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Office of
Emergency and
Remedial Response

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September 1985

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Superfund Record of Decision:

Biscayne, Aquifer Sites, FL

TECHNICAL REPORT DATA
(Please read Instructions on the reverse before completing)

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16. ABSTRACT

The Biscayne Aquifer is the sole underground source of drinking water for 3 million residents of southeast Florida. It is a highly permeable, wedge-shaped, unconfined shallow aquifer composed of limestone and sandstone.

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. These sites are located near each other in north Dade County, Florida. The remedial actions for the three hazardous waste sites are being addressed in four phases:

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. 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--ROD signed 9/16/85.

The selected remedial action for Phase IV includes adding air stripping to the existing water treatment system in the study area and operating the Miami Springs and Preston municipal wells for the dual purpose of providing potable water and recovering contaminated water from the aquifer. Total capital cost for the selected remedial alternative is estimated to be $5,268,000 with O&M costs approximately $334,400 per year.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Record of Decision Biscayne Aquifer Sites, FL Contaminated Media: gw Key contaminants: Vinyl chloride, VOCs, trans-1, 2-dichloroethene		

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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 Aquife 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 system - is a cost-effective remedy and provides adequate protectio 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

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

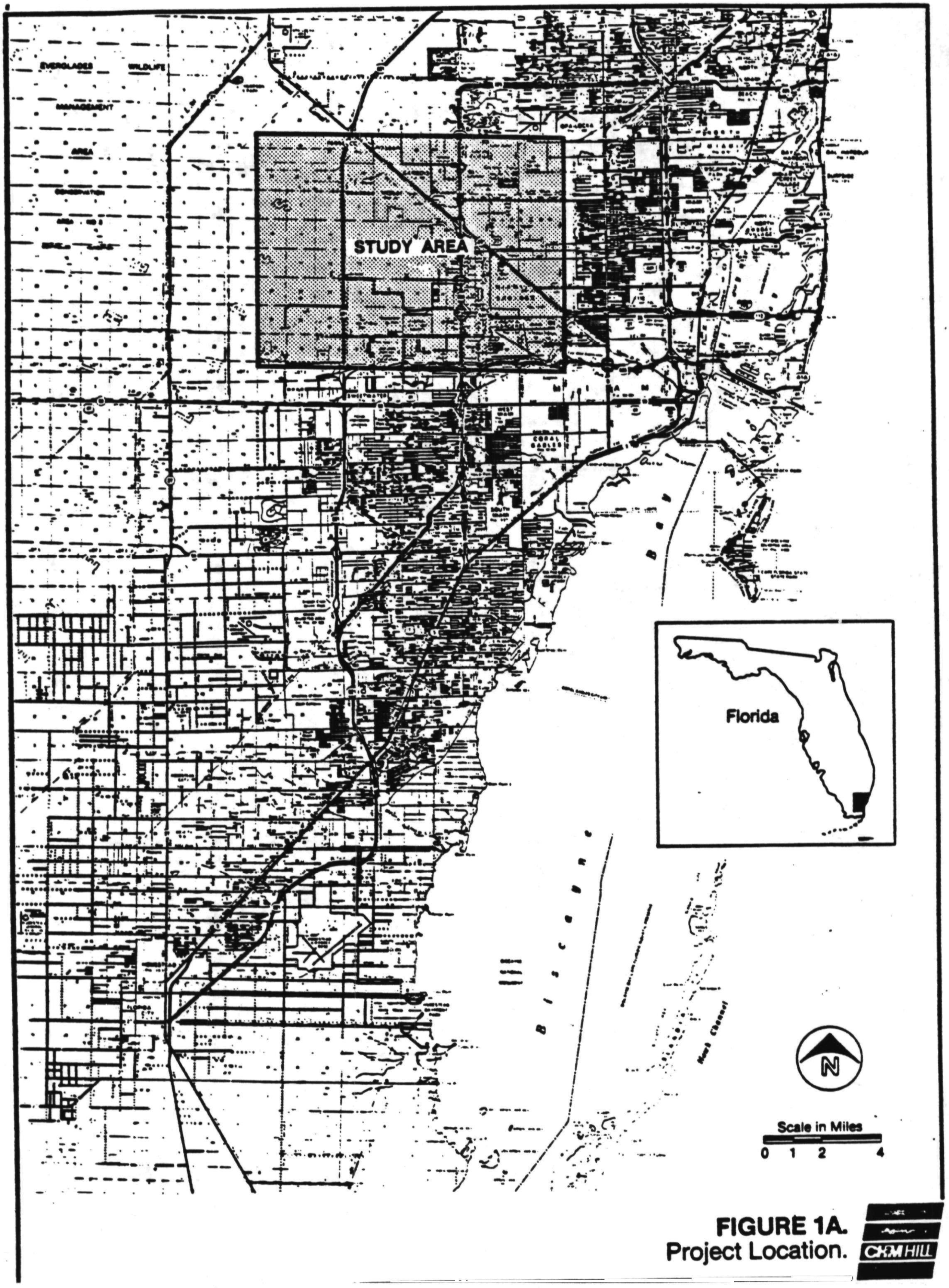


FIGURE 1A.
Project Location.

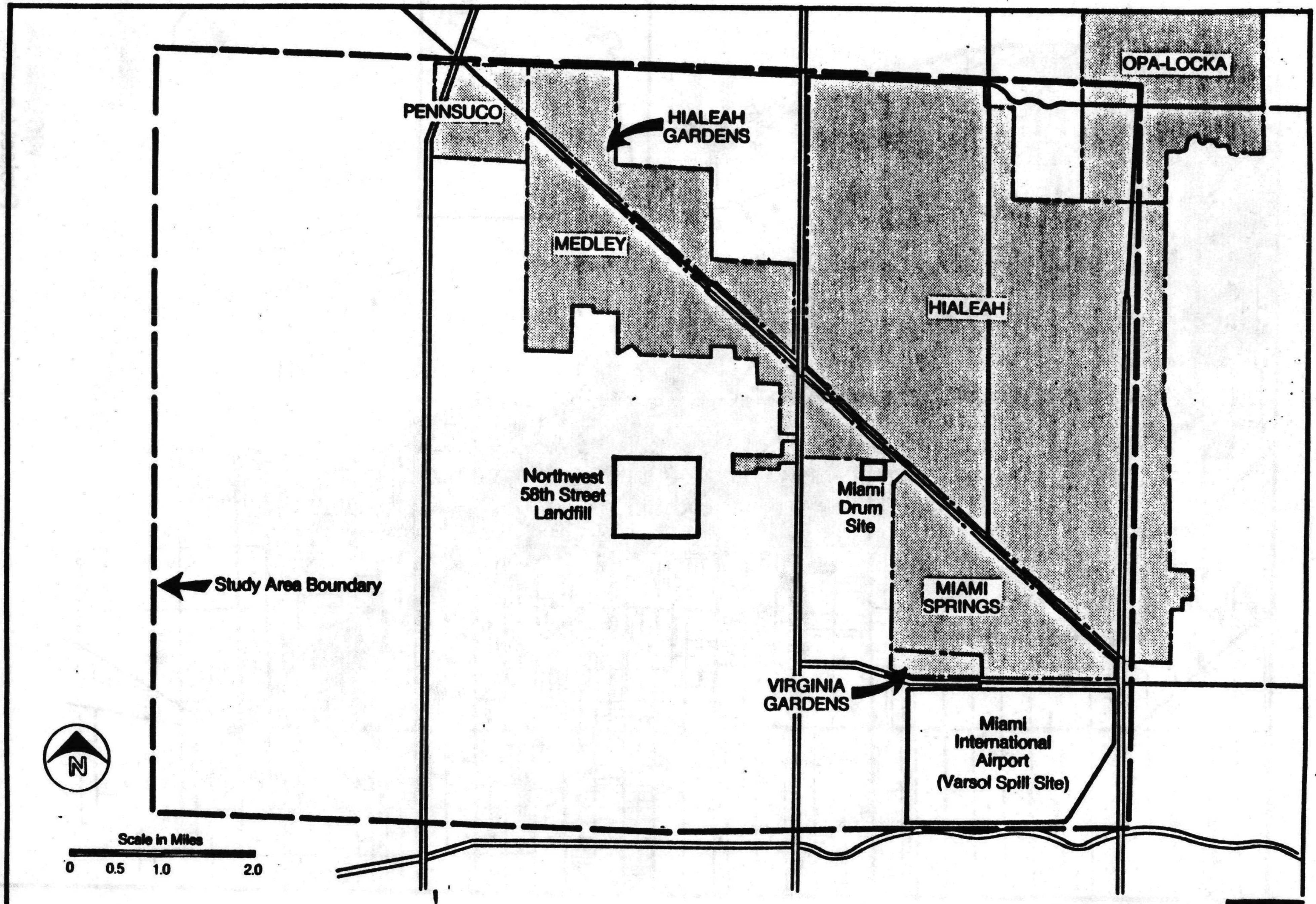


FIGURE 1B
Study Ar

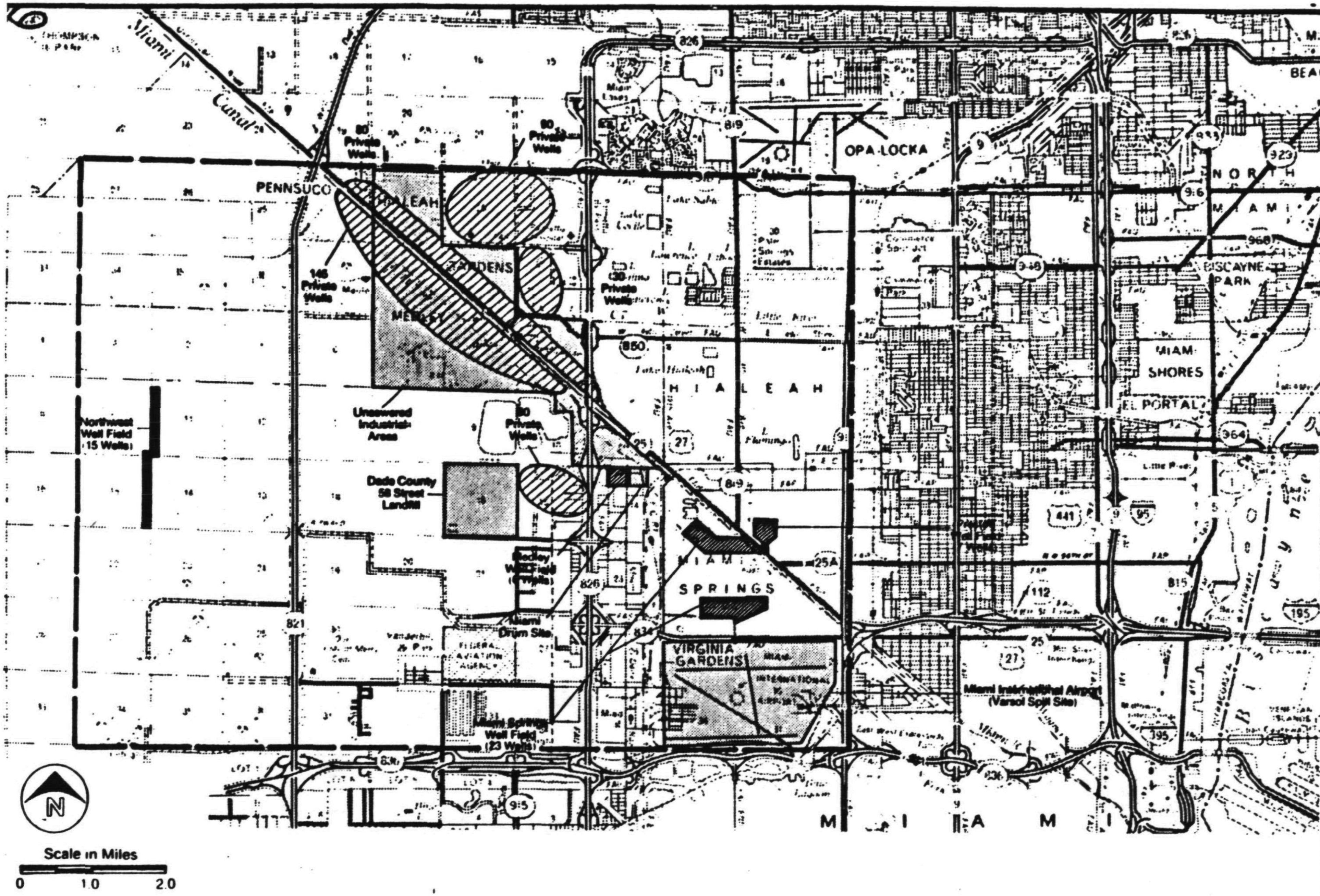


FIGURE 2.
Location of Potential Contamination Sites, Public Well Fields, and Private Wells in the Study Area.

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.

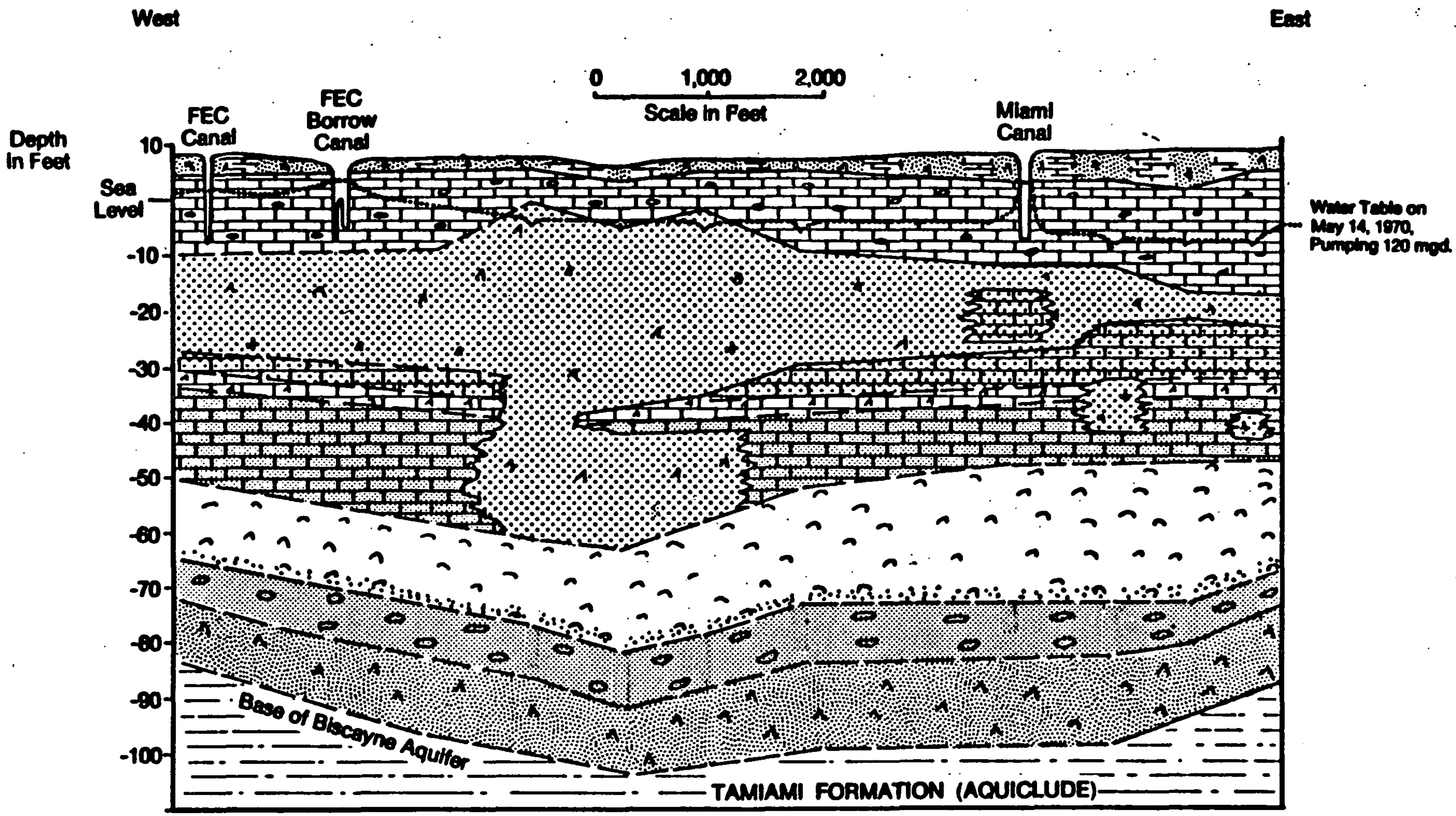
Almost all of the study area is within the 100-year flood plain. Wetlands form the border of the western edge of the area, but are not affected by it. The average annual rainfall over the study area is approximately 60 inches, of which as much as 80 percent falls during the rainy season (June to September). 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.



LEGEND

- Sand, Quartz and Limestone Fragments
- Limestone, Mostly Oolitic
- Sand, Quartz, Fine-grained
- Limestone, White-gray, Sandy
- Limestone, Hard, Brown Shelly
- Marl, Green, Shelly
- Limestone—Sandstone, Tan, Shelly, and Thin Beds of Sand
- Sandstone, White-gray, Shelly, and Thin Beds of Sand Near Bottom
- Sandstone, Gray-green, Shelly, and Sandy Concretions
- Sand, Quartz, Fine to Course Grained, and Sandy Concretions

Source: Meyer, 1972.

FIGURE 3.
Section of the Biscayne Aquifer in the Miami Springs—Preston Well Field Area.

CH2M HILL

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.

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.

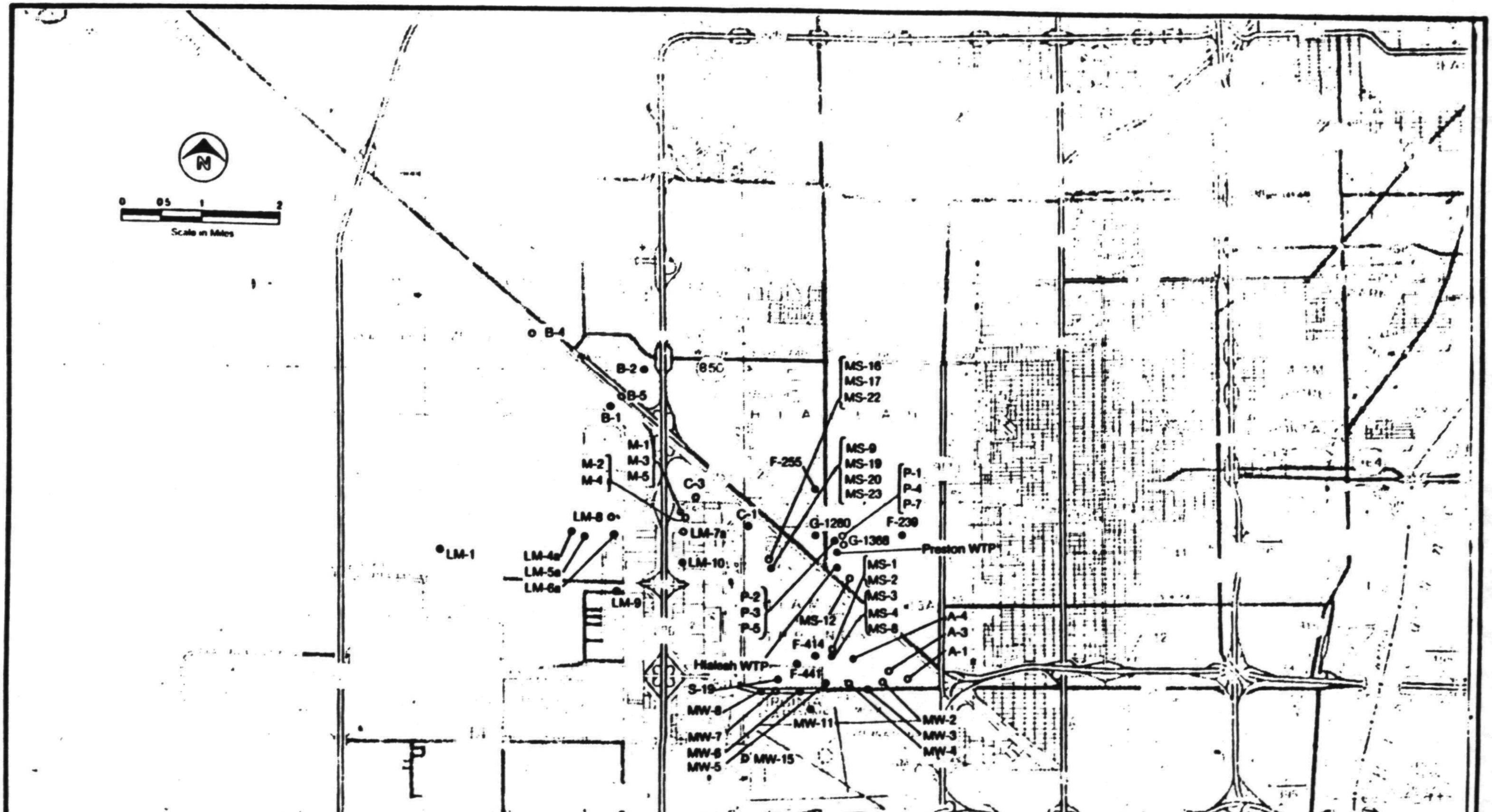
CURRENT SITE STATUS

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.



LEGEND

△ Detected in at least one sample, no criteria given.

o Detected in at least one sample, but at levels less than established criteria

…ted in at least one sample, at levels above criteria.

N… …d in Table 4-2 are for data classification purposes only, and are not intended to be …rd unless the criteria is a published standard

E 4. Wells Showing Positive Results for Volatile Organics (P… …ntial.

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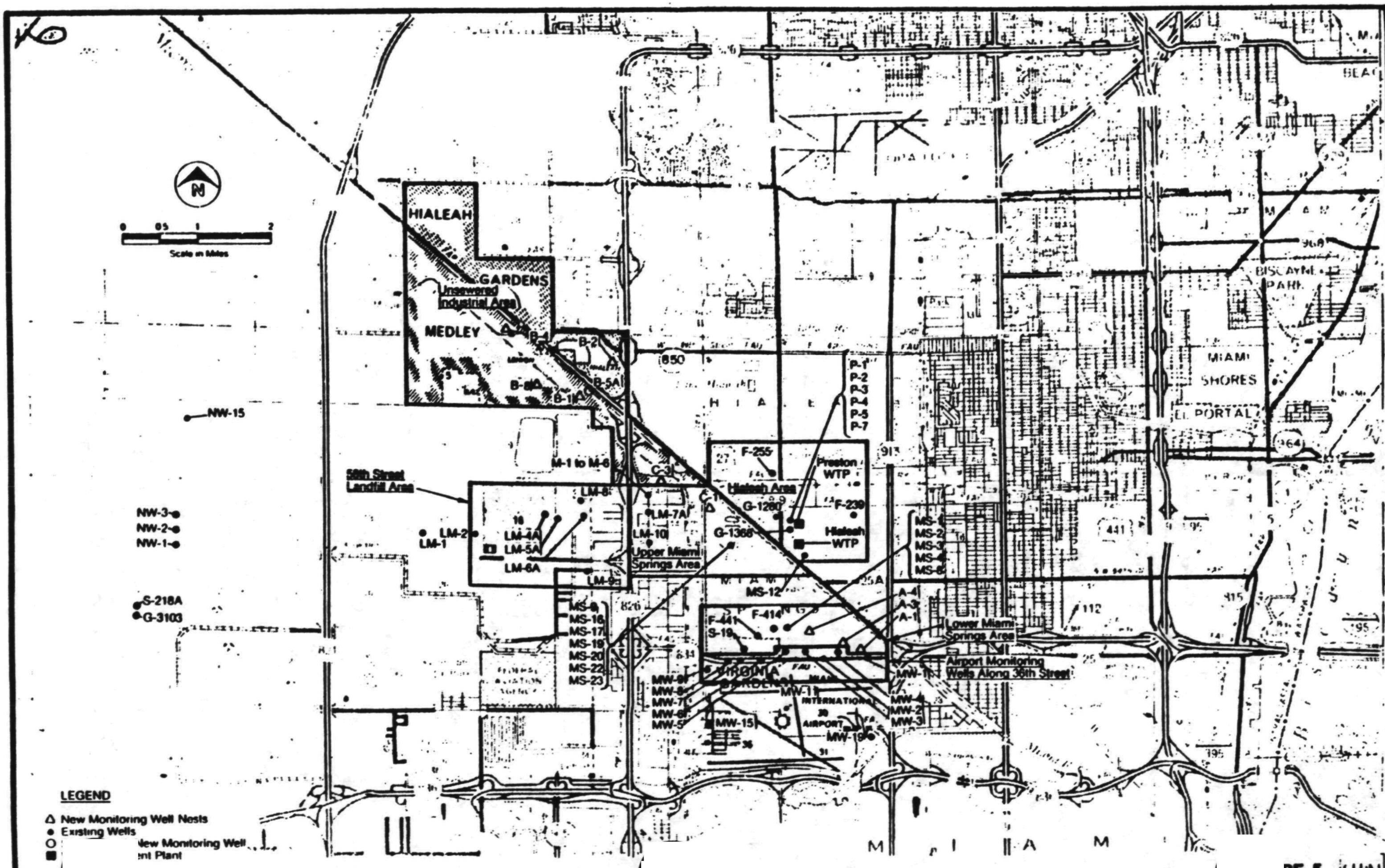
The effects of contaminated ground water on surface-water quality were found to be similar to those identified in an earlier county sampling program. In 1981, as part of routine surface-water monitoring, Dade County conducted analyses of water from the Miami Canal for a wide array of physical and chemical 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



RE 5.
Well Sampling Locations and Geographical Areas for Da ation.

-4-

		PARAMETER	WELL DESIGNATION																	
			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			O								O							
		CADMIUM													O				O	O
		CHROMIUM	O		O	O					O	O	O	O	O					O
		LEAD	O				O				O	O		O				O	O	O
		MERCURY				O		O												O
		SELENIUM		O										O						
		ZINC	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
	VOLATILE OGRANICS	CHLOROBENZENE				O						O		O						O
		CHLOROETHANE				Δ				Δ		Δ								
		1,1-DICHLOROETHANE								●			●	●						
		TRANS-1,2-DICHLOROETHENE							O	O				O						O
		1,1,2,2-TETRACHLOROETHANE										●					●			
		TOLUENE							O			O					O			
		1,1,1-TRICHLOROETHANE											●	●		O				●
		TRICHLOROETHENE				O	O			O										
		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												O				O			
	UNIDENTIFIED COMPOUNDS (EXTRACTABLE)							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

TABLE 1.
Contaminants Detected in the Airport

CH2M HILL

		PARAMETER	S-19	F-441	F-414	MS-1	MS-2	MS-3	MS-4	MS-8	A-4a	A-4b	A-4c	A-4d	A-3a	A-3b	A-3c	A-3d	A-1a	A-1b	A-1c	A-1d
			WELL DESIGNATION																			
PRIORITY POLLUTANTS	INORGANICS	ARSENIC		○																		
		CADMIUM			○	○					○											
		CHROMIUM	○		○	○	○		○													
		COPPER		○			○															
		LEAD	○	○	○																	
		MERCURY					○	○			○											
		SELENIUM		○	○						○	○	○									
		ZINC	○	○	○	○	○	○	○	○	○	○	○		○	○	○		○	○	○	
	VOLATILE OGRANICS	BENZENE			●							●										
		CHLOROBENZENE			○		○	○		○	○					○	○				○	
		CHLOROETHANE														△	△					
		CHLOROMETHANE											△									
		1,1-DICHLOROETHANE										●									●	
		TRANS-1,2-DICHLOROETHENE			○		○	○		○	○											
		ETHYL BENZENE			○						○											
		METHYLENE CHLORIDE	●	●	●																	
		1,1,2,2-TETRACHLOROETHANE							●													
		TETRACHLOROETHENE																	○		○	
		TOLUENE		○	○						○	○	○									
		VINYL CHLORIDE			●	●	●	●		●	●	●	●			●	●					
	TOTAL RECOVERABLE PHENOLS					△																
OIL & GREASE														○				○				
OTHER ORGANIC COMPOUNDS		ACETONE		△	△																	
		C8 ALKYLPHENOL						△														
		DIMETHYLHEPTANE			△																	
		METHYL BUTYL KETONE									△											
		METHYL SULFIDE	△																			
		STYRENE									○											
		M-XYLENE			○																	
		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 2.
Contaminants Detected in the Lower Miami Springs Area.

CH2M HILL

Category	Group	Parameter	NW-1	NW-2	NW-3	NW-15	S-218a	G-3103*
PRIORITY POLLUTANTS	INORGANICS	LEAD				○		
		MERCURY					○	
		SELENIUM	○					
		ZINC	○	○	○		○	
	VOLATILE ORGANICS							
	BASE/NEUTRAL & ACID EXTRACTABLE ORGANICS							
	PESTICIDES PCB's							
	TOTAL RECOVERABLE PHENOLS							
OTHER ORGANIC COMPOUNDS		HEXADECANE				△		
		PENTAOXAPENTADECANE				△		
		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

*Sampling results not included because of surface trash at the wellhead area.

TABLE 6.
Contaminants Detected in the Undeveloped Area.

CH2M HILL

		PARAMETER	C-1a	C-1b	C-1c	LM-7a Depth in ft			LM-10 Depth in ft			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
						15	30	60	10	30	60													
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

		PARAMETER	G1368	F255	G1280	F239	P1	P2	P3	P4	P5	P7	MS12
			WELL DESIGNATION										
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)				△								

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

		PARAMETER	WELL DESIGNATION																	
			LM-2			LM-4a			LM-5a			LM-6a			LM-8			LM-9		
			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	2[illegible]	[illegible]
PRIORITY POLLUTANTS	INORGANICS	ARSENIC											○	○				○		
		CHROMIUM	○	○		○	○	○	○	○	○	○	○	○	○	○	○	○		
		COPPER												●						
		LEAD		○		○													○	○
		MERCURY				○		○		○							○			○
		SELENIUM			○					○		○				○				
		ZINC	○	○	○	○		○	○	○	○	○	○	○		○	○	○	○	○
	VOLATILE OGRANICS	BENZENE							●											
		CHLOROBENZENE				○	○	○	○	○	○	○	○	○	○	○	○	○	○	
		CHLOROETHANE																△		
		1,1-DICHLOROETHANE																●	●	
		TRANS-1,2-DICHLOROETHENE																○	○	
		ETHYL BENZENE							○		○									
		1,1,2,2-TETRACHLOROETHANE				●	●		●		●			●						
		TRICHLOROETHENE							○									○	○	
		TOLUENE				○	○				○			○		○	○	○		
		VINYL CHLORIDE																	●	
	BASE/NEUTRAL & ACID EXTRACTABLE ORGANICS	BENZYL BUTYL PHTHALATE					△													
		CHRYSENE					●													
		2,4-DIMETHYLPHENOL									○									
		2,4-DINITROPHENOL									○									
		4-NITROPHENOL					●				○									
		PENTACHLOROPHENOL					●													
		PHENOL									○									
	PESTICIDES & PCB's	4,4'-DDT																●		
		ENDOSULFAN SULFATE																△		
		PCB's (total)				●														
	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

		PARAMETER	B-1a	B-1b	B-1c	B-2a	B-2b	B-2c	B-4a	B-4b	B-4c	B-5a	B-8a	B-8b	B-8c	C-3a	C-3b	C-3c
			WELL DESIGNATION															
PRIORITY POLLUTANTS	INORGANICS	ARSENIC						●										
		CADMIUM		○														
		CHROMIUM		○	○		○					○	○	○	○	○		
		LEAD									○							
		MERCURY					○								○			○
		SELENIUM														○		
		ZINC	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	VOLATILE ORGANICS	ACRYLONITRILE					●											
		1,1,2,2-TETRACHLOROETHANE			●		●											
		TRICHLOROETHENE														○		
		TOLUENE			○			○		○		○					○	
	PESTICIDES & PCB's	PCB-1260								●								
	BASE/NEUTRAL & ACID EXTRACTABLE ORGANICS	BIS (2-ETHYLHEXYL) PHTHALATE	○															
	TOTAL RECOVERABLE PHENOLS			△			△	△	△					△				
OTHER ORGANIC COMPOUNDS	ACETONE						△			△								
	BUTANEDIOL			△														
	1,4-DIOXANE														○			
	HEXADECANOIC ACID			△														
	METHYL BUTYL KETONE						△	△		△						△		
	METHYL ETHYL KETONE						△											
	METHYL ISOBUTYL KETONE						△											
	STYRENE							○										
	TETRAHYDRODIOXIDETHIOPHENE														△			
	TETRAHYDROFURAN													○				
	TETRAHYDROTHIOPHENE												△	△	△			
	TETRAHYDROTHIOPHENE DIOXIDE														△			
	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 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		Maximum Concentration Detected (µg/L)		
		Concentration (µg/L)	Reference (See Table 12)	Entire Study Area	Well Fields	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

gnR1

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	0.00008	b	0.83	ND	ND
PCB-1260	0.1 } total)			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

gnR109a/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
Other Volatile Organic Compounds (Not Priority Pollutants)						
Styrene	5	1,330	h	6.3	4*	ND
Chlorotoluene	--	3,450	f	80	80	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

gnR109a

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.

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

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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.

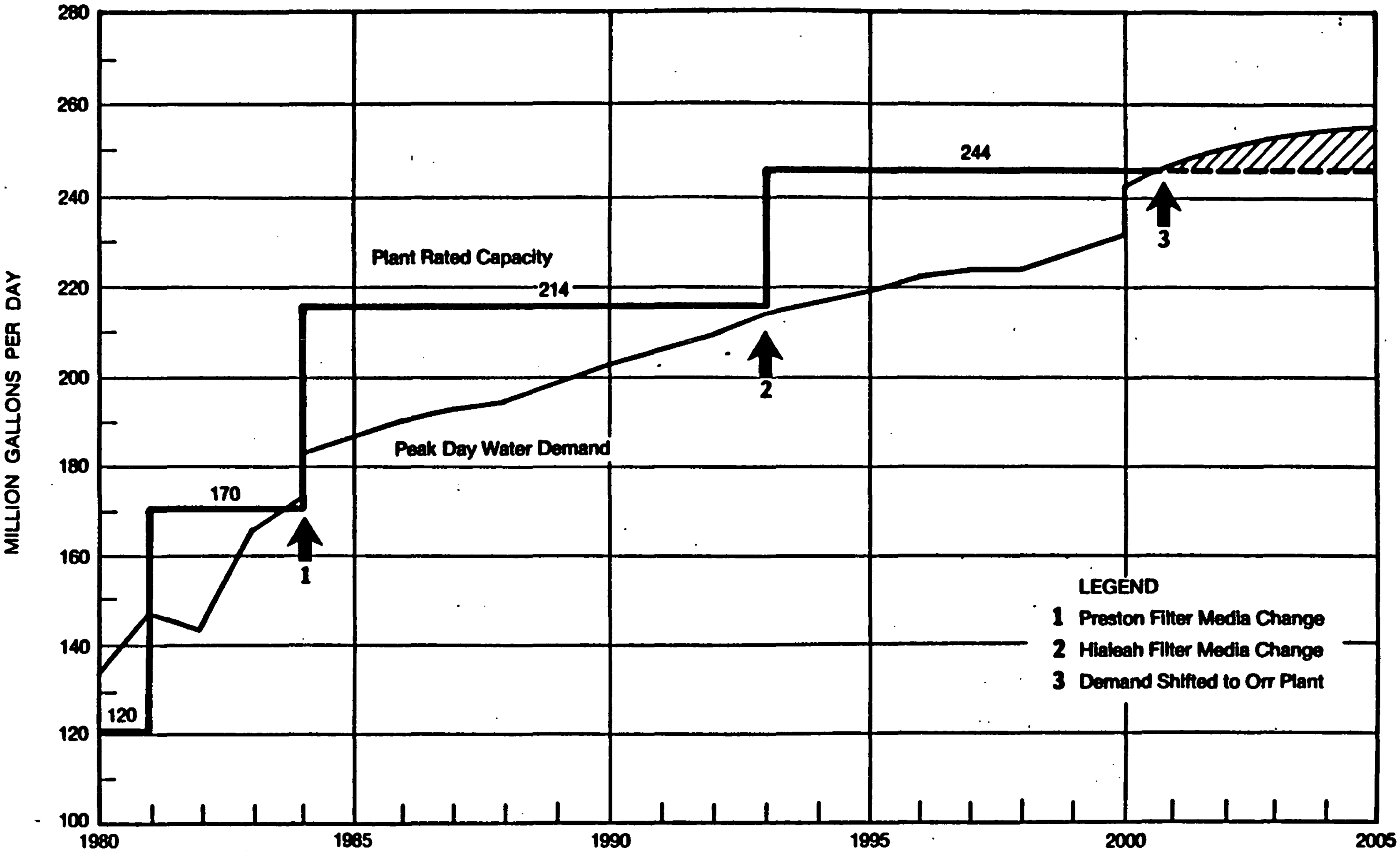
of the Northwest Well Field is only 150 mgd, conditions in the near future will demand additional water withdrawal, either from the existing well fields or from new well fields.

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.

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

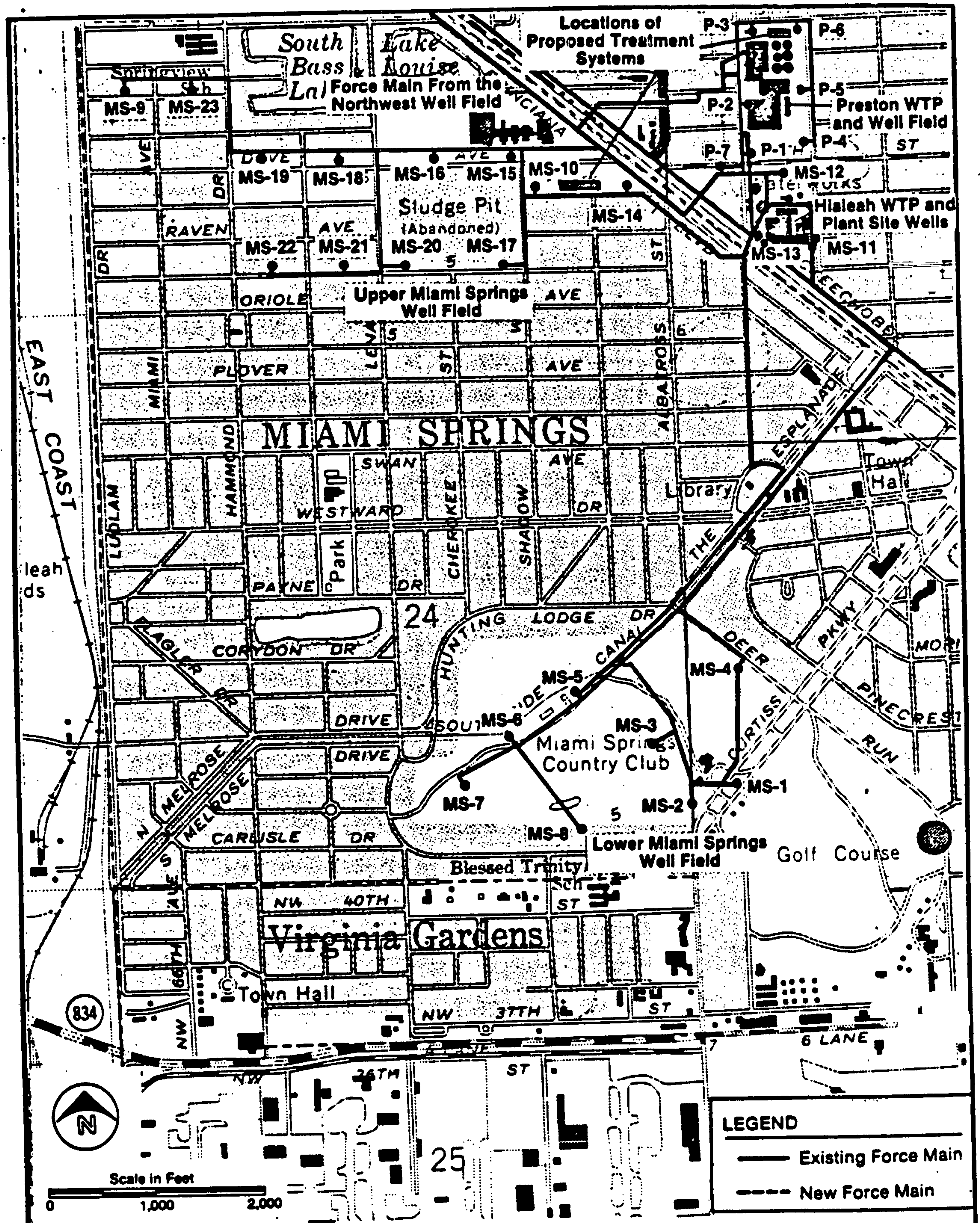

FIGURE 7. Location of the Proposed Treatment Systems.

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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.

<u>Alternative 3</u>: 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. 2)

WTP	Compound	Maximum RI Value (ppb)	Maximum RI Value After Pretreatment (ppb)	Excess Lifetime Cancer Risk (a)		EPA Drinking Water Health Advisory (μg/L) (b)			EPA Interim Drinking Water Std. (μg/L) (c)	Florida Drinking Water Std. (μg/L) (d)	Data Classification Criteria/ Cleanup Goals (μg/L)
				10^{-6}	10^{-5}	1-day	10-day	Chronic			
Hialeah	Vinyl Chloride	21.21	0.03	2.0	20	--	--	--	0[e]	1.0	1.0
	1,1-Dichloroethene	5.12	0.02	0.034	0.34	1,000	00	70	0[e]	--	0.04
	1,1-Dichloroethane	11.43	0.1	0.94	9.4	--	--	--	--	--	0.9
	Trans-1,2-Dichloroethene	22.9	0.18	--	--	2,700	270	--	--	--	270
	Chlorobenzene	4.5	0.009	--	--	00	00	500[e,f]	--	--	488
	Toluene	1.4	0.015	--	--	21,500	2,200	340	--	--	340
	Methyl Butyl Ketone	20.0	6.2	--	--	--	--	--	--	--	--
	Ethyl Ether	4.46	0.19	--	--	--	--	--	--	--	--
	Chloroethane	0.80	0.002	--	--	--	--	--	--	--	--
	1,1,2,2-Tetrachloroethane	0.64	0.24	0.17	1.7	--	--	--	--	--	0.2
	1,1,1-Trichloroethane	0.80	0.01			--	--	1,000	200	200	22
Preston	Vinyl Chloride	19.2	0.025	2.0	20	--	--	--	0[e]	1.0	1.0
	Trans-1,2-Dichloroethene	30.8	0.24	--	--	--	2,700	270	--	--	270
	Methylene Chloride	1.7	0.02	0.19	1.9	13,000	1,500	250[e,f]	--	--	0.2
	Chlorobenzene	1.83	0.004	--	--	--	--	500	--	--	488
	O&P Xylene	0.38	0.006	--	--	--	--	--	--	--	620
	Styrene	1.20	0.03	--	--	--	--	--	--	--	1,330
	Total Recoverable Phenols	3.6	3.6	--	--	--	--	3,500[e,g]	--	--	--

SOURCES:

(a) EPA Ambient Water Quality Criteria Documents, 1980. Values have been adjusted to levels for water only.
(b) Memorandum from William N. Hedeman, to Lee Thomas, U.S. EPA, May 2, 1983. 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, October 5, 1983 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 μg/L.
(g) Health based criterion. Taste threshold is 300 μg/L.

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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

Alternative 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.
2. Contaminant Recovery and Air Stripping at Miami Springs and Preston Well Fields	5,260	334.4/yr	Predicted VOC concentrations in water after air stripping are below Florida drinking water standards and 10^{-6} 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 19). 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 0.2 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 WASA 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.
3. Expansion of Northwest Well Field and abandonment of contaminated well fields	10,651.6	1,290.3/yr	This alternative would allow Hialeah and Preston WTPs to provide uncontaminated drinking water to the public. However, the existing groundwater 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 Unsewered 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 peat bogs 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	14,625.1*	9,991.9/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. 2). 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. WASA 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.

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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

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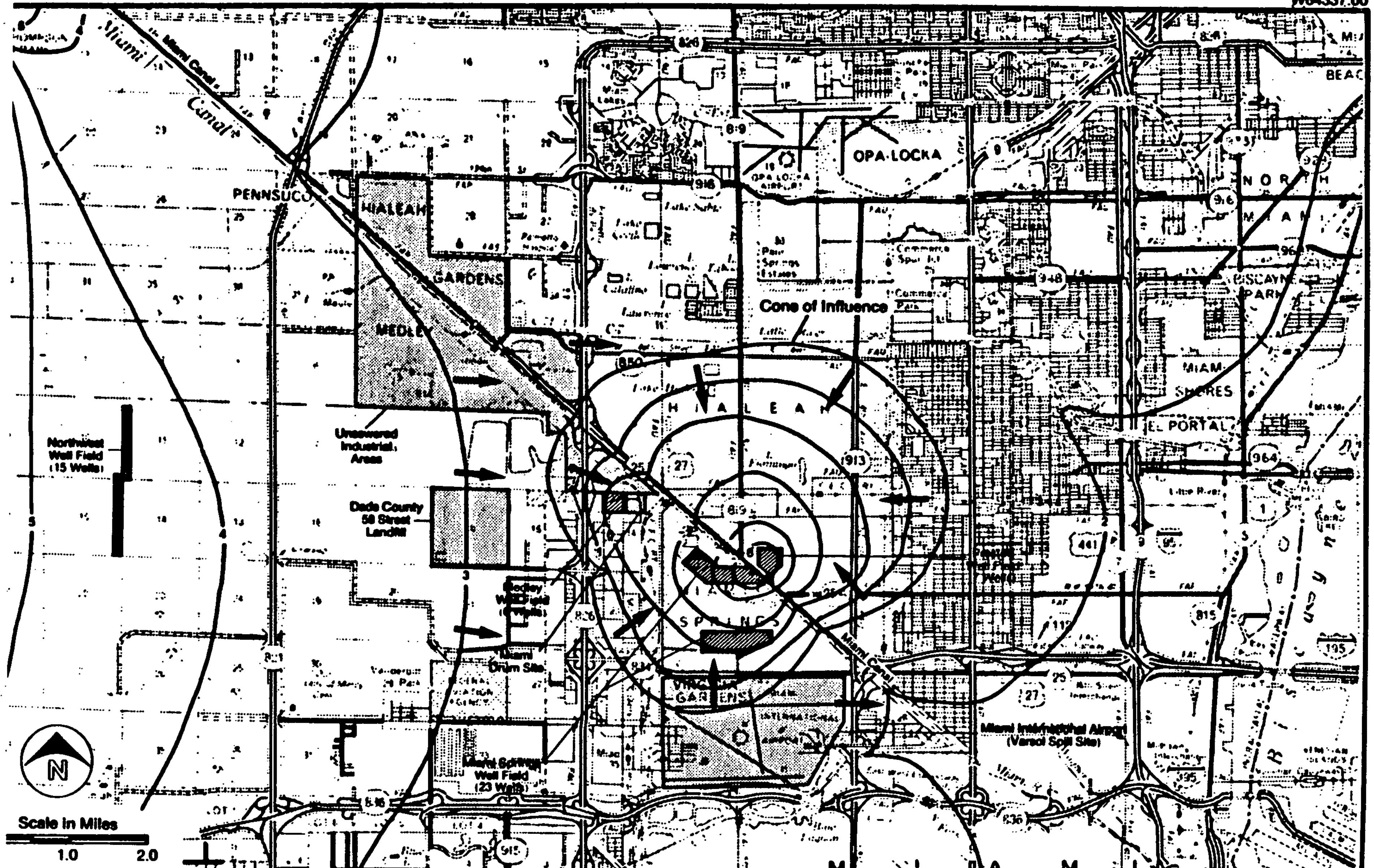

D

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 Gr r Flow.

FIGURE 8.

Altitude of Water Table and Gro /ater Flow in the Study Area, May 1980.

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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 650 for Miami

Table 19
SUMMARY OF VOC EMISSIONS FROM THE PROPOSED TREATMENT SYSTEMS (ALTERNATIVE NO. 2)

		Total VOCs from Pretreatment				State of Florida Allowable Emission Cutoff Levels	
		Mean Values		Maximum Values			
WTP	Description	(lb/d)	(tpy)	(lb/d)	(tpy)	(lb/hr)	(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/m^3 (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/m^3. Maximum 1-hour impacts for vinyl chloride at either facility are well below 0.038 mg/m^3 (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/m^3)	TLV (mg/m^3)
Miami Springs Well Field	Vinyl Chloride	0.012	10
	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 Well Field	Vinyl Chloride	0.015	10
	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 (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 [illegible]ovided in all areas within well field protect[illegible]es and ultimately in all commercial and indu[illegible] 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

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

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.

3. Air Stripping: Commenters were concerned about the health effects of airborne pollution on people living near the proposed tower sites. They asked about the benefits of air stripping and the end result of the remedial action 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.

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.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IV

345 COURTLAND STREET
ATLANTA, GEORGIA 30365

Mr. Udai P. Singh
Water Resource Engineer
CH2M Hill
7201 N.W. 11th Place
P.O. Box 1647
Gainesville, Florida 32602

Dear Udai,

I have recently received the review and comments on the Biscayne Aquifer Project, Phase2 Groundwater Monitoring Data from the CDC Superfund Implementation Group. As you and I have previously discussed, low to moderate concentrations of additional compounds not identified in Phase 1 sampling have been identified. It was for these compounds that you requested guidance on minimally acceptable drinking water standards to protect public health. We have also taken the liberty to comment on a number of other compounds for which your criteria appears either too low or high or had no criteria established.

Please feel free to contact me if there are any questions regarding the attachment to this letter.

Sincerely Yours,

Chuck

Chuck Pietrosewicz

Public Health Advisor

cc: Jim Orban, EPA
Georgi Jones, CDC/SIG

Attachment-1

ATTACHMENT

Compound	Recommended Minimum Standard (ppb)	Reference
Boron	None Available	
Aluminum	10	1
Zinc	5,000	2
Iron	300	2
Vanadium	70	1
1-1 dichloroethene	0.31-0.34	2
Trihalomethanes	100	2
Acenapthene	.28, .2	3,4
Methylxylene	620	2
Toluene	340	2
Trichloroethane	1,000	2
Di-N-Butylphthalate	1,100	5
Bis(2-ethylhexyl)phthalate	6,000	5
Pentachlorophenol	30	5
Heptachlor	.24	5
Lindane	1.1	5
Chlordane	.23	3
Endrin aldehyde	.2	2
Carbon disulfide	None Available	
1,4-dioxane	570/10 days; <570/>10 days	2
2,4,5-T	1,000	5
Polynuclear Aromatic Hydocarbons	Equal criteria can be given to all	
1,2-dichloropropane	100/ 10days	2
Acrilonitrile	3/short term; .34/lifetime	3

ATTACHMENT cont'd

REFERENCES

1- CDC/SIG Literature Review
2- EPA Primary & Secondary Drinking Water Standards (current)
3- EPA Cancer Assessment Group Recommendations
4- World Health Organization
5- Natiónal Academy of Science