

APPENDIX 10.2.8.1

UIC EXPLORATORY WELL PERMIT APPLICATION



FPL

Florida Power & Light Company, P.O. Box 14000, Juno Beach, FL 33408-0420
Environmental Services Department

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WEST PALM BEACH

FLDEP-09-0003

January 20, 2009

Mr. Joe May, P.G.
Florida Department of Environmental Protection
400 N. Congress Ave, Suite 200
West Palm Beach, FL 33401

**RE: Florida Power & Light Company Turkey Point Units 6 & 7
Construction Permit Application for a Class V Exploratory Well and
Associated Dual-Zone Monitor Well**

Dear Mr. May:

Florida Power & Light Company (FPL) is hereby submitting an application (one original and one copy) for a Florida Department of Environmental Protection (FDEP) Class V exploratory well and associated dual-zone monitor well construction permit. The permit application is for the construction of a 3,500-foot deep Class V exploratory well and associated dual-zone monitor well to allow the evaluation of the subsurface at the FPL Turkey Point site in connection with proposed Turkey Point Units 6&7. A check in the amount of \$750 is attached for the processing fee of the permit application. Permit application forms with supporting information are attached.

Should you have any questions regarding the application, please contact me at (561) 691-7518 or Matt Raffenberg at (561) 691-2808.

Sincerely,

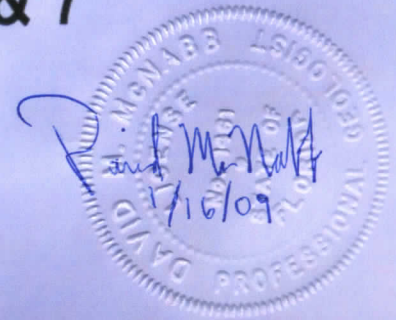

Barbara Linkiewicz

Director, Environmental Licensing

cc: Joe Haberfeld/FDEP-Tallahassee
Steve Anderson/SFWMD
David Holtz/Holtz Eng.
Cindy Mulkey/FDEP
Mike Halpin/FDEP
David McNabb/ McNabb Hydrogeological

Ron Reese/USGS
Nancy Marsh/USEPA
Augustine Socarris/DERM
Randall LaBauve/FPL

Construction Permit Application to Construct a Class V Exploratory Well and Dual-Zone Monitor Well at the Florida Power & Light Company Turkey Point Units 6 & 7



Prepared by:

MHC

McNabb
Hydrogeologic
Consulting, Inc.

Prepared for:



FPL

January 2009

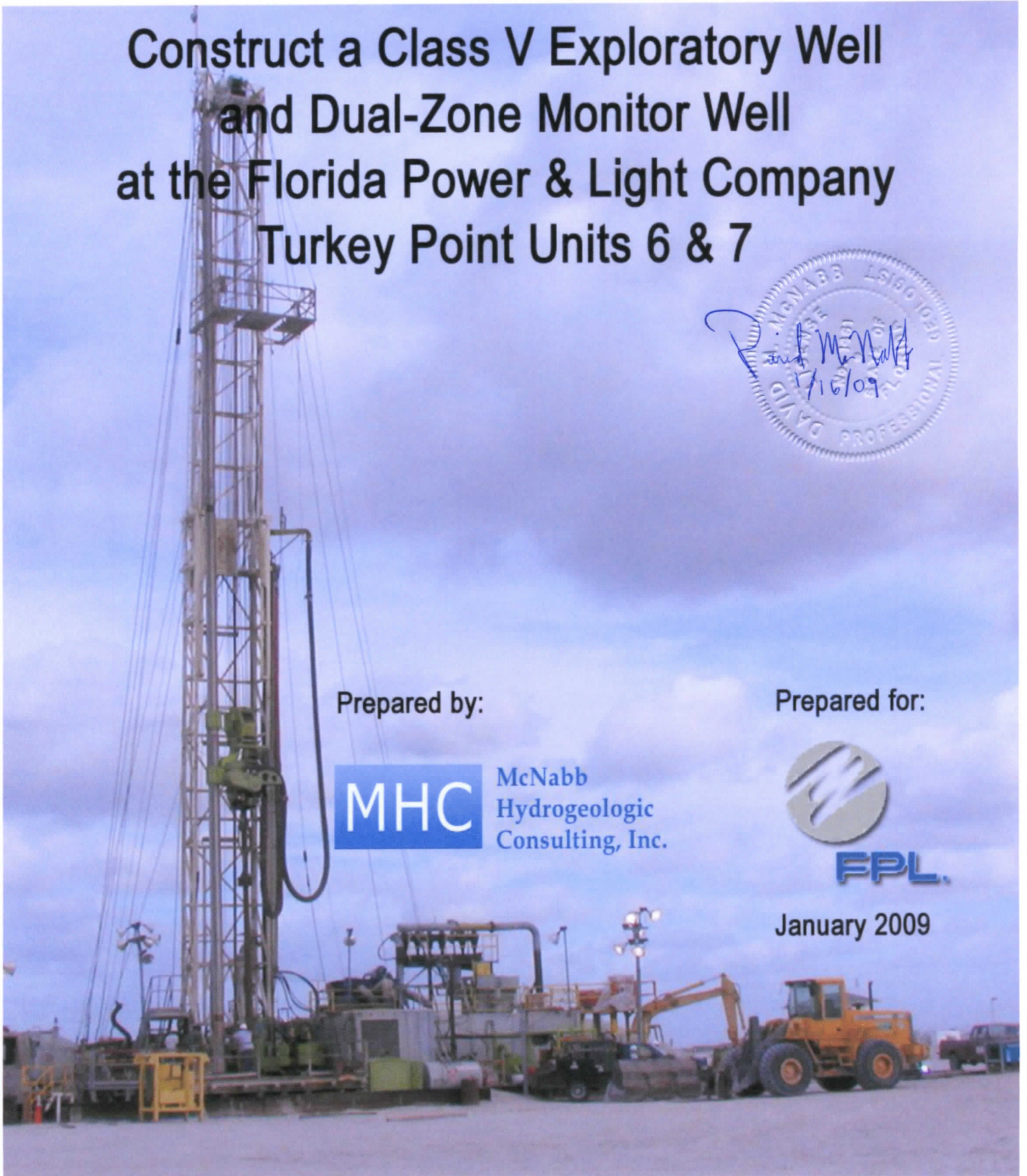


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Supporting Information for a Class V Exploratory Well Construction Permit to allow Construction of an Exploratory Well and Dual-Zone Monitor Well at Florida Power & Light Company Turkey Point Units 6 & 7

Introduction

The information provided below follows the instructions in Part I, Directions, Florida Department of Environmental Protection (FDEP) Form 62-528.900(1), Application to Construct/Operate/ Abandon Class I, III, or V Injection Well Systems, Florida Administrative Code (F.A.C.). Comments received during a pre-application meeting with FDEP were considered during the preparation of the permit application supporting information. A completed Form 62-528.900(1) is provided in Attachment A.

Part I. Directions, Page 1

- D. Please see the requested engineering drawings, specifications and design data provided in Attachment B.
- E. Please refer to the Project Location map provided in Figure 1.

Part II. Subpart B – General Project Description, Page 2

Florida Power & Light Company (FPL) is proposing to construct two new nuclear power plant units at its Turkey Point Plant Property. The Turkey Point facility is located on the shore of Biscayne Bay in Miami-Dade County, Florida, approximately 25 miles south of Miami. The nearest city limits are Florida City, 8 miles west, and Homestead, 9 miles northwest. Please see the Turkey Point Units 6 & 7 Plant Area diagram showing the location of the proposed exploratory well EW-1, associated dual-zone monitor well DZMW-1, and proposed area for an injection wellfield provided in Attachment C.

Five electric generating units (two natural gas/oil conventional units, two nuclear and one combined cycle natural gas) currently exist at the site. The two additional nuclear units will be constructed to generate a nominal 1,100 megawatts each. Reclaimed water from the Miami-Dade Water and Sewer Department and saltwater ($\geq 19,000$ mg/L chloride) are the proposed cooling water sources for the main cooling towers at the proposed nuclear units. The wastewater disposal requirements for the two units are anticipated to be a combined total of approximately 20 million gallons per day (mgd) when using only reclaimed water for a cooling water source. The combined disposal requirements are anticipated to be as high as 90 mgd when using only saltwater as a cooling water source. Disposal volumes are estimated to be between 20 mgd and 90 mgd when using a combination of reclaimed and saltwater for cooling. For purposes of providing upper bounds for the project, an approximate disposal capacity of 90 mgd is assumed for the project description.

A deep injection well system is proposed for disposal of non-hazardous industrial wastewater from the power generation process. Based on the upper bounds set for this project, the deep injection well system will consist of up to 10 primary deep injection wells, 2 backup deep injection wells, associated dual-zone monitor wells, piping and instrumentation.

FPL proposes to construct an exploratory well to investigate the geology and hydrogeology of the site and the feasibility of disposal of non-hazardous fluids via deep well injection. Construction of exploratory well EW-1 and dual-zone monitor well DZMW-1 will fully comply with the requirements of Chapter 403, Florida Statutes, and all applicable rules of the FDEP. This permit application proposes the construction of Exploratory Well EW-1 and associated dual-zone monitor well DZMW-1 pursuant to the provisions of rule 62-528.603, F.A.C. EW-1 has been designed, and will be constructed, to Class I Industrial deep injection well standards. FPL plans to begin construction of EW-1 and DZMW-1 as soon as possible after permit issuance. EW-1 will be converted to a Class I Industrial deep injection well if the site geology and hydrogeology are conducive to deep well injection and following issuance of a Class I deep injection well construction permit.

The proposed EW-1 will have a tubing and packer design consisting of a pit pipe with a minimum diameter of 64-inches, concentric casings (54-, 44-, 34-, and 24-inch diameter) and a nominal 18-inch (16.60-inch inside diameter) fiberglass reinforced pipe (FRP) tubing set inside the 24-inch diameter casing on a positive-seal packer. A cut-sheet for the FRP tubing and drawing of the positive-seal packer is provided in Attachment D. Based on review of data from other deep injection well systems in southeast Florida, the top of the injection zone is anticipated to be present at a depth of approximately 2,900 feet below land surface (bls). Approximately 800 to 1,000 feet of confining limestone and dolomite beds are anticipated to be present between the injection zone and the base of the Underground Source of Drinking Water (USDW). It is anticipated that the 24-inch diameter casing will be installed to a depth of approximately 2,900 feet bls and the well will have an anticipated total depth of 3,500 feet bls. EW-1 will be constructed with the drilling rig at an elevation of approximately 5 feet above the North American Vertical Datum of 1988 (NAVD 88) following de-mucking and partial backfill. Near the end of completion of well construction (and prior to mechanical integrity testing), the top of the 34- and 24-inch diameter casings and FRP injection liner will be raised to an elevation of approximately 28 feet NAVD 88. This will allow for proper wellhead finishing once the site elevation has been raised to an elevation of approximately 22 feet NAVD 88. The site is being elevated to address potential flood levels from storm surge.

EW-1 will be constructed in accordance with the requirements of Chapter 62-528, F.A.C. The annulus between the 24-inch casing and the FRP tubing will be filled with Baracor 100 mixed to a 1% solution to provide corrosion protection. A Material Safety Data Sheet for Baracor 100 is provided in Attachment E. The depth of the top of the injection zone is anticipated to be approximately 2,900 feet bls. The design for EW-1 is provided in Figure 2. The EW-1 wellhead design is provided in the design drawings in Attachment B.

The key hydrogeologic issues to be investigated in the EW-1 exploratory well program are (1) the degree of development of the proposed injection zone ("boulder zone") at the Turkey Point site and (2) the hydraulic characteristics of the confining strata between the injection zone and the base of the USDW. FPL is aware of the likely hydrogeology at the Turkey Point site, and the exploratory well program is being implemented to further evaluate confinement in the area.

The injection casing in well EW-1 is proposed to be seated at a depth of approximately 2,900 feet bls, a greater depth than other regional Underground Injection Control (UIC) wells to maximize the thickness of the confining strata between the injection zone and base of the USDW. The now standard practice of grouting the pilot hole will also be employed to prevent the possible development of double borehole conditions. The data collected during the drilling and testing of well EW-1 will be utilized in a confinement analysis that will be submitted to the FDEP in support of the Class I injection well construction permit application for the proposed Turkey Point injection well system.

The dual-zone monitor well will be constructed with a pit pipe with a minimum diameter of 44-inches and concentric casings (34-, 24-, 16-, and 6-5/8 -inch diameter) as part of the exploratory well system. It will be placed within 150 feet of EW-1 at a distance of approximately 75 feet to the north of EW-1. The upper zone will monitor the first suitable zone above the base of the underground source of drinking water (USDW). The base of the USDW is anticipated at a depth of approximately 1,450 feet bls based on review of data from the Miami-Dade North and South Regional WWTP deep injection well systems and USGS Water-Resources Investigations Report 94-4010, by R.S. Reese titled "Hydrogeology and the distribution and origin of salinity in the Floridan Aquifer System, Southeastern Florida". The lower monitor zone will be constructed to monitor a suitable zone within the primary confining units above the injection zone and below the base of the USDW. Based on a review of data from other wells in southeast Florida, it is estimated that suitable upper and lower zones will occur between 1,400 bls and 1,420 feet bls and 1,850 to 1,870 feet bls, respectively. The actual depth of each monitor interval will be dependent upon field testing performed during construction and will be subject to approval by the UIC Technical Advisory Committee (TAC) and FDEP. DZMW-1 will be constructed with the drilling rig at an elevation of approximately 5 feet above NAVD 88 following de-mucking and partial backfill. Near the end of completion of well construction (and prior to mechanical integrity testing), the top of the 24-, 16-, and 6-5/8-inch diameter casings will be raised to an elevation of approximately 28 feet NAVD 88. This will allow for proper wellhead finishing once the site elevation has been raised to an elevation of approximately 22 feet NAVD 88. The site is being elevated to address potential flood levels from storm surges. The proposed design of the dual-zone monitor well is provided in Figure 3. The DZMW-1 wellhead design is provided in the design drawings in Attachment B.

It is the intention of FPL to convert exploratory well EW-1 to a Class I Industrial deep injection well IW-1 if the geology and hydrogeology of the site is determined to be appropriate for deep well injection. The dual-zone monitor well proposed in this permit application would then become a part of the Class I Industrial deep injection well system. Upon conversion, the deep injection well would have a permitted injection capacity of up to 18.6 mgd at a peak hourly flow, corresponding to an injection rate of 10 feet per second (fps) in accordance with Rule 62-528.415(1)(f)2., F.A.C. However, it is anticipated that the deep injection well will be operated at an injection rate of approximately 10 mgd.

Please refer to Attachment B for technical specifications for the construction of EW-1 and associated dual-zone monitor well DZMW-1. For convenience, the supporting information provided below follows the format of Paragraph A of the Engineering and Hydrogeologic Data Required for Support of Application to Construct, Operate, and Abandon Class I, III, or V Injection Well Systems, DEP Form No. 62-528.900(1). The applicant has opted to

provide the appropriate information requirements of Paragraph A – Class I Test/Injection Well Construction and Testing Permit instead of Paragraph G – Class V Well Construction Permit, since it is the intention of the applicant to convert the exploratory well to a Class I Industrial deep injection well system. This application is for a Class V Exploratory Well Construction Permit to allow the construction of exploratory well EW-1 and associated dual-zone monitor well DZMW-1. Specific information directly related to a Class I deep injection well system that is not appropriate for this exploratory well construction permit will be addressed in the Class I deep injection well construction permit that will follow if FPL opts to convert the exploratory well to a Class I Industrial deep injection well.

Engineering and Hydrologic Data

The following information is provided in support of a Class V Exploratory Well Construction Permit to allow the construction of an exploratory well and associated dual-zone monitor well. The information follows the format of Section A (Class I Test/Injection Well Construction and Testing Permit) of the Engineering and Hydrologic Data Required for Support of Application to Construct, Operate, and Abandon Class I, Class III, or Class V Injection Well Systems for DEP Form No. 62-528.900(1) to provide the Department with a complete description of the planned project. Information requirements of Section F (Exploratory Well Construction and Testing Permit) and Section J (Monitor Well Permit) are also included.

Section A. Class I Test/Injection Well Construction and Testing Permit

- 1. A map showing the location of the proposed injection well of well field area for which a permit is sought and the applicable area of review. Within the area of review, the map must show the number or name, and location of all producing wells, injection wells, abandoned wells, dry holes, surface bodies of water, springs, public water systems, mines (surface and subsurface), quarries, water wells and other pertinent surface features including residences and roads. The map should also show faults, if known or suspected. Only information of public record and pertinent information known to the applicant is required to be included on this map.**

A map showing the proposed exploratory well EW-1 location at the FPL Turkey Point Units 6 & 7 and a 4-mile-radius preliminary area of review with the requested information is provided in Figure 4. There are two known residential structures at the same location within a 4-mile radius of the proposed exploratory well, as shown on Figure 4. These residential structures (located on Biscayne National Park property) do not have a potable water well. The preliminary area of review was prepared with the assumption that the disposal needs for Units 6 & 7 will be 90 mgd. However, this application is for one exploratory well. Volumetric calculations to justify the 4-mile radius preliminary area of review along with assumptions used in the calculations are provided below.

- The calculations assume that disposal via a deep injection well system at a rate of 90 mgd takes place for a period of 10 years. This provides a conservative approach since it is anticipated that Units 6 & 7 will typically operate with a disposal need of less than 90 mgd.

- The injection zone has a vertical extent of 200 feet.
- The assumed porosity of the injection zone in accordance with FDEP guidance is 20%.

Volume = (90 million gallons x 365 days x 10 years) = 328,500,000,000 gallons

Using the equation Volume = radius² x pi x vertical thickness x porosity x 7.48 gal/ft³ and solving for the radius gives the following:

328,500,000,000 gallons = radius² x 3.14 x 200 feet x 0.2 x 7.48 gallons/ft²

radius = 18,700 feet = 3.5 miles

Based on the above volumetric calculations, the aerial extent of injected fluid is anticipated to have a radius of 3.5 miles from the injection well system after operation of the system with the above assumptions. Therefore, a 4-mile radius preliminary area of review was performed in support of this permit application. The preliminary area of review calculation presented above was based upon the conceptual plan assuming disposal needs of up to 90 mgd, which could be revised or modified as the power plant's plans develop and information is obtained from the exploratory well.

There are no known or suspected faults or other geological features within the preliminary area of review that would be expected to affect groundwater flow within the Floridan Aquifer System. The following sources were reviewed with regard to the presence of absence of faults within the preliminary area of review:

Barnett, R.S., 1975, Basement structure of Florida and its implications: Transactions Gulf Coast Association of Geological Societies, v. 25, p. 122-142.

Duncan, J.G., Evans, W.L., III, Aylor, J.G., Jr., and Li, L., 1994, Geological framework of the Lower Floridan Aquifer System, St. Lucie, Martin and Palm Beach Counties: Report prepared by the Florida Geological Survey for the FDEP, 126 p.

Fries, M.W., 2002, Lineament analysis South Florida Region, Aquifer Storage and Recovery Regional Study: U.S. Army Corps of Engineers, Draft Technical Memorandum (July 2004), 55 p.

Klitgord, K.M., Popenoe, P., and Schouten, H., 1984, Florida: A Jurassic transform plate boundary: Journal of Geophysical Research, v. 89, n. B9, p. 7753-7772.

Miller, J.A., 1986, Hydrogeologic framework of the Floridan Aquifer System in Florida and in parts of Georgia, Alabama, and South Carolina: U.S. Geological Survey Professional Paper 1403-B, 91 p.

Smith, D.L., and Lord, K.M., 1997, Tectonic evolution and geophysics of the Florida Basement, in Randazzo, A.F., and Jones, D.S., (eds.) The Geology of Florida, University of Florida Press, p. 13-26.

Winston, G.O., 1995, The Boulder Zone Dolomites of Florida, Volume 1, Paleogene and Upper Cretaceous Zones of the Southeastern Peninsula and the Keys: Miami Geological Survey.

2. **A tabulation of data on all wells within the area of review which penetrate into the proposed injection zone, confining zone, or proposed monitoring zone. Such data shall include a description of each well's type, construction, date drilled, location, depth, record of plugging and/or completion, and any additional information the Department may require.**

A well inventory was conducted to locate permitted wells within a 4-mile radius of the proposed exploratory well. Data obtained from the South Florida Water Management District (SFWMD), the Oil and Gas and Geological Investigations section of the Florida Geological Survey, United States Geological Survey (USGS) and FDEP were reviewed in the preparation of the preliminary area of review. Additionally, the residences within the area of review were contacted to inquire about the presence or absence of potable water wells associated with the residences. No potable water wells were found to be associated with the residences. Figure 4 provides a map showing all wells identified in the preliminary area of review which penetrate the Floridan Aquifer, and are therefore, pertinent to the preliminary area of review. There are no known potable water wells within ½-mile of the proposed exploratory well or on the Turkey Point Plant property based on review of the above referenced data sources. Table 1 provides a summary of the wells within the preliminary area of review that penetrate the Floridan Aquifer, and are therefore, pertinent to the preliminary area of review. In addition to the wells that penetrate the Floridan Aquifer within the area of review, one well was identified in Section 16, Township 57S, and Range 40E, one well was identified in Section 28, Township 57S, and Range 40E, one well was identified in Section 29, Township 57S, and Range 40E, one well was identified in Section 30, Township 57S, and Range 40E, two wells were identified in Section 32, Township 57S, and Range 40E, one well was identified in Section 9, Township 58S, and Range 40E, and one well was identified in Section 10, Township 58S, and Range 40E. Each of the identified wells was completed into the Biscayne Aquifer and is not used for potable water supply.

3. **Maps and cross sections indicating the general vertical and lateral limits within the area of review of all underground sources of drinking water, their position relative to the injection formation and the direction of water movement, where known, in each underground source of drinking water which may be affected by the proposed injection.**

A cross-section location map and cross-sections showing vertical and lateral limits of the USDW, the injection formation within the preliminary area of review are provided in Figures 5, 6, and 7. The USDW flow direction is also noted on Figure 5, 6, and 7. The prevailing regional direction of water movement in the USDWs is east-south-east as indicated on the map provided in Figure 5. The flow direction of the USDW in the Biscayne Aquifer at the site may experience seasonal fluctuations. The USDW flow direction within the preliminary area of review in the Upper Floridan Aquifer is east-south-east. Surface features are depicted on Figure 1.

The following sources were reviewed to obtain USDW location and flow direction information:

Bush, P.W., and Johnston, R.H., 1988, Ground-water hydraulics, regional flow, and ground-water development of the Floridan Aquifer System in Florida and in parts of Georgia, South Carolina, and Alabama: U.S. Geological Survey Professional Paper 1403-C, 80 p.

Reese, R.S., 1994, Hydrogeology and the distribution and origin of salinity in the Floridan Aquifer System, Southeastern Florida: U.S. Geological Survey Water-Resources Investigations Report 94-4010, 56 p.

Fish, J.E., and Stewart, M., 1991 Hydrogeology of the Surficial Aquifer System, Dade County, Florida: U.S. Geological Survey Water-Resources Investigations Report 90-4108, 56 p.

The zone that will be used for injection if the exploratory well is converted to an injection well is below the deepest USDW throughout the preliminary area of review and all of Miami-Dade County.

4. **Maps and cross sections detailing the hydrogeology and geologic structures of the local area.**

Please refer to Figures 1, 5, 6, and 7 for the requested information.

5. **Generalized maps and cross sections illustrating the regional geologic setting.**

Please see the Regional Cross-Sections Location Map provided in Figure 8, the North-South Geologic and Hydrogeologic Cross-Section provided in Figure 9, and the East-West Geologic and Hydrogeologic Cross-Section provided in Figure 10. The figures provide a map and cross-sections illustrating the regional geology and hydrogeology to a depth of approximately 3,500 feet bls.

6. **Proposed operating data.**

(a) Average and maximum daily rate and volume of the fluid to be injected.

This permit application is for the construction of an exploratory well and dual-zone monitor well, therefore, no injection is proposed. The appropriate information will be provided in support of a Class I injection well construction and testing permit if FPL opts to convert the exploratory well to a Class I Industrial deep injection well.

(b) Average and maximum injection pressure.

This permit application is for the construction of an exploratory well as defined in rule 62-528.200(26), F.A.C. and dual-zone monitor well, therefore, no injection is proposed. The appropriate information will be provided in support of a Class I injection well construction and testing permit if FPL opts to convert the exploratory well to a Class I Industrial deep injection well.

(c) Source and an analysis of the chemical, physical, radiological and biological characteristics of injection fluids.

This permit application is for the construction of an exploratory well and dual-zone monitor well, therefore, no injection is proposed. The appropriate information will be provided in support of a Class I injection well construction and testing permit if FPL opts to convert the exploratory well to a Class I Industrial deep injection well.

7. **Proposed formation testing program to obtain an analysis of the chemical, physical and radiological characteristics of and other information on the injection zone.**

The chemical, physical and radiological characteristics of the injection zone will be determined through geophysical logging (refer to the technical specifications for details of the proposed logging program), formation sampling at 10-foot intervals (drill cuttings), and formation fluid sampling. A water sample will be collected from the interval that will be intended for use as the injection zone (after the exploratory well has been converted to a Class I Industrial deep injection well) and analyzed for Primary and Secondary Drinking Water Standards and Minimum Criteria to determine the chemical, physical and radiological characteristics of the injection zone native water.

8. **Proposed stimulation program.**

The need for a stimulation program is not anticipated. The exploratory and dual-zone monitor well will undergo pumping development and air-development to remove mud and drill cuttings after completion of drilling. The developed fluids will be containerized and removed from the site for disposal off-site.

9. **Proposed injection program.**

No injection will take place into the exploratory or dual-zone monitor wells. If the exploratory well is converted to a Class I Industrial deep injection well via the permitting process, fluids will be pumped from an on-site pump station to the injection wells via a pipeline.

10. **Engineering drawings of the surface and subsurface construction details of the system.**

Please refer to the Design Drawings provided in Attachment B.

11. **Contingency plans to cope with all shut-ins or well failures, so as to protect the quality of the waters of the State as defined in Rule 62-3 and 62-520, F.A.C., including alternate or emergency discharge provisions.**

Injection into the exploratory well will not take place. If the exploratory well is converted to a Class I Industrial deep injection well via the permitting process, injection of non-hazardous construction related wastewater may take place during plant construction. Following completion of plant construction, non-hazardous wastewater from the power plant will be disposed of via the converted injection well. The completed injection well system will include backup Class I Industrial deep injection wells for disposal of water when one of the deep injection wells is out of service.

12. **Plans (including maps) and proposed monitoring data to be reported for meeting the monitoring requirements in Rule 62-528.425, F.A.C.**

Dual-zone monitor well DZMW-1 will be located approximately 75 feet north of EW-1. Refer to the Turkey Point Units 6 & 7 Plant Area diagram provided in Attachment C for the proposed location of monitor well DZMW-1. Please refer to Attachment F for the proposed monitoring program for the converted Class I Industrial deep injection well system. Both monitoring zones of the monitor well will undergo sampling and analysis for Primary and Secondary Drinking Water Standards and Municipal Wastewater Minimum Criteria Ground Water Monitoring Parameters following completion of construction of the well. Upon commencing operational testing of the deep injection well system, monitoring data will be submitted to the Southeast District and Tallahassee offices of the FDEP on a monthly basis.

13. **For wells within the area of review which penetrate the injection zone but are not properly completed or plugged, the corrective action proposed to be taken under Rule 62-528.300 (5), F.A.C.**

No wells within the preliminary area of review penetrate the zone that is anticipated to be used for injection.

14. **Construction procedures including a cementing and casing program, logging procedures, deviation checks, proposed methods for isolating drilling fluids from surficial aquifers, proposed blowout protection (if necessary), and a drilling, testing and coring program.**

For a detailed description of construction procedures for construction of exploratory well EW-1 and dual-zone monitor well DZMW-1, please refer to the technical specifications provided in Attachment B. A stripping head will be utilized while drilling below the base of the Hawthorn Group to provide blowout prevention.

The geophysical logging, coring, and packer testing program has been designed to provide the data needed to evaluate the confining characteristics of the strata between the injection zone and the base of the USDW. The base of the USDW will be identified via interpretation of geophysical logs and confirmed through water sampling during straddle packer testing. The confining characteristics of intervals overlying the Boulder Zone will be evaluated via interpretation of geophysical logs, straddle packer pumping data, drill cutting samples, and core sample data.

15. **A certification that the applicant has ensured, through a performance bond or other appropriate means, the resources necessary to close, plug or abandon the well as required by Rule 62-528.435 (9), F.A.C.**

The proposed abandonment procedures for the exploratory well and dual-zone monitor well and the estimated cost to perform the work in 2008 dollars is presented in Attachment G. Figure 11 provides a plugging and abandonment diagram of the exploratory well and the dual-zone monitor well. A certification of financial responsibility is not required for an exploratory well. A demonstration of financial responsibility for the plugging and abandonment of the wells will be provided to the Department if FPL applies for the construction permit to convert the exploratory well to a Class I Industrial deep injection well.

Section F. Exploratory Well Construction and Testing Permit

1. **Conceptual plan of the injection project. Include number of injection wells, proposed injection zone, nature and volume of injection fluid, and proposed monitoring program.**

Please see the General Project Description provided on pages 1 through 3 of this supporting information document for the conceptual plan of the project, number of injections, proposed injection zone, and nature and volume of the injection fluid. Please see Attachment F of this document for the proposed monitoring plan.

2. **Preliminary Area of Review Study. Include the proposed radius of the area of review with justification for the radius. Provide a map showing the location of the proposed injection well or well field area for which a permit is sought and the applicable area of review. Within the area of review, the map must show the number or name, and location of all producing wells, injection wells, abandoned wells, dry holes, surface bodies of water, springs, public water systems, mines (surface and subsurface), quarries, water wells and other pertinent surface features including residences and roads. The map should also show faults, if known or suspected. Only information of public record and pertinent information known to the applicant is required to be included on this map.**

Please see the response to Section A, Item 1 for the requested information.

3. **Proposed other uses of the exploratory well.**

Please see the General Project Description provided on pages 1 and 2 of this supporting information document for the proposed uses of the exploratory well.

4. **Drilling and testing plan for the exploratory well. The drilling plan must specify the proposed drilling program, sampling, coring, and testing procedures.**

Please see the General Project Description provided on pages 1 through 3 of this supporting information document for the drilling and testing program and Attachment B of this document for the drilling and testing plan including the drilling program, sampling, coring, and testing procedures.

5. **Abandonment Plan.**

Please see the plugging and abandonment plan provided in Attachment G.

Section J. Monitor Well Permit

1. **A site map showing the location of the proposed monitor wells for which a permit is sought. The map must be to scale and show the number or name, and location of all producing wells, injection wells, abandoned wells, dry holes, water wells and other pertinent surface features including structures and roads.**

Please see Figure 4 for the requested information.

2. **Maps and cross sections indicating the general vertical and lateral limits within the area of review of all underground sources of drinking water, their position relative to the injection formation and the direction of water movement, where**

known, in each underground source of drinking water which may be affected by the proposed injection.

A cross-section location map and cross-sections showing vertical and lateral limits of the USDW, the injection formation within the preliminary area of review are provided in Figures 5, 6, and 7. The USDW flow direction is also noted on Figure 5, 6, and 7. The prevailing regional direction of water movement in the USDWs is east-south-east as indicated on the map provided in Figure 5. The flow direction of the USDW in the Biscayne Aquifer at the site may experience seasonal fluctuations. The USDW flow direction with the preliminary area of review in the Upper Floridan Aquifer is east-south-east. Surface features are depicted on Figure 1.

The following sources were reviewed to obtain USDW location and flow direction information:

Bush, P.W., and Johnston, R.H., 1988, Ground-water hydraulics, regional flow, and ground-water development of the Floridan Aquifer System in Florida and in parts of Georgia, South Carolina, and Alabama: U.S. Geological Survey Professional Paper 1403-C, 80 p.

Reese, R.S., 1994, Hydrogeology and the distribution and origin of salinity in the Floridan Aquifer System, Southeastern Florida: U.S. Geological Survey Water-Resources Investigations Report 94-4010, 56 p.

Fish, J.E., and Stewart, M., 1991 Hydrogeology of the Surficial Aquifer System, Dade County, Florida: U.S. Geological Survey Water-Resources Investigations Report 90-4108, 56 p.

The zone that will be used for injection if the exploratory well is converted to an injection well is below the deepest USDW throughout the preliminary area of review and all of Miami-Dade County.

3. **Maps and cross sections detailing the hydrogeology and geologic structures of the local area.**

Please refer to Figures 1, 5, 6, and 7 for the requested information.

4. **Generalized maps and cross sections illustrating the regional geologic setting.**

Please see the Regional Cross-Sections Location Map provided in Figure 8, the North-South Geologic and Hydrogeologic Cross-Section provided in Figure 9, and the East-West Geologic and Hydrogeologic Cross-Section provided in Figure 10. The figures provide a map and cross-sections illustrating the regional geology and hydrogeology to a depth of approximately 3,500 feet bls.

5. **Proposed formation testing program to obtain an analysis of the chemical, physical and radiological characteristics of and other information on the monitor zone(s).**

The chemical, physical and radiological characteristics of the injection zone will be determined through geophysical logging (refer to the technical specifications for details of the proposed logging program), formation sampling at 10-foot intervals

(drill cuttings), and formation fluid sampling. A water sample will be collected from the intervals that will be intended for use as the monitoring zones and analyzed for Primary and Secondary Drinking Water Standards and Minimum Criteria to determine the chemical, physical and radiological characteristics of the monitor zones native water.

6. **Proposed monitoring procedure.**

Dual-zone monitor well DZMW-1 will be located approximately 75 feet north of EW-1. Refer to the Turkey Point Units 6 & 7 Plant Area diagram provided in Attachment C for the proposed location of monitor well DZMW-1. Please refer to Attachment G for the proposed monitoring program for the converted Class I Industrial deep injection well system. Both monitoring zones of the monitor well will undergo sampling and analysis for Primary and Secondary Drinking Water Standards and Municipal Wastewater Minimum Criteria Ground Water Monitoring Parameters following completion of construction of the well. Upon commencing operational testing of the deep injection well system, both zones of the monitoring well will be sampled weekly throughout the operational testing period and monthly thereafter. Water level in both monitor zones will also be monitored and recorded continuously. The monitoring data will be submitted to the Southeast District and Tallahassee offices of the FDEP on a monthly basis.

7. **Engineering drawings of the surface and subsurface construction details of the monitoring system.**

Please see the design drawings provided in Attachment B for the requested information.

8. **Proposed monitoring data to be reported for meeting the monitoring requirements in Rule 62-528.425, F.A.C.**

Please refer to Attachment G for the proposed monitoring program for the converted Class I Industrial deep injection well system. Both monitoring zones of the monitor well will undergo sampling and analysis for Primary and Secondary Drinking Water Standards and Municipal Wastewater Minimum Criteria Ground Water Monitoring Parameters following completion of construction of the well. Upon commencing operational testing of the deep injection well system, monitoring data will be submitted to the Southeast District and Tallahassee offices of the FDEP on a monthly basis.

9. **Construction procedures including a cementing and casing program, logging procedures, deviation checks, proposed methods for isolating drilling fluids from surficial aquifers, proposed blowout protection (if necessary), and a drilling, testing and coring program.**

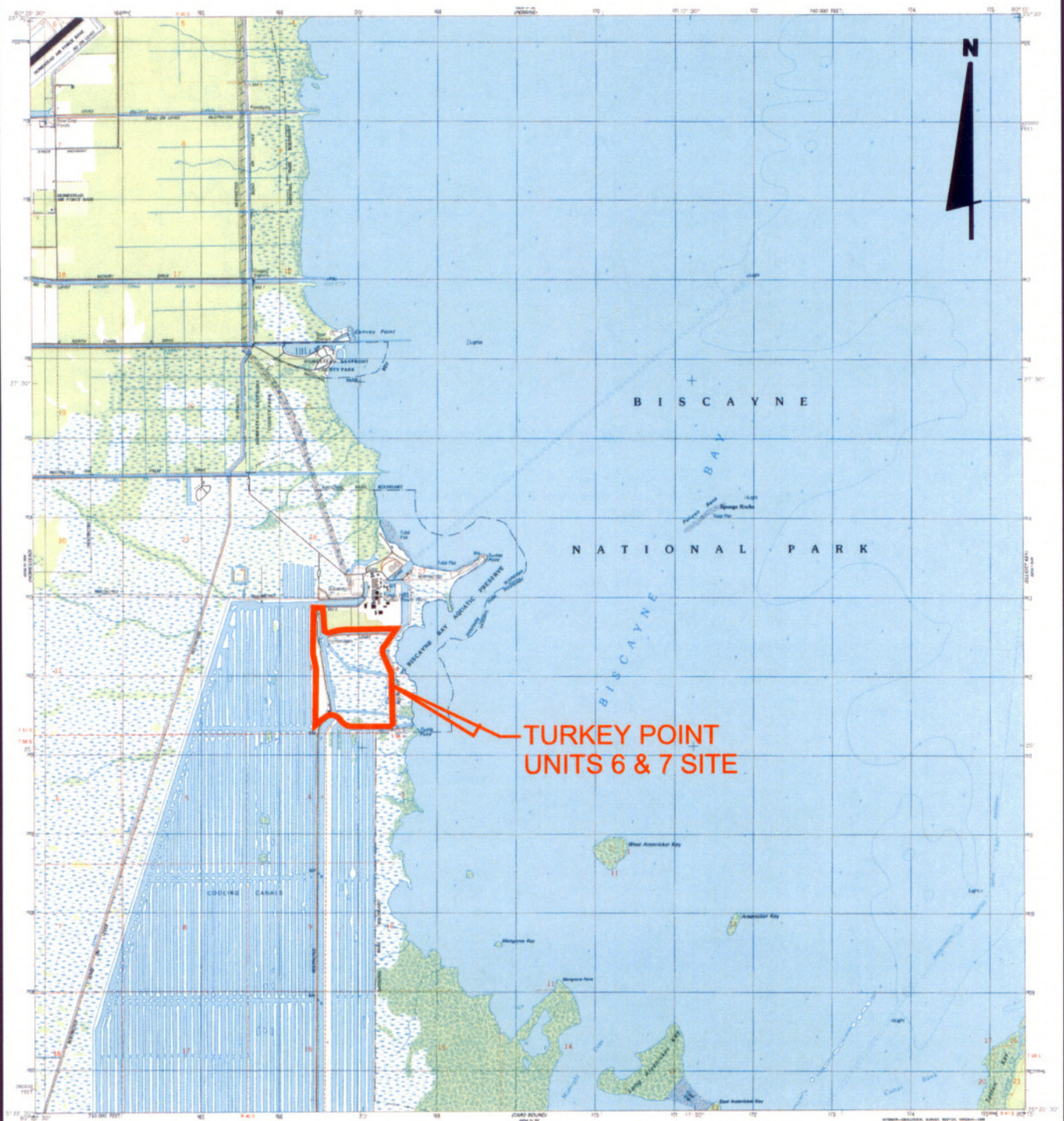
Please see Attachment B for the requested information.

10. **Monitor Well Information.**

The proposed monitor well will be a dual-zone monitor well with an anticipated upper monitor zone of approximately 1,400 to 1,420 feet bls and an upper monitor

zone of approximately 1,850 to 1,870 feet bls. The monitor well will be located approximately 75 feet north of exploratory well EW-1.

Figures and Table



Latitude 25° 25' 20.8" N. Longitude 80° 19' 46.4" W.
 Township 57S Range 40E Section 25
 Source: USGS 7.5" Topographic Map

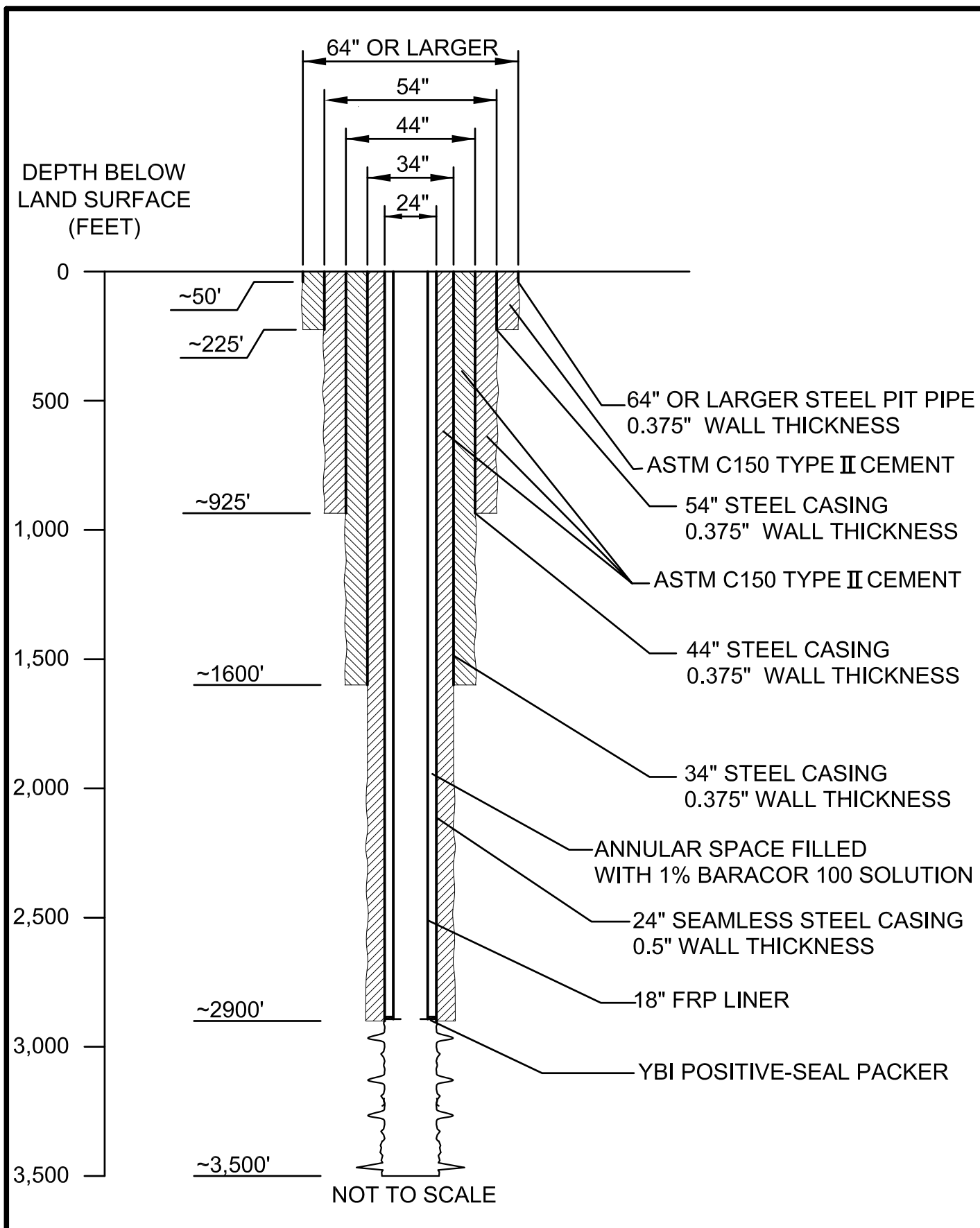
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MHC McNabb Hydrogeologic Consulting, Inc.
 601 HERITAGE DRIVE, SUITE 110
 Jupiter, Florida 33458
 Phone 561.891.0763 - Fax 561.623.5469

FPL TURKEY POINT
 EXPLORATORY WELL
 UNITS 6 & 7

PROJECT
 LOCATION MAP

FIGURE 1



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Jupiter, Florida 33458
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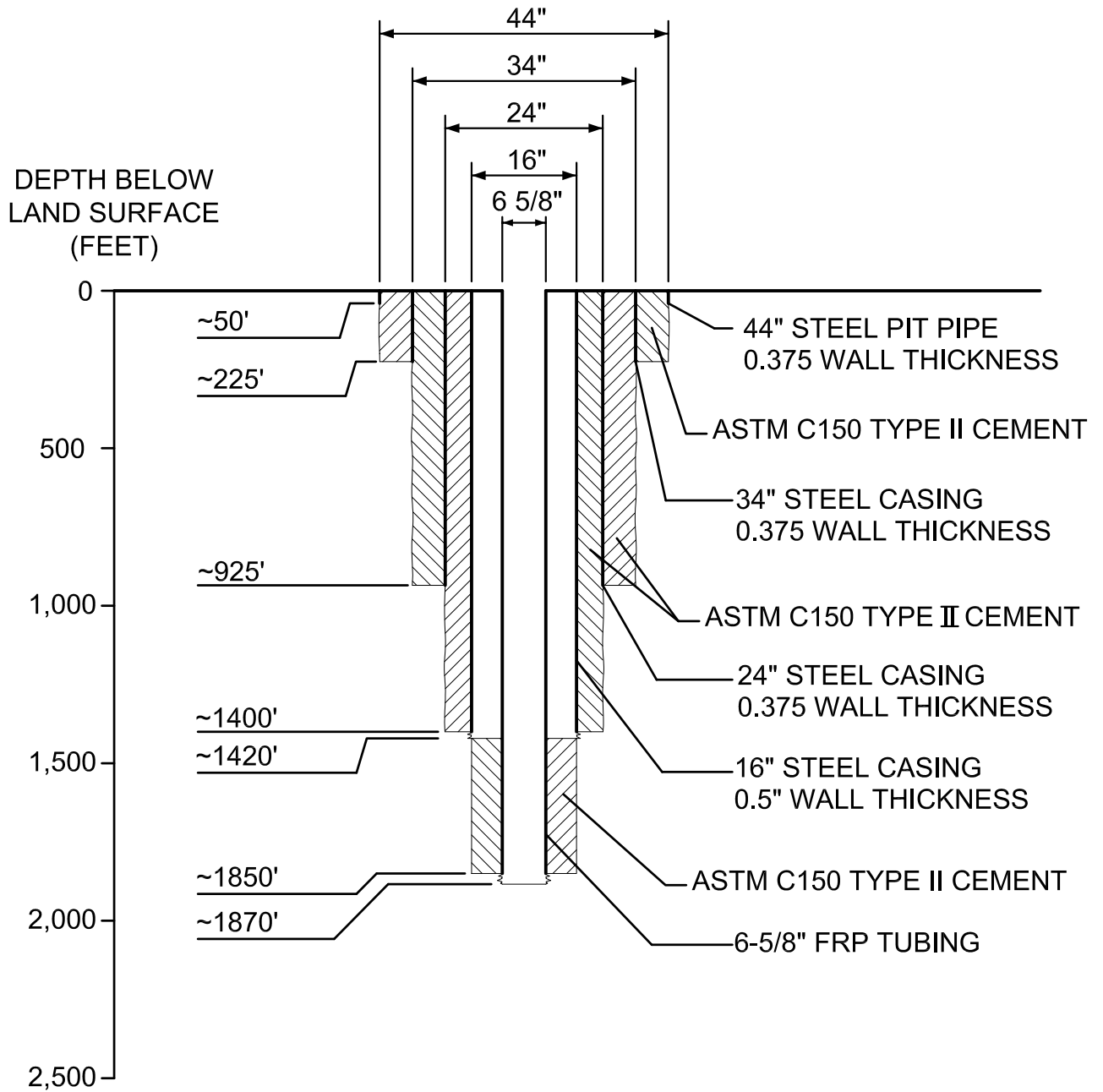
FPL TURKEY POINT
EXPLORATORY WELL
UNITS 6 & 7

EXPLORATORY WELL EW-1
DESIGN DIAGRAM

FIGURE 2

Note: The top of the 34" and 24" diameter casings and injection tubing will be extended to ~6 feet above final site elevation (~22 feet NAVD 88) after drilling is completed.

DUAL-ZONE MONITOR WELL



NOT TO SCALE



McNabb Hydrogeologic Consulting, Inc.

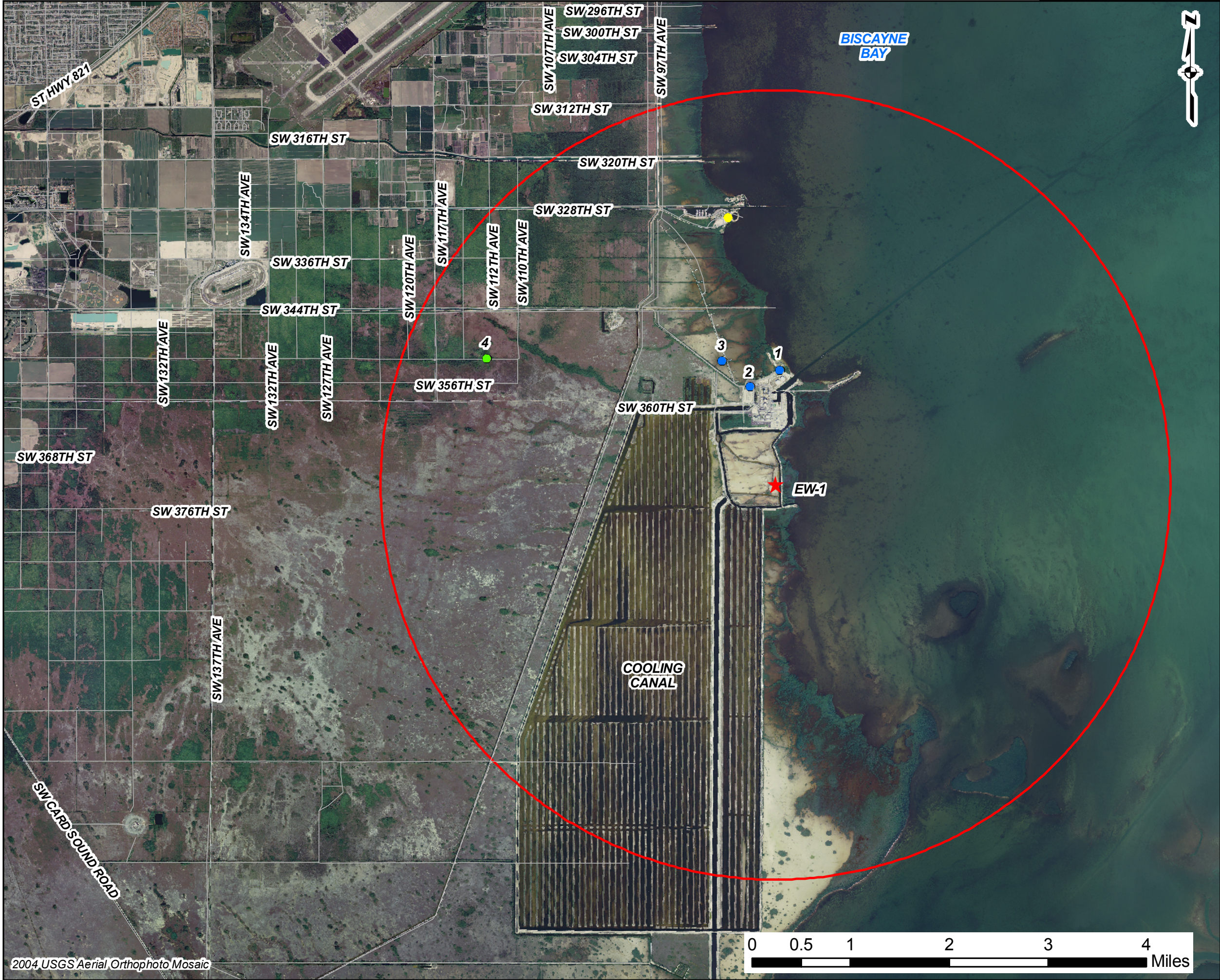
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Jupiter, Florida 33458
Phone 561.891.0763 • Fax 561.623.5469

FPL TURKEY POINT
EXPLORATORY WELL
UNITS 6 & 7

DUAL ZONE MONITOR WELL
DZMW-1
DESIGN DIAGRAM

FIGURE 3

Note: The top of the 24", 16", and 6-5/8" diameter casings will be extended to ~6 feet above final site elevation (~22 feet NAVD 88) after drilling is completed.



**FPL TURKEY POINT
EXPLORATORY WELL
UNITS 6 & 7**
Preliminary Area of Review Map

LEGEND

- 4-mile Preliminary Area of Review
- Residents within the Area of Review

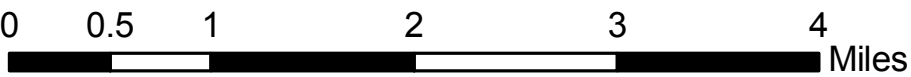
Wells

- Industrial Supply
- Unknown Use
- EW-1 Well Location

*See corresponding tabular data sheet for well details

FIGURE# 4

DATE: AUGUST 2008



Note: There are no known potable water wells associated with the residences within the Preliminary Area of Review.



FPL Turkey Point Exploratory Well Project
 Latitude 25° 25' 20.769 N. Longitude 80° 19' 46.448 W.
 Township 57S Range 40E Section 25
 Source: USGS 7.5" Topographic Map

NOT TO SCALE



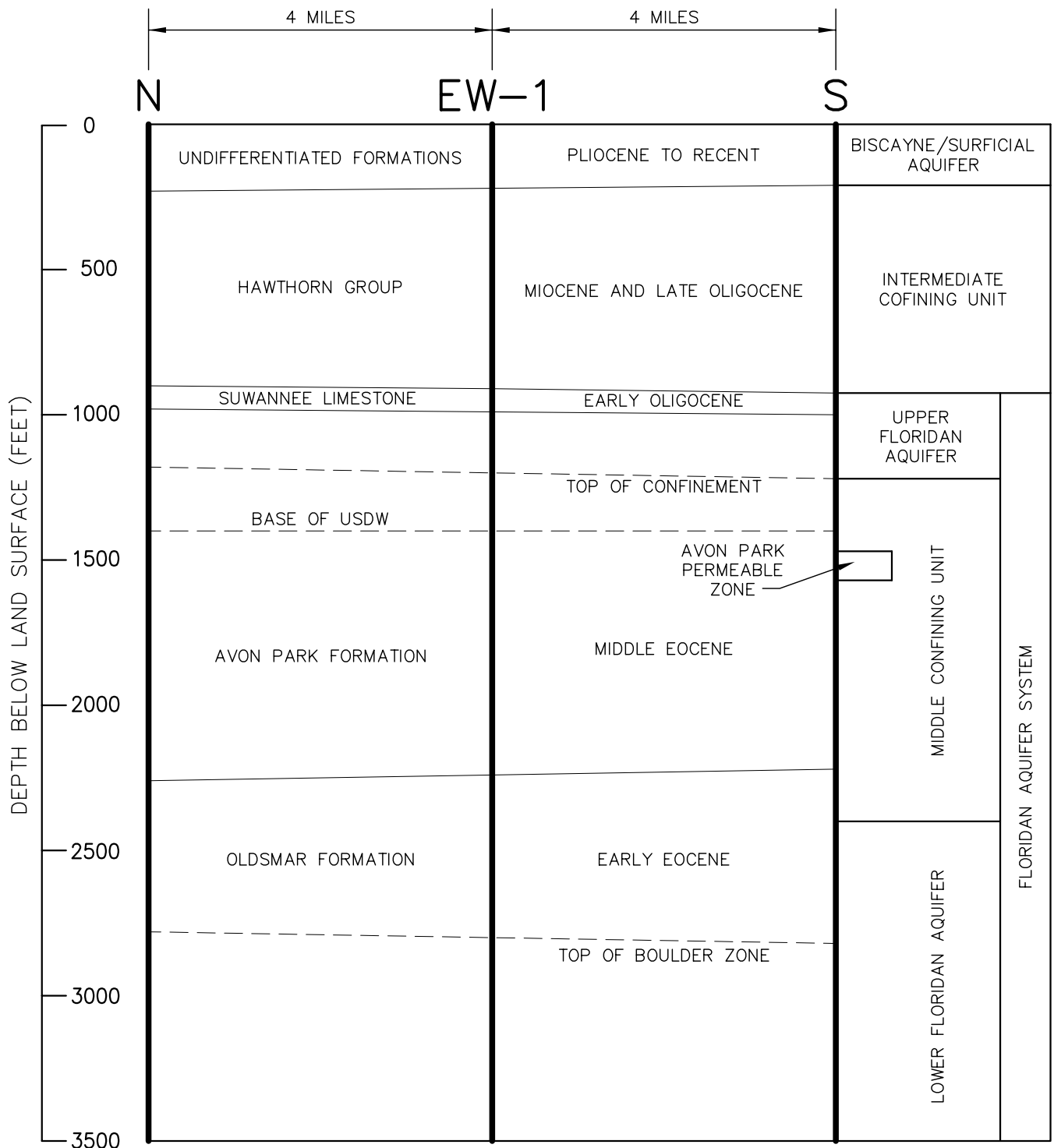
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 Jupiter, Florida 33458
 Phone 561.891.0763 • Fax 561.623.5469

FPL TURKEY POINT
 EXPLORATORY WELL
 UNITS 6 & 7

LOCAL CROSS SECTIONS
 LOCATION MAP

FIGURE 5



Note: The prevailing regional USDW flow direction in the Biscayne Aquifer is east-south-east but may vary locally in response to seasonal fluctuations. Local and regional USDW flow direction in the Floridan Aquifer is east-south-east.



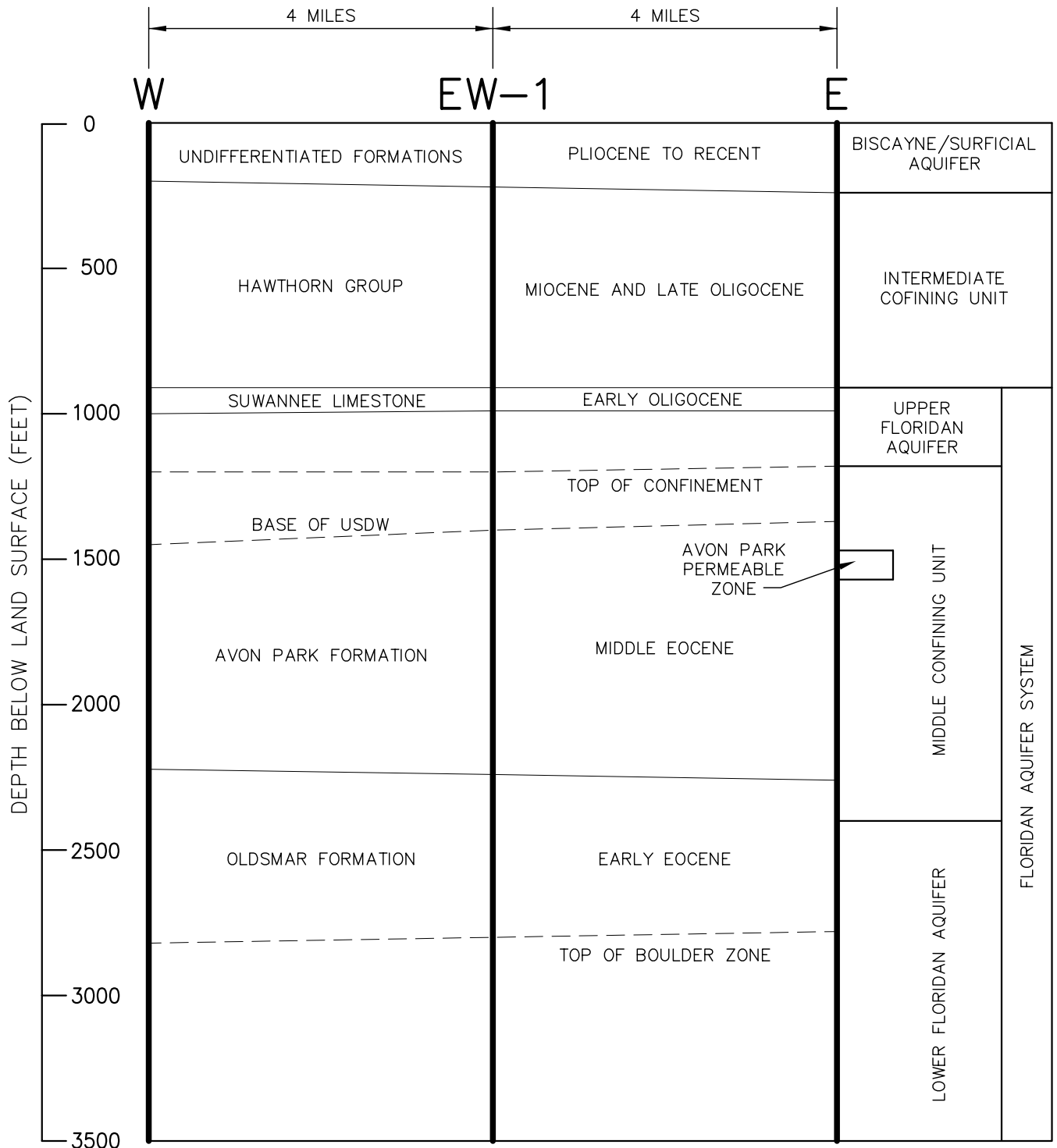
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Phone 561.891.0763 • Fax 561.623.5469

FPL TURKEY POINT
EXPLORATORY WELL
UNITS 6 & 7

NORTH-SOUTH
LOCAL CROSS SECTION

FIGURE 6



Note: The prevailing regional USDW flow direction in the Biscayne Aquifer is east-south-east but may vary locally in response to seasonal fluctuations. Local and regional USDW flow direction in the Floridan Aquifer is east-south-east.



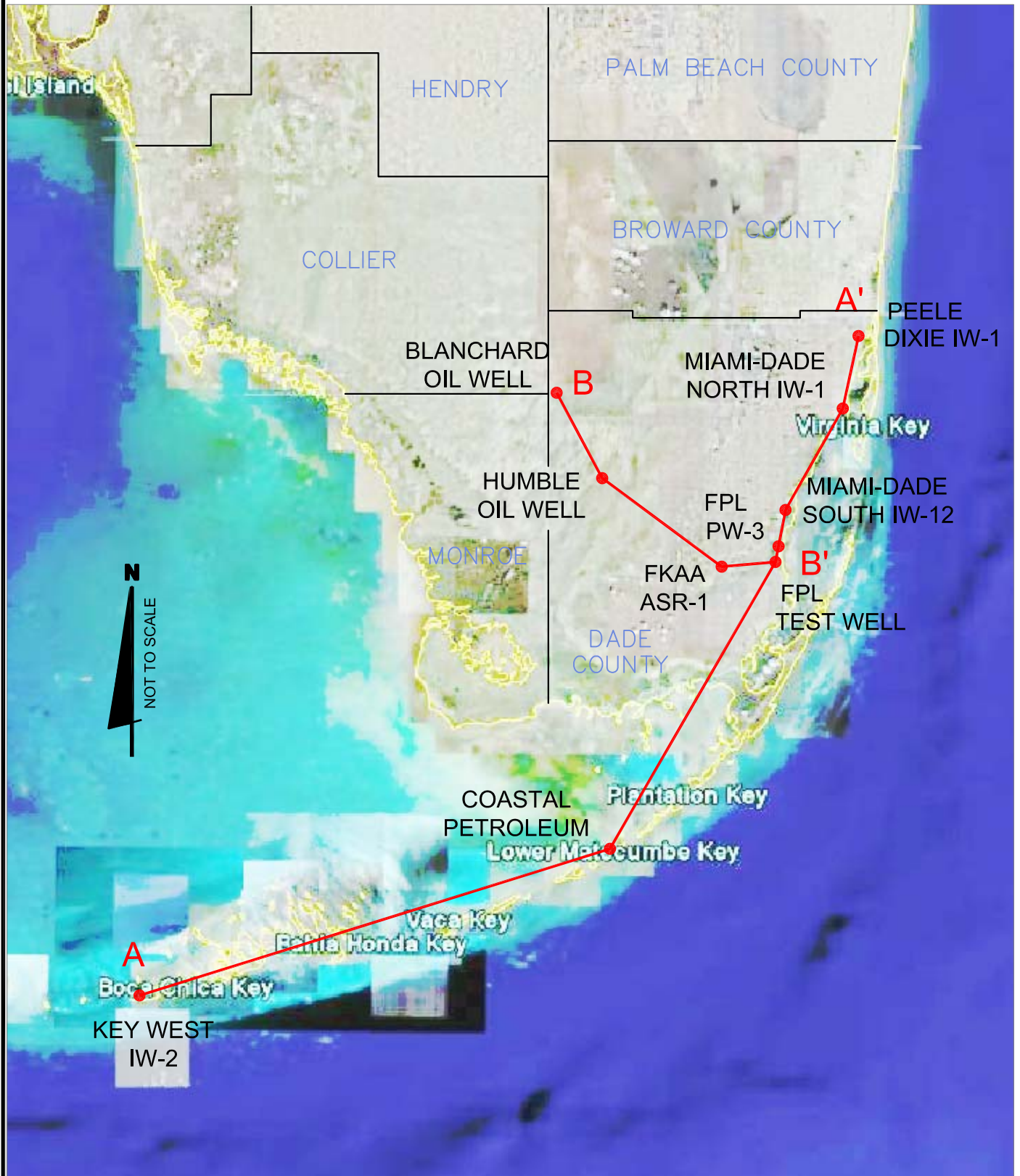
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FPL TURKEY POINT
EXPLORATORY WELL
UNITS 6 & 7

EAST-WEST
LOCAL CROSS SECTION

FIGURE 7



NOT TO SCALE



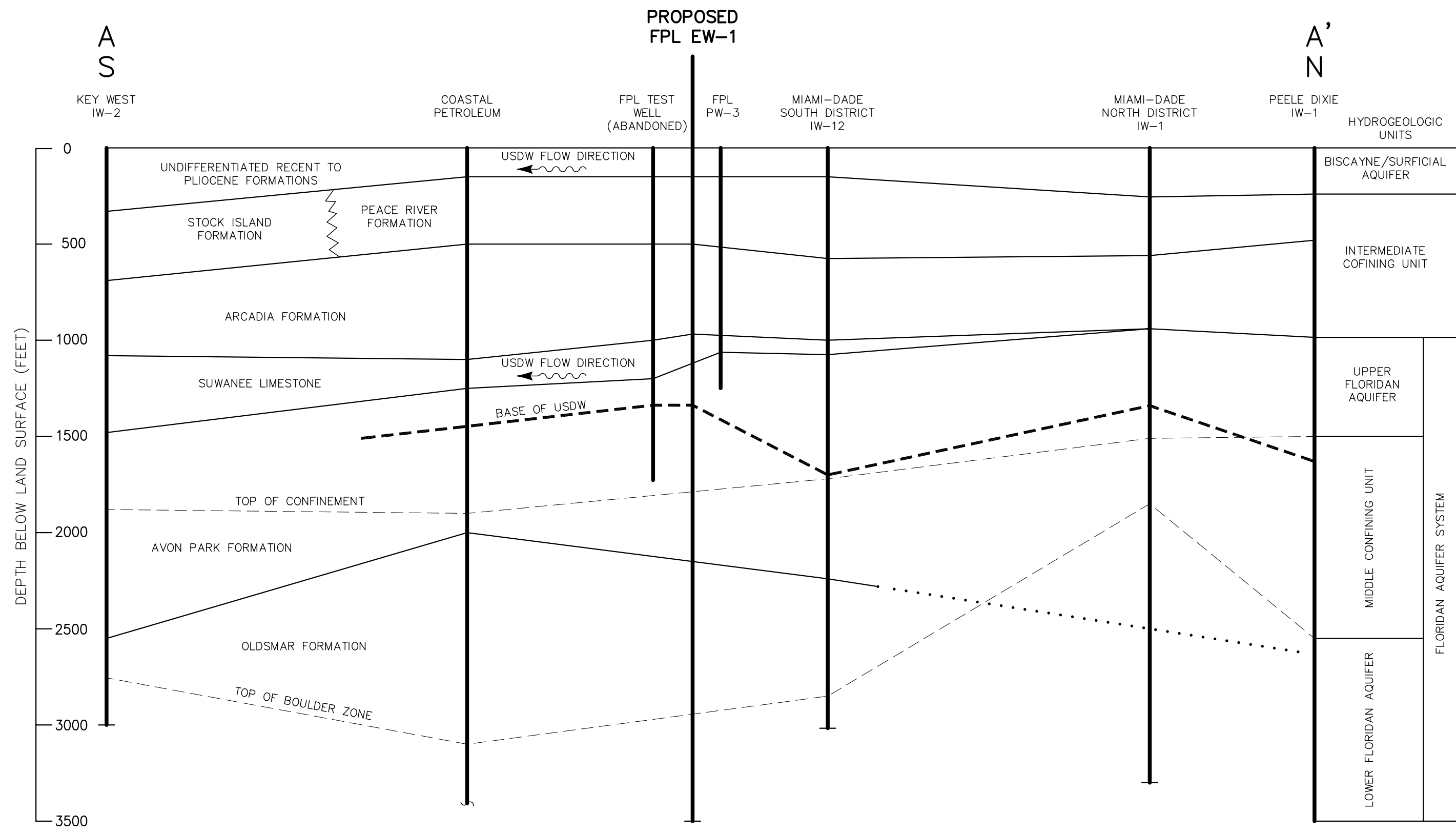
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FPL TURKEY POINT
EXPLORATORY WELL
UNITS 6 & 7

REGIONAL CROSS
SECTIONS LOCATION MAP

FIGURE 8



* PREVAILING REGIONAL USDW FLOW DIRECTION IS EAST-SOUTH-EAST.

NOTE: THE AVON PARK FORMATION - OLDSMAR FORMATION CONTACT IS NOT WELL DOCUMENTED IN PORTIONS OF MIAMI DADE COUNTY.

MHC

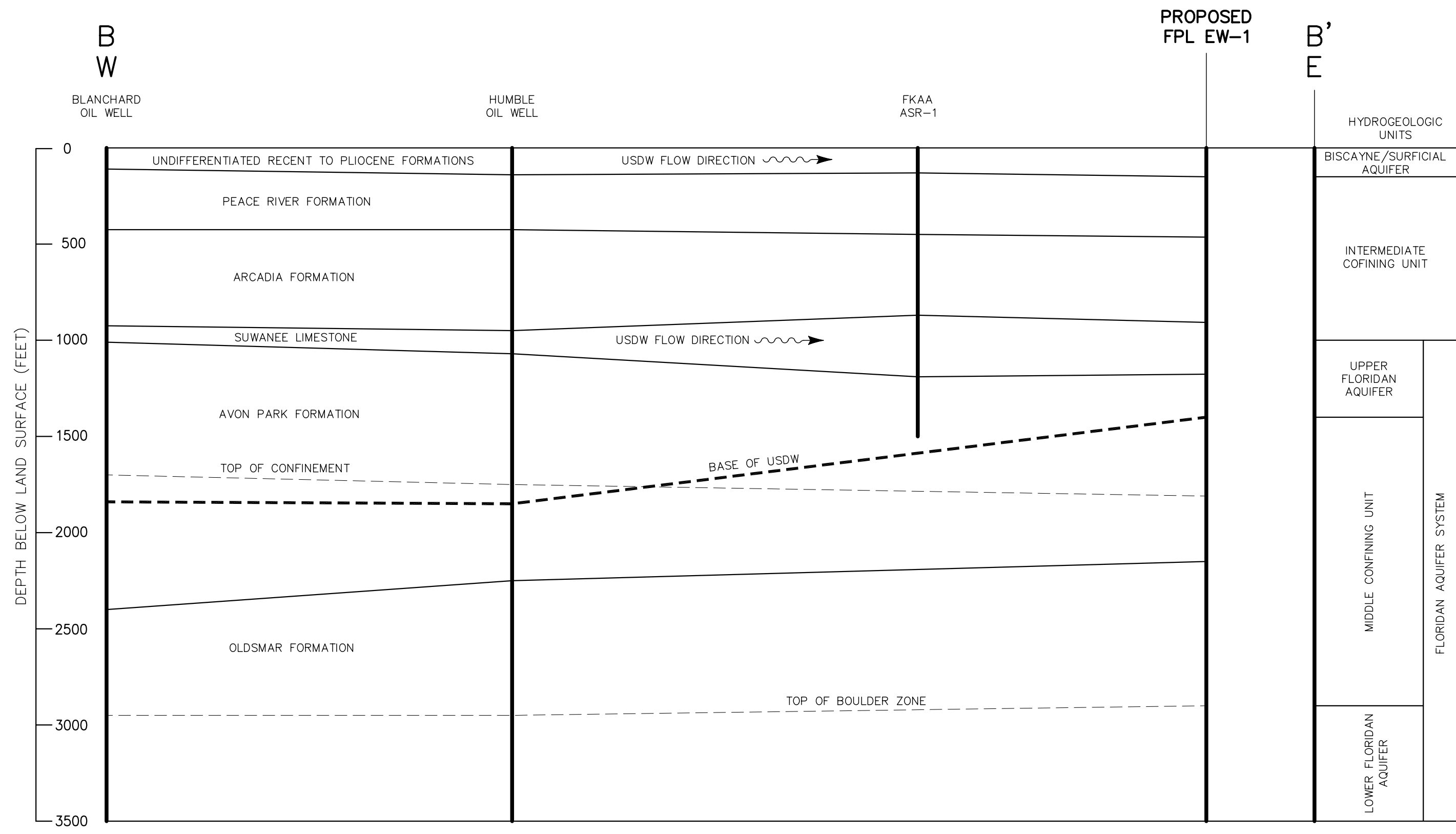
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FPL TURKEY POINT
EXPLORATORY WELL
UNITS 6 & 7

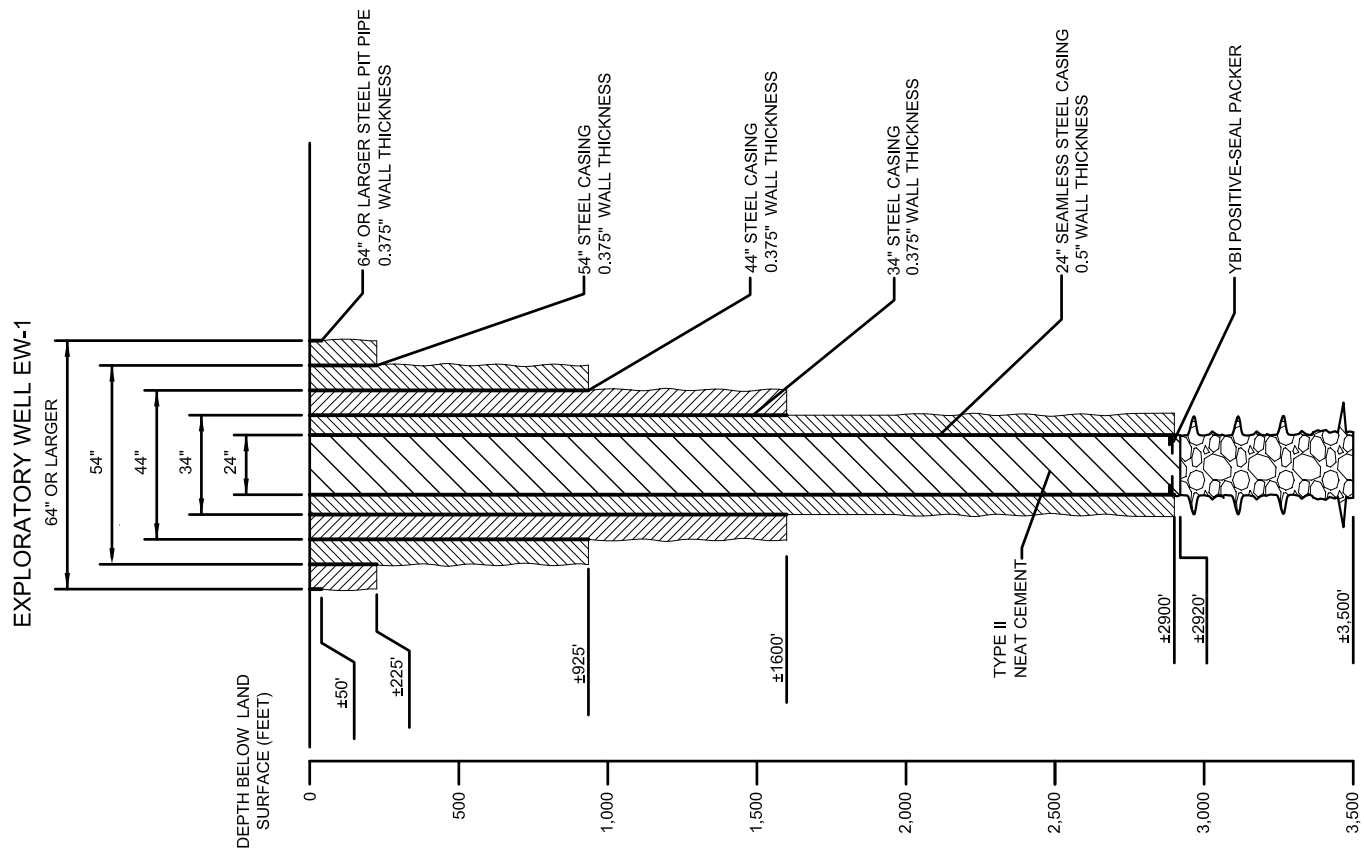
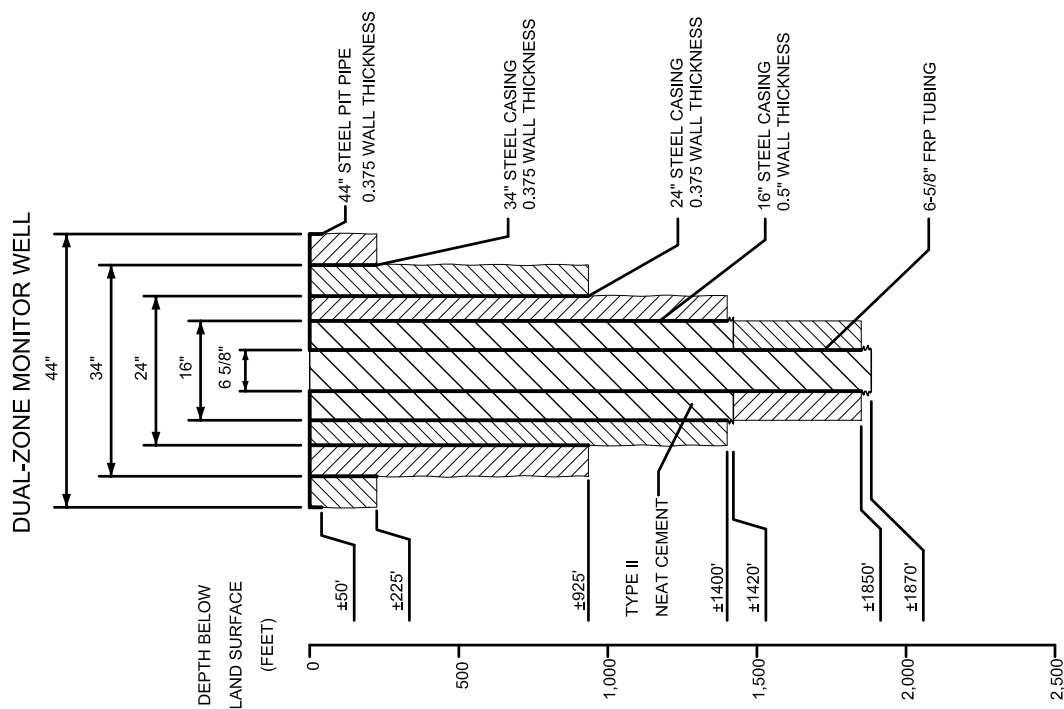
NORTH-SOUTH
REGIONAL CROSS SECTION

FIGURE 9



* PREVAILING REGIONAL USDW FLOW DIRECTION IS EAST-SOUTH-EAST.

NOTE: THE AVON PARK FORMATION - OLDSMAR FORMATION CONTACT IS NOT WELL DOCUMENTED IN PORTIONS OF MIAMI DADE COUNTY.



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FPL TURKEY POINT
EXPLORATORY WELL
UNITS 6 & 7

PLUGGING AND
AND
ABANDONMENT DIAGRAM

FIGURE 11

TABLE 1. FPL TURKEY POINT EXPLORATORY WELL UNITS 6 & 7 PRELIMINARY AREA OF REVIEW WELL SUMMARY

Well ID	Well Construction Permit No.	Well Name	Well Owner	Address/Location	Latitude	Longitude	Well Diameter (inches)	Total Well Depth (feet)	Well Use
1	N/A	PW-3	Florida Power and Light	FP&L Turkey Point Power Plant	25.43929	-80.32896	24	1,246	Industrial Supply
2	N/A	PW-4	Florida Power and Light	FP&L Turkey Point Power Plant	25.43683	-80.33704	24	1,243	Industrial Supply
3	N/A	PW-1	Florida Power and Light	FP&L Turkey Point Power Plant	25.43953	-80.36594	24	1,242	Industrial Supply
4	N/A	GB-1	Florida Power and Light	FP&L Turkey Point Power Plant	25.44095	-80.37200	unknown*	1,225	unknown*
<i>GIS AND TABULAR DATA SOURCES: FGS Wells, USGS Wells, FDEP PWS Wells, FDEP WSRP Wells, FDEP Limited Use Wells, SFWMD Water Use Permits, SFWMD Well Construction Permits, Florida Public Service Commission Archives, & FDOH SuperAct Wells</i> *FPL records indicate GB-1 has a diameter of 6-inches and has a historical monitoring use. Note: Only wells which penetrate the Floridan Aquifer (determined to be pertinent) are included.									

Attachment A

FDEP Form 62-528.900(1)



**Florida Department of
Environmental Protection**
Twin Towers Office Bldg., 2600 Blair Stone Road,
Tallahassee, Florida 32399-2400

DEP Form No:	62-528.900(1)
Form Title:	Application to Construct/ Operate/Abandon Class I, III, or V Injection Well Systems
Effective Date:	
DEP Application No.:	(Filled in by DEP)

**APPLICATION TO CONSTRUCT/OPERATE/ABANDON
CLASS I, III, OR V INJECTION WELL SYSTEMS**

Part I. Directions

- A. All applicable items must be completed in full in order to avoid delay in processing this application. Where attached sheets or other technical documentation are utilized in lieu of the blank space provided, indicate appropriate cross-reference in the space and provide copies to the Department in accordance with C. below. Where certain items do not appear applicable to the project, indicate N/A in the appropriate spaces.
- B. All information is to be typed or printed in ink.
- C. Four (4) copies of this application and four (4) copies of supporting information such as plans, reports, drawings and other documents shall be submitted to the appropriate District/Subdistrict office. An engineering report is also required to be submitted to support this application pursuant to the applicable sections of Rule 62-528, F.A.C. The attached list* shall be used to determine completeness of supporting data submitted or previously received. A check for the application fee in accordance with Rule 62-4.050, F.A.C., made payable to the Department shall accompany the application.
- D. For projects involving construction, this application is to be accompanied by four (4) sets of engineering drawings, specifications and design data as prepared by a Professional Engineer registered in Florida, where required by Chapter 471, Florida Statutes.
- E. Attach 8 1/2" x 11" USGS site location map indicating township, range and section and latitude/longitude for the project.

PART II. General Information

- A. Applicant Name Randall R. LaBauve Title Vice President
Address Florida Power & Light Company, 700 Universe Blvd.
City Juno Beach State Florida Zip 33408
Telephone Number 561-691-7001
- B. Project Status: ☒ New ☐ Existing
☐ Modification (specify) _____

*"Engineering and Hydrogeologic Data Required for Support of Application to Construct, Operate and Abandon Class I, III, or V Injection Wells"

- C. Well Type: ☒ Exploratory Well ☐ Test/Injection Well

DEP Form No:	62-528.900(1)
Form Title:	Application to Construct/ Operate/Abandon Class I, III, or V Injection Well Systems
Effective Date:	
DEP Application No.:	(Filled in by DEP)

D. Type of Permit Application

- ☐ Class I Test/Injection Well Construction and Testing Permit
- ☐ Class I Well Operation Permit
- ☐ Class I Well Operation Repermitting
- ☐ Class I Well Plugging and Abandonment Permit
- ☐ Class III Well Construction/Operation/Plugging and Abandonment Permit
- ☐ Class I Exploratory Well Construction and testing Permit
- ☒ Class V Well Construction Permit
- ☐ Class V Well Operation Permit
- ☐ Class V Well Plugging and Abandonment Permit
- ☐ Monitor Well Only

E. Facility Identification:

Name Turkey Point Power Plant

Facility Location: Street 9760 S.W. 344 Street

City Florida City County Miami-Dade

SIC Code(s) 4911 Electric Services

F. Proposed facility located on Indian Lands: Yes ☐ No ☒

G. Well Identification:

Well No. 1 of 1 Wells
(total #)

Purpose (Proposed Use) Non-hazardous industrial wastewater disposal

Well Location: Latitude: 25° 25' 20.8" Longitude: 80° 19' 46.4"
(attach separate sheet(s), if necessary, for multiple wells)

Subpart B. General Project Description:

H. General Project Description: Describe the nature, extent and schedule of the injection well project. Refer to existing and/or future pollution control facilities, expected improvement in performance of the facilities and state whether the project will result in full compliance with the requirements of Chapter 403, F.S., and all rules of the Department. Attach additional sheet(s) if necessary or cross-reference the engineering report.

Please see the supporting information for a Class V Exploratory Well Construction

Permit.

DEP Form No:	62-528.900(1)
Form Title:	Application to Construct/ Operate/Abandon Class I, III, or V Injection Well Systems
Effective Date:	
DEP Application No.:	(Filled in by DEP)

PART III. Statement by Applicant and Engineer

A. Applicant

I, the owner/authorized representative* of Florida Power & Light Company, certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment. I understand that this certification also applies to all subsequent reports submitted pursuant to this permit. Where construction is involved, I agree to retain the design engineer, or other professional engineer registered in Florida, to provide inspection of construction in accordance with Rule 62-528.455(1)(c), F.A.C.

Signed *RR LaBauve*

Date 1/20/2009

Randall R. LaBauve, Vice President
Name and Title (Please Type)

561-691-7001
Telephone Number

*Attach a Letter of Authorization.

B. Professional Engineer Registered in Florida

This is to certify that the engineering features of this injection well have been designed/examined by me and found to be in conformity with modern engineering principles applicable to the disposal of pollutants characterized in the permit application. There is reasonable assurance, in my professional judgement, that the well, when properly maintained and operated, will discharge the effluent in compliance with all applicable statutes of the State of Florida and the rules of the Department. It is also agreed that the undersigned will furnish the applicant a set of instructions for proper maintenance and operation of the well.

Signed *David F. Holtz*

David F. Holtz, P.E.
Name (Please Type)

Holtz Consulting Engineers, Inc.
Company Name (Please Type)



(Please Affix Seal)

50 South U.S. Highway One, Suite 209, Jupiter FL 33477
Mailing Address (Please Type)

Florida Registration No. 42595 Date 1-16-09 Phone No. 561-575-2005

DEP Form No:	62-528.900(1)
Form Title:	Application to Construct/ Operate/Abandon Class I, III, or V Injection Well Systems
Effective Date:	
DEP Application No.:	(Filled in by DEP)

**ENGINEERING AND HYDROLOGIC DATA
REQUIRED FOR SUPPORT OF APPLICATION
TO CONSTRUCT, OPERATE, AND ABANDON
CLASS I, III, OR V INJECTION WELL SYSTEMS**

The following information shall be provided for each type of permit application.

A. CLASS I TEST/INJECTION WELL CONSTRUCTION AND TESTING PERMIT

1. A map showing the location of the proposed injection wells of well field area for which a permit is sought and the applicable area of review. Within the area of review, the map must show the number or name, and location of all producing wells, injection wells, abandoned wells, dry holes, surface bodies of water, springs, public water systems, mines (surface and subsurface), quarries, water wells and other pertinent surface features including residences and roads. The map should also show faults, if known or suspected. Only information of public record and pertinent information known to the applicant is required to be included on this map.
2. A tabulation of data on all wells within the area of review which penetrate into the proposed injection zone, confining zone, or proposed monitoring zone. Such data shall include a description of each well's type, construction, date drilled, location, depth, record of plugging and/or completion, and any additional information the Department may require.
3. Maps and cross sections indicating the general vertical and lateral limits within the area of review of all underground sources of drinking water, their position relative to the injection formation and the direction of water movement, where known, in each underground source of drinking water which may be affected by the proposed injection.
4. Maps and cross sections detailing the hydrology and geologic structures of the local area.
5. Generalized maps and cross sections illustrating the regional geologic setting.
6. Proposed operating data.
 - (a) Average and maximum daily rate and volume of the fluid to be injected;
 - (b) Average and maximum injection pressure; and,
 - (c) Source and an analysis of the chemical, physical, radiological and biological characteristics of injection fluids.
7. Proposed formation testing program to obtain an analysis of the chemical, physical and radiological characteristics of and other information on the injection zone.
8. Proposed stimulation program.
9. Proposed injection procedure.
10. Engineering drawings of the surface and subsurface construction details of the system.

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Effective Date:	
DEP Application No.:	(Filled in by DEP)

11. Contingency plans to cope with all shut-ins or well failures, so as to protect the quality of the waters of the State as defined in Rule 62-3 and 62-520, F.A.C., including alternate or emergency discharge provisions.
12. Plans (including maps) and proposed monitoring data to be reported for meeting the monitoring requirements in Rule 62-528.425, F.A.C.
13. For wells within the area of review which penetrate the injection zone but are not properly completed or plugged, the corrective action proposed to be taken under Rule 62-528.300(5), F.A.C.
14. Construction procedures including a cementing and casing program, logging procedures, deviation checks, proposed methods for isolating drilling fluids from surficial aquifers, proposed blowout protection (if necessary), and a drilling, testing and coring program.
15. A certification that the applicant has ensured, through a performance bond or other appropriate means, the resources necessary to close, plug or abandon the well as required by Rule 62-528.435(9), F.A.C.

B. CLASS I INJECTION WELL OPERATION PERMIT

1. A report shall be submitted with each application for a Class I Well operating permit, which shall include, but not be limited to, the following information:
 - (a) Results of the information obtained under the construction permit described in A. CLASS I TEST/INJECTION WELL CONSTRUCTION AND TESTING PERMIT, including:
 - (1) All available logging and testing program data and construction data on the well or well field;
 - (2) A satisfactory demonstration of mechanical integrity for all new wells pursuant to Rule 62-528.300(6), F.A.C;
 - (3) The actual operating data, including injection pressures versus pumping rates where feasible, or the anticipated maximum pressure and flow rate at which the permittee will operate, if approved by the Department;
 - (4) The actual injection procedure;
 - (5) The compatibility of injected waste with fluids in the injection zone and minerals in both the injection zone and the confining zone; and,
 - (6) The status of corrective action on defective wells in the area of review.
 - (b) Record drawings, based upon inspections by the engineer or persons under his direct supervision, with all deviations noted;
 - (c) Certification of completion submitted by the engineer of record;
 - (d) If requested by the Department, operation manual including emergency procedures;

DEP Form No:	62-528.900(1)
Form Title:	Application to Construct/ Operate/Abandon Class I, III, or V Injection Well Systems
Effective Date:	
DEP Application No.:	(Filled in by DEP)

- (e) Proposed monitoring program and data to be submitted;
- (f) Proof that the existence of the well has been recorded on the surveyor's plan at the county courthouse; and,
- (g) Proposed plugging and abandonment plan pursuant to Rule 62-528.435(2), F.A.C.

C. CLASS I WELL OPERATION REPERMITTING

1. An updated map showing the location of the injection wells or well field area for which a permit is sought and the applicable area of review. Within the area of review, the map must show the number or name, and location of all producing wells, injection wells, abandoned wells, dry holes, surface bodies of water, springs, public water systems, mines (surface and subsurface), quarries, water wells and other pertinent surface features including residences and roads. The map should also show faults, if known or suspected. Only information of public record and pertinent information known to the applicant is required to be included on this map.
2. A tabulation of data on all wells within the area of review which penetrate into the injection zone, confining zone, or monitoring zone. Such data shall include a description of each well's type, construction, date drilled, location, depth, record of plugging and/or completion, and any additional information the Department may require.
3. Maps and cross sections indicating the general vertical and lateral limits within the area of review of all underground sources of drinking water, their position relative to the injection formation and the direction of water movement, where known, in each underground source of drinking water which may be affected by the injection.
4. Maps and cross sections detailing the hydrology and geologic structures of the local area.
5. Generalized maps and cross sections illustrating the regional geologic setting.
6. Contingency plans to cope with all shut-ins or well failures, so as to protect the quality of the waters of the State as defined in Rule 62-3 and 62-520, F.A.C., including alternate or emergency discharge provisions.
7. For wells within the area of review which penetrate the injection zone but are not properly completed or plugged, the corrective action proposed to be taken under Rule 62-528.300(5), F.A.C.
8. A certification that the applicant has ensured, through a performance bond or other appropriate means, the resources necessary to close, plug or abandon the well as required by Rule 62-528.435(9), F.A.C.
9. A report shall be submitted with each application for repermitting of Class I Well operation which shall include the following information:
 - (a) All available logging and testing program data and construction data on the well or well field;

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- (b) A satisfactory demonstration of mechanical integrity for all wells pursuant to Rule 62-528.300(6), F.A.C.;
- (c) The actual operating data, including injection pressures versus pumping rates where feasible, or the anticipated maximum pressure and flow rate at which the permittee will operate, if approved by the Department;
- (d) The actual injection procedure;
- (e) The compatibility of injected waste with fluids in the injection zone and minerals in both the injection zone and the confining zone;
- (f) The status of corrective action on defective wells in the area of review;
- (g) Record drawings, based upon inspections by the engineer or persons under his direct supervision, with all deviations noted;
- (h) Certification of completion submitted by the engineer of record;
- (i) An updated operation manual including emergency procedures;
- (j) Proposed revisions to the monitoring program or data to be submitted; and,
- (k) Proposed plugging and abandonment plan pursuant to Rule 62-528.435(2), F.A.C.

D. CLASS I WELL PLUGGING AND ABANDONMENT PERMIT

- 1. The reasons for abandonment.
- 2. A proposed plan for plugging and abandonment describing the preferred and alternate methods, and justification for use.
 - (a) The type and number of plugs to be used;
 - (b) The placement of each plug including the elevation of the top and bottom;
 - (c) The type and grade and quantity of cement or any other approved plugging material to be used; and,
 - (d) The method for placement of the plugs.
- 3. The procedure to be used to meet the requirements of Rule 62-528.435, F.A.C.

DEP Form No:	62-528.900(1)
Form Title:	Application to Construct/ Operate/Abandon Class I, III, or V Injection Well Systems
Effective Date:	
DEP Application No.:	(Filled in by DEP)

E. CLASS III WELLS CONSTRUCTION/OPERATION/PLUGGING AND ABANDONMENT PERMIT

Construction Phase

1. A map showing the location of the proposed injection wells or well field area for which a permit is sought and the applicable area of review. Within the area of review, the map must show the number or name, and location of all producing wells, injection wells, abandoned wells, dry holes, surface bodies of water, springs, public water system, mines (surface and subsurface), quarries, water wells and other pertinent surface features including residences and roads. The map should also show faults, if known or suspected. Only information of public record and pertinent information known to the applicant is required to be included on this map.
2. A tabulation of data on all wells within the area of review which penetrate into the proposed injection zone, confining zone, or proposed monitoring zone. Such data shall include a description of each well's type, construction, date drilled, location, depth, record of plugging and/or completion, and any additional information the Department may require.
3. Maps and cross sections indicating the general vertical and lateral limits within the area of review of all underground sources of drinking water, their position relative to the injection formation and the direction of water movement, where known, in each underground source of drinking water which may be affected by the proposed injection.
4. Maps and cross sections detailing the hydrology and geologic structures of the local area.
5. Generalized maps and cross sections illustrating the regional geologic setting.
6. Proposed operating data:
 - (a) Average and maximum daily rate and volume of the fluid to be injected;
 - (b) Average and maximum injection pressure; and,
 - (c) Source and an analysis of the chemical, physical, radiological and biological characteristics of injection fluids, including any additives.
7. Proposed formation testing program to obtain an analysis of the chemical, physical and radiological characteristics of and other information on the injection zone.
8. Proposed stimulation program.
9. Proposed injection procedure.
10. Engineering drawings of the surface and subsurface construction details of the system.

DEP Form No:	62-528.900(1)
Form Title:	Application to Construct/ Operate/Abandon Class I, III, or V Injection Well Systems
Effective Date:	
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11. Contingency plans to cope with all shut-ins or well failures or catastrophic collapse, so as to protect the quality of the waters of the State as defined in Rule 62-3 and 62-520, F.A.C., including alternate or emergency discharge provisions.
12. Plans (including maps) and proposed monitoring data to be reported for meeting the monitoring requirements in Rule 62-528.425, F.A.C.
13. For wells within the area of review which penetrate the injection zone but are not properly completed or plugged, the corrective action proposed to be taken under Rule 62-528.300(5), F.A.C.
14. Construction procedures including a cementing and casing program, logging procedures, deviation checks, proposed methods for isolating drilling fluids from surficial aquifers, and a drilling, testing and coring program.
15. A certificate that the applicant has ensured, through a performance bond or other appropriate means, the resources necessary to close, plug or abandon the well as required by Rule 62-528.435(9), F.A.C.
16. Expected changes in pressure, native fluid displacement, direction of movement of injection fluid.
17. A proposed monitoring plan, which includes a plan for detecting migration of fluids into underground sources of drinking water, a plan to detect water quality violation in the monitoring wells, and the proposed monitoring data to be submitted.

Operation Phase

1. The following information shall be provided to the Department prior to granting approval for the operation of the well or well field:
 - (a) All available logging and testing program data and construction data on the well or well field;
 - (b) A satisfactory demonstration of mechanical integrity for all new wells pursuant to Rule 62-528.300(6), F.A.C.;
 - (c) The actual operating data, including injection pressure versus pumping rate where feasible, or the anticipated maximum pressure and flow rate at which the permittee will operate, if approved by the Department;
 - (d) The results of the formation testing program;
 - (e) The actual injection procedure; and,
 - (f) The status of corrective action on defective wells in the area of review.

Plugging and abandonment Phase

1. The justification for abandonment.

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2. A proposed plan for plugging and abandonment describing the preferred and alternate methods.
 - (a) The type and number of plugs to be used;
 - (b) The placement of each plug including the elevation of the top and bottom;
 - (c) The type and grade and quantity of cement or any other approved plugging material to be used; and,
 - (d) The method for placement of the plugs.
3. The procedure to be used to meet the requirements of Rule 62-528.435, F.A.C.

F. EXPLORATORY WELL CONSTRUCTION AND TESTING PERMIT

1. Conceptual plan of the injection project. Include number of injection wells, proposed injection zone, nature and volume of injection fluid, and proposed monitoring program.
2. Preliminary Area of Review Study. Include the proposed radius of the area of review with justification for that radius. Provide a map showing the location of the proposed injection well or well field area for which a permit is sought and the applicable area of review. Within the area of review, the map must show the number or name, and location of all producing wells, injection wells, abandoned wells, dry holes, surface bodies of water, springs, public water systems, mines (surface and subsurface), quarries, water wells and other pertinent surface features including residences and roads. The map should also show faults, if known or suspected. Only information of public record and pertinent information known to the applicant is required to be included on this map.
3. Proposed other uses of the exploratory well.
4. Drilling and testing plan for the exploratory well. The drilling plan must specify the proposed drilling program, sampling, coring, and testing procedures.
5. Abandonment Plan.

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G. CLASS V WELL CONSTRUCTION PERMIT

(This form should be used for Class V Wells instead of Form 62-528.900(3), F.A.C., when there is a need for a Technical Advisory Committee and an engineering report.)

1. Type and number of proposed Class V Wells:

- ☐ Wells Receiving Domestic Waste
- ☐ Desalination Process Concentrate Wells (Reverse Osmosis, etc.)
- ☐ Aquifer Storage and Recovery Wells
- ☐ Aquifer Remediation Wells
- ☐ Salt-water Intrusion Barrier Wells
- ☐ Cooling Water Return Flow Wells Open-looped System
- ☐ Subsidence Control Wells
- ☐ Sand Backfill Wells
- ☐ Experimental Technology Wells
- ☐ Wells used to inject spent brine after halogen recovery
- ☐ Radioactive Waste Disposal Wells*
- ☐ Borehole Slurry Mining Wells
- ☐ Other non-hazardous Industrial or Commercial Disposal Wells
- (explain) _____
- 1 Other (explain) Exploratory Well

*Provided the concentrations of the waste do not exceed drinking water standards contained in Chapter 62-550, F.A.C.

2. Project Description:

- (a) Description and use of proposed injection system;
- (b) Nature and volume of injected fluid (the Department may require an analysis including bacteriological analysis) in accordance with Rule 62-528.635(2)(b), F.A.C.; and,
- (c) Proposed pretreatment.

3. Water well contractor's name, title, state license number, address, phone number and signature.

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4. Well Design and Construction Details. (For multi-casing configurations or unusual construction provisions, an elevation drawing of the proposed well should be attached.)

(a) Proposed total depth;

(b) Proposed depth and type of casing(s);

(c) Diameter of well;

(d) Cement type, depth, thickness; and,

(e) Injection pumps (if applicable): _____ gpm @ _____ psi

Controls: _____

5. Water Supply Wells - When required by Rule 62-528.635(1), F.A.C., attach a map section showing the locations of all water supply wells within a one-half (1/2) mile radius of the proposed well. The well depths and casing depths should be included. When required by Rule 62-528.635(2), F.A.C., results of bacteriological examinations of water from all water supply wells within one-half (1/2) mile and drilled to approximate depth of proposed well should be attached.

6. Area of review (When required by Rule 62-528.300(4), F.A.C.)

Include the proposed radius of the area of review with justification for that radius. Provide a map showing the location of the proposed injection well or well field area for which a permit is sought and the applicable area of review. Within the area of review, the map must show the number or name, and location of all producing wells, injection wells, abandoned wells, dry holes, surface bodies of water, springs, public water systems, mines (surface and subsurface), quarries, water wells and other pertinent surface features including residences and roads. The map should also show faults, if known or suspected. Only information of public record and pertinent information known to the applicant is required to be included on this map.

H. CLASS V WELL OPERATION PERMIT

(Final report of the construction that includes the following information may be submitted with the application to operate.)

1. Permit Number of Class V Construction Permit: _____

2. Owner's Name: _____

3. Type of Wells: _____

4. Construction and Testing Summary:

(a) Actual Dimensions:

Diameter		Well Depth		Casing Depth	
	(inches)		(feet)		(feet)

(b) Result of Initial Testing

5. Proposed Operating Data:

- (a) Injection Rate (GPM);
- (b) Description of injected waste; and,
- (c) Injection pressure and pump controls.

6. Proposed Monitoring Plan (if any):

- (a) Number of monitoring wells;
- (b) Depth(s);
- (c) Parameters;
- (d) Frequency of sampling; and,
- (e) Instrumentation (if applicable) Flow _____
Pressure _____

I. CLASS V WELLS PLUGGING AND ABANDONMENT PERMIT

- 1. Permit number of Class V construction or operating permit.
- 2. Type of well.
- 3. Proposed plugging procedures, plans and specifications.
- 4. Reasons for abandonment.

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J. MONITOR WELL PERMIT

This section should be used only when application is made for a monitor well only. If a monitor well is to be constructed under a Class I, III, or V injection well construction permit, it is necessary to fill in this section.

1. A site map showing the location of the proposed monitor wells for which a permit is sought. The map must be to scale and show the number or name, and location of all producing wells, injection wells, abandoned wells, dry holes, water wells and other pertinent surface features including structures and roads.
2. Maps and cross sections indicating the general vertical and lateral limits within the area of review of all underground sources of drinking water, their position relative to the injection formation and the direction of water movement, where known, in each underground source of drinking water which may be affected by the proposed injection.
3. Maps and cross sections detailing the hydrology and geologic structures of the local area.
4. Generalized maps and cross sections illustrating the regional geologic setting.
5. Proposed formation testing program to obtain an analysis of the chemical, physical and radiological characteristics of and other information on the monitor zone(s).
6. Proposed monitoring procedure.
7. Engineering drawings of the surface and subsurface construction details of the monitoring system.
8. Proposed monitoring data to be reported for meeting the monitoring requirements in Rule 62-528.425, F.A.C.
9. Construction procedures including a cementing and casing program, logging procedures, deviation checks, proposed methods for isolating drilling fluids from surficial aquifers, proposed blowout protection (if necessary), and a drilling, testing and coring program

10. Monitor Well Information:

☐ On-site ☒ Multizone ☐ Single-zone

☐ Regional ☐ Other (specify) _____

Proposed Monitoring Interval(s) Approx. 1,400' to 1,420' and 1,850' to 1,870'

Distance and Direction From Associated Injection Well Approximately 75 feet north
of EW-1.

Attachment B

Technical Specifications and Design Drawings

Technical Specification Sections

General Requirements (11 pages)
Mobilization and Cleanup (2 pages)
Surficial Monitor Wells (2 pages)
Water Quality Testing (5 pages)
Drilling (4 pages)
Geophysical Logging (4 pages)
Casing (Mild Steel) (3 pages)
Injection Tubing (FRP) (2 pages)
Grout Seal (3 pages)
Pressure Mechanical Integrity Testing (3 pages)
Inflatable Packer Testing (3 pages)
Core Sampling (2 pages)
Acceptance Criteria (1 page)
Drawing – Well Profiles
Drawing – Exploratory Well Head
Drawing – Dual-Zone Monitor Wellhead and Annular Tank

SECTION 01001

GENERAL REQUIREMENTS

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. The Specifications included in these Contract Documents establish the performance and quality requirements for material and equipment and the minimum standards for the construction and testing of a Class V exploratory well and associated dual-zone monitor well at the Florida Power & Light Company Turkey Point Power Plant eight miles east of Florida City, Florida.
- B. The Project consists of the following: Site preparation including construction of temporary drilling pads, eight surficial monitor wells, mobilization, demobilization and cleanup, construction of one 24-inch diameter Class V exploratory well with tubing and packer design with a total depth of approximately 3,500 feet in depth, one dual-zone monitor well with a total depth of approximately 1,870 feet, reinforced concrete drilling pads, and installation of wellhead piping and appurtenances.
- C. Part 6 – DETAILED CONSTRUCTION SCHEDULE provides separate general construction procedures for the exploratory well and the dual-zone monitor well.

PART 2 – REASONABLY IMPLIED PARTS OF THE WORK SHALL BE DONE ALTHOUGH ABSENT FROM SPECIFICATIONS

2.01 GENERAL

- A. Specific tasks not completely described in these Specifications, that are necessary or normally required as a part of the work described, or that are necessary or required to make each installation satisfactorily or legally operable, shall be performed by the CONTRACTOR as incidental work without extra cost to the OWNER or CONSULTANT, as if fully described in these Specifications. The expense of such work shall be included in the applicable unit or lump sum prices for the work described.

PART 3 – SITE ACCESS

3.01 GENERAL

- A. The OWNER has the responsibility to provide legal access to the drilling site. The CONTRACTOR has the responsibility to provide physical access to the drilling site.

PART 4 – MATERIALS AND WORKMANSHIP

4.01 GENERAL

- A. The CONTRACTOR shall, except as specifically stated in the Contract Documents, provide all labor, materials, equipment, tools, and other facilities and services necessary for proper completion of all work under the Contract Documents.
- B. The CONTRACTOR, in addition to furnishing the services of drillers experienced in the type of formations to be encountered, shall also furnish an adequate number of competent helpers. The drillers shall keep well logs and reports of the drilling, developing, and test-pumping operations. Drillers shall also be capable of making accurate lithologic classifications of the formations and handle representative rock cuttings and water samples as indicated in the DRILLING Section.
- C. The CONTRACTOR shall guarantee that all work will be performed in a workmanlike manner by qualified well drillers, and will conform with these Specifications

4.02 EQUIPMENT

- A. The CONTRACTOR shall furnish capable equipment to construct the well by rotary drilling with conventional mud and reverse-air circulation, as specified in the DRILLING Section. The CONTRACTOR's drilling rigs, tools, equipment, and methods shall be subject to the CONSULTANT's approval.

4.03 COORDINATION

- A. CONTRACTOR shall cooperate in the coordination of its work with the activities of other Contractors on this project in a manner that will provide the least interference with the OWNER's operations and other Contractors and utility companies working the area, and in the interfacing and connection of the separate elements of the overall project work without additional costs to the OWNER.
- B. If any difficulty or dispute should arise in the accomplishment of the above, the problem shall be brought immediately to the attention of the CONSULTANT.

- C. CONTRACTOR's project superintendent shall attend weekly construction coordination meetings to be held at the site during normal working hours when requested by the CONSULTANT. No additional charge shall be made to the OWNER or the CONSULTANT for attendance at such meetings.
- D. All Contractors working on this site are subject to this requirement for cooperation, and all shall abide by the CONSULTANT's decision in resolving project coordination problems.

4.04 PERMITS

- A. Upon Notice of Award, the CONTRACTOR shall acquire all necessary permits with local and state regulatory agencies for the drilling of the exploratory and dual-zone monitor wells, as well as permits for all other related activities.
- B. The following permits have been obtained by the OWNER:
 - 1. Florida Department of Environmental Protection (FDEP) Class V Exploratory Well and Dual-Zone Monitor Well Construction Permit.
- C. A copy of the OWNER secured permit is provided at the end of this document. Bidders are cautioned to read the permit and provide allowances in their Bid necessary to fully comply with regulatory agency requirements for compliance.
- D. Drilling operations shall not commence until all other necessary construction permits have been obtained, submitted to and approved by the CONSULTANT and, when required, approved by the FDEP . CONTRACTOR shall be solely responsible for acquiring other necessary permits. No construction shall be allowed until all permits are obtained or written evidence is submitted to the OWNER demonstrating that the permitting agency has given permission to proceed.

4.05 CONSTRUCTION PHOTOGRAPHS

- A. Provide photographs showing the pre-construction site and the post-construction site. All photographs shall be taken by a professional commercial photographer, equipped to take interior/exterior photographs. Film handling and development shall be done by commercial laboratories. Use 35 mm color film and indicate on the back of each print the date, job title, and brief description of the photographs and location where the photograph was taken. Deliver to CONSULTANT two 3-inch by 5-inch glossy color prints of each exposure, with all negatives. The numbers of exposures listed below shall be as a minimum. CONTRACTOR shall, in all cases, provide a sufficient number of exposures as may be necessary to cover the entire scope of work.
- B. Take a minimum of 72 exposures of the pre-construction site and the property adjacent to the perimeter of the construction site. Particular emphasis shall be

directed to existing structures both inside and outside the site, or as directed by the CONSULTANT.

- C. Take a minimum of 72 exposures of the post-construction site. Particular emphasis shall be directed to new structures and facilities both inside and outside the plant boundary, areas restored by the CONTRACTOR, or as indicated by CONSULTANT.

4.06 SCHEDULING

- A. The CONTRACTOR shall plan the work and carry it out with minimum interference to the OWNER and other Contractors. Prior to starting the work, the CONTRACTOR shall confer with the CONSULTANT and OWNER's representative to develop an approved work schedule which will permit the project to progress as normally as practical. The CONTRACTOR may do certain parts of the construction work outside normal working hours to avoid undesirable conditions.
- B. The CONTRACTOR shall make every effort to schedule testing activities during normal working hours and avoid testing activities on nationally recognized holidays (i.e., Labor Day, Thanksgiving, Christmas, and New Year). Work schedules should reflect these holidays in particular.
- C. The CONTRACTOR shall schedule all work or tests [excluding the radioactive tracer survey (RTS)], which will be attended by representatives of the Florida Department of Environmental Protection (FDEP), from 9:00 AM to 4:00 PM Monday through Thursday. The RTS will be performed on Monday through Thursday beginning by 9:00 AM.

4.07 STANDBY TIME

- A. General:
 - 1. During the progress of the work under these Specifications, it will be necessary for the CONSULTANT to perform work of an experimental nature on the exploratory well and monitor wells that will require the services of the drilling crew and drilling equipment, or work that may require such crew and equipment to standby during normal working hours.
 - 2. During the progress of the work under these Specifications, it will be necessary for the FDEP and the Technical Advisory Committee (TAC) to review and approve submittals before construction of that well continues. The time shall be paid on an hourly basis to a maximum of 12 hours per day at the unit contract price as stated in the Proposal of these Specifications for standby time. During standby, the CONTRACTOR shall keep his staff onsite and available for work at all times.
 - 3. In such an event, the representative of the CONSULTANT shall request the CONTRACTOR to furnish such assistance or to cease operations, and

will state the anticipated extent or duration thereof. The CONTRACTOR shall promptly furnish such assistance or cease operations. The time required for this purpose, as may be thus ordered, shall be recorded on the CONTRACTOR's daily log and the CONSULTANT's daily log. If there are any discrepancies, the time noted on the CONSULTANT's daily log shall prevail. The time shall be paid on an hourly basis at the unit Contract prices as stated in the Proposal of these Specifications for standby time. During standby, the CONTRACTOR shall keep his staff onsite and available for work at all times.

4.08 PROTECTION OF PROPERTY AND ENVIRONMENT

- A. The CONTRACTOR shall take special precautions to reduce to a minimum the nuisances and damages to property. Any damage to public or private property shall be immediately repaired at the CONTRACTOR's sole expense. Equipment, tools, and material shall be located in places where they will produce a minimum of nuisance.
- B. In all cases, the CONTRACTOR will use mud tanks and all the necessary equipment to substitute for a mud pit. A mud pit shall not be used. Drill cuttings and/or drilling mud resulting from any of the operations shall be disposed of by hauling the fluids to a predetermined disposal site provided by the CONTRACTOR. Such site shall be approved in writing by the appropriate state or county agency before the start of construction. No drilling operations shall begin without an approved disposal site for cuttings and drilling fluids. It shall be the CONTRACTOR's sole responsibility to obtain the necessary agency approvals.
- C. The CONTRACTOR shall observe the rules and regulations of the State of Florida and agencies of the United States Government prohibiting the pollution of surface waters by the dumping of any refuse, rubbish, or debris therein.
- D. CONTRACTOR shall not cause nor permit an action to occur which would allow an overflow of drilling fluids or saline waters to escape the confines of the drilling containment pad. The CONTRACTOR shall remain solely responsible for any property damage, remediation costs, or regulatory fines which might result from such occurrence.

PART 5 – DESCRIPTION OF WORK

5.01 CONSTRUCTION SCHEDULE

- A. The construction schedule presented in PART 6, DETAILED CONSTRUCTION SCHEDULE, has been prepared to illustrate the general manner in which the CONSULTANT intends that project activities shall proceed.

- B. Upon award of the Contract and before start of construction, the CONTRACTOR shall prepare and submit to the CONSULTANT for his approval a detailed construction schedule containing anticipated start and completion dates for each of the steps in PART 6, DETAILED CONSTRUCTION SCHEDULE.
- C. Time constraints imposed upon the schedule require that the drilling CONTRACTOR have substantial completion within 270 days of Notice to Proceed.
- D. With each submittal for monthly pay estimate, the CONTRACTOR shall provide a revised construction schedule which reflects construction activities completed to date and anticipated start and completion dates for remaining construction activities.

PART 6 – DETAILED CONSTRUCTION SCHEDULE

6.01 CONSTRUCTION OF EXPLORATORY WELL EW-1

- A. The site preparation, drilling pad construction, and construction and testing of exploratory well EW-1 shall generally proceed as follows:
 - 1. Install temporary power, water service, and CONSULTANT's construction office.
 - 2. Clear and prepare the site, build and stabilize soil for drilling pad.
 - 3. Construct a temporary drilling pad with a minimum 64-inch diameter pit pipe large enough to contain the drilling rig and tanks, and other equipment and materials in accordance with the Drawings. Install four surficial monitor wells in accordance with the SURFICIAL MONITOR WELLS Section and Drawings.
 - 4. Set up drilling equipment at the location of the proposed exploratory well in accordance with the MOBILIZATION AND CLEANUP Section and Drawings.
 - 5. Drill a nominal 12-inch diameter pilot hole using the mud-rotary method to approximately 250 feet in depth in accordance with the DRILLING Section. Perform geophysical logging in accordance with the GEOPHYSICAL LOGGING Section.
 - 6. Ream the pilot hole using the mud-rotary method to a nominal 64-inch diameter to approximately 225 feet in accordance with the DRILLING Section. Perform geophysical logging in accordance with the GEOPHYSICAL LOGGING Section.
 - 7. Provide and install approximately 225 feet of 54-inch diameter casing and cement with ASTM C150, Type II neat cement as directed by the CONSULTANT in accordance with the CASING (MILD STEEL) and GROUT SEAL Sections.
 - 8. Drill out cement plug and drill a nominal 12-inch diameter pilot hole centered at the bottom of the 54-inch casing using standard mud rotary method to approximately 950 feet in depth in accordance with the

DRILLING Section. Conduct geophysical logging in accordance with the GEOPHYSICAL LOGGING Section.

9. Ream the pilot hole to a nominal 54-inch diameter using standard mud rotary method to approximately 925 feet in depth in accordance with the DRILLING Section. Perform geophysical logging in accordance with the GEOPHYSICAL LOGGING Section.
10. Provide and install approximately 925 feet of 44-inch diameter casing and cement with ASTM C150, Type II cement with 4 percent bentonite by weight followed by ASTM C150, Type II neat cement as directed by the CONSULTANT in accordance with the CASING (MILD STEEL) and GROUT SEAL Sections. The quantity of neat cement shall be sufficient to fill the lower 200 feet of the annulus around the 44-inch diameter casing. Cement annulus between 44-inch diameter casing and 54-inch diameter casing with ASTM C150, Type II cement with 12 percent bentonite by weight as directed by the CONSULTANT and in accordance with the GROUT SEAL Section. Perform geophysical logging in accordance with the GEOPHYSICAL LOGGING Section.
11. Drill out cement plug and drill a nominal 12-inch diameter pilot hole centered at the bottom of the 44-inch casing using closed circulation reverse-air drilling method to approximately 1,650 feet in depth in accordance with the DRILLING Section. Collect water samples during reverse-air drilling in accordance with the DRILLING Section. Conduct geophysical logging in accordance with the GEOPHYSICAL LOGGING Section. Perform a minimum of two and up to four inflatable packer tests in the interval from 1,250 to 1,650 feet in depth at test intervals selected by the CONSULTANT in accordance with the INFLATABLE PACKER TESTING Section. Grout pilot hole from the bottom to within 100 feet of the base of the 44-inch diameter casing with Type II cement with 12 percent bentonite by weight as directed by the CONSULTANT, and in accordance with the GROUT SEAL Section.
12. Ream the pilot hole to a nominal 44-inch diameter using closed circulation reverse air drilling method to approximately 1,600 feet in depth in accordance with the DRILLING Section. Perform geophysical logging in accordance with the GEOPHYSICAL LOGGING Section.
13. Provide and install approximately 1,600 feet of 34-inch diameter casing and cement with ASTM C150, Type II cement with 4 percent bentonite by weight followed by ASTM C150, Type II neat cement as directed by the CONSULTANT in accordance with the CASING (MILD STEEL) and GROUT SEAL Sections. The quantity of neat cement shall be sufficient to fill the lower 200 feet of the annulus around the 34-inch diameter casing. Cement annulus between 34-inch diameter casing and 44-inch diameter casing with ASTM C150, Type II cement with 12 percent bentonite by weight as directed by the CONSULTANT and in accordance with the GROUT SEAL Section. Perform geophysical logging in accordance with the GEOPHYSICAL LOGGING Section.
14. Drill a nominal 12-inch diameter hole using open-circulation, reverse-air method centered at the bottom of the 34-inch casing to approximately

3,500 feet in depth. While drilling the pilot hole, perform a minimum of four and up to eight inflatable packer tests in the interval from 1,650 to 2,900 feet in depth as determined by the CONSULTANT in accordance with the INFLATABLE PACKER TESTING Section. While drilling the pilot hole, collect a minimum of six and up to eight 4-inch diameter cores in 10-foot intervals between 1,650 and 2,900 feet in depth at depths selected by the CONSULTANT in accordance with the CORE SAMPLING Section. Collect water samples during reverse-air drilling in accordance with the DRILLING Section. Conduct geophysical logging in accordance with the GEOPHYSICAL LOGGING Section. Install a drillable bridge plug at approximately 2,900 feet in depth and grout pilot hole from approximately 2,900 to within 100 feet of the base of the 34-inch diameter casing with Type II cement with 12 percent bentonite by weight as directed by the CONSULTANT and in accordance with the GROUT SEAL Section.

15. Ream the hole using closed-circulation reverse-air method to a nominal 34-inch diameter to approximately 2,898 feet in accordance with the DRILLING Section. Ream the hole to a nominal 24-inch diameter over the interval from 2,898 to 2,900 feet. Ream the hole to a nominal 22-inch diameter over the interval from 2,900 to 3,500 feet. Perform geophysical logging in accordance with the GEOPHYSICAL LOGGING Section.
16. Provide and install approximately 2,900 feet of 24-inch diameter casing with positive-seal packer outer mandrel and cement with ASTM C150 Type II neat cement as directed by the CONSULTANT in accordance with the CASING (MILD STEEL) and GROUT SEAL Sections. The quantity of neat cement shall be sufficient to fill the lower 200 feet of the annulus around the 24-inch diameter casing. Cement from the top of the neat cement to the base of the 34-inch diameter casing with ASTM C150, Type II cement with 4 percent bentonite cement. Cement annulus between 24-inch diameter casing and 34-inch diameter casing with ASTM C150, Type II cement with 12 percent bentonite by weight as directed by the CONSULTANT and in accordance with the GROUT SEAL Section. Perform geophysical logging in accordance with the GEOPHYSICAL LOGGING Section. Complete cementing 24-inch casing to land surface after performing cement bond log.
17. Purge five well volumes from the exploratory well and provide laboratory services for sampling and analysis of background water quality. Purge water shall be handled as described in Paragraph 3.08 of the DRILLING Section.
18. Conduct a casing pressure test using an inflatable packer at 150 psi for a minimum of one hour in accordance with the PRESSURE MECHANICAL INTEGRITY TEST Section.
19. Demobilize the drilling rig from the well and construct a temporary platform to an elevation of approximately 25 feet NAVD 88.
20. Weld 24-inch and 34-inch diameter casings onto previously installed 24-inch and 34-inch diameter casings to raise the elevation of the top of the

- 24-inch and 34-inch diameter casings to approximately 28 feet NAVD 88.
Cement the annulus between the 24-inch and 34-inch diameter casings.
21. Run a video survey and perform geophysical logging in accordance with the GEOPHYSICAL LOGGING Section.
 22. Install approximately 2,890 feet of 18-inch diameter FRP tubing with positive seal packer inner mandrel in accordance with the FRP manufacturer's recommended procedures. The top of the FRP injection tubing shall be installed to an elevation of approximately 28 feet NAVD.
 23. Conduct annular pressure test in accordance with INJECTION TUBING (FRP) Section and the PRESSURE MECHANICAL INTEGRITY TEST Section.
 24. Construct one permanent 30-foot by 40-foot reinforced concrete pad in accordance with Drawings. This will occur after the elevation of the site has been raised to an elevation of approximately 22 feet NAVD 88.
 25. Provide and install permanent wellhead assembly, piping, instrumentation and control, and related work as depicted on the Drawings.
 26. Demobilize drilling equipment and move to MW-1 location in accordance with the MOBILIZATION AND CLEANUP Section.

6.02 CONSTRUCTION OF MONITOR WELL MW-1

- B. The site preparation, drilling pad construction, and construction and testing of monitor well MW-1 shall generally proceed as follows:
1. Clear and prepare the site and build and stabilize soil subbase for drilling pad.
 2. Construct a temporary drilling pad, with a minimum 44-inch diameter pit pipe, large enough to contain the drilling rig and tanks, and other possible sources of spillage in accordance with the Drawings. Install four surficial monitor wells in accordance with the SURFICIAL MONITOR WELLS Section and Drawings.
 3. Set up drilling equipment at the location of the proposed monitor well in accordance with the MOBILIZATION AND CLEANUP Section and Drawings.
 4. Drill a nominal 12-inch diameter pilot hole using the mud-rotary method to approximately 250 feet in depth in accordance with the DRILLING Section. Perform geophysical logging in accordance with the GEOPHYSICAL LOGGING Section.
 5. Ream the pilot hole using the mud-rotary method to a nominal 44-inch diameter to approximately 225 feet in accordance with the DRILLING Section. Perform geophysical logging in accordance with the GEOPHYSICAL LOGGING Section.
 6. Provide and install approximately 225 feet of 34-inch diameter casing and cement with ASTM C150, Type II neat cement as directed by the CONSULTANT in accordance with the CASING (MILD STEEL) and GROUT SEAL Sections.

7. Drill out cement plug and drill a nominal 12-inch diameter pilot hole centered at the bottom of the 34-inch casing using standard mud rotary method to approximately 950 feet in depth in accordance with the DRILLING Section. Conduct geophysical logging in accordance with the GEOPHYSICAL LOGGING Section.
8. Ream the pilot hole to a nominal 34-inch diameter using standard mud rotary method to approximately 925 feet in depth in accordance with the DRILLING Section. Perform geophysical logging in accordance with the GEOPHYSICAL LOGGING Section.
9. Provide and install approximately 925 feet of 24-inch diameter casing and cement with ASTM C150, Type II cement with 4 percent bentonite by weight followed by ASTM C150, Type II neat cement as directed by the CONSULTANT in accordance with the CASING (MILD STEEL) and GROUT SEAL Sections. The quantity of neat cement shall be sufficient to fill the lower 200 feet of the annulus around the 24-inch diameter casing. Cement annulus between 34-inch diameter casing and 24-inch diameter casing with ASTM C150, Type II cement with 12 percent bentonite by weight as directed by the CONSULTANT and in accordance with the GROUT SEAL Section. Perform geophysical logging in accordance with the GEOPHYSICAL LOGGING Section.
10. Drill out cement plug and drill a nominal 12-inch diameter pilot hole centered at the bottom of the 24-inch casing using closed circulation reverse-air drilling method to approximately 1,900 feet in depth in accordance with the DRILLING Section. Conduct geophysical logging in accordance with the GEOPHYSICAL LOGGING Section. Perform a minimum of 2 and up to 4 inflatable packer tests in the interval from 1,300 to 1,900 feet in depth at test intervals selected by the CONSULTANT in accordance with the INFLATABLE PACKER TESTING Section. Install a drillable bridge plug at approximately 1,850 feet in depth and grout pilot hole from approximately 1,850 to 1,430 feet in depth with Type II cement with 12 percent bentonite by weight as directed by the CONSULTANT and in accordance with the GROUT SEAL Section. Install limestone gravel with a diameter of no greater than 1-inch over the interval from 1,430 to 1,390 feet. Grout the pilot hole from approximately 1,390 to within 100 feet of the base of the 24-inch diameter casing with Type II cement with 12 percent bentonite by weight as directed by the CONSULTANT and in accordance with the GROUT SEAL Section.
11. Ream the pilot hole to a nominal 24-inch diameter using closed circulation reverse air drilling method to approximately 1,400 feet in depth in accordance with the DRILLING Section. Perform geophysical logging in accordance with the GEOPHYSICAL LOGGING Section.
12. Provide and install approximately 1,400 feet of 16-inch diameter casing and cement with ASTM C150, Type II cement with 4 percent bentonite by weight followed by ASTM C150, Type II neat cement as directed by the CONSULTANT in accordance with the CASING (MILD STEEL) and GROUT SEAL Sections. The quantity of neat cement shall be sufficient to fill the lower 200 feet of the annulus around the 16-inch diameter

- casing. Cement annulus between 24-inch diameter casing and 16-inch diameter casing with ASTM C150, Type II cement with 12 percent bentonite by weight as directed by the CONSULTANT and in accordance with the GROUT SEAL Section. Perform geophysical logging in accordance with the GEOPHYSICAL LOGGING Section.
13. Drill a nominal 16-inch diameter hole using open-circulation, reverse-air method centered at the bottom of the 16-inch casing to approximately 1,845 feet in depth.
 14. Drill a 12-inch diameter hole over the interval from 1,845 to 1,870 feet in accordance with the DRILLING Section. Conduct geophysical logging in accordance with the GEOPHYSICAL LOGGING Section.
 15. Demobilize the drilling rig from the well and construct a temporary platform to an elevation of approximately 25 feet NAVD 88.
 16. Weld 16-inch diameter casing onto previously installed 16-inch diameter casing to raise the elevation of the top of the 16-inch diameter casing to approximately 28 feet NAVD 88.
 17. Weld 24-inch diameter casing onto previously installed 24-inch diameter casing to raise the elevation of the top of the 24-inch diameter casing to approximately 28 feet NAVD 88. Cement the annulus between the 16-inch and 24-inch diameter casings.
 18. Provide and install approximately 1,850 feet of 6-5/8-inch diameter FRP casing with California packer and cement with ASTM C150 Type II neat cement the interval from 1,850 to 1,420 feet as directed by the CONSULTANT in accordance with the INJECTION TUBING (FRP) and GROUT SEAL Sections. The top of the FRP tubing shall be installed to an elevation of approximately 28 feet NAVD 88.
 19. A minimum of 96-hours after cementing the FRP tubing, perform a cement bond log on FRP tubing in accordance with the GEOPHYSICAL LOGGING Section.
 20. Conduct a casing pressure test using an inflatable packer at 150 psi for a minimum of one hour in accordance with the PRESSURE MECHANICAL INTEGRITY TEST Section.
 21. Run a video survey and perform geophysical logging in accordance with the GEOPHYSICAL LOGGING Section.
 22. Construct one permanent 10-foot by 10-foot reinforced concrete pad in accordance with Drawings. This will occur after the elevation of the site has been raised to an elevation of approximately 22 feet NAVD 88.
 23. Provide and install permanent wellhead assembly, piping, instrumentation and control as depicted on the Drawings.
 24. Demobilize drilling equipment and cleanup site in accordance with the MOBILIZATION AND CLEANUP Section.

END OF SECTION

MOBILIZATION AND CLEANUP

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. This section covers the Work necessary to move in and move out personnel and equipment, set up and remove drill rigs, locate temporary facilities, install surface casing, and clean up site, complete.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Provide all materials and equipment required to accomplish the Work as specified.

PART 3 - EXECUTION

3.01 GENERAL

- A. Set up well drilling equipment within the designated easement area shown on the Drawings. Accomplish all required Work in accordance with applicable portions of these Specifications. Install temporary drilling pads with pit piping.
- B. The elevation [relative to the North American Vertical Datum of 1988 (NAVD 88)] of each surficial monitor well and the drilling rig floor elevation shall be surveyed by a Florida registered surveyor. The certified survey shall be submitted to the CONSULTANT a minimum of 14 days prior to commencement of drilling operations at the exploratory well and the dual-zone monitor well.
- C. Upon completion of the exploratory well and dual-zone monitor well, the location and elevation of the exploratory well (top of the 24-inch diameter casing) and the dual-zone monitor well (top of the 16-inch diameter casing) shall be surveyed by a Florida registered surveyor. Elevations shall be surveyed relative to NAVD 88 and well locations shall be reported in State Planar Coordinates and latitude and longitude. The certified survey shall be submitted to the CONSULTANT within 14 days of completion of well construction.
- D. Some obstructions may not be shown. Bidders are advised to carefully inspect the existing facilities before preparing their proposals. The removal and replacement of minor obstructions such as electrical conduits, water, waste piping, and similar items shall be anticipated and accomplished, even though not shown or specifically mentioned.

3.02 SECURITY FENCE

- A. CONTRACTOR's security fence may be constructed for the protection of materials, tools, and equipment of the CONTRACTOR and subcontractors. At completion of the Work, remove fence from the site and restore the area.

3.03 CONTAMINATION PRECAUTIONS

- A. Avoid contamination of the project area. Do not dump waste oil, rubbish, or other similar materials on the ground. Cleanup of any contamination by the CONTRACTOR, his employees, or his subcontractors shall be performed by the CONTRACTOR at his sole expense.

3.04 SITE RESTORATION AND CLEANUP

- A. The CONTRACTOR shall at all times during the Work, keep the premises clean and orderly, and upon completion of the Work, repair all damage caused by equipment and leave the project free of rubbish or excess materials of any kind.
- B. Stockpile excavated materials in a manner that will cause the least damage to adjacent lawns, grassed areas, gardens, shrubbery, or fences, regardless of whether these are on OWNER property, private property, or on federal, state, county, or city property or rights-of-way. Remove all excavated materials from grassed and planted areas.
- C. All existing drainage ditches and culverts shall be reopened and graded and natural drainage restored. Restore culverts broken or damaged to their original condition and location.
- D. Where existing trees and shrubs are designated on the Drawings to remain, protect from damage by erecting protective barriers, trimming or pruning, or transplanting temporarily until construction is complete.

END OF SECTION

SURFICIAL MONITOR WELLS

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. These Specifications cover the work necessary for construction of surficial monitor wells. Surficial monitor wells shall be installed at each corner of the exploratory and monitor well drilling pads. The CONTRACTOR may have to plug and abandon the surficial monitor wells at the completion of construction of the exploratory and dual-zone monitor wells. This will be communicated near the completion of the project.
- B. The CONTRACTOR shall furnish all labor, materials, tools, and equipment necessary to drill and complete the wells, including drilling, casing, sealing, gravel pack, and completion of well head, and all other work required to complete the work as specified herein and as shown on the Drawings.

PART 2 - PRODUCTS

2.01 PVC PIPE

- A. PVC pipe shall be the size shown on the Drawings and meet all the requirements of Schedule 40 PVC pipe in ASTM D1785. Slots to be 0.020-inch wide.

2.02 GRAVEL

- A. Gravel for packing around the 2-inch PVC pipe shall be free from roots, trash, and other deleterious material. The material shall be appropriate for use with the designated screen slot size.

2.03 SURFACE COMPLETION

- A. Each well shall be completed with a removable cap and a protective concrete-filled outer casing, which shall be approved by the CONSULTANT. The top of the well casing shall be surveyed relative to NAVD 88.
- B. It is the CONTRACTOR's responsibility to maintain the integrity of each monitor well. Should a monitor well be damaged, the CONTRACTOR shall repair or replace the monitor well immediately and re-survey the top of the well casing relative to NAVD 88.

PART 3 - EXECUTION

3.01 WELL DEVELOPMENT

- A. Following placement of the casing screen assembly and gravel pack, the well shall be developed by airlift pumping. Development shall continue until clean formation water is being produced from the well.
- B. Upon completion of development, install locking cap and permanently label each well as directed by the CONSULTANT.

END OF SECTION

WATER QUALITY TESTING

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. This Section describes the water sampling and water quality testing work to be performed under this Contract.
- B. CONTRACTOR will Contract out and pay for the services of an FDEP certified water laboratory to perform water quality testing as specified within this Contract.
- C. The CONTRACTOR shall provide the name and address of the state certified laboratory that will perform the analyses. The laboratory shall be acceptable to the CONSULTANT and OWNER.
- D. Water samples will be collected by laboratory personnel. FDEP standard operating procedures (SOPs) shall be followed.
- E. All water samples will be transported or shipped to the laboratory immediately upon collection. EPA method sampling protocols (e.g. holding times, preservatives) shall be followed.

PART 2 – PRODUCTS

2.01 WATER QUALITY SAMPLING PARAMETERS

- A. Weekly sampling of the surficial monitor wells
 - 1. Chlorides.
 - 2. Conductivity.
 - 3. Total dissolved solids (TDS) (EPA 160.1 or equal methodology).
 - 4. pH.
 - 5. Temperature.
 - 6. Water level relative to NAVD 88.
- B. At the completion of the pumping portion of each inflatable packer test, as described in INFLATABLE PACKER TESTING Section
 - 1. Chlorides.
 - 2. Conductivity.
 - 3. Total dissolved solids (TDS) (EPA 160.1 or equal methodology).
 - 4. pH.
 - 5. Temperature.
 - 6. TKN
 - 7. Ammonia

- C. Final Background Analysis Upon Completion and Development of Exploratory Well EW-1, as described in the DRILLING Section:
 - 1. Primary and secondary drinking water standards and Municipal Wastewater Minimum Criteria Groundwater Monitoring Parameters (See Table 1 for complete listing).
- D. Final Background Analysis Upon Completion and Development of both monitoring zone of Dual-Zone Monitor Well DZMW-1, as described in the DRILLING Section:
 - 1. Primary and secondary drinking water standards and Municipal Wastewater Minimum Criteria Groundwater Monitoring Parameters (See Table 1 for complete listing).

PART 3 – EXECUTION

3.01 LABORATORY DUTIES

- A. Provide water quality analysis as described in PART 2, PRODUCTS, within 3 working days to allow data to be used during drilling operations.
- B. Perform background water sample collection using properly trained personnel for water samples following development of exploratory and dual-zone monitor wells.
- C. Ensure locking cap and identification label is in place at each surficial monitor well following completion of sampling.
- D. Promptly notify CONSULTANT and CONTRACTOR of any irregularities in sample(s).
- E. Weekly sampling of the surficial monitor wells shall take place the same day of each week selected by the CONSULTANT and the analytical results shall be submitted to the CONSULTANT within four day of collection.
- F. Submit 5 copies of test results immediately after completion of testing. Reports must include:
 - 1. Well identification.
 - 2. Water sample identification.
 - 3. Time and date of sample.
 - 4. Laboratory name/telephone/address/QA-QC contact person.
 - 5. Signature of inspector.
 - 6. Methods of test.
 - 7. Chain-of-custody receipts.

TABLE 1
LIST OF WATER QUALITY PARAMETERS
NEEDED FOR BACKGROUND LEVEL ANALYSIS

PRIMARY DRINKING WATER STANDARDS

PARAMETER

Alachlor (Polychlorinated Biphenyl or PCB)
Aldicarb
Aldicarb sulfoxide
Aldicarb sulfone
Aroclors (Polychlorinated Biphenyls or PCBs)
Alpha, Gross
Antimony
Arsenic
Atrazine
Barium
Benzene
Benzo(a)pyrene
Beryllium
Bis(2-ethylhexyl) adipate (Di(2-ethylhexyl) adipate)
Bis(2-ethylhexyl) phthalate (Di(2-ethylhexyl) phthalate)
Cadmium
Carbofuran
Carbon Tetrachloride (Tetrachloromethane)
Chlordane
Chlorobenzene (Monochlorobenzene)
Chloroethylene (Vinyl Chloride)
Chromium
Coliforms, Total
Cyanide
2,4-D (2,4-Dichlorophenoxyacetic acid)
Dalapon (2,2-Dichloropropionic acid)
Dibromochloropropane (DBCP)
1,2-Dibromoethane (EDB, Ethylene Dibromide)
1,2-Dichlorobenzene (o-Dichlorobenzene)
1,4-Dichlorobenzene (p-Dichlorobenzene or Para Dichlorobenzene)
1,2-Dichloroethane (Ethylene dichloride)
1,1-Dichloroethylene (Vinylidene chloride)
1,2-Dichloroethylene (cis-1,2-Dichloroethylene or trans-1,2-Dichloroethylene)
cis-1,2-Dichloroethylene (1,2-Dichloroethylene)
trans-1,2-Dichloroethylene (1,2-Dichloroethylene)
Dichloromethane (Methylene chloride)
1,2-Dichloropropane
Di(2-ethylhexyl) adipate (Bis(2-ethylhexyl) adipate)
Di(2-ethylhexyl) phthalate (Bis(2-ethylhexyl) phthalate)
Dinoseb
Diquat
EDB (Ethylene dibromide, 1,2-Dibromoethane)
Endothall
Endrin
Ethylbenzene
Ethylene dichloride (1,2-Dichloroethane)
Fluoride
Glyphosate (Roundup)
Gross Alpha
Heptachlor
Heptachlor Epoxide
Hexachlorobenzene (HCB)
gamma-Hexachlorocyclohexane (Lindane)
Hexachlorocyclopentadiene
Lead

PRIMARY DRINKING WATER STANDARDS, CONT'D

PARAMETER

Lindane (gamma-Hexachlorocyclohexane)
Mercury
Methoxychlor
Methylene chloride (Dichloromethane)
Monochlorobenzene (Chlorobenzene)
Nickel
Nitrate (as N)
Nitrite (as N)
Total Nitrate + Nitrite (as N)
Oxamyl
p-Dichlorobenzene or Para Dichlorobenzene (1,4-Dichlorobenzene)
Pentachlorophenol
Perchloroethylene (Tetrachloroethylene)
Picloram
Polychlorinated biphenyl (PCB or Aroclors)
Radium
Roundup (Glyphosate)
Selenium
Silver
Silvex (2,4,5-TP)
Simazine
Sodium
Styrene (Vinyl benzene)
Tetrachloroethylene (Perchloroethylene)
Tetrachloromethane (Carbon Tetrachloride)
Thallium
Toluene
Toxaphene
2,4,5-TP (Silvex)
1,2,4-Trichlorobenzene
1,1,1-Trichloroethane
1,1,2-Trichloroethane
Trichloroethylene (Trichloroethene, TCE)
Trihalomethanes, Total
Vinyl Chloride (Chloroethylene)
Xylenes (total)

SECONDARY DRINKING WATER STANDARDS

PARAMETER

Aluminum
Chloride
Color
Copper
Ethylbenzene
Fluoride
Foaming Agents (MBAS)
Iron
Manganese
Odor
pH
Silver
Sulfate
Toluene
Total Dissolved Solids (TDS)
Xylenes
Zinc

**MUNICIPAL WASTEWATER MINIMUM CRITERIA
GROUND WATER MONITORING PARAMETERS**

INORGANICS

Ammonia
Nitrogen (organic)
Total Kjeldahl Nitrogen
Total Phosphorus (phosphate)

VOLATILE ORGANICS

Chloroethane
Chloroform
para-Dichlorobenzene (1,4 Dichlorobenzene)
1,2-Dichloroethylene (cis-1,2-Dichloroethylene or trans-1,2-Dichloroethylene)

BASE/NEUTRAL ORGANICS

Anthracene
Butylbenzylphthalate
Dimethylphthalate
Naphalene
Phenanthrene

PESTICIDES AND PCBs

Aldrin
Dieldrin

ACID EXTRACTABLES

2-chlorophenol
Phenol
2,4,6-trichlorophenol

OTHER

Conductivity
Biological Oxygen Demand
Chemical Oxygen Demand
Temperature

END OF SECTION

DRILLING

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. This section covers the work, materials, and equipment necessary for pilot-hole and reamed hole drilling, complete.

PART 2 - PRODUCTS

2.01 GENERAL

- A. All equipment shall be in good working condition prior to use in the work. Operate and maintain equipment in conformance with manufacturer's recommendations.

2.02 DRILLING EQUIPMENT

- A. Provide commercially available mud rotary and closed circulation reverse-air rotary drilling rigs capable of completing the wells as shown on the attached well construction drawings.
- B. Provide all tools, bits, and all other necessary equipment for drilling.

2.03 DRILLING FLUID

- A. Provide all drilling fluids, water, and additives as required. Review fluids and additives with the CONSULTANT prior to drilling. Additives and fluids are subject to approval by the CONSULTANT and regulatory agencies.

2.04 TEST AND SAMPLING EQUIPMENT

- A. Provide equipment for measuring drilling fluid properties.
- B. Provide sampling bags.
- C. Provide water sample containers.

PART 3 - EXECUTION

3.01 DRILLING

- A. Notify the CONSULTANT 10 days (Saturdays, Sundays, and holidays excepted) prior to drilling.

- B. Provide at all times a thoroughly experienced, competent, and licensed driller during all operations at the drill site.
- C. The well are to be of the type and characteristics described in the CONSTRUCTION PROCEDURES and on the Drawings. The exact depth of wells and length of casings are to be determined in the field in accordance with information obtained in each site from the corresponding pilot hole or from actual drilling operations.
- D. The well shall be drilled by the closed-circulation, mud-rotary method from land surface to the top of the Floridan Aquifer, which is anticipated to be located at a depth of approximately 925 feet below land surface. Reverse-air closed circulation shall be used below the top of the Floridan Aquifer.
- E. Following completion of each pilot hole, prepare the borehole for geophysical logging, packer testing, and coring as required in the DETAILED CONSTRUCTION SCHEDULE. Borehole preparation shall include, but not be limited to: (1) continuation of circulation until drill cuttings have been removed from the borehole and (2) circulation of the drilling mud in the borehole until it is uniform and the drill pipe has been removed from the borehole. The CONTRACTOR must make all reasonable efforts to leave the borehole free from obstruction in preparation for geophysical logging.
- F. All pilot holes below approximately 925 feet in depth, with the exception of the injection zone interval, shall be grouted from bottom to within 150 feet of the base of the previously installed casing before reaming begins. The cost of providing and installing grout during pilot hole backplugging shall be included in the cost of reaming.
- G. Drill the boreholes of the dimensions and at the location shown on the attached well construction Drawings. It is the responsibility of the CONTRACTOR to ensure that the wells are constructed at the precise location indicated on the Drawings.
- H. The boreholes shall be drilled so as to permit the installation of the casing straight and plumb to the tolerances specified in the CASING (MILD STEEL) Section.
- I. Use only drilling fluids and additives specifically recommended by the manufacturer for use in water well drilling. Avoid contamination of the samples or the aquifer. Do not introduce muds, clays, or drilling aids into the wells or use lime, cement, organic matter, or other material to stop circulation losses of the drilling fluid, without reviewing the proposed program with the CONSULTANT.
- J. Whenever drilling at a depth of artesian flow, the CONTRACTOR shall provide for all the tools, piping, equipment, and operations necessary to prevent the uncontrolled artesian flow of water. A blowoff prevention method, such as a

stripping head, capable of controlling artesian flow is required while drilling or testing below a depth of 925 feet.

- K. It is the intent of this Contract that no drilling fluids or waters developed during construction be allowed to escape the confines of the drilling pad.

3.02 ALIGNMENT REQUIREMENTS

- A. Pilot holes and reamed holes shall be drilled round and straight throughout.
- B. A mechanical drift indicator shall be run in pilot holes and reamed holes at intervals not greater than 90 feet. Tool scale shall clearly delineate 10 minutes or less. Any deviation in plumbness greater than 45 minutes of 1 degree shall be corrected by the CONTRACTOR at his own expense.

3.03 COMPLIANCE WITH GOVERNMENTAL REGULATIONS

- A. Construct the wells in strict conformance with all laws, rules, regulations, and standards related to the construction of wells in the State of Florida, and in Miami-Dade County.

3.04 FORMATION SAMPLES

- A. Two sets of representative formation samples shall be collected while drilling the pilot hole between 10 feet below the ground surface to the full depth of the wells. Samples shall be taken every 10 feet and each change in formation or material type. The method must yield samples that are representative of the actual depth to which drilling has progressed.
- B. Formation samples shall be collected and handled in accordance with formation sampling methods contained in "Groundwater and Wells", second edition, published by Johnson Division.
- C. One set of samples shall be kept in cloth bags which will be secured by the Contractor from the Florida Geological Survey, 903 West Tennessee Street, Tallahassee, Florida 32304. After being put in their containers, they shall be properly labeled and one set delivered by the CONTRACTOR to the Florida Geological Survey upon completion of each well.
- D. The CONTRACTOR shall submit the second set of samples, also collected in cloth bags to the CONSULTANT.

3.05 PROTECTION OF WATER QUALITY

- A. Take all necessary precautions to prevent brackish water, saltwater, diesel fuel, gasoline, or other deleterious substances from entering the wells, either through

the opening or by seepage through the ground surface. Maintain precautions during and after construction of the wells until accepted by the OWNER.

3.06 DRILLING AND WELL LOGS

- A. Furnish the CONSULTANT with a daily drilling log. The log shall accurately describe depths of lost circulation zones; drilled intervals; time, depth, and description of any unusual occurrences or problems during drilling; and diameters and lengths of casing installed. Keep the log up-to-date with the progress of drilling. Keep a copy at the drill site for inspection by the CONSULTANT.
- B. File all records and reports with the proper agencies required by federal, state, and local codes or regulations.

3.07 DISPOSAL OF CUTTINGS

- A. Remove from the drill site all cuttings, water, or other material removed by drilling operations which are not required to complete the work unless directed otherwise by the OWNER. Solid materials shall be disposed of in accordance with local and state regulations in a sound environmental manner that avoids violation of surface and groundwater quality standards. Approval of such a disposal site shall be secured in writing by the CONTRACTOR, submitted to the CONSULTANT and OWNER and approved by FDEP before start of construction.

3.08 DRILLING FLUID AND SALTWATER DISPOSAL

- A. No discharge of drilling fluid or saltwater will be allowed at the drilling site.
- B. The CONTRACTOR shall be responsible for providing, installing, and maintaining all necessary tank trucks, pipe, pumps, and equipment necessary to pump and haul excess pad drainage, drilling fluid, and pumped water to a predetermined disposal site, in accordance with federal, state, and local regulations.

END OF SECTION

GEOPHYSICAL LOGGING

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. This section covers the work, materials, and equipment necessary for geophysical logging of the borehole, complete.

PART 2 - PRODUCTS

2.01 GENERAL

- A. CONTRACTOR will provide continuous-recording geophysical logging equipment capable of running:
 - 1. Spontaneous potential.
 - 2. Gamma ray.
 - 3. Caliper.
 - 4. Temperature.
 - 5. Fluid resistivity.
 - 6. Flowmeter.
 - 7. Borehole compensated sonic log.
 - 8. Cement bond log.
 - 9. Color video survey (with rotating head).
 - 10. Casing Collar Locator (CCL).
 - 11. Dual induction log.
 - 12. Borehole Televiewer.
- B. A schedule of geophysical logs anticipated for this project is presented at the end of this section.

PART 3 - EXECUTION

3.01 GENERAL

- A. The open hole intervals shall be prepared for logging by circulating all drill cuttings from the hole and conditioning the drilling fluid until uniform and properly weighted to prevent the well from flowing and/or the formation from collapsing into the hole. Logging shall be done as soon as possible after drilling and preparation of the hole.
- B. The CONTRACTOR shall be responsible for keeping the borehole open and free of obstructions during geophysical logging, and shall remove any obstruction to the logging tools at his own expense. In the event the logging tools do not reach within 20 feet of the bottom of the hole as measured with the drill pipe, the

CONTRACTOR shall clean the hole to the original drilled depth at his own expense. The logs shall be rerun at the CONTRACTOR's expense. Standby time necessary to rerun the logs shall not be paid.

- C. Geophysical logs are to be run on the most sensitive scale available which is consistent with a minimum of off-scale deflection.
- D. Dual induction, sonic, and caliper logs will be reproduced using scales of 1-inch equals 100 feet; 2 inches equals 100 feet; and 5 inches equals 100 feet.
- E. All logs shall be clearly labeled with all pertinent information regarding the well, location, depths, scales, etc. Repeat sections shall be run to verify logging tool performance on all logs. Provide six field copies at the time of logging and 20 report quality copies and one reproducible original within 7 days of logging. Logs shall also be submitted electronically in ASCII format.
- F. Video surveys of the borehole shall be recorded on digital video compact disc. The video quality must be acceptable to the CONSULTANT. Flushing with water may be necessary to obtain a clear video. CONTRACTOR shall furnish the OWNER with the master video survey of all runs and 15 copies of the video survey of the completed exploratory well and monitor well.
- G. All temperature logs (except for mechanical integrity) shall be run within 48 hours after cementing. The cost of performing temperature logs following cementing operations shall be included with casing installation.
- H. The CONTRACTOR shall provide and operate pumps capable of adequately stressing the aquifer during dynamic logs (e.g., flow meter, temperature, fluid conductivity). Dynamic logs shall be performed in stages, if necessary, to insure that the lower parts of the borehole are adequately stressed and yield meaningful data, as determined by the CONSULTANT.
- I. The CONTRACTOR shall repeat the television survey at his own cost if water quality is inadequate or the borehole is not properly conditioned, as evaluated by the CONSULTANT.
- J. The CONTRACTOR shall assist the CONSULTANT during geophysical logging and data collection and interpretation, as needed. The assistance will include the preparation of composite geophysical logs and sonic porosity versus apparent fluid resistivity (Rwa) plots.

Geophysical Logging Schedule for Exploratory Well EW-1	
Pilot and Reamed Hole all Drilling Intervals	90-Foot Intervals Single Shot Drift Surveys
12" Pilot Hole 0' – 250'	Caliper and Gamma Ray
64" Reamed Hole 0' – 225'	Caliper and Gamma Ray
12" Pilot Hole 250' – 950'	Dual Induction and Spontaneous Potential Caliper and Gamma Ray
54" Reamed Hole 225' – 925'	Caliper and Gamma Ray
44" Casing Cement	Temperature (all stages not reaching surface)
12" Pilot Hole 950' – 1,650'	Dual Induction and Spontaneous Potential Caliper and Gamma Ray Sonic and Flowmeter* Fluid Conductivity* and Temperature*
44" Reamed Hole 950' – 1,600'	Caliper and Gamma Ray
34" Casing Cement	Temperature (all stages)
12" Pilot Hole 1,650' – 3,500'	Dual Induction and Spontaneous Potential Caliper and Gamma Ray Sonic and Flowmeter* Fluid Conductivity* and Temperature* Video and Borehole Televiewer
Final Reamed Hole 1,600' – 3,500'	Caliper and Gamma Ray
24" Casing Cement	Temperature (all stages)
24" Casing	Cement Bond Log and Video
Completed Well	Temperature and Video

*Shall be performed under both static and pumping conditions.

Geophysical Logging Schedule for Dual-Zone Monitor Well DZMW-1	
Pilot and Reamed Hole all Drilling Intervals	90-Foot Intervals Single Shot Drift Surveys
12" Pilot Hole 0' – 250'	Caliper and Gamma Ray
44" Reamed Hole 0' – 225'	Caliper and Gamma Ray
12" Pilot Hole 250' – 950'	Dual Induction and Spontaneous Potential Caliper and Gamma Ray
34" Reamed Hole 225' – 925'	Caliper and Gamma Ray
24" Casing Cement	Temperature (all stages not reaching surface)
12" Pilot Hole 950' – 1,900'	Dual Induction and Spontaneous Potential Caliper and Gamma Ray Sonic and Flowmeter* Fluid Conductivity* and Temperature*
24" Reamed Hole 925' – 1,400'	Caliper and Gamma Ray
16" Casing Cement	Temperature (all stages)
16"/12" Pilot Hole 1,400' – 1,870'	Caliper and Gamma Ray
6-5/8" Casing Cement	Temperature (all stages)
6-5/8" Casing	Cement Bond Log
Completed Well	Video

END OF SECTION

CASING (MILD STEEL)

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. This section covers the work, materials, and equipment necessary for furnishing, and installing well casing, complete.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Provide all materials and equipment necessary for joining and installing the casing as specified.

2.02 WELL CASING

- A. All casing shall be new and unused carbon steel pipe, and shall conform with the latest revision of ASTM 139, Grade B. The final casing string of the exploratory well AND 16-inch diameter casing of the monitor well shall be seamless and shall conform to ASTM A53, and/or API 5L Grade B latest revision. Ends of plain end pipe shall be perfectly square and shall be furnished beveled for field V-notch butt welding.
- B. CONTRACTOR shall furnish three copies of the mill certificates to the CONSULTANT for approval before delivering pipe to jobsite. All pipe shall be clearly labeled with manufacturer's heat numbers, which will be reviewed by both the CONTRACTOR and the CONSULTANT upon delivery.
- C. Casing shall be as follows:

Diameter (Inches) (ID/OD)	Wall Thickness (Inches)	Weight (Pounds/Ft)	Approximate Total Length (Feet)
15.00/16.00	0.500	82.86	1,400
23.00/24.00	0.500	125.49	2,900
23.25/24.00	0.375	94.70	925
33.25/34.00	0.375	134.67	1,825
43.25/44.00	0.375	174.72	925
53.25/54.00	0.375	214.99	225

- B. Steel casings shall be equal to those manufactured by Bethlehem Steel Company, National Tube Division of the U.S. Steel Company, or equivalent. Casings shall be furnished uncoated, except that ends may be coated for protection.

2.03 FITTINGS

- A. Provide all fittings, drive shoes, and centering guides as shown on the attached well construction drawing or as necessary to complete the wells.
- B. All casing centralizers shall be manufactured by a service company acceptable to the CONSULTANT. The CONTRACTOR may propose fabrication of centralizers in the field provided they are constructed of exactly the same carbon steel as the casings. All centralizers shall provide at least 3-1/2 inches of clearance around the casing.
- C. Alternative centralizer locations to those indicated below may be used with prior approval from the CONSULTANT based on results of the caliper log.
- D. Casing centralizers spaced 90 degrees around the casing as follows:
 - 1. One at 5 feet above the bottom end.
 - 2. One at 50 feet above the bottom end.
 - 3. One at 100 feet above the bottom end.
 - 4. One at every 200 feet thereafter to nearest 200 feet from ground surface.

2.04 INJECTION WELL PACKER

- A. CONTRACTOR shall furnish and install an injection tubing packer. The injection tubing packer shall be a retrievable positive seal packer, such as the Youngquist Brothers, Inc. (YBI packer), or an equivalent design approved by the CONSULTANT.
- B. A minimum of two coats of coal tar epoxy, or other coating approved by the CONSULTANT, shall be applied on all surfaces of the packer assembly except for the contact surface.

PART 3 - EXECUTION

3.01 GENERAL

- A. Casing lengths shall be joined watertight by welding, so that the resulting joint shall have the same structural integrity as the casing itself.
- B. The standards of the American Welding Society shall apply for all welded joint casing and accessories. All welds shall conform to the latest revision of ANSI B31.1.
- C. Casing which fails, collapses, or separates during construction shall be removed from the hole and repaired or replaced at CONTRACTOR's sole expense.

Positive internal pressure shall be maintained inside the casings during cementing operations and until the cement has set.

- D. Casings shall be installed and cemented in place to within 0.5 degrees of vertical.

3.02 WELDING PERFORMANCE QUALIFICATIONS

- A. All welders and welding operators shall be certified at the Contractor's sole expense by a qualified testing laboratory before performing any welding under this section. Qualification tests shall be in accordance with Section IX, Article III of the ASME Boiler and Pressure Vessel Code. Welders and operators shall be qualified for making groove welds in carbon steel and stainless steel pipe in positions 2G and 5G for each welding process to be used.

3.03 END PREPARATION

- A. Pipe ends shall be prepared preferably by machine shaping. Beveled ends for butt welding shall conform to ANSI B16.25.

3.04 CLEANING

- A. Surfaces shall be clean and free of paint, oil, rust, scale, slag, or other material detrimental to welding.

3.05 ALIGNMENT AND SPACING

- A. Align ends to be joined within existing commercial tolerances on diameters, wall thicknesses, and out-of-roundness.
- B. The shielded metal-arc, flux core arc welding, or gas metal arc welding process shall be used for all carbon steel field welding.
- C. No welding shall be performed if there is impingement of any rain, or high wind on the weld area or if the ambient temperature is below 32 degrees F. If the ambient is less than 32 degrees F, local preheating to a temperature warm to the hand is required.
- D. Each layer of deposited weld metal shall be thoroughly cleaned prior to the deposition of each additional layer of weld metal, including the final pass, with a power-driven wire brush. Surface defects which will affect the soundness of weld shall be chipped out or ground out.
- E. There shall be a minimum of three weld passes on pipe sizes 6 inches and larger.

END OF SECTION

INJECTION TUBING (FRP)

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. This Section covers the work, materials, and equipment necessary for furnishing, and installing the exploratory and monitor well FRP tubing complete.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Tubing material for the exploratory well and monitor shall be FRP.
- B. Provide all materials and equipment necessary for joining and installing the tubing as specified.

2.02 FRP

- A. The tubing for the exploratory well shall be new and unused fiberglass reinforced thermosetting aromatic amine cured epoxy resin casing, and shall conform with the latest revision of ASTM D2996 and D2310. The tubing shall be produced by the filament-winding method. The tubing shall be joined using tubing couplings manufactured by the FRP tubing manufacturer specifically for use with the specified diameter and have API 6-round short threaded connections. Tubing internal pressure rating shall be 1,250 psi or higher.
- B. The final casing for the dual-zone monitor well shall be new and unused fiberglass reinforced thermosetting aromatic amine cured epoxy resin casing, and shall conform with the latest revision of ASTM D2996 and D2310. The casing shall be produced by the filament-winding method. The casing shall have integral joints with API 8-round short threaded connections. Pin ends shall be lathe cut while box ends are wound-in contiguous with the pipe body. Casing internal pressure rating shall be 1,250 psi or higher.
- C. Tubing shall be equal in performance to that manufactured by Tubular Fiberglass Corporation, Houston, TX. Tubing weight, dimensions, and performance ratings shall be as follows:

Nominal Size (in)	Nominal OD (in)	Minimum ID (in)	Wall Thickness (in)	Maximum Box/Coupling OD (in)	Nominal Weight (lb/ft)	Approx. Length (ft)
18	18.11	16.50	0.76	22.30	46.7	2,890
6-5/8	5.97	5.33	0.27	7.98	4.8	1,850

2.03 FITTINGS

- A. Provide all fittings, drive shoes, and centering guides as shown on the attached well construction drawing or as necessary to complete the well.
- B. Tubing centralizers spaced 90 degrees around the 6-5/8 inch diameter casing as follows:
 - 1. One at 25 feet above the bottom end.
 - 2. One at 50 feet above the bottom end.
 - 3. One at 100 feet above the bottom end.
 - 4. One at every 100 feet thereafter to nearest 100 feet from ground surface.
- C. FRP tubing couplings for the exploratory well tubing shall be manufactured by the same method used for FRP tubing and by the same manufacturer that produces the FRP casing.

PART 3 - EXECUTION

3.01 GENERAL

- A. All casing and tubing shall be installed by a method appropriate for the well, as selected by the CONTRACTOR.
- B. Casings and tubings which fail, collapses, or separates during construction shall be removed from the hole and repaired or replaced at the CONTRACTOR'S sole expense
- C. All fiberglass casing shall be installed by or under the supervision of representatives of the manufacturer unless the CONTRACTOR can document to the satisfaction of the CONSULTANT successful experience in installing pressure-tight fiberglass casing in injection well systems. Accurate documentation of torque operations for every joint shall be provided to the CONSULTANT.
- D. All FRP tubing connections shall be made using calibrated power tongs and screwed together per the torque recommendations of the FRP manufacturer.

END OF SECTION

GROUT SEAL

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. This section covers the work, materials, and equipment necessary for furnishing, and installing the grout seal, complete.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Provide all grout and the materials and equipment necessary for placement of the grout as specified.

2.02 PORTLAND CEMENT

- A. Conform to ASTM C 150, Type II.

2.03 BENTONITE AND OTHER ADDITIVES

- A. Furnish all bentonite required for cementing in the proportions specified.

2.04 MIXING WATER

- A. An adequate and safe water supply for cementing will be the CONTRACTOR's responsibility.

PART 3 - EXECUTION

3.01 NEAT CEMENT GROUT

- A. Portion one sack of cement to not more than 5.8 gallons of water. All grout shall have zero percent free water when pumped.

3.02 ADDITIVES

- A. The use of special cements, bentonite, or other admixtures (ASTM C494) to reduce permeability, increase fluidity or yield, and/or control set time, and the composition of the resultant slurry shall be approved by the CONSULTANT prior to their use. Only bentonite will be considered as cement additives when cementing steel casings. Calcium chloride and bentonite may be used during pilot hole back plugging.

3.03 PLACING

- A. Cementing of casing shall be accomplished in the presence of the CONSULTANT, filling completely the annular space between hole and casing from the bottom of the casing or the top of the previous cement stage, to the level shown on the Drawings.
- B. Cementing of casing shall be accomplished using a tremie pipe set no more than 5 feet above the bottom of the hole or level of the previous stage. The cement grout must completely fill annular space to the level instructed by the CONSULTANT. Gravel may be used to fill cavernous zones if fill-up when attempting to cement through such zones is less than 20% of theoretical fill-up. Gravel lifts shall not exceed 30 feet prior to pumping additional cement.
- C. Cementing of the pilot holes shall be accomplished using a tremie pipe set no more than 5 feet above the bottom of the pilot hole or level of the previous stage. The cement grout must completely fill the pilot hole to the level instructed by the CONSULTANT. Up to 3% calcium chloride may be added to the mixture when cementing pilot holes. Gravel may be used to fill cavernous zones if fill-up when attempting to cement through such zones is less than 20% of theoretical fill-up. Gravel lifts shall not exceed 30 feet prior to pumping additional cement.
- D. The method used shall be optional with the CONTRACTOR among those described in Section A1-8.4 "Grouting of Annular Space Surrounding Protective Casing," AWWA Standard for Deep Wells (AWWA A100-66), and provided there is no conflict with requirements of these Specifications.
- E. The method of grout placement shall be reviewed by the CONSULTANT. No method shall be permitted that does not force grout from the bottom of the space to be grouted to the surface. The grouting shall be done continuously and in such a manner as will ensure the entire filling of the annular space around the casing.
- F. Casings shall be cemented with grout pipes with an inside diameter of not less than 1.0 inch. Grout pipes shall be withdrawn as the annulus is filled, and before the cement has begun to set. Grout pipe shall be set not more than 5 feet above the top of the previous cement stage tagged.
- G. A temperature log shall not be required for cement stages emplaced entirely within the surface casing (above 200 feet below land surface) or for which the top of cement is tagged within 20 feet of land surface.
- H. The top of cement shall be tagged with collarless tremie pipe prior to pumping cement except for the first cement stage of each casing and cement stages that have reached surface.
- I. When casings are being set and cemented in place, it is the CONTRACTOR's responsibility to insure that these operations are conducted in such a manner that

the casing collapse and burst strengths (with safety factor) are not exceeded and the casing is not caused to fail. Cement shall be pumped or placed so that excessive pressures will not result and affect the cement-casing bond.

- J. The CONTRACTOR shall be solely responsible for any defect in the cementing work due to improper, or lack of, equipment, technology, personnel or experience, either of CONTRACTOR or of any of his subcontractors. CONTRACTOR shall pay all costs necessary to correct such defects. Should CONTRACTOR fail to correct defects, the OWNER may refuse to accept the well.

3.04 DRILLABLE BRIDGE PLUG

- A. The CONTRACTOR shall furnish equipment and personnel to install a commercial drillable bridge plug as approved by the CONSULTANT or may construct a bridge plug in place using cuttings and a lift of at least 10 feet of Portland ASTM C150, Type II neat cement.
- B. The CONTRACTOR shall backfill open borehole sections as necessary prior to the installation of casing. Gravel shall be placed by the tremie method. The CONSULTANT must approve gravel installation method prior to installing gravel.

3.05 SETTING TIME

- A. No drilling operations will be permitted until the grout has cured.
- B. Minimum setting time between stages will be at least 8 hours. Longer time may be necessary if high yield cement is used. After cementing is completed on a casing, casing and well must remain undisturbed for at least 24 hours for setting of the cement.

END OF SECTION

PRESSURE MECHANICAL INTEGRITY TESTING

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. This section covers the work necessary to perform casing and annular pressure testing of EW-1 and DZMW-1.
- B. Pressure tests must begin during daylight hours Monday through Friday.

PART 2 - PRODUCTS

2.01 PACKER

- A. The packer shall be of a diameter appropriate for completely sealing the casing to be pressure tested. The packer shall seal tightly against the casing walls to effectively isolate the well casing from the open hole below the casing.
- B. The packer shall be run on drill pipe.

2.02 PUMPING EQUIPMENT

Furnish pumping equipment of sufficient size and capacity to pressurize the test interval to a pressure of 150 psi.

2.03 PRESSURE TEST SETUP

- A. Furnish pressure pack-off device sufficient to seal the drill pipe and wellhead prior to running of the casing pressure test with no leaks.
- B. CONTRACTOR shall furnish a calibrated pressure gauge for pressure test. Furnish pressure gauge calibration certification demonstrating the gauge has been calibrated within the previous 90 days. The gauge supplied shall have a calibrated range from 0.0 to 200 psi in 1 psi increments with an accuracy of plus or minus 0.50 percent.
- C. Annular pressuring testing shall be performed after filling the annular space with Baracor 100 solution and sealing the annular space at surface as indicated in the Design Drawings.

PART 3 - EXECUTION

3.01 PACKER INSTALLATION

- A. The packer shall be installed in the well casing to a location of not less 10 feet above the outer mandrel of the YBI positive-seal packer and not more than 30 feet above the outer mandrel of IW-1 final casing pressure test.

- B. The packer shall be installed below the lowermost casing joint for the packer pressure test performed on the 16-inch and 6-5/8-inch diameter casings of DZMW-1.
- C. The packer shall be inflated at a pressure such that the well casing is not damaged and an effective hydraulic seal is obtained. Consideration of the construction details of the well shall be made to prevent damage to the well.
- D. A preliminary pressure test shall be conducted prior to performing the final pressure test for the regulatory agency.
- E. The CONTRACTOR shall notify the CONSULTANT of the anticipated start time of the final pressure test at least 72 hours in advance. The CONSULTANT will coordinate the testing schedule with the FDEP. The CONTRACTOR shall not be entitled to compensation for standby time if less than 72 hours advance notice is given to the CONSULTANT.

3.02 PRESSURE TEST 24-INCH CASING OF EW-1 16-INCH AND 6-INCH CASINGS OF DZMW-1.

- A. Install wellhead, packer, CONTRACTOR's pressure gauge and pumping equipment such that no surface leaks exist and such that pressure gauge can be monitored for a 1-hour pressure test.
- B. Completely fill well and all equipment lines with water and pressure casing to approximately 160 to 170 psi. Allow 10 minutes for any trapped air to accumulate at the top of the wellhead. Bleed off all air in the system. Begin 60 minute monitoring period with a minimum casing pressure of 150 psi. The casing shall be tested for at least 60 minutes with no greater than plus or minus 5.0 percent pressure gain or loss. The volume of water discharged from the casing shall be accurately measured when releasing the pressure from the casing. If a plus or minus 5.0 percent pressure gain or loss can not be maintained the following shall be done:
 - 1. If the pressure decrease is due to a surface leak in the equipment installed by the CONTRACTOR, the CONTRACTOR shall repair the leak at his own expense and rerun the pressure test at no cost to the OWNER.
 - 2. If the pressure increase or decrease is due to conditions in the well and the CONTRACTOR has demonstrated that the packer has mechanically seated at the bottom of the casing, the CONTRACTOR shall reseal the packer and/or perform the pressure test when conditions in the well become stable. No additional payment shall be made for pressure test setup.

3. If the pressure decrease is due to the packer not having an adequate hydraulic seal, then the CONTRACTOR shall be required to reseal the packer and rerun the pressure test at his own expense.

3.03 ANNULAR PRESSURE TEST OF EW-1

- A. Install CONTRACTOR's pressure gauge and pumping equipment such that no surface leaks exist and such that pressure gauge can be monitored for a 1-hour pressure test.
- B. Completely fill well annulus and all equipment lines with water and pressure annulus to 150 psi. The annular space shall be tested for at least 60 minutes with no greater than plus or minus 5.0 percent pressure gain or loss. The volume of water discharged from the annulus shall be accurately measured when releasing the pressure from the annulus. If 150 psi pressure can not be maintained the following shall be done:
 1. If the pressure decrease is due to a surface leak in the equipment installed by the CONTRACTOR, the CONTRACTOR shall repair the leak at his own expense and rerun the pressure test at no cost to the OWNER.

END OF SECTION

INFLATABLE PACKER TESTING

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. This section covers the work, materials, and equipment necessary for performing packer tests, complete.
- B. While drilling the 12-inch diameter pilot hole intervals of EW-1 between 1,250 and 1,650 feet, a minimum two and up to four inflatable packer tests shall be performed. While drilling the 12-inch diameter pilot hole intervals of EW-1 between 1,650 and 2,900 feet in depth, a minimum of four and up to eight inflatable packer tests may be performed. While drilling the 12-inch diameter pilot hole intervals of DZMW-1 between 925 and 1,900 feet, a minimum two and up to four inflatable packer tests shall be performed.

PART 2 - PRODUCTS

2.01 PACKER

- A. Furnish and install a dual-seal, open-hole packers of a diameter appropriate for the size of hole drilled. Large diameter packer or packer sleeves may be necessary to test large diameter portions of the borehole.
- B. Packers shall be run on drill pipe or tubing having a minimum inside diameter of 6 inches from the surface to the appropriate testing depths.
- C. Furnish drill pipe or tubing and all required fittings for running and setting the packer to the maximum depth of the well and for packer element separations of from 20 to 50 feet in 2-foot increments, and as specified by manufacturer.
- D. Provide water level or pressure transducers and data logger such as Insitu Hermit 3000 or equal to monitor water levels in the drill string. Pressure transducers shall be placed inside the drill pipe just above the pump and in the annulus above the packer.

2.02 SUBMERSIBLE PUMP AND FITTINGS

- A. Provide two 4-inch submersible pumps and piping capable of being set a minimum of 120 feet below the water level inside the drill pipe. One pump shall have a capacity of not less than 100 gpm at a total head of 140 feet, and the other not more than 10 gpm at a total head of 140 feet.
- B. Provide pump discharge with 2-inch throttling valve to regulate flow from 10 to 100 gpm, and a calibrated volumetric turbine meter.

PART 3 - EXECUTION

3.01 GENERAL

A. Run the packer tests in the intervals selected by the CONSULTANT as follows:

1. Set packer assembly to the deepest interval selected for testing and open ports between packer at the test interval. The test interval shall be fully developed until free of drilling fluids and is producing representative formation water to the satisfaction of the CONSULTANT.
2. Install submersible pump selected by the CONTRACTOR to a depth of up to 120 feet below the water level inside the tubing or drill pipe.
3. Prior to commencing each packer test background water level data will be collected. The CONTRACTOR shall run a preliminary test to confirm that the packer has seated and that all equipment is functioning properly. Preliminary testing shall be run for 30 minutes.
4. A packer test shall consist of a minimum 2-hour background period (or until water level in the test interval have stabilized), pumping test lasting approximately 4 hours in duration or for a long enough period to purge one drill pipe volume from the test interval, whichever is greater, and a 2-hour recovery period.
5. Just prior to the completion of the pumping portion of the packer test, collect water quality sample in accordance with WATER QUALITY TESTING Section.
6. After the recovery period, remove pump and water level measuring device, deflate packers and reset at next upper interval and repeat packer testing as per above.
7. Data from the water level measuring device must be recorded continuously and given to the CONSULTANT in an electronic ASCII format.
8. The CONTRACTOR shall be solely responsible for the data logging. The CONTRACTOR shall provide an electronic copy of the raw data in a format acceptable to the CONSULTANT.
9. In the event of test failure for any cause, including loss or non-recording of data, the CONTRACTOR shall repeat the test at his own cost.

10. The costs for the packer tests shall include an average of 24 hours of development time per test.

END OF SECTION

CORE SAMPLING

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. This section covers the work necessary to drill core samples, complete.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Provide all materials and equipment necessary for drilling, collecting, and storing the core samples as specified.

2.02 CORE BARREL AND BIT

- A. The core barrel and bit shall be of the appropriate sizes to recover 4-inch diameter cores. The length of the core barrel shall be a minimum of 10 feet.

2.03 CORE BOXES

- A. Cores shall be stored in sturdy wooden boxes of the proper size for the diameter of core collected. Each core box shall hold no more than 10 feet of 4-inch core.

PART 3 - EXECUTION

3.01 GENERAL

- A. A minimum of six and up to eight 4-inch diameter cores each 10 feet in length shall be taken during the drilling of the EW-1 pilot hole between 1,650 and 2,900 feet in depth.
- B. The exact depths and length of the interval to be cored may be changed by the CONSULTANT based on subsurface conditions.
- C. Cores shall be stored at the site until completion of the work in sturdy wooden boxes of the proper size. All boxes shall be clearly and permanently labeled with the depth, the top, and the bottom of the core.
- D. The CONTRACTOR shall not be paid for cores with less than 50 percent recovery.
- E. The CONSULTANT will select up to three samples from each core on which the CONTRACTOR shall have laboratory analyses conducted to determine vertical and horizontal permeability, porosity, specific gravity, Young's Modulus, and

compressive strength. The CONTRACTOR shall submit the name of the laboratory and test methods for review to the CONSULTANT before analyses.

- F. Upon completion of exploratory well construction, cores shall be packed and shipped to the Florida Geological Survey or other agency as directed by the Construction Permit.

END OF SECTION

ACCEPTANCE CRITERIA

PART 1 - GENERAL

1.01 WELL ACCEPTANCE CRITERIA

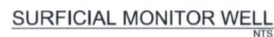
- A. All casing installed shall be plumb and true to line per AWWA-6 and these specifications. The deepest anticipated finished well depth may be 3,500-ft.
- B. All boreholes shall be constructed so they are straight. The maximum allowable inclination from vertical at any portion of a hole or survey point shall be one degree; the maximum allowable difference between any two successive survey points shall be 0.5 degrees. No doglegs will be permitted. Reamed holes shall continuously track pilot holes.
- C. All casing, screens, grout, gravel packs, bridge plugs, and sand caps shall be set to the depths directed by the ENGINEER. Alternative depths suggested by the CONTRACTOR because of alignment, equipment problems or failure to set the casing to the depth selected by the ENGINEER will not be given consideration.
- D. The 24-inch diameter injection casing and annulus between the 18-inch diameter injection tubing and 24-inch diameter injection casing shall be pressure tested to 150 psi. No pressure change of plus or minus five percent is allowed in 60 minutes. The test shall be repeated under controlled conditions to the satisfaction of the ENGINEER and regulatory agency.
- E. The injection well shall satisfy the FDEP construction permit, the rules of 62-528, F.A.C. and approved modifications to the FDEP well construction permit.
- F. No payment for the well will be due if the CONTRACTOR fails to meet all of the above requirements.

Guarantee

The guarantee for injection wells and other wells is normally one year from the date of final acceptance by the OWNER. This could result in the guarantee expiring before the well is brought into service.

END OF SECTION

1. ALL CASING SHALL BE NEW AND UNUSED CARBON STEEL PIPE, AND SHALL CONFORM WITH THE LATEST REVISION OF ASTM 139, GRADE B. THE FINAL CASING STRING OF THE EXPLORATORY WELL AND 16-INCH DIAMETER CASING OF THE MONITOR WELL SHALL BE SEAMLESS AND SHALL CONFORM TO ASTM A53, AND/OR API 5L, GRADE B LATEST REVISION.
2. SURFICIAL MONITOR WELLS TOP OF CASING TO BE COMPLETED APPROXIMATELY 2 FEET ABOVE EXISTING GRADE.
3. DUAL-ZONE MONITOR WELL TO BE COMPLETED WITH TOP OF 24", 16" AND 6-5/8" CASINGS AT AN ELEVATION OF APPROXIMATELY 28' NAVD 88
4. EXPLORATORY WELL EW-1 TO BE COMPLETED WITH TOP OF 24", 16" AND 6-5/8" CASINGS AT AN ELEVATION OF APPROXIMATELY 28' NAVD 88.



NOTE:
PROPOSED CASING DEPTHS ARE APPROXIMATE
AND SUBJECT TO CHANGE DUE TO FIELD CONDITIONS

David Haly
P.E. 42595 4/16/09

DESIGN					 David McNabb, PG President McNabb Hydrogeologic Consulting, Inc. 601 Heritage Drive, Suite 110 Jupiter, Florida 33456 904/881-6763 • Fax 904/516-1235-69 • dmcnabb@mhcnab.com	HOLTZ CONSULTING ENGINEERS, INC. 50 SOUTH US HIGHWAY ONE, SUITE 209 FORT LAUDERDALE, FLORIDA 33407 PH: (954) 375-3000	DAVID F. HOLTZ, P.E., BOEE License No:	FPL TURKEY POINT EXPLORATORY WELL UNITS 6 & 7	WELL PROFILES	SHEET 1 DWG - DATE AUGUST 2008 PROJ -
DR										
CHK										
APVD										
	NO.	DATE	REVISION	BY	APVD					



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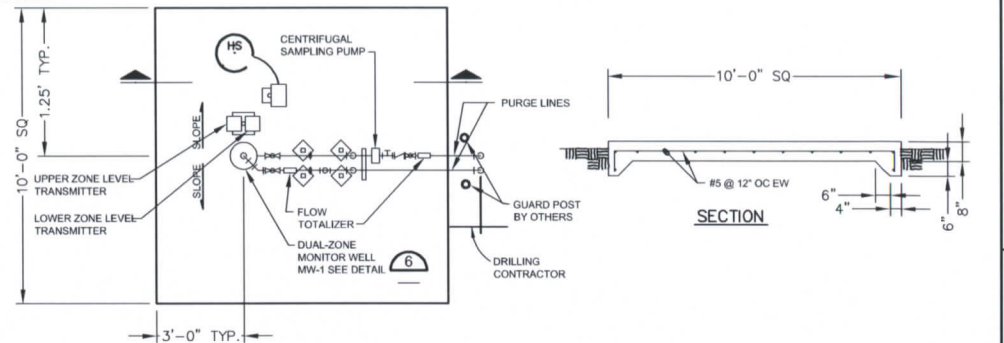


DSGN						 David McNabb, PG President McNabb Hydrogeologic Consulting, Inc. 803 Heritage Oaks, Suite 110 Jupiter, Florida 33450 561.881.0763 • Fax 561.851.6233 • dmcnabb@mhccorp.com	HOLTZ CONSULTING ENGINEERS, INC. 50 SOUTH US HIGHWAY ONE, SUITE 209 JUPITER, FLORIDA 33477 PH: (888) 378-2600	DAVID F. HOLTZ, P.E., BOEE License No:	FPL TURKEY POINT EXPLORATORY WELL PROJECT	EXPLORATORY WELL HEAD	SHEET 2
DR					DWG -						
CHK					DATE AUGUST 2008						
APVD					PROJ -						
	NO.	DATE	REVISION	BY	APVD						

1. SUBSURFICABLE PUMP SHALL BE 316 SST GRUFSH OR EQUAL. APPROXIMATE SIZE 1/2 TO 1 HP FINAL SIZE TO BE DETERMINED BASED ON FIELD CONDITIONS. ASSUME PUMP SET 100' DEEP.

2. CENTRIFUGAL SAMPLING PUMP SHALL BE SELF PRIMING HORIZONTAL END SUCTION TYPE BRONZE CONSTRUCTION W/ 316 SST SHAFT. PUMP SHALL BE GORMAN-RUPP OR EQUAL. APPROXIMATE SIZE 1/2 TO 1 HP, 460V AC, THREE PHASE. FINAL SIZE TO BE DETERMINED BASED ON FIELD CONDITIONS.

3. ALL PIPING AND FITTINGS ABOVE PAD LEVEL TO BE 316 SST. UNDERGROUND DISCHARGE PIPING TO BE SCH 40 PVC.



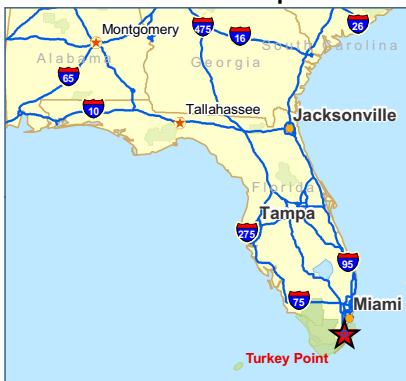
USGN						MHC David McNabb, PG President	HOLTZ CONSULTING ENGINEERS, INC. 80 SOUTH US HIGHWAY ONE, SUITE 209 JUPITER, FLORIDA 33477 (561) 775-2058	DAVID F. HOLTZ, P.E., BOGE	FPL TURKEY POINT EXPLORATORY WELL PROJECT	DUAL-ZONE ANNULAR TANK WELLHEAD AND ANNULAR TANK	SHEET 3
DR											DWG -
CHK											DATE AUGUST 2008
APVD	NQ	DATE	REVISION		BY	APVD	961-881-2782 • Fax 961-881-6233-6888 • dmcnabb@holtzinc.com	License No:			PROJ.

Attachment C

Preliminary Site Plan

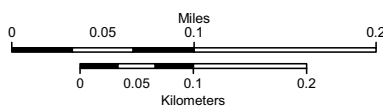


Overview Map



Turkey Point Units 6 & 7 Plant Area

- Well Locations
- Proposed Area for Additional UIC Wells
- Turkey Point Units 6 & 7 Plant



GIS Map Code: US-TURK-000039-R000E
 Coordinate System: State Plane, Florida East FIPS 0901
 Horizontal Datum: North American Datum 1983
 Vertical Datum: North American Vertical Datum 1988

Attachment D

FRP Cut-Sheet and Positive- Seal Packer Drawing



FUTURE PIPE INDUSTRIES, INC.

RED BOX 1250

FIBERGLASS TUBING, CASING, AND LINERS
AROMATIC AMINE CURED EPOXY RESIN

Maximum service temperature is 212° F (100 ° C) **

DIMENSIONAL SPECIFICATIONS

February 2005

Nominal Size (inches)	Nominal I.D. (inches)	Minimum Drift Dia (inches)	Nominal O.D. (inches)	Nominal Wall (inches)	Pin Upset O.D. (inches)	Max Box OD* (inches)	Nominal Weight		Connection Type API 5B, Table 14*, 7**, 6*** Fourteenth Edition August 96
							(lbs/ft)	(lbs/ft)	
2-3/8	2.00	1.91	2.21	0.10	2.69	3.45	0.7	21	2-3/8" 8Rd EUE Long*IJ
2-7/8	2.47	2.37	2.73	0.13	3.19	3.95	1.0	31	2-7/8" 8Rd EUE Long*IJ
3-1/2	3.00	2.90	3.30	0.15	3.85	4.84	1.5	44	3-1/2" 8Rd EUE Long*IJ
4	3.33	3.24	3.68	0.17	4.35	5.17	2.0	61	4" 8Rd EUE Long* TC
4-1/2	3.98	3.89	4.40	0.21	4.85	5.77	2.5	76	4-1/2" 8Rd EUE Long*IJ
5-1/2	4.42	4.33	4.87	0.23	5.60	6.70	3.2	97	5-1/2" 8Rd Csg Long**IJ
6-5/8	5.43	5.33	5.97	0.27	6.73	7.98	4.8	144	6-5/8" 8Rd Csg Long**IJ
7	6.21	6.11	6.83	0.31	7.10	8.61	5.8	173	7" 8Rd Csg Long**IJ
7-5/8	6.21	6.11	6.83	0.31	7.73	9.35	6.4	192	7-5/8" 8Rd Csg Long**IJ
9-5/8	7.84	7.75	8.63	0.40	9.73	11.81	10.3	309	9-5/8" 8Rd Csg*** IJ
10-3/4	8.85	8.76	9.76	0.45	10.85	13.12	13.1	394	10-3/4" 8Rd Csg***IJ
11-3/4	10.72	10.62	11.70	0.49	11.93	14.00	16.4	491	11-3/4" 8/6Rd Csg***TC
13-3/8	11.97	11.87	13.06	0.55	13.55	15.20	20.7	621	13-3/8" 8/6Rd Csg***TC
16	14.48	14.39	15.80	0.66	16.23	18.65	30.0	900	16" 6Rd Csg TC
18	16.60	16.50	18.11	0.76	18.74	22.30	40.8	1,223	18" 6Rd Csg TC
20	17.98	17.89	19.62	0.82	20.10	24.00	46.9	1,406	20" 6Rd Csg TC

*Depending on the application, smaller maximum box diameters are available.

Thread lengths may exceed API L4

PERFORMANCE AND RATINGS (-60 deg F to +150 deg F **)

30 ft Standard Joint Length

Nominal Size	Internal Pressure Rating (psi)	Mill Test Pressure (psi)	Collapse Rating (psi)	Axial Tension Rating (lbs)	Stretch vs Tension-Over-Pipe-Wt Stretch (ft) = Coeff. x P x L
2-3/8	1,250	1,570	640	10,500	0.467
2-7/8	1,250	1,570	670	16,000	0.295
3-1/2	1,250	1,570	600	22,500	0.221
4	1,250	1,570	640	29,000	0.169
4-1/2	1,250	1,570	640	41,000	0.118
5-1/2	1,250	1,570	600	49,500	0.101
6-5/8	1,250	1,570	590	72,500	0.069
7	1,250	1,570	590	76,500	0.052
7-5/8	1,250	1,570	590	86,500	0.052
9-5/8	1,250	1,570	580	140,500	0.033
10-3/4	1,250	1,570	600	161,500	0.025
11-3/4	1,250	1,570	450	103,500	0.029
13-3/8	1,250	1,570	450	129,000	0.023
16	1,250	1,570	450	167,000	0.016
18	1,250	1,570	450	194,000	0.012
20	1,250	1,570	450	208,000	0.010

Where: P = Tensile Load (1,000 lbs)

L = String Length (1,000 ft)

MECHANICAL & PHYSICAL PROPERTIES

TUBING/CASING BODY PROPERTIES	UNIT	VALUE	VALUE	TEST METHOD
		2-3/8 - 10-3/4	11-3/4 - 20	
Tensile Strength, Hoop	psi	31,300	31,300	ASTM D1599
Tensile Strength, Axial	psi	30,000	12,000	ASTM D2105
Modulus of Elasticity, Axial	10E+06 psi	3.0	2.0	ASTM D2105
Specific Gravity	---	1.9	1.9	ASTM D792
Density	lbs/in ³	0.07	0.07	ASTM D792
Thermal Conductivity	Btu/hr/ft ² /in/degF	2.4	2.4	ASTM C177
Thermal Expansion Coefficient (Linear)	10E-05in/in/degF	1.1	1.2	ASTM D696
Flow Factor	---	150	150	Hazen Williams

** De-rating required for service temperatures above 150° F (65 ° C) - Maximum service temperature is 212° F (100 ° C)

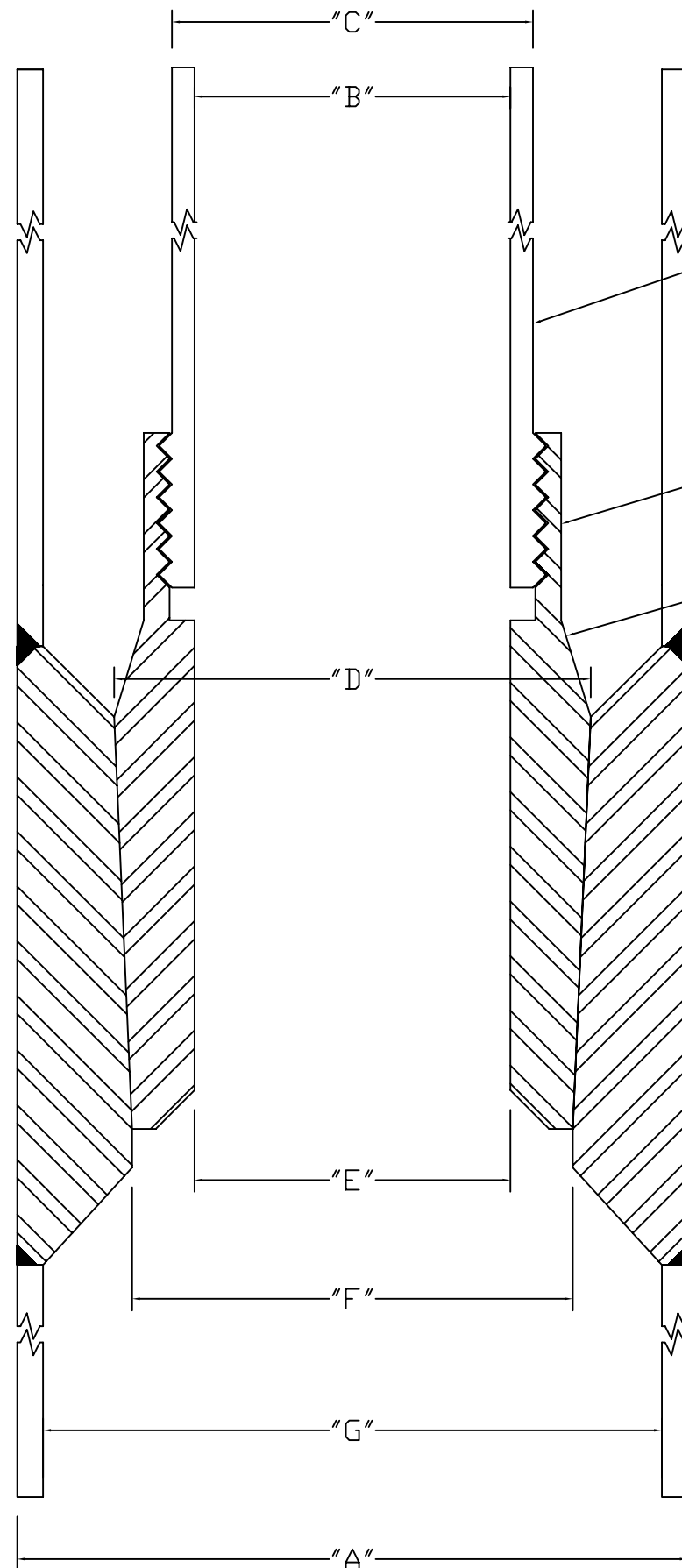


RED BOX CASING & TUBING SYSTEM



YELLOW BOX LINE PIPE SYSTEM

11811 Proctor Road, Houston, Texas 77038 Tel: 281-847-2987 Fax: 281-847-1931 sales@Future-Pipe.com



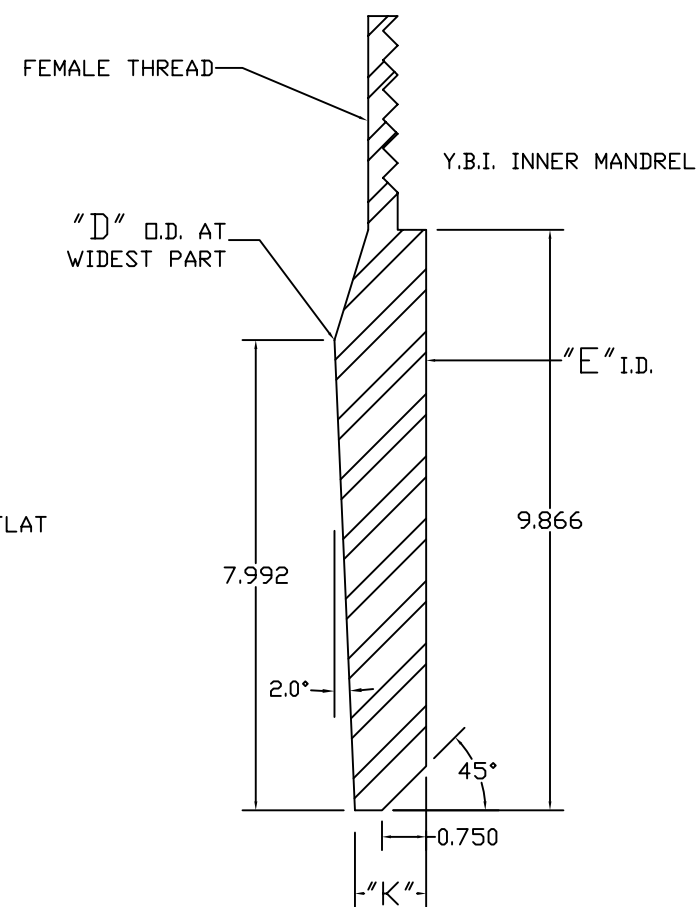
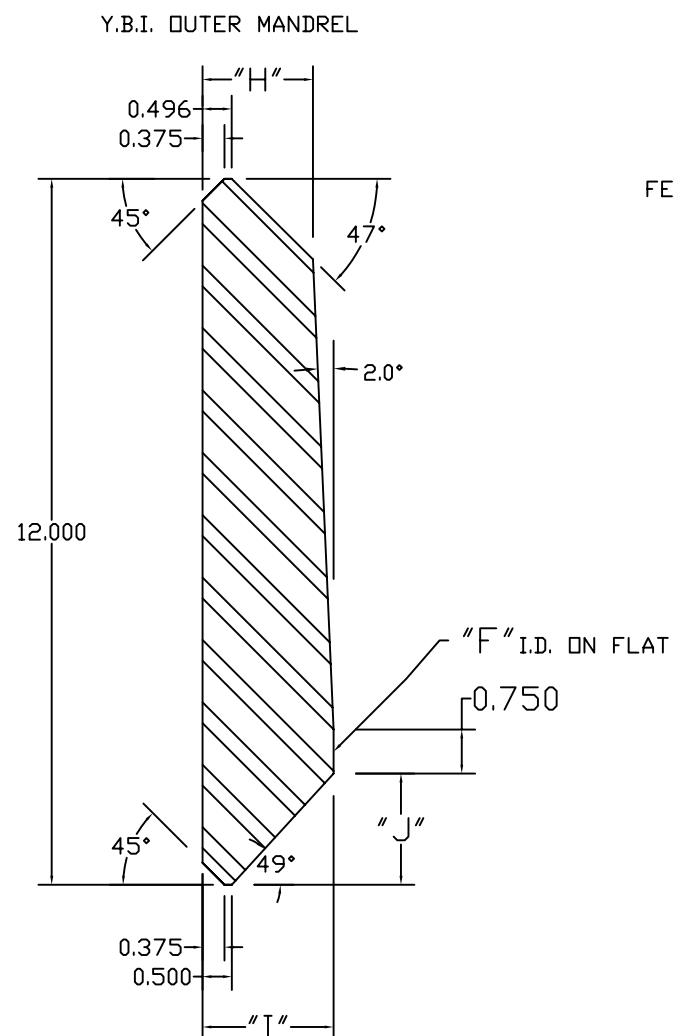
NOTE: ABOVE DIAMETERS ARE NOT TO SCALE

1250 RED BOX FRP TUBING

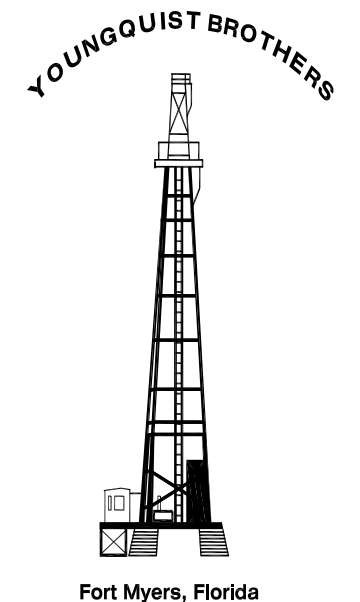
0.500-INCH WALL THICKNESS ASTM A53 GRADE B STEEL INJECTION CASING

COUPLING

Y.B.I. POSITIVE SEAL PACKER INNER MANDREL



PACKER SIZE	CASING NOMINAL O.D. "A"	FRP NOMINAL I.D. "B"	FRP O.D. "C"	INNER MANDREL O.D. "D"	INNER MANDREL I.D. "E"	OUTER MANDREL I.D. "F"	CASING I.D. "G"	"H"	"I"	"J"	"K"
7-5/8	12	6.21	7.21	9.75	6.21	9.192	11	1.069	1.404	1.040	1.491
9-5/8	14	7.84	8.84	11.27	7.84	10.712	13	1.328	1.644	1.316	1.436
10-3/4	16	8.85	9.85	13.27	8.85	12.712	15	1.328	1.644	1.316	1.931
11-3/4	18	10.72	11.72	13.75	10.72	13.192	17	2.150	2.404	2.190	1.236
13-3/8	18	11.97	12.97	14.896	11.97	14.338	17	1.530	1.831	1.531	1.184
16	20	14.48	15.48	17.25	14.48	16.692	19	1.339	1.654	1.328	1.106
18	24	16.50	17.50	21.618	16.50	21.060	23	1.140	1.470	1.116	2.280
21	26	17.98	18.98	22.242	17.98	21.684	25	1.884	2.158	1.907	1.852



Y.B.I. POSITIVE SEAL PACKER	
FPL	
JOB # 268126	
DRAWN BY: PAUL MCCOLLERS	DRAWN ON: DECEMBER 28, 2004
SCALE: NONE	SHEET 1 of 1
ALL DIMENSIONS ARE IN INCHES	

Attachment E
Baracor 100 MSDS

MATERIAL SAFETY DATA SHEET

Product Trade Name: **BARACOR™ 100**

Revision Date: 02-Jan-2007

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: BARACOR™ 100
Synonyms: None
Chemical Family: Blend
Application: Corrosion Inhibitor

Manufacturer/Supplier Baroid Drilling Fluids
a Product Service Line of Halliburton Energy Services, Inc.
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By Chemical Compliance
Telephone: 1-580-251-4335

2. COMPOSITION/INFORMATION ON INGREDIENTS

SUBSTANCE	CAS Number	PERCENT	ACGIH TLV-TWA	OSHA PEL-TWA
Nitrilotriacetic acid, trisodium salt monohydrate	5064-31-3	1 - 5%	Not applicable	Not applicable
Methanol	67-56-1	10 - 30%	200 ppm	200 ppm (S)

3. HAZARDS IDENTIFICATION

Hazard Overview May cause eye, skin, and respiratory irritation. May cause headache, dizziness, and other central nervous system effects. May be fatal if swallowed. May cause blindness. May be absorbed through the skin. Repeated overexposure may cause liver and kidney effects. Flammable.

4. FIRST AID MEASURES

Inhalation If inhaled, remove to fresh air. If not breathing give artificial respiration, preferably mouth-to-mouth. If breathing is difficult give oxygen. Get medical attention.

Skin In case of contact, immediately flush skin with plenty of soap and water for at least 15 minutes. Get medical attention. Remove contaminated clothing and launder before reuse.

Eyes In case of contact, or suspected contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention immediately after flushing.

Ingestion	If swallowed, induce vomiting immediately by giving two glasses of water and sticking fingers down throat; never give anything to an unconscious person. Get medical attention.
-----------	---

Notes to Physician	Not Applicable
--------------------	----------------

5. FIRE FIGHTING MEASURES

Flash Point/Range (F):	92
Flash Point/Range (C):	33
Flash Point Method:	PMCC
Autoignition Temperature (F):	Not Determined
Autoignition Temperature (C):	Not Determined
Flammability Limits in Air - Lower (%):	6
Flammability Limits in Air - Upper (%):	36

Fire Extinguishing Media	Water fog, carbon dioxide, foam, dry chemical.
--------------------------	--

Special Exposure Hazards	May be ignited by heat, sparks or flames. Use water spray to cool fire exposed surfaces. Closed containers may explode in fire. Decomposition in fire may produce toxic gases. Runoff to sewer may cause fire or explosion hazard.
--------------------------	--

Special Protective Equipment for Fire-Fighters	Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.
--	--

NFPA Ratings:	Health 2, Flammability 3, Reactivity 0
HMIS Ratings:	Flammability 3, Reactivity 0, Health 2

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures	Use appropriate protective equipment. Wear self-contained breathing apparatus in enclosed areas.
---------------------------------	--

Environmental Precautionary Measures	Prevent from entering sewers, waterways, or low areas.
--------------------------------------	--

Procedure for Cleaning / Absorption	Isolate spill and stop leak where safe. Remove ignition sources and work with non-sparking tools. Contain spill with sand or other inert materials. Scoop up and remove.
-------------------------------------	--

7. HANDLING AND STORAGE

Handling Precautions	Avoid contact with eyes, skin, or clothing. Avoid breathing vapors. Wash hands after use. Launder contaminated clothing before reuse. Ground and bond containers when transferring from one container to another.
----------------------	---

Storage Information	Store away from oxidizers. Keep from heat, sparks, and open flames. Keep container closed when not in use. Product has a shelf life of 24 months.
---------------------	---

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls	Use in a well ventilated area. Local exhaust ventilation should be used in areas without good cross ventilation.
----------------------	--

Respiratory Protection	Positive pressure self-contained breathing apparatus if methanol is released.
------------------------	---

Hand Protection	Impervious rubber gloves.
-----------------	---------------------------

Skin Protection	Rubber apron.
-----------------	---------------

Eye Protection Chemical goggles; also wear a face shield if splashing hazard exists.

Other Precautions Eyewash fountains and safety showers must be easily accessible.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Liquid
Color:	Brown
Odor:	Alcohol
pH:	9-11
Specific Gravity @ 20 C (Water=1):	1.01
Density @ 20 C (lbs./gallon):	8.4
Bulk Density @ 20 C (lbs/ft3):	Not Determined
Boiling Point/Range (F):	212
Boiling Point/Range (C):	100
Freezing Point/Range (F):	-9
Freezing Point/Range (C):	-23
Vapor Pressure @ 20 C (mmHg):	Not Determined
Vapor Density (Air=1):	> 1
Percent Volatiles:	Not Determined
Evaporation Rate (Butyl Acetate=1):	1.6
Solubility in Water (g/100ml):	Soluble
Solubility in Solvents (g/100ml):	Not Determined
VOCs (lbs./gallon):	Not Determined
Viscosity, Dynamic @ 20 C (centipoise):	35
Viscosity, Kinematic @ 20 C (centistrokes):	Not Determined
Partition Coefficient/n-Octanol/Water:	-0.84 (OECD117)
Molecular Weight (g/mole):	Not Determined

10. STABILITY AND REACTIVITY

Stability Data:	Stable
Hazardous Polymerization:	Will Not Occur
Conditions to Avoid	Keep away from heat, sparks and flame.
Incompatibility (Materials to Avoid)	Strong oxidizers.
Hazardous Decomposition Products	Ammonia. Oxides of nitrogen. Carbon monoxide and carbon dioxide.
Additional Guidelines	Not Applicable

11. TOXICOLOGICAL INFORMATION

Principle Route of Exposure	Eye or skin contact, inhalation.
Inhalation	May cause respiratory irritation. May cause central nervous system depression including headache, dizziness, drowsiness, incoordination, slowed reaction time, slurred speech, giddiness and unconsciousness.
Skin Contact	May cause skin irritation. May be absorbed through the skin and produce effects similar to those caused by inhalation and/or ingestion.
Eye Contact	Causes severe eye irritation May cause eye burns.

Ingestion	May be fatal or cause blindness if swallowed. May produce nervous system effects such as feeling of weakness, unsteady walk, and dilation of blood vessels.
Aggravated Medical Conditions	Skin disorders. Eye ailments.
Chronic Effects/Carcinogenicity	Prolonged or repeated exposure may cause eye, blood, lung, liver, kidney, heart, central nervous system and spleen damage.
Other Information	None known.
Toxicity Tests	
Oral Toxicity:	LD50: 3500 mg/kg (Rat)
Dermal Toxicity:	LD50: > 3000 mg/kg (Rabbit)
Inhalation Toxicity:	Not determined
Primary Irritation Effect:	Not determined
Carcinogenicity	Not determined
Genotoxicity:	Not determined
Reproductive / Developmental Toxicity:	Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air)	Not determined
Persistence/Degradability	BOD(28 Day): 10% of COD
Bio-accumulation	Not Determined

Ecotoxicological Information

Acute Fish Toxicity:	Not determined
Acute Crustaceans Toxicity:	TLM48: 402.5 mg/l (Daphnia magna)
Acute Algae Toxicity:	Not determined
Chemical Fate Information	Not determined
Other Information	Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method	Disposal should be made in accordance with federal, state, and local regulations.
Contaminated Packaging	Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT

Flammable Liquid, N.O.S., 3, UN1993, III, (33.3 C)
(Contains Methanol)
NAERG 128

Canadian TDG

Flammable Liquid, N.O.S.(Contains Methanol), 3, UN1993, III, (33.3 C)

ADR

UN1993,Flammable Liquid, N.O.S.(Contains Methanol), 3, III

Air Transportation**ICAO/IATA**

UN1993,Flammable Liquid, N.O.S., 3, III
(Contains Methanol Solution)

Sea Transportation**IMDG**

UN1993,Flammable Liquid, N.O.S.(Contains Methanol), 3, III, (33.3 C)
EmS F-E, S-E

Other Shipping Information

Labels: Flammable Liquid

15. REGULATORY INFORMATION**US Regulations**

US TSCA Inventory All components listed on inventory.

EPA SARA Title III Extremely Hazardous Substances Not applicable

EPA SARA (311,312) Hazard Class Acute Health Hazard
Chronic Health Hazard
Fire Hazard

EPA SARA (313) Chemicals This product contains toxic chemical(s) listed below which is(are) subject to the reporting requirements of Section 313 of Title III of SARA and 40 CFR Part 372:
Methanol//67-56-1

EPA CERCLA/Superfund Reportable Spill Quantity For This Product EPA Reportable Spill Quantity is 2380 Gallons based on Methanol (CAS: 67-56-1).

EPA RCRA Hazardous Waste Classification If product becomes a waste, it does meet the criteria of a hazardous waste as defined by the US EPA, because of:

Ignitability D001

California Proposition 65 The California Proposition 65 regulations apply to this product.

MA Right-to-Know Law One or more components listed.

NJ Right-to-Know Law One or more components listed.

PA Right-to-Know Law One or more components listed.

Canadian Regulations

Canadian DSL Inventory	All components listed on inventory.
WHMIS Hazard Class	B2 Flammable Liquids D1A Very Toxic Materials D2A Very Toxic Materials D2B Toxic Materials

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

Additional Information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

*****END OF MSDS*****

Attachment F

Proposed Monitoring Plan

FPL Turkey Point Power Plant Deep Injection Well System Proposed Monitoring Program		
Monitoring Station	Parameter	Frequency
Injection Well	Primary/Secondary DWS/Minimum Criteria* Flowrate Wellhead Pressure Annulus Pressure	Prior to Start-up Continuous Continuous Continuous
DZMW-1 both monitoring zones	Primary/Secondary DWS/ Minimum Criteria* Water Level referenced to NAVD 88 Specific Conductivity pH Chloride Temperature Total Dissolved Solids (TDS) Total Phosphorous Sulfate Sodium Calcium Magnesium Potassium Carbonate Bicarbonate Gross Alpha Radium-226 Radium-228	Prior to Start-up Continuous Weekly* Weekly* Weekly* Weekly* Weekly* Weekly* Weekly* Weekly* Weekly* Weekly* Weekly* Weekly* Weekly* Monthly** Monthly** Monthly**
Wastestream	Total Dissolved Solids Chloride Specific Conductivity pH Temperature	Weekly* Weekly* Weekly* Weekly* Weekly*
DWS - Drinking Water Standards *Frequency decreased to monthly following operational testing and Department approval ** Frequency decreased to quarterly following operational testing and Department approval		

Note: The above monitoring program is proposed to be utilized following conversion of exploratory well EW-1 to Class I deep injection well IW-1.

*Minimum Criteria = Municipal Wastewater Minimum Criteria Ground Water Monitoring Parameters.

Attachment G

Plugging and Abandonment Plan

Plugging and Abandonment Procedures and Cost Estimate for FPL Turkey Point Exploratory Well and Dual-Zone Monitor Well

EW-1

1. Stop artesian flow from well with brine solution to lower the hydrostatic head below land surface. Conduct a caliper log of the entire well.
2. Remove FRP tubing from EW-1.
3. Place limestone gravel with an average diameter not larger than one inch down exploratory well to fill the open hole from the bottom of the well up to approximately 20 feet below the base of the final casing.
4. Place neat cement, through grout pipe, from approximately 20 feet below the base of the casing of EW-1 to land surface.

Cost Estimate for EW-1 in 2008 Dollars

	<u>EW-1</u>
Mobilize drill rig and kill EW-1	\$ 100,000
Remove FRP tubing	\$ 60,000
Fill the open hole of EW-1 with gravel to 20 feet below base of the 24-inch casing, approximately 58 cubic yards at \$50/yd	\$ 2,900
Place neat cement through grout pipe from 20 feet below base of the 24-inch casing of EW-1 to land surface, 8,424 cubic feet at \$30/cubic foot.	\$ 252,720
Estimated Cost for EW-1 P&A	\$ 415,620
20% Contingency	\$ 83,124
Total Estimated Cost for EW-1 P&A with Contingency	\$ 498,744

**Plugging and Abandonment Procedures and Cost Estimate for FPL Turkey Point Exploratory
Well and Dual-Zone Monitor Well**

DZMW-1

1. Stop artesian flow from both monitor zones with brine solution to lower the hydrostatic head below land surface.
2. Place neat cement in the deep monitoring zone through grout pipe from 1,870 feet bls to land surface.
3. Place neat cement in the upper monitoring zone through grout pipe from 1,420 feet bls to land surface.

Cost Estimate for DZMW-1 in 2008 Dollars

	<u>DZMW-1</u>
Mobilize drill rig to DZMW-1	\$ 50,000
Place neat cement in deep monitoring zone of DZMW-1 through grout pipe from 1,870 feet bls to land surface, 314 cubic feet at \$30/cubic foot	\$ 9,420
Place neat cement in DZMW-1 annulus through grout pipe, in stages, from 1,420 feet bls to land surface, 1,467 cubic feet at \$30/cubic foot	\$ 44,010
Total Estimated Cost for DZMW-1 P&A	\$ 103,430
20% Contingency	\$ 20,686
Total Estimated Cost for DZMW-1 P&A with Contingency	\$ 124,116
Total Estimated Cost for EW-1 and DZMW-1 P&A	\$ 622,860

Date Estimate Prepared: December 18, 2008



APPENDIX 10.2.8.2

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION



FPLNNP-09-0376

May 28, 2009

Mr. Joe May, P.G.
Florida Department of Environmental Protection
400 N. Congress Ave, Suite 200
West Palm Beach, FL 33401

**RE: FDEP Request for Information
Florida Power & Light Company Turkey Point Units 6 & 7
Construction Permit Application for a Class V Exploratory Well and
Associated Dual-Zone Monitor Well**

Dear Mr. May:

Florida Power & Light Company (FPL) is hereby submitting a response to the Florida Department of Environmental Protection (FDEP) Request for Information (RFI) dated May 5, 2009 for the above referenced project. This response was prepared by McNabb Hydrogeologic Consulting Inc. on behalf of FPL.

Should you have any questions regarding the information, please contact me at (561) 691-7518 or Matt Raffenberg at (561) 691-2808.

Sincerely,

Barbara Linkiewicz

Director, Environmental Licensing

cc: George Heuler/FDEP-Tallahassee
Steve Anderson/SFWMD
David Holtz/Holtz Eng.
Cindy Mulkey/FDEP
Mike Halpin/FDEP
David McNabb/ McNabb Hydrogeological

Ron Reese/USGS
Nancy Marsh/USEPA
Augustine Socarris/DERM
Randall LaBauve/FPL



McNabb Hydrogeologic Consulting, Inc.

601 Heritage Drive, Suite 110
Jupiter, Florida 33458
Phone: 561-891-0763
Fax: 561-623-5468

May 18, 2009

Bechtel Power Corporation
5275 Westview Drive
Frederick, Maryland 21703-8306
Attention FPL COL
Job No. 25409
RANDY KIES - PROJECT ENGINEER

**RE: Florida Power & Light Company Turkey Point Units 6 & 7
Construction Permit Application for a Class V Exploratory Well and Associated
Dual-Zone Monitor Well
Response to Request for Information**

Dear Mr. Kies:

The purpose of this letter is to provide a response to the Florida Department of Environmental Protection (FDEP) Request for Information (RFI) dated May 5, 2009 for the above referenced project. For ease of review, each of the questions in the RFI is provided below in *italics* followed by our response.

1. *Figures - The Department needs a scaled drawing that includes the locations of wells EW-1, DZMW-1, and the planned site drilling pad. This figure should include approximate elevations and distances between wells and other structures. The figure in Attachment C does not show enough detail at the EW-1 location.*

Please see Figure 1 which provides the requested information.

2. *Attachment B, Water Quality Testing Part 2.01.B. - Sulfate should be added to the water quality parameters for the packer tests.*

The Water Quality Testing specification section has been modified to reflect that water quality samples collected at the conclusion of the pumping portion of inflatable packer testing shall be laboratory analyzed for sulfate in addition to the parameters that were already included in the parameter list. Please see the revised Water Quality Testing specification section provided in Attachment A.

3. *The section of Attachment B on Injection Tubing specifies a nominal 18-inch FRP tubing with a maximum coupling OD of 22.30 inches. The ID of the injection casing is 23 inches, leaving 0.35 inches of clearance for installation of the FRP tubing. This appears to be a very minimal clearance, even for a fluid-filled annulus. Can a tubing with a narrower coupling*

diameter be used? Has a fluid-filled annulus injection well been successfully installed with a 0.35 inches of clearance?

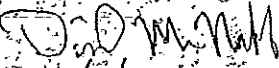
An injection tubing with a narrower coupling diameter could be used but is not desired for this well design. A narrower coupling would require a lower pressure rating for the injection tubing and/or a reduced inside diameter of the injection tubing which would reduce the desired operating injection rate of the well. Additionally, when installed, the injection tubing will be under compression in order to maintain a tight seal at the packer. A small annular space is desirable to prevent flexing of the tubing within the injection casing in order to maintain compression on the injection tubing.

Class I deep injection wells were recently designed, permitted, and constructed with a 0.175-inch annular space between the injection tubing and the final casing at the Florida Power & Light Company (FPL) West County Energy Center (WCEC). The inside diameter of the final casing of IW-1 and IW-2 at the FPL WCEC is 19-inches. The outside diameter of the injection tubing couplings is 18.65-inches. The successful installation of the FRP injection tubing at the FPL WCEC wells was demonstrated via successful annular pressure testing.

Should you have any questions regarding the information presented herein, please contact me at (561) 891-0763.

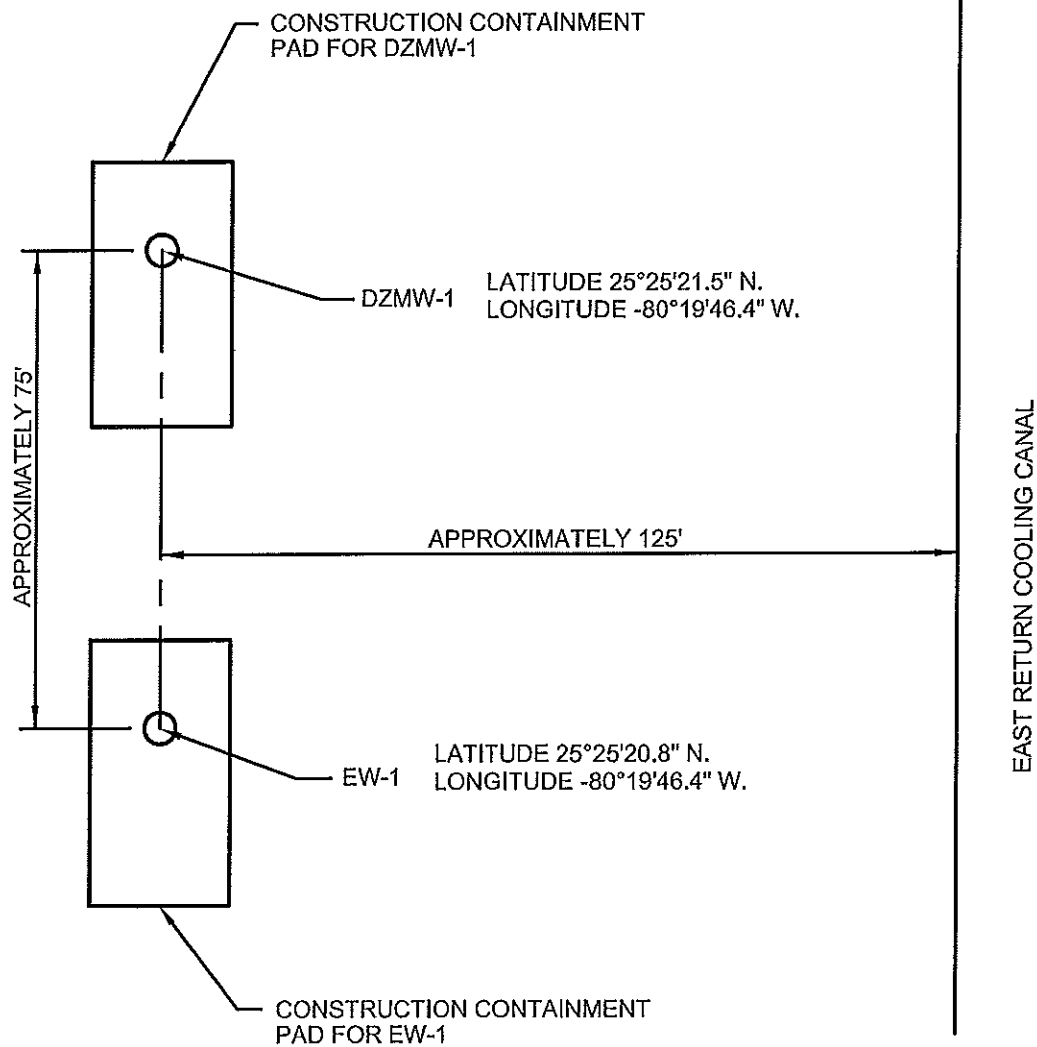
Sincerely,

McNabb Hydrogeologic Consulting, Inc.



5/17/09

David McNabb, P.G.



Note: Current elevation at proposed well location is approximately 0 feet NAVD 88. The elevation will be raised to approximately 5 feet NAVD 88 prior to well construction.



McNabb Hydrogeologic Consulting, Inc.

601 HERITAGE DRIVE, SUITE 110
Jupiter, Florida 33458
Phone 561.891.0763 • Fax 561.623.5469

FPL TURKEY POINT
EXPLORATORY WELL
UNITS 6 & 7

PRELIMINARY WELL SITE
PLAN

FIGURE 1

Attachment A

Revised Water Quality Testing Specification

WATER QUALITY TESTING

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. This Section describes the water sampling and water quality testing work to be performed under this Contract.
- B. CONTRACTOR will Contract out and pay for the services of an FDEP certified water laboratory to perform water quality testing as specified within this Contract.
- C. The CONTRACTOR shall provide the name and address of the state certified laboratory that will perform the analyses. The laboratory shall be acceptable to the CONSULTANT and OWNER.
- D. Water samples will be collected by laboratory personnel. FDEP standard operating procedures (SOPs) shall be followed.
- E. All water samples will be transported or shipped to the laboratory immediately upon collection. EPA method sampling protocols (e.g. holding times, preservatives) shall be followed.

PART 2 – PRODUCTS

2.01 WATER QUALITY SAMPLING PARAMETERS

- A. Weekly sampling of the surficial monitor wells
 - 1. Chlorides.
 - 2. Conductivity.
 - 3. Total dissolved solids (TDS) (EPA 160.1 or equal methodology).
 - 4. pH.
 - 5. Temperature.
 - 6. Water level relative to NAVD 88.
- B. At the completion of the pumping portion of each inflatable packer test, as described in INFLATABLE PACKER TESTING Section
 - 1. Chlorides.
 - 2. Conductivity.
 - 3. Total dissolved solids (TDS) (EPA 160.1 or equal methodology).
 - 4. pH.
 - 5. Temperature.
 - 6. TKN
 - 7. Ammonia
 - 8. Sulfate

- C. Final Background Analysis Upon Completion and Development of Exploratory Well EW-1, as described in the DRILLING Section:
 - 1. Primary and secondary drinking water standards and Municipal Wastewater Minimum Criteria Groundwater Monitoring Parameters (See Table 1 for complete listing).
- D. Final Background Analysis Upon Completion and Development of both monitoring zone of Dual-Zone Monitor Well DZMW-1, as described in the DRILLING Section:
 - 1. Primary and secondary drinking water standards and Municipal Wastewater Minimum Criteria Groundwater Monitoring Parameters (See Table 1 for complete listing).

PART 3 – EXECUTION

3.01 LABORATORY DUTIES

- A. Provide water quality analysis as described in PART 2, PRODUCTS, within 3 working days to allow data to be used during drilling operations.
- B. Perform background water sample collection using properly trained personnel for water samples following development of exploratory and dual-zone monitor wells.
- C. Ensure locking cap and identification label is in place at each surficial monitor well following completion of sampling.
- D. Promptly notify CONSULTANT and CONTRACTOR of any irregularities in sample(s).
- E. Weekly sampling of the surficial monitor wells shall take place the same day of each week selected by the CONSULTANT and the analytical results shall be submitted to the CONSULTANT within four day of collection.
- F. Submit 5 copies of test results immediately after completion of testing. Reports must include:
 - 1. Well identification.
 - 2. Water sample identification.
 - 3. Time and date of sample.
 - 4. Laboratory name/telephone/address/QA-QC contact person.
 - 5. Signature of inspector.
 - 6. Methods of test.
 - 7. Chain-of-custody receipts.

END OF SECTION

TABLE 1
LIST OF WATER QUALITY PARAMETERS
NEEDED FOR BACKGROUND LEVEL ANALYSIS

PRIMARY DRINKING WATER STANDARDS

PARAMETER

Alachlor (Polychlorinated Biphenyl or PCB)
Aldicarb
Aldicarb sulfoxide
Aldicarb sulfone
Aroclors (Polychlorinated Biphenyls or PCBs)
Alpha, Gross
Antimony
Arsenic
Atrazine
Barium
Benzene
Benzo(a)pyrene
Beryllium
Bis(2-ethylhexyl) adipate (Di(2-ethylhexyl) adipate)
Bis(2-ethylhexyl) phthalate (Di(2-ethylhexyl) phthalate)
Cadmium
Carbofuran
Carbon Tetrachloride (Tetrachloromethane)
Chlordane
Chlorobenzene (Monochlorobenzene)
Chloroethylene (Vinyl Chloride)
Chromium
Coliforms, Total
Cyanide
2,4-D (2,4-Dichlorophenoxyacetic acid)
Dalapon (2,2-Dichloropropionic acid)
Dibromochloropropane (DBCP)
1,2-Dibromoethane (EDB, Ethylene Dibromide)
1,2-Dichlorobenzene (o-Dichlorobenzene)
1,4-Dichlorobenzene (p-Dichlorobenzene or Para Dichlorobenzene)
1,2-Dichloroethane (Ethylene dichloride)
1,1-Dichloroethylene (Vinylidene chloride)
1,2-Dichloroethylene (cis-1,2-Dichloroethylene or trans-1,2-Dichloroethylene)
cis-1,2-Dichloroethylene (1,2-Dichloroethylene)
trans-1,2-Dichloroethylene (1,2-Dichloroethylene)
Dichloromethane (Methylene chloride)
1,2-Dichloropropane
Di(2-ethylhexyl) adipate (Bis(2-ethylhexyl) adipate)
Di(2-ethylhexyl) phthalate (Bis(2-ethylhexyl) phthalate)
Dinoseb
Diquat
EDB (Ethylene dibromide, 1,2-Dibromoethane)
Endothall
Endrin
Ethylbenzene
Ethylene dichloride (1,2-Dichloroethane)
Fluoride
Glyphosate (Roundup)
Gross Alpha
Heptachlor
Heptachlor Epoxide
Hexachlorobenzene (HCB)
gamma-Hexachlorocyclohexane (Lindane)
Hexachlorocyclopentadiene
Lead

PRIMARY DRINKING WATER STANDARDS, CONT'D

PARAMETER

Lindane (gamma-Hexachlorocyclohexane)
Mercury
Methoxychlor
Methylene chloride (Dichloromethane)
Monochlorobenzene (Chlorobenzene)
Nickel
Nitrate (as N)
Nitrite (as N)
Total Nitrate + Nitrite (as N)
Oxamyl
p-Dichlorobenzene or Para Dichlorobenzene (1,4-Dichlorobenzene)
Pentachlorophenol
Perchloroethylene (Tetrachloroethylene)
Picloram
Polychlorinated biphenyl (PCB or Aroclors)
Radium
Roundup (Glyphosate)
Selenium
Silver
Silvex (2,4,5-TP)
Simazine
Sodium
Styrene (Vinyl benzene)
Tetrachloroethylene (Perchloroethylene)
Tetrachloromethane (Carbon Tetrachloride)
Thallium
Toluene
Toxaphene
2,4,5-TP (Silvex)
1,2,4-Trichlorobenzene
1,1,1-Trichloroethane
1,1,2-Trichloroethane
Trichloroethylene (Trichloroethene, TCE)
Trihalomethanes, Total
Vinyl Chloride (Chloroethylene)
Xylenes (total)

SECONDARY DRINKING WATER STANDARDS

PARAMETER

Aluminum
Chloride
Color
Copper
Ethylbenzene
Fluoride
Foaming Agents (MBAS)
Iron
Manganese
Odor
pH
Silver
Sulfate
Toluene
Total Dissolved Solids (TDS)
Xylenes
Zinc

**MUNICIPAL WASTEWATER MINIMUM CRITERIA
GROUND WATER MONITORING PARAMETERS**

INORGANICS

Ammonia
Nitrogen (organic)
Total Kjeldahl Nitrogen
Total Phosphorus (phosphate)

VOLATILE ORGANICS

Chloroethane
Chloroform
para-Dichlorobenzene (1,4 Dichlorobenzene)
1,2-Dichloroethylene (cis-1,2-Dichloroethylene or trans-1,2-Dichloroethylene)

BASE/NEUTRAL ORGANICS

Anthracene
Butylbenzylphthalate
Dimethylphthalate
Naphalene
Phenanthrene

PESTICIDES AND PCBs

Aldrin
Dieldrin

ACID EXTRACTABLES

2-chlorophenol
Phenol
2,4,6-trichlorophenol

OTHER

Conductivity
Biological Oxygen Demand
Chemical Oxygen Demand
Temperature