PROGRESS ENERGY FLORIDA, INC.

CRYSTAL RIVER UNIT 3

DOCKET NUMBER 50 - 302 / LICENSE NUMBER DPR - 72

ATTACHMENT

RESPONSE TO REQUEST FOR DOCUMENTS

BINDER 1 OF 3

Documents Enclosed:

1. PEF letter with Aquifer Performance Test Plan March 4, 2009
2. Enhydro letter and Drawdown Test Report September 2009
3. CREC CCP and Solid Waste Management Plan
4. FDEP Solid Waste Management Facility Checklist January 29, 2009
5. Enhydro Water Use Feasibility & Impact Assessment Report June 5, 2006
6. Enhydro letter to PEF RAI Response November 26, 2006
7. EnHydro & Quest Baseline Wetland Assess Procedure May 27, 2009
8. Geraghty and Miller Hydrogeologic Report October 15, 1979
9. Tetra Tech Water Use Calculation Package October 2008
10. PEF letter to FDEP NPDES Permit Renewal App CR 1,2,3 October 28, 2009
11. PEF letter to FDEP NPDES Permit Renewal App CR 4 & 5 January 25, 2010
12. PEF letter to FDEP NPDES Major Permit Mod Application September 11, 2009
13. PEF letter to FDEP NPDES Monitoring Report Units 4&5 September 25, 2008
14. PEF letter to FDEP NPDES Monitoring Report September 2004

PEF letter with Aquifer Performance Test Plan
March 4, 2009

Progress Energy

March 4, 2009

Florida Department of Environmental Protection
Siting Coordination Office
2600 Blair Stone Road MS-48
Tallahassee, Florida 32399-2400

Attention: Mr. Mike Halpin

RE: Progress Energy Crystal River Units 4 & 5
PA77-09A2
Conditions of Certification Required Submittals

Dear Mr. Halpin:

In accordance with the Conditions of Certification F.9.d, Progress Energy Florida (PEF) submits the required final Aquifer Performance Test plan. A copy of this submittal is also being sent to Mr. Paul Williams of the SWFWMD.

Should you, or your staff, or any other agency representatives have questions regarding this request, please contact me at (727) 820-5588.

Sincerely,

Michael Shrader
Lead Environmental Specialist

Cc: Paul Williams, SWFWMD

PROGRESS ENERGY - CRYSTAL RIVER ENERGY COMPLEX

AQUIFER PERFORMANCE TEST PLAN

Conditions of Certification PA-77-09K

Citrus County, Florida

Revised: February 18, 2009

Prepared by:

EnHydro, LLC
334 East Lake Rd., #173
Palm Harbor, FL 34685-2427

EnHydro

Prepared for:

Progress Energy
15760 West Power Line St.
Crystal River, Florida 34428-6708

PROGRESS ENERGY – CRYSTAL RIVER ENERGY COMPLEX
AQUIFER PERFORMANCE TEST PLAN
Conditions of Certification PA-77-09K

1.0 INTRODUCTION

EnHydro, LLC (EnHydro) is pleased to present this proposed Aquifer Performance Test (APT) plan to Progress Energy Florida (PEF) for submittal to the appropriate regulatory agencies as required by Special Condition #15 of the recently-modified Conditions of Certification for the Crystal River Energy Complex. The proposed APT will be conducted on one of the three new production wells that are currently being installed to supply fresh water for the planned air pollution control (flue gas desulfurization, or FGD) systems at the Crystal River North Power Plant. Condition #15 is presented below for reference:

15. For the purpose of determining site-specific transmissivity, a step drawdown and a multi well constant rate test shall be performed on one or more of the following: District ID Nos. ***14, 15, 16*** *Licensee ID Nos.* ***PW-8, PW-9a, and PW-10a****, after the wells have been fully developed. The test shall be performed in accordance with the specifications set forth in Design Aid 3, Water Use Permit Information Manual and an Aquifer Performance Testing (APT) Plan submitted to and approved by the District. The APT Plan shall be submitted to the District, within 90 days of the approval of the modification of the conditions of certification. The APT shall be conducted by the Licensee within 6 months of construction of the wells included in the APT Plan and prior to the use of any of the wells constructed for the APT's. All recorded raw data shall be submitted to the District within thirty (30) days of completion of the APT.*

The proposed APT plan presented herein entails the following elements: 1) an initial single-well specific capacity test to be performed on one of the new production wells (PW-10); 2) the installation of a groundwater level observation well within the cone of influence of the production well; and 3) the execution of a 72-hour multiple-well APT. These elements are presented below along with appropriate supporting information.

2.0 BACKGROUND & INITIAL SITE INVESTIGATION

The water supply needs of the Progress Energy Crystal River Energy Complex North Power Plant for plant operation and air pollution control uses are supplied by a linear wellfield located on the east side of US Highway 19 near Red Level in Citrus County, Florida. The linear wellfield consists of four existing production wells that are currently in service (10-inch diameter x 200-ft deep), three existing standby wells (10-inch diameter x 200-ft deep), and three new production wells (12-inch diameter x 200-ft deep).

The subsurface lithology and hydrogeology of the site has been documented in previous reports submitted in support of the recent modification to the Conditions of Certification. In general, there is little to no surficial aquifer present at the site. The dolomitic limestone of the Upper Floridan Aquifer is found within less than 10 feet of the surface at the site. In each of the existing wells drilled at the site, the first highly transmissive zone was encountered in the range of 50 – 80 ft below land surface (bls), followed by a relatively consistent series of dense, less transmissive limestone to the total depth of the wells at 200 ft bls. The wells are typically cased at approximately 50 ft bls and completed with an open borehole.

3.0 SINGLE-WELL AQUIFER TEST (SPECIFIC CAPACITY TEST)

As part of the well construction program for the installation of the three new production wells, a single-well specific capacity test was to be performed on each of the existing standby wells and on each of the new wells. At the time of the preparation of this plan, the tests have been performed on the three existing standby wells and on two of the three new wells. A summary of the results of the specific capacity tests is provided as **Table 1**.

Table 1 – Specific Capacity Testing Results from Existing and New Wells

Well ID	Specific Capacity @ Indicated Pumping Rate (gpm/ft)				
	110 gpm	250 gpm	375 gpm	450 gpm	675 gpm
PW-5	200	238	226	188	151
PW-6	333	352	361	317	288
PW-7	157	198	181	146	133
PW-9	355	417	341	287	235
PW-10	61	69	65	62	58

Note – all wells are 200 ft deep with 50 ft of casing

The results of the tests indicate that the drawdown resulting from the pumping of the wells at the design rate (450 gpm) will result in approximately two feet of drawdown at the wellhead in most of the wells; water level stabilization was typically reached within about 15 minutes of initiation of pumping. Well PW-10 exhibited significantly lower specific capacity values than did any of the other wells; this may be either due to a lower level of development of the cavities and voids than what was encountered in the other wells, or to error in the execution of the specific capacity test by the well drilling contractor. As part of this APT plan, another specific capacity test will be performed on well PW-10 to confirm the values reported above.

Single-well specific capacity tests will be performed on wells PW-9 and PW-10 following the completion of well drilling and development. Well PW-9 has been tentatively selected for use in the long-term APT due to the fact that it will allow the most distant well from the existing production wells (PW-10) to be used as an outlying monitoring well, thus minimizing the chance that pumping from the existing wells will affect the results of the test. The specific capacity test will be run during a period of no rainfall, and will be initiated by establishing a stable water level in the well (referenced to NGVD). Following the installation of the test pump, the water level will be measured with an electric water level tape. Discharge rates will be measured using a calibrated impeller-type water meter. The discharged water will be routed to a discharge point at least 500 ft from the pumping well.

The water level in the pumping well will be measured on 5-minute intervals for a period of 30 minutes prior to the beginning of the test. The well will be pumped at five successively-increasing rates (110, 250, 375, 450, and 675 gpm). At each rate, the well will be pumped for a minimum of one hour, or until water levels have stabilized for at least 15 minutes. Water levels will be collected every 30 seconds for the first five minutes, recording the water level to the nearest one-tenth of a foot (0.01 ft). After the first five minutes, water levels will be collected every five minutes and recorded along with the discharge rate. After the water level has stabilized the pumping rate will be increased to the next higher rate and the process will be repeated for all five steps. Following the final step, the pump will be turned off and recovery water levels will be collected on the same intervals as were used for the pumping test.

4.0 GROUNDWATER LEVEL OBSERVATION WELLS

The results of the single-well specific capacity test will be used to determine the appropriate distance from the pumping well for the installation of the primary groundwater level observation well to be used in the multiple-well aquifer test. This distance between the pumping well and the primary observation well will be determined using the approximation of aquifer transmissivity generated by the analysis of the specific capacity test and by an estimate of the distance-drawdown relationship. Given the minor drawdown observed during the step-drawdown testing of the existing standby wells, it is unlikely that the observation well will be installed further than 25 ft away from the pumping well. The observation well will be cased and drilled to the same depths as the production well (casing @ 50 ft bls; total depth @ 200 ft bls). The final determination of the location of the observation well will be determined by distance-drawdown evaluation of the results of the final specific capacity test to be performed on well PW-9.

Wells PW-10 and PW-8 will also be monitored during the APT, as will the nearest wetlands monitoring well (Hydrologic Monitoring Station #2 - to be established approximately 750 ft south of the wellfield alignment – see **Figure 3**). The wetlands monitoring well will be installed to approximately 20 ft deep adjacent to a small water body on private property south of and adjacent to the PEF wellfield. However, given the preliminary observations during the initial specific capacity tests, it is unlikely that any response will be observed in the wetlands monitoring well.

5.0 MULTIPLE-WELL AQUIFER TEST

For the multiple-well aquifer test, a pumping and discharge setup similar to that employed for the single-well test will be used; the discharged water, however, will be routed through the pipeline to the power plant area west of US 19 to avoid potential recharge-related effects. Prior to initiating the test, the observation well will be instrumented with an electronic digital water level transducer and data logger to record water levels within the well. The static water level will be verified using an electric water level tape, and the water level transducer and data logger will be calibrated to the actual water level. A vented water level transducer cable will be used during the test for barometric compensation.

Prior to initiating the multiple-well aquifer test, the pre-pumping static water level (referenced to NGVD) and background water level trends will be determined in the observation and pumping wells. Water levels will be measured to the nearest 0.01-ft; background water levels will be recorded on an hourly basis using the transducer and data logger for a period of three days preceding and following the test. The background water level data will be analyzed using the methods described in Halford (2006; US Geological Survey Scientific Investigations Report 2006-5024).

The time-distribution and volume of pumpage from the existing production wells (PW-1, PW-2, PW-3, and PW-4) will also be recorded. Due to the essential nature of the water produced by the existing production wells in the operation of the power plant, it may not be possible to conduct the APT with these wells turned off. However, if the existing wells must be pumped during the APT, every effort possible will be made to maintain the pumping at a steady rate and to not switch wells on and off during the APT.

Not less than 24 hours prior to the planned start of the test, the pump and control valve in the production well will be adjusted so that the initial discharge of the pump will be close to the constant rate selected for the test (450 gpm). Once the test has commenced, the actual pump discharge will be recorded along with the water level data collected during the test. Water levels will be measured to the nearest 0.01-ft and will be measured according to a logarithmic schedule as follows:

Frequency of Measurement	Time After Pumping Started
every 15 seconds	0 – 2 minutes
every 30 seconds	2 – 5 minutes
every 1 minute	5 – 15 minutes
every 5 minutes	15 – 60 minutes
every 10 minutes	60 – 120 minutes
every 0.5 hour	2 – 5 hours
every 1 hour	thereafter

The production well (PW-9) will be pumped for a minimum of 48 hours, or until a review of the data shows that water levels in the pumping and observation wells have stabilized for a period of at least six hours. Upon reaching the conclusion that the test is complete, the pump will be stopped and water level measurements will be collected using the same schedule as the one used for the pumping test. Recovery data will be collected until the water level in the observation well has recovered to within 0.05 ft of the original static water level; the measurement schedule will be as follows:

Frequency of Measurement	Time After Pumping Stopped
every 15 seconds	0 – 2 minutes
every 30 seconds	2 – 5 minutes
every 1 minute	5 – 15 minutes
every 5 minutes	15 – 60 minutes
every 10 minutes	60 – 120 minutes
every 0.5 hour	2 – 5 hours
every 1 hour	thereafter

Rainfall amounts during the aquifer test will be recorded. Ideally, the test will be performed during a period of no rainfall. However, if rainfall occurs during the test, the test will be terminated and rescheduled if it is determined that recharge from rainfall is causing water levels in the observation well to rise. Additionally, barometric readings will be recorded to allow for the correction of the water level data for fluctuations in barometric pressure.

6.0 DATA ANALYSIS

The multiple-well aquifer test data will be analyzed by analytical and/or graphical techniques (AquiferWin32, AQTESOLV, etc.) to determine the transmissivity and storage coefficient of the production zone; due to the lack of any significant surficial aquifer or confining interval, any calculated value for leakance is not expected to be representative of the conditions at the site. The raw drawdown and recovery data will be adjusted as/if necessary to account for the effects of tidal fluctuations and atmospheric pressure changes, as well as for the effects of adjacent pumpage from the four existing production wells. Both time-drawdown and distance-drawdown data will be evaluated in the analysis of the data.

7.0 AQUIFER TEST PROGRAM REPORT

A professional report will be prepared documenting the results of the aquifer performance testing activities. The report will include sections on the following: 1) a summary of the geologic and hydrogeologic conditions beneath the site; 2) documentation of the construction techniques used for the production well and the observation well; 3) a description of the procedure used for running the single-well and multiple-well tests; 4) the analysis of the data collected during the test to determine the hydraulic characteristics of the hydrogeologic system based on the results of the single-well and multiple-well tests; 5) a discussion of the limitations involved with the APT and a range of possible values for transmissivity at the site; 6) an appendix including tabulations of the water level, rainfall, pump discharge, and adjacent pumping data collected during the aquifer performance testing program; and 7) a discussion of all corrections made to the raw data during the analysis of the results of the aquifer performance testing.

FIGURES

Enhydro, LLC

Drawn By: DLS
Date: 07/30/07

0 1,750 3,500 14,000 Feet

NORTH

Figure 1

Progress Energy Crystal River Power Station Location Map

Legend

PEF Crystal River Power Station WUP Boundary

EnHydro

Drawn By: DLS
Revised: 02/23/09

N
W E
S

0 375 750 1,500 Feet

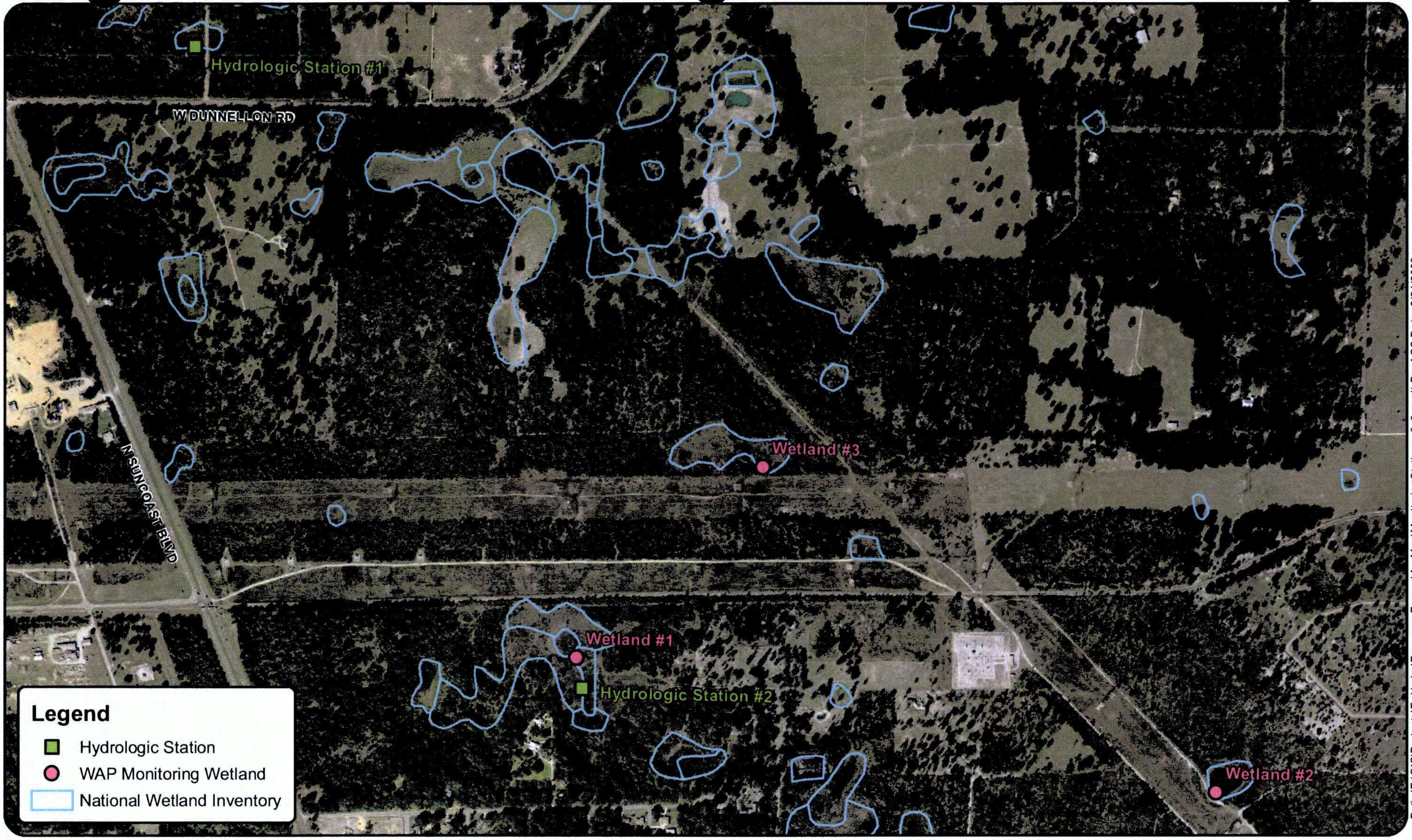
Legend

- Water Use Permit Boundaries
- ○ Currently Operational Wells
- △ Existing Stand By Wells
- □ New Production Wells

Figure 2

Progress Energy Crystal River
North Plant Wellfield Layout

Reference: 2004 Aerial SWFWMD



QUEST ecology

735 Lakeview Drive
Wimauma, FL 33598
Tel. 813.642.0799
Fax 813.642.0380

Progress Energy, Crystal River
Citrus County, Florida

Figure 3
Monitoring Stations

N W E S

0 1,000 Feet

Enhydro letter and Drawdown Test Report September 2009

EnHydro, LLC
consulting hydrogeologists and wellfield technology services

September 8, 2009

Mr. Michael Shrader, Q.E.P.
Lead Environmental Specialist
Environmental Services Section
Progress Energy Florida, Inc.
PO Box 14042
PEF-903
St. Petersburg, FL 33733

**Re: New & Rehabilitated Production Wells - Capacity Testing Results
Progress Energy Florida - Crystal River Energy Complex
Crystal River, Florida**

Dear Mike:

As requested, EnHydro, LLC (EnHydro) is pleased to present this letter documenting the results of specific capacity testing performed on the referenced wells. The testing was performed by the water well contractor, Citrus Well Drilling, Inc. (Citrus) of Hernando, FL and was witnessed by an EnHydro Licensed Professional Geologist.

Each test was designed and executed in a similar fashion. Following the completion of the installation and development of each well, a pump was set in the well with the pump intake located at approximately 45 ft below land surface (bls). The water discharged by the pump was routed through a mechanical flowmeter installed in the discharge line. Water levels and discharge rates were measured by Citrus' site personnel.

The Conditions of Certification for the site require that the following information be submitted to the Southwest Florida Water Management District (SWFWMD) for each step in the step-drawdown (specific capacity) tests for each well:

- Static water level before pumping
- Duration of test pumping
- Gallons per minute pumped
- Final water level measured during pumping

In addition to the aforementioned data, we are also supplying the raw water level data collected by Citrus in accordance with the contractual specifications that were provided to them. These data have been graphed by us to more clearly document the performance of the wells. The data and graphs are provided as attachments to this letter report.

EnHydro, LLC

Table 1 – Well PW-5

Step Number	Static Water Level Before Pumping (ft bls)	Duration of Test Pumping (min)	Gallons per Minute Pumped (gpm)	Final Water Level Measured During Pumping (ft bls)	Drawdown (ft)	Specific Capacity (gpm/ft)
1	11.02	60	112.5	11.57	0.55	204.55
2	11.57	60	250	12.07	1.05	238.10
3	12.07	60	362.5	12.68	1.66	218.37
4	12.68	60	450	13.42	2.40	187.50
5	13.42	60	675	15.48	4.46	**151.35**

Table 2 – Well PW-6

Step Number	Static Water Level Before Pumping (ft bls)	Duration of Test Pumping (min)	Gallons per Minute Pumped (gpm)	Final Water Level Measured During Pumping (ft bls)	Drawdown (ft)	Specific Capacity (gpm/ft)
1	9.10	60	112.5	9.43	0.33	340.91
2	9.43	60	250	9.81	0.71	352.11
3	9.81	60	362.5	10.14	1.04	348.56
4	10.14	60	450	10.52	1.43	316.90
5	10.52	60	675	11.44	2.34	**288.46**

Table 3 – Well PW-7

Step Number	Static Water Level Before Pumping (ft bls)	Duration of Test Pumping (min)	Gallons per Minute Pumped (gpm)	Final Water Level Measured During Pumping (ft bls)	Drawdown (ft)	Specific Capacity (gpm/ft)
1	10.27	60	112.5	10.97	0.70	160.71
2	10.97	60	250	11.53	1.26	198.41
3	11.53	60	362.5	12.34	2.07	175.12
4	12.34	60	450	13.35	3.08	146.10
5	13.35	60	675	15.34	5.07	**133.14**

EnHydro, LLC

Table 4 – Well PW-8

Step Number	*Static Water Level Before Pumping (ft bls)*	*Duration of Test Pumping (min)*	*Gallons per Minute Pumped (gpm)*	*Final Water Level Measured During Pumping (ft bls)*	*Drawdown (ft)*	*Specific Capacity (gpm/ft)*
1	12.32	70	112.5	15.89	3.57	31.51
2	15.89	60	250	18.76	6.44	38.82
3	18.76	60	362.5	22.01	9.69	37.41
4	22.01	60	450	24.69	12.37	36.38
5	24.69	100	675	32.21	19.89	**33.94**

Table 5 – Well PW-9

Step Number	*Static Water Level Before Pumping (ft bls)*	*Duration of Test Pumping (min)*	*Gallons per Minute Pumped (gpm)*	*Final Water Level Measured During Pumping (ft bls)*	*Drawdown (ft)*	*Specific Capacity (gpm/ft)*
1	9.16	60	112.5	9.47	0.31	362.90
2	9.47	60	250	9.76	0.6	416.67
3	9.76	60	362.5	10.26	1.1	329.55
4	10.26	60	450	10.73	1.57	286.62
5	10.73	60	675	12.03	2.87	**235.19**

Table 6 – Well PW-10

Step Number	*Static Water Level Before Pumping (ft bls)*	*Duration of Test Pumping (min)*	*Gallons per Minute Pumped (gpm)*	*Final Water Level Measured During Pumping (ft bls)*	*Drawdown (ft)*	*Specific Capacity (gpm/ft)*
1	8.00	60	112.5	9.80	1.80	62.50
2	9.80	60	250	11.61	3.61	69.25
3	11.61	60	362.5	13.79	5.79	62.61
4	13.79	60	450	15.40	7.40	60.81
5	15.40	60	675	19.65	11.65	**57.94**

EnHydro, LLC

Discussion

The specific capacity of a well – expressed in gallons per minute per foot of drawdown (gpm/ft) – is a standard measure of the well's relative productivity. This, in turn, is a reflection of the transmissivity of the aquifer – the ability of the aquifer to transmit water. The results of the specific capacity testing of the three new wells and the three rehabilitated wells at Progress Energy Florida's Crystal River Wellfield indicate a wide variation in the specific capacity of the wells – values range from 34 – 288 gpm/ft.

This extreme range of values is likely due to two issues: 1) the variable nature of the Upper Floridan Aquifer in the vicinity of the wellfield; and 2) the fact that some of the well casings had to be set deeper than others in order to achieve a competent grout seal. In some cases, the well casing had to be driven through and past the most transmissive zone of the aquifer due to concerns over the development of sinkholes.

Regardless of the extreme variation in the measured specific capacity values, the worst-performing well (Well PW-8) is still capable of producing the target production rate of 450 gpm with the water level drawn down to only 25 ft bls, leaving over 50 ft of casing between this pumping water level and the base of the casing (top of the open hole interval). Given this large safety margin, no negative issues are anticipated as a result of the relatively low specific capacity of Well PW-8. Likewise, the second-worst performing well (PW- 10) will have a safety margin of approximately 35 ft between the pumping water level and the base of the casing (at the design rate of 450 gpm).

Closing Comments

Please do not hesitate to call me at (813) 293-0740 with any questions that you might have concerning this report. Thank you for once again giving EnHydro, LLC the opportunity to provide our services to you and to Progress Energy Florida.

Sincerely yours,

EnHydro, LLC

H. Cliff Harrison, P.G.
Senior Hydrogeologist

Progress Energy Crystal River - Production Well #PW-5

Upper Floridan Aquifer Step Drawdown Test Data

11/19/2009

Data Summary

Yield Q (gpm)	Drawdown s (ft)	Specific Capacity Q/s (gpm/ft)	s/Q
112.5	0.55	204.55	0.004889
250	1.05	238.10	0.0042
362.5	1.66	218.37	0.004579
450	2.4	187.50	0.005333
675	4.46	151.35	0.006607

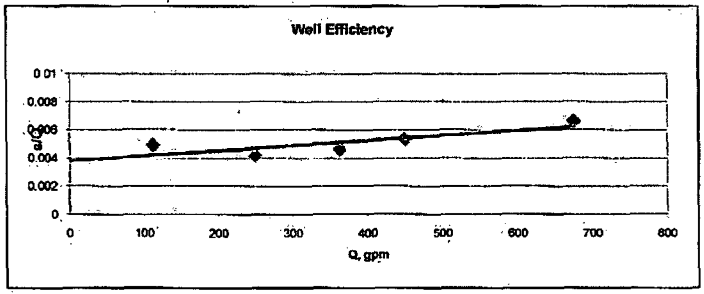
12-in diam. Production Well

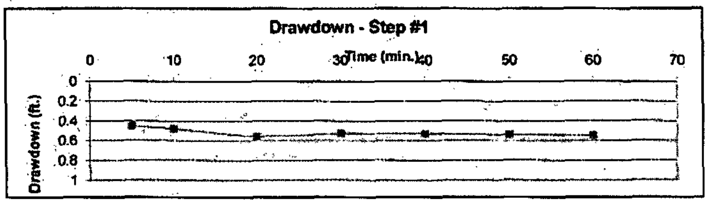
Well Casing Depth = 50 ft bls
Well Total Depth = 200 ft bls

Static Water Level (ft bmp)		Measuring Point Elevation (ft above land surface)	
	11.02		1.15

Step #1 Pumping Rate (gpm) = 112.5

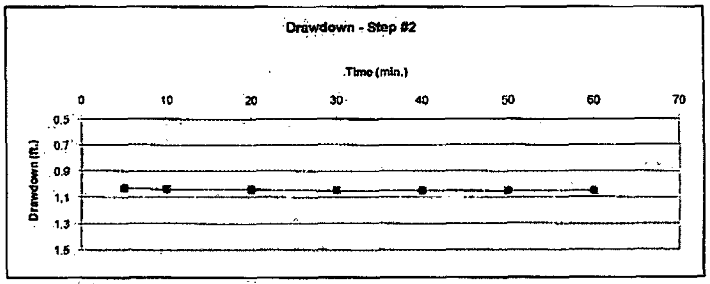
Elapsed Time (min.)	Pumping Water Level (ft bmp)	Drawdown (ft)	Specific Capacity (gpm/ft)
5	11.47	0.45	
10	11.5	0.48	
20	11.58	0.56	
30	11.55	0.53	
40	11.55	0.53	
50	11.56	0.54	
60	11.57	0.55	204.55





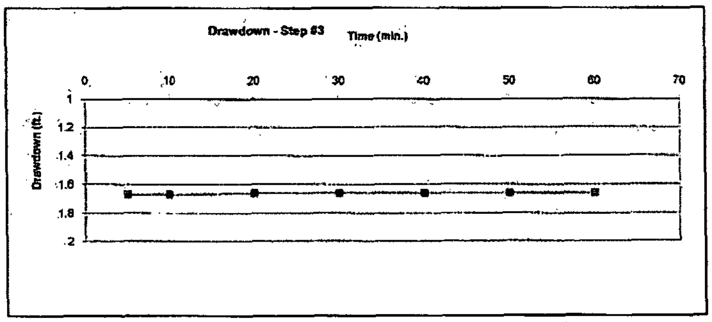
Step #2 Pumping Rate (gpm) = 250

Elapsed Time (min.)	Pumping Water Level (ft bmp)	Drawdown (ft)	Specific Capacity (gpm/ft)
5	12.05	1.03	
10	12.06	1.04	
20	12.06	1.04	
30	12.07	1.05	
40	12.07	1.05	
50	12.07	1.05	
60	12.07	1.05	238.10



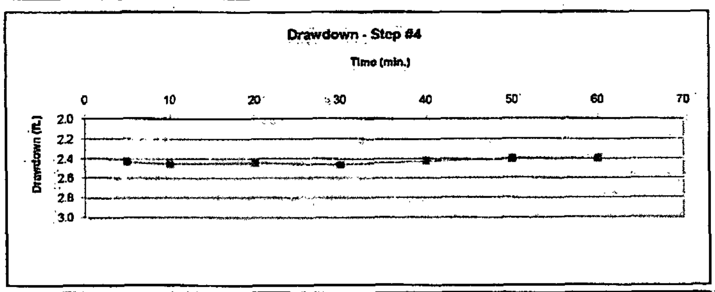
Step #3 Pumping Rate (gpm) = 362.5

Elapsed Time (min.)	Pumping Water Level (ft bmp)	Drawdown (ft)	Specific Capacity (gpm/ft)
5	12.69	1.67	
10	12.69	1.67	
20	12.68	1.66	
30	12.68	1.66	
40	12.68	1.66	
50	12.68	1.66	
60	12.68	1.66	218.37

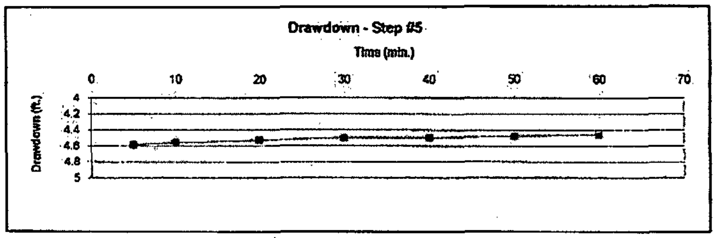


Step #4 Pumping Rate (gpm) = 450

Elapsed Time (min.)	Pumping Water Level (ft bmp)	Drawdown (ft)	Specific Capacity (gpm/ft)
5	13.45	2.43	
10	13.47	2.45	
20	13.46	2.44	
30	13.48	2.46	
40	13.44	2.42	
50	13.42	2.40	
60	13.42	2.40	187.50



Step #5	Pumping Rate (gpm) =		675
Elapsed Time (min.)	Pumping Water Level (ft bmp)	Drawdown (ft)	
5	15.61	4.59	
10	15.58	4.56	
20	15.55	4.53	
30	15.52	4.5	
40	15.52	4.5	
50	15.5	4.48	
60	15.48	4.48	*151.35*



Submitted By:	Wheeler Construction, Inc.
Contact:	Paul Wheeler (352) 726-0973 paul@citrusbuilder.com
Responsible Entity:	Citrus Well Drilling
Contact:	Ray Townsend
Submittal No:	063 Revision No: 0
Specification No:	0256 - 1.03
Specification Name:	Final Pump Test Results #5
Description:	Final Pump Test Results #5

Project and Contract Identification

Subcontractor	Wheeler Construction, Inc.
Project Name	Progress Energy Crystal River Plant Units 4 & 5 SCR/FGD
Project Number	44000
Contract Title	Water Wells & Pumps
Contract No.	C5.8160
Spec. Sect. No.	02526 Art. No. 1.03

Subcontractor's Approval: Submission of this document shall represent Subcontractor's approval as specified in the Contract Documents. Subcontractor remains liable for accuracy of Submittals as provided in the Contract Documents.

Date Contractor Received

____

Contractor's Action

(See Contract Documents)

Initials & Date	Initials & Date
(A) JDK 12/23/08	E
B	F
C	G
D	

LOCATION:	Progress Energy PW # 5	DATE:	11/19/2008
WELL SIZE:	10"	PRE-TEST INFO:	Joe Goater

TIME	GPM	WATER LEVEL	TIME	GPM	WATER LEVEL
1:50	112.5	11.02	3:20		12.07
1:51		11.4	3:30		12.07
1:52		11.41	3:40		12.07
1:53		11.41	3:50	250 / 362.5	12.07
1:55		11.47	3:51	362.5	12.58
1:57		11.49	3:52		12.59
2:00		11.5	3:53		12.62
2:05		11.5	3:55		12.69
2:10		11.582	3:57		12.69
2:15		11.54	4:00		12.69
2:20		11.55	4:05		12.69
2:30		11.55	4:10		12.68
2:40		11.56	4:15		12.68
2:50	112.5 / 250	11.57	4:20		12.68
2:51	250	11.99	4:30		12.68
2:52		12.03	4:40		12.68
2:53		12.04	4:50	362.5 / 450	12.68
2:55		12.05	4:51	450	13.45
2:57		12.06	4:52		13.47
3:00		12.06	4:53		13.48
3:05		12.06	4:55		13.45
3:10		12.06	4:57		13.47
3:15		12.07	5:00		13.47

Citrus Well Drilling
P.O. Box 369
Hernando , FL 34442

LOCATION:	Progress Energy PW # 5	DATE:	11/19/2008
WELL SIZE:	10"	PRE-TEST INFO:	Joe Goater

TIME	GPM	WATER LEVEL
5:05		13.47
5:10		13.46
5:15		13.45
5:20		13.48
5:30		13.44
5:40		13.42
5:50	450 / 675	13.42
5:51	675	15.55
5:52		15.65
5:53		15.66
5:55		15.61
5:57		15.59
6:00		15.58
6:05		15.56
6:10		15.55
6:15		15.54
6:20		15.52
6:30		15.52
6:40		15.5
6:50		15.48
6:51	0	11.31
6:52		11.09

TIME	GPM	WATER LEVEL
6:53		11.06
6:55		11.04
6:57		11.03
7:00		11.02
7:05		
7:10		
7:15		
7:20		
7:30		

CITRUS WELL DRILLING

P.O. Box 369 Hernando, FL 34442

352-726-5454

Progress Energy Crystal River - Production Well #PW-6

Upper Floridan Aquifer Step Drawdown Test Data

11/5/2009

Data Summary

Yield Q (gpm)	Drawdown s (ft)	Specific Capacity Q/s (gpm/ft)	s/Q
112.5	0.33	340.91	0.002933
250	0.71	352.11	0.00284
362.5	1.04	348.56	0.002869
450	1.42	316.90	0.003156
675	2.34	288.46	0.003467

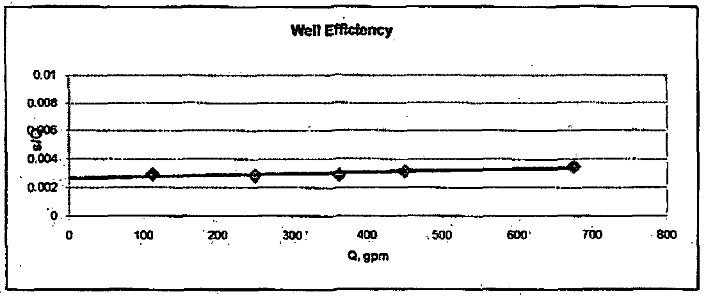
10-in diam. Production Well			
Well Casing Depth =	50 ft bls		
Well Total Depth =	200 ft bls		
Static Water Level (ft bmp)	9.10	Measuring Point Elevation (ft above land surface)	1.25

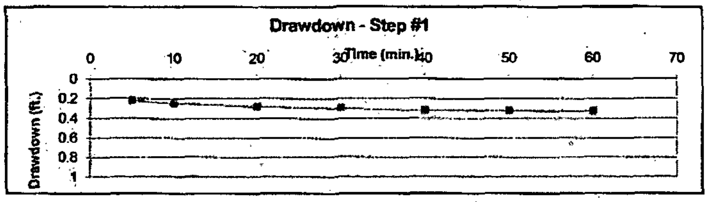
Step #1		Pumping Rate (gpm) =	112.5
Elapsed Time (min.)	Pumping Water Level (ft bmp)	Drawdown (ft)	Specific Capacity (gpm/ft)
5	9.32	0.22	
10	9.35	0.25	
20	9.38	0.28	
30	9.4	0.3	
40	9.42	0.32	
50	9.42	0.32	
60	9.43	0.33	*340.91*

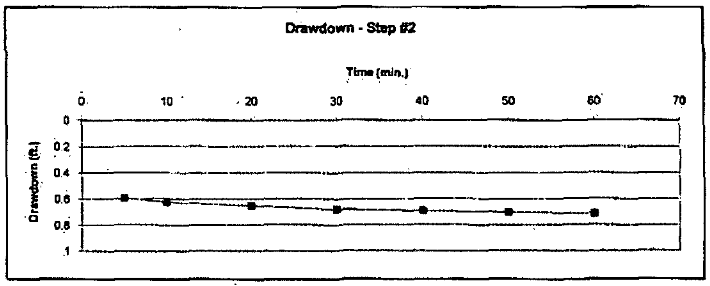
Step #2		Pumping Rate (gpm) =	250
Elapsed Time (min.)	Pumping Water Level (ft bmp)	Drawdown (ft)	Specific Capacity (gpm/ft)
5	9.69	0.59	
10	9.72	0.62	
20	9.75	0.65	
30	9.78	0.68	
40	9.79	0.69	
50	9.8	0.7	
60	9.81	0.71	*352.11*

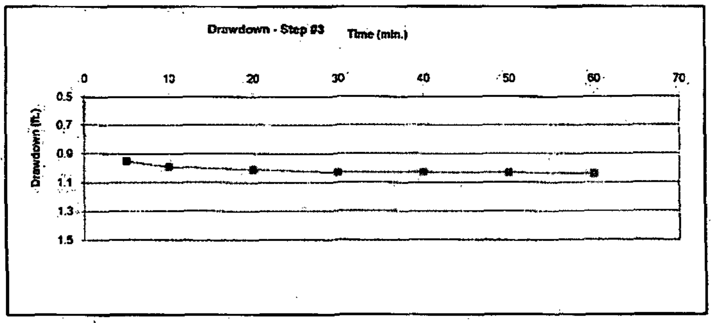
Step #3		Pumping Rate (gpm) =	362.5
Elapsed Time (min.)	Pumping Water Level (ft bmp)	Drawdown (ft)	Specific Capacity (gpm/ft)
5	10.05	0.95	
10	10.09	0.99	
20	10.11	1.01	
30	10.13	1.03	
40	10.13	1.03	
50	10.13	1.03	
60	10.14	1.04	*348.56*

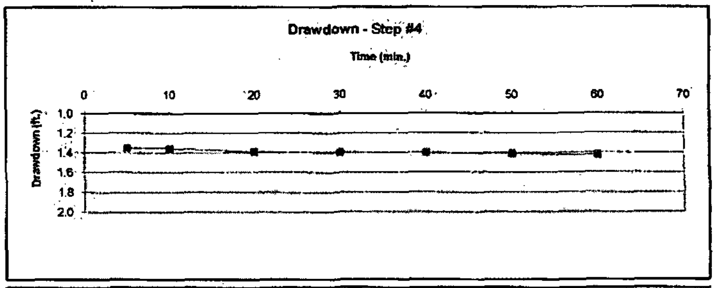
Step #4		Pumping Rate (gpm) =	450
Elapsed Time (min.)	Pumping Water Level (ft bmp)	Drawdown (ft)	Specific Capacity (gpm/ft)
5	10.45	1.35	
10	10.46	1.36	
20	10.49	1.39	
30	10.5	1.40	
40	10.5	1.40	
50	10.51	1.41	
60	10.52	1.42	*316.90*



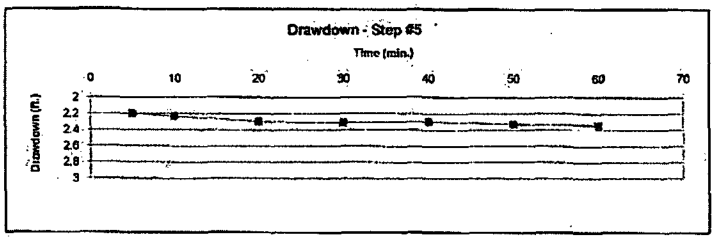








Step #5	Pumping Rate (gpm) =		675
Elapsed Time (min.)	Pumping Water Level (ft bmp)	Drawdown (ft)	
5	11.3	2.2	
10	11.33	2.23	
20	11.4	2.3	
30	11.41	2.31	
40	11.4	2.3	
50	11.43	2.33	
60	11.44	2.34	*288.46*



Submitted By:	Wheeler Construction, Inc.		
Contact:	Paul Wheeler	(352) 726-0973	paul@citrusbuilder.com
Responsible Entity:	Citrus Well Drilling		
Contact:	Ray Townsend		
Submittal No:	056	Revision No:	0
Specification No:	02526 - 1.03C		
Specification Name:	Final Pump Test Results #6		
Description:	Final Pump Test Results #6		

Project and Contract Identification

Subcontractor	Wheeler Construction, Inc.
Project Name	Progress Energy Crystal River Plant Units 4 & 5 SCR/FGD
Project Number	44000
Contract Title	Water Wells & Pumps
Contract No.	C5.8160
Spec. Sect. No.	02526 Art. No. 1.03C

Subcontractor's Approval: Submission of this document shall represent Subcontractor's approval as specified in the Contract Documents. Subcontractor remains liable for accuracy of Submittals as provided in the Contract Documents.

Date Contractor Received

____

Contractor's Action

(See Contract Documents)

Initials & Date	Initials & Date
Ⓐ JDK 12/01/08	E
B	F
C	G
D	

LOCATION:	Progress Energy PW-6	DATE:	11/13/2008
WELL SIZE:	10"	PRE-TEST INFO:	Joe Goater

TIME	GPM	WATER LEVEL
9:00	0	9.1
9:01	112.5	9.28
9:02		9.29
9:03		9.3
9:05		9.32
9:07		9.34
9:10		9.35
9:15		9.38
9:20		9.38
9:25		9.39
9:30		9.4
9:40		9.42
9:50		9.42
10:00	112.5 / 250	9.43
10:01	250	9.61
10:02		9.66
10:02		9.67
10:05		9.69
10:07		9.7
10:10		9.72
10:15		9.74
10:20		9.75
10:25		9.77

TIME	GPM	WATER LEVEL
10:30	250	9.78
10:40		9.79
10:50		9.8
11:00	250 /362.5	9.81
11:01	362.5	9.95
11:02		9.99
11:03		10.041
11:05		10.05
11:07		10.05
11:10		10.09
11:15		10.11
11:20		10.11
11:25		10.12
11:30		10.13
11:40		10.13
11:50		10.13
12:00	362.5 / 450	10.14
12:01	450	10.4
12:02		10.43
12:03		10.44
12:05		10.45
12:07		10.45
12:10		10.46

CITRUS WELL DRILLING
P.O. Box 369 Hernando, FL 34442
352-726-5454

LOCATION:_____ Progress Energy PW_6 **DATE:** 11/13/2008

WELL SIZE: 10" **PRE-TEST INFO:** Joe Goater

TIME	GPM	WATER LEVEL
12:15	450	10.49
12:20		10.49
12:25		10.5
12:30		10.5
12:40		10.5
12:50		10.51
1:00	450 / 675	10.52
14:01		11.17
1:02		11.18
1:03		11.27
1:05		11.3
1:07		11.32
1:10		11.33
1:15		11.35
1:20		11.4
1:25		11.4
1:30		11.41
1:40		11.4
1:50		11.43
2:00	675 / 0	11.44
2:01	0	10.18
2:02		10.06
2:03		9.95

TIME	GPM	WATER LEVEL
2:05	0	9.8
2:07		9.7
2:10		9.59
2:15		9.48
2:20		9.4
2:25		9.34
2:30		9.29
2:40		9.24
0.125		9.2
3:00		9.17
3:10		9.15
3:20		9.13
3:30		9.1

CITRUS WELL DRILLING
P.O. Box 369 Hernando, FL 34442
352-726-5454

Progress Energy Crystal River - Production Well #PW-7

Upper Floridan Aquifer Step Drawdown Test Data

1/14/2009

Data Summary

Yield Q (gpm)	Drawdow n s (ft)	Specific Capacity Q/s (gpm/ft)	s/Q
112.5	0.7	160.71	0.006222
250	1.26	198.41	0.00504
362.5	2.07	175.12	0.00571
450	3.08	146.10	0.006844
675	5.07	133.14	0.007511

10-in diam. Production Well

Well Casing Depth = 50 ft bls
Well Total Depth = 200 ft bls

Static Water Level (ft bmp)		Measuring Point Elevation (ft above land surface)	
	10.27		1.35

Step #1 — Pumping Rate (gpm) = 112.5

Elapsed Time (min.)	Pumping Water Level (ft bmp)	Drawdown (ft)	Specific Capacity (gpm/ft)
5	10.9	0.63	
10	10.92	0.65	
20	10.94	0.67	
30	10.95	0.68	
40	10.95	0.68	
50	10.97	0.7	
60	10.97	0.7	*160.71*

Step #2 — Pumping Rate (gpm) = 250

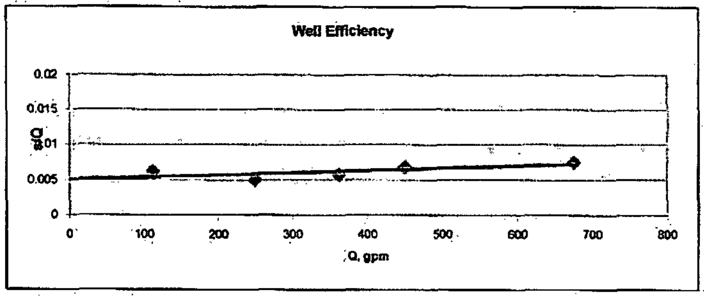
Elapsed Time (min.)	Pumping Water Level (ft bmp)	Drawdown (ft)	Specific Capacity (gpm/ft)
5	11.51	1.24	
10	11.5	1.23	
20	11.52	1.25	
30	11.52	1.25	
40	11.52	1.25	
50	11.53	1.26	
60	11.53	1.26	*198.41*

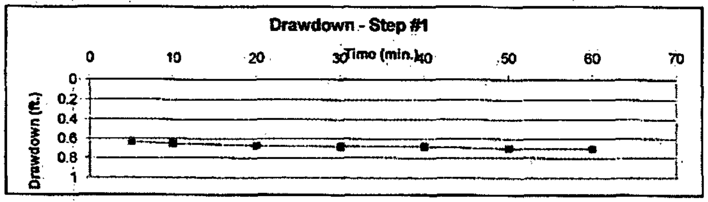
Step #3 — Pumping Rate (gpm) = 362.5

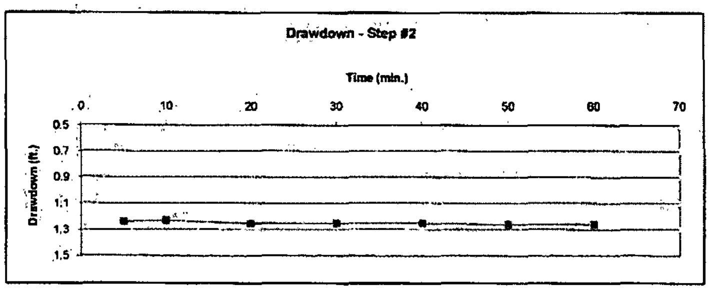
Elapsed Time (min.)	Pumping Water Level (ft bmp)	Drawdown (ft)	Specific Capacity (gpm/ft)
5	12.32	2.05	
10	12.32	2.05	
20	12.32	2.05	
30	12.32	2.05	
40	12.33	2.06	
50	12.33	2.06	
60	12.34	2.07	*175.12*

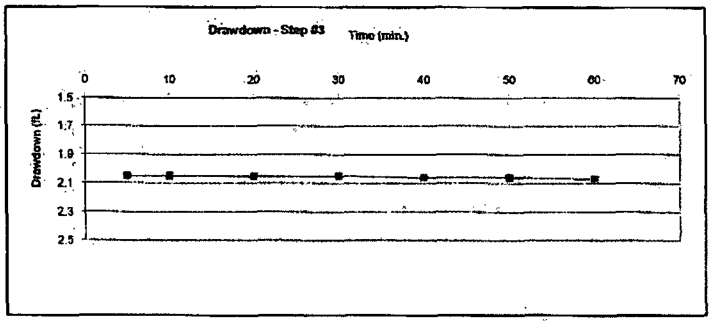
Step #4 — Pumping Rate (gpm) = 450

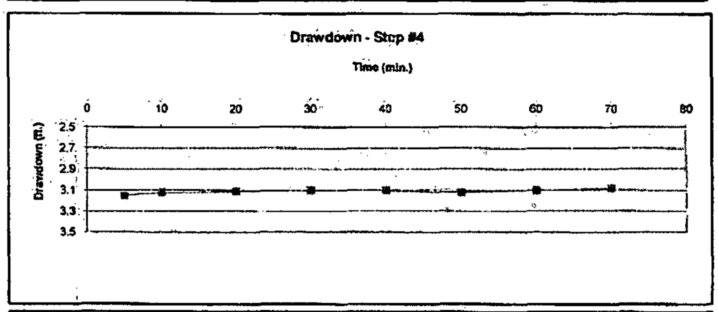
Elapsed Time (min.)	Pumping Water Level (ft bmp)	Drawdown (ft)	Specific Capacity (gpm/ft)
5	13.42	3.15	
10	13.39	3.12	
20	13.38	3.11	
30	13.37	3.10	
40	13.37	3.10	
50	13.39	3.12	
60	13.37	3.10	
70	13.35	3.08	*146.10*



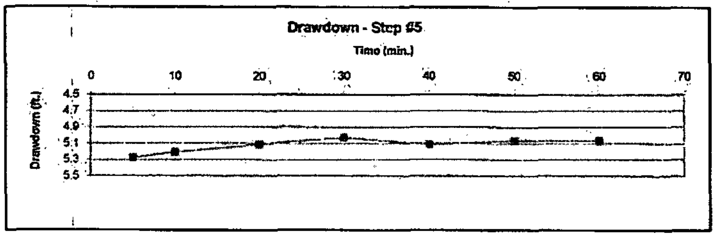








Step #5		Pumping Rate (gpm) =	675
Elapsed Time (min.)	Pumping Water Level (ft bmp)	Drawdown (ft)	
5	15.55	5.28	
10	15.48	5.21	
20	15.38	5.11	
30	15.3	5.03	
40	15.38	5.11	
50	15.34	5.07	
60	15.34	5.07	*133.14*



Submitted By:	Wheeler Construction, Inc.
Contact:	Paul Wheeler (352) 726-0973 paul@citrusbuilder.com
Responsible Entity:	Citrus Well Drilling, Inc.
Contact:	Ray Townsend
Submittal No:	080 Revision No: 1
Specification No:	02526 - 1.03
Specification Name:	Final Pump Test Results #7
Description:	Final Pump Test Results #7

Project and Contract Identification		Date Contractor Received
Subcontractor	Wheeler Construction, Inc.	
Project Name	Progress Energy Crystal River Plant Units 4 & 5 SCR/FGD	
Project Number	44000	**Contractor's Action**
Contract Title	Water Wells & Pumps	(See Contract Documents)
Contract No.	C5.8160	Initials & Date / Initials & Date
Spec. Sect. No.	02526 Art. No. 1.03	ⓐJDK 2/9/09 E
		B F
		C G
		D

Subcontractor's Approval: Submission of this document shall represent Subcontractor's approval as specified in the Contract Documents. Subcontractor remains liable for accuracy of Submittals as provided in the Contract Documents.

LOCATION: Progress Energy Well # 7 **DATE:** 1/14/2009

WELL SIZE: 10" (existing well) **PRE-TEST INFO:** Joe Goater

TIME	GPM	WATER LEVEL
8:30	0	10.27
8:31	112.5	10.89
8:32	112.5	10.9
8:33	112.5	10.9
8:35	112.5	10.9
8:37	112.5	10.9
8:40	112.5	10.92
8:45	112.5	10.93
8:50	112.5	10.94
8:55	112.5	10.94
9:00	112.5	10.95
9:10	112.5	10.95
9:20	112.5	10.97
9:30	112.5/250	10.97
9:31	250	11.51
9:32	250	11.52
9:33	250	11.53
9:35	250	11.51
9:37	250	11.5
9:40	250	11.5
9:45	250	11.51
9:50	250	11.52
9:55	250	11.52

TIME	GPM	WATER LEVEL
10:00	250	11.52
10:10	250	11.52
10:20	250	11.53
10:30	250/362.5	11.53
10:31	362.5	11.95
10:32	362.5	12.3
10:33	362.5	12.3
10:35	362.5	12.32
10:37	362.5	12.32
10:40	362.5	12.32
10:45	362.5	12.32
10:50	362.5	12.32
10:55	362.5	12.32
11:00	362.5	12.32
11:10	362.5	12.33
11:20	362.5	12.33
11:30	362.5/450	12.34
11:31	450	13.19
11:32	450	13.26
11:33	450	13.33
11:35	450	13.42
11:37	450	13.4
11:40	450	13.39

CITRUS WELL DRILLING
P.O. Box 369 Hernando, FL 34442
352-726-5454

LOCATION: Progress Energy Well # 7 **DATE:** 1/14/2009

WELL SIZE: 10" (existing well) **PRE-TEST INFO:** Joe Goater

TIME	GPM	WATER LEVEL
11:45	450	13.37
11:50	450	13.38
11:55	450	13.38
12:00	450	13.37
12:10	450	13.37
12:20	450	13.39
12:30	450	13.37
12:40	450/675	13.35
12:41	675	15.35
12:42	675	15.58
12:43	675	15.58
12:45	675	15.55
12:47	675	15.53
12:50	675	15.48
12:55	675	15.42
1:00	675	15.38
1:05	675	15.32
1:10	675	15.3
1:20	675	15.38
1:30	675	15.34
1:40	675/0	15.34
1:41	0	10.68
1:42	0	10.6

TIME	GPM	WATER LEVEL
1:43	0	10.55
1:45	0	10.53
1:47	0	10.51
1:50	0	10.49
1:55	0	10.46
2:00	0	10.43
2:05	0	10.42
2:10	0	10.4
2:20	0	10.38
2:30	0	10.36
2:40	0	10.34
2:50	0	10.33
3:00	0	10.3
3:10	0	10.27

CITRUS WELL DRILLING
P.O. Box 369 Hernando, FL 34442
352-726-5454

Progress Energy Crystal River - Production Well #PW-8

Upper Floridan Aquifer Step Drawdown Test Data

5/11/2009

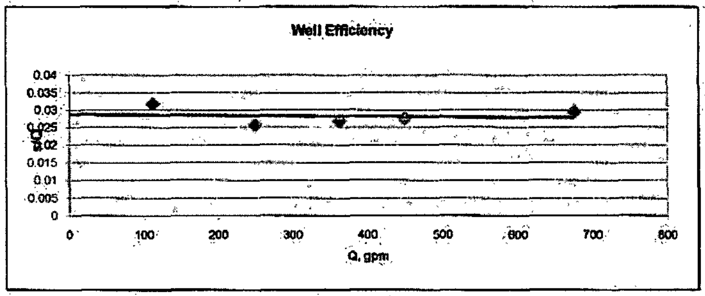
Data Summary

Yield Q (gpm)	Drawdown s (ft)	Specific Capacity Q/s (gpm/ft)	s/Q
112.5	3.57	31.51	0.031733
250	6.44	38.82	0.02576
362.5	9.69	37.41	0.026731
450	12.37	36.38	0.027489
675	19.89	33.94	0.029467

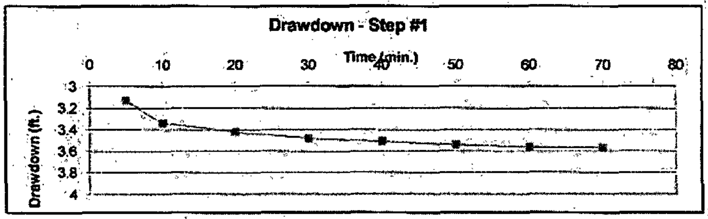
12-in diam. Production Well

Well Casing Depth = 84.5 ft bls
Well Total Depth = 220 ft bls

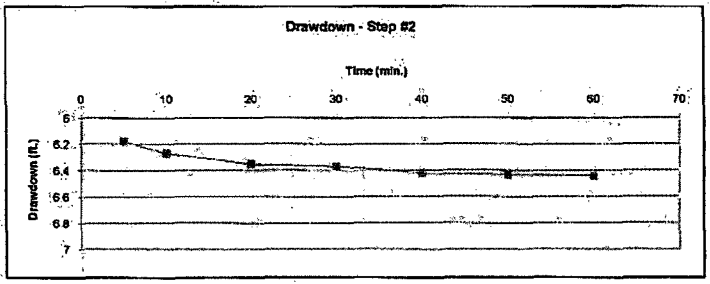
Static Water Level (ft bmp)		Measuring Point Elevation (ft above land surface)	
	12.32		2.80



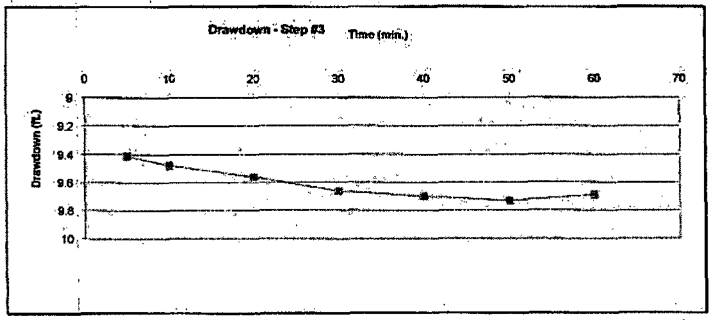
Step #1	Pumping Rate (gpm) =		112.5
Elapsed Time (min.)	Pumping Water Level (ft bmp)	Drawdown (ft)	Specific Capacity (gpm/ft)
5	15.45	3.13	
10	15.66	3.34	
20	15.74	3.42	
30	15.8	3.48	
40	15.83	3.51	
50	15.86	3.54	
60	15.88	3.56	
70	15.89	3.57	31.51



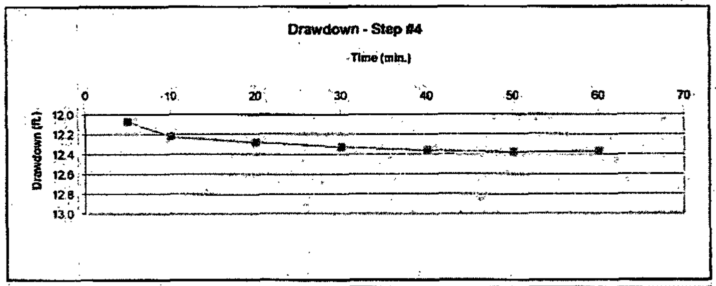
Step #2	Pumping Rate (gpm) =		250
Elapsed Time (min.)	Pumping Water Level (ft bmp)	Drawdown (ft)	Specific Capacity (gpm/ft)
5	18.5	6.18	
10	18.59	6.27	
20	18.67	6.35	
30	18.69	6.37	
40	18.74	6.42	
50	18.75	6.43	
60	18.76	6.44	38.82



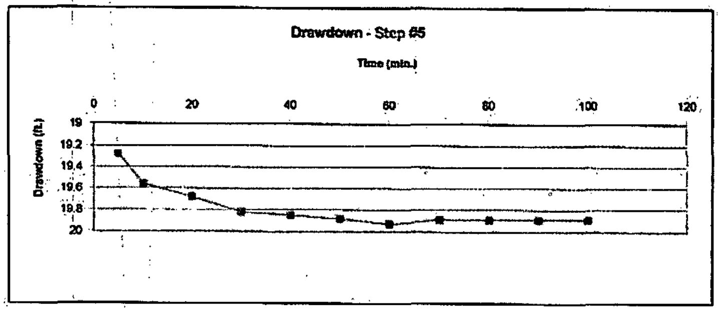
Step #3	Pumping Rate (gpm) =		362.5
Elapsed Time (min.)	Pumping Water Level (ft bmp)	Drawdown (ft)	Specific Capacity (gpm/ft)
5	21.73	9.41	
10	21.8	9.48	
20	21.88	9.56	
30	21.98	9.66	
40	22.02	9.7	
50	22.05	9.73	
60	22.01	9.69	37.41



Step #4	Pumping Rate (gpm) =		450
Elapsed Time (min.)	Pumping Water Level (ft bmp)	Drawdown (ft)	Specific Capacity (gpm/ft)
5	24.39	12.07	
10	24.54	12.22	
20	24.6	12.28	
30	24.65	12.33	
40	24.68	12.36	
50	24.7	12.38	
60	24.69	12.37	36.38



Step #5		Pumping Rate (gpm) =	675
Elapsed Time (min.)	Pumping Water Level (ft bmp)	Drawdown (ft)	
5	31.6	19.28	
10	31.88	19.56	
20	32	19.68	
30	32.14	19.82	
40	32.17	19.85	
50	32.2	19.88	
60	32.25	19.93	
70	32.21	19.89	
80	32.21	19.89	
90	32.21	19.89	
100	32.21	19.89	33.94



Submitted By:	Wheeler Construction, Inc.
Contact:	Paul Wheeler (352) 726-0973 paul@citrusbuilder.com
Responsible Entity:	Citrus Well Drilling
Contact:	Ray Townsend
Submittal No:	100 Revision No: 0
Specification No:	02520 - 1.03
Specification Name:	Step Draw-Down Test Result_8
Description:	Step Draw-Down Test Result_8

Project and Contract Identification		Date Contractor Received
Subcontractor	Wheeler Construction, Inc.	
Project Name	Progress Energy Crystal River Plant Units 4 & 5 SCR/FGD	
Project Number	44000	**Contractor's Action**
Contract Title	Water Wells & Pumps	(See Contract Documents)
Contract No.	C5.8160	Initials & Date: A ___ B ___ C ___ D ___
Spec. Sect. No.	02520 Art. No. 1.03	Initials & Date: E ___ F ___ G ___

Subcontractor's Approval: Submission of this document shall represent Subcontractor's approval as specified in the Contract Documents. Subcontractor remains liable for accuracy of Submittals as provided in the Contract Documents.

APPROVED | Action Code: A | 5/18/2009 | BMCD# 44000-5.8160-25720

LOCATION: Progress Energy Well # 8 **DATE:** 5-11-2009

WELL SIZE: 12" **PRE-TEST INFO:** Step Test / Static 12.32

TIME	GPM	WATER LEVEL
9:29	0	12.32
9:30	112.5	15.2
9:31	112.5	15.27
9:32	112.5	15.33
9:33	112.5	15.38
9:35	112.5	15.465
9:37	112.5	15.56
9:40	112.5	15.66
9:50	112.5	15.74
10:00	112.5	15.8
10:10	112.5	15.83
10:20	112.5	15.86
10:30	112.5	15.88
10:40	112.5	15.89
10:41	250	18.35
10:42	250	18.39
10:43	250	18.45
10:45	250	18.5
10:47	250	18.5
10:50	250	18.59
11:00	250	18.67
11:10	250	18.69
11:20	250	18.74

TIME	GPM	WATER LEVEL
11:30	250	18.75
11:40	250	18.76
11:41	362.5	21.19
11:42	362.5	21.39
11:43	362.5	21.46
11:45	362.5	21.73
11:47	362.5	21.79
11:50	362.5	21.8
12:00	362.5	21.88
12:10	362.5	21.98
12:20	362.5	22.02
12:30	362.5	212.05
12:40	362.5	22.01
12:41	450	24.03
12:42	450	24.25
12:43	450	24.33
12:45	450	24.39
12:47	450	24.46
12:50	450	24.54
1:00	450	24.6
1:10	450	24.65
1:20	450	24.68
1:30	450	24.7

CITRUS WELL DRILLING
P.O. Box 369 Hernando, FL 34442
352-726-5454

LOCATION: Progress Energy Well # 8 DATE: 5-11-2009

WELL SIZE: 12" PRE-TEST INFO:

TIME	GPM	WATER LEVEL
1:40	450	24.69
1:41	675	31.5
1:42	675	31.31
1:43	675	31.42
1:45	675	31.6
1:47	675	31.73
1:50	675	31.88
2:00	675	32
2:10	675	32.14
2:20	675	32.17
2:30	675	32.2
2:40	675	32.25
2:50	675	32.21
3:00	675	32.21
3:10	675	32.21
3:20	675	32.21
3:30	0	16.9
3:31		16.04
3:32		15.39
3:33		14.93
3:35		14.45
3:37		13.98
3:40		13.56

TIME	GPM	WATER LEVEL
3:50		12.98
4:00		12.75
4:10		12.66
4:20		12.56
4:30		12.51
4:40		12.49
4:50		12.46
5:00		12.42
5:10		12.39
5:20		12.38
5:30		12.37
5:40		12.36
5:50		12.36
6:00		12.36

CITRUS WELL DRILLING
P.O. Box 369 Hernando, FL 34442
352-726-5454

Progress Energy Crystal River - Production Well #PW-9

Upper Floridan Aquifer Step Drawdown Test Data

11/21/2008

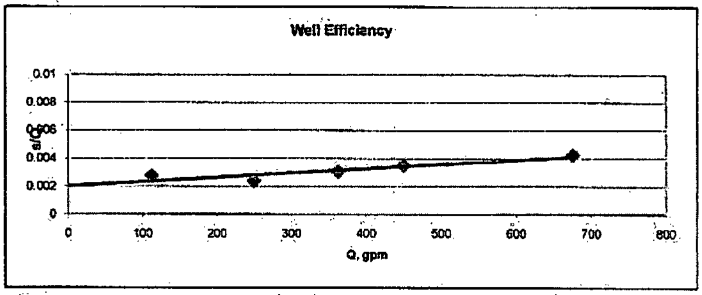
Data Summary

Yield Q (gpm)	Drawdown s (ft)	Specific Capacity Q/s (gpm/ft)	s/Q
112.5	0.31	362.90	0.002756
250	0.6	416.67	0.0024
362.5	1.1	329.55	0.003034
450	1.57	286.62	0.003489
675	2.87	235.19	0.004252

12-in diam. Production Well

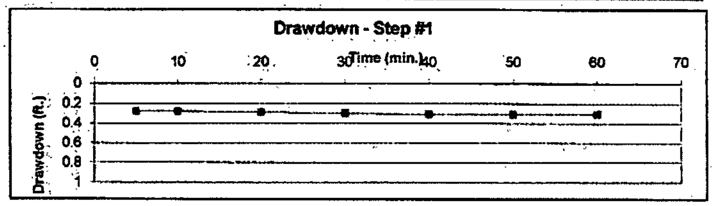
Well Casing Depth = 58.5 ft bls
Well Total Depth = 200 ft bls

Static Water Level (ft bmp)		Measuring Point Elevation (ft above land surface)	
	9.16		2.95



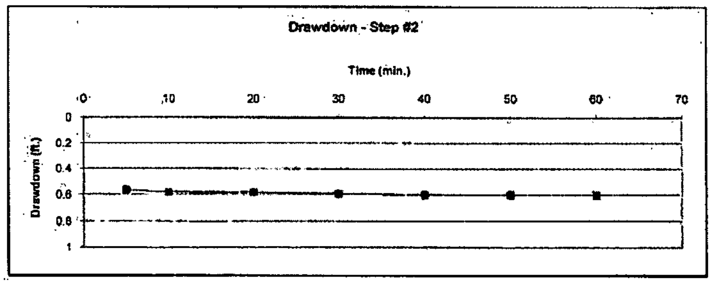
Step #1 Pumping Rate (gpm) = 112.5

Elapsed Time (min.)	Pumping Water Level (ft bmp)	Drawdown (ft)	Specific Capacity (gpm/ft)
5	9.44	0.28	
10	9.44	0.28	
20	9.45	0.29	
30	9.46	0.3	
40	9.47	0.31	
50	9.47	0.31	
60	9.47	0.31	*362.90*



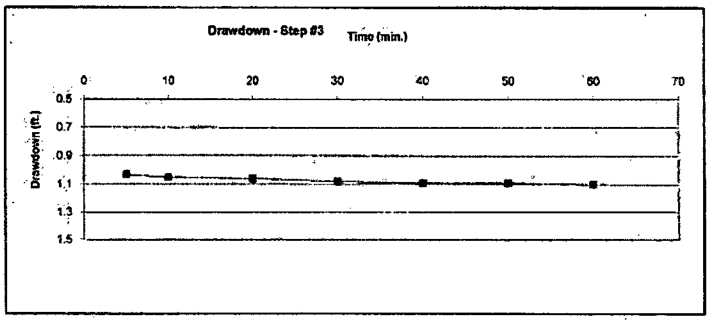
Step #2 Pumping Rate (gpm) = 250

Elapsed Time (min.)	Pumping Water Level (ft bmp)	Drawdown (ft)	Specific Capacity (gpm/ft)
5	9.72	0.56	
10	9.74	0.58	
20	9.74	0.58	
30	9.75	0.59	
40	9.76	0.6	
50	9.76	0.6	
60	9.76	0.6	*416.67*



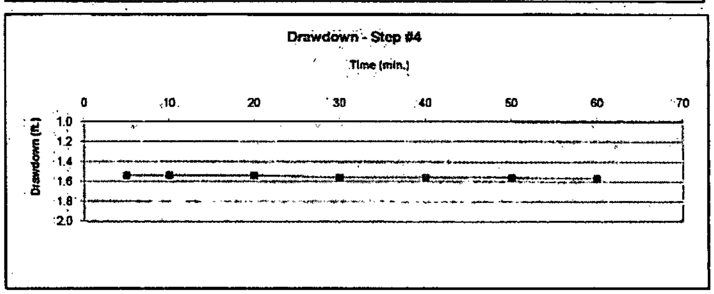
Step #3 Pumping Rate (gpm) = 362.5

Elapsed Time (min.)	Pumping Water Level (ft bmp)	Drawdown (ft)	Specific Capacity (gpm/ft)
5	10.19	1.03	
10	10.21	1.05	
20	10.22	1.06	
30	10.24	1.08	
40	10.25	1.09	
50	10.25	1.09	
60	10.26	1.1	*329.55*

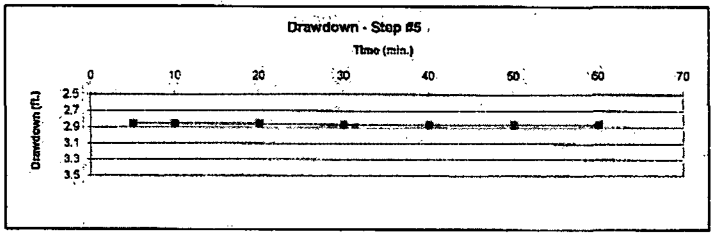


Step #4 Pumping Rate (gpm) = 450

Elapsed Time (min.)	Pumping Water Level (ft bmp)	Drawdown (ft)	Specific Capacity (gpm/ft)
5	10.7	1.54	
10	10.7	1.54	
20	10.7	1.54	
30	10.72	1.56	
40	10.72	1.56	
50	10.72	1.56	
60	10.73	1.57	*286.62*



Step #5		Pumping Rate (gpm) =	675
Elapsed Time (min.)	Pumping Water Level (ft bmp)	Drawdown (ft)	
5	12.02	2.86	
10	12.02	2.86	
20	12.02	2.86	
30	12.03	2.87	
40	12.03	2.87	
50	12.03	2.87	
60	12.03	2.87	*235.19*



Submitted By:	Wheeler Construction, Inc.		
Contact:	Paul Wheeler	(352) 726-0973	paul@citrusbuilder.com
Responsible Entity:	Citrus Well Drilling		
Contact:	Ray Townsend		
Submittal No:	070	Revision No:	0
Specification No:	02520 - 1.03		
Specification Name:	Step Draw-Down Test Result #9		
Description:	Step Draw-Down Test Result #9		

Project and Contract Identification				Date Contractor Received
Subcontractor	Wheeler Construction, Inc.			
Project Name	Progress Energy Crystal River Plant Units 4 & 5 SCR/FGD			
Project Number	44000			**Contractor's Action**
Contract Title	Water Wells & Pumps			(See Contract Documents)
Contract No.	C5.8160			
Spec. Sect. No.	02520	Art. No.	1.03	

Subcontractor's Approval: Submission of this document shall represent Subcontractor's approval as specified in the Contract Documents. Subcontractor remains liable for accuracy of Submittals as provided in the Contract Documents.

Initials & Date	Initials & Date
Ⓐ JDK 12/23/08	E
B	F
C	G
D	

LOCATION:	Progress Energy # 9	DATE:	11/21/2008
WELL SIZE:	12"	PRE-TEST INFO:	Joe Goater

TIME	GPM	WATER LEVEL	TIME	GPM	WATER LEVEL
10:30	0	9.16	12:00	250	9.75
10:31	112.5	9.41	12:10		9.76
10:32		9.43	12:20		9.76
10:33		9.43	12:30	250 / 362.5	9.76
10:35		9.44	12:31	362.5	10.15
10:37		9.44	12:32		10.16
10:40		9.44	12:33		10.18
10:45		9.45	12:35		10.19
10:50		9.45	12:37		10.2
10:55		9.45	12:40		10.21
11:00		9.46	12:45		10.22
11:10		9.47	12:50		10.22
11:20		9.47	12:55		10.23
11:30	112.5 / 250	9.47	1":00		10.24
11:31	250	9.69	1:10		10.25
11:32		9.7	1:20		10.25
11:33		9.71	1:30	362.5 / 450	10.26
11:35		9.72	1:31	450	10.67
11:37		9.73	1:31		10.69
11:40		9.74	1:33		10.7
11:45		9.74	1:35		10.7
11:50		9.74	1:37		10.7
11:55		9.74	1:40		10.7

CITRUS WELL DRILLING
P.O. Box 369 Hernando, FL 34442
352-726-5454

LOCATION: Progress Energy # 9 DATE: 11/21/2008

WELL SIZE: 12" PRE-TEST INFO: Joe Goater

TIME	GPM	WATER LEVEL	TIME	GPM	WATER LEVEL
1:45	450	10.7	3:35	0	9.49
1:50		10.7	3:37		9.46
1:55		10.71	3:40		9.43
2:00		10.72	3:45		9.4
2:10		10.72	3:50		9.38
2:20		10.72	3:55		9.35
2:30	450 / 675	10.73	4:00		9.34
2:31	675	11.85	4:10		9.33
2:32		11.9	4:20		9.3
2:33		11.94	4:30		9.3
2:35		12.02	4:40		9.3
2:37		12.02	4:50		9.3
2:40		12.02			
2:45		12.03			
2:50		12.02			
2:55		12.02			
3:00		12.03			
3:10		12.03			
3:20		12.03			
3:30	675 / 0	12.03			
3:31	0	9.63			
3:32		9.57			
3:33		9.53			

CITRUS WELL DRILLING

P.O. Box 369 Hernando, FL 34442

352-726-5454

Progress Energy Crystal River - Production Well #PW-10

Upper Floridan Aquifer Step Drawdown Test Data

11/5/2009

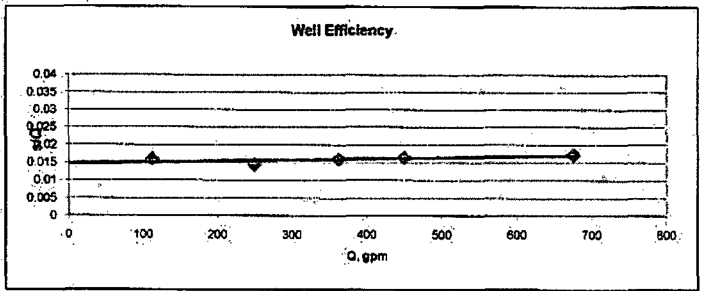
Data Summary

Yield Q (gpm)	Drawdown s (ft)	Specific Capacity Q/s (gpm/ft)	s/Q
112.5	1.8	62.50	0.016
250	3.61	69.25	0.01444
362.5	5.79	62.61	0.015972
450	7.4	60.81	0.016444
675	11.65	57.94	0.017259

12-in diam. Production Well

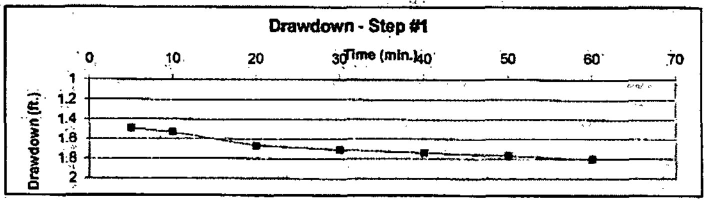
Well Casing Depth = 58.5 ft bls
Well Total Depth = 200 ft bls

Static Water Level (ft bmp)		Measuring Point Elevation (ft above land surface)
	8.00	3.25



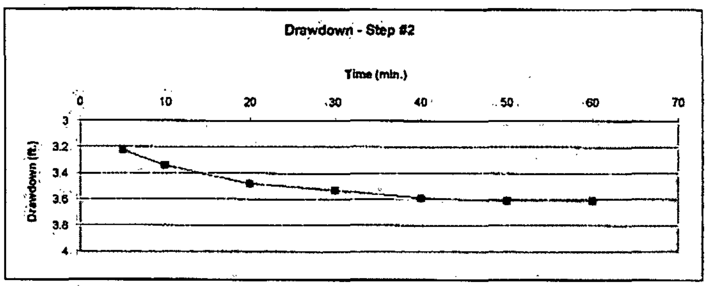
Step #1 Pumping Rate (gpm) = 112.5

Elapsed Time (min.)	Pumping Water Level (ft bmp)	Drawdown (ft)	Specific Capacity (gpm/ft)
5	9.49	1.49	
10	9.53	1.53	
20	9.67	1.67	
30	9.71	1.71	
40	9.74	1.74	
50	9.77	1.77	
60	9.8	1.8	62.50



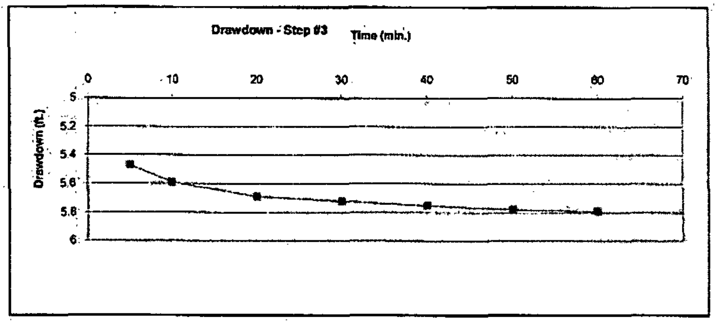
Step #2 Pumping Rate (gpm) = 250

Elapsed Time (min.)	Pumping Water Level (ft bmp)	Drawdown (ft)	Specific Capacity (gpm/ft)
5	11.22	3.22	
10	11.34	3.34	
20	11.48	3.48	
30	11.53	3.53	
40	11.59	3.59	
50	11.61	3.61	
60	11.61	3.61	69.25



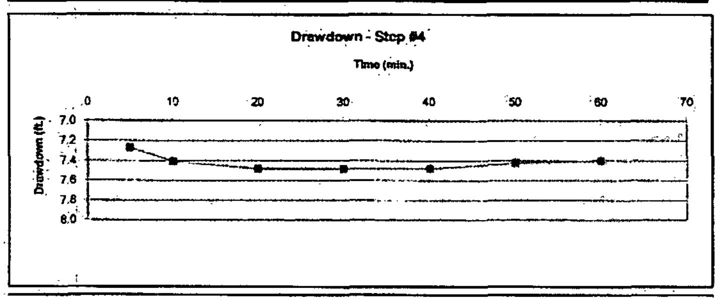
Step #3 Pumping Rate (gpm) = 362.5

Elapsed Time (min.)	Pumping Water Level (ft bmp)	Drawdown (ft)	Specific Capacity (gpm/ft)
5	13.47	5.47	
10	13.59	5.59	
20	13.69	5.69	
30	13.72	5.72	
40	13.75	5.75	
50	13.78	5.78	
60	13.79	5.79	62.61

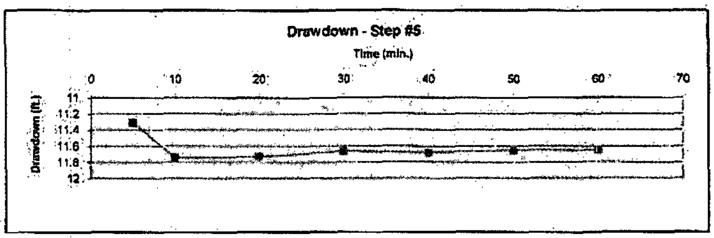


Step #4 Pumping Rate (gpm) = 450

Elapsed Time (min.)	Pumping Water Level (ft bmp)	Drawdown (ft)	Specific Capacity (gpm/ft)
5	15.27	7.27	
10	15.41	7.41	
20	15.48	7.48	
30	15.48	7.48	
40	15.48	7.48	
50	15.42	7.42	
60	15.4	7.40	60.81



Step #5		Pumping Rate (gpm) =	675
Elapsed Time (min.)	Pumping Water Level (ft bmp)	Drawdown (ft)	
5	19.31	11.31	
10	19.74	11.74	
20	19.73	11.73	
30	19.66	11.66	
40	19.68	11.68	
50	19.65	11.65	
60	19.65	11.65	57.94



Submitted By:	Wheeler Construction, Inc.
Contact:	Paul Wheeler (352) 726-0973 paul@citrusbuilder.com
Responsible Entity:	Citrus Well Drilling
Contact:	Ray Townsend
Submittal No:	071 Revision No: 0
Specification No:	02520 - 1.03
Specification Name:	Step Draw-Down Test Result #10
Description:	Step Draw-Down Test Result #10

Project and Contract Identification

Subcontractor	Wheeler Construction, Inc.
Project Name	Progress Energy Crystal River Plant Units 4 & 5 SCR/FGD
Project Number	44000
Contract Title	Water Wells & Pumps
Contract No.	C5.8160
Spec. Sect. No.	02520 Art. No. 1.03

Subcontractor's Approval: Submission of this document shall represent Subcontractor's approval as specified in the Contract Documents. Subcontractor remains liable for accuracy of Submittals as provided in the Contract Documents.

Date Contractor Received

Contractor's Action

(See Contract Documents)

Initials & Date	Initials & Date
(A) JDK 12/23/08	E
B	F
C	G
D	

	A	B	C	D	E	F	G
1	LOCATION:	Progress Energy PW #10			DATE:		11/5/2008
2	WELL SIZE:	12"			PRE-TEST INFO:		Joe Goater
3							
4							
5	TIME	GPM	WATER LEVEL		TIME	GPM	WATER LEVEL
6	9:00	0	8		10:30		11.53
7	9:01	112.5	9.35		10:40		11.59
8	9:02	112.5	9.43		10:50		11.61
9	9:03		9.46		11:00	250 / 367.50	11.61
10	9:05		9.49		11:01		13.24
11	9:07		9.51		11:02		13.33
12	9:10		9.53		11:03		13.39
13	9:15		9.62		11:05		13.47
14	9:20		9.67		11:07		13.52
15	9:25		9.68		11:10		13.59
16	9:30		9.71		11:15		13.67
17	9:40		9.74		11:20		13.69
18	9:50		9.77		11:25		13.71
19	10:00	112.5 / 250	9.8		11:30		13.72
20	10:01	250	11		11:40		13.75
21	10:02		11.06		11:50		13.78
22	10:03		11.11		12:00	250 / 450	13.79
23	10:05		11.22		12:01		15.08
24	10:07		11.28		12:02		15.16
25	10:10		11.34		12:03		15.22
26	10:15		11.43		12:05		15.27
27	10:20		11.48		12:07		15.31
28	10:25		11.51		12:10		15.41
29	Citrus Well Drilling						
30	P.O. Box 369 Hernando, FL 34442						
31	352-726-5454						

	A	B	C	D	E	F	G
32	LOCATION:	Progress Energy PW # 10			DATE:		11/5/2008
33	WELL SIZE:	12"			PRE-TEST INFO:		Joe Goater
34							
35	TIME	GPM	WATER LEVEL		TIME	GPM	WATER LEVEL
36	12:15	450	15.46		2:50	675	19.73
37	12:20		15.48		2:55		19.72
38	12:25		15.48		3:00		19.66
39	12:30		15.48		3:10		19.68
40	12:40		15.48		3:20		19.65
41	12:50		15.42		3:30		19.65
42	1:00		15.4		3:31	0	10.54
43	1:10		15.35		3:32		10.45
44	1:20		15.35		3:33		10.12
45	1:30		15.33		3:35		9.62
46	1:40		15.43		3:37		9.32
47	1:50		15.31		3:40		9.04
48	2:00		15.27		3:45		8.75
49	2:10		15.32		3:50		8.59
50	2:20		15.28		3:55		8.48
51	2:30	450 / 675	15.28		4:00		8.41
52	2:31	675	18.8		4:10		8.29
53	2:32		18.99		4:20		8.2
54	2:33		19.08		4:30		8.15
55	2:35		19.31		4:40		8.12
56	2:37		19.34		4:50		8.08
57	2:40		19.74		5:00		8.05
58	2:45		19.67		5:10		8.02
59	CITRUS WELL DRILLING						
60	P.O. Box 369 Hernando, FL 34442						
61	352-726-5454						

	A	B	C	D	E	F	G
62	LOCATION:	Progress Energy PW #10			DATE:		11/5/2008
63	WELL SIZE:	12"			PRE-TEST INFO:		Joe Goater
64							
65	TIME	GPM	WATER LEVEL		TIME	GPM	WATER LEVEL
66	5:20	0	8.01				
67	5:30		8				
68							
69							
70							
71							
72							
73							
74							
75							
76							
77							
78							
79							
80							
81							
82							
83							
84							
85							
86							
87							
88							
89	CITRUS WELL DRILLING						
90	P.O. Box 369 Hernando, FL 34442						
91	352-726-5454						

CREC CCP and Solid Waste Management Plan

Golder Associates

April 14, 2010 083-82671

Mr. Steven Parrish
Progress Energy Florida, Inc.
15760 West Powerline Street
Crystal River, FL 34428

RE: SITE-WIDE COAL COMBUSTION PRODUCTS (CCP)/ SOLID WASTE MATERIALS MANAGEMENT PLAN (REVISED) CRYSTAL RIVER ENERGY COMPLEX CRYSTAL RIVER, FLORIDA

Dear Mr. Parrish:

In conjunction with Progress Energy Florida, Inc. (PEF), Golder Associates Inc. (Golder) has prepared this Site-Wide Coal Combustion Products (CCP)/Solid Waste Materials Management Plan (Revised) for the Crystal River Energy Complex.

The undersigned certifies that the content of the Plan is consistent with the requirements outlined in Section VI., G. of the Conditions of Certification, Progress Energy Florida, Crystal River Energy Complex (PA 77-09A2) that was issued by the Florida Department of Environmental Protection (FDEP) on August 28, 2008.

Should you have any questions or comments, please contact me at 904.363.3430 or by email at kkarably@golder.com.

Sincerely,

GOLDER ASSOCIATES INC.

Kenneth B. Karably, P.E.
Florida Professional Engineer No. 42366

4/14/2010
Date

KENNETH B. KARABLY LICENSE No. 42366 STATE OF FLORIDA PROFESSIONAL ENGINEER

KBK/ams

FN: G:\Projects\083\083-82\083-82671\CCP Solid Waste Management Plan\Final 14 APR 2010\PEF Cvr ltr 4-14-2010.doc

TABLE OF CONTENTS

TABLE OF CONTENTS

(Continued)

List of Tables

List of Figures

1.0 INTRODUCTION

1.1 PURPOSE

The purpose of this Coal Combustion Product (CCP) and Solid Waste Material Management Plan is to describe the procedures for management of CCPs and other (non-CCP) waste material generated at the Crystal River Energy Complex (CREC) operated by Progress Energy Florida, Inc. (PEF) and complies with applicable sections of rule Chapter 62-701, F.A.C. The fossil plant is located near Crystal River in Citrus County, Florida. This plan is designed to assist the facility in maintaining compliance with applicable permits and environmental regulations, preventing release of products to the environment. The requirements for a CCP and Solid Waste Material Management Plan were detailed in the Conditions of Certification (FDEP, August 28, 2008) which states:

> *No later than December 31, 2008 or 180 days prior to the initial operation of Unit 4 and 5 FGD scrubbers (whichever occurs first), the licensee shall submit a site-wide Coal Combustion By-Product (CCP)/Solid Waste Materials Management Plan that addresses operations of the fossil generating units to the Department's SWD Office and Siting Office for review and approval. The plan shall, at a minimum, include the following information:*
>
> 1. *Descriptions and procedures for all applicable processes for on-site storage practices and management of CCPs, solid wastes and industrial by-products at the site.*
> 2. *Plans or methods to minimize waste streams, and maximize beneficial use opportunities of CCPs;*
> 3. *Methods for preventing or minimizing the release of contaminants to the environment, including (as applicable) leachate collection and control methods that meet the requirements of Chapter 62-701, F.A.C.;*
> 4. *Certification for the above information, as appropriate, by a Professional Engineer registered in the state of Florida.*

According to rule Chapter 62-701, F.A.C., Solid Waste Management Facilities, industrial byproducts are exempt from solid waste disposal regulation provided the industrial byproducts definition is met. Industrial byproducts are exempt from Chapter 62-701 F.A.C. if:

1. A majority of the industrial byproducts are demonstrated to be sold, used, or re-used with one year;
2. The industrial byproducts are not discharged, deposited, injected, dumped, spilled, leaked, or placed into or upon any land or be emitted into the air or discharged into any waters including groundwater, or otherwise enter the environment such that a threat of contamination in excess of water quality standards and criteria or air quality standards is caused; and
3. The industrial byproducts are not hazardous waste.

1.2 Facility

1.2.1 Location

The CREC is located near the Gulf of Mexico in Citrus County, Florida. The CREC encompasses approximately 4,750 acres and is situated in portions of Sections 28 through 36, Township 17 South, Range 16 East and Sections 3, 4, 5, 9, and 10, Township 18 South, Range 16 East (Golder, April 2007). The center of the CREC is at approximately 28°57'50" latitude, and 82°41'41" west longitude.

1.2.2 Operations

The CREC consists of five generating units. Units 1, 2, 4, and 5 are coal-fired steam units and combined are capable of producing 2,313 mega watts (MW). Located on the south side of the complex, Units 1 and 2 were built in the 1960s and are capable of producing 866 MW. Located on the north side of the complex, Units 4 and 5 were built in the 1980s and are capable of producing 1,437 MW. Unit 3 is an 838 MW nuclear power plant located on the south side of the complex and is excluded from this plan.

Units 3, 4, and 5 are certified under PA77-09N (FDEP, January 15, 2010). Units 1 and 2 were built in the 1960s and, as such, pre-date the Power Plant Siting Act.

Crystal River Units 4 and 5 Conditions of Certification (PA 77-09N) addresses the ash landfill for the storage of fly ash and bottom ash generated by Units 4 and 5. The COC was amended to include the storage of ash generated by Units 1 and 2. Therefore, the ash storage area contains ash that is generated by all four coal-fired units.

1.2.3 Permits

CREC currently maintains three (3) Industrial Wastewater Permits (IWWP) issued by the Florida Department of Environmental Protection (FDEP). Two separate IWWPs pertain to surface water discharges for Unit 1, 2 and 3 and Units 4 and 5, and constitute authorization to discharge to Waters of the State under the National Pollutant Discharge Elimination System (NPDES). An additional IWWP covers groundwater discharges for the CREC facility.

<u>NPDES IWWP FL0000159 - Units 1, 2 and 3 (FDEP, May 9, 2005)</u>

Industrial Wastewater Facility Permit Number FL0000159 was issued in May 2005 by FDEP for Units 1, 2 and 3. The permit authorizes the following discharges to state waters under NPDES: once-through condenser cooling water, treated nuclear auxiliary cooling water, treated coal pile rainfall runoff, intake screen wash water, and treated non-radioactive waste/radiation waste. This permit authorizes and requires select monitoring of 12 surface water discharge locations, two internal discharge locations, and six (6) storm water discharge locations.

<u>NPDES IWWP FL0036366 - Units 4 and 5 (FDEP, August 15, 2005)</u>

Industrial Wastewater Facility Permit Number FL0036366 was issued in August 2005 by FDEP for Units 4 and 5 and authorizes discharge to state waters under NPDES. Wastewater at the facility consists of non-contact recirculating cooling tower blowdown (CTBD) and runoff from coal and ash storage and handling areas. CTBD discharges to the site discharge canal after being chlorinated in the cooling towers. Rainfall runoff from the coal yard, ash storage area, ash sluice/dewatering system, and transport truck rinseate is treated in the collection areas by sedimentation. Runoff overflow occasionally discharges to the runoff collection system which in turn discharges to the site discharge canal covered under permit FL0000159. This permit authorizes and requires select monitoring of two (2) surface water discharge locations (CTBD) and one (1) storm water discharge location which includes internal outfall from the coal storage area and ash storage area.

IWWP FLA016960 (FDEP, January 9, 2007, Revised November 17, 2009)

Industrial Wastewater Facility Permit Number FLA016960 was issued in January 2007 by FDEP for the CREC and authorizes effluent disposal by land application via a percolation pond system consisting of three ponds. The wastewater sources include plant equipment drains, laboratory drains, floor drains, neutralized wastes from demineralizer resin beds, water treatment process wastewater, boiler blowdown, boiler drains, pre-heater wash drains, sewage treatment plant effluents, transformer area storm water drainage, FGD blowdown, precipitator washes, boiler washes, cooling water blowdown, and filtration concentrate. This permit requires quarterly monitoring of the percolation pond land application system and quarterly monitoring of a twelve (12) well monitoring well network.

2.0 COAL COMBUSTION PRODUCT AND NON-COAL COMBUSTION PRODUCT – MATERIALS

Product materials generated at CREC Units 1, 2, 4 and 5 have been grouped into the following categories:

Coal Combustion Products (CCPs)

- Fly Ash (All units)
- Bottom Ash – pyrite free (Units 1 and 2)
- Bottom Ash (Units 4 and 5)
- Flue Gas Desulfurization Products (Gypsum) (Units 4 and 5)

Non-Coal Combustion Products (Non-CCPs)

- Pyrite Mill Reject (Units 1 and 2)
- Cooling Tower Sludge (Units 4 and 5, Helper Cooling Towers)
- Dredge Materials (intake/discharge canals, ditch cleanings, IWW ponds)
- Truck Wash Solids
- Aardelite Product

Miscellaneous Solid Wastes

- Units 4 and 5 Coal Yard Soil
- Impacted Soils (site-wide)

This section provides product process descriptions, material characteristics, estimated generation rates, and transport destinations. A site plan showing identified areas is presented on Figure 1. Process flow diagrams for the above coal combustion products and non-coal combustion products are provided on Figures 2 and 3. A summary of coal combustion products and non-coal combustion products is provided in Table 1.

2.1 FLY ASH

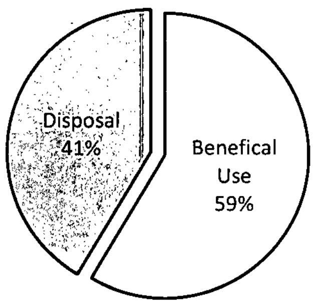
Fly ash is an industrial byproduct produced during the coal combustion process in each unit and is captured from furnace flue gas and collected by electrostatic precipitators (ESPs). Fly ash collected in Units 1 and 2 ESPs is transferred pneumatically to storage silos or to a former aboveground storage tank (AST) located immediately west of the Units 1 and 2 power block. Units 4 and 5 fly ash is transferred from the ESPs to individual storage silos. Fly ash from storage silos is loaded into pressure-differential trucks or conditioned by a pug mill prior to being loaded into dump trucks for off-site beneficial use or on-site storage.

A primary ash contractor supports PEF with the management and final disposition of fly ash. To the extent that the primary ash contractor is unable to use or sell these materials, it transfers temporarily unsalable fly ash to the existing on-site fly ash storage area located east of Units 4 and 5 (see Figure 1). The primary ash contractor supports CREC with the transportation, spreading, compacting and pile maintenance operations for the Units 1, 2, 4, and 5 ash storage area. Fly ash may be removed for off-site beneficial use from the storage area by a secondary ash contractor. The secondary ash contractor supports PEF with ash reclamation and beneficial use opportunities.

Fly ash is typically gray in color with a particle size that ranges from a very fine ash to pebble sized spent cinders. In November 2007, statistically representative samples were collected from the fly ash storage area for synthetic precipitation leaching procedure (SPLP) analysis. Based on mean concentrations of the sample results, SPLP exceedances of Primary Drinking Water Standards (Chapter 62-550, FAC) (PDWS), Secondary Drinking Water Standards (Chapter 62-550, FAC) (SDWS) and Groundwater Guidance Concentrations (Chapter 62-777, FAC) (GGC) were reported for the following: aluminum (SDWS), antimony (PDWS), arsenic (PDWS), boron (GGC), molybdenum (GGC), selenium (PDWS) and vanadium (GGC).

Approximately 554,000 tons of fly ash per year is produced from Units 1, 2, 4, and 5. Approximately 324,000 tons of this fly ash is transported off-site for beneficial reuse a year. The remaining ash is deposited in the fly ash storage area. Table 2 provides production, beneficial use and disposal rates of Units 1, 2, 4 and 5 fly ash (based on 2007 and 2008 data provided by PEF).

Units 1, 2, 4, and 5 Fly Ash



2.2 UNITS 1 AND 2 BOTTOM ASH

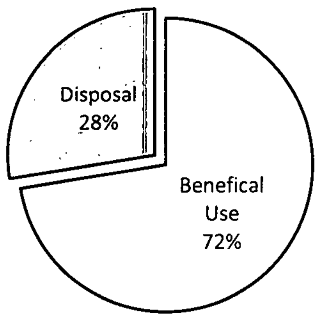
Units 1 and 2 are dry bottom ash boilers and are pyrite-free. Pyrites are separated from the coal for Units 1 and 2 at the pulverizers. Two fractions of bottom ash, heavy and fine, are generated from Units 1 and 2. The heavy bottom ash is collected in a vacuum truck directly from the boilers, which is transported to the Units 1 and 2 bottom ash storage area. The heavy bottom ash is transferred approximately three times per day for each unit. The fine bottom ash is conveyed to the Units 1 and 2 bottom ash silo and is transported via pan truck to the Units 1 and 2 bottom ash storage area approximately once per week.

A primary ash contractor supports PEF with management and final disposition of bottom ash from Units 1 and 2 to the extent that it is unable to sell or use the materials. The primary ash contractor supports CREC with the transport, spreading, compacting, and pile maintenance operation for the bottom ash that it determines not to be salable. Bottom ash from Units 1 and 2 deposited in the Units 1 and 2 bottom ash storage pile may be removed for off-site beneficial use by a secondary ash contractor who support CREC with ash reclamation and beneficial use opportunities.

Units 1 and 2 bottom ash is typically light brownish gray in color and ranges from very fine ash to gravel size cinders. In November 2007, statistically representative samples were collected from the Units 1 and 2 bottom ash storage pile for SPLP analysis. The mean SPLP values of the Units 1 and 2 bottom ash exceeded the respective PDWS or SDWS for: arsenic (PDWS) and aluminum (SDWS).

Units 1 and 2 generate approximately 25,000 tons per year of bottom ash. Approximately 18,000 tons of this bottom ash is transported off-site for beneficial reuse per year, while the remainder is storage in the Units 1 and 2 bottom ash storage pile. Table 2 provides production, beneficial use and disposal rates of Units 1 and 2 bottom ash (based on 2007 and 2008 data provided by PEF).

Units 1 and 2 Bottom Ash



2.3 UNITS 4 AND 5 BOTTOM ASH

Units 4 and 5 bottom ash has the same characteristics as bottom ash generated in Units 1 and 2 except that Units 4 and 5 bottom ash contain pyrite. Units 4 and 5 use wet systems for bottom ash handling. Bottom ash from each boiler falls into a hopper and is transported with water into a transfer tank. An ash slurry pump transfers the bottom ash/water mixture to a dewatering bin where solids are allowed to settle. The wet bottom ash (about 20% moisture) from each dewatering bin is then transported in 30 ton capacity open-top trucks for either off-site beneficial use or on-site storage at the Units 4 and 5 bottom ash storage pile.

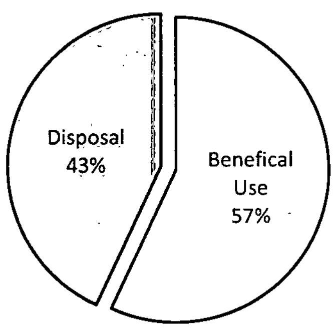
Water from the dewatering bins overflows into an ash settling tank. Solids which are carried over with the water settle and are pumped back into the dewatering bin. Water overflows the ash settling tank into a surge tank where it is pumped back to the bottom ash hopper to sluice more bottom ash. This is a closed loop system with no blow down. A pit below the bottom ash hopper catches any leakage from the bottom ash hopper and a sump pump sends this water to the dewatering bin. Make-up water to the system comes from service water and is introduced at either the ash settling tank or directly to the surge tank.

A primary ash contractor supports PEF with the purchase of its salable bottom ash from Units 4 and 5. This primary ash contractor supports CREC with the transport, spreading, compacting, and maintenance operations for the Units 4 and 5 bottom ash that may be temporarily unsalable. A secondary ash contractor supports PEF with the reclamation of bottom ash from the Units 4 and 5 bottom ash storage pile for off-site beneficial use.

Units 4 and 5 bottom ash typically ranges from very fine to gravel sized ash and is brownish gray in color. In November 2007, statistically representative samples were collected from the Units 4 and 5 bottom ash storage pile for SPLP analysis. The mean SPLP values of the Units 4 and 5 bottom ash exceeded the PDWS for arsenic and the SDWS for aluminum and iron

The average amount of bottom ash generated by Units 4 and 5 is approximately 45,000 tons per year. According to records, approximately 26,000 tons per year of this bottom ash is transported off-site for beneficial use with the remainder being deposited in the Units 4 and 5 bottom ash storage pile. Table 2 provides production, beneficial use and disposal rates of Units 4 and 5 bottom ash (based on 2007 and 2008 data provided by PEF).

Units 4 and 5 Bottom Ash



2.4 FLUE GAS DESULFURIZATION PRODUCTS

The flue gas desulfurization (FGD) system has been constructed for Units 4 and 5 and became operational in December 2009. The FGD system produces synthetic gypsum (calcium sulfate). FGD system operations include a gypsum dewatering facility, a conveyor, and a storage area. The synthetic gypsum produced by the FGD system is transported off-site for beneficial reuse or disposal. Depending on plant operations during a given year, the projected annual production of gypsum by the Units 4 and 5 FGD system is 350,000 tons for 2010, and 650,000 tons for each successive year. Some waste gypsum is expected to be produced which would be transported off-site for disposal or beneficial re-use. In March 2010, samples were collected from the temporary gypsum stockpile for SPLP analysis (Golder, April 2010). The mean SPLP values of the gypsum stockpile samples exceeded the respective PDWS and/or SDWS of the following constituents: aluminum (SDWS), fluoride (PDWS and SDWS), sulfate (SDWS), and total dissolved solids (SDWS).

As part of the FGD system construction process, the Former North Ash Pond was converted to the FGD Blowdown Pond System which became operational in February 2010. Ash excavated from the Former North Ash Pond was deposited in the High Chloride Ash piles within the ash storage area. The FGD

Blowdown Pond System consists of two lined settling ponds that are designed to settle out most of the suspended solids in the liquid blowdown waste stream. After settling of suspended solids, the liquid is pumped to the existing South Plant percolation pond. As part of the FGD Blowdown Pond System, the Primary Pond is the pond to which FGD blowdown is pumped, with the Backup Pond available when needed for cleanout and maintenance of the Primary Pond. Pond solids are to be removed from the ponds after the solids have accumulated to a design elevation and will be transported offsite for beneficial reuse or disposal. In March 2010, solids samples were collected from influent blowdown waste stream for SPLP analysis (Golder, April 2010). The mean SPLP values of the FGD Blowdown Pond System solids exceeded the respective PDWS, SDWS or GGC of the following constituents: boron (GGC), manganese (SDWS), fluoride (PDWS and SDWS), sulfate (SDWS) and total dissolved solids (SDWS).

2.5 UNITS 1 AND 2 MILL REJECTS

The Units 1 and 2 boilers utilize a milling process that separates pyrites from the coal. The mill rejects, consisting of coal, rock and pyrites, are collected in a pile within the Units 1 and 2 coal yard. Units 1 and 2 produce approximately 1,755 tons of mill rejects per year.

PEF has arranged for the off-site beneficial use of these mill rejects. A cement plant will purchase all mill rejects generated at the Units 1 and 2 coal yard for use as an off-quality fuel by blending the rejects with their normal coal for use in the cement kiln. The current stock of mill rejects is being removed at a rate which should deplete the pile. Mill rejects generated in the future will be transported directly to the cement plant once every two to three months, in reasonable shipment quantities (typically batches of 250 to 500 tons).

The Units 1 and 2 mill rejects range from a large gravel size to a fine grained mixture of coal, rock and pyrites. In November 2007, statistically representative samples were collected for SPLP analysis from the Units 1 and 2 mill rejects pile. The mean SPLP values of the mill reject samples exceeded the respective PDWS or SDWS of the following constituents: aluminum (SDWS), arsenic (PDWS), iron (SDWS), manganese (SDWS), sulfate (SDWS), and total dissolved solids (SDWS).

2.6 COOLING TOWER SLUDGE

Units 4 and 5 employ natural draft hyperbolic cooling towers for water cooling. Units 1 and 2 use a once-through cooling system with discharge into the plant's once-through-cooling water discharge canal. The discharge canal employs a series of auxiliary mechanical draft cooling towers to cool discharge canal water in order to meet the point of compliance temperature requirements.

Approximately 16,000 CY of cooling tower solid material is generated over six years from Units 4 and 5 cooling towers. CREC is exploring dewatering options (lined drying beds or filter press) for these solids prior to transport off site. Beneficial use options for these solids are also being explored with local landfills for use as daily cover. If beneficial use is not viable, the solids will be transported off-site for disposal. The discharge canal auxiliary cooling towers generate approximately 500 CY of solids (predominately consisting of sand and shell) every three years. The auxiliary cooling tower solids have, in the past, been put to beneficial use on site as road material.

The discharge canal auxiliary cooling towers generate approximately 500 CY of solids (predominately consisting of sand and shell) every three years. The auxiliary cooling tower solids have, in the past, been put to beneficial use on site as road material.

On January 14, 2009, PEF submitted via email a request to FDEP to authorize on-site use of cooling tower solids as "fill-material". The request included a proposed sampling plan for the Department's review and approval. On February 4, 2009, the Department submitted an email approving PEF's proposed sampling parameters with the following changes: include SPLP for nickel, sodium, chlorides, vanadium, antimony, and boron. The following parameters were sampled and analyzed in accordance with EPA Method 1312 Synthetic Precipitation Leaching Procedure which is designed to determine the leachability of analytes.

Parameter	TCLP (RCRA Limits)	SPLP (Drinking Water Standards)	Other
Antimony		X	
Arsenic	X	X	
Barium	X	X	
Boron		X	
$CaCO_3$			Totals
Cadmium	X	X	
Chloride		X	Totals
Chromium	X	X	
Lead	X	X	
$MgSO_4$			Totals
Mercury	X	X	
Selenium	X	X	
Silver	X	X	
Sodium		X	Totals
Nickel		X	
pH			pH Units
Vanadium		X	
Zinc		X	

The sampling plan is based on the constituents expected to be seen in the cooling tower solids primarily due to the intake water quality and chemical usage such as algaecides and acid. Some potential constituents include inorganic salts (e.g. $CaCO_3$, $MgSO_4$) as a result of natural deposition from the intake cooling water and metals.

The analytical results did not exceed respective primary and secondary drinking water standards and guidance concentrations with the following exceptions: Sodium (PDWS) was exceeded and chloride (SDWS) was exceeded. Because the plant is considered an "existing facility", secondary drinking water standards do not apply for this location. While sodium was the only constituent of concern, PEF is pursuing an exemption for sodium because of its natural presence in this coastal environment.

As previously described, cooling tower solids from Units 4 and 5 are generated over an approximate 6 year period. When the solids are generated, PEF will explore beneficial use of the material prior to disposal. The analytical results from the parameters sampled in 2009 were favorable and thus beneficial use as on site road material or on site fill material is preferred instead of disposal.

The Department will be notified of any future beneficial use opportunities such as on-site road material or on-site fill material. To evaluate any such beneficial use opportunities, PEF will refer to the 2009 sampling plan that was reviewed and approved by the Department unless the Department requires an amendment to the sampling approach.

2.7 DREDGE MATERIALS

As part of ongoing maintenance to ensure proper function of the plant's water bodies, excavation or dredging of deposited solids is necessary. Generally, this is performed on an as-needed basis; however, based on past experience, some locations may be subject to a scheduled frequency for the removal work. The following are the dredging subject areas:

- Ash storage area ponds and canal;
- Former north ash pond;
- Percolation ponds;
- Ditches and canals;
- Future FGD Blowdown Settling Ponds; and
- Future Units 4 and 5 coal yard storm water ponds.

The ash storage area ponds are located to the south of the ash storage area and serve as storm water runoff ponds. The ash storage area retention ditch is located on the east and north sides of the ash storage area. The water bodies are excavated approximately every six months. In the past, fly ash was the primary material recovered and was returned to the fly ash storage pile.

The former north ash pond was used for the storage of fly ash and bottom ash from Units 1 and 2. The 29-acre pond is located northwest of Units 1 and 2. In the past, ash has been excavated for disposal in the high chloride ash pile. In 2009, excavation of material from the former north ash pond was completed.

The plant has four (4) percolation ponds, three (3) serve Units 1 and 2 (South IWW Percolation Ponds) and one (1) serves Units 4 and 5 (North IWW Percolation Pond). The ponds are part of the plants wastewater management system. The South IWW Percolation Ponds are excavated/dredged approximately every four years producing approximately 5,000 CY of dredge material. The North IWW Percolation Pond is excavated/dredged approximately every eight years producing about 2,500 CY of material each time. Dredge spoils from the percolation ponds are typically transported off-site for disposal.

Within the CREC there are more than 21,000 linear feet of ditches and canals. The drainage ditches are typically 5 to 10 feet wide with an average depth of 3 feet. They exist north of Units 4 and 5, east and south of the mill reject pile, south of the Units 1 and 2 coal yard, north and east of the Units 4 and 5 coal yard. The intake canal is dredged approximately every 5 years, producing approximately 6,000 CY of dredged material for potential beneficial reuse off-site as landfill cover. Ditches and canals within the plant are excavated/dredged on an as-needed basis; no estimate of quantity is made.

Two storm water management ponds are to be constructed adjacent to Units 4 and 5 coal yard. The ponds are to be constructed on the east side of the coal yard and are designed to manage storm water runoff from the lined Units 4 and 5 coal yard. Additionally, one coal pile runoff treatment pond will be constructed that will treat the discharge from the runoff collection ponds and will then discharge to the north percolation pond. It is assumed that excavated/dredged spoils from these ponds will consist of coal fines that can be reused on-site or transported off-site for beneficial re-use. Storm water from Units 1 and 2 coal yard is collected and conveyed to a percolation pond via drainage ditches located on the east and south sides of the coal yard. Periodically, the ditches and pond are excavated and the solids (coal fines) are returned to the coal pile.

Prior to off-site disposal, analytical testing will be conducted as necessary. Prior to on-site disposal in the ash landfill, characterization of dredge material is unnecessary as the landfill which includes dredge material in the commingled pile have been characterized and results are contained in the ECT report dated March 2008.

2.8 TRUCK WASH SOLIDS

In 2009, a truck wash facility was constructed on the south side of the ash storage area. The truck wash is used primarily to wash the ash and synthetic gypsum transport trucks after they have been loaded on-site and prior to them leaving site. Trucks wash within a contained area which has an underground drain system flowing into an excavated catch basin. The catch basin has adequate size, which promotes settling of the washed materials. The recovered solids resulting from the washing operation will be disposed of in an off-site landfill. The estimated quantity of recovered solids from the truck is approximately 250 CY every three years. Liquids from the washing operations flow into a percolation basin. Overflow from the percolation basin flows into a drain which feeds into the perimeter ditch on the east side of the ash storage area.

Characterization of these recovered solids has not been made but generally should be consistent with the materials referenced in Sections 2.1, 2.2, 2.3, and 2.4 as that is where they are derived from.

2.9 AARDELITE PRODUCT

From May 1988 to September 2005, fly ash from Units 1 and 2 was used to produce Aardelite material, a patented lightweight aggregate material used in making masonry blocks and similar applications. This pellet sized material was manufactured from a mixture of hydrated lime and fly ash. The Aardelite aggregate facility is currently in cold shut down phase and given the current market conditions there are no plans of restarting this facility in the foreseeable future. An ash contractor operates a leased facility which houses the Aardelite facility as well as other operations focused on ash re-use at CREC.

Aardelite aggregate material is gray in color and typically pellet sized. In November 2007, samples of Aardelite material were collected for SPLP analysis. The mean SPLP values of the Aardelite samples exceeded the respective PDWS or SDWS of the following constituents: arsenic (PDWS) and aluminum (SDWS).

2.10 UNITS 4 AND 5 COAL YARD SOIL

As part of the CREC's Clear Air Project, a geomembrane liner was installed beneath the Units 4 and 5 coal yard and associated storm water runoff ponds. Native soil from beneath the coal pile was returned to areas it was excavated from or placed on top of the completed liner prior to coal placement.

2.11 IMPACTED SOIL

During plant operations, it is possible that soils could be impacted on occasion. If necessary, notification of impacted soils would be made to the FDEP and local county program prior to remediation and/or off-site disposal. Impacted soils will be appropriately characterized prior to disposal.

3.0 PRODUCT MANAGEMENT UNITS

The following product management units have been identified at the Crystal River Energy Complex:

- Ash storage area, including:
  - Fly ash storage pile,
  - Units 1 and 2 bottom ash storage pile,
  - Units 4 and 5 bottom ash storage pile,
  - Commingled materials pile, and
  - High chloride ash pile;
- Mill rejects pile;
- Former Aardelite facility;
- Ash storage silos;
- Former North Ash Pond; and
- Gypsum handling areas (future).

This section provides descriptions of these management units, including types of materials, potential release points, and existing management practices. A summary of product management units is provided in Table 3.

3.1 ASH STORAGE AREA

3.1.1 Unit Description and Operation

The ash storage area is located east of Units 4 and 5 and incorporates the following separate management piles: fly ash (Units 1, 2, 4 and 5), Units 1 and 2 bottom ash, Units 4 and 5 bottom ash, commingled materials and high chloride ash.

The total ash storage area covers approximately 95 acres and is permitted (PA 77-09) to reach a maximum height of 80 feet above grade with 4 horizontal: 1 vertical side-slopes (FDEP letter dated March 28, 1988 from Mr. Hamilton Owen). A primary ash contractor supports CREC with the transportation, spreading, compacting, and pile maintenance operations of fly and bottom ash that presently is deemed unsalable. The ash storage area is graded to manage storm water runoff into the ash storage area and associated ditches.

3.1.1.1 Fly Ash Storage Pile

The fly ash storage pile receives fly ash from Units 1, 2, 4, and 5. The fly ash storage pile is located along the eastern and central portions of the ash storage area. A primary ash contractor supports PEF with the transportation, spreading, compacting and maintenance of fly ash material. Conditioned fly ash (moisture content approximately 20 percent) is transported to the fly ash pile and deposited in the fly ash material distribution area. Fly ash is compacted and graded to control runoff and infiltration. Fly ash is reclaimed from the pile by a secondary ash contractor for off-site beneficial use. Approximately 230,000 tons per year of fly ash is added to the fly ash storage pile.

3.1.1.2 Units 1 and 2 Bottom Ash Storage Pile

The Units 1 and 2 bottom ash storage pile receives fine and heavy bottom ash from Units 1 and 2. The Units 1 and 2 bottom ash storage pile is located north of the fly ash storage pile. A primary ash contractor supports CREC with the transportation, spreading, compacting, and pile maintenance operations concerning Units 1 and 2 bottom ash. Conditioned bottom ash (approximately 20-percent moisture content) is transported from the Unit 1 and 2 bottom ash silos and deposited at the Units 1 and 2 bottom ash material distribution area. Material from the Unit 1 and 2 bottom ash pile is reclaimed for off-site beneficial use by a secondary ash contractor. Approximately 7,000 tons per year of bottom ash from Units 1 and 2 are added to the ash storage area.

3.1.1.3 Units 4 and 5 Bottom Ash Storage Pile

The Units 4 and 5 bottom ash storage pile receives bottom ash from Units 4 and 5. The Units 4 and 5 bottom ash storage pile is located southwest of the fly ash storage pile. A primary ash contractor supports CREC with the transportation, spreading, compacting, and pile maintenance operations for bottom ash that may presently be deemed unsalable. The primary ash contractor transports bottom ash with a moisture content of approximately 20% from Units 4 and 5 bottom ash silos in open top, 30-ton capacity trucks and deposits the material at the appropriate working face. The pile is graded to manage storm water runoff into the ash storage area ponds and associated ditches. Bottom ash is reclaimed from the pile for off-site beneficial use by a secondary ash management contractor. Approximately 19,000 tons per year of bottom ash from Units 4 and 5 are added to the storage pile.

3.1.1.4 Commingled Materials Pile

The commingled material pile is located northeast of the fly ash pile within the ash storage area. The deposited materials consist primarily of cooling tower sludge, dredge spoils (sands and silts), fly ash, soil (mainly silty fine sand), and limestone. Based on the October 2008 aerial survey, the amount of material in the commingled materials pile is estimated at approximately 205,000 cubic yards. Due to the heterogeneous nature of the material, options for beneficial use are limited. Currently, no commingled materials are added to the pile. The commingled materials pile will be graded to an even elevation and dressed with side-slopes to match existing grades. Fly ash will be deposited in the remaining airspace.

3.1.1.5 High Chloride Ash Pile

The high chloride ash pile is located in the ash storage area on the northwest side of the fly ash pile. The pile contains fly ash and bottom ash excavated from the former north ash pond. The deposited material is known to have high chloride levels, making it generally unsuitable for many concrete and aggregate beneficial uses. Aardelite material remaining at the Aardelite facility was also transferred to the high chloride ash pile. The current plan is to cap the high chloride ash pile area in 2010.

3.1.2 Potential Constituents of Concern

According to SPLP analysis of the ash storage area materials sampled in November 2007, the following mean SPLP results exceeded PDWS, SDWS, or GGC: aluminum (SDWS), antimony (PDWS), arsenic

(PDWS), boron (GGC), iron (SDWS), molybdenum (GGC), selenium (PDWS), sulfate (SDWS), total dissolved solids (SDWS), and vanadium (GGC).

3.1.3 Potential Release Points

The ash storage area is unlined and there is potential for leaching and percolation of the stored material to the soil, groundwater, and surface water.

The ash storage area storm water retention system is designed and constructed to retain the area runoff from a 10-year, 24-hour rainfall event (8.34-inches) (KBN, December 1987). The retained runoff is designed to be disposed of by means of evaporation and percolation (KBN, December 1987). Runoff draining to the south and west would flow to the storm water retention ponds located on the south side of the storage area. Runoff from the west drains to the ponds via a drainage ditch on the west side of the storage area. On the east and north sides of the storage area runoff discharges directly to the perimeter ash storage area retention canal located on the east and north sides of the area. In the event of storm event in excess of 10-year, 24-hour rainfall total, runoff is designed to discharge to the Units 4 and 5 storm water retention ditch system via an overflow structure (KBN, December 1987).

3.1.4 Existing Management Practices

The ash storage area is to be operated in a manner that minimizes the contact between ash and water. The active areas of the ash storage area are to be sloped and compacted to minimize the potential for rainfall infiltration (KBN, December 1987). The storm water from the working face is to be initially retained in a temporary retention area to allow for the settling of suspended solids prior to discharge into the ash storage area storm water system.

3.1.4.1 Groundwater Monitoring

There are four existing monitoring wells that are used for groundwater monitoring of this area. All four wells – MWI-2R (downgradient), MWC-12R (upgradient), MWC-21R (downgradient) and MWB-30 (background) – are screened with the upper Floridan aquifer with a total depth of approximately 20 feet. The groundwater monitoring plan, which includes these four wells as part of the eleven well network, was intended to monitor the storage area, detect potential releases to the groundwater, and comply with the facility's Conditions of Certification, FDEP Industrial Wastewater Permit (FLA016960), and applicable groundwater quality regulations. Samples are collected on a quarterly basis for the following parameters: antimony, arsenic, barium, beryllium, cadmium, copper, cyanide, dissolved oxygen, fluoride, gross alpha, iron, lead, nickel, nitrogen, pH, radium 226 and 228, sodium, thallium, total dissolved solids, turbidity, and zinc (FLA 016960, Condition III.B.3). While the permit number FLA016960 does not specifically identify the ash storage area, it is considered included by reference (PEF, 2007). A revised groundwater monitoring plan was prepared in 2007 (Golder, April 2007) which superseded a previous plan (Dames & Moore, April 1995). Additional temporary monitoring wells (TW-1 through TW-5) were installed around the ash storage area as part of the geotechnical and hydrogeological site investigation for the proposed vertical expansion of the ash storage area. Based on discussions with FDEP Staff in December 2009, these temporary wells will be converted to permanent monitoring wells and included in the routine sampling events (except for TW-2 which will be used as a piezometer only).

Monitoring well, MWC-12R, is located hydraulically upgradient of the ash storage area and provides background water quality data. Monitoring well, MWI-2R, is located immediately downgradient of the ash storage area and monitors the immediate effects of ash leachate on natural groundwater quality levels (KBN, December 1987). Monitoring well, MWC-21R, is located further downgradient of the ash storage area and Units 4 and 5 coal yard and monitors the effects of ash leachate after mixing with groundwater and the effects of leachate from the coal storage area on groundwater quality levels (KBN, December 1987). Monitoring well, MWB-30, is the facility background well. According to groundwater data from April 2005 to April 2008, mean arsenic and gross alpha concentrations in MWI-2R exceeded PDWS but did not exceed the PDWS further downgradient in MWC-20R.

3.1.4.2 Surface Water Monitoring

Surface water monitoring for the ash storage area is conducted per discharge event at the ash storage area overflow weir (C40) prior to discharge into the runoff collection system. The following parameters are to be reported per discharge: flow, total suspended solids, length of discharge, and total recoverable metals including: arsenic, cadmium, chromium, copper, iron, lead, mercury, nickel, selenium, vanadium, and zinc (FLA 0036366, Condition I.A.12).

3.1.4.3 Inspections and Maintenance

Inspections of the soil cover material, open ash storage areas and storm water retention system for erosion damage or unusual circumstances are performed on a monthly basis. Notifications are automatically generated to remind the responsible person to conduct inspections and follow-up notices are generated for supervision when inspections have been done.

As necessary, the primary ash contractor supports CREC by performing maintenance and repairing erosion of the soil cover materials and open ash storage area. They also repair any damage to the storm water retention system. Additionally, monthly inspections area conducted in accordance with the facility's Best Management Plans (BMPs) (PEF, March 2007 and PEF, May 2007). The purpose of the inspections are to ensure the storm water management system is operating properly, prevent the release of pollutants and ash, observe any significant erosion, and determine if any maintenance is necessary. Routine maintenance includes mowing, sediment removal, vegetation clearing from intake and discharge structures, and repair of eroded areas.

3.2 MILL REJECTS STORAGE PILE

3.2.1 Unit Description and Operation

The mill rejects pile is located in the southeast corner of the Units 1 and 2 coal storage yard. The pile consists of a mixture of coal, pyrite, and rocks that have been separated from Units 1 and 2 fuel supply. The mill rejects pile is managed by PEF personnel. The estimated inventory of the pile is approximately 24,000 tons. The Units 1 and 2 coal yard produce approximately 1,755 tons of mill rejects per year.

Presently, beneficial use for the mill rejects occurs at a cement plant that will blend the rejects with its fuel stream for use as an off-quality fuel in the cement kiln. PEF expects the beneficial use opportunity will continue for the next few years. The current stockpile of mill rejects will be used in a cement kiln – and is expected to be depleted. After the stockpile is depleted, the cement plant plans to transport mill rejects to their facility every two or three months. It is anticipated that there will be a small mill rejects pile of 250 to 500 tons in the Units 1 and 2 coal yard between shipments.

3.2.2 Potential Constituents of Concern

According to SPLP analysis of the mill rejects pile in November 2007, mean SPLP exceedances of PDWS and SDWS included: aluminum (SDWS), arsenic (PDWS), iron (SDWS), manganese (SDWS), sulfate (SDWS), and total dissolved solids (SDWS).

3.2.3 Potential Release Points

Potential impacts to the soil, groundwater, and surface water from the mill rejects storage pile could occur. Stormwater runoff from the east and south sides drains toward a perimeter ditch. This perimeter ditch, located on the east and south sides of the pile, continues westward and encircles the Units 1 and 2 coal yard on three sides (east, south, and west). The entire Units 1 and 2 coal yard storm water management system is designed to contain runoff resulting from a 10-year, 24-hour storm event (FL0000159). In the event of a storm event in excess of 10-year, 24-hour rainfall, runoff is designed to discharge to an adjacent salt marsh via a NPDES outfall (D-0H).

3.2.4 Existing Management Practices

The mill rejects pile is maintained by PEF Units 1 and 2 coal yard personnel.

3.2.4.1 Groundwater Monitoring

Two wells are used for groundwater monitoring of the mill rejects storage pile: MWB-30 (background) and MWC-29 (downgradient). Both wells are installed at a total depth of 20 feet below ground surface and are designed to monitor the Upper Floridan aquifer. Well MWB-30 serves as a facility wide background well and MWC-29 is located southwest of the storage pile. Groundwater samples are collected on a quarterly basis for the following parameters: antimony, arsenic, barium, beryllium, cadmium, copper, cyanide, dissolved oxygen, fluoride, gross alpha, iron, lead, nickel, nitrogen, pH, radium 226 and 228, sodium, thallium, total dissolved solids, turbidity, and zinc (FLA 016960, Condition III.B.3). A revised groundwater monitoring plan was prepared in 2007 (Golder, April 2007) which supersedes a previous plan (Dames & Moore, April 1995).

Monitoring well, MWC-29, is located hydraulically downgradient of the Units 1 and 2 coal yard and monitoring the groundwater adjacent to the coal storage area and mill rejects pile. According to groundwater data from April 2005 to April 2008, mean groundwater concentrations did not exceed any PDWS or permit compliance well limits (FLA 019660, Condition III.B.3).

3.2.4.2 Surface Water Monitoring

Surface water monitoring is not conducted specifically for the mill rejects pile, but is conducted for the Units 1 and 2 coal yard when the storm water management system is discharging to the adjacent salt marsh at outfall D-0H. The following parameters are to be reported daily when discharging: arsenic, cadmium, chromium, copper, flow rate, iron, lead, mercury, nickel, pH, selenium, total dissolved solids, vanadium, and zinc in accordance with FL0000159, Condition I.A.22.Permit FL0000159,Condition I.A.22, addressees which parameters to report when discharging occurs.

3.2.4.3 Inspections and Maintenance

Monthly and annual inspections are performed based on the guidelines specified in the Units 1, 2, and 3 BMP (PEF, March 2007). The intent of the inspections is to ensure that the storm water management system is operating properly and to control release s. When identified during inspections, material eroded from the mill reject pile will be pushed back onto the pile, sediment removed from ditches, and outfall structures cleared of debris.

3.3 FORMER AARDELITE FACILITY

3.3.1 Unit Description and Operation

The former Aardelite facility, located north of Units 1 and 2, was used to produce Aardelite, a patented lightweight aggregate for use in making masonry blocks and other similar applications. The pellet-sized material was manufactured from a mixture of hydrated lime and fly ash. Aardelite is no longer produced and, in 2009, the unsold stockpile (<1,000 cubic yards) was transferred to the high chloride ash pile (located within the ash storage area) which is scheduled to be capped in 2010.

3.3.2 Potential Constituents of Concern

According to SPLP analysis of the Aardelite product in November 2007, mean SPLP results for aluminum exceeded SDWS and arsenic exceeded PDWS.

3.4 ASH STORAGE SILOS

3.4.1 Unit Description and Operation

Ash storage silos are used for fly ash and bottom ash for Units 1, 2, 4, and 5 prior to transport to their respective storage piles or off-site beneficial use. Units 1 and 2 fly ash is stored in a designated silo and in a converted above ground storage tank. Units 1 and 2 fly ash is transported from these intermediate storage locations by an ash contractor. The bottom ash from Units 1 and 2 consists of two types, heavy and fine. The heavy bottom ash is transported by PEF employees directly from the Units 1 and 2 boilers via vacuum trucks to the Units 1 and 2 bottom ash storage pile within the ash storage area. The Units 1 and 2 fine bottom ash is conveyed pneumatically to a combined storage silo. Fine bottom ash from the silo is emptied into a pan truck weekly and transported by PEF employees to the ash storage area. All bottom ash from Units 1 and 2 is conveyed dry.

Units 4 and 5 fly ash is pneumatically conveyed to respective storage silos prior to transportation by an ash contractor to the ash storage area or off-site beneficial use. Units 4 and 5 fly ash is either loaded into pressure-differential trucks from the storage silo or it is conditioned to a moisture content of approximately 20% prior to being loaded into open trucks for transport. The bottom ash from Units 4 and 5 is conveyed with water to four storage silos (aka dewatering bins) prior to loading into trucks for transport by an ash contractor to the ash storage area or off-site beneficial use. Water used to convey bottom ash is contained in a closed loop system and so, with the exception of about 20% moisture content of the bottom ash, there is no water disposal.

3.4.2 Potential Constituents of Concern

According to ash SPLP analysis performed in November 2007, the following mean SPLP results exceeded PDWS, SDWS, and GGC: aluminum (SDWS), antimony (PDWS), arsenic (PDWS), boron (GGC), iron (SDWS), molybdenum (GGC), selenium (PDWS), and vanadium (GGC).

3.4.3 Potential Release Points

Fly ash and bottom ash stored in silos at Units 1, 2, 3, and 4 is not considered a significant release point. Ash stored in these completely enclosed storage containers does not pose a potential release to soil, groundwater or surface water. Ash that is spilled during transfer associated with transport truck loading is promptly removed according to management practices.

3.4.4 Existing Management Practices

Management practices of the ash storage silos consists of visual inspections of the silos and removal of ash that may inadvertently been released to the ground surface. As a normal part of ash handling, during transfer of ash from the storage silos to transport trucks, ash may be inadvertently spilled on the ground, which in many instances is an impervious surface. Spilled ash is generally cleaned up within twenty-four hours.

The ash storage silos are not part of the groundwater or surface water monitoring performed at the site, due to the limited potential of release to the environment. Inspections of the storage silos are performed as part of the facility-wide inspections prescribed in the Best Management Practices (BMPs) (PEF, March 2007 and PEF, May 2007). Besides structural maintenance of the storage silos, BMP-related maintenance is generally limited to recovery of spilled ash.

3.5 FORMER NORTH ASH POND

3.5.1 Unit Description and Operation

The 29-acre former north ash pond was used for the storage of fly ash and bottom ash from Units 1 and 2. Units 1 and 2 fly ash and bottom ash was sluiced with water to the pond and allowed to dewater prior to being loaded into trucks for off-site disposal (KBN, December 1987). Use of the pond for ash storage and management has been discontinued.

The former north ash pond has been converted for use as FGD Blowdown Ponds as part of the facility's clean air project. The residual ash has been excavated and transferred to the high chloride ash pile (located within the ash storage area) which is scheduled to be capped in 2010. The former north ash pond has been modified into the two lined FGD blowdown ponds (see Section 2.4).

3.5.2 Potential Constituents of Concern

According to ash SPLP analysis performed in November 2007, the following mean SPLP results exceeded PDWS, SDWS, and GGC: aluminum (SDWS), arsenic (PDWS), iron (SDWS), selenium (PDWS), and vanadium (GGC).

3.6 GYPSUM HANDLING AREAS

3.6.1 Unit Description and Operation

The Units 4 and 5 FGD System gypsum handling management areas include the gypsum dewatering facility and the temporary gypsum storage area.

3.6.1.1 Gypsum Dewatering Facility

The gypsum slurry from the Units 4 and 5 FGD System is dewatered in vacuum filter beds. The gypsum is dewatered and washed by the FGD vacuum filters to produce a gypsum cake (approximately 90% solids content by weight). The gypsum cake is then conveyed from the dewatering facility to the temporary storage area via conveyor. Filtrate from the vacuum filter beds is pumped to FGD filtrate tanks then from there it is routed back into the process as scrubber make-up water and to aid in limestone processing.

3.6.1.2 Temporary Gypsum Storage Area

The temporary gypsum storage area consists of a dual-truck load out tower and a lined concrete storage pad. The gypsum cake produced by the dewatering facility is transported either to the truck load out tower or the storage pad via the conveyor. The anticipated maximum production of gypsum from Units 4 and 5 FGD Units is approximately 2,100 tons per day. The temporary gypsum storage area is sized to hold 32,000 tons of gypsum or 12 days of maximum production. Waste gypsum will be stored in a separate pile on the lined storage pad. Gypsum is transported from the temporary storage area for off-site beneficial use or off-site disposal.

3.6.2 Potential Constituents of Concern

According to the SPLP analysis of samples collected from the gypsum stockpile in March 2010, the following mean SPLP results exceeded PDWS or SDWS: aluminum (SDWS), fluoride (PDWS and SDWS), sulfate (SDWS) and total dissolved solids (SDWS).

3.6.3 Potential Release Points

The gypsum dewatering facility is not considered a significant release point.

The temporary storage pad is lined and designed with a three-foot perimeter wall and sumps to collect storm water and seepage thereby limiting the potential release of water.

3.6.4 Existing Management Practices

The gypsum pile at the temporary storage pile is watered down by an off-road water truck to create a hard outer crust, thus reducing dust generation. Stormwater and seepage from the temporary gypsum storage area is collected and conveyed to the FGD filtrate tanks or blowdown tanks. The gypsum storage pile is contained on concrete pad with a GCL underneath.

Neither groundwater nor surface water monitoring is conducted specifically for the gypsum handing areas.

3.7 FGD BLOWDOWN POND SYSTEM

3.7.1 Unit Description and Operation

The FGD Blowdown Pond System consists of two lined ponds, the Primary Pond and Backup Pond, which receive FGD blowdown wastewater from the Units 4 and 5 FGD units. The ponds are designed to manage wastewater from the FGD unit process and allow for the settling of suspended solids. The ponds will be periodically dredged and solids will be disposed of off-site or transported off-site for beneficial reuse.

3.7.2 Potential Constituents of Concern

It is anticipated that FGD materials will be have sulfates and trace levels of some metals.

3.7.3 Potential Release Points

The FGD wastewater settling ponds are lined and designed with adequate freeboard for storm events thereby limiting the potential release of FGD wastewater. The remainder of the area that was the former North Ash Pond has been graded such that all surface water within the former ash pond is directed to the west of the former ash pond and is designed to contain all the water from a 25-year, 24-hour storm event.

3.7.4 Existing Management Practices

The wastewater settling ponds will be periodically cleaned out using a suction dredge built on wheels to protect the liner. The wastewater settling pond will be maintained by PEF personnel.

3.7.4.1 Groundwater Monitoring

Four wells are employed to monitor groundwater at the FGD Blowdown Pond system and former north ash pond. Well MWC-16 located at the southwest corner serves as a downgradient well, well MWC-28 diagonally across in the northeast corner is the upgradient well, well MWC-31 located immediately downgradient of the FGD pond pump station serves as a downgradient well, and MWB-30 serves as the background well. The wells are designed to monitor the Upper Floridan aquifer and are typically installed at a total depth of approximately 20 feet below ground surface except well MWC-31 which was installed at 25.5 feet below ground surface but at the sample elevation as MWC-28 and MWC-16. Groundwater samples are collected on a quarterly basis for the following parameters: antimony, arsenic, barium, beryllium, cadmium, copper, cyanide, dissolved oxygen, fluoride, gross alpha, iron, lead, nickel, nitrogen, pH, radium 226 and 228, sodium, thallium, total dissolved solids, turbidity, and zinc (FLA 016960, Condition III.B.3). A revised groundwater monitoring plan was prepared in 2007 (Golder, April 2007) which supersedes a previous plan (Dames & Moore, April 1995).

3.7.4.2 Surface Water Monitoring

Monitoring as part of NPDES permit FL0000159 is conducted at outfall D-OC1. Flow rate measurements are required daily when discharging, oil and grease sample analysis is required weekly, and total suspended soil analysis is required three times per week (FL0000159, Condition I.A.12). When the outfall is discharging, samples are collected in accordance with NPDES permit FL0000159, Condition 1.A.12.

3.7.4.3 Inspections and Maintenance

Monthly and annual inspections are conducted as part of the facility-wide inspections in accordance with the BMP plans. Necessary maintenance as part of the scheduled activities or resulting from observations from the inspections may include sediment and vegetation removal and stabilization of eroded areas.

4.0 REFERENCES

Dames & Moore, Inc., April 1995. Groundwater Monitoring Plan, Florida Power Corporation, Crystal River Energy Complex.

Environmental Consulting & Technology, Inc. (ECT), March 2008. Coal Combustion Product/Solid Material Sampling Report, Crystal River Power Plant.

Florida Department of Environmental Protection (FDEP), January 15, 2010. Conditions of Certification, Progress Energy Florida, Crystal River Energy Complex, Unit 3 Nuclear Plant, Unit 4 and Unit 5 Fossil Plant, PA 77-09N.

Florida Department of Environmental Protection (FDEP), May 9, 2005. Industrial Wastewater Permit No. FL0000159 (NPDES), Progress Energy Florida, Inc., Crystal River Plants 1, 2, and 3.

Florida Department of Environmental Protection (FDEP), August 15, 2005. Industrial Wastewater Permit No. FL0036366 (NPDES), Progress Energy Florida, Inc., Crystal River Units 4 and 5.

Florida Department of Environmental Protection (FDEP), January 9, 2007. Industrial Wastewater Permit No. FL016960 (Groundwater), Progress Energy Florida, Inc., Crystal River Energy Complex.

Golder Associates Inc. (Golder), April 2007. Revised Groundwater Monitoring Plan, Progress Energy Florida, Crystal River Energy Complex.

Golder Associates Inc. (Golder), April 2010. Technical Memorandum: Flue Gas Desulfurization Products Sampling and Characterization, Progress Energy Florida, Crystal River Energy Complex.

KBN Engineering and Applied Science, Inc. (KBN), December 1987. Site Certification Application Revision for Ash Disposal Area, Florida Power Corporation, Crystal River Units 4 & 5.

Mineral Resource Technologies, Inc. (MRTI), March 2007. Proposal to Progress Energy-Florida, Inc. for Coal Ash Management and Marketing for Crystal River Station – Ash Product Landfill.

Progress Energy Florida, Inc. (PEF), February 8, 2007. Letter to Mr. William Kutash, Florida Department of Environmental Protection.

Progress Energy Florida, Inc. (PEF), March 2007. Crystal River Units 1, 2 & 3, Best Management Practices, NPDES FL0000159.

Progress Energy Florida, Inc. (PEF), May 2007. Crystal River Units 4 and 5, Best Management Practices Plan, NPDES FL0036366.

TABLE 1
SUMMARY OF COAL COMBUSTION PRODUCT AND NON-COAL COMBUSTION PRODUCT MATERIALS

Crystal River Energy Complex
Citrus County, Florida

	Type		Generation				Material Type		
Material	CCP	Non-CCP Solid	Active	Inactive	Source	Storage Location	Industrial Byproduct*	Solid Waste*	Rationale for Material Type Designation
Fly Ash	X		X		Units 1, 2, 4, and 5	Fly ash pile	X		Several potential beneficial end uses
Bottom Ash – 1 & 2	X		X		Units 1 and 2	Bottom Ash (Units 1 & 2) Pile	X		Several potential beneficial end uses
Bottom Ash – 4 & 5	X		X		Units 4 and 5	Bottom Ash (Units 4 & 5) Pile	X		Potential beneficial end uses
Gypsum – 4 & 5	X		X		Units 4 and 5	Temporary gypsum storage area	X		Beneficial use off-site
						Waste gypsum pile		X	Off-site disposal
FGD Pond Solids	X		X		Units 4 and 5	FGD Blowdown Ponds		X	Off-site disposal
Mill Rejects		X	X		Units 1 and 2	East side of Units 1 & 2 coal yard	X		Beneficial use off-site
Mixed Waste - Pile	X	X		X	Commingled Materials Pile	Northeast side of fly ash pile		X	Encapsulated on-site or off-site disposal
High Chloride Ash	X			X	High Chloride Ash Pile	Northeast side of fly ash pile		X	Encapsulated on-site or off-site disposal
Aardelite Product	X			X	Former Aardelite facility	Pile at former Aardelite facility	X		Potential beneficial end use
Dredge Spoils – Fly Ash Ponds	X	X	X		Stormwater ponds (2) SW side of fly ash pile	None		X	Off-site disposal
Dredge Spoils – Perc Ponds		X	X		Percolation ponds: 2 near Units 1 & 2 and 3 near Units 4 & 5	None		X	Off-site disposal
Dredge Spoils – Ditches and Canals		X	X		Drainage ditches and canals throughout plant	None		X	Off-site disposal
Dredge Spoils – Ash Pond	X	X		X	Former North Ash Pond	None		X	Encapsulated on-site or off-site disposal
Dredge Spoils – West Pond		X	X		Pond west of Units 1 & 2 former ASTs	None		X	Off-site disposal
Dredge Spoils – Stormwater Ponds		X	X (Future)		Proposed stormwater ponds (3) near Units 4 & 5 coal yard	(Future)		X	Off-site disposal
Truck Wash Solids		X	X (Future)		Proposed truck wash	(Future)	X		Assumed non-contaminated – beneficial use as landfill cover
Cooling Tower Sludge – 1 & 2		X	X		Cooling towers for Units 1 & 2	None		X	Off-site disposal
Cooling Tower Sludge – 4 & 5		X	X		Cooling towers for Units 4 & 5	None		X	Off-site disposal
Units 4 & 5 Coal Yard Soil		X		X	Soil excavation for coal yard liner	Units 4 and 5 coal yard	X		Beneficial use off-site or as onsite fill
Contaminated Soil		X	X		Throughout Plant	None		X	Contaminated and would require treatment and disposal

* Term as defined in Chapter 62-701, F.A.C.

Checked by: SFS
Reviewed by: KBK

Prepared: 12/16/2008
Revised: 05/05/2009
Revised: 04/14/2010

Table 2
Average Ash and Gypsum Production, Beneficial Use, and Disposal Rates

Crystal River Energy Complex
Citrus County, Florida

Coal Combustion Product	Average Production Rate (tons per day)	Average Beneficial Use Rate (tons per day)	Average Disposal Rate (tons per day)
Fly Ash (Units 1, 2, 4, and 5)[1]	1,519	889	630
Units 1 and 2 Bottom Ash[1]	70	51	19
Units 4 and 5 Bottom Ash[1]	123	70	53
Units 4 and 5 Gypsum[2]	2,100	2,100	0

NOTES:

1. Production, Beneficial Use, and Disposal data provided by PEF, 2008.
2. Maximum estimated production rate. Beneficial use and disposal rates will vary based on market conditions. No gypsum will be disposed of on-site.

Checked by: SFS
Reviewed by: KBK

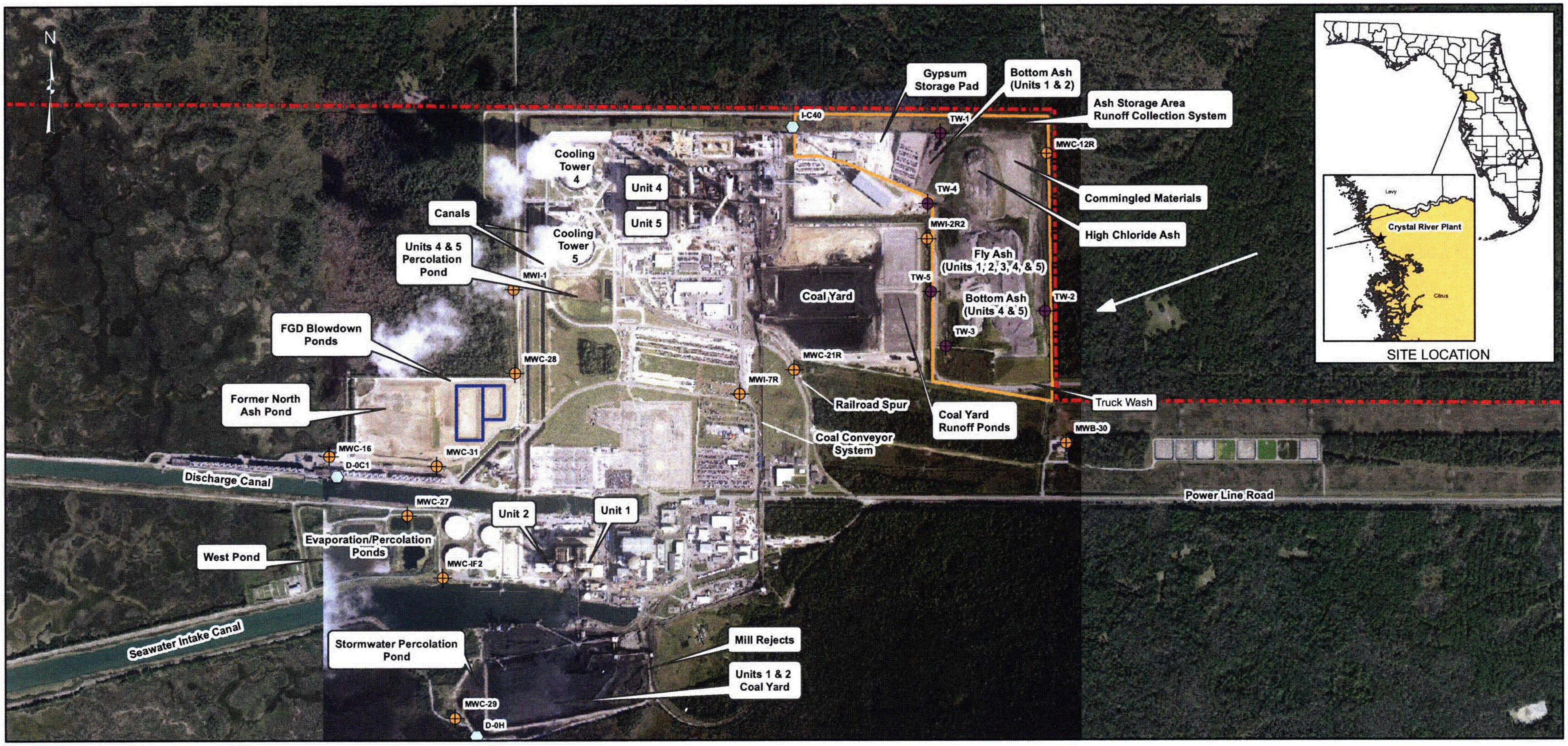
TABLE 3
SUMMARY OF PRODUCT MANAGEMENT UNITS

Crystal River Energy Complex
Citrus County, Florida

	Solid Type					Potential Environmental Impact		Impact Prevention and Monitoring		Ultimate Use			
										Reuse		Disposal	
Management Unit	CCP	Non-CCP	Solid	Hazardous	Average SPLP Exceedance	GW	SW	GW	SW	Onsite	Offsite	Onsite	Offsite
Fly Ash Storage Pile	X		Fly ash	No	Al, Sb, As, Bo, Mo, Se, V	X	X	X	X		X		
Units 1 and 2 Bottom Ash Storage Pile	X		Bottom ash (pyrite free)	No	Al, As	X	X	X	X		X		
Units 4 and 5 Bottom Ash Storage Area	X		Bottom ash (with pyrite)	No	Al, As, Fe	X	X	X	X		X		
Commingled Materials Pile	X	X		No	Al, As	X	X	X	X			X	X
High Chloride Ash Pile	X		Ash	No	Al, As, Fe, Se, V	X	X	X	X			X	X
Gypsum Storage Pile	X		Gypsum	No	Al, F, SO_4, TDS						X		X
Mill Rejects Pile		X	Coal, soil, rocks, pyrite	No	Al, As, Fe, Mn, SO_4, TDS	X	X	X	X			X	X
Former Aardelite Facility		X	Aardelite (fly ash aggregate)	No	Al, As	X	X				X		
Ash Storage Silos	X		Fly ash and bottom ash (Units 1, 2, 4, and 5)	No	Al, Sb, As, Bo, Fe, Mo, Se, V						X		
Former North Ash Pond	X	X	Ash, spoils, truck wash solids, sludge	No	Al, As, Fe, Se, V	X	X	X	X			X	X
FGD Blowdown Ponds	X		FGD solids (gypsum)	No	Bo, Mn, F, SO_4, TDS	X	X	X	X		X		X

Checked by: SFS
Reviewed by: KBK

N:\File\2008\083-82671 PEF Crystal River CCP\B - GWMP\MapDocuments\08382671B003 Rev3.mxd

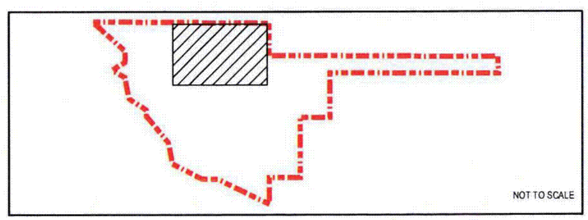


0 500 1,000 2,000 Feet

SCALE AS SHOWN

LEGEND

- Approximate Property Boundary
- <all other values>
- Surface Water Discharge Location
- Approximate Groundwater Flow Direction
- FGD BLOWDOWN PONDS
- ASH STORAGE AREA



REFERENCE

1. Foreground Imagery, Survey Data, October 2009
2. Background Imagery, Department of Revenue, 2007.

PROJECT

PROGRESS ENERGY

TITLE

CRYSTAL RIVER SITE PLAN
CITRUS COUNTY, FLORIDA

Progress Energy

PROJECT No. 08382671			08382671B003	REV. 3
DESIGN	SFS	3/31/2010		
GIS	JWT	4/18/2010		
CHECK	SKP	4/18/2010		
REVIEW	KBK	4/18/2010		

FIGURE 1

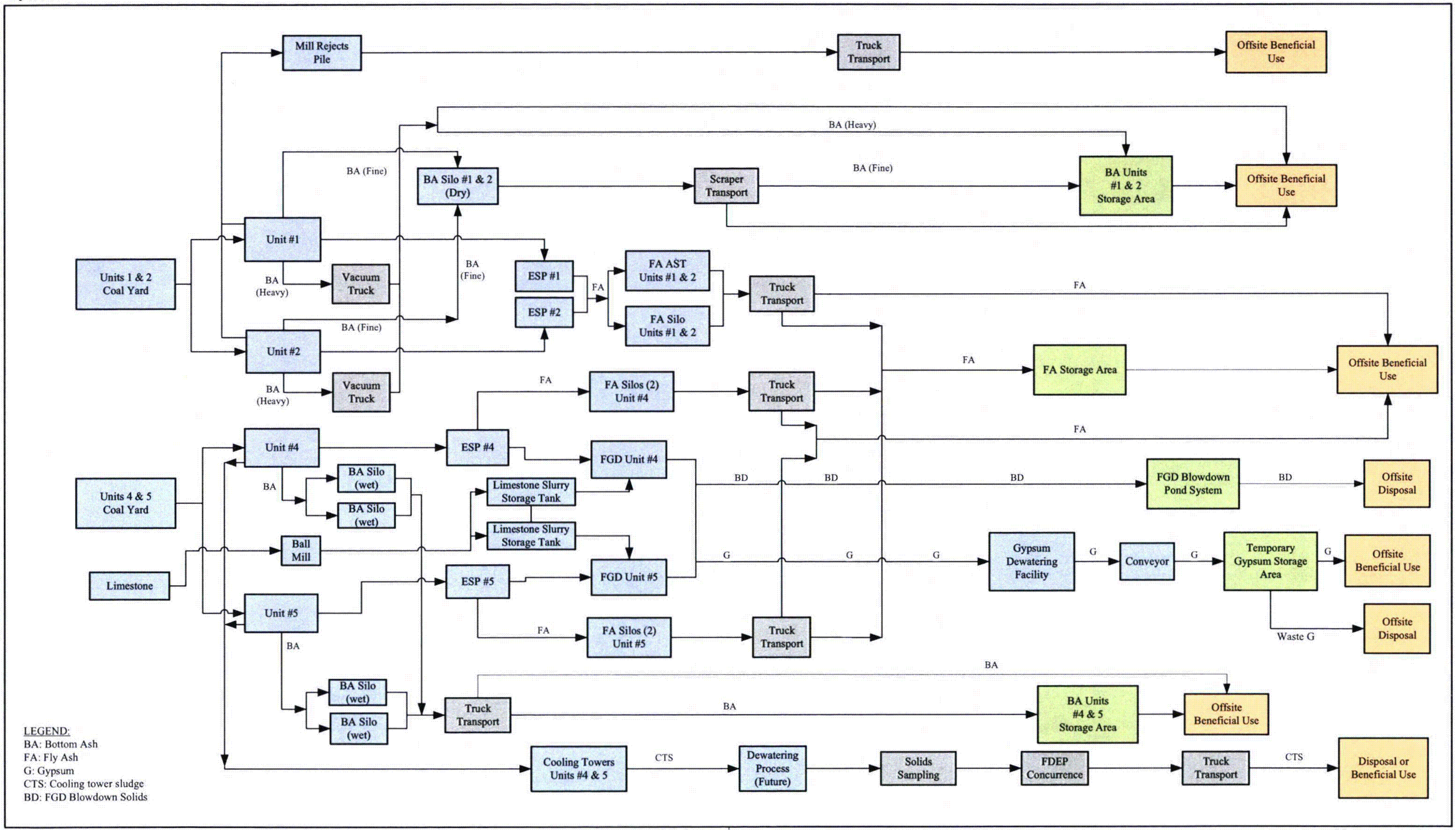


Figure 2
Process Flow Diagram for Coal Combustion Products and Non-Combustion Waste Products
Progress Energy Crystal River Energy Complex
Crystal River, Florida

REV. 0	SCALE: NTS	
DESIGN	JTD	09/15/08
CADD	SFS	03/30/10
CHECK	SKP	04/14/10
REVIEW	KBK	04/14/10

Progress Energy

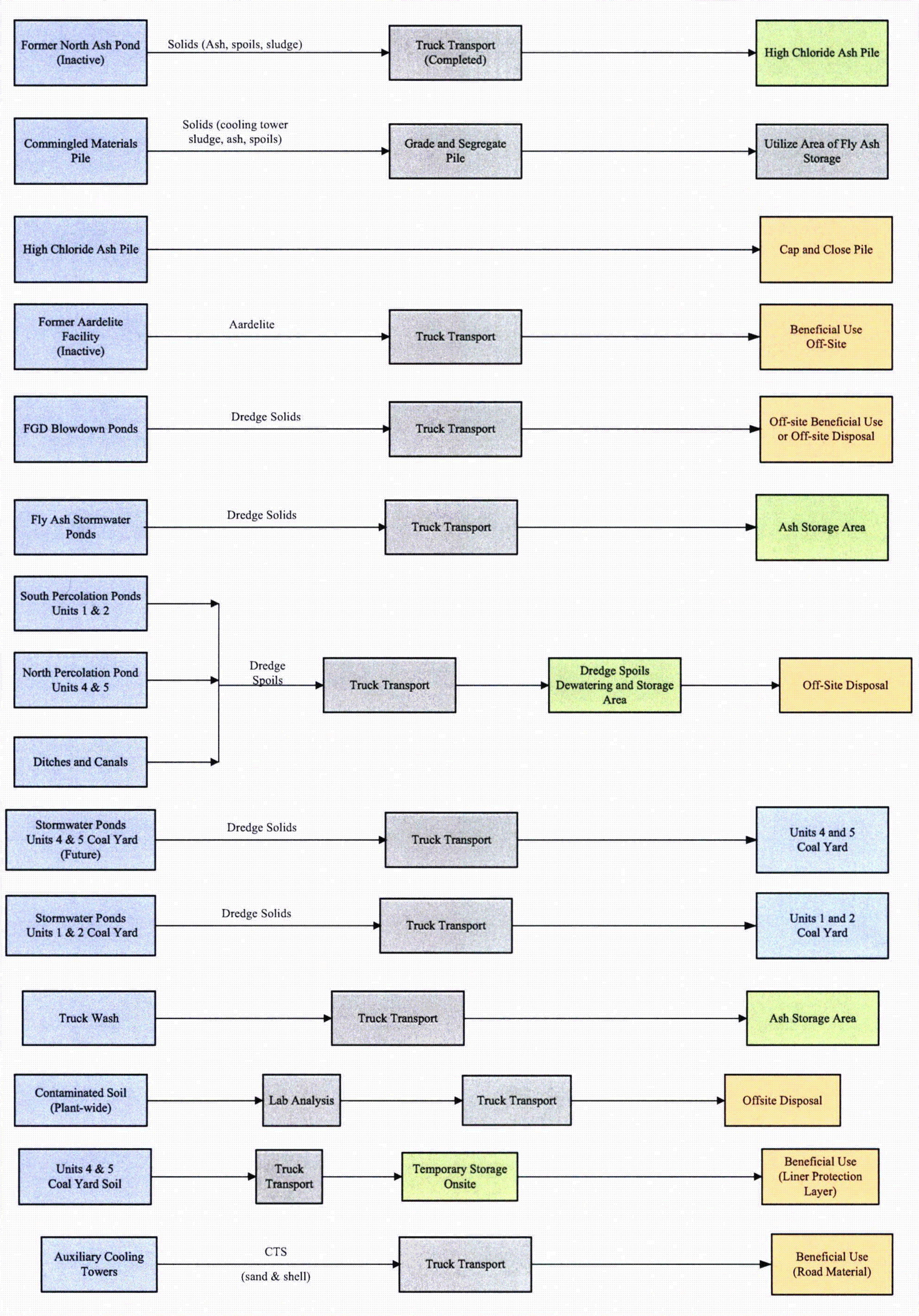


Figure 3
Process Flow Diagram for Inactive CCP Disposal Areas and Non-CCP Solids
Progress Energy Crystal River Energy Complex
Crystal River, Florida

REV. 0	SCALE: NTS	
DESIGN	JTD	09/15/08
CADD	SFS	03/30/10
CHECK	SKP	04/14/10
REVIEW	KBK	04/14/10

Progress Energy

FDEP Solid Waste Management Facility Checklist January 29, 2009

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
SOLID WASTE MANAGEMENT FACILITY
INSPECTION CHECKLIST

Facility Name: Progress Energy Crystal River Energy Complex

WACS No.: 97667 COMET Project Number: N/A

Inspection Date: 1-29-09 Permit No.: Power Plant Siting PA 77-09A2 Issue Date: 08-28-2008

Facility Address: Powerline Road, Crystal River

City: Crystal River County: Citrus Zip: _____

Permittee or Operating Authority: Progress Energy

Telephone Number (Permittee or Operating Authority _____

Inspection Participants (Include ALL Facility and Department Employees With Corresponding Titles):

Principal Inspector: Stephanie Watson (FDEP)

Other Participants: Doug Yowell, Cynthia Wilkinson, Jay Chesser III, Erika Tuchbaum-Biro (Progress Energy)

TYPE OF FACILITY (check all that apply):

Landfill:
- ☐Class I
- ☐Class II
- ☐Class III

C&D Facility:
- ☐Disposal
- ☐Disposal w/Recycling
- ☐Land Clearing

Waste Processing Facility:
- ☐Transfer Station
- ☐C&D Recycling
- ☐Class III MRF
- ☐MSW MRF
- ☐Pulverizer/Shredder
- ☐Compactor/Baling
- ☐Other _____

Other Facilities:
- ☐Composting Facility
- ☐WTE Facility
- ☐Waste Tire Facility
- ☐Yard Trash Processing Facility
- ☐Stationary Soil Treatment Facility
- ☐Incinerator/Trench Burner
- ☐Unauthorized Disposal
- ☒Other Coal-fired Power Plant

TYPE OF INSPECTION (check all that apply):

- ☐Operation
- ☐Closure
- ☐Long-Term Care
- ☐Complaint Investigation
- ☐Routine Inspection
- ☐Follow-up Inspection
- ☒Other Inspection of ash management areas

ATTACHMENTS TO THE INSPECTION CHECKLIST (check all that apply):

This Cover Page includes the following attachments.

Section No.		Section Title
☐	1.0	File Review
☐	2.0	Landfill Operation and Maintenance
☐	3.0	Landfill Long-Term Care
☐	4.0	Waste Processing Facilities
☐	5.0	C&D Debris Disposal Facilities
☐	6.0	Recycling Operations at C&D Debris Disposal Facilities
☐	7.0	Land Clearing Debris Disposal Facilities
☐	8.0	Compost Facilities
☐	9.0	Waste Tire Facilities
☐	10.0	Yard Trash Processing Facilities
☐	11.0	Stationary Soil Treatment Facilities
☐	12.0	WTE Facilities
☐	13.0	Complaint Investigations
☒	14.0	Narrative and Signatures

(Revised 10/05)

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
INSPECTION CHECKLIST

SECTION 14.0 – NARRATIVE AND SIGNATURES

REQUIREMENTS:
THIS SECTION PROVIDES AN OPPORTUNITY FOR THE DEPARTMENT INSPECTOR TO ADD A NARRATIVE EXPLAINING ANY REQUIREMENTS IDENTIFIED AS "NOT OK" AT THE TIME OF THE INSPECTION. SOME REQUIREMENTS MAY BE IDENTIFIED AS "OK" BUT ARE DISCUSSED FURTHER IN THE "AREAS OF CONCERN" PORTION OF THE NARRATIVE SECTION.

14.1 Explanation for all "NOT OK" responses (continue on separate sheet if necessary).

The purpose of this inspection was to inspect the facility's ash management areas, including the ash landfill, which is located east of Units 4 & 5, and the inactive North Ash Pond, which is located southwest of Units 4 & 5. The ash landfill can be accessed via the North Access Road. Accessing the North Ash Pond requires entrance through the facility's Access Control Point (Homeland Security).

Department and Progress Energy staff observed the top and sides of the ash landfill, which contains high chloride ash from the north ash pond, fly ash from Units 1, 2, 4, & 5, bottom ash from Units 4 & 5, co-mingled waste, and bottom Ash from Units 1 & 2. The ash landfill is a dry ash management unit that does not receive sluice water. Most side slopes of the ash landfill appeared to be 4H:1V with the exception of the fly ash storage area. The east side slope was fairly steep; however, no problems were noted with regard to the slope's integrity. More than adequate area was observed between the side slope and perimeter road to accommodate proper grading of the side slope. This was mentioned to PE staff. Jay Chesser indicated that it was PE's intention to properly grade the east side slope of the fly ash storage area. No significant areas of erosion were observed on the ash landfill.

The North Ash Pond, which formerly received sluice water and ash, is no longer in operation. All existing ash has been excavated and removed to the high chloride ash area of the ash landfill. The North Ash Pond has been lined with clean dirt in preparation for liner construction to accommodate by-product from the Flue Gas Desulfurization (FGD) units that are under construction at Units 4 & 5.

Additional Notes: The Gypsum Handling Area has not been constructed; this area is being used for contractor parking for the construction of the FGD units and Electrostatic Precipitators for Units 4 & 5. The area located just east of Units 4 & 5 coal storage area is being prepared for liner construction for the proposed stormwater ponds. The Truck Wash, which will be located at the southeast corner of the ash landfill, has not been constructed. The limestone processing building has been constructed, but is not in operation. The gypsum conveyors are under construction. The North Access Road is completed and is in use.

Signed: Stephanie Watson 12/5/09
DEP Representative Date

[initials] 2/18/09

(Revised 10/05)

Enhydro Water Use Feasibility & Impact Assessment Report June 5, 2006

EnHydro, LLC
consulting hydrogeologists and wellfield technology services

Water Use Feasibility and Impact Assessment Report

Submitted to the

Southwest Florida Water Management District

in support of a

Modification to Power Plant Site Certification PA77-09

Florida Power dba
Progress Energy Florida, Inc.

Crystal River Energy Complex
15760 Powerline St.
Crystal River, FL 34428

334 East Lake Rd., #173 Palm Harbor, FL 34685-2427 • *ph – 813.293.0740, fax – 813.448.9322*

Professional Certification

In accordance with provisions in Chapter 492, Florida Statutes, I hereby certify that I have examined this Water Use Feasibility and Impact Assessment Report and attest that this report has been reviewed and approved by the undersigned Florida Professional Geologist.

EnHydro, LLC has prepared this report in a manner consistent with sound geologic practices and that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality under similar circumstances. Information provided to EnHydro, LLC by client representatives, agents, and other consultants has been accepted in good faith and is assumed to be accurate.

____

Signature

H. Cliff Harrison, P.G.
Registered Professional Geologist
Registration No. 1926, State of Florida

EnHydro, LLC
Geology Business License GB504, State of Florida

____

Date

Introduction

Progress Energy Florida, Inc. (PEF) operates two 739-megawatt (MW) coal-fired power generating units (Units 4 & 5) at the Crystal River Energy Complex in Citrus County, Florida. Currently, groundwater well withdrawals for cooling and other operational uses for these units are limited to 1.0 million gallons per day (mgd) on an annual average basis; maximum withdrawals are limited to 3.0 mgd on a peak month daily basis. The groundwater withdrawals for Units 4 & 5 (Crystal River North Plant) and associated facilities are authorized under the Conditions of Certification (PA 77-09, OGC Case No. 04-1837). Additionally, the Southwest Florida Water Management District (SWFWMD) issued Individual Water Use Permit No. 204695.03 on October 28, 1997 to cover the 1.0 mgd of groundwater required for cooling and other uses associated with the Crystal River South Plant (Units 1 & 2).

This report deals only with proposed groundwater withdrawal increases for the Crystal River North Plant, where plans are currently under development to add additional air pollution control equipment. Similar pollution control equipment may be added to the Crystal River South Plant.

To comply with Federal air quality standards, PEF is currently in the design phase of a program to install Flue Gas Desulfurization (FGD) units at the Crystal River North Power Plant. The FGD process involves the mixing of pulverized limestone with water to produce a slurry. The slurry is then injected the stack gas column where it interacts with the hot stack gas, producing gypsum and water vapor as the sulfur is stripped from the stack gas and combines with the limestone. PEF's design team has determined that a total of 6.72 mgd of water will be required to supply the existing uses (1.0 mgd) and the proposed FGD system (5.72 mgd).

To assess the potential for the proposed groundwater withdrawal increase to induce vertical or lateral migration of mineralized water into the production well pumping zone, PEF authorized EnHydro, LLC (EnHydro) to conduct a comprehensive review of the data collected during the initial installation of the existing wells was conducted to determine the nature of the water quality profile beneath the site. Lithologic and water quality information from the drilling of the original wells (***Evaluation of the Pumping Test Conducted on June 1978 at the FPC Site near Route 19, Crystal River, Citrus County, Florida – Geraghty & Miller, Inc. – July, 1978*** and ***Hydrogeologic Report on Florida Power Corporation's Proposed Well Field to Supply Water to Units 4 and 5 at Crystal River, Florida – Geraghty & Miller, Inc. – October, 1979***) was reviewed and compared to recent monitoring well water quality data collected and reported to the SWFWMD by PEF; well logs were also prepared for each of the existing production wells and were combined into a conceptual hydrogeologic framework. In addition, a surface geophysical investigation using electrical resistivity imaging (ERI) was conducted in an attempt to delineate the interface between the fresher, shallow groundwater and the more mineralized, underlying deeper groundwater.

An initial assessment of the estimated impacts anticipated to occur as a result of the proposed withdrawal increase was then conducted using the Groundwater Vistas modeling interface (based on Modflow2000) and the SWFWMD's District-Wide Regulatory Model (DWRM). The DWRM is calibrated to represent groundwater pumping conditions across the SWFWMD at the estimated 2001 (drought-year) rates; GW Vistas allows the user to evaluate the additional drawdown predicted to occur as a result of the proposed increase in pumping.

The initial model simulations, based on preliminary estimates of the amount of additional water that would be required to supply the FGD system and using the default aquifer geometry and hydraulic parameters in the DWRM model, indicated that the proposed withdrawal increase would not cause unacceptable drawdown impacts to either the surficial aquifer or to adjacent legal users of groundwater from the Upper Floridan Aquifer. The predicted drawdown within the Upper Floridan Aquifer was less than one foot, indicating that the proposed increase would not induce either lateral or vertical migration of mineralized groundwater. The location of the existing production and monitoring wells (near to, and generally east of, US 19, approximately five miles from the coastline) however, led to some degree of uncertainty regarding the validity of this conclusion due to the lack of monitoring well data closer to the coast.

A review of the water quality data presented in the ***Coastal Ground-Water Quality Monitoring Network / Water-Use Permit Network Report (Volume V) – Southwest Florida Water Management District – March, 2005*** indicated that there are two SWFWMD monitoring wells located on the project site. Monitoring wells "***FL Power Corp #2***" and "***FPC Well 3 NR Crystal R***" are located approximately three miles west of US 19, closer to the coastline than the Progress Energy production and monitoring wells. Although the historical water quality data from monitoring well "***FPC Well 3 NR Crystal R***" does not indicate any long-term increase in either chloride or sulfate concentrations, the data from monitoring well "***FL Power Corp #2***" suggests a rise in chloride concentration from approximately 100 mg/l to 400 mg/l over the past 15 years; sulfate concentrations have increased from approximately 30 mg/l to 120 mg/l over the same time period.

The trends observed in the water quality data from the single monitoring well suggest that there is at least a possibility that the long-term pumping of the existing wellfield has induced lateral migration of poor-quality groundwater.

However, historical records also show that hurricane-related storm surges have pushed saltwater onto the land surface on multiple occasions over the past 30 years. Due to the shallow open interval monitored by these two monitoring wells compared to the production zone of the wellfield ("***FL Power Corp #2***" is reported to be open from 42 – 47 ft bls, and "***FPC Well 3 NR Crystal R***" is open from 52 – 67 ft bls, compared to approximately 50 – 200 ft for the production wells) and the fact that no such long-term increasing trend has been identified in the production wells or in PEF's monitoring wells, it was decided (at the recommendation of the SWFWMD) to install a triple-zone monitoring well in the vicinity of the shallow SWFWMD monitoring wells to assess the actual water quality profile beneath the site in that area.

PEF authorized EnHydro to construct and test a triple-zone monitoring well (MZ-3) in the vicinity of the SWFWMD monitoring wells (approximately 3 miles west of US 19). Water and lithologic samples were collected during drilling on 10-ft increments. Upon reaching the target depth of 250 ft bls, the well was completed as a triple-zone monitoring well; open intervals are: MZ-3S (140-150 ft bls), MZ-3I (170-180 ft bls), and MZ-3D (210-220 ft bls). Water quality samples collected on 10-ft intervals were submitted to a certified laboratory for analysis. Concentrations of chloride and sulfate ions in the water samples were considerably lower than those reported by the SWFWMD for monitoring well "***FL Power Corp #2***", suggesting that the "***FL Power Corp #2***" may have been impacted by storm surge water deposited on the land surface; the new monitoring well MZ-3 did not display sulfate concentrations as high as those reported from "***FL Power Corp #2***" until approximately 200 ft bls, and chloride concentrations similar to those reported from "***FL Power Corp #2***" were not observed in the 250-ft deep borehole.

Subsequent to the completion of the new monitoring well MZ-3, a final set of model runs was conducted. For this evaluation, the default parameters in the DWRM model were altered to more accurately reflect the lithology observed beneath the site. Rather than attempting to simulate the hydrogeologic system as a single-layer system with the default values for layer elevations (top = 100 ft above MSL, bottom = 0 ft MSL), three layers were defined with top and bottom elevations that closely approximate the observed lithology; aquifer hydraulic parameters were left unchanged from the model's default values. The impact assessment that was run with the revised model layer dimensions indicated that the maximum drawdown to be expected in the Upper Floridan Aquifer as a result of the proposed withdrawal increase is approximately 0.227 ft; the maximum predicted drawdown in the surficial aquifer is 0.181 ft. These predicted values indicate that the proposed withdrawal increase will not cause unacceptable environmental impacts, nor will it cause unacceptable impacts to adjacent legal users of groundwater from the Upper Floridan Aquifer.

Previous Work

In 1978 and 1979, a series of test wells and production wells were drilled and tested at the Crystal River Power Plant site by Geraghty & Miller, Inc.. **Table 1** summarizes the construction details of these wells:

Table 1 – Existing Production and Monitoring Wells

Well ID	Status	Cased Depth (ft bls)	Total Depth (ft bls)	Water Quality Data Collected During Drilling
PW-1	pumping	35	200	2 samples (top & bottom of open interval)
PW-2	pumping	47	200	2 samples (top & bottom of open interval)
PW-3	pumping	60	200	2 samples (top & bottom of open interval)
PW-4	pumping	41	200	2 samples (top & bottom of open interval)
PW-5	standby	50	200	2 samples (top & bottom of open interval)
PW-6	standby	50	200	2 samples (top & bottom of open interval)
PW-7	standby	50	200	2 samples (top & bottom of open interval)
MZ-1S	not monitored	60	245	30-ft interval samples
MZ-1I	not monitored	360	373	30-ft interval samples
MZ-1D	not monitored	472	478	30-ft interval samples
MZ-2S	not monitored	35	255	6 samples
MZ-2I	monitor well	349	373	6 samples
MZ-2D	monitor well	461	488	6 samples
SMW-1	not monitored	60	250	2 samples (top & bottom of open interval)
SMW-2	not monitored	60	245	2 samples (top & bottom of open interval)
TP-1	abandoned?	60	250	2 samples (top & bottom of open interval)

The well construction and testing reports (***Evaluation of the Pumping Test Conducted on June 1978 at the FPC Site near Route 19, Crystal River, Citrus County, Florida – Geraghty & Miller, Inc. – July, 1978*** and ***Hydrogeologic Report on Florida Power Corporation's Proposed Well Field to Supply Water to Units 4 and 5 at Crystal River, Florida – Geraghty & Miller, Inc. – October, 1979***) include analyses of the pumping tests performed on the wells at the time of installation. A maximum drawdown of 2.51 ft was predicted, based on a pumping rate of 3.0 mgd from four wells. This analysis was done using a transmissivity value of 1,000,000 gpd/ft (133,690 ft2/day), which is only approximately 25% of the value used in the DWRM model (about 500,000 ft2/day, or 3,750,000 gpd/ft.

Water quality data and lithologic descriptions from samples collected during the drilling of the original wells were taken from the reports and plotted on the individual well logs (**Appendix A**). These data were utilized in developing the conceptual model of the aquifer system for use in the recent modeling efforts. The data presented in these reports suggest the following generalities regarding the hydrogeologic profile beneath the site:

- Primary producing zone of aquifer (high permeability) ~10-80 ft bls
- Water quality:
  - 0-250 ft bls = fresh water
  - 250-490 ft bls = low chloride, increased sulfate
  - saltwater (high chloride) interface is deeper than 490 ft bls
- Aquifer permeability – 0-200 ft bls = moderate to high; 200-490 ft bls = low

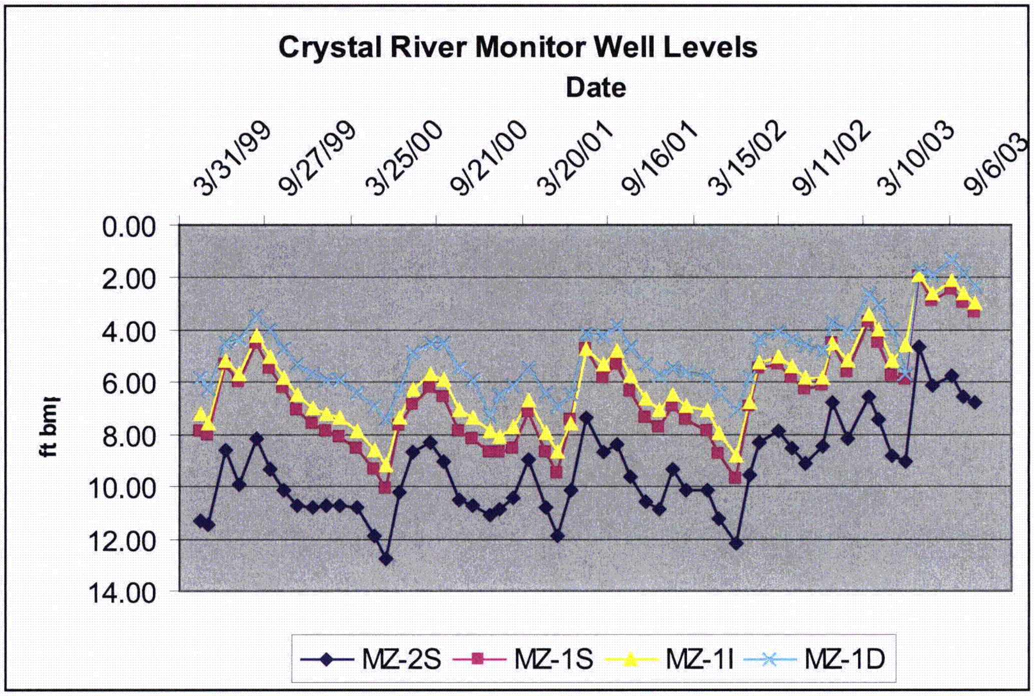
Dissolved chloride ion concentrations in deep monitor well MZ-2D (completed to a depth of 488 ft bls) never exceeded 40 mg/l, although total dissolved solids (TDS) concentrations were observed to be as high as 2,736 mg/l, due to the high sulfate concentrations observed between 200 – 400 ft bls.

Water Quality Trend Investigation

Since a potential increase in the concentration of dissolved minerals in the makeup water produced by the production wells would have a negative effect on the efficiency of the FGD system and on the composition of the water discharged from the site, it is important to understand whether the water quality profile beneath the site has changed in the 25 years that the wells have been in operation. This is also an important step in providing reasonable assurance to the SWFWMD permit application review team that the proposed increase in groundwater withdrawal will not cause unacceptable negative impacts to the environment or to adjacent legal users of groundwater. If the water quality profile has remained relatively unchanged during the life of the permit, it would indicate that the current rate of groundwater withdrawal is not causing any negative impacts to the groundwater system.

To assess the water quality profile beneath the site, and specifically to determine if there has been any significant change in the water quality profile since the installation of the production wells in the late 1970s, several data sets were examined. First, historic records of water level measurements in the site monitoring wells were obtained from PEF. The data that were available (1999 – 2003) indicate a long-term gradual rise in water levels in all four monitoring wells (**Figure 1**), indicating that the groundwater system beneath the site is not being overly stressed by the current rate of pumping. This confirms that the pumping at the site is not currently causing drawdown-related migration of poor-quality water from beneath the production zone.

Figure 1 - Water Level Trends in Site Monitoring Wells



The second data set that was examined was the quality of the water produced by the existing production wells and that of samples obtained from the monitoring wells on the site. Sulfate and chloride concentrations in the monitoring wells have remained relatively stable over the past 10 years, with some minor increases being followed by a return to the long-term trend. Sulfate and chloride concentrations are presented in **Figures 2** and **3**, below.

Figure 2a – Sulfate Concentrations in Production Wells

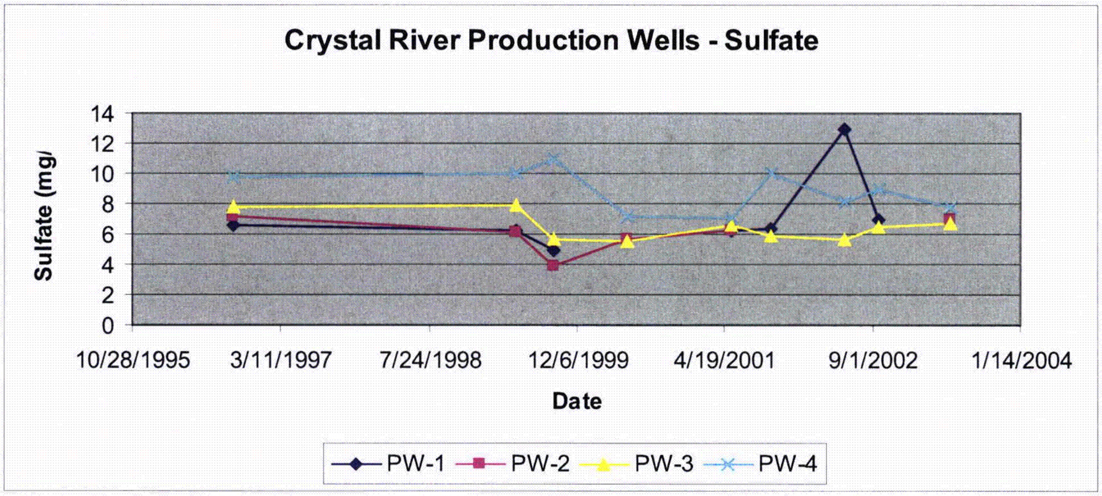
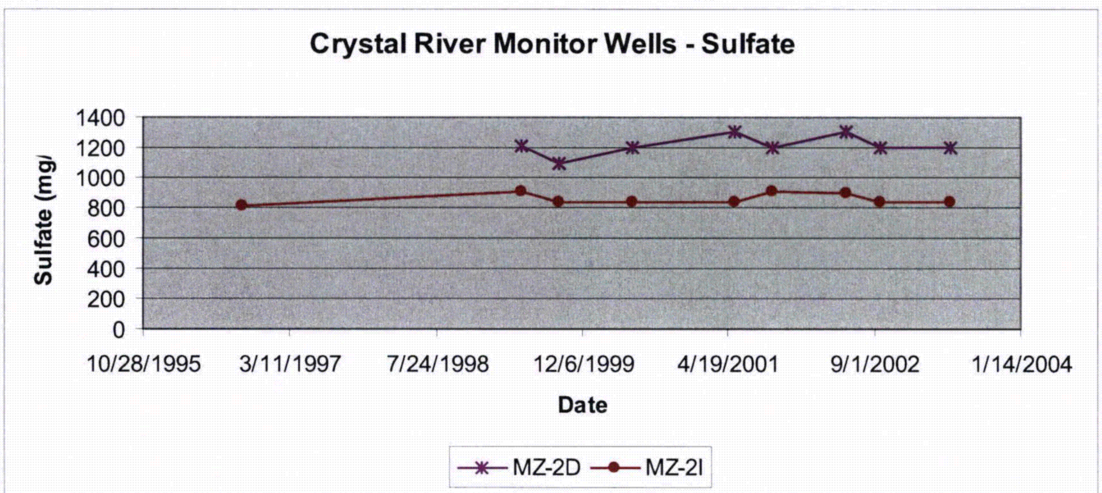


Figure 2b – Sulfate Concentrations in Monitoring Wells



Additionally, the concentrations of several other key parameters in a sample collected from production well NWP-2 on July 14, 2005 were compared to analytical results for a sample collected when the well was installed and tested in 1979. The results of these analyses are presented in **Table 2**, below. Although chloride concentrations show an increase from 6.0 mg/l to 9.5 mg/l, other parameters, such as specific conductance and sulfate concentrations have either remained steady (spec. cond. = 460 umhos/cm in 2005, compared to 450 umhos/cm in 1979), or dropped (sulfate = 2.4 mg/l in 2005, compared to 9 mg/l in

1979). These data all support the hypotheses that the current rate of groundwater withdrawal is well within the capacity of the groundwater system beneath the site, and that the currently-permitted withdrawal is not causing unacceptable negative impacts to the groundwater system or to adjacent legal users of groundwater.

Figure 3 – Chloride Concentrations in Production and Monitoring Wells

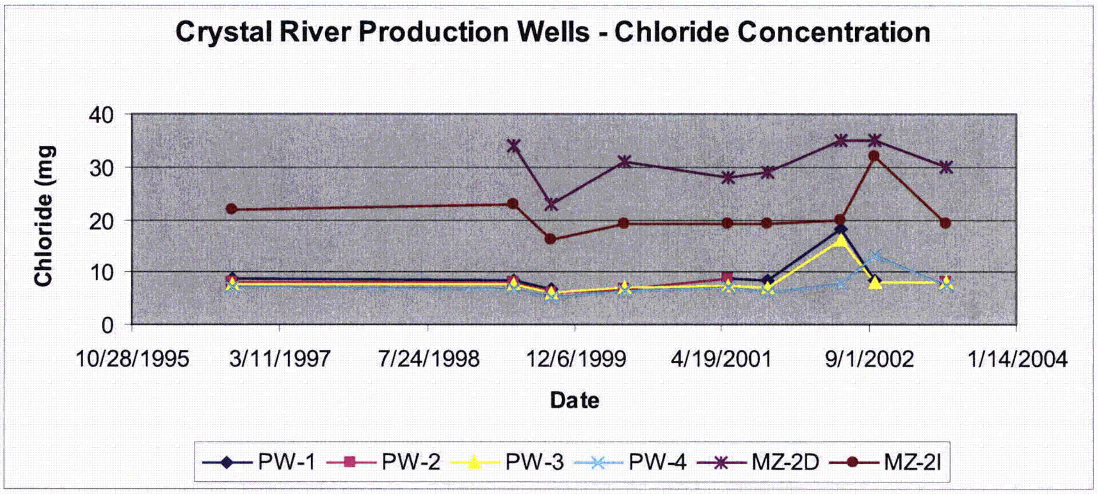


Table 2 – Groundwater Characterization – Production Well No. PW-2

Parameter	Results (2005)	Historical Data (1979)	Units of measure
Hardness (as CaCo3)	240	212	mg/l
Calcium	77	72	mg/l
Iron	2.7	1.47	mg/l
Magnesium	11	7.8	mg/l
Sodium	3.9	3.8	mg/l
Silica (as SiO2)	5000	Nr	ug/l
Chloride	9.5	6.0	mg/l
Sulfate	2.4	9	mg/l
Fluoride	0.11	0.13	mg/l
Nitrogen (as Nitrate)	0.010	0.02	mg/l
pH	7.11	6.8	SU
Specific Conductance	460	450	umhos/cm
Color	60	n/r	PCU
Total Suspended Solids	5.0	4.0	mg/l
Turbidity	19	22	NTU
Hydroxide Alkalinity	1.0	Nr	mg/l
Bicarbonate Alkalinity (as CaCO3)	220	214	mg/l
Carbonate Alkalinity (as CaCO3)	1.0	n/r	mg/l
Alkalinity	220	214	mg/l
Phenolphthalein Alkalinity	1.0	n/r	mg/l
Total Dissolved Solids	220	330	mg/l
Carbon dioxide	230	n/r	mg/l

Electrical Resistivity Imaging Survey

As a supplement to this investigation, EnHydro was authorized to conduct an Electrical Resistvity Imaging (ERI) survey in an attempt to identify the depth at which the fresh-water zone transitions to the more mineralized (sulfate-rich) water below. The reasoning behind attempting to identify the transition zone using non-invasive surface geophysical techniques was that the only direct method of acquiring such information is to drill a salinity profile exploratory well and to collect water samples on a continuous basis during drilling. This approach costs significantly more than the non-invasive ERI technique, so it was decided to attempt the less costly method first.

The ERI survey report, prepared by our subcontractor, Subsurface Evaluations, Inc., is attached to this report as **Appendix B**. In summary, the ERI survey indicated that water-bearing zones containing groundwater with increased mineralization were found at approximately 160 ft below land surface (bls) at the western end of the ERI transect (near the guard station at the plant entrance). Unfortunately, the ERI surveys run in the vicinity of and east of US 19 did not produce meaningful results; the shallow limestone in that area appears very dense and highly resistive (electrically), causing the ERI signal to attenuate and therefore not penetrate deep enough to identify mineralized zones in the groundwater system.

The ERI survey results that were obtained did provide some important information, however. The ERI survey transect near the guard station is in the vicinity of the two wells in the SWFWMD's Coastal Ground-Water Quality Monitoring Network (CGWQMN) that are located on the site. The recent CGWQM report prepared by the SWFWMD (March, 2005) indicates different long-term trends for the two wells, which are only about 3000 ft apart. Well ID "***FL POWER CORP #2***" and "***FPC WELL 3 NR CRYSTAL R***" are located near the guard station (***FL POWER CORP #2***) and about 3000 ft east (***FPC WELL 3 NR CRYSTAL R***). The CGWQMN report shows an increase in chloride and sulfate concentrations over the past 15 years in ***FL POWER CORP #2***, while no significant trend was noted in ***FPC WELL 3 NR CRYSTAL R*** during the same time period. The water quality trends in these two wells are presented in **Figures 4 and 5**.

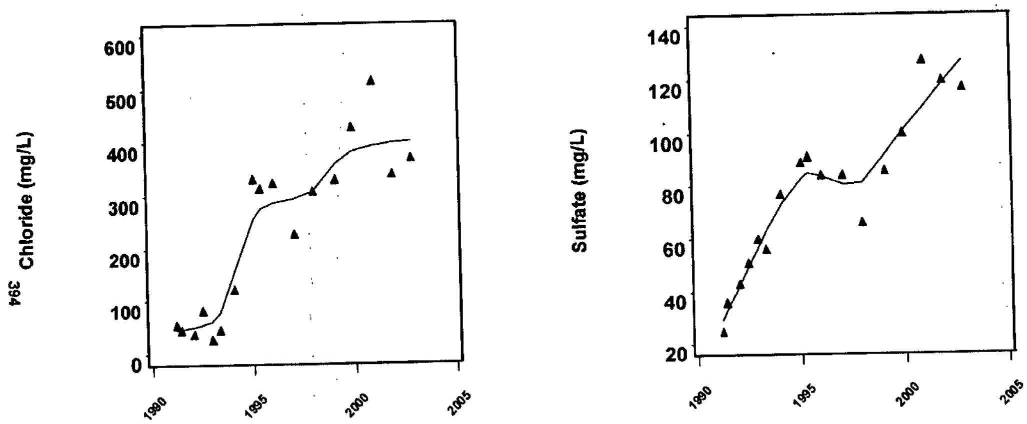
The construction details of the two CGWQMN wells on the site ***as reported in the SWFWMD's March, 2005 CGWQMN report*** are as follows:

FL POWER CORP #2 – total depth: 42 ft bls; cased depth: 47 ft bls

FPC WELL 3 NR CRYSTAL R – total depth: 51.8 ft bls; cased depth: 67 ft bls

As can be seen from this information, the open intervals of these wells are shallower than, or just intersecting the top of, the production zone of the wellfield. The water quality data from ***FL POWER CORP #2*** is significantly different from that found in the production zone of the wellfield. We requested that the SWFWMD verify the cased and total depth of ***FL POWER CORP #2*** by running a suite of geophysical logs on the well; unfortunately, the well has been damaged and the technician could not lower his tool down the well. The SWFWMD CGWQMN project manager has confirmed that the reported cased and total depths were provided by the USGS and have not been verified; he also expressed interest in replacing the well if an access agreement/easement can be developed between the SWFWMD and PEF.

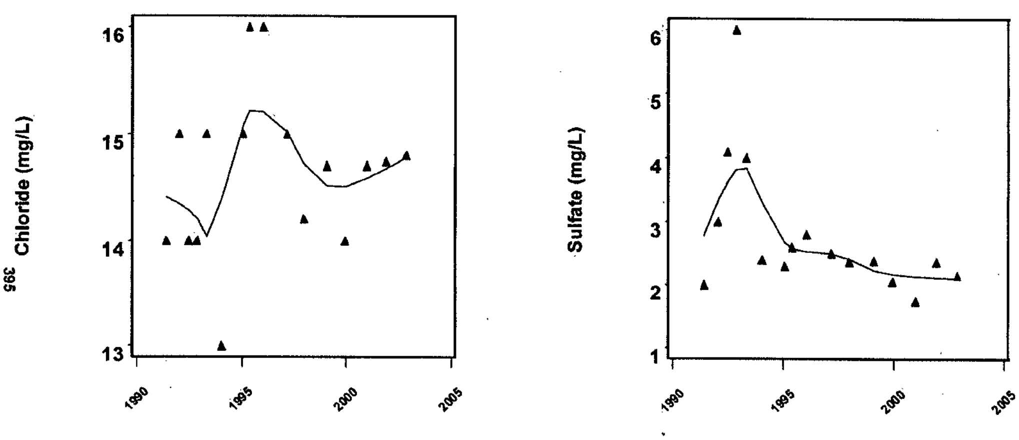
Figure 4 – Water Quality Trend – CGWQMN monitoring well "FL POWER CORP #2"



Appendix C-19. Water Quality Scatterplots Fitted with a LOWESS Curve for FL POWER CORP #2.

For comparison purposes, it is helpful to know how these concentrations compare to seawater. Sodium and chloride (the two ions in table salt) are the two primary ions in seawater. At 19,000 mg/l for chloride and 10,500 mg/l for sodium, they comprise 54% and 30% of the total weight of ions in seawater, respectively. The next two most common ions, magnesium (at 1280 mg/l) and sulfate (at 2700 mg/l) comprise 3.7% and 7.7% of the weight of seawater ions, respectively. Together, these four ions comprise almost 96% of the weight of ions present in seawater. Therefore, the highest observed concentrations of chloride and sulfate in ***FL POWER CORP #2*** are approximately 3% and 5% of seawater, respectively.

Figure 5 – Water Quality Trend – CGWQMN monitoring well "FPC WELL 3 NR CRYSTAL R"



395

Appendix C-20. Water Quality Scatterplots Fitted with a LOWESS Curve for FPC WELL 3 NEAR CRYSTAL RIVER.

Triple-zone Monitoring Well Construction and Testing

During the preliminary review of the water quality within the Upper Floridan Aquifer beneath the project site (based on previous drilling logs, PEF monitoring data, and SWFWMD CGWMN reports), it was determined that there was a single data point, SWFWMD CGWMN monitoring well ***FL POWER CORP #2***, that displayed an anomalous water quality profile. Questions were raised by SWFWMD staff regarding the significance of the apparent worsening trend in the monitoring data from this well; if the trend represents actual trend within the groundwater system it could be a sign that long-term pumping has caused horizontal migration of mineralized water. The validity of the water quality data from this shallow (42 – 47 ft bls) monitoring interval is questionable, however, due to the significant difference between the chloride concentration (and to a lesser extent, sulfate concentration) in water samples collected from monitoring well ***FL POWER CORP #2*** and that observed from other monitoring wells on the site. Additionally, historical observations by PEF personnel at the Crystal River Power Plant site include multiple instances during which storm surges pushed salt water some distance on-shore; such occurrences could have allowed seawater to migrate downward into the surficial aquifer, resulting in the observed water quality trends.

To provide a higher level of assurance regarding the actual water quality profile beneath the site, and to provide an "early warning" sentinel point at which to monitor water quality trends in the shallow and deeper production zones, SWFWMD staff suggested the installation of a multiple-zone monitoring well near the location of ***FL POWER CORP #2***. A drilling and testing plan was submitted for SWFWMD's review and approval. The plan called for drilling a 10-in diameter test hole using a dual-rotary drilling rig. By following the bit down the hole with the 10-in casing, water quality samples could be collected at 10-ft intervals without concern that overlying, fresher zones would dilute the samples coming from the current drilling interval. The location of this new well, identified as monitoring well MZ-3, is provided in **Figure 6**.

The drilling and testing plan approved by the SWFWMD called for drilling to approximately 250 ft bls (or to the zone of transition to highly-mineralized groundwater). Lithology samples were collected continuously and described by an EnHydro hydrogeologist (lithologic descriptions are presented in **Appendix C**). Water samples were collected every 10 ft during drilling operations, and were analyzed in the field for pH and specific conductance. Additionally, samples from the same 10-ft intervals were collected for laboratory analysis of pH, specific conductance, total dissolved solids (TDS), and chloride, sulfate, and sulfide ion concentrations. The results of the field analyses are presented in **Table 3**. A summary of the laboratory analyses is presented in **Table 4** and **Figure 7**; complete laboratory analytical results are presented in **Appendix D**.

Figure 6 – Location of Monitoring Well MZ-3

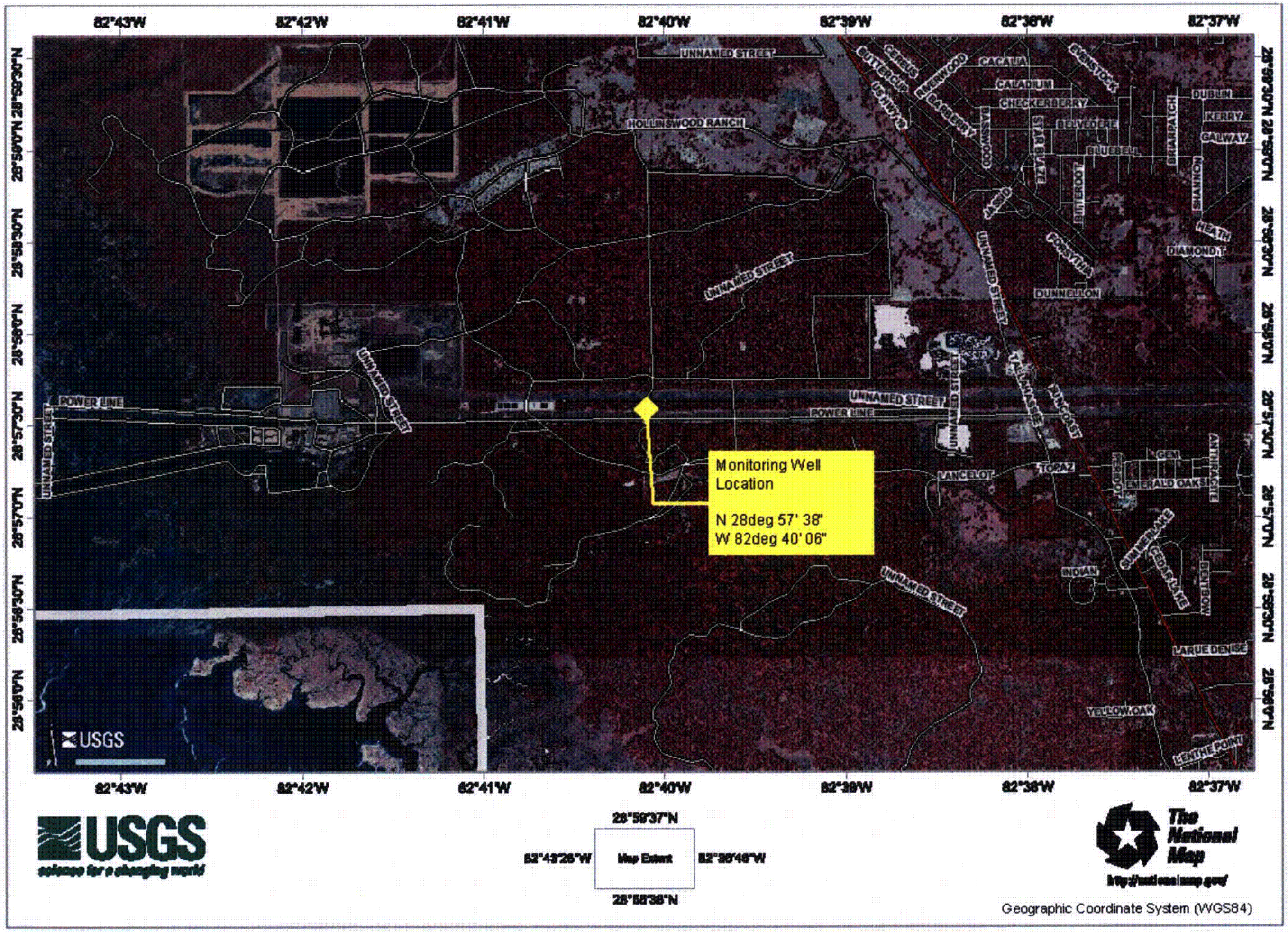


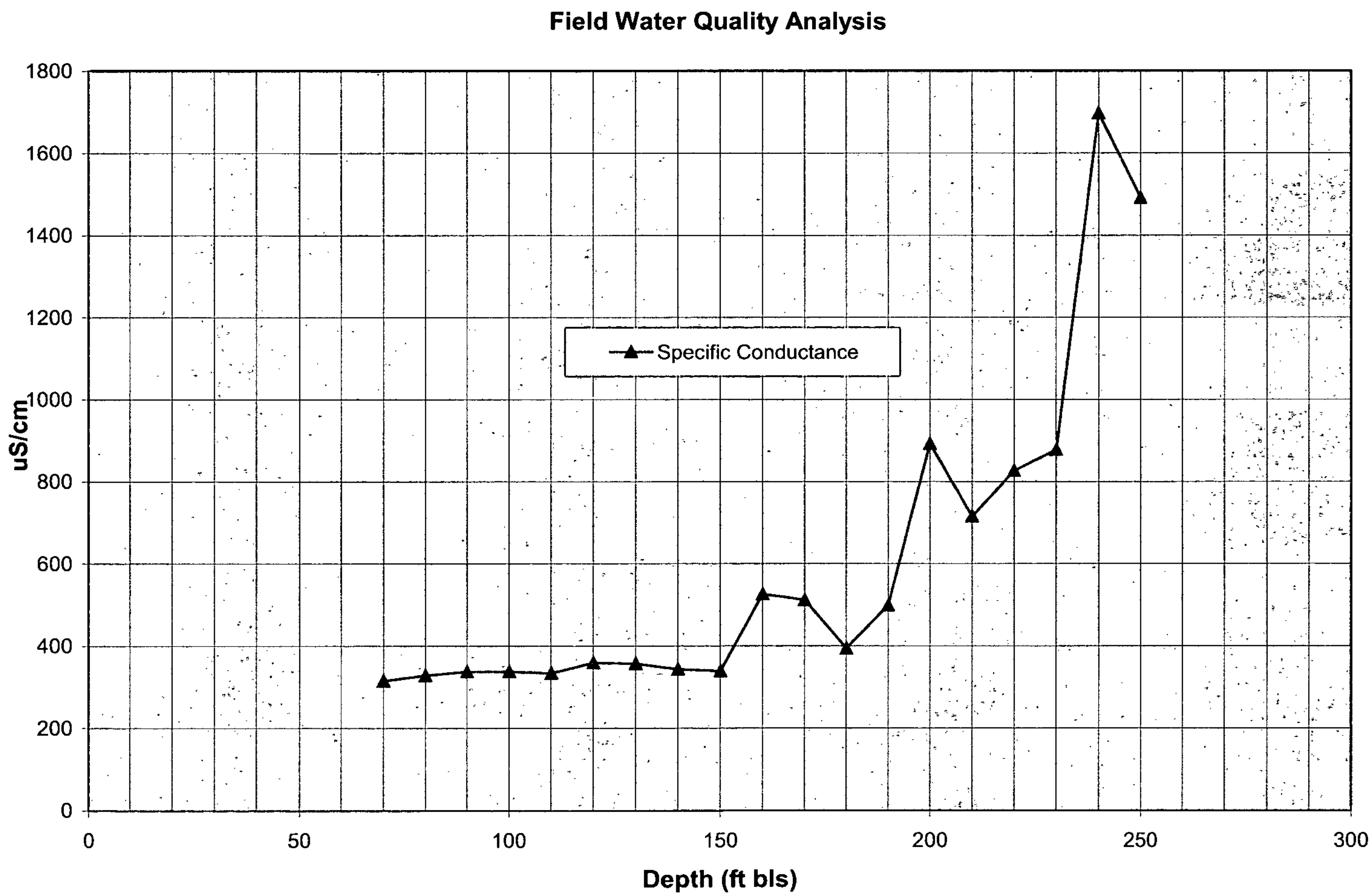
Table 3 – Field Water Quality Analysis Results

Depth (ft bls)	Temperature (deg C)	Specific Conductance (uS/cm2)	Dissolved Oxygen (mg/l)	pH	ORP
70	21.48	315	6.94	8.15	3.5
80	21.87	328	9.11	8.20	45.0
90	21.62	337	7.96	8.19	37.7
100	21.39	337	7.32	8.29	28.4
110	22.01	334	7.84	8.16	15.3
120	22.44	359	8.12	8.14	22.3
130	22.53	357	7.84	8.19	20.3
140	22.51	343	7.54	7.89	36.0
150	22.12	339	7.32	7.87	46.7
160	22.52	526	8.03	7.80	28.5
170	21.65	512	8.05	7.77	-14.9
180	21.92	394	8.14	7.69	-31.6
190	21.97	499	7.56	7.78	-71.5
200	22.09	892	7.48	7.89	-79.6
210	22.63	715	6.98	8.01	-77.6
220	22.29	826	7.34	7.97	-102.0
230	22.13	877	7.18	7.95	-109.0
240	22.96	1697	6.56	6.51	-103.2
250	22.74	1491	7.44	7.93	-121.6

Table 4 – Laboratory Water Quality Analysis Results

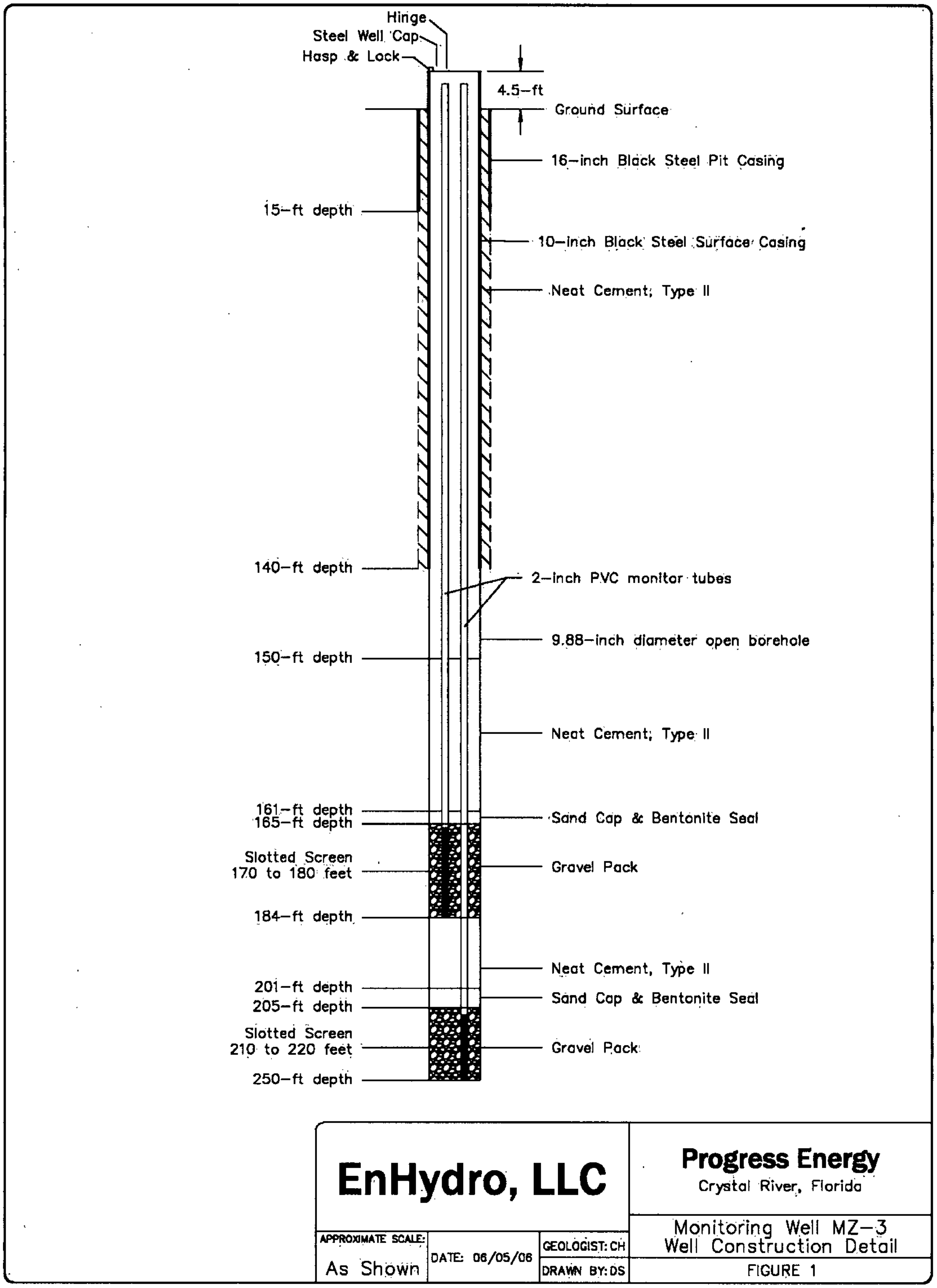
Depth (ft bls)	Specific Conductance (umhos/cm)	pH	Total Dissolved Solids (mg/l)	Chloride (mg/l)	Sulfate (mg/l)	Sulfide (mg/l)
70	480	7.99	240	13	45	<1.0
80	440	7.93	250	12	40	<1.0
90	460	7.97	230	13	30	2.4
100	470	8.08	270	16	170	2.6
110	470	8.15	290	22	22	<1.0
120	500	7.96	260	21	21	<1.0
130	490	8.00	270	24	27	<1.0
140	480	7.97	250	22	19	<1.0
150	480	7.91	240	26	19	<1.0
160	750	8.01	400	79	80	2.7
170	750	8.00	390	64	59	<1.0
180	560	7.92	300	21	30	<1.0
190	710	7.95	410	28	61	<1.0
200	1300	7.88	910	33	710	<1.0
210	1000	7.83	630	32	24	<1.0
220	1200	7.80	770	34	380	<1.0
230	1300	7.80	870	32	400	<1.0
240	2500	8.04	2100	48	1600	1.8
250	2200	7.92	1800	46	1300	1.6

Figure 7 – Field Water Quality Profile – MZ-3



Based on the results of the field analytical data, and in consultation with the SWFWMD, the following intervals were chosen for monitoring zones: MZ-3S (140-150 ft bls), MZ-3I (170-180 ft bls), and MZ-3D (210-220 ft bls). The bottom two monitoring intervals (MZ-3I and MZ-3D) were constructed by placing a 10-ft slotted screen and casing to the target depth, backfilling with a graded gravel pack, then sealing the top of the gravel pack with bentonite pellets, fine sand, and neat cement. The upper zone (MZ-3S) is accessed through the annulus around the two lower monitoring zone casings, between the monitoring zone casings and the 10-in surface casing. A construction diagram of the triple-zone monitoring well MZ-3 is provided as **Figure 8**; the well log of MZ-3 is provided in **Appendix A** along with the well logs developed for the previously-drilled wells.

Figure 8 – Schematic Construction Diagram of Monitoring Well MZ-3



Analytical Groundwater Modeling

Subsequent to the completion of the triple-zone monitoring well, a three-dimensional groundwater model was set up in the Groundwater Vistas modeling interface (based on Modflow2000). The lithology and water quality encountered during the drilling of each of the existing wells were depicted on individual well log forms, and this information was used in the development of the model layer elevations. The purpose of this final phase of the investigation was to assess the likelihood that the proposed increase would be feasible and sustainable as determined by the additional drawdown in the Upper Floridan Aquifer that is predicted by the model.

Feasibility and sustainability were assessed based on the predicted upward vertical or lateral movement of mineralized water due to the increased drawdown caused by the proposed withdrawal increase. The potential for lateral movement is assessed by the extent of the predicted cone of depression, or area influenced by the drawdown. The upward vertical movement of mineralized water can be predicted using the Ghyben-Herzberg relationship, which is based on the balance of forces for a static groundwater system that is composed of fresh groundwater overlying saline groundwater (variable density, stratified relationship). The Ghyben-Herzberg relationship states that the depth to the interface between fresh and saline groundwater will be at a depth approximately equal to 40 times the height of the freshwater water table above sea level.

For many areas, the Ghyben-Herzberg relationship is a good indicator of the position of the saltwater intrusion line. It can also be used to estimate the extent of the predicted vertical movement of the mineralized water interface: one foot of drawdown in the fresh water layer should result in approximately 40 feet of upward vertical movement of the underlying mineralized water. It must be understood, however, that the Ghyben-Herzberg relationship assumes that the aquifer is homogenous, with no intervening zones of lower or higher transmissivity. The low permeability zone observed between 200 – 490 ft bls in the deep test wells drilled at the site in 1978-1979 would be expected to retard any predicted upward vertical movement as a result of increased withdrawals from the producing zone (<200 ft bls, primarily 0 – 80 ft bls).

The groundwater model that was used to evaluate the proposed groundwater withdrawal increase is Groundwater Vistas, ver. 4, by Environmental Simulations, Inc.. GW Vistas is a user-friendly modeling interface based on Modflow 2000. GW Vistas was chosen by the SWFWMD to run their recently-released District-Wide Regulatory Model (DWRM). The advantage of using GW Vistas with the DWRM is that the DWRM has been calibrated to automatically calculate groundwater levels within the SWFWMD at two successive time-steps. Time-step #1 represents groundwater levels across the

SWFWMD at pre-development conditions; time-step #2 represents the groundwater levels as a result of the Water Use Permits that are currently permitted by the SWFWMD. This allows the investigator or permit reviewer to superimpose proposed additional withdrawals onto the currently-permitted withdrawals to estimate the predicted additional drawdown that will be caused by the proposed additional withdrawals. GW Vistas also allows the investigator to "zoom in" on the area being investigated using a focused telescopic mesh refinement (Focus TMR), causing the model to put more weight on the permitted withdrawals and existing conditions in the immediate vicinity of the proposed withdrawal increase; the result is that the Focus TMR results are considered to be a more realistic drawdown prediction than if the entire DWRM coverage area were to be factored into the calculations.

During the initial setup of the GW Vistas model for the simulation of the proposed withdrawal increase, a significant omission was discovered in the DWRM. The DWRM was calibrated using the groundwater withdrawal points (wells) that appear in the SWFWMD's Water Use Permitting (WUP) database. However, because production wells PW-1, PW-2, PW-3, and PW-4 are permitted under the Site Certification issued by the Florida Department of Environmental Protection (FDEP) for the Crystal River North Power Plant (Units 4 and 5) on November 21, 1978, these wells do not appear in the SWFWMD's WUP database. Because of this omission, the existing wells were entered into the model and assigned their permitted withdrawal rates during the Focus TMR phase of the model run, resulting in a more accurate representation of the groundwater conditions at the site.

The GW Vistas model was also modified to represent the locations of wells PW-5, PW-6, and PW-7, which were installed in the late 1970s but never plumbed and brought on-line, and additional proposed wells PW-8, PW-9, PW-10, PW-11, and PW-12. The pumping rates at all 12 wells were set at 389 gpm (24 hours/day), or 560,000 gpd, for a total simulated withdrawal of 6.72 mgd on an Average Annual Daily (AAD) basis; this total equals the currently-permitted 1.0 mgd plus the additional 5.72 mgd for the proposed FGD system. The proposed pumping rate was evaluated at a 365-day duration as well as at a 20-year duration; this was done to more accurately represent a steady-state simulation of the proposed long-term additional withdrawal. A Peak Month Daily pumping scenario (AAD + 40%) of 9.41 MGD for 30 days was also modeled.

In the 365-day scenario, presented in **Figures 9 and 10**, the maximum drawdown predicted in the surficial and Upper Floridan Aquifers was 0.22 and 0.34 ft, respectively. The 20-year scenario (**Figures 11 and 12**) predicted 0.24 ft of drawdown in the surficial aquifer and 0.34 ft of drawdown in the Upper Floridan Aquifer. The final model scenario was run to depict the anticipated drawdowns that would be expected from pumping at the proposed maximum daily rate (Peak

Month Day) of 9.41 mgd (**Figures 13 and 14**); the predicted drawdown in the surficial aquifer was 0.07 ft, while that in the Upper Floridan Aquifer was 0.46 ft.

The maximum predicted drawdown in the Upper Floridan Aquifer (0.46 ft) can be equated to approximately a 19-ft vertical rise in the mineralized water interface. Given that the depth to the saline water interface is approximately 490 ft (290 ft below the bottom of the wells) it is apparent that the proposed withdrawal will not cause unacceptable negative impacts to either the groundwater resource or to adjacent legal users of groundwater.

Summary and Recommendations

The potential negative effects of the proposed increase in groundwater withdrawal at the PEF Crystal River Power Plant were evaluated using several different lines of investigation. Water quality, lithology, and hydraulic parameters determined during the installation of the original wells in the late 1970's were reviewed. Water quality data from that time were compared to water quality data collected by PEF over recent years; no significant changes were observed in the quality of the water produced by the production wells. Aquifer levels, as monitored by the intermediate and deep monitoring wells on site, have risen by as much as five feet over the past seven years.

To assess the validity of the apparent water quality trends observed in a single SWFWMD monitoring well that is reported to be open from 42 – 47 ft bls (well is damaged - actual cased and total depths are unknown), triple-zone monitoring well **MZ-3** was constructed at the site in the vicinity of the suspect SWFWMD monitoring well. The well was drilled using techniques designed to provide the best possible representative water quality samples from successively deeper zones. Water quality samples were collected at 10-ft intervals during the drilling of the well and were submitted to a certified laboratory for analysis. Between 70 ft bls and 250 ft bls, no water was encountered containing chloride concentrations approaching the values reported from the SWFWMD monitoring well. Additionally, sulfate concentrations similar to those reported from the SWFWMD monitoring well were not observed until the depth of 200 ft bls was reached (other than one sample collected at 100 ft bls that displayed an anomalous sulfide concentration).

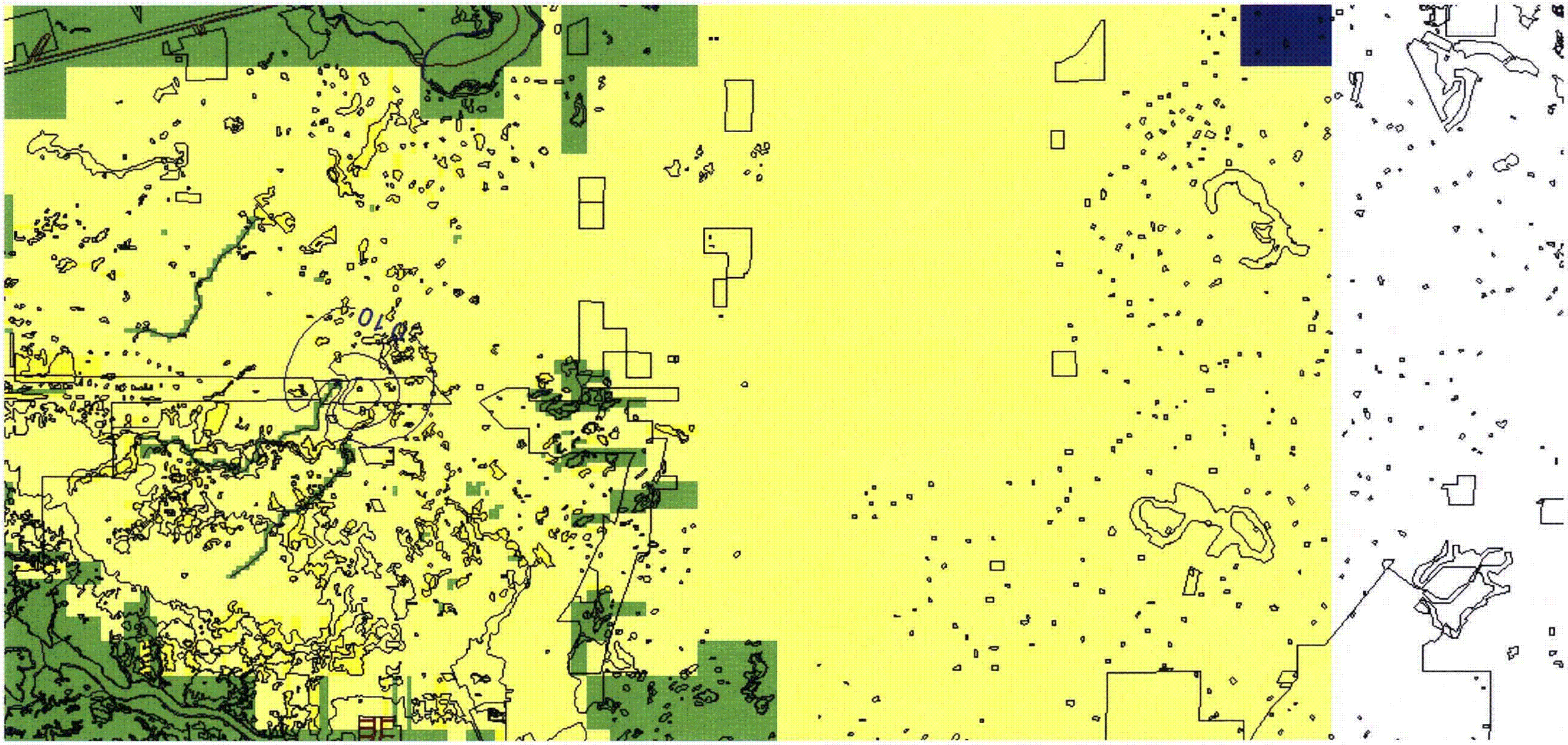
A thorough review of the lithologic and water quality data available from previous and recent drilling operations, combined with an analytical modeling estimate of the predicted drawdowns expected to result from the proposed additional withdrawals, indicates that the proposed withdrawal increase will not induce unacceptable drawdown in either the surficial or Upper Floridan Aquifers.

Additionally, the proposed withdrawal increase is not anticipated to cause either vertical or lateral migration of mineralized groundwater.

Although no negative impacts are anticipated as a result of the proposed withdrawal increase, in order to safeguard against unexpected negative impacts to the surficial aquifer and adjacent wetlands it is recommended that PEF incorporate additional monitoring points associated with monitoring well MZ-3 into the existing groundwater monitoring program at the Crystal River Energy Complex. Each zone of monitoring well MZ-3 should be monitored monthly for water levels (measuring points are to be surveyed for elevation), and quarterly for the same currently-approved suite of water quality parameters that are being monitored in the existing monitoring and production wells (chloride, conductivity, nitrate, phosphate, TDS, sulfate, alkalinity, calcium, magnesium, potassium, and sodium). Expanding the groundwater monitoring program to include monitoring well MZ-3 will provide an additional layer of assurance of the ability of the Upper Floridan Aquifer to provide the desired quantity of groundwater without inducing the lateral or upward migration of mineralized, poorer-quality groundwater.

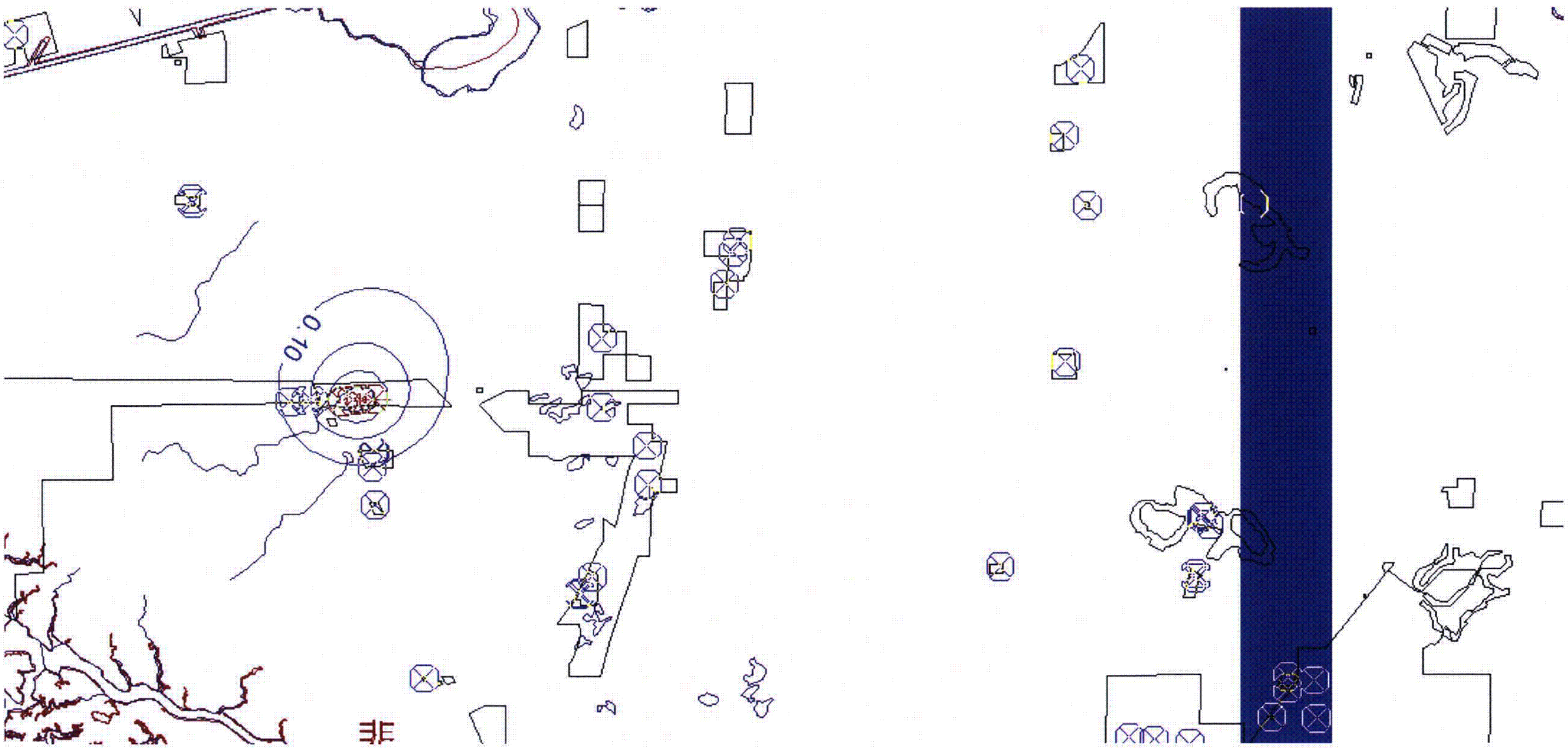
EnHydro, LLC

Figure 9
Proposed FGD withdrawal with existing wells and eight new wells – 12 wells @ ***0.56 MGD (6.72 MGD total) – 365 days***
SURFICIAL AQUIFER IMPACTS ***(AVERAGE ANNUAL DAILY PUMPAGE)***
Maximum drawdown = 0.22 ft (contour interval = 0.05 ft)



EnHydro, LLC

Figure 10
Proposed FGD withdrawal with existing wells and eight new wells – 12 wells @ ***0.56 MGD (6.72 MGD total) – 365 days***
UPPER FLORIDAN AQUIFER IMPACTS (***AVERAGE ANNUAL DAILY PUMPAGE)***
Maximum drawdown = 0.34 ft (contour interval = 0.05 ft)



EnHydro, LLC

Figure 11
Proposed FGD withdrawal with existing wells and eight new wells – 12 wells @ ***0.56 MGD (6.72 MGD total) – 7300 days (20 years)*** ***(AVERAGE ANNUAL DAILY PUMPAGE)***
SURFICIAL AQUIFER IMPACTS
Maximum drawdown = 0.24 ft (contour interval = 0.05 ft)

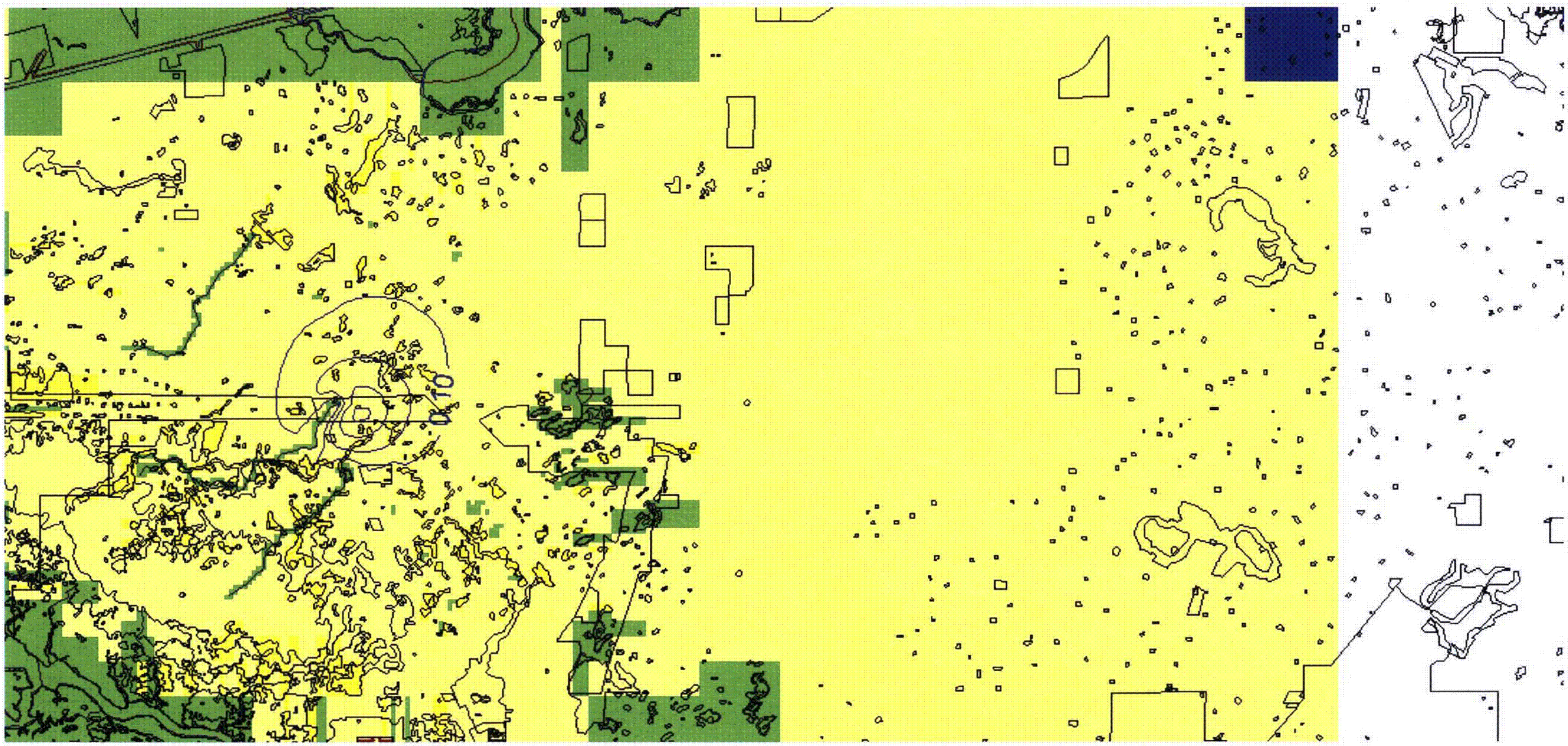


Figure 12
Proposed FGD withdrawal with existing wells and eight new wells – 12 wells @ ***0.56 MGD (6.72 MGD total) – 7300 days (20 years)*** ***(AVERAGE ANNUAL DAILY PUMPAGE)***
UPPER FLORIDAN AQUIFER IMPACTS
Maximum drawdown = 0.34 ft (contour interval = 0.05 ft)

Figure 13
Proposed FGD withdrawal with existing wells and eight new wells – 12 wells @ ***0.784 MGD (9.41 MGD total) – 30 days***
SURFICIAL AQUIFER IMPACTS ***(PEAK MONTH DAILY PUMPAGE)***
Maximum drawdown = 0.07 ft (contour interval = 0.05 ft)

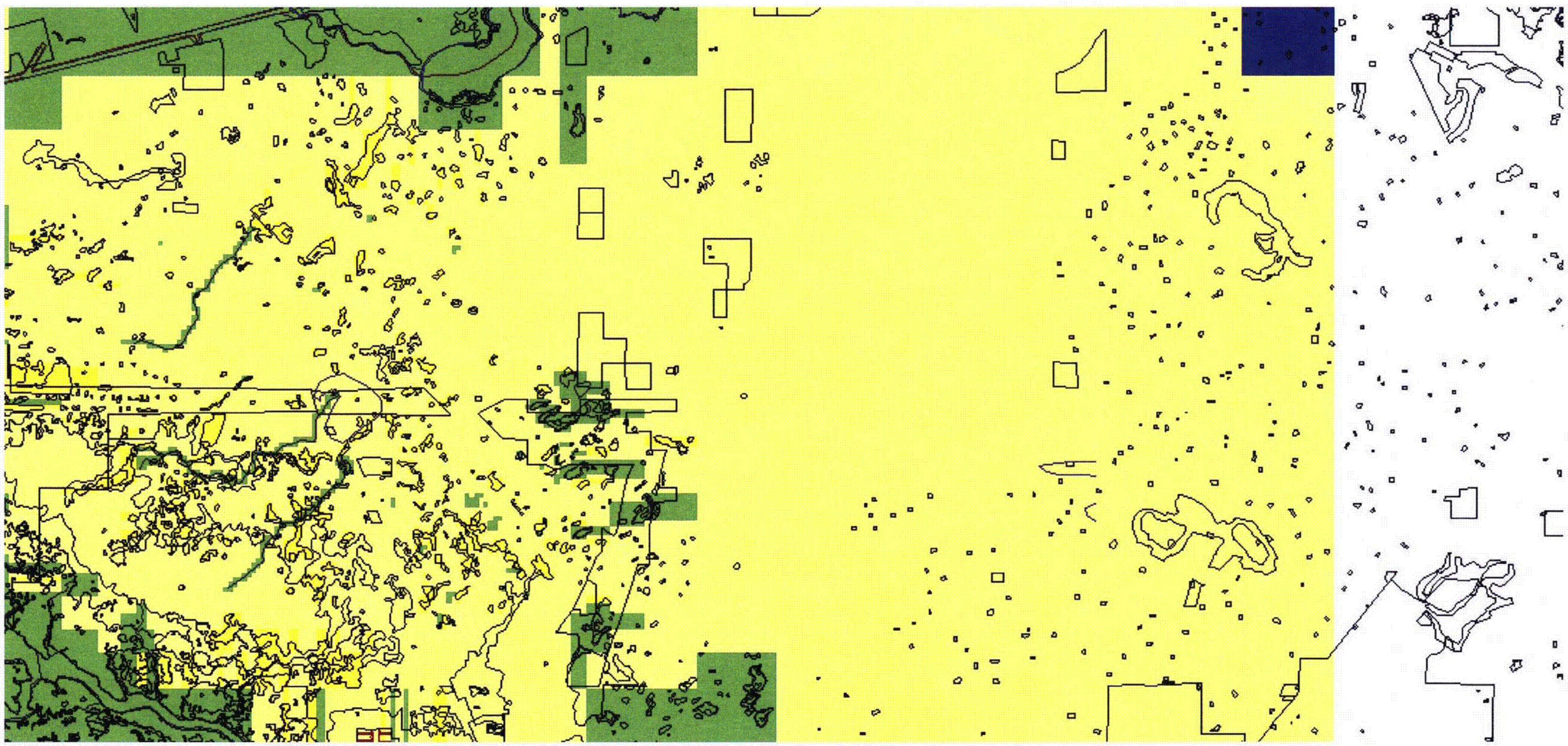


Figure 14
Proposed FGD withdrawal with existing wells and eight new wells – 12 wells @ ***0.784 MGD (9.41 MGD total) – 30 days***
UPPER FLORIDAN AQUIFER IMPACT (***PEAK MONTH DAILY PUMPAGE)***
Maximum drawdown = 0.46 ft (contour interval = 0.05 ft)

References Cited:

"Evaluation of the Pumping Test Conducted on June 1978 at the FPC Site near Route 19, Crystal River, Citrus County, Florida" – Geraghty & Miller, Inc.; July, 1978.

"Hydrogeologic Report on Florida Power Corporation's Proposed Well Field to Supply Water to Units 4 and 5 at Crystal River, Florida" – Geraghty & Miller, Inc.; October, 1979

"Coastal Ground-Water Quality Monitoring Network / Water-Use Permit Network Report (Volume V)" – Southwest Florida Water Management District; March, 2005

Enhydro letter to PEF RAI Response
November 26, 2006

EnHydro, LLC

consulting hydrogeologists and wellfield technology services

November 26, 2006

Mr. Michael Shrader, Q.E.P.
Lead Environmental Specialist
Environmental Services Section
Progress Energy Florida, Inc.
100 Central Avenue
CX1B
St. Petersburg, FL 33701

Re: Response to Request for Additional Information (RAI)
Water Use Permit Application No.: 20003672.001
Project Name: Site Certification PA 77-06
Progress Energy Florida - Crystal River Energy Complex
Crystal River, Citrus County, Florida

Dear Mike:

EnHydro, LLC (EnHydro) is pleased to present this letter report to Progress Energy Florida (PEF) in response to questions presented by the Southwest Florida Water Management District (SWFWMD) in their Request for Additional Information (RAI) dated August 16, 2006. We have developed responses for the questions that fall under our area of responsibility as discussed in our August 23, 2006 proposal; these responses are presented below in normal font, preceded by representations of the SWFWMD's questions in ***bold, italic*** font.

<u>GROUNDWATER MODELING</u>

Groundwater modeling performed for this application utilized the use of the DWRM. This model has limitations with respect to the way wetlands and lakes are simulated that may cause the model to under predict drawdown near these features. Numerous wetlands appear to be present in the vicinity of the proposed wells (Attachment C). In addition, an evaluation comparing DWRM aquifer parameters and parameters determined in previous investigations is appropriate.

3. ***Please revise the model in accordance with these issues as appropriate and provide additional documentation as to the validity of the model to simulate the all water-level declines associated with this application.***

In our meeting with the SWFWMD to clarify the requests put forth in their RAI, SWFWMD staff indicated that their concern on this issue revolves around the fact that the model uses a "Rivers Package" to simulate not only the effect of streams and rivers on the surficial aquifer, but also to represent wetlands and lakes. The effect of this is that wetlands and lakes are treated as constant recharge sources, when in reality wetlands (and to a lesser extent lakes) act as *declining* recharge sources. The concern is that this may cause the model to underestimate drawdown beneath and in the vicinity of wetlands and lakes.

334 East Lake Rd., #173 Palm Harbor, FL 34685-2427 • *ph – 813.293.0740, fax – 813.448.9322*

It was agreed that the model would be re-run with the "Rivers Package" turned off. Following the instructions provided by the author of Groundwater Vistas (James Rumbaugh), the model was changed by selecting Model/MODFLOW/Packages, putting a zero next to "river" in the 1st column, and un-checking the "automatically reset package units" option.

The Rivers Package was turned off in all model runs submitted for this response. The results of the revised modeling are presented below, in our answer to ***Question 8***. The primary result was that, with the Rivers Package off, the drawdowns in the surficial aquifer are increased beneath the creek that is located in the southwest quadrant of the drawdown footprint; in the previous runs (with the Rivers Package turned on), the drawdown contour deviates around the creek. This result is intuitive because it would be expected that, if having the Rivers Package active causes the model to underpredict drawdown near wetlands, turning off the Rivers Package should cause drawdown to increase beneath these features. Accordingly, as the results presented later in this report document, the effect on the model results of turning off the Rivers Package is an increased drawdown beneath the creek.

Additionally, aquifer parameters used in the DWRM model are presented below, along with parameters determined in previous investigations at the site prepared by Gearaghty & Miller (***1979 - Hydrogeologic Report on Florida Power Corporation's Proposed Well Field to Supply Water to Units 4 and 5 at Crystal River, Florida***) and as reported by the SWFWMD (***1994 - Aquifer Characteristics Within the Southwest Florida Water Management District***).

Table 1 – Aquifer Parameters from DWRM and from Previous Reports

Well ID	Open Interval (ft bls)	Transmissivity (gpd/ft)	Storage Coefficient (ft/ft)	Leakance (gpd/ft^3)	Source
Upper Floridan (layer 3) MINIMUM		1,794,235	0.0001	0.012	DWRM v.1
Upper Floridan (layer 3) MAXIMUM		32,916,406	0.0001	0.039	DWRM v.1
PW-1 (spec. cap. test)	35 – 200	1,880,000	nr	nr	G & M, 1979
PW-3 (spec. cap. test)	60 – 200	1,650,000	nr	nr	G & M, 1979
PW-6 (spec. cap. test)	50 – 200	1,200,000	nr	nr	G & M, 1979
PW-7 (spec. cap. test)	50 – 200	1,650,000	nr	nr	G & M, 1979
FPC Crystal River	Averaged from spec. cap. tests	1,700,000	0.05	nr	SWFWMD, 1994

The minimum aquifer transmissivity value used in the DWRM model is comparable to that reported in previous investigations at the site.

FIELD INVESTIGATIONS

The revised work plan provided to the District for investigations into the potential for salt- water intrusion in this area included the following:

"Once the new well is completed and the MP elevations are surveyed, we will be comparing static water levels in the new monitoring wells with those in the existing wells to evaluate the potential for upward or lateral migration. Additionally, we are investigating the possibility of conducting water quality profile logging of the production wells that were installed 30 years ago, but were never brought on-line."

In particular, spatial, temporal and vertical groundwater elevations in the aquifer of interest are important indicators of the potential for mineralized water movement.

4. ***Please describe the results of the proposed investigations.***

5. ***Please provide an analysis of groundwater elevations throughout the area of concern and provide maps showing all monitoring locations and groundwater-flow maps. Provide a comparison of measured and simulated heads.***

On September 26, 2006, geophysical logging was performed to document the current water quality profile in wells PW-5, PW-6, PW-7, and TP-1. Logs run included: electric logs (8/16/32/64-in. resistivity and SP logs), natural gamma, caliper, temperature, and fluid conductivity). The fluid conductivity values as measured in 1978/1979 are compared to those determined by the recent logs are presented in **Table 2**, below. Copies of the recent logs are provided as **Appendix A**.

Table 2 – Fluid Conductivity Values (uS/cm)

Well ID	1978/1979 (lab results)	2006 (interpreted from logs)	Difference
PW-5	427	420*	-7
PW-6	460	480*	+20
PW-7	447	360	-87
TP-1	427	480	+60

* - fluid conductivity logs for PW-5 & PW-6 indicate increases in bottom 20 ft of borehole; inconclusive due to wells not being purged prior to logging

Measuring point elevations were surveyed for wells PW-5, PW-6, PW-7, and MZ-3 (S, I, and D), and water levels were measured in the wells on 10/30/06. Recent groundwater elevations collected on October 30, 2006 are presented in **Table 3**, below; historic groundwater elevations are presented in **Figure 1**. Monitoring well locations are shown on **Figure 2** and on the Specific Purpose Survey, provided as **Appendix B**. A review of the water levels indicates that there is a slight (0.2 ft) downward gradient between the MZ-3I and MZ-3D monitoring intervals (170-180 ft bls and 210-220 ft bls, respectively); no gradient exists between the MZ-3S (140-150 ft bls) and MZ-3I intervals. Water levels decrease westward (PW-6 > PW-5 > MZ-3), reflecting the expected seaward gradient. The observed water levels (~2.5 - ~4.0 ft NGVD) are approximately 1.5 – 3.0 ft lower than those predicted to have existed in 2001 by the SWFWMD's DWRM model (see **Figure 6**).

Table 3 – Water Levels (10/30/06)

Well ID	MP Elevation (ft NGVD)	Depth to Water (ft bmp)	Water Table Elevation (ft NGVD)
PW-5	9.46	5.86	3.60
PW-6	9.66	5.55	4.11
MZ-3S	10.15	7.34	2.81
MZ-3I	9.82	7.01	2.81
MZ-3D	9.82	7.21	2.61

The ERI survey concluded that the "detection and delineation of the freshwater/saltwater interface in this area was not successful", however, Page 11 of the EnHydro text states "increased mineralization were found at approximately 160 feet below land surface..."

6. Please explain the apparent difference in these conclusions.

The referenced statement on Page 11 of the EnHydro report reads "In summary, the ERI survey indicated that water-bearing zones containing groundwater with increased mineralization were found at approximately 160 ft below land surface (bls) at the western end of the ERI transect (near the guard station at the plant entrance).

The referenced statement from the ERI survey was taken from the "Conclusions" section of the Subsurface Evaluations, Inc. (SEI) ERI Survey Report. Previously on the same page, SEI's ERI report states that, in the survey area west of US 19 (the western end of the ERI transect, near the guard station), "...the profiles show a subsurface deeper zone of more conductive material, which may indicate the presence of more permeable material or groundwater with higher TDS values than encountered in the near-surface soils. The detection and delineation of the freshwater/saltwater interface in this area cannot be confirmed based on the ERI data alone."

Figure 2 of SEI's ERI survey (Resistivity contour intervals adjusted to highlight high conductivity areas for possible freshwater/saltwater interface) indicates a zone of possible increased mineralization in the groundwater below approximately 160 ft bls. As the water quality profile prepared for the new monitoring well MZ-3 indicates, there are slight increases in TDS, specific conductance, and chlorides at approximately 160 – 175 ft bls, at approximately 200 ft bls, and at approximately 230 ft bls.

The referenced statement on Page 11 of the EnHydro report is hereby revised to read: "In summary, the ERI survey completed by SEI indicated that water-bearing zones containing groundwater with increased mineralization may be present below the depth of approximately 160 ft below land surface (bls) at the western end of the ERI transect (near the guard station at the plant entrance). Alternatively, the ERI survey results may be due to the presence of more permeable material at this depth, which is the lower limit of the depth of investigation achieved during the ERI survey."

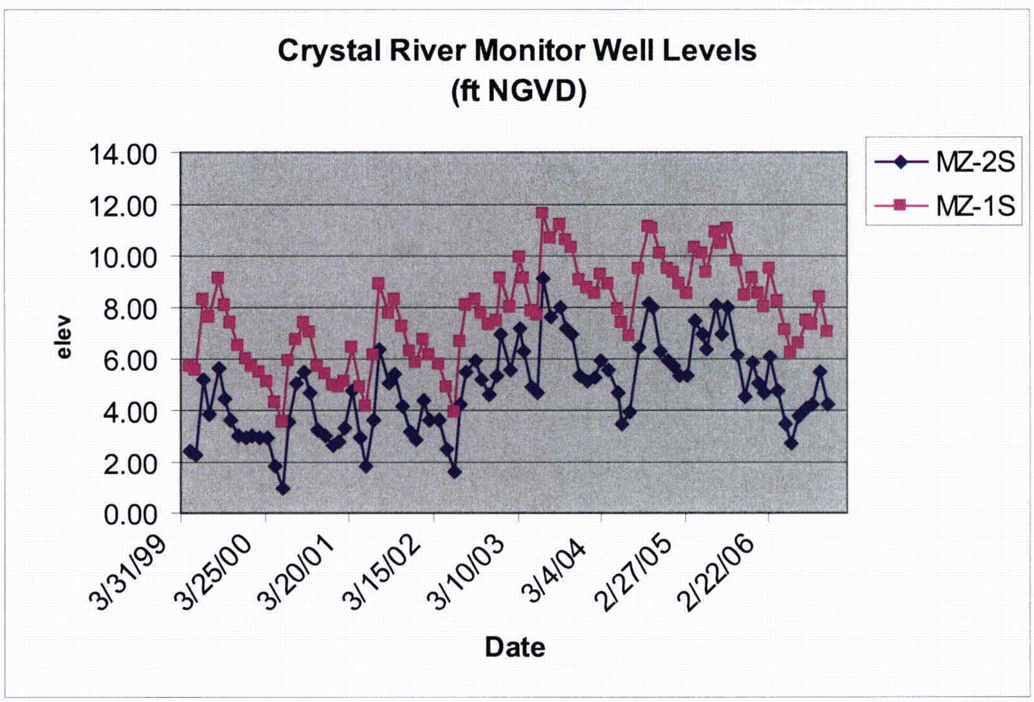
Page 8 of the EnHydro report states "a long-term gradual rise in water levels in all four monitoring wells indicating that the groundwater system beneath the site is not being overly stressed by the current rate of pumping".

7. ***Please explain how a 4-year period with a major drought in Year 2 (when water levels were lowest) supports the conclusions reached. Please provide a map or maps showing the locations of the monitoring wells with respect to the wells used for production during the period of record.***

The groundwater elevation data provided in the previously-submitted Feasibility Report has been supplemented with up-to-date information; seven years of water level data from the production zone of the Upper Floridan Aquifer (MZ-2S & MZ-1S) are presented in **Figure 1**. Although a longer period of record would better support the conclusion addressed above, the available data indicate that there has been no overall decline in water levels at the site over the period of record. A map showing the locations of the monitoring and production wells is provided as **Figure 2**.

USGS and SWFWMD records were searched to find additional suitable groundwater elevation databases from nearby monitoring wells with which to compare the onsite data. The nearest long-term monitoring well tapping similar depths as the production zone at Progress Energy (approx. 60 – 200 ft bls) is USGS Well # 285421082361602 (CRYSTAL RIVER DEEP WELL AT CRYSTAL RIVER FL) located approximately 4 miles south of the project site (**Figure 3**). The groundwater elevation data for the period of record for this well is presented as **Figure 4**; water levels at this site have remained within a two-foot range for the majority of the period of record.

Figure 1 – Historic Groundwater Elevations – Upper Floridan Production Zone



EnHydro, LLC

Figure 2 – Location of Progress Energy Production and Monitoring Wells

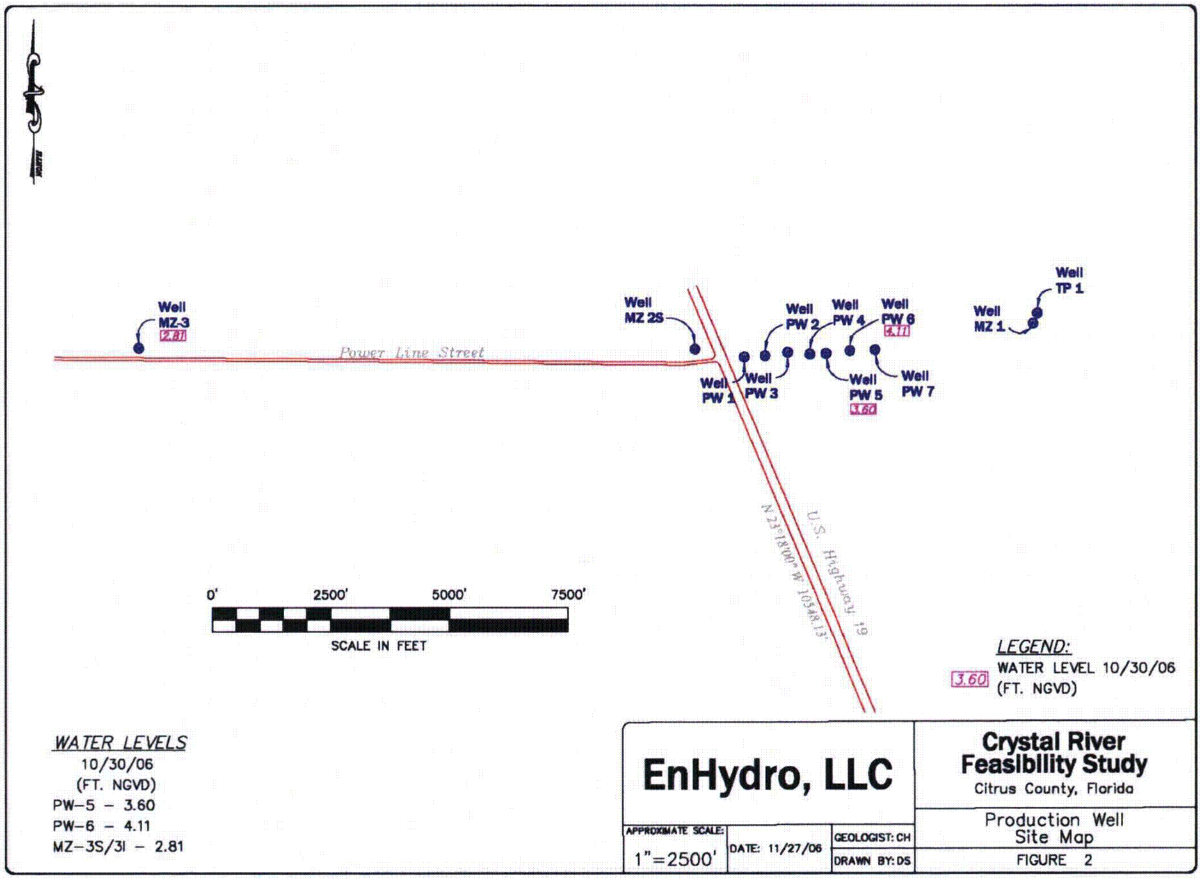


Figure 3 – Location of Progress Energy Production Wells and USGS Crystal River Deep Well

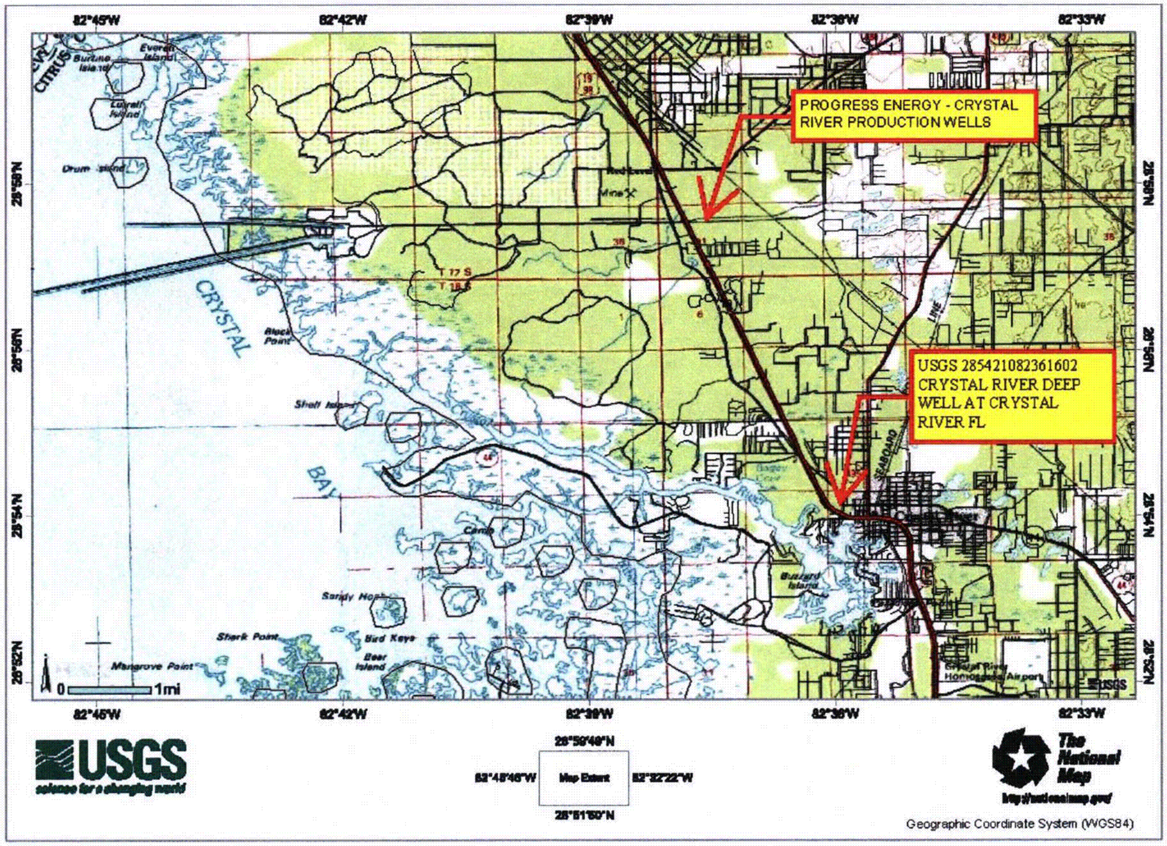
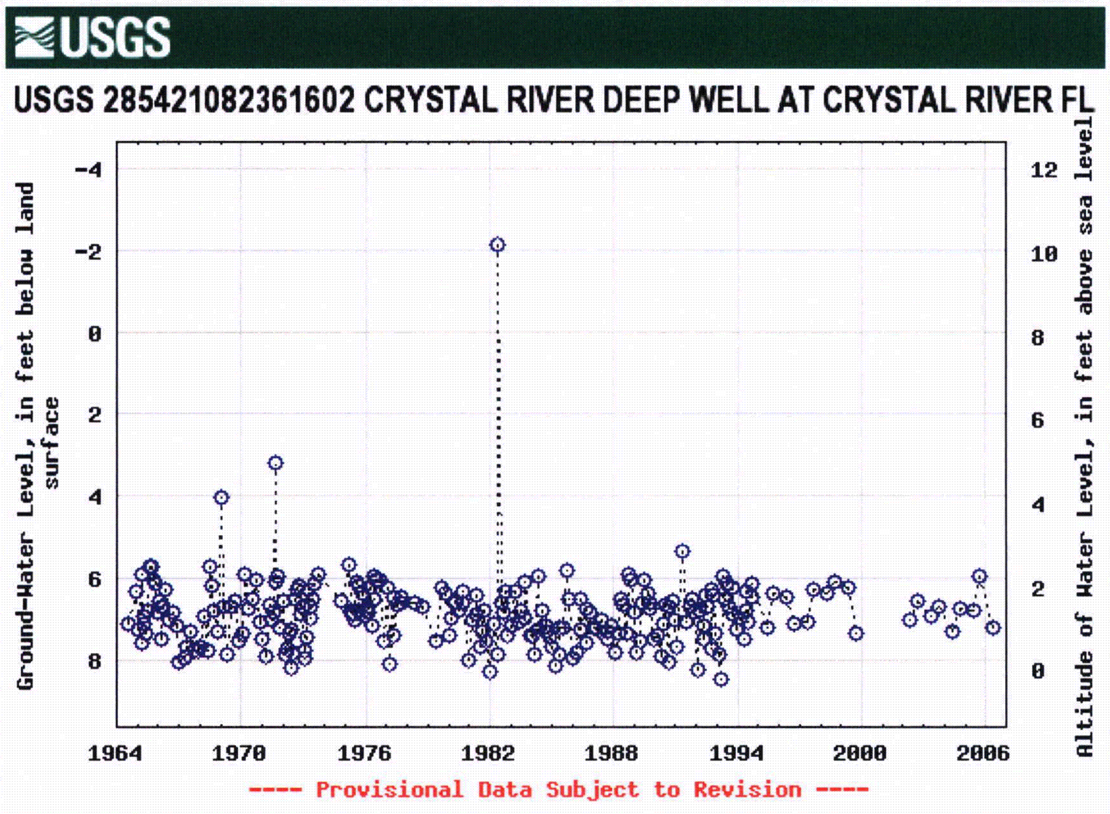


Figure 4 – Groundwater Elevations – USGS Crystal River Deep Well



ENVIRONMENTAL EVALUATION

District staff requires the information requested here in order to adequately assess potential wetland and surface-water (lakes and streams) impacts. Additional environmental issues may need to be addressed once the above questions have been addressed.

8. ***In order to assess the hydrologic impacts associated with proposed water use from all permits and sources, the applicant must perform analyses that demonstrate the extent of the water-level drawdown in the surficial and Floridan aquifers, including related lake level and spring flow impacts (where applicable) as a result of cumulative withdrawals. To evaluate cumulative hydrologic impacts from all legal and permitted withdrawals, please provide modeling results that address the above-mentioned concerns and provide maps to document models and display results at the appropriate scale(s). Please show the cumulative predicted drawdown associated with the currently permitted withdrawals for all users, and the cumulative predicted drawdown associated with all permitted withdrawals plus the additional withdrawals requested. Please submit all model input and output files (electronic MODFLOW or Groundwater Vistas files) and sign and seal all reports describing modeling results.***

We have prepared revised model outputs based on the requested revisions; all revised model runs were conducted with the Rivers Package turned off as discussed previously. The model outputs are summarized below:

Figures 5 & 6 represent the model output from running the SWFWMD-supplied *DWRM_040704.gwv* file in GWVistas. The model is set to display the assumed 2001 conditions, based upon permitted withdrawals at that time. Groundwater levels in the vicinity of the Crystal River Power Plant's wellfield are shown at approximately 5.5 ft NGVD. This estimate is approximately 1.5 – 2 ft higher than what was observed in October, 2006, but is well within the historical range of water levels beneath the site.

The *DWRM_040704.gwv* model has one significant deficiency: existing production wells PW-1, PW-2, PW-3, and PW-4 are not represented in the SWFWMD's database because these wells were included in the Conditions of Certification for the Power Plant rather than in a Water Use Permit. In order to evaluate the effect of the current pumping on the surrounding groundwater levels, a model run was executed in which the existing wells were included. Pumping rates for each of the four existing wells were set at 250,000 gpd, or 25% of the permitted rate (1.0 mgd). The model was executed first to evaluate the incremental impact of the existing pumpage.

The results of the incremental impact assessment for the pumpage from the existing production wells are presented in **Figures 7 & 8**. A maximum of 0.10 ft of additional drawdown is indicated in the surficial aquifer in the vicinity of the wellfield; incremental impacts in the Upper Floridan Aquifer are predicted to be less than 0.12 ft.

To simulate the proposed additional withdrawals sought by Progress Energy, an additional model run was executed with the pumping rates at each of the 12 wells (four existing, three installed but never plumbed, and five proposed new wells) set at 533,334 gpd, for a total of 6.4 mgd. The results of the incremental impact assessment for the proposed withdrawal increase are presented in **Figures 9 & 10**. A maximum of 0.54 ft of additional drawdown is indicated in the surficial aquifer in the vicinity of the wellfield; incremental impacts in the Upper Floridan Aquifer are predicted to be less than 0.64 ft.

At the request of the SWFWMD staff, the model was next set up to simulate cumulative withdrawals from the PEF wells and from other legal users of groundwater in the area. The results are expressed in feet of deviation from the baseline DWRM conditions. **Figures 11 & 12** depict the cumulative effect of PEF's currently-permitted withdrawals and that of the other existing users of groundwater in the area. A significant impact to the surficial aquifer is identified to the southeast of the PEF wellfield, in an area with approximately 0.93 ft of cumulative effect on the surfical aquifer. In this scenario, the existing pumpage of the wells at PEF exhibits only 0.17 ft of cumulative effect on the surficial aquifer. Similarly, as much as 0.45 ft of cumulative effect is identified in the Upper Floridan, at a location to the northeast of the PEF wellfield; the existing PEF pumpage only exhibits 0.22 ft of cumulative effect on the Upper Floridan Aquifer.

Finally, **Figures 13 & 14** depict the cumulative effect of PEF's proposed withdrawals and that of the other existing users of groundwater in the area. An impact to the surficial aquifer as described above is seen to the southeast of the PEF wellfield, with approximately 1.28 ft of cumulative effect on the surfical aquifer, while the existing pumpage of the wells at PEF exhibits only 0.63 ft of cumulative effect. In the Upper Floridan, the existing PEF pumpage exhibits 0.76 ft of cumulative effect, about one foot greater than that observed to the northeast of the PEF wellfield (approximately 0.66 ft).

Figure 5
Existing Permitted Withdrawals (SWFWMD WUPs @ 2001)
SURFICIAL AQUIFER Groundwater Levels
Water Table Elevation Range = 0.08 – 64.88 ft NGVD (contour interval = 1 ft)

wells for CR Units 1&2 <u>only</u>
source: DWRM_040704.GWV

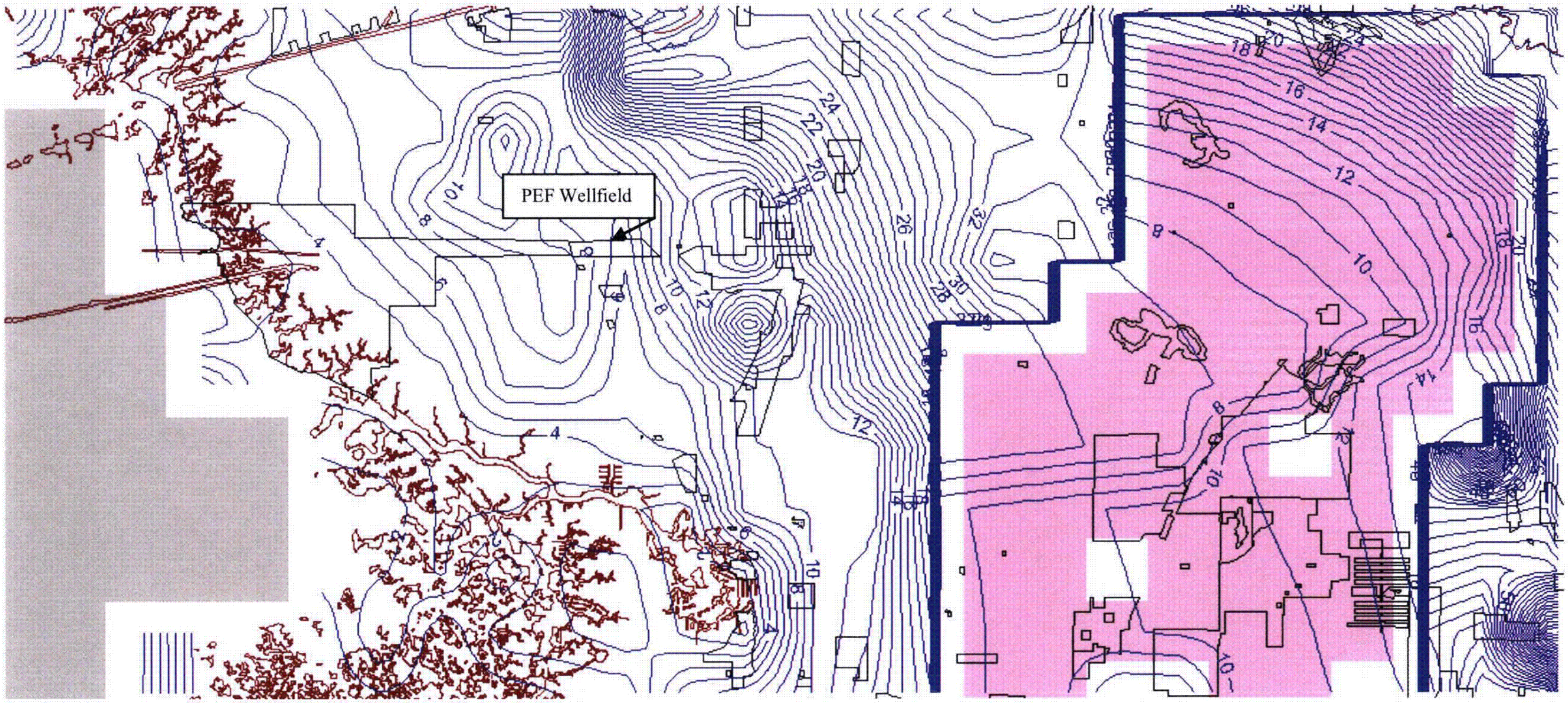


Figure 6
Existing Permitted Withdrawals (SWFWMD WUPs @ 2001)
UPPER FLORIDAN AQUIFER Groundwater Levels
Water Table Elevation Range = 1.52 – 41.98 ft NGVD (contour interval = 1 ft)

wells for CR Units 1&2 <u>only</u>
source: DWRM_040704.GWV

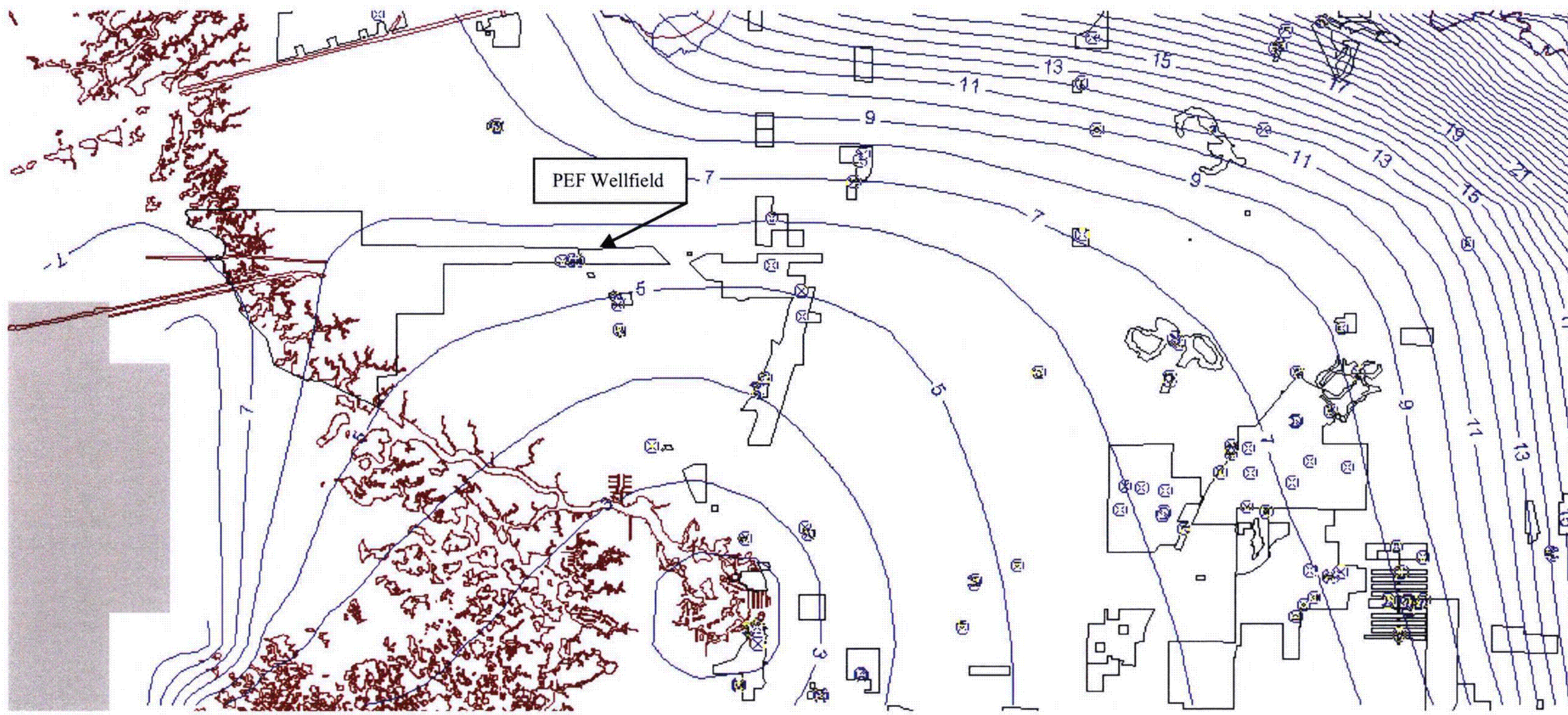


Figure 7
Existing Permitted Withdrawals (including Conditions of Certification Wells) ***wells for both CR Units 1&2 and 4&5***
SURFICIAL AQUIFER ***Incremental Impacts (w/ existing wells)***
Maximum Drawdown = 0.10 ft (contour interval = 0.02 ft)

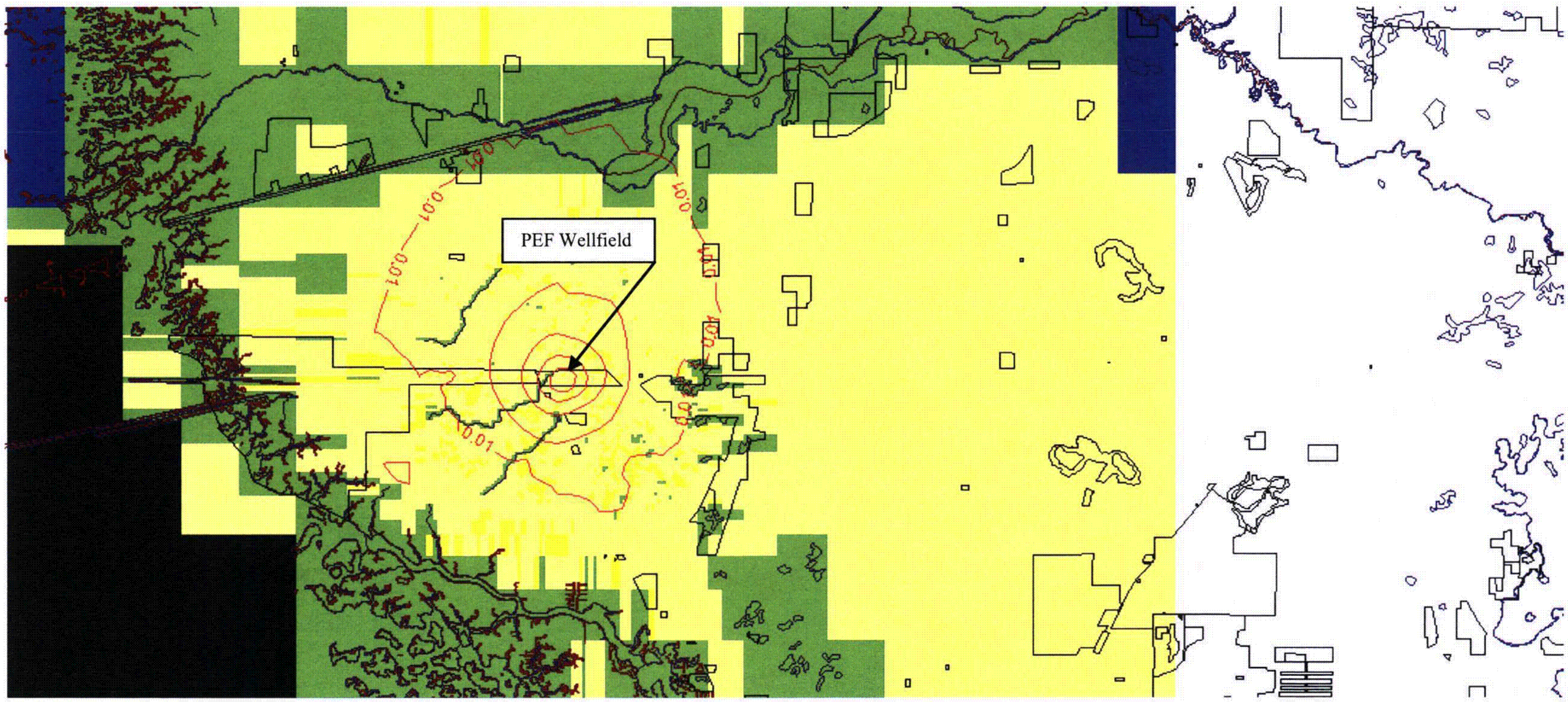
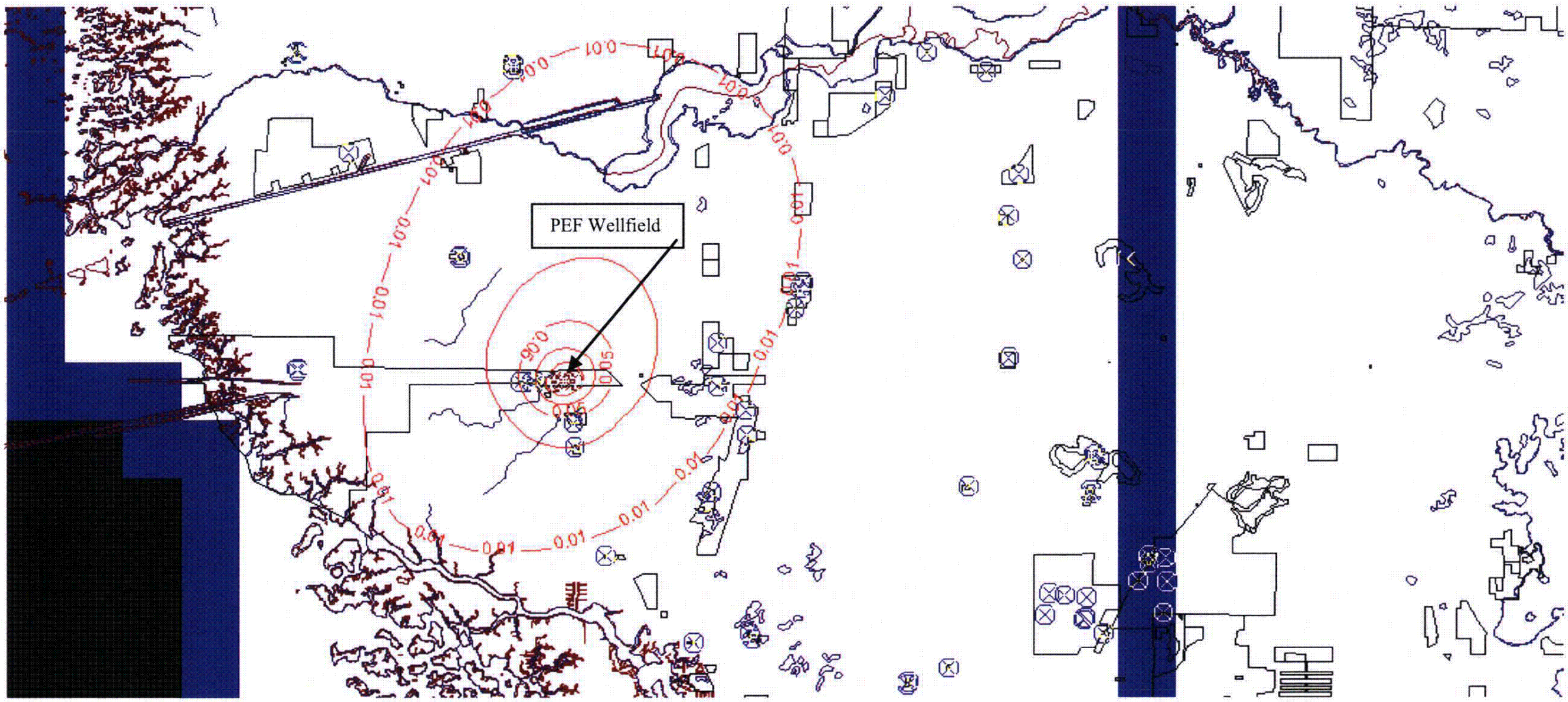


Figure 8
Existing Permitted Withdrawals (including Conditions of Certification Wells) ***wells for both CR Units 1&2 and 4&5***
UPPER FLORIDAN AQUIFER ***Incremental Impacts (w/ existing wells)***
Maximum Drawdown = 0.12 ft (contour interval = 0.02 ft)



EnHydro, LLC

Figure 9
Proposed withdrawal with existing wells and eight new wells – 12 wells @ ***0.53 MGD (6.40 MGD total) – 365 days***
SURFICIAL AQUIFER ***Incremental Impacts (w/ existing & proposed wells)***
Maximum drawdown = 0.54 ft (contour interval = 0.05 ft) *wetlands shown for environmental evaluation*

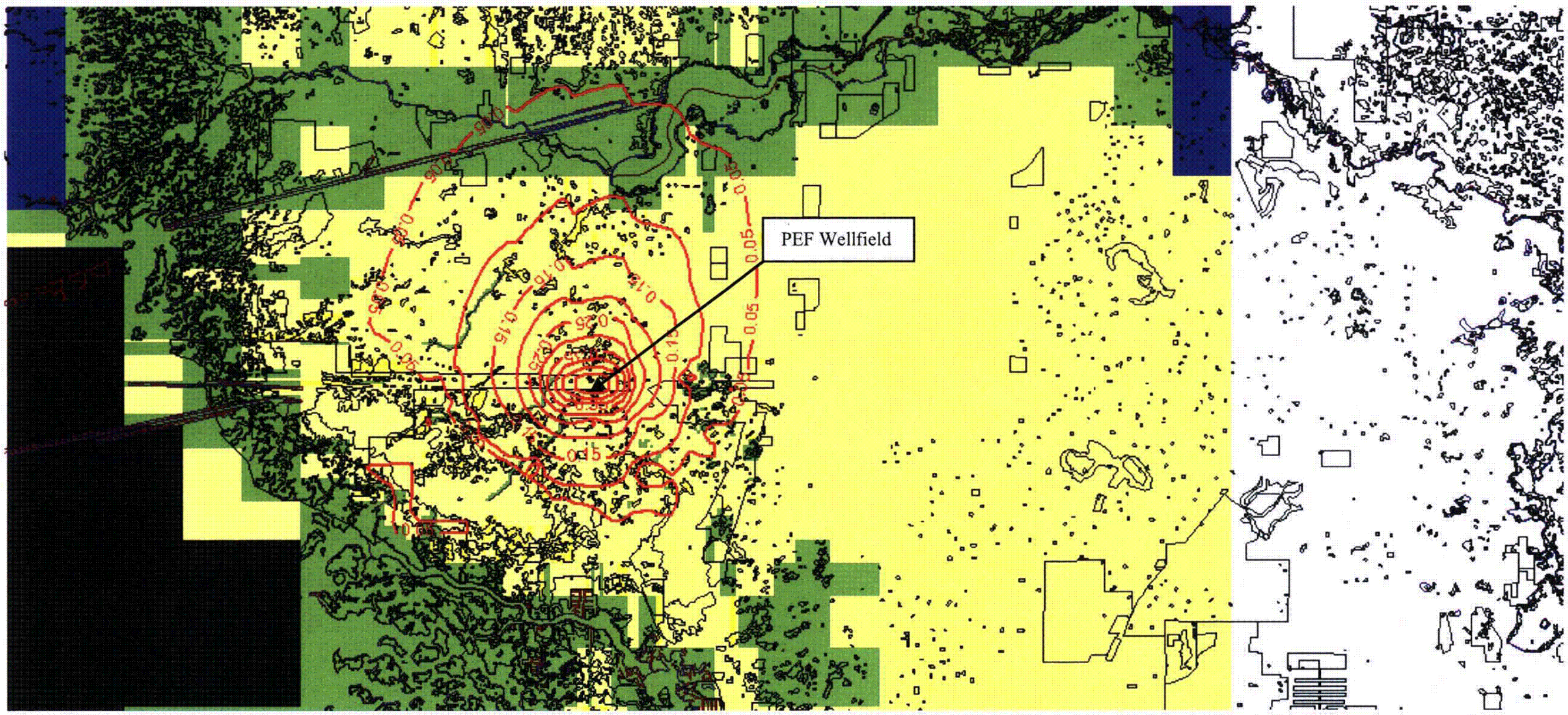


Figure 10
Proposed withdrawal with existing wells and eight new wells – 12 wells @ ***0.53 MGD (6.40 MGD total) – 365 days***
UPPER FLORIDAN AQUIFER ***Incremental Impacts (w/ existing & proposed wells)***
Maximum drawdown = 0.64 ft (contour interval = 0.05 ft)

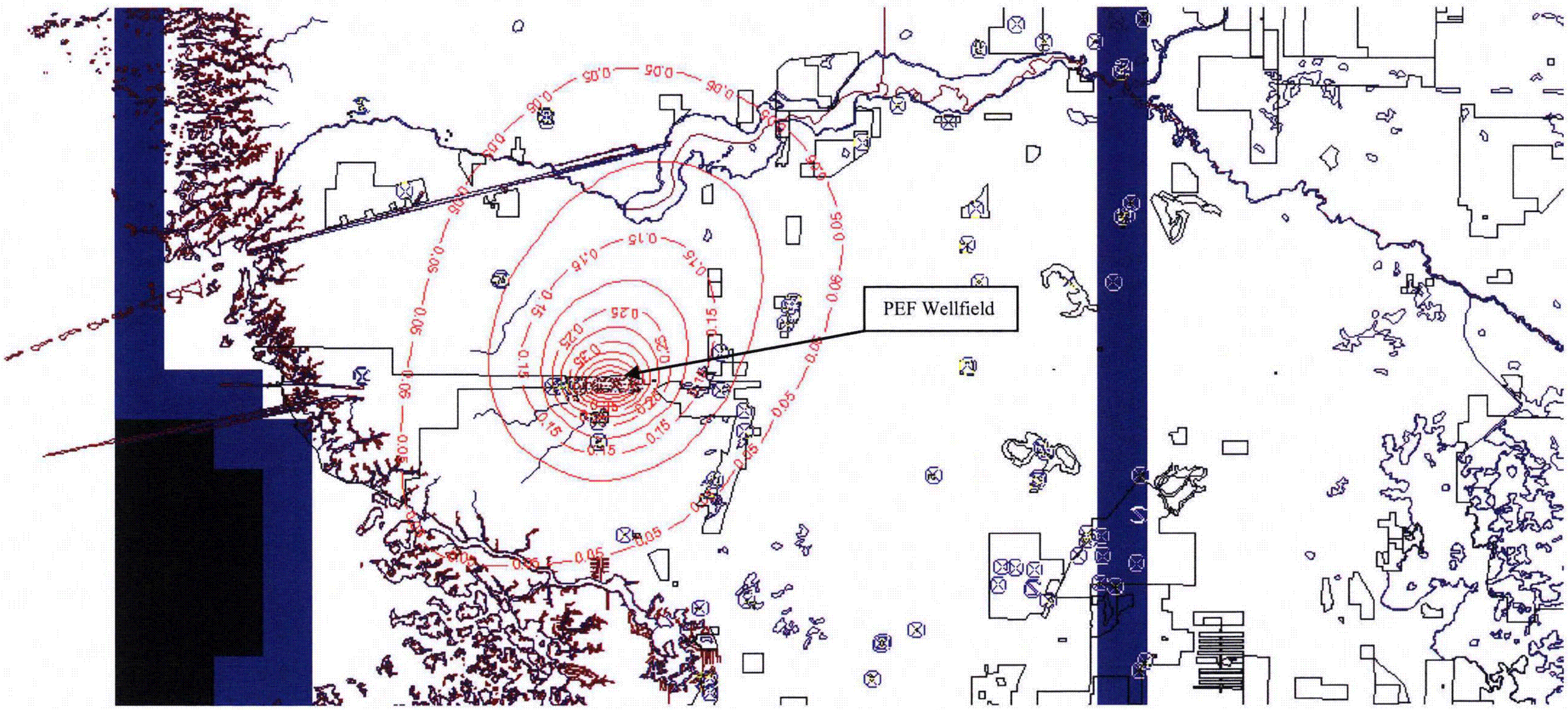


Figure 11
Existing Permitted Withdrawals (including Conditions of Certification Wells) ***wells for both CR Units 1&2 <u>and 4&5</u>***
SURFICIAL AQUIFER ***Cumulative Impacts (w/ existing & buffer wells)***
Maximum cumulative impact = 0.93 ft ***(0.17 ft @ PEF Wellfield)*** (contour interval = 0.05 ft)

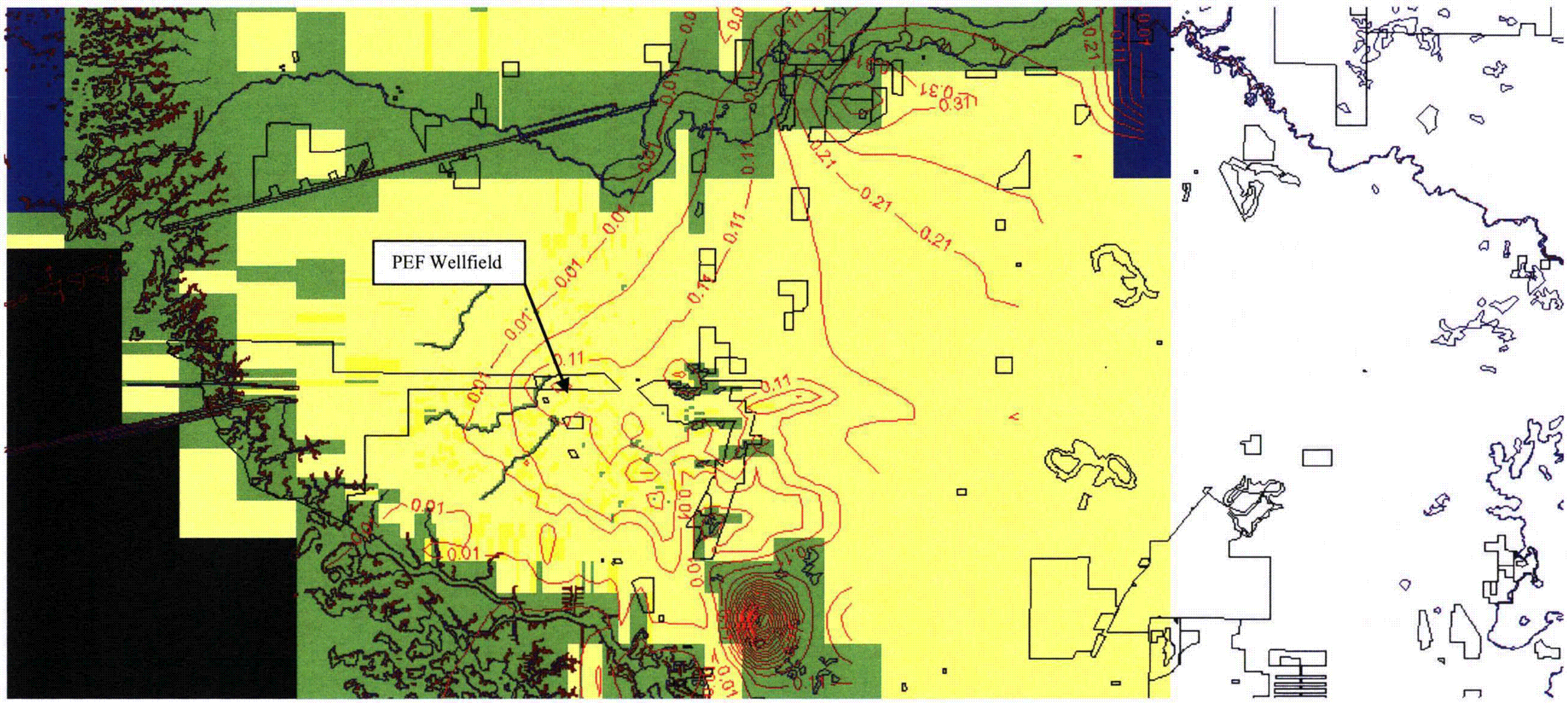


Figure 12
Existing Permitted Withdrawals (including Conditions of Certification Wells) ***wells for both CR Units 1&2 and 4&5***
UPPER FLORIDAN AQUIFER ***Cumulative Impacts (w/ existing & buffer wells)***
Maximum cumulative impact = 0.45 ft ***(0.22 ft @ PEF Wellfield)*** (contour interval = 0.05 ft)

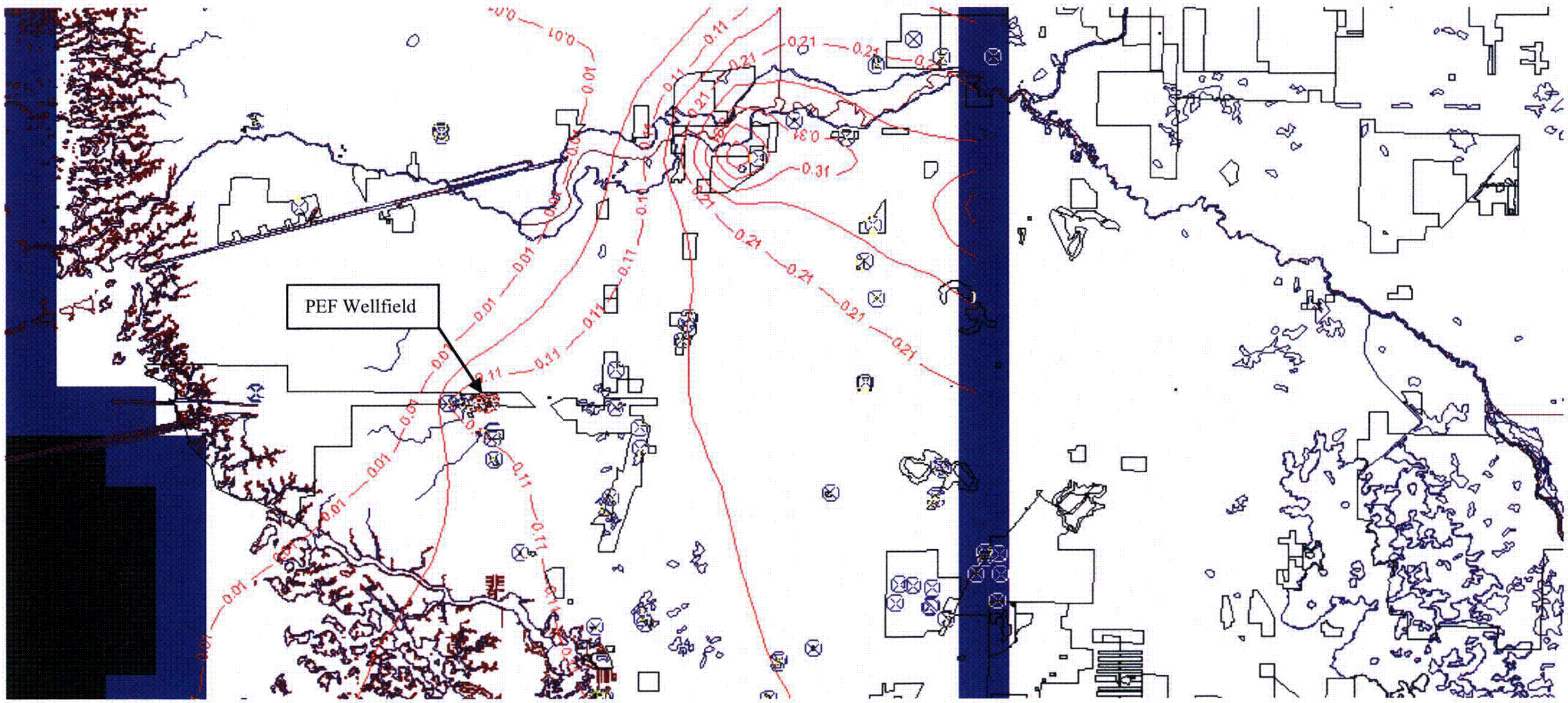


Figure 13
Proposed withdrawal with existing wells and eight new wells – 12 wells @ ***0.53 MGD (6.40 MGD total) – 365 days***
SURFICIAL AQUIFER ***Cumulative Impacts (w/ existing & buffer wells)***
Maximum drawdown = 1.28 ft ***(0.63 ft @ PEF Wellfield)*** (contour interval = 0.05 ft)

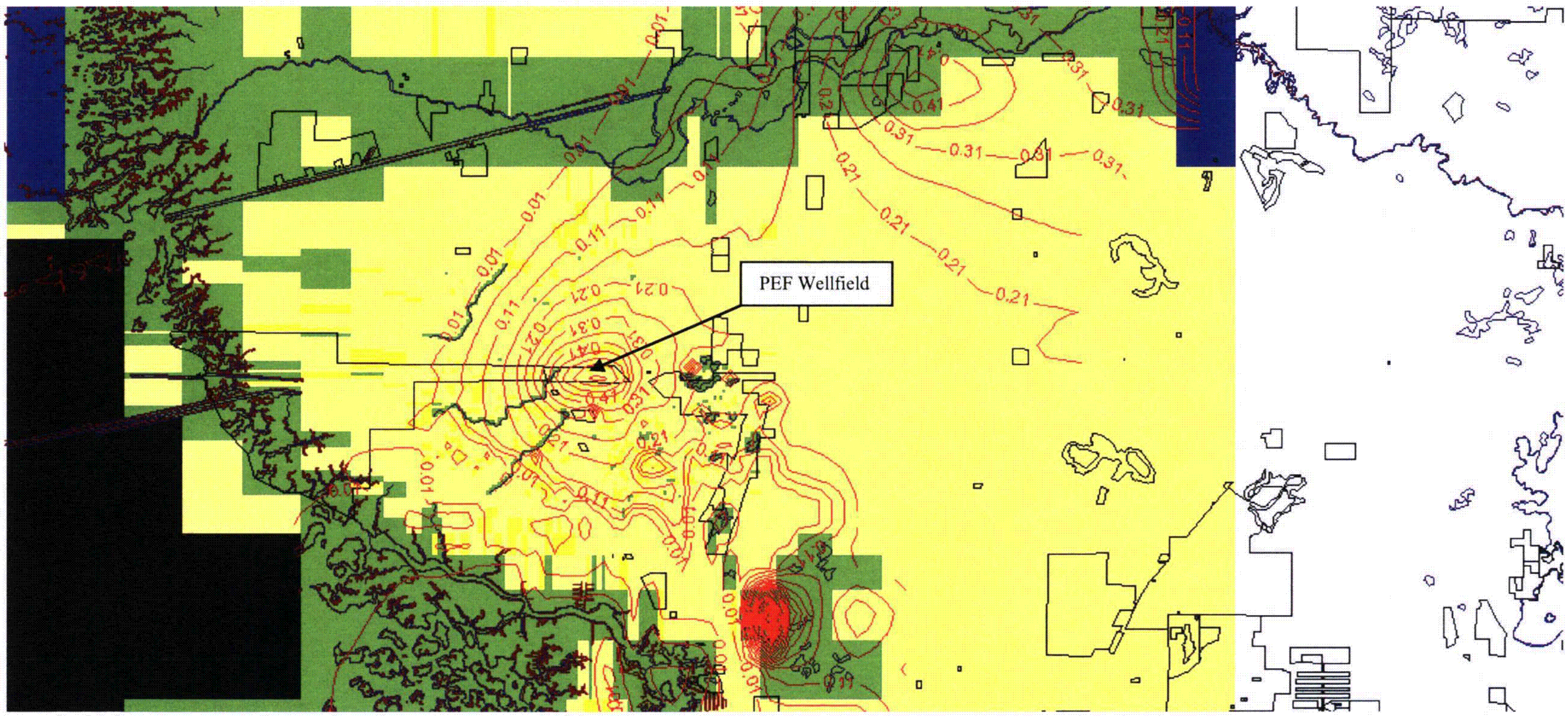
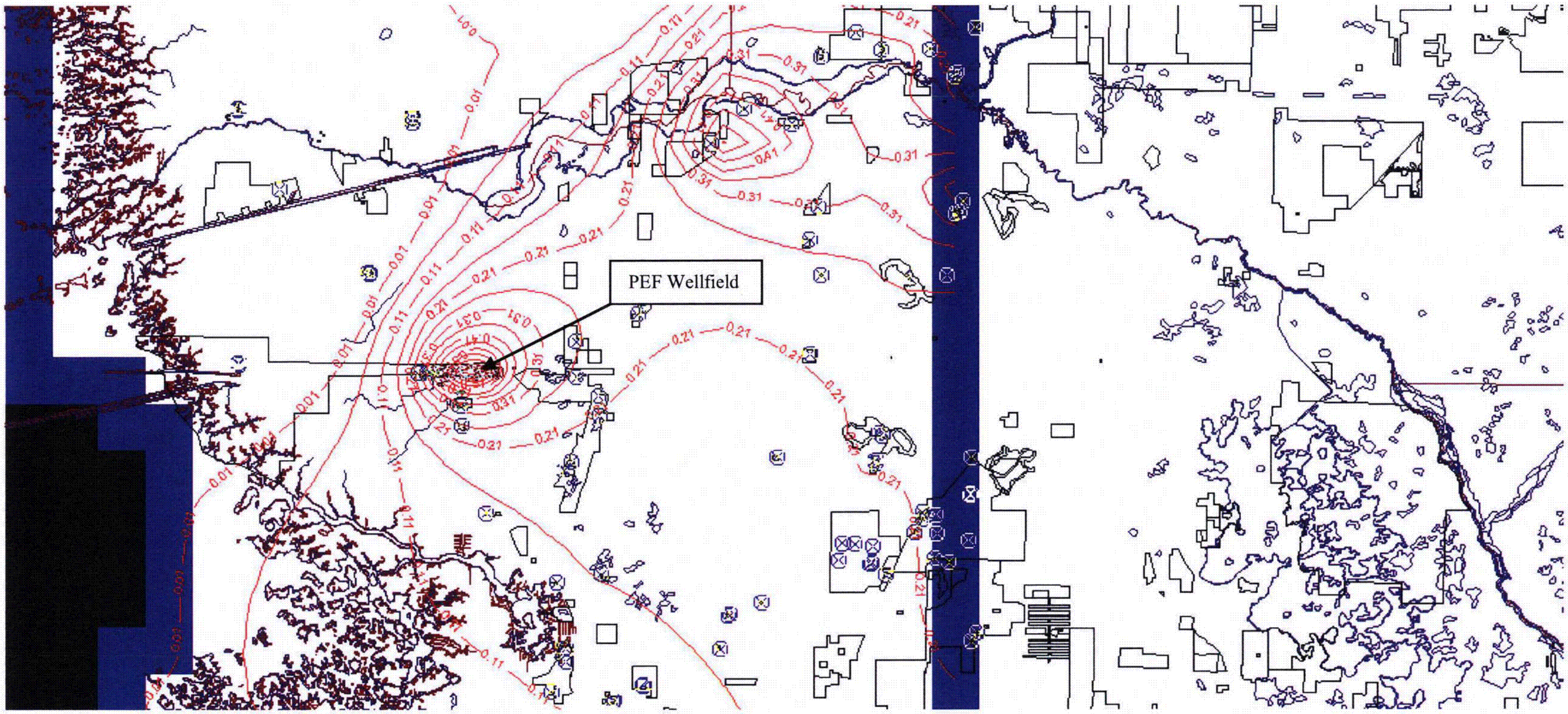


Figure 14
Proposed withdrawal with existing wells and eight new wells – 12 wells @ ***0.53 MGD (6.40 MGD total) – 365 days***
UPPER FLORIDAN AQUIFER ***Cumulative Impacts (w/ existing & buffer wells)***
Maximum drawdown = ***0.76 ft @ PEF Wellfield*** (contour interval = 0.05 ft)



REASONABLE ASSURANCE

Information must be provided to demonstrate that the application provides reasonable assurance that the water use: 1) is necessary to fulfill a certain reasonable demand; 2) will not cause quantity or quality changes which adversely impact the water resources, including both surface and ground waters; 3) will not cause adverse environmental impacts to wetlands, lakes, streams, estuaries, fish and wildlife, or other natural resources; 4) will comply with the provisions of 4.3 of the Basis of Review described in Rule 40D-2.091; F.A.C., 5) will not adversely impact off-site land uses existing at the time of the application; 6) will not adversely impact an existing legal withdrawal; 7) will incorporate water conservation measures; 8) will not cause water to go to waste; and 9) will not otherwise be harmful to the water resources within the District.

9. ***Please demonstrate that the water use meets the criteria for issuance set forth Subsections 40D-2.301(1)(a. through m.). Documentation should include information which demonstrates that surface-water bodies and wetlands will not be appreciably impacted as well as demonstrating that the potentiometric surface of the Floridan Aquifer, adjacent Floridan Aquifer wells, and mitigation/impact areas will not be appreciably impacted. Please provide documentation and appropriate maps to demonstrate that the application meets the criteria for issuance.***

The criteria for issuance set forth in 40D-2.301(1)(a. through m.) include the following:

40D-2.301 Conditions for Issuance of Permits
(1) In order to obtain a Water Use Permit, an Applicant must demonstrate that the water use is reasonable and beneficial, is in the public interest, and will not interfere with any existing legal use of water, by providing reasonable assurances, on both an individual and a cumulative basis, that the water use:
(a) Is necessary to fulfill a certain reasonable demand;
(b) Will not cause quantity or quality changes that adversely impact the water resources, including both surface and ground waters;
(c) Will not cause adverse environmental impacts to wetlands, lakes, streams, estuaries, fish and wildlife, or other natural resources;
(d) Will comply with the provisions of 4.3 of the Basis of Review described in 40D-2.091 (Minimum Flows & Levels);
(e) Will utilize the lowest water quality the Applicant has the ability to use;
(f) Will not significantly induce saline water intrusion;
(g) Will not cause pollution of the aquifer;
(h) Will not adversely impact offsite land uses existing at the time of the application;
(i) Will not adversely impact an existing legal withdrawal:
(j) Will incorporate water conservation measures;
(k) Will incorporate reuse measures to the greatest extent practicable;
(l) Will not cause water to go to waste; and
(m) Will not otherwise be harmful to the water resources within the District.

Criteria b, c, d, f, g, h, i, and m will be addressed below. However, criteria a, e, j, k, and l will be addressed by Progress Energy.

(b) Will not cause quantity or quality changes that adversely impact the water resources, including both surface and ground waters;

The proposed water use allocation increase is not anticipated to adversely impact surface water or groundwater. The maximum anticipated additional drawdown in the surficial aquifer is 0.54 ft; in the Upper Floridan Aquifer it is 0.64 ft. However, at the point at which the surficial aquifer drawdown contours intersect the surface waters of the

Withlacoochee River, the predicted drawdown is <0.01 ft. Additionally, since the Upper Floridan Aquifer drawdown is predicted to be less than 1.0 ft overall, no adverse impacts to the groundwater resources are anticipated.

(c) Will not cause adverse environmental impacts to wetlands, lakes, streams, estuaries, fish and wildlife, or other natural resources;

Three small isolated creek traces to the west and southwest of the production wells and a small portion of the large series of wetlands to the east of the production wells are included in the 0.1-ft drawdown contour in the surficial aquifer (**Figure 9**). Additionally, numerous small, isolated wetlands fall within the 0.1-ft drawdown contour. These wetlands are not anticipated to be negatively impacted by the proposed withdrawal increase due to the minor nature of the predicted drawdown and the highly productive nature of the underlying Upper Floridan Aquifer.

(d) Will comply with the provisions of 4.3 of the Basis of Review described in 40D-2.091 (Minimum Flows & Levels);

Minimum Flows & Levels (MFLs) have been or will soon be set by the SWFWMD for the Withlacoochee River and the King's Bay Spring Complex at Crystal River. As shown in **Figure 9**, the King's Bay Spring Complex is outside of the predicted 0.05-ft drawdown contour. A portion of the Withlacoochee River in the vicinity of the Lake Rousseau Dam is within the 0.05-ft contour, but outside of the 0.01-ft drawdown contour. This "fringe" of the predicted drawdown impacts is not anticipated to cause negative impacts to water levels in the Withlacoochee River.

(f) Will not significantly induce saline water intrusion;

The maximum predicted drawdown in the Upper Floridan Aquifer is 0.64 ft. Under the assumptions given in the Ghyben-Herzberg relationship, one foot of drawdown can be equated to a 40-ft rise in the freshwater-saltwater interface. The predicted drawdown would therefore raise the freshwater-saltwater interface by approximately 25.6 ft. Given that the depth to saline water beneath the site is approximately 450 – 500 ft bls, and that the production wells are only open to 200 ft bls, the proposed withdrawal increase is not expected to induce saline water intrusion.

(g) Will not cause pollution of the aquifer;

There are no known sources of pollution that could be expected to be drawn into the aquifer as a result of the proposed withdrawal increase.

(h) Will not adversely impact offsite land uses existing at the time of the application;

The relatively small drawdown impacts predicted by the model are not anticipated to adversely impact any existing offsite land uses.

(l) Will not adversely impact an existing legal withdrawal;

The nearest existing legal Upper Floridan Aquifer withdrawal location, as shown in **Figure 10**, is located south of the PEF wellfield approximately on the 0.25-ft drawdown contour line. As such, the proposed withdrawal is not anticipated to adversely impact any existing legal withdrawals.

(m) Will not otherwise be harmful to the water resources within the District.

The proposed withdrawal appears to meet the requirements for permitting by the SWFWMD. No harm is anticipated to be caused to the water resources of the District as a result of the proposed withdrawal increase.

Summary & Conclusions

The withdrawal allocation increase proposed by Progress Energy Florida for the Crystal River North Plant (Units 4 & 5) is anticipated to cause, at the most, an additional 0.54 ft of drawdown in the surficial aquifer (0.64 ft in the Upper Floridan Aquifer) over and above the drawdown that is expected as a result of the currently-permitted water uses in the area. No significant harm is expected to be caused to surface water bodies, groundwater resources, existing legal users of groundwater, or to the Minimum Flows and Levels set by the SWFWMD for various water bodies in the area. It is our opinion that the proposed withdrawal meets the conditions for permit issuance set forth in Ch. 40-D-2.301(1)(a. through m.), F.A.C.. If you have any questions regarding this report, please do not hesitate to contact us at 813.293.0740. Thank you.

Sincerely yours,

EnHydro, LLC

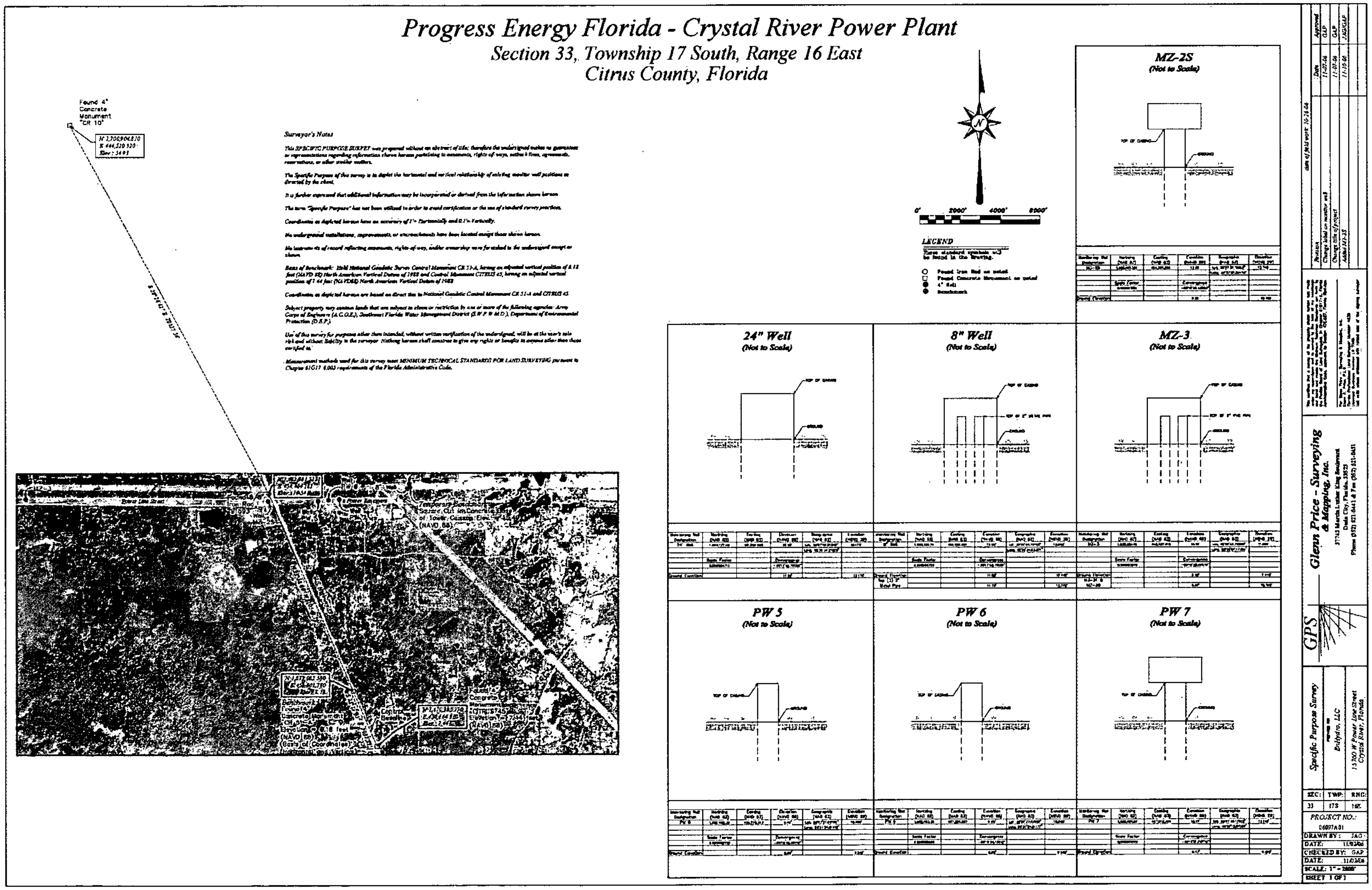
H. Cliff Harrison, P.G.
Senior Hydrogeologist

APPENDIX A

GEOPHYSICAL LOGS

APPENDIX B

SPECIFIC PURPOSE SURVEY


Progress Energy Florida - Crystal River Power Plant
Section 33, Township 17 South, Range 16 East
Citrus County, Florida
Surveyor's Notes
LEGEND
MZ-2S
(Not to Scale)
24" Well
(Not to Scale)
8" Well
(Not to Scale)
MZ-3
(Not to Scale)
PW 5
(Not to Scale)
PW 6
(Not to Scale)
PW 7
(Not to Scale)
GPS
Glenn Price - Surveying & Mapping, Inc.
Specific Purpose Survey
EnHydro, LLC

APPENDIX C

MODEL OUTPUT REPORTS

Southwest Florida
Water Management District

District-Wide Regulation Model Report

Date: Monday, November 27, 2006
Time: 11:31:25

Modeler: H. Cliff Harrison, P.G.

Permit Name: RAI CR North @ 1.0 mgd incremental
Permit Number:

Description of Model: Focus TMR Simulation for 365.0 Days

Model Characteristics

Groundwater Vistas File: Vista5.gwv
Groundwater Vistas Version: Version 4.21 Build 14
Working Directory: D:\DWRM\work

Model Type: MODFLOW2000
Root File Name: gv153
Input: gv153.bas, gv153.dis, gv153.zone, gv153.bcf, gv153.wel, gv153.drn, gv153.rch, gv153.pcg, gv153.oc, gv153.chd

Output: gv153.glo, gv153.lst, gv153.cbb, gv153.cbw, gv153.crc, gv153.hds, gv153.ddn

Rows: 105 Columns: 111 Layers: 4
Stress Periods: 3

Well Summary

Well: PW-1 at (r:54,c:52,layers 3 to 3) pumping 0.250 MGD
SAS K = 14.60 IAS T = 25 UFA T = 549606
SAS/IAS Leakance = 1.933e-003 IAS/UFA Leakance = 3.895e-002
SAS Sy = 2.00e-001 IAS S = 1.000e-003 UFA S = 1.000e-004

Well: PW-2 at (r:53,c:55,layers 3 to 3) pumping 0.250 MGD
SAS K = 14.60 IAS T = 25 UFA T = 549606
SAS/IAS Leakance = 1.933e-003 IAS/UFA Leakance = 3.895e-002
SAS Sy = 2.00e-001 IAS S = 1.000e-003 UFA S = 1.000e-004

Well: PW-3 at (r:53,c:57,layers 3 to 3) pumping 0.250 MGD
SAS K = 14.43 IAS T = 25 UFA T = 493609
SAS/IAS Leakance = 1.314e-003 IAS/UFA Leakance = 3.895e-002
SAS Sy = 2.00e-001 IAS S = 1.000e-003 UFA S = 1.000e-004

Well: PW-4 at (r:53,c:59,layers 3 to 3) pumping 0.250 MGD
SAS K = 14.43 IAS T = 25 UFA T = 493609
SAS/IAS Leakance = 1.314e-003 IAS/UFA Leakance = 3.895e-002
SAS Sy = 2.00e-001 IAS S = 1.000e-003 UFA S = 1.000e-004

List Changes Made to Model Parameters

Model Output Summary

Drawdowns below are from Stress Period Number 3

Maximum drawdown beneath wetlands in SAS:	0.10 ft.
Maximum drawdown in IAS:	0.15 ft.
Maximum drawdown in UFA:	0.15 ft.

Cumulative Mass Balance Error: 0.00 percent

Comments

This groundwater modeling analysis was completed based on geologic principals and the hydrogeologic data available at this time of the modeling analysis. All the preceding geological analyses and interpretations(s) were made during the evaluation of Water Use Permit Application No. on Monday, November 27, 2006 by H. Cliff Harrison, P.G., P.G. No. 1926, a Registered Professional Geologist pursuant to Chapter 429, Florida Statutes (F.S.) and Chapter 61G16, Florida Administrative Code (F.A.C.).

Signature Placed Here
Date:

<u>Original Focus TMR Report Text:</u>

>>>>>>>>>> Focus TMR Model Created by Groundwater Vistas <<<<<<<<<<
>>>>>>>>>> DISTRICT-WIDE REGULATION MODEL Version 1 <<<<<<<<<<
>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>><<<<<<<<<<<<<<<<<<<<<<<<<<<<<<
<<<<

Date: 11:22:33 Monday, November 27, 2006

Summary of Wells in the Focus TMR Model: D:RiverCR North @ 1.0 mgd incremental.tmr

Stress Period 1 - Pre-Development
Stress Period 2 - All Existing Wells on at Annual Average Estimated Water Use Rates
Stress Period 3 - New Permit Wells On at Permitted Rates

Buffer Area in UTM meters: Xmin = 338147.400000 Ymin = 3201599.000000
Xmax = 344776.800000 Ymax = 3207771.200000

The following existing wells are inside the buffer area:

Well Name	X	Y	Top Layer	Bottom Layer	Q (MGD)
0042940030001	341719.4	3203809.2	3	3	-0.047
0042940030002	341729.0	3203798.0	3	3	-0.034
0042940030003	341696.7	3203576.8	3	3	-0.001
0046950030003	340717.3	3204654.3	3	3	-0.269
0046950030004	340600.3	3204655.9	3	3	-0.225
0046950030005	340327.3	3204648.6	3	3	-0.127
0088740010001	341736.9	3202955.6	3	3	-0.001

TOTAL FLOW IN BUFFER ZONE WELLS = -0.705

>>>>>>>>>> Parameters Have Not Been Changed in Buffer Zone <<<<<<<<<<

>>>>>>>>>> Recharge Multiplier = 1.000000 <<<<<<<<<<

There are 4 Focus Wells in this analysis.

Well Name	X	Y	Top Layer	Bottom Layer	Q (MGD)
PW-1	341195.4	3204647.0	3	3	-0.250

Layer Properties at this location (row = 54, column = 52):

Layer	K or T	Leakance	Storage
1(SAS)	1.459971e+001	1.933256e-003	0.200000
2(IAS)	2.500000e+001	3.894772e-002	0.001000
3(UFA)	5.496064e+005	1.000000e-003	0.000100
4(LFA)	0.000000e+000	0.000000e+000	0.000100

Well Name	X	Y	Top Layer	Bottom Layer	Q (MGD)
PW-2	341368.8	3204670.0	3	3	-0.250

Layer Properties at this location (row = 53, column = 55):

Layer	K or T	Leakance	Storage
1(SAS)	1.459971e+001	1.933256e-003	0.200000
2(IAS)	2.500000e+001	3.894772e-002	0.001000
3(UFA)	5.496064e+005	1.000000e-003	0.000100
4(LFA)	0.000000e+000	0.000000e+000	0.000100

Well Name	X	Y	Top Layer	Bottom Layer	Q (MGD)
PW-3	341501.8	3204676.0	3	3	-0.250

Layer Properties at this location (row = 53, column = 57):

Layer	K or T	Leakance	Storage
1(SAS)	1.442502e+001	1.314097e-003	0.200000
2(IAS)	2.500000e+001	3.894772e-002	0.001000
3(UFA)	4.936092e+005	1.000000e-003	0.000100
4(LFA)	0.000000e+000	0.000000e+000	0.000100

Well Name	X	Y	Top Layer	Bottom Layer	Q (MGD)
PW-4	341675.2	3204682.0	3	3	-0.250

Layer Properties at this location (row = 53, column = 59):

Layer	K or T	Leakance	Storage
1(SAS)	1.442502e+001	1.314097e-003	0.200000
2(IAS)	2.500000e+001	3.894772e-002	0.001000
3(UFA)	4.936092e+005	1.000000e-003	0.000100
4(LFA)	0.000000e+000	0.000000e+000	0.000100

Total Flow Rate at the Wells Listed Above = 1.000 MGD
Total Flow at Same Wells in Stress Period 2 = 0.000 MGD

Net Difference for Transient Period = 1.000 MGD

Southwest Florida
Water Management District

District-Wide Regulation Model Report

Date: Monday, November 27, 2006
Time: 12:04:55

Modeler: H. Cliff Harrison, P.G.

Permit Name: RAI CR North @ 6.4 mgd incremental
Permit Number:

Description of Model: Focus TMR Simulation for 365.0 Days

Model Characteristics

Groundwater Vistas File: Vista7.gwv
Groundwater Vistas Version: Version 4.21 Build 14
Working Directory: D:\DWRM\work

Model Type: MODFLOW2000
Root File Name: gv155
Input: gv155.bas, gv155.dis, gv155.zone, gv155.bcf, gv155.wel, gv155.drn, gv155.rch, gv155.pcg, gv155.oc, gv155.chd

Output: gv155.glo, gv155.lst, gv155.cbb, gv155.cbw, gv155.crc, gv155.hds, gv155.ddn

Rows: 105 Columns: 126 Layers: 4
Stress Periods: 3

Well Summary

Well: PW-1 at (r:54,c:52,layers 3 to 3) pumping 0.533 MGD
SAS K = 14.60 IAS T = 25 UFA T = 549606
SAS/IAS Leakance = 1.933e-003 IAS/UFA Leakance = 3.895e-002
SAS Sy = 2.00e-001 IAS S = 1.000e-003 UFA S = 1.000e-004

Well: PW-2 at (r:53,c:55,layers 3 to 3) pumping 0.533 MGD
SAS K = 14.60 IAS T = 25 UFA T = 549606
SAS/IAS Leakance = 1.933e-003 IAS/UFA Leakance = 3.895e-002
SAS Sy = 2.00e-001 IAS S = 1.000e-003 UFA S = 1.000e-004

Well: PW-3 at (r:53,c:57,layers 3 to 3) pumping 0.533 MGD
SAS K = 14.43 IAS T = 25 UFA T = 493609
SAS/IAS Leakance = 1.314e-003 IAS/UFA Leakance = 3.895e-002
SAS Sy = 2.00e-001 IAS S = 1.000e-003 UFA S = 1.000e-004

Well: PW-4 at (r:53,c:59,layers 3 to 3) pumping 0.533 MGD
SAS K = 14.43 IAS T = 25 UFA T = 493609
SAS/IAS Leakance = 1.314e-003 IAS/UFA Leakance = 3.895e-002
SAS Sy = 2.00e-001 IAS S = 1.000e-003 UFA S = 1.000e-004

Well: PW-5-NEW at (r:53,c:61,layers 3 to 3) pumping 0.533 MGD
SAS K = 14.43 IAS T = 25 UFA T = 493609
SAS/IAS Leakance = 1.314e-003 IAS/UFA Leakance = 3.895e-002
SAS Sy = 2.00e-001 IAS S = 1.000e-003 UFA S = 1.000e-004

Well: PW-6-NEW at (r:53,c:63,layers 3 to 3) pumping 0.533 MGD
SAS K = 14.43 IAS T = 25 UFA T = 493609
SAS/IAS Leakance = 1.314e-003 IAS/UFA Leakance = 3.895e-002
SAS Sy = 2.00e-001 IAS S = 1.000e-003 UFA S = 1.000e-004

Well: PW-7-NEW at (r:53,c:65,layers 3 to 3) pumping 0.533 MGD
SAS K = 14.43 IAS T = 25 UFA T = 493609
SAS/IAS Leakance = 1.314e-003 IAS/UFA Leakance = 3.895e-002
SAS Sy = 2.00e-001 IAS S = 1.000e-003 UFA S = 1.000e-004

Well: PW-8-NEW at (r:53,c:66,layers 3 to 3) pumping 0.533 MGD
SAS K = 14.43 IAS T = 25 UFA T = 493609
SAS/IAS Leakance = 1.314e-003 IAS/UFA Leakance = 3.895e-002
SAS Sy = 2.00e-001 IAS S = 1.000e-003 UFA S = 1.000e-004

Well: PW-9-NEW at (r:53,c:68,layers 3 to 3) pumping 0.533 MGD
SAS K = 14.43 IAS T = 25 UFA T = 493609
SAS/IAS Leakance = 1.314e-003 IAS/UFA Leakance = 3.895e-002
SAS Sy = 2.00e-001 IAS S = 1.000e-003 UFA S = 1.000e-004

Well: PW-10-NEW at (r:53,c:70,layers 3 to 3) pumping 0.533 MGD
SAS K = 14.43 IAS T = 25 UFA T = 493609
SAS/IAS Leakance = 1.314e-003 IAS/UFA Leakance = 3.895e-002
SAS Sy = 2.00e-001 IAS S = 1.000e-003 UFA S = 1.000e-004

Well: PW-11-NEW at (r:53,c:72,layers 3 to 3) pumping 0.533 MGD
SAS K = 14.43 IAS T = 25 UFA T = 493609
SAS/IAS Leakance = 1.314e-003 IAS/UFA Leakance = 3.895e-002
SAS Sy = 2.00e-001 IAS S = 1.000e-003 UFA S = 1.000e-004

Well: PW-12-NEW at (r:53,c:74,layers 3 to 3) pumping 0.533 MGD
SAS K = 14.43 IAS T = 25 UFA T = 493609
SAS/IAS Leakance = 1.314e-003 IAS/UFA Leakance = 3.895e-002
SAS Sy = 2.00e-001 IAS S = 1.000e-003 UFA S = 1.000e-004

List Changes Made to Model Parameters

Model Output Summary

Drawdowns below are from Stress Period Number 3

Maximum drawdown beneath wetlands in SAS:	0.56 ft.
Maximum drawdown in IAS:	0.72 ft.
Maximum drawdown in UFA:	0.72 ft.

Cumulative Mass Balance Error: 0.00 percent

Comments

This groundwater modeling analysis was completed based on geologic principals and the hydrogeologic data available at this time of the modeling analysis. All the preceding geological analyses and interpretations(s) were made during the evaluation of Water Use Permit Application No. on Monday, November 27, 2006 by H. Cliff Harrison, P.G., P.G. No. 1926, a Registered Professional Geologist pursuant to Chapter 429, Florida Statutes (F.S.) and Chapter 61G16, Florida Administrative Code (F.A.C.).

<u>Signature Placed Here</u>
Date:

Original Focus TMR Report Text:

>>>>>>>>>> Focus TMR Model Created by Groundwater Vistas <<<<<<<<<<
>>>>>>>>>> DISTRICT-WIDE REGULATION MODEL Version 1 <<<<<<<<<<
>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>><<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<
<<<<

Date: 11:48:52 Monday, November 27, 2006

Summary of Wells in the Focus TMR Model: D:RiverCR North @ 6.4 mgd incremental.tmr

Stress Period 1 - Pre-Development
Stress Period 2 - All Existing Wells on at Annual Average Estimated Water Use Rates
Stress Period 3 - New Permit Wells On at Permitted Rates

Buffer Area in UTM meters: Xmin = 338147.400000 Ymin = 3201599.000000
Xmax = 345919.800000 Ymax = 3207771.200000

The following existing wells are inside the buffer area:

Well Name	X	Y	Top Layer	Bottom Layer	Q (MGD)
0012720010001	345478.0	3205675.7	3	3	-0.061
0042940030001	341719.4	3203809.2	3	3	-0.047
0042940030002	341729.0	3203798.0	3	3	-0.034
0042940030003	341696.7	3203576.8	3	3	-0.001
0046950030003	340717.3	3204654.3	3	3	-0.269
0046950030004	340600.3	3204655.9	3	3	-0.225
0046950030005	340327.3	3204648.6	3	3	-0.127
0067980010003	345472.5	3204534.2	3	3	-0.088
0088740010001	341736.9	3202955.6	3	3	-0.001
0121210000003	345318.5	3201776.5	3	3	-0.026

TOTAL FLOW IN BUFFER ZONE WELLS = -0.879

>>>>>>>>>> Parameters Have Not Been Changed in Buffer Zone <<<<<<<<<<

>>>>>>>>>> Recharge Multiplier = 1.000000 <<<<<<<<<<

There are 12 Focus Wells in this analysis.

Well Name	X	Y	Top Layer	Bottom Layer	Q (MGD)
PW-1	341195.4	3204647.0	3	3	-0.533

Layer Properties at this location (row = 54, column = 52):

Layer	K or T	Leakance	Storage
1(SAS)	1.459971e+001	1.933256e-003	0.200000
2(IAS)	2.500000e+001	3.894772e-002	0.001000
3(UFA)	5.496064e+005	1.000000e-003	0.000100
4(LFA)	0.000000e+000	0.000000e+000	0.000100

PW-2	341368.8	3204670.0	3	3	-0.533

Layer Properties at this location (row = 53, column = 55):

Layer	K or T	Leakance	Storage
1(SAS)	1.459971e+001	1.933256e-003	0.200000
2(IAS)	2.500000e+001	3.894772e-002	0.001000
3(UFA)	5.496064e+005	1.000000e-003	0.000100
4(LFA)	0.000000e+000	0.000000e+000	0.000100

PW-3	341501.8	3204676.0	3	3	-0.533

Layer Properties at this location (row = 53, column = 57):

Layer	K or T	Leakance	Storage
1(SAS)	1.442502e+001	1.314097e-003	0.200000
2(IAS)	2.500000e+001	3.894772e-002	0.001000
3(UFA)	4.936092e+005	1.000000e-003	0.000100
4(LFA)	0.000000e+000	0.000000e+000	0.000100

PW-4	341675.2	3204682.0	3	3	-0.533

Layer Properties at this location (row = 53, column = 59):

Layer	K or T	Leakance	Storage
1(SAS)	1.442502e+001	1.314097e-003	0.200000
2(IAS)	2.500000e+001	3.894772e-002	0.001000
3(UFA)	4.936092e+005	1.000000e-003	0.000100
4(LFA)	0.000000e+000	0.000000e+000	0.000100

PW-5-NEW	341820.2	3204686.0	3	3	-0.533

Layer Properties at this location (row = 53, column = 61):

Layer	K or T	Leakance	Storage
1(SAS)	1.442502e+001	1.314097e-003	0.200000
2(IAS)	2.500000e+001	3.894772e-002	0.001000
3(UFA)	4.936092e+005	1.000000e-003	0.000100
4(LFA)	0.000000e+000	0.000000e+000	0.000100

PW-6-NEW	341965.2	3204690.0	3	3	-0.533

Layer Properties at this location (row = 53, column = 63):

Layer	K or T	Leakance	Storage
1(SAS)	1.442502e+001	1.314097e-003	0.200000
2(IAS)	2.500000e+001	3.894772e-002	0.001000
3(UFA)	4.936092e+005	1.000000e-003	0.000100
4(LFA)	0.000000e+000	0.000000e+000	0.000100

PW-7-NEW	342110.2	3204694.0	3	3	-0.533

Layer Properties at this location (row = 53, column = 65):

Layer	K or T	Leakance	Storage
1(SAS)	1.442502e+001	1.314097e-003	0.200000
2(IAS)	2.500000e+001	3.894772e-002	0.001000
3(UFA)	4.936092e+005	1.000000e-003	0.000100
4(LFA)	0.000000e+000	0.000000e+000	0.000100

PW-8-NEW	342255.2	3204698.0	3	3	-0.533

Layer Properties at this location (row = 53, column = 66):

Layer	K or T	Leakance	Storage
1(SAS)	1.442502e+001	1.314097e-003	0.200000
2(IAS)	2.500000e+001	3.894772e-002	0.001000
3(UFA)	4.936092e+005	1.000000e-003	0.000100
4(LFA)	0.000000e+000	0.000000e+000	0.000100

PW-9-NEW	342400.2	3204702.0	3	3	-0.533

Layer Properties at this location (row = 53, column = 68):

Layer	K or T	Leakance	Storage
1(SAS)	1.442502e+001	1.314097e-003	0.200000
2(IAS)	2.500000e+001	3.894772e-002	0.001000
3(UFA)	4.936092e+005	1.000000e-003	0.000100
4(LFA)	0.000000e+000	0.000000e+000	0.000100

PW-10-NEW	342545.2	3204706.0	3	3	-0.533

Layer Properties at this location (row = 53, column = 70):

Layer	K or T	Leakance	Storage
1(SAS)	1.442502e+001	1.314097e-003	0.200000
2(IAS)	2.500000e+001	3.894772e-002	0.001000
3(UFA)	4.936092e+005	1.000000e-003	0.000100
4(LFA)	0.000000e+000	0.000000e+000	0.000100

PW-11-NEW	342690.2	3204710.0	3	3	-0.533

Layer Properties at this location (row = 53, column = 72):

Layer	K or T	Leakance	Storage
1(SAS)	1.442502e+001	1.314097e-003	0.200000
2(IAS)	2.500000e+001	3.894772e-002	0.001000
3(UFA)	4.936092e+005	1.000000e-003	0.000100
4(LFA)	0.000000e+000	0.000000e+000	0.000100

PW-12-NEW	342835.2	3204714.0	3	3	-0.533

Layer Properties at this location (row = 53, column = 74):

Layer	K or T	Leakance	Storage
1(SAS)	1.442502e+001	1.314097e-003	0.200000
2(IAS)	2.500000e+001	3.894772e-002	0.001000
3(UFA)	4.936092e+005	1.000000e-003	0.000100
4(LFA)	0.000000e+000	0.000000e+000	0.000100

Total Flow Rate at the Wells Listed Above	=	6.400 MGD
Total Flow at Same Wells in Stress Period 2	=	0.000 MGD
Net Difference for Transient Period	=	6.400 MGD

Southwest Florida
Water Management District

District-Wide Regulation Model Report

Date: Monday, November 27, 2006
Time: 12:24:35

Modeler: H. Cliff Harrison, P.G.

Permit Name: RAI CR North @ 1.0 mgd cumulative & buffer wells
Permit Number:

Description of Model: Focus TMR Simulation for 365.0 Days

Model Characteristics

Groundwater Vistas File: Vista8.gwv
Groundwater Vistas Version: Version 4.21 Build 14
Working Directory: D:\DWRM\work

Model Type: MODFLOW2000
Root File Name: gv156
Input: gv156.bas, gv156.dis, gv156.zone, gv156.bcf, gv156.wel, gv156.drn, gv156.rch, gv156.pcg, gv156.oc, gv156.chd

Output: gv156.glo, gv156.lst, gv156.cbb, gv156.cbw, gv156.crc, gv156.hds, gv156.ddn

Rows: 105 Columns: 111 Layers: 4
Stress Periods: 3

Well Summary

Well: PW-1 at (r:54,c:52,layers 3 to 3) pumping 0.250 MGD
SAS K = 14.60 IAS T = 25 UFA T = 549606
SAS/IAS Leakance = 1.933e-003 IAS/UFA Leakance = 3.895e-002
SAS Sy = 2.00e-001 IAS S = 1.000e-003 UFA S = 1.000e-004

Well: PW-2 at (r:53,c:55,layers 3 to 3) pumping 0.250 MGD
SAS K = 14.60 IAS T = 25 UFA T = 549606
SAS/IAS Leakance = 1.933e-003 IAS/UFA Leakance = 3.895e-002
SAS Sy = 2.00e-001 IAS S = 1.000e-003 UFA S = 1.000e-004

Well: PW-3 at (r:53,c:57,layers 3 to 3) pumping 0.250 MGD
SAS K = 14.43 IAS T = 25 UFA T = 493609
SAS/IAS Leakance = 1.314e-003 IAS/UFA Leakance = 3.895e-002
SAS Sy = 2.00e-001 IAS S = 1.000e-003 UFA S = 1.000e-004

Well: PW-4 at (r:53,c:59,layers 3 to 3) pumping 0.250 MGD
SAS K = 14.43 IAS T = 25 UFA T = 493609
SAS/IAS Leakance = 1.314e-003 IAS/UFA Leakance = 3.895e-002
SAS Sy = 2.00e-001 IAS S = 1.000e-003 UFA S = 1.000e-004

List Changes Made to Model Parameters

Model Output Summary

Drawdowns below are from Stress Period Number 3

Maximum drawdown beneath wetlands in SAS:	1.07 ft.
Maximum drawdown in IAS:	1.33 ft.
Maximum drawdown in UFA:	0.49 ft.

Cumulative Mass Balance Error: 0.00 percent

Comments

This groundwater modeling analysis was completed based on geologic principals and the hydrogeologic data available at this time of the modeling analysis. All the preceding geological analyses and interpretations(s) were made during the evaluation of Water Use Permit Application No. on Monday, November 27, 2006 by H. Cliff Harrison, P.G., P.G. No. 1926, a Registered Professional Geologist pursuant to Chapter 429, Florida Statutes (F.S.) and Chapter 61G16, Florida Administrative Code (F.A.C.).

<u>Signature Placed Here</u>
Date:

Original Focus TMR Report Text:

>>>>>>>>>> Focus TMR Model Created by Groundwater Vistas <<<<<<<<<<
>>>>>>>>>> DISTRICT-WIDE REGULATION MODEL Version 1 <<<<<<<<<<
>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>><<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<
<<<<

Date: 12:09:31 Monday, November 27, 2006

Summary of Wells in the Focus TMR Model: D:RiverCR North @ 1.0 mgd cumulative & buffer wells.tmr

Stress Period 1 - Pre-Development
Stress Period 2 - All Existing Wells on at Annual Average Estimated Water Use Rates
Stress Period 3 - New Permit Wells On at Permitted Rates

All Public Supply Wells in Buffer Area will be On at Permitted Rates

Buffer Area in UTM meters: Xmin = 338147.400000 Ymin = 3201599.000000
Xmax = 344776.800000 Ymax = 3207771.200000

The following existing wells are inside the buffer area:

Well Name	X	Y	Top Layer	Bottom Layer	Q (MGD)
0042940030001	341719.4	3203809.2	3	3	-0.052
0042940030002	341729.0	3203798.0	3	3	-0.037
0042940030003	341696.7	3203576.8	3	3	-0.001
0046950030003	340717.3	3204654.3	3	3	-0.269
0046950030004	340600.3	3204655.9	3	3	-0.225
0046950030005	340327.3	3204648.6	3	3	-0.127
0088740010001	341736.9	3202955.6	3	3	-0.001

TOTAL FLOW IN BUFFER ZONE WELLS = -0.712

>>>>>>>>>> Parameters Have Not Been Changed in Buffer Zone <<<<<<<<<<

>>>>>>>>>> Recharge Multiplier = 1.000000 <<<<<<<<<<

There are 4 Focus Wells in this analysis.

Well Name	X	Y	Top Layer	Bottom Layer	Q (MGD)
PW-1	341195.4	3204647.0	3	3	-0.250

Layer Properties at this location (row = 54, column = 52):

Layer	K or T	Leakance	Storage
1(SAS)	1.459971e+001	1.933256e-003	0.200000
2(IAS)	2.500000e+001	3.894772e-002	0.001000
3(UFA)	5.496064e+005	1.000000e-003	0.000100
4(LFA)	0.000000e+000	0.000000e+000	0.000100

PW-2	341368.8	3204670.0	3	3	-0.250

Layer Properties at this location (row = 53, column = 55):

Layer	K or T	Leakance	Storage
1(SAS)	1.459971e+001	1.933256e-003	0.200000
2(IAS)	2.500000e+001	3.894772e-002	0.001000
3(UFA)	5.496064e+005	1.000000e-003	0.000100
4(LFA)	0.000000e+000	0.000000e+000	0.000100

PW-3	341501.8	3204676.0	3	3	-0.250

Layer Properties at this location (row = 53, column = 57):

Layer	K or T	Leakance	Storage
1(SAS)	1.442502e+001	1.314097e-003	0.200000
2(IAS)	2.500000e+001	3.894772e-002	0.001000
3(UFA)	4.936092e+005	1.000000e-003	0.000100
4(LFA)	0.000000e+000	0.000000e+000	0.000100

PW-4	341675.2	3204682.0	3	3	-0.250

Layer Properties at this location (row = 53, column = 59):

Layer	K or T	Leakance	Storage
1(SAS)	1.442502e+001	1.314097e-003	0.200000
2(IAS)	2.500000e+001	3.894772e-002	0.001000
3(UFA)	4.936092e+005	1.000000e-003	0.000100
4(LFA)	0.000000e+000	0.000000e+000	0.000100

Total Flow Rate at the Wells Listed Above = 1.000 MGD
Total Flow at Same Wells in Stress Period 2 = 0.000 MGD

Net Difference for Transient Period = 1.000 MGD

Southwest Florida
Water Management District

District-Wide Regulation Model Report

Date: Monday, November 27, 2006
Time: 12:43:04

Modeler: H. Cliff Harrison, P.G.

Permit Name: RAI CR North @ 6.4 mgd cumulative & buffer wells
Permit Number:

Description of Model: Focus TMR Simulation for 365.0 Days

Model Characteristics

Groundwater Vistas File: Vista9.gwv
Groundwater Vistas Version: Version 4.21 Build 14
Working Directory: D:\DWRM\work

Model Type: MODFLOW2000
Root File Name: gv157
Input: gv157.bas, gv157.dis, gv157.zone, gv157.bcf, gv157.wel, gv157.drn, gv157.rch, gv157.pcg, gv157.oc, gv157.chd

Output: gv157.glo, gv157.lst, gv157.cbb, gv157.cbw, gv157.crc, gv157.hds, gv157.ddn

Rows: 105 Columns: 126 Layers: 4
Stress Periods: 3

Well Summary

Well: PW-1 at (r:54,c:52,layers 3 to 3) pumping 0.533 MGD
SAS K = 14.60 IAS T = 25 UFA T = 549606
SAS/IAS Leakance = 1.933e-003 IAS/UFA Leakance = 3.895e-002
SAS Sy = 2.00e-001 IAS S = 1.000e-003 UFA S = 1.000e-004

Well: PW-2 at (r:53,c:55,layers 3 to 3) pumping 0.533 MGD
SAS K = 14.60 IAS T = 25 UFA T = 549606
SAS/IAS Leakance = 1.933e-003 IAS/UFA Leakance = 3.895e-002
SAS Sy = 2.00e-001 IAS S = 1.000e-003 UFA S = 1.000e-004

Well: PW-3 at (r:53,c:57,layers 3 to 3) pumping 0.533 MGD
SAS K = 14.43 IAS T = 25 UFA T = 493609
SAS/IAS Leakance = 1.314e-003 IAS/UFA Leakance = 3.895e-002
SAS Sy = 2.00e-001 IAS S = 1.000e-003 UFA S = 1.000e-004

Well: PW-4 at (r:53,c:59,layers 3 to 3) pumping 0.533 MGD
SAS K = 14.43 IAS T = 25 UFA T = 493609
SAS/IAS Leakance = 1.314e-003 IAS/UFA Leakance = 3.895e-002
SAS Sy = 2.00e-001 IAS S = 1.000e-003 UFA S = 1.000e-004

Well: PW-5-NEW at (r:53,c:61,layers 3 to 3) pumping 0.533 MGD
SAS K = 14.43 IAS T = 25 UFA T = 493609
SAS/IAS Leakance = 1.314e-003 IAS/UFA Leakance = 3.895e-002
SAS Sy = 2.00e-001 IAS S = 1.000e-003 UFA S = 1.000e-004

Well: PW-6-NEW at (r:53,c:63,layers 3 to 3) pumping 0.533 MGD
SAS K = 14.43 IAS T = 25 UFA T = 493609
SAS/IAS Leakance = 1.314e-003 IAS/UFA Leakance = 3.895e-002
SAS Sy = 2.00e-001 IAS S = 1.000e-003 UFA S = 1.000e-004

Well: PW-7-NEW at (r:53,c:65,layers 3 to 3) pumping 0.533 MGD
SAS K = 14.43 IAS T = 25 UFA T = 493609
SAS/IAS Leakance = 1.314e-003 IAS/UFA Leakance = 3.895e-002
SAS Sy = 2.00e-001 IAS S = 1.000e-003 UFA S = 1.000e-004

Well: PW-8-NEW at (r:53,c:66,layers 3 to 3) pumping 0.533 MGD
SAS K = 14.43 IAS T = 25 UFA T = 493609
SAS/IAS Leakance = 1.314e-003 IAS/UFA Leakance = 3.895e-002
SAS Sy = 2.00e-001 IAS S = 1.000e-003 UFA S = 1.000e-004

Well: PW-9-NEW at (r:53,c:68,layers 3 to 3) pumping 0.533 MGD
SAS K = 14.43 IAS T = 25 UFA T = 493609
SAS/IAS Leakance = 1.314e-003 IAS/UFA Leakance = 3.895e-002
SAS Sy = 2.00e-001 IAS S = 1.000e-003 UFA S = 1.000e-004

Well: PW-10-NEW at (r:53,c:70,layers 3 to 3) pumping 0.533 MGD
SAS K = 14.43 IAS T = 25 UFA T = 493609
SAS/IAS Leakance = 1.314e-003 IAS/UFA Leakance = 3.895e-002
SAS Sy = 2.00e-001 IAS S = 1.000e-003 UFA S = 1.000e-004

Well: PW-11-NEW at (r:53,c:72,layers 3 to 3) pumping 0.533 MGD
SAS K = 14.43 IAS T = 25 UFA T = 493609
SAS/IAS Leakance = 1.314e-003 IAS/UFA Leakance = 3.895e-002
SAS Sy = 2.00e-001 IAS S = 1.000e-003 UFA S = 1.000e-004

Well: PW-12-NEW at (r:53,c:74,layers 3 to 3) pumping 0.533 MGD
SAS K = 14.43 IAS T = 25 UFA T = 493609
SAS/IAS Leakance = 1.314e-003 IAS/UFA Leakance = 3.895e-002
SAS Sy = 2.00e-001 IAS S = 1.000e-003 UFA S = 1.000e-004

List Changes Made to Model Parameters

Model Output Summary

Drawdowns below are from Stress Period Number 3

Maximum drawdown beneath wetlands in SAS:	1.36 ft.
Maximum drawdown in IAS:	2.19 ft.
Maximum drawdown in UFA:	0.79 ft.

Cumulative Mass Balance Error: 0.00 percent

Comments

This groundwater modeling analysis was completed based on geologic principals and the hydrogeologic data available at this time of the modeling analysis. All the preceding geological analyses and interpretations(s) were made during the evaluation of Water Use Permit Application No. on Monday, November 27, 2006 by H. Cliff Harrison, P.G., P.G. No. 1926, a Registered Professional Geologist pursuant to Chapter 429, Florida Statutes (F.S.) and Chapter 61G16, Florida Administrative Code (F.A.C.).

<u>*Signature Placed Here*</u>
Date:

Original Focus TMR Report Text:

>>>>>>>>>> Focus TMR Model Created by Groundwater Vistas <<<<<<<<<<
>>>>>>>>>> DISTRICT-WIDE REGULATION MODEL Version 1 <<<<<<<<<<
>>>>>>>>>>>>>>>>>>>>>>>>>>>>>><<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<
<<<<

Date: 12:29:25 Monday, November 27, 2006

Summary of Wells in the Focus TMR Model: D:RiverCR North @ 6.4 mgd cumulative & buffer wells.tmr

Stress Period 1 - Pre-Development
Stress Period 2 - All Existing Wells on at Annual Average Estimated Water Use Rates
Stress Period 3 - New Permit Wells On at Permitted Rates

All Public Supply Wells in Buffer Area will be On at Permitted Rates

Buffer Area in UTM meters: Xmin = 338147.400000 Ymin = 3201599.000000
Xmax = 345919.800000 Ymax = 3207771.200000

The following existing wells are inside the buffer area:

Well Name	X	Y	Top Layer	Bottom Layer	Q (MGD)
0012720010001	345478.0	3205675.7	3	3	-0.061
0042940030001	341719.4	3203809.2	3	3	-0.052
0042940030002	341729.0	3203798.0	3	3	-0.037
0042940030003	341696.7	3203576.8	3	3	-0.001
0046950030003	340717.3	3204654.3	3	3	-0.269
0046950030004	340600.3	3204655.9	3	3	-0.225
0046950030005	340327.3	3204648.6	3	3	-0.127
0067980010003	345472.5	3204534.2	3	3	-0.088
0088740010001	341736.9	3202955.6	3	3	-0.001
0121210000003	345318.5	3201776.5	3	3	-0.028

TOTAL FLOW IN BUFFER ZONE WELLS = -0.889

>>>>>>>>>> Parameters Have Not Been Changed in Buffer Zone <<<<<<<<<<

>>>>>>>>>> Recharge Multiplier = 1.000000 <<<<<<<<<<

There are 12 Focus Wells in this analysis.

Well Name	X	Y	Top Layer	Bottom Layer	Q (MGD)
PW-1	341195.4	3204647.0	3	3	-0.533

Layer Properties at this location (row = 54, column = 52):

Layer	K or T	Leakance	Storage
1(SAS)	1.459971e+001	1.933256e-003	0.200000
2(IAS)	2.500000e+001	3.894772e-002	0.001000
3(UFA)	5.496064e+005	1.000000e-003	0.000100
4(LFA)	0.000000e+000	0.000000e+000	0.000100

PW-2	341368.8	3204670.0	3	3	-0.533

Layer Properties at this location (row = 53, column = 55):

Layer	K or T	Leakance	Storage
1(SAS)	1.459971e+001	1.933256e-003	0.200000
2(IAS)	2.500000e+001	3.894772e-002	0.001000
3(UFA)	5.496064e+005	1.000000e-003	0.000100
4(LFA)	0.000000e+000	0.000000e+000	0.000100

PW-3	341501.8	3204676.0	3	3	-0.533

Layer Properties at this location (row = 53, column = 57):

Layer	K or T	Leakance	Storage
1(SAS)	1.442502e+001	1.314097e-003	0.200000
2(IAS)	2.500000e+001	3.894772e-002	0.001000
3(UFA)	4.936092e+005	1.000000e-003	0.000100
4(LFA)	0.000000e+000	0.000000e+000	0.000100

PW-4	341675.2	3204682.0	3	3	-0.533

Layer Properties at this location (row = 53, column = 59):

Layer	K or T	Leakance	Storage
1(SAS)	1.442502e+001	1.314097e-003	0.200000
2(IAS)	2.500000e+001	3.894772e-002	0.001000
3(UFA)	4.936092e+005	1.000000e-003	0.000100
4(LFA)	0.000000e+000	0.000000e+000	0.000100

PW-5-NEW	341820.2	3204686.0	3	3	-0.533

Layer Properties at this location (row = 53, column = 61):

Layer	K or T	Leakance	Storage
1(SAS)	1.442502e+001	1.314097e-003	0.200000
2(IAS)	2.500000e+001	3.894772e-002	0.001000
3(UFA)	4.936092e+005	1.000000e-003	0.000100
4(LFA)	0.000000e+000	0.000000e+000	0.000100

PW-6-NEW	341965.2	3204690.0	3	3	-0.533

Layer Properties at this location (row = 53, column = 63):

Layer	K or T	Leakance	Storage
1(SAS)	1.442502e+001	1.314097e-003	0.200000
2(IAS)	2.500000e+001	3.894772e-002	0.001000
3(UFA)	4.936092e+005	1.000000e-003	0.000100
4(LFA)	0.000000e+000	0.000000e+000	0.000100

PW-7-NEW	342110.2	3204694.0	3	3	-0.533

Layer Properties at this location (row = 53, column = 65):

Layer	K or T	Leakance	Storage
1(SAS)	1.442502e+001	1.314097e-003	0.200000
2(IAS)	2.500000e+001	3.894772e-002	0.001000
3(UFA)	4.936092e+005	1.000000e-003	0.000100
4(LFA)	0.000000e+000	0.000000e+000	0.000100

PW-8-NEW	342255.2	3204698.0	3	3	-0.533

Layer Properties at this location (row = 53, column = 66):

Layer	K or T	Leakance	Storage
1(SAS)	1.442502e+001	1.314097e-003	0.200000
2(IAS)	2.500000e+001	3.894772e-002	0.001000
3(UFA)	4.936092e+005	1.000000e-003	0.000100
4(LFA)	0.000000e+000	0.000000e+000	0.000100

PW-9-NEW	342400.2	3204702.0	3	3	-0.533

Layer Properties at this location (row = 53, column = 68):

Layer	K or T	Leakance	Storage
1(SAS)	1.442502e+001	1.314097e-003	0.200000
2(IAS)	2.500000e+001	3.894772e-002	0.001000
3(UFA)	4.936092e+005	1.000000e-003	0.000100
4(LFA)	0.000000e+000	0.000000e+000	0.000100

PW-10-NEW	342545.2	3204706.0	3	3	-0.533

Layer Properties at this location (row = 53, column = 70):

Layer	K or T	Leakance	Storage
1(SAS)	1.442502e+001	1.314097e-003	0.200000
2(IAS)	2.500000e+001	3.894772e-002	0.001000
3(UFA)	4.936092e+005	1.000000e-003	0.000100
4(LFA)	0.000000e+000	0.000000e+000	0.000100

PW-11-NEW	342690.2	3204710.0	3	3	-0.533

Layer Properties at this location (row = 53, column = 72):

Layer	K or T	Leakance	Storage
1(SAS)	1.442502e+001	1.314097e-003	0.200000
2(IAS)	2.500000e+001	3.894772e-002	0.001000
3(UFA)	4.936092e+005	1.000000e-003	0.000100
4(LFA)	0.000000e+000	0.000000e+000	0.000100

PW-12-NEW	342835.2	3204714.0	3	3	-0.533

Layer Properties at this location (row = 53, column = 74):

Layer	K or T	Leakance	Storage
1(SAS)	1.442502e+001	1.314097e-003	0.200000
2(IAS)	2.500000e+001	3.894772e-002	0.001000
3(UFA)	4.936092e+005	1.000000e-003	0.000100
4(LFA)	0.000000e+000	0.000000e+000	0.000100

Total Flow Rate at the Wells Listed Above	=	6.400 MGD
Total Flow at Same Wells in Stress Period 2	=	0.000 MGD
Net Difference for Transient Period	=	6.400 MGD