SITE: Miami Drum Svcs
BREAK: 8.6
OTHER: v.2

Five-Year Review Report

Second Five-Year Review Report
for
Miami Drum Services

Miami-Dade County, Florida

May 2008

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Date: 5/1/08

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List of Acronyms

ARAR	Applicable or Relevant and Appropriate Requirement
CD	Consent Decree
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COCs	Contaminants of Concern
CPRM	Cross Program Revitalization Measures
DERM	Dade Environmental Resources Management
DOT	Department of Transportation
EPA	United States Environmental Protection Agency
FEC	Florida East Coast Railway
FDEP	Florida Department of Environmental Protection
FDER	Florida Department of Environmental Regulation
FYR	Five-Year Review
ICs	Institutional Controls
MCL	Maximum Contaminant Level
mg/Kg	Milligrams per Kilogram
NCP	National Contingency Plan
NPL	National Priorities List
O&M	Operation and Maintenance
OU	Operable unit
PFP	Protective for People Under Current Conditions
PPB	Parts Per Billion
PRP	Potentially Responsible Party
RA	Remedial Action
RAO	Remedial Action Objectives
RD	Remedial Design
RG	Remedial Goals
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RPM	Remedial Project Manager
SARA	Superfund Amendments and Reauthorization Act of 1986
SCTL	Soil Cleanup Target Levels
SDWA	Safe Drinking Water Act
SFWMD	South Florida Water Management District
SW RAU	Sitewide Ready for Anticipated Use
TBCs	To-be-considered goals/criteria
µg/L	Micrograms per Liter
VOCs	Volatile Organic Compounds
WASD	Miami-Dade Water and Sewer Department
WTP	Water Treatment Plant

Executive Summary

Introduction

The Miami Drum Services Site (the Site) has two operable units (OUs) that will be discussed in this report. OU1 addresses soil contamination, and OU2 addresses ground water contamination at the Site. Ground water contamination at the Site has commingled with contamination released from two other nearby sources of contamination to the Biscayne Aquifer: the Varsol Spill Superfund Site and Northwest 58th Street Landfill Superfund Site. The OU2 Record of Decision (ROD) was signed in September 1985 and addresses ground water contamination in the Biscayne Aquifer associated with these three Superfund sites: Miami Drum Services, Varsol Spill, and Northwest 58th Street Landfill.

The selected remedy for OU1 of the Miami Drum Services Site in Miami-Dade County, Florida, included removal of soils with off-site disposal of contaminated soil, on-site treatment of contaminated ground water, and capping of the excavated portion with clean fill. The remedy for OU1 did not include institutional controls (ICs). The remedy for OU1 was presented in the September 1982 ROD (referred to in this document as OU1 ROD); construction of the selected OU1 remedy was completed in 1982. The selected remedy for OU2 of the Miami Drum Services Site was presented in the 1985 Biscayne Aquifer Sites ROD (referred to in this document as OU2 ROD) and included installation of air stripping towers at the Preston and Hialeah Water Treatment Plants (WTPs). The OU2 remedy was designed to remove volatile organic compounds (VOCs) in the Biscayne Aquifer from the public drinking water supply. The OU2 ROD also called for ICs. Sections 24-43.2 and 24-43.3 of the Miami-Dade County Code of Ordinances, which regulate the permitting and use of wells in the vicinity of sources of contamination, meet the IC requirements for OU2.

The Site covers 1.2 acres and is now wholly contained within an 82-acre parcel owned by Miami-Dade County. Since the implementation of the soil remedy in 1982, the county has used the Site and surrounding property as a train maintenance yard for the Miami Transit Authority's light rail system. The property is in industrial reuse and is anticipated to remain in its current use for the foreseeable future. With respect to the 2007 Cross Program Revitalization Measures (CPRM), this Site is considered Protective for People Under Current Conditions (PFP), and exposure to contamination is under control. The property is not included in the Sitewide Ready for Anticipated Use (SW RAU) cross program revitalization measure because it does not have enforceable ICs in place for all media of concern. Ongoing treatment and monitoring of the ground water for this Site is required. The triggering action for this policy Five-Year Review (FYR) was the date of signature for the first FYR on May 2, 2003. The next FYR for the Miami Drum Services Site will be required by 2013.

Discussions are underway regarding the possibility of combining the FYRs for the Biscayne Aquifer Sites, since they are addressed in a single ROD and there are efficiencies to be gained from evaluating these sites together. Because it had a No Action ROD, FYRs are not required for the Varsol Spill Site. Currently, the Northwest 58th Street Landfill is on a separate FYR schedule from the Miami Drum Services Site; the next FYR for the Northwest 58th Street

Landfill is required by September 2010. This review could provide an opportunity to unify the FYR schedule for these two sites, so that their FYRs could be performed together in the future.

Remedial Action Objectives

The remedial action objectives (RAOs) established to address human health and environmental concerns for the Miami Drum Services Site addressed both soil and ground water. The OU1 RAO for soil was to remove contaminated soils that could leach hazardous substances into the drinking water supply aquifer for Dade County through removal of soil with contaminant concentrations above industrial use standards. The selected remedy from the OU1 ROD was accomplished through a removal action. The OU2 RAOs for the ground water at the Site consisted of restoring the Biscayne Aquifer to drinking water standards. The only OU2 cleanup goal that was not based on federal MCLs was use of the 1.0 μg/L state standard for vinyl chloride. The excavation and off-site disposal of contaminated soils in 1982 removed soil above industrial use standards at that time. Pumping and treatment of the ground water in the Biscayne Aquifer has made good progress toward achieving the OU2 cleanup goals for ground water. Most contaminants of concern (COCs) have attained OU2 cleanup goals for drinking water and all have shown a decreasing trend over time. However, several COCs remain above OU2 cleanup goals and therefore treatment of the ground water should continue.

Technical Assessment

According to the data reviewed, the site inspection, and the interviews, the selected remedy is functioning as intended by the RODs. Access controls and continued industrial use of the Site ensure continued protectiveness of the selected remedy for OU1. The Miami-Dade Water and Sewer Department (WASD) staff plan to indefinitely continue use of the air stripping towers to treat contamination in the Biscayne Aquifer. WASD is required to monitor the water quality of the air stripping towers' influent and effluent on a weekly basis. There are no planned changes to either the land use or ground water use at the Site, and current uses remain consistent with both the selected remedy and the original exposure assumptions. Although the OU1 ROD did not require ICs, ICs are necessary for the Site because soils are present on-site that contain contaminant concentrations above levels that allow for unrestricted use and unlimited exposure. There is no other information that calls into question the protectiveness of the selected remedy.

Protectiveness Statement

The selected remedy at OU1 is protective of human health and the environment in the short term and exposure pathways that could result in unacceptable risks are under control. Based on the site inspection, access controls are well maintained and public access to the Site is restricted. The Site is in industrial reuse and the site owner intends for this use to continue in the long term. Clean fill was placed over the excavated portions of the Site and the cover has been maintained. ICs for soil will be required prior to site deletion in order to ensure the long-term protectiveness of the soil remedy.

The selected remedy at OU2 is protective of human health and the environment and exposure pathways that could result in unacceptable risks are under control. Based on the site inspection and ground water sampling data from the last five years, the Site's remedy is effectively treating the ground water contamination. Ground water monitoring results from the Preston and Hialeah wells have shown a decreasing trend in total VOCs over the last five years. Air emissions associated with the air stripping towers are well below permitted limits. The air stripping treatment continues to be effective at removing VOCs and finished drinking water from the Preston and Hialeah WTPs must meet all state and federal standards prior to being supplied as drinking water to the public. WASD plans to continue using the air strippers to treat the ground water from the Biscayne Aquifer in the long term. Institutional controls restricting the use of ground water are currently in place.

Because the remedial actions at OU1 and OU2 are protective, the Site is protective of human health and the environment. The actions described above ensure the continued protectiveness of the selected remedies.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site name ***(from WasteLAN)*****: Miami Drum Services**		
EPA ID ***(from WasteLAN)*****: FLD076027820**		
Region: 4	**State: FL**	**City/County: Miami-Dade County**
SITE STATUS		
NPL status: ☒ Final ☐ Deleted ☐ Other (specify)		
Remediation status (choose all that apply): ☐ Under Construction ☒ Operating ☒ Complete		
Multiple OUs?* ☒ YES ☐ NO	**Construction completion date:** 04/28/1993	
Has site been put into reuse? ☒ YES ☐ NO		
REVIEW STATUS		
Lead agency: ☒ EPA ☐ State ☐ Tribe ☐ Other Federal Agency		
Author name: Amanda Knoff		
Author title: Project Manager	**Author affiliation: E² Inc.**	
Review period****:** 8/24/2007 to 5/01/2008		
Date(s) of site inspection: 10/10/2007		
Type of review: ☐ Post-SARA ☒ Pre-SARA ☐ NPL-Removal only ☐ Non-NPL Remedial Action Site ☐ NPL State/Tribe-lead ☐ Regional Discretion		
Review number: ☐ 1 (first) ☒ 2 (second) ☐ 3 (third) ☐ Other (specify)		
Triggering action: ☐ Actual RA Onsite Construction at OU# ☐ Actual RA Start at OU#1 ☐ Construction Completion ☒ Previous Five-Year Review Report ☐ Other (specify)		
Triggering action date ***(from WasteLAN)*****:** 05/02/2003		
Due date ***(five years after triggering action date)*****:** 05/02/2008		

* ["OU" refers to operable unit.]
** [Review period should correspond to the actual start and end dates of the FYR in WasteLAN.]

Five-Year Review Summary Form, continued

Issues:
1) Institutional controls necessary to ensure the long-term protectiveness of the soil remedy at the Miami Drum Services Site were not called for in the ROD and have not been implemented.
2) WASD's current air permit will require renewal in 2010.
3) The two Biscayne Aquifer Sites that require FYRs have different review FYR schedules. Miami Drum Services and the Northwest 58th Street Landfill receive FYRs, but currently receive them on different schedules, while Varsol Spill does not require FYRs.

The first issue affects long-term protectiveness. Issues 2 and 3 do not affect either short- or long-term protectiveness.

Recommendations and Follow-up Actions:
1) Design and implement ICs for the soil remedy.
2) Apply for renewal of WASD air permit by July 6, 2010.
3) Consider combining FYRs for the constituent sites addressed by the Biscayne Aquifer ROD (OU2 ROD).

Protectiveness Statement(s):
The selected remedy at OU1 is protective of human health and the environment in the short term and exposure pathways that could result in unacceptable risks are under control. Based on the site inspection, access controls are well maintained and public access to the Site is restricted. The Site is in industrial reuse and the site owner intends for this use to continue in the long term. Clean fill was placed over the excavated portions of the Site and the cover has been maintained. ICs for soil will be required prior to site deletion in order to ensure the long-term protectiveness of the soil remedy.

The selected remedy at OU2 is protective of human health and the environment and exposure pathways that could result in unacceptable risks are under control. Based on the site inspection and ground water sampling data from the last five years, the Site's remedy is effectively treating the ground water contamination. Ground water monitoring results from the Preston and Hialeah wells have shown a decreasing trend in total VOCs over the last five years. Air emissions associated with the air stripping towers are well below permitted limits. The air stripping treatment continues to be effective at removing VOCs and finished drinking water from the Preston and Hialeah WTPs must meet all state and federal standards prior to being supplied as drinking water to the public. WASD plans to continue using the air strippers to treat the ground water from the Biscayne Aquifer in the long term. Institutional controls restricting the use of ground water are currently in place.

Because the remedial actions at OU1 and OU2 are protective, the Site is protective of human health and the environment. The actions described above ensure the continued protectiveness of the selected remedies.

Other Comments: None

Second Five-Year Review Report
for
Miami Drum Services Superfund Site

1.0 Introduction

The purpose of a Five-Year Review (FYR) is to evaluate the implementation and performance of a remedy in order to determine if the selected remedy will continue to be protective of human health and the environment. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The U.S. Environmental Protection Agency (EPA) prepares FYRs pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121 and the National Contingency Plan (NCP). CERCLA 121 states:

> "If the President selects a remedial action that results in any hazardous substances; pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews."

EPA interpreted this requirement further in the NCP; 40 Code of Federal Regulations (CFR) Section 300.430(f)(4)(ii), which states:

> "If a remedial action is selected that results is hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such actions no less often than every five years after the initiation of the selected remedial action."

E^2 Inc., an EPA Region 4 contractor, conducted the FYR and prepared this report regarding the remedies implemented at the Miami Drum Services Site in Miami-Dade County, Florida. Miami-Dade Water and Sewer Department (WASD) has collected ground water and air emissions information during the previous five years. This FYR was conducted from September 2007 to May 2008, with EPA, E^2 Inc., WASD, and Miami-Dade Transit Authority staff participating in the site inspection on October 10, 2007. EPA is the lead agency for developing and implementing the selected remedy for the Superfund-financed cleanup at the Miami Drum Services Site. The Florida Department of Environmental Protection (FDEP, formerly Florida Department of Environmental Regulation), as the support agency representing the State of Florida, has reviewed all supporting documentation and provided input to EPA during the FYR process.

The Miami Drum Services Site has two operable units (OUs) that will be discussed in this report. OU1 addresses soil contamination at the Site, and OU2 addresses ground water contamination at the Site. Two remedial actions have been completed at this Site and monitoring is ongoing.

This is the second FYR for the Site. The triggering action for this policy review is the date of signature of the first FYR on May 2, 2003. This is considered a 'policy' FYR because both RODs were written before the Superfund Amendments and Reauthorization Act of 1986 (SARA) became effective. The OU1 remedy left contaminated soils on site above levels that allow for unrestricted use and unlimited exposure. Although the selected OU2 remedial action for ground water, upon completion, is not expected to leave hazardous substances, pollutants, or contaminants remaining on site above levels that allow for unrestricted use and unlimited exposure, the remedial action requires five years or more to complete. Therefore, a review will be conducted every five years.

This review will be placed in the site file and the Site's local information repository upon completion. The repository is located at the Miami-Dade County Public Library, 101 W. Flagler, Miami, Florida, 33128. This FYR is being conducted because contaminated soils were left on site above levels that allow for unrestricted use or unlimited exposure and because there are occasional exceedances of ground water standards in some of the wells located in the Biscayne Aquifer study area.

This FYR includes a review of the remedies for both soil and ground water contamination at the Miami Drum Services Site. The soil remedy for the Site was presented in the 1982 ROD for OU1. The ground water remedy for the Site was presented in the 1985 ROD for the Biscayne Aquifer Superfund Sites (OU2 ROD), which addresses ground water contamination associated not only with the Miami Drum Services Site (OU2), but also the Varsol Spill and Northwest 58th Street Landfill Sites. The Varsol Spill Site does not require separate FYRs because it had a No Action ROD. The Northwest 58th Street Landfill does require FYRs; its third FYR was signed on September 30, 2005.

The next FYR for the Miami Drum Services Site will be due in May 2013. However, EPA should consider merging the FYR schedules for the Miami Drum Services and Northwest 58th Street Landfill Sites in September, 2010.

2.0 Site Chronology

The following is a chronology of significant events associated with the Miami Drum Services Site.

Table 1: Chronology of Site Events

Event	Date
Discovery of contamination at Miami Drum Services Site	November 1979
Excavation of materials and soils from Miami Drum Services Site	December 1981 - January 1982
EPA Region 4 concurrence with removal actions at Miami Drum Services Site	August 1982
FDER acceptance of removal actions at Miami Drum Services Site	September 1982
Miami Drum Services Site Record of Decision for OU1 signed	September 1982
Phase I Report – Protection of Biscayne Aquifer	October 1982
Dade County Wellfield Protection Ordinance adopted	September 1983
Final Listing on National Priorities List for Miami Drum Services Site	September 8, 1983
Phase II Report – Protection of Biscayne Aquifer	February 1984
Phase III Report – Protection of Biscayne Aquifer	May 1985
Varsol Spill Site No Action Record of Decision signed	March 29, 1985
Remedial Investigation / Feasibility Study for Biscayne Aquifer Sites completed	September 16, 1985
Biscayne Aquifer Record of Decision signed	September 16, 1985
Consent Decree finalized	February, 25, 1987
Remedial Design begins for Biscayne Aquifer Sites	September 1, 1987
Northwest 58th Street Landfill Record of Decision signed	September 21, 1987
Remedial Design for Biscayne Aquifer Sites completed	September 30, 1987
Cooperative Agreement executed by EPA for Biscayne Aquifer Sites	September 1988
Removal Assessment completed	August 25, 1992
Initiation of long-term response action (operation of air stripping towers at Preston and Hialeah WTPs)	September 1, 1992
Construction Completion for Miami Drum Services Site achieved	April 28, 1993
Close Out Report for Miami Drum Services Site finalized	June 21, 1993
Conclusion of EPA funding of long-term response action	September 30, 2002
First FYR for Miami Drum Services signed	May 2, 2003
Third FYR report for Northwest 58th Street Landfill signed	September 30, 2005

3.0 Background

3.1 Physical Characteristics

The Miami Drum Services Site, which occupies approximately 1.2 acres, is currently located within an 82 acre parcel that is owned by the Miami-Dade County Transit Authority (Transit Authority). This parcel is located at 6601 NW 72nd Avenue, in an unincorporated area of Northwest Miami-Dade County, Florida. The Site is located just north of the Miami International Airport. In 1981, Dade County acquired the former Miami Drum Services property on behalf of the Transit Authority and the Site was incorporated into the Transit Authority's Palmetto Yard rail maintenance facility, which is used for servicing the trains for Miami's light rail system. Currently, the Site is partially asphalt-paved, partially covered with gravel roads, and partially uncovered land that is bisected by train tracks. The Varsol Spill Site is located within the Miami International Airport. The Northwest 58th Street Landfill Site is located west of both the Miami Drum Services Site and the Miami International Airport. The Landfill occupies one square mile near the Palmetto Expressway on NW 58th Street in the community of Hialeah. The locations of the three sites, which together comprise the Biscayne Aquifer Sites, are shown in Figure 1.

The contaminated soil on the former Miami Drum Services property that was a source of ground water contamination exceeded the property boundaries of the 1.2-acre Miami Drum Services parcel by several feet. A more detailed map of the Site is available in Figure 2. The Biscayne Aquifer underlies the Miami Drum Services Site and was affected by the soil contamination at the Miami Drum Services Site as well as the Varsol Spill and the Northwest 58th Street Landfill Sites. Each of these sites acted as a source of ground water contamination, which commingled and affected the overall quality of the Biscayne Aquifer. EPA decided to address the Biscayne Aquifer Sites as a single management unit because all three sites affected the same general area of the Biscayne Aquifer. However, numerous other possible contributors of ground water contamination also exist in the area. Regulatory agencies recognized that the effects of the Biscayne Aquifer Sites would likely be interrelated and that some of the suspected problems would not be solely attributable to any individual site. The Biscayne Aquifer is designated as a "sole source aquifer" under the Safe Drinking Water Act of 1974. Ground water flow in the Biscayne Aquifer is locally regulated by pumpage of municipal wells and canal flow controls. The canal flow controls are used for flood prevention, replenishment of ground water supplies, and to control saltwater intrusion. The canals are highly controlled water bodies and do not represent environmentally sensitive habitats.

The Miami Drum Services Site is located in a commercial and industrial area of Hialeah, but is surrounded by residentially populated areas, including the communities of Miami Springs, Medley, Hialeah Gardens, Pinewood Park, and Miami. The metro Miami area was the fifth most densely populated urbanized area in the United States according to the 2000 census. The United States Census Bureau estimates that Miami-Dade County had a population over 2.4 million in 2006, making it the most populous county in Florida and the eighth-most populous county in the United States.

Figure 1: Site Vicinity Map for the Biscayne Aquifer Sites

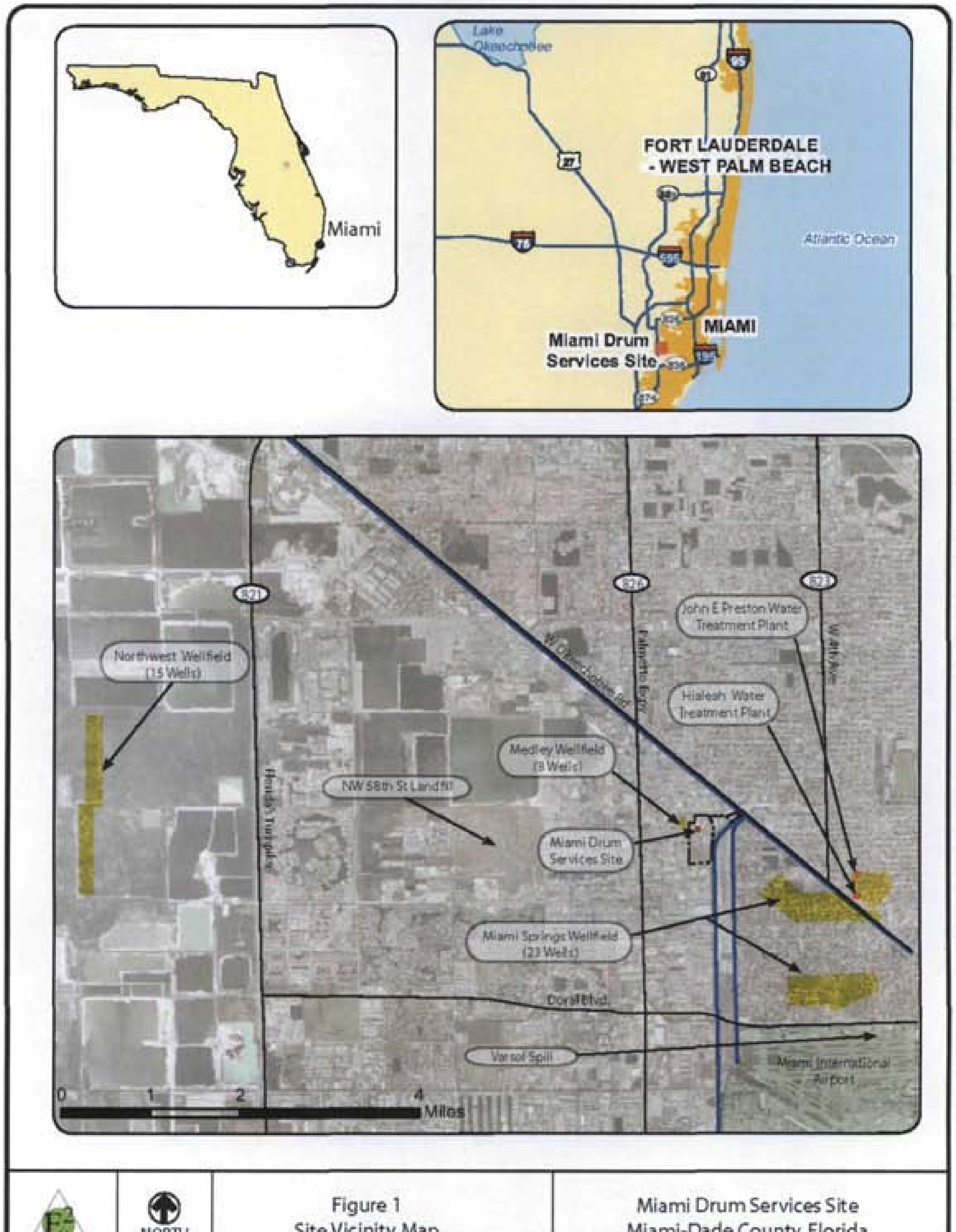
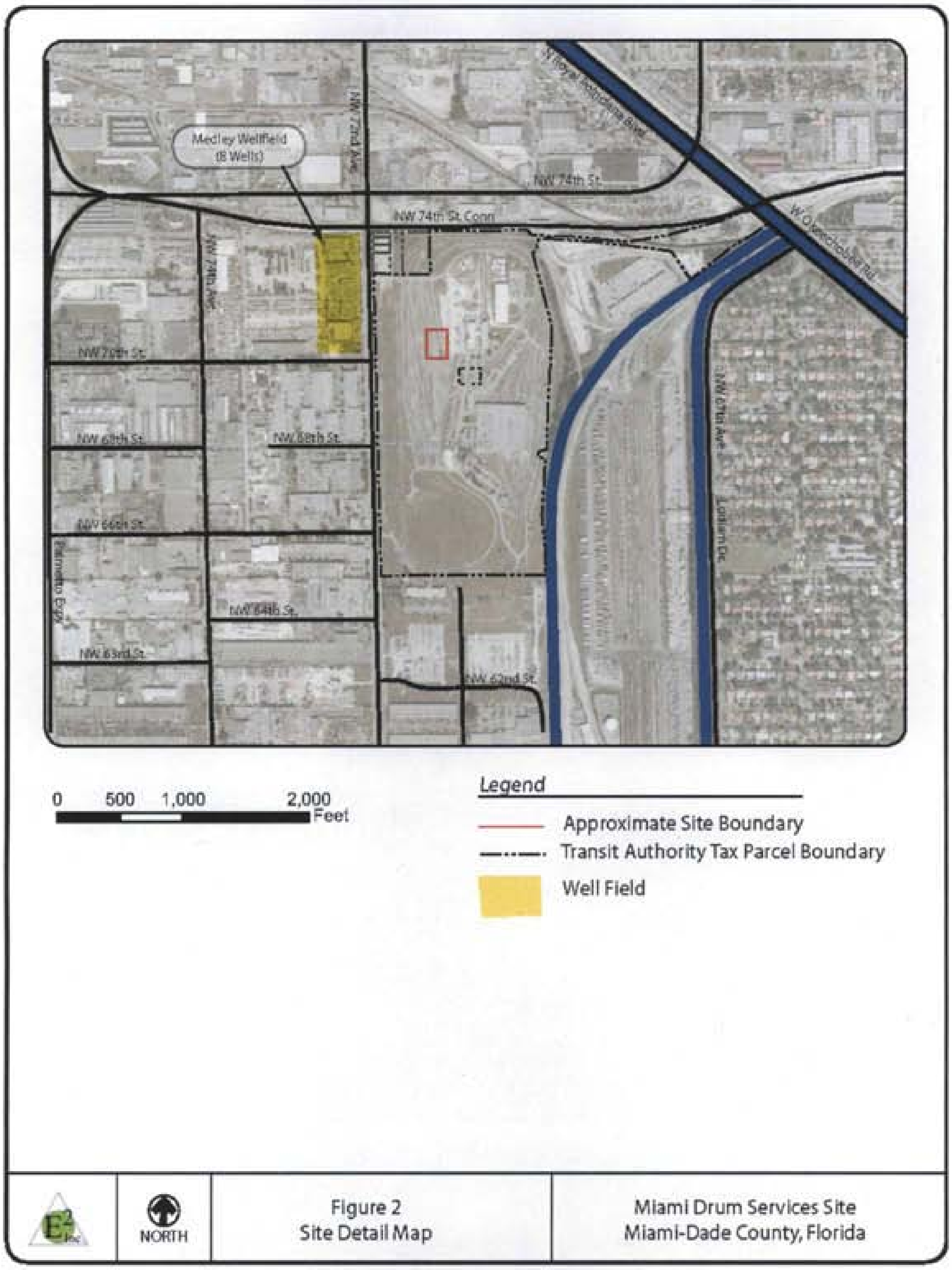


Figure 2: Detailed Site Map for the Miami Drum Services Site



3.2 Land and Resource Use

The Site is located in a primarily industrial area near several cities as well as a few unincorporated areas. The cities of Miami Springs and Virginia Gardens are primarily residential, whereas the cities of Medley and Hialeah Gardens are heavily industrial. The City of Hialeah is a mix of residential, commercial, and industrial areas. Currently, there is an expressway north of the Site, to the south and west are commercial areas, and to the east is additional transportation infrastructure. Since the property was in industrial use at the time of remedy selection, and its projected use was also industrial, cleanup to residential levels did not appear to be warranted. Cleanup of soil to industrial standards in order to remove contaminated soils that could leach hazardous substances into the drinking water supply for Dade County was the primary goal of the OU1 ROD. After Miami Drum abandoned the Site, it was acquired by Dade County through eminent domain proceedings for construction of the Palmetto Yard maintenance facility, a part of the Dade County Rapid Rail Transit Project. The former drum recycling facility was located in what is now the northwest quadrant of the 82-acre train maintenance yard. Now in operation, the William Lehman Operations and Maintenance Center serves as a major train repair facility for Dade County's aboveground electric rail system. The facility supports the public transportation system by providing the maintenance required for daily operation of the trains. The Site has been in industrial use since its cleanup and there are no plans to change its current industrial use. The surrounding mix of industrial, commercial, and residential uses is also likely to remain very similar.

The three sites that make up the Biscayne Aquifer Sites are relatively close in proximity to one another, but the study area defined to address the ground water contamination from these sites encompasses approximately 80 square miles. The local hydrology of the Biscayne Aquifer is influenced most significantly by municipal wells, the Florida East Coast Canal located about one quarter of a mile east of the Miami Drum Services Site, and the Miami Canal located less than one mile northeast of the Site. Municipal wells in the area are located within three major wellfields. As seen in Figure 1, the Medley Wellfield is located approximately 750 feet west of the Site, while the Miami Springs and Preston Wellfields are located approximately one mile southeast of the Site. The nearest well to the Miami Drum Services Site in the Miami Springs/Preston Wellfields is Miami Springs Well No. 9. This well is located on the east side of the Florida East Coast Canal, approximately one half of a mile southeast of the Site. The Northwest Wellfield is located several miles west of the Site. The Biscayne Aquifer serves as the sole source of drinking water for the more than four million residents of southeastern Florida. The Miami Springs Wellfield operates 25 public water supply wells, the Hialeah Wellfield operates 23, and the Preston Wellfield operates seven wells. As of 2007, these 55 wells provided drinking water for approximately one million people (Figure 2-2 and Exhibit C-1 of Miami-Dade County, Water Supply Facilities Work Plan Support Data, revised March 2008, CDM Project No. 6430-57901-061). These wellfields provide drinking water for the populations of Miami Gardens, Medley, Miami Springs, El Portal, Miami Shores, North Miami, Biscayne Park, North Miami Beach, Golden Beach, Aventura, Sunny Isles, Opa Locka, Miami Beach, Indian Creek Village, Hialeah Gardens, Hialeah, and most of Miami City. In addition, the transient Miami Airport population is served by water from these wellfields (Miami-Dade County, Water Supply Facilities Work Plan Support Data, revised March 2008, CDM Project No. 6430-57901-061).

The three Biscayne Aquifer Sites are all located within the Miami Springs Wellfield. Ground water flows from under the Northwest 58th Street Landfill directly to the Miami Springs Wellfield, and the Medley Wellfield lies directly across the street from the Miami Drum Services Site. The Medley Wellfield was taken out of service when contamination was discovered at the Miami Drum Services Site and is not currently permitted by the South Florida Water Management District. However, during recent testing, contamination was not detected in this wellfield. As a result, this wellfield was brought back online as a backup wellfield due to the start of a Department of Transportation-initiated turnpike construction project at 74th Street. This was done as a precaution because the construction is occurring very close to a significant water main and WASD wanted to ensure that a backup water supply would be available should the current water main be damaged by the construction project. The Medley Wellfield consists of 70-foot deep production wells that have been approved by the County Health Department; these wells are currently pumped every two weeks for maintenance purposes. The water that is pumped from the Medley Wellfield is added to untreated water at the Preston and Hialeah WTPs.

This Site currently meets the criteria for the cross program revitalization measure Protective for People Under Current Conditions because there are no unacceptable risks to current industrial users and ICs are in place restricting the use of ground water. Remedial goals for soils have been met; the removal action at the Site removed contaminated soils to meet industrial standards and prevent contaminants from leaching to ground water. In order to achieve the more stringent Ready for Anticipated Use measure, enforceable ICs must be implemented for the soils remaining at the Site that prevent unrestricted use.

3.3 History of Contamination

The privately owned Miami Drum Services (Miami Drum) facility operated from approximately 1966 to 1981. For approximately 15 years, drums were washed on site with a caustic cleaning solution which, along with drum residues containing industrial solvents, phenols, acids, and heavy metals, was disposed of in open, unlined pits on the property. These practices lead to the contamination of both soils and ground water. As many as 5,000 drums of various chemical waste materials, including corrosives, solvents, phenols, and toxic metals, were observed on the Site while the company was in operation.

Since the property was located near existing rail lines, Dade County acquired the land for a maintenance facility and repair yard. Not long after construction of the rail yard began, county transportation officials discovered the hazardous waste contamination left by Miami Drum Services. At that time, construction of the rail maintenance facility was halted to address the contamination. The county immediately began working with the state and EPA to address the hazardous waste left on site and remediate the soils and ground water.

3.4 Initial Response

In April 1981, Dade County forced the drum recycling facility to cease operation due to violations of its operating permits, which were enforced through a local court order. During the summer, Dade County began negotiations with the State of Florida and EPA for a Cooperative Agreement on the Site as well as a Feasibility Study (FS) to address ground water contamination. In November 1981, Dade County initiated actions to obtain a cleanup contractor for the Miami Drum Services Site. The county's FS for the soil contamination was completed in December 1981; the FS identified the area of contaminated soils, which extended beyond the property lines of the abandoned Miami Drum facility. The county's FS recommended excavation and relocation of contaminated soils. The first phase of the recommended cleanup addressed soil contamination through the removal and off-site disposal of hazardous waste soils and debris. The activities for this removal were initiated in December 1981. Extensive soil borings were performed at the Site and cores up to 10 feet deep were analyzed for contaminants. The primary soil contaminants included phenols, mercury, lead, cadmium, chromium, arsenic, nickel, oil and grease, dieldrin, and lindane. Many of these COCs were present in concentrations that greatly exceeded the maximum allowable concentration for public drinking water supplies according to state regulations.

Cleanup at the Site also included removal of the above ground structures, drums, and debris. Between December 8 and 21, 1981, the northern 160 feet of the property were excavated to a depth of two feet. Approximately 150,000 gallons of ground water associated with the excavation were treated and recharged to the Biscayne Aquifer. The excavation of the southern portion of the property and treatment of 500,000 gallons of associated ground water was performed from the end of December 1981 to January 4, 1982. Completion of treatment and on-site disposal of remaining water from the excavations, final cleanup of the Site's soils, and demobilization occurred during the first week of January 1982. Immediately afterwards, the excavated areas were backfilled with clean fill material. Dade County then contracted with O.H. Materials Company to remove the 400 to 500 remaining drums from the Site and relocate the contaminated soils to an approved disposal facility. A total of 15,000 tons of contaminated soil and debris was excavated from the Miami Drum Services Site and disposed of at a hazardous waste facility in Emelle, Alabama. The selected remedy from the OU1 ROD was accomplished through a removal action.

As the county implemented its selected cleanup, EPA completed a FS for the contaminated surface material at the Site. This study concurred with the county's FS in its recommendation of the excavation and off-site disposal of contaminated soils. Although the county's removal had not officially been approved for CERCLA funding prior to its implementation, the county requested and complied with EPA and state guidance as the cleanup proceeded. This allowed EPA to refund the majority of the county's cleanup costs.

3.5 Basis for Taking Action

3.5.1 OU1

EPA did not create a separate Risk Assessment document for the Site. However, the OU1 ROD, signed in September 1982, listed several reasons for taking action at the Miami Drum Services Site. The bases for action included the threat to public health presented by the contaminated drums left on site, the absence of an effective drainage control system, the presence of hazardous substances on site, the leachable properties of these substances, the risk of contamination of Dade County's drinking water supply, the hydrology of the area that accelerates the migration of hazardous substances, the prevailing weather conditions that exacerbate the leaching process, and the absence of barriers at the Site to contain the contamination. The primary contaminants for soil included phenols, mercury, lead, cadmium, chromium, arsenic, nickel, oil and grease, dieldrin, and lindane. Exposure pathways of concern included direct contact with drums or contaminated soils, leaching of hazardous substances into the drinking water supply aquifer, and ingestion of contaminated ground water. The cleanup standards for soil contamination at the Site were based on industrial use standards and the extent of soil excavation was dictated by engineering and scientific judgment.

3.5.2 OU2

Additional information on the basis for addressing the contaminated ground water was developed during the time between the Site's RODs. In late 1981, the Florida Department of Environmental Regulation (FDER, currently Florida Department of Environmental Protection) contracted with Technos Inc. to determine the extent of ground water contamination at the Miami Drum Services Site. Data showed a significant conductivity anomaly coincident with the Site that provided evidence of a strong plume-like trend to the southeast, in the direction of ground water flow and towards the Miami Springs/Preston Wellfields. Several less significant conductivity lobes were also detected west and north of the Site toward the Medley Wellfield. Although the Miami Drum Services Site significantly contributed to the area-wide ground water problem, this Remedial Investigation (RI), as well as a separate RI conducted in 1983 by FDER, found no evidence of an independent, concentrated contaminant plume from the Site. The result of the Miami Drum investigations as well as the Varsol Spill and 58th Street Landfill investigations indicated that there was no concentrated contaminant plume emanating from the Biscayne Aquifer Sites to the local wellfields. However, dispersed low-level VOC contamination was detected throughout the study area, indicating that the ground water plumes had blended together and become indistinguishable from the generally poor quality of the ground water. The main explanation for this lies in the hydrogeologic conditions within the study area, including the high transmissivity of the Biscayne Aquifer, widespread interaction of ground water with surface water bodies, and the high, continuous pumping of ground water at several municipal wellfields. However, despite the lack of a concentrated plume, the data indicated widespread levels of low to moderate contamination with VOCs, the most common of which was vinyl chloride, which exceeded acceptable levels and contributed to an increased risk of cancer. Trans-1,2-dichloroethane was also a COC; it is known to interfere with liver function.

The cleanup goals for ground water established in the OU2 ROD were based on EPA's primary and secondary drinking water standards, if available. If these were not available for a contaminant, then remedial goals were based on health effects and designed to reduce the human health risk to within EPA's acceptable risk range (i.e., Hazard Quotients less than one and an excess lifetime cancer risk for site-related exposures between $1x10^{-4}$ and $1x10^{-6}$). Sources used to establish health-based standards included the Centers for Disease Control, EPA Cancer Assessment Group recommendations, and the National Academy of Sciences. The priority pollutants and their cleanup goals as provided in the OU2 ROD are listed in Table 2, below.

Table 2: Priority Pollutants Listed in the OU2 ROD

Contaminant	Cleanup Goals from OU2 ROD[1] (µg/L)
Inorganics	
Arsenic	50
Cadmium	10
Chromium	50
Lead	50
Mercury	2
Selenium	10
Volatile Organics	
Vinyl Chloride	1
1,1,2,2-Tetrachloroethane	0.2
Benzene	0.7
Methylene Chloride (or Dichloromethane)	0.2
1,1-Dichloroethane	0.9
1,1-Dichloroethene	0.04
Acrylonitrile	0.34
Chlorobenzene (or Monochlorobenzene)	488
Cis-1,2-Dichloroethene	270
Trans-1,2-Dichloroethene	270
Toluene	340
Xylenes (total)	620
Trichloroethene (or Trichloroethylene)	28
Ethylbenzene	1,400
Tetrachloroethene (or Tetrachloroethylene)	9

Contaminant	Cleanup Goals from OU2 ROD[1] (µg/L)
Chloroform	100
Bromodichloromethane	100
1,1,1-Trichloroethane	22
Styrene	1,330
Chlorotoluene	3,450
Carbon Disulfide	830
Tetrahydrofuran	57
Chloroethane	N/A
Chloroethane	N/A
Other Organic Compounds	
Chrysene	0.2
Anthracene	0.2
Benzo(a)anthracene	0.2
Benzo(b)fluoranthene	0.2
Benzo(k)fluoranthene	0.2
Benzo(a)pyrene	0.2
Benzo(ghi)perylene	0.2
Phenanthrene	0.2
Pyrene	0.2
Fluoranthene	0.2
Indeno(1,2,3-cd)pyrene	0.2
2,4-Dimethylphenol	400
2,4-Dinitrophenol	70
4-Nitrophenol	70
Pentachlorophenol	30
Phenol	3,500
Bis(2-ethylhexyl)phthalate (or Di(2-ethylhexyl)phthalate)	6,000
1,4-Dioxane	570
2,4,5-Trichlorophenol	2,600
Benzyl Butyl Phthalate	N/A
Pesticides and PCBs	
PCB (total)	0.00008
4,4'-DDT	0.00002
2,4-D (or Dichlorophenoxy acetic acid, 2,4-)	100
Silvex (2,4,5-TP)	10
Endosulfan sulfate	N/A

1. Based on the OU2 ROD, pages 12-14, Table 11.

Of the priority pollutants identified in the OU2 ROD, VOCs were the most prevalent contaminants found throughout the study area, in the wellfields, and in finished water from the Preston and Hialeah WTPs prior to installation of the air strippers. Heavy metals were sporadically detected in the study area, with maximum concentrations in the wellfields and WTPs that were below the primary drinking water MCLs. Similarly, the priority pollutant base/neutral and acid extractable organic compounds were sporadically detected in the study area, but were not detected in the wellfields or WTPs.

In general, ground water from the municipal production wells contained higher contaminant levels than water from the other monitoring wells. This was likely due to continuous pumping of the production wells drawing contaminants to the surface from within and around the wellfield cones of influence. VOC contamination in the Biscayne Aquifer study area was present in all three of the aquifer's vertical levels (upper, middle, and deep); the middle and bottom zones had contamination levels that were two to three times those of the upper zone. This was likely due to the pumping of the production wells in the two lower zones, which draws contaminants from the upper zone to the lower zones.

4.0 Remedial Actions

In accordance with CERCLA and the NCP, the overriding goals for any remedial action are protection of human health and the environment and compliance with applicable or relevant and appropriate requirements (ARARs). A number of remedial alternatives were considered for the Site, and final selection was made based on implementability, remedial action objectives, protectiveness of human health and the environment, and cost.

4.1 Remedy Selection

Remedy selection for the Miami Drum Services Site was addressed through two RODs – a 1982 ROD for soil contamination in OU1 and the 1985 Biscayne Aquifer ROD that addressed ground water contamination as OU2.

4.1.1 OU 1

On September 13, 1982, EPA signed the OU1 ROD to address soil contamination at the Miami Drum Services Site, selecting the county's removal and off-site disposal of contaminated soils as the remedy. The OU1 ROD described the selected removal action, stating that the extent of the excavation in the selected alternative was based on engineering and scientific judgment. The selected removal action left 3,900 cubic yards of mercury-contaminated soil in place. This decision was based on the fact that on-site conditions were more alkaline than those in the surrounding areas, which was judged to make the mercury less prone to leaching. The OU1 ROD contained EPA's determination that the removal action undertaken by Dade County was conducted in accordance with CERCLA program requirements and met the conditions that had been outlined by the state for authorization of retroactive funding of the county's cleanup. The county had funded the initial cleanup prior to final approval due to the urgent need to protect public health and continue construction of the rail maintenance yard. EPA used the local expertise of the Dade County Department of Environmental Quality (now DERM) to design and implement the removal at the Site. The selected remedy included the removal and proper disposal of approximately 15,000 tons of contaminated soil, and the treatment of approximately 650,000 gallons of contaminated ground water directly beneath the Site. The OU1 RAO for soil was to remove contaminated soils that could leach hazardous substances into the drinking water supply aquifer for Dade County through removal of soil with contaminant concentrations above industrial use standards. Institutional controls were not mentioned as a necessary component of the selected remedy.

4.1.2 OU 2

On September 16, 1985, EPA signed the OU2 ROD to address ground water contamination at the Miami Drum Services Site. For the 1985 Biscayne Aquifer Sites ROD (OU2 ROD), an extensive community involvement process was carried out during design of the selected remedy. EPA addressed citizen concerns on the proposed remedy and issued the Biscayne Aquifer Sites ROD (OU2 ROD) on September 16, 1985. Principal components of the selected remedy from the OU2 ROD included use of existing wells in the Miami Springs and Preston Wellfields as recovery wells, and treatment of the contaminated ground water through aeration via air stripping towers installed at the Preston and Hialeah WTPs. The OU2 ROD also called for ICs restricting the use of ground water for the Biscayne Aquifer Sites, noting that the existing Dade County regulations governing discharges and well permitting acted as a form of existing ICs to restrict ground water usage. In addition, the OU2 ROD recommended a preventative action program administered at the county level to address pollution caused by small quantity generators and industrial facilities not connected to the sanitary sewer system. The Biscayne Aquifer Protection Plan, created by EPA in 1985, was the recommended outcome of the need for supplementary preventative actions. The 20 recommendations contained in the Plan can be found in Appendix G.

The OU2 ROD also selected installation of air stripping towers at the Hialeah and Preston WTPs to remove VOCs through aeration and meet the selected cleanup goals. The cone of influence of these two wellfields covers the Miami Drum Services Site and a large portion of the regional VOC plume that affects the Biscayne Aquifer. Tests of the towers and sampling results suggested that air stripping would reduce VOCs to concentrations below EPA's required $1x10^{-6}$ excess lifetime cancer risk level. The OU2 ROD generally used MCLs to establish cleanup goals for the region's ground water. In the case of vinyl chloride, the State of Florida's drinking water standard, based on a $1x10^{-6}$ cancer risk level, was adopted, requiring a 1.0 μg/L cleanup goal. The federal MCL standard, based on the same risk level but a different study, was 2.0 μg/L. The selected air stripping remedy can reduce water concentrations of vinyl chloride to 0.03 μg/L, below both federal and state drinking water standards.

4.2 Remedy Implementation

4.2.1 OU1

Using funds originally earmarked for transportation projects, DERM completed removal of the contaminated soil in January of 1982 and began treating the ground water. EPA reimbursed Dade County for 90 percent of its expenses with funds that the Agency recovered from Miami Drum Services and more than 60 other parties that had contributed to the contamination at the Site. After the contaminated soil was removed and cleanup of the ground water began, Dade County was able to resume construction of the rail maintenance yard. The OU1 ROD did not require implementation of any additional actions beyond the county's removal action. A more detailed description of the implementation of this removal action is available in Section 3.4. The Removal Assessment for this action was conducted in 1992 just prior to the Site's Construction Completion designation.

4.2.2 OU2

The OU2 ROD addressed the ground water contamination in the Biscayne Aquifer through pumping and treatment at the Preston and Hialeah WTPs. All Miami Dade Water and Sewer Department (WASD) water supply wells pump water from the Biscayne Aquifer. Remedial Design (RD) for OU2 was completed in September 1987. The RD determined the type of air stripping tower and packing that would be most effective for VOC contamination in the Biscayne Aquifer. It also concluded that withdrawal and treatment of ground water at a centralized location (i.e., the Preston and Hialeah WTPs) was preferable to treatment of ground water at each individual supply well.

In 1988, EPA signed a Cooperative Agreement for the Biscayne Aquifer remedy with WASD, which then constructed a treatment system to handle the combined capacity of the Preston and Hialeah WTPs. Water supply for WASD is derived primarily from seven major wellfields located in the Hialeah-Preston and Alexander Orr Service Areas. Treatment of water from the seven major wellfields is achieved at the three major WTPs: Hialeah, John E. Preston, and Alexander Orr, Jr. The Hialeah and John E. Preston WTPs treat water from the Northwest, Miami Springs, and Hialeah Wellfields. Alexander Orr, Jr. WTP treats water from the Alexander Orr, Snapper Creek, Southwest, and West Wellfields. All three WTPs use conventional lime softening, followed by filtration and disinfection. Upon discovery of contamination, the Hialeah, Miami Springs, and Preston Wellfields were removed from service until the air strippers were installed and functioning at the Hialeah and Preston WTPs. Prior to 1992, supply water for these two plants was provided from the uncontaminated Northwest Wellfield. Since September 1992, the Hialeah and John E. Preston WTPs have used air stripping to treat the VOC contamination present in the Miami Springs and Preston Wellfields.

According to the OU2 ROD, Dade County was designated to conduct the necessary water quality monitoring activities at its own expense. Monitoring occurs at the supply wells and the WTPs. WASD monitored VOC contamination in the Hialeah, Upper and Lower Miami Springs, and John E. Preston Wellfield supply wells quarterly from 1968 to 1992. From 1993 to the present, monitoring of each supply well has been conducted annually. Monitoring also takes place at the WTPs; WASD monitors the untreated water influent, the air stripper tower influent, and the finished water effluent at least four times per month. The results of the water quality monitoring will be discussed in more detail in Section 6.4.

The drinking water from the Preston and Hialeah WTPs must meet all state and federal drinking water standards prior to being supplied as drinking water to the public. Water quality analysis is also performed throughout the year for internal purposes and to meet federal, DERM, and Department of Health requirements for public water supplies. These water quality analyses include sampling for metals, anions, physical and chemical properties, microbes, organics, and VOCs. These "Typical Average Analyses" are made available to WASD consumers annually in the consumer confidence report. Current MCLs set by EPA and drinking water standards set by FDEP and Miami-Dade County are also listed in this annual report. In the past, concentrations of vinyl chloride have exceeded the MCL in water samples collected from water supply wells prior to treatment with the air strippers, indicating a continuing need for treatment of the water to reduce this contaminant to below MCLs in the finished water.

Every four years, WASD must apply to FDEP for a Title V Air Operation permit for the air emissions associated with the air stripping towers. WASD last renewed its permit on January 30, 2006, the final permit number for which is No. 0250281-010-AV. The permit covers the emissions of VOCs and particulates from the 64 air stripping towers associated with the Biscayne Aquifer remedy as well as the seven diesel engine generators that are used as a backup power supply for the air stripping towers and a rotary lime kiln used in the water treatment process. The air stripping towers are capable of treating up to 245.12 million gallons of water per day. Each tower is equipped with a blower that reduces concentrations of VOCs and trihalomethanes (THMs) in the water. Annual statements of compliance are required as part of this permit, and these must be submitted to both FDEP and EPA within 60 days of the end of each calendar year. Compliance is measured by three separate determinations of the total air pollutant emissions rate through the test section of the tower. WASD has been and continues to be in compliance with its air permit during the last five years.

4.3 Operation and Maintenance (O&M)

The OU1 ROD did not discuss operations or maintenance. Dade County Transit Authority currently maintains the access controls at the Site. The selected remedy for OU2 included O&M activities related to the air stripping treatment facilities at the Preston and Hialeah WTPs. Of the priority pollutants identified in the OU2 ROD, VOCs were the most prevalent contaminants found throughout the study area, in the well fields, and in finished water from the Preston and Hialeah WTPs prior to installation of the air strippers. Because of the low or nonexistent concentrations of contaminants other than VOCs, the ability of the existing water treatment process to reduce metal concentrations to below MCLs, the presence of ICs to limit exposure to contaminated ground water, and the highly immobile nature of the base/neutral and acid extractable organic compounds, it was determined that the organic compounds present in the ground water could be effectively removed by aeration alone.

The 1985 ROD for the Biscayne Aquifer Sites (OU2 ROD) projected annual O&M costs of $334,400 for the life of the project (until monitoring of untreated water confirms that ground water cleanup goals listed in the OU2 ROD have been met). O&M therefore requires monitoring of water quality at both WTPs. When the OU2 ROD was signed, water at the WTPs was monitored for all VOC priority pollutants twice a year – once by

WASD and once by DERM. The OU2 ROD stated that this monitoring was sufficient and that it should continue until FDER determined that ground water cleanup goals listed in the OU2 ROD had been met. EPA supported the construction and operation of the air stripping towers, providing 47.8% of the cost of construction and $1 million per year for 10 years for their operation. Now the county is solely responsible for funding the operation of the air strippers. The air strippers have been in almost continuous operation since their installation in 1992. The brief periods in the past when air stripping ceased were due to power outages or shortages associated with weather events; the WTPs now have backup generators that can operate the air stripping towers during local power outages.

The monitoring schedule at the WTPs has changed somewhat since the OU2 ROD. Currently, individual production wells are tested once a year for the 21 regulated VOCs, and the untreated water, tower influent, and tower effluent (or finished water) are sampled twice a week. In addition to the 21 regulated VOCs, WASD also monitors individual THM species, including chloroform, bromoform, bromodichloromethane, dibromochloromethane, 1,1-dichloroethane, and m-dichlorobenzene.

WASD conducts this monitoring as a matter of best practice rather than because it is mandated. It is possible for WASD to conduct a comprehensive well survey in a week, if necessary. More detailed results of this annual monitoring are presented in Section 6.4.

Table 3: O&M Costs

Date	Maintenance Costs	Electricity for Towers	Total Cost
2003	$119,785	$662,900	$782,685
2004	$120,062	$662,900	$782,962
2005	$217,689	$662,900	$880,589
2006	$158,025	$662,900	$820,925
2007	$154,701	$662,900	$817,601
Total	**$770,262**	**$3,314,500**	**$4,084,762**

WASD is responsible for the operation and maintenance of the air stripping towers at the Preston and Hialeah WTPs. The cost of the electricity used to continuously operate the air stripping towers is the main operational expense. Other maintenance costs include time and materials for repairs and general tower maintenance.

5.0 Progress Since the Last Five-Year Review

Protectiveness Statement from the last Five-Year Review

In the last FYR the protectiveness statement described the Site as protective of human health and the environment. The full protectiveness statement from the previous FYR report is provided below:

> Based upon records in the FDEP files in Tallahassee, Florida, the selected remedy, as executed, appears to remain protective of human health and the environment. Continued groundwater monitoring at each municipal supply well, and the water treatment plant influent and effluent should be performed and documented to ensure long-term protectiveness.
>
> Long-term protectiveness of the remedial action for the Miami Drum Services Site is maintained by continued operation of the Dade County Transit Maintenance and Repair Facility. Long -term protectiveness of the remedial action for the groundwater contaminant plume is through continued monitoring of municipal supply wells and continued treatment of the groundwater at both the John E. Preston and Hialeah Water Treatment Plants.

Summary of Previous Five-Year Review

From July 25, 2002, through May 2, 2003, the first FYR of the Miami Drum Services Site's remedy was conducted. During the review, the Army Corps of Engineers visited the Site, inspected the WTPs, and reviewed supply well and WTP monitoring data. Supply wells are sampled on an annual basis. Analysis of these data indicated that all of the Preston wells reported total VOC concentrations lower than 5 ppb during the five years prior to the first FYR (please note that the WASD presents ground water contaminant concentrations in units of ppb, which are equivalent to μg/L). Water quality monitoring of the Lower Miami Springs wells indicated that all of the wells had recorded total VOC concentrations lower than 10 ppb during the five years prior to 2002. The Upper Miami Springs wells, including the well closest to the Miami Drum Services Site (No. 9), had total VOC concentrations that varied between non-detect and 15 ppb over the five year monitoring period, with 2002 results of 2 ppb. All of the wellfields' monitoring data had a spike in total VOC concentrations during the 1994-1995 time period, which the first FYR attributed to the initiation of pumping at these supply wells in 1992. The 2003 FYR reported that there had been noticeable reductions in the concentrations of COCs in each municipal supply well since the initiation of remedial actions, and that, with the exception of Hialeah well No. 8, all supply wells had total VOC concentrations lower than 5 ppb. In terms of air monitoring, the air emissions limit specified in WASD's air permit had never been exceeded and the VOC emissions calculated for the Hialeah and Preston WTPs were significantly below permitted emission levels. The statement of protectiveness from the first FYR indicated that based on ground water monitoring results, the remedial action appeared to be performing as intended and that it remained protective of human health and the environment. The protectiveness statement noted the need for continued monitoring of each municipal supply well and the WTP influent and effluent, as well as continued treatment of the ground water. It further stated that long-term protectiveness was dependent on continued use of the Site as the Transit Authority's maintenance and repair facility.

Recommendations from the Previous Five-Year Review

The following table provides a chronological summary by issue of the recommendations made in the 2003 FYR and any follow up actions that have been taken to address those recommendations in the five years since the last FYR.

Table 4: Summary of Progress on Recommendations from the 2003 FYR

	Recommendations from 2003 FYR	Status of Issue at Time of 2003 FYR	Actions Taken Between FYRs	Status in 2008
5.1	Sample supply wells annually for VOCs and provide COC trend information in a summary report.	No summary report on reduction of VOCs in supply wells due to the treatment remedy.	WASD sampled each Preston and Hialeah well annually. Numeric and graphic trend data were compiled for 1988-2006.	Annual sampling of each Preston and Hialeah well is ongoing. Data continue to be collected and compiled.
5.2	Analyze supply wells for biodegradation parameters.	Unclear if reduction of VOCs is occurring due to pump and treatment remedy or through biodegradation.	No action.	The type of sampling and analysis WASD performs is not capable of distinguishing between the effects of the pump and treat remedy and biodegradation.
5.3	Calculate total mass of volatiles emitted at the treatment plant.	Mass of volatiles emitted is only tracked at the air strippers and not for the WTPs as a whole.	No action.	WASD deems emissions from settling ponds as insignificant. Summa canister data did not indicate significant emissions from WTP as a whole. Emissions levels for air stripping towers are significantly below permitted levels.
5.4	Review repository and update files.	Local information repository for the Site does not contain all applicable reports.	EPA delivered a copy of the 2003 FYR to the site information repository.	The local repository contains hardcopies of the 1983 RI by FDEP and the 2003 FYR by ACOE.
5.5	Issue a No Further Action with Conditions declaration for the Site and implement the required Restrictive Covenant upon site closure.	No ICs are in place to ensure the surface seal at the Site is maintained.	Negotiations initiated for ICs to ensure the protectiveness of the soil remedy.	Negotiations in progress among EPA, FDEP, DERM, and the Dade County Transit Authority to design and implement ICs for the soil remedy.

5.1 Annual Monitoring and Trend Reporting

WASD creates annual data summary reports for the Preston and Hialeah wells, reporting the total VOC concentrations observed in parts per billion as well as detailed reports by COC. This type of monitoring data has been collected since 1998 and has been compiled into both tables and graphs to illustrate the downward trend in VOC contamination in the wells serving the Preston and Hialeah WTPs. Materials showing the trend data for all Preston and Hialeah wells are available in Appendix C.

5.2 Evaluation of Biodegradation

Mr. Diaz, Division Chief for Laboratory Services, explained that WASD has not conducted any studies to make the determination on the relative roles of air stripping and biodegradation in the improved water quality from the Preston and Hialeah wells. He stated that WASD assumes that the air strippers are the primary mechanism of cleanup despite the possibility of some biodegradation occurring simultaneously. The type of sampling and analysis that WASD performs on a regular basis is not capable of distinguishing between the effects of the pump and treat remedy and biodegradation. WASD data monitors VOC concentrations and trends, but does not provide information about the underlying cause of the observed trends. WASD views this type of analysis as outside the purview of its currently required monitoring and analysis activities. WASD staff expressed the opinion that some natural degradation is likely occurring, but that this would not eliminate the need for the air stripping towers, which are vital to producing a water supply that complies with state and federal standards.

5.3 Total WTP Emissions

Mass balance calculations are currently performed on the influent and effluent of the air stripping towers to comply with WASD's air permit. WASD staff members explained that they perform extensive monitoring and data tracking activities in order to comply with county, state, and federal standards. The terms of the permit do not require calculation of the WTP emissions separately from the tower emissions, nor do any of the regulatory agencies. Therefore, WASD does not have the resources to undertake additional monitoring and analysis, since the monitoring and data tracking activities already required are time consuming and extensive. Previously, the WTP used Summa canisters for air monitoring around the plant and in the surrounding neighborhoods. This was done for nine years, until the only supplier of canisters went out of business. None of the data collected during the nine-year period indicated problems with air contamination in the neighborhoods or at the eight-hour threshold limit for employees of the plant. These data indicate to WASD staff that the amount of air emissions due to WTP activities other than the air stripping towers is minimal.

5.4 Site Repository

E^2 Inc. staff visited the site repository at the Miami Public Library on October 11, 2007 and reviewed the materials available on the Miami Drum Services Site. These included hardcopies of the 1983 Remedial Investigation report created by FDEP and the 2003 FYR produced by ACOE. Other materials were available online at the library. The most recent report on the Site, the previous FYR, was publicly available.

5.5 Institutional Controls

The OU2 ROD called for ICs restricting the use of ground water at the Biscayne Aquifer sites. Sections 24-43.2 and 24-43.3 of the Miami-Dade County Code of Ordinances, which regulate the permitting and use of wells in the vicinity of sources of contamination, meet the IC requirements for OU2.

While the OU1 ROD did not call for ICs, ICs are necessary for the Site because the remedy does not allow for unrestricted use and unlimited exposure to soils. The soil remedy for OU1 involved the excavation and off-site disposal of soils based on industrial use standards and the backfilling of excavated areas with clean fill. Currently, there are no restrictions in place to ensure that the land use remains industrial, that exposure to mercury-contaminated soils does not occur, or that the soil cover is maintained. ICs setting forth these restrictions may therefore be needed.

6.0 Five-Year Review Process

6.1 Administrative Components

EPA Region 4 initiated the FYR in August 2007 and scheduled its completion for May 2008. The EPA Miami Drum Review team was led by Julie Santiago-Ocasio of EPA, Remedial Project Manager (RPM) for the Miami Drum Services Site, and also included Kelsey Helton of FDEP, and contractor support provided by E^2 Inc. In August 2007, EPA held a scoping call to discuss the Site and items of interest as they related to the protectiveness of the remedy currently in place. Julie Santiago-Ocasio established a review schedule that consisted of the following:

- Community notification;
- Document review;
- Data collection and review;
- Site inspection;
- Local interviews; and
- FYR Report development and review.

6.2 Community Notification and Involvement

On October 6, 2007, a public notice was published in the *Miami Herald* announcing the commencement of the FYR process for the Miami Drum Services Site, providing contact information for L'Tonya Spencer, the Site's Community Involvement Coordinator, and inviting community participation. The FYR report will be made available to the public in the Site's information repository once it has been finalized. The designated public repository for the Site is the Miami-Dade County Public Library located at 101 W. Flagler, Miami, Florida, 33128. On October 11, 2007, as part of the site inspection, E^2 Inc. staff visited the Miami-Dade County Public Library to verify that Miami Drum Services Site documents were available to the public in the library's reference room. Upon completion of the FYR, a public notice will be placed in the *Miami Herald* to announce the availability of the FYR report in the site document repository. The only citizen comments or concerns regarding cleanup activities at the Site received from the public to date are the public comments provided to EPA during the public comment period for the OU2 proposed plan. All of these comments received by EPA during this period were addressed in the Responsiveness Summary section of the OU2 ROD.

6.3 Document Review

This FYR included a review of relevant, site-related documents including the Record of Decision, remedial action reports, and recent monitoring data. A complete list of the documents reviewed can be found in Appendix A.

ARARs Review

Section 121 (d) (2) (A) of CERCLA specifies that Superfund remedial actions must meet any federal standards, requirements, criteria, or limitations that are determined to be legally applicable or relevant and appropriate requirements (ARARs). ARARs are identified in RODs and are determined during the Remedial Investigation/Feasibility Study (RI/FS) and at other stages in the remedy selection process. ARARs are those standards, criteria, or limitations promulgated under federal or state law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site. To-Be-Considered Criteria (TBCs) are non-promulgated advisories and guidance that are not legally binding, but should be considered in determining the necessary level of cleanup for protection of human health or the environment. While TBCs do not have the status of ARARS, EPA's approach to determining if a remedial action is protective of human health and the environment involves consideration of TBCs along with ARARs.

Location-specific ARARs are restrictions placed on the concentration of hazardous substances or the conduct of activities solely on the basis of location (e.g., wetlands). Action-specific ARARs are technology- or activity-based requirements or limitations on actions taken with respect to hazardous wastes. These requirements are triggered by the particular remedial activities that are selected to accomplish a remedy. Chemical-specific ARARs are specific numerical quantity restrictions on individually listed contaminants in specific media. Examples of chemical-specific ARARs include the MCLs specified under the Safe Drinking Water Act as well as the ambient water quality criteria that are enumerated under the Clean Water Act. Because there are usually numerous contaminants of potential concern for any Site, various numerical quantity requirements can be ARARs. The final remedy selected for this Site was designed to meet or exceed all chemical-specific ARARs and meet location- and action-specific ARARs, which were identified in the OU1 and OU2 RODs. State ARARs must also be met if they are more stringent than federal requirements.

Soil

The remedial action selected in the OU1 ROD for soil was excavation of soils above industrial soil cleanup standards. The selected remedy from the OU1 ROD was accomplished through a removal action. Numeric remedial action objectives were not developed, and ARARs were not identified in the OU1 ROD for soil contaminants at this Site. Since the OU1 ROD did not establish such ARARs, a review of the protectiveness of ARARs for the remediation of soil contamination is not required as part of this FYR.

Ground Water

ARARs identified in the OU2 ROD for ground water and considered for this FYR are listed in the table below. Specifically, the table presents ground water standards for drinking water purposes. At the time of the ROD, ARARs for many contaminants were not well-established. Therefore, EPA developed the cleanup goals based on both existing standards (i.e., National Drinking Water Standards, Florida's general VOC standard), and the most recent toxicological information available at the time (i.e., EPA's recommended Ambient Water Criteria, other criteria developed by Centers for Disease and Control, World Health Organization, and National Academy of Sciences).

Vinyl chloride is the only contaminant for which the state standard (1.0 μg/L) was used instead of the federal standard (2.0 μg/L) at the time of the OU2 ROD. Since the signing of the OU2 ROD, Florida has developed its drinking water standards (promulgated on November 19, 1987, formerly FAC 17-22.210, now FAC 62-550.310), which incorporated Florida's general VOC standard at the time of the OU2 ROD.

Between the signing of the OU2 ROD and the time of this FYR, the requirements for the following ARARs listed in the OU2 ROD have become more stringent: ARARs for arsenic decreased from 50 μg/L to 10 μg/L, ARARs for cadmium decreased from 10 μg/L to 5 μg/L, ARARs for lead decreased 50 μg/L to 15 μg/L, ARARs for chlorobenzene decreased from 488 μg/L to 100 μg/L, ARARs for cis-1,2-dichloroethene decreased from 270 μg/L to 70 μg/L, ARARs for trans-1,2-dichloroethene decreased from 270 μg/L to 100 μg/L, ARARs for trichloroethene decreased from 28 μg/L to 5 μg/L, ARARs for ethylbenzene decreased from 1,400 μg/L to 700 μg/L, ARARs for tetrachloroethene decreased from 9 μg/L to 5 μg/L, ARARs for styrene decreased from 1,330 μg/L to 100 μg/L, ARARs for pentachlorophenol decreased from 30 μg/L to 1 μg/L, ARARs for bis(2-ethylhexyl)phthalate decreased from 6,000 μg/L to 6 μg/L, and ARARs from 2,4-dichlorophenoxy acetic acid decreased from 100 μg/L to 70 μg/L.

More than half of the ARARs that have become more stringent are VOCs (seven VOCs out of 13 contaminants), which are the primary concern at the Site. Based on monitoring data, total VOC concentrations have shown a pronounced declining trend in the past five years. Currently, most of the sampled wells have total VOC concentrations under 5 μg/L, which is below or comparable to all of the seven newer, more stringent ARARs for VOCs. Therefore, these changes in ARARs do not appear to affect the protectiveness of the selected OU2 remedy. In addition, all of the seven VOCs with more stringent current ARARs are currently monitored by WASD using standards that are equal to or less than the current ARARs. This is further indication that the VOC ARARs changes do not affect the protectiveness of the remedy.

Table 5: Summary of Ground Water ARARs

Contaminant	Original ARARs from 1985[1] (μg/L)	Current Standards for Ground Water ARARs Identified in the OU2 ROD (μg/L)	ARAR changes since 1985
Inorganics			
Arsenic	50	10[2]	More stringent
Cadmium	10	5[2]	More stringent
Chromium	50	100[2]	Less stringent
Lead	50	15[2]	More stringent
Mercury	2	2[2]	No
Selenium	10	50[2]	Less stringent

Contaminant	Original ARARs from 1985[1] (µg/L)	Current Standards for Ground Water ARARs Identified in the OU2 ROD (µg/L)	ARAR changes since 1985
Volatile Organics			
Vinyl Chloride	1	1[3]	No
1,1,2,2-Tetrachloroethane	0.2	0.2[4]	No
Benzene	0.7	5[2]	Less stringent
Methylene Chloride (or Dichloromethane)	0.2	3[2]	Less stringent
1,1-Dichloroethane	0.9	0.9[4]	No
1,1-Dichloroethene	0.04	7[2]	Less stringent
Acrylonitrile	0.34	0.34[4]	No
Chlorobenzene (or Monochlorobenzene)	488	100[2]	More stringent
Cis-1,2-Dichloroethene	270	70[2]	More stringent
Trans-1,2-Dichloroethene	270	100[2]	More stringent
Toluene	340	1,000[2]	Less stringent
Xylenes (total)	620	10,000[2]	Less stringent
Trichloroethene (or Trichloroethylene)	28	5[2]	More stringent
Ethylbenzene	1,400	700[2]	More stringent
Tetrachloroethene (or Tetrachloroethylene)	9	5[2]	More stringent
Chloroform	100	100[4]	No
Bromodichloromethane	100	100[4]	No
1,1,1-Trichloroethane	22	200[2]	Less stringent
Styrene	1,330	100[2]	More stringent
Chlorotoluene	3,450	3,450[4]	No
Carbon Disulfide	830	830[4]	No
Tetrahydrofuran	57	57[4]	No
Chloroethane	N/A	5[2]	N/A
Chloroethane	N/A	N/A	N/A
Other Organic Compounds			
Chrysene	0.2	0.2[4]	No
Anthracene	0.2	0.2[4]	No
Benzo(a)anthracene	0.2	0.2[4]	No
Benzo(b)fluoranthene	0.2	0.2[4]	No
Benzo(k)fluoranthene	0.2	0.2[4]	No
Benzo(a)pyrene	0.2	0.2[2]	No
Benzo(ghi)perylene	0.2	0.2[4]	No
Phenanthrene	0.2	0.2[4]	No
Pyrene	0.2	0.2[4]	No
Fluoranthene	0.2	0.2[4]	No
Indeno(1,2,3-cd)pyrene	0.2	0.2[4]	No
2,4-Dimethylphenol	400	400[4]	No
2,4-Dinitrophenol	70	70[4]	No
4-Nitrophenol	70	70[4]	No

Contaminant	Original ARARs from 1985[1] (µg/L)	Current Standards for Ground Water ARARs Identified in the OU2 ROD (µg/L)	ARAR changes since 1985
Pentachlorophenol	30	1[2]	More stringent
Phenol	3,500	3,500[4]	No
Bis(2-ethylhexyl)phthalate (or Di(2-ethylhexyl)phthalate)	6,000	6[2]	More stringent
1,4-Dioxane	570	570[4]	No
2,4,5-Trichlorophenol	2,600	2,600[4]	No
Benzyl Butyl Phthalate	N/A	N/A	N/A
Pesticides and PCBs			
PCB (total)	0.00008	0.5[2]	Less stringent
4,4'-DDT	0.00002	0.00002[4]	No
2,4-D (or Dichlorophenoxy acetic acid, 2,4-)	100	70[2]	More stringent
Silvex (2,4,5-TP)	10	50[2]	Less stringent
Endosulfan sulfate	N/A	N/A	N/A

1. Based on the OU2 ROD, pages 12-14, Table 11.
2. National Drinking Water MCLs as of 2008 (40 CFR 141), which are available at http://www.epa.gov/safewater/contaminants/index.html#primary (accessed on 4/2/2008).
3. Florida Drinking Water MCLs as of 2008, which are available at http://www.dep.state.fl.us/legal/Rules/drinkingwater/62-550.pdf (accessed on 4/2/2008).
4. If there are no current National Drinking Water MCLs that could be applied to a contaminant for which the recommended criteria (i.e., To-Be-Considered standards) were used at the time of the ROD, the original ARARs are presented. This applies to contaminants for which OU2 cleanup goals were set using EPA's recommended Ambient Water Criteria. Current values for this ARAR were not included in this analysis because these criteria do not contain a standard for exposure through water consumption alone. The only standard in the Ambient Water Criteria that includes water consumption as an exposure pathway combines this exposure with consumption of fish from surface water. Since consumption of fish is not a relevant exposure pathway for the remedy, the original ARAR concentration was retained.

6.4 Data Review

Air

The air stripping towers at the Preston and Hialeah WTPs are subject to a federally enforceable limit on total and individual hazardous air pollutant emissions as well as the limits imposed by the state through its Title V Air Operations permit. Based on the amount of emissions approved in the air permit, the permit describes the WTPs as a major source of hazardous air pollutants. However, over the last five years, the WTPs have reported much lower emission volumes than those allowed under the permit. The following table outlines the standards established in the air emissions permit. These emissions limits assume that all pollutants detected are emitted from the towers.

Table 6: Emissions Standards for Air Operation Permit

Contaminant	Emissions Limit (tons per year)
1,1-Dichloroethane	1.00
Vinyl Chloride	1.00
1,2-Dichloroethylene	1.00
Chloroform	40.00
Dichlorobromoethane	10.00
Chlorodibromoethane	3.00
Methylene chloride	1.00
Trichloroethylene	1.00
Total VOCs	50.00

Emissions data are collected from the towers on a monthly basis and summed for the 12-month period from January to December of each calendar year. These 12-month totals are reported to demonstrate compliance with the terms of the air emission permit. The data for the past four years are presented in the table below.

Table 7: Total Annual Air Emissions from the Preston and Hialeah WTPs in Tons

Contaminant	2003	2004	2005	2006	2007
1,1-Dichloroethane	0.000	0.029	0.049	0.050	0.019
Vinyl Chloride	0.094	0.078	0.059	0.53	0.030
1,2-Dichloroethylene	0.000	0.029	0.049	0.050	0.021
Chloroform	17.661	10.953	11.985	13.121	10.835
Dichlorobromoethane	4.369	2.505	2.784	3.595	2.715
Chlorodibromoethane	0.930	0.657	1.155	0.767	0.577
Methylene Chloride	0.000	0.029	0.049	0.130	0.019
Trichloroethylene	0.000	0.004	0.049	0.050	0.019
VOCs	21.204	14.134	17.251	17.286	13.696
THMs	0.900	0.078	0.078	0.145	0.604
Total (VOCs and THMs)	**22.104**	**14.212**	**17.330**	**17.431**	**14.301**

As demonstrated by the data in the two preceding tables, the annual emissions from the WTPs are far below the 50-ton limit imposed by the air permit. WASD documents the monthly and cumulative 12-month totals for the tons of each air pollutant emitted. The last five years of emissions data indicate that there have not been any exceedances of permitted levels of individual contaminants or in the total volume of pollutants emitted. In the last five years, the WTPs have emitted approximately one third of the total emissions allowed under the permit for each year.

Ground Water

Of the priority pollutants identified in the OU2 ROD, VOCs were the most prevalent contaminants found throughout the study area, in the well fields, and in finished water from the Preston and Hialeah WTPs prior to installation of the air strippers. Heavy metals were sporadically detected in the study area, with maximum concentrations in the wellfields and WTPs that were below the primary drinking water MCLs. Similarly, the priority pollutant base/neutral and acid extractable organic compounds were sporadically detected in the study area, but were not detected in the wellfields or WTPs. Because of the low or nonexistent concentrations of contaminants other than VOCs, the ability of the existing water treatment process to reduce metal concentrations to below MCLs, the presence of ICs to limit exposure to contaminated ground water, and the highly immobile nature of the base/neutral and acid extractable organic compounds, it was determined that the organic compounds present in the ground water could be effectively removed by aeration alone. When the OU2 ROD was signed, water at the WTPs was monitored for all VOC priority pollutants twice a year – once by WASD and once by DERM. The OU2 ROD stated that this monitoring was sufficient and that it should continue until FDER determined that ground water cleanup goals listed in the OU2 ROD had been met.

Ground water monitoring has been ongoing at the Preston and Hialeah WTPs since the installation of the air stripping towers. The table below summarizes 18 years of ground water sampling data. WASD often samples each of these wells several times a year, though at least one sampling event per well per year is required. Since data from multiple sampling events exist for some years and not others, this table presents the results of only one sampling event per year. The sampling event for each year was selected based on its similarity to the time of year in which the previous year's sampling event occurred, in order to make the results as comparable as possible. For ease of presentation, WASD has also aggregated these results, which are presented below as the total VOCs detected in each well for each year. These data indicate that concentrations of total VOCs have declined over time. Early on the trends were not as clear, but in the last five years, the declining trend has become more pronounced; during this period, most of the sampled wells have had total VOC concentrations under 5 ppb. Several wells still have results above some individual MCLs, and continued operation of the air stripping towers is therefore necessary. However, the data indicate a significant temporal reduction in total VOC concentrations in the Biscayne Aquifer ground water that feeds the Preston and Hialeah Wellfields.

Table 8: WASD Total VOC Analysis and Data Summary for Hialeah and Preston Wells

	H-01	H-02	H-03	H-04	H-05	H-06	H-07	H-08	H-09	H-10	H-11	H-12	H-13	H-14	H-15	H-16	H-17	H-18	H-19	H-20	H-21	H-22	H-23	P-01	P-02	P-03	P-04	P-05	P-06	P-07
Sep-88	5.60	13.5	11.0	1.60	3.10	7.80	1.40	4.10		0.00	6.20	5.40	2.70	0.00	6.20	1.60		1.40	1.20		2.70			2.60	1.00	2.90	2.50	2.70	1.10	2.90
Sep-89	19.6	39.0	16.4	15.4	4.70	2.00	2.40	12.5	7.20	4.60		4.90	17.4	12.1	11.9	13.3		17.6	13.5	14.6	6.40	4.30	21.0	5.60	7.40	13.1	13.0	21.1	8.90	11.4
Oct-90	14.4	8.80	12.1	8.60	2.40	10.5		6.60	0.00	10.4	9.10	7.60	2.60	0.00	4.20	3.50	13.5	5.90	3.90	16.2	5.00		8.30	8.20	3.00	6.70	10.0	8.30	2.80	5.80
Oct-91	6.80	8.00	3.30	6.50	1.80	1.70	0.00	2.50	2.40	4.60	6.30	6.60	5.90	0.70	4.60	0.00	9.80	3.30	3.70	7.40	7.20	2.40	2.40	7.30		3.50	5.70	7.90	2.70	6.00
Oct-92	8.40	14.0	6.00	5.20	1.20	1.60	0.00	7.80	8.10	4.00	3.40	3.90	2.40	2.00	3.40	4.10		4.20	4.50	5.60	2.00	0.90	8.20	2.30		4.50	5.90	5.90	0.50	1.20
Sep-93	15.8	21.9	12.9	8.80	9.71	9.37	0.00	34.7	0.00	1.00	10.3	7.70	0.00	5.10	1.40	1.09		1.83	2.52	11.4	2.09	0.73		4.17		3.77	7.00	9.40	2.16	10.1
Nov-94	5.45	17.5	8.45	5.22		9.66	0.00	50.0	8.41	4.89	12.6	11.3	7.22	5.55		2.91	3.98	2.76	3.02	23.6	4.53		2.67	23.2		2.94	18.3	38.7	3.01	9.85
Nov-95	1.67	7.28	10.0	3.27	6.36	0.00	0.44	53.6	11.1	1.03	12.2	11.9	6.76	3.91	2.87	4.74	2.22	2.36		13.4	6.95	1.53	5.48	5.33		1.82	26.2	11.9	2.74	2.73
Oct-96	4.91	14.90	10.00	2.77	2.21	3.38	0.31	28.30	7.33	1.69	9.75	10.10	2.91	2.11	2.42	1.88	4.79		8.77	14.20	2.86	1.85	8.03	2.13		3.99	4.19	23.90	4.46	2.59
Oct-97	2.53	8.13	5.44	2.27	2.32	5.87	0.25	21.30	4.64		5.68	2.21	1.90		2.90	1.95	3.56	0.44	3.43	5.41	0.83	1.10		0.92	3.53	3.62	7.02	16.00	1.15	
Nov-98	1.68	8.58	7.97	1.57	1.39	1.14	0.00	17.40	5.78	1.25		4.02	0.75	1.22		0.92	1.41	1.03	4.29	15.90			3.17	1.53	3.51	2.08	3.92	14.50	1.00	0.97
Oct-99	1.87					2.21			6.28	0.49	3.69	2.31	0.49	0.71	1.84	0.59	0.64	1.35	2.83	9.27	1.38	0.64	3.48	2.11	3.84	1.31	4.30		2.26	1.36
Nov-00	0.83	5.73	0.64	0.40	0.60	0.80	0.00	16.70	4.40	0.88	1.55	1.24	0.43	0.42	1.03	1.18	0.66	1.45	3.44	9.62	1.65	0.99	4.40	0.36	1.26	3.10	1.55	8.82	2.55	
Apr-02	0.86	3.22	0.00	0.00	0.00	0.00	0.00	8.64	2.68	0.00					0.00	0.00		0.00	1.17	5.35	0.00	0.00	1.97		0.00		0.59	1.39	2.48	0.00
Apr-03	0.57	3.45	0.00	0.42	0.00	0.33	0.00	7.65	2.69	0.00	0.00	1.25	0.00	0.00		0.00	0.00	0.42	0.48	3.07	0.35	0.00	0.99	0.00	0.00	1.46	0.00	1.26	6.54	0.51
May-04	0.49	1.78	0.00		0.00	0.00	0.28	2.07	1.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.26	0.32	0.58	2.56	0.23	0.20	0.81	0.00	0.00	1.90	0.00	1.57	0.00	0.00
Aug-05	0.31	1.50	0.00	0.31	0.00	0.42	0.00	1.89	1.25	0.00	0.34	0.56	0.00	0.00	0.00	0.00	0.29	0.30	0.43	1.07	0.52	0.00	1.04	0.00	0.85		0.00	0.97	1.43	0.00
Nov-06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.97	0.00	0.34	0.53	0.33	0.00	0.26	0.21	0.00	0.30	0.36	1.26	0.69	0.22	0.85	0.00	0.00	0.64	0.22		2.12	0.27
Nov-07	0.00	0.00		0.00	0.00	0.00	0.00	0.47	2.12	0.00	0.25	0.29	0.00	0.00	0.00	0.00	0.00	0.44	0.00	1.62	1.14	0.29	0.41	0.21	0.32	0.81	0.26	0.32	0.49	0.29
Average	8.0	14.3	6.4	7.2	2.3	2.6	0.4	11.9	5.1	3.3	5.2	4.7	3.5	1.5	4.2	4.5	7.8	4.8	4.3	8.8	2.8	1.0	7.9	4.9	3.4	5.9	6.0	10.6	2.7	4.3

Notes:

1. Blank spaces indicate that a well was not sampled.
2. Total VOC concentrations are reported in ppb.

Figure 3: WASD Graph of Total VOCs Over Time

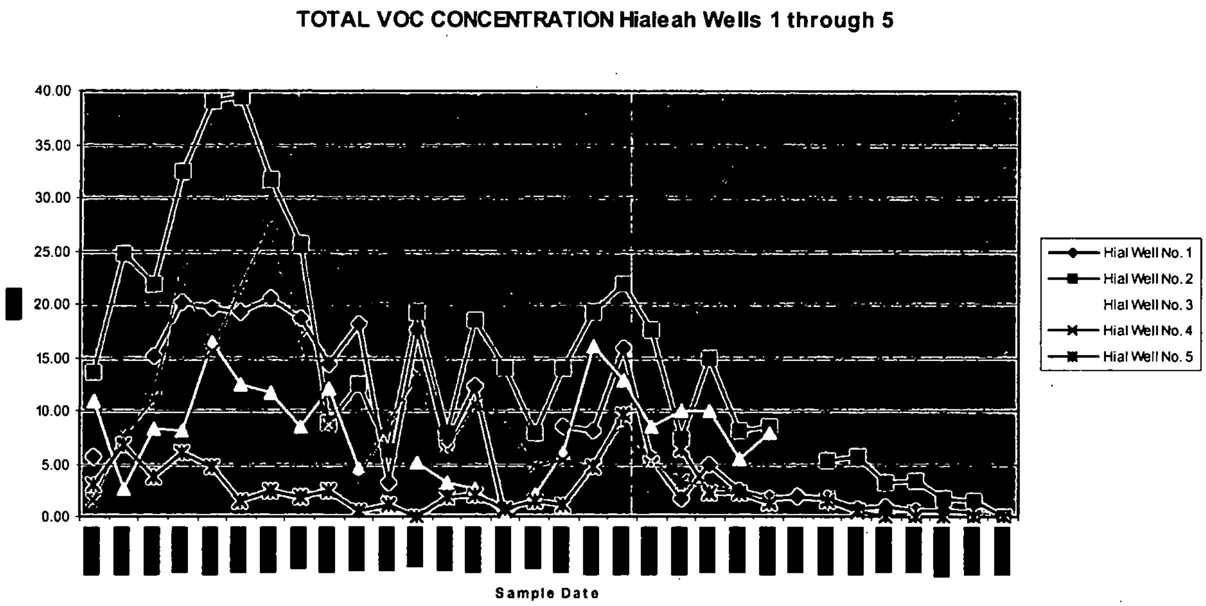


Figure 3 illustrates the downward trend in total VOC concentrations detected in Hialeah wells 1-5 from September 1988 through November 2006. For clarity in presentation, only five wells are presented in the graph, but the trends in this graph are representative of the trends found in the remaining Hialeah and Preston wells. As noted in the previous FYR, there was a spike in total VOCs detected in some wells during the time period from 1993-1995. However, since that time, these wells have also displayed a downward trend in total VOC concentrations. Since installation of the air strippers, vinyl chloride concentrations have dropped off significantly over time and all other organic contaminants are most frequently below detection limits. During the 2007 annual sampling of all Preston and Hialeah wells, 27 of the 30 wells had total VOC concentrations between 0 and 1 ppb; the other three wells had total VOC concentrations lower than 3 ppb. The design specifications for the air stripping towers were to remove 99 percent of the DCE, which was the most difficult compound to remove via air stripping. Ground water monitoring results for total VOCs over the last 18 years for all 30 Preston and Hialeah wells, as well as graphs illustrating the downward trend in total VOC concentrations that has occurred in all of the Preston and Hialeah wells, are provided in Appendix C.

The drinking water from the Preston and Hialeah WTPs must meet all state and federal drinking water standards prior to being supplied as drinking water to the public. Water quality analysis is also performed throughout the year for internal purposes and to meet federal, DERM, and Department of Health requirements for public water supplies. These water quality analyses include sampling for metals, anions, physical and chemical properties, microbes, organics, and VOCs. These "Typical Average Analyses" are made available to WASD consumers annually in the consumer confidence report. Current MCLs set by EPA, and drinking water standards set by FDEP and Miami-Dade County are also listed in this annual report. In the past, concentrations of vinyl chloride have exceeded the MCL in water samples taken from water supply wells prior to treatment through the air strippers, indicating a continuing need for treatment of the water to reduce this contaminant to below MCLs in the finished water.

Soil

The OU1 ROD evaluated two proposed alternatives for the removal and off-site disposal of contaminated soils. One alternative for the excavation and removal of contaminated soil was based on engineering and scientific judgment and the other required excavation and removal of all soils with contaminant concentrations in excess of ten times the State of Florida's minimum criteria for ground water, based on toxicity tests. The former of these alternatives, which involved the excavation and off-site disposal of soils based on industrial use standards and the backfilling of excavated areas with clean fill, was selected and implemented at the Miami Drum Services Site. The primary difference between these two remedies was that the latter would have involved the excavation and removal of an additional 3,900 cubic yards of mercury-contaminated soil. Given that on-site soils are more alkaline than the conditions specified for the extraction procedure toxicity test, it was judged that the mercury would not be as prone to leach from this more basic soil. Currently, there are no restrictions in place to ensure that the land use remains industrial, that exposure to mercury-contaminated soils does not occur, or that the soil cover is maintained. ICs setting forth these restrictions may therefore be needed.

6.5 Site Inspection

The site inspection for this FYR was conducted on October 10, 2007, and was attended by EPA, WASD, Transit Authority, DERM, and contractor staff. Site visit participants included:

- Julie Santiago-Ocasio, EPA Site RPM
- Jan Rogers, EPA South Florida Office
- Marjorie Jolly, WASD
- Tom Segars, WASD
- Raymond Diaz, WASD
- Ana T. Caveda, WASD
- Jorge Acevedo, WASD
- Tom Kux, DERM
- Adien Toledo, Dade County Transit
- Amanda Knoff, E^2 Inc.
- Cara Forster, E^2 Inc.

The purpose of the inspection was to assess site conditions, create a photographic record of these conditions, and confirm that the Site is being used in an appropriate manner. The site inspection visit began at the Preston WTP where WASD staff explained the monitoring and sampling procedures for the wells and the operation of the air stripping towers. Site participants then traveled in vehicles to tour the Miami Springs, Northwest, and Medley Wellfields. The site tour ended after a tour of the Transit Authority train maintenance yard and an inspection of the area near the former Miami Drum Services property.

The air stripping towers at the Preston WTP are 33 feet tall and 13 feet in diameter and take 35 minutes to process the water. The 44 towers cost $49 million to install and operation of the towers doubled the electrical bill for the plant. All of the air stripping towers operate continuously because if they were stopped, it would be a time consuming and extensive process to bring them back online. All of the towers have the same configuration, which includes continuous packing with black polypropylene half saddles that provide extensive surface area and therefore increase exposure of the water to air. The air blown through the towers causes the VOCs to volatilize, removing the VOCs from the water. The towers are capable of treating between 2.4 and 4.2 million gallons of water a day and process this water with an average air to water ratio of 30 to one. Each WTP handles 450 gallons of water per minute. During the site inspection, the towers appeared to be in good condition and functioning effectively.

The five labs connected to the WTPs in Miami-Dade County analyze water from a 450 square mile distribution area. The labs' primary purpose is to monitor the WTPs in Miami-Dade County and to help ensure that the WTPs maintain regulatory compliance. To this end, individual production wells are tested once a year for the 21 regulated VOCs, and the untreated water, tower influent, and tower effluent (or finished water) is sampled twice a week. This monitoring is not required by EPA or the State of Florida, but is carried out by Miami-Dade County as a matter of best practice. It is possible for WASD to conduct a comprehensive well survey in a week if necessary. WASD plans to continue use of the air strippers even if the COCs listed in the OU2 ROD reach the cleanup goals that were set in the OU2 ROD. This decision is due to numerous drinking water regulations with which Miami-Dade County must comply in addition to the EPA standards related to the Miami Drum Services Superfund Site. These additional regulations are specified in the Florida Administrative Code, Chapter 62-550. The WTPs must meet local, state, and federal MCL requirements for finished water. WASD views the air stripping towers as key to meeting these other regulatory obligations.

The towers are currently operated as a preventative measure because sometimes spills occur that Miami-Dade County is not notified about until after the contamination has reached the WTP. The need to take the towers off line one winter during a freeze-induced power shortage created compliance problems for the WTP. During this period, an unexpected spill reached the public water supply. As a result, Miami-Dade County was required to spend $7 million on the infrastructure necessary to install backup generators for the air stripping towers. The WTP always had generators, but by 1998, the air stripping towers had their own backup generators, and since that time they have been in continuous operation. This strategy should prevent such spills from causing exceedances in the future.

Mr. Kux of DERM raised the question of why the Miami Drum Services Site has not been deleted from the NPL while the Northwest 58th Street Landfill and Varsol Spill Sites have been deleted from the NPL. He expressed concern at the possibility that soil and ground water contamination above regional standards might still be present at the Site when it is deleted. He explained that DERM's 2002 letter to EPA was still representative of DERM's concerns regarding this Site. Mr. Segars mentioned that whether or not the Site was deleted from the NPL would not affect the current WASD sampling and monitoring schedule at the WTPs; use of the towers would continue.

After inspecting the Northwest Wellfield, the site inspection team continued to the Miami-Dade Transit Agency's rail maintenance yard and met Mr. Adien Toledo, an environmental engineer with Miami-Dade County, for a tour of the former Miami Drum Services Site. The former Miami Drum Services property is a 1.2-acre piece of land, which was incorporated into the 82-acre Transit Agency parcel in the early 1980s and is currently owned by Miami-Dade County. The exact location of the Miami Drum Services Site is not delineated on the existing property. No monitoring wells were observed on or near the former Miami Drum Services property. Current land uses at the property include staging areas for heavy equipment, rail lines, a train maintenance building, an office building, and vacant land. The transit property is currently in industrial use and the county has no plans to change that use in the future. Participants discussed the possibility of ICs for the property. Mr. Kux and Mr. Toledo agreed that as DERM and the Transit Authority are sister agencies within Miami-Dade County, language for the land use restrictions could be worked out between these agencies with oversight from FDEP and EPA.

Also as part of the site inspection, E² Inc. staff conducted research at the Miami-Dade County Public Records office on October 11, 2007 and gathered the following deed information pertaining to the Site. E² Inc. staff also identified the following information pertaining to the property history of the Miami Drum Services Site. The CERCLIS address for the Miami Drum Services Site is listed as 7049 NW 70th Street, while the Miami-Dade public records list the Site's address as 7020 NW 72nd Ave. The Miami-Dade Transit Authority has subsumed the site area within its rail maintenance yard, which has an address of 6601 NW 72nd Ave. All the items listed below correspond to the Site's original address as recorded by Miami-Dade County (7020 NW 72nd Ave) or the Site's current address (6601 NW 72nd Ave). No deed information was found for the Site's CERCLIS address (7049 NW 70th Street).

Table 9: Deed Documents for the Miami Drum Services Site

Date	Type of Document	ICs mentioned	Book #	Page #
1982	Satisfaction of Judgment	Satisfaction by Miami Drum Services to Dade County of $1,407.	11393	261
1987	Judgment	Judgment for EPA and against Miami Drum Services as well as other PRPs for response costs in the amount of $2,298,100.	13371	1959
1999	Lien	Lien in the amount of $9,063.64 by Calissi Properties against the parcel for unpaid environmental engineering and testing services.	18494	2485

Date	Type of Document	ICs mentioned	Book #	Page #
2000	Covenant of Construction	Dolores Boyd grants right to install and covenants to maintain three temporary soil borings on the parcel.	19257	1995
2002	Lien	A lien in the amount of $11,524 unpaid to Florida Environmental Engineering Inc. for soil cleanup/testing at the parcel.	20821	1456
2005	Warranty Deed	Describes restructuring of parcel ownership.	23276	3488

The complete site inspection checklist is included in Appendix D.

6.6 Interviews

During the FYR process, interviews were conducted with parties impacted by the Site, including representatives of Miami-Dade Transit, WASD, DERM, and FDEP. Interviews were conducted by E[2] Inc. The purpose of the interviews was to document the perceived status of the Site and any problems or successes with those parts of the selected remedy that have been implemented to date. Interview forms are presented in Appendix F.

Table 10: Interview Subjects

Name	Position	Affiliation
Kelsey Helton	Staff geologist	FDEP
Tom Kux	Contaminated Properties Representative	DERM
Tom Segars	Director of Operations	WASD
Raymond Diaz	Division Lab Chief	WASD
Adien Toledo	Environmental Engineer	Dade County

Ms. Helton stated that a review of historic well data provided by WASD indicated that concentrations of the COCs have been decreasing and that other than the implementation of a restrictive covenant to ensure that land use remains industrial, the selected remedy remains adequate. She stated that there are no ICs in place for this Site currently, but there is a need for ICs. She stated that the state's mercury soil standard for direct contact is 3 mg/Kg for unrestricted use and if this is exceeded on site, then an IC will be necessary to ensure maintenance of the surface seal and long-term protectiveness. State mercury standards for commercial/industrial use are 17 mg/Kg for soils and 2.1 mg/Kg for leachability to ground water. She mentioned that paving the Site could help address concerns about direct contact and leaching from remaining soils. She urged continued involvement of the State in site review activities and stated that FDEP would need to review the proposed restrictive covenant or other deed document to ensure compliance with state laws.

Mr. Kux stated that he believes that the selected remedy is performing as designed. He stated that the last official DERM communication related to this Site was the 2002 letter from DERM to EPA sent during the previous FYR. He felt that DERM's response contained in Comment 3 of the 2002 letter still applies to the Site. This comment states: "upon site closure under CERCLA, DERM would require that representative ground water samples be obtained from the Site to determine the current contaminant conditions at that time. If ground water impacts are present above sub-regional ground water contaminant concentrations, DERM may require additional assessment at the Site and, unless remediated to sub-regional levels, a No Further Action with Conditions requiring a restrictive covenant prohibiting on-site water usage." Mr. Kux also stated that there has not been any ground water monitoring at the Site, only at the WTPs. DERM's concern is to sample the ground water at the Site prior to delisting to compare on-site ground water levels with regional and sub-regional levels for the Biscayne Aquifer. Mr. Kux stated that in the Site's current condition, it will require ICs, but that IC discussions are still in a very preliminary stage. DERM's primary concerns about the Site include obtaining a better understanding of EPA's goals for the site's closure, EPA's projected timeframe for delisting the Site, and clarification of EPA's expectations regarding Miami-Dade County and WASD roles and responsibilities in relation to the Site.

Mr. Segars stated that he believed that the selected remedy is performing well and that he was not aware of any citizen complaints. He said that monitoring of the water at the WTPs is a continuous process and that more monitoring occurs than was intended by the EPA remedy for the Miami Drum Services Site. This monitoring addresses production wells and helps identify potential problems early. He explained that EPA funding initially helped offset operational expenses, primarily the electrical expense of operating the towers. When EPA funding stopped however, WASD continued operating the towers, so the end of EPA funding had no impact on operational status. He stated that concentrations of the compounds of interest have decreased over time. The VOC concentrations have gone down over the period of operation of the towers, though chloroform has increased due to new regulations on the use of disinfectants. There is a downward trend in total VOCs, though not at a rapid rate. Mr. Segars said that WASD's public outreach activities in the last five years have been limited to the annual consumer confidence reports. This report mentions the use of air stripping towers to reduce exposure to volatile compounds. He felt that it is helpful to have public awareness on the Site to help generate public support for local government expenditures to address these problems. Mr. Segars described the selected remedy for the Biscayne Aquifer Sites as unique and innovative and said that the key players had lots of foresight to make the decisions they did; he feels that it has been a great success. Nevertheless, he stated that even if the Site were deleted, there would still be a need to operate the air strippers due to the long-term nature of these sites' impact on the aquifer. He expressed the opinion that even if EPA closed out the Site, the Site's impact on ground water will persist and therefore EPA will need to be involved in this remedy in the long term.

Mr. Diaz stated that he believes the selected remedy is performing well based on the annual monitoring data from each production well. The Department of Public Health requires that all wells be sampled once a month for total chloroform, which is done by the respective lab for each wellfield. The South Florida Water Management District requires chlorides testing of each production well twice a year at the wellheads. These are the only required monitoring events at the production wells. WASD also voluntarily monitors the 21 regulated VOCs once a year at the wellheads. The lab that runs these analyses is the Alexander Orr lab. He stated that there are no new wells planned at this time for the Biscayne Aquifer and that no wells have recently been taken out of service due to saltwater intrusion. He explained that community outreach activities included the development and circulation of a brochure on the towers when they were installed, which has been followed by distribution of the annual consumer confidence reports that identify the treatment processes used and the monitoring results. He concluded that reviewing the data on an annual basis and the changes in the contamination in the wellfields provided him a sense of satisfaction because the cleanup has been successful and that success reflects on all the parties involved - EPA, WASD management, the research team, etc. He stated that it is rare and gratifying that a long-term project like this one has had such tangible results and made such significant improvements to the Biscayne Aquifer.

Mr. Toledo expressed his belief that there are no problems with the selected remedy. He stated that when the removal was conducted, soil was removed and water sampling done to ensure that standards for industrial use were met. He said that the Transit Authority would rely on DERM for future sampling and monitoring at the Site. He was not aware of any complaints from the public about the Site. He stated that the Transit Authority has not disturbed the site area. He has seen no evidence of train maintenance activities performed outside of the train garage building. All mechanical work is done on pavement and under cover and the garage building has its own drainage system and water separators. In the area of the Site, no train maintenance is performed - only train switching. The Site is used essentially as a parking lot for trains. The county's trains are electrical and therefore require no fuel and very little oil to run. Property transactions regarding the Site are complex, as Dade County began acquiring property for the rail yard in 1975 and continued to acquire property for about seven years; the county eventually acquired over 150 parcels for the rail yard, only one of which was the Miami Drum Services Site. Mr. Toledo said that the reuse of the Site as the train maintenance yard has had a positive impact on the community, because it provides environmentally friendly public transportation for county residents. He confirmed that property use at the Site would remain unchanged. The county is planning expansion of the rail lines to the airport, north to the stadium, and west to the county line. These projects are being planned on a 30 to 50 year time horizon and will require the services that are provided at the maintenance yard for many years to come.

7.0 Technical Assessment

7.1 Question A: Is the remedy functioning as intended by the decision documents?

The OU1 ROD selected excavation and off-site disposal of soils based on industrial use standards and the backfilling of excavated areas with clean fill. This selected remedy was implemented in 1982 and the Site has been in industrial use since that time. Currently access controls are in place at the Transit Authority property, but ICs must be implemented to ensure long-term protectiveness of the soil remedy.

The OU2 ROD selected a remedy that includes use of the existing wellfields for contaminant recovery and provision of air stripping treatment systems at the Preston and Hialeah WTPs. This remedy was installed in 1992 and has been in operation since that time. The OU2 ROD did not include an estimated time to achieve cleanup goals in the ground water.

The air stripping towers have operated continuously for the last five years, effectively removing VOCs from the drinking water supply. Levels of VOC contaminants in the aquifer have decreased over time and the air stripping process removes the VOCs that remain. Ground water in the Biscayne Aquifer still exceeds several MCLs. Therefore, treatment of the ground water in the aquifer should continue. The OU2 ROD states that existing ICs would address remaining low levels of VOCs in the aquifer. Institutional controls for OU2 include Dade County Ordinances regulating the permitting and use of wells in the vicinity of sources of contamination. These ICs are still in place, though additional ICs to address remaining soil contamination are necessary to ensure the long-term protectiveness of the Site.

7.2 Question B: Are the exposure assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives (RAOs) Used at the Time of Remedy Selection Still Valid?

The exposure assumptions for the OU1 ROD assumed future industrial use of the Site and this is still valid. Clean fill was placed over the excavated areas where contaminated soils remained. While no soil-related ICs are in place at this time, current site conditions do not indicate that any digging has occurred that would cause exposure to the contaminated soils under the clean fill. The OU2 ROD assumed that exposure to ground water would be through ingestion as drinking water and established cleanup goals that were protective for consumption of ground water. These exposure assumptions remain valid. With the development of new federal standards, ARARs for several of the ground water COCs have changed during the more than 20 years since the OU2 ROD was signed. A detailed list of these changes is available in Section 6.3.

These ARAR changes do not affect the protectiveness of the selected remedy because the WTPs monitor the water to ensure that the drinking water from the Preston and Hialeah wells meets all state and federal drinking water standards prior to being supplied as drinking water to the public. Water quality analysis is performed throughout the year for internal purposes and to meet federal, DERM, and Department of Health requirements for public water supplies. These water quality analyses include sampling for metals, anions, physical and chemical properties, microbes, organics, and VOCs. These "Typical Average Analyses" are made available to WASD consumers annually in the consumer confidence report. Current MCLs set by EPA, and drinking water standards set by FDEP and Miami-Dade County are also listed in this annual report. In the past, concentrations of vinyl chloride have exceeded the MCL in water samples taken from water supply wells prior to treatment through the air strippers, indicating a continuing need for treatment of the water to reduce this contaminant to below MCLs in the finished water.

Of the priority pollutants identified in the OU2 ROD, VOCs were the most prevalent contaminants found throughout the study area, in the well fields, and in finished water from the Preston and Hialeah WTPs prior to installation of the air strippers. Because of the low or nonexistent concentrations of contaminants other than VOCs, the ability of the existing water treatment process to reduce metal concentrations to below MCLs, the presence of ICs to limit exposure to contaminated ground water, and the highly immobile nature of the base/neutral and acid extractable organic compounds, it was determined that the organic compounds present in the ground water could be effectively removed by aeration alone. When the OU2 ROD was signed, water at the WTPs was monitored for all VOC priority pollutants twice a year – once by WASD and once by DERM. The OU2 ROD stated that this monitoring was sufficient and that it should continue until FDER determined that ground water cleanup goals listed in the OU2 ROD had been met.

Concentrations of contaminants in the Biscayne Aquifer are decreasing over time, and though current MCLs have not been met for all COCs at this time, progress toward this goal has been substantial.

7.3 Question C: Has Any Other Information Come to Light That Could Call Into Question the Protectiveness of the Remedy?

No information identified during this FYR calls into question the protectiveness of the selected remedy. Protectiveness of the selected remedy was confirmed by the continued presence of clean fill over the former Miami Drum Services Site, access controls at the Transit Authority property, and the continued industrial use of the parcel. Likewise, monitoring of ground water and finished drinking water shows that concentrations of COCs are declining over time and that drinking water is protected through the air stripping treatment occurring at the WTPs.

7.4 Technical Assessment Summary

According to the data reviewed, the site inspection, and the interviews, the selected remedy is functioning as intended by the RODs. Miami-Dade Transit Authority staff confirmed that industrial land use at the Site is scheduled to continue and that no change in land use is anticipated for the future. WASD staff plan to indefinitely continue use of the air stripping towers to treat contamination in the Biscayne Aquifer. There are no planned changes to either the land use or ground water use at the Site and current use remains consistent with the selected remedy and the original exposure assumptions. Countywide ground water ICs are in place. However, ICs for soil will be required prior to the site's deletion and in order to ensure the long-term protectiveness of the soil remedy. There is no other information that calls into question the protectiveness of the remedy.

8.0 Issues

Table 11: Current Issues for the Miami Drum Services Site

Issue	Affects Current Protectiveness	Affects Future Protectiveness
Institutional controls necessary to ensure the long-term protectiveness of the soil remedy at the Miami Drum Services Site were not called for in the ROD and have not been implemented.	No	Yes
The current air permit will require renewal in 2010.	No	No
The two Biscayne Aquifer Sites that require FYRs have different review FYR schedules.	No	No

9.0 Recommendations and Follow-up Actions

Table 12: Recommendations to Address Current Issues at the Miami Drum Services Site

Issue	Recommendations	Party Responsible for Implementation	Oversight Agency	Milestone Date	Affects Protectiveness?	
					Current	Future
Institutional controls necessary to ensure the long-term protectiveness of the soil remedy at the Miami Drum Services Site were not called for in the ROD and have not been implemented.	Design and implement ICs for the soil remedy.	Dade County	EPA, FDEP	9/30/10	No	Yes
The current air permit will require renewal in 2010.	Apply for renewal by July 6, 2010.	WASD	EPA	7/6/10	No	No
The two Biscayne Aquifer Sites that require FYRs have different review FYR schedules.	Consider combining FYRs for the constituent sites addressed by the Biscayne Aquifer ROD (OU2 ROD).	EPA	EPA	9/30/10	No	No

10.0 Protectiveness Statements

The selected remedy at OU1 is protective of human health and the environment in the short term and exposure pathways that could result in unacceptable risks are under control. Based on the site inspection, access controls are well maintained and public access to the Site is restricted. The Site is in industrial reuse and the site owner intends for this use to continue in the long term. Clean fill was placed over the excavated portions of the Site and the cover has been maintained. ICs for soil will be required prior to site deletion in order to ensure the long-term protectiveness of the soil remedy.

The selected remedy at OU2 is protective of human health and the environment and exposure pathways that could result in unacceptable risks are under control. Based on the site inspection and ground water sampling data from the last five years, the Site's remedy is effectively treating the ground water contamination. Ground water monitoring results from the Preston and Hialeah wells have shown a decreasing trend in total VOCs over the last five years. Air emissions associated with the air stripping towers are well below permitted limits. The air stripping treatment continues to be effective at removing VOCs and finished drinking water from the Preston and Hialeah WTPs must meet all state and federal standards prior to being supplied as drinking water to the public. WASD plans to continue using the air strippers to treat the ground water from the Biscayne Aquifer in the long term. Institutional controls restricting the use of ground water are currently in place.

Because the remedial actions at OU1 and OU2 are protective, the Site is protective of human health and the environment. The actions described above ensure the continued protectiveness of the selected remedies.

11.0 Next Review

The next FYR for the Miami Drum Services Site is required within five years of the signature of this review, by May 2013. Ground water monitoring and air stripping should continue at the WTPs. The next review should also confirm that ICs have been implemented for the soil remedy.

Discussions are underway regarding the possible deletion of the Site and progress toward delisting of the Site should be discussed in the next FYR. Additionally, since the three sites that comprise the Biscayne Aquifer Sites are addressed as a single management unit, there are efficiencies to be gained from addressing these sites in a single FYR. Currently, the Northwest 58th Street Landfill is on a separate FYR schedule from the Miami Drum Services Site. The Varsol Spill Site does not require separate FYRs because the Site did not trigger the FYR criteria (i.e., levels of residual contamination on site that would preclude unrestricted use). However, since the OU2 cleanup goals established in the 1985 Biscayne Aquifer ROD (OU2 ROD) for ground water at these three sites have not been met, ongoing FYRs are required. EPA should consider combining the FYRs for these sites into a single FYR. This would allow a consistent schedule of FYRs for the Biscayne Aquifer Sites and could offer a more thorough and efficient review of these sites than can be created under the current system of separate FYRs. The next FYR for the Northwest 58th Street Landfill is required by September 2010. This review could provide an opportunity to unify the FYR schedule so that their FYRs could be performed at the same time from that point onward.

Appendix A: List of Documents Reviewed

"Air Stripping Tower Pollutant Emissions," prepared by Miami-Dade Water and Sewer Department for the Preston and Hialeah Water Treatment Plants. 2001-2006.

"Field Investigations of Uncontrolled Hazardous Waste Sites," Fit Project task report to EPA on the feasibility of abating the source of ground-water pollution at Miami Drum Services Dade County, Florida. Prepared by Clemons, Aton, Harman, and Scott-Simpson of ecology and environment, inc. December 8, 1981.

"Five-Year Review Report for Miami Drums Services, Miami, Dade County, Florida," Prepared by the U.S. Army Corps of Engineers. May 2, 2003.

"Memo: Final 5 Year Review dated September 2002 and submitted by the US Army Corps of Engineers for the Miami Drums Superfund Site," prepared by DERM. October 28, 2002.

"Memo: Final 5 Year Review dated September 2002 and submitted by the US Army Corps of Engineers for the Miami Drums Superfund Site," prepared by DERM. January 22, 2004.

"Miami Dade County Property Appraiser Profile," available online at: http://gisims2.miamidade.gov/myhome/propmap.asp (accessed 9/3/07 for Folio No. 30-4035-000-1052).

Miami-Dade County Code of Ordinances, Sections 24-43.2 and 24-43.3 (http://www.municode.com/resources/gateway.asp?pid=10620&sid=9, Accessed 4/15/08).

Miami-Dade County, Water Supply Facilities Work Plan Support Data, Revised March 2008. CDM Project No. 6430-57901-061.

"Record of Decision: Miami Drum Services." EPA/ROD/R04-82/001. September 13, 1982.

"Record of Decision: Varsol Spill, Miami Drum Services, and Northwest 58th Street Landfill." EPA/ROD/R04-85/004. September 16, 1985.

"Title V Air Operation Permit Renewal," Final Permit Project No.:0250281-010-AV. Issued by Permitting & Compliance Authority of the Florida Department of Environmental Protection, Southeast District. January 30, 2006.

"Volatile Organic Contaminants Analyses Data Summary for Hialeah and Preston Wells," prepared by Miami-Dade Water and Sewer Department. 2007.

Appendix B: Press Notices

U. S. Environmental Protection Agency, Region 4
Announces A Five Year Review
for the
Miami Drum Services Superfund Site
Miami, Dade County, Florida

CERCLA, as amended by SARA, requires that remedial actions of hazardous substances be subject to a Five-Year Review to ensure the selected remedy remains protective of human health and the environment.

Site Background: The Miami Drum Services site (the Site) is in Hialeah, Dade County, Florida. The Site, which covers 1.3 acres, is located about two miles north of the Miami International Airport. The surrounding area is mostly commercial, but also contains several municipal wellfields. Between 1966 and 1981, Miami Drum Services cleaned and recycled drums at the Site. Due to poor waste handling practices, the soil became contaminated with metals, pesticides, and organic solvents and the ground water, including the Biscayne Aquifer, became contaminated with volatile organic compounds.

Cleanup Action: In 1982, the soil contamination was addressed through the excavation and off-site disposal of abandoned drums and the most contaminated soils. Dade County paid for this cleanup and was reimbursed by EPA. In 1983, the Site was added to EPA's National Priorities List of priority sites requiring cleanup. The site property was later acquired by Dade County for use as a maintenance facility for its Rapid Rail Transit system.

EPA decided to address the cleanup of the ground water contamination from this Site in conjunction with two other Superfund Sites in Miami (Varsol Spill and Northwest 58th Street Landfill), since contamination from all three sites affected the Biscayne Aquifer. These three sites collectively became known as the Biscayne Aquifer site, which has a study area covering almost 80 square miles. One remedy was selected to address ground water contamination from all three sites and to protect the regional water supply. In 1985, EPA selected the ground water remedy, which included using the Hialeah and Preston municipal wellfields to pump and treat the contaminated ground water using air strippers and granular activated carbon. A preventative action program to be implemented by Dade County, called the Biscayne Aquifer Protection Plan, was also recommended. In 1992, sixty-four air strippers were added to the two water treatment plants and since that time over 600,000 gallons of contaminated ground water have been treated. As a result, the previously impacted Preston and Hialeah wellfields have been placed back into service. The ground water treatment system meets the daily drinking water demands of almost one million people in northern Dade County. EPA reimbursed Dade County for the operation and maintenance of the air stripping towers for 10 years, until September 2002. Ground water monitoring began in 1988 and annual monitoring is ongoing.

Five-Year Review Schedule: EPA plans to complete the Five-Year Review process in May 2008. Comments are welcome during this time. As part of the Five-Year Review process, EPA will be available to answer any questions about the Site. Community members who have questions about the Site, the Five-Year Review process, or who would like to participate in a community interview, are asked to contact the Project Manager, L'Tonya Spencer.

Contact Information: If you would like more information or have any questions, comments and/or concerns about the Five-Year Review, you may contact the following:

L'Tonya Spencer, Community Involvement Coordinator
404-562-8463 / 1-800-564-7577 (Toll Free)
spencer.latonya@epa.gov
U.S. EPA, Region 4 – Superfund Division
61 Forsyth Street
Atlanta, GA 30303

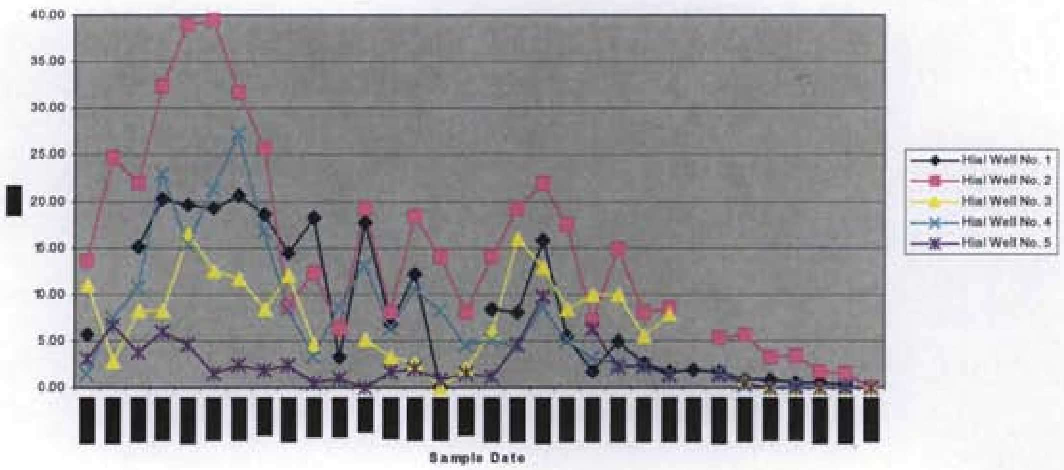
Site-related documents in Site Repository can be found at:

U.S. EPA Region 4	Local Document Repository
Waste Division (Mailcode: 4WD-SRTSB)	Miami Dade County Public Library
61 Forsyth Street	101 W. Flagler
Atlanta, Georgia 30303	Miami, FL 33128

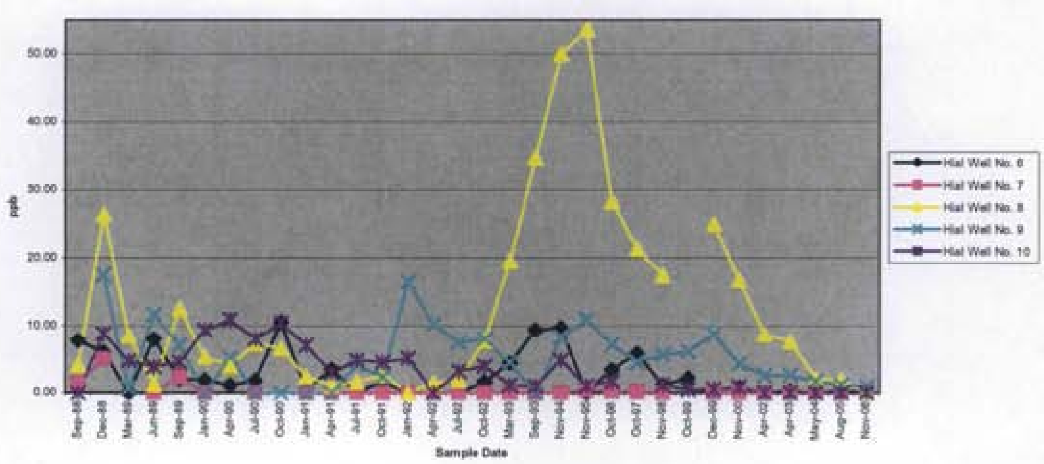
Or view online at: http://cfpub.epa.gov/supercpad/cursites/csitinfo.cfm?id=0400746.

Appendix C: History of Ground Water Monitoring for the Miami Drum Services Site

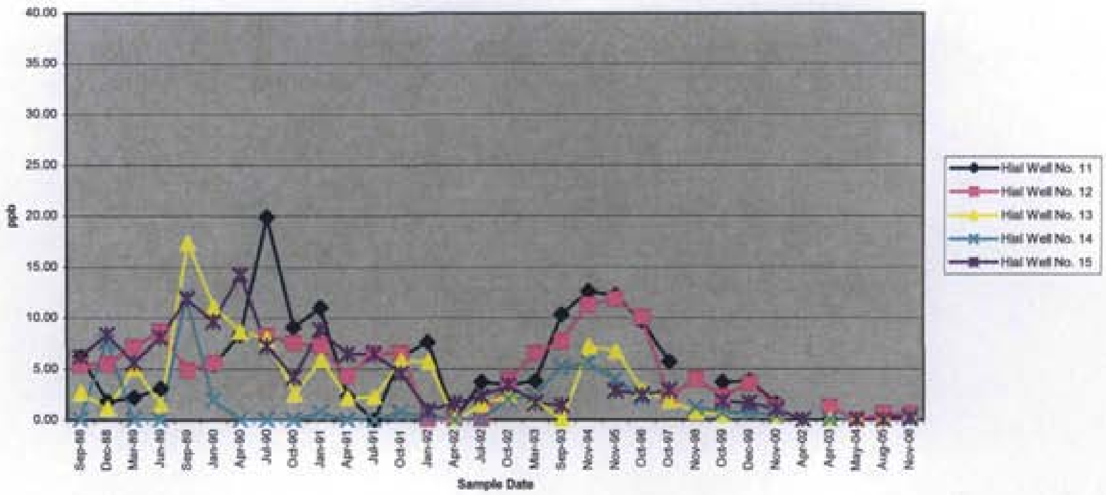
TOTAL VOC CONCENTRATION Hialeah Wells 1 through 5



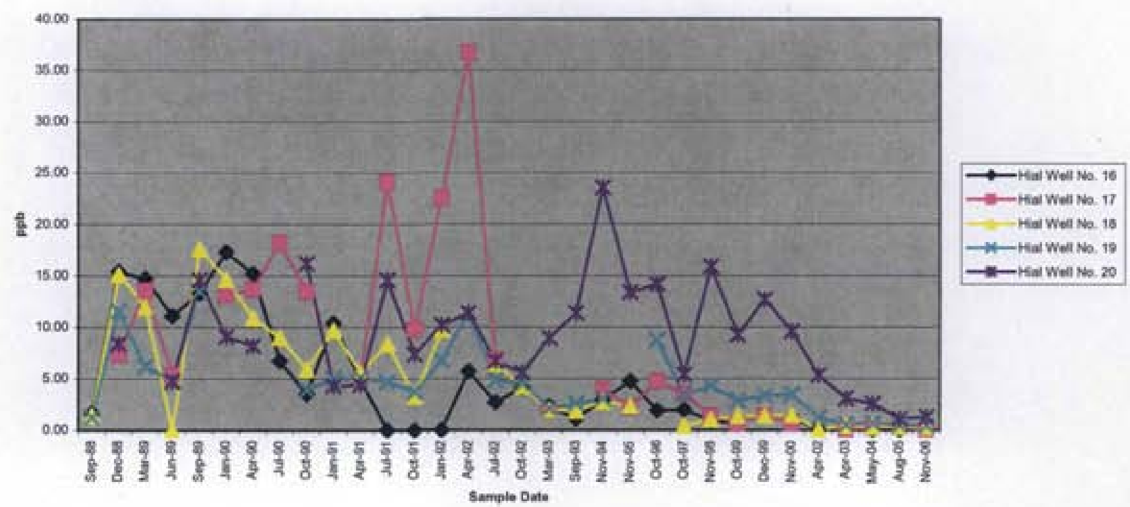
TOTAL VOC CONCENTRATION Hialeah Wells 6 through 10



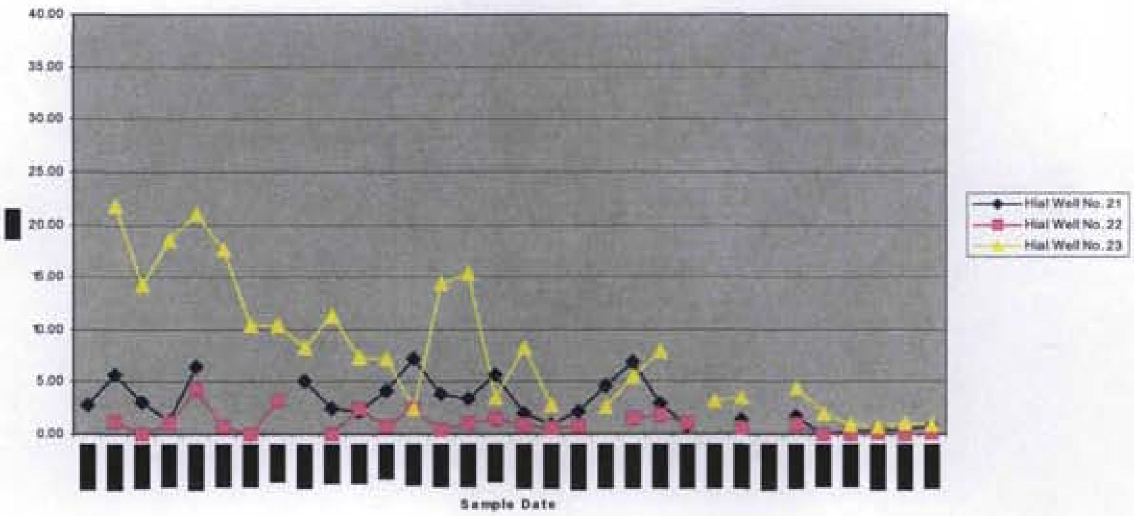
TOTAL VOC CONCENTRATION Hialeah Wells 11 through 15



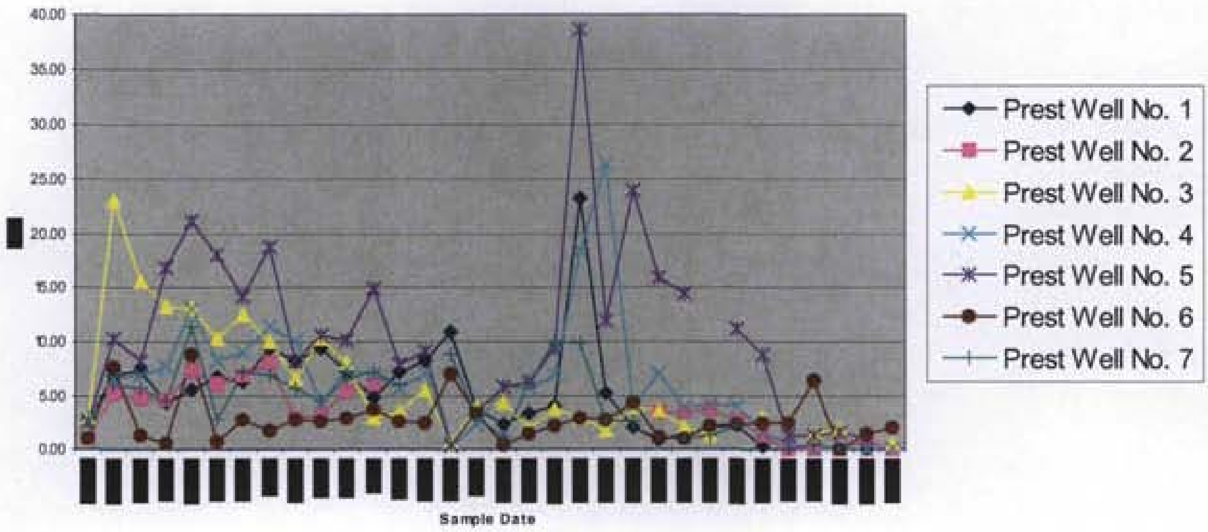
TOTAL VOC CONCENTRATION Hialeah Wells 16 through 20



TOTAL VOC CONCENTRATION Hialeah Wells 21 through 23



TOTAL VOC CONCENTRATION Preston Wells 1 through 7



Appendix D: Site Inspection Checklist

FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST	
I. SITE INFORMATION	
Site name: Miami Drum Services	**Date of inspection: 10/10/2007**
Location and Region: Miami, Florida	**EPA ID: FLD076027820**
Agency, office, or company leading the five-year review: EPA Region 4	**Weather/temperature: partly sunny, mid 80s at WTP, light rain mid 80s at Site/Transit Authority**
Remedy Includes: (Check all that apply) ☒ Landfill cover/containment ☐ Access controls ☒ Institutional controls ☒ Ground water pump and treatment ☐ Surface water collection and treatment ☐ Other: Access controls are in place, though not required.	☐ Monitored natural attenuation ☐ Ground water containment ☐ Vertical barrier walls
Attachments: ☐ Inspection team roster attached	☐ Site map attached
II. INTERVIEWS (Check all that apply)	
1. **O&M site manager** _____ Name _____ Title mm/dd/yyyy Date Interviewed ☐ at Site ☐ at office ☐ by phone Phone no. _____ Problems, suggestions; ☐ Report attached _____	
2. **O&M staff** _____ Name _____ Title mm/dd/yyyy Date Interviewed ☐ at Site ☐ at office ☐ by phone Phone no. _____ Problems, suggestions; ☐ Report attached _____	

3.	**Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.). Fill in all that apply. Agency Miami Water and Sewer Department Contact Tom Segars (Name) — Director of Operations (Title) — 10/16/07 (Date) — 305-520-4721 (Phone No.) Problems; suggestions; ☐ Report attached see Appendix C Agency Miami Water and Sewer Department Contact Ray Diaz (Name) — Division Chief for Labs (Title) — 10/16/07 (Date) — 305-460-7120 (Phone No.) Problems; suggestions; ☐ Report attached see Appendix C Agency Miami Dade County Transit Authority Contact Adien Toledo (Name) — Engineer (Title) — 10/17/07 (Date) — 786-469-5274 (Phone No.) Problems; suggestions; ☐ Report attached see Appendix C Agency Dade Environmental Resources Management Contact Tom Kux (Name) — _____ (Title) — 10/16/07 (Date) — 305-372-6520 (Phone No.) Problems; suggestions; ☐ Report attached see Appendix C
4.	**Other interviews** (optional) ☐ Report attached

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1.	**O&M Documents**			
	☐ O&M manual	☐ Readily available	☐ Up to date	☐ N/A
	☐ As-built drawings	☐ Readily available	☐ Up to date	☐ N/A
	☐ Maintenance logs	☐ Readily available	☐ Up to date	☐ N/A
	Remarks: _____			
2.	**Site-Specific Health and Safety Plan**	☐ Readily available	☐ Up to date	☐ N/A
	☐ Contingency plan/emergency response plan	☐ Readily available	☐ Up to date	☐ N/A
	Remarks: _____			
3.	**O&M and OSHA Training Records**	☐ Readily available	☐ Up to date	☐ N/A
	Remarks: _____			

4.	**Permits and Service Agreements**				
	☒ Air discharge permit	☒ Readily available	☒ Up to date	☐ N/A	
	☐ Effluent discharge	☐ Readily available	☐ Up to date	☐ N/A	
	☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☐ N/A	
	☐ Other permits _____	☐ Readily available	☐ Up to date	☐ N/A	
	Remarks: _____				
5.	**Gas Generation Records**	☐ Readily available	☐ Up to date	☐ N/A	
	Remarks: _____				
6.	**Settlement Monument Records**	☐ Readily available	☐ Up to date	☐ N/A	
	Remarks: _____				
7.	**Ground water Monitoring Records**	☒ Readily available	☒ Up to date	☐ N/A	
	Remarks: Sent before site visit via e-mail.				
8.	**Leachate Extraction Records**	☐ Readily available	☐ Up to date	☐ N/A	
	Remarks: _____				
9.	**Discharge Compliance Records**				
	☐ Air	☐ Readily available	☐ Up to date	☐ N/A	
	☐ Water (effluent)	☐ Readily available	☐ Up to date	☐ N/A	
	Remarks: _____				
10.	**Daily Access/Security Logs**	☐ Readily available	☐ Up to date	☐ N/A	
	Remarks: _____				

IV. O&M COSTS

1.	**O&M Organization**	
	☐ State in-house	☐ Contractor for State
	☐ PRP in-house	☐ Contractor for PRP
	☐ Federal Facility in-house	☐ Contractor for Federal Facility
	☒ Other Dade County funds operation of the air strippers that treat the ground water.	

2. **O&M Cost Records**

☐ Readily available ☐ Up to date

☐ Funding mechanism/agreement in place ☐ Unavailable

Original O&M cost estimate _____ ☐ Breakdown attached

Total annual cost by year for review period if available

From mm/dd/yyyy (Date) To mm/dd/yyyy (Date) _____ (Total cost) ☐ Breakdown attached

From mm/dd/yyyy (Date) To mm/dd/yyyy (Date) _____ (Total cost) ☐ Breakdown attached

From mm/dd/yyyy (Date) To mm/dd/yyyy (Date) _____ (Total cost) ☐ Breakdown attached

From mm/dd/yyyy (Date) To mm/dd/yyyy (Date) _____ (Total cost) ☐ Breakdown attached

From mm/dd/yyyy (Date) To mm/dd/yyyy (Date) _____ (Total cost) ☐ Breakdown attached

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☒ Gates secured ☐ N/A

Remarks: Both the water treatment plant and the site area within the Transit Authority maintenance yard have access controlled by fencing and manned security booths at entrances.

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☐ N/A

Remarks: _____

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☒ No ☐ N/A

Site conditions imply ICs not being fully enforced ☐ Yes ☒ No ☐ N/A

Type of monitoring (e.g., self-reporting, drive by) _____

Frequency _____

Responsible party/agency Dade County

Contact	_____	_____	mm/dd/yyyy	_____
	Name	Title	Date	Phone no.

Reporting is up-to-date ☐ Yes ☐ No ☐ N/A

Reports are verified by the lead agency ☐ Yes ☐ No ☐ N/A

Specific requirements in deed or decision documents have been met ☐ Yes ☐ No ☐ N/A

Violations have been reported ☐ Yes ☐ No ☐ N/A

Other problems or suggestions: ☐ Report attached

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A

Remarks: No ICs are in place for the soil remedy at this time, but they are likely necessary and discussions have commenced between DERM and Dade Transit Authority on their nature and implementation.

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident

Remarks: _____

2. **Land use changes on site** ☒ N/A

Remarks: _____

3. **Land use changes off site** ☒ N/A

Remarks: _____

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. Roads damaged ☐ Location shown on site map ☒ Roads adequate ☐ N/A

Remarks: A paved road runs across the former site area in the Transit Authority maintenance yard.

B. Other Site Conditions

Remarks: The exact location of the former one acre Miami Drum Site within the 84 acre maintenance yard is not known, but its general position is available.

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

A. Landfill Surface

1.	**Settlement** (Low spots)	☐ Location shown on site map	☐ Settlement not evident
	Arial extent _____		Depth _____
	Remarks: _____		
2.	**Cracks**	☐ Location shown on site map	☐ Cracking not evident
	Lengths _____	Widths _____	Depths _____
	Remarks: _____		
3.	**Erosion**	☐ Location shown on site map	☐ Erosion not evident
	Arial extent _____		Depth _____
	Remarks: _____		
4.	**Holes**	☐ Location shown on site map	☐ Holes not evident
	Arial extent _____		Depth _____
	Remarks: _____		
5.	**Vegetative Cover**	☐ Grass	☐ Cover properly established
	☐ No signs of stress	☐ Trees/Shrubs (indicate size and locations on a diagram)	
	Remarks: _____		
6.	**Alternative Cover** (armored rock, concrete, etc.)		☐ N/A
	Remarks: _____		
7.	**Bulges**	☐ Location shown on site map	☐ Bulges not evident
	Arial extent _____		Height _____
	Remarks: _____		
8.	**Wet Areas/Water Damage**	☐ Wet areas/water damage not evident	
	☐ Wet areas	☐ Location shown on site map	Arial extent _____
	☐ Ponding	☐ Location shown on site map	Arial extent _____
	☐ Seeps	☐ Location shown on site map	Arial extent _____
	☐ Soft subgrade	☐ Location shown on site map	Arial extent _____
	Remarks: _____		
9.	**Slope Instability**	☐ Slides	☐ Location shown on site map
	☐ No evidence of slope instability		
	Arial extent _____		
	Remarks: _____		

B. Benches ☐ Applicable ☐ N/A

(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1.	**Flows Bypass Bench**	☐ Location shown on site map	☐ N/A or okay
	Remarks: _____		

2.	**Bench Breached**	☐ Location shown on site map	☐ N/A or okay
	Remarks: _____		
3.	**Bench Overtopped**	☐ Location shown on site map	☐ N/A or okay
	Remarks: _____		

C. Letdown Channels ☐ Applicable ☐ N/A

(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1.	**Settlement** (Low spots)	☐ Location shown on site map	☐ No evidence of settlement
	Arial extent _____		Depth _____
	Remarks: _____		
2.	**Material Degradation**	☐ Location shown on site map	☐ No evidence of degradation
	Material type_____		Arial extent _____
	Remarks: _____		
3.	**Erosion**	☐ Location shown on site map	☐ No evidence of erosion
	Arial extent _____		Depth _____
	Remarks: _____		
4.	**Undercutting**	☐ Location shown on site map	☐ No evidence of undercutting
	Arial extent _____		Depth _____
	Remarks: _____		
5.	**Obstructions**	Type _____	☐ No obstructions
	☐ Location shown on site map	Arial extent _____	
	Size _____		
	Remarks: _____		
6.	**Excessive Vegetative Growth**	Type _____	
	☐ No evidence of excessive growth		
	☐ Vegetation in channels does not obstruct flow		
	☐ Location shown on site map	Arial extent _____	
	Remarks: _____		

D. Cover Penetrations ☐ Applicable ☐ N/A

1.	**Gas Vents**	☐ Active		☐ Passive
	☐ Properly secured/locked	☐ Functioning	☐ Routinely sampled	☐ Good condition
	☐ Evidence of leakage at penetration		☐ Needs Maintenance	☐ N/A
	Remarks: _____			

2.	**Gas Monitoring Probes** ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A Remarks: _____
3.	**Monitoring Wells** (within surface area of landfill) ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A Remarks: _____
4.	**Extraction Wells Leachate** ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A Remarks: _____
5.	**Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A Remarks: _____
E. Gas Collection and Treatment	☐ Applicable ☐ N/A
1.	**Gas Treatment Facilities** ☐ Flaring ☐ Thermal destruction ☐ Collection for reuse ☐ Good condition ☐ Needs Maintenance Remarks: _____
2.	**Gas Collection Wells, Manifolds and Piping** ☐ Good condition ☐ Needs Maintenance Remarks: _____
3.	**Gas Monitoring Facilities** (e.g., gas monitoring of adjacent homes or buildings) ☐ Good condition ☐ Needs Maintenance ☐ N/A Remarks: _____
F. Cover Drainage Layer	☐ Applicable ☐ N/A
1.	**Outlet Pipes Inspected** ☐ Functioning ☐ N/A Remarks: _____
2.	**Outlet Rock Inspected** ☐ Functioning ☐ N/A Remarks: _____
G. Detention/Sedimentation Ponds	☐ Applicable ☐ N/A
1.	**Siltation** Area extent _____ Depth _____ ☐ N/A ☐ Siltation not evident Remarks: _____

2. **Erosion** Area extent _____ Depth _____

☐ Erosion not evident

Remarks: _____

3. **Outlet Works** ☐ Functioning ☐ N/A

Remarks: _____

4. **Dam** ☐ Functioning ☐ N/A

Remarks: _____

H. Retaining Walls ☐ Applicable ☐ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident

Horizontal displacement _____ Vertical displacement _____

Rotational displacement _____

Remarks: _____

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident

Remarks: _____

I. Perimeter Ditches/Off-Site Discharge ☐ Applicable ☐ N/A

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident

Area extent _____ Depth _____

Remarks: _____

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A

☐ Vegetation does not impede flow

Area extent _____ Type _____

Remarks: _____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident

Area extent _____ Depth _____

Remarks: _____

4. **Discharge Structure** ☐ Functioning ☐ N/A

Remarks: _____

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident

Area extent _____ Depth _____

Remarks: _____

2. **Performance Monitoring** Type of monitoring _____

☐ Performance not monitored

Frequency _____ ☐ Evidence of breaching

Head differential _____

Remarks: _____

IX. GROUND WATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A

A. Ground water Extraction Wells, Pumps, and Pipelines ☒ Applicable ☐ N/A

1. **Pumps, Wellhead Plumbing, and Electrical**

☒ Good condition ☒ All required wells properly operating ☐ Needs Maintenance ☐ N/A

Remarks: Well houses very sturdy and all wellfields operational.

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**

☒ Good condition ☐ Needs Maintenance

Remarks:

3. **Spare Parts and Equipment**

☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided

Remarks: Backup Medley Wellfield recently developed.

B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☐ N/A

1. **Collection Structures, Pumps, and Electrical**

☐ Good condition ☐ Needs Maintenance

Remarks: Surface water collection to feed water treatment plants may occur in the future but is not taking place currently.

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**

☐ Good condition ☐ Needs Maintenance

Remarks: _____

3. **Spare Parts and Equipment**

☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided

Remarks: _____

C. Treatment System ☒ Applicable ☐ N/A

1. **Treatment Train** (Check components that apply)

☐ Metals removal ☐ Oil/water separation ☐ Bioremediation

☒ Air stripping ☐ Carbon adsorbers

☐ Filters _____

☐ Additive (e.g., chelation agent, flocculent) _____

☐ Others _____

☐ Good condition ☐ Needs Maintenance

☐ Sampling ports properly marked and functional

☐ Sampling/maintenance log displayed and up to date

☐ Equipment properly identified

☐ Quantity of ground water treated annually max capacity is 245.12 million gallons per day

☐ Quantity of surface water treated annually _____

Remarks: _____

2. **Electrical Enclosures and Panels** (properly rated and functional)

☐ N/A ☐ Good condition ☐ Needs Maintenance

Remarks: _____

3. **Tanks, Vaults, Storage Vessels**

☐ N/A ☐ Good condition ☐ Proper secondary containment ☐ Needs Maintenance

Remarks: _____

4. **Discharge Structure and Appurtenances**

☐ N/A ☐ Good condition ☐ Needs Maintenance

Remarks: _____

5. **Treatment Building(s)**

☐ N/A ☒ Good condition (esp. roof and doorways) ☐ Needs repair

☐ Chemicals and equipment properly stored

Remarks: _____

6. **Monitoring Wells** (pump and treatment remedy)

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition

☐ All required wells located ☐ Needs Maintenance ☐ N/A

Remarks: _____

D. Monitoring Data

1. **Monitoring Data**

☐ Is routinely submitted on time ☒ Is of acceptable quality

2. **Monitoring data suggests:**

☐ Ground water plume is effectively contained ☒ Contaminant concentrations are declining

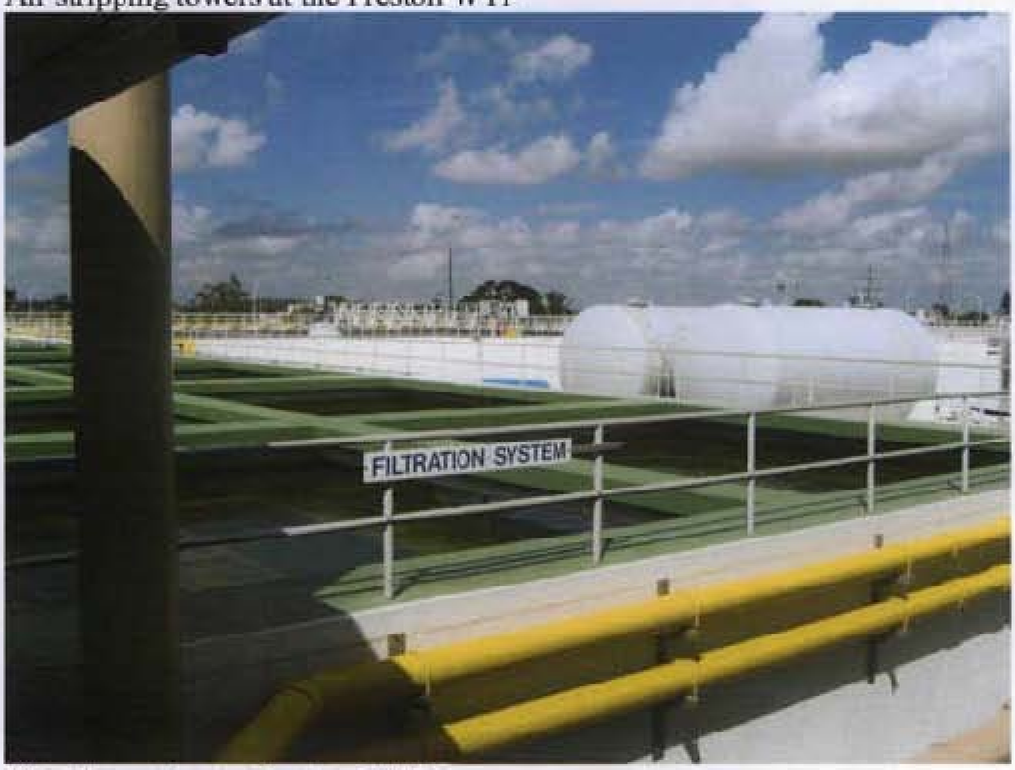
E. Monitored Natural Attenuation	
1.	**Monitoring Wells** (natural attenuation remedy) ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ All required wells located ☐ Needs Maintenance ☐ N/A Remarks: _____

X. OTHER REMEDIES
If there are remedies applied at the Site and not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS	
A.	**Implementation of the Remedy**
	Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.). The remedy was designed to cleanup the soil contamination to industrial standards and to treat regional contamination of the Biscayne Aquifer through air stripping. The site area is part of the Transit Authority's train maintenance yard and has access controls in place and is in industrial use. The ground water treatment is occurring through the air strippers at the Preston and Hialeah water treatment plants. Data indicate that vinyl chloride, the most persistent contaminant, has been decreasing over time and in the last several years the other COCs have mostly been at non-detect levels.
B.	**Adequacy of O&M**
	Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. Dade County is responsible for the operations and maintenance of the air stripping towers at the two water treatment plants. The tour of the water treatment plant indicated that water treatment plant personnel were performing all necessary operation and maintenance activities in a timely fashion.
C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future. There were no indications of potential problems with the remedies.
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. Dade County undertakes regular monitoring of the influent and effluent of the water treatment plants and of each of its production wells. This monitoring is extensive and consistent and no opportunities for optimization were evident.

Appendix E: Photographs from Site Inspection Visit

Air stripping towers at the Preston WTP



Filtration system at Preston WTP


Air stripping towers at the Hialeah WTP


An air stripping tower


White Rock Quarry, near Northwest Wellfield


Settling ponds for WTP solids, located near the Northwest Wellfield

Entrance to rail maintenance yard office building

Train maintenance garage at rail yard


Equipment staging area east of the Miami Drum Services Site


View north from former site location


Trains parked on tracks west of former site


View south from former site location

Appendix F: Interview Forms

Interview Form for Miami Drum Services' Five-Year Review

Site Name: **Miami Drum Services** **EPA ID No.:** **FLD076027820**
Interviewer Name: **Cara Forster** **Affiliation:** **E2 Inc.**
Subject's Name: **Adien Toledo** **Affiliation:** **Miami Dade County**
Subject's Contact Information: **786-469-5274**
Time: **10am** **Date:** **11/13/07**
Type of Interview (Circle one): **In Person** **Phone** **Mail** **Other__________**

Site Owner: Miami Transit Authority

1. **How well do you believe the remedy currently in place is performing?**

   The remedy was put in place over ten years ago. I have no reason to believe there are any problems with the remedy. When the county buys property, it conducts environmental assessments to avoid acquiring contaminated property. I expect that was done even back when this property was acquired.

2. **Has your office conducted any site-related activities or communications in the last five years? If so, please give purpose and results of these activities.**

   When the removal was conducted, soil was removed and water sampling was done to ensure that standards for industrial use were met. I believe that DERM will be taking responsibility of any future sampling and monitoring for the old Miami Drum Site. Tom Kux, the DERM representative that was present during your visit, is or will be involved in this.

3. **Are you aware of any complaints or inquiries regarding environmental issues or the remedial action since implementation of the cleanup?**

   I'm not aware of any.

4. **Have you had any difficulties complying with the intended institutional controls, such as not disturbing the cap?**

   We haven't disturbed the area. As I understand it, there are no ground water wells on the Site and there are no drinking water wells there.

5. **What is the frequency of Operation & Maintenance (O&M) activities and inspections at the Site? To your knowledge has the maintenance been implemented as intended?**

No train maintenance activities are performed outside of the train garage building. All mechanical work is done on pavement and under cover and the garage building has its own drainage system and water separators. In the area of the Site, no train maintenance is performed - only train switching. The Site is used essentially as a parking lot for trains. The trains used here are electrical so there is no fuel and very little oil. They are very clean.

6. **What effect has this Site had on the surrounding community, if any?**

   I was told that acquisition of the land began in 1975 and continued up until about the early 1980's. About 150 properties were purchased during that time, one of which was the Miami Drum Site.

7. **What effect has the reuse of the Site as a Transit center had on the community? Are you aware of any changes in projected land use?**

   Positive, because it provides public transportation for the county residents. The light rail system reduces energy use through mass transit and is more efficient than automobiles because it is electrical. The light rail system is environmentally friendly.

   The property use should stay the same. We are expanding the train system to the airport, north to the stadium, and west to county line. The county will be here for a long time. These expansions are planned on a 30-50 year time horizon.

8. **Should EPA do more to keep involved parties and surrounding neighbors informed of activities at the Site? By what methods?**

   I thought it was a closed case. The only thing I see is the need to notify any future property owners of the Site's contamination and history. Other than that there is no need for additional communication.

9. **Do you have any comments, suggestions, or recommendations regarding the Site's management or operations?**

   No.

Interview Form for Miami Drum Services' Five-Year Review

Site Name: Miami Drum Services **EPA ID No.:** FLD076027820
Interviewer Name: Cara Forster **Affiliation:** E2 Inc.
Subject's Name: Raymond Diaz **Affiliation:** Miami Water and Sewer Department
Subject's Contact Information: 305-460-7120
Time: 10am **Date:** 10/16/07
Type of Interview (Circle one): In Person Phone Mail Other__________

Remedy Implementer: Miami-Dade Water and Sewer Department (Ray Diaz)

1. **How well do you believe the remedy currently in place is performing?**

   I believe it's performing well, based on annual monitoring at the wellheads of each of our production wells. The Department of Public Health requires that all wells be sampled once a month for total chloroform, and that testing is done by the respective lab for each wellfield. SFWMD requires chlorides testing of each production well twice a year at the wellheads. These are the only required monitoring events at the production wells. WASD voluntarily performs monitoring of the 21 regulated VOCs once a year at the wellheads. The lab that runs these analyses is the Alexander Orr lab. The lab certification numbers for the Alexander Orr lab are: State Department of Health ID (E56720) and EPA ID (FL00193).

2. **Are you aware of any complaints or inquiries regarding environmental issues or the remedy since implementation of the air strippers?**

   No I am not, but check with Tom Segars on whether the air sampling was done in response to citizen concerns.

3. **What is the frequency of Operation & Maintenance (O&M) activities at the Site? To your knowledge has the monitoring been implemented as intended?**

   Ask Tom Segars, as he is in charge of operations.

4. **In 2002, EPA funding for the air strippers expired. Has that created any difficulties with continued operation of the air strippers? What is the Department's perspective on the past and present funding arrangements?**

   I would refer you to Tom for that question.

5. **In the last five years, has the Department conducted a study of whether VOC reduction is due to air stripping or biodegradation? What does the monitoring data show?**

No, we have not conducted any studies to make that determination. We assume the air strippers are the primary mechanism of cleanup. I'm sure some biodegradation is also going on, but we haven't explored that to make a determination.

6. **Are there any wells in the Preston or Hialeah Wellfields that have been taken out of service in the last five years due to saltwater intrusion? Are there any new wells planned for these wellfields? If so, where and when will the new wells be installed?**

   No, as far as I know, there are no wells that have been taken out of service for saltwater intrusion. There are no new wells planned for these wellfields. There is the possibility of installing new wells for Aquifer Storage and Recovery, but that does not involve the Biscayne Aquifer. Aquifer Storage and Recovery is a means of injecting fresh water from the Biscayne Aquifer into the deeper brackish aquifer during the wet season and extracting that fresh water for use during the dry season.

7. **The previous air permit for VOCs emissions expired in 2005. Was that permit renewed? If so, are the terms of the new permit different? What trends are shown by the air emissions data?**

   Richard O'Rourke manages that permit. Jorge Acevedo works with him and might also be able to answer that question.

8. **What effect has this Site had on the surrounding community, if any?**

   I refer you to Tom for that question.

9. **Has your office conducted any public awareness activities to make citizens aware of the treatment of their water supply? Should EPA do more to keep involved parties informed of activities at the Site? By what methods?**

   Early on we created a nice brochure that explained about the air stripping towers and there was some public relations about the project. The consumer confidence reports identify the treatment processes used and therefore list the air strippers. Consumer confidence reports are required annually and so we continue to make the public aware of water treatment activities and the air stripper process and its benefits. Communication is a great thing. We should all try hard to make one another aware of what we are doing.

10. **Do you have any comments, suggestions, or recommendations regarding the Site's management or operations?**

    Looking at the data on an annual basis and looking at the changes in contamination at the wellfield makes me feel good that I've worked toward something that has been successful. It's a success that reflects on all parties - EPA, WASD management, the research team. It's good to see a project, especially a long-term project like this one, that has such tangible results. I feel a lot of satisfaction in knowing we made good decisions and it has made significant improvements to the Biscayne Aquifer.

Interview Form for Miami Drum Services' Five-Year Review

Site Name: Miami Drum Services **EPA ID No.:** FLD076027820
Interviewer Name: Cara Forster **Affiliation:** E2 Inc.
Subject's Name: Tom Segars **Affiliation:** Miami Water and Sewer Department
Subject's Contact Information: 305-520-4721
Time: 6pm **Date:** 10/17/07
Type of Interview (Circle one): In Person **Phone** Mail Other__________

1. **How well do you believe the remedy currently in place is performing?**

   We don't see increasing residuals, so I believe it is performing well.

2. **Are you aware of any complaints or inquiries regarding environmental issues or the remedy since implementation of the air strippers?**

   No.

3. **What is the frequency of Operation & Maintenance (O&M) activities at the Site? To your knowledge has the monitoring been implemented as intended?**

   24/7. Yes, more monitoring occurs than was intended.

4. **In 2002, EPA funding for the air strippers expired. Has that created any difficulties with continued operation of the air strippers? What is the Department's perspective on the past and present funding arrangements?**

   EPA funding helped offset operational expenses, primarily the electrical expense of operating the towers. When funding stopped, we continued operating the towers, so the end of funding had no impact on operational status.

5. **In the last five years, has the Department conducted a study of whether VOC reduction is due to air stripping or biodegradation? What does the monitoring data show?**

   Our data wouldn't show that, but perhaps DERM would know. We've seen decreased concentrations in the compounds of interest over time. But, no studies have been undertaken specifically to address this question. Our monitoring addresses production wells and helps identify potential problems early. We examine VOC concentrations through annual monitoring and over time have seen some wells where concentrations of contaminants were once high and are now low. We don't look at regulatory aspects, so we can only speak to what we see in the water.

6. **Are there any wells in the Preston or Hialeah Wellfields that have been taken out of service in the last five years due to saltwater intrusion? Are there any new wells planned for these wellfields? If so, where and when will the new wells be installed?**

   No. We work with SFWMD to monitor saltwater intrusion in the area. We haven't seen anything that would cause us to take a well out of service for saltwater intrusion. There may be plans to install new wells in the upper Floridan aquifer, but there are no plans to install new wells in the Biscayne aquifer.

7. **The previous air permit for VOC emissions expired in 2005. Was that permit renewed? If so, are the terms of the new permit different? What trends are shown by the air emissions data?**

   I don't believe the terms of the new permit are different. In terms of emissions, the towers strip VOCs out of the water. There is also a chloroform component to emissions that may have increased due to new regulations on disinfecting the water. The VOC side of emissions has gone down over the period of operation of the towers. There is a downward trend with the VOCs, though not at an extreme rate.

8. **What effect has this Site had on the surrounding community, if any?**

   No impact.

9. **Has your office conducted any public awareness activities to make citizens aware of the treatment of their water supply? Should EPA do more to keep involved parties informed of activities at the Site? By what methods?**

   We are required to conduct some public involvement activities related to water treatment. The comprehensive drinking water report goes out to all consumers once a year. This report says we use air stripping to reduce exposure to volatile compounds, but this has been our only public involvement during the last five years. At some level any contaminated property is of interest to public because addressing these sites involves costs to local government borne by county taxpayers. It is helpful to have public awareness of these sites in order to help generate public support for these types of expenditures. Involving the public can also help prevent future contamination. Public education on safe disposal practices is important as a preventative measure. All sorts of household chemicals are potential sources of contamination. Education helps people understand the consequences of their actions and the effects these actions can have on their water supply and coastal areas that contribute to quality of life here. EPA guidance on proper disposal practices of household chemicals and funding for local education programs would be helpful for the local schools and community. DERM or the state health department could help facilitate EPA outreach activities. The WTPs do not have time to create these educational materials, but there is great value in doing so. EPA does lots of good work and especially here in south Florida. Public education is important and we don't spend enough time on it.

10. Do you have any comments, suggestions, or recommendations regarding the Site's management or operations?

This project was really unique. It was the first time Superfund money was aimed directly at a drinking water supply. It was innovative and the key players had lots of foresight to make the decisions they did. It's been a super success – the remedy took contaminated ground water and turned it into drinking water – it's the ultimate in recycling because it addresses millions of gallons of water a day. If this Site is closed out, there will still be a need to have the air strippers operating, probably for the rest of our lives. The need for the towers is a given because of long-term nature of these sites' impact on the aquifer. Even if EPA closed out the Site, the Site's impact on ground water will be with us for a while, so EPA will need to be involved in this remedy in the long term.

Interview Form for Miami Drum Services' Five-Year Review

Site Name: Miami Drum Services **EPA ID No.:** FLD076027820
Interviewer Name: Cara Forster **Affiliation:** E2 Inc.
Subject's Name: Tom Kux **Affiliation:** Miami-Dade County DERM
Subject's Contact Information: 305-372-6520 or KuxT@miamidade.gov
Time: 3 pm **Date:** 10/16/07
Type of Interview (Circle one): In Person **Phone** Mail Other__________

1. **How well do you believe the remedy currently in place is performing?**

   Remedy is performing as designed.

2. **Are you aware of any complaints or inquiries regarding environmental issues or the remedial action since implementation of the cleanup?**

   No.

3. **Has your office conducted any site-related activities or communications in the last five years? If so, what was the purpose and result of these activities?**

   The last official DERM communication related to this Site is recorded in the 2003 letters from DERM to EPA that were created for last FYR.

4. **DERM comments on the previous Five-Year Review for this Site indicated that if ground water under the site showed contamination over sub-regional levels, that DERM might require additional assessment and unless remediated to sub-regional levels. Has this changed or have the results of ground water monitoring in the last five years given any insight into whether this will be necessary?**

   No. DERM's response contained in Comment 3 of the 2003 letters still applies. Also, there has not been any ground water monitoring at the site, only at the water treatment plants. DERM's concern is to sample the ground water at the Site prior to delisting to compare on-site ground water levels with regional and sub-regional levels for the Biscayne Aquifer. If on-site levels of ground water contamination are above regional and sub-regional levels, the Site may require additional remediation or if not will require ICs. DERM wants confirmatory sampling before site closure.

5. **Are you comfortable with the Institutional Controls (ICs) required for the Site and their current status of implementation?**

   As it stands ICs will be required, but this question is not really applicable at this time because design of ICs is not yet underway.

6. **What effect has the reuse of the Site had on the community? Are you aware of any changes in projected land use?**

I'm not aware of any projected land use changes.

7. **Are you aware of any changes to state or local laws that might affect the protectiveness of the remedy?**

   Not that I'm aware of.

8. **Should EPA do more to keep involved parties and surrounding neighbors informed of activities at the Site? By what methods?**

   Not aware of any information activities performed by EPA except for the FYRs.

9. **Do you have any comments, suggestions, or recommendations regarding the Site's management or operations?**

   Yes, these comments were discussed with EPA during the site visit. DERM's primary concerns about the Site include obtaining a better understanding of EPA's goals for site closure, EPA's projected timeframe for delisting this Site, and clarification of EPA's expectations regarding Miami-Dade County and the county's Water and Sewer Department in terms of roles and responsibilities in relation to this Site.

Interview Form for Miami Drum Services' Five-Year Review

Site Name: Miami Drum Services **EPA ID No.:** FLD076027820
Interviewer Name: Cara Forster **Affiliation:** E2 Inc.
Subject's Name: Kelsey Helton **Affiliation:** FDEP
Subject's Contact Information: 850-245-8969
Time: 10:30am **Date:** 11/13/07
Type of Interview (Circle one): In Person Phone Mail Other__________

1. **How well do you believe the remedy currently in place is performing?**

   After a brief review of historic municipal well data and as noted by the WASD ground water data, concentrations on the COCs have been going down. Pending the review of the effluent data I anticipate confirmation of remedy effectiveness. Other than implementation of a restrictive covenant to ensure that land use remains industrial, the remedy remains adequate.

2. **Are you aware of any complaints or inquiries regarding environmental issues or the remedial action in the last five years?**

   No.

3. **Has your office conducted any site-related activities or communications in the last five years? If so, what was the purpose and result of these activities?**

   I don't think so, no.

4. **Are you comfortable with the Institutional Controls (ICs) required for the Site and their current status of implementation?**

   There are no ICs in place for this Site, but there is a need for ICs. In terms of ICs, EPA has indicated that the State takes the lead on and is involved in the development of ICs and so FDEP will need to review the restrictive covenant or other deed document and make sure it complies with state laws.

5. **What effect has the reuse of the Site had on the community? Are you aware of any changes in projected land use?**

   FDEP is not familiar with the impacts of reuse on this Site. Based on the information from DERM and the Transit Authority, plans exist for the Site to remain industrial into the future.

6. **Are you aware of any changes to state laws that might affect the protectiveness of the remedy?**

FDEP will review ground water data and current drinking water standards as part of the FYR process to see if any changes to state laws have affected the standards for COCs related to this Site. This review will also include comparison of ROD standards with Florida Chapter 62-777 for soil standards. I don't anticipate that there will be any changes to state law that would affect the remedy.

7. **Should EPA do more to keep involved parties and surrounding neighbors informed of activities at the Site? By what methods?**

   The State should be kept involved in terms of correspondence from EPA, site visits relative to FYRs, and other site milestones.

8. **Do you have any comments, suggestions, or recommendations regarding the Site's management or operations?**

   The mercury soil standard for direct contact is 3 mg/Kg for unrestricted exposure. Commercial/industrial use has a standard of 17 mg/Kg, and for leachability to ground water the standard is 2.1 mg/Kg. Pavement could help address direct contact and leaching. ICs should require maintenance of the areas with waste left in place to ensure long-term protectiveness. Access restrictions are in place due to Transit Authority ownership.

   If the Northwest 58th Street Landfill Site is maintained as a landfill and closed under Chapter 62-770 of Florida state law and if ground water contamination has not migrated off site, then there is a public entity responsible for O&M, which may explain the Site's deletion. Varsol Spill may have been deleted because nothing was found there.

Appendix G: Referenced Documents

Sections 24-43.2 and 24-43.3 of the Miami-Dade County Code of Ordinances (Ground Water Institutional Controls)

Source: http://www.municode.com/resources/gateway.asp?pid=10620&sid=9

Sec. 24-43.2. Regulation of on-site domestic well systems and other water supply wells.
(1) *Regulation of on-site domestic well systems generally.*
(a) Notwithstanding any provision of this Code, no County or municipal officer, agent, employee or Board shall approve, grant or issue any building permit certificate of use and occupancy (except for changes in ownership), municipal occupational license (except for changes in ownership), platting action (final plat, waiver of plat or equivalent municipal platting action) or zoning action (district boundary change, unusual use, use variance or equivalent municipal zoning action) for any land use served or to be served by an on-site domestic well system without obtaining the prior written approval of the Director of the Department of Environmental Resources Management or his designee.
Furthermore, notwithstanding any provision of this Code, no person shall construct, utilize, operate, occupy or cause, allow, let, permit or suffer to be constructed, utilized, operated or occupied any land use served or to be served by a domestic well system without obtaining the prior written approval of the Director of the Department of Environmental Resources Management or his designee.
Pursuant to the foregoing, the Director of the Department of Environmental Resources Management or his designee shall issue his written approval only if the Director or his designee determines that:
(i) That the existing land use for the property or the land use requested for the property is in compliance with Section 24-43.1 of this chapter, and
(ii) That the installation of a public water main to serve the property from the nearest available point of connection to an available public water main is not within a feasible distance for public water mains, and
(iii) That the groundwater at the site does not require treatment in order to meet the primary drinking water quality standards specified in Chapter 17.22, Florida Administrative Code, as same may be amended from time to time, and
(iv) That the groundwater at the site does not contain more than two hundred fifty (250) milligrams per liter (mg/l) of chlorides at a depth of thirty (30) feet from ground elevation.
(b) No construction may be begun on any project within Miami-Dade County involving the construction of a well capable of withdrawing water without obtaining approval from the Director, Environmental Resources Management. No well that withdraws water in excess of five thousand (5,000) gallons per day from groundwater, surface water or any other water or waters of Miami-Dade County may be maintained or operated without a permit. All permit applications shall be filed with the Director, Environmental Resources Management, on forms provided by him and shall include but shall not be limited to the following information:
(i) The name and address of the applicant (if the applicant is a corporation include the address of the principal business office);
(ii) The date the application is filed;

(iii) The source of water supply (if the water is from a lake, spring, river, stream or other source of surface water the name generally given to the source by the people in the vicinity. If the water is from a groundwater source this fact shall be stated on the application);
(iv) The quantity of water applied for;
(v) The use to be made of the water and any limitation thereon (the description shall include the nature of the proposed use, the method of withdrawal or division of the water and facts, figures and other information on which the amount of water requested was based);
(vi) The place where the water is to be used;
(vii) The location of the well and for surface waters, the point of diversion;
(viii) The total related land area owned by the applicant;
(ix) The necessity for the well;
(x) Any known persons who may be directly affected by the granting of the application;
(xi) The signature of the applicant or his agent (if the signer is signing in a representative capacity he shall attach proof of his authority--in the case of a corporation, governmental body or public utility the applicant shall attach a certified copy of the authority under which the application is made);
(xii) Other information as may be requested by the Department.
(2) *Conditions for a well permit.*
(a) In order to obtain a well permit an applicant must show that the intended use:
(i) Is a reasonable, beneficial use, and
(ii) Will not interfere with any legal use of water existing at the time of the application, including both exempted domestic uses and uses exercised under the authority of a valid permit, and
(iii) Is consistent with the public interest.
(b) In determining whether a use is consistent with the public interest, the Director, Environmental Resources Management, may consider the following factors:
(i) The maximum economic development of the water resources consistent with present and future uses;
(ii) The control of such waters for such purposes as environmental protection, drainage, flood control and water storage;
(iii) The quantity of water available for application to a reasonable-beneficial use;
(iv) Preservation of wasteful, uneconomic, impractical or unreasonable uses of water resources;
(v) The preservation and enhancement of water quality of the County and the provisions of the water quality standards and classifications established pursuant to Chapter 24 of the Code of Miami-Dade County;
(vi) The County's water resources policy as expressed in Chapter 24 of the Code;
(vii) The availability and proximity of public water supply; and
(viii) The satisfaction of the requirements of Section 24-43.3 of the Code.
(c) The Director may reserve water from use by permit applicants in such locations and quantities and for such seasons of the year as may reasonably be necessary to protect the public health, safety or fish and wildlife. Such reservations shall be subject to periodic review and revision in light of changed conditions except that all legal uses of water existing at the time of the reservation shall not be subject to this regulation so long as such uses are not contrary to the public interest. Any applicant aggrieved by an action of the Director, Environmental Resources Management, may appeal to the Environmental Quality Control Board under the procedures and standards set forth in Section 24-11 of the Code.

(3) *Permits for existing uses.* All uses of water in existence before the effective date of this section, unless otherwise exempted from regulation by law, may be continued after the adoption of this permit system. A permit for any existing use shall be issued upon proper application. Failure to apply for a permit for any existing use for one (1) year after the effective date of this ordinance shall constitute an abandonment of the right granted by this section. Notwithstanding the above, when an approved public water main has been made available and operative in any portion of the public right-of-way or easement abutting the property, the use of any on site domestic well system shall cease and connection shall be made to a public water main within six (6) months from the date that the Director or his designee determines that the approved public water main is made available and operative, and

(a) The existing sewage loading on the property exceeds the maximum allowable sewage loading permitted by Sections 24-43.1(3) or 24-43.1(4)(b) of this Code, or

(b) The groundwater quality for the property exceeds the potable water standards in Section 24-43.3(2) of this chapter.

(4) *Competing applications.*

(a) If two (2) or more applications, otherwise in compliance with the provisions of this chapter, are pending for a quantity of water that is inadequate for both (or all) or which for any other reason are in conflict, the Director, Environmental Resources Management, shall have the right to modify or approve the application or applications to best serve the public interest. In considering the relative benefit to be derived by the public from such proposed uses of water the Director may within the same type of use and source consider the following:

(i) Public users should be preferred over private users;

(ii) Economically more productive uses should be preferred over less productive uses;

(iii) The purposes expressly declared to be in the public interest in Chapter 24 of the Code should be given primary consideration.

(b) In the event two (2) or more competing applications which have equally qualified under Section 24-43.2(4)(a) above cannot be reconciled by modification by the Director, the Director shall give preference to:

(i) Renewal application, or

(ii) If none or all are renewal applications, to the first properly filed application.

(5) *Modification, renewal and transfer of permits.* A permittee may apply to the Director for approval of any modification of a permit use. The Director may approve any modification of use which involves a decrease in the quantity of water required. Modification of any other term or terms of a permit may be granted at the discretion of the Director provided that such modification does not effect substantially the public interest.

(6) *Revocation of permits.*

(a) Pursuant to a hearing, the Environmental Quality Control Board may upon application by the Director:

(i) Revoke any permit for complete nonuse of water supply allowed by the permit for a period of one (1) year or more;

(ii) Permanently revoke in whole or in part any permit for any material false statement in the application to continue, to initiate, or to modify a use, or for any material false statement in any report or statement of fact required by the user pursuant to the provisions of this section;

(iii) Permanently or temporarily revoke in whole or in part any permit for the willful violation of conditions of the permit;

(iv) Revoke in whole or in part for a period not to exceed one (1) year any permit for the violation of any provision of Chapter 24 or regulation adopted thereunder;
(v) Revoke, in whole or in part, any permit where adequate public water becomes available.
(b) The Director may cancel any permit with the written consent of the permittee.
(7) *Emergency drought conditions.* Nothing in this section shall be construed to prohibit the exercise of emergency powers to control the use, withdrawal or diversion of water during periods of emergency water shortage.
(8) *Violation of section.* It shall be unlawful for any person without a permit to construct, operate or maintain a well as required by this section.
(9) *Effect of denial.* When an application for a permit has been denied by the Director and that denial, pursuant to a timely appeal, has not been overruled by the Environmental Quality Control Board a new application for a permit shall not be resubmitted within one (1) year of such final denial unless the applicant can demonstrate a substantial change in conditions or unless the permit applied for is substantially modified and is in compliance with the Director's reason for denial.
(10) *Definitions.*
(a) *Domestic use* means any use of water for individual personal needs or for household purposes such as drinking, bathing, eating, cooking or sanitation.
(b) *Emergency* means that situation where the public health, safety or welfare or the health of animals, fish or aquatic life or of a public water supply or recreational, commercial, industrial, agricultural or other reasonable use of water is immediately in danger or threatened by an insufficient supply, restricted source, deleterious quality or other conditions of the water within the County.
(c) *Director or DERM* means the Director of the Department of Environmental Resources Management with powers as provided by Section 24-7 of the Code.
(d) *Groundwater* means water beneath the surface of the ground whether or not flowing through known and definite channels.
(e) *Person* means any and all persons including but not limited to any individual, firm, association, organization, partnership, business trust, corporation, company, United States of America, the State of Florida and all the municipalities and public agencies thereof located within Miami-Dade County.
(f) *Reasonable-beneficial use* means the use of water in such quantity as is necessary for economic and efficient utilization for a purpose and in a manner which is both reasonable and consistent with the public interest.
(g) *Surface water* means water upon the surface of the earth whether contained in bounds created naturally or artificially or diffused. Water from a natural spring or well shall be classified as surface water when it exits from the spring or well onto the earth's surface.
(h) *Water or waters of the County* means any and all waters on or beneath the surface of the ground including natural or artificial water courses, lakes, ponds or diffused surface water and water percolating, standing or flowing beneath the surface of the ground as well as all coastal waters in the geographic boundaries of Miami-Dade County, Florida.
(i) *Water shortage* means that situation within all or part of Miami-Dade County, Florida wherein insufficient water is available to meet the requirements of the permit system or where the conditions are such as to require temporary reduction in the total use within the area to protect water resources from serious harm.

(j) *Well* means any excavation that is drilled, cored, bored, washed, driven, dug, jetted or otherwise constructed when the intended use of such excavation is for the location, acquisition, development or artificial recharge of groundwater or removal of water from beneath the ground. The term well does not include sandpoint wells or any wells for the purpose of obtaining or prospecting for oil, natural gas, minerals or products of mining or quarrying or the inserting of media to dispose of oil brinds or to repressure an oil or natural gas-bearing formation or for storing petroleum, natural gas or other products.
(Ord. No. 04-214, §§ 1, 5, 12-2-04)

Sec. 24-43.3. Potable water standards.
(1) GENERAL PROHIBITIONS. It shall be unlawful for any person, firm, corporation, private or public utility, to cause, permit or otherwise allow any potable water supply to breach the values set forth in Section 24-43.3(2).
(2) POTABLE WATER STANDARDS FOR MIAMI-DADE COUNTY.
(a) Bacteriological quality; sampling. Compliance with the bacteriological requirements of these standards shall be based on examinations of samples collected at representative points throughout the distribution system. The frequency of sampling and the location of sampling points shall be established by the DERM after investigation of the source, method of treatment, and protection of the water concerned. In no event shall the frequency be less than as set forth below:
TABLE INSET:

Populations Served	*Minimum Number of Samples Per Month*
25--2,500	2
2,501--3,300	3
3,301--4,100	4
4,101--4,900	5
4,901--5,800	6
5,801--6,700	7
6,701--7,600	8
7,601--8,500	9
8,501--9,400	10
9,401--10,300	11
10,301--11,100	12
11,101--12,000	13
12,001--12,900	14
12,901--13,700	15
13,701--14,600	16

14,601--15,500	17
15,501--16,300	18
16,301--17,200	19
17,201--18,100	20
18,101--18,900	21
18,901--19,800	22
19,801--20,700	23
20,701--21,500	24
21,501--22,300	25
22,301--23,200	26
23,201--24,000	27
24,001--24,900	28
24,901--25,000	29
25,001--28,000	30
28,001--33,000	35
33,001--37,000	40
37,001--41,000	45
41,001--46,000	50
46,001--50,000	55
50,001--54,000	60
54,001--59,000	65
59,001--64,000	70
64,001--70,000	75
70,001--76,000	80
76,001--83,000	85
83,001--90,000	90
90,001--96,000	95
96,001--111,000	100
111,001--130,000	110
130,001--160,000	120

160,001--190,000	130
190,001--220,000	140
220,001--250,000	150
250,001--290,000	160
290,001--320,000	170
320,001--360,000	180
360,001--410,000	190
410,001--450,000	200
450,001--500,000	210
500,001--550,000	220
550,001--600,000	230
600,001--660,000	240
660,001--720,000	250
720,001--780,000	260
780,001--840,000	270
840,001--910,000	280
910,001--970,000	290
970,001--1,050,000	300
1,050,001--1,140,000	310
1,140,001--1,230,000	320
1,230,001--1,320,000	330
1,320,001--1,420,000	340
1,420,001--1,520,000	350
1,520,001--1,630,000	360
1,630,001--1,730,000	370
1,730,001--1,850,000	380
1,850,001--1,970,000	390
1,970,001--2,060,000	400
2,060,001--2,270,000	410
2,270,001--2,510,000	420

2,510,001--2,750,000	430
2,750,001--3,020,000	440
3,020,001--3,320,000	450
3,320,001--3,620,000	460
3,620,001--3,960,000	470
3,960,001--4,310,000	480
4,310,001--4,690,000	490
4,690,001--	500

(b) Laboratories in which water examinations are made for required reports shall be subject to inspection at any time by the DERM.

(c) Bacterial limits. The presence of organisms of the coliform group as indicated by samples examined shall not exceed the following limits:

(i) When ten (10) ml standard portions are examined not more than ten (10) percent in any month shall show the presence of the coliform group. The presence of the coliform group in three (3) or more ten (10) ml portions of a standard sample shall not be allowable if this occurs:

1. In two (2) consecutive samples;
2. In more than one (1) sample per month when less than twenty (20) are examined per month; or
3. In more than five (5) percent of the samples when twenty (20) or more are examined per month.

When organisms of the coliform group occur in three (3) or more of the ten (10) ml portions of a single standard sample, daily samples from the same sampling point shall be collected promptly and examined until the results obtained from at least two (2) consecutive samples show the water to be of satisfactory quality.

(ii) When one hundred (100) ml standard portions are examined, not more than sixty (60) percent in any month shall show the presence of the coliform group. The presence of the coliform group in all five (5) of the one hundred (100) ml portions of a standard sample shall not be allowable if this occurs:

1. In two (2) consecutive samples;
2. In more than one (1) sample per month when less than five (5) are examined per month; or
3. In more than twenty (20) percent of the samples when five (5) or more are examined per month.

When organisms of the coliform group occur in all five (5) of the one hundred (100) ml portions of a single standard sample, daily samples from the same sampling point shall be collected promptly and examined until the results obtained from at least two (2) consecutive samples show the water to be of satisfactory quality.

(iii) When the membrane filter technique is used, the arithmetic mean coliform density of all standard samples examined per month shall not exceed one (1) per one hundred (100) ml. Coliform colonies per standard sample shall not exceed 3/50 ml, 4/100 ml, 7/200 ml, or 13/500 ml in:

1. Two (2) consecutive samples;
2. More than one (1) standard sample when less than twenty (20) are examined per month; or

3. More than five (5) percent of the standard samples when twenty (20) or more are examined per month.

When coliform colonies in a single standard sample exceed the above values, daily samples from the same sampling point shall be collected promptly and examined until the results obtained from at least two (2) consecutive samples show the water to be of satisfactory quality.

(d) Physical characteristics; sampling. The frequency and manner of sampling shall be determined by the DERM. Under normal circumstances the DERM may require that samples be collected one (1) or more times per week from representative points in the distribution system and examined for turbidity, color, threshold odor, and taste.

(e) Physical limits. The water shall contain no impurity which would cause offense to the sense of sight, taste, or smell. Under general use, the following limits shall not be exceeded:

Turbidity--5 nephelometric turbidity units

Color--15 units

Threshold odor number--3

(f) Chemical characteristics; sampling. The frequency and manner of sampling shall be determined by the DERM. Under normal circumstances, analyses for substances listed in Section 24-43.3(2)(h) need be made only annually. If, however, there is some presumption of unfitness because of the presence of undesirable elements, compounds, or materials, periodic determinations for the suspected toxicant or material shall be made more frequently and an exhaustive sanitary survey shall be made to determine the source of the pollution. Where the concentration of a substance is not expected to increase in processing and distribution, available and acceptable source water analyses performed in accordance with standard methods may be used as evidence of compliance with these standards.

(g) Chemical limits. The water shall not contain impurities in concentrations which may be hazardous to the health of the consumers. It should not be excessively corrosive to the water supply system. Substances used in its treatment shall not remain in the water in concentrations greater than required by good practice. Substances which may have deleterious physiological effect, or for which physiological effects are not known, shall not be introduced into the system in a manner which would permit them to reach the consumer. Each public water supply utility shall test the finished water produced by each of its water treatment plants on an annual basis for the materials identified as priority pollutants by the United States Environmental Protection Agency as set forth in Schedule A, attached hereto and made a part hereof [but not reproduced at length herein], and such other materials as may be designated by the DERM. Each of the other community water systems shall test the finished water produced by its water treatment system every third year for the aforesaid materials identified as priority pollutants by the United States Environmental Protection Agency, and such other materials as may be designated by the DERM. The first of the previously mentioned analyses shall be performed, and the results submitted to the DERM, no later than one hundred fifty (150) days after the effective date of Ordinance No. 84-41. Subsequent analyses shall be performed, and the results submitted to the DERM, no later than July first of the respective year.

Analyses conducted to determine compliance with this section shall be made in accordance with an analytical method acceptable to DERM in accordance with Schedule A, attached hereto and made a part hereof, and at the detection limits achievable using the specific technique. The laboratory performing these tests shall have appropriate experience in these types of drinking water analyses and shall be certified by the State of Florida Department of Health and Rehabilitative Services (DHRS).

After submittal of the test results to the utilities and community water systems for their review and comments at a public workshop, DERM shall make available to the public thirty (30) days thereafter an annual publication of the test results. Said publication shall contain the test results of all public water supply utilities and other community water systems in Miami-Dade County including comments regarding the test results by the utilities and community water systems.

(h) The following chemical substances shall not be present in a water supply in excess of the listed concentrations:

TABLE INSET:

Substance	*Concentration in mg/l*
Arsenic (AS)..........	0.01
Chloride (CI)..........	250
Copper (CU)..........	1.0
Cyanide (CN)..........	0.01
Iron (FE)..........	0.3
Manganese (MN)..........	0.05
Methylene blue active substances (MBAs)..........	0.5
Nitrate Nitrogen (NO 3 --N)..........	10
Phenols..........	0.001
Sulphate (SO 4)..........	250
Total dissolved solids..........	500
Zinc (ZN)	5

(i) The presence of the following substances in excess of the concentrations listed shall constitute grounds for rejection of raw water supply:

TABLE INSET:

Substance	*Concentration in mg/l*
Arsenic (AS)	0.05
Barium (BA)	1.0
Cadmium (CD)	0.01
Chromium (hexavalent) (CR + °)	0.05
Cyanide (CN)	0.2
Lead (PB)	0.05
Selenium (SE)	0.01
Silver (AG)	0.05

Mercury	0.002
Nitrate (ASN)	45

(j) Analytical methods. Analytical methods to determine compliance with the requirements of these standards shall be those specified in Standard Methods for the Examination of Water and Waste Water, sixteenth edition.

(k) All public water supply systems shall employ an approved method of disinfection acceptable to the DERM. Such disinfection shall be accomplished continuously in such a manner as to assure the continued feeding of the disinfection agent.

(i) Those systems utilizing gas chlorine shall provide duplex systems that will assure the continued application of chlorine to the water even as containers are expended and replaced;

(ii) Those systems utilizing chlorine shall maintain a minimum three-tenths (0.3) milligrams per liter as free chlorine throughout its distribution system. In no case shall a chlorine residual in excess of two (2.0) milligrams per liter be maintained in the distribution system;

(iii) Utilization of other methods of disinfection acceptable to the DERM shall have established limits set by the DERM;

(iv) The minimum amount of chlorine to be stored at the water treatment facility or immediately accessible to the facility shall be a thirty-day supply. In lieu of this requirement the utility may provide to the DERM copies of long term contracts indicating available quantity together with transportation contracts;

(v) All public water supply systems shall provide to the DERM breakpoint chlorination curves for:

1. All individual wells which are used as a supply of raw water;
2. Composite breakpoint curves for the raw water supply used for average and maximum day demand.

(l) Every public water supply shall install a suitable measuring device at each source of supply and at the point that water is pumped to the distribution system in order that a record may be maintained of the water produced and treated. The quantities indicated by these measuring devices shall be tabulated daily and recorded.

(m) When the annual average of the maximum daily air temperatures for the location in which the public water system is situated is the following, the corresponding concentration of fluoride shall not be exceeded:

TABLE INSET:

Temperature (in degrees F)	*(Degrees C)*	*Level (mg/l)*
50.0--53.7	10.0--12.0	1.8
53.8--58.3	12.1--14.6	1.7
58.4--63.8	14.7--17.6	1.5
63.9--70.6	17.7--21.4	1.4
70.7--79.2	21.5--26.2	1.2
79.3--90.5	26.3--32.5	1.1

(n) Public water supply systems cleaning and disinfection. No person, Board, or municipality charged with the management or control of a public water supply shall put into service any new plant, pumping station, main, standpipe, reservoir, tank, or other pipe or structure through which water is delivered to consumers for potable or household purposes, nor resume the use of any such structure, facilities, or main after it has been cleaned, until such structure, facilities or main has been effectively sterilized or disinfected. Provided, that this may not necessarily apply to mains, reservoirs, tanks, or other structures, the waters from which are subsequently treated or purified.

(o) Adequate pressure shall be maintained in the mains to deliver the water for which they were designed, whether it be for fire, industrial, or domestic use. In no event, however, shall the pressure at the point of delivery to any customer fall below twenty (20) pounds per square inch, nor shall the static pressure exceed one hundred (100) pounds per square inch.

(p) By-passing unlawful. Where a potable water treatment facility has been provided, it shall be unlawful to by-pass the facility or any part thereof. In the event of an emergency, the supplier may temporarily utilize a by-pass. However, it shall be unlawful to fail to immediately notify the DERM of such an emergency. Such notification shall not be a defense to any civil liability under this chapter.

(q) When an approved public water main is made available and operative in a public right-of-way or easement abutting the property, any existing individual potable water supply system, device, or equipment shall, within ninety (90) days, be abandoned and the source of potable water for the residence or building shall be from the approved public water supply main.

(r) Public water supply systems; cross-connections and use of dual supplies.

(i) Certain cross-connections prohibited. No officers, Board, corporation, municipality or other persons having the management of a public water supply shall permit any physical connection between the distribution system of such supply and that of any other water supply unless such other supply is regularly examined as to its quality by those in charge of the public supply to which the connection is made and is also found to be safe and potable. This provision shall apply to all water distribution systems either inside or outside of any building or buildings.

(ii) Permissible arrangement where dual supplies are used. If a potable water supply is used as an auxiliary supply delivered to an elevated tank, or to a suction tank, which tank is also supplied with water from a source with which cross-connections are not permitted by Section 24-43.3(2)(r)(i), such tank shall be opened to atmospheric pressure and the potable water supply shall be discharged at an elevation above the high water line of the tank.

(s) Facilities in actual use and operation as of the date of the enactment of this section which exceed the criteria set forth in any of the provisions of Section 24-43.3 hereof, certified by a competent state or county agency as a present or potential health hazard, shall be designated by the Director, Environmental Resources Management, as priority public water supply areas. Upon such designation the Miami-Dade County Water and Sewer Authority and the County Manager shall initiate proceedings for the creation of a special taxing district for public water system for the elimination of the potable water wells therein or take such other commensurate steps as to assure the elimination of the potable water wells therein, on a timely basis.

(t) All treatment facilities shall be designed to have a treatment capacity equal to maximum day demand.

(u) Any cross-connections in the treatment facility or distribution system are to be eliminated upon direction of the Director, Environmental Resources Management. In the event such a cross-connection is maintained by a user after an order to disconnect is given by the DERM, he may order the discontinuance of service by the utility to the user until the cross-connection is eliminated.

(v) No water supply well shall be constructed or used until a written approval from the DERM has been received by the owner and/or driller of the well:
(i) The DERM shall be notified by the well driller at least twenty-four (24) hours prior to initiating construction of a permitted well;
(ii) In wells where the casing is driven it shall be known as drive pipe, and shall be equipped with couplings allowing for butt joints between lengths of casing. For wells in which the casing is not driven "merchant casing," standard pipes or pipe especially constructed for gravel wall wells will be acceptable;
(iii) Where telescoped casing is utilized, an approved watertight seal shall be made where increases or reductions occur in casing size. The initial stage of the telescope casing shall extend a minimum of thirty (30) feet into the groundwater table;
(iv) When water is to be obtained from limestone strata, the casing shall extend sufficiently far into unbroken limestone to be seated firmly in it but in no case shall it be less than thirty (30) feet into the aquifer;
(v) Wells drilled by the rotary method shall have an annular space sealed by the use of a neat cement grout at the bottom of the hole and to the surface by neat cement or other approved material;
(vi) Once the construction of the well is completed it shall be protected at all times to prevent entrance of contaminating material until such time as the pump may be placed;
(vii) The top of the casing shall be so constructed as to exclude any influent but shall not extend less than one (1) foot above the surface of the ground;
(viii) A concrete pad shall be constructed around the well a minimum of twelve (12) inches thick, two (2) feet horizontal from the casing;
(ix) Pump houses or pump pits shall be constructed so as to provide for positive drainage. Where such is not possible sump pumps or an alternative acceptable to the DERM shall be provided. Such systems shall be installed as duplex systems;
(x) Where provided, well vents shall be adequately protected;
(xi) In those situations where suction lines from a well casing are indicated, the suction pipe shall be so constructed to prohibit inundation. Minimum requirement shall be twelve (12) inches of clearance between the invert and ground surface;
(xii) A sampling tap shall be provided on the discharge of the well pump piping or in such a location as to assure a true raw water sample;
(xiii) The use of dynamite for the construction of wells shall be prohibited;
(xiv) Dug wells, infiltration galleries and other sources of water supply requiring rearrangement of natural features are hereby prohibited as a source of public water supply;
(xv) The use of surface water as a raw water source is prohibited;
(xvi) All wells shall be located on terrain not subject to ponding or flooding. Furthermore, the slope of the ground surface in the vicinity of the well(s) shall be away from the well. In level areas, well compacted earth shall be placed around the well so as to elevate the platform, pad or apron;
(xvii) As far as is practical, wells shall be located on the upstream side of possible sources of pollution;
(xviii) The minimum separation between a well or wells and possible sources of contamination shall be a function of the drawdown and radius of influence of the well or wells. It shall be the responsibility of the design engineer to present data showing the radius of influence and drawdown together with a sanitary survey of the area influenced by the well. Such a survey shall

extend one-half (1/2) mile beyond the radius of influence of the well field. In the cases involving multiple wells the interference among wells shall be determined. It shall be the design engineer's responsibility to show that the top thirty (30) feet of the aquifer is not tapped by the well(s). In no case shall the well be located less than one hundred (100) horizontal feet from any source of contamination. However the DERM shall have the power to require additional spacing when conditions justify;

(xix) All wells shall be accessible for such attention as necessary;

(xx) All wells shall be equipped with an opening suitable for introduction of a disinfecting agent and measurement of drawdown and static water level;

(xxi) When using chlorine as a disinfecting agent, a quantity, at least equal to the volume of the casing, of a strength of fifty (50) milligrams per liter shall be injected into the well. The solution shall be permitted to stand a minimum of twenty-four (24) hours and then pumped out for a sufficient length of time to remove the disinfecting agent;

(xxii) Once the well has been evacuated in accordance with subsection (21), a series of twenty (20) or more daily samples, twenty (20) series, shall be collected and submitted to the Division of Health laboratory, the well being pumped for a minimum of thirty (30) minutes each day at its proposed capacity just prior to collecting the samples. At the discretion of the DERM the samples may be reduced to duplicate daily samples for a minimum of ten (10) days. Such samples will necessitate pumping for a minimum of thirty (30) minutes as indicated above;

(xxiii) Interpretation of the laboratory results in the well survey will be made in accordance with applicable parts of the water supply standards;

(xxiv) Once the series of twenty (20) or more consecutive satisfactory samples have been collected a complete analysis shall be performed of the raw water for both physical and chemical characteristics of the complete analysis shall be furnished to the DERM.

(Ord. No. 04-214, §§ 1, 5, 12-2-04)

CDM

Miami Dade County

Water Supply Facilities Work Plan

Support Data

Revised March 2008

Miami Dade County

Water Supply Facilities Work Plan

Support Data

Revised March 2008

CDM Project No.6430-57901-061

MIAMI-DADE WATER AND SEWER DEPARTMENT

WATER SUPPLY FACILITIES WORK PLAN

March 2008

The following individual was in responsible charge for the preparation of the following sections of the Water Supply Facilities Work Plan, using available data provided by the Miami-Dade Water and Sewer Department and other water suppliers within Miami-Dade County:

Sections 1 through 5

SIGNATURE

For:
Camp Dresser & McKee Inc.
800 Brickell Avenue, Suite 500
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(Seal)

Kenneth L. Caban, P.E., BCEE
PE Number 59276

Date: 3/26/08

CDM

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Section 1 Introduction

Miami-Dade County (County) is continuing to experience growth, as it has over the last several decades. The Miami-Dade Water and Sewer Department (MDWASD) provides drinking water to approximately two million customers in the County. Because of rapid population growth, complex environmental issues and developing regulatory and statutory requirements, MDWASD is developing a comprehensive 20-year plan for water supply development.

1.1 Background

In response to the finding that traditional water supply sources will not be sufficient to meet demands of the growing population, of industries and of the environment, the Florida Legislature enacted bills in 2002, 2004 and 2005. These bills, Senate Bills 360 and 444, significantly changed Chapters 163 Intergovernmental Programs and 373 Water Resources, Florida Statute (F.S.), to improve the coordination of water supply and land use planning by strengthening the statutory requirements linking regional water supply plans prepared by the water management districts and the comprehensive plans prepared by local governments.

The current statutory provisions direct local governments to do the following with regard to water supply:

1. Coordinate appropriate aspects of its comprehensive plan with the appropriate water management district's regional water supply plan. [s. 163.3177(4)(a), F.S.]

2. Ensure that its future land use plan is based upon the availability of adequate water supplies and public facilities and services. [s. 163.3177(6)(a), F.S., effective July 1, 2005.] Data and analysis demonstrating that adequate water supplies and associated public facilities will be available to meet projected growth demands must accompany all proposed Future Land Use Map amendments submitted to the Department of Community Affairs (DCA) for review. The submitted package must also include an amendment to the Capital Improvements Element, if necessary, to demonstrate that adequate public facilities will be available to serve the proposed Future Land Use Map modification.

3. Ensure that adequate water supplies and facilities are available to serve new development no later than the date on which the local government anticipates issuing a certificate of occupancy and consult with the applicable water supplier prior to approving a building permit, to determine whether adequate water supplies will be available to serve the development by the anticipated issuance date of the certificate of occupancy. [s. 163.3180(2)(a), F.S., effective July 1, 2005.] Local governments should update their comprehensive plans and land development regulations as soon as possible to address this water supply concurrency requirement.

4. Revise the General Sanitary Sewer, Solid Waste, Drainage, Potable Water, and Natural Groundwater Aquifer Recharge Element (hereafter the "Infrastructure Element"), within 18 months after the water management district approves an updated regional water supply plan, to:

   a. Identify and incorporate the alternative water supply project(s) selected by the local government from projects identified in the updated regional water supply plan, or the alternative project proposed by the local government under s. 373.0361(7), F.S. [s. 163.3177(6)(c), F.S.];
   b. Identify the traditional and alternative water supply projects and the conservation and reuse programs necessary to meet current and future water use demands within the local government's jurisdiction [s. 163.3177(6)(c), F.S.]; and
   c. Include a water supply facilities work plan for at least a 10-year planning period for construction of public, private, and regional water supply facilities, which are identified in the element as necessary to serve existing and new development. [s. 163.3177(6)(c), F.S.] Amendments to incorporate the water supply facilities work plan into the comprehensive plan are exempt from the twice-a-year amendment limitation. [s. 163.3177(6)(c), F.S.]

5. To the extent necessary to maintain internal consistency after making changes described in Paragraphs 1 through 4 above, revise the Conservation Element to assess projected water needs and sources for at least a 10-year planning period, considering the appropriate regional water supply plan(s) or, in the absence of an approved regional water supply plan, the applicable District Water Management Plan. [s.163.3177(6)(d), F.S.] If the established planning period of a comprehensive plan is greater than ten years, the plan must address the water supply sources necessary to meet and achieve the existing and projected water use demand *for the established planning period*, considering the appropriate regional water supply plan. [s. 163.3167(13), F.S.]

6. To the extent necessary to maintain internal consistency after making changes described in Paragraphs 1 through 4 above, revise the Intergovernmental Coordination Element to ensure coordination of the comprehensive plan with applicable regional water supply plans and regional water supply authorities' plans. [s. 163.3177(6)(h)1., F.S.]

7. Address in its Evaluation and Appraisal Report (EAR) the extent to which the local government has implemented the 10-year water supply facilities work plan, including the development of alternative water supplies, and determine whether the identified alternative water supply projects, traditional water supply projects, and conservation and reuse programs are meeting local water use demands. [s.163.3191(2)(l), F.S.]

This Water Supply Facilities Work Plan is meant to satisfy portions of the above statutory requirements (other portions will be satisfied elsewhere by MDWASD) and, as stated in Item 1 above, to coordinate with the Lower East Coast (LEC) regional water supply plan. The LEC Plan was adopted on February 15, 2007 by the South Florida Water Management District (SFWMD).

1.2 Purpose and Objectives

The purpose of this Water Supply Facilities Work Plan is to present MDWASD's water supply systems and to provide a plan for implementing water supply facilities, including the development of traditional and Alternative Water Supplies necessary to serve existing and new development. These water supplies were developed by first incorporating demand reductions due to conservation. In addition, this plan incorporates information on wholesale customers and other water suppliers that provide water to portions of Miami-Dade County: the City of North Miami, the City of North Miami Beach, and the City of Homestead.

The MDWASD and the SFWMD have scheduled meetings with local governments to assist them in their efforts to prepare a Water Supply Facilities Work Plan (Work Plan). The overall objective of the meetings is to develop an outline for local governments to use in the preparation of their work plans that identify and plan for water supplies facilities needed to serve existing and new development within the local government's jurisdiction. This outline will be developed to specifically address these local governments served by MDWASD since they provide water to most of the municipalities within the County. MDWASD will coordinate and provide information to the local governments in Miami-Dade County to assist them in the preparation of their Work Plans.

The information contained within this Work Plan will be included in an amendment to various elements of the County's Comprehensive Plan. This Work Plan is to be coordinated and updated every five years within 18 months after February 15, 2007, the date LEC regional water supply plan was adopted.

This Water Supply Facilities Work Plan includes the following primary sections:

- Section 2 - Water Service Area
- Section 3 - Existing Water Supply Facilities
- Section 4 - Population and Water Demand Projections
- Section 5 - Water Supply Facilities Work Plan

Section 2
Water Service Area
2.1 MDWASD Service Area

The MDWASD water service area contains interconnected systems and thus, for the most part, functions as a single service area. However, for the convenience of discussing existing facilities, the service area may be broken down into three subareas by water treatment facilities: the Hialeah-Preston area serving the northern part of Miami-Dade County, the Alexander Orr, Jr. area serving the central and portions of the southern part of Miami-Dade County and the South Dade area (formerly known as the Rex Utility District) serving the southern part of Miami-Dade County, shown on **Figure 2-1**.

Within the MDWASD service area, there are 14 wholesale customers. Of the 14 wholesale customers, 12 have executed 20-year water use agreements. Agreements with the City of Hialeah and the City of Miami Beach are being developed and must be submitted to the SFWMD within six months of the issuance of the 20-year water use issued on November 15, 2007. The City of North Miami Beach will stop purchasing water from MDWASD in 2008. The City of North Miami Beach will remain a wholesale customer until then.

In addition to MDWASD, there are four other water suppliers within Miami-Dade County that provide water to parts of unincorporated Miami-Dade County and within their respective municipal boundaries. Two municipalities in the South Dade area are Florida City and the City of Homestead. MDWASD does not have an agreement with Florida City. Water is sold to and purchased from the City of Homestead. MDWASD purchases water from the City of Homestead to provide water to serve the Redavo area and pays retail rates. MDWASD has an agreement with the City of Homestead, however, this agreement is not a large user agreement. The agreement also provides for an emergency interconnection at SW 137 Avenue and 288 Street that can be used by either party. In the North Dade area, the City of North Miami and the City of North Miami Beach provide water to portions of unincorporated or incorporated parts of Miami-Dade County.

2.2 Hialeah-Preston Subarea

The Hialeah-Preston (H-P) subarea is comprised of dedicated low-pressure pipelines, remote storage tanks, pumping facilities and high pressure systems. This system delivers water to Hialeah, Miami Springs, the City of Miami and other portions of northeastern Miami-Dade County, shown on **Figure 2-2,** generally north of Flagler street.

2.3 Alexander Orr, Jr. Subarea

The Alexander Orr, Jr. (AO) subarea is comprised of a high pressure system comprised of two major piping loops. This system delivers water to nearly all of Miami-Dade County south of approximately Flagler Street and north of SW 248th

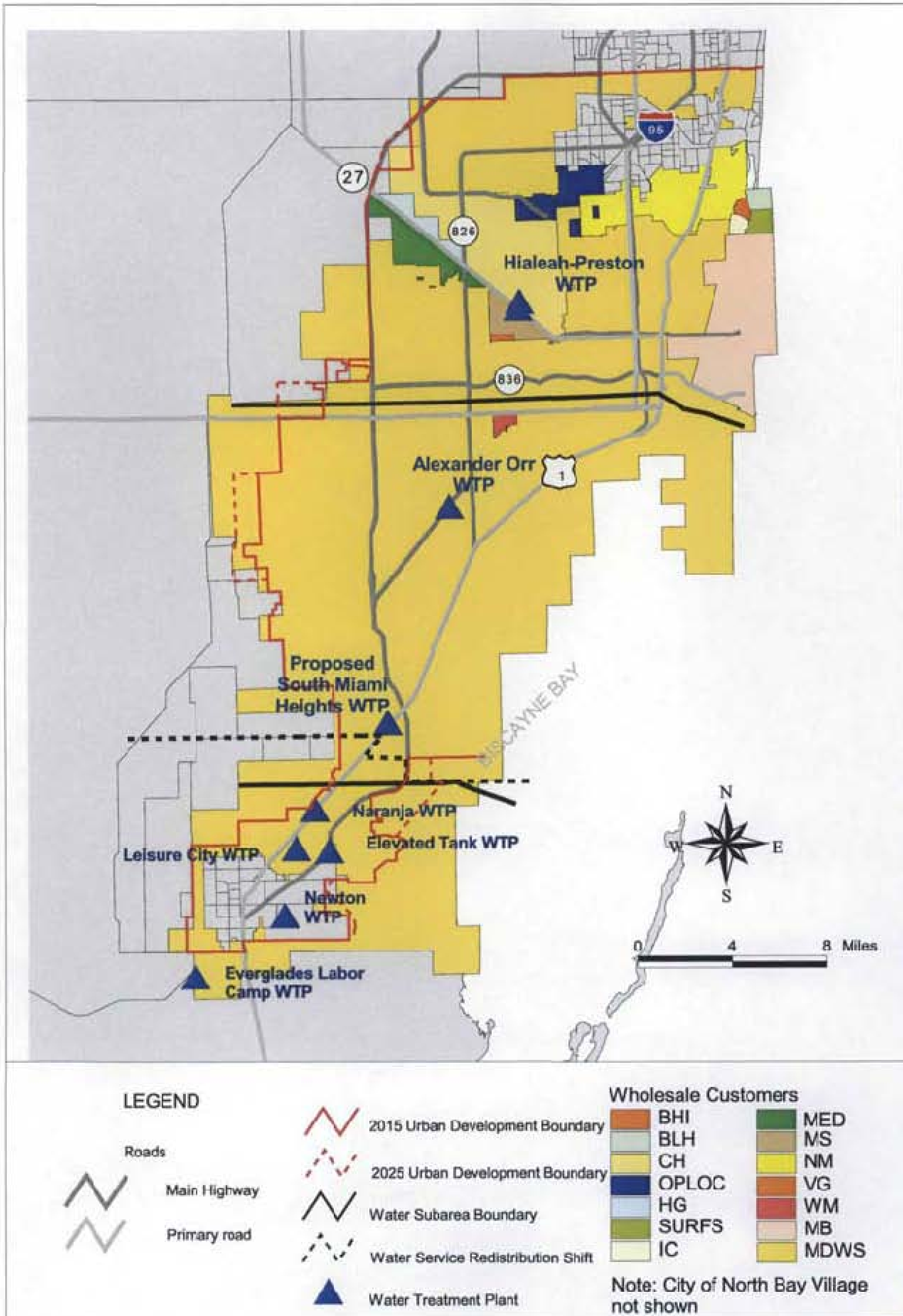

Figure 2-1: MDWASD Service Area and Wholesale Customers 3/25/2008

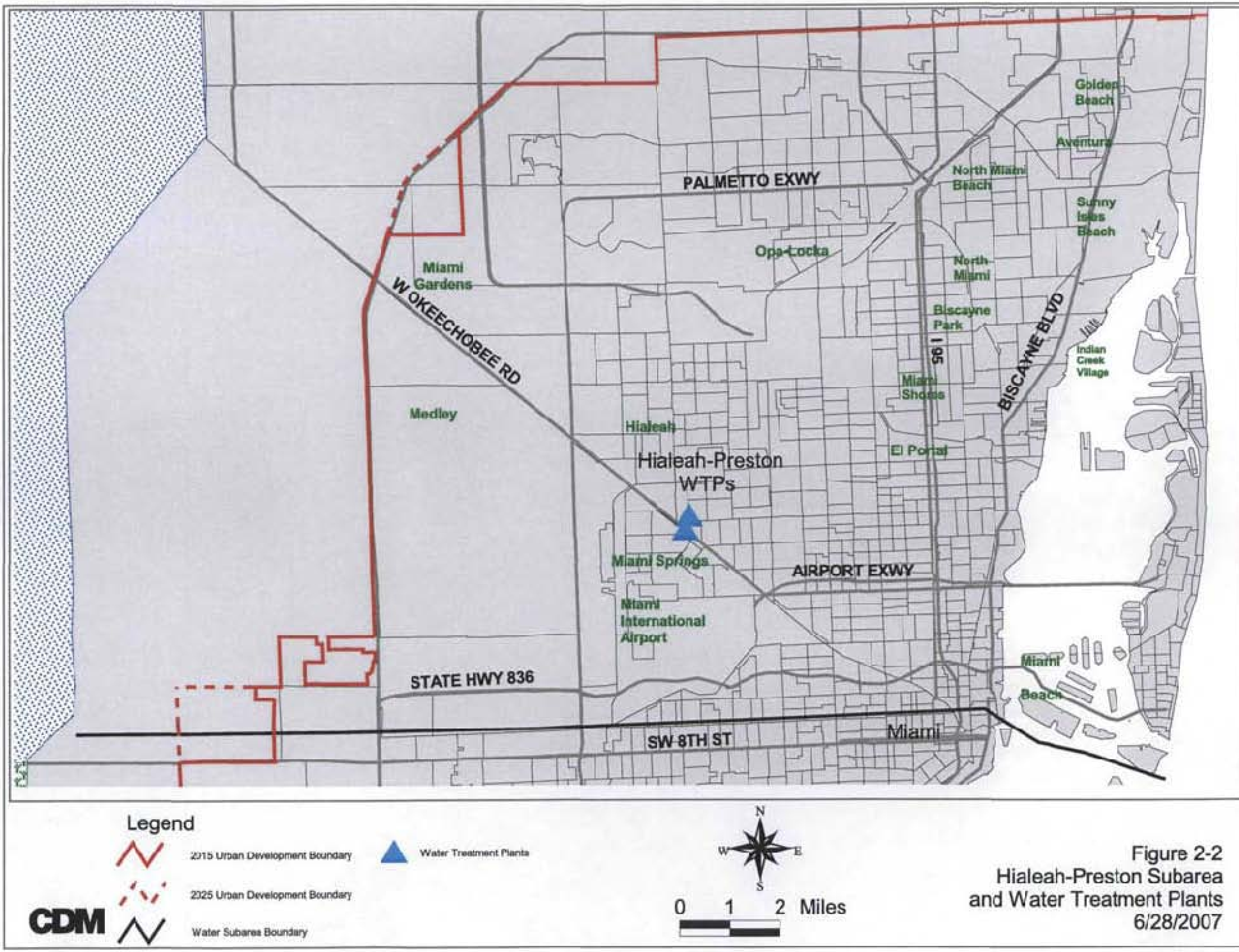

Figure 2-2
Hialeah-Preston Subarea
and Water Treatment Plants
6/28/2007

Street, including Virginia Key, Fisher Island, the Village of Key Biscayne and, upon request, to the City of Homestead, and Florida City, shown on **Figure 2-3.**

2.4 South Dade Subarea

The South Dade subarea consists of small distribution systems and storage tanks that evolved around each individual water treatment plant (WTP) within each WTP's distinct service areas. These systems deliver water to nearly all of Miami-Dade County south of S.W. 248^{th} street and east of S.W. 197^{th} avenue. Homestead and Florida City are within this area. Florida City provides water service within its incorporated boundaries and to a small portion of unincorporated Miami-Dade County. In addition, Florida City purchases water from the City of Homestead to service a small portion of Florida City's service area on the southeast corner of U.S. 1 and S.W. 328^{th} Street. The City of Homestead provides water within its municipal boundary and for a portion of unincoriporated Miami-Dade County including the Redavo development. This development consists of 107 homes and an approximate population o f 310. **Figure 2-4** shows the current South Dade subarea.

MDWASD has plans for the construction and operation of the South Miami Heights (SMH) WTP in the South Dade subarea. The SMHWTP is scheduled to come on line as early as July 2011. Of the five existing plants in the South Dade subarea, only Everglades and Newton WTPs will remain in service after the SMHWTP begins operations. Everglades and Newton WTPs will continue serving MDWASD customers once the SMHWTP begins operations. The existing distribution and storage systems will be incorporated into the future plans. A general shift will occur in the northern boundary of the South Dade subarea once the proposed South Miami Heights Water Treatment Plant comes into service in 2012. The northern boundary will be shifted northward such that portions of the population currently within the Alexander-Orr subarea will be within the South Dade subarea. Figure 2-1 and 2-4 illustrate the boundary shift. The boundary shift will cause a general redistribution of service between the Alexander-Orr and South Miami-Dade areas, but will not have other effects on the population expected to be served by MDWASD.

2.5 Wholesale Customers

The 14 wholesale water customers within the MDWASD service area have large user agreements. These agreements, with the exception of the City of North Miami and the City of North Miami Beach, are for 20-year periods. **Table 2-1** identifies the 14 wholesale customers and the status of their large user contracts.

As outlined in the Miami-Dade County Code of Ordinances, Chapter 2, Article XXXVII, Section 2-347, if a private or municipal water or sewer utility proposes to expand its assigned service area, the Director or designee shall determine whether or not the Department whether or not the Department shall release the portion of the service area requested.

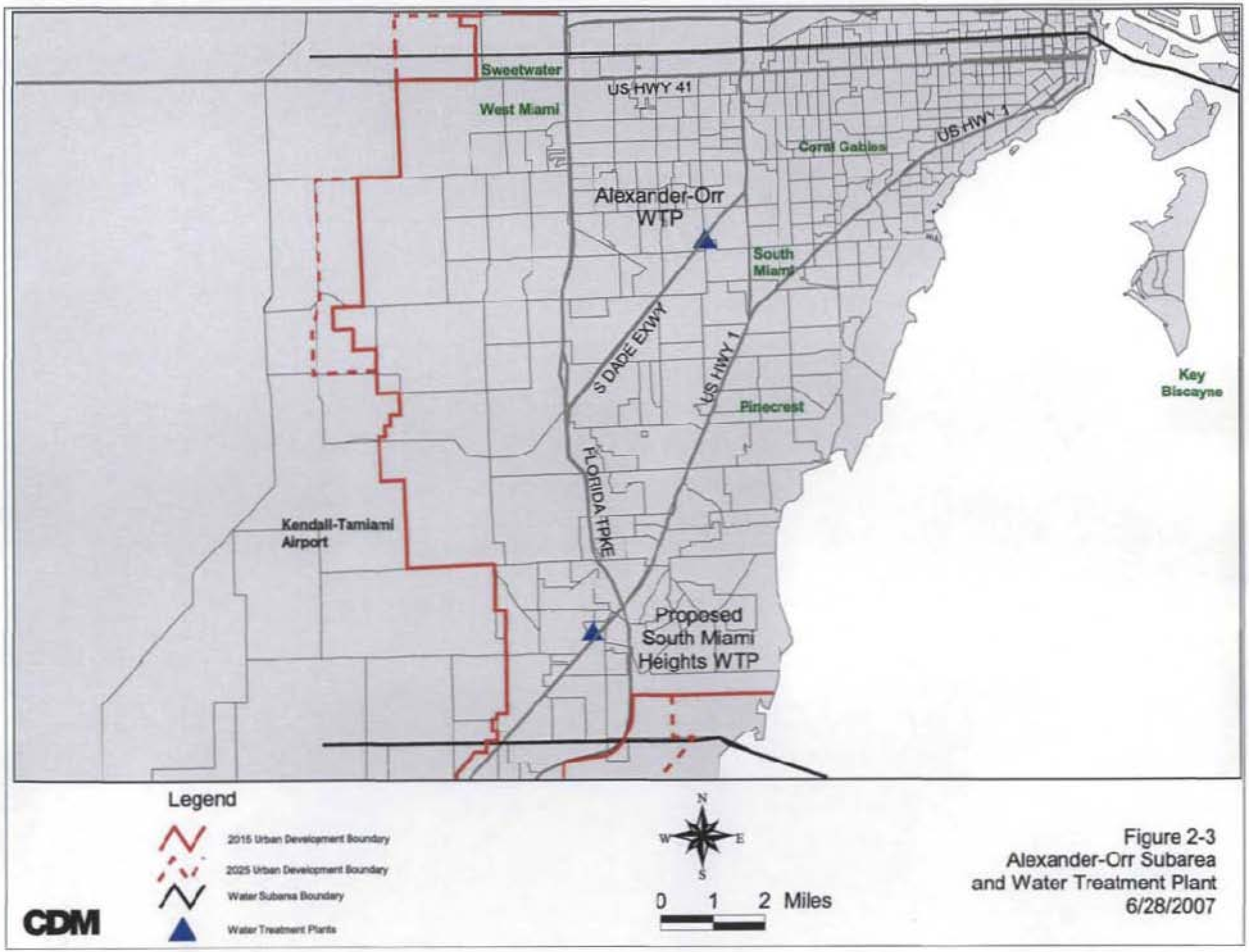

Figure 2-3
Alexander-Orr Subarea
and Water Treatment Plant
6/28/2007

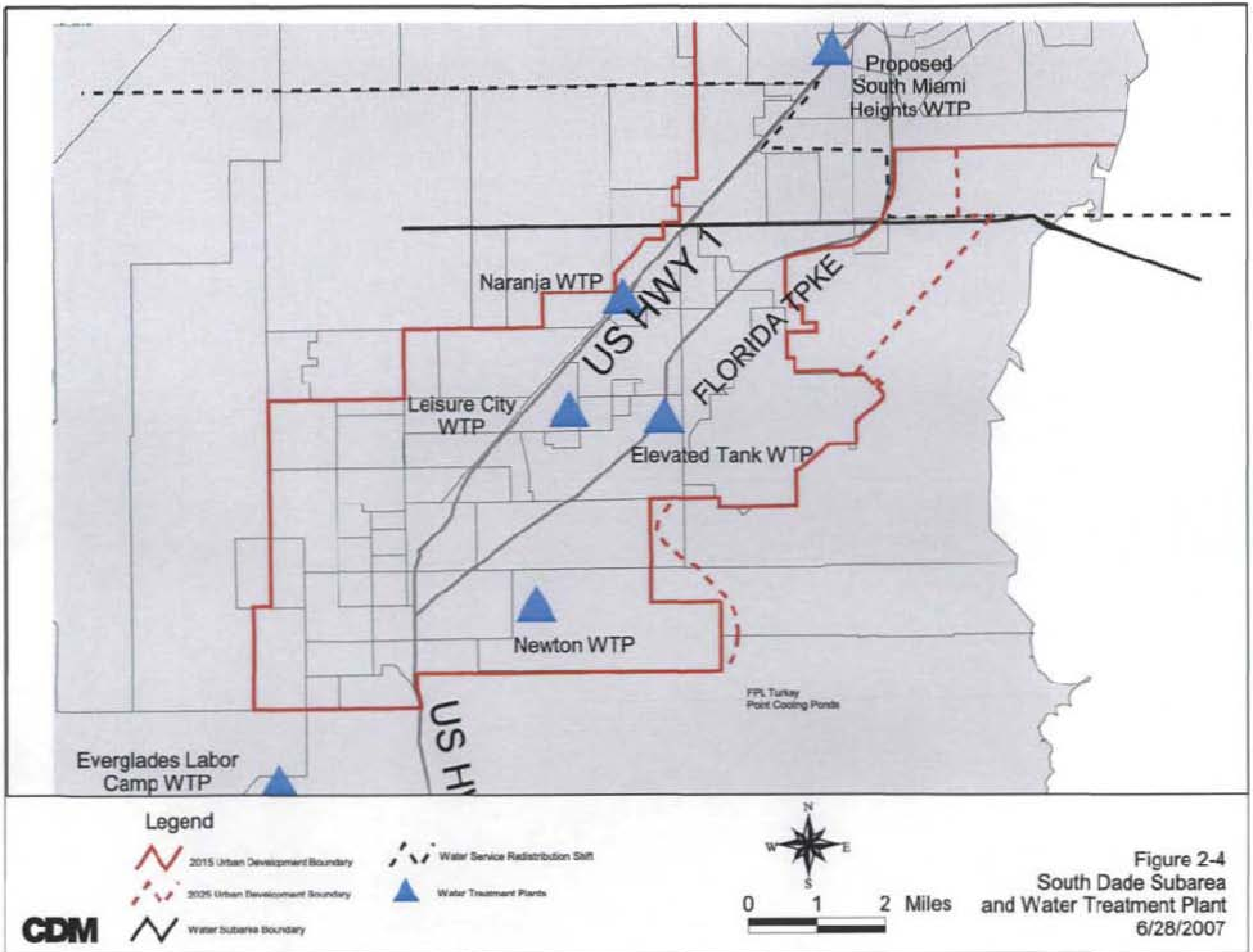

Figure 2-4
South Dade Subarea
and Water Treatment Plant
6/28/2007

Table 2-1 Wholesale Water Agreements for 20 Year Period

Municipality	Status
Bal Harbour Village (BLH)	Signed, executed agreement
Town of Bay Harbour Islands (BHI)	Signed, executed agreement
City of Hialeah (CH)	20 Year agreement may not be necessary if interlocal agreement for RO Plant is approved, agreement must be submitted to the SFWMD within six months of November 15, 2007
City of Hialeah Gardens (HG)	Signed, executed agreement
Indian Creek Village (IC)	Signed, executed agreement
Town of Medley (MED)	Signed, executed agreement
City of Miami Beach (MB)	Agreement must be submitted to the SFWMD within six months of November 15, 2007
City of Miami Springs (MS)	Signed, executed agreement
City of North Bay Village (NB)	Signed, executed agreement
City of North Miami (NM)	Signed, executed agreement
City of Opa-Locka (OPLOC)	Signed, executed agreement
Town of Surfside (SURFS)	Signed, executed agreement
Village of Virginia Gardens (VG)	Signed, executed agreement
City of West Miami (WM)	Signed, executed agreement

Source: MDWASD Water Use Permit No. Re-issue 13-00017-W, November 15, 2007

2.6 Other Water Suppliers (Non-MDWASD)

Other water suppliers located in Miami-Dade County have facilities and provide water to portions of Miami-Dade County. These facilities are located in the extreme northern and extreme southern parts of the County as shown in **Figure 2-5**. Other water suppliers within the County are:

- City of North Miami
- City of North Miami Beach
- Florida City
- City of Homestead

The Florida Keys Aqueduct Authority (FKAA) has facilities in the southern part of the County to serve Monroe County. These facilities include supply wells, a treatment facility and a transmission main to serve Monroe County.

2.6.1 City of North Miami

In the northern part of the County, the City of North Miami provides water service to parts of northern Miami-Dade County within its municipal boundaries, as well as outside of its municipal boundaries extending into the northwestern parts of unincorporated Miami-Dade County.

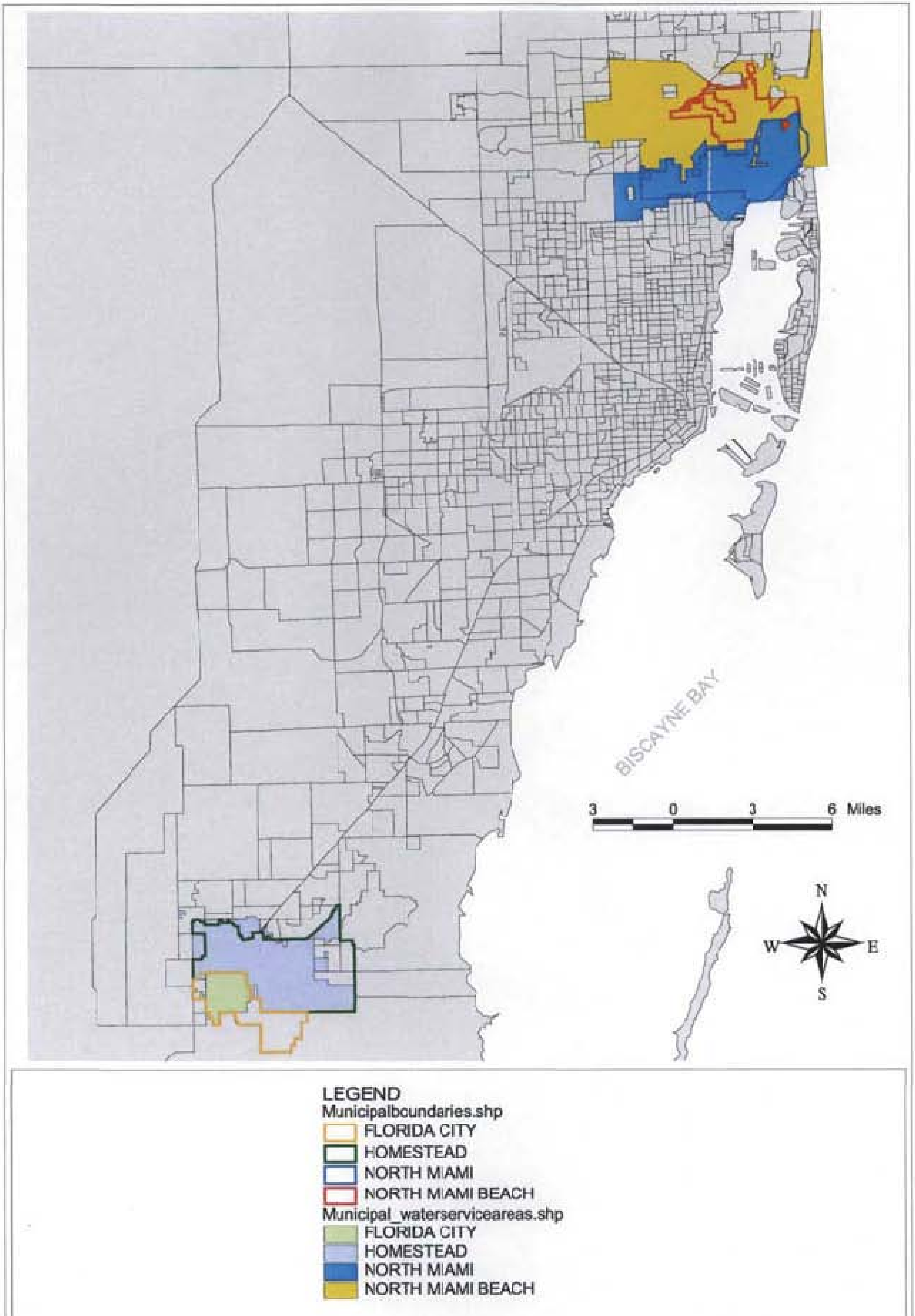

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Figure 2-5: Other Water Suppliers in Miami-Dade Co.
3/25/2008

The City's service area consists of a high pressure distribution system comprised of three main distribution lines, which are interconnected. The service area is generally bounded by NE 163rd Street to the north, Biscayne Bay to the east, NW 105th Street to the south, and NW 27th Avenue to the west. It serves a population of over 70,000 people in a 13 square-mile area, servicing the City of North Miami, the Village of Biscayne Park, and parts of unincorporated Miami Dade County.

2.6.2 City of North Miami Beach

In the northern part of the County, the City of North Miami Beach provides water service to parts of northern Miami-Dade County within its municipal boundaries, as well as outside of its municipal boundaries extending into the northeastern and northwestern parts of unincorporated Miami-Dade County. The City of North Miami Beach provides service entirely or to portions of the City of Aventura, Town of Golden Beach, City of Miami Garden, and City of Sunny Isles Beach. The City of North Miami Beach has emergency interconnections with Bal Harbor Village, City of Hallandale Beach, and City of North Miami.

The City's distribution system consists of a high pressure system, distributing potable water service to more than 187,000 people in northeast Miami-Dade County, specifically servicing the City of North Miami Beach, City of Miami Gardens, City of Aventura, City of Golden Beach, and City of Sunny Isles Beach and some areas of unincorporated Miami-Dade County. The service area is generally bounded by the Snake Creek Canal and Ives Dairy Road to the north, NW 37th Avenue to the west, NE and NW 135th Street to the south, and Collins Avenue to the east. Only about 25 percent of the City system's service area is within City limits.

2.6.3 City of Homestead

The City of Homestead provides water within most of its municipal boundaries and to a small part of southern Miami-Dade County including a portion of Florida City and parts of unincorporated Miami-Dade County. The City of Homestead sells water to MDWASD to serve a portion of unincorporated Miami-Dade County in a development consisting of 107 homes. This development, named Redavo, has an estimated population of 310. Currently, the City of Homestead and Miami-Dade County have an agreement. However, this agreement is not a wholesale agreement. In addition, MDWASD provides some water service within portions of the municipal boundary of the City of Homestead. In addition, the City of Homestead sells water to Florida City to service a small portion of Florida City's service area on the southeast corner of U.S. 1 and S.W. 328th Street.

The City of Homestead's service area comprises a high pressure water distribution system that services approximately 10,240 acres in southern Miami-Dade County, with an estimated present population of 71,252. The service area is generally bounded by SW 296th Street to the North, SW 137th Avenue to the east, SW 344th Street to the south, and SW 192nd Avenue to the west.

2.6.4 Florida City

In the southern part of the County, Florida City provides water service to parts of southern Miami-Dade County within its municipal boundaries and to a small portion of unincorporated Miami-Dade County. The City's service area is comprised by a high pressure distribution system that services approximately 1,520 acres in southern Miami-Dade County. The service area has a current population of over 15,000, and is generally bounded by SW 328th Street to the north, SW 172nd Avenue to the east, SW 352nd Street to the south, and SW 187th Avenue to the west. In addition, Florida City purchases water from the City of Homestead to service a small portion of Florida City's service area on the southeast corner of U.S. 1 and S.W. 328th Street.

2.6.5 Florida Keys Aqueduct Authority

The Florida Keys Aqueduct Authority (FKAA) has facilities in the southern part of the County to serve Monroe County. The FKAA does not provide service within Miami-Dade County, despite some of their water supply, treatment, and transmission facilities being located within Miami-Dade County. These facilities include supply wells, a treatment facility and a transmission main to serve Monroe County.

2.6.6 Large and Small Public Water Supply Systems

Additional public water supply systems within Miami-Dade County exist. Miami-Dade County has conducted a preliminary survey of these public water systems. A list of these public water supply systems provided by the State of Florida Department of Health is contained in Appendix G.

Section 3
Existing Water Supply Facilities
3.1 Water Supply Wellfields (Sources of Water)

The MDWASD water system is currently served by the previously mentioned three large treatment plants and the smaller treatment plants in the southern portion of Miami-Dade County. The existing water supplies serving these treatment plants originate from two major aquifer systems in Miami-Dade County: the Surficial and the Floridan Aquifer Systems. The Surficial Aquifer System, also known as the Biscayne Aquifer, is the major source of drinking water and occurs at or near the land surface in most of the County, and is the principal water-bearing unit of the Surficial Aquifer System in the region (Causaras, 1987). Groundwater from the Floridan Aquifer is used for blending at the Alexander Orr, Jr. Water Treatment Plant (WTP). Blending of groundwater from the Floridan Aquifer is proposed at the Hialeah-Preston WTPs in 2010.

The 20-Year water use permit for Miami-Dade County was approved by the SFWMD Governing Board on November 15, 2007. The water use permit limits the annual allocation to 152,741 million gallons and the maximum monthly allocation to 13,364 million gallons. These allocations are further limited by the wellfield operational plan described in Limiting Condition 27 of the water use permit. A copy of the approved water use permit and limiting conditions is located in Appendix H.

3.1.1 Wellfields and Capacities

The existing MDWASD water supply system is comprised of eight major Biscayne Aquifer wellfields in the Hialeah-Preston and Alexander Orr, Jr. subareas, twelve Biscayne Aquifer water supply wells located at five individual water systems (formerly Rex Utility District water system) in South Dade County and the Floridan Aquifer blending wells at the Alexander Orr, Jr. Subarea, as shown in **Table 3-1, Table 3-2** and **Figure 3-1**. Each of the wellfield is described below.

3.1.2 Hialeah-Preston Subarea Wellfields

The Hialeah-Preston WTPs are supplied by four water supply wellfields, shown on Figure 3-1. The total designed installed capacity from the four wellfields in the Hialeah-Preston subarea is approximately 295 million gallons per day (MGD). Appendix A provides detailed information about well construction and capacities of the Hialeah-Preston area wellfields.

In addition to these wellfileds, four abandoned wells at a medley wellfield have been rehabilitated and would be available on a stand-by basis in the event of an emergency.

Table 3-1 Biscayne Aquifer Wellfield Data

Wellfield	**Wellfield Data**	
	Installed Design Capacity (mgd)	**Number of Wells**
Hialeah-Preston		
Hialeah	12.54	3
John E. Preston	53.28	7
Miami Springs	79.30	20
Northwest[(a)]	149.35	15
Subtotal	**294.47**	**45**
Medley Wellfield [(b)]	43.20	4
Alexander Orr		
Alexander Orr	74.40	10
Snapper Creek	40.00	4
Southwest	161.20	17
West	32.40	3
Subtotal	**308.00**	**34**
Existing South Dade		
Elevated Tank	4.32	2
Everglades Labor Camp	4.18	3
Leisure City	6.12	4
Naranja	1.15	1
Newton	4.32	2
Subtotal	**20.09**	**12**
Proposed South Miami Heights		
Caribbean Park	*3.00*	*2*
Former Plant	*3.00*	*1*
Roberta Hunter Park	*14.00*	*8*
Rock Pit Park (Future)	*3.00*	*2*
Subtotal	***23.00***	***13***
MDWASD System Total (Biscayne Aquifer)	**645.56**	**104**

(a) Northwest wellfield capacity at 150 mgd when pumps operate at low speed.
(b) Wells in this wellfield had been abandoned. They were recently restored with the purpose of using them only during an emergency
Source: MDWASDWater Use Permit No. Re-issue 13-00017-W, November 15, 2007

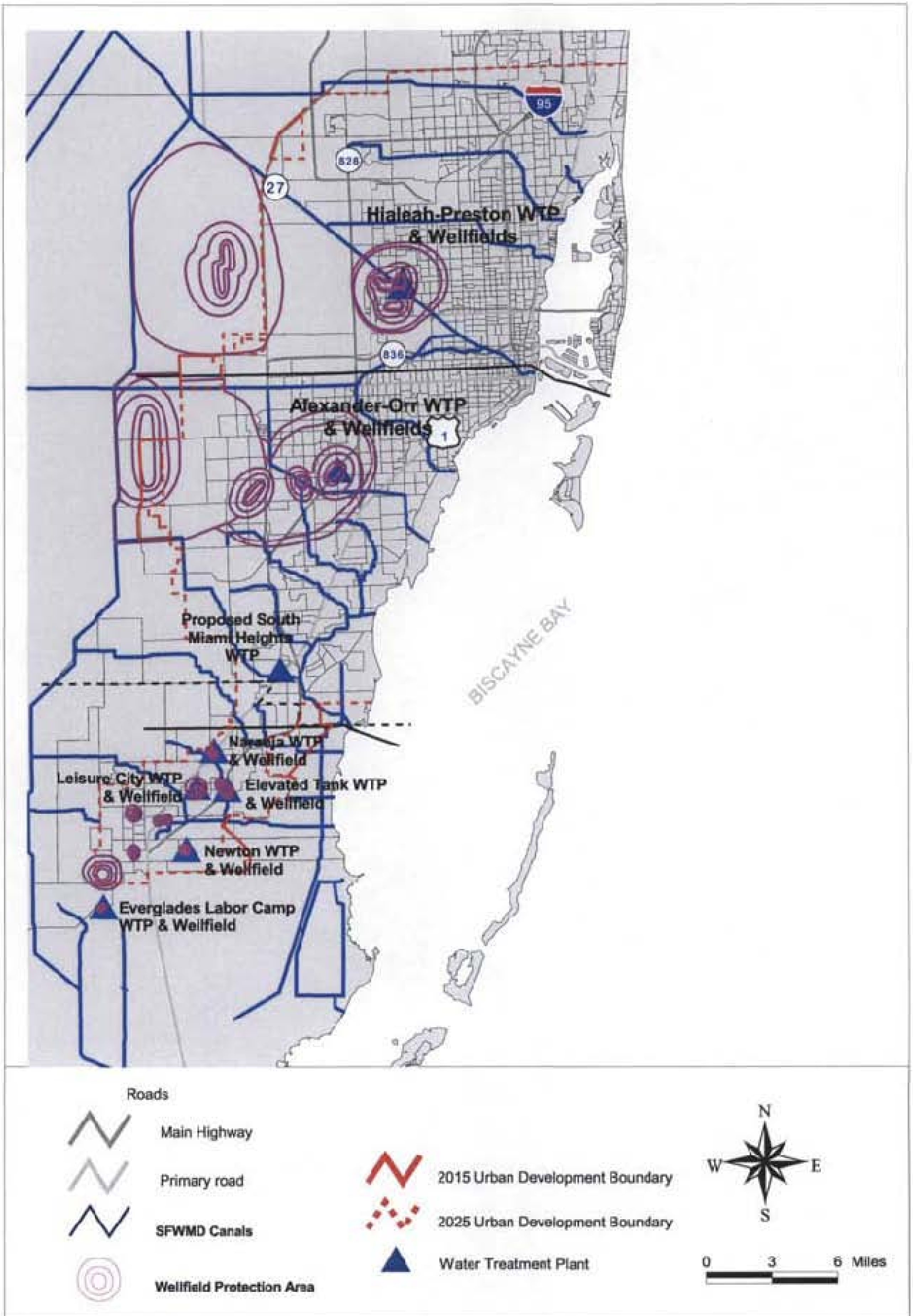

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Figure 3-1: MDWASD Wellfields, Wellfield Protection Areas, Raw Water Lines, and WTPs
3/7/2008

Table 3-2 Floridan Aquifer Wellfield Data

Wellfield	Wellfield Data	
	Design Capacity (mgd)	**Number of Wells**
Hialeah-Preston[a]	12.50	5
Alexander Orr		
Southwest	7.00	2
West	10.50	3
Subtotal	17.50	5
Hialeah RO WTP[a][b]	24.00	7
MDWASD System Total (Floridan Aquifer)	**54.00**	**17**

(a) Proposed wells
(b) Hialeah RO WTP (Phase 1, 10 mgd by 2012; Phase 2, 5 mgd by 2018; Phase 3 2.5 mgd by 2028)
Source: MDWASD Water Use Permit No. Re-issue 13-00017-W, November 15, 2007

3.1.2.1 Hialeah Wellfield

The three active wells located in the Hialeah Wellfield were constructed in 1936. Each well is 14 inches in diameter, 115 feet deep and have casing depths of 80 feet. The total wellfield capacity is 12.5 mgd or 8,700 gpm (2,900 gpm for each well).

3.1.2.2 John E. Preston Wellfield

The seven active wells located in the John E. Preston Wellfield were constructed in 1966 and 1972. Each well is 42 inches in diameter, 107 feet deep and have casing depths of 66. The capacity of wells No. 1 through No. 6 is 5,000 gallons per minute (gpm) each and the capacity of well No. 7 is 7,000 gpm. The total wellfield capacity is 53.28 mgd.

3.1.2.3 Miami-Springs Wellfield

The twenty active wells located in the Miami Springs Wellfield were constructed between 1924 and 1954. These wells are 14 inches and 30 inches in diameter, 80 to 90 feet deep and have casing depths of 80 feet. The total wellfield capacity is 79.30 mgd or 55,070 gpm (ranging between or 2,500 and 5,000 gpm for each well).

3.1.2.4 Northwest Wellfield

The Northwest Wellfield has fifteen active wells that were constructed in 1980. The wells are 40 inches and 48 inches diameter and 80 to 100 feet deep, with casing depths ranging from 46 to 57 feet. These wells have two-speed motors. The total nominal capacity of the wells at the low speed flow rate is 149.35 mgd. The capacity of each well, except well No. 10, is 10 mgd at the low speed flow rate. Well 10 have a low speed capacity of 9.35 mgd. The total nominal capacity for the wells at the high speed flow is 220.94 mgd.

3.1.2.5 Medley Wellfield

The Medley wellfield had previously been abandoned. However, four wells were recently rehabilitated for emergency use only. The wells are 42 inches and 48 inches in diameter and 100 to 115 feet deep, with casing depths ranging from 42 to 48 feet. The total wellfield capacity is 43.20 mgd or 30,000 gpm (7,500 gpm for each well).

3.1.2.6 Floridan Aquifer Blending

Five Upper Floridan Aquifer wells are proposed in the Hialeah-Preston Wellfields. These proposed Upper Floridan Aquifer wells are for the blending of brackish and fresh water at the Hialeah-Preston WTPs. These wells are to be constructed in 2008. The design capacity of the Hialeah-Preston Upper Floridan Aquifer wells is 12.50 mgd and is proposed by 2010.

Pumpage from the Floridan aquifer wells and Biscayne aquifer wells recharged by reclaimed water will be operated on a priority basis, referred to as a "first on, last off" priority. Changes to wellfield operations must be approved via modification of the approved Wellfield Operation Plan by District staff prior to implementation.

3.1.3 Alexander Orr, Jr. Subarea Wellfields

The Alexander Orr, Jr. WTP is supplied by four water supply wellfields as shown on Figure 3-1. The total designed installed capacity from the four wellfields in the Alexander Orr, Jr. service area is approximately 308 mgd. There are Floridan aquifer wells at two of the wellfields. Appendix A provides detailed information about well construction and capacities, of the Alexander Orr, Jr. area wellfields.

3.1.3.1 Alexander Orr, Jr. Wellfield

The ten active wells located in the Alexander Orr, Jr. Wellfield were constructed between 1949 and 1964. These wells are 16 inches and 42 inches in diameter, 100 feet deep and have casing depths ranging from 40 to 50 feet. The capacity of the wellfield is 74.4 mgd (ranging between 4,170 and 7,500 gpm for each well). Because this wellfield is closest to saline water, there exist the potential for saltwater intrusion, as has occurred in the past. Improvements to a control structure on the C-2 Canal has assisted in reducing saltwater intrusion in recent years.

3.1.3.2 Snapper Creek Wellfield

The four active wells located in the Snapper Creek Wellfield were constructed in 1976. These wells are 24 inches in diameter, 108 feet deep and have casing depths of 50 feet. The total wellfield capacity is 40.0 mgd or 27,760 gpm (6,940 gpm for each well).

3.1.3.3 Southwest Wellfield

The seventeen active wells located in the Southwest Wellfield were constructed between 1953 and 1997. These wells are 20 inches to 48 inches in diameter, 88 to 104 feet deep and have casing depths ranging from 33 to 54 feet. The total wellfield capacity is 161.16 mgd (ranging between or 4,900 and 7,500 gpm for each well).

3.1.3.4 West Wellfield

The West Wellfield has three wells that were constructed in 1994. The wells are 24 inches in diameter and 70 feet deep, with casing depths of 40 feet. The total wellfield capacity is 32.4 mgd or 7,500 gpm per well. This wellfield is limited by the SFWMD to 15 mgd on either an average or maximum daily basis. Well No. 29 pumpage is limited to 5 mgd; Well No. 30 is limited to 10 mgd; and Well No. 31 is to be used as a standby well only to be used with prior written approval from the SFWMD.

3.1.3.5 Floridan Aquifer Blending (and ASR)

Three Upper Floridan Aquifer wells are located in the West Wellfield and two are located in the Southwest Wellfield. Currently, there are Upper Floridan Aquifer wells in service and the blending of brackish and fresh water is occurring in the raw water line feeding the Alexander Orr, Jr. WTP. These wells were constructed in 1996 and 1997 and are 30 inches in diameter. The total depth of these wells is between 1,200 feet and 1,300 feet with casing depths between 835 feet and 850 feet. The total capacity of the West Wellfield wells is 15.12 mgd or 3,500 gpm per well. The total capacity of the Southwest Wellfield wells is 10.08 mgd or 3,500 gpm per well.

Blending is currently in operation. Therefore, there are no capital improvement requirements associated with the current blending activities.

MDWASD also anticipates using these wells for storage of fresh Biscayne Aquifer water in the Floridan Aquifer occasionally during the wet season (when operating water levels in canal permit) for extraction and use in the dry season. To do so, MDWASD designed an ultra-violet (UV) light disinfection system for each ASR site to treat the Biscayne aquifer water before injecting in the Floridan aquifer.

Prior to increasing withdrawals from the Biscayne Aquifer to store in the Floridan Aquifer, the MDWASD must request temporary authorization to do so. This storage of Biscayne Aquifer water must be consistent with the Department of Environmental Protection Underground Injection Control permits.

Pumpage from the Floridan aquifer wells and Biscayne aquifer wells recharged by reclaimed water will be operated on a priority basis, referred to as a "first on, last off" priority. Changes to wellfield operations must be approved via modification of the approved Wellfield Operation Plan by District staff prior to implementation.

3.1.4 South Dade Subarea Wellfields

The five South Dade WTPs are supplied by five individual water supply wellfields as shown on Figure 3-1. The total designed installed capacity from the five wellfields for the South Dade subarea is 19.80 mgd. Appendix A provides detailed information about well construction and capacities, of the existing South Dade area wellfields. The proposed South Miami Heights Wellfield will serve the South Dade area starting in 2012.

3.1.4.1 Elevated Tank Wellfield

The two active wells located in the Elevated Tank Wellfield were constructed in 1982 and 1996. These wells are 12 inches and 16 inches in diameter, 45 to 50 feet deep and have casing depths of 35 and 40 feet. The wellfield's capacity totals 4.32 mgd or 1,500 gpm for each well.

3.1.4.2 Everglades Wellfield

The three active wells located in the Everglades Wellfield were constructed from 2000 to 2001. These wells are 18 inches in diameter, between 50 and 55 feet deep and have casing depths of 40 and 45 feet. The wellfield's capacity totals 4.18 mgd, ranging between or 700 and 1,500 gpm for each well, excluding the three abandoned wells.

3.1.4.3 Leisure City Wellfield

The four active wells located in the Leisure City Wellfield were constructed between 1953 and 1971. These wells are 6 inches and 12 inches in diameter, approximately 30 to 40 feet deep and have casing depths ranging from 25 to 35 feet. The wellfield's capacity totals 6.12 mgd, ranging between or 450 and 1,500 gpm for each well.

3.1.4.4 Naranja Wellfield

The only active well located in the Naranja Wellfield was constructed in 1975. This well is 12 inches in diameter, 40 feet deep and has a casing depth of 35 feet. The wellfield's capacity totals 1.15 mgd or 800 gpm.

3.1.4.5 Newton Wellfield

The two active wells located in the Newton Wellfield were constructed in 2000 and 2001. These wells are 18 inches in diameter, approximately 65 feet deep and have casing depths ranging from 50 to 53 feet. The wellfield's capacity totals 4.32 mgd or 1,500 gpm for each well, excluding two abandoned wells.

3.1.4.6 Future South Miami Heights Wellfield

MDWASD has plans for the construction and operation of the South Miami Heights WTP and associated wellfields in the South Dade subarea. Of the five existing WTPs and wellfields in the South Dade subarea, only Everglades and Newton WTPs and wellfields will remain in service. The four anticipated wellfields and their capacities are: Caribbean Park Wellfield, 3.0 mgd; Former Plant Wellfield, 3.0 mgd; Roberta Hunter Park Wellfield, 14.0 mgd; and Rock Pit Park Wellfield, 3.0 mgd. The total annual average daily demand for the future South Miami Heights WTP will be approximately 18 mgd.

3.1.5 Other Water Supply Wellfields

3.1.5.1 City of North Miami

The City of North Miami Winson Water Treatment Plant (WTP) is currently supplied exclusively from the Biscayne Aquifer. There are presently eight 12-inch diameter wells, ranging in depths from 56 to 124 feet. They were drilled and put into service in 1962. Two wells are located at the WTP site, and another three pairs are located at three different public parks in the vicinity of the WTP. These wellfields provide water supply to a portion of unincorporated Miami-Dade County in addition to within the City of North Miami municipal boundary.

3.1.5.2 City of North Miami Beach

The City of North Miami Beach Norwood Water Treatment Plant is supplied by 16 Biscayne aquifer and 4 Floridan aquifer wells. These wellfields provide water supply to a portion of unincorporated and incorporated Miami-Dade County in addition to within the City of North Miami Beach municipal boundary.

3.1.5.3 City of Homestead

The City of Homestead is currently supplied by six Biscayne aquifer withdrawal wells, with a current capacity of 15.22 MGD. There are two 16-inch, two 18-inch, and two 20-inch diameter wells, all 60 feet in depth. The Wittkop Park wellfield, in the northwest part of the service area, has 4 wells, and the Harris wellfield, located just east of Federal Highway, US-1, has two wells. These wellfields provide water supply to a portion of unincorporated Miami-Dade County in addition to within the City of Homestead municipal boundary.

3.1.5.4 Florida City

The City of Florida City water treatment plant is supplied by four production wells located on a site adjacent to the treatment plant. There are two 12-inch and two 10-inch diameter wells. All four wells withdraw water from the Biscayne aquifer.

3.2 Water Treatment/Storage Facilities

The MDWASD water system is based on the three large treatment plants and the smaller treatment plants in the extremely southern portion of Miami-Dade County, as shown on **Figure 3-2**.

3.2.1 Hialeah-Preston Water Treatment Plants (WTPs)

The Hialeah and John E. Preston WTPs are located at 200 W. 2nd Avenue and 1100 W. 2nd Avenue, respectively. The adjacent facilities in Hialeah share interconnected source water and finished water storage capacity. These two plants serve the Hialeah-Preston subarea, generally, the service area that lies north of Flagler Street. The two plants have similar treatment processes, which are described separately below. The Hialeah-Preston WTPs are to receive groundwater from five Upper Floridan Aquifer wells located in the Miami Springs Wellfield and the Northwest Wellfield.

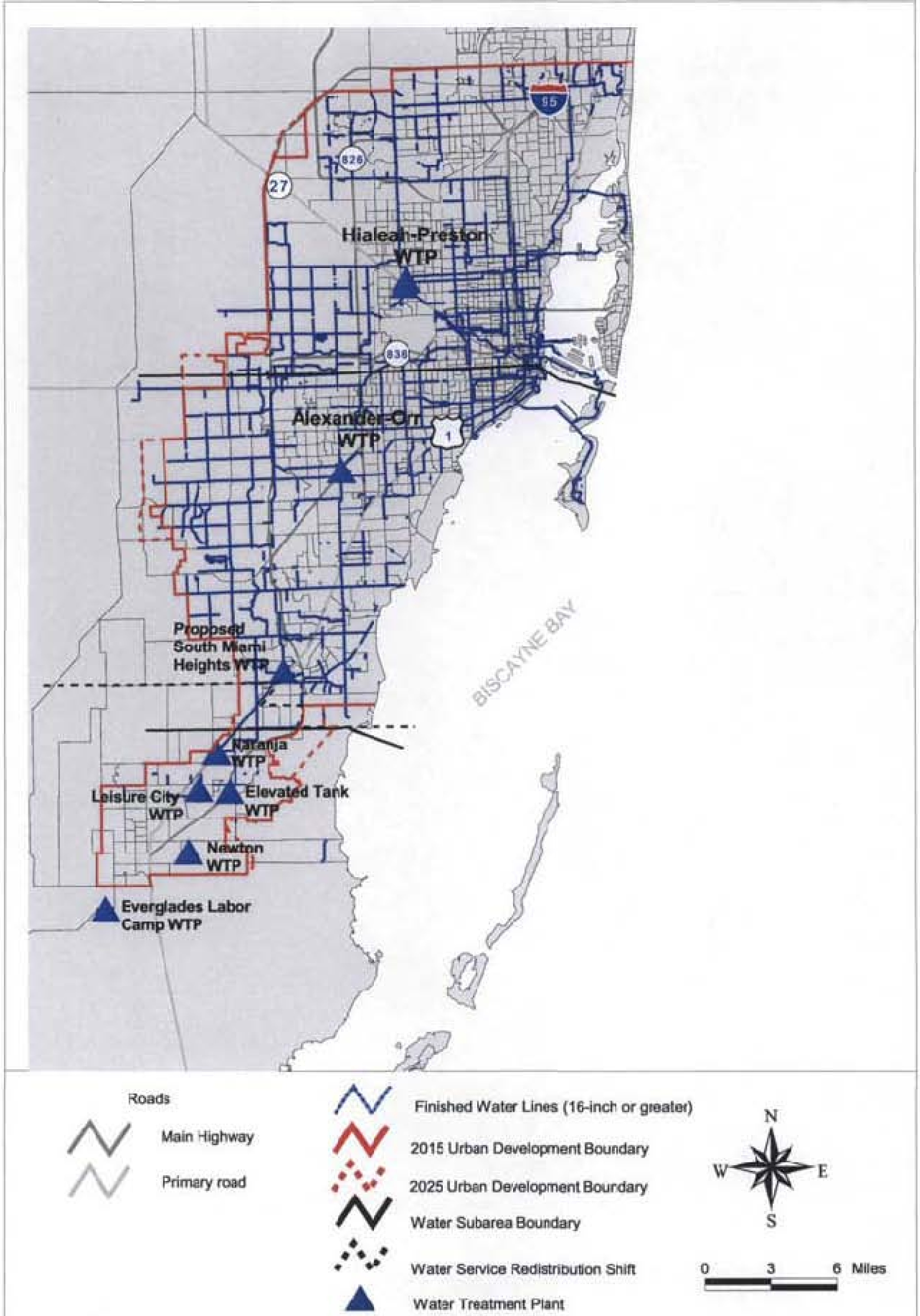

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Figure 3-2: MDWASD
Water Treatment Plants and
Finished Water Lines
6/27/2007

These blending activities of brackish and fresh water are proposed to occur at the Hialeah-Preston WTPs by 2010.

3.2.1.1 Hialeah Water Treatment Plant

The Hialeah WTP was originally designed in 1924 with a total capacity of 10 mgd. By 1935, the plant's capacity totaled 40 mgd. In 1946, capacity was increased to 60 mgd. Air strippers with a capacity of 84 mgd were added to the treatment process in 1991 to remove volatile organics from the finished water. A 3.2 MG storage reservoir for both the Hialeah and John E. Preston WTPs was also added in 1991. There are plans to rerate and upgrade the Hialeah WTP to a capacity of 70 mgd, if necessary.

The source water for Hialeah WTP is from the Hialeah-Miami Springs Wellfields, supplemented by the Northwest Wellfield. The Hialeah WTP has a current rated capacity of 60 mgd. The treatment process includes lime softening with sodium silicate activated by chlorine, recarbonation, chlorination, ammoniation, fluoridation, filtration, and air stripping. The plant site is relatively small, and is surrounded by residential areas.

3.2.1.2 John E. Preston Water Treatment Plant

The John E. Preston WTP was originally designed as a 60 mgd plant in 1968 and upgraded to 110 mgd in 1980. The plant was rerated to a total capacity of 130 mgd in 1984. The plant reached its present capacity of 165 mgd with another addition in 1988. In 1991, the plant was modified with an air stripping capacity of 185 mgd to remove VOCs. In 2005, the plant process modifications to provide enhanced softening for reduction of color and total organic carbon came on line.

The main source of water for the Preston WTP is from the Northwest Wellfield. The current rated capacity is 165 mgd with a treatment process similar to that of the Hialeah WTP. This includes lime softening with ferric and other coagulant and chemicals added prior to lime for enhanced softening, recarbonation, chlorination, ammoniation, fluoridation, filtration, and air stripping. The Preston plant is also sited in a residential area of Hialeah.

3.2.2 Alexander Orr, Jr. Water Treatment Plant

The Alexander Orr, Jr. WTP is located at 6800 S.W. 87th Avenue in Miami. The original design capacity was 40 mgd in 1954. This plant has undergone several expansions during the past 50 years. The raw water pumping capacity was increased by 32 mgd to 262 mgd in 1995 with an additional source from the West Wellfield. Additional reservoir and high pressure service capacities were also added to bring the total plant design capacity to 256 mgd. The plant rated capacity is 217.74 mgd.

The Alexander Orr, Jr. WTP receives its source water from the Alexander Orr, Jr. Wellfield, Snapper Creek Wellfield, Southwest Wellfield, and the West Wellfield. The Alexander Orr, Jr. WTP treatment process is similar to the other two major plants utilizing lime softening with activated sodium silicate added prior to lime as a coagulant aid, recarbonation, fluoridation, chlorination, ammoniation, and filtration. Unlike the Hialeah and Preston WTPs, this plant does not utilize enhanced softening or air stripping towers. The Alexander Orr, Jr. WTP also receives groundwater from five Upper Floridan Aquifer wells located in the West Wellfield and the Southwest Wellfield. Currently, these Upper Floridan Aquifer wells are in service and the blending of brackish and fresh water is occurring in the raw water line feeding the WTP. Finished water is distributed to a service area generally delineated as south of Flagler Street.

3.2.3 South Dade Water Treatment Plants

In 1985, MDWASD purchased an existing private utility known as the Rex Utility District Water System. Today, this system is referred to as the South Dade Water System. At the time of purchase, the system consisted of six plants and associated wellfields. Since the time of purchase, the Redavo WTP has been taken out of service.

The South Dade Water System is currently made up of five small WTPs that draw groundwater from the 12 wells located at the plant sites. The five small plants serving the South Dade Service Area include Elevated Tank, Everglades Labor Camp, Leisure City, Naranja, and Newton WTPs. These plants are located in the Southern portion of the County as shown on Figure 3-2. The plants utilize in-line disinfection with free chlorine and stabilization with the addition of polyphosphate. The two-year average annual daily flow (ADF) for the plants ranges from approximately 0.2 mgd at Naranja to over 3 mgd at Leisure City. This system serves a population of approximately 15,500 in the Leisure City, Everglades Labor Camp, and Naranja areas excluding the cities of Homestead and Florida City, which provide their own water service. These small treatment plant capacities are limited by the pumping capabilities at each plant. It is anticipated that these treatment plants will be replaced by the proposed South Miami Heights WTP by 2012.

MDWASD has plans for the construction and operation of the South Miami Heights (SMH) WTP in the South Dade subarea. Of the five existing plants in the South Dade subarea, only Everglades and Newton WTPs will remain in service when the SMH WTP comes into service in July 2011. The total annual average daily demand for the future South Miami Heights WTP will be approximately 18 mgd.

3.2.4 Other Water Treatment Plants

3.2.4.1 City of North Miami

The City of North Miami Norman H. Winson Water Treatment Plant is located at Sunkist Grove, 12100 NW 11th Avenue, and was commissioned in 1962. The Winsom WTP utilizes lime-softening and is capable of supplying 9.3 MGD of water to consumers, but on average the plant produces 8.5 MGD, or 65 percent of the total demand which is approximately 13.5 MGD. The Winsom WTP provides treated water to a portion of unincorporated Miami-Dade County in addition to within the City of North Miami municipal boundary.

3.2.4.2 City of North Miami Beach

The City of North Miami Beach supplies water through the City owned and operated Norwood-Oeffler Water Treatment Plant, located on the northeast corner of NW 191st Street and NW 9th Avenue. The Norwood-Oeffler Water Treatment plant, originally constructed in 1953, is a lime-softening water treatment facility. The plant was upgraded in 2007 to include membrane treatment of raw water from the Biscayne and Floridan Aquifers. The treatment now consists of blending of lime softening and nanofiltration of Biscayne Aquifer water with reverse osmosis for the Floridan Aquifer water. The treated water is stored in two above-ground storage tanks at the Norwood-Oeffler WTP prior to being pumped into the City's water transmission and distribution system. The Water Treatment Plant is currently permitted by the South Florida Water Management District (SFWMD) to withdraw 26.31 mgd of raw water from the Biscayne Aquifer and 12.07 mgd from the Floridan Aquifer. The WTP provides treated water to a portion of unincorporated and incorporated Miami-Dade County in addition to within the City of North Miami Beach municipal boundary.

3.2.4.3 City of Homestead

The City is supplied by two water treatment plants. The Wittkop Park plant is located at 505 NW 9th Street, and is supplied by four Biscayne aquifer wells with a capacity of 11.2 MGD. The Harris Field water treatment plant is located at 1084 NE 8th Street. This plant is supplied by two Biscayne aquifer wells, and has a capacity of 5.7 MGD. Both water treatment facilities use chlorination for disinfection, and have a combined capacity of 16.92 MGD. The Wittkop and Harris Field WTPs provide treated water to a portion of unincorporated Miami-Dade County in addition to within the City of Homestead municipal boundary.

3.2.4.4 Florida City

The City of Florida City supplies water through a chlorination water treatment facility, with a capacity of 4 MGD. The water treatment plant is located at 461 NW 6 Avenue, adjacent to the City's Loren Roberts Park.

3.2.5 Finished Water Storage

3.2.5.1 Hialeah Preston Subarea

The finished water storage facilities for the Hialeah-Preston subarea consist of both "in-plant" and remote storage facilities. The storage facilities are summarized in **Table 3-3**.

Table 3-3 Hialeah-Preston Finished Water Storage Facilities

Location	Description	Capacity (MG)
Hialeah WTP	Reservoir – Ground Storage	3.0
Hialeah WTP	Clearwell	1.7
John E. Preston WTP	Ground Storage Tank No. 1	9.0
John E. Preston WTP	Ground Storage Tank No. 2	14.0
John E. Preston WTP	Clearwell	1.1
N.W. 20th Street	Ground Storage Tank	7.5
N.W. 36th Street	Ground Storage Tank	5.0
N.W. 67th Street	Ground Storage Tank	8.2
N.W. 30th Street	Ground Storage Tank	2.5
N.E. 79th Street	Elevated Storage Tank	2.0
Carol City	Ground Storage Tank	2.0
	Total Storage	**56.0**

Source: MDWASD Water Facilities Master Plan, 2003 and MDWASD

3.2.5.2 Alexander Orr, Jr. Subarea

The water storage facilities of the Alexander Orr, Jr. subarea consist of a 39-MG ground storage tank located at the WTP site and a 1.6-MG plant clear well.

3.2.5.3 South Dade Subarea

The South Dade Subarea currently has no significant storage facilities. Therefore, the system is very vulnerable to emergency situations.

MDWASD has plans for the construction and operation of the South Miami Heights WTP in the South Dade subarea. Within those plans, a 5 MG reservoir is being planned for on-site plant finished water storage.

3.2.5.4 Other Water Suppliers

The City of North Miami has two storage tanks that hold treated water prior to being pumped into the distribution system. The total combined storage capacity of the two tanks is 2.25 million gallons, or 17 percent of the current average daily demand. These storage tanks provide storage of treated water to service a portion of unincorporated Miami-Dade County in addition to within the City of North Miami municipal boundary.

The City of North Miami Beach stores the treated water in two above-ground storage tanks at the Norwood-Oeffler WTP prior to being pumped into the City's water transmission and distribution system. The storage capacities of the tanks are 4.2 and 2.0 million gallons. The City also uses a 2-million gallon remote tank bringing the total storage capacity in the City's water-supply system to 8.2 million gallons. These storage tanks provide storage of treated water to service a portion of unincorporated

Miami-Dade County in addition to within the City of North Miami Beach municipal boundary.

The City of Homestead stores the finished water in three elevated storage tanks. After treatment, water from five of the six wells is stored in an elevated water storage tank at either Harris Field (0.5 MG), Wittkop Park (0.5 MG), or the Homestead Motorsports Complex (1.0 MG). Water from Well No. 5 at Harris Field is pumped directly into the system after treatment on an as-needed basis. The combined capacity of the storage tanks is 2 MG. These storage tanks provide storage of treated water to service a portion of unincorporated Miami-Dade County in addition to within the City of Homestead municipal boundary.

Florida City has one storage tank that holds treated water prior to distribution within its service area. The tank's storage capacity is 0.5 million gallons.

3.3 Water Distribution Facilities

The MDWASD water distribution system is currently supplied by the three large treatment plants and the smaller treatment plants in the southern portion of Miami-Dade County. The distribution systems serving these treatment plants are comprised of loops and are interconnected, as shown on Figure 3-2.

3.3.1 Hialeah-Preston Subarea

Finished water from the Hialeah and John E. Preston WTPs is pumped through a system of dedicated low-pressure pipelines to remote storage tanks and pumping facilities. This system provides water service to the southeastern part of the Hialeah-Preston subarea. The low pressure system starts at the Hialeah WTP with a 42-inch diameter main heading due east along N.W. 62nd Street, and 36-inch and 42-inch diameter mains running southeast along Okeechobee Road then parallel to the Miami River. The main on N.W. 62nd Street connects to the N.W. 67th Street pumping station, which pumps the water to the south through a 30-inch diameter main running along N.W. 10th Ave. The 30-inch diameter main continues south and connects into the N.W. 36th Street pumping station. This main continues further south and connects into the golf ground pump station.

The 36-inch and 42-inch diameter mains combine into a 54-inch diameter main at N.W. 42nd Avenue. They split again into a 36-inch and a 42-inch diameter main at N.W. 32nd Avenue. These mains connect to the 30th Avenue pump station. The 30th Avenue pump station feeds two 36-inch diameter mains that connect to the 20th Street pumping station to complete the loop. The pipe loop is made predominantly of concrete and cast iron pipes that were installed in the early 1930s. Some segments of this loop having been in service for more than 60 years. Replacement of these pipes are scheduled in the Department maintenance program.

The remaining part of this subarea is served by a high pressure system. Water is pumped into the system by five high service in-plant pumps with a total capacity of

34.1 mgd at 167 feet total dynamic head (TDH). The high pressure system delivers water service to Hialeah, Miami Springs, and a high pressure main connected to the City of Miami. The northern section of the subarea is supplied by one major piping loop. The loop begins at the plant with a 60-inch diameter main heading north along West 4th Avenue (N.W. 57th Ave.) to N.W. 191st Street. At this location, it turns east until it reaches N.E. 20th Avenue. It then turns south and connects into a 54-inch diameter main that connects to the N.W. 67th Street pumping station.

The southwestern portion of the subarea is supplied by a 36-inch diameter main that connects to the 60-inch diameter main heading out of the John E. Preston WTP at West 23rd Street. The main heads west on N.W. 74th Street then turns south on N.W. 107th Avenue. It eventually interconnects with the Alexander Orr, Jr. subarea piping network on S.W. 8th Street around S.W. 117th Avenue.

3.3.2 Alexander Orr, Jr. Subarea

The distribution system of the Alexander Orr, Jr. subarea is comprised of two major piping loops. The first major loop traverses the south and west portion of the subarea. The loop starts at the WTP with a 60-inch diameter main heading west on S.W. 64th Street and a 48-inch diameter main that runs south along S.W. 87th Avenue (Galloway Road) until S.W. 216th Street. The 48-inch diameter main then heads west along S.W. 216th Street to a tee connection at S.W. 127th Avenue. One branch of the tee runs north on S.W. 127th Avenue to S.W. 184th Street and then turns west to 137th Avenue. The 48-inch diameter main travels north on 137th Avenue to S.W. 152nd Street, where it connects into a 24-inch diameter main running east-west on 152nd Street and a 36-inch diameter main that continues north on 137th Avenue to S.W. 120th Street. There, the 36-inch diameter main turns west, then runs north along Hammocks Boulevard to S.W. 88th Street where it reduces to a 24-inch diameter main that runs north along S.W. 152nd Avenue to 72nd Street. The 24-inch diameter main then runs east-west on S.W. 72nd Street. At S.W. 147th Avenue, it connects with a 36-inch diameter main that runs north to S.W. 56th Street (Miller Road), where it connects with a 42-inch diameter main that runs east on Miller Road. This 42-inch diameter main enlarges to a 48-inch diameter main that eventually connects to the 60-inch diameter main at the intersection of Miller Road and S.W. 117th Avenue to complete the loop. A 36-inch diameter main branches off of the 60-inch diameter main at the intersection of Miller Road and S.W. 117th Avenue. This 36-inch diameter main heads north along S.W. 117th Avenue and eventually interconnects the Alexander Orr, Jr. and the Hialeah-Preston subareas.

The second loop starts at the WTP with two 48-inch diameter mains. One main runs north on S.W. 87th Avenue (Galloway Avenue) to S.W. 40th Street (Bird Road) and then turns east. The main continues east along Bird Road, reduces to a 42-inch diameter main at N.W. 57th Avenue, then connects through a 30-inch diameter pipe connection with the second 48-inch diameter main at Bird Road and S.W. 37th Avenue (Douglas Road). The second 48-inch diameter main travels along Highway 874 to S.W. 56th Street, where it turns east then northeast between S.W. 67th Avenue and S.W. 62nd

Avenue to S.W. 48th Street. The main runs east on S.W. 48th Street then northeast through several changes in direction, where it connects to the other 48-inch diameter main at Bird Road and S.W. 37th Avenue. The main then travels north along South Dixie Highway and eventually interconnects with the Hialeah-Preston Service Area piping network through a 36-inch diameter pipe that runs along S.W. 2nd Avenue.

3.3.3 South Dade Subarea

The South Dade water distribution system consists of small water mains with diameters ranging from 16 inches to 4 inches. The distribution system is centered around each individual WTP. Each has its own sets of water main loops within the distinct service areas. The Leisure City, Elevated Tank, and Naranja WTPs, however, are so well interconnected that they can be generally considered as one distribution area. More than 63 percent of the South Dade subarea is served by these three plants. The distribution system of these three plants form one major loop that is bounded on the north by S.W. 248th Street, on the south by S.W. 304th Street, on the east by S.W. 117th Avenue, and on the west by S.W. 172nd Avenue.

The Everglades Labor Camp WTP serves a small area that is bounded on the north by S.W. 376th Street, on the south by S.W. 384th Street, on the east by S.W. 192nd Avenue, and on the west by S.W. 194th Path. This distribution system consists of one 12-inch-diameter loop around the service area interconnected with several 8-inch diameter distribution mains. The Everglades Labor Camp and the Newton WTP distribution system are interconnected via an 8-inch diameter main that runs east along S.W. 376th Street then heads north on S.W. 187th Avenue, where it connects with a 12-inch diameter main at S.W. 360th Street. The 8-inch diameter main continues north on S.W. 187th Avenue until S.W. 352nd Street, where it connects into a small distribution loop that terminates with a 16-inch diameter stub-out.

The Newton WTP distribution system consists of a single 12-inch diameter water main that runs east and west on S.W. 336th Street. The eastbound main then branches north and south along S.W. 152nd Avenue. The southbound branch then turns east on S.W. 344th Street and ultimately connects to the FP&L Turkey Point generating plant. The northbound branch continues along S.W. 152nd Avenue, where it connects to the Leisure City WTP distribution system at S.W. 304th Street. A 6-inch diameter main running south from SW 288th Street on S.W. 137th Avenue then east on S.W. 328th Street connects to an 8-inch diameter main that runs south on 117th Street. This 8-inch diameter main connects to the 12-inch diameter main to FP&L Turkey Point generating plant. This main ultimately completes the interconnection of the Newton WTP with the Leisure City, Elevated Tank, and Naranja WTPs' distribution areas.

The westbound branch of the 12-inch diameter main turns south on S.W. 162nd Avenue then heads south and west on Palm Drive. The main then continues south on S.W. 167th Avenue then west on S.W. 360th Street until it connects to the Everglades Labor Camp WTP 8-inch diameter main that runs north on SW 187th Avenue.

The South Dade distribution system is interconnected with the Alexander Orr distribution system in the vicinity of SW 127th Avenue. MDWASD has plans for the construction and operation of the South Miami Heights WTP and associated wellfields in the South Dade Subarea. Of the five exsisting WTPs and wellfields in the South Dade area, only Everglades and Newton WTPs and wellfields will remain in service when the SMHWTP comes on line in 2012. MDWASD will be constructing a water main to interconnect with the Everglades and Newton Systems to provide water and meet additional future demands. The SMHWTP will connect to the existing distribution systems of the South Dade Plants to be taken out of service in 2012, when SMHWTP is online.

3.3.4 Other Water Distribution Facilities

3.3.4.1 City of North Miami

The City of North Miami's distribution system consists of two 16-inch and one 12-inch diameter ductile iron pipes. The two 16-inch diameter pipes mostly service the areas east of the WTP. One of the 16-inch pipes eventually connects to a 20-inch pipe and then to two 12-inch pipes. The 20-inch and one of the two 12-inch pipes connects o a large 30-inch transmission main at different points. This 30-inch pipe serves as the main transmission line on the far-east side of the City. The other 16-inch main reduces to a 12-inch pipe. The 12-inch transmission main leaving the WTP travels west, then north, and expands into the distribution system. The City also maintains seven supply interconnections with MDWASD and an emergency interconnection with the City of North Miami Beach. This distribution system provides treated water to service a portion of unincorporated Miami-Dade County in addition to within the City of North Miami municipal boundary.

3.3.4.2 City of North Miami Beach

The City of North Miami Beach distribution system provides treated water to service a portion of unincorporated Miami-Dade County in addition to within the City of North Miami Beach municipal boundary from the WTP.

The City has eleven high service pumps that deliver finished water to the distribution system at approximately 60 to 80 psi and have a combined capacity of 32.4 mgd. The City's distribution system is fed by 18-inch, 24-inch, and 36-inch diameter transmission mains.

3.3.4.3 City of Homestead

The City's water distribution system is comprised of an interconnected string of mains ranging from 2-inches to 24-inches in diameter, mostly of ductile iron pipe. The water from the storage tanks flows into the mains, with a pressure of 45 to 60 psi.

3.3.4.4 Florida City

Florida City's water distribution system is comprised of an interconnected string of mains ranging from 2-inches to 24-inches in diameter, mostly of ductile iron pipe.

The City's distribution system provides service within its municipal boundaries and provides service to and to a small portion of unincorporated Miami-Dade County. In addition, Florida City purchases water from the City of Homestead to service a small portion of Florida City's service area on the southeast corner of U.S. 1 and S.W. 328th Street.

3.4 Summary

As shown within this section, the MDWASD water supply and treatment systems have sufficient installed capacity to produce more potable water than is currently required. The supply capacity and treatment capacity are 645.56 MGD and 495.90 MGD, respectively. **Table 3-4** summarizes this information. **Table 3-5** summarizes other suppliers facilities capacities.

The capacities of these water supply and treatment systems have been coordinated with future demands and allocations. Sections 4 and 5 of this Work Plan address future demands and required water supply facilities.

Table 3-4 MDWASD Facilities Capacities

Facility	Installed Capacity (mgd)
Hialeah-Preston Water Treatment Plants	60 + 165 = **225**
Hialeah-Preston Well fields	
Preston	53.28
Hialeah	12.54
Miami Springs	79.30
Northwest[(a)]	149.35
Subtotal	**294.47**
Medley Wellfield [(b)]	43.20
Alexander Orr Water Treatment Plant	**248**
Alexander Orr Well fields	
Orr Plant	74.40
Snapper Creek	40.00
Southwest	161.20
West	32.40
Subtotal	**308.00**
South Dade Water Treatment Plants	**10.61**
South Dade Wellfields	
Elevated Tank	4.32
Everglades Labor Camp	4.18
Leisure City	6.12
Naranja	1.15
Newton	4.32
South Dade Wellfield Subtotal	**20.09**
South Miami Heights Water Treatment Plant [(c)]	***20***
South Miami Heights Wellfields [(c)]	
Caribbean Park	*3.00*
Former Plant	*3.00*
Roberta Hunter Park	*14.00*
Rock Pit Park	*3.00*
South Dade Wellfield Subtotal	***23.00***
WASD Wellfield Total	**645.56**
WASD Water Treatment Plant[(d)] Total	**495.90**

(a) Northwest wellfield capacity at 150 mgd when pumps operate at low speed.
(b) Wells in this wellfield had been abandoned. They were recently restored with the purpose of using them only during an emergency.
(c) Proposed Facilities once these facilities come on line, South Dade's Elevated Tank, Leisure City and Naranja dropout.
(d) Not including Elevated Tank, Leisure City and Naranja, but including South Miami Heights.
Source: MDWASD Draft Wellfield Operational Plan, 2007 and MDWASD Water Use Permit No. Re-issue 13-00017-W, November 15, 2007

Table 3-5 Other Suppliers' Facilities Capacities

Facility	Installed Capacity (mgd)
City of North Miami	•
Norman H. Winsom Water Treatment Plant	9.30
City's well fields (8 wells)	**14.96**
City of North Miami Beach	
Norwood-Oeffler Water Treatment Plant	**32.00**
City of North Miami Beach Wellfields	
Biscayne Aquifer Wellfields	27.90
Floridan Aquifer Wellfields	12.07
City of North Miami Beach Wellfields Total	**39.97**
City of Homestead	
Wittkop Park – Harris Field Water Treatment Plants	11.2+5.7=**16.9**
City of Homestead Wellfields	
Wittkop Park	11.23
Harris Field	5.76
City of Homestead Wellfields Total	**16.99**
Florida City	
Florida City Water Treatment Plant	***4***
Florida City Wellfields	***4***

Source: City of North Miami Beach SFWMD Water Use Permit Staff Report (August 2007) and Water Use Permit No. Re-issue 13-00060-W, Draft Water Supply Facilities Work Plan (City of North Miami, March 2008), Information provided by discussions with staff for the City of Homestead and Florida City

Section 4
Population and Water Demand Projections

This section presents historical and projected population projections from Year 2001 through Year 2030 for MDWASD's service area. Population data were obtained from the Miami-Dade County Planning and Zoning (P&Z) Department and were derived from Transportation Analysis Zone (TAZ). Further, the Consolidated Water Use Permit Application (No. 040511-5) submitted to South Florida Water Management District (SFWMD) in July 2005 indicates that the population data presented in this section was accepted by SFWMD for its use in the Lower East Coast (LEC) Plan 2005-2006 update. The Lower East Coast (LEC) Plan 2005-2006 update was approved on February 15, 2007.

4.1 Historical Population

Historical populations served by the MDWASD system are shown in **Table 4-1** in one year increments from Year 2001 to Year 2006. The population in MDWASD's service area grew approximately 7.3% between Year 2001 and year 2006. Table 4-1 also provides a summary of historical population within Miami-Dade County. The MDWASD system served approximately 90% of the County total population in 2006.

Table 4-1 Historical Population Served by MDWASD

YEAR	TOTAL MDWASD	TOTAL COUNTY
2001	2,073,679	2,283,887
2002	2,103,951	2,319,040
2003	2,134,223	2,354,193
2004	2,164,495	2,389,346
2005	2,194,768	2,424,499
2006	2,225,040	2,459,652

Source: Miami-Dade Planning & Zoning Department

4.2 Population Projections

Population projections for MDWASD's service area in five year increments from Year 2007 to 2027 and Year 2030 are shown in **Table 4-2**. Overall, the population served by MDWASD is expected in increase approximately 26.2% from Year 2006 to Year 2030. There are two important developments for the projected population distributions that should be noted. The first development concerns the population of the City of North Miami Beach currently served by MDWASD's water distribution system. The City of North Miami Beach has filed for a water use permit and will be implementing an alternative water use program that will allow the City to serve its entire population. As a result, the City of North Miami Beach's population currently served by MDWASD is expected to drop out by the end of 2007, resulting in a net negative growth rate (-0.89%) in the population served by MDWASD between 2007 and 2008.

Table 4-2 Population Projections to be Served by MDWASD

Year	Total MDWASD	Total County
2007	2,250,944	2,494,805
2012	2,349,221	2,670,569
2017	2,487,519	2,834,172
2022	2,609,268	2,979,533
2027	2,731,018	3,124,894
2030	2,804,068	3,212,111

Sources: Miami-Dade Planning & Zoning Department

The second development (mentioned earlier) concerns a general shift in the northern boundary of the South Dade area once the proposed South Miami Heights Water Treatment Plant comes into service in 2012. The northern boundary will be shifted northward such that portions of the population currently within the Alexander-Orr subarea will be within the South Dade subarea. **Figure 4-1** illustrates the boundary shift. The boundary shift will cause a general redistribution of service between the Alexander-Orr and South Dade areas, but will not have other effects on the population expected to be served by MDWASD. In 2030, MDWASD will serve potable water to approximately 87% of the total County population.

4.3 Historical Water Use

Historic water use figures were obtained from MDWASD and reflect water provided by the Hialeah-Preston, Alexander-Orr, Everglades, Leisure City, Newton, Elevated Tank, and Naranja WTPs and associated wellfields. These water use figures provide the basis for forecasting future water demands for MDWASD's service area. **Table 4-3,** referred to as Table F in previous submittals to MDWASD and the SFWMD, provides the historical raw and finished water use by subarea for Year 2001 through Year 2006. Information shown in Table 4-3 includes per capital annual average and maximum month water use.

4.4 Water Demand Projections

The water demand projections presented herein are based on initial system-wide finished water daily per capita use rate of 155 gallons per capita per day (gpcd). The per capita use was determined by taking a 5-year average from 2002 to 2006. The initial per capita rate was adjusted to reflect reductions resulting from water conservation and reuse irrigation water projects.

Table 4-4, referred to as Table G in previous submittals to the SFWMD, provides the projected raw and finished water use for Year 2007 through Year 2030. Table 4-4 also provides projected raw water pumpage from the Biscayne and Floridan Aquifers in five-year increments to indicate how the sources of water will be used to meet future demands.

TABLE 4-3(10/26/07)
Miami-Dade Water and Sewer Department (MDWASD)
Past Water Use (2001-2006)

1	2	3	4	5	6	7	8	9	10	11	12
FINISHED WATER HISTORICAL USE							RAW WATER HISTORICAL USE[a]				Ratio Finished : Raw (Total Annual Use)
Year	Population Served*	Per Capita Usage (gpcd)	Total Annual Use (MG)	Average Month Use (MG)	Max Month Use (MG)	Ratio Max:Average Month	Total Annual Use (MG)	Average Month Use (MG)	Max Month Use (MG)	Ratio Max:Average Month	
TOTAL MDWASD WATER SYSTEM SERVICE AREA**											
2001	2,073,679	151.28	114,493	9,541	9,927.5	1.04	117,159	9,763	10,129	1.04	1.0233
2002	2,103,951	156.99	120,614	10,051	10,961.4	1.09	122,931	10,244	11,163	1.09	1.0192
2003	2,134,223	158.51	123,511	10,293	10,676.1	1.04	125,884	10,490	10,878	1.04	1.0192
2004	2,164,495	156.90	124,301	10,358	10,861.1	1.05	126,685	10,557	11,063	1.05	1.0192
2005	2,194,768	154.96	124,098	10,341	10,734.8	1.04	126,670	10,556	11,031	1.04	1.0207
2006	2,225,040	153.30	124,677	10,390	10,988.6	1.06	127,019	10,585	11,170	1.06	1.0188
	5-year Average (2002-2006)	156.13			3-year Average (2004-2006)	1.05			3-year Average (2004-2006)	1.05	1.02

* Source of Projected Population Information: Miami-Dade County Planning and Zoning Department

** From MDWASD Raw and Finished Water Historical Data 2001 - 2006

(a) Raw-to-finished water ratio is 1.02. MDWASD is in the process of improving its raw water metering/accounting system.

TABLE 4-4 (3/10/2008)
MDWASD WATER DEMAND BY SOURCE

1	2	3	4	5	6	7
PROJECTIONS						
Year	Population	Finished Water Use (gpcd)	AADD Finished Water Use[(a)] (MGD)	Water Conservation[(b)] (MGD) Credit	Adjusted Finished Water Demand[(c)] (MGD)	Adjusted Finished Water Use (gpcd)
2007	2,250,944	155	348.90	1.09	347.81	154.52
2008	2,230,894	155	345.79	2.24	343.55	154.00
2009	2,260,476	155	350.37	3.53	346.84	153.44
2010	2,290,058	155	354.96	4.82	350.14	152.90
2011	2,319,639	155	359.54	6.34	353.20	152.27
2012	2,349,221	155	364.13	7.77	356.36	151.69
2013	2,378,803	155	368.71	9.28	359.43	151.10
2014	2,408,385	155	373.30	10.09	363.21	150.81
2015	2,438,819	155	378.02	10.89	367.13	150.53
2016	2,463,169	155	381.79	11.70	370.09	150.25
2017	2,487,519	155	385.57	12.51	373.06	149.97
2018	2,511,869	155	389.34	13.30	376.04	149.71
2022	2,609,268	155	404.44	16.46	387.98	148.69
2027	2,731,018	155	423.31	19.62	403.69	147.82
2030	2,804,068	155	434.63	19.62	415.01	148.00

Footnotes

(a) Annual Average Daily Demand (AADD) Finished Water Projections between 2007 and 2030 assume 155 gpcd total water system demand prior to application of credits (e.g. conservation).

(b) WASD will be undertaking the 20-year water use efficiency plan and expects reductions in per capita water consumption. Water Conservation projections were taken from comments
MDWASD submitted to SFWMD on 4/6/2007. Values reflect projections as of 4/6/2007. Real losses in non-revenue water (e.g. unaccounted-for-water) are assumed to remain at less than 10%. Water Conservation shall be in accordance with SFWMD Water Use Permit No. Re-Issue 13-00017-W, Limiting Condition Nos. 45 and 49 and Exhibit 27.

(c) Adjusted after taking credit in finished water demand projections for reductions in finished water use associated with water conservation.

4.5 Water Conservation and Reuse

4.5.1 MDWASD

4.5.1.1 Water Conservation

The per capita usages contained in Table 4-4 are adjusted taking into consideration MDWASD water conservation. MDWASD will be undertaking a 20-year water conservation plan and will evaluate ways for reducing non-revenue water. Water Conservation projections were taken from the MDWASD 20-year Water Use Efficiency Goal Based Plan (Plan) approved by the SFWMD in May 2007. Included in the Plan is the Water Conservation Best Management Practices (BMP) Planning Spreadsheet prepared by Malcolm Pirnie, Inc. in 2007. Table 5 Countywide BMP Implementation Schedule, Costs, and Savings Projections from The Water Use Efficiency 5-Year Plan is located in Appendix E. Currently, MDWASD implements all BMPs included in the 20-year plan in addition to various irrigation, xeriscape and plumbing fixture efficiency ordinances and some reuse within the three wastewater treatment plant sites or in their vicinities. Water conservation activities are funded annually through the operations and maintenance budget and are therefore not included in capital budgets. Values contained within Table 4-4 reflect projections as of May 31, 2007.

Water conservation projections do not reflect water demand reductions presented by the "Unaccounted Water Loss Reduction Plan (February 2007)" prepared by Malcolm Pirnie, Inc. and currently under review by MDWASD. The potential additional reduction in water demands as a result of real non-revenue water loss is estimated at 14.25 mgd over the next ten years.

Water Conservation will be in accordance with SFWMD Water Use Permit No. Re-Issue 13-00017-W, Limiting Condition Nos. 45 and 49 and Exhibit 27.

4.5.1.2 Water Reuse

MDWASD has committed to implement a total of 170 mgd of reuse in accordance with the County's 20-year water use permit. The reuse projects and implementation schedule are listed in in Exhibit 30 of the County's 20-year water use permit, included in Appendix F. Reuse projects to recharge the aquifer with highly treated reclaimed water will be in place before additional withdrawals over the base condition water use are made from the Alexander Orr and South Dade subarea wellfields. These wellfields supply water to several municipalities included in MDWASD's retail and wholesale customer service area.

A 7.0 mgd reuse irrigation project is anticipated at the North District Wastewater Treatment Plant in 2012. Of the 7.0 mgd, approximately 5.0 mgd are for projects associated with the City of North Miami and City of North Miami Beach service areas. A 1.0 mgd reuse irrigation project is anticipated at the Central District Wastewater Treatment Plant in 2011. This project is currently under construction in the Village of Key Biscayne.

4.5.2 Other Water Suppliers

4.5.2.1 City of North Miami

The City of North Miami has developed a water conservation plan to help reduce the demand for potable water and lower its consumption on a per capita basis. The conservation plan includes the adoption of Xeriscape/Florida friendly landscaping methods, the implementation of a water conservation public education program, the implementation of a leak detection program, water loss prevention programs, and the utilization of reuse water for irrigation and non-potable water uses. The City is also implementing an incentives program, and encouraging the development of "green buildings". They will also continue to enforce the wellfield protection ordinance which limits the allowable land uses within the wellfield's cone of influence, and will continue to monitor water quality levels in the drainage basins to maintain a minimum level of service standards. Currently, all the City's wastewater is treated by MDWASD, and therefore the City does not have a water reuse and reclamation program.

4.5.2.2 City of North Miami Beach

The City of North Miami Beach has seen major successes in way of alerting and educating residents on water and environmental conservation. In 2005, the City created a Water Conservation Program that applies conservation methods to reduce water demand and to lower the per capita consumption of potable water. The program includes collective efforts to increase the overall water use efficiency and to limit water losses to 10 percent or less. They have also initiated a water conservation educational and outreach program. Another aspect of the conservation program is the continuation and installation of water efficient landscape, plumbing and irrigation ordinances, as well as a water shortage and emergency ordinance. They have begun the use of alternative water sources, mainly the Floridan aquifer, and are developing a reclaimed water use method. Other methods for water conservation taking place at the City include meter replacements and a showerhead exchange program.

Also, the North Miami Beach Water fund established the Foundation for Water and Environmental Education which is a not-for-profit organization with funds and programs managed by its own directors and established to maintain and aid water resource management in the City of North Miami Beach community.

4.5.2.3 City of Homestead

The City of Homestead has developed a water conservation plan to reduce potable water consumption. The plan includes a permanent irrigation ordinance which establishes irrigation restrictions prohibiting landscape irrigation between 9:00 AM and 5:00 PM., a Xeriscape ordinance that promotes use of Xeriscape landscape methods, an ultra-low volume plumbing fixture ordinance that establishes water conservation standards for plumbing fixtures installed in new construction, a leak detection program expansion by using water correlators which pinpoint leaks that are yet to surface. In addition, the City has a residential and commercial meter replacement program where all meters will be replaced within the next 5 years. The City will adopt the Automatic Meter Reading technology which allows the reading of water consumption remotely which will allow accurate and true monthly readings. Also, the City is implementing a rain sensor device ordinance that requires all irrigation systems equipped with automatic controls to have a rain sensor switch which turns off the system when more than 0.5 inches of rain has fallen. A water conservation education program is also taking place.

The City has also implemented a reclaimed water system, where most of the wastewater from the City's sewer service area is treated at the City's Wastewater Treatment Plant (WWTP). The wastewater from the City's WWTP receives treatment (including ultra-violet radiation to eliminate the possible formation of disinfection by-products) and is reused to recharge the surficial aquifer. 100% of the City's WWTP output [approximately 6 MGD (4.730 MGD, average)] is currently recharging the aquifer via two primary and four secondary rapid infiltration trenches.

4.5.2.4 Florida City

Florida City is currently implementing a water main replacement program, where they are abandoning all existing 2, 4 and 6-inch diameter mains and installing new 8 and 12-inch diameter DIP water mains. They are also following the SFWMD restrictions for irrigation water use that are currently in place.

4.6 Summary

In summary, the historically based MDWASD service area projected water demands as adjusted for water conservation and reuse are presented in **Table 4-5** as "adjusted" finished water demand and per capita water use. The resulting anticipated finished water demands in 5-year increments an in 2030 is as follows:

Table 4-5 MDWASD Service Area Incremental Water Demands

Year	Population	Adjusted Finished Water (mgd)	Per Capita Water Use (gpcd)
2007	2,250,944	347.81	154.52
2012	2,349,221	356.36	151.69
2017	2,487,519	373.06	149.97
2022	2,609,268	387.98	148.69
2027	2,731,018	403.69	147.82
2030	2,804,068	415.01	148.00

Section 5
Water Supply Facilities Work Plan

This section details the water supply facilities that are planned in order to meet MDWASD's water demands through 2030. For ease of reference, the project start and finish dates have been provided below the title of the following subsections. The Capital Improvement Elements Tables 8 and 12 located in Appendix B.

5.1 South Miami Heights W.T.P. and Wellfield

Start 2007
Finish 2012

Construction on the South Miami Heights Water Treatment Plant (WTP) and Wellfield program will begin in 2008. This facility will use a parallel treatment train of ultra-low pressure/nanofiltration reverse osmosis and ultrafiltration membranes for treatment of 20 mgd of Biscayne aquifer water from ten wells.

5.2 Alternative Water Supply Projects

The following proposed alternative water supply (AWS) projects are to meet MDWASD's increased water demands through 2030, which encompasses the proposed 20-year Consumptive Use Permit period. AWS projects have been identified to meet water demands in the MDWASD service area and are presented in **Table 5-1, Table 5-2** and **Figure 5-1**. These projects are to be completed in increments commensurate with the projected growth, as presented in **Figure 5-2** and **Figure 5-3**. All costs are in terms of December, 2006 (ENR CCI=7888) dollars.

The plan described herein demonstrates that the proposed projects, by their location, volume of water produced, and timing of implementation, will be sufficient to offset the corresponding raw water demand increases. These projects will undergo further refinement and development over the next few months. The flow (Q MGD) shown in parentheses below represents the corresponding amount of finished water annual average daily demand (AADD) provided by the projects in terms of million gallons per day (MGD). These AWS projects and AADD assume that all current wholesalers will remain on the MDWASD system through 2030, except the City of North Miami Beach which drops out after 2007.

Table 5-1: Miami-Dade Water and Sewer Department (MDWASD)
Proposed Alternative Water Supply Projects
From Alternative Water Supply Plan Submitted 10/26/2007

Year	Annual Average Finished Water Quantity in MGD and Source		
2007	7.20	ASR Ultraviolet (UV) Disinfection System for ASR Sys. @ W&SW Wellfield	AWS
2009	4.70	Floridan Aquifer Blending Wellfield at Hialeah/Preston	AWS
2011	8.50	Hialeah Floridan R.O. W.T.P. Phase 1 (WTP Initial Capacity 10.0 MGD)	AWS
2012	2.00	North District W.W.T.P. Reuse Projects	Credit
2012	1.00	Central Distr. W.W.T.P. Reuse Project	Credit
2013	18.60	South Distr. W.R.P. Groundwater Recharge Ph 1	Offset
2017	4.50	Hialeah Floridan R.O. W.T.P. Phase 2 (WTP Total Capacity 15.0 MGD)	AWS
2020	21.00	West District W.R.P. Canal Recharge Ph 2	Offset
2025	16.00	West District W.R.P. Canal Recharge Phase 3	Offset
2027	2.00	Hialeah Floridan R.O. W.T.P. Phase 3 (WTP Total Capacity 17.5 MGD)	AWS
Subtotal	85.50		
Water Conservation	19.62	20-year Water Use Efficiency Plan (4/6/2007)	Credit
Total	105.12		

Note:
Non-revenue potential real water loss reduction target is 14.25 MGD by 2017
No credit give for reuse projects in North District and Central District W.W.T.P.s. Future credits may be given to offset increases in per capita consumption.

TABLE 5-2 (3/25/2008)
MDWASD FINISHED WATER DEMAND BY SOURCE

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
PROJECTIONS								ADJUSTED FINISHED WATER AADD (MGD)											
								Biscayne Aquifer							Floridan Aquifer				
								South Dade[e]		South Miami Heights Membrane Softening(f)									
Year	Population	Finished Water Use (gpcd)	AADD Finished Water Use[a] (MGD)	Water Conservation[b] (MGD) Credit	Reuse/ Reclaimed Water[c] (MGD) Credit	Adjusted Finished Water Demand[d] (MGD)	Adjusted Finished Water Use (gpcd)	Elevated Tank/ LeisureCity/ Naranja	Everglades Labor Camp/ Newton	Transfer from Elevated Tank/ LeisureCity/ Naranja	Caribb. Park/ Former Plant/ Roberta Hunter[g]	SW Wellfield Increase	Hialeah-Preston/ Alexander-Orr Lime Softening	Total Biscayne Aquifer[h]	Hialeah RO WTP[i]	Hialeah-Preston/ Alexander-Orr Blending[j]	Total Floridan Aquifer	Total All Sources	AADD Finished Water Deficit
2007	2,250,944	155	348.90	1.09	0.00	347.81	154.52	4.30	2.80	0.00	0.00	0.00	333.51	340.61	0.00	7.20	7.20	347.81	0.00
2008	2,230,894	155	345.79	2.24	0.00	343.55	154.00	4.30	3.06	0.00	0.00	0.00	328.99	336.35	0.00	7.20	7.20	343.55	0.00
2009	2,260,476	155	350.37	3.53	0.00	346.84	153.44	4.30	3.32	0.00	0.00	0 00	332.02	339.64	0.00	7.20	7.20	346.84	0.00
2010	2,290,058	155	354.96	4.82	0.00	350.14	152.90	4.30	3.60	0.00	0.00	0.00	330.34	338.24	0.00	11.90	11.90	350.14	0 00
2011	2,319,639	155	359.54	6.34	0.00	353.20	152 27	4.30	3.60	0.00	0.00	0.00	333.40	341.30	0.00	11.90	11.90	353.20	0.00
2012	2,349,221	155	364.13	7.77	0.00	356.36	151 69	4.30	4.10	0.00	0.00	0.00	331.34	339.74	4.72	11.90	16.62	356.36	0.00
2013	2,378,803	155	368.71	9.28	0.00	359.43	151.10	4.30	4.10	0.00	0.00	0.00	330.64	339.04	8.50	11.90	20.40	359.44	0.00
2014	2,408,385	155	373.30	10.09	0.00	363.21	150.81	0.00	4 10	2.17	6.72	0.00	329.81	342.81	8.50	11.90	20.40	363.21	0.00
2015	2,438,819	155	378.02	10.89	0.00	367.13	150.53	0.00	4.10	2.17	10.62	0.00	329.83	346.73	8.50	11.90	20.40	367.13	0.00
2016	2,463,169	155	381.79	11.70	0.00	370.09	150.25	0.00	4.10	2.17	11.33	0.00	332.09	349.69	8.50	11.90	20.40	370.09	0.00
2017	2,487,519	155	385.57	12.51	0.00	373.06	149.97	0.00	4.10	2.17	13.15	0.00	333.24	352 66	8.50	11.90	20.40	373.06	0.00
2018	2,511,869	155	389.34	13.30	0.00	376.04	149.71	0.00	4.10	2.17	13.15	0.00	331.72	351.14	13.00	11.90	24.90	376.04	0.00
2022	2,609,268	155	404.44	16.46	0.00	387.98	148.69	0.00	4.10	2.17	15.83	10.25	330.73	363.08	13.00	11.90	24.90	387.98	0.00
2027	2,731,018	155	423.31	19.62	0.00	403.69	147.82	0.00	4.10	2.17	15.83	25.96	330.73	378.79	13.00	11.90	24.90	403.69	0.00
2030	2,804,068	155	434.63	19.62	0.00	415.01	148.00	0.00	4.10	2.17	15.83	35.00	331.01	388.11	15.00	11 90	26.90	415.01	0 00

See Footnotes Page 2

NOTE: All water use numbers on this table are projections for planning purposes.
The Limiting Conditions contain the allocations authorized by the SFWMD water use permit.

Footnotes

(a) Annual Average Daily Demand (AADD) Finished Water Projections between 2007 and 2030 assume 155 gpcd total water system demand prior to application of credits (e.g. conservation)

(b) WASD will be undertaking the 20-year water use efficiency plan and expects reductions in per capita water consumption. Water Conservation projections were taken from comments MDWASD submitted to SFWMD on 4/6/2007. Values reflect projections as of 4/6/2007. Real losses in non-revenue water (e.g unaccounted-for-water) are assumed to remain at less than 10%. Conservation must be in accordance with Limiting Condition Nos. 45 and 49 and Exhibit 27 of the 20-year Water Use Permit approved on November 15, 2008.

(c) Tentative Alternative Water Supply Reuse/Reclaimed Water Projects to replace finished water demand. Items 1 and 2 result in credits that reduce finished water demands (demand management).

1. North District WWTP Reuse Projects. This excludes the 5 mgd that will be used by the City of North Miami Beach. See CIE Table 8, Project 29.		2.0 mgd +/-
2. Central District WWTP Reuse Projects. See CIE Table 8, Project 30.		1.0 mgd +/-
	Total (est.)	3.0 mgd +/-

(d) Adjusted after taking credit in finished water demand projections for reductions in finished water use associated with water conservation and reuse (demand management).

(e) South Dade (Raw : Finished) Ratio = 1.0 : 1.0

(f) Membrane Softening (Raw . Finished) Ratio = 1.18 : 1.00 (85% Recovery)

(g) Beginning 2014, withdrawals from SMH WTP are considered offsets from Phase 1 GWR (23 mgd) near SMH (Metro Zoo)

(h) Base condition water use (347.0 mgd) represents values agreed to by SFWMD and MDWASD and demonstrated by modeling to not cause a net increase in water fromt eh regional canal system. Biscayne Aquifer base condition water use of 347.0 mgd equales to 340.34 mgd of finished water annual average daily demand (AADD) **assuming a 1.02 raw-to-finished water ratio.** South District Water Reclamation Plant (SDWRP) Reclaimed Water Projects for Groundwater Recharge (GWR) and for future West District WRP (WDWRP) for Phases 2 and 3 Canal Recharge as shown in the table below and assuming a gallon-for-gallon offset. The applied (MGD) amounts represents total Biscayne Aquifer withdrawals to apply a gallon-for-gallon offset

Phase	SDWWTP Reclaimed (mgd)	Recharge Area	Applied (MGD) Offset	AADD (mgd)	Implementation Year
1	30	S. Miami Heights	23	18	2014
2	28	Alex-Orr	21	20	2020
3	21	Alex-Orr	16	15	2026
Total (est.)	79		60	53	

(i) RO WTP (Raw : Finished) Ratio = 1.33 : 1.00

(j) Lime Softening UFA Blending (Raw : Finished) Ratio = 1.02 : 1.00 (Subject to ongoing field verification and subsequent adjustments.)

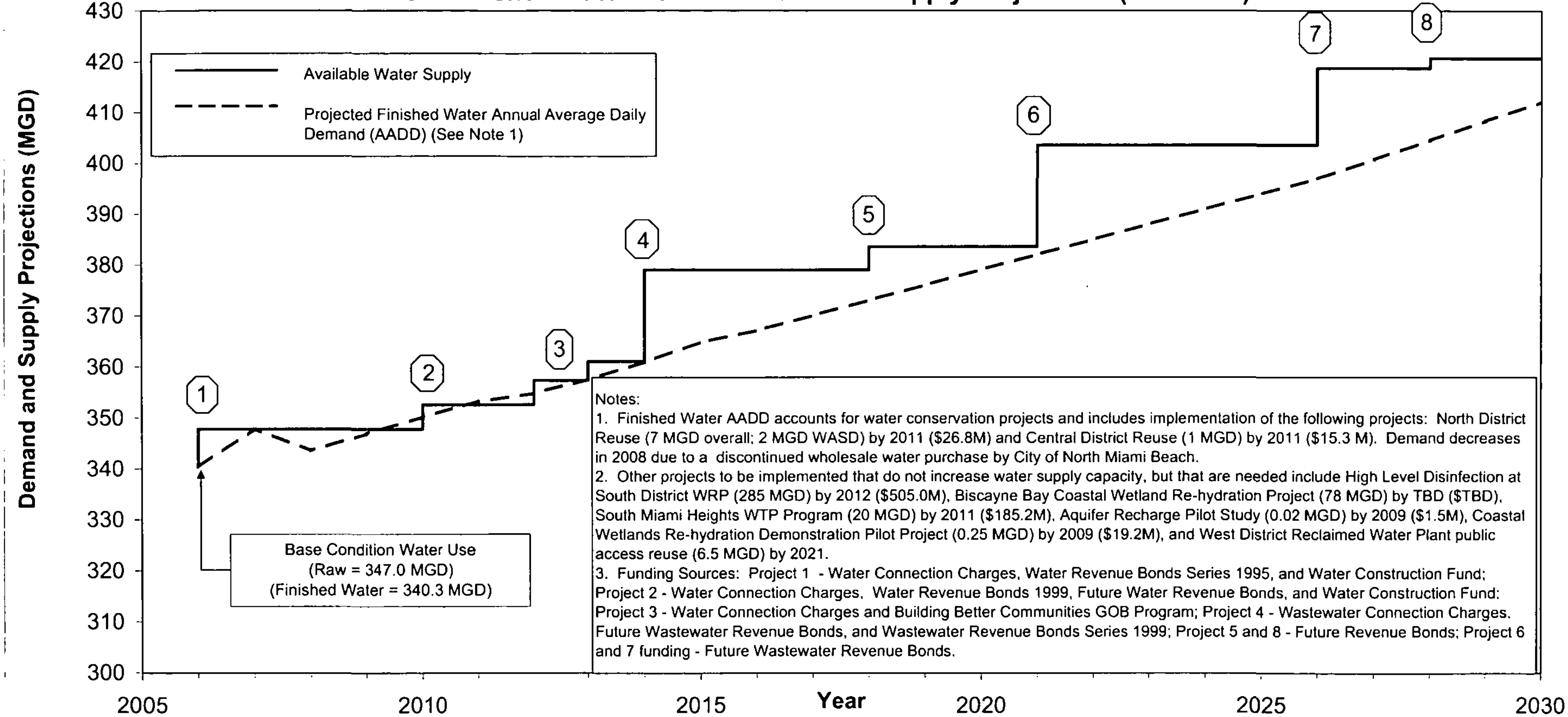
(k) MDWASD is in the process of improving its raw water metering/accounting system, which may result in an adjustment to the historical raw water values.

(l) Exclusive of any Biscayne water occasionally available for ASR

NOTE: All water use numbers on this table are projections for planning purposes.
The Limiting Conditions contain the allocations authorized by the SFWMD water use permit.

Figure 5-1

MDWASD Finished Water Demand and Water Supply Projections (3/25/2008)

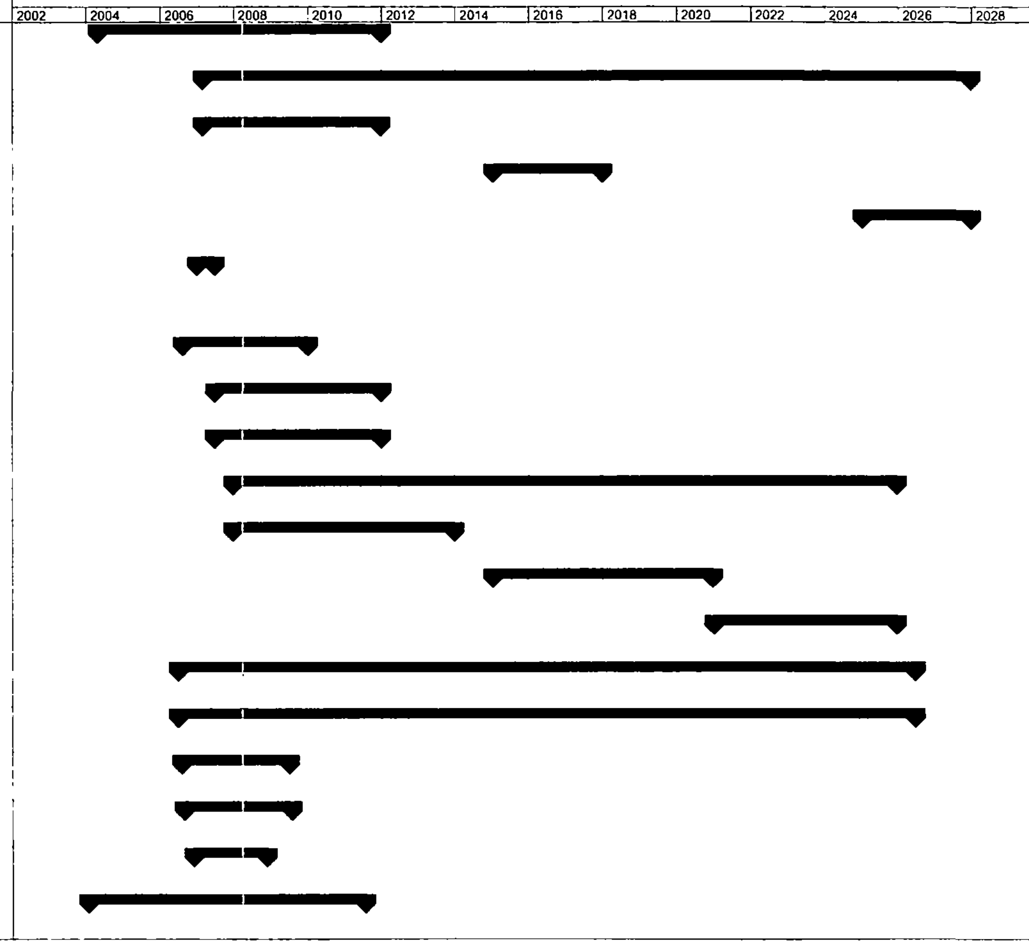


Project Names:

1. ASR Ultraviolet (UV) Disinfection System for ASR Sys. @ W&SW Wellfield (7.2 MGD ASR&bl, $6.4M)
2. Floridan Aquifer Blending Wellfield at Hialeah/Preston (4.7 MGD, $10.3M)
3. Hialeah Floridan Aquifer R.O. W.T.P. Phase 1 (4.72 MGD in 2012, 8.5 MGD in 2013, $93.0M) (WTP Capacity = 10 MGD)
4. South Distr. W.R.P. Groundwater Recharge Ph 1(18.6 MGD, $357.5M)
5. Hialeah Floridan Aquifer R.O. W.T.P. Phase 2 (4.5 MGD, $25.0M) (WTP Capacity = 15.0 MGD)
6. West District W.R.P. Canal Recharge Ph 2 (21 MGD, $482.0M)
7. West District W.R.P. Canal Recharge Ph 3 (16 MGD, $317.5M)
8. Hialeah Floridan Aquifer R.O. W.T.P. Phase 3 (2.0 MGD, $9.7M) (WTP Capacity = 17.5 MGD)

Miami-Dade Reuse and Alternative Water Supply Conceptual Programs (3/25/2008)

ID	Project	Reuse Flow(a) (MGD)	Estimated Capital Cost(b) $(Million)
1	HLD at SDWWTP		505.0
2	Hialeah Floridan Aquifer R.O. WTP (WTP Capacity)		
3	Hialeah Floridan Aquifer R.O. W.T.P. Phase 1 (10.0 MGD)		93.0
7	Hialeah Floridan Aquifer R.O. W.T.P. Phase 2 (5.0 MGD)		25.0
11	Hialeah Floridan Aquifer R.O. W.T.P Phase 3 (2.5 MGD)		9.7
15	ASR Ultraviolet (UV) Disinfection System for ASR System at W&SW Wellfield (7.2 MGD ASR & blending)		6.4
17	Floridan Aquifer Blending at Hialeah/Preston (4.7 MGD)		10.3
21	North District W.W.T.P. Reuse Projects (7.0 MGD)	7	26.8
25	Central District W.W.T.P. Reuse Project (1.0 MGD)	1	15.3
29	Water Reclamation Plants (WRP) Projects		
30	South District W.R.P. Groundwater Recharge Ph 1 (18.6 MGD)	30	357.5
35	West District W.R.P. Canal Recharge Ph 2 (21 MGD)*	28	482
39	West District W.R.P. Canal Recharge Ph 3 (16 MGD)	21	317
43	Miscellaneous Programs/Projects/Studies		
44	Water Conservation/UFW Reduction Program (Up to 19.62 MGD)		25.2
45	Biscayne Bay Coastal Wetlands Rehydr. Pilot.		19.2
46	Aquifer Recharge Pilot Study (20,000 GPD)	0.02	1.0
47	Other AWS Studies/Evaluations		2.0
48	South Miami Heights W.T.P. & Wellfield		185.2

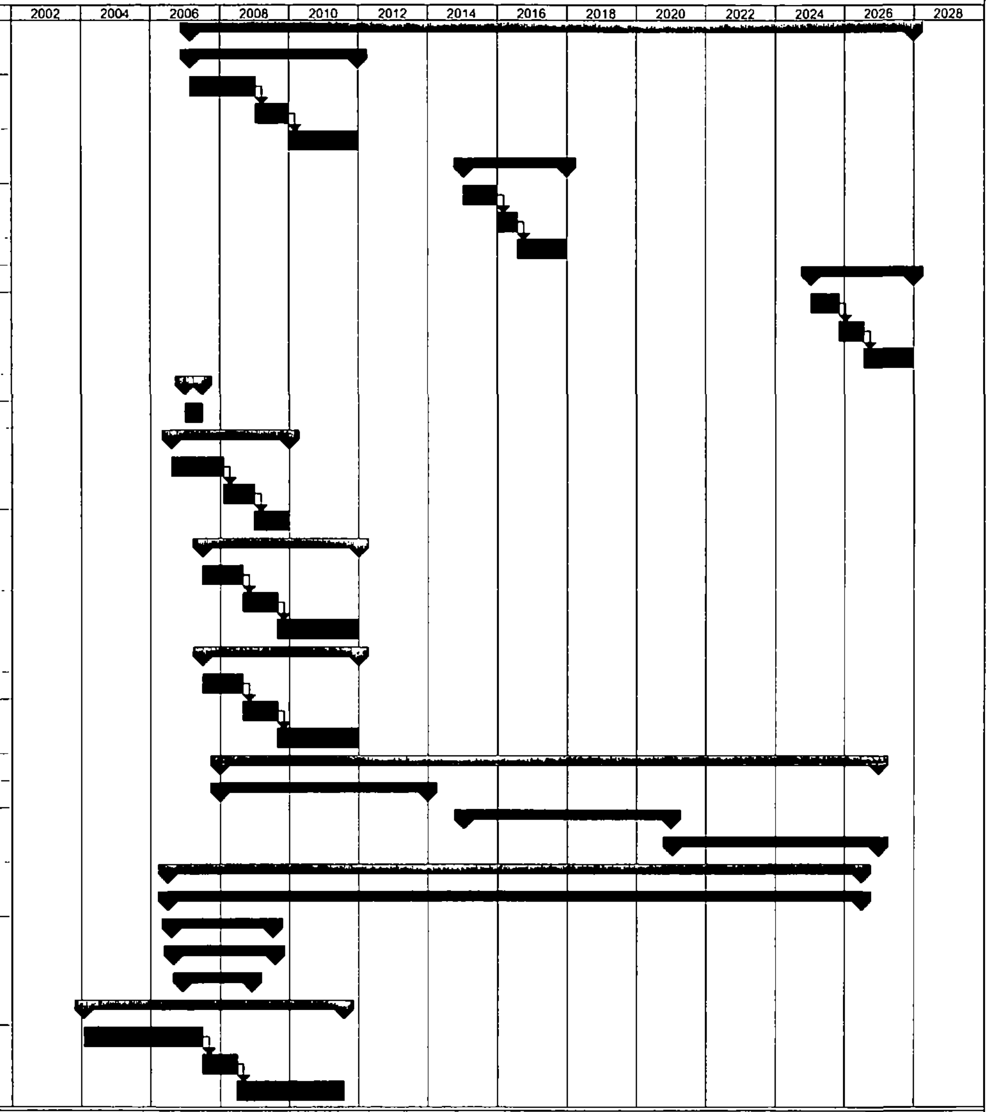


(a) Exclusive of Coastal Wetlands Rehydration Project (78 mgd)
(b) December, 2006 (ENR CCI = 7888)

FIGURE 5-2
Tue 3/25/08
Reuse Program ScheduleRev.mpp

Miami-Dade Reuse and Alternative Water Supply (AWS) Conceptual Programs (3/25/2008)
20-Year Water Use Permit

ID	Task Name	Start	Finish
1	**Hialeah Floridan Aquifer R.O. WTP (WTP Capacity)**	**Thu 3/1/07**	**Thu 12/30/27**
2	**Hialeah Floridan Aquifer R.O. W.T.P Phase 1 (10.0 MGD)**	**Thu 3/1/07**	**Sun 12/25/11**
3	Planning/Design	Thu 3/1/07	Tue 1/13/09
4	Permitting/Procurement	Wed 1/14/09	Tue 12/29/09
5	Construction/Start-up	Wed 12/30/09	Sun 12/25/11
6	**Hialeah Floridan Aquifer R.O. W.T.P. Phase 2 (5 MGD)**	**Thu 1/15/15**	**Sat 12/30/17**
7	Planning/Design	Thu 1/15/15	Wed 12/30/15
8	Permitting/Procurement	Thu 12/31/15	Fri 7/29/16
9	Construction/Start-up	Sat 7/30/16	Sat 12/30/17
10	**Hialeah Floridan Aquifer R.O. W.T.P. Phase 3 (2.5 MGD)**	**Wed 1/15/25**	**Thu 12/30/27**
11	Planning/Design	Wed 1/15/25	Mon 11/10/25
12	Permitting/Procurement	Tue 11/11/25	Wed 7/29/26
13	Construction/Start-up	Thu 7/30/26	Thu 12/30/27
14	**ASR UV Disinfection Sys. for ASR at W&SW Wellfield (7.2 MGD ASR & blending)**	**Mon 1/1/07**	**Fri 6/29/07**
15	Start-up	Mon 1/1/07	Fri 6/29/07
16	**Floridan Aquifer Blending Wellfield at Hialeah/Preston (4.7 MGD)**	**Fri 8/11/06**	**Wed 12/30/09**
17	Planning/Design	Fri 8/11/06	Sun 2/3/08
18	Permitting/Procurement	Mon 2/4/08	Mon 12/29/08
19	Construction/Start-up	Tue 12/30/08	Wed 12/30/09
20	**North District W.W.T.P. Reuse Projects (7.0 MGD)**	**Mon 7/2/07**	**Sun 1/1/12**
21	Planning/Design	Mon 7/2/07	Fri 8/29/08
22	Permitting/Procurement	Sat 8/30/08	Sat 8/29/09
23	Construction/Start-up	Sun 8/30/09	Sun 1/1/12
24	**Central District W.W.T.P. Reuse Projects (1.0 MGD)**	**Mon 7/2/07**	**Sun 1/1/12**
25	Planning/Design	Mon 7/2/07	Fri 8/29/08
26	Permitting/Procurement	Sat 8/30/08	Sat 8/29/09
27	Construction/Start-up	Sun 8/30/09	Sun 1/1/12
28	**Water Reclamation Plants (WRP) Projects**	**Sun 12/30/07**	**Wed 12/30/26**
29	**South District W.R.P. Groundwater Recharge Ph 1 (18.6 MGD)**	**Sun 12/30/07**	**Mon 12/30/13**
34	**West District W.R.P. Canal Recharge Ph 2 (21 MGD)**	**Thu 1/15/15**	**Wed 12/30/20**
38	**West District W.R.P. Canal Recharge Ph 3 (16 MGD)**	**Fri 1/15/21**	**Wed 12/30/26**
42	**Miscellaneous Programs/Projects/Studies**	**Mon 7/3/06**	**Wed 7/1/26**
43	**Water Conservation (Up to 19.62 MGD)**	**Mon 7/3/06**	**Wed 7/1/26**
44	**Biscayne Bay Coastal Wetlands Rehydr. Pilot.**	**Tue 8/8/06**	**Fri 7/10/09**
45	**Aquifer Recharge Pilot Study (20,000 GPD)**	**Fri 9/1/06**	**Mon 8/3/09**
46	**Other AWS Studies/Evaluations**	**Tue 12/5/06**	**Wed 12/3/08**
47	**South Miami Heights W.T.P. & Wellfield**	**Wed 1/28/04**	**Sun 7/31/11**
48	Planning/Design	Wed 1/28/04	Sat 6/30/07
49	Permitting/Procurement	Sun 7/1/07	Tue 6/24/08
50	Construction/Start-up	Wed 6/25/08	Sun 7/31/11



LEGEND: STUDY PLANNING/DESIGN PERMITTING/PROCUREMENT CONSTRUCTION/START-UP

CDM

FIGURE 5-3
Tue 3/25/08
WaterSupplyProjects.mpp

5.2.1 Hialeah Floridan Aquifer R.O. W.T.P

Start 2007
Finish 2027

A new upper Floridan aquifer reverse osmosis water treatment plant is to be constructed. The exact location of this plant has not yet been determined, but is expected to be in the northern part of the County (i.e., Hialeah). Ownership, financing, and operational issues associated with the RO WTP is the subject of a Joint Participation Agreement (JPA) between the County and the City of Hialeah, which was approved by the Miami-Dade County Board of County Commissioners on July 26, 2007. Regardless of the outcome, the WTP will directly utilize the Floridan Aquifer as the alternative water supply using the RO treatment to remove salt. The County is currently preparing a Notice to Professional Consultants (NTPC) to select the design professional for the project. It is anticipated that this plant will be constructed to an initial capacity and its capacity expanded, as required, in three phases, as described below.

5.2.1.1 Hialeah Floridan Aquifer R.O. W.T.P. Phase 1 (10.0 MGD)

Start 2007
Finish 2011

Phase 1 planning and design of this WTP will begin in the middle of 2007, with construction and start-up extending to 2011. The Phase 1 production for this plant will be 10 mgd. The Phase 1 cost is estimated at $93 million.

5.2.1.2 Hialeah Floridan Aquifer R.O. W.T.P. Phase 2 (5.0 MGD)

Start 2015
Finish 2017

Phase 2 planning and design of this WTP will begin in the middle of 2015, with construction and start-up extending to 2017. The Phase 2 production for this plant will be 5 mgd. The Phase 2 cost is estimated at $25 million.

5.2.1.3 Hialeah Floridan Aquifer R.O. W.T.P. Phase 3 (2.5 MGD)

Start 2025
Finish 2027

Phase 3 planning and design of this WTP will begin in the middle of 2025, with construction and start-up extending to 2027. The Phase 3 production for this plant will be 2.5 mgd. The Phase 3 cost is estimated at $9.7 million.

5.2.2 ASR Ultraviolet (UV) Disinfection System for ASR System at W&SW Wellfield (7.2 MGD ASR and blending)

Start 2007
Finish 2007

The Upper Floridan Aquifer wells are in service and the blending of brackish and fresh water is underway in 2007. The anticipated UFA quantity is 7.2 MGD of blending AADD capacity to the County's water supply. This project uses the brackish Floridan Aquifer water to blend with the fresh Biscayne Aquifer raw water. MDWASD also anticipates using these wells for storage of fresh Biscayne Aquifer water in the Floridan Aquifer during the wet season for extraction and use in the dry season. To do so, MDWASD designed a ultra-violet (UV) light disinfection system for each ASR site. Project construction costs totaled $6.4 million (for the UV system).

5.2.3 Floridan Aquifer Blending at Hialeah/Preston (4.7 MGD)

Start 2006
Finish 2009

MDWASD is planning on constructing two Floridan Aquifer blending wells to supply raw water to the Hialeah/Preston WTP complex. This project will further increase AADD capacity by 4.7 MGD by blending the Floridan Aquifer water with the raw water supply at an estimated cost of $10.3 million by 2009. This project is currently under design by MDWASD.

5.2.4 North District W.W.T.P. Reuse Projects (7.0 MGD)

Start 2007
Finish 2011

This project is a 7 MGD reclaimed water (e.g. purple pipe) irrigation project at the NDWWTP with an estimated cost of $26.8 million and its completion is scheduled for 2011. Part of the reclaimed water will be pumped to the City of North Miami Beach. Approximately 2 MGD will be used to replace a current potable water irrigation in the MDWASD service area. MDWASD has selected a Consultant to design the project.

5.2.5 Central District W.W.T.P. Reuse Project (1.0 MGD)

Start 2007
Finish 2011

This project is a 1 MGD reclaimed water (e.g. purple pipe) irrigation project at the CDWWTP with an estimated cost of $15.3 million and its completion is scheduled for 2011. The project will replace potable water irrigation at Crandon Park and certain areas of Key Biscayne as a potable water credit. MDWASD has prepared a NTPC for selecting a Consultant to design the project, and will take the requests to advertise to the December 2007 Board of County Commissioners.

5.2.6 Water Reclamation Plants (WRP) Projects

5.2.6.1 South District W.R.P. Groundwater Recharge Ph 1 (18.6 MGD)

Start 2007
Finish 2013

Phase 1 of the Groundwater Replenishment (GWR) project upstream of the South Miami Heights WTP is scheduled to be ready for implementation by 2014 expanding the finished water AADD by 18.6 MGD at a cost of $357.5 million. MDWASD has selected a Consultant to design the project. Design could be completed by mid-2009.

This potential certified project will provide advanced treatment of 30 MGD of secondary effluent to produce approximately 23 MGD of highly treated reclaimed water that will be piped to replenish ground water for water supply purposes. The technologies to be used include micro-filtration and reverse osmosis which filters out small particles and uses ultraviolet light for disinfection. High quality water would be piped to areas upgradient of the proposed South Miami Heights wellfield and discharged into the groundwater through underground trenches. Based upon this replenishment of water, more water can be withdrawn and treated for drinking water purposes at this treatment plant. This approach will enable the continuous use of the South Miami Heights WTP, which will be constructed over the next four to five years.

5.2.6.2 West District W.R.P. Canal Recharge Ph 2 (21 MGD)

Start 2015
Finish 2020

Phase 2 of the GWR for the Alexander-Orr WTP will add 21 MGD to the water supply with total costs estimated at $482 million. MDWASD recently completed the Interim Wastewater Facilities Master Plan, which recommends the establishment of the West District Water Reclamation Plant (WDWRP), combined with wastewater storage facilities for peak wet weather conditions in the Central West area of the County. MDWASD is looking at the option of constructing a new West District Water Reclamation Plant (WDWRP) to produce high quality recharge water to offset groundwater withdrawals in the Alexander Orr subarea wellfields namely, increased withdrawal at the Southwest Wellfield. This plant is scheduled to come on line in 2020 to provide additional water supply beginning in 2021.

5.2.6.3 West District W.R.P. Canal Recharge Ph 3 (16 MGD)

Start 2021
Finish 2025

Phase 3 of the GWR at Alexander-Orr will add 16 MGD to the water supply and is scheduled to be in operation in 2026 at a cost of $317 million. Originally, the Phase 3 GWR would be supplied by the SDWWTP. This plan was modified by the recently completed MDWASD Interim Wastewater Facilities Master Plan, which recommends the establishment of the West District Water Reclamation Plant (WDWRP), combined with wastewater storage facilities for peak wet weather conditions in the Central West area of the County. The WDWRP will produce high quality recharge water to offset groundwater withdrawals in the Alexander Orr subarea wellfields namely, increased withdrawal at the Southwest Wellfield. This plant is scheduled to come on line by 2026.

5.2.7 Miscellaneous Projects

5.2.7.1 Water Conservation/Non-Revenue Potential Water Loss Reduction Program (Up to 19.62 MGD)

Start 2006
Finish 2026

These projects serve to reduce the demand for water through demand management. They include, but are not limited to, various water conservation projects currently being implemented by MDWASD. The County's Water Use Efficiency Five-Year Plan was approved by the Board for the next five years and has been expanded to cover the next 20 years with a projected reduction in demand of 19.62 MGD over that time period. That represents more than 10% of the additional supply required to meet future demands. Examples of ongoing conservation projects include the bathroom and kitchen retrofits program, Miami-Dade green lodging and restaurant program, low income seniors full retrofit program, rebates for high efficiency toilets and washers, and landscaping irrigation evaluations. Similarly, the Non-Revenue Real Water Loss Program identified potential reductions in water demand of as much as 14.25 MGD by 2030 through demand management activities.

5.2.7.2 Biscayne Bay Coastal Wetlands Rehydration Pilot

Start 2006
Finish 2014

The Coastal Wetland Rehydration (CWR) program is an example of a project that will serve to reach effluent reuse goals of Miami-Dade County. The 0.25 MGD CWR demonstration project is estimated to cost $19.2 million with a project end date in 2009, whereas costs for the full scale of approximately 78 MGD plant are estimated at $621 million with a project completion date in 2014. The wetland rehydration process requires thorough removal of nutrients from the reuse water and is consistent with the Comprehensive Everglades Restoration Program (CERP), which envisions reused wastewater as a practical water supply source for this purpose. A pilot project to test different treatment technologies and to gain insights into the biological and ecological response of typical wetlands to highly treated effluent has been contemplated in the CERP and is a current requirement in the Agreement with the SFWMD. The results of the demonstration project will help to optimize the treatment system and the preferred areas for rehydration to maximize the benefits to the wetlands and to the Bay. The demonstration project advances the current CERP schedule by several years and provides a unique opportunity to accelerate this aspect of the Everglades' restoration. Currently, the Department and the SFWMD are reevaluating this project's scope and size. The Agreement with the SFWMD will be modified when the project's scope is agreed upon.

5.3 20-Year Work Plan and Capital Improvement Plan

As demonstrated in the previous sections, the Alternative Water Supply Plan being proposed by the County should meet the increased water demands through 2030. As a confirmation that the County is committed to fund these projects, the projects for the 20-Year Work Plan have been included in the County's Capital Improvement Element. A copy of Tables 8 and 12 from the County's Capital Improvement Element is contained within Appendix D and summarized in **Table 5-3** for the next 5 years (2008 - 2012).

5.4 Other Water Suppliers Future Plans

5.4.1 City of North Miami

The City of North Miami has plans for a two-phase expansion of the Winson WTP. Phase I, to be concluded by 2010, will add an additional 8.5 MGD capacity from a Reverse Osmosis (RO) system. Phase II will add additional membrane treatment to the RO facility, which will create an additional 4.0 MGD capacity. The proposed improvements would total an increase of 12.5 MGD to the capacity of the WTP.

The City has also identified that the Floridan aquifer would be the only water resource alternative for the increase in demand. Therefore, the City plans to construct an additional ten Floridan wells to supply the RO Facility. The City will add a raw water transmission main from the wells to the WTP.

A third expansion plan is the addition of a 5 MG storage tank, to be located on a vacant parcel owned by the City's new Biscayne Landing development. The City may decide to forgo with the construction of the tank and utilize the parcel for another smaller RO Treatment facility or a reuse facility.

These water supply system improvements planned by the City of North Miami will provide water supply for those portions of unincorporated Miami-Dade County which are currently served by the City of North Miami.

5.4.2 City of North Miami Beach

The Norwood-Oeffler WTP was recently (2006) expanded to a total capacity of 32 MGD. The expansion included 2 MG and 5 MG storage tanks for finished water. The City is also planning for a future expansion by 2015 to further increase the capacity of the WTP to a total of 42 MGD. The City also recently constructed four new Floridan wells and five new Biscayne wells which supply the WTP.

These water supply system improvements planned by the City of North Miami Beach will provide water supply for those portions of unincorporated and incorporated Miami-Dade County which are currently served by the City of North Miami Beach.

Table 5-3 MDWASD Water/Alternative Water Supply CIE Program

Project Name	Expenditure[a] (In Millions of Dollars)						Six Year Totals
	2007/ 2008	**2008/ 2009**	**2009/ 2010**	**2010/ 2011**	**2011/ 2012**	**2012/ 2013**	
Sewer Facilities							
Village of Key Biscayne Reuse Distr. System	2.85	0.00	0.00	0.00	0.00	0.00	2.85
Biscayne Bay Coastal Wetlands Rehydr. Pilot.	0.11	2.98	9.12	5.56	0.00	0.00	17.77
Aquifer Recharge Pilot Study (20,000 gpd)	0.24	2.00	0.00	0.00	0.00	0.00	2.24
North District W.W.T.P. Reuse Projects (7.0 mgd)	1.53	6.17	12.93	6.16	0.00	0.00	26.79
Central District W.W.T.P. Reuse Project (1.0 mgd)	0.90	3.36	7.03	4.00	0.00	0.00	15.29
South District W.R.P. Groundwater Recharge Ph 1 (18.6 mgd)	8.93	17.87	34.48	78.81	121.40	96.00	357.49
West District W.R.P. Canal Recharge Ph 2 (21 mgd)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
West District W.R.P. Canal Recharge Ph 3 (16 mgd)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Biscayne Bay Coast. Wetlands Reh. (75.7 mgd)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Water Facilities							
South Miami Heights W.T.P. & Wellfield	13.14	19.12	26.58	12.92	12.48	0.00	84.24
ASR Ultraviolet (UV) Disinfection System for ASR Syst. @W&SW Wellfield(7.2 mgd ASR&bl)	6.83	0.00	0.00	0.00	0.00	0.00	6.83
Floridan Aquifer Blending at Hialeah/Preston(4.7 mgd)	0.82	2.57	6.60	0.00	0.00	0.00	9.99
Hialeah Floridan Aquifer R.O. W.T.P. Phase 1 (10.0 mgd)	10.49	18.29	34.44	26.67	2.66	0.00	92.55
Hialeah Floridan Aquifer R.O. W.T.P. Phase 2 (5.0 mgd)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hialeah Floridan Aquifer R.O. W.T.P. Phase 3 (2.5 mgd)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Totals	**45.84**	**72.36**	**131.1 8**	**134.1 2**	**136.54**	**96.00**	**616.04**

Source: MDWASD CDMP CIE
[a] December, 2006 Dollars (ENR CCI=7888)

5.4.3 City of Homestead

The City of Homestead is currently in the process of analyzing the different ways of improving or expanding their systems to increase capacity as the population within its municipal boundary and in parts of unincorporated Miami-Dade County where it provides water increases. The two major alternatives are either upgrading the existing well pumping capacity or installing additional wells. However, the City has not yet agreed on any type of improvements, and therefore no additional information can be provided at this time.

5.4.4 Florida City

Due to the fact that the SFWMD is currently adjusting any further withdrawals from the Biscayne aquifer, the City plans to increase its Water Treatment Plant capacity by installing additional wells and withdrawing water from the Floridan aquifer, which will require membrane filtration treatment and chlorination prior to distribution. The timeline for this expansion is not yet known.

5.5 Conclusion

In conclusion, and as **Table 5-4** shows, MDWASD has prepared a work plan which demonstrates that Department (e.g. public) facilities are available to meet the projected growth demands (which reflect credits for conservation and for reuse/reclaimed water). As noted on the table, regarding Permitted Amounts, these amounts are in accordance with the 20-year Water Use Permit approved by SFWMD on November 15, 2007. This permit has 58 limiting conditions, which include numerous reporting requirements. The permit and the limiting conditions are located in Appendix H.

Table 5-4 Comparison of Facility Capacity and Anticipated Future Permitted Amount

	2007	2012	2017	2022	2027	2030
MDWASD Population Served	2,250,944	2,349,221	2,487,519	2,609,268	2,731,018	2,804,068
Average Daily Demand (Finished) MGD[1]	347.81	356.36	373.06	387.98	403.69	415.01
Demand per Capita Finished (GPCD) [1]	154.52	151.69	149.97	148.69	147.82	148.00
Available Facility Capacity (MGD)	483.61	495.90	495.90	495.90	495.90	495.90
Facility Capacity Surplus (Deficit)[2]	135.80	139.54	122.84	107.92	92.21	80.89
Permitted Amount (MGD Annual Avg.)[3]	347.81	356.36	373.06	387.98	403.69	415.01
Permitted Surplus MGD (Deficit)	0	0	0	0	0	0

MGD = Million Gallons per Day

1. Reflects credits for water conservation
2. Calculated by subtracting Average Daily Demand (finished) from Available Facility Capacity
3. The permitted amount are from Exhibit 13B from the Miami-Dade Water and Sewer 20-Year Water Use Permit, issued on November 15, 2007.

APPENDIX A

Wellfield Data Tables

EXHIBIT A-1
Summary of Construction and Capacity in the Hialeah-Preston Subarea Wellfields
Wellfield Operational Plan, South Florida Water Management District

Well Number	Status if Not Active	Date Constructed	Diameter (Inches)	Total Depth (feet)	Casing Depth (feet)	Pump Type[1]	Capacity[1] (gpm)	Wellfield Capacity (gpm)[1]	Wells - Designed Installed Capacity (MGD)[1]	Wellfield Designed Installed Capacity (MGD)[1]
Hialeah Wellfield										
11		1936	14	115	80	C	2900	8,700	4.18	**12.54**
12		1936	14	115	80	C	2900		4.18	
13		1936	14	115	80	C	2900		4.18	
John E. Preston Wellfield										
1 (24)		1966	42	107	66	T	5000	37,000	7.20	**53.28**
2 (25)		1966	42	107	66	T	5000		7.20	
3 (26)		1966	42	107	66	T	5000		7.20	
4 (27)		1966	42	107	66	T	5000		7.20	
5 (28)		1966	42	107	66	T	5000		7.20	
6 (29)		1966	42	107	66	T	5000		7.20	
7 (30)		1972	42	107	66	T	7000		10.08	
Miami Springs (Lower) Wellfield										
1		1924	14	115	80	C	3000	23,000	4.32	**33.12**
2		1924	14	115	80	C	2500		3.60	
3		1924	14	115	80	C	2500		3.60	
4		1924	14	115	80	C	2500		3.60	
5		1924	14	115	80	C	2500		3.60	
6		1924	30	115	80	T	5000		7.20	
7		1924	14	115	80	C	2500		3.60	
8		1924	14	115	80	C	2500		3.60	
Miami Springs (Upper) Wellfield										
9		1949	14	115	80	C	2500	32,070	3.60	**46.18**
10		1954	14	115	80	C	2900		4.18	
14		1936	30	115	80	C	4170		6.00	
15		1945	14	115	80	C	2500		3.60	
16		1936	14	115	80	C	2500		3.60	

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Well Number	Status if Not Active	Date Constructed	Diameter (Inches)	Total Depth (feet)	Casing Depth (feet)	Pump Type[1]	Capacity[1] (gpm)	Wellfield Capacity (gpm)[1]	Wells - Designed Installed Capacity (MGD)[1]	Wellfield Designed Installed Capacity (MGD)[1]
17		1936	14	115	80	C	2500		3.60	
18		1945	14	115	80	C	2500		3.60	
19		1945	14	115	80	C	2500		3.60	
20		1945	14	115	80	C	2500		3.60	
21		1945	14	115	80	C	2500		3.60	
22		1945	14	115	80	C	2500		3.60	
23		1949	14	115	80	C	2500		3.60	
Northwest Wellfield[5]										
1 (31)		1980	48	80	46	T	6950	103,800	10.00	**149.35**
2 (32)		1980	48	80	46	T	6950		10.00	
3 (33)		1980	48	80	46	T	6950		10.00	
4 (34)		1980 & 1999	40	100	57	T	6950		10.00	
5 (35)		1980	48	80	46	T	6950		10.00	
6 (36)		1980	48	80	46	T	6950		10.00	
7 (37)		1980	48	80	46	T	6950		10.00	
8 (38)		1980	48	80	46	T	6950		10.00	
9 (39)		1980	48	80	46	T	6950		10.00	
10 (40)		1980 & 1999	40	100	57	T	6500		9.35	
11 (41)		1980	48	80	46	T	6950		10.00	
12 (42)		1980	48	80	46	T	6950		10.00	
13 (43)		1980 & 1999	40	100	57	T	6950		10.00	
14 (44)		1980 & 1999	40	100	57	T	6950		10.00	
15 (45)		1980 & 1999	40	100	57	T	6950		10.00	
Total Capacities - Biscayne Aquifer with NW Wellfield Pumps at Low Speed							**204,570**	**204,570**	**294.47**	**294.47**

EXHIBIT A-1
Summary of Construction and Capacity in the Hialeah-Preston Subarea Wellfields
Wellfield Operational Plan, South Florida Water Management District

Well Number	Status if Not Active	Date Constructed	Diameter (Inches)	Total Depth (feet)	Casing Depth (feet)	Pump Type[1]	Capacity[1] (gpm)	Wellfield Capacity (gpm)[1]	Wells - Designed Installed Capacity (MGD)[1]	Wellfield Designed Installed Capacity (MGD)[1]
Emergency Wellfield [6]										
Medley Wellfield										
1	*Stand-by*	*N/A*	*42 - 48*	*100 - 115*	*42 - 48*	*T*	*7,500*	*30,000*	*10.80*	***43.20***
2	*Stand-by*	*N/A*	*42 - 48*	*100 - 115*	*42 - 48*	*T*	*7,500*		*10.80*	
5	*Stand-by*	*N/A*	*42 - 48*	*100 - 115*	*42 - 48*	*T*	*7,500*		*10.80*	
6	*Stand-by*	*N/A*	*42 - 48*	*100 - 115*	*42 - 48*	*T*	*7,500*		*10.80*	

Notes:

1. gpm = gallons per minute; MGD = million gallons per day; C = Centrifugal; T = Turbine; N/A = Not Available

2. Initial source for capacity information was extracted from the 2002 Water Facilities Master Plan. After site visits from MSA and documents provided by MDWASD well operator, conflicting information was provided to senior MDWASD staff for verification. When required, changes were made accordingly.

3. Information other than capacity information is based on data included in the South Dade Water Use Permit provided by MDWASD staff.

4. Well number in parenthesis represent the number of the wells as previously provided to the SFWMD in Item II-2A, Table A - Well Description Tables.

5. Capacity of Northwest Wellfield assumes that only the low speed flow rate of 10 MGD can be achieved from each well with all wells pumping (except for 9.35 for well #10.) If all pumps were to be run at high speed, the capacity of the wellfield would increase by an additional 71.59 MGD for a total of 220.94 MGD.

6. Wells in this wellfield had been abandoned. They were recently restored with the purpose of using them only for emergency purposes.

EXHIBIT A-2
Summary of Construction and Capacities in the Alexander Orr Subarea Wellfields
Wellfield Operational Plan, South Florida Water Management District

Well Number	Status if Not Active	Date Constructed	Diameter (Inches)	Total Depth (feet)	Casing Depth (feet)	Pump Type[1]	Capacity[1] (gpm)	Wellfield Capacity (gpm)[1]	Wells - Designed Installed Capacity (MGD)[1]	Wellfield Designed Installed Capacity (MGD)[1]
Alexander Orr Wellfield										
1		1949	16	100	40	T	4170	51,690	6.00	**74.40**
2		1949	16	100	40	T	4170		6.00	
3		1949	16	100	40	T	4170		6.00	
4		1949	16	100	40	T	4170		6.00	
5		1952	16	100	40	T	4170		6.00	
6		1952	16	100	40	T	4170		6.00	
7		1952	16	100	40	T	4170		6.00	
8		1952	16	100	40	T	7500		10.80	
9		1964	24	100	50	T	7500		10.80	
10		1964	24	100	50	T	7500		10.80	
Snapper Creek Wellfield										
21		1976	24	108	50	T	6940	27,760	10.00	**40.00**
22		1976	24	108	50	T	6940		10.00	
23		1976	24	108	50	T	6940		10.00	
24		1976	24	108	50	T	6940		10.00	
Southwest Wellfield										
11		1953	20	100	40	T	4900	111,900	7.06	**161.16**
12		1953	20	100	40	T	4900		7.06	
13		1953	20	100	40	T	4900		7.06	
14		1953	20	100	40	T	4900		7.06	
15		1953	20	100	40	T	4900		7.06	
16		1953	20	100	40	T	4900		7.06	
17		1959	24	100	35	T	7500		10.80	
18		1959	24	100	35	T	7500		10.80	
19		1959	24	100	35	T	7500		10.80	

EXHIBIT A-2

Summary of Construction and Capacities in the Alexander Orr Subarea Wellfields

Wellfield Operational Plan, South Florida Water Management District

Well Number	Status if Not Active	Date Constructed	Diameter (Inches)	Total Depth (feet)	Casing Depth (feet)	Pump Type[1]	Capacity[1] (gpm)	Wellfield Capacity (gpm)[1]	Wells - Designed Installed Capacity (MGD)[1]	Wellfield Designed Installed Capacity (MGD)[1]
20		1959	24	100	35	T	7500		10.80	
25		1982	24	104	54	T	7500		10.80	
26		1982	24	104	54	T	7500		10.80	
27		1982	24	104	54	T	7500		10.80	
28		1982	24	104	54	T	7500		10.80	
38 (32)		1997	48	88	33	T	7500		10.80	
39 (33)		1997	48	88	33	T	7500		10.80	
40 (34)		1997	48	88	33	T	7500		10.80	
West Wellfield										
29		1994	24	70	35	T	7500	22,500	10.80	**32.40**
30		1994	24	70	35	T	7500		10.80	
31	Stand-by	1994	24	70	35	T	7500		10.80	
Total Capacities - Biscayne Aquifer							**213,850**	**213,850**	**307.96**	**307.96**

Floridan Aquifer ASR Wells										
West Wellfield										
33 - ASR 1 (35)	Used for blending, not for injection.	1996	30	1300	850		3500		5.04	**15.12**
34 - ASR 2 (36)	Used for blending, not for injection.	1997	30	1250	845		3500		5.04	
35 - ASR 3 (37)	Used for blending, not for injection.	1997	30	1210	835		3500		5.04	

EXHIBIT A-2
Summary of Construction and Capacities in the Alexander Orr Subarea Wellfields
Wellfield Operational Plan, South Florida Water Management District

Well Number	Status if Not Active	Date Constructed	Diameter (Inches)	Total Depth (feet)	Casing Depth (feet)	Pump Type[1]	Capacity[1] (gpm)	Wellfield Capacity (gpm)[1]	Wells - Designed Installed Capacity (MGD)[1]	Wellfield Designed Installed Capacity (MGD)[1]
Southwest Wellfield										
36 - ASR 4 (38)	Inactive	1997	30	1200	765		3500		5.04	**10.08**
37 - ASR 5 (39)	Inactive	1998	30	1200	760		3500		5.04	

Notes:

1. gpm = gallons per minute; MGD = million gallons per day; C = Centrifugal; T = Turbine; N/A = Not Available
2. Initial source for capacity information was extracted from the 2002 Water Facilities Master Plan. After site visits from MSA and documents provided by MDWASD well operator, conflicting information was provided to senior MDWASD staff for verification. When required, changes were made accordingly.
3. Information other than capacity information is based on data included in the South Dade Water Use Permit provided by MDWASD staff.
4. Well number in parenthesis represent the number of the wells as previously provided to the SFWMD in Item II-2A, Table A - Well Description Tables.

EXHIBIT A-3
Summary of Construction and Capacity in the South Dade Subarea Wellfields
Wellfield Operational Plan, South Florida Water Management District

Well Number	Status if Not Active	Date Constructed	Diameter (Inches)	Total Depth (feet)	Casing Depth (feet)	*Pump Type*[1]	Capacity[1] (gpm)	Wellfield Capacity (gpm)[1]	Wells - Designed Installed Capacity (MGD)[1]	Wellfield Designed Installed Capacity (MGD)[1]
Existing Wellfields in South Dade										
Elevated Tank Wellfield										
1		1982	12	40	35	T	1500	3,000	2.16	4.32
2		1996	16	50	40	T	1500		2.16	
Everglades Wellfield										
1A		2000	18	55	45	T	1500	2,900	2.16	4.18
2A		2001	18	55	42	T	700		1.01	
3A		2000	18	50	40	T	700		1.01	
Leisure City Wellfield										
2		1953	6	30	25	T	450	4,250	0.65	6.12
3		1957	12	35	30	T	1500		2.16	
4		1966	12	35	30	T	800		1.15	
5		1971	12	40	35	T	1500		2.16	
Naranja Wellfield										
1		1975	12	40	35	T	800	800	1.15	1.15
Newton Wellfield										
1A		2000	18	65	50	T	1500	3,000	2.16	4.32
2B		2001	18	66	53	T	1500		2.16	
Total Capacities - Existing Wells								13,950	20.09	20.09
Proposed (South Miami Heights) Wellfields[4]										
Caribbean Park Wellfield										

EXHIBIT A-3
Summary of Construction and Capacity in the South Dade Subarea Wellfields
Wellfield Operational Plan, South Florida Water Management District

Well Number	Status if Not Active	Date Constructed	Diameter (Inches)	Total Depth (feet)	Casing Depth (feet)	*Pump Type*[1]	Capacity[1] (gpm)	Wellfield Capacity (gpm)[1]	Wells - Designed Installed Capacity (MGD)[1]	Wellfield Designed Installed Capacity (MGD)[1]
1		*Proposed*	*N/A*	*N/A*	*N/A*	*T*	*1050*	*2,100*	*1.50*	*3.00*
2		*Proposed*	*N/A*	*N/A*	*N/A*	*T*	*1050*		*1.50*	
Former Plant Wellfield										
1		*Proposed*	*N/A*	*N/A*	*N/A*	*T*	*2100*	*2,100*	*3.00*	*3.00*
Roberta Hunter Park Wellfield										
1		*Proposed*	*N/A*	*N/A*	*N/A*	*T*	*1050*	*7,350*	*2.00*	*14.00*
2		*Proposed*	*N/A*	*N/A*	*N/A*	*T*	*1050*		*2.00*	
3		*Proposed*	*N/A*	*N/A*	*N/A*	*T*	*1050*		*2.00*	
4		*Proposed*	*N/A*	*N/A*	*N/A*	*T*	*1050*		*2.00*	
5		*Proposed*	*N/A*	*N/A*	*N/A*	*T*	*1050*		*2.00*	
6		*Proposed*	*N/A*	*N/A*	*N/A*	*T*	*1050*		*2.00*	
7		*Proposed*	*N/A*	*N/A*	*N/A*	*T*	*1050*		*2.00*	
Rock Pit Park Wellfield										
1		*Future*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
2		*Future*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*

Notes:
1. gpm = gallons per minute; MGD = million gallons per day; C = Centrifugal; T = Turbine; N/A = Not Available
2. Initial source for capacity information was extracted from the 2002 Water Facilities Master Plan. After site visits from MSA and documents provided by MDWASD well operator, conflicting information was provided to senior MDWASD staff for verification. When required, changes were made accordingly.
3. Information other than capacity information is based on data included in the South Dade Water Use Permit provided by MDWASD staff.
4. Proposed wells, already designed and permitted (except for Rock Pit Park wells which are only at the conceptual design level).

APPENDIX B

Miami-Dade County Capital Improvements Element Tables 8 and 12 (Partial)

EXHIBIT B-1
CIE TABLE 8 (Partial)
SEWER FACILITIES

April 2007

Project Name and Location	Purpose* / Year of Completion	Prior Years	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	Six Year Totals	Future Years	Project Totals	Funding Source
		Expenditures / Revenues (In Millions of Dollars)										
Village of Key Biscayne Reuse Distr.System	3/2008	4.15	2.85	0.00	0.00	0.00	0.00	0.00	2.85	0.00	7.00	835,914
Village of Key Biscayne		7.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.00	
Biscayne Bay Coastal Wetlands Rehydr. Pilot	2/2011	1.43	0.11	2.98	9.12	5.56	0.00	0.00	17.77	0.00	19.20	521,914
Systemwide		4.51	0.00	0.00	14.69	0.00	0.00	0.00	14.69	0.00	19.20	961
Aquifer Recharge Pilot Study (20,000 gpd) **	2/2010	0.48	0.24	2.00	0.00	0.00	0.00	0.00	2.24	0.00	2.72	521,914
Systemwide		0.72	0.00	2.00	0.00	0.00	0.00	0.00	2.00	0.00	2.72	
North District W.W.T.P. Reuse Projects (7mgd)	2/2012	0.01	1.53	6.17	12.93	6.16	0.00	0.00	26.79	0.00	26.80	521,914,
W.W. System - North District Area		1.54	6.17	0.00	19.09	0.00	0.00	0.00	25.26	0.00	26.80	961
Central Distr. W.W.T.P. Reuse Project (1mgd)	2/2012	0.01	0.90	3.36	7.03	4.00	0.00	0.00	15.29	0.00	15.30	521,914,
W.W. System - Central District Area		0.91	3.36	0.00	11.03	0.00	0.00	0.00	14.39	0.00	15.30	961
South Distr. W.R.P. Groundwater Recharge Ph 1 (18.6 mgd)	2/2013	0.01	8.93	17.87	34.48	78.81	121.40	96.00	357.49	0.00	357.50	521,961,
W.W. System - South District Area		12.01	6.13	8.67	113.29	0.00	217.40	0.00	345.49	0.00	357.50	
West District W.R.P. Canal Recharge Ph 2 (21 mgd)	2/2020	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	298.00	298.00	961
W.W. System - South District Area		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	298.00	298.00	
West District W.R.P. Canal Recharge Ph 3 (16 mgd)	2/2025	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	217.50	217.50	961
W.W. System - South District Area		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	217.50	217.50	
Biscayne Bay Coast.Wetlands Reh.(75.7 mgd)	2/2021	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	621.00	621.00	1171
W.W. Systemwide		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	621 00	621.00	
TOTALS		6.09	14.56	32.38	63.56	94.53	121.40	96.00	422.43	1,136.50	1,565.02	
		19.69	15.66	10.67	158.10	0.00	217.40	0.00	401.83	1,136.50	1,558.02	

* 1=Existing Deficiency; 2=Future Growth; 3=Combined
** Aquifer Recharge Pilot Study includes 388,980 Expenditures in Prior Years for a Reuse Feasibility Study Update.
Projects "strikethrough" are proposed deletions, April 2007 CDMP Amendment Cycle

Source: Miami-Dade Water and Sewer Department and Department of Planning and Zoning.
Data provided by the Office of Strategic Business Management.

EXHIBIT B-2
CIE TABLE 12 (PARTIAL)
WATER FACILITIES

April 2007

Project Name and Location	Purpose* / Year of Completion	Prior Years	Expenditures / Revenues 2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	Six Year Totals	Future Years	Project Totals	Funding Source
		(In Millions of Dollars)										
South Miami Heights W.T.P. & Wellfield	3/2013	15.65	13.14	19.12	26.58	12.92	12.48	0.00	84.24	0.00	99.89	520,1007,
11800 SW 208 St.		50.63	3.91	2.59	33.01	0.00	9.75	0.00	49.26	0.00	99.89	1170,1171,
Alternative Water Supply												
A. ASR Ultraviolet (UV) Disinfection System	3/2009	0.93	6.83	0.00	0.00	0.00	0.00	0.00	6.83	0.00	7.76	520,969
for ASR Sys. @ W&SW Wellfield (7.2 mgd ASR&bl)		7.47	7.48	0.28	0.00	0.00	0.00	0.00	7.76	0.28	15.51	7.76
B. Southwest Wellfield Monitoring	1/2006	1.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.22	520,912
Southwest		1.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.22	
C. Floridan Aquifer Blending at	3/2009	0.41	0.82	2.57	6.60	0.00	0.00	0.00	9.99	0.00	10.40	520,959,
Hialeah/Preston (4.7 mgd)		3.80	0.00	0.00	6.60	0.00	0.00	0.00	6.60	0.00	10.40	998,1178
D. Hialeah Floridan Aquifer R.O. W.T.P.	1/2011	0.45	10.49	18.29	34.44	26.67	2.66	0.00	92.55	0.00	93.00	520,
Phase 1 (10 mgd)		37.70	4.94	3.90	41.63	2.17	2.66	0.00	55.30	0.00	93.00	1135
E. Hialeah Floridan Aquifer R.O. W.T.P.	2/2017	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25.00	25.00	998
Phase 2 (5 mgd)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25.00	25.00	
F. Hialeah Floridan Aquifer R.O. W.T.P.	2/2027	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.70	9.70	998
Phase 3 (2.5 mgd)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.70	9.70	
TOTALS		18.66	31.28	39.98	67.62	39.59	15.14	0.00	193.61	34.70	246.97	
		100.82	16.33	6.77	81.24	2.17	12.41	0.00	118.92	34.98	254.72	

* 1=Existing Deficiency; 2=Future Growth; 3=Combined
Projects "strikethrough" are proposed deletions, April 2007 CDMP Amendment Cycle

Source: Miami-Dade Water and Sewer Department and Department of Planning and Zoning.
Data provided by the Office of Strategic Business Management.

APPENDIX C

Water Supply for Municipalities

Appendix C

Water Supply for Municipalities

Service Area:

Miami-DadeCounty's 20-year Water Supply Facilities Work Plan (Work Plan) identifies traditional alternative water supply projects, conservation and reuse programs, and capital improvement projects necessary to meet the projected water demands within the Department's service area. The MDWASD's service area covers the entire Miami-Dade County within the Urban Development Boundary (UDB), excluding portions of North Miami and North Miami Beach, Homestead and Florida City. In 2008, North Miami Beach's new WTP will be in operation and the City will no longer be supplied by MDWASD. The areas within the Urban Expansion are included in the planning horizon after 2015. Future water supplies provided by MDWASD or other city utilities within the County's jurisdiction, including unincorporated areas are included in the County's 20-year Work Plan .

Population and Water Demand:

Exhibits C-1 through C-3 include municipal and service area population projections for all municipalities within Miami-Dade County through 2030. Population data was obtained from the Miami-Dade County Department of Planning and Zoning (P&Z) and was derived from Transportation Analysis Zone (TAZ) data. Exhibit C-4 contains the population projections for other utilities supplying water to areas within unincorporated Miami-Dade County. Also included in Exhibits C-1 through C-3 are the water demand projections using a system wide per capita of 155 as included in the Department's 20-year water use permit.

Water Conservation:

Currently, MDWASD is implementing all Best Management Practices (BMPs) included in the 20-year Water Use Efficiency Plan, which was approved by the South Florida Water Management District in May 2007. The Plan identifies a total of approximately 20 mgd of water saved through the year 2030. In addition, all of MDWASD's wholesale customers are required to submit a Water Conservation Plan to the Department's Water Use Efficiency Section as mandated by County Ordinance 06-177, Section 32-83.1 of the Miami-Dade County Code. The Plan will identify BMPs based on population characteristics and type of service for each municipal service area. The implementation of all BMPs in MDWASD's service area will result in a reduction in per capita usage as identified in Section 4, Table 4-4 of the County's Work Plan. Furthermore, Miami-Dade Water and Sewer Department will establish per capita consumption for all municipalities including those in MDWASD's retail customer service area. Based on this data, the Department will work with the municipalities to address those with higher than average per capitas and will target programs for those areas.

In addition, Miami-Dade County has developed recommendations for new development that would achieve higher water use savings than currently required by code. The recommendations were developed by an Advisory Committee and were presented to the Board of County Commissioners (BCC) on June 5, 2007. These Water Conservation recommendations were adopted by Ordinance on February 5, 2008. The Ordinance requires that a manual for implementation of the recommendations be developed by July 2008. These Water efficiency recommendations represent an additional 30% to the water savings identified in the 20-year Water Use Efficiency Plan. All applicants will be required to comply with these future code requirements. The list of recommendations submitted to the BCC and the Ordinance relating to water use efficiency standard are presented in Appendix D and are also posted in the Miami-Dade Water Conservation Portal. The implementation of all BMPs identified in the 20-year Water Use Efficiency Plan will result in an adjusted system wide per capita of 147.82 by year 2027.
Reuse:

MDWASD has committed to implement a total of 170 mgd of reuse as noted in the County's 20-year water use permit. A list of the reuse projects and deadlines as presented in Exhibit 30 of the County's 20-year water use permit and are included in Appendix F. Reuse projects to recharge the aquifer with highly treated reclaimed water will be in place before additional withdrawals over the base condition water use are made from the Alexander Orr and South Dade subarea wellfields. These wellfields supply water to several municipalities included in MDWASD's retail and wholesale customer service area. In addition, reuse irrigation projects are anticipated for the North and Central District Wastewater Treatment Plants. These projects will be implemented in the City of North Miami and North Miami Beach, and are currently under construction for Key Biscayne.

Exhibit C-1
Water Supply Service Area
Retail Customers by Municipality

Municipality	Municipal Population Projections (Year)						Service Area Population (Year)						Water Supply by MDWASD - Projected AADF Finished Water (MGD) - 155 gpcd[6] (Year)					
	2007	2010	2015	2020	2025	2030	2007	2010	2015	2020	2025	2030	2007	2010	2015	2020	2025	2030
Aventura[1]	34,927	35,414	36,224	36,595	36,965	37,335	23,030	23,495	24,270	24,622	24,974	25,325	3.57	3.64	3.76	3.82	3.87	3.93
Coral Gables	50,817	51,360	52,265	53,007	53,748	54,489	same as municipal						7.88	7.96	8.10	8.22	8.33	8.45
Cutler Bay	41,053	44,730	50,859	53,240	55,621	58,002	same as municipal						6.36	6.93	7.88	8.25	8.62	8.99
Doral	33,258	37,689	45,074	47,679	50,284	52,889	same as municipal						5.15	5.84	6.99	7.39	7.79	8.20
El Portal	1,854	1,850	1,844	1,831	1,818	1,805	same as municipal						0.29	0.29	0.29	0.28	0.28	0.28
Key Biscayne	12,606	12,837	13,220	13,538	13,856	14,174	same as municipal						1.95	1.99	2.05	2.10	2.15	2.20
Miami	404,266	418,508	442,246	468,507	494,769	521,030	same as municipal						62.66	64.87	68.55	72.62	76.69	80.76
Miami Gardens[2]	100,541	106,969	112,028	116,536	121,044	125,552	62,828	61,568	64,497	67,417	70,338	73,259	9.74	9.54	10.00	10.45	10.90	11.36
Miami Lakes	24,868	25,673	27,015	28,454	29,894	31,333	same as municipal						3.85	3.98	4.19	4.41	4.63	4.86
Miami Shores	12,159	12,187	12,233	12,278	12,324	12,370	same as municipal						1.88	1.89	1.90	1.90	1.91	1.92
Palmetto Bay	26,900	27,878	29,507	31,260	33,012	34,764	same as municipal						4.17	4.32	4.57	4.85	5.12	5.39
Pinecrest	19,484	19,765	20,233	20,596	20,960	21,323	same as municipal						3.02	3.06	3.14	3.19	3.25	3.31
South Miami	12,417	12,739	13,274	13,808	14,342	14,875	same as municipal						1.92	1.97	2.06	2.14	2.22	2.31
Sweetwater	13,645	14,168	15,039	15,921	16,803	17,685	same as municipal						2.11	2.20	2.33	2.47	2.60	2.74
Total	788,797	821,765	871,060	913,249	955,438	997,626	739,186	764,446	811,575	852,158	892,741	933,323	114.57	118.49	125.79	132.08	138.37	144.67

Notes:

1. A portion of Aventura's municipal population served by North Miami Beach (NMB).
2. Miami Garden's Municipal Boundary is within Miami-Dade Water and Sewer Department's(MDWASD), NMB and City of Opa Locka's Service Area. The water supply for a portion of Miami Garden's municipal population within NMB's Service Area is provided by MDWASD. In 2008, water for the area within NMB supplied by MDWASD, will be provided by the City of NMB.
3. Population projections provided by Miami-Dade Department of Planning and Zoning Transportion Analysis Zone (TAZ) 2004 population data.
4. 2008 -MDWASD no longer supplies North Miami Beach service area.
5. Population in Urban Expansion Areas included in projections after 2015.
6. Projections based on systemwide average per capita of 155 gpcd.
7. gpcd = gallons per capita per day
8. AADF = annual average daily flow
9. MGD = million gallons per day

Exhibit C-2

Water Supply Service Area

Wholesale Customers

Municipality	Municipal Population Projection						Service Area Population						Water Supply by MDWASD - Projected AADF Finished Water (mgd) - 155 gpcd[5]					
	Year						Year						Year					
	2007	2010	2015	2020	2025	2030	2007	2010	2015	2020	2025	2030	2007	2010	2015	2020	2025	2030
Bal Harbour	4,091	4,205	4,397	4,589	4,781	4,973	same as municipal						0.63	0.65	0.68	0.71	0.74	0.77
Bay Harbour Islands	6,200	6,379	6,678	6,965	7,253	7,540	same as municipal						0.96	0.99	1.04	1.08	1.12	1.17
Hialeah	226,167	232,724	243,654	251,541	259,428	267,314	228,397	234,992	245,986	253,903	261,820	269,736	35.40	36.42	38.13	39.35	40.58	41.81
Hialeah Gardens	23,340	24,751	27,104	29,459	31,813	34,168	same as municipal						3.62	3.84	4.20	4.57	4.93	5.30
Indian Creek Village	49	50	52	54	56	58	same as municipal						0.01	0.01	0.01	0.01	0.01	0.01
Medley	612	639	684	741	799	856	same as municipal						0.09	0.10	0.11	0.11	0.12	0.13
Miami Beach	106,286	110,677	117,997	124,489	130,980	137,472	same as municipal						16.47	17.15	18.29	19.30	20.30	21.31
Miami Springs[1]	15,603	15,813	16,162	16,434	16,705	16,977	same as municipal						2.42	2.45	2.51	2.55	2.59	2.63
North Bay Village	8,113	8,405	8,890	9,379	9,867	10,356	same as municipal						1.26	1.30	1.38	1.45	1.53	1.61
North Miami[2]	69,368	72,482	77,891	80,772	83,652	86,532	97,504	101,012	113,385	110,496	115,034	118,453	10.76	11.24	13.00	12.43	13.00	13.41
North Miami Beach[3]	42,361	53,173	53,940	55,131	56,322	57,513	164,982	n/a					7.60	n/a				
Opa Locka[4]	15,941	16,260	16,792	17,264	17,736	18,208	18,447	18,803	19,396	19,922	20,448	20,975	2.86	2.91	3.01	3.09	3.17	3.25
Surfside	5,159	5,280	5,483	5,680	5,878	6,076	same as municipal						0.80	0.82	0.85	0.88	0.91	0.94
Virginia Gardens	2,157	2,205	2,285	2,354	2,424	2,494	same as municipal						0.33	0.34	0.35	0.36	0.38	0.39
West Miami	5,878	5,905	5,951	5,973	5,995	6,017	same as municipal						0.91	0.92	0.92	0.93	0.93	0.93
Total	531,324	558,950	587,960	610,825	633,689	656,554	686,817	525,727	560,731	576,430	599,556	621,564	84.14	79.14	84 47	86.82	90.32	93.65

Notes:

1. On August 27, 2007, Miami Springs passed and adopted a resolution No. 2007-336 Authorizing the Transfer of the City's Water and Sewer Public Utilities System to MDWASD.
2. Projected AADF for North Miami (NM) is based on population within NMs service area (larger than municipal boundary) supplied by MDWASD.
3. 2008 -MDWASD no longer supplies North Miami Beach service area.
4. Projected AADF for Opa Locka is based on the service area population
5. Projections based on systemwide average per capita of 155 gpcd.
6. gpcd = gallons per capita per day
7. AADF = annual average daily flow
8. MGD = million gallons per day

Exhibit C-3
Water Supply Service Area
Other Customers within MDWASD's service area

Municipality	Municipal Population Projection						Service Area Population						Population served by WASD						Water Supply by MDWASD - Projected AADF Finished Water (mgd) - 155 gpcd[7]					
	Year						Year						Year						F					
	2007	2010	2015	2020	2025	2030	2007	2010	2015	2020	2025	2030	2007	2010	2015	2020	2025	2030	2007	2010	2015	2020	2025	2030
Biscayne Park[1]	3,443	3,453	3,471	3,476	3,480	3,484	n/a						Included in City of North Miami						Included in City of North Miami					
Golden Beach[2]	923	937	960	1,107	1,254	1,401	n/a						n/a						n/a					
Sunny Isles[3]	17,466	26,442	29,747	32,411	35,076	37,740	n/a						Included in City of NMB	n/a					Included in City of NMB	n/a				
Florida City[4]	13,105	15,371	19,148	22,466	25,783	29,101	13,105	15,371	19,148	22,466	25,783	29,101	1,498	2,005	2,851	3,284	3,718	4,151	0.23	0.31	0.44	0.51	0.58	0.64
Homestead[5]	54,653	62,475	76,921	86,166	97,985	107,494	52,796	60,155	72,419	80,953	89,486	98,020	2,354	3,002	5,492	6,346	7,200	8,054	0.36	0.47	0.85	0.98	1.12	1.25
Islandia[6]	1	0	0	0	1	1	n/a						n/a						n/a					
Total	89,591	108,679	130,247	145,626	163,578	179,221	65,901	75,526	91,567	103,418	115,270	127,121	3,852	5,008	8,343	9,630	10,918	12,205	0.60	0.78	1.29	1.49	1.69	1.89

Notes:

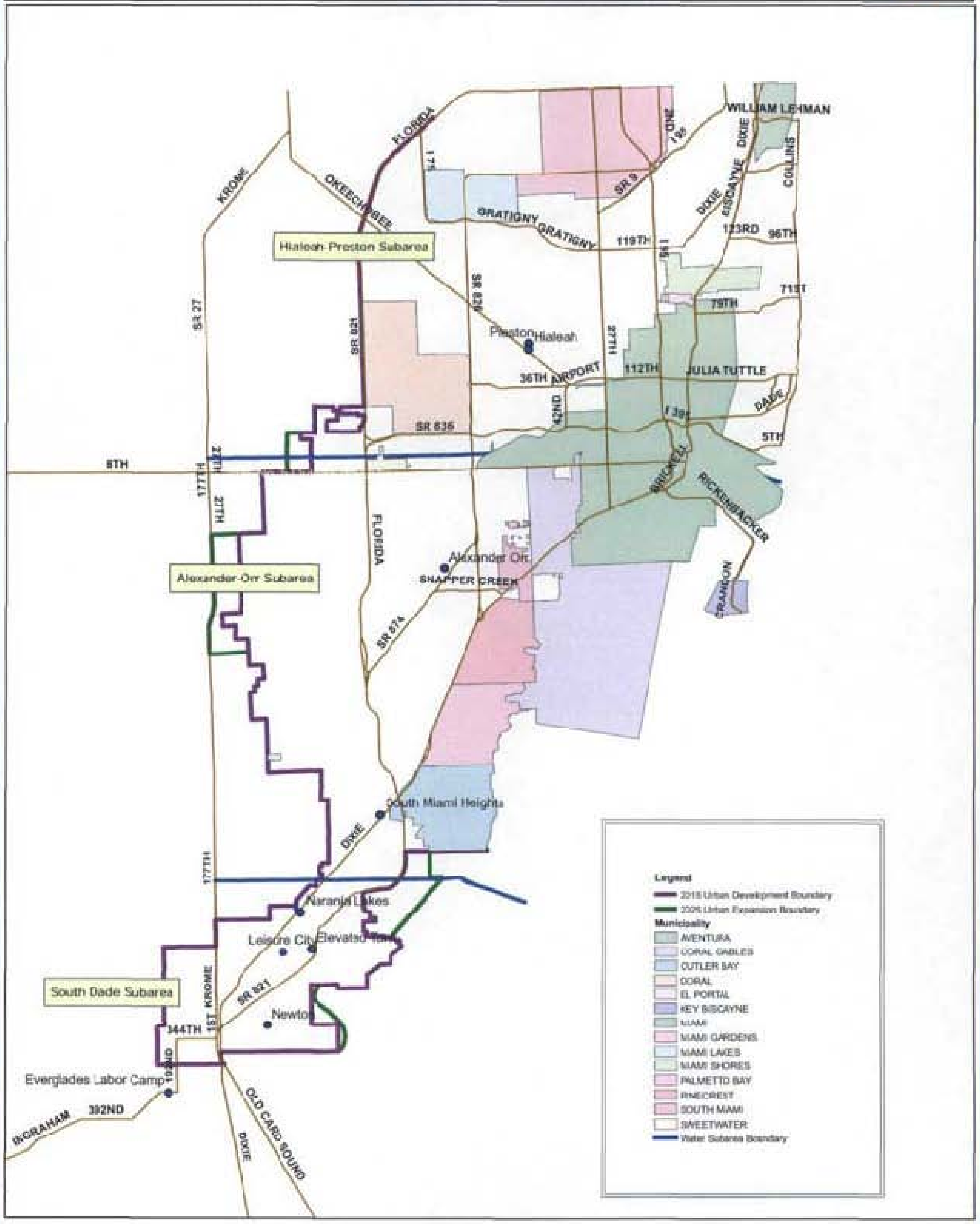
1. Municipality located within the City of North Miami's Service Area. The water supply for this area is provided by MDWASD. The water demand projections are included with the City of North Miami's service area supplied by MDWASD.
2. Municipality located within the City of North Miami Beach's Service Area. The water supply for this area is provided by the City of NMB.
3. Municipality located within the City of North Miami Beach's Service Area. Water supply for a portion within the Municipal Boundary is provided by NMB and the rest is provided by MDWASD. Note that in 2008, the water supply for Sunny Isles will be provided entirely by the City of NMB.
4. Population served by MDWASD is within Florida City's Municipal Boundary and within MDWASD's service area.
5. Population served by MDWASD is within Homestead's Municipal Boundary and within MDWASD's service area.
6. No water service.
7. Projections based on systemwide average per capita of 155 gpcd.
8. gpcd = gallons per capita per day
9. AADF = annual average daily flow
10. MGD = million gallons per day

Exhibit C-4
Other Utilities

Utility	Projected Unincorporated Population Served						Projected Water Demand (MGD)[1]					
	Year						Year					
	2007	2010	2015	2020	2025	2030	2007	2010	2015	2020	2025	2030
North Miami[1]	12158	12454	12948	13399	13849	14300	1.95	1.99	2.07	2.14	2.22	2.29
North Miami Beach[2]	25567	29728	30419	30948	31478	32007	3.68	4.28	4.38	4.46	4.53	4.61
Homestead[3]	2611	2844	3232	3660	4088	4516	0.46	0.50	0.57	0.64	0.72	0.79
Florida City[5]	See note No. 5						See note No. 5					
Total served by others	40,336	45,026	46,599	48,007	49,415	50,823	6.08	6.77	7.02	7.24	7.46	7.69

Notes:
1. Projected water demands based on per capita provided by the Utility
   North Miami = 160 gpcd
   North Miami Beach = 144 gpcd
   Homestead = 175 gpcd
2. gpcd = gallons per capita per day
3. AADF = annual average daily flow
4. MGD = million gallons per day
5. Total area of unincorporated Miami-Dade County to be served by Florida City consist of commerical development with projected water demand of 72,100 gpd.

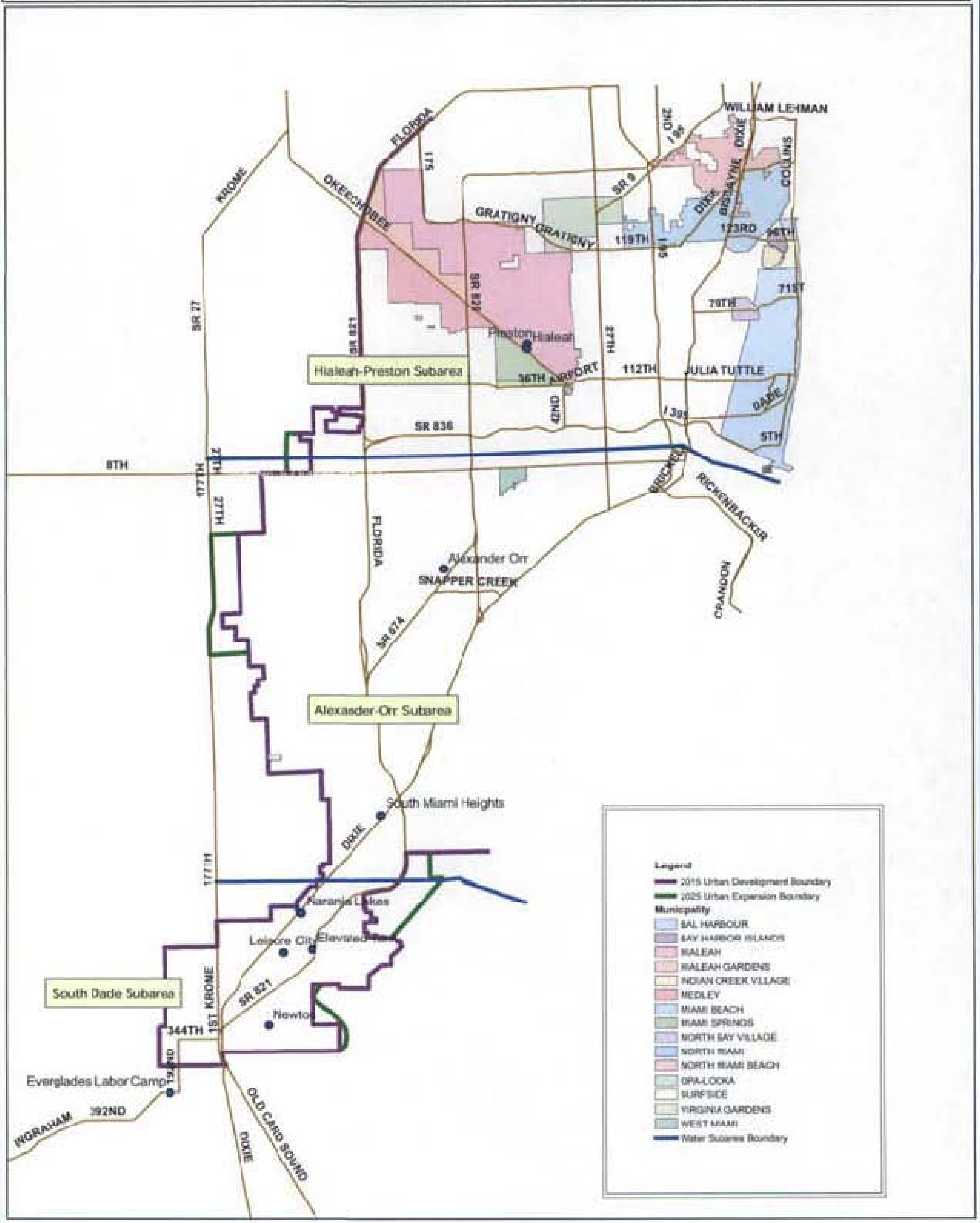
Exhibit C-5
Retail Customers by Municipality



April 2008

0 2 4 Miles

Exhibit C-6
Wholesale Customers by Municipality



April 2008

Miles
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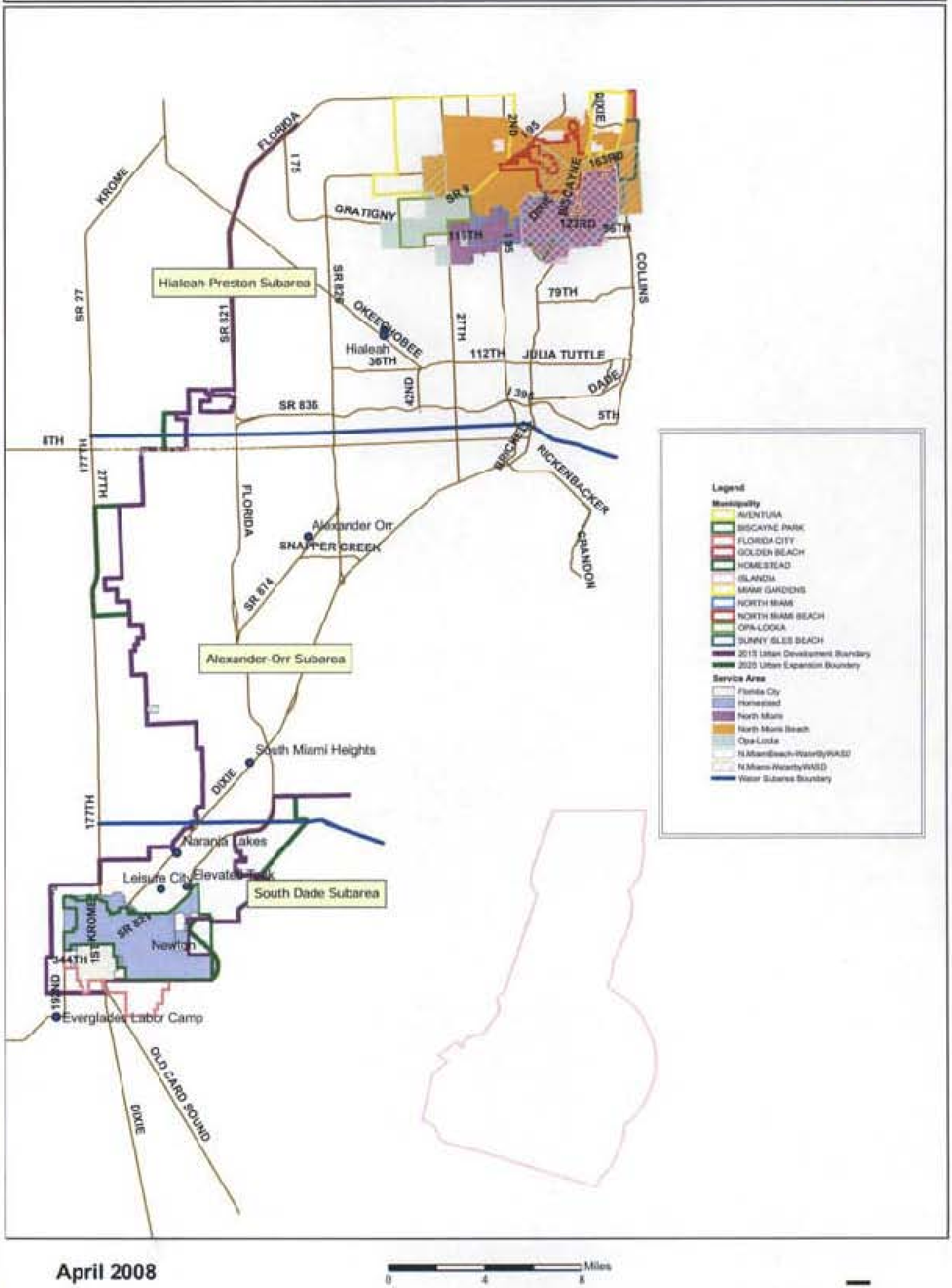
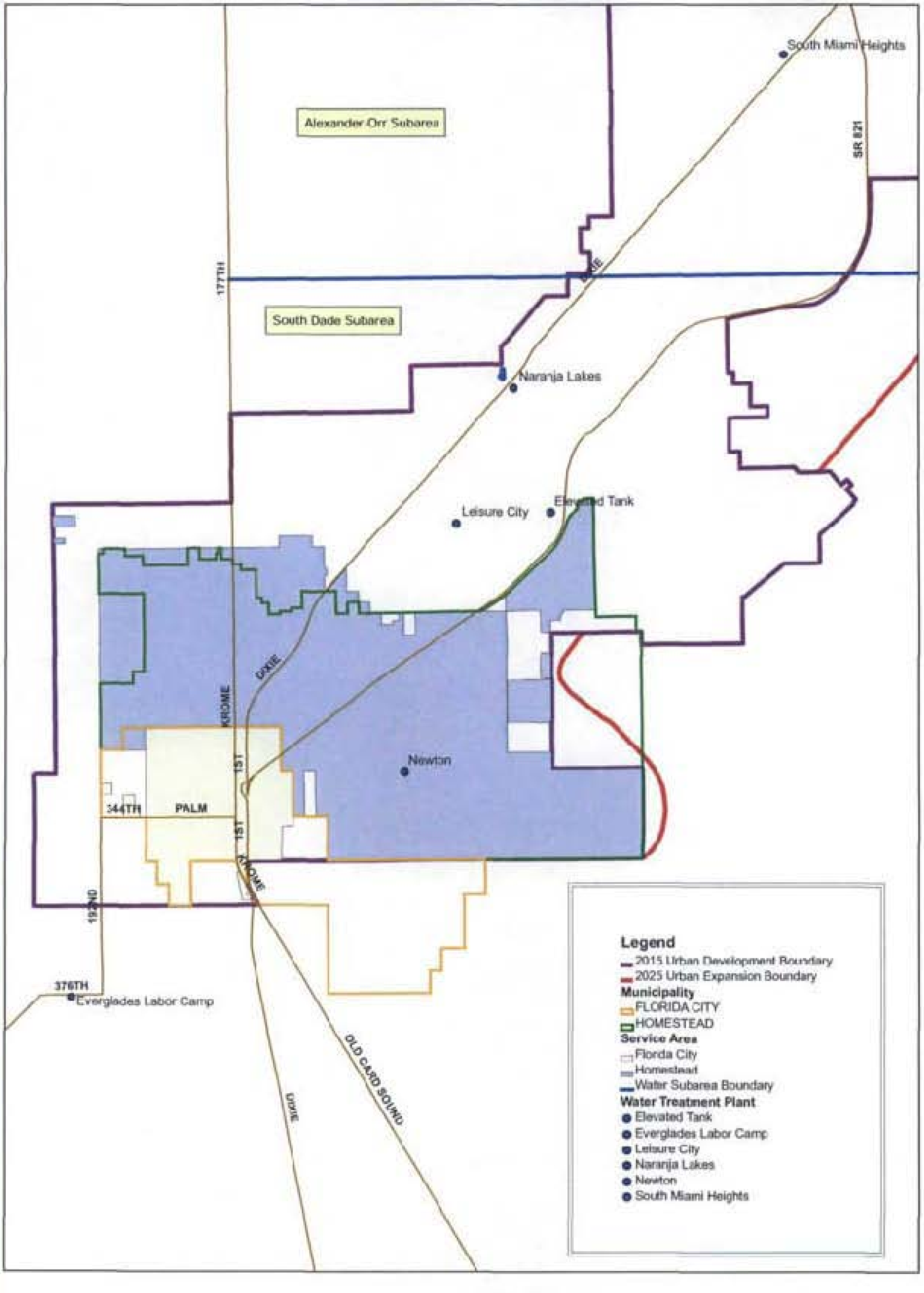
Exhibit C-7
Other Customers -Biscayne Park, Golden Beach, Sunny Isles, Fl City, Homestead, Islandia



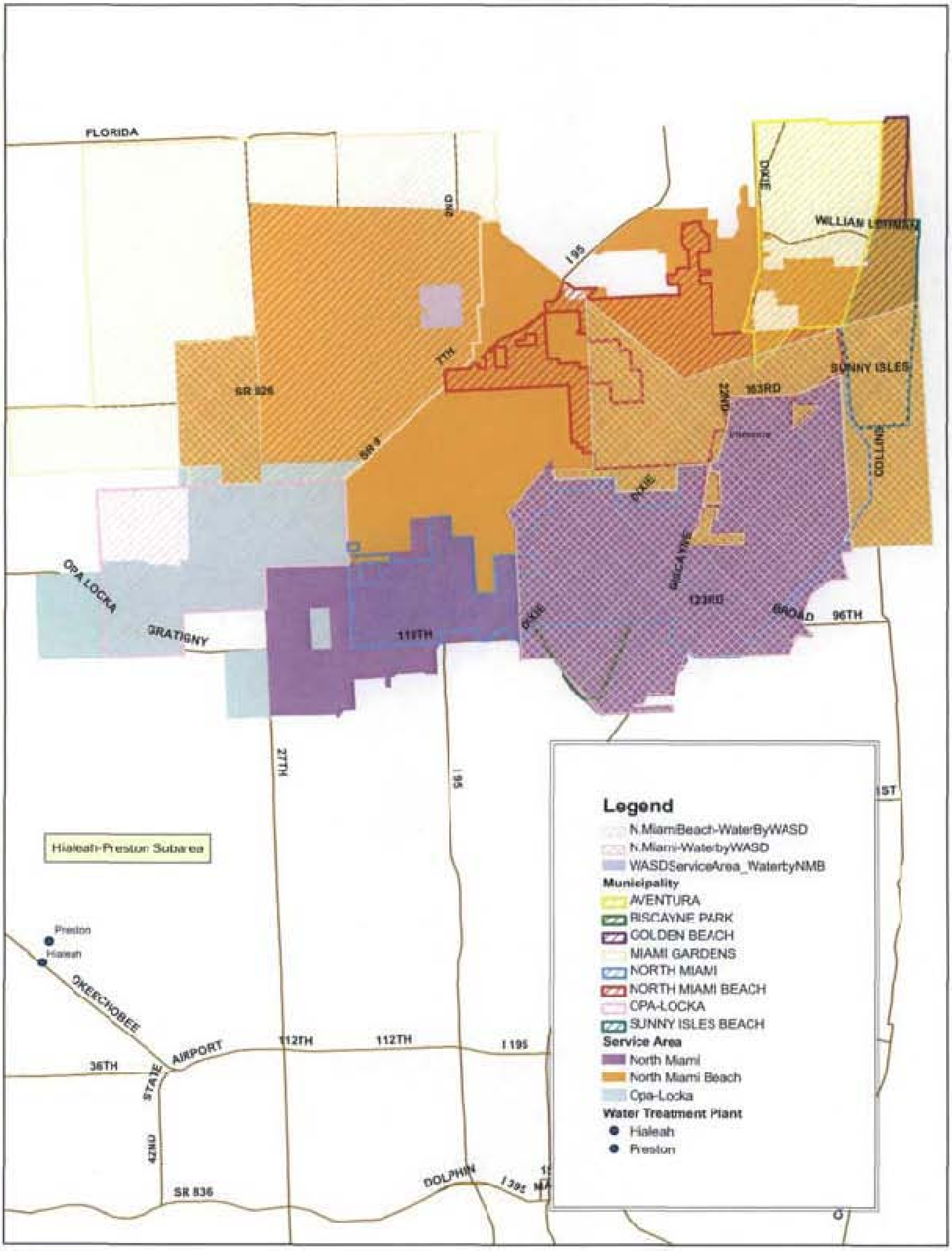
April 2008

Exhibit C-8
Homestead and Florida City
Municipal and Service Area Boundary



April 2008

Exhibit C-9
North Miami Beach, North Miami, Aventura, Miami Gardens, Biscayne Park, Golden Beach, Opa-Locka, Sunny Isles Beach
Municipal and Service Area Boundary



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April 2008

APPENDIX D

Water Use Efficiency

Recommendation

Memorandum MIAMI-DADE COUNTY

Date: June 5, 2007

Agenda Item No. 12(B)3

To: Honorable Chairman Bruno A. Barreiro and Members, Board of County Commissioners

From: George M. Burgess
County Manager

Subject: Set of standards and directions for the development community that addresses water conservation issues and alternative water supplies

At the request of the Government Operations and Environment Committee Chair, an Advisory Committee was established with the goal of developing countywide guidelines that address water conservation issues and alternative water supplies for the development community, specifically, for new development. The Advisory Committee is comprised of several departments including the Department of Environmental Resources Management, the General Services Administration, the Building Department, Park and Recreation, Planning and Zoning, the Building Code Compliance Office, the Fire Department, the Public Works Department and the Water and Sewer Department. In addition to County staff, the Advisory Committee includes representation from stakeholder groups such as the American Society of Landscape Architects, the South Florida Builders Association, the Sierra Club, the Latin Builders Association, the Tropical Audubon, the Association of Cuban American Engineers, the Florida Regional Planning Council, the Farm Bureau, the South Florida Water Management District, the Audubon Society and the Greater Miami Chamber of Commerce.

The Advisory Committee held five meetings between January 26, 2007 and April 20, 2007. These meetings were advertised in the County's meeting calendar and were open to public comment. The Advisory Committee, as part of its review process, evaluated the documents including "Green Building" practices, the Florida Friendly Landscape Guidelines and the Florida Yards and Neighborhoods criteria.

The Advisory Committee has summarized its findings as shown on Attachment A which consists of recommendations for 1) Residential New Construction, 2) Commercial Development, 3) Alternative Water Supplies, and 4) Public Information/Education/Legislation recommendations. In the first category, Residential New Construction, the recommendations are divided into two parts, indoor water use specifications such as high efficiency toilets, faucets, clothes washers, and outdoor water use specifications which include the implementation of the Florida Friendly Landscape Guidelines, gutter downspouts, roof runoffs and rain harvesting for recharge purposes as well as drip irrigation or micro-sprinklers. Examples of recommendations made in the second category, Commercial Development, take into account the use of automatic shut-offs, solenoids, controllers, flow restrictors, plumbing fixtures for toilets and faucets, designs for toilet and fixtures that reduce the volume of water wasted and the installation of overflow sensors on equipment cooling towers. The third category, Alternative Water Supplies, bases its recommendations on the eventuality that water service is not available in a particular area, as such the construction of a 1 million gallons per day reverse osmosis plant is proposed as an option or the construction of an alternative water supply water treatment plant and distribution system. If water service is available and the area is considered to be within a reuse zone, developers should consider installing "purple pipes". The fourth category, Public Information/Education/Legislation provides recommendations on the dissemination of public information and education and legislation regarding water conservation.

Assistant County Manager

Attachment A

Water Conservation Issues & Alternative Water Supplies for the Development Community

Residential Indoor Water Use Specifications

1. Only High Efficiency Toilets (HET) which shall be defined as 1.2 gallons per flush, that meet the standard specifications of the Unified North America Requirements (UNAR) and display the Environmental Protection Agency's WaterSense label shall be installed. http://cuwcc.org/Uploads/product/HET_06-07-19.pdf

2. There shall be one control valve, or one set of hot and cold valves required for each High Efficiency Showerhead which shall be defined to provide no more than 1.5 gallons per minute (gpm).

3. High Efficiency faucets which shall be defined to provide 1.0 gpm.

4. Residential units equipped with clothes washer connections shall have installed High Efficiency (HE) Clothes Washer(s) with a water factor of 6 or less (Tier 3b) as identified by the Consortium for Energy Efficiency at http://www.ceel.org/reid/seha/rwsh.rwsh-prod.pdf, Energy Star (and WaterSense certified when available).

5. Dishwashers shall be rated with use of 6.5 gallons/cycle or less, Energy Star and WaterSense certified.

6. Multi-unit residential – apply items 1-6 and:
   Require sub-metering for all multi-unit residential development which will include: separate meter and monthly records kept of all major water-using functions such as cooling towers and individual buildings.

Residential Outdoor Water Use Specifications:

1. Florida Friendly Landscapes guidelines and principles shall be applied to all landscape installations in compliance with Florida Yards & Neighborhoods criteria.

2. Gutter downspouts, roof runoff, and rain harvesting shall be used to encourage increased recharge and other non-potable uses on the property, thru the use of elements and features such as rain barrels and directing runoff to landscaped areas.

3. Require and provide "Florida Friendly Landscapes" within all public rights-of-way.

4. Use drip irrigation or micro-sprinklers when appropriate.

5. Use of porous surface (bricks, gravel, turf block, mulch, pervious concrete, etc) whenever possible on walkways, driveways, and patios.

6. Florida Yards and Neighborhoods Program information on Florida Friendly Landscapes shall be included in the sales literature provided to homebuyers.

7. The landscape plan and plant palette shall be developed based on site characteristics (soil, drainage, structural limitations (utilities, overhangs, lights, etc.) and shall include:

   a. Per the County's Landscaping Ordinance, existing native trees, palms and associated native understory, shall be retained and preserved along with identified undergrowth and be a focal point of the landscape.

   b. 80% of plant materials to be utilized on site shall be from the Florida-Friendly Plant List and shall have a moderate to high drought tolerance.

   c. All plants will be grouped in the landscape plan by similar water and maintenance requirements and shall be spaced to allow for maturation.

   d. Turf areas will be evenly shaped for ease of maintenance and will be no less than 4 feet wide and will not be placed on any berms.

e. No more than 30% of the total area required for landscaping may be turf or grass.
f. Soils analysis should be completed and used in the plant selection process where applicable and a copy should be provided to the home buyer.

g. Limit use of rock mulch due to heat loading: rock mulch shall not exceed 5% of total landscaped area.

h. Use of environmentally friendly organic mulches that are applied 3 inches deep around plants and trees with two inches clear around each plant.

i. Homes with landscapes adjoining surface water bodies should provide for maintenance free or low maintenance zone up to 10 feet within and to the water body. This area can be enhanced with natural wetland vegetation, in any case, the area should be planted to eliminate erosion potential.

The Irrigation Plan for Common Areas: Shall be developed to meet the water use requirements of the landscape plan.

a. All landscape beds shall be irrigated by a low volume irrigation system, preferably utilizing bubbler and low trajectory spray heads.

b. All landscape plant beds shall be irrigated with low-volume irrigation appropriate for plant type.

c. Turf shall be irrigated by zones separate from zones for irrigation of shrubs and ground cover plantings.

d. Swing joints or flex pipe shall be used when installing sprinklers to help prevent broken pipes and sprinklers.

e. Irrigation systems shall be designed for minimum overlap.

f. Soil moisture sensors or other water saving technologies shall be installed. Devices shall be installed and function according to manufacturers' recommendations.

2. Commercial Development Recommendations

1. Use waterless technologies where available.

2. Maximize use of on-site sources of water.

3. Choose equipment that is water and energy efficient.

4. Install automatic shut offs, solenoids and controllers to turn water off when not in use.

5. Install flow restrictors when possible.

6. Eliminate once-through cooling.

Plumbing Fixtures and Practices

Toilets and Urinals

a. Ensure all water closets use no more than 1.3 gallons per flush, high efficiency toilets (HETs) can achieve 20 to 25% water use savings.
b. Use toilets included the Uniform North American Requirements (UNAR) certified list.
c. Consider waterless urinals.

Faucets

a. Install hand washing faucets or aerators that use no more than 1.0 gallons per minute.
b. Install sensor controls on hand washing faucets in public restrooms.
c. Install showerheads that use no more than 1.5 gallons per minute.

Plumbing Design

a. Use tankless water heating or other devices that reduce water wasted waiting for the water to get hot where possible.

b. Post prominent signs in all restrooms and other water using areas listing telephone numbers to promptly report leaks and other plumbing problems.

Cooling Towers

a. Eliminate all once-through cooling.
b. On cooling towers, install both makeup and blowdown meters.
c. Equip cooling towers with overflow sensors on the overflow pipes to alert the operator to problems that can waste thousands of gallons daily.
d. All cooling towers should achieve at least (5.0) cycles of concentration.

Boilers

a. Equip boilers with makeup meters and conductivity controllers for blowdown control.
b. Reuse or return steam condensate to the boiler wherever possible.
c. Install makeup meters on all recirculating closed water loops used for heating and cooling systems so that leaks in the recirculating systems can be easily detected.

Equipment Selection

a. Eliminate all water cooled equipment using once-through cooling.
b. All water-cooled equipment should be eliminated unless it uses chilled water or cooling tower loop. This includes ice makers, refrigeration equipment, and ice cream machines.

Dishwashing Equipment

a. Dishwashers should use less than 1.2 gallons per rack for fill-and-dump machines and less than 0.9 gallons per rack for all other types of machines. For under the counter machines, water use should not exceed 1.0 gallons per rack for high-temperature machines and 1.7 gallons per rack for low-temperature machines.
b. Pre-rinse spray valves that use 1.6 gallons per minute and have a shot off valve.

Food Preparation

a. Use connectionless steamers. They do not need either a water supply or a wastewater drain.
b. Select ice machines that use no more than 20 gallons per hundred pounds of ice made.

Irrigation controllers

a. Soil moisture sensors or other water saving technologies shall be installed. Devices shall be installed and function according to manufacturers' recommendations.

Irrigation equipment and design

a. Use drip irrigation or microsprinklers for planning beds (once plants are established, irrigation is not usually needed).
b. Create hydrozoned areas, with beds and turf watered separately.
c. Design systems to maintain manufacturer-recommended pressure to prevent misting and unnecessary pipe wear.

Soil

a. Do not add soil on top of tree roots.

Mulch

a. Use organic, preferably locally derived mulch, such as pine bark, dyed landscape mulch, or enviromulch. Avoid cypress mulch which encourages deforestation of natural areas.
b. Limit use of rock mulch due to increased heat and reflection.
c. Mulch should be 3-4 inches deep over the root zone and several inches away from the base of plants.

Plant Selection

a. Use low-maintenance (drought tolerant) species. The Florida Extension Service's Florida Yards and Neighborhoods Program list these species in a publication for South Florida. http://miami-dade.ifas.ufl.edu/programs/fyn/publications/dtpl.htm.
b. Plant selection should be based on the plant's adaptability to the existing conditions present at the landscaped area and native plant communities. Select plants that are drought and freeze tolerant.
c. For areas with limited soil space such as parking lots, use naturally small stature trees or use palms. Information for small stature trees for restricted spaces, such as narrow swales and limited space residential lots where canopy and roots can become problem can be found at http://miami-dade.ufledu/programs/urbanhort/publications/PDF/Samll%20Trees%20for%20Miami-Dade.pdf.
d. Florida-friendly landscape principles should be applied. These principles conserve water and protect the environment and include efficient irrigation, practical use of turf, appropriate use of mulches, and proper maintenance. (Ref. 373.185 F.S.).

[illegible]

Infrastructure Requirements

1. In the event that the MDWASD cannot provide services, the construction of Reverse Osmosis (RO) plants for

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developments equal or larger than 1 MGD water allocation.

a. Requirement of installation of a potable water treatment plant and distribution system. This requirement should exempt the developer from water connection charges.

b. RO plants should be owned and operated by MDWASD – Chapter 24 language needs to be amended.

2. In the event that the MDWASD cannot provide services, the construction of satellite wastewater reclamation facilities producing irrigation quality reclaimed water (62-610, Part III), larger than 100,000 gallons per day.

a. Modify language in Chapter 24 to allow for the construction of wastewater reclamation facilities plants even if the project is within feasible distance of, or actually connected to sanitary sewers. The quality of the treated effluent should be reviewed to possibly allow for a lower level of treatment for irrigation and other uses.

b. Wastewater reclamation facilities should be owned and operated by MDWASD – Chapter 24 language needs to be amended.

3. For developments where water supply is available, all developers should consider the installation of "purple pipes" if the development is within a reuse zone and feasible distance from the "Mandatory Reuse Area" (MRA).

4. Public Info[illegible] Recommendations

1. Expand "Factual Data" concept to encourage water conservation.
Revise Section 24-43.1(5) includes provisions for use of factual data in lieu of tabulated rates. Section can be expanded to provide credits for the use of water saving strategies (e.g., reuse of gray water for toilet flushing, dual-flush toilets, etc.).
NOTE: This will require similar adoption in MDWASD rules.

2. Add "Non-Revenue Water" ordinance to Chapter 24, Miami-Dade County Environmental Protection Ordinance. Implement an Ordinance for "unaccounted-for" water (a.k.a. "non-revenue" water) that requires compliance with an established standard. The ordinance shall be structured to address "real" and "apparent" water losses in accordance with the principles established by the International Water Association (IWA) and IWA book 'Losses in Water Distribution Networks - A Practitioner's Guide to Assessment, Monitoring and Control.' The ordinance can be incorporated into Chapter 24, Miami-Dade County Environmental Protection Code and managed by the Department of Environmental Resources Management (DERM) similar to the Volume Sewer Customer Ordinance.

3. Encourage the review and adoption of County ordinances for both:
   - landscape protection, preservation and management, and for
   - water conservation by the County and its municipalities

4. A Hot Water Recirculation System or Point-of-Use Hot Water heater shall supply water to hot water fixtures further than ten linear feet of pipe away from the hot water heater. All hot water pipes shall be insulated.

5. Promote use of grey water for toilets and other uses discharging to public sanitary sewers.

6. All withdrawal from the aquifer should be metered including residential irrigation wells.

7. Landscape irrigation controller, soil moisture sensor, and irrigation system run time information. This sleeve shall be connected to the irrigation controller for use by the homeowner.

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MEMORANDUM

Agenda Item No. 7(A)

TO:	Honorable Chairman Bruno A. Barreiro and Members, Board of County Commissioners	DATE:	February 5, 2008
FROM:	R. A. Cuevas, Jr. County Attorney	SUBJECT:	Ordinance relating to water use efficiency standards

Ordinance 08-14

The accompanying ordinance was prepared and placed on the agenda at the request of Commissioner Natacha Seijas.

R. A. Cuevas, Jr.
County Attorney

RAC/bw

Memorandum MIAMI-DADE COUNTY

Date: February 5, 2008

To: Honorable Chairman Bruno A. Barreiro
and Members, Board of County Commissioners

From: George M. Burgess
County Manager

Subject: Ordinance relating to water use efficiency standards

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The ordinance relating to water use efficiency standards will not have a fiscal impact to Miami-Dade County. The development of the Water Use Efficiency Manual, reviews of Development of Regional Impact (DRI) projects and the public information and outreach activities required in the ordinance will be performed using existing resources.

There will not be an impact to the public except for High Efficiency Appliances, which currently have a higher initial cost. In addition, there will be a fiscal impact to a developer if a DRI project is required to install an alternative water supply, however; the impact will depend on the size and scope of the project.

Susanne M. Torriente
Assistant County Manager

fis00508

MEMORANDUM

(Revised)

TO:	Honorable Chairman Bruno A. Barreiro and Members, Board of County Commissioners	DATE:	February 5, 2008
FROM:	R. A. Cuevas, Jr. County Attorney	SUBJECT:	Agenda Item No. 7(A)

Please note any items checked.

_____ "4-Day Rule" ("3-Day Rule" for committees) applicable if raised

_____ 6 weeks required between first reading and public hearing

_____ 4 weeks notification to municipal officials required prior to public hearing

_____ Decreases revenues or increases expenditures without balancing budget

_____ Budget required

_____ Statement of fiscal impact required

_____ Bid waiver requiring County Manager's written recommendation

_____ Ordinance creating a new board requires detailed County Manager's report for public hearing

_____ Housekeeping item (no policy decision required)

_____ No committee review

Approved	______	Mayor	Agenda Item No. 7(A)
Veto	______		2-5-08
Override	______		

ORDINANCE NO. 08-14

ORDINANCE RELATING TO WATER USE EFFICIENCY STANDARDS; CREATING SECTION 8-31 OF THE CODE OF MIAMI-DADE COUNTY, FLORIDA; ADOPTING LOCAL TECHNICAL AMENDMENTS TO FLORIDA BUILDING CODE FOR NEW RESIDENTIAL AND COMMERCIAL DEVELOPMENTS; REVISING AND PROVIDING FOR MAXIMUM FLOW RATES AND CONSUMPTION FOR PLUMBING FIXTURES, FIXTURE FITTINGS AND APPLIANCES; CREATING SECTIONS 32-84, 32-85 AND 32-86 OF THE CODE OF MIAMI-DADE COUNTY, FLORIDA; PROVIDING FOR PUBLICATION OF WATER USE EFFICIENCY STANDARDS MANUAL FOR NEW RESIDENTIAL AND COMMERCIAL DEVELOPMENTS; PROVIDING FOR EVALUATION OF ALTERNATIVE WATER SUPPLY PROJECTS FOR NEW DEVELOPMENTS OF REGIONAL IMPACT; PROVIDING FOR WATER USE EFFICIENCY AND CONSERVATION EDUCATION AND OUTREACH; AMENDING SECTION 8A-381 OF THE CODE OF MIAMI-DADE COUNTY, FLORIDA TO REQUIRE SUBMETERS IN MULTI-FAMILY RESIDENTIAL DEVELOPMENTS; PROVIDING SEVERABILITY, INCLUSION IN THE CODE AND AN EFFECTIVE DATE

WHEREAS, Miami-Dade County's main source of drinking water is the Biscayne Aquifer which also serves two national parks, the Everglades and Biscayne National Park, agricultural interests, industrial and other users; and

WHEREAS, the Miami-Dade Water and Sewer Department ("Department") supplies potable water to over 400,000 retail customers and provides wholesale water service to 15 municipalities; and

WHEREAS, approximately 348 million gallons per day is withdrawn from the Biscayne Aquifer by the Department for public water supply; and

WHEREAS, Miami-Dade County is located within the Lower East Coast planning area of the South Florida Water Management District ("District"); and

WHEREAS, the District has adopted a new Regional Water Availability Rule that includes the Lower East Coast as a geographic area with restrictions on the utilization of specific water supply sources; and

WHEREAS, the Department has applied to the District for a 20-year Consumptive Use Permit; and

WHEREAS, the County is required to develop alternative water sources to meet increased demands over the next 20 years; and

WHEREAS, the County is making significant financial investments in capital improvement projects to provide adequate water supply for projected water demands by the use of alternative water supplies such as reclaimed water and brackish water from the Floridan Aquifer; and

WHEREAS, this Board finds that the efficient use and conservation of water reflect responsible use of a limited and precious resource that is essential to life, and will prevent and reduce wasteful, uneconomical, impractical, or unreasonable use of water resources; and

WHEREAS, in 2006, this Board approved the Miami-Dade County Water Use Efficiency Five-Year Plan ("Water Use Efficiency Plan") which is goal-based, accountable and measures water conservation efforts; and

WHEREAS, in 2007, the District approved the Water Use Efficiency Plan for 20 years to coincide with the County's proposed 20-year Consumptive Use Permit; and

WHEREAS, a stakeholder Advisory Committee appointed by the Director of the Water and Sewer Department provided this Board with recommendations to achieve maximum water use savings for all new development in Miami-Dade County; and

WHEREAS, in accordance with R-884-06, Miami-Dade County is a partner with the Environmental Protection Agency WaterSense Program for the promotion and implementation of water use saving technologies through its Water-Use Efficiency Plan; and

WHEREAS, Miami-Dade County is an active participant in the Florida Department of Environmental Protection Conserve Florida Water Program for the development of statewide guidelines for water use efficiency; and

WHEREAS, this Board finds that significant amounts of water can be saved through the installation of efficient water fixtures, appliances and other water saving measures and equipment; and

WHEREAS, such water use efficiency measures in new developments will help ensure that the County meets its water conservation goals provided in the Water Use Efficiency Plan for the duration of the County's 20-year water use permit; and

WHEREAS, the Florida Building Code, as amended by local technical amendments pursuant to Section 553.73(4)(b), Florida Statutes, is the uniform building code for Miami-Dade County; and

WHEREAS, based on the local conditions of water resources and the projected demand for water in Miami-Dade County, this Board finds that there is a local need to strengthen the requirements of the Florida Building Code for Miami-Dade County to meet the water conservation goals provided in the Water Use Efficiency Plan and to ensure the availability of potable water to meet the County's projected demand for water and protect the public's health, safety and welfare; and

WHEREAS, the proposed local technical amendments to the Florida Building Code addresses the County's needs,

NOW, THEREFORE, BE IT ORDAINED BY THE BOARD OF COUNTY COMMISSIONERS OF MIAMI-DADE COUNTY, FLORIDA:

Section 1. Section 8-31 of the Code of Miami-Dade County is hereby created to read as follows: [1]

>>**Sec. 8-31. Local Technical Amendments to Florida Building Code**

(A) The County hereby adopts the following local technical amendments to Chapter 6 (Plumbing) of the Florida Building Code.

604.4 Maximum flow and water consumption.

The maximum water consumption flow rates and quantities for all plumbing fixtures, fixture fittings and appliances shall be in accordance with Table 604.4. Effective July 1, 2008, permit applications for new residential and commercial structures shall include high efficiency plumbing fixtures, fixture fittings and appliances as provided in Table 604.4. Such high efficiency plumbing fixtures, fixture fittings and appliances shall comply with the specifications of U.S. Environmental Protection Agency (EPA) WaterSense Program or the Uniform North American Requirements (UNAR) Guidelines and Specifications.

Exceptions:

1. Blowout design water closets [3.5 gallons (13L) per flushing cycle].
2. Vegetable sprays.

1 Words Stricken through and/or [[double bracketed]] shall be deleted. Words underscored and/or >>double arrowed<< constitute the amendment proposed. Remaining provisions are now in effect and remain unchanged.

3. Clinical sinks [4.5 gallons (17 L) per flushing cycle].
4. Service sinks.
5. Emergency showers.<<

TABLE 604.4

MAXIMUM FLOW RATES AND CONSUMPTION FOR PLUMBING FIXTURES>>,<< [[~~AND~~]] FIXTURE FITTINGS >>AND APPLIANCES<<

PLUMBING FIXTURE OR FIXTURE FITTING	MAXIMUM FLOW RATE [[~~OR QUANTITY~~]][b]
Lavatory, private	[[~~2.2~~]] >>1.0<< gpm at 60 psi
Lavatory, public, (metering)	0.25 gallon per metering cycle
Lavatory, public (other than metering)	0.5 gpm at 60 psi
Shower head[a]	[[~~2.5~~]] >> 1.5<< gpm at 80 psi
Sink faucet	[[~~2.2~~]] >> 1.0<< gpm at 60 psi
Urinal	>>Waterless or 0.5<< gallon per flushing cycle
Water closet	[[~~1.6~~]] >>1.28<< gallons per flushing cycle
>>Dishwasher (residential)<<	>>6.5 gallons per cycle or less (Energy Star/Water Sense Certified)[c]<<
>>Dishwasher (commercial)<<	>>less than 1.2 gallons per rack for fill and dump machines and less than 0.9 gallons per rack for all other types of machines<<
>>Under the counter machines<<	>>1.0 gallon or less per rack for high-temperature machines and 1.7 gallons per rack for low-temperature machines<<
>>Washing machine<<	>>Water factor of 8 or lower (Energy Star/Water Sense Certified)[c]<<

For SI: 1 gallon = 3.785 L, 1 gallon per minute = 3.785 L/m
1 pound per square inch = 6.895 kPa.
a. A hand-held shower spray is a shower head.
b. Consumption tolerances shall be determined from referenced standards.
>>c. Water factor in gallons per cycle per cubic foot<<

>>(B) The County hereby adopts the following local technical amendments to Chapter 29 (Residential) of the Florida Building Code.

P2903.2 Maximum flow and water consumption.

The maximum water consumption flow rates and quantities for all plumbing fixtures, fixture fittings and appliances shall be in accordance with Table P2903.2a. Effective July 1, 2008, permit applications for new residential structures shall include high efficiency plumbing fixtures, fixture fittings and appliances as provided in Table P2903.2a. Such high efficiency plumbing fixtures, fixture fittings and appliances shall comply with the specifications of U.S. Environmental Protection Agency (EPA) WaterSense Program or the Uniform North American Requirements (UNAR) Guidelines and Specifications.<<

TABLE P2903.2a
MAXIMUM FLOW RATES AND CONSUMPTION FOR
PLUMBING FIXTURES>>,<< [[~~AND~~]] FIXTURE FITTINGS AND
>>APPLIANCES<<

PLUMBING FIXTURE OR FIXTURE FITTING	PLUMBING FIXTURE OR FIXTURE FITTING >>MAXIMUM FLOW RATE [b]<<
Lavatory faucet	[[~~2.2~~]] >>1.0<< gpm at 60 psi
Shower head [a]	[[~~2.5~~]]>>1.5<<gpm at 80 psi
Sink faucet	[[~~2.2~~]]>>1.0<< gpm at 60 psi
Water closet	[[~~1.6~~]]>>1.28<< gallons per flushing cycle
>>Dishwasher (residential)<<	>>6.5 gallons per cycle or less (Energy Star/Water Sense Certified) [c]<<
>>Washing Machine<<	>>Water factor of 8 or lower (Energy Star/Water Sense Certified) [c]<<

For SI: 1 gallon = 3.785 L, 1 gallon per minute = 3.785 L/m.
1 pound per square inch = 6.895 kPa.
a. A handheld shower spray is a showerhead.
b. Consumption tolerances shall be determined from referenced standards.
>>c. Water factor in gallons per cycle per cubic foot<<

Section 2. Section 32-84 of the Code of Miami-Dade County, Florida is hereby created to read as follows:

>>Sec. 32-84. Water use efficiency standards manual

The Miami-Dade Water and Sewer Department ("MDWASD"), in consultation with the Planning Department and such other applicable county departments and agencies, shall publish a water use efficiency standards manual to achieve maximum water savings in new residential and commercial developments in the incorporated and unincorporated areas of Miami-Dade County. The manual shall be initially published on July 1, 2008 and shall be updated annually on July 1 following approval by the County Commission. Each applicant for water service to a new residential or commercial development in incorporated and unincorporated areas of Miami-Dade County shall include in its application every water use efficiency standard that will be incorporated into the new development. The County or applicable municipality shall review the application for compliance with the manual. In evaluating the application for compliance, the County or applicable municipality will consider the availability of products required to implement the water use efficiency standards. The developer's agreement for water service shall include the water use efficiency standards approved by the County.<<

Section 3. Section 32-85 of the Code of Miami-Dade County is hereby created to read as follows:

>>Sec. 32-85. Alternative water supply for developments of regional impact.

Applications for new Developments of Regional Impact ("DRI") with a projected water demand of one million gallons per day or greater shall be evaluated by MDWASD to determine the feasibility of an alternative water supply project. Such projects may include the installation of a reverse osmosis plant, wastewater reclamation facility and reuse distribution system.<<

Section 4. Section 32-86 of the Code of Miami-Dade County is hereby created to read as follows:

>>Sec. 32-86. Water use efficiency and conservation education and outreach.

The Miami-Dade County Water Use Efficiency Manager shall provide public information, education and outreach on all water use efficiency standards and water conservation programs.<<

Section 5. Section 8A-381 of the County of Miami-Dade County, Florida is hereby amended to read as follows:

Sec. 8A-381. Intent and application.

* * *

(c) The provisions of this article shall apply to multiple unit properties utilizing water services. >>Effective July 1, 2008, all permit applications for new multi-family residential developments shall be required to include a submeter for each individual dwelling unit.<<

Section 6. If any section, subsection, sentence, clause or provision of this ordinance is held invalid, the remainder of this ordinance shall not be affected by such invalidity.

Section 7. It is the intention of the Board of County Commissioners, and it is hereby ordained that the provisions of this ordinance, including any Sunset provision, shall become and be made a part of the Code of Miami-Dade County, Florida. The sections of this ordinance may be renumbered or relettered to accomplish such intention and the word "ordinance" may be changed to "section", "article" or other appropriate word.

<u>Section 8.</u> This ordinance shall become effective on July 1, 2008 unless vetoed by the Mayor within ten (10) days of enactment, and if vetoed, shall become effective only upon an override by this Board.

PASSED AND ADOPTED: February 5, 2008

Approved by County Attorney as
to form and legal sufficiency.

Prepared by:

Henry N. Gillman

Sponsored by Commissioner Natacha Seijas

APPENDIX E

Table 5 Countywide BMP Implementation

Schedule, Costs, and Savings Projections

from The Water Use Efficiency 5-Year Plan

Table 5: Countywide BMP Implementation Schedule, Costs, and Savings Projections

BMP	Category	Sector	Cost/ measure[1]	Savings Rate (gallons per meas. per day)	2007: No. of Meas. in 2007	2007: Cumulative No. of Meas.	2007: 2007 Cost	2007: Cum. Cost ($ to date)	2007: New Water Savings (GPD)	2007: 2007 Cumulative Water Savings Rate (GPD)
Water-Efficient Landscape and Irrigation Evaluations and Rebates with Moisture Sensor Retrofit	Landscape & Irrigation Evaluations plus Moisture Sensor Retrofit (without Rebate)[1]	SF	$250	233	300	300	$75,000	$75,000	69,900	69,900
		MF County-Owned (~25 irrigated acres)	$8,010	35,000	20	20	$160,200	$160,200	700,000	700,000
High-Efficiency Clothes Washer Rebate	Common-area Washers[1]	MF with Common-area Clothes Washers	$300	48	50	50	$15,000	$15,000	2,400	2,400
High Efficiency Toilet (HET) Retrofit/Rebate	Retrofit (includes showerhead and aerators)[1]	SF - Elderly	$250	64	1,000	1,000	$250,000	$250,000	64,000	64,000
		County-Owned MF Housing[1]	$0	64	0	0	$0	$0	0	0
	Rebate (toilet only)[1]	SF	$100	29	750	750	$75,000	$75,000	21,750	21,750
	Toilet Exchange Program	SF	$130	29	0	0	$0	$0	0	0
	Toilet Exchange Program	MF	$130	29	0	0	$0	$0	0	0
Showerhead Exchange	No Categories	SF	$1.60	35	1,600	1,600	$2,560	$2,560	56,000	56,000
	No Categories	MF	$1.60	35	1,600	1,600	$2,560	$2,560	56,000	56,000
Retrofit Kit Give Away	No Categories	SF	$2.38	12	1,600	1,600	$3,808	$3,808	19,200	19,200
	No Categories	MF	$2.38	12	1,600	1,600	$3,808	$3,808	19,200	19,200
Industrial, Commercial and Institutional Water Use Evaluation/ Implementation	Leak Detection and Repair of County-owned Facilities	NR	$4,740	1,000	25	25	$118,500	$118,500	25,000	25,000
	Evaluate and Retrofit County-owned Administrative Buildings[1]	NR	$1,600	1,500	22	22	$35,200	$35,200	33,000	33,000
	Evaluate and Retrofit Private Commercial Buildings	NR	$1,600	1,000	0	0	$0	$0	0	0
	Hotel Program[1]	NR	$667	1,617	12	12	$8,000	$8,000	19,404	19,404
Plan Total					For 2007		**$753,000**	**$753,000**	**1,086,000**	**1,086,000**
Sub-total for SF							**$416,000**	**$416,000**	**231,000**	**231,000**
Sub-total for MF							**$22,000**	**$22,000**	**78,000**	**78,000**
Sub-total for NR							**$322,000**	**$322,000**	**779,000**	**779,000**

BMP	Category	Sector	2008: No. of Meas. in 2008	2008: Cumulative No. of Meas.	2008: 2008 Cost	2008: Cum. Costs ($ to date)	2008: New Water Savings (GPD)	2008: 2008 Cumulative Water Savings Rate (GPD)
Water-Efficient Landscape and Irrigation Evaluations and Rebates with Moisture Sensor Retrofit	Landscape & Irrigation Evaluations plus Moisture Sensor Retrofit (without Rebate)[1]	SF	300	600	$75,000	$150,000	69,900	139,800
		MF County-Owned (~25 irrigated acres)	20	40	$160,200	$320,400	700,000	1,400,000
High-Efficiency Clothes Washer Rebate	Common-area Washers[1]	MF with Common-area Clothes Washers	50	100	$15,000	$30,000	2,400	4,800
High Efficiency Toilet (HET) Retrofit/Rebate	Retrofit (includes showerhead and aerators)[1]	SF - Elderly	1,000	2,000	$250,000	$500,000	64,000	128,000
		County-Owned MF Housing[1]	1,000	1,000	$0	$0	64,000	64,000
	Rebate (toilet only)[1]	SF	0	750	$0	$75,000	0	21,750
	Toilet Exchange Program	SF	1,630	1,630	$211,900	$211,900	47,270	47,270
	Toilet Exchange Program	MF	0	0	$0	$0	0	0
Showerhead Exchange	No Categories	SF	1,600	3,200	$2,560	$5,120	56,000	112,000
	No Categories	MF	1,600	3,200	$2,560	$5,120	56,000	112,000
Retrofit Kit Give Away	No Categories	SF	1,600	3,200	$3,808	$7,616	19,200	38,400
	No Categories	MF	1,600	3,200	$3,808	$7,616	19,200	38,400
Industrial, Commercial and Institutional Water Use Evaluation/ Implementation	Leak Detection and Repair of County-owned Facilities	NR	25	50	$118,500	$237,000	25,000	50,000
	Evaluate and Retrofit County-owned Administrative Buildings[1]	NR	10	32	$16,000	$51,200	15,000	48,000
	Evaluate and Retrofit Private Commercial Buildings	NR	0	0	$0	$0	0	0
	Hotel Program[1]	NR	12	24	$8,000	$16,000	19,404	38,808
Plan Total			For 2008		**$871,000**	**$1,623,000**	**1,158,000**	**2,244,000**
Sub-total for SF					**$547,000**	**$959,000**	**257,000**	**488,000**
Sub-total for MF					**$22,000**	**$43,000**	**142,000**	**220,000**
Sub-total for NR					**$303,000**	**$625,000**	**760,000**	**1,537,000**

BMP	Category	Sector	2009: No. of Meas. in 2009	2009: Cumulative No. of Meas.	2009: 2009 Cost	2009: Cum. Costs ($ to date)	2009: New Water Savings (GPD)	2009: 2009 Cumulative Water Savings Rate (GPD)
Water-Efficient Landscape and Irrigation Evaluations and Rebates with Moisture Sensor Retrofit	Landscape & Irrigation Evaluations plus Moisture Sensor Retrofit (without Rebate)[1]	SF	360	960	$93,600	$249,600	83,880	223,680
		MF County-Owned (~25 irrigated acres)	20	60	$160,200	$480,600	700,000	2,100,000
High-Efficiency Clothes Washer Rebate	Common-area Washers[1]	MF with Common-area Clothes Washers	50	150	$15,000	$45,000	2,400	7,200
High Efficiency Toilet (HET) Retrofit/Rebate	Retrofit (includes showerhead and aerators)[1]	SF - Elderly	1,000	3,000	$250,000	$750,000	64,000	192,000
		County-Owned MF Housing[1]	2,500	3,500	$0	$0	160,000	224,000
	Rebate (toilet only)[1]	SF	0	750	$0	$75,000	0	21,750
	Toilet Exchange Program	SF	1,630	3,260	$211,900	$423,800	47,270	94,540
	Toilet Exchange Program	MF	0	0	$0	$0	0	0
Showerhead Exchange	No Categories	SF	1,770	4,970	$2,832	$7,952	61,950	173,950
	No Categories	MF	1,720	4,920	$2,752	$7,872	60,200	172,200
Retrofit Kit Give Away	No Categories	SF	1,770	4,970	$4,213	$11,829	21,240	59,640
	No Categories	MF	1,720	4,920	$4,094	$11,710	20,640	59,040
Industrial, Commercial and Institutional Water Use Evaluation/ Implementation	Leak Detection and Repair of County-owned Facilities	NR	30	80	$142,200	$379,200	30,000	80,000
	Evaluate and Retrofit County-owned Administrative Buildings[1]	NR	10	42	$16,000	$67,200	15,000	63,000
	Evaluate and Retrofit Private Commercial Buildings	NR	0	0	$0	$0	0	0
	Hotel Program[1]	NR	12	36	$8,000	$24,000	19,404	58,212
Plan Total			For 2009		**$911,000**	**$2,534,000**	**1,286,000**	**3,530,000**
Sub-total for SF					**$563,000**	**$1,519,000**	**278,000**	**766,000**
Sub-total for MF					**$22,000**	**$65,000**	**244,000**	**463,000**
Sub-total for NR					**$327,000**	**$952,000**	**765,000**	**2,302,000**

WSH = Water Savings Horizon
GPD = gallons per day
TG = thousand gallons

Table 5: Countywide BMP Implementation Schedule, Costs, and Savings Projections

BMP	Category	Sector	Cost/ measure[1]	Savings Rate (gallons per meas. per day)	2010						2011						2016					
					No. of Meas. in 2010	Cumulative No. of Meas.	2010 Cost	Cum. Costs ($ to date)	New Water Savings (GPD)	2010 Cumulative Water Savings Rate (GPD)	No. of Meas. in 2011	Cumulative No. of Meas.	2011 Cost	Cum. Costs ($ to date)	New Water Savings (GPD)	2011 Cumulative Water Savings Rate (GPD)	No. of Meas. in 2016	Cumulative No. of Meas.	2016 Cost	Cum. Costs ($ to date)	New Water Savings (GPD)	2016 Cumulative Water Savings Rate (GPD)
Water-Efficient Landscape and Irrigation Evaluations and Rebates with Moisture Sensor Retrofit	Landscape & Irrigation Evaluations plus Moisture Sensor Retrofit (without Rebates)[1]	SF	$260	233	360	1,320	$93,600	$343,200	83,880	307,560	360	1,680	$93,600	$436,800	83,880	391,440	340	3,420	$88,400	$889,200	79,220	796,860
		NR County Owned (~20 irrigated acres)	$8,010	35,000	20	80	$160,200	$640,800	700,000	2,800,000	20	100	$160,200	$801,000	700,000	3,500,000	0	140	$0	$1,121,400	0	4,900,000
High-Efficiency Clothes Washer Rebate	Common-area Washers[1]	MF with Common-area Clothes Washers	$300	48	50	200	$15,000	$60,000	2,400	9,600	50	250	$15,000	$75,000	2,400	12,000	50	500	$15,000	$150,000	2,400	24,000
High Efficiency Toilet (HET) Retrofit/Rebate	Retrofit (includes showerhead and aerators)[1]	SF - Elderly	$250	64	1,000	4,000	$250,000	$1,000,000	64,000	256,000	1,000	5,000	$250,000	$1,250,000	64,000	320,000	1,000	10,000	$250,000	$2,500,000	64,000	640,000
		County-Owned MF Housing[1]	$0	64	2,000	6,000	$0	$0	128,000	384,000	2,000	8,500	$0	$0	128,000	544,000	0	11,000	$0	$0	0	704,000
	Rebate (toilet only)[1]	SF	$100	29	0	750	$0	$75,000	0	21,750	0	750	$0	$75,000	0	21,750	0	750	$0	$75,000	0	21,750
	Toilet Exchange Program	SF	$130	29	1,630	4,890	$211,900	$635,700	47,270	141,810	1,630	6,520	$211,900	$847,600	47,270	189,080	1,630	14,670	$211,900	$1,907,100	47,270	425,430
	Toilet Exchange Program	MF	$130	29	0	0	$0	$0	0	0	0	0	$0	$0	0	0	2,240	11,200	$291,200	$1,456,000	64,960	324,800
Showerhead Exchange	No Categories	SF	$1.60	35	1,770	6,740	$2,832	$10,784	61,950	235,900	1,770	8,510	$2,832	$13,616	61,950	297,850	1,770	17,360	$2,832	$27,776	61,950	607,600
	No Categories	MF	$1.60	35	1,720	6,640	$2,752	$10,624	60,200	232,400	1,720	8,360	$2,752	$13,376	60,200	292,600	1,720	16,960	$2,752	$27,136	60,200	593,600
Retrofit Kit Give Away	No Categories	SF	$2.38	12	1,770	6,740	$4,213	$16,041	21,240	80,880	1,770	8,510	$4,213	$20,254	21,240	102,120	1,770	17,360	$4,213	$41,317	21,240	208,320
	No Categories	MF	$2.38	12	1,720	6,640	$4,094	$15,803	20,640	79,680	1,720	8,360	$4,094	$19,897	20,640	100,320	1,720	16,960	$4,094	$40,365	20,640	203,520
Industrial, Commercial and Institutional Water Use Evaluation/ Implementation	Leak Detection and Repair of County-owned Facilities	NR	$4,740	1,000	30	110	$142,200	$521,400	30,000	110,000	30	140	$142,200	$663,600	30,000	140,000	30	290	$142,200	$1,374,600	30,000	290,000
	Evaluate and Retrofit County-owned Administrative Buildings[1]	NR	$1,600	1,500	10	52	$16,000	$83,200	15,000	78,000	10	62	$16,000	$99,200	15,000	93,000	10	112	$16,000	$179,200	15,000	168,000
	Evaluate and Retrofit Private Commercial Buildings	NR	$1,600	1,500	0	0	$0	$0	0	0	0	0	$0	$0	0	0	270	1,080	$340,800	$1,704,000	316,500	1,587,500
	Hotel Program[1]	NR	$667	1,617	12	48	$8,000	$32,000	19,404	77,616	12	60	$8,000	$40,000	19,404	97,020	12	120	$8,000	$80,000	19,404	194,040
Plan Total					Per 2010		$811,000	$3,440,000	1,286,000	4,216,000	Per 2011		$811,000	$4,256,000	1,294,000	6,102,000	Per 2016		$1,278,000	$11,574,000	898,000	11,796,000
Sub-total for SF							$563,000	$2,281,000	275,000	1,044,000			$563,000	$2,844,000	278,000	1,323,000			$558,000	$5,641,000	274,000	2,735,000
Sub-total for MF							$22,000	$87,000	244,000	796,000			$22,000	$109,000	244,000	949,000			$314,000	$1,674,000	146,000	1,835,000
Sub-total for NR							$227,000	$1,276,000	765,000	3,066,000			$227,000	$1,504,000	765,000	3,831,000			$398,000	$4,465,000	384,000	7,150,000

WSH = Water Savings Horizon
GPD = gallons per day
TG = thousand gallons

Table 5: Countywide BMP Implementation Schedule, Costs, and Savings Projections

BMP	Category	Sector	Cost/ measure	Savings Rate (gallons per meas. per day)	2021: No. of Meas. in 2021	2021: Cumulative No. of Meas.	2021: 2021 Cost	2021: Cum. Costs ($ to date)	2021: New Water Savings (GPD)	2021: 2021 Cumulative Water Savings Rate (GPD)	2026: No. of Meas. in 2026	2026: Cumulative No. of Meas.	2026: 2026 Cost	2026: Cum. Costs ($ to date)	2026: New Water Savings (GPD)	2026: 2026 Cumulative Water Savings Rate (GPD)	Water Savings Across the 20-Year WSH (Cumulative Water Savings 2007-2026) (MG)	Total # of BMPs (Count of BMPs 2007-2026)
Water-Efficient Landscape and Irrigation Evaluations and Rebates with Moisture Sensor Retrofit	Landscape & Irrigation Evaluations plus Moisture Sensor Retrofit (without Rebate)	SF	$260	233	340	5,120	$88,400	$1,331,200	79,220	1,192,960	340	6,820	$88,400	$1,773,200	79,220	1,589,060	8,575	6,820
		MF County-Owned (~20 irrigated acres)	$8,010	35,000	0	140	$0	$1,121,400	0	4,900,000	0	140	$0	$1,121,400	0	4,900,000	30,400	140
High-Efficiency Clothes Washer Rebate	Common-area Washers	MF with Common-area Clothes Washers	$300	48	50	750	$15,000	$225,000	2,400	36,000	50	1,000	$15,000	$300,000	2,400	48,000	184	1,000
High Efficiency Toilet (HET) Retrofit/Rebate	Retrofit (includes showerhead and aerators)	SF - Elderly	$250	64	1,000	15,000	$250,000	$3,750,000	64,000	960,000	1,000	20,000	$250,000	$5,000,000	64,000	1,280,000	4,909	20,000
		County-Owned MF Housing	$0	64	0	11,000	$0	$0	0	704,000	0	11,000	$0	$0	0	704,000	4,298	11,000
	Rebate (toilet only)	SF	$100	29	0	750	$0	$75,000	0	21,750	0	750	$0	$75,000	0	21,750	159	750
	Toilet Exchange Program	SF	$130	29	1,630	23,620	$211,900	$2,966,600	47,270	681,780	1,630	30,870	$211,900	$4,026,100	47,270	898,130	3,279	30,870
	Toilet Exchange Program	MF	$130	29	2,240	22,400	$291,200	$2,912,000	64,960	649,600	2,240	33,600	$291,200	$4,368,000	64,960	974,400	2,645	33,600
Showerhead Exchange	No Categories	SF	$1.60	35	1,770	26,210	$2,832	$41,936	61,950	917,350	1,770	35,060	$2,832	$56,096	61,950	1,227,100	4,964	35,063
	No Categories	MF	$1.60	35	1,720	25,560	$2,752	$40,896	60,200	894,600	1,720	34,160	$2,752	$54,656	60,200	1,195,600	4,505	34,160
Retrofit Kit Give Away	No Categories	SF	$2.38	12	1,770	26,210	$4,213	$62,380	21,240	314,520	1,770	35,060	$4,213	$83,443	21,240	420,720	1,569	35,060
	No Categories	MF	$2.38	12	1,720	25,560	$4,094	$60,833	20,640	306,720	1,720	34,160	$4,094	$81,301	20,640	409,920	1,562	34,160
Industrial, Commercial, and Institutional Water Use Evaluation/ Implementation	Leak Detection and Repair of County-owned Facilities	NR	$4,740	1,000	30	440	$142,200	$2,085,600	30,000	440,000	30	590	$142,200	$2,796,600	30,000	590,000	2,228	590
	Evaluate and Retrofit County-owned Administrative Buildings	NR	$1,600	1,500	0	122	$0	$195,200	0	183,000	0	122	$0	$195,200	0	183,000	1,005	122
	Evaluate and Retrofit Private Commercial Buildings	NR	$1,600	1,500	213	2,130	$340,800	$3,408,000	319,500	3,195,000	213	3,195	$340,800	$5,112,000	319,500	4,792,500	13,684	3,195
	Hotel Program	NR	$667	1,617	12	180	$8,000	$120,001	19,404	291,060	12	240	$8,000	$160,001	19,404	388,080	1,487	240
Plan Total					For 2021		$1,383,000	$16,397,000	791,000	15,668,000	For 2026		$1,383,000	$23,303,000	791,000	19,623,000	84,000	246,867
Sub-total for SF							$658,000	$8,228,000	274,000	4,069,000			$658,000	$11,514,000	274,000	5,437,000	21,000	135,000
Sub-total for MF							$214,000	$3,238,000	148,000	2,591,000			$214,000	$4,504,000	148,000	3,332,000	14,000	113,020
Sub-total for NR							$492,000	$5,931,000	369,000	6,613,000			$492,000	$8,394,000	369,000	10,854,000	55,000	4,287

WSH = Water Savings Horizon
GPD = gallons per day
TG = thousand gallons

APPENDIX F

Exhibit 30 from Miami-Dade County
20-Year Water Use Permit,
November 15, 2007

Reuse Projects and Deadlines

Project	Reclaimed water generated from and amount to be treated	Quantity of Reclaimed Wastewater Applied	Reclaimed water used for	Implementation Deadline
1.	South District WWTP 21.9 mgd	18.6 MGD *finished water assuming 15% treatment loss. The recharge volume may vary depending on actual treatment loss*	Recharge South Dade Miami Heights wellfields or other project	January 1, 2014
2.	South District WWTP 89.1 mgd	75.7 MGD *finished reclaimed water assuming 15% treatment loss. The applied volume may vary depending on actual treatment loss.*	Biscayne Coastal Wetlands or other project	Jan. 1, 2021
3.	South District WWTP 1 mgd	1 MGD	Public access irrigation water (landfill cap)	Existing
4.	West District Reclaimed Water Plant 24.7 mgd	21 MGD *finished water assuming 15% treatment loss. The recharge volume may vary depending on actual treatment loss.*	Recharge Southwest, Snapper Creek, and Alex Orr Wellfields (Alex Orr WTP/Central water system)	January 1, 2021
5.	West District Reclaimed Water Plant 18.8 mgd	16 MGD *finished water assuming 15% treatment loss. The recharge volume may vary depending on actual treatment loss.*	Recharge Southwest, Snapper Creek, and Alex Orr Wellfields (Alex Orr WTP/Central water system)	January 1, 2026
6.	West District Reclaimed Water Plant 6.5 mgd	6.5 MGD minimal treatment losses	Public access projects to be determined	September 1, 2021
7.	North District WWTP 7 mgd	7 MGD minimal treatment losses	Public access irrigation projects	January 1, 2012
8.	Central District WWTP 1 mgd	1 MGD minimal treatment losses	Public access irrigation projects	January 1, 2012
	TOTAL REQUIRED PROJECTS = 170 MGD			January 1, 2026
9.	North and/or Central WWTP	Up to 70 MGD*	FP&L nuclear plant – Turkey Point	
10.	North and/or Central WWTP	14 MGD *	FP&L gas powered plant expansion – Turkey Point	
	OTHER POTENTIAL LARGE-SCALE PROJECTS = 84 MGD			
	GRAND TOTAL = 254 MGD Miami-Dade is committed to providing 170 MGD reclaimed water + 84 MGD contingent on FP&L receiving authorization to construct these power facilities			January 1, 2026

EXHIBIT 30

APPENDIX G

List of Large and Small

Public Water Systems

Exhibit G-1
List of Large and Small Public Water Supply Systems

PWS ID	Mailing Name	**Mailing Street**	**City**	**Zip**	**Capacity(GPD)**
4130048	ANDERSON'S CORNER GROCERY	15730 SW 232 STREET	MIAMI	33170	8000
4130053	HIGHTAILIN' IT	20264 OLD CUTLER ROAD	MIAMI	33189	28000
4130112	BENSON LIGHTING	12955 SW 87 AVE	MIAMI	33176	36000
4130159	BROOKS (J R) & SON	18401-50 SW 256 STREET	HOMESTEAD	33031	28000
4130320	CAMP OWAISSA BAUER	17001 SW 264 STREET	MIAMI	33031	183000
4130322	REDLAND JR. HIGH SCHOOL	16001 SW 248 ST	HOMESTEAD	33031	144000
4130445	TROPICAL RESEARCH & EDUCATION (	18905 SW 280 STREET	HOMESTEAD	33031	36000
4130496	FRANKSHER BUILDING	9300 SOUTH DIXIE HIGHWAY	MIAMI	33170	64000
4130588	REDLANDS MOBILE HOME PARK	17360 S.W. 232 STREET	MIAMI	33170	100000
4130721	KOA MIAMI SOUTH	20675 SW 162 AVENUE	MIAMI	33187	122000
4130736	VILLA DE DON POLLO	20500 SOUTH DIXIE HIGHWAY	MIAMI	33189	36000
4130793	DELUXE MOTEL	28475 SOUTH DIXIE HIGHWAY	LEISURE CITY	33033	46000
4130811	DE LEON HARVESTING	19855 SW 272 STREET	HOMESTEAD	33031	36000
4130823	DAN LEWIS PROPERTIES	22401-22415 SO. DIXIE HWY.	MIAMI	33170	15000
4130833	JONES' TRAILER PARK	14601 NW 185TH STREET #11	MIAMI	33016	50000
4130871	MDWASA - MAIN SYSTEM	3071 SW 38 AVENUE	MIAMI	33146	442740000
4130891	ROBERTS AIR	28701 SW 219 AVENUE	HOMESTEAD	33030	28000
4130893	DADE HOMESTEAD GAA - ADMIN.	28700 SW 217TH AVENUE	HOMESTEAD	33030	28000
4130894	DADE HOMESTEAD GAA SKYDIVE	28700 SW 217 AVENUE	HOMESTEAD	33030	28000
4130897	DADE LANDSCAPE NURSERY	50 SW 32 ROAD	MIAMI	33129	86000
4130933	MONKEY JUNGLE	14805 SW 216 ST	MIAMI	33170	122000
4130934	MONTESSORI COUNTRY SCHOOL	20130 SW 304 ST	HOMESTEAD	33030	38000
4130951	LAST CHANCE LOUNGE	35800 SOUTH DIXIE HIGHWAY	FLORIDA CITY	33034	5000
4130977	NORTH MIAMI CITY OF	12100 NW 11 AVE (PLANT)	NORTH MIAMI	33161	9300000
4131080	PEDERSEN BUILDING	17511 SW 99 ROAD	MIAMI	33157	17000
4131185	GROVE INN	22540 S.W. 177 AVENUE	MIAMI	33170	36000
4131192	REDLAND GOLF & COUNTRY CLUB	24451 SW 177 AVENUE	HOMESTEAD	33090	57000
4131202	MDWASA/REX UTILITIES	P.O. BOX 316	MIAMI	33133	12030000
4131217	RINKER CEMENT MILL	1200 NW 137 AVENUE	MIAMI	33166	720000
4131250	ROYAL TERN MOTEL INC	26480 S DIXIE HIGHWAY	HOMESTEAD	33032	61000
4131312	SILVER PALM MOBILE HOMES	17350 SW 232 STREET	MIAMI	33170	122000
4131313	SILVER PALMS METHODIST CHURCH	15855 SOUTHWEST 248 STREET	HOMESTEAD	33031	36000
4131403	AMERICANA VILLAGE	19800 SW 180 AVE. #602	MIAMI	33187	500000
4131436	MASTER CARPETS	18040 SOUTH DIXIE HIGHWAY	MIAMI	33157	46000
4131454	R & R CAFE	18401 SW 256 ST	HOMESTEAD	33031	36000
4131618	NORTH MIAMI BEACH	19150 NW 8 AVENUE	NORTH MIAMI BEACH	33162	32000000
4131631	HOMESTEAD AIR FORCE BASE	31 CES/DEMW WATER PLANT	HOMESTEAD	33039	1300000
4131923	BISC NATL PK-ELLIOTT KEY	9700 SW 328 STREET	HOMESTEAD	33033	12000
4131958	SUNRISE COMMUNITY	22300 S.W. 162 AVENUE	MIAMI	33170	150000
4131961	REDLAND FRUIT AND SPICE PARK	24801 SW 187TH AVENUE	MIAMI	33031	46000
4131962	CASTELLOW HAMMOCK PARK	28450 SW 152 AVE	MIAMI	33129	1700
4134228	CHEVRON KROME	24800 SW 177 AVE.	HOMESTEAD	33031	1000
4134234	RINKER MATERIALS - SWEETWATER	1200 N.W. 137TH AVENUE	MIAMI	33165	5000
4134237	JACK'S BAIT & TACKLE	35412 SO. DIXIE HWY. .	FLORIDA CITY	33034	3200
4134239	LIBERTY (FORMERLY SHELL GAS STA1	24797 SW 177 AVENUE	MIAMI	33030	9600
4134300	REDLAND CHRISTIAN ACADEMY	17700 SW 280 ST	HOMESTEAD	33031	10000
4134301	IGLESIA BUEN SAMARITANO	25795 SW 137 AVE	MIAMI	33032	12000
4134328	ATLANTIC FERTILIZER	18375 SW 260 ST	HOMESTEAD	33031	1000
4134334	COSTA NURSERY II	18201 SW 216 ST	MIAMI	33170	1000
4134338	BENITO JUAREZ PARK	19825 SW 376 STREET	HOMESTEAD	33034	1700
4134358	DADE JUVENILE RESIDENTIAL FACILIT	18500 SW 424 ST	FLORIDA CITY	33034	35000
4134363	HOMESTEAD JEHOVAH'S WITNESS	18505 SW 288 STREET	HOMESTEAD	33030	1
4134364	FROG POND/DADE CORNERS	17696 SW 8 STREET	MIAMI	33194	1
4134368	EVERGLADES PK-PINE ISLAND	PO BOX 279	HOMESTEAD	33030	100000
4134369	EVERGLADES PK-HEADQTRS	PO BOX 279	HOMESTEAD	33030	100000
4134371	EVERGLADES PK-DAN BEARD	40001 S.R. 9336	HOMESTEAD	33034	100000
4134372	EVERGLADES PK-LONG PINE KEY	PO BOX 279	HOMESTEAD	33030	10800
4134373	EVERGLADES NATIONAL PARK BILL R(	40001 S.R. 9336	HOMESTEAD	33034	20000
4134374	EVERGLADES PK-ROYAL PALM	40001 S.R. 9336	HOMESTEAD	33034	21600
4134375	EVERGLADES PK-SHARK VALLEY	PO BOX 279	HOMESTEAD	33030	8000
4134376	EVERGLADES SHARK VALLEY TOWER	PO BOX 279	HOMESTEAD	33030	1
4134379	BERNECKER'S NURSERY	16900 SW 216 STREET	MIAMI	33170	5000
4134382	BUTLER'S NURSERY	15870 SW 216 STREET	MIAMI	33170	5000
4134384	CAULEY SQUARE TEA ROOM	22400 OLD DIXIE HWY	MIAMI	33170	10000
4134385	UNITARIAN UNIVERSAL CONGR'N OF N	7701 SW 76 AVE	MIAMI	33143	5000
4134387	COCONUT PALM TRADING POST	17750 SW 248 STREET	HOMESTEAD	33187	5000
4134388	COFFEY'S MARKET	20090 SW 177 AVENUE	MIAMI	33187	5000
4134393	COOPERTOWN	22700 SW 8 ST	MIAMI	33144	5000
4134394	COSTA NURSERY	22290 SW 162 AVENUE	MIAMI	33170	5000
4134400	EL NOPAL	22605 S DIXIE HWY	MIAMI	33177	5000
4134402	GREENLEAF NURSERY	19355 SW 304 STREET	HOMESTEAD	33030	5000
4134414	PLAYPEN SOUTH (GATOR KICKS)	23101 S DIXIE HWY	MIAMI	33189	5000
4134417	REDLAND TAVERN	17701 SW 232 STREET	GOULDS	33170	5000

Exhibit G-1
List of Large and Small Public Water Supply Systems

PWS ID	Mailing Name	Mailing Street	City	Zip	Capacity(GPD)
4134420	SAFARI RESTAURANT	26700 SW 8 ST	MIAMI	33193	5000
4134422	SOUTH FLORIDA TESTING SERVICE	17301 OKEECHOBEE ROAD	HIALEAH	33016	5000
4134430	TOM THUMB #122	23200 SW 177 AVENUE MIAMI 33170	MIAMI 33170	33010	5000
4134431	REDLAND EXXON	14695 SW 216 STREET	MIAMI	33177	5000
4134434	COMMUNITY ASPHALT	14005 N.W. 186 STREET	HIALEAH	33018	5000
4134439	RINKER-F.E.C. OFFICE	13292 NW 119 AVENUE	HIALEAH	33178	3000
4134442	REDLAND COMMUNITY CHURCH	14601 SW 248 ST.	MIAMI	33032	3000
4134443	COMCAST CABLE	20800 SW 167 AVE.	MIAMI	33187	3000
4134445	FIRST GRACE FAITH PENTECOST	24637 SW 137 AVENUE	PRINCETON	33032	3000
4134446	KENT MOTEL	22345 S. DIXIE HWY.	GOULDS	33170	3000
4134448	PALMS PROFESSIONAL CENTER	18430 S. DIXIE HWY.	MIAMI	33157	3000
4134451	FARM CREDIT SERVICE	24700 SW 177 AVENUE	HOMESTEAD FL 33090	33030	2720
4134453	RINKER-F.E.C. SHOP	12155 NW 136 STREET	HIALEAH	33178	16000
4134454	OKEECHOBEE RANCH	17015 OKEECHOBEE RD	HIALEAH GARDENS	33018	3000
4134459	CIRCLE D FARMS	32700 SW 217 AVENUE	HOMESTEAD	33090	3000
4134462	REDLANDS GROCERY	26400 SW 187 AVENUE	HOMESTEAD	33031	3000
4134464	SUNRISE ADULT GROUP HOME (15190	15190 SW 272 STREET	NARANJA	33032	3000
4134465	SUNRISE ADULT SERVICES (29800)	29800 OLD DIXIE HWY	HOMESTEAD	33030	3000
4134468	U-HAUL RENTAL & SERVICES	16500 SO. DIXIE HIGHWAY	MIAMI	33157	3000
4134471	CERTIFIED AUTO	6812 SW 81 STREET	MIAMI	33143	3000
4134494	DINAS QUICK MART	22745 SO. DIXIE HWY	MIAMI	33170	3000
4134498	CREATIVE YEARS	15680 SW 232 STREET	MIAMI	33170	2000
4134499	OUR LADY OF MERCY CEMETERY	11411 NW 25 STREET	DORAL	33172	2000
4134502	CHRISTIAN FAMILY WORSHIP CENTER	27500 OLD DIXIE HIGHWAY	HOMESTEAD	33031	9600
4134506	FIRST BAPTIST CHURCH REDLAND	16390 SW 248 STREET	HOMESTEAD	33031	2000
4134508	AVIARY BIRD SHOP	22707 SO. DIXIE HIGHWAY	GOULDS	33170	2000
4134512	DE LEON BROMELIADS	13745 S.W. 216TH ST.	MIAMI	33170	5000
4134516	TOM THUMB #127	18400 SW 177 AVENUE MIAMI 33187	HIALEAH	33010	2400
4134518	CHRIST LIFE CENTER	9775 SW 87 AVENUE	MIAMI	33176	500
4134519	OKEECHOBEE BARRIER	FLA TURNPIKE & OKEECHOBEE	MIAMI	33016	9600
4134522	1ST BAPTIST CHURCH OF HOMESTEAI	29050 KROME AVE. MAIL: POBOX 900428	HOMESTEAD	33030	5000
4134523	WOMEN'S CLUB OF HOMESTEAD	17905 SW 292 STREET	HOMESTEAD	33030	3300
4134524	REDLAND CHURCH OF THE NAZARENI	22755 SW 177 AVENUE	MIAMI	33170	7200
4134525	RINKER HYDRO-CONDUIT	13292 NW 118TH AVENUE	MIAMI	33178	1400
4134527	RINKER EMPLOYEES	12150 NW 136 ST	MIAMI	33178	3750
4134528	FRUTICUBA	16751 KROME AVENUE	MIAMI	33187	0
4134529	US 1 MOTORS	17528 SOUTH DIXIE HWY	MIAMI	33157	20
4134531	CITGO EXPRESS MART	24790 SW 177 AVE	HOMESTEAD	33031	1000
4134532	SUNOCO KROME AVE	26400 SW 177 AVE	MIAMI	33169	50
4134533	GATOR PARK	24050 SW 8 STREET	MIAMI	33193	30
4134535	VILA & SONS	13901 NW 118 AVE	MEDLEY	33178	50
4134536	EVERGLADES STORE	38005 INGRAHAM HWY	FLORIDA CITY	33034	15
4134537	MANNHEIMER FOUNDATION	20255 SW 360 STREET	HOMESTEAD	33034	0
4134538	BT SOUTH DBA BOODY TRAP	29000 SOUTH DIXIE HWY	HOMESTEAD	33033	120
4134540	CHEVRON GAS STATION	23150 SW 177 AVE	MIAMI	33170	320
4134542	LA CIDRA	19130 SW 177 AVENUE	MIAMI	33187	3200
4134543	SCHNEBLY WINERY	30205 SW 217 AVENUE	HOMESTEAD	33030	4800
4134544	FRUTERIA CACHITA	17800 SW 177 AVENUE	MIAMI	33187	200

APPENDIX H

Miami-Dade County Water and Sewer Department 20-Year Water Use Permit

FORM #0299
Rev 5/93

SOUTH FLORIDA WATER MANAGEMENT DISTRICT
WATER USE PERMIT NO. RE-ISSUE 13-00017-W
(NON - ASSIGNABLE)

Date Issued: 15-NOV-2007 **Expiration Date:** November 15, 2027

Authorizing: THE CONTINUATION OF AN EXISTING USE OF GROUND WATER FROM THE BISCAYNE AQUIFER AND UPPER FLORIDAN AQUIFER FOR PUBLIC WATER SUPPLY USE WITH AN ANNUAL ALLOCATION OF 152741 MILLION GALLONS.

Located In: Miami-Dade County, S--/T53S/R39-41
S--/T54S/R39-42E
S--/T55S/R39-40E
S--/T56S/R38-39E
S--/T57S/R38-40E

Issued To: MIAMI-DADE WATER AND SEWER DEPARTMENT
(MIAMI-DADE CONSOLIDATED PWS)
P.O.BOX 330316
MIAMI. FL 33233-0316

This Permit is issued pursuant to Application No.040511-5 , dated May 11, 2004, for the Use of Water as specified above and subject to the Special Conditions set forth below. Permittee agrees to hold and save the South Florida Water Management District and its successors harmless from any and all damages, claims or liabilities which may arise by reason of the construction, maintenance or use of activities authorized by this permit. Said application, including all plan and specifications attached thereto, is by reference made a part hereof.

Upon written notice to the permittee, this permit may be temporarily modified, or restricted under a Declaration of Water Shortage or a Declaration of Emergency due to Water Shortage in accordance with provisions of Chapter 373, Fla. Statutes, and applicable rules and regulations of the South Florida Water Management District.

This Permit may be permanently or temporarily revoked, in whole or in part, for the violation of the conditions of the permit or for the violation of any provision of the Water Resources Act and regulations thereunder.

This Permit does not convey to the permittee any property rights nor any privileges other than those specified herein, nor relieve the permittee from complying with any law, regulation, or requirement affecting the rights of other bodies or agencies.

Limiting Conditions are as follows:

SEE PAGES 2 - 10 OF 10 (58 LIMITING CONDITIONS).

South Florida Water Management
District, by its Governing Board

On ORIGINAL SIGNED BY:

By ELIZABETH VEGUILLA
Deputy Clerk

LIMITING CONDITIONS

1. This permit shall expire on November 15, 2027.
2. Application for a permit modification may be made at any time.
3. Water use classification:

   Public water supply

4. Source classification is:

   Ground Water from:
   Biscayne Aquifer
   Upper Floridan Aquifer

5. Annual allocation shall not exceed 152741 MG.

   Maximum monthly allocation shall not exceed 13364 MG.

   The allocations above are further constrained by the wellfield operational plan described in Limiting Condition 27. The offset reuse allocations are not applied to the reuse projects outlined in limiting condition #39 that are in addition to the wellfield recharge projects.
   The following limitations to the average annual withdrawals from specific sources are applicable through December 31, 2012:
   Biscayne aquifer: 126,425 MG
   Floridan aquifer: 6,723 MG
   The following limitations to the average annual withdrawals from specific sources are applicable from January 1, 2013 through December 31, 2017:
   Biscayne aquifer: 132,119 MG
   Floridan aquifer: 8,555 MG
   Reuse offset: 5,647 MG (South Miami Heights recharge)
   The following limitations to the average annual withdrawals from specific sources are applicable from January 1, 2018 through December 31, 2022:
   Biscayne aquifer: 136,156 MG
   Floridan aquifer: 10,741 MG
   Reuse offset: 10,614 MG (South Miami Heights & SWWF recharge)
   The following limitations to the average annual withdrawals from specific sources are applicable from January 1, 2023 through December 31, 2027:
   Biscayne aquifer: 142,000 MG
   Floridan aquifer: 10,741 MG
   Reuse offset: 16,461 MG (So. Miami Heights & SWWF recharge)

6. Pursuant to Rule 40E-1.6105, F.A.C., Notification of Transfer of Interest in Real Property, within 30 days of any transfer of interest or control of the real property at which any permitted facility, system, consumptive use, or activity is located, the permittee must notify the District, in writing, of the transfer giving the name and address of the new owner or person in control and providing a copy of the instrument effectuating the transfer, as set forth in Rule 40E-1.6107, F.A.C.

   Pursuant to Rule 40E-1.6107 (4), until transfer is approved by the District, the permittee shall be liable for compliance with the permit. The permittee transferring the permit shall remain liable for all actions that are required as well as all violations of the permit which occurred prior to the transfer of the permit.

   Failure to comply with this or any other condition of this permit constitutes a violation and pursuant to Rule 40E-1.609, Suspension, Revocation and Modification of Permits, the District may suspend or revoke the permit.

This Permit is issued to:
Miami-Dade Water and Sewer Department
3071 SW 38th Ave.
Miami, FL 33146
Attn: John W. Renfrow, P.E., Director

7. Withdrawal facilities:

Ground Water - Existing:

1 - 18" X 50' X 500 GPM Well Cased To 40 Feet
1 - 42" X 107' X 7000 GPM Well Cased To 69 Feet
1 - 30" X 1200' X 3500 GPM Well Cased To 760 Feet
1 - 42" X 68' X 8500 GPM Well Cased To 60 Feet
3 - 48" X 88' X 7500 GPM Wells Cased To 33 Feet
1 - 30" X 1250' X 3500 GPM Well Cased To 845 Feet
4 - 24" X 108' X 8300 GPM Wells Cased To 50 Feet
1 - 14" X 115' X 3800 GPM Well Cased To 80 Feet
4 - 40" X 100' X 10420 GPM Wells Cased To 57 Feet
1 - 24" X 70' X 3470 GPM Well Cased To 35 Feet
2 - 24" X 100' X 7500 GPM Wells Cased To 50 Feet
10 - 48" X 80' X 10420 GPM Wells Cased To 46 Feet
1 - 30" X 115' X 2500 GPM Well Cased To 80 Feet
1 - 30" X 1200' X 3500 GPM Well Cased To 765 Feet
1 - 42" X 68' X 10000 GPM Well Cased To 60 Feet
1 - 12" X 40' X 800 GPM Well Cased To 35 Feet
4 - 24" X 100' X 4900 GPM Wells Cased To 35 Feet
1 - 16" X 100' X 7500 GPM Well Cased To 40 Feet
1 - 30" X 1210' X 3500 GPM Well Cased To 835 Feet
4 - 24" X 104' X 6940 GPM Wells Cased To 54 Feet
2 - 24" X 70' X 6945 GPM Wells Cased To 35 Feet
1 - 18" X 66' X 1500 GPM Well Cased To 53 Feet
6 - 42" X 107' X 7000 GPM Wells Cased To 66 Feet
1 - 18" X 65' X 1500 GPM Well Cased To 50 Feet
1 - 6" X 30' X 400 GPM Well Cased To 25 Feet
1 - 18" X 55' X 500 GPM Well Cased To 42 Feet
20 - 14" X 115' X 2500 GPM Wells Cased To 80 Feet
1 - 18" X 55' X 1500 GPM Well Cased To 45 Feet
1 - 30" X 1300' X 3500 GPM Well Cased To 850 Feet
2 - 42" X 68' X 8500 GPM Wells Cased To 54 Feet
1 - 12" X 35' X 800 GPM Well Cased To 30 Feet
1 - 12" X 35' X 1200 GPM Well Cased To 30 Feet
1 - 16" X 50' X 1600 GPM Well Cased To 40 Feet
7 - 16" X 100' X 4170 GPM Wells Cased To 40 Feet
1 - 30" X 115' X 4170 GPM Well Cased To 80 Feet
2 - 12" X 40' X 1600 GPM Wells Cased To 35 Feet
6 - 20" X 100' X 4900 GPM Wells Cased To 40 Feet
1 - 42" X 68' X 10000 GPM Well Cased To 54 Feet
1 - 48" X 80' X 10416.67 GPM Well Cased To 46 Feet

Ground Water - Proposed:

12 - 17" X 1300' X 2083 GPM Wells Cased To 1150 Feet
2 - " X 1042 GPM Wells With Unknown Total And Cased Depth
9 - " X 1400 GPM Wells With Unknown Total And Cased Depth

1 - " X 2800 GPM Well With Unknown Total And Cased Depth

Reclaimed - Proposed:

1 - " x HP X 12000 GPM1 unspecified Pump
2 - " x HP X 10000 GPM1 unspecified Pumps

8. Permittee shall mitigate interference with existing legal uses that was caused in whole or in part by the permittee's withdrawals, consistent with the approved mitigation plan. As necessary to offset the interference, mitigation will include pumpage reduction, replacement of the impacted individual's equipment, relocation of wells, change in withdrawal source, or other means.

   Interference to an existing legal use is defined as an impact that occurs under hydrologic conditions equal to or less severe than a 1 in 10 year drought event that results in the:

   (1) Inability to withdraw water consistent with provisions of the permit, such as when remedial structural or operational actions not materially authorized by existing permits must be taken to address the interference; or

   (2) Change in the quality of water pursuant to primary State Drinking Water Standards to the extent that the water can no longer be used for its authorized purpose, or such change is imminent.

9. Permittee shall mitigate harm to existing off-site land uses caused by the permittee's withdrawals, as determined through reference to the conditions for permit issuance. When harm occurs, or is imminent, the District will require the permittee to modify withdrawal rates or mitigate the harm. Harm caused by withdrawals, as determined through reference to the conditions for permit issuance, includes:

   (1) Significant reduction in water levels on the property to the extent that the designed function of the water body and related surface water management improvements are damaged, not including aesthetic values. The designed function of a water body is identified in the original permit or other governmental authorization issued for the construction of the water body. In cases where a permit was not required, the designed function shall be determined based on the purpose for the original construction of the water body (e.g. fill for construction, mining, drainage canal, etc.)

   (2) Damage to agriculture, including damage resulting from reduction in soil moisture resulting from consumptive use; or

   (3) Land collapse or subsidence caused by reduction in water levels associated with consumptive use.

10. Permittee shall mitigate harm to the natural resources caused by the permittee's withdrawals, as determined through reference to the conditions for permit issuance. When harm occurs, or is imminent, the District will require the permittee to modify withdrawal rates or mitigate the harm. Harm, as determined through reference to the conditions for permit issuance includes:

   (1) Reduction in ground or surface water levels that results in harmful lateral movement of the fresh water/salt water interface,

   (2) Reduction in water levels that harm the hydroperiod of wetlands,

   (3) Significant reduction in water levels or hydroperiod in a naturally occurring water body such as a lake or pond,

   (4) Harmful movement of contaminants in violation of state water quality standards, or

   (5) Harm to the natural system including damage to habitat for rare or endangered species.

11. If any condition of the permit is violated, the permit shall be subject to review and possible modification, enforcement action, or revocation.

12. Authorized representatives of the District shall be permitted to enter, inspect, and observe the permitted system to determine compliance with special conditions.

13. The Permittee is advised that this permit does not relieve any person from the requirement to obtain all necessary federal, state, local and special district authorizations.

14. The permit does not convey any property right to the Permittee, nor any rights and privileges other than those specified in the Permit and Chapter 40E-2, Florida Administrative Code.

15. Permittee shall submit all data as required by the implementation schedule for each of the limiting conditions to: S.F.W.M.D., Supervising Hydrogeologist - Post-Permit Compliance, Water Use Regulation Dept. (4320), P.O. Box 24680, West Palm Beach, FL 33416-4680.

16. In the event of a declared water shortage, water withdrawal reductions will be ordered by the District in accordance with the Water Shortage Plan, Chapter 40E-21, F.A.C. The Permittee is advised that during a water shortage, pumpage reports shall be submitted as required by Chapter 40E-21, F.A.C.

17. Prior to the use of any proposed water withdrawal facility authorized under this permit, unless otherwise specified, the Permittee shall equip each facility with a District-approved operating water use accounting system and submit a report of calibration to the District, pursuant to Section 4.1, Basis of Review for Water Use Permit Applications.

    In addition, the Permittee shall submit a report of recalibration for the water use accounting system for each water withdrawal facility (existing and proposed) authorized under this permit every five years from each previous calibration, continuing at five-year increments.

18. Monthly withdrawals for each withdrawal facility shall be submitted to the District quarterly. The water accounting method and means of calibration shall be stated on each report.

19. Within six months of permit issuance, the Permittee shall implement the following water level monitoring program:The existing monitoring program is described in Exhibit 9.
    The permittee submit annual Monitoring Program summary reports. The annual report will summarize hydrologic and water quality conditions ascertained from the monitoring data collected. The report will include review and analysis of the data collected and recommendations regarding the monitoring network.

20. Within six months of permit issuance, the Permittee shall implement the following water quality monitoring program:See exhibit 10 for a schedule of completion of the USGS project to update the salt front delineation and monitoring network.
    The permittee shall submit annual Monitoring Program summary reports. The annual report will summarize the status of the project to update the salt front and install new monitor wells.

21. The Permittee shall submit to the District an updated Well Description Table (Table A) within one month of completion of the proposed wells identifying the actual total and cased depths, pump manufacturer and model numbers, pump types, intake depths and type of meters.In addition, the permittee shall submit an updated Table B within one month of installing the reclaimed water recharge pumps. If the location of a proposed well is different from the locations identified in this staff report, the permittee shall submit a report to the District for review and approval that demonstrates that the revised location meets the conditions for permit issuance. District approval of the report is required prior to the issuance of a well construction permit.

22. Permittee shall secure a well construction permit prior to construction, repair, or abandonment of all wells, as described in Chapters 40E-3 and 40E-30, Florida Administrative Code.

23. In the event that the treated water quality produced through the blending of Floridan aquifer water at the rates required under this permit degrades as a result of significant increase in salinity, or other water quality parameters of the Floridan aquifer, the permittee may request the District to authorize specific

actions to limit the water quality increases. Such actions could include a) authorization to inject specified volumes of fresh water into the Floridan aquifer as directed by the District (and otherwise consistent with the provisions of the DEP issued UIC permit), or b) temporarily reducing the volume of Floridan water required to be used for blending until water quality issues are resolved. The threshold of water quality degradation that would trigger the District to consider these relief actions include: a) significant adverse affects to the water treatment or distribution system that would affect the ability to deliver drinkable water or otherwise require modifications to the existing treatment process or equipment; or b) a violation of applicable State primary or secondary drinking water standards. In the event that the permittee is authorized to inject fresh water into the Floridan, the volume injected shall be measured and reported separately and reported on the timeframes outlined in limiting condition 18.

24. The Permittee is authorized to exercise the emergency wells at the Medley Wellfield for a total of two hours per month as needed for bacterial clearance and pump maintenance. Operation of the emergency wells at the Medley Wellfield for more than this amount shall require prior approval from SFWMD. Pumpage data shall be collected and report in accordance with Limiting condition 18.

25. Permittee shall implement the wellfield operating plan described in District staff report prepared in support of recommendation for permit issuance.See Exhibit 14

26. The permittee may request temporary authorization from the District to increase withdrawals from the Biscayne aquifer system wells during storm events, for storage within the Floridan aquifer system consistent with their Department of Environmental Protection (DEP) issued Underground Injection Control permits.The District will consider the availability of stormwater that is not otherwise needed for environmental protection or enhancement and is in no way bound to authorize such requests. All such requests shall be made in writing to the Director of Water Use Regulation.

    The permittee shall report injection/withdrawals from the ASR wells in the following manner:

    Biscayne Aquifer water injected
    Biscayne Aquifer water recovered
    Floridan Aquifer withdrawal

27. No more than 15 mgd shall be withdrawn from the West Biscayne aquifer Wellfield on any given day.

28. No more than 25,550 MGY shall be withdrawn during any 12 month consecutive period from the combined Hialeah, Preston and Miami Springs Biscayne aquifer wellfields

29. No more than 8,065 mgy shall be withdrawn during any 12 month consecutive period from the Snapper Creek Wellfield unless reclaimed water recharge is implemented in locations and amounts necessary to offset the impact of the increase to Everglades water bodies per limiting conditions 38 and 39.

30. No more than 31,353 mgy shall be withdrawn during any 12 month consecutive period from the Southwest Biscayne aquifer Wellfield unless reclaimed water recharge is implemented in locations and amounts necessary to offset the impact of the increase to Everglades water bodies per limiting conditions 38 and 39.

31. No more than 67,343 mgy shall be withdrawn during any 12 month consecutive period from the combined West, Southwest Snapper Creek and Alexander Orr Biscayne aquifer wellfields unless reclaimed water recharge is implemented in locations and amounts necessary to offset the impact of the increase to Everglades water bodies per limiting conditions 38 and 39.

32. No more than 1,825 mgy shall be withdrawn during any 12 month consecutive period from the South Miami Heights Wellfield unless reclaimed water recharge is implemented in locations and amounts necessary to offset the impact of the increase to Everglades water bodies per limiting condition 38.

33. No more than 1,497 mgy shall be withdrawn during any 12 month consecutive period from the combined Everglades Labor Camp and Newton wellfields.

34. No more than 1,745 mgy shall be withdrawn during any 12 month consecutive period from the combined Elevated Tank, Leisure City and Naranja wellfields.

35. Pumpage from Floridan aquifer wells and Biscayne aquifer wells recharged by reclaimed water will be operated on a priority basis, referred to as a "first on, last off" priority. Changes to wellfield operations must be approved via modification of the approved Wellfield Operation Plan by District staff prior to implementation.

36. The permittee shall operate the West Wellfield in accordance with the Memorandum of Understanding between the U.S. Department of the Interior, the Governor of the State of Florida, Miami Dade County and the District incorporated in Exhibit 32.

37. The permittee will develop alternative water supplies in accordance with the schedules described in Exhibit 29.
The permittee will provide annual updates per limiting condition 47 of the status of all alternative water supply projects. The status report shall include work completed to date, expenditures and any anticipated changes in the timelines.

38. In the event that a milestone specified in the alternative water supply schedule and plan contained in Exhibit 29 is going to be missed, the permittee shall notify the Executive Director of the District in writing explaining the nature of the delay, actions taken to bring the project back on schedule and an assessment of the impact the delay would have on the rates of withdrawals from the Everglades water bodies and associated canals as defined in District CUP rules. The District will evaluate the situation and take actions as appropriate which could include: a) granting an extension of time to complete the project (if the delay is minor and doesn't affect the Everglades Waterbodies or otherwise violates permit conditions), b)take enforcement actions including consent orders and penalties, c) modify allocations contained in this permit from the Biscayne aquifer including capping withdrawal rates until the alternative water supply project(s) are completed (in cases where the delay would result in violations of permit conditions) or d) working with the Department of Community Affairs to limit increase demands for water until the alternative water supply project is completed.

39. The permittee shall implement a minimum of 170 MGD of reuse projects as set forth in Projects 1-8 of Exhibit 30 on or before the deadlines provided therein. The exact volume of reclaimed water applied will depend on the treatement losses resulting from the process that are implemented. In the event any of these projects do not require or allow as much reuse as anticipated, the County shall identify and implement other reuse projects that will provide provide beneficial reuse of water by the deadlines set forth in Exhibit 30. Any changes to Exhibit 30 must be reviewed and approved by the District in consultation with the Department of Environmental Protection (DEP) in accordance with Parts I & II of Chapter 373, Florida Statutes, and District rules governing consumptive uses of water in Chapter 40E-2, F.A.C., and DEP rules governing the treatment and use of reclaimed water in Chapter 62-610, F.A.C.

40. Reuse Project numbers 1, 4, and 5 in Exhibit 30 for wellfield recharge must be in place and operating prior to any additional withdrawals from the wellfield over the base condition water use as identified in Exhibit 14C.

41. In addition to the reuse required by limiting condition 39, the Permittee shall work with Florida Power and Light (FP&L) in their development of additional power projects such as the gas power plant expansion and the proposed nuclear power plant. In the event the nuclear power plant is approved, the County shall make public access reclaimed water available from the County's Central and North wastewater treatment plants which can be used for both the gas powered plant and the nuclear power plant.

42. By November 15, 2011, the Permittee shall submit a report for District review and approval identifying the location, treatment, timing and volume for Reuse Projects 4 & 5 which provide groundwater recharge for the Southwest Wellfield. The report shall demonstrate that the proposed recharge sites and operations shall at a minimum prevent increased withdrawals from the C-4, C-2 and eastward groundwater seepage from Everglades National Park over the base condition water use and is otherwise a beneficial reuse of water per Chapter 62-610, F.A.C..

43. For Reuse Project number 2 of Exhibit 30 for rehydration of Biscayne Coastal Wetlands, the Permittee shall develop and complete a pilot testing program in consultation with the District, the Florida Department of Environmental Protection (DEP) and Biscayne Bay National Park. Following the pilot testing program, the parties shall agree on the water quality treatment required and the feasibility of this project on or before January 15, 2011. Extension of this deadline may be issued in writing by the District upon demonstration of good cause such as events beyond the control of the permittee or after consideration of the results/data collected, the District determines that additional testing is necessary. In determining the water quality needed, the parties will consider State and Federal water quality discharge standards, the volume and timing of water to be delivered to Biscayne Bay and the location of delivery. In the event the parties do not reach agreement on the feasibility by January 15, 2011, the Permittee shall begin development of an alternate reuse project from the South District wastewater facility and shall provide the District with a proposal for an alternate project including a conceptual design and schedule for implementation on or before December 15, 2011.

44. Permittee shall maintain an accurate flow meter at the intake of the water treatment plant for the purpose of measuring daily inflow of water.Permittee shall maintain a calibrated flow meter(s) at the intake (raw water) and discharge (treated water) points within the Hialeah/Preston, Alexander Orr, and proposed Hialeah RO and South Miami Heights water treatment plants for the purpose of measuring treatment losses and shall submit monthly data quarterly as required pursuant to Limited Condition # 18.

45. The Water Conservation Plan required by Section 2.6.1 of the Basis of Review for Water Use Permit Applications within the South Florida Water Management District, must be implemented in accordance with the approved implementation schedule.The Water Conservation Plan outlined in Exhibit 27 must be implemented in accordance with the approved implementation schedule. The permittee shall submit an annual report covering water conservation activities during the prior calendar year by March 15 of each year describing water conservation activities for the year including expenditures, projects undertaken and estimated water savings.

46. Permittee shall determine unaccounted-for distribution system losses on a quarterly basis and report the findings on an annual basis. The losses shall be determined for the entire system and for each of the water treatment plants (comparing water pumped from the wells compared to the volume into and out of the treatment plant), utilizing the most recent, approved water accounting and IWA/AWWA water audit methodologies. The permittee shall verify the IWA/AWWA water audit methods to be used with the District for the subsequent year in each annual report. The annual report shall cover activities during the prior calendar year and be submitted on March 15 of each year. In addition to the unaccounted-for loss data, the report shall include the status of the activities (actions and expenditures along with the associated water savings) completed during the year to implement the approved water loss reduction plan (Exhibit 26).
In the event that the difference between the volume of water produced from the treatment plant (column 1 in Exhibit 25) and the sum of the metered and user sale amounts (columns 2, 11 and 13 in Exhibit 25) exceeds 10 percent of the treated water produced (column 4 in Exhibit 25), the permittee shall include in the annual report a description of additional actions which will be implemented the following year(s) to reduce the losses to less than ten percent. If the District concludes that the progress towards achieving losses of less than 10 percent as identified in the unaccounted for losses plan is inconsistent with the plan schedule, the Permittee shall be required to revise the plan, to be approved by the District.

47. All annual reports required in these limiting conditions shall address activities that occurred during a calendar year and shall be submitted to Water Use Compliance on or before March 15th of the following year.

48. By July 1, 2008, the permittee shall submit the final report comparing the volumes of water withdrawn using the cumulative calibrated wellhead flow meter data versus the methods formerly used to estimate flows into/out of the Hialeah-Preston and Alexander Orr water treatment plants. Based on the results of this report and upon District review, the permittee may be required to modify this permit. The necessity to modify the permit will be determined based on a) the degree to which the actual withdrawals (as determined by the calibrated wellhead meters) differs from the historic estimation method, and b) whether

the difference is sufficiently large to affect the demonstration that conditions of permit issuance will be met over the life of the permit. See exhibit 33 for all related milestones for this limiting condition.

49. Every five years, the permittee shall submit a water use compliance report for review and approval by District Staff. The compliance report shall contain sufficient information to maintain reasonable assurance the permittee's use will continue to meet the applicable rules and statutes for the remainder of the permit duration, including:
(a) The results of a water conservation audit that documents the efficiency of water use. The audit shall identify where the specific quantities of water are used and any unaccounted for losses. If the goals of the conservation plan are not achieved, the permittee shall propose and implement specific actions to reduce the water use to acceptable levels within timeframes proposed by the permittee and approved by the District.
(b) A comparison of the permitted allocation, the actual and projected use, and reasonable-beneficial use of water as identified in District rules and updated population and per capita use rates. In the event the permit allocation is greater than the allocation provided for under District rule, the permittee shall apply for a letter modification to reduce the allocation consistent with District rules and the updated population and per capita use rates to the extent they are considered by the District to be indicative of long term trends in the population and per capita use rates over the permit duration. In the event that the permit allocation is less than necessary to meet the actual projected demands allowable under District rule, the permittee shall apply for a modification of the permit to increase the allocation if the permittee intends to utilize an additional allocation, or modify its operation to comply with the existing conditions of the permit.
(c) Summary of the current and previous four years progress reports for implementation of the Alternative Water Supply Plan and any modifications necessary to continue to meet the Plan requirements, and conditions for issuance.
(d) Information demonstrating that the conditions for issuance of the permit are being complied with, pursuant to Limiting Condition # 55 and Section 373.236, F.S.
(e) Updates or amendments to the County's reuse plan.
These compliance reports shall be due on March 15th, 2013, 2018, and 2023.

50. The Permittee shall provide the District with annual updates by March 15th each year describing the activities associated with the implementation of their approved reuse feasibility plan including the following information: (1) the status of distribution system construction, including location and capacity of a) existing reuse lines b) proposed reuse lines to be constructed in the next five years; (2) a summary of uncommitted supplies for the next five years; (3) the status of reuse plan implementation including status of pilot projects, plan design construction, volume of reuse available, volume of wastewater disposed of ; and (4) the status/copies of any ordinances related to reuse (5) any proposed changes to the reuse plan set forth in Exhibit 30. The first annual update is due March 15, 2008.

51. The Permittee shall notify the District within 30 days of any change in service area boundary. If the Permittee will not serve a new demand within the service area for which the annual allocation was calculated, the annual allocation may then be subject to modification and reduction.

52. It has been determined that this project relies, in part on the waters from the Central and Southern Project, and as such is considered to be an indirect withdrawal from an MFL water body under recovery (Everglades). The Lower East Coast Regional Water Supply Plan (May 2000), which is the recovery plan for the Everglades, incorporates a series of water resource development projects and operational changes that are to be completed over the duration of the permit and beyond. If the recovery plan is modified and it is determined that this project is inconsistent with the approved recovery plan, the Permittee shall be required to modify the permit consistent with the provisions of Chapter 373, Florida Statutes.

53. This Permit supersedes and/or cancels the following Water Use Permits:
13-00037-W (Hialeah/Preston/Miami Springs/Northwest)
13-00040-W (South Dade)

54. Within six months, executed large user water agreements with Hialeah and Miami Beach shall be submitted to the District. In the event that the final agreements are for volumes less than those used in

the formulation of the allocations in this permit, the allocations shall be reduced through a letter modification.

55. If it is determined that the conditions for permit issuance are no longer met for the 20 year permit duration, the permittee shall obtain a modification of the Permit from the District as necessary to come into compliance with the conditions for permit issuance. Such conditions for permit issuance include minimum flows and levels, water reservations, and other conditions ensuring the use does not cause water resource harm and is consistent with the objectives of the District, including implementation of the *Comprehensive Everglades Restoration Plan*.

56. Within two years of permit issuance, potable public water supply utilities are required to provide a study evaluating emergency water supply preparedness, including analysis of demand management measures, potential pumpage shifting and the feasibility of emergency interconnections for the purpose of supplying water on a short-term, emergency basis to adjoining utilities. The Permittee must provide the District with a copy of the study. As to emergency interconnects, the feasibility study must assess the technical, physical and economic ability of the Permittee to develop interconnecting pipes capable of delivering water to adjoining utilities to meet emergency, short-term water supply needs. (in the event of an interconnect being established, individual public water supply Permit allocations will not address the emergency usage.) It is the policy of the District to encourage emergency interconnects between adjoining public water supply utilities for the purpose of providing emergency water supply. Thus, where the feasibility study indicates emergency interconnects are possible, the District encourages the adjoining utilities to implement the same.

57. The permittee shall operate surface water control structure known as the Mid-canal structure and bridge in accordance with the approved operational plan included in Exhibit 31. In addition, whenever this structure is opened for the purpose of raising water in the Wellfield Protection Canal down stream of the structure, the upstream structure that delivers water from the L-30 canal shall be opened in a manner to deliver equal volumes to those passed through the Mid-canal structure and bridge. The permittee shall submit operation and flow data logs regarding both structures to the District quarterly.

58. If in the event the permittee does not comply with the limiting conditions herein, the District shall take appropriate action to require compliance, which may include imposition of penalties, injunctive relief and other enforcement mechanisms under Chapter 373, Florida Statutes.

EPA/ROD/R04-82/001
1982

EPA Superfund
Record of Decision:

MIAMI DRUM SERVICES
EPA ID: FLD076027820
OU 01
MIAMI, FL
09/13/1982

MIAMI DRUM SERVICES, DADE COUNTY, FLORIDA.

#DR

ANALYSES REVIEWED:

I HAVE REVIEWED THE FOLLOWING DOCUMENTS DESCRIBING THE ANALYSIS OF COST EFFECTIVENESS OF REMEDIAL ALTERNATIVES FOR THE MIAMI DRUM SITE:

- REPORT TITLED "THE FEASIBILITY OF ABATING THE SOURCE OF GROUND WATER POLLUTION AT MIAMI DRUM SERVICES, DADE COUNTY, FLORIDA," DECEMBER 8, 1981.

- REPORT TITLED "EVALUATION OF THE CLEANUP ACTIVITIES ALREADY UNDERTAKEN AT THE MIAMI DRUM SERVICES HAZARDOUS SITE, DADE COUNTY, FLORIDA," SEPTEMBER 1, 1982.

- STAFF SUMMARIES AND RECOMMENDATIONS.

- RECOMMENDATION BY FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION.

#DE

DECLARATIONS

CONSISTENT WITH THE COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION AND LIABILITY ACT OF 1980, AND THE NATIONAL CONTINGENCY PLAN, I HAVE DETERMINED THAT THE EXCAVATION OF CONTAMINATED SOILS AND DEBRIS AND THEIR TRANSPORTATION TO AN EPA APPROVED LANDFILL FOR SECURE BURIAL PROVIDES AN APPROPRIATE LEVEL OF CLEAN UP. THE ACTION TAKEN IS A COST-EFFECTIVE REMEDY, AND IT EFFECTIVELY AND RELIABLY MITIGATES AND MINIMIZES DAMAGE TO, AND PROVIDES ADEQUATE PROTECTION OF PUBLIC HEALTH, WELFARE AND THE ENVIRONMENT. I HAVE ALSO DETERMINED THAT THE ACTION TAKEN IS APPROPRIATE WHEN BALANCED AGAINST THE NEED TO USE TRUST FUND MONEY AT OTHER SITES. IN ADDITION, THE CHOSEN REMEDY COMPLIED WITH THE REQUIREMENTS OF SECTION 101(24) OF CERCLA BECAUSE OFF-SITE DISPOSAL IS MORE COST-EFFECTIVE THAN POTENTIAL ON-SITE REMEDIES.

RITA M. LAVELLE
ASSISTANT ADMINISTRATOR
OFFICE OF SOLID WASTE & EMERGENCY RESPONSE.

EXECUTIVE SUMMARY
RECORD OF DECISION
MIAMI DRUM SERVICES, DADE COUNTY, FLORIDA

DURING DECEMBER 1981 THROUGH JANUARY 1982, DADE COUNTY PROCEEDED WITH THE EXCAVATION AND DISPOSAL OF HIGHLY CONTAMINATED SOILS AT THE MIAMI DRUM SERVICES, INC. SITE. THE STATE SUBMITTED A COOPERATIVE AGREEMENT ON DECEMBER 11, 1981 AND A REQUEST FOR A DEVIATION FROM THE GRANT REGULATIONS TO ALLOW PRE-AWARD COSTS TO BE PAID UPON FINAL AWARD. A SUPERFUND ALLOCATION FOR THE PRE-AWARD COSTS AND FOR A FEASIBILITY STUDY WAS APPROVED IN AN ACTION MEMORANDUM ON JUNE 1, 1982. THE AWARD IS BASED UPON THE SATISFACTORY COMPLETION AND ACCEPTANCE BY THE STATE OF SEVERAL CONDITIONS DESCRIBED IN A MEMORANDUM FROM RITA M. LAVELLE, ASSISTANT ADMINISTRATOR FOR SOLID WASTE AND EMERGENCY RESPONSE TO CHARLES R. JETER, REGIONAL ADMINISTRATOR, REGION IV, OF JUNE 2, 1982. THE RECORD OF DECISION PROVIDES EPA'S DETERMINATION THAT THE REMEDIAL ACTION UNDERTAKEN BY DADE COUNTY WAS CONDUCTED IN ACCORDANCE WITH CERCLA PROGRAM REQUIREMENTS MEETING THE FIRST CONDITION OF THE JUNE 2ND MEMORANDUM.

THE RECORD OF DECISION CONTAINS THE FOLLOWING INFORMATION:

- BRIEFING SHEET SUMMARIZING THE TECHNICAL FINDINGS AND CONCLUSIONS OF THE DADE COUNTY REMEDIAL ACTION

- ACTION MEMORANDUM DATED JUNE 1, 1982, ALLOCATING SUPERFUND MONIES TO THE MIAMI DRUM SITE

- MEMORANDUM DATED JUNE 2, 1982 CONCERNING THE APPROVAL OF CERCLA EXPENDITURES AT THE MIAMI DRUM SERVICES SITE AND OUTLINING THE CONDITIONS THAT MUST BE MET

- MEMORANDUM DATED JULY 8, 1982, FROM WILLIAM N. HEDEMAN REQUESTING A DEVIATION FROM 40 CFR PART 30.345 (4) TO ALLOW PRE-AWARD COSTS

- MEMORANDUM FROM CHARLES R. JETER DATED AUGUST 26, 1982, PROVIDING REGION IV'S CONCURRENCE WITH THE TECHNICAL EVALUATION REPORT ON THE DADE COUNTY REMEDIAL ACTION

- MEMORANDUM FROM TERRY COLE, ASSISTANT SECRETARY, STATE OF FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION, DATED SEPTEMBER 1, 1982, PROVIDING THE STATE'S ACCEPTANCE AND APPROVAL OF THE TECHNICAL EVALUATION REPORT ON THE DADE COUNTY REMEDIAL ACTION

- FINAL REPORT "EVALUATION OF THE CLEAN-UP ACTIVITIES ALREADY UNDERTAKEN AT THE MIAMI DRUM SERVICES HAZARDOUS WASTE SITE, DADE COUNTY, FLORIDA," SEPTEMBER 1, 1982

- FIELD INVESTIGATION TEAM REPORT, "THE FEASIBILITY OF ABATING THE SOURCE OF GROUND WATER POLLUTION AT MIAMI DRUM SERVICES, DADE COUNTY, FLORIDA," DECEMBER 8, 1981.

MIAMI DRUM SERVICES
DADE COUNTY, FLORIDA
BRIEFING SHEET

PURPOSE

- THE PURPOSE OF THIS BRIEFING IS TO REQUEST APPROVAL FOR THE REMEDIAL ACTION RECOMMENDED BY REGION IV AND THE STATE OF FLORIDA FOR THE MIAMI DRUM SITE. A "RECORD OF DECISION" HAS BEEN PREPARED TO DOCUMENT THIS APPROVAL. THIS PRESENTATION COMPLETES THE FIRST CONDITION CONTAINED IN THE LAVELLE TO JETER MEMORANDUM OF JUNE 2, 1982.

BACKGROUND

- MIAMI DRUM SERVICES (MDS) IS AN APPROXIMATELY 1 ACRE INACTIVE DRUM RECYCLING FACILITY. THE SOILS WERE CONTAMINATED BY PHENOLS, HEAVY METALS, OIL AND GREASE, PESTICIDES AND OTHER MATERIALS FROM THE DRUM CLEANING OPERATION. RESISTIVITY MEASUREMENTS IDENTIFIED A PLUME OF UNDETERMINED COMPOSITION IN THE GROUND WATER UNDERLYING THE AREA.

- IN APRIL 1981, DADE COUNTY FILED A SUIT AGAINST MIAMI DRUM SERVICES, INC., FOR CLEANUP OF THE SITE. THE COURT GRANTED THE COUNTY PRELIMINARY RELIEF AND ORDERED THE COMPANY TO CEASE OPERATIONS. MIAMI DRUM SERVICES SUBSEQUENTLY FILED A MOTION TO DISMISS THE CASE. THE MOTION WAS DENIED, BUT THE COMPANY APPEALED THE DENIAL. THE COUNTY'S SUIT AGAINST MIAMI DRUM SEEKS INJUNCTIVE RELIEF, RECOVERY OF ALL FUNDS SPENT FOR CLEANUP, COMPENSATORY DAMAGES FOR HARM TO NATURAL RESOURCES, AND PUNITIVE DAMAGES.

TECHNICAL SUMMARY

- GIVEN THE POTENTIAL FOR PROTRACTED LITIGATION, THERE EXISTED AN URGENT NEED FOR SOURCE CONTROL ACTION AT THE SITE BECAUSE OF:

  (1) THE SERIOUS DANGER TO PUBLIC HEALTH AND WELFARE PRESENTED BY THE CONTAMINATED DRUMS STILL ON SITE;

  (2) THE ABSENCE OF AN EFFECTIVE DRAINAGE CONTROL SYSTEM;

  (3) THE AMOUNT AND FORM OF HAZARDOUS SUBSTANCE PRESENT AT THE SITE;

  (4) THE LEACHABLE PROPERTIES OF THESE SUBSTANCES;

  (5) THE RISK OF CONTAMINATION OF THE DRINKING WATER SUPPLIES OF DADE COUNTY;

  (6) THE HYDROGEOLOGY OF THE AREA WHICH HELPS IN ACCELERATING THE MIGRATION OF HAZARDOUS SUBSTANCES INTO THE AQUIFER AND LOCAL SURFACE WATER BODIES;

  (7) THE PREVAILING WEATHER CONDITIONS (RAINFALL) CONTRIBUTING TO THE LEACHING PROCESS; AND

  (8) THE ABSENCE OF NATURAL OR MAN-MADE BARRIERS AT THE SITE TO CONTAIN THE CONTAMINATION.

- A NUMBER OF REMEDIAL ALTERNATIVES WERE CONSIDERED IN THE INITIAL SCREENING. ALTERNATIVES IDENTIFIED FELL INTO FOUR GENERAL CATEGORIES:

  - NO ACTION
  - ONSITE CONTAINMENT

- ONSITE TREATMENT
- OFFSITE REMOVAL AND DISPOSAL.

A FEASIBILITY STUDY PERFORMED BY AN EPA CONTRACTOR RECOMMENDED EXCAVATION AND RELOCATION OF THE CONTAMINATED MATERIALS TO AN EXISTING AND APPROVED DISPOSAL FACILITY. THE NO ACTION ALTERNATIVE WAS DETERMINED NOT TO BE PROTECTIVE OF PUBLIC HEALTH. ONSITE CONTAINMENT WAS EVALUATED, BUT BECAUSE OF THE HIGH GROUND WATER TABLE (ONE TO THREE FEET FROM THE SURFACE), THE DEPTH TO AN AQUTCLUDE (100 FEET OR MORE), AND THE SOLUTION CAVITY NATURE OF THE SOIL, A CONTAINMENT WALL WOULD HAVE ADVERSE ENVIRONMENTAL EFFECTS AS WELL AS HAVING SERIOUS CONSTRUCTABILITY PROBLEMS. ONSITE TREATMENT WOULD INVOLVE INCINERATION OF THE SOIL AND, BECAUSE THE HEAVY METALS WOULD REMAIN, DISPOSAL OF THE RESIDUE. AFTER THE EXPENSE OF INCINERATION, FULLY 75% OF THE SOIL VOLUME WOULD STILL HAVE TO BE DISPOSED OFF-SITE.

- TWO LEVELS OF CLEANUP WERE INVESTIGATED TO DETERMINE THE MOST COST EFFECTIVE REMEDY:

  (C) SOIL EXCAVATION TO EXTENT DICTATED BY ENGINEERING AND SCIENTIFIC JUDGMENT

  COST $1,568,660.09

  (D) EXCAVATION OF SOILS IN EXCESS OF 10 TIMES THE STATE OF FLORIDA "MINIMUM CRITERIA " FOR GROUND WATER BASED ON EP TOXICITY TESTS.

  COST $2,314,000.00+.

ALTERNATIVE C WAS IMPLEMENTED. THE PRIMARY DIFFERENCE BETWEEN C AND D IS THAT D WOULD HAVE REQUIRED THE REMOVAL OF AN ADDITIONAL 3900 CUBIC YARDS OF MERCURY CONTAMINATED SOIL. THE SOIL ON THE SITE IS MORE ALKALINE THAN THE CONDITIONS SPECIFIED FOR THE EP TOXICITY TEST AND IT WAS JUDGED THAT THE MERCURY WOULD NOT BE AS PRONE TO LEACH FROM THIS MORE BASIC SOIL.

EACH ALTERNATIVE WAS DETERMINED TO EFFECTIVELY MITIGATE DAMAGE TO, AND PROVIDE ADEQUATE PROTECTION OF PUBLIC HEALTH, WELFARE AND THE ENVIRONMENT.

- THE RECOMMENDED ALTERNATIVE INCLUDES EXCAVATION AND TRANSPORTATION OFFSITE OF CONTAMINATED SOILS. THE TOTAL (UNAUDITED) COST FOR THIS IS $1,568,660.09.

- THE "RECORD OF DECISION" CERTIFIES THAT:

  - THE SELECTED REMEDY IS A COST EFFECTIVE ACTION FOR THE SITE

  - MONIES ARE AVAILABLE IN THE FUND TO FINANCE THE REMEDY

  - OFF-SITE DISPOSAL IS MORE COST EFFECTIVE THAN POTENTIAL ON-SITE REMEDIES.

STATUS OF REMAINING CONDITIONS

- PROGRESS HAS BEEN ACHIEVED IN COMPLYING WITH THE REMAINING THREE CONDITIONS CONTAINED IN THE JUNE 2, 1982 MEMO:

1. AN AUDIT MUST BE PERFORMED BY THE EPA INSPECTOR GENERAL TO DETERMINE THE EXACT AMOUNT OF ELIGIBLE AND ALLOWABLE PROJECT COSTS INCURRED BY DADE COUNTY FOR THE SURFACE CLEANUP. THE AUDIT HAS BEEN PERFORMED AND A FINAL REPORT IS IN PREPARATION. SPECIAL LANGUAGE IN THE COOPERATIVE AGREEMENT WILL CONDITION THE LEVEL OF FUNDING ON THE FINAL DETERMINATION BY THE INSPECTOR GENERAL.

2. THE PROPER GRANT PROCEDURES FOR THE AWARD OF A COOPERATIVE AGREEMENT MUST BE COMPLETED, INCLUDING THE PROCESSING OF A DEVIATION FROM EPA GRANT REGULATIONS TO PERMIT ALLOWABLE COSTS PRIOR TO EXECUTION OF THE COOPERATIVE AGREEMENT. THE PROPER PROCEDURES, INCLUDING A DEVIATION FROM EPA GRANT REGULATIONS, HAVE BEEN FOLLOWED.

3. USE OF CERCLA FUNDS TO REIMBURSE 90 PERCENT OF DADE COUNTY'S SURFACE CLEANUP EXPENSES IS CONDITIONED ON THE COUNTY'S ASSIGNING TO EPA ITS CLAIM AGAINST MIAMI DRUM SERVICES, INC., UP TO THE AMOUNT OF REIMBURSEMENT FROM THE FUND. DEPENDING ON THE COUNTY'S DESIRES, THIS CAN BE HANDLED IN ONE OF SEVERAL WAYS. THE COUNTY CAN DISMISS WITHOUT PREJUDICE ITS CLAIM AGAINST MIAMI DRUM SERVICES, INC. AND SEEK A STAY OF THE REMAINING PROCEEDINGS WHILE THE FEDERAL GOVERNMENT PURSUES COST RECOVERY. ALTERNATIVELY, EPA, THE COUNTY AND PERHAPS THE STATE, MAY ENTER INTO AN AGREEMENT WHEREBY THE COUNTY WILL AGREE TO REPAY THE FUND IF A MONETARY AWARD IS OBTAINED FROM MIAMI DRUM SERVICES IN THE COUNTY'S PROCEEDINGS. THIS CONDITION HAS BEEN ADDRESSED AS A GRANT SPECIAL CONDITION WHICH MUST BE MET BEFORE MONEY CAN FLOW TO THE STATE/COUNTY.

SECOND OPERABLE UNIT

- THE COOPERATIVE AGREEMENT WORK PLAN INCLUDES A REMEDIAL INVESTIGATION AND FEASIBILITY STUDY TO ADDRESS THE PLUME IDENTIFIED BY RESISTIVITY MEASUREMENTS. DEPENDING ON THE RESULTS OF THIS WORK, THE STATE MAY WISH TO AMEND THE COOPERATIVE AGREEMENT TO IMPLEMENT A REMEDY.

FOLLOW-UP ACTIONS

- THE FOLLOWING ACTIONS ARE REQUIRED TO MOVE THE PROJECT TO THE STAGE WHERE THE COUNTY CAN RECEIVE MONEY FROM THE FUND FOR THE ACTION TAKEN:

  - APPROVE THE REMEDY -- AA, OSWER
  - CONSUMMATE STATE SUPERFUND COOPERATIVE AGREEMENT -- HEADQUARTERS/STATE
  - FULFILL SPECIAL CONDITIONS -- REGION/STATE/COUNTY.

#TMA

TABLES, MEMORANDA, ATTACHMENTS

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
SEPTEMBER 13, 1982

MEMORANDUM

SUBJECT: RECORD OF DECISION FOR THE MIAMI DRUM SERVICES SITE, DADE COUNTY, FLORIDA

FROM: WILLIAM N. HEDEMAN, JR., DIRECTOR
OFFICE OF EMERGENCY AND REMEDIAL RESPONSE (WH-548)

TO: RITA M. LAVELLE, ASSISTANT ADMINISTRATOR
OFFICE OF SOLID WASTE AND EMERGENCY RESPONSE (WH-562-A)

I AM FORWARDING FOR YOUR APPROVAL A RECORD OF DECISION FOR THE MIAMI DRUM SERVICES SITE. THE RECORD OF DECISION IS BASED UPON OUR REVIEW OF THE REMEDIAL ACTION UNDERTAKEN BY DADE COUNTY DURING DECEMBER 1981 THROUGH JANUARY 1982. THE FINDINGS CONCLUDE THAT THE REMEDIAL ACTION PROVIDES AN ADEQUATE LEVEL OF CLEAN-UP TO EFFECTIVELY MITIGATE AND MINIMIZE DAMAGE TO, AND PROVIDES ADEQUATE PROTECTION OF PUBLIC HEALTH, WELFARE AND THE ENVIRONMENT. FURTHER, THE ACTIONS TAKEN ARE CONSISTENT WITH CERCLA PROGRAM REQUIREMENTS. IF YOU FEEL THE NEED FOR A BRIEFING ON THE CONTENTS OF THE RECORD OF DECISION, I CAN DO SO AT YOUR CONVENIENCE.

22750 JRI

Record of Decision
Remedial Alternative Selection

SITE: Biscayne Aquifer Sites - Study Area Ground Water, Dade County, Florida.

DOCUMENTS REVIEWED:

I am basing my decision on the following documents describing the analysis of cost-effectiveness of remedial alternatives for this site:

- Evaluation of the Clean-up Activities Already Undertaken at the Miami Drum Services Hazardous Waste Site, Dade County, Florida, September 1, 1982
- Phase I--Compilation and Evaluation of Data for the Protection of the Biscayne Aquifer and Environment in North Dade County, Florida, October 15, 1982
- Remedial Investigation for Miami Drum Services Site, Florida, Florida Department of Environmental Regulation, Tallahassee, Florida 32301, November 1983
- Phase II--Sampling, Analytical, and Investigative Program for the Protection of the Biscayne Aquifer and Environment in North Dade County, Florida, February 1984
- Phase III--Feasibility of Remedial Actions for the Protection of the Biscayne Aquifer in Dade County, Florida, May 1985
- Staff Summaries and Recommendations
- Recommendations from Florida DER and Dade County DERM

DESCRIPTION OF SELECTED REMEDY:

The remedy selected is to add air stripping to the existing water treatment system in the study area and to operate the Miami Springs and Preston municipal wells for the dual purpose of providing potable water and recovering contaminated water from the Aquifer. Operation and maintenance for air stripping includes energy costs, labor to operate the system, materials and supplies and equipment replacement (fans and pumps). Operation of the air stripping system will continue until the cleanup goals are achieved at the influent to the treatment plant.

FUTURE ACTIONS:

Another decision document is planned to address proper closure of the 58th Street Landfill. This should also include provisions for a potable water supply for the private well users in the Landfill area. In addition, while the items in the Biscayne Aquifer Protection Plan are generally not within the Agency's scope of authority, we are evaluating methods to encourage and facilitate these actions to prevent future contamination of the Aquifer and the address, if necessary, the contaminants which will not be removed by the chosen remedy.

DECLARATIONS:

Consistent with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), and the National Contingency Plan (40 CFR Part 300), I have determined that alternative 2 as described in the Summary of Remedial Alternatives Selection - adding air stripping to the existing water treatment syrtem - is a cost-effective remedy and provides adequate protection of public health welfare and the environment. The State of Florida has been consulted and agrees with the approved remedy. The remedial action does not affect or impact any floodplain or wetland areas. A key element of the Remedial Action includes institutional controls over placement of wells in the study area.

I have determined that the action being taken is appropriate when balanced against the availability of Trust Fund monies for use at other sites.

9/16/85
Date

J. Winston Porter
Assistant Administrator
Solid Waste and Emergency Response

NWS 001 003151

RECORD OF DECISION
SUMMARY OF REMEDIAL ALTERNATIVE SELECTION
BISCAYNE AQUIFER SITES, DADE COUNTY, FLORIDA

BACKGROUND

INTRODUCTION

Three sites proposed for the National Priorities List in October 1981 are located in northwest Dade County, Florida. After consulting with the state and county, EPA decided to address these sites as a single management unit for the performance of the RI/FS. A major reason for this decision was that all three sites affect the same general area of the Biscayne Aquifer. Wells in this area supply water to approximately 200,000 residents within the study area and approximately 600,000 residents outside it. The agencies recognized that the effects of these sites on the aquifer could be interrelated and that some of the suspected problems would not be solely attributable to an individual site. This management scheme worked well for the RI/FS and is also appropriate for the remedy.

A package of four decision documents that address the three sites is planned. This entire package is being completed in phases, with the Phase III document due for completion in the Fall of 1985. The four phases are:

- Phase I: Varsol Spill Site--immediate area soil and ground water. Record of Decision (ROD) signed 3/29/85.
- Phase II: Miami Drum--source control (soils and encountered ground water), completed September 1982. Record of Decision (ROD) signed 9/13/82.
- Phase III: 58th Street Landfill--immediate area soil, surface water, and ground water. Enforcement Decision Document (EDD) scheduled Fall 1985.
- Phase IV: Study Area Ground Water--Record of Decision (ROD) included herein.

SITE LOCATION AND DESCRIPTION

The Biscayne Aquifer is the sole underground source of drinking water for three million residents of southeast Florida. Three Biscayne Aquifer hazardous waste sites on the EPA National Priorities List were addressed as one management unit for the remedial investigation and feasibility study: (1) Miami Drum Site, (2) Northwest 58th Street Landfill, and (3) Varsol Spill Site (Miami International Airport). These sites are located near each other in north Dade County, Florida. The study area including these sites is defined in Figures 1-A and 1-B. Locations of these sites and public well fields, as well as private wells within the study area, are shown in Figure 2. The topography in the study area is flat, approximately 5 feet above sea level.

The study area, which encompasses approximately 80 square miles, includes several cities as well as unincorporated areas (Figure 1-B). The Cities of Miami Springs and Virginia Gardens are primarily residential, whereas the Cities of Medley and Hialeah Gardens are heavily industrial. The City of Hialeah is a mix of residential, commercial, and industrial areas.

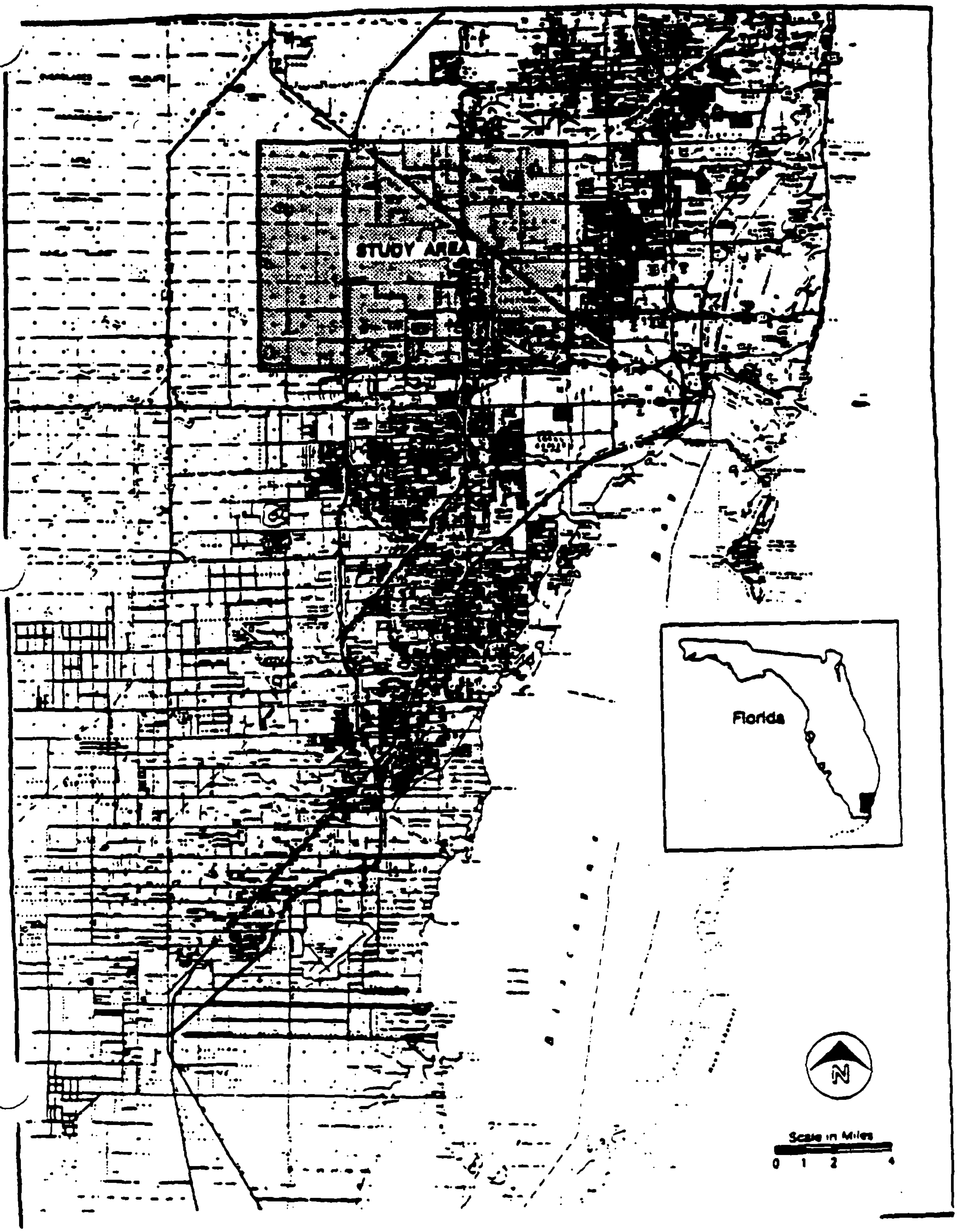
There are numerous and varied businesses, large and small, located within the study area, including industrial manufacturing plants, reclamation plants, land disposal facilities, and abandoned landfills. The western one-third of the study area is essentially undeveloped.

Miami Drum Services was an inactive drum recycling facility located west of Miami Springs at 7049 N.W. 70th Street in Miami. The dimensions of this site are 242 feet (north-south axis) by 230 feet (east-west axis), and it is located in a predominantly industrial area. The FEC Canal is located about one quarter of a mile east of the Miami Drum Site, and the Miami Canal is located less than one mile northeast of the site. The Medley Well Field is located approximately 750 feet west of this site, while the Miami Springs and Preston Well Fields are located about 5,000 feet southeast of the site.

The Northwest 58th Street Landfill occupies a one-square-mile area near the western perimeters of the Town of Medley and the City of Miami Springs. Present development adjacent to this landfill site includes industrial uses to the south (Northwest 58th Street) and east (Northwest 87th Avenue), a rock pit operation to the north (Northwest 74th Street), and undeveloped land to the west (Northwest 97th Avenue). A new resource recovery plant is located directly west of, and adjacent to, the landfill. The Medley and Miami Springs Well Fields are approximately one and one-half miles and two and one-half miles downgradient from the eastern edge of the landfill, respectively.

The Varsol Spill Site is located in the northeast section of Miami International Airport (MIA). The airport is located less than one-half mile south of the lower Miami Springs

NWS 001 003153



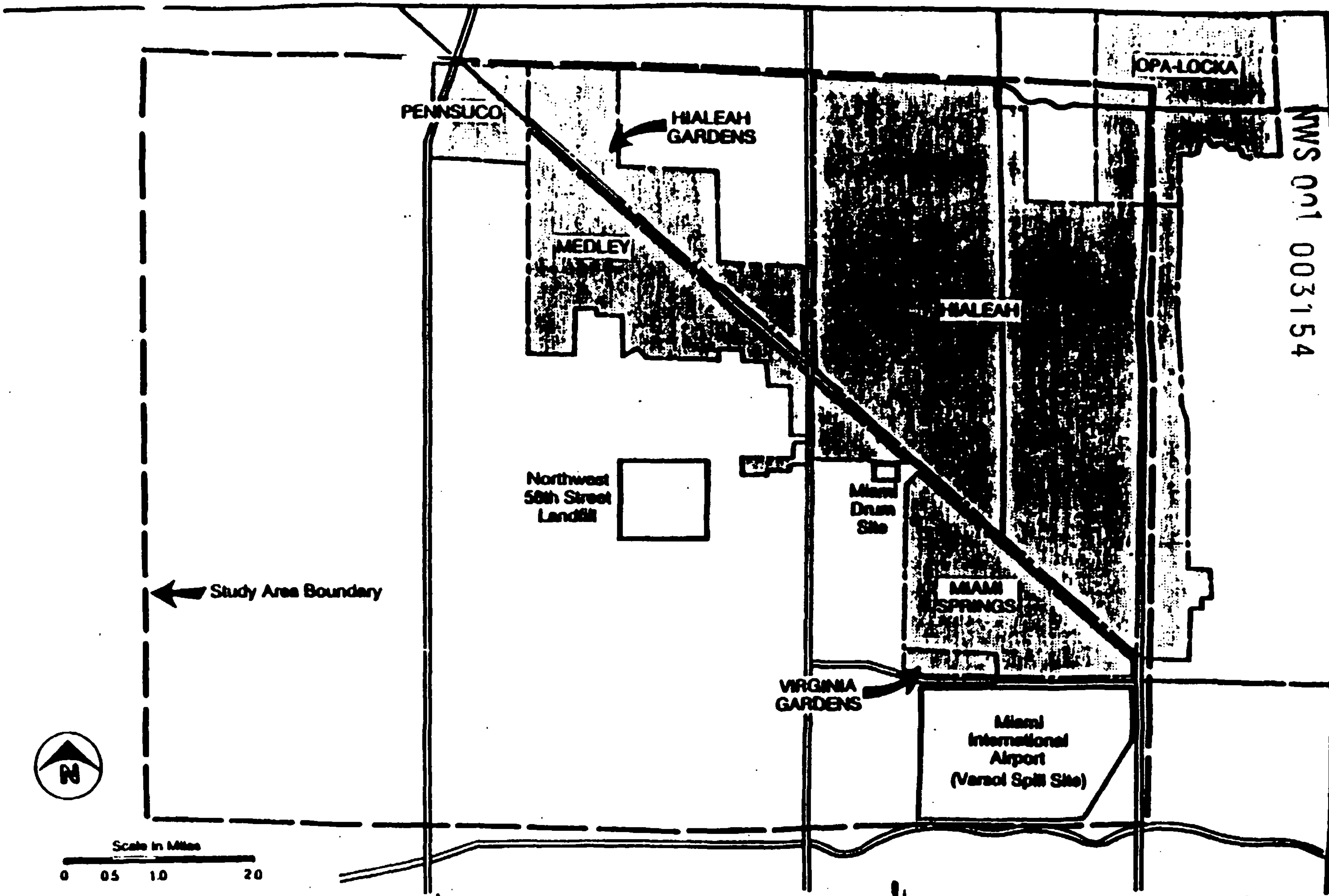


FIGURE 1B.
Study Area.

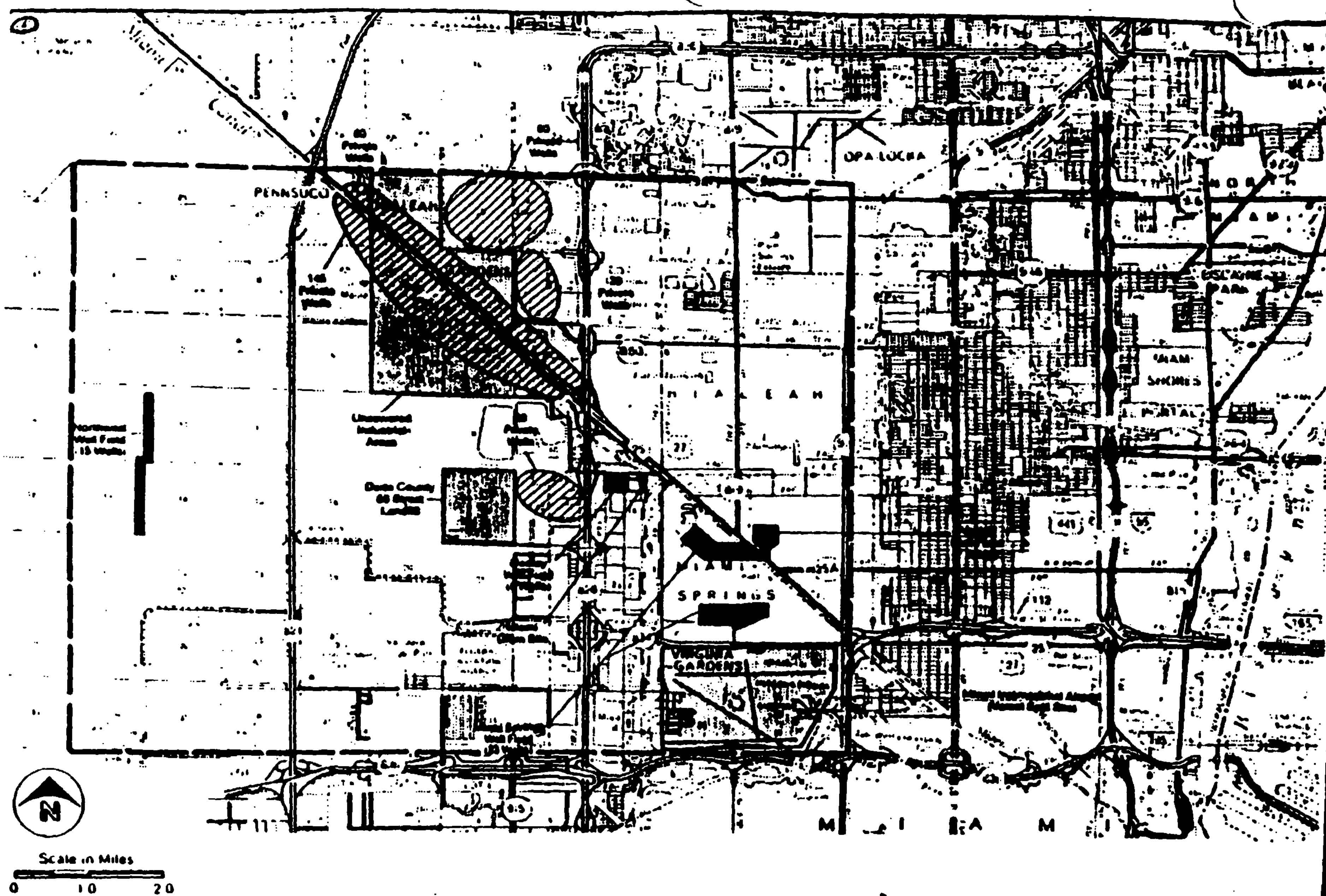


FIGURE 2.
Location of Potential Contamination Sites, Public Well Fields, and Private Wells in the Study Area.

NWS 001
003155

Well Field. The Miami Canal runs adjacent to the northeast corner of the airport, the Tamiami Canal runs immediately south of the airport, and two other canals are located near the western edge of the airport.

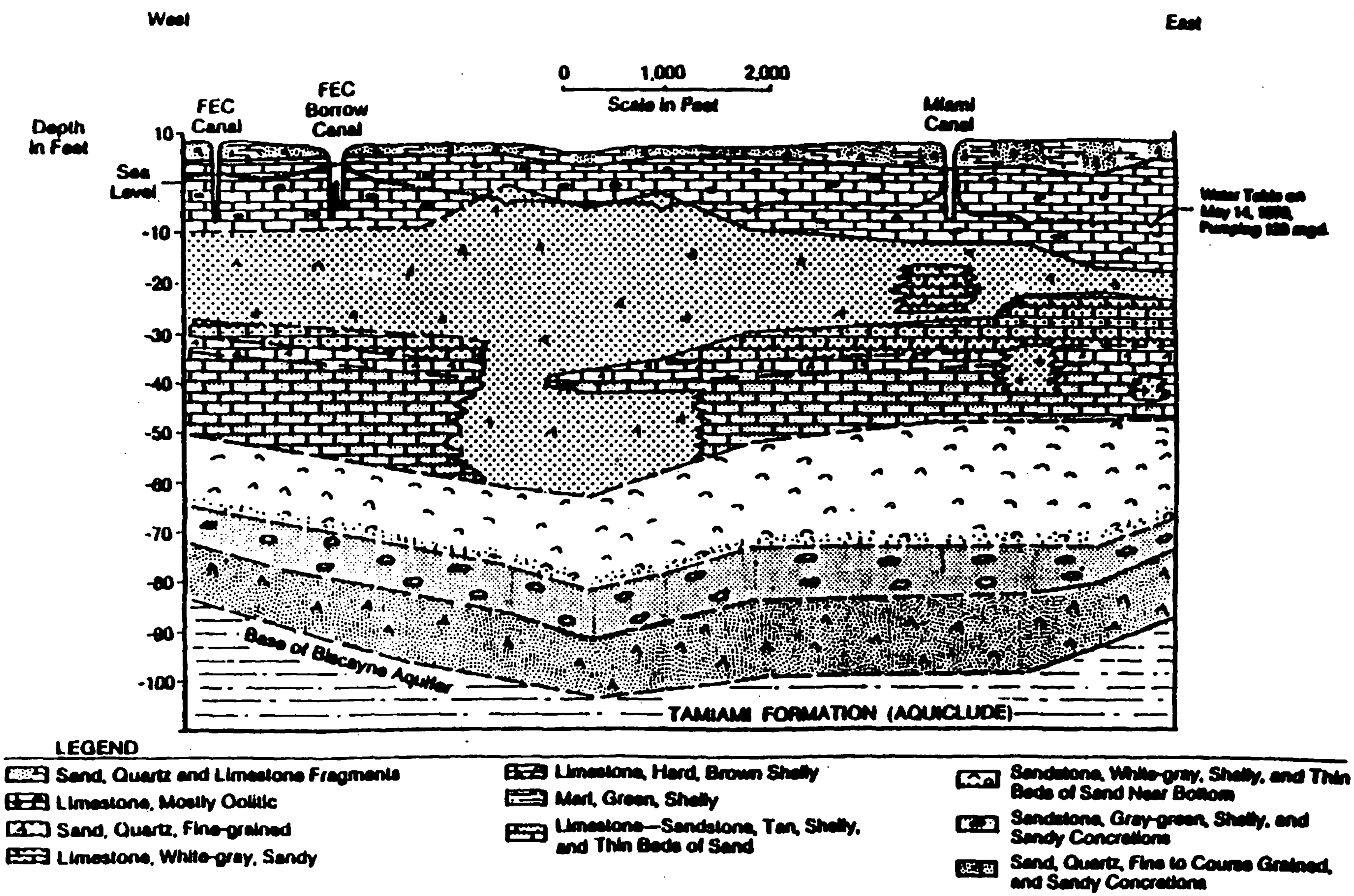
Almost all of the study area is within the 100-year flood plain. Wetlands form the border of the western edge of the area, but are not affected by it. The average annual rainfall over the study area is approximately 60 inches, of which as much as 80 percent falls during the rainy season (June to September). Parts of the study area are inundated intermittently during the rainy season. Surface water in the area consists of man-made lakes and canals, and is not used for drinking water. The water table beneath the study area is located approximately 2 to 3 feet below the natural land surface.

The major drainage systems of the area are the Miami and Tamiami Canals draining into the Biscayne Bay. The secondary drainage systems include the 58th Street, Dressel, and 25th Street Canals. The Miami Canal originates at Lake Okeechobee and flows south and southeast toward Biscayne Bay at Miami. The portion of the Miami Canal in the study area is regulated, and used principally for drainage and flood control. It is used for navigation downstream of the study area.

The Tamiami Canal runs west to east, between its mouth at Miami Canal, immediately downstream of the study area, and the Dade-Broward Levee, about 14 miles upstream. It operates as a typical Everglades canal and is used for drainage.

The Biscayne Aquifer, which is a highly permeable, wedge-shaped, unconfined shallow aquifer composed of limestone and sandstone, underlies the study area. The top of the aquifer is near the natural ground surface, and its base is approximately 60 feet below ground surface in the Northwest Well Field area and approximately 105 feet below ground surface in the Miami International Airport (MIA) area. Figure 3 shows the geologic section of the Biscayne Aquifer in the Miami Springs/Preston Well Field area. In general, this aquifer is divisible, from top to bottom, into three distinct water-producing zones, of 15 to 20 foot thickness. These zones are separated by dense, silty to sandy limestones and well-cemented quartz sands that act as aquitards.

Historically, the cone of depression resulting from the withdrawal of approximately 150 million gallons per day (mgd) of water from the Miami Springs and Preston Well Fields encompassed the northern half of the Airport, all of the Miami Drum Site, and extended as far west as one-half mile east of the 58th Street Landfill. Dade County has shifted pumping to the Northwest Well Field to minimize use of the contaminated wells.



ce Meyer, 1972

FIGURE 3.
Section of the Biscayne Aquifer in the Miami Springs–Preston Well Field Area.

NWS 001003158

The cone of depression corresponding to a drawdown of 0.25 foot that results from the withdrawal of water from the new Northwest Well Field and a limited amount of water from the Miami Springs/Preston Well Fields encompasses the western edge of the 58th Street Landfill.

SITE HISTORY

Miami Drum Site

The privately-owned Miami Drum Services (MDS) facility operated for approximately 15 years before Dade County, through a local court order, forced it to cease operation in June 1981. As many as 5,000 drums of various chemical waste materials, including corrosives, solvents, phenols, and toxic metals, were observed on the site while the company was operating. Drums were washed with a caustic cleaning solution which, along with drum residues containing industrial solvents, acids, and heavy metals, was disposed of onsite in open, unlined pits. Eventually, the surface soils on the site became saturated.

The abandoned Miami Drum Site was acquired by Dade County for construction of the Palmetto Yard maintenance facility of the Dade County Rapid Rail Transit Project. Extensive soil borings were performed at the site during December 1981 and cores up to 10 feet deep were analyzed for contaminants. Dade County contracted with O. H. Materials Company to remove the 400 to 500 existing drums from the site, excavate contaminated soils based on the core analyses, and relocate them to an existing, approved disposal facility. This activity was jointly funded by the EPA and Dade County. In addition to this action, the contaminated water encountered during excavation was removed, treated, and disposed of onsite. At the present time, the maintenance facility of the Dade County Rapid Rail Transit system is operating at this site.

Northwest 58th Street Landfill Site

Dade County owns this landfill, which began operation in 1952 as an open dump. Some waste was placed into shallow trenches dug below the water table, resulting in deposition of refuse in the saturated zone of the aquifer. Open burning of waste was used as a volume reduction method until it was banned in 1960. Since the ban, waste has accumulated at approximately three times the 1960-61 rate. Since its startup in 1952, this facility has received from 100,000 to 1,000,000 tons per year of municipal solid waste. Garbage from domestic and industrial sources comprises about 65 percent of the wastes disposed of at the site. The remainder from other sources includes street debris, discarded autos and appliances, furniture, tree trimmings, liquid wastes, and other rubbish. The estimated recent disposal rate (applicable through July 1982) for garbage and trash was about 90,000 tons per month; for liquid wastes, consisting mainly of grease trap pump-outs, it was about 200,000 to 400,000 gallons per month. Since January 1975, this landfill has been receiving daily cover consisting of muck and crushed rock from quarry overburden and, more recently, calcium carbonate sludge from the Miami Dade Water and Sewer Authority water treatment plants. Since September 1982, the landfill has been closed for all purposes, except for the disposal of construction debris.

This site is not permitted as a sanitary landfill by the Florida Department of Environmental Regulation (FDER). According to preliminary close-out plans for the landfill, it is classified as an open dump and has been operating in violation of a consent order between the FDER and Metro Dade County dated July 30, 1979. Final close-out plans for the landfill are being prepared at this time and are planned to include the private well users in the immediate area.

Varsol Spill Site

Industrial operations associated with a typical commercial airport have resulted in hydrocarbon contamination of surface and ground waters in the vicinity of MIA. Since 1966, approximately 15 hydrocarbon spills and leaks have been recorded. The total discharge of hydrocarbon materials is estimated to be approximately 2 million gallons. This includes the spillage of an estimated 1.5 million gallons of a light, petroleum-fraction solvent, discovered at the Eastern Airlines maintenance base in the northeast section of the airport around 1970. During 1970, a jet fuel spill of approximately 66,000 gallons was discovered near the west central area of Eastern Airlines properties. Also in that year, National Airlines was responsible for an accidental spill of an unknown amount of jet fuels into the drainage canals that ultimately discharge into the Tamiami Canal. They were ordered to stop discharging cleaning solvents and degreasers to an airport drainage canal at this time. In 1981, Braniff Airlines was ordered to stop this same practice. Several other smaller spills and discharges of jet oil, aviation gas, cleaning solvents, and degreasers have also occurred at the airport. Several areas within MIA have heavy accumulations of oil lying on the ground. This is often the result of employees from various aircraft maintenance operations discharging oily wastes onto the ground and into storm sewers. Another major underground jet fuel spill was discovered in 1983 in the vicinity of Concourse E during ongoing construction and improvements in the area.

Removal of underground hydrocarbons at the airport was attempted in the early 1970's, primarily at the Eastern Airlines maintenance base. Hydrocarbon decontamination separator trenches were installed by Eastern Airlines in 1971 to remove the 1.5 million gallons of petroleum-fraction solvent that had spilled underground. The recovery operations were terminated in August 1973 because of slime build-up in the trenches and the extremely slow natural migration of hydrocarbons into the trenches. Actual recovered volumes were approximately 133,000 gallons of hydrocarbons, or less than 10 percent of the estimated spill volume. Other recovery procedures at the airport have been implemented only in conjunction with dewatering operations at construction sites within the airport and have been unsuccessful in removing substantial quantities of hydrocarbons. During April 1981, construction activities in the west-central area of the Eastern Airlines maintenance base revealed a thick hydrocarbon layer floating on the water table in an excavated trench, probably from previous fuel spills.

Eastern Airlines installed 54 shallow observation wells during the early 1970's at their maintenance base in the general area of the petroleum fraction solvent spill. Measurements of fluid levels in these monitoring wells, specifically the water-table depth and hydrocarbon thickness in the upper layer of the water table, were taken twice per year, during the dry season and the wet season, from 1975 to 1981. The hydrocarbon layer thickness, according to these data, shows a declining trend with time, and, in some wells, the presence of the layer could not be detected in the second year. In the Concourse E area, Dade County installed 43 monitoring wells to determine the extent and magnitude of jet fuel spilled. Dade County also installed three recovery wells in the Concourse E area and started the recovery operation in mid-1983. Through May 1984, over 102,000 gallons of jet fuel had been recovered from this area. Recovery operations are continuing.

CURRENT SITE STATUS

The initial study, conducted in 1982, compiled and evaluated existing data relevant to the contamination problem. This evaluation indicated the presence of dispersed, low-level concentrations of numerous toxic contaminants in the ground water beneath the study area. The conclusions were based on limited data, relevant mainly to inorganics, with virtually no ground water monitoring data available, especially for organics.

The Remedial Investigation (RI), begun in late 1982, consisted of a unified, planned, and intensive sampling effort to fill in the data gaps found in the Phase I study and to determine the magnitude and extent of ground-water contamination. Criteria for data classification were developed from existing literature, and were based on effects to human health. Data evaluation based on the RI indicated that widespread low to moderate levels of several toxic contaminants, mostly in the volatile organics category, are present in ground water throughout the study area. Vinyl chloride was the most common contaminant detected and its concentration often exceeded the cleanup goals. No concentrated priority pollutant plume could be found.

Earlier investigations by Eastern Airlines, based on fluid level measurements on top of the water table, showed declining thickness of the petroleum-fraction solvent layer with respect to time. By 1981, most Eastern Airlines data showed no hydrocarbon thickness at the Varsol Spill Site. The RI in 1982 and 1983 did not find a plume or pockets of the solvent in ground water at and around the spill site and in the neighboring lower Miami Springs area.

In late 1981 (prior to cleanup of the contaminated soils), FDER contracted with Technos, Inc., to determine the extent of ground-water pollution at the Miami Drum Site. Geophysical measurements using electromagnetics (EM) and ground penetrating radar (GPR) provided the data for this study. The EM results showed a significant conductivity anomaly coincident with the site that provided evidence of a strong plume-like trend to the southeast in the direction of ground-water flow and towards the Miami Springs/Preston Well Fields. Several less significant conductivity lobes were also detected west and north of the site toward the Medley Well Field. The Miami Drum Site significantly contributed to the areawide ground water problem. However, this RI, as well as a separate remedial investigation conducted during 1983 by FDER at the Miami Drum Site, found no evidence of a contaminant plume from the site.

During the late 1970's, investigations by the U. S. Geological Survey and Technos, Inc., had determined that, based on the dissolved inorganic content of the ground water, leachate from the 58th Street Landfill had infiltrated the Biscayne Aquifer beneath and adjacent to the landfill site in the form of a ground-water plume moving in an easterly direction with the natural downgradient water movement. However, examination of extensive priority pollutant data from the 1982-1983 RI (heavy metals as well as organics) that were non-existent during the earlier USGS and Technos studies did not reveal a ground-water contaminant plume in the vicinity of the landfill.

The results of these investigations indicate that, at this time, there is no concentrated contaminant plume emanating from any of the three sites in the study area. However, low, dispersed levels of volatile organic chemicals have been found throughout the study area and plumes have blended together and become indistinguishable with the general poor ground-water quality in the developed area. The main explanation for this is found in the geohydrologic conditions within the study area: the high transmissivity of the Biscayne Aquifer; the widespread interaction of ground water with surface-water bodies throughout the study area; and the high, continuous pumping of ground water at the several municipal well fields. The overall ground-water quality in the study area is addressed in Phase IV.

NWS 001 003163

RECORD OF DECISION
SUMMARY OF REMEDIAL ALTERNATIVE SELECTION
BISCAYNE AQUIFER SITES, DADE COUNTY, FLORIDA

PHASE IV: STUDY AREA GROUND WATER

Phases I, II, and III of this Record of Decision (ROD) cover on-site (source control) remedies. Phase IV summarizes off-site contamination and corresponding remedies for contaminated ground water in the study area.

CURRENT SITE STATUS

Results of the remedial investigation (RI) showed that the quality of the ground water in the developed study area is virtually the same. No concentrated contaminant plume was found emanating from any of the three sites. However, low, dispersed levels of volatile organic chemicals (VOC) have been found throughout the developed study area, as shown below and in Figure 4.

Geographical Area	Total VOCs	Vinyl Chloride	Trans-1, 2-dichloroethene
Airport Monitoring Wells	10	3.5	1.1
Lower Miami Springs Wells	20	8.7	3.6
Upper Miami Springs Wells	33	17	7.3
Hialeah Area Wells	57	23	28
58th Street Landfill Wells	6.2	0.31	0.53
Unsewered Industrial Area Wells	1.0	0.25	0.25

Notes:
1. All values are mean values and are reported in μg/L.
2. There are fewer monitoring wells in the Unsewered Industrial Area than in other areas. Results of analyses from these wells might not be indicative of the water quality of the whole area.

Because of geohydrologic conditions within the study area (high transmissivity of the Biscayne Aquifer, widespread interaction of ground water with surface-water bodies, and the high, continuous pumping of ground water at the several municipal well fields), plumes have blended together and become indistinguishable from the general poor ground water quality in the study area. However, we believe that a substantial portion of the contamination addressed in this response action was released from the NPL sites mentioned previously.

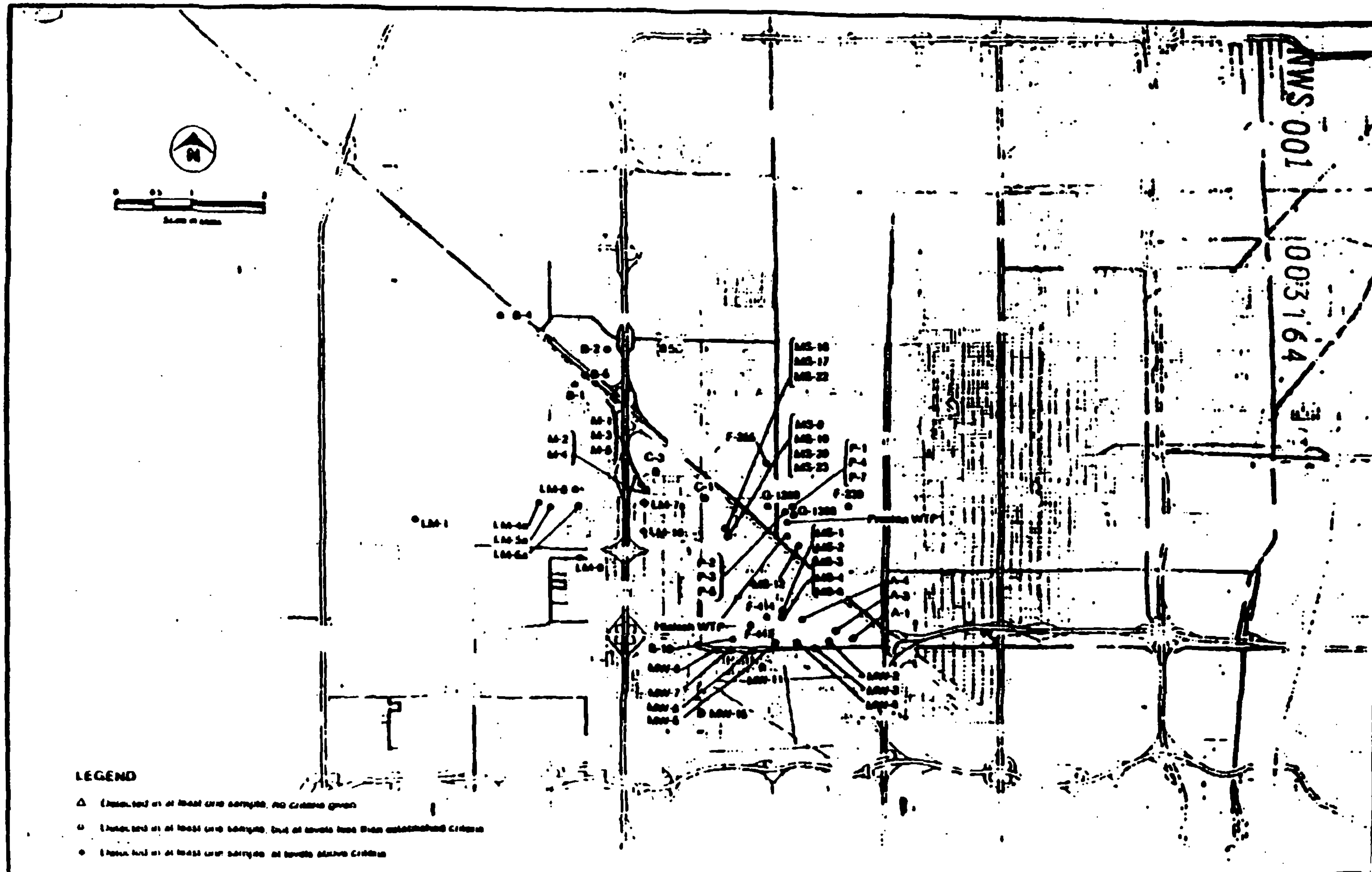


FIGURE 4.
Wells Showing Positive Results for Volatile Organics (Priority Pollutants)

The effects of contaminated ground water on surface-water quality were found to be similar to those identified in an earlier county sampling program. In 1981, as part of routine surface-water monitoring, Dade County conducted analyses of water from the Miami Canal for a wide array of physical and chemical parameters, including chlorinated pesticides and herbicides. Runoff was determined to be the primary source of high levels of dissolved solids and bacteria. Some phenol from industrial pollution was identified, as well as minimal levels of metals, pesticides, and herbicides. The only ground-water related problem discovered was low levels of dissolved oxygen resulting from ground water interaction with surface water. The current sampling program results have not shown contaminants traceable to the ground water.

A comparison of the ground water in the developed portion of the study area with that of the undeveloped western area near the Northwest Well Field shows that the former is poorer in quality than the "true background" ground water in the latter. Figure 5 shows the monitoring well locations and corresponding geographical areas defined for data evaluation. Wells G-3103, S-218A, NW-1, NW-2, NW-3, and NW-15, located in the undeveloped western area, were monitored for all 129 EPA priority pollutants for background conditions. Results, shown in Table 6 (see page 7), include an absence of volatile organics in these wells. The RI detected extractable organics on only one occasion in well G-3103, but we attributed this to the presence of trash and debris in the vicinity.

Tables 1, 2, 7, 8, 9, and 10 (see pages 5, 6, 8, 9, 10, and 11) list the contaminants detected in each geographical area within the study area. These results confirm the presence of VOCs in low to moderate levels throughout the study area and demonstrate that the ground water quality in the developed areas is the result of contamination from multiple sources.

The priority pollutants and reported carcinogens found in the Biscayne Aquifer study area during the RI are given in Table 11 (see pages 12 through 14). Table 11 also shows the laboratory detection limits; the maximum concentrations found in the study area, the well fields, and the water treatment plant finished water; and data classification criteria/cleanup goals for each contaminant. These goals were developed from existing standards when available, such as EPA primary drinking water standards, and from the most recent toxicological information available. The Centers for Disease Control (CDC) in Atlanta have reviewed the data classification criteria and suggested changes and additions, which have been incorporated into Table 11. References used in establishing the criteria are given in Table 12 (see page 15). The cleanup goal for vinyl chloride has been set

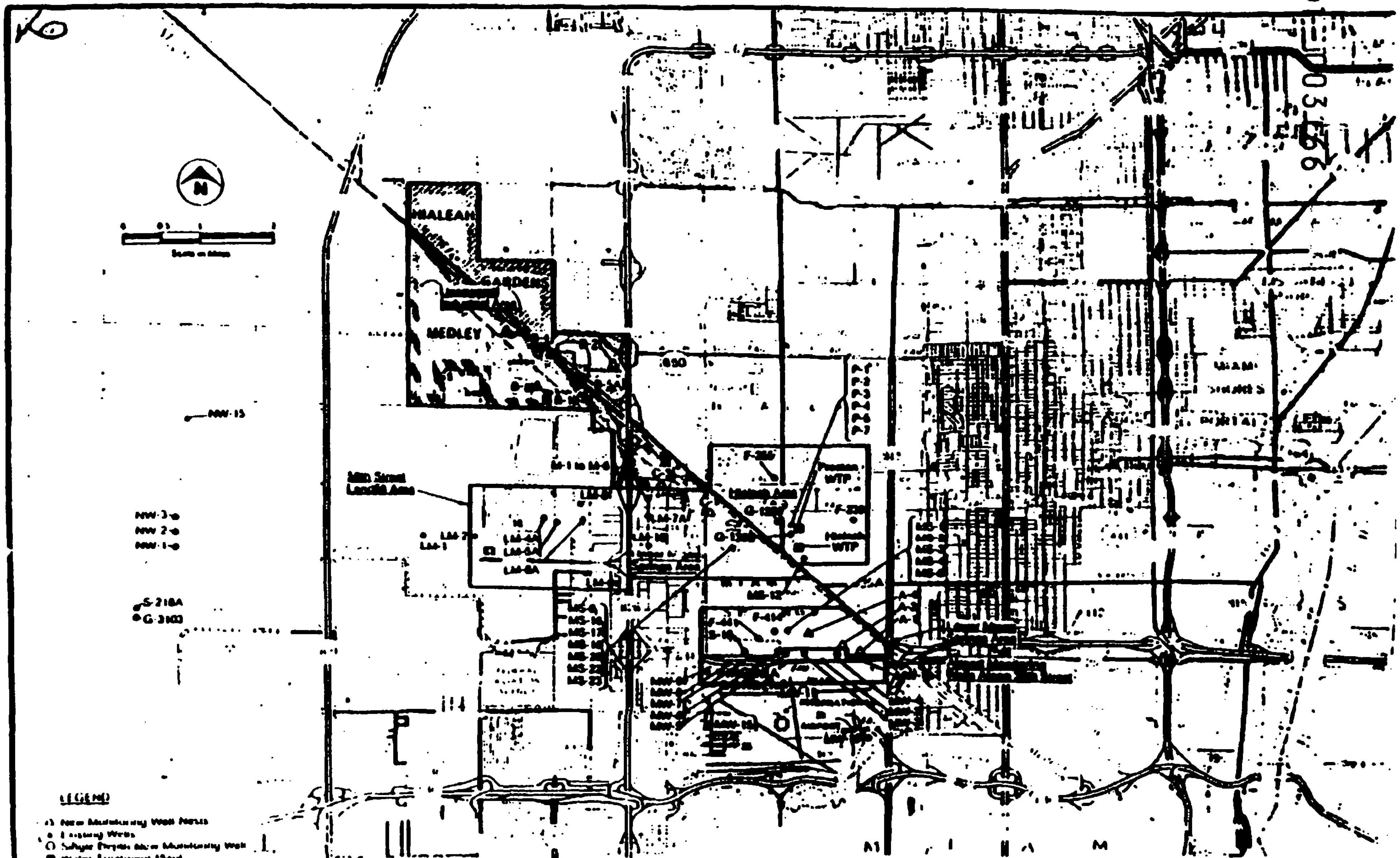


FIGURE 5.
Well Sampling Locations and Geographical Areas for Data Evaluation.

NWS 001 PARAMETER 003167

				MW1		MW2		MW3		MW4		MW5		MW6		MW7		MW8		MW9	MW11
				S	D	S	D	S	D	S	D	S	D	S	D	S	D	S	D	D	D
PRIORITY POLLUTANTS	INORGANICS	ARSENIC				○								○							
		CADMIUM														○				○	○
		CHROMIUM		○		○	○					○	○	○	○	○					○
		LEAD		○				○				○	○		○				○	○	○
		MERCURY					○		○												○
		SELENIUM			○										○						
		ZINC		○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	VOLATILE ORGANICS	CHLOROBENZENE					○						○		○						○
		CHLOROETHANE					Δ				Δ		Δ								
		1,1-DICHLOROETHANE									●			●	●						
		TRANS-1,2-DICHLOROETHENE								○	○				○					–	○
		1,1,2,2-TETRACHLOROETHANE											●					●			
		TOLUENE								○			○					○			
		1,1,1-TRICHLOROETHANE												●	●		○				●
		TRICHLOROETHENE					○	○			○										
		VINYL CHLORIDE						●	●		●	●	●		●		●				●
	TOTAL RECOVERABLE PHENOLS						Δ					Δ	Δ			Δ	Δ	Δ		Δ	Δ
OTHER ORGANIC COMPOUNDS	ACETONE									Δ											
	DIMETHYL SULFIDE																		Δ		
	METHYL BUTYL KETONE									Δ			Δ			Δ					
	METHYL ETHYL KETONE									Δ											
	METHYL ISOBUTYL KETONE									Δ											
	STYRENE													○				○			
	UNIDENTIFIED COMPOUNDS (EXTRACTABLE)								Δ												

WELL DESIGNATION

LEGEND

Δ Detected in at least one sample, no criteria given.

○ Detected in at least one sample, but at levels less than established criteria.

● Detected in at least one sample at levels above criteria.

TABLE 1.
Contaminants Detected in the Airport Monitoring Wells Along 36th St.

CH2M HILL

NWS 001 003168

PARAMETER	S-10	F-411	F-414	MS-1	MS-2	MS-3	MS-4	MS-6	A-4a	A-4b	A-4c	A-4d	A-3a	A-3b	A-3c	A-3d	A-1a	A-1b	A-1c	A-1d
PRIORITY POLLUTANTS — INORGANICS																				
ARSENIC		O																		
CADMIUM			O	O					O											
CHROMIUM	O		O	O	O		O													
COPPER		O			O															
LEAD	O	O	O																	
MERCURY					O	O			O											
SELENIUM		O	O						O	O	O									
ZINC	O	O	O	O	O	O	O	O	O	O	O		O	O	O		O	O	O	
PRIORITY POLLUTANTS — VOLATILE ORGANICS																				
BENZENE			●							●										
CHLOROBENZENE			O		O	O		O	O					O	O				O	
CHLOROETHANE														Δ	Δ					
CHLOROMETHANE											Δ									
1,1-DICHLOROETHANE										●									●	
TRANS-1,2-DICHLOROETHENE			O		O	O		O	O											
ETHYL BENZENE			O						O											
METHYLENE CHLORIDE	●	●	●																	
1,1,2,2-TETRACHLOROETHANE							●													
TETRACHLOROETHENE																	O		O	
TOLUENE		O	O						O	O	O									
VINYL CHLORIDE			●	●	●	●		●	●	●	●			●	●				●	
TOTAL RECOVERABLE PHENOLS				Δ																
OIL & GREASE												O				O				
OTHER ORGANIC COMPOUNDS																				
ACETONE		Δ	Δ																	
C8 ALKYLPHENOL						Δ														
DIMETHYLHEPTANE			Δ																	
METHYL BUTYL KETONE									Δ											
METHYL SULFIDE	Δ																			
STYRENE									O											
M-XYLENE			O																	
O&P-XYLENE		O	O						O	O										
UNIDENTIFIED COMPOUNDS (EXTRACTABLE)										Δ							Δ		Δ	

WELL DESIGNATION

LEGEND

Δ Detected in at least one sample, no criteria given.

O Detected in at least one sample, but at levels less than established criteria.

● Detected in at least one sample at levels above criteria.

TABLE 2
Contaminants Detected in the Lower Miami Springs Area

CH2M HILL

NWS 001 003169

		PARAMETER	NW-1	NW-2	NW-3	NW-1S	S-218a	G-3103*
PRIORITY POLLUTANTS	INORGANICS	LEAD				O		
		MERCURY					O	
		SELENIUM	O					
		ZINC	O	O	O		O	
	VOLATILE ORGANICS							
	BASE/NEUTRAL & ACID EXTRACTABLE ORGANICS							
	PESTICIDES PCB's							
	TOTAL RECOVERABLE PHENOLS							
OTHER ORGANIC COMPOUNDS	HEXADECANE					△		
	PENTAOXAPENTADECANE					△		
	UNIDENTIFIED COMPOUNDS (EXTRACTABLE)						△	

*Sampling results not included because of surface trash at the wellhead area.

LEGEND

△ Detected in at least one sample, no criteria given.

O Detected in at least one sample, but at levels less than established criteria.

● Detected in at least one sample

TABLE 6.
Contaminants Detected in the Undeveloped Area.

CH2M HILL

NWS 001 003170

		PARAMETER	WELL DESIGNATION																					
			C-1a	C-1b	C-1c	LM-7a Depth in ft 15	LM-7a 30	LM-7a 60	LM-10 Depth in ft 10	LM-10 30	LM-10 60	MS-9	MS-16	MS-17	MS-19	MS-20	MS-22	MS-23	M-1	M-2	M-3	M-4	M-5	M-6
PRIORITY POLLUTANTS	INORGANICS	ARSENIC							○															
		CADMIUM											○		○									
		CHROMIUM	○			○	○	○	○	○	○			○	○									
		COPPER																	○					
		LEAD							○	○			○											
		MERCURY										○	○	○	○	○			○		○	○		○
		SELENIUM							○		○		○			○						○		
		ZINC	○	○	○		○	○	○	○	○	○	○	○	○	○	○	○	○			○	○	○
	VOLATILE OGRANICS	CHLOROBENZENE		○	○		○	○		○	○	○	○		○	○	○	○		○	○	○	○	
		CHLOROETHANE														△			△	△	△			
		1,1-DICHLOROETHANE		●	●				●		●	●		●	●	●		●	●		●			
		1,1-DICHLOROETHENE			●							●			●	●		●						
		TRANS-1,2-DICHLOROETHENE		○	○					○	○	○		○	○	○	○	○						
		ETHYL BENZENE			○																			
		METHYLENE CHLORIDE							●												●		●	
		1,1,2,2-TETRACHLOROETHANE			●											●								
		1,1,1,-TRICHLOROETHANE														○								
		TOLUENE		○	○	○		○		○	○		○			○	○							
		VINYL CHLORIDE		●	●					●	●	●			●	●	●	●	●	●	●			
	PESTICIDES & PCB's	PCB-1254 (AROCLOR 1254)									●													
		CYANIDE							○															
		TOTAL RECOVERABLE PHENOLS								△	△								△			△		
OTHER ORGANIC COMPOUNDS		C8 ALKYLPHENOL			△																			
		CHLOROMETHYLBENZENE																				△		
		1-CHLORO-2-METHYLBENZENE																				△		
		CHLOROTOLUENE																				○		
		ETHYL ETHER												△		△								
		HEXADECANOIC ACID																						△
		HEXAHYDROAZEPINONE																						△
		METHYL BUTYL KETONE												△					△					
		METHYLENEPENTANONE																						△
		STYRENE			○			○		○	○									○				
		O&P-XYLENE									○									○		○		
		UNIDENTIFIED COMPOUNDS (EXTRACTABLE)																		△				△

LEGEND

△ Detected in at least one sample, no criteria given.

○ Detected in at least one sample, but at levels less than established criteria.

● Detected in at least one sample at levels above criteria.

TABLE 7.
Contaminants Detected in the Upper Miami Springs Area.

CH2M HILL

NWS 001 003171

		PARAMETER	G1368	F255	G1280	F238	P1	P2	P3	P4	P5	P7	MS12
PRIORITY POLLUTANTS	INORGANICS	CADMIUM				●							
		CHROMIUM				○	○	○	○	○	○		○
		LEAD	○	○	○	●							
		SELENIUM						○					
		ZINC	○	○	○	○	○	○	○	○	○	○	○
	VOLATILE OGRANICS	BENZENE	●										
		CHLOROBENZENE								○	○	○	
		TRANS-1,2-DICHLOROETHENE	○	○	○	○	○	○	○	○	○	○	○
		METHYLENE CHLORIDE		●		●		●					
		TOLUENE	○										
		VINYL CHLORIDE		●	●	●	●	●	●	●	●	●	●
	TOTAL RECOVERABLE PHENOLS								△			△	
OTHER ORGANIC COMPOUNDS		ACETONE	△										
		HEXAHYDROAZEPINONE	△										
		STYRENE								○	○		
		TETRAMETHYLPENTANONE	△										
		O&P XYLENE	○							○			
		UNIDENTIFIED COMPOUNDS (EXTRACTABLE)			△								

WELL DESIGNATION applies to columns G1368 through MS12.

LEGEND

△ Detected in at least one sample, no criteria given.

○ Detected in at least one sample, but at levels less than established criteria.

● Detected in at least one sample at levels above criteria.

TABLE 8.
Contaminants Detected in Hialeah Area.

CH2M HILL

NWS 001 003172

		LM-2			LM-4a			LM-5a			LM-6a			LM-8			LM-9		
	PARAMETER	Depth in Ft			Depth in Ft			Depth in Ft			Depth in Ft			Depth in Ft			Depth in Ft		
		10	30	60	20	40	64	10	30	60	10	30	60	10	30	60	10	30	58
PRIORITY POLLUTANTS – INORGANICS	ARSENIC											○	○				○		
	CHROMIUM	○	○		○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	COPPER												●						
	LEAD		○		○													○	○
	MERCURY				○		○		○							○			○
	SELENIUM			○					○		○				○				
	ZINC	○	○	○	○		○	○	○	○	○	○	○		○	○	○	○	○
PRIORITY POLLUTANTS – VOLATILE ORGANICS	BENZENE							●											
	CHLOROBENZENE				○	○	○	○	○	○	○	○	○	○	○	○	○	○	
	CHLOROETHANE																△		
	1,1-DICHLOROETHANE																●	●	
	TRANS-1,2-DICHLOROETHENE																○	○	
	ETHYL BENZENE							○		○									
	1,1,2,2-TETRACHLOROETHANE				●	●		●		●			●						
	TRICHLOROETHENE							○									○	○	
	TOLUENE				○	○				○			○		○	○	○		
	VINYL CHLORIDE																	●	
PRIORITY POLLUTANTS – BASE/NEUTRAL & ACID EXTRACTABLE ORGANICS	BENZYL BUTYL PHTHALATE					△													
	CHRYSENE					●													
	2,4-DIMETHYLPHENOL									○									
	2,4-DINITROPHENOL									○									
	4-NITROPHENOL					●				○									
	PENTACHLOROPHENOL					●													
	PHENOL									○									
PRIORITY POLLUTANTS – PESTICIDES & PCB's	4,4'-DDT																●		
	ENDOSULFAN SULFATE																△		
	PCB's (total)				●														
PRIORITY POLLUTANTS	TOTAL RECOVERABLE PHENOLS		△		△	△	△	△	△	△	△						△		
OTHER ORGANIC COMPOUNDS	ACETONE				△				△										
	C2 ALKYL PHENOL									△									
	C3 ALKYLBENZOIC ACID									△									
	BENZOIC ACID									△									
	CARBON DISULFIDE												○						
	1,4-DIOXANE				○														
	ETHYL ETHER																△		
	HEXADECANE					△													
	HEXADECANOIC ACID				△				△										
	METHYL ACETATE				△														
	METHYL BENZOIC ACID									△									
	METHYL BUTYL KETONE				△			△											
	METHYL ETHYL KETONE				△	△													
	2-METHYL PHENOL									△									
	4-METHYL PHENOL									△									
	PHOSPHORIC ACID, TRIBUTYL ESTER				△	△		△	△										
	STYRENE							○		○			○		○	○			
	TETRAHYDROFURAN				●														
	2,4,5-TRICHLOROPHENOL									○									
	M-XYLENE												○			○			
	O&P-XYLENE							○								○			
	UNIDENTIFIED COMPOUNDS, EXTRACTABLE				△	△		△	△	△									

△ Detected in at least one sample, no criteria given.
○ Detected in at least one sample but at levels less than established criteria.
● Detected in at least one sample at levels above criteria.

TABLE 9.
Contaminants Detected in the 58th Street Landfill Area.

CH2M HILL

NWS 001 003173

		PARAMETER	B-1a	B-1b	B-1c	B-2a	B-2b	B-2c	B-4a	B-4b	B-4c	B-5a	B-6a	B-6b	B-6c	C-3a	C-3b	C-3c
PRIORITY POLLUTANTS	INORGANICS	ARSENIC						●										
		CADMIUM		O														
		CHROMIUM		O	O		O					O	O	O	O	O		
		LEAD									O							
		MERCURY					O								O			O
		SELENIUM														O		
		ZINC	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
	VOLATILE ORGANICS	ACRYLONITRILE					●											
		1,1,2,2-TETRACHLOROETHANE			●		●											
		TRICHLOROETHENE														O		
		TOLUENE			O			O		O		O					O	
	PESTICIDES & PCB's	PCB-1260								●								
	BASE/NEUTRAL & ACID EXTRACTABLE ORGANICS	BIS (2-ETHYLHEXYL) PHTHALATE	O															
		TOTAL RECOVERABLE PHENOLS		Δ			Δ	Δ	Δ					Δ				
OTHER ORGANIC COMPOUNDS		ACETONE					Δ			Δ								
		BUTANEDIOL		Δ														
		1,4-DIOXANE													O			
		HEXADECANOIC ACID		Δ														
		METHYL BUTYL KETONE					Δ	Δ		Δ						Δ		
		METHYL ETHYL KETONE					Δ											
		METHYL ISOBUTYL KETONE					Δ											
		STYRENE						O										
		TETRAHYDRODIOXIDETHIOPHENE													Δ			
		TETRAHYDROFURAN												O				
		TETRAHYDROTHIOPHENE											Δ	Δ	Δ			
		TETRAHYDROTHIOPHENE DIOXIDE													Δ			
		O&P-XYLENE										O						
		UNIDENTIFIED COMPOUNDS (EXTRACTABLE)		Δ	Δ								Δ		Δ		Δ	

LEGEND

Δ Detected in at least one sample, no criteria given.

O Detected in at least one sample, but at levels less than established criteria.

● Detected in at least one sample at levels above criteria

TABLE 10.
Contaminants Detected in the Unsewered Industrial Area

CH2M HILL

Table 11
PRIORITY POLLUTANTS/CARCINOGENS FOUND IN
THE BISCAYNE AQUIFER STUDY AREA

Contaminant	EPA Contract Lab Analytical Method Detection Limit (µg/L)	Data Classification Criteria/Clean-up Goals: Concentration (µg/L)	Data Classification Criteria/Clean-up Goals: Reference (See Table 12)	Maximum Concentration Detected (µg/L): Entire Study Area	Maximum Concentration Detected (µg/L): Well Fields	Maximum Concentration Detected (µg/L): Finished Water From Treatment Plants
Heavy Metals (Primary Drinking Water Standards)						
Arsenic	10	50	a	320	ND	20
Cadmium	1	10	a	12	2	ND
Chromium	10	50	a	40	20	ND
Lead	5	50	a	260	25	10
Mercury	0.2	2	a	1.8	1.4	ND
Selenium	2	10	a	4	2	2
Priority Pollutant Volatile Organic Compounds (VOCs)						
Vinyl Chloride	5	1	1	190	79	9.4
1,1,2,2-Tetrachloroethane	5	0.2	b	5.7	3*	ND
Benzene	5	0.7	b	8	ND	ND
Methylene Chloride	5	0.2	b	20	6.4	ND
1,1-Dichloroethane	5	0.9	b	55	55	3*
1,1-Dichloroethene	5	0.04	b	22	22	ND
Acrylonitrile	100	0.34	d	70*	ND	ND
Chlorobenzene	5	488	e	30	20	3*
1,2-Dichloroethene (cis and trans)	5	270	d	140	55	17
Toulene	5	340	d	38	3*	ND
m - xylene	5	620 (total)	d	20	ND	ND
o & p - xylene	5			23	4*	ND
Trichloroethene	5	28	c	3*	ND	ND
Ethyl benzene	5	1,400	f	5	ND	ND
Tetrachloroethene	5	9	c	3*	ND	ND
Chloroform	5	100	a	ND	ND	18
Bromodichloromethane	5	100	d	ND	ND	6.1
1,1,1-Trichloroethane	5	22	b	58	4*	ND
Chloromethane	5			4*	ND	94
Chloroethane	5			23	23	ND

Note: ND = Not Detected
* = Estimated Value

gnR1093/40b

Table 11
(Continued)

Contaminant	EPA Contract Lab Analytical Method Detection Limit (µg/L)	Data Classification Criteria/Clean-up Goals: Concentration (µg/L)	Data Classification Criteria/Clean-up Goals: Reference (See Table 12)	Maximum Concentration Detected (µg/L): Entire Study Area	Maximum Concentration Detected (µg/L): Well Fields	Maximum Concentration Detected (µg/L): Finished Water From Treatment Plants
Priority Pollutant Base/Neutral and Acid Extractable Organic Compounds						
Chrysene	20	0.2	g	20	ND	ND
Anthracene	20	0.2	g	20	ND	ND
Benzo (A) Anthracene	40	0.2	g	40	ND	ND
Benzo (B and K) Fluoranthene	40	0.2	g	40	ND	ND
Benzo (A) Pyrene	40	0.2	g	90	ND	ND
Benzo (GHI) Perylene	40	0.2	g	40	ND	ND
Phenanthrene	20	0.2	g	20	ND	ND
Pyrene	20	0.2	g	20	ND	ND
Fluoranthene	20	0.2	g	20	ND	ND
Indeno (1,2,3-CD) Pyrene	40	0.2	g	40	ND	ND
2,4-Dimethylphenol	20	400	f	110	ND	ND
2,4-Dinitrophenol	100	70	f	14	ND	ND
4-Nitrophenol	200	70	f	200	ND	ND
Pentachlorophenol	40	30	h	40	ND	ND
Phenol	20	3,500	i	38	ND	ND
Bis (2-Ethylhexyl) Phthalate	20	6,000	h	86	ND	ND
Benzyl Butyl Phthalate	20			20	ND	ND
Pesticides and PCBs						
PCB-1254	0.1	(combined total) 0.00008	b	0.83	ND	ND
PCB-1260	0.1			3.1	ND	ND
PCB (total)	0.1	0.00008	b	7.7	ND	ND
4,4'-DDT	0.1	0.00002	b	0.10	ND	ND
2,4-D	1.0	100	a	26	ND	ND
Silvex (2,4,5-TP)	0.2	10	a	17	ND	ND
Endosulfan Sulfate	0.1	--		0.18	ND	ND

Note: ND = Not Detected
 * = Estimated Value

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Table 11
(Continued)

Contaminant	EPA Contract Lab Analytical Method Detection Limit (µg/L)	Data Classification Criteria/Clean-up Goals: Concentration (µg/L)	Data Classification Criteria/Clean-up Goals: Reference (See Table 12)	Maximum Concentration Detected (µg/L): Entire Study Area	Maximum Concentration Detected (µg/L): Well Fields	Maximum Concentration Detected (µg/L): Finished Water From Treatment Plants
Other Volatile Organic Compounds (Not Priority Pollutants)						
Styrene	5	1,330	h	6.3	4*	ND
Chlorotoluene	--	3,450	f	80	ND	ND
Carbon Disulfide	10	830	f	3*	ND	ND
Tetrahydrofuran	--	57	j	400	ND	ND
Other Extractable Organic Compounds (Not Priority Pollutants)						
1,4-Dioxane	--	570	k	10	ND	ND
2,4,5-Trichlorophenol	200	2,600	f	14*	ND	ND

Note: ND = Not Detected
* = Estimated Value

gnk109a/40b

Table 12
DATA CLASSIFICATION CRITERIA REFERENCES

a. EPA primary drinking water standards. National Interim Primary Drinking Water Regulations. EPA-570/9-76-003. U.S. EPA, Office of Water Supply, Washington, D.C.

b. Criteria for statistical cancer risk of 10^{-6}. U.S. Environmental Protection Agency. 1980. Ambient Water Quality Criteria. EPA 440/5-80-027, -038, -019, -053, -052, -026, -033, -029, -042, -069, -073, -077, and -078.

c. EPA, Cancer Assessment Group. Recommendations. Written communication between EPA Region IV and CH2M HILL.

d. Value established by EPA, Office of Drinking Water, Criteria and Standards Division.

e. Based on available toxicity data for protection of public health; note that taste and odor problems are experienced with concentrations in excess of 20 µg/L. U.S. Environmental Protection Agency. 1980. Ambient Water Quality Criteria. EPA 440/5-80-028.

f. EPA suggested permissible ambient goal based on health effects. Sittig, M. 1981. Handbook of Toxic and Hazardous Chemicals. Noyes Publications, Park Ridge, N.J.

g. The World Health Organization has established a value of 0.2 µg/L as a recommended total concentration for the sum of six Polynuclear Aromatic Hydrocarbons (PAH's) that are considered animal carcinogens in drinking water. This value has been assigned to each PAH in this table, even though they have not all been identified as carcinogens. Written communication between CDC (Atlanta) and CH2M HILL.

h. National Academy of Science Guidance to EPA, Office of Drinking Water. Written communication between EPA Region IV and CH2M HILL.

i. Based on available toxicity data for protection of public health; note that taste and odor problems are experienced with concentrations in excess of 300 µg/L U.S. Environmental Protection Agency. 1980. Ambient Water Quality Criteria. EPA 440/5-80-067.

j. Value is one tenth of the ten day value established by EPA, Office of Drinking Water, Criteria and Standards Division.

k. Centers for Disease Control (CDC) recommended criterion. Written communication between CDC (Atlanta) and CH2M HILL.

l. Florida VOC standard based on statistical cancer risk of 10^{-6}. State of Florida rule 17-22.

at 1.0 µg/L which is the State of Florida's standard based on 10^{-6} cancer risk level. The federal 10^{-6} cancer risk level, based on a different study, is 2.0 µg/L (correspondence from State of Florida). A list of organic contaminants found in in the study area that are not priority pollutants or carcinogens and for which no criteria are available is given in Table 13 (see page 17).

The priority pollutant VOCs were the most prevalent contaminants found throughout the study area, in the well fields (Upper Miami Springs, Lower Miami Springs, Preston and Medley Well Fields), and in finished water from the water treatment plants (Hialeah and Preston WTPs). Heavy metals were found sporadically in the study area, with maximum concentrations in the well fields and the water treatment plants at levels lower than primary drinking water standard maximum contaminant levels (MCLs). The priority pollutant base/neutral and acid extractable organic compounds were found sporadically in the study area, but were not detected in the well fields or the water treatment plants. Priority pollutant pesticides and PCBs were found in a few instances in the study area, but were not detected in the well fields or the water treatment plants. Other volatile and extractable organic compounds with criteria available, also listed in Table 11, are not priority pollutants. They were found sporadically in the study area and in a few instances in the well fields, but were not detected in the water treatment plants. Other volatile and extractable organic compounds with no criteria available, listed in Table 13, are not priority pollutants or known or suspected carcinogens. They were found sporadically in the study area and in a few instances in the well fields, but were generally not detected in the water treatment plants.

The ground water quality in the study area is of special concern because of VOC contamination detected in the Miami Springs, Preston, and Medley Municipal Well Fields as well as in treated water from the Hialeah and Preston Water Treatment Plants. In general, the water from the municipal production wells (except the Northwest Well Field) was more contaminated than that from the other monitoring wells. This is probably due to the continuous pumping of the production wells, which tends to draw contaminants from within and around the cone of influence of the well field area. VOC contamination of the Biscayne Aquifer in the study area was detected in all three vertical levels (water-producing zones). The middle and bottom zones had two to three times as high a degree of contamination as was encountered in the upper zone (Table 14, page 18). This disparity probably occurs because the production wells in the two lower zones draw contaminants from the upper zone while pumping.

NWS 001 003179

Table 13
OTHER CONTAMINANTS FOUND IN THE BISCAYNE AQUIFER STUDY AREA FOR WHICH CLASSIFICATION CRITERIA ARE NOT AVAILABLE (NOT PRIORITY POLLUTANTS OR KNOWN CARCINOGENS)

Contaminant	Maximum Concentration Detected (µg/L) Entire Study Area	Well Fields	Finished Water From Water Treatment Plant
Volatile Organic Compounds			
Acetone	200	ND	ND
1-Chloro-2-Methylbenzene	97	97	ND
Methyl Butyl Ketone	150	110	ND
Methyl Ethyl Ketone	13,000	ND	ND
Dimethylheptane	8	ND	ND
Chloromethylbenzene	70	70	ND
Ethyl Ether	20	20	ND
Methyl Acetate	30	ND	ND
Tetrahydrothiophene	100	ND	ND
Tetramethylpentanone	20	ND	ND
Dimethyl Sulfide	20	ND	ND
Methyl Isobutyl Ketone	90	ND	ND
Methyl Sulfide	10	ND	ND
Extractable Organic Compounds			
Dimethylheptane	8	ND	ND
C8 Alkylphenol	50	6	ND
Hexadecanoic Acid	100	100	ND
Benzoic Acid	200	ND	ND
C2 Alkylphenol	120	ND	ND
C3 Alkylphenol	21	ND	ND
Hexadecane	700	700	ND
Methyl Benzoic Acid	50	ND	ND
2-Methyl Phenol	390	ND	ND
4-Methyl Phenol	150	ND	ND
Phosphoric Acid, Tributyl Ester	30	ND	ND
Butanediol	200	ND	ND
Tetrahydrothiophene Dioxide	50	ND	ND
Pentaoxapentadecane	10	10	ND
Hexahydroazopinone	700	700	ND
Methylenepentanone	60	60	ND
Unidentified Extractable Organics	800	800	33

Note: ND = Not Detected

gnR109a/40d

At present, the Medley Well Field has been permanently shut off and the Miami Springs and Preston Well Fields are in minimal use. Use of the new, uncontaminated Northwest Well Field is being maximized, and water from this well field is being pumped to the Hialeah and Preston Water Treatment Plants. The peak day water demand in the area is increasing yearly and is projected to be 255 million gallons per day (mgd) in the year 2005 (see Figure 6). Since the capacity

Table 14
MEAN VALUES FOR SELECT ANALYTICAL PARAMETERS FOR WELLS IN THE SHALLOW, MEDIUM, AND DEEP ZONES

	Upper	Middle	Deep	Cleanup Goal
Vinyl Chloride	0.35	12	10	1
Trans-1,2-dichloroethene	0.36	6.7	4.3	270
Total VOCs	7.8	22	19	--

Note: All values reported in μg/L.

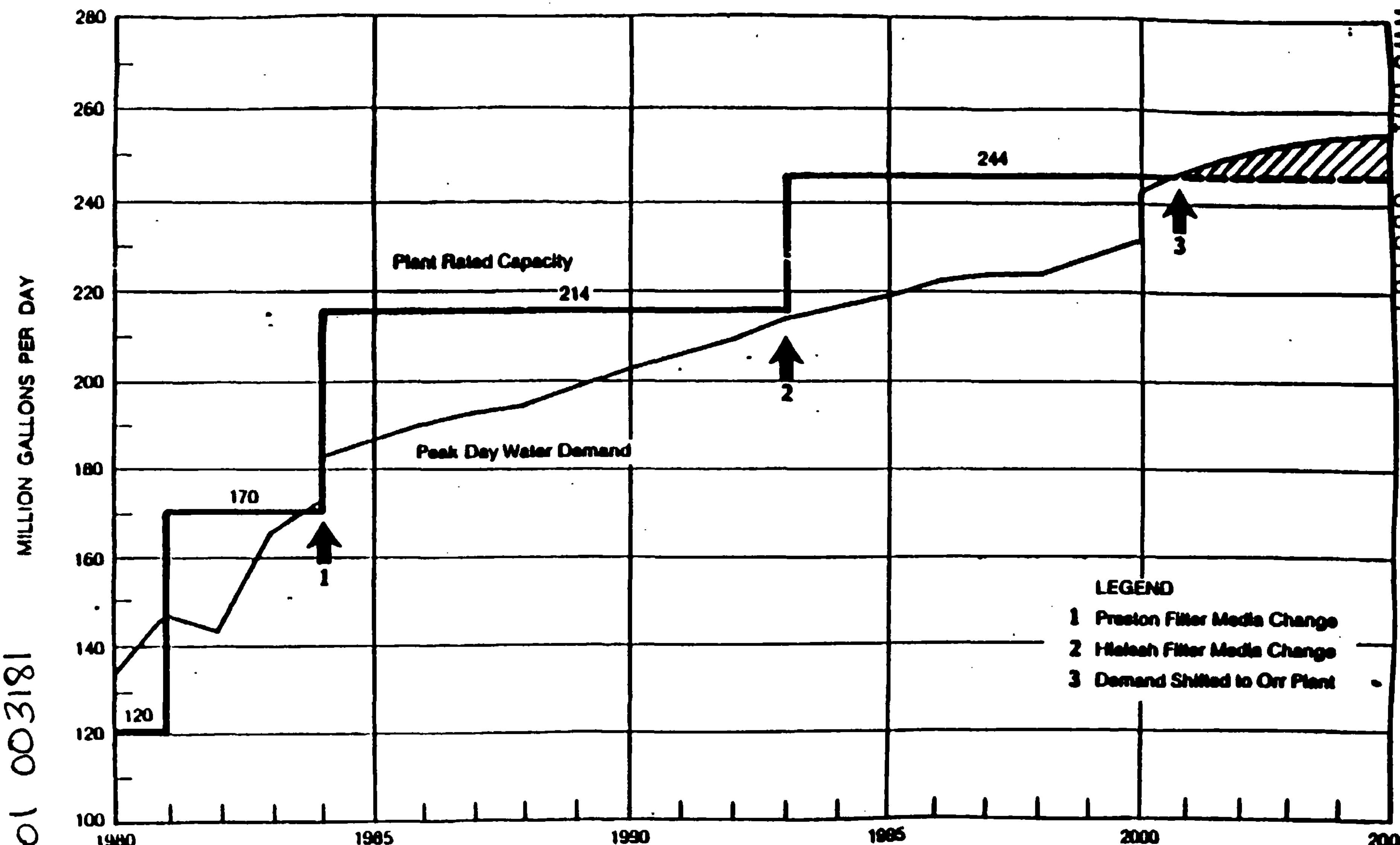
of the Northwest Well Field is only 150 mgd, conditions in the near future will demand additional water withdrawal, either from the existing well fields or from new well fields.

ENFORCEMENT ANALYSIS

The Miami Drum Services site, the Northwest 58th Street Landfill site and the Varsol Spill site were collectively designated as the Biscayne Aquifer Site to address the threat to the regional ground water supply.

Miami Drum Services

EPA is currently proceeding with cost recovery actions to recover EPA's removal expenditures at this site. According to information gathered during a responsible party search and financial assessment study, the owners and operators of the site are not financially capable of remedial activities or reimbursement to EPA for its remedial expenditures. EPA and DOT are currently investigating generators and transporters as financially viable potential responsible parties. Notice letters for the Remedial Design/Remedial Action phase are being drafted and will be mailed in the near future.



Source Miami Water and Sewer Authority

FIGURE 6.
Implementation Schedule Based on Water Demand, Plant Rated Capacity, and Aquifer Clean Up.

CH2M HILL

Northwest 58th Street Landfill

The State of Florida is planning the closure of the Northwest 58th Street Dump pursuant to the requirements of Chapter 17-7.07 of the Florida Adminstrative Code. An Enforcement Decision Document is currently being prepared by EPA. A consent decree with Dade County detailing the elements of the closure will be prepared concurrently with the EDD. Notice letters for the Remedial Design/Remedial Action phase are being drafted and will be mailed in the near future.

Varsol Spill Site

A no-action record of decision was signed for the Varsol Spill site on March 29, 1985.

ALTERNATIVES EVALUATION

The primary objective of the remedial action resulting from the remedial investigation/feasibility study is to provide uncontaminated drinking water to the public. A secondary benefit of the remedial action is significant cleanup of the contaminated portion of the aquifer.

Ground water treatment at the source was considered before off-site remedial alternatives were developed. Ground-water quality at the source, i.e., in the immediate vicinity of the Miami Drum site, the Northwest 58th Street Landfill, and the Varsol Spill site was found by the RI to be very similar to the ground-water quality throughout the study area. Source control action taken at the Miami Drum site (soil excavation and removal as well as treatment of ground water encountered during excavation) has already reduced ground water contamination at this site to levels as low as those offsite. Prior to any source control action taken, data indicate that the Miami Drum site significantly contributed to the areawide ground water problem. Source control at the 58th Street Landfill in the form of proper landfill closure and leachate control has been recommended in the feasibility study (FS). The landfill closure plan is presently being prepared by Dade County and its consultants. Also, Dade County commissioners have approved, in concept, a bond issue for implementation of the closure plan; details of the bond issue are being worked out before it is presented to the public. The County is also taking appropriate actions to address the private well users in the immediate area of the landfill. The spill site at the Miami International Airport no longer has detectable levels of petroleum-fraction solvent. Therefore, the no-action alternative was selected. No concentrated contaminant plume was found emanating from any of the three sites.

Besides these sources, there are numerous other unidentified smaller sources (small businesses and individuals) scattered throughout the study area that are known to be contributing to ground-water contamination. However, no distinguishable plume could be identified from any of these sources. In addition, the RI found that continuous pumping of the Miami Springs and Preston production wells tends to draw contaminants from within and around the cone of influence of the well field area, covering most of the developed study area. In view of these data, it was deemed impractical to treat the ground water at each source. Since the mechanism exists for withdrawing water at centralized locations at the well fields, it was more reliable and practical to consider withdrawal and treatment of ground water at these locations offsite. Therefore, the alternative of ground-water treatment at each source was rejected in favor of the off-site treatment alternative.

Alternatives Considered

The following ten off-site remedial action alternatives were considered:

1. No action.

2. Use well fields for contaminant recovery and provide treatment systems using air stripping, granular activated carbon, or both.

3. Abandon contaminated well fields, find clean well fields, and pump to existing WTPs.

4. Abandon contaminated well fields and WTPs and relocate.

5. Provide bottled water for consumption and continue operating WTPs for non-consumptive purposes.

6. Provide home treatment systems.

7. Establish countywide spill prevention, containment, and cleanup plans.

8. Develop land-use restrictions to protect the aquifer from the effects of urbanization.

9. Use the Medley Well Field for ground-water recovery; treat using air stripping, granular activated carbon, or both; and discharge treated ground water into the aquifer.

10. Abandon septic tanks and provide centralized collection and treatment.

Initial Screening of Alternatives

An initial screening of the above alternatives was based on conceptual costs, effects of the alternative, and acceptable engineering practices as recommended in Section 300.68(h) of the National Contingency Plan (NCP). Remedial actions that far exceeded the cost of other alternatives, yet did not offer significantly greater protection to public health or the environment were rejected. Remedial action alternatives were also rejected if they failed to mitigate and prevent harm to public health or welfare, or to the environment. If the remedial action alternatives were infeasible for the location and conditions of the release, inapplicable to the problem, or represented an unreliable means of addressing the problem, they were rejected on the basis of unacceptable engineering practices.

Table 15 (see page 23) presents a qualitative summary of the initial screening process for all the off-site remedial action alternatives. Alternatives 4, 5, and 6 were rejected. Alternatives 7, 8, and 10 were accepted only as supplemental remedies to a primary remedy, since they were only partially applicable to the problem. The remedial action alternatives accepted for detailed evaluation as primary remedies included Alternatives 1, 2, 3, and 9.

Detailed Evaluation of Alternatives

Details of the remedial action alternatives accepted for further evaluation are provided below.

Alternative 1: The no-action alternative was considered before proceeding to other off-site alternatives. The Superfund Implementation Group of the Centers for Disease Control (CDC) made the following comments following an independent review of the RI data:

> "All study areas show serious concentrations of the Biscayne Aquifer ground water with priority pollutants and carcinogens. For many pollutants the chemical concentration is far above the EPA ambient water quality criteria, the concentration associated with the EPA estimate of a lifetime excess cancer risk of 1:100,000, or the national drinking water standard... With this in mind we consider the Biscayne Aquifer a serious potential threat to the public health."

Implementing the no-action alternative would result in adverse public health and environmental effects since the ground water would remain contaminated and human consumption would continue. This alternative is infeasible, inapplicable, and unreliable since, without remedial actions, safe drinking water will not be provided to the public.

Table 15
INITIAL SCREENING OF OFFSITE REMEDIAL ACTION ALTERNATIVES

Remedial Offsite Control Alternative	Further Consideration	Comments
1. No action	Yes	
2. Use well fields for contaminant recovery and provide treatment systems using air stripping, granular activated carbon, or both.	Yes	
3. Abandon contaminated well fields, find clean well fields, and pump to existing WTPs.	Yes	
4. Abandon contaminated well fields and WTPs and relocate.	No	Availability of adequate water supply questionable. Will not clean up the aquifer. Extremely expensive (approximately $140 million).
5. Provide bottled water for consumption and continue operating WTP's for non-consumptive purposes.	No	Temporary measure. Difficult to control access.
6. Provide home treatment systems	No	Temporary measure. Difficult to monitor; requires regular maintenance. Expensive O&M.
7. Establish county-wide spill prevention, containment, and cleanup plans.	Yes, partial	Supplemental to primary alternative.
8. Develop land use restrictions to protect the aquifer from the effects of urbanization.	Yes, partial	Supplemental to primary alternative.
9. Use Medley Well Field for ground-water recovery; treat using air stripping, GAC, or a combination of both; and discharge treated ground water into the aquifer.	Yes	
10. Abandon septic tanks and provide centralized collection and treatment.	Yes, partial	Supplemental to primary alternative.

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Alternative 2: This alternative recommends that the existing contaminated Miami Springs and Preston Well Fields be used as recovery wells. Water will be treated for removal of contaminants that existing treatment cannot remove.

The types of contamination found in the study area during the RI included volatile organic compounds (VOCs), base/neutral and acid extractable organic compounds, and metals. The VOCs were the predominant type of contamination found in the well fields. Base/neutral and acid extractable organic compounds were found at very low concentrations, if at all. At the well fields, metal concentrations were below primary drinking water standards and will be further reduced in the softening process at each WTP. In a few cases, some heavy metals (primarily lead) were found in monitoring wells at levels above the primary drinking water standards. However, even if the maximum lead concentrations found in the study area entered the well fields, the existing treatment process would reduce the level below the primary drinking water standard.

It was determined that the types of organic compounds present in the ground water of the well fields can be effectively removed by aeration alone, including the maximum VOC concentrations. Granular activated carbon (GAC) treatment was not necessary since it was determined that there was no need to treat the low or non-existent concentrations of base/neutral and acid extractable organic compounds. Should the need arise, GAC treatment can be added to the WTPs. The extractable organic compounds are highly immobile, and have not exhibited significant migration to date and are not expected to do so. If they do, and are found in the Miami Springs/Preston Well Fields at levels above cleanup goals, additional actions would be evaluated. Low levels that remain in the aquifer at this time are presently being addressed through institutional controls. Final actions on the low levels remaining will be addressed at a later date.

Under this alternative, raw water from the Miami Springs Well Field will be treated at a new air stripping unit located on land owned by the Miami-Dade Water and Sewer Authority (WASA) near Wells No. MS-10 and MS-14. An air stripping system to treat raw water from the Preston Well Field will be constructed at the Preston Water Treatment Plant. The location and schematic of these proposed systems are shown in Figure 7.

The combined design capacity of the Hialeah and Preston WTPs will be approximately 244 mgd in the year 2000. The Northwest Well Field will be used to provide 150 mgd of uncontaminated water to the above WTPs. The remaining WTP

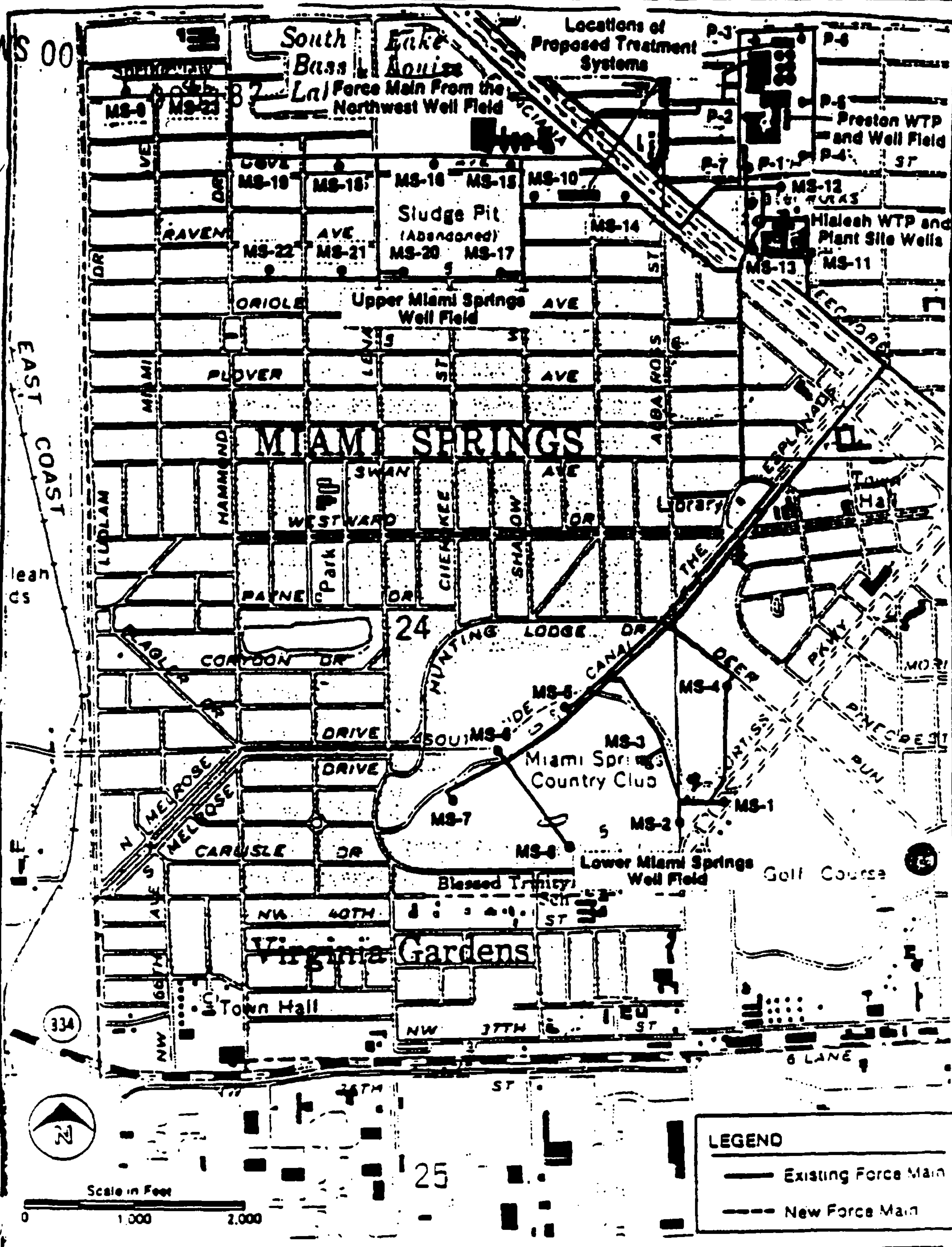

FIGURE 7.
Location of the Proposed Treatment Systems.

demand of 94 mgd will be provided by treating contaminated raw water from the Preston Well Field and the Upper Miami Springs Well Field. The air stripping pretreatment system for the Hialeah WTP will be designed to treat 43.2 mgd of raw water from the Upper Miami Springs Well Field, and the air stripping pretreatment system for the Preston WTP will be designed for treating 60 mgd of raw water from the Preston Well Field.

Air stripping the contaminated water will reduce the VOCs to below 10^{-6} excess lifetime cancer risk concentrations (see Table 16, page 27). Although, as noted on page 3, there is a discrepancy between State and Federal 10^{-6} cancer risk levels for vinyl chloride, the air stripping system would reduce the vinyl chloride to 0.03 µg/L, well below either at the same cost. This alternative will have minimum adverse environmental impact and no air pollution problem will be created (see later section on consistency with other environmental laws). Implementation will be relatively simple and take only one year or less to complete. Use of this alternative will provide uncontaminated drinking water to the public, and aid in cleaning up the contaminated portion of the aquifer.

Total present worth cost for this alternative is estimated at $8,420,400. This includes a capital cost of $5,268,000 and operation and maintenance cost of $334,400 per year.

Alternative 3: The uncontaminated new Northwest Well Field, located at the western edge of the Biscayne Aquifer study area, has a capacity of 150 mgd, with fifteen 10-mgd wells. Well field water is pumped to the Hialeah and Preston WTPs through a 96-inch diameter force main approximately 9 miles long. Alternative No. 3, by adding ten new 10-mgd wells, will increase the capacity of the Northwest Well Field from 150 mgd to 250 mgd and enable it to meet the needs of both the Hialeah and Preston WTPs in the year 2000. Once the expansion of the Northwest Well Field is complete, the Upper and Lower Miami Springs Well Fields, the Preston Well Field, and the Hialeah plantsite wells will be abandoned.

Adequate capacity for additional ground-water withdrawal will have to be determined and a consumptive-use permit obtained from the South Florida Water Management District.

This will require an extended period for implementation of 1½ to 2 years. Implementation will create a potential for contamination of the Northwest Well Field by (1) migration of contaminants from other areas of the aquifer into the well field's cone of influence which extends into the Northwest 58th Street Landfill and the unsewered industrial area of Medley, and (2) industrial development of land, if permitted, within the well field's cone of influence,

Table 16
HEALTH RISKS ASSOCIATED WITH THE HIALEAH AND PRESTON WTP PRETREATMENT SYSTEMS (ALTERNATIVE NO. 3)

WTP	Compound	Maximum DI Value (ppb)	Maximum DI Value After Pretreatment (ppb)	Excess Lifetime Cancer Risk (a) 10^{-6}	Excess Lifetime Cancer Risk (a) 10^{-5}	EPA Drinking Water Health Advisory (ug/l) (b) 1-day	EPA Drinking Water Health Advisory (ug/l) (b) 10-day	EPA Drinking Water Health Advisory (ug/l) (b) Chronic	EPA Interim Drinking Water Std. (ug/l) (c)	Florida Drinking Water Std. (ug/l) (d)	Dade Classification Criteria/Cleanup Goals (ug/l)
Hialeah	Vinyl Chloride	31.31	0.01	2.0	20	--	--	--	[illegible]	1.0	1.0
	1,1-Dichloroethene	3.13	0.03	0.036	0.36	1,000	[illegible]	70	[illegible]	--	[illegible]
	1,1-Dichloroethane	11.41	0.1	0.94	9.4	--	--	--	--	--	[illegible]
	Trans-1,2-Dichloroethene	33.9	0.10	--	--	2,700	270	--	--	--	[illegible]
	Chlorobenzene	4.5	[illegible]	--	--	[illegible]	[illegible]	[illegible] (e,f)	--	--	[illegible]
	Toluene	1.6	0.003	--	--	21,500	3,400	340	--	--	[illegible]
	Methyl Butyl Ketone	20.0	6.3	--	--	--	--	--	--	--	--
	Ethyl Ether	4.66	0.19	--	--	--	--	--	--	--	--
	Chloroethane	[illegible]	0.001	--	--	--	--	--	--	--	--
	1,1,2,2-Tetrachloroethane	0.64	0.36	0.17	1.7	--	--	--	--	--	[illegible]
	1,1,1-Trichloroethane	[illegible]	0.04			--	--	1,000	200	200	[illegible]
Preston	Vinyl Chloride	10.3	0.025	2.0	20	--	--	--	[illegible]	1.0	1.0
	Trans-1,2-Dichloroethene	[illegible]	0.36	--	--	--	2,700	270	--	--	[illegible]
	Methylene Chloride	1.7	[illegible]	0.19	1.9	13,000	1,300	[illegible]	--	--	[illegible]
	Chlorobenzene	1.03	[illegible]	--	--	--	--	[illegible] (e,f)	--	--	[illegible]
	M&P Xylene	0.16	[illegible]	--	--	--	--	--	--	--	[illegible]
	Styrene	1.20	[illegible]	--	--	--	--	--	--	--	[illegible]
	Total Recoverable Phenols	3.6	3.6	--	--	--	--	[illegible] (e,g)	--	--	--

SOURCES:

(a) EPA Ambient Water Quality Criteria Documents, 1980. Values have been adjusted to levels for water only.

(b) Memorandum from William [illegible], to Lee Thomas, U.S. EPA, [illegible]. Health advisory concentrations are not expected to lead to adverse health effects if the exposure continues for the time period indicated.

(c) U.S. EPA Interim Drinking Water Standards, Federal Register, [illegible] and June 12, 1984.

(d) Florida Regulations (Florida DER, Florida Administrative Code, Chapter 17-22)

(e) EPA proposed recommended maximum contaminant level, Federal Register, June 12, 1984.

(f) Health based criterion. Olfactory threshold is 20 ug/L.

(g) Health based criterion. Taste threshold is 300 ug/L.

[illegible]

resulting in aquifer contamination. Uncontaminated drinking water will be provided to the public, but the aquifer will not be restored through use of this alternative.

Total present worth cost for this alternative is estimated at $22,815,000. This includes a capital cost of $10,651,600 and an operation and maintenance cost of $1,290,300 per year.

Alternative 9: Medley Well Field's location in the study area provides a suitable site for an off-site recovery well system. Ground-water quality is similar to the rest of the study area, except that there are higher concentrations of base/neutral and acid extractable organic compounds which are highly immobile. Under this alternative, raw water from the Medley Well Field will be pumped to an on-site treatment system and reinjected into the aquifer after treatment. Three of the six wells will be used to pump water from the aquifer to a treatment system consisting of air stripping followed by carbon adsorption. Treated water will be re-injected into the aquifer through the well casings of the remaining three Medley wells. The well field will act as a recovery well system for the study area. However, it would recover ground water from only a small part of the study area because of its smaller cone of influence, compared to that of the Miami Springs and Preston Well Fields.

Implementation of this alternative will be fairly easy and require a relatively short period of time (one year or less). It will cause minimum adverse environmental impact. Although it will clean up a portion of the extractable organic compounds, it will not recover a large volume of drinkable ground water. The goal of providing uncontaminated drinking water would not be met in the immediate future.

Total present worth for this alternative is estimated at $105,047,000 (this does not include refurbishing pumps and other equipment recently removed from the wellhead). This includes a capital cost of $14,625,100 and an operation and maintenance cost of $9,591,900 per year.

Table 17 (see page 29) presents a summary of the detailed analysis of these four alternatives for cost, public health, environmental, technical, and other considerations. Table 18 (see page 30) presents a summary of the cost evaluation of these alternatives, including total present worth.

RECOMMENDED ALTERNATIVE

Alternative No. 1, no action, was the least desirable alternative considered in the detailed evaluation, and was

Table 17
SUMMARY OF PRIMARY ALTERNATIVES

Alternatives and Components	Costs ($K) Capital	O&M	Public Health Considerations	Environmental Considerations	Technical Considerations	Other
1. No Action	0	0	This alternative will not provide uncontaminated drinking water to the public or aid in cleaning up the contaminated aquifer.	Environmental impact will be adverse, since ground water will remain contaminated and human consumption will continue.	Inapplicable and unreliable for solving ground water contamination problem.	CDC evaluation concluded that the contamination of the Biscayne Aquifer poses a serious potential threat to human health.
3. Contaminant Recovery and Air Stripping at Miami Springs and Preston Well Fields	5,360	334.0/yr	Predicted VOC concentrations in water after air stripping are below Florida drinking water standards and 10 excess lifetime cancer risk concentrations (see Table 16). This alternative will aid in cleaning up the contaminated portion of the aquifer and provide uncontaminated drinking water to the public.	Minimal adverse environmental impact from implementation of this alternative. No air pollution problem created because of the dilution and mixing effect that occurs during air stripping and VOC's ultimate destruction by the sun's ultraviolet light. VOC emissions from air stripping towers are much below emission levels allowed by the State of Florida (see Table 18). Disposal of hydrogen sulfide into the air will not create a significant odor problem because the concentration of hydrogen sulfide found in the well fields is less than 0.3 mg/L. There are no threats to surface water that would affect public health.	Air stripping for VOCs removal from drinking water is reliable and proven technology. Constructing the proposed treatment system would not require an unconventional technology or construction method. Tie-ins to existing lines would be made in a conventional manner. Land already owned by MDWA will be used for constructing the system.	Implementation would require that funds be made available to design, construct, and operate the facility; the proposed allowable levels of contaminants in the finished water be accepted by state and local governments, as well as area residents; and the proper permits for construction and operation be obtained. Time to implement (design and construction) approximately one year.
5. Expansion of Northwest Well Field and abandonment of contaminated well fields	10,431.6	1,290.0/yr	This alternative would allow Hialeah and Preston WTPs to provide uncontaminated drinking water to the public. However, the existing ground-water contamination in the study area would not be removed (no aquifer cleanup provided).	Implementation could result in the future contamination of the Northwest Well Field by (1) migration of contaminants from other areas of the aquifer into the well field's cone of influence which extends into the Northwest 58th Street Landfill and the Uncontrolled Industrial Area of Medley, and (2) industrial development of land, if permitted, within the well field's cone of influence, resulting in aquifer contamination. There are no threats to surface water that would affect public health.	Reliable technology. The proposed new well houses would be constructed in a conventional manner and would be similar to the existing Northwest Well Field wells. No additional land would be required for construction.	A consumptive use permit would have to be obtained from the South Florida Water Management District. This involves proving technical feasibility by determining (1) the effect of increased pumping on the water conservation area to the west, (2) the potential for saltwater intrusion, and (3) the effect of drawdown on the pool [illegible] in the area. Time to implement 1½ to 2 years.
9. Use Medley Well Field for ground-water recovery; treat with air stripping and GAC; and discharge treated ground water back to the aquifer	16,423.1*	2,391.0/yr	This alternative will aid in cleaning up only a small area of the contaminated aquifer, and will provide no immediate and direct aid in supplying uncontaminated drinking water to the public (negligible effect on water quality at WTPs).	Minimal adverse environmental impact from implementation of this alternative. Discharge of organic compounds into the atmosphere will not create a significant air pollution source (same reasons as those for Alternative No. 3). The contaminated ground water pumped from the aquifer will be treated to bring it to drinking water standards prior to injection into the aquifer. There are no threats to surface water that would affect public health.	Reliable technology. Construction would incorporate as much of the existing Medley Well Field equipment into the new facility as possible. MDWA currently owns the land where Medley Well Field is located. No additional land will be needed for construction.	Implementation would require funds to design, construct, and operate the facility; public and regulatory acceptance of the alternative, and the proper permits for construction and operation. Time to implement approximately one year.

* Does not include cost of refurbishing pumps and other equipment recently removed from the wellhead.

[illegible]

Table 18
SUMMARY OF COST EVALUATION OF PRIMARY ALTERNATIVES

Alternative No.	Description	Cost (January 1984 dollars) Capital	O&M	Total Present Worth[a]
2	Use well fields for contaminant recovery and provide treatment systems using air stripping.	5,268,000	334,400/yr	8,420,400
3	Abandon contaminated well fields, find clean well fields, and pump to existing WTPs.	10,651,600	1,290,300/yr	22,815,000
9	Use the Medley Well Field for ground-water recovery; treat using air stripping and GAC; and discharge treated ground water back to the aquifer.	14,625,100[b]	9,591,900/yr	105,047,000[b]

[a] Total present worth costs were developed based on 30-year life and 10 percent interest rate.
[b] Does not include costs for refurbishing pumps and other equipment recently removed from the wellhead.

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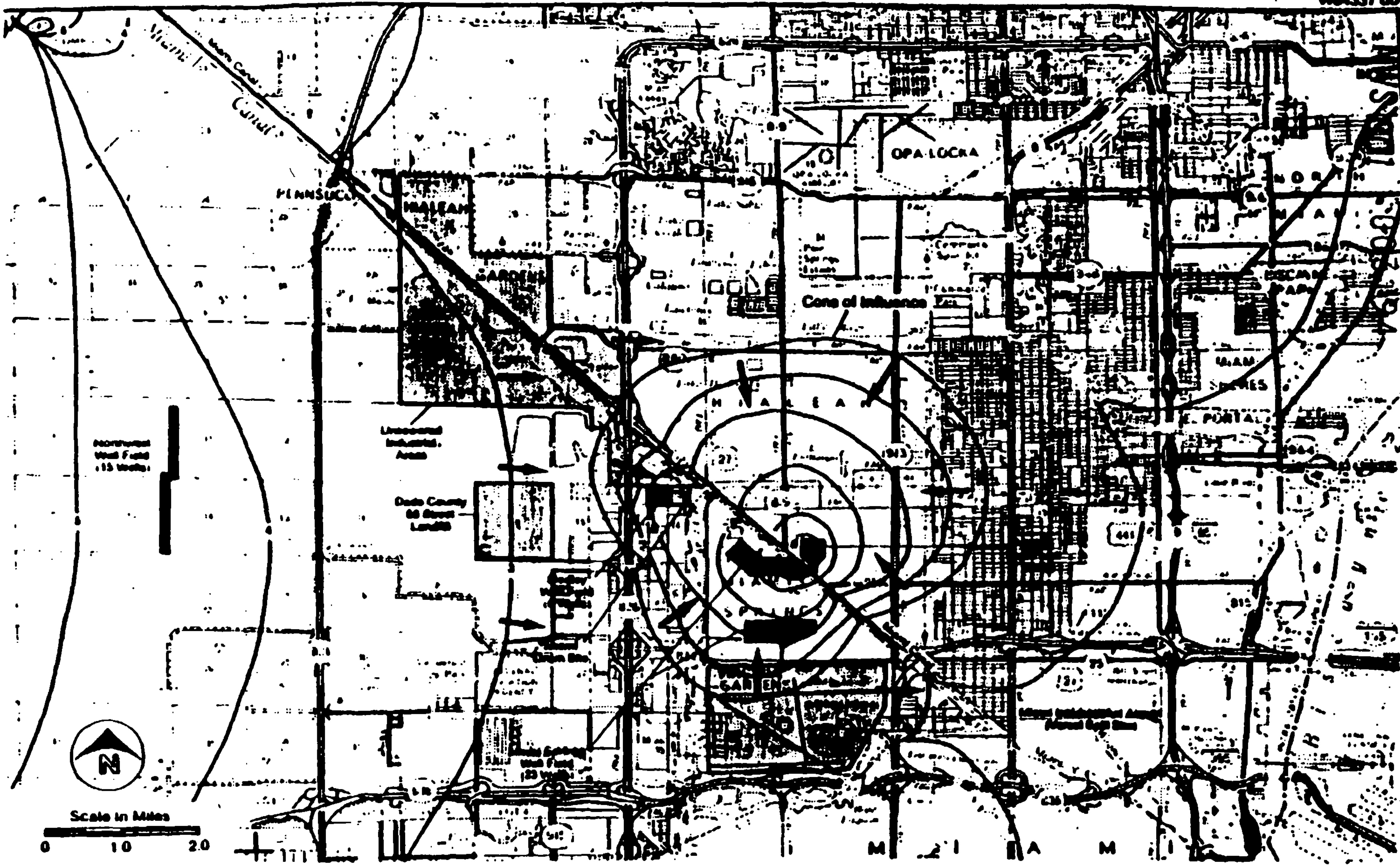
rejected on both public health and environmental grounds (see Table 17). Alternative No. 2 (air stripping at Miami Springs and Preston Well Fields) was selected over Alternative No. 3 (expansion of the Northwest Well Field). The operation of the Northwest Well Field has created a cone of influence that extends almost to the western boundary of the Northwest 58th Street Landfill. Therefore, the ground-water movement while the well field west of the landfill is operating is westward toward the well field. However, the RI found that water in the western part of the study area was uncontaminated. If the Miami Springs and Preston Well Fields are not used in the future, and if the present withdrawal capacity of the Northwest Well Field is increased due to heightened water demand, great potential exists for the contaminants from the study area to move into the uncontaminated Northwest Well Field because of the expansion of its cone of influence under those conditions.

Alternative No. 2 was selected over Alternative No. 9 (ground water recovery, treatment, and discharge to aquifer, from Medley Well Field) since Alternative No. 9 would not provide acceptable drinking water to the affected community. In addition, the alternative is more costly than Alternative No. 2.

The remedy provided for in Alternative No. 2 (air stripping at Miami Springs and Preston Well Fields) was found to be superior to the other alternatives investigated in the detailed evaluation. Only Alternative No. 2 will fulfill both goals of the study by providing uncontaminated drinking water to the public as well as providing significant cleanup of the aquifer. Also, Alternative No. 2 has the lowest present worth cost of the feasible remedies ($8,420,400) (excluding the no-action alternative).

On the basis of the above comparisons, Alternative No. 2 is recommended as the appropriate remedial action for the study area ground water. Use of existing Miami Springs and Preston Well Fields for contaminant recovery and provision of treatment systems using air stripping (see Figure 7) will provide clean drinking water to the public. A secondary benefit of this remedial action is significant cleanup of the contaminated portion of the aquifer.

Figure 8 shows the water table contour in the study area when Miami Springs and Preston Well Fields were fully operational. The cone of influence from these well fields and the direction of ground-water flow are indicated in this figure. The cone of influence covers a large portion of the study area and the ground water within this cone would move toward the well fields, if Alternative No. 2 were implemented. Furthermore, since the natural ground-water flow is toward the east/southeast, ground water upgradient of the



LEGEND

Water Table Contour-Shows Altitude of Water Table. Contour Interval is 1 and 2 feet. Datum is National Geodetic Vertical Datum of 1929 (NGVD).

Direction of Ground Water Flow

FIGURE 8.
Altitu… of Water Table and Ground Water Flow in the Study Area, May 1980.

cone of influence would eventually move into either the cone of influence or the Miami Canal. The Miami Springs and Preston Well Fields will thus recover most of the contaminated ground water from the study area.

Most of the remaining contaminated ground water from the study area will flow into the Miami Canal, with ultimate discharge to the Biscayne Bay and the Atlantic Ocean. The ground water from the upper (least contaminated) layer of the aquifer flowing from the study area to the Miami Canal for a short time period each year will not adversely affect water quality in the canal, which is used only for flood control, navigation, and industrial purposes. In addition, through gradual expansion of potable water lines and regulatory controls, Dade County has virtually eliminated the potable use of private wells in the study area. The small number of private wells in the immediate area of the 58th Street Landfill will be addressed in the EDD.

The remedy provided by the recommended alternative offers a choice, in theory, of treating the ground water for VOC removal either before or after existing conventional treatment at the WTPs.

WASA is currently conducting studies to design and build a treatment system that will handle the combined capacity of the Preston and Hialeah WTPs. This system will be designed to treat approximately 170 mgd of finished water, and will include the blended water from Northwest, Miami Springs, and Preston Well Fields. While this alternative is technically feasible, it was not selected for detailed evaluation in the FS because of the added expense of treating an additional 67 mgd of water above the proposed design capacity of 103 mgd (Alternative No. 2). As a large portion of the blended water would come from the uncontaminated Northwest Well Field, it was decided in the FS not to treat the Northwest Well Field water by the air stripping system.

WASA's motive for treating the finished water (as opposed to the raw water) from the WTPs is to reduce the level of trihalomethanes (resulting mainly from chlorination of the water at the WTPs) and color in the water. The additional treatment for this purpose is unrelated to the hazardous waste contamination of the ground water in the study area, and thus the added costs are not eligible for federal participation. The recommended remedial action of Alternative No. 2 compares favorably with WASA's plans because it essentially reduces the VOC contaminants to similar levels while incurring lower costs.

CONSISTENCY WITH OTHER ENVIRONMENTAL LAWS

The recommended remedial action protects public health and welfare, and the environment. It is consistent with other related environmental laws and requirements such as RCRA, Air Quality Standards, and Executive Orders related to Floodplains and Wetlands.

As explained earlier, the study area contains elevated levels of VOCs in the ground water. These levels pose a threat to public health and the environment, especially since the ground water is being used for drinking water purposes. The recommended treatment would bring the quality of the water withdrawn from the contaminated well fields to levels below those set by the cleanup goals to protect public health. The regional administrator concurs with the cleanup goals. Thus, the recommended remedial action will be environmentally sound with respect to drinking water quality.

With respect to air quality standards, the recommended alternative would generate VOC emissions from air stripping towers. However, these emissions would be far below the levels allowed by the State of Florida (see Table 19, page 35). An air quality analysis using EPA-approved modeling techniques was performed to predict the impact of VOCs from the installation of air stripping towers at the proposed Miami Springs and Preston Well Field locations. EPA air quality models ISC, PTDIS, and PTPLU were used to determine the impact from the stripper tower complexes at various distances downwind. The air stripping towers would be located in residential neighborhoods, with the nearest residences being approximately 40 meters from each stripper complex.

For the air quality analysis, impact receptors were placed downwind from each source at 25, 50, 75, 100, 150, 300, 600, 1,000, and 1,600 meters. Using worst conditions, it was determined that maximum predicted 1-hour concentrations, which would be expected to be greater than longer-term averages, are at 100 meters downwind of each treatment facility. Table 20 (see page 36) presents the maximum predicted 1-hour impacts (concentrations) from each facility for each contaminant emitted into the air. Table 20 also compares these concentrations to threshold limit values (TLVs) set by the American Conference of Governmental Hygienists, which are daily 8-hour averages that would not be expected to produce adverse effects on workers. This comparison shows that the maximum concentrations are several orders of magnitude below the corresponding TLVs.

The smallest ratio of TLV to estimated maximum concentrations is for vinyl chloride, over 800 and 500 for Miami

Table 19
SUMMARY OF VOC EMISSIONS FROM THE PROPOSED TREATMENT SYSTEMS (ALTERNATIVE NO. 2)

WTP	Description	Total VOCs from Pretreatment: Mean Values (lb/d)	Mean Values (tpy)	Maximum Values (lb/d)	Maximum Values (tpy)	State of Florida Allowable Emission Cutoff Levels (lb/hr)	Cutoff Levels (tpy)
Hialeah	Treat water from the upper and lower Miami Springs wells and the Hialeah plantsite wells	14.6	2.7	30.8	5.6	60	15
Preston	Treat water from Preston Well Field, abandon Medley Well Field, and blend with Northwest Well Field	15.0	2.74	25.0	4.53	60	15

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Springs and Preston facilities, respectively. Moreover, EPA Prevention of Significant Deterioration (PSD) regulations (available only for vinyl chloride in the list in Table 20) define significant emission rates and monitoring concentrations for vinyl chloride of 1 ton per year and 0.015 mg/m³ (24-hour average), respectively. For comparison, the equivalent 1-hour impact significant monitoring concentration (derived from the PSD regulations) would be approximately 0.038 mg/m³. Maximum 1-hour impacts for vinyl chloride at either facility are well below 0.038 mg/m³ (approximately one-third of this value). Thus, comparison of maximum air emission impacts with the TLVs and PSD values suggests that the health impact from inhalation of released VOCs is not likely to be significant.

Table 20
MAXIMUM PREDICTED 1-HOUR AVERAGE CONCENTRATIONS FROM EMISSIONS FROM AIR STRIPPING FACILITIES (RECOMMENDED ALTERNATIVE) AND COMPARISON WITH TLVs

Location of Facility	Compound	Maximum 1-Hour Concentration (mg/m³)	TLV (mg/m³)
Miami Springs	Vinyl Chloride	0.012	10
Well Field	1,1-Dichloroethene	0.003	20
	1,1-Dichloroethane	0.006	810
	1,2-Dichloroethene	0.013	790
	Chlorobenzene	0.002	350
	Toluene	0.0008	375
	Methyl Ethyl Ketone	0.008	20
	Ethyl Ether	0.002	1,200
	Chloroethane	0.0005	Not Available
	1,1,2,2-Tetrachloroethane	0.0002	7
	1,1,1-Trichloroethane	0.0005	1,900
Preston	Vinyl Chloride	0.015	10
Well Field	1,2-Dichloroethene	0.024	790
	Methylene Chloride	0.001	250
	Chlorobenzene	0.001	350
	Xylene	0.0003	435
	Styrene	0.0009	215

The area of the proposed air stripping facilities contains neither known threatened or endangered species nor wetlands. It is, like almost all of Dade County, located in the 100-year floodplain. However, the Miami Canal with its several flood control structures minimizes and controls the flood in the study area, including that proposed for air stripping facilities. Also, building permits are issued by Dade County only if the ground at the proposed structures is raised above the 100-year flood elevation before the structure is built on it. In this case, both at the Miami Springs and Preston Well Field locations, the elevation of the existing surface at the construction sites will need to be raised by only one to two feet to ensure that the air stripping treatment facilities are not built on the 100-year flood plain.

To the extent that contaminated ground water flows to or is in contact with area surface water, it causes no violation of any water quality standards.

COMMUNITY RELATIONS

An extensive community relations program was implemented during the course of the RI and FS. Local and state agencies, such as Florida DER and Dade County DERM, were active participants during the entire project.

A public meeting was held in Miami in September 1982 to present the results of the initial study (evaluation of existing data) and to outline the plans for the RI. Three issues of Remedies, a newsletter summarizing project activities and reports, were mailed to over 400 individuals and organizations, primarily in the Dade County area, in October 1983, March 1984, and July 1984.

A public meeting to present the RI findings, outline the FS activities, and solicit comments on possible cleanup alternatives was held in the study area in October 1983. Preliminary results of the detailed evaluation of the remedial action alternatives were explained in a public meeting in March 1984 and public comments and suggestions were sought. EPA sponsored another public meeting in July 1984 to present and receive public comment on the recommended remedial action. Two workshops on study findings, risk assessments, and proposed cleanup and prevention activities were held for the press, elected and appointed officials, and the general public during July 1984. A final public meeting was held in February 1985 in the Miami Springs City Hall to discuss the draft FS report and to accept public comments (up to three weeks after this meeting). A community relations responsiveness summary is attached.

The above activities provided excellent opportunities in both formal and informal settings for communication between interested citizens and the agencies: EPA, Florida Department of Environmental Regulation, Dade County Department of Environmental Resources Management, and the Centers for Disease Control. Except for a few minor concerns, the public was generally supportive of the remedial action recommended for the study area. Some questions were raised on the potential for air pollution problems resulting from implementation of the recommended remedial action (air stripping). Others were concerned about the availability of EPA funds for implementation of the recommended remedial action, as they wished to avoid the use of water user charges to fund cleanup actions. These and other public comments are addressed in the attached responsiveness summary.

At this time, two other community relations activities are planned for the near future. An Executive Summary of the entire project will be published and distributed to citizens, educational institutions, the press, and concerned officials. The Summary will highlight the findings of the RI, detail the present and potential risks to the environment and public health, present recommendations for remedial actions, and list measures that can be taken by individuals and local governing bodies to prevent future hazardous waste contamination. In addition, a final issue of the newsletter, Remedies, will be published and distributed, to provide an update on the agency decisions for implementation and funding of the recommended remedial actions.

OPERATION AND MAINTENANCE

In addition to the $5,268,000 capital costs required for the recommended alternative, shown in Table 18 (see page 30), operation and maintenance (O&M) costs will be incurred for the life of the project. All O&M costs pertain to the operation of the air stripping treatment facilities. These include costs for labor (operator time), energy (power costs), materials and supplies, and equipment replacement (fans and pumps). Detailed O&M costs for each facility are presented in Table 21 (see page 39). Total estimated O&M costs are $334,400 per year (January 1984 dollars).

In addition to these O&M activities, monitoring of water at both the Hialeah and Preston Water Treatment Plants will be required. At present, water at these WTPs is monitored for all VOC priority pollutants twice a year--once by Miami-Dade WASA and once by Dade County DERM. This monitoring is sufficient and should be continued. The recommended air stripping treatment systems will be operated until monitoring of raw water quality confirms that all cleanup goals have been met. It will be the responsibility of the Florida DER to ensure that these goals are met.

Table 21
SUMMARY OF O&M COSTS

Item	Miami Springs Facility	Preston Facility
Labor		
Time Requirements (hr/wk)	20	28
Cost - Hourly ($/h)	20.00	20.00
- Yearly ($)	21,000	29,100
Energy		
Total Power Requirements (BHP)	207	287
Power Cost - Hourly ($/kW-hr)	0.07	0.07
- Yearly ($)	94,500	131,200
Materials and Supplies ($)	3,600	5,000
Equipment Replacement		
Fans		
Operating Life (yr)	5	5
Annual Cost ($/yr)	7,400	10,300
Pumps		
Operating Life (yr)	10	10
Annual Cost ($/yr)	13,600	18,900
Combine Equipment Replacement Cost ($/yr)	21,000	29,000
Total Annual O&M Costs ($/yr)	140,100	194,300

As will be set out in the cooperative agreement, EPA and the state/county will share capital costs for the proposed air stripping systems. In addition, EPA will reimburse a portion of the O&M costs during the first twelve months of the operation of the treatment facility. All water quality monitoring costs will be the responsibility of Dade County.

SCHEDULE

Based on the project goals of cleaning up the aquifer and providing uncontaminated drinking water to the public, the recommended implementation schedule is to design, construct, and start up the two air stripping treatment facilities concurrently. This method of implementation also provides a backup water source in case one of the well fields is not operational.

Key milestones and dates for project implementation are presented in Table 22 (see page 40).

Table 22
PROJECT IMPLEMENTATION SCHEDULE

Key Milestones	Date
Approve Remedial Action (sign ROD)	August 1985
Award Cooperative Agreement for Design	September 1985
Start Design	September 1985
Complete Design	January 1986
Start Construction	Mid 1986
Complete Construction	Late 1986

FUTURE ACTIONS

Remedial Action

Once the air stripping treatment systems are constructed and operating, remedial response at the site will be completed through continued treatment of the well field water, until it meets or exceeds the cleanup goals. When it does, the goal of providing safe drinking water to the public will have been met. A secondary benefit provided by the remedial action will be significant cleanup of the contaminated portion of the aquifer. Miami-Dade Water and Sewer Authority will be responsible for operating these facilities in a proper manner. The monitoring well system installed for this RI/FS and selected county monitoring wells can be used to measure the effectiveness of the remedy for aquifer cleanup. Certain contaminants will remain in the aquifer in the study area. Should these contaminants create a problem, they can be addressed in a future action.

An enforcement decision document (EDD) is planned for the Northwest 58th Street Landfill, and would include proper closure plans for the landfill which would also address the private wells in the immediate vicinity of the landfill. This EDD is scheduled for fall 1985.

Existing Institutional Controls

There are existing regulations in Dade County to control potable water quality and regulate wells in the study area

NWS 001 003203

(applicable to all of Dade County). Dade County Code 24-11 prohibits discharges affecting water quality to surface water and ground water, as well as sewers. This regulation is aimed at prohibiting water pollution in the area, and it establishes water quality standards for Dade County. Dade County Code 24-45 regulates construction and operation of wells in the study area (applicable to all of Dade County). Construction and/or operation of a new or existing well requires a permit from Dade County Department of Environmental Resources Management (DERM). Thus, through existing institutional controls, Dade County can control the installation of wells through the County.

Supplementary Institutional Controls

The RI/FS acknowledged that ground-water contamination in the study area is being caused not only by the three Superfund sites discussed in this ROD package, but also by small generators such as individuals and homeowners, through indiscriminate disposal of such items as automobile oils, paint cans, and pesticide bottles. Small industries and businesses also contribute, with operating practices leading to the runoff and eventual disposal of chemicals, solvents, cleaning fluids, and oils into the aquifer.

The feasibility study recommended a preventive action program for the entire Biscayne Aquifer area of Dade, Broward, and Palm Beach Counties. County-level responsibility for the program, which is called the Biscayne Aquifer Protection Plan, was suggested, to ensure adequate consideration of hazardous waste issues not fully addressed by the federal and state agencies. Proper implementation of these kinds of supplementary preventive actions through local agencies can eliminate most existing and potential sources of ground-water contamination in the Biscayne Aquifer area.

The 20 recommended actions of the plan are listed in Table 23 (see pages 42-44), along with the current status of Dade County's implementation program for the recommendations.

Table 23
THE BISCAYNE AQUIFER PROTECTION PLAN

Priority No.	Recommendation	Status of Implementation in Dade County
1	Local governments should consider providing a local hazardous waste storage and transfer facility for individuals and small generators.	Not Implemented; County has designated 5 acres for the locations of potential hazardous waste storage transfer sites, as required by Florida statutes
2	A well field protection program should be developed to regulate land use within the cones of influence of producing wells.	Implemented
3	Existing local inspection and enforcement programs should be examined for ways to strengthen their ability to provide surveillance over the multitude of small quantity producers of industrial and commercial wastes.	Being Implemented
4	The effectiveness of existing local programs to regulate the activities of small quantity industrial and commercial waste generators, including their waste disposal practices, should be increased or new programs developed.	Not Implemented; Planned
5	Public awareness and education programs on hazardous waste issues should be developed.	Partially Implemented
6	A program regulating the installation, maintenance, and replacement of storage tanks should be developed.	Being Implemented
7	A program for the handling and disposal of liquid and other hazardous waste materials by commercial haulers should be developed.	Implemented
8	Leak-proof sewers should be provided in all areas within well field protection zones and ultimately in all commercial and industrial areas.	Not Implemented

Table 23
THE BISCAYNE AQUIFER PROTECTION PLAN
(continued)

Priority No.	Recommendation	Status of Implementation in Dade County
9	A spill prevention, control, and countermeasure program should be developed.	Partially Implemented
10	Pretreatment of wastes from commercial and industrial users should be required before discharging wastewater to a sewer system.	Implemented
11	A program should be implemented to control exfiltration from existing sewers.	Not Implemented
12	Responsible parties should be held liable for contamination at the site and responsible for paying the cost of ground-water cleanup.	Partially Implemented
13	An emergency spill cleanup program should be developed.	Partially Implemented
14	The public should be encouraged to report improper disposal of hazardous wastes through continuation of existing programs or the development of new programs.	Partially Implemented
15	A program to control ground-water pollution from agricultural chemicals should be developed.	Not Implemented; Planned
16	A program to collect and recycle automobile drain oils should be developed.	Implemented
17	A tri-county coordinating committee on hazardous waste and related issues should be established.	Not Implemented
18	Regulatory review of tenants in industrial parks should be obtained to ensure that stormwater and wastewater systems are adequate for each tenant.	Partially Implemented

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Table 23
THE BISCAYNE AQUIFER PROTECTION PLAN
(continued)

Priority No.	Recommendation	Status of Implementation in Dade County
19	A "safe" contamination level of pollutants in local soils should be determined.	Not Implemented
20	New ground-water monitoring systems should be established or existing systems expanded to study areas close to producing wells for early signs of ground-water contamination.	Partially Implemented

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COMMUNITY RELATIONS RESPONSIVENESS SUMMARY BISCAYNE AQUIFER SITES FEASIBILITY STUDY

INTRODUCTION

EPA held a public meeting on February 7, 1985, at the Miami Springs City Hall to discuss the Feasibility Study (FS) report for the Biscayne Aquifer site and to accept public comment. The meeting, held from 7:30 to 11:00 p.m., was attended by 34 people.

James Orban, EPA's site manager for the project, chaired the meeting. He was assisted by Udai Singh and Ken Cable of CH2M HILL, EPA's technical consultant. They provided a brief description of the site history, the nature of the problem, and the findings of the Remedial Investigation (RI). This was followed by a more detailed presentation of the cleanup alternatives considered and the recommended actions.

Mr. Orban then requested questions and comments from the audience and stated that EPA would also accept written comments until February 28, 1985. He indicated that all comments would be considered in the decision-making process and that a written response to the comments would be included in the Record of Decision.

SUMMARY OF PUBLIC COMMENT AND AGENCY RESPONSE

Questions and comments offered at the meeting are summarized below. They are divided into three categories: general comments relating to the project as a whole, those pertaining to specific sites, and those concerning recommended cleanup activities for the area's ground water. No written comments were received during the public comment period.

GENERAL COMMENTS/QUESTIONS

1. Public Involvement: Speakers thought that public notice for the meeting was inadequate, that there had not been sufficient involvement of citizens during the study process, and that the plans had been prepared "behind closed doors".

   Response: Public notice for the meeting was provided by display advertisements in the Ft. Lauderdale News and the Miami Herald. A press release announcing the meeting was distributed to all local newspapers. The RI and FS reports were available for public review at the Palm Beach, Dade, and Broward County offices. EPA had previously implemented an extensive community relations program for the site.

A public meeting was held in September 1982 to present the results of the initial study and to outline the plans for Remedial Investigations. Three issues of Remedies, a newsletter summarizing project activities and reports, were mailed to over 400 individuals and organizations in October 1983, March 1984, and July 1984.

A public meeting to present the Remedial Investigation findings, outline the Feasibility Study activities, and solicit comments on possible cleanup alternatives to be evaluated was held in October 1983. Preliminary results of the detailed evaluation of the remedial action alternatives were explained in a public meeting in March 1984. Also presented for comments and suggestions at this meeting was the preliminary outline of the program for the protection of the Biscayne Aquifer.

EPA sponsored another public meeting in July 1984 to present and receive public comment on the recommended alternatives and the Biscayne Aquifer Protection Plan. Two workshops on study findings, risk assessments, and proposed cleanup and prevention activities were held for the press, elected and appointed officials, and the general public during July 1984. EPA believes these activities provided excellent opportunities in both formal and informal settings for two-way communication between interested citizens and the agencies: EPA, Florida Department of Environmental Regulation, Dade County Department of Environmental Resources Management, and the Centers for Disease Control.

2. Funding for Cleanup: Questions concerned the availability of EPA funds for implementation of cleanup activities, private sector responsibility for cleanup, and incentives to encourage private sector site cleanup. Commenters indicated that water user charges should not be used to fund cleanup actions.

   Response: EPA has identified the responsible parties, and will influence these parties to do what is necessary to clean up the site. EPA will also use available Superfund funds to implement the cleanup.

3. Local Agencies: Speakers expressed a lack of confidence in the ability of county agencies to deal with hazardous waste issues. They were critical of the County's hydrocarbon removal operation at the airport, the lack of technical training of Dade County

Department of Community Affairs staff, inaccuracies in the County's report on Munisport landfill, operation of the 58th Street landfill, and the lack of information about contamination on the west side of the airport.

Response: EPA pursued the Remedial Investigation and Feasibility Study for the Biscayne Aquifer and made recommendations for cleanup activities under the authority of the Superfund program. Expenditure of program funds is limited to cleanup of existing uncontrolled hazardous waste sites and cannot be extended to cover costs of developing and implementing plans designed to prevent the occurrence of future hazardous waste disposal problems. These are responsibilities of local agencies.

4. Federal Agencies: Respondents indicated that the process for study and cleanup of sites takes too long, and that EPA should have proposed an Environmental Impact Statement (EIS) on the use of wetlands near the Northwest Well Field for industrial development.

   Response: EPA recognizes that the length of the Remedial Investigation and Feasibility Study process causes frustration among local residents who are concerned about the effects of the sites on their health and property values. Yet, if the problems are to be effectively solved it is essential that they be thoroughly understood before long term cleanup actions are recommended. At Biscayne Aquifer, this required extensive testing at a number of different sites and evaluation of 12 source control and 10 off-site remedial action alternatives. These activities were accomplished as expediently as possible.

   Responsibility for implementation of an EIS rests within a different division of EPA. Officials will refer the request to the appropriate section within EPA for further consideration. Wetlands were given proper consideration during the remedial investigation and feasibility study. The result showed that no wetland areas would be impacted by the remedial action. This RI/FS process and the public involvement is equivalent to an EIS.

SITE SPECIFIC COMMENTS/QUESTIONS

1. Varsol Spill Site: Commenters thought the presence of hydrocarbons at the airport site should have been a target for Superfund action.

   Response: As the speaker indicated, hydrocarbons are not included in the list of hazardous substances regulated by the Superfund program. The project studies did assist the State and local officials in identifying and addressing the problem. However, formal Superfund action is not appropriate.

Over 1.5 million gallons of Varsol were believed to have been spilled at the site in 1968. EPA conducted an extensive sampling program at the site, but was unable to confirm the presence of a plume of toxic substances. It is possible that the solvent was biodegraded or dispersed through the aquifer.

2. Miami Drum Site and 58th Street Landfill:

a. Speakers suggested that EPA in its RI did not identify a contaminant plume at the 58th Street landfill because it did not have much concern about contaminant migration since the adjacent Miami Springs Well Field is only used as a back-up water supply source.

Response: The presence of a contaminant plume in ground water downgradient of the 58th Street landfill was documented in the late 1970s by the U.S. Geological Survey and various studies by consultants; however, that was a non-toxic, non-organic substance survey. Between November 1982 and March 1983, EPA conducted a more comprehensive survey: a series of six sampling programs which tested for all 129 priority pollutants, including organic as well as inorganic toxic substances.

b. Speakers thought EPA's focus on municipal drinking water and ground water was too narrow and did not permit sufficient consideration of problems that require attention at these sites. They were concerned about cleanup and closure of the 58th Street landfill and felt these activities should be included as recommended remedial actions.

Response: EPA considered a wide range of alternatives for remedial action at the sites, related both to specific sources of contamination as well as to the off-site, area-wide nature of the problem. EPA did include in the FS an analysis of remedial alternatives for the 58th Street landfill, including proper closure. The closure plan will also address the private wells in the immediate area of the landfill.

RECOMMENDED ACTION COMMENTS/QUESTIONS

1. Recommendation Development: One speaker questioned the process of developing recommendations for cleanup actions and indicated he did not feel the recommendations covered all problems identified by project studies. He suggested consideration of a variation of Alternative 3 that would keep Preston and Miami Springs Well Fields open for emergency backup and would implement plans to minimize future contamination in the Miami Springs area.

   Response: EPA performed a detailed evaluation of Alternative 3 and found that it was not cost-effective (the total present worth cost for Alternative 3 was over $23 million as compared to the cost of the recommended alternative ($8.5 million). Alternative 3 also would not provide the additional benefit provided by Alternative 2: significant cleanup of the contaminated portion of the aquifer, which will be accomplished by pumping from the Miami Springs and Preston Well Fields.

2. Biscayne Aquifer Protection Plan: Speakers identified the need for federal protection of wetlands in the Northwest well field area. They suggested preparation of an EIS or use of EPA's veto power over Corps of Engineers' 404C permits to control land development near the new Northwest Well Field.

   Response: The suggested actions are not within the domain of the Superfund branch at EPA. Officials will refer this recommendation for consideration to the proper division within EPA.

[redacted] on water quality.

   Response: EPA completed a detailed estimate of air pollution resulting from air stripping towers and found that air stripping meets all state air emission requirements and is far below allowable air emission limits. It will not have adverse impacts upon the environment or human health. The benefit of air stripping is that it will be removing 97 percent to over 99 percent of the volatile organic compounds from the water withdrawn from the Miami Springs and Preston Well Fields, thus considerably improving the quality of potable water in the study area.

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4. Effect on Land Values: One speaker (from the flooded area) was concerned about the effect of the cleanup activities on land values in her Miami Springs neighborhood. She wanted to know the effect of the recommended alternative on her property value.

Response: The Miami Springs and Preston Well Fields had been pumping for 20 to 30 years, artificially lowering the water table in the area. When pumping began at the new Northwest Well Field and the Miami Springs and Preston Well Fields were shut down, the water table in the area rose, causing flooding of residential properties.

EPA's recommendation is to begin pumping the Miami Springs and Preston Well Fields, and to treat the water by air stripping so as to provide clean water to the public. Although this study was not meant to address the flooding problem at the sites, the effect of the recommended actions is to return the water table to its former position, thus resolving the flooding problem.

Biscayne Aquifer Protection Plan

The Plan's 20 recommendations, presented on p. 17 of the Plan, are listed below.

The Biscayne Aquifer Protection Plan

Immediate Implementation Recommended

1. Provide local waste storage/transfer facilities for small waste generators, individuals
2. Regulate land use within well field protection zones
3. Monitor small quantity waste generators
4. Improve regulation of small quantity waste generators
5. Develop public awareness/education program
6. Regulate storage tanks
7. Control handling/disposal by commercial waste haulers

Short-term Implementation Recommended

8. Construct leak-proof sewers in well field protection zones
9. Develop a spill prevention, control, and countermeasure program
10. Pretreat commercial/industrial waste
11. Control leakage from existing sewers
12. Hold responsible parties liable for cleanup costs
13. Adopt emergency spill cleanup program
14. Encourage public reporting of improper waste disposal

Future Implementation Recommended

15. Control groundwater pollution from agriculture
16. Collect/recycle automobile drain oils
17. Establish tri-county coordinating committee
18. Review stormwater/wastewater systems
19. Determine "safe" soil contamination levels
20. Monitor groundwater near wells

October 2002 DERM Memo

MIAMI-DADE COUNTY, FLORIDA

MIAMI-DADE

DERM

ENVIRONMENTAL RESOURCES MANAGEMENT
POLLUTION CONTROL DIVISION
33 S.W. 2nd AVENUE
SUITE 800
MIAMI, FLORIDA 33130-1540
(305) 372-6817

October 28, 2002

Jim Mcguire, Section Chief
WMD-SSMB
United States Environmental Protection Agency
Region IV
61 Forsyth Street SW
Atlanta, GA 30303

RE: 5 Year Review dated September 2002 and submitted by the US Army Corps of Engineers for the Miami Drums Superfund site (HWR-43/File –14722/ EPA ID FLD076027820) located at, near, or in the vicinity of 7049 NW 70 Street, Miami, Miami-Dade County, Florida.

Dear Mr. Mcguire:

The Pollution Remediation Section of the Department of Environmental Resources Management (DERM) has reviewed the referenced submittal, received September 19, 2002. DERM hereby offers the following comments and responses to specific items requested to be addressed by DERM:

1. The Florida East Coast Railway Hialeah Yard site is a petroleum contaminated site currently in a state administered cleanup program. Active remedial action is currently progressing.

2. The results of the soil assessment conducted in 1981 and the soil removal actions that subsequently took place were evaluated to determine if current soil cleanup requirements have been achieved at the site. The soil results and soil removal actions were compared to cleanup target levels contained within Chapter 24, Code of Miami-Dade County, which, upon completion under the CERCLA process, will apply. Provided the upper 2' of clean fill material or an impermeable surface cap such as asphalt or concrete is maintained across the site, the soil removal action previously conducted is sufficient to comply with the cleanup requirements applicable to this site. However, upon site closure, a No Further Action with Conditions will apply which will require a restrictive covenant to ensure that the surface seal (fill, concrete or asphalt) is maintained.

3. The ROD for this site determined that the groundwater contamination identified is part of a regional impact that is currently being addressed through treatment directly at the municipal water supply plant. Upon site closure under CERCLA, DERM would require that representative groundwater samples be obtained from the site to determine the current conditions at that time. If groundwater impacts are present above sub-regional groundwater contaminant concentrations, DERM may require additional assessment at the site and, unless remediated to sub-regional

Mr. Mcguire
HWR-43 File-14722
October 28, 2002
Page 2

contaminant concentrations, a No Further Action with Conditions requiring a restrictive covenant prohibiting on-site water usage.

If you have any questions regarding this letter please contact Thomas Kux of the Pollution Remediation Section at (305) 372-6700.

Sincerely,

Wilbur Mayorga, P.E., Chief
Pollution Remediation Section

TK
pc: Richard Bonner, US Army Corps, PO Box 4970, Jacksonville, FL 32232-0019
Bill Niemes, US Army Corps
Jesus Diaz, FDEP (TAL)

January 2004 DERM Memo

MIAMI-DADE COUNTY, FLORIDA

MIAMI-DADE

DERM

ENVIRONMENTAL RESOURCES MANAGEMENT
POLLUTION CONTROL DIVISION
33 S.W. 2nd AVENUE
SUITE 900
MIAMI, FLORIDA 33130-1540
(305) 372-6917

January 22, 2004

Jamey Watt, Remedial Project Manager
WMD-SSMB
United States Environmental Protection Agency
Region IV
61 Forsyth Street SW
Atlanta, GA 30303

RE: Final 5 Year Review dated September 2002 and submitted by the US Army Corps of Engineers for the Miami Drums Superfund site (HWR-43/File -14722/ EPA ID FLD076027820) located at, near, or in the vicinity of 7049 NW 70 Street, Miami, Miami-Dade County, Florida.

Dear Mr. Watt:

The Pollution Remediation Section of the Department of Environmental Resources Management (DERM) has reviewed the referenced submittal, received December 26, 2003. DERM provided comments on the Draft report in the attached letter dated October 28, 2002. The only additional comment provided pertains to the action item contained in the report regarding Miami-Dade County updating the local repository with additional information. As discussed with you and Thomas Kux, P.G., of DERM, on January 22, 2004, DERM does not have additional items to update the local repository.

If you have any questions regarding this letter please contact Thomas Kux, P.G., of the Pollution Remediation Section at (305) 372-6700.

Sincerely,

Wilbur Mayorga, P.E., Chief
Pollution Remediation Section

TK
attach
pc: Jesus Diaz, FDEP (TAL)