

**Special Publication SJ2004-SP16**

**Demineralization Concentrate Database  
and GIS Data Layers**

**for the  
Investigation of Demineralization  
Concentrate Management Project**



**DEMINERALIZATION CONCENTRATE DATABASE – TASK B.2  
AND  
GIS DATA LAYERS – TASK B.3**

**FOR THE**

**INVESTIGATION OF DEMINERALIZATION CONCENTRATE MANAGEMENT PROJECT**

**BY**

**REISS ENVIRONMENTAL AND  
SUBCONSULTANTS MICKLEY AND ASSOCIATES AND MALCOLM PIRNIE**

**ST. JOHNS RIVER WATER MANAGEMENT DISTRICT  
PALATKA, FLORIDA**

**JANUARY 2002**



# INTRODUCTION

The Demineralization Concentrate Database and GIS Data Layers are part of the overall scope of the St. Johns River Water Management District's Investigation of Demineralization Concentrate Management Project and are provided in fulfillment of the requirements of Task B.2 and Task B.3 of Contract No. SE418AA. The tasks require preparation of a relational database of information concerning demineralization concentrate management for demineralization plants greater than 0.1 million gallons per day (mgd) in Florida and development of GIS Data Layers (point coverage or shapefile) representing each category of location data identified from the demineralization plant database.

This document provides the following information to support the database and GIS deliverables:

- Methodology
- Content of database and GIS layers
- User's Guide
- References

# METHODOLOGY

Per the contract, the relational database was created in Microsoft Access and structured to accommodate the following information:

1. Name of plant
2. Address and telephone number of plant
3. Name, address, and telephone number of owner
4. Name, address, and telephone number of operator
5. Type and description of demineralization process
6. Location by county and by latitude and longitude
7. Date plant became or is scheduled to become operational
8. Plant capacity
9. Description of process water by name of source-water body, location of withdrawal in latitude and longitude, depth of withdrawal in NGVD if from a groundwater source, rate of withdrawal in mgd, average annual quantity of water withdrawn in mgd, and quality of source water by major physical and chemical characteristics
10. Description of demineralization process concentrate by management strategy, description of treatment process, name of receiving water body, location of point of discharge to receiving water body in latitude and longitude and in feet NGVD if discharge is to groundwater,

physical and chemical characterization of concentrate, and receiving water body

11. Pertinent environmental permit information for each demineralization treatment plant and associated concentrate discharge project including permit or application number, name of permitting agency, permit conditions, status of permit, and status of pending applications
12. Pertinent information for demineralization projects that were proposed but not implemented because of regulatory limitations
13. Description of permitting issues encountered

This structured database was then populated based on a survey of and collection of information from multiple sources throughout the state of Florida:

- Past surveys
- Florida Department of Environmental Protection (FDEP) district offices
- Water management district (WMD) offices
- Membrane plant contacts
- Other

The information gathered, the approach used, and the general findings of this effort are discussed for each of these sources in the following sections.

## **PAST SURVEYS**

The information collection process began with the development of a tentative list of water utility plants that utilize demineralization technologies. The initial list was compiled from past survey efforts (Mickley et al., 1993; Mickley 2001), which included a total of 73 plants and some background information available for many of these plants. This initial plant list was refined through interactions with FDEP and the individual demineralization plants.

A total of 22 plants were eliminated from further consideration due to one of the following reasons:

- Plant has been taken out of service (11 plants)
- Plant size is below the 0.1 mgd cutoff (8 plants)
- Plant was never built (3 plants)

The plants that were eliminated are listed in Table 1. In addition, a total of five plants not on the original list were added during the course of the project. Therefore, the final plant list has 51 operating plants, 2 stand-by

plants, and 3 plants under construction, for a total of 56 plants. This final list of 56 plants is provided in Table 2.

No situations were identified where a demineralization plant was taken out of service or never built due to difficulties associated with disposing of the concentrate. Conversations with FDEP representatives did not result in the identification of any demineralization plants that were not implemented due to concentrate management regulations. FDEP personnel indicated that, if there was an issue with the proposed discharge option, the agency would suggest looking at different alternatives that could more readily receive a permit.

Table 1. Demineralization plants eliminated from original list

Demineralization Plant	Comments from Research
FDEP Northeast District Jacksonville	
1-Marineland	Facility shut down since August 2000
FDEP Central District — Orlando	
2-Indian River North Beaches	Plant dismantled and sold to City of Palm Bay
3-Aquarina Development	Plant capacity less than 0.1 mgd
FDEP Southwest District — Tampa	
4-Camelot Lake Motor Home Park	Plant capacity less than 0.1 mgd
5-Sarasota County Utility — Sorrento	Plant has no current records
6-Southbay Utilities	Plant no longer operating (since about 1999)
7-Jacaranda (Venice Gardens)	Plant was decommissioned
8-Sarasota County Util. — Plantation	Plant was decommissioned
FDEP South District — Fort Myers	
9-Knight Island Utilities, Cape Haze	Plant still operating but size is below 0.1 mgd
10-Gasparilla Pines, Englewood	Plant taken out of service in 2000
11-Island Water Association	Plant was an old 1973 plant; evidently no longer operating
12-Lee County, Fort Myers	Plant was never built
13-Florida Keys Aqueduct	Original plant not operating; equipment used at two 'never' plants
14-Naples	Plant was never built
15-Burnt Stores Utility — Colony	Plant no longer operating as of 1997
16-Collier County South	Under construction; operation date is late 2002
FDEP Southeast District — West Palm Beach	
17-Joe's Point Homeowners Assoc.	Plant capacity less than 0.1 mgd
18-Deerfield Beach, Fla.	Plant permit application withdrawn
19-Ocean Towers	Plant capacity less than 0.1 mgd
20-Palm Beach Park	Plant capacity less than 0.1 mgd
21-Princess Condominiums	Plant capacity less than 0.1 mgd
22-St. Lucie Ticonderoga	Plant could not be identified

Table 2. Demineralization plants (>0.1 mgd) in Florida

Demineralization Plant	County	Water Management District	Plant Type	Approximate Capacity (mgd)
FDEP Northeast District — Jacksonville				
1-Palm Coast Utility	Flagler	SJRWMD	NF	2
2-Hastings	St. Johns	SJRWMD	BRO	0.22
3-North Beach Utility	St. Johns	SJRWMD	BRO	0.55
FDEP Central District — Orlando				
4-City of Palm Bay	Brevard	SJRWMD	BRO	1.5
5-Melbourne	Brevard	SJRWMD	BRO	6.5
6-South Brevard Water Coop	Brevard	SJRWMD	BRO	0.1
7-Hobart Park	Indian River	SJRWMD	BRO	3.5
8-Indian River Countryside North	Indian River	SJRWMD	BRO	0.2
9-Indian River South Beach (south county)	Indian River	SJRWMD	BRO	8.57
10-Vero Beach, City of	Indian River	SJRWMD	BRO	2
11-Halifax Plantation	Volusia	SJRWMD	BRO	0.5
12-Spruce Creek WTP	Volusia	SJRWMD	BRO	0.5
FDEP Southwest District — Tampa				
13-Wauchula	Hardee	SWFWMD	NF	2.1
14-Tampa Bay Desal	Hillsborough	SWFWMD	SRO	23
15-Dunedin, City of	Pinnelas	SWFWMD	NF	9.5
16-Englewood Water Dist., Englewood	Sarasota	SWFWMD	BRO	2.5
17-Sarasota City Utils, Carlton, Sarasota	Sarasota	SWFWMD	EDR	12
18-Sarasota, City of	Sarasota	SWFWMD	BRO	4.5
19-Sun & Fun Resort	Sarasota	SWFWMD	BRO	0.15
20-Venice, City of	Sarasota	SWFWMD	BRO	4
FDEP South District — Fort Myers				
21-Burnt Store, Punta Gorda	Charlotte	SFWMD	BRO	0.56
22-Charlotte Harbor — Harbor Heights, Fla.	Charlotte	SFWMD	BRO	0.5
23-Gasparilla Island Water Association	Charlotte	SFWMD	BRO	0.75
24-Rotunda west	Charlotte	SFWMD	BRO	0.5
25-Collier County north	Collier	SFWMD	NF & BRO	12-NF and 8-BRO
26-Marco Island RO	Collier	SFWMD	BRO	6
27-Marco Is. Water Lime Softening — UF	Collier	SFWMD	UF	1.67
28-Cape Coral	Lee	SFWMD	BRO	15
29-Fort Myers, City of	Lee	SFWMD	NF	12
30-Great Pine Island, Bokelia	Lee	SFWMD	BRO	1.5
31-Gulf Utility — Corkscrew WTP	Lee	SFWMD	NF	0.25
32-Island Water Association, Sanibel Island	Lee	SFWMD	BRO	4.32
33-Florida Keys Aqueduct Authority, Marathon, Fla.	Monroe	SFWMD	SRO	1
34-Florida Keys Aqueduct Authority, Stock Island, Fla.	Monroe	SFWMD	SRO	2



Table 2 – Continued

Demineralization Plant	County	Water Management District	Plant Type	Approximate Capacity (mgd)
FDEP Southeast District — West Palm Beach				
35-City of Sunrise, Fla., Sawgrass	Broward	SFWMD	NF	12
36-Cooper City	Broward	SFWMD	NF	3
37-Hollywood, City of — RO/NF	Broward	SFWMD	NF and BRO	14-NF and 4-BRO
38-Miramar	Broward	SFWMD	NF	7.5
39-Plantation East WTP	Broward	SFWMD	NF	6
40-Hutchison Island — Marriott	Martin	SFWMD	BRO	0.4
41-Martin County Utility	Martin	SFWMD	BRO	3.56
42-Sailfish Point Utility	Martin	SFWMD	BRO	0.35
43-Tropical Farms Utility	Martin	SFWMD	NF	1.5
44-Boynton Beach	Palm Beach	SFWMD	NF	8
45-Jupiter, City of	Palm Beach	SFWMD	BRO	12
46-Palm Beach County WTP 3	Palm Beach	SFWMD	NF	9.32
47-Palm Beach County WTP 9	Palm Beach	SFWMD	NF	23
48-Plantation Central WTP	Palm Beach	SFWMD	NF	12
49-Royal Palm Beach	Palm Beach	SFWMD	NF	1.5
50-Tequesta Village WTP	Palm Beach	SFWMD	BRO	1.2
51-Village of Wellington	Palm Beach	SFWMD	NF	4.5
52-City of Port St. Lucie, Fla.	St. Lucie	SFWMD	RO	4
53-Fort Pierce Utility Authority	St. Lucie	SFWMD	BRO	4
54-Holiday Pines Service Corp.	St. Lucie	SFWMD	BRO	0.29
55-Spanish Lakes	St. Lucie	SFWMD	BRO	0.75
56-St. Lucie West Service	St. Lucie	SFWMD	NF	2

Legend

- SJRWMD – St. Johns River Water Management District
- SWFWMD – Southwest Florida Water Management District
- SFWMD – South Florida Water Management District
- NF – nanofiltration
- UF – ultrafiltration
- BRO – brackish reverse osmosis
- RO – reverse osmosis
- EDR – electro-dialysis

Note: In the demineralization plant database, the nanofiltration and reverse osmosis processes located at the Hollywood WTP are listed as two separate plants.

## FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

Communications and data collection from FDEP were focused on the FDEP district offices. The first purpose for interaction with the FDEP district offices was to review and modify the initial plant list. Later interactions focused on obtaining copies of the concentrate disposal permits and discussing individual plant disposal issues with FDEP personnel.

There are six FDEP district offices. Five of these offices have at least one drinking water demineralization plant greater than 0.1 mgd (Table 3).

Table 3. Number of demineralization plants by FDEP district

District	District Office Location	Number of Demineralization Plants
Southwest	Tampa	8
Southeast	West Palm Beach	22
South	Fort Myers	14
Central	Orlando	9
Northeast	Jacksonville	3
Total		56

The following information pertains to identifying demineralization plants and obtaining disposal permits from FDEP.

Concentrate disposal permits:

- The FDEP district offices do not distinguish between demineralization drinking water plants and other industrial wastewater generating plants, thus there was no simple means of identifying demineralization plants.
- Two sections of the FDEP offices write disposal permits. The industrial wastewater section issues an NPDES permit (industrial wastewater facility discharge permit) for industrial plants disposing effluent to surface waters (and also to land application and reuse systems); the underground injection control (UIC) group issues permits for the construction and operation of injection wells.
- The industrial wastewater permit contains helpful information about the demineralization plant, treatment of the concentrate prior to

discharge, the discharge system, and the monitoring requirements. In addition, permittee and facility addresses are included as well as facility latitude and longitude. In some districts, disposal site latitude and longitude are also provided in these permits.

- The UIC permits contain only a passing reference to the source of the effluent being disposed and focus on details of the injection well and monitoring system.
- In general, plants disposing to surface water (or land application) or via injection wells have readily identifiable permits but only the industrial wastewater permits contain useful information about the demineralization plant and any treatment of concentrate prior to disposal.
- Plants disposing concentrate to the sewer do not require disposal permits; thus, knowledge about the existence of these plants was difficult to obtain.
- Plants land applying concentrate, including reuse systems, have an industrial wastewater permit if they are managing the disposal system. If the system is managed by a wastewater treatment plant (WWTP), as is frequently the case, the WWTP holds the disposal system permit, not the demineralization plant. This situation was the case for all of the FDEP districts.
- In addition, the Fort Myers and Orlando districts also have industrial wastewater permits for many facilities that *generate* wastewater regardless of how the wastewater is disposed (except for disposal to the sewer). Thus, demineralization plants disposing concentrate by injection well frequently also have industrial wastewater facility discharge permits. As mentioned previously, these permits contain helpful descriptive information about the demineralization plant, treatment of concentrate, and the disposal system.

The variation in data available by type of permit and between FDEP offices and the absence of a differentiation between demineralization and other water treatment plants was not fully known in advance.

While initial requests focused on the discharge permits, additional requests were needed to obtain missing information not contained on these permits. As a result, several communications (telephone, fax, email) were made over a period of many months and with several people from each FDEP district office as follows:

- Requests for information from the FDEP offices were undertaken in phases and in small increments so as not to overwhelm the FDEP staff at any one time. The broad phases included identification of

membrane plants, obtaining permits, discussing permitting situations of individual plants.

- Information collection with the FDEP district offices involved rounds of telephone messages, faxes, and emails and involved at least one person from the industrial wastewater section and one from the UIC section.
- The information available depended on the type of concentrate disposal method, as not all demineralization facilities have disposal permits.
- UIC permits contained minimal information beyond description of the injection well, monitoring well, and monitoring requirements.
- Land application permits held by WWTPs that dispose WTP demineralization concentrate contain little information about the demineralization treatment plant and any treatment done to concentrate prior to disposal.
- Between the perceived need to move in phases, the need to interact with several people in each office, the wide variance in response time, the time it took for the offices to search for information (as it wasn't centralized), and the fact that many plants did not have permits, a significant period of time was required for the information compilation effort.

In summary, the best-case conditions (disposal to surface water or disposal to land application where the disposal is managed by the WTP) produced information from FDEP offices consisting of:

- Name and address of permittee
- Name and address of facility
- Permit number, date of issue, expiration date
- Plant latitude and longitude
- Disposal means
- Identification of modifications, consent orders, administrative orders, or variances associated with the permits
- Description of plant
- Description of wastewater treatment
- Description of the discharge system
- Monitoring requirements
- Permitting status of a plant
- Some disposal permitting history of a plant

In the case of disposal to an injection well, the list of available information was reduced to the following:

- Permit number, date of issue, expiration date

- Disposal means
- Identification of modifications, consent orders, administrative orders, or variances associated with the permits
- Monitoring requirements
- Permitting status of a plant
- Some disposal permitting history of a plant

During the course of data collection, yearly facility inspection reports were obtained for some facilities. These reports provided little information since they are not focused on concentrate management. Therefore, FDEP concentrate management-related information was available only through discussions with and requests of FDEP permitting staff. Also, the fact that most of these reports were not readily (easily) available made information collection extremely difficult.

During the course of seeking production well locations, the team found that an FDEP database existed that contained this information. The 'data layer name' is referred to as the potable water system (PWS). FDEP personnel in the Facilities Division, Bureau of Groundwater and Drinking Water, Drinking Water Section of FDEP, originally prepared this data layer. After multiple interactions, we were informed during the week of September 20, 2001, that this information was no longer available due to security concerns resulting from the terrorist actions of September 11, 2001. Continued efforts were made to obtain this information through a district representative but were not successful at the time data collection efforts ended. Production well data collection efforts have been completed based on all available information.

## WATER MANAGEMENT DISTRICTS

The water management districts (WMDs) were approached as part of the source water data collection effort. Source water information included production well depths, diameters, and well locations.

Florida demineralization drinking water plants greater than 0.1 mgd are located in three of the five WMDs. Table 4 lists the number of plants in each of these three districts.

Table 4. Number of demineralization plants by water management district

Water Management District	Number of Demineralization Plants
St. Johns River Water Management District	12

Southwest Florida Water Management District	8
South Florida Water Management District	36
Total	56

The information obtained from the WMDs initially appeared to be very difficult to disseminate into the type of information required for this project. In some cases, it was the result of the information not being referenced to individual utilities but to the financial entity (county, city, private organization, etc.) owning the wells. In other cases, the information had not yet been put into electronic format. Two districts suggested that the easiest means of getting the information requested was to obtain it directly from the utilities. Therefore, this suggestion was the approach taken to gather most of the source water information – directly from the water demineralization plants.

Several utilities did not know where or how to get this source water information. Further interactions with the WMDs near the end of the data collection effort did provide some information on the production wells, including the following:

Well locations:

- The locations of the production wells are on the well construction permits. Most frequently, however, these are given in terms of section, township, and range.
- Sometimes the well locations are on the consumptive use permits or water use permits (CUPs or WUPs).
- By obtaining the CUP/WUP number from the plant and providing this to the WMD, it was possible, in several cases, for the WMD to provide a list of well locations and sometimes other well information (depth, diameter, etc.) for wells under that permit number.
- Frequently, there are many more wells under a permit number than are currently used by the plant of interest; therefore, the remaining wells are being used by other water or wastewater plants owned by the same financial entity.
- To identify the well locations of interest, well numbers are needed from the demineralization plant.
- This approach, however, is not a guarantee that wells will be located. In several instances, the WMD reported fewer wells than were being used by the plants. The difference in the number of wells may have to do with newer wells on-line, the financial entity being changed since the WMD information was gathered, etc. In some other cases, it

appeared that the WMD did not have current information in their database.

- In the case of SFWMD, a list of plants drawing water from the Floridan and other lower depth aquifers was provided. Most of the wells drilled into these aquifers are for desalting plants. The list provided information for perhaps 1/4th of these plants in their district. The reason for missing plants is not known.

Source water quality:

- Some water quality information is periodically reported to the WMDs by the plant. This information is plant-dependent.
- Every two years, the drinking water plants submit a compliance report that includes an extensive water quality analysis of the well waters.
- Water quality information was more easily obtained from the membrane plants than production well locations and thus information on source water quality was requested from the plants rather than the WMDs.

Withdrawal rates:

- Plants are required to report monthly withdrawals from each production well. When these values are totaled for 12 months for each well providing raw water to the plant, the yearly total wellfield combined withdrawal rate can be obtained.
- As with the source water quality information, this information was obtained from the individual plants rather than the WMDs.

In summary, information obtained from the WMDs consisted of production well locations and well depths and diameters for approximately 15 of the 56 demineralization plants.

## **INDIVIDUAL DEMINERALIZATION PLANTS**

After obtaining permits (where available) and discussing the individual plant permitting issues with FDEP offices and after obtaining information from the WMDs, the information compilation effort focused on the individual demineralization plants. Approximately 80% of the effort expended in information collection involved interactions with the plants. On average, each plant was contacted nine times for information and some as much as 18 times. This contact included telephone calls, faxes, and emails. Approximately half of the telephone calls, particularly to smaller sized membrane plants, required leaving a message, which affected the response time from these plants. A wide range of responses to information requests was encountered and included the following:

- The impact of the September 11 terrorist attacks on plant operation and time available to respond to our information requests was quite evident. Intensive and extensive security precautions and measures were being implemented and this impacted the already low priority (from the plant perspective) given to gathering and supplying the information previously requested from each demineralization plant.
- In general, smaller capacity plants had much more difficulty spending time to gather information and had more difficulty finding the information requested.
- Some plants provided information quickly while others never responded to phone messages. Daily communication records were kept to follow the interaction with each plant.
- Most contacts were very willing to provide qualitative and descriptive information that did not require looking up reports that were not immediately available. Much of this more general information was obtained during the initial telephone conversation. Report-related information (production well locations, source water and concentrate water qualities, annual production well withdrawals, etc.) that required some amount of searching and then faxing or emailing, was usually slow in coming. Most of the repeated communications with individual plants were to remind individuals that the information was still being requested or to talk with other individuals who were referred to us by previous contacts.

In all but a few cases, the information for the individual demineralization plants was obtained from administrative personnel (utility directors, environmental specialists, operation managers, etc.) and plant personnel (plant managers, production supervisors, operators, etc.). In several instances, the administrative staff referred the data collection requests to plant/field individuals. For the smaller plants, the operators were frequently the only people, aside from their engineering support, that knew about the information being requested. Therefore, some of the smaller plants referred us directly to their engineering support.

## **OTHER SOURCES**

It was determined that Palm Beach County has developed GIS data for production wells in their county. After contacting the Department of Health, after September 11, 2001, the Health Department indicated that policy had been reviewed and it had been decided that we should collect this data directly from the demineralization plants. Individual plants were contacted as described previously.



## CONTENT OF DATABASE AND GIS LAYERS

The demineralization plant database was developed using Microsoft Access 2000 software and the GIS Data Layers using ArcInfo. As information was initially collected, it was added to an Excel spreadsheet file where individual data items were kept in separate columns and rows for data management purposes. Information items with several distinct pieces such as water quality analyses, production well locations, etc., were kept in separate Excel sheets, one for each of these subject areas, for organizational and data management purposes.

After initial contact had been made with most of the demineralization plants and a substantial amount of information was available, a summary report form was designed to use as a guide for the development of the database report form. The database tables were designed, and information was transferred from the Excel spreadsheets into the database tables. This effort resulted in the first version of the database. Two refinements of report form format were made, and each time the database was populated with updated data from these spreadsheets. This information is entered into specific datafields in the database, which are eventually utilized to produce the demineralization plant summary report. An explanation of the content in each of the datafields used to generate this summary report is presented in Table 5.

Once the demineralization plant database was complete, the location information was used to generate GIS Data Layers for demineralization plant locations, plant source water locations, and plant discharge regime locations. These GIS Data Layers were created in ArcInfo format representing each location category. Also, the ArcMap and Arcview project files have the database-related and plant summary reports hot-linked from the Access database. This configuration allows all the data associated with the demineralization plant to be viewed when the location is selected in the GIS data layer. An example of this function is provided in the next section, "User's Guide."

In summary, the Access database includes a total of 56 individual demineralization plant summary reports, and the GIS data files include three Data Layers for the demineralization plant locations, plant source water locations, and plant discharge regime locations. Also, the Access database and GIS Data Layers are linked.

Table 5. Explanation of the demineralization plant database content

Field Name	Description of Field Information
General Information	
FDEP office	District office location
Facility	Name and address of the water treatment plant
Permittee	The owner and responsible legal organization mentioned in the operating and disposal permits
Operator	The name of the organization operating the plant. Sometimes plant operation is contracted to another organization
Contacts	Names, positions, telephone numbers of people associated with the plant who were contacted for information, typically from the permittee and operator organizations, sometimes the consulting engineer
Plant lat/long	Location of the plant in terms of latitude and longitude. When data is generated by FDEP it is frequently the location of the driveway leading from the main road into the plant
Disposal type	Method of concentrate disposal
Industrial wastewater facility permit number	A permit for concentrate disposal for plants disposing to surface waters or via land application methods. Some FDEP districts have these permits for plants disposing to injection wells (in addition to UIC permits). No districts have these permits for plants disposing concentrate to the sewer (or influent to the wastewater treatment plant)
New or renewed?	Referring to the industrial wastewater facility permit (IWWFP), which has a five-year life
Issuance date	Referring to the IWWFP
Expiration date	Referring to the IWWFP
Modified?	Referring to whether the IWWFP has been modified since issuance yet prior to renewal
Status	Operating status of the plant
Plant start date	Year the plant began operation
County	County where the plant is located
Plant description	Type of membrane plant
Available plant capacity (mgd)	Installed plant capacity
Concentrate treatment	Description of any treatment done to the concentrate prior to disposal
Discharge system	Description of the concentrate disposal system

Table 5 – Continued

Field Name	Description of Field Information
General Information	
Nature of monitoring	Description of the monitoring sites where sampling of concentrate is required by the IWWFP requirements
Consent order/ administrative order	When a facility is not in compliance, these are two enforcement tools that FDEP may use to bring about compliance. The database entry is a description of any such orders attached to the discharge permit
Variance	A variance is one of three regulatory relief mechanisms available. The first is a mixing zone, the second is a variance, which amounts to a revision of the standards applied, the third is an exemption which amounts to 'waiving the rule.' The database entry is a description of any such variance attached to the discharge permit
Disposal lat/long	Location of the concentrate disposal site in terms of latitude and longitude
Process comments from plant	Comments made by plant contacts mostly having to do with expansion plans
Concentrate Water Quality Information	
Where concentrate water quality information is more extensive, it is typically from non-routine in-plant studies. The more frequent case of less extensive water quality information usually involve data taken to meet the IWWFP monitoring requirements and reported in the discharge monitoring reports (DMRs)	
Details for Surface Discharge/Land Application	
Mixing zone	Description of any mixing zones (one of the regulatory relief mechanisms)
Parameters monitored	Lists of the chemical and physical parameters that are part of the monitoring requirements associated with the IWWFP
Biological diversity parameters monitored	Description of any biological diversity parameters that are part of the monitoring requirements
Toxicity monitored	Description of any toxicity monitoring requirements
Monitoring well	Description of any groundwater monitoring requirements not associated with injection well disposal of concentrate; requirements may be associated with land applications disposal of concentrates

Table 5 – Continued

Field Name	Description of Field Information
Details for Deep Well Injection	
Injection well permit number	The UIC permit number for the injection well
UIC permit date of issuance	Self explanatory
UIC permit date expiration	Self explanatory
Deep injection well characteristics	Description of the injection well
Monitoring well characteristics	Description of the monitoring well(s) associated with the injection well
Maximum injection rate	Permitted maximum rate
Details for Disposal to Sewer	
Name of WWTP	Name of the WWTP receiving the concentrate
Disposal conditions	Any monitoring requirements, fees paid, or other conditions associated with the disposal. Most typically there are none, particularly if the WWTP and water treatment plant are owned by the same organization
Source Water Information	
Name of aquifer	Self explanatory
Total number of wells	Number of active production wells
Well information	This section contains information about each production well: identification numbers, the locations of the well (latitude and longitude where possible), the casing diameter, the total well depth, the depth of final casing, and any pertinent comments
Rate of withdrawal	The annual total combined withdrawal from the wells and the corresponding daily withdrawal rate. Where possible, the annual withdrawal is from measurements; however, in some cases it is estimated
Water quality	Where this information is more extensive, it typically comes from a bi-annual compliance report that may be required by the water management district or from an analysis conducted as part of the well drilling requirements. Where the data is less extensive, it is typically from a monthly or other periodic monitoring

	requirement report
--	--------------------

Table 5 – *Continued*

Field Name	Description of Field Information
Disposal-Related Comments From FDEP Offices	
This section contains comments made by the FDEP district office associated with the plant; comments concerning concentrate disposal aspects	
Disposal-Related Comments From Plant	
This section contains comments made by contacts associated with the plant; comments concerning concentrate disposal issues	

# USER'S GUIDE

The database has been created in Microsoft Access. While not contracted to provide custom user interfaces and reports, a number of actions have been taken to support access to and use of the database. First, the database structure has been designed with multiple tables:

*tblConcentrateWaterQuality, tblContact, tblOriginalPlant, tblPlant, tblSourceWaterQuality, tblWellInformation, tblWellLocation, tblWellSize and tblWithdrawal.* These tables separate the large volume of information obtained on the plants and are also accessed to generate summary reports on each of the demineralization plants in the database.

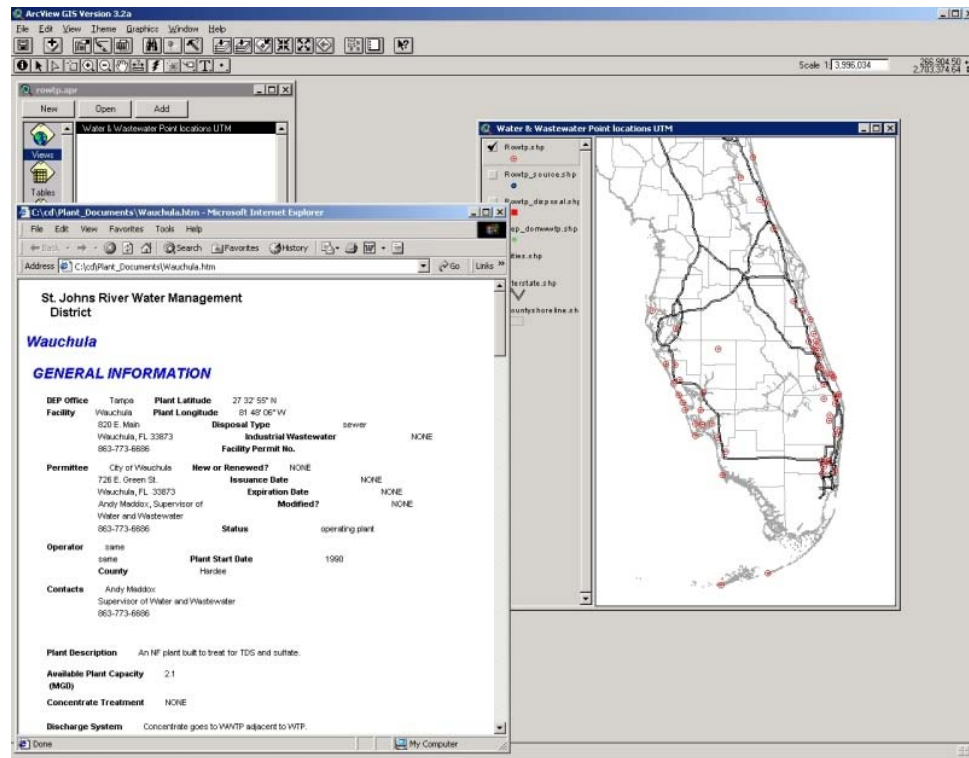
When accessing the database, it immediately prompts the user with a menu that provides options for using the database. These options are as follows:

- View Full Report – This option allows the user to view full report of all plants.
- View Plant List – This option allows the user to double click on a plant name from the datasheet list to view details from that plant.
- Close – This option allows the user to by-pass this window, thereby accessing the database directly.

This simple menu was attached to the front of the database to aid the less familiar user in accessing individual demineralization plant summary reports from the database. Otherwise, the database functions as a standard Access database.

The GIS Data Layers have been created in ArcInfo with all the functions associated with this software. The ArcInfo data files represent multiple layers: Demineralization Facility Locations, WTP Source Locations, and WTP Disposal Locations. When the user accesses the GIS and selects a demineralization plant location, since the database is related with hot links to the summary plant reports, it will allow the user to view all the information associated with this particular demineralization plant. An example of the GIS Data Layers linked with the Demineralization Plant Summary Reports is presented in Figure 1.

Figure 1. Example of GIS Data Layers linked with the Demineralization Plant Summary Reports



## SUMMARY REPORTS AND GIS DATA LAYERS

There are a total of six reports, based on table data and queries. Table 6 contains the report names and association with some tables and queries. The tables and queries were utilized to separate the information obtained on the demineralization plants for organizational and data management purposes, and are also accessed to generate summary reports on each of the demineralization plants in the database. Therefore, the report titled *rptPlant* is the main report, which is supported by all the other subreports created in the Access database. The main plant report (*rptPlant*) generates over 250 pages of information on the demineralization plants; due to the magnitude of this report, an example of one demineralization plant report is presented in Figure 2.



Table 6. Report names and association with tables and queries

Report	Table	Query
rptPlant		qryPlantFull
rptSubConcentrateWaterQuality		qrySubConcentrateWaterQuality
rptSubContact	tblSubContact	
rptSubSourceWaterQuality		qrySubSourceWaterQuality
rptSubWellInformation	tblWellInformation	
rptSubWithdrawal		qrySubWithdrawal

Additionally, this demineralization plant database was utilized to generate GIS Data Layers to locate the demineralization plants, plant source water locations, and plant discharge regimes. The Access database was also linked to the ArcInfo project file, which allows all the information associated with the demineralization plant to be viewed when the location is selected in the GIS Data Layer. Exhibit 1 presents the GIS Data Layers for each of the location categories.

## REFERENCES

- Mickley, M.C., R. Hamilton, L. Gallegos, and J. Truesdall. 1993. *AWWARF membrane concentrate disposal*. Sponsored by AWWA Research Foundation. Denver, Colo.: AWWA Research Foundation and American Water Works Association.
- Mickley, M.C. 2001. *Membrane concentrate disposal: Practices and regulations*. Denver, Colo.: Bureau of Reclamation.

Figure 2. Example of demineralization plant report

**St. Johns River Water Management District**  
***City of Venice RO Plant***

**GENERAL INFORMATION**

<b>DEP Office Facility</b>	Tampa City of Venice RO Plant 200 North Warfield Venice, FL 34292 941-486-2624	<b>Plant Latitude</b>	27 05' 58" N
		<b>Plant Longitude</b>	82 26' 27" W
		<b>Disposal Type</b>	Surface Water Disposal
		<b>Industrial Wastewater Facility Permit No.</b>	FL0035335 (P)
<b>Permittee</b>	City of Venice 401 W. Venice Avenue Venice, FL 34285 Attn: Mr. John M. Lane, Director of Utilities 941-486-2626	<b>New or Renewed?</b>	Renewed
		<b>Issuance Date</b>	12/3/1997
		<b>Expiration Date</b>	12/2/2002
		<b>Modified?</b>	yes
		<b>Status</b>	operating plant
<b>Operator</b>	same same	<b>Plant Start Date</b>	1975
		<b>County</b>	Sarasota
<b>Contacts</b>	Bill Green Superintendent 941-486-2624		

**Plant Description** A reverse osmosis plant producing an average flow of 2.0 mgd and a maximum 7-day average flow of 3.56 mgd.

**Available Plant Capacity** 4 (mgd)

**Concentrate Treatment** Concentrate is currently pretreated by chlorination and aeration prior to discharge which goes to a small creek behind the plant. But by 11/2001 concentrate will go to new outfall on the Intercoastal. New treatment will use air compressor and static mixers and addition of chlorine. This will treat for H2S in the pipeline on its way to the outfall.

**Discharge System** Limited dilution of present system leads to chronic toxicity problems. (As of 11/2001) Discharge of pretreated concentrate is through an outfall on the east bank of the Intercoastal Waterway at a location about 1,000 feet west of the plant and 200 feet south of Venice Avenue Bridge. This part of the Intracoastal Waterway (ICWW) is a 200-foot-wide, man-made, canal, connecting Roberts Bay and Lemon Bay, and is designated as a Class III water body. Outfall consists of a 50-foot long, 24-inch diameter pipe with 42 discharge ports (diffusers) located at the toe of the ICWW embankment discharging parallel to the channel with a minimum velocity of 20 feet per second at an approximate water depth of 7.7 feet. The angle of orientation of the diffusers will be 30 degree from horizontal to minimize bottom scouring or an erosion control pad will be placed under the diffuser, if the angle is less than 30 degrees from horizontal, to minimize

**Nature of Monitoring** effluent, edge of mixing zone

**Consent Order/** **NONE**

**Administrative Order**

**Variance** NONE

**Disposal Latitude** 27 05' 58" N

**Disposal Longitude** 82 26'27" W

**Process Comments From Plant** Do not see plant expansion in next 3–4 years. Present capacity is 4 mgd; average, 2.5 mgd; 2 in summer and 3 in winter. They have a fourth skid that hasn't been run yet — it is used for backup. New permit will allow for expansions.

## **CONCENTRATE WATER QUALITY INFORMATION**

<b>Specie</b>	<b>mg/L</b>
Ca	670
Mg	280
Na	250
K	12
Fe	--
Mn	--
Sr	24
Ba	--
T. Hard.	--
pH	--
T.Alk.	--
CO3	--
erosion.	
HCO3	162
SO4	2800
Cl	610
NO3	--
T.N.	--
F	3.4
SiO2	--
TDS	8200

## **DETAILS FOR SURFACE DISCHARGE/LAND APPLICATION**

<b>Receiving Water Body Name</b>	(As of 11/2001) Discharge is through an outfall on the east bank of the Intercoastal Waterway. This part of the Intracoastal Waterway (ICWW) is a 200-foot-wide, man-made, canal, connecting Roberts Bay and Lemon Bay, and is designated as a Class III water body.
<b>Mixing Zone</b>	A mixing zone is granted with a surface area of 210-feet (length centered over diffuser, north and south) by 45-feet (width from center line of diffuser, east and west) for radium 226 & 228 and gross alpha. Also granted is a mixing zone of 116 feet (length centered over diffuser, north and south) by 30 feet (width from center line of diffuser, east and west) for chronic toxicity
<b>Parameters Monitored</b>	Flow, specific conductance, total recoverable copper, total nitrogen, total phosphorus, 5-day carbonaceous oxygen demand [the preceding must be sampled for at least six months — continued sampling depends on the results], TSS, gross alpha, pH, DO, iron, fluoride, hydrogen sulfide, total residual chlorine, chloride, combined radium 226& 228.
<b>Biological Diversity Parameters Monitored</b>	NONE
<b>Toxicity Monitored</b>	Chronic (edge of mixing zone) and acute (effluent) (menidia beryllina and mysidopsis bahia)
<b>Monitoring Well Parameters (non-DWI)</b>	not applicable

## **DETAILS FOR DEEP WELL INJECTION**

<b>Injection Well Permit Number</b>	not applicable
<b>UIC Permit Date of Issue</b>	not applicable
<b>UIC Permit Date of Expiration</b>	not applicable
<b>Deep Injection Well Characteristics</b>	not applicable
<b>Monitoring Well Characteristics</b>	not applicable
<b>Maximum Injection Rate</b>	not applicable

## DETAILS FOR DISPOSAL TO SEWER

Name of WWTP not applicable  
 Disposal Conditions not applicable  
 Requirements not applicable

## SOURCE WATER INFORMATION

Name of Aquifer Floridan aquifer (upper); also called Intermediate aquifer

Total Number of Wells 12

Well Information (Note: Latitude and longitude information may be obtained from the District upon written request and with concurrence from FDEP.)

Designation	Diameter (in)	Depth (ft)		Comment
		Total	Cased	
RO2A/49	10	450	230	
RO8/50	12	450	230	
RO7/51	12	350	230	
RO1E/52	12	405	269	
RO2E/54	12	261	207	
RO3E/55	12	388	237	
RO4E/56	12	320	242	
RO5E/57	12	320	220	
RO1A/65	12	359	225	
RO6E/77	12	320	220	future
RO7E/78	12	320	220	future
RO8E/79	12	320	220	future
RO2/33	10	385	230	
RO3/34	10	450	230	
RO4/35	10	450	230	

### Rate of Withdrawal

Year	Annual Withdrawal Rate (MG)	Daily Withdrawal Rate (mgd)
2000	1555.39	2000 4.26

### Water Quality Information

Specie	mg/L
Ca	454
Mg	194
Na	228
K	9
Fe	0.03
Mn	0
Sr	17
Ba	0.03
T. Hard.	--
pH	7.4
T.Alk.	--
CO3	0
HCO3	96
SO4	1474
Cl	548
NO3	0
F	0
SiO2	29
TDS	2888
Ra 226/228	--
Gross A	--

## DISPOSAL-RELATED COMMENTS FROM DEP OFFICES

Permit modified 8/11/2000 with listed outfall change and the listed monitoring requirements. Permit modification of 1/23/2001 was an extension of the deadline for completion of the listed outfall.

## ***DISPOSAL-RELATED COMMENTS FROM PLANT***

Have until 11/2001 to relocate the outfall to the Intercoastal. They started about 10 years ago and were 2 days from having it passed when an environmental group (Manasota88) challenged it. Went through several legal things when Manasota88 group decided to drop it about 2 years ago. So DEP issued a go-ahead to relocate the outfall. Originally (since 1975) they put concentrate into a little creek behind the plant. Tests showed heavy influence from tides and rain. So DEP wanted concentrate to go to Intercoastal which is about 1/2 mile away. So pipeline and diffuser is under construction now and should be operational by 11/2001.