Dewberry & Davis.

- An intermediate CCO meeting was held on March 11, 2004, and was attended by representatives of FEMA, the county, SFWMD, and Dewberry & Davis.

- An intermediate CCO meeting was held on December 16, 2004, and was attended by representatives of FEMA, the county, SFWDM, and Dewberry & Davis.

- An intermediate CCO meeting was held on February 14, 2005, and was attended by representatives of the county and SFWMD.

- A preliminary DFIRM CCO meeting was held on February 10, 2006, and was attended by representatives of FEMA, SFWMD, the county, Dewberry & Davis, Kimley-Horn & Associates, the Town of Surfside, and Cities of Aventura, Coral Gables, Hialeah, Hialeah Gardens, Miami Beach, Miami Springs, North Miami Beach, Sunny Isles Beach, and Sweetwater; and the Villages of El Portal, Miami Shores, and Palmetto Bay.

- A revised preliminary DFIRM CCO meeting was held on January 30, 2008, and was attended by representatives of FEMA, SFWMD, the county, Dewberry & Davis, the Cities of Aventura, Coral Gables, Doral, Florida City, Hialeah, Homestead, Miami, Miami Gardens, North Miami, South Miami, and Sunny Isles Beach; the Towns of Bay Harbor Islands, Cutler Bay, Medley, Miami Lakes, and Surfside; and the Villages of Biscayne Park, Indian Creek Village, Key Biscayne, Miami Shores, Palmetto Bay, and Pinecrest.

- No final CCO meeting was held for this revision.

2.0 AREA STUDIED

2.1 Scope of Study

This FIS covers the geographic area of Miami-Dade County, Florida.

January 20, 1993, FIS

All or portions of the following sources have been studied by detailed methods: the coastlines of the Atlantic Ocean, Florida Bay, and Biscayne Bay.

Ponding areas studied to determine flood levels on a volumetric basis include the following: the Vanderbilt Park area north of State Road 836 to State Road 25 and west from State Road 826 to State Road 821; the area west of State Road 821 to State Road 27 and south of State Road 25 to State Road 90; the Kendall Lakes area north to State Road 90 and west of State Road 821 to State Road 27; the Tamiami Airport area west of Lingren Road to State Road 27 and south of State Road 94 to Eureka Drive; the University of Miami area from the C-1W Canal north to State Road 94 and west of State Road 821 to Lingren Road; the area west of the Florida East Coast Railway to the CSX Transportation and south of the

C-1W Canal to the C-103N Canal; the area west of the Florida East Coast Railway to State Road 27 and south of the C-103N Canal to the City of Homestead; the area south of State Road 94 to Hainlin Drive and west of State Road 27 to L-30 including the area east of State Road 27 to CSX Transportation from Eureka Drive to Hainlin Drive; an area in the East Everglades west of L-30 and north of Grossman Drive to Lots 2 through 6; the area west of State Road 27 to L-31N and south of Hainlin Drive to Mowry Drive; and the Florida City area from Mowry Drive south State Road 27 and west to Loveland Road.

The areas studied by detailed methods were selected with priority given to all known flood hazard areas and areas of projected development and proposed construction.

All or portions of the following flooding sources in the county were studied by approximate methods: Miami River Canal, the Miami River, the Little River Canal, Snake Creek Canal, Snapper Creek Canal, and Canals C-100 and C-100B. For the remaining area in southern Miami-Dade County east of the Florida East Coast Railway to the limit of coastal flooding, flood profiles were estimated for Canals C-1, C-102, C-102N, C-103, C-103N, and C-103S based on the results of the approximate canal studies and shallow flooding area studies. Approximate analyses were used to study those areas having a low development potential or minimal flood hazards. The scope and methods of study were proposed to, and agreed upon by, FEMA and Miami-Dade County.

March 2, 1994, FIS

Special Flood Hazard Areas and Base Flood Elevations were changed to reflect updated coastal hydraulic analyses for the area covered by Transect 24 of Biscayne Bay. In addition, the FIRM was converted to a digital map format. A computer generated digital map of Miami-Dade County provided by the Metro-Dade County Office of Computer Services and Information Systems was used as the base map for the revised FIRM (Metro-Dade County, 1992). As a result of the digital conversion process, the FIRM reflected minor adjustments to road and streamline locations and floodplain boundaries from what was shown on previous versions of the Miami-Dade County FIRM.

May 16, 1994, FIRM

Selected FIRM panels and the Index were revised to reflect the addition of Flood Hazard Zone elevation boundary.

July 17, 1995, FIRM

Selected FIRM panels and the Index were revised to reflect modifications of the Coastal Barrier Resource Systems units.

Revised Countywide FIS

For this revision, revised hydrologic and hydraulic analyses and digital floodplain mapping for C-1, C-100, C-102, C-103, C-2, C-3, C-4, C-5, C-6, C-7, Florida City, Goulds, and North Canal basins were prepared by Miami-Dade County Department of Environmental Resources Management. In addition, digital base mapping files of Miami-Dade County were provided to FEMA by the Miami-Dade County Information Technology Department.

This FIS also incorporates the determinations of letters issued by FEMA resulting in map changes (Letter of Map Revision [LOMR], Letter of Map Revision - based on Fill [LOMR-F], and Letter of Map Amendment [LOMA], as shown in Table 1, "Letters of Map Correction."

TABLE 1 - LETTERS OF MAP CORRECTION

Community	Flooding Source(s)/Project Identifier	Date Issued	Type
Miami-Dade (Unincorporated Areas)	County Squire Lake	July 6, 1996	LOMR
Miami-Dade (Unincorporated Areas)	Sparling Lake	December 25, 1997	LOMR
Miami-Dade (Unincorporated Areas)	Biscayne Bay – West Property	September 6, 2002	LOMR
Miami-Dade (Unincorporated Areas)	Brickell Plaza	July 22, 2005	LOMR
City of Miami	Atlantic Ocean / Biscayne Bay – Yacht Club at Brickell	September 24, 1999	LOMR
City of Miami	Atlantic Ocean / Biscayne Bay – Four Seasons Hotel & Tower	September 3, 2002	LOMR
Village of Palmetto Bay	Atlantic Ocean / Biscayne Bay – West Property	September 6, 2002	LOMR
City of Miami	Atlantic Ocean / Biscayne Bay – SOSA Property	June 26, 2003	LOMR
City of Miami	Atlantic Ocean / Biscayne Bay – Villa Magna / Jade Residences	February 27, 2004	LOMR
City of Miami	Atlantic Ocean / Biscayne Bay – Ice Condominium	February 16, 2005	LOMR
City of Miami	Atlantic Ocean / Biscayne Bay – The Plaza on Brickell	July 22, 2005	LOMR
City of Miami	Atlantic Ocean / Biscayne Bay – The Island of Brickell Key	June 30, 2006	LOMR
City of Miami	Atlantic Ocean / Biscayne Bay – The Island of Brickell Key	October 30, 2006	LOMR

TABLE 1 - LETTERS OF MAP CORRECTION - continued

Community	Flooding Source(s)/Project Identifier	Date Issued	Type
City of Miami	Atlantic Ocean / Biscayne Bay – The Cite	February 7, 2007	LOMR
City of Miami	Atlantic Ocean / Biscayne Bay – Paramount at Edgewater Square	January 22, 2008	LOMR
City of Miami	Atlantic Ocean / Biscayne Bay – Quantum on the Bay	July 31, 2008	LOMR

2.2 Community Description

Miami-Dade County is located at the southeastern tip of the Florida Peninsula and is bordered on the east by the Atlantic Ocean and Biscayne Bay. It is also bordered by Collier County to the northwest, Broward County to the north, and Monroe County and Florida Bay to the southwest and south. The City of Miami is located in the northeast portion of Miami-Dade County. Other major cities include the Cities of Miami Beach, Coral Gables, North Miami Beach, and Hialeah. The total area encompassed by Miami-Dade County is 1,955 square miles (U.S. Department of Commerce, 1981).

Miami-Dade County is Florida's most populous county. The county is served by a network of highways including Florida's Turnpike and Interstates 75 and 95. Major roads include U.S. Routes 1, 27, 41, and 441. Miami-Dade County's network of state routes includes State Routes 9, 27, 826, and 828. Service also includes the Florida East Coast Railway, the CSX Transportation, Miami International Airport, the Port of Miami, and a system of canals including the Intracoastal Waterway (State of Florida, 1983). Public transportation includes bus service, mass transit train (Metrorail), and commuter rail (Tri-Rail). In 2006, the population of Metro-Dade County was estimated to be 2,402,208. This represents a 6.6-percent increase from 2000 to 2006 (U.S. Bureau of the Census, 2006).

Miami-Dade County is flat and low with elevations generally below 10 feet National Geodetic Vertical Datum of 1929 (NGVD). The western and southern areas are mostly marsh with a mean elevation of approximately five feet Mean Sea Level (MSL). Drainage is mainly into the Atlantic Ocean or the Everglades, which is a vast expanse of marshland covering much of the southern part of the state (State of Florida, 1983).

Almost one-third of Miami-Dade County falls within the Everglades National Park (State of Florida, 1983). Drainage and water supply canals draining interior portions of the state traverse through the metropolitan areas of the county and discharge into Biscayne Bay and the Atlantic Ocean.

Biscayne National Park covers all of Biscayne Bay south of Key Biscayne to the Miami-Dade/Monroe County line and includes the City of Islandia.

The climate of Miami-Dade County is subtropical marine, characterized by a long, warm summer with abundant rainfall followed by a mild, dry winter. The marine influence is evident by the low daily range of temperatures and the rapid warming of cold air masses that pass to the east of the state. The Miami area is subject to frequent winds from the east or southeast. The average daily range of temperature is only 10 degrees Fahrenheit (^{o}F) at Miami Beach and well inland the average daily range is near 18^{o}F (State of Florida, 1983). Miami-Dade County has an average annual rainfall of 57.77 inches (The University Presses of Gainesville, 1983).

2.3 Principal Flood Problems

Miami-Dade County is located along the Atlantic Ocean, Florida Bay, and Biscayne Bay and is susceptible to flooding from tidal surges associated with tropical storms and hurricanes. Miami-Dade County's sandy beach areas are located on the Atlantic side of several coastal barrier islands separated from the mainland by Biscayne Bay. Wave energy in the area is low relative to other portions of Florida, primarily due to the proximity of the Bahamas Banks, which provides a sheltering effect from most oceanic storm waves. Additional problems are presented by ponding in the very flat, poorly drained areas and drainage canals that traverse portions of the county.

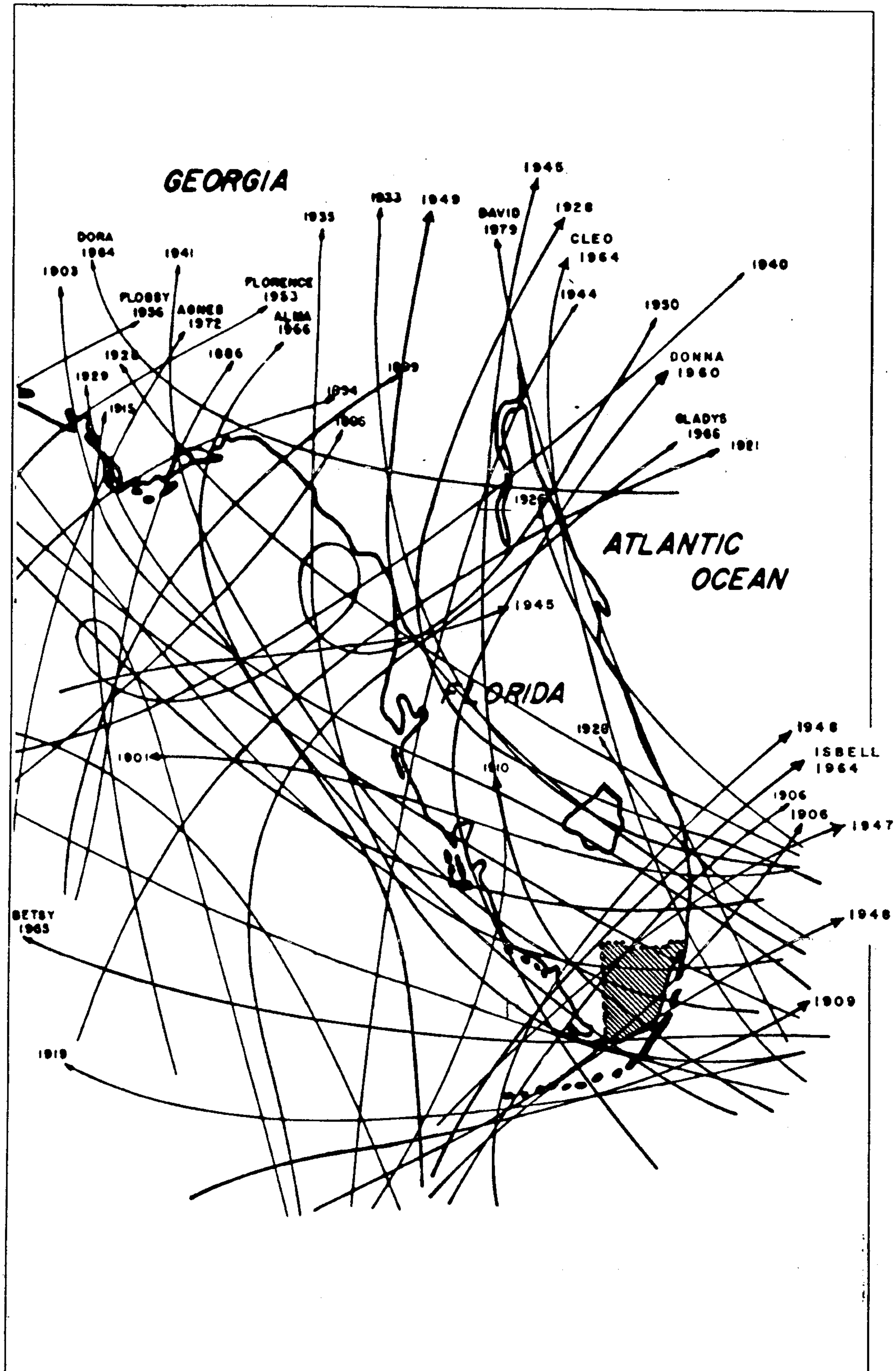
There is considerable historical evidence of storms affecting the southeastern coast of the U.S. during and prior to the 1900s (American Meteorological Society, 1963). The tracks of some of the larger storms occurring in the region, including the 1926 hurricane, are shown in Figure 1, "Historical Storm Tracks (1900-1981)."

Beach erosion problems were negligible until the passage of the 1926 hurricane. This Category 3 storm caused structural and flood damage to existing buildings and infrastructure on the island, as well as significant beach erosion. This "damage prompted the first efforts at beach erosion control, largely consisting of the installation of sheet pile or wood groin fields. The use of these structures became so extensive that littoral sand movement was restricted, and sand lost to offshore areas began to occur during storm events, leading to additional shore erosion. By the mid 1950's, over 56% of the shoreline within the project area had no dry beach at high tide (U.S. Corps of Engineers, 1975). In addition to the impacts the lack of a beach had on the tourism economy, the lack of a protective beach often led to extensive property damage during storm events" (Miami-Dade County, 2008).

Flooding has been caused by several hurricanes as the centers passed through or near Miami-Dade County. Some of the most severe are as follows.

<u>September 6-22, 1926</u>

This was the most severe storm on record to hit the Miami area. Miami Beach recorded a maximum two-minute average wind velocity of 132 miles per hour (mph). Storm tides of 13.2 and 10.9 feet NGVD were recorded at Coconut Grove and at the mouth of the Miami River, respectively (USACE, 1961).



HISTORICAL STORM TRACKS (1900 - 1981)

FEDERAL EMERGENCY MANAGEMENT AGENCY

MIAMI-DADE COUNTY, FL AND INCORPORATED AREAS

FIGURE 1

October 30 - November 8, 1935

Gust in excess of 150 mph were responsible for a tide of eight feet NGVD at Dinner Key, south of Miami (USACE, 1961).

September 11-19, 1947

Maximum wind speed at Miami was approximately 90 mph and tides at Miami Beach reached a height of 4.2 feet NGVD (USACE, 1961).

October 9-15, 1947

This hurricane, with accompanying wave washover, caused minor flooding on the bay side of Miami Beach.

Hurricane King - October 15-19, 1950

Winds gusted up to 150 mph and tides of over 5 feet NGVD were recorded in Biscayne Bay. A tide height of 5.1 feet NGVD was recorded at Miami Beach (USACE, 1961).

Hurricane Cleo - August 20-September 5, 1964

The Florida Keys reported tides of 3.6 feet NGVD (American Meteorological Society, 1980).

Hurricane Betsy - August 27-September 12, 1965

This hurricane caused considerable flooding between the greater Miami and Palm Beach area. Miami Beach reported at 6.1 feet Mean Low Water (MLW) tide (American Meteorological Society, 1980).

Hurricane Andrew - August 24, 1992

This hurricane made landfall near Homestead in southern Miami-Dade County. It destroyed 25,000 homes and damaged more than 200,000 others in south Florida. Andrew produced approximately 7 inches of rain, a maximum storm surge of 16 feet, 165 mph sustained winds, and was later rated as a Category 5 hurricane (State of Florida, 2007).

Hurricane Irene – October 14-20, 1999

Hurricane Irene was a Category 1 storm as it made landfall in Monroe and Miami-Dade Counties, moving southwest to northeast. The storm caused major flooding due to 9-18 inches of rainfall, beach erosion, and minor wind damages. Property damages exceeded $327 million statewide (State of Florida, 2007).

In some residential areas, flooding lasted for a week displacing several hundred people and isolating thousands more. The total losses (agricultural and property) were estimated near $600 million mostly in Dade, Broward and Palm Beach counties. Additional losses to near $200 million occurred in the rest of the state of Florida. An estimated 700,000 costumers lost electricity (National Hurricane Center, 1999).

No-Name Storm – October 3-4, 2000

This subtropical depression interacted with a stalled frontal boundary across southern Florida to produce widespread rainfall, with accumulations of 12 to 18 inches. These include 17.5 inches in South Miami, 15.79 inches at the Miami Weather Forecast Office (near Sweetwater), and 15.30 inches at Miami International Airport. Flood damage in southeast Florida was estimated at $700 million (National Hurricane Center, 2000).

2005 Hurricanes

According to a Tropical Weather Summary published by the National Hurricane Center, the 2005 Atlantic hurricane season was the most active on record. Twenty-eight tropical storms formed, including one subtropical storm, breaking the old record of 21 set in 1933. Fifteen storms became hurricanes, breaking the old record of 12 set back in 1969. Seven of the hurricanes became major hurricanes, category three or higher on the Saffir-Simpson hurricane scale, including four, Emily, Katrina, Rita, and Wilma that reached Category five intensity. This is the first time in the available records dating back to 1851 that four category five hurricanes have occurred in a season. In contrast, in an average season there would have been 11 named storms, 6 hurricanes, and 2 major hurricanes. The season also included three depressions that did not reach tropical storm strength (National Hurricane Center, 2007).

Hurricane Katrina – August 25, 2005

Katrina first made land fall on August 25, 2005, near the Miami-Dade / Broward County line as a category one hurricane. Rainfall was heavy in places and exceeded 14 inches in Homestead, Florida. A storm surge of 3-5 feet was measured in parts of Monroe County (State of Florida, 2007).

Katrina was one of the most devastating natural disasters in United States history, producing catastrophic damage and many casualties in the New Orleans area and along the Mississippi Gulf Coast and additional casualties in Florida, Georgia and Alabama. Katrina was directly responsible for an estimated 1500 deaths in the United States making it the deadliest U.S. hurricane since the Palm Beach-Lake Okeechobee hurricane of September 1928. Katrina also caused an estimated $81 billion dollars in damage, making it the costliest U.S. hurricane on record (National Hurricane Center, 2007).

Hurricane Wilma – October 24, 2005

Hurricane Wilma struck southwest Florida as a Category 3 hurricane on October 24, 2005, and moved through peninsula in just 4.5 hours. Because the hurricane moved quickly across the southern Florida peninsula, however, the rain amounts were not very large in Florida and storm totals ranged generally from 3 to 7 inches. Some locations in southeast Florida had totals of only 1 to 2 inches -- or less.

Based on the surface observations and the Doppler data it can be concluded that most of the southeastern Florida peninsula experienced at least category 1 hurricane conditions, and that some parts of northern Miami-Dade County, Broward, and Palm Beach Counties likely had category 2 hurricane conditions, including wind gusts to near 100 kt, at the standard 10 m height above ground. It is expected that the upper floors of the many high rise buildings in South Florida experienced wind speeds greater than occurred there at 10 m.

Relatively minor storm surge flooding occurred on the Biscayne Bay shoreline of Dade County.

In southern Florida, the swath of damage was unusually widespread due to the large size of Wilma's core. The damage included numerous downed trees, substantial crop losses, downed power lines and poles, broken windows, extensive roof damage, and destruction of mobile homes. Wilma caused the largest disruption to electrical service ever experienced in Florida. Media reports indicate up to 98 per cent of South Florida lost electrical service, and Florida Power and Light reported outages in 42 Florida counties. The amount of total insured damage compiled by the Property Claim Services of the Insurance Services Office, Inc., is $10.3 billion. Using a doubling of insured losses to obtain the total damage gives a current estimate of Wilma's U.S. damage of $20.6 billion, making Wilma the third costliest hurricane in U.S. history, behind only Katrina and Andrew (National Hurricane Center, 2006).

2.4 Flood Protection Measures

Currently, the interior lands in Miami-Dade County are drained by a network of canals, which are part of the central and southern Florida flood control project, with structures controlling the discharge into the Atlantic Ocean and Everglades. These canals are operated under the authority of the South Florida Water Management District (SFWMD). Miami-Dade County's shoreline is currently protected in part by Federal, local, and private projects. The Federal projects include the following:

1. A local cooperative agreement between the Federal government and the County was executed in October of 1972, providing the terms for cost-sharing and establishing a ten-year project life. The Miami-Dade County Beach Erosion Control and Hurricane Protection Project spans that part of the shoreline of Miami-Dade County between Government Cut and Haulover Beach Park, and was constructed from 1975 through 1982 (Miami-Dade County, 2008). This project involved placing 12,247,000 cubic yards of sand between Government Cut and Bakers Haulover Inlet (USACE, 1982).

For the highly developed segment from Government Cut through Bakers Haulover Inlet, the Project called for a 75' wide surge protection dune, followed by a 50' flat berm at an elevation of +9.0 feet, with natural seaward slopes. In Haulover Beach Park the surge protection dune feature was eliminated. The project design is intended to provide an 80% reduction in storm damage during a 100-year storm event.

The local cooperative agreement was amended in 1986 by the Water Resources Development Act and added the Sunny Isles Beach segment to the original project and extended the cost-sharing for both sections to fifty years. Phase 2 of the Project, completed in 1988, called for the construction of a 20'-wide level berm at an elevation of +9.0 feet with natural seaward slopes. It is 2.5 miles long, adjoins the segment at Haulover Park, and extends north to the Town of Golden Beach. (Miami-Dade County, 2008).

A number of areas [60% of the Project length] have required multiple nourishment events to maintain a viable beachfront (Miami-Dade County, 2008), indicating that the project may be deficient in providing surge protection in certain areas, since the beach is being washed away. The wave analysis performed for this Flood Insurance Study did not include the Miami-Dade County Beach Erosion Control and Hurricane Protection Project.

2. Virginia Key and Key Biscayne Beach Erosion Control Project included beach replenishment as well as a groin field to reduce otherwise excessive losses of the protective beach.

3. Another Federal flood protection measure consists of the placement of an initial 1,625,000 cubic yards of beach fill over a 0.85-mile segment of shore in Bal Harbour. In addition, the south jetty of Bakers Haulover Inlet was extended about 735 feet. Five adjustable groins were also placed in the fill section. In 1978, Bal Harbour planted assorted dune vegetation to stabilize the shoreline against wind erosion (USACE, 1972).

4. In 2002, when the 32nd Street breakwaters were constructed, approximately 125,000 cubic yards of sand were excavated from the southern portion of Miami Beach (from approximately 22nd to 5th Streets) and used to backfill behind the structures to minimize any downdrift effects that might otherwise occur (Miami-Dade, 2008).

5. In Miami-Dade County, nourishment projects are planned and implemented on an as-needed basis. The County conducts surveys of the entire Miami-Dade shoreline minimally on an annual basis. These annual surveys are supplemented by permit-required monitoring related to specific projects, and post-storm surveys of eroded areas as necessary. The resulting profiles are subsequently compared to the design sections of the Federal project by County consultants and the Corps. Areas where the profiles are nearing the Federal design section are targeted for

nourishment and the design and permitting is initiated for those areas (Miami-Dade, 2008).

Through mid-2006, a total of 26 nourishment projects have occurred, with 11 of these major nourishment events in excess of 100,000 cubic yards. Many of the remaining smaller placements were emergency truck haul projects to address several persistent erosional hotspots, particularly at the north end of Sunny Isles Beach (3 small projects), and from 27th to 34th Streets in Miami Beach (7 small projects). Breakwater structures have been installed at both these locations to moderate the high erosion rates with some success. Haulover Park has been used as a disposal area for maintenance dredging of beach quality sand from the Intracoastal Waterway just west of the park. More recently, these maintenance-dredging events have utilized Bal Harbour beach as the preferred disposal site for dredged material (Miami-Dade, 2008).

6. The C-4 Basin Flood Hazard Mitigation Project includes the installation of large pumps at control structures S25B and S26 to move outflow against the incoming tide; an emergency detention basin; and dredging and shaping of the supply canal (Miami-Dade County, 2005).

7. The Miami Beach Truck Haul Nourishment Project is a relatively small nourishment of three localized erosional hotspots located at approximately 27th, 44, and 55th Streets in Miami Beach. The project placed a total of 110,000 cubic yards (30,000, 50,000, and 30,000 cubic yards at 27th, 44th, and 55th Streets, respectively) of beach quality sand trucked in from inland quarries. Construction was initiated in April 2006 and was completed in November 2006. The total estimated cost of this project is $3.2 million, which was shared equally between the State of Florida and Miami-Dade County.

Private efforts for flood protection include the following: over 58 seawalls/bulkheads in the commercially developed 2.5-mile reach north of Haulover Beach Park as well as 21 groins of varying elevations along that reach; and 266 seawalls and bulk heads of which the top elevations are between 10 and 15 feet MLW within the 1.25-mile residential stretch known as Golden Beach. There are no groins present along this reach of shoreline.

FEMA specifies that all levees must have a minimum of 3 foot freeboard against 1-percent annual chance flooding to be considered a safe flood protection structure.

Levees exist in the study area; however, it has been ascertained that none of these levees can protect the community from rare events such as the 1-percent annual chance flood. The criteria used to evaluate protection against the 1-percent annual chance flood are 1) adequate design, including freeboard, 2) structural stability, and 3) proper operation and maintenance. Levees that do not protect against the 1-percent annual chance flood are not considered in the hydraulic analysis of the 1-percent annual chance floodplain.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the county, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude which are expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1, and 0.2 percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (1 percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency and peak elevation-frequency relationships for each flooding source studied in detail affecting the county.

Previous Countywide FIS

Snake Creek, Little River, Miami River, and Snapper Creek Canals, and Canals C-100 and C-100B were studied previously by the U.S. Army Corps of Engineers (USACE) (USACE, 1954). That study determined the standard project flood profile for each canal. The 1-percent annual chance flood profiles for Little River, Miami River, and Snapper Creek Canals, and Canals C-100 and C-100B were determined from approximate methods, supplemented by the USACE study. In addition to the USACE study, Snake Creek Canal was studied previously by the SFWMD (South Florida Water Management District, 1976). That study determined the 1-percent annual chance profile for Snake Creek Canal.

Hydrologic analyses were carried out for the 1-percent annual chance flood for each of the ponding study areas described in Section 2.1 of this study. The SFWMD Technical Paper No. 81-3 was used to determine the five-day rainfall for the 1-percent annual chance frequency (South Florida Water Management District, 1981).

The amount of rainfall that will run off (rainfall excess) from a particular basin is less than the total rainfall, due to infiltration loss, vegetation cover, and other characteristics. To establish the rainfall excess, the Soil Conservation Service (SCS) has developed runoff curve numbers, which relate rainfall to direct runoff

(U.S. Department of Agriculture, 1972). The runoff curve numbers were used to calculate the infiltration losses based on the soil type, vegetation cover, and land use in each ponding study area.

For Little River, Miami River, and Snapper Creek Canals, and Canals C-100 and C-100B, unit hydrographs developed in the USACE Detailed Design Memorandums for each canal were used to develop flood hydrographs (USACE, 1954). Flood hydrographs were developed by applying the rainfall excess to the unit hydrographs using the SCS Type II storm distribution. Peak discharges of flood hydrographs were then used for hydraulic application.

For the SFWMD study of Snake Creek Canal, two rainfall stations were selected for a frequency study of rainfall depth.

Inundation from the Atlantic Ocean, Biscayne Bay, and Florida Bay caused by passage of storms (storm surge) was determined by the joint probability method (U.S. Department of Commerce, 1970). The storm populations were described by probability distributions of five parameters that influence surge heights. These parameters were central pressure depression (which measures the intensity of the storm), radius to maximum winds, forward speed of the storm, shoreline crossing point, and crossing angle. These characteristics were described statistically based on analysis of observed storms in the vicinity of Miami-Dade County. Primary sources of the data for this analysis were prepared by the National Oceanic and Atmospheric Administration (NOAA) (U.S. Department of Commerce, 1978; U.S. Department of Commerce, 1975; U.S. Department of Commerce, 1979). A summary of the parameters used for the area are presented in Table 2, "Parameter Values for Surge Elevations (Alongshore Hurricanes)."

For areas subject to flooding directly from the Atlantic Ocean, Biscayne Bay, and Florida Bay, the FEMA standard storm surge model was used to simulate the coastal surge generated by any chosen storm (that is, any combination of the five storm parameters defined previously). By performing such simulations for a large number of storms, each of known total probability, the frequency distribution of surge height can be established as a function of coastal location. These distributions incorporate the large-scale surge behavior, but do not include an analysis of the added effects associated with much finer scale wave phenomena, such as wave height or runup. As the final step in the calculations, the astronomic tide for the region is then statistically combined with the computed storm surge to yield recurrence intervals of total water level (Tetra Tech, Inc., 1981).

The storm-surge elevations for the 10-, 2-, 1-, and 0.2-percent annual chance floods have been determined for Miami-Dade County and are shown in Table 3, "Summary of Stillwater Elevations." The analyses reported herein reflect the stillwater elevations due to tidal and wind setup effects and include the contributions from wave action effects.

CENTRAL PRESSURE DEPRESSION (MILLIBARS)	19	33	47	61	75	89	103	117
AVERAGE ASSIGNED PROBABILITIES*	.38	.21	.14	.11	.09	.04	.02	.01
STORM RADIUS TO MAXIMUM WINDS (NAUTICAL MILES)		13.0			28.0			
PROBABILITY		.48			.52			
FORWARD SPEED (KNOTS)	9.5			18.0		26.5		
PROBABILITIES: ENTERING		.67			.30			.03
DIRECTION OF STORM PATH (DEGREES FROM TRUE NORTH)	224.0		291.5		359.0		65.5	
PROBABILITY	.03		.34		.35		.28	
FREQUENCY OF STORM OCCURRENCE (STORM/NAUTICAL MILE/YEAR)				.00558				

*Average of entering alongshore and exiting probabilities

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

MIAMI-DADE COUNTY, FL AND INCORPORATED AREAS

PARAMETER VALUES FOR SURGE ELEVATIONS (ALONGSHORE HURRICANES)

FLOODING SOURCE AND TRANSECT	FLOOD INSURANCE RATE MAP PANEL	STILLWATER ELEVATIONS (feet NGVD)				ZONE	BASE FLOOD ELEVATION[1,2] (FEET NGVD)
		10% (10-YEAR)	2% (50-YEAR)	1% (100-YEAR)	0.2% (500-YEAR)		
Atlantic Ocean/ Intracoastal Waterway							
1	132, 131	5.0	6.2	6.6	7.6	VE AE	9 – 10 7 – 9
		5.2	5.8	6.0	6.4	AE	6
2	134, 153	5.0	6.2	6.6	7.6	VE AE	9 – 10 7 – 9
		5.6	6.2	6.4	6.9	AE	6 – 7
3	134, 153	5.0	6.2	6.7	7.6	VE AE	9 – 10 7 – 9
4	134, 153	5.0 N/A	6.2 N/A	6.7 7.2	7.6 8.1	VE AE	9 – 10 7 – 9
5	142, 161	5.0 N/A	6.2 N/A	6.7 7.2	7.6 8.1	VE AE	9 – 10 7 – 9
6	142, 161	5.1	6.2	6.7	7.6	VE AE	9 – 10 7 – 8
		N/A	N/A	7.6	8.2	AE	8 – 9
7	142, 161	5.2 N/A	6.3 N/A	6.8 7.7	7.7 N/A	VE AE	9 – 11 7 - 9

[1]Rounded to the nearest foot and may include effects of wave action

[2]Due to map scale limitations, base flood elevations shown on map may represent average elevations for the zones depicted

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

MIAMI-DADE COUNTY, FL AND INCORPORATED AREAS

SUMMARY OF STILLWATER ELEVATIONS

ATLANTIC OCEAN/INTRACOASTAL WATERWAY

FLOODING SOURCE AND TRANSECT	FLOOD INSURANCE RATE MAP PANEL	STILLWATER ELEVATIONS (feet NGVD)				ZONE	BASE FLOOD ELEVATION[1,2] (FEET NGVD)
		10% (10-YEAR)	2% (50-YEAR)	1% (100-YEAR)	0.2% (500-YEAR)		
Atlantic Ocean/ Intracoastal Waterway							
8	143, 144, 163	5.2	6.3	6.8	7.7	VE	9 – 11
		7.0	7.5	7.8	8.7	AE	8 – 10
9	143, 144, 163	5.2	6.4	6.8	7.7	VE	9 – 11
						AE	7 – 9
		6.7	7.5	7.9	8.5	AE	8 – 10
10	143, 144, 163	5.2	6.4	6.9	7.8	VE	9 – 11
						AE	7 – 9
		7.0	7.5	8.9	8.7	AE	9 – 11
11	306, 307, 326	5.2	6.4	6.9	7.8	VE	9 – 11
						AE	7 – 9
		6.8	7.4	8.9	8.4	AE	9 – 11
12	306, 307, 326	5.3	6.5	7.0	7.9	VE	9 – 11
						AE	7 – 9
		7.0	7.5	8.9	8.6	AE	8 – 10
13	306, 309, 328	5.4	6.6	7.1	8.1	VE	9 – 11
						AE	7 – 9
		6.8	7.3	7.6	8.3	AE	8 – 10
14	308, 309, 328	5.4	6.7	7.2	8.1	VE	9 – 11
						AE	7 – 9
		6.6	N/A	7.3	N/A	VE	9 – 10
						AE	7 - 9

[1]Rounded to the nearest foot and may include effects of wave action

[2]Due to map scale limitations, base flood elevations shown on map may represent average elevations for the zones depicted

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

MIAMI-DADE COUNTY, FL AND INCORPORATED AREAS

SUMMARY OF STILLWATER ELEVATIONS

ATLANTIC OCEAN/INTRACOASTAL WATERWAY

FLOODING SOURCE AND TRANSECT	FLOOD INSURANCE RATE MAP PANEL	STILLWATER ELEVATIONS (feet NGVD) 10% (10-YEAR)	2% (50-YEAR)	1% (100-YEAR)	0.2% (500-YEAR)	ZONE	BASE FLOOD ELEVATION[1,2] (FEET NGVD)
Atlantic Ocean/ Intracoastal Waterway							
15	312, 316, 317	5.4	6.7	7.1	8.1	VE	9 – 11
						AE	7 – 9
		6.8	8.5	9.3	10.2	AE	9 – 11
16	314, 318, 319	6.8	8.5	9.0	10.4	VE	11 – 13
						AE	9 – 11
		7.4	9.2	9.8	11.1	AE	10 – 12
		5.5	6.7	7.2	8.2	VE	9 – 11
						AE	8 – 9
17	318, 481, 482	8.3	10.4	10.9	12.9	VE	13 – 15
						AE	11 – 13
		5.9	7.2	7.8	8.8	VE	11 – 12
						AE	8 – 10
18	477, 481, 482, 484	8.7	10.8	11.5	13.4	VE	14 – 15
						AE	12 – 14
		6.0	7.3	7.8	8.8	VE	10 – 12
						AE	8 – 10
19	477, 483, 484	7.9	9.9	11.4	12.6	VE	13 – 16
						AE	11 – 13
		5.6	6.9	7.3	8.4	VE	9 – 11
						AE	7 – 9
		8.8	10.9	11.5	13.7	AE	12 - 14
		7.4	9.2	9.9	11.5	AE	10 – 12
		6.8	8.5	9.0	10.7	AE	9 - 11

[1]Rounded to the nearest foot and may include effects of wave action

[2]Due to map scale limitations, base flood elevations shown on map may represent average elevations for the zones depicted

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

MIAMI-DADE COUNTY, FL AND INCORPORATED AREAS

SUMMARY OF STILLWATER ELEVATIONS

ATLANTIC OCEAN/INTRACOASTAL WATERWAY

FLOODING SOURCE AND TRANSECT	FLOOD INSURANCE RATE MAP PANEL	STILLWATER ELEVATIONS (feet NGVD)				ZONE	BASE FLOOD ELEVATION[1,2] (FEET NGVD)
		10% (10-YEAR)	2% (50-YEAR)	1% (100-YEAR)	0.2% (500-YEAR)		
Atlantic Ocean/ Intracoastal Waterway							
20	483, 484	5.6	6.9	7.3	8.4	VE	10 – 11
		6.2	7.8	8.4	9.9	AE	8 – 10
21	491, 492	5.7	7.0	7.4	8.5	VE	10 – 11
		6.2	7.7	8.4	9.3	AE	8 – 10
22	459, 467	8.2	10.4	10.8	12.6	VE	13 – 17
						AE	11 – 13
23	468, 469	8.4	10.5	11.0	12.8	VE	13 – 17
						AE	11 – 13
24	602, 606	8.7	10.7	11.6	13.1	VE	14 – 18
						AE	12 – 14
		7.7	9.3	9.9	11.3	AE	10 – 12
25	604, 608	8.7	10.4	11.3	12.6	VE	13 – 18
						AE	11 – 13
		6.8	8.2	9.1	10.7	AE	9 – 11
		5.8	6.9	7.7	9.1	AE	8 – 9
26	639, 643	6.2	7.5	8.0	8.9	VE	10 – 12
						AE	9 - 10

[1]Rounded to the nearest foot and may include effects of wave action

[2]Due to map scale limitations, base flood elevations shown on map may represent average elevations for the zones depicted

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

MIAMI-DADE COUNTY, FL AND INCORPORATED AREAS

SUMMARY OF STILLWATER ELEVATIONS

ATLANTIC OCEAN/INTRACOASTAL WATERWAY

FLOODING SOURCE AND TRANSECT	FLOOD INSURANCE RATE MAP PANEL	STILLWATER ELEVATIONS (feet NGVD) 10% (10-YEAR)	2% (50-YEAR)	1% (100-YEAR)	0.2% (500-YEAR)	ZONE	BASE FLOOD ELEVATION[1,2] (FEET NGVD)
Atlantic Ocean/ Intracoastal Waterway							
27	593, 594, 613, 614	8.8	10.6	11.4	12.8	VE	14 – 18
		8.6	10.8	11.0	12.9	AE	11 – 13
		6.8	7.9	8.6	9.7	AE	9 – 11
		5.5	6.4	7.0	7.9	AE	7 – 9
		4.0	4.6	5.0	5.6	AE	5 – 7
28	727, 731, 732, 755, 752	8.7	10.5	11.4	12.6	VE	14 - 18
						AE	12 – 14
		7.3	9.2	9.8	11.3	AE	10 – 12
		5.7	7.2	8.0	9.2	AE	8 – 10
		4.2	5.3	5.9	6.8	AE	6 – 8
29	777, 781	6.1	7.5	8.0	9.0	VE	11 – 12
		8.0	9.6	10.3	11.5	AE	11
30	730, 735-754, 755	8.7	10.6	11.2	12.4	VE	13 – 17
						AE	11 – 13
		7.1	8.3	8.9	9.9	AE	9 – 11
		5.6	6.4	6.9	7.7	AE	7 – 9
		3.9	4.5	4.8	5.4	AE	5 – 7
		2.6	3.0	3.2	3.6	AE	3 – 5
31	740, 745, 764, 765,	6.5	8.0	8.7	9.8	AE	9 – 11
	768, 769, 788,	8.5	10.1	10.8	12.0	AE	11 – 12
						VE	11 - 13

[1]Rounded to the nearest foot and may include effects of wave action

[2]Due to map scale limitations, base flood elevations shown on map may represent average elevations for the zones depicted

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

MIAMI-DADE COUNTY, FL AND INCORPORATED AREAS

SUMMARY OF STILLWATER ELEVATIONS

ATLANTIC OCEAN/INTRACOASTAL WATERWAY

FLOODING SOURCE AND TRANSECT	FLOOD INSURANCE RATE MAP PANEL	STILLWATER ELEVATIONS (feet NGVD)				ZONE	BASE FLOOD ELEVATION[1,2] (FEET NGVD)
		10% (10-YEAR)	2% (50-YEAR)	1% (100-YEAR)	0.2% (500-YEAR)		
Atlantic Ocean/ Intracoastal Waterway							
32	764, 768	8.7	10.7	11.0	12.1	VE	13 – 16
						AE	11 – 13
		6.4	7.9	8.6	9.9	AE	9
		5.3	6.0	6.2	7.0	AE	6 – 8
		3.5	4.0	4.1	4.6	AE	4 – 6
		1.6	1.8	1.9	2.1	AE	2 – 4
33	740, 745, 882, 901, 902, 904	8.2	9.8	10.4	11.3	VE	12 – 15
						AE	10 – 12
		5.8	6.8	7.3	8.1	VE	9 – 10
		4.4	5.1	5.3	5.9	VE	7 – 8
						AE	5 – 7
		2.6	3.1	3.2	3.6	AE	3 – 5
		1.6	1.8	1.9	2.1	AE	2
34	720, 740, 880, 883, 891, 892, 894	7.8	9.3	10.3	10.5	VE	12 – 15
						AE	10 – 12
		5.4	6.0	6.2	6.8	VE	8 – 9
		4.2	4.6	4.8	5.3	VE	7 – 8
						AE	5 – 7
		2.4	2.7	2.8	3.1	AE	3 – 5
		1.1	1.2	1.3	1.4	AE	1 - 3

[1]Rounded to the nearest foot and may include effects of wave action

[2]Due to map scale limitations, base flood elevations shown on map may represent average elevations for the zones depicted

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

MIAMI-DADE COUNTY, FL AND INCORPORATED AREAS

SUMMARY OF STILLWATER ELEVATIONS

ATLANTIC OCEAN/INTRACOASTAL WATERWAY

FLOODING SOURCE AND TRANSECT	FLOOD INSURANCE RATE MAP PANEL	STILLWATER ELEVATIONS (feet NGVD)				ZONE	BASE FLOOD ELEVATION[1,2] (FEET NGVD)
		10% (10-YEAR)	2% (50-YEAR)	1% (100-YEAR)	0.2% (500-YEAR)		
Atlantic Ocean/ Intracoastal Waterway							
35	720, 860, 880, 882, 886, 889, 1030	9.4	11.1	11.6	13.4	VE	14 – 18
						AE	12 – 14
		7.4	10.0	9.1	12.1	VE	11 – 12
						AE	10 – 11
		7.3	8.1	9.0	9.8	AE	10
		7.1	N/A	8.7	N/A	AE	9 – 10
		3.8	N/A	4.7	5.8	AE	5 – 7
		3.7	N/A	4.5	N/A	AE	4 – 5
		1.7	N/A	2.1	N/A	AE	2 – 3
		1.0	N/A	1.2	N/A	AE	1
36	720, 860, 870, 1025	9.4	N/A	11.6	N/A	D	N/A[3]
		3.6	N/A	4.4	N/A	AE	4 – 6
		1.7	N/A	2.1	N/A	AE	2 – 3

[1]Rounded to the nearest foot and may include effects of wave action

[2]Due to map scale limitations, base flood elevations shown on map may represent average elevations for the zones depicted

[3]Area not mapped—located in Everglades National Park

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

MIAMI-DADE COUNTY, FL AND INCORPORATED AREAS

SUMMARY OF STILLWATER ELEVATIONS

ATLANTIC OCEAN/INTRACOASTAL WATERWAY

Revised Countywide FIS

For this revision of the C-1, C-100, C-102, C-103, C-2, C-3, C-4, C-5, C-6, C-7, Florida City, Goulds, and North Canal basins, rainfall depths used in the Xpsoftware's Expert Stormwater and Wastewater Management (XP-SWMM) models were developed by statistically analyzing the rain gage data collected for gages within the basins. 72-hour duration storms and SFWMD rainfall distribution were used in the 1-percent annual chance and 0.2-percent annual chance flood simulation. 10-percent annual chance flood simulation used 24-hour duration storms and SFWMD rainfall distribution.

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals.

Previous Countywide FIS

For the ponding areas of Miami-Dade County, the hydraulic analyses were prepared using a variation of the basic "rainfall minus losses equals storage" relationship or the Hydrologic Budget Method. This methodology was used in determining excess rainfall amounts and water-surface elevations for the 1-percent annual chance flood.

The western portion of Miami-Dade County was divided into ponding areas, which were delineated by roadways, railroads, levees, and natural ridges. For each ponding area, the stage-storage relations were determined by planimetering contour maps to determine the area below each elevation. The degree of existing urban development and surface water was noted and expressed as a percentage of individual ponding areas. A weighted SCS runoff curve number for each study area was then developed based on the hydrologic soil groups of the soil types and the computed percentage of impervious areas.

To compute the storage capacity of the soil, depths to the water table were determined for the wet season from data furnished by the U.S. Geological Survey (USGS) (USGS, 1965-1978).

The 1-percent annual chance five-day volume of runoff in acre-feet was computed for each ponding area, and the water-surface elevation determined from the stage-storage relationship.

The 1-percent annual chance flood profiles for the Miami River, the Little River, and Snapper Creek Canals, and Canal C-100 were determined by approximate methods.

The approximate method involved using the USACE HEC-2 step-backwater computer program (USACE, 1988); USACE detailed design memorandums (USACE, 1954); aerial photographs (FEMA, 1981; Dade County Engineering

Department, 1984); 1-foot contour maps (Dade County, Florida, Board of County Commissioners, various dates); field investigations; and cross-sectional data obtained from SFWMD. Head loss through bridges was not considered.

The 1-percent annual chance flood profile for Snake Creek Canal was developed by the SFWMD with a computer program employing the standard step-backwater computation method (South Florida Water Management District, 1976).

Flooding caused by overflow of Canals C-1, C-102, C-102N, and C-103 Canals was studied by approximate methods. These canals discharge from shallow flooding areas bounded on the southeast by U.S. Route 1 and the Florida East Coast Railway. A one-foot elevation loss from the ponding study elevations was approximated for the U.S. Route 1 and Florida East Coast Railway crossings to obtain the upstream canal elevations. A linear relationship was assumed between these elevations and the approximate 1-percent annual chance elevations at solinity barrier structures S 20F, S 21, S 21A, and S 179.

Hydraulic analyses, considering storm characteristics and the shoreline and bathymetric characteristics of the flooding sources studied, were carried out to provide estimates of the elevations of floods of the selected recurrence intervals along each shoreline.

The FEMA storm surge model was utilized to simulate the hydrodynamic behavior of the surge generated by various synthetic storms. This model utilizes a grid pattern approximating the geographical features of the study area and the adjoining areas. Surges were computed utilizing grids of five by five nautical miles, and one by one nautical mile, depending on the resolution required. Before applying the numerical model to the study area, three recent hurricanes that have affected the study area were simulated for verification purposes. Surge elevations computed by the numerical model were compared to recorded tide gage heights at the City of Miami Beach, Florida. The results are listed below.

Location	Storm	Computed Plus Tide (Feet NGVD)	Feet NGVD
Miami Beach (City Pier)	1926	10.0	10.4 (a)
Miami Beach (City Pier)	King-1950	5.0	5.1 (b)
Miami Beach	Betsy 1965	5.5	5.5 (b)

a - High-Water Mark - "Survey Report - Analysis of Hurricane Problems in Coastal Areas of Florida," prepared by the USACE, dated September 29, 1961.

b - Data from the gaging station, NOAA, and National Ocean Survey (NOS).

Land elevations for the models were obtained from USGS topographic maps and the City of Miami topographic maps (U.S. Department of the Interior, 1962, et cetera; Dade County, Florida, Board of County Commissioners, various dates).

Friction factors (Manning's "n") for inland areas were chosen based upon aerial photography flown in 1981 and by field inspection in 1983 (Dade County, Florida, Board of County Commissioners, various dates). Manning's "n" values ranged from 0.025 to 0.300.

Water depths and land heights for the model grid systems were obtained from NOS hydrographic surveys with various dates and scales (U.S. Department of Commerce, Bathymetric Maps; U.S. Department of Commerce, Selected NOS Hydrographic Surveys).

The methodology for analyzing the effects of wave heights associated with coastal storm surge flooding is described in a National Academy of Sciences (NAS) report (National Academy of Sciences, 1977). This method is based on the following major concepts. First, depth-limited waves in shallow water reach a maximum breaking height that is equal to 0.78 times the stillwater depth. The wave crest elevation is 70 percent of the total wave height plus the stillwater elevation. The second major concept is that wave height may be diminished due to the presence of obstructions such as sand dunes, dikes and seawalls, buildings, and vegetation. The amount of energy dissipation is a function of the physical characteristics of the obstruction and is determined by procedures described in the report titled Methodology for Calculating Wave Action Effects Associated with Storm Surge (National Academy of Sciences, 1977). The third major concept is that wave height can be regenerated in open fetch areas due to the transfer of wind energy to the water. This added energy is related to fetch length and depth.

Wave heights were computed along transects (cross section lines) that were located along the coastal areas, as illustrated in Figure 2, "Transect Location Map," in accordance with the Users Manual for Wave Height Analysis (FEMA, 1981). The transects were located with consideration given to the physical and cultural characteristics of the land so that they would closely represent conditions in their locality. Transects were close together in areas of complex topography and dense development. In areas having more uniform characteristics, they were spaced at larger intervals. It was also necessary to locate transects in areas where unique flooding existed and in areas where computed wave heights varied significantly between adjacent transects. Each transect was taken perpendicular to the shoreline and extended inland to a point where wave action ceased. Along each transect, wave heights and elevations were computed considering the combined effects of changes in ground elevation, vegetation, and physical features.

The stillwater elevations for the 1-percent annual chance flood were used as the starting water-surface for these computations. Wave heights were calculated to the nearest 0.1 foot, and wave elevations were determined at whole-foot increments along the transects. The location of the 3-foot breaking wave determining the terminus of the V-Zone (area with velocity wave action) was also computed at each transect. Table 4 provides a listing of the transect locations and stillwater elevations, as well as initial wave crest elevations.

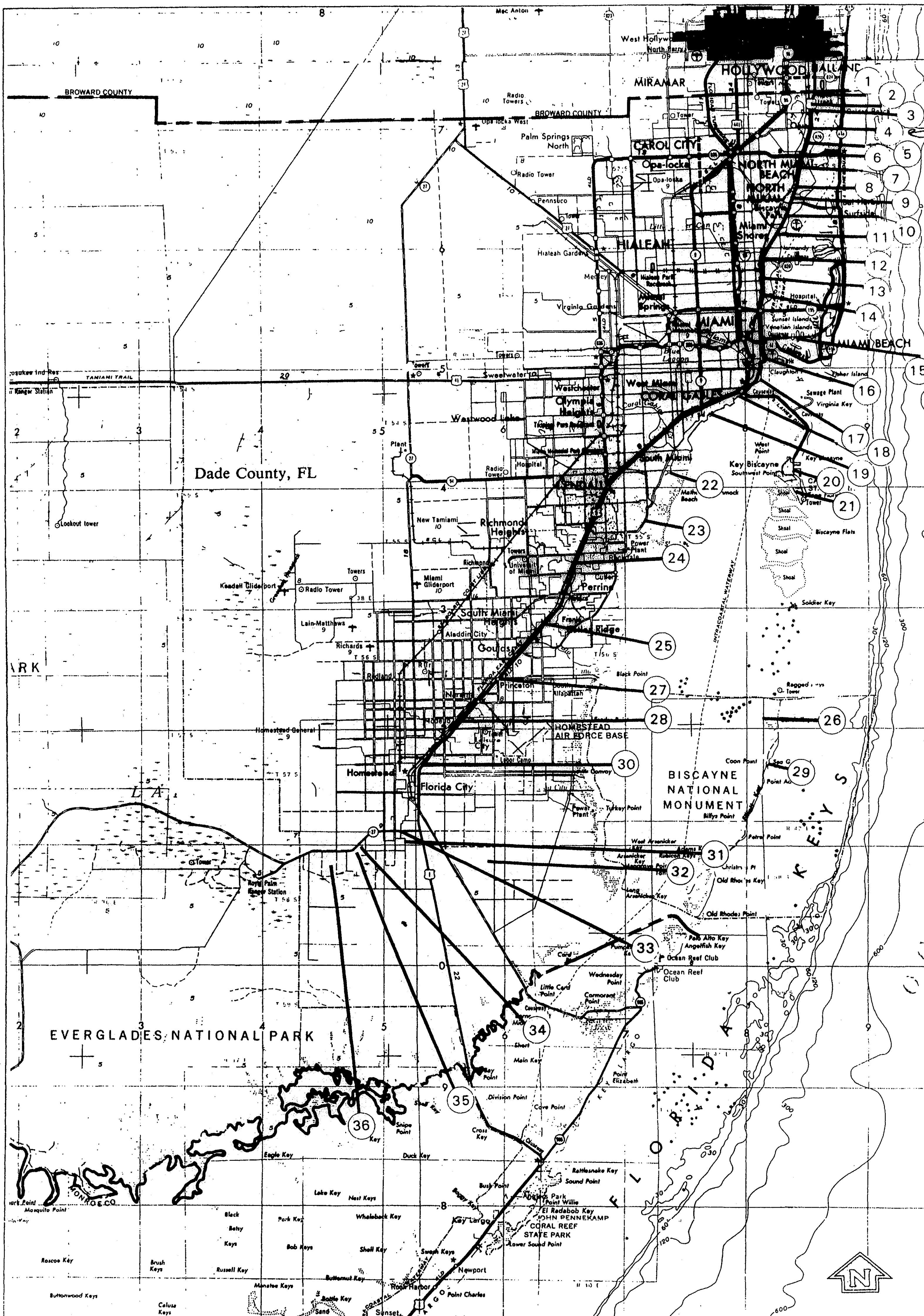


FIGURE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

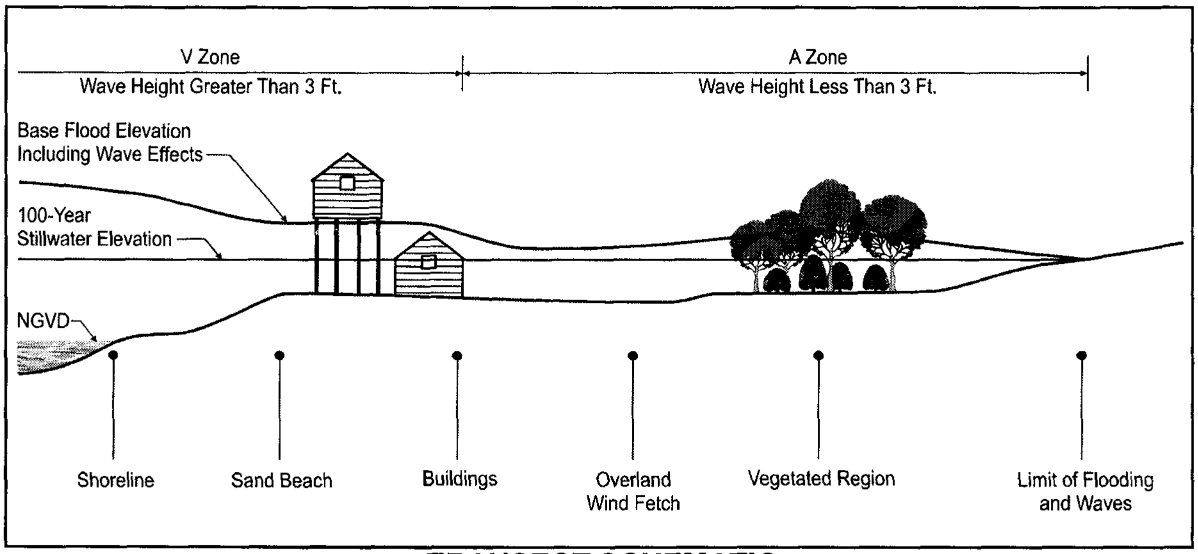
MIAMI-DADE COUNTY, FL AND INCORPORATED AREAS

APPROXIMATE SCALE

5 0 5 10 15 Miles

TRANSECT LOCATION MAP

Figure 3 is a profile for a hypothetical transect showing the effects of energy dissipation on a wave as it moves inland. This figure shows the wave elevations being diminished by obstructions such as buildings, vegetation, and rising ground elevations and being increased by open unobstructed wind fetches. Actual wave conditions in Miami-Dade County may not necessarily include all the situations illustrated in Figure 3, "Transect Schematic."



TRANSECT SCHEMATIC Figure 3

After analyzing wave heights along each transect for the county, wave elevations were interpolated between transects. Various source data were used in the interpolation, including the aerial photographs, topographic maps, beach profiles, and engineering judgment (FEMA, 1981; U.S. Department of the Interior, 1962, et cetera; TRW-REDI, 1992; USACE, 1981; Florida Department of Natural Resources, 1980). Controlling features affecting the elevations were identified and considered in relation to their positions at a particular transect and their variation between transects. The results of the calculations are accurate until local topography, vegetation or cultural development within the county undergo any major changes. The results of this analysis are summarized in Table 4, "Transect Locations, Stillwater Starting Elevations, and Initial Wave Crest Elevations."

TABLE 4 – TRANSECT LOCATIONS, STILLWATER STARTING ELEVATIONS, AND INITIAL WAVE CREST ELEVATIONS

Transect	Location	Elevation (Feet) Stillwater	Wave Crest
1	From the Atlantic coastline, approximately 900 feet south of intersection of North Drive and Ocean Boulevard in Golden Beach, westward across the Intracoastal Waterway floodplain	6.6[1] 6.0[2]	10.2[1] 6.0[2]
2	From the Atlantic coastline, approximately 1,500 feet north of the intersection of Verona Avenue and Ocean Boulevard in Golden Beach, westward across the Intracoastal Waterway floodplain	6.6[1] 6.4[2]	10.2[1] 7.4[2]
3	From the Atlantic coastline, approximately 200 feet north of intersection of Verona Avenue and Ocean Boulevard in Golden Beach, westward across the Intracoastal Waterway floodplain	6.7[1] 6.6[2]	10.4[1] 7.4[2]
4	From the Atlantic coastline, approximately 200 feet north of intersection of North Bay Road and Ocean Boulevard, westward across the Dumfoundling Bay/Intracoastal Waterway floodplain	6.7[1] 7.2[2]	10.4[1] 9.0[2]
5	From the Atlantic coastline, approximately 400 feet south of intersection of Northeast 172nd Street and Ocean Boulevard, westward across Biscayne Creek/Maule Lake floodplain in North Miami Beach	6.7[1] 7.6[3]	10.4[1] 9.4[3]
6	From the Atlantic coastline, approximately 1,700 feet south of intersection of Sunny Isles Boulevard and Ocean Boulevard, westward across the Biscayne Creek floodplain in North Miami	6.7[1] 7.6[3]	10.4[1] 8.7[3]
7	From the Atlantic coastline, approximately 4,250 feet north of Bakers Haulover Cut, westward across the Intracoastal Waterway floodplain in North Miami	6.8[1] 7.7[2]	10.5[1] 9.5[2]

[1]Atlantic Ocean (Open Coast) [2]Intracoastal Waterway [3]Biscayne Creek

TABLE 4 – TRANSECT LOCATIONS, STILLWATER STARTING ELEVATIONS, AND INITIAL WAVE CREST ELEVATIONS - continued

Transect	Location	Elevation (Feet) Stillwater	Wave Crest
8	From the Atlantic coastline, approximately 800 feet north of Bakers Haulover cut, westward across the Biscayne Bay floodplain in North Miami	6.8[1] 7.8[2]	10.5[1] 10.1[2]
9	From the Atlantic coastline, approximately 1,350 feet north of intersection of Kane Concourse and Collins Avenue in Bal Harbour, westward across the Biscayne Bay floodplain	6.8[1] 7.9[2]	10.5[1] 10.3[2]
10	From the Atlantic coastline, approximately 400 feet north of intersection of Surfside Boulevard/91st Street and Collins Avenue in Surfside, westward across the Biscayne Bay floodplain	6.9[1] 8.0[2]	10.7[1] 10.9[2]
11	From the Atlantic coastline, approximately 900 feet south of intersection of 85th Street and Collins Avenue in Miami Beach, westward across the Biscayne Bay floodplain	6.9[1] 8.0[2]	10.7[1] 10.9[2]
12	From the Atlantic coastline, approximately 850 feet north of intersection of West 63rd Street and Collins Avenue in Miami Beach, westward across the Indian Creek/Biscayne Bay floodplain	7.0[1] 8.0[2]	10.8[1] 10.1[2]
13	From the Atlantic coastline, approximately 4,900 feet south of intersection of West 63rd Street and Collins Avenue in Miami Beach, westward across the Indian Creek/Biscayne Bay floodplain	7.1[1] 7.6[2]	11.0[1] 9.5[2]
14	From the Atlantic coastline, approximately 800 feet north of intersection of Indian Creek Drive and Arthur Godfrey Road in Miami Beach, westward across the Indian Creek/Biscayne Bay floodplain	7.2[1] 7.3[2]	11.1[1] 10.0[2]
15	From the Atlantic coastline, approximately 1,400 feet south of intersection of Lincoln Road and Collins Avenue in Miami Beach, westward across the Biscayne Bay floodplain	7.1[1] 8.1[2]	11.0[1] 10.7[2]

[1]Atlantic Ocean (Open Coast) [2]Biscayne Bay

TABLE 4 – TRANSECT LOCATIONS, STILLWATER STARTING ELEVATIONS, AND INITIAL WAVE CREST ELEVATIONS - continued

		Elevation (Feet)	
Transect	Location	Stillwater	Wave Crest
16	From the Atlantic coastline at Fisher Island, approximately 200 feet south of intersection of 1st Street and C Street, westward across the Biscayne Bay floodplain	7.2[1] 9.7[2]	11.1[1] 13.2[2]
17	From the Atlantic coastline of Virginia Key, approximately 2,750 feet north of intersection of Crandon Boulevard and Virginia Key Beach Road	7.8[1] 10.9[2]	12.1[1] 14.6[2]
18	From the Atlantic coastline of Key Biscayne, approximately 3,200 feet south of Bear Cut Inlet, westward across the Biscayne Bay floodplain	7.8[1] 11.5[2]	12.1[1] 16.1[2]
19	From the Atlantic coastline at Key Biscayne, approximately 1,350 feet north of intersection of Harbor Drive and Crandon Boulevard, westward across the Biscayne Bay floodplain	7.3[1] 11.5[2]	11.3[1] 16.1[2]
20	From the Atlantic coastline of Key Biscayne, approximately 300 feet north of intersection of Wood Drive and Crandon Boulevard, westward across Key Biscayne to its western shoreline	7.3[1] 9.4[2]	11.3[1] 9.9[2]
21	From the Atlantic coastline at Key Biscayne, approximately 1,200 feet north of the Cape Florida Old Lighthouse Tower, westward across Key Biscayne to its western shoreline	7.4[1] 8.4[2]	11.4[1] 9.5[2]
22	From the western Biscayne Bay shoreline, approximately 875 feet south of intersection of Leucadendra Drive and Arvida Parkway in Coral Gables, westward	10.8[2]	16.7[2]
23	From the western Biscayne Bay shoreline, approximately 3,100 feet south of Snapper Creek Canal in Coral Gables, westward	11.0[2]	17.0[2]
24	From the western Biscayne Bay shoreline, approximately 3,300 feet south of intersection of Royal Palm Drive and Southwest 67th Court, westward	11.6[2]	17.9[2]

[1]Atlantic Ocean (Open Coast) [2]Biscayne Bay

TABLE 4 – TRANSECT LOCATIONS, STILLWATER STARTING ELEVATIONS, AND INITIAL WAVE CREST ELEVATIONS - continued

Transect	Location	Elevation (Feet) Stillwater	Wave Crest
25	From the western Biscayne Bay shoreline, approximately 1,900 feet south of intersection of Thomas Road and Southwest 77th Avenue, westward	11.3[2]	17.5[2]
26	From the Atlantic coastline of Sands Key, approximately 4,000 feet north of Sands Cut, westward across Sands Key to its western shoreline	8.0[1]	12.4[1]
27	From the western Biscayne Bay shoreline, approximately 2,700 feet north of Princeton Canal, westward	11.2[2]	17.5[2]
28	From the western Biscayne Bay shoreline, approximately 200 feet south of Fender Point, westward	11.4[2]	17.6[2]
29	From the Atlantic coastline of Sea Grape Point on Elliott Key, westward across Elliott Key to its western shoreline	8.0[1]	12.4[1]
30	From the western Biscayne Bay shoreline, approximately 900 feet south of Mowry Canal, westward	11.2[2]	17.3[2]
31	From the Atlantic coastline at Elliott Key, approximately 1,000 feet north of Christmas Point, westward across Elliott Key to its western shoreline	8.7[1]	13.4[1]
32	From the western Biscayne Bay shoreline, approximately 1.2 miles south of Turkey Point, westward	11.0[1]	16.1[1]
33	From the western Card Sound shoreline, approximately 1 mile south of the Florida Power & Light Company's cooling canals, northwestward	10.4[3]	14.5[3]
34	From the eastern shoreline of Middle Key in Barnes Sound, to the western shoreline of Barnes Sound, northwestward	9.7[4]	14.0[4]

[1]Atlantic Ocean (Open Coast) [2]Biscayne Bay
[3]Card Sound [4]Barnes Sound

TABLE 4 – TRANSECT LOCATIONS, STILLWATER STARTING ELEVATIONS, AND INITIAL WAVE CREST ELEVATIONS - continued

Transect	Location	Elevation (Feet)	
		Stillwater	Wave Crest
35	From the northern shoreline of Florida Bay (Long Sound), approximately 1.2 miles west of U.S. Highway 1, northward	11.6[1]	17.9[1]
36	From the northern shore of Florida Bay (Trout Cove), approximately 3,000 feet east of Trout Creek, northward	11.6[1]	17.5[1]

[1]Florida Bay (Long Sound)

The results of the wave height analysis showed that the velocity zone dissipated rapidly along the Miami Beach restoration project due to the hurricane dune. The velocity zone along the Atlantic shoreline and inside Biscayne Bay dissipated rapidly due to dense mangrove vegetation, rising ground elevation, and seawalls along the shoreline. The velocity zone along the coastal shoreline generally extended inland as much as 1,070 feet, and along the bay shoreline, it extended inland as much as 1,270 feet. The north bay waters along the Intracoastal Waterway to the Broward county line had wave heights of less than three feet that dissipated rapidly due to vegetation, buildings, and rising ground elevations.

For the March 2, 1994, revision, the wave heights for Transect 24 were reanalyzed to take into account the dissipative effects of houses west of Canal C-100A. Information used in the reanalyses came from 1992 aerial photographs (TRW-REDI, 1992) that had spot elevations added. The spot elevations were surveyed by Schwebke-Shiskin and Associates, Inc., in February 1993.

Revised Countywide FIS

For this revision of the C-1, C-100, C-102, C-103, C-2, C-3, C-4, C-5, C-6, C-7, Florida City, Goulds, and North Canal basins, flood elevations were determined using XP-SWMM (Miami-Dade County DERM, August 2003-March 2007). A hypothetical tidal wide of 2-ft height was used as the downstream boundary condition of the XP-SWMM models.

All qualifying bench marks within a given jurisdiction that are cataloged by the National Geodetic Survey (NGS) and entered into the National Spatial Reference System (NSRS) as First or Second Order Vertical and have a vertical stability classification of A, B, or C are shown and labeled on the FIRM with their 6-character NSRS Permanent Identifier.

Bench marks cataloged by the NGS and entered into the NSRS vary widely in vertical stability classification. NSRS vertical stability classifications are as follows:

- Stability A: Monuments of the most reliable nature, expected to hold position/elevation well (e.g., mounted in bedrock)
- Stability B: Monuments which generally hold their position/elevation well (e.g., concrete bridge abutment)
- Stability C: Monuments which may be affected by surface ground movements (e.g., concrete monument below frost line)
- Stability D: Mark of questionable or unknown vertical stability (e.g., concrete monument above frost line, or steel witness post)

In addition to NSRS bench marks, the FIRM may also show vertical control monuments established by a local jurisdiction; these monuments will be shown on the FIRM with the appropriate designations. Local monuments will only be placed on the FIRM if the community has requested that they be included, and if the monuments meet the aforementioned NSRS inclusion criteria.

To obtain current elevation, description, and/or location information for bench marks shown on the FIRM for this jurisdiction, please contact the Information Services Branch of the NGS at (301) 713-3242, or visit their Web site at www.ngs.noaa.gov.

3.3 Vertical Datum

All FISs and FIRMs are referenced to a specific vertical datum. The vertical datum provides a starting point against which flood, ground, and structure elevations can be referenced and compared. Until recently, the standard vertical datum in use for newly created or revised FISs and FIRMs was the National Geodetic Vertical Datum of 1929 (NGVD 29). With the finalization of the North American Vertical Datum of 1988 (NAVD 88), many FIS reports and FIRMs are being prepared using NAVD 88 as the referenced vertical datum.

All flood elevations shown in this FIS report and on the FIRM are referenced to NGVD 29. Structure and ground elevations in the community must, therefore, be referenced to NGVD 29. It is important to note that adjacent communities may be referenced to NAVD 88. This may result in differences in base flood elevations across the corporate limits between the communities.

For more information on NAVD 88, see Converting the National Flood Insurance Program to the North American Vertical Datum of 1988, FEMA Publication FIA-20/June 1992, or contact the Vertical Network Branch, National Geodetic Survey, Coast and Geodetic Survey, National Oceanic and Atmospheric Administration, Rockville, Maryland 20910 (Internet address http://www.ngs.noaa.gov).

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. Therefore, each FIS provides 1-percent annual chance flood elevations and delineations of the 1- and 0.2-percent annual chance floodplain boundaries and 1-percent annual chance floodway to assist in developing floodplain management measures.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1 percent annual chance flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2 percent annual chance flood is employed to indicate additional areas of flood risk in the community. For ponding areas that are studied in detail, the 1-percent annual chance floodplain boundaries have been delineated using topographic maps at a scale of 1:12,000 (Dade County, Florida, Board of County Commissioners, various dates). For each coastal flooding source studied in detail, the 1- and 0.2-percent annual chance floodplain boundaries have been delineated using the flood elevations determined at each transect. Between transects, the boundaries were interpolated using topographic maps at a scale of 1:24,000 enlarged to scales of 1:12,000 and 1:6,000 with a contour interval of five feet (U.S. Department of the Interior, 1962, et cetera).

The 1- and 0.2-percent annual chance floodplain boundaries are shown on the FIRM (Exhibit 1). On this map, the 1-percent annual chance floodplain boundaries correspond to the boundaries of the areas of special flood hazard (Zones A, AE, AH, and VE), and the 0.2-percent annual chance floodplain boundaries correspond to the boundaries of areas of moderate flood hazard. In cases where the 1- and 0.2-percent annual chance floodplain boundaries are close together, only the 1-percent annual chance floodplain boundaries have been shown. Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data. For the streams studied by approximate methods, only the 1-percent annual chance floodplain boundaries are shown on the FIRM (Exhibit 1).

For the March 2, 1994, FIS due to the digital conversion, floodplain boundaries were adjusted as necessary to maintain the relationships between roads and floodplains previously presented on the January 20, 1993, FIRM (FEMA, 1994).

For this revision, floodplain mapping was provided by DERM for the following basins: C-1, C-100, C-102, C-103, C-2, C-3, C-4, C-5, C-6, C-7, Florida City, Goulds, and North Canal. For the basin boundary locations, see Figure 4, "Basin Location Map" (Miami-Dade County DERM, April 2005-April 2007). Adjustments of the floodplain boundaries were made as necessary to maintain the relationships between roads and floodplains as previously presented on the March 2, 1994, FIS. Additional adjustment of the floodplain boundaries were also made to ensure that the streamlines of the flooding sources were maintained within the floodplain.

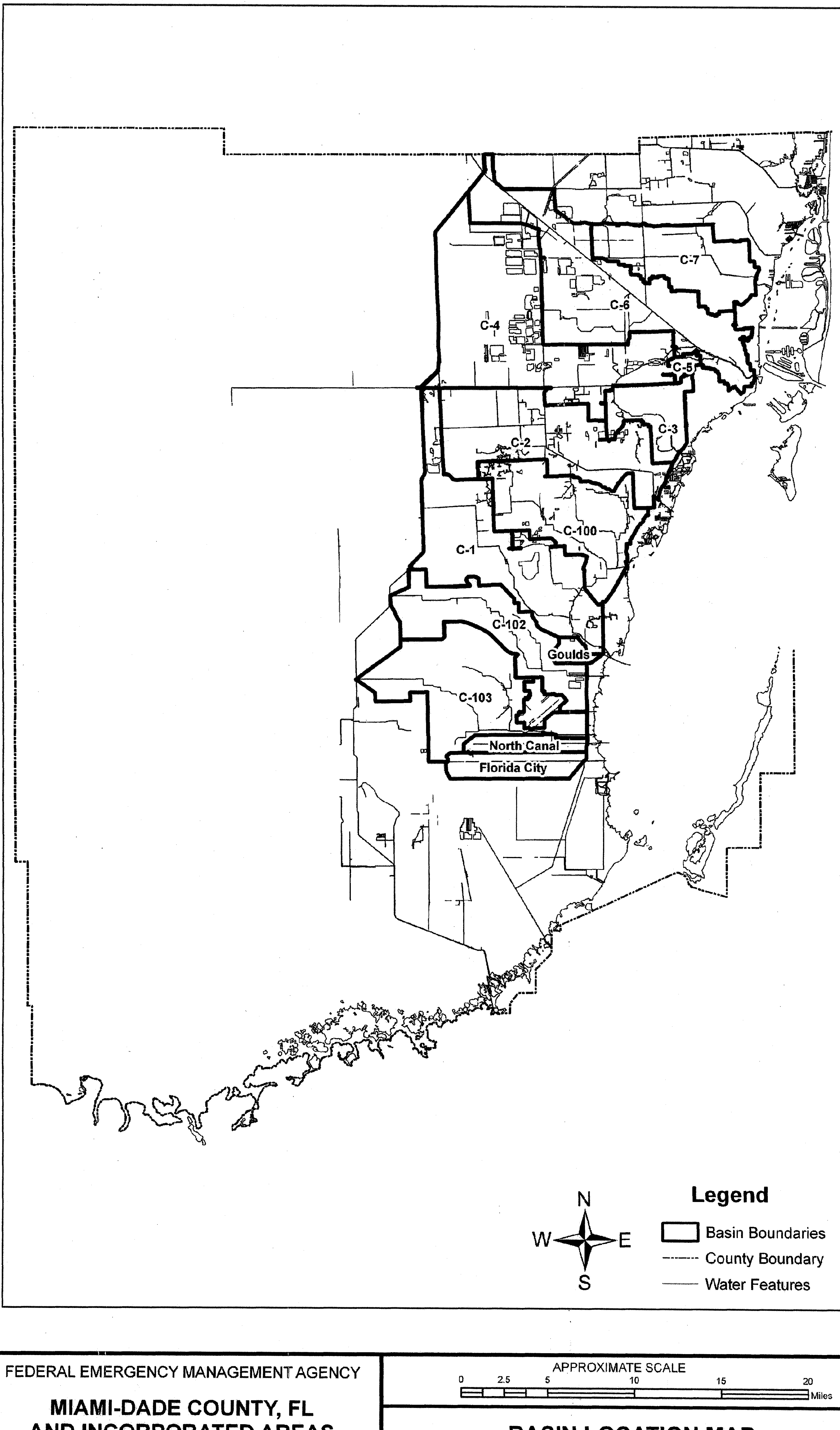


FIGURE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

MIAMI-DADE COUNTY, FL AND INCORPORATED AREAS

APPROXIMATE SCALE

0 2.5 5 10 15 20 Miles

BASIN LOCATION MAP

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the NFIP, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 1-percent annual chance floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that the 1-percent annual chance flood can be carried without substantial increases in flood heights. Minimum federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced.

The area between the floodway and 1-percent annual chance floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water-surface elevation of the 1-percent annual chance flood by more than 1.0 foot at any point.

No floodways were calculated as part of this study.

5.0 INSURANCE APPLICATIONS

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. The zones are as follows:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 1-percent annual chance floodplains that are determined in the FIS by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base flood elevations or depths are shown within this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 1-percent annual chance floodplains that are determined in the FIS by detailed methods. In most instances, whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AH

Zone AH is the flood insurance rate zone that corresponds to the areas of 1-percent annual chance shallow flooding (usually areas of ponding) where average depths are between 1 and 3 feet. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AO

Zone AO is the flood insurance rate zone that corresponds to the areas of 1-percent annual chance shallow flooding (usually sheet flow on sloping terrain) where average depths are between 1 and 3 feet. Average whole-depths derived from the detailed hydraulic analyses are shown within this zone.

Zone A99

Zone A99 is the flood insurance rate zone that corresponds to areas of the 1-percent annual chance floodplain that will be protected by a Federal flood protection system where construction has reached specified statutory milestones. No base flood elevations or depths are shown within this zone.

Zone V

Zone V is the flood insurance rate zone that corresponds to the 1-percent annual chance coastal floodplains that have additional hazards associated with storm waves. Because approximate hydraulic analyses are performed for such areas, no base flood elevations are shown within this zone.

Zone VE

Zone VE is the flood insurance rate zone that corresponds to the 1-percent annual chance coastal floodplains that have additional hazards associated with storm waves. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 0.2-percent annual chance floodplain, areas within the 0.2-percent annual chance floodplain, and to areas of 1-percent annual chance flooding where average depths are less than 1 foot, areas of 1-percent annual chance flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 1-percent annual chance flood by levees. No base flood elevations or depths are shown within this zone.

Zone D

Zone D is the flood insurance rate zone that corresponds to unstudied areas where flood hazards are undetermined, but possible.

6.0 FLOOD INSURANCE RATE MAP

The FIRM is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 1-percent annual chance floodplains that were studied by detailed methods, shows selected whole-foot base flood elevations or average depths. Insurance agents use the zones and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols, the 1- and 0.2-percent annual chance floodplains. Floodways and the locations of selected cross sections used in the hydraulic analyses and floodway computations are shown where applicable.

The current FIRM presents flooding information for the entire geographic area of Dade County. Historical data relating to the maps prepared for each community up to and including the January 20, 1993, countywide FIS, are presented in Table 5, "Community Map History."

7.0 OTHER STUDIES

Flood Insurance Studies have been prepared for the unincorporated areas of Collier County (FEMA, November 2005), Broward County and Incorporated Areas (FEMA, October 1997), and Monroe County and Incorporated Areas (FEMA, February 2005).

Because it is based on more up-to-date analyses, this FIS supersedes the previously printed FIS for Dade County (FEMA, 1994).

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this FIS can be obtained by contacting FEMA, Federal Insurance and Mitigation Division, Koger Center - Rutgers Building, 3003 Chamblee Tucker Road, Atlanta, Georgia 30341.

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISIONS DATE	FIRM EFFECTIVE DATE	FIRM REVISIONS DATE
Aventura, City of	*	None	*	*
Bal Harbour, Town of	*	None	*	*
Bay Harbour Islands, Town of	*	None	*	*
Biscayne Park, Village of	*	None	*	*
Coral Gables, City of	*	None	*	*
Doral, City of	*	None	*	*
El Portal, Village of	*	None	*	*
Florida City, City of	*	None	*	*
Golden Beach, Town of	*	None	*	*
Hialeah, City of	*	None	*	*
Hialeah Gardens, City of	*	None	*	*
Homestead, City of	*	None	*	*
Indian Creek Village, Village of	*	None	*	*
Islandia, City of	*	None	*	*

*Same as the Unincorporated Areas of Miami-Dade County, Florida

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

MIAMI-DADE COUNTY, FL AND INCORPORATED AREAS

COMMUNITY MAP HISTORY

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISIONS DATE	FIRM EFFECTIVE DATE	FIRM REVISIONS DATE
Key Biscayne, Village of	*	None	*	*
Medley, Town of	*	None	*	*
Miami, City of	*	None	*	*
Miami Beach, City of	*	None	*	*
Miami-Dade County (Unincorporated Areas)	September 30, 1972	None	September 30, 1972	July 1, 1974 March 18, 1977 August 25, 1978 November 25, 1978 January 5, 1984 November 4, 1987 January 20, 1993
Miami Gardens, City of	*	None	*	*
Miami Lakes, Town of	*	None	*	*
Miami Shores, Village of	*	None	*	*
Miami Springs, City of	*	None	*	*
North Bay Village, Village of	*	None	*	*
North Miami, City of	*	None	*	*

*Same as the Unincorporated Areas of Miami-Dade County, Florida

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

MIAMI-DADE COUNTY, FL AND INCORPORATED AREAS

COMMUNITY MAP HISTORY

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISIONS DATE	FIRM EFFECTIVE DATE	FIRM REVISIONS DATE
North Miami Beach, City of	*	None	*	*
Opa-Locka, City of	*	None	*	*
Palmetto Bay, Village of	*	None	*	*
Pinecrest, Village of	*	None	*	*
South Miami, City of	*	None	*	*
Sunny Isles Beach, City of	*	None	*	*
Surfside, Town of	*	None	*	*
Sweetwater, City of	*	None	*	*
Virginia Gardens, Village of	*	None	*	*
West Miami, City of	*	None	*	*

*Same as the Unincorporated Areas of Miami-Dade County, Florida

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

MIAMI-DADE COUNTY, FL AND INCORPORATED AREAS

COMMUNITY MAP HISTORY

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