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Miami-Dade Water and Sewer Department

Rehabilitation of Production Well Nos. 13, 14, and 15 at the Northwest Wellfield

Final Report

January 2001

MONTGOMERY WATSON

Executive Summary

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Executive Summary

Production Wells Nos. 13, 14 and 15 at the Miami-Dade Water and Sewer Department's (MDWASD) Northwest Wellfield underwent construction rehabilitation during early 1999. This project was performed in response to regulatory concerns that the wells may have been producing groundwater that was under the direct influence of surface water (GWUDI).

In 1995 and 1996, the Florida Department of Environmental Protection (FDEP) performed a screening sampling of water produced from the production wells within the Northwest Wellfield. This sampling was conducted during a state-wide evaluation of community water supply systems, as required by the Safe Drinking Water Act. In January 1997, the MDWASD received notification from the FDEP that Well No. 10 in the Northwest Wellfield had received score results that designated that well as GWUDI. In addition to Well No. 10, other wells within the wellfield (Nos. 5 and 15) scored "marginal" results that required further testing to determine their GWUDI status. Through subsequent water sampling and analyses performed during mid through late 1997, Wells Nos. 13, 14 and 15 were suspected to be GWUDI. An Agreement was entered into effective March 1998 between Miami-Dade County and the FDEP to institute a program to test and rehabilitate MDWASD's water production wells. The program intended to prevent the occurrence of certain surface water pathogens in water produced by MDWASD.

As a result of this program, Well No. 10 was successfully rehabilitated in early 1998. Wells Nos. 13, 14 and 15 underwent rehabilitation in early 1999. The highlights of the rehabilitation performed on Wells Nos. 13, 14 and 15 are as follows:

- The existing 48-inch diameter casings were pressure grouted with superplasticized Class "H" cement.

- New 40-inch diameter steel casings were installed inside the existing 48-inch casings and extend from land surface to between 54 and 56 feet below land surface (bls).

- A 38-inch diameter pilot hole was then drilled to between 80 and 88 feet bls in each of the wells. Activities performed within the pilot hole included drilling, pumping development, air-lift development, and step-rate pump testing.

- The rehabilitated wells now yield water at specific capacities in excess of 500 gallons per minute per foot of drawdown (gpm/ft) when pumped at rates of between 5,000 gpm and 7,000 gpm.

- Microscopic particulate analyses (MPA) performed on water collected from Wells Nos. 13, 14 and 15 following the rehabilitation indicate that the concentration of particulate matter in water produced from the well has been significantly reduced. EPA Relative Risk Factors are within limits that allow for continued safe operation of the wells by MDWASD.

Section 1

Section 1
Introduction

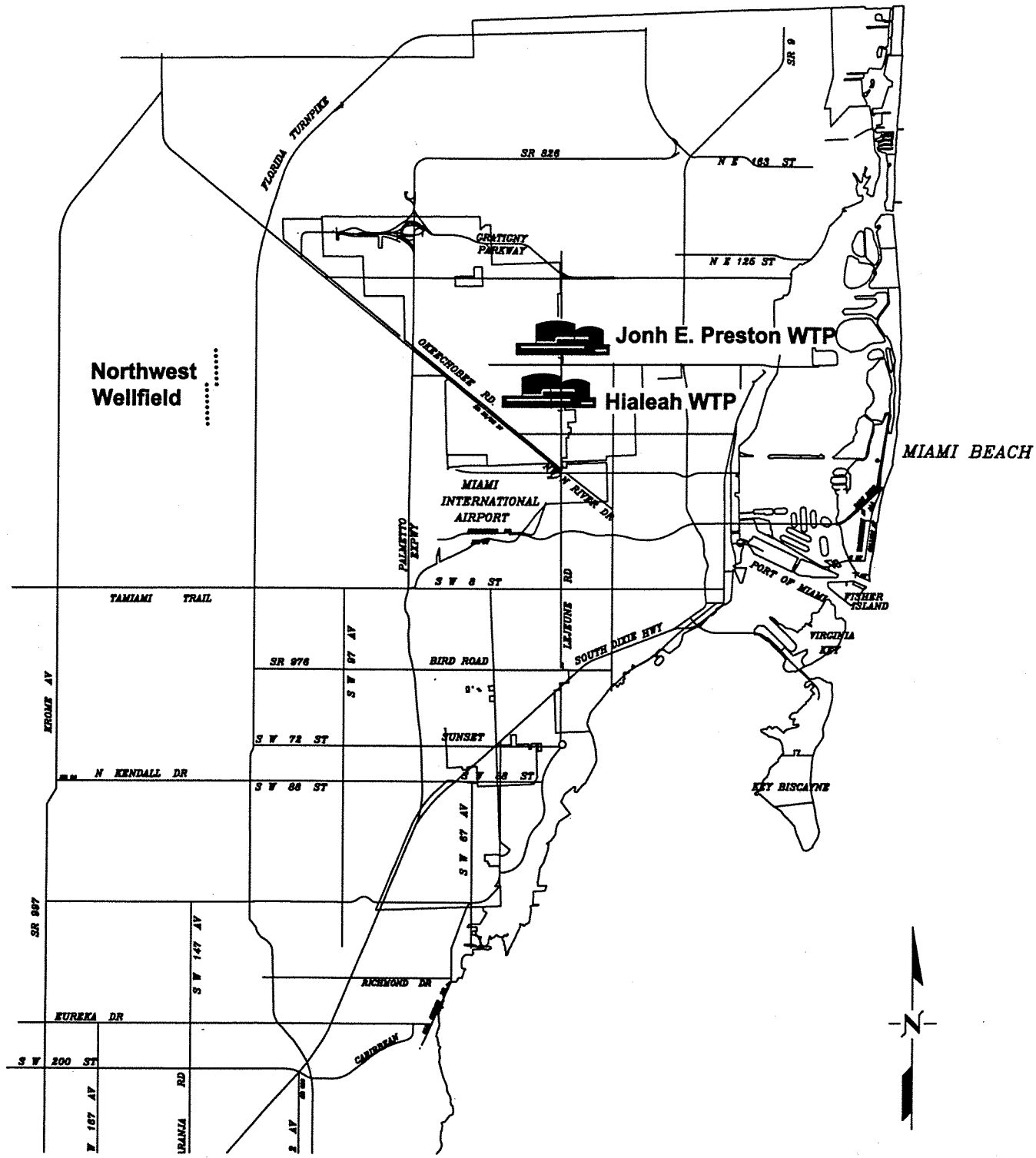
The Miami-Dade Water and Sewer Department's (MDWASD's) Northwest Wellfield consists of fifteen supply wells which provide raw water primarily to the John E. Preston Water Treatment Plant. The Northwest Wellfield is located approximately one mile west of the Florida Turnpike, at the western terminus of N.W. 58 Street. **Figure 1-1** presents the Site Location Map. Each of the supply wells at the Northwest Wellfield is equipped with a 32-inch diameter dual-speed pump rated at design capacity of 10 million gallons of water per day (mgd) and 15 mgd. The total installed withdrawal capacity for the wellfield is 225 mgd. The average day permitted capacity of the Northwest Wellfield is currently 165 million gallons (equivalent to 60.23 billion gallons per year), as contained in MDWASD's South Florida Water Management District Consumptive Water Use Permit (No. 13-00037-W).

Water collected from the wells within the Northwest Wellfield was sampled and analyzed by the microscopic particulate analysis (MPA) method by the Florida Department of Environmental Protection (FDEP) between 1995 and 1996. This sampling was conducted by the FDEP during a state-wide evaluation of community water supply systems, as required by the Safe Drinking Water Act.

In January 1997, the MDWASD received notification from the FDEP that Well No. 10 in the Northwest Wellfield had received score results that designated the well as producing groundwater under the direct influence of surface water (GWUDI). In addition to Well No. 10, other wells within the wellfield (Nos. 5 and 15) scored "marginal" results that required further testing to determine their GWUDI status. Subsequent water sampling and analyses performed between 1997 and 1998 indicated that Wells Nos. 13, 14 and 15 were suspected to be GWUDI. As a result of these findings, the wells identified were required to undergo rehabilitation, as per an Agreement signed between MDWASD and the FDEP. The Agreement was entered into effective March 1998 instituting a program to test and rehabilitate MDWASD's water production wells. The program intended to prevent the occurrence of certain surface water pathogens in water produced by MDWASD. A copy of the Agreement is presented in **Appendix A.**

Tests performed on Well No. 10 during a 1997 wellhead investigation conducted by the MDWASD and Montgomery Watson indicated that a possible "short-circuit" of flow around the outside of the casing may have been the cause of particulate matter contained in water collected from the well. Well No. 10 was successfully rehabilitated in early 1998. The results from that demonstration project are included in a report entitled "Rehabilitation of Production Well No. 10 at the Northwest Wellfield" by Montgomery Watson dated May 1999. Wells Nos. 13, 14 and 15 underwent similar rehabilitations in early 1999.

This report presents the sequence of the rehabilitation, including the methods and materials used during the work at Wells Nos. 13, 14 and 15. Tests conducted throughout the rehabilitation are also presented, along with an interpretation of the results. This report also includes new geophysical and hydrogeologic findings that have resulted from performance of this work and a summary of the quality of water now produced from the wells.



MONTGOMERY WATSON	Site Location Map	Figure 1-1

Section 2

Section 2
Wellfield Construction and Testing

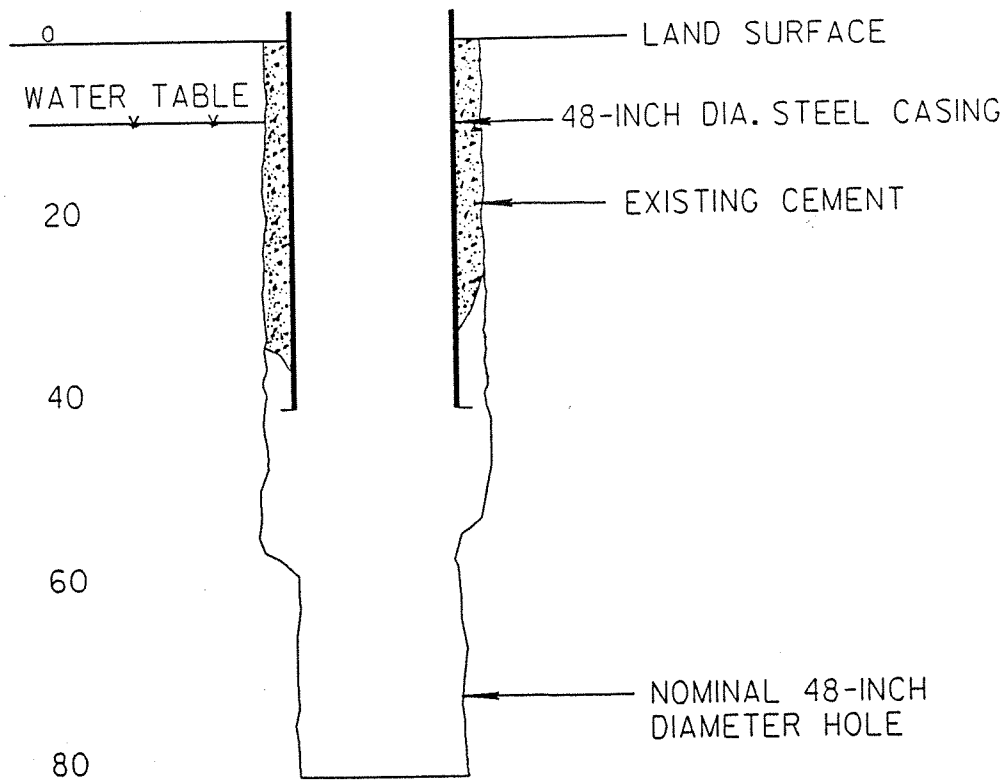
The fifteen (15) supply wells comprising the Northwest Wellfield were built in 1981 by the Alsay-Pippin Corporation of Lake Worth, Florida. **Table 2-1** presents well construction details for MDWASD's water supply wells prior to rehabilitation. A typical as-built construction diagram of a supply well at the Northwest Wellfield is presented on **Figure 2-1.** The supply wells were drilled by the mud-rotary method, where drilling mud is circulated (pumped) down through a hollow drill pipe and out, into the borehole through nozzles in a rotary drilling bit. The drilled rock cuttings and mud then flow up, around the outside of the drill bit and pipe to the surface, where the mud is then filtered and re-pumped back down the drill pipe. The mud-rotary drilling method is a conventional drilling method in southern Florida, and is particularly useful in obtaining accurate samples of the geologic formations penetrated during drilling.

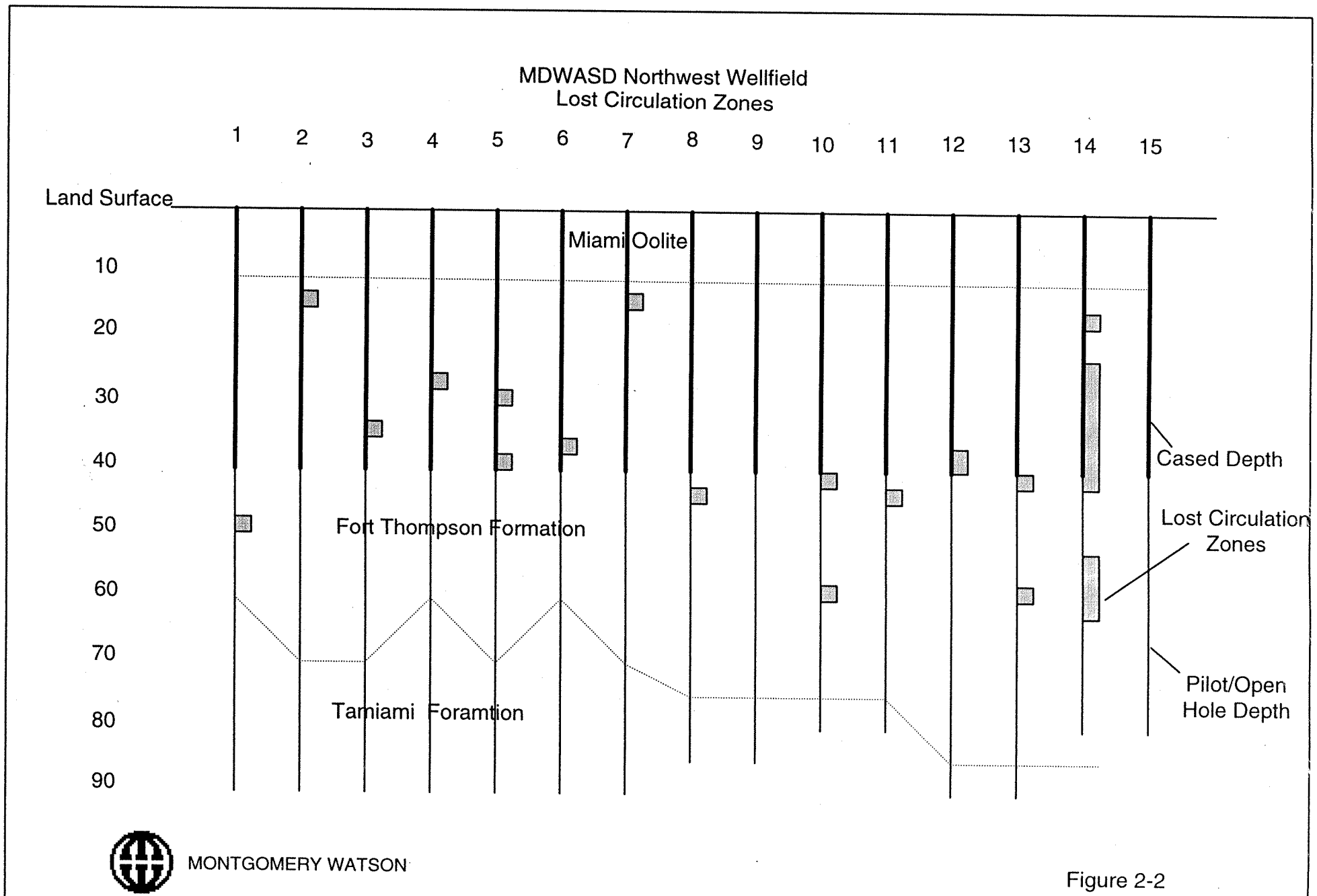
Table 2-1. Description of Wells - Northwest Wellfield

Well No.	1 thru 7	8 thru 15
Map Designation B-2(d)	1 thru 7	8 thru 15
Existing/Proposed	Exist	Exist
Diameter (inches)	48 inches	48 inches
Total Depth	80 feet	80 feet
Cased Depth	46 feet	46 feet
Screened Interval	N/A	N/A
Pumped or Flowing	Pumped	Pumped
Working Value. If Artesian (Yes/No)	N/A	N/A
Pump Manufacturer and Model No.	Byron Jackson Model 32 RXL	Byron Jackson Model 32 RXL
Pump (Centrifugal, Type Jet, Deep Jet, Turbine, etc.)	Vertical turbine	Vertical turbine
Intake Depth (NGVD)	40 feet	40 feet
Pump Capacity (GPM at _ft of head at _PSI)	7600 gpm @ 104 feet	7600 gpm @ 104 feet
Active (Yes/No)	Yes	Yes
Year Drilled	1981	1981
Type of Meter	Meter at plant	Meter at plant
Florida Plane Coordinates	SEC 14 TWP 53 RGE 39	SEC 11 TWP 53 RGE 39

A nominal 54-inch diameter borehole was drilled to a depth of approximately 45 feet bls at each of the supply wells at the Northwest Wellfield. Numerous "lost circulation" zones were encountered within the Biscayne aquifer during the drilling of these boreholes. Lost circulation is a condition whereby the formation is so porous and permeable that the drilling mud fills voids in the formation and there is insufficient mud volume in the circulation system for the fluid to be pumped back to surface. In response to this condition, it is typical for the drilling contractor to add significant quantities of additional mud and/or other additives to increase the viscosity (thicken) of the drilling fluid, in order to regain circulation. **Figure 2-2** presents a cross section of the depths of the lost circulation zones as recorded in the original drilling records during the construction of the wellfield.

EXISTING WELL CONFIGURATION





MONTGOMERY WATSON

Figure 2-2

Steel casings (48-inch diameter) were installed to depths of between 40 and 45 feet bls. The casings were then held suspended in tension within the mud-filled hole and cemented by the "pressure grouting" technique. Pressure grouting involves lowering an open-ended tremie pipe to near the base of the casing to be cemented. The tremie pipe is then affixed and sealed to the top of the casing by a "pressure header" coupling. Cement is then pumped down the tremie pipe, and forced into the annular space between the casing and the drilled hole. The fluid column between the outside of the tremie pipe and the inside of the casing remains sealed during this process by the pressure header, and prevents the cement from filling the inside of the casing. The cement is pumped this way under pressure, from "bottom to top" until it reaches land surface.

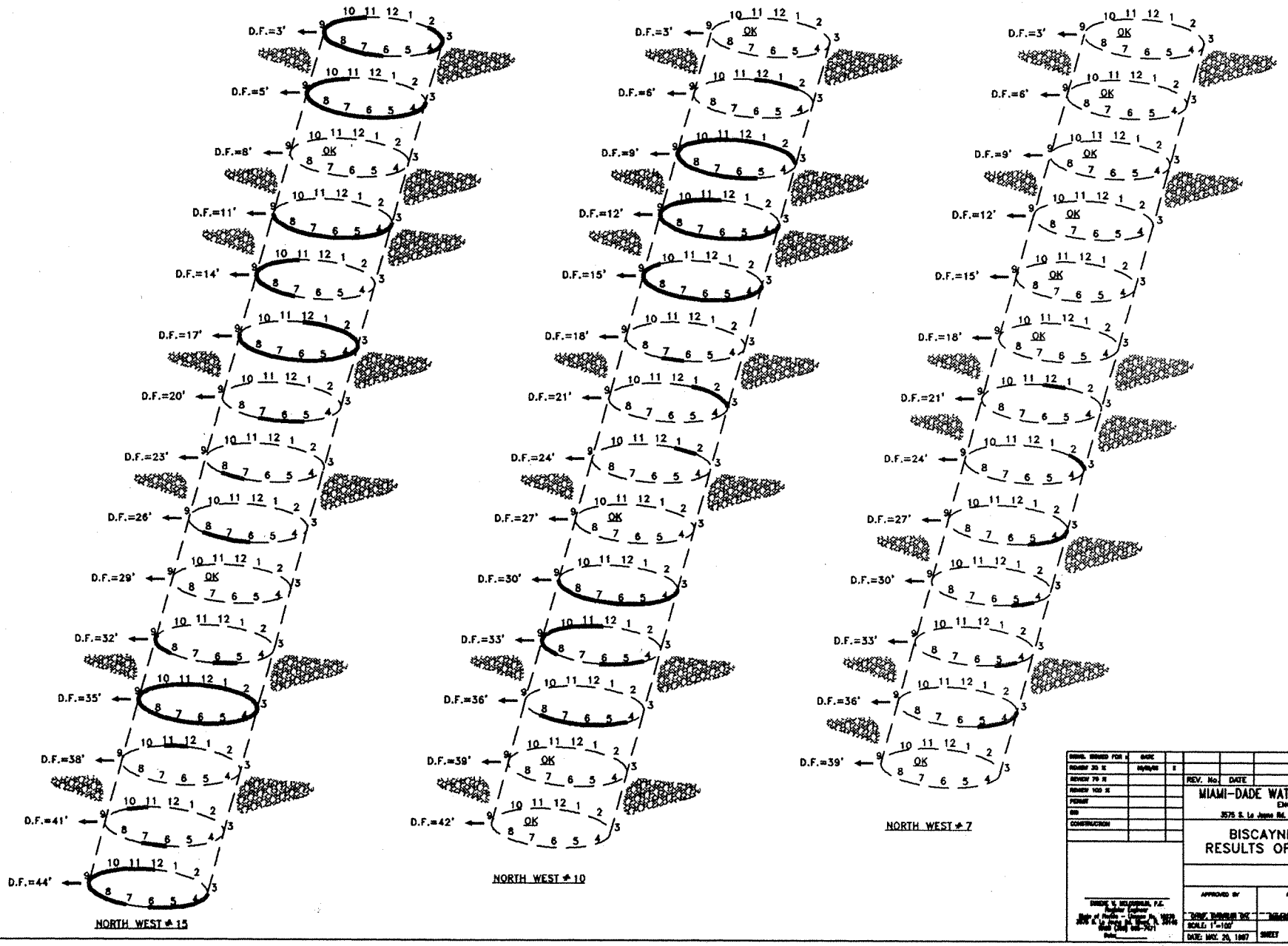
Typically, the cement will fill the annulus around the casing and the drilled hole, resulting in a complete seal around the casing as the cement rises to the surface. For this reason, the pressure grouting technique is a conventional method of cementing in southern Florida. However, when the drilling mud within the hole has been thickened extensively, there is a potential for the pumped cement to rise as "fingers", resulting in uncemented channels behind the casing. These uncemented zones could ultimately create a connection (short-circuit) between surface water and the borehole of the supply well.

Open Hole Completions

After the cement behind the 48-inch diameter casings was allowed to harden, the contractor proceeded to drill out the open holes. At first, the bit was lowered to near the bottom of the casing and the cement "plug" was drilled out. The process of drilling the plug should be done slowly and carefully, so as to prevent the bit from "clanking" violently against the inside bottom of the well casing. If care is not taken during this process, the cement around the outside of the well casing could be broken off, resulting in an incomplete cement seal near the base of the casing. This condition could create a potential short-circuit that might exist in the annular space around the well casing. The original open holes of the wells were drilled with a 32-inch diameter bit to a depth of about 80 feet bls.

1997 Tapping Test Results

Figure 2-3 presents the results of "tapping tests" conducted on Wells No. 7, 10 and 15 in the Northwest Wellfield during 1997. For these tests, a hammer was used to tap the circumference of the inside of the well casing at regular (3-foot) intervals. Evaluation of the soundings has been used to estimate the presence or absence of a cement bond behind the casing. The results of the test indicated that a "hollow" sound (implying the lack of a cement bond) was recorded along portions of the casing between depths of 6 feet to 24 feet bls and between 30 feet to 36 feet bls. These results indicated that although the casing was pressure grouted, the cement may have channeled along sections of the annulus. The diver observed that there was very little cement located near the base of the original well casings at Wells Nos. 10 and 15. In contrast, few hollow areas were detected at Well No. 7, which was cleared of the GWUDI classification.


D.F.=3'
D.F.=5'
D.F.=8'
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D.F.=26'
D.F.=29'
D.F.=32'
D.F.=35'
D.F.=38'
D.F.=41'
D.F.=44'
NORTH WEST # 15
D.F.=3'
D.F.=6'
D.F.=9'
D.F.=12'
D.F.=15'
D.F.=18'
D.F.=21'
D.F.=24'
D.F.=27'
D.F.=30'
D.F.=33'
D.F.=36'
D.F.=39'
D.F.=42'
NORTH WEST # 10
D.F.=3'
D.F.=6'
D.F.=9'
D.F.=12'
D.F.=15'
D.F.=18'
D.F.=21'
D.F.=24'
D.F.=27'
D.F.=30'
D.F.=33'
D.F.=36'
D.F.=39'
NORTH WEST # 7
MIAMI-DADE WATER AND SEWER DEPARTMENT
ENGINEERING DIVISION
BISCAYNE AQUIFER WELLS
RESULTS OF SOUNDING CASINGS

Figure 2-3

Pre-Rehabilitation Microscopic Particulate Analysis Sampling

In response to FDEP's GWUDI designation letter of January 1997, MDWASD initiated an intensive microscopic particulate analysis (MPA) sampling program at each of the wells in the Northwest Wellfield. **Table 2-2** presents a summary of the MPA data collected from each of Wells Nos. 13, 14 and 15 resulting from that effort.

Table 2-2. Summary of Pre-Rehabilitation MPA Data from Wells No. 13, 14 and 15

	EPA Relative Risk Factors		
Date	**Well No. 13**	**Well No. 14**	**Well No. 15**
9/6/95	30	14	14
9/13/95	0	4	0
10/4/95	0	No sample this date	4
10/11/95	9	No sample this date	10
12/19/95	0	4	0
2/14/96	20	20	12
2/21/99	2	No sample this date	4
3/6/99	15	No sample this date	14
3/13/96	4	No sample this date	4
5/22/97	No sample this date	No sample this date	12
6/11/97	No sample this date	No sample this date	10
6/16/97	No sample this date	No sample this date	17
6/18/97	12	17	No sample this date
6/25/97	No sample this date	No sample this date	23
7/9/97	1	No sample this date	No sample this date
7/16/97	No sample this date	5	4
8/13/97	0	No sample this date	No sample this date
8/20/97	No sample this date	5	5
8/26/97	No sample this date	No sample this date	0
9/17/97	1	No sample this date	6
10/8/97	No sample this date	No sample this date	0
10/15/97	4	4	No sample this date
11/19/97	No sample this date	No sample this date	0
12/15/97	No sample this date	No sample this date	4
1/13/98	No sample this date	No sample this date	4
2/11/98	No sample this date	No sample this date	4

Section 3

Section 3
Hydrogeology

Regional Geologic Setting

Northwestern Miami-Dade County is underlain by geologic units consisting of limestone and sand exhibiting varying permeability from land surface to approximately 160 feet bls. The geologic formations most typically present within this section are the Miami Oolite, the Fort Thompson Formation, and the Tamiami Formation. **Figure 3-1** presents a regional stratigraphic cross section of the surficial sediments and geologic formations in the Northwest Wellfield area. These units form the surficial aquifer system, and comprise the primary source of potable water in southern Florida (Fish, 1991). The Miami Oolite forms the top of the surficial aquifer system in Miami-Dade County and is typically between 10 and 15 feet thick, with a hydraulic conductivity of greater than 1,000 feet per day (ft/day). Lying below the Miami Oolite is the Fort Thompson Formation, which is typically a cream to white-colored fossiliferous shelly limestone. The Fort Thompson Formation is approximately 60 feet thick in the Northwest Wellfield area and contains numerous solution-enhanced porosity features. This formation typically exhibits hydraulic conductivities of up to 10,000 ft/day in the Northwest Wellfield area. Lying below the Fort Thompson Formation is the Tamiami Formation, which is described as gray-colored sandy limestone. The Tamiami Formation is approximately 70 feet thick in the Northwest Wellfield area and exhibits hydraulic conductivities of up to 1,000 ft/day.

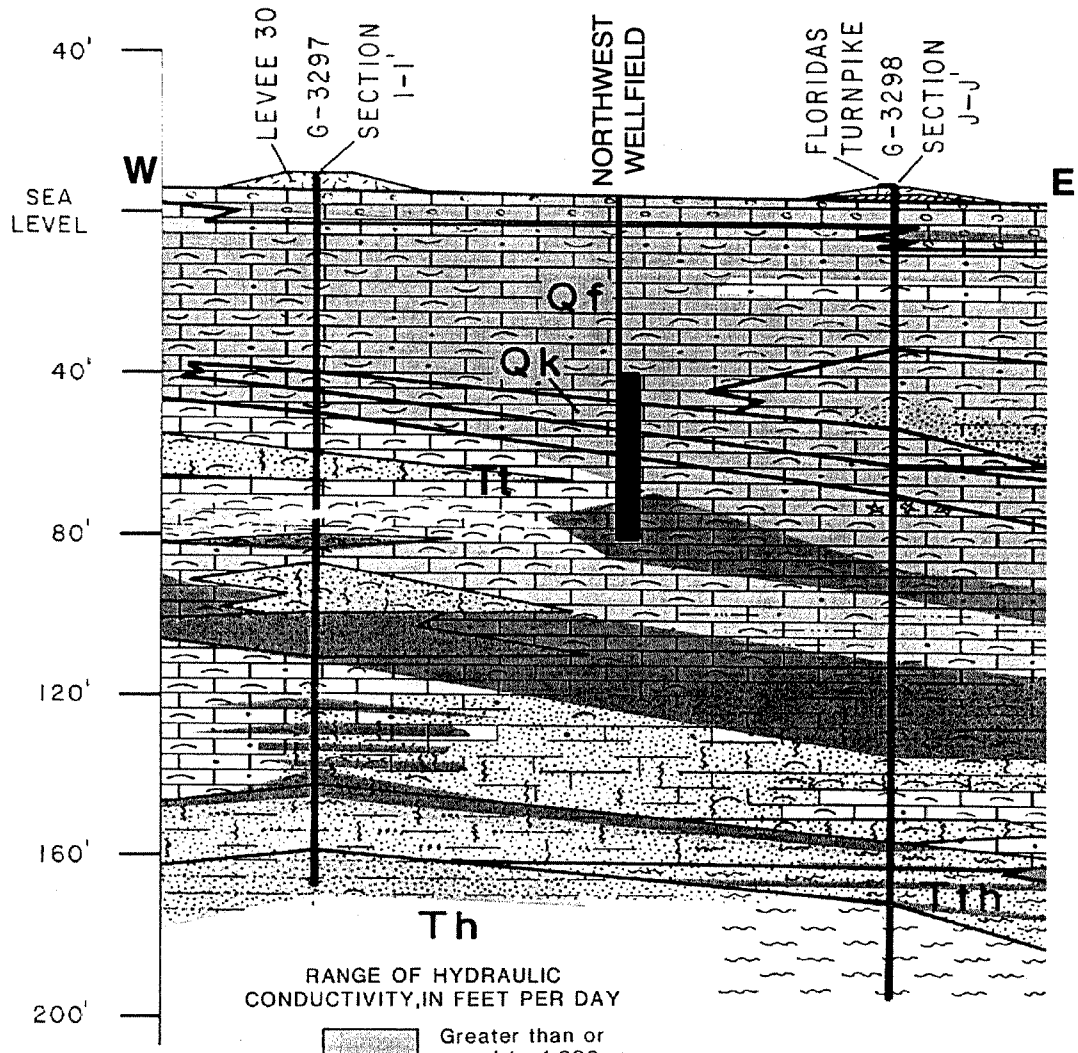
The surficial aquifer is an unconfined aquifer, recharged by rain water and surface-water features such as canals, wetlands and lakes. Contained within the surficial aquifer system (typically within the Fort Thompson Formation) is a highly permeable unit referred to as the Biscayne aquifer, in which most public supply wellfields in southeastern Florida are completed. Lying below and separating the surficial aquifer system from lower aquifer systems are the lower permeability clay-rich sediments of the Hawthorn Formation.

Wellfield Stratigraphy

Figure 3-2 presents a hydrostratigraphic cross section developed from the original lithologic and construction descriptions of the wells within the Northwest Wellfield. The figure reveals that a horizon of white to tan-colored limestone extends from near land surface to a depth of approximately 50 feet bls in the southern portion of the wellfield. This horizon is identified as the Fort Thompson Formation. This formation thickens to approximately 70 feet from the southern portion of the wellfield to the northern portion of the wellfield. Numerous lost circulation zones were documented in the driller's logs of this formation, which contains the water-bearing zones of the Biscayne Aquifer. The transmissivity of this unit is approximately 1,300,000 feet squared per day within the wellfield, as estimated from the specific capacity data collected from the wells during the original wellfield construction.

Below the upper Fort Thompson Formation, the limestones become gray-colored, and contain higher quantities of sand. This change in lithology was contiguous across the wellfield and is herein identified as the Tamiami Formation. The top of this formation was encountered at a

Regional Stratigraphic Cross Section



RANGE OF HYDRAULIC CONDUCTIVITY, IN FEET PER DAY

- Greater than or equal to 1,000
- 100 to 1,000
- 10 to 100
- 0.1 to 10
- Less than or equal to 0.1

- Fill
- Peat or muck
- Sand
- Sandstone
- Detrital carbonate sand
- Rock fragments
- Concretions
- Marine shells
- Freshwater shells
- Silt
- Clay
- Claystone or siltstone
- Micrite, lime mud
- Limestone
- Oolitic limestone
- Coralline limestone, biolithite

GEOLOGIC FORMATIONS

Ql	Lake Flirt Marl
Qp	Pamlico Sand
Qm	Miami Oolite
Qa	Anastasia Formation
Qk	Key Largo Limestone
Qf	Fort Thompson Formation
Tt	Tamiami Formation
Th	Hawthorn Formation
Tth	Tamiami Formation and Hawthorn Formation undifferentiated

Formation boundary

G-3295 Test well and number

0 5 10 MILES

0 5 10 KILOMETERS

Vertical Scale Greatly Exaggerated

Well with Open Hole Completion

Source: Fish, J.E. and Stewart, M., 1991. Hydrology of the Surficial Aquifer System, Dade County, Florida. USGS Water-Resources Investigations Report 90-4108

Figure 3-1

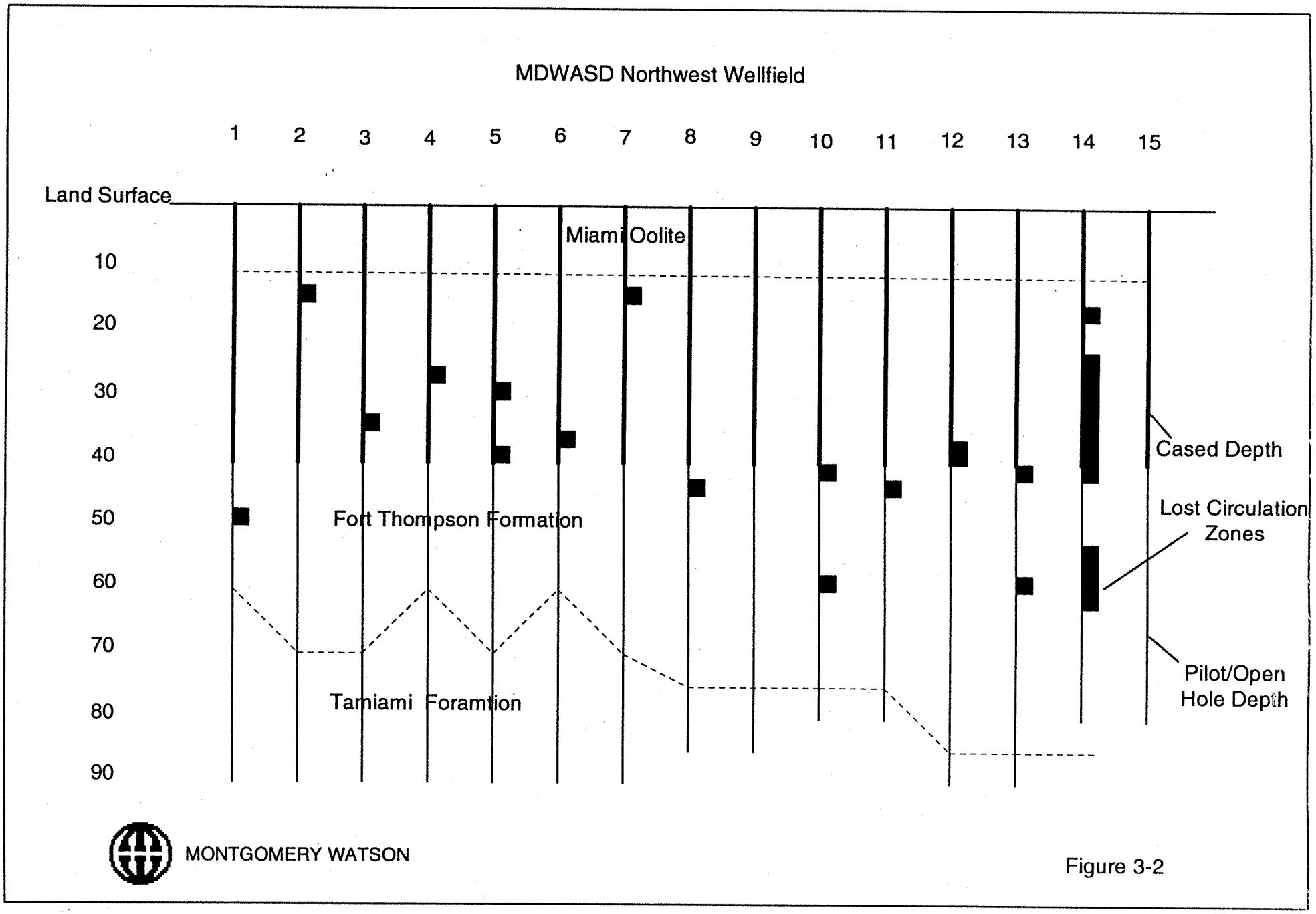

MDWASD Northwest Wellfield
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
Land Surface
10
20
30
40
50
60
70
80
90
Miami Oolite
Fort Thompson Formation
Tamiami Foramtion
Cased Depth
Lost Circulation Zones
Pilot/Open Hole Depth
MONTGOMERY WATSON

Figure 3-2

depth of approximately 60 feet bls in the southern portion of the wellfield. Within the northern portion of the wellfield, it was encountered at a depth of 80 feet bls.

Findings from the Rehabilitation Project at Well No. 10

During the drilling, deepening and testing of Well No. 10, lithologic samples were collected and described. The lithologic samples provided a detailed characterization of the geologic units present at the Northwest Wellfield. Cuttings collected from near the base of the 40-inch casing were comprised of white to cream-colored limestone to a depth of approximately 80 feet bls (representing the Fort Thompson Formation). Cuttings within the interval from 40 feet to approximately 60 feet bls exhibited very high porosity, in the form of large solution channels and vugs. Below the depth of 60 feet bls, the samples exhibited relatively thin zones of macro-porosity separated by denser zones with more "pinpoint" and intergranular-type porosity.

Below the depth of 80 feet bls, the limestone became dark gray-colored, and exhibited relatively low porosity. This formation was interpreted to represent the Tamiami Formation. Limestone was present to a depth of approximately 95 feet bls. Below this depth, the strata became loosely-consolidated and was comprised primarily of shell fragments and fine sand. These sediments were very soft and penetrated easily during drilling. At a depth of approximately 115 feet bls, the sediments contained a significant percentage of dark gray-colored clay. At a depth of 120 feet bls, the sediments were comprised entirely of clay. This clay was interpreted as representing the uppermost sediments of the Hawthorn Formation. The entire penetrated thickness of the sediments comprising the surficial aquifer system at the Northwest Wellfield was therefore estimated at 115 feet.

Test Borings at Wells Nos. 13, 14 and 15 Installed by PSI

Test borings were drilled adjacent to Wells Nos. 13, 14 and 15 during September 1998 by PSI, Inc., through the use of the "dual-tube" rotary drilling method. This drilling method utilizes an inner coring tube suspended within an outer drilling tube. Both tubes are advanced as the borehole is drilled. Mud, air or water is pumped down the annular space between the tubes and circulated up around the outside of the core barrel. The rock cuttings (and often entire cored sections) produced as the drill bit penetrates the formation are preserved within the inner barrel. This method provides for excellent recovery of depth-specific cuttings and cores with very little mixing of unconsolidated materials within the drilled hole. The site-specific information collected from the test borings is presented in a Technical Memorandum contained in **Appendix B.**

Section 4

Section 4
Well Rehabilitation and Testing

In October 1998, Youngquist Brothers, Inc. (Youngquist), a Fort Myers based well contractor, was awarded the contract (No. W-801) for the construction rehabilitation of Wells Nos. 13, 14, and 15. Youngquist mobilized to the wellfield during January 1999 and constructed a rotating head assembly within the Well No. 15 wellhouse. A generalized sequence of work was then followed for each well, which consisted of:

1. Brush well casing and perform an alignment test on the 48-inch casing.
2. Conduct a pre-rehabilitation video survey, caliper log and flowmeter log.
3. Backfill the open hole with gravel and fine grained sand.
4. Perform specific capacity tests at intervals of every 10 feet during open hole backfilling.
5. Perform a pressure grout of the 48-inch casing.
6. Perform a hydrostatic pressure test on 48-inch casing.
7. Drill out the cement plug and ream the open hole to 60 feet bls.
8. Install 40-inch diameter casing to approximately 56 feet bls.
9. Perform a pressure grout of the 40-inch casing.
10. Drill out the cement plug and ream the open hole to 80 feet bls.
11. Perform a hydrostatic pressure test of 40-inch casing using inflatable packer.
12. Perform air-lift and pump development.
13. Perform a post-rehabilitation video survey, caliper log, flowmeter survey and step-rate pump test.
14. Disinfect the well and place the well back into service after obtaining clearance from the Department of Health.
15. Perform water quality and MPA sampling to evaluate the effectiveness of rehabilitation.

Well No. 15 Rehabiliation

On January 15, 1999, a caliper survey and stationary flowmeter log was performed along the entire length of the well casing and open hole of Well No. 15. Copies of the geophysical surveys performed on Well No. 15 are contained in **Appendix D.** The caliper survey revealed that the 48-inch diameter well casing extended to a depth of 42 feet bls and the open hole of the well extended to 76 feet bls. The open hole immediately below the casing exhibited a diameter similar to that of the casing to a depth of approximately 50 feet bls. Several portions of the open hole below 50 feet bls were restricted to a diameter of approximately 32 inches, representing the diameter of the bit used to drill the open hole. Numerous thin zones displaying larger diameters were also present within the borehole.

Backfilling and Specific Capacity Tests

Prior to infilling the open hole with fine sand and gravel, Youngquist performed a brief specific capacity test on Well No. 15. During the test, the well was pumped at a rate of 7,100 gpm. A total of approximately 3 feet of drawdown was observed in the well, equating to a specific capacity of 2,700 gpm/ft. The open hole was then backfilled with fine sand to a depth of 70 feet

bls and the well was again pumped at a rate of 7,100 gpm. The specific capacity of the well was not observed to change significantly as a result of the modification of the borehole. Youngquist then backfilled the open hole from 70 feet bls to 60 feet bls and again pumped the well at a rate of 7,100 gpm. The specific capacity of the well was not observed to change significantly as a result of the modification of the borehole. These results were interpreted to mean that the open hole from below 60 feet bls did not contribute significant quantities of water to the well during pumping. Conversely, that meant that most of the water coming into the well was from above 60 feet bls.

Youngquist then backfilled the open hole from 60 feet bls to 50 feet bls. In this configuration, flow of water into the well was coming from between the base of the casing at 42 feet bls and 50 feet bls. The well was then pumped at a rate of 6,000 gpm. A drawdown of approximately 4 feet was observed, equating to a specific capacity of 1,400 gpm (representing a 40% decline from the specific capacities recorded earlier). The results were interpreted to mean that the interval from 50 feet bls to 60 feet bls contributed some water to the well, and would be available to contribute water after the new casing was set deeper in the aquifer. In addition, the interval from just below the casing (from 42 feet bls to 50 feet bls) was also contributing significant quantities of water to the well, and might be the source of "short circuit" water coming from around the outside of the 48 inch casing. **Figure 4-1** presents a hydrogeologic interpretation of the results from the backfilling specific capacity tests conducted on Well No. 15. Subsequently, Youngquist backfilled the remaining portion of the open hole (from 50 feet bls to 44 feet bls) with gravel and fine sand, in preparation for performing the pressure grout operation on the 48-inch casing.

Pressure Grouting Operation

On January 25, 1999 a pressure grout operation was conducted on the existing 48-inch casing of Well No. 15. Prior to the actual cementing operation, a pressure header was welded to the top of the 48-inch casing. The pressure header was configured to allow the passage of a 4-inch diameter tremie pipe, which was installed to a depth of 40 feet bls (just above the base of the 48-inch well casing). Class "H" cement containing a 2.5% component of Daracem-19, a superplasticizer manufactured by W.R. Grace Co. was then pumped through the tremie pipe, into the well. The superplasticizer was added to the cement to act as a "wetting agent", enhancing the ability of the cement to flow into small cracks, voids and interstices within the formation. A total of 188 cubic feet of Class H cement was emplaced under a maximum recorded wellhead pumping pressure of 1.5 pounds per square inch (psi). The cement was then left to harden overnight.

Reaming Operation and Liner Installation

Youngquist then drilled the cement plug and open hole with the reverse-air method to a nominal diameter of 46 inches. Reaming was accomplished with a staged drill bit assembly utilizing a 12-inch diameter stinger (pilot) bit followed by a 46-inch diameter reaming bit. During the drilling operation, a bit rotation of approximately 30 revolutions per minute was maintained. The weight on the bit was maintained between a range of approximately 500 pounds to 1,000 pounds. During the reaming operation, cuttings and lithologic samples were collected at 5-foot intervals. The reaming operation proceeded to a depth of 62 feet bls, in preparation for installing the new 40-inch diameter (0.375-inch wall thickness) steel liner to a depth of 58 feet bls. The liner was comprised of two 40-foot long segments of steel pipe, which were connected by a

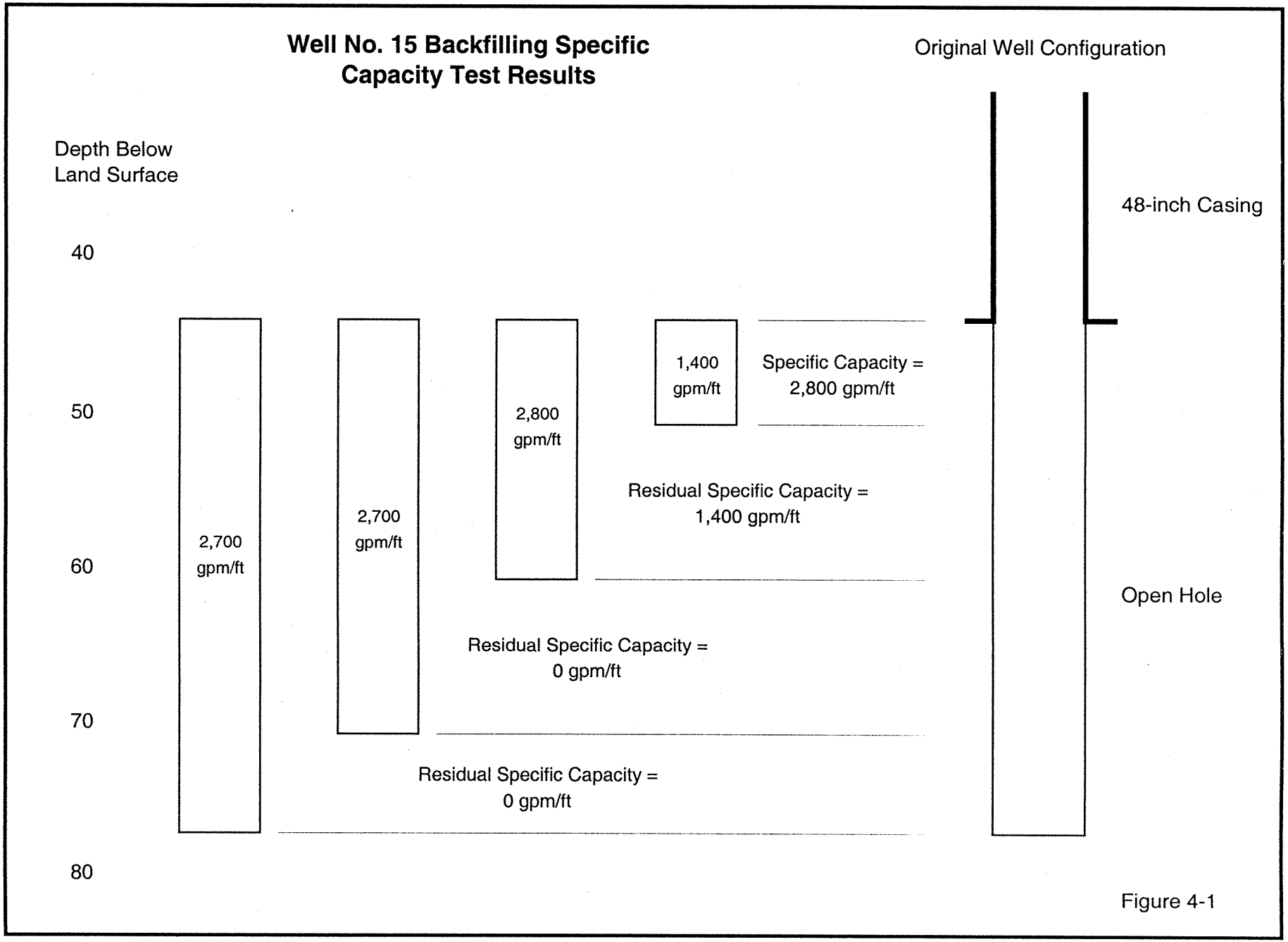

Well No. 15 Backfilling Specific Capacity Test Results
Original Well Configuration
Depth Below Land Surface
40
50
60
70
80
48-inch Casing
Open Hole
2,700 gpm/ft
2,700 gpm/ft
2,800 gpm/ft
1,400 gpm/ft
Specific Capacity = 2,800 gpm/ft
Residual Specific Capacity = 1,400 gpm/ft
Residual Specific Capacity = 0 gpm/ft
Residual Specific Capacity = 0 gpm/ft

Figure 4-1

welded joint. Welding was performed by a Florida certified welder. The lower portion of one of the pipes was then cut so that the total length of the connected pipe was 58 feet. A cementing header was welded to the top of the liner. Centralizers were welded around the pipe at 90-degree spacings at installed depths of 10 feet bls, 30 feet bls, 46 feet bls and 57 feet bls. The liner was lowered into the well with a crane.

Liner Testing and Grouting

After the liner was lowered to a total depth of 58 feet bls, an alignment test was conducted. A plummet possessing a maximum external diameter of 39 inches passed freely to the bottom of the liner, showing no detectable deviation. A tremie pipe was then lowered through the header, to depth of 50 feet bls. Two attempts were made to cement the liner in place while at a depth of 58 feet bls. Two stages of cement were pumped with no detectable returns or fill-up in the annular space around the casing. It was then decided to lift the 40-inch liner to a depth of 54 feet bls and attempt to cement it in place at that position. The open hole was then backfilled with fine sand to a depth of 55 feet bls and the liner was prepared for cementing. Cementing took place in two stages. The first stage took place on January 26, 1999 during which 435 cubic feet of cement were emplaced. The second stage was emplaced on February 1, 1999 during which 25 cubic feet of cement were emplaced. During the second stage of emplacement, cement was observed to return to the surface, indicating the annular fill-up had been achieved.

Over the next two weeks, several unsuccessful attempts were made to perform a hydrostatic pressure test on the 40-inch casing using the cement plug emplaced at the base of the casing. It was then decided that the open hole would be drilled and an inflatable packer would be used to perform the test. The open hole of the well was then drilled to a depth of 88 feet bls using a 38-inch diameter bit. Following drilling to the total depth of the well, a hydrostatic pressure test was successfully conducted on the well casing using an inflatable packer set at the base of the 40-inch casing.

Development and Pumping Test

Reverse-air development took place by utilizing compressed air forced through the drill bit assembly. The air exited out at holes located at the drill bit, forcing cuttings and water up, out the discharge hose (routed out of the roof of the wellhouse) at rates of approximately 500 gallons per minute. The drill pipe and bit assembly was raised and lowered along the entire length of the open hole (from 54 feet bls to 88 feet bls) for a 20-hour period during this process. After air-lift development was complete, the centrifugal pump assembly was again lowered into the well, to begin pumping development at rates between 3,000 gpm and 8,000 gpm. Pumping development took place for a total of 20 hours.

During pumping development, a flowmeter log and video survey (conducted by MDWASD) were performed. A copy of the flowmeter log is contained in **Appendix D**. Upon the completion of the pumping development for the day, a caliper log was also conducted. Analysis of these logs indicated that most of the water produced by the well was flowing into the open hole from the interval between 55 feet bls and 65 feet bls.

On April 5, 1999 Well No. 15 was tested at a variety of pumping rates, which were achieved by adjusting a valve mounted on the 24-inch diameter discharge piping. The results of the specific

capacity testing conducted are summarized on **Table 4-1.** An as-built diagram of the re-completed well is presented on **Figure 4-2.** Youngquist Bros. subsequently filed a Well Completion Report at the SFWMD, a copy of which is included in **Appendix C.**

Table 4-1. Well No. 15 Step-rate pumping test summary

Pumping Rate (gpm)	Water Level (fbls)	Drawdown (ft)	Specific Capacity (gpm/ft)
0	7.8	0	0
2,100	9.0	1.25	1,680
3,800	11.2	3.40	1,120
5,600	14.0	6.25	900
7,000	17.8	10.0	700

Upon completion of the step-rate pumping test, MDWASD reinstalled the permanent pump in Well No. 15. The well was then disinfected by Youngquist and subjected to bacteriological testing.

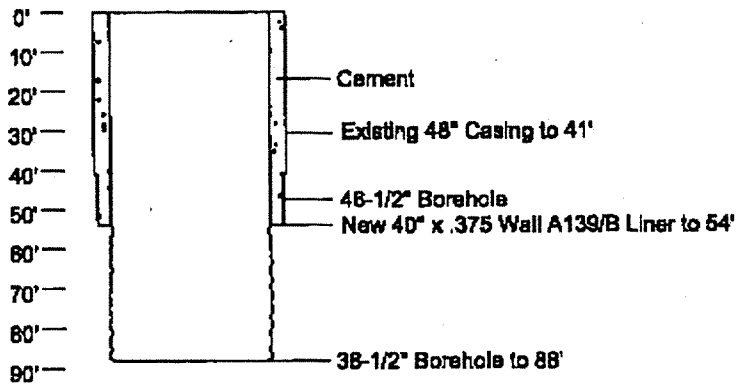
Well No. 14 Rehabilitation

On April 21, 1999 mobilized to Well No. 14. The well was then brushed and subjected to a casing alignment test and caliper survey. Copies of the geophysical logs for Well No. 14 are contained in **Appendix E.** The geophysical surveys indicated that the 48-inch diameter well casing extended to a depth of 41 feet bls and the open hole extended to a total depth of 78 feet bls.

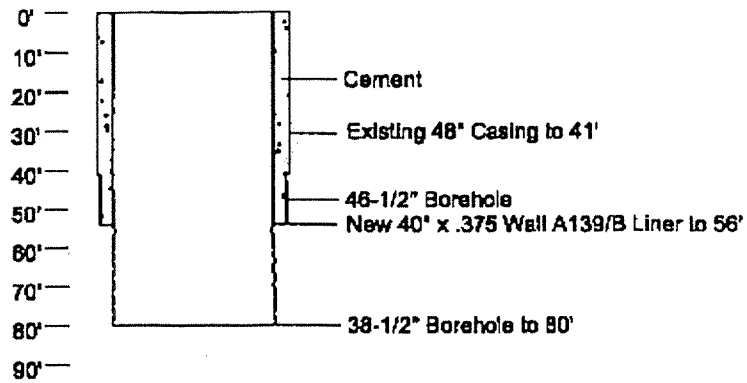
Backfilling and Specific Capacity Tests

Youngquist performed a brief specific capacity test on Well No. 14 on April 21, 1999 prior to backfilling the open hole with sand and gravel. During the test, the well was pumped at a rate of 7,500 gpm. A total of approximately 5.3 feet of drawdown was observed in the well, equating to a specific capacity of 1,400 gpm/ft. The open hole was then backfilled with fine sand to a depth of 70 feet bls and a the well was again pumped at a rate of 7,500 gpm. The specific capacity of the well was not observed to change significantly as a result of the modification of the borehole. Youngquist then backfilled the open hole from 70 feet bls to 60 feet bls and again pumped the well at a rate of 5,000 gpm. The specific capacity of the well was observed to decline to 1,190 gpm/ft with the well in this configuration. These results were interpreted to mean that the open hole from below 60 feet bls contributed relatively modest quantities of water to the well during pumping. Conversely, that meant that most of the water coming into the well was from above 60 feet bls.

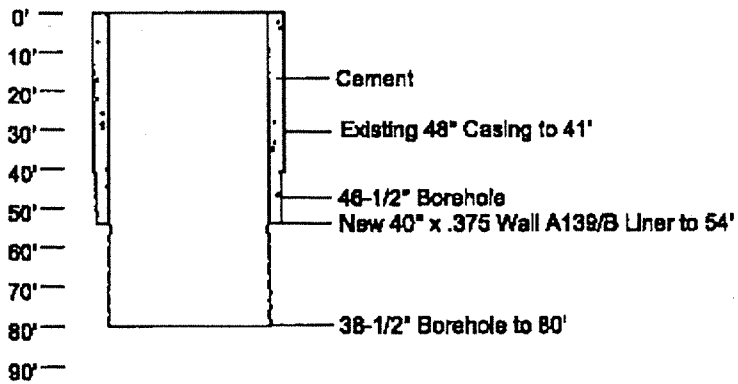
Youngquist then backfilled the open hole from 60 feet bls to 50 feet bls. In this configuration, flow of water into the well was coming from between the base of the casing and 50 feet bls. The well was then pumped at a rate of 3,600 gpm. A specific capacity of 1,160 gpm was observed



NW # 15



NW # 13



NW # 14

Record Drawings

Youngquist Brothers, Inc.	Miami-Dade Contract W-801
15465 Pine Ridge Road	July 12, 1999
Ft. Myers, Florida 33908	Drawn by: DC

Figure 4-2

with the well in this configuration. The results were interpreted to mean that the interval from 50 feet bls to 60 feet bls contributed a relatively small quantity of water to the well. In addition, the interval from just below the casing (from 42 feet bls to 50 feet bls) was also contributing significant quantities of water to the well, and might be the source of "short circuit" water coming from around the outside of the 48 inch casing. **Figure 4-3** presents a hydrogeologic interpretation of the results from the backfilling specific capacity tests conducted on Well No. 14. Subsequently, Youngquist backfilled the remaining portion of the open hole with gravel and fine sand, in preparation for performing the pressure grout operation on the 48-inch casing.

Pressure Grouting Operation

On April 26, 1999 a pressure grout operation was conducted on the existing 48-inch casing of Well No. 14. A total of 82 cubic feet of superplasticized Class H cement was emplaced under a maximum recorded wellhead pumping pressure of 1.5 pounds per square inch (psi). The cement was then left to harden overnight.

Reaming Operation and Liner Installation

Youngquist then drilled the cement plug and open hole with the reverse-air method to a nominal diameter of 46 inches. Reaming was accomplished with a staged drill bit assembly utilizing a 12-inch diameter stinger (pilot) bit followed by a 46-inch diameter reaming bit. The reaming operation proceeded to a depth of 58 feet bls, in preparation for installing the new 40-inch diameter (0.375-inch wall thickness) steel liner to a depth of 54 feet bls. A cementing header was welded to the top of the liner. Centralizers were welded around the pipe at 90-degree spacings at installed depths of 10 feet bls, 30 feet bls, 40 feet bls and 50 feet bls.

Liner Testing and Grouting

After the liner was lowered to a total depth of 54 feet bls, an alignment test was conducted. A plummet possessing a maximum external diameter of 39 inches passed freely to the bottom of the liner, showing no detectable deviation. A tremie pipe was then lowered through the header, to depth of 50 feet bls. Cementing took place in two stages. The first stage took place on May 6, 1999 during which 482 cubic feet of cement were emplaced. The second stage was emplaced on May 7, 1999 during which 370 cubic feet of cement were emplaced. During the second stage of emplacement, cement was observed to return to the surface, indicating the annular fill-up had been achieved.

After the cement was allowed to harden, the open hole of the well was drilled to a depth of 80 feet bls using a 38-inch diameter bit. Following drilling to the total depth of the well, a hydrostatic pressure test was successfully conducted on the 40-inch casing using an inflatable packer set at the base of the casing.

Development and Pumping Test

Reverse-air development took place by utilizing compressed air forced through the drill bit assembly. The air exited out at holes located at the drill bit, forcing cuttings and water up, out the discharge hose (routed out of the roof of the wellhouse) at rates of approximately 500 gallons per minute. The drill pipe and bit assembly was raised and lowered along the entire length of the open hole (from 54 feet bls to 80 feet bls) for a 20-hour period during this process. After air-lift development was complete, the centrifugal pump assembly was again lowered into the well, to

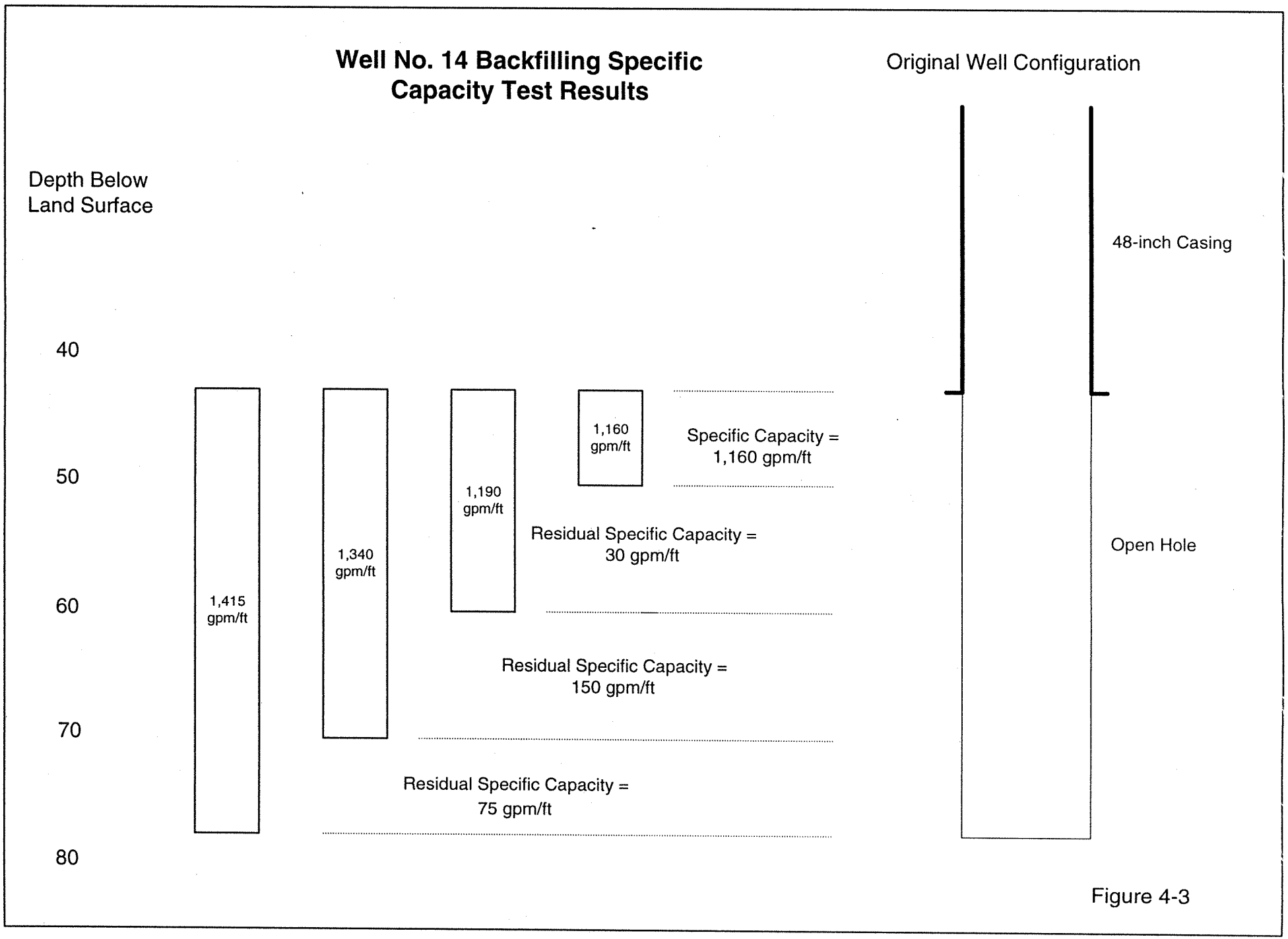

Well No. 14 Backfilling Specific Capacity Test Results
Depth Below Land Surface
40
50
60
70
80
1,415 gpm/ft
1,340 gpm/ft
1,190 gpm/ft
1,160 gpm/ft
Specific Capacity = 1,160 gpm/ft
Residual Specific Capacity = 30 gpm/ft
Residual Specific Capacity = 150 gpm/ft
Residual Specific Capacity = 75 gpm/ft
Original Well Configuration
48-inch Casing
Open Hole

Figure 4-3

begin pumping development at rates between 2,000 gpm and 7,000 gpm. Pumping development took place for a total of 20 hours.

During pumping development, a flowmeter log and video survey (conducted by MDWASD) were performed. A copy of the flowmeter log is contained in **Appendix E.** Upon the completion of the pumping development for the day, a caliper log was also conducted. Analysis of these logs indicated that most of the water produced by the well was flowing into the open hole from the interval between 55 feet bls and 65 feet bls.

On May 24, 1999 Well No. 14 was tested at a variety of pumping rates, which were achieved by adjusting a valve mounted on the 24-inch diameter discharge piping. The results of the specific capacity testing conducted are summarized on **Table 4-2.** An as-built diagram of the re-completed well is presented on **Figure 4-2.**

Table 4-2. Well No. 14 Step-rate pumping test summary, May 24, 1999

Pumping Rate (gpm)	Water Level (fbls)	Drawdown (ft)	Specific Capacity (gpm/ft)
0	8.0	0	0
2,500	9.5	1.5	1,670
4,570	13.3	5.3	860
5,710	18.3	10.3	560
7,000	20.8	12.8	550

Upon completion of the step-rate pumping test, MDWASD reinstalled the permanent pump in Well No. 14. The well was then disinfected by Youngquist and subjected to bacteriological testing.

Well No. 13 Rehabilitation

On June 6, 1999, Youngquist mobilized to Well No. 13. The well was then brushed and subjected to a casing alignment test and caliper survey. Copies of the geophysical logs for Well No. 13 are contained in **Appendix F.** The geophysical surveys indicated that the 48-inch diameter well casing extended to a depth of 44 feet bls and the open hole extended to a total depth of 78 feet bls. A very large cavity was present from the base of the well casing to a depth of 48 feet bls.

Backfilling and Specific Capacity Tests

Youngquist performed a brief specific capacity test on Well No. 13 on June 2, 1999 prior to backfilling the open hole with sand and gravel. During the test, the well was pumped at a rate of 4,880 gpm. A total of approximately 1.75 feet of drawdown was observed in the well, equating to a specific capacity of 2,790 gpm/ft. The open hole was then backfilled with fine sand to a depth of 70 feet bls and the well was pumped at a rate of 7,500 gpm. The specific capacity of the

well was not observed to change significantly as a result of the modification of the borehole. Youngquist then backfilled the open hole from 70 feet bls to 60 feet bls and pumped the well at a rate of 6,500 gpm. The specific capacity of the well was observed to decline to 1,860 gpm/ft with the well in this configuration. These results were interpreted to mean that the open hole from below 60 feet bls contributed relatively modest quantities of water to the well during pumping. Conversely, that meant that most of the water coming into the well was from above 60 feet bls. **Figure 4-4** presents a hydrogeologic interpretation of the results from the backfilling specific capacity tests conducted on Well No. 13. Subsequently, Youngquist backfilled the remaining portion of the open hole with gravel and fine sand, in preparation for performing the pressure grout operation on the 48-inch casing.

Pressure Grouting Operation

On June 7, 1999 a pressure grout operation was conducted on the existing 48-inch casing of Well No. 13. A total of 82 cubic feet of superplasticized Class H cement was emplaced under a maximum recorded wellhead pumping pressure of 1.5 pounds per square inch (psi). The cement was then left to harden overnight.

Reaming Operation and Liner Installation

Youngquist then drilled the cement plug and open hole with the reverse-air method to a nominal diameter of 46 inches. Reaming was accomplished with a staged drill bit assembly utilizing a 12-inch diameter stinger (pilot) bit followed by a 46-inch diameter reaming bit. During the drilling operation, a bit rotation of approximately 30 revolutions per minute was maintained. The weight on the bit was maintained between a range of approximately 500 pounds to 1,000 pounds. During the reaming operation, cuttings and lithologic samples were collected at 5-foot intervals. The reaming operation proceeded to a depth of 58 feet bls, in preparation for installing the new 40-inch diameter (0.375-inch wall thickness) steel liner to a depth of 56 feet bls. A cementing header was welded to the top of the liner. Centralizers were welded around the pipe at 90-degree spacings at installed depths of 10 feet bls, 30 feet bls, 40 feet bls and 50 feet bls. The liner was lowered into the well with a crane.

Liner Testing and Grouting

After the liner was lowered to a total depth of 56 feet bls, an alignment test was conducted. A plummet possessing a maximum external diameter of 39 inches passed freely to the bottom of the liner, showing no detectable deviation. A tremie pipe was then lowered through the header, to depth of 50 feet bls. Cementing took place in three stages. The first stage took place on June 14, 1999 during which 547 cubic feet of cement were emplaced. The second stage was emplaced on June 15, 1999 during which 223 cubic feet of cement were emplaced. The third stage was emplaced on June 16, 1999 during which 212 cubic feet of cement were emplaced During the third stage of emplacement, cement was observed to return to the surface, indicating the annular fill-up had been achieved.

After the cement was allowed to harden, the open hole of the well was drilled to a depth of 80 feet bls using a 38-inch diameter bit. Following drilling to the total depth of the well, a hydrostatic pressure test was successfully conducted on the 40-inch casing using an inflatable packer set at the base of the casing.

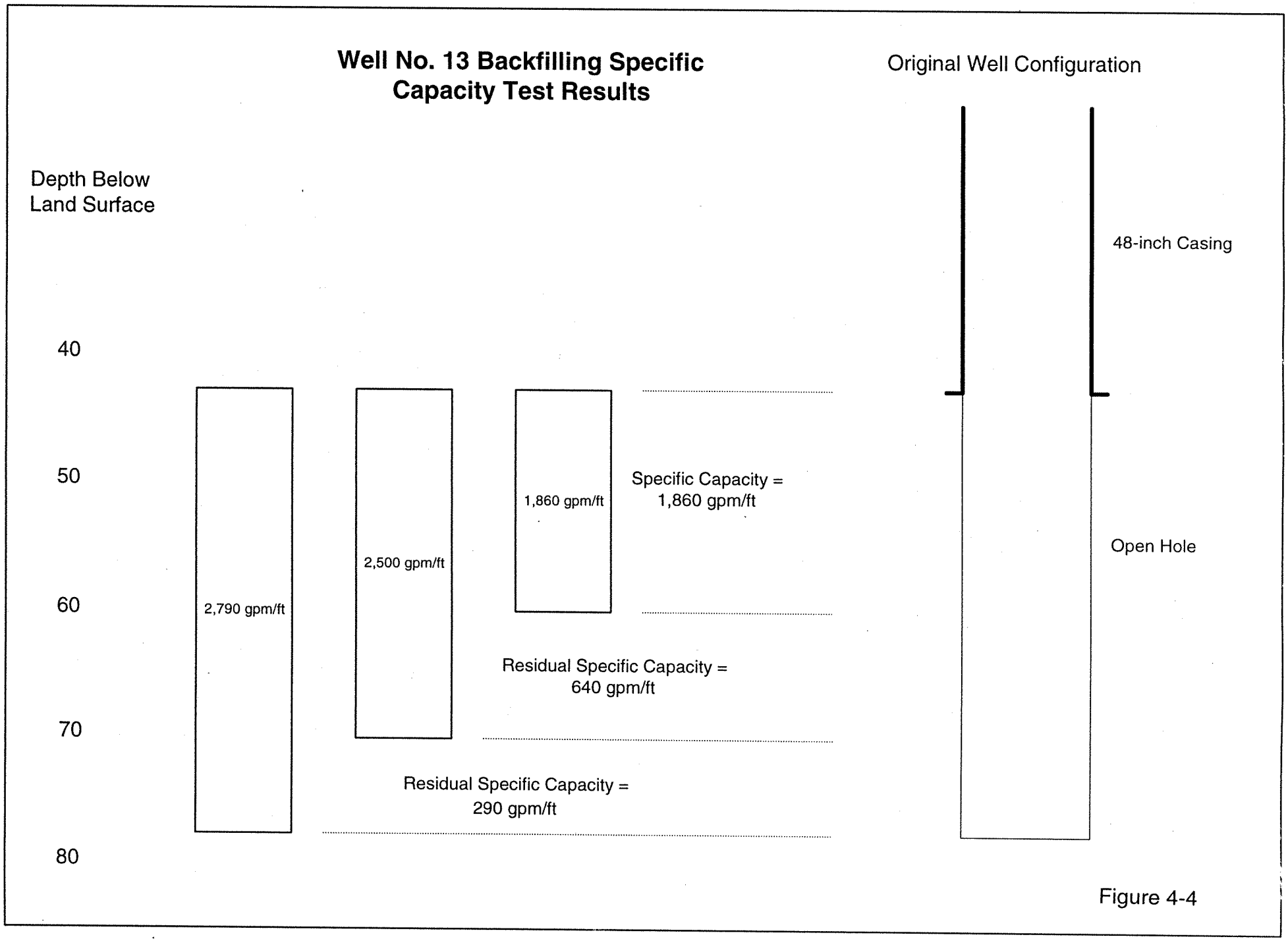

Well No. 13 Backfilling Specific Capacity Test Results
Depth Below Land Surface
40
50
60
70
80
2,790 gpm/ft
2,500 gpm/ft
1,860 gpm/ft
Specific Capacity = 1,860 gpm/ft
Residual Specific Capacity = 640 gpm/ft
Residual Specific Capacity = 290 gpm/ft
Original Well Configuration
48-inch Casing
Open Hole

Figure 4-4

Development and Pumping Test

Reverse-air development took place by utilizing compressed air forced through the drill bit assembly. The air exited out at holes located at the drill bit, forcing cuttings and water up, out the discharge hose (routed out of the roof of the wellhouse) at rates of approximately 500 gallons per minute. The drill pipe and bit assembly was raised and lowered along the entire length of the open hole (from 56 feet bls to 80 feet bls) for a 20-hour period during this process. After air-lift development was complete, the centrifugal pump assembly was again lowered into the well, to begin pumping development at rates between 2,000 gpm and 8,000 gpm. Pumping development took place for a total of 20 hours.

During pumping development, a flowmeter log and video survey (conducted by MDWASD) were performed. A copy of the flowmeter log is contained in **Appendix F**. Upon the completion of the pumping development for the day, a caliper log was also conducted. Analysis of these logs indicated that most of the water produced by the well was flowing into the open hole from the interval between 60 feet bls and 70 feet bls.

On June 25, 1999 Well No. 13 was tested at a variety of pumping rates, which were achieved by adjusting a valve mounted on the 24-inch diameter discharge piping. The results of the specific capacity testing conducted are summarized on **Table 4-3.** An as-built diagram of the re-completed is presented on **Figure 4-2.**

Table 4-3. Well No. 13 Step-rate pumping test summary, June 25, 1999

Pumping Rate (gpm)	Water Level (fbls)	Drawdown (ft)	Specific Capacity (gpm/ft)
0	5.0	0	0
2,170	6.17	1.17	1,850
4,000	8.65	3.65	1,100
5,600	12.0	6.90	810
7,500	16.4	11.4	660

Upon completion of the step-rate pumping test, MDWASD reinstalled the permanent pump in Well No. 13. The well was then disinfected by Youngquist and subjected to bacteriological testing.

Section 5

Section 5
Post-Rehabilitation Water Quality

Following the re-installation of pumping equipment, Well Nos. 13, 14, and 15 were placed back into service by MDWASD and water samples were collected from the wellhead tap. The water was analyzed by MDWASD's laboratory for various drinking water parameters. The laboratory results are contained in **Appendix G** and summarized on **Table 5-1.**

Table 5-1. Post-rehabilitation water quality summary.

Constituent	**Method**	**Well No. 13 Concentration**	**Well No. 14 Concentration**	**Well No. 15 Concentration**
Chloride	4500CL-B	58 mg/L	62 mg/L	61 mg/L
Alkalinity	2320 B	216 mg/L	211 mg/L	200 mg/L
Total Hardness	EPA130-2	217 mg/L	213 mg/L	203 mg/L
Ca Hardness	3500-CaD	190 mg/L	190 mg/L	174 mg/L
Ammonia	4500NH3-D	0.217 mg/L	0.244 mg/L	0.27 mg/L
pH	4500-H	7.39	7.41	7.65
Bromide	EPA300.0	0.126 mg/L	0.148 mg/L	0.176 mg/L
Conductivity	2510-A	520 micromho	573 micromho	565 micromho
UV254	5910	0.576 cm^{-1}	0.514 cm^{-1}	0.469 cm^{-1}
TOC	5310-B	16.78 mg/l	16.48 mg/l	15.1 mg/l

MPA Sampling Results

As per the Agreement, water samples were collected from Well Nos. 13, 14, and 15 during the wet and dry seasons following the rehabilitation. The definitions of wet and dry seasons were specifically detailed in the GWUDI Agreement, with wet season from May 1 to October 31. Sampling also required a certain minimum and/or maximum amount of rainfall in the previous 7 days.

The water samples were split and analyzed by a laboratory under contract to MDWASD (Environmental Associates) and the Tampa Branch of the Florida Department of Health Laboratory under contract to the FDEP. The laboratory analyses sheets are contained in **Appendix H** and the resultant EPA Relative Risk Factors are summarized on **Table 5-2.**

Table 5-2. Post-rehabilitation MPA results summary.

Date of Sample		MDWASD Laboratory Result	Florida Department of Health Laboratory Results
Well No. 13			
September 7, 1999	Wet Season	0	9
September 20, 1999	Wet Season	0	4
November 15, 1999	Dry Season	0	4
December 6, 1999	Dry Season	12	4
Well No. 14			
October 12, 1999	Wet Season	0	4
November 16, 1999	Dry Season	0	4
December 6, 1999	Dry Season	0	4
June 12, 2000	Wet Season	0	0
Well No. 15			
July 6, 1999	Wet Season	0	14
August 10, 1999	Wet Season	0	15
November 22, 1999	Dry Season	0	9
January 10, 2000	Dry Season	0	10

The results of the MPA sampling indicate concentrations that equate to Categories "A" and "B", as specified within the Agreement. These results compare favorably with those obtained from the three wells prior to the rehabilitation, which yielded Relative Risk Factors above 15 several times from samples collected between September 1995 and August 1997. As a result of the post-rehabilitation analysis results, Well Nos. 13, 14, and 15 have been removed from further investigation and placed back into service by MDWASD.

Section 6

Section 6
Conclusions and Recommendations

The information collected during this project indicates that construction rehabilitation has successfully reduced the concentration of surface water-related particulate matter produced in water collected from Well Nos. 13, 14, and 15 at MDWASD's Northwest Wellfield.

Well Nos. 13, 14, and 15 have been recompleted to draw water from open-holes set within the Tamiami Formation, with the open holes beginning at least 54 feet bls. Well Nos. 13 and 14 are set with open holes from 56 feet to 80 feet bls, while Well No. 15 is set from 54 feet to 88 feet bls. Following rehabilitation, the specific capacities of Well Nos. 13, 14, and 15 were reduced from 2,790 to 660 gpm/ft (of drawdown), 1,400 to 550 gpm/ft, and 2,700 to 700 gpm/ft, respectively. The pre-rehabiltation tests were performed using pumping rates of 4,880 gpm, 7,500 gpm, and 7,100 gpm, while the post-rehabilitation tests were performed at 7,500 gpm for Well No. 13 and 7,000 gpm for Well Nos. 14 and 15.

With the completion of rehabilitation at Well Nos. 13, 14, and 15 and obtaining acceptable MPA results, MDWASD has successfully addressed the concern that these wells were potentially under the direct influence of surface water.

Appendix A

AGREEMENT BETWEEN
FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
AND
MIAMI-DADE COUNTY

This Agreement is entered into and effective as of _____ 1998, between the Florida Department of Environmental Protection (FDEP) and Miami-Dade County, (County), for implementation of a program intended to prevent the occurrence of certain surface water pathogens in drinking water produced by Miami-Dade Water and Sewer Department (MDWASD).

WHEREAS, pursuant to the Safe Drinking Water Act, 42 U.S.C. Section 300f, et.seq., and the Surface Water Treatment Rule, (40 C.F.R. Parts 141 and 142), which impose certain requirements for filtration and disinfection of water produced by public water systems, FDEP is responsible for identifying ground waters in the State of Florida which are directly influenced by surface water (GWUDI) and which may consequently be at risk for waterborne pathogens such as Giardia and Cryptosporidium; and

WHEREAS, FDEP has primary responsibility for establishing procedures for determining GWUDI status; and

WHEREAS, in October, 1992, the U.S. Environmental Protection Agency (EPA) published the Consensus Method for Determining Groundwaters Under the Direct Influence of Surface Water Using Microscopic Particulate Analysis (MPA); and

WHEREAS, FDEP has commenced a statewide GWUDI evaluation program; and

WHEREAS, in connection with the GWUDI program, FDEP informed County by letter dated January 23, 1997, that Well No. 10 at County's Northwest Wellfield (NWWF) was designated by FDEP as GWUDI in January 1997; and

WHEREAS, County notified FDEP by letter dated February 13, 1997, of its disagreement with the GWUDI designation; and

WHEREAS, the County asserts the designation may potentially require significant expenditures by County which may not be justified; and

WHEREAS, the County asserts Giardia and Cryptosporidium have not been detected in MDWASD's drinking water system; and

WHEREAS, it is the goal of FDEP and County to protect the public health.

NOW, THEREFORE, in consideration of the mutual covenants made herein, the County and FDEP hereby agree as follows:

1. Background

Pursuant to the letters dated January 23, 1997, and March 10, 1997, to MDWASD from FDEP, copies of which are attached hereto as Exhibits "A" and "B" and which are incorporated herein by reference, Dade County has commissioned an independent evaluation of the GWUDI status of Well No. 10. Upon completion of the evaluation and submission of a report to FDEP on October 23, 1997, all relevant information will be reviewed and assessed by FDEP for applicability in determining GWUDI status. This evaluation, rehabilitation of Well No. 10, and successful post rehabilitation monitoring will satisfy the requirements set forth by FDEP for the re-consideration of FDEP's designation of Well No 10 as GWUDI. The terms of this Agreement will also satisfy the FDEP requirement of additional monitoring at the NWWF and provide for examination of the GWUDI issue for all wells within County's water supply system.

2. Objectives

The objectives of FDEP and County are the following:

a. To develop a raw water sampling protocol for wells identified through the historical and future screening MPA data evaluation that will identify suspect wells. Suspect wells are those wells that exhibit Type D MPA results, or those with Type C results in a majority of their cyclical MPA monitoring samples. Cyclical MPA monitoring is a sampling process undertaken for those wells with Type C results where

no more than five MPA tests are taken, including at least two wet season and one dry season result. Type A,B, C, and D MPA categories are defined under the section entitled ":Sampling" (4.2b).

b. To develop a wellhead investigation program to determine the integrity of wells that have the potential for being designated GWUDI;

c. To implement water treatment plant sampling to ensure that high quality drinking water continues to be provided to the public;

d. To develop a wellfield maintenance program that will identify any future deficiencies at the wells as they become apparent; and

e. To take corrective action necessary at MDWASD wellfields to maintain high quality drinking water.

3. Sampling Program Overview

County will evaluate the eighty-eight system-wide water wells operated by MDWASD. The evaluation will include a system-wide raw water sampling component, a wellhead investigation program, a water treatment plant sampling regime, and systematic wellfield maintenance. These procedures will be applied on a wellfield by wellfield basis. The County's entire water system will undergo raw water sampling unless relevant historical data is available. Sample results will be distributed among the categories defined in Section 4.2b. "Suspect " wells that are determined to require rehabilitation will be rehabilitated per a rehabilitation schedule contained in Section 4.5 "Post- Rehabilitation" of this Agreement. "Suspect" wells are those wells with Type D MPA sample results, or those with Type C results in a majority of their cyclical MPA monitoring samples. Maintenance for "non-suspect" wells will be completed within five

years. The wellfields as shown on Exhibit C may be evaluated in the following order:

1. Northwest Wellfield (15 wells)
2. South Dade Water Supply System (12 wells)
3. Alexander Orr/Snapper Creek/Southwest/West Wellfields (31 wells)
4. Hialeah/Miami Springs/Preston Wellfields (30 wells)

4. Sampling Procedures

County will perform the following procedures set forth below, which are reflected on the flowchart attached hereto as Exhibit "D". Notwithstanding, if there is a conflict between this section and the flowchart, the provisions of this section shall govern.

4.1 General

a. Daily rainfall data will be collected from nearby rainfall stations (generally NOAA stations) as identified in Exhibit "E" for each of the MDWASD wellfields.

b. Wells entering into cyclical MPA or wellhead investigation will be brushed, disinfected, flushed, shown to be chlorine-free and televised.

c. For the duration of the raw water sampling, quarterly reports will be provided to FDEP and Dade County Health Department (DCHD) including the results of all MPA, Giardia, Cryptosporidium, fecal coliform, total coliform, and Heterotrophic Plate Count (HPC) sampling.

d. MDWASD proposes to complete a feasibility study on particle count technology within six months of the effective date of this Agreement.

e. For purpose of wet weather sampling, the parties will make their best efforts to take samples following a seven-day cumulative rainfall of between two and three inches. In no event will any sample results be accepted if the wet weather rainfall is less than one inch or during an excessive rainfall event of greater than five inches during the seven days prior to sampling.

f. For the purposes of dry season sampling (November 1 - May 30), all MPA samples must be taken after a seven-day dry period in which the cumulative rainfall shall not exceed one inch.

g. The rainfall data will be evaluated at each relevant rainfall station in order to determine the most appropriate MPA sampling times.

h. In consideration of the extensive historical data collected since December 1995 on the NW wellfield, it is agreed by both parties that the following wells will be:

(i) Cleared from further investigation:
1,2,3,5,6,7,8,9,11,12

(ii) Subject to cyclical monitoring: 4

(iii) Subject to well investigation/rehabilitation:
10,13,14,15

4.2 Sampling

a. Wells that have undergone no relevant MPA testing will have one wet season screening MPA sample taken, hereinafter called "screening MPA."

b. Historical MPA data collected after December 13, 1995, and screening MPA data will be reviewed. Historical MPA data includes MPA data

acquired by either FDEP or MDWASD prior to the effective date of this Agreement. MPA categories will be based on the following distributions:

MPA Value	Category
0-9	Type A
10-15	Type B
16-19	Type C
≥ 20	Type D

c. Wells with one or more sample result, all of which are only Type A MPA result, will be scheduled for brushing, disinfection and videography and removed from further investigation pursuant to the terms of this agreement.

d. If a single screening MPA value falls within the Type B category, an additional wet season MPA sample will be collected. If the second MPA value is a Type A or B, the well will be scheduled for brushing, disinfection, and videography and removed from further investigation.

e. Wells with any screening or historical MPA value that is Type C will enter into cyclical MPA monitoring.

f. Wells with any screening or historical MPA value that is Type D will be turned off and wellhead investigation will be initiated, and be hereinafter defined as "suspect wells".

4.3 Cyclical MPA Monitoring and Monthly MPA, Giardia and Cryptosporidium Sampling

a. For purposes of this Agreement, "cyclical MPA monitoring" is defined as a sampling procedure which includes the collection and analysis of

two wet season and one dry season MPA samples. The County and FDEP combined shall take three and only three cyclical MPA samples, except as an additional two samples are allowed under "c" below. Two samples will be collected and analyzed during Miami-Dade County's wet season (June 1 to October 31), and the third sample will be collected during the dry season.

b. If any of the three MPA samples in the cyclical MPA monitoring yields a Type D result, the well will immediately be turned off and the wellhead investigation program, as detailed below, will be initiated.

c. If any of the cyclical MPA monitoring yields a Type C result, MDWASD will initiate two months of monthly MPA, Giardia, and Cryptosporidium sampling, hereinafter defined as "monthly sampling." If three or more of a maximum of five cyclical and monthly MPA samples are Type C, then the well will undergo wellhead investigation. If not and the cyclical MPA monitoring is complete, the well will exit the sampling program, and the well will be declared not to be GWUDI.

d. If Giardia and/or Cryptosporidium is present in any of the monthly sampling or if any of the MPA results are Type D, the well in question will immediately be turned off and the wellhead investigation program will commence.

e. If both of two wet season MPA results are Type A or B, the cyclical MPA monitoring will be continued as outlined. If the cyclical MPA monitoring has been fulfilled, the sampling program will end, and the well will be declared not to be GWUDI.

4.4 Wellhead Investigation Program

a. This wellhead investigation applies only to wells identified in the sampling program as needing further structural investigation, based on the results of Section 4.3c and 4.3d.

b. To determine the integrity of the grout seal, a tapping test or cement bond log will be performed on the wells as appropriate.

c. Well casing integrity will be verified through a pressure test.

d. A rehabilitation plan will be developed on a case-by-case basis to address any deficiencies identified in the series of tests.

e. The rehabilitation plans developed for the wells will be implemented with the more severely damaged wells being rehabilitated first.

f. Letter notification of which wells are to be rehabilitated along with a schedule of rehabilitation will be submitted to FDEP on a quarterly basis along with updates on the status of any on-going rehabilitation The County agrees to complete well rehabilitation, as appropriate, at a minimum rate of eight per year, if eight or more wells are found to need rehabilitation as per the procedures established herein. The provision to complete well rehabilitation at a minimum rate of eight wells per year will become effective twelve months after the effective date of this Agreement.

g. After rehabilitation has been completed, a 20 series bacteriological survey (Rule 62-555.315(3)(c), F.A.C.) will be performed on the well, and the results will be submitted to FDEP and DCHD.

h. After completing the bacteriological survey and being cleared for service by the appropriate regulatory agencies, the well will be placed in service

and MPA split sampling will commence as defined in Section 4.5.

4.5 Post-Rehabilitation

a. If a well has undergone rehabilitation through the wellhead investigation program as described in Section 4.4, after completing the bacteriological survey and being cleared by the Dade County Health Department (DCHD), the well will be placed in service and split sampling will commence. Additionally, for any rehabilitated well that had Type D MPA results prior to rehabilitation, a temporary particle counter will be installed on the wellhead and used to monitor particle sizes and counts in the water drawn by the well.

b. All MPA samples for a rehabilitated well will be collected by a split sampling method. One of the samples will be analyzed by a laboratory under contract with MDWASD, and the other sample will be analyzed by FDEP. MPA categories will be based on the above described distributions (Section 4.2b).

c. If the results of the MPA split samples differ by greater than two Relative Risk Factor (RRF) units and fall within two categories, the well will be resampled following a split sampling procedure. However, if the RRF differential is within two units and the results fall in two different categories, the results from MDWASD's contract laboratory will be used for evaluation. Wells will not be resampled if the MPA results fall within a single category.

d. If four of no more than seven post-rehabilitation MPA results are Type A or B (must include at least two wet and two dry season samples)

sampling will end, and the well will be declared not to be GWUDI. Otherwise, the well will be turned off and declared to be GWUDI.

e. If the resulting MPA value from the split sampling is Type D, the well will be shut off and declared to be GWUDI.

4.6 Plant Sampling Regime

a. Monthly HPC samples will be taken on the raw and finished water at each of the John E. Preston, Hialeah, and Alexander Orr WTPs.

b. Monthly Giardia and Cryptosporidium samples will be collected on the raw water at the John E. Preston, Hialeah and Alexander Orr Water Treatment Plants.

c. Rotational Giardia, Cryptosporidium and HPC sampling will be performed for the South Dade Water Supply System.

d. If any raw water sample is positive for Giardia or Cryptosporidium, finished water samples will be collected and analyzed for Giardia and Cryptosporidium, and a more intensive sampling program for the raw and finished water will be developed.

e. For the duration of the plant sampling, Giardia, Cryptosporidium, and HPC results will be submitted to FDEP and DCHD on a monthly basis in the form of a letter report.

4.7 Wellfield Maintenance

a. Maintenance of all MDWASD wells will be approached on a wellfield by wellfield basis.

b. A general wellfield maintenance program will be developed and submitted to FDEP within one year after the effective date of the Agreement.

c. Maintenance will be completed at one wellfield before work progresses to the next wellfield.

d. The general wellhead investigation program may be modified on a wellfield by wellfield basis as appropriate.

e. Any sampling that is a part of the wellfield maintenance will be applied system- wide.

4.8 Task Duration

a. Screening MPAs will be finished within the first complete wet season after the effective date of this Agreement.

b. Within six months of receiving MPA results with a Type C or D result, brushing, disinfecting and videography will be initiated.

c. When brushing, disinfecting and videography is completed, cyclical MPA monitoring will begin within three months.

d. If an MPA sample yields a Type D result, the well will undergo wellhead investigation which will commence within one month of receiving the result.

e. For wells subject to cyclical MPA monitoring, such monitoring will be completed within one year after the historical or screening MPA sample was analyzed or within one year after the effective date of this Agreement, whichever is later.

5. The County may submit and FDEP may review and consider other pertinent information and data submitted by County which may include, but not be limited to the following: fluctuations in temperature, pH, turbidity, color, particle counts, hydrogeologic characteristics, geochemical analyses and well construction integrity.

6. MDWASD will coordinate with the Dade County Department of Environmental Resources Management (DERM) to modify the existing county-wide Wellhead Protection Program to prohibit the presence of feedlots within the protection areas.

7. FDEP shall perform or cause to be performed the following:

   a. FDEP will collect up to one-third of the wet season cyclical MPA monitoring samples and will participate in testing all samples collected in the split sampling method for sampling of rehabilitated wells.

   b. All data submittals will be expeditiously reviewed, commented upon as necessary, and maintained and updated bi-monthly.

8. If either party is delayed or prevented from performing the covenants and obligations set forth herein by a Force Majeure or inevitable accident or occurrence, or by other causes beyond the party's reasonable control, the party shall be allowed an appropriate time extension as mutually agreed to by the County and FDEP. As used herein, Force Majeure shall mean an act of God which includes but is not limited to sudden, unexpected or extraordinary forces of nature such as floods, tornadoes, hurricanes, fires, earthquakes, landslides, epidemics, explosions or other forces of nature. Inevitable accidents or occurrences shall mean those which are unpreventable by either party and

shall include but not be limited to strikes, lockouts, other industrial disturbances, wars, blockades, acts of public enemies, insurrections, riots, federal, state, county and local governmental restraints and restrictions, military action, civil disturbances, explosions, conditions in federal, state, county and local permits. Upon occurrence of or threat of a Force Majeure, inevitable accident or occurrence or other cause beyond the reasonable control of either party, the party shall notify the other party within seven days and shall notify the other party of the anticipated length and cause of the delay and the timetable pursuant to which the party intends to complete performance. If the County and FDEP are unable to agree to a time extension, then each party shall have the right to pursue all available legal and equitable remedies.

9. By execution of this Agreement, FDEP adopts the sampling procedures provided for herein for the MDWASD wells and agrees to refrain from designating MDWASD wells as GWUDI unless a well fails to meet the criteria set forth in the section entitled "Post-Rehabilitation", subsection d. or if testing of a post-rehabilitation well results in Type D water. With regard to the GWUDI designation, FDEP further agrees not to commence enforcement action against the County and not to impose and enforce penalties or fines during the term of this Agreement unless County is in default of this Agreement. Representatives from FDEP and MDWASD shall meet as necessary, but at least once a quarter, to discuss the progress of this Agreement and any other additional information, issues or concerns with the potential to materially affect the terms of this Agreement.

10. The County does not admit to, waive any rights related to, and expressly reserves the right to defend against the following in any legal and administrative action or proceeding brought by the State of Florida and the Untied States: any alleged violation of 42 U.S.C. Section 300f, et. seq., 40 C.F.R. Parts 141 and 142, and any other federal law and federal regulations; state law and state regulations and local law and regulations, and consequently, the County does not admit any liability arising from or related to the foregoing. Further, FDEP does not waive any rights related to, and expressly reserves the right to allege the following in any legal and administrative action or proceeding brought by the State of Florida or the United States: any alleged violation of 42 U.S.C. Section 300f, et seq. 40 C.F.R. Parts 141 and 142, and any other federal law and federal regulations; state law and state regulations and local law and regulations. The provisions of this section notwithstanding, nothing in this section is intended to impair the contractual obligations of the parties set forth in this Agreement.

11. This Agreement may be amended from time to time or extended by mutual written agreement of the parties hereto.

12. This Agreement shall remain in effect for five years unless terminated earlier by either party upon 90 days prior written notice.

STATE OF FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION

By:_____
Mimi Drew, Director
Division of Water Facilities
Date:_____

ATTEST:

By: _____

MIAMI-DADE COUNTY

By: _____
County Manager
Date:_____

Approved as to form and legal sufficiency:

_____
Assistant County Attorney

Appendix B

MEMORANDUM

MONTGOMERY WATSON

To: Vincent Flick **Date:** December 15, 1998

From: Robert T. Verrastro

Copy: Gene McLoughlin, Nancy Seith

Subject: Test Boring Construction at the Northwest Wellfield

EXECUTIVE SUMMARY

This memorandum summarizes the hydrogeologic information collected from test borings that were installed adjacent to Wells Nos. 13, 14, and 15 at the Northwest Wellfield. The test borings were installed during August 1998 by Professional Services Industries, Inc. (PSI) with observation performed by MDWASD staff and Montgomery Watson. The test boring program included the collection of continuous cores to depths of approximately 100 feet below land surface (bls) and the performance of downhole video surveys and pumping tests. Subsequent to the construction, Montgomery Watson performed additional analysis of the cores.

The following conclusions are derived from the information collected during this project:

- The supply wells at the northern end of the Northwest Wellfield yield water from multiple, relatively thin (from one to four-foot thick) zones of very high porosity within the surficial aquifer.

- The "roof" of the water-bearing portion of the aquifer appears to exist at a depth of approximately 12 feet below land surface.

- The base of water-bearing materials at Wells Nos. 13 and 15 presently lies at a depth of approximately 70 feet bls. At Well No. 14, water bearing strata appears to be present to a depth of 80 feet bls.

- Based upon the information collected to date, the new casings at Wells 13 and 15 should be set at a depth of approximately 55 feet bls. Because Well No. 14 appears to contain numerous deeper flow zones, the new casing at that well should extend deeper, to approximately 60 feet bls.

INTRODUCTION AND BACKGROUND

The Miami-Dade Water and Sewer Department's (MDWASD's) Northwest Wellfield consists of fifteen supply wells which provide raw water to the John E. Preston and Hialeah Water Treatment Plants. The Northwest Wellfield is located approximately one mile west of the Florida Turnpike, at the northwestern western terminus of N.W. 58 Street. **Figure 1** presents a Project Location Map. Each of the supply wells at the Northwest Wellfield is equipped with a 32-inch diameter dual-speed pump rated at design capacities of 10 million gallons of water per day (mgd) and 15 mgd. The total installed withdrawal capacity for the wellfield is approximately 225 mgd. **Figure 2** presents a typical as-built diagram of the wells.

Water collected from the wells within the Northwest Wellfield was sampled and analyzed by the microscopic particulate analysis method by the Florida Department of Environmental Protection between 1995 and 1996. In January 1997, the MDWASD received notification that Well No. 10 in the wellfield had received analysis scores that designated that well as producing groundwater under the direct influence of surface water. In addition to Well No. 10, several of the other wells within the wellfield, including Wells Nos. 13, 14, and 15 yielded water samples that indicated that they might be under the direct influence of surface water. As a result, MDWASD initiated several investigations into the significance of the analyses results and the potential cause of surface waters entering the wells.

During early 1998, Well No. 10 was retrofitted with a new 40-inch diameter casing which was grouted in place and set to a total depth of 64 feet below land surface (bls). The open-hole of the retrofitted well was completed between the depth of 64 feet bls and 104 feet bls. In it's retrofitted configuration, Well No. 10 produces approximately 8 mgd with a pumping water level of approximately 27 feet bls. Currently, Well No. 10 is being evaluated for effectiveness of the recompletion. To date, water from the well continues to yield low concentrations of surface water indicator constituents, however, the concentrations of those constituents appear to have decreased.

MDWASD is currently in the process of securing a contractor to perform additional retrofitting at Wells Nos. 13, 14 and 15 at the Northwest Wellfield. In preparation of this work, PSI was subcontracted to perform additional investigations at the wellfield. The intent of the investigations was to gain a greater understanding of the hydraulic nature of the materials lying from land surface to a depth of approximately 100 feet bls, so that the supply wells can be effectively retrofitted while retaining high production capacities.

This report presents the sequence of the test boring construction, including the methods and materials used during the work. Tests conducted throughout the project are also presented, along with an interpretation of the results. This report also presents new hydrogeologic findings and recommendations that have resulted from performance of this work.

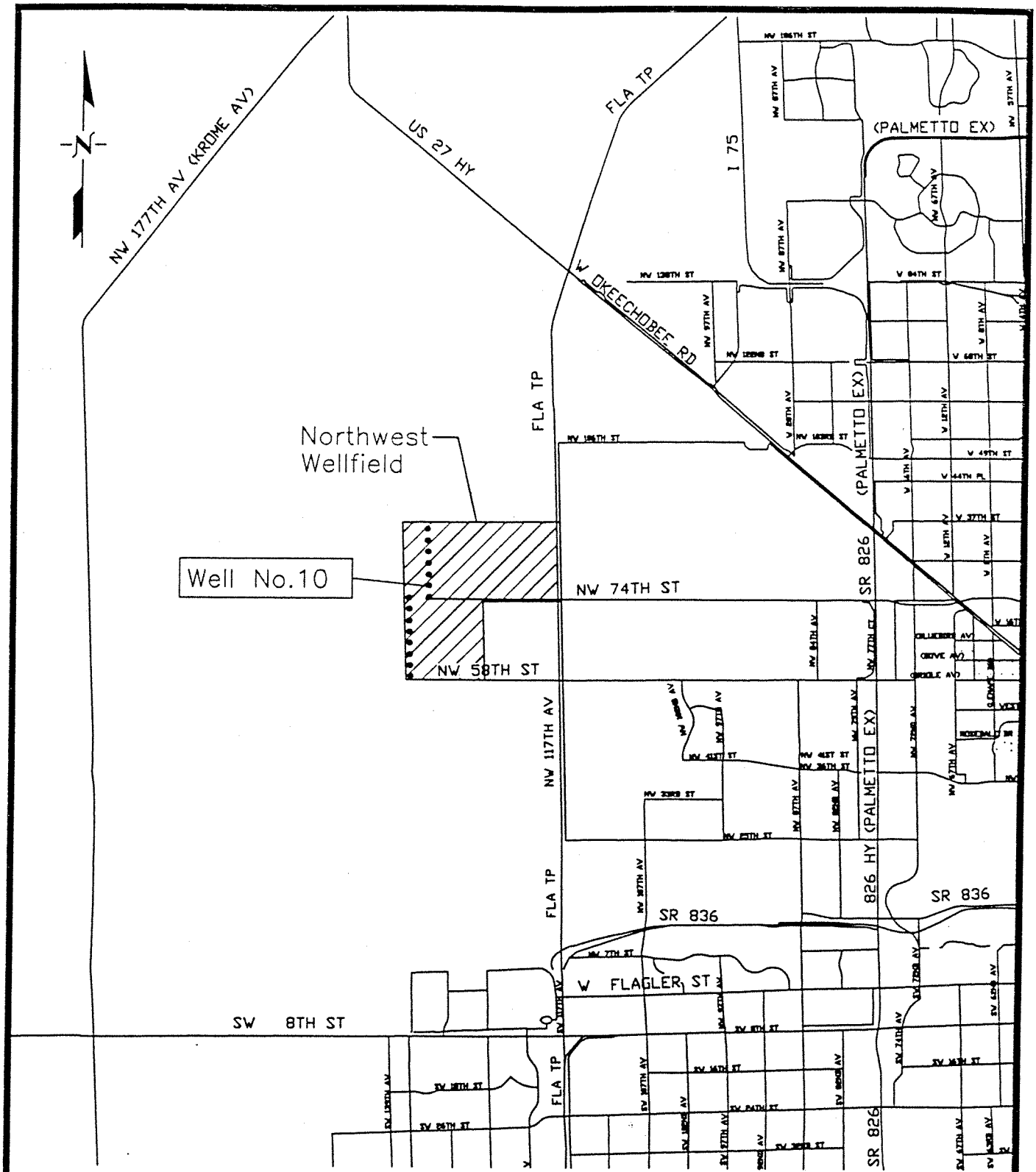
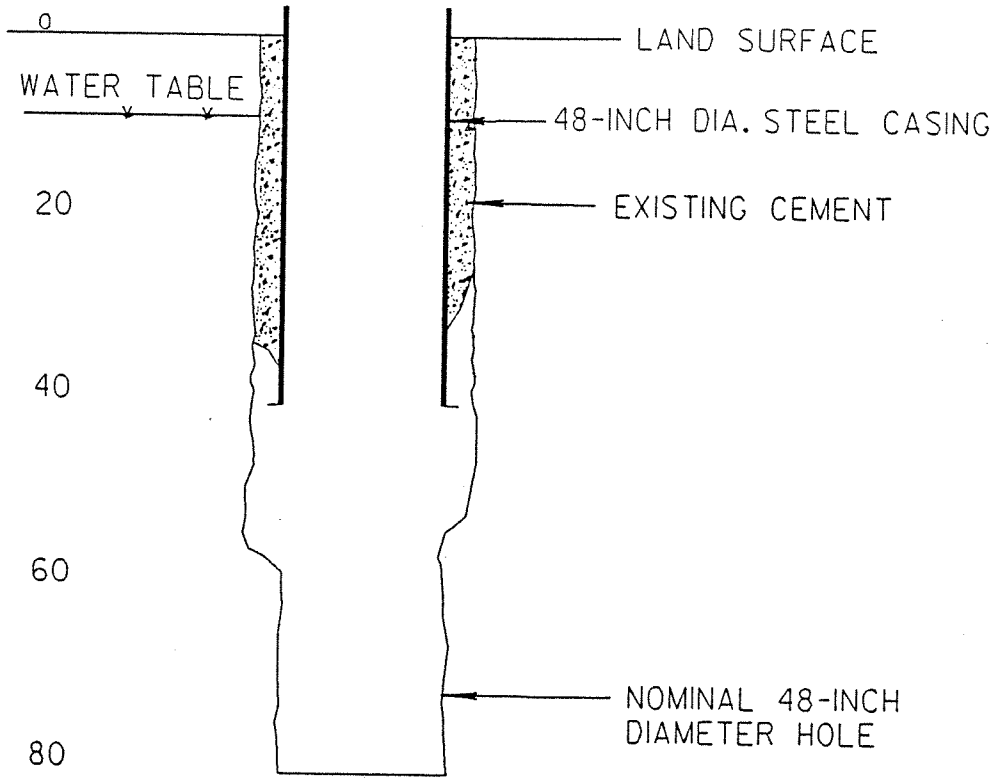

NW 177TH AV (KROME AV)
US 27 HY
FLA TP
I 75
(PALMETTO EX)
W OKEECHOBEE RD
Northwest
Wellfield
Well No.10
NW 74TH ST
NW 58TH ST
SR 826
NW 117TH AV
826 HY (PALMETTO EX)
SR 836
W FLAGLER ST
SW 8TH ST
MONTGOMERY WATSON
SERVE • CONSERVE
MIAMI–DADE WATER AND SEWER DEPARTMENT
NORTHWEST WELLFIELD
LOCATION MAP

Figure 1

EXISTING WELL CONFIGURATION



CONSTRUCTION AND TESTING METHODS

The test borings were constructed by PSI through the use of the "dual-tube" rotary drilling method. This drilling method utilizes an inner coring tube suspended within an outer drilling tube. Both tubes are advanced as the borehole is drilled. Mud, air or water is pumped down the annular space between the tubes and circulated up, through the inner tube. As the fluid travels up the inner tube, it carries the rock cuttings (and often entire cored sections) produced as the drill bit penetrates the formation. This method provides for excellent recovery of depth-specific cuttings and cores with very little mixing of unconsolidated materials within the drilled hole.

Rate of Penetration

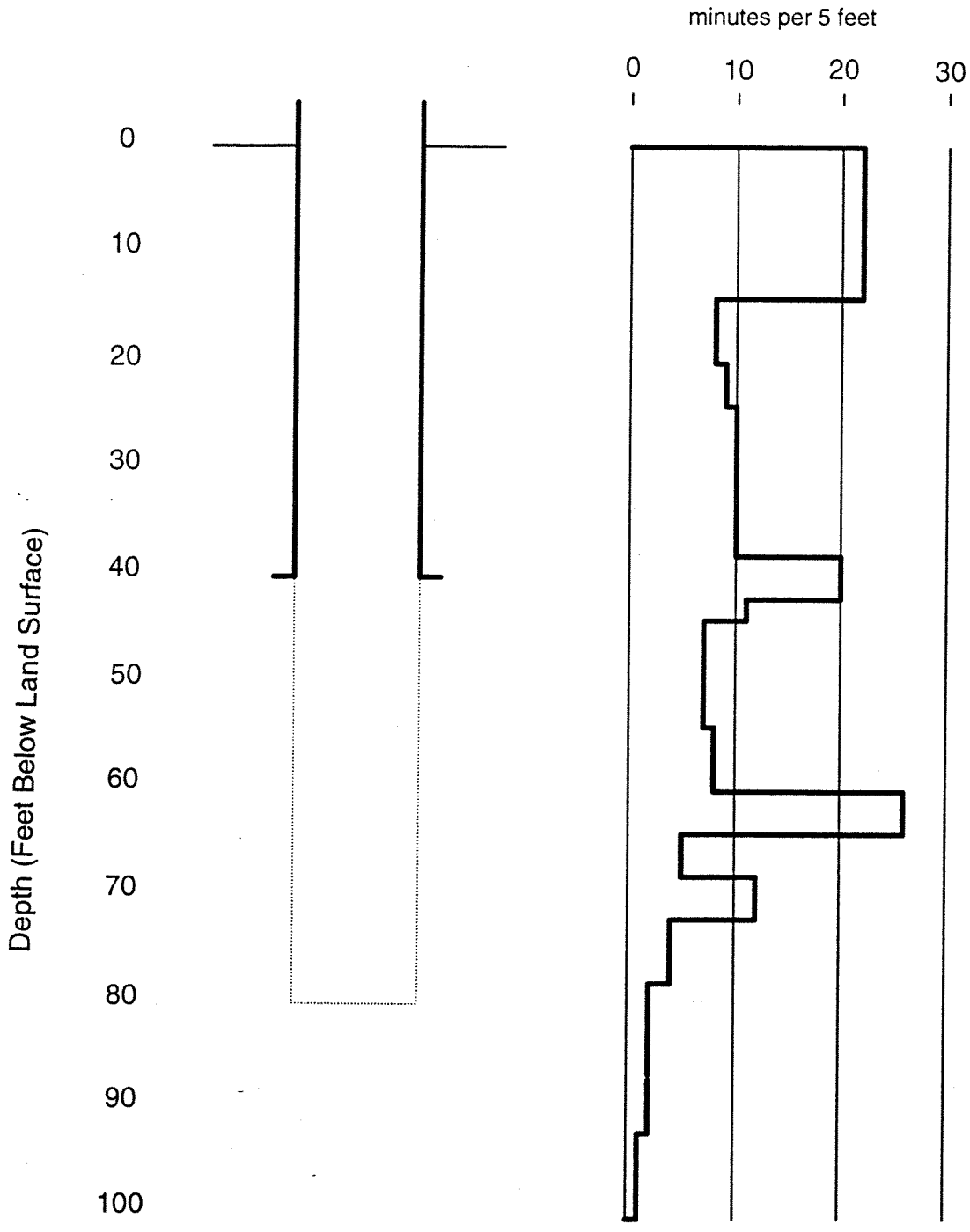
As each of the boreholes was drilled, the rate of penetration through the rock was recorded by PSI. Graphs of the rate of penetration were then prepared by Montgomery Watson, and are shown on **Figures 3, 4** and **5.** The rate of penetration is a useful indicator of the consolidation of a rock layer. Hard or highly fractured strata usually takes longer to drill through (as measured in units of drilling time [minutes] per footage length) than softer or more uniform strata. In the surficial aquifer system of south Florida, there is a strong positive association between strata hardness and water yield. Hard formations often contain fractures and secondary porosity features that result in high transmissivity and water yield. Softer strata typically contains higher quantities of clay or sand, and does not yield large quantities of water.

The graphs contain some common features between all of the borings. In particular, the graphs of Well Nos. 13 and Well No. 15 were nearly identical, whereas the graph from Well No. 14 was more unique. The interval from land surface to approximately 15 feet bls is typically very hard (ie, displays relatively slow penetration rates). The interval at approximately 40 feet bls (the depth to the bottom of the supply well casings) is also very hard in each of the borings. A third hard interval is exhibited in the wells near a depth of approximately 60 feet bls and a fourth interval is exhibited near a depth of approximately 75 feet bls. Between these intervals were softer, more uniform formational zones that drilled relatively quickly. The drilling rate alone, however, cannot be used as a sole indicator of the water-producing capacity of a particular formation. This information was used in conjunction with additional information collected during the project to build a comprehensive interpretation of the hydrogeology of the site, to be discussed in a subsequent section of this memorandum.

HYDROGEOLOGY

The original objective of the PSI project was the collection of continuous cores from land surface to approximately 100 feet bls. A basic description of the lithology (for instance,

Well No. 13 Rate of Penetration



MONTGOMERY WATSON

Figure 3

Well No. 14 Rate of Penetration

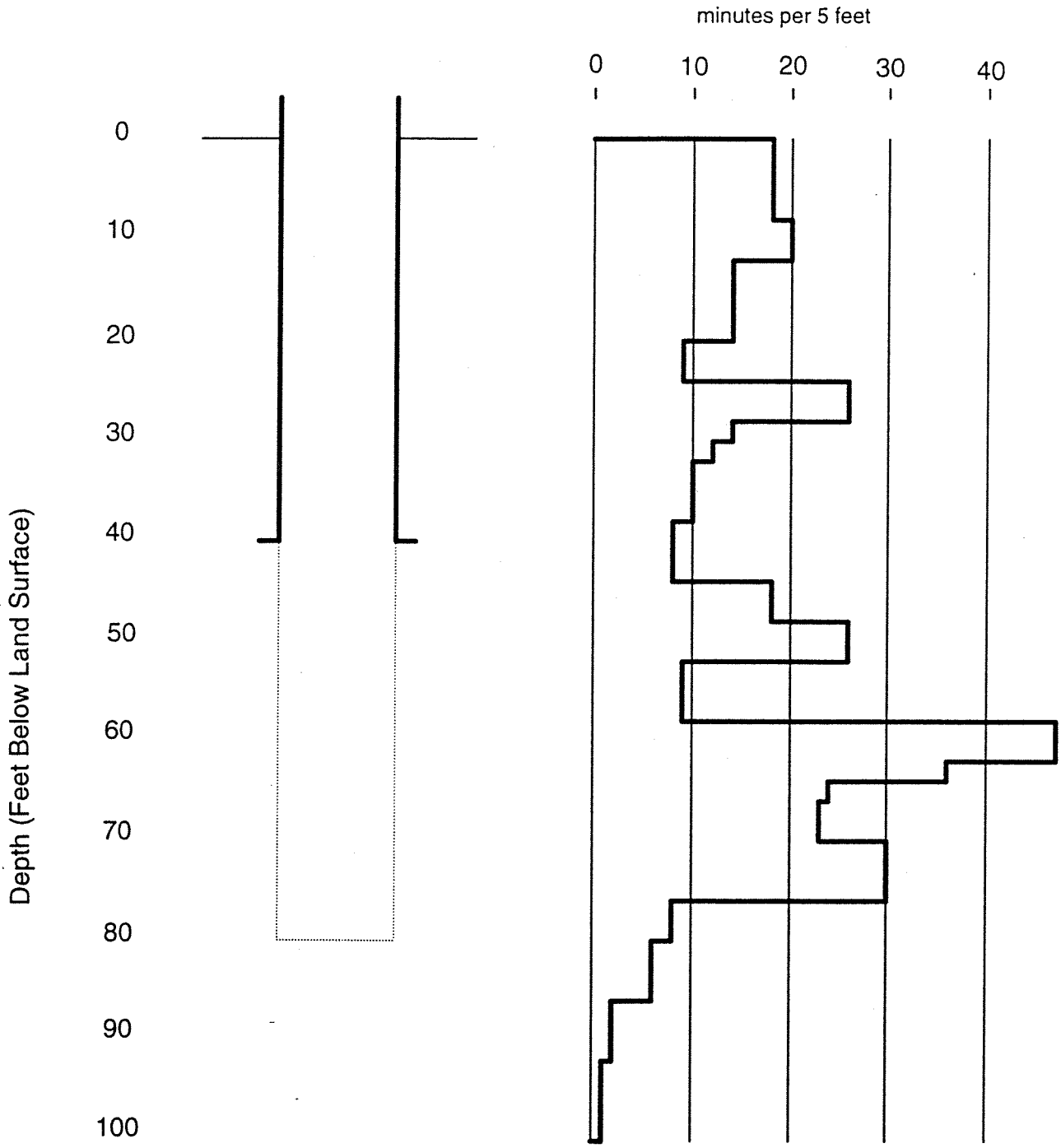


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Figure 4

Well No. 15 Rate of Penetration

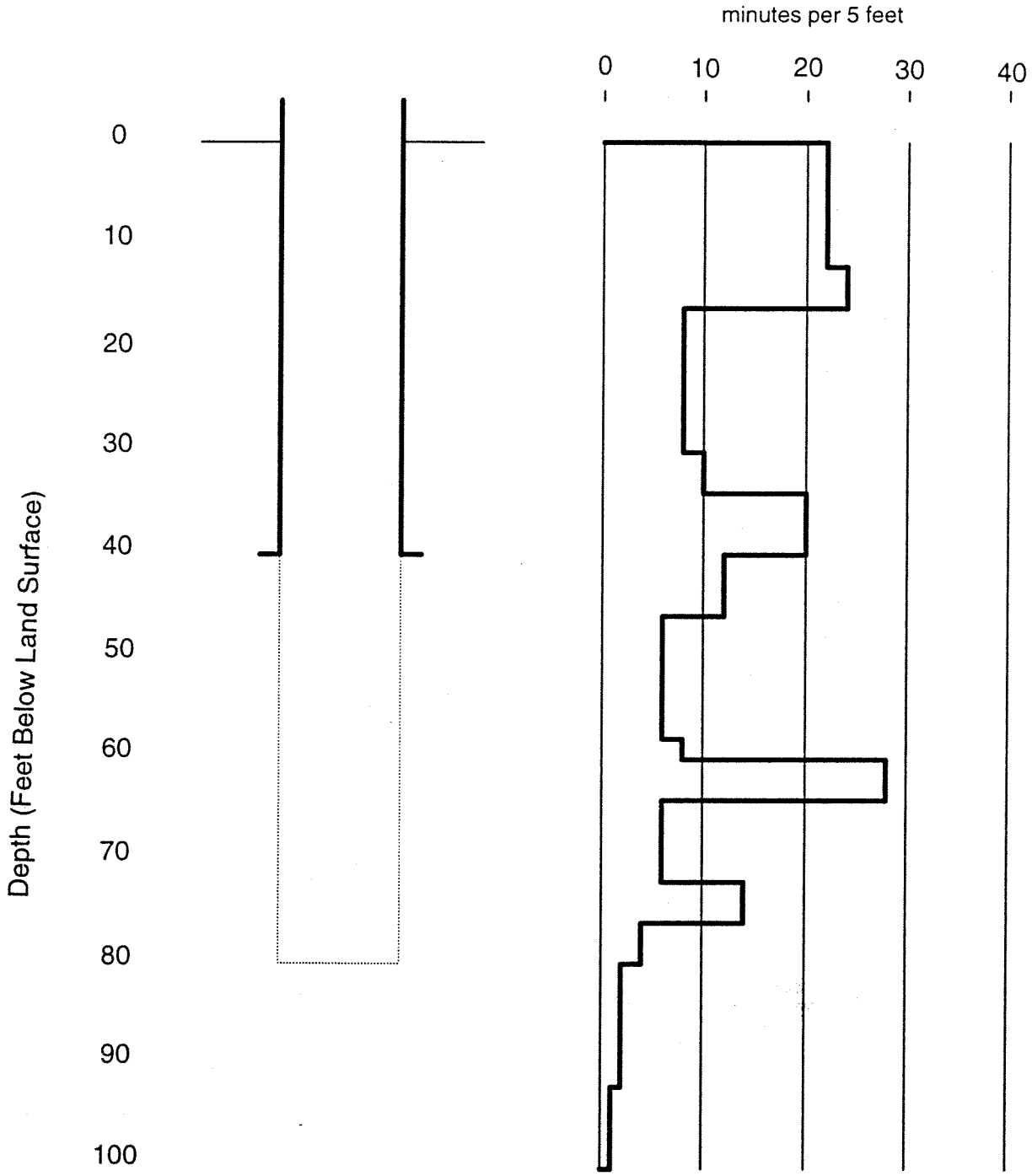

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Figure 5

Dunham's Limestone Classification Scheme

<table>
<tr><th colspan="5">Classification of limestones according to depositional texture</th></tr>
<tr><td colspan="4">Depositional texture recognizable</td><td></td><td>Depositional texture not recognizable</td></tr>
<tr><td colspan="4">Original components not bound together during deposition</td><td>Original components bound together during deposition</td><td rowspan="4">Crystalline carbonate (subdivide according to physical or diagenetic texture)</td></tr>
<tr><td colspan="3">Contains mud (fine silt and clay size particles)</td><td>Lacks mud</td><td rowspan="3">Boundstone</td></tr>
<tr><td colspan="2">Mud-supported</td><td colspan="2">Grain-supported</td></tr>
<tr><td>Less than 10 percent grains</td><td>More than 10 percent grains</td><td rowspan="2">Packstone</td><td rowspan="2">Grainstone</td></tr>
<tr><td>Mudstone</td><td>Wackestone</td></tr>
</table>

Source: After Dunham (1962), Table 1. By permission Amer. Assoc. Petrol. Geol.

MONTGOMERY WATSON

Figure 6

"limestone" or "sandstone"), including color, grain size and composition and the recovery percentages from each boring is contained in the PSI report. A more refined description of the rock textures and porosity types is provided herein. For the lithologic description, Dunham's (1992) classification scheme was utilized. A copy of Dunham's classification of limestones is presented in **Figure 6.** Summaries of the porosities exhibited at each of the boring locations are presented on **Figures 7, 8** and **9.**

Lithologic Summary

From land surface to a depth of approximately 15 feet below land surface is composed of algal-laminated wackestones, packestones and bioclastic grainstones. Occasional mudstone layers and rip-up clast layers (less than 1 foot thick) were observed in this interval. The mudstones and wackestones exhibited porosities of between 1% to 5%. The packestone and grainstone intervals exhibited moldic porosities of between 10% to 30%. This interval was interpreted as representative of the Miami Limestone.

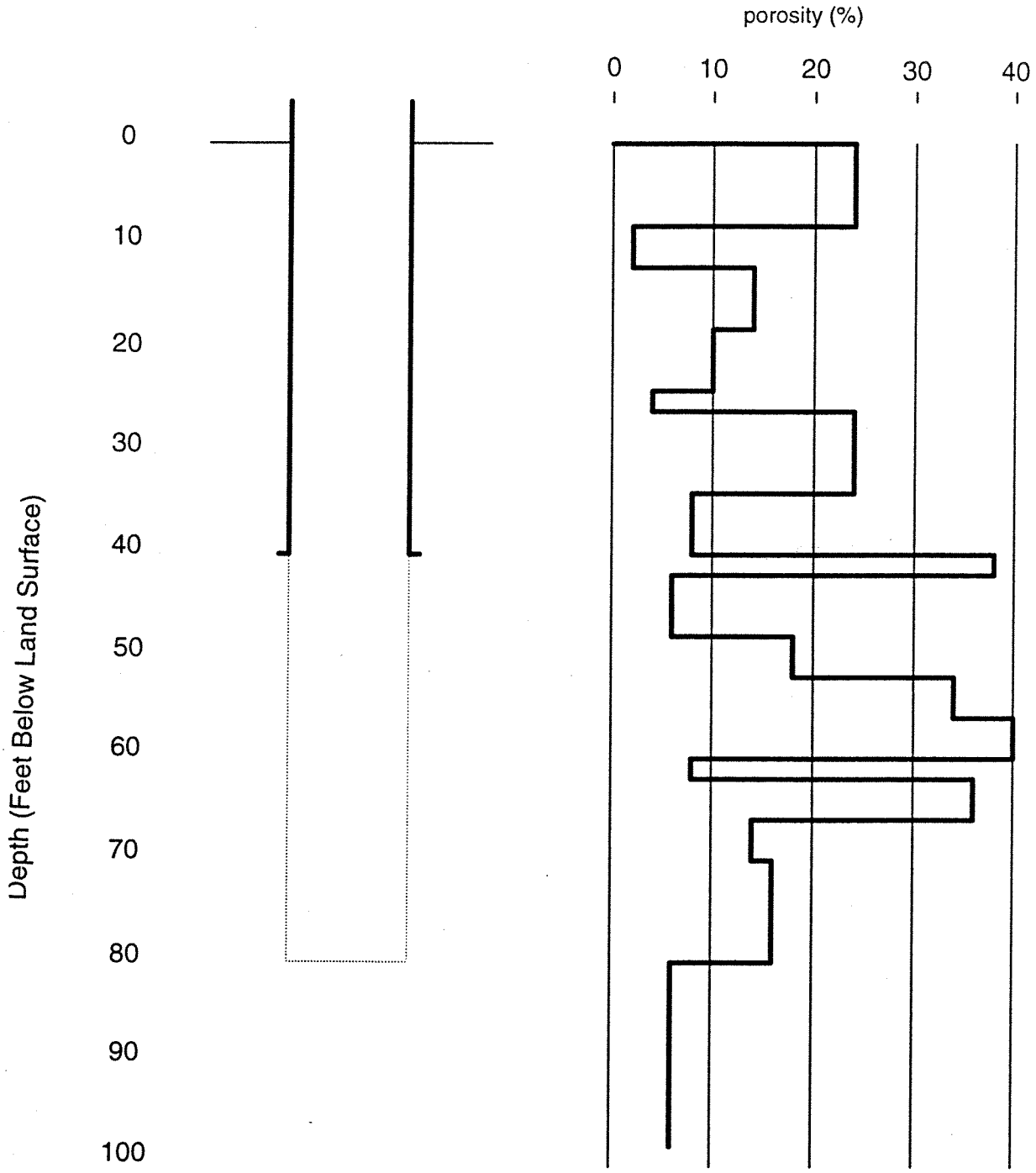
From approximately 15 feet bls to 25 feet bls, a gray-colored fossiliferous grainstone interval was observed. This interval exhibited intergranular and pinpoint moldic porosities of between 5% to 15%. From approximately 25 feet bls to 40 feet bls, a light-gray colored fossiliferous packestone/wackestone was observed. This interval exhibited moldic porosities of between 8% to 20%.

At a depth of approximately 40 feet bls, a one-foot-thick shelly, coraline boundstone was observed. This interval appears to represent an ancient oyster-bed or reef. This thin interval exhibited porosities of between 30% to 50%, and comprised the upper flow zones observed during the video surveys to be discussed shortly.

From 41 feet bls to approximately 57 feet bls, a fossiliferous packestone and grainstone interval was observed, exhibiting porosities of between 5% to 30%. From 57 feet bls to 60 feet bls, another shelly, coraline boundstone was observed, exhibiting porosities of between 30% to 50%. This interval represented another flow zone observed in the borings during the video surveys. From 60 feet bls to 80 feet bls, a fine-grained, fossiliferous and chalky packestone was observed, exhibiting porosities of between 5% to 15%. Occasional zones of higher porosity (from 30% to 40%) were observed in this interval at Well No. 14. The interval from 15 feet bls to 80 feet bls was interpreted as representative of the Fort Thompson Formation.

Below 80 feet bls, the rock became more dark-gray colored, and contained appreciable quantities of quartz sand. The limestone represented a fine-grained wackestone that exhibited porosities of between 5% to 10%. This interval (below 80 feet bls) was interpreted as representing an equivalent of the Tamiami Formation.

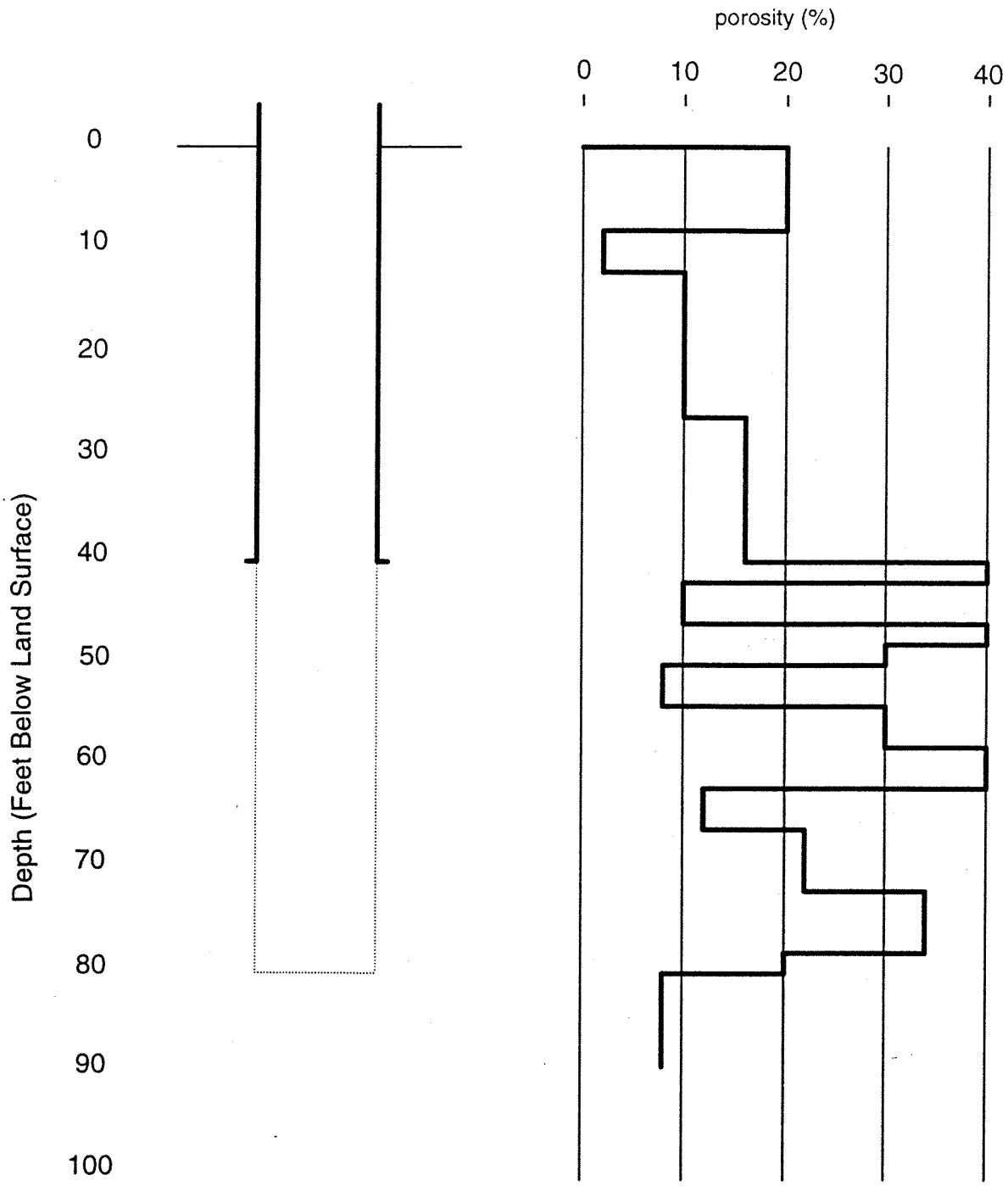
NWWF Well No. 13
Visual Estimate of Porosity



MONTGOMERY WATSON

Figure 7

NWWF Well No. 14
Visual Estimate of Porosity



MONTGOMERY WATSON

Figure 8

NWWF Well No. 15
Visual Estimate of Porosity

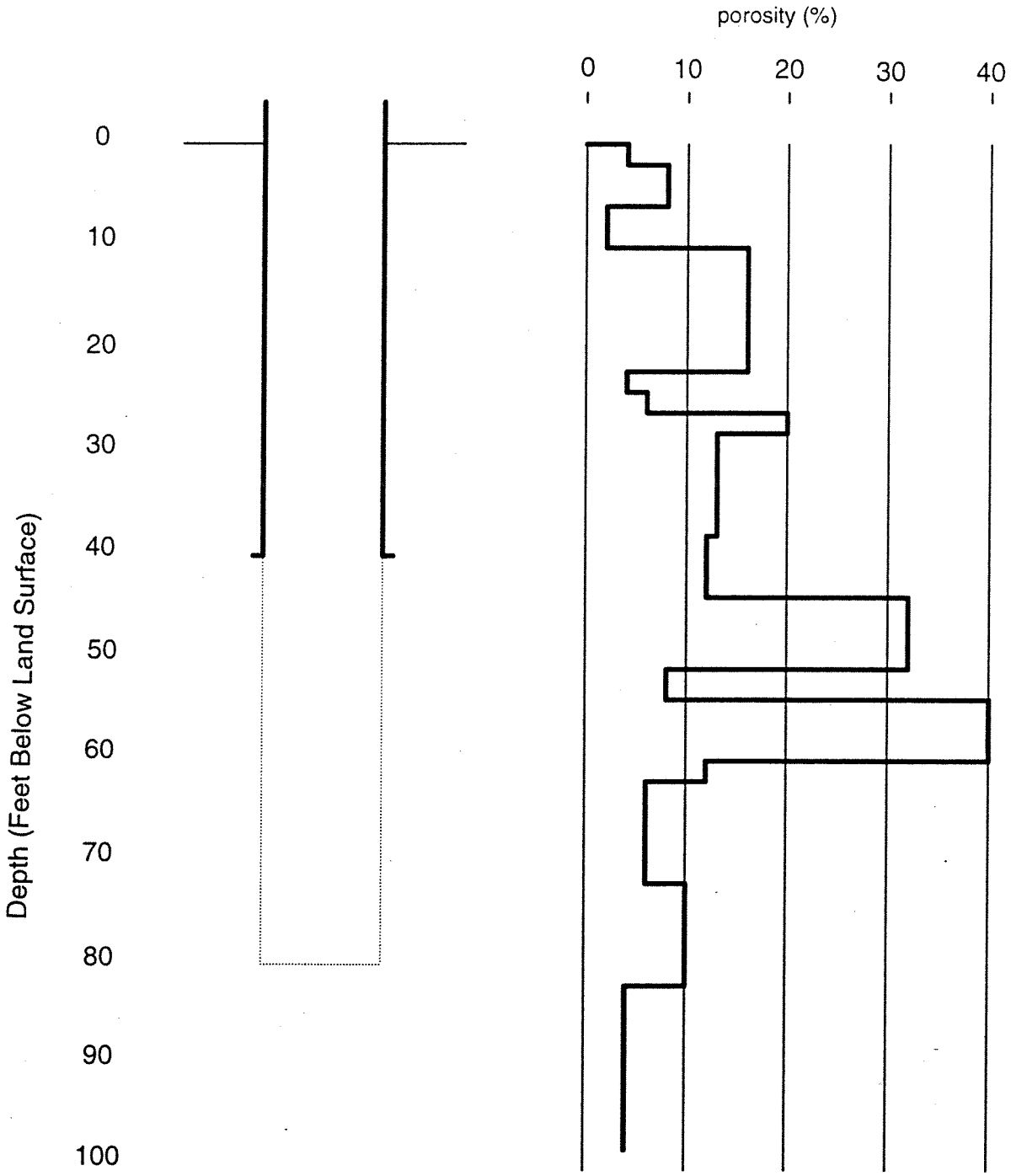


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Figure 9

Pumping Tests

As the borings at Wells Nos. 13 and 14 were drilled, brief pumping tests were performed. The pump had been removed from Well No. 15, therefore these tests were not performed at that well. For the pumping tests, the borings (installed approximately 30 feet away from each respective supply well) were used as observation wells and the corresponding supply wells were operated (pumped) at the normal rate (approximately 7,000 gpm) for a period of approximately 10 minutes. Upon completion of the pumping portion of the test, water levels were allowed to recover for a period of approximately 10 minutes. As the boreholes were advanced, various lengths of the open holes were exposed to the formation during these tests, to ascertain the degree of hydraulic connection between the formations penetrated by the boring and those at the supply well. A pressure transducer and data-logger system was used to continuously record water levels in the borings during the tests. Water level information collected during the tests is attached.

Well No. 13 Results

The first pumping test conducted at Well No. 13 was performed with the boring open hole exposed between 7.85 feet bls and 10 feet bls. When the supply well was turned on, a relatively gradual drawdown was observed in the boring location. This response is probably reflective of a relatively slow, "diffused" downward leakance of water through relatively "tight" geologic materials near the water table, into the production zone of Well No. 13 (the open hole of that supply well is completed from 40 feet bls to 80 feet bls). When the pump was turned off, a relatively slow, gradual rise in the water level was also observed at the borehole location.

The next pumping test in the boring was conducted with the open-hole exposed between 7.85 feet bls to 20 feet bls. In contrast to the earlier test, the water-level response in the boring to pumping was instantaneous. This indicates a nearly direct hydraulic connection between the open hole of the supply well and the materials at a depth of 20 feet bls. This information was subsequently interpreted to mean that the "roof" of the production zone existed somewhere above 20 feet bls at the wellfield.

The reader may recall that similar results were obtained at Well No. 10, when a pumping test was performed at that supply well. During that test, a 14-foot deep observation monitor well had been installed within the wellhouse. Instantaneous water-level responses were observed during the initiation and cessation of pumpage. It therefore appears that the "roof" of the production zone of the supply wells at the Northwest Wellfield extends to just below 10 feet bls (between 10 feet bls and 20 feet bls).

Subsequent pumping tests were performed on this boring with the open-hole exposed between the following intervals: 7.85 feet bls to 30 feet bls; 7.85 feet bls to 40 feet bls; 50 feet bls to 60 feet bls; and 74.5 feet bls to 80 feet bls. The response to pumping in the

boring was instantaneous during each of these tests, indicating direct hydraulic connection between the boring and the supply well open-hole.

Well No. 14 Results

The pumping tests performed on the boring at Well No. 14 yielded similar results to those at Well No. 13. A pumping test was conducted at this location with the open-hole of the boring exposed from 4.75 feet bls to 10 feet bls. The water-level response during this test was relatively gradual, indicating diffused downward leakage of water through low-permeability materials overlying the aquifer. This response supports the interpretation that the roof of the aquifer lies somewhere between the depth of 10 feet bls and 20 feet bls at the wellfield.

Subsequent pumping tests were performed on the Well No. 14 boring with the open-hole exposed between the following intervals: 30 feet bls to 40 feet bls; 30 feet bls to 60 feet bls; and 60 feet bls to 80 feet bls. The response to pumping in the boring was instantaneous during each of these tests, indicating direct hydraulic connection between the boring and the open-hole of the supply well.

Video Surveys

After each of the boreholes were constructed to total depth, a video survey was performed by MDWASD. The video surveys were useful in assessing the in-situ visual conditions of the formations penetrated by the borehole. During the video surveys performed at Wells Nos. 13 and 14, the corresponding supply wells were operated (pumped), in an effort to determine zones where active water flow was taking place. A "pumped" video at Well No. 15 was not possible, because the pump had been removed from that well prior to initiation of this project.

Well No. 13 Results

The pumped video performed at Well No. 13 indicated that a small amount of flow was occurring at a zone between 40 and 42 feet bls. Additional minor flows were observed from a highly porous intervals between 50 and 51 feet bls and between 68 and 69 feet bls. Most of the flow in the well, however, appeared to be occurring in the interval between 57 feet bls to 60 feet bls.

Well No. 14 Results

The pumped video performed at Well No. 14 indicated that flow was occurring in two zones. Major flow was observed between 56 and 57 feet bls and minor flow was observed at the bottom of the borehole, near a depth of 78 feet bls.

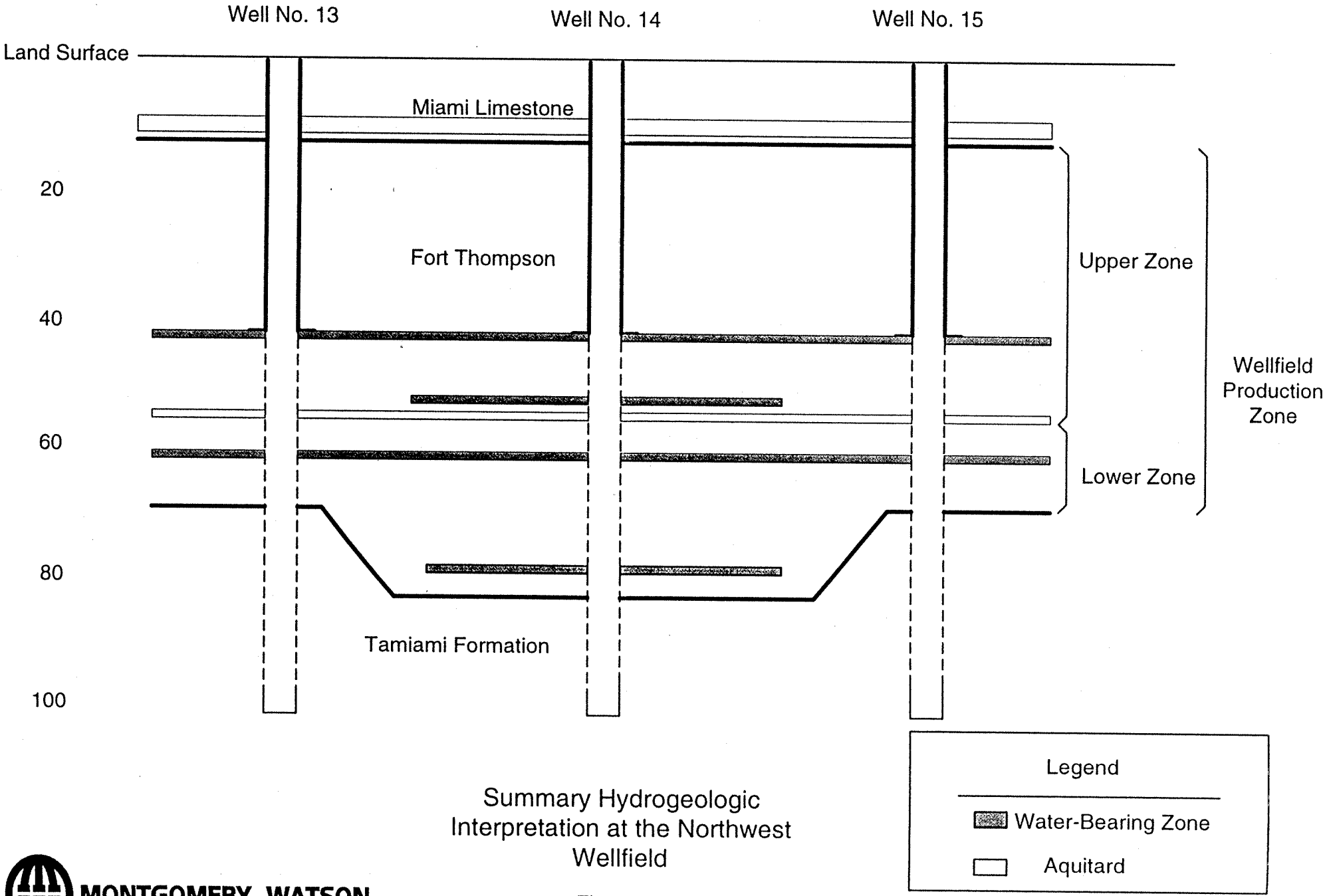
Borehole Cementing

Subsequent performance of the drilling and testing program, the boring holes were filled (plugged) with neat cement grout from total depth to land surface. The cement grout was emplaced with the tremie method. During the cementing process, the quantities of pumped cement were recorded, along with the corresponding "fill-up" of the borehole. This information can often be used to interpret the hydraulic properties of the penetrated formations. For instance, PSI installed a 3"-diameter, 15-foot deep well adjacent to supply Well No. 15 to secure a water supply for the drilling process. Upon the completion of the work, this well was plugged in a manner similar to the deep boreholes. During the cementing process, this well took nearly 50 times the theoretical volume of cement to fill the open hole, indicating highly permeable materials existing at a depth of just below 10 feet bls at the site.

SUMMARY AND RECOMMENDATIONS

Wells Nos. 13, 14 and 15 at the Northwest Wellfield produce water from numerous thin high-transmissivity zones that are separated by softer, denser strata. **Figure 10** represents a summary hydrogeologic interpretation of the information collected during this project. The "roof" of the water-bearing portion of the aquifer appears to extend to approximately 15 feet bls. Currently, all of the well casings are completed to 40 feet bls, which represents the depth to the top of the uppermost flow zone. The interval between 15 feet bls and 40 feet bls are in direct hydraulic connection. A dense interval appears to be present in each well, between the depths of 45 feet bls to 55 feet bls. A "middle" flow zone appears to be available in each of the wells, at a depth of between 57 feet bls and 60 feet bls. At Well No. 14, a "lower" flow zone appears to be particularly well developed between the depths of 75 feet bls to 78 feet bls.

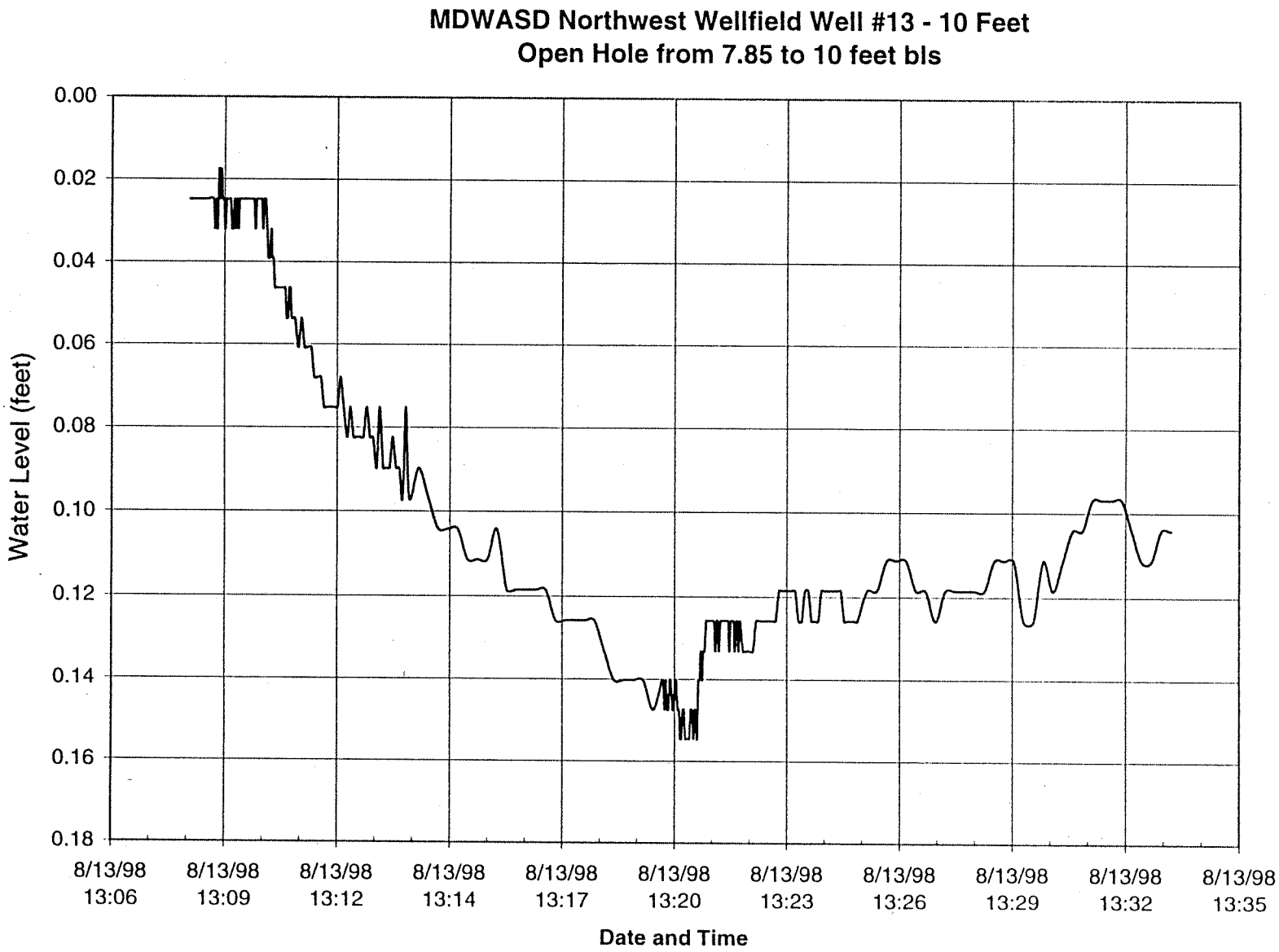
To eliminate a potential hydraulic connection with surface waters, Wells Nos. 13 and 15 should be retrofitted with inner casings set to minimum depths of 55 feet bls (just below the dense interval observed in each of the test wells. The open holes of these wells will then draw water from available flow zones from 55 feet bls to 80 feet bls, designated as the "lower zone" of the production interval. Since Well No. 14 appears to have more available flow zones, the inner casing at this well should be set to a depth of approximately 60 feet bls.

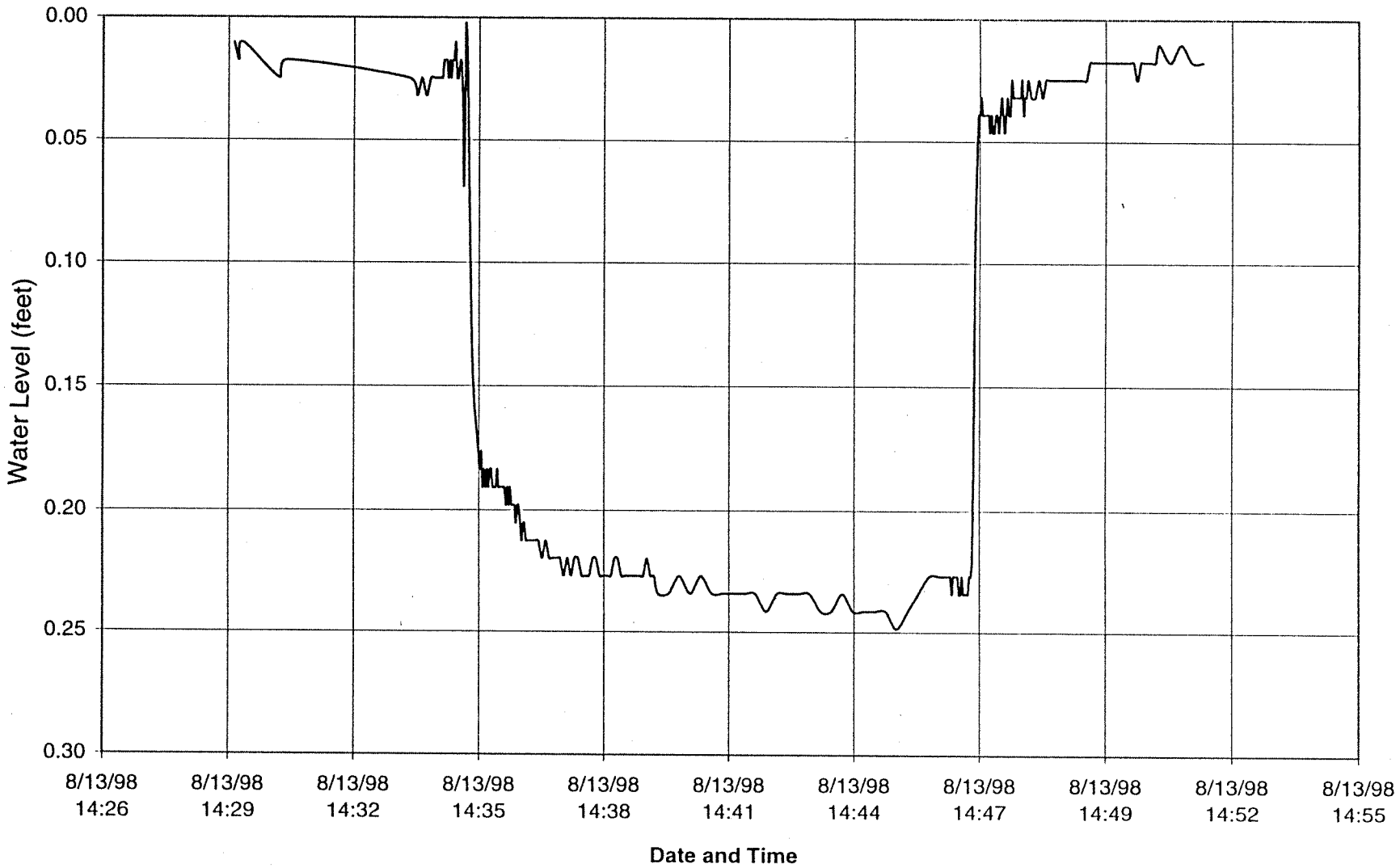


Summary Hydrogeologic Interpretation at the Northwest Wellfield

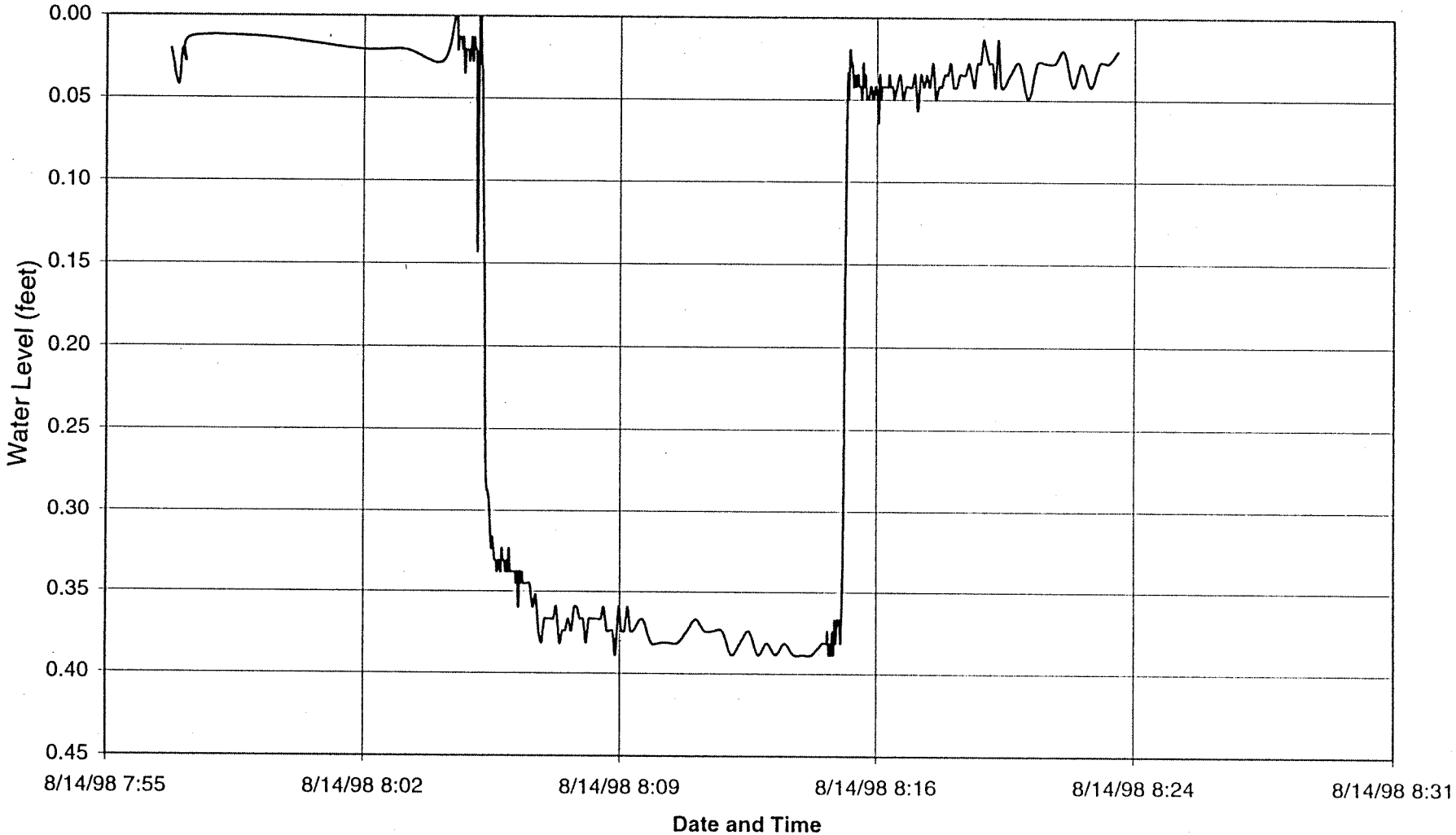
MONTGOMERY WATSON

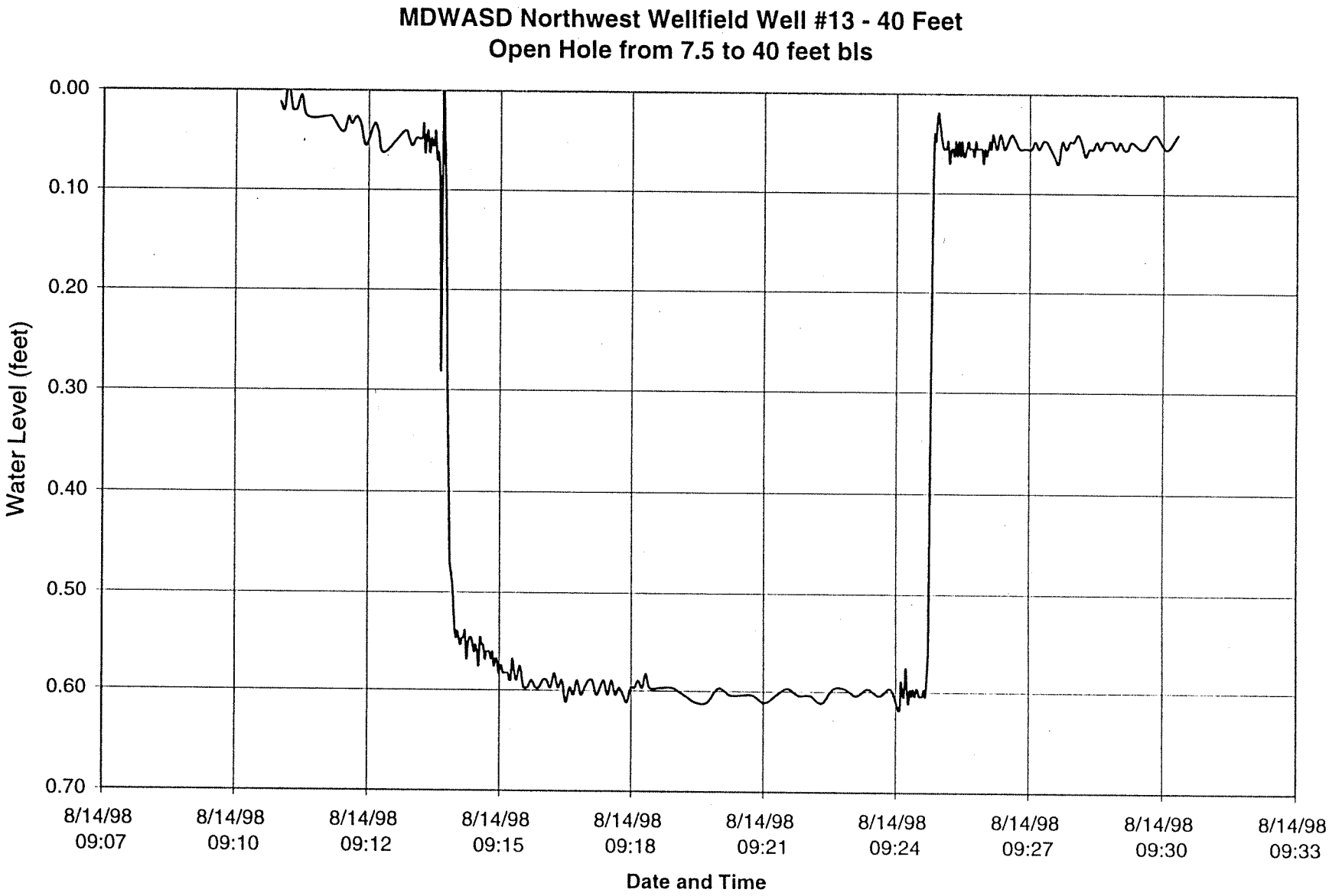
Figure 10.

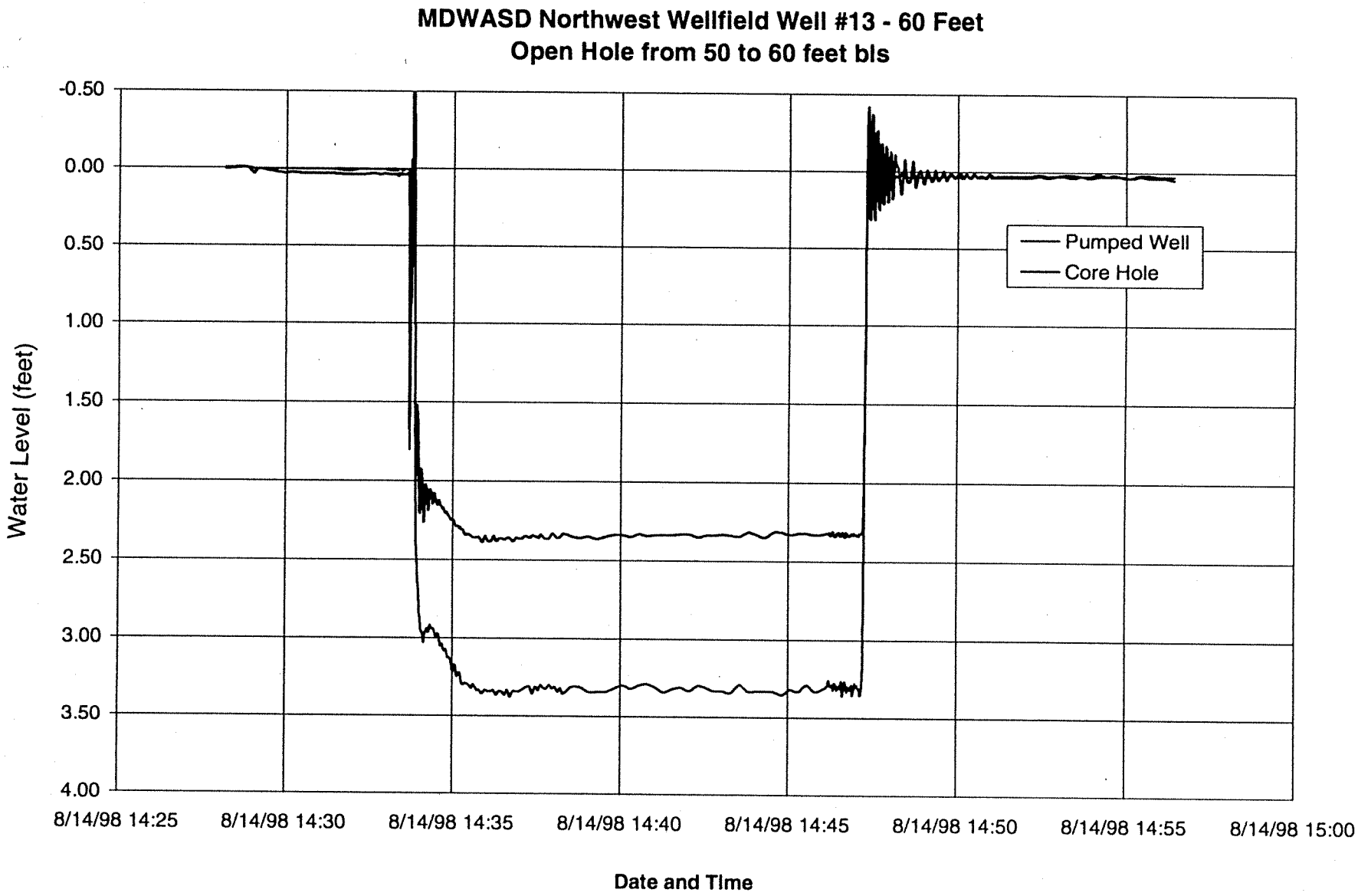

MDWASD Northwest Wellfield Well #13 - 10 Feet
Open Hole from 7.85 to 10 feet bls
Water Level (feet)
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16
0.18
8/13/98 13:06
8/13/98 13:09
8/13/98 13:12
8/13/98 13:14
8/13/98 13:17
8/13/98 13:20
8/13/98 13:23
8/13/98 13:26
8/13/98 13:29
8/13/98 13:32
8/13/98 13:35
Date and Time

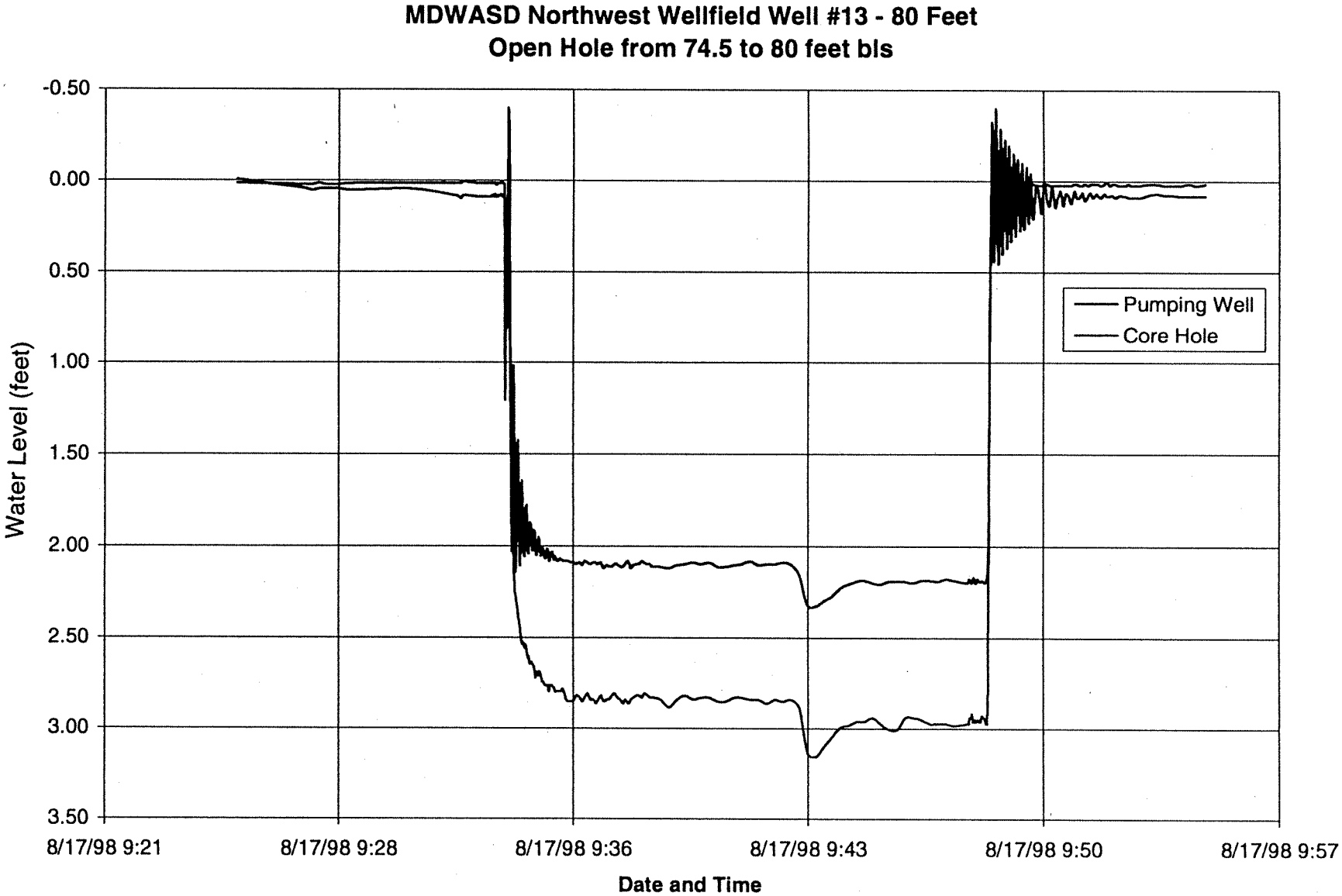

MDWASD Northwest Wellfield Well #13 - 20 FT
Open Hole from 7.85 to 20 feet bls
Water Level (feet)
0.00
0.05
0.10
0.15
0.20
0.25
0.30
8/13/98 14:26
8/13/98 14:29
8/13/98 14:32
8/13/98 14:35
8/13/98 14:38
8/13/98 14:41
8/13/98 14:44
8/13/98 14:47
8/13/98 14:49
8/13/98 14:52
8/13/98 14:55
Date and Time

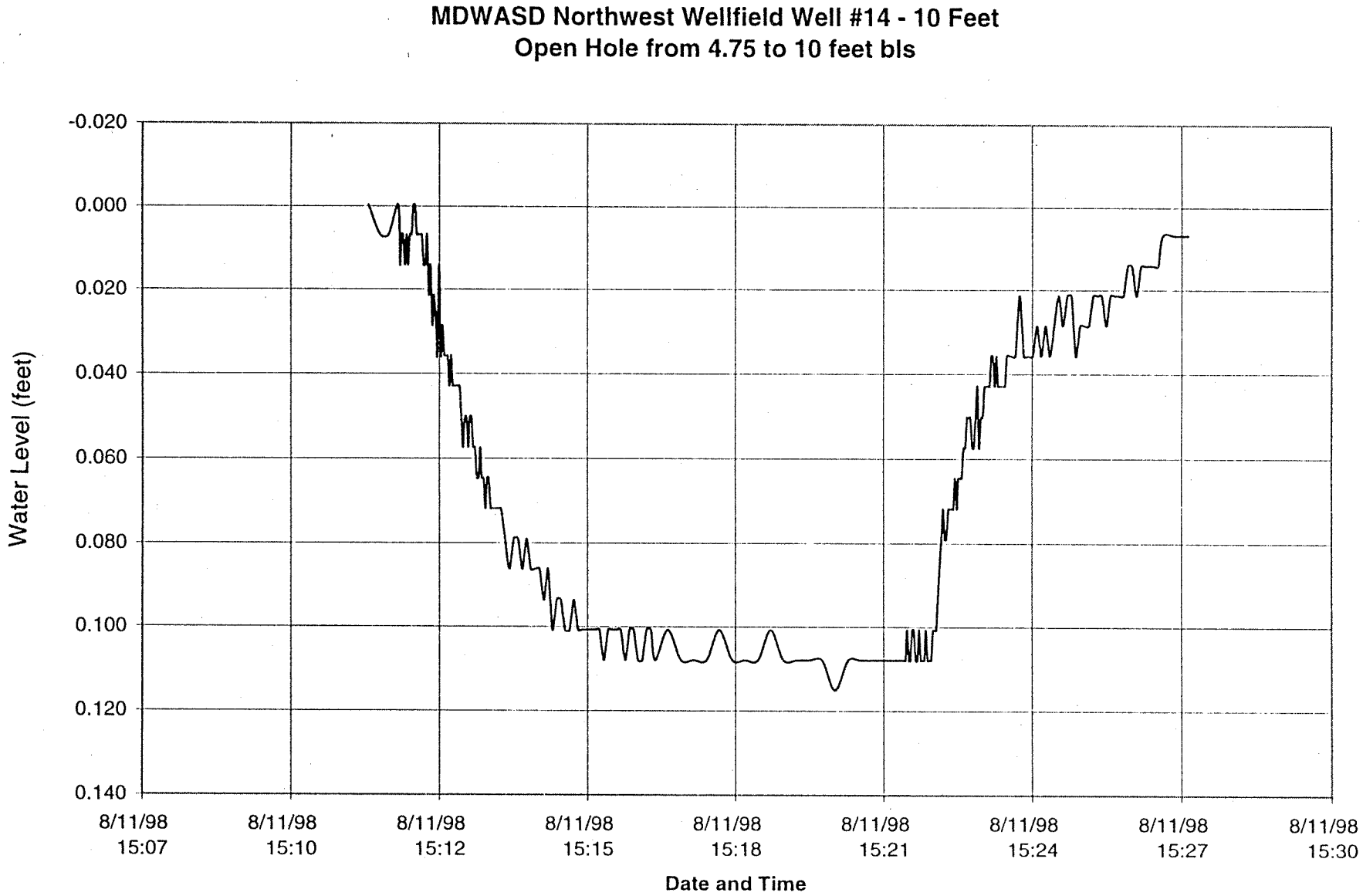
MDWASD Northwest Wellfield Well #13 - 30 Feet
Open Hole from 7.85 to 30 feet bls

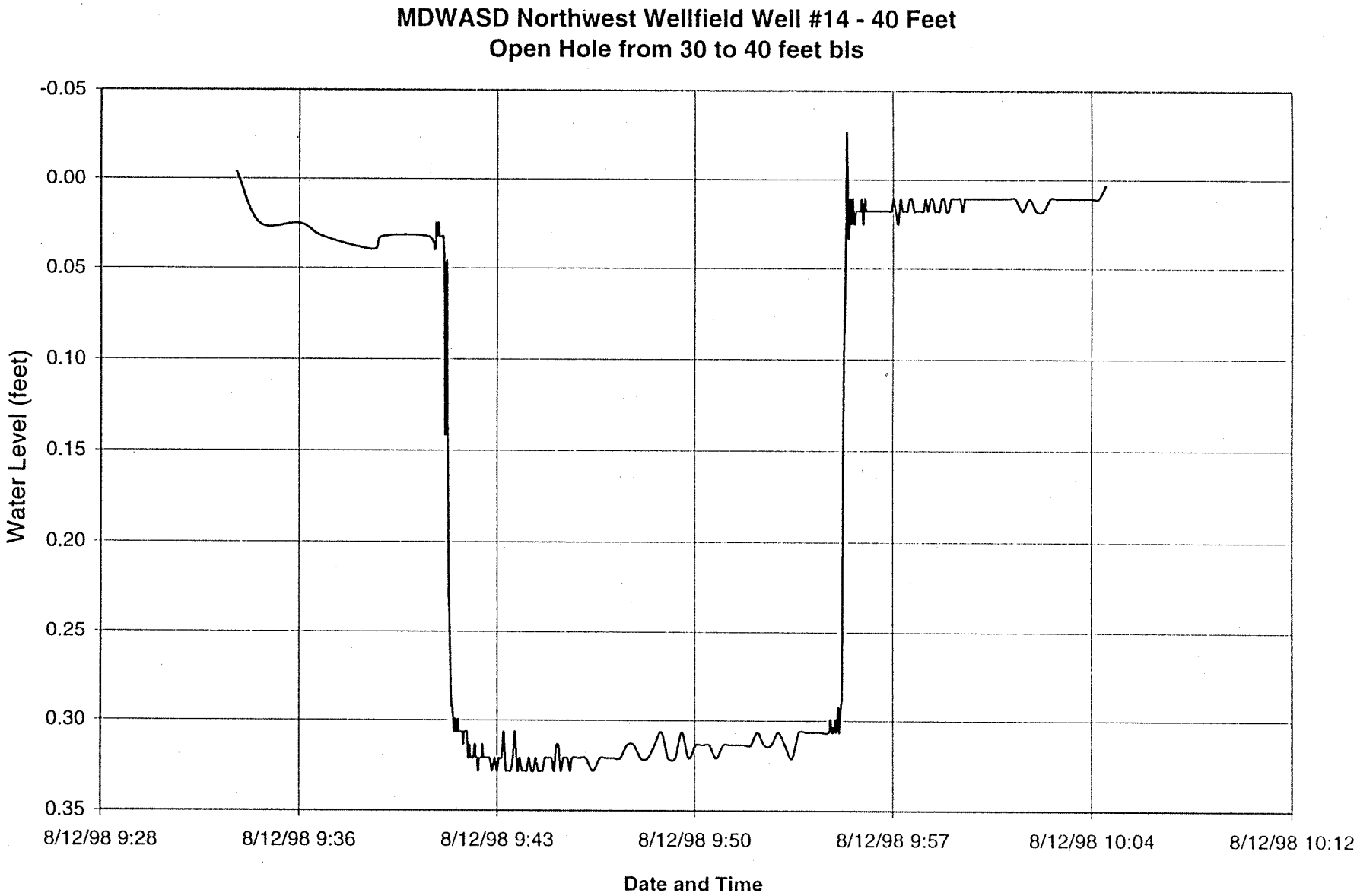


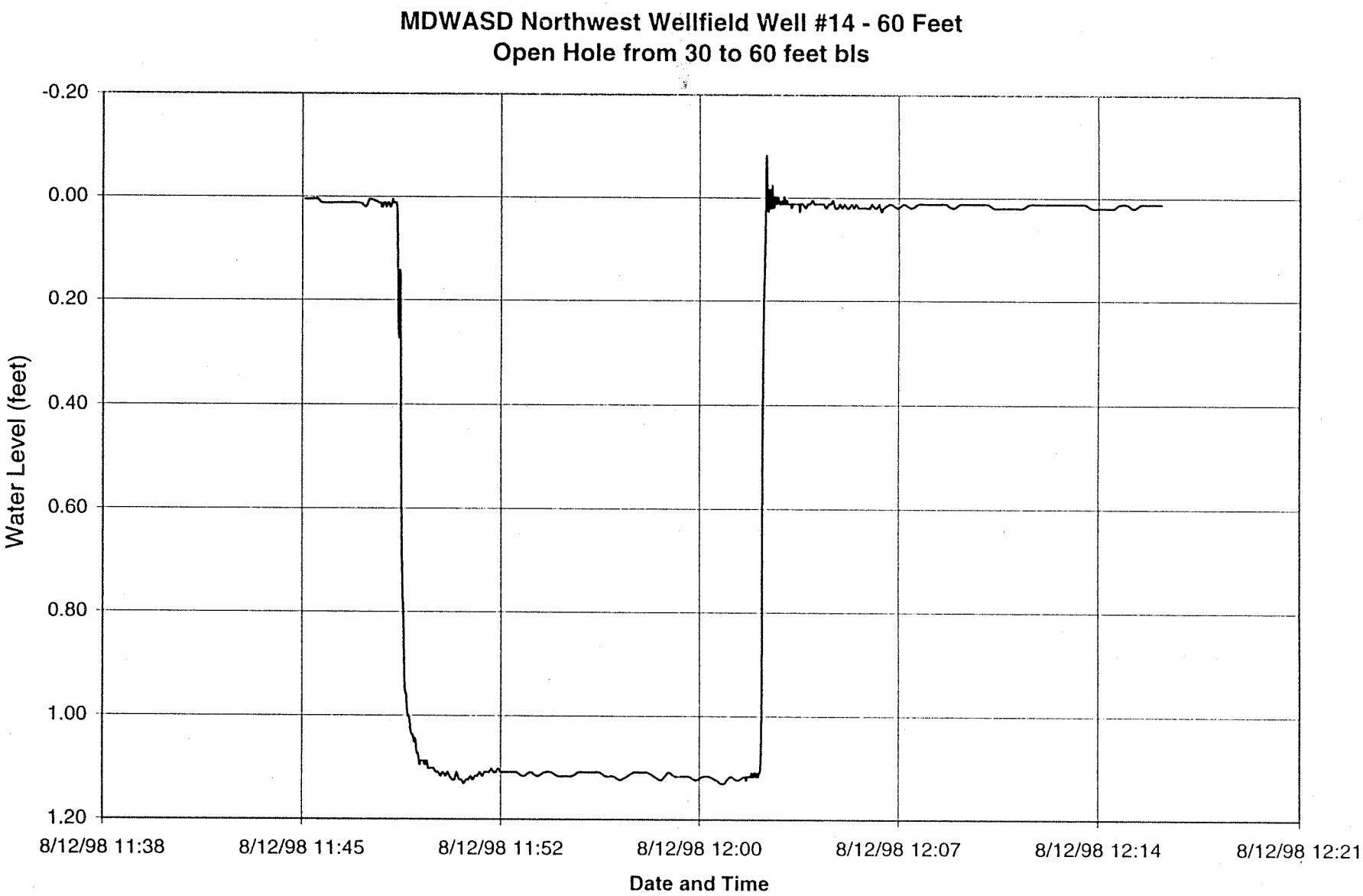

MDWASD Northwest Wellfield Well #13 - 40 Feet
Open Hole from 7.5 to 40 feet bls
Water Level (feet)
0.00
0.10
0.20
0.30
0.40
0.50
0.60
0.70
8/14/98 09:07
8/14/98 09:10
8/14/98 09:12
8/14/98 09:15
8/14/98 09:18
8/14/98 09:21
8/14/98 09:24
8/14/98 09:27
8/14/98 09:30
8/14/98 09:33
Date and Time

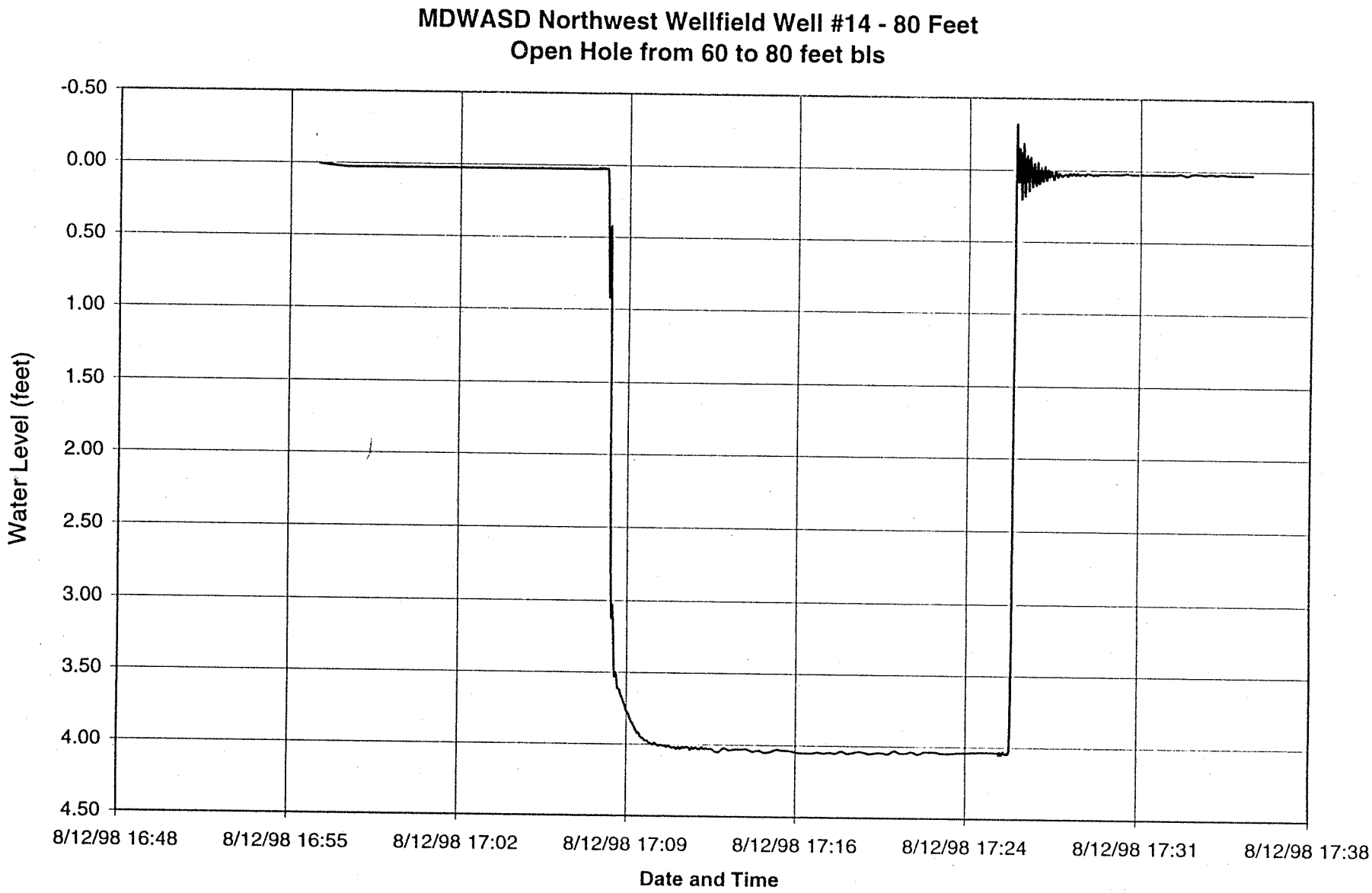

MDWASD Northwest Wellfield Well #13 - 60 Feet
Open Hole from 50 to 60 feet bls
-0.50
0.00
0.50
1.00
1.50
2.00
2.50
3.00
3.50
4.00
Water Level (feet)
Pumped Well
Core Hole
8/14/98 14:25
8/14/98 14:30
8/14/98 14:35
8/14/98 14:40
8/14/98 14:45
8/14/98 14:50
8/14/98 14:55
8/14/98 15:00
Date and Time


MDWASD Northwest Wellfield Well #13 - 80 Feet
Open Hole from 74.5 to 80 feet bls
-0.50
0.00
0.50
1.00
1.50
2.00
2.50
3.00
3.50
Water Level (feet)
Pumping Well
Core Hole
8/17/98 9:21
8/17/98 9:28
8/17/98 9:36
8/17/98 9:43
8/17/98 9:50
8/17/98 9:57
Date and Time


MDWASD Northwest Wellfield Well #14 - 10 Feet
Open Hole from 4.75 to 10 feet bls
Water Level (feet)
-0.020
0.000
0.020
0.040
0.060
0.080
0.100
0.120
0.140
8/11/98 15:07
8/11/98 15:10
8/11/98 15:12
8/11/98 15:15
8/11/98 15:18
8/11/98 15:21
8/11/98 15:24
8/11/98 15:27
8/11/98 15:30
Date and Time


MDWASD Northwest Wellfield Well #14 - 40 Feet
Open Hole from 30 to 40 feet bls
-0.05
0.00
0.05
0.10
0.15
0.20
0.25
0.30
0.35
Water Level (feet)
8/12/98 9:28
8/12/98 9:36
8/12/98 9:43
8/12/98 9:50
8/12/98 9:57
8/12/98 10:04
8/12/98 10:12
Date and Time


MDWASD Northwest Wellfield Well #14 - 60 Feet
Open Hole from 30 to 60 feet bls
-0.20
0.00
0.20
0.40
0.60
0.80
1.00
1.20
Water Level (feet)
8/12/98 11:38
8/12/98 11:45
8/12/98 11:52
8/12/98 12:00
8/12/98 12:07
8/12/98 12:14
8/12/98 12:21
Date and Time


MDWASD Northwest Wellfield Well #14 - 80 Feet
Open Hole from 60 to 80 feet bls
-0.50
0.00
0.50
1.00
1.50
2.00
2.50
3.00
3.50
4.00
4.50
Water Level (feet)
8/12/98 16:48
8/12/98 16:55
8/12/98 17:02
8/12/98 17:09
8/12/98 17:16
8/12/98 17:24
8/12/98 17:31
8/12/98 17:38
Date and Time

Appendix C

Well Completion Reports

WELL COMPLETION REPORT

FORM 0124 Rev. 4/85

WELL PERMIT NO. SF0722

Miami Dade Water + Sewer Dept 3575 South LeJune Rd, Miami, FL 33
Owner Address City State Zip

Contractor's Signature 2172 9/25/99
License No. Completion Date

Cameron Webster
Driller's Name Registration No.

Casing Depth 56 Total Depth 80 Well # 13

TYPE OF WORK: Construct ( ) Repair (✓) Abandon ( )
WELL USE: Domestic Well ( ) Public (✓) Monitor ( ) Test ( )
Irrigation ( ) Fire Well ( ) Other _____
METHOD: Rotary with MUD ( ) or Air (✓) Cable Tool ( ), Jet ( )
Casing Driven ( ), Other _____
STATIC WATER LEVEL 8 Ft. below top of casing
PUMPING WATER LEVEL 20 Ft. after 3 Hrs. at 7000 GPM
PUMP SIZE 16" H.P. CAPACITY 7000 GPM
PUMP TYPE Turbine INTAKE DEPTH 53
From top of ground

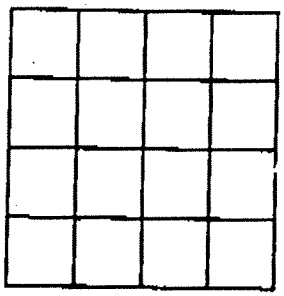
LOCATION

Located Near _____

County _____

¼ ¼ Section Township Range

Latitude-Longitude



LOCATE IN SECTION

Cuttings sent to District? ( ) Yes ( ) No

Note: PWS Wells attach a site map if well location is different from site location on permit application.

Grout Thickness & Depth	Casing & Screen Diameter & Depth		Depth (ft) From	Depth (ft) To	DRILL CUTTINGS LOG Examine cuttings every 20 ft. or at formation changes Give color, grain size, and type of material Note cavities, depth to producing zones.
	48	4	40	50	LIMESTONE
	40	5/6	50	70	POROUS LIMESTONE
			70	80	DENSE LIMESTONE
Number of bags					

Casing: Black Steel (✓) Galv. ( ) PVC ( ) Fiberglass ( )
Screen: Type _____ Slot size _____
Screened from _____ (ft.) to _____ (ft.)
Type of grout with % additives CLASS H NEAT
Water: Clear ( ) Colored (✓) Sulphur ( ) Salty ( ) Iron ( )
Conductivity _____ Chlorides _____ mg/l

WELL COMPLETION REPORT

FORM 0124
Rev. 4/85

WELL PERMIT NO. SF0722298

Miami Dade Water & Sewer Dept. 3575 South LeJeune Rd., Miami, FL 33146-222
Owner — Address — City — State — Zip

Contractor's Signature: [signature] — 2172 (License No.) — 5/27/99 (Completion Date)

Driller's Name: Cameron Webster — Registration No.

Casing Depth: 54' 40" — Total Depth: 80' — Well # 14

TYPE OF WORK: Construct ( ) Repair (✓) Abandon ( )
WELL USE: Domestic Well ( ) Public (✓) Monitor ( ) Test ( )
Irrigation ( ) Fire Well ( ) Other _____
METHOD: Rotary with MUD ( ) or Air (✓), Cable Tool ( ), Jet ( )
Casing Driven ( ), Other _____
STATIC WATER LEVEL 8.2 Ft. below top of casing
PUMPING WATER LEVEL 18.5 Ft. after 3 Hrs. at 7000 GPM
PUMP SIZE 16" H.P. CAPACITY 7000 GPM
PUMP TYPE Turbine INTAKE DEPTH 53'
From top of ground

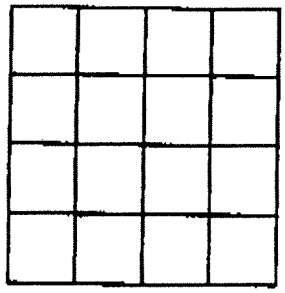
LOCATION

Located Near _____

County _____

¼ ¼ Section Township Range

Latitude-Longitude



LOCATE IN SECTION

Cuttings sent to District? ( ) Yes ( ) No

Note: PWS Wells attach a site map if well location is different from site location on permit application.

Grout Thickness & Depth	Casing & Screen Diameter & Depth		Depth (ft) From	Depth (ft) To	DRILL CUTTINGS LOG Examine cuttings every 20 ft. or at formation changes. Give color, grain size, and type of material. Note cavities, depth to producing zones.
	48"	41'	40	50	Lime some chirt
	40"	54'	50	60	Pourous Limestone
			60	70	Pourous Limestone
			70	80	Harder Denser Lime & Quartzy material.
Number of bags					

Casing: Black Steel (✓) Galv. ( ) PVC ( ) Fiberglass ( )
Screen: Type _____ Slot size _____
Screened from _____ (ft.) to _____ (ft.)
Type of grout with % additives Class H Neat
Water: Clear ( ) Colored ( ) Sulphur ( ) Salty ( ) Iron ( )
Conductivity _____ Chlorides _____ mg/l

WELL COMPLETION REPORT

FORM 0124
Rev. 4/85

WELL PERMIT NO. SF0722980

Miami Dade Water & Sewer Dept. 3575 South LeJeune Rd Miami, FL 33146-2221
Owner — Address — City — State — Zip

Contractor's Signature — License No. — Completion Date — Casing Depth — Total Depth — Well #

Cameron Webster
Driller's Name — Registration No.

2172 | 4/12/99 | 54 FT. | 88 FT | 15

TYPE OF WORK: Construct ( ) Repair (✓) Abandon ( )
WELL USE: Domestic Well ( ) Public (✓) Monitor ( ) Test ( )
Irrigation ( ) Fire Well ( ) Other _____
METHOD: Rotary with MUD ( ) or Air (✓), Cable Tool ( ), Jet ( )
Casing Driven ( ), Other _____
STATIC WATER LEVEL 8 Ft. below top of casing
PUMPING WATER LEVEL 20 Ft. after 3 Hrs. at 7000 GPM
PUMP SIZE 16" H.P. CAPACITY 7000 GPM
PUMP TYPE Turbine INTAKE DEPTH 53'
From top of ground

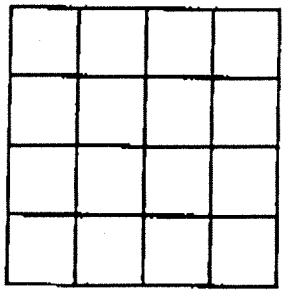
LOCATION

Located Near _____

County _____

¼ ¼ Section Township Range

Latitude-Longitude



LOCATE IN SECTION

Cuttings sent to District? ( ) Yes ( ) No

Note: PWS Wells attach a site map if well location is different from site location on permit application.

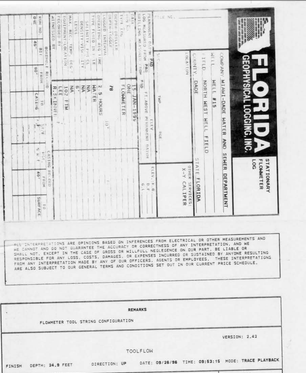
Grout Thickness & Depth	Casing & Screen Diameter & Depth		Depth (ft) From	Depth (ft) To	DRILL CUTTINGS LOG Examine cuttings every 20 ft. or at formation changes Give color, grain size, and type of material Note cavities, depth to producing zones.
	48	41			3/4" Cuttings
	40	54	54	88	mostly LIMESTONE
					Water Zone
					58'-66'
Number of bags					

Casing: Black Steel (✓) Galv. ( ) PVC ( ) Fiberglass ( )
Screen: Type _____ Slot size _____
Screened from _____ (ft.) to _____ (ft.)
Type of grout with % additives CLASS A Neat
Water: Clear ( ) Colored (✓) Sulphur ( ) Salty ( ) Iron ( )
Conductivity _____ Chlorides _____ mg/l

Appendix D

MONTGOMERY WATSON

Well No. 15
Geophysical Logs



ANY INTERPRETATIONS ARE OPINIONS BASED ON INFERENCES FROM ELECTRICAL OR OTHER MEASUREMENTS AND WE CANNOT AND DO NOT GUARANTEE THE ACCURACY OR CORRECTNESS OF ANY INTERPRETATION, AND WE SHALL NOT, EXCEPT IN THE CASE OF GROSS OR WILLFUL NEGLIGENCE ON OUR PART, BE LIABLE OR RESPONSIBLE FOR ANY LOSS, COSTS, DAMAGES, OR EXPENSES INCURRED OR SUSTAINED BY ANYONE RESULTING FROM ANY INTERPRETATION MADE BY ANY OF OUR OFFICERS, AGENTS OR EMPLOYEES. ANY INTERPRETATION MADE BY US OR OUR OFFICERS, AGENTS OR EMPLOYEES ARE BASED ON OUR GENERAL TERMS AND CONDITIONS SET OUT IN OUR CURRENT PRICE SCHEDULE.

REMARKS

FLOWMETER TOOL STRING CONFIGURATION

VERSION: 2.42

TOOLFLOW

FINISH DEPTH: **36.8** FEET DIRECTION: UP DATE: **09/26/98** TIME: **09:53:15** MODE: **TRACE PLAYBACK**

GR
0 API 150

-- CENTRALIZER -- 3 FT. LONG

-- TOTAL TOOL STRING LENGTH = 13 FT. --

-- 1 11/16" WEIGHT -- 5 FT. LONG

-- FLOWMETER -- 5 FT. LONG

-- SPINNER MEASURE POINT
AT 4 FT. FROM BOTTOM

-- CENTRALIZER -- BOT

GR
0 API 150

START DEPTH: **99.0** FEET DIRECTION: UP DATE: **09/26/98** TIME: **09:52:52** MODE: **TRACE PLAYBACK**

TOOLFLOW

VERSION: 2.42

REMARKS

STATIONARY FLOWMETER LOG.
FLOWRATE = 9.000 GPM.

VERSION: 2.42

FLOW2

FINISH DEPTH: **39.7** FEET DIRECTION: **TIME** DATE: **01/15/99** TIME: **15:34:59** MODE: **ORIGINAL**

TIME DRIVE
-50 FPM 50

STATIONARY FLOWMETER
0.0 CPS 100.0

40 FEET
45 FEET
50 FEET
55 FEET
60 FEET
65 FEET
70 FEET

TIME DRIVE
-50 FPM 50

STATIONARY FLOWMETER
0.0 CPS 100.0

START DEPTH: **99.7** FEET DIRECTION: **TIME** DATE: **01/15/99** TIME: **15:09:41** MODE: **ORIGINAL**

FLOW2

VERSION: 2.42

REMARKS

STATIONARY FLOWMETER LOG.
FLOWRATE = 7.000 GPM.

VERSION: 2.42

FLOW1

FINISH DEPTH: **39.8** FEET DIRECTION: **TIME** DATE: **01/15/99** TIME: **14:58:55** MODE: **ORIGINAL**

TIME DRIVE
-50 FPM 50

STATIONARY FLOWMETER
0.0 CPS 100.0

40 FEET
45 FEET
50 FEET
55 FEET
60 FEET
65 FEET
70 FEET

TIME DRIVE
-50 FPM 50

STATIONARY FLOWMETER
0.0 CPS 100.0

START DEPTH: **70.8** FEET DIRECTION: **TIME** DATE: **01/15/99** TIME: **14:43:31** MODE: **ORIGINAL**

FLOW1

VERSION: 2.42

COMPANY MIAMI-DADE WATER AND SEWER DISTRICT

WELL WELL #19

FIELD NORTH WEST WELL FIELD STATE FLORIDA

FLORIDA GEOPHYSICAL LOGGING, INC.

X-Y CALIPER LOG

FILE NO. _____

COMPANY MIAMI DADE WATER AND SEWER

WELL N.W.W.F #15

FIELD NORTH WEST WELL FIELD

COUNTY _____ STATE _____

LOCATION

SEC. _____ TWP _____ RGE _____

OTHER SERVICES:
FLOWMETER

PERMANENT DATUM PAD ELEV. _____
LOG MEASURED FROM PAD FT. ABOVE PERMANENT DATUM
DRILLING MEASURED FROM PAD

ELEV.: K.B. _____
D.F. _____
G.L. _____

DATE	20-APRIL-1999	
RUN NO.		
TYPE LOG	X-Y CALIPER	
DEPTH-DRILLER	77.8'	
DEPTH-LOGGER	78'	
LOGGED INTERVAL	78' TO 35'	TO
OPERATING RIG TIME	2.5 HOURS	
TYPE FLUID IN HOLE	WATER	
SALINITY, PPM CL	NA	
DENSITY-VISCOSITY	NA	
LEVEL	FULL	
MAX. REC. TEMP. DEG F.	NA	
EQUIPMENT-LOCATION	102 FTM	
RECORDED BY	LEE	
WITNESSED BY	R.SKINNER	AUGUSTIN

BOREHOLE RECORD				CASING RECORD			
RUN NO.	BIT	FROM	TO	SIZE	WGT.	FROM	TO
	32"	78'	CASING	48"	.375 W.T	78'	SURFACE

ALL INTERPRETATIONS ARE OPINIONS BASED ON INFERENCES FROM ELECTRICAL OR OTHER MEASUREMENTS AND WE CANNOT AND DO NOT GUARANTEE THE ACCURACY OR CORRECTNESS OF ANY INTERPRETATION, AND WE SHALL NOT, EXCEPT IN THE CASE OF GROSS OR WILLFULL NEGLEGENCE ON OUR PART, BE LIABLE OR RESPONSIBLE FOR ANY LOSS, COSTS, DAMAGES, OR EXPENSES INCURRED OR SUSTAINED BY ANYONE RESULTING FROM ANY INTERPRETATION MADE BY ANY OF OUR OFFICERS, AGENTS OR EMPLOYEES. THESE INTERPRETATIONS ARE ALSO SUBJECT TO OUR GENERAL TERMS AND CONDITIONS SET OUT IN OUR CURRENT PRICE SCHEDULE.

REMARKS

XY CALIPER/GAMMA RAY TOOL STRING CONFIGURATION

VERSION: 2.42

TOOLXYGRS

FINISH DEPTH: 24.9 FEET DIRECTION: UP DATE: 09/26/96 TIME: 09:58:54 MODE: TRACE PLAYBACK

GR
0 (API) 10

-- GAMMA RAY -- 3 FT. LONG
MEASURE POINT 7.5 FT. FROM BOT

-- TOTAL TOOL STRING LENGTH = 9 FT. --

-- XY CALIPER -- 6 FT. LONG

--SHORT ARM MEASURE POINT 3 FT. FROM BOT

-- BOT

GR
0 (API) 10

START DEPTH: 99.0 FEET DIRECTION: UP DATE: 09/26/96 TIME: 09:58:33 MODE: TRACE PLAYBACK

TOOLXYGRS

VERSION: 2.42

VERSION: 2.42

MAIN PASS

NW14XYMP

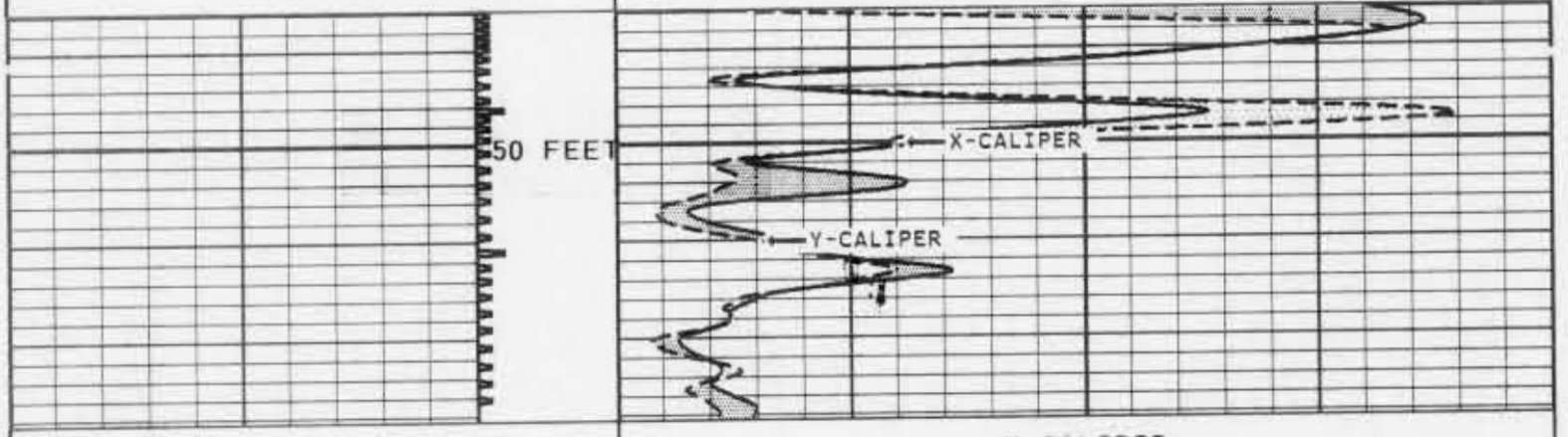
FINISH DEPTH: 40.9 FEET DIRECTION: UP DATE: 04/20/99 TIME: 11:43:07 MODE: TRACE PLAYBACK

Y>X CALIPER

X>Y CALIPER

Y-CALIPER
30.00 CPS 50.00

X-CALIPER
30.00 CPS 50.00



X-CALIPER

30.00 CPS 50.00

Y-CALIPER

30.00 CPS 50.00

X>Y CALIPER

Y>X CALIPER

START DEPTH: **78.6** FEET DIRECTION: **UP** DATE: **04/20/99** TIME: **11:42:44** MODE: **TRACE PLAYBACK**

NW14XYMP

MAIN PASS

VERSION: 2.42

VERSION: 2.42

REPEAT PASS

NW14XYRP

FINISH DEPTH: **42.9** FEET DIRECTION: **UP** DATE: **04/20/99** TIME: **11:41:25** MODE: **TRACE PLAYBACK**

Y>X CALIPER

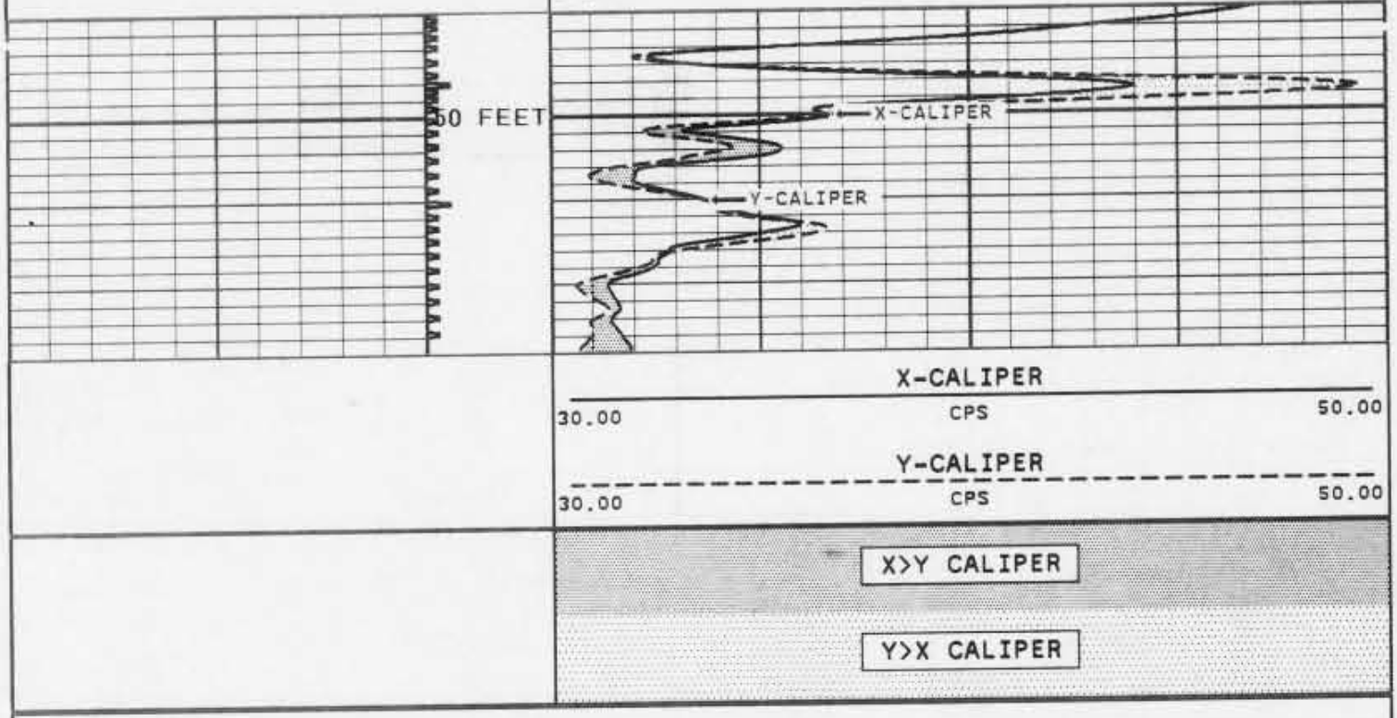
X>Y CALIPER

Y-CALIPER

30.00 CPS 50.00

X-CALIPER

30.00 CPS 50.00



START DEPTH: 78.0 FEET DIRECTION: UP DATE: 04/20/99 TIME: 11:41:03 MODE: TRACE PLAYBACK

NW14XYRP

REPEAT PASS

VERSION: 2.42

MASTER CALIBRATION SUMMARY

FILE: DATE: 04/20/99 TIME: 11:35 VERSION: 2.42

X-CALIPER #01

DATE: 04/19/99 TIME: 14:29

	MEASURED	UNITS	STANDARD	MINIMUM	MAXIMUM	DEVIATION	UNITS
30	671.6	CPS	30.0	29.9	30.2	0.16	CPS
40	812.5	CPS	40.0	39.8	40.2	0.16	CPS
60	1070.4	CPS	58.0	58.0	58.3	0.00	CPS

Y-CALIPER #01

DATE: 04/19/99 TIME: 14:29

	MEASURED	UNITS	STANDARD	MINIMUM	MAXIMUM	DEVIATION	UNITS
30	622.8	CPS	30.0	29.8	30.2	0.20	CPS
40	744.8	CPS	40.0	39.6	40.0	0.02	CPS
60	993.6	CPS	59.0	58.7	59.1	0.16	CPS

COMPANY MIAMI DADE WATER AND SEWER.

WELL N.W.W.F #14

FIELD NORTH WEST WELL FIELD STATE FLORIDA

FLORIDA GEOPHYSICAL LOGGING, INC.

X-Y CALIPER LOG

FILE NO. _____

COMPANY MIAMI-DADE WATER AND SEWER DEPARTMENT

WELL WELL #15

FIELD NORTH WEST WELL FIELD

COUNTY DADE STATE FLORIDA

LOCATION

SEC. _____ TWP _____ RGE _____

OTHER SERVICES:
FLOWMETER

PERMANENT DATUM PAD ELEV. _____
LOG MEASURED FROM PAD FT. ABOVE PERMANENT DATUM
DRILLING MEASURED FROM PAD

ELEV.: K.B. _____
D.F. _____
G.L. _____

DATE	15-JAN-1999	
RUN NO.	ONE	
TYPE LOG	X-Y CALIPER	
DEPTH-DRILLER	80'	
DEPTH-LOGGER	78'	
LOGGED INTERVAL	78' TO 40'	TO
OPERATING RIG TIME	2.5 HOURS	
TYPE FLUID IN HOLE	WATER	
SALINITY, PPM CL	NA	
DENSITY-VISCOSITY	NA	
LEVEL	6'	
MAX. REC. TEMP. DEG F.	NA	
EQUIPMENT-LOCATION	102 FTM	
RECORDED BY	LEE	
WITNESSED BY	R.SKINNER	

BOREHOLE RECORD				CASING RECORD			
RUN NO.	BIT	FROM	TO	SIZE	WGT.	FROM	TO
ONE	46"	80'	CASING	48"	.5 W.T	40'	SURFACE

ALL INTERPRETATIONS ARE OPINIONS BASED ON INFERENCES FROM ELECTRICAL OR OTHER MEASUREMENTS AND WE CANNOT AND DO NOT GUARANTEE THE ACCURACY OR CORRECTNESS OF ANY INTERPRETATION, AND WE SHALL NOT, EXCEPT IN THE CASE OF GROSS OR WILLFULL NEGLEGENCE ON OUR PART, BE LIABLE OR RESPONSIBLE FOR ANY LOSS, COSTS, DAMAGES, OR EXPENSES INCURRED OR SUSTAINED BY ANYONE RESULTING FROM ANY INTERPRETATION MADE BY ANY OF OUR OFFICERS, AGENTS OR EMPLOYEES. THESE INTERPRETATIONS ARE ALSO SUBJECT TO OUR GENERAL TERMS AND CONDITIONS SET OUT IN OUR CURRENT PRICE SCHEDULE.

REMARKS

XY CALIPER/GAMMA RAY TOOL STRING CONFIGURATION

VERSION: 2.42

TOOLXYGRL

FINISH DEPTH: 24.9 FEET DIRECTION: UP DATE: 09/26/98 TIME: 09:57:35 MODE: TRACE PLAYBACK

GR
0 (API) 10

-- GAMMA RAY -- 3 FT. LONG
MEASURE POINT 7.5 FT. FROM BOT

-- TOTAL TOOL STRING LENGTH = 9 FT. --

-- XY CALIPER -- 6 FT. LONG

-- LONG ARM MEASURE POINT 1 FT. FOM BOT

-- BOT

GR
0 (API) 10

START DEPTH: **99.0** FEET DIRECTION: **UP** DATE: **09/26/96** TIME: **09:57:13** MODE: **TRACE PLAYBACK**

TOOLXYGRL

VERSION: 2.42

VERSION: 2.42

MAIN PASS

NW15XY

FINISH DEPTH: **37.7** FEET DIRECTION: **UP** DATE: **01/15/99** TIME: **16:00:39** MODE: **TRACE PLAYBACK**

Y>X CALIPER

GAMMA RAY BACKUP

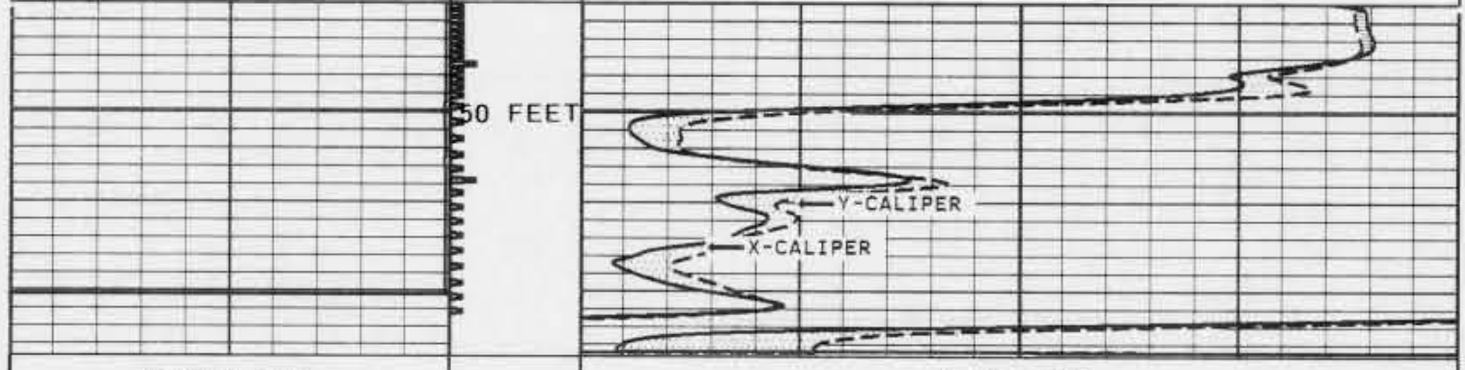
X>Y CALIPER

GAMMA RAY BACKUP
100 (API) 200

GAMMA RAY
0 (API) 100

Y-CALIPER
30.00 CPS 50.00

X-CALIPER
30.00 CPS 50.00



GAMMA RAY
0 (API) 100

GAMMA RAY BACKUP
100 (API) 200

X-CALIPER
30.00 CPS 50.00

Y-CALIPER
30.00 CPS 50.00

GAMMA RAY BACKUP

X>Y CALIPER

Y>X CALIPER

START DEPTH: 77.1 FEET DIRECTION: UP DATE: 01/15/99 TIME: 15:56:17 MODE: TRACE PLAYBACK

NW15XY

MAIN PASS

VERSION: 2.42

VERSION: 2.42

NW15XY1

FINISH DEPTH: 39.2 FEET DIRECTION: UP DATE: 01/15/99 TIME: 16:06:46 MODE: TRACE PLAYBACK

Y>X CALIPER

GAMMA RAY BACKUP

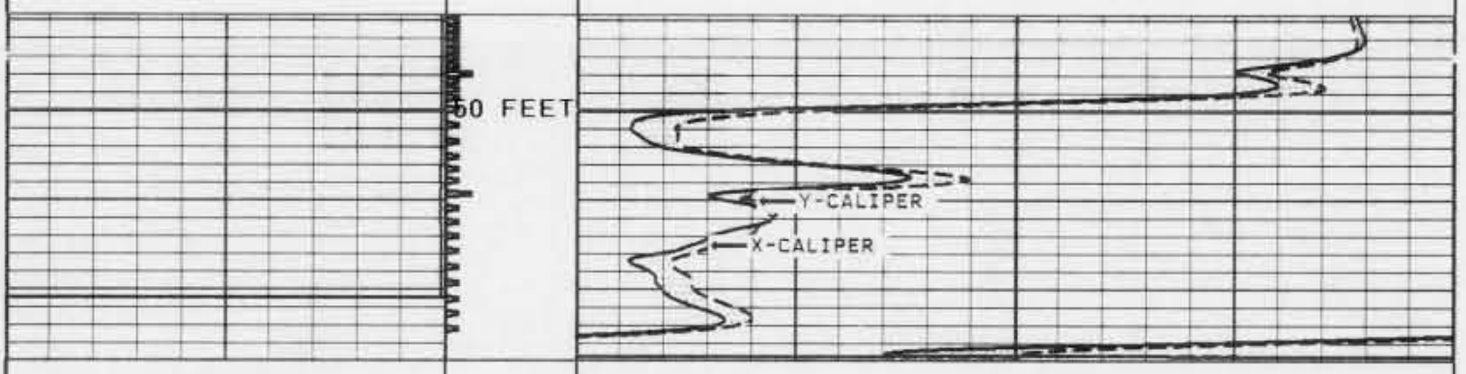
X>Y CALIPER

GAMMA RAY BACKUP
100 (API) 200

Y-CALIPER
30.00 CPS 50.00

GAMMA RAY
0 (API) 100

X-CALIPER
30.00 CPS 50.00



GAMMA RAY
0 (API) 100

GAMMA RAY BACKUP
100 (API) 200

X-CALIPER
30.00 CPS 50.00

Y-CALIPER
30.00 CPS 50.00

GAMMA RAY BACKUP

X>Y CALIPER

Y>X CALIPER

START DEPTH: 77.5 FEET DIRECTION: UP DATE: 01/15/99 TIME: 16:05:10 MODE: TRACE PLAYBACK

NW15XY1

VERSION: 2.42

MASTER CALIBRATION SUMMARY

FILE: DATE: 01/15/99 TIME: 15:55 VERSION: 2.42

X-CALIPER #01

DATE: 01/15/99 TIME: 12:20

	MEASURED	UNITS	STANDARD	MINIMUM	MAXIMUM	DEVIATION	UNITS
40	810.9	CPS	40.0	39.9	40.3	0.13	CPS
60	1077.8	CPS	59.5	59.3	59.7	0.18	CPS

Y-CALIPER #01

DATE: 01/15/99 TIME: 12:20

	MEASURED	UNITS	STANDARD	MINIMUM	MAXIMUM	DEVIATION	UNITS
40	734.9	CPS	40.0	39.6	40.4	0.06	CPS
60	994.6	CPS	59.5	59.2	59.5	0.07	CPS

COMPANY MIAMI-DADE WATER AND SEWER DISTRICT

WELL WELL #15

FIELD NORTH WEST WELL FIELD STATE FLORIDA

Appendix E

Well No. 14
Geophysical Logs

FLORIDA GEOPHYSICAL LOGGING, INC.

X-Y CALIPER LOG

COMPANY MIAMI DADE WATER AND SEWER

WELL N.W.W.F #14

FIELD NORTH WEST WELL FIELD

COUNTY STATE

LOCATION SEC TWP RGE

OTHER SERVICES: NONE

ELEV.: K.B. D.F. G.L.

PERMANENT DATUM: GROUND ELEV. FT. ABOVE PERMANENT DATUM

LOG MEASURED FROM PAD FT. ABOVE PERMANENT DATUM

DRILLING MEASURED FROM PAD

DATE	24-MAY-1999
RUN NO.	ONE
TYPE LOG	X-Y CALIPER
DEPTH-DRILLER	60'
DEPTH-LOGGER	58'
BTM. LOG INTERVAL	56'
TOP LOG INTERVAL	30'
CASING-DRILLER	48" @ 0
CASING-LOGGER	48" @ 0
BIT SIZE	48"
TYPE FLUID IN HOLE	WATER
DENS. LB/GAL	NA
VISCOSITY	NA
PH	NA
FLUID LOSS	FULL
SOURCE OF SAMPLE	NA
RM @ MEAS. TEMP.	NA
RMF @ MEAS. TEMP.	NA
RMC @ MEAS. TEMP.	NA
SOURCE RMF RMC	NA
RM @ BHT	NA
TIME CIRC.	2 HOURS
MAX. REC. TEMP.	NA
EQUIP. LOCATION	FULL
RECORDED BY	NA
WITNESSED BY	LEE FTM

BOREHOLE RECORD

BIT	FROM	TO
48"	0	60'

CASING RECORD

SIZE	WT.	FROM	TO
48"	.375	K.B.	SURFACE

REMARKS

XY CALIPER/GAMMA RAY TOOL STRING CONFIGURATION

VERSION: 2.42

TOOLXYGRL

FINISH DEPTH: **24.9** FEET DIRECTION: **UP** DATE: **09/26/96** TIME: **09:57:35** MODE: **TRACE PLAYBACK**

GR 0 (API) 10

-- GAMMA RAY -- 3 FT. LONG
MEASURE POINT 7.5 FT. FROM BOT

-- TOTAL TOOL STRING LENGTH = 9 FT. --

-- XY CALIPER -- 6 FT. LONG

-- LONG ARM MEASURE POINT 1 FT. FOM BOT

-- BOT

GR 0 (API) 10

START DEPTH: **99.0** FEET DIRECTION: **UP** DATE: **09/26/96** TIME: **09:57:13** MODE: **TRACE PLAYBACK**

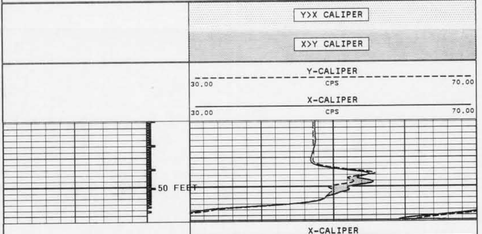
TOOLXYGRL

VERSION: 2.42
VERSION: 2.42

MAIN PASS

NW14XY2MP

FINISH DEPTH: **27.3** FEET DIRECTION: **UP** DATE: **05/04/99** TIME: **10:24:13** MODE: **ORIGINAL**



START DEPTH: **61.6** FEET DIRECTION: **UP** DATE: **05/04/99** TIME: **10:22:52** MODE: **ORIGINAL**

NW14XY2MP

MAIN PASS

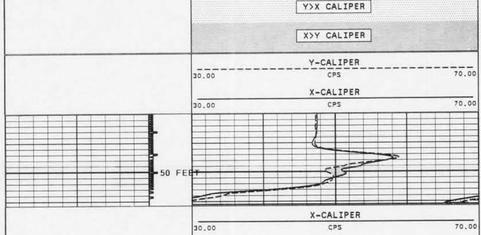
VERSION: 2.42

VERSION: 2.42

REPEAT PASS

NW14XY2RP

FINISH DEPTH: **29.5** FEET DIRECTION: **UP** DATE: **05/04/99** TIME: **10:18:34** MODE: **ORIGINAL**



START DEPTH: **60.8** FEET DIRECTION: **UP** DATE: **05/04/99** TIME: **10:17:16** MODE: **ORIGINAL**

NW14XY2RP

REPEAT PASS

VERSION: 2.42

MASTER CALIBRATION SUMMARY

FILE: DATE: 05/04/99 TIME: 10:10 VERSION: 2.42

X-CALIPER #01

DATE: 05/04/99 TIME: 09:35

	MEASURED	UNITS	STANDARD	MINIMUM	MAXIMUM	DEVIATION	UNITS
30	680.0	CPS	30.0	29.3	29.8	0.16	CPS
40	818.0	CPS	40.0	39.4	39.7	0.17	CPS
60	1070.4	CPS	58.0	58.0	58.3	0.00	CPS

Y-CALIPER #01

DATE: 05/04/99 TIME: 09:35

	MEASURED	UNITS	STANDARD	MINIMUM	MAXIMUM	DEVIATION	UNITS
30	618.0	CPS	30.0	30.2	30.5	0.18	CPS
40	750.0	CPS	40.0	39.2	39.6	0.02	CPS
60	993.6	CPS	58.0	58.7	59.1	0.16	CPS

COMPANY MIAMI DADE WATER AND SEWER.

WELL N.W.W.F #14

FIELD NORTH WEST WELL FIELD STATE FLORIDA

FLORIDA GEOPHYSICAL LOGGING, INC

XY CALIPER LOG

Company MIAMI DADE W&S
Well #14
Field NW WELL FIELD
County DADE
State/Prv FL

Company	MIAMI DADE WATER AND SEWER
Well	#14
Field	NW WELL FIELD
County	DADE
State/Prv	FL
Location	
Other Services	SEE REMARKS
Permanent Datum	GROUND LEVEL
Elevation	N/A
Log Measured From	GROUND LEVEL
Drilling Measured From	N/A
Elevation	K.B. / D.F. / G.L.

Date	5/25/99	
Run Number	ONE	
Depth Driller	84'	
Depth Logger	84'	
Bottom Logged Interval	84'	
Top Log Interval	54'	
Open Hole Size	38.5"	
Type Fluid	WATER	
Density / Viscosity	N/A	
Max. Recorded Temp.	N/A	
Estimated Cement Top	N/A	
Time Well Ready	ON ARRIVAL	
Time Logger on Bottom	1400	
Equipment Number	103	
Location	FT MYR	
Recorded By	DENISON	LEE
Witnessed By	T. URAM	A. DURAND

Borehole Record			Tubing Record			
Run Number	Bit	From	To	Size	Weight	From	To
	38.5"	54'	80'				
	24"	80'	84'				

Casing Record	Size	Wgt/Ft	Top	Bottom
Surface String	40"	375	SURFACE	54'
Prot. String				
Production String				
Liner				

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Comments

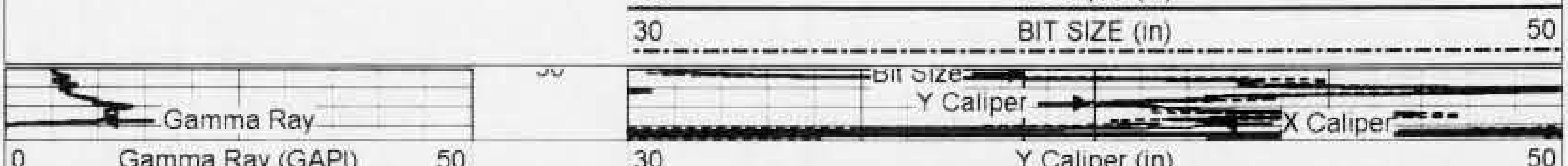
FLOWMETER

FLORIDA GEOPHYSICAL LOGGING, INC.

MAIN PASS

Database File: nwwf.db
Dataset Pathname: pass3.1
Presentation Format: grxyc.prs
Dataset Creation: Wed May 26 08:48:04 1999 by Calc VER_5.12
Charted by: Depth in Feet scaled 1:1200

0 Gamma Ray (GAPI) 50	30 Y Caliper (in) 50
	30 X Caliper (in) 50
	30 BIT SIZE (in) 50



0 Gamma Ray (GAPI) 50	30 Y Caliper (in) 50
	30 X Caliper (in) 50
	30 BIT SIZE (in) 50

FLORIDA GEOPHYSICAL LOGGING, INC.

MAIN PASS

Database File: nwwf.db
Dataset Pathname: pass3.1
Presentation Format: grxyc.prs
Dataset Creation: Wed May 26 08:48:04 1999 by Calc VER_5.12
Charted by: Depth in Feet scaled 1:600

0 Gamma Ray (GAPI) 50	30 Y Caliper (in) 50
	30 X Caliper (in) 50
	30 BIT SIZE (in) 50

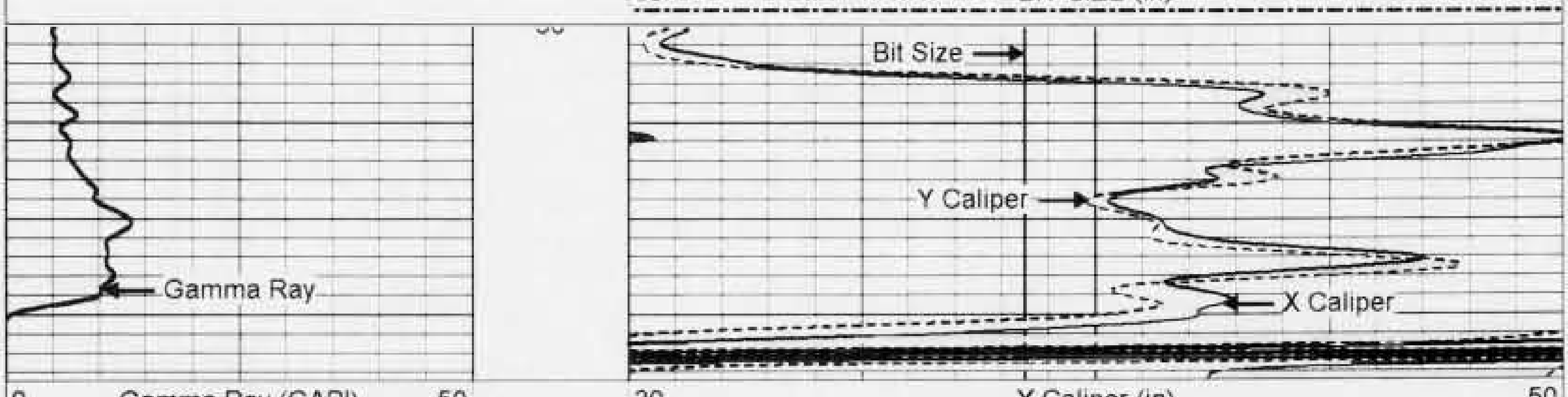
0 Gamma Ray (GAPI) 50	30 Y Caliper (in) 50
	30 X Caliper (in) 50
	30 BIT SIZE (in) 50

FLORIDA GEOPHYSICAL LOGGING, INC.

MAIN PASS

Database File: nwwf.db
Dataset Pathname: pass3.1
Presentation Format: grxyc.prs
Dataset Creation: Wed May 26 08:48:04 1999 by Calc VER_5.12
Charted by: Depth in Feet scaled 1:240

0 Gamma Ray (GAPI) 50	30 Y Caliper (in) 50
	30 X Caliper (in) 50
	30 BIT SIZE (in) 50



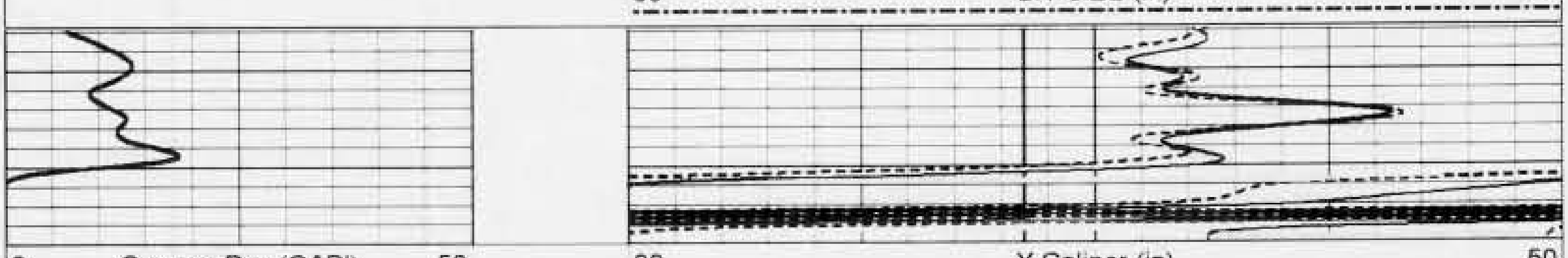
0 Gamma Ray (GAPI) 50	30 Y Caliper (in) 50
	30 X Caliper (in) 50
	30 BIT SIZE (in) 50

FLORIDA GEOPHYSICAL LOGGING, INC.

REPEAT PASS

Database File: nwwf.db
Dataset Pathname: pass4
Presentation Format: grxyc.prs
Dataset Creation: Tue May 25 14:22:08 1999 by Log VER_5.12
Charted by: Depth in Feet scaled 1:240

0 Gamma Ray (GAPI) 50	30 Y Caliper (in) 50
	30 X Caliper (in) 50
	30 BIT SIZE (in) 50



0 Gamma Ray (GAPI) 50	30 Y Caliper (in) 50
	30 X Caliper (in) 50
	30 BIT SIZE (in) 50

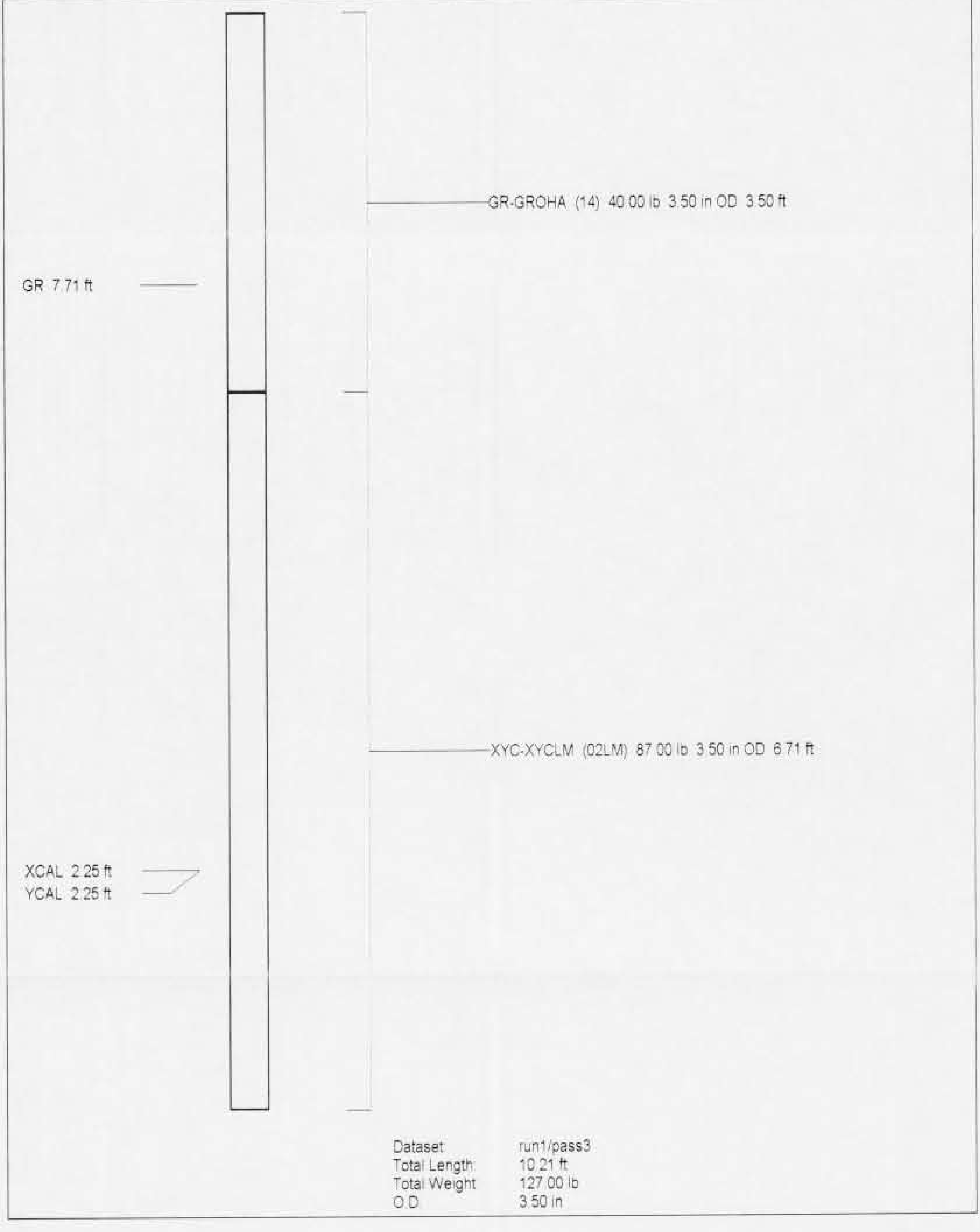
XY Caliper Calibration Report

Serial Number/Model: 02LM-XYCLM
Performed: Tue May 25 13:33:43 1999

Ring			X Caliper		Y Caliper	
1:	30	in	999.798	cps	1044.48	cps
2:	40.5	in	1155.12	cps	1180.94	cps
3:	57.5	in	1410.57	cps	1397.26	cps
4:		in		cps		cps
5:		in		cps		cps
6:		in		cps		cps

Gamma Ray Calibration Report

Serial Number:	14	
Tool Model:	GROHA	
Performed:	Wed May 05 17:25:51 1999	
Calibrator Value:	120	GAPI
Background Reading:	39.762	cps
Calibrator Reading:	324.482	cps
Sensitivity:	0.421466	GAPI/cps



Dataset: run1/pass3
Total Length: 10.21 ft
Total Weight: 127.00 lb
O.D.: 3.50 in

FLORIDA GEOPHYSICAL LOGGING, INC
FLOWMETER LOG

Company	MIAMI DADE WATER AND SEWER
Well	#14
Field	NW WELL FIELD
County	DADE
State/Prv	FL
Location	
Other Services	SEE REMARKS

Company MIAMI DADE W&S
Well #14
Field NW WELL FIELD
County DADE
State/Prv FL

Permanent Datum	GROUND LEVEL	Elevation	N/A
Log Measured From	GROUND LEVEL		
Drilling Measured From	N/A		

Elevation: K.B. / D.F. / G.L.

Date	5/25/99
Run Number	ONE
Depth Driller	84'
Depth Logger	84'
Bottom Logged Interval	84'
Top Log Interval	54'
Open Hole Size	38.5"
Type Fluid	WATER
Density / Viscosity	NA
Max. Recorded Temp	NA
Estimated Cement Top	NA
Time Well Ready	ON ARRIVAL
Time Logger on Bottom	1530
Equipment Number	103
Location	FT MYR
Recorded By	DENISON / LEE
Witnessed By	T URAM / A. DURAND

Borehole Record				Tubing Record			
Run Number	Bit	From	To	Size	Weight	From	To
	38.5"	54'	80'				
	24"	80'	84'				

Casing Record	Size	Wgt/Ft	Top	Bottom
Surface String	40"	375	SURFACE	54'
Prot. String				
Production String				
Liner				

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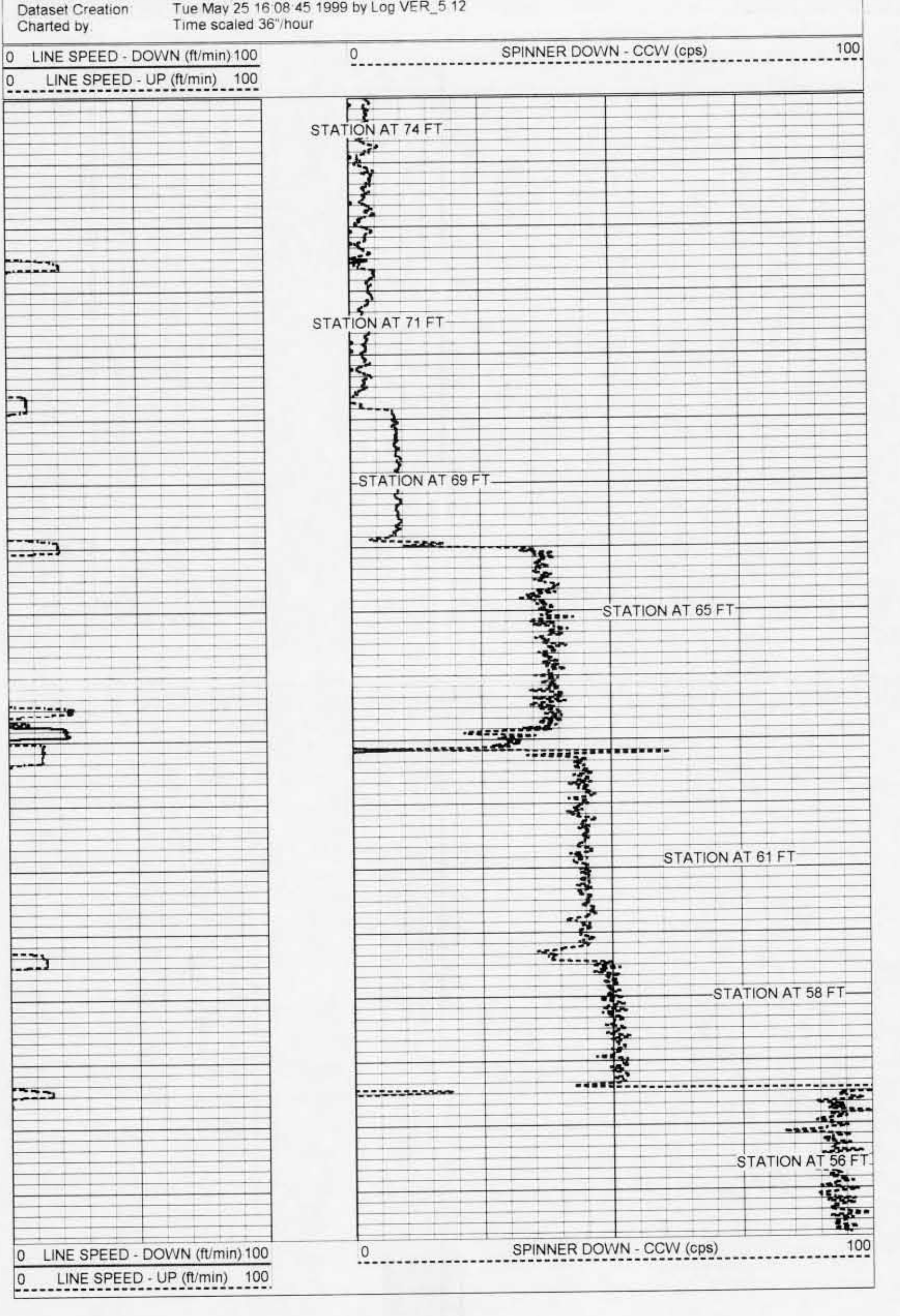
Comments

XY CALIPER

FLORIDA GEOPHYSICAL LOGGING, INC. — FLOW RATE = 7000 GPM

Database File: nwwf.db
Dataset Pathname: pass14
Presentation Format: flowcals.prs
Dataset Creation: Tue May 25 16:08:45 1999 by Log VER_5.12
Charted by: Time scaled 36"/hour

0 LINE SPEED - DOWN (ft/min) 100 | 0 SPINNER DOWN - CCW (cps) 100
0 LINE SPEED - UP (ft/min) 100

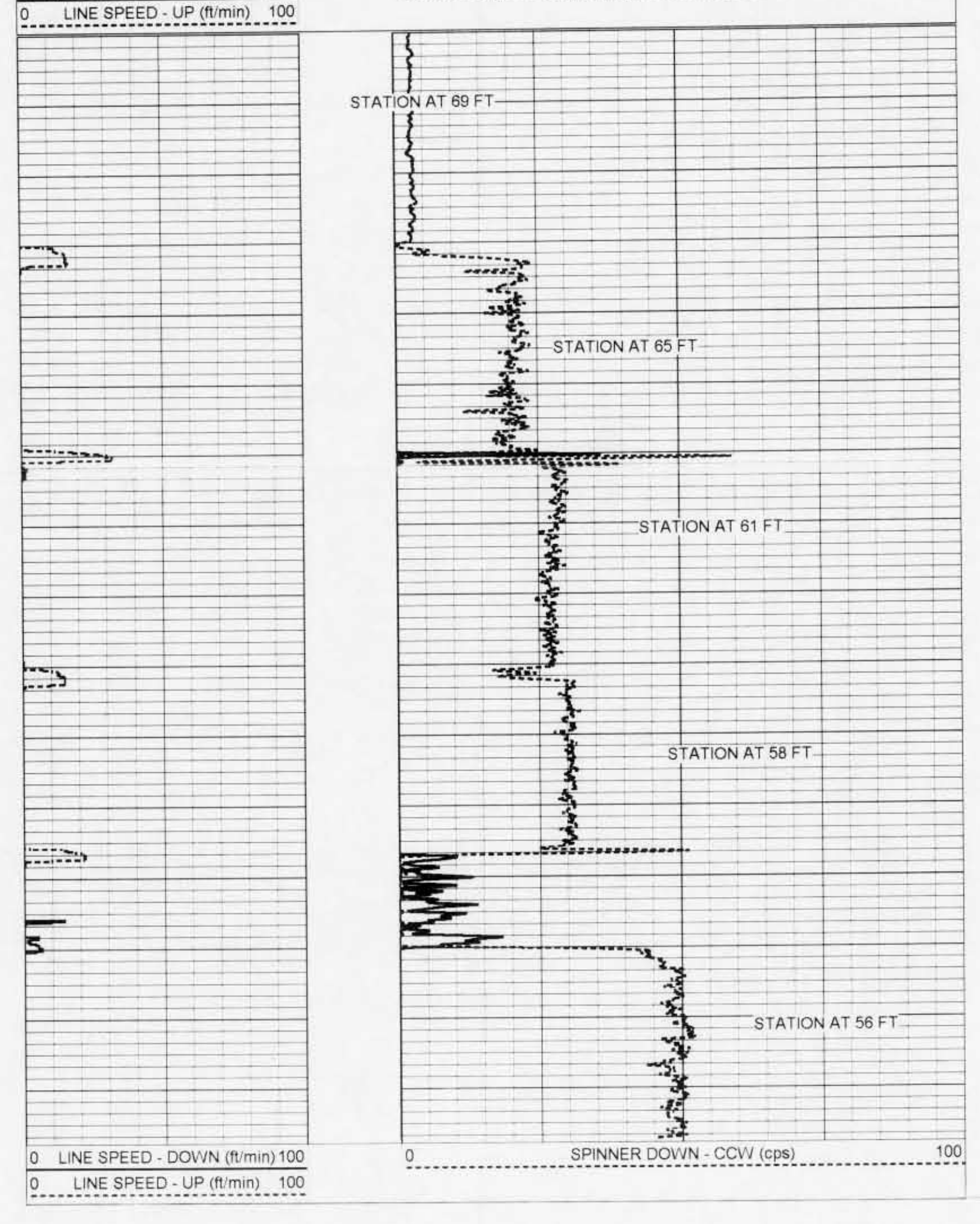


0 LINE SPEED - DOWN (ft/min) 100 | 0 SPINNER DOWN - CCW (cps) 100
0 LINE SPEED - UP (ft/min) 100

FLORIDA GEOPHYSICAL LOGGING, INC. — FLOW RATE = 4000 GPM

Database File: nwwf.db
Dataset Pathname: pass13
Presentation Format: flowcals.prs
Dataset Creation: Tue May 25 15:45:13 1999 by Log VER_5.12
Charted by: Time scaled 36"/hour

0 LINE SPEED - DOWN (ft/min) 100 | 0 SPINNER DOWN - CCW (cps) 100
0 LINE SPEED - UP (ft/min) 100

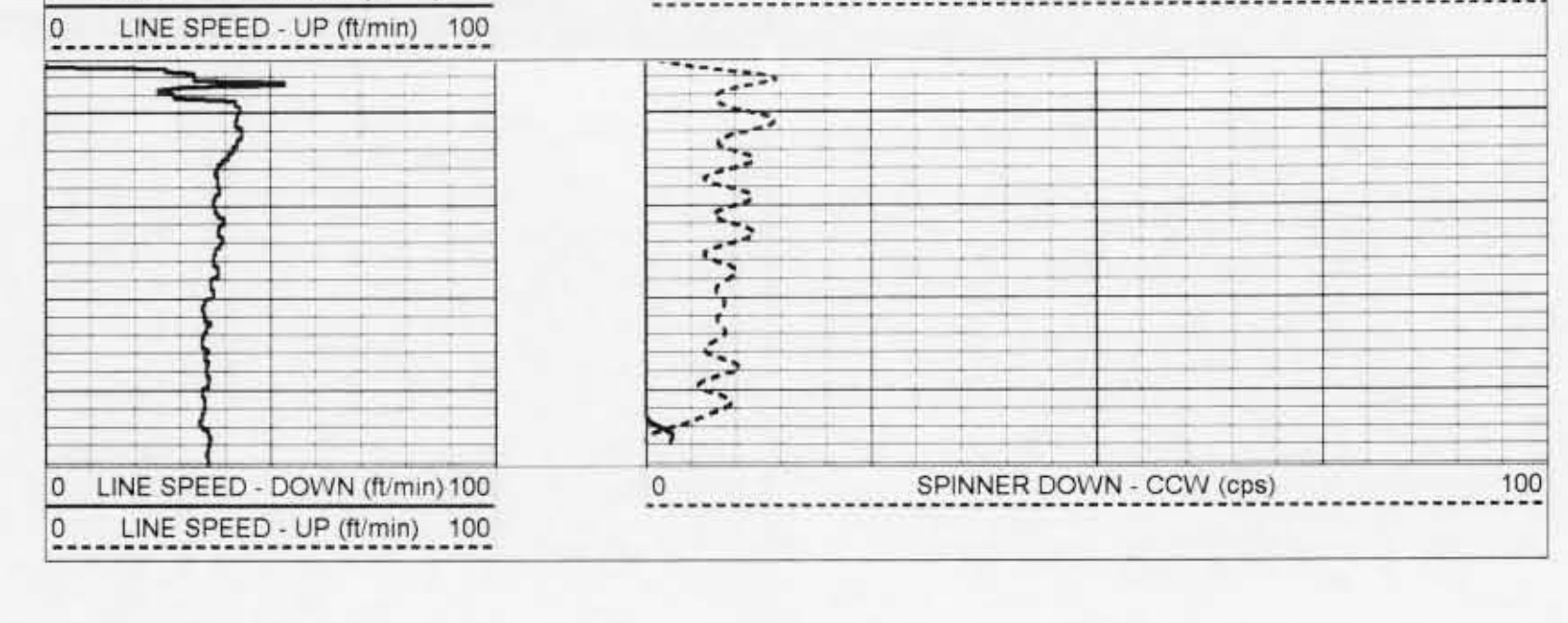


0 LINE SPEED - DOWN (ft/min) 100 | 0 SPINNER DOWN - CCW (cps) 100
0 LINE SPEED - UP (ft/min) 100

FLORIDA GEOPHYSICAL LOGGING, INC. — CALIBRATION PASSES

Database File: nwwf.db
Dataset Pathname: pass5
Presentation Format: flowcals.prs
Dataset Creation: Tue May 25 15:10:45 1999 by Log VER_5.12
Charted by: Depth in Feet scaled 1:240

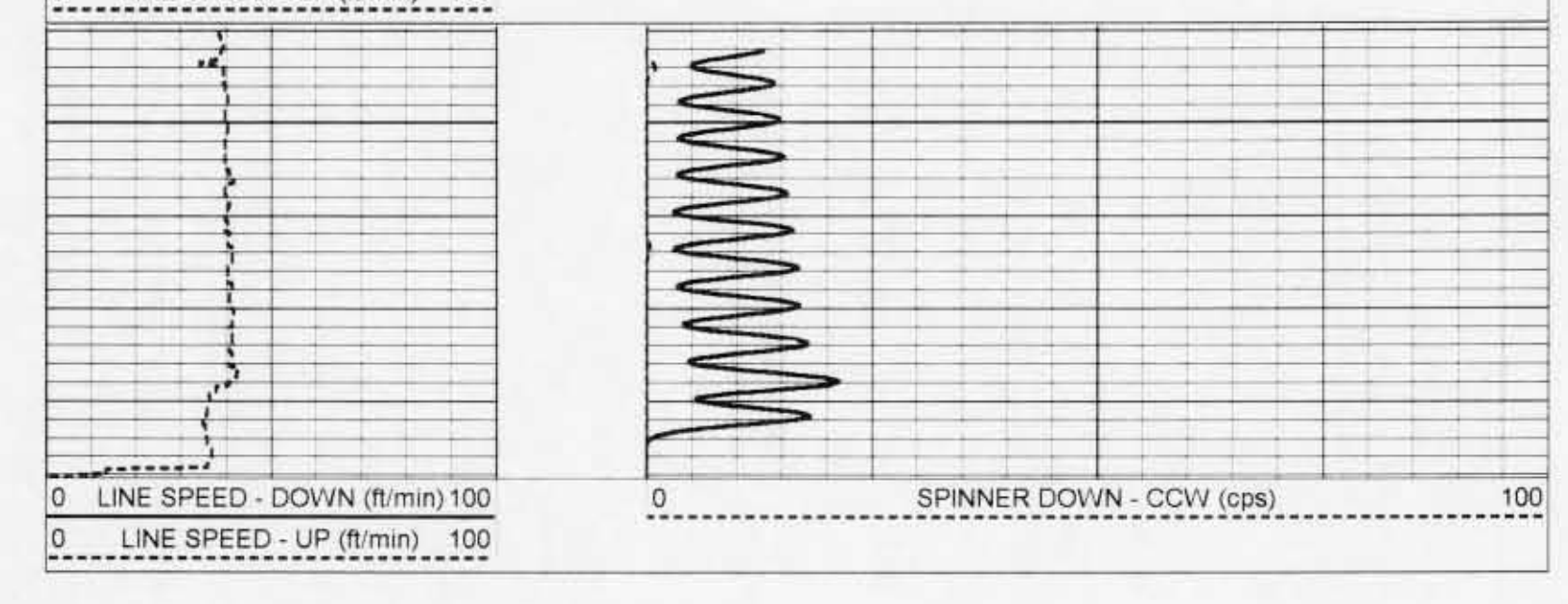
0 LINE SPEED - DOWN (ft/min) 100 | 0 SPINNER DOWN - CCW (cps) 100
0 LINE SPEED - UP (ft/min) 100



0 LINE SPEED - DOWN (ft/min) 100 | 0 SPINNER DOWN - CCW (cps) 100
0 LINE SPEED - UP (ft/min) 100

Database File: nwwf.db
Dataset Pathname: pass6
Presentation Format: flowcals.prs
Dataset Creation: Tue May 25 15:14:26 1999 by Log VER_5.12
Charted by: Depth in Feet scaled 1:240

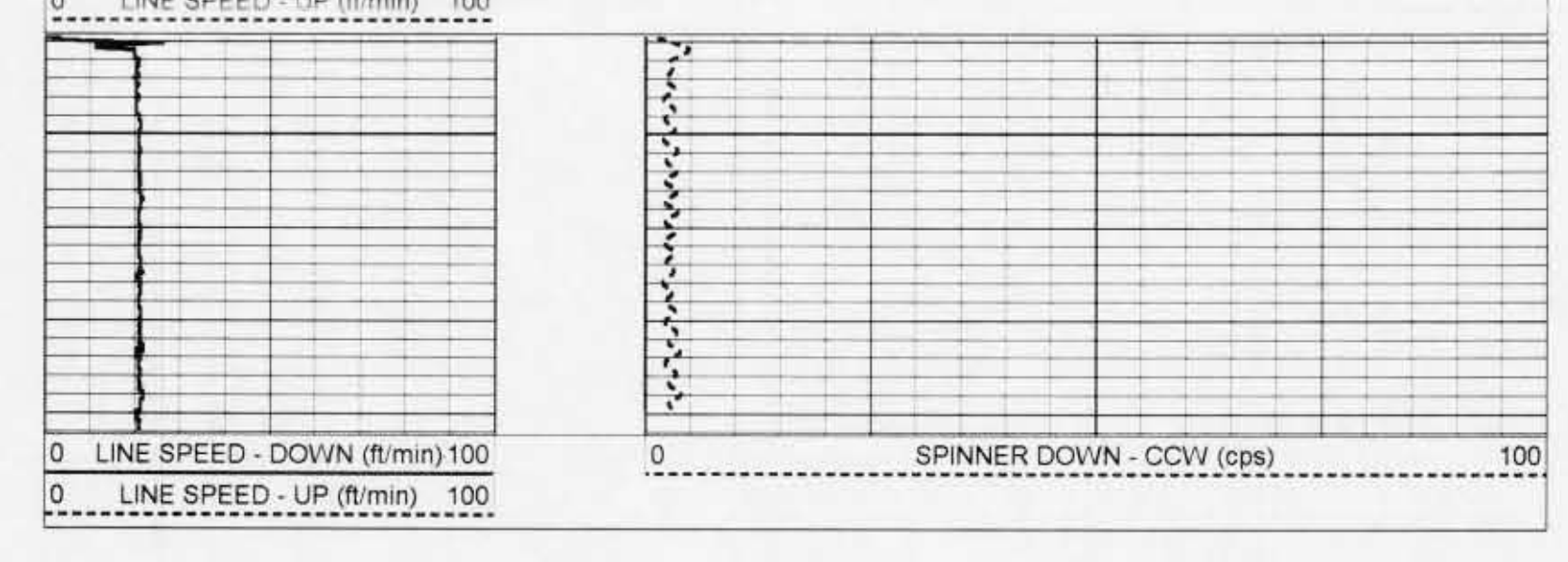
0 LINE SPEED - DOWN (ft/min) 100 | 0 SPINNER DOWN - CCW (cps) 100
0 LINE SPEED - UP (ft/min) 100



0 LINE SPEED - DOWN (ft/min) 100 | 0 SPINNER DOWN - CCW (cps) 100
0 LINE SPEED - UP (ft/min) 100

Database File: nwwf.db
Dataset Pathname: pass7
Presentation Format: flowcals.prs
Dataset Creation: Tue May 25 15:23:15 1999 by Log VER_5.12
Charted by: Depth in Feet scaled 1:240

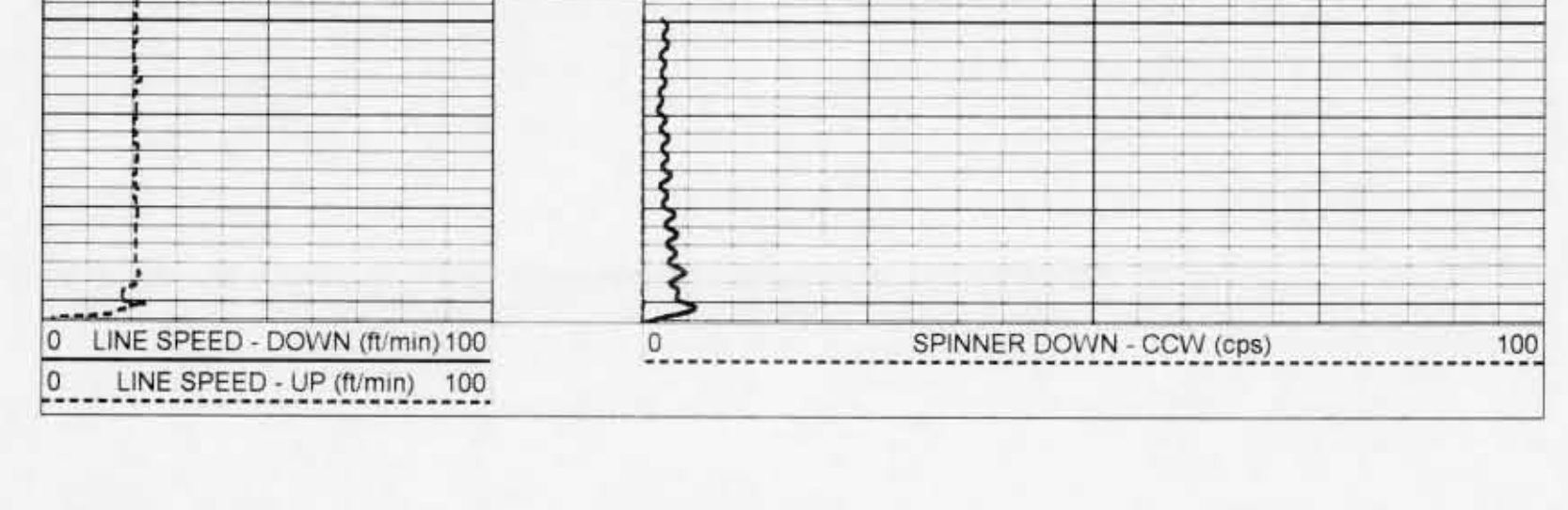
0 LINE SPEED - DOWN (ft/min) 100 | 0 SPINNER DOWN - CCW (cps) 100
0 LINE SPEED - UP (ft/min) 100



0 LINE SPEED - DOWN (ft/min) 100 | 0 SPINNER DOWN - CCW (cps) 100
0 LINE SPEED - UP (ft/min) 100

Database File: nwwf.db
Dataset Pathname: pass8
Presentation Format: flowcals.prs
Dataset Creation: Tue May 25 15:25:42 1999 by Log VER_5.12
Charted by: Depth in Feet scaled 1:240

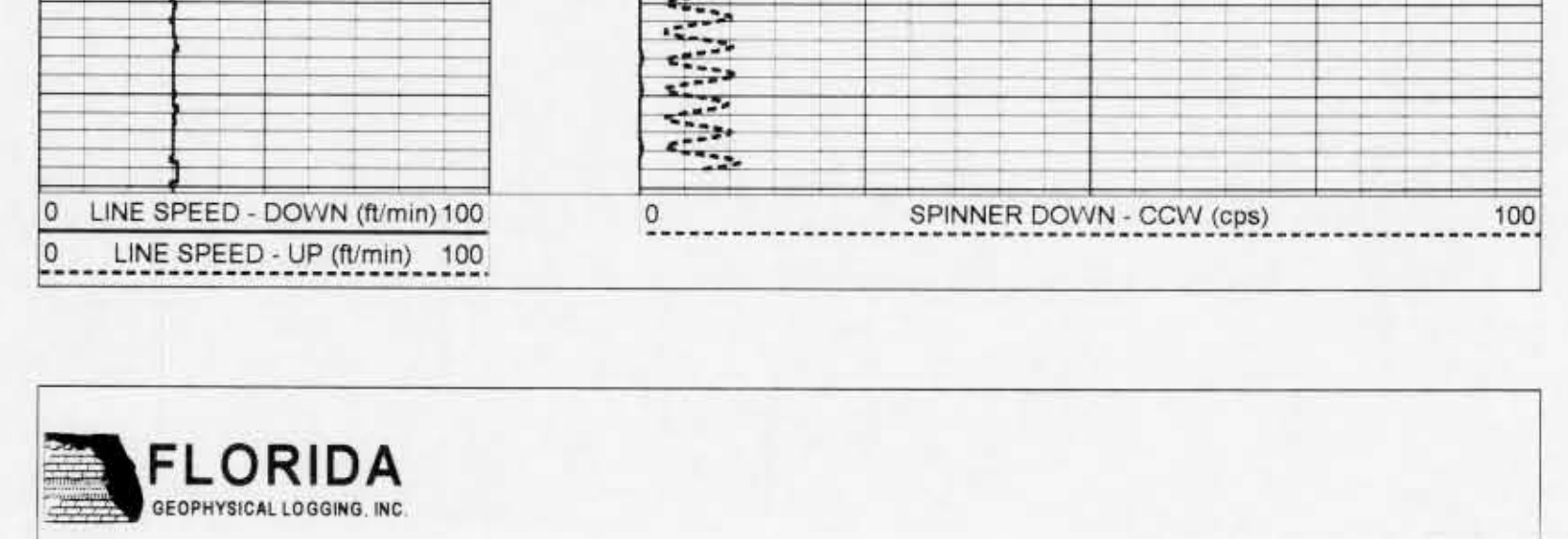
0 LINE SPEED - DOWN (ft/min) 100 | 0 SPINNER DOWN - CCW (cps) 100
0 LINE SPEED - UP (ft/min) 100



0 LINE SPEED - DOWN (ft/min) 100 | 0 SPINNER DOWN - CCW (cps) 100
0 LINE SPEED - UP (ft/min) 100

Database File: nwwf.db
Dataset Pathname: pass9
Presentation Format: flowcals.prs
Dataset Creation: Tue May 25 15:27:45 1999 by Log VER_5.12
Charted by: Depth in Feet scaled 1:240

0 LINE SPEED - DOWN (ft/min) 100 | 0 SPINNER DOWN - CCW (cps) 100
0 LINE SPEED - UP (ft/min) 100

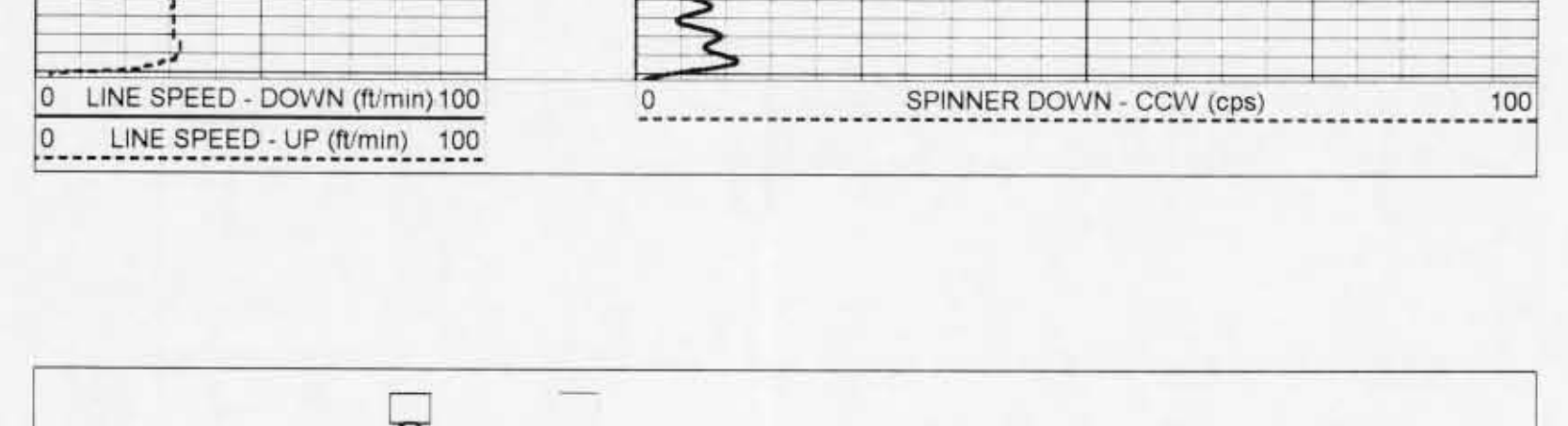


0 LINE SPEED - DOWN (ft/min) 100 | 0 SPINNER DOWN - CCW (cps) 100
0 LINE SPEED - UP (ft/min) 100

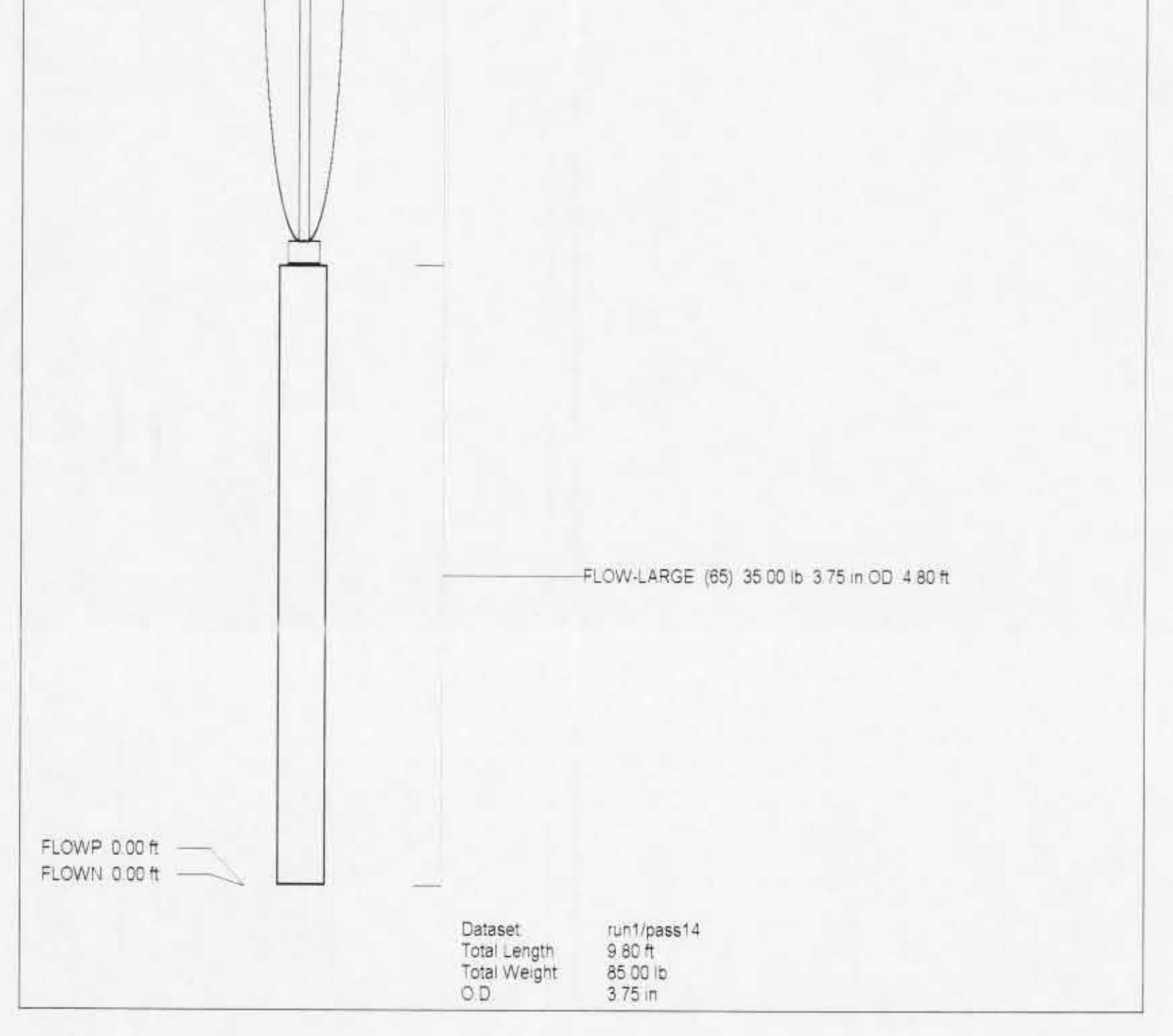
FLORIDA GEOPHYSICAL LOGGING, INC.

Database File: nwwf.db
Dataset Pathname: pass10
Presentation Format: flowcals.prs
Dataset Creation: Tue May 25 15:29:18 1999 by Log VER_5.12
Charted by: Depth in Feet scaled 1:240

0 LINE SPEED - DOWN (ft/min) 100 | 0 SPINNER DOWN - CCW (cps) 100
0 LINE SPEED - UP (ft/min) 100



0 LINE SPEED - DOWN (ft/min) 100 | 0 SPINNER DOWN - CCW (cps) 100
0 LINE SPEED - UP (ft/min) 100



Dataset: run1/pass14
Total Length: 9.80 ft
Total Weight: 85.00 lb
O.D.: 3.75 in

Appendix F

Well No. 13
Geophysical Logs

FLORIDA GEOPHYSICAL LOGGING, INC.

FLOW METER LOG

Company	MIAMI DADE WATER AND SEWER
Well	#13
Field	NW WELL FIELD
County	DADE
State/Prv	FL
Location	
Other Services	XYC

Company MIAMI DADE W&S
Well
Field NW WELL FIELD
County DADE
State/Prv FL

Permanent Datum	GROUND LEVEL	Elevation	N/A	Elevation K.B. D.F. G.L.
Log Measured From	GROUND LEVEL			
Drilling Measured From	N/A			

Date	6/2/99
Run Number	TWO
Depth Driller	78'
Depth Logger	78'
Bottom Logged Interval	78'
Top Log Interval	35'
Open Hole Size	32"
Type Fluid	WATER
Density / Viscosity	N/A
Max. Recorded Temp.	N/A
Estimated Cement Top	N/A
Time Well Ready	ON ARRIVAL
Time Logger on Bottom	1130
Equipment Number	103
Location	FT MYERS
Recorded By	FERGUSON
Witnessed By	T. URAM / A. DURAND

Borehole Record				Tubing Record			
Run Number	Bit	From	To	Size	Weight	From	To
	32"	45'	78'				

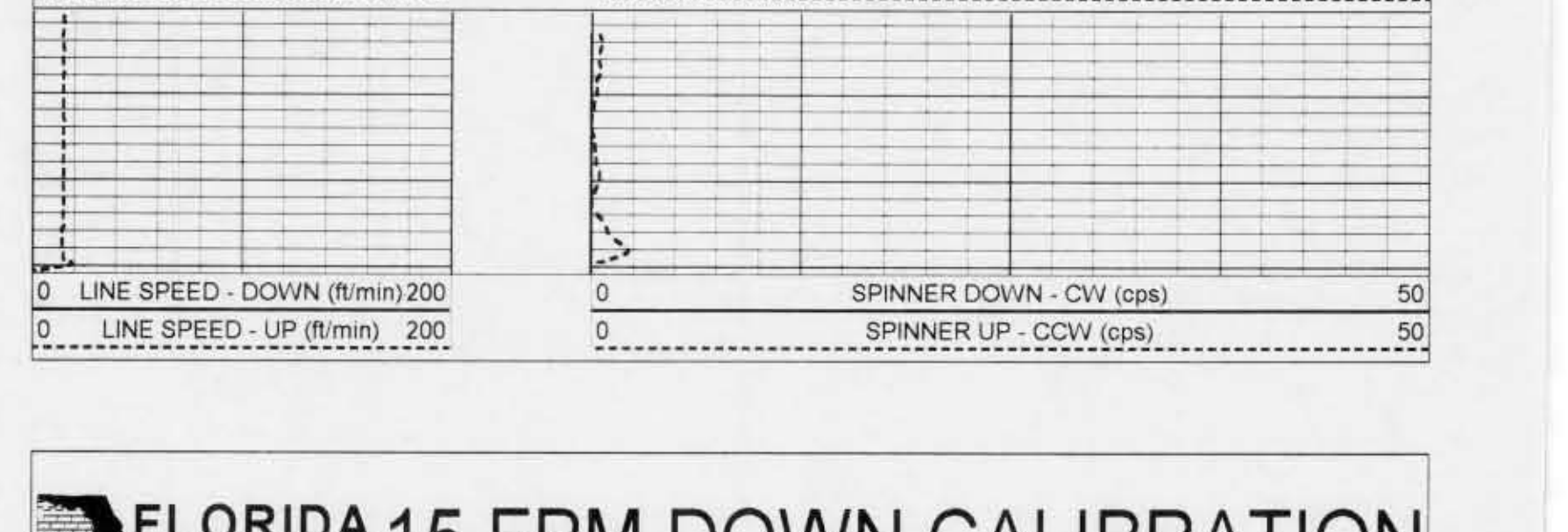
Casing Record	Size	Wgt/Ft	Top	Bottom
Surface String	48"	375	SURFACE	45'
Prot. String				
Production String				
Liner				

<<< Fold Here >>>

Comments

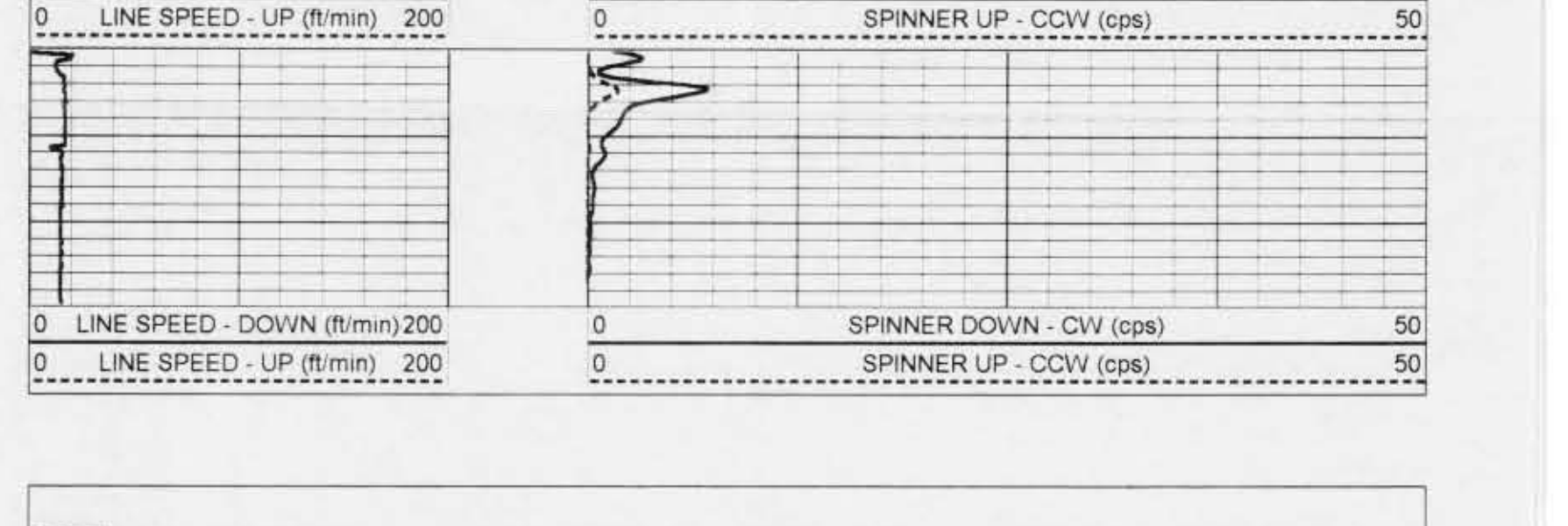
FLORIDA GEOPHYSICAL LOGGING, INC. — 15 FPM UP CALIBRATION

Database File: nwwf.db
Dataset Pathname: run2/pass8
Presentation Format: flowcals.prs
Dataset Creation: Wed Jun 02 12:57:45 1999 by Log VER_5.12
Charted by: Depth in Feet scaled 1:240



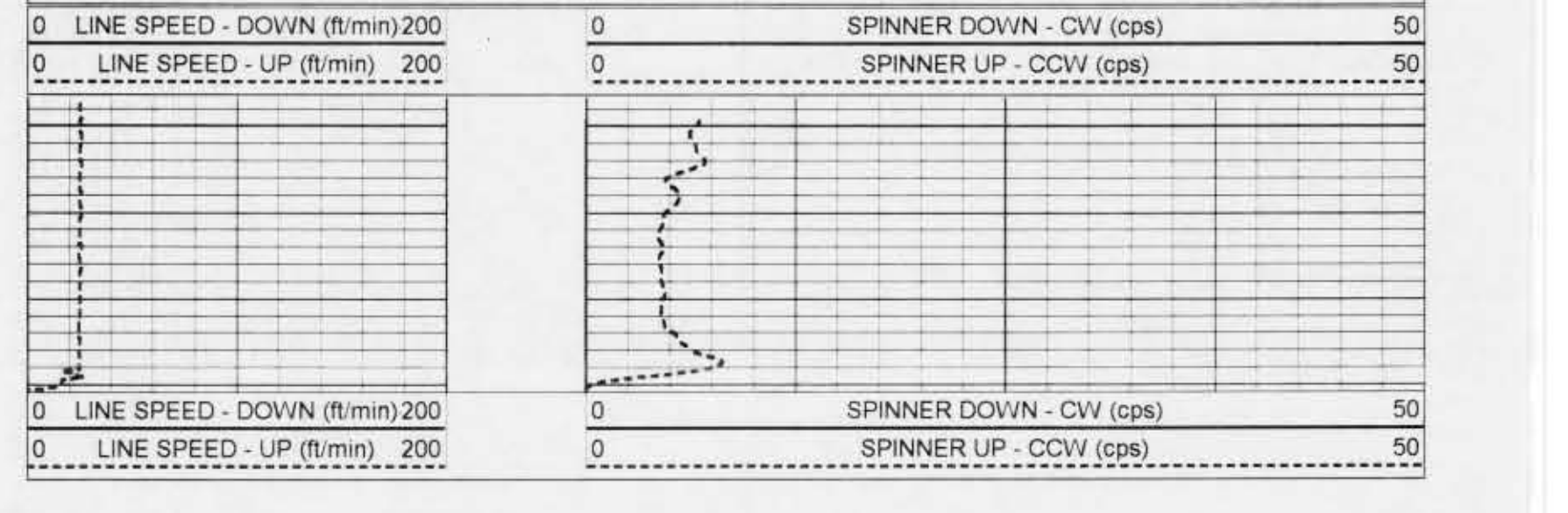
FLORIDA GEOPHYSICAL LOGGING, INC. — 15 FPM DOWN CALIBRATION

Database File: nwwf.db
Dataset Pathname: run2/pass9
Presentation Format: flowcals.prs
Dataset Creation: Wed Jun 02 13:00:06 1999 by Log VER_5.12
Charted by: Depth in Feet scaled 1:240



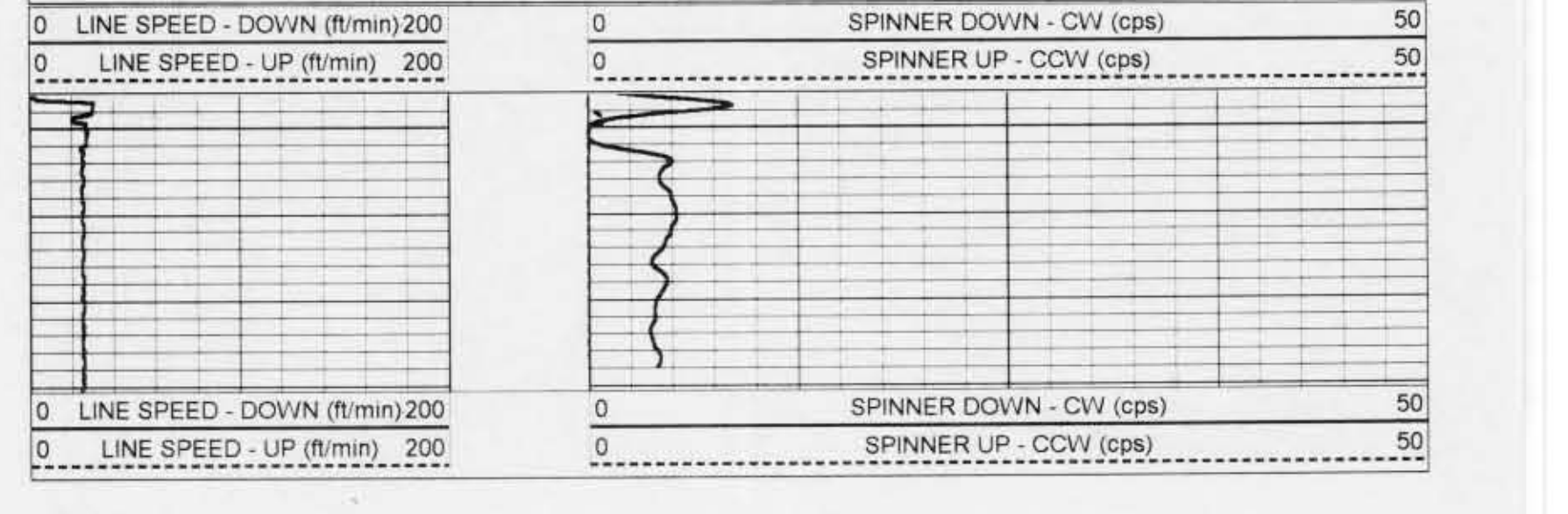
FLORIDA GEOPHYSICAL LOGGING, INC. — 25 FPM UP CALIBRATION

Database File: nwwf.db
Dataset Pathname: run2/pass3
Presentation Format: flowcals.prs
Dataset Creation: Wed Jun 02 12:50:00 1999 by Log VER_5.12
Charted by: Depth in Feet scaled 1:240



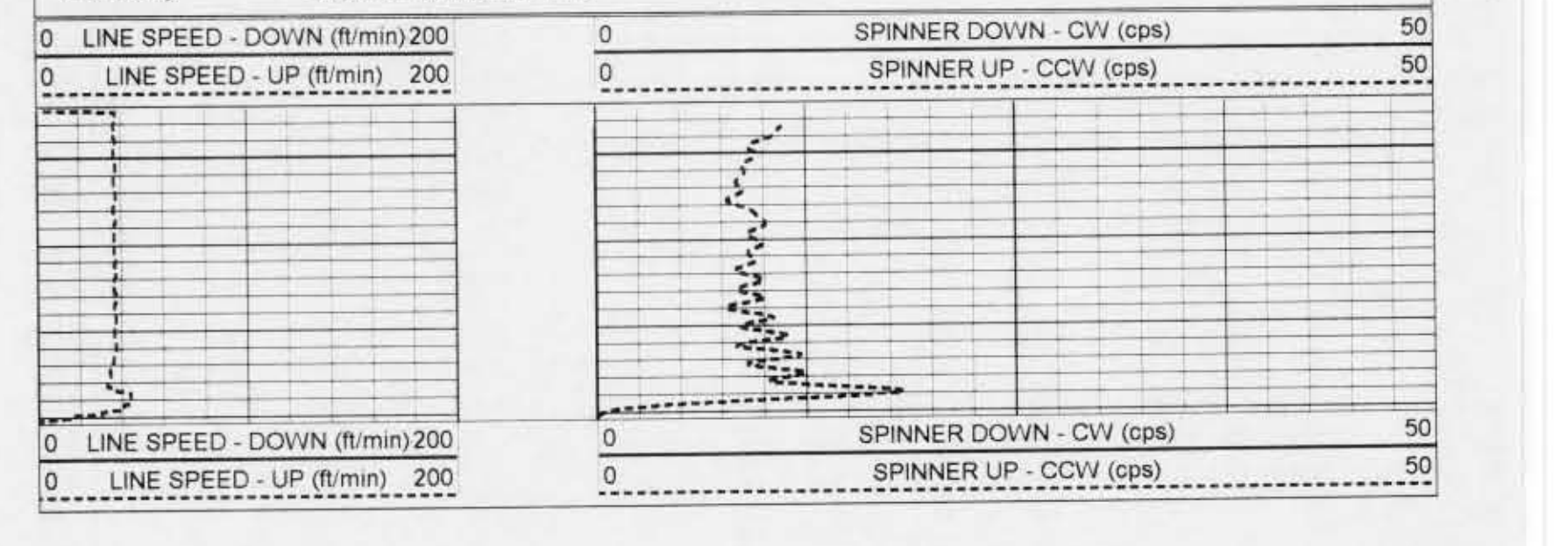
FLORIDA GEOPHYSICAL LOGGING, INC. — 25 FPM DOWN CALIBRATION

Database File: nwwf.db
Dataset Pathname: run2/pass4
Presentation Format: flowcals.prs
Dataset Creation: Wed Jun 02 12:51:44 1999 by Log VER_5.12
Charted by: Depth in Feet scaled 1:240



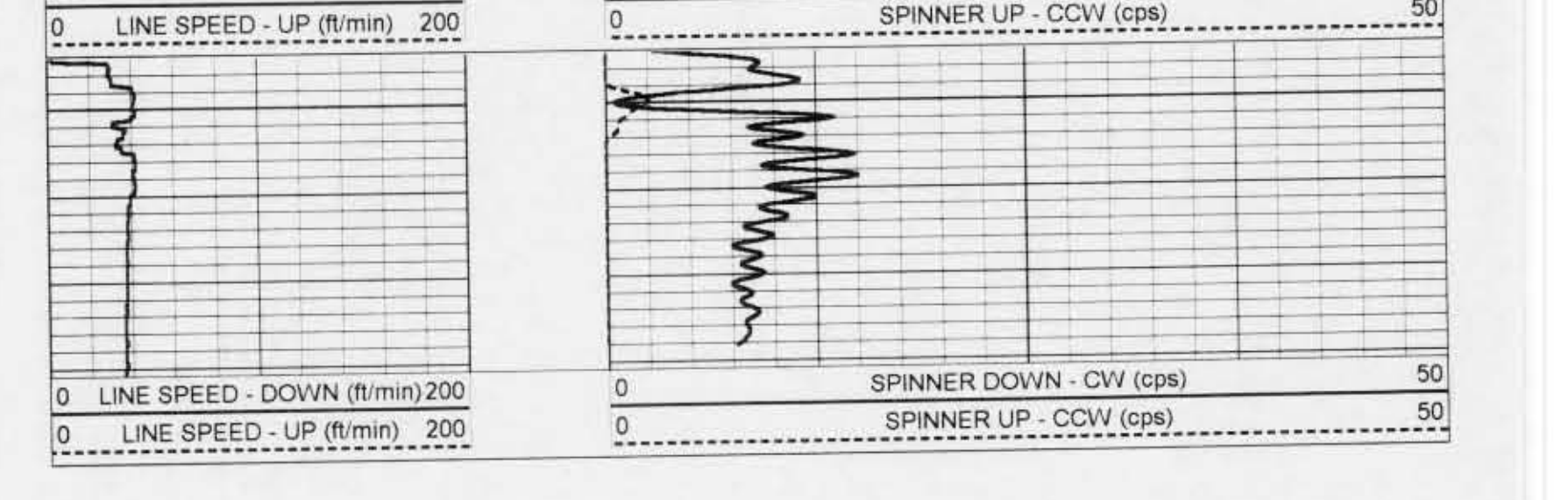
FLORIDA GEOPHYSICAL LOGGING, INC. — 35 FPM UP CALIBRATION

Database File: nwwf.db
Dataset Pathname: run2/pass6
Presentation Format: flowcals.prs
Dataset Creation: Wed Jun 02 12:55:00 1999 by Log VER_5.12
Charted by: Depth in Feet scaled 1:240



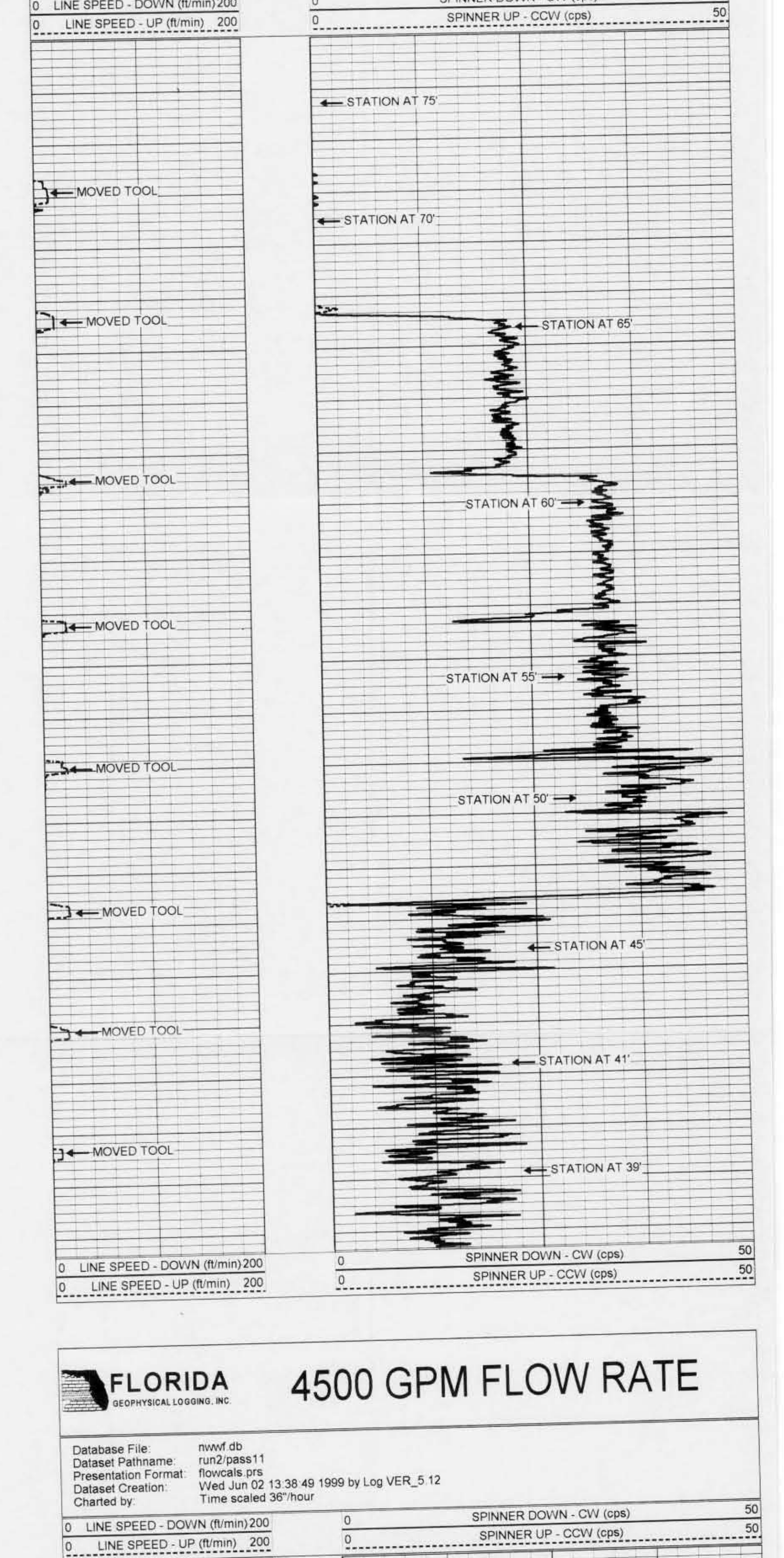
FLORIDA GEOPHYSICAL LOGGING, INC. — 37 FPM DOWN CALIBRATION

Database File: nwwf.db
Dataset Pathname: run2/pass7
Presentation Format: flowcals.prs
Dataset Creation: Wed Jun 02 12:56:19 1999 by Log VER_5.12
Charted by: Depth in Feet scaled 1:240



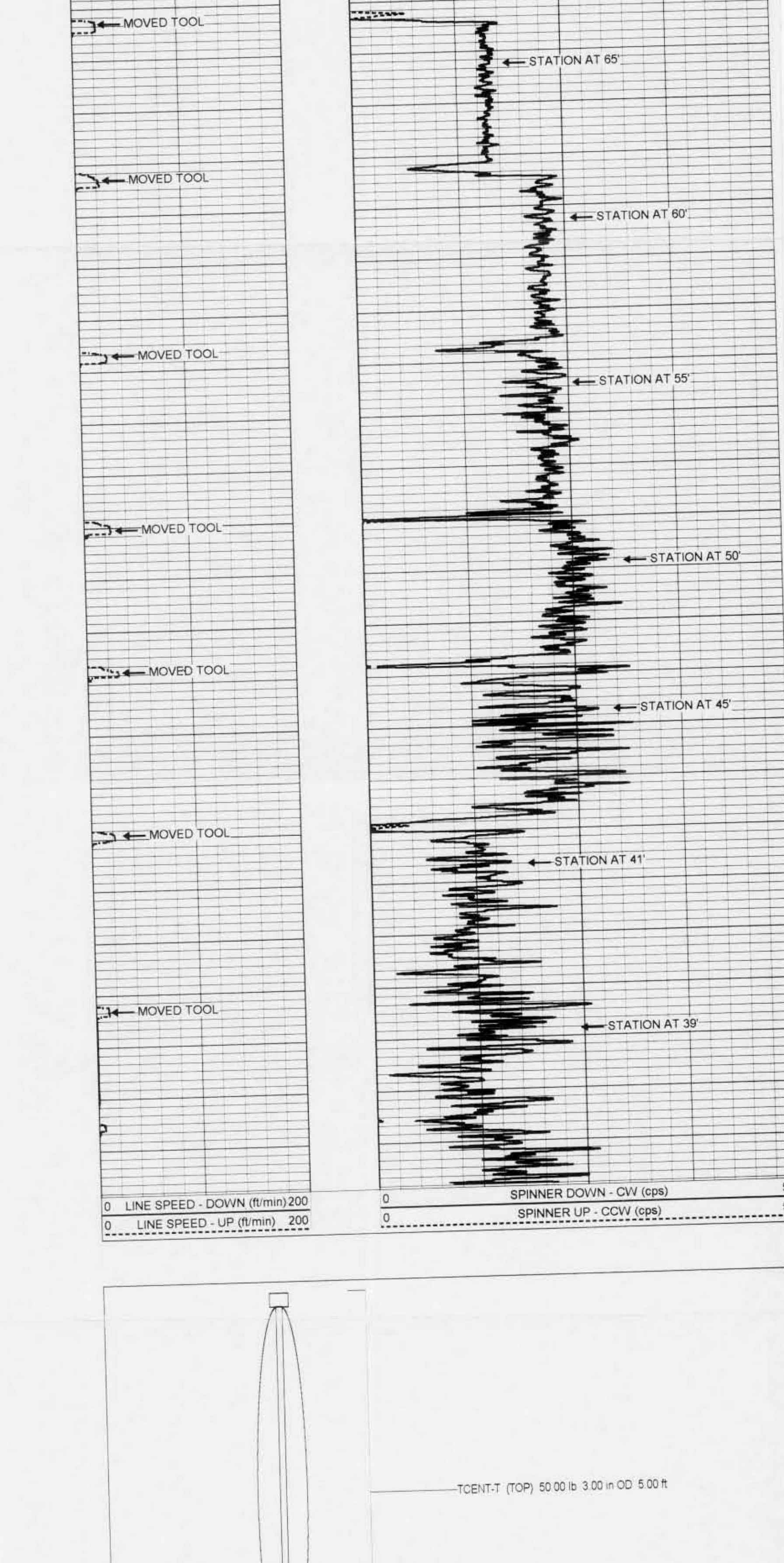
FLORIDA GEOPHYSICAL LOGGING, INC. — 7000 GPM FLOW RATE

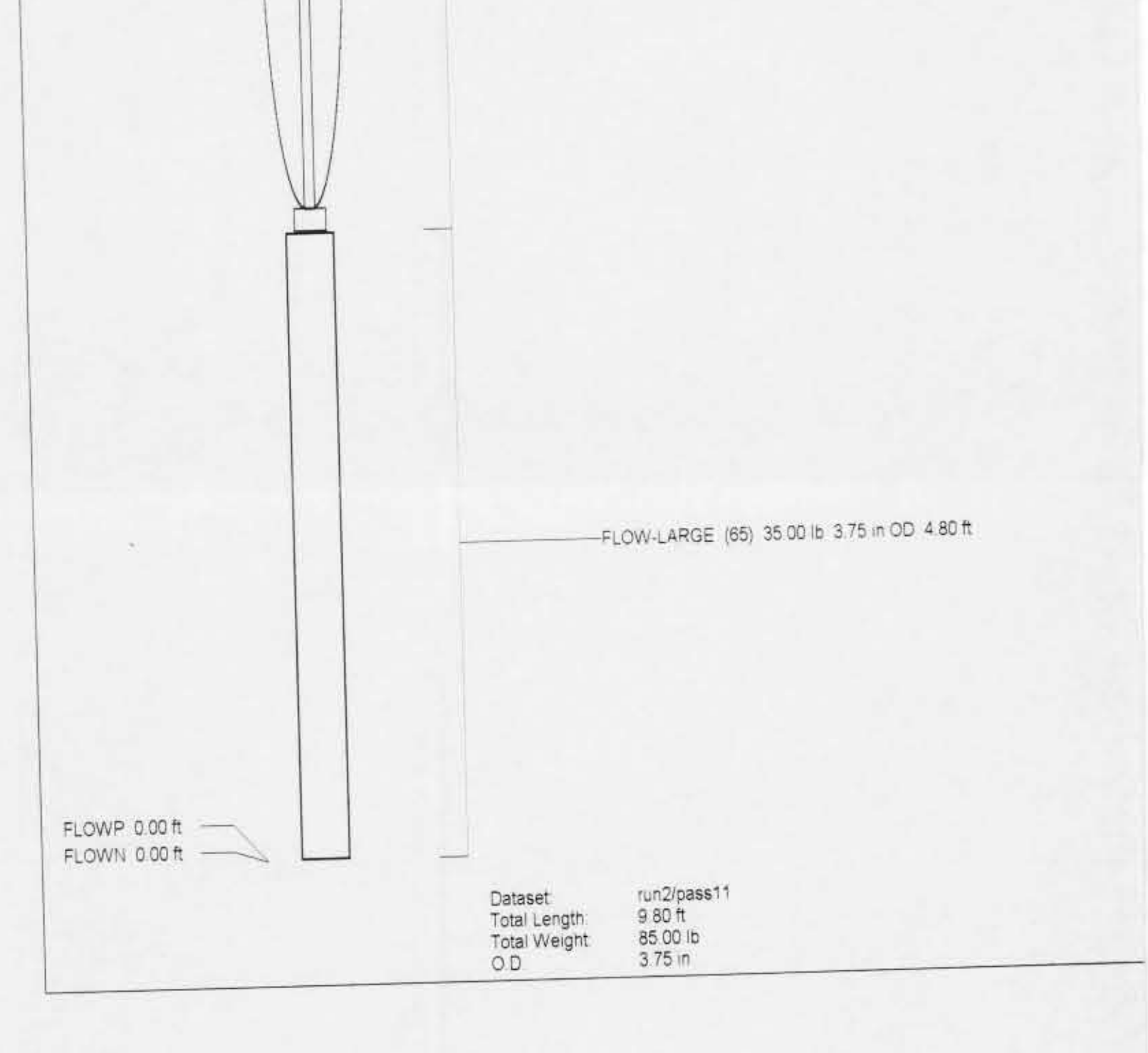
Database File: nwwf.db
Dataset Pathname: run2/pass10
Presentation Format: flowcals.prs
Dataset Creation: Wed Jun 02 13:08:44 1999 by Log VER_5.12
Charted by: Time scaled 36"/hour



FLORIDA GEOPHYSICAL LOGGING, INC. — 4500 GPM FLOW RATE

Database File: nwwf.db
Dataset Pathname: run2/pass11
Presentation Format: flowcals.prs
Dataset Creation: Wed Jun 02 13:38:49 1999 by Log VER_5.12
Charted by: Time scaled 36"/hour





Dataset: run2/pass11
Total Length: 9.80 ft
Total Weight: 85.00 lb
O.D. 3.75 in

FLORIDA GEOPHYSICAL LOGGING, INC.

X-Y CALIPER GAMMA RAY LOG

Company	MIAMI DADE WATER AND SEWER		Other Services
Well	#13		FLOW METER
Field	NW WELL FIELD		
County	DADE	State/Prv FL	
Location			
Permanent Datum	GROUND LEVEL	Elevation N/A	Elevation K.B. D.F. G.L.
Log Measured From	GROUND LEVEL		
Drilling Measured From	N/A		

Company MIAMI DADE W&S
Well
Field NW WELL FIELD
County DADE
State/Prv FL

Date	6/2/99
Run Number	TWO
Depth Driller	78'
Depth Logger	78'
Bottom Logged Interval	78'
Top Log Interval	35'
Open Hole Size	32"
Type Fluid	WATER
Density / Viscosity	NA
Max. Recorded Temp.	NA
Estimated Cement Top	NA
Time Well Ready	ON ARRIVAL
Time Logger on Bottom	1130
Equipment Number	103
Location	FT MYERS
Recorded By	FERGUSON
Witnessed By	T. URAM A. DURAND

Borehole Record				Tubing Record			
Run Number	Bit	From	To	Size	Weight	From	To
	32"	45'	78'				

Casing Record	Size	Wgt/Ft	Top	Bottom
Surface String	48"	375	SURFACE	45'
Prot. String				
Production String				
Liner				

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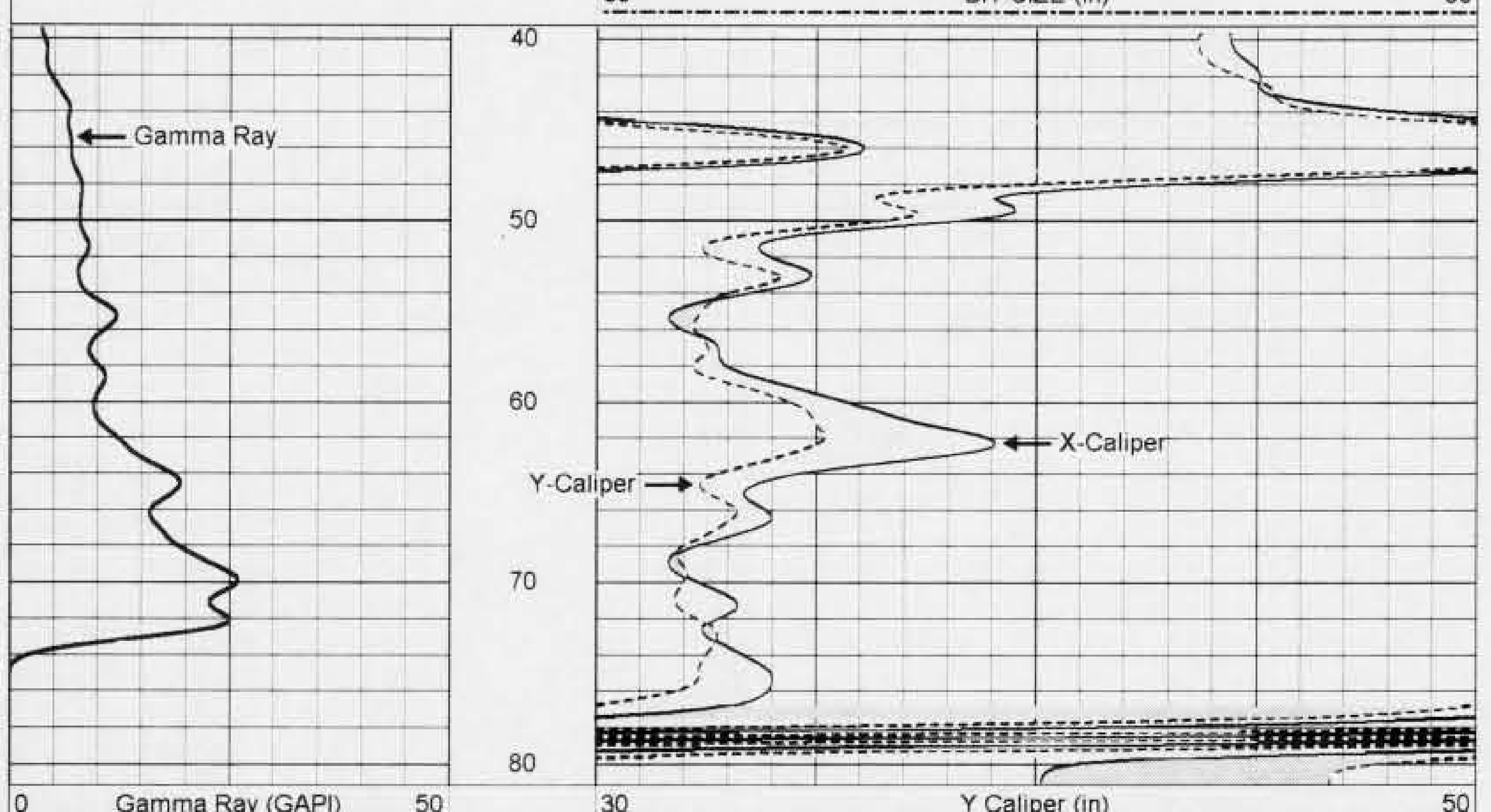
All interpretations are opinions based on inferences from electrical or other measurements and we cannot and do not guarantee the accuracy or correctness of any interpretation, and we shall not, except in the case of gross or willful negligence on our part, be liable or responsible for any loss, costs, damages, or expenses incurred or sustained by anyone resulting from any interpretation made by any of our officers, agents or employees. These interpretations are also subject to our general terms and conditions set out in our current Price Schedule

Comments

FLORIDA GEOPHYSICAL LOGGING, INC. — MAIN PASS

Database File: nwwf.db
Dataset Pathname: run2/pass2
Presentation Format: grxyc.prs
Dataset Creation: Wed Jun 02 12:02:01 1999 by Log VER_5.12
Charted by: Depth in Feet scaled 1:120

0 Gamma Ray (GAPI) 50 | 30 Y Caliper (in) 50 | 30 X Caliper (in) 50 | 30 BIT SIZE (in) 50

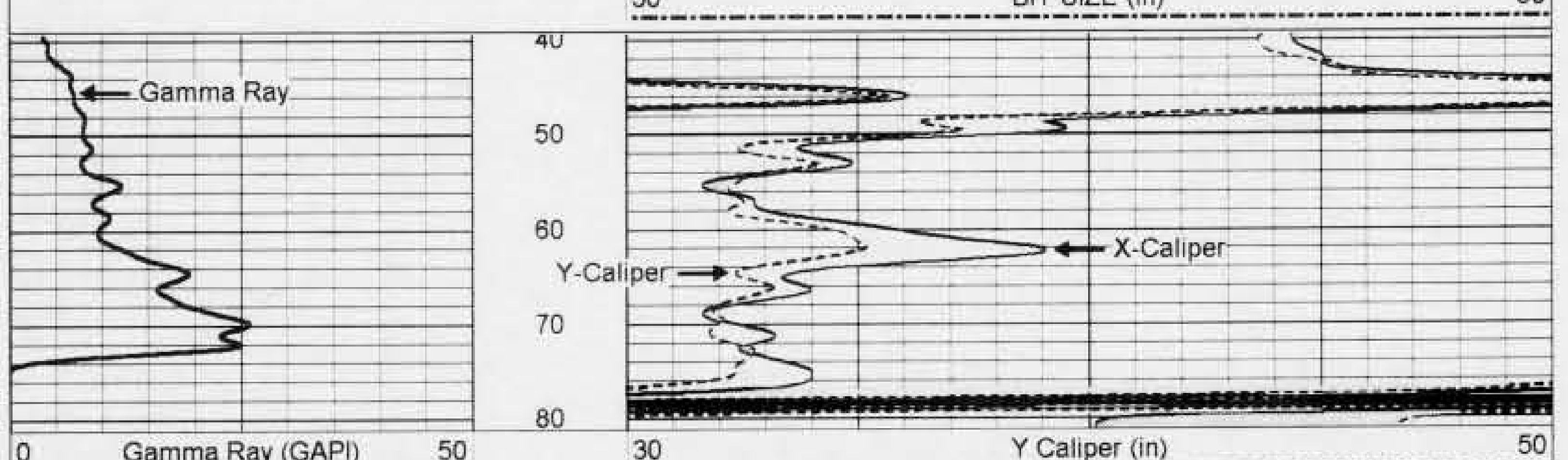


0 Gamma Ray (GAPI) 50 | 30 Y Caliper (in) 50 | 30 X Caliper (in) 50 | 30 BIT SIZE (in) 50

FLORIDA GEOPHYSICAL LOGGING, INC. — MAIN PASS

Database File: nwwf.db
Dataset Pathname: run2/pass2
Presentation Format: grxyc.prs
Dataset Creation: Wed Jun 02 12:02:01 1999 by Log VER_5.12
Charted by: Depth in Feet scaled 1:240

0 Gamma Ray (GAPI) 50 | 30 Y Caliper (in) 50 | 30 X Caliper (in) 50 | 30 BIT SIZE (in) 50

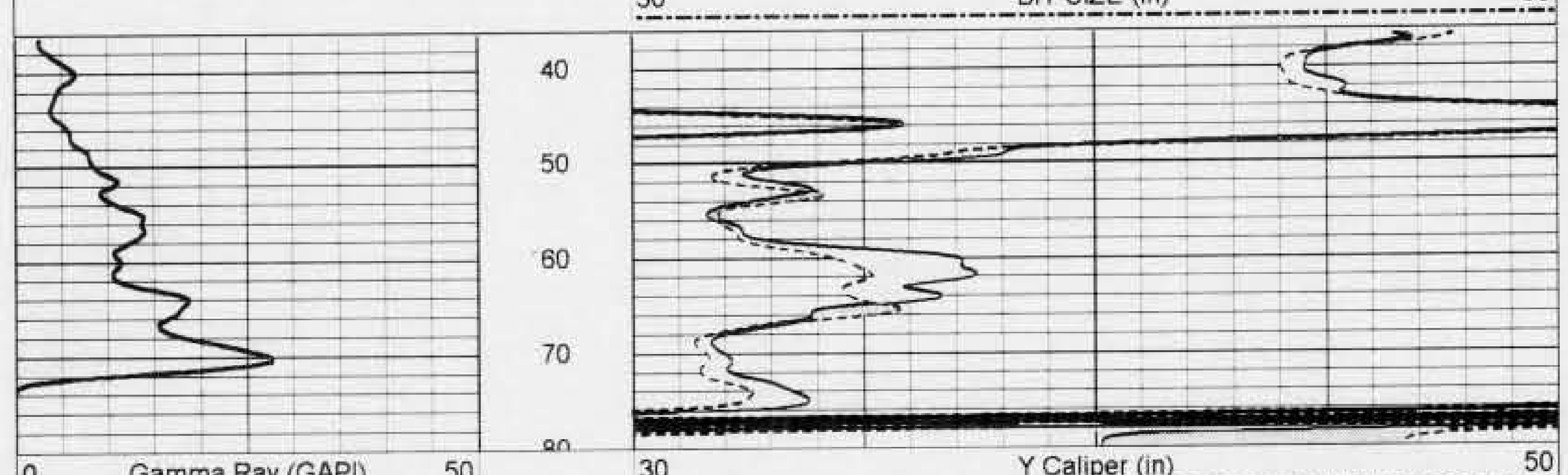


0 Gamma Ray (GAPI) 50 | 30 Y Caliper (in) 50 | 30 X Caliper (in) 50 | 30 BIT SIZE (in) 50

FLORIDA GEOPHYSICAL LOGGING, INC. — REPEAT PASS

Database File: nwwf.db
Dataset Pathname: run2/pass1
Presentation Format: grxyc.prs
Dataset Creation: Wed Jun 02 11:54:15 1999 by Log VER_5.12
Charted by: Depth in Feet scaled 1:240

0 Gamma Ray (GAPI) 50 | 30 Y Caliper (in) 50 | 30 X Caliper (in) 50 | 30 BIT SIZE (in) 50



0 Gamma Ray (GAPI) 50 | 30 Y Caliper (in) 50 | 30 X Caliper (in) 50 | 30 BIT SIZE (in) 50

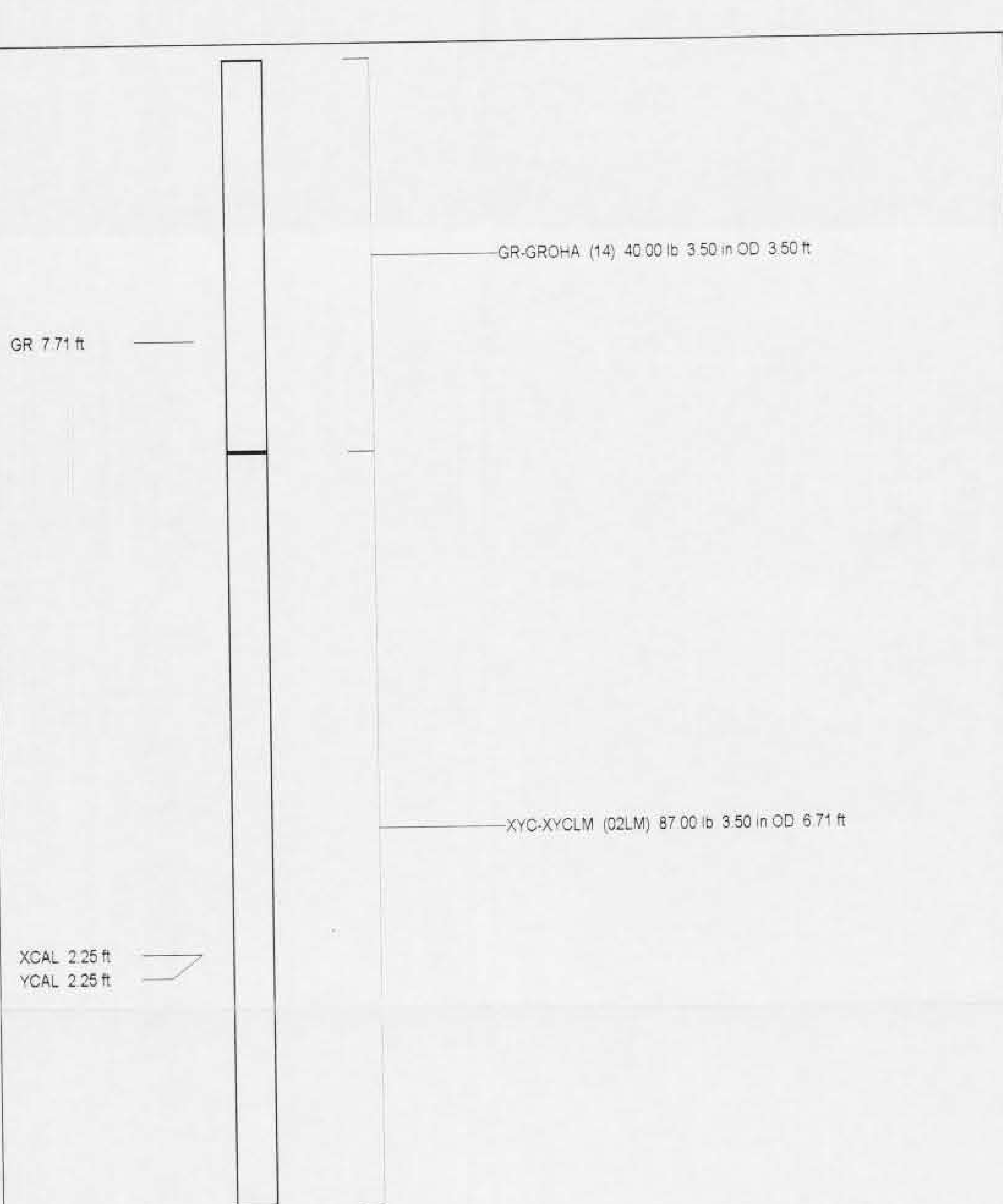
XY Caliper Calibration Report

Serial Number/Model: 02LM-XYCLM
Performed: Wed Jun 02 07:09:30 1999

Ring			X Caliper		Y Caliper	
1:	30	in	1009.98	cps	1051.22	cps
2:	40.5	in	1161.78	cps	1183.66	cps
3:	56.5	in	1414.42	cps	1398.29	cps
4:		in		cps		cps
5:		in		cps		cps
6:		in		cps		cps

Gamma Ray Calibration Report

Serial Number:	14	
Tool Model:	GROHA	
Performed:	Wed May 05 17:25:51 1999	
Calibrator Value:	120	GAPI
Background Reading:	39.762	cps
Calibrator Reading:	324.482	cps
Sensitivity:	0.421466	GAPI/cps



Dataset: run2/pass2
Total Length: 10.21 ft
Total Weight: 127.00 lb
O.D.: 3.50 in

Appendix G

C O V E R

S H E E T

FAX

To: **Mr. Joe De Marzio, Department of Health & Rehabilitative Services**

Fax #: (305) 623-3620

Subject: **Bacteriology Results for NW Well # 13.**

Date: July 21, 1999

Pages: 1, including this cover sheet.

Date	Sample	MF Result	Analyst
7/16/99 8:00 am	N. W. Well # 13	A	DR
7/16/99 2:00 pm	N. W. Well # 13	A	DR
7/17/99 9:00 am	N. W. Well # 13	A	AWT
7/17/99 4:10 pm	N. W. Well # 13	A	AWT
7/18/99 8:15 am	N. W. Well # 13	A	AS
7/18/99 3:28 pm	N. W. Well # 13	A	AS

From the desk of...

Marjorie Jolly, Chemist 3
Preston Water Quality Laboratory

Miami-Dade Water & Sewer Department
1100 West 2 nd Avenue
Hialeah, Fl. 33010

Tel: (305) 887-2007
Fax: (305) 882-5767

C O V E R

S H E E T

FAX

To: **Mr. Joe De Marzio, Department of Health & Rehabilitative Services**

Fax #: (305) 623-3620

Subject: **Bacteriology Results for NW Well # 14.**

Date: June 25, 1999

Pages: 1, including this cover sheet.

Date	Sample	MF Result	Analyst
6/14/99 8:05 am	N. W. Well # 14	A	AS
6/14/99 2:00 pm	N. W. Well # 14	A	AS
6/15/99 7:24 am	N. W. Well # 14	A	AS
6/15/99 2:05 pm	N. W. Well # 14	A	AS
6/16/99 7:24 am	N. W. Well # 14	A	AS
6/16/99 1:35 pm	N. W. Well # 14	A	AS
6/17/99 7:24 am	N. W. Well # 14	A	AS
6/17/99 1:45 pm	N. W. Well # 14	A	AS
6/18/99 7:41 am	N. W. Well # 14	A	OC
6/18/99 1:50 pm	N. W. Well # 14	A	OC
6/19/99 7:30 am	N. W. Well # 14	A	OC
6/19/99 2:33 pm	N. W. Well # 14	A	OC
6/20/99 7:30 am	N. W. Well # 14	A	AS
6/20/99 2:33 pm	N. W. Well # 14	A	AS

From the desk of...

Marjorie Jolly, Chemist 3
Preston Water Quality Laboratory

Miami-Dade Water & Sewer Department
1100 West 2 nd Avenue
Hialeah, Fl. 33010

Tel: (305) 887-2007
Fax: (305) 882-5767

C O V E R

S H E E T

FAX

To: **Mr. Joe De Marzio, Department of Health & Rehabilitative Services**

Fax #: (305) 623-3620

Subject: **Bacteriology Results for NW Well # 14.**

Date: June 25, 1999

Pages: 1, including this cover sheet.

Date	Sample	MF Result	Analyst
6/21/99 7:17 am	N. W. Well # 14	A	AS
6/21/99 1:30 pm	N. W. Well # 14	A	AS
6/22/99 7:45 am	N. W. Well # 14	A	AS
6/22/99 1:35 pm	N. W. Well # 14	A	AS
6/23/99 7:20 am	N. W. Well # 14	A	AS
6/23/99 2:30 pm	N. W. Well # 14	A	AS

From the desk of...

Marjorie Jolly, Chemist 3
Preston Water Quality Laboratory

Miami-Dade Water & Sewer Department
1100 West 2 nd Avenue
Hialeah, Fl. 33010

Tel: (305) 887-2007
Fax: (305) 882-5767

COVER SHEET

FAX

To: **Mr. Joe De Marzio, Department of Health & Rehabilitative Services**
Fax #: (305) 623-3620
Subject: **Bacteriology Results for NW Well # 15.**
Date: May 3, 1999
Pages: 1, including this cover sheet.

Date	Sample	MF Result	Analyst
4/23/99 7:30 am	N. W. Well # 15	A	OC
4/23/99 2:05 pm	N. W. Well # 15	A	OC
4/24/99 8:15 am	N. W. Well # 15	A	OC
4/24/99 2:20 pm	N. W. Well # 15	A	OC
4/25/99 7:15 am	N. W. Well # 15	A	AS
4/25/99 1:40 pm	N. W. Well # 15	A	AS
4/26/99 7:18 am	N. W. Well # 15	A	AS
4/26/99 1:40 pm	N. W. Well # 15	A	AS
4/27/99 7:18 am	N. W. Well # 15	A	AS
4/27/99 1:40 pm	N. W. Well # 15	A	AS
4/28/99 7:21 am	N. W. Well # 15	A	AS
4/28/99 4:31 pm	N. W. Well # 15	A	AS
4/29/99 7:20 am	N. W. Well # 15	A	AS
4/29/99 1:40 pm	N. W. Well # 15	A	AS

From the desk of...

Marjorie Jolly, Chemist 3
Preston Water Quality Laboratory

Miami-Dade Water & Sewer Department
1100 West 2 nd Avenue
Hialeah, Fl. 33010

Tel: (305) 887-2007
Fax: (305) 882-5767

COVER SHEET FAX

To: **Mr. Joe De Marzio, Department of Health & Rehabilitative Services**
Fax #: (305) 623-3620
Subject: **Bacteriology Results for NW Well # 15.**
Date: May 3, 1999
Pages: 1, including this cover sheet.

Date	Sample	MF Result	Analyst
4/30/99 7:18 am	N. W. Well # 15	A	OC
4/30/99 2:10 pm	N. W. Well # 15	A	OC
5/01/99 7:35 am	N. W. Well # 15	A	OC
5/01/99 1:58 pm	N. W. Well # 15	A	OC
5/02/99 7:35 am	N. W. Well # 15	A	OC
5/02/99 2:00 pm	N. W. Well # 15	A	OC

From the desk of...

Marjorie Jolly, Chemist 3
Preston Water Quality Laboratory

Miami-Dade Water & Sewer Department
1100 West 2 nd Avenue
Hialeah, Fl. 33010

Tel: (305) 887-2007
Fax: (305) 882-5767

MIAMI-DADE WATER AND SEWER DEPARTMENT
RAYMOND DIAZ, ACTING CHIEF, LABORATORY DIVISION
JOHN E. PRESTON WATER QUALITY ASSURANCE LABORATORY, CERTIFICATION # 56084
ANALYTICAL RESULTS

Log Number	Sample Identification	Date Collected	Date Analyzed	Parameter	Result	Units	MDL	Method
2694	N.W. Well Field #13	07/15/99	07/16/99	pH	7.39	----	0.01	SM4500-H
		07/15/99	07/16/99	Alkalinity	216	ppm	0.07	SM2320-B
		07/15/99	07/16/99	Total Hardness	217	ppm	0.80	EPA130.2
		07/15/99	07/16/99	Ca Hardness	190	ppm	0.60	SM3500-CaD
		07/15/99	07/16/99	Chloride	58	ppm	0.70	SM4500CL-B
		07/15/99	07/19/99	Ammonia	0.217	ppm	0.001	SM4500 NH3-D
		07/15/99	07/20/99	Bromide	0.126	ppm	0.003	EPA300.0
		07/15/99	07/19/99	Conductivity	520	micromho	----	SM2510-A
		07/15/99	07/17/99	UV254	0.576	cm-1	0.001	SM 5910
		07/15/99	07/20/99	TOC	16.78	ppm	0.30	SM5310-B

Analyst: A. Thomas/A. Benitez/D. Meacham/A. Toledo Title: Chemist 2/Chemist 1's Date: 07/23/99

Reviewer: Marjorie Jolly Title: Chemist 3 Date: 07/26/99

CHRSFORM8.WK4

MIAMI-DADE WATER AND SEWER DEPARTMENT
RAYMOND DIAZ, ACTING CHIEF, LABORATORY DIVISION
JOHN E. PRESTON WATER QUALITY ASSURANCE LABORATORY, CERTIFICATION # 56084
ANALYTICAL RESULTS

Log Number	Sample Identification	Date Collected	Date Analyzed	Parameter	Result	Units	MDL	Method
2274	NW #14	06/21/99	06/21/99	pH	7.41	----	0.01	SM4500-HB
2274	NW #14	06/21/99	06/22/99	Alkalinity	211	ppm	0.15	SM2320-B
2274	NW #14	06/21/99	06/22/99	T. Hardiness	213	ppm	0.70	EPA 130.2
2274	NW #14	06/21/99	06/22/99	Ca Hardness	190	ppm	1.00	SM3500-CaD
2274	NW #14	06/21/99	06/22/99	Chloride	62	ppm	1.00	SM4500 CL-B
2274	NW #14	06/21/99	06/22/99	Ammonia	0.244	ppm	0.001	SM4500 NH3-D
2274	NW #14	06/21/99	06/23/99	Bromide	0.148	ppm	0.003	EPA 300.0
2274	NW #14	06/21/99	06/23/99	UV254	0.514	cm-1	0.001	SM5910
2274	NW #14	06/21/99	06/23/99	Conductivity	573	Micro mho	----	SM2510-B
2274	NW #14	06/21/99	06/24/99	TOC	16.48	ppm	0.26	SM5310-B

Analyst: A.T./ A.B./D M./A W.T. Title: Chemist 2, Chemist 1, Chemist 1, Chemist 1 Date: 06/25/99

Reviewer: Marjorie Jolly Title: Chemist 3 Date: 06/29/99

CHRSFORM5.WK4

MIAMI-DADE WATER AND SEWER DEPARTMENT
RAYMOND DIAZ, ACTING CHIEF, LABORATORY DIVISION
JOHN E. PRESTON WATER QUALITY ASSURANCE LABORATORY, CERTIFICATION # 56084
ANALYTICAL RESULTS

Log Number	Sample Identification	Date Collected	Date Analyzed	Parameter	Result	Units	MDL	Method
1554	North West Well # 15	04/27/99	04/27/99	Alkalinity	200	ppm	0.15	SM2320-B
				pH	7.65	-----	0.01	SM4500-HB
				Total Hardness	203	ppm	0.70	EPA-130.2
				Ca Hardness	174	ppm	1.0	SM-3500 Ca-D
				Bromide	0.176	ppm	3.30	EPA-300.0
				TOC	15.1	ppm	0.26	SM5310-B
				Ammonia	0.27	ppm	0.05	SM450-NH3-D
				Chloride	61	ppm	1.0	SM4500Cl-B
				UV254	0.469	cm-1	0.001	SM5910
				Color	83	pcu	0.21	SM2120C
				Conductivity	565	micromho	-----	SM2510-B
1625	North West Well #15	05/02/99	05/02/99	Alkalinity	199	ppm	0.15	SM2320-B
				pH	7.70	-----	0.01	SM4500-HB
				Total Hardness	200	ppm	0.70	EPA-130.2
				Ca Hardness	177	ppm	1.0	SM-3500 Ca-D
				Bromide	0.171	ppm	3.30	EPA-300.0
				TOC	15.5	ppm	0.26	SM5310-B
				Ammonia	0.242	ppm	0.05	SM450-NH3-D
				Chloride	63	ppm	1.0	SM4500Cl-B
				UV254	0.513	cm-1	0.001	SM5910
				Color	67	pcu	0.21	SM2120C
				Conductivity	553	micromho	-----	SM2510-B

Analyst: AT, AB, DM, AWT AB K.D.M. Title: Chemist 2, Chemist 1, Chemist 1, Chemist 1 Date: 5/13/99

Reviewer: Marjorie Jolly Title: Chemist 3 Date: 5/14/99

CHRSFORM.WK4

Appendix H

NORTHWEST WELLFIELD WELL #13

MPA RESULTS

REPORT: Microscopic Particulate Analysis

ENVIRONMENTAL ASSOCIATES, LTD.
24 Oak Brook Drive , Ithaca, NY 14850, Phone (607) 272-8902 Fax (607)256-7092

PWS ID#	Well ID#	Utility Name	EAL Sample ID:
FL4130871	Northwest Wellfield Well #13	Miami Dade Water & Sewer	11732

Project Code Number: 99-05119B, Req.#H34940

COLLECTION:

Collector: David Ramos Date collected: 9/7/99 Time: 4:45pm

RECEIPT OF FILTER: Receiver of Sample: J. Antosh Carrier: Federal Express

Date Rec.: 9/9/99 Time: 10:30 AM Temp. of Rec. Sample: 1°C Tracking Number: 813833390583

FILTER PROCESSING Techician: J. Antosh Time: 11:00 AM Date: 9/9/99

Color of water around filter: light brown
Filter color: light brown
Color of sediment: grey
gallons filtered: 980

Total volume of sediment: 1 ml
Volume of sediment/100 gallons: 0.1 ml/100gal
Phase equivalent gallon volume examined: 15

GIARDIA/CRYPTOSPORIDIUM # Observed Calc. #/100 Gallons

Giardia cyst confirmed: - -
Giardia cyst presumptive : - -
Cryptosporidium oocyst confirmed: - -
Cryptosporidium oocyst presumptive: - -

ANALYSIS OF PARTICULATES: Analyst Todd Wheaton Date: 9/11/99

key = (EH) - extremely heavy (H) - heavy (M) -moderate (R) - rare (NF) - none found

PARTICULATE DEBRIS

	Quantity	Description
Large part. 5 µm & larger	EH	silt & sand, clumped brown
Small part. up to 5 µm	EH	fine brown & amorphous
Plant debris	NF	

PROTOZOANS

	Quantity	Description
Other Coccidia	NF	
Other protozoans	NF	

OTHER ORGANISMS

Nematodes	NF	
Nematode eggs	NF	
Rotifers	NF	
Crustaceans	NF	
Crustacean eggs	NF	
Insects	NF	
Other	R	R-7/100gal. pollen, H-iron(Crenothrix) & R-environmental bacteria

ALGAE

Green Algae	NF	
Diatoms	NF	
Blue-Green Algae	NF	
Flagellated Algae	NF	

Microscopy: Phase / Hoffman Magnification: 10,20,40,100x Dilution: not dil. :

Flotation Parameters: Percoll@/Sucrose gradient pellet vol.: 10 µl suspension vol.: 1000 µl µl pellet/100gal.: 102

Type of Material examined: ☒ direct examination of unfloated sediment by ☒ floated (suspended) pellet

COMMENTS:

No primary surface water indicators were observed. Based upon microscopic particulate analysis and the proposed EPA risk factors associated with bio-indicators there is a low risk of surface contamination (EPA risk factors= 0 low risk).

REPORT REVIEWED BY: Susan H. Bartus DATE: September 22 1999

PWS ID#	Well ID#	Utility Name	EAL Sample ID:
FL4130871	Northwest Wellfield Well 13	Miami Dade Water & Sewer	11732

EPA Relative Surface Water Risk Factors

Date: 9/7-8/99

Primary Particulates	#/100 gallon	Relative Frequency	Relative Risk Factor	Comments
Giardia (confirmed)	0	NF	0	
Coccidia (confirmed)	0	NF	0	
Diatoms (with chloroplasts)	0	NF	0	
Other Algae (with chloroplasts)	0	NF	0	
Insects/larvae	0	NF	0	
Rotifers	0	NF	0	
Plant Debris (with chlorophyll)	0	NF	0	
		EPA Relative Risk = 0		Low Risk

Secondary Particulates			
Nematodes	0	NF	
Crustaceans	0	NF	
Amoeba	0	NF	
Non-photo.flagellates & ciliates	0	NF	
Photosynthetic flagellates	0	NF	
Other:	7	R	no relative risk factor assigned

COMMENTS: No primary surface water indicators were observed. Based upon microscopic particulate analysis and the proposed EPA risk factors associated with bio-indicators there is a low risk of surface contamination (EPA risk factors= 0 low risk).

REFERENCE: Consensus Method for Determining Groundwaters Under the Direct Influence of Surface Water Using Microscopic Particulate Analysis (MPA) USEPA Manchester Environmental Laboratory, EPA 910/9-92-029, October 1992.

REPORT REVIEWED BY: Susan H. Bertron DATE: September 22, 1999

FLORIDA DEPARTMENT OF HEALTH

MPA SAMPLE REPORT

Lab Sample # E99-0147 **Utility:** PWS#4130871 Miami Dade Water & Sewer Dept. well #13

Date/time Collected 09/07/99 04:45 PM 09/08/99 09:10 AM **Date/time Processed:** 09/09/99 10:30 AM **By:** Larson/Chiprich

PROCESSING INFORMATION

filter color: light gray

color of water around the filter: tan tint with particles

Total volume water filtered (gal):	490	Percoll/sucrose flotation pellet volume (µl):	60
Total volume filter sediment (µl):	794	Percoll/sucrose flotation packed sediment (µl):	400
µl sediment/100 gallons sampled:	162	µl flotation pellet volume/100 gallons sampled:	12
number of slides examined:	3	material examined:	floated (suspended) pellet

Primary Particulates	#/100 gallon	Relative frequency*	Relative Risk Factor*	Comments
Giardia	NA	NA	NA	
Coccidia	NA	NA	NA	
Diatoms (with chloroplasts)	0	NS	0	
Other Algae (with chloroplasts)	32	M	9	
Insects / Larvae	0	NS	0	
Rotifers	0	NS	0	
Plant Debris	0	NS	0	
		EPA Relative Risk=	9	

*Reference: USEPA Consensus Method for Determining Groundwaters Under the Direct Influence of Surface Water Using Microscopic Particulate Analysis (MPA): NA = Not Assayed

EH = extremely heavy H = heavy M = moderately heavy R = rare NF = None found

Secondary Particulates	#/100 gallon	Comments
Large amorphous debris	R	
Fine amorphous debris	EH	
Minerals	M	
Plant pollen	5	
Nematodes	0	
Crustaceans	0	
Amoeba	2	
Flagellates & ciliates	0	
Other: eggs	0	
Other: fungal filaments & spores	R	

Comments: One slide of the packed pellet from the flotation tube was also examined; it contained one alga.

Based upon microscopic particulate analysis and the EPA risk factors associated with bio-indicators, there is a low risk of surface contamination. Determination of surface water influence should not be based solely on the results of one or two MPAs. Other pertinent information, such as water quality data and on-site surveys, should be used in conjunction with the MPA results in making this determination.

Reported by: [signature] Date: 09/28/99

Jeb Bush
Governor

Tampa Branch Laboratory
3952 West Dr. Martin Luther King Jr. Boulevard • Tampa, FL 33614-8404
Fax: (813)871-7468 Phone:(813)871-7465 Suncom: 512-6278

Robert G. Brooks, M.D.,
Secretary

MIAMI-DADE WATER & SEWER DEPARTMENT
RAYMOND DIAZ, CHIEF, LABORATORY DIVISION
JOHN E. PRESTON WATER TREATMENT PLANT LABORATORY CERTIFICATION #56084
FIELD SAMPLING LOG

#3

Analysis Required: RAW WATER

☒ M.P.A. ☐ Cryptosporidium ☐ Enterovirus

Sample Location: NorthWest Wellfield Well # 13

Composite ☒ Grab ☐ Other ☐

Start Time: 4:45 p.m. Date: 09/07/99

Meter Reading: 64770 Turbidity: 0.59 Temperature: 24.0°C pH: 7.06

Stop Time: 9:10 a.m. Date: 09/08/99

Meter Reading: 65750 Turbidity: 0.51 Temperature: 24.0°C pH: 7.15

Total Volume Filtered: 980

Weather Conditions:

At setup: ☑ Clear ☐ Cloudy ☐ Raining

At finish: ☑ Clear ☐ Cloudy ☐ Raining

Site Conditions:

At setup: ☐ Dry ☑ Moderate Standing Water ☐ Area Flooded

At finish: ☐ Dry ☑ Moderate Standing Water ☐ Area Flooded

Sample Collector: David Ramos (Print Name) David Ramos (Signature)

Shipping Date and Time: 09/08/99 - 1500

Final Destination: Environmental Assoc. LTD

Received By: _____ (Print Name) _____ (Signature)

Recommended Filtered Sample Volumes:
Giarda / Crypto: 100 liters
Enterovirus: 60 - 100 gals
MPA: 600 - 1000 gals

REPORT: Microscopic Particulate Analysis

ENVIRONMENTAL ASSOCIATES, LTD.
24 Oak Brook Drive , Ithaca, NY 14850, Phone (607) 272-8902 Fax (607)256-7092

PWS ID#	Well ID#	Utility Name	EAL Sample ID:
FL4130871	NW Wellfeld Well #13	Miami Dade Water & Sewer	11769

Project Code Number: 99-05119B, Req.#H34940

COLLECTION:

Collector: A.C. Salazar Date collected: 9/20/99 Time: 4:16pm

RECEIPT OF FILTER:

Receiver of Sample: J. Runyan Carrier: Federal Express

Date Rec.: 9/22/99 Time: 10:25 AM Temp. of Rec. Sample: 1°C Tracking Number: 813833390594

FILTER PROCESSING Techician: J. Antosh Time: 12:00 PM Date: 9/22/99

Color of water around filter: tan
Filter color: tan
Color of sediment: grey
gallons filtered: 630

Total volume of sediment: 0.08 ml
Volume of sediment/100 gallons: 0.01 ml/100gal.
Phase equivalent gallon volume examined: 107

GIARDIA/CRYPTOSPORIDIUM

	# Observed	Calc. #/100 Gallons
Giardia cyst confirmed:	-	-
Giardia cyst presumptive :	-	-
Cryptosporidium oocyst confirmed:	-	-
Cryptosporidium oocyst presumptive:	-	-

ANALYSIS OF PARTICULATES: Analyst Todd Wheaton Date: 9/23/99

key = (EH) - extremely heavy (H) - heavy (M) -moderate (R) - rare (NF) - none found

PARTICULATE DEBRIS

	Quantity	Description
Large part. 5 µm & larger	EH	silt & sand, clumped brown
Small part. up to 5 µm	EH	fine amorphous debris
Plant debris	NF	

OTHER ORGANISMS

Nematodes	NF	
Nematode eggs	NF	
Rotifers	NF	
Crustaceans	NF	
Crustacean eggs	NF	
Insects	NF	
Other	R	1/100gal. pollen, iron bacteria(Crenothrix)

PROTOZOANS

	Quantity	Description
Other Coccidia	NF	
Other protozoans	NF	

ALGAE

Green Algae	NF	
Diatoms	NF	
Blue-Green Algae	NF	
Flagellated Algae	NF	

Microscopy: Phase / Hoffman Magnification: 10,20,40,100x Dilution: not dil. : _____

Flotation Parameters: Percoll@/Sucrose gradient pellet vol.: 10 µl suspension vol.: 200 µl µl pellet/100gal.: 12.7

Type of Material examined: ☒ direct examination of unfloated sediment by ☒ floated (suspended) pellet

COMMENTS:

No primary surface water indicators were observed. Based upon microscopic particulate analysis and the proposed EPA risk factors associated with bio-indicators there is a low risk of surface contamination (EPA risk factors= 0 low risk).

REPORT REVIEWED BY: Susan H. Bartus **DATE:** September 29, 1999

PWS ID#	Well ID#	Utility Name	EAL Sample ID:
FL4130871	NW Wellfeld Well #13	Miami Dade Water & Sewer	11769

EPA Relative Surface Water Risk Factors

Date: 9/20-21/99

Primary Particulates	#/100 gallon	Relative Frequency	Relative Risk Factor	Comments
Giardia (confirmed)	0	NF	0	
Coccidia (confirmed)	0	NF	0	
Diatoms (with chloroplasts)	0	NF	0	
Other Algae (with chloroplasts)	0	NF	0	
Insects/larvae	0	NF	0	
Rotifers	0	NF	0	
Plant Debris (with chlorophyll)	0	NF	0	
		EPA Relative Risk = 0		Low Risk

Secondary Particulates			
Nematodes	0	NF	
Crustaceans	0	NF	
Amoeba	0	NF	
Non-photo.flagellates & ciliates	0	NF	
Photosynthetic flagellates	0	NF	
Other:	1	R	pollen, Crenothrix-no relative risk factor assigned

COMMENTS: No primary surface water indicators were observed. Based upon microscopic particulate analysis and the proposed EPA risk factors associated with bio-indicators there is a low risk of surface contamination (EPA risk factors= 0 low risk).

REFERENCE: Consensus Method for Determining Groundwaters Under the Direct Influence of Surface Water Using Microscopic Particulate Analysis (MPA) USEPA Manchester Environmental Laboratory, EPA 910/9-92-029, October 1992.

REPORT REVIEWED BY: Susan H. Bates DATE: September 29, 1999

FLORIDA DEPARTMENT OF HEALTH

MPA SAMPLE REPORT

Lab Sample # E99-0152 **Utility:** PWS#4130871 Miami Dade Water & Sewer Dept. well #13

Date/time Collected 09/20/99 04:16 PM 09/21/99 08:30 AM **Date/time Processed:** 09/22/99 12:45 PM **By:** Larson

PROCESSING INFORMATION

filter color light gray — color of water around the filter: tan tint

Total volume water filtered (gal): 750 — Percoll/sucrose flotation pellet volume (µl): 20

Total volume filter sediment (µl): 411 — Percoll/sucrose flotation packed sediment (µl): 200

µl sediment/100 gallons sampled: 54.8 — µl flotation pellet volume/100 gallons sampled: 2.7

number of slides examined: 2 — material examined: floated (suspended) pellet

Primary Particulates	#/100 gallon	Relative frequency*	Relative Risk Factor*	Comments
Giardia	NA	NA	NA	
Coccidia	NA	NA	NA	
Diatoms (with chloroplasts)	0	NS	0	
Other Algae (with chloroplasts)	4.8	R	4	
Insects / Larvae	0	NS	0	
Rotifers	0	NS	0	
Plant Debris	0	NS	0	
		EPA Relative Risk=	4	

*Reference: USEPA Consensus Method for Determining Groundwaters Under the Direct Influence of Surface Water Using Microscopic Particulate Analysis (MPA): NA = Not Assayed

EH = extremely heavy H = heavy M = moderately heavy R = rare NF = None found

Secondary Particulates	#/100 gallon	Comments
Large amorphous debris	M	
Fine amorphous debris	EH	
Minerals	M	
Plant pollen	0.3	
Nematodes	0	
Crustaceans	0	
Amoeba	0	
Flagellates & ciliates	0	
Other: eggs	0.3	
Other: fungal filaments & spores	R	

Comments: Entire floated pellet examined.

Based upon microscopic particulate analysis and the EPA risk factors associated with bio-indicators, there is a low risk of surface contamination. Determination of surface water influence should not be based solely on the results of one or two MPAs. Other pertinent information, such as water quality data and on-site surveys, should be used in conjunction with the MPA results in making this determination.

Reported by: Date: 09/28/99

Jeb Bush
Governor

Tampa Branch Laboratory
3952 West Dr. Martin Luther King Jr. Boulevard • Tampa, FL 33614-3404
Fax: (813)871-7468 Phone:(813)871-7465 Suncom: 512-6278

Robert G. Brooks, M.D.,
Secretary

MIAMI-DADE WATER & SEWER DEPARTMENT
RAYMOND DIAZ, CHIEF, LABORATORY DIVISION
JOHN E. PRESTON WATER TREATMENT PLANT LABORATORY CERTIFICATION #56084
FIELD SAMPLING LOG

Analysis Required: RAW WATER

☒ M.P.A. ☐ Cryptosporidium ☐ Enterovirus

Sample Location: N.W. Wellfield Well # 13

Composite ☒ Grab ☐ Other ☐

Start Time: 4:16 pm Date: 09/20/99

Meter Reading: 32180 Turbidity: 0.36 Temperature: 24°C pH: 7.39

Stop Time: 8:30 Date: 09/21/99

Meter Reading: 32810 Turbidity: 0.31 Temperature: 24°C pH: 7.35

Total Volume Filtered: 630

Weather Conditions:

At setup: ☐ Clear ☑ Cloudy ☐ Raining

At finish: ☐ Clear ☐ Cloudy ☑ Raining

Site Conditions:

At setup: ☐ Dry ☑ Moderate Standing Water ☐ Area Flooded

At finish: ☐ Dry ☐ Moderate Standing Water ☑ Area Flooded

Sample Collector: AC Salazar (Print Name) (Signature)

Shipping Date and Time: 09/21/99 - 1500

Final Destination: Environmental Associates LTD

Received By: (Print Name) (Signature)

Recommended Filtered Sample Volumes:
Giarda / Crypto: 100 liters
Enterovirus: 60 - 100 gals
MPA: 600 - 1000 gals

REPORT: Microscopic Particulate Analysis

ENVIRONMENTAL ASSOCIATES, LTD.
24 Oak Brook Drive , Ithaca, NY 14850, Phone (607) 272-8902 Fax (607)256-7092

PWS ID#	Well ID#	Utility Name	EAL Sample ID:
FL4130871	NW Wellfield Well#13	Miami Dade Water & Sewer	12088

Project Code Number: 99-05119B, Req.#H35192

COLLECTION:

Collector: David Ramos Date collected: 11/15/99 Time: 3:45pm

RECEIPT OF FILTER: Receiver of Sample: J. Antosh Carrier: Federal Express

Date Rec.: 11/17/99 Time: 10:20 AM Temp. of Rec. Sample: 1°C Tracking Number: 813833390686

FILTER PROCESSING Technician: J. Antosh Time: 12:20 PM Date: 11/17/99

Color of water around filter: clear
Filter color: brown
Color of sediment: brown
gallons filtered: 700

Total volume of sediment: 0.2 ml
Volume of sediment/100 gallons: 0.03 ml/100gal.
Phase equivalent gallon volume examined: 86

GIARDIA/CRYPTOSPORIDIUM # Observed Calc. #/100 Gallons

Giardia cyst confirmed: - -
Giardia cyst presumptive : - -
Cryptosporidium oocyst confirmed: - -
Cryptosporidium oocyst presumptive: - -

ANALYSIS OF PARTICULATES: Analyst Todd Wheaton Date: 11/18/99

key = (EH) - extremely heavy (H) - heavy (M) -moderate (R) - rare (NF) - none found

PARTICULATE DEBRIS

	Quantity	Description
Large part. 5 µm & larger	EH	silt & sand, clumped brown
Small part. up to 5 µm	EH	fine brown amorphous
Plant debris	NF	

PROTOZOANS

	Quantity	Description
Other Coccidia	NF	
Other protozoans	NF	

OTHER ORGANISMS

Nematodes	NF	
Nematode eggs	NF	
Rotifers	NF	
Crustaceans	NF	
Crustacean eggs	NF	
Insects	NF	
Other	R	3/100gal. pollen

ALGAE

Green Algae	NF	
Diatoms	NF	
Blue-Green Algae	NF	
Flagellated Algae	NF	

Microscopy: Phase / Hoffman Magnification: 10,20,40,100x Dilution: not dil. : ✓

Flotation Parameters: Percoll@/Sucrose gradient pellet vol.: 10 µl suspension vol.: 400 µl µl pellet/100gal.: 28.6

Type of Material examined: ☒ direct examination of unfloated sediment by ☒ floated (suspended) pellet

COMMENTS:

No primary surface water indicators were observed. Based upon microscopic particulate analysis and the proposed EPA risk factors associated with bio-indicators there is a low risk of surface contamination (EPA risk factors= 0 low risk).

REPORT REVIEWED BY: Susan H. Bartos DATE: November 30, 1999

PWS ID#	Well ID#	Utility Name	EAL Sample ID:
FL4130871	NW Wellfield Well#13	Miami Dade Water & Sewer	12088

EPA Relative Surface Water Risk Factors

Date: 11/15-16/99

Primary Particulates	#/100 gallon	Relative Frequency	Relative Risk Factor	Comments
Giardia (confirmed)	0	NF	0	
Coccidia (confirmed)	0	NF	0	
Diatoms (with chloroplasts)	0	NF	0	
Other Algae (with chloroplasts)	0	NF	0	
Insects/larvae	0	NF	0	
Rotifers	0	NF	0	
Plant Debris (with chlorophyll)	0	NF	0	
		EPA Relative Risk = 0		Low Risk

Secondary Particulates			
Nematodes	0	NF	
Crustaceans	0	NF	
Amoeba	0	NF	
Non-photo.flagellates & ciliates	0	NF	
Photosynthetic flagellates	0	NF	
Other:	3	R	pollen-no relative risk factor assigned

COMMENTS: No primary surface water indicators were observed. Based upon microscopic particulate analysis and the proposed EPA risk factors associated with bio-indicators there is a low risk of surface contamination (EPA risk factors= 0 low risk).

REFERENCE: Consensus Method for Determining Groundwaters Under the Direct Influence of Surface Water Using Microscopic Particulate Analysis (MPA) USEPA Manchester Environmental Laboratory, EPA 910/9-92-029, October 1992.

REPORT REVIEWED BY: Susan H. Bretos DATE: November 30, 1999

FLORIDA DEPARTMENT OF HEALTH

MPA SAMPLE REPORT

Lab Sample # E99-0191 **Utility:** PWS#4130871 Miami Dade Water & Sewer Dept. well #13

Date/time Collected 11/15/99 03:45 PM 11/16/99 08:25 AM **Date/time Processed:** 11/17/99 10:30 AM **By:** Larson/Mosbaugh

PROCESSING INFORMATION

filter color gray — color of water around the filter: clear

Total volume water filtered (gal): 670 — Percoll/sucrose flotation pellet volume (µl): NA

Total volume filter sediment (µl): 90 — Percoll/sucrose flotation packed sediment (µl): NA

µl sediment/100 gallons sampled: 13 — µl flotation pellet volume/100 gallons sampled: NA

number of slides examined: 3 — material examined: unfloated sediment

Primary Particulates	#/100 gallon	Relative frequency*	Relative Risk Factor*	Comments
Giardia	NA	NA	NA	
Coccidia	NA	NA	NA	
Diatoms (with chloroplasts)	0	NS	0	
Other Algae (with chloroplasts)	5	R	4	
Insects / Larvae	0	NS	0	
Rotifers	0	NS	0	
Plant Debris	0	NS	0	
		EPA Relative Risk=	4	

*Reference: USEPA Consensus Method for Determining Groundwaters Under the Direct Influence of Surface Water Using Microscopic Particulate Analysis (MPA): NA = Not Assayed

EH = extremely heavy H = heavy M = moderately heavy R = rare NF = None found

Secondary Particulates	#/100 gallon	Comments
Large amorphous debris	M	
Fine amorphous debris	M	
Minerals	H	
Plant pollen	14	
Nematodes	0	
Crustaceans	0	
Amoeba	0	
Flagellates & ciliates	0	
Other: eggs	4	
Other: fungal filaments & spores	M	

Comments:

Based upon microscopic particulate analysis and the EPA risk factors associated with bio-indicators, there is a low risk of surface contamination. Determination of surface water influence should not be based solely on the results of one or two MPAs. Other pertinent information, such as water quality data and on-site surveys, should be used in conjunction with the MPA results in making this determination.

Reported by: [signature] Date: 12/08/99

Jeb Bush
Governor

Tampa Branch Laboratory
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Robert G. Brooks, M.D.,
Secretary

TAG

MIAMI-DADE WATER & SEWER DEPARTMENT
RAYMOND DIAZ, CHIEF, LABORATORY DIVISION
JOHN E. PRESTON WATER TREATMENT PLANT LABORATORY CERTIFICATION #56084
FIELD SAMPLING LOG

Analysis Required: RAW WATER

☒ M.P.A. ☐ Cryptosporidium ☐ Enterovirus

Sample Location: NW wellfield NW well #13

Composite ☒ Grab ☐ Other ☐

Start Time: 3:45 p.m. Date: 11/15/99

Meter Reading: 77610 Turbidity: 0.44 Temperature: 25.5°C pH: 7.29

Stop Time: 8:25 a.m. Date: 11/16/99

Meter Reading: 78310 Turbidity: 0.35 Temperature: 25.0°C pH: 7.28

Total Volume Filtered: 700 gals.

Weather Conditions:

At setup: ☑ Clear ☐ Cloudy ☐ Raining

At finish: ☑ Clear ☐ Cloudy ☐ Raining

Site Conditions:

At setup: ☐ Dry ☑ Moderate Standing Water ☐ Area Flooded

At finish: ☐ Dry ☑ Moderate Standing Water ☐ Area Flooded

Sample Collector: David Ramos (Print Name) David Ramos (Signature)

Shipping Date and Time: 11/16/99 @ 1500 hrs.

Final Destination: Environmental Associates

Received By: _____ (Print Name) _____ (Signature)

Recommended Filtered Sample Volumes:
Giarda / Crypto: 100 liters
Enterovirus: 60 - 100 gals
MPA: 600 - 1000 gals

REPORT: Microscopic Particulate Analysis

ENVIRONMENTAL ASSOCIATES, LTD.
24 Oak Brook Drive , Ithaca, NY 14850, Phone (607) 272-8902 Fax (607)256-7092

PWS ID#	Well ID#	Utility Name	EAL Sample ID:
FL4130871	NW Wellfield Well#13	Miami Dade Water & Sewer	12172

Project Code Number: 99-05119B, Req.#H35192

COLLECTION:

Collector: David Ramos Date collected: 12/6/99 Time: 3:20pm

RECEIPT OF FILTER: Receiver of Sample: J. Antosh Carrier: Federal Express

Date Rec.: 12/9/99 Time: 9:30 AM Temp. of Rec. Sample: 1°C Tracking Number: 813833390701

FILTER PROCESSING Technician: J. Antosh Time: 10:30 AM Date: 12/9/99

Color of water around filter: cloudy
Filter color: brown
Color of sediment: brown
gallons filtered: 750

Total volume of sediment: 0.1 ml
Volume of sediment/100 gallons: 0.01 ml/100gal.
Phase equivalent gallon volume examined: 107

GIARDIA/CRYPTOSPORIDIUM

	# Observed	Calc. #/100 Gallons
Giardia cyst confirmed:	-	-
Giardia cyst presumptive :	-	-
Cryptosporidium oocyst confirmed:	-	-
Cryptosporidium oocyst presumptive:	-	-

ANALYSIS OF PARTICULATES: Analyst Todd Wheaton Date: 12/22/99

key = (EH) - extremely heavy (H) - heavy (M) -moderate (R) - rare (NF) - none found

PARTICULATE DEBRIS

	Quantity	Description
Large part. 5 µm & larger	EH	silt & sand, clumped amorph.
Small part. up to 5 µm	EH	fine brown & amorphous
Plant debris	NF	

PROTOZOANS

	Quantity	Description
Other Coccidia	NF	
Other protozoans	R	15/100gal. photo. flagellates

OTHER ORGANISMS

Nematodes	NF	
Nematode eggs	NF	
Rotifers	NF	
Crustaceans	NF	
Crustacean eggs	NF	
Insects	NF	
Other	NF	

ALGAE

Green Algae	M	54/100gal. Chlorella
Diatoms	NF	
Blue-Green Algae	M	52/100gal. colonial
Flagellated Algae	R	Chlamydomonas

Microscopy: Phase / Hoffman Magnification: 10,20,40,100x Dilution: not dil. :

Flotation Parameters: Percoll@/Sucrose gradient pellet vol.: 10 µl suspension vol.: 400 µl µl pellet/100gal.: 13.3

Type of Material examined: ☒ direct examination of unfloated sediment by ☒ floated (suspended) pellet

COMMENTS:

Primary surface water indicators observed: green algae and blue-green algae. Based upon microscopic particulate analysis and the proposed EPA risk factors associated with bio-indicators there is a low risk of surface contamination (EPA risk factors= 12 moderate risk).

REPORT REVIEWED BY: Susan M. Bartos **DATE:** January 3, 2000

PWS ID#	Well ID#	Utility Name	EAL Sample ID:
FL4130871	NW Wellfield Well#13	Miami Dade Water & Sewer	12172

EPA Relative Surface Water Risk Factors

Date: 12/6-7/99

Primary Particulates	#/100 gallon	Relative Frequency	Relative Risk Factor	Comments
Giardia (confirmed)	0	NF	0	
Coccidia (confirmed)	0	NF	0	
Diatoms (with chloroplasts)	0	NF	0	
Other Algae (with chloroplasts)	106	H	12	
Insects/larvae	0	NF	0	
Rotifers	0	NF	0	
Plant Debris (with chlorophyll)	0	NF	0	
		EPA Relative Risk = 12		Moderate Risk

Secondary Particulates			
Nematodes	0	NF	
Crustaceans	0	NF	
Amoeba	0	NF	
Non-photo.flagellates & ciliates	0	NF	
Photosynthetic flagellates	15	R	photo flagellates-no relative risk factor assigned
Other:	0	NF	

COMMENTS: Primary surface water indicators observed: green algae and blue-green algae. Based upon microscopic particulate analysis and the proposed EPA risk factors associated with bio-indicators there is a low risk of surface contamination (EPA risk factors= 12 moderate risk).

REFERENCE: Consensus Method for Determining Groundwaters Under the Direct Influence of Surface Water Using Microscopic Particulate Analysis (MPA) USEPA Manchester Environmental Laboratory, EPA 910/9-92-029, October 1992.

REPORT REVIEWED BY: Susan N. Bartos DATE: January 3, 2000 Environmental Associates, Ltd.

FLORIDA DEPARTMENT OF HEALTH

MPA SAMPLE REPORT

Lab Sample # E99-0208 **Utility:** PWS#4130871 Miami Dade Water & Sewer Dept. well #13

Date/time Collected 12/08/99 03:20 PM 12/07/99 08:55 AM **Date/time Processed:** 12/08/99 10:50 AM **By:** Larson/Mosbaugh

PROCESSING INFORMATION

filter color light gray
color of water around the filter: clear
Total volume water filtered (gal): 840
Percoll/sucrose flotation pellet volume (µl): NA
Total volume filter sediment (µl): 80
Percoll/sucrose flotation packed sediment (µl): NA
µl sediment/100 gallons sampled: 9.6
µl flotation pellet volume/100 gallons sampled: NA
number of slides examined: 2
material examined: unfloated sediment

Primary Particulates	#/100 gallon	Relative frequency*	Relative Risk Factor*	Comments
Giardia	NA	NA	NA	
Coccidia	NA	NA	NA	
Diatoms (with chloroplasts)	0	NS	0	
Other Algae (with chloroplasts)	1	R	4	
Insects / Larvae	0	NS	0	
Rotifers	0	NS	0	
Plant Debris	8.6	R	0	
		EPA Relative Risk=	4	

*Reference: USEPA Consensus Method for Determining Groundwaters Under the Direct Influence of Surface Water Using Microscopic Particulate Analysis (MPA): NA = Not Assayed
EH = extremely heavy H = heavy M = moderately heavy R = rare NF = None found

Secondary Particulates	#/100 gallon	Comments
Large amorphous debris	H	
Fine amorphous debris	H	
Minerals	H	
Plant pollen	9.3	
Nematodes	0	
Crustaceans	0	
Amoeba	0.7	
Flagellates & ciliates	0	
Other: eggs	2	
Other: fungal filaments & spores	R	

Comments:

Based upon microscopic particulate analysis and the EPA risk factors associated with bio-indicators, there is a low risk of surface contamination. Determination of surface water influence should not be based solely on the results of one or two MPAs. Other pertinent information, such as water quality data and on-site surveys, should be used in conjunction with the MPA results in making this determination.

Reported by: [signature] Date: 12/17/99

Jeb Bush
Governor

Tampa Branch Laboratory
3952 West Dr. Martin Luther King Jr. Boulevard • Tampa, FL 33614-8404
Fax: (813)871-7468 Phone:(813)871-7465 Suncom: 512-6278

Robert G. Brooks, M.D.,
Secretary

NORTH

MIAMI-DADE WATER & SEWER DEPARTMENT
RAYMOND DIAZ, CHIEF, LABORATORY DIVISION
JOHN E. PRESTON WATER TREATMENT PLANT LABORATORY CERTIFICATION #56084
FIELD SAMPLING LOG

Analysis Required: RAW WATER

☒ M.P.A. ☐ Cryptosporidium ☐ Enterovirus

Sample Location: Northwest Wellfield Well # 13

Composite ☒ Grab ☐ Other ☐

Start Time: 3:20 pm Date: 12/6/99

Meter Reading: 34860 Turbidity: 0.17 Temperature: 25.0°C pH: 7.29

Stop Time: 9:00 a.m. Date: 12/7/99

Meter Reading: 35610 Turbidity: 0.26 Temperature: 24.5°C pH: 7.24

Total Volume Filtered: 750

Weather Conditions:

At setup: ☐ Clear ☑ Cloudy ☐ Raining

At finish: ☑ Clear ☐ Cloudy ☐ Raining

Site Conditions:

At setup: ☐ Dry ☑ Moderate Standing Water ☐ Area Flooded

At finish: ☐ Dry ☑ Moderate Standing Water ☐ Area Flooded

Sample Collector: David Ramos (Print Name) x David Ramos (Signature)

Shipping Date and Time: 12/07/99 - 1500

Final Destination: Environmental Assoc.

Received By: _____ (Print Name) _____ (Signature)

Recommended Filtered Sample Volumes:
Giarda / Crypto: 100 liters
Enterovirus: 60 - 100 gals
MPA: 600 - 1000 gals

NORTHWEST WELLFIELD WELL # 14

MPA RESULTS

REPORT: Microscopic Particulate Analysis

ENVIRONMENTAL ASSOCIATES, LTD.
24 Oak Brook Drive , Ithaca, NY 14850, Phone (607) 272-8902 Fax (607)256-7092

PWS ID#	Well ID#	Utility Name	EAL Sample ID:
FL4130871	NW Wellfield-Well #14	Miami Dade Water & Sewer	11783

Project Code Number: 99-05119B, Req #H34940

COLLECTION:
Collector: A.C. Salaar Date collected: 9/21/99 Time: 4:16pm

RECEIPT OF FILTER: Receiver of Sample: J. Runyan Carrier: Federal Express
Date Rec.: 9/23/99 Time: 10:20 AM Temp. of Rec. Sample: 1°C Tracking Number: 813833390609

FILTER PROCESSING Techician: J. Antosh Time: 11:00 AM Date: 9/23/99

Color of water around filter: tan
Filter color: tan
Color of sediment: gray
gallons filtered: 390
Total volume of sediment: 0.5 ml
Volume of sediment/100 gallons: 0.1 ml/100gal.
Phase equivalent gallon volume examined: 20

GIARDIA/CRYPTOSPORIDIUM # Observed Calc. #/100 Gallons

Giardia cyst confirmed: - -
Giardia cyst presumptive : - -
Cryptosporidium oocyst confirmed: - -
Cryptosporidium oocyst presumptive: - -

ANALYSIS OF PARTICULATES: Analyst Todd Wheaton Date: 9/29/99

key = (EH) - extremely heavy (H) - heavy (M) -moderate (R) - rare (NF) - none found

PARTICULATE DEBRIS

	Quantity	Description
Large part. 5 µm & larger	EH	fine silt & sand
Small part. up to 5 µm	EH	fine amorphous debris
Plant debris	NF	

OTHER ORGANISMS

Nematodes	NF	
Nematode eggs	NF	
Rotifers	NF	
Crustaceans	NF	
Crustacean eggs	NF	
Insects	NF	
Other	R	10/100gal. pollen

PROTOZOANS

	Quantity	Description
Other Coccidia	NF	
Other protozoans	NF	

ALGAE

Green Algae	H	97/100gal. Scenedesmus, Tetraedron, Pediastrum.
Diatoms	H	51/100gal. Navicula
Blue-Green Algae	NF	
Flagellated Algae	R	5/100gal. Chlamydomonas

Microscopy: Phase / Hoffman Magnification: 10,20,40,100x Dilution: not dil. :

Flotation Parameters: Percoll@/Sucrose gradient pellet vol.: 10 µl suspension vol.: 1000 µl µl pellet/100gal.: 128.2

Type of Material examined: ☒ direct examination of unfloated sediment by ☒ floated (suspended) pellet

COMMENTS:
Primary surface water indicators observed: green algae and diatoms. Based upon microscopic particulate analysis and the proposed EPA risk factors associated with bio-indicators there is a high risk of surface contamination (EPA risk factors= 25 high risk).

REPORT REVIEWED BY: Susan H. Burton DATE: October 5, 1999

PWS ID#	Well ID#	Utility Name	EAL Sample ID:
FL4130871	NW Wellfield-Well #14	Miami Dade Water & Sewer	11783

EPA Relative Surface Water Risk Factors

Date: 9/21-22/99

Primary Particulates	#/100 gallon	Relative Frequency	Relative Risk Factor	Comments
Giardia (confirmed)	0	NF	0	
Coccidia (confirmed)	0	NF	0	
Diatoms (with chloroplasts)	51	H	13	
Other Algae (with chloroplasts)	97	H	12	
Insects/larvae	0	NF	0	
Rotifers	0	NF	0	
Plant Debris (with chlorophyll)	0	NF	0	
		EPA Relative Risk = 25		High Risk

Secondary Particulates			
Nematodes	0	NF	
Crustaceans	0	NF	
Amoeba	0	NF	
Non-photo.flagellates & ciliates	0	NF	
Photosynthetic flagellates	0	NF	
Other:	10	R	pollen-no relative risk factor assigned

COMMENTS: Primary surface water indicators observed: green algae and diatoms. Based upon microscopic particulate analysis and the proposed EPA risk factors associated with bio-indicators there is a high risk of surface contamination (EPA risk factors= 25 high risk).

REFERENCE: Consensus Method for Determining Groundwaters Under the Direct Influence of Surface Water Using Microscopic Particulate Analysis (MPA) USEPA Manchester Environmental Laboratory, EPA 910/9-92-029, October 1992.

REPORT REVIEWED BY: Susan H. Bates DATE: October 5, 1999

Environmental Associates, Ltd.

L0/2692

FLORIDA DEPARTMENT OF HEALTH

MPA SAMPLE REPORT

Lab Sample # E99-0153 **Utility:** PWS#4130871 Miami Dade Water & Sewer Dept. well #14
Date/time Collected 09/21/99 04:16 PM 09/22/99 08:10 AM **Date/time Processed:** 09/23/99 10:40 AM **By:** Larson

PROCESSING INFORMATION

filter color: light tan and gray
color of water around the filter: tan tint with particles
Total volume water filtered (gal): 830
Percoll/sucrose flotation pellet volume (µl): 100*
Total volume filter sediment (µl): 2826
Percoll/sucrose flotation packed sediment (µl): 500
µl sediment/100 gallons sampled: 340
µl flotation pellet volume/100 gallons sampled: 34.0
number of slides examined: 5
material examined: floated (suspended) pellet

Primary Particulates	#/100 gallon	Relative frequency*	Relative Risk Factor*	Comments
Giardia	NA	NA	NA	
Coccidia	NA	NA	NA	
Diatoms (with chloroplasts)	0	NS	0	
Other Algae (with chloroplasts)	36	M	9	
Insects / Larvae	0	NS	0	
Rotifers	0	NS	0	
Plant Debris	0	NS	0	
		EPA Relative Risk=	9	

*Reference: USEPA Consensus Method for Determining Groundwaters Under the Direct Influence of Surface Water Using Microscopic Particulate Analysis (MPA): NA = Not Assayed
EH = extremely heavy H = heavy M = moderately heavy R = rare NF = None found

Secondary Particulates	#/100 gallon	Comments
Large amorphous debris	M	
Fine amorphous debris	EH	
Minerals	H	
Plant pollen	0	
Nematodes	0	
Crustaceans	0	
Amoeba	0	
Flagellates & ciliates	0	
Other: eggs	0	
Other: fungal filaments & spores	R	

Comments: *A portion of the filter sediment (1000 µl) was floated and this floated pellet was examined to provide the equivalent of 109 gallons of water examined. One slide of the packed pellet from the floatation tube was also examined; it contained 2 algae.

Based upon microscopic particulate analysis and the EPA risk factors associated with bio-indicators, there is a low risk of surface contamination. Determination of surface water influence should not be based solely on the results of one or two MPAs. Other pertinent information, such as water quality data and on-site surveys, should be used in conjunction with the MPA results in making this determination.

Reported by: [signature] Date: 09/28/99

Jeb Bush
Governor
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Robert G. Brooks, M.D.,
Secretary

MIAMI-DADE WATER & SEWER DEPARTMENT
RAYMOND DIAZ, CHIEF, LABORATORY DIVISION
JOHN E. PRESTON WATER TREATMENT PLANT LABORATORY CERTIFICATION #56084
FIELD SAMPLING LOG

Analysis Required: RAW WATER

☒ M.P.A. ☐ Cryptosporidium ☐ Enterovirus

Sample Location: N.W. Wellfield Well #14

Composite ☒ Grab ☐ Other ☐ _____

Start Time: 4:16 pm Date: 09/21/99

Meter Reading: 26070 Turbidity: 0.814 Temperature: 25°C pH: 7.27

Stop Time: 8:10 a.m. Date: 09/22/99

Meter Reading: 26460 Turbidity: 0.40 Temperature: 25°C pH: 7.24

Total Volume Filtered: 390 Invalidated

Weather Conditions:

At setup: ☐ Clear ☐ Cloudy ☒ Raining

At finish: ☑ Clear ☐ Cloudy ☐ Raining

Site Conditions:

At setup: ☐ Dry ☐ Moderate Standing Water ☒ Area Flooded

At finish: ☐ Dry ☐ Moderate Standing Water ☒ Area Flooded

Sample Collector: A.C. Salazar (Print Name) _____ (Signature)

Shipping Date and Time: 09/22/99 - 1500

Final Destination: Environmental Assoc. LTD

Received By: _____ (Print Name) _____ (Signature)

Recommended Filtered Sample Volumes:
Giarda / Crypto: 100 liters
Enterovirus: 60 - 100 gals
MPA: 600 - 1000 gals

REPORT: Microscopic Particulate Analysis

ENVIRONMENTAL ASSOCIATES, LTD.
24 Oak Brook Drive , Ithaca, NY 14850, Phone (607) 272-8902 Fax (607)256-7092

PWS ID#	Well ID#	Utility Name	EAL Sample ID:
FL4130871	NW Wellfield Well #14	Miami Dade Water & Sewer	11959

Project Code Number: 99-05119B, Req.#H35118

COLLECTION:

Collector: David Ramos Date collected: 10/12/99 Time: 4:30pm

RECEIPT OF FILTER: Receiver of Sample: J. Antosh Carrier: Federal Express

Date Rec.: 10/14/99 Time: 10:45 AM Temp. of Rec. Sample: 2°C Tracking Number: 813833390642

FILTER PROCESSING Technician: J. Antosh Time: 11:30 AM Date: 10/14/99

Color of water around filter: light tan
Filter color: light tan
Color of sediment: brown
gallons filtered: 920

Total volume of sediment: 0.1 ml
Volume of sediment/100 gallons: 0.01 ml/100gal.
Phase equivalent gallon volume examined: 110

GIARDIA/CRYPTOSPORIDIUM # Observed Calc. #/100 Gallons

Giardia cyst confirmed: – –
Giardia cyst presumptive : – –
Cryptosporidium oocyst confirmed: – –
Cryptosporidium oocyst presumptive: – –

ANALYSIS OF PARTICULATES: Analyst Todd Wheaton Date: 10/23/99

key = (EH) - extremely heavy (H) - heavy (M) -moderate (R) - rare (NF) - none found

PARTICULATE DEBRIS

	Quantity	Description
Large part. 5 µm & larger	EH	silt & sand, mineral crystals
Small part. up to 5 µm	EH	fine brown amorphous
Plant debris	NF	

PROTOZOANS

	Quantity	Description
Other Coccidia	NF	
Other protozoans	R	2/100gal. flagellates

OTHER ORGANISMS

Nematodes	NF
Nematode eggs	NF
Rotifers	NF
Crustaceans	NF
Crustacean eggs	NF
Insects	NF
Other	NF

ALGAE

Green Algae	NF
Diatoms	NF
Blue-Green Algae	NF
Flagellated Algae	NF

Microscopy: Phase / Hoffman Magnification: 10,20,40,100x Dilution: not dil. :

Flotation Parameters: Percoll@/Sucrose gradient pellet vol.: 10 µl suspension vol.: 400 µl µl pellet/100gal.: 10.9

Type of Material examined: ☒ direct examination of unfloated sediment by ☒ floated (suspended) pellet

COMMENTS:

No primary surface water indicators were observed. Based upon microscopic particulate analysis and the proposed EPA risk factors associated with bio-indicators there is a low risk of surface contamination (EPA risk factors= 0 low risk).

REPORT REVIEWED BY: Susan A. Britton DATE: October 28 1999

PWS ID#	Well ID#	Utility Name	EAL Sample ID:
FL4130871	NW Wellfield Well #14	Miami Dade Water & Sewer	11959

EPA Relative Surface Water Risk Factors

Date: 10/12/99

Primary Particulates	#/100 gallon	Relative Frequency	Relative Risk Factor	Comments
Giardia (confirmed)	0	NF	0	
Coccidia (confirmed)	0	NF	0	
Diatoms (with chloroplasts)	0	NF	0	
Other Algae (with chloroplasts)	0	NF	0	
Insects/larvae	0	NF	0	
Rotifers	0	NF	0	
Plant Debris (with chlorophyll)	0	NF	0	
		EPA Relative Risk = 0		Low Risk

Secondary Particulates			
Nematodes	0	NF	
Crustaceans	0	NF	
Amoeba	0	NF	
Non-photo.flagellates & ciliates	2	R	flagellates-no relative risk factor assigned
Photosynthetic flagellates	0	NF	
Other:	0	NF	

COMMENTS: No primary surface water indicators were observed. Based upon microscopic particulate analysis and the proposed EPA risk factors associated with bio-indicators there is a low risk of surface contamination (EPA risk factors= 0 low risk).

REFERENCE: Consensus Method for Determining Groundwaters Under the Direct Influence of Surface Water Using Microscopic Particulate Analysis (MPA) USEPA Manchester Environmental Laboratory, EPA 910/9-92-029, October 1992.

REPORT REVIEWED BY: Susan H. Bertuso DATE: October 28, 1999 Environmental Associates, Ltd.

L072692

FLORIDA DEPARTMENT OF HEALTH

MPA SAMPLE REPORT

Lab Sample # E99-0168 **Utility:** PWS#4130871 Miami Dade Water & Sewer Dept. well #14

Date/time Collected 10/12/99 04:30 PM – 10/13/99 08:00 AM **Date/time Processed:** 10/14/99 10:30 AM **By:** Larson

PROCESSING INFORMATION

filter color: light tan and gray
color of water around the filter: tan tint
Total volume water filtered (gal): 890
Percoll/sucrose flotation pellet volume (µl): NA
Total volume filter sediment (µl): 142
Percoll/sucrose flotation packed sediment (µl): NA
µl sediment/100 gallons sampled: 16.0
µl flotation pellet volume/100 gallons sampled: NA
number of slides examined: 2
material examined: unfloated pellet

Primary Particulates	#/100 gallon	Relative frequency*	Relative Risk Factor*	Comments
Giardia	NA	NA	NA	
Coccidia	NA	NA	NA	
Diatoms (with chloroplasts)	0	NS	0	
Other Algae (with chloroplasts)	2	R	4	
Insects / Larvae	0	NS	0	
Rotifers	0	NS	0	
Plant Debris	0	NS	0	
		EPA Relative Risk=	4	

*Reference: USEPA Consensus Method for Determining Groundwaters Under the Direct Influence of Surface Water Using Microscopic Particulate Analysis (MPA): NA = Not Assayed

EH = extremely heavy H = heavy M = moderately heavy R = rare NF = None found

Secondary Particulates	#/100 gallon	Comments
Large amorphous debris	H	
Fine amorphous debris	H	
Minerals	EH	
Plant pollen	8.8	
Nematodes	0	
Crustaceans	0	
Amoeba	0	
Flagellates & ciliates	0	
Other: eggs	0	
Other: fungal filaments & spores	R	

Comments:

Based upon microscopic particulate analysis and the EPA risk factors associated with bio-indicators, there is a low risk of surface contamination. Determination of surface water influence should not be based solely on the results of one or two MPAs. Other pertinent information, such as water quality data and on-site surveys, should be used in conjunction with the MPA results in making this determination.

Reported by: [signature] Date: 10/25/99

Jeb Bush, Governor
Robert G. Brooks, M.D., Secretary
Tampa Branch Laboratory
3952 West Dr. Martin Luther King Jr. Boulevard • Tampa, FL 33614-8404
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#2

MIAMI-DADE WATER & SEWER DEPARTMENT
RAYMOND DIAZ, CHIEF, LABORATORY DIVISION
JOHN E. PRESTON WATER TREATMENT PLANT LABORATORY CERTIFICATION #56084
FIELD SAMPLING LOG

Analysis Required: **RAW WATER**

☒ M.P.A. ☐ Cryptosporidium ☐ Enterovirus

Sample Location: NW Wellfield well #14

Composite ☒ Grab ☐ Other ☐

Start Time: 4:30 pm Date: 10/12/99

Meter Reading: 76690 Turbidity: 0.25 Temperature: 26.0°C pH: 7.26

Stop Time: 9:00 a.m. Date: 10/13/99

Meter Reading: 77610 Turbidity: 0.21 Temperature: 26.0° pH: 7.28

Total Volume Filtered: 920 gals.

Weather Conditions:

At setup: ☐ Clear ☑ Cloudy ☐ Raining

At finish: ☐ Clear ☑ Cloudy ☐ Raining

Site Conditions:

At setup: ☑ Dry ☐ Moderate Standing Water ☐ Area Flooded

At finish: ☑ Dry ☐ Moderate Standing Water ☐ Area Flooded

Sample Collector: David Ramos (Print Name) David Ramos (Signature)

Shipping Date and Time: 10/13/99 - 1500

Final Destination: Environmental Assoc. Inc.

Received By: _____ (Print Name) _____ (Signature)

Recommended Filtered Sample Volumes:
Giardia / Crypto: 100 liters
Enterovirus: 60 - 100 gals
MPA: 600 - 1000 gals

REPORT: Microscopic Particulate Analysis

ENVIRONMENTAL ASSOCIATES, LTD.
24 Oak Brook Drive , Ithaca, NY 14850, Phone (607) 272-8902 Fax (607)256-7092

PWS ID#	Well ID#	Utility Name	EAL Sample ID:
FL4130871	NW Wellfield Well #14	Miami Dade Water & Sewer	12099

Project Code Number: 99-05119B, Req.#H35192

COLLECTION:

Collector: David Ramos Date collected: 11/16/99 Time: 3:10pm

RECEIPT OF FILTER: Receiver of Sample: J. Antosh Carrier: Federal Express

Date Rec.: 11/18/99 Time: 10:30 AM Temp. of Rec. Sample: 4°C Tracking Number: 813833390675

FILTER PROCESSING Technician: J. Antosh Time: 10:45 AM Date: 11/18/99

Color of water around filter: clear
Filter color: tan
Color of sediment: gray
gallons filtered: 930

Total volume of sediment: 0.15 ml
Volume of sediment/100 gallons: 0.02 ml/100gal.
Phase equivalent gallon volume examined: 102

GIARDIA/CRYPTOSPORIDIUM # Observed Calc. #/100 Gallons

Giardia cyst confirmed: - -
Giardia cyst presumptive : - -
Cryptosporidium oocyst confirmed: - -
Cryptosporidium oocyst presumptive: - -

ANALYSIS OF PARTICULATES: Analyst Todd Wheaton Date: 11/18/99

key = (EH) - extremely heavy (H) - heavy (M) -moderate (R) - rare (NF) - none found

PARTICULATE DEBRIS

	Quantity	Description
Large part. 5 µm & larger	EH	silt & sand, crystals
Small part. up to 5 µm	EH	fine amorphous debris
Plant debris	NF	

PROTOZOANS

	Quantity	Description
Other Coccidia	NF	
Other protozoans	NF	

OTHER ORGANISMS

Nematodes	NF
Nematode eggs	NF
Rotifers	NF
Crustaceans	NF
Crustacean eggs	NF
Insects	NF
Other	NF

ALGAE

Green Algae	NF
Diatoms	NF
Blue-Green Algae	NF
Flagellated Algae	NF

Microscopy: Phase / Hoffman Magnification: 10,20,40,100x Dilution: not dil. :

Flotation Parameters: Percoll@/Sucrose gradient pellet vol.: 10 µl suspension vol.: 500 µl µl pellet/100gal.: 16.1

Type of Material examined: ☒ direct examination of unfloated sediment by ☒ floated (suspended) pellet

COMMENTS:

No biological materials were observed. Based upon microscopic particulate analysis and the proposed EPA risk factors associated with bio-indicators there is a low risk of surface contamination (EPA risk factors= 0 low risk).

REPORT REVIEWED BY: Susan A. Bartos DATE: December 1 1999

PWS ID#	Well ID#	Utility Name	EAL Sample ID:
FL4130871	NW Wellfield Well #14	Miami Dade Water & Sewer	12099

EPA Relative Surface Water Risk Factors

Date: 11/16/99

Primary Particulates	#/100 gallon	Relative Frequency	Relative Risk Factor	Comments
Giardia (confirmed)	0	NF	0	
Coccidia (confirmed)	0	NF	0	
Diatoms (with chloroplasts)	0	NF	0	
Other Algae (with chloroplasts)	0	NF	0	
Insects/larvae	0	NF	0	
Rotifers	0	NF	0	
Plant Debris (with chlorophyll)	0	NF	0	
		EPA Relative Risk = 0		Low Risk

Secondary Particulates			
Nematodes	0	NF	
Crustaceans	0	NF	
Amoeba	0	NF	
Non-photo.flagellates & ciliates	0	NF	
Photosynthetic flagellates	0	NF	
Other:	0	NF	

COMMENTS: No biological materials were observed. Based upon microscopic particulate analysis and the proposed EPA risk factors associated with bio-indicators there is a low risk of surface contamination (EPA risk factors= 0 low risk).

REFERENCE: Consensus Method for Determining Groundwaters Under the Direct Influence of Surface Water Using Microscopic Particulate Analysis (MPA) USEPA Manchester Environmental Laboratory, EPA 910/9-92-029, October 1992.

REPORT REVIEWED BY: Susan H. Bartos DATE: December 1, 1999 Environmental Associates, Ltd. L072692

FLORIDA DEPARTMENT OF HEALTH

MPA SAMPLE REPORT

Lab Sample # E99-0192 **Utility:** PWS#4130871 Miami Dade Water & Sewer Dept. well #14
Date/time Collected 11/16/99 03:10 PM – 11/17/99 08:50 AM **Date/time Processed:** 11/18/99 11:30 AM **By:** Larson

PROCESSING INFORMATION

filter color: off-white
color of water around the filter: yellow tint
Total volume water filtered (gal): 950
Percoll/sucrose flotation pellet volume (µl): NA
Total volume filter sediment (µl): 136
Percoll/sucrose flotation packed sediment (µl): NA
µl sediment/100 gallons sampled: 14.3
µl flotation pellet volume/100 gallons sampled: NA
number of slides examined: 3
material examined: unfloated sediment

Primary Particulates	#/100 gallon	Relative frequency*	Relative Risk Factor*	Comments
Giardia	NA	NA	NA	
Coccidia	NA	NA	NA	
Diatoms (with chloroplasts)	0	NS	0	
Other Algae (with chloroplasts)	9	R	4	
Insects / Larvae	0	NS	0	
Rotifers	0	NS	0	
Plant Debris	0	NS	0	
		EPA Relative Risk=	4	

*Reference: USEPA Consensus Method for Determining Groundwaters Under the Direct Influence of Surface Water Using Microscopic Particulate Analysis (MPA): NA = Not Assayed
EH = extremely heavy H = heavy M = moderately heavy R = rare NF = None found

Secondary Particulates	#/100 gallon	Comments
Large amorphous debris	H	
Fine amorphous debris	M	
Minerals	EH	
Plant pollen	8	
Nematodes	0	
Crustaceans	0	
Amoeba	0	
Flagellates & ciliates	0	
Other: eggs	0	
Other: fungal filaments & spores	R	

Comments:

Based upon microscopic particulate analysis and the EPA risk factors associated with bio-indicators, there is a low risk of surface contamination. Determination of surface water influence should not be based solely on the results of one or two MPAs. Other pertinent information, such as water quality data and on-site surveys, should be used in conjunction with the MPA results in making this determination.

Reported by: [signature] Date: 12/08/99

Jeb Bush, Governor
Robert G. Brooks, M.D., Secretary
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NORTH TAG

MIAMI-DADE WATER & SEWER DEPARTMENT
RAYMOND DIAZ, CHIEF, LABORATORY DIVISION
JOHN E. PRESTON WATER TREATMENT PLANT LABORATORY CERTIFICATION #56084
FIELD SAMPLING LOG

Analysis Required: **RAW WATER**

☒ M.P.A. ☐ Cryptosporidium ☐ Enterovirus

Sample Location: N.W. Wellfield Well #14

Composite ☒ Grab ☐ Other ☐

Start Time: 3:10 P.M Date: 11/16/99

Meter Reading: 78320 Turbidity: 9.42 Temperature: 25.0°C pH: 7.33

Stop Time: 8:50 a.m. Date: 11/17/99

Meter Reading: 79250 Turbidity: 0.33 Temperature: 25.0°C pH: 7.42

Total Volume Filtered: 930 gals.

Weather Conditions:

At setup: ☑ Clear ☐ Cloudy ☐ Raining

At finish: ☐ Clear ☑ Cloudy ☐ Raining

Site Conditions:

At setup: ☐ Dry ☑ Moderate Standing Water ☐ Area Flooded

At finish: ☐ Dry ☑ Moderate Standing Water ☐ Area Flooded

Sample Collector: David Ramos (Print Name) David Ramos (Signature)

Shipping Date and Time: 11/17/99 - 1500

Final Destination: Environmental Assoc.

Received By: (Print Name) (Signature)

Recommended Filtered Sample Volumes:
Giarda / Crypto: 100 liters
Enterovirus: ~~60 - 100~~ gals
MPA: 600 - 1000 gals

REPORT: Microscopic Particulate Analysis

ENVIRONMENTAL ASSOCIATES, LTD.
24 Oak Brook Drive , Ithaca, NY 14850, Phone (607) 272-8902 Fax (607)256-7092

PWS ID#	Well ID#	Utility Name	EAL Sample ID:
FL4130871	NW Wellfield Well#14	Miami Dade Water & Sewer	12173

Project Code Number: 99-05119B, Req.#H35192

COLLECTION:

Collector: David Ramos Date collected: 12/6/99 Time: 3:40pm

RECEIPT OF FILTER: Receiver of Sample: J. Antosh Carrier: Federal Express

Date Rec.: 12/9/99 Time: 9:30 AM Temp. of Rec. Sample: 1°C Tracking Number: 813833390701

FILTER PROCESSING Technician: J. Antosh Time: 10:45 AM Date: 12/9/99

Color of water around filter: cloudy
Filter color: gray
Color of sediment: brown
gallons filtered: 910

Total volume of sediment: 0.1 ml
Volume of sediment/100 gallons: 0.01 ml/100gal.
Phase equivalent gallon volume examined: 111

GIARDIA/CRYPTOSPORIDIUM

	# Observed	Calc. #/100 Gallons
Giardia cyst confirmed:	-	-
Giardia cyst presumptive :	-	-
Cryptosporidium oocyst confirmed:	-	-
Cryptosporidium oocyst presumptive:	-	-

ANALYSIS OF PARTICULATES: Analyst Todd Wheaton Date: 12/22/99

key = (EH) - extremely heavy (H) - heavy (M) -moderate (R) - rare (NF) - none found

PARTICULATE DEBRIS

	Quantity	Description
Large part. 5 µm & larger	EH	silt & sand, clumped amorph.
Small part. up to 5 µm	EH	fine brown amorphous
Plant debris	NF	

PROTOZOANS

	Quantity	Description
Other Coccidia	NF	
Other protozoans	NF	

OTHER ORGANISMS

Nematodes	NF	
Nematode eggs	NF	
Rotifers	NF	
Crustaceans	NF	
Crustacean eggs	NF	
Insects	NF	
Other	R	1/100gal. pollen, iron bacteria(Crenothrix)

ALGAE

Green Algae	NF	
Diatoms	NF	
Blue-Green Algae	NF	
Flagellated Algae	NF	

Microscopy: Phase / Hoffman Magnification: 10,20,40,100x Dilution: not dil. :

Flotation Parameters: Percoll@/Sucrose gradient pellet vol.: 10 µl suspension vol.: 400 µl µl pellet/100gal.: 11.0

Type of Material examined: ☒ direct examination of unfloated sediment by ☒ floated (suspended) pellet

COMMENTS:

No primary surface water indicators were observed. Based upon microscopic particulate analysis and the proposed EPA risk factors associated with bio-indicators there is a low risk of surface contamination (EPA risk factors= 0 low risk).

REPORT REVIEWED BY: Susan N. Bentzen DATE: January 3, 2000

PWS ID#	Well ID#	Utility Name	EAL Sample ID:
FL4130871	NW Wellfield Well#14	Miami Dade Water & Sewer	12173

EPA Relative Surface Water Risk Factors

Date: 12/6-7/99

Primary Particulates	#/100 gallon	Relative Frequency	Relative Risk Factor	Comments
Giardia (confirmed)	0	NF	0	
Coccidia (confirmed)	0	NF	0	
Diatoms (with chloroplasts)	0	NF	0	
Other Algae (with chloroplasts)	0	NF	0	
Insects/larvae	0	NF	0	
Rotifers	0	NF	0	
Plant Debris (with chlorophyll)	0	NF	0	
		EPA Relative Risk = 0		Low Risk

Secondary Particulates			
Nematodes	0	NF	
Crustaceans	0	NF	
Amoeba	0	NF	
Non-photo.flagellates & ciliates	0	NF	
Photosynthetic flagellates	0	NF	
Other:	0	NF	

COMMENTS: No primary surface water indicators were observed. Based upon microscopic particulate analysis and the proposed EPA risk factors associated with bio-indicators there is a low risk of surface contamination (EPA risk factors= 0 low risk).

REFERENCE: Consensus Method for Determining Groundwaters Under the Direct Influence of Surface Water Using Microscopic Particulate Analysis (MPA) USEPA Manchester Environmental Laboratory, EPA 910/9-92-029, October 1992.

REPORT REVIEWED BY: Susan H. Bates DATE: January 3, 2000 Environmental Associates, Ltd. L072692

FLORIDA DEPARTMENT OF HEALTH

MPA SAMPLE REPORT

Lab Sample # E99-0209 **Utility:** PWS#4130871 Miami Dade Water & Sewer Dept. well #14
Date/time Collected 12/08/99 03:40 PM 12/07/99 08:55 AM **Date/time Processed:** 12/08/99 10:55 AM **By:** Larson/Mosbaugh

PROCESSING INFORMATION

filter color gray
Total volume water filtered (gal): 830
Total volume filter sediment (µl): 50
µl sediment/100 gallons sampled: 6.0
number of slides examined: 2
color of water around the filter: yellow
Percoll/sucrose flotation pellet volume (µl): NA
Percoll/sucrose flotation packed sediment (µl): NA
µl flotation pellet volume/100 gallons sampled: NA
material examined: unfloated sediment

Primary Particulates	#/100 gallon	Relative frequency*	Relative Risk Factor*	Comments
Giardia	NA	NA	NA	
Coccidia	NA	NA	NA	
Diatoms (with chloroplasts)	0	NS	0	
Other Algae (with chloroplasts)	13	R	4	
Insects / Larvae	0	NS	0	
Rotifers	0	NS	0	
Plant Debris	12	R	0	
		EPA Relative Risk=	4	

*Reference: USEPA Consensus Method for Determining Groundwaters Under the Direct Influence of Surface Water Using Microscopic Particulate Analysis (MPA):
NA = Not Assayed
EH = extremely heavy H = heavy M = moderately heavy R = rare NF = None found

Secondary Particulates	#/100 gallon	Comments
Large amorphous debris	M	
Fine amorphous debris	R	
Minerals	M	
Plant pollen	5	
Nematodes	0	
Crustaceans	0	
Amoeba	4	
Flagellates & ciliates	0	
Other: eggs	2	also moderate rotifer eggs
Other: fungal filaments & spores	R	

Comments:

Based upon microscopic particulate analysis and the EPA risk factors associated with bio-indicators, there is a low risk of surface contamination. Determination of surface water influence should not be based solely on the results of one or two MPAs. Other pertinent information, such as water quality data and on-site surveys, should be used in conjunction with the MPA results in making this determination.

Reported by: [signature] Date: 12/17/99

Jeb Bush
Governor

Tampa Branch Laboratory
3952 West Dr. Martin Luther King Jr. Boulevard • Tampa, FL 33614-6404
Fax: (813)871-7468 Phone:(813)871-7465 Suncom: 512-6278

Robert G. Brooks, M.D.,
Secretary

NORTH

MIAMI-DADE WATER & SEWER DEPARTMENT
RAYMOND DIAZ, CHIEF, LABORATORY DIVISION
JOHN E. PRESTON WATER TREATMENT PLANT LABORATORY CERTIFICATION #56084
FIELD SAMPLING LOG

Analysis Required: RAW WATER

☒ M.P.A. ☐ Cryptosporidium ☐ Enterovirus

Sample Location: Northwest Wellfield Well # 14

Composite ☒ Grab ☐ Other ☐

Start Time: 3:40 Date: 12/6/99

Meter Reading: 70820 Turbidity: 0.34 Temperature: 24.0°C pH: 7.44

Stop Time: 8:55 a.m. Date: 12/7/99

Meter Reading: 71730 Turbidity: 0.14 Temperature: 24.0°C pH: 7.28

Total Volume Filtered: 910

Weather Conditions:

At setup: ☐ Clear ☑ Cloudy ☐ Raining

At finish: ☑ Clear ☐ Cloudy ☐ Raining

Site Conditions:

At setup: ☐ Dry ☑ Moderate Standing Water ☐ Area Flooded

At finish: ☐ Dry ☑ Moderate Standing Water ☐ Area Flooded

Sample Collector: David Ramos (Print Name) David Ramos (Signature)

Shipping Date and Time: 12/07/99 - 1500

Final Destination: Environmental Assoc.

Received By: _____ (Print Name) _____ (Signature)

Recommended Filtered Sample Volumes:
Giarda / Crypto: 100 liters
Enterovirus: 60 - 100 gals
MPA: 600 - 1000 gals

REPORT: PARTICULATES, GIARDIA, AND CRYPTOSPORIDIUM

ENVIRONMENTAL ASSOCIATES LTD.
24 Oak Brook Drive, Ithaca, NY 14850
(607) 272-8902 Fax (607) 256-7092

Filter ID: 13271 Client: Miami Dade Water & Sewer

Station/Body of water: N.W. Wellfield Well #14

RECEIPT OF FILTER:

Date Received: 6/14/2000 # of filters: 1 Type: _____ Carrier: Federal Express

COLLECTION:

Collector: David Ramos
Temperature: °F
Water Type: Ground Water

Date collected: 6/12-13/2000
Turbidity: 0.24

FILTER PROCESSING

Color of water around filter: clear
Filter color: tan
Color of sediment: brown
gallons filtered: 1100

Total volume of sediment: 0.05 ml
Volume of sediment/100 gallons: 0.005 ml/100L
IFA equivalent gallon volume examined: -----
Phase equivalent gallon volume examined: 100gal.

GIARDIA/CRYPTOSPORIDIUM

	# Observed	Calc. #/100 Gallons
Giardia cyst confirmed:	--	-
Giardia cyst presumptive :	-	-
Cryptosporidium oocyst confirmed:	-	-
Cryptosporidium oocyst presumptive:	--	-

ANALYSIS OF PARTICULATES:

key = (EH) - extremely heavy [>20/field @ 100X] (H) - heavy [10-20/field @ 100X]
(M) -moderate [4-9/field @ 100X] (R) - rare [<1-3/field @ 100X] (NF) - none found

PARTICULATE DEBRIS

	Quantity	Description
Large part. 5 µm & larger	EH	fine silt & sand
Small part. up to 5 µm	EH	fine amorphous debris
Plant debris	NF	

OTHER ORGANISMS

Nematodes	R	5/100gal.
Nematode eggs	NF	
Rotifers	NF	
Crustaceans	NF	
Crustacean eggs	NF	
Insects	NF	
Other	NF	

PROTOZOANS

	Quantity	Description
Other Coccidia	NF	
Other protozoans	NF	

ALGAE

Green Algae	NF	
Diatoms	NF	
Blue-Green Algae	NF	
Flagellated Algae	NF	

COMMENTS:

No primary surface water indicators were observed. Based upon microscopic particulate analysis and the proposed EPA risk factors associated with bio-indicators there is a low risk of surface contamination (EPA risk factors= 0 low risk).

CALCULATED VALUES

Total algae -----
Log removal algae -----

% Sediment Reduction -----
Filtration performance -----

REPORT REVIEWED BY: Susan H. Bartos DATE: June 27, 2000

PWS ID#	Well ID#	Utility Name	EAL Sample ID:
FL4130871	N.W. Wellfield Well #14	Miami Dade Water & Sewer	13271

EPA Relative Surface Water Risk Factors

Date: 6/12-13/2000

Primary Particulates	#/100 gallon	Relative Frequency	Relative Risk Factor	Comments
Giardia (confirmed)	0	NF	0	
Coccidia (confirmed)	0	NF	0	
Diatoms (with chloroplasts)	0	NF	0	
Other Algae (with chloroplasts)	0	NF	0	
Insects/larvae	0	NF	0	
Rotifers	0	NF	0	
Plant Debris (with chlorophyll)	0	NF	0	
		EPA Relative Risk = 0		Low Risk

Secondary Particulates			
Nematodes	5	R	no relative risk factor assigned
Crustaceans	0	NF	
Amoeba	0	NF	
Non-photo.flagellates & ciliates	0	NF	
Photosynthetic flagellates	0	NF	
Other:	0	NF	

COMMENTS: No primary surface water indicators were observed. Based upon microscopic particulate analysis and the proposed EPA risk factors associated with bio-indicators there is a low risk of surface contamination (EPA risk factors= 0 low risk).

REFERENCE: Consensus Method for Determining Groundwaters Under the Direct Influence of Surface Water Using Microscopic Particulate Analysis (MPA) USEPA Manchester Environmental Laboratory, EPA 910/9-92-029, October 1992.

REPORT REVIEWED BY: Susan H. Bertuso DATE: June 27, 2000 Environmental Associates, Ltd. L072692

FLORIDA DEPARTMENT OF HEALTH

MPA SAMPLE REPORT

Lab Sample # E00-0068 Utility: PWS#4130871 Miami Dade Water & Sewer Dept. well #14

Date/time Collected 06/12/00 03:55 PM 06/13/00 07:55 AM Date/time Processed: 06/14/00 11:20 AM By: Larson/Kazanis

PROCESSING INFORMATION

filter color gray
color of water around the filter: Dirty
Total volume water filtered (gal): 950
Percoll/sucrose flotation pellet volume (µl): NA
Total volume filter sediment (µl): 60
Percoll/sucrose flotation packed sediment (µl): NA
µl sediment/100 gallons sampled: 6.3
µl flotation pellet volume/100 gallons sampled: NA
number of slides examined: 6
material examined: unfloated sediment

Primary Particulates	#/100 gallon	Relative frequency*	Relative Risk Factor*	Comments
Giardia	NA	NA	NA	
Coccidia	NA	NA	NA	
Diatoms (with chloroplasts)	0	NS	0	
Other Algae (with chloroplasts)	0.2	NS	0	
Insects / Larvae	0	NS	0	
Rotifers	0.2	NS	0	
Plant Debris	0	NS	0	
		EPA Relative Risk=	0	

*Reference: USEPA Consensus Method for Determining Groundwaters Under the Direct Influence of Surface Water Using Microscopic Particulate Analysis (MPA):

NA = Not Assayed
EH = extremely heavy H = heavy M = moderately heavy R = rare NF = None found

Secondary Particulates	#/100 gallon	Comments
Large amorphous debris	M	
Fine amorphous debris	M	
Minerals	M	
Plant pollen	1.5	
Nematodes	1.6	
Crustaceans	0	
Amoeba	0.4	
Flagellates & ciliates	0	
Other: eggs	0.1	
Other: fungal filaments & spores	R	

Comments: Entire pellet examined.

Based upon microscopic particulate analysis and the EPA risk factors associated with bio-indicators, there is a low risk of surface contamination. Determination of surface water influence should not be based solely on the results of one or two MPAs. Other pertinent information, such as water quality data and on-site surveys, should be used in conjunction with the MPA results in making this determination.

Reported by: [signature] Date: 06/23/00

Jeb Bush
Governor

Tampa Branch Laboratory
3952 West Dr. Martin Luther King Jr. Boulevard • Tampa, FL 33614-8404
Fax: (813)871-7468 Phone:(813)871-7465 Suncom: 512-6278

Robert G. Brooks, M.D.
Secretary

MIAMI-DADE WATER & SEWER DEPARTMENT
RAYMOND DIAZ, CHIEF, LABORATORY DIVISION
JOHN E. PRESTON WATER TREATMENT PLANT LABORATORY CERTIFICATION #56084
FIELD SAMPLING LOG

Analysis Required: **RAW WATER**

☒ M.P.A. ☐ Cryptosporidium ☐ Enterovirus

Sample Location: N.W. Wellfield Well # 14

Composite ☒ Grab ☐ Other ☐

Start Time: 3:55 pm Date: 06/12/00

Meter Reading: 82650 Turbidity: 0.46 Temperature: 22°C pH: 7.34

Stop Time: 7:55 a.m. Date: 06/13/00

Meter Reading: 83750 Turbidity: 0.24 Temperature: 22.0°C pH: 7.27

Total Volume Filtered: 1100 gals

Weather Conditions:

At setup: ☑ Clear ☐ Cloudy ☐ Raining

At finish: ☑ Clear ☐ Cloudy ☐ Raining

Site Conditions:

At setup: ☑ Dry ☐ Moderate Standing Water ☐ Area Flooded

At finish: ☑ Dry ☐ Moderate Standing Water ☐ Area Flooded

Sample Collector: David Ramos (Print Name) x David Ramos (Signature)

Shipping Date and Time: 06/13/00 – 1500

Final Destination: Environmental Assoc.

Received By: _____ (Print Name) _____ (Signature)

Recommended Filtered Sample Volumes:
Giardia / Crypto: 100 liters
Enterovirus: 60 - 100 gals
MPA: ~~600 - 1000 gals~~

fieldraw.wk4 revised:0298

NORTHWEST WELLFIELD WELL #15

MPA RESULTS

REPORT: Microscopic Particulate Analysis

ENVIRONMENTAL ASSOCIATES, LTD.
24 Oak Brook Drive , Ithaca, NY 14850, Phone (607) 272-8902 Fax (607)256-7092

PWS ID#	Well ID#	Utility Name	EAL Sample ID:
FL4130871	NW Wellfield-Well #15	Miami Dade Water & Sewer	11500

Project Code Number: PO#99-05119R, Req.#H34539

COLLECTION:

Collector: David Ramos Date collected: 7/6/99 Time: 3:45pm

RECEIPT OF FILTER: Receiver of Sample: J. Antosh Carrier: Federal Express

Date Rec.: 7/8/99 Time: 10:00 AM Temp. of Rec. Sample: 1°C Tracking Number: 805646569454

FILTER PROCESSING Techician: J. Antosh Time: 2:50 PM Date: 7/8/99

Color of water around filter: clear
Filter color: brown
Color of sediment: brown
gallons filtered: 860

Total volume of sediment: 0.1 ml
Volume of sediment/100 gallons: 0.01 ml/100gal
Phase equivalent gallon volume examined: 105

GIARDIA/CRYPTOSPORIDIUM # Observed Calc. #/100 Gallons

Giardia cyst confirmed: – –
Giardia cyst presumptive : – –
Cryptosporidium oocyst confirmed: – –
Cryptosporidium oocyst presumptive: – –

ANALYSIS OF PARTICULATES: Analyst Todd Wheaton Date: 7/17/99

key = (EH) - extremely heavy (H) - heavy (M) -moderate (R) - rare (NF) - none found

PARTICULATE DEBRIS

	Quantity	Description
Large part. 5 µm & larger	EH	silt & sand, clumped brown
Small part. up to 5 µm	EH	fine brown & amorphous
Plant debris	NF	

PROTOZOANS

	Quantity	Description
Other Coccidia	NF	
Other protozoans	M	24/100gal. flagellates, photo flagellates

OTHER ORGANISMS

Nematodes	NF	
Nematode eggs	NF	
Rotifers	NF	
Crustaceans	NF	
Crustacean eggs	NF	
Insects	NF	
Other	R	R-iron bacteria(Crenothrix), R-1/100gal. plant debris without chlorophyll

ALGAE

Green Algae	NF	
Diatoms	NF	
Blue-Green Algae	NF	
Flagellated Algae	R	Chlamydomonas

Microscopy: Phase / Hoffman Magnification: 10,20,40,100x Dilution: not dil. : ____

Flotation Parameters: Percoll@/Sucrose gradient pellet vol.: <10 µl suspension vol.: 400 µl µl pellet/100gal.: 11.6

Type of Material examined: ☒ direct examination of unfloated sediment by ☒ floated (suspended) pellet

COMMENTS:

No primary surface water indicators were observed. Based upon microscopic particulate analysis and the proposed EPA risk factors associated with bio-indicators there is a low risk of surface contamination (EPA risk factors= 0 low risk).

REPORT REVIEWED BY: Susan N. Bontrop DATE: July 28, 1999

PWS ID#	Well ID#	Utility Name	EAL Sample ID:
FL4130871	NW Wellfield-Well #15	Miami Dade Water & Sewer	11500

EPA Relative Surface Water Risk Factors

Date: 7/7/99

Primary Particulates	#/100 gallon	Relative Frequency	Relative Risk Factor	Comments
Giardia (confirmed)	0	NF	0	
Coccidia (confirmed)	0	NF	0	
Diatoms (with chloroplasts)	0	NF	0	
Other Algae (with chloroplasts)	0	NF	0	
Insects/larvae	0	NF	0	
Rotifers	0	NF	0	
Plant Debris (with chlorophyll)	0	NF	0	
		EPA Relative Risk = 0		Low Risk

Secondary Particulates			
Nematodes	0	NF	
Crustaceans	0	NF	
Amoeba	0	NF	
Non-photo.flagellates & ciliates	5	R	flagellates-no relative risk factor assigned
Photosynthetic flagellates	19	R	photo. flagellates-no relative risk factor assigned
Other:	1	R	Crenothrix, plant debris-no relative risk factor

COMMENTS: No primary surface water indicators were observed. Based upon microscopic particulate analysis and the proposed EPA risk factors associated with bio-indicators there is a low risk of surface contamination (EPA risk factors= 0 low risk).

REFERENCE: Consensus Method for Determining Groundwaters Under the Direct Influence of Surface Water Using Microscopic Particulate Analysis (MPA) USEPA Manchester Environmental Laboratory, EPA 910/9-92-029, October 1992.

REPORT REVIEWED BY: Susan H. Bartos DATE: July 28, 1999 Environmental Associates, Ltd.

FLORIDA DEPARTMENT OF HEALTH

COPY

MPA SAMPLE REPORT

Lab Sample # E99-0101 Utility: PWS#4130871 Miami Dade Water & Sewer Dept. well #15

Date/time Collected 07/06/99 03:45 PM 07/07/99 08:05 AM Date/time Processed: 07/08/99 10:30 AM By: Kazanis

PROCESSING INFORMATION

filter color gray color of water around the filter: murky

Total volume water filtered (gal): 850 Percoll/sucrose flotation pellet volume (µl): 160

Total volume filter-sediment (µl): 430 Percoll/sucrose flotation packed sediment (µl): 100

µl sediment/100 gallons sampled: 50.6 µl flotation pellet volume/100 gallons sampled: 21.2

number of slides examined: 3 material examined: floated (suspended) pellet

Primary Particulates	#/100 gallon	Relative frequency*	Relative Risk Factor*	Comments
Giardia	NA	NA	NA	
Coccidia	NA	NA	NA	
Diatoms (with chloroplasts)	0	NS	0	
Other Algae (with chloroplasts)	542	EH	14	unicells, clusters, euglenoid
Insects / Larvae	0	NS	0	
Rotifers	0	NS	0	
Plant Debris	0	NS	0	
		EPA Relative Risk=	14	

*Reference: USEPA Consensus Method for Determining Groundwaters Under the Direct Influence of Surface Water Using Microscopic Particulate Analysis (MPA): NA = Not Assayed

EH = extremely heavy H = heavy M = moderately heavy R = rare NF = None found

Secondary Particulates	#/100 gallon	Comments
Large amorphous debris	M	
Fine amorphous debris	M	
Minerals	R	
Plant pollen	6	
Nematodes	0	
Crustaceans	0	
Amoeba	25	
Flagellates & ciliates	19	
Other: eggs	4	
Other: fungal filaments & spores	R	

Comments: Algae were detected at a level almost twice that of the level for EH risk given in the numerical range table.

Based upon microscopic particulate analysis and the EPA risk factors associated with bio-indicators, there is a moderate risk of surface contamination. Determination of surface water influence should not be based solely on the results of one or two MPAs. Other pertinent information, such as water quality data and on-site surveys, should be used in conjunction with the MPA results in making this determination.

Reported by: [signature] Date: 07/19/99

MIAMI-DADE WATER & SEWER DEPARTMENT
RAYMOND DIAZ, CHIEF, LABORATORY DIVISION
JOHN E. PRESTON WATER TREATMENT PLANT LABORATORY CERTIFICATION #56084
FIELD SAMPLING LOG

Analysis Required: RAW WATER

☒ M.P.A. ☐ Cryptosporidium ☐ Enterovirus

Sample Location: N.W. Wellfield Well # 15

Composite ☒ Grab ☐ Other ☐

Start Time: 3:45 p.m. Date: 07/06/99

Meter Reading: 71810 Turbidity: 0.39 Temperature: 23.0°C pH: 7.26

Stop Time: 8:05 a.m. Date: 07/07/99

Meter Reading: 72670 Turbidity: 0.26 Temperature: 23.0°C pH: 7.33

Total Volume Filtered: 860

Weather Conditions:

At setup: ☑ Clear ☐ Cloudy ☐ Raining

At finish: ☑ Clear ☐ Cloudy ☐ Raining

Site Conditions:

At setup: ☐ Dry ☑ Moderate Standing Water ☐ Area Flooded

At finish: ☐ Dry ☑ Moderate Standing Water ☐ Area Flooded

Sample Collector: David Ramos (Print Name) David Ramos (Signature)

Shipping Date and Time: 07/07/99 - 1500

Final Destination: Environmental Associates, LTD

Received By: _____ (Print Name) _____ (Signature)

Recommended Filtered Sample Volumes:
Giarda / Crypto: 100 liters
Enterovirus: 60 - 100 gals
MPA: 600 - 1000 gals

REPORT: Microscopic Particulate Analysis

ENVIRONMENTAL ASSOCIATES, LTD.
24 Oak Brook Drive , Ithaca, NY 14850, Phone (607) 272-8902 Fax (607)256-7092

PWS ID#	Well ID#	Utility Name	EAL Samcle ID:
FL4130871	Northwest Wellfield Well #15	Miami Dade Water & Sewer	11636

Project Code Number: 99-05119R, Req.#H34539

COLLECTION:

Collector: David Ramos Date collected: 8/10/99 Time: 4:15pm

RECEIPT OF FILTER: Receiver of Sample: J. Antosh Carrier: Federal Express

Date Rec.: 8/12/99 Time: 10:10 AM Temp. of Rec. Sample: 3°C Tracking Number: 805646569476

FILTER PROCESSING Techician: J. Antosh Time: 4:15 PM Date: 8/12/99

Color of water around filter: clear
Filter color: gray
Color of sediment: brown
gallons filtered: 1193

Total volume of sediment: 0.1 ml
Volume of sediment/100 gallons: 0.01 ml/100gal
Phase equivalent gallon volume examined: 71

GIARDIA/CRYPTOSPORIDIUM # Observed Calc. #/100 Gallons

Giardia cyst confirmed: - -
Giardia cyst presumptive : - -
Cryptosporidium oocyst confirmed: - -
Cryptosporidium oocyst presumptive: - -

ANALYSIS OF PARTICULATES: Analyst Todd Wheaton Date: 8/17/99

key = (EH) - extremely heavy (H) - heavy (M) -moderate (R) - rare (NF) - none found

PARTICULATE DEBRIS

	Quantity	Description
Large part. 5 µm & larger	M	silt & sand, clumped brown
Small part. up to 5 µm	EH	fine amorphous debris
Plant debris	NF	

PROTOZOANS

	Quantity	Description
Other Coccidia	NF	
Other protozoans	M	43/100gal. photo. flagellates, flagellates

OTHER ORGANISMS

Nematodes	NF	
Nematode eggs	NF	
Rotifers	NF	
Crustaceans	NF	
Crustacean eggs	NF	
Insects	NF	
Other	R	R-10/100gal. pollen, M-iron bacteria(Crenothrix)

ALGAE

Green Algae	NF	
Diatoms	NF	
Blue-Green Algae	NF	
Flagellated Algae	R	euglenoid

Microscopy: Phase / Hoffman Magnification: 10,20,40,100x Dilution: not dil. :

Flotation Parameters: Percoll©/Sucrose gradient pellet vol.: 10 µl suspension vol.: 800 µl µl pellet/100gal.: 8.4

Type of Material examined: ☒ direct examination of unfloated sediment by ☒ floated (suspended) pellet

COMMENTS:

No primary surface water ndicators were observed. Based upon microscopic particulate analysis and the proposed EPA risk factors associated with bio-indicators there is a low risk of surface contamination (EPA risk factors= 0 low risk)

REPORT REVIEWED BY: Susan M. Bertics DATE: August 25 1999

PWS ID#	Well ID#	Utility Name	EAL Sample ID:
FL4130871	Northwest Wellfield Well	Miami Dade Water & Sewer	11636

EPA Relative Surface Water Risk Factors

Date: 8/10-11/99

Primary Particulates	#/100 gallon	Relative Frequency	Relative Risk Factor	Comments
Giardia (confirmed)	0	NF	0	
Coccidia (confirmed)	0	NF	0	
Diatoms (with chloroplasts)	0	NF	0	
Other Algae (with chloroplasts)	0	NF	0	
Insects/larvae	0	NF	0	
Rotifers	0	NF	0	
Plant Debris (with chlorophyll)	0	NF	0	
		EPA Relative Risk = 0		Low Risk

Secondary Particulates			
Nematodes	0	NF	
Crustaceans	0	NF	
Amoeba	0	NF	
Non-photo.flagellates & ciliates	37	M	flagellates-no relative risk factor assigned
Photosynthetic flagellates	6	R	photo. flagellates-no relative risk factor assigned
Other:	10	R	pollen, Crenothrix-no relative risk factor assigned

COMMENTS: No primary surface water ndicators were observed. Based upon microscopic particulate analysis and the proposed EPA risk factors associated with bio-indicators there is a low risk of surface contamination (EPA risk factors= 0 low risk).

REFERENCE: Consensus Method for Determining Groundwaters Under the Direct Influence of Surface Water Using Microscopic Particulate Analysis (MPA) USEPA Manchester Environmental Laboratory, EPA 910/9-92-029, October 1992.

REPORT REVIEWED BY: Susan H. Bretos DATE: August 25, 1999 Environmental Associates, Ltd.

L072692

FLORIDA DEPARTMENT OF HEALTH

MPA SAMPLE REPORT

Lab Sample # E99-0127 Utility: PWS#4130871 Miami Dade Water & Sewer Dept. well #15

Date/time Collected 08/10/99 04:15 PM 08/11/99 08:00 AM Date/time Processed: 08/12/99 10:10 AM By: Kazanis/Stark

PROCESSING INFORMATION

filter color: brown/gray

color of water around the filter: tan

Total volume water filtered (gal):	538	Percoll/sucrose flotation pellet volume (µl):	134
Total volume filter sediment (µl):	189	Percoll/sucrose flotation packed sediment (µl):	200
µl sediment/100 gallons sampled:	35.1	µl flotation pellet volume/100 gallons sampled:	24.9

number of slides examined: 3 material examined: floated (suspended) pellet

Primary Particulates	#/100 gallon	Relative frequency*	Relative Risk Factor*	Comments
Giardia	NA	NA	NA	
Coccidia	NA	NA	NA	
Diatoms (with chloroplasts)	1	R	6	
Other Algae (with chloroplasts)	82	M	9	unicells, clusters, euglenoid
Insects / Larvae	0	NS	0	
Rotifers	0	NS	0	
Plant Debris	0	NS	0	

EPA Relative Risk= 15

*Reference: USEPA Consensus Method for Determining Groundwaters Under the Direct Influence of Surface Water Using Microscopic Particulate Analysis (MPA):

NA = Not Assayed

EH = extremely heavy H = heavy M = moderately heavy R = rare NF = None found

Secondary Particulates	#/100 gallon	Comments
Large amorphous debris	R	
Fine amorphous debris	M	
Minerals	R	
Plant pollen	10	
Nematodes	0	
Crustaceans	0	
Amoeba	68	
Flagellates & ciliates	42	
Other: eggs	M	
Other: fungal filaments & spores	R	

Comments:

Based upon microscopic particulate analysis and the EPA risk factors associated with bio-indicators, there is a moderate risk of surface contamination. Determination of surface water influence should not be based solely on the results of one or two MPAs. Other pertinent information, such as water quality data and on-site surveys, should be used in conjunction with the MPA results in making this determination.

Reported by: Lillian M. Stark Date: 09/03/99

MIAMI-DADE WATER & SEWER DEPARTMENT
RAYMOND DIAZ, CHIEF, LABORATORY DIVISION
JOHN E. PRESTON WATER TREATMENT PLANT LABORATORY CERTIFICATION #56084
FIELD SAMPLING LOG

Analysis Required: RAW WATER

☒ M.P.A. ☐ Cryptosporidium ☐ Enterovirus

Sample Location: NorthWest Wellfield Well # 15

Composite ☒ Grab ☐ Other ☐

Start Time: 4:15 pm Date: 08/10/99

Meter Reading: 72837 Turbidity: 0.25 Temperature: 25.0°C pH: 7.25

Stop Time: 8:00 a.m Date: 08/11/99

Meter Reading: 74030 Turbidity: 0.19 Temperature: 25.0°C pH: 7.33

Total Volume Filtered: 1193

Weather Conditions:

At setup: ☑ Clear ☐ Cloudy ☐ Raining

At finish: ☑ Clear ☐ Cloudy ☐ Raining

Site Conditions:

At setup: ☐ Dry ☒ Moderate Standing Water ☐ Area Flooded

At finish: ☐ Dry ☒ Moderate Standing Water ☐ Area Flooded

Sample Collector: David Ramos (Print Name) David Ramos (Signature)

Shipping Date and Time: 08/11/99 - 1500

Final Destination: Environmental Assoc. Ltd.

Received By: (Print Name) (Signature)

Recommended Filtered Sample Volumes:
Giarda / Crypto: 100 liters
Enterovirus: 60 - 100 gals
MPA: 600 - 1000 gals

REPORT: Microscopic Particulate Analysis

ENVIRONMENTAL ASSOCIATES, LTD.
24 Oak Brook Drive , Ithaca, NY 14850, Phone (607) 272-8902 Fax (607)256-7092

PWS ID#	Well ID#	Utility Name	EAL Sample ID:
FL4130871	NW Wellfield-Well #15	Miami Dade Water & Sewer	12113

Project Code Number: 99-05119B, Req.#H35192

COLLECTION:

Collector: David Ramos Date collected: 11/22/99 Time: 4:00pm

RECEIPT OF FILTER: Receiver of Sample: J. Runyan Carrier: Federal Express

Date Rec.: 11/24/99 Time: 10:45 AM Temp. of Rec. Sample: 1°C Tracking Number: 813833390697

FILTER PROCESSING Technician: J. Antosh Time: 12:00 PM Date: 11/24/99

Color of water around filter: clear
Filter color: tan
Color of sediment: brown
gallons filtered: 904.2

Total volume of sediment: 0.08 ml
Volume of sediment/100 gallons: 0.01 ml/100gal
Phase equivalent gallon volume examined: 113

GIARDIA/CRYPTOSPORIDIUM

	# Observed	Calc. #/100 Gallons
Giardia cyst confirmed:	-	-
Giardia cyst presumptive :	-	-
Cryptosporidium oocyst confirmed:	-	-
Cryptosporidium oocyst presumptive:	-	-

ANALYSIS OF PARTICULATES: Analyst Todd Wheaton Date: 12/3/99

key = (EH) - extremely heavy (H) - heavy (M) -moderate (R) - rare (NF) - none found

PARTICULATE DEBRIS

	Quantity	Description
Large part. 5 µm & larger	EH	silt & sand, clumped brown
Small part. up to 5 µm	EH	fine amorphous debris
Plant debris	NF	

OTHER ORGANISMS

Nematodes	NF	
Nematode eggs	NF	
Rotifers	NF	
Crustaceans	NF	
Crustacean eggs	NF	
Insects	NF	
Other	NF	

PROTOZOANS

	Quantity	Description
Other Coccidia	NF	
Other protozoans	R	1/100gal, photo, flagellates

ALGAE

Green Algae	NF	
Diatoms	NF	
Blue-Green Algae	NF	
Flagellated Algae	R	Phacus

Microscopy: Phase / Hoffman Magnification: 10,20,40,100x Dilution: not dil. :

Flotation Parameters: Percoll@/Sucrose gradient pellet vol.: NF µl suspension vol.: 400 µl µl pellet/100gal.: 8.8

Type of Material examined: ☒ direct examination of unfloated sediment by ☒ floated (suspended) pellet

COMMENTS:

No primary surface water indicators were observed. Based upon microscopic particulate analysis and the proposed EPA risk factors associated with bio-indicators there is a low risk of surface contamination (EPA risk factors= 0 low risk).

REPORT REVIEWED BY: Susan H. Bartos DATE: December 6, 1999

PWS ID#	Well ID#	Utility Name	EAL Sample ID:
FL4130871	NW Wellfield-Well #15	Miami Dade Water & Sewer	12113

EPA Relative Surface Water Risk Factors

Date: 11/22/99

Primary Particulates	#/100 gallon	Relative Frequency	Relative Risk Factor	Comments
Giardia (confirmed)	0	NF	0	
Coccidia (confirmed)	0	NF	0	
Diatoms (with chloroplasts)	0	NF	0	
Other Algae (with chloroplasts)	0	NF	0	
Insects/larvae	0	NF	0	
Rotifers	0	NF	0	
Plant Debris (with chlorophyll)	0	NF	0	
		EPA Relative Risk = 0		Low Risk

Secondary Particulates			
Nematodes	0	NF	
Crustaceans	0	NF	
Amoeba	0	NF	
Non-photo.flagellates & ciliates	0	NF	
Photosynthetic flagellates	1	R	Phacus-no relative risk factor assigned
Other:	0	NF	

COMMENTS: No primary surface water indicators were observed. Based upon microscopic particulate analysis and the proposed EPA risk factors associated with bio-indicators there is a low risk of surface contamination (EPA risk factors= 0 low risk).

REFERENCE: Consensus Method for Determining Groundwaters Under the Direct Influence of Surface Water Using Microscopic Particulate Analysis (MPA) USEPA Manchester Environmental Laboratory, EPA 910/9-92-029, October 1992.

REPORT REVIEWED BY: Susan H. Bartos DATE: December 6, 1999 Environmental Associates, Ltd.

FLORIDA DEPARTMENT OF HEALTH

MPA SAMPLE REPORT

Lab Sample # E99-0195 **Utility:** PWS#4130871 Miami Dade Water & Sewer Dept. well #15

Date/time Collected 11/22/99 04:00 PM 11/23/99 08:30 AM **Date/time Processed:** 11/24/99 08:09 AM **By:** Larson

PROCESSING INFORMATION

filter color: light gray
color of water around the filter: clear
Total volume water filtered (gal): 727
Percoll/sucrose flotation pellet volume (µl): NA
Total volume filter sediment (µl): 50
Percoll/sucrose flotation packed sediment (µl): NA
µl sediment/100 gallons sampled: 6.9
µl flotation pellet volume/100 gallons sampled: NA
number of slides examined: 5
material examined: unfloated sediment

Primary Particulates	#/100 gallon	Relative frequency*	Relative Risk Factor*	Comments
Giardia	NA	NA	NA	
Coccidia	NA	NA	NA	
Diatoms (with chloroplasts)	0	NS	0	
Other Algae (with chloroplasts)	48.7	M	9	*Scendesmus, Trachelomonas, Tetraedron*, euglenoid, unicellular and multicellular
Insects / Larvae	0	NS	0	
Rotifers	0.1	NS	0	
Plant Debris	9.8	R	0	
		EPA Relative Risk=	9	

*Reference: USEPA Consensus Method for Determining Groundwaters Under the Direct Influence of Surface Water Using Microscopic Particulate Analysis (MPA): NA = Not Assayed

EH = extremely heavy H = heavy M = moderately heavy R = rare NF = None found

Secondary Particulates	#/100 gallon	Comments
Large amorphous debris	H	
Fine amorphous debris	H	
Minerals	H	
Plant pollen	4.3	
Nematodes	0	
Crustaceans	0	
Amoeba	2.1	
Flagellates & ciliates	1	
Other: eggs	1.6	
Other: fungal filaments & spores	R	

Comments: Entire pellet examined.

Based upon microscopic particulate analysis and the EPA risk factors associated with bio-indicators, there is a low risk of surface contamination. Determination of surface water influence should not be based solely on the results of one or two MPAs. Other pertinent information, such as water quality data and on-site surveys, should be used in conjunction with the MPA results in making this determination.

Reported by: [signature] Date: 12/08/99

Jeb Bush
Governor

Tampa Branch Laboratory
3952 West Dr. Martin Luther King Jr. Boulevard • Tampa, FL 33614-8404
Fax: (813)871-7468 Phone:(813)871-7465 Suncom: 512-6278

Robert G. Brooks, M.D.,
Secretary

MIAMI-DADE WATER & SEWER DEPARTMENT
RAYMOND DIAZ, CHIEF, LABORATORY DIVISION
JOHN E. PRESTON WATER TREATMENT PLANT LABORATORY CERTIFICATION #56084
FIELD SAMPLING LOG

Analysis Required: RAW WATER

☒ M.P.A. ☐ Cryptosporidium ☐ Enterovirus

Sample Location: NorthWest Wellfield Well # 15

Composite ☒ Grab ☐ Other ☐ _____

Start Time: 4:00 p.m. Date: 11/22/99

Meter Reading: 79296.5 Turbidity: 0.19 Temperature: 25.0°C pH: 7.19

Stop Time: 8:30 a.m. Date: 11/23/99

Meter Reading: 80200.7 Turbidity: 0.11 Temperature: 25.0°C pH: 7.24

Total Volume Filtered: 904.2

Weather Conditions:

At setup: ☑ Clear ☐ Cloudy ☐ Raining

At finish: ☑ Clear ☐ Cloudy ☐ Raining

Site Conditions:

At setup: ☐ Dry ☑ Moderate Standing Water ☐ Area Flooded

At finish: ☐ Dry ☑ Moderate Standing Water ☐ Area Flooded

Sample Collector: David Ramos (Print Name) David Ramos (Signature)

Shipping Date and Time: 11/23/99 – 1500

Final Destination: Environmental Associates LTD

Received By: _____ (Print Name) _____ (Signature)

Recommended Filtered Sample Volumes:
Giarda / Crypto: 100 liters
Enterovirus: 60 - 100 gals
MPA: 600 - 1000 gals

REPORT: Microscopic Particulate Analysis

ENVIRONMENTAL ASSOCIATES, LTD.
24 Oak Brook Drive , Ithaca, NY 14850, Phone (607) 272-8902 Fax (607) 2[illegible]-7092

PWS ID#	Well ID#	Utility Name	EAL Sample ID
FL4130871	NW Wellfield Well #15	Miami Dade Water & Sewer	12358

Project Code Number: PO#99-05119B, Req #H35192

COLLECTION:

Collector: David Ramos Date collected: 1/10/2000 Time: 3:55pm

RECEIPT OF FILTER:

Receiver of Sample: J. Antosh Carrier: Federal Express

Date Rec.: 1/12/2000 Time: 10:30 AM Temp. of Rec. Sample: 1 °C Tracking Number: 813833390723

FILTER PROCESSING Technician: J. Antosh Time: 11:00 AM Date: 1/12/2000

Color of water around filter: clear
Filter color: light brown
Color of sediment: brown
gallons filtered: 830

Total volume of sediment: 0.02 ml
Volume of sediment/100 gallons: 0.002 ml/100ga
Phase equivalent gallon volume examined: 116

GIARDIA/CRYPTOSPORIDIUM

	# Observed	Calc. #/100 Gallons
Giardia cyst confirmed:	-	-
Giardia cyst presumptive :	-	-
Cryptosporidium oocyst confirmed:	-	-
Cryptosporidium oocyst presumptive:	-	-

ANALYSIS OF PARTICULATES: Analyst Todd Wheaton Date: 1/21/2000

key = (EH) - extremely heavy (H) - heavy (M) -moderate (R) - rare (NF) - none found

PARTICULATE DEBRIS

	Quantity	Description
Large part. 5 µm & larger	H	silt & sand, clumped brown
Small part. up to 5 µm	EH	fine brown amorphous
Plant debris	NF	

PROTOZOANS

	Quantity	Description
Other Coccidia	NF	
Other protozoans	R	6/100gal. photo. flagellat s

OTHER ORGANISMS

Nematodes	NF
Nematode eggs	NF
Rotifers	NF
Crustaceans	NF
Crustacean eggs	NF
Insects	NF
Other	R 1/100gal. fungal spore, iron bacteria(Crenothrix)

ALGAE

Green Algae	NF
Diatoms	NF
Blue-Green Algae	NF
Flagellated Algae	R euglenoid

Microscopy: Phase / Hoffman Magnification: 10,20,40,100x Dilution: not dil. :

Flotation Parameters: Percoll@/Sucrose gradient pellet vol.: 10 µl suspension vol.: 300 µl µl pellet/100gal.: .4

Type of Material examined: ☒ direct examination of unfloated sediment by ☒ floated (suspended) pellet

COMMENTS:

No primary surface water indicators were observed. Based upon microscopic particulate analysis and the proposed EPA risk factors associated with bio-indicators there is a low risk of surface contamination (EPA risk factors= 0 low risk).

REPORT REVIEWED BY: Susan N. Bates DATE: January 24, 2000

PWS ID#	Well ID#	Utility Name	EAL Sample ID:
FL4130871	NW Wellfield Well #15	Miami Dade Water & Sewer	12358

EPA Relative Surface Water Risk Factors

Date: 1/10-11/00

Primary Particulates	#/100 gallon	Relative Frequency	Relative Risk Factor	Comments
Giardia (confirmed)	0	NF	0	
Coccidia (confirmed)	0	NF	0	
Diatoms (with chloroplasts)	0	NF	0	
Other Algae (with chloroplasts)	0	NF	0	
Insects/larvae	0	NF	0	
Rotifers	0	NF	0	
Plant Debris (with chlorophyll)	0	NF	0	
		EPA Relative Risk = 0		Low Risk

Secondary Particulates			
Nematodes	0	NF	
Crustaceans	0	NF	
Amoeba	0	NF	
Non-photo.flagellates & ciliates	0	NF	
Photosynthetic flagellates	6	R	euglenoid-no relative risk factor assigned
Other:	1	R	fungal spore, Crenothrix- no relative risk factor

COMMENTS: No primary surface water indicators were observed. Based upon microscopic particulate analysis and the proposed EPA risk factors associated with bio-indicators there is a low risk of surface contamination (EPA risk factors= 0 low risk).

REFERENCE: Consensus Method for Determining Groundwaters Under the Direct Influence of Surface Water Using Microscopic Particulate Analysis (MPA) USEPA Manchester Environmental Laboratory, EPA 910/9-92-029, October 1992.

REPORT REVIEWED BY: Susan H. Bartos DATE: January 24, 2000

FLORIDA DEPARTMENT OF HEALTH

MPA SAMPLE REPORT

Lab Sample # E00-0007 **Utility:** PWS#4130871 Miami Dade Water & Sewer Dept well #15

Date/time Collected 01/10/00 03:55 PM – 01/11/00 08:55 AM **Date/time Processed:** 01/12/00 10:55 AM **By:** Larson/Mosbaugh

PROCESSING INFORMATION

filter color: light gray tint
color of water around the filter: tan tint
Total volume water filtered (gal): 890
Total volume filter sediment (µl): 40
µl sediment/100 gallons sampled: 4.5
number of slides examined: 4
Percoll/sucrose flotation pellet volume (µl): NA
Percoll/sucrose flotation packed sediment (µl): NA
µl flotation pellet volume/100 gallons sampled: NA
material examined: unfloated sediment

Primary Particulates	#/100 gallon	Relative frequency*	Relative Risk Factor*	Comments
Giardia	NA	NA	NA	
Coccidia	NA	NA	NA	
Diatoms (with chloroplasts)	0	NS	0	
Other Algae (with chloroplasts)	24.9	M	9	unicellular, euglenoid, *Trachelomonas*
Insects / Larvae	0	NS	0	
Rotifers	0	NS	0	
Plant Debris	65.6	M	1	
		EPA Relative Risk=	10	

*Reference: USEPA Consensus Method for Determining Groundwaters Under the Direct Influence of Surface Water Using Microscopic Particulate Analysis (MPA): NA = Not Assayed

EH = extremely heavy H = heavy M = moderately heavy R = rare NF = None found

Secondary Particulates	#/100 gallon	Comments
Large amorphous debris	H	
Fine amorphous debris	M	
Minerals	M	
Plant pollen	4.0	
Nematodes	0	
Crustaceans	0	
Amoeba	1.5	
Flagellates & ciliates	0	
Other: eggs	0.7	
Other: fungal filaments & spores	R	

Comments: Entire pellet examined.

Based upon microscopic particulate analysis and the EPA risk factors associated with bio-indicators, there is a moderate risk of surface contamination. Determination of surface water influence should not be based solely on the results of one or two MPAs. Other pertinent information, such as water quality data and on-site surveys, should be used in conjunction with the MPA results in making this determination.

Reported by: [signature] Date: 01/18/00

Jeb Bush
Governor

Tampa Branch Laboratory
3952 West Dr. Martin Luther King Jr. Boulevard • Tampa, FL 33614-8404
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Robert G. Brooks, M.D.,
Secretary

#2

MIAMI-DADE WATER & SEWER DEPARTMENT
RAYMOND DIAZ, CHIEF, LABORATORY DIVISION
JOHN E. PRESTON WATER TREATMENT PLANT LABORATORY CERTIFICATION #56084
FIELD SAMPLING LOG

Analysis Required: RAW WATER

☒ M.P.A. ☐ Cryptosporidium ☐ Enterovirus

Sample Location: NW Wellfield Well # 15

Composite ☒ Grab ☐ Other ☐

Start Time: 3:55 p.m. Date: 01/10/00

Meter Reading: 7350 Turbidity: 0.57 Temperature: 22.5°C pH: 7.37

Stop Time: 8:55 Date: 01/11/00

Meter Reading: 8180 Turbidity: 0.35 Temperature: 22.0°C pH: 7.37

Total Volume Filtered: 830

Weather Conditions:

At setup: ☐ Clear ☑ Cloudy ☐ Raining

At finish: ☑ Clear ☐ Cloudy ☐ Raining

Site Conditions:

At setup: ☑ Dry ☐ Moderate Standing Water ☐ Area Flooded

At finish: ☑ Dry ☐ Moderate Standing Water ☐ Area Flooded

Sample Collector: David Ramos (Print Name) David Ramos (Signature)

Shipping Date and Time: 01/11/00 - 1500

Final Destination: Environmental Assoc.

Received By: _____ (Print Name) _____ (Signature)

Recommended Filtered Sample Volumes:
Giarda / Crypto: 100 liters
Enterovirus: 60 - 100 gals
MPA: 600 - 1000 gals