

MONTGOMERY WATSON



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December 11, 1997

Mr. William W. Cocke, P.G. Florida Department of Environmental Protection Underground Injection Control Division 400 North Congress Avenue, West Palm Beach, Florida 33401

SUBJECT: City of Fort Lauderdale Fiveash WTP ASR System Aquifer Storage and Recovery Well ASR-1 and Floridan Monitor Well FMW-1 Weekly Summary Report #1 FDEP Permit No. 0128340-002-UC (Fort Lauderdale Project No. 9771) (Montgomery Watson File No. 1324007.28090285/6.7.1)

Dear Mr. Cocke:

Montgomery Watson Americas, Inc. is pleased to submit the following Weekly Summary Report on behalf of the City of Ft. Lauderdale. This report is the first Weekly Summary Report for the City of Ft. Lauderdale Fiveash Water Treatment Plant (WTP) Aquifer Storage and Recovery System. The summary report covers the reporting period from November 28, 1997 at 0700 hours through December 8, 1997 at 0700 hours. In accordance with Specific Condition 4.D in the construction permit, the following information is attached to this document:

- Daily Engineer Reports
- Driller Shift Reports
- Lithologic Logs
- Core Lithologic Logs
- Geophysical Logs:

Pilot Hole

Dual Induction, Spontaneous Potential, Gamma Ray Caliper, Gamma Ray

Reamed hole

Caliper, Gamma Ray

Pad Monitor Well Sampling Results

- 315 p 14

2328 - 10th Avenue North Suite 501 Lake Worth, Florida 33461-6616 Tel: 561 586 8830 Fax: 561 586 8834

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AQUIFER STORAGE AND RECOVERY WELL (ASR-1)

Drilling of the well began on November 29, 1997. The pilot hole was drilled to 471 feet below pad level (bpl) and geophysical logs were performed on November 30, 1997. Reaming commenced on December 1, 1997 and was completed to a depth of 210 feet bpl on December 2, 1997. Following geophysical logging of the reamed hole, 26-inch casing was set and cemented to 198 feet bpl on December 3, 1997. Pilot hole drilling resumed on December 4, 1997 and proceeded to a depth of 1,125 feet bpl on December 7, 1997. During pilot hole drilling between 950 feet bpl and 1,020 feet bpl, three intervals were cored. The first two cores yielded less than 10% recovery with the third core yielding approximately 80% recovery.

FLORIDAN MONITOR WELL (FMW-1)

No construction activities during the reporting period.

SHALLOW MONITOR WELL (SMW-1)

No construction activities during the reporting period.

PROPOSED FUTURE ACTIVITIES FOR NEXT REPORTING PERIOD

Preparations will be made for the completion of the following tasks:

AQUIFER STORAGE AND RECOVERY WELL (ASR-1)

During the second week of construction at the Fiveash site, geophysical logs will be run in the pilot hole to 1,125 feet bpl. Following receipt of casing depth approval, the hole will be reamed and 16-inch casing will be set and cemented to the approved depth

FLORIDAN MONITOR WELL (FMW-1)

No activities planned.

SHALLOW MONITOR WELL (SMW-1)

No activities planned.

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DRILLING OBSERVATION AND TESTING

Drilling observation, testing, and sampling were conducted by Neil Johnson and Randy Skinner.

CONTRACTOR

Youngquist Brothers, Inc. Drilling Superintendent: Jay Swartzentruber

SUB-CONTRACTORS

Florida Geophysical Logging Florida Cementing, Inc.

If you should have any questions, please do not hesitate to contact Anne M. Murray, P.G. at 954-472-0300.

Sincerely,

A. Mam For ANN'S HURRAY

Anne M. Murray, P.G. Project Manager

AMM/jg

cc: TAC List (w/ attachments) Maurice Tobon (w/o attachments) Wayne Welch (w/o attachments) Armando Sampedro (w/ attachments) Randy Skinner (w/ attachments) Neil Johnson (w/ attachments)

SOUTHEAST DISTRICT U.I.C. TECHNICAL ADVISORY COMMITTEE (Rev01DEC97)

Agency	Address	TAC Member
FDEP (SED):	FDEP, UIC Permitting P.O. Box 15425 West Palm Beach, FL 33416 Telephone (561) 681-6600 FAX: (561) 681-6760 INTERNET: username@WPB1.dep	Bill Cocke, TAC Chairman (Cocke_W) Len Fishkin p.state.fl.us
FDEP (TAL):	FDEP, Bureau of Drinking Water and Ground Water Resources - UIC 2600 Blair Stone Road Tallahassee, FL 32399-2400 (850) 921-9412 FAX: (850) 414-9031 INTERNET: username@dep.state.f	Cathy McCarty
USEPA:	USEPA, Region IV 345 Courtland Street, N.E. Atlanta, Georgia 30365 (404) 347-3379 FAX: (404) 347-1799	Nancy Marsh - Permitting Scott Hoskins, Comp./Enf.
USGS:	USGS, Water Resources Division 9100 N.W. 36th St., Suite 107 Miami, FL 33178 (305) 594-0655 FAX: (305) 526-2881 INTERNET: username@ws01sflmi	Ron Reese (Rsresse) (DC & BC. PBC) a.er.usgs.GOV
SFWMD:	SFWMD, P.O. Box 24680 3301 Gun Club Road West Palm Beach, FL 33416 (561) 686-8800, Ext. 6853 FAX: (407) 687-6436	Steven D. Anderson

BCDNRP	BCDNRP	Garth Hinkle
	218 S.W. 1st. Avenue	
	Fort Lauderdale, Florida 33301	
	(954) 519-1256	
	FAX: (954) 519-1496	

BCPHU

BCPHU 2421 S.W. 6th Avenue Ft. Lauderdale, FL 33315 (954) 467-4846 FAX: (954) 467-4898 Phong Nguyen

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CITY OF FORT LAUDERDALE FIVEASH W	TP ASR WELL SYSTEM	HOURS WOR		1/21/1997 :00 - 12:00
	Sun Mc	on Tue W	ed Thr	Fri Sat
JOB NUMBER: 1324007.28090290	Weather	r Overcast	Rain	Heavy Rain x
CONTRACTOR: Youngquist Brothers, Inc.	Temperature 32 - 5	50 50 - 70	70 - 85 ×	> 85
	Wind Still	Medium x	High	
	Humidity	Moderate	-× Humid	Report No. 1
SOBSERVER: M. Randal Skinne	SHIFT SUMMARY	START	DEPTH:	0

OBSERVER:	M. Randal Skinner	START DEPTH:	0
DRILLER:		END DEPTH:	0
ACTIVITY:	Water Table Monitor Well Sampling. Site Work		
SUB CONTRACTORS:	Ardamen and Associates		
FORMATION SAMPLES:			
WATER SAMPLES:		۵۳۰٫۰۰٬۰٬۰۰۰٬۰۰۰٬۰۰۰٬۰۰۰٬۰۰۰٬۰۰۰٬۰۰۰٬۰۰۰٬	
TESTING:		·····	

TIME

DESCRIPTION

10:00 On site. YBI is on site, performing set-up work. Ardamen is on site, and sampling surface water monitor wells.
1040 Spoke with FI. Lauderdale lab personnel about sampling procedures. Sampled pad monitor wells.

1200 Off Site.



CITY OF FORT LAUDERDALE FIVEASH WTP ASR SY	DATE(S): <u>11/25/97</u> HOURS WORKED: <u>0915 - 1115</u> STEM
	Sun Mon Tue Wed Thr Fri Sat
JOB NUMBER: 1324007.28090290 Wea	her Clear Overcast Rain Heavy Rain
CONTRACTOR: Youngquist Brothers, Inc. Tempera	
W	ind Still Medium High
Humi	dity Dry Moderate Humid Report No.
SHIFT SUN	MARY
OBSERVER: <u>Neil Johnson</u> DRILLER: Ronnie Thames	START DEPTH: 0 END DEPTH: 0

DRILLER:	Ronnie Thames	END DEPTH:	0
ACTIVITY:	Pre-construction meeting / Rigging up to drill		
SUB CONTRACTORS:			
FORMATION SAMPLES:			
WATER SAMPLES:			*****
TESTING:			

DESCRIPTION
NAJ on site
YBI rigging up for ASR
Unloaded field conductivity meter, chloride kits, specs, drawings, and permits into trailer
Pre-construction meeting at WTP
End meeting. NAJ off site



CITY OF FORT LAUDERDALE FIVEASH WI	TP ASR SYSTEM	DATE(S) HOURS WORKED		1/28/97 30 - 1430
	Sun Mor	1 Tue Wed	Thr	Fri Sat ×
JOB NUMBER: 1324007.28090290	Weather	Overcast x	Rain	Heavy Rain
CONTRACTOR: Youngquist Brothers, Inc.	Temperature 32 - 50	50 - 70	70 - 85 x	> 85
	Wind Still x	Medium	High	
	Humidity Dry	Moderate	Humid ·x	Report No. 3
	IIFT SUMMARY	00-00-00-00-00-00-00-00-00-00-00-00-00-		
OBSERVER: Neil Johnson		START DEF	·····	

UBSERVER:	Nell Johnson	START DEPTH:	0
DRILLER:	Ronnie Thames	END DEPTH:	0
ACTIVITY:	Sample pad monitor wells		***************************************
SUB CONTRACTORS:			
FORMATION SAMPLES:			
WATER SAMPLES:	ASR-1 and FMW-1 Weekly Pad Monitor Well S	Samples	
TESTING:			

TIME			DESCRIPTION		
12:30	NAJ on site				
	YBI mixing drilling mu	d. Sanders lab sch	eduled by Jay to sa	ample PMW today.	
13:00					
	YBI provided 8 sampl				
13:30	Sampled ASR-1 PMV				
	Well	Held	Read	Depth to Water	Temperature
	PMW-1 / N	10	1.52	8.48	82.0
	PMW-2 / W	10	1.30	8.70	82.0
	PMW-3 / E	10	1.50	8.50	83.0
	PMW-4 / S	9	8.02	8.02	82.0
13:50	Sampled FMW-1 PMV	N			
	Well	Held	Read	Depth to Water	Temperature
	PMW-1 / N	9	1.65	7.35	80.0
	PMW-2 / W	8	0.49	7.51	80.5
	PMW-3 / E	9	1.29	7.71	80.5
	PMW-4/S	9	1.35	7.65	80.0
	Several of the wells co	ontain very dirty wat	ter. Wells should be	e pump-developed.	
14:30	 Loading drill pipe onto 	ria floor. NAJ off s	ite		

14:30 Loading drill pipe onto rig floor. NAJ off site



CITY OF FORT LAUDERDALE FIVEASH WTP ASR SYST	DATE(S): <u>11/29/97</u> HOURS WORKED: <u>11:15 - 22:00</u>
S	Sun Mon Tue Wed Thr Fri Sat
JOB NUMBER: 1324007.28090290 Weather	r Clear Overcast Rain Heavy Rain x
CONTRACTOR: Youngquist Brothers, Inc. Temperature	
Wind	d Still Medium High
Humidity	Dry Moderate Humid Report No. -x 4
SHIFT SUMM	ARY

JAIFT SUWWART					
OBSERVER:	Neil Johnson	START DEPTH:	0		
DRILLER:	Ronnie Thames	END DEPTH:	200		
ACTIVITY:	Drilling 12-1/4 pilot hole				
SUB CONTRACTORS:					
FORMATION SAMPLES:	****	**************************************			
WATER SAMPLES:	антантан талантан улуу байлан казан талар казан калантан казан уулуу байлай. Кулуу байлай казан казан казан ку Талар				
TESTING:					

TIME	DESCRIPTION
15:45	NAJ on site
	Drilling at 110 ft. -2 stands drill collar and bit $-WOB = 3K$
16:10	KD at 110 ft.
16:25	Made connection – DP stand #1
17:25	Took cuttings sample 120-130 ft.
18:30	KD at 168
	Cameron Webster (driller) on site. Installing electric pump on pad.
19:05	Drilling at 197 ft. $WOB = 3500 ROP = 2-3 min/ft.$
19:20	Stop drilling at 200 ft. Problem with mud pump
20:45	YBI will replace mud pump
21:45	New pump on site
	YBI will schedule loggers for 07:00 tomorrow. Will call at 06:00 if not ready.
	Will resume drilling tonight stopping at 400 ft. or well into clay.
22.00	NA Loff of to



		DAT	E(S):	11/30/97
		HOURS WOR	KED: 06	5:30 - 14:45
CITY OF FORT LAUDERDALE FIVEASH WTP ASR SYS	бтем			
198	<u></u>			
	Sun Mon	Tue We	ed Thr	Fri Sat
L				
JOB NUMBER: 1324007.28090290 Weath	er Clear	Overcast	Rain	Heavy Rain
		x		n antara falanan ata mangana ang
CONTRACTOR: Youngquist Brothers, Inc. Temperatu	re 32 - 50	50 - 70	70 - 85	> 85
			х	
Wi	nd Still	Medium	High	
	×			
Humid	ity Dry	Moderate	Humid	Report No.
			×	5
	Ł			L

	SHIFTSUM	MARY	
OBSERVER:	Neil Johnson	START DEPTH: 408	
DRILLER:	Ronnie Thames	END DEPTH: 470	-
ACTIVITY:	Drilling 12-1/4 pilot hole		-
SUB CONTRACTORS:			-
FORMATION SAMPLES:			-
WATER SAMPLES:			-
TESTING:			-
		***************************************	-

TIME	DESCRIPTION
06:30	NAJ on site
	KD at 408 ft. no clay
07:10	Between 410 and 420 ft. greenish clayey sand. Repairing desander
07:20	Both desanding units working. Drilling very fast 2-3 ft/min
07:38	Geolograph not working well.
	Drilling at 461 ft. WOB = 3800
07:45	KD at 470 ft.
	Cuttings are still green clayey sand. Very soft drilling
08:00	Circulating and thinning mud
08:45	Making chip trays
10:00	FGL truck on site
11:55	Log TD = 471 ft. Begin caliper/gamma log.
12:20	End log. Switching tools
13:40	Begin DI/SP log.
14:00	End log. FGL rigging down.
14:45	YBI will call when ready to begin rearning.
	NAJ off site



CITY OF FORT LAUDERDALE FIVEASH WTP ASR SYSTEM	DATE(S): HOURS WORKED:	<u>12/1/97</u> 07:30 - 15:30
Sun	Mon Tue Wed	Thr Fri Sat
JOB NUMBER: 1324007.28090290 Weather G	lear Overcast I	Rain Heavy Rain
CONTRACTOR: Youngquist Brothers, Inc. Temperature 32	2 - 50 50 - 70 7(0 - 85 > 85
Wind		High
Humidity		umid Report No. 6
	x	· 6

SHIFT SUMMARY					
OBSERVER:	Neil Johnson	START DEPTH:	470		
DRILLER:	Ronnie Thames	END DEPTH:	470		
ACTIVITY:	Reaming for 26-in. casing	74-Adamse4			
SUB CONTRACTORS:	Masonry crew, Rinker				
FORMATION SAMPLES:		***************************************			
WATER SAMPLES:		//////////////////////////////////////			
TESTING:					

TIME	DESCRIPTION
07:30	NAJ on site
	BHA rigged up
08:30	Masonry crew on site – block not delivered.
	Received Sanders' pad monitor well data from YBI.
09:00	Anne Murray on site to discuss schedule, specs, permits, and casing setting depth (190-200 ft.)
	Decided to run packer test on FMW-1.
09:45	Begin reaming
10:00	KD at 28 ft.
	Making connection
10:25	Resumed reaming from 28 ft.
11:15	Tim Case from Sanders Laboratory on site
11:30	Reaming at 55 ft. WOB = $4K$
11:50	Took PMW samples (11-28-97) to Susan Chen at CITY lab
11:55	Rinker on site with block.
13:30	Received results from PMW sampling (11-21-97) from CITY
13:45	Submitted chain-of-custody for (11-28-97) samples to CITY
13:55	Reaming at 80 ft. $WOB = 6K$.
	Masons 2/3 complete. Pad is chipped along eastern edge underneath block.

- 14:00 Edwards Electric on site for trailer electric. RMS on site.
- 14:30 Measured 26-in. Casing
- header 40.21 ft., 40.33 ft., 40.28 ft., 40.30 ft., and 40.29 ft.
- 15:30 NAJ off site



CITY OF FORT LAUDERDALE FIVEASH WT	P ASR WELL SYSTEM	DA1 HOURS WOF	re(s): Ked:	12/2/1997):00 - 13:00
	Sun Mon	Tue W	ed Thr	Fri Sat
JOB NUMBER: 1324007.28090290	Weather Clear	Overcast X	Rain	Heavy Rain
CONTRACTOR: Youngquist Brothers, Inc.	Temperature 32 - 50		70 - 85 x	> 85
	Wind Still	Medium ×	High	
	Humidity	Moderate X	Humid	Report No. 7
S OBSERVER: M. Randal Skinner	HIFT SUMMARY	START	DEPTH	75

OBSERVER:	M. Randal Skinner	START DEPTH:	75
DRILLER:	Ronnie Thames	END DEPTH:	200
ACTIVITY:	Ream hole to 200 feet for surface casing	404 	
SUB CONTRACTORS:			
FORMATION SAMPLES:			**************************************
WATER SAMPLES:			
TESTING:			
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TIME

DESCRIPTION

0910 On site. Met with Anne Murray about status of project. Ream has progressed to 157 feet bpl.
1000 Spoke with contractor about schedule for geophysical logging. Loggers will be onsite at 4:00 am Wendsday to calpier the ream.

- 1100 Spoke with driller about keeping WOB records.
- 1245 Off Site.



		DATE(S HOURS WORKED		2/3/1997 50 - 17:00
CITY OF FORT LAUDERDALE FIVEASH WT	P ASR WELL SYSTEM			
	Sun Mon	Tue Wed x	Thr	Fri Sat
JOB NUMBER: 1324007.28090290	Weather Clear	Overcast X	Rain	Heavy Rain
CONTRACTOR: Youngquist Brothers, Inc.	Temperature 32 - 50	50 - 70	70 - 85 x	> 85
· · · ·	Wind Still	Medium ×	High	PANI
	Humidity Drý	Moderate X	Humid	Report No. 8

	SHIFT SUMMARY		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
OBSERVER:	M. Randal Skinner and Neil Johnson	START DEPTH:	200
DRILLER:	Ronnie Thames	END DEPTH:	200
	Set and Cement Surface Casing		
SUB CONTRACTORS:	Florida Geophysical, Florida Cement		
FORMATION SAMPLES:			
WATER SAMPLES:		ан маланан ул бүүлчээн нэрэгэн наан таасаан артан түрээл үүрэг үүн бүл үүн түрэг артан таасаа таасаа таасаа таа	
TESTING:			

TIME

DESCRIPTION

- 0330 ON Site
- Waiting on loggers.
- 0445 Loggers are rigged up, but having problems with computer system.
- 0530 Running log.
- 0540 Rig down loggers.
- 0600 Begin 26 inch casing run.
- 0850 End 26 inch casing run. Five stands in the hole. Setting depth is 198.4 feetbls.
- 0910 Rig up to run cement.
- 1100 Sending pre-flush @ 3 bbls/min.
- 1132 End Stage #1. 90 bbls of neat pumped.
- Rig down cement truck.
- 1148 Head pressure at 42 PSI.
- 1330 Head pressure at 0 PSI.
- 1610 Tag annulus at 20 feet bls.
- 1700 Drilling will re-start at 0000 hr. Off Site.



		DAT HOURS WOR		1/97-12/5/97 :30 - 01:30
CITY OF FORT LAUDERDALE FIVEASH WTP ASR SYSTI	EM			
S	un Mon	Tue We	ed Thr x	Fri Sat
JOB NUMBER: <u>1324007.28090290</u> Weather	Clear	Overcast	Rain x	Heavy Rain x
CONTRACTOR: Youngquist Brothers, Inc. Temperature	32 - 50	50 - 70	70 - 85 ×	> 85
Wind	Still x	Medium x	High	<u></u>
Humidity	Dry	Moderate	Humid .×	Report No. 9
SHIFT SUMMA				8997.AD32/2014

	SHIFT SUMMARY		
OBSERVER:	Neil Johnson/Randy Skinner	START DEPTH:	470
DRILLER:	Ronnie Thames/Cameron Webster	END DEPTH:	949
ACTIVITY:	Drilling 12-1/4 pilot hole	ted.	
SUB CONTRACTORS:			
FORMATION SAMPLES:			
WATER SAMPLES:			,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
TESTING:			

TIME	DESCRIPTION
09:30	NAJ on site
09:40	Drilling at 579 ft. Driller noticed possible change in formation at 574 ft. Present ROP = $2 \min/ft$
10:06	Drilling at 587 ft. WOB = $4K$ ROP = $2min/ft$.
10:20	KD at 591 ft.
11:40	Drilling at 627 ft. WOB = 5K ROP = 2-3 min/ft
	Cuttings 60% LSwhite, recrystallized, porous 40% CLAYolive-green.
12:00	Drilling at 638 ft. WOB = $6K$ ROP = 2-3 min/ft.
	50% LS—white to gray 50% CLAY—olive-green
12:20	Drilling at 651 ft. WOB = 6K ROP = 1 min/ft.
12:50	Drilling at 665 ft. WOB = 6K ROP = $<1 \text{ min/ft.}$
13:00	Loading tanker with fluids from cuttings pit.
	ASR-1 PMW-3/East is underwater from parking lot runoff
13:15	Received copy of PMW results (11-28-97) from CITY
13:30	KD at 710 ft.
14:28	Drilling at 735 ft. WOB = 4K ROP =- <1 min/ft
15:16	Drilling at 768 ft. WOB = 5K ROP = 1 min/ft
15:18	KD at 771 ft.

16:05 Drilling at 771 ft. WOB = 5K ROP = <1 min/ft

- 16:50 KD at 831 ft.
- 17:20 Drilling at 847 ft. WOB = 8K ROP =- <1 min/ft Cuttings contain chert nodules
- 17:30 Drilling at 856 ft.
- 17:32 Drilling at 860 ft. Driller noted harder material
- 17:59 Drilling at 873 ft. WOB = 8K ROP = 1 min/ft
- 18:15 Drilling at 885 ft.
- 18:20 KD at 891 ft.
- 18:42 Drilling at 894 ft. $WOB = 10K ROP = \langle 2 min/ft.$
- 18:50 RMS on site
- 18:55 Drilling at 900 ft. 95% CLAY/SILT 5% LS-white, soft encountered in 1-2 ft.-thick units
- 20:10 Drilling at 935 ft.
- 21:00 Stop drilling at 949 ft. Prepare to core
- 23:00 Tight hole. Driller will run wiper trip and core in the a.m.
- 01:00 Core will not occur until morning tower
- 01:30 RMS off site.



CITY OF FORT LAUDERI	DALE FIVEASH W	TP ASR SYST	EM	DAT HOURS WOR	E(S):07	12/5/97 730 - 1630
		S	un Mon	Tue W	əd Thr	Fri Sat
JOB NUMBER: 1324	007.28090290	Weather	Clear	Overcast x	Rain	Heavy Rain
CONTRACTOR: Youngqu	ist Brothers, Inc.	Temperature	32 - 50	50 - 70 x	70 - 85	> 85
		Wind	Still	Medium ×	High	
		Humidity	Dıy	Moderate	Humid x	Report No. 10
		IIFT SUMM	ARY	<u></u>		
OBSERVER:	Neil Johnson Bonnie Thames	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		START I	DEPTH: 95	*****

DRILLER:	Ronnie Thames	END DEPTH: 950	
ACTIVITY:	Sampled pad monitor wells / coring	47-4-1-1-1-4-1-4-1-4-1-4-1-4-1-4-1-4-1-4	
SUB CONTRACTORS:			
FORMATION SAMPLES:			
WATER SAMPLES:	ASR-1 and FMW-1 Weekly Pad Monitor Well San	ples	
TESTING:	· · · · · · · · · · · · · · · · · · ·	1	

TIME			DESCRIPTION	
07:30	NAJ on site			•
	YBI running wiper tri	ps.		
08:00	Sampled FMW-1 PM	IW		
	Well	Depth to Water	Temperature	
	PMW-1 / N	6.53	26.5	
	PMW-2 / W	6.67	27.0	
	PMW-3 / E	6.90	26.0	
	PMW-4/S	6.82	27.0	
08:30	Sampled ASR-1 PM	N		
	Well	Depth to Water	Temperature	
	PMW-1 / N	7.64	27.5	
	PMW-2 / W	7.89	27.5	
	PMW-3 / E	6.61	27.0	
	PMW-4/S	7.18	26.5	
09:30	TOOH for coring.			
10:00	Checked heat number 16624). YBI will look	ers on 16-inch casing. i into this.	No mill certs for Mexican pipe (heat numbers 16625 and	
10:50	TIH with core barrel			

- Tagged bottom of hole at 941 ft. then lost circulation Unable to regain circulation. TOOH 12:45
- 13:45
- Mud and rocks in ball seat. Will TIH with bit to clean hole. 15:30
- 16:30 NAJ off site.

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CITY OF FORT LAUDERDALE FIVEASH WTP ASR SYS	ТЕМ	DAT HOURS WOR	E(S): KED:1(12/6/97 1040 - 1910	
	Sun Mon	Tue W	ed Thr	Fri Sat x	
JOB NUMBER: 1324007.28090290 Weath	er Clear x	Overcast	Rain	Heavy Rain	
CONTRACTOR: Youngquist Brothers, Inc. Temperatur	re 32 - 50	50 - 70 ×	70 - 85	> 85	
Wir	nd Still	Medium x	High		
Humidi	ty Dry ×	Moderate	Humid	Report No. 11	
	4401/				

	SHIFT SUMMARY						
OBSERVER:	Neil Johnson	START DEPTH: 949					
DRILLER:	Ronnie Thames	END DEPTH: 960					
ACTIVITY:	Coring during pilot hole						
SUB CONTRACTORS:		₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩	-				
FORMATION SAMPLES:							
WATER SAMPLES:							
TESTING:		•					
			-				

TIME	DESCRIPTION
10:40	NAJ on site
	Circulating hole KD with DP #5
10:50	Connecting DP #6 to core barrel string
10:55	Lost circulation at approximately 320 ft.
11:30	Could not regain circulation TOH
12:00	Laid down inner core barrel
12:10	Limestone gravel and clay in ball seat of core barrel - trying to determine where rocks came from
12:15	Cleaning coring pump
12:30	Found rag and a few rocks in pump. Will try again. YBI will call when DP #15 in hole and circulating.
12:50	NAJ off site
17:20	NAJ on site - Ball already dropped. Circulating at 948 ft.
17:24	Begin coring at 948 feet
17:39	Stop coring at 960 feet. Raised core barrel and tagged bottom at 960 feet.
17:40	TOH w/ core barrel
18:50	Recovered approx. 1 ft. of core. Will TIH with bit to clean hole
19:10	NAJ off site

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CITY OF FORT LAUDERDALE FIVEASH WT	P ASR WELL SY	STEM	DAT HOURS WORI		2/6-7/1997 :00 - 07:00
	Sur ×		Tue We	ed Thr	Fri Sat
JOB NUMBER: 1324007.28090290	Weather	Clear	Overcast X	Rain	Heavy Rain
CONTRACTOR: Youngquist Brothers, Inc.	Temperature	32 - 50 ×	50 - 70	70 - 85	> 85
	Wind	Still	Medium x	High	
	Humidity	Dry x	Moderate	Humid	Report No. 12
C		ov.			

	SHIFT SUMMARY		
OBSERVER:	M. Randal Skinner and Neil Johnson	START DEPTH:	974
DRILLER:	Cameron Webster	END DEPTH:	986
ACTIVITY:	Cutting Core at 974 feet.		
SUB CONTRACTORS:			
FORMATION SAMPLES:			
WATER SAMPLES:			
TESTING:		***	

TIME	DESCRIPTION
2100	On site,
	TIH to drill out core hole.
2250	Drilling out core hole at 960 feet bls.
2310	Picking core depth at 974 feet.
0300	TOOH for core run.
0300	TIH with core barrel.
0600	Circulating on bottom.
0617	Begin core run. 60 PSI, 2-4 K on bit.
0630	End core run. First 2 feet were very competent.
0700	TOOH with core.
	Off Site

WRTC_DAILY



CITY OF FORT LAUDER	DALE FIVEASH W	TP ASR SYST	HOURS WORK			DATE(S): <u>12/7</u> ORKED: <u>11</u>		
		an a riser a	un Mon × X	Tue	Wed	Thr	Fri	Sat
JOB NUMBER: 13240	007.28090290	Weather	Clear x	Overc	ast	Rain	Heavy	Rain
CONTRACTOR: Youngqu	ist Brothers, Inc.	Temperature	32 - 50	50 - x	70	70 - 85	>8	35
		Wind	Still	Medi ×	um	High	ndina (10)ada ana da di anga anga anga anga anga anga anga ang	
		Humidity	Dry x	Mode	rate	Humid	Report	
OBSERVER:	SI Neil Johnson	HIFT SUMM	ARY	STA		אַס אדר	7	

OBSERVER:	Neil Johnson	START DEPTH:	987
DRILLER:	Ronnie Thames/Cameron Webster	END DEPTH:	1125
ACTIVITY:	Drilling 12-1/4 pilot hole to 1,125 ft.		**************************************
SUB CONTRACTORS:			*****
FORMATION SAMPLES:			
WATER SAMPLES:	***************************************		······
TESTING:	90		

TIME	DESCRIPTION
11:15	NAJ on site
	Bit at 987 ft., bottom of the previous core interval
11:25	Resume drilling at 987 ft. WOB = 4K ROP = <1 min/ft.
	90% LS-white to gray
11:34	Drilling at 1,000 ft. $WOB = 4K$
11:40	Drilling at 1,003 ft. WOB = $4K$ ROP = 6 min/ft Harder material
12:00	Drilling at 1,008 ft. WOB = $4K$ 4.5 ft. of good material
	Prepare to core
14:06	TIH with core barrel
16:37	Dropped the ball
16:50	Begin coring at 1,009 ft.
17:30	End coring at 1,022 ft.
17:35	TOOH with core barrel
18:00	NAJ off site
21:30	NAJ on site
21:35	Tagged top of core hole at 1009 ft.
22:18	Drilling new hole at 1022 ft.
22:19	Drilling at 1025 ft. WOB = $3-4K$

- 22:42 Drilling at 1,040 ft. WOB = 2K soft
- 22:54 Drilling at 1,050 ft. WOB = 2K soft
- 22:58 Drilling at 1,055 ft. WOB = 3K
- 23:05 Drilling at 1,060 ft. WOB = 3-4K
- 23:19 KD at 1071 ft.
- 00:05 Drilling at 1080 ft. WOB = 2K
- Cuttings 90% LS-white, chalky 10% LS-gray, hard
- 00:21 Drilling at 1,095 ft. WOB = 2K
- 00:58 Drilling at 1,111 ft. WOB = 3K
- Cuttings 90% LS-tan, friable, forams and echinoids 10% LS-gray, hard 01:25 TD pilot hole at 1,125 ft. WOB = 3K
- Loggers scheduled for 07:30. Will run short wiper trip then TOOH
- 01:30 NAJ off site

Daily Op	erations	Report Fo	rm									Dia N	umber: _	742		Cement	Stage Rep	orts
							Super	rintender	nt: <u> </u>	<u></u>					 Stage N	lumber:		Tag: Feet
Job Numb	per:		Well Nur	nber: <u>4</u> .	271		Lead	Driller:						Tav		larrel Pre Flush		arrel Flush
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Pterce Reports Daily Operations Report Form Rig Number: 248 Superintendent: _____ Date: 12-01-77 Stage Number:____ Well Number: AST Lead Driller: Job Number: ___ Shift: 200 Barrel Pre Flush Barrel Flush Time Time Total Details of Operations in Sequence and Remarks From То Hours Туре Barrels Lead CuFt Sacks Drill 324 hold Type Barrels Tail CuFt Sacks Notes Stage Number:_ Tag: ____ Feet **Barrel Pre Flush Production Recap** Barrel Flush Ending Borehole Footage: Beginning Borehole Footage: Casing Size: Footage: Bit # Size Тура Serial Number in Out Barrels Lead Footage Curn. Hours Bit # Size Туре Type CuFt Serial Number in Out Footage Sacks Cum, Hours Barrels Tail CuFt **Employee Name** Type Sacks Total Empl Time Time Time Time Total **Employee Name** Empl Initials Hours From To From To Hours Initials 1922 12 Run There 0700 Notes So and Record and 1120 0700 12 1420 Thatin the 12 5700 12 0705 1925 R--25 Timi 12

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Daily O	perations	Report Fo	orm										Die b	lumber:	222		Cemen	Stage R	eports	i kin
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Job Numb	er: <u>773</u>	33	Well Nur	nber: <u></u>	<u> </u>		Lead D	Driller: _					Shift:	Ta y	E	larrel Pre Flush	Ba	arrel Flush
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Daily Operations Report Form

Cement Stage Reports Rig Number: 248 Jay 5 Superintendent: Date: 12-4-97 Stage Number 978035 Well Number: __ASR ± 1 Job Number: Shift: Dau < Lead Driller: Barrel Pre Flush Barrel Flush ولعارضة فالمحاج شوج فأجرار الا و المار المرام المرا**م منهو عليها.** من المام المراجع المراجع المراجع Time Time Total Details of Operations in Sequence and Remarks From То Hours Type Barrels Lead CuFt Sacks A. 0700 54 A. 25 T Circulate to bottom could mid Туре Barrels Tail CuFt Sacks TODHWINGLit TTHY core bearly muard off That I same Notes TIHY 12 14 hit Dlug wit TOOH Trans alrand out bit 1900 化成化过程 计安全分析 · . . . 化合成分离物 化酸化化 法规定律师 化分子输送器 医马马 Stage Number: Tag: . Feet Barrel Pre Flush Barrel Flush **Production Recap** . بورید می در د يوري وينافع والمرجو المراجع Beginning Borehole Footage: $\mathcal{F}_{i}(\mathbf{r}) = \mathcal{F}_{i}(\mathbf{r}) + \mathcal{F}$ Ending Borehole Footage: Reamed Size: Footage: Casing Size: (ممحر Footage: Bh ø Size Тура Serial Number in Out Barreis Lead 5 Footage Cum, Hours Bit # Size Туре Serial Number Туре CuFt in Out Footage Curn. Hours Sacks <u>___</u> سينيا بالمين. مستريب لون ن : د : د : . را الله ، . The second second Barrels Tail Employee Name Type CuFt Sacks Time Time Total Empl Time Time Total **Employee Name** Empl Initials From To Hours From To Hours Initials a martin the second and the Konnie Thames 0700 1900 12:0 **北部运行的** Sala Constantine Notes 0700 Sonny Roomarine 1900 12-12 Section of the sectio ميلية ميزون وزيرين المدينة المتدينة المراجع BACK SALL SALL 1. 日本 0700 Philip Sharid 19:00 117 المجاور والمحاصر والمحافظ 接入成熟想的 化电子分子 and the second second 0700 12 1900 peza 1400ins بیکی بعد ایک تام بود از از مرکز مرکز ایک میکرد با از مرکز مرکز مرکز مرکز میکرد. Standard St. 1 1. 1948-10 19 (J. 19) the second second Sec. 1.5. زید: میلاند میشد و مدیر ملکاند میشو از مادی مان and the second secon Second . . (PEN) 2.25 1 12 N 14 ار بر ایک میکنون ا من المراجع الم مراجع المراجع ال and the second $\{r_{i}, r_{i}\} \in \{r_{i}\}$ China and Sanathing and 1. 18 . 14 - ALL DANS Sector Sector

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	iction Rec	- <i>U</i> 1U	Ending Borehole Foctage		Reamed	Size: 12/2	Footage:	Casing Si	ze: 2/2 Foot		Barrel Pre Flush	Barre	l Flush
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Stt ø S	Size Ty	<u> </u>	Number In		tage Curn. Hours			rial Numberin	Out Foo	tage Cum. Hours	Type Barrels Lead	CuFt	Sacks
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		Report For			Superintendent	Ja	4 5	Rig I	Number:2	48		tage Reports Tag:	Feet
Job Numb	er:	78035	Well Number:	<u>R = 1</u>	Lead Driller:				Shift: N		Barrel Pre Flush	Barrel Flush	
Time From	Time To	Total Hours		Details of Op	erations in S	equence	and Rem	arks		Туре	Barrels Lead	CuFt Sacks	
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	Iction Rec		۹ Ending Borehole Footage	R	earned Size:	Footage:	Ca	sing Size: <u>26</u>	II Pootage: Z	623 (r. 1	Number: Barrel Pre Flush	Tag: Barret Flush	_ Feet
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Time From	Time To	Total Hours	Employee Name	Empl Time Initials From		Total Hours	Em	ployee Name		Empl nitials	Barrels Tail	CuFt Sacks	5
1900	0700	、第1七番	Caneron Idebster	CW SER	187 - C.				4 1 - 19 - 19 - 19 - 19 - 19 - 19 - 19 -	1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1	hind a start of the second s	lotes	
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\$1900	0700	小12線	Juan Dominguez	JD .			to the state	e de la composición d La composición de la c	file and the second	2000 (S.S.	and the second		
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	20700	(法):125	Adam Pitilon	A.P.Z SEE		R SAME	- Alteria		And we want the second s				
······	·			AND REAL		States and a		1. E +		SAN (58)			
	ALC: NO				藏一部國家當地	- States	化物料的合法		States 2				
			- 4 19 19 - 전망가가 가지, 영국 -	. : : : : : : : : : : : : : : : : : : :		김 아이에 가지?							JAN T

Daily Ope	erations	Report Fo	rm	····						Cement S	tage Reports	-1. S.
					Superintendent:			Rig Number: کمیک Date: ∠	2-7-97	Stage Number		Feet
Job Numbe	er: <u>978</u>	2035	Well Number: <u>MSR</u>	<u></u>	Lead Driller:		en ske ge Agerget	Shift:	Day	Barrel Pre Flush	Barrel Flush	
Time From	Time To	Total Hours		Details of Ope	erations in S	equence	and Remarks			Type Barrels Lead	CuFt Sacks	
			TOOH Trace to see	1 Laid	aus Sam	c	et na et part			Type Barrels Tail	CuFt Sacks	E. F.
	- '		TTH 712/14 bit ta	17-d @974"	t the second	• .			e transfer al		Cachs	-
			clean out once ho									
			Drilled Devitale F19		cire. hol	e clea.	,		÷ .		Votes	
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			Core \$1 1008 +0 102	1	13'							
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Produ Beginning B	ction Rec orehole Fool	tage: <u>974</u>	Ending Borehole Footage	R	amed Size: <u>12 1</u> 4	Footage:	Casing Size	22 Footage:	201	Barrel Pre Flush	Barrel Flush	
		0	Number In Out F	ootage Cum. Hours			rial Number In	Out Footage	Cum, Hours	Type Barrels Lead	CuFt Sack	s
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Daily Op	erations	Report Fo	rm						Oila	Cement	Stage Repo	rts
				s	uperintendent:	_ Jai	<u>, </u>	Rig Number: Date:	12-7-97	Stage Number:		
Job Numb	er: <u>9</u> 7	8036	Well Number:	<u>srª1</u> i	ead Driller:		•		Night	Barrel Pre Flush		Flush
Time	Time	Total							· . J			en Alexandra
From	То	Hours		Details of Ope	rations in S	equence	and Remarks			Type Barrels Lead	CuFt	Sacks
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Prod	uction Rec				0.1	<u>></u> 	<u> </u>	anna 1913 an an an Anna Anna Anna An	ng - Alter Alter	Stage Number: Barrel Pre Flush	Tag Barre	: Feet Flush
	Borehole Foot		Ending Borehole Footage	1125' Rea	umed Size: 12 ¹	Footage:	Casing Size:	26" Footage	201			
Bit #	Size T	ype Serial i	Number in Out F	ootage Cum. Hours	Bit # Size	Type Ser	al Number In	Out Footage	Cum. Hours	Type Barrels Lead	CuFt	Sacks
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Time	Time	Total	Employee Name	Empl Time	Time	Total	Employee	Name	Empl	Type Barrels Tail	CuFt	Sacks
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LITHOLOGIC DESCRIPTION

Date:12-10-97Contractor: Youngquist Brothers.Location: 5-ASH ASRWell: ASR-1

- 0'-30' Sand 100%, white to light tan and brown, coarse grained, well rounded and well sorted, unimodal, quarts based with trace lithics-heavies-and feldspar. Sand is mostly clean but has been mixed with drilling mud and fill material.
- 30'-60' Sand 100%, white to light tan, fine grained, well rounded and well sorted, unimodal, quarts based with trace lithics-heavies-and feldspar. Sand is mostly clean.
- 60'-90' Limestone 75%, medium to light gray, wackestone packstone, contains carbonate sandquarts sand, recrystalized (clear tan rhombs), well cemented, intergranular porosity is present. Rock is recrystalized calcite. Contains fragments of plecypoda, and gastropoda.

Sand 25%, white to light tan and brown, fine grained, well rounded and well sorted, unimodal, quarts based with trace lithics-heavies-and feldspar. Sand is mostly clean.

90'-170' Limestone 65%, light gray to white, fine grained wackestone - packstone, contains carbonate sand- abundant bioclast fragments- and trace quarts and lithics, poorly cemented, porosity is present.

Sand 30%, white to light tan, fine grained, well rounded and well sorted, unimodal, quarts based with trace lithics-heavies-and feldspar. Sand is mostly clean but has been mixed with drilling mud.

Shell 5%, tan opaque, recrystalized and low Mg calcite constituents, some are etched, breakage is common (possibly secondary), hash like in zones. Fossils including gastropods and plecypods.

170'-200 Limestone 95%, medium to light gray, wackestone-packstone, contains carbonate sandquarts sand, recrystalized (clear tan rhombs), well cemented, intergranular and moldic porosity is present. Rock is recrystalized calcite. Contains fragments of plecypoda, and gastropoda.

Sand 5%, white to light tan and brown, fine grained, well rounded and well sorted, unimodal, quarts based with trace lithics-heavies-and feldspar. Sand is mostly clean.

200-250 Limestone, 95%, medium to dark gray, wackestone to recrystalized packstone, contains carbonate sand- bioclasts- and trace quarts and lithics, possible Mn, recrystalized (clear tan rhombus, can make up as much as 25% of total volume), cemented with abundant pore filling calcite spar cement (white),moderately cemented, porosity is

Observer mRP Page (of 5

Sand 5%, white to light tan and brown, fine grained, well rounded and well sorted, unimodal, quarts based with trace lithics-heavies-and feldspar. Sand is mostly clean.

250-270 Limestone, 85%, medium to dark gray, wackestone to sandy packstone, contains carbonate sand- bioclasts- and trace quarts and lithics, possible Mn, recrystalized (clear tan rhombus, can make up as much as 25% of total volume), cemented with abundant pore filling calcite spar cement (white),moderately cemented, porosity is

Sand 5%, white to light tan and brown, fine grained, well rounded and well sorted, unimodal, quarts based with trace lithics-heavies-and feldspar. Sand is mostly clean.

Shell 10%, tan opaque, recrystalized and low Mg calcite constituents, some are etched, breakage is common (possibly secondary), hash like in zones. Fossils including gastropods and plecypods.

270-310 Limestone, 65%, medium gray to light green, wackestone, contains carbonate sandbioclasts- and trace quarts and lithics, possible Mn, recrystalized (clear tan rhombus, can make up as much as 25% of total volume), cemented with abundant pore filling calcite spar cement (white), moderately cemented, porosity is

Yellowish gray to olive clay, 20%, The clay is plastic, and interbedded with minor light olive gray to white limestone. The clay contains quartz sand, silt, and minor plecypoda material, and calcite and dolomite cement. Contains isolated occurrences of plecypods. Clay is dominantly montmorillonite.

Sand 5%, white to light tan and brown, fine grained, well rounded and well sorted, unimodal, quarts based with trace lithics-heavies-and feldspar. Sand is mostly clean.

Shell 5%, tan opaque, recrystalized and low Mg calcite constituents, some are etched, breakage is common (possibly secondary), hash like in zones. Fossils including gastropods and plecypods.

310-350 Clay, 90%, Yellowish gray to olive ,The clay is nodular,and interbedded with minor light olive gray to white limestone. The clay contains quartz sand, silt, and minor plecypoda material, and calcite and dolomite cement. Contains isolated occurrences of plecypods. Clay is dominantly montmorillonite.

Limestone 10%, light gray to white, fine grained wackestone - packstone, contains carbonate sand- abundant bioclast fragments- and trace quarts and lithics, poorly cemented, porosity is present.

350-425 Clay, 95%, Yellowish gray to olive ,The clay is nodular,and interbedded with minor light olive gray to white limestone. The clay contains quartz sand, silt, and minor plecypoda material, and calcite and dolomite cement. Contains isolated occurrences of plecypods. Clay is dominantly montmorillonite.

Observer m.R.A. Page 2 of 5

Shell 5%, tan opaque, recrystalized and low Mg calcite constituents, some are etched, breakage is common (possibly secondary), hash like in zones. Fossils including gastropods and plecypods.

- 425-450 Clay, 100%, light green to dark olive, the clay is plastic, and is interbedded with minor amounts of light olive gray to white limestone. The clay contains quartz sand, silt, and minor plecypoda material (fragmented), and calcite and dolomite cement. Porosity and, permeability are absent due to plastic nature of clay.
- 450-470 Limestone, 65%, medium gray to light green, wackestone, contains carbonate sandbioclasts- and trace quarts and lithics, possible Mn, recrystalized (clear tan rhombus, can make up as much as 25% of total volume), cemented with abundant pore filling calcite spar cement (white),moderately cemented, porosity is

Yellowish gray to olive clay, 20%, The clay is plastic, and interbedded with minor light olive gray to white limestone. The clay contains quartz sand, silt, and minorplecypoda material, and calcite and dolomite cement. Contains isolated occurrences of plecypods. Clay is dominantly montmorillonite.

Sand 5%, white to light tan and brown, fine grained, well rounded and well sorted, unimodal, quarts based with trace lithics-heavies-and feldspar. Sand is mostly clean.

Shell 5%, tan opaque, recrystalized and low Mg calcite constituents, some are etched, breakage is common (possibly secondary), hash like in zones. Fossils including gastropods and plecypods.

- 470-550 Clay, 100%, dark olive, the clay is plastic, and is interbedded with minor amounts of light olive gray to white limestone. The clay contains quartz sand, silt, and minor plecypoda material (fragmented), and calcite and dolomite cement. Porosity and, permeability are absent due to plastic nature of clay.
- 550-555 Limestone 100% Complexly interbedded, argillaceous limestone. Limestone is generally light gray to white, poor to moderately indurated, mudstones and wackestones. Porosity is low.Grains include minor fossil debris, and peloids.
- 555-690 Clay, 100%, light green to gray, the clay is plastic, and is interbedded with minor amounts of light olive gray to white limestone. The clay contains quartz sand, silt, and minor plecypoda material (fragmented), and calcite and dolomite cement. Porosity and, permeability are absent due to plastic nature of clay.
- 690-720 Limestone90% Complexly interbedded, argillaceous limestone. Limestone is generally light gray to white, poor to moderately indurated, mudstones and wackestones. Porosity is low.Grains include minor fossil debris, and peloids.

Clay, 10%, light green to gray, the clay is plastic, and is interbedded with minor amounts of light olive gray to white limestone. The clay contains quartz sand, silt, and minor

Observer <u>nRS</u> Page <u>S</u> of <u>5</u>

plecypoda material (fragmented), and calcite and dolomite cement. Porosity and, permeability are absent due to plastic nature of clay.

720-910 Clay, 90%, light green to gray, the clay is plastic, and is interbedded with minor amounts of light olive gray to white limestone. The clay contains quartz sand, silt, and minor plecypoda material (fragmented), and calcite and dolomite cement. Porosity and, permeability are absent due to plastic nature of clay.

Limestone10% Complexly interbedded, argillaceous limestone. Limestone is generally light gray to white, poor to moderately indurated, mudstones and wackestones. Porosity is low.Grains include minor fossil debris, and peloids.

910-970 Clay, 20%, light green to gray, the clay is plastic, and is interbedded with minor amounts of light olive gray to white limestone. The clay contains quartz sand, silt, and minor plecypoda material (fragmented), and calcite and dolomite cement. Porosity and, permeability are absent due to plastic nature of clay.

Limestone80% Complexly interbedded, argillaceous limestone. Limestone is generally medium gray to white, poor to moderately indurated, mudstones and wackestones. Porosity is low.Grains include minor fossil debris, and peloids, abundant phosphate is present.

970-1030 Limestone, 90% white to medium gray, moderately indurated boundstones to wackstones, locally grades to packstone and grainstone. Contains phosphate nodules. Some bioclasts are represented as moldic porosity, and high secondary porosity and permeability are present (intergranular, interparticle and moldic). Locally the rock is recrystalized. Well indurated, and contains

coarse spar cement (reducing). Biotics include reef fauna assemblage (diverse mollusk, foram, bryozoan, corals).

Clay, 10%, light green to gray, the clay is plastic, and is interbedded with minor amounts of light olive gray to white limestone. The clay contains quartz sand, silt, and minor plecypoda material (fragmented), and calcite and dolomite cement. Porosity and, permeability are absent due to plastic nature of clay.

1030-1050 Limestone, 80%, Moderately soft, highly fossiliferous, very pale orange to tan, pelletal, wackestones, and packstones, with 5% to 10% intergranular porosity. Locally, the unit is composed of thin layers of very hard micrite, of low porosity and permeability. Abundant foraminifera, and echinoids.

Clay, 20%, light green to gray, the clay is plastic, and is interbedded with minor amounts of light olive gray to white limestone. The clay contains quartz sand, silt, and minor plecypoda material (fragmented), and calcite and dolomite cement. Porosity and, permeability are absent due to plastic nature of clay.

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1050-1125 Limestone, 80%, Moderately soft, highly fossiliferous, very pale orange to tan, pelletal, wackestones, and packstones, with 15% to 40% intergranular porosity. Locally, the unit is composed of thin layers of very hard micrite, of low porosity and permeability. Abundant foraminifera, and echinoids.

Observer	Zer	R	<u>e</u>
Page	5	of	5

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WELL # ASR-1 CORE DESCRIPTION

DATE(S): 12/6/97

CITY OF FORT LAUDERDALE - FIVEASH

WTP ASR WELL

JOB NUMBER 1324007 COST CODE 28090290

CONTRACTOR: Youngquist

TOTAL DEPTH:	959	feet
COUNTY:	Broward	
OWNER:	City of Fort Lauderdale	
DRILLING METHOD:	Carbide Aggressive Drilling	
DRILLER(S):	Ronnie Thames	
DATUM POINT:	Pad level	
DATUM POINT	8.0 NGVD	
ELEVATION:		
HYDROLOGIC UNITS:	Upper Floridan	
% RECOVERY	10 %	
CORED INTERVAL	949 - 959	

1	DEPT below	'H / pad)	DEPTH INTERVAL	DESCRIPTION	DRILLING COMMENTS
949	to	950	I	Limestone, argillaceous, Limestone is medium gray to white, poor to moderately indurated, succrosic mudstones and wackestones. Porosity is inter-granular and low. Grains include trace fossil debris, and peloids, abundant phosphate is present.	Penetration rate = 2 minute/foot. Weight on bit = 2 K. RPM of kelly = 30. Pump pressure held at a constant of 65 psi.
950	to	959	9	NO RECOVERY	Penetration rate = 30 seconds/foot. Weight on bit = 0 K. RPM of kelly = 30. Pump pressure held at a constant of 85 psi.



WELL # ASR-1 CORE DESCRIPTION

DATE(S): 12/7/97

CITY OF FORT LAUDERDALE - FIVEASH

WTP ASR WELL

JOB NUMBER 1324007 COST CODE 28090290

CONTRACTOR: Youngquist

TOTAL DEPTH:	986	feet
COUNTY:	Broward	
OWNER:	City of Fort Lauderdale	
DRILLING METHOD:	Carbide Aggressive Drilling	
DRILLER(S):	Ronnie Thames	
DATUM POINT:	Pad level	
DATUM POINT	8.0 NGVD	
ELEVATION:		
HYDROLOGIC UNITS:	Upper Floridan	
% RECOVERY	10 %	
CORED INTERVAL	974 - 986	

)EPT below		DEPTH INTERVAL	DESCRIPTION	DRILLING COMMENTS
974	to	975	Ĩ	Limestone, limestone is light gray to white, well indurated, mudstone to wackestone. Porosity is inter-granular and moldic. Permeability is low. Grains include fossil debris, and peloids, minor phosphate is present.	Penetration rate = 5 minute/foot. Weight on bit = 2 K. RPM of kelly = 30. Pump pressure held at a constant of 70 psi.
975	to	986	9	NO RECOVERY	Penetration rate = 30 seconds/foot. Weight on bit = 0 K. RPM of kelly = 30. Pump pressure held at a constant of 85 psi.



WELL # ASR-1 CORE DESCRIPTION

DATE(S): 12/8/97

CITY OF FORT LAUDERDALE - FIVEASH

WTP ASR WELL

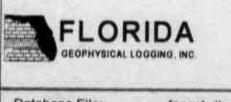
JOB NUMBER 1324007 COST CODE 28090290

CONTRACTOR: Youngquist

TOTAL DEPTH:	1022	feet
COUNTY:	Broward	
OWNER:	City of Fort Lauderdale	
DRILLING METHOD:	Carbide Aggressive Drilling	
DRILLER(S):	Ronnie Thames	
DATUM POINT:	Pad level	
DATUM POINT	8.0 NGVD	
ELEVATION:		
HYDROLOGIC UNITS:	Upper Floridan	
% RECOVERY	85 %	
CORED INTERVAL	1008 - 1022	

	(loci bolon pad)		DEPTH INTERVAL	DESCRIPTION	DRILLING COMMENTS			
1008	to	1017	8	Limestone, white to medium gray, moderately indurated boundstones to wackstones, locally grades to packstone and grainstone. Contains phosphate nodules. Some bioclasts are represented as moldic porosity, and high secondary porosity and permeability are present (intergranular, interparticle and moldic). Locally the rock is recrystalized. Well indurated, and contains coarse spar cement (reducing). Biotics include reef fauna assemblage (diverse mollusk, foram, bryozoan, corals).	Penetration rate = 5 minute/foot. Weight on bit = 2-4 K. RPM of kelly = 30. Pump pressure held at a constant of 70 psi.			
1017	to	1022	5	NO RECOVERY	Penetration rate = 30 seconds/foot. Weight on bit = 0 K. RPM of kelly = 30. Pump pressure held at a constant of 85 psi.			

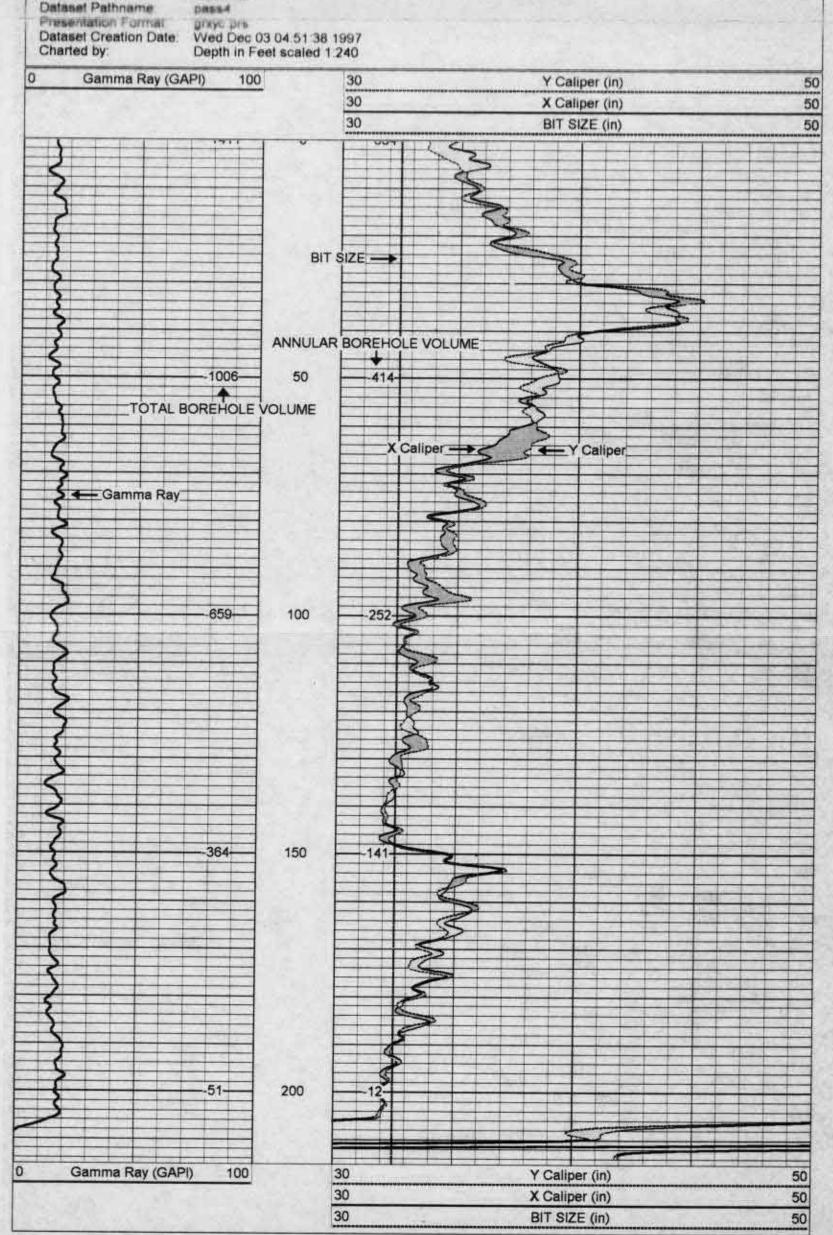
Casing record Surface String Prof. String Production String Inter	Casing Record	TWO 1	ber	Witnessed By	Recorded By	Location	Equipment Number	Time Logger on Bottom	Time Well Ready	Estimated Cement Top	Max Renorded Term	Type Huid	Upen Hole Size	Top Log Interval	Bottom Logged Interval	Depth Logger	Depth Uniler	Run Number	Date	Field	ASR-1 FIVE A BROW	SH	ww		ATS	SON	CEOPH	FL
Size	Sze	12.25" 32.5" SURF	Bit From					3						and the second	A State State State					Permanent Datum Log Measured From Dnilling Measured From		Location	Country	Field	Well	Company	GEOPHYSICAL LOGGING, INC	FLORIDA
Nigiv	WeekEt	207	To	R.SKINNER	P.McHUGH	FT. MYERS	103	0430	00500	NA	NIN	WAIEK	32.5	SURFACE	207	20/	207	OMI	3-DEC-97	n PAD om PAD From PAD			BROWARD	FIVE ASH WWTP	ASR-1	MONTGO	3, INC	A
ie			Size Weight	-	KLEE															Elevation				WWTP		MONTGOMERY WATSON	LOG	GAMMA RAY
	-	4	ght From																	PAD			State/Prv FLORIDA			TSON	「日本	RAY
Bottom	Dallacas		To										No. of Concession, Name							Elevation K.B D.F G.L	NONE	Other Services	IDA					
iterpretation,	etations , and w	e shall	not,	exc	ept.	in tì	18 C	ase	e of	gro	155	or v e by	willf y an	ul n iy o	egli f ou	igei ur c	nce	on	our , aç	rements and we part, be liable tents or employ current Price Si	or responsives. Thes	sible f	or any lo	SS. CO	sts. c	amades	or expenses	incurred
	-		-	-	_				-	-	-	-	-	-	-		(Co	mm	ents		-	-		_	1		

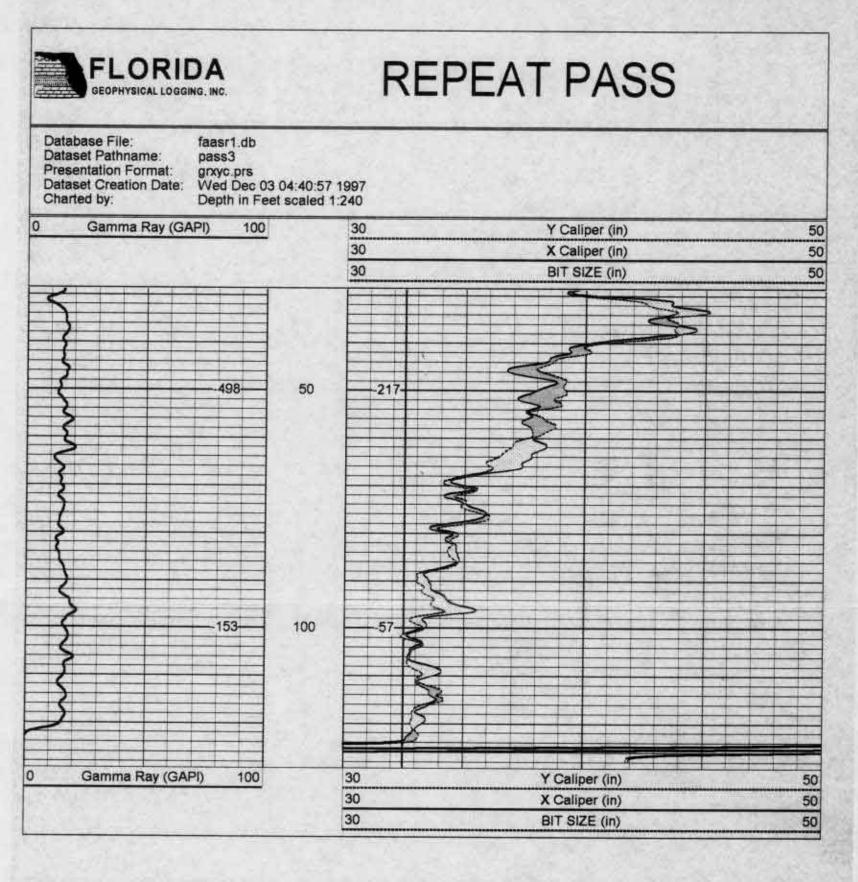




Database File

faasr1 db



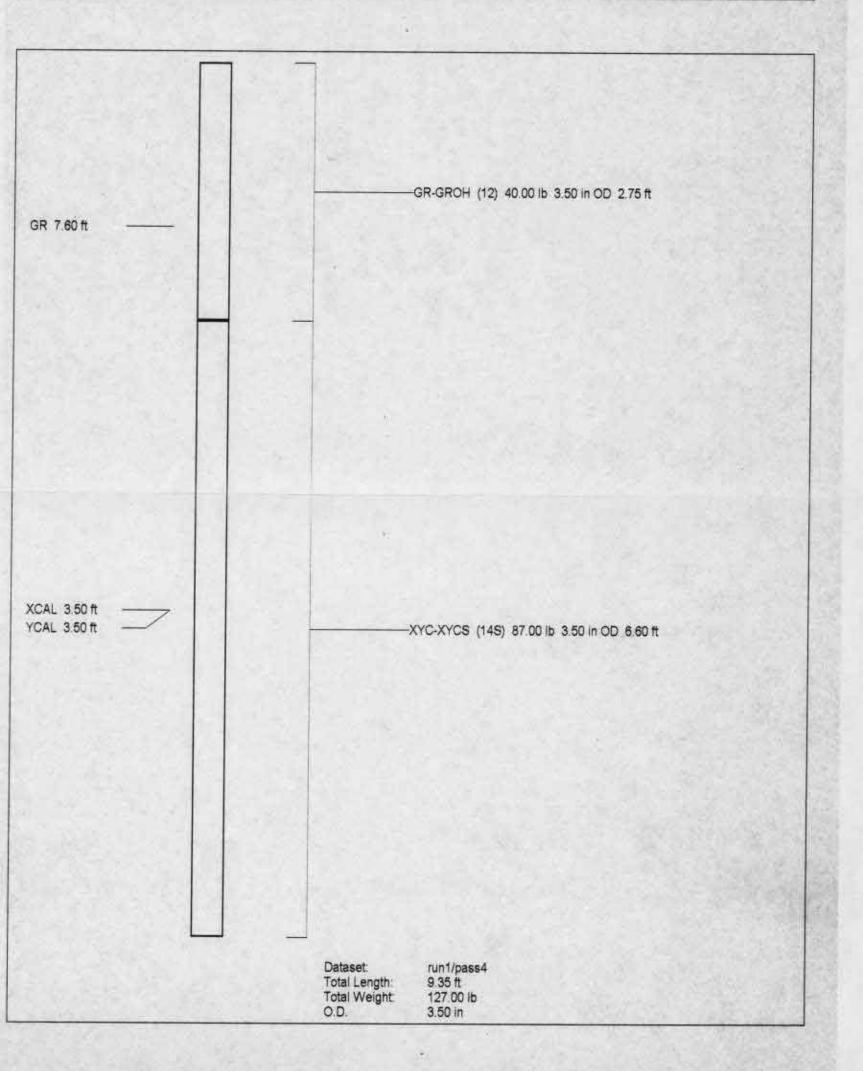


Serial Number:	145	10 10 St. 19 St.	1.1.1
ool Model: Performed:	XYCS Wed Dec 03 04:2	1:19 1997	
Small Ring:	20 57	in in	
Large Ring:	57	in	
	X Caliper	Y Caliper	
Reading with Small Ring: Reading with Large Ring:	533.634 1051.55	487.187	cps
		959.059	cps
Gain: Offset:	0.0714399 -18.1227	0.0784111 -18.2009	

Serial Number:

12

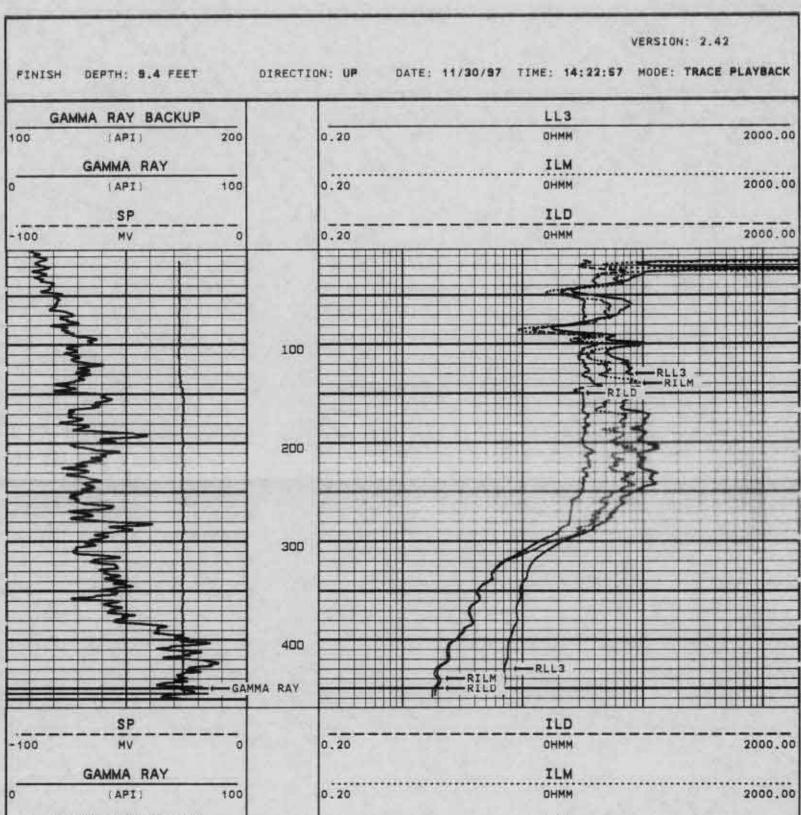
Calibrator Value: Background Reading: Calibrator Reading:	100 0 99.0549	GAPI cps cps		
Sensitivity:	1.00954	GAPI/cps		



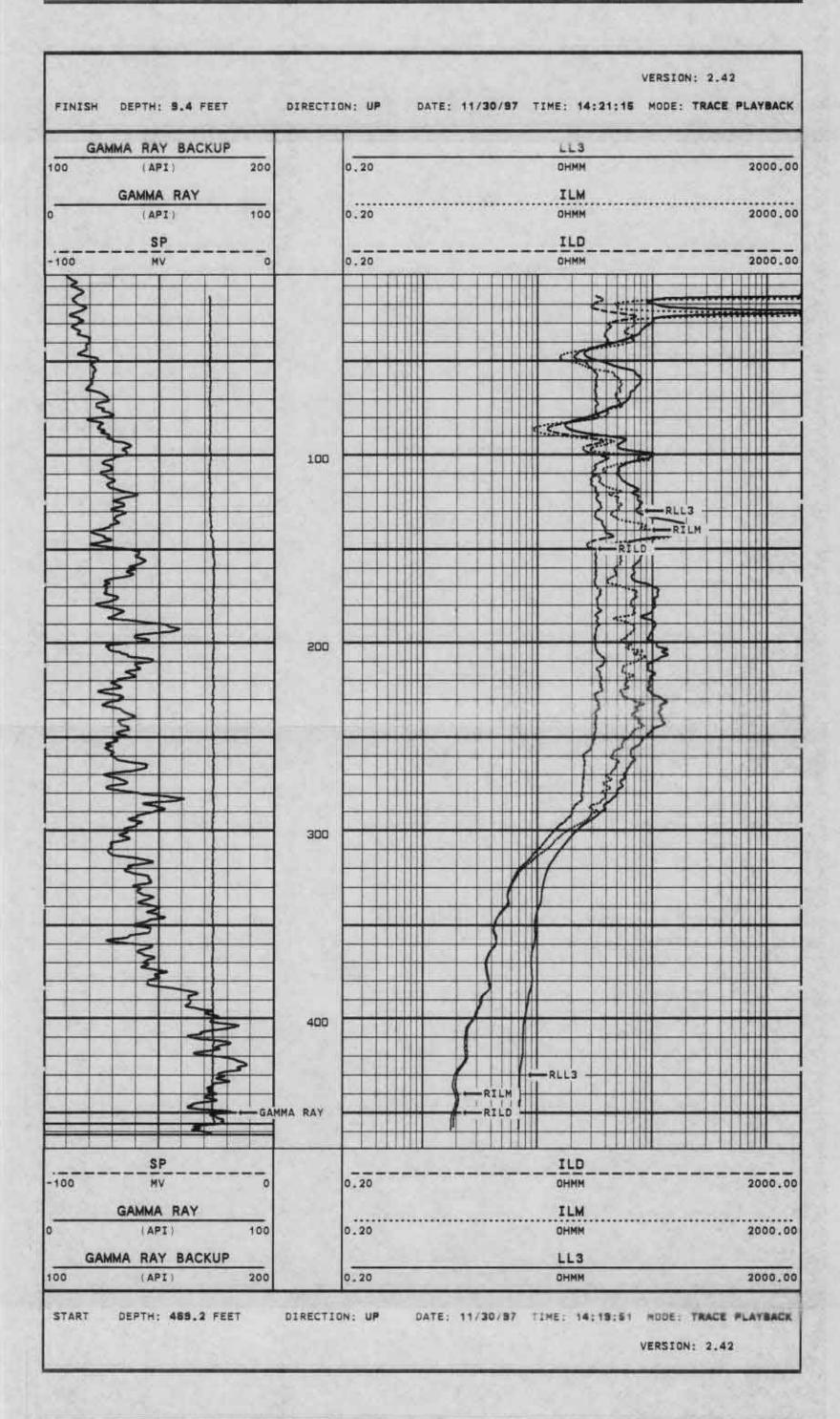
ONE 12	NO.	в	WITNESSED BY	RECORDED BY	MENT		LEVEL	DENSITY-VISCOSITY	SALINITY. PPM CL	TYPE FLUID IN HOLE	OPERATING RIG TIME	LOGGED INTERVAL	DEPTH-DRILLER	TYPE LOG	RUN NO.	DATE	PERMANENT DATUM P LOG MEASURED FROM DRILLING MEASURED	FILE NO					
1/4" 470*	BIT PI	BOREHOLE RECORD			CATION	TEMP. DEG F.		SCOSITY	PPM CL	N HOLE	GTIME	VAL	R			ALC: NO	FROM PAD LEVEL	LOCATION	COUNTY	FIELD	WELL	COMPAN	
SURFACE	+ - 1	CORD	N. JOHNSON	6	102 FTM	NA	FULL	NA	NA	m l	HOL	470' 10	470	DIL/LL3/SP/GR	ONE	30-NOVEMBER-1997	FT.ABOVE	TWP	BROWARD	FIVEASH	ASR #1	COMPANY CITY OF F	FLORID/ GEOPHYSICAL LOGGING, I
	SIZE W											SURFACE		P/GR		ER-1997	PERMANENT DATUM	RGE				FT.LAUDERDALE	IDA GGING, INC
	WGT. FROM	CASING RECORD	A DESCRIPTION OF THE PARTY OF T									10					UM ELEV.:K.B. G.L.	GAMMA RAY	STATE FLORIDA			W.T.P.	DUAL INDUCTION

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.

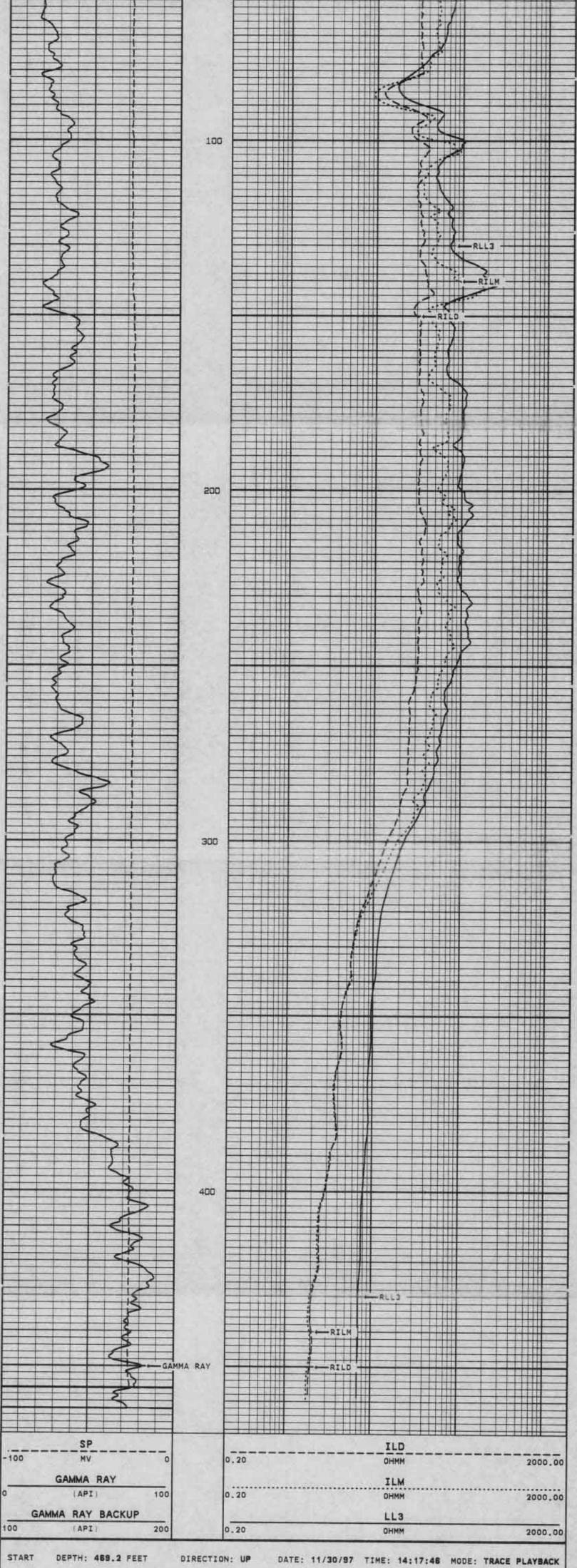
-- GAMMA RAY -- 3 FT. LONG MEASURE POINT 25.5 FT. FROM BOT -- DUAL INDUCTION/LATERLOG3 -- TOTAL TOOL STRING LENGTH = 27 FT. ---- SP MEASURE POINT -- 18.3 FT. FROM BOT -- ILD MEASURE POINT -- 18.3 FT. FROM BOT -- TEM MEASURE POINT -- 12.5 FT. FROM BOT -- LL3 MEASURE POINT -- 3.2 FT, FROM BOT -- BOT



	.3	LI		ACKUP	AMMA RAY	GA
2000.00	MM	он	0.20	200	(API)	00
E: TRACE PLAYBACK	14:21:36 MODE:	DATE: 11/30/97 TIME:	IRECTION: UP	9.2 FEET D	DEPTH: 4	START
ION: 2.42	VERSIC					



GA	AMMA RAY BACKU	P	1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	LL3	
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,	(API)	100	0.20	ОНММ	2000.0
	SP			ILD	
100	MV	0	0.20	OHMM	2000.0
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VERSION: 2.42

GA	AMMA RAY BACKU	P		LL3	
100	API	200	0.20	OHMM	2000.0
	GAMMA RAY			ILM	
	(API)	100	0.20	онмм	2000.0
	SP			ILD	
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1	1 1	-GAMMA RAY			
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	SP			ILD	
100	MV	0	0.20	онмм	2000.0
	GAMMA RAY	1		ILM	
	(API)	100	0.20	онмм	2000.00
GA	MMA RAY BACKUP			LL3	
00	(API)	200	0.20	OHMM	2000.00

		MASTER	CALIBRAT	ION SUMMAR	Y		
FILE:		DATE: 11/	30/97	TIME: 14:	12	VERSION: 2.	42
			ILD TOOL	#10			
		DATE: 11	/30/97	TIME: 10	: 05		
	MEASURED	UNITS	STANDARD	MINIMUM	MAXIMUM	DEVIATION	UNITS
LOOP OPEN LOOP CLOSED	45.0 681.7	MV MV	0.0 400.0	-0.3 398.7	1.5 401.5	0.41 0.55	ММНО ММНО
			ILM TOOL	#10			
		DATE: 11	/30/97	TIME: 12	:00		
				MINIMUM		DEVIATION	UNITS
LOOP OPEN LOOP CLOSED		MV MV	0.0 454.0	-0.9 463.1	1.1 464.9	0.46 0.30	ммно ммно
			LL3 TOOL	#10			
		DATE: 11	/30/97	TIME: 10	: 05		
	MEASURED	UNITS				DEVIATION	UNITS
BOX 1000 0HMS	79.7	MV	1.0	1.0	1.1	0.02	OHMS OHMS
BOX 100 CHMS BOX 10 CHMS	108.7 409.2 2543.6	MV MV MV	10.0 100.0 1000.0	99.8	100.4	0.05 0.13 1.11	OHMS

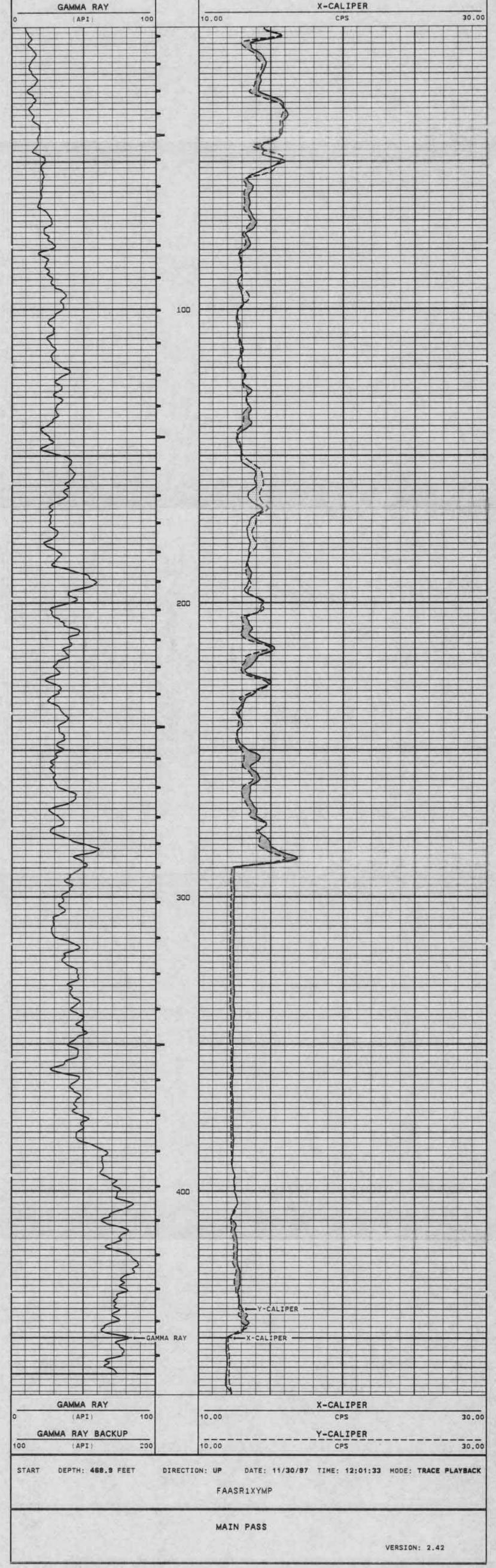
COMPANY	CITY OF FT.LAUDE	RDALE	
	FIVEASH WATER TR	EATMENT PLANT	
WELL	ASR #1		
FIELD	FIVEASH	STATE	

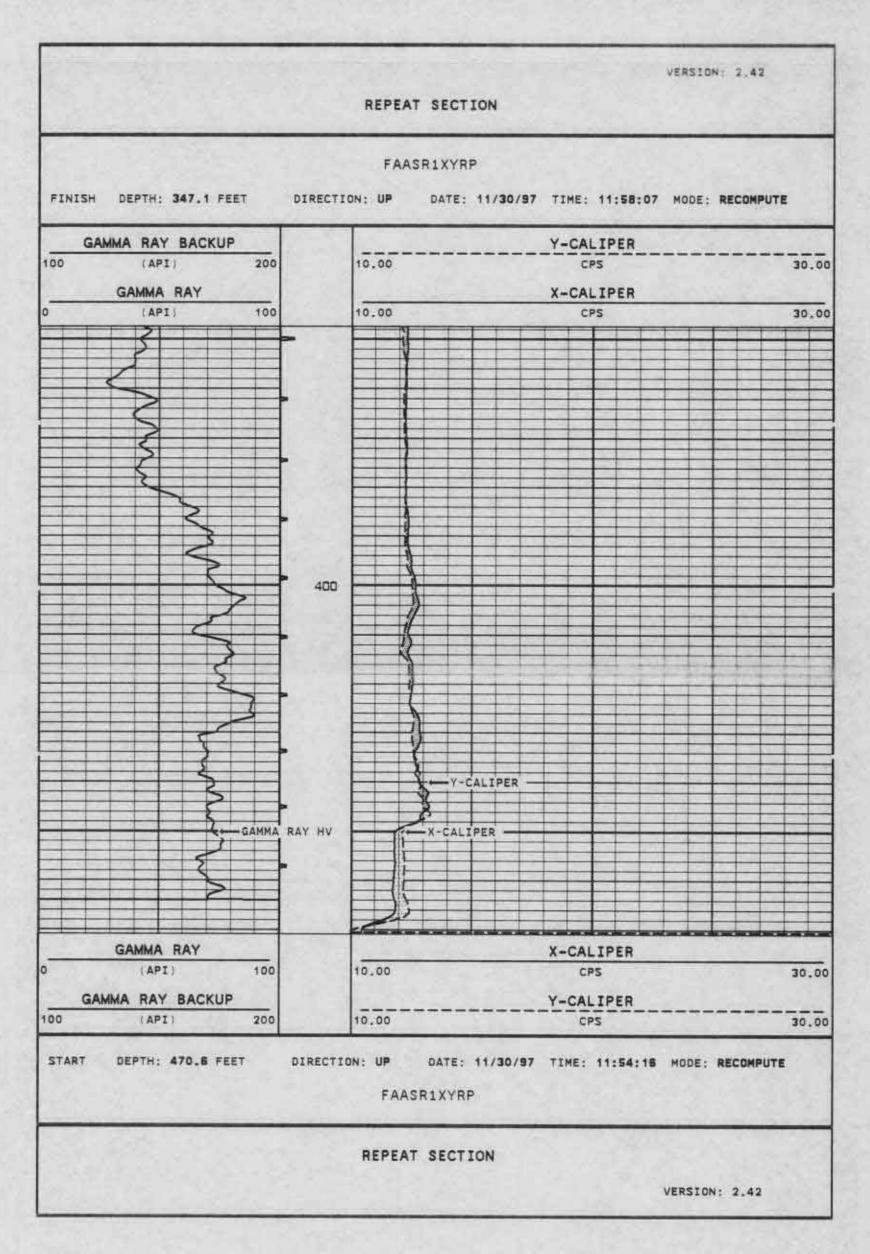
	RUN NO		WITNESSED	RECORDED BY	EQUIPMENT-LOCATION	MAX. REC. TEMP. DEG	LEVEL	DENSITY	SALINIT	OPERATING RIG TIME	LOGGED INTERVAL	DEPTH-LOGGER	DEPTH-DRILLER	TYPE LOG	RUN NO	DATE	PERMANENT DATUM PAD LEVEL LOG MEASURED FROM PAD DRILLING MEASURED FROM PA	FJ	LE NO				-	
12 1/4"	BIT	BOREHOLE	BY	BY	-LOCATIO	TEMP. D		DENSITY-VISCOSITY	SALINITY PPM CL	RIG TIM	TERVAL	GER	LLER				DATUM P RED FROM MEASURED	Dac	50	8	FI	WELL	co	
470'		LE RECORD			N	EG F.		TY		n m							PAD FROM P	Î	LOCATION		FIELD 1		MPANY_	EOPH
SURFACE	1 10	õ	N. JOHNSON	LEE	102 FTM	NA	FULL	NA	NA	1.5 HOURS	1.1.4	470'	470'	X-Y CALIPER/GR	ONE	30-NOVEMBER-1997	EL FT.ABOVE	INF		BROWARD	FIVEASH	ASR #1	COMPANY CITY OF FT	GEOPHYSICAL LOGGING, I
	SIZE										SURFACE			ER/GR		ER-1997	PERMANENT DATUM	Xor		100			FT.LAUDERDALE W.T.P.	GGING, IN
	WGT -	CASING															ATUM	1		TS .	-		LE W.	0
	FROM	CASING RECORD									TO	A TO A	The second s				ELEV.:K.B. D.F. G.L.		DIL/LL3/SP	STATE FLORIDA			T.P.	X-Y CALIPER GAMMA RAY LOG
	TO																		SP	DA				77

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	REMARKS
	XY CALIPER/GAMMA RAY TOOL STRING CONFIGURATION
11	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
Ш	807

		MAI	N PASS		VERSION: 2.42
			SR1XYMP		
FINISH DEPTH: 4.1 FEET		DIRECTION: UP	DATE: 11/30/97	TIME: 12:14:08	MODE: TRACE PLAYBACK
GAMMA RAY BACKUP	200	10.00		Y-CALIPER CPS	30.0





		MASTER	R CALIBRAT	ION SUMMAR	Y		
FILE:		DATE: 11	30/97	TIME: 14:	01	VERSION: 2.	42
			X-CALIPER	#01			
		DATE: 07	/08/97	TIME: 17	:45		
	MEASURED	UNITS		MINIMUM	MAXIMUM	DEVIATION	UNITS
5" 10" 20" 29,5"	391.2 466.1 725.9		6.0	5.9 9.9 20.0	5.2 10.2 20.1	0.11 0.08 0.05	CPS
			Y-CALIPER	#01			
		DATE: 07	/08/97	TIME: 17	:45		
	MEASURED	UNITS	STANDARD	MINIMUM	MAXIMUM	DEVIATION	UNITS
6" 10"	352.5	CPS	5.0	5.9 9.9	F 1	0.14	
20" 29.5"	667.6 959.0	CPS CPS CPS	20.0 29.5	19.9	20.1 29.9		CPS CPS
			GR API CA	#12			
		DATE: 08	/23/97	TIME: 18	: 20		
	MEASURED	UNITS	STANDARD	MINIMUM	MAXIMUM	DEVIATION	UNITS
		CPS	0.0	6.8	44 6	5.70 12.39	

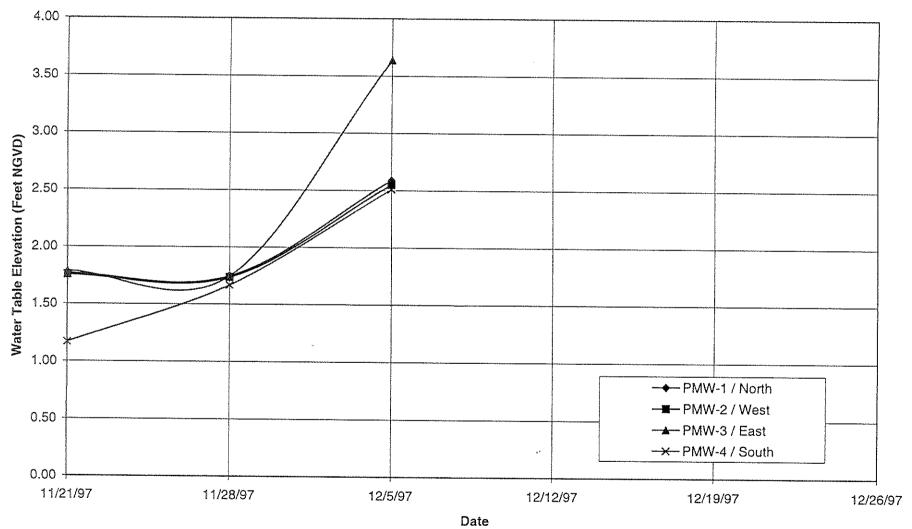
COMPANY	CITY OF FT.LAUDERDALE	1 State of the second	
	FIVEASH WATER TREATMEN	NT PLANT	
WELL	ASR #1	Contraction of the second	1 AND AND AND AND
FIELD	FIVEASH	STATE FLORIDA	

		ASR-1																															
	×	PMW-1 / Nonh								PMW-2 / West							PMW-3 / East							PMW-4 / South									
Date	Reporting Agency	Depth to Water (ft)	Elevation Top of Casing (tt)	Elev	Field Temp (°C)	Lab Temp (°C)	Conductivity (µmhos/cm)	Chloride (mg/)	TDS (mg/)	Depth to Water (ft)	Elevation Top of Casing (#)	Elevation Water Table (ft)	Field Temp ("C)	Lab Temp (°C)	Conductivity (µmhos/cm)	Chloride (mg/l)	TDS (mg/l)	Depth to Water (ft)	Elevation Top of Casing (tt)	Elévation Water Table (ft)	Field Temp (°C)	Lab Temp (°C)	Conductivity (µmhos/cm)	Chloride (mg/l)	TDS (mg/l)	Depth to Water (ft)	Elevation Top of Casing (t)	Elevation Water Table (ft)	Field Temp (°C)	Lab Temp (°C)	Conductivity (µmhos/cm)	Chloride (mg/l)	TDS (mg/l)
11/21/97	Sanders		10.23			26.7	539	30	335		10.44			26.1	524	12	326		10.25			26.5	667	55	413		9.69			26.5	156	10	104
11/21/97 11/26/97 12/5/97 12/12/97 12/12/97 12/19/97 12/26/97	FTL FTL FTL	8.46 8.48 7.64		1.77 1.75 2.59			506 638 641	12 47 48	320 250	8.68 8.70 7.89		1.76 1.74 2.55	27.5 27.8 27.5	22.9 23.5	523 504 471	28 5 10	532 50	8.46 8.50 6.61		1.79 1.75 3.64		23.2 23.3	661 404 390	49 15 18	100 204	8.52 8.02 7.18		1.17 1.67 2.51	27,5 27,8 26.5	22.9 23.3	179 149 155	6 5 8	32 86

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Wat Level ASR

City of Ft. Lauderdale Fiveash WTP ASR-1 Pad Monitor Well Water Level Data



Chloride ASR

City of Ft. Lauderdale Fiveash WTP ASR-1 Pad Monitor Well Chloride Data

